FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	F 2023(150)		1
STATE	STATE DIST.	COUNTY	
TEXAS	ODA	WINKLER	
CONT.	SECT.	JOB	HIGHWAY NO.
1371	01	023	FM 1232

INDEX OF SHEETS

SEE SHEET 2

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT NO. F 2023(150)

WINKLER COUNTY
FM 1232

CSJ: 1371-01-023 LIMITS: FROM SH 302 TO SH 115

LENGTH OF ROADWAY	= 29,267.04	FT.	= 5.543 MI.
LENGTH OF BRIDGE	= 0.00	FT.	= 0.000 MI.
NET LENGTH OF PROJECT	= 29,267.04	FT.	= 5.543 MI.

FUNCTIONAL CLASSIFICATION: MAJOR COLLECTOR

DESIGN SPEED: 50 MPH (RURAL), 35 MPH (URBAN)
A.A.D.T. (2021) = 1,429
A.A.D.T. (2041) = 2,001
% TRUCK = 51.1

FINAL PLANS

CONTRACTOR: _____

LETTING DATE: _____

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED: _____

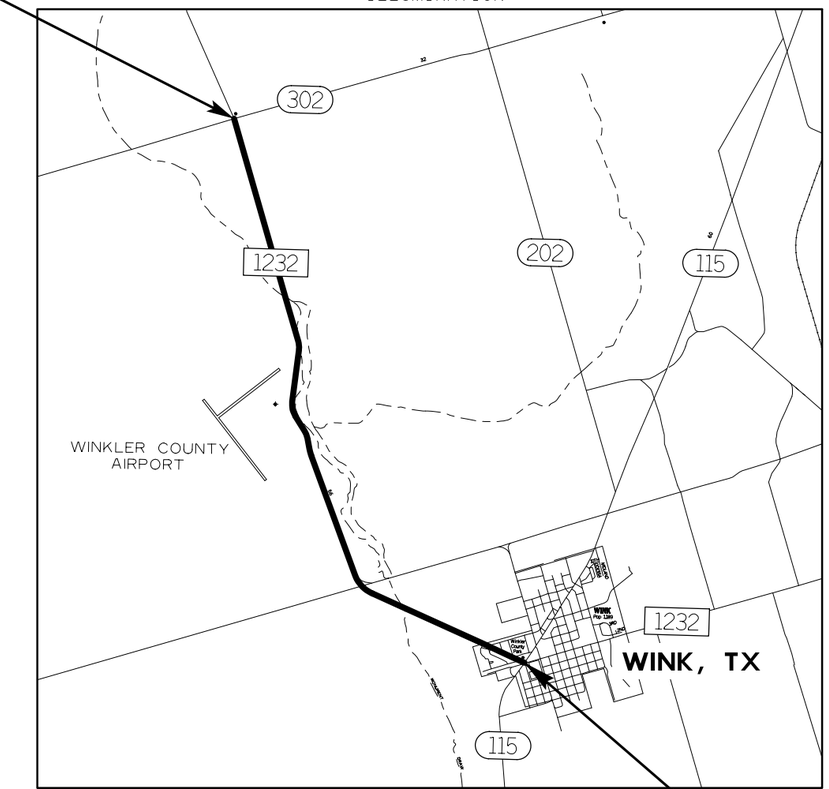
DATE WORK WAS ACCEPTED: _____

FINAL CONTRACT COST: $ _____

FOR THE CONSTRUCTION OF REHABILITATION OF EXISTING ROAD CONSISTING OF WIDENING, REWORKING EXISTING BASE MATERIAL, FLEX BASE, PAVING, DRAINAGE STRUCTURES, SIGNING, PAVEMENT MARKINGS, AND ILLUMINATION

BEGIN PROJECT
BEGIN CSJ 1371-01-023

STA 101+05.60
LAT. : 31.8154779
LONG. :-103.2031985
RM: 212+0.000



N.T.S

EXCEPTIONS: NONE
EQUATIONS: NONE
RAILROAD CROSSING: NONE

END PROJECT
END CSJ 1371-01-023

STA 393+72.64
LAT. : 31.7513106
LONG. :-103.1601333
RM: 216+1.573

OMEGA ENGINEERS, INC.
6090 SURETY DR., SUITE 104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER

PREPARED BY:

OSCAR J. GUTIERREZ, PE
PROJECT MANAGER
OMEGA ENGINEERS, INC.
FIRM # F-2147

7/17/2023
DATE

Texas Department of Transportation

SUBMITTED FOR LETTING: 7/28/2023

DocuSigned by: Joel Romero, PE
AREA ENGINEER

RECOMMENDED FOR LETTING: 8/2/2023

DocuSigned by:
DIRECTOR OF TRANSPORTATION
PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 8/2/2023

DocuSigned by: E. Z. Zyl3, PE
DISTRICT ENGINEER

NO 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 CONTRACTS (FORM FHWA 1273, JULY, 2022)

COUNTY WINKLER PROJ. NO.
HWY. NO. FM 1232 LETTING DATE
DATE ACCEPTED

PLOTTED ON: 7/17/2023 10:04:00 AM

$FILEABBREV$

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1	TITLE SHEET
2	INDEX OF SHEETS
3-5	PROJECT LAYOUT
6	EXISTING TYPICAL SECTIONS
7-12	PROPOSED TYPICAL SECTIONS
13-13F	GENERAL NOTES
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15-17	CONSOLIDATED SUMMARY
	TRAFFIC CONTROL PLAN
18	LINE DIAGRAM
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45	*TCP(2-3)-23
46	*TCP(2-8)-23
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141	*SCP-MD
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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED "*" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THE PROJECT.

STATE OF TEXAS · HORACIO FERNANDEZ · 93064 · LICENSED · PROFESSIONAL ENGINEER

H. Fernandez, P.E.

HORACIO FERNANDEZ (PE # 93064)

7/17/2023

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED "**" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THE PROJECT.

STATE OF TEXAS · JORGE L NAVARRETE · 146579 · LICENSED · PROFESSIONAL ENGINEER

JORGE L. NAVARRETE (PE # 146579)

7/17/2023

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED "***" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THE PROJECT.

STATE OF TEXAS · OSCAR J. GUTIERREZ · 95690 · LICENSED · PROFESSIONAL ENGINEER

OSCAR J. GUTIERREZ (PE # 95690)

7/17/2023

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED "****" HAVE BEEN SELECTED BY ME OR UNDER MY SUPERVISION AND ARE APPLICABLE TO THE PROJECT.

STATE OF TEXAS · RUDY L. GOMEZ · 58664 · REGISTERED · PROFESSIONAL ENGINEER

RUDY L. GOMEZ (PE # 58664)

7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

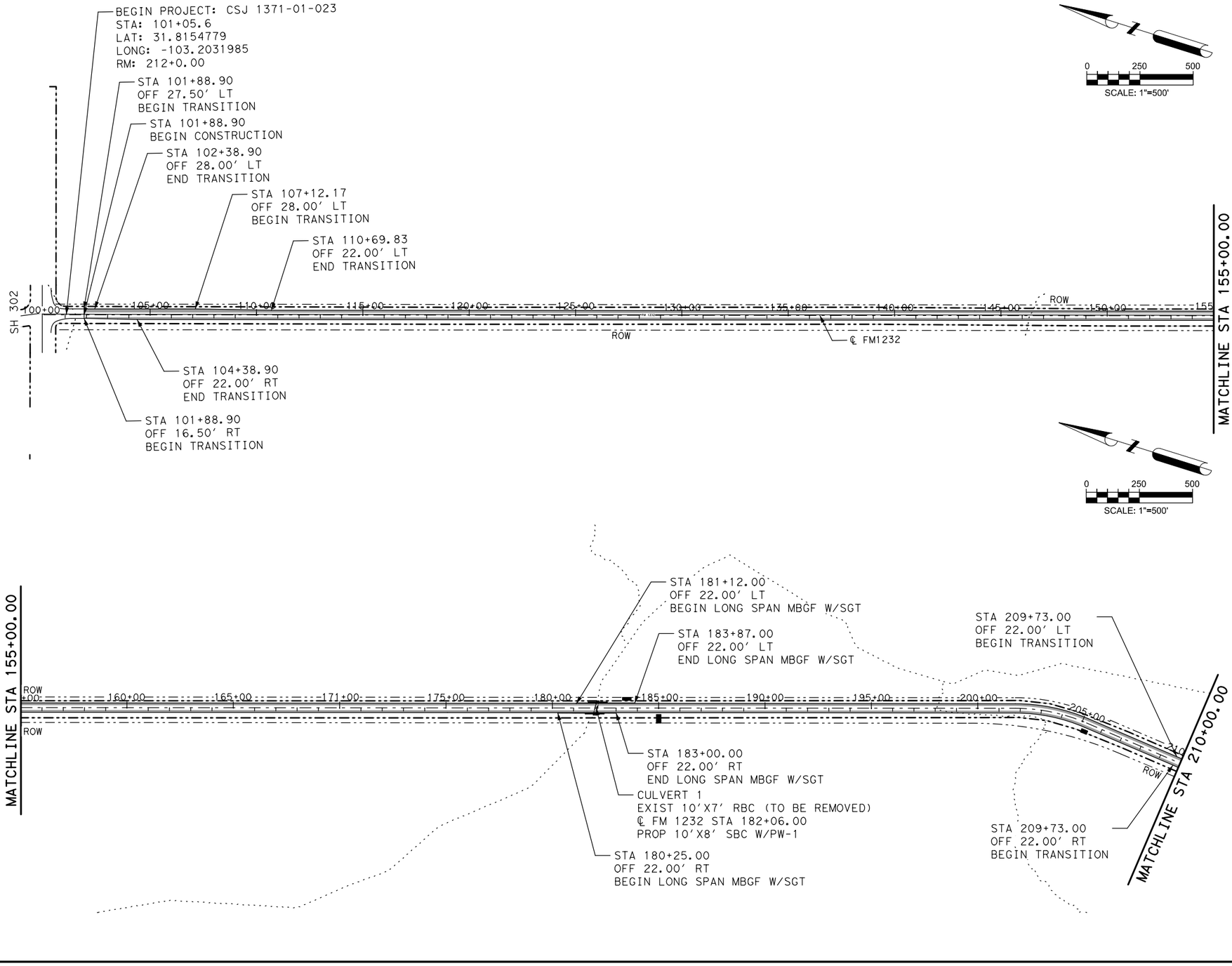
Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

INDEX OF SHEETS

SHEET 1 OF 1

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		2
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ODA	WINKLER	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232
CHK	OEI				



LEGEND

- PROPOSED WIDENING
- RIGHT OF WAY (ROW)
- SAWCUT
- PROP DRAINAGE STRUCTURE

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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PROJECT LAYOUT
BEGIN PROJECT TO STA 210+00.00

SHEET 1 OF 3

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		3
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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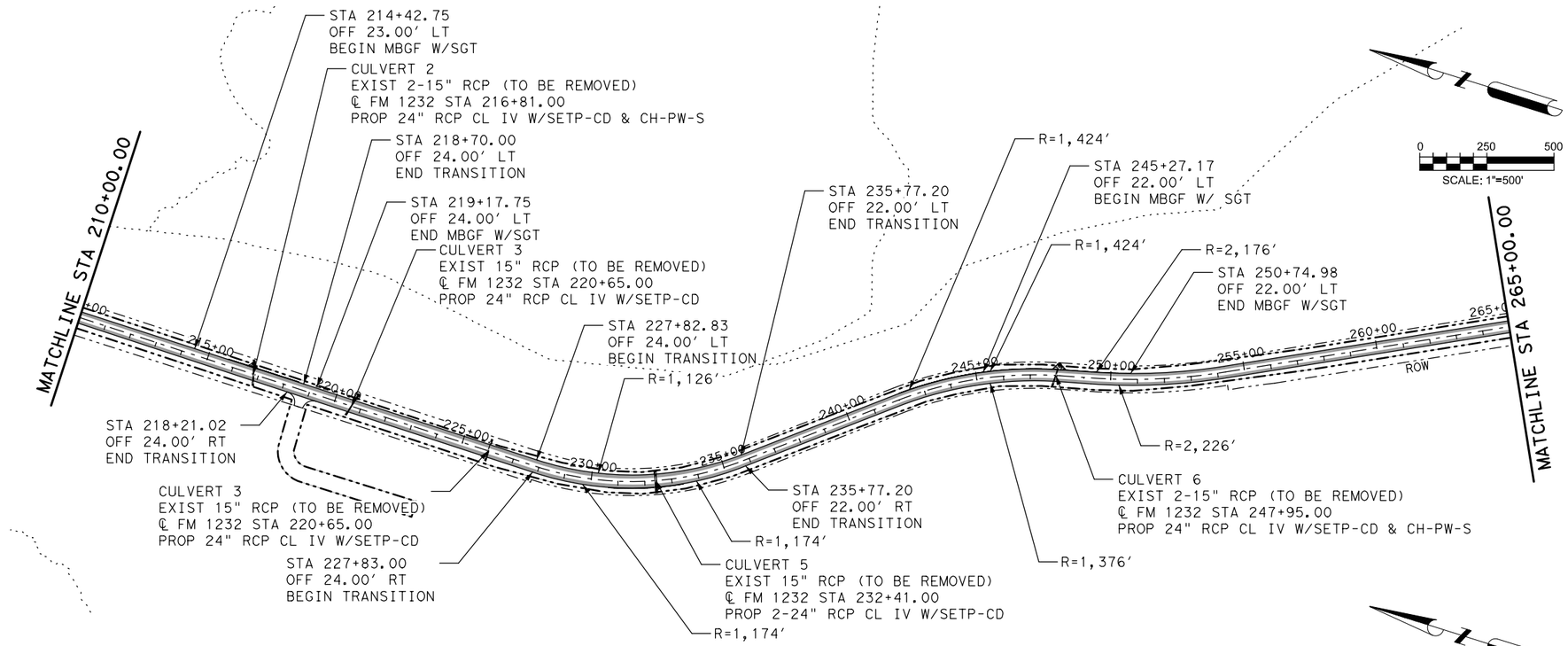

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

OMEGA ENGINEERS, INC.
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EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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FM 1232
SH 302 TO SH 115

PROJECT LAYOUT
STA 210+00.00 TO STA 320+00.00

SHEET 2 OF 3

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		4
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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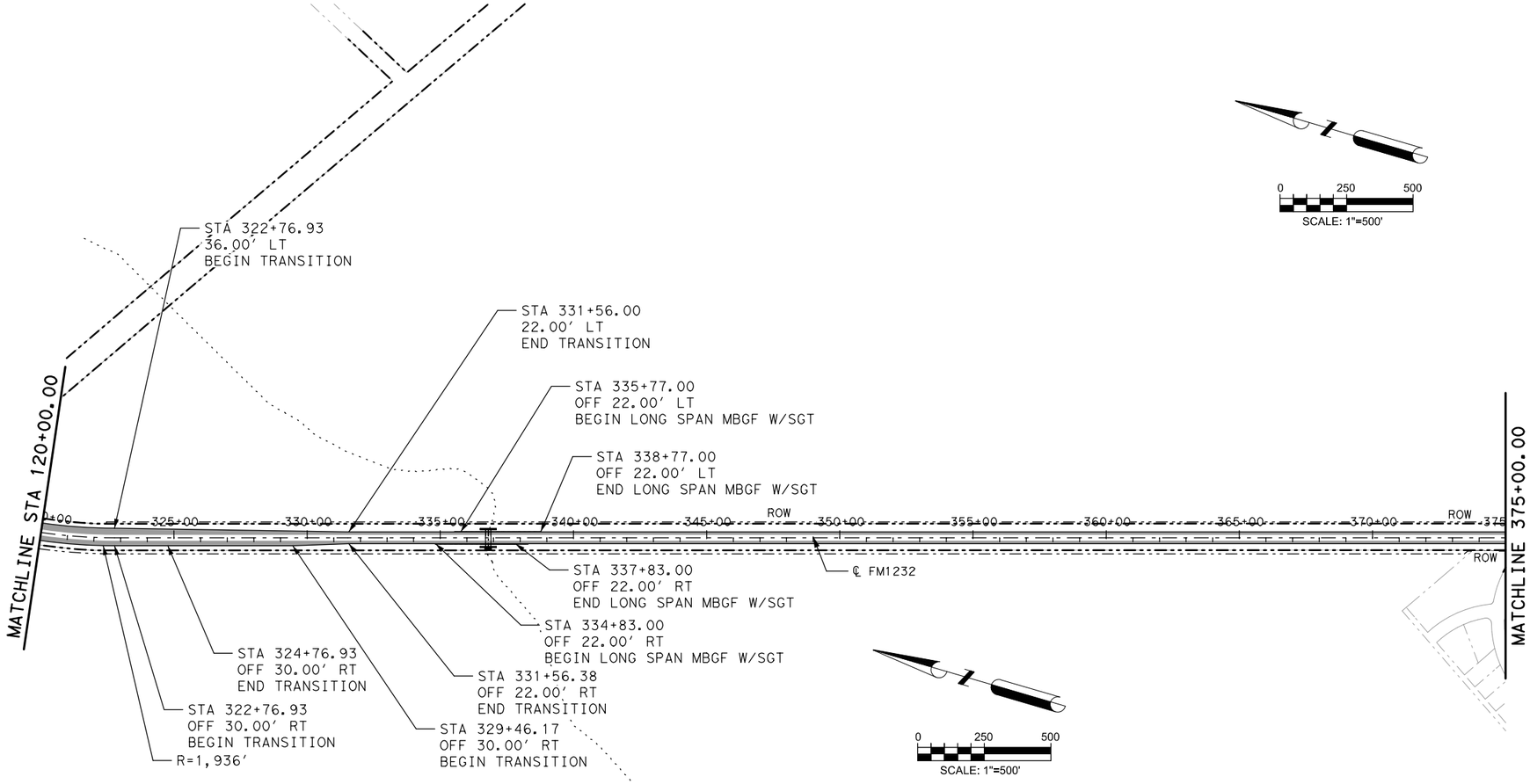

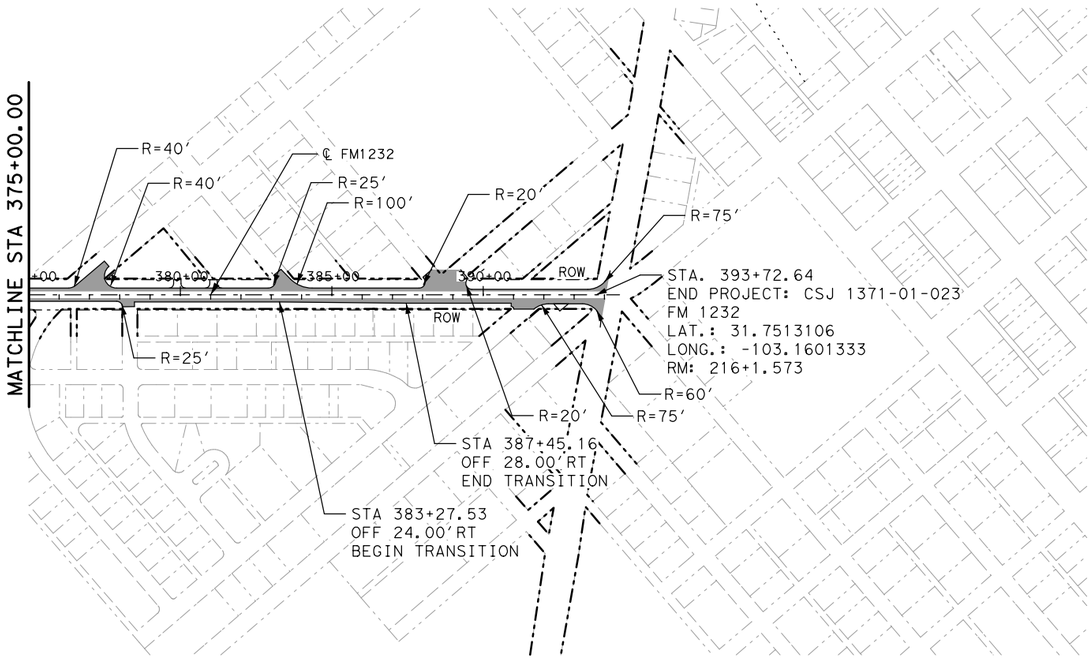

LEGEND

- PROPOSED WIDENING
- RIGHT OF WAY (ROW)
- SAWCUT
- PROP DRAINAGE STRUCTURE

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
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EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
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FM 1232
SH 302 TO SH 115

PROJECT LAYOUT
STA 320+00.00 TO END OF PROJECT

SHEET 3 OF 3

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	5
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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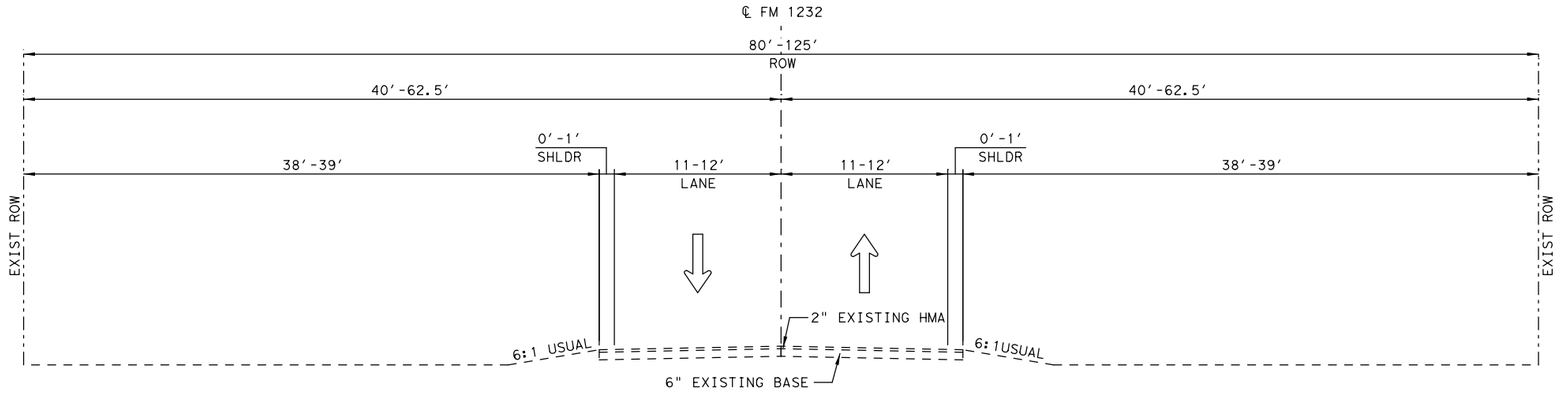
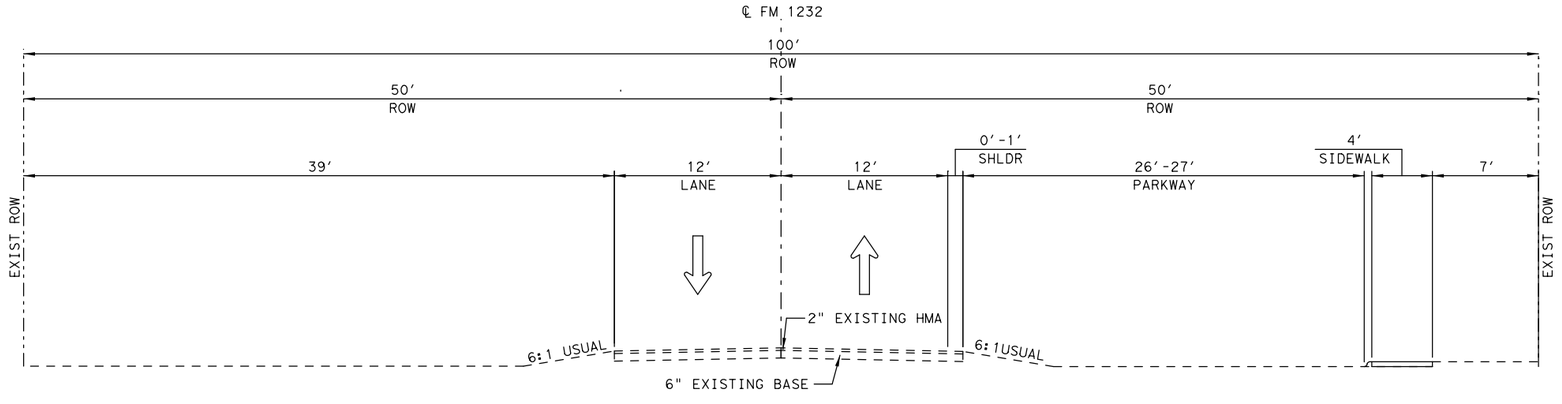
LEGEND

↑↓ DIRECTION OF TRAFFIC



FM 1232 EXISTING TYPICAL SECTION I

STA 100+00.00 TO STA 378+57.00



FM 1232 EXISTING TYPICAL SECTION II

STA 378+57.00 TO 394+23.46

DATE	BY	REV	REVISION

JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P915 308 6413 F281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
EXISTING TYPICAL SECTIONS

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	6
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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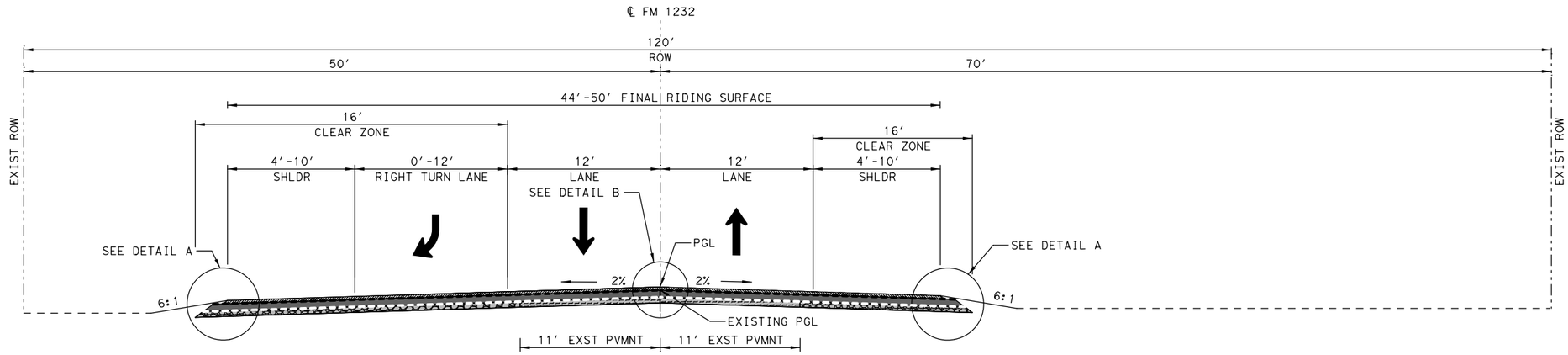


LEGEND

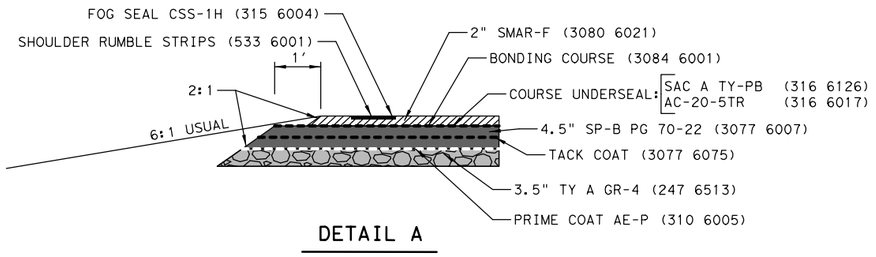
- DIRECTION OF TRAFFIC
- EXISTING BASE
- NEW FLEX BASE

NOTES:

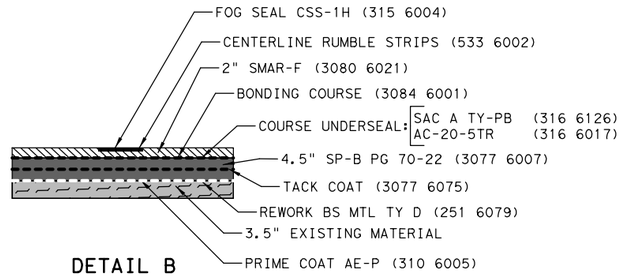
1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. ALL DIMENSIONS ARE TO PAVEMENT MARKINGS UNLESS OTHERWISE INDICATED.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL INFORMATION.
5. SAW CUT IS SUBSIDIARY TO THE VARIOUS BID ITEMS.
6. SAW CUT EXISTING PAVEMENT IN A NEAT AND STRAIGHT MANNER.

FM 1232 PROPOSED TYPICAL SECTION

STA 101+88.90 TO STA 110+69.85

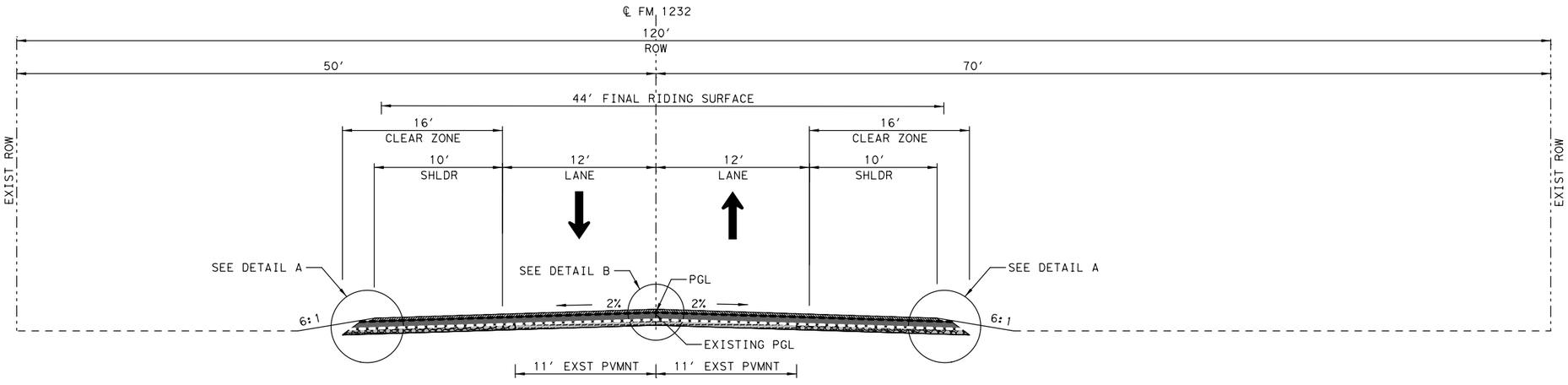


DETAIL A



DETAIL B

*4.5" STAB BASE AND ACP REMOVAL IS PAID UNDER ITEM (105 6040)



FM 1232 PROPOSED TYPICAL SECTION

STA 110+69.85 TO STA 195+98.00
STA 199+98.00 TO STA 209+73.00
STA 235+00.00 TO STA 240+75.00
STA 331+56.00 TO STA 383+27.53
STA 255+32.00 TO STA 302+38.61

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
PROPOSED
TYPICAL SECTIONS

SHEET 1 OF 6

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	7
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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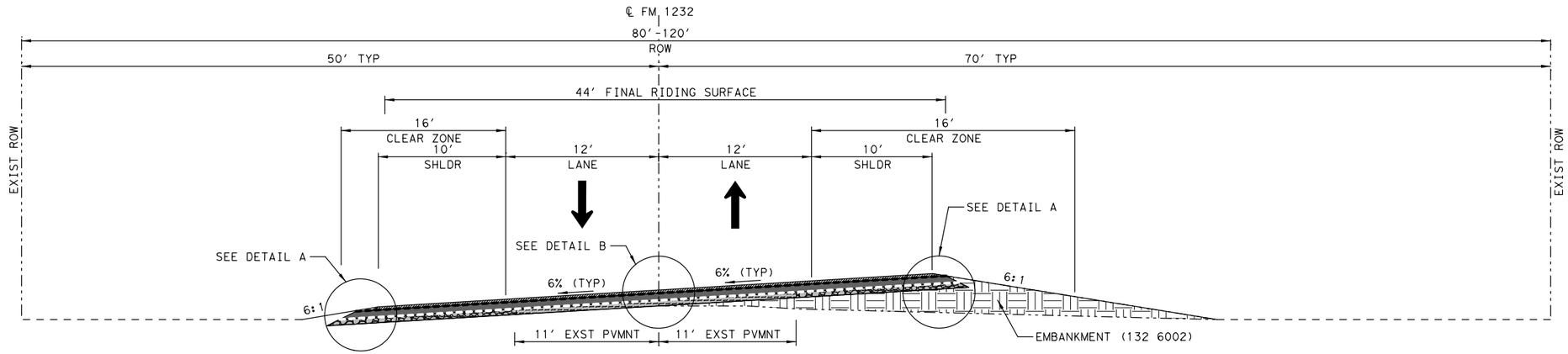
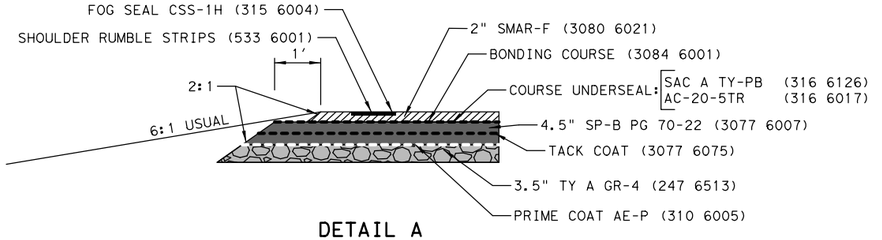
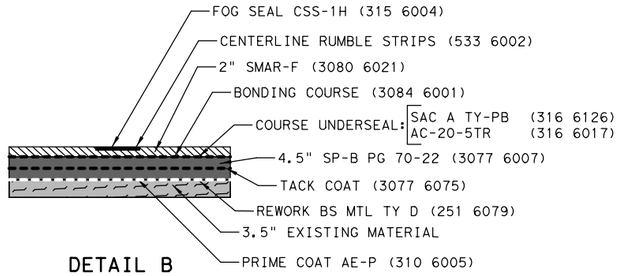


FM 1232 PROPOSED TYPICAL SECTION (FULL SUPER)

STA 195+98.00 TO STA 199+98.00
STA 225+73.00 TO STA 237+90.00
STA 240+75.00 TO STA 255+32.00

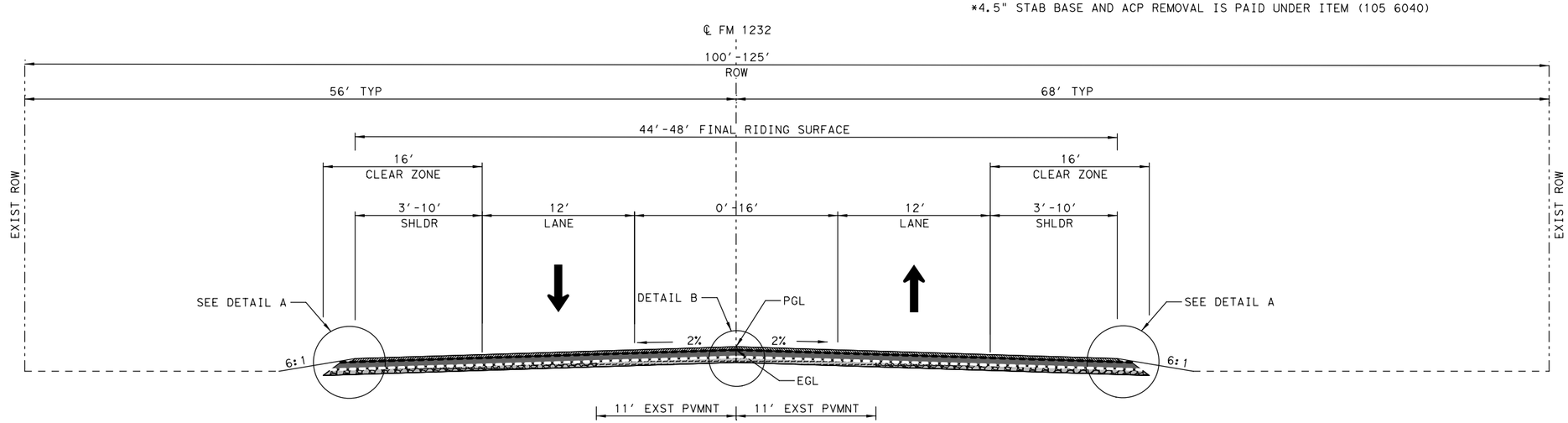


DETAIL A



DETAIL B

*4.5" STAB BASE AND ACP REMOVAL IS PAID UNDER ITEM (105 6040)



FM 1232 TYPICAL SECTION

STA 209+73.00 TO STA 218+21.43
STA 227+24.14 TO STA 235+00.00

LEGEND

- DIRECTION OF TRAFFIC
- EXISTING BASE
- NEW FLEX BASE

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. ALL DIMENSIONS ARE TO PAVEMENT MARKINGS UNLESS OTHERWISE INDICATED.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL INFORMATION.
5. SAW CUT IS SUBSIDIARY TO THE VARIOUS BID ITEMS.
6. SAW CUT EXISTING PAVEMENT IN A NEAT AND STRAIGHT MANNER.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

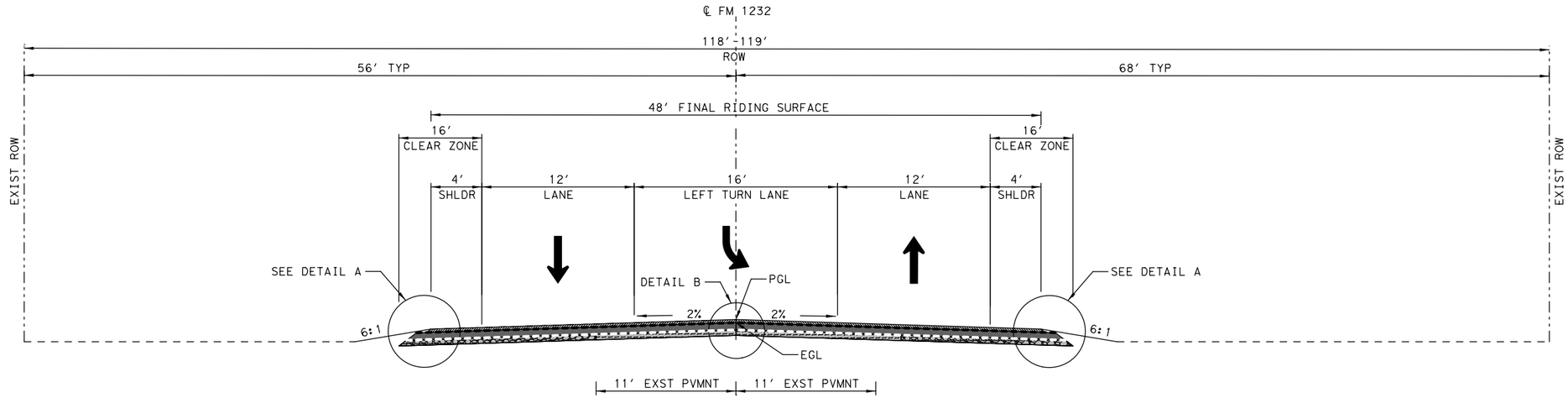
OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
PROPOSED
TYPICAL SECTIONS

SHEET 2 OF 6

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	8
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232



FM 1232 TYPICAL SECTION

STA 218+94.13 TO STA 225+73.00

LEGEND

- DIRECTION OF TRAFFIC
- EXISTING BASE
- NEW FLEX BASE

NOTES:

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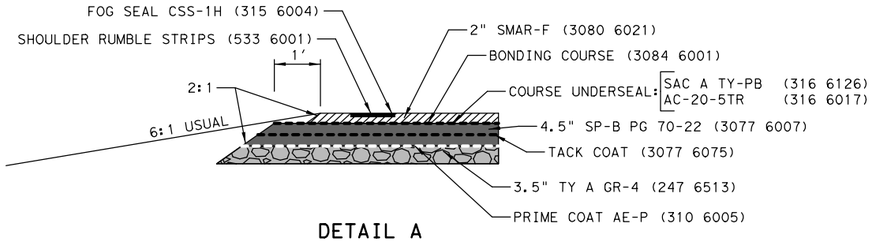
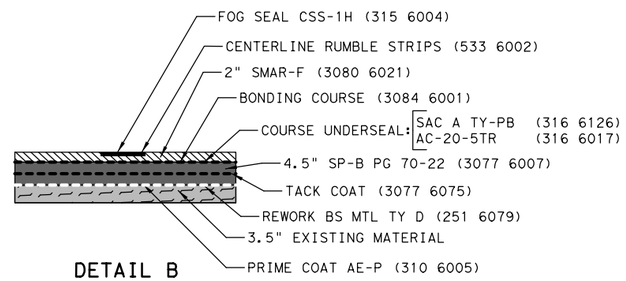
6. SAW CUT EXISTING PAVEMENT IN A NEAT AND STRAIGHT MANNER.

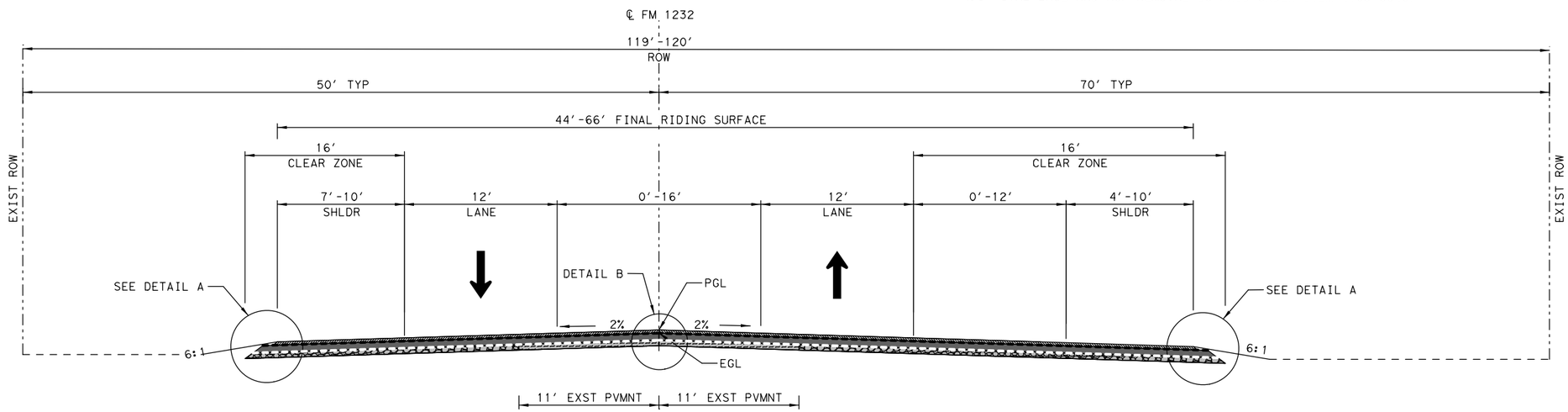


DETAIL A



DETAIL B

*4.5" STAB BASE AND ACP REMOVAL IS PAID UNDER ITEM (105 6040)



FM 1232 PROPOSED TYPICAL SECTION

STA 302+38.61 TO STA 306+79.78

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
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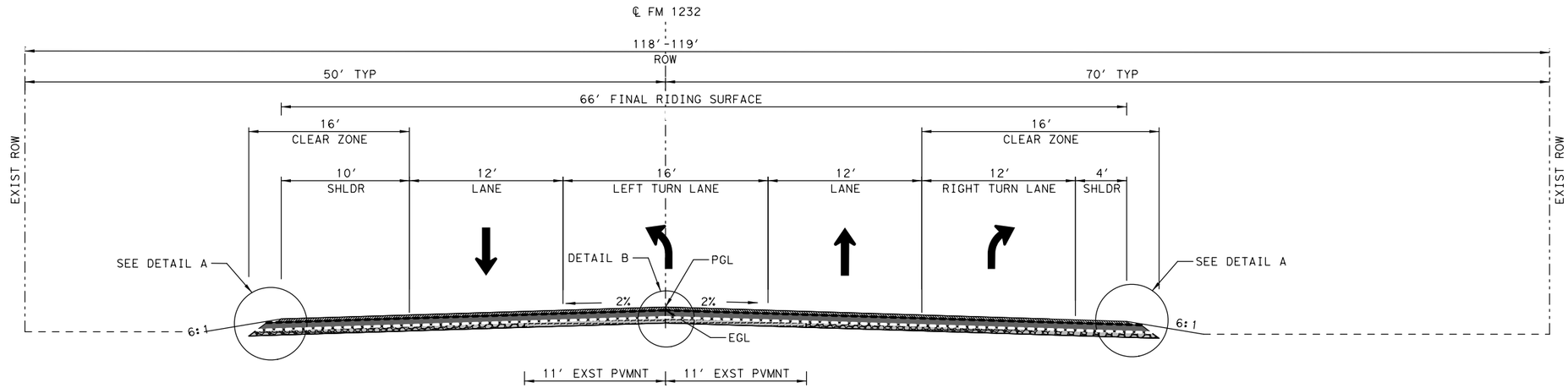
FM 1232
SH 302 TO SH 115
PROPOSED
TYPICAL SECTIONS

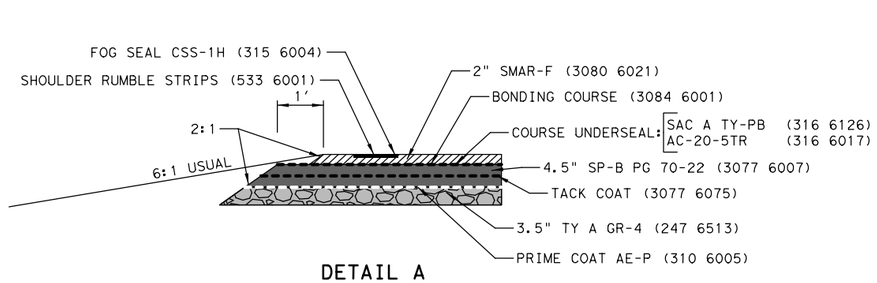
SHEET 3 OF 6

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	9
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232



FM 1232 PROPOSED TYPICAL SECTION

STA 306+79.78 TO STA 314+87.14



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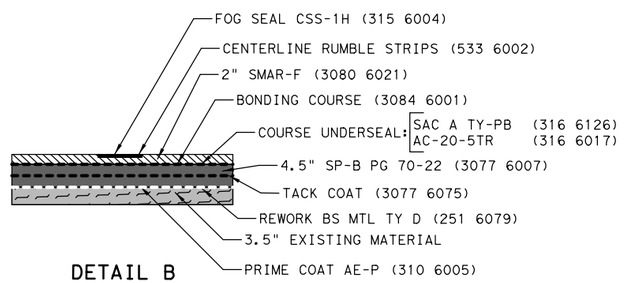
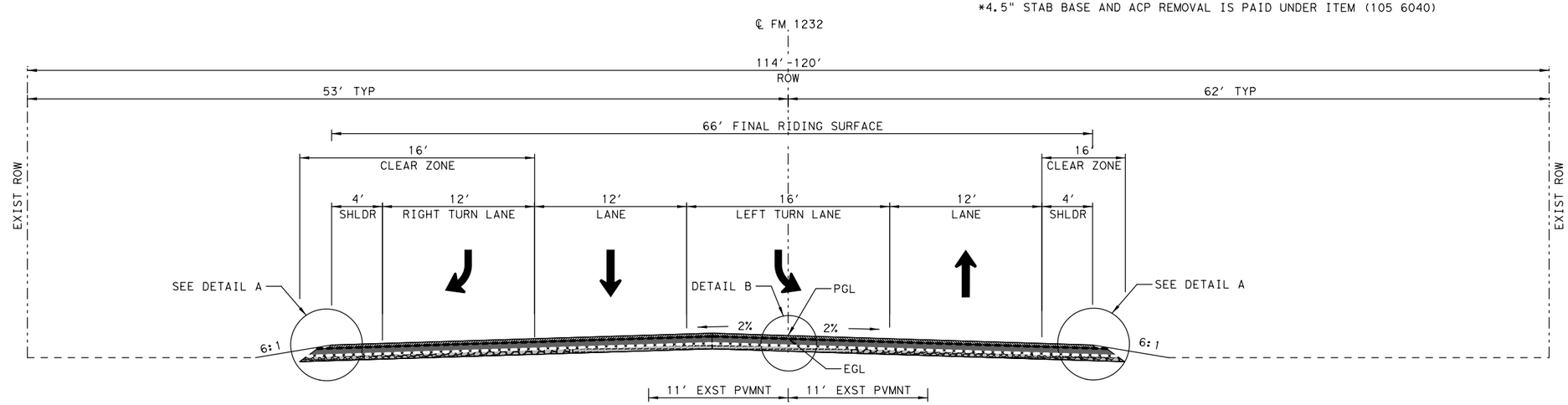


DETAIL B

*4.5" STAB BASE AND ACP REMOVAL IS PAID UNDER ITEM (105 6040)



FM 1232 PROPOSED TYPICAL SECTION

STA 315+74.74 TO STA 324+34.00

LEGEND

- DIRECTION OF TRAFFIC
- EXISTING BASE
- NEW FLEX BASE

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. ALL DIMENSIONS ARE TO PAVEMENT MARKINGS UNLESS OTHERWISE INDICATED.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL INFORMATION.
5. SAW CUT IS SUBSIDIARY TO THE VARIOUS BID ITEMS.
6. SAW CUT EXISTING PAVEMENT IN A NEAT AND STRAIGHT MANNER.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

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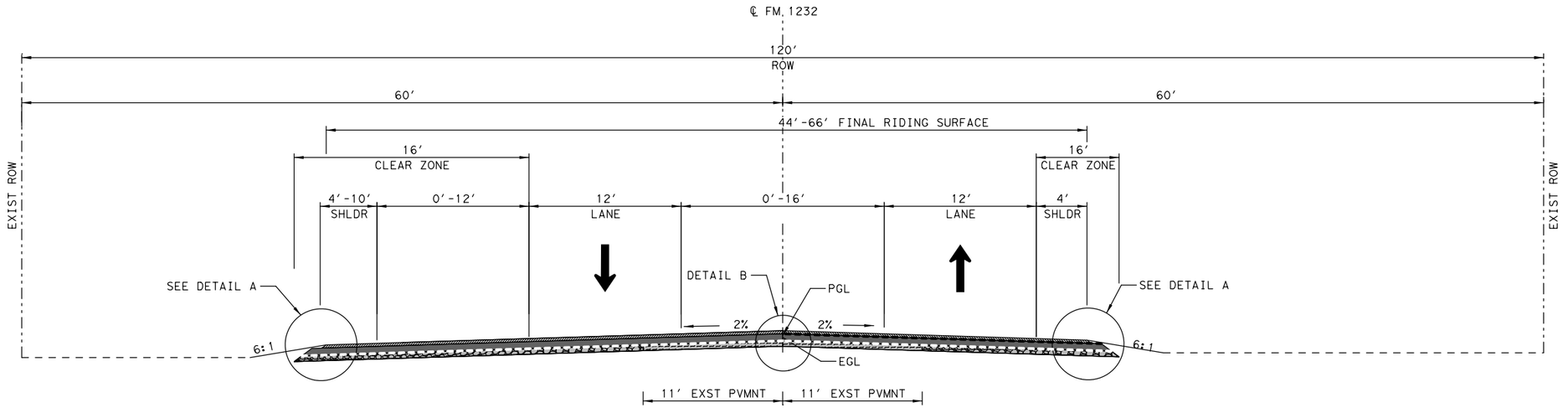
FM 1232
SH 302 TO SH 115
PROPOSED TYPICAL SECTIONS

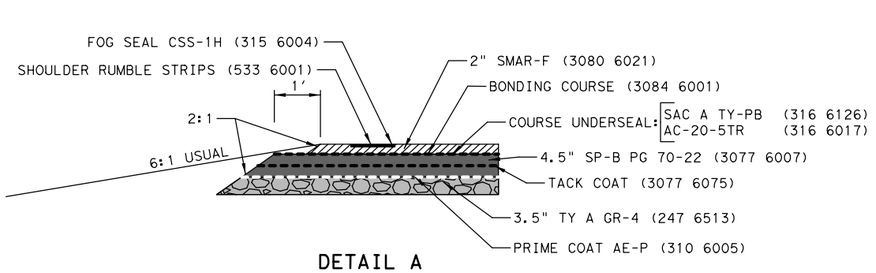
SHEET 4 OF 6

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	10
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

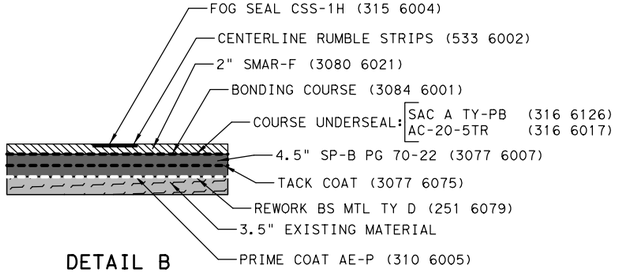


FM 1232 PROPOSED TYPICAL SECTION

STA 324+34.00 TO STA 331+56.00

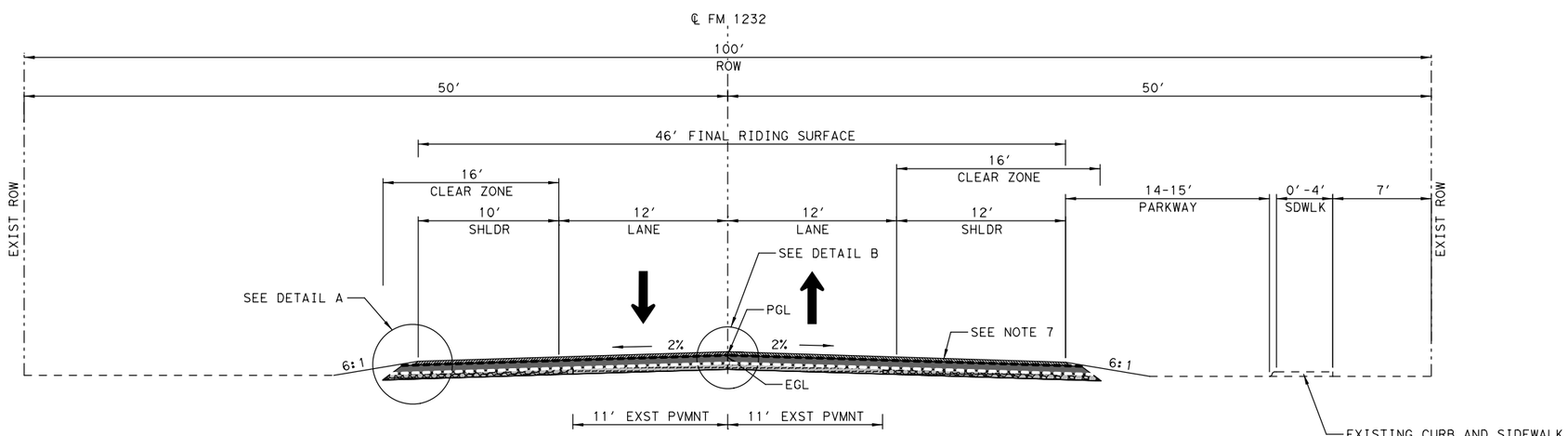


DETAIL A



DETAIL B

*4.5" STAB BASE AND ACP REMOVAL IS PAID UNDER ITEM (105 6040)



FM 1232 PROPOSED TYPICAL SECTION

STA 378+48.59 TO STA 383+27.53

LEGEND

- DIRECTION OF TRAFFIC
- EXISTING BASE
- NEW FLEX BASE

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. ALL DIMENSIONS ARE TO PAVEMENT MARKINGS UNLESS OTHERWISE INDICATED.
4. REFER TO CROSS SECTIONS FOR ADDITIONAL INFORMATION.
5. SAW CUT IS SUBSIDIARY TO THE VARIOUS BID ITEMS.
6. SAW CUT EXISTING PAVEMENT IN A NEAT AND STRAIGHT MANNER.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

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FM 1232
SH 302 TO SH 115
PROPOSED TYPICAL SECTIONS

SHEET 5 OF 6

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	11
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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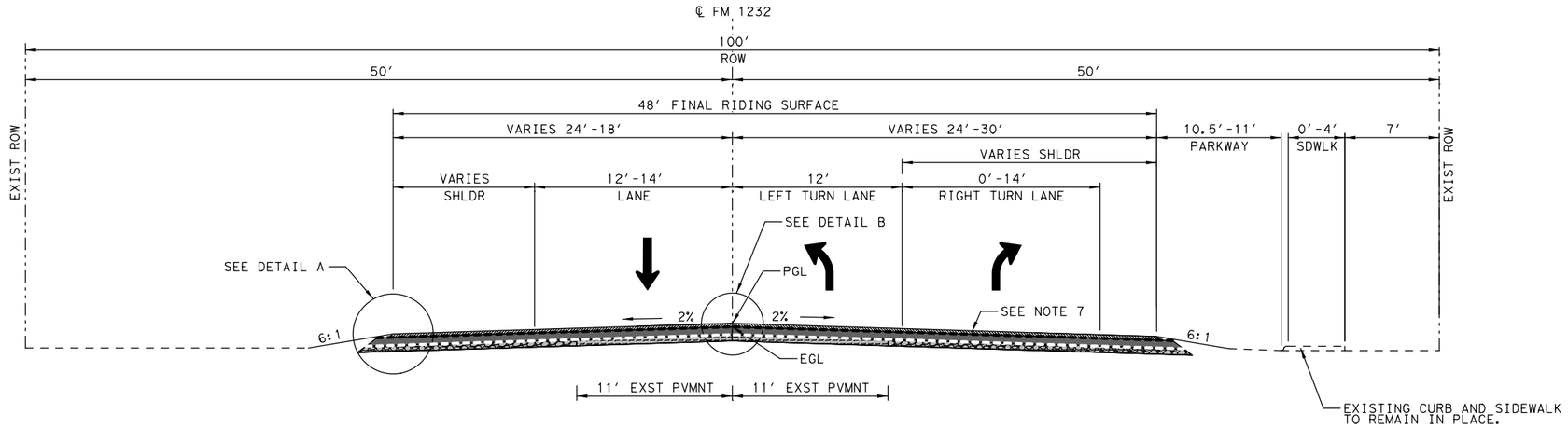

FM 1232 PROPOSED TYPICAL SECTION

STA 383+27.53 TO STA 393+68.46

LEGEND

- DIRECTION OF TRAFFIC
- EXISTING BASE
- NEW FLEX BASE

NOTES:

1. TYPICAL SECTIONS ARE FOR GENERAL INFORMATION ONLY. REFER TO STANDARDS FOR PROPER CONSTRUCTION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
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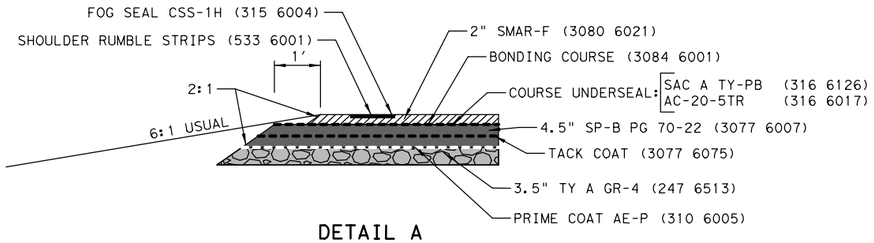
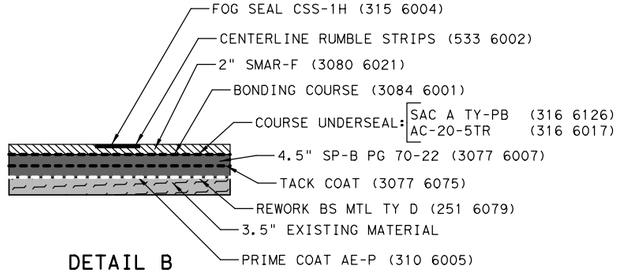
5. SAW CUT IS SUBSIDIARY TO THE VARIOUS BID ITEMS.
6. SAW CUT EXISTING PAVEMENT IN A NEAT AND STRAIGHT MANNER.



DETAIL A



DETAIL B

*4.5" STAB BASE AND ACP REMOVAL IS PAID UNDER ITEM (105 6040)

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

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FM 1232

SH 302 TO SH 115

PROPOSED TYPICAL SECTIONS

SHEET 6 OF 6

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		12
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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Material Specification Information

Grading Requirements

Item	Description	Grading Requirements Percent Retained - Sieves				Soil Constants		Wet Ball
						L.L. Max.	P.I. Max.	Mill Max.
		1-3/4”	7/8”	3/8”	#40			
247	Type A GR 4	0-3	10-35	20-55	65-85	40	12	40

The maximum increase in material passing the number 40 sieve resulting from the wet ball mill test shall not exceed 20%.

Cure the finished section of flex base until the moisture content is at least half of the optimum moisture content or as directed by the engineer before applying the next successive course or prime coat.

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address:

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

The site is organized by District, Project Type (Construction or Maintenance), Letting Date, CCSJ/Project Name.

Item 5: Control of the Work

Use Method C for construction surveying.

In the event the finished surface does not conform to the typical sections or does not meet the required IRI, rework the non-conforming area to the limits necessary and employ additional survey control as directed.

In curves and superelevation section, place construction stakes at intervals of 50 feet along the centerline and at the crownline and quarter points of the typical section. In the event that a satisfactory riding surface can’t be constructed, place additional staking as directed by the Engineer.

Item 6: Control of Materials

Restrict storage of equipment and materials to approved areas. The Engineer will not approve storage in any TxDOT yard.

Promptly and properly dispose of any waste generated from servicing equipment on the project.

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

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

The Buy America Material Classification Sheet is located at the below link. https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7: Legal Relations and Responsibilities

If access to the project is required through a new or unapproved driveway (i.e. Material source, stockpile location, field office, etc.), obtain an approved “Permit to Construct Access Driveway Facilities on Highway Right Of Way” (TxDOT Form 1058) before beginning any construction operations.

Utilities (public, private and TxDOT) exist throughout the project. Prior to any excavation, investigate to determine the utility locations within the project right of way. Contact the TxDOT Odessa Traffic Operations shop at 432-498-4690 to investigate and determine the location of any TxDOT utility that may exist within the project right of way. Exercise caution when excavating in areas where investigations have determined that utilities exist. The contractor is responsible for maintaining utility markings

No significant traffic generator events identified.

As an element of ensuring public safety and convenience under Article 7.2.4, the Contractor is hereby directed to open all closed lanes and shoulder and remove all traffic control devices from any areas where work is not being actively performed unless overnight traffic control is required and approved by the engineer. Removed devices must be stored outside of the clear zones near the right of way line or removed from the right of way line entirely.

Manage construction to minimize disruption to traffic. Maintain roadway in a good and passable condition, including proper drainage. Provide for safe ingress and egress to adjacent property and for construction equipment entering or exiting the construction area.

At any time during construction that a previously installed crash cushion is damaged by the traveling public and is requested to be repaired by the Engineer, the repair will be paid at the same unit cost as the original installation.

Item 8: Prosecution and Progress

The following portions of the plans may affect the Contractor's planned construction sequencing. The Contractor’s attention is directed to the appropriate plan sheet or standard sheet.

-Traffic Control Plan

-Storm Water Pollution Prevention Plan

-Environmental Permit, Issues and Commitments (EPIC)

Maintain ingress and egress to side streets and private property at all times.

Initiate the installation of Item 628 “Electrical Services” as part of the initial work sequence to allow TxDOT the lead-time necessary for coordination with utility companies to establish and provide for electrical service(s) proposed for this project.

Working days will be computed and charged in accordance with Article 8. 3.1.5. “Standard Workweek”

Begin work 90 calendar days after the authorization date to begin work. Do not begin work before or after this period unless authorized in writing by the Engineer.

90 day lead time is needed to allow for sufficient time to obtain and produce materials needed for various bid items in this project.

Item 110: Excavation

In all excavated areas, broom the existing base or subgrade to remove any loose material. This work is considered subsidiary to this item.

Before excavation and embankment operations begin, windrow all topsoil (approx. 4 inches) to be reused on side slopes or behind the proposed curb and gutter. This work is subsidiary to Item 110, "Excavation" and Item 132, "Embankment".

Excavate only the volume of material that can reasonably be replaced with new HMAC within 24 hours of removal based on anticipated production rates. The Engineer may halt further excavation if any excavated volumes have not been replaced with HMAC within 48 hours of excavation.

Item 132: Embankment

Material quality test requirements will be waived for material excavated from the right of way on this project and utilized in embankment.

Item 150: Blading

When directed, fill and grade low areas outside the embankment areas to drain.

Preserve the top 4" of topsoil outside of the work area. Preserve this material in windrows until topsoil can be replaced and seeded to stabilize all exposed terrain.

Item 216: Proof Rolling

Proof rolling will be required on rock embankments where density tests are not practical and at other locations as directed.

Item 247: Flexible Base

The estimated quantity of flexible base shown includes all roadways, intersecting streets and driveways. The measured area for payment will be the crown width only. The side slope tapers are not included in the measurements for the flexible base but are considered subsidiary to this item.

Assume responsibility for the disposal of all boulders not fractured during ordinary rolling methods and those too large to be incorporated into the foundation course as approved.

Maintain moisture during compaction as directed by the Engineer. Determine the moisture content of the material in accordance with Tex-115-E or Tex-103-E as directed by the Engineer.

Item 310: Prime Coat

AE-P will have a minimum 72 hour curing time or as directed by the engineer.

Each application of emulsified asphalt mixture will contain approximately 80% of emulsified asphalt and 20% water.

Item 316: Seal Coat

Apply **1** surface treatment(s).

Furnish Class A aggregate for the surface course.

Do not apply asphalt cement between August 31st and May 1st unless authorized in writing.

Place a string line or other suitable marking where needed to assure smooth neat lines or as directed.

Surface treat the existing surfaced intersections, auxiliary lanes, curve widenings and widened dip sections plus any additional areas encountered during construction to conform to the existing surface. The limits are the greater of the end of the curb returns, the right of way line, or the adjacent traffic lane.

Perform rock land and shoot test strips for each day’s work at each location or as directed by the Engineer.

Provide the Engineer with this information prior to the seal coat application. Provide control that is acceptable to the Engineer for yield calculations.

Wet the stockpile of aggregate prior to use.

The use of a variable rate nozzle will be required on this project as determined by the engineer.

Contractor shall provide a list of stockpile locations prior to any material placed on the job site. Contractor shall have the Engineer and Odessa District Environmental Officer approve any and all stockpile locations prior to stockpiling of aggregate or other material. Stockpile locations will not be permitted on or adjacent to landscaped and non-mow areas.

As seal coat operations are completed at each location, clean and level all stockpile locations to the satisfaction of the Engineer.

Clean up paper, asphalt and excess rock after seal coat placement as each reference location is completed. Contractor shall not proceed ahead more than two reference locations before clean-up operations have been accomplished at the previous completed reference locations.

Contractor shall clean and remove asphalt from unauthorized concrete at the expense of the Contractor.

Item 400: Excavation and Backfill for Structures

Aggregate for cement stabilized backfill will be an approved material.

The addition of cement stabilized backfill under the pipe will not be required for this project. However, the Contractor will be required to shape the subgrade (trench bottom) to conform to a Class C bedding in sand or loam. If rock or rock outcrops are encountered, a Class B bedding consisting of sand or chat material will be required under the pipe.

Item 402: Trench Excavation Protection

Any roadway excavation needed at proposed structures will be done before placing structures in order to minimize trench excavation protection.

Item 416: Drilled Shaft Foundations

For drilled shaft foundations for roadway illumination assemblies, provide Class C concrete with 6-1/2” slump for dry type placements in accordance with Table 2, Slump Requirements.

Item 432: Riprap

Reinforce all riprap on this project with no. 3 bars spaced 12 inches O.C.B.W. or no. 4 bars spaced at 18 inches O.C.B.W.

Broom finish all riprap on this project unless otherwise directed.

Polypropylene fiber may not be used in lieu of reinforcing steel.

In addition to reinforcing steel, polypropylene fiber is required at a rate of 1.5 lbs. /cy.

Item 464: Reinforced Concrete Pipe

At locations where existing culverts are cut, use Class A concrete to patch the areas at the joint between the new construction and the existing structure.

Item 467: Safety End Treatment

Provide shop drawings for pipe runners.

All Type II SET’s shall have riprap aprons.

Item 502: Barricades, Signs, and Traffic Handling

Furnish flaggers to warn equipment operators of approaching traffic.

Relocate or remove temporary signs as necessary. This work is considered subsidiary to the various bid items.

Stop work immediately if any major traffic control element such as an advanced warning flashing panel or TMA or PCMS is not in good working order or control setup.

Maintain "No Center Line", "Do Not Pass" and "Pass With Care" signs until the permanent lane markings have been placed in accordance with plans.

Place orange fencing around sidewalk, wheelchair ramps and other pedestrian areas that pose a hazard to pedestrian traffic as directed.

Use Shoulder Drop-Off (CW8-9A) signs during construction when shoulder drop-off conditions are 3 inches or greater or as directed. Placement shall be in accordance with the “Texas Manual on Uniform Traffic Control Devices”.

This project has a regulatory work zone speed reduction within the project limits. The work zone speed limit is reduced from **75** mph to **60** mph. Placement of speed reduction zone signs shall comply with BC (3)-21. Speed resumption signs are required at the end of a speed reduction zone.

Place chevrons, at a minimum, on every other drum used for outsides of curves, merging tapers and shifting tapers. Vertical panels shall be self-righting.

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.

When construction operations result in a drop-off of more than 2 inches, a 3:1 or flatter slope will be required. The slope must be constructed with a compacted material capable of supporting vehicles as approved by the Engineer. This work shall be done expeditiously during daylight hours. Flaggers and appropriate signing to safely guide traffic through the work area will be required as directed by the Engineer. This shall be considered subsidiary to Item 502.

Any and all traffic control plan changes must be approved by the Engineer prior to implementation.

Item 504: Field Office and Laboratory

Provide a Type D structure (asphalt mix control laboratory) for the asphalt mix control laboratory for the Engineer's exclusive use. In addition to the requirements of Item 504, this structure will have a minimum height of 8 feet and provide a minimum of 400 square feet of gross floor area for permanently located asphalt plants, or 200 square feet for temporary located plants serving one project. The floor area will be partitioned into a minimum of two interconnected rooms, each room furnished with an exterior door and a minimum of two windows. The floor will have sufficient strength to support the testing equipment and have an impervious covering.

Item 506: Temporary Erosion, Sedimentation, and Environmental Controls

In accordance with the Construction General Permit (CGP), erosion control and stabilization measures should be initiated as soon as practicable to include installing erosion control logs, windrow topsoil to preserve seed bank, and maintain erosion control logs.

The total disturbed area for this project is **49.9** Acres. The disturbed area in this project, all project locations in the contract, and Contractor Project Specific Locations (PSLS), within 1 mile of the project limits, for the contract will further establish the authorization requirements for storm water discharges. The department will obtain an authorization to discharge storm water from the Texas Commission On Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain any required authorization from the TCEQ for any Contractor PSLS for construction support activities on or off the right of way. When the total area disturbed for all projects in the contract and PSLS within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLS on the right of way, to the Engineer (or to the appropriate MS4 operator when on an off-state system route).

Upon acceptance of the project, all SW3P devices will become property of the State and maintenance responsibility is transferred to the State until final stabilization is attained. When applying cement for emulsion, asphalt treatment, or any other soil stabilization, sprinkle water as needed to control cement from blowing and contaminating adjacent vegetation and waters.

Item 530: Intersections, Driveways, and Turnouts

Reinforce concrete driveways with no. 3 bars spaced at 12" O.C.B.W. or with #4 bars spaced at 18" O.C.B.W.

Surface treat turnouts before the roadway is treated with the second one course surface treatment.

Polypropylene fiber may not be used in lieu of reinforcing steel.

In addition to reinforcing steel, polypropylene fiber is required at a rate of 1.5 lbs./cy.

Item 540: Metal Beam Guard Fence

Provide steel post for this project.

Item 585: Ride Quality for Pavement Surfaces

Use surface test Type B pay adjustment schedule 2 to evaluate ride quality of the travel lanes in accordance with Item 585, “Ride Quality for Pavement Surfaces.”

Item 610: Roadway Illumination Assemblies

Changes in the locations of poles, conduit, pull boxes, or other items as shown on the plans may be made in those instances deemed necessary, or when requested by the Contractor and approved.

Item 618: Conduit

Place a single continuous piece of warning tape in accordance with this item along the entire length of each underground conduit installation. Locate warning tape approximately twelve inches above conduit as indication that a buried electrical line exists below the tape. Cement stabilized backfilled conduit is exempt from this requirement. Comply with warning tape requirements for any installation of buried conduit, including portions of conduit located outside of cement stabilized backfill.

When trenched conduit is proposed beneath roadways under construction, install conduit after grading operations have been completed and before any surfacing begins at that location.

When shown on the plans as bored conduit, install conduit by an approved directional boring method.

Maintain a minimum 24” depth from finish grade to top of conduit for conduit proposed beneath pavement.

Use an approved ditching method. Place and backfill conduit proposed beneath existing pavement in accordance with the section shown in the plans. Schedule and complete work so that all lanes open to traffic at night.

For conduit raceways that are intended to remain empty or unused, extend the lower end of conduit from the face of the foundation to a minimum of 1’ beyond the edge of the foundation or the riprap apron, whichever is farthest, and use conduit cap fittings for both ends of conduit. Do not glue caps or use duct tape when capping ends of conduit raceways that are intended to remain empty. Prevent dirt and debris from entering raceways during construction by temporarily capping both ends of open raceways. Other than conduit raceways that are intended to remain unused, fit each exposed end of raceways with a bushing. Where steel raceway is used, install a ground-type bushing and connect the bushing and ground rod with a bonding jumper.

Item 620: Electrical Conductors

Note the requirements of Item 7, Article 18. Electrical Requirements, of the standard specifications.

Do not exceed four hundred and fifty feet (450’) between ground boxes where conduit and conductor is used.

Item 628: Electrical Services

Initiate and complete the construction of all electrical services at the earliest possible time to facilitate lead-time required to coordinate with utility companies and establish power for the proposed electrical service(s.)

Before construction or installation of any electrical service(s) on this project, contact TxDOT Odessa Traffic Operations shop at 432-498-4690 to facilitate coordination with the appropriate energy company or companies.

Physically identify the location for each proposed electrical service on the project and request the physical address for each proposed electrical service identified; the Engineer will provide the physical address for each respective location. Permanently mark the physical address of any proposed electrical service on the respective meter base lid. Use one of two methods for permanent marking. For the preferred method of marking, use an approved die-stamp, with a minimum ½” height of alpha-numeric characters and stamp physical address on meter base lid. After stamping, apply coating of zinc-rich paint to the stamped area. Do not damage meter base. Replace meter base if determined by the Engineer as damaged or unacceptable. No additional compensation will be made for replacement of meter bases in the event an unacceptable determination is made.

When approved, use an alternate method of marking by providing a brass or aluminum plate tag with the physical address embossed by a machine-stamp process. Affix this tag to the meter base by a method approved by the Engineer. Provide a sample of a stamped plate tag for approval of this alternate method. The permanent physical address is required to be marked on the meter base prior to initiation of electrical service. Materials, labor, tools, equipment and incidentals necessary to complete this work will be considered as subsidiary to Item 628, "Electrical Services".

Use materials from the Prequalified Material Producer Lists as shown on the Texas Department of Transportation (TxDOT) – Construction Division's (CST) Material Producer List. See TxDOT website (www.TxDOT.gov) - business > resources > material producer list - for list of prequalified manufacturers. Category is "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials found on this list."

For incidental material and parts necessary for construction of electrical services, including the service entrance weather-head, rigid metal conduit (RMC) and PVC conduit, conduit fittings, service conductors, circuit breakers, ground rods and clamps, grounding bushing(s), and mounting hardware including straps and channel brackets for conduit support, furnish products and/or materials that comply with the plans and specifications. Prior to construction of any electrical service, submit to the Engineer respective catalog cut sheets for incidental materials and parts. Electrical services constructed of materials or parts which do not comply with the plans and specifications will be cause for rejection of a portion or all of the work.

Install photocell(s) facing north when practical.

Item 644: Small Roadside Sign Assemblies

All new sign supports for stop and yield signs will have a 12" red strip of Type C High Specific Intensity Reflective tape. Place the top of the tape 4' above the edge of the roadway. This work will not be paid for directly and will be subsidiary to the pertinent bid item.

For standard small sign details and dimensions, refer to the "Standard Highway Sign Designs for Texas (SHSD)"; a supplement to the Texas Manual on Uniform Traffic Control Devices (TMUTCD)".

Locate and mark existing reference marker(s) perpendicular to the road and along the right of way, or as directed, prior to removal. Erect new reference marker(s) at the original location, upon completion of construction.

Only bolt clamp style slip bases will be allowed for sign assemblies. Set screws will not be allowed.

Item 656: Foundations for Traffic Control Devices

Install a 5/8" x 8' copper clad ground rod in all signal poles and signal controller foundations, and make a system ground connection at the ground rod in addition to the ground connection required by the standard sheet, "Traffic Signal Controller Slab And Base". Maintain two inches (2") of ground rod extension above the finish surface of the foundation. Material, labor, tools, and incidentals necessary to provide and install this ground rod are considered subsidiary to the various bid items**.**

Item 658: Delineator and Object Marker Assemblies

Delineator and object marker assembly posts shall be composed of post-consumer recycled materials. Embedded stub shall be perforated square tubing.

Item 662: Work Zone Pavement Markings

After permanent pavement markings are placed, pull tabs from hot mix surface and/or cut off tabs flush with the pavement on seal coat surface. Remove tabs from the project and dispose of properly.

Materials used for non-removable work zone pavement markings will be paint and beads or other approved materials.

Item 666 Retroreflectorized Pavement Markings

Type I markings shall meet the minimum retroreflectivity values defined by Article 4.4 Retroreflectivity Requirements.

This Contract totals more than 200,000 feet of pavement markings; use a mobile retroreflectometer for retroreflectivity measurements. Portable retroreflectometers may not be used for this Contract.

Place Type I pavement markings with a ribbon-gun application.

Measure thickness for markings in accordance with Tex-854-B using usage rates (Part II).

Item 668: Prefabricated Pavement Markings

Do not tab or use existing RR pavement marking**s** for placement of proposed RR pavement marking; place proposed RR pavement markings in accordance with standard RCD(1)-16 and RCD(2)-16.

Item 672: Raised Pavement Markers

Do not place raised pavement markers until the micro-surfacing has cured a minimum of 48 hours.

Item 677: Eliminating Existing Pavement Markings and Markers

Submit eliminating plan for approval by the Engineer in accordance with Item 677.

Item 685: Roadside Flashing Beacon Assemblies

Provide a minimum of 7 feet from the roadway surface to the bottom of the flashing signal head.

Use concrete drilled shaft foundations for this project.

Item Special Spec 3077: Superpave Mixtures

Binder:

Provide a binder that has a performance grade of 70-22 (PG 70-22) for the “B” mix.

Aggregate quality:

Furnish class “B” aggregate for the type B mixFurnish aggregates that meets sac requirements for the shoulders and/or ramps.

Mixture design:

Design a mixture with a gradation that has stone on stone contact and passes below the reference zone.

Test method Tex-530-C (Boil Test) will not be required.

Placement:

Semi-trailer type vehicles are prohibited from dumping directly into the finishing machine for the finished surface unless the trailer is equipped with an auger slatted chain or another approved conveyor.

No more than 10% RAP will be allowed in non-surface courses.

No RAS will be allowed.

Mineral filler will not be allowed.

Lime will not be allowed as an anti-stripping agent.

Field sand will not be allowed.

Item 3080: Stone-Matrix Asphalt

Binder:

Furnish Type I asphalt-rubber binder containing Grade C rubber.

Aggregate quality:

Provide Class **A** aggregate. Blending of SAC A and SAC B material will not be allowed for the coarse aggregate.Magnesium sulfate soundness loss will not be greater than 20 percent when Class A aggregate is required.

Mixture design:

Test method Tex-530-C (Boil Test) will not be required.

Placement:

Semi-trailer type vehicles are prohibited from dumping directly into the finishing machine for the finished surface unless the trailer is equipped with an auger slatted chain or another approved conveyor.

No RAP will be allowed in the surface course.

No RAS will be allowed.

Mineral filler will not be allowed.

Lime will not be allowed as an anti-stripping agent.

Field sand will not be allowed.

Item 3084: Bonding Course

Use Tracking-Resistant Asphalt Interlayer (TRAIL) for bonding course.

Item 6001: Portable Changeable Message Sign

PCMS shall be placed in operation a minimum of one (1) week prior to construction. Location(s) and duration for PCMS shall be as directed by the Engineer.

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

General Note 5 of TCP (1-1)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation. General Note 6 of TCP (1-2)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

General Note 5 of TCP (2-1)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

General Note 8 of TCP (2-3)-18 provides for additional shadow vehicle(s) with truck mounted attenuator (TMA); one (1) additional shadow vehicle with TMA is included in the basis of estimate for this operation. The shadow vehicle(s) with TMA specified on the traffic control plan as “required” plus the ‘additional shadow vehicle’ is the quantity that has been estimated for this operation.

BASIS OF ESTIMATE FOR STATIONARY TMAs				
		TMA (STATIONARY)		
PHASE	STANDARD	REQUIRED	ADDITIONAL	TOTAL
3	TCP(1-1)-18	1	1	2
1 & 6	TCP(1-2)-18	1	1	2
3	TCP(2-1)-18	1	1	2
4 & 5	TCP(2-3)-18	1	1	2

There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (3-1)-13; the shadow vehicle(s) with TMA specified on the traffic control plan as “required” is the quantity that has been estimated for this operation.There are no General Notes for additional shadow vehicle(s) with truck mounted attenuator (TMA) on TCP (3-3)-14; the shadow vehicle(s) with TMA specified on the traffic control plan as “required” is the quantity that has been estimated for this operation.

BASIS OF ESTIMATE FOR MOBILE TMAs				
		TMA (MOBILE)		
PHASE	STANDARD	REQUIRED	ADDITIONAL	TOTAL
6	TCP(3-1)-13	2	0	2
6	TCP(3-3)-14	2	0	2

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 TMAs needed for the project.

County: Winkler
Highway: FM 1232

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1371-01-023 **DISTRICT** Odessa **COUNTY** Winkler
HIGHWAY FM 1232

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1371-01-023**			
		PROJECT ID		**A00180187**			
		COUNTY		**Winkler**			
		HIGHWAY		**FM 1232**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	105-6052	REMOVE STAB BASE & ASPH PAV (4"-5")	SY	71,424.000		71,424.000	
	110-6001	EXCAVATION (ROADWAY)	CY	33,166.000		33,166.000	
	132-6002	EMBANKMENT (FINAL)(DENS CONT)(TY A)	CY	18,688.000		18,688.000	
	150-6002	BLADING	HR	80.000		80.000	
	169-6004	SOIL RETENTION BLANKETS (CL 1) (TY D)	SY	448.000		448.000	
	216-6001	PROOF ROLLING	HR	80.000		80.000	
	247-6513	FL BS (CMP IN PLC) (TY A GR 4) (3.5")	SY	97,981.000		97,981.000	
	251-6079	REWORK BS MTL (TY D)(SURF)(ORD COMP)	SY	71,424.000		71,424.000	
	310-6005	PRIME COAT (AE-P)	GAL	33,386.000		33,386.000	
	315-6004	FOG SEAL (CSS-1H)	GAL	4,382.000		4,382.000	
	316-6017	ASPH (AC-20-5TR)	GAL	59,177.000		59,177.000	
	316-6126	AGGR(TY-PB GR-4 SAC-A)	CY	1,425.000		1,425.000	
	351-6002	FLEXIBLE PAVEMENT STRUCTURE REPAIR(6")	SY	5,445.000		5,445.000	
	400-6002	STRUCT EXCAV (BOX)	CY	1,302.000		1,302.000	
	400-6005	CEM STABIL BKFL	CY	176.000		176.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	373.000		373.000	
	403-6001	TEMPORARY SPL SHORING	SF	5,967.000		5,967.000	
	416-6029	DRILL SHAFT (RDWY ILL POLE) (30 IN)	LF	70.000		70.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	96.000		96.000	
	459-6007	GABION MATTRESSES (GALV)(12 IN)	SY	49.000		49.000	
	462-6021	CONC BOX CULV (8 FT X 6 FT)	LF	88.000		88.000	
	462-6024	CONC BOX CULV (9 FT X 5 FT)	LF	137.000		137.000	
	462-6032	CONC BOX CULV (10 FT X 8 FT)	LF	55.000		55.000	
	466-6130	HEADWALL (CH - PW - S) (DIA= 24 IN)	EA	2.000		2.000	
	466-6171	WINGWALL (PW - 1) (HW=10 FT)	EA	2.000		2.000	
	466-6172	WINGWALL (PW - 1) (HW=11 FT)	EA	2.000		2.000	
	466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA	4.000		4.000	
	467-6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	8.000		8.000	
	467-6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	2.000		2.000	
	496-6001	REMOV STR (BOX CULVERT)	EA	1.000		1.000	
	496-6005	REMOV STR (WINGWALL)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	330.000		330.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	21.000		21.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	620.000		620.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	620.000		620.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	1,440.000		1,440.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1371-01-023 **DISTRICT** Odessa **COUNTY** Winkler
HIGHWAY FM 1232

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1371-01-023**			
		PROJECT ID		**A00180187**			
		COUNTY		**Winkler**			
		HIGHWAY		**FM 1232**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	1,440.000		1,440.000	
	510-6003	ONE-WAY TRAF CONT (PORT TRAF SIG)	MO	4.000		4.000	
	512-6072	PTB (FRN&INSTL)(SGL SLP)(TY 1) OR (STL)	LF	920.000		920.000	
	512-6074	PTB (MOVE)(SGL SLP)(TY 1) OR (STL)	LF	3,120.000		3,120.000	
	512-6076	PTB (REMOVE)(SGL SLP)(TY 1) OR (STL)	LF	920.000		920.000	
	529-6002	CONC CURB (TY II)	LF	115.000		115.000	
	530-6002	INTERSECTIONS (ACP)	SY	3,935.000		3,935.000	
	530-6005	DRIVEWAYS (ACP)	SY	454.000		454.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	54,787.000		54,787.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	44,592.000		44,592.000	
	540-6002	MTL W-BEAM GD FEN (STEEL POST)	LF	3,564.000		3,564.000	
	540-6033	MTL BM GD FEN (LONG SPAN SYSTEM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	450.000		450.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	18.000		18.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	545-6003	CRASH CUSH ATTEN (MOVE & RESET)	EA	32.000		32.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	4.000		4.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	4.000		4.000	
	610-6288	IN RD IL (TY SA) 50T-10 (400W EQ) LED	EA	7.000		7.000	
	618-6005	CONDT (HDPE) (2")	LF	415.000		415.000	
	618-6006	CONDT (HDPE) (2") BORE	LF	1,165.000		1,165.000	
	618-6070	CONDT (RM) (2")	LF	10.000		10.000	
	620-6003	ELEC CONDR (NO.12) BARE	LF	1,580.000		1,580.000	
	620-6004	ELEC CONDR (NO.12) INSULATED	LF	3,160.000		3,160.000	
	620-6009	ELEC CONDR (NO.6) BARE	LF	10.000		10.000	
	620-6010	ELEC CONDR (NO.6) INSULATED	LF	20.000		20.000	
	624-6002	GROUND BOX TY A (122311)W/APRON	EA	9.000		9.000	
	628-6015	ELC SRV TY A 120/240 060(SS)SS(E)SP(O)	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	79.000		79.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	13.000		13.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	86.000		86.000	
	658-6060	REMOVE DELIN & OBJECT MARKER ASSMS	EA	20.000		20.000	
	662-6008	WK ZN PAV MRK NON-REMOV (W)6"(SLD)	LF	119,700.000		119,700.000	
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	LF	118,100.000		118,100.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	500.000		500.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	5,860.000		5,860.000	
	666-6018	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	LF	300.000		300.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1371-01-023 **DISTRICT** Odessa **COUNTY** Winkler
HIGHWAY FM 1232

			CONTROL SECTION JOB		**1371-01-023**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00180187**		
			COUNTY		**Winkler**		
			HIGHWAY		**FM 1232**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	666-6030	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	LF	2,211.000		2,211.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	4,609.000		4,609.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	59,149.000		59,149.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	10,356.000		10,356.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	42,126.000		42,126.000	
	668-6076	PREFAB PAV MRK TY C (W) (24") (SLD)	LF	260.000		260.000	
	668-6077	PREFAB PAV MRK TY C (W) (ARROW)	EA	32.000		32.000	
	668-6085	PREFAB PAV MRK TY C (W) (WORD)	EA	31.000		31.000	
	668-6092	PREFAB PAV MRK TY C (W) (36")(YLD TRI)	EA	15.000		15.000	
	672-6007	REFL PAV MRKR TY I-C	EA	640.000		640.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,232.000		1,232.000	
	677-6001	ELIM EXT PAV MRK & MRKS (4")	LF	524,405.000		524,405.000	
	677-6007	ELIM EXT PAV MRK & MRKS (24")	LF	26.000		26.000	
	677-6019	ELIM EXT PAV MRK & MRKS (36")(YLD TRI)	EA	13.000		13.000	
	752-6002	BRUSH REMOVAL	MI	6.000		6.000	
	3077-6007	SP MIXESSP-BSAC-B PG70-22	TON	40,699.000		40,699.000	
	3077-6075	TACK COAT	GAL	16,697.000		16,697.000	
	3080-6021	STONE-MTRX-ASPH SMAR-F SAC-A	TON	17,090.000		17,090.000	
	3084-6001	BONDING COURSE	GAL	11,940.000		11,940.000	
	5107-6001	STEEL FENCE (REMOVE)	LF	213.000		213.000	
	5107-6002	STEEL FENCE (INSTALL)	LF	138.000		138.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	3.000		3.000	
	6185-6002	TMA (STATIONARY)	DAY	690.000		690.000	
	6185-6005	TMA (MOBILE OPERATION)	DAY	50.000		50.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
1	464-6018	RC PIPE (CL IV)(24 IN)	LF	362.000		362.000	
2	464-6019	RC PIPE (CL IV)(30 IN)	LF	63.000		63.000	
1A	4216-6002	THERMOPLASTIC PIPE (PP) (24")	LF	362.000		362.000	
2A	4216-6003	THERMOPLASTIC PIPE (PP) (30")	LF	63.000		63.000	

	TRAFFIC CONTROL PLAN CSJ: 1371-01-023 (WINKLER COUNTY)															
	0403 6001	0502 6001	0510 6003	0512 6072	0512 6074	0512 6076	0545 6003	0545 6005	0545 6007	0662 6008	0662 6109	0662 6037	0662 6111	6001 6002	6185 6002	6185 6005
SHEETS	TEMPORARY SPECIAL SHORING	BARRICADES, SIGNS AND TRAFFIC HANDLING	ONE-WAY TRAF CONT (PORT TRAF SIG)	PTB (FRN&INSTL) (SGL SLP) (TY 1) OR (STL)	PTB (MOVE) (SGL SLP) (TY 1) OR (STL)	PTB (REMOVE) (SGL SLP) (TY 1) OR (STL)	CRASH CUSH ATTEN (MOVE & RESET)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL) (L) (N) (TL3)	WK ZN PAV MRK NON-REMOV (W) 6" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY W	WK ZN PAV MRK NON-REMOV (Y) 6" (SLD)	WK ZN PAV MRK SHT TERM (TAB) TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
	SF	MO	MO	LF	LF	LF	EA	EA	EA	LF	EA	LF	EA	EA	DAY	DAY
TRAFFIC CONTROL PLAN	5,967	18	4	920	3,120	920	32	4	4	119,700	500	118,100	5,860	3	690	50
CSJ: 1371-01-023 PROJECT TOTALS:	5,967	18	4	920	3,120	920	32	4	4	119,700	500	118,100	5,860	3	690	50

	MBGF SUMMARY CSJ: 1371-01-023 (WINKLER COUNTY)				
	0540 6002	0540 6033	0542 6001	0544 6001	0544 6003
SHEETS	MTL W-BEAM GD FEN (STEEL POST)	MTL BM GD FEN (LONG SPAN SYSTEM)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)
	LF	EA	LF	EA	EA
ROADWAY PLAN & PROFILE	3,564	4	450	18	4
CSJ: 1371-01-023 PROJECT TOTALS:	3,564	4	450	18	4

DESCRIPTION	FROM STA	TO STA	LENGTH (FT)	EXISTING WIDTH (FT) BEGIN	EXISTING WIDTH (FT) END	EXISTING WIDTH (FT) AVG.	EXISTING SURFACE AREA (SY)	PROPOSED WIDTH (FT) BEGIN	PROPOSED WIDTH (FT) END	PROPOSED WIDTH (FT) AVG.	PROPOSED SURFACE AREA (SY)	0105 6052 REMOVE STAB BASE & ASPH PAV (4"-5") 1.00/SY	0110 6001 EXCAVATION (ROADWAY) 1.00/CY	0132 6002 EMBANKMENT (FINAL) (DENSITY CONT) (TY A) 1.00/CY	0150 6002 BLADING 1.00/HR	0169 6004 SOIL RETENTION BLANKETS (CL 1) (TY D) 1.00/SY	0216 6001 PROOF ROLLING 1.00/HR	0247 6513 FL BS (CMP IN PLC) (TY A GR 4) (3.5") 1.00/SY
ROADWAY (TURN BAY TIE IN)	101+89	104+39	250	24	24	24	667	44	50	47	1,307	612						821
ROADWAY (TURN BAY)	104+39	107+12	273	24	24	24	728	50	50	50	1,517	668						979
TRANSITION (PROPOSED)	107+12	110+70	358	24	24	24	955	50	44	47	1,869	876						1,164
ROADWAY (NO TRANSTITON)	110+70	209+73	9,903	24	24	24	26,409	44	44	44	48,416	24,208				199		28,884
TRANSITION (PROPOSED)	209+73	218+70	897	24	24	24	2,392	44	48	46	4,585	2,193						2,901
ROADWAY (TURN BAY)	218+70	227+87	917	24	24	24	2,447	48	48	48	4,893	2,242						3,232
TRANSITION (PROPOSED)	227+87	235+77	790	24	24	24	2,106	48	44	46	4,037	1,931						2,650
ROADWAY (NO TRANSTITON)	235+77	304+03	6,826	24	24	24	18,203	44	44	44	33,372	16,686	33,166	18,688	80	249	80	20,025
TRANSITION (PROPOSED)	304+03	309+59	556	24	24	24	1,483	44	66	55	3,398	1,360						2,823
ROADWAY (TURN BAY)	309+59	322+77	1,318	24	24	24	3,515	66	66	66	9,666	3,222						8,996
TRANSITION (PROPOSED)	322+77	331+56	879	24	24	24	2,344	66	44	55	5,372	2,149						3,954
ROADWAY (NO TRANSTITON)	331+56	378+49	4,693	24	24	24	12,515	44	44	44	22,944	11,472						14,401
ROADWAY (PARKWAY)	378+49	391+01	1,252	24	24	24	3,339	44	46	45	6,260	3,061						5,620
ROADWAY (NO TRANSTITON)	391+01	392+15	114	24	24	24	304	46	48	47	596	279						542
ROADWAY (NO TRANSTITON)	392+15	394+05	190	24	24	24	507	48	48	48	1,013	465						989
		TOTAL LENGTH:	29,216 FT	TOTAL EXISTING SA:			77,914 SY	TOTAL PROPOSED SURFACE AREA:			149,245 SY							
										CSJ: 1371-01-023 PROJECT TOTALS:		71,424	33,166	18,688	80	448	80	97,981

DESCRIPTION	FROM STA	TO STA	LENGTH (FT)	EXISTING WIDTH (FT) BEGIN	EXISTING WIDTH (FT) END	EXISTING WIDTH (FT) AVG.	EXISTING SURFACE AREA (SY)	PROPOSED WIDTH (FT) BEGIN	PROPOSED WIDTH (FT) END	PROPOSED WIDTH (FT) AVG.	PROPOSED SURFACE AREA (SY)	0251 6079 REWORK BS MTL (TY D) (SURF) (ORD COMP) 1.00/SY	0310 6005 PRIME COAT (AE-P) .2 GAL/SY	0315 6004 FOG SEAL (CSS-1H) 0.15 GAL/SY	0316 6017 ASPH (AC-20-5TR) 0.38 GAL/SY	0316 6126 AGGR (TY-PB GR-4 SAC-A) 110 SY/CY	0351 6002 FLEXIBLE PAVEMENT STRUCTURE REPAIR (6") 1.00/SY	0529 6002 CONC CURB (TY II) 1.00/LF
ROADWAY (TURN BAY TIE IN)	101+89	104+39	250	24	24	24	667	44	50	47	1,307	612	282	38	517	13		
ROADWAY (TURN BAY)	104+39	107+12	273	24	24	24	728	50	50	50	1,517	668	325	41	599	15		
TRANSITION (PROPOSED)	107+12	110+70	358	24	24	24	955	50	44	47	1,869	876	402	54	740	18		
ROADWAY (NO TRANSTITON)	110+70	209+73	9,903	24	24	24	26,409	44	44	44	48,416	24,208	10,454	1,485	19,234	461		
TRANSITION (PROPOSED)	209+73	218+70	897	24	24	24	2,392	44	48	46	4,585	2,193	1,004	135	1,818	44		
ROADWAY (TURN BAY)	218+70	227+87	917	24	24	24	2,447	48	48	48	4,893	2,242	1,080	138	1,937	47		
TRANSITION (PROPOSED)	227+87	235+77	790	24	24	24	2,106	48	44	46	4,037	1,931	903	118	1,600	39		
ROADWAY (NO TRANSTITON)	235+77	304+03	6,826	24	24	24	18,203	44	44	44	33,372	16,686	7,229	1,024	13,257	318	5,445	
TRANSITION (PROPOSED)	304+03	309+59	556	24	24	24	1,483	44	66	55	3,398	1,360	828	83	1,338	33		
ROADWAY (TURN BAY)	309+59	322+77	1,318	24	24	24	3,515	66	66	66	9,666	3,222	2,419	198	3,784	91		115
TRANSITION (PROPOSED)	322+77	331+56	879	24	24	24	2,344	66	44	55	5,372	2,149	1,203	132	2,115	51		
ROADWAY (NO TRANSTITON)	331+56	378+49	4,693	24	24	24	12,515	44	44	44	22,944	11,472	5,096	704	9,115	219		
ROADWAY (PARKWAY)	378+49	391+01	1,252	24	24	24	3,339	44	46	45	6,260	3,061	1,713	188	2,484	60		
ROADWAY (NO TRANSTITON)	391+01	392+15	114	24	24	24	304	46	48	47	596	279	163	17	236	6		
ROADWAY (NO TRANSTITON)	392+15	394+05	190	24	24	24	507	48	48	48	1,013	465	285	28	401	10		
		TOTAL LENGTH:	29,216 FT	TOTAL EXISTING SA:			77,914 SY	TOTAL PROPOSED SURFACE AREA:			149,245 SY							
										CSJ: 1371-01-023 PROJECT TOTALS:		71,424	33,386	4,382	59,177	1,425	5,445	115

DATE	BY	REV	REVISION

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P#915 308 6413 F#281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

CONSOLIDATED SUMMARY

SHEET 1 OF 3

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	15
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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DESCRIPTION	FROM STA	TO STA	LENGTH (FT)	EXISTING WIDTH (FT) BEGIN	EXISTING WIDTH (FT) END	EXISTING WIDTH (FT) AVG.	EXISTING SURFACE AREA (SY)	PROPOSED WIDTH (FT) BEGIN	PROPOSED WIDTH (FT) END	PROPOSED WIDTH (FT) AVG.	PROPOSED SURFACE AREA (SY)	0530 6002 INTERSECTIONS (ACP) SY 1.00/SY	0530 6005 DRIVEWAYS (ACP) SY 1.00/SY	0752 6002 BRUSH REMOVAL MI 1.00/MI	3077 6007 SP MIXES SP-B SAC-B PG70-22 TON 110 LBS/ 4.5 IN	3077 6075 TACK COAT GAL .1 GAL/SY	3080 6021 STONE-MTRX -ASPH SMAR-F SAC-A TON 110 LBS/ 2.00 IN	3084 6001 BONDING COURSE GAL 0.1 GAL/SY
ROADWAY (TURN BAY TIE IN)	101+89	104+39	250	24	24	24	667	44	50	47	1,307			6	345	141	145	105
ROADWAY (TURN BAY)	104+39	107+12	273	24	24	24	728	50	50	50	1,517				397	163	167	121
TRANSITION (PROPOSED)	107+12	110+70	358	24	24	24	955	50	44	47	1,869				490	201	206	150
ROADWAY (NO TRANSTITON)	110+70	209+73	9,903	24	24	24	26,409	44	44	44	48,416				12,732	5,227	5,326	3,873
TRANSITION (PROPOSED)	209+73	218+70	897	24	24	24	2,392	44	48	46	4,585		218		1,224	502	514	367
ROADWAY (TURN BAY)	218+70	227+87	917	24	24	24	2,447	48	48	48	4,893				1,317	540	554	391
TRANSITION (PROPOSED)	227+87	235+77	790	24	24	24	2,106	48	44	46	4,037				1,101	452	463	323
ROADWAY (NO TRANSTITON)	235+77	304+03	6,826	24	24	24	18,203	44	44	44	33,372				8,805	3,615	3,684	2,670
TRANSITION (PROPOSED)	304+03	309+59	556	24	24	24	1,483	44	66	55	3,398				1,012	414	432	272
ROADWAY (TURN BAY)	309+59	322+77	1,318	24	24	24	3,515	66	66	66	9,666	2,024			2,962	1,210	1,265	773
TRANSITION (PROPOSED)	322+77	331+56	879	24	24	24	2,344	66	44	55	5,372				1,475	602	624	430
ROADWAY (NO TRANSTITON)	331+56	378+49	4,693	24	24	24	12,515	44	44	44	22,944	597			6,208	2,548	2,599	1,836
ROADWAY (PARKWAY)	378+49	391+01	1,252	24	24	24	3,339	44	46	45	6,260	1,132	171		2,091	857	883	501
ROADWAY (NO TRANSTITON)	391+01	392+15	114	24	24	24	304	46	48	47	596	182			199	82	85	48
ROADWAY (NO TRANSTITON)	392+15	394+05	190	24	24	24	507	48	48	48	1,013		65		341	143	143	81
		TOTAL LENGTH:		29,216 FT	TOTAL EXISTING SA:		77,914 SY	TOTAL PROPOSED SURFACE AREA:			149,245 SY							
											CSJ: 1371-01-023 PROJECT TOTALS:	3,935	454	6	40,699	16,697	17,090	11,940

ROADWAY SUMMARY CONT'D
CSJ: 1371-01-023 (WINKLER COUNTY)

SHEETS	0400 6002 STRUCT EXCAV (BOX) CY	0400 6005 CEM STABIL BKFL CY	0402 6001 TRENCH EXCAVATION PROTECTION LF	0432 6002 RIPRAP (CONC) (5 IN) CY	0459 6007 GABION MATTRESSESES (GALV) (12 IN) SY	0462 6021 CONC BOX CULV (8 FT X 6 FT) LF	0462 6024 CONC BOX CULV (9 FT X 5 FT) LF	0462 6032 CONC BOX CULV (10 FT X 8 FT) LF	0464 6018 RC PIPE (CL IV) (24 IN) LF	0464 6019 RC PIPE (CL IV) (30 IN) LF	0466 6130 HEADWALL (CH-PW-S) (DIA=24 IN) EA	0466 6171 WINGWALL (PW-1) (HW=10 FT) EA	0466 6172 WINGWALL (PW - 1) (HW=11 FT) EA	0466 6182 WINGWALL (PW - 1) (HW=7 FT) EA
CULVERT LAYOUT 1	71	32	60	2				55				2		
CULVERT LAYOUT 2		15	49	6	9				74		1			
CULVERT LAYOUT 3		16	30		6				69					
CULVERT LAYOUT 4		19	35							63				
CULVERT LAYOUT 5		25							135					
CULVERT LAYOUT 6		15	65	15	4				84		1			
CULVERT LAYOUT 7	888	31	82	52		88							2	
CULVERT LAYOUT 8	343	23	52	21	30		137							4
CSJ: 1371-01-023 PROJECT TOTALS:	1,302	176	373	96	49	88	137	55	362	63	2	2	2	4

DRAINAGE SUMMARY
CSJ: 1371-01-023 (WINKLER COUNTY)

DRAINAGE SUMMARY CONT'D
CSJ: 1371-01-023 (WINKLER COUNTY)

SHEETS	0467 6390 SET (TY II) (24 IN) (RCP) (4: 1) (C) EA	0467 6419 SET (TY II) (30 IN) (RCP) (4: 1) (C) EA	0496 6001 REMOVE STR (BOX CULVERT) TON	0496 6005 REMOVE STR (WINGWALL) EA	0496 6007 REMOV STR (PIPE) LF	5107 6001 STEEL FENCE (REMOVE) LF	5107 6002 STEEL FENCE (INSTALL) LF
CULVERT LAYOUT 1			1	2		213	138
CULVERT LAYOUT 2	1				60		
CULVERT LAYOUT 3	2				30		
CULVERT LAYOUT 4		2			60		
CULVERT LAYOUT 5	4				30		
CULVERT LAYOUT 6	1				60		
CULVERT LAYOUT 7					60		
CULVERT LAYOUT 8					30		
CSJ: 1371-01-023 PROJECT TOTALS:	8	2	1	2	330	213	138

*FOR CULVERT LAYOUT 1 THRU 6, THE CONTRACTOR HAS THE CHOICE OF USING THERMOPLASTIC PIPE ITEM 4216-6002 AND 4216-6003 AS AN ALTERNATIVE BID ITEM IN LIEU OF ITEMS 464-6018 AND 464-6019.

PAVEMENT MARKING SUMMARY
CSJ: 1371-01-023 (WINKLER COUNTY)

SHEETS	0533 6001 RUMBLE STRIPS (SHOULDER) LF	0533 6002 RUMBLE STRIPS (CENTERLINE) LF	0644 6001 IN SM RD SN SUP&AM TY10BWG(1)SA(P) EA	0644 6004 IN SM RD SN SUP&AM TY10BWG(1)SA(T) EA	0644 6076 REMOVE SM RD SN SUP&AM EA	0658 6060 REMOVE DELIN & OBJECT MARKER ASSMS EA	0666 6018 REFL PAV MRK TY I (W)6"(DOT)(100MIL) LF	0666 6030 REFL PAV MRK TY I (W)8"(DOT)(100MIL) LF	0666 6036 REFL PAV MRK TY I (W)8"(SLD)(100MIL) LF	0666 6309 RE PM W/RET REQ TY I (W)6"(SLD)(100MIL) LF	0666 6318 RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL) LF
SIGNING & PAVEMENT MARKING LAYOUTS (1-7)	54,787	44,592	79	13	86	20	300	2,211	4,609	59,149	10,356
CSJ: 1371-01-023 PROJECT TOTALS:	54,787	44,592	79	13	86	20	300	2,211	4,609	59,149	10,356

PAVEMENT MARKING SUMMARY CONT'D
CSJ: 1371-01-023 (WINKLER COUNTY)

SHEETS	0666 6321 RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL) LF	0668 6076 PREFAB PAV MRK TY C (W)(24")(SLD) LF	0668 6077 PREFAB PAV MRK TY C (W)(ARROW) EA	0668 6085 PREFAB PAV MRK TY C (W)(WORD) EA	0668 6092 PREFAB PAV MRK TY C (W)(36")(YLD TRI) EA	672 6007 REFL PAV MRKR TY I-C EA	672 6009 REFL PAV MRKR TY II-A-A EA	677 6001 ELIM EXT PAV MRK & MRKS (4") LF	677 6007 ELIM EXT PAV MRK & MRKS (24") LF	0677 6019 ELIM EXT PAV MRK & RKS (36")(YLD TRI) EA
SIGNING & PAVEMENT MARKING LAYOUTS (1-7)	42,126	260	32	31	15	640	1,232	524,405	26	13
CSJ: 1371-01-023 PROJECT TOTALS:	42,126	260	32	31	15	640	1,232	524,405	26	13

DATE	BY	REV	REVISION

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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CONSOLIDATED SUMMARY

SHEET 2 OF 3

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	16
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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	ILLUMINATION SUMMARY CSJ: 1371-01-023 (WINKLER COUNTY)										
	0416 6029	0610 6288	0618 6005	0618 6006	0618 6070	0620 6003	0620 6004	0620 6009	0620 6010	0624 6002	0628 6015
SHEETS	DRILL SHAFT (RDWY ILL POLE) (30 IN)	IN RD IL (TY SA) 50T-10 (400W EQ) LED	CONDT (HDPE) (2")	CONDT (HDPE) (2") BORE	CONDT (RM) (2")	ELEC CONDR (NO.12) BARE	ELEC CONDR (NO.12) INSULATED	ELEC CONDR (NO.6) BARE	ELEC CONDR (NO.6) INSULATED	GROUND BOX TY A (122311)W/APRON	ELC SRV TY A 120/240 060(SS)SS(E)SP(O)
	LF	EA	LF	LF	LF	LF	LF	LF	LF	EA	EA
ILLUMINATION	70	7	415	1,165	10	1,580	3,160	10	20	9	1
CSJ: 1371-01-023 PROJECT TOTALS:	70	7	415	1,165	10	1,580	3,160	10	20	9	1

	SW3P SUMMARY CSJ: 1371-01-023 (WINKLER COUNTY)			
	0506 6020	0506 6024	0506 6042	0506 6043
SHEETS	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (18")	BIODEG EROSN CONT LOGS (REMOVE)
	SY	SY	LF	LF
SW3P	620	620	1,440	1,440
CSJ: 1371-01-023 PROJECT TOTALS:	620	620	1,440	1,440

DATE	BY	REV	REVISION

OMEGA ENGINEERS, INC.
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EL PASO, TEXAS 79905
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SH 302 TO SH 115

CONSOLIDATED SUMMARY

SHEET 3 OF 3

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		17
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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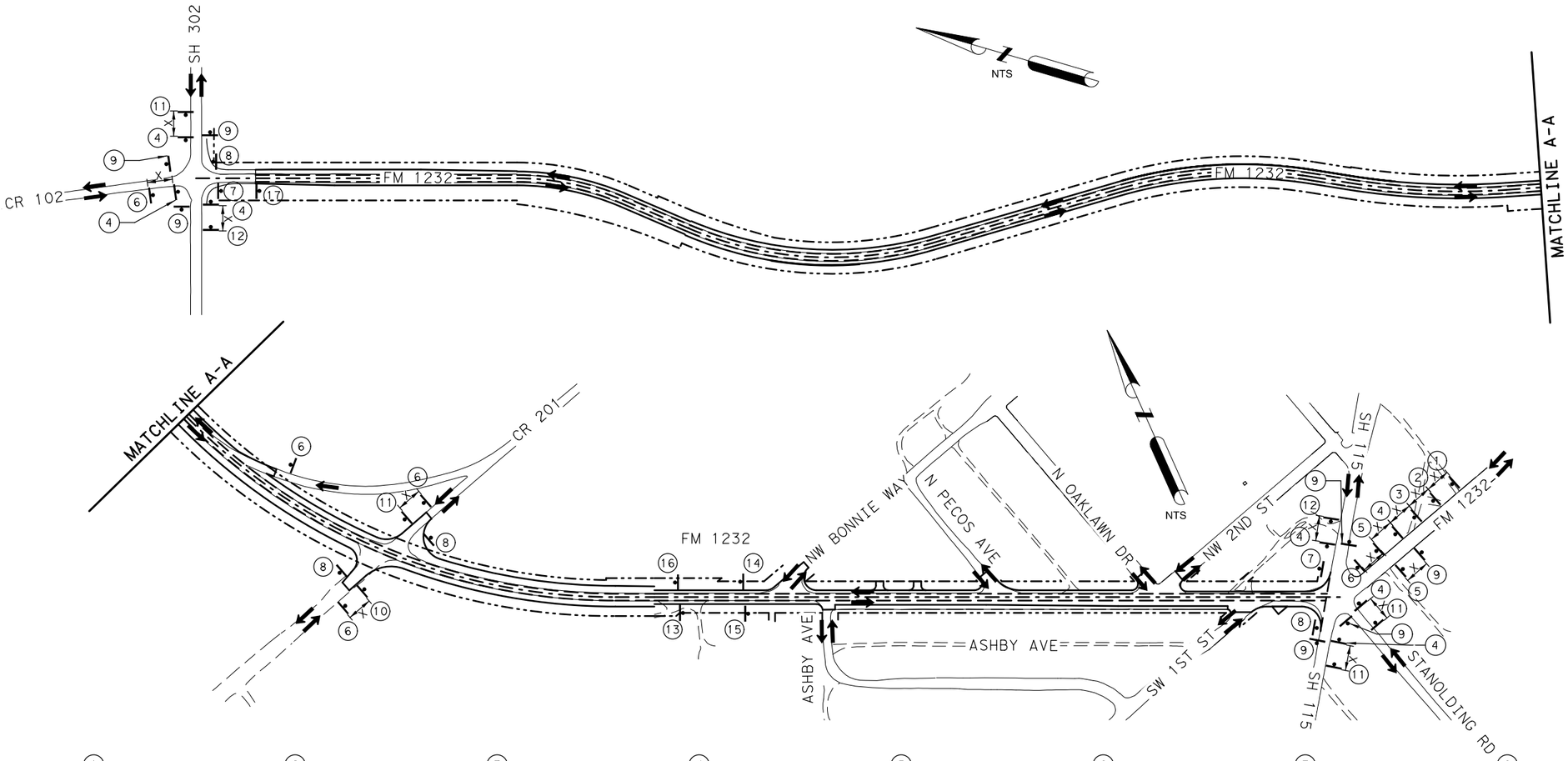

LEGEND

- WORK ZONE SIGN
- DIRECTION OF TRAFFIC

NOTES:

1. REFER TO BC(2)-21 FOR SIGN DISTANCE "X".
2. SPEED REDUCTION WILL BE IMPLEMENTED AS APPROVED BY THE COMISSION.
3. REFER TO BC(2)-21 FOR SIGNAGE AT CROSS ROADS.

(1) Give Us A BRAKE — CW21-1T

(2) OBEY WARNING SIGNS STATE LAW — R20-3T

(3) STAY ALERT / TALK OR TEXT LATER — G20-10T

(4) BEGIN WORK ZONE — G20-9TP; TRAFFIC FINES DOUBLE — R20-5T; WHEN WORKERS ARE PRESENT — R20-5aTP

(5) SPEED LIMIT 35 — R2-1

(6) ROAD WORK AHEAD — CW20-1D

(7) BEGIN ROAD WORK NEXT X MILES — G20-5T; NAME ADDRESS CITY STATE / CONTRACTOR — G20-6T

(8) END ROAD WORK — G20-2

(9) END WORK ZONE — G20-2bT

(10) ROAD WORK ⇦ NEXT 4 MILES NEXT 2 MILES ⇨ — G20-1aT

(11) ROAD WORK ⇦ NEXT 6 MILES — G20-1bTL

(12) ROAD WORK NEXT 6 MILES ⇨ — G20-1bTR

(13) SPEED LIMIT 35 — CW3-5

(14) SPEED LIMIT 45 — CW3-5

(15) WORK ZONE / SPEED LIMIT 35 — G20-5aP; R2-1

(16) WORK ZONE / SPEED LIMIT 45 — G20-5aP; R2-1

DATE	BY	REV	REVISION

STATE OF TEXAS — HORACIO FERNANDEZ — 93064 — LICENSED PROFESSIONAL ENGINEER

7/17/2023

H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
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FM 1232
SH 302 TO SH 115

LINE DIAGRAM

SHEET 1 OF 1

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	18
DRN	OEI	STATE: TEXAS	DIST.: ODA	COUNTY: WINKLER
CHK	OEI	CONT.: 1371	SECT.: 01	JOB: 023 — HIGHWAY NO.: FM 1232

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LOC NO.	TCP PHASE	PLAN SHEET NUMBER	LOCATION	STA	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION									
															MOVE / RESET		L	L	R	R	S	S
							PROPOSED MATERIAL	PROPOSED THICKNESS	DESCRIPTION	WIDTH	HEIGHT		INSTALL	REMOVE	MOVE/ RESET	FROM LOC.#	N	W	N	W	N	W
1	2		CULVERT 1	180+56	TL 3	BI							2								X	
2	2		CULVERT 1	183+56	TL 3	BI							2								X	
3	2		CULVERT 2	215+33.59	TL 3	BI									2	1					X	
4	2		CULVERT 2	218+33.59	TL 3	BI									2	2					X	
5	2		CULVERT 3	219+15.00	TL 3	BI									2	3					X	
6	2		CULVERT 3	222+15.00	TL 3	BI									2	4					X	
7	2		CULVERT 4	224+52.4	TL 3	BI									2	5					X	
8	2		CULVERT 4	227+52.4	TL 3	BI									2	6					X	
9	2		CULVERT 5	230+91.58	TL 3	BI									2	7					X	
10	2		CULVERT 5	233+91.58	TL 3	BI									2	8					X	
11	2		CULVERT 6	246+45.13	TL 3	BI									2	9					X	
12	2		CULVERT 6	249+45.13	TL 3	BI									2	10					X	
13	2		CULVERT 7	276+50	TL 3	BI									2	11					X	
14	2		CULVERT 7	286+50	TL 3	BI									2	12					X	
15	2		CULVERT 8	335+29.63	TL 3	BI									2	13					X	
16	2		CULVERT 8	338+29.63	TL 3	BI									2	14					X	
17	GRD BRK-1		ROADWAY TANGENT	352+00	TL 3	BI								2	2	15					X	
18	GRD BRK-2		ROADWAY TANGENT	394+50	TL 3	BI								2	2	16					X	
												TOTALS	4	4	32							

LEGEND:

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

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

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER

7/17/2023
H. Fernandez, P.E.

CRASH CUSHION SUMMARY SHEET

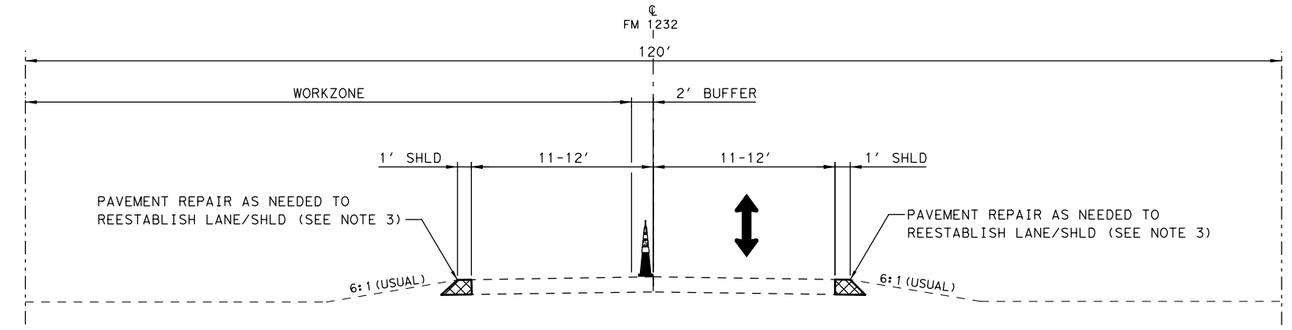
FILE: ccss.dgn	DN: TxDOT	CK:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY	
	ODA	WINKLER	
	FEDERAL AID PROJECT		SHEET NO.
			19

PHASE 1

1. PLACE ADVANCE WARNING SIGNING.
2. PLACE EROSION CONTROL MEASURES IN ACCORDANCE WITH SW3P SITE PLAN.
3. COMPLETE 6" EXISTING FLEXIBLE PAVEMENT REPAIR AT EACH SIDE OF THE ROAD BEFORE ANY WIDENING.
4. PLACE TRAFFIC CONTROL DEVICES DAILY ACCORDING TO TCP STANDARD (1-2b) USE A PILOT CAR TO DIRECT TRAFFIC.
5. CONTRACTOR TO ENSURE 13' OF PAVEMENT FROM CENTERLINE TO THE EDGE OF REPAIRED AREAS ALONG THE ROADWAY AND AT CULVERT LOCATIONS.
6. LIMIT WORK AREA TO HALF MILE SECTIONS. CONTRACTOR TO DEMONSTRATE HIGHER DAILY PRODUCTION RATE IN ORDER TO ALLOW LONGER WORK AREA, OR AS DIRECTED BY THE ENGINEER.
7. ELIMINATE EXISTING PAVEMENT MARKINGS AS NECESSARY.
8. PLACE WORK ZONE PAVEMENT MARKINGS

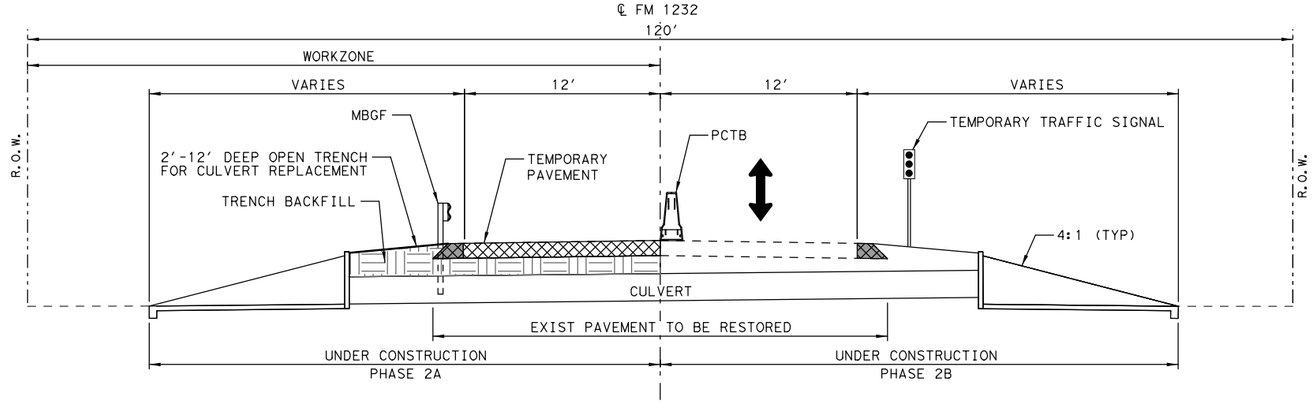
LEGEND

- EXISTING
- PAVEMENT REPAIR
- 2" SMAR-F
- 4.5" SP-B PG 70-22 HMA
- 3.5" REWORKED EXIST. MATERIAL
- 3.5" TY A GR-4 FLEX BASE
- COMPLETED WORK
- PORT TRAFF BARRIER (CONC OR STEEL)
- EMBANKMENT (132-6002)
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION



PHASE 2

1. INSTALL CULVERTS
   - -INSTALL TRAFFIC CONTROL DEVICES IN ACCORDANCE TO STANDARD 2-8b AND USE PCTB AND CRUSH CUSHIONS TO PROTECT WORK ZONE.
   - -INSTALL CULVERTS IN ACCORDANCE WITH CULVERT LAYOUTS.
   - -SAW-CUT ALONG TRAVEL LANE EDGELINE FOR TEMPORARY PAVEMENT CONSTRUCTION
   - -CULVERTS TO BE DONE 1/2 AT A TIME
   - -WORK FROM DOWNSTREAM TO UPSTREAM
   - -INSTALL MBGF AND SGT FEATURES. REFER TO ROADWAY P&P SHEETS FOR MBGF LOCATIONS AND LENGTHS.
   - -FLAGGERS ARE REQUIRED DURING DAY TIME
   - -PROVIDE 3:1 SAFETY WEDGE AT DROP OFFS. THIS WILL BE SUBSIDIARY TO EXCAVATION.
   - -COORDINATE WITH ENGINEER IF MULTIPLE CULVERT WORK IS TO BE PROPOSED BY CONTRACTOR



CULVERT 2 THRU CULVERT 6

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STATE OF TEXAS
HORACIO FERNANDEZ
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FM 1232
SH 302 TO SH 115

TCP NARRATIVE

SHEET 1 OF 4

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		20
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ODA	WINKLER	
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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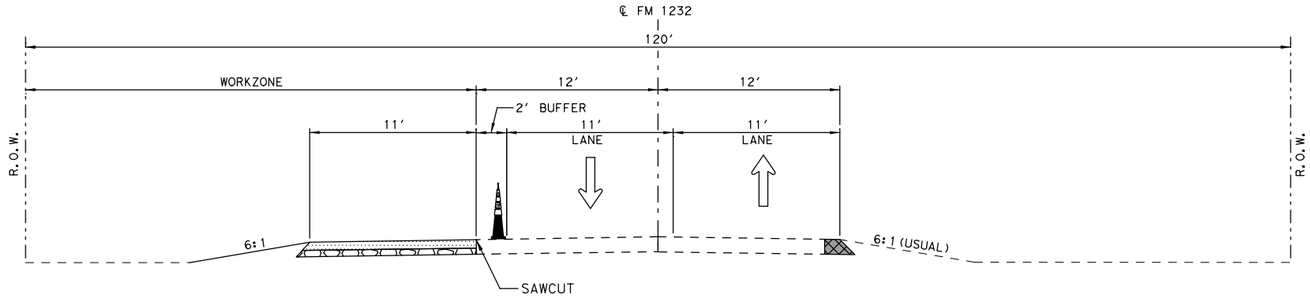
PHASE 3

1. PLACE ADVANCED WARNING SIGNING.
2. THE MAXIMUM WORK AREA LENGTH SHALL BE BASED ON DAILY PRODUCTION FOR THE APPLICABLE WORK ITEM AS PER TCP. ADJUSTMENTS MUST BE APPROVED BY ENGINEER FOR SIGHT DISTANCE, ETC.
3. PLACE TRAFFIC CONTROL DEVICES ACCORDING TO TRAFFIC CONTROL PLAN STANDARD (2-1b)-18.
   - -ELIMINATE EXISTING PAVEMENT MARKINGS.
   - -PLACE WORK ZONE PAVEMENT MARKINGS.
4. SAW-CUT ALONG TRAVEL LANE EDGELINE
   - -EXCAVATE
   - -MAINTAIN AN EDGE SLOPE OF 3:1 OR FLATTER
   - -PLACE 3.5" TY A GR-4 FLEX BASE
   - -PRIME COAT FLEX BASE
   - -PLACE 4.5" SP-B PG 70-22 HMA OVER PRIMED BASE
   - -PLACE 1 COURSE UNDER SEAL OVER SP-B HMA
   - -AC-20-5TR
   - -SAC A TY-PB

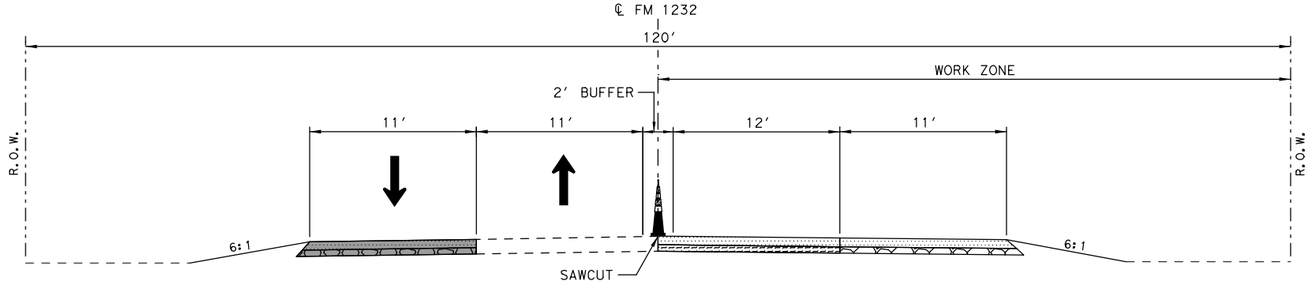


LEGEND

- EXISTING
- PAVEMENT REPAIR
- 2" SMAR-F
- 4.5" SP-B PG 70-22 HMA
- 3.5" REWORKED EXIST. MATERIAL
- 3.5" TY A GR-4 FLEX BASE
- COMPLETED WORK
- PORT TRAFF BARRIER (CONC OR STEEL)
- EMBANKMENT (132-6002)
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION

PHASE 4

1. PLACE ADVANCED WARNING SIGNING.
2. THE MAXIMUM WORK AREA LENGTH SHALL BE BASED ON DAILY PRODUCTION FOR THE APPLICABLE WORK ITEM AS PER TCP. ADJUSTMENTS MUST BE APPROVED BY ENGINEER FOR SIGHT DISTANCE, PRODUCTION RATE, ETC.
3. PLACE WORK ZONE PAVEMENT MARKINGS
   - -USE STANDARD "TCP (2-3b)-18", TO SHIFT ALL TRAFFIC ONTO NEWLY CONSTRUCTED SHOULDER AND EXISTING LANE.
4. SAW-CUT ALONG EXISTING CROWN AND AT CALLOUTS.
   - -REMOVE EXISTING ACP AND 2.5" OF FLEXBASE UNDER TRAVEL LANE
   - -MAINTAIN AN EDGE SLOPE OF 3:1 OR FLATTER AT ALL DROP OFFS DAILY SUBSIDIARY TO EXCAVATION.
5. REWORK 3.5" EXISTING MATERIAL UNDER EXISTING TRAVEL LANE.
   - -EXCAVATE AND PLACE 3.5" OF TY A GR-4 AT WIDENING AREA.
   - -MAINTAIN AN EDGE SLOPE OF 3:1 OR FLATTER AT ALL DROP OFFS DAILY SUBSIDIARY TO EXCAVATION
   - -PLACE 4.5" SP-B PG 70-22 OVER PRIMED BASE
   - -PLACE 1 COURSE UNDER SEAL OVER SP-B HMA
   - -AC-20-5TR
   - -SAC A TY-PB



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SH 302 TO SH 115

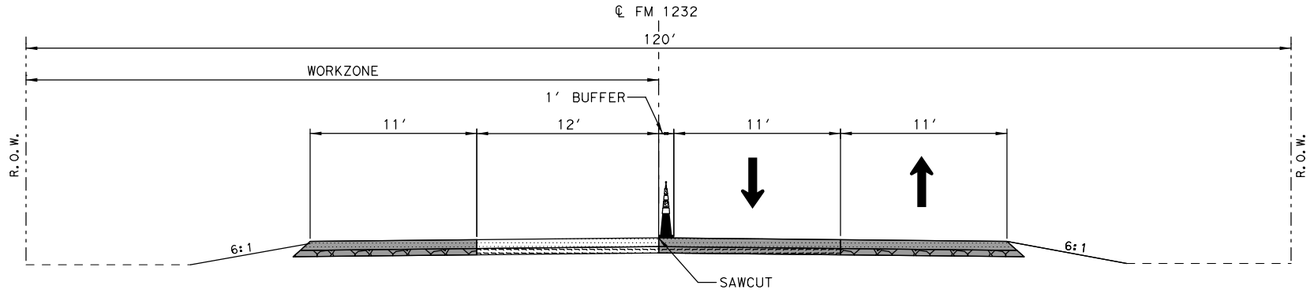
TCP NARRATIVE

SHEET 2 OF 4

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	21
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

PHASE 5

1. PLACE ADVANCED WARNING SIGNING.
2. THE MAXIMUM WORK AREA LENGTH SHALL BE BASED ON DAILY PRODUCTION FOR THE APPLICABLE WORK ITEM AS PER TCP. ADJUSTMENTS MUST BE APPROVED BY ENGINEER FOR SIGHT DISTANCE, PRODUCTION RATE, ETC.
3. USE STANDARD "TCP (2-3b)-18" TO SHIFT ALL TRAFFIC ONTO NEWLY CONSTRUCTED LANE/SHOULDER.
4. SAW-CUT ALONG EXISTING CROWN AND EDGE OF TRAVEL LANE.
   -REMOVE EXISTING ACP AND 2.5" OF FLEXBASE UNDER TRAVEL LANE
5. REWORK 3.5" EXISTING MATERIAL UNDER TRAVEL LANE
   -PLACE 4.5" SP-B PG 70-22 OVER PRIMED BASE
   -PLACE 1 COURSE UNDER SEAL
      -AC-20-5TR
      -SAC A TY-PB

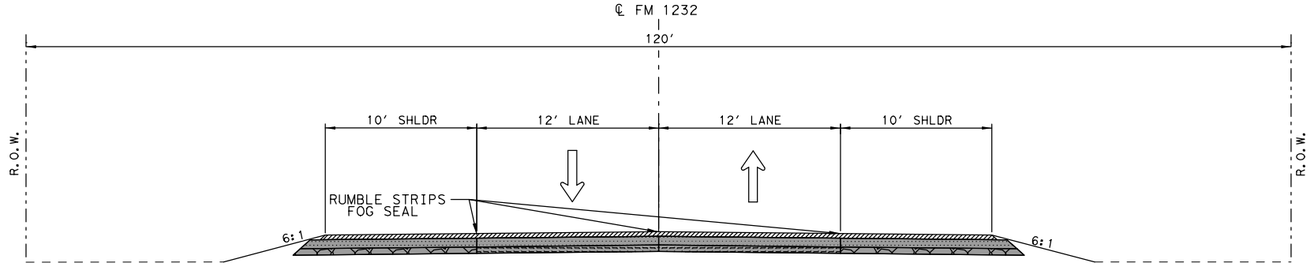


LEGEND

- EXISTING
- PAVEMENT REPAIR
- 2" SMAR-F
- 4.5" SP-B PG 70-22 HMA
- 3.5" REWORKED EXIST. MATERIAL
- 3.5" TY A GR-4 FLEX BASE
- COMPLETED WORK
- PORT TRAFF BARRIER (CONC OR STEEL)
- EMBANKMENT (132-6002)
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION

PHASE 6

1. PLACE ADVANCED WARNING SIGNING.
2. USE STANDARD TRAFFIC CONTROL PLAN (1-2b)-18
   -CONTRACTOR MAY ONLY PERFORM WORK THAT CAN BE COMPLETED AND MADE AVAILABLE TO TRAFFIC AT THE END OF THE WORK DAY
   -CONTRACTOR TO OPEN BOTH LANES TO TRAFFIC BY END OF WORK DAY
3. FINAL CONFIGURATION
   -FINISH WITH 2" SMAR-F HMA
   -INSTALL SHOULDER AND CENTERLINE RUMBLE STRIPS
   -PLACE FOG SEAL ON RUMBLE STRIPS
   -STRIPE PROJECT WITH FINAL CONFIGURATION
   -INSTALL FINAL SIGNS
   -PUNCH LIST ITEMS
   -FINAL CLEANUP



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TCP NARRATIVE

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		22
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
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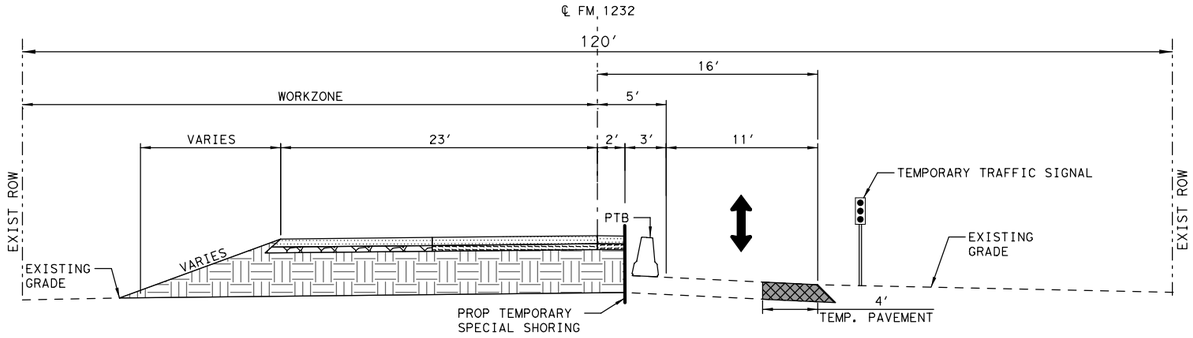
GRADE BREAK CONSTRUCTION PHASE 1

1. PLACE ADVANCE WARNING SIGNING.
2. PLACE EROSION CONTROL MEASURES IN ACCORDANCE WITH SW3P SITE PLAN.
3. CONTRACTOR TO ENSURE 16′ OF PAVEMENT FROM CENTERLINE.
4. IMPLEMENT TCP STANDARD 2-8b.
   - -ELIMINATE EXISTING PAVEMENT MARKINGS AS NECESSARY.
   - -PLACE WORK ZONE PAVEMENT MARKINGS
   - -INSTALL SPECIAL SHORING AS GRADE DIFFERENTIAL INCREASES
   - -INSTALL PTB
5. REMOVE EXISTING ACP
   - -REMOVE EXISTING FLEXBASE AND PLACE IN A NEAR BY LOCATION FOR REUSE
6. FILL WITH EMBANKMENT TO THE REQUIRED GRADE
   - -PLACE AND REWORK 3.5" EXISTING MATERIAL UNDER TRAVEL LANE
   - -PLACE 3.5" OF TY A GR-4 FLEX BASE AT WIDENING AREA
   - -PRIME COAT REWORKED MATERIAL AND TY A GR-4 FLEX BASE
   - -PLACE 4.5" SP-B PG 70-22 HMA OVER PRIMED BASE
   - -PLACE 1 COURSE UNDER SEAL OVER SP-B HMA
   - -AC-20-5TR
   - -SAC A TY-PB
7. PLACE TEMPORARY PAVEMENT MARKERS



LEGEND

- EXISTING
- PAVEMENT REPAIR
- 2" SMAR-F
- 4.5" SP-B PG 70-22 HMA
- 3.5" REWORKED EXIST. MATERIAL
- 3.5" TY A GR-4 FLEX BASE
- COMPLETED WORK
- PORT TRAFF BARRIER (CONC OR STEEL)
- EMBANKMENT (132-6002)
- PROPOSED TRAFFIC DIRECTION
- EXISTING TRAFFIC DIRECTION

NOTES

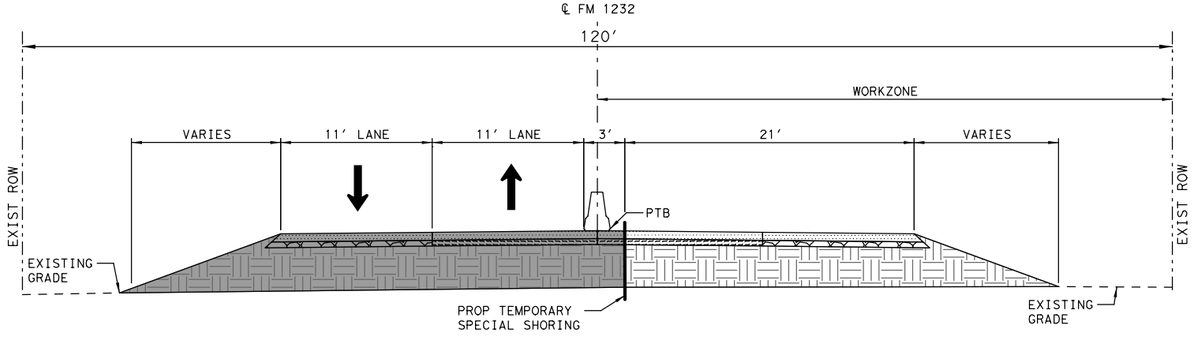
1. GRADE BREAK CONSTRUCTION PHASING SHALL OCURR PRIOR TO PHASE 6.

GRADE BREAK CONSTRUCTION PHASE 2

1. PLACE ADVANCE WARNING SIGNING.
2. PLACE EROSION CONTROL MEASURES IN ACCORDANCE WITH SW3P SITE PLAN.
3. IMPLEMENT TCP STANDARD TCP (2-3b)-18 WITH THE USE OF PTB, THEN SHIFT TRAFFIC IN BOTH DIRECTIONS TO NEWLY CONSTRUCTED SECTION.
4. ELIMINATE EXISTING PAVEMENT MARKINGS AS NECESSARY.
   - -PLACE WORK ZONE PAVEMENT MARKINGS
   - -KEEP SPECIAL SHORING UNTIL NOT NEEDED.
5. REMOVE EXISTING ACP
   - -REMOVE EXISTING FLEXBASE AND PLACE IN A NEAR BY LOCATION FOR REUSE
6. FILL WITH EMBANKMENT TO THE REQUIRED GRADE
   - -PLACE AND REWORK 3.5" EXISTING MATERIAL UNDER TRAVEL LANE
   - -PLACE 3.5" OF TY A GR-4 FLEX BASE AT WIDENING AREA
   - -PRIME COAT REWORKED MATERIAL AND TY A GR-4 FLEX BASE
   - -PLACE 4.5" SP-B PG 70-22 HMA OVER PRIMED BASE
   - -PLACE 1 COURSE UNDER SEAL OVER SP-B HMA
     - -AC-20-5TR
     - -SAC A TY-PB
7. PLACE TEMPORARY MARKERS
8. REMOVE SPECIAL SHORING, PTB, AND TCP AND SHIFT TRAFFIC TO NEWLY CONSTRUCTED SECTION.
9. REMOVE CONFLICTING STRIPING. (GO TO NEXT LOCATION IF ANY)

TEMPORARY SPECIAL SHORING (0403 6001)					
LOCATION	STA	TO	STA	AREA, SF	COMMENTS
CULVERT 1	181+90	TO	182+21	380	PAID UNDER TCP ITEMS.
CULVERT 2	216+70	TO	216+92	200	
CULVERT 6	247+83	TO	248+06	367	
ROADWAY TANGENT	280+50	TO	283+20	1,180	
CULVERT 7	283+20	TO	283+50	570	
ROADWAY TANGENT	283+50	TO	284+04	223	
CULVERT 8	336+60	TO	337+00	444	
ROADWAY TANGENT	356+72	TO	362+03	2,603	
		TOTAL AREA, SF		5,967	

TEMPORARY SPECIAL SHORING LIMITS ARE PRESENTED FOR QUANTITIES PURPOSES ONLY.
CONTRACTOR IS RESPONSIBLE FOR SHORING LIMITS AND DESIGN.



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FM 1232
SH 302 TO SH 115

TCP NARRATIVE

SHEET 4 OF 4

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	23
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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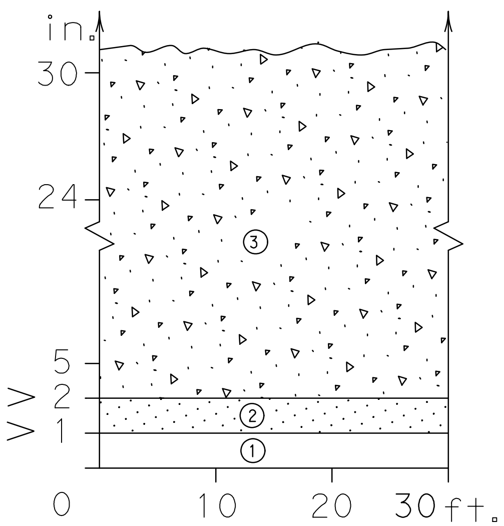
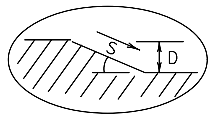
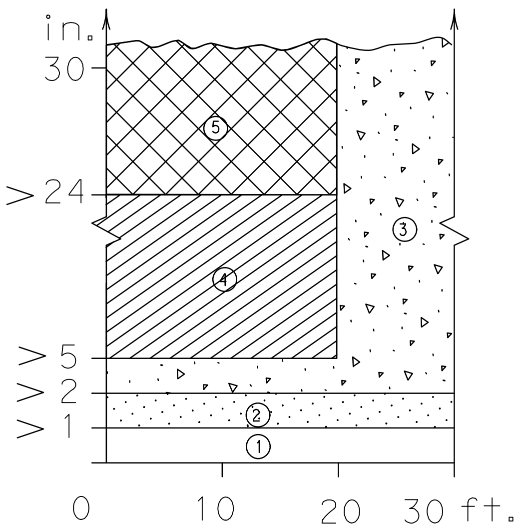
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

Edge Height (D) in Inches versus Lateral Clearance (Y) in Feet

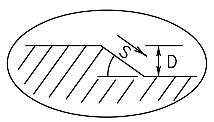


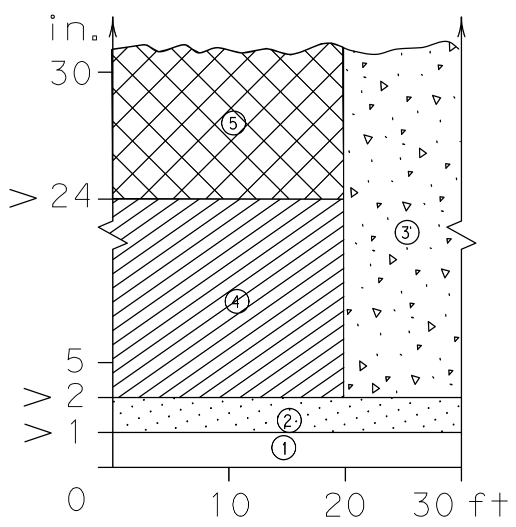
Edge Condition I
S = (3:1) (or flatter)





Edge Condition II
S = ((2.99):1) to (1:1)





Edge Condition III
S is steeper than (1:1)

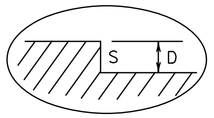
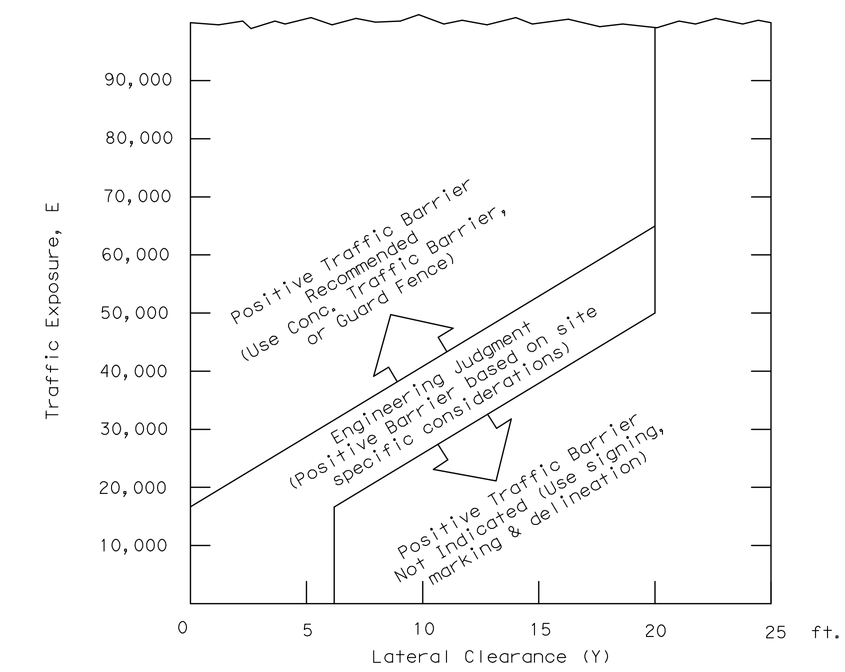


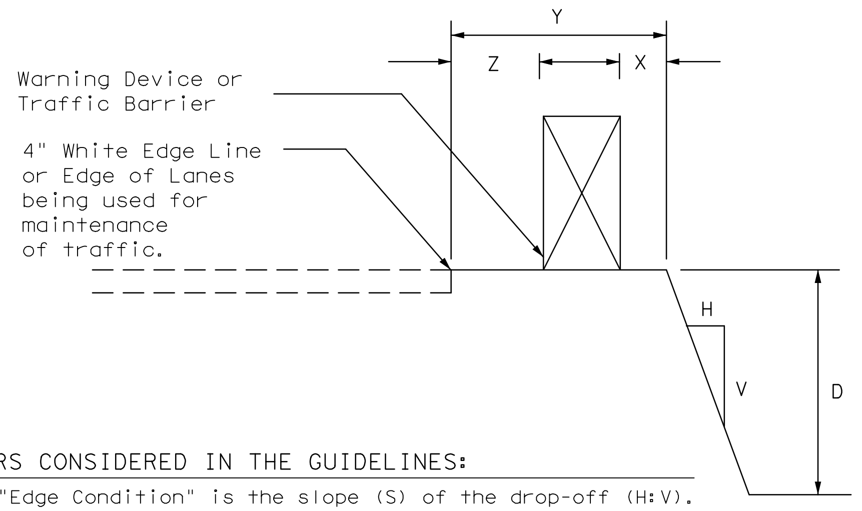
FIGURE-1: CONDITIONS INDICATING USE OF POSITIVE BARRIER FOR ZONE 5 (▩)



1. E = ADT x T
Where ADT is that portion of the average daily traffic volume traveling within 20 feet (generally two adjacent lanes) of the edge dropoff condition; and, T is the duration time in years of the dropoff condition.

2. Figure-1 provides a practical approach to the use of positive barriers for the protection of vehicles from pavement drop-offs. Other factors, such as the presence of heavy machinery, construction workers, or the mix and volume of traffic may make the use of positive barriers appropriate, even when the edge condition alone may not justify the use of a barrier.

3. An approved end treatment should be provided for any positive barrier end located within the clear zone.



Zone	Treatment Types Guidelines:
1	No treatment
2	CW 8-11 "Uneven Lanes" signs.
3	CW 8-9a Shoulder Drop-Off" or CW 8-11 signs plus vertical panels.
4	CW8-9a or CW 8-11, signs plus drums. Where restricted space precludes the use of drums, use vertical panels. An edge slope to that of the profered Edge Condition I.
5	Check indications (Figure-1) for possitive barrier. Where positive barrier is not indicated, the treatment shown above for Zone-4 may be used after consideration of other applicable factors.

These guidelines apply to temporary traffic control areas or work zones where continuous pavement edges or drop-offs exists parallel and adjacent to a lane used by traffic. The edge conditions may be present between shoulders and travel lanes, between adjacent or opposing travel lanes, or at intermediate points across the width of the paved surface. Due to the variability in construction operations, tolerances in the variables may be allowed by the engineer. These guidelines do not apply to short term operations. These guidelines do not constitute a rigid standard or policy; rather, they are guidance to be used in conjunction with engineering judgement. These guidelines may be updated on the Design Division's on-line manuals.

FACTORS CONSIDERED IN THE GUIDELINES:

1. The "Edge Condition" is the slope (S) of the drop-off (H:V). The "Edge Height is the depth of the drop-off "D".

2. Distance "X" is to be the maximum practical under job conditions. Two feet minimum for high speed conditions. Distance "Y" is the lateral clearance from edge of travel lane to edge of dropoff. Distance "Z" does not have a minimum.

3. In addition to the factors considered in the guidelines, each construction zone drop-off situation should be analyzed individually, taking into account other variables, such as: traffic mix, posted speed in the construction zone, horizontal curvature, and the practicality of the treatment options.

4. The conditions for indicating the use of positive or protective barriers are given by Zone-5 and Figure-1. Traffic barriers are primarily applicable for high speed conditions. Urban areas with speeds of 30 mph or less may have a lesser need for signing, delineation, and barriers. Right-angled edges, however, with "D" greater than 2 inches and located within a lateral offset of 6 feet, may indicate a higher level of treatment.

5. If the distance "Y" must be less than 3 feet, the use of a positive barrier may not be feasible. In such a case, consider either: 1) narrowing the lanes to a desired 11 to 12 feet or 10 foot minimum (see CW20-8 sign), or 2) provide an edge slope such as Edge Condition I.

Edge Condition Notes:

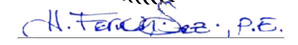
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

2. Edge Condition II: Most vehicles are able to traverse an edge condition with a slope between (2.99 to 1) and (1 to 1) so long as "D" does not exceed 5 inches. Under-carriage drag on most automobiles will occur when "D" exceeds 6 inches. As "D" exeeds 24 inches, the possibility for rollover is greater in most vehicles.

3. Edge Condition III: When slopes are greater than (1 to 1) and where "D" is greater than 2 inches, a more difficult control factor may exist for some vehicles, if not properly treated. For example, where "D" is greater than 2 inches and up to 24 inches different types of vehicles may experience different steering control at different edge heights. Automobiles might experience more steering control differential when "D" is greater than 2 inches and up to 5 inches. Trucks, particularly those with high loads, have more steering control differential when "D" is greater than 5 inches and up to 24 inches. When "D" exceeds 24 inches, the possibility of rollover is greater for most vehicles.

4. Milling or overlay operations that result in Edge Condition III should not be in place without appropriate warning treatments, and these conditions should not be left in place for extended periods of time.

Engineer's Seal



Date 7/17/2023

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

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© TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS 03-01 08-01 9-21	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		24

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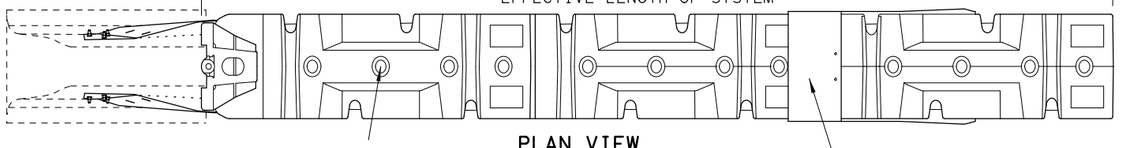
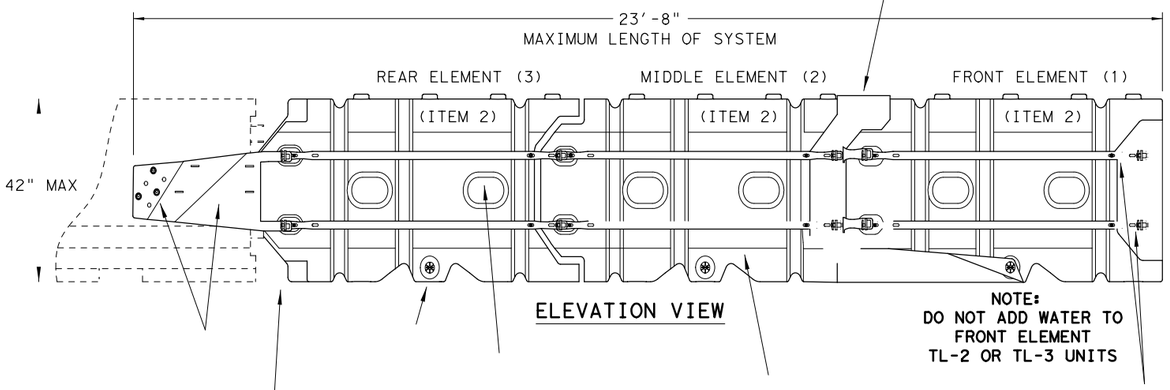
SYSTEM SHOWN - ABSORB-M TL-3



PLAN VIEW

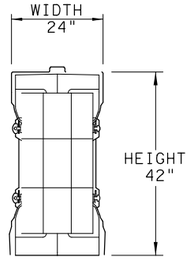
TRAFFIC FLOW



ELEVATION VIEW

NOTE:
DO NOT ADD WATER TO
FRONT ELEMENT
TL-2 OR TL-3 UNITS

TRAFFIC FLOW



SECTION A-A

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

GENERAL NOTES

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

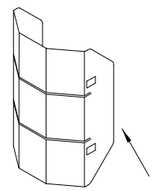
BILL OF MATERIALS (BOM) ABSORB-M TL-3 & TL-2 SYSTEMS			QTY	QTY
ITEM #	PART NUMBER	PART DESCRIPTION	TL-2 SYSTEM	TL-3 SYSTEM
1	BSI-1809036-00	TRANSITION-(GALV)	1	1
* 2	BSI-1808002-00	PRE-ASSEMBLED ABSORBING (ELEMENTS)	2	3
* 3	BSI-4004598	FILL CAPS	8	12
* 4	BSI-4004599	DRAIN PLUGS	2	3
* 5	BSI-1809053-00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

* COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE

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

** APPLY DECAL



NOSE PLATE

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

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

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

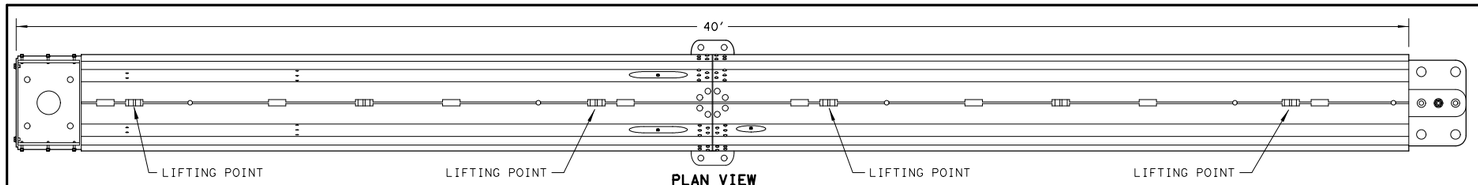
SACRIFICIAL

Texas Department of Transportation — Design Division Standard

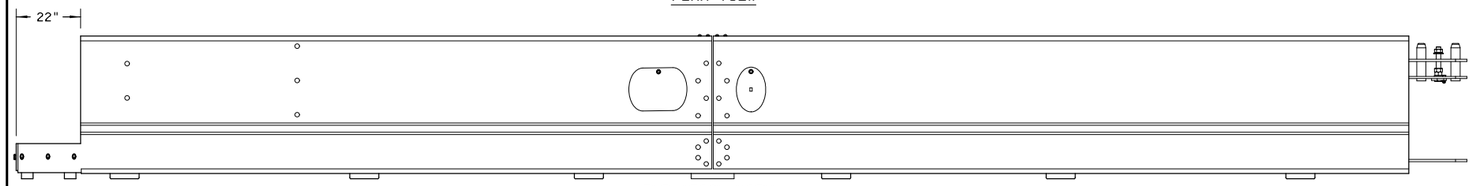
LINDSAY TRANSPORTATION SOLUTIONS
CRASH CUSHION
(MASH TL-3 & TL-2)
TEMPORARY - WORK ZONE
ABSORB(M)-19

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		25

DATE:
FILE:

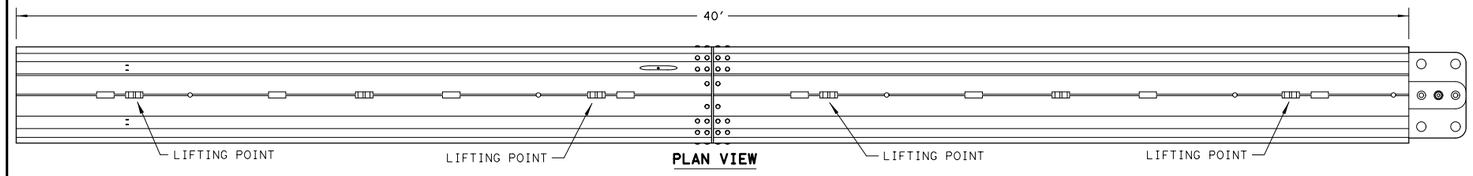


PLAN VIEW

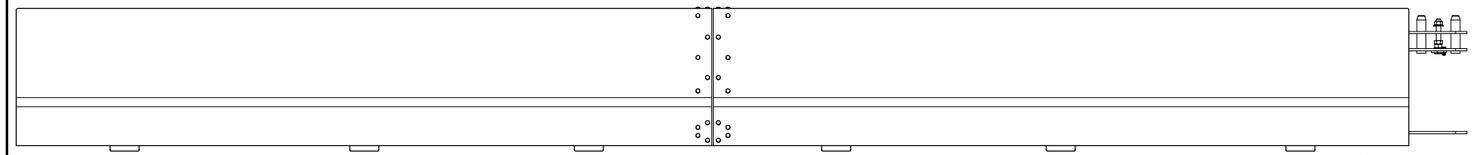


ELEVATION VIEW

BARRIERGUARD END SECTION - 40 FT. MALE OR FEMALE END SECTION

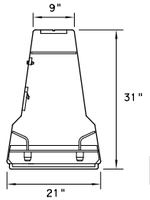


PLAN VIEW

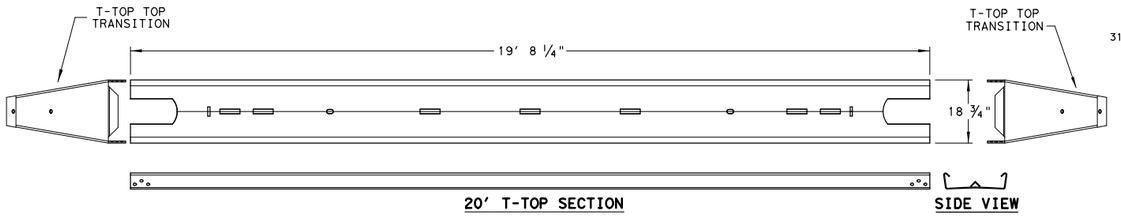


ELEVATION VIEW

BARRIERGUARD STANDARD SECTION - 40 FT.

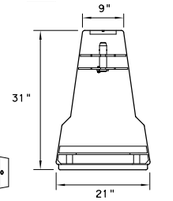


FEMALE END CROSS SECTION

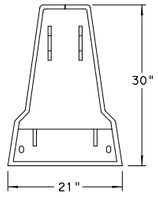


20' T-TOP SECTION

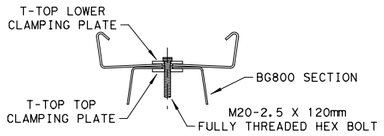
SIDE VIEW



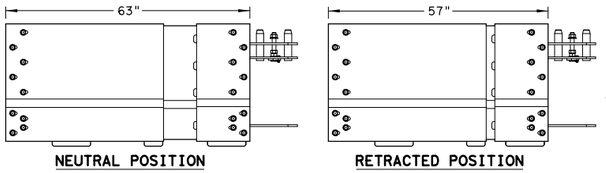
MALE END CROSS SECTION



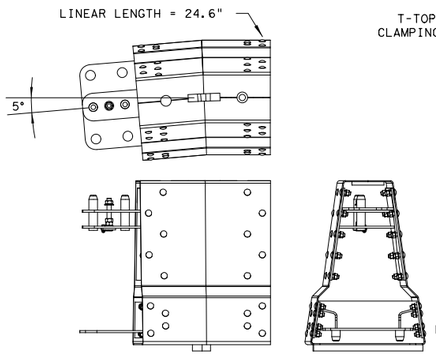
FULL HEIGHT TERMINAL COVER



T-TOP MOUNTING DETAIL



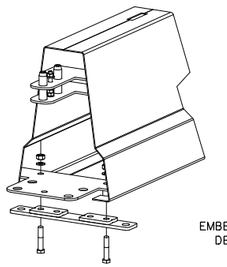
VARIABLE LENGTH BARRIER



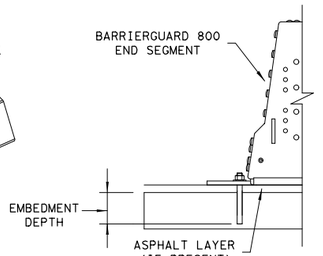
5° (LH) LEFT HAND ANGLE SECTION

NOTE: ADDITIONAL ANGLE SECTION AVAILABLE

5° (RH) RIGHT HAND ANGLE SECTION
10° (LH) LEFT HAND ANGLE SECTION
10° (RH) RIGHT HAND ANGLE SECTION



INTERMEDIATE ANCHOR AT QUICKLINK



SEE ANCHORING TABLE

GENERAL NOTES

1. THE SYSTEM SHOWN ON THIS DRAWING IS A PROPRIETARY BARRIER TRADED AS BARRIERGUARD 800 AND BARRIERGUARD 800 MDS AND HAS BEEN DESIGNED AND MANUFACTURED BY LAURA METAAL ROAD SAFETY INC. FOR TECHNICAL ASSISTANCE AND APPLICATION SUPPORT CONTACT LEE STUART AT LAURA METAAL ROAD SAFETY INC. AT (702) 664-2009 OR lstuart.laurametaal@outlook.com
2. THE BARRIERGUARD 800 SYSTEM HAS BEEN CRASH TESTED TO MASH AND HAS FHWA APPROVAL AS A TL-3 BARRIER. THE DEFLECTION TABLE OUTLINES BASIC SYSTEM PERFORMANCE AND COMPONENT ANCHORING REQUIREMENTS.
3. THIS DRAWING PACKAGE PROVIDES THE RELEVANT INFORMATION AND GENERAL GRAPHICS REQUIRED TO IDENTIFY THE COMPONENT PARTS OF BARRIERGUARD 800 AND THEIR INCORPORATION AS A WHOLE SYSTEM FOR DEPARTMENTAL STANDARD APPLICATIONS.
4. BARRIERGUARD 800 REQUIRES ANCHORING (PINNING) AT EACH END OF THE INSTALLED LENGTH. (INTERMEDIATE ANCHORS CAN BE USED TO REDUCE DEFLECTION).
5. INSTALLATION OF BARRIERGUARD 800 OR BARRIERGUARD 800 MDS, NORMALLY STARTS WITH A MALE TERMINAL SECTION AND IS FINISHED WITH A FEMALE TERMINAL SECTION. STANDARD SECTIONS ARE USED BETWEEN THE TERMINAL SECTIONS TO OBTAIN THE REQUIRED LENGTH OF POSITIVE BARRIER PROTECTION.
6. THE FULL HEIGHT TERMINAL (FHT) SECTIONS MAY BE CAPPED WITH A FHT COVER, HOWEVER IF EXPOSED TO ON-COMING TRAFFIC THE END SHOULD BE PROTECTED WITH A SUITABLE CRASH CUSHION. THE BARRIERGUARD 800 RANGE IS COMPATIBLE WITH MOST COMMONLY USED CRASH CUSHION END TREATMENTS. FOR DETAILS OF BARRIERGUARD 800 CRASH CUSHION CONNECTIONS THAT ARE NOT DETAILED WITHIN THESE DRAWINGS, PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR MORE DETAILS. THE FULL HEIGHT TERMINAL COVER IS SUITABLE FOR THE "DOWN STREAM" END OF A SYSTEM THAT DOES NOT HAVE EXPOSURE TO ON-COMING TRAFFIC.
7. WHEN INSTALLING THE MINIMUM DEFLECTION SYSTEM (MDS),THE SYSTEM CAN BE INSTALLED WITH ADDITIONAL INTERMEDIATE ANCHORS ALONG THE LENGTH OF THE BARRIER RUN AT INTERVALS SHOWN IN THE DEFLECTION TABLE. EACH BARRIER RUN CAN BE MADE UP OF ANY MIXTURE OF THE SYSTEMS BY THE INTRODUCTION OF INTERMEDIATE ANCHORS AND/OR T-TOP AS REQUIRED.
8. THERE ARE SEVERAL METHODS OF ACHIEVING RADIUS IN A LENGTH OF BARRIERGUARD 800. RADIUS CAN BE ACHIEVED USING VARIOUS METHODS AND THUS ALLOWING THE BARRIERGUARD TO FOLLOW THE DESIRED CURVATURE IN THE INSTALLATION, THESE METHODS ARE, THE MOVEMENT IN THE QUICKLINK, ADJUSTABLE 20FT. SECTIONS OR SHORT ANGLED SECTIONS WHICH ALLOW A RADIUS AS LOW AS 12FT. FOR FURTHER INFORMATION AND ADVICE CONTACT LAURA METAAL ROAD SAFETY INC.
9. A BARRIERGUARD 800 VARIABLE LENGTH BARRIER (VLB) SECTION SHOULD BE USED WHEN BARRIERGUARD 800 OR BARRIERGUARD 800 MDS IS ANCHORED ACROSS A BRIDGE EXPANSION JOINT. IF T-TOP IS TO BE USED IN CONJUNCTION WITH THE VLB, THE T-TOP SHOULD BE USED FOR MINIMUM 40FT ON EITHER SIDE OF THE VLB AND TERMINATED WITH TRANSITIONS. THE VLB SECTION PROVIDES APPROXIMATELY 7in OF EXTENSION AND 7in OF CONTRACTION. MULTIPLE VLB'S CAN BE LINKED TOGETHER TO PROVIDE MORE EXPANSION OR CONTRACTION. THE VLB'S SHOULD BE PLACED IN THE VICINITY OF THE EXPANSION JOINT. THE VLB DOES NOT NEED TO BE PLACED DIRECTLY OVER THE EXPANSION JOINT BUT MUST BE BETWEEN THE NEAREST ANCHORS ON EACH SIDE OF THE JOINT. IT IS RECOMMENDED THAT THE VLB IS PLACED WITHIN 40FT OF THE JOINT.
10. THE T-TOP CAN BE INSTALLED EITHER BEFORE OR AFTER THE BARRIERGUARD 800 HAS BEEN FULLY ASSEMBLED AND ANCHORED IN PLACE. T-TOP IS REQUIRED WHEN THE BARRIERGUARD 800 IS USED AS A MDS, ANCHORED EVERY 20FT, GATE SECTIONS AND VARIABLE LENGTH BARRIERS. THE T-TOP SHOULD EXTEND 40FT ON EITHER SIDE OF THESE CONDITIONS AND BE TERMINATED WITH TRANSITIONS.
11. THE BARRIERGUARD 800 RANGE HAS BEEN DESIGNED TO BE USED ON AND HAS BEEN TESTED ANCHORED ON ASPHALT, CONCRETE AND COMPACTED SUBBASE. CONTACT LAURA METAAL ROAD SAFETY INC. FOR FURTHER INFORMATION.
12. BARRIERGUARD 800 COMPONENTS ARE MANUFACTURED IN SI [METRIC] UNITS. ENGLISH UNITS SHOWN ARE APPROXIMATE. ALL COMPONENTS ARE FULLY GALVANIZED.
13. BARRIERGUARD 800 SYSTEMS SHALL BE ASSEMBLED AND INSTALLED IN ACCORDANCE WITH THE MANUFACTURERS DETAILED DRAWINGS, PROCEDURES AND SPECIFICATIONS. FOR ANY INSTALATIONS OUTSIDE OF THE SCOPE OF THESE DRAWINGS PLEASE CONTACT LAURA METAAL ROAD SAFETY INC. FOR DETAILS.

BARRIERGUARD 800 DEFLECTION TABLE

	STANDARD SYSTEM	MINIMUM DEFLECTION SYSTEMS (MDS)
DESCRIPTION	ONLY ANCHORED AT THE EXTREME ENDS OF THE BARRIER LENGTH	ANCHORED EVERY 20 FT.
DEFLECTION AT MASH TL-3	5'-6"	18 1/2"
T-TOP REQUIREMENTS	NONE REQUIRED	REQUIRED FOR MDS SECTIONS

STANDARD ANCHORING REQUIREMENTS (TABLE)

	RESIN STUD ANCHORS			DRIVEN ANCHORS		Hilti HSL-3 SHALLOW MECHANICAL
	CONCRETE *	UNREINFORCED CONCRETE *	ASPHALT	ASPHALT	SUBBASE/SOIL	CONCRETE
ANCHOR DIAMETER	1 in.	1 in.	1 in.	1-3/16 in.	5-1/2 in.	* *
EMBEDMENT DEPTH	6 in.	8 in.	16 in.	16 in.	32 in.	* *
DRILL DIAMETER	1-1/8 in.	1-1/8 in.	1-1/8 in.	1-3/16 in.	DRIVEN	* *
PULL OUT CAPACITY (MIN)	17500 lb	17500 lb	N/A	N/A	N/A	* *
SHEAR CAPACITY (MIN)	25000 lb	25000 lb	N/A	N/A	N/A	* *

* ALTERNATIVE ANCHORS INCLUDING MECHANICAL ANCHORS FOR CONCRETE MAYBE USED IF THEY MEET THE STRENGTH REQUIREMENTS LISTED, DETAILS WILL BE MANUFACTURER SPECIFIC.

* * CONTACT: LAURA METAAL ROAD SAFETY INC. FOR SPECIFIC APPLICATION.

Texas Department of Transportation

Design Division Standard

BARRIERGUARD 800 SYSTEM
STEEL BARRIER
MASH TL-3
BARRIERGUARD-19

FILE: barrierguard19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		26

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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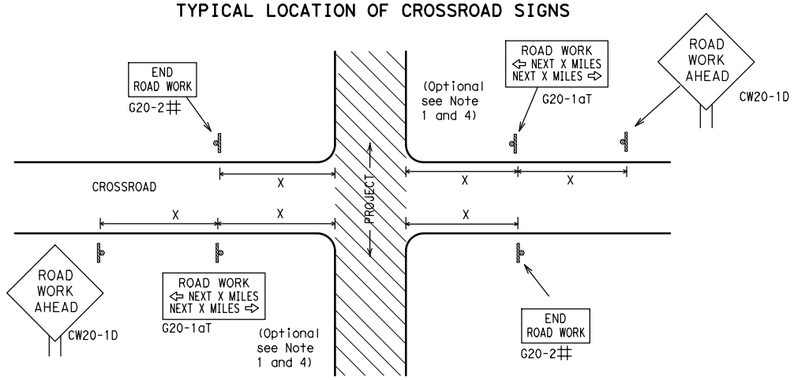
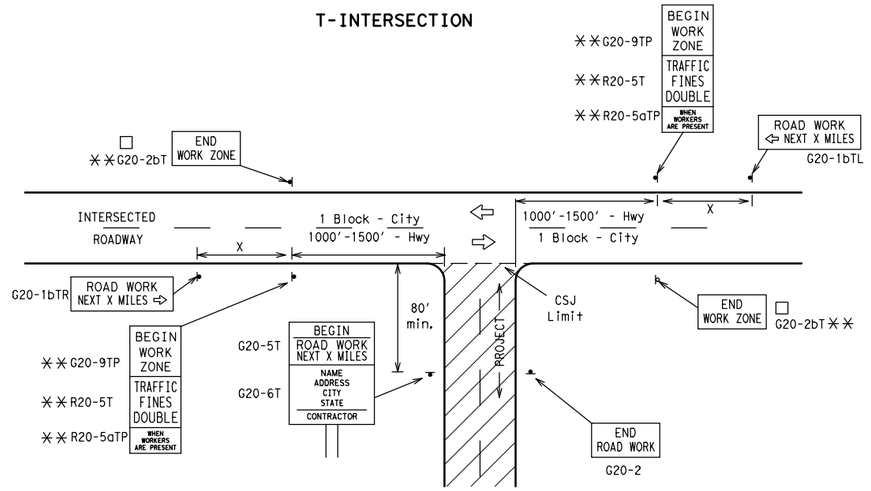
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

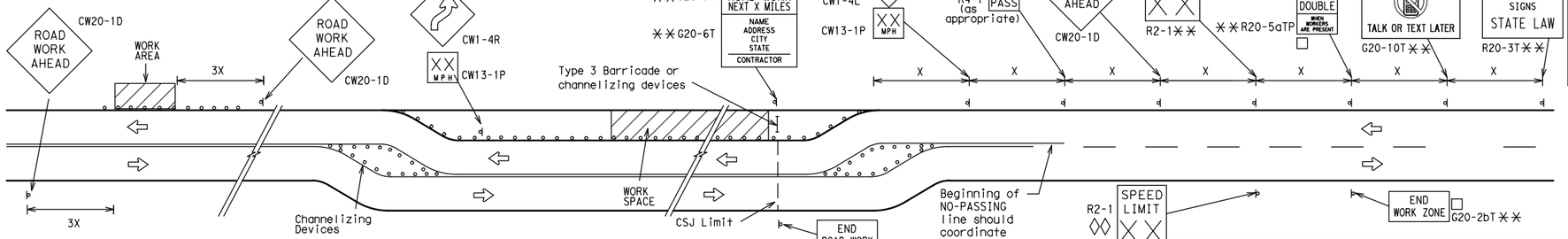
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

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

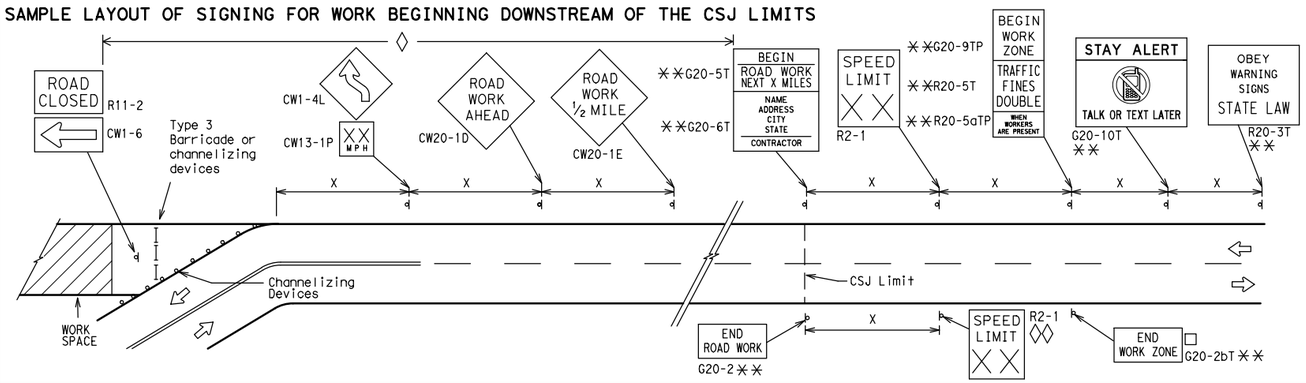
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

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



NOTES

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

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

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

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

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

LEGEND

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

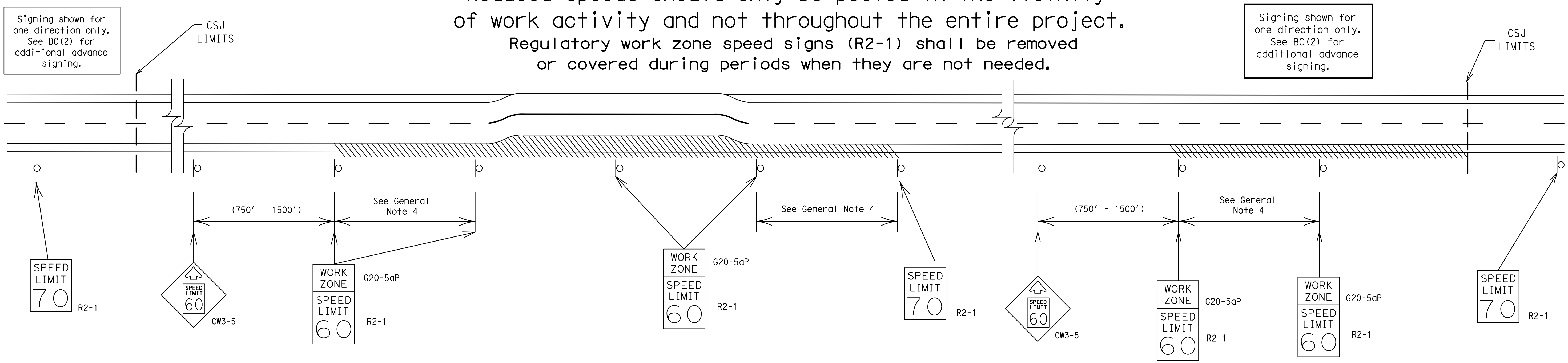
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	WINKLER		28

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS 9-07 8-14 7-13 5-21	DIST ODA	COUNTY WINKLER		SHEET NO. 29

DATE: 7/17/2023 10:06:22 AM
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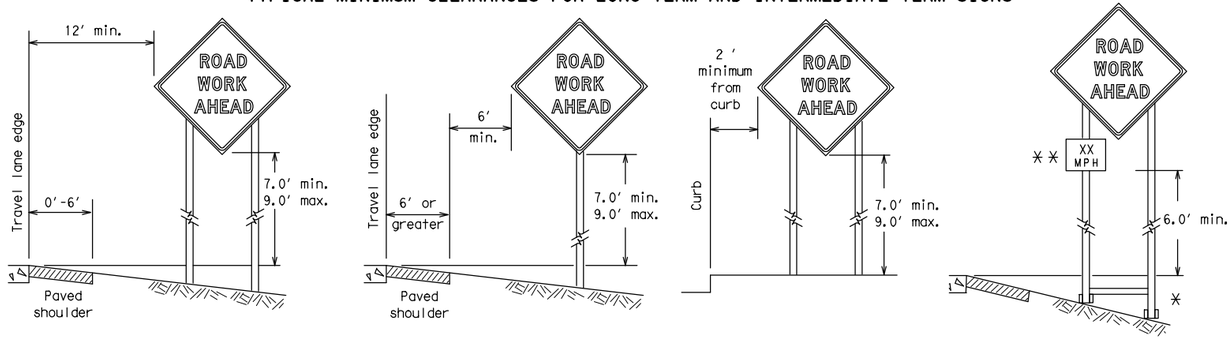
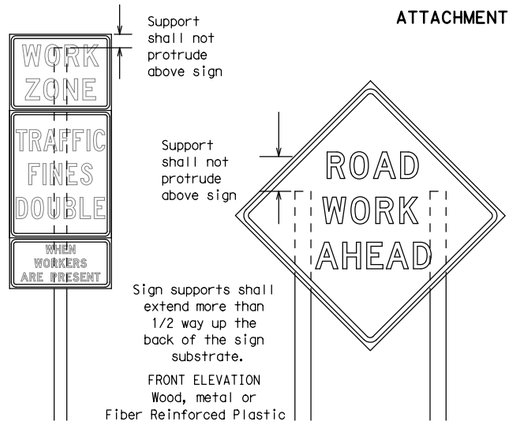
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



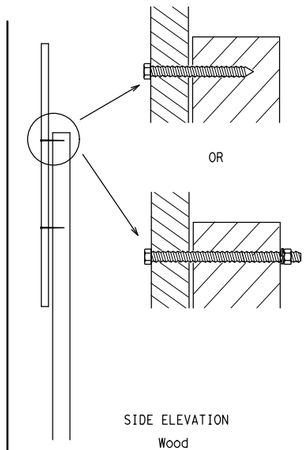
⚹ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⚹⚹ 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



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.

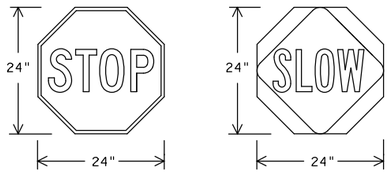


Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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.

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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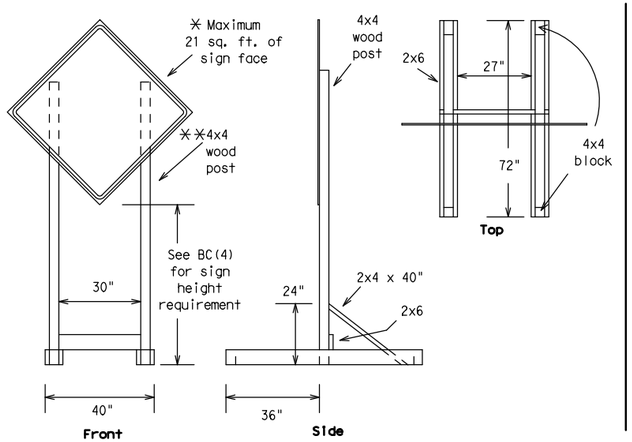
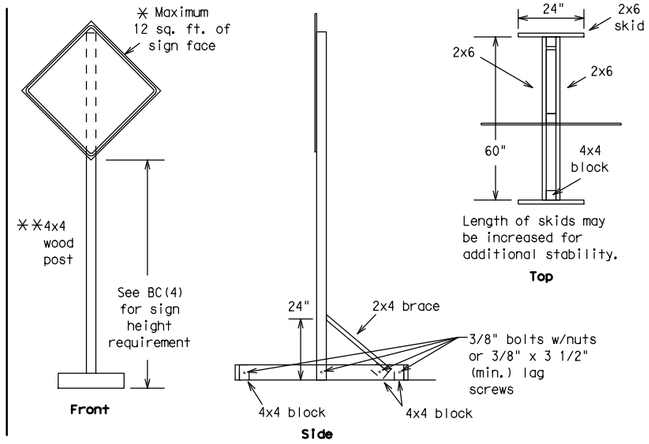
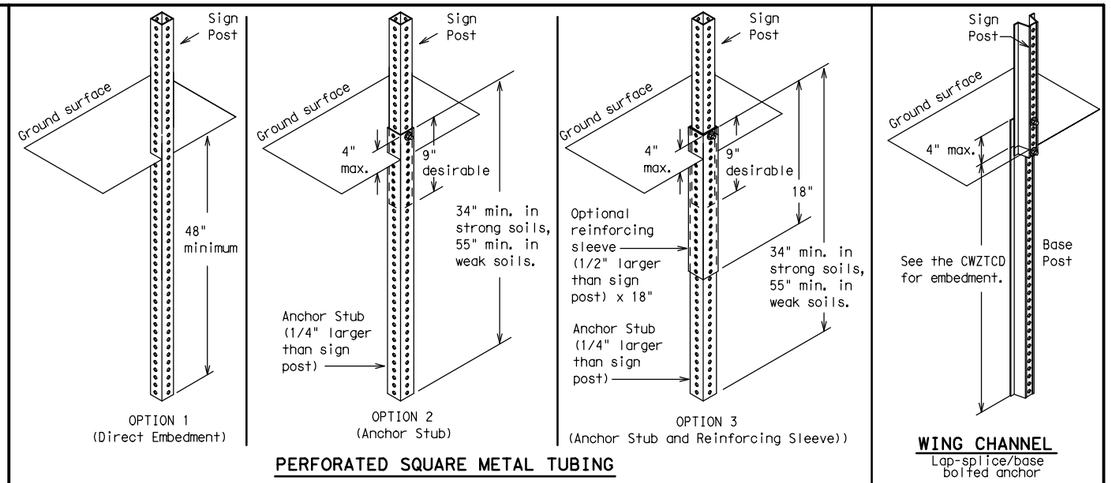




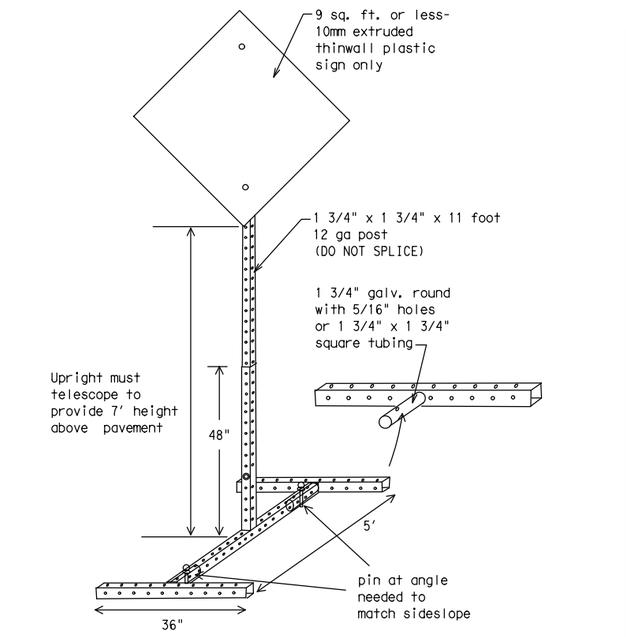
SKID MOUNTED WOOD SIGN SUPPORTS

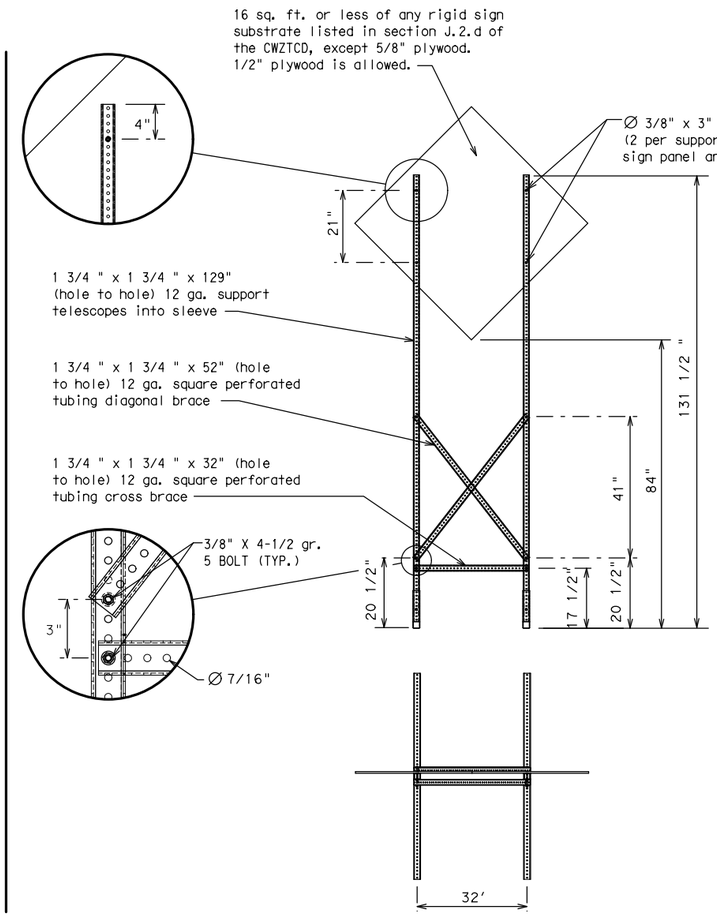
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

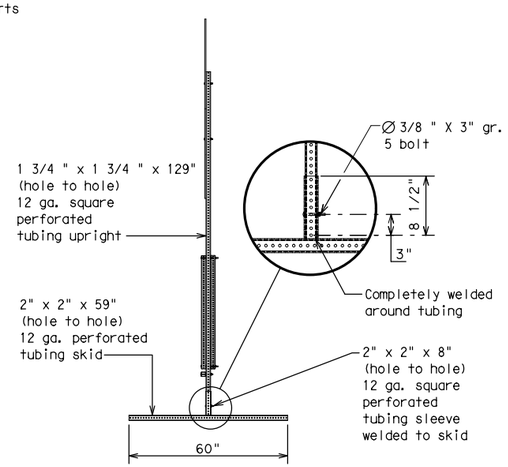


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	WINKLER		31

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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)

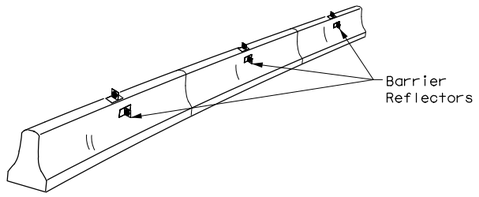
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	WINKLER		32

100

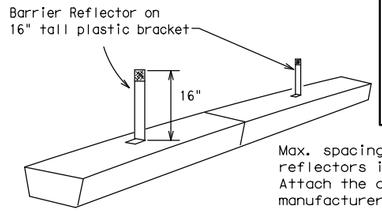
DATE: 7/17/2023 10:06:23 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete\dms1487\BC(1)-21 THRU BC(12)-21.dgn

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



CONCRETE TRAFFIC BARRIER (CTB)

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

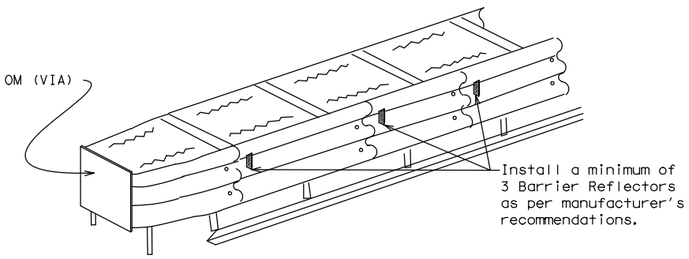


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

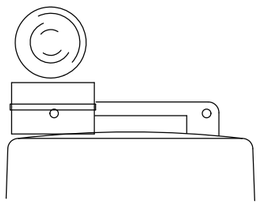


DELINEATION OF END TREATMENTS

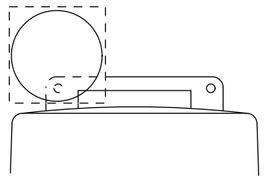
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

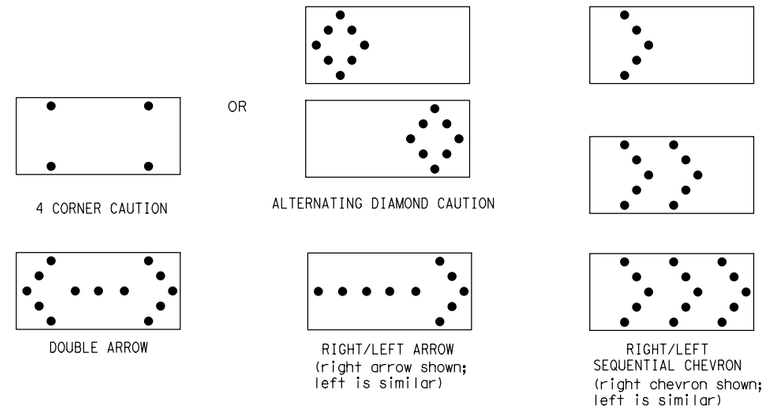
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

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

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

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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ODA	WINKLER		33

DATE: 7/17/2023 10:06:23 AM
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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:

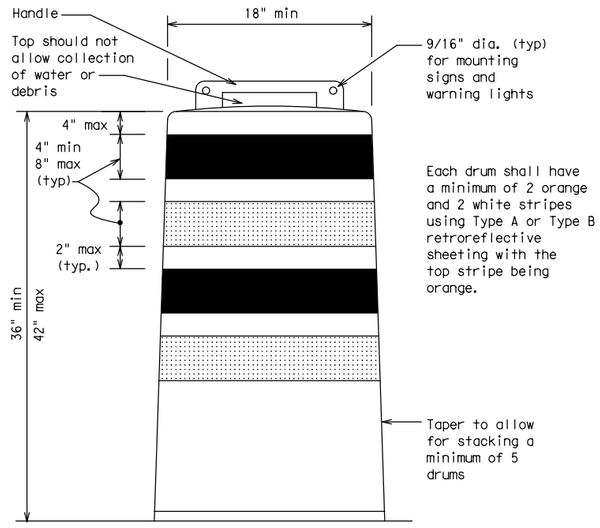
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

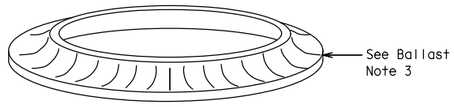
RETROREFLECTIVE SHEETING

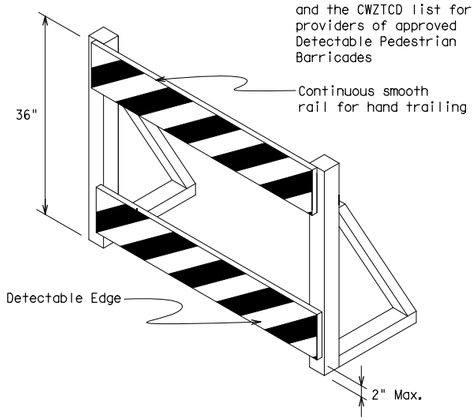
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

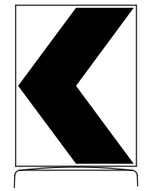




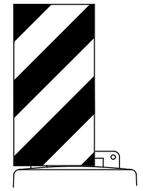


DETECTABLE PEDESTRIAN BARRICADES

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	1371	01	023	FM 1232
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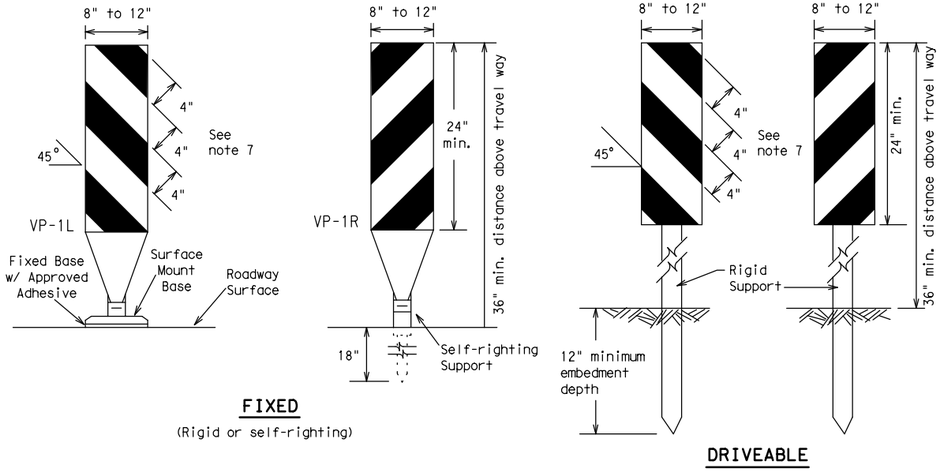
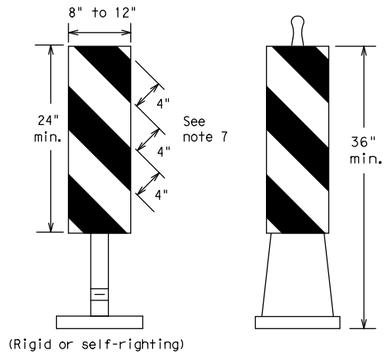


FIXED
(Rigid or self-righting)

DRIVEABLE

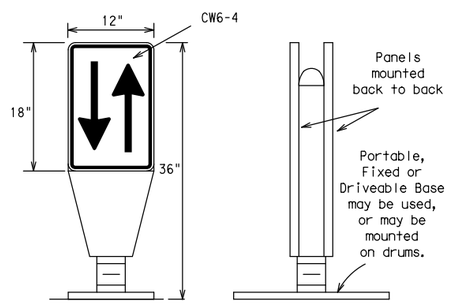


(Rigid or self-righting)

PORTABLE

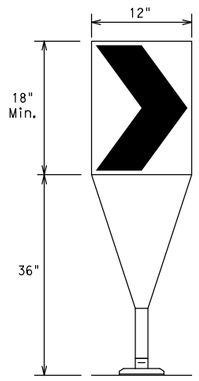
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



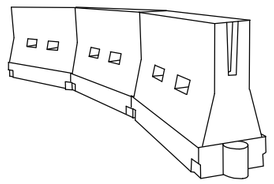
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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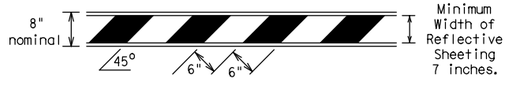
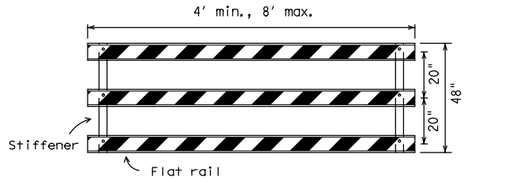
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



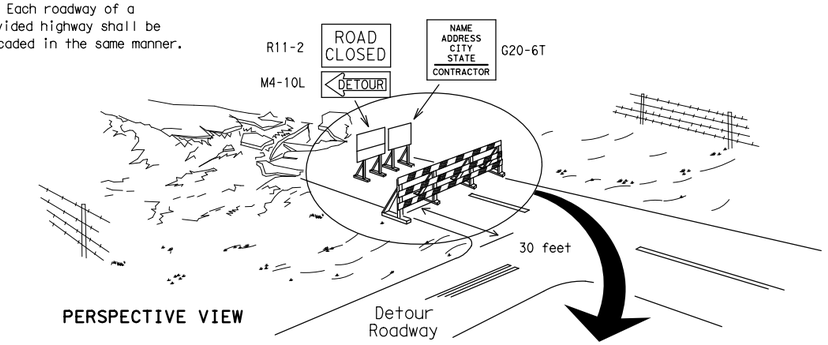
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

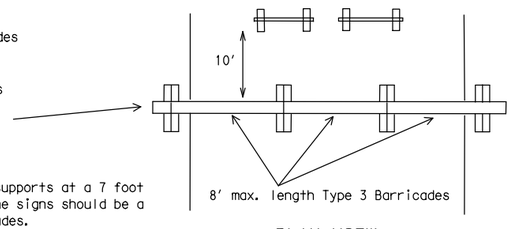
TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

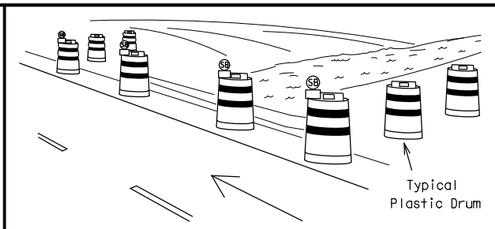
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

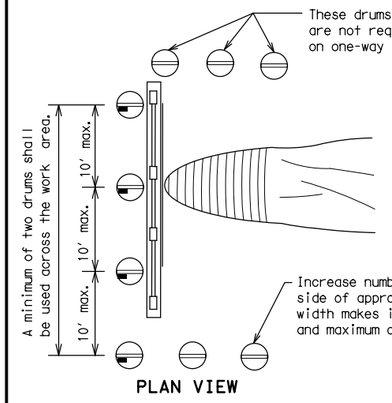
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

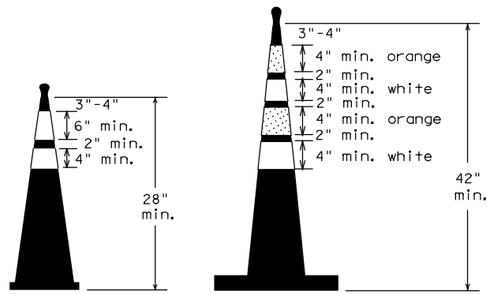
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

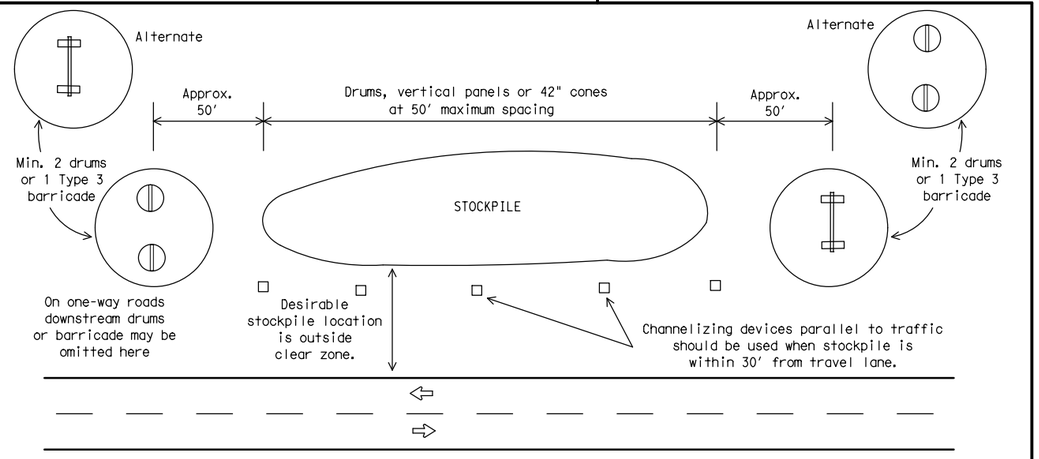
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

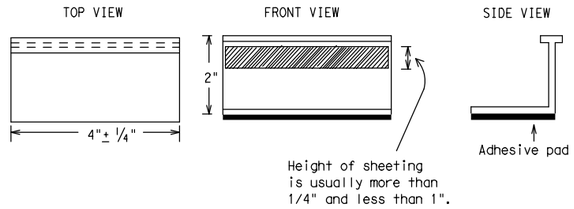
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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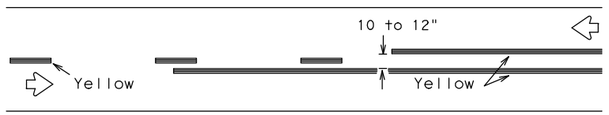
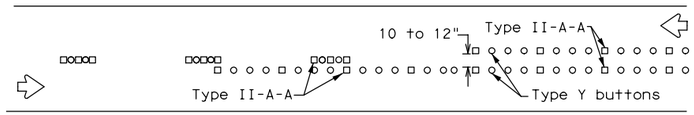
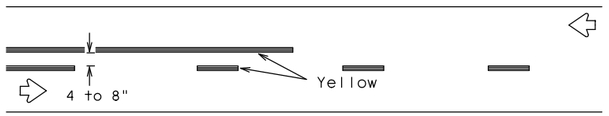
PAVEMENT MARKING PATTERNS



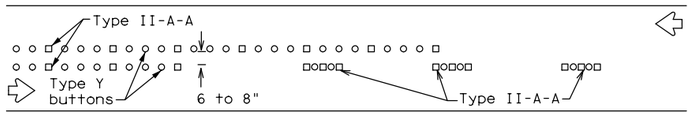
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



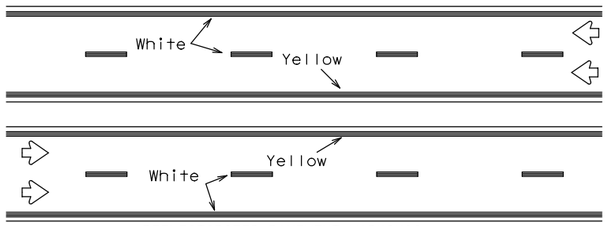
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



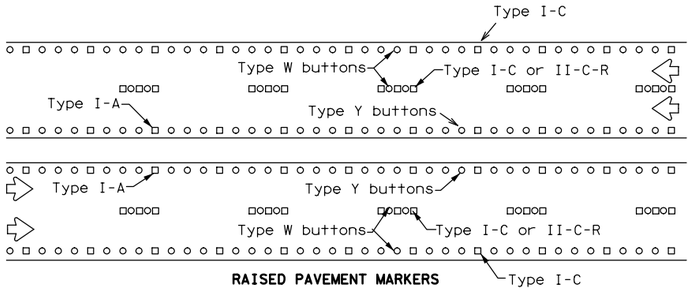
RAISED PAVEMENT MARKERS - PATTERN B

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



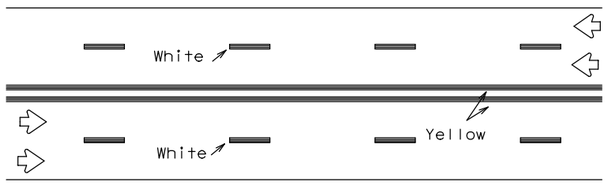
REFLECTORIZED PAVEMENT MARKINGS



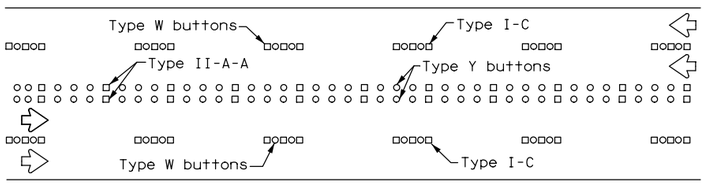
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



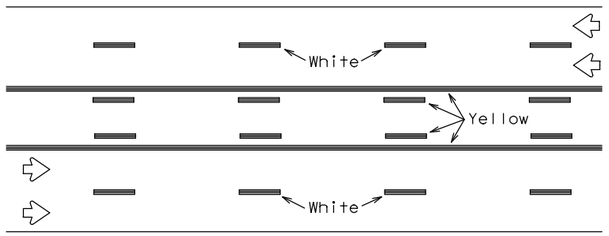
REFLECTORIZED PAVEMENT MARKINGS



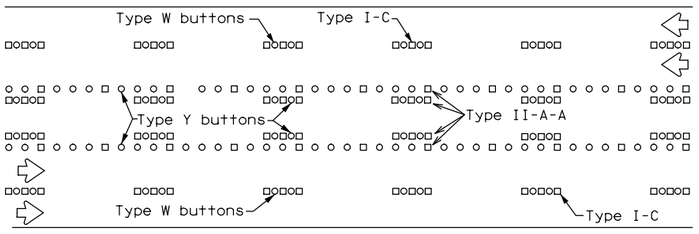
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

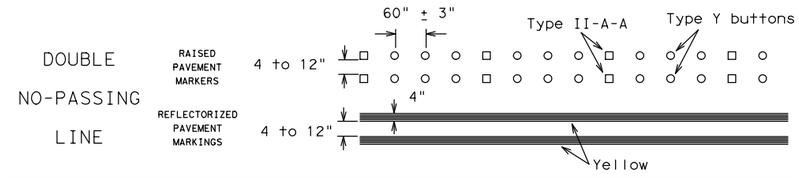
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

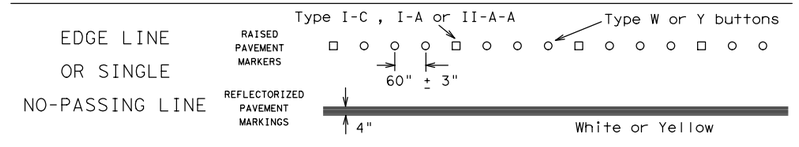
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

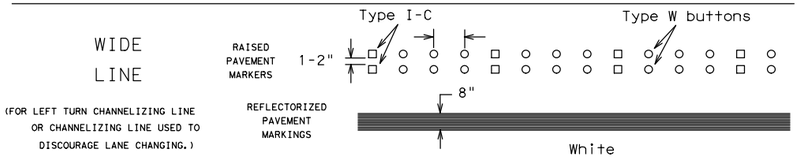


EDGE LINE OR SINGLE NO-PASSING LINE



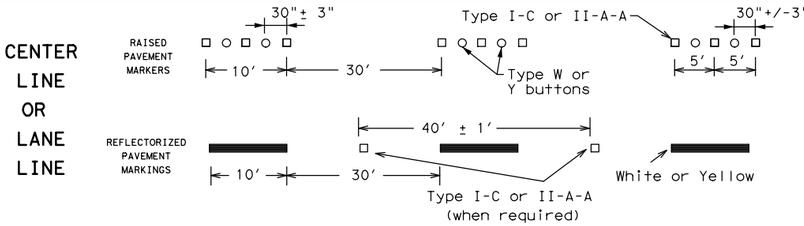
WIDE LINE

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

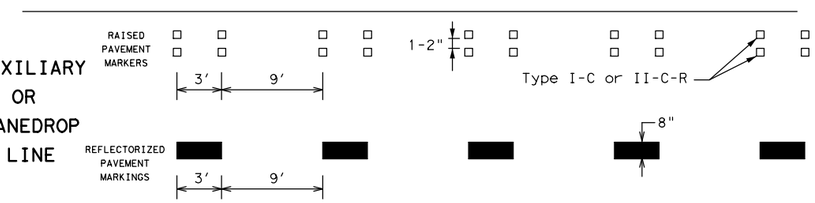


BROKEN LINES

CENTER LINE OR LANE LINE

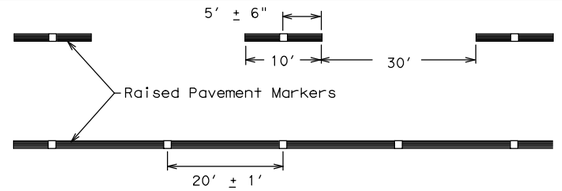


AUXILIARY OR LANEDROP LINE



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."

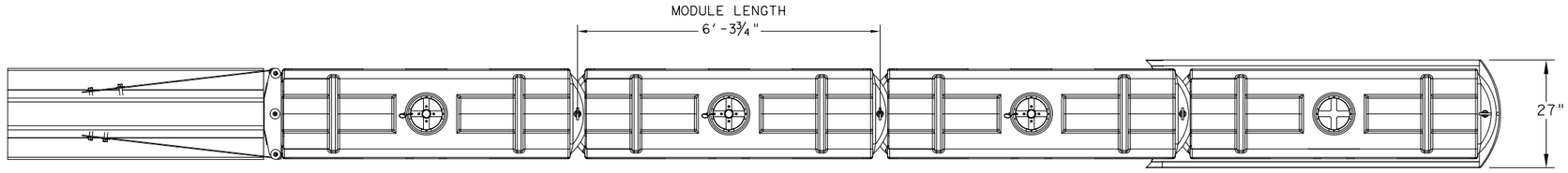
Texas Department of Transportation

Traffic Safety Division Standard

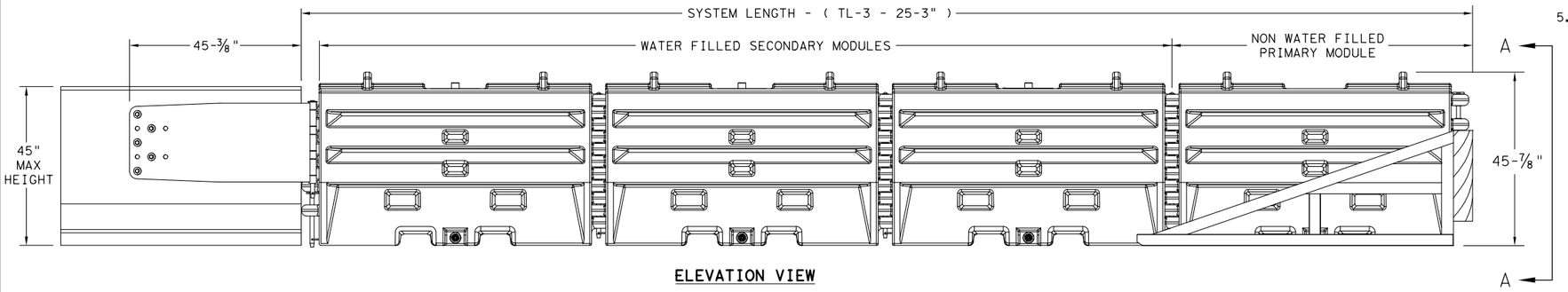
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

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	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		38



PLAN VIEW



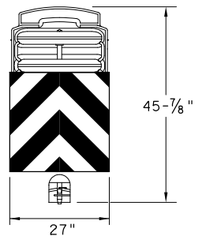
ELEVATION VIEW

GENERAL NOTES

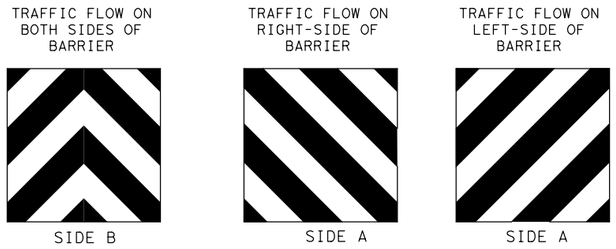
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, 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"



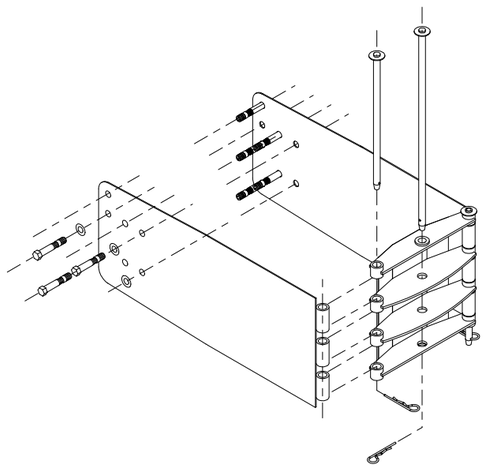
SECTION A-A



NOSE SHEETING PANEL DELINEATION

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

BILL OF MATERIAL		
PART NUMBER	DESCRIPTION	QTY: TL-3
45131	TRANSITION FRAME, GALVANIZED	1
45150	TRANSITION PANEL, GALVANIZED	2
45147-CP	TRANSITION SHORT DROP PIN W/ KEEPER PIN, GALVANIZED	2
45148-CP	TRANSITION LONG DROP PIN W/ KEEPER PIN, GALVANIZED	1
45050	ANCHOR BOLTS	9
12060	WASHER, 3/4" ID X 2" OD	9
45044-Y	SLED YELLOW WATER FILLED MODULE	3
45044-YH	SLED YELLOW "NO FILL" MODULE	1
45044-S	CIS (CONTAINMENT IMPACT SLED), GALVANIZED	1
45043-CP	T-PIN W/ KEEPER PIN	4
18009-B-I	FILL CAP W/ "DRIVE BY" FLOAT INDICATOR	3
45033-RC-B	DRAIN PLUG	3
45032-DPT	DRAIN PLUG REMOVAL TOOL	1



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

NOTE:
SEE MANUFACTURER'S INSTALLATION MANUAL FOR FURTHER DETAILS.

TRANSITION OPTIONS
SLED TRANSITION TO CONCRETE TRAFFIC BARRIER (TEMPORARY OR PERMANENT)
SLED TRANSITION TO STEEL TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO PLASTIC TRAFFIC BARRIER (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO W-BEAM OR THRIE BEAM GUARD RAIL (CONTACT MFGR FOR PROPER TRANSITION)
SLED TRANSITION TO CONCRETE BRIDGE ABUTMENT

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

SLED
CRASH CUSHION
TL-3 MASH COMPLIANT
(TEMPORARY, WORK ZONE)
SLED-19

FILE: sled19.dgn	DN: TxDOT	CK: KM	DW: VP	CK:
©TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		39

DATE: 7/17/2023
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete\dms14871\SLED-19.dgn

DATE: 7/17/2023
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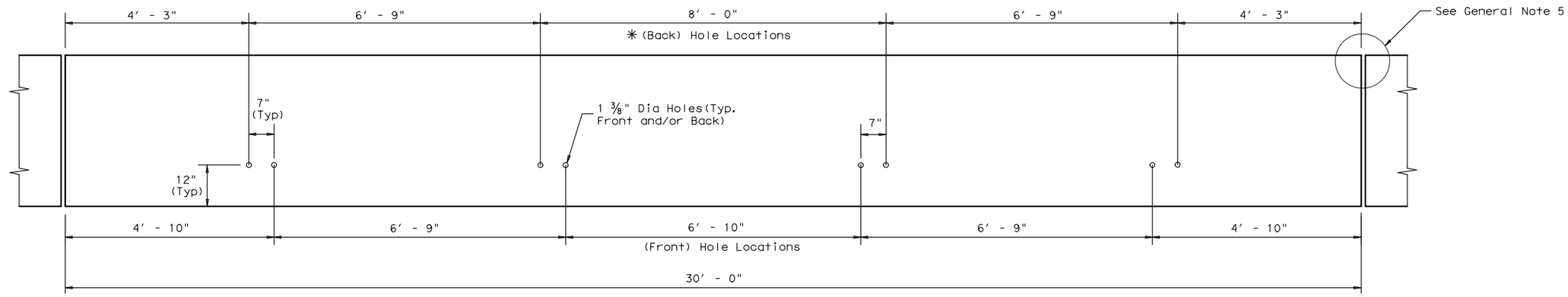
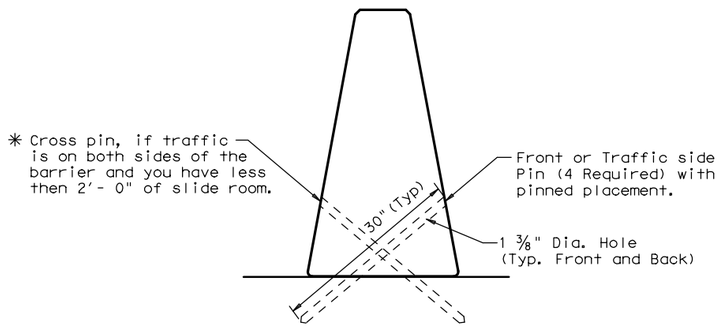


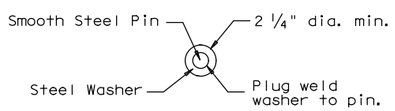
DETAIL 1

Precast SSCB(42")
Showing hole locations

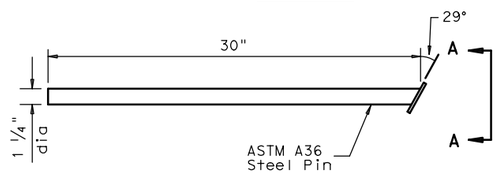


DETAIL 2

Placement on (ACP)
Asphalt Conc. Pavement
or Treated Base Material
(30" Pin required)

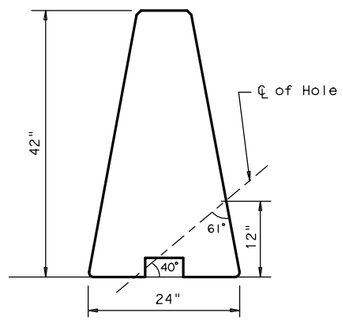


VIEW A-A

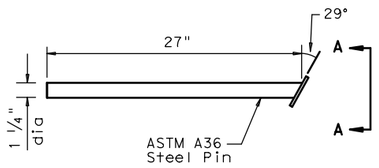


(30") PIN DETAIL

See Detail 2



HOLE LOCATION DETAIL



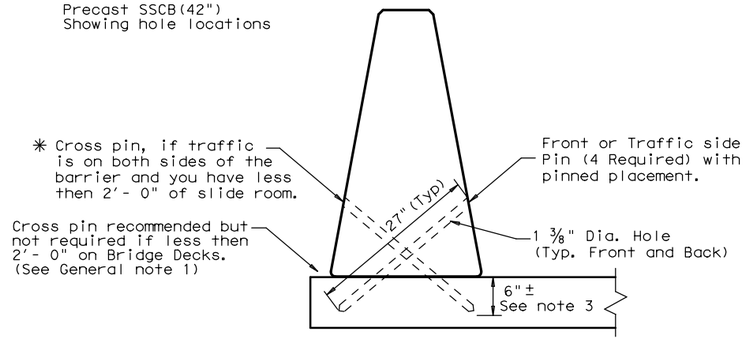
(27") PIN DETAIL

See Detail 3

Note:
Steel washer welded to pin at 29° angle so that the washer is flush with barrier surface. (See View A-A)

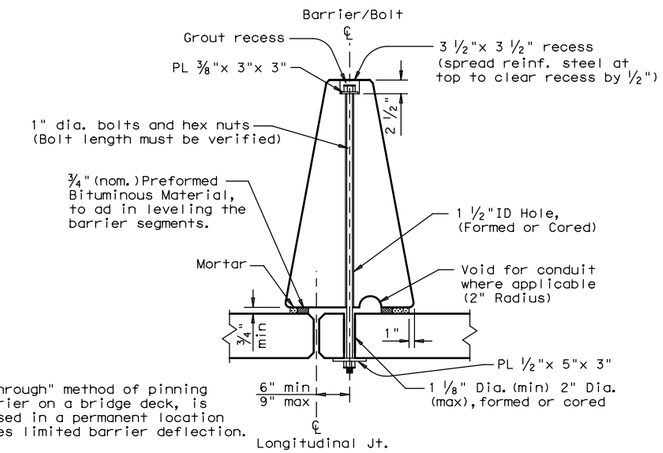
DETAIL 3

Bridge Deck or CRCP
(27" Pin required).



CORE DRILLING EXISTING BARRIER

Core drilling existing concrete barrier is permitted. Holes shall be drilled with coring or masonry drilling type equipment. Percussion (star) drilling shall not be used. A special drill bit (to cut through existing reinforcing) will likely be required. Spalls in the concrete exceeding ½" shall be patched.



Note:
The "Bolt Through" method of pinning precast barrier on a bridge deck, is primarily used in a permanent location that requires limited barrier deflection.

PRECAST SSCB (BOLT THROUGH) PLACEMENT OVER LONGITUDINAL EXPANSION JOINT

For bolt through locations, use the (Front) hole locations shown on Detail 1.

GENERAL NOTES

1. These details provide a method of laterally restraining precast concrete barrier to limit deflections under normally expected passenger vehicle impacts. These details are intended for use in work zones, primarily on bridge decks, or pavement where temporary barrier must be placed less then 2 ft. from the longitudinal edge of the deck or dropoff and parallel to the direction of travel. Other applications of these details are acceptable as directed by the Engineer.
2. Each precast concrete barrier section shall have a minimum of four or total of eight 1 ⅜in. ID holes formed or cored through the barrier. The center lines of the holes are shown in the hole location detail. If rebar is encountered, the entry point may be shifted 2" plus or minus longitudinally along the barrier. The eight holes are spaced along the length of the barrier as shown in Detail 1.
3. The drilling of the travel surface is accomplished by placing the pre-drilled barrier section on the travel surface in the desired position. Then the hole is drilled with the bit passing though the hole in the barrier. The bit is to be inserted into the hole in the barrier so that the travel surface is drilled to a point which is slightly more than the pin length.
4. Note that steel washers have been welded to the top of the steel pins to aid in the removal of the pins, when the barrier is removed.
5. See SSCB(2) standard sheet for reinforcement requirements and joint connection types.
6. The forming or coring of holes in the barrier, drilling of holes in bridge deck or pavement, fabrication and materials for the 1 ¼in. pins, installation of pins, and any repair to the barrier shall be considered as subsidiary to the barrier bid items.
7. The barrier and travel surface will be repaired as directed by the Engineer in accordance with Item 429, "Concrete Structure Repair."
8. All steel pins shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
9. Weight of barrier is approx. 700 lbs per foot.

Texas Department of Transportation

Design Division Standard

SINGLE SLOPE CONCRETE BARRIER

PRECAST BARRIER (TYPE 1) PINNED PLACEMENT

SSCB(5)-10

FILE: sscb510.dgn	DN: TxDOT	CK: AM	DW: BD	CK:
©TxDOT December 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		40

DATE: 7/17/2023 10:06:44 AM
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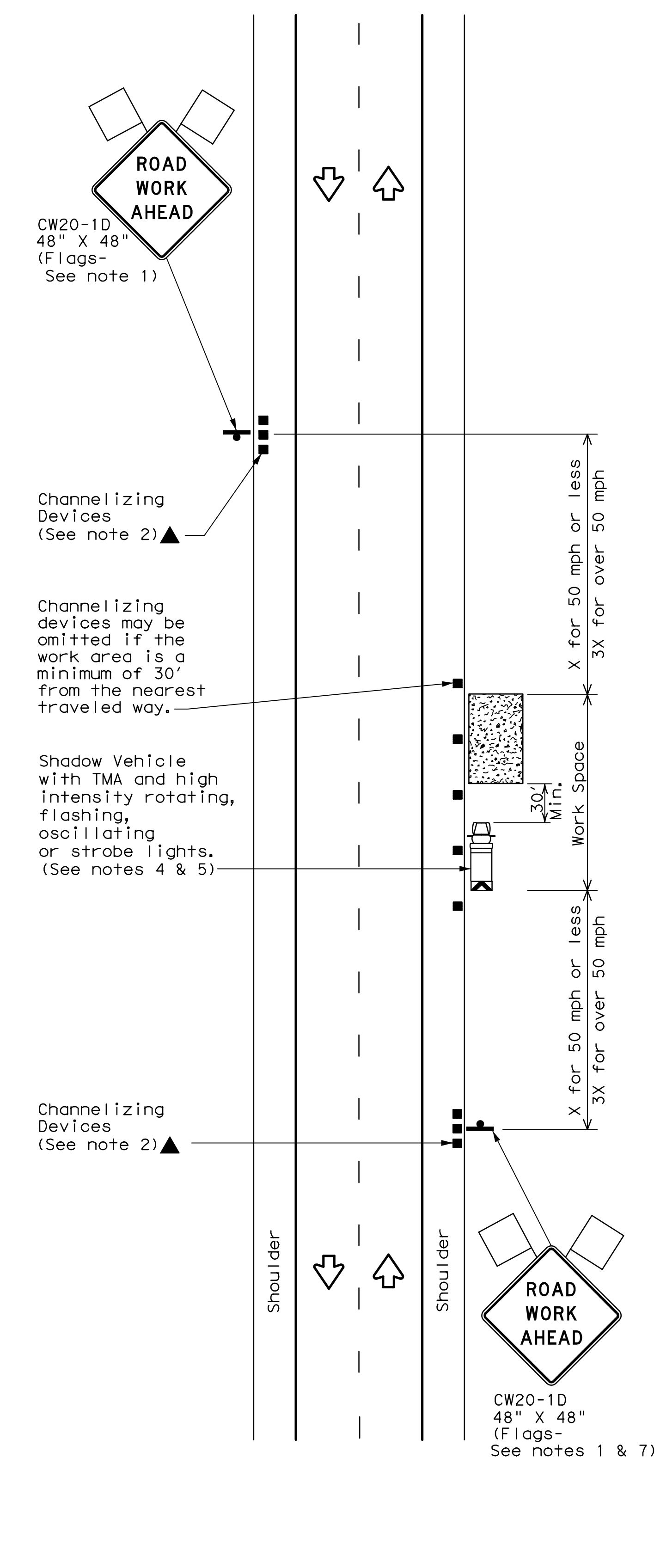
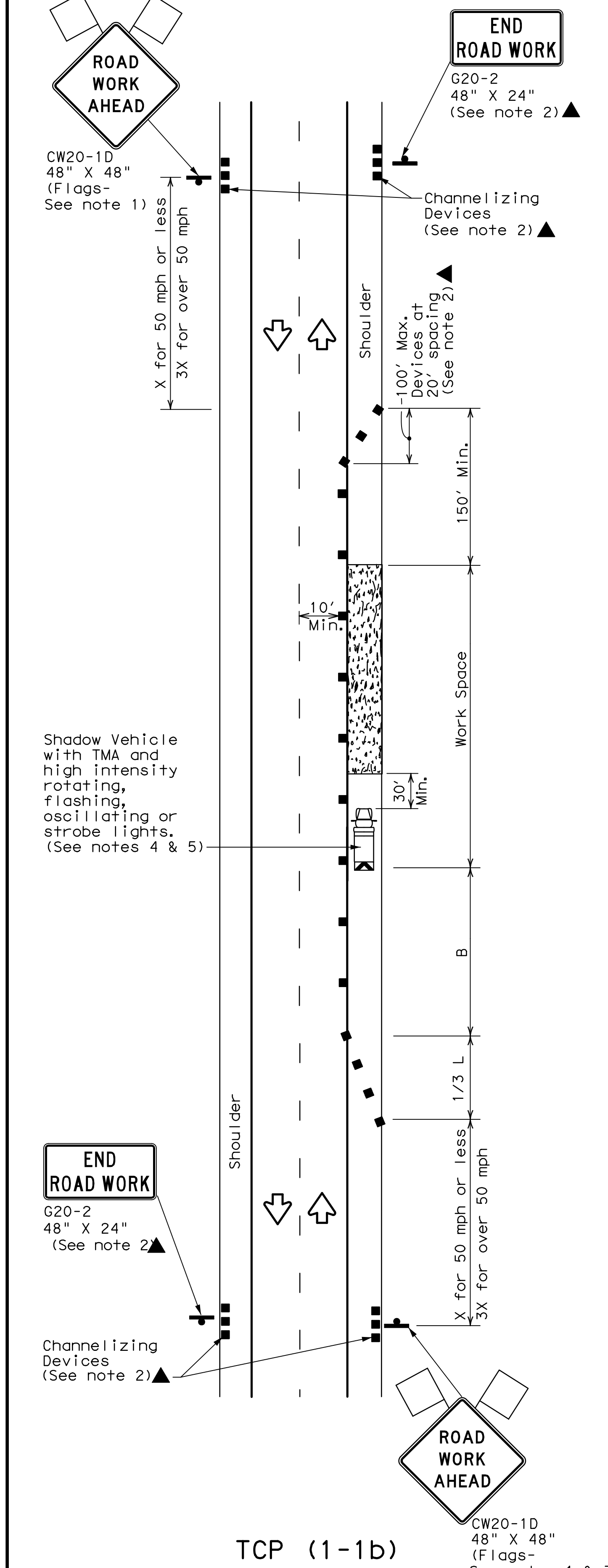


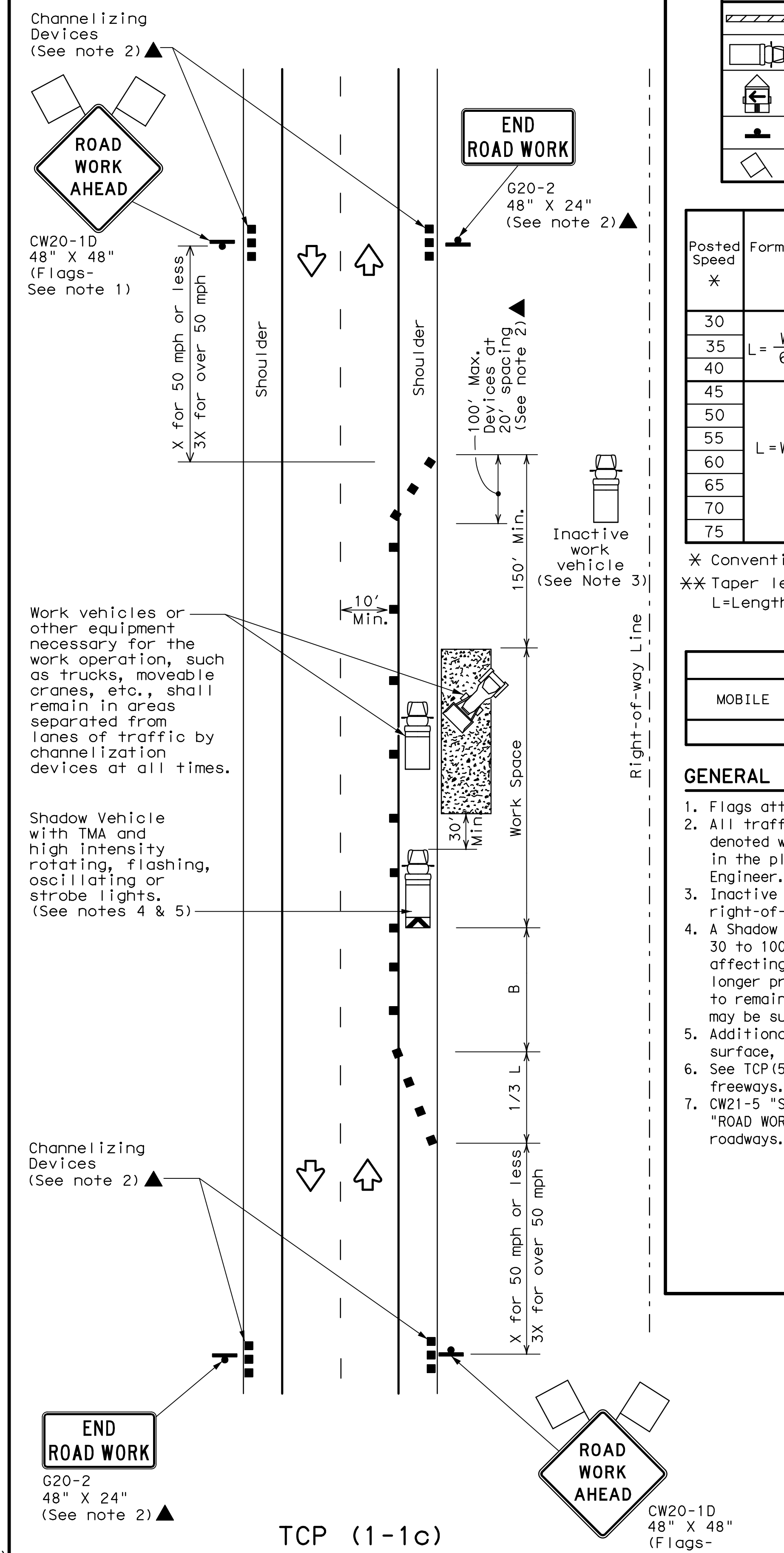
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation

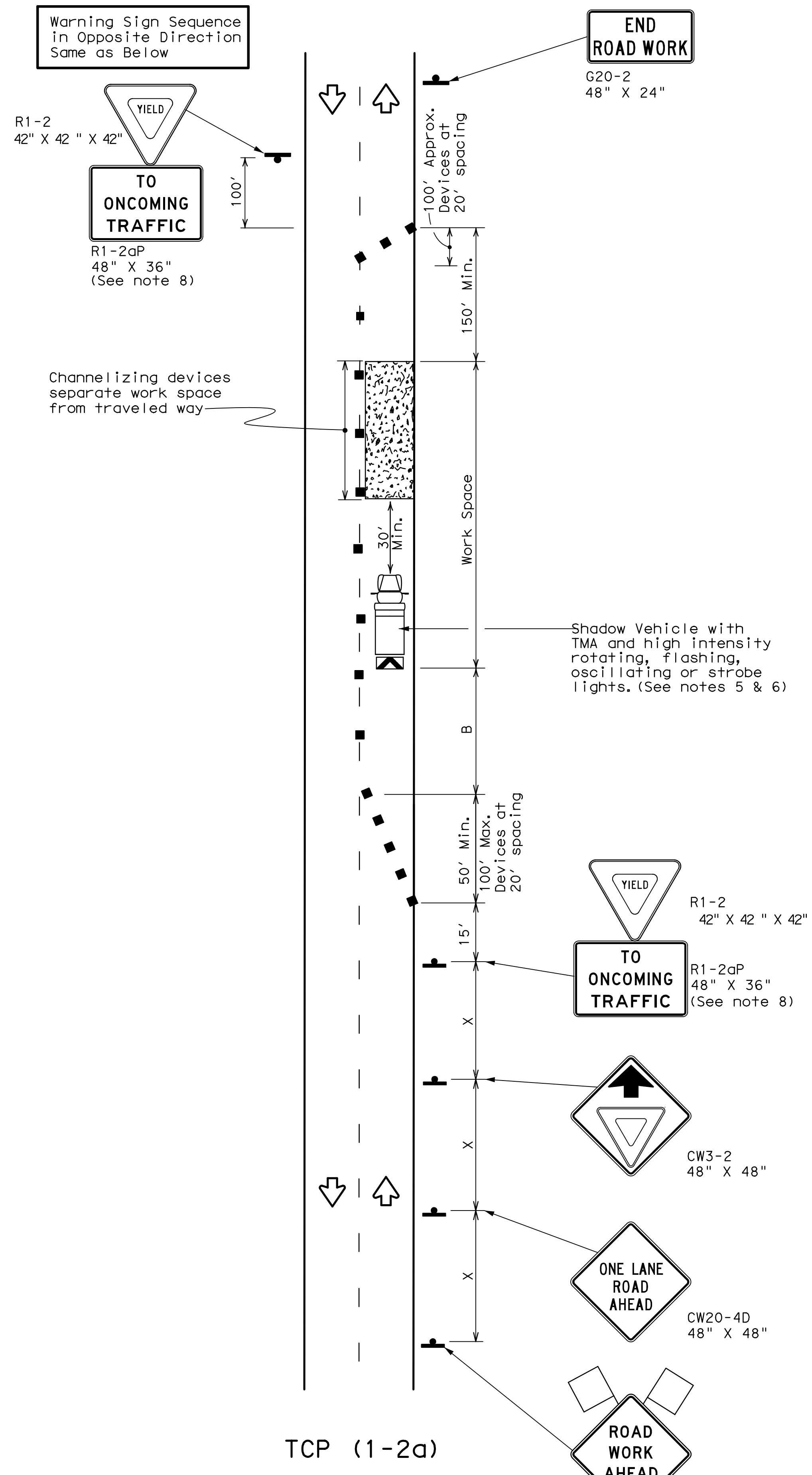
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

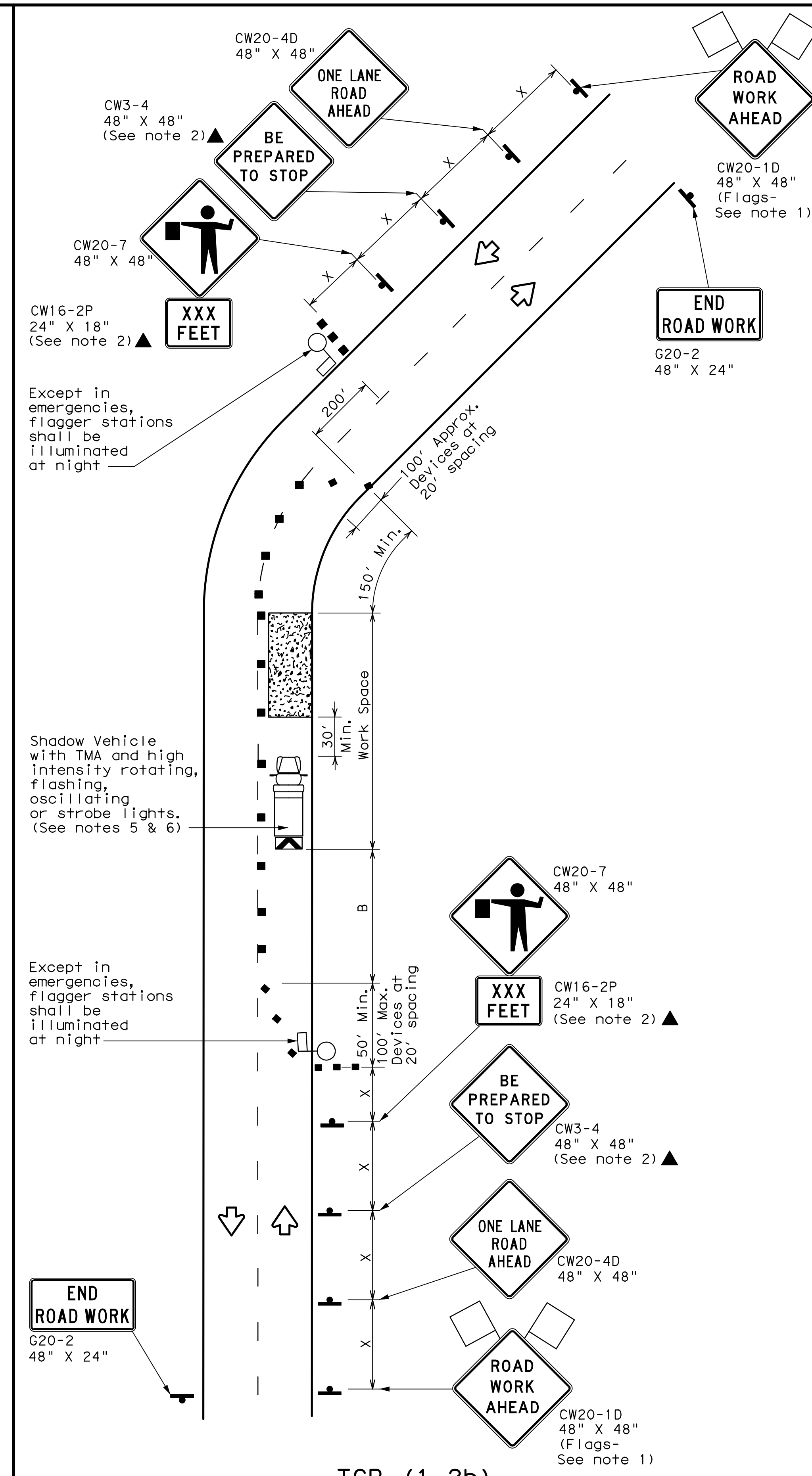
FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	41

151



ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



ONE LANE TWO-WAY CONTROL WITH FLAGGERS

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	42

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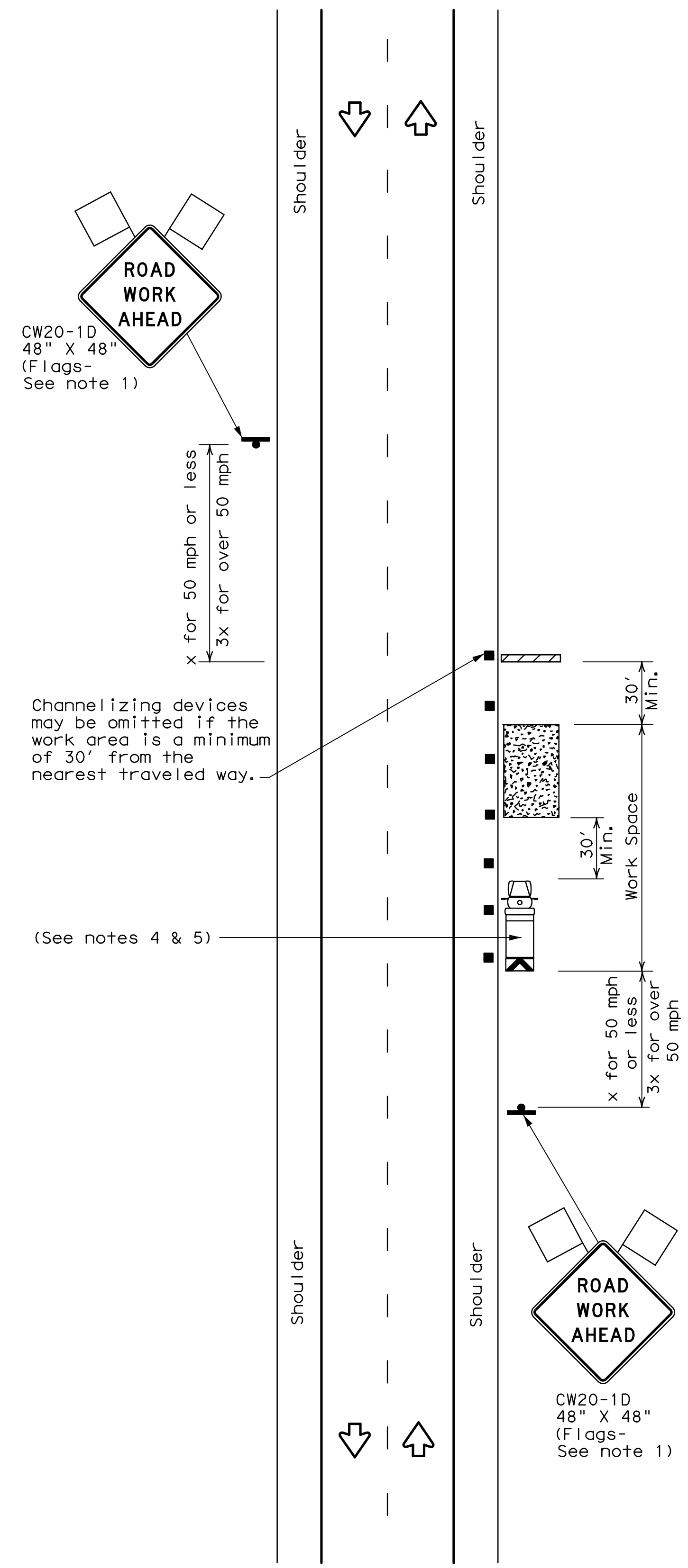
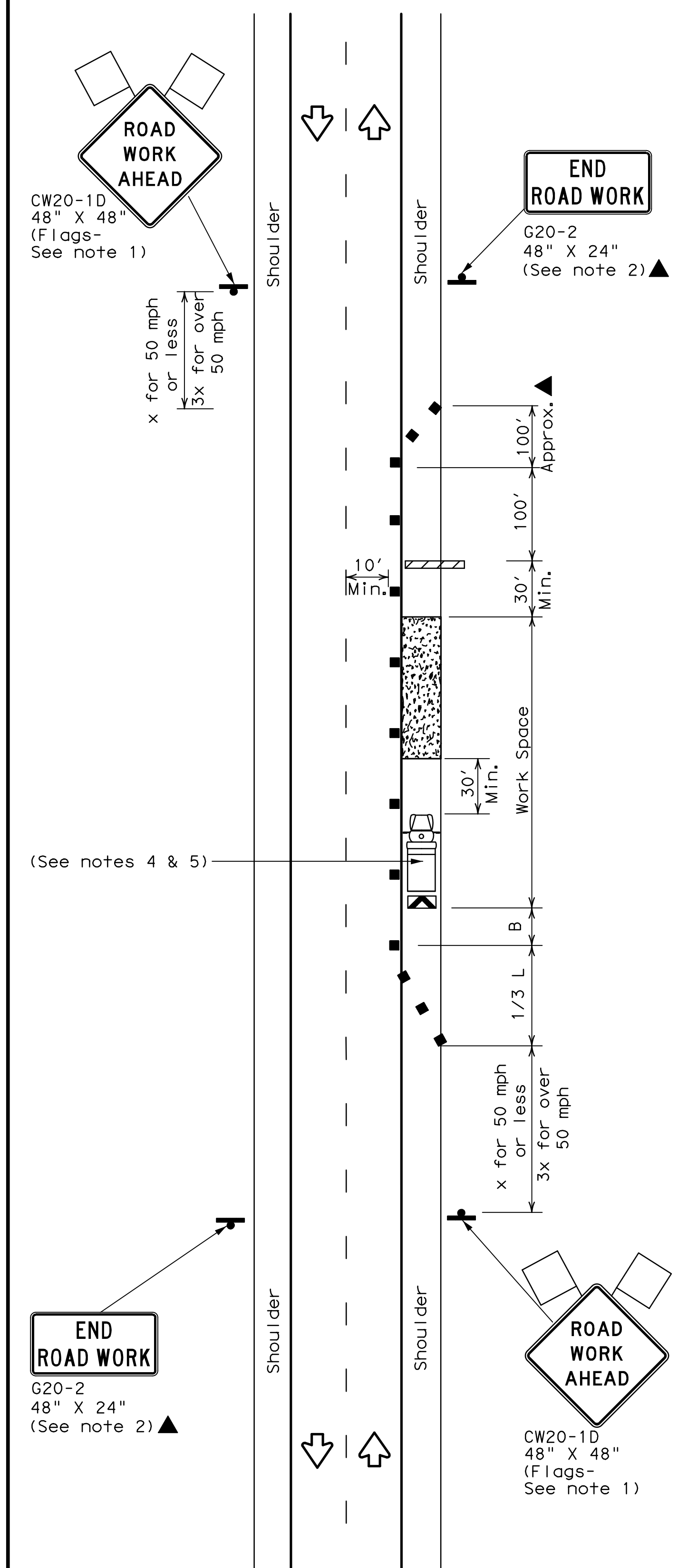


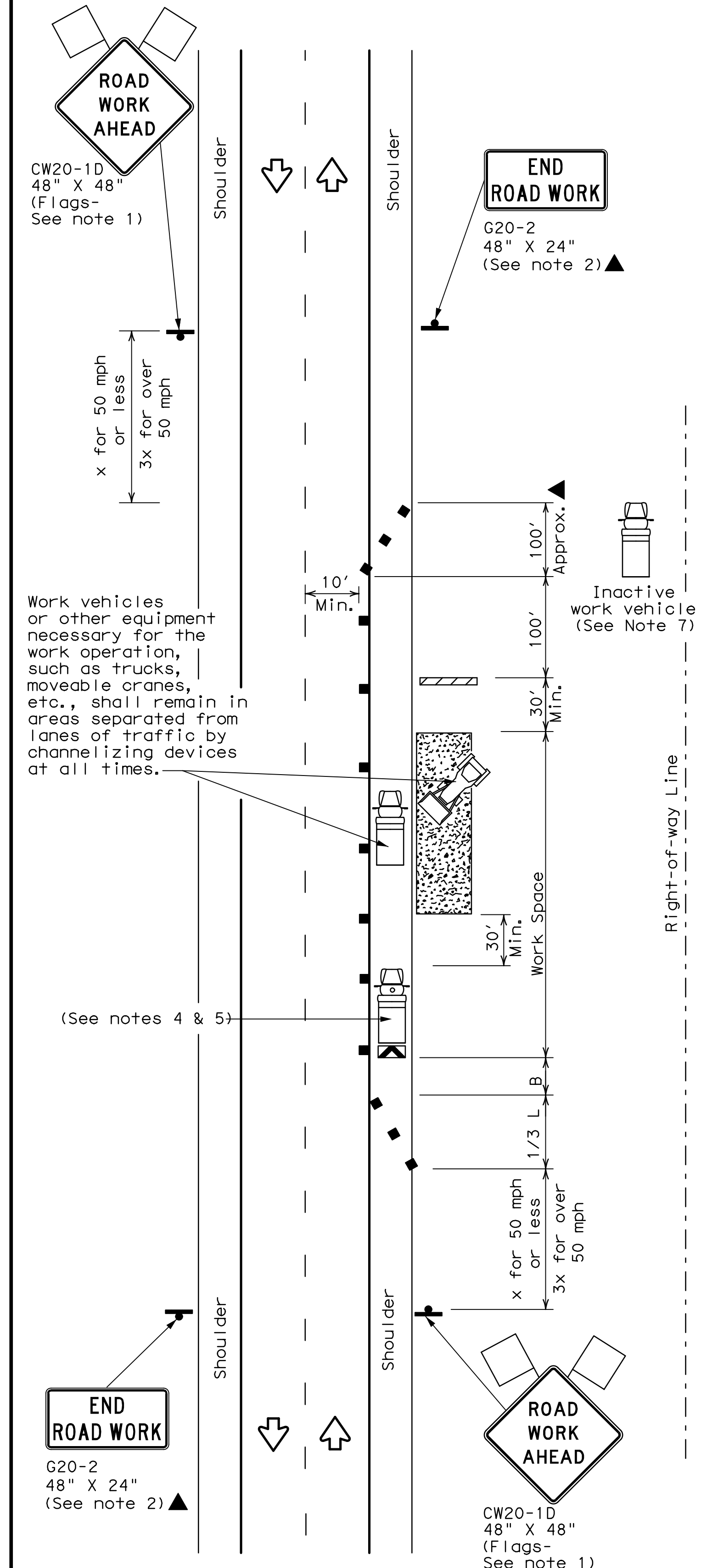
TCP (2-1a)

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

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	43

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DATE: 7/17/2023 10:07:01 AM
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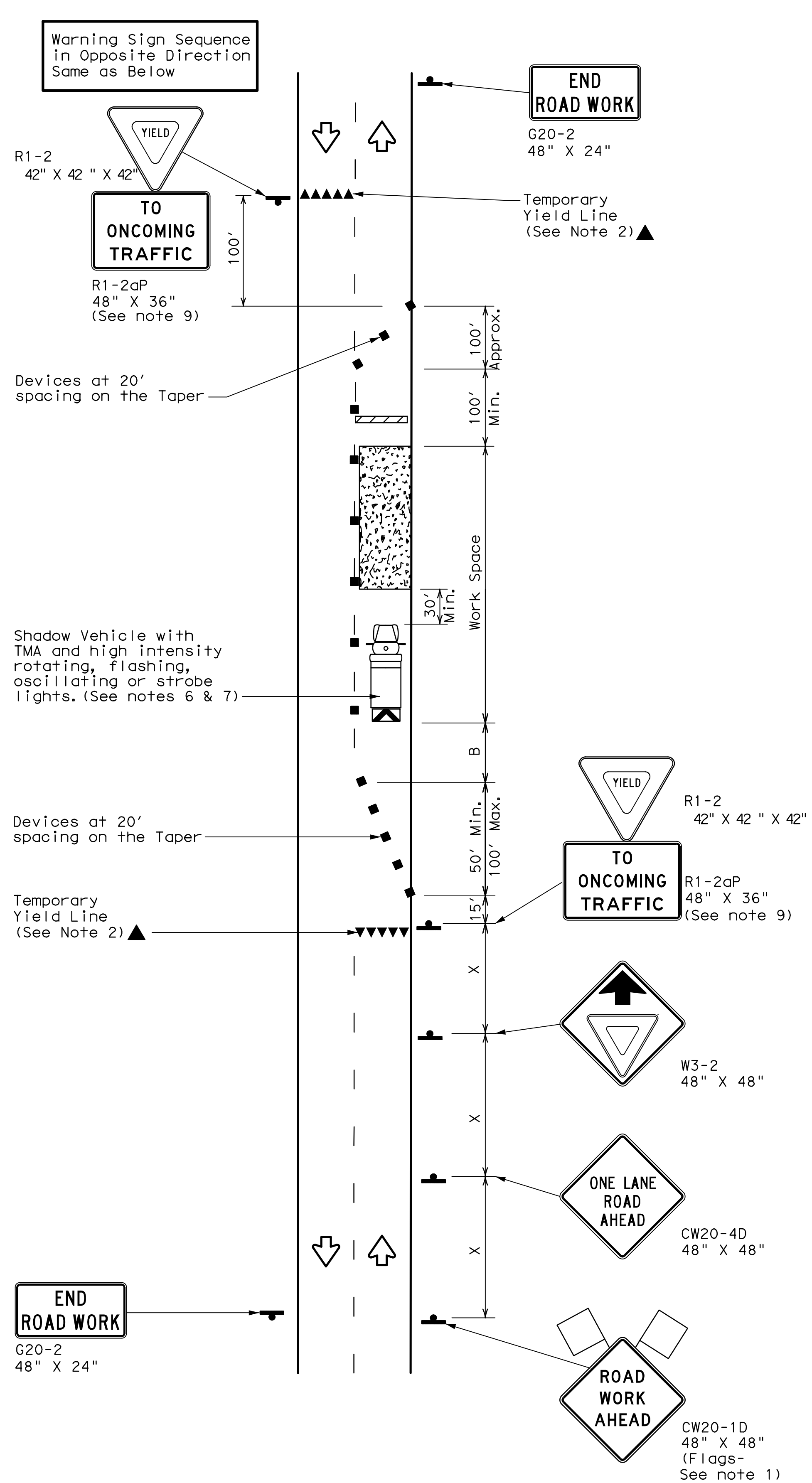
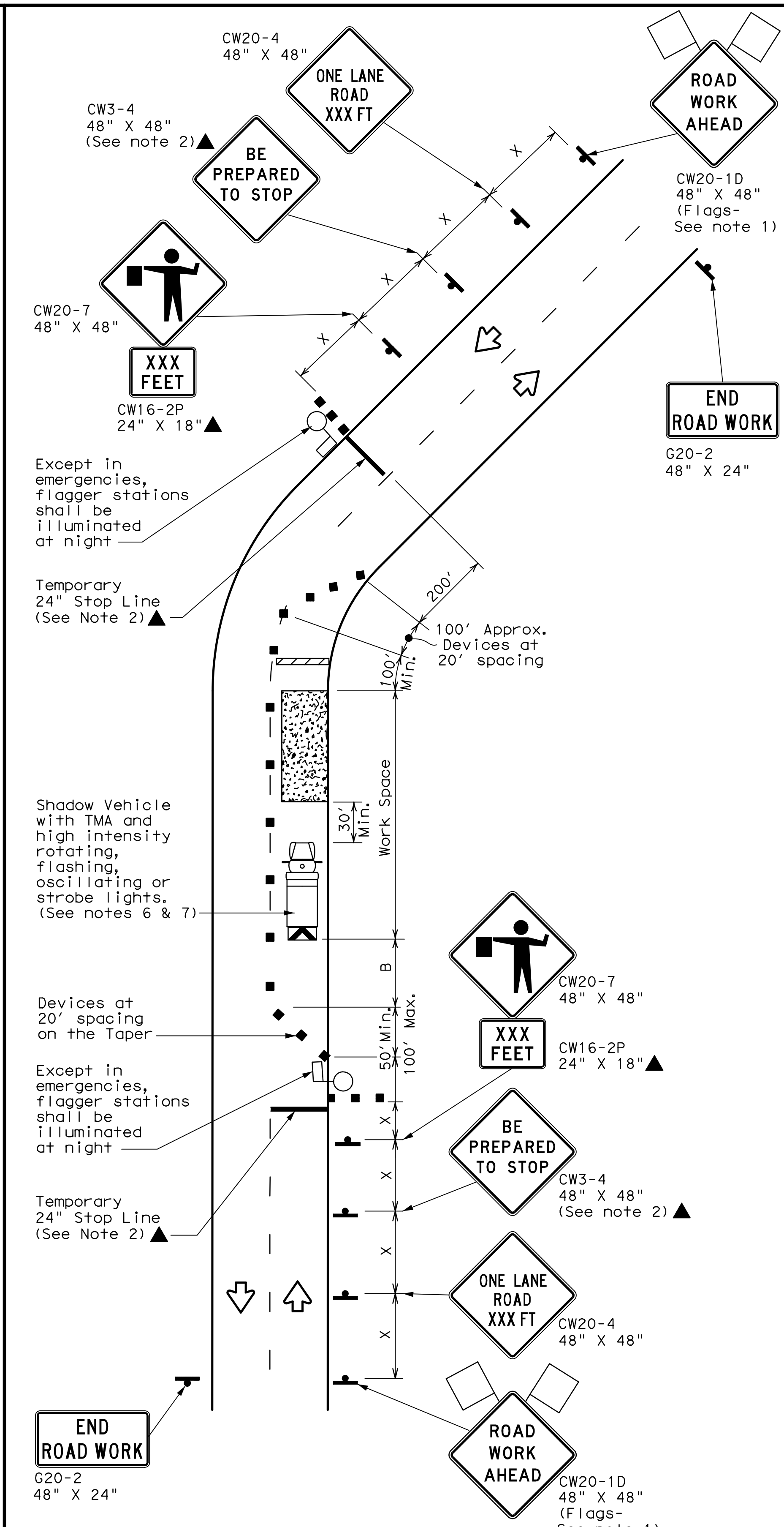


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

Posted Speed *	Formula	Minimum Desirable Taper Lengths **			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"	Stopping Sight Distance
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent			
30	$L = \frac{WS^2}{60}$	150'	165'	180'	30'	60'	120'	90'	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
REVISIONS 8-95 3-03 1-97 2-12 4-98 2-18	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	44

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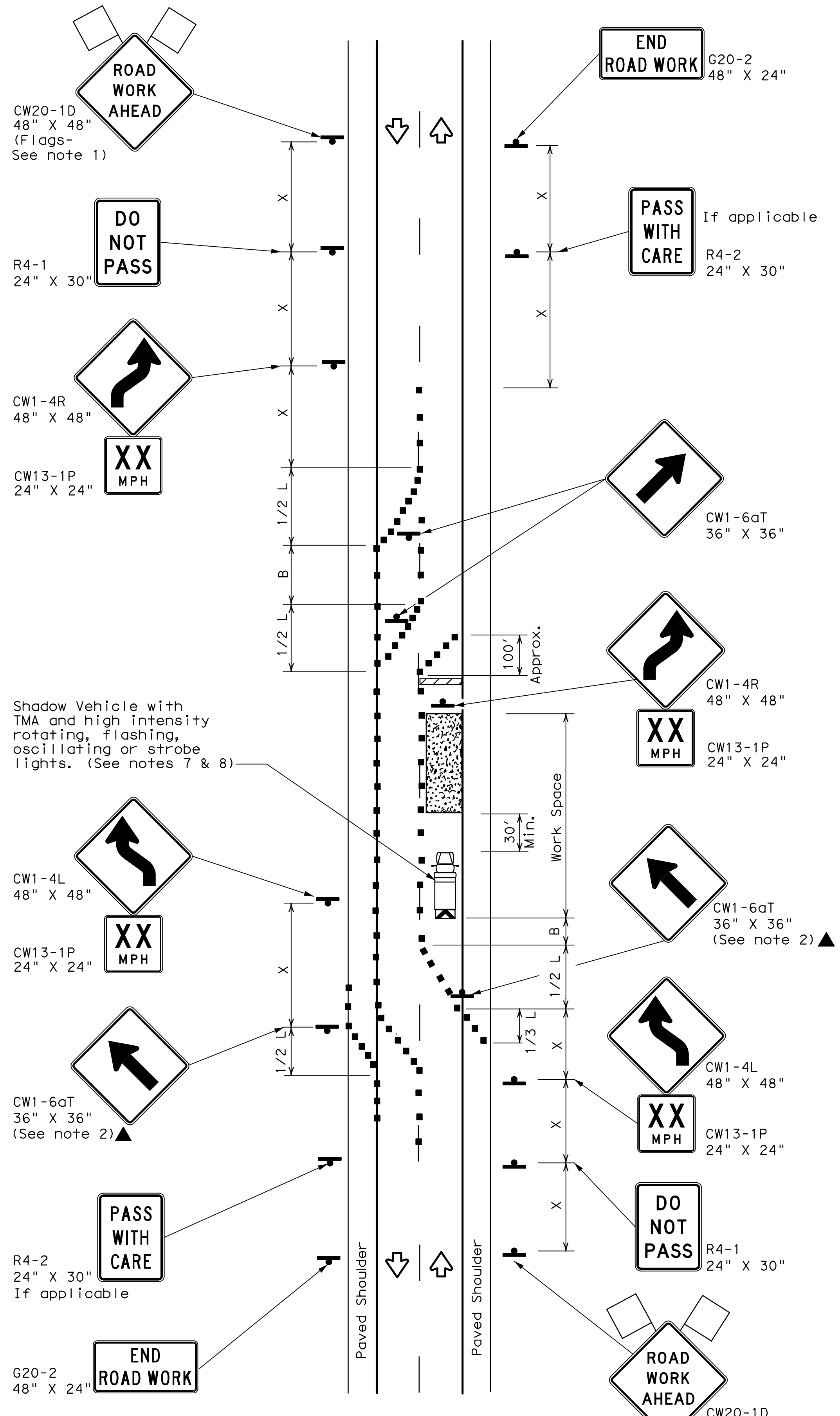
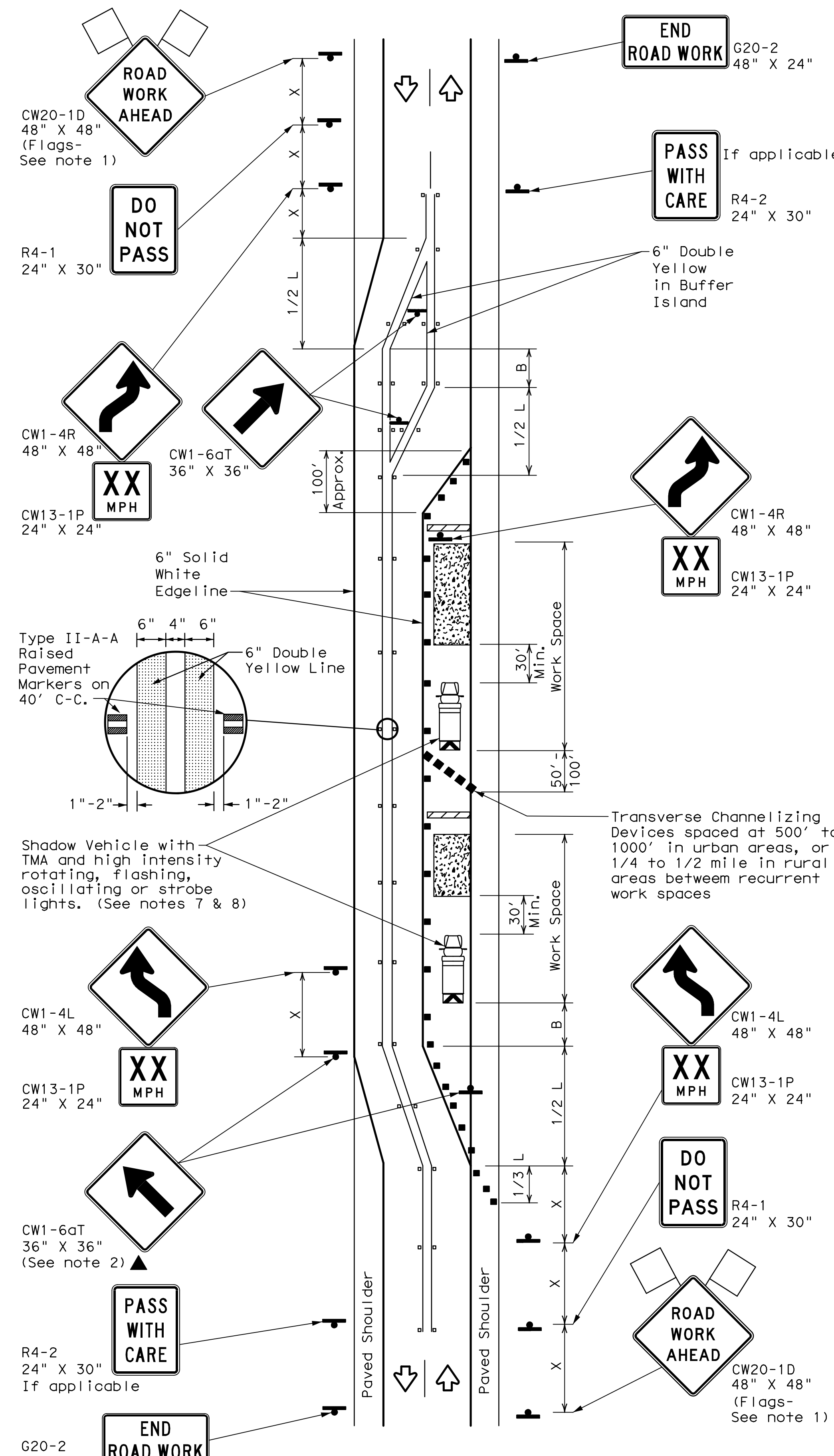


TCP (2-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



TCP (2-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS
ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-3a)

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

Texas Department of Transportation | Traffic Safety Division Standard

TRAFFIC CONTROL PLAN
TRAFFIC SHIFTS ON TWO-LANE ROADS

TCP(2-3)-23

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©TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	45

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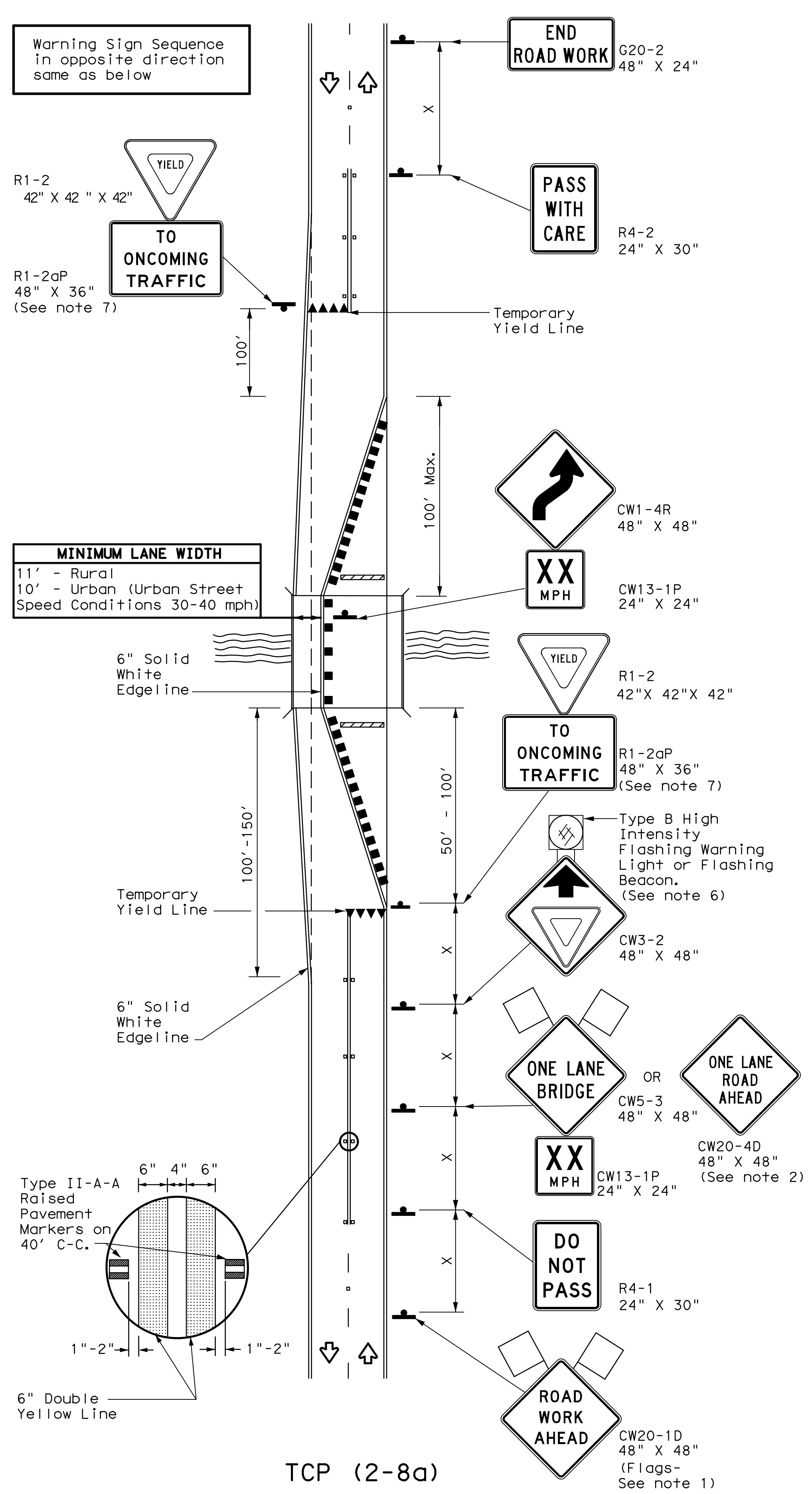
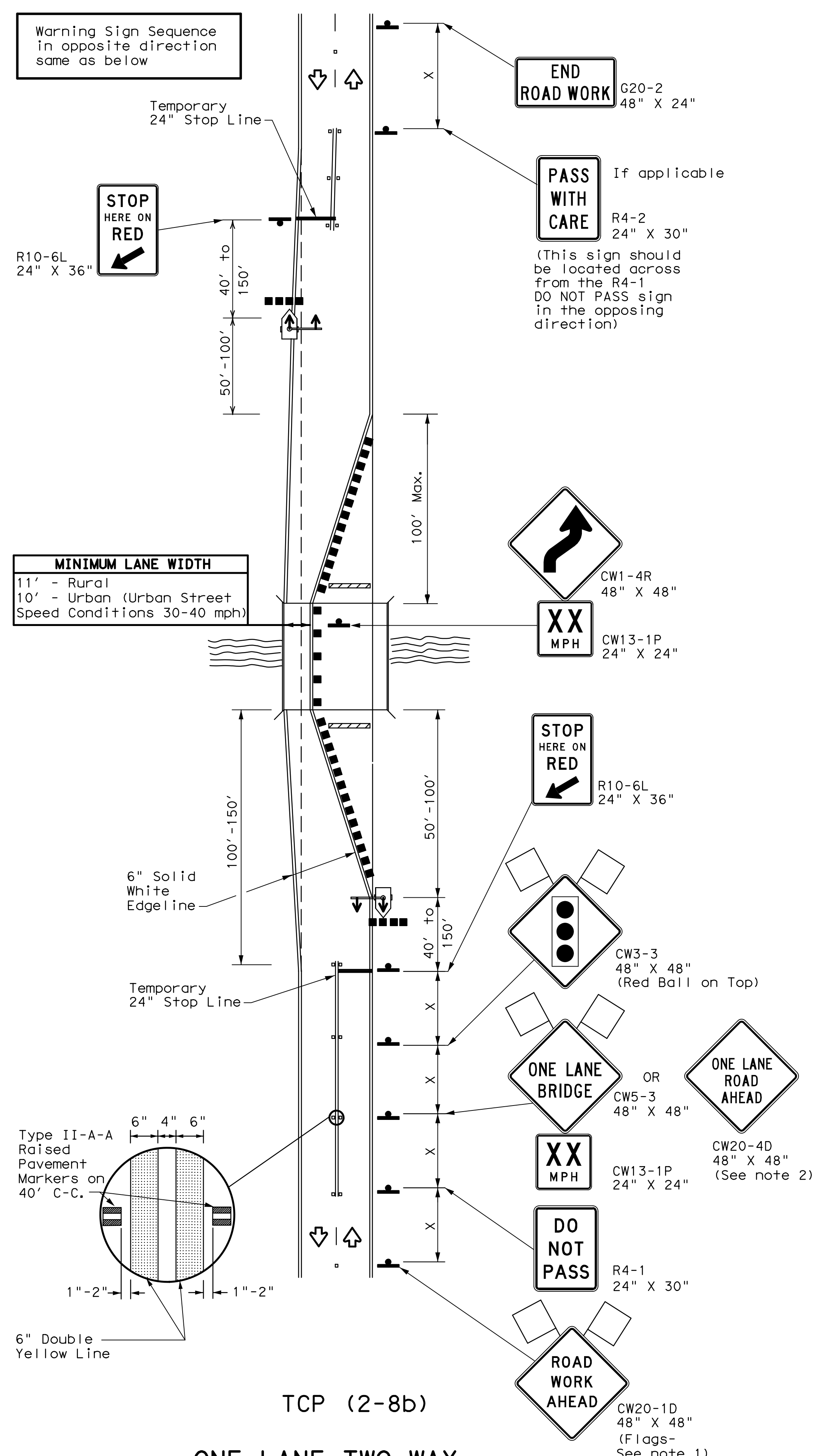


TCP (2-8a)

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



TCP (2-8b)

ONE LANE TWO-WAY
TRAFFIC CONTROL WITH TRAFFIC SIGNAL

LEGEND

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

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

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

TYPICAL USAGE

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

GENERAL NOTES

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

TCP (2-8a)

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

TCP (2-8b)

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

Texas Department of Transportation

Traffic Safety Division Standard

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

TCP(2-8)-23

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© TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	1371	01	023	FM 1232
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	ODA		WINKLER	46

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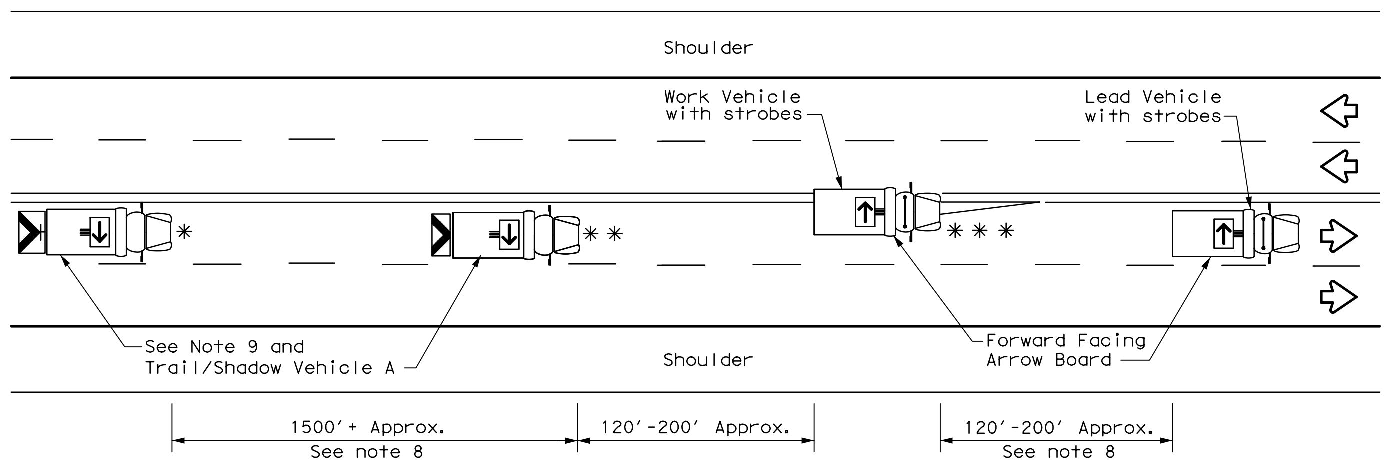
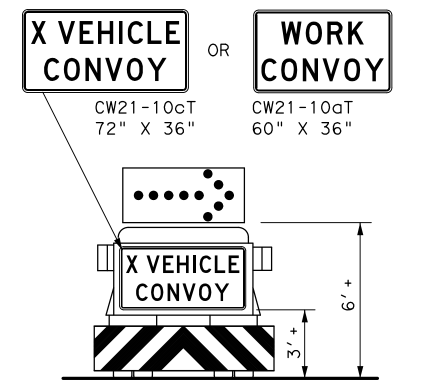


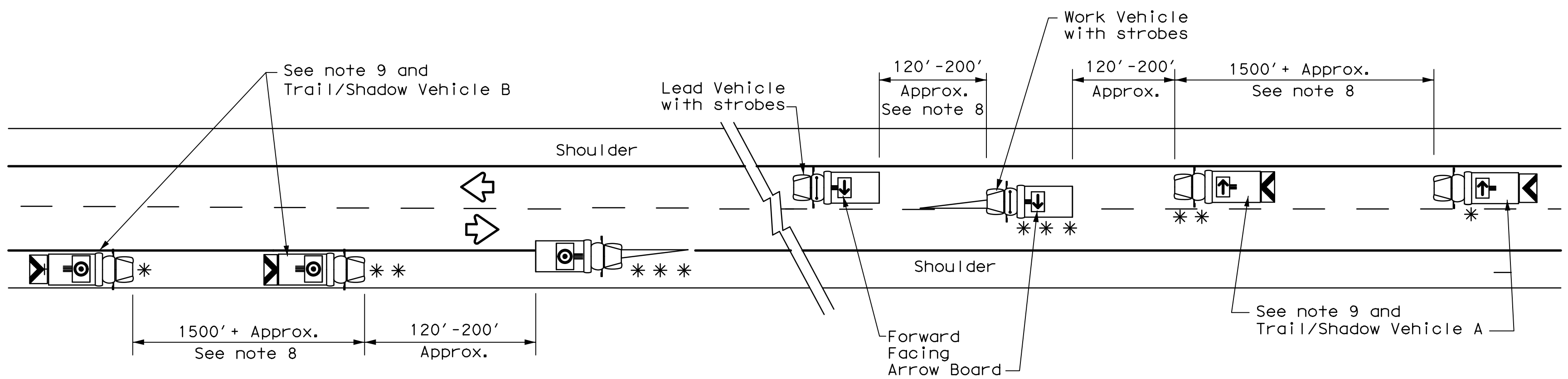
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

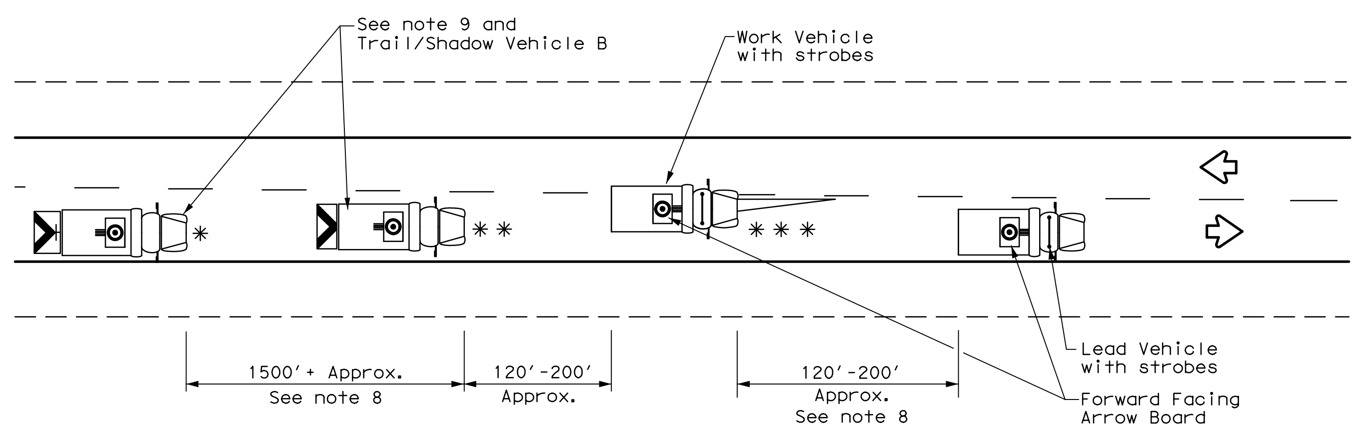


WORK ON SHOULDER

WORK ON TRAVEL LANE

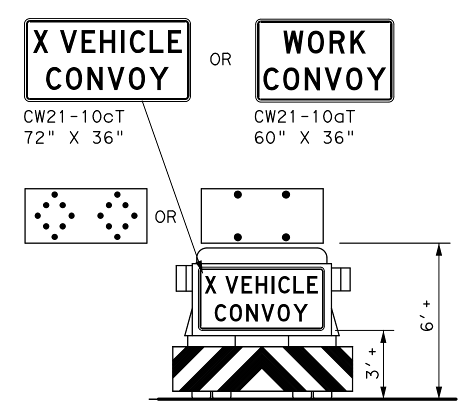
TCP (3-1b)

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

Symbol	Description	Symbol	Arrow Board Display
*	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.

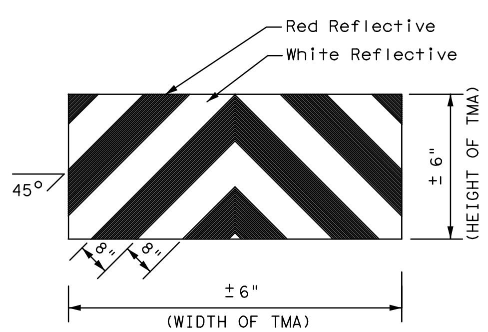
6. Each vehicle shall have two-way radio communication capability.

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

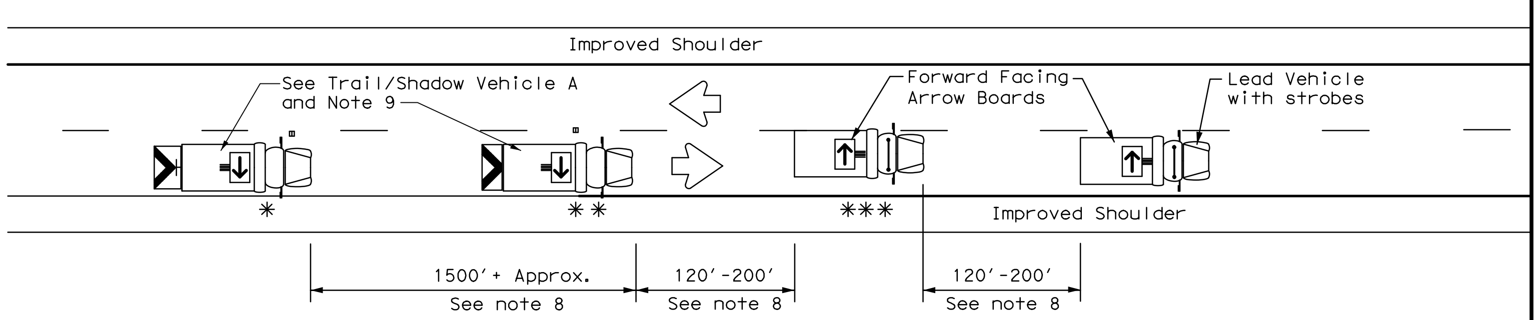
Traffic Operations Division Standard

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 2-94 4-98 8-95 7-13 1-97	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	47

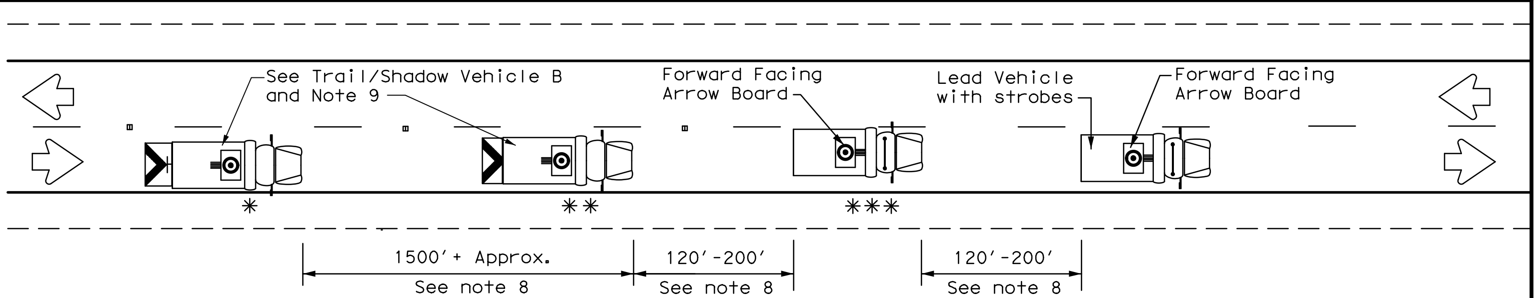
175



TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS

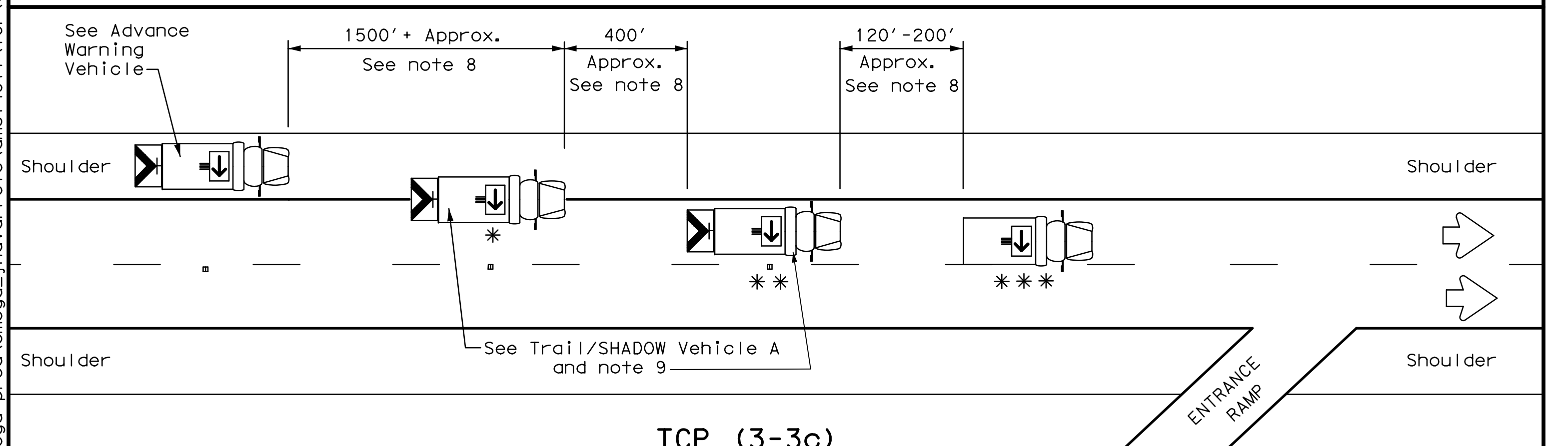
(WORK ON TRAVEL LANE)



TCP (3-3b)

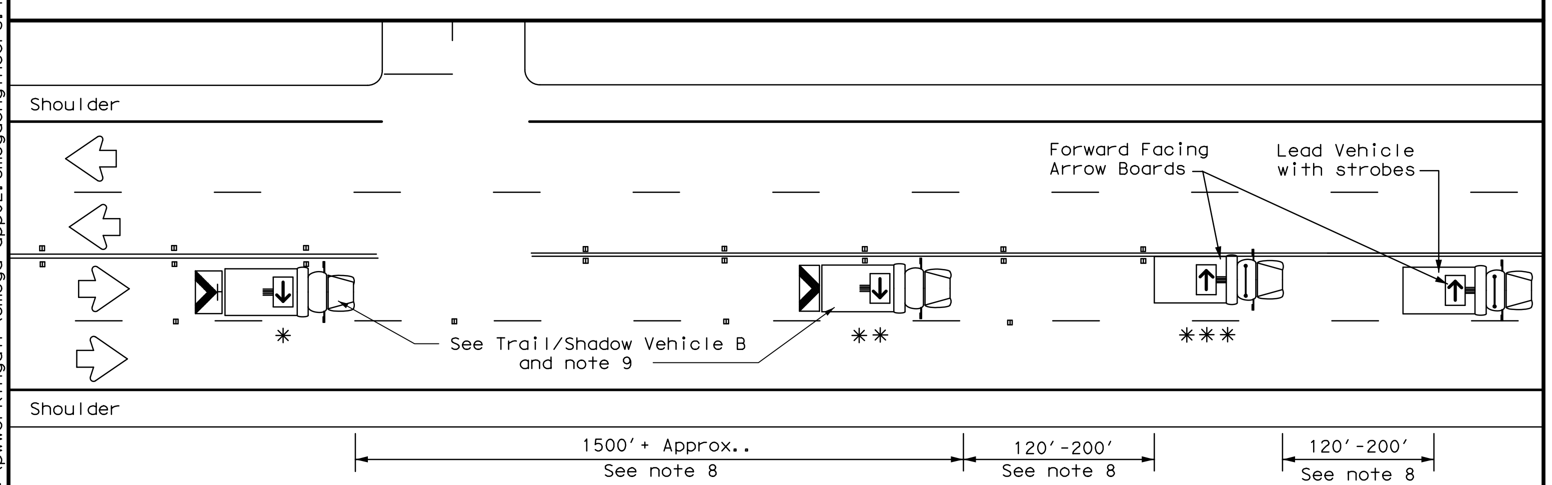
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS

(WORK ON TRAVEL LANE)



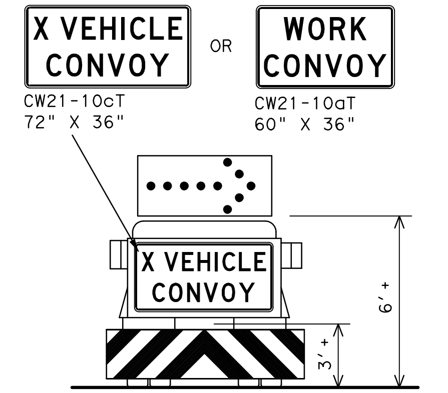
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



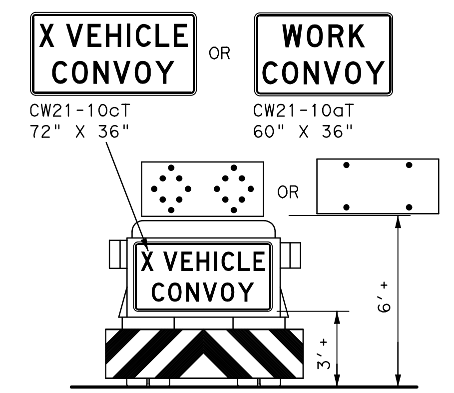
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



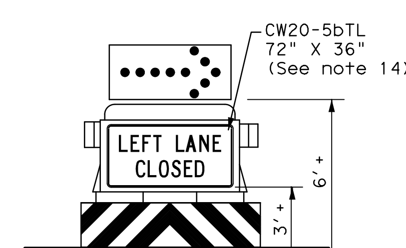
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

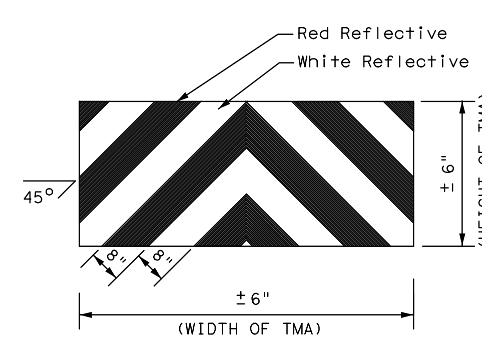


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

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

TYPICAL USAGE

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

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©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97 7-14	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	48

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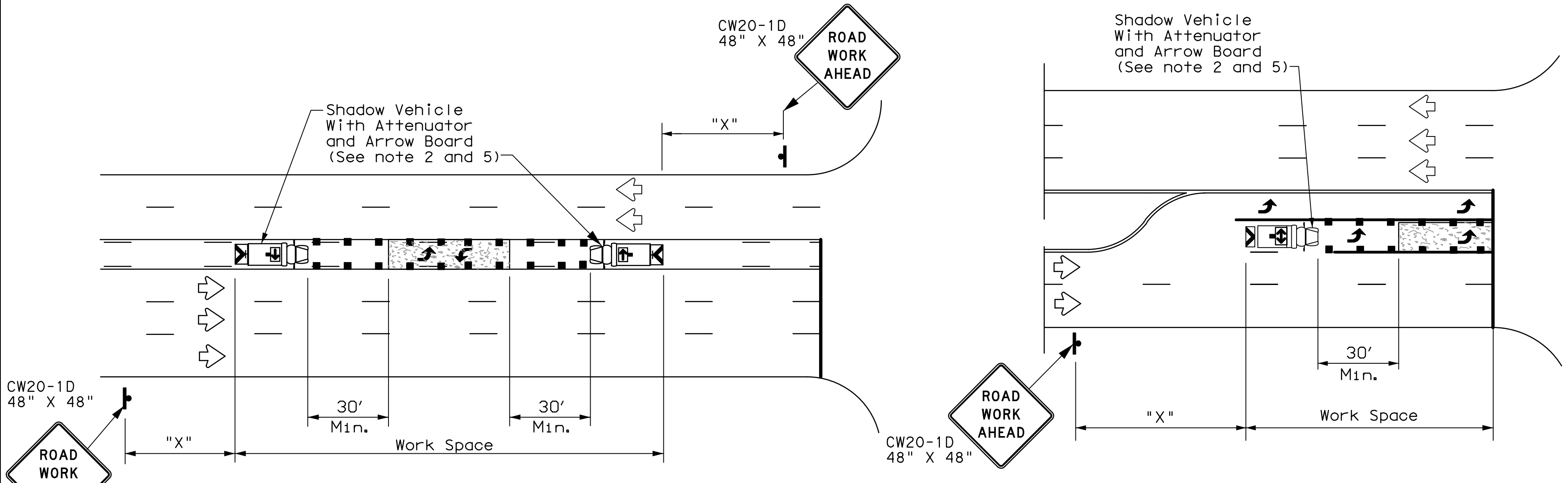
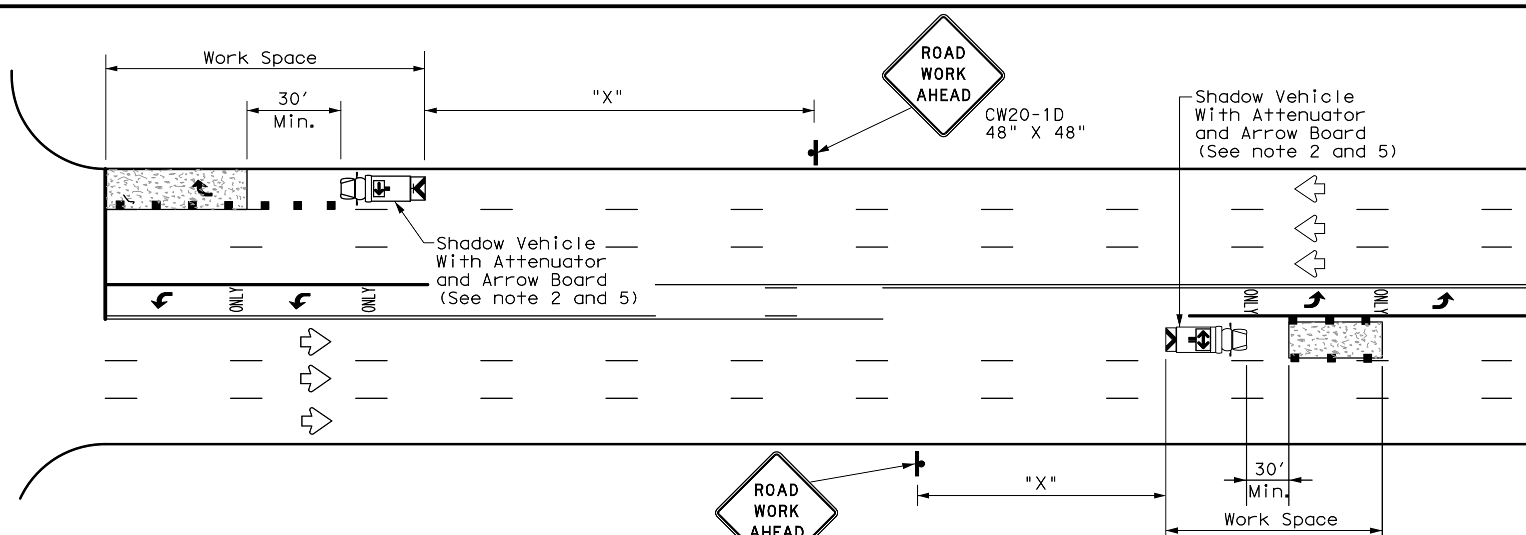


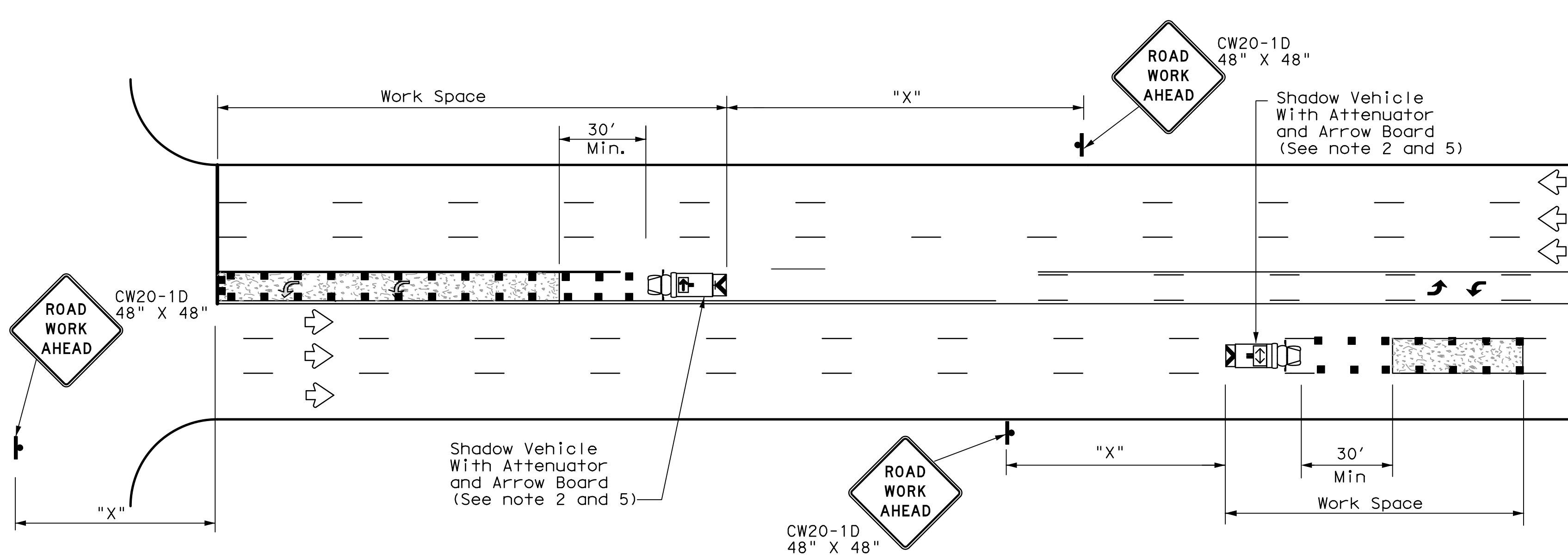
TYPICAL TRAFFIC CONTROL FOR
CONTINUOUS LEFT TURN LANE SYMBOL MARKINGS

TYPICAL TRAFFIC CONTROL FOR
OUTSIDE DUAL LEFT TURN LANE SYMBOL MARKINGS



TYPICAL TRAFFIC CONTROL FOR
OUTSIDE LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
INSIDE LANE MARKINGS



TYPICAL TRAFFIC CONTROL FOR
LEFT TURN LANE MARKINGS

TYPICAL TRAFFIC CONTROL FOR
CENTER LANE MARKINGS

LEGEND

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

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

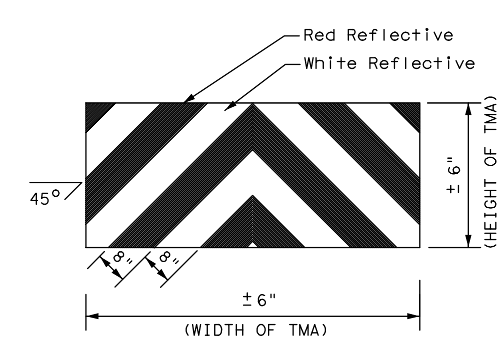
✳ Conventional Roads Only

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS FOR ISOLATED WORK AREAS UNDIVIDED HIGHWAYS

TCP(3-4)-13

FILE: tcp3-4.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT July, 2013	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS	DIST ODA		COUNTY WINKLER	SHEET NO. 49

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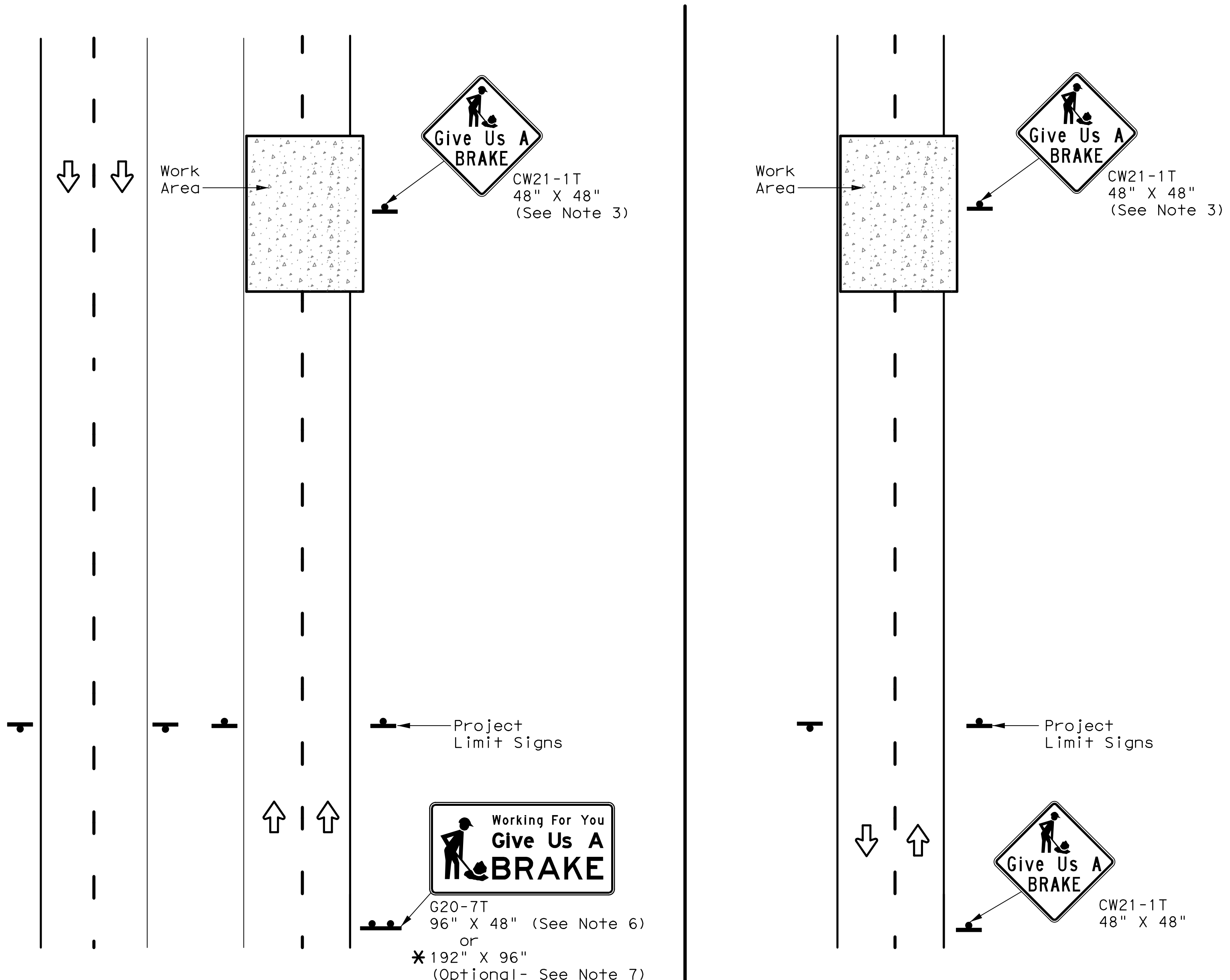


DIVIDED HIGHWAY

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
						Size	(LF) ①	(LF) ②	24" DIA. (LF)
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	
(symbol)	Sign
(symbol)	Large Sign
(arrow)	Traffic Flow

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

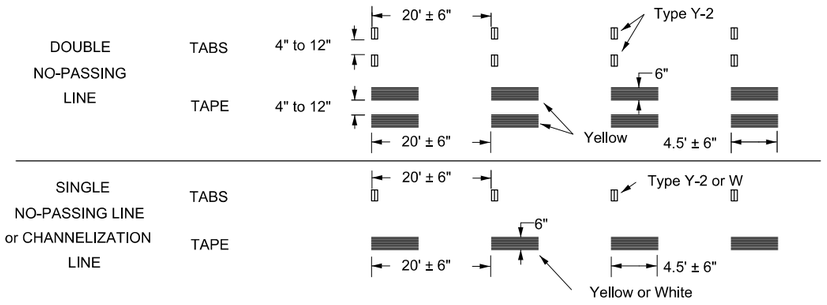
WORK ZONE "GIVE US A BRAKE" SIGNS

WZ(BRK)-13

FILE: wzbrk-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
6-96 5-98 7-13	DIST	COUNTY		SHEET NO.
8-96 3-03	ODA	WINKLER		50

116

WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS



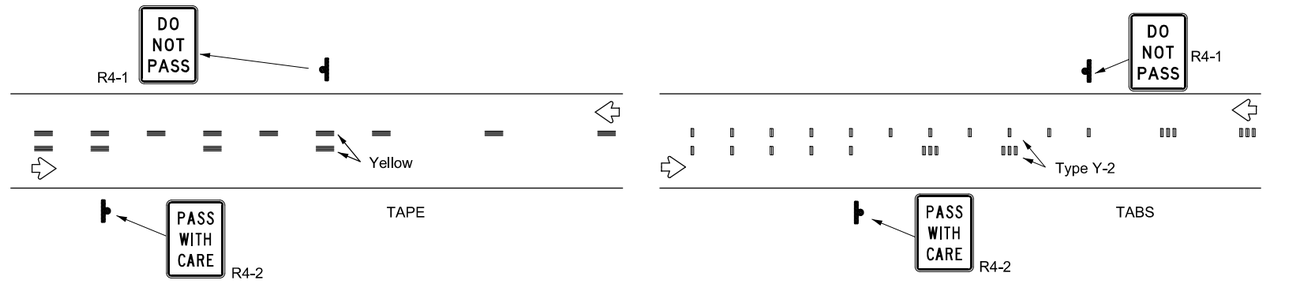
NOTES:

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

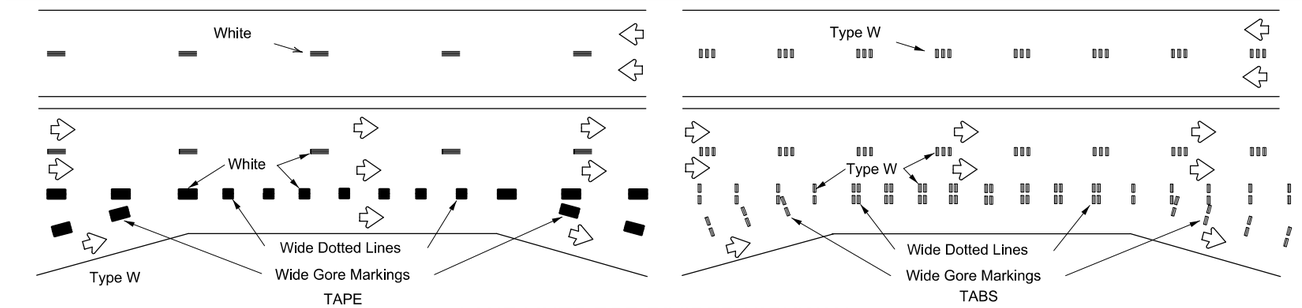
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

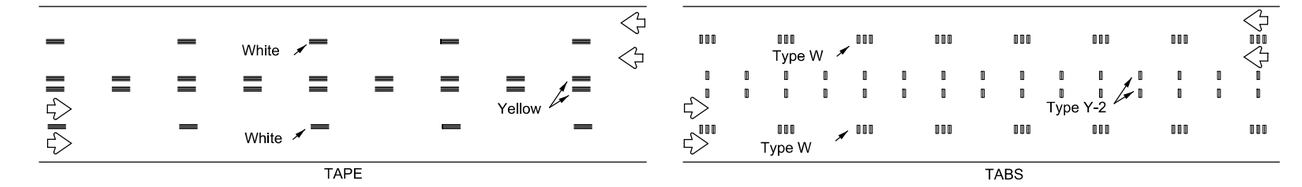
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



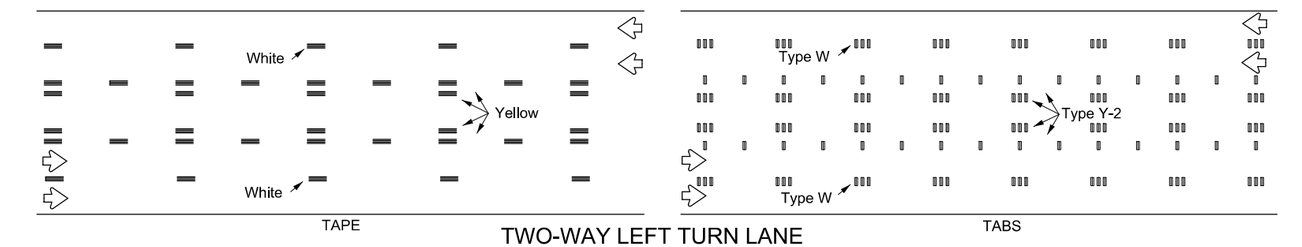
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



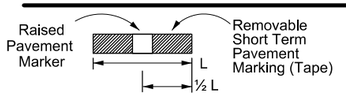
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

1. DMSs referenced above can be found along with embedded links to their respective MPLs at the following website:

http://www.txdot.gov/business/contractors_consultants/material_specifications/default.htm

Texas Department of Transportation

Traffic Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

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© TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
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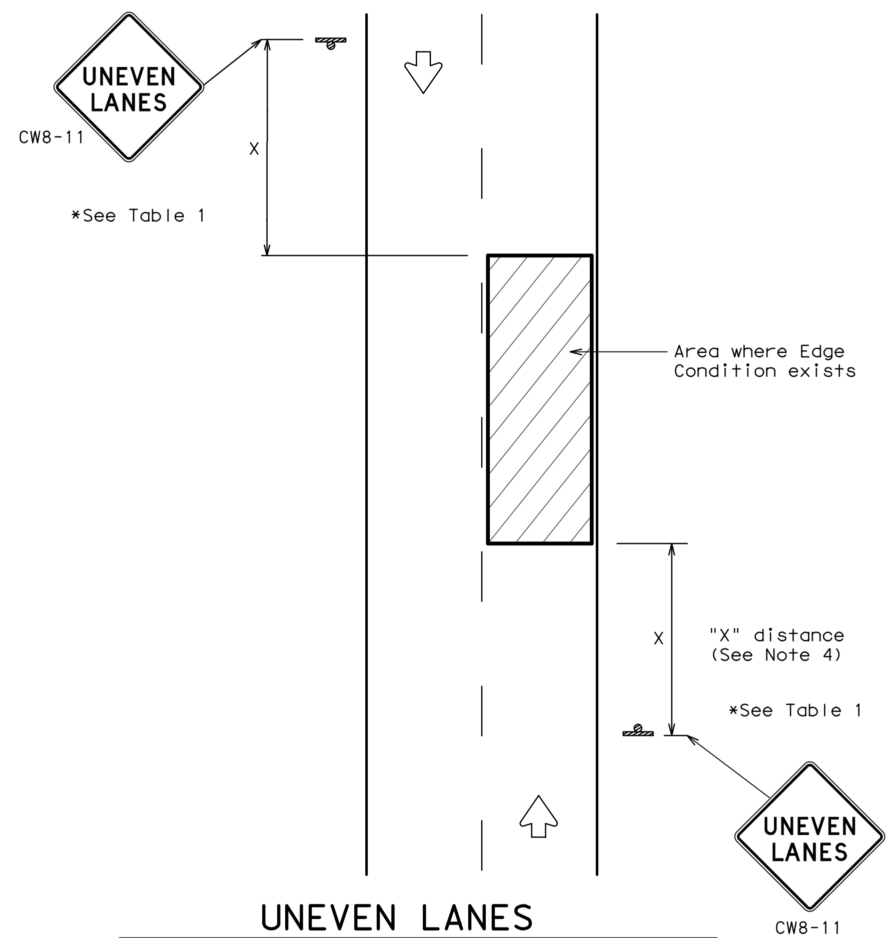
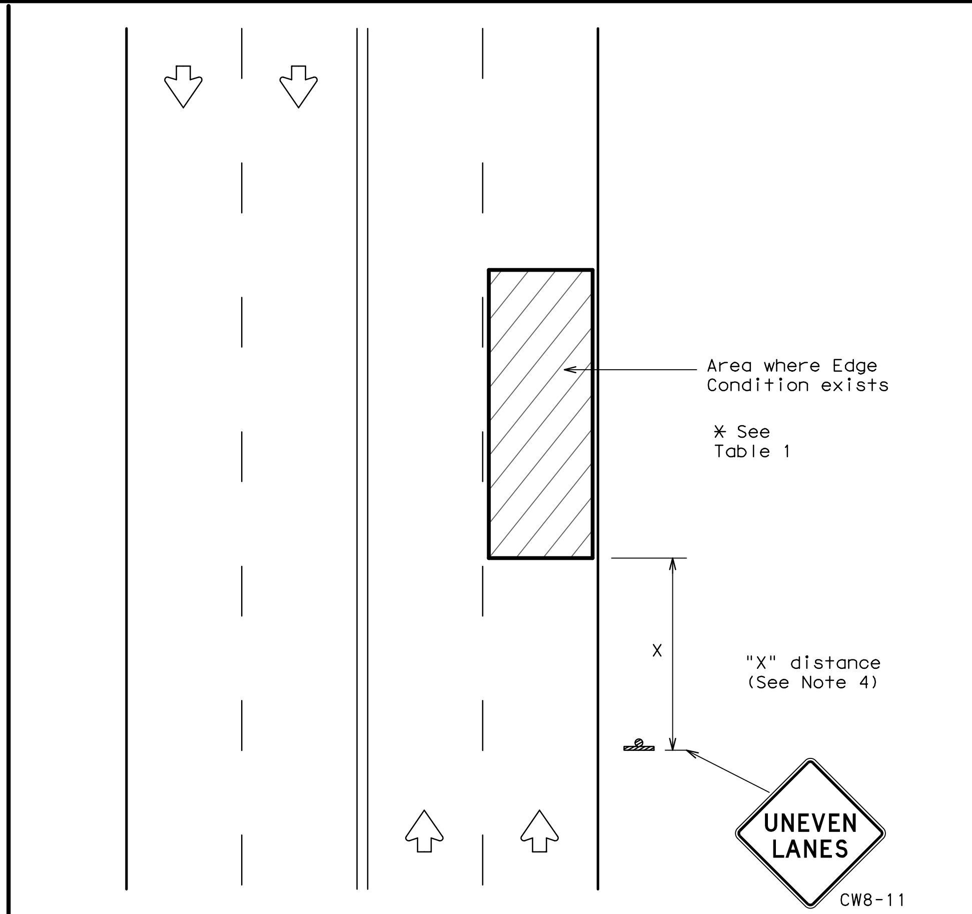
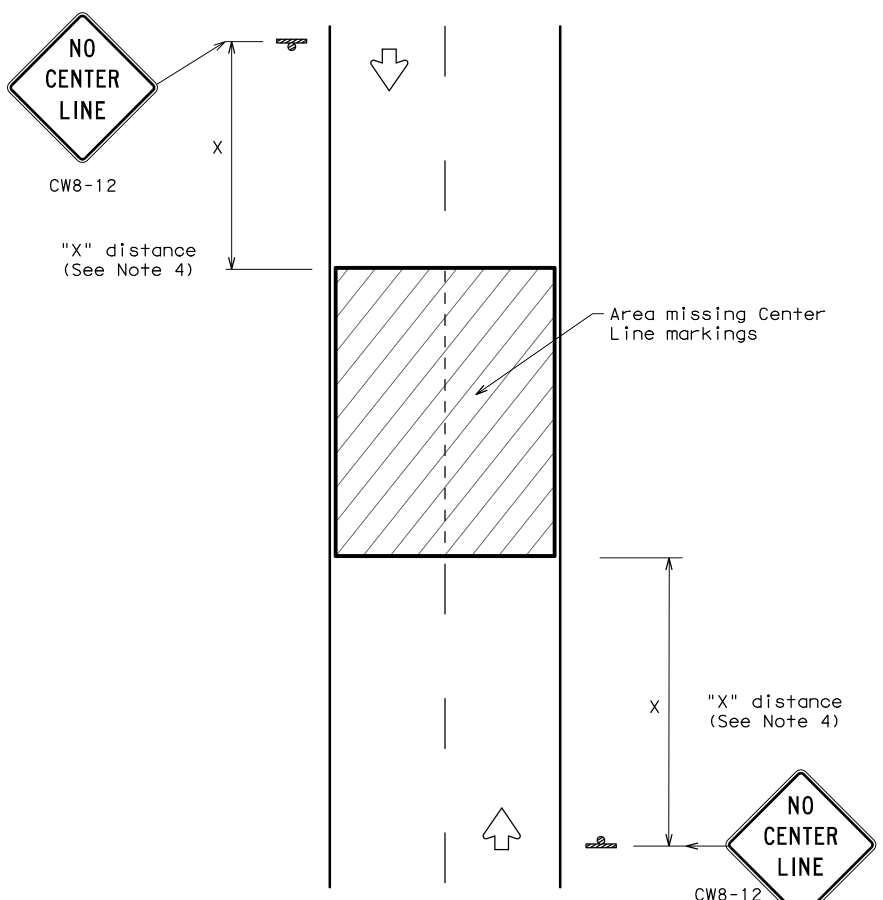


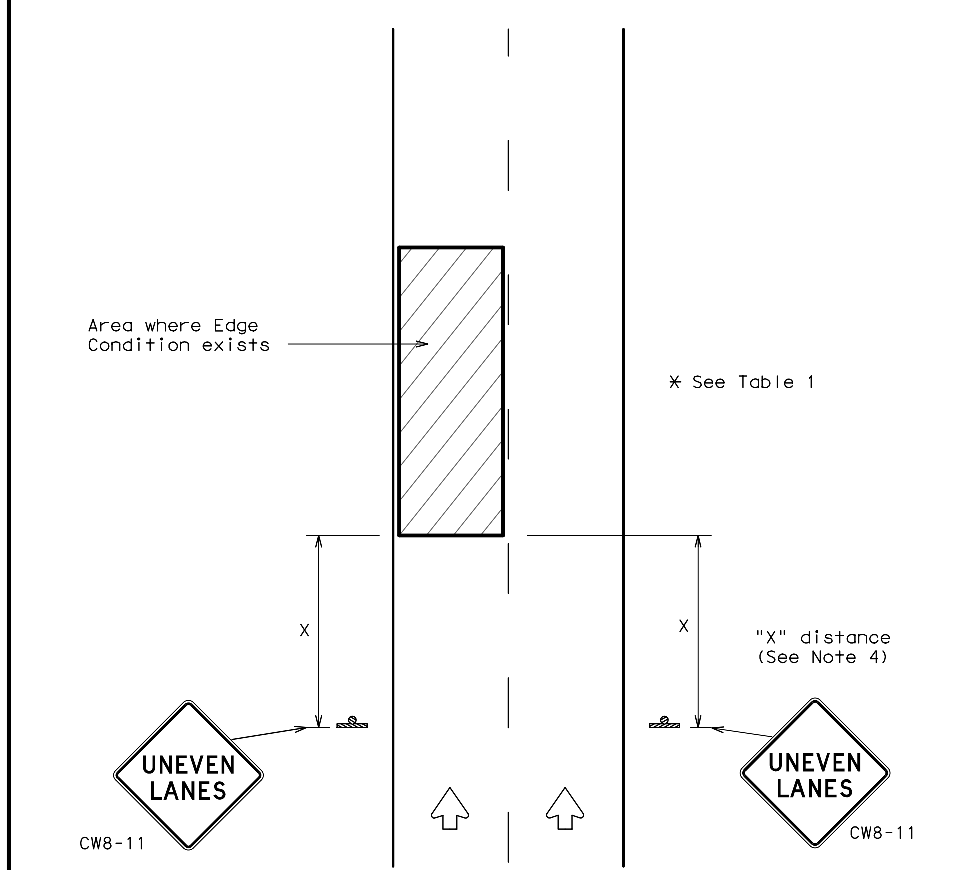
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

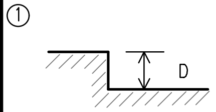
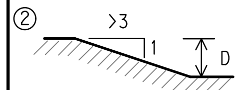
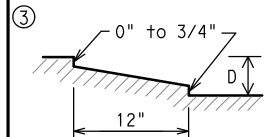
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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: $1\frac{1}{4}$" (maximum-planing) $1\frac{1}{2}$" (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

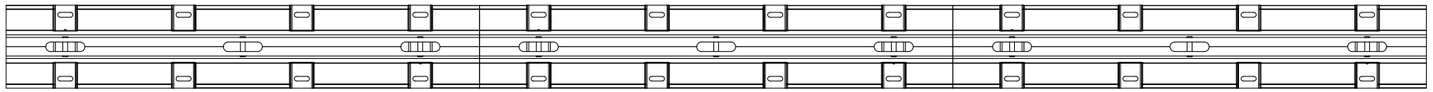
SIGNING FOR UNEVEN LANES

WZ(UL)-13

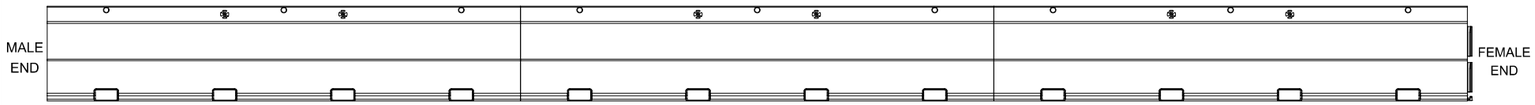
FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS 8-95 2-98 7-13 1-97 3-03	DIST ODA	COUNTY WINKLER		SHEET NO. 52

112

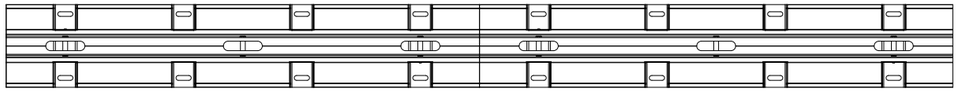
DATE: 7/17/2023
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete\dms1487i\ZONEGUARD-19.dgn



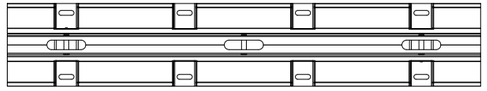
PLAN VIEW



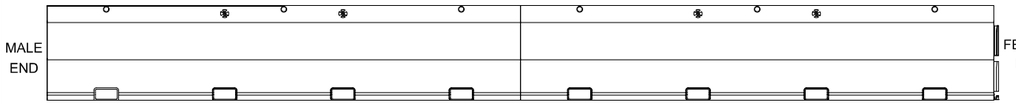
ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 50'–0"



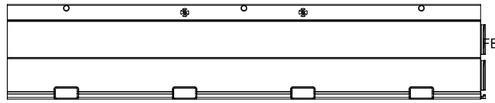
PLAN VIEW



PLAN VIEW

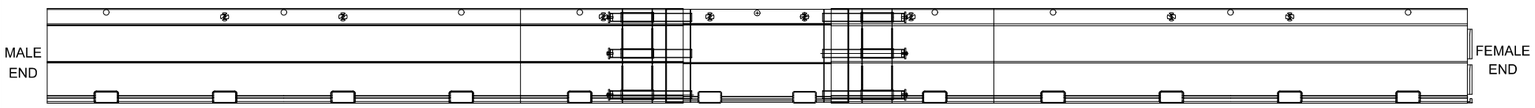


ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 33'–4"

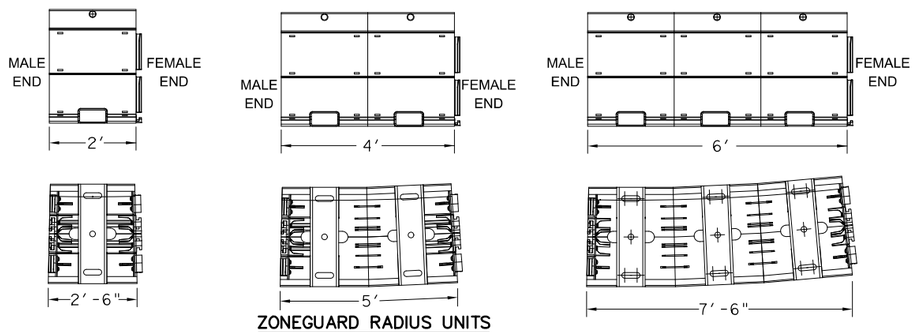


ELEVATION VIEW
ZONEGUARD STANDARD UNIT x 16'–8"

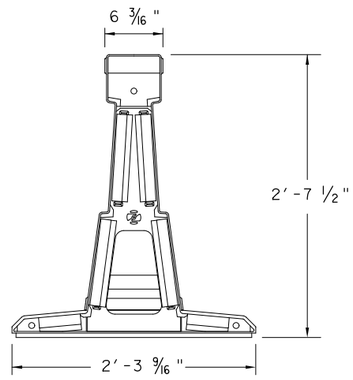
PLAN VIEW



ELEVATION VIEW
ZONEGUARD EXPANSION UNIT x 46'–5½"
(SEE GENERAL NOTE 5)



ZONEGUARD RADIUS UNITS



ZONEGUARD TYPICAL SECTION

GENERAL NOTES

1. FOR TECHNICAL AND APPLICATION SUPPORT PLEASE CONTACT HILL & SMITH INC. AT 614-340-6294.
2. ZONEGUARD HAS BEEN ACCEPTED BY FHWA AS A MASH TL-3 LONGITUDINAL BARRIER.
3. STANDARD INSTALLATIONS REQUIRE ANCHORING AT EACH END OF THE RUN. MINIMUM DEFLECTION INSTALLATIONS REQUIRE ANCHORING AT 33'-4 CENTERS. NO MODIFICATIONS ARE NECESSARY OTHER THAN INCREASED ANCHORING.
4. 50-0' UNITS CAN BE USED TO ACHIEVE DOWN TO AN 800' RADIUS CURVE. 16'-8" UNITS CAN BE USED TO ACHIEVE CURVES DOWN TO 250' RADIUS. SPECIAL SHORT UNITS (SHOWN) IN 2.5 DEGREE INCREMENTS CAN BE USED TO ACHIEVE DIRECTION CHANGES OR AT A FIXED RADIUS OF 47'-0".
5. HILL & SMITH OFFERS AN EXPANSION UNIT THAT CAN BE USED ACROSS A BRIDGE EXPANSION JOINT OR TO ACCOMMODATE THERMAL EXPANSION. THE UNIT IS ANCHORED IN THE MIDDLE, AND ADJUSTED ACCORDING TO THE TEMPERATURE AT THE TIME OF INSTALLATION. THE EXPANSION JOINT CAN BE USED WITH ENGINEER APPROVAL. THE EXPANSION UNIT HAS NOT BEEN ASSESSED TO MASH CRITERIA.
6. ANCHOR PINS ARE 1 ¼" DIAMETER. LENGTH IS 1'-8" FOR ASPHALT AND 1'-0" FOR CONCRETE. SEE ANCHORING TABLE FOR ADDITIONAL DETAILS.

	STANDARD INSTALLATION	MINIMUM DEFLECTION INSTALLATION CONCRETE	MINIMUM DEFLECTION INSTALLATION ASPHALT
	FOUR ANCHORS AT END OF THE RUN	TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4"	TWO ANCHORS (ONE EACH SIDE) EVERY 33'-4"
MASH TL-3 DEFLECTION (2270 KG TRUCK @ 25° & 100 KM/HR)	6'-10"	5"	2'-0"

EXPECTED DEFLECTION TABLE

DESCRIPTION	ASPHALT	CONCRETE
1 1/4" PIN ANCHOR	1'–8" LONG, MINIMUM ASPHALT COVER OF 3"	1'–0" LONG, MINIMUM CONCRETE COVER OF 6"
1 1/4" ALL THREAD ANCHOR	-	1'–0" LONG, MINIMUM EMBEDMENT OF 6"

ANCHORING TABLE

ALTERNATE ANCHORING METHODS CERTIFIED BY HILL & SMITH, INC. ARE AVAILABLE PER FHWA APPROVAL LETTER.

Texas Department of Transportation

Design Division Standard

ZONEGUARD SYSTEM
STEEL BARRIER
MASH TL-3
ZONEGUARD-19

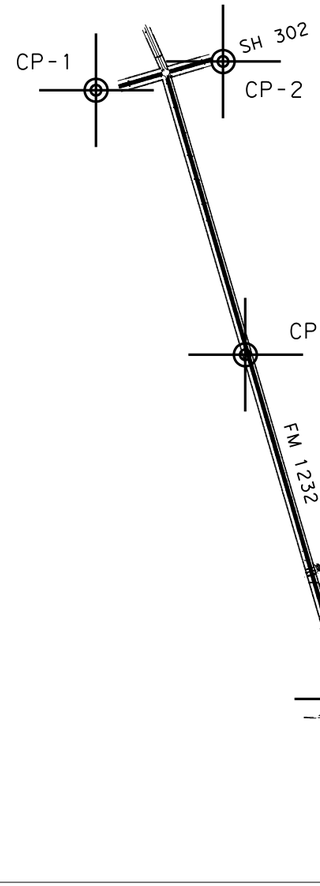
FILE: zoneguard19	DN: TxDOT	CK: KM	DW: VP	CK: CGL	
© TxDOT: JULY 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1371	01	023	FM 1232	
	DIST	COUNTY		SHEET NO.	
	ODA	WINKLER		53	

HORIZONTAL / VERTICAL CONTROL - GRID COORDINATES

PT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-1	10635455.54	1404251.04	2823.85′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-2	10635834.73	1405927.68	2824.72′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-3	10631964.65	1406221.19	2821.65′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-4	10627419.48	1407621.90	2807.04′	5/8" IR W/SAM CONTROL CAP IN CONCRETE

HORIZONTAL / VERTICAL CONTROL - SURFACE COORDINATES

PT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-1	10636731.80	1404419.55	2823.85′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-2	10637111.03	1406096.39	2824.72′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-3	10633240.49	1406389.94	2821.65′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-4	10628694.77	1407790.81	2807.04′	5/8" IR W/SAM CONTROL CAP IN CONCRETE



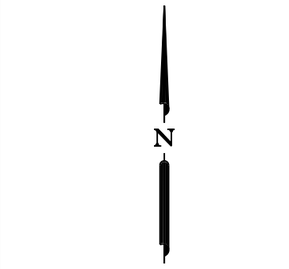
MATCH SHEET 2 OF 3

NOTES:

1. ALL PROJECT COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203, NAD 83 (2011) / NAVD 88. ALL DISTANCES SHOWN HEREON ARE SURFACE. SURFACE COORDINATES MAY BE CONVERTED TO GRID BY DIVIDING BY A LOCAL SURFACE ADJUSTMENT FACTOR OF 1.00012.
UNITS: U.S. SURVEY FEET

2. CONTROL WAS ESTABLISHED USING STATIC AND GPS OBSERVATIONS PROCESSED TO CORS STATIONS TXEL, TXKM, AND TXMH.

3. A CALIBRATION SHOULD BE PERFORMED WHEN USING THE CONTROL SHOWN HEREON.



GRAPHIC SCALE
SCALE: 1" = 2000' (11" X 17")
SCALE: 1" = 1000' (22" X 34")
WINKLER COUNTY, TEXAS

Neil Hines 10/25/2022

Survey Date: APRIL, 2022

SAM
4801 Southwest Parkway
Building Two, Suite 100
Austin, Texas 78735
(512) 447-0575
Fax: (512) 326-3029
Texas Firm Registration No. 10064300

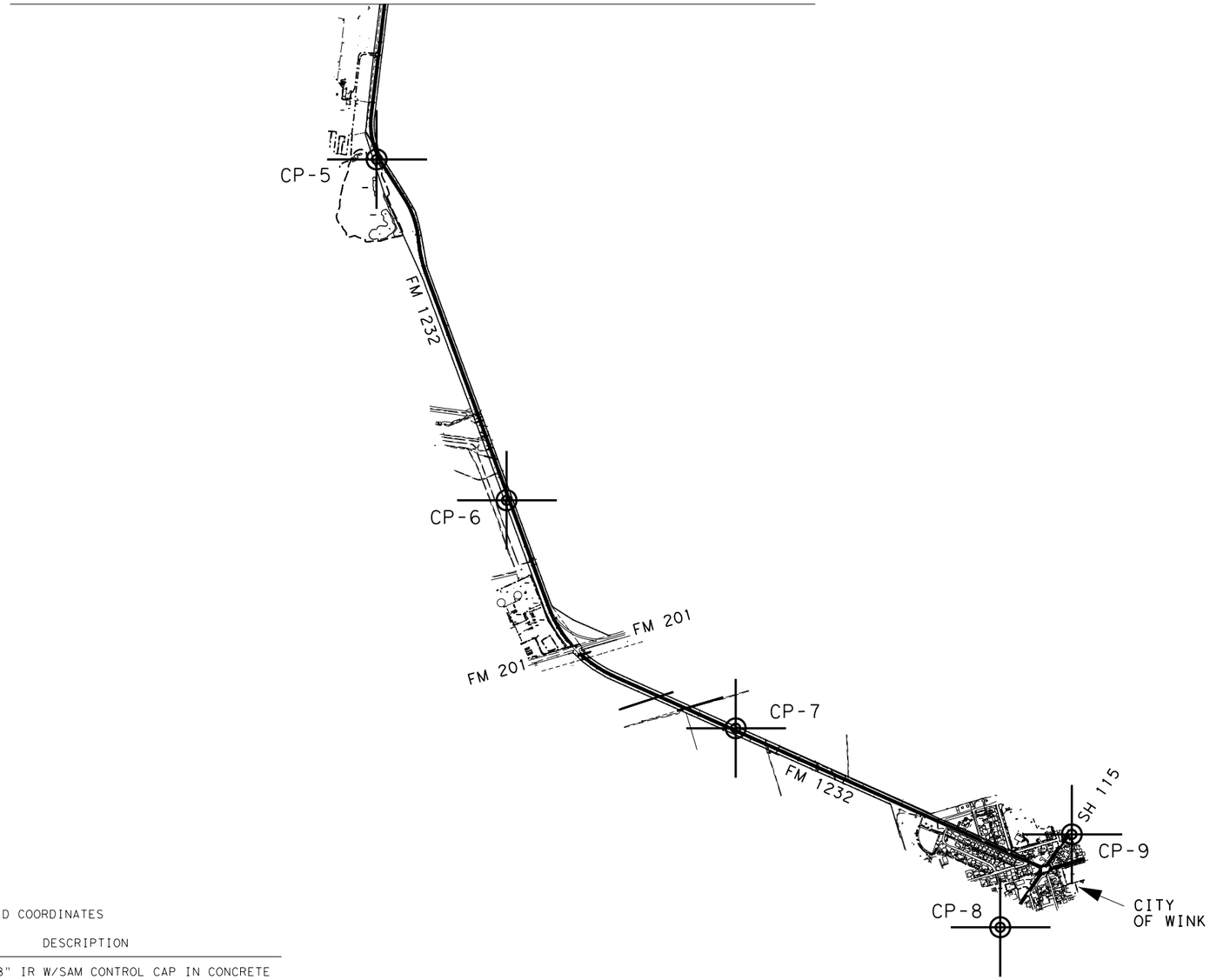
Texas Department of Transportation

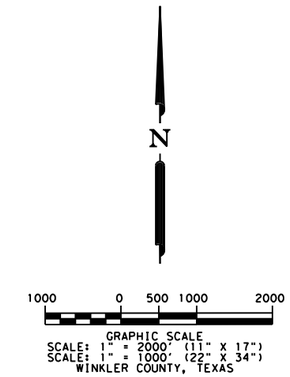
SURVEY CONTROL LAYOUT SHEET

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
	SEE TITLE SHEET		54
STATE	DISTRICT	COUNTY	
TEXAS	ODA	WINKLER	
CONTROL	SECTION	JOB	HIGHWAY NO.
1371	01	023	FM 1232

FILE:n:\102106236A\100\Survey\02Base\DGN\Control Sheets\02369A_FM 1232_Layout_Sheet 1_Control Sheets_Surface.dgn

MATCH SHEET 1 OF 3





HORIZONTAL / VERTICAL CONTROL - GRID COORDINATES

PT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-5	10622644.29	1407857.89	2791.56′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-6	10617470.27	1409830.05	2800.51′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-7	10614007.95	1413307.49	2785.96′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-8	10610988.42	1417321.89	2789.44′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-9	10612397.74	1418408.10	2790.06′	5/8" IR W/SAM CONTROL CAP IN CONCRETE

HORIZONTAL / VERTICAL CONTROL - SURFACE COORDINATES

PT	NORTHING	EASTING	ELEV.	DESCRIPTION
CP-5	10623919.00	1408026.83	2791.56′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-6	10618744.37	1409999.23	2800.51′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-7	10615281.63	1413477.09	2785.96′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-8	10612261.74	1417491.97	2789.44′	5/8" IR W/SAM CONTROL CAP IN CONCRETE
CP-9	10613671.23	1418578.31	2790.06′	5/8" IR W/SAM CONTROL CAP IN CONCRETE

NOTES:

1. ALL PROJECT COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203, NAD 83 (2011) / NAVD 88. ALL DISTANCES SHOWN HEREON ARE SURFACE. SURFACE COORDINATES MAY BE CONVERTED TO GRID BY DIVIDING BY A LOCAL SURFACE ADJUSTMENT FACTOR OF 1.00012.
UNITS: U.S. SURVEY FEET

2. CONTROL WAS ESTABLISHED USING STATIC AND GPS OBSERVATIONS PROCESSED TO CORS STATIONS TXEL, TXKM, AND TXMH.

3. A CALIBRATION SHOULD BE PERFORMED WHEN USING THE CONTROL SHOWN HEREON.

Neil Hines 10/25/2022

Survey Date: APRIL, 2022

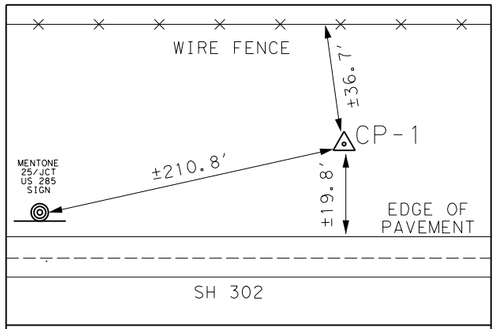
SAM
4801 Southwest Parkway
Building Two, Suite 100
Austin, Texas 78735
(512) 447-0575
Fax: (512) 326-3029
Texas Firm Registration No. 10064300

Texas Department of Transportation

SURVEY CONTROL LAYOUT SHEET

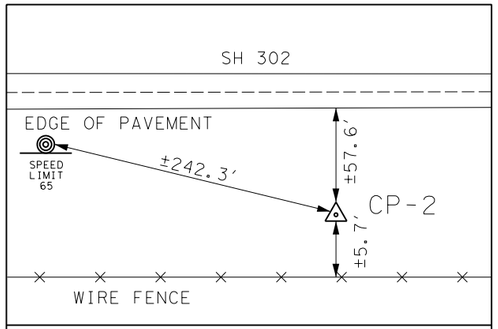
FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
	SEE TITLE SHEET		55
STATE	DISTRICT	COUNTY	
TEXAS	ODA	WINKLER	
CONTROL	SECTION	JOB	HIGHWAY NO.
1371	01	023	FM 1232

FILE:J:\102106269A\100\Survey\02Base\DGN\Control Sheets\02369A_FM 1232_Layout_Sheet 2_Control Sheets_Surface.dgn



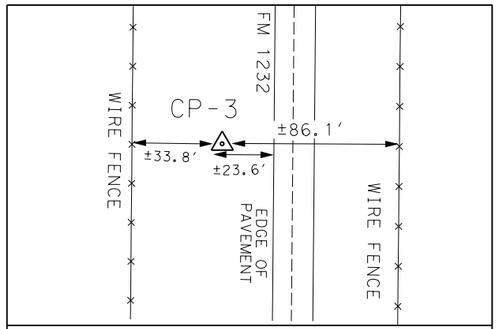
CP-1 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 0.2 MILES WEST OF THE SH 302 AND FM 1232 INTERSECTION IN THE NORTH RIGHT-OF-WAY OF SH 302 ±36.7 FEET SOUTH OF A WIRE FENCE, ±19.8 FEET NORTH OF THE EDGE OF PAVEMENT, AND ±210.8 FEET EAST OF THE MENTONE 25/JCT US 285 SIGN.

SURFACE COORDINATES	GRID COORDINATES
N = 10636731.80	N = 10635455.54
E = 1404419.55	E = 1404251.04
ELEV = 2823.85'	ELEV = 2823.85'



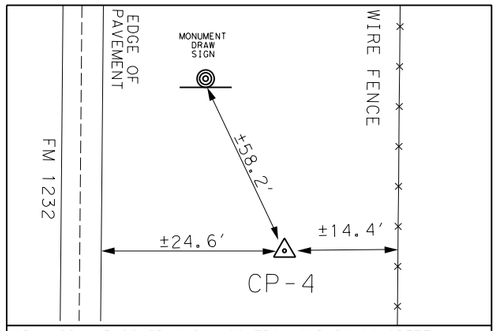
CP-2 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 0.4 MILES EAST OF THE FM 1232 AND SH 302 INTERSECTION IN THE SOUTH RIGHT-OF-WAY OF SH 302, ±242.3 FEET EAST OF A "SPEED LIMIT 65" SIGN, ±57.6 FEET SOUTH OF THE EDGE OF PAVEMENT, AND ±5.7 FEET NORTH OF A WIRE FENCE.

SURFACE COORDINATES	GRID COORDINATES
N = 10637111.03	N = 10635834.73
E = 1406096.39	E = 1405927.68
ELEV = 2824.72'	ELEV = 2824.72'



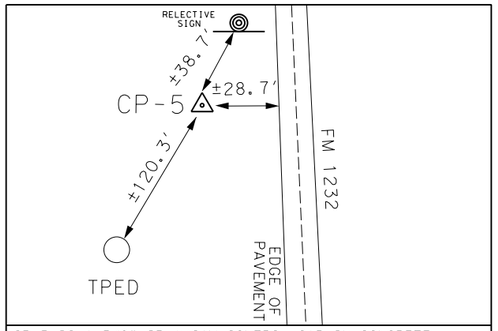
CP-3 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 0.7 MILES SOUTH OF THE FM 1232 AND SH 302 INTERSECTION IN THE WEST RIGHT-OF-WAY OF FM 1232, ±86.1 FEET WEST OF THE EAST WIRE FENCE, ±23.6 FEET WEST OF THE EDGE OF PAVEMENT, AND ±33.8 FEET EAST OF THE WEST WIRE FENCE.

SURFACE COORDINATES	GRID COORDINATES
N = 10633240.49	N = 10631964.65
E = 1406389.94	E = 1406221.19
ELEV = 2821.65'	ELEV = 2821.65'



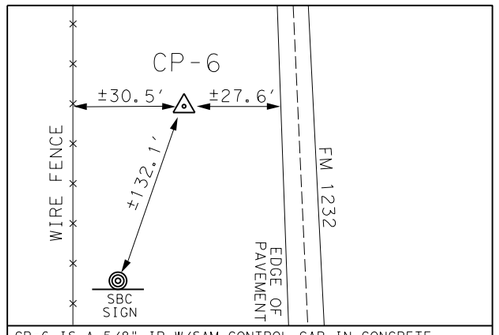
CP-4 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 1.6 MILES SOUTH OF THE FM 1232 AND SH 302 INTERSECTION IN THE EAST RIGHT-OF-WAY OF FM 1232, ±14.4 FEET WEST OF A WIRE FENCE, ±24.6 FEET EAST OF THE EDGE OF PAVEMENT, AND ±58.2 FEET SOUTH OF THE "MONUMENT DRAW" SIGN.

SURFACE COORDINATES	GRID COORDINATES
N = 10628694.77	N = 10627419.48
E = 1407790.81	E = 1407621.90
ELEV = 2807.04'	ELEV = 2807.04'



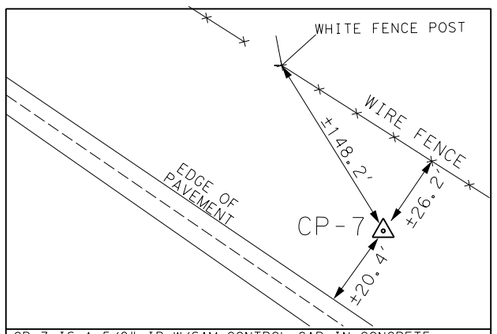
CP-5 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 1.5 MILES NORTH OF THE FM 1232 AND FM 201 INTERSECTION IN THE WEST RIGHT-OF-WAY OF FM 1232, ±120.3 FEET NORTH OF A TELEPHONE PEDESTAL, ±28.7 FEET WEST OF THE EDGE OF PAVEMENT, AND ±38.7 FEET SOUTH OF A REFLECTIVE SIGN.

SURFACE COORDINATES	GRID COORDINATES
N = 10623919.00	N = 10622644.29
E = 1408026.83	E = 1407857.89
ELEV = 2791.56'	ELEV = 2791.56'



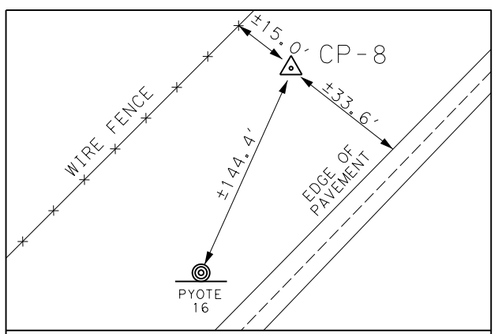
CP-6 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 0.5 MILES NORTH OF THE FM 1232 AND FM 201 INTERSECTION IN THE WEST RIGHT-OF-WAY OF FM 1232, ±132.1 FEET NORTH OF A SBC SIGN, ±27.6 FEET WEST OF THE EDGE OF PAVEMENT, AND ±30.5 FEET EAST OF A WIRE FENCE.

SURFACE COORDINATES	GRID COORDINATES
N = 10618744.37	N = 10617470.27
E = 1409999.23	E = 1409830.05
ELEV = 2800.51'	ELEV = 2800.51'



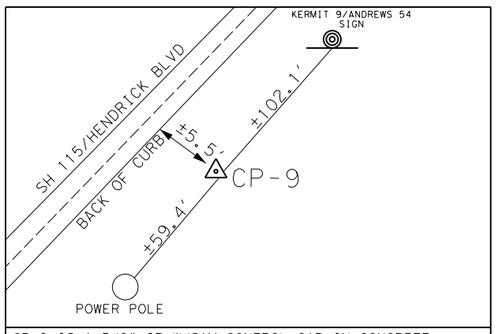
CP-7 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 1.0 MILE NORTHWEST OF THE FM 1232 AND SH 115 INTERSECTION IN THE NORTHEAST RIGHT-OF-WAY OF FM 1232, ±148.2 FEET SOUTH EAST OF A WHITE GATE POST, ±20.4 FEET NORTH OF THE EDGE OF PAVEMENT, AND ±26.2 FEET SOUTH OF A WIRE FENCE.

SURFACE COORDINATES	GRID COORDINATES
N = 10615281.63	N = 10614007.95
E = 1413477.09	E = 1413307.49
ELEV = 2785.96'	ELEV = 2785.96'



CP-8 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 0.2 MILES SOUTHWEST OF THE FM 1232 AND SH 115 INTERSECTION IN THE NORTH RIGHT-OF-WAY OF SH 115, ±144.4 FEET NORTH OF A "PYOTE 16" SIGN, ±33.6 FEET WEST OF THE EDGE OF PAVEMENT, AND ±15.0 FEET EAST OF A WIRE FENCE.

SURFACE COORDINATES	GRID COORDINATES
N = 10612261.74	N = 10610988.42
E = 1417491.97	E = 1417321.89
ELEV = 2789.44'	ELEV = 2789.44'



CP-9 IS A 5/8" IR W/SAM CONTROL CAP IN CONCRETE LOCATED 0.1 MILES NORTHEAST OF THE FM 1232 AND SH 115 INTERSECTION IN THE EAST RIGHT-OF-WAY OF SH 115, ±102.1 FEET SOUTH OF A "KERMIT 9/ANDREWS 54" SIGN, ±5.5 FEET EAST OF THE BACK OF CURB, AND ±59.4 FEET NORTH OF A POWER POLE.

SURFACE COORDINATES	GRID COORDINATES
N = 10613671.23	N = 10612397.74
E = 1418578.31	E = 1418408.10
ELEV = 2790.06'	ELEV = 2790.06'

NOTES:

1. ALL PROJECT COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, TEXAS CENTRAL ZONE (4203, NAD 83 (2011) / NAVD 88. ALL DISTANCES SHOWN HEREON ARE SURFACE. SURFACE COORDINATES MAY BE CONVERTED TO GRID BY DIVIDING BY A LOCAL SURFACE ADJUSTMENT FACTOR OF 1.00012.
UNITS: U.S. SURVEY FEET

2. CONTROL WAS ESTABLISHED USING STATIC AND GPS OBSERVATIONS PROCESSED TO CORS STATIONS TXEL, TXKM, AND TXMH.

3. A CALIBRATION SHOULD BE PERFORMED WHEN USING THE CONTROL SHOWN HEREON.

NOT TO SCALE

Neil Hines 10/25/2022

Survey Date: APRIL, 2022

SAM
4801 Southwest Parkway
Building Two, Suite 100
Austin, Texas 78735
(512) 447-0575
Fax: (512) 326-3029
Texas Firm Registration No. 10064300

Texas Department of Transportation

HORIZONTAL AND VERTICAL CONTROL SHEET

FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
	SEE TITLE SHEET		56
STATE	DISTRICT	COUNTY	
TEXAS	ODA	WINKLER	
CONTROL	SECTION	JOB	HIGHWAY NO.
1371	01	023	FM 1232

FILE:n:\021062369A\100\Survey\02Base\DGN\Control Sheets\62369A_FM 1232_Control Sheets_3 1115.dgn

FM 1232

Beginning chain FM1232 description

Point FM123201 N 10,636,962.0891 E 1,405,340.6896 Sta 100+00.00

Course from FM123201 to PC FM1232_1 S 16° 15′ 51.03" E Dist 10,176.7598

Curve Data					
Curve FM1232_1					
P.I. Station	203+51.05	N	10,627,025.2853	E	1,408,239.6714
Delta =	23° 10′ 30.09" (RT)				
Degree =	6° 44′ 26.45"				
Tangent =	174.2869				
Length =	343.8084				
Radius =	850.0000				
External =	17.6842				
Long Chord =	341.4695				
Mid. Ord. =	17.3238				
P.C. Station	201+76.76	N	10,627,192.5973	E	1,408,190.8594
P.T. Station	205+20.57	N	10,626,852.2646	E	1,408,218.7003
C.C.		N	10,626,954.5407	E	1,407,374.8759
Back = S	16° 15′ 51.03" E				
Ahead = S	6° 54′ 39.06" W				
Chord Bear = S	4° 40′ 35.99" E				

Course from PT FM1232_1 to PC FM1232_2 S 6° 54′ 39.06" W Dist 2,266.7392

Curve Data					
Curve FM1232_2					
P.I. Station	231+98.55	N	10,624,193.7400	E	1,407,896.4727
Delta =	39° 21′ 15.43" (LT)				
Degree =	4° 58′ 56.07"				
Tangent =	411.2421				
Length =	789.8912				
Radius =	1,150.0000				
External =	71.3190				
Long Chord =	774.4552				
Mid. Ord. =	67.1543				
P.C. Station	227+87.31	N	10,624,601.9943	E	1,407,945.9554
P.T. Station	235+77.20	N	10,623,846.6840	E	1,408,117.0904
C.C.		N	10,624,463.6208	E	1,409,087.6001
Back = S	6° 54′ 39.06" W				
Ahead = S	32° 26′ 36.38" E				
Chord Bear = S	12° 45′ 58.66" E				

Course from PT FM1232_2 to PC FM1232_3 S 32° 26′ 36.38" E Dist 615.9697

Curve Data					
Curve FM1232_3					
P.I. Station	245+07.19	N	10,623,061.8408	E	1,408,616.0021
Delta =	25° 17′ 05.51" (RT)				
Degree =	4° 05′ 33.20"				
Tangent =	314.0259				
Length =	617.8258				
Radius =	1,400.0000				
External =	34.7865				
Long Chord =	612.8246				
Mid. Ord. =	33.9431				
P.C. Station	241+93.17	N	10,623,326.8540	E	1,408,447.5377
P.T. Station	248+10.99	N	10,622,750.2627	E	1,408,655.1348
C.C.		N	10,622,575.8005	E	1,407,266.0477
Back = S	32° 26′ 36.38" E				
Ahead = S	7° 09′ 30.87" E				
Chord Bear = S	19° 48′ 03.62" E				

Course from PT FM1232_3 to PC FM1232_4 S 7° 09′ 30.87" E Dist 116.6357

FM 1232 CONT'D

Curve Data					
Curve FM1232_4					
P.I. Station	251+79.51	N	10,622,384.6199	E	1,408,701.0576
Delta =	13° 03′ 46.07" (LT)				
Degree =	2° 36′ 15.67"				
Tangent =	251.8797				
Length =	501.5754				
Radius =	2,200.0000				
External =	14.3720				
Long Chord =	500.4898				
Mid. Ord. =	14.2787				
P.C. Station	249+27.63	N	10,622,634.5362	E	1,408,669.6694
P.T. Station	254+29.21	N	10,622,148.2650	E	1,408,788.1194
C.C.		N	10,622,908.6911	E	1,410,852.5205
Back = S	7° 09′ 30.87" E				
Ahead = S	20° 13′ 16.94" E				
Chord Bear = S	13° 41′ 23.90" E				

Course from PT FM1232_4 to PC FM1232_5 S 20° 13′ 16.94" E Dist 5,332.8850

Curve Data					
Curve FM1232_5					
P.I. Station	315+62.36	N	10,616,393.1320	E	1,410,908.0337
Delta =	45° 40′ 52.14" (LT)				
Degree =	3° 00′ 56.04"				
Tangent =	800.2702				
Length =	1,514.8443				
Radius =	1,900.0000				
External =	161.6577				
Long Chord =	1,475.0396				
Mid. Ord. =	148.9819				
P.C. Station	307+62.09	N	10,617,144.0769	E	1,410,631.4217
P.T. Station	322+76.93	N	10,616,066.3894	E	1,411,638.5621
C.C.		N	10,617,800.8085	E	1,412,414.3136
Back = S	20° 13′ 16.94" E				
Ahead = S	65° 54′ 09.08" E				
Chord Bear = S	43° 03′ 43.01" E				

Course from PT FM1232_5 to FM123202 S 65° 54′ 09.08" E Dist 7,146.5302

Point FM123202 N 10,613,148.5306 E 1,418,162.2875 Sta 394+23.46

Ending chain FM1232 description

CR 201 (EAST)

Beginning chain P_CR201_E description

Point E20100 N 10,616,492.9700 E 1,411,036.0690 Sta 10+00.00

Course from E20100 to E20101 N 73° 10′ 13.94" E Dist 176.1268

Point E20101 N 10,616,543.9629 E 1,411,204.6523 Sta 11+76.13

Ending chain P_CR201_E description

CR 201 (WEST)

Beginning chain P_CR201_W description

Point W20100 N 10,616,446.0414 E 1,410,872.6152 Sta 10+00.00

Course from W20100 to W20101 N 72° 58′ 34.99" E Dist 168.5495

Point W20101 N 10,616,495.3869 E 1,411,033.7795 Sta 11+68.55

Ending chain P_CR201_W description

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
HORIZONTAL ALIGNMENT DATA SHEET

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	57
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

PI	ELEV	L	G1%	G2%	K	CREST OR SAG
100+00.00	2,825.17			-0.7348%		
100+86.63	2,824.53	114	-0.7348%	0.1874%	124	SAG
101+68.50	2,824.69	50	0.1874%	-0.3190%	98	CREST
102+80.00	2,824.33	80	-0.3190%	0.2144%	149	SAG
106+61.47	2,825.15	100	0.2144%	-0.4480%	151	CREST
108+73.87	2,824.20	83	-0.4480%	0.4096%	97	SAG
110+70.18	2,825.00	143	0.4096%	-0.3069%	200	CREST
113+01.28	2,824.29	108	-0.3069%	0.8128%	96	SAG
113+94.83	2,825.05	79	0.8128%	-0.1182%	85	CREST
117+73.25	2,824.61	63	-0.1182%	0.5295%	97	SAG
121+92.57	2,826.83	158	0.5295%	-0.5270%	150	CREST
124+54.03	2,825.45		-0.5270%	-0.1453%		
127+61.45	2,825.00	72	-0.1453%	-0.8668%	100	CREST
130+41.41	2,822.57	220	-0.8668%	0.5995%	150	SAG
135+19.95	2,825.44	433	0.5995%	-0.9493%	280	CREST
139+76.38	2,821.11	111	-0.9493%	-1.5058%	199	CREST
142+04.05	2,817.68		-1.5058%	-1.1426%		
146+07.35	2,813.07	149	-1.1426%	0.4001%	97	SAG
147+87.85	2,813.80	114	0.4001%	1.5846%	96	SAG
150+17.86	2,817.44	270	1.5846%	0.2309%	199	CREST
153+24.40	2,818.15	77	0.2309%	-0.5420%	100	CREST
154+71.04	2,817.35		-0.5420%	-0.0301%		
156+33.49	2,817.31	112	-0.0301%	-0.7812%	149	CREST
158+21.83	2,815.83	211	-0.7812%	-0.0771%	300	SAG
161+21.78	2,815.60		-0.0771%	-0.5402%		
162+23.25	2,815.05		-0.5402%	-0.2440%		
164+73.05	2,814.44		-0.2440%	-0.6495%		
165+38.51	2,814.02		-0.6495%	-0.1688%		
166+46.47	2,813.84	68	-0.1688%	-0.9686%	85	CREST
168+45.70	2,811.91	151	-0.9686%	-1.8441%	172	CREST
170+35.18	2,808.41	228	-1.8441%	-0.4150%	160	SAG
173+70.62	2,807.02	167	-0.4150%	-2.4022%	84	CREST
181+00.00	2,789.50	600	-2.4022%	3.8274%	96	SAG
186+35.61	2,810.00	306	3.8274%	0.1918%	84	CREST
191+48.09	2,810.98	433	0.1918%	-4.9525%	84	CREST
196+67.18	2,785.28	600	-4.9525%	1.2751%	96	SAG
200+81.91	2,790.56	116	1.2751%	-0.1089%	84	CREST
201+86.20	2,790.45	92	-0.1089%	0.5120%	149	SAG
204+27.48	2,791.69	112	0.5120%	1.6770%	96	SAG
206+03.20	2,794.63		1.6770%	1.3546%		
209+78.40	2,799.71		1.3546%	0.9354%		
211+28.35	2,801.12	69	0.9354%	0.1151%	84	CREST
213+20.64	2,801.34		0.1151%	0.2438%		
217+11.93	2,802.29	91	0.2438%	1.1817%	97	SAG
218+81.17	2,804.29	248	1.1817%	-1.7658%	84	CREST
221+71.23	2,799.17	94	-1.7658%	-0.7967%	97	SAG
225+60.71	2,796.07	213	-0.7967%	0.9847%	120	SAG
228+08.96	2,798.51	283	0.9847%	-1.8537%	100	CREST
230+41.19	2,794.21	145	-1.8537%	-0.3446%	96	SAG
232+33.17	2,793.55	65	-0.3446%	0.3269%	97	SAG
234+83.88	2,794.37	113	0.3269%	1.5006%	96	SAG
238+14.60	2,799.33	159	1.5006%	-0.3907%	84	CREST
241+47.65	2,798.03	163	-0.3907%	1.3040%	96	SAG
245+56.53	2,803.36	245	1.3040%	-0.8308%	115	CREST
248+16.00	2,801.20	274	-0.8308%	2.0159%	96	SAG
250+49.71	2,805.91	193	2.0159%	-0.2825%	84	CREST
252+09.94	2,805.46	76	-0.2825%	0.5092%	96	SAG
254+50.38	2,806.69		0.5092%	0.0676%		
255+37.82	2,806.75	83	0.0676%	0.9288%	96	SAG

PI	ELEV	L	G1%	G2%	K	CREST OR SAG
256+49.02	2,807.78	102	0.9288%	-0.0892%	100	CREST
259+73.07	2,807.49	114	-0.0892%	0.4790%	201	SAG
261+11.91	2,808.15	62	0.4790%	-0.1454%	100	CREST
264+09.39	2,807.72	65	-0.1454%	-0.9135%	85	CREST
267+31.49	2,804.78	263	-0.9135%	0.5483%	180	SAG
269+91.21	2,806.20	200	0.5483%	-0.5312%	185	CREST
275+00.00	2,803.50	300	-0.5312%	0.3452%	342	SAG
281+20.00	2,805.64	350	0.3452%	-1.7543%	167	CREST
284+70.00	2,799.50	350	-1.7543%	0.2402%	175	SAG
288+95.39	2,800.52		0.2400%	0.6273%		
291+81.90	2,802.32	200	0.6273%	-1.0486%	119	CREST
295+56.51	2,798.39	274	-1.0486%	0.5189%	175	SAG
298+06.60	2,799.69	120	0.5189%	-0.0393%	215	CREST
301+39.50	2,799.56		-0.0393%	0.3368%		
302+86.88	2,800.05	50	0.3368%	-0.2559%	84	CREST
304+65.39	2,799.60		-0.2559%	0.0336%		
309+78.43	2,799.77		0.0336%	-0.3360%		
312+68.39	2,798.80		-0.3360%	-0.1615%		
317+59.11	2,798.00		-0.1615%	-0.5553%		
322+39.09	2,795.34		-0.5553%	-0.8015%		
326+83.65	2,791.77	358	-0.8015%	-1.5175%	500	CREST
329+08.45	2,788.36		-1.5175%	-1.7166%		
330+41.05	2,786.09		-1.7166%	-1.3009%		
332+07.00	2,783.93		-1.3009%	-1.4856%		
336+80.00	2,776.90	500	-1.4856%	2.4490%	127	SAG
341+21.00	2,787.70	382	2.4490%	-0.1567%	147	CREST
347+48.62	2,786.72		-0.1567%	0.2750%		
351+00.00	2,787.68	200	0.2750%	0.5200%	816	SAG
359+11.00	2,791.90	200	0.5200%	-0.6883%	166	CREST
369+57.28	2784.70	384	-0.6883%	0.4335%	342	SAG
377+36.00	2788.07		0.4335%	0.2141%		
379+32.00	2788.49		0.2141%	0.8003%		
381+10.00	2789.92	100	0.8003%	0.4966%	329	CREST
383+62.00	2791.17	100	0.4966%	1.2306%	136	SAG
384+62.00	2792.40	100	1.2306%	0.3623%	115	CREST
386+00.00	2792.90		0.3623%	0.4051%		
388+45.00	2793.89		0.4051%	0.6785%		
390+20.00	2795.08	129	0.6785%	-0.0368%	180	CREST
392+36.00	2795.00	60	-0.0368%	0.3211%	168	SAG
393+07.00	2795.23	82	0.3211%	-0.4830%	102	CREST
393+75.00	2794.90	53	-0.4830%	0.3491%	64	SAG
394+23.46	2795.07		0.3491%			

SAFETY APPURTENANCES

1. THIS PROJECT MEETS THE BASIC SAFETY REQUIREMENTS OF THE 3R DESIGN CRITERIA. SIGNING AND PAVEMENT MARKINGS MEET CURRENT STANDARDS.
2. GUARD FENCE (INCLUDING CONNECTION TO STRUCTURES, POST SPACING AND END TREATMENTS), SIGNING, AND PAVEMENT MARKINGS MEET CURRENT STANDARDS. CROSS DRAINAGE CULVERTS, PARALLEL CULVERTS, LUMENAIRE SUPPORTS, AND SIGN SUPPORTS WITHIN THE REQUIRED CLEAR ZONE OF 30 FEET HAVE BEEN SAFETY TREATED OR ARE BEING UPGRADED TO STANDARDS.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
VERTICAL ALIGNMENT DATA SHEET

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		58
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

10:08:08 AM
7/17/2023
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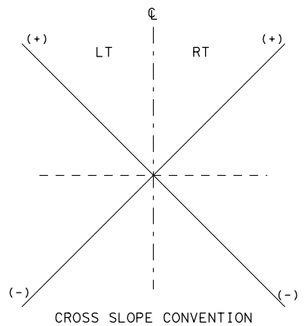
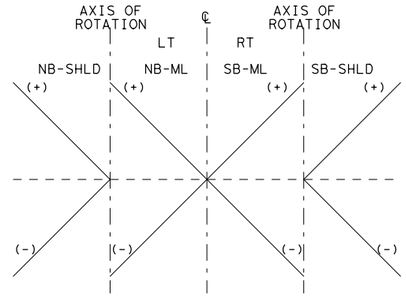
STATION	LT CROSS SLOPE	RT CROSS SLOPE	COMMENTS
100+00	-2.00%	-2.00%	NORMAL CROWN
195+98	-2.00%	-2.00%	END NORMAL CROWN BEGIN X-SLOPE TRANSITION
196+98	-2.00%	2.00%	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
198+98	-2.00%	2.00%	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
199+98	-2.00%	-2.00%	END X-SLOPE TRANSITION BEGIN NORMAL CROWN
200+48	-2.00%	-2.00%	END NORMAL CROWN BEGIN X-SLOPE TRANSITION
202+41	6.00%	-6.00%	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
204+56	6.00%	-6.00%	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
206+49	-2.00%	-2.00%	END X-SLOPE TRANSITION BEGIN NORMAL CROWN
225+73	-2.00%	-2.00%	END NORMAL CROWN BEGIN X-SLOPE TRANSITION
228+94	-6.00%	6.00%	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
234+70	-6.00%	6.00%	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
237+90	-2.00%	-2.00%	END X-SLOPE TRANSITION BEGIN NORMAL CROWN
240+75	-2.00%	-2.00%	END NORMAL CROWN BEGIN X-SLOPE TRANSITION
242+52	5.40%	-5.40%	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
247+52	5.40%	-5.40%	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
249+87	-4.40%	4.40%	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
253+78	-4.40%	4.40%	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
255+32	-2.00%	-2.00%	END X-SLOPE TRANSITION BEGIN NORMAL CROWN



CROSS SLOPE CONVENTION

	STATION	NB-SHLD	NB-ML	SB-ML	SB-SHLD	ML-COMMENTS	SHLD-COMMENTS
CURVE FM1232_5	305+81	-2.00%	-2.00%	-2.00%	-2.00%	END NORMAL CROWN BEGIN X-SLOPE TRANSITION	END NORMAL CROWN BEGIN X-SLOPE TRANSITION
	308+41	-4.50%	-4.50%	4.50%	4.50%	END X-SLOPE TRANSITION BEGIN SUPERELEVATION	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
	312+60	-4.50%	-	-	4.50%	-	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
	313+50	-2.00%	-	-	2.00%	-	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
	317+50	-2.00%	-	-	2.00%	-	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
	318+40	-4.50%	-	-	4.50%	-	END X-SLOPE TRANSITION BEGIN SUPERELEVATION
	321+98	-4.50%	-4.50%	4.50%	4.50%	END SUPERELEVATION BEGIN X-SLOPE TRANSITION	END SUPERELEVATION BEGIN X-SLOPE TRANSITION
	324+58	-2.00%	-2.00%	-2.00%	-2.00%	END X-SLOPE TRANSITION BEGIN NORMAL CROWN	END X-SLOPE TRANSITION BEGIN NORMAL CROWN
	394+23	-2.00%	-2.00%	-2.00%	-2.00%	NORMAL CROWN	NORMAL CROWN

1.) REFER TO PLAN AND PROFILE SHEETS FOR AXIS OF ROTATION LOCATIONS.



CROSS SLOPE CONVENTION

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L. NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR. STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
TABLE OF CROSS SLOPES

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	59
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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7/17/2023
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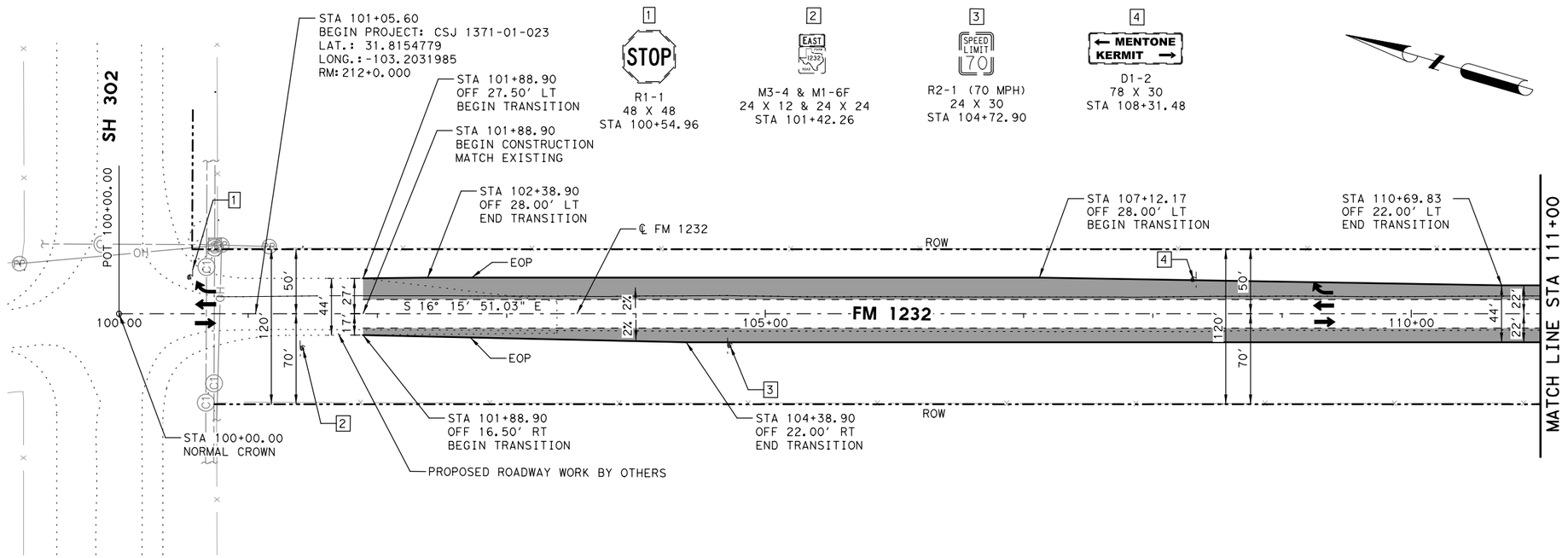


0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

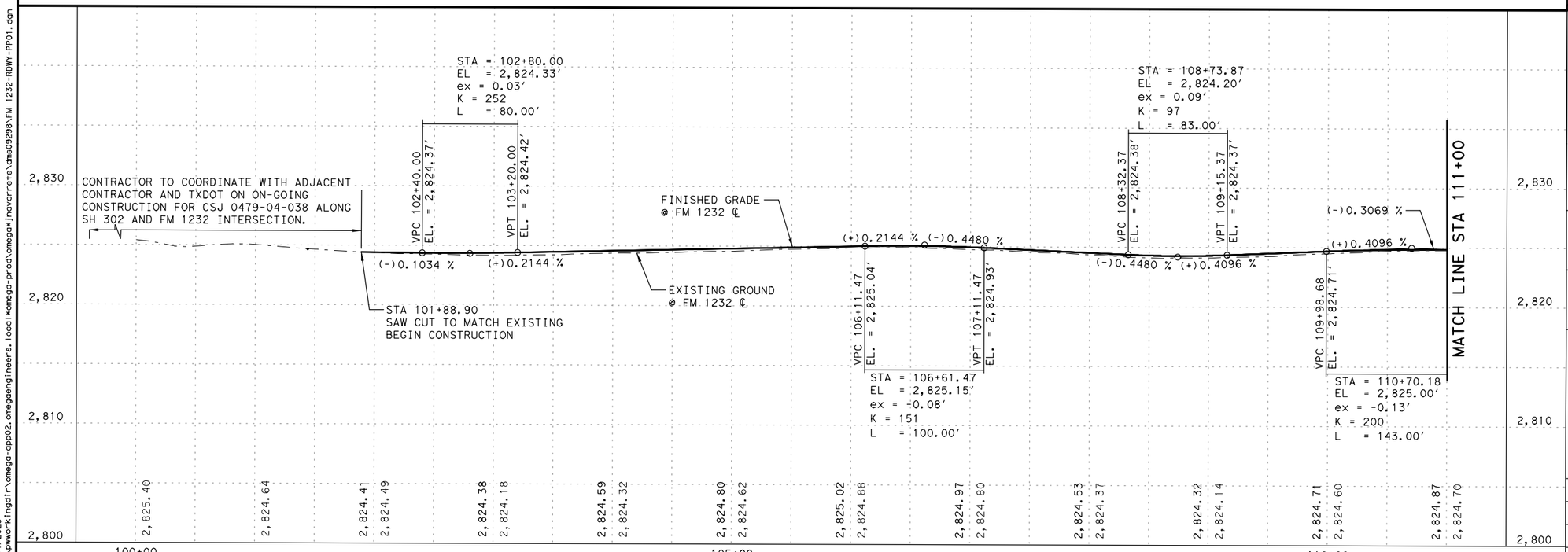
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

100+00	101+00	102+00	103+00	104+00	105+00	106+00	107+00	108+00	109+00	110+00	SHEET TOTAL
			19	20	19	35	51	43	34	26	247
			12	20	21	7	2	3	6	14	85

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
BEGIN PROJECT TO STA 111+00

SHEET 1 OF 27

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		60
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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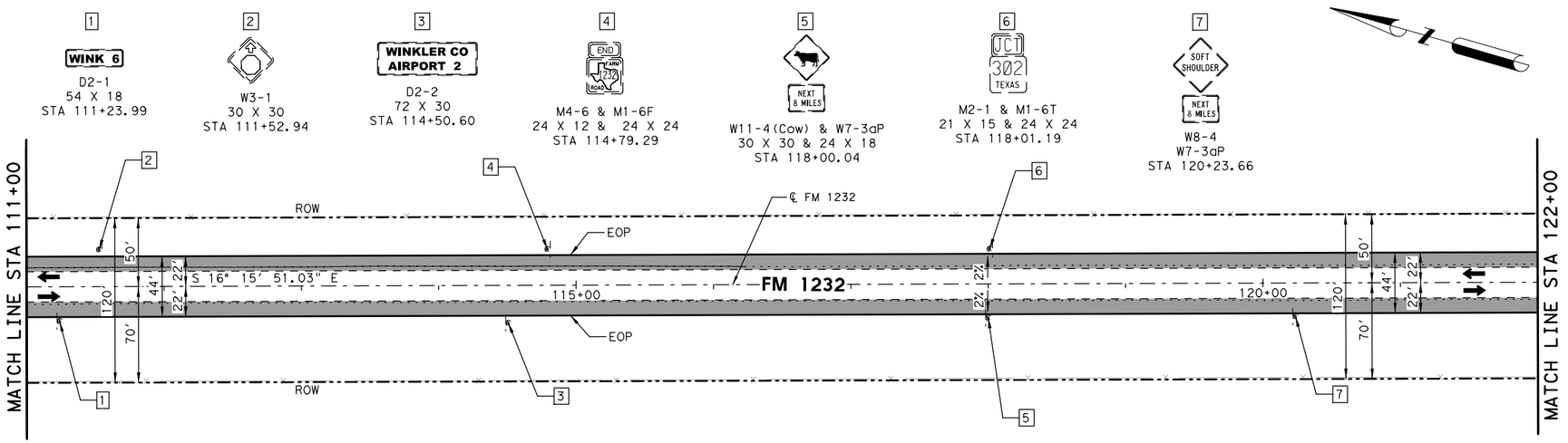


111+00	112+00	113+00	114+00	115+00	116+00	117+00	118+00	119+00	120+00	121+00	SHEET TOTAL
36	51	38	33	35	36	40	31	25	26	30	381
10	2	5	5	5	6	3	6	9	12	12	75

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

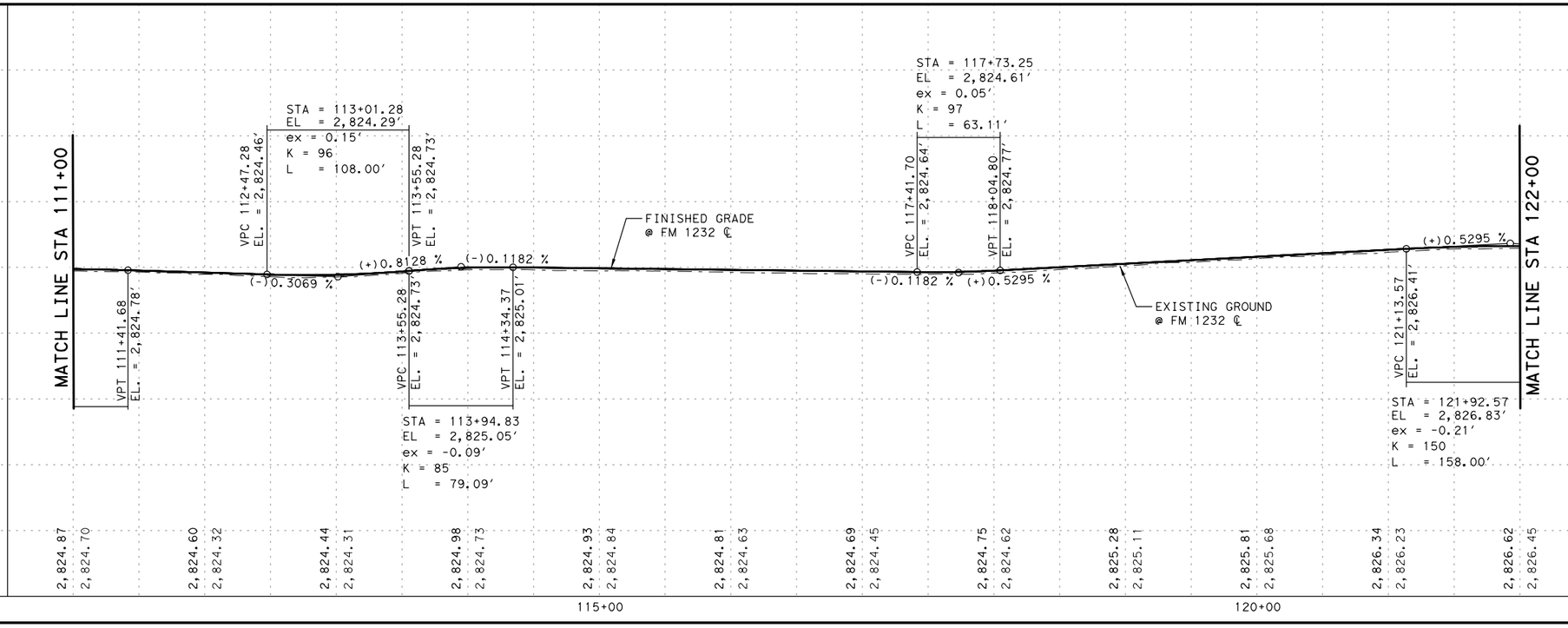
0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.



JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
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TX PE Firm Reg. No. F-2147
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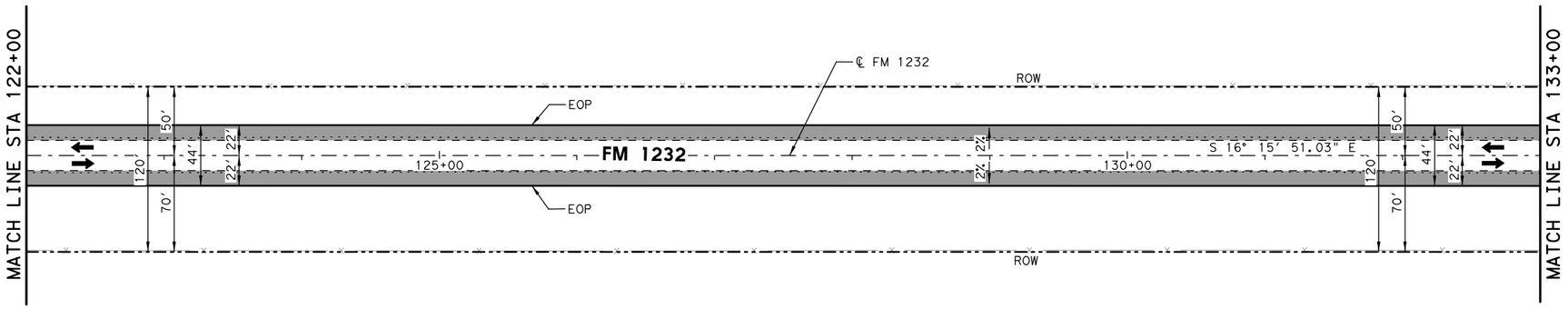
FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
111+00 TO STA 122+00

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	61
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232



0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

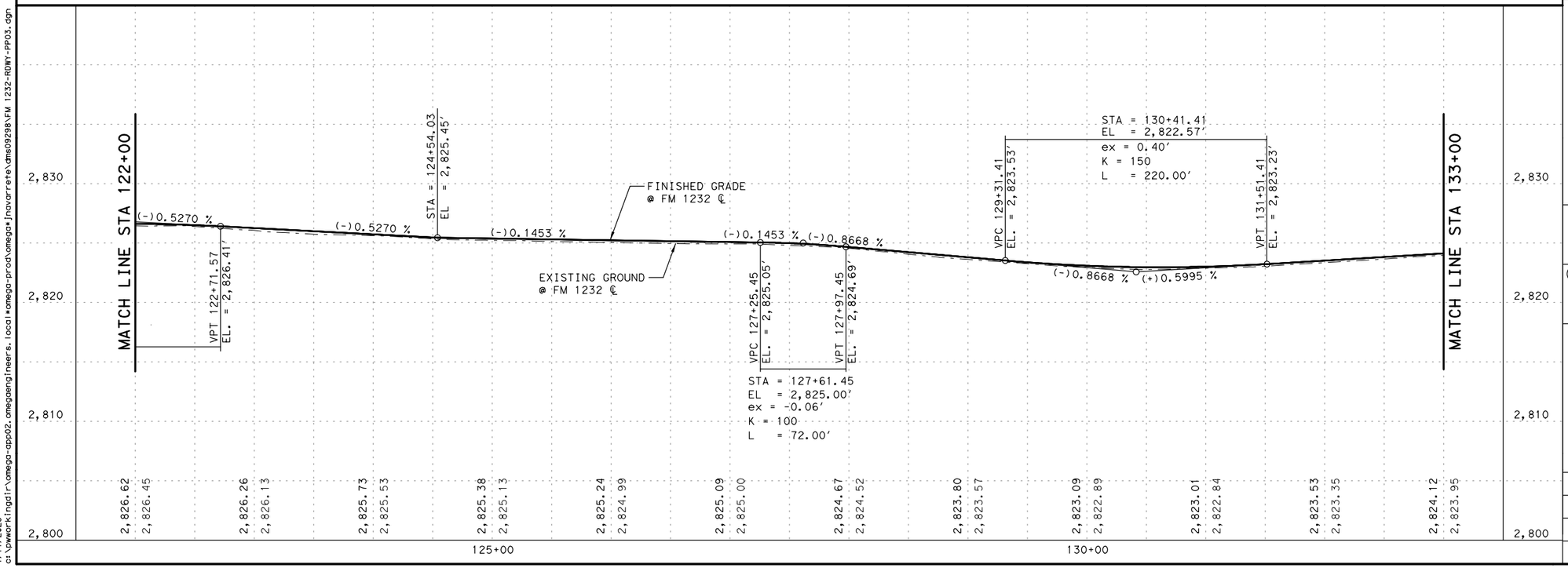
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

122+00	123+00	124+00	125+00	126+00	127+00	128+00	129+00	130+00	131+00	132+00	SHEET TOTAL
40	44	51	51	39	34	54	54	29	28	34	458
6	4	3	4	5	15	15	5	16	19	7	99

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
146579
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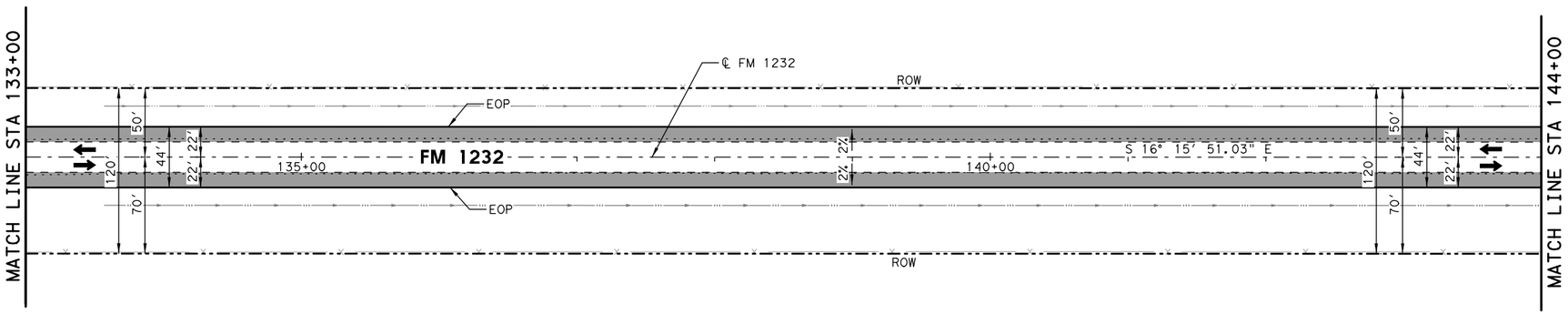
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 122+00 TO STA 133+00

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	62
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232



0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

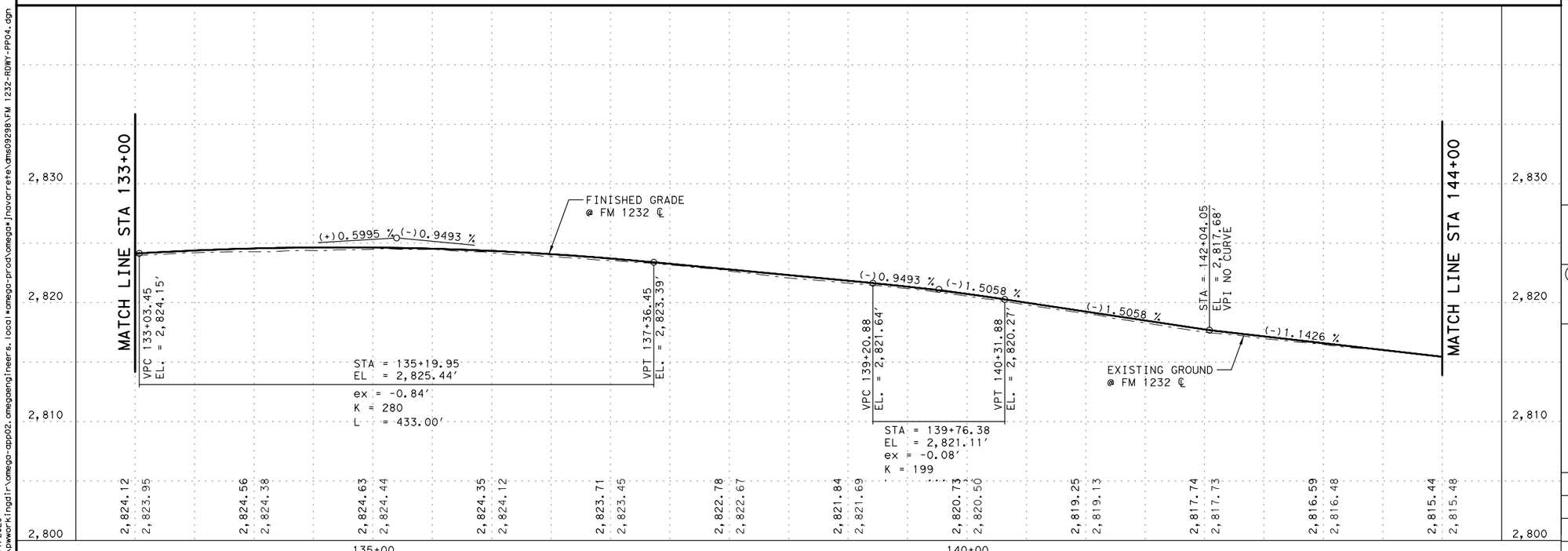
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

133+00	134+00	135+00	136+00	137+00	138+00	139+00	140+00	141+00	142+00	143+00	SHEET TOTAL
46	79	154	224	249	312	328	278	244	186	273	2,373
3	10	12	3	2	0	0	2	4	9	7	52

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
146579
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PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 133+00 TO STA 144+00

SHEET 4 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	63
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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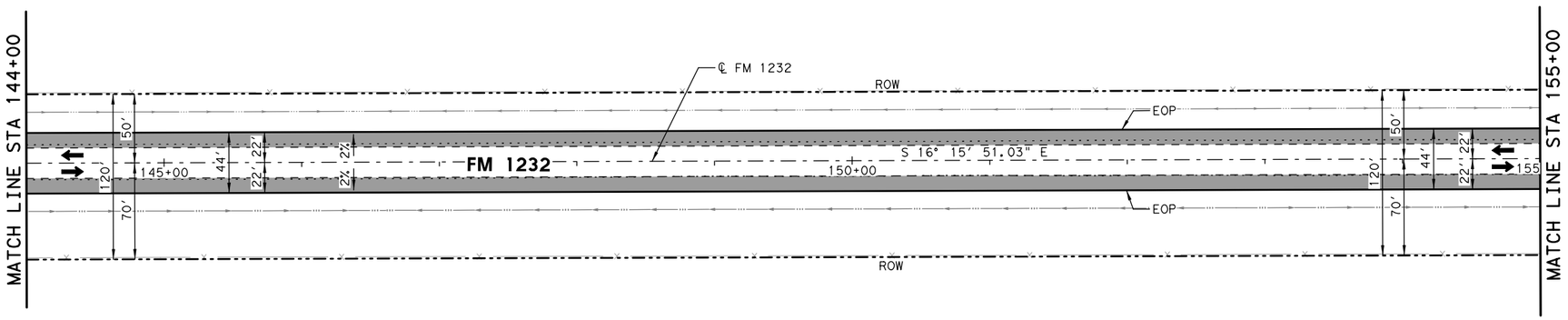


0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

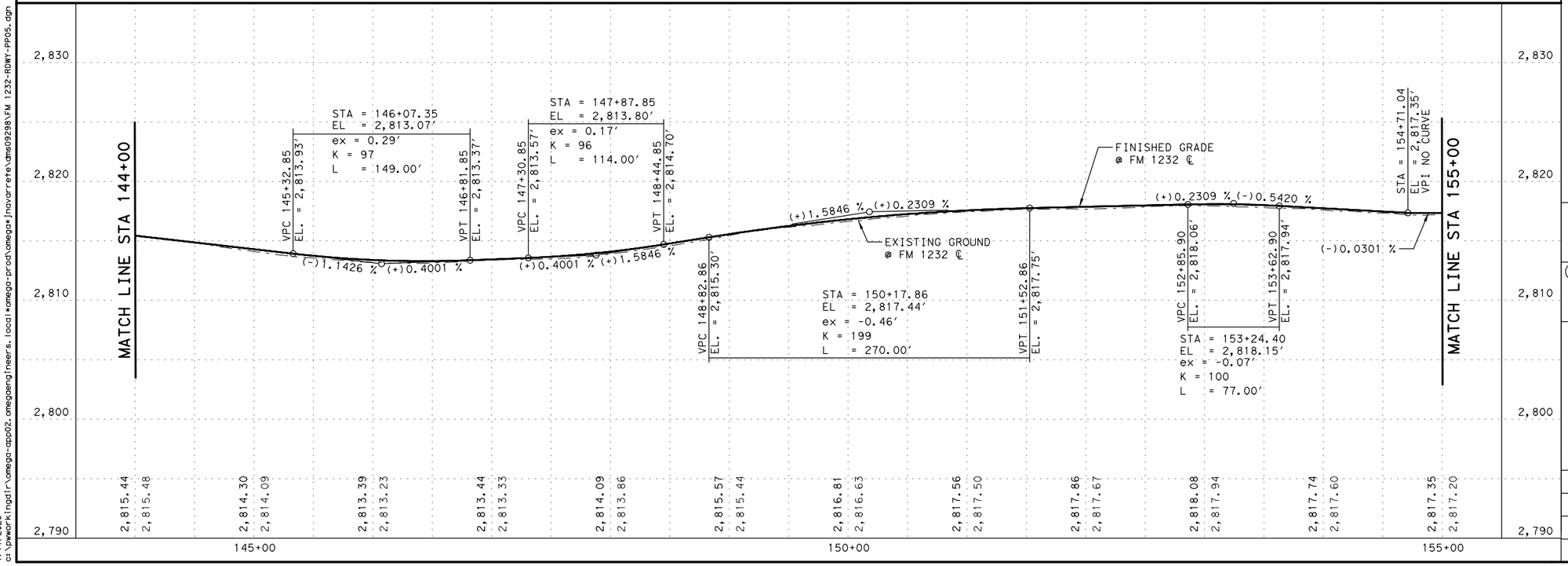
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

144+00	145+00	146+00	147+00	148+00	149+00	150+00	151+00	152+00	153+00	154+00	SHEET TOTAL
305	160	103	102	78	113	263	352	253	117	107	1,953
3	13	23	24	34	26	5	0	6	24	24	182

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 144+00 TO STA 155+00

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	64
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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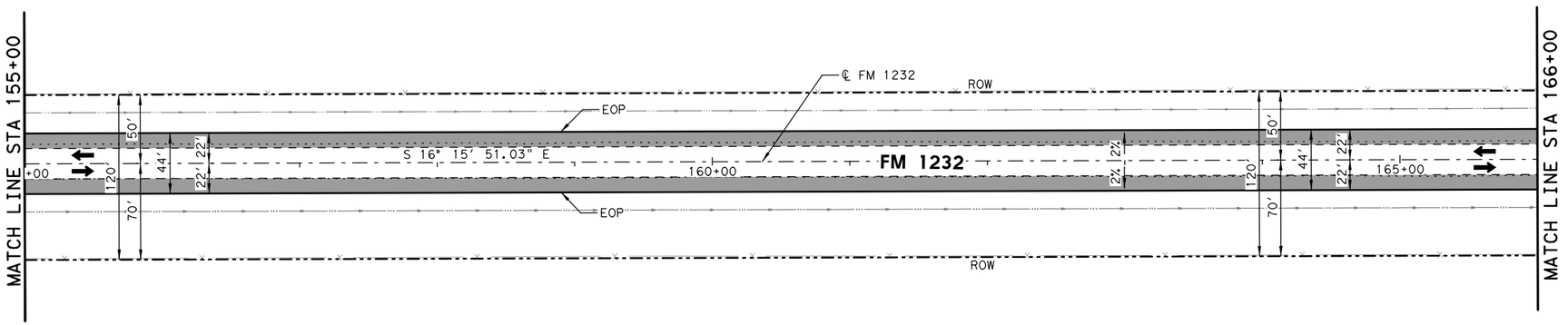

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

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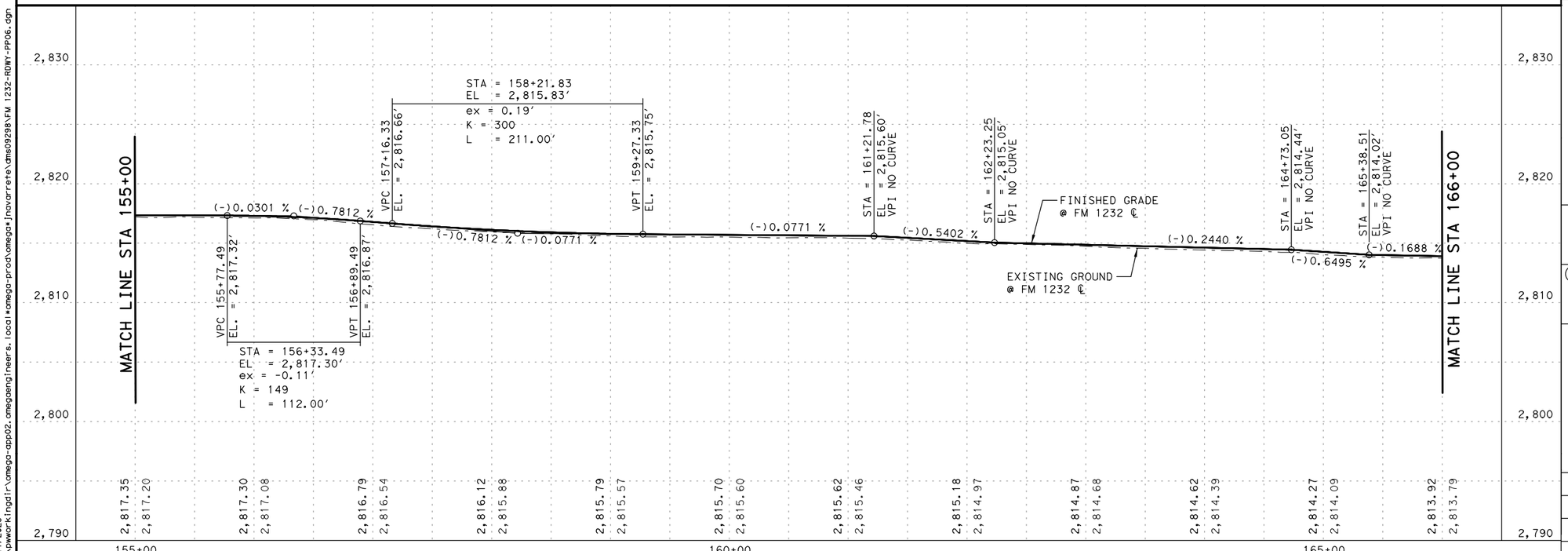
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

155+00	156+00	157+00	158+00	159+00	160+00	161+00	162+00	163+00	164+00	165+00	SHEET TOTAL
157	182	159	125	132	154	169	173	186	181	162	1,780
9	7	10	11	8	7	8	9	4	4	9	86

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



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6090 SURETY DR, STE #104
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OMEGAENGINEERS.COM
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Texas Department of Transportation®

FM 1232

SH 302 TO SH 115

ROADWAY

PLAN & PROFILE

STA 155+00 TO STA 166+00

SHEET 6 OF 27

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	65
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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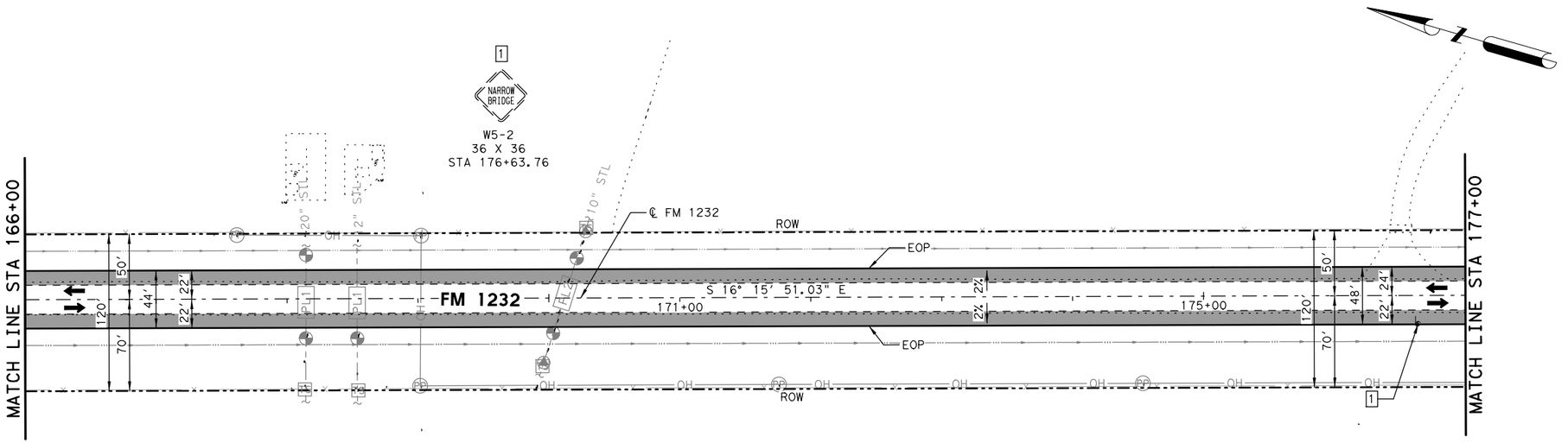


0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

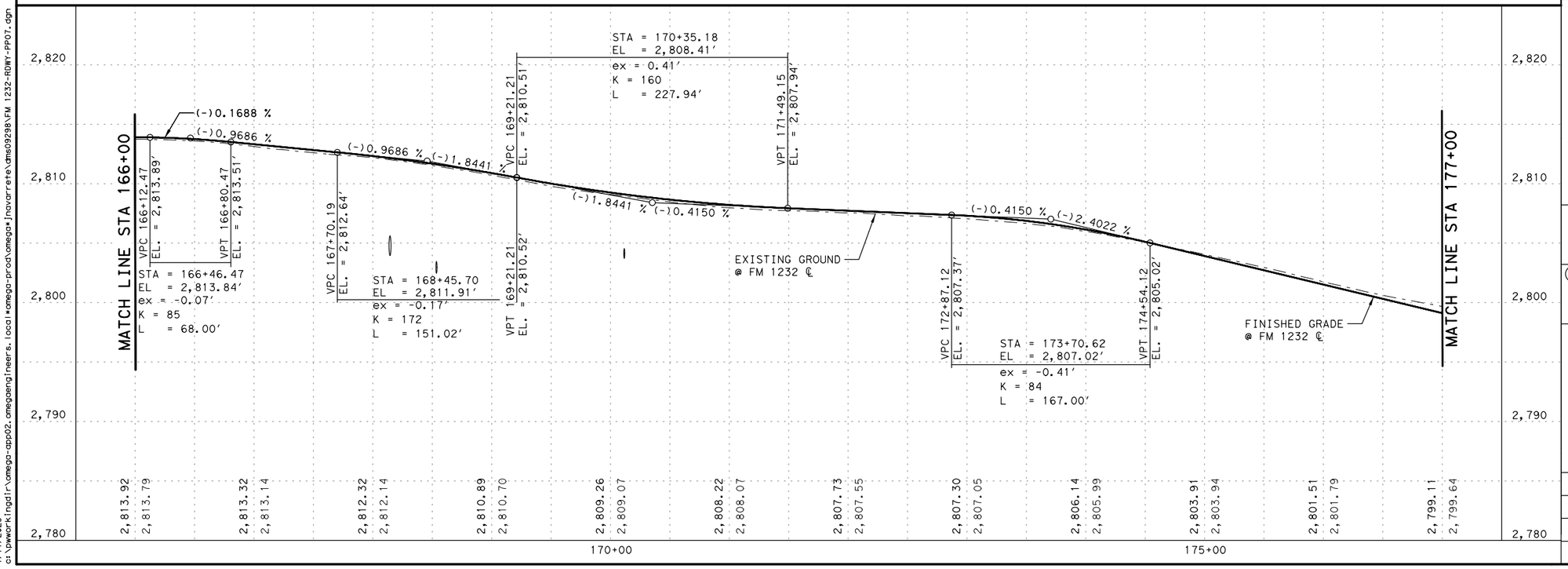
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

166+00	167+00	168+00	169+00	170+00	171+00	172+00	173+00	174+00	175+00	176+00	SHEET TOTAL
180	183	142	123	127	106	97	126	218	247	207	1,756
7	4	5	11	14	20	20	11	6	2	16	116

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 166+00 TO STA 177+00

SHEET 7 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	66
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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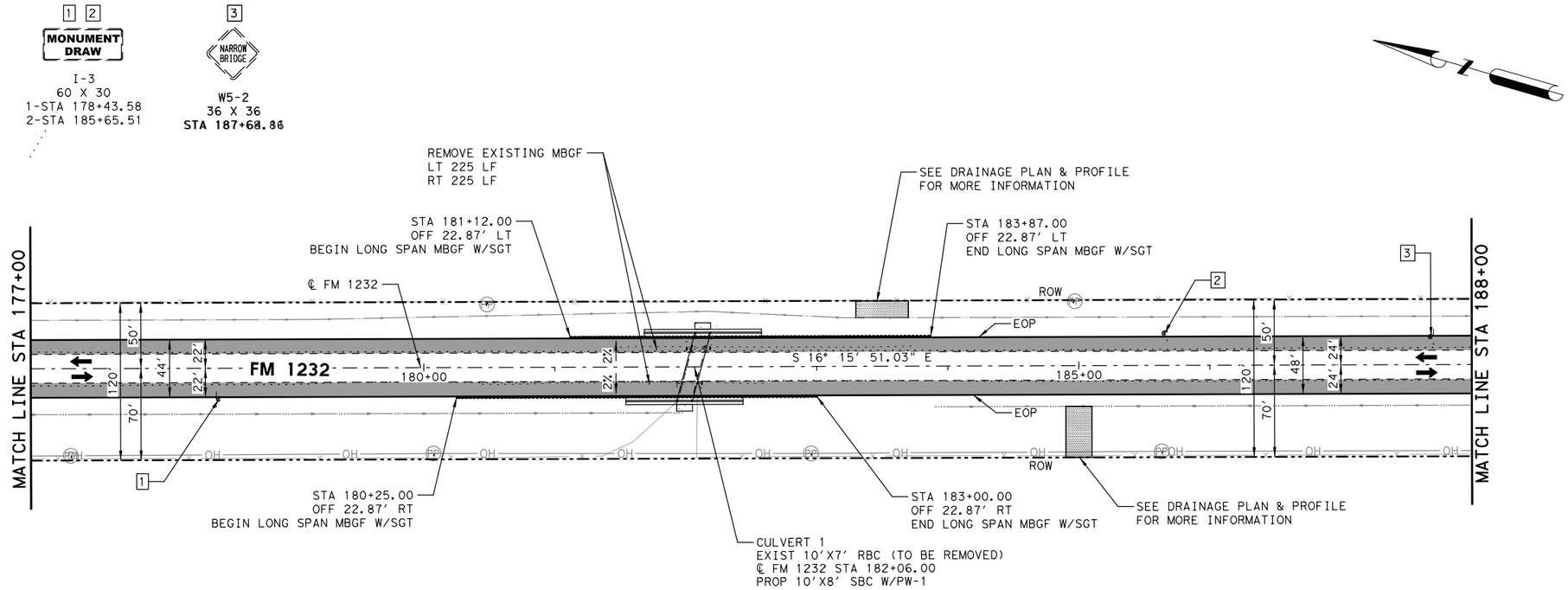
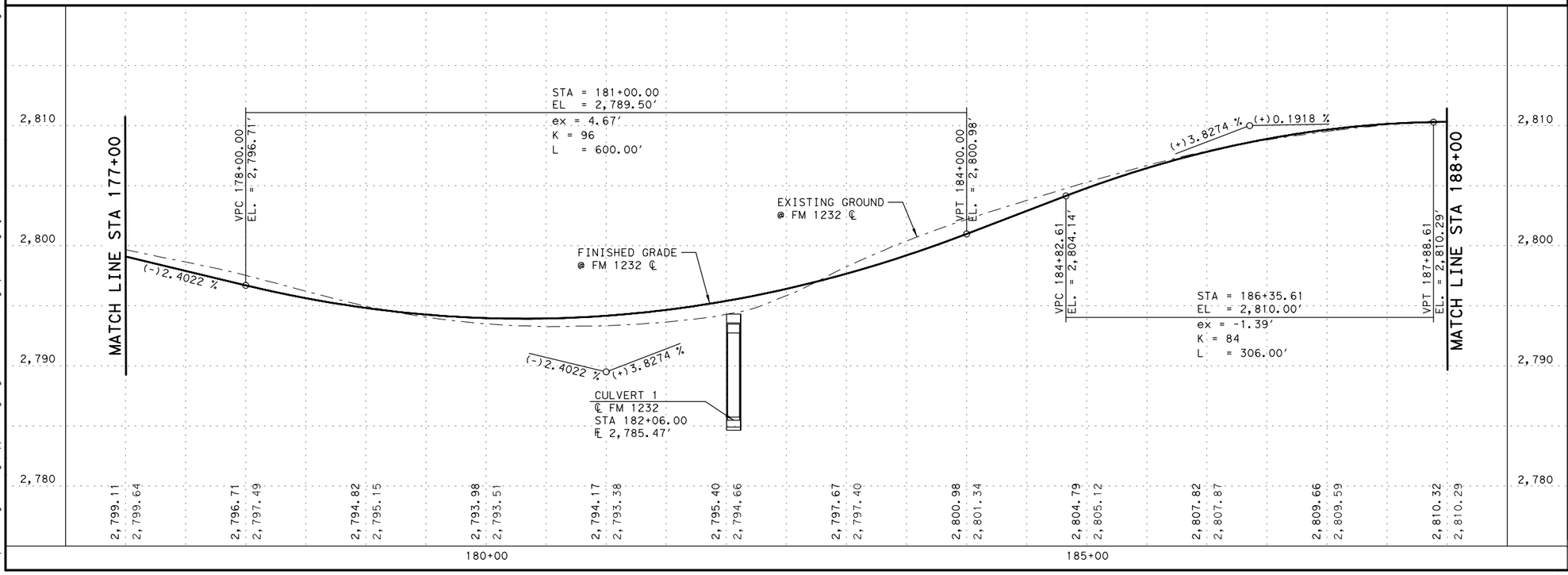


177+00	178+00	179+00	180+00	181+00	182+00	183+00	184+00	185+00	186+00	187+00	SHEET TOTAL
274	402	290	60	5	1	288	622	524	399	323	3,188
16	2	52	354	621	657	342	4	0	0	3	2,051



0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

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2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

STATE OF TEXAS
JORGE L NAVARRETE
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7/17/2023

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TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 177+00 TO STA 188+00

SHEET 8 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	67
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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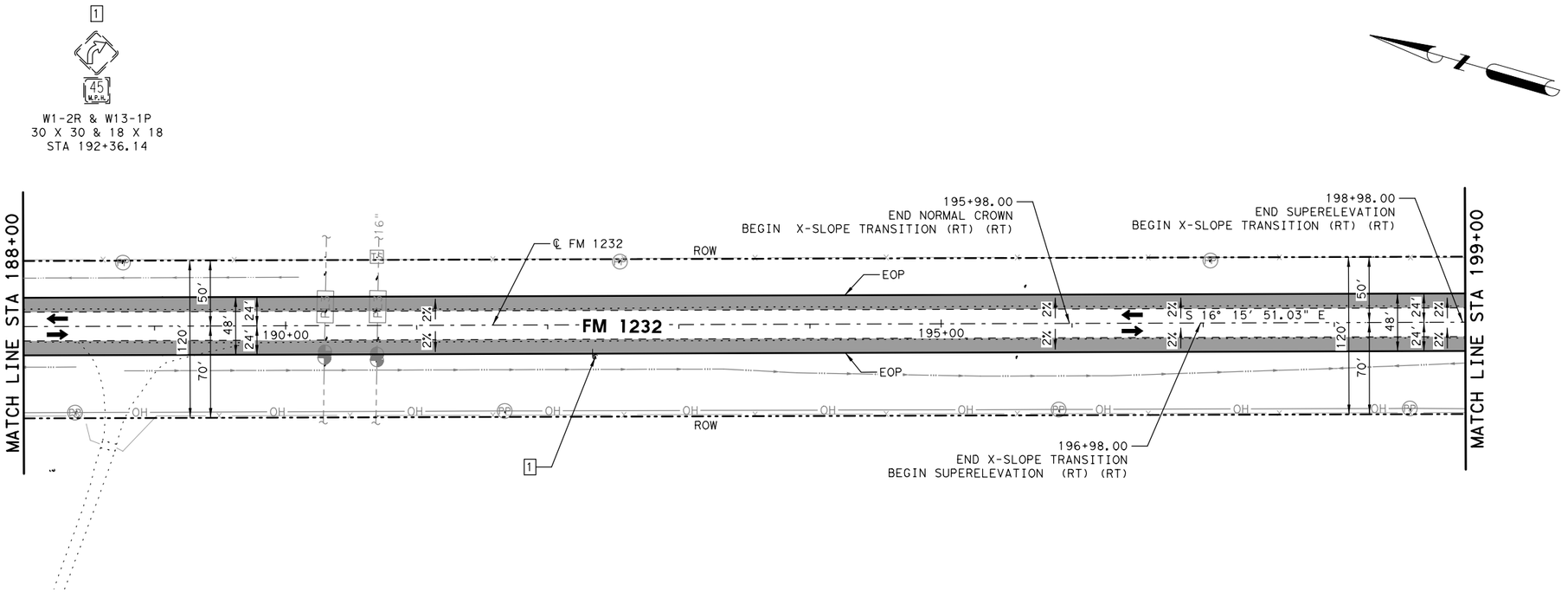


LEGEND

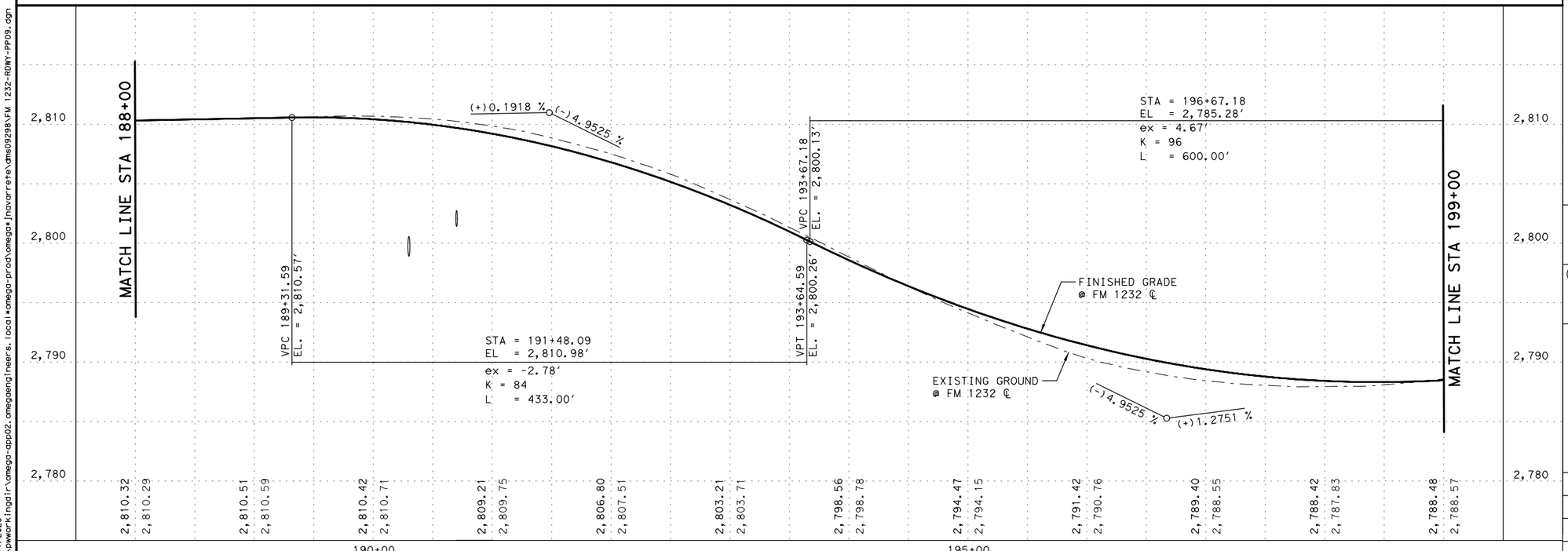
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

188+00	189+00	190+00	191+00	192+00	193+00	194+00	195+00	196+00	197+00	198+00	SHEET TOTAL
214	279	364	435	506	520	329	106	97	91	116	3,057
8	9	10	7	0	0	60	196	258	251	172	971

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 188+00 TO STA 199+00

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	68
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

7/17/2023
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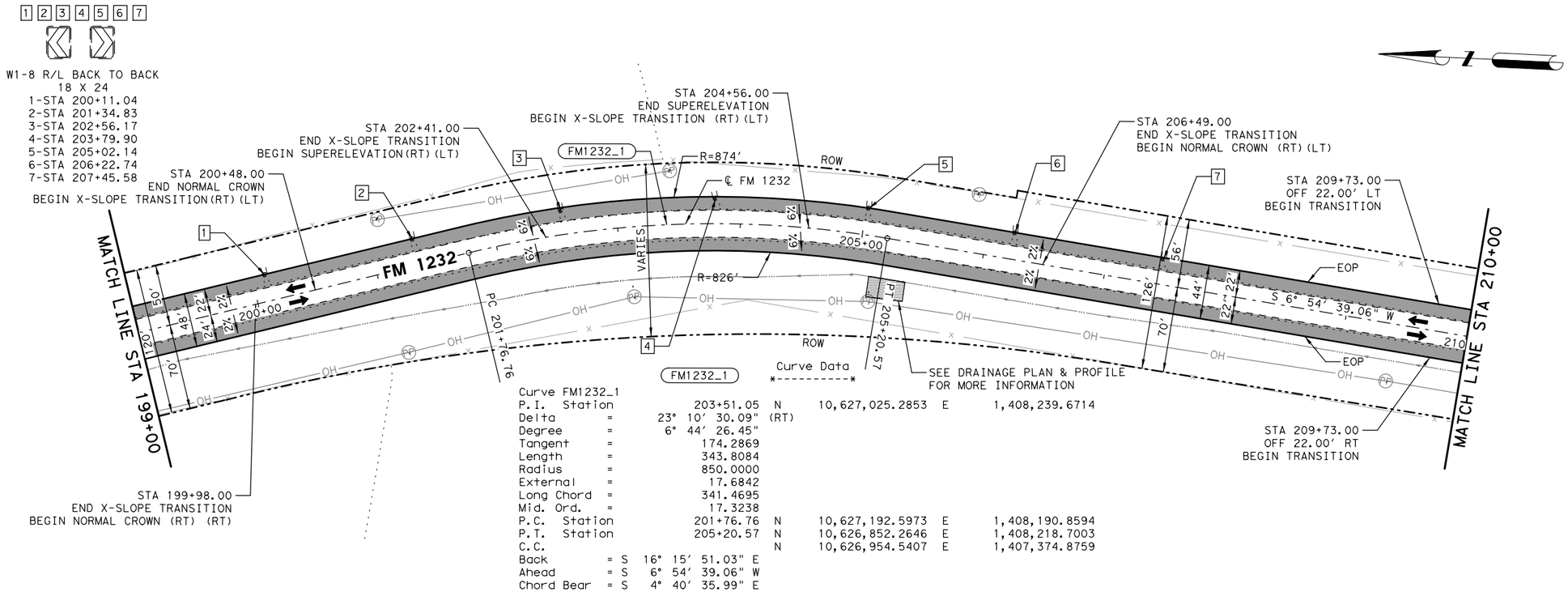

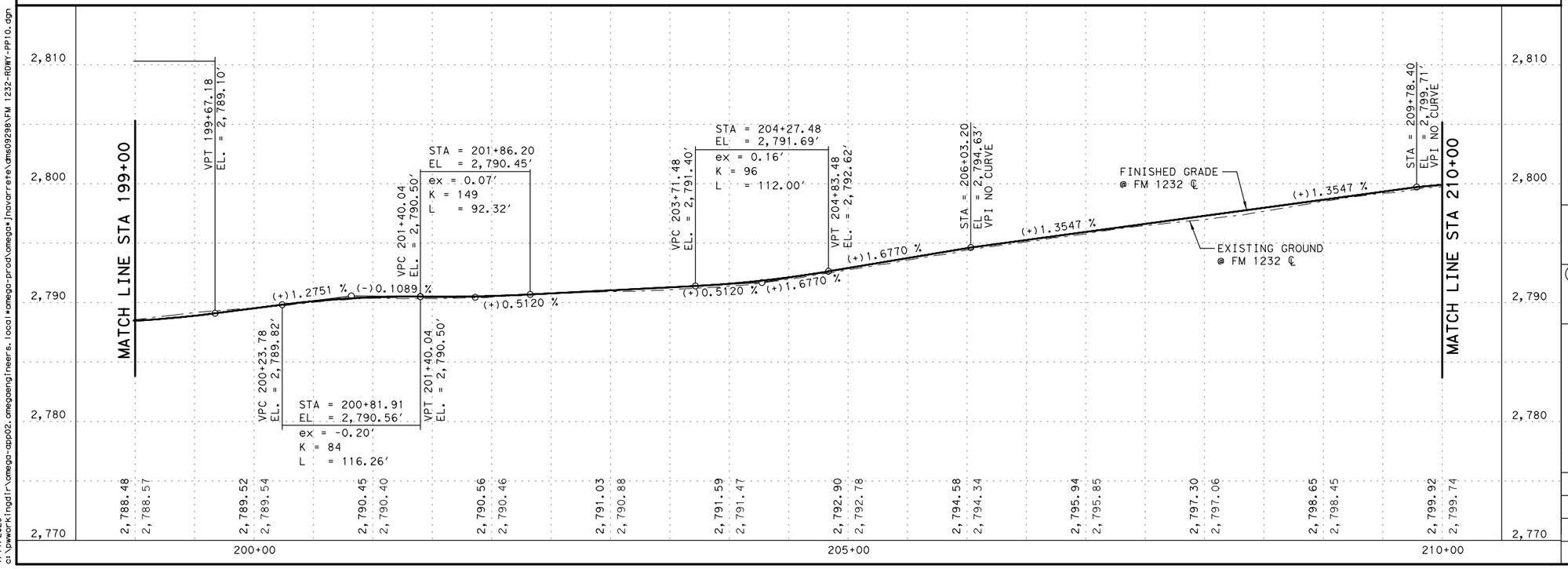

199+00	200+00	201+00	202+00	203+00	204+00	205+00	206+00	207+00	208+00	209+00	SHEET TOTAL
155	168	156	156	122	103	175	381	554	374	224	2,568
78	42	18	54	152	205	176	130	61	75	93	1,084

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 199+00 TO STA 210+00

SHEET 10 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	69
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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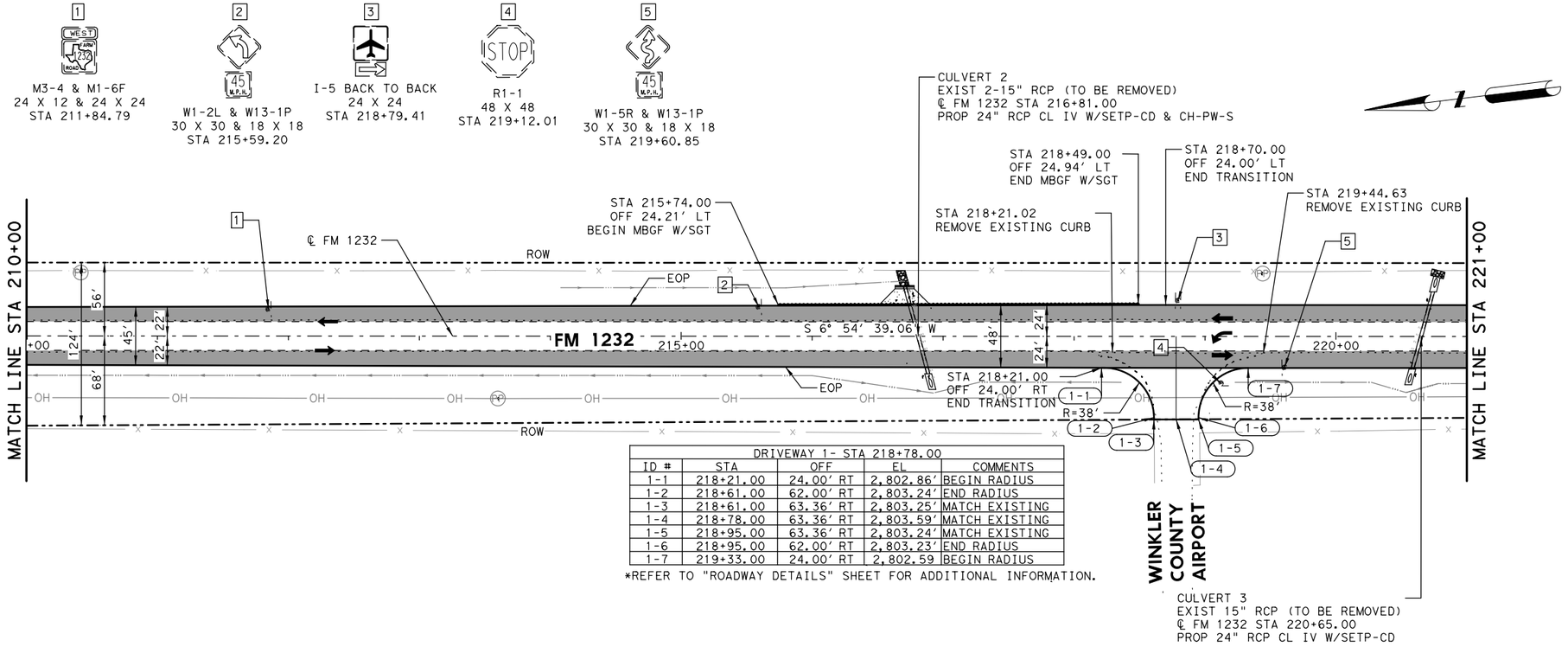
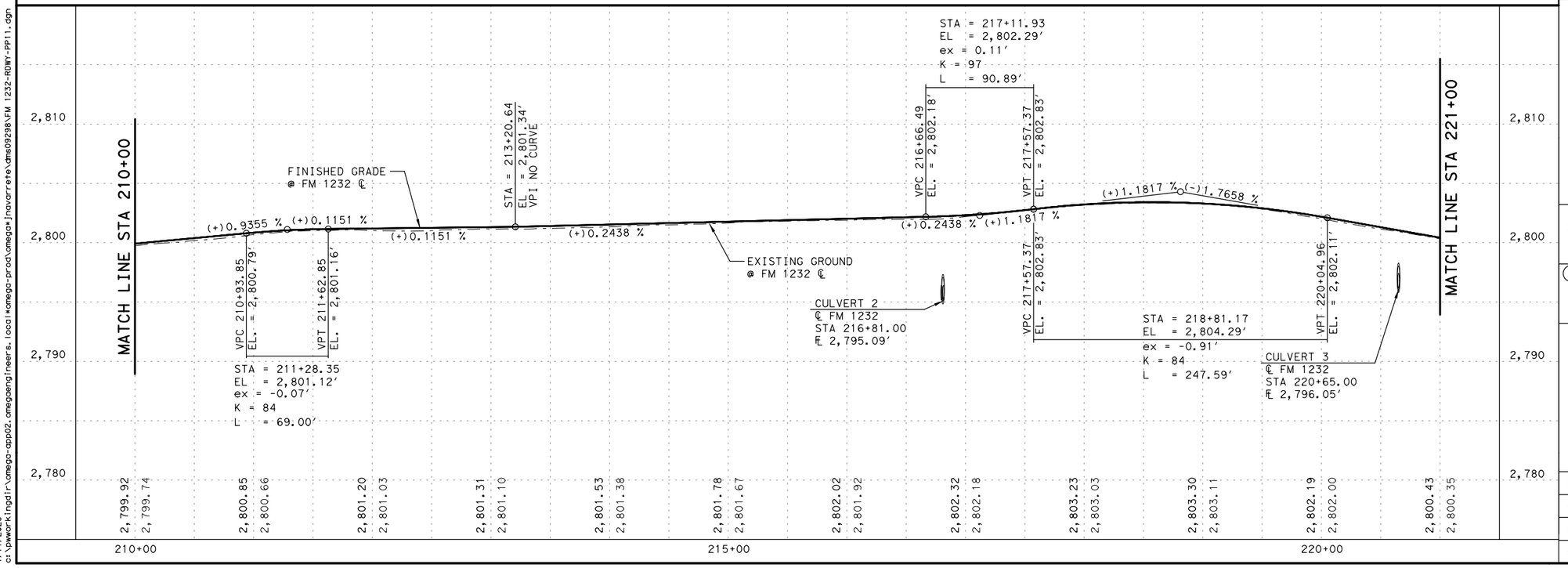


DRIVEWAY 1- STA 218+78.00				
ID #	STA	OFF	EL	COMMENTS
1-1	218+21.00	24.00' RT	2,802.86'	BEGIN RADIUS
1-2	218+61.00	62.00' RT	2,803.24'	END RADIUS
1-3	218+61.00	63.36' RT	2,803.25'	MATCH EXISTING
1-4	218+78.00	63.36' RT	2,803.59'	MATCH EXISTING
1-5	218+95.00	63.36' RT	2,803.24'	MATCH EXISTING
1-6	218+95.00	62.00' RT	2,803.23'	END RADIUS
1-7	219+33.00	24.00' RT	2,802.59	BEGIN RADIUS

*REFER TO "ROADWAY DETAILS" SHEET FOR ADDITIONAL INFORMATION.



210+00	211+00	212+00	213+00	214+00	215+00	216+00	217+00	218+00	219+00	220+00	SHEET TOTAL
258	307	255	157	111	230	329	164	84	141	128	2,164
39	24	33	32	20	7	19	194	183	8	20	579

0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
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DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
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OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 210+00 TO STA 221+00

SHEET 11 OF 27

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	70
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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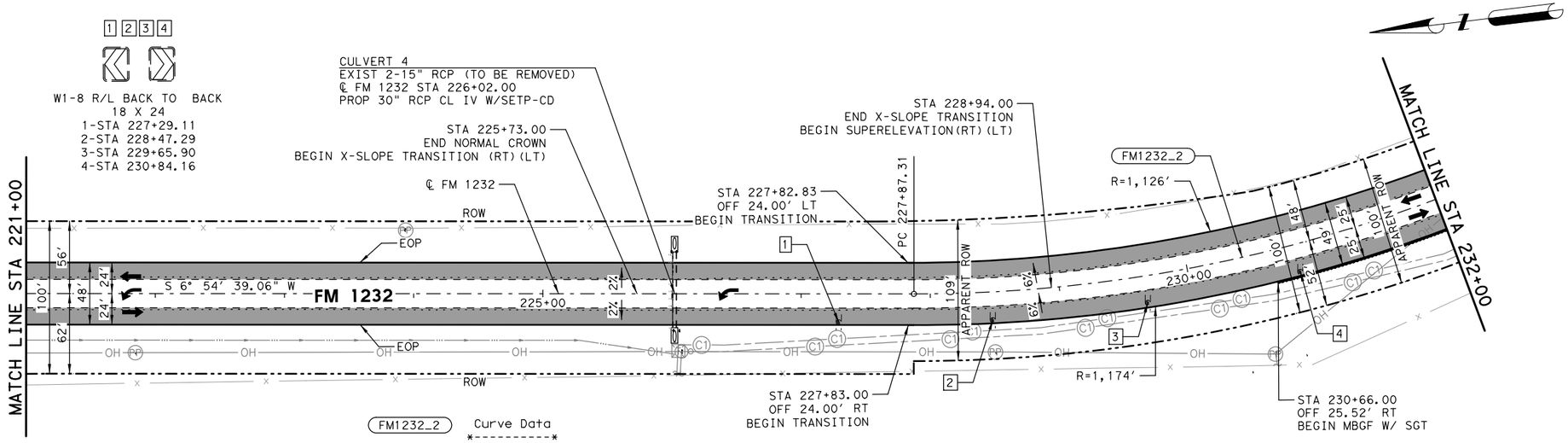
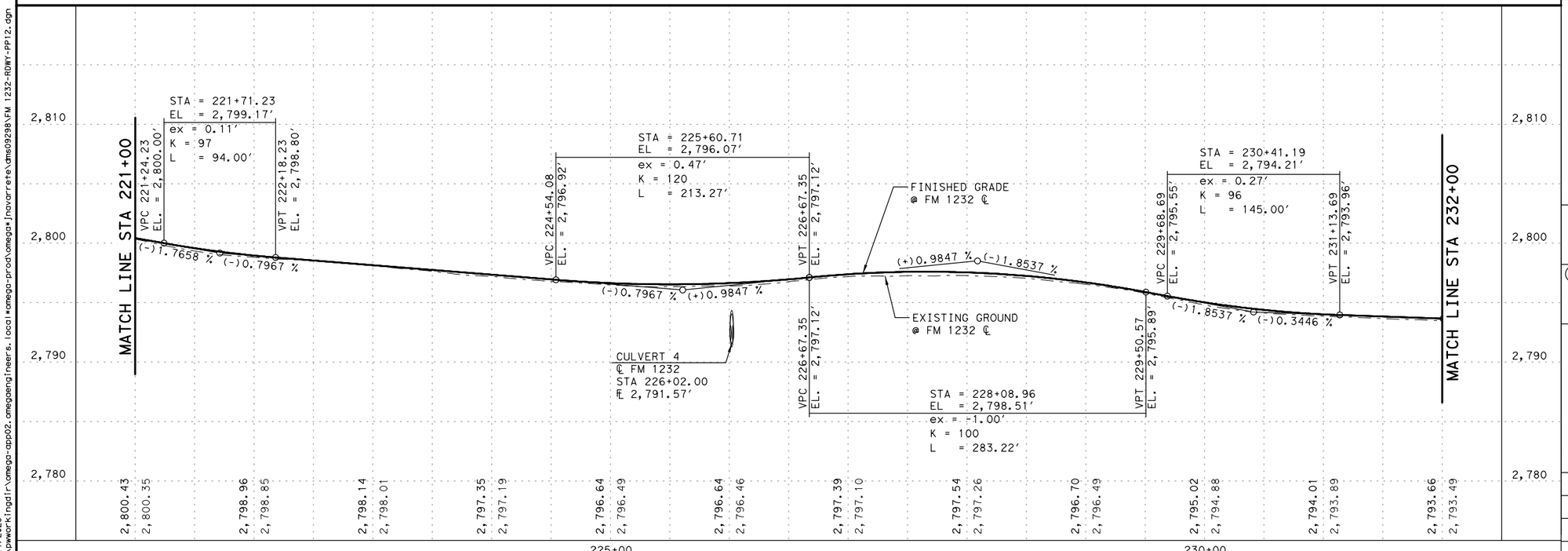


FM1232_2 Curve Data

Curve FM1232_2					
P.I. Station	231+98.55	N	10,624,193.7400	E	1,407,896.4727
Delta =	39° 21′ 15.43" (LT)				
Degree =	4° 58′ 56.07"				
Tangent =	411.2421				
Length =	789.8912				
Radius =	1,150.0000				
External =	71.3190				
Long Chord =	774.4552				
Mid. Ord. =	67.1543				
P.C. Station	227+87.31	N	10,624,601.9943	E	1,407,945.9554
P.T. Station	235+77.20	N	10,623,846.6840	E	1,408,117.0904
C.C.		N	10,624,463.6208	E	1,409,087.6001
Back =	S 6° 54′ 39.06" W				
Ahead =	S 32° 26′ 36.38" E				
Chord Bear =	S 12° 45′ 58.66" E				

221+00	222+00	223+00	224+00	225+00	226+00	227+00	228+00	229+00	230+00	231+00	SHEET TOTAL
55	89	178	202	145	55	33	41	57	50	26	931
149	163	40	13	41	357	355	56	63	208	292	1,737



0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 221+00 TO STA 232+00

SHEET 12 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	71
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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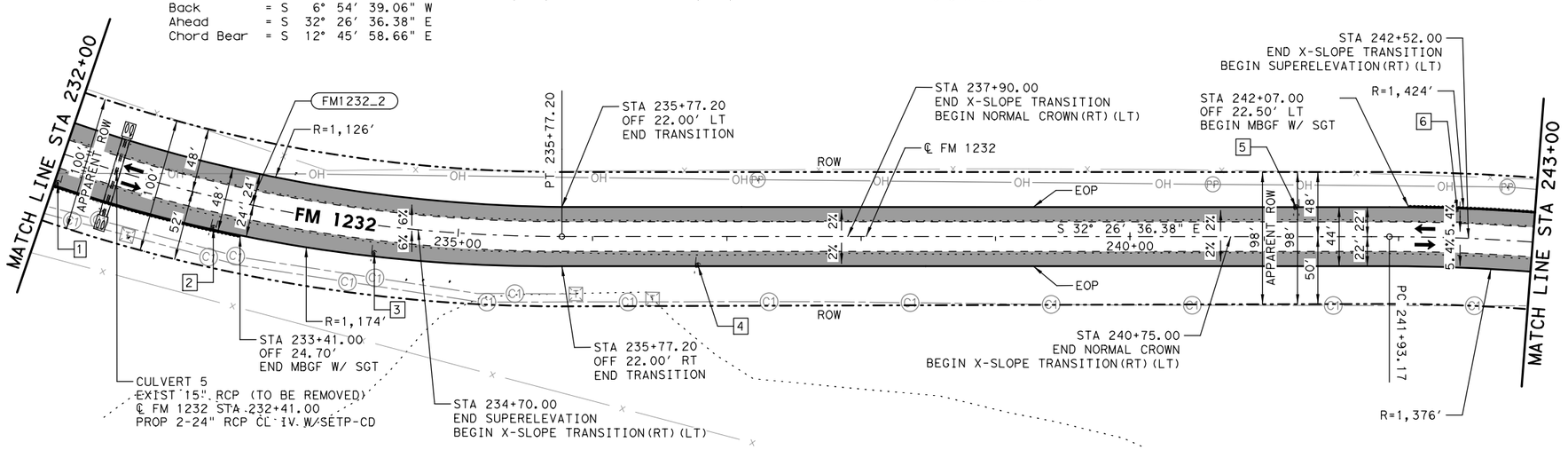
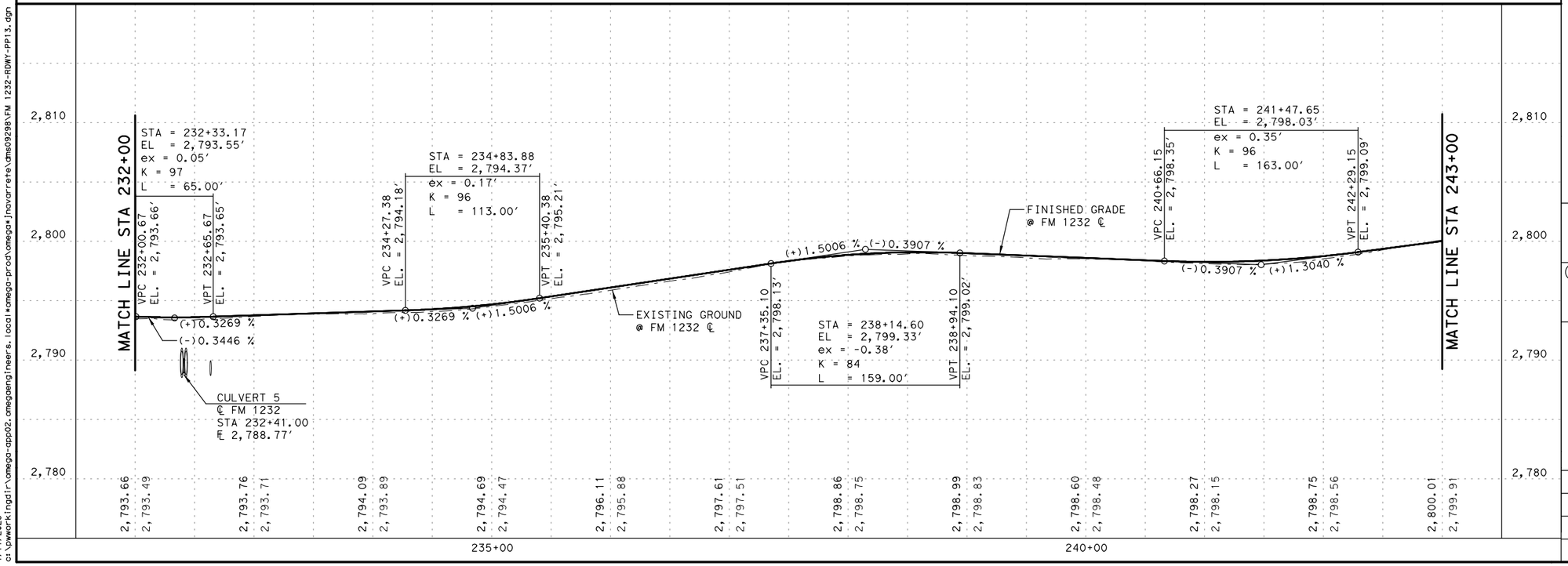
Curve Data					
		FM1232_2			
Curve FM1232_2					
P.I. Station	231+98.55	N	10,624,193.7400	E	1,407,896.4727
Delta =	39° 21′ 15.43" (LT)				
Degree =	4° 58′ 56.07"				
Tangent =	411.2421				
Length =	789.8912				
Radius =	1,150.0000				
External =	71.3190				
Long Chord =	774.4552				
Mid. Ord. =	67.1543				
P.C. Station	227+87.31	N	10,624,601.9943	E	1,407,945.9554
P.T. Station	235+77.20	N	10,623,846.6840	E	1,408,117.0904
C.C.		N	10,624,463.6208	E	1,409,087.6001
Back = S	6° 54′ 39.06" W				
Ahead = S	32° 26′ 36.38" E				
Chord Bear = S	12° 45′ 58.66" E				

1 2 3 5 6 — W1-8 R/L BACK TO BACK, 18 X 24
1-STA 232+02.39
2-STA 233+20.62
3-STA 234+39.74
5-STA 241+23.81
6-STA 242+42.97

4 — W1-8R, 18 X 24, 236+78.47



232+00	233+00	234+00	235+00	236+00	237+00	238+00	239+00	240+00	241+00	242+00	SHEET TOTAL
29	41	44	45	41	35	46	48	42	32	17	420
238	193	185	185	123	48	14	17	15	35	71	1,124



0 50 100
SCALE: 1"=100′ H
1"=10′ V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 232+00 TO STA 243+00

SHEET 13 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	72
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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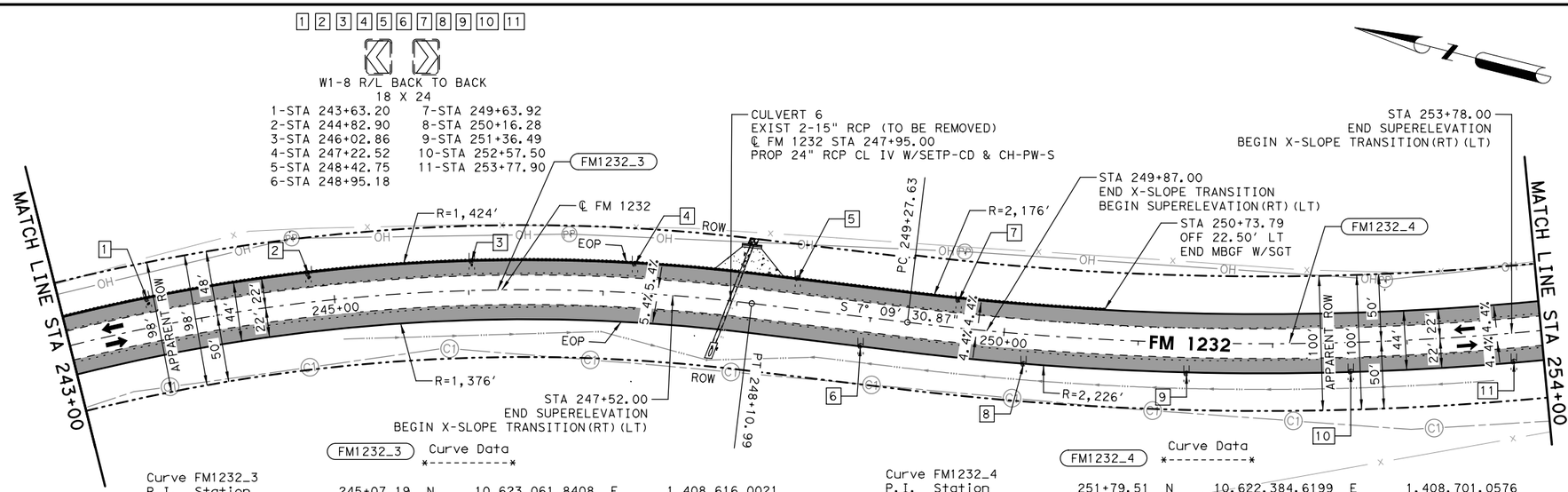


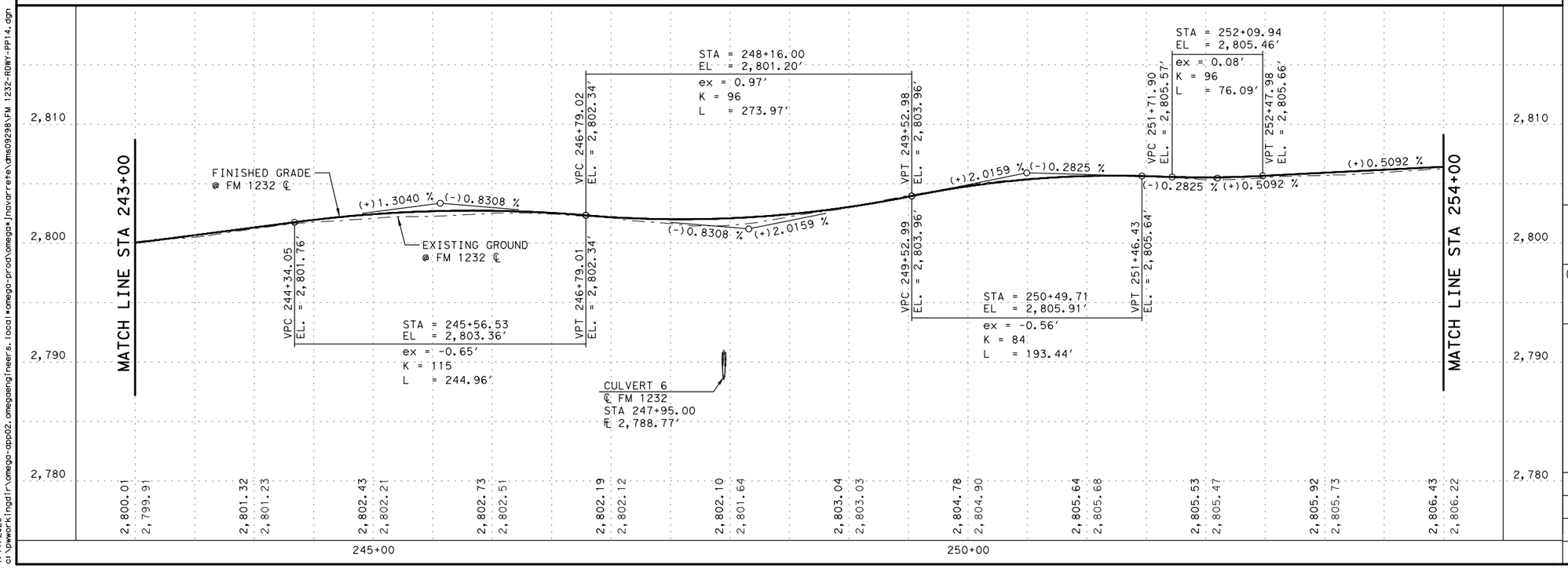
FM1232_3 Curve Data

Curve FM1232_3					
P.I. Station	245+07.19	N	10,623,061.8408	E	1,408,616.0021
Delta =	25° 17' 05.51" (RT)				
Degree =	4° 05' 33.20"				
Tangent =	314.0259				
Length =	617.8258				
Radius =	1,400.0000				
External =	34.7865				
Long Chord =	612.8246				
Mid. Ord. =	33.9431				
P.C. Station	241+93.17	N	10,623,326.8540	E	1,408,447.5377
P.T. Station	248+10.99	N	10,622,750.2627	E	1,408,655.1348
C.C.		N	10,622,575.8005	E	1,407,266.0477
Back =	S 32° 26' 36.38" E				
Ahead =	S 7° 09' 30.87" E				
Chord Bear =	S 19° 48' 03.62" E				

FM1232_4 Curve Data

Curve FM1232_4					
P.I. Station	251+79.51	N	10,622,384.6199	E	1,408,701.0576
Delta =	13° 03' 46.07" (LT)				
Degree =	2° 36' 15.67"				
Tangent =	251.8797				
Length =	501.5754				
Radius =	2,200.0000				
External =	14.3720				
Long Chord =	500.4898				
Mid. Ord. =	14.2787				
P.C. Station	249+27.63	N	10,622,634.5362	E	1,408,669.6694
P.T. Station	254+29.21	N	10,622,148.2650	E	1,408,788.1194
C.C.		N	10,622,908.6911	E	1,410,852.5205
Back =	S 7° 09' 30.87" E				
Ahead =	S 20° 13' 16.94" E				
Chord Bear =	S 13° 41' 23.90" E				

243+00	244+00	245+00	246+00	247+00	248+00	249+00	250+00	251+00	252+00	253+00	SHEET TOTAL
23	28	16	24	46	54	42	57	75	57	42	464
80	75	92	107	103	205	207	73	39	39	46	1,066



0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 243+00 TO STA 254+00

SHEET 14 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	73
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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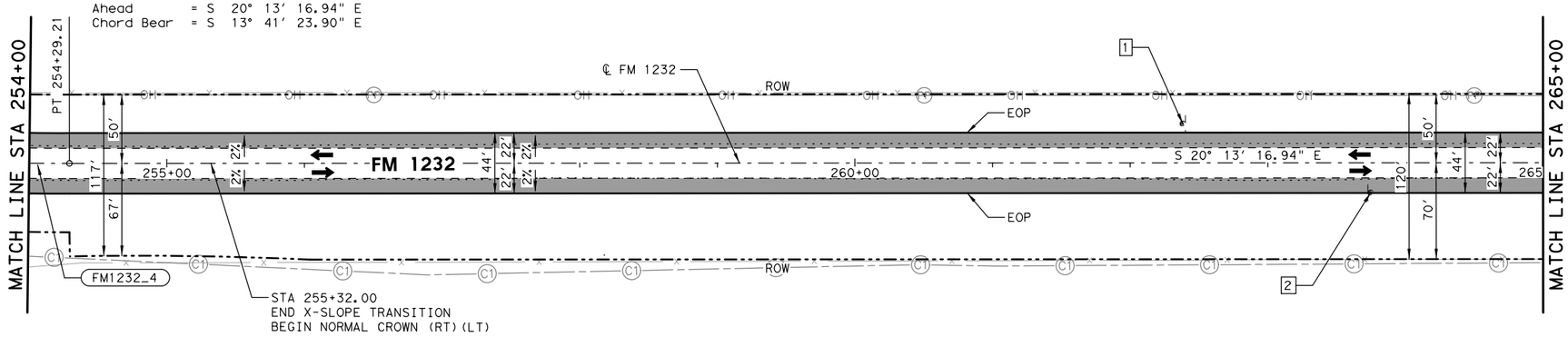
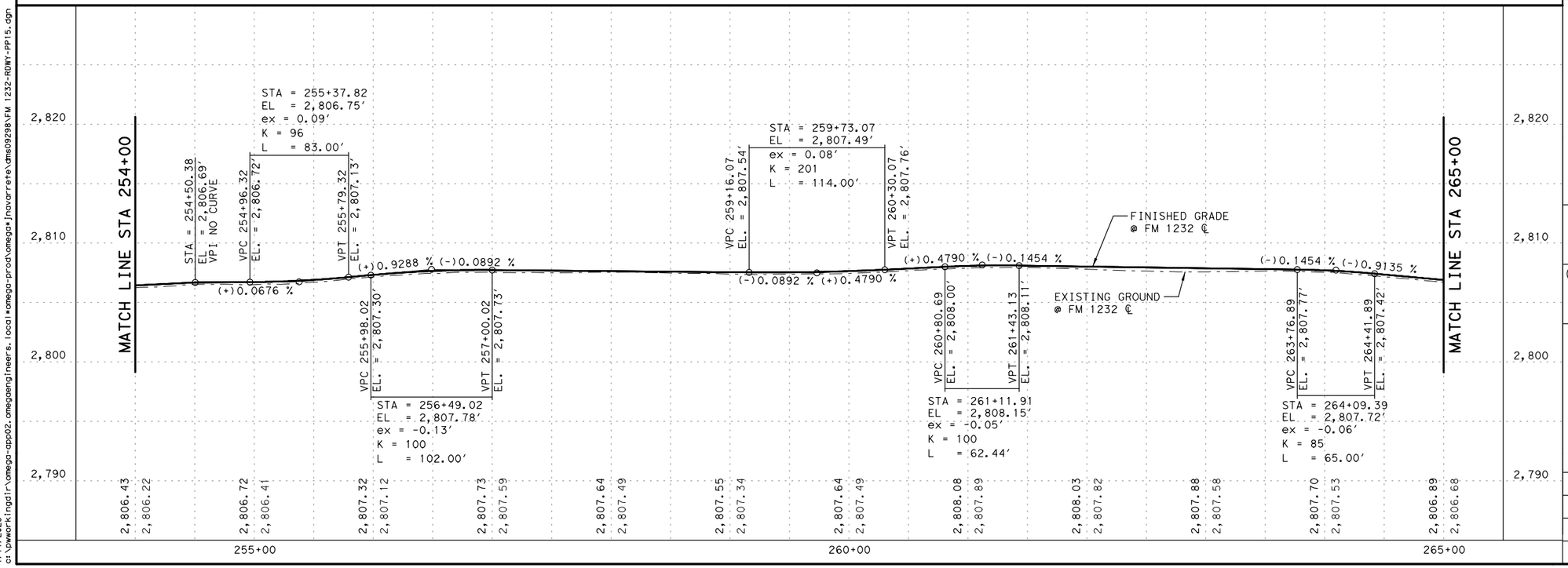
FM1232_4 Curve Data

Curve FM1232_4					
P.I. Station	251+79.51	N	10,622,384.6199	E	1,408,701.0576
Delta =	13° 03′ 46.07" (LT)				
Degree =	2° 36′ 15.67"				
Tangent =	251.8797				
Length =	501.5754				
Radius =	2,200.0000				
External =	14.3720				
Long Chord =	500.4898				
Mid. Ord. =	14.2787				
P.C. Station	249+27.63	N	10,622,634.5362	E	1,408,669.6694
P.T. Station	254+29.21	N	10,622,148.2650	E	1,408,788.1194
C.C.		N	10,622,908.6911	E	1,410,852.5205
Back =	S 7° 09′ 30.87" E				
Ahead =	S 20° 13′ 16.94" E				
Chord Bear =	S 13° 41′ 23.90" E				

1 — W1-5R & W13-1P, 30 X 30 & 18 X 18, STA 262+38.21

2 — HISTORICAL MARKER 1 MILE ON LEFT, D7-6aT, 48 X 48, STA 263+74.68





254+00	255+00	256+00	257+00	258+00	259+00	260+00	261+00	262+00	263+00	264+00	SHEET TOTAL
51	51	38	32	42	55	50	49	48	33	35	484
50	33	15	13	9	5	5	4	5	13	13	165

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

0 50 100
SCALE: 1"=100′ H
1"=10′ V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

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2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
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STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 254+00 TO STA 265+00

SHEET 15 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	74
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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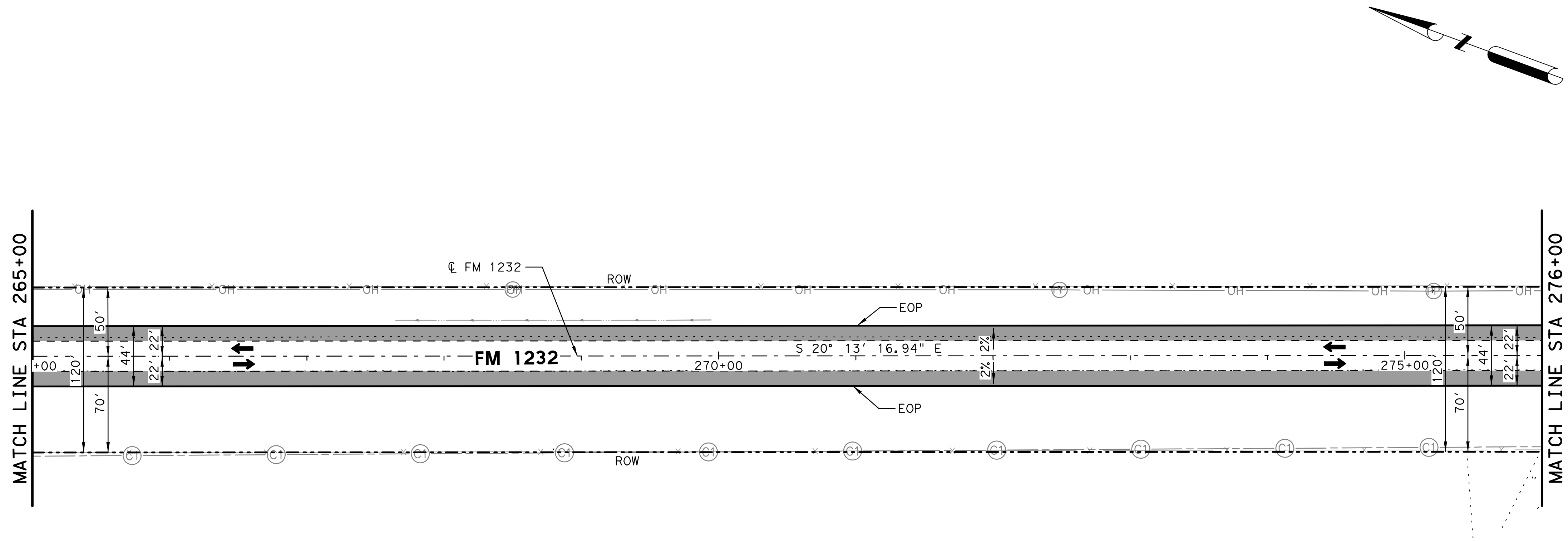


0 50 100
SCALE: 1"=100' H
1"=10' V

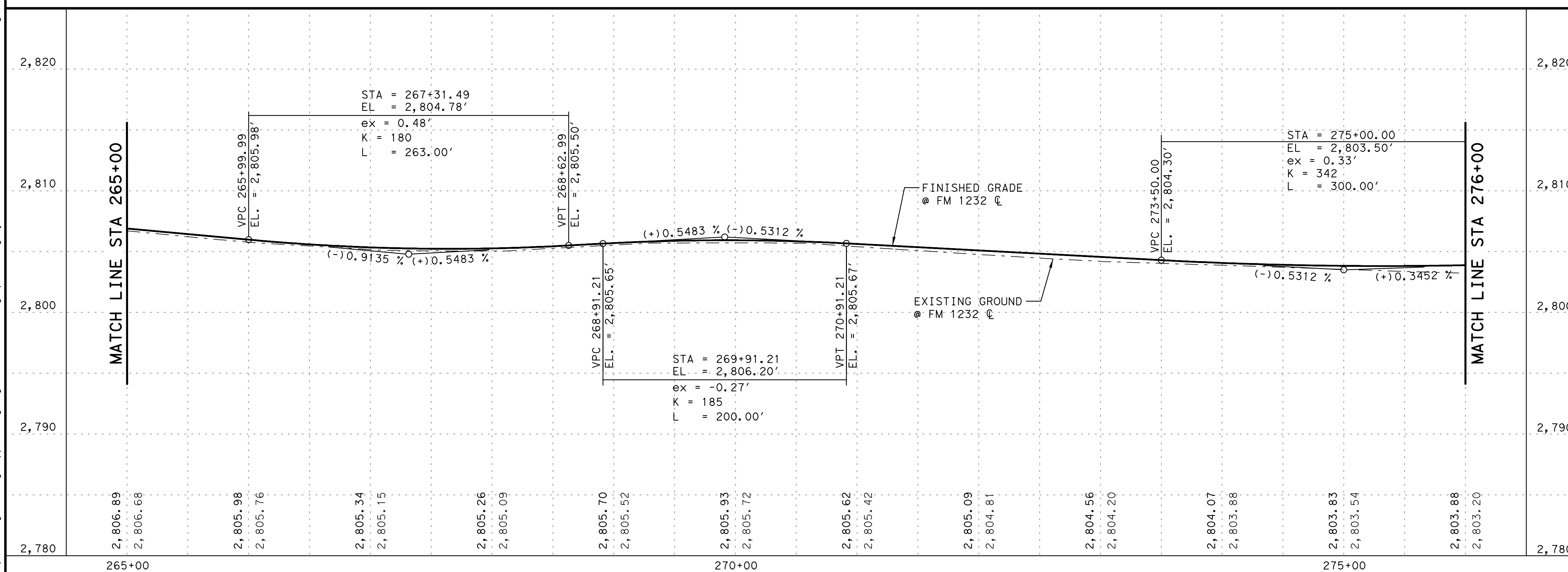
LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

265+00	266+00	267+00	268+00	269+00	270+00	271+00	272+00	273+00	274+00	275+00	SHEET TOTAL	DESCRIPTION	UNIT
42	41	51	43	42	56	42	31	35	44	41	468	EXCAVATION (ROADWAY)	CY
15	14	4	10	11	6	13	16	15	10	9	123	EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
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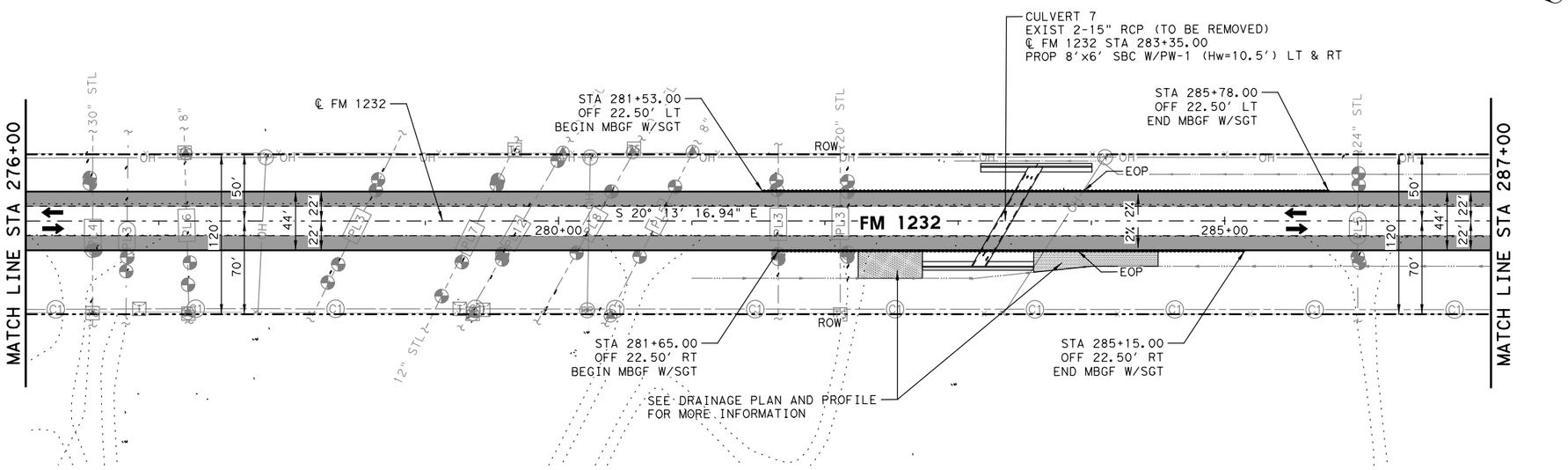
Texas Department of Transportation®

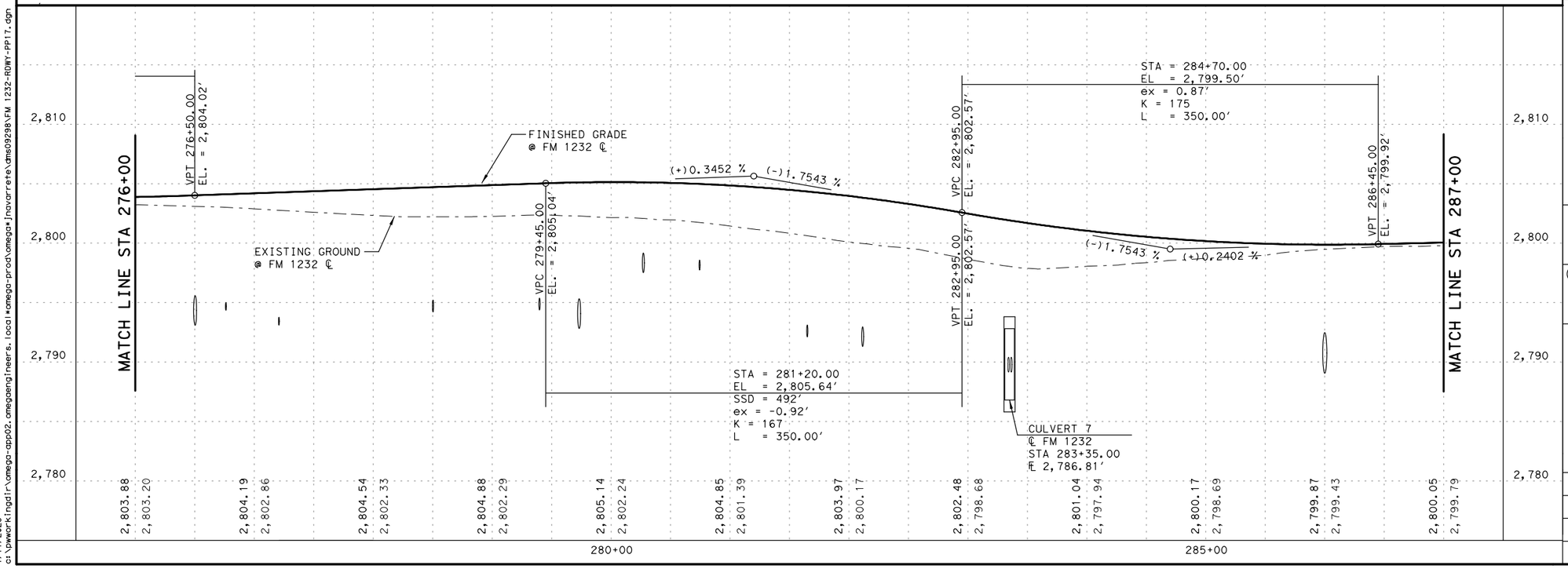
FM 1232
SH 302 TO SH 115
ROADWAY PLAN & PROFILE

STA 265+00 TO STA 276+00

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET		SHEET NO. 75
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT. 1371	SECT. 01	JOB 023	HIGHWAY NO. FM 1232



276+00	277+00	278+00	279+00	280+00	281+00	282+00	283+00	284+00	285+00	286+00	SHEET TOTAL
16	3	0	0	0	42	128	117	112	136	116	670
37	138	412	620	658	741	873	1,019	849	436	153	5,936



0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

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3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

STATE OF TEXAS
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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 276+00 TO STA 287+00

SHEET 17 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	76
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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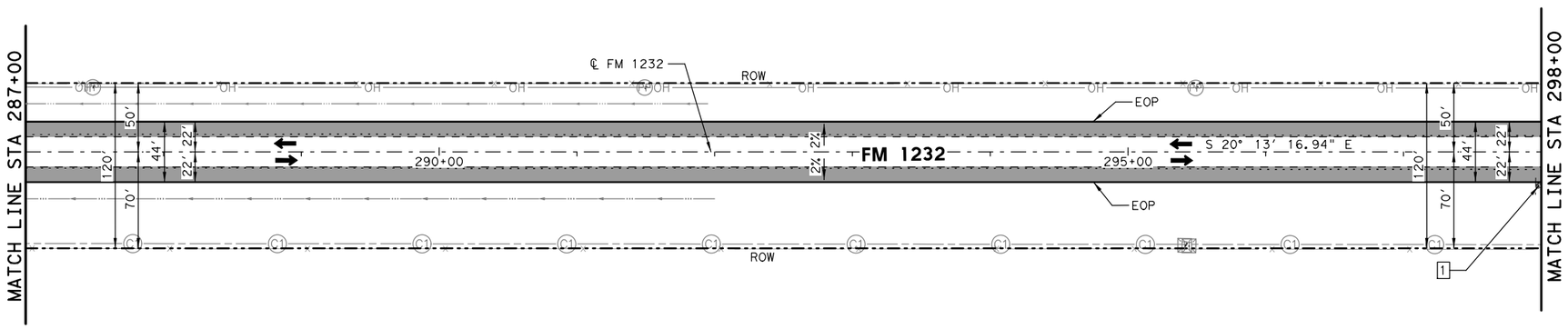
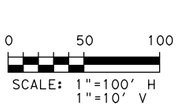
W1-2L & W13-1P
30 X 30 & 18 X 18
STA 297+97.90





LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

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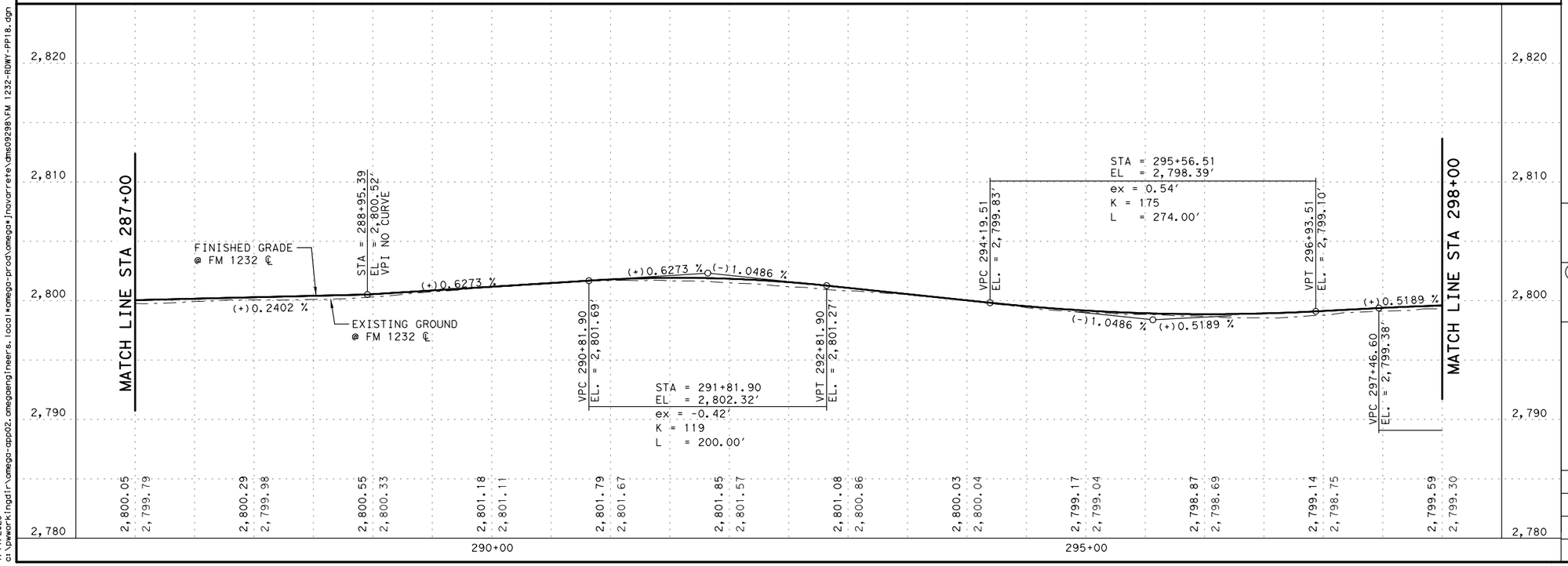
287+00	288+00	289+00	290+00	291+00	292+00	293+00	294+00	295+00	296+00	297+00	SHEET TOTAL
148	141	106	179	252	140	29	52	63	42	26	1,178
44	36	23	8	0	9	21	14	8	11	25	199

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



OMEGA ENGINEERS, INC.
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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 287+00 TO STA 298+00

SHEET 18 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	77
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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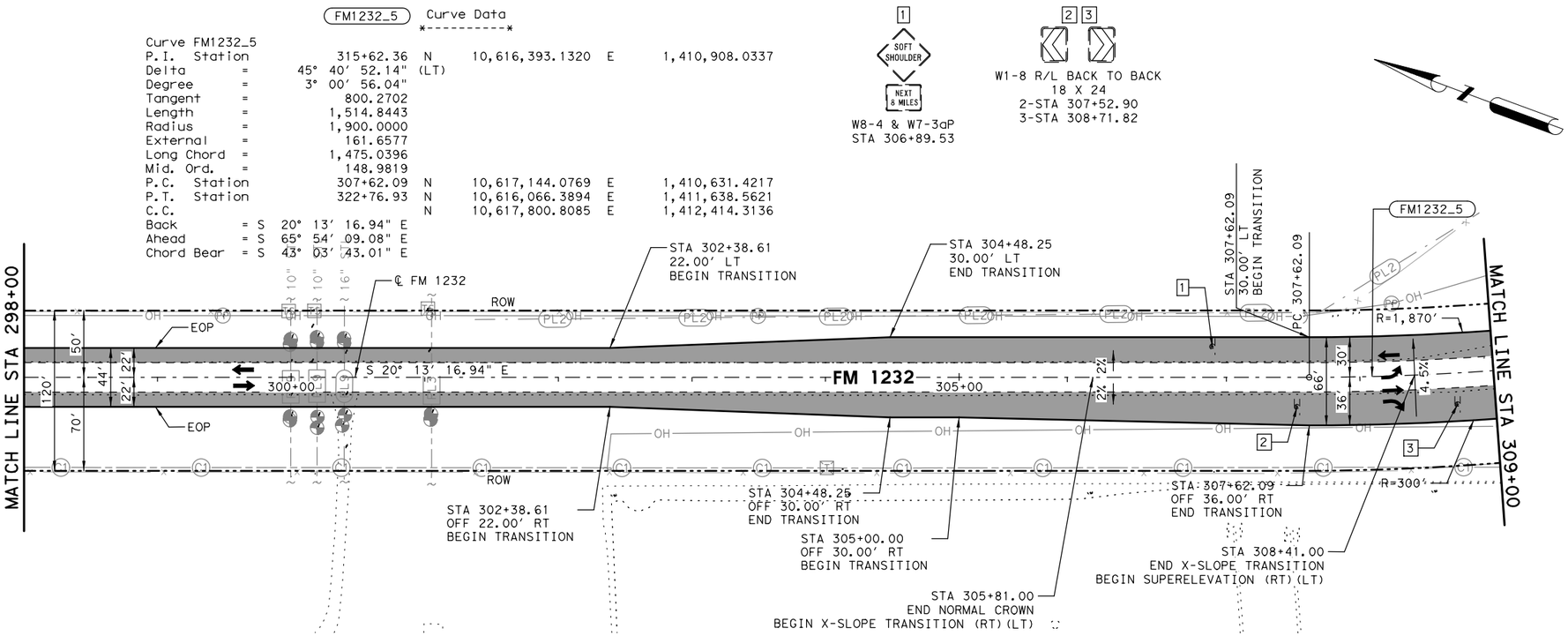
FM1232_5 Curve Data

Curve FM1232_5					
P.I. Station	315+62.36	N	10,616,393.1320	E	1,410,908.0337
Delta =	45° 40′ 52.14" (LT)				
Degree =	3° 00′ 56.04"				
Tangent =	800.2702				
Length =	1,514.8443				
Radius =	1,900.0000				
External =	161.6577				
Long Chord =	1,475.0396				
Mid. Ord. =	148.9819				
P.C. Station	307+62.09	N	10,617,144.0769	E	1,410,631.4217
P.T. Station	322+76.93	N	10,616,066.3894	E	1,411,638.5621
C.C.		N	10,617,800.8085	E	1,412,414.3136
Back =	S 20° 13′ 16.94" E				
Ahead =	S 65° 54′ 09.08" E				
Chord Bear =	S 43° 03′ 43.01" E				



298+00	299+00	300+00	301+00	302+00	303+00	304+00	305+00	306+00	307+00	308+00	SHEET TOTAL
27	46	59	53	42	37	43	55	56	42	23	483
23	5	0	2	3	4	4	6	17	36	150	250

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

0 50 100
SCALE: 1"=100′ H
1"=10′ V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

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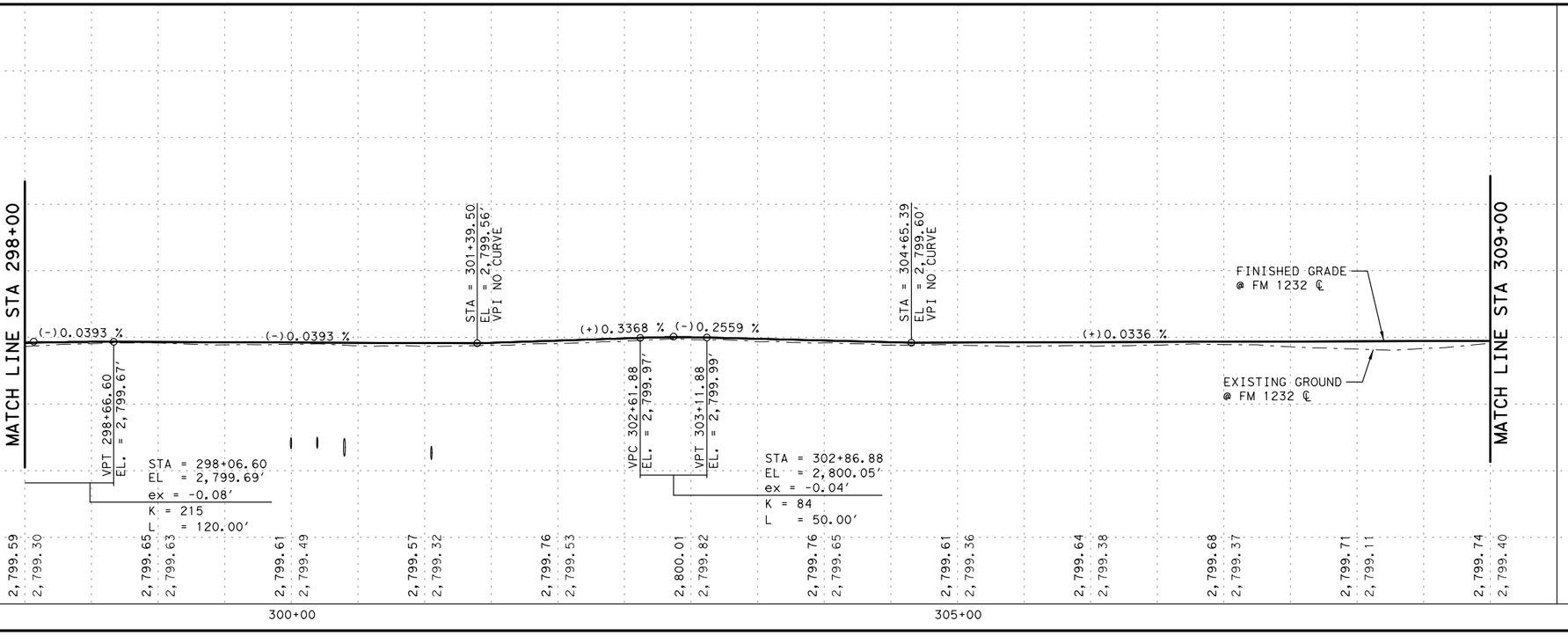

STATE OF TEXAS
JORGE L NAVARRETE
146579
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7/17/2023

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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 298+00 TO STA 309+00

SHEET 19 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	78
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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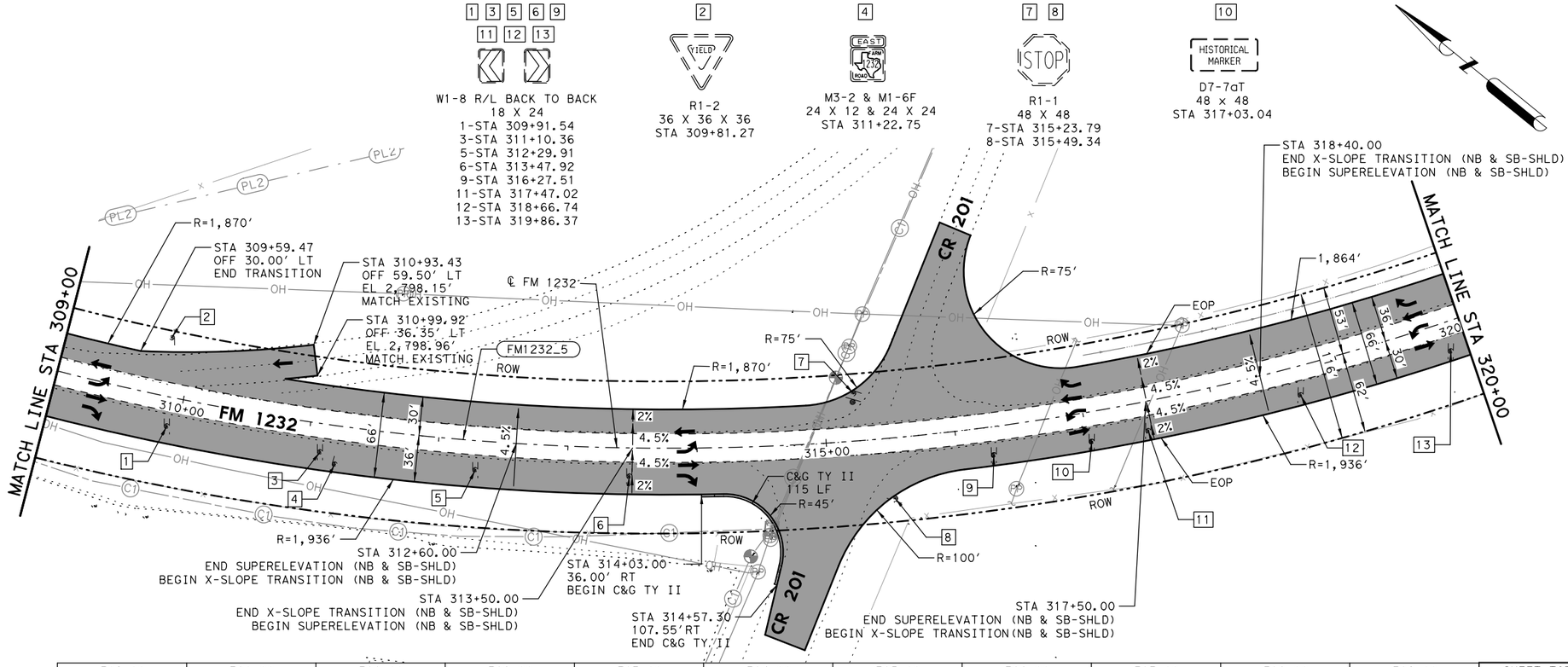

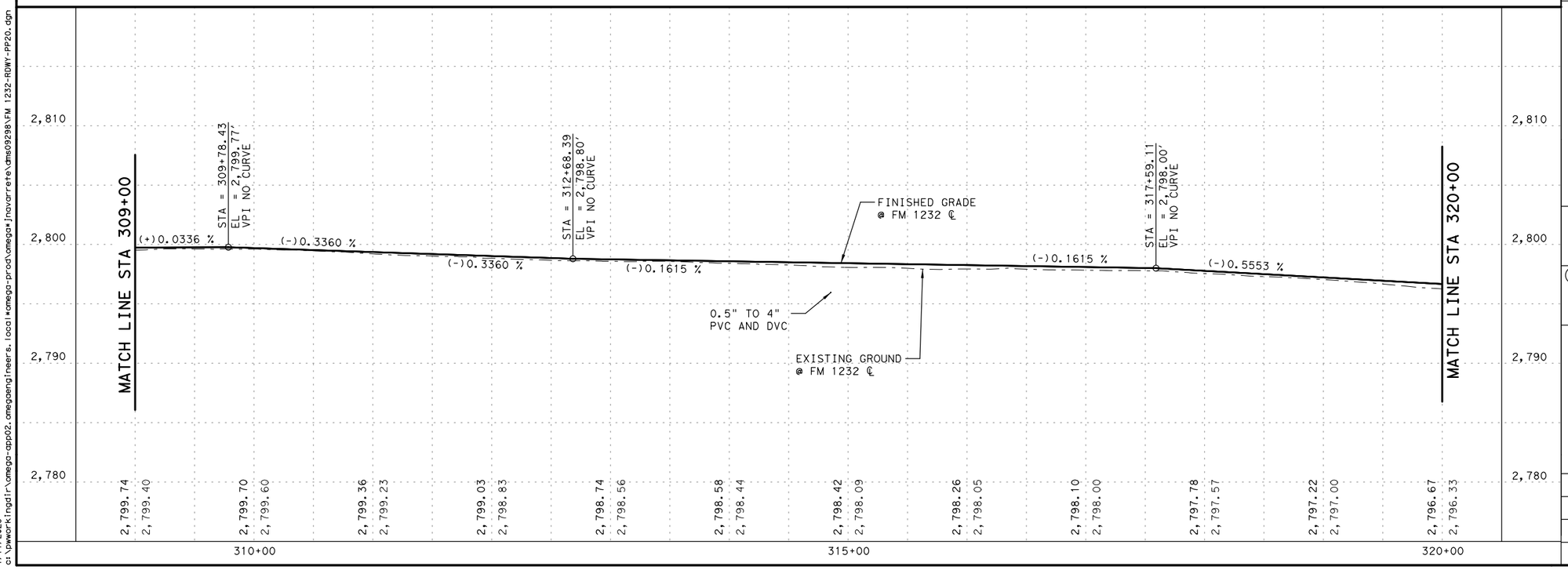

309+00	310+00	311+00	312+00	313+00	314+00	315+00	316+00	317+00	318+00	319+00	SHEET TOTAL
34	76	101	74	49	55	123	298	253	72	48	1,183
249	219	181	198	240	183	69	54	111	175	175	1,854

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 309+00 TO STA 320+00

SHEET 20 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	79
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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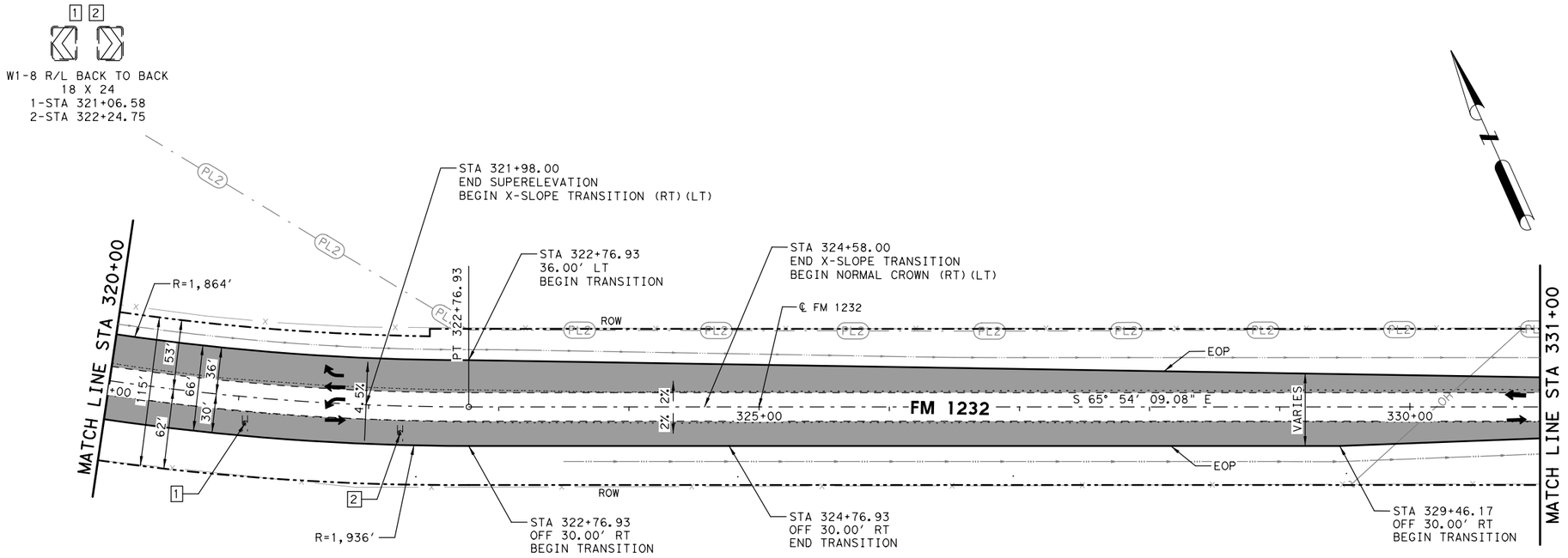

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

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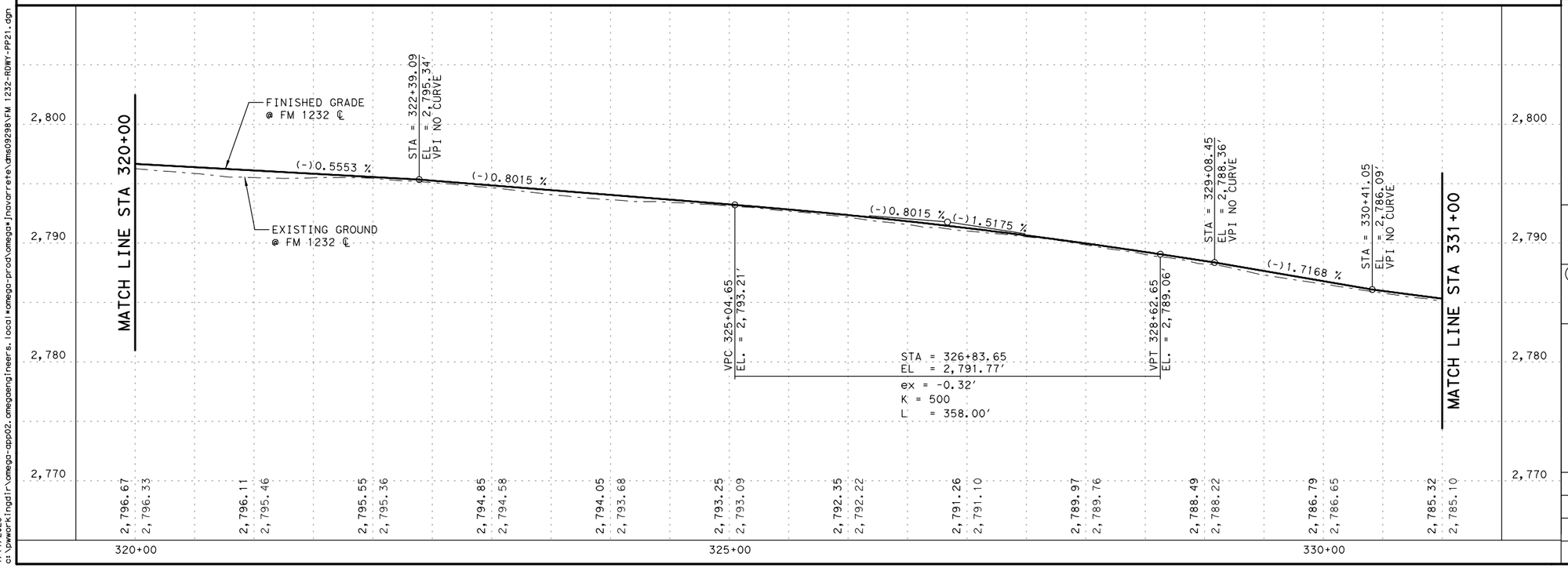
320+00	321+00	322+00	323+00	324+00	325+00	326+00	327+00	328+00	329+00	330+00	SHEET TOTAL
41	33	75	86	63	86	124	159	171	186	202	1,226
174	248	241	163	123	81	33	14	12	14	30	1,133

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
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OMEGA ENGINEERS, INC.
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P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 320+00 TO STA 331+00

SHEET 21 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	80
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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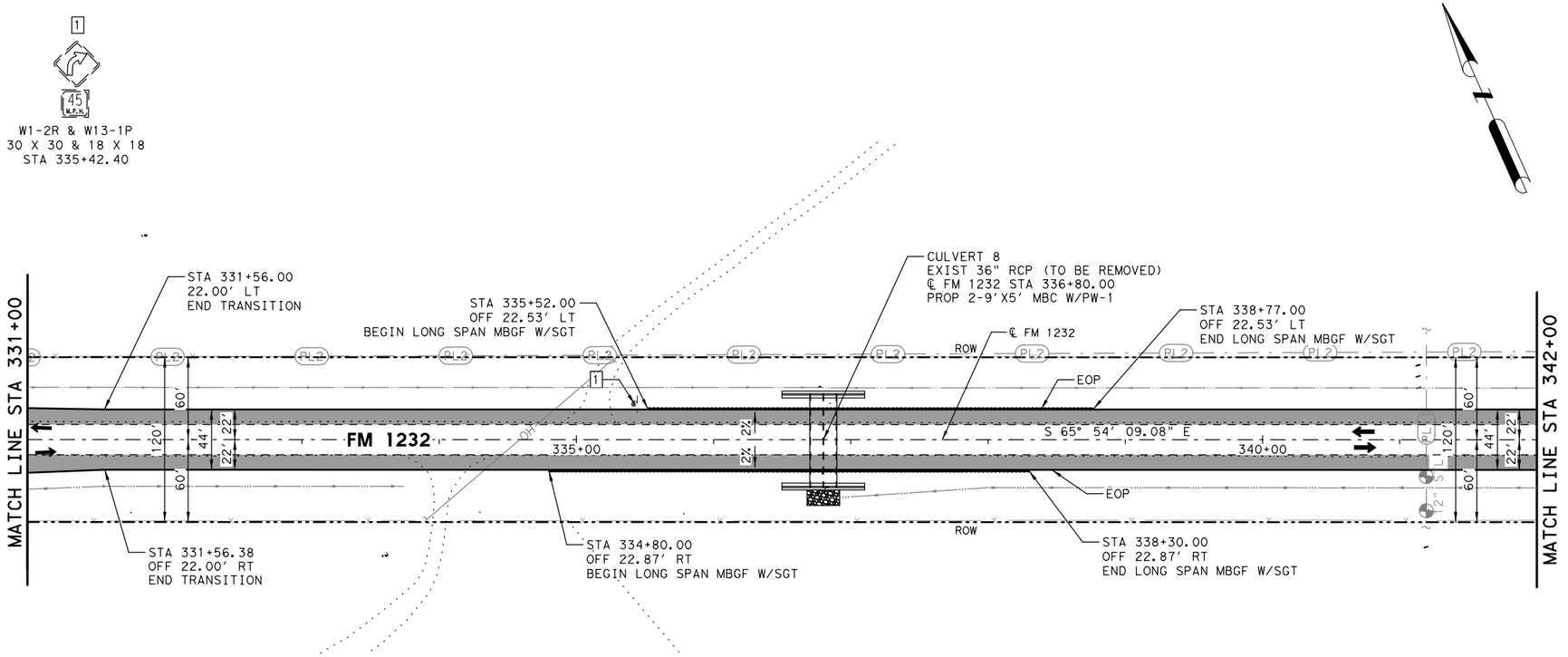

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

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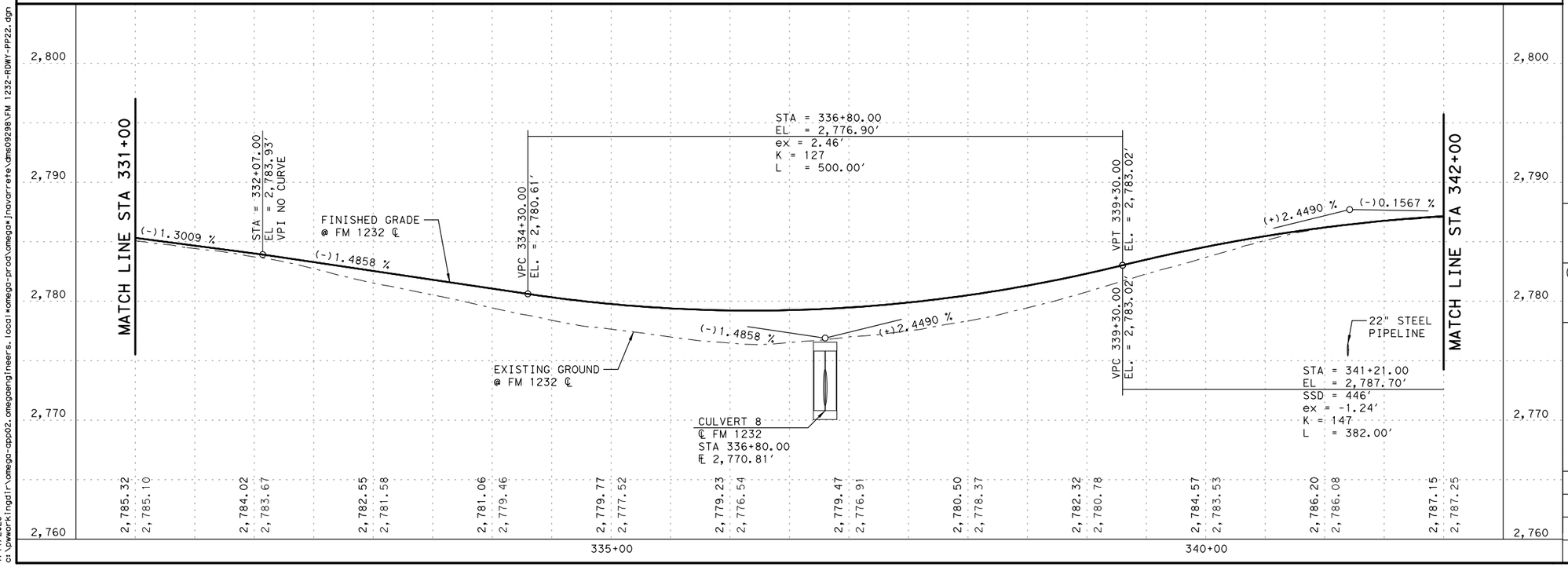
331+00	332+00	333+00	334+00	335+00	336+00	337+00	338+00	339+00	340+00	341+00	SHEET TOTAL
190	168	113	36	3	7	13	18	84	191	298	1,121
39	37	112	310	533	675	627	587	425	161	56	3,562

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 331+00 TO STA 342+00

SHEET 22 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	81
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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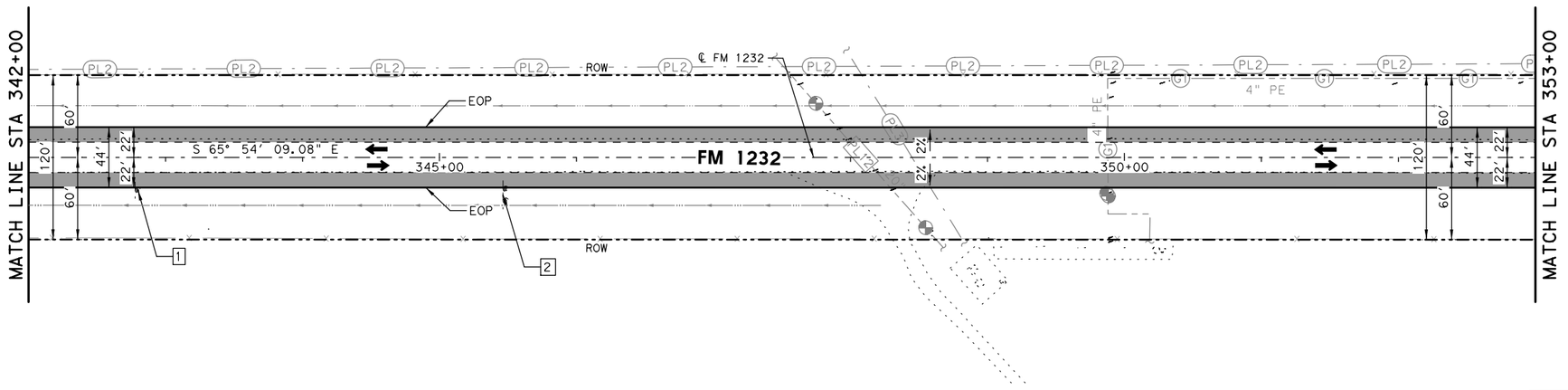
1

W3-5
36 X 36
STA 342+79.82

2

W3-5
108 X 60
STA 345+46.33



342+00	343+00	344+00	345+00	346+00	347+00	348+00	349+00	350+00	351+00	352+00	SHEET TOTAL
332	288	210	130	99	88	106	91	68	88	100	1,600
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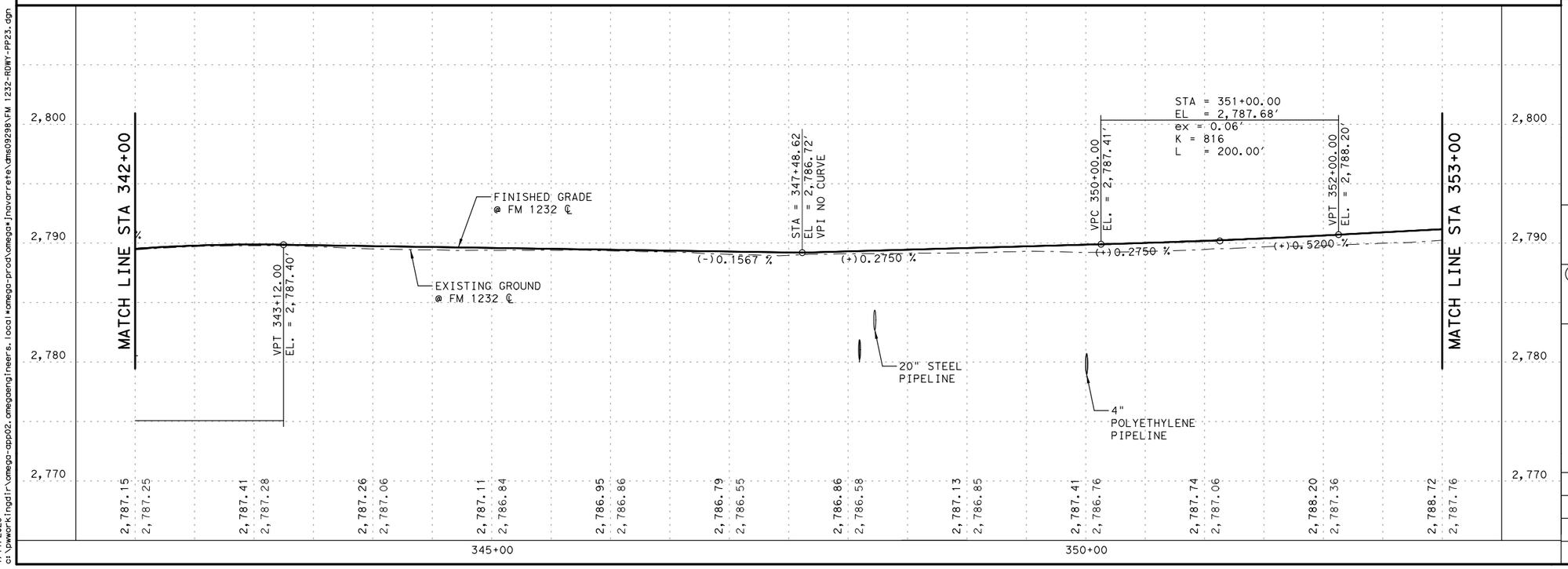

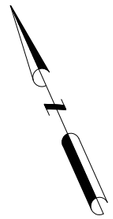

0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

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3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
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DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY

7/17/2023

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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 342+00 TO STA 353+00

SHEET 23 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	82
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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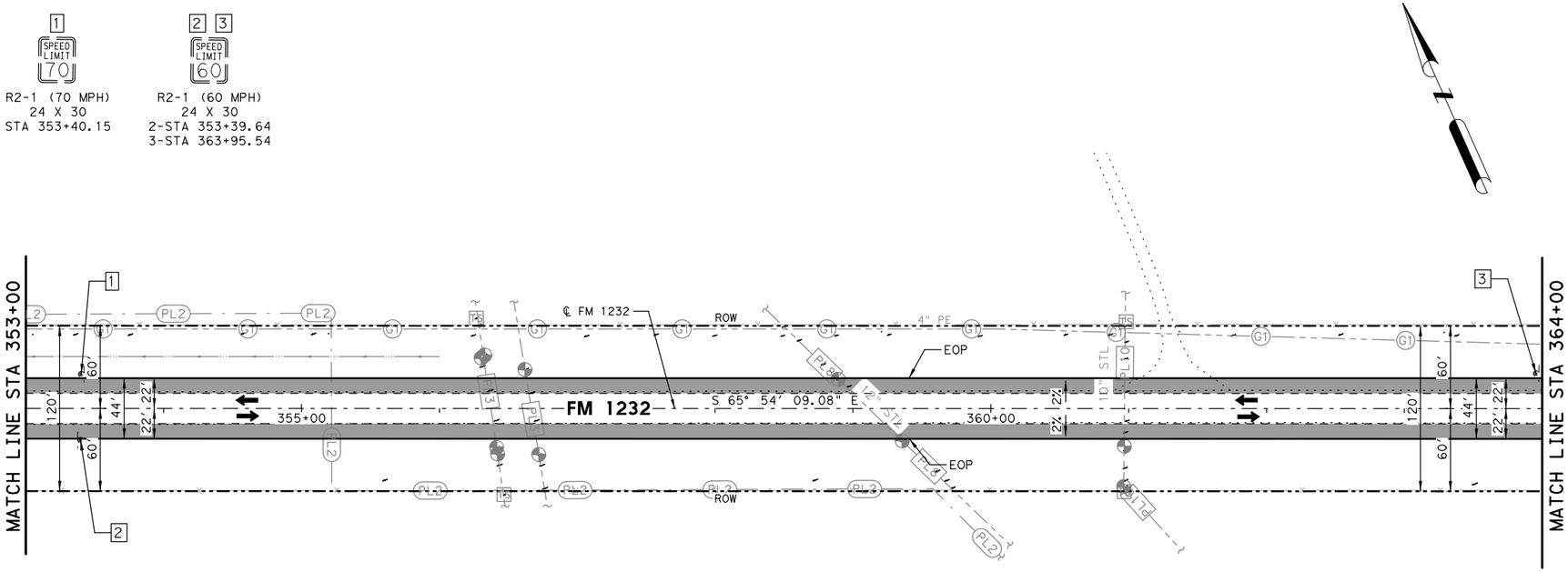


LEGEND

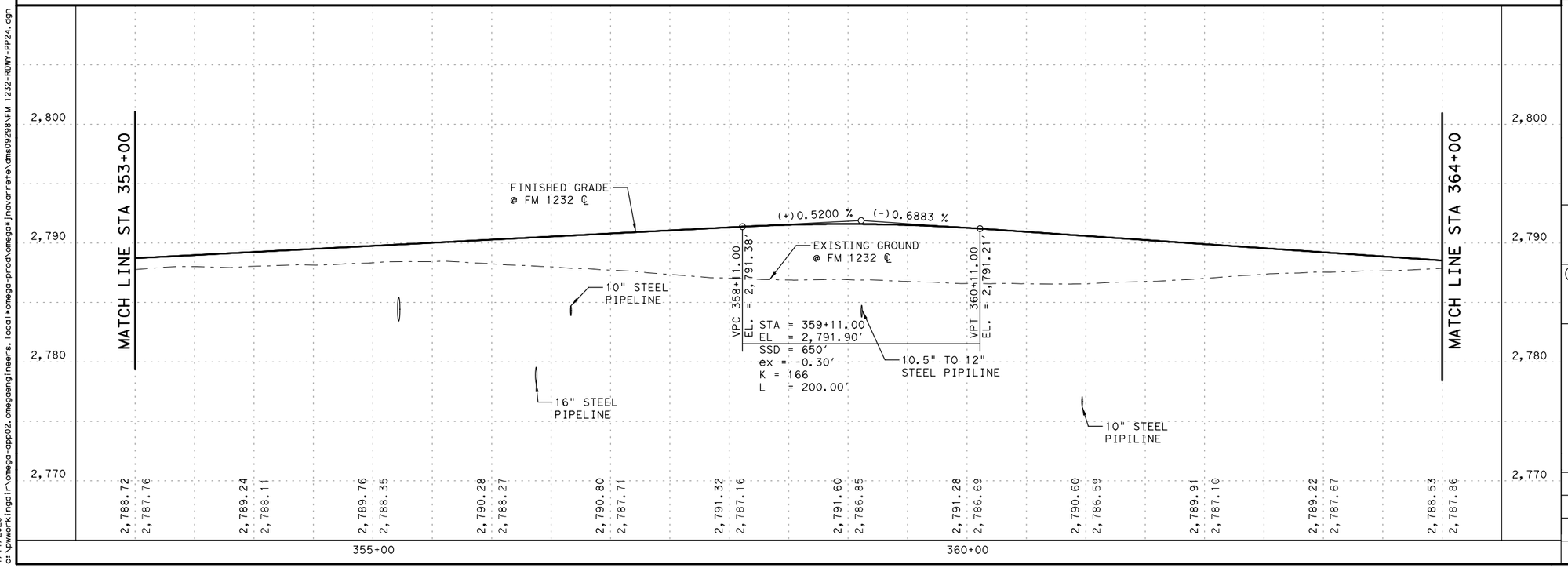
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

353+00	354+00	355+00	356+00	357+00	358+00	359+00	360+00	361+00	362+00	363+00	SHEET TOTAL
88	67	47	16	0	0	0	0	0	0	0	218
95	126	195	292	523	918	1,239	1,348	1,230	890	474	7,330

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232

SH 302 TO SH 115

ROADWAY

PLAN & PROFILE

STA 353+00 TO STA 364+00

SHEET 24 OF 27

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	83
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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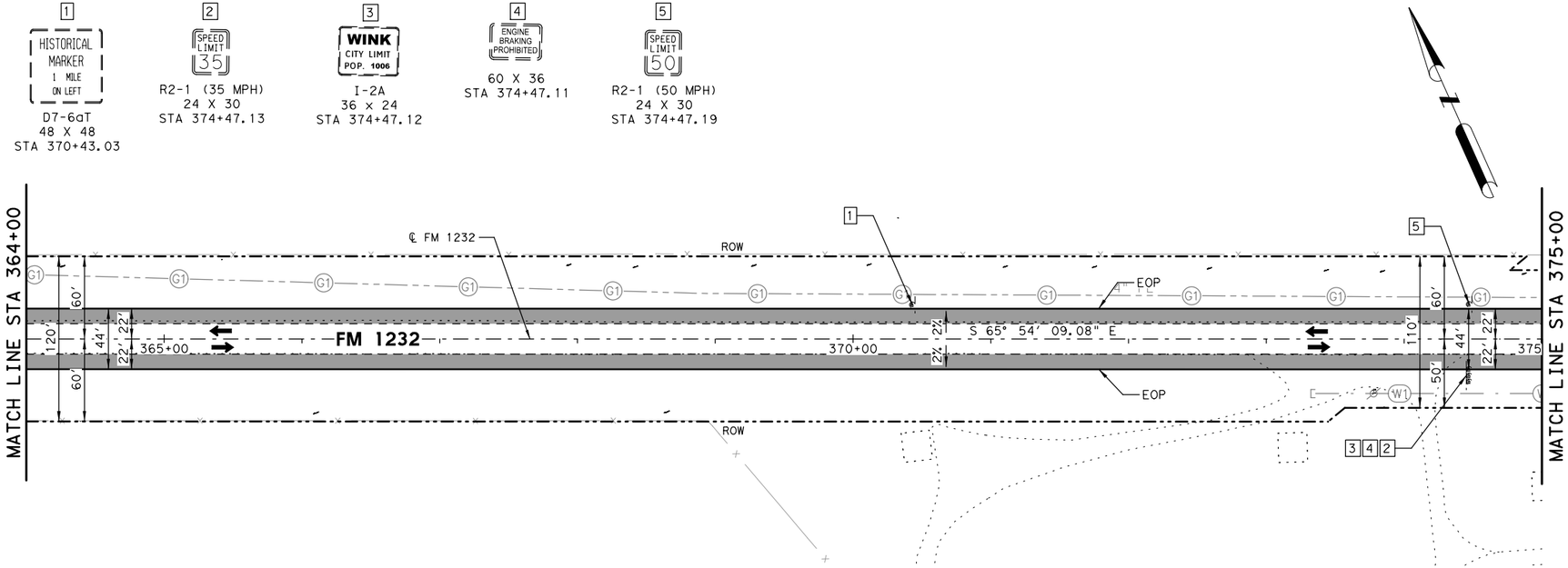
1 HISTORICAL MARKER 1 MILE ON LEFT
D7-6aT
48 X 48
STA 370+43.03

2 SPEED LIMIT 35
R2-1 (35 MPH)
24 X 30
STA 374+47.13

3 WINK CITY LIMIT POP. 1006
I-2A
36 x 24
STA 374+47.12

4 ENGINE BRAKING PROHIBITED
60 X 36
STA 374+47.11

5 SPEED LIMIT 50
R2-1 (50 MPH)
24 X 30
STA 374+47.19



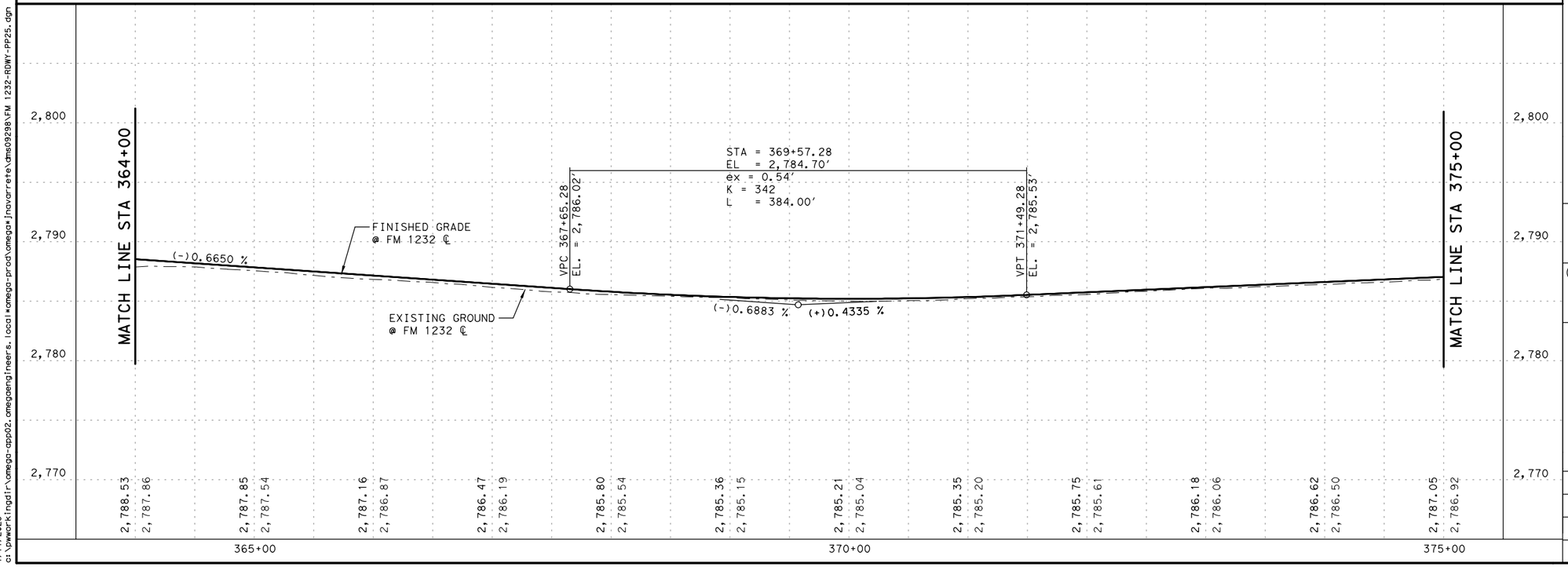
SCALE: 1"=100' H
1"=10' V

LEGEND
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:
1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

364+00	365+00	366+00	367+00	368+00	369+00	370+00	371+00	372+00	373+00	374+00	SHEET TOTAL
14	40	41	28	32	50	54	49	51	55	57	471
156	23	10	15	14	7	8	13	12	10	7	275

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 364+00 TO STA 375+00

SHEET 25 OF 27

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	84
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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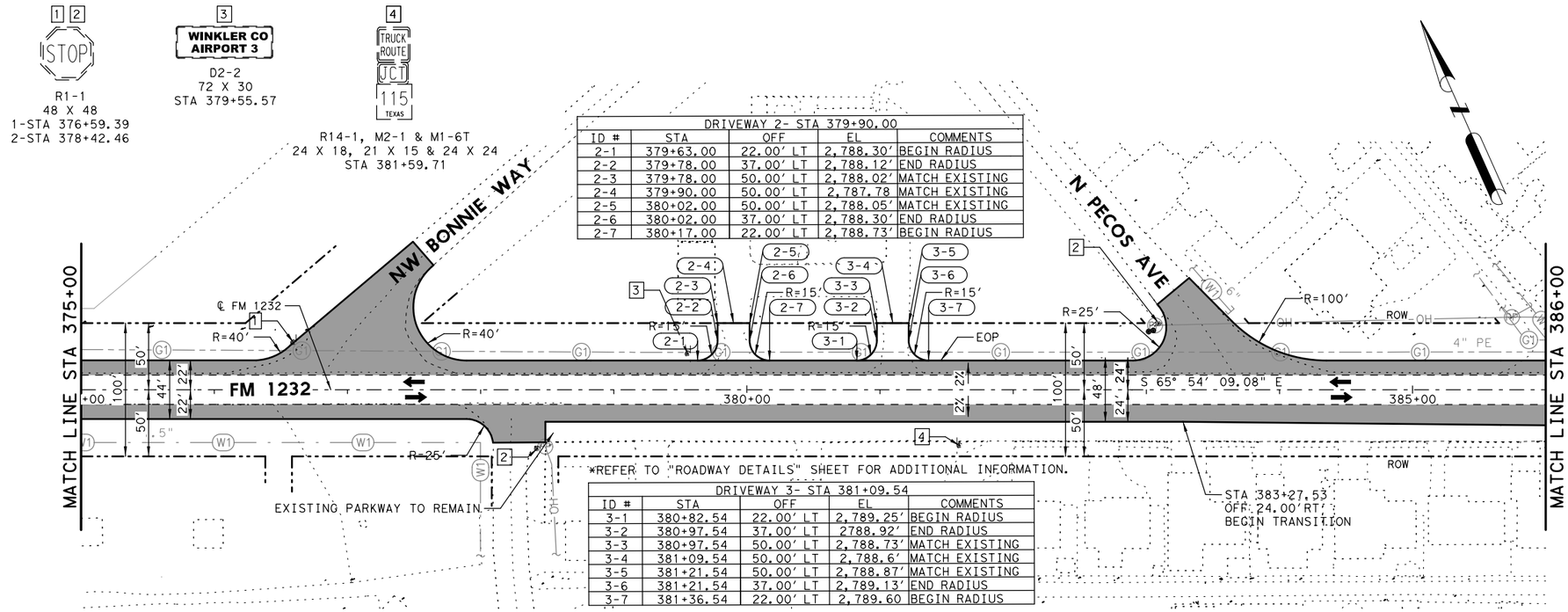


DRIVEWAY 2- STA 379+90.00

ID #	STA	OFF	EL	COMMENTS
2-1	379+63.00	22.00' LT	2,788.30'	BEGIN RADIUS
2-2	379+78.00	37.00' LT	2,788.12'	END RADIUS
2-3	379+78.00	50.00' LT	2,788.02'	MATCH EXISTING
2-4	379+90.00	50.00' LT	2,787.78	MATCH EXISTING
2-5	380+02.00	50.00' LT	2,788.05'	MATCH EXISTING
2-6	380+02.00	37.00' LT	2,788.30'	END RADIUS
2-7	380+17.00	22.00' LT	2,788.73'	BEGIN RADIUS

DRIVEWAY 3- STA 381+09.54

ID #	STA	OFF	EL	COMMENTS
3-1	380+82.54	22.00' LT	2,789.25'	BEGIN RADIUS
3-2	380+97.54	37.00' LT	2788.92'	END RADIUS
3-3	380+97.54	50.00' LT	2,788.73'	MATCH EXISTING
3-4	381+09.54	50.00' LT	2,788.6'	MATCH EXISTING
3-5	381+21.54	50.00' LT	2,788.87'	MATCH EXISTING
3-6	381+21.54	37.00' LT	2,789.13'	END RADIUS
3-7	381+36.54	22.00' LT	2,789.60	BEGIN RADIUS

0 50 100
SCALE: 1"=100' H
1"=10' V

LEGEND

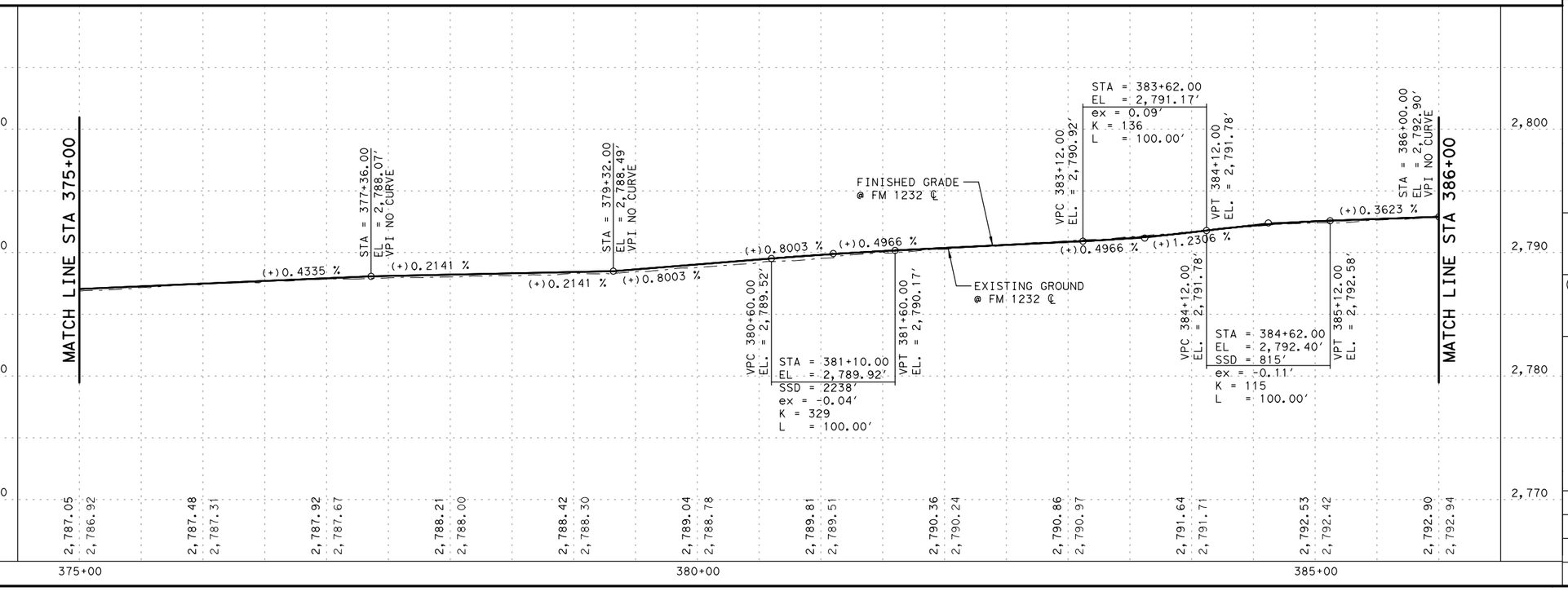
- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- (C-#) ALIGNMENT CURVE NAME
- (#) DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- [#] SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

375+00	376+00	377+00	378+00	379+00	380+00	381+00	382+00	383+00	384+00	385+00	SHEET TOTAL
63	80	174	173	88	113	143	120	100	118	103	1,275
4	3	3	3	0	2	3	2	0	0	0	20

DESCRIPTION	UNIT
EXCAVATION (ROADWAY)	CY
EMBANKMENT	CY



7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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FM 1232
SH 302 TO SH 115
ROADWAY
PLAN & PROFILE
STA 375+00 TO STA 386+00

SHEET 26 OF 27

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	85
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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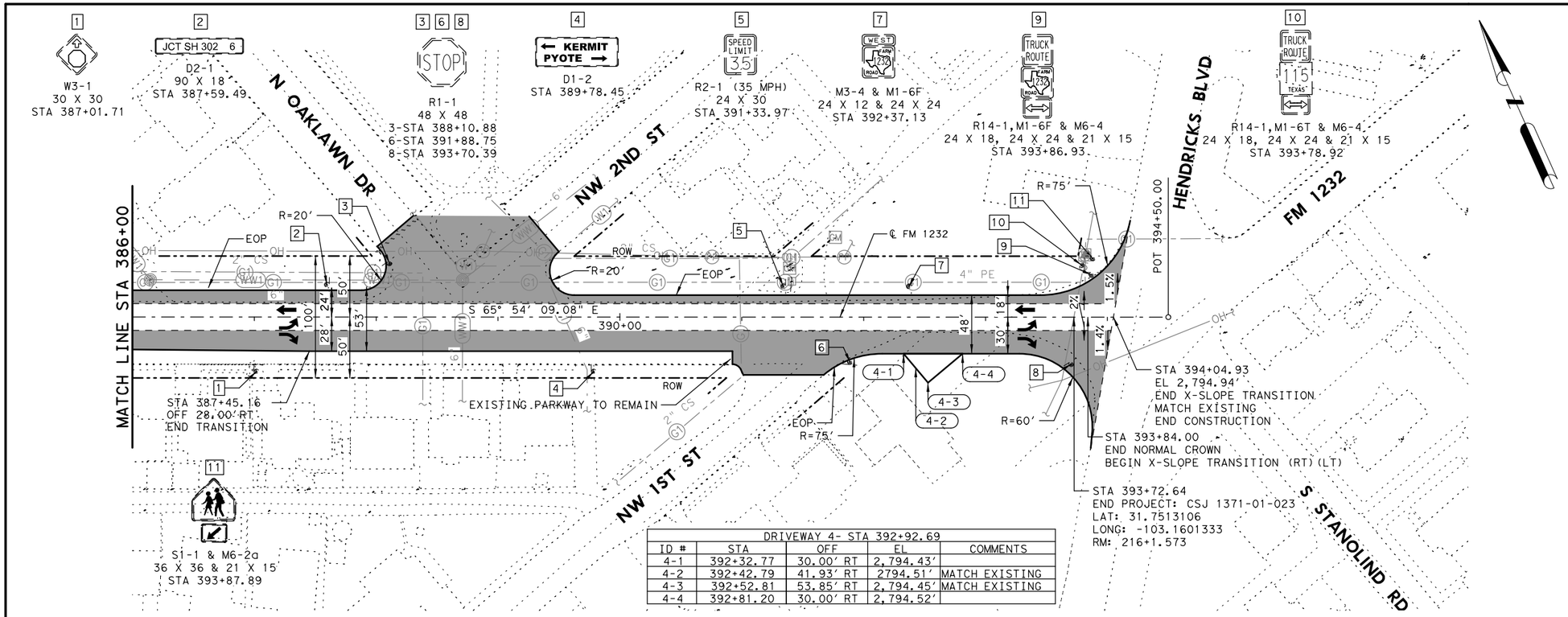


DRIVEWAY 4- STA 392+92.69				
ID #	STA	OFF	EL	COMMENTS
4-1	392+32.77	30.00' RT	2,794.43'	
4-2	392+42.79	41.93' RT	2794.51'	MATCH EXISTING
4-3	392+52.81	53.85' RT	2,794.45'	MATCH EXISTING
4-4	392+81.20	30.00' RT	2,794.52'	

0 50 100

SCALE: 1"=100' H
1"=10' V

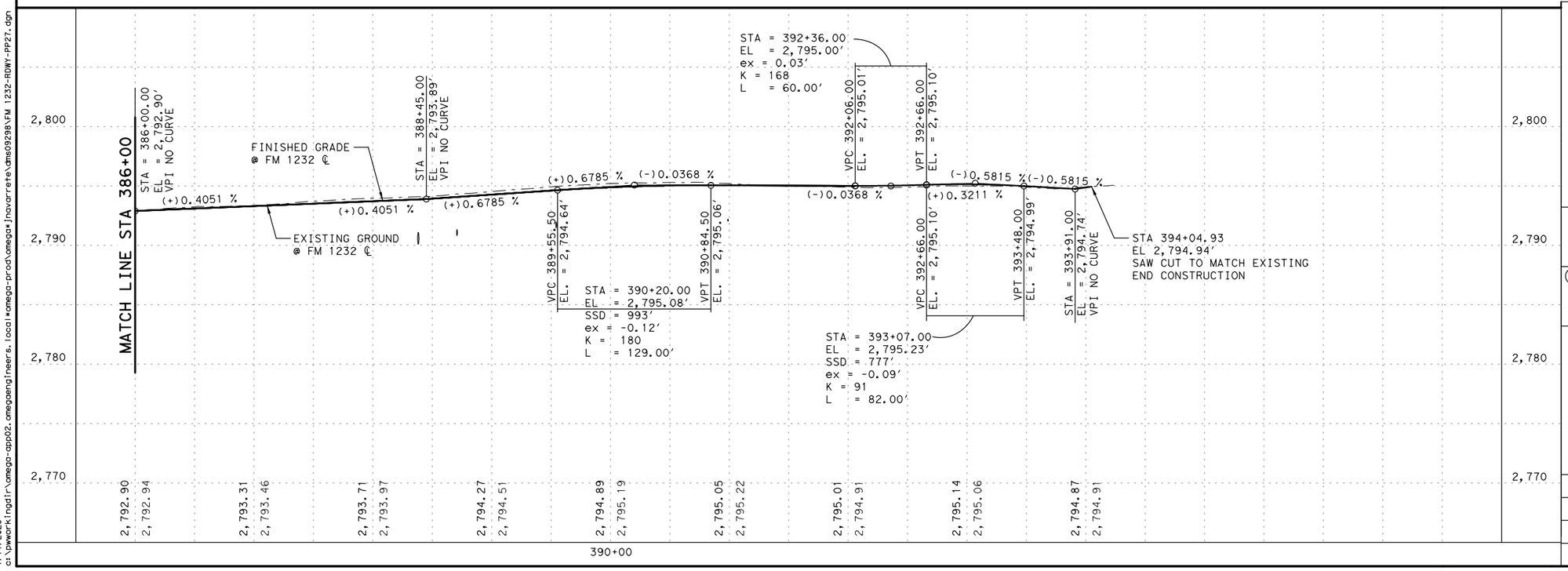
LEGEND

- PROPOSED EOP
- EXISTING EOP
- SAWCUT LINE
- C-# ALIGNMENT CURVE NAME
- # DRIVEWAY ID
- DIRECTION OF TRAFFIC
- PROPOSED WIDENING
- # SIGN TO BE REMOVED

NOTES:

1. SEE CONTROL DATA SHEETS FOR INFORMATION.
2. SEE HORIZONTAL ALIGNMENT DATA SHEET FOR INFORMATION.
3. SEE REMOVAL LAYOUT SHEETS FOR INFORMATION.
4. SEE CROSS-SECTIONS FOR SIDE SLOPES AND DETAILS.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

386+00	387+00	388+00	389+00	390+00	391+00	392+00	393+00	394+00	395+00	SHEET TOTAL	DESCRIPTION	UNIT
92	114	150	244	220	142	118	66	94		1,240	EXCAVATION (ROADWAY)	CY
0	0	0	0	0	0	0	0	4		4	EMBANKMENT	CY



7/17/2023

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6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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TX PE Firm Reg. No. F-2147
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FM 1232

SH 302 TO SH 115

ROADWAY

PLAN & PROFILE

STA 386+00 TO END PROJECT

SHEET 27 OF 27

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	86
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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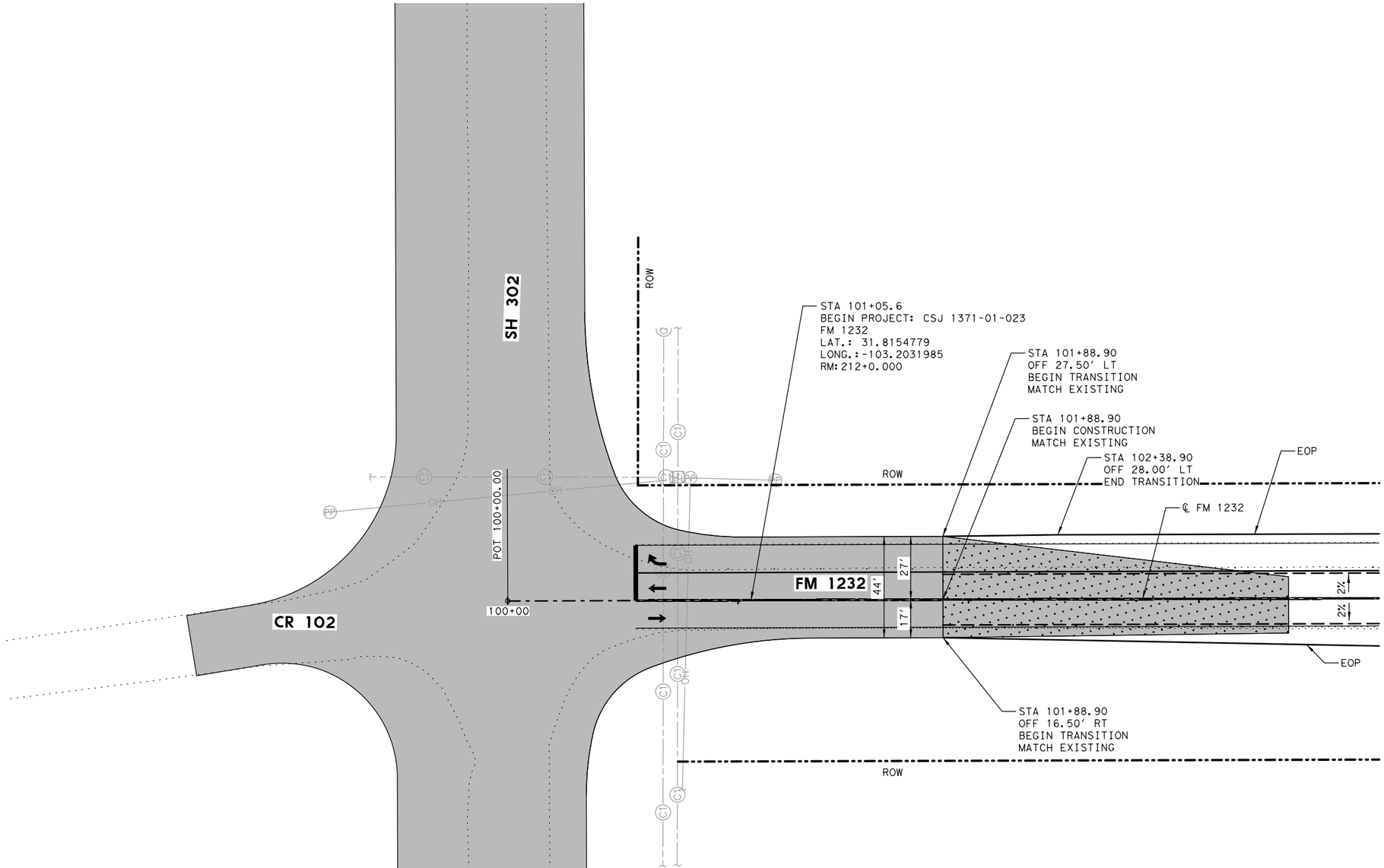

0 25 50

SCALE: 1"=50'

LEGEND

- PROPOSED EOP
- EXISTING EOP
- DIRECTION OF TRAFFIC
- WORK DONE BY OTHERS
- RECLAIMED MATERIAL PAID UNDER ITEM 3089.

NOTES:

1. REFER TO CSJ: 0479-04-038 PLAN SET FOR ADDITIONAL DETAILS ON WORK DONE BY OTHERS.
2. REFER TO PAVEMENT MARKING LAYOUTS FOR INFORMATION.
3. REFER TO UTILITY LAYOUTS FOR INFORMATION.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

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6090 SURETY DR, STE #104
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OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
INTERSECTION LAYOUT
SH 302

SHEET 1 OF 3

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		87
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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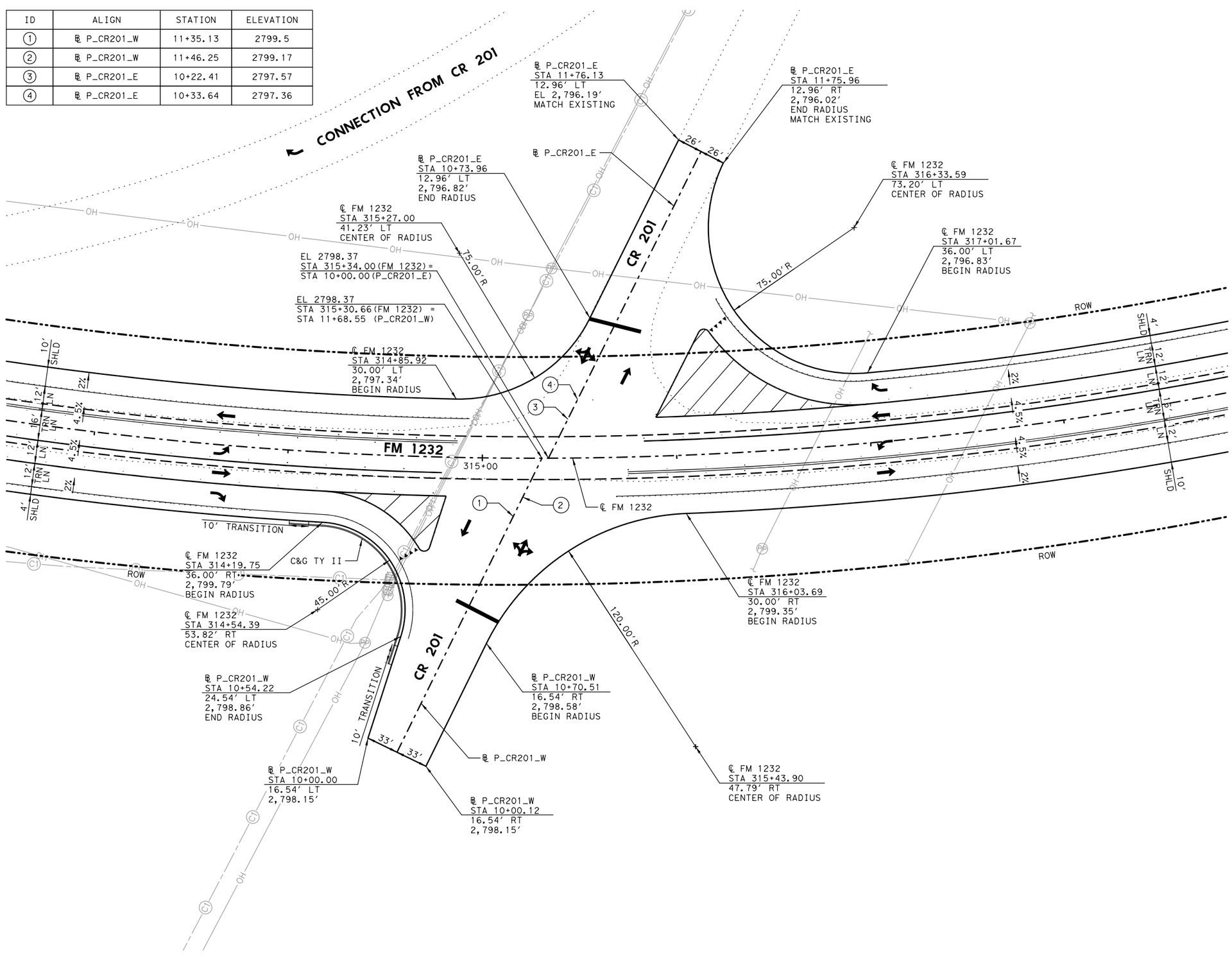
ID	ALIGN	STATION	ELEVATION
1	℄ P_CR201_W	11+35.13	2799.5
2	℄ P_CR201_W	11+46.25	2799.17
3	℄ P_CR201_E	10+22.41	2797.57
4	℄ P_CR201_E	10+33.64	2797.36



0 25 50
SCALE: 1"=50'

LEGEND

- PROPOSED EOP
- EXISTING EOP
- DIRECTION OF TRAFFIC
- CO RD

NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DATA SHEETS FOR CURVE DATA.
2. REFER TO PAVEMENT MARKING LAYOUTS FOR INFORMATION.
3. REFER TO UTILITY LAYOUTS FOR INFORMATION.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
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7/17/2023

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6090 SURETY DR, STE #104
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TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
INTERSECTION LAYOUT
COUNTY ROAD 201

SHEET 2 OF 3

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	88
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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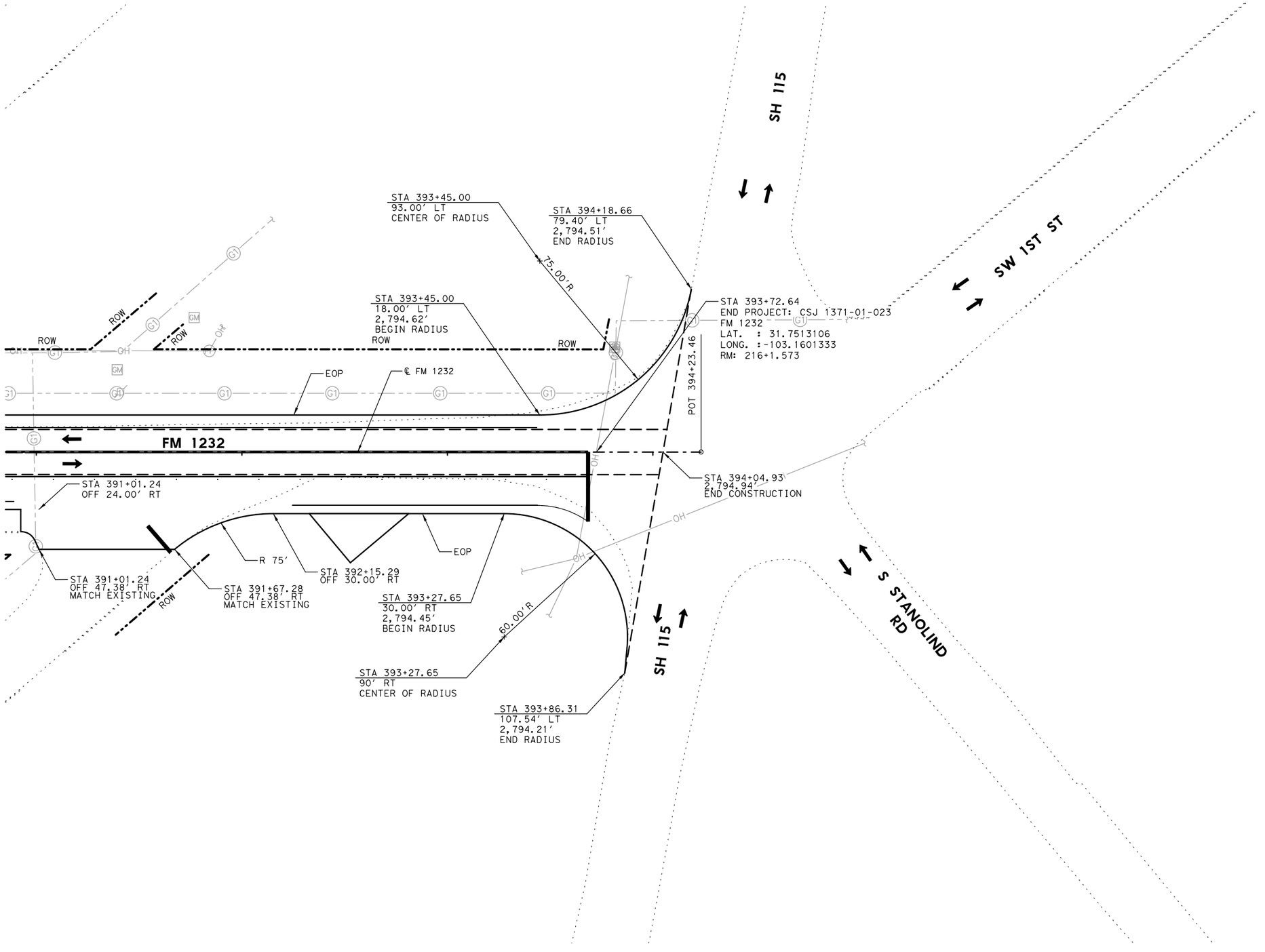

LEGEND

PROPOSED EOP

EXISTING EOP

DIRECTION OF TRAFFIC

NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DATA SHEETS FOR CURVE DATA.
2. REFER TO PAVEMENT MARKING LAYOUTS FOR INFORMATION.
3. REFER TO UTILITY LAYOUTS FOR INFORMATION.

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

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6090 SURETY DR, STE #104
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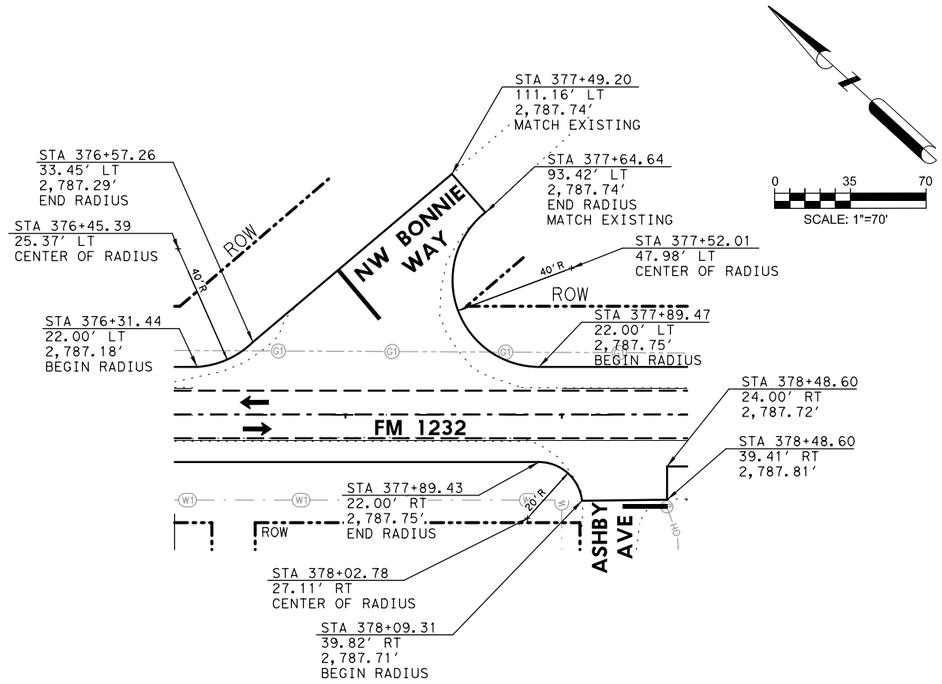
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

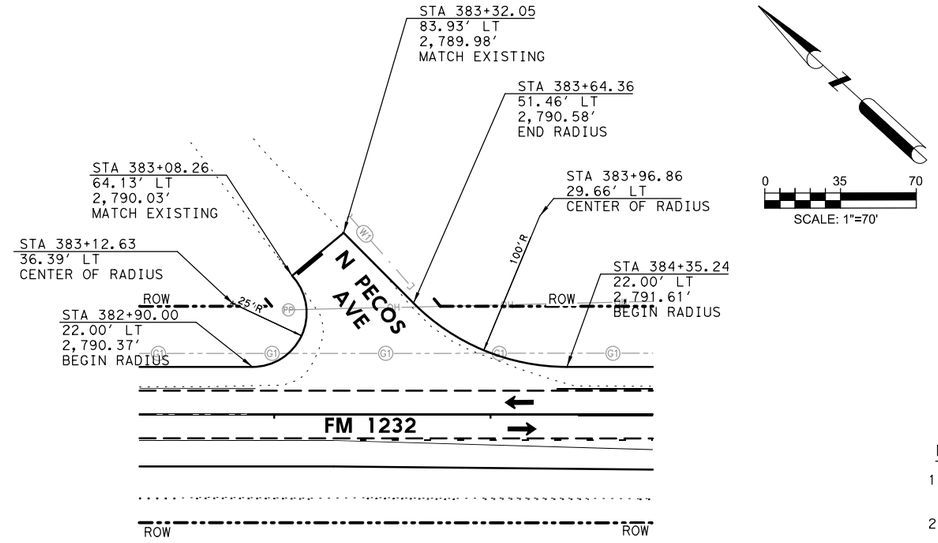
Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
INTERSECTION LAYOUT SH 115

SHEET 3 OF 3

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		89
DRN	OEI	STATE	DIST.	COUNTY	
		TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232



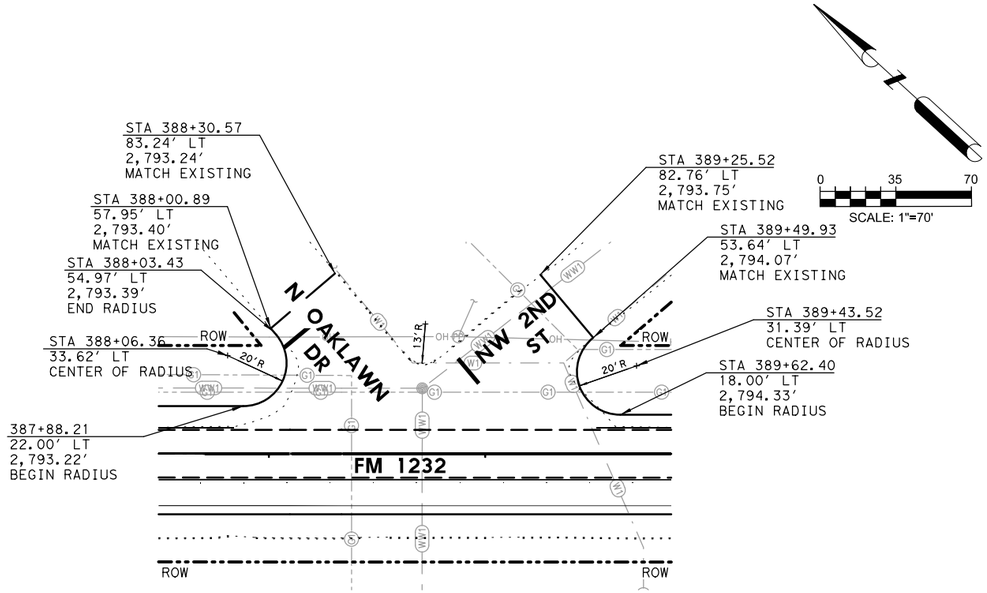


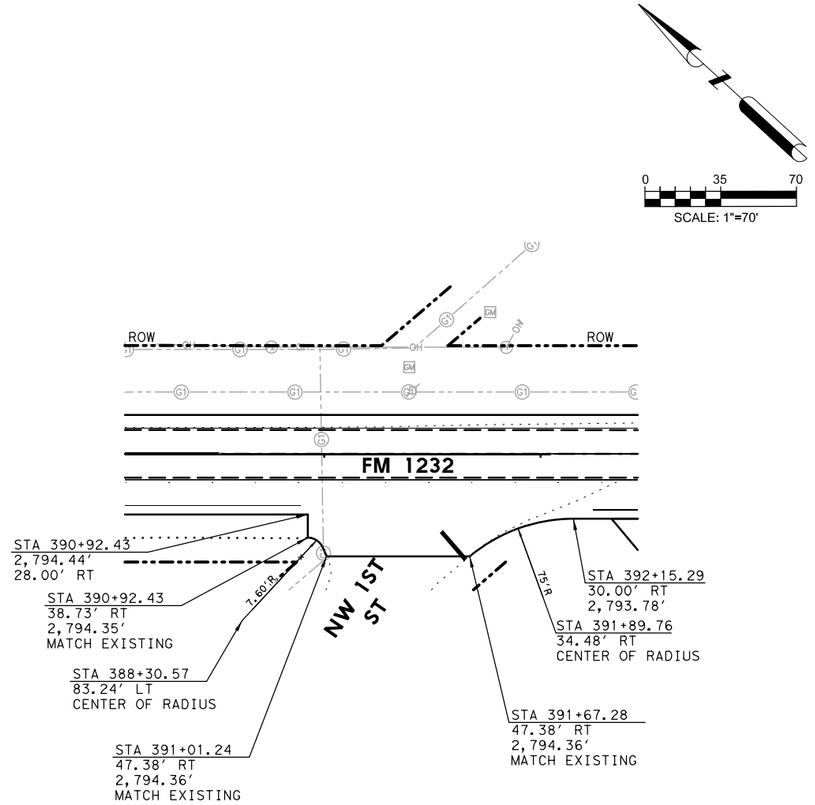
LEGEND

- PROPOSED EOP
- EXISTING EOP
- DIRECTION OF TRAFFIC

NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DATA SHEETS FOR CURVE DATA.
2. REFER TO PAVEMENT MARKING LAYOUTS FOR INFORMATION.
3. REFER TO UTILITY LAYOUTS FOR INFORMATION.





DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
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LICENSED
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7/17/2023

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Texas Department of Transportation®

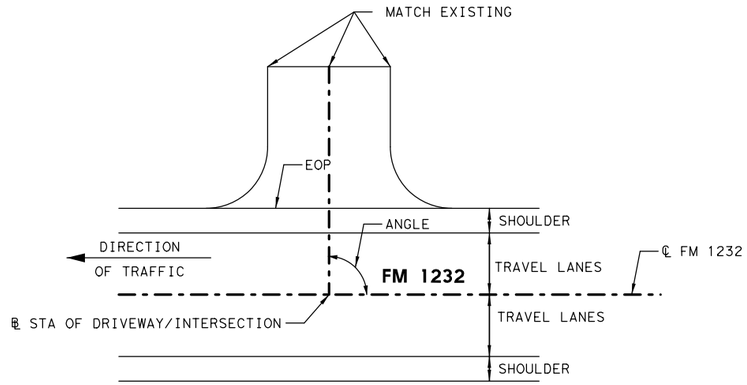
FM 1232
SH 302 TO SH 115
CROSS STREETS DETAILS

SHEET 1 OF 1

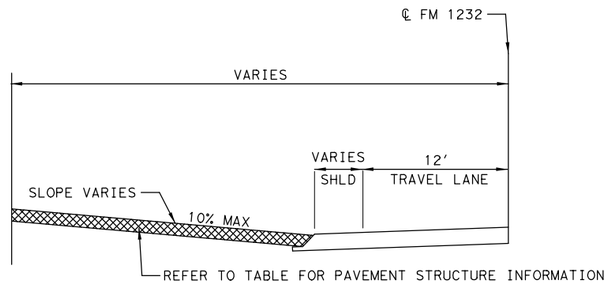
		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		90
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

P&P SHEET NUMBER	CROSS STREET NAME	STATION	LT	RT	ANGLE	EXISTING SURFACE	PROPOSED SURFACE	ROADWAY ITEM 0530 6002 INTERSECTIONS (ACP)	0247 6513 FL BS (CMP IN PLC) (TY A GR 4) (3.5")	FOR CONTRACTOR INFORMATION ONLY 0310 6005 PRIME COAT (AE-P)	0316 6017 ASPH (AC-20-5TR)	0316 6126 AGGR(TY-PB GR-4 SAC-A)	3080 6021 STONE-MTRX-ASPH SMAR-F SAC-A	3084 6001 BONDING COURSE	3077 6007 SP MIXES SP-B SAC-B PG70-22	3077 6075 TACK COAT
		STA			DEGREE	MATERIAL	MATERIAL	SY	SY	0.2 GAL/SY	0.38 GAL/SY	110 SY/CY	110 LBS/SY/IN; 2 IN	0.1 GAL/SY	110 LBS/SY/IN; 4.5 IN	0.1 GAL/SY
										GAL	GAL	CY	TON	GAL	TON	GAL
20	CONNECTION FROM CR 201	210+69.16	X		17.6	ASPHALT	ACP	205	205	41	78	2	23	21	51	21
20	W CR 201	315+30.65		X	63.9	ASPHALT	ACP	845	845	169	322	8	93	85	210	85
20	E CR 201	315+34.00	X		63.3	ASPHALT	ACP	976	976	196	371	9	108	98	242	98
26	NW BONNIE WAY	376+39.39	X		41	ASPHALT	ACP	597	597	120	227	6	66	60	148	60
26	ASHBY AVE	378+21.86		X	90	ASPHALT	ACP	80	80	16	31	1	9	8	20	8
26	N PECOS AVE	383+84.36	X		130.4	ASPHALT	ACP	362	362	73	138	4	40	37	90	37
27	N OAKLAWN DR	388+74.32	X		128.9	ASPHALT	ACP	690	690	138	263	7	76	69	171	69
27	NW 2ND ST	388+59.32	X		40.3	ASPHALT	ACP									
27	NW 1ST ST	391+34.26		X	90	ASPHALT	ACP	182	182	37	70	2	21	19	46	19
							TOTAL:	3,937	3,937	790	1,500	39	436	397	978	397

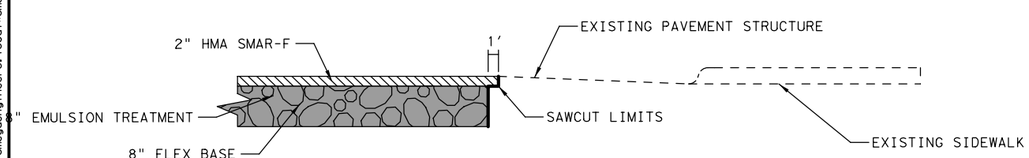
P&P SHEET NUMBER	DRIVEWAY ID	STATION	LT	RT	ANGLE	EXISTING SURFACE	PROPOSED SURFACE	ROADWAY ITEM 0530 6005 DRIVEWAYS (ACP)	0247 6513 FL BS (CMP IN PLC) (TY A GR 4) (3.5")	FOR CONTRACTOR INFORMATION ONLY 0310 6005 PRIME COAT (AE-P)	0316 6017 ASPH (AC-20-5TR)	0316 6126 AGGR(TY-PB GR-4 SAC-A)	3080 6021 STONE-MTRX-ASPH SMAR-F SAC-A	3084 6001 BONDING COURSE	3077 6007 SP MIXES SP-B SAC-B PG70-22	3077 6075 TACK COAT
		STA			DEGREE	MATERIAL	MATERIAL	SY	SY	0.2 GAL/SY	0.38 GAL/SY	110 SY/CY	110 LBS/SY/IN; 2 IN	0.1 GAL/SY	110 LBS/SY/IN; 4.5 IN	0.1 GAL/SY
										GAL	GAL	CY	TON	GAL	TON	GAL
11	1	218+78.00		X	90	ASPHALT	ACP	218	218	44	83	2	24	22	54	22
26	2	379+90.00	X		90	ASPHALT	ACP	86	86	18	33	1	10	9	22	9
26	3	381+09.54	X		90	ASPHALT	ACP	86	86	18	33	1	10	9	22	9
27	4	392+92.69		X	40	ASPHALT	ACP	65	65	13	25	1	8	7	17	7
							TOTAL:	455	455	93	174	5	52	47	115	47



PLAN OF TYPICAL DRIVEWAY/INTERSECTION



PROFILE VIEW OF DRIVEWAY/INTERSECTION



PROP WIDENING ADJACENT TO EXISTING PAVEMENT DETAIL

STA 378+00.00 TO STA 390+92.00

DATE	BY	REV	REVISION

STATE OF TEXAS
JORGE L NAVARRETE
146579
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

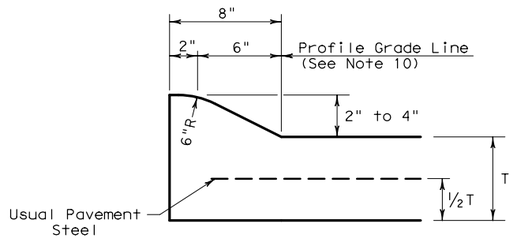
OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ROADWAY DETAILS

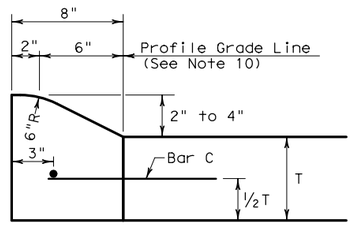
SHEET 1 OF 1

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	91
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

DATE: 7/17/2023
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete\dms14869\CCCG-22.dgn



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



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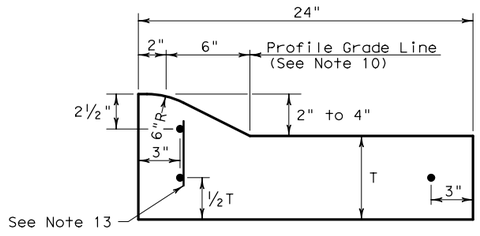
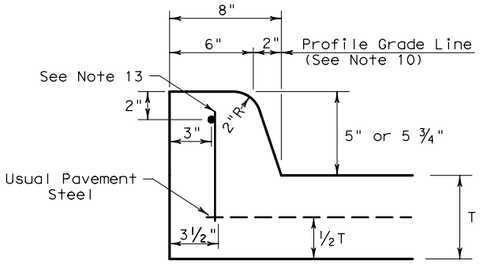
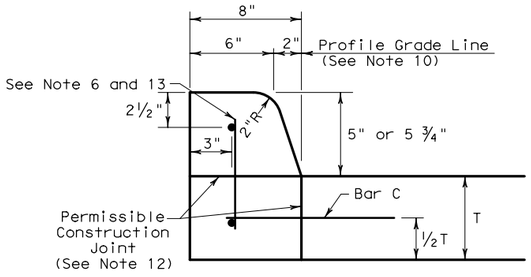


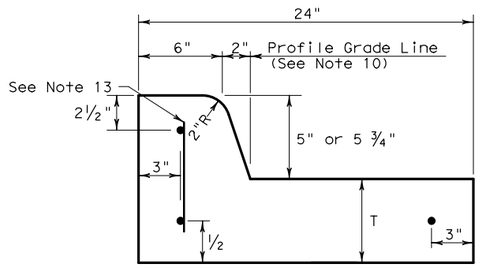
TYPE I CURB AND GUTTER
2" - 4" HEIGHT



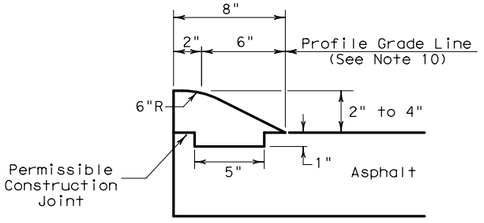
TYPE II CURB (MONOLITHIC)
5" - 5 ¾" HEIGHT



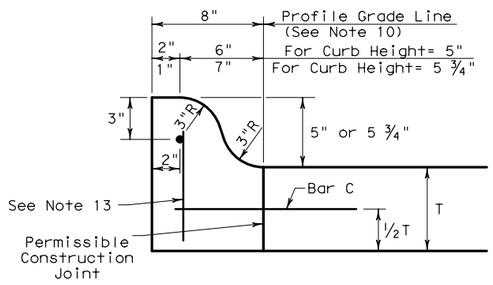
TYPE II CURB
5" - 5 ¾" HEIGHT



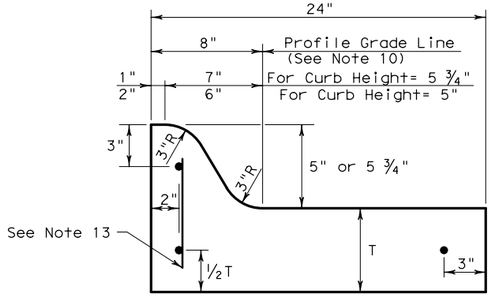
TYPE II CURB AND GUTTER
5" - 5 ¾" HEIGHT



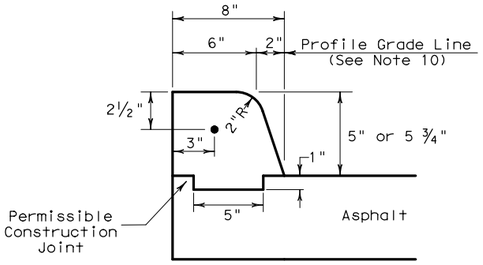
TYPE III CURB (KEYED)
2" - 4" HEIGHT



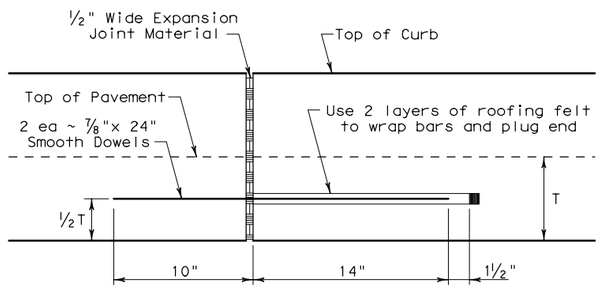
TYPE IIa CURB
5" - 5 ¾" HEIGHT



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

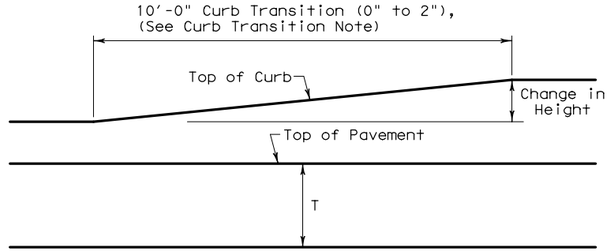


TYPE IV CURB (KEYED)
5" - 5 ¾" HEIGHT



EXPANSION JOINT DETAIL

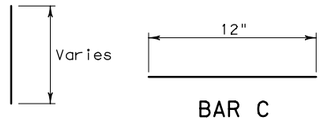
CURB TRANSITION NOTE:
Field conditions may require a longer or shorter transition, and shall be shown elsewhere in the plans, or as directed by the Engineer.



CURB TRANSITION
Note: To be paid for as Highest Curb

GENERAL NOTES

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



BAR B

BAR C

Texas Department of Transportation

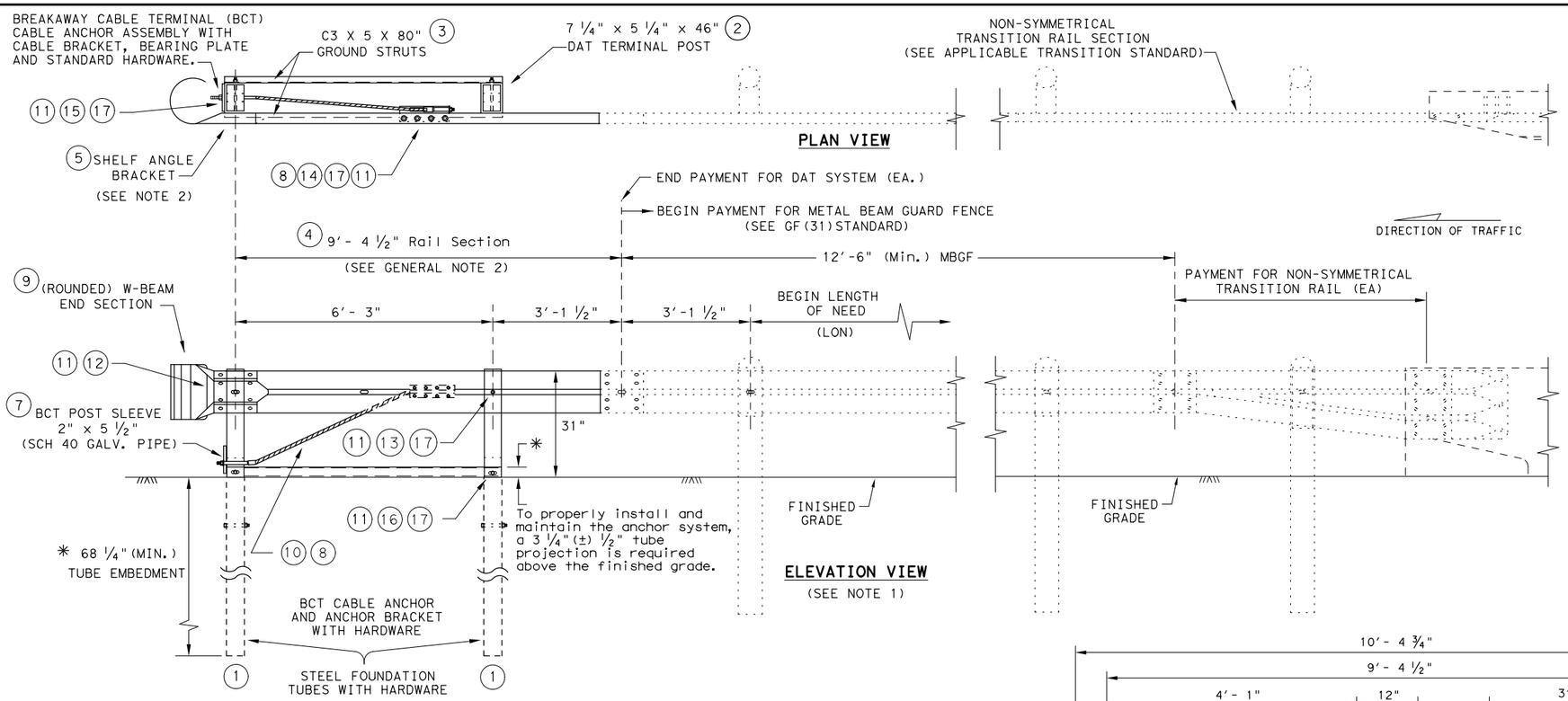
Design Division Standard

CONCRETE CURB AND CURB AND GUTTER

CCCG-22

FILE: cccg21.dgn	DN: TXDOT	CK: AN	DW: CS	CK: KM
©TxDOT: JUNE 2022 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		92

DATE: 7/17/2023
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete\dms14869\GF(31)-19.dgn



DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

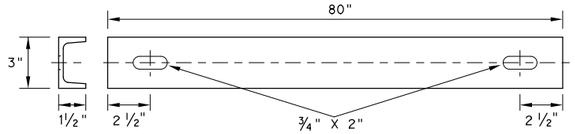
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN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

MOW STRIP INSTALLATION

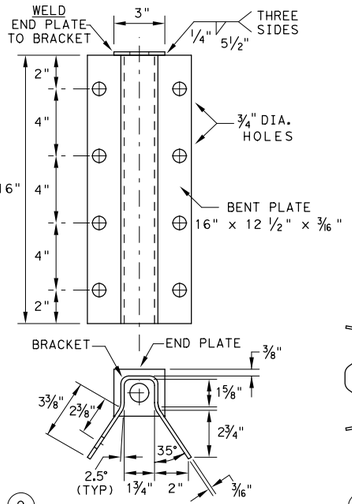
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

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

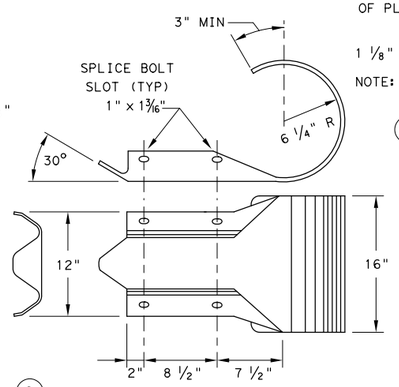
(4) **TERMINAL RAIL ELEMENT FOR DAT**



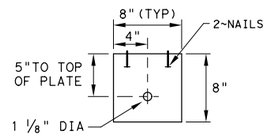
(3) **CHANNEL STRUT**
C3 X 5 X 80", GRADE A36



(8) **GUARDRAIL ANCHOR BRACKET**

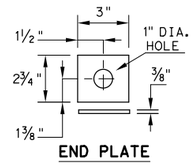


(9) **W-BEAM END SECTION (ROUNDED) (12 GA.)**

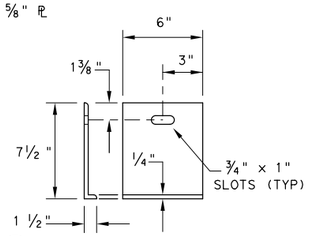


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

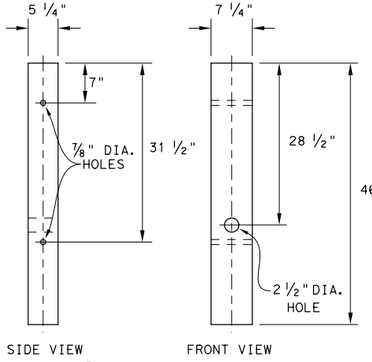
(6) **BEARING PLATE**
8"x 8"x 5/8" PL



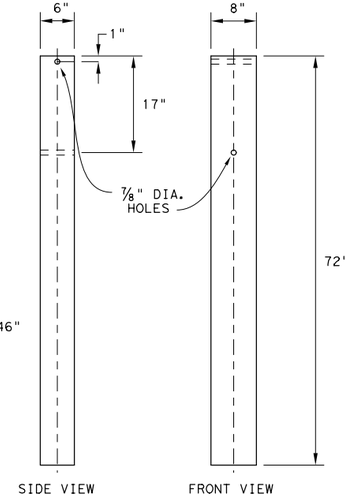
END PLATE



(5) **SHELF ANGLE BRACKET**



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



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

Texas Department of Transportation

Design Division Standard

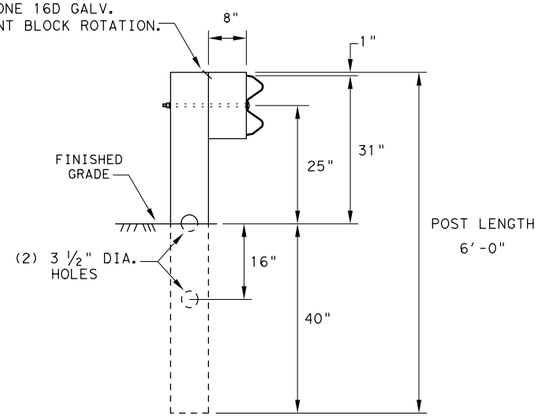
METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
© TxDOT:	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1371	01	023	FM 1232	
	DIST	COUNTY		SHEET NO.	
	ODA	WINKLER		93	

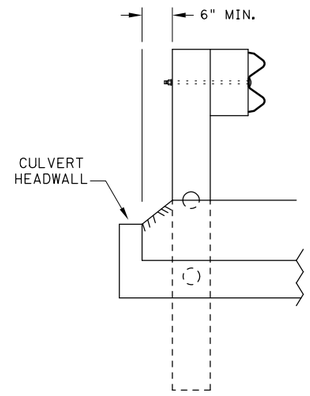
DATE: 7/17/2023
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete\dms14869\GF(31)LS-19.dgn

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



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

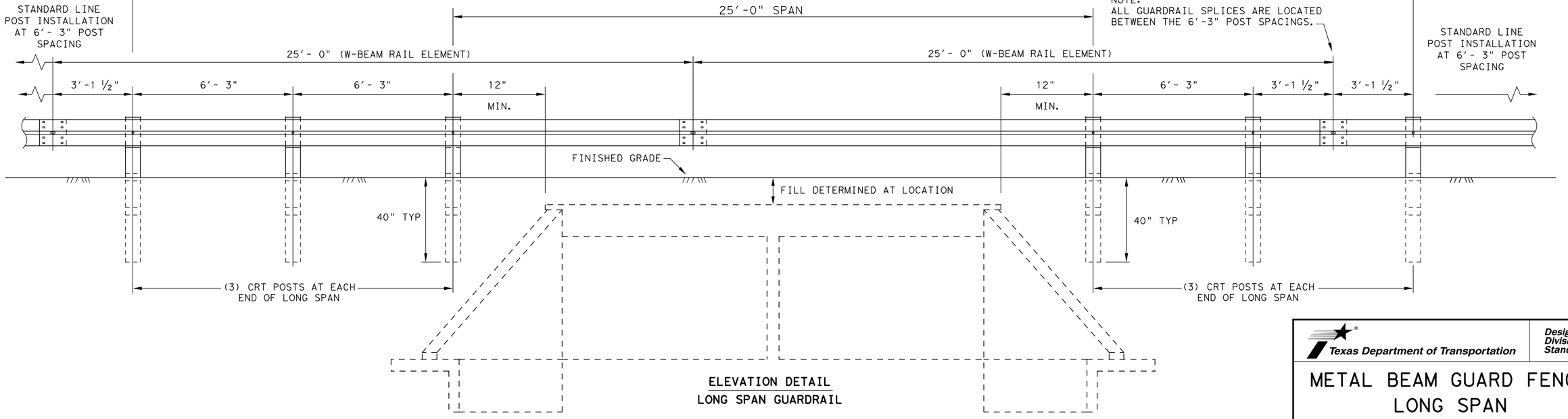
GENERAL NOTES

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.

DIRECTION OF TRAFFIC

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.

GF(31) - LONG SPAN SYSTEM (PAID FOR BY THE EACH)



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

FILE: gf31ls19.dgn	DN: TxDOT		CK: KM	DW: VP		CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1371	01	023		FM 1232	
	DIST	COUNTY				SHEET NO.
	ODA	WINKLER				94

DATE: 7/17/2023
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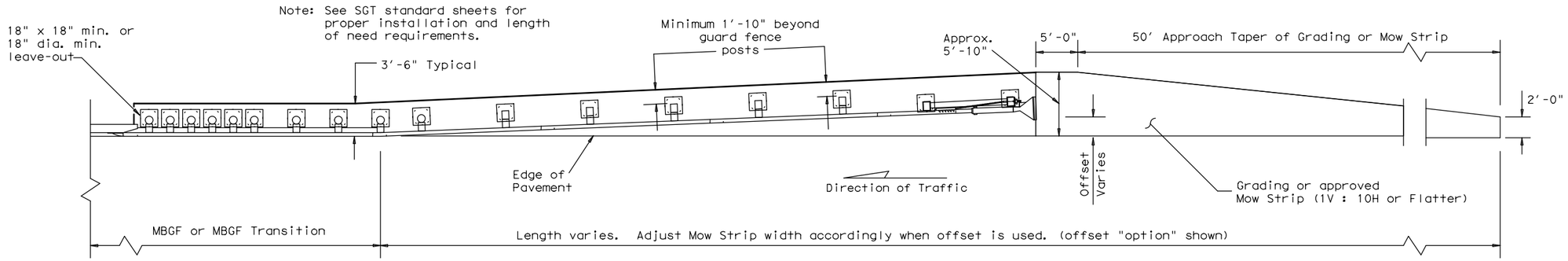
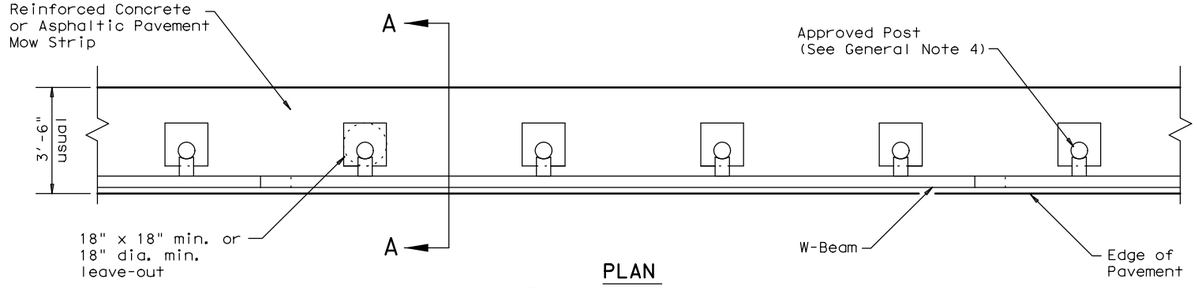
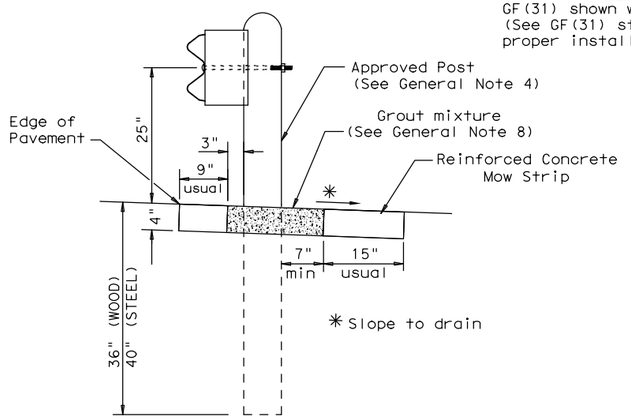


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



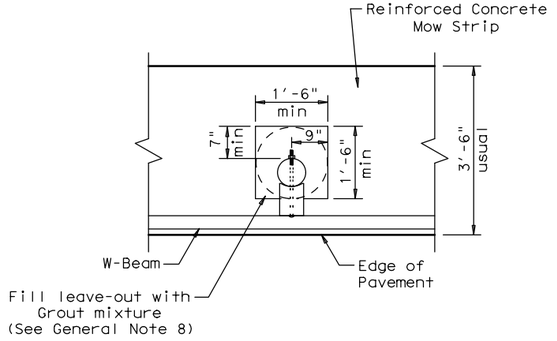
PLAN

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



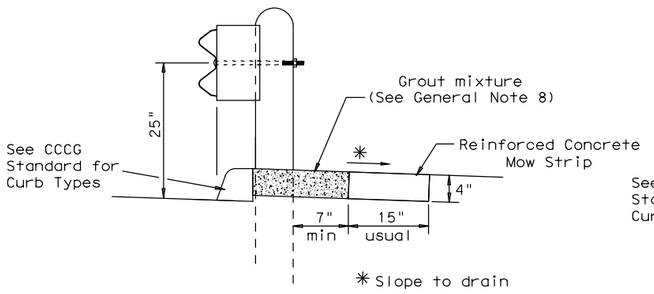
SECTION A-A

Typical



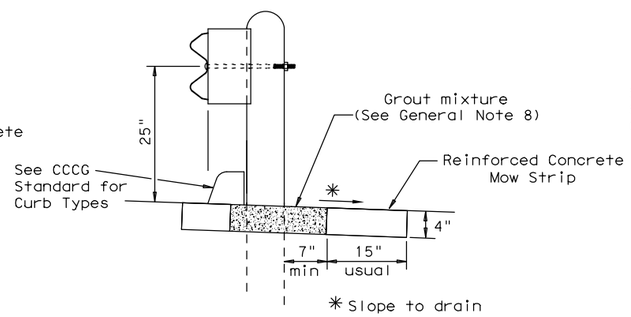
MOW STRIP DETAIL

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



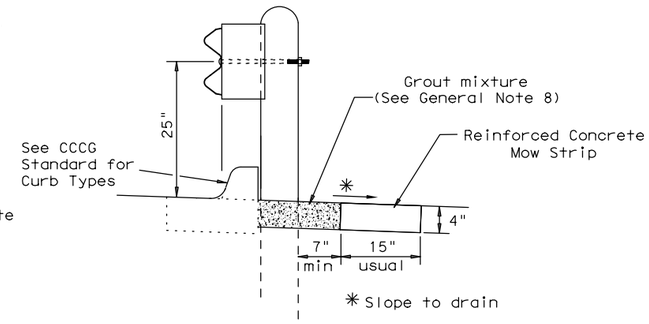
CURB OPTION (1)

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	1371	01	023		FM 1232	
	DIST	COUNTY			SHEET NO.	
	ODA	WINKLER			95	

DATE: 7/17/2023
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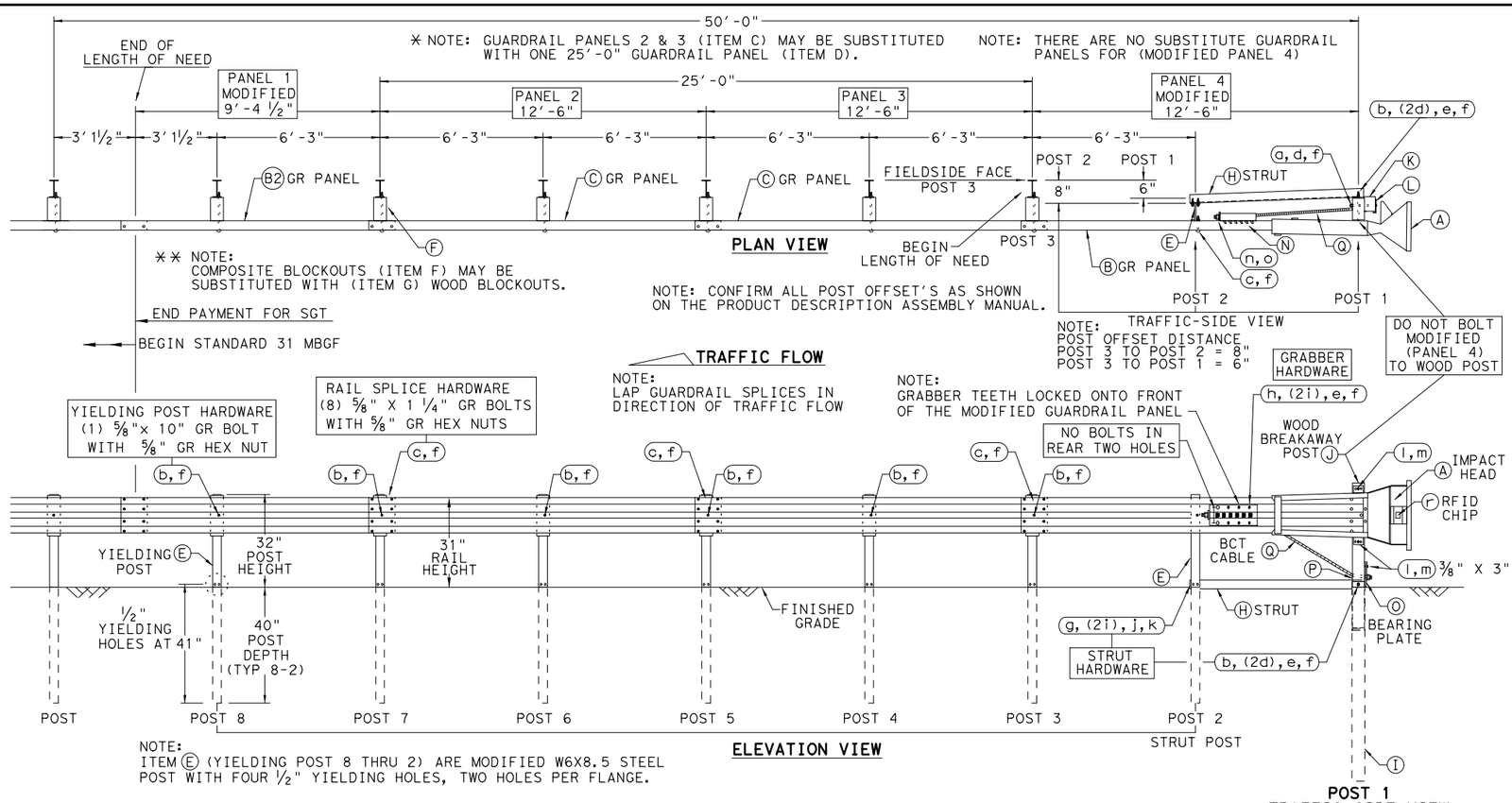
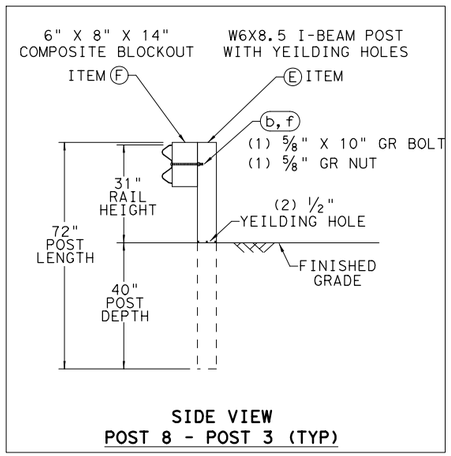


GENERAL NOTES

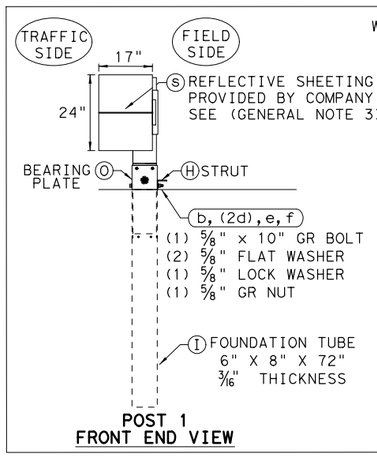
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

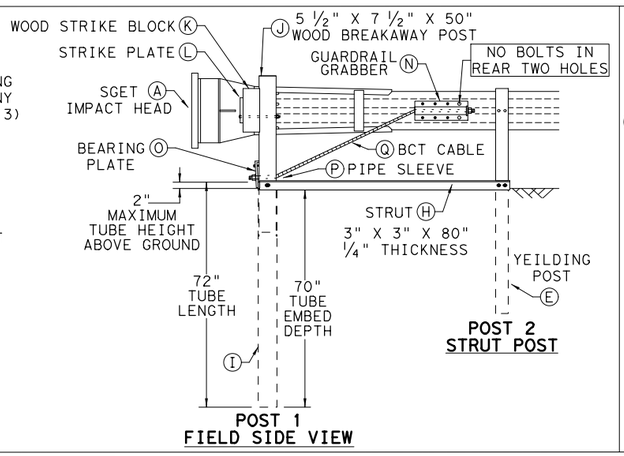
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



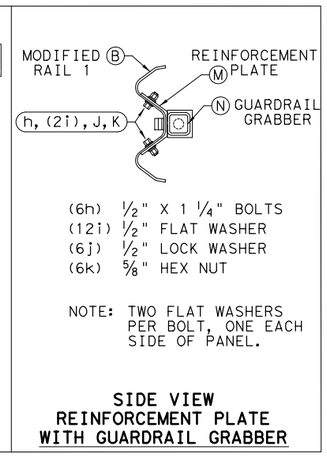
SIDE VIEW
POST 8 - POST 3 (TYP)



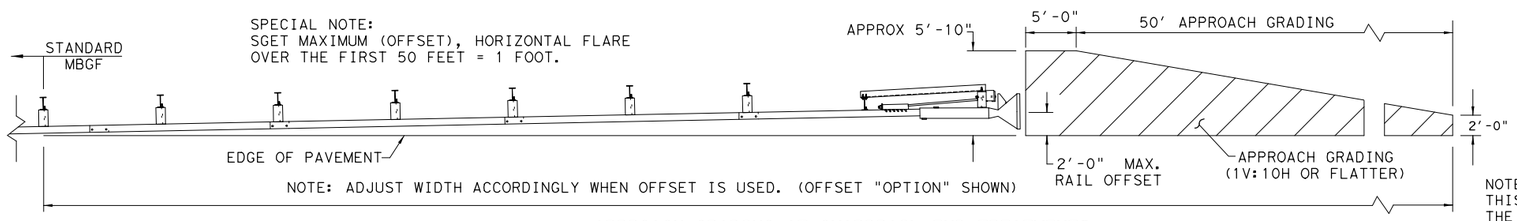
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		96

DATE: 7/17/2023
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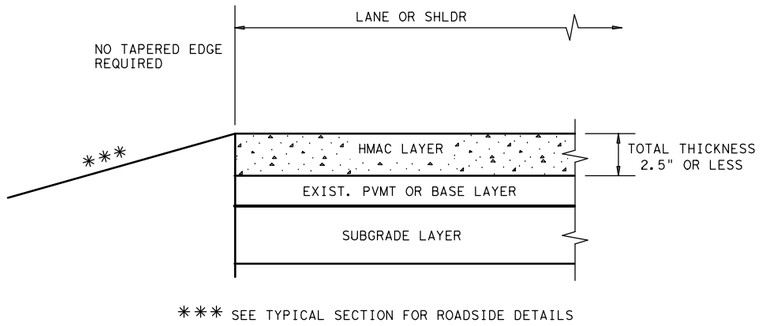
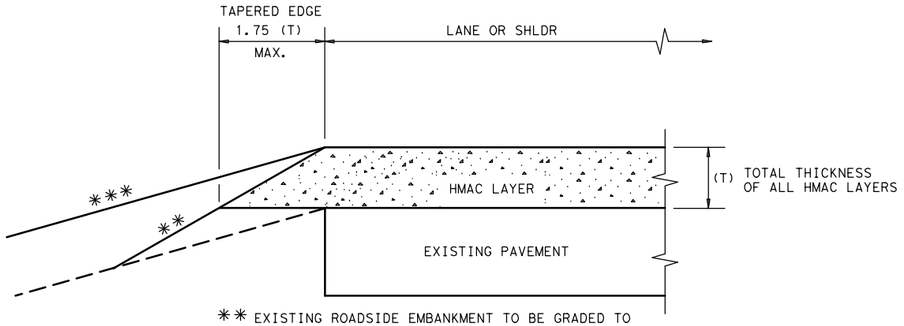


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

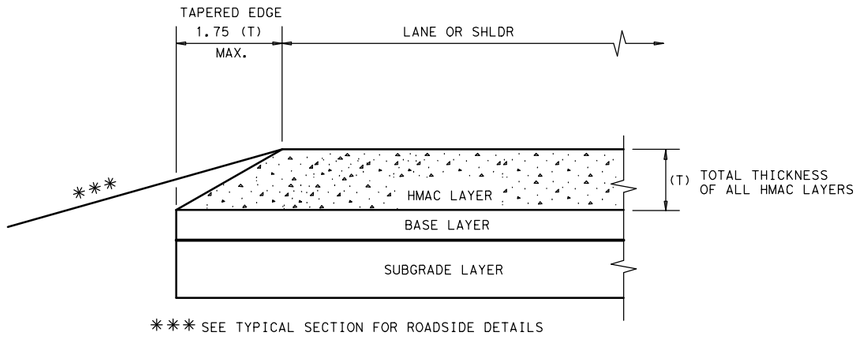
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

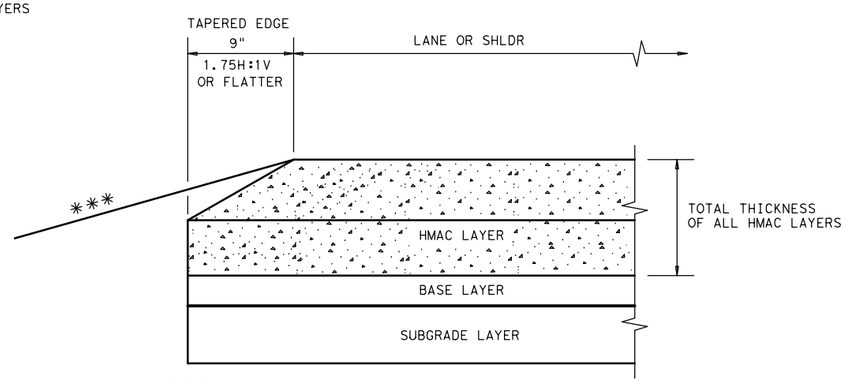
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

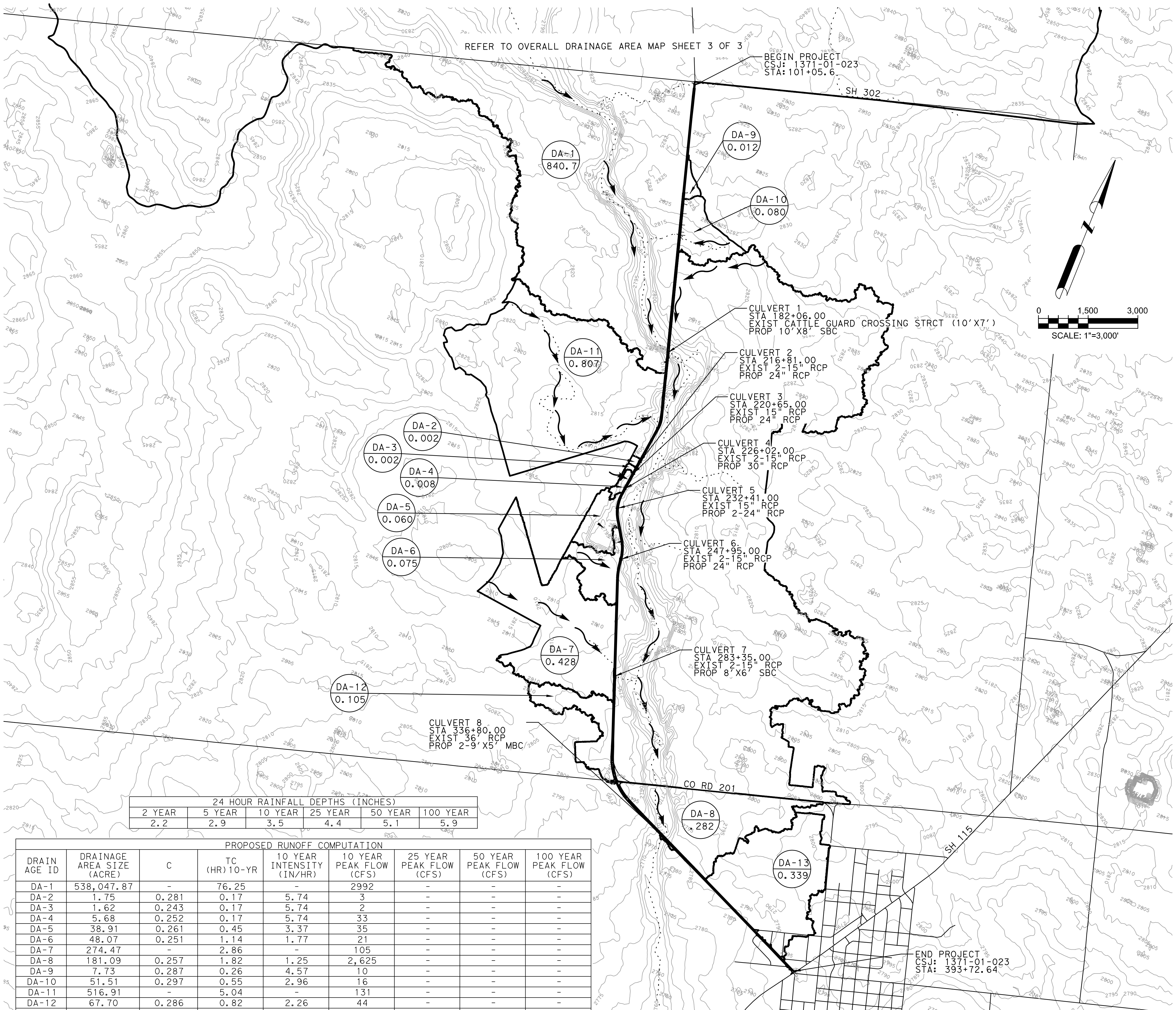
Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS HMAC PAVEMENT

TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		97



24 HOUR RAINFALL DEPTHS (INCHES)					
2 YEAR	5 YEAR	10 YEAR	25 YEAR	50 YEAR	100 YEAR
2.2	2.9	3.5	4.4	5.1	5.9

PROPOSED RUNOFF COMPUTATION

DRAINAGE ID	DRAINAGE AREA SIZE (ACRE)	C	TC (HR) 10-YR	10 YEAR INTENSITY (IN/HR)	10 YEAR PEAK FLOW (CFS)	25 YEAR PEAK FLOW (CFS)	50 YEAR PEAK FLOW (CFS)	100 YEAR PEAK FLOW (CFS)
DA-1	538,047.87	-	76.25	-	2992	-	-	-
DA-2	1.75	0.281	0.17	5.74	3	-	-	-
DA-3	1.62	0.243	0.17	5.74	2	-	-	-
DA-4	5.68	0.252	0.17	5.74	33	-	-	-
DA-5	38.91	0.261	0.45	3.37	35	-	-	-
DA-6	48.07	0.251	1.14	1.77	21	-	-	-
DA-7	274.47	-	2.86	-	105	-	-	-
DA-8	181.09	0.257	1.82	1.25	2,625	-	-	-
DA-9	7.73	0.287	0.26	4.57	10	-	-	-
DA-10	51.51	0.297	0.55	2.96	16	-	-	-
DA-11	516.91	-	5.04	-	131	-	-	-
DA-12	67.70	0.286	0.82	2.26	44	-	-	-
DA-13	217.04	-	2.56	-	107	-	-	-

LEGEND

- DA-# / XX — SUB AREA ID / SQ MILES
- DRAINAGE AREA BOUNDARY
- 5FT CONTOURS
- FLOW DIRECTION

1. THE PROJECT AREA IS LOCATED WITHIN AN UNMAPPED/UNSTUDIED FEMA AREA.
2. ALL ELEVATIONS ARE BASED ON NAVD 1988 VERTICAL DATUM.
3. THE DESIGN FREQUENCY FOR THIS PROJECT IS THE 10-YEAR FREQUENCY AND CHECKED FOR THE 100-YR FREQUENCY.
4. PEAK FLOW ESTIMATION/HYDROLOGY WAS DEVELOPED BASED ON THE RATIONAL METHOD FOR DA LESS THAN 200 ACRES AND THE HYDROGRAPH METHOD FOR DA GREATER THAN 200 ACRES AS PER TXDOT HDM SEPTEMBER 2019.
5. NOAA ATLAS 14-POINT PRECIPITATION FREQUENCY DEPTH ESTIMATES, 24-HOUR DURATION WERE USED.
6. HYDRAULIC ANALYSIS FOR CROSS CULVERTS WAS PERFORMED USING FHWA-HY8 7.6.
7. LARGE SECTIONS OF THE 100-YR RAIN EVENT WATERSHED ARE NON-CONTRIBUTING FOR LOWER FREQUENCY STORM EVENTS.
8. TWO SETS OF WATERSHEDS WERE DELINEATED FOR EACH OUTFALL TO ASSIST WITH DESIGN AND CHECK FLOOD EVENTS.
9. PEAK FLOW, CONTRIBUTING DRAINAGE AREA, AND TIME OF CONCENTRATION USED IS SUMMARIZE IN HYDROLOGIC TABLE.
10. PEAK FLOWS SHOWN IN TABLE BASED ON CONTRIBUTING AREA PER FREQUENCY STORM EVENT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED PROFESSIONAL ENGINEER
7/17/2023
H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
OVERALL DRAINAGE AREA MAP-10YR

SHEET 1 OF 3

DSN	OEI	FED.RD. DIV.NO. 6	PROJECT NO. SEE TITLE SHEET		SHEET NO. 98
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
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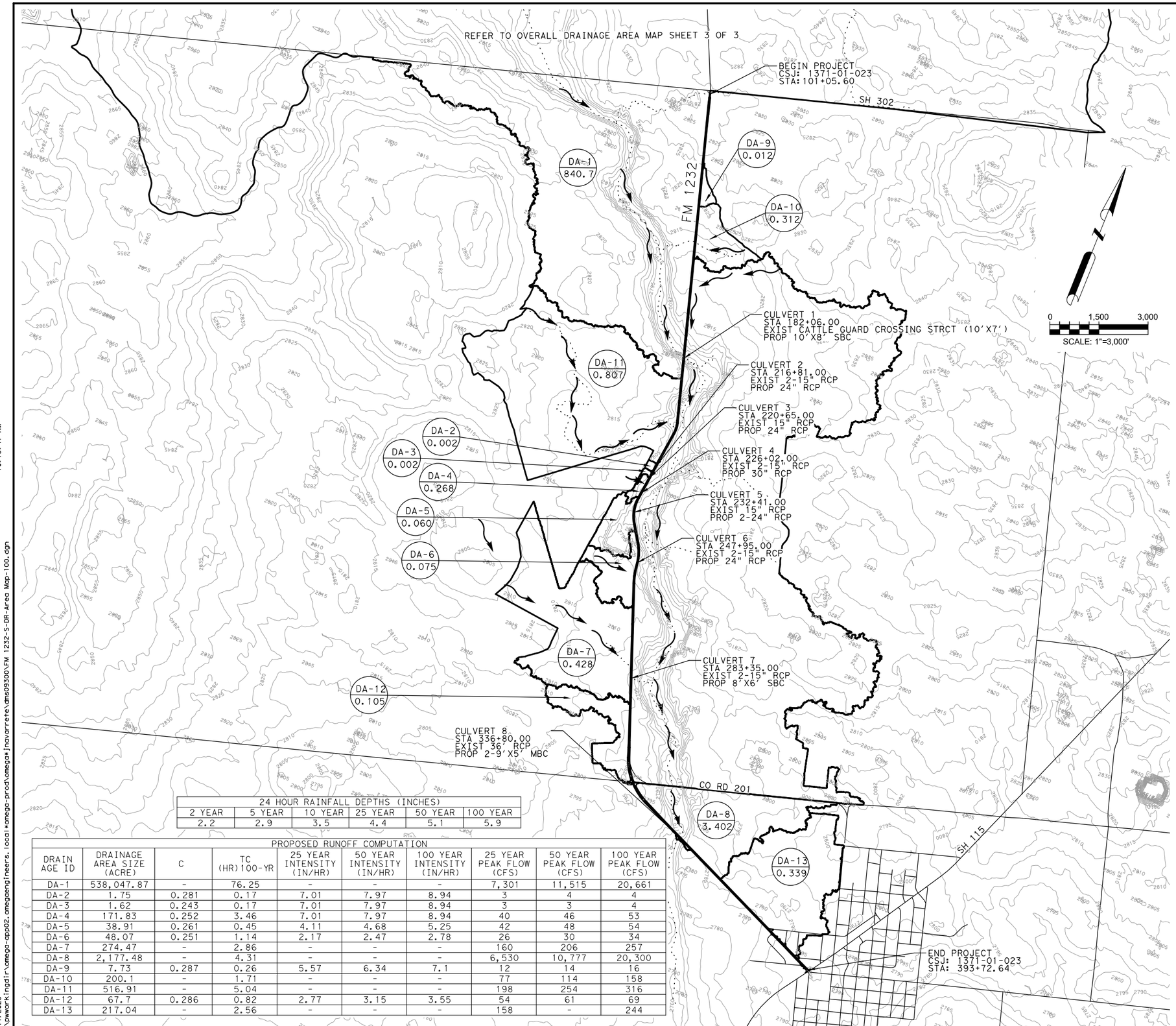

24 HOUR RAINFALL DEPTHS (INCHES)					
2 YEAR	5 YEAR	10 YEAR	25 YEAR	50 YEAR	100 YEAR
2.2	2.9	3.5	4.4	5.1	5.9

PROPOSED RUNOFF COMPUTATION

DRAIN AGE ID	DRAINAGE AREA SIZE (ACRE)	C	TC (HR)100-YR	25 YEAR INTENSITY (IN/HR)	50 YEAR INTENSITY (IN/HR)	100 YEAR INTENSITY (IN/HR)	25 YEAR PEAK FLOW (CFS)	50 YEAR PEAK FLOW (CFS)	100 YEAR PEAK FLOW (CFS)
DA-1	538,047.87	-	76.25	-	-	-	7,301	11,515	20,661
DA-2	1.75	0.281	0.17	7.01	7.97	8.94	3	4	4
DA-3	1.62	0.243	0.17	7.01	7.97	8.94	3	3	4
DA-4	171.83	0.252	3.46	7.01	7.97	8.94	40	46	53
DA-5	38.91	0.261	0.45	4.11	4.68	5.25	42	48	54
DA-6	48.07	0.251	1.14	2.17	2.47	2.78	26	30	34
DA-7	274.47	-	2.86	-	-	-	160	206	257
DA-8	2,177.48	-	4.31	-	-	-	6,530	10,777	20,300
DA-9	7.73	0.287	0.26	5.57	6.34	7.1	12	14	16
DA-10	200.1	-	1.71	-	-	-	77	114	158
DA-11	516.91	-	5.04	-	-	-	198	254	316
DA-12	67.7	0.286	0.82	2.77	3.15	3.55	54	61	69
DA-13	217.04	-	2.56	-	-	-	158	-	244

LEGEND

DA-# / XX — SUB AREA ID / SQ MILES

DRAINAGE AREA BOUNDARY

5FT CONTOURS

FLOW DIRECTION

1. THE PROJECT AREA IS LOCATED WITHIN AN UNMAPPED/UNSTUDIED FEMA AREA.
2. ALL ELEVATIONS ARE BASED ON NAVD 1988 VERTICAL DATUM.
3. THE DESIGN FREQUENCY FOR THIS PROJECT IS THE 10-YEAR FREQUENCY AND CHECKED FOR THE 100-YR FREQUENCY.
4. PEAK FLOW ESTIMATION/HYDROLOGY WAS DEVELOPED BASED ON THE RATIONAL METHOD FOR DA LESS THAN 200 ACRES AND THE HYDROGRAPH METHOD FOR DA GREATER THAN 200 ACRES AS PER TXDOT HDM SEPTEMBER 2019.
5. NOAA ATLAS 14-POINT PRECIPITATION FREQUENCY DEPTH ESTIMATES, 24-HOUR DURATION WERE USED.
6. HYDRAULIC ANALYSIS FOR CROSS CULVERTS WAS PERFORMED USING FHWA-HY8 7.6.
7. LARGE SECTIONS OF THE 100-YR RAIN EVENT WATERSHED ARE NON-CONTRIBUTING FOR LOWER FREQUENCY STORM EVENTS.
8. TWO SETS OF WATERSHEDS WERE DELINEATED FOR EACH OUTFALL TO ASSIST WITH DESIGN AND CHECK FLOOD EVENTS.
9. PEAK FLOW, CONTRIBUTING DRAINAGE AREA, AND TIME OF CONCENTRATION USED IS SUMMARIZE IN HYDROLOGIC TABLE.
10. PEAK FLOWS SHOWN IN TABLE BASED ON CONTRIBUTING AREA PER FREQUENCY STORM EVENT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115

OVERALL DRAINAGE AREA MAP-100YR

SHEET 2 OF 3

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	99
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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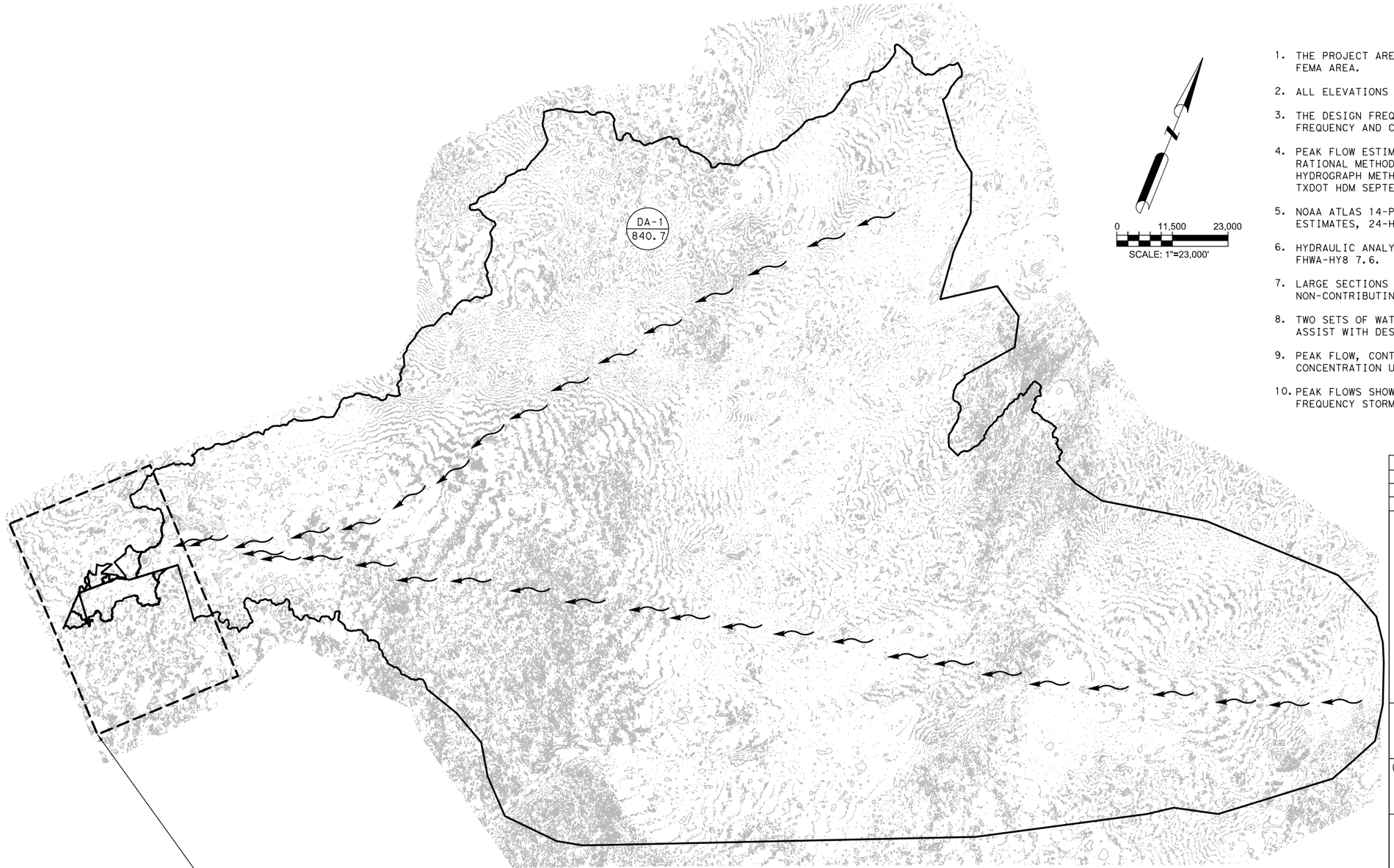

LEGEND

- DA-# / XX — SUB AREA ID; SQ MILES
- DRAINAGE AREA BOUNDARY
- 5FT CONTOURS
- FLOW DIRECTION

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5. NOAA ATLAS 14-POINT PRECIPITATION FREQUENCY DEPTH ESTIMATES, 24-HOUR DURATION WERE USED.
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7. LARGE SECTIONS OF THE 100-YR RAIN EVENT WATERSHED ARE NON-CONTRIBUTING FOR LOWER FREQUENCY STORM EVENTS.
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DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
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07/17/2023
H. Fernández, P.E.

OMEGA ENGINEERS, INC.
8200 N MOPAC EXPRESSWAY, STE #280
AUSTIN, TEXAS 78759
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:512 575 2288 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

OVERALL DRAINAGE AREA MAP

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		100
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ODA	WINKLER	
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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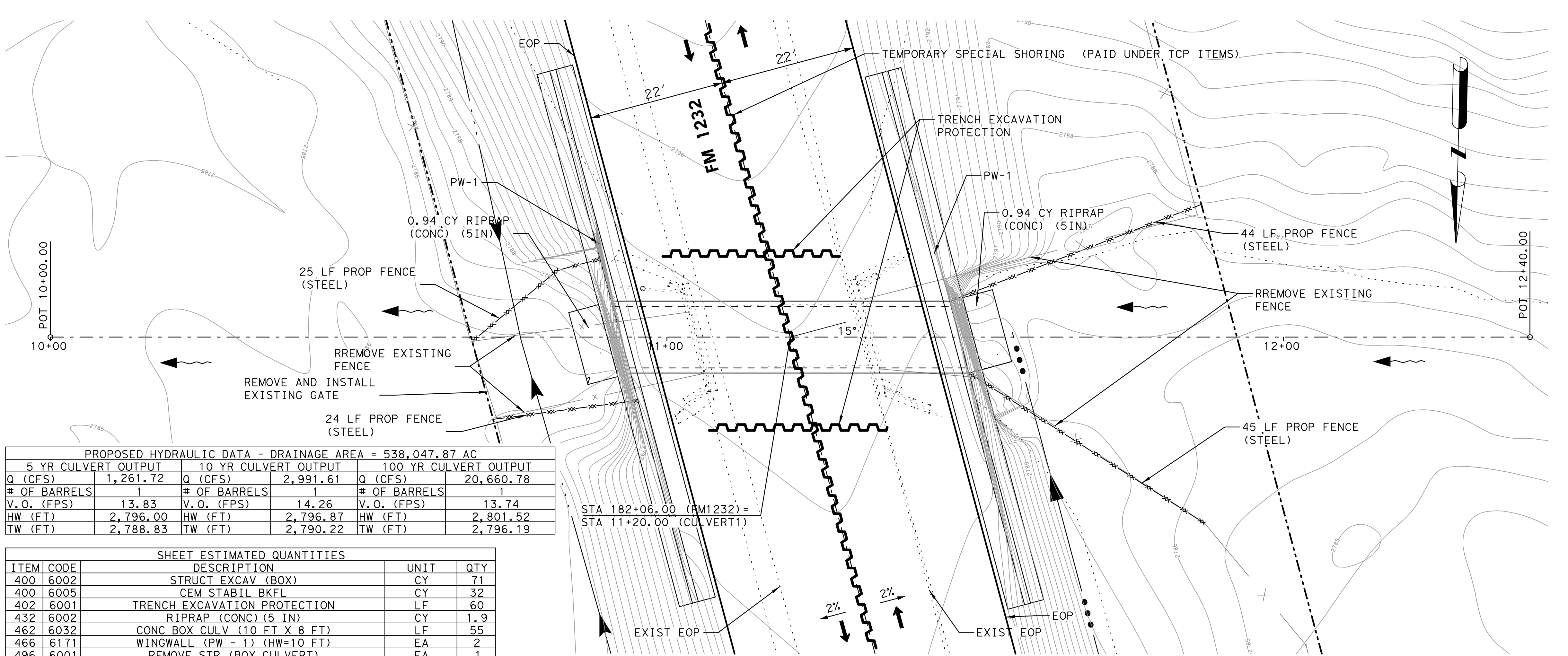


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 538,047.87 AC					
5 YR CULVERT OUTPUT		10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	1,261.72	Q (CFS)	2,991.61	Q (CFS)	20,660.78
# OF BARRELS	1	# OF BARRELS	1	# OF BARRELS	1
V.O. (FPS)	13.83	V.O. (FPS)	14.26	V.O. (FPS)	13.74
HW (FT)	2,796.00	HW (FT)	2,796.87	HW (FT)	2,801.52
TW (FT)	2,788.83	TW (FT)	2,790.22	TW (FT)	2,796.19

SHEET ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6002	STRUCT EXCAV (BOX)	CY	71
400	6005	CEM STABIL BKFL	CY	32
402	6001	TRENCH EXCAVATION PROTECTION	LF	60
432	6002	RIPRAP (CONC)(5 IN)	CY	1.9
462	6032	CONC BOX CULV (10 FT X 8 FT)	LF	55
466	6171	WINGWALL (PW - 1) (HW=10 FT)	EA	2
496	6001	REMOVE STR (BOX CULVERT)	EA	1
496	6005	REMOV STR (WINGWALL)	EA	2
5107	6001	STEEL FENCE (REMOVE)	LF	213
5107	6002	STEEL FENCE (INSTALL)	LF	138

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.

SCALE: 1"=20' H
1"=10' V

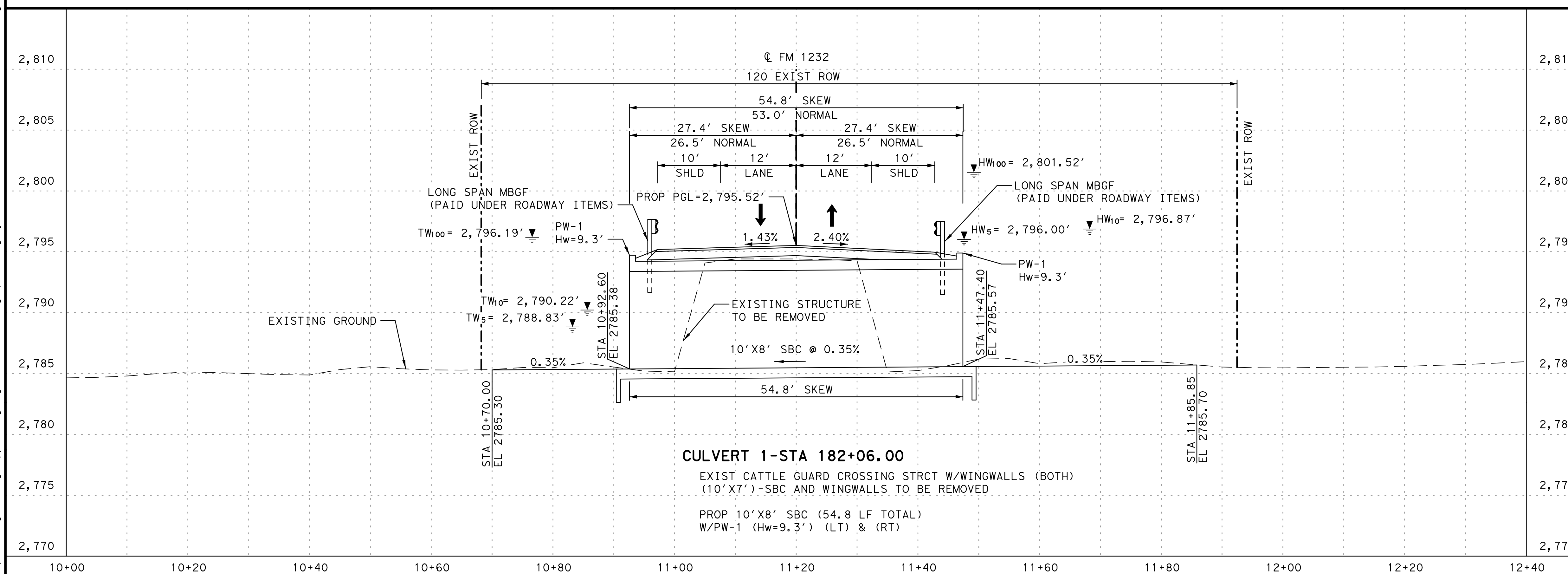
LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467)SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2 AND "GRADE BREAK CONSTRUCTION" PH 1 & 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION



CULVERT 1-STA 182+06.00

EXIST CATTLE GUARD CROSSING STRCT W/WINGWALLS (BOTH) (10'X7')-SBC AND WINGWALLS TO BE REMOVED

PROP 10'X8' SBC (54.8 LF TOTAL) W/PW-1 (Hw=9.3') (LT) & (RT)

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED PROFESSIONAL ENGINEER
7/17/2023
H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
CULVERT LAYOUT 1

SHEET 1 OF 8

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		101
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ODA	WINKLER	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	1371	01	023	FM 1232

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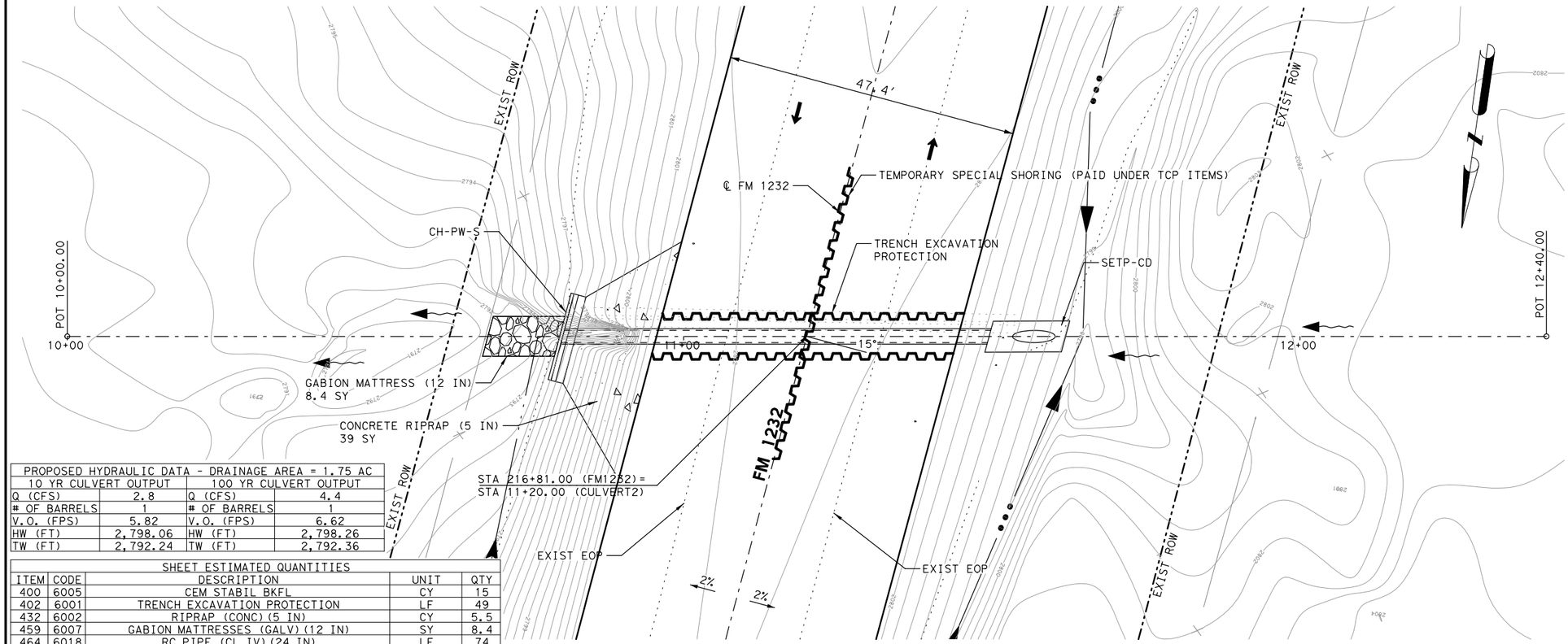
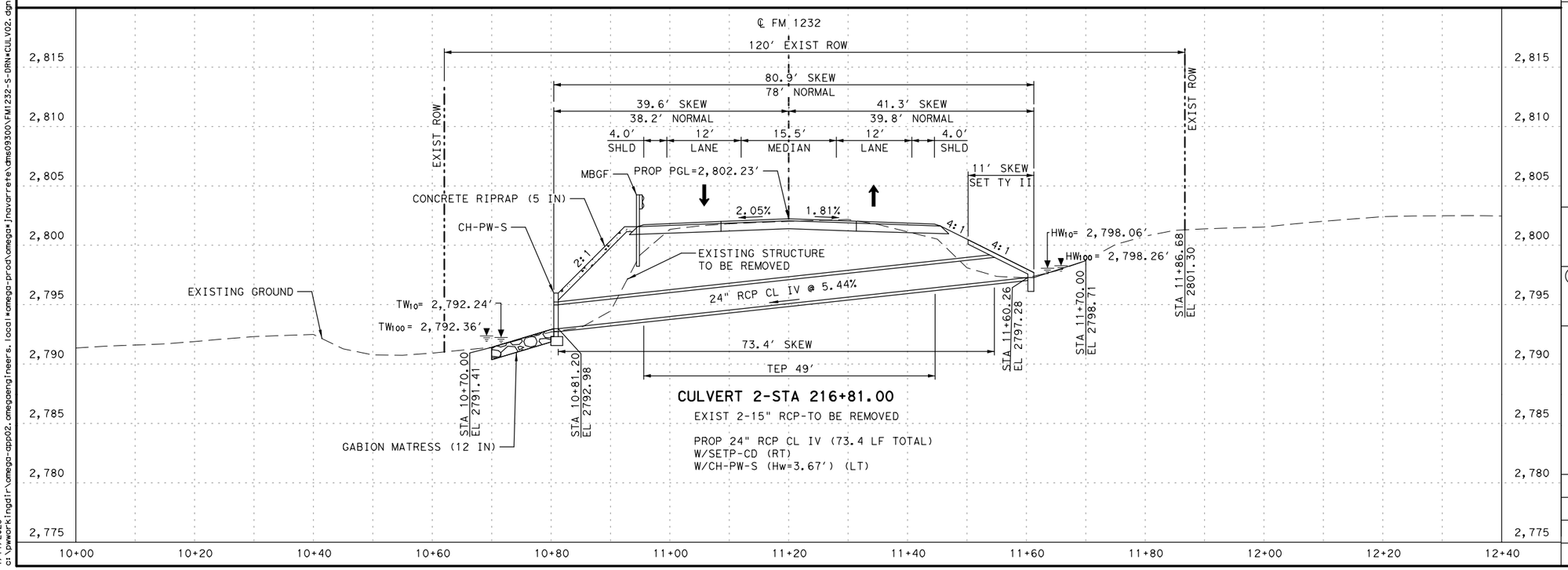


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 1.75 AC			
10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	2.8	Q (CFS)	4.4
# OF BARRELS	1	# OF BARRELS	1
V.O. (FPS)	5.82	V.O. (FPS)	6.62
HW (FT)	2,798.06	HW (FT)	2,798.26
TW (FT)	2,792.24	TW (FT)	2,792.36

SHEET ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6005	CEM STABIL BKFL	CY	15
402	6001	TRENCH EXCAVATION PROTECTION	LF	49
432	6002	RIPRAP (CONC) (5 IN)	CY	5.5
459	6007	GABION MATTRESSES (GALV) (12 IN)	SY	8.4
464	6018	RC PIPE (CL IV) (24 IN)	LF	74
466	6130	HEADWALL (CH - PW - S) (DIA= 24 IN)	EA	1
467	6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	1
496	6007	REMOV STR (PIPE)	LF	60



CULVERT 2-STA 216+81.00

EXIST 2-15" RCP-TO BE REMOVED

PROP 24" RCP CL IV (73.4 LF TOTAL)
W/SETP-CD (RT)
W/CH-PW-S (Hw=3.67') (LT)

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.

0 10 20
SCALE: 1"=20' H
1"=10' V

LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467) SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
7/17/2023
H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 2

SHEET 2 OF 8

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	102
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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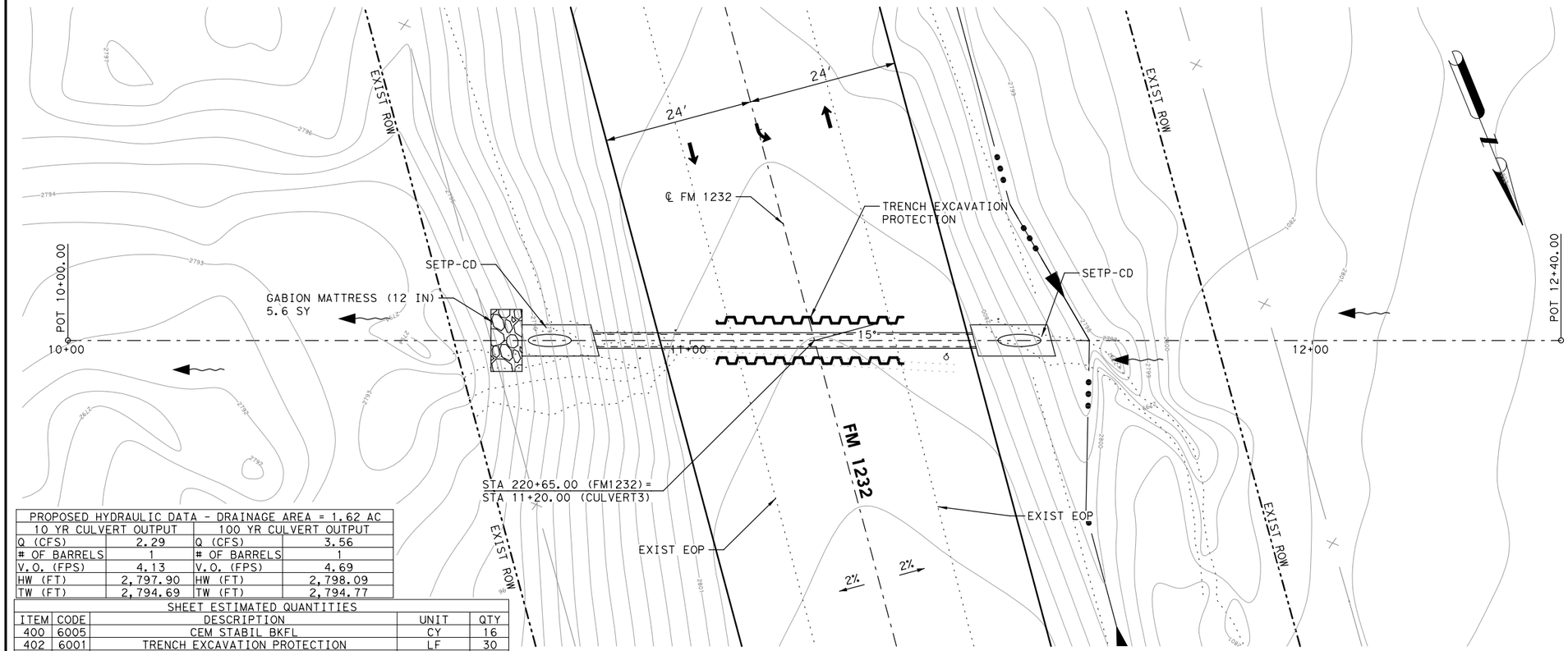
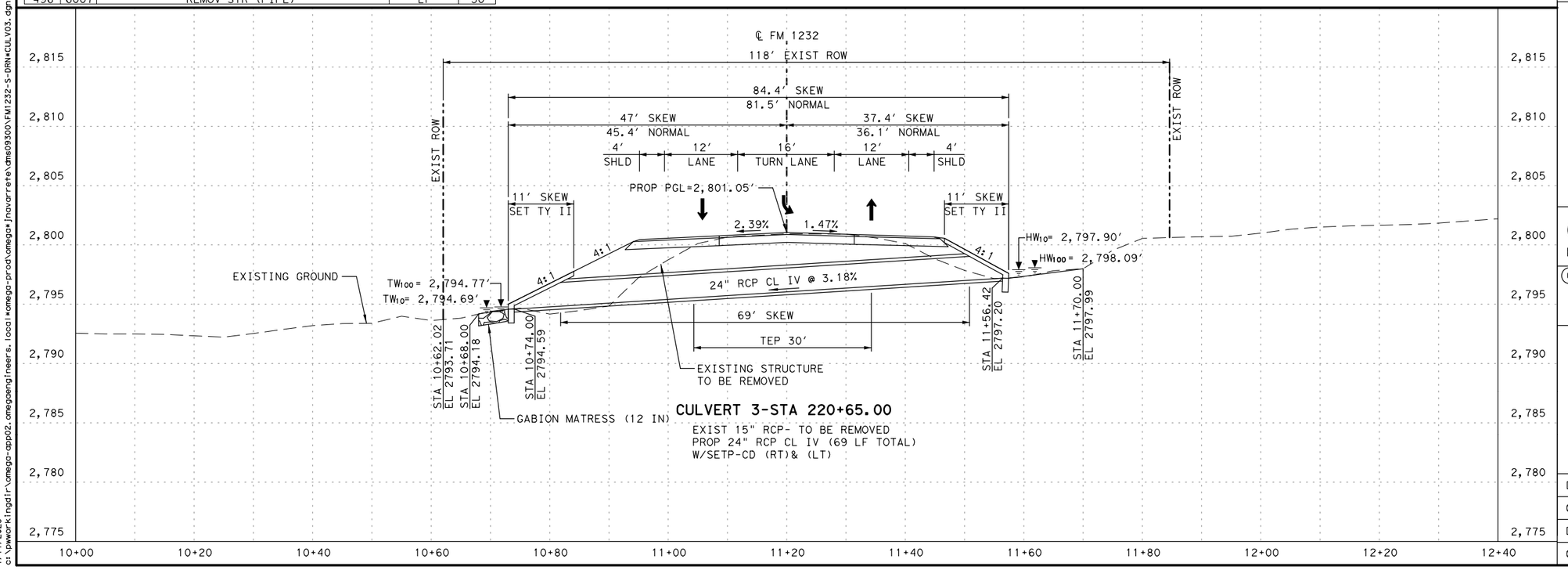


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 1.62 AC			
10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	2.29	Q (CFS)	3.56
# OF BARRELS	1	# OF BARRELS	1
V.O. (FPS)	4.13	V.O. (FPS)	4.69
HW (FT)	2,797.90	HW (FT)	2,798.09
TW (FT)	2,794.69	TW (FT)	2,794.77

SHEET ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6005	CEM STABIL BKFL	CY	16
402	6001	TRENCH EXCAVATION PROTECTION	LF	30
459	6007	GABION MATTRESSES (GALV) (12 IN)	SY	5.6
464	6018	RC PIPE (CL IV) (24 IN)	LF	69
467	6390	SET (TY II) (24 IN) (RCP) (4:1) (C)	EA	2
496	6007	REMOV STR (PIPE)	LF	30



CULVERT 3-STA 220+65.00

EXIST 15" RCP- TO BE REMOVED
PROP 24" RCP CL IV (69 LF TOTAL)
W/SETP-CD (RT)& (LT)

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.

0 10 20
SCALE: 1"=20' H
1"=10' V

LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467) SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED PROFESSIONAL ENGINEER
7/17/2023
H. Fernández, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
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OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 3

SHEET 3 OF 8

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	103
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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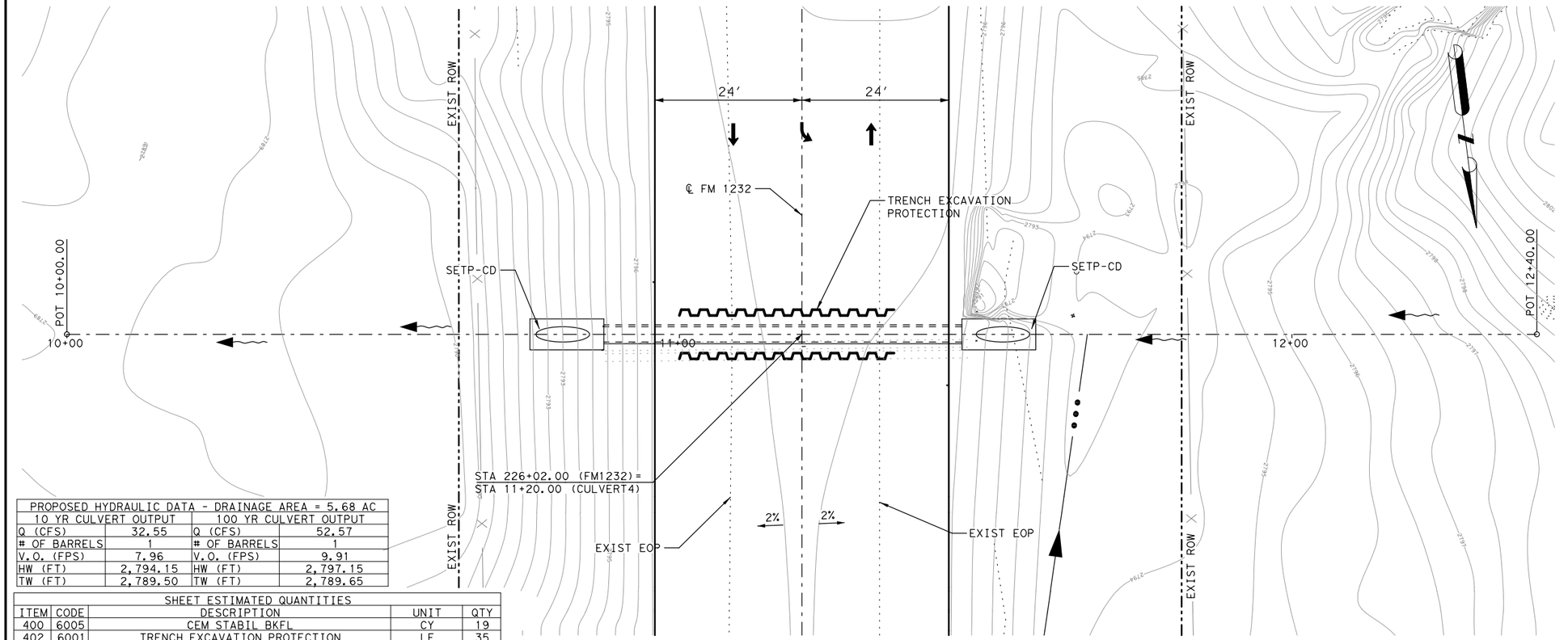


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 5.68 AC			
10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	32.55	Q (CFS)	52.57
# OF BARRELS	1	# OF BARRELS	1
V.O. (FPS)	7.96	V.O. (FPS)	9.91
HW (FT)	2,794.15	HW (FT)	2,797.15
TW (FT)	2,789.50	TW (FT)	2,789.65

SHEET ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6005	CEM STABIL BKFL	CY	19
402	6001	TRENCH EXCAVATION PROTECTION	LF	35
464	6019	RC PIPE (CL IV) (30 IN)	LF	63
467	6419	SET (TY II) (30 IN) (RCP) (4: 1) (C)	EA	2
496	6007	REMOV STR (PIPE)	LF	60

0 10 20

SCALE: 1"=20′ H
1"=10′ V

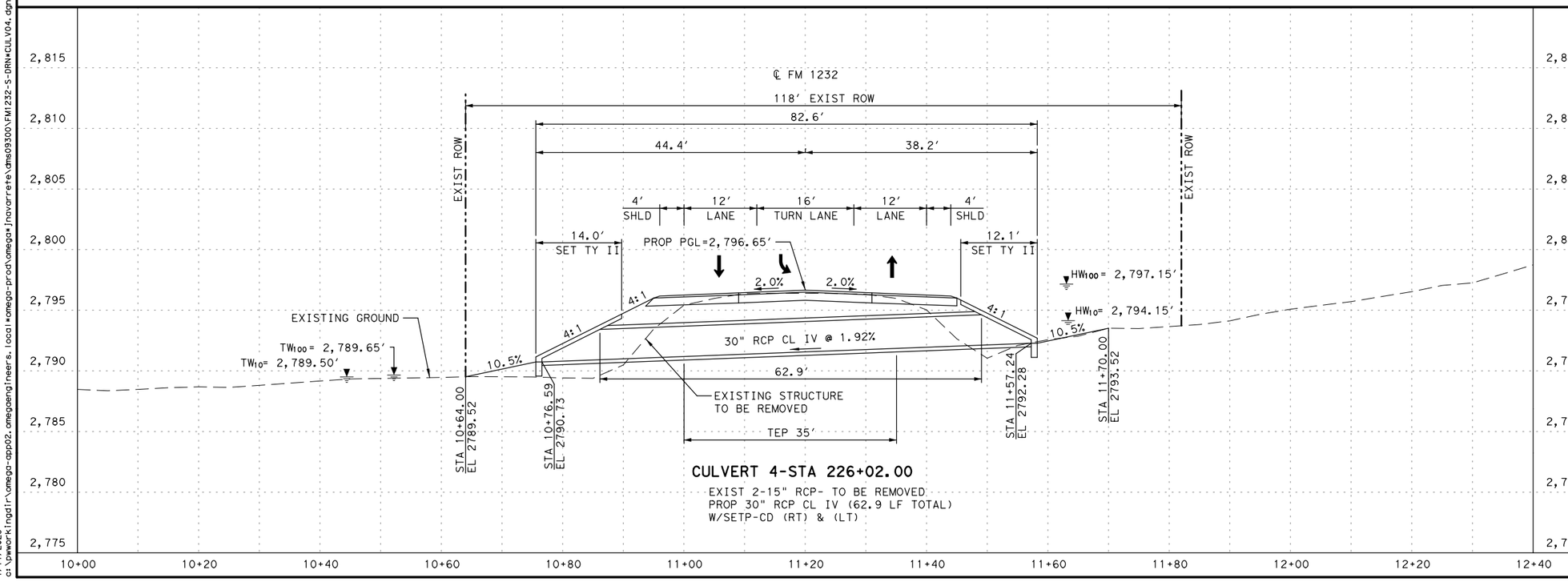
LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467)SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.



CULVERT 4-STA 226+02.00

EXIST 2-15" RCP- TO BE REMOVED
PROP 30" RCP CL IV (62.9 LF TOTAL)
W/SETP-CD (RT) & (LT)

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

H. Fernández, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 4

SHEET 4 OF 8

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	104
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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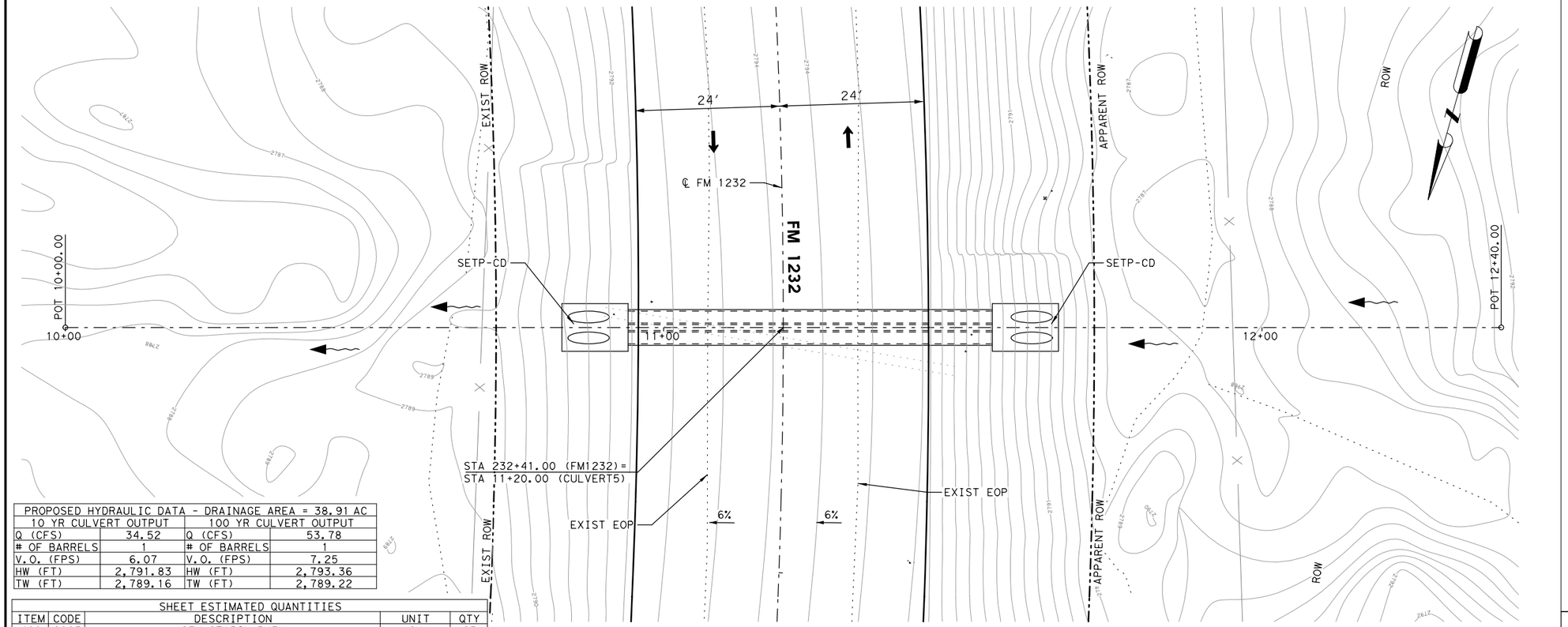
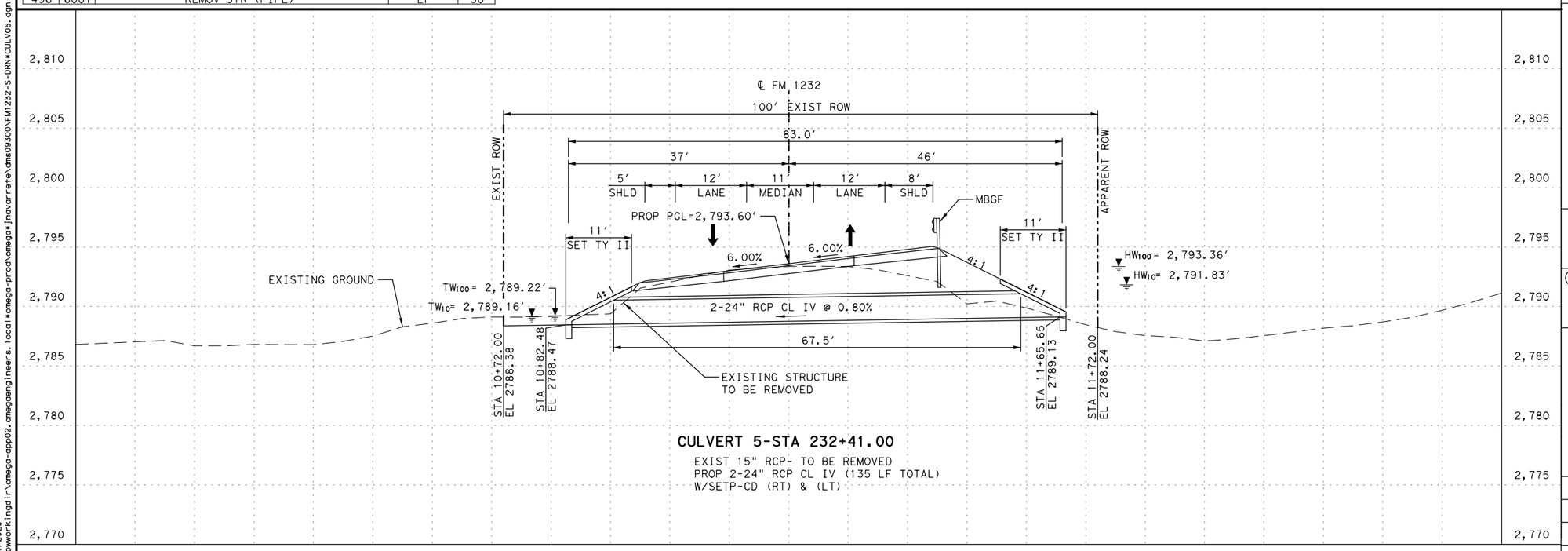


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 38.91 AC			
10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	34.52	Q (CFS)	53.78
# OF BARRELS	1	# OF BARRELS	1
V.O. (FPS)	6.07	V.O. (FPS)	7.25
HW (FT)	2,791.83	HW (FT)	2,793.36
TW (FT)	2,789.16	TW (FT)	2,789.22

SHEET ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6005	CEM STABIL BKFL	CY	25
464	6018	RC PIPE (CL IV) (24 IN)	LF	135
467	6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	4
496	6007	REMOV STR (PIPE)	LF	30



CULVERT 5-STA 232+41.00

EXIST 15" RCP- TO BE REMOVED
PROP 2-24" RCP CL IV (135 LF TOTAL)
W/SETP-CD (RT) & (LT)

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.

0 10 20
SCALE: 1"=20' H
1"=10' V

LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467)SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
7/17/2023
H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 5

SHEET 5 OF 8

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	105
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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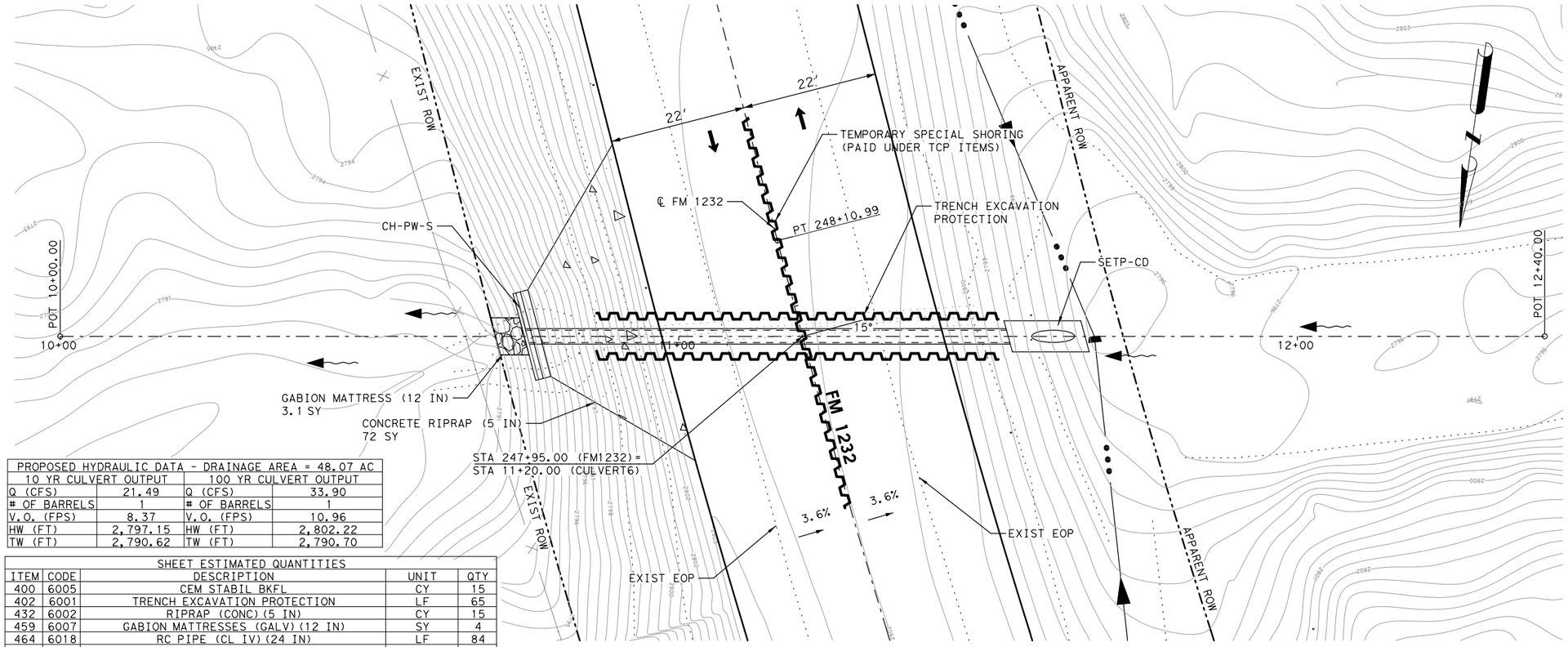
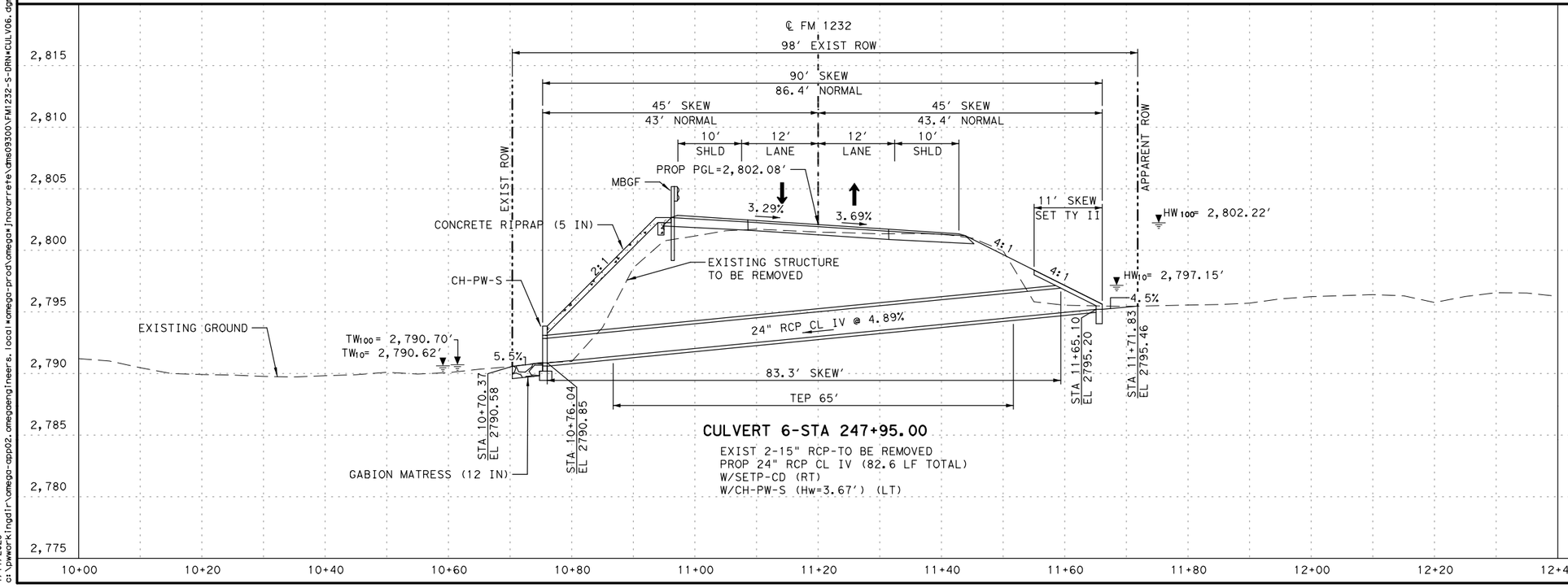


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 48.07 AC			
10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	21.49	Q (CFS)	33.90
# OF BARRELS	1	# OF BARRELS	1
V.O. (FPS)	8.37	V.O. (FPS)	10.96
HW (FT)	2,797.15	HW (FT)	2,802.22
TW (FT)	2,790.62	TW (FT)	2,790.70

SHEET ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6005	CEM STABIL BKFL	CY	15
402	6001	TRENCH EXCAVATION PROTECTION	LF	65
432	6002	RIPRAP (CONC) (5 IN)	CY	15
459	6007	GABION MATTRESSES (GALV) (12 IN)	SY	4
464	6018	RC PIPE (CL IV) (24 IN)	LF	84
466	6130	HEADWALL (CH - PW - S) (DIA= 24 IN)	EA	1
467	6390	SET (TY II) (24 IN) (RCP) (4: 1) (C)	EA	1
496	6007	REMOV STR (PIPE)	LF	60

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.



CULVERT 6-STA 247+95.00

EXIST 2-15" RCP-TO BE REMOVED
PROP 24" RCP CL IV (82.6 LF TOTAL)
W/SETP-CD (RT)
W/CH-PW-S (Hw=3.67') (LT)

0 10 20
SCALE: 1"=20' H
1"=10' V

LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467)SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
7/17/2023
H. Fernández, P.E.

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Ph915 308 6413 Fx281 647 9184

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 6

SHEET 6 OF 8

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	106
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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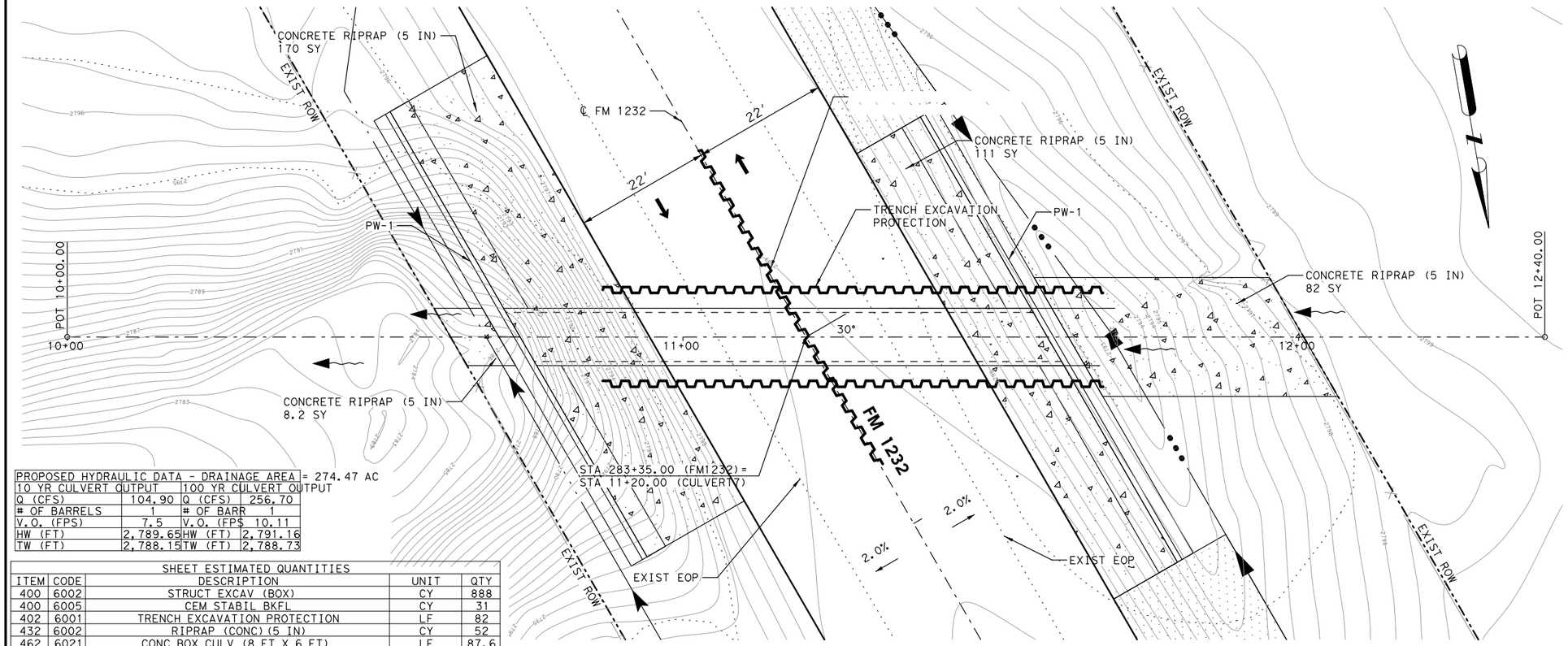
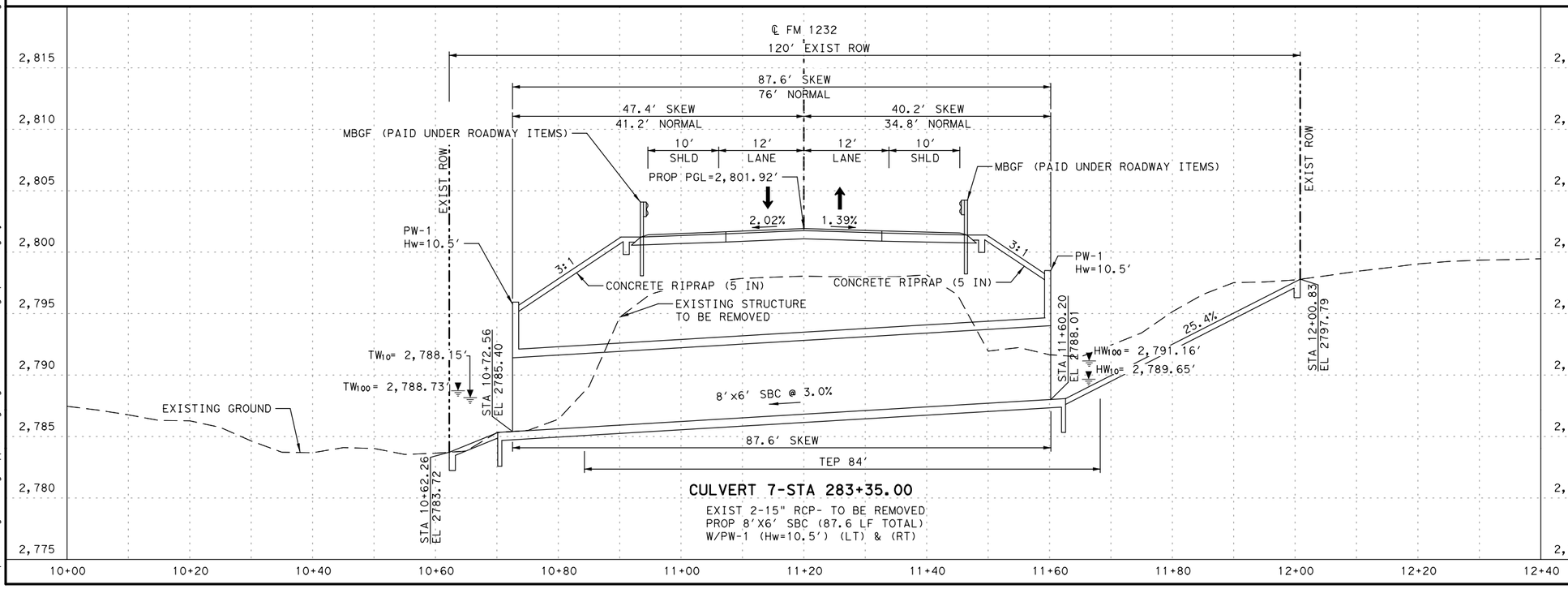


PROPOSED HYDRAULIC DATA - DRAINAGE AREA	= 274.47 AC		
10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	104.90	Q (CFS)	256.70
# OF BARRELS	1	# OF BARR	1
V.O. (FPS)	7.5	V.O. (FPS	10.11
HW (FT)	2,789.65	HW (FT)	2,791.16
TW (FT)	2,788.15	TW (FT)	2,788.73

SHEET ESTIMATED QUANTITIES				
ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6002	STRUCT EXCAV (BOX)	CY	888
400	6005	CEM STABIL BKFL	CY	31
402	6001	TRENCH EXCAVATION PROTECTION	LF	82
432	6002	RIPRAP (CONC)(5 IN)	CY	52
462	6021	CONC BOX CULV (8 FT X 6 FT)	LF	87.6
466	6172	WINGWALL (PW - 1) (HW=11 FT)	EA	2
496	6007	REMOV STR (PIPE)	LF	60

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.



CULVERT 7-STA 283+35.00

EXIST 2-15" RCP- TO BE REMOVED
PROP 8'X6' SBC (87.6 LF TOTAL)
W/PW-1 (Hw=10.5') (LT) & (RT)

SCALE: 1"=20' H, 1"=10' V

LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467)SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

H. Fernández, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
Ph915 308 6413 Fx281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 7

SHEET 7 OF 8

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	107
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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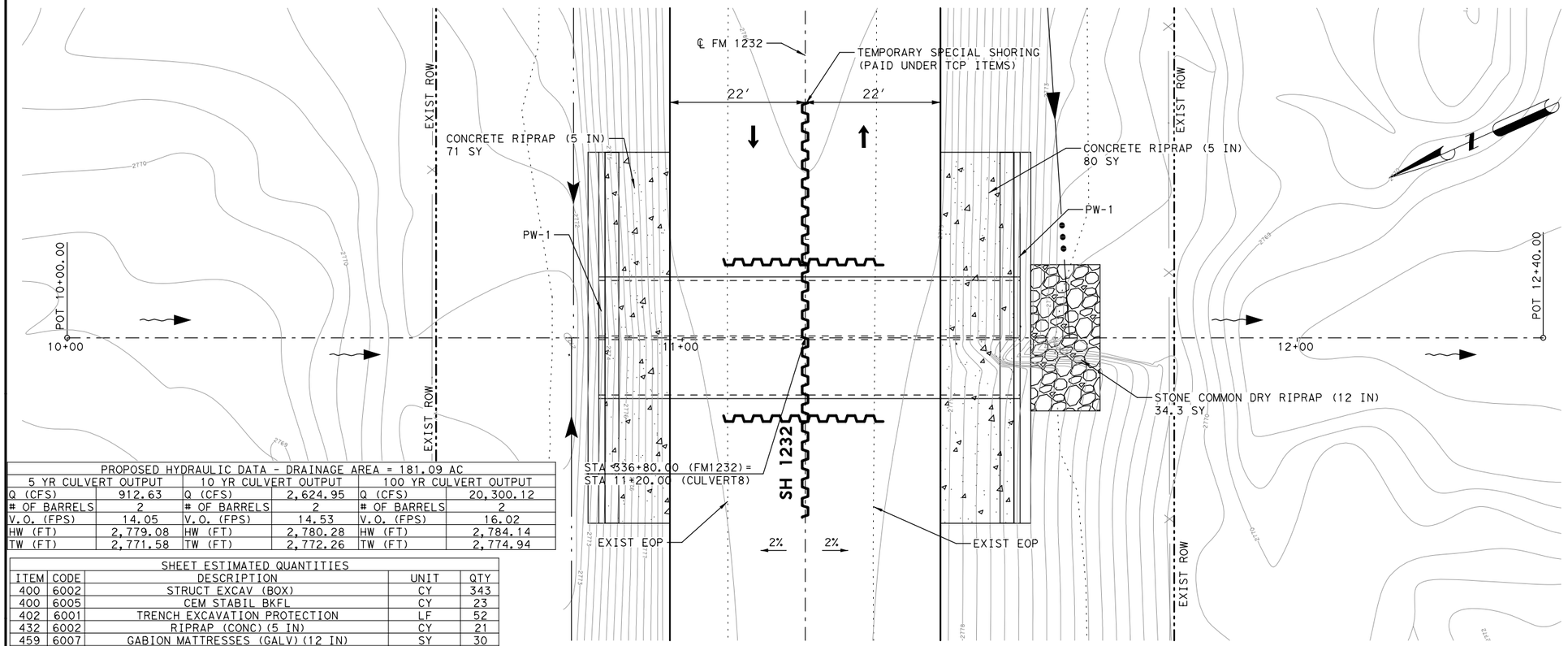
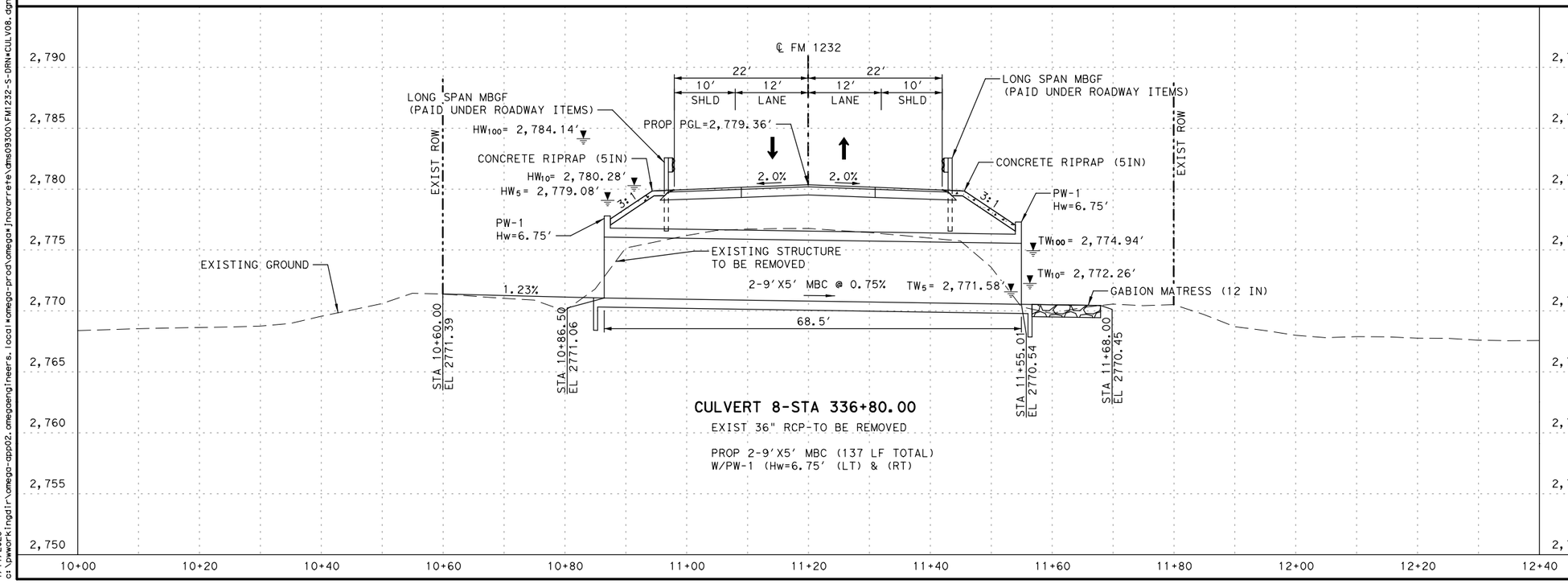


PROPOSED HYDRAULIC DATA - DRAINAGE AREA = 181.09 AC					
5 YR CULVERT OUTPUT		10 YR CULVERT OUTPUT		100 YR CULVERT OUTPUT	
Q (CFS)	912.63	Q (CFS)	2,624.95	Q (CFS)	20,300.12
# OF BARRELS	2	# OF BARRELS	2	# OF BARRELS	2
V.O. (FPS)	14.05	V.O. (FPS)	14.53	V.O. (FPS)	16.02
HW (FT)	2,779.08	HW (FT)	2,780.28	HW (FT)	2,784.14
TW (FT)	2,771.58	TW (FT)	2,772.26	TW (FT)	2,774.94

SHEET ESTIMATED QUANTITIES

ITEM	CODE	DESCRIPTION	UNIT	QTY
400	6002	STRUCT EXCAV (BOX)	CY	343
400	6005	CEM STABIL BKFL	CY	23
402	6001	TRENCH EXCAVATION PROTECTION	LF	52
432	6002	RIPRAP (CONC)(5 IN)	CY	21
459	6007	GABION MATTRESSES (GALV)(12 IN)	SY	30
462	6024	CONC BOX CULV (9 FT X 5 FT)	LF	137
466	6182	WINGWALL (PW - 1) (HW=7 FT)	EA	4
496	6007	REMOV STR (PIPE)	LF	30

NOTE: FOR GENERAL DESIGN INFORMATION, REFER TO DRAINAGE GENERAL NOTES.



CULVERT 8-STA 336+80.00

EXIST 36" RCP-TO BE REMOVED

PROP 2-9′X5′ MBC (137 LF TOTAL)
W/PW-1 (Hw=6.75′ (LT) & (RT)

0 10 20
SCALE: 1"=20′ H
1"=10′ V

LEGEND

- PROP DIRECTION OF TRAFFIC
- PROPOSED DITCH
- DIRECTION OF FLOW

NOTES:

1. CONTRACTOR MUST FIELD VERIFY ALL PROPOSED INVERT ELEVATIONS, PIPE DIAMETERS AND FINISHED GRADE ELEVATIONS BEFORE INSTALLATION OF PROPOSED CULVERTS.
2. ALL PROPOSED SET STRUCTURES (ITEM 467)SHALL BE CAST IN PLACE.
3. GRADING WORK FOR PROPOSED CULVERT EXCAVATION AND EMBANKMENT WILL BE SUBSIDIARY TO ITEM 110 AND 132.
4. COORDINATE CULVERT CONSTRUCTION WITH TCP PH 2 AND "GRADE BREAK CONSTRUCTION" PH 1 & 2.
5. ALTHOUGH THE HYDRAULIC ANALYSIS SHOWS THE STRUCTURE TO BE ADEQUATE FOR A 5 YEAR DESIGN STORM AND NOT A 10 YEAR, THE STRUCTURE HAS BEEN FOUND TO BE ADEQUATE IN RECENT SIGNIFICANT FLOODING EVENTS. NO OVERTOPPING OF THE ROADWAY ALONG MONUMENT DRAW HAS EVER BEEN OBSERVED OR RECORDED BY TXDOT.

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
7/17/2023
H. Fernández, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

CULVERT LAYOUT 8

SHEET 8 OF 8

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	108
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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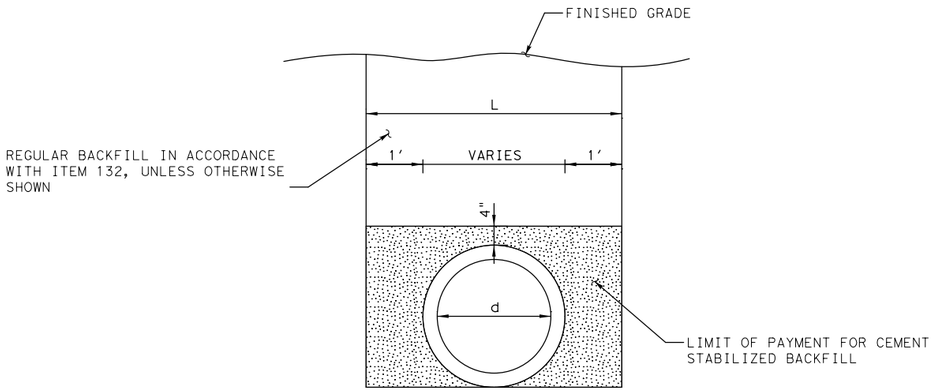
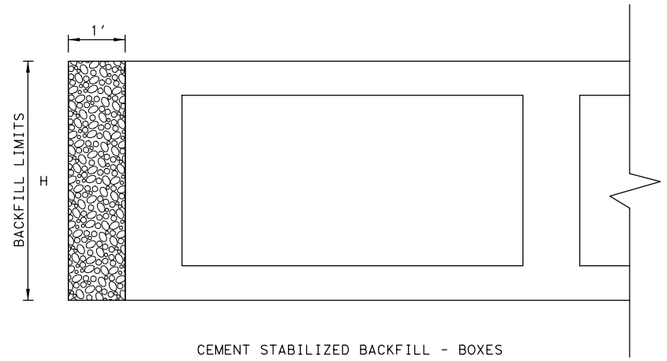
CEMENT STABILIZED BACKFILL CALCULATIONS									
CULVERT ID	CL STA	NUMBER OF PIPES/BOXES	LENGTH UNDER ROADWAY (FT)	LENGTH OF BACKFILL (FT)	HEIGHT OF BACKFILL (FT)	TOTAL VOLUME (CF)	PIPE VOLUME (CF)	VOLUME NEEDED (CF)	0400 6005 CEMENT STABIL BKFL VOLUME (CY)
1	182+06.00	1	50	13.67	9.5	NA	NA	950	35
2	216+81.00	1	53	4.50	2.83	676	260	416	15
3	220+65.00	1	54	4.50	2.83	685	264	421	16
4	226+02.00	1	52	5.08	3.42	903	387	516	19
5	232+41.00	2	53	8.00	2.83	1201	520	681	25
6	247+95.00	1	50	4.50	2.83	637	245	392	15
7	283+35.00	1	56	10.80	7.33	NA	NA	821	31
8	336+80.00	2	48	21.75	6.50	NA	NA	624	23



CEMENT STABILIZED BACKFILL - PIPES



CEMENT STABILIZED BACKFILL - BOXES

EXCAVATION AND BACKFILL DIAGRAMS FOR DRAINAGE STRUCTURES

DATE	BY	REV	REVISION

HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
STATE OF TEXAS
7/17/2023
H. Fernández, P.E.

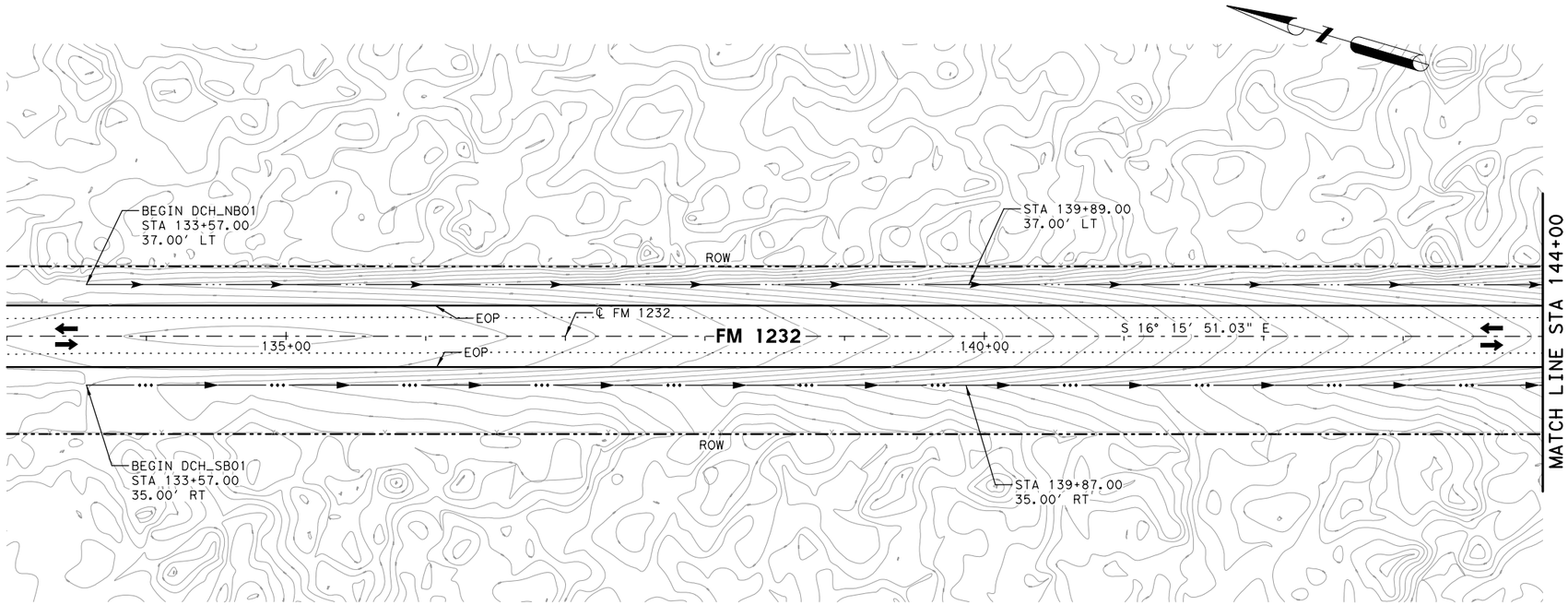
OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115

CULVERT DETAILS

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		109
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232



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SCALE: 1"=100' H
1"=10' V

LEGEND

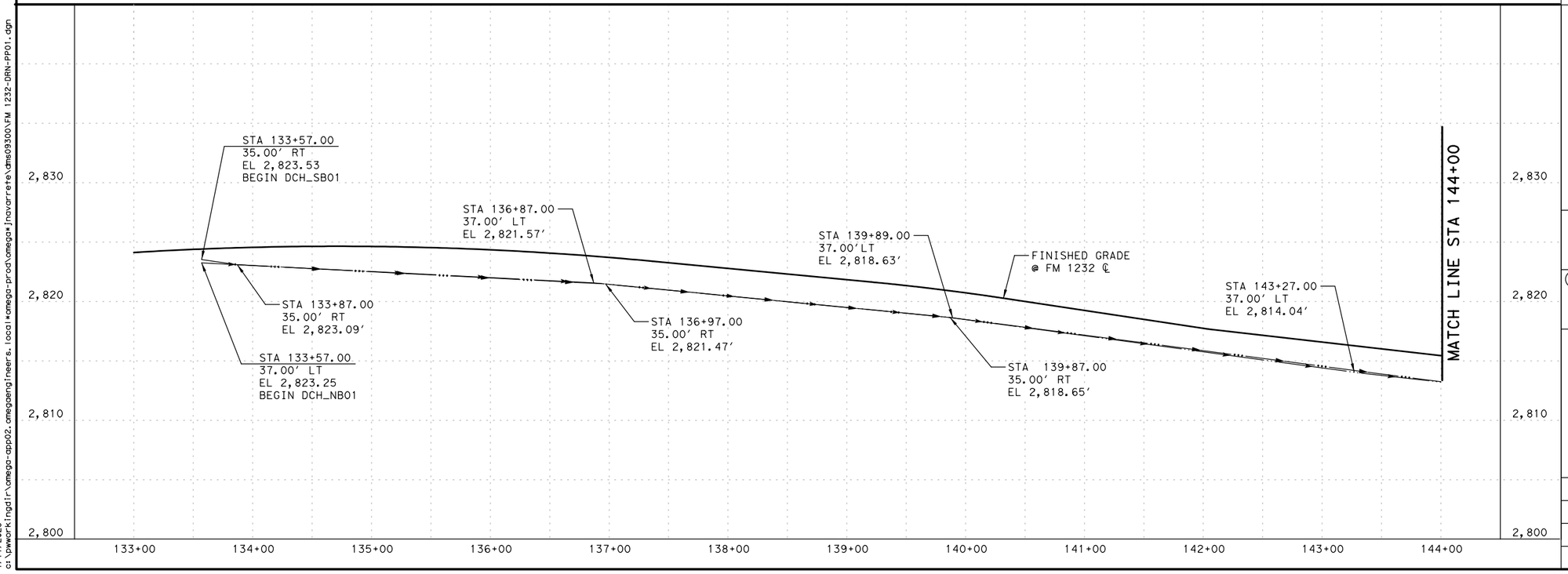
- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

1. SEE UTILITY LAYOUT SHEETS FOR INFORMATION.
2. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR ADDITIONAL ROADWAY INFORMATION.
3. SPECIAL DITCHES PRESENTED HEREIN RANGE FROM STA 101+46.73 TO STA 225+33.00 AND STA 678+04.00 TO STA 828+35.47, REFER TO ROADWAY CROSS SECTIONS FOR ADDITIONAL DITCH ℄ WITHIN THESE LIMITS.
4. REFER TO CROSS CULVERTS SHEETS FOR MORE INFORMATION.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

DATE	BY	REV	REVISION

*THE INFORMATION SHOWN CONCERNING TYPE AND LOCATION OF UTILITIES IS NOT GUARANTEED TO BE ACCURATE OR ALL INCLUSIVE. BEFORE DIGGING WORK IN AREA, THE CONTRACTOR IS RESPONSIBLE FOR MAKING DETERMINATIONS AS TO THE TYPE AND LOCATION OF ALL UTILITIES TO AVOID DAMAGE THERETO.



HORACIO FERNANDEZ
93064
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
7/17/2023
H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
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EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P915 308 6413 F281 647 9184

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 133+00 TO STA 144+00

SHEET 1 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	110
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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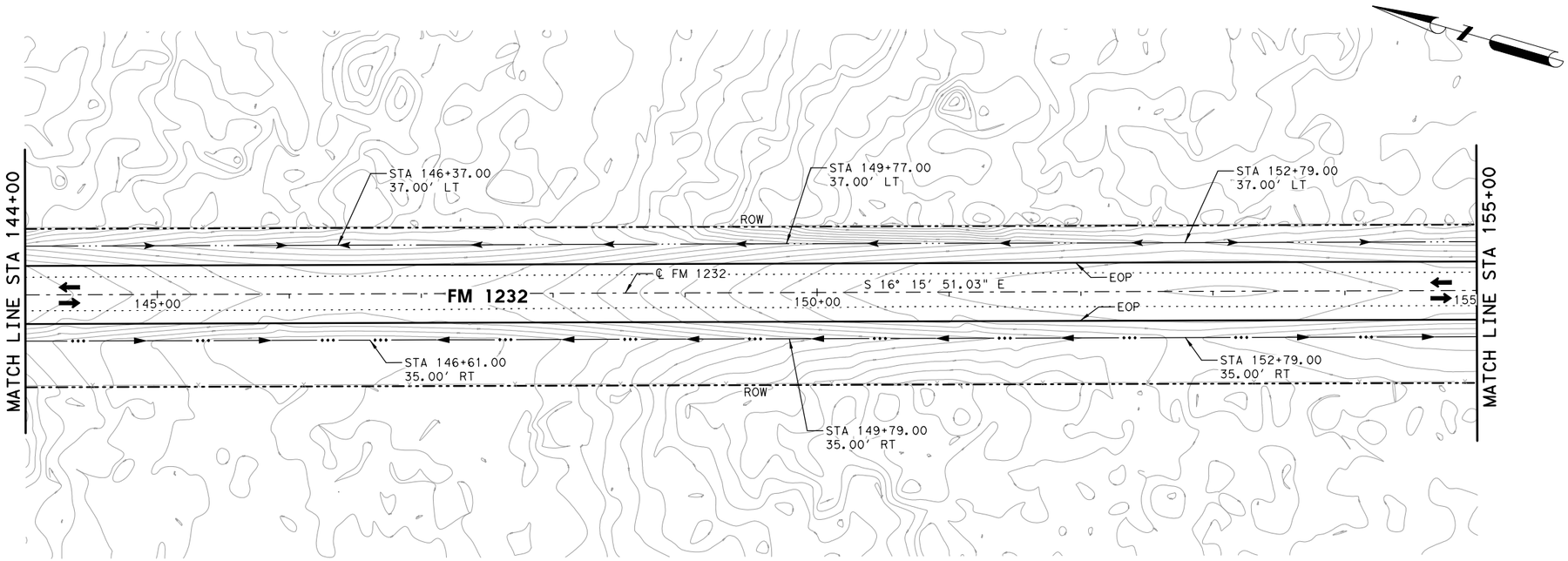

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

1. SEE UTILITY LAYOUT SHEETS FOR INFORMATION.
2. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR ADDITIONAL ROADWAY INFORMATION.
3. SPECIAL DITCHES PRESENTED HEREIN RANGE FROM STA 101+46.73 TO STA 225+33.00 AND STA 678+04.00 TO STA 828+35.47, REFER TO ROADWAY CROSS SECTIONS FOR ADDITIONAL DITCH ℄ WITHIN THESE LIMITS.
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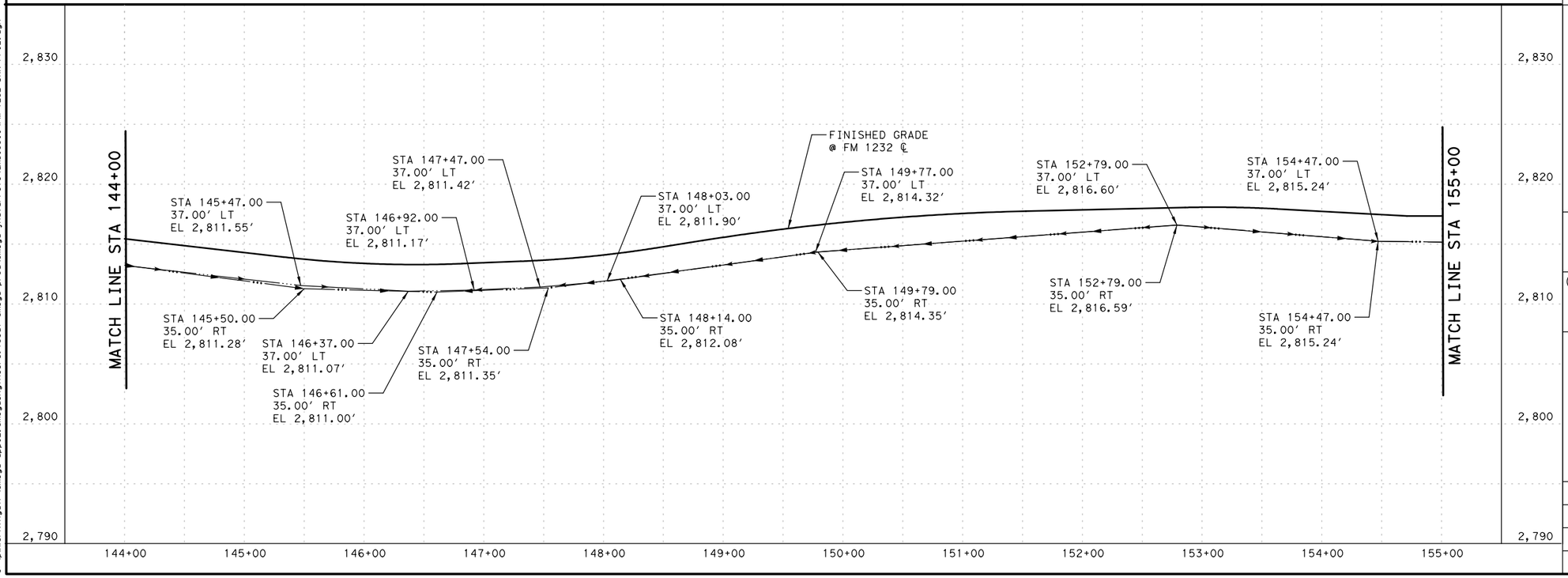
DATE	BY	REV	REVISION



HORACIO FERNANDEZ
93064
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
7/17/2023
H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P#915 308 6413 F#281 647 9184

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 144+00 TO STA 155+00.00

SHEET 2 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	111
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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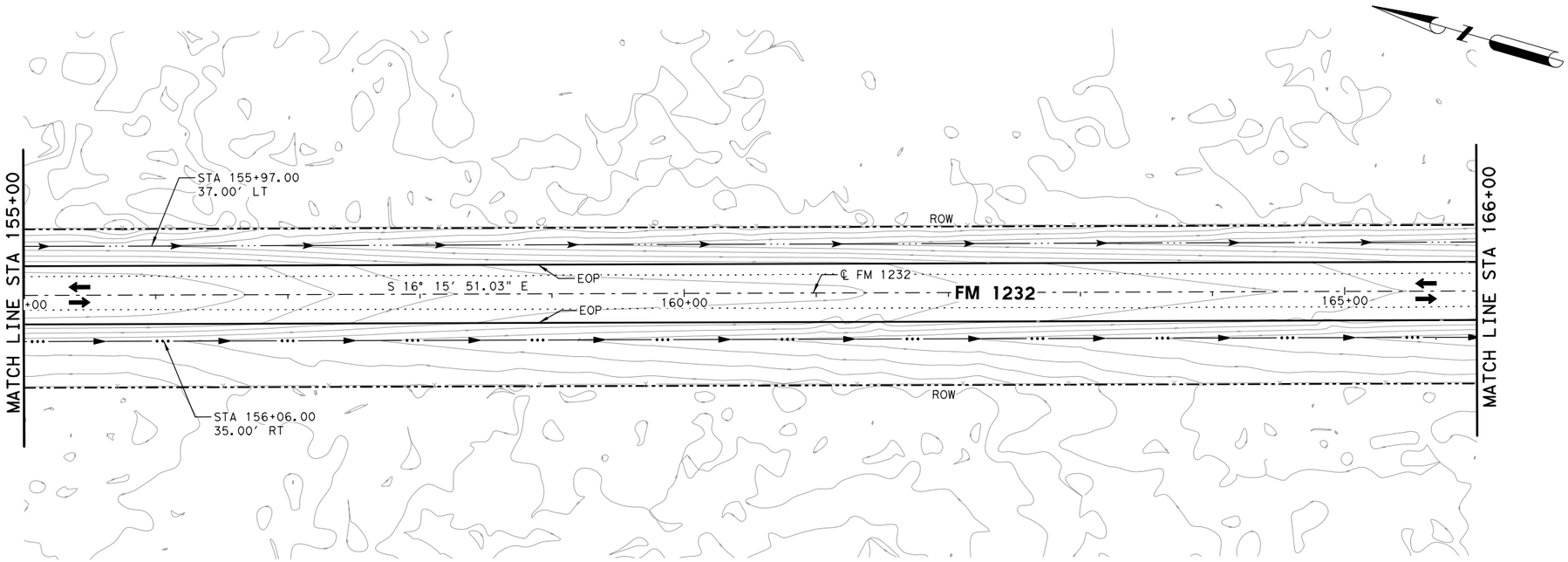

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SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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2. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR ADDITIONAL ROADWAY INFORMATION.
3. SPECIAL DITCHES PRESENTED HEREIN RANGE FROM STA 101+46.73 TO STA 225+33.00 AND STA 678+04.00 TO STA 828+35.47, REFER TO ROADWAY CROSS SECTIONS FOR ADDITIONAL DITCH ℄ WITHIN THESE LIMITS.
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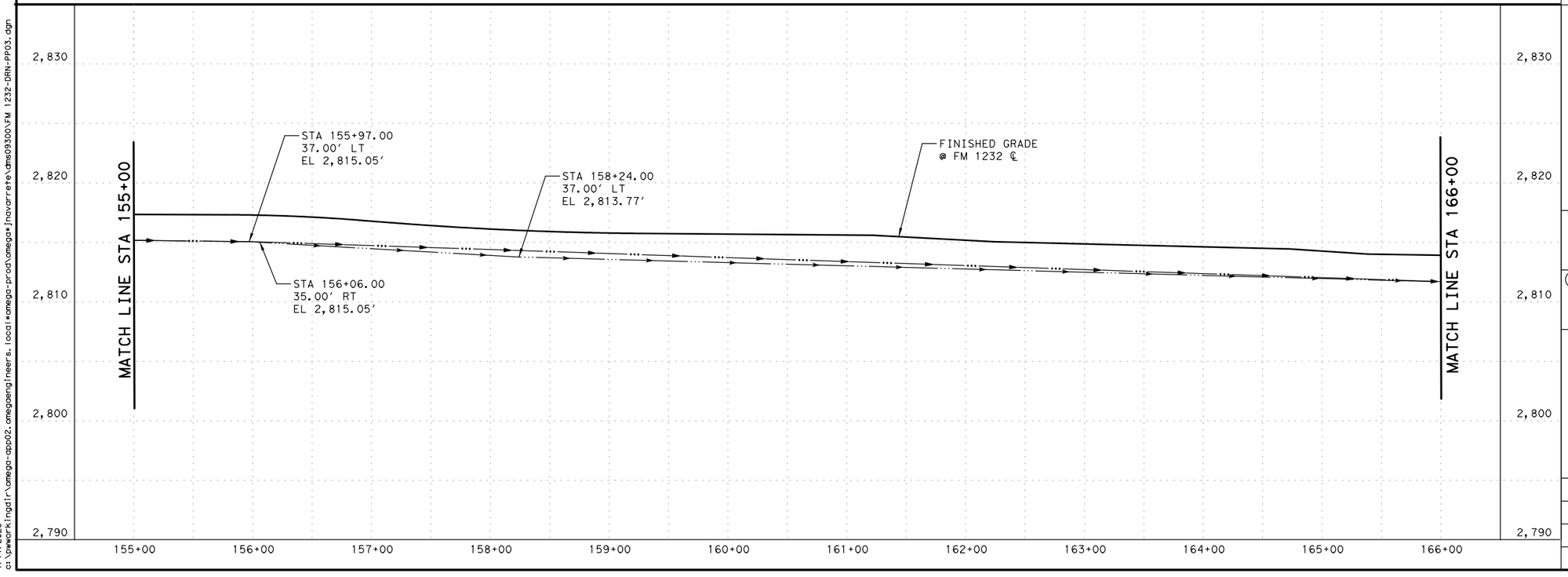
DATE	BY	REV	REVISION



STATE OF TEXAS
HORACIO FERNANDEZ
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LICENSED
PROFESSIONAL ENGINEER

7/17/2023

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P915 308 6413 F281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 155+00 TO STA 166+00

SHEET 3 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	112
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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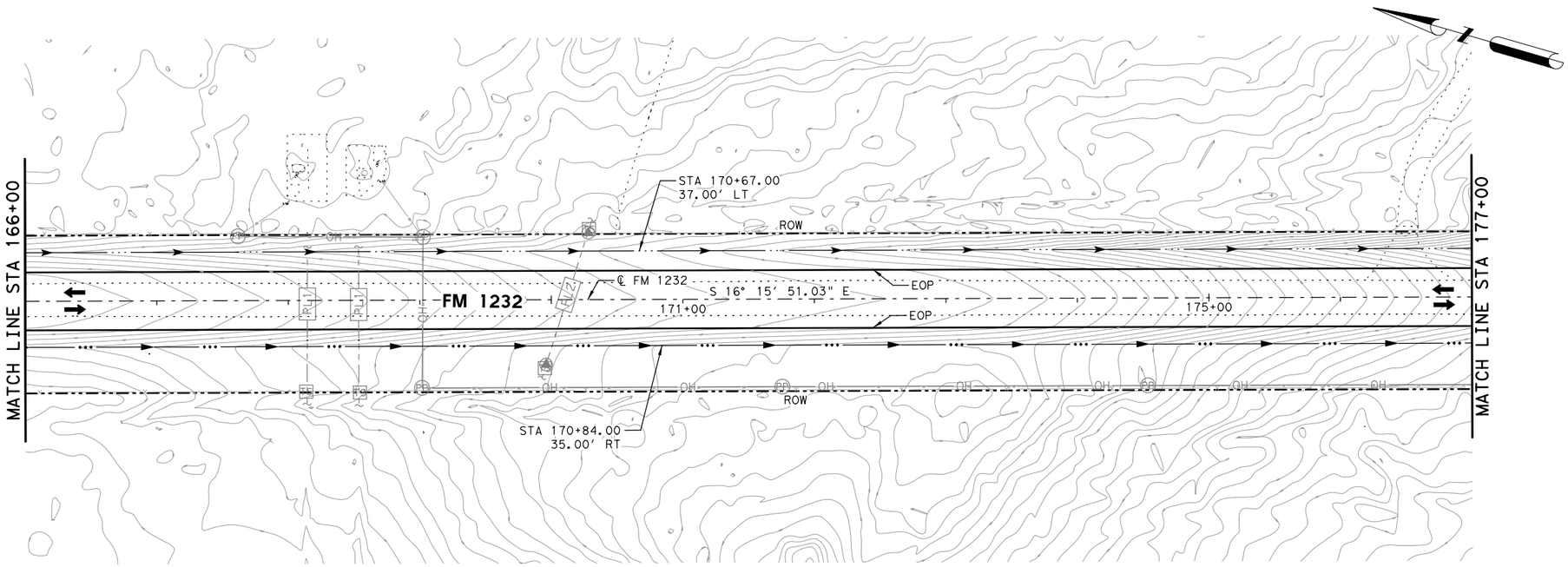

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

1. SEE UTILITY LAYOUT SHEETS FOR INFORMATION.
2. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR ADDITIONAL ROADWAY INFORMATION.
3. SPECIAL DITCHES PRESENTED HEREIN RANGE FROM STA 101+46.73 TO STA 225+33.00 AND STA 678+04.00 TO STA 828+35.47, REFER TO ROADWAY CROSS SECTIONS FOR ADDITIONAL DITCH ℄ WITHIN THESE LIMITS.
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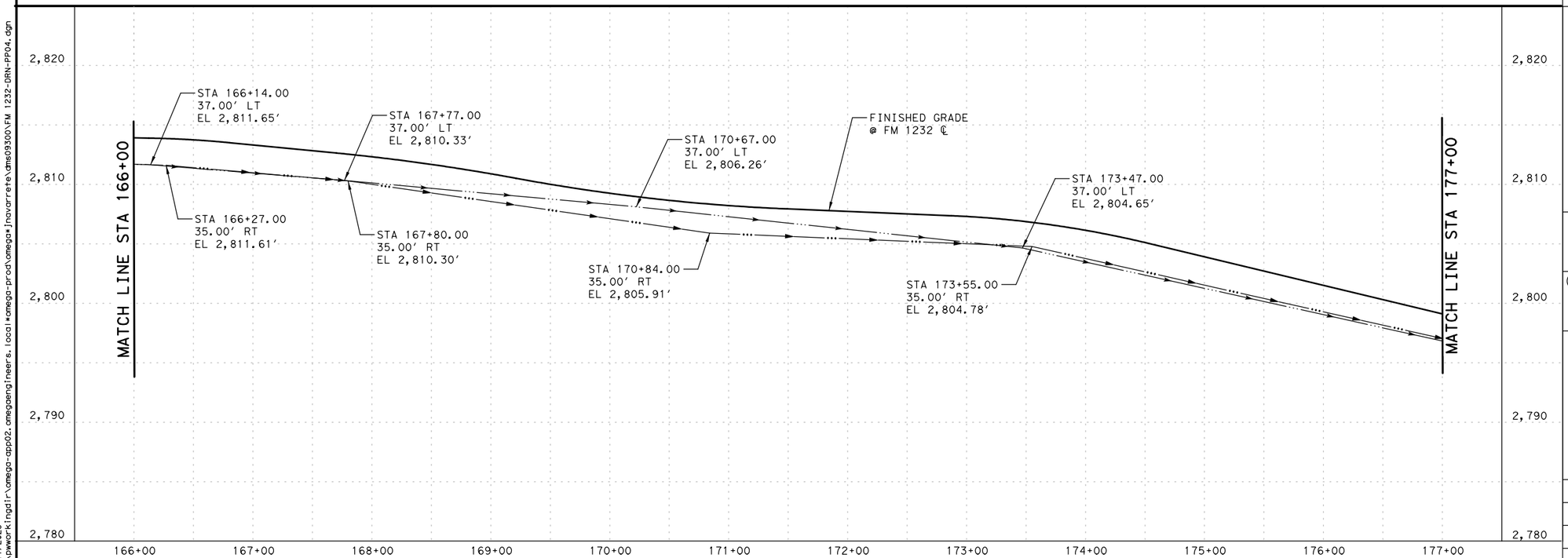

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
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P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 166+00 TO STA 177+00

SHEET 4 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	113
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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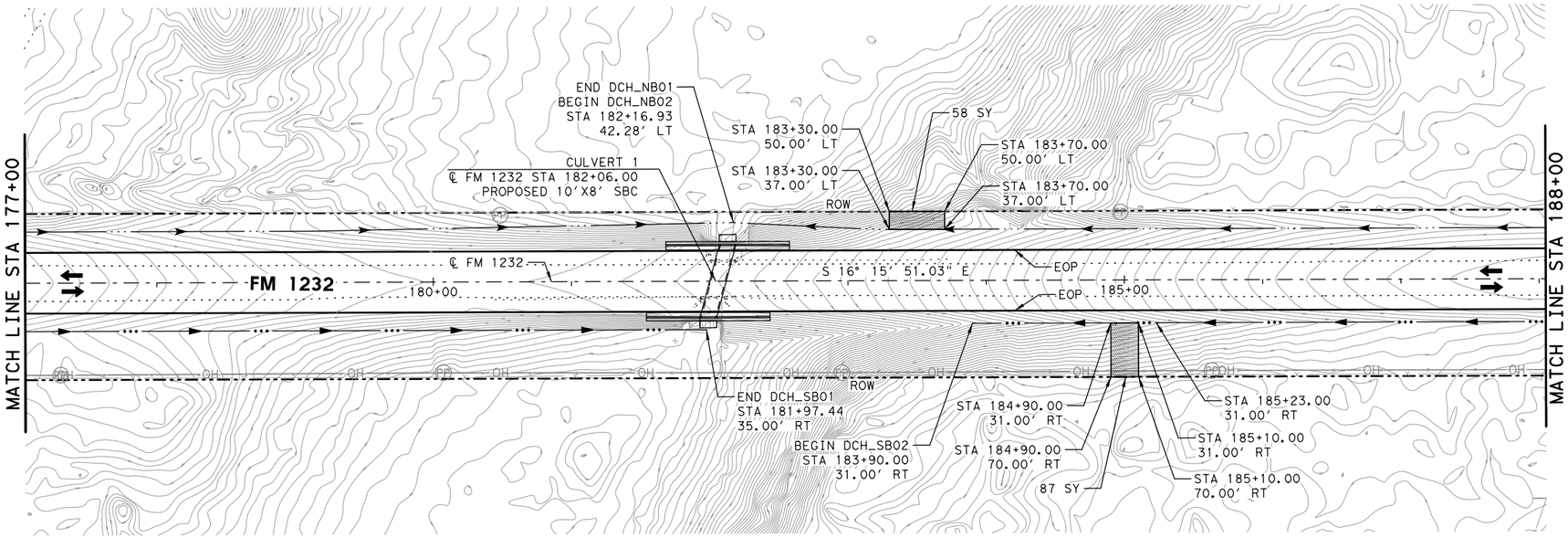

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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2. REFER TO ROADWAY PLAN AND PROFILE SHEETS FOR ADDITIONAL ROADWAY INFORMATION.
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4. REFER TO CROSS CULVERTS SHEETS FOR MORE INFORMATION.
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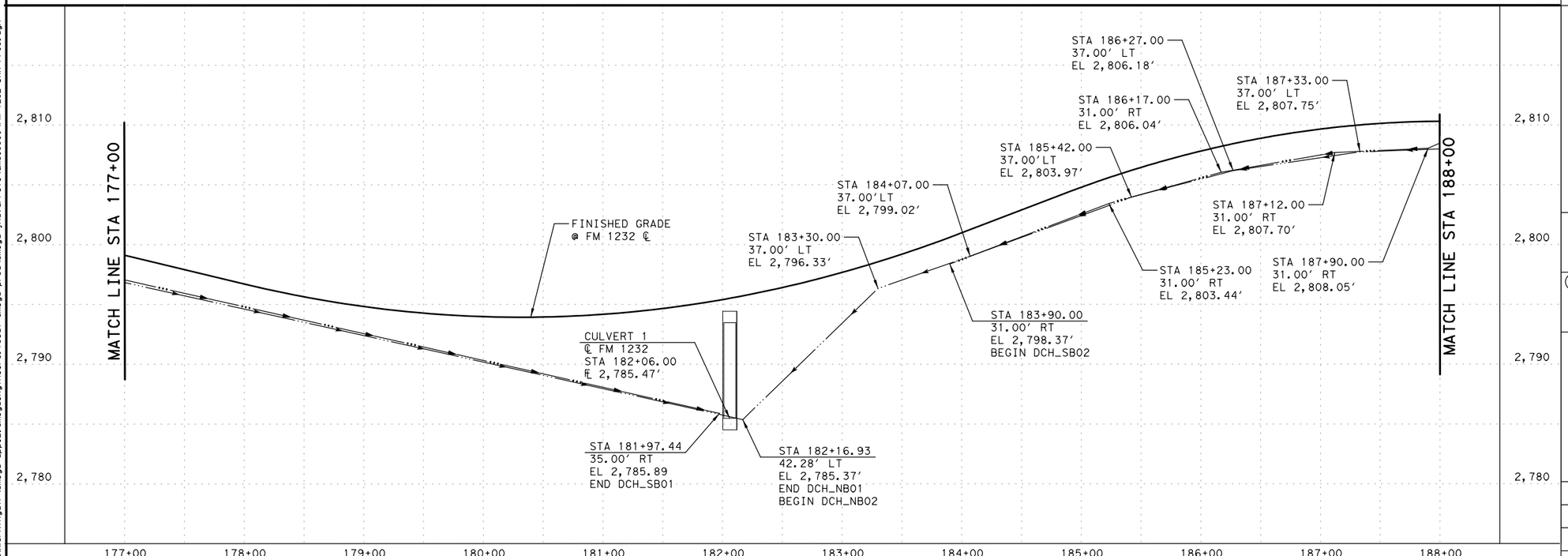

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232

SH 302 TO SH 115

DITCH PLAN & PROFILE

STA 177+00 TO STA 188+00

SHEET 5 OF 17

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		114
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ODA	WINKLER	
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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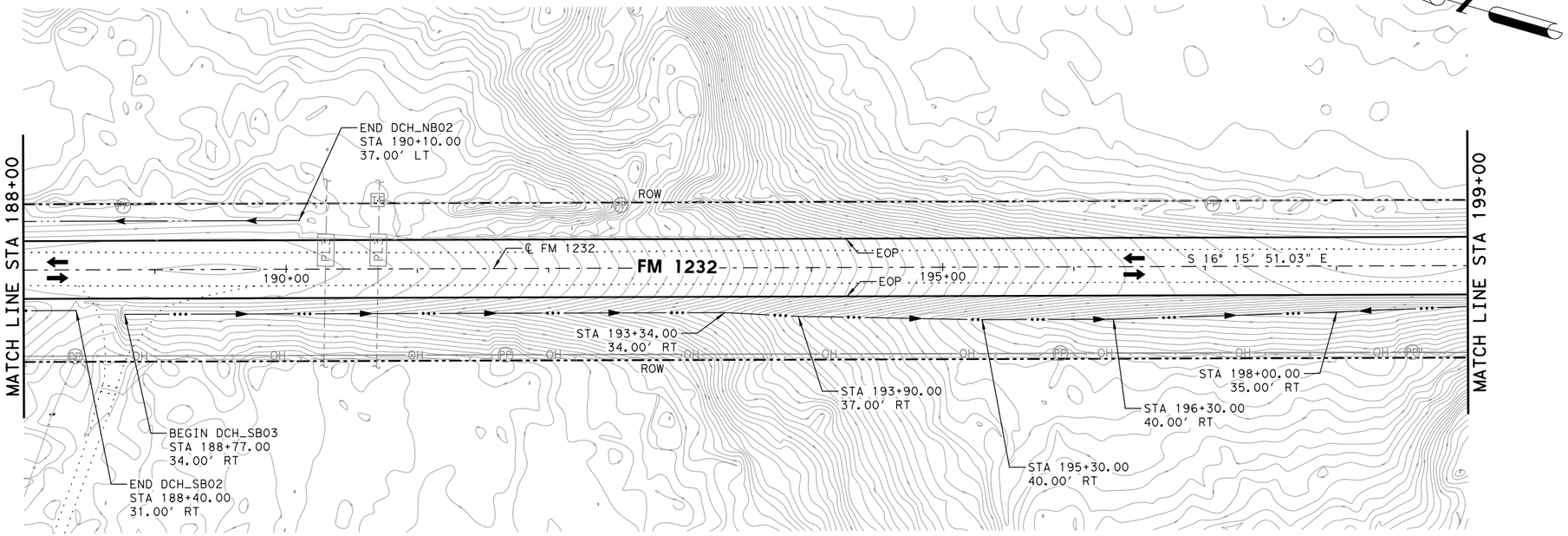

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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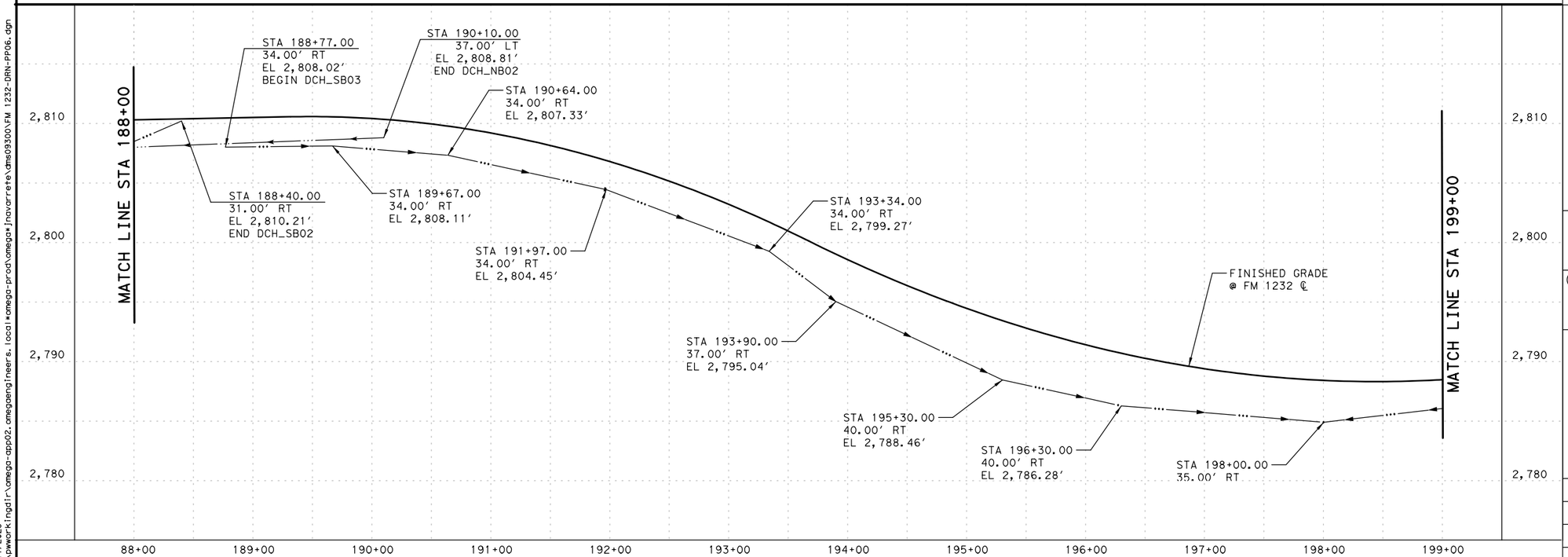

STATE OF TEXAS
HORACIO FERNANDEZ
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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 188+00 TO STA 199+00

SHEET 6 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	115
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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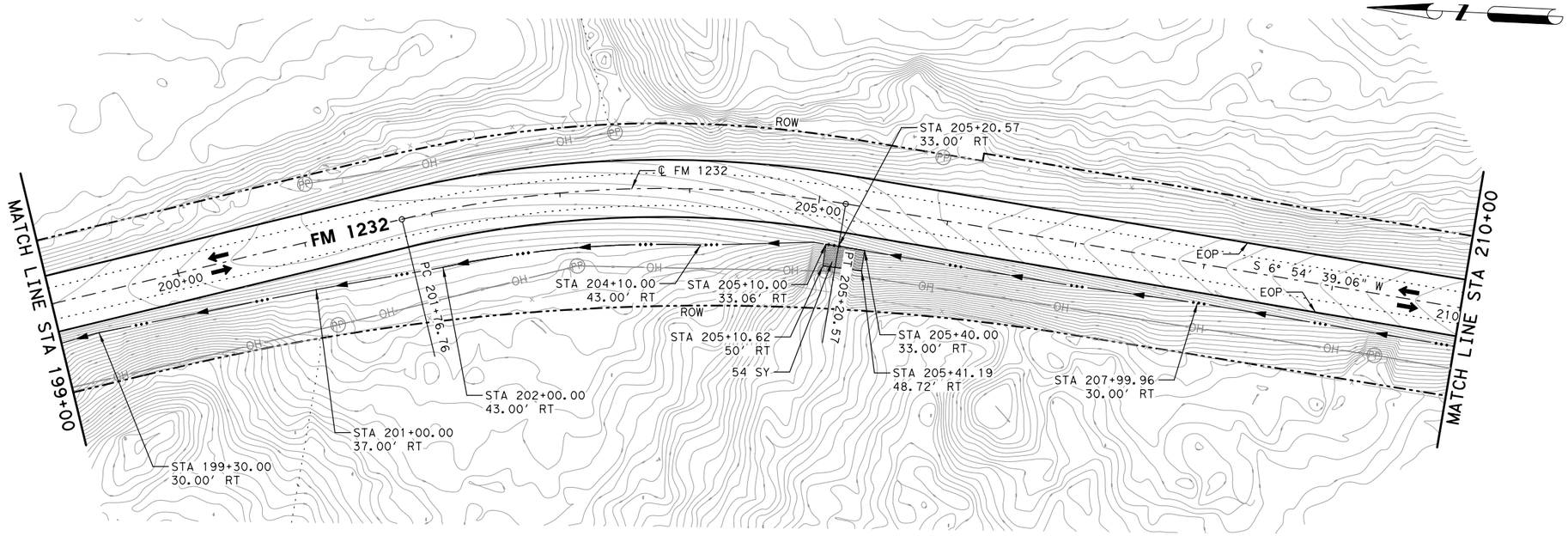

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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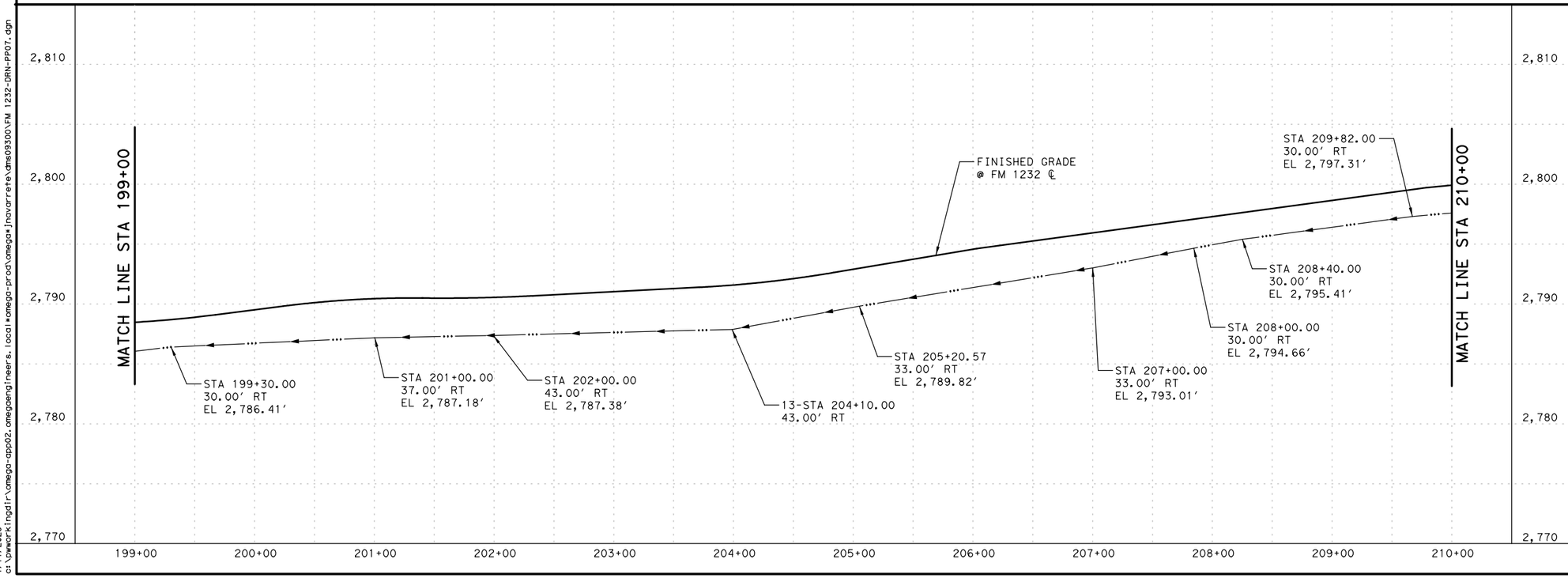

STATE OF TEXAS
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FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 199+00 TO STA 210+00

SHEET 7 OF 17

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	116
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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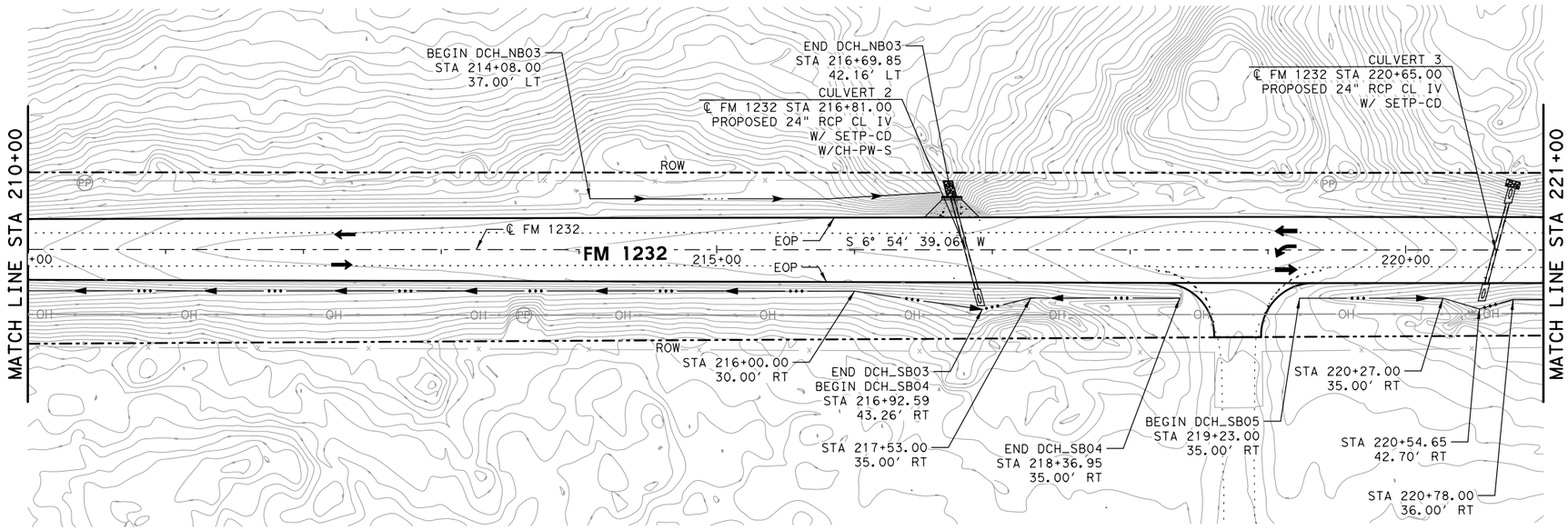

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

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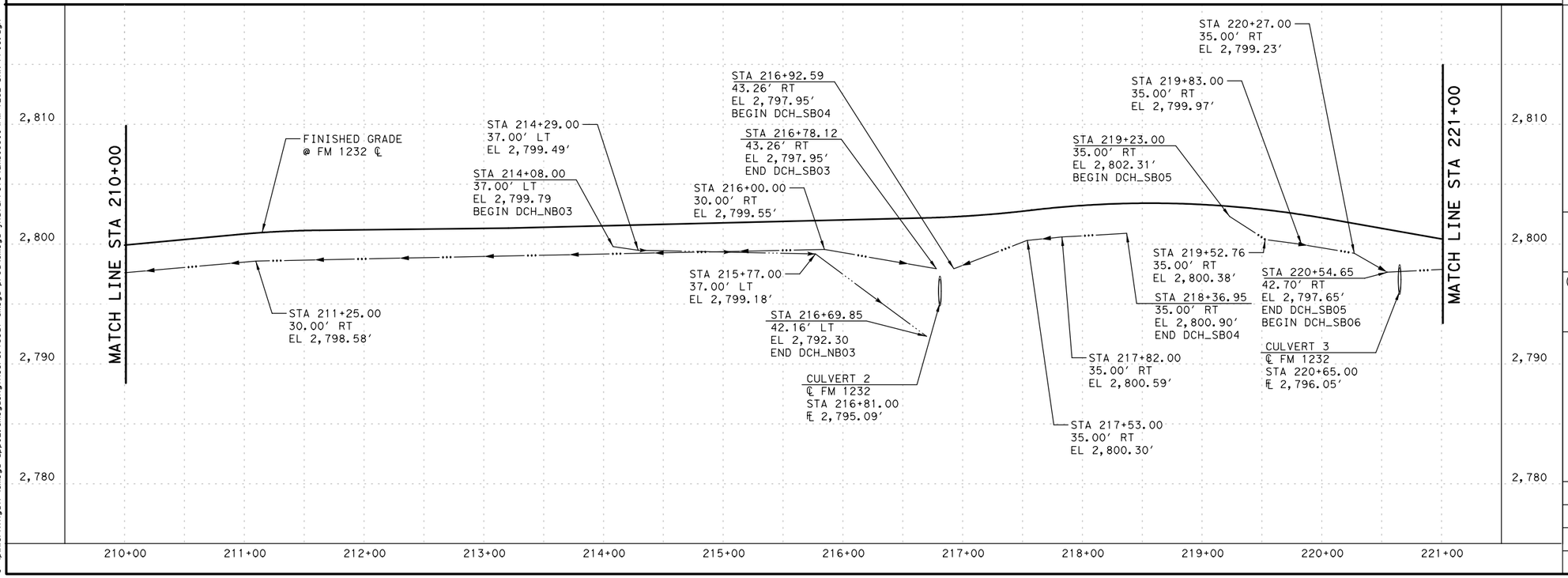

STATE OF TEXAS
HORACIO FERNANDEZ
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LICENSED
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7/17/2023

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TX PE Firm Reg. No. F-2147
P915 308 6413 F281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 210+00 TO STA 221+00

SHEET 8 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	117
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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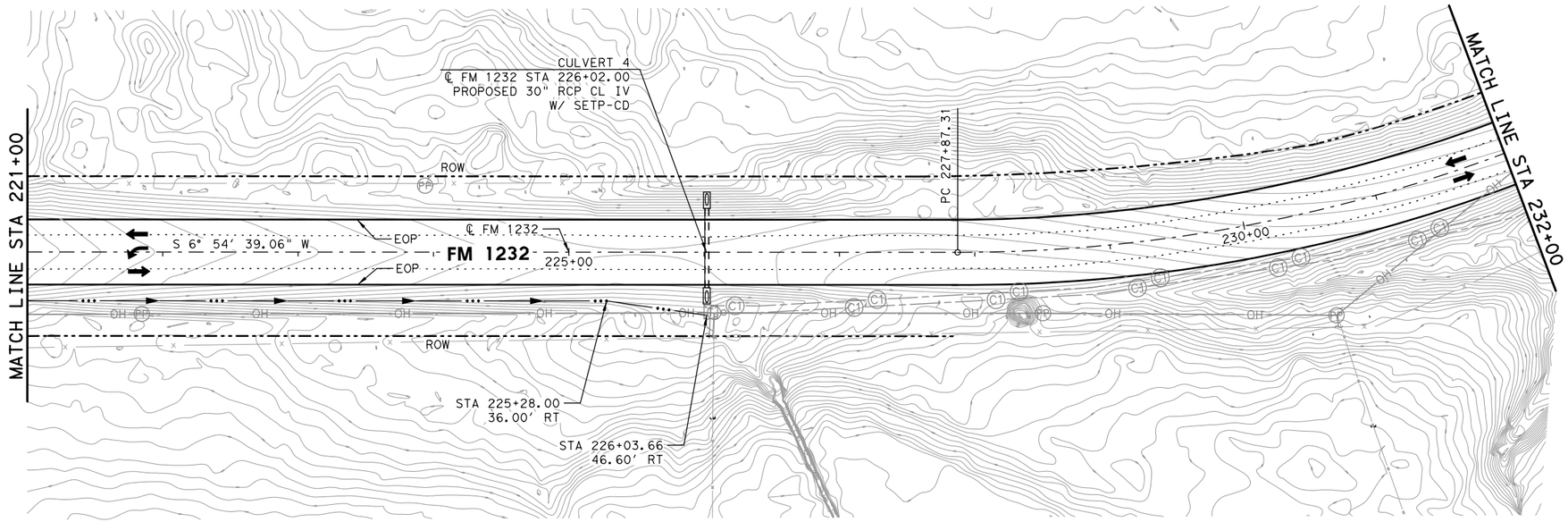

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

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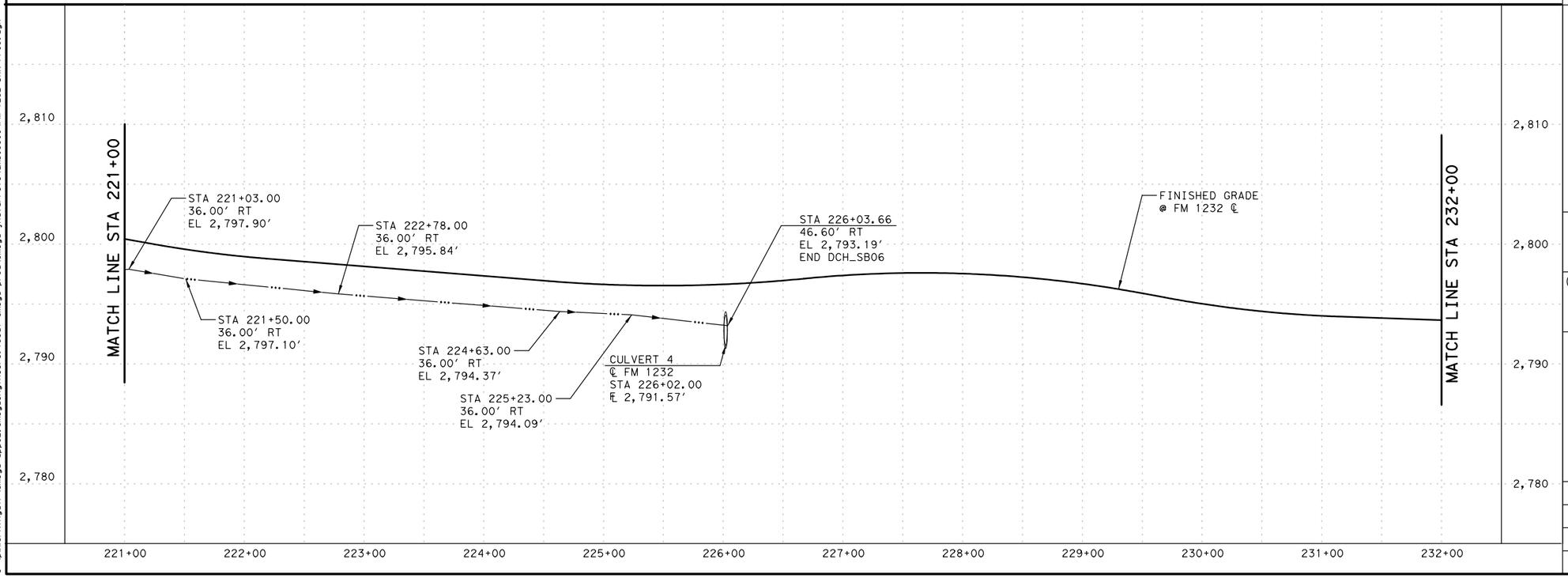

HORACIO FERNANDEZ
93064
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

7/17/2023

H. Fernandez, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 221+00 TO STA 232+00

SHEET 9 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	118
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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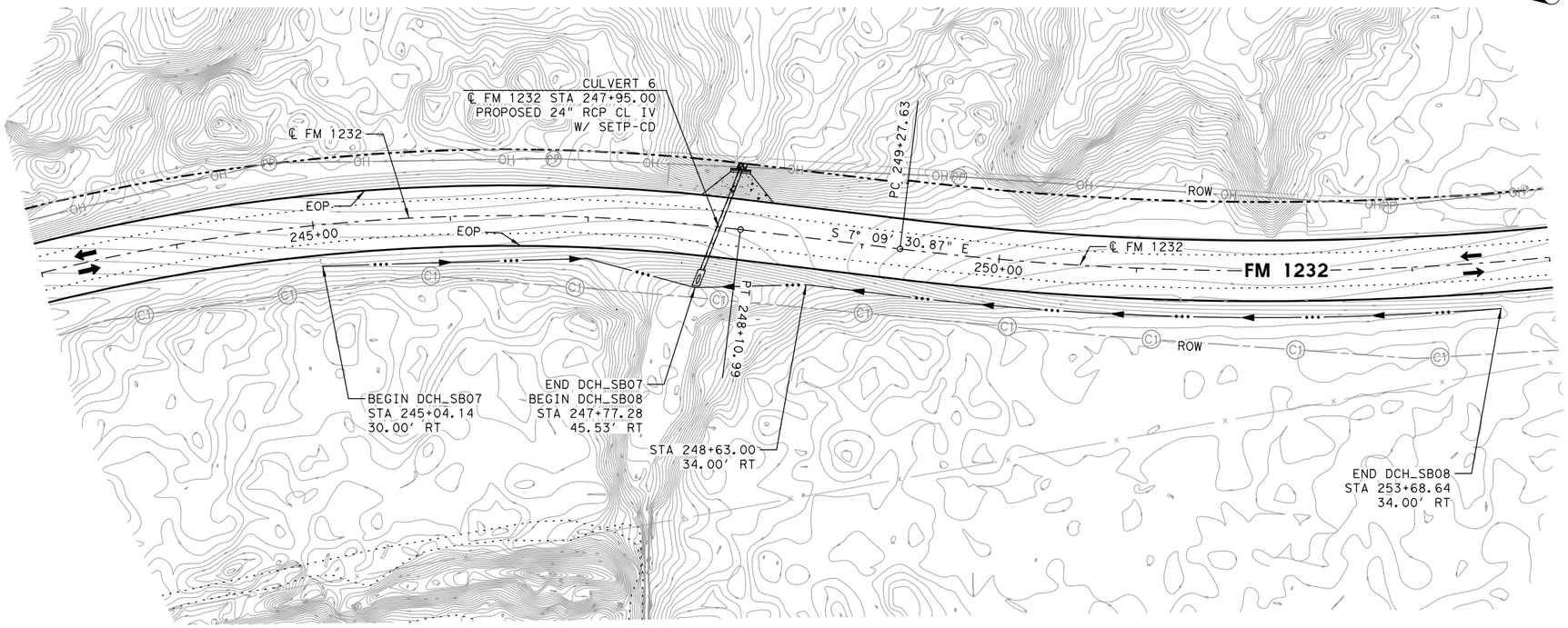

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

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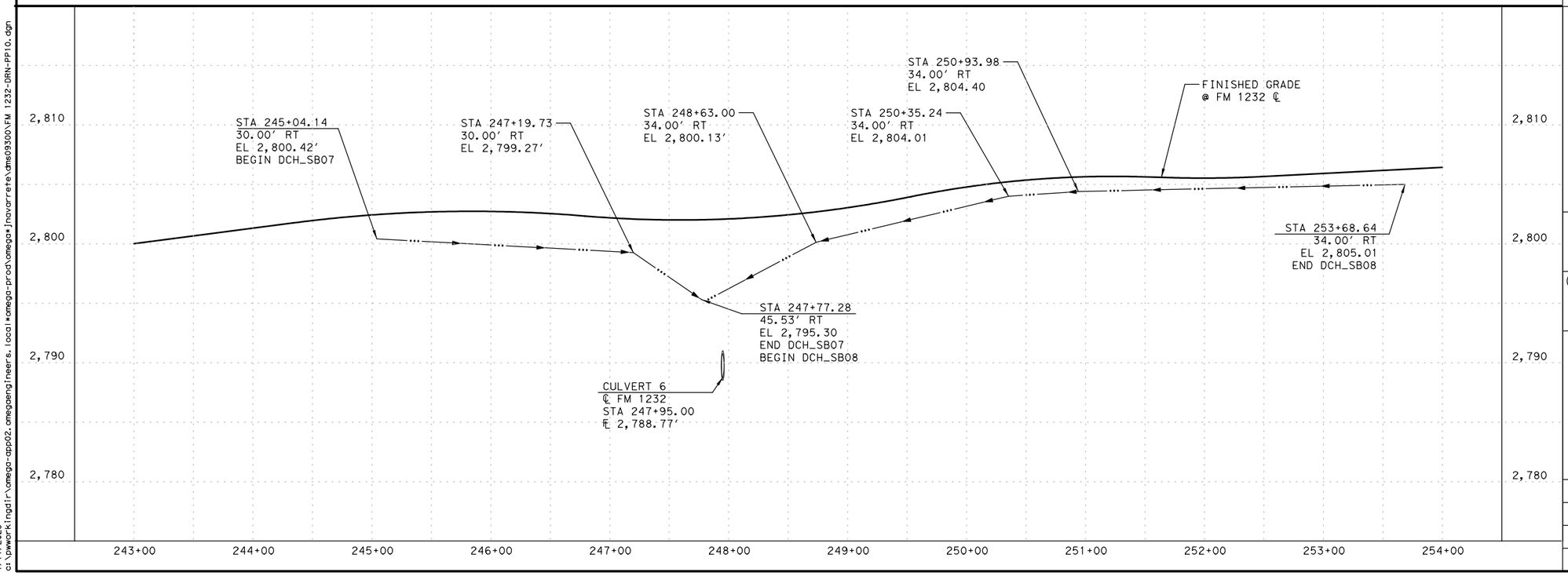

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
7/17/2023
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OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P#915 308 6413 F#281 647 9184

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 243+00 TO STA 254+00

SHEET 10 OF 17

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	119
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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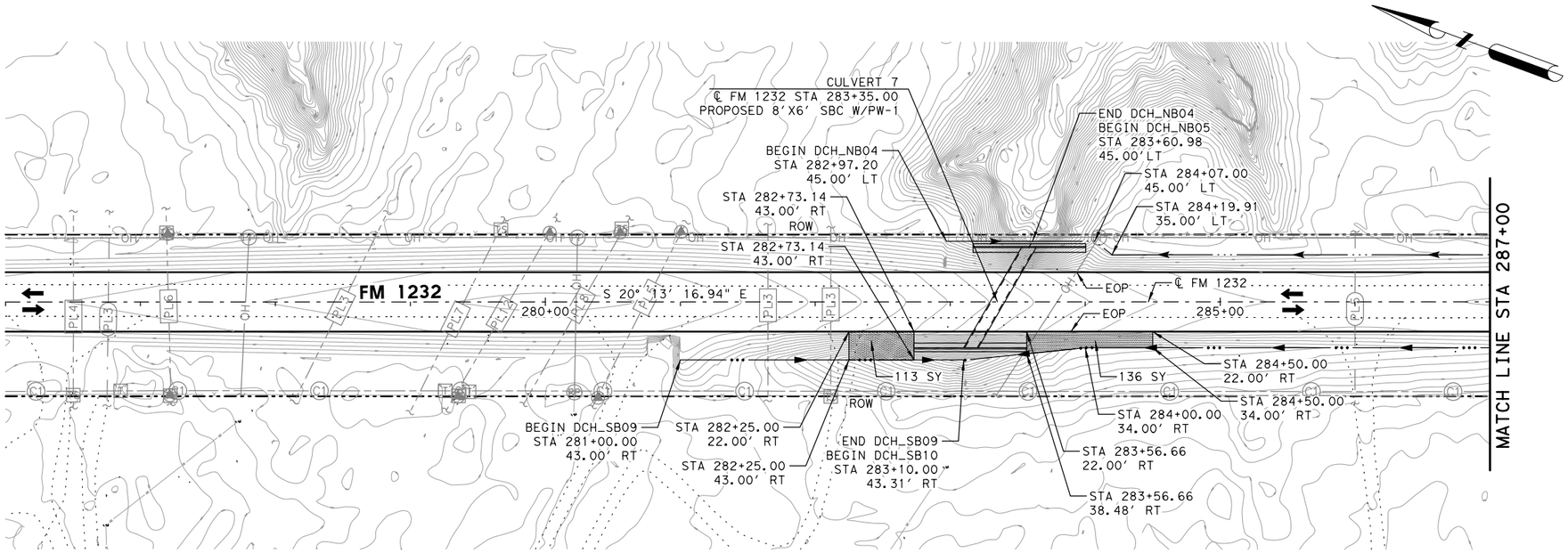

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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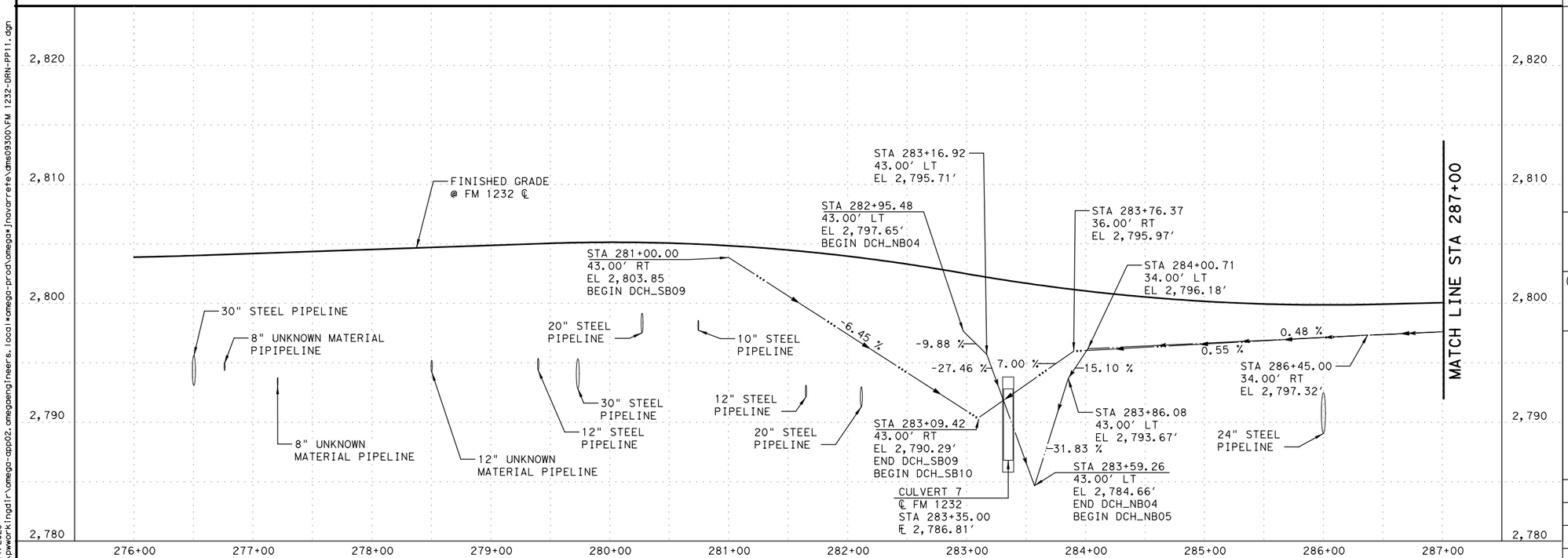

HORACIO FERNANDEZ
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LICENSED PROFESSIONAL ENGINEER
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7/17/2023

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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 276+00 TO STA 287+00

SHEET 11 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	120
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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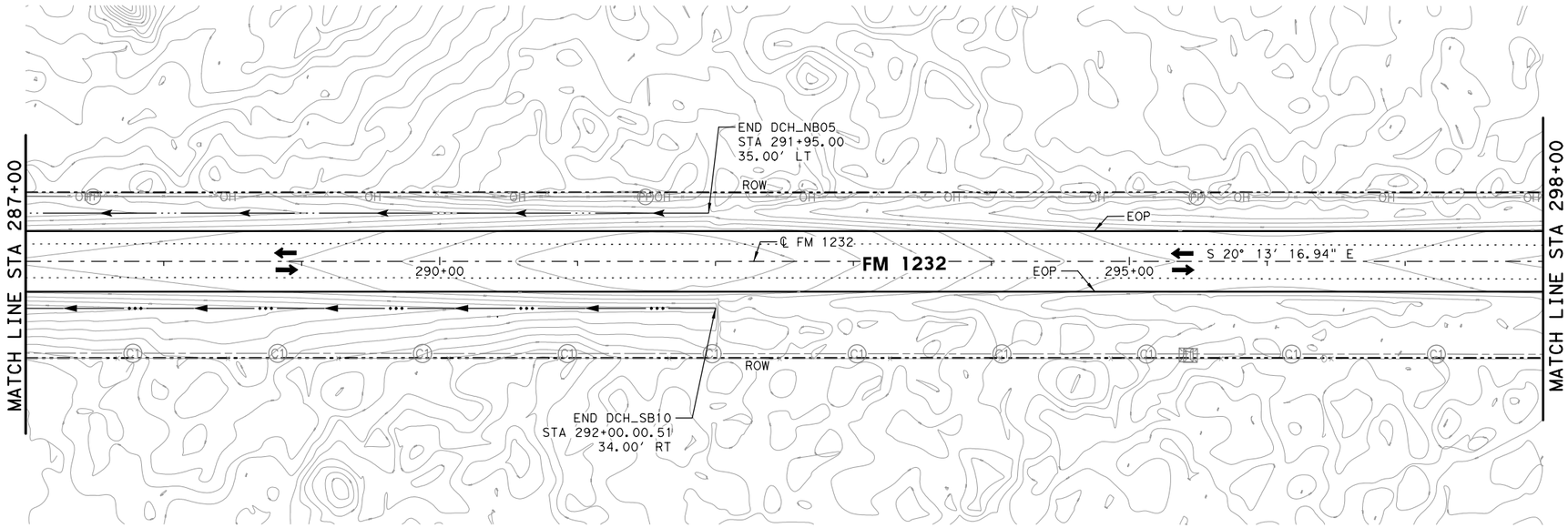

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

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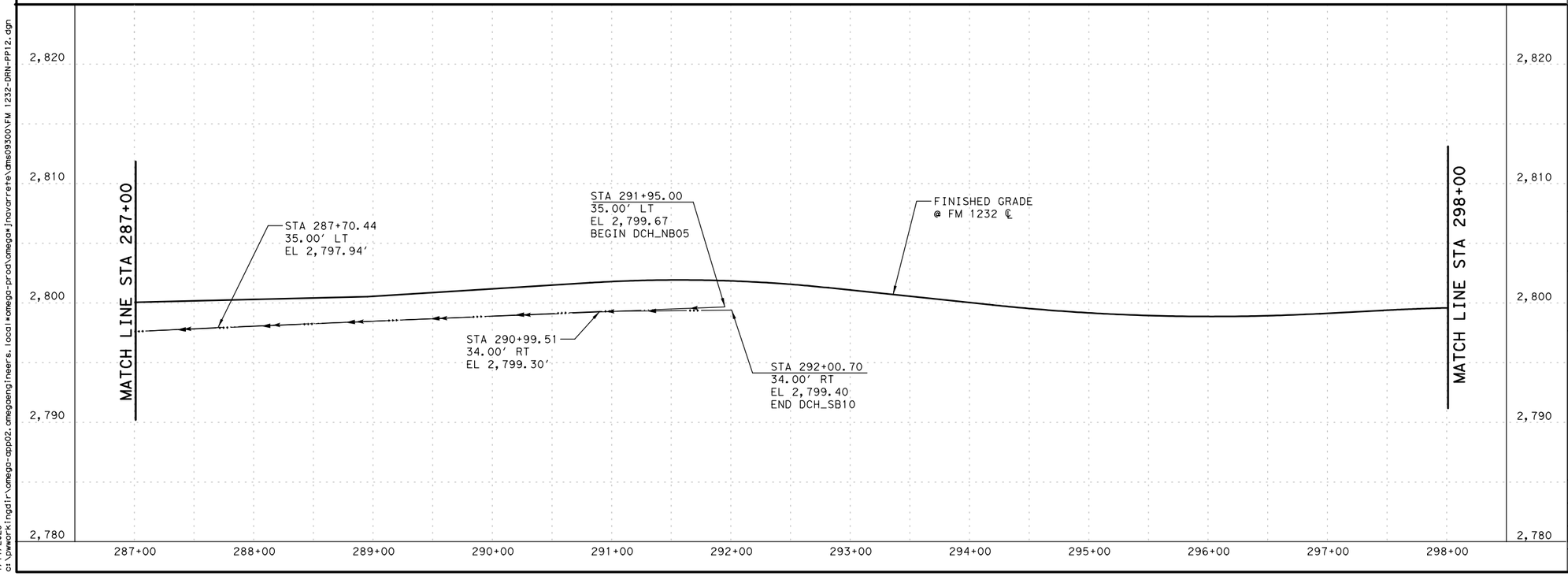

STATE OF TEXAS
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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 287+00 TO STA 298+00

SHEET 12 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	121
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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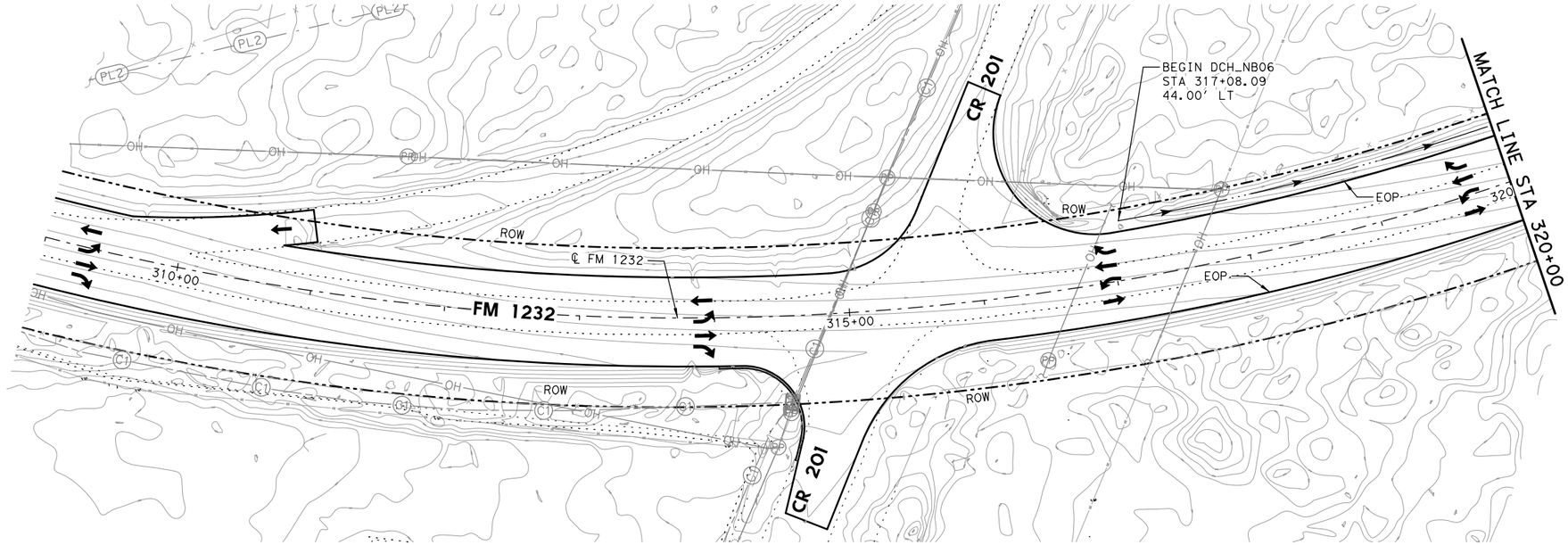

0 50 100

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

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3. SPECIAL DITCHES PRESENTED HEREIN RANGE FROM STA 101+46.73 TO STA 225+33.00 AND STA 678+04.00 TO STA 828+35.47, REFER TO ROADWAY CROSS SECTIONS FOR ADDITIONAL DITCH ℄ WITHIN THESE LIMITS.
4. REFER TO CROSS CULVERTS SHEETS FOR MORE INFORMATION.
5. CONTRACTOR TO FIELD VERIFY DEPTH AND LOCATION OF EXISTING UTILITIES PRIOR TO ANY CONSTRUCTION.

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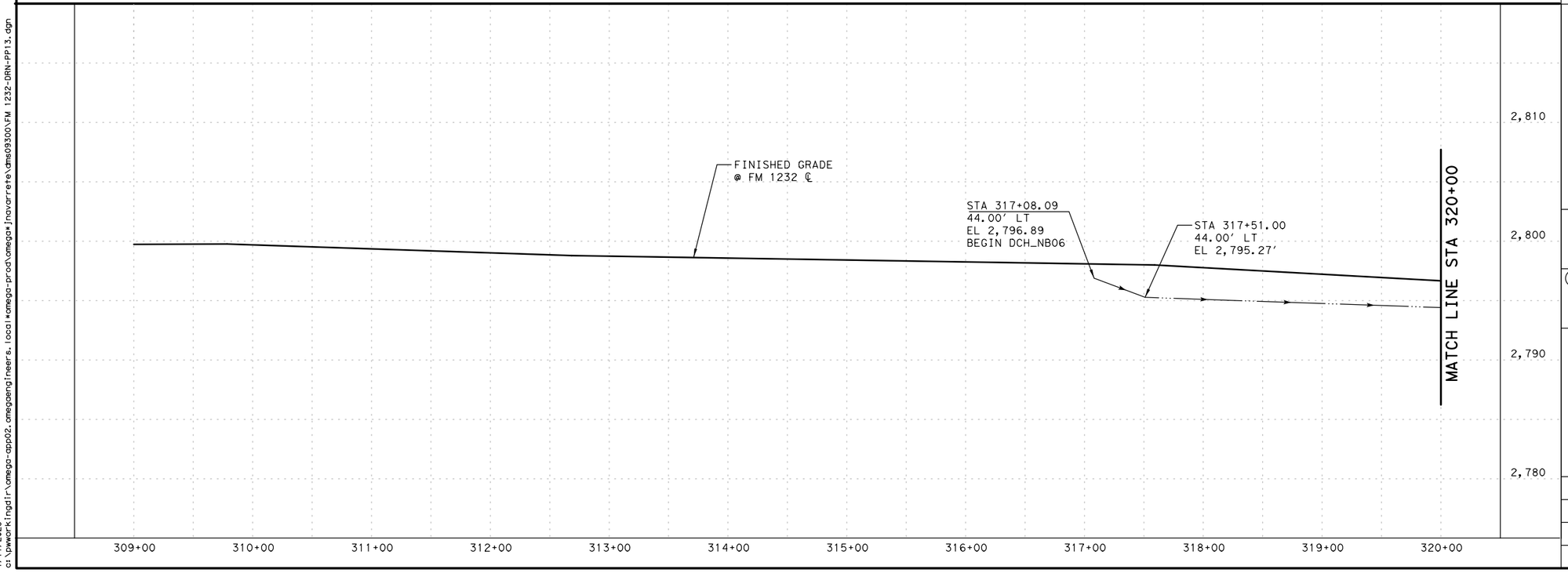

DATE	BY	REV	REVISION

STATE OF TEXAS
HORACIO FERNANDEZ
93064
LICENSED
PROFESSIONAL ENGINEER
7/17/2023
H. Fernández, P.E.

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 309+00 TO STA 320+00

SHEET 13 OF 17

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	122
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
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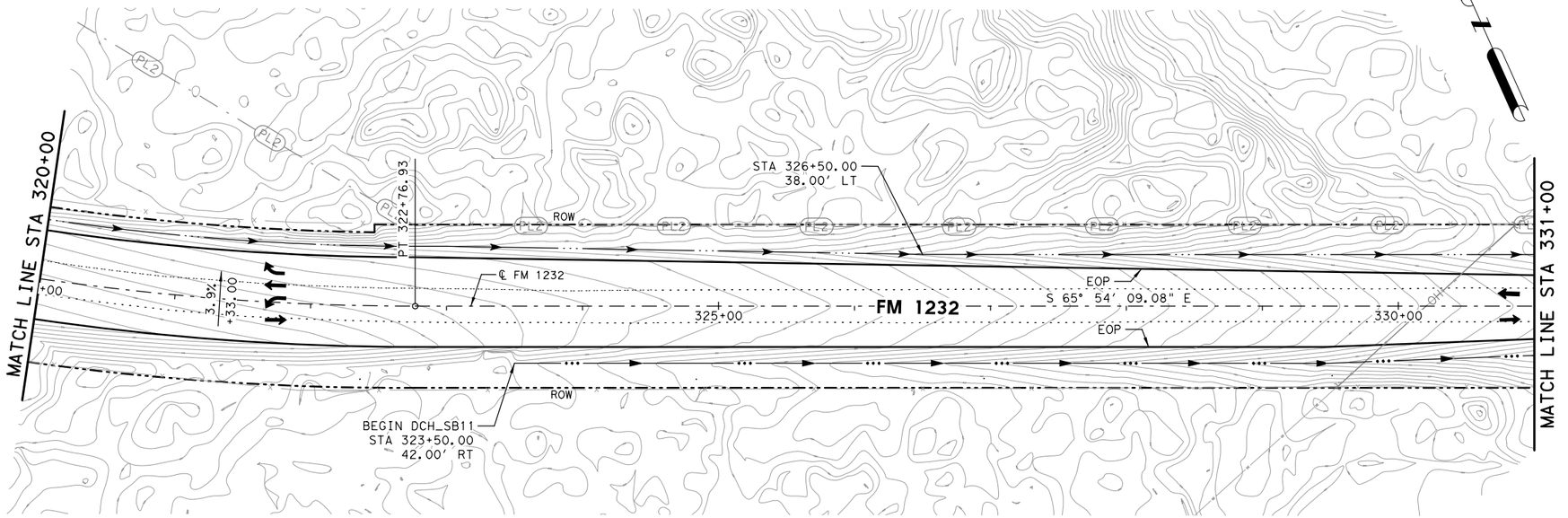

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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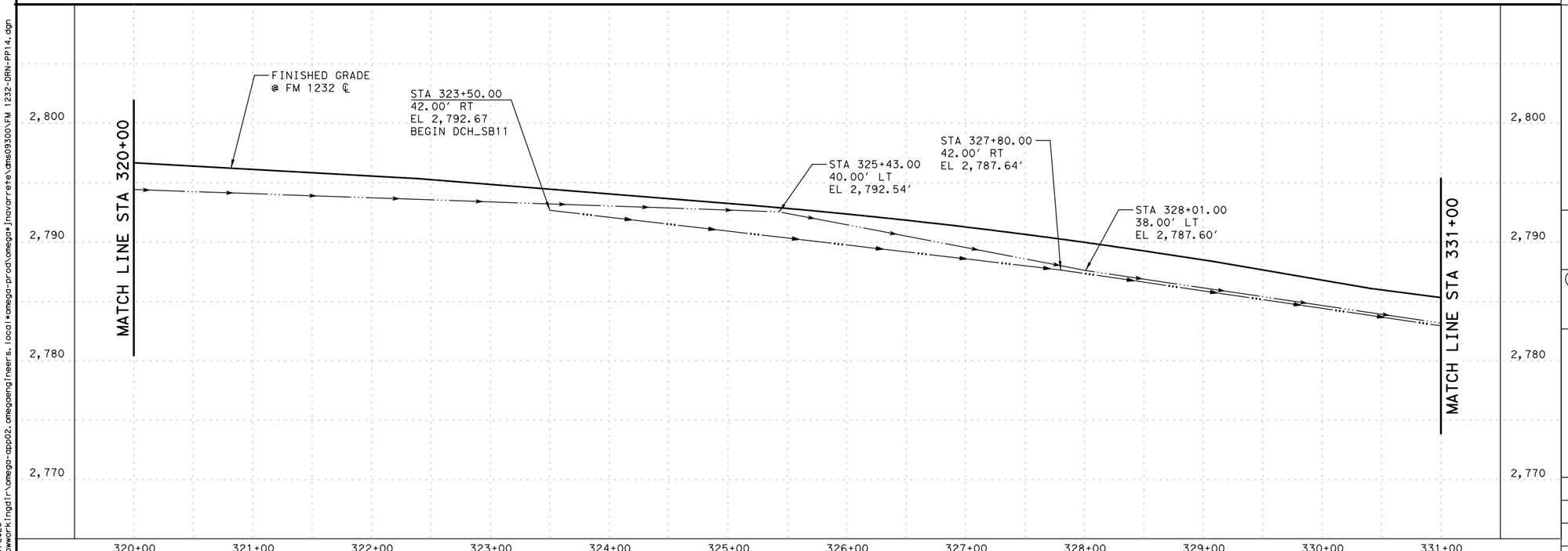

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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 320+00 TO STA 331+00

SHEET 14 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	123
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
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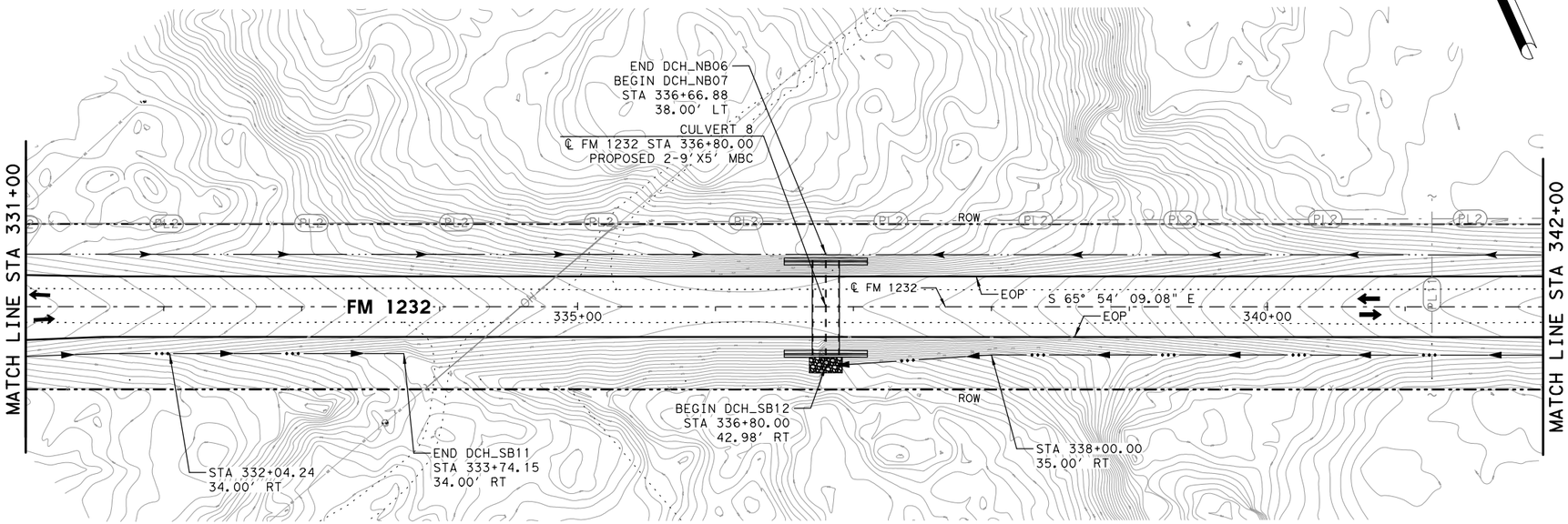

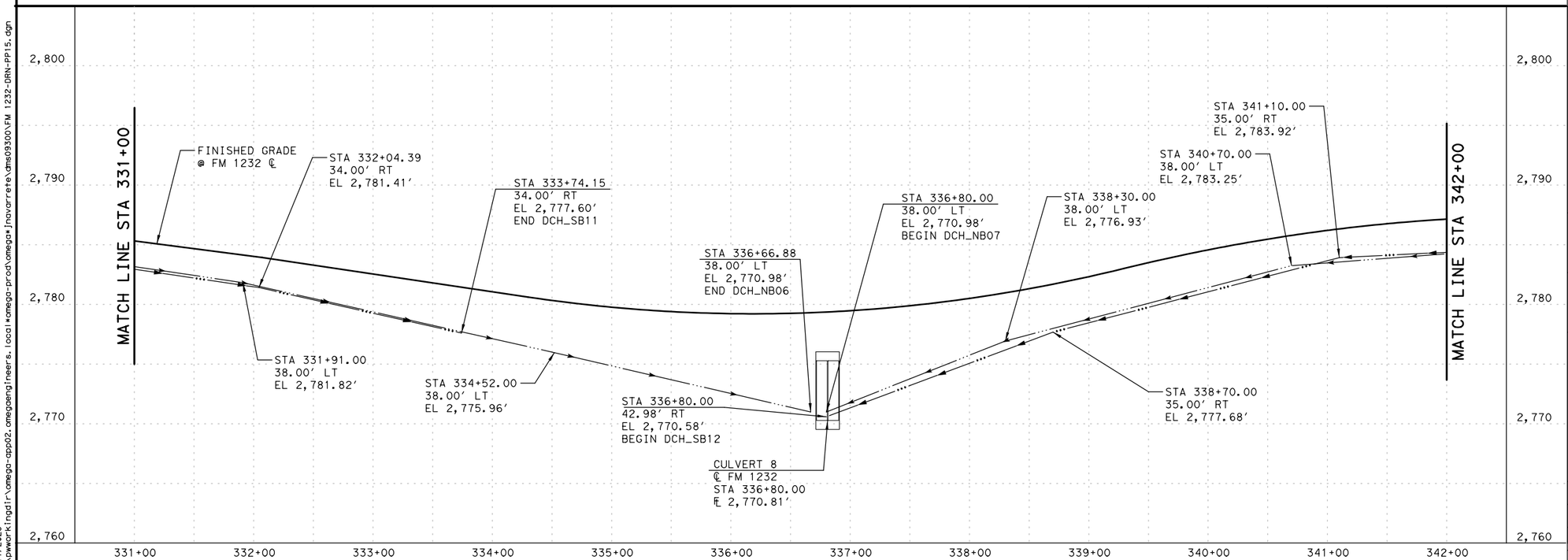

SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
- EXISTING R.O.W.
- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
DITCH PLAN & PROFILE

STA 331+00 TO STA 342+00

SHEET 15 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	124
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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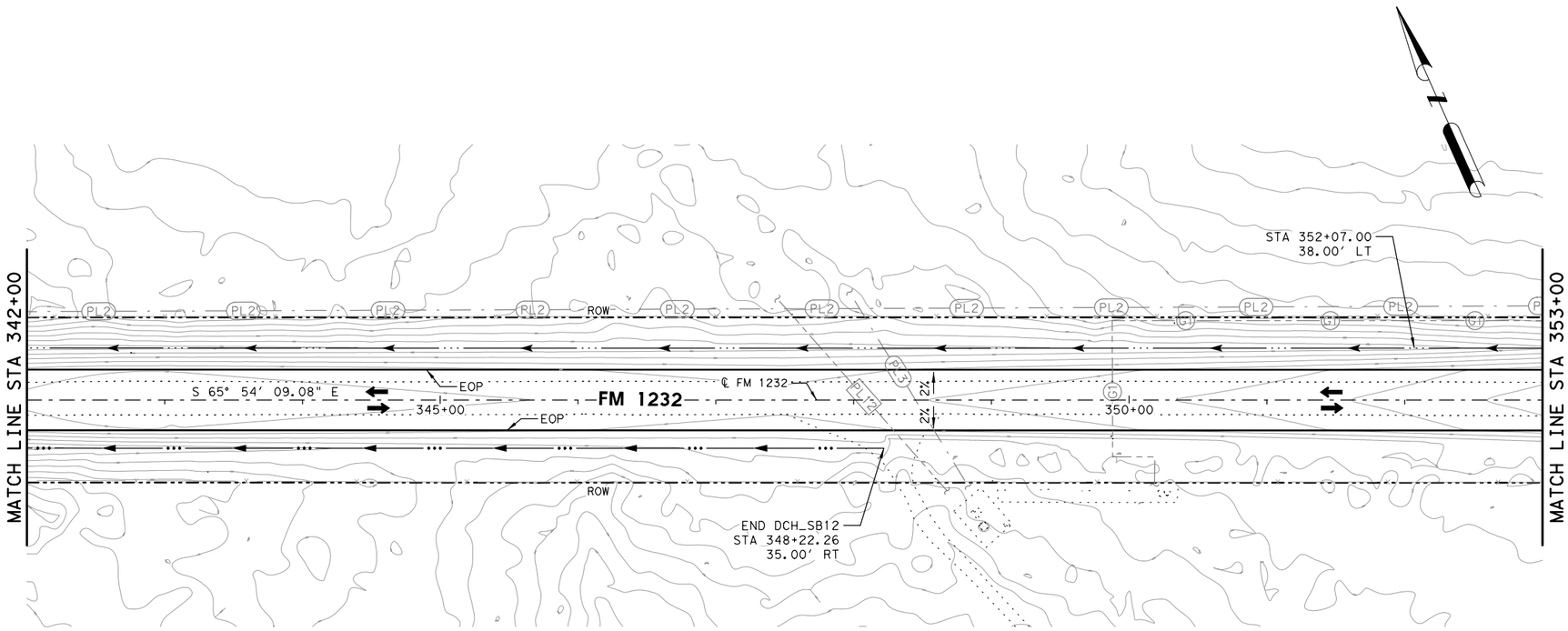

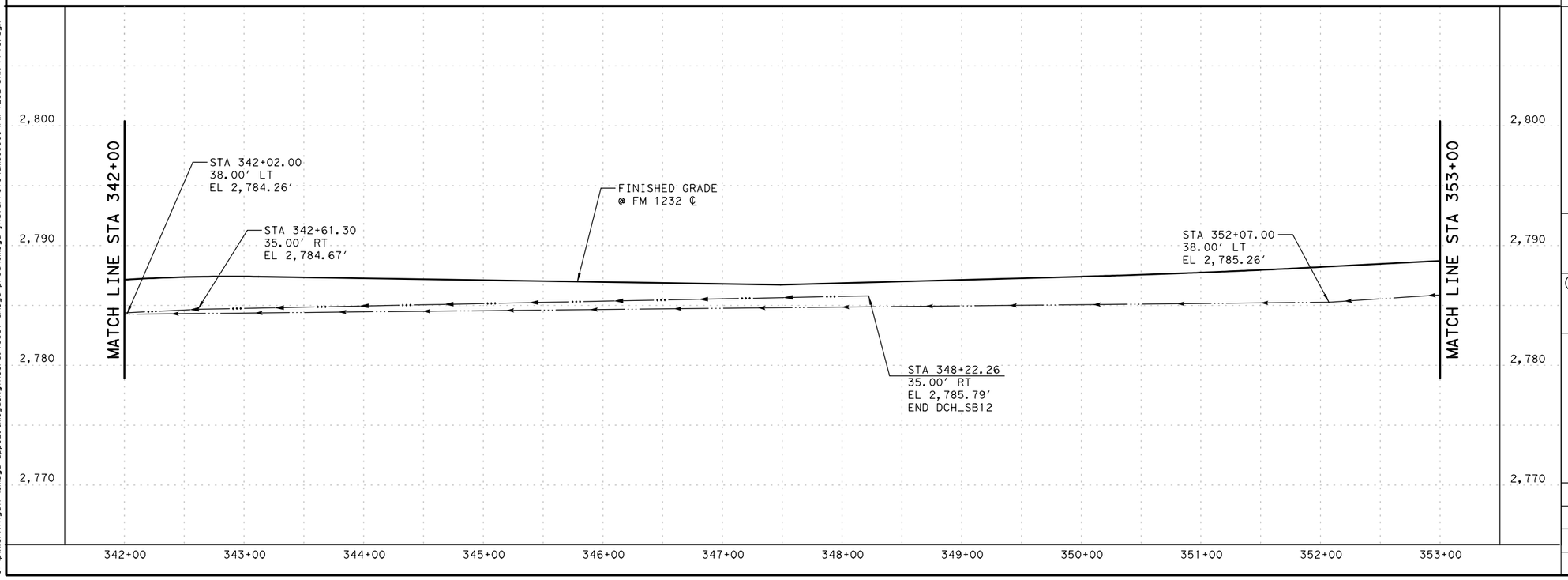

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SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
- EXISTING GROUND AT LEFT DITCH ℄
- EXISTING GROUND AT RIGHT DITCH ℄
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- (#) DRIVEWAY #
- EXISTING UTILITY CROSSING
- SOIL RETENTION BLANKET TY D

NOTES:

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Texas Department of Transportation®

FM 1232

SH 302 TO SH 115

DITCH PLAN & PROFILE

STA 342+00 TO STA 353+00

SHEET 16 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	125
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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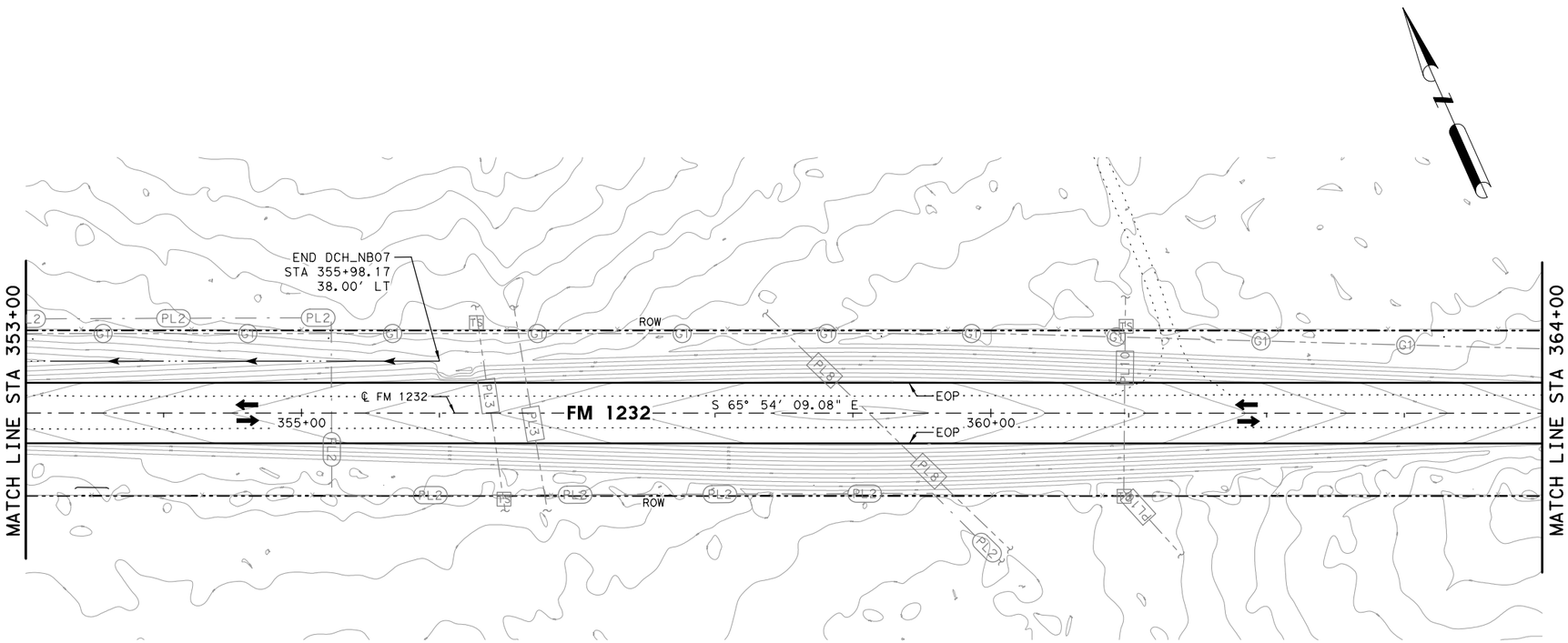

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SCALE: 1"=100' H
1"=10' V

LEGEND

- DIRECTION OF TRAFFIC
- PROP LEFT DITCH
- PROP RIGHT DITCH
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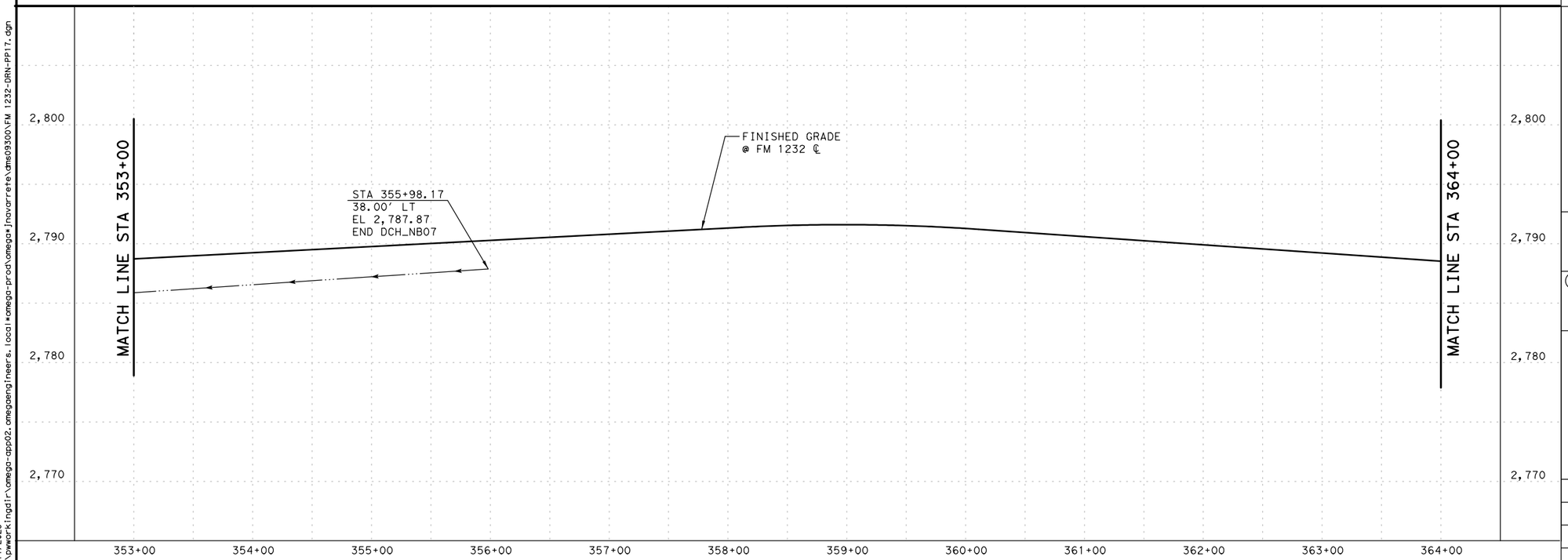

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Texas Department of Transportation®

FM 1232

SH 302 TO SH 115

DITCH PLAN & PROFILE

STA 353+00 TO STA 364+00

SHEET 17 OF 17

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	126
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
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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 (2) "C" Conc (Curb) (CY)	Class (3) "C" Conc (Wingwall) (CY)	Total Wingwall Area (SF)
CULVERT 1-STA 182+06.00 (Both)	1 ~ 10' X 8'	1.2'	SCP-10	PW-1	15	4:1	10"	10"	0.500	9.333	N/A	N/A	38.650	12.078	N/A	0.0	0.4	90.4	1442
CULVERT 7-STA 283+35.00 (Both)	1 ~ 8' X 6'	8.5'	SCP-8	PW-1	30	3:1	8"	8"	3.854	10.521	N/A	N/A	36.445	10.777	N/A	0.0	3.0	107.8	1534
CULVERT 8-STA 336+80.00 (Both)	2 ~ 9' X 5'	3.8'	MC-9-10	PW-1	0	3:1	9"	7"	1.000	6.750	N/A	N/A	20.250	19.750	N/A	0.0	1.4	38.6	546

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
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H. Fernandez, P.E.

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Texas Department of Transportation
Bridge Division Standard

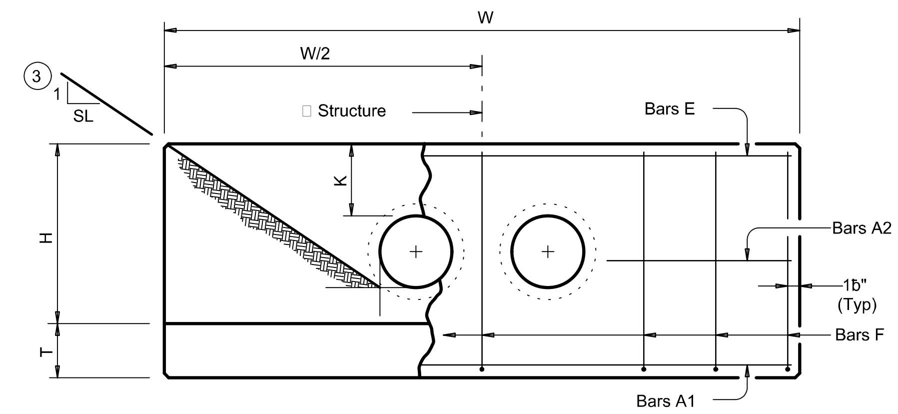
BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

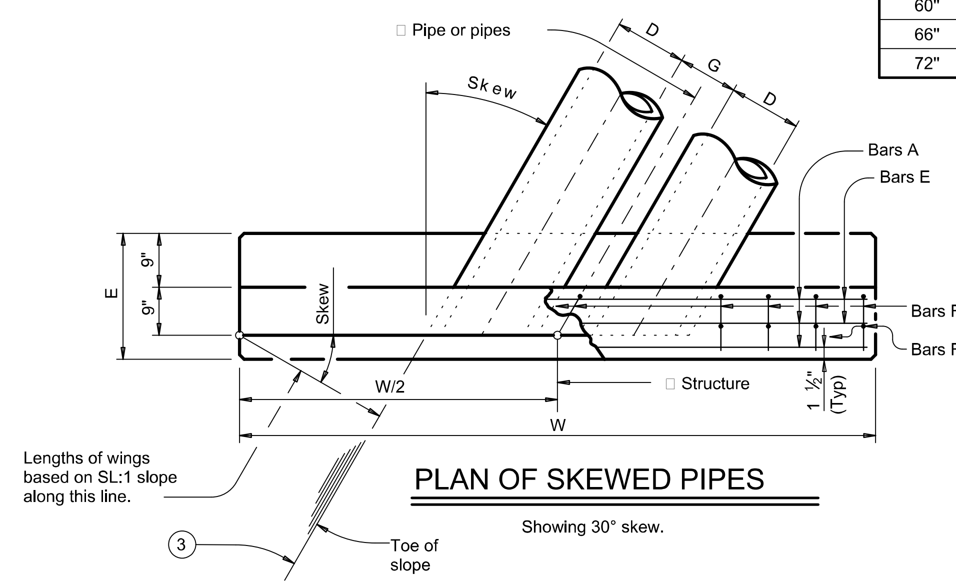
FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS	DIST ODA		COUNTY WINKLER	SHEET NO. 127

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew						30° Skew						45° Skew					
		Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe			Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 4"	124	1.1	1' - 9 ¾"	15	0.2	10' - 5"	130	1.2	2' - 0"	16	0.2	12' - 9"	159	1.5	2' - 5 ¾"	17	0.3
	15"	10' - 7"	136	1.3	2' - 3"	17	0.2	11' - 10"	159	1.5	2' - 6"	18	0.2	14' - 6"	191	1.8	3' - 0 ¾"	20	0.3
	18"	11' - 11"	165	1.5	2' - 9"	19	0.3	13' - 3"	174	1.7	3' - 1"	29	0.3	16' - 3"	207	2.1	3' - 9 ¼"	33	0.4
	21"	13' - 2"	203	1.9	3' - 2 ¼"	31	0.4	14' - 9"	233	2.1	3' - 6 ¾"	33	0.4	18' - 0"	276	2.6	4' - 4 ¼"	36	0.5
	24"	14' - 6"	240	2.1	3' - 8 ¼"	34	0.4	16' - 2"	251	2.4	4' - 1 ¾"	36	0.5	19' - 10"	318	2.9	5' - 0 ¾"	39	0.6
	27"	15' - 9"	258	2.5	4' - 0 ¾"	38	0.5	17' - 7"	292	2.8	4' - 6 ¼"	39	0.6	21' - 7"	342	3.4	5' - 6 ¼"	44	0.7
	30"	17' - 1"	297	2.8	4' - 5 ¾"	40	0.6	19' - 1"	311	3.1	5' - 0"	42	0.6	23' - 4"	388	3.8	6' - 1 ¾"	47	0.8
	33"	18' - 5"	320	3.3	4' - 9 ¾"	43	0.6	20' - 6"	358	3.6	5' - 4 ¾"	46	0.7	25' - 1"	439	4.4	6' - 7 ¼"	51	0.9
	36"	19' - 8"	401	4.0	5' - 3"	47	0.9	21' - 11"	422	4.5	5' - 10 ¾"	50	0.9	26' - 10"	517	5.5	7' - 2 ¼"	55	1.2
	42"	22' - 3"	476	5.0	6' - 0 ¾"	53	1.1	24' - 10"	528	5.6	6' - 8 ¾"	56	1.2	30' - 5"	634	6.9	8' - 3"	76	1.4
	48"	25' - 11"	577	6.6	6' - 9 ¾"	60	1.3	28' - 10"	637	7.3	7' - 7 ¼"	79	1.5	35' - 4"	791	9.0	9' - 3 ¾"	88	1.8
	54"	28' - 6"	711	7.8	7' - 9"	83	1.6	31' - 9"	781	8.7	8' - 8"	81	1.8	38' - 11"	958	10.7	10' - 7 ¼"	97	2.2
	60"	31' - 1"	805	9.2	8' - 6 ¼"	91	1.9	34' - 8"	881	10.2	9' - 6 ¼"	97	2.1	42' - 5"	1,113	12.5	11' - 8"	124	2.6
	66"	33' - 8"	907	10.6	9' - 0 ¾"	98	2.1	37' - 6"	1,028	11.8	10' - 1 ¼"	102	2.4	46' - 0"	1,235	14.5	12' - 4 ¼"	132	2.9
	72"	36' - 3"	1,071	12.1	9' - 8"	105	2.4	40' - 5"	1,207	13.5	10' - 9 ¼"	110	2.6	49' - 6"	1,446	16.6	13' - 2 ¼"	141	3.2
3:1	12"	13' - 6"	178	1.6	1' - 9 ¾"	15	0.2	15' - 0"	189	1.8	2' - 0"	15	0.2	18' - 5"	237	2.2	2' - 5 ¾"	17	0.2
	15"	15' - 3"	212	1.9	2' - 3"	17	0.2	17' - 0"	223	2.1	2' - 6"	17	0.3	20' - 10"	276	2.6	3' - 0 ¾"	20	0.3
	18"	17' - 1"	231	2.3	2' - 9"	19	0.3	19' - 1"	259	2.5	3' - 1"	29	0.3	23' - 4"	318	3.1	3' - 9 ¼"	32	0.4
	21"	18' - 11"	306	2.7	3' - 2 ¼"	31	0.4	21' - 1"	339	3.0	3' - 6 ¾"	33	0.4	25' - 10"	413	3.7	4' - 4 ¼"	36	0.5
	24"	20' - 8"	345	3.1	3' - 8 ¾"	35	0.4	23' - 1"	384	3.5	4' - 1 ¾"	36	0.5	28' - 3"	462	4.2	5' - 0 ¾"	40	0.6
	27"	22' - 6"	376	3.7	4' - 0 ¾"	38	0.5	25' - 1"	438	4.1	4' - 6 ¼"	39	0.6	30' - 9"	522	5.0	5' - 6 ¼"	44	0.7
	30"	24' - 4"	422	4.1	4' - 5 ¾"	40	0.6	27' - 2"	466	4.6	5' - 0"	42	0.6	33' - 3"	578	5.6	6' - 1 ¾"	47	0.8
	33"	26' - 2"	476	4.8	4' - 10"	43	0.6	29' - 2"	522	5.3	5' - 4 ¾"	46	0.7	35' - 9"	644	6.5	6' - 7 ¼"	51	0.9
	36"	27' - 11"	590	5.9	5' - 3"	47	0.8	31' - 2"	645	6.6	5' - 10 ¾"	50	0.9	38' - 2"	787	8.0	7' - 2 ¼"	56	1.2
	42"	31' - 7"	684	7.3	6' - 0 ¼"	53	1.1	35' - 3"	776	8.2	6' - 8 ¾"	56	1.2	43' - 2"	933	10.0	8' - 3"	79	1.4
	48"	36' - 9"	880	9.6	6' - 9 ¾"	61	1.3	41' - 0"	953	10.7	7' - 7 ¼"	81	1.5	50' - 2"	1,166	13.1	9' - 3 ¾"	88	1.8
	54"	40' - 5"	1,065	11.4	7' - 9"	85	1.6	45' - 0"	1,185	12.7	8' - 8"	89	1.8	55' - 2"	1,435	15.5	10' - 7 ¼"	97	2.2
	60"	44' - 0"	1,224	13.3	8' - 6 ¼"	93	1.9	49' - 1"	1,356	14.8	9' - 6 ¼"	96	2.1	60' - 1"	1,635	18.2	11' - 8"	124	2.6
	66"	47' - 7"	1,357	15.4	9' - 1"	98	2.1	53' - 1"	1,497	17.2	10' - 1 ¼"	103	2.3	65' - 1"	1,892	21.1	12' - 4 ¼"	130	2.9
	72"	51' - 3"	1,624	17.7	9' - 8"	105	2.3	57' - 2"	1,787	19.7	10' - 9 ¼"	109	2.6	70' - 0"	2,218	24.1	13' - 2 ¼"	139	3.2
4:1	12"	17' - 7"	232	2.1	1' - 9 ¾"	15	0.2	19' - 8"	259	2.4	2' - 0"	16	0.2	24' - 0"	314	2.9	2' - 5 ¾"	18	0.2
	15"	19' - 11"	272	2.5	2' - 3"	17	0.2	22' - 3"	301	2.8	2' - 6"	18	0.3	27' - 3"	361	3.5	3' - 0 ¾"	21	0.3
	18"	22' - 3"	313	3.0	2' - 9"	19	0.3	24' - 10"	344	3.3	3' - 1"	29	0.3	30' - 5"	427	4.0	3' - 9 ¼"	32	0.4
	21"	24' - 7"	407	3.6	3' - 2 ¼"	31	0.4	27' - 5"	446	4.0	3' - 6 ¾"	33	0.4	33' - 7"	549	4.9	4' - 4 ¼"	36	0.5
	24"	26' - 11"	455	4.1	3' - 8 ¾"	35	0.4	30' - 0"	499	4.5	4' - 1 ¾"	36	0.5	36' - 9"	609	5.6	5' - 0 ¾"	40	0.6
	27"	29' - 3"	514	4.8	4' - 0 ¾"	38	0.5	32' - 7"	562	5.4	4' - 6 ¼"	40	0.6	39' - 11"	703	6.6	5' - 6 ¼"	43	0.7
	30"	31' - 7"	568	5.4	4' - 5 ¾"	40	0.6	35' - 3"	620	6.0	5' - 0"	42	0.6	43' - 2"	768	7.4	6' - 1 ¾"	49	0.8
	33"	33' - 11"	634	6.2	4' - 10"	43	0.7	37' - 10"	710	7.0	5' - 4 ¾"	46	0.7	46' - 4"	848	8.5	6' - 7 ¼"	52	0.9
	36"	36' - 3"	776	7.7	5' - 3"	48	0.9	40' - 5"	868	8.6	5' - 10 ¾"	49	0.9	49' - 6"	1,058	10.6	7' - 2 ¼"	56	1.1
	42"	40' - 11"	921	9.6	6' - 0 ¼"	53	1.0	45' - 7"	1,022	10.7	6' - 8 ¾"	57	1.2	55' - 10"	1,262	13.1	8' - 3"	78	1.4
	48"	47' - 7"	1,152	12.6	6' - 10"	61	1.3	53' - 1"	1,268	14.0	7' - 7 ¼"	80	1.5	65' - 1"	1,587	17.2	9' - 3 ¾"	86	1.8
	54"	52' - 3"	1,416	14.9	7' - 9 ¼"	86	1.6	58' - 4"	1,589	16.6	8' - 8"	89	1.8	71' - 5"	1,924	20.4	10' - 7 ¼"	95	2.2
	60"	56' - 11"	1,606	17.5	8' - 6 ¾"	92	1.9	63' - 6"	1,806	19.5	9' - 6 ¼"	95	2.1	77' - 9"	2,192	23.9	11' - 8"	122	2.6
	66"	61' - 7"	1,819	20.2	9' - 0 ¾"	97	2.1	68' - 8"	2,019	22.5	10' - 1 ¼"	101	2.4	84' - 2"	2,472	27.6	12' - 4 ¼"	131	2.9
	72"	66' - 3"	2,150	23.2	9' - 8"	104	2.4	73' - 11"	2,379	25.9	10' - 9 ¼"	108	2.6	90' - 6"	2,937	31.7	13' - 2 ¼"	138	3.2
6:1	12"	25' - 11"	342	3.1	1' - 9 ¾"	15	0.2	28' - 10"	374	3.5	2' - 0"	16	0.2	35' - 4"	456	4.3	2' - 5 ¾"	17	0.2
	15"	29' - 3"	390	3.7	2' - 3"	17	0.2	32' - 7"	442	4.2	2' - 6"	18	0.2	39' - 11"	549	5.1	3' - 0 ¾"	20	0.3
	18"	32' - 7"	459	4.4	2' - 9"	20	0.3	36' - 4"	515	4.9	3' - 1"	29	0.3	44' - 7"	629	6.0	3' - 9 ¼"	33	0.4
	21"	36' - 0"	608	5.3	3' - 2 ¼"	31	0.4	40' - 2"	660	5.9	3' - 6 ¾"	33	0.4	49' - 2"	823	7.2	4' - 4 ¼"	38	0.5
	24"	39' - 4"	672	6.0	3' - 8 ¾"	35	0.4	43' - 11"	748	6.7	4' - 1 ¾"	36	0.5	53' - 9"	920	8.2	5' - 0 ¾"	42	0.6
	27"	42' - 8"	770	7.1	4' - 0 ¾"	38	0.5	47' - 8"	852	8.0	4' - 6 ¼"	41	0.5	58' - 4"	1,039	9.7	5' - 6 ¼"	45	0.7
	30"	46' - 1"	839	8.0	4' - 5 ¾"	40	0.6	51' - 5"	949	8.9	5' - 0"	44	0.6	62' - 11"	1,162	10.9	6' - 1 ¾"	48	0.8
	33"	49' - 5"	947	9.2	4' - 10"	45	0.7	55' - 2"	1,040	10.3	5' - 4 ¾"	48	0.7	67' - 6"	1,292	12.6	6' - 7 ¼"	50	0.9
	36"	52' - 10"	1,151	11.4	5' - 3"	49	0.8	58' - 11"	1,287	12.7	5' - 10 ¾"	51	1.0	72' - 1"	1,583	15.6	7' - 2 ¼"	55	1.1
	42"	59' - 6"	1,365	14.2	6' - 0 ¼"	55	1.0	66' - 5"	1,530	15.8	6' - 8 ¾"	57	1.2	81' - 4"	1,875	19.4	8' - 3"	76	1.4
	48"	69' - 4"	1,737	18.5	6' - 10"	59	1.3	77' - 4"	1,942	20.7	7' - 7 ¼"	79	1.5	94' - 9"	2,368	25.3	9' - 3 ¾"	86	1.8
	54"	76' - 1"	2,138	22.0	7' - 9 ¼"	83	1.6	84' - 10"	2,378	24.6	8' - 8"	87	1.8	103' - 11"	2,912	30.1	10' - 7 ¼"	95	2.2
	60"	82' - 10"	2,426	25.8	8' - 6 ¾"	90	1.9	92' - 5"	2,681	28.8	9' - 6 ¼"	94	2.1	113' - 2"	3,294	35.3	11' - 8"	122	2.6
	66"	89' - 7"	2,730	29.9	9' - 0 ¾"	96	2.1	99' - 11"	3,038	33.3	10' - 1 ¼"	101	2.4	122' - 4"	3,697	40.8	12' - 4 ¼"	130	2.9
	72"	96' - 3"	3,218	34.2	9' - 8"	102	2.4	107' - 5"	3,580	38.2	10' - 9 ¼"	108	2.6	131' - 6"	4,372	46.8	13' - 2 ¼"	139	3.2

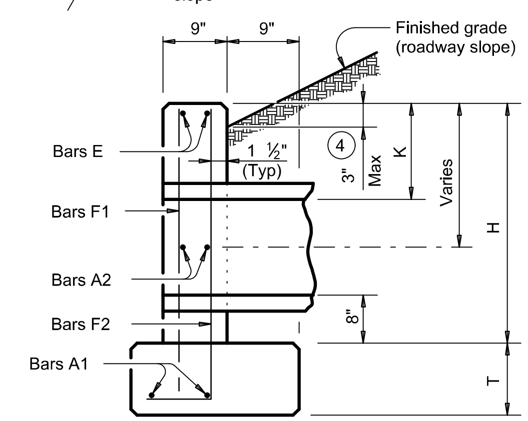


ELEVATION



PLAN OF SKEWED PIPES

Showing 30° skew.



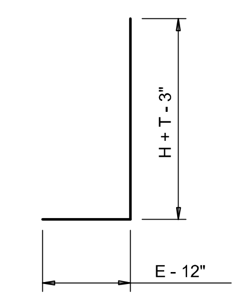
SECTION AT CENTER OF PIPE

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~



BARS F2

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.

(1) Total quantites include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

(6) Quantities shown are for one structure end only (one headwall).

Texas Department of Transportation | Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

CH-PW-S

FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS	DIST ODA	COUNTY WINKLER		SHEET NO. 128

DATE: 7/17/2023 10:18:57 AM
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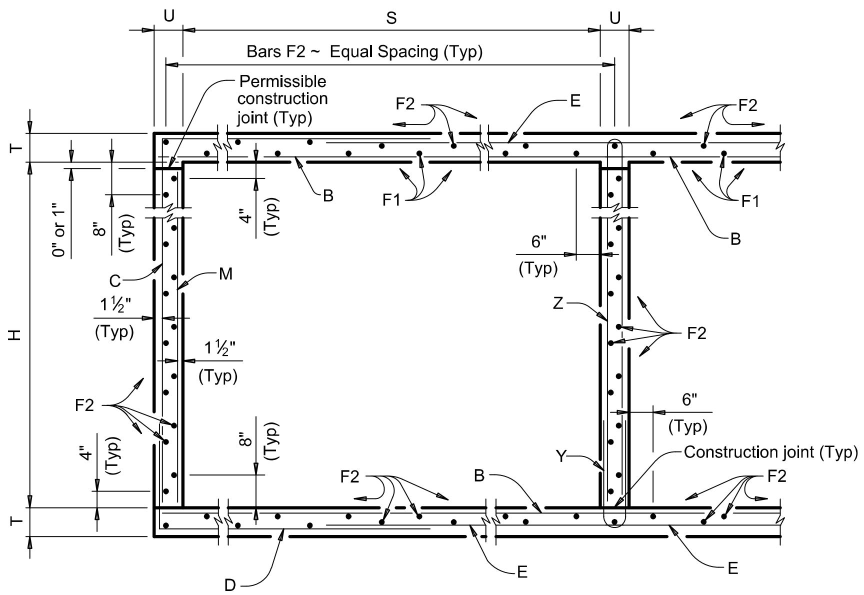
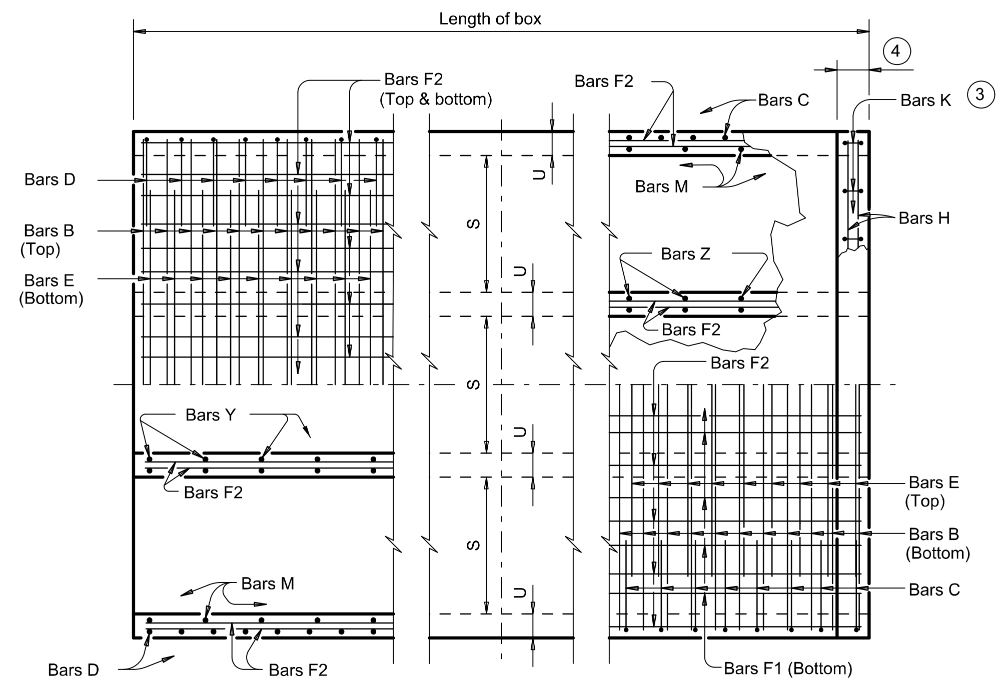


TYPICAL SECTION



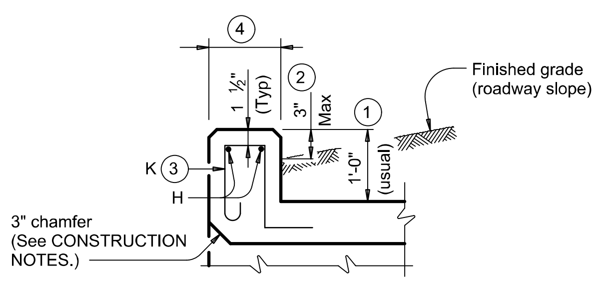
PART PLANS

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86"
Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).



SECTION THRU CURB

TABLE OF BAR DIMENSIONS		
H	"X"	"Y"
4'-0"	4'-7 ½"	5'-5"
5'-0"	5'-7 ½"	5'-5"
6'-0"	6'-7 ½"	5'-5"
7'-0"	7'-7 ½"	5'-5"
8'-0"	8'-7 ½"	5'-5"
9'-0"	9'-7 ½"	5'-5"

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed, and Bars Y and Z may be reversed.

MATERIAL NOTES:

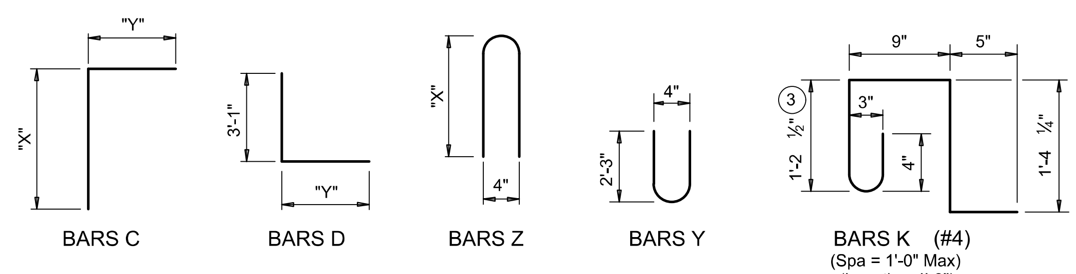
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



HL93 LOADING

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

9'-0" SPAN
0' TO 10' FILL

MC-9-10

FILE: mc910ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT		CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB		HIGHWAY
REVISIONS	1371	01	023		FM 1232
	DIST	COUNTY			SHEET NO.
	ODA	WINKLER			129

BILLS OF REINFORCING STEEL (For Box Length = 40 feet)

NUMBER OF SPANS	SECTION DIMENSIONS				Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4						Bars H 4 ~ #4		Bars K		QUANTITIES					
													Bars C		Bars D																					Bars Y		Bars Z						Per Foot of Barrel		Curb		Total	
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	9' - 0"	4' - 0"	9"	7"	162	#6	6"	19' - 6"	4,745	108	#6	9"	10' - 1"	1,636	8' - 7"	1,392	162	#6	6"	14' - 1"	3,427	14	18"	39' - 9"	372	62	18"	39' - 9"	1,646	108	9"	4' - 0"	289	54	9"	4' - 9"	171	9' - 5"	340	19' - 6"	52	42	117	1.356	350.5	1.5	169	55.7	14,187
3	9' - 0"	4' - 0"	9"	7"	162	#6	6"	29' - 1"	7,077	108	#6	9"	10' - 1"	1,636	8' - 7"	1,392	162	#6	6"	23' - 8"	5,759	21	18"	39' - 9"	558	89	18"	39' - 9"	2,363	108	9"	4' - 0"	289	108	9"	4' - 9"	343	9' - 5"	679	29' - 1"	78	62	173	1.975	502.4	2.2	251	81.2	20,347
4	9' - 0"	4' - 0"	9"	7"	162	#6	6"	38' - 8"	9,409	108	#6	9"	10' - 1"	1,636	8' - 7"	1,392	162	#6	6"	33' - 3"	8,091	28	18"	39' - 9"	743	116	18"	39' - 9"	3,080	108	9"	4' - 0"	289	162	9"	4' - 9"	514	9' - 5"	1,019	38' - 8"	103	80	223	2.594	654.3	2.9	326	106.6	26,499
5	9' - 0"	4' - 0"	9"	7"	162	#6	6"	48' - 3"	11,740	108	#6	9"	10' - 1"	1,636	8' - 7"	1,392	162	#6	6"	42' - 10"	10,422	35	18"	39' - 9"	929	143	18"	39' - 9"	3,797	108	9"	4' - 0"	289	216	9"	4' - 9"	685	9' - 5"	1,359	48' - 3"	129	100	278	3.213	806.2	3.6	407	132.1	32,656
6	9' - 0"	4' - 0"	9"	7"	162	#6	6"	57' - 10"	14,072	108	#6	9"	10' - 1"	1,636	8' - 7"	1,392	162	#6	6"	52' - 5"	12,754	42	18"	39' - 9"	1,115	170	18"	39' - 9"	4,514	108	9"	4' - 0"	289	270	9"	4' - 9"	857	9' - 5"	1,698	57' - 10"	155	118	328	3.832	958.2	4.3	483	157.6	38,810
2	9' - 0"	5' - 0"	9"	7"	162	#6	6"	19' - 6"	4,745	108	#6	9"	11' - 1"	1,798	8' - 7"	1,392	162	#6	6"	14' - 1"	3,427	14	18"	39' - 9"	372	68	18"	39' - 9"	1,806	108	9"	5' - 0"	361	54	9"	4' - 9"	171	11' - 5"	412	19' - 6"	52	42	117	1.421	362.1	1.5	169	58.3	14,653
3	9' - 0"	5' - 0"	9"	7"	162	#6	6"	29' - 1"	7,077	108	#6	9"	11' - 1"	1,798	8' - 7"	1,392	162	#6	6"	23' - 8"	5,759	21	18"	39' - 9"	558	97	18"	39' - 9"	2,576	108	9"	5' - 0"	361	108	9"	4' - 9"	343	11' - 5"	824	29' - 1"	78	62	173	2.062	517.2	2.2	251	84.6	20,939
4	9' - 0"	5' - 0"	9"	7"	162	#6	6"	38' - 8"	9,409	108	#6	9"	11' - 1"	1,798	8' - 7"	1,392	162	#6	6"	33' - 3"	8,091	28	18"	39' - 9"	743	126	18"	39' - 9"	3,346	108	9"	5' - 0"	361	162	9"	4' - 9"	514	11' - 5"	1,235	38' - 8"	103	80	223	2.702	672.2	2.9	326	111.0	27,215
5	9' - 0"	5' - 0"	9"	7"	162	#6	6"	48' - 3"	11,740	108	#6	9"	11' - 1"	1,798	8' - 7"	1,392	162	#6	6"	42' - 10"	10,422	35	18"	39' - 9"	929	155	18"	39' - 9"	4,116	108	9"	5' - 0"	361	216	9"	4' - 9"	685	11' - 5"	1,647	48' - 3"	129	100	278	3.343	827.3	3.6	407	137.3	33,497
6	9' - 0"	5' - 0"	9"	7"	162	#6	6"	57' - 10"	14,072	108	#6	9"	11' - 1"	1,798	8' - 7"	1,392	162	#6	6"	52' - 5"	12,754	42	18"	39' - 9"	1,115	184	18"	39' - 9"	4,886	108	9"	5' - 0"	361	270	9"	4' - 9"	857	11' - 5"	2,059	57' - 10"	155	118	328	3.983	982.4	4.3	483	163.6	39,777
2	9' - 0"	6' - 0"	9"	7"	162	#6	6"	19' - 6"	4,745	108	#6	9"	12' - 1"	1,960	8' - 7"	1,392	162	#6	6"	14' - 1"	3,427	14	18"	39' - 9"	372	74	18"	39' - 9"	1,965	108	9"	6' - 0"	433	54	9"	4' - 9"	171	13' - 5"	484	19' - 6"	52	42	117	1.486	373.7	1.5	169	60.9	15,118
3	9' - 0"	6' - 0"	9"	7"	162	#6	6"	29' - 1"	7,077	108	#6	9"	12' - 1"	1,960	8' - 7"	1,392	162	#6	6"	23' - 8"	5,759	21	18"	39' - 9"	558	105	18"	39' - 9"	2,788	108	9"	6' - 0"	433	108	9"	4' - 9"	343	13' - 5"	968	29' - 1"	78	62	173	2.148	532.0	2.2	251	88.1	21,529
4	9' - 0"	6' - 0"	9"	7"	162	#6	6"	38' - 8"	9,409	108	#6	9"	12' - 1"	1,960	8' - 7"	1,392	162	#6	6"	33' - 3"	8,091	28	18"	39' - 9"	743	136	18"	39' - 9"	3,611	108	9"	6' - 0"	433	162	9"	4' - 9"	514	13' - 5"	1,452	38' - 8"	103	80	223	2.810	690.1	2.9	326	115.3	27,931
5	9' - 0"	6' - 0"	9"	7"	162	#6	6"	48' - 3"	11,740	108	#6	9"	12' - 1"	1,960	8' - 7"	1,392	162	#6	6"	42' - 10"	10,422	35	18"	39' - 9"	929	167	18"	39' - 9"	4,434	108	9"	6' - 0"	433	216	9"	4' - 9"	685	13' - 5"	1,936	48' - 3"	129	100	278	3.472	848.3	3.6	407	142.5	34,338
6	9' - 0"	6' - 0"	9"	7"	162	#6	6"	57' - 10"	14,072	108	#6	9"	12' - 1"	1,960	8' - 7"	1,392	162	#6	6"	52' - 5"	12,754	42	18"	39' - 9"	1,115	198	18"	39' - 9"	5,257	108	9"	6' - 0"	433	270	9"	4' - 9"	857	13' - 5"	2,420	57' - 10"	155	118	328	4.134	1,006.5	4.3	483	169.6	40,743
2	9' - 0"	7' - 0"	9"	7"	162	#6	6"	19' - 6"	4,745	108	#6	9"	13' - 1"	2,122	8' - 7"	1,392	162	#6	6"	14' - 1"	3,427	14	18"	39' - 9"	372	74	18"	39' - 9"	1,965	108	9"	7' - 0"	505	54	9"	4' - 9"	171	15' - 5"	556	19' - 6"	52	42	117	1.551	381.4	1.5	169	63.5	15,424
3	9' - 0"	7' - 0"	9"	7"	162	#6	6"	29' - 1"	7,077	108	#6	9"	13' - 1"	2,122	8' - 7"	1,392	162	#6	6"	23' - 8"	5,759	21	18"	39' - 9"	558	105	18"	39' - 9"	2,788	108	9"	7' - 0"	505	108	9"	4' - 9"	343	15' - 5"	1,112	29' - 1"	78	62	173	2.235	541.4	2.2	251	91.6	21,907
4	9' - 0"	7' - 0"	9"	7"	162	#6	6"	38' - 8"	9,409	108	#6	9"	13' - 1"	2,122	8' - 7"	1,392	162	#6	6"	33' - 3"	8,091	28	18"	39' - 9"	743	136	18"	39' - 9"	3,611	108	9"	7' - 0"	505	162	9"	4' - 9"	514	15' - 5"	1,668	38' - 8"	103	80	223	2.918	701.4	2.9	326	119.6	28,381
5	9' - 0"	7' - 0"	9"	7"	162	#6	6"	48' - 3"	11,740	108	#6	9"	13' - 1"	2,122	8' - 7"	1,392	162	#6	6"	42' - 10"	10,422	35	18"	39' - 9"	929	167	18"	39' - 9"	4,434	108	9"	7' - 0"	505	216	9"	4' - 9"	685	15' - 5"	2,224	48' - 3"	129	100	278	3.602	861.3	3.6	407	147.7	34,860
6	9' - 0"	7' - 0"	9"	7"	162	#6	6"	57' - 10"	14,072	108	#6	9"	13' - 1"	2,122	8' - 7"	1,392	162	#6	6"	52' - 5"	12,754	42	18"	39' - 9"	1,115	198	18"	39' - 9"	5,257	108	9"	7' - 0"	505	270	9"	4' - 9"	857	15' - 5"	2,781	57' - 10"	155	118	328	4.285	1,021.4	4.3	483	175.7	41,338
2	9' - 0"	8' - 0"	9"	7"	162	#6	6"	19' - 6"	4,745	108	#6	9"	14' - 1"	2,285	8' - 7"	1,392	162	#6	6"	14' - 1"	3,427	14	18"	39' - 9"	372	80	18"	39' - 9"	2,124	108	9"	8' - 0"	577	54	9"	4' - 9"	171	17' - 5"	628	19' - 6"	52	42	117	1.616	393.0	1.5	169	66.1	15,890
3	9' - 0"	8' - 0"	9"	7"	162	#6	6"	29' - 1"	7,077	108	#6	9"	14' - 1"	2,285	8' - 7"	1,392	162	#6	6"	23' - 8"	5,759	21	18"	39' - 9"	558	113	18"	39' - 9"	3,000	108	9"	8' - 0"	577	108	9"	4' - 9"	343	17' - 5"	1,257	29' - 1"	78	62	173	2.321	556.2	2.2	251	95.0	22,499
4	9' - 0"	8' - 0"	9"	7"	162	#6	6"	38' - 8"	9,409	108	#6	9"	14' - 1"	2,285	8' - 7"	1,392	162	#6	6"	33' - 3"	8,091	28	18"	39' - 9"	743	146	18"	39' - 9"	3,877	108	9"	8' - 0"	577	162	9"	4' - 9"	514	17' - 5"	1,885	38' - 8"	103	80	223	3.026	719.3	2.9	326	123.9	29,099
5	9' - 0"	8' - 0"	9"	7"	162	#6	6"	48' - 3"	11,740	108	#6	9"	14' - 1"	2,285	8' - 7"	1,392	162	#6	6"	42' - 10"	10,422	35	18"	39' - 9"	929	179	18"	39' - 9"	4,753	108	9"	8' - 0"	577	216	9"	4' - 9"	685	17' - 5"	2,513	48' - 3"	129	100	278	3.731	882.4	3.6	407	152.8	35,703
6	9' - 0"	8' - 0"	9"	7"	162	#6	6"	57' - 10"	14,072	108	#6	9"	14' - 1"	2,285	8' - 7"	1,392	162	#6	6"	52' - 5"	12,754	42	18"	39' - 9"	1,115	212	18"	39' - 9"	5,629	108	9"	8' - 0"	577	270	9"	4' - 9"	857	17' - 5"	3,141	57' - 10"	155	118	328	4.437	1,045.6	4.3	483	181.8	42,305
2	9' - 0"	9' - 0"	9"	7"	162	#6	6"	19' - 6"	4,745	108	#6	9"	15' - 1"	2,447	8' - 7"	1,392	162	#6	6"	14' - 1"	3,427	14	18"	39' - 9"	372	86	18"	39' - 9"	2,284	108	9"	9' - 0"	649	54	9"	4' - 9"	171	19' - 5"	700	19' - 6"	52	42	117	1.681	404.7	1.5	169	68.7	16,356
3	9' - 0"	9' - 0"	9"	7"	162	#6	6"	29' - 1"	7,077	108	#6	9"	15' - 1"	2,447	8' - 7"	1,392	162	#6	6"	23' - 8"	5,759	21	18"	39' - 9"	558	121	18"	39' - 9"	3,213	108	9"	9' - 0"	649	108	9"	4' - 9"	343	19' - 5"	1,401	29' - 1"	78	62	173	2.407	571.0	2.2	251	98.4	23,090
4	9' - 0"	9' - 0"	9"	7"	162	#6	6"	38' - 8"	9,409	108	#6	9"	15' - 1"	2,447	8' - 7"	1,392	162	#6	6"	33' - 3"	8,091	28	18"	39' - 9"	743	156	18"	39' - 9"	4,142	108	9"	9' - 0"	649	162	9"	4' - 9"	514	19' - 5"	2,101	38' - 8"	103	80	223	3.134	737.2	2.9	326	128.2	29,814
5	9' - 0"	9' - 0"	9"	7"	162	#6	6"	48' - 3"	11,740	108	#6	9"	15' - 1"	2,447	8' - 7"	1,392	162	#6	6"	42' - 10"	10,422	35	18"	39' - 9"	929	191	18"	39' - 9"	5,072	108	9"	9' - 0"	649	216	9"	4' - 9"	685	19' - 5"	2,802	48' - 3"	129	100	278	3.861	903.5	3.6	407	158.0	36,545
6	9' - 0"	9' - 0"	9"	7"	162	#6	6"	57' - 10"	14,072	108	#6	9"	15' - 1"	2,447	8' - 7"	1,392	162	#6	6"	52' - 5"	12,754	42	18"	39' - 9"	1,115	226	18"	39' - 9"	6,001	108	9"	9' - 0"	649	270	9"	4' - 9"	857	19' - 5"	3,502	57' - 10"	155	118	328	4.588	1,069.7	4.3	483	187.8	43,272

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HL93 LOADING

Texas Department of Transportation

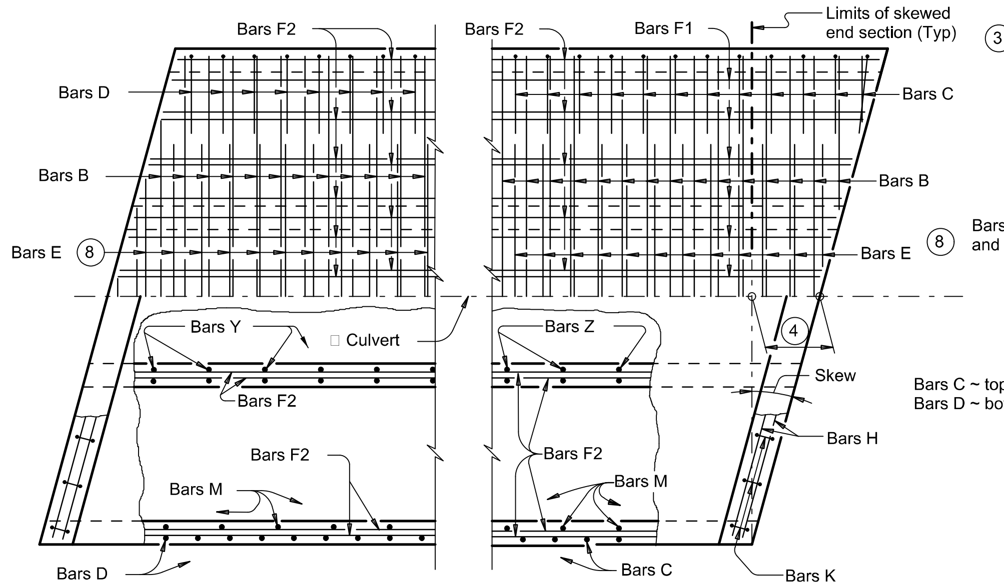
Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE

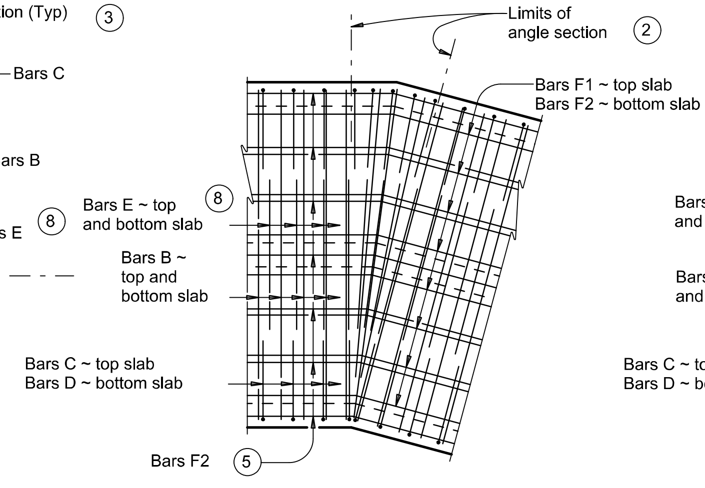
9'-0" SPAN
0' TO 10' FILL

MC-9-10

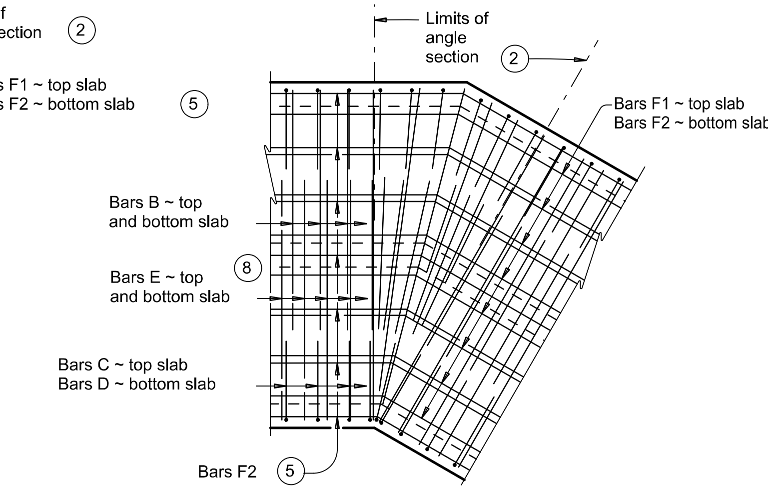
FILE: mc910ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	130



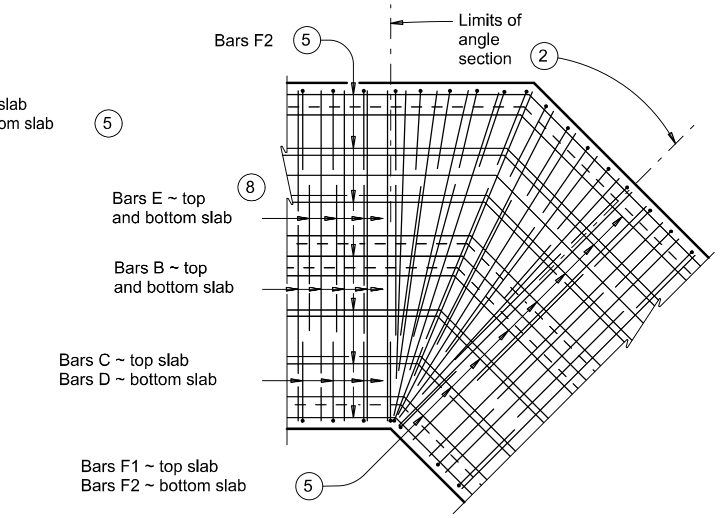
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



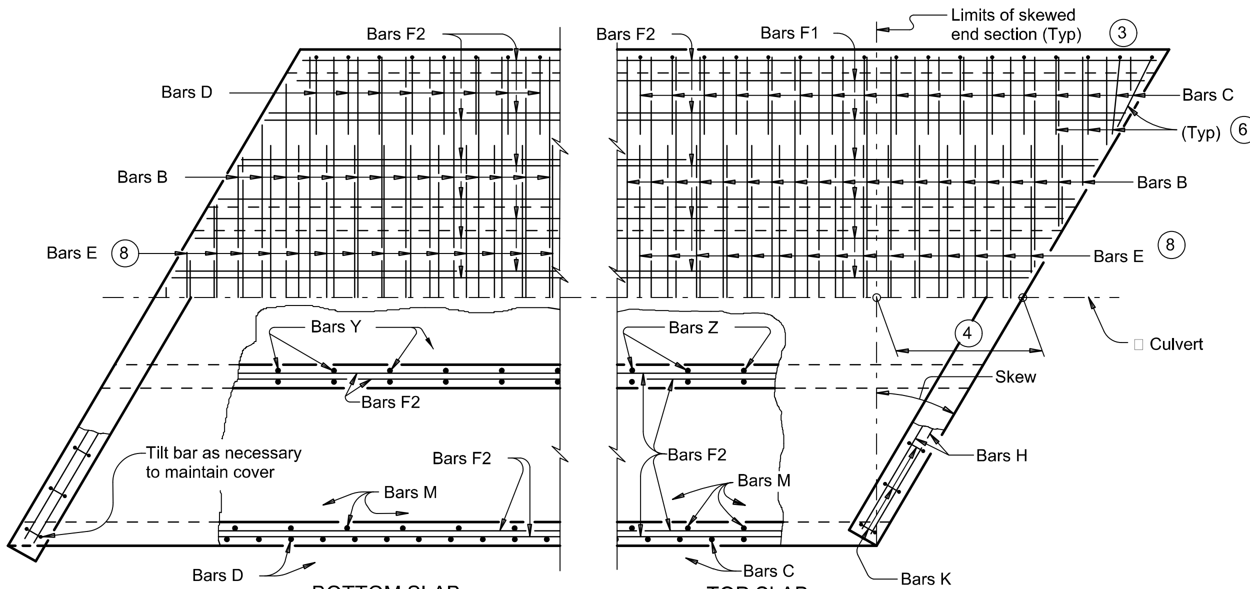
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



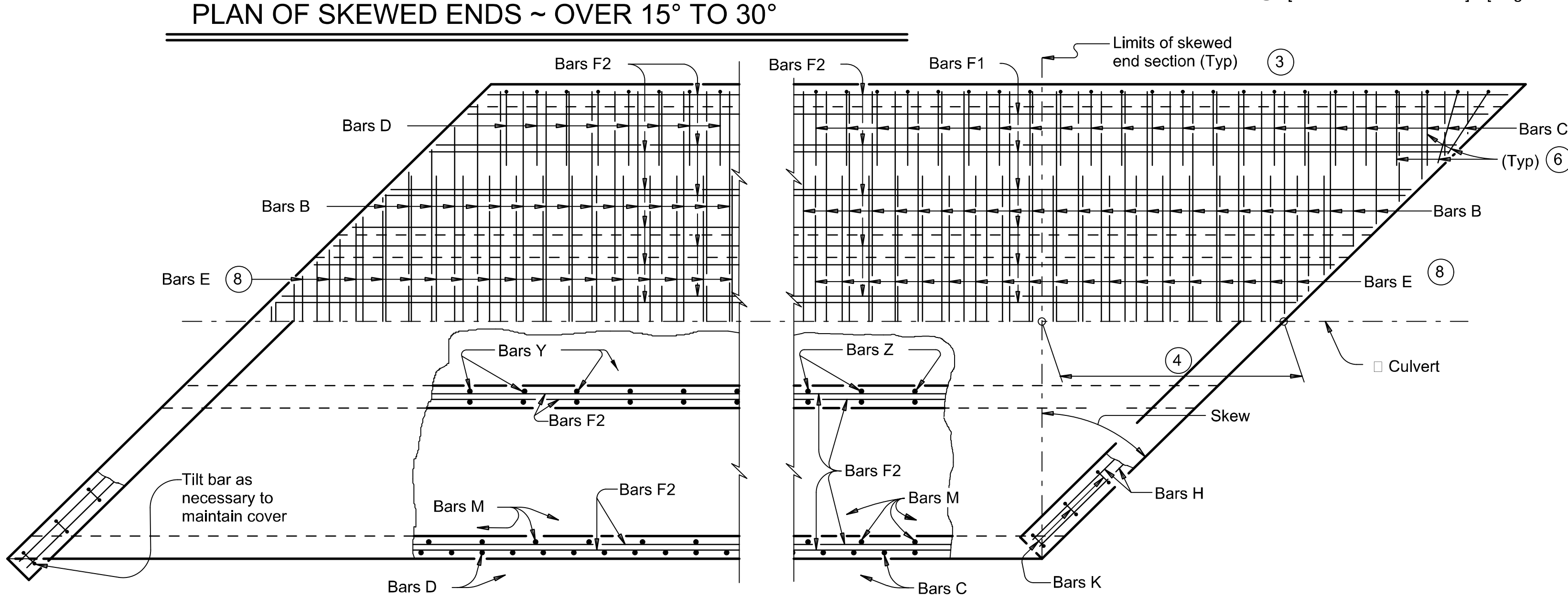
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B and Bars E will vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.

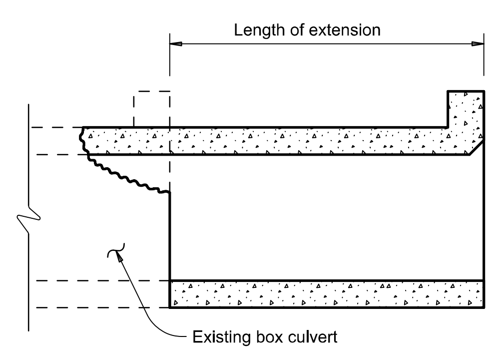
(8) Extend Bars E as shown on the MC standard sheet for direct traffic culverts.

CONSTRUCTION NOTES:
Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1½" clear cover.

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.



LENGTHENING DETAIL (1)

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

MC-MD

FILE:	mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
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		DIST		COUNTY	SHEET NO.
		ODA		WINKLER	131

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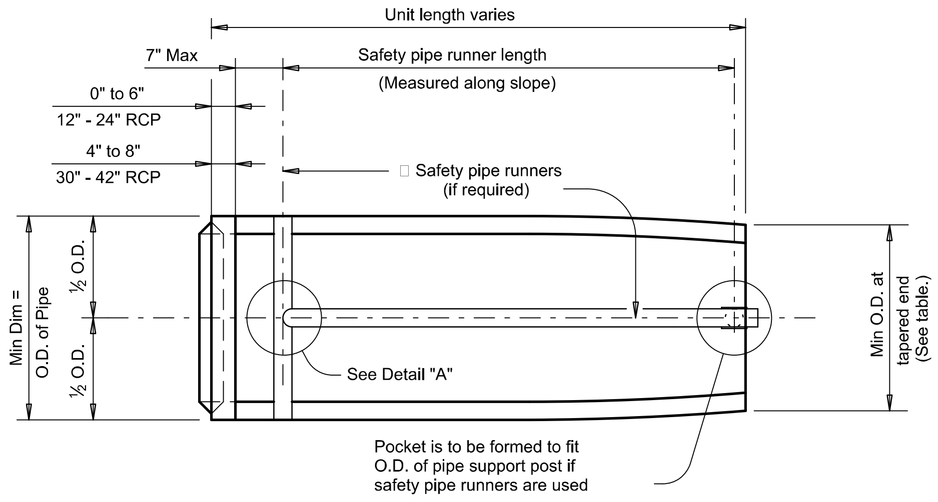
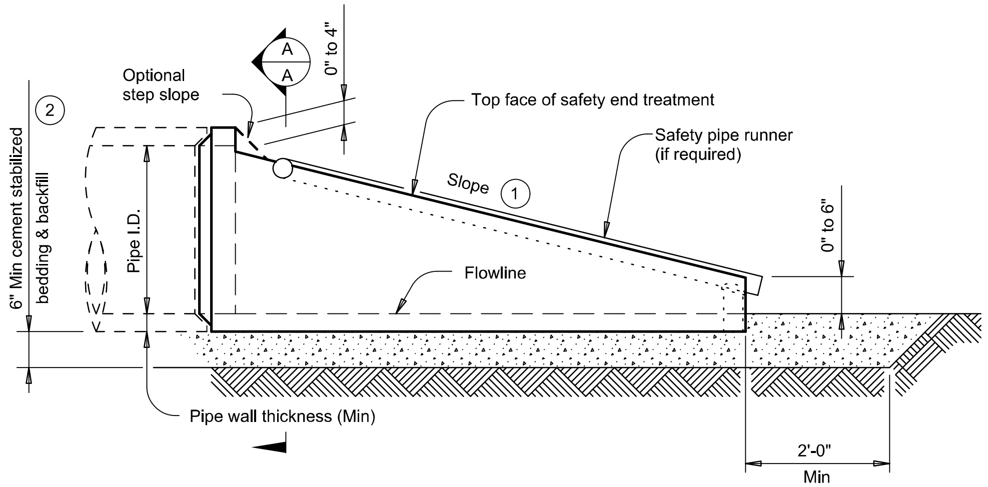


PLAN VIEW

(Showing spigot end connection.)



LONGITUDINAL ELEVATION

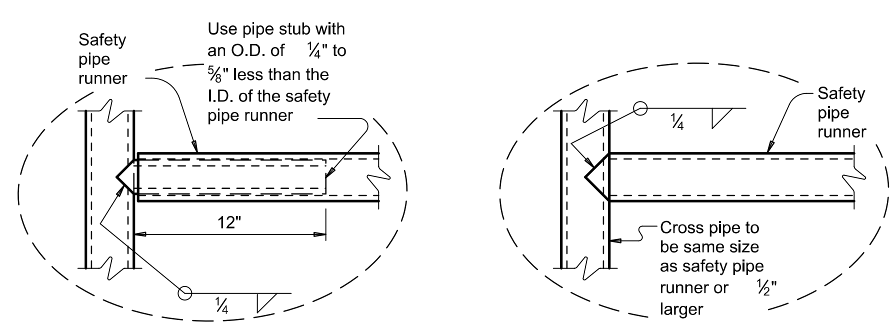
(Showing spigot end connection.)

MAX SAFETY PIPE RUNNER LENGTHS AND REQUIRED SAFETY PIPE RUNNER SIZES			
Max Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

1. Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.
2. Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.
3. Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap be considered subsidiary to the Item "Safety End Treatment".
4. Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	Min Wall Thickness	Min O.D.	Min O.D. at Tapered End	Min Reinf Requirements (sq. in. / ft. of pipe)	Slope	Minimum Length of Unit	Single Pipe: Skew	Single Pipe: Pipe Runners Required	Multiple Pipe: Skew	Multiple Pipe: Pipe Runners Required
12"	2"	16"	16"	0.07 Circ.	3:1	2' - 0"	≤ 45°	No	≤ 45°	No
					4:1	2' - 8"				
					6:1	4' - 0"				
15"	2 ¼"	19 ½"	19"	0.07 Circ.	3:1	2' - 10"	≤ 45°	No	≤ 45°	No
					4:1	3' - 9"				
					6:1	5' - 8"				
18"	2 ½"	23"	21 ½"	0.07 Circ.	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
					4:1	4' - 10"				
					6:1	7' - 3"				
24"	3"	30"	27"	0.07 Circ.	3:1	5' - 3"	≤ 45°	No	≤ 30°	No
					4:1	7' - 0"			> 30°	Yes
					6:1	10' - 6"				
30"	3 ½"	37"	31"	0.18 Circ.	3:1	6' - 3"	≤ 15°	No	≤ 15°	No
					4:1	8' - 2"	> 15°	Yes	> 15°	Yes
					6:1	12' - 1"				
36"	4"	44"	36"	0.19 Ellip.	3:1	7' - 10"	= 0°	No	≥ 0 °	Yes
					4:1	10' - 4"	> 0°	Yes		
					6:1	15' - 4"				
42"	4 ½"	51"	41 ½"	0.23 Ellip.	3:1	9' - 6"	≥ 0 °	Yes	≥ 0 °	Yes
					4:1	12' - 6"				
					6:1	18' - 7"				



OPTION A

OPTION B

DETAIL A

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 safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (CRP) may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".

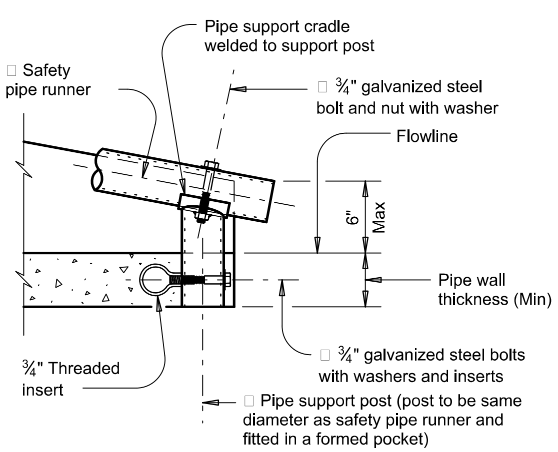
When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Manufacture precast concrete end sections in accordance with Item 464, "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Provide precast concrete end sections with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for grout, mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

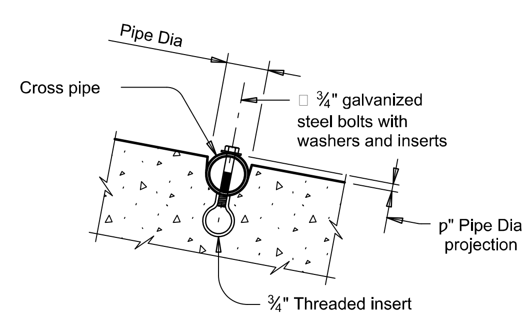
Methods of lifting shall be provided by the manufacturer for ease of loading, unloading, and installation.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.



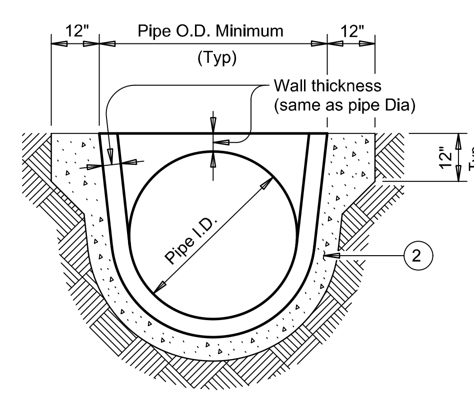
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

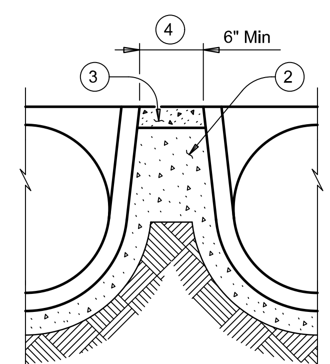


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-RC

FILE: psetrcss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	132

DATE: 7/17/2023 10:19:16 AM
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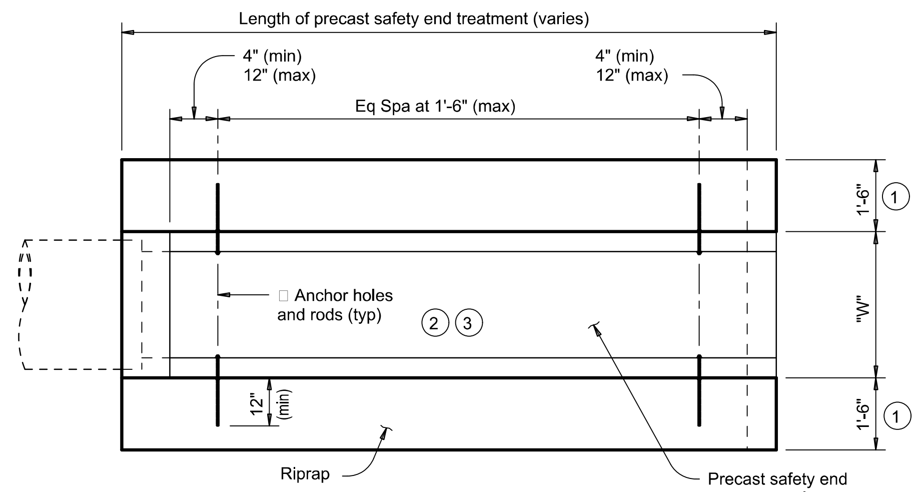
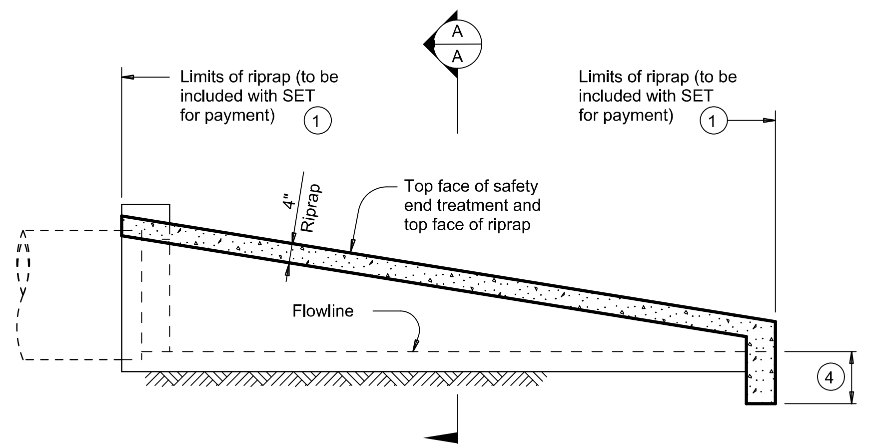
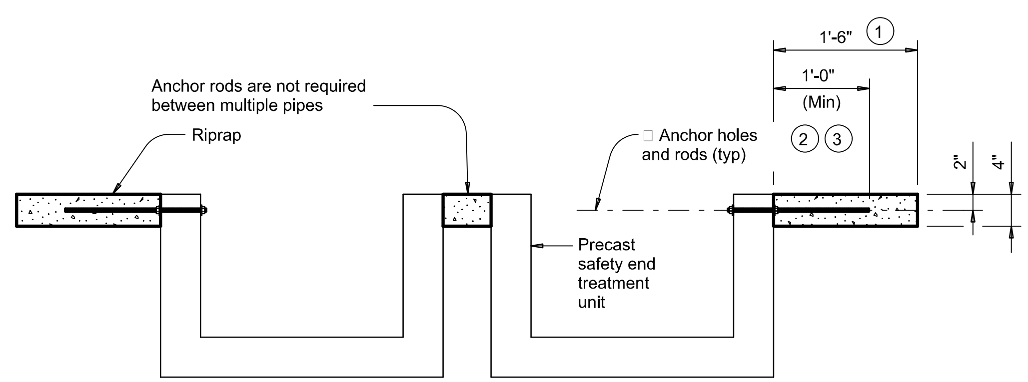


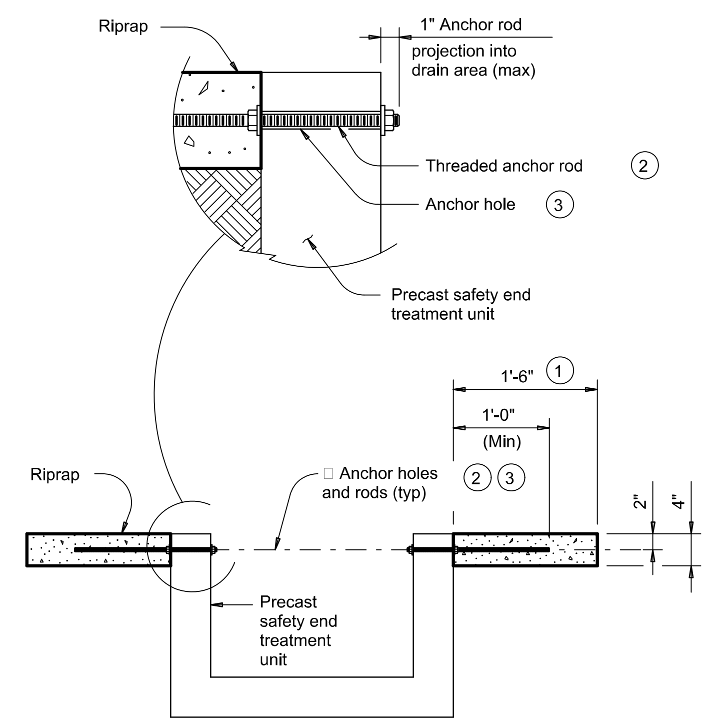
PLAN



LONGITUDINAL ELEVATION



MULTIPLE PIPE INSTALLATION



SINGLE PIPE INSTALLATION

SECTION A-A

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert (Pipe) I.D.	PSET-SC and PSET-SP Standards				PSET-RC and PSET-RP Standards			
	Unit Width "W"	Side Slope			Unit Width "W"	Side Slope		
		3:1	4:1	6:1		3:1	4:1	6:1
12"	23.0"	0.1	0.2	0.2	16.0"	0.1	0.1	0.2
15"	26.5"	0.2	0.2	0.3	19.5"	0.1	0.2	0.2
18"	30.0"	0.2	0.2	0.3	23.0"	0.2	0.2	0.3
24"	37.0"	0.3	0.3	0.5	30.0"	0.2	0.3	0.4
30"	44.5"	0.3	0.4	0.6	37.0"	0.3	0.3	0.5
36"	51.5"	0.4	0.5	0.7	44.0"	0.3	0.4	0.6
42"	58.5"	0.5	0.6	0.8	51.0"	0.4	0.5	0.7

(1) Riprap placed beyond the limits shown will be paid as concrete riprap in accordance with Item 432, "Riprap". When riprap is cast integrally with the precast safety end treatment, this dimension is 1'-0" minimum.

(2) 1#2" Dia ASTM A307 Gr A threaded anchor rod with 2 nuts and 2 washers. Galvanize all components in accordance with Item 445, "Galvanizing". Repair galvanizing that is damaged during transport or construction in accordance with the specifications.

(3) 3#4" through holes in walls of safety end treatment for riprap anchor rods may be drilled with rotary (coring or masonry) type drilling equipment or may be formed. Do not use percussive (star) type drilling equipment. If holes are drilled, patch spalls in the inside face of the wall exceeding 1#2" from the holes.

(4) Provide riprap toe wall when dimension is shown elsewhere in the plans or when field conditions require a toe wall.

(5) Quantities shown are for one end of one reinforced concrete pipe culvert. For multiple pipe culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only. Quantities are based on the minimum unit lengths shown on the Precast Saftey End Treatment (SET) standard sheets.

MATERIAL NOTES:

Provide Class "B" riprap in accordance with Item 432, "Riprap".
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. The anchor rods shown are always required.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item 467, "Safety End Treatment".
Refer to PSET-SC or PSET-SP standard sheets for details of square safety end treatments not shown. Refer to PSET-RC or PSET-RP standard sheets for details of round safety end treatments not shown.
For precast units with integrally cast riprap, substitute reinforcing steel in the amount on 0.26 in./ft. minimum for the threaded anchor rods shown. When requested, submit sealed engineering drawings for approval prior to construction. Shop drawings will not be required. Note that a proprietary precast unit with integral riprap is available from L&R Precast Concrete Works, Inc. (956) 583-6293 or www.lrprecast.com.
Payment for riprap and toewalls is included in the price bid for each safety end treatment.

These riprap details are only applicable when notes that require placement of riprap with precast safety end treatments are shown elsewhere in the plans.

Precast units with integrally cast riprap are permitted unless noted otherwise on the plans.

Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II RIPRAP DETAILS

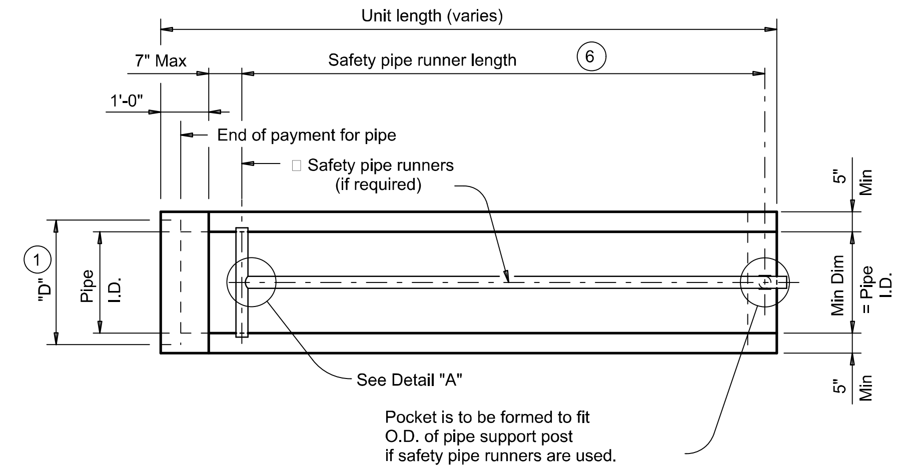
PSET-RR

FILE: psetrrse-20.dgn	DN: GAF	CK: TxDOT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		133

DATE: 7/17/2023 10:19:22 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jn\...SET-RR.dgn

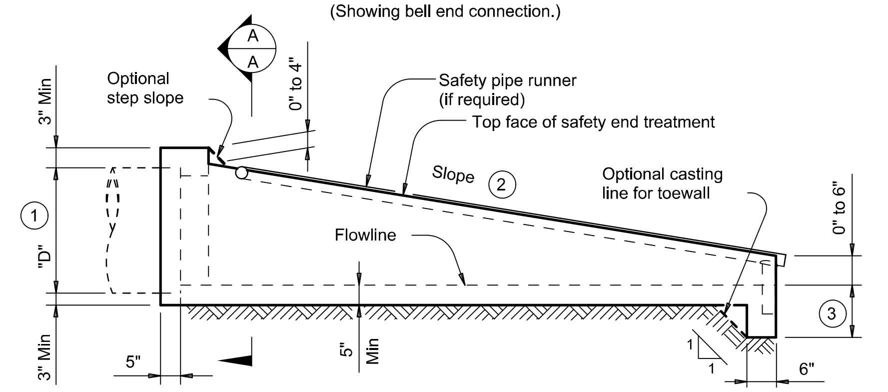
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe: Skew	Single Pipe: Pipe Runners Required	Multiple Pipes: Skew	Multiple Pipes: Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 ¼"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 ½"	1.60"	24.00"	3:1	4' - 6"	≤ 45°	No	≤ 45°	No
				4:1	5' - 8"				
				6:1	8' - 0"				
24"	3"	1.95"	31.00"	3:1	6' - 2"	≤ 45°	No	= 30°	No
				4:1	7' - 10"			> 30°	Yes
				6:1	11' - 3"				
30"	3 ½"	2.65"	38.50"	3:1	7' - 10"	= 15°	No	= 15°	No
				4:1	10' - 1"	> 15°	Yes	> 15°	Yes
				6:1	14' - 8"				
36"	4"	2.75"	45.50"	3:1	9' - 5"	= 0°	No	≥ 0°	Yes
				4:1	12' - 3"	> 0°	Yes		
				6:1	17' - 11"				
42"	4 ½"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



PLAN

(Showing bell end connection.)



LONGITUDINAL ELEVATION

(Showing bell end connection.)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size: Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 ½" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Measured along slope.

(7) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" - D12 x D12 or 5"x5" - D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

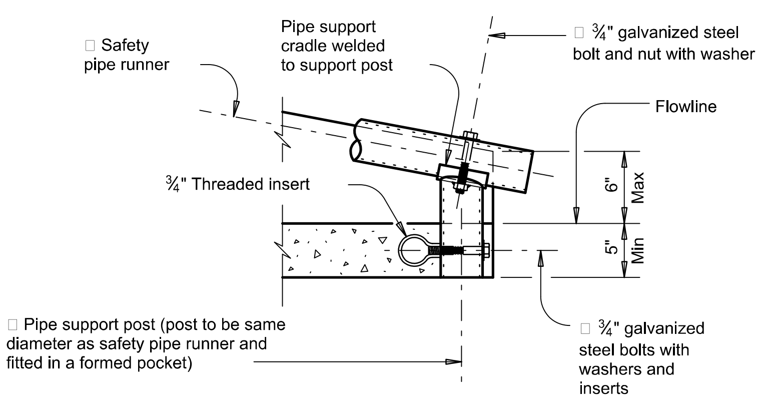
At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

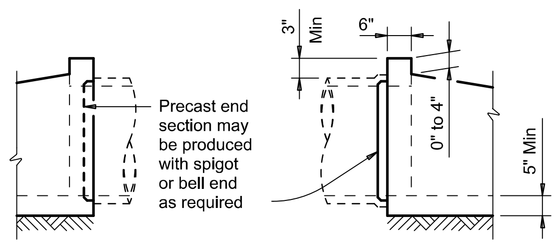
Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.



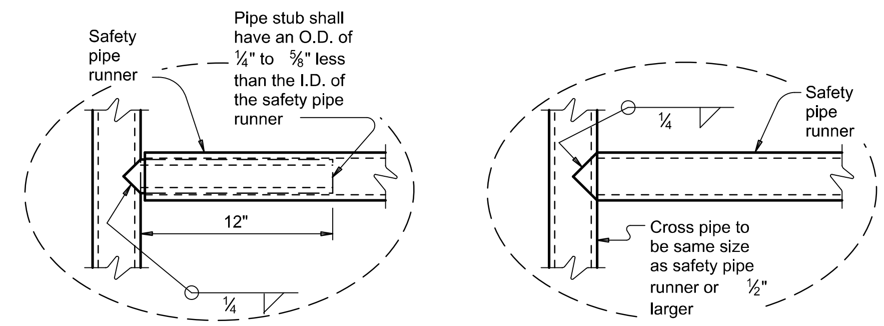
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



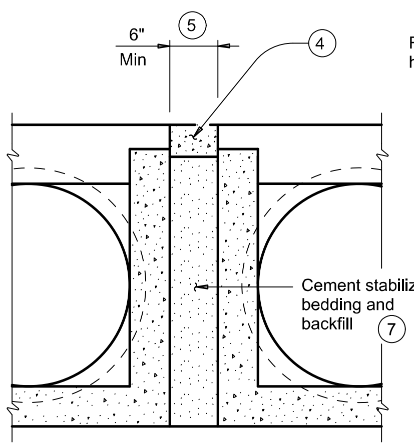
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)

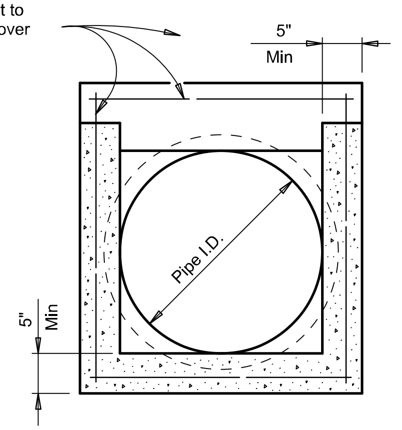


DETAIL A

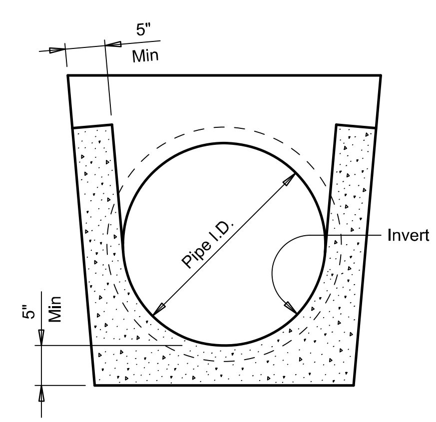
(If required)



MULTIPLE PIPE INSTALLATION

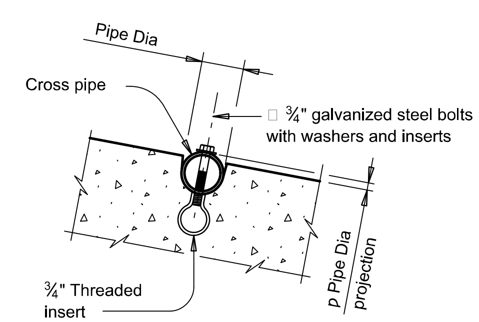


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

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Texas Department of Transportation — Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

FILE: psetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS 12-21: Added 42" TP	DIST ODA	COUNTY WINKLER		SHEET NO. 134

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

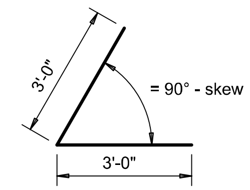
Maximum Wingwall Height Hw	Dimensions W	X	Y	Z	Variable Reinforcing: Bars J1 Size	Bars J1 Spa	Bars J2 Size	Bars J2 Spa	Estimated Quantities per ft of wing (2~wings) (4) Reinf (Lb/Ft)	Conc (CY/Ft)	Estimated Quantities per ft of Toewall (1~toewall) Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

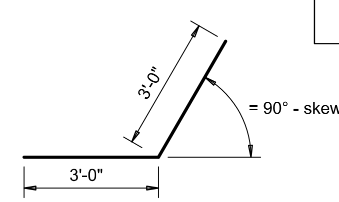
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2

WING DIMENSION FORMULAS:

(All values are in feet.)

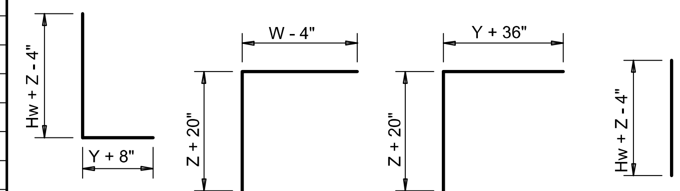
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

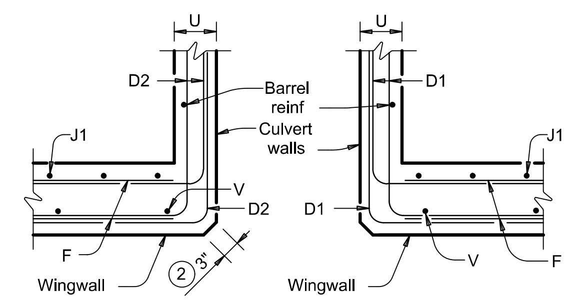
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

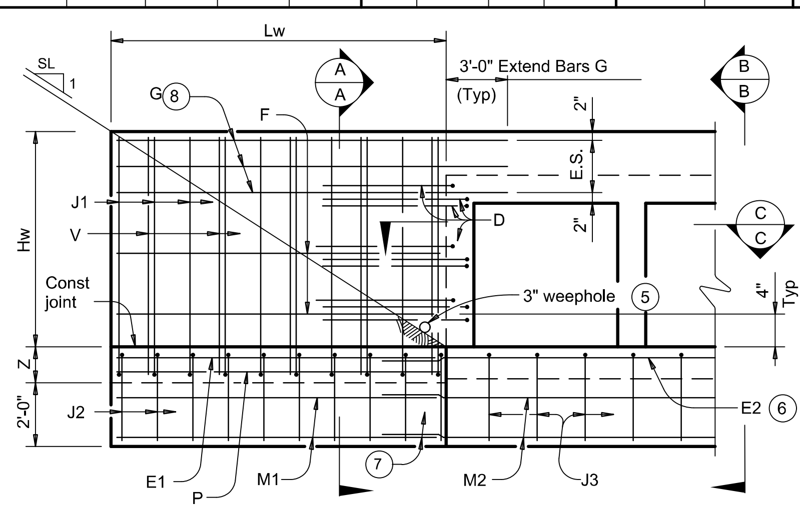
See applicable box culvert standard sheet for S, H, T, and U values.



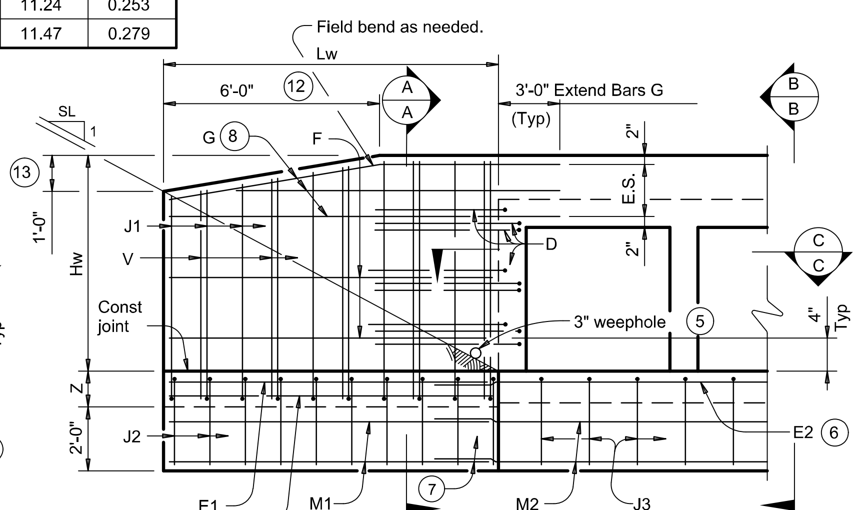
BARS J1 BARS J2 BARS J3 BARS V



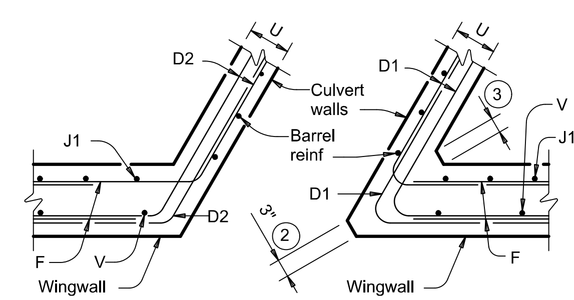
SECTION C-C - PW-1



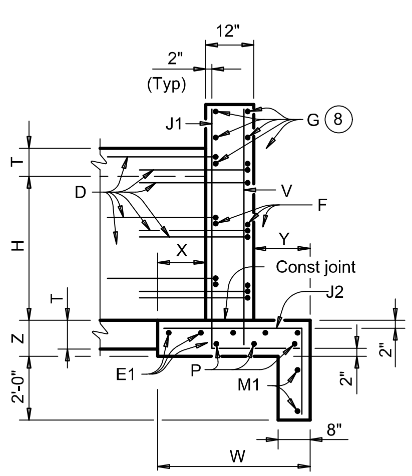
PARTIAL ELEVATION - PW-1



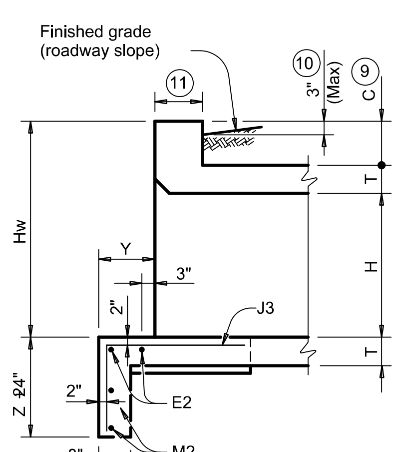
PARTIAL ELEVATION - PW-2



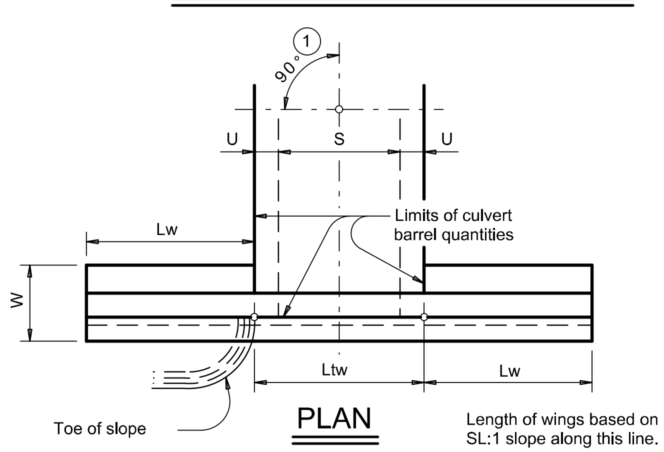
SECTION C-C - PW-2



SECTION A-A
(Showing wing reinforcement.)



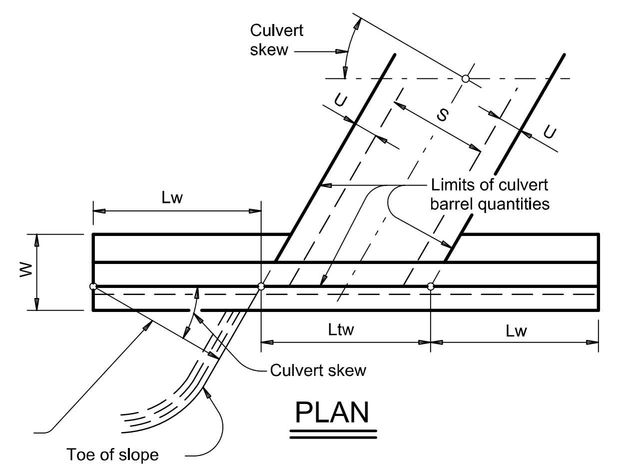
SECTION B-B
(Showing wing reinforcement.)



PLAN

Length of wings based on SL:1 slope along this line.

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

(1) Skew = 0°

(2) At discharge end, chamfer may be ¾" minimum.

(3) For 15° skew ~ 1"
For 30° skew ~ 2"
For 45° skew ~ 3"

(4) Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.

(5) Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.

(6) Extend Bars E2 1'-6" minimum into the wingwall footing.

(7) Lap Bars M1 1'-6" minimum with Bars M2.

(8) Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.

(9) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

(10) For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(11) 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elswhere in the plans.

(12) 3'-0" for Hw < 4'.

(13) 6" for Hw < 4'.

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation

Bridge Division Standard

CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	135

DATE: 7/17/2023 10:19:34 AM
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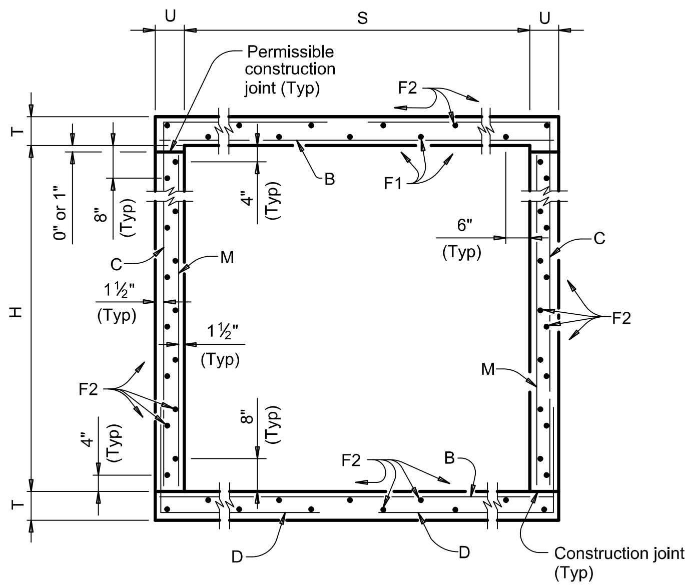
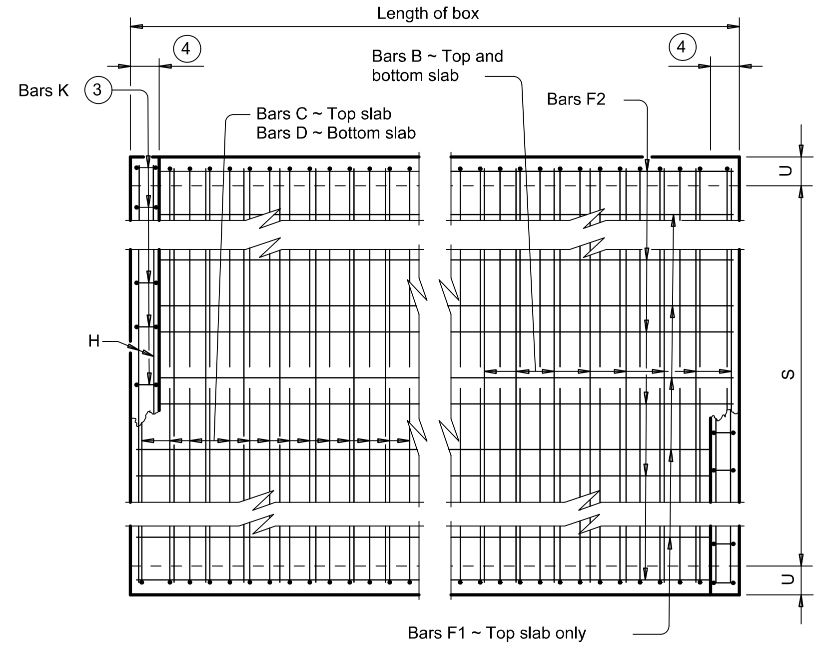
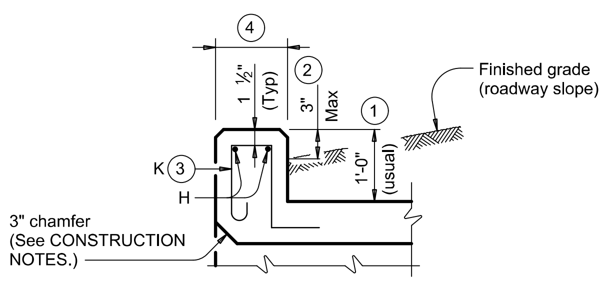


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

① 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

② For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

③ For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

④ 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

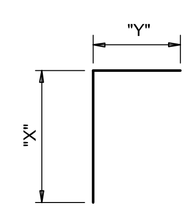
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min
- Uncoated or galvanized ~ #7 = 3'-3" Min

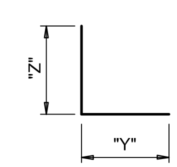
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

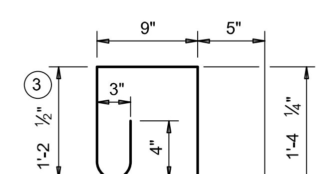
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
04/2021 Updated X values.	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	136

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DATE: 7/17/2023 10:19:39 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnd\...

SECTION DIMENSIONS				(5) FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																	QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' - 0"	4' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	10' - 4"	2,514	4' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	4' - 0"	289	7	39' - 9"	186	37	39' - 9"	982	10' - 11"	29	24	67	0.724	219.9	0.8	96	29.8	8,893
10' - 0"	4' - 0"	9"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	10' - 5"	2,535	4' - 7"	5' - 10"	162	#6	6"	9' - 0"	2,190	5' - 10"	3' - 2"	108	9"	4' - 0"	289	7	39' - 9"	186	37	39' - 9"	982	10' - 11"	29	24	67	0.793	221.0	0.8	96	32.5	8,934
10' - 0"	4' - 0"	10"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	10' - 7"	2,575	4' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	82	12"	4' - 0"	219	7	39' - 9"	186	37	39' - 9"	982	11' - 1"	30	26	72	0.897	222.2	0.8	102	36.7	8,991
10' - 0"	4' - 0"	11"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	10' - 8"	2,595	4' - 9"	5' - 11"	162	#6	6"	9' - 3"	2,251	5' - 11"	3' - 4"	82	12"	4' - 0"	219	7	39' - 9"	186	37	39' - 9"	982	11' - 1"	30	26	72	0.967	223.3	0.8	102	39.5	9,032
10' - 0"	4' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	10' - 10"	2,636	4' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	108	9"	4' - 0"	289	7	39' - 9"	186	37	39' - 9"	982	11' - 3"	30	26	72	1.074	228.0	0.8	102	43.8	9,223
10' - 0"	4' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	10' - 11"	2,656	4' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	108	9"	4' - 0"	289	7	39' - 9"	186	37	39' - 9"	982	11' - 5"	31	26	72	1.183	230.1	0.9	103	48.2	9,306
10' - 0"	4' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	11' - 1"	2,697	5' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	108	9"	4' - 0"	289	7	39' - 9"	186	37	39' - 9"	982	11' - 7"	31	26	72	1.294	233.1	0.9	103	52.6	9,428
10' - 0"	4' - 0"	15"	12"	30'	162	#6	6"	11' - 9"	2,859	162	#6	6"	11' - 3"	2,737	5' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	108	9"	4' - 0"	289	7	39' - 9"	186	37	39' - 9"	982	11' - 9"	31	26	72	1.407	236.2	0.9	103	57.2	9,549
10' - 0"	5' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	11' - 4"	2,758	5' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	5' - 0"	361	7	39' - 9"	186	41	39' - 9"	1,089	10' - 11"	29	24	67	0.767	230.5	0.8	96	31.5	9,316
10' - 0"	5' - 0"	9"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	11' - 5"	2,778	5' - 7"	5' - 10"	162	#6	6"	9' - 0"	2,190	5' - 10"	3' - 2"	108	9"	5' - 0"	361	7	39' - 9"	186	41	39' - 9"	1,089	10' - 11"	29	24	67	0.836	231.5	0.8	96	34.3	9,356
10' - 0"	5' - 0"	10"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	11' - 7"	2,819	5' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	82	12"	5' - 0"	274	7	39' - 9"	186	41	39' - 9"	1,089	11' - 1"	30	26	72	0.947	232.4	0.8	102	38.7	9,397
10' - 0"	5' - 0"	11"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	11' - 8"	2,839	5' - 9"	5' - 11"	162	#6	6"	9' - 3"	2,251	5' - 11"	3' - 4"	82	12"	5' - 0"	274	7	39' - 9"	186	41	39' - 9"	1,089	11' - 1"	30	26	72	1.016	233.4	0.8	102	41.5	9,438
10' - 0"	5' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	11' - 10"	2,879	5' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	108	9"	5' - 0"	361	7	39' - 9"	186	41	39' - 9"	1,089	11' - 3"	30	26	72	1.130	238.6	0.8	102	46.0	9,645
10' - 0"	5' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	11' - 11"	2,900	5' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	108	9"	5' - 0"	361	7	39' - 9"	186	41	39' - 9"	1,089	11' - 5"	31	26	72	1.245	240.7	0.9	103	50.7	9,729
10' - 0"	5' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	12' - 1"	2,940	6' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	108	9"	5' - 0"	361	7	39' - 9"	186	41	39' - 9"	1,089	11' - 7"	31	26	72	1.362	243.7	0.9	103	55.4	9,850
10' - 0"	5' - 0"	15"	12"	30'	162	#7	6"	11' - 9"	3,891	162	#6	6"	12' - 3"	2,981	6' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	108	9"	5' - 0"	361	7	39' - 9"	186	41	39' - 9"	1,089	11' - 9"	31	26	72	1.481	272.5	0.9	103	60.1	11,004
10' - 0"	6' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	12' - 4"	3,001	6' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	6' - 0"	433	7	39' - 9"	186	45	39' - 9"	1,195	10' - 11"	29	24	67	0.811	241.0	0.8	96	33.3	9,737
10' - 0"	6' - 0"	8"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	12' - 4"	3,001	6' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	6' - 0"	433	7	39' - 9"	186	45	39' - 9"	1,195	10' - 11"	29	24	67	0.811	241.0	0.8	96	33.3	9,737
10' - 0"	6' - 0"	9"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	12' - 6"	3,042	6' - 7"	5' - 11"	162	#6	6"	9' - 1"	2,210	5' - 11"	3' - 2"	82	12"	6' - 0"	329	7	39' - 9"	186	45	39' - 9"	1,195	11' - 1"	30	26	72	0.926	241.5	0.8	102	37.9	9,761
10' - 0"	6' - 0"	10"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	12' - 7"	3,062	6' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	82	12"	6' - 0"	329	7	39' - 9"	186	45	39' - 9"	1,195	11' - 1"	30	26	72	0.996	242.5	0.8	102	40.7	9,801
10' - 0"	6' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	12' - 10"	3,123	6' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	108	9"	6' - 0"	433	7	39' - 9"	186	45	39' - 9"	1,195	11' - 3"	30	26	72	1.185	249.1	0.8	102	48.2	10,067
10' - 0"	6' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	12' - 11"	3,143	6' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	108	9"	6' - 0"	433	7	39' - 9"	186	45	39' - 9"	1,195	11' - 5"	31	26	72	1.307	251.2	0.9	103	53.1	10,150
10' - 0"	6' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	13' - 1"	3,183	7' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	108	9"	6' - 0"	433	7	39' - 9"	186	45	39' - 9"	1,195	11' - 7"	31	26	72	1.430	254.2	0.9	103	58.1	10,271
10' - 0"	6' - 0"	15"	12"	30'	162	#7	6"	11' - 9"	3,891	162	#6	6"	13' - 3"	3,224	7' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	108	9"	6' - 0"	433	7	39' - 9"	186	45	39' - 9"	1,195	11' - 9"	31	26	72	1.556	283.1	0.9	103	63.1	11,425
10' - 0"	7' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	13' - 4"	3,244	7' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	7' - 0"	505	7	39' - 9"	186	45	39' - 9"	1,195	10' - 11"	29	24	67	0.854	248.9	0.8	96	35.0	10,052
10' - 0"	7' - 0"	8"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	13' - 4"	3,244	7' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	7' - 0"	505	7	39' - 9"	186	45	39' - 9"	1,195	10' - 11"	29	24	67	0.854	248.9	0.8	96	35.0	10,052
10' - 0"	7' - 0"	9"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	13' - 6"	3,285	7' - 7"	5' - 11"	162	#6	6"	9' - 1"	2,210	5' - 11"	3' - 2"	82	12"	7' - 0"	383	7	39' - 9"	186	45	39' - 9"	1,195	11' - 1"	30	26	72	0.975	248.9	0.8	102	39.8	10,058
10' - 0"	7' - 0"	10"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	13' - 7"	3,305	7' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	82	12"	7' - 0"	383	7	39' - 9"	186	45	39' - 9"	1,195	11' - 1"	30	26	72	1.045	249.9	0.8	102	42.6	10,098
10' - 0"	7' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	13' - 10"	3,366	7' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	108	9"	7' - 0"	505	7	39' - 9"	186	45	39' - 9"	1,195	11' - 3"	30	26	72	1.241	257.0	0.8	102	50.5	10,382
10' - 0"	7' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	13' - 11"	3,386	7' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	108	9"	7' - 0"	505	7	39' - 9"	186	45	39' - 9"	1,195	11' - 5"	31	26	72	1.368	259.1	0.9	103	55.6	10,465
10' - 0"	7' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	14' - 1"	3,427	8' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	108	9"	7' - 0"	505	7	39' - 9"	186	45	39' - 9"	1,195	11' - 7"	31	26	72	1.498	262.1	0.9	103	60.8	10,587
10' - 0"	7' - 0"	15"	12"	30'	162	#7	6"	11' - 9"	3,891	162	#6	6"	14' - 3"	3,467	8' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	108	9"	7' - 0"	505	7	39' - 9"	186	45	39' - 9"	1,195	11' - 9"	31	26	72	1.630	290.9	0.9	103	66.1	11,740
10' - 0"	8' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	14' - 4"	3,488	8' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	8' - 0"	577	7	39' - 9"	186	49	39' - 9"	1,301	10' - 11"	29	24	67	0.897	259.5	0.8	96	36.7	10,474
10' - 0"	8' - 0"	8"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	14' - 4"	3,488	8' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	8' - 0"	577	7	39' - 9"	186	49	39' - 9"	1,301	10' - 11"	29	24	67	0.897	259.5	0.8	96	36.7	10,474
10' - 0"	8' - 0"	9"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	14' - 6"	3,528	8' - 7"	5' - 11"	162	#6	6"	9' - 1"	2,210	5' - 11"	3' - 2"	82	12"	8' - 0"	438	7	39' - 9"	186	49	39' - 9"	1,301	11' - 1"	30	26	72	1.025	259.0	0.8	102	41.8	10,462
10' - 0"	8' - 0"	10"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	14' - 7"	3,548	8' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	82	12"	8' - 0"	438	7	39' - 9"	186	49	39' - 9"	1,301	11' - 1"	30	26	72	1.095	260.0	0.8	102	44.6	10,502
10' - 0"	8' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	14' - 10"	3,609	8' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	108	9"	8' - 0"	577	7	39' - 9"	186	49	39' - 9"	1,301	11' - 3"	30	26	72	1.296	267.5	0.8	102	52.7	10,803
10' - 0"	8' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	14' - 11"	3,630	8' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	108	9"	8' - 0"	577	7	39' - 9"	186	49	39' - 9"	1,301	11' - 5"	31	26	72	1.430	269.6	0.9	103	58.1	10,887
10' - 0"	8' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	15' - 1"	3,670	9' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	108	9"	8' - 0"	577	7	39' - 9"	186	49	39' - 9"	1,301	11' - 7"	31	26	72	1.566	272.6	0.9	103	63.5	11,008
10' - 0"	8' - 0"	15"	12"	30'	162	#7	6"	11' - 9"	3,891	162	#6	6"	15' - 3"	3,711	9' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	108	9"	8' - 0"	577	7	39' - 9"	186	49	39' - 9"	1,301	11' - 9"	31	26	72	1.704	301.5	0.9	103	69.0	12,162

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE

0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS: 04/2021 Updated X values.	DIST ODA	COUNTY WINKLER		SHEET NO. 137

BILLS OF REINFORCING STEEL (For Box Length = 40 feet) — QUANTITIES

SECTION DIMENSIONS				FILL HEIGHT (5)	Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	" X "	" Y "	No.	Size	Spa	Length	Wt	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' - 0"	9' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	15' - 4"	3,731	9' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	9' - 0"	649	7	39' - 9"	186	53	39' - 9"	1,407	10' - 11"	29	24	67	0.940	270.0	0.8	96	38.4	10,895
10' - 0"	9' - 0"	8"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	15' - 4"	3,731	9' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	108	9"	9' - 0"	649	7	39' - 9"	186	53	39' - 9"	1,407	10' - 11"	29	24	67	0.940	270.0	0.8	96	38.4	10,895
10' - 0"	9' - 0"	9"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	15' - 6"	3,772	9' - 7"	5' - 11"	162	#6	6"	9' - 1"	2,210	5' - 11"	3' - 2"	108	9"	9' - 0"	649	7	39' - 9"	186	53	39' - 9"	1,407	11' - 1"	30	26	72	1.074	273.0	0.8	102	43.8	11,023
10' - 0"	9' - 0"	10"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	15' - 7"	3,792	9' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	162	6"	9' - 0"	974	7	39' - 9"	186	53	39' - 9"	1,407	11' - 1"	30	26	72	1.144	282.2	0.8	102	46.6	11,388
10' - 0"	9' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	15' - 10"	3,853	9' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	162	6"	9' - 0"	974	7	39' - 9"	186	53	39' - 9"	1,407	11' - 3"	30	26	72	1.352	286.2	0.8	102	54.9	11,550
10' - 0"	9' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	15' - 11"	3,873	9' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	162	6"	9' - 0"	974	7	39' - 9"	186	53	39' - 9"	1,407	11' - 5"	31	26	72	1.492	288.3	0.9	103	60.5	11,633
10' - 0"	9' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	16' - 1"	3,913	10' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	162	6"	9' - 0"	974	7	39' - 9"	186	53	39' - 9"	1,407	11' - 7"	31	26	72	1.634	291.3	0.9	103	66.2	11,754
10' - 0"	9' - 0"	15"	12"	30'	162	#7	6"	11' - 9"	3,891	162	#6	6"	16' - 3"	3,954	10' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	162	6"	9' - 0"	974	7	39' - 9"	186	53	39' - 9"	1,407	11' - 9"	31	26	72	1.778	320.1	0.9	103	72.0	12,908
10' - 0"	10' - 0"	8"	7"	7'	162	#6	6"	10' - 11"	2,656	162	#6	6"	16' - 4"	3,974	10' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	10' - 11"	29	24	67	0.984	286.9	0.8	96	40.2	11,571
10' - 0"	10' - 0"	8"	7"	10'	162	#6	6"	10' - 11"	2,656	162	#6	6"	16' - 4"	3,974	10' - 6"	5' - 10"	162	#6	6"	8' - 11"	2,170	5' - 10"	3' - 1"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	10' - 11"	29	24	67	0.984	286.9	0.8	96	40.2	11,571
10' - 0"	10' - 0"	9"	8"	13'	162	#6	6"	11' - 1"	2,697	162	#6	6"	16' - 6"	4,015	10' - 7"	5' - 11"	162	#6	6"	9' - 1"	2,210	5' - 11"	3' - 2"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	11' - 1"	30	26	72	1.123	289.9	0.8	102	45.8	11,699
10' - 0"	10' - 0"	10"	8"	16'	162	#6	6"	11' - 1"	2,697	162	#6	6"	16' - 7"	4,035	10' - 8"	5' - 11"	162	#6	6"	9' - 2"	2,230	5' - 11"	3' - 3"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	11' - 1"	30	26	72	1.193	290.9	0.8	102	48.6	11,739
10' - 0"	10' - 0"	12"	9"	20'	162	#6	6"	11' - 3"	2,737	162	#6	6"	16' - 10"	4,096	10' - 10"	6' - 0"	162	#6	6"	9' - 5"	2,291	6' - 0"	3' - 5"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	11' - 3"	30	26	72	1.407	295.0	0.8	102	57.1	11,901
10' - 0"	10' - 0"	13"	10"	23'	162	#6	6"	11' - 5"	2,778	162	#6	6"	16' - 11"	4,116	10' - 11"	6' - 0"	162	#6	6"	9' - 6"	2,312	6' - 0"	3' - 6"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	11' - 5"	31	26	72	1.553	297.0	0.9	103	63.0	11,984
10' - 0"	10' - 0"	14"	11"	26'	162	#6	6"	11' - 7"	2,819	162	#6	6"	17' - 1"	4,157	11' - 0"	6' - 1"	162	#6	6"	9' - 8"	2,352	6' - 1"	3' - 7"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	11' - 7"	31	26	72	1.702	300.1	0.9	103	69.0	12,106
10' - 0"	10' - 0"	15"	12"	30'	162	#7	6"	11' - 9"	3,891	162	#6	6"	17' - 3"	4,197	11' - 1"	6' - 2"	162	#6	6"	9' - 10"	2,393	6' - 2"	3' - 8"	162	6"	10' - 0"	1,082	7	39' - 9"	186	53	39' - 9"	1,407	11' - 9"	31	26	72	1.852	328.9	0.9	103	75.0	13,259

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

DATE: 7/17/2023 10:19:48 AM
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HL93 LOADING

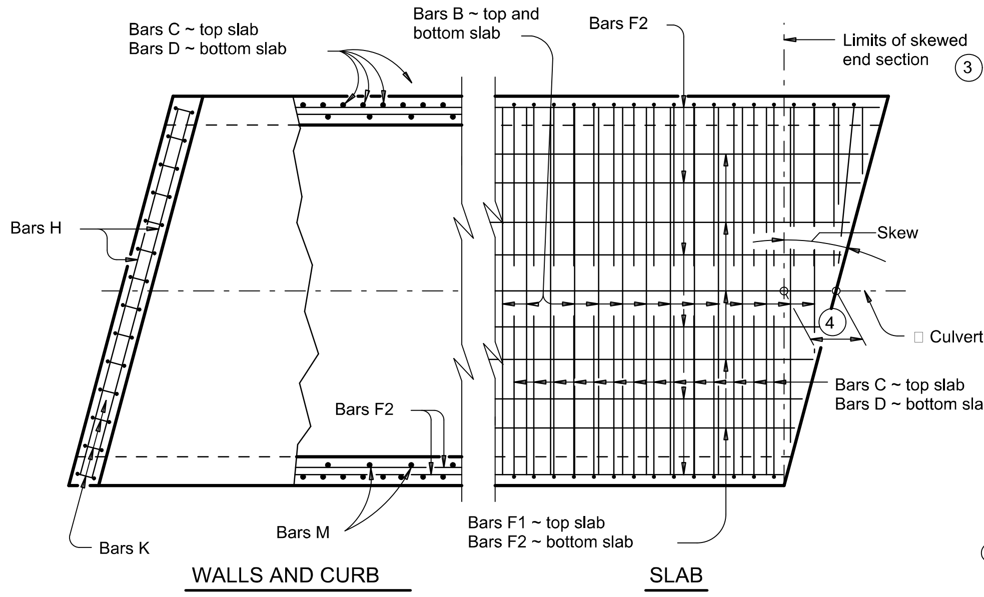
Texas Department of Transportation

Bridge Division Standard

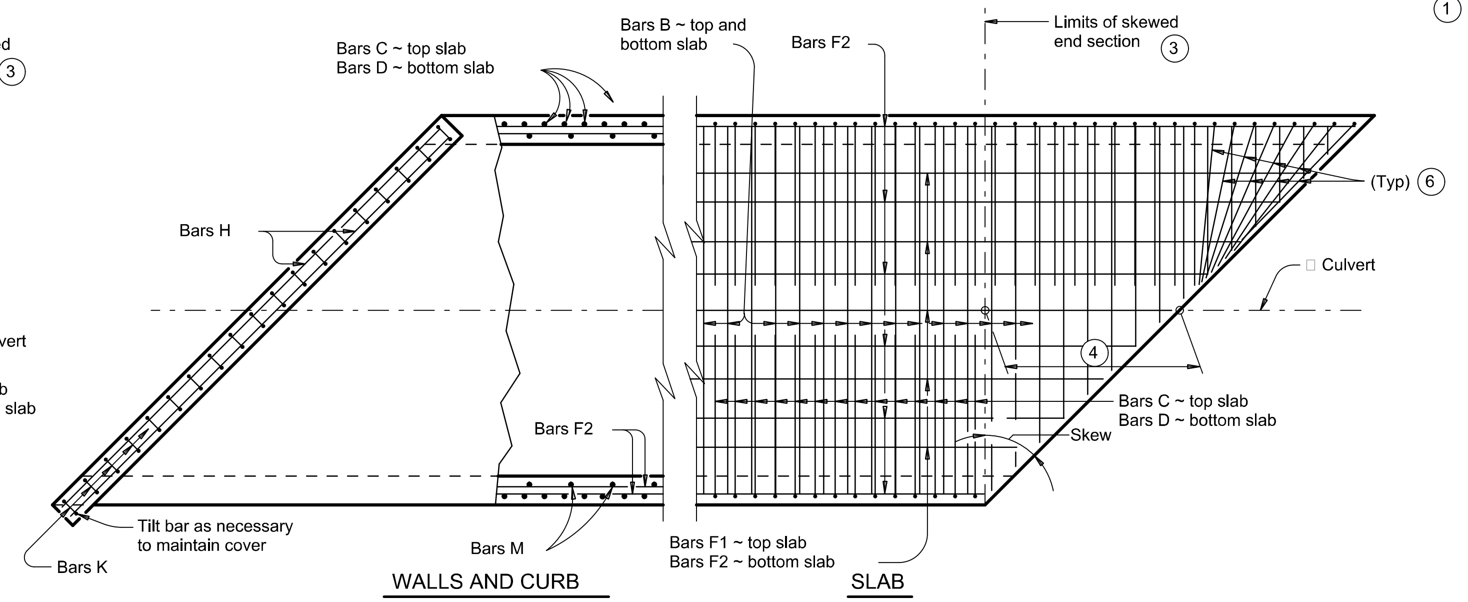
SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

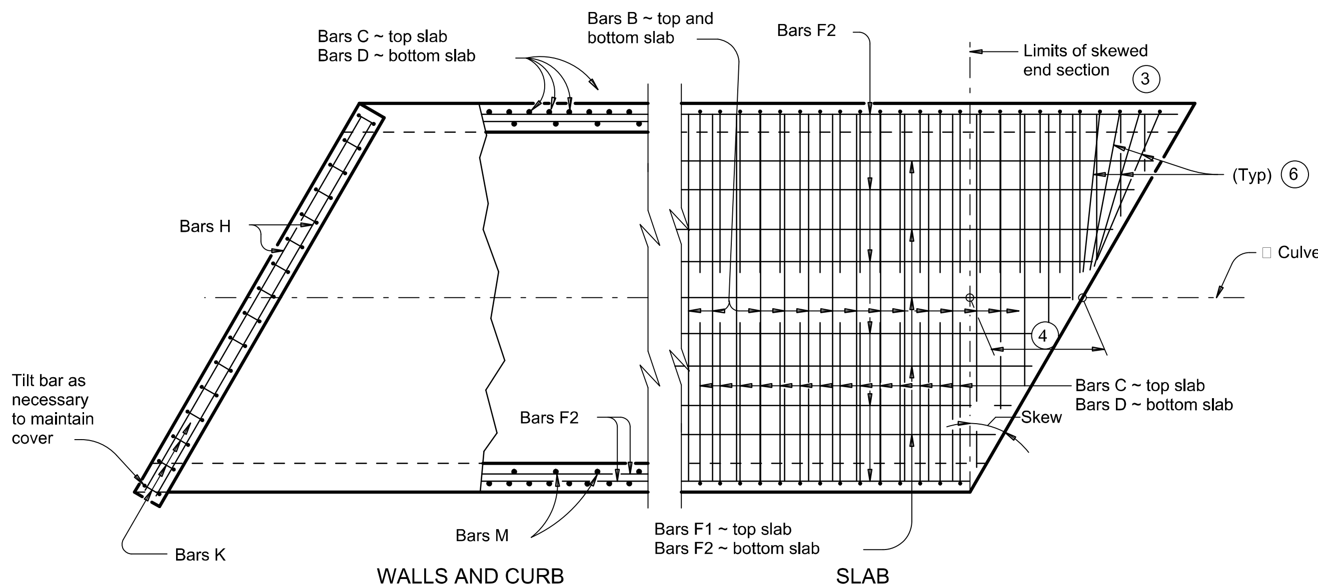
FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 04/2021 Updated X values.	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		138



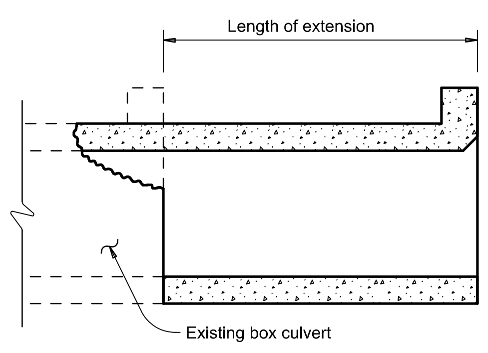
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



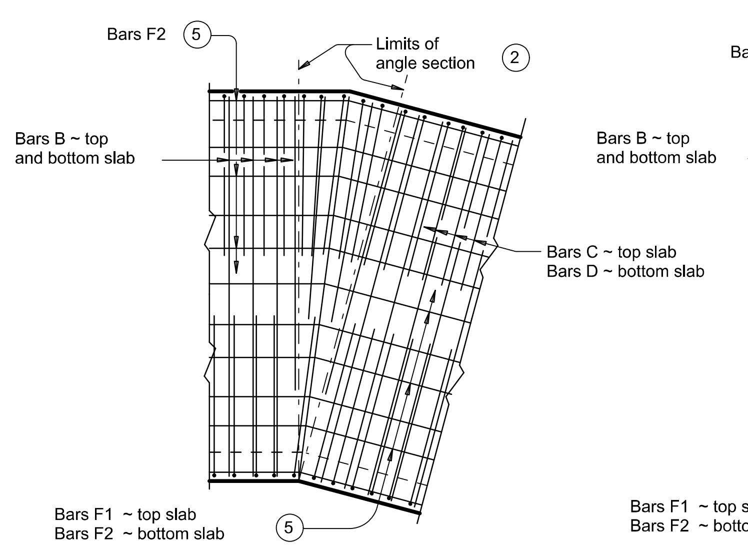
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



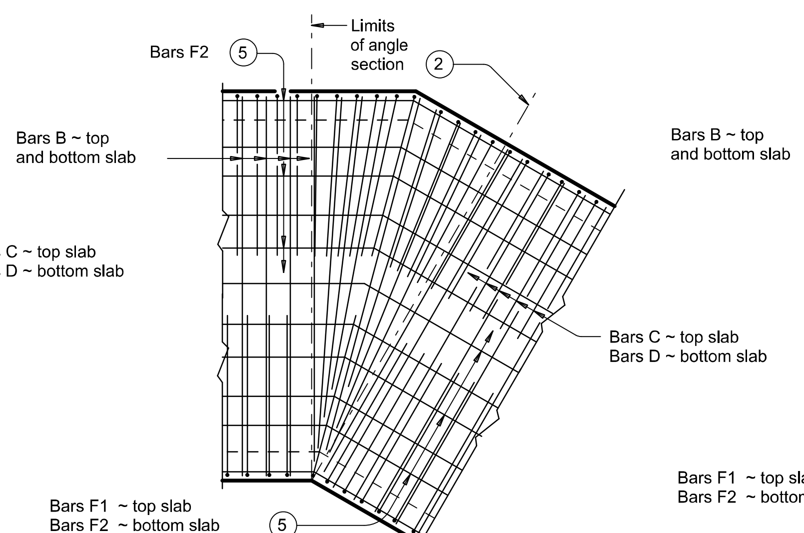
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



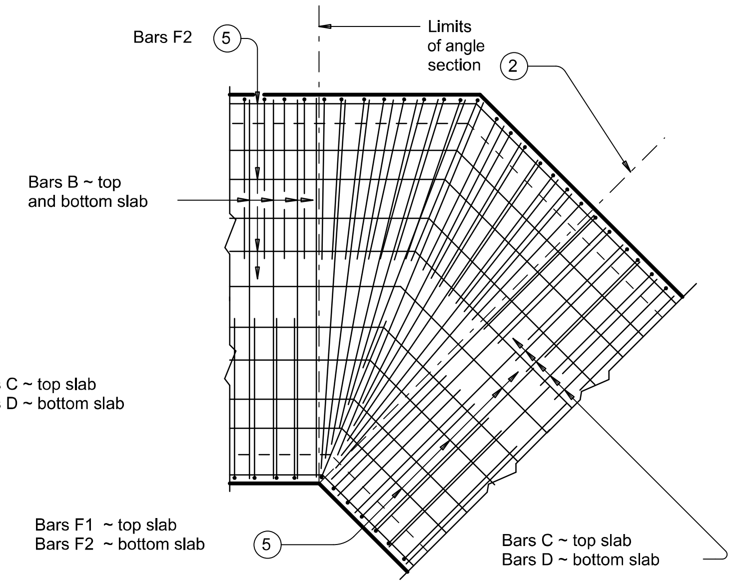
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.
For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.
Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Single Box Culverts Cast-In-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	139

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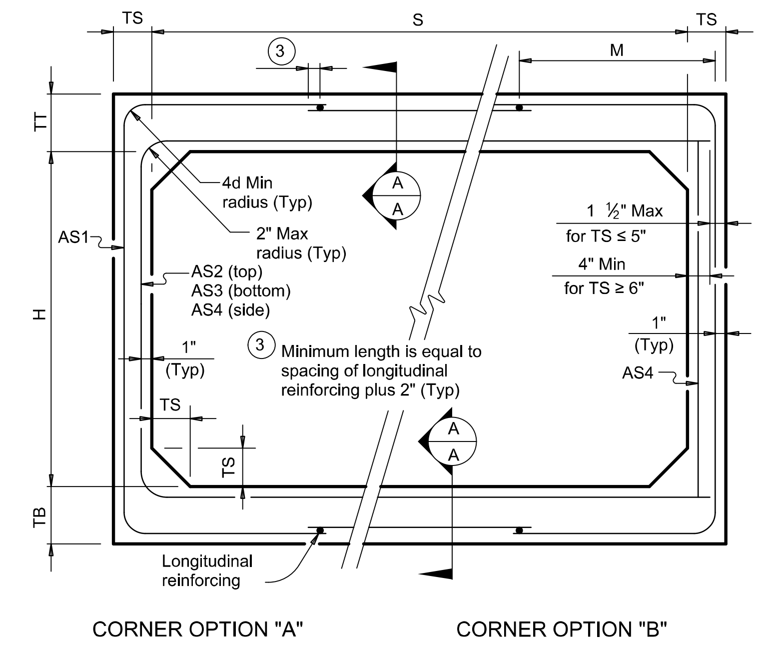
BOX DATA

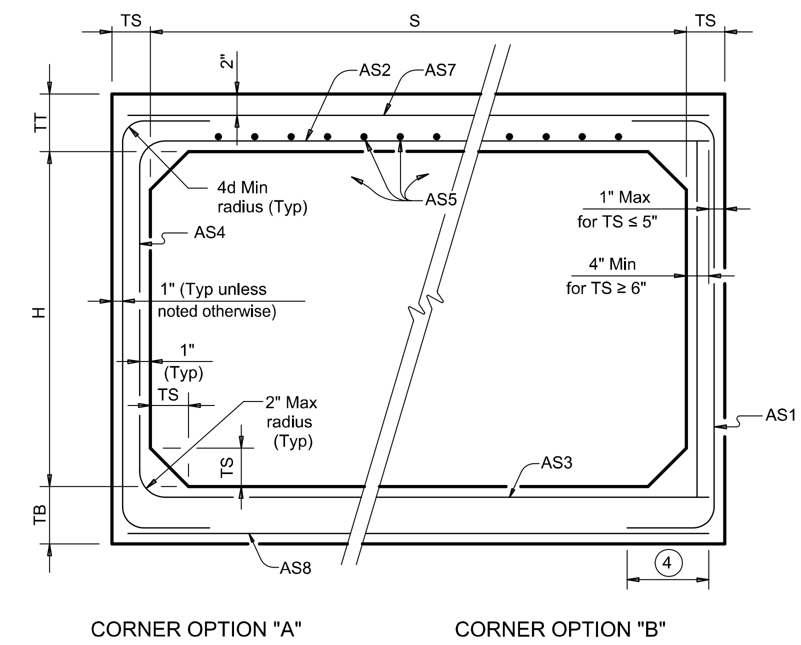
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
10	4	10	10	10	< 2	-	0.33	0.34	0.27	0.24	0.24	0.24	0.24	16.5
10	4	10	10	10	2 < 3	58	0.38	0.35	0.30	0.24	-	-	-	16.5
10	4	10	10	10	3 - 5	53	0.31	0.28	0.27	0.24	-	-	-	16.5
10	4	10	10	10	10	52	0.36	0.32	0.33	0.24	-	-	-	16.5
10	4	10	10	10	15	52	0.47	0.42	0.43	0.24	-	-	-	16.5
10	4	10	10	10	20	52	0.61	0.54	0.55	0.24	-	-	-	16.5
10	4	10	10	10	25	52	0.75	0.67	0.68	0.24	-	-	-	16.5
10	5	10	10	10	< 2	-	0.30	0.36	0.30	0.24	0.24	0.24	0.24	17.5
10	5	10	10	10	2 < 3	58	0.35	0.39	0.34	0.24	-	-	-	17.5
10	5	10	10	10	3 - 5	52	0.28	0.31	0.30	0.24	-	-	-	17.5
10	5	10	10	10	10	52	0.33	0.35	0.36	0.24	-	-	-	17.5
10	5	10	10	10	15	47	0.42	0.46	0.47	0.24	-	-	-	17.5
10	5	10	10	10	20	47	0.55	0.59	0.61	0.24	-	-	-	17.5
10	5	10	10	10	25	47	0.68	0.73	0.75	0.24	-	-	-	17.5
10	6	10	10	10	< 2	-	0.28	0.38	0.33	0.24	0.24	0.24	0.24	18.5
10	6	10	10	10	2 < 3	58	0.32	0.42	0.37	0.24	-	-	-	18.5
10	6	10	10	10	3 - 5	53	0.26	0.34	0.33	0.24	-	-	-	18.5
10	6	10	10	10	10	52	0.30	0.38	0.39	0.24	-	-	-	18.5
10	6	10	10	10	15	47	0.39	0.49	0.51	0.24	-	-	-	18.5
10	6	10	10	10	20	47	0.50	0.63	0.65	0.24	-	-	-	18.5
10	6	10	10	10	25	47	0.61	0.78	0.80	0.24	-	-	-	18.5
10	7	10	10	10	< 2	-	0.25	0.40	0.36	0.24	0.24	0.24	0.24	19.5
10	7	10	10	10	2 < 3	58	0.30	0.45	0.40	0.24	-	-	-	19.5
10	7	10	10	10	3 - 5	58	0.24	0.36	0.35	0.24	-	-	-	19.5
10	7	10	10	10	10	52	0.28	0.40	0.42	0.24	-	-	-	19.5
10	7	10	10	10	15	47	0.36	0.52	0.54	0.24	-	-	-	19.5
10	7	10	10	10	20	47	0.46	0.67	0.69	0.24	-	-	-	19.5
10	7	10	10	10	25	47	0.56	0.82	0.85	0.24	-	-	-	19.5
10	8	10	10	10	< 2	-	0.24	0.41	0.38	0.24	0.24	0.24	0.24	20.5
10	8	10	10	10	2 < 3	64	0.27	0.47	0.43	0.24	-	-	-	20.5
10	8	10	10	10	3 - 5	58	0.24	0.38	0.38	0.24	-	-	-	20.5
10	8	10	10	10	10	52	0.26	0.42	0.44	0.24	-	-	-	20.5
10	8	10	10	10	15	47	0.34	0.54	0.57	0.24	-	-	-	20.5
10	8	10	10	10	20	47	0.43	0.69	0.72	0.24	-	-	-	20.5
10	9	10	10	10	< 2	-	0.24	0.42	0.41	0.24	0.24	0.24	0.24	21.5
10	9	10	10	10	2 < 3	70	0.26	0.50	0.46	0.24	-	-	-	21.5
10	9	10	10	10	3 - 5	64	0.24	0.40	0.40	0.24	-	-	-	21.5
10	9	10	10	10	10	58	0.25	0.43	0.46	0.24	-	-	-	21.5
10	9	10	10	10	15	52	0.32	0.56	0.59	0.24	-	-	-	21.5
10	9	10	10	10	20	47	0.40	0.71	0.75	0.24	-	-	-	21.5
10	10	10	10	10	< 2	-	0.24	0.44	0.44	0.24	0.24	0.24	0.24	22.5
10	10	10	10	10	2 < 3	79	0.25	0.52	0.48	0.24	-	-	-	22.5
10	10	10	10	10	3 - 5	70	0.24	0.42	0.43	0.24	-	-	-	22.5
10	10	10	10	10	10	64	0.24	0.44	0.48	0.24	-	-	-	22.5
10	10	10	10	10	15	52	0.30	0.57	0.61	0.24	-	-	-	22.5
10	10	10	10	10	20	52	0.38	0.73	0.77	0.24	-	-	-	22.5

(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.

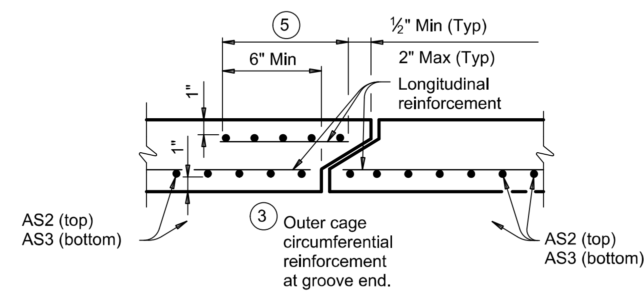


FILL HEIGHT 2 FT AND GREATER



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)".

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Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

10'-0" SPAN

SCP-10

FILE: scp10sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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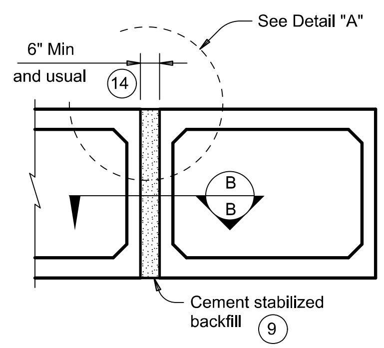
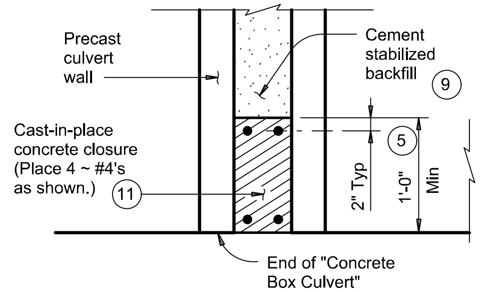
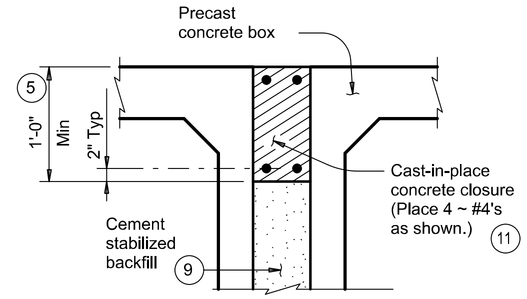


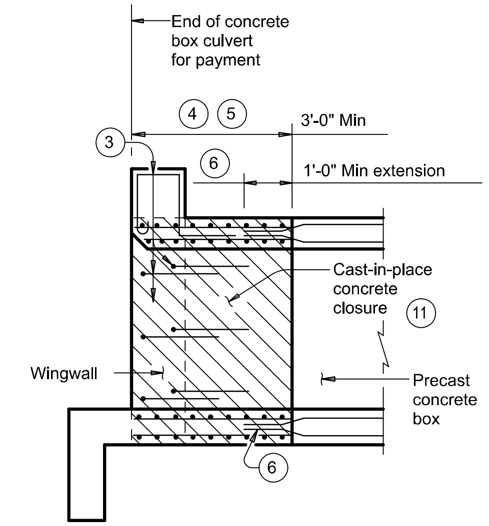
MULTIPLE UNIT PLACEMENT



SECTION B-B

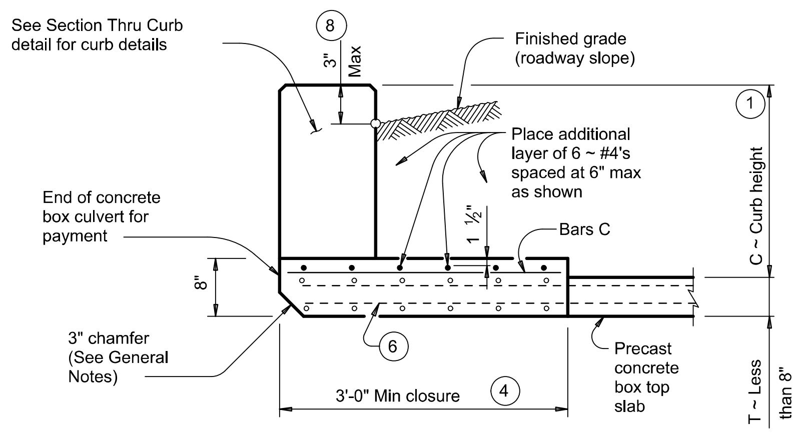


DETAIL "A" (13)

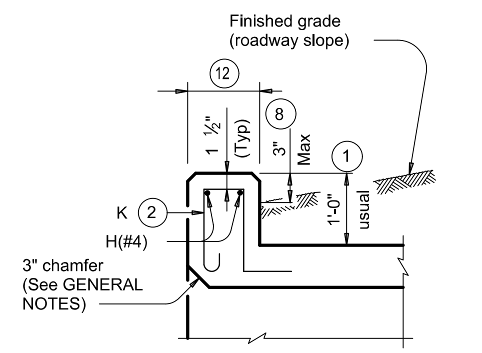


WINGWALL CONNECTION

(Also applies to safety end treatment.)

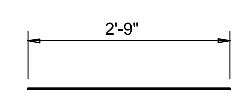


SECTION THRU TOP SLABS LESS THAN 8"

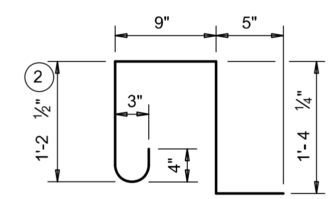


SECTION THRU CURB

QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



BARS C (#4)
(Spa = 1'-0" Max)



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

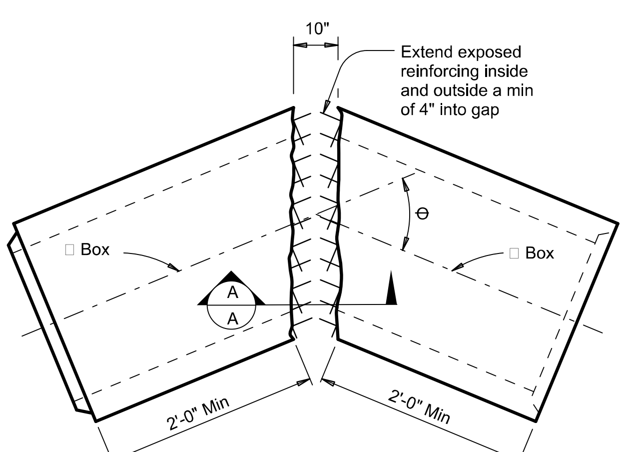
1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
4. Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
6. Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is considered part of the box culvert for payment.
11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
12. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

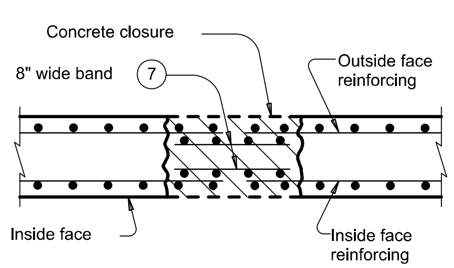
MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

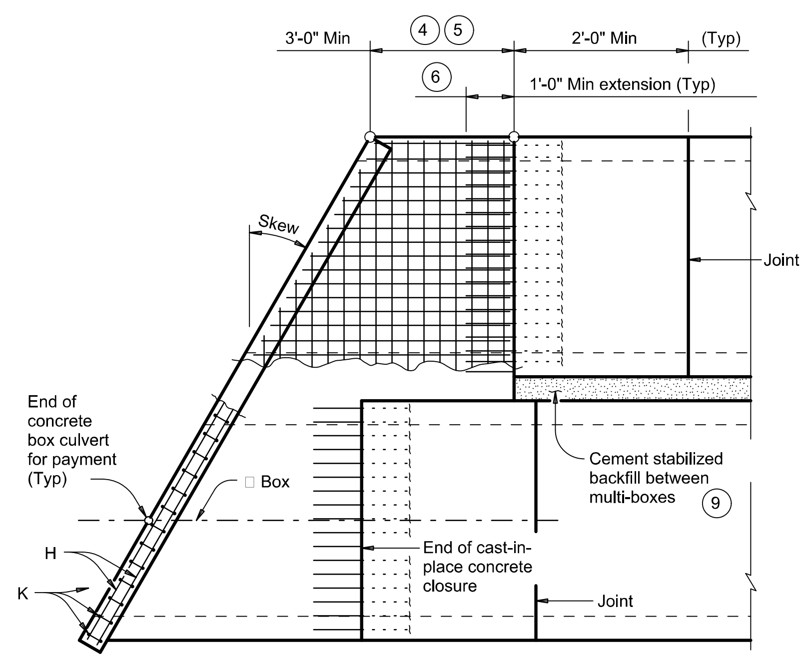
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	141

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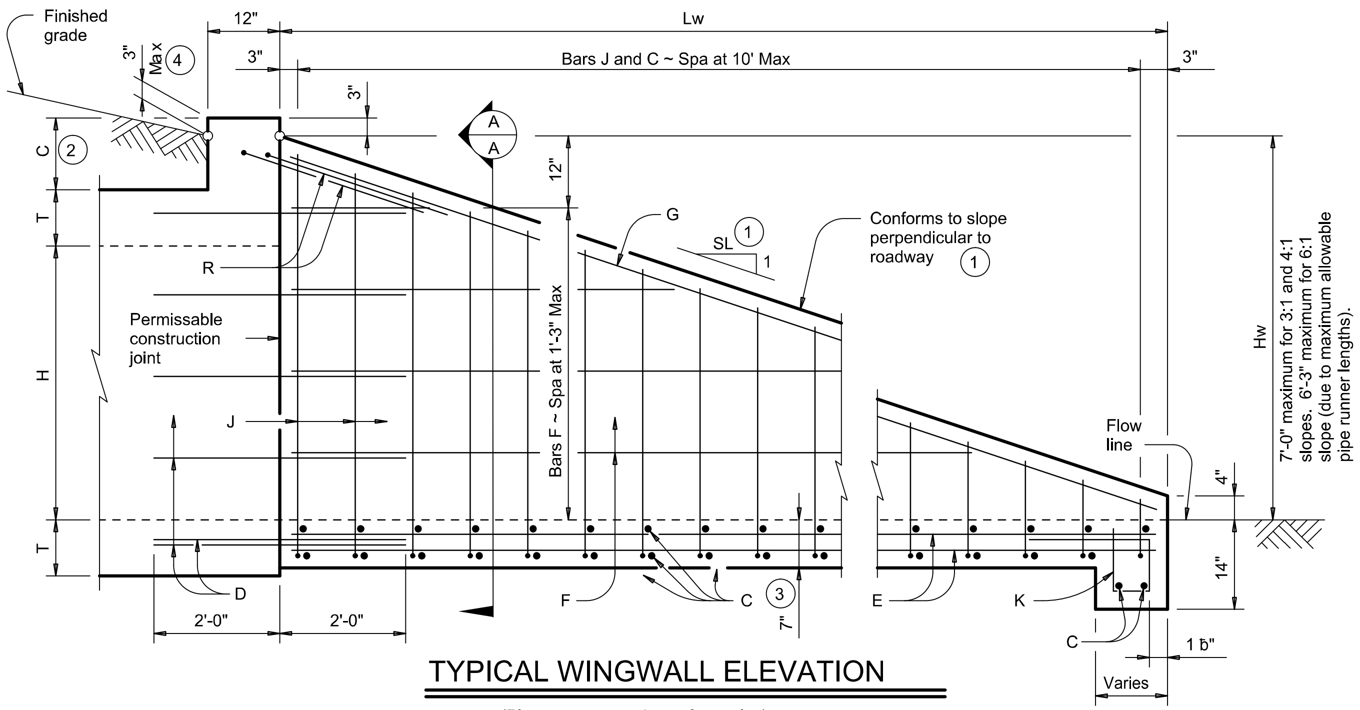
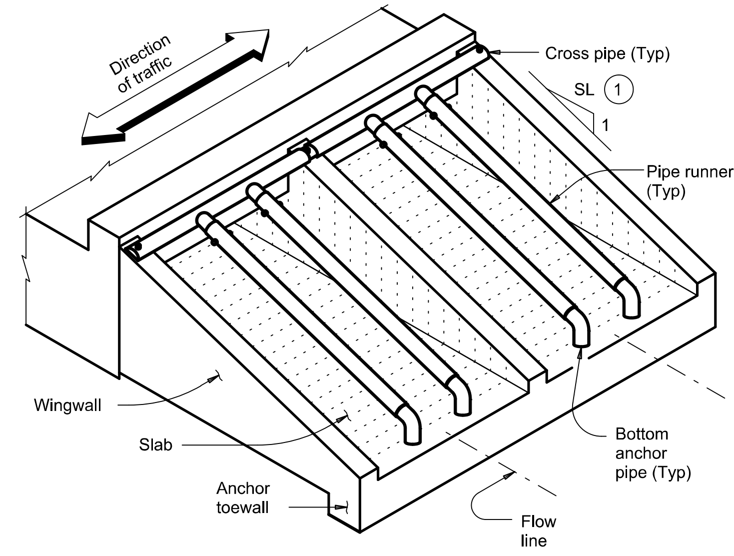


TYPICAL WINGWALL ELEVATION

(Pipe runners not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

WING DIMENSION CALCULATIONS:

Hw = H + T + C - 0.250'
Lw = (Hw - 0.333') (SL)

For cast-in-place culverts:
Atw = (N) (S) + (N + 1) (U)
For precast culverts:
Atw = (N) (2U + S) + (N - 1) (0.500')

Total Wingwall Area (SF)
= (0.5) (Hw + 0.333') (Lw) (N + 1)
Total Concrete Volume (CY)
= [(Wingwall Area) (0.583') +
(Lw) (Atw) (0.583') +
(Atw) (1.167') (1.167' - 0.583')] ÷ (27)

PIPE RUNNER DIMENSION CALCULATIONS:

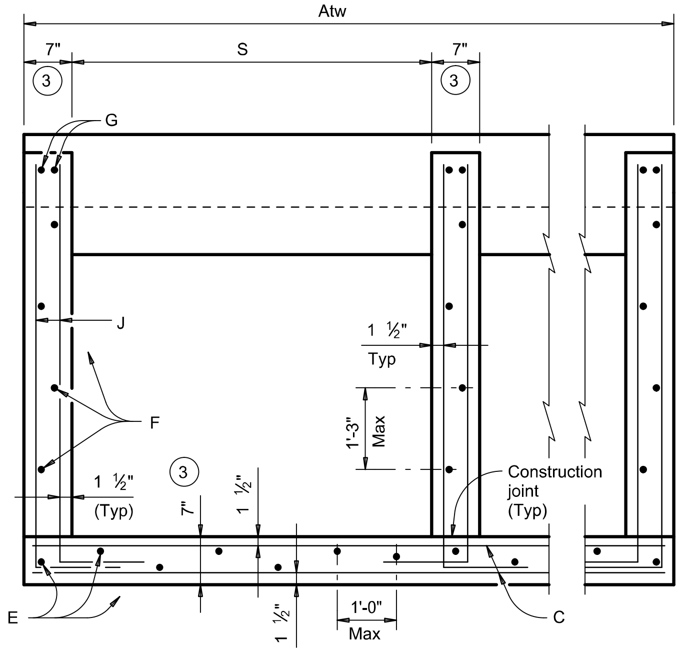
Pipe Runner Length
= (Lw) (K1) (1.917')
Total Reinforcing (Lb)
= (1.55) (Lw) (Atw) +
(4.43) (Atw) +
(K2) (Hw) (N + 1) (Lw) √

C = Height of curb above top of top slab (feet)
Hw = Height of wingwall (feet)
K = Constant value for use in formulas

Slope SL:1	K1	K2
3:1	1.054	7.45
4:1	1.031	8.49
6:1	1.014	10.30

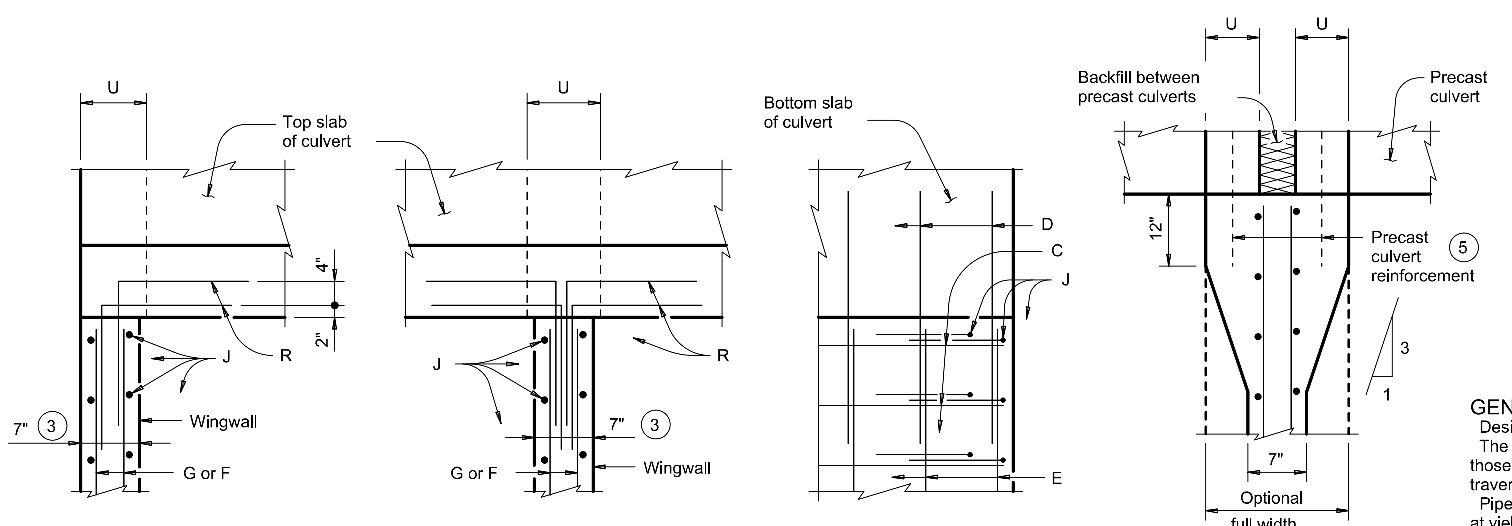
Atw = Anchor toewall length (feet)
Lw = Length of wingwall (feet)
N = Number of culvert barrels
SL:1 = Side slope ratio (horizontal : 1 vertical)

See applicable box culvert standard for H, S, T, and U values.



SECTION A-A

(Showing typical wingwall and wing slab reinforcing. Pipe runners not shown for clarity.)



AT TOP OF EXTERIOR WINGWALL
(Cast-in-place culvert)

AT TOP OF INTERIOR WINGWALL
(Cast-in-place culvert)

AT OUTSIDE OF BOTTOM SLAB
(Cast-in-place culvert)

AT INTERIOR WINGWALL
(Precast culvert)

PLAN VIEWS OF CORNER DETAILS

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Adjust reinforcing as necessary to provide a minimum clear cover of 1 ½".
Provide Class "C" concrete (f'c = 3,600 psi).
Provide pipe runners, cross pipes, and anchor pipes meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts.
Galvanize all steel components, except the concrete reinforcing, unless required elsewhere in the plans, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the Item 445, "Galvanizing".

GENERAL NOTES:

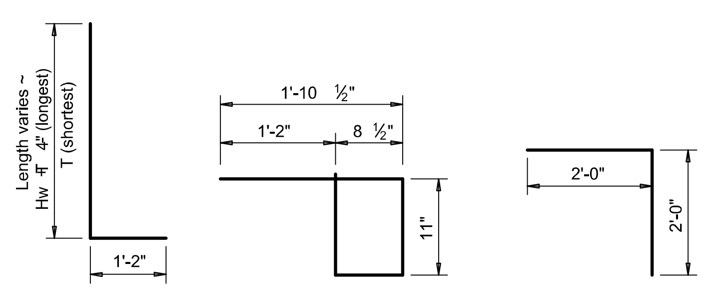
Designed according to AASHTO LRFD Bridge Design Specifications.
The safety end treatments shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
The quantities for pipe runners, reinforcing steel, and concrete resulting from the formulas given herein are for Contractor's information only.
See the Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
Alternate design drawings bearing the seal of a professional engineer will be acceptable for precast construction of the safety end treatments.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

1. Recommended values of slope are: 3:1, 4:1, and 6:1. Provide 3:1 or flatter slope.
2. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures without railing and curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet.
3. Wingwall and slab thicknesses may be the same as the adjacent culvert wall and slab thicknesses (7" minimum). If thicknesses greater than the minimum (7") are used, no changes will be made in quantities and no additional compensation will be allowed.
4. For vehicle safety, reduce curb height, if necessary, to provide a maximum 3" projection. No changes will be made in quantities and no additional compensation will be allowed for this work.
5. For culverts with C = 0", the precast culvert reinforcing may extend 1'-0" minimum into wingwall. Wingwall Bars D and R may be omitted. Otherwise, refer to the Wingwall Connection detail on the Box Culvert Precast Miscellaneous Details (SCP-MD) standard sheet.

TABLE OF REINFORCING BAR SIZES AND SPACING

Bar	Size	Spacing
C	#4	10" Max
D	#4	Match F and E
E	#4	1'-0" Max
F	#4	1'-3" Max
G	#6	As shown
J	#4	10" Max
K	#4	1'-0" Max
R	#4	As shown



BARS J

BARS K
(Length = 4'-3")

BARS R

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
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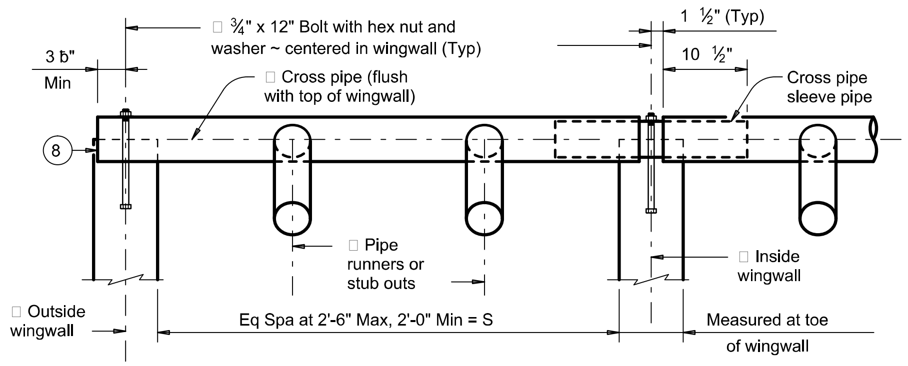
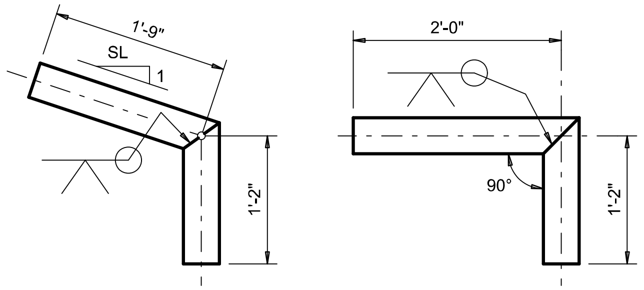


NOTE: At Contractor's option, make the cross pipe continuous across the inside wingwalls. If option is selected, omit the sleeve pipe and make a ∃" diameter through hole in the cross pipe to accept the anchor bolt at the centerline of each inside wingwall.

CROSS PIPE INSTALLATION DETAILS



OPTION A

OPTION B (10)

BOTTOM ANCHOR PIPE DETAILS

(6) Cross pipe is the same size as the pipe runner. Cross pipe stub out is the same size as the anchor pipe.

(7) Note that actual slope of safety pipe runner may vary slightly from side slope.

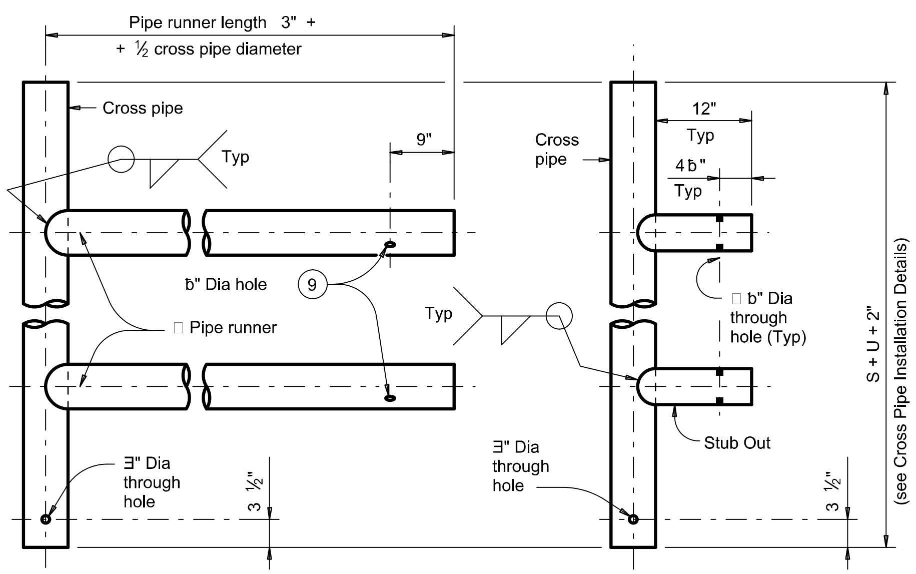
(8) Take care to ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1#2" hole to ensure that the lap of the safety pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MAXIMUM PIPE RUNNER LENGTHS AND REQUIRED PIPE RUNNER AND ANCHOR PIPE SIZES (6)

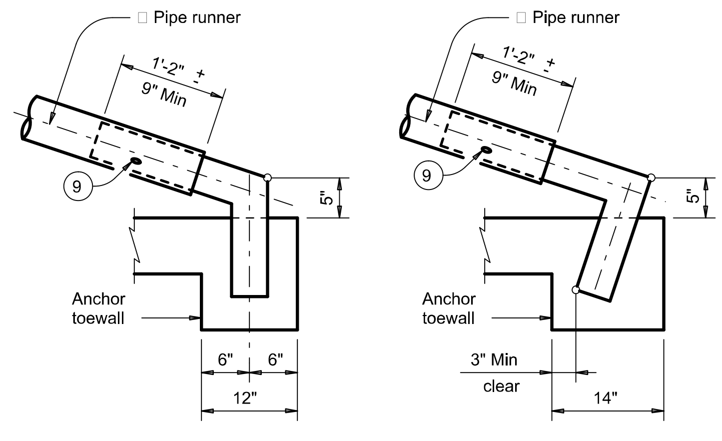
Maximum Pipe Runner Length	Required Pipe Runner Size			Required Anchor Pipe Size		
	Pipe Size	Pipe O.D.	Pipe I.D.	Pipe Size	Pipe O.D.	Pipe I.D.
10'- 0"	3" STD	3.500"	3.068"	2" STD	2.375"	2.067"
19'- 8"	4" STD	4.500"	4.026"	3" STD	3.500"	3.068"
34'- 2"	5" STD	5.563"	5.047"	4" STD	4.500"	4.026"



OPTION A2

OPTION A1

FOR USE IN OUTSIDE CULVERT BAY

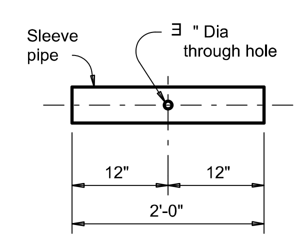


OPTION B1

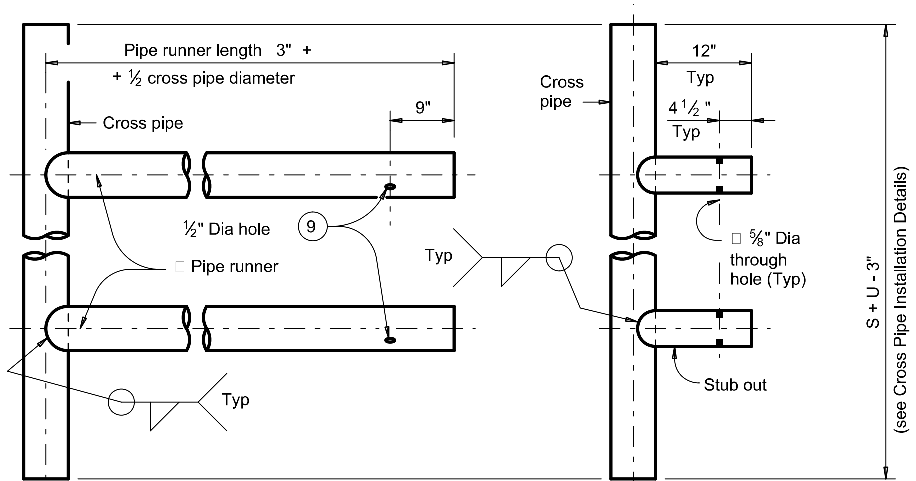
OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Wingwall not shown for clarity.)



CROSS PIPE SLEEVE PIPE DETAILS

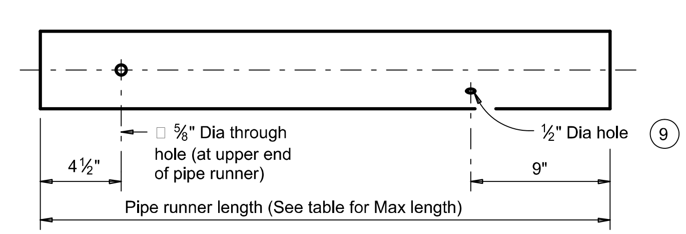


OPTION A2

OPTION A1

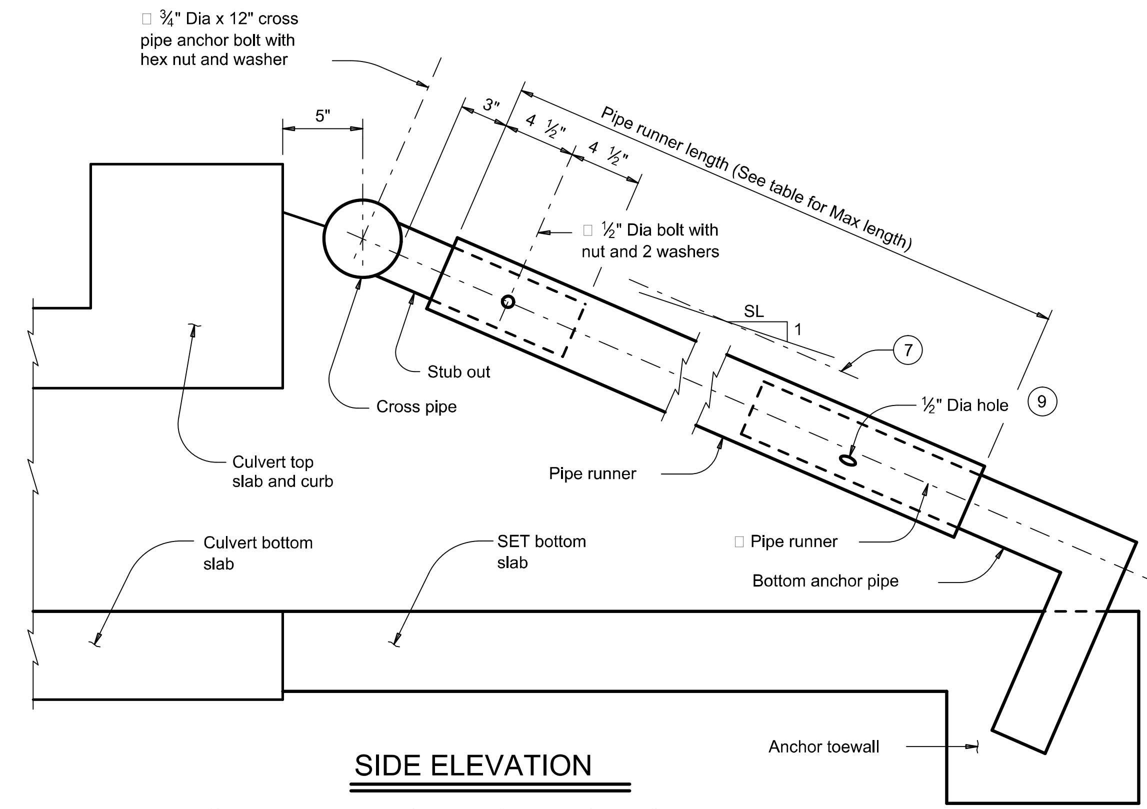
FOR USE IN INSIDE CULVERT BAY

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

(Showing pipe runner with Cross Pipe Connection Option A1 and Bottom Anchor Toewall Option B2. Wingwall not shown for clarity.)

DATE: 7/17/2023 10:20:26 AM

FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnd\...

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 0° SKEW BOX CULVERTS
(MAXIMUM Hw = 7'-0")
TYPE I ~ CROSS DRAINAGE

SETB-CD

FILE: setbcdse-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		143

1

R1-1
48 X 48
STA 100+61.26

2

M3-2 & M1-6F
24 X 12 & 24 X 24
STA 101+37.77

3

D1-2
78 X 30
STA 102+55.62

4

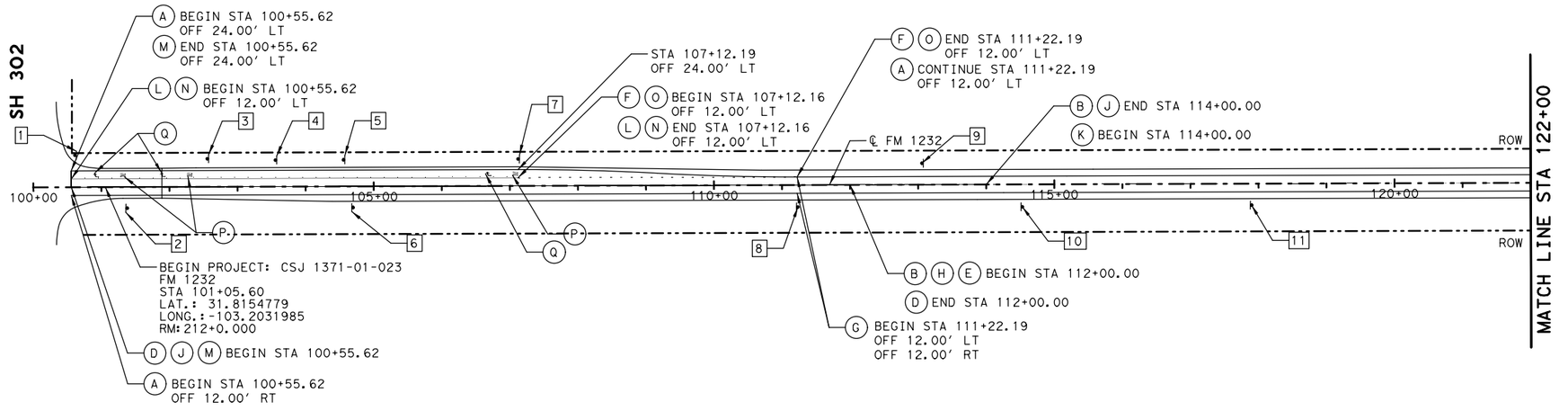
M4-6 & M1-6F
24 X 12 & 24 X 24
STA 103+55.62

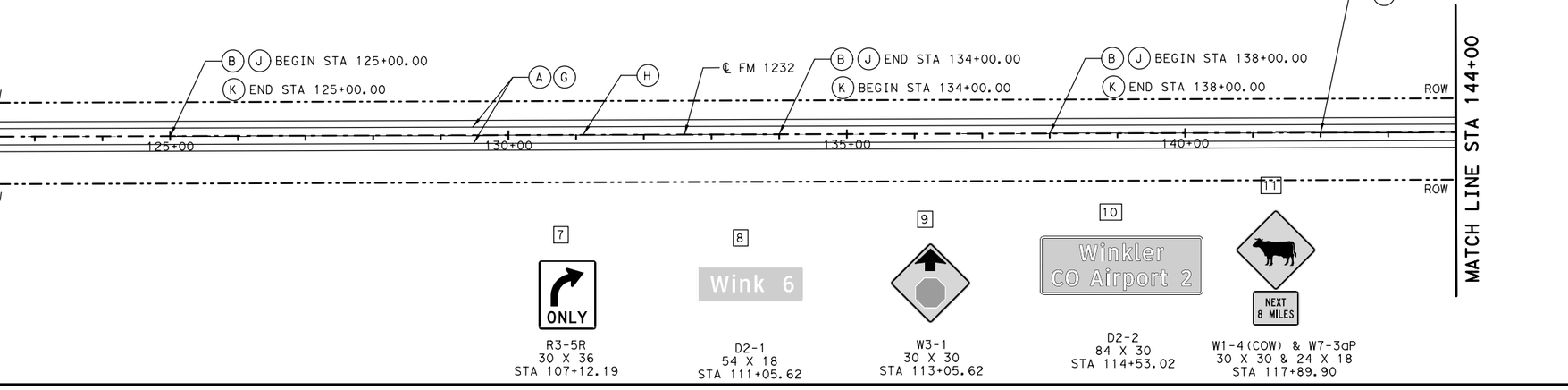
5

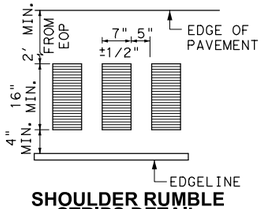
M2-1 & M1-6T
24 X 15 & 24 X 24
STA 104+55.62

6

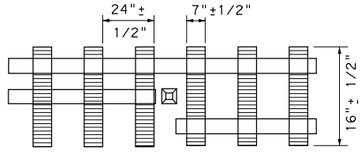
R2-1
24 X 30
STA 104+69.64



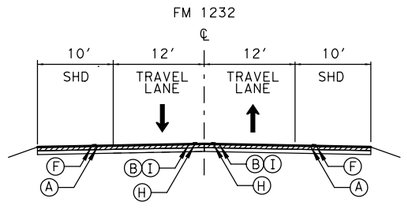




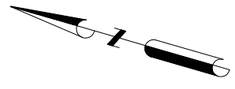
SHOULDER RUMBLE STRIPS DETAIL



CENTERLINE RUMBLE STRIPS DETAIL



PAVEMENT MARKING TYPICAL LAYOUT
N.T.S
STA 107+12.19 TO STA 209+73.00



7

R3-5R
30 X 36
STA 107+12.19

8

D2-1
54 X 18
STA 111+05.62

9

W3-1
30 X 30
STA 113+05.62

10

D2-2
84 X 30
STA 114+53.02

11

W1-4(COW) & W7-3aP
30 X 30 & 24 X 18
STA 117+89.90

0 100 200
SCALE: 1"=200'

LEGEND

- [#] PROPOSED SIGN ID
- PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
- (E) 6" YELLOW BRK
- (F) 8" WHITE DOT
- (G) RUMBLE STRIPS (SHLDR) ASPHALT
- (H) RUMBLE STRIPS (CL) ASPHALT
- (I) PAV MRKR TY II-A-A @ 20'
- (J) PAV MRKR TY II-A-A @ 40'
- (K) PAV MRKR TY II-A-A @ 80'
- (L) 8" WHITE SLD
- (M) 24" WHITE SLD
- (N) PAV MRKR TY I-C @ 20'
- (O) PAV MRKR TY I-C @ 48'
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 100+00 TO STA 144+00

SHEET 1 OF 7

		FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	144
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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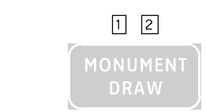
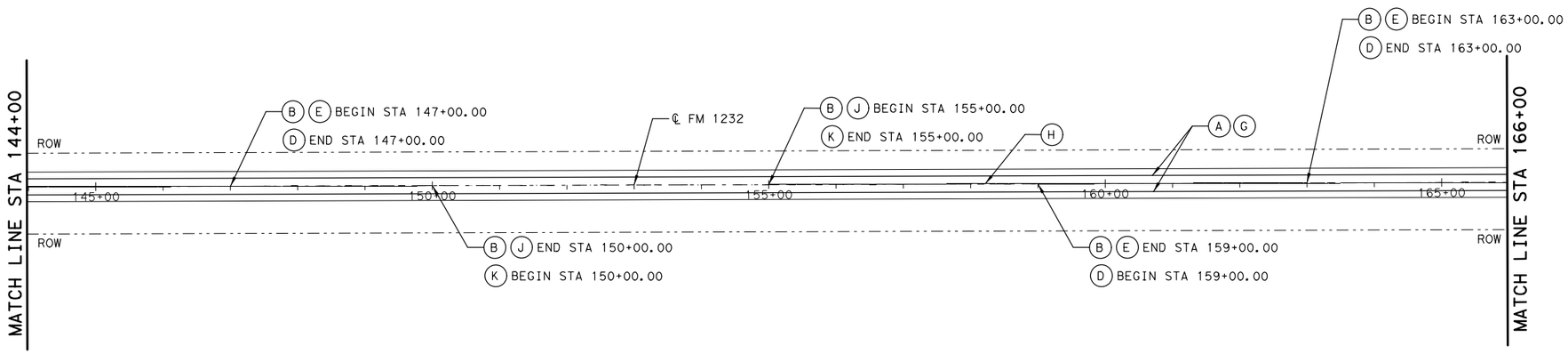
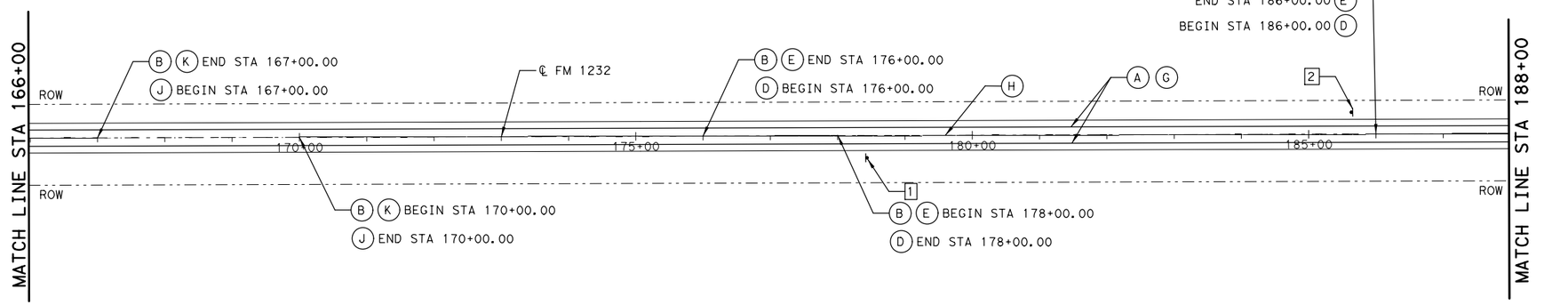
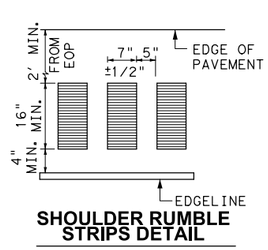


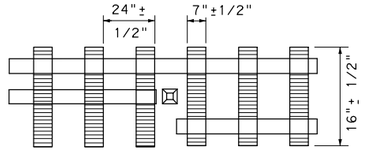
I-3
60 X 30
2-STA 178+43.56
3-STA 185+63.48



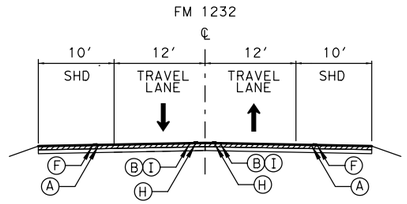




SHOULDER RUMBLE STRIPS DETAIL



CENTERLINE RUMBLE STRIPS DETAIL

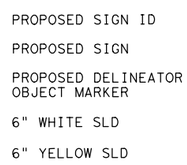


PAVEMENT MARKING TYPICAL LAYOUT
N.T.S
STA 107+12.19 TO STA 209+73.00

LEGEND

- # PROPOSED SIGN ID
- PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
- (E) 6" YELLOW BRK
- (F) 8" WHITE DOT
- (G) RUMBLE STRIPS (SHLDR) ASPHALT
- (H) RUMBLE STRIPS (CL) ASPHALT
- (I) PAV MRKR TY II-A-A @ 20'
- (J) PAV MRKR TY II-A-A @ 40'
- (K) PAV MRKR TY II-A-A @ 80'
- (L) 8" WHITE SLD
- (M) 24" WHITE SLD
- (N) PAV MRKR TY I-C @ 20'
- (O) PAV MRKR TY I-C @ 48'
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES

DATE	BY	REV	REVISION



7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 144+00 TO STA 188+00

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		145
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ODA	WINKLER	
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

7/17/2023
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1

W1-2R & W13-1P
30 X 30 & 18 X 18
STA 192+27.89

2 3 4 5 6 7 8
14 15 16 17 18

W1-8 R/L BACK TO BACK
18 X 24
2-STA 200+03.86
3-STA 201+29.61
4-STA 202+51.26
5-STA 203+74.67
6-STA 204+95.89
7-STA 206+19.26
8-STA 207+44.11
14-STA 227+17.59
15-STA 228+43.32
16-STA 229+58.10
17-STA 230+76.55
18-STA 231+97.33

9

M3-4 & M1-6F
24 X 12 & 24 X 24
STA 211+78.78

10

W1-2L & W13-1P
30 X 30 & 18 X 18
STA 215+52.73

11

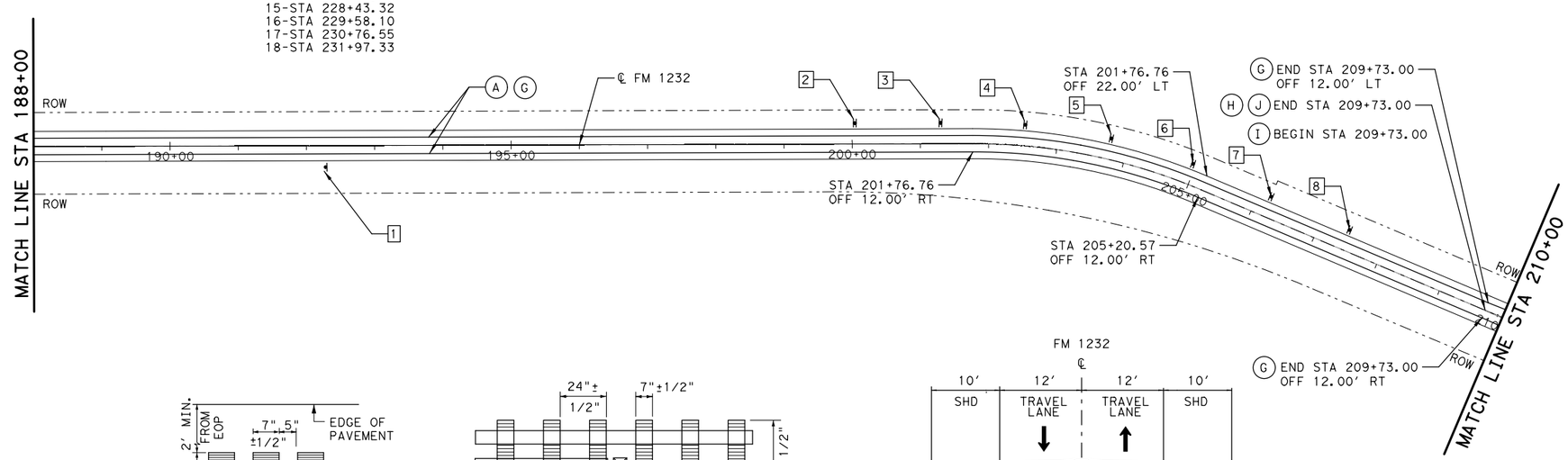
I-5 & M6-1G
BACK TO BACK
24 X 24 & 12 X 9
STA 218+66.87

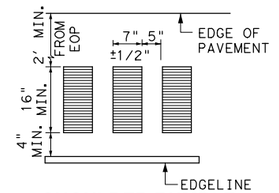
12

R1-1
36 X 36
STA 219+21.09

13

W1-5R & W13-1P
30 X 30 & 18 X 18
STA 219+60.08



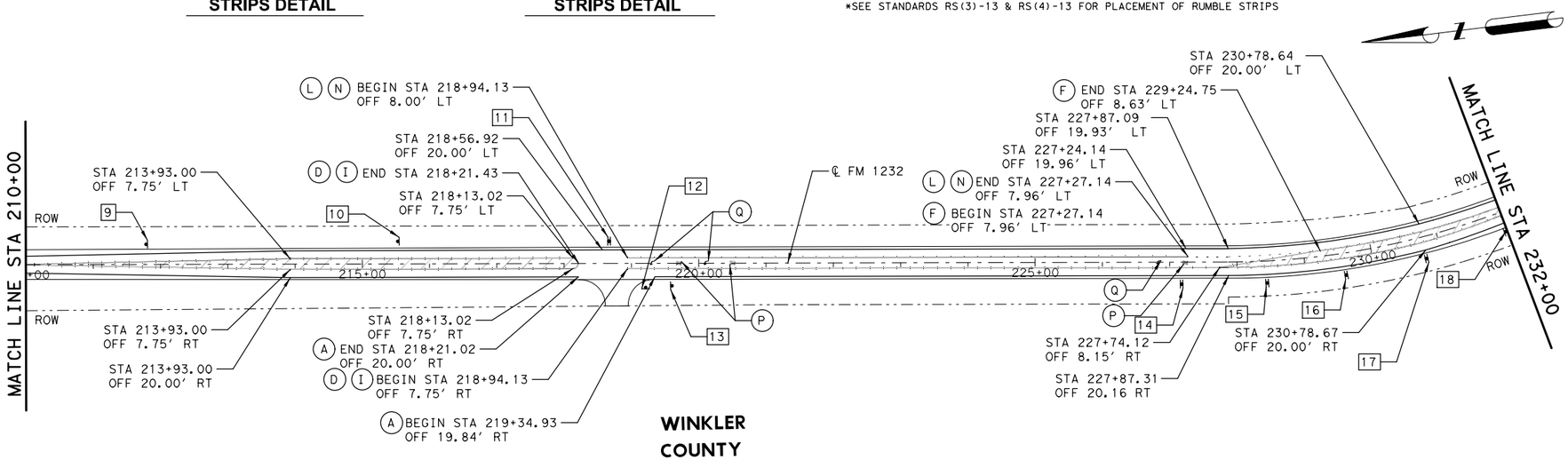


SHOULDER RUMBLE STRIPS DETAIL

CENTERLINE RUMBLE STRIPS DETAIL

PAVEMENT MARKING TYPICAL LAYOUT
N.T.S
STA 107+12.19 TO STA 209+73.00

*SEE STANDARDS RS(3)-13 & RS(4)-13 FOR PLACEMENT OF RUMBLE STRIPS



WINKLER COUNTY AIRPORT

0 100 200
SCALE: 1"=200'

LEGEND

- [#] PROPOSED SIGN ID
- PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
- (E) 6" YELLOW BRK
- (F) 8" WHITE DOT
- (G) RUMBLE STRIPS (SHLDR) ASPHALT
- (H) RUMBLE STRIPS (CL) ASPHALT
- (I) PAV MRKR TY II-A-A @ 20'
- (J) PAV MRKR TY II-A-A @ 40'
- (K) PAV MRKR TY II-A-A @ 80'
- (L) 8" WHITE SLD
- (M) 24" WHITE SLD
- (N) PAV MRKR TY I-C @ 20'
- (O) PAV MRKR TY I-C @ 48'
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 188+00 TO STA 232+00

SHEET 3 OF 7

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		146
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

1 2 3 4 5 6 7 8 9

10 11 12 13 14 15 16

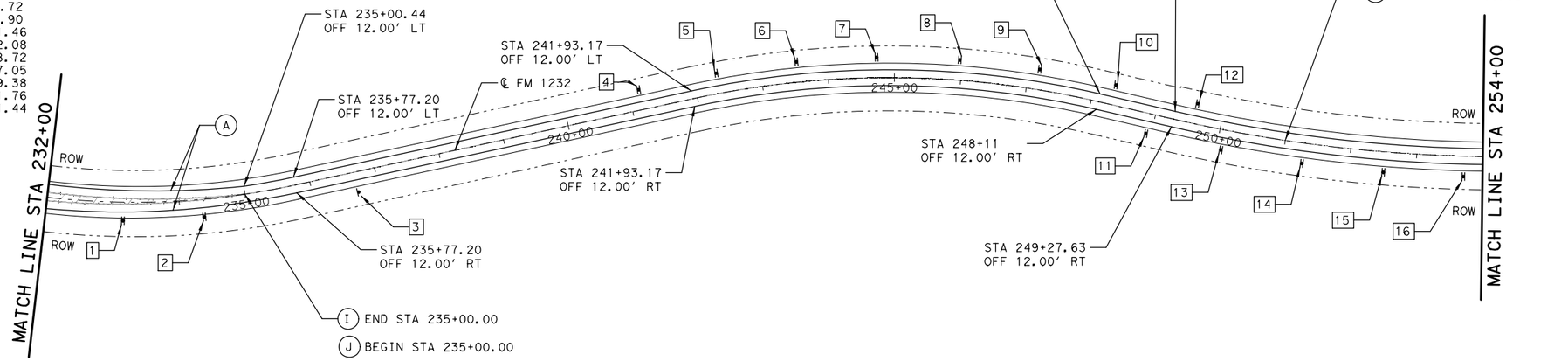
W1-8 R/L BACK TO BACK
18 X 24
1-STA 233+15.33
2-STA 234+35.80
3-STA 236+69.01
4-STA 241+15.41
5-STA 242+34.62
6-STA 243+54.43
7-STA 244+73.40
8-STA 245+96.72
9-STA 247+15.90
10-STA 248+31.46
11-STA 248+92.08
12-STA 249+68.72
13-STA 250+07.05
14-STA 251+29.38
15-STA 252+51.76
16-STA 253+71.44

17

W1-5R & W13-1P
48 X 48
18 X 18
STA 262+33.04

18

D7-6aT
48 X 48
STA 263+57.56



0 100 200
SCALE: 1"=200'

LEGEND

- [#] PROPOSED SIGN ID
- ● PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
- (E) 6" YELLOW BRK
- (F) 8" WHITE DOT
- (G) RUMBLE STRIPS (SHLDR) ASPHALT
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- (I) PAV MRKR TY II-A-A @ 20'
- (J) PAV MRKR TY II-A-A @ 40'
- (K) PAV MRKR TY II-A-A @ 80'
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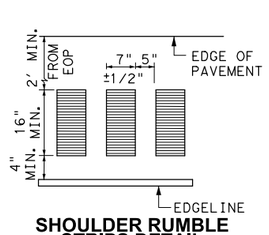
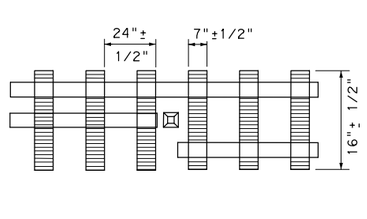
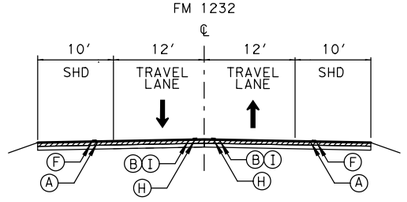
- (N) PAV MRKR TY I-C @ 20'
- (O) PAV MRKR TY I-C @ 48'
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES



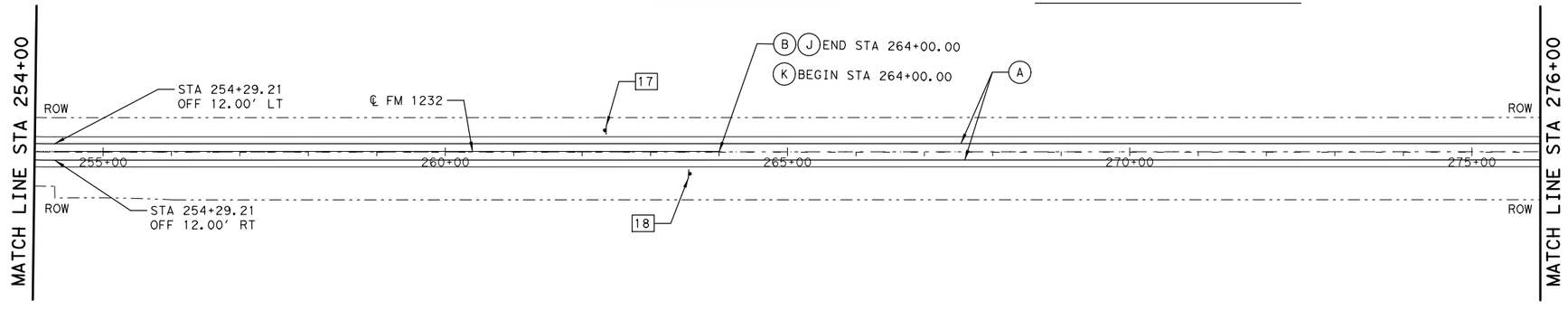
SHOULDER RUMBLE STRIPS DETAIL



CENTERLINE RUMBLE STRIPS DETAIL



PAVEMENT MARKING TYPICAL LAYOUT
N.T.S
STA 235+00 TO STA 304+03.00



DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 232+00 TO STA 276+00

SHEET 4 OF 7

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	147
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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7/17/2023
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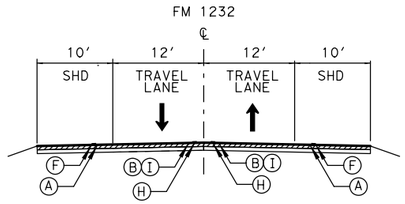
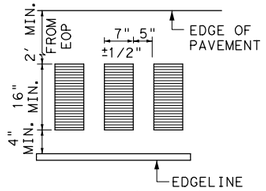
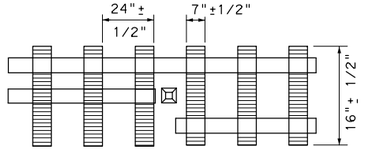


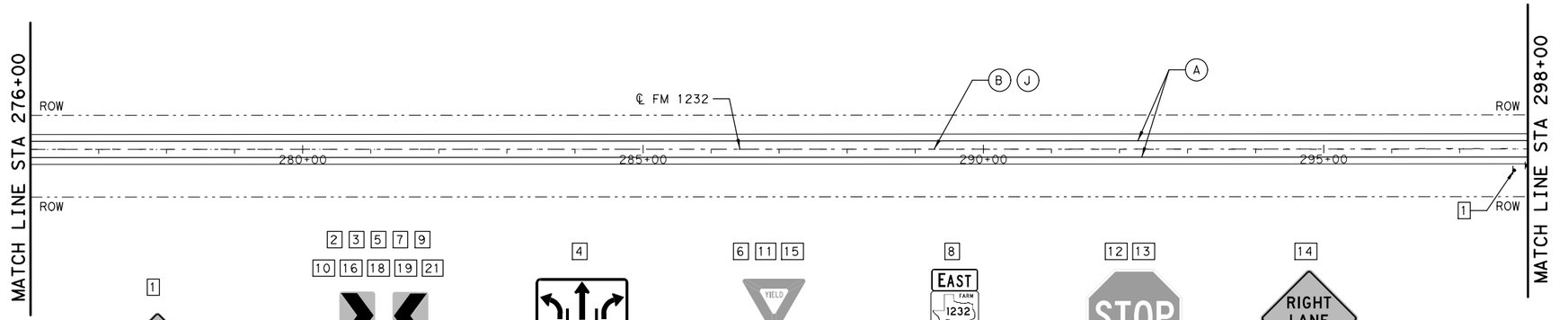
PAVEMENT MARKING TYPICAL LAYOUT
N.T.S
STA 235+00 TO STA 304+03.00



SHOULDER RUMBLE STRIPS DETAIL



CENTERLINE RUMBLE STRIPS DETAIL



1
45 MPH
W1-2L & W13-1P
30 X 30 & 18 X 18
STA 297+80.04

2 3 5 7 9
10 16 18 19 21
W1-8 R/L BACK TO BACK
18 X 24
2-STA 307+37.80
3-STA 308+54.62
5-STA 309+74.24
7-STA 310+94.78
9-STA 312+13.65
10-STA 313+33.53
16-STA 316+90.88
18-STA 317+31.63
19-STA 318+49.24
21-STA 319+85.65

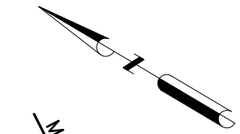
4
ONLY ONLY ONLY
R3-8b
48 X 30
STA 309+02.11

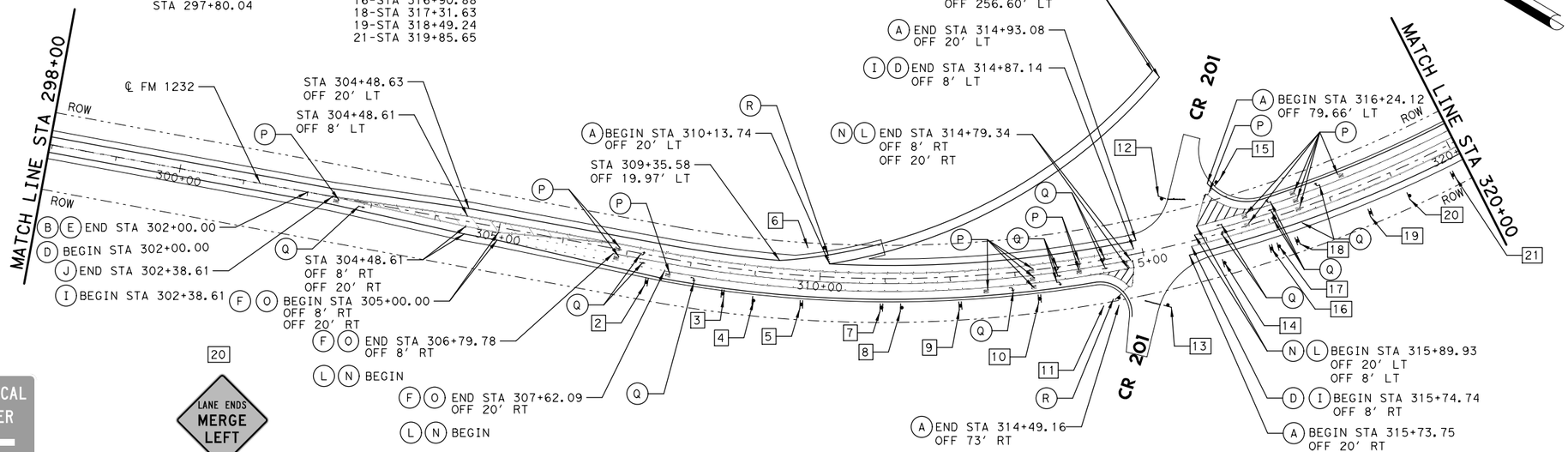
6 11 15
YIELD
R1-2
36 X 36 X 36
6-STA 309+78.27
11-STA 314+32.58
15-STA 316+38.24

8
EAST
FARM 1232 ROAD
M3-2 & M1-6F
24 X 12 & 24 X 24
STA 311+25.53

12 13
STOP
R1-1
48 X 48
12-STA 315+46.89
13-STA 315+51.13

14
RIGHT LANE ENDS
W9-1R
36 X 36
STA 316+17.23





17
HISTORICAL MARKER
D7-7aTL/T BACK TO BACK
48 x 48
STA 317+03.04

20
LANE ENDS MERGE LEFT
W9-2TL
36 X 36
STA 319+13.58

0 100 200
SCALE: 1"=200'

LEGEND

- [#] PROPOSED SIGN ID
- PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
- (E) 6" YELLOW BRK
- (F) 8" WHITE DOT
- (G) RUMBLE STRIPS (SHLDR) ASPHALT
- (H) RUMBLE STRIPS (CL) ASPHALT
- (I) PAV MRKR TY II-A-A @ 20′
- (J) PAV MRKR TY II-A-A @ 40′
- (K) PAV MRKR TY II-A-A @ 80′
- (L) 8" WHITE SLD
- (M) 24" WHITE SLD
- (N) PAV MRKR TY I-C @ 20′
- (O) PAV MRKR TY I-C @ 48′
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P915 308 6413 F281 647 9184

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 276+00 TO STA 320+00

SHEET 5 OF 7

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	148
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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7/17/2023
c:\pwworking\dr\omega-app02.omegaengineers.local+omega-prod\omega+jnavarrete\dms09307\FM 1232-PM-PLN05.dgn

1 2

W1-8 R/L BACK TO BACK
18 X 24
1-STA 320+92.38
2-STA 322+13.05

3

R3-8b
48 X 30
STA 322+76.93

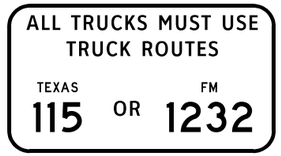
4

W1-2R & W13-1P
30 X 30 & 18 X 18
STA 335+29.87

5

W3-5
36 X 36
STA 342+74.66

6



M1-6T3
108 X 60
STA 345+48.16

7

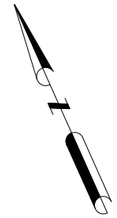
R2-1(70 MPH)
24 X 30
STA 353+31.73

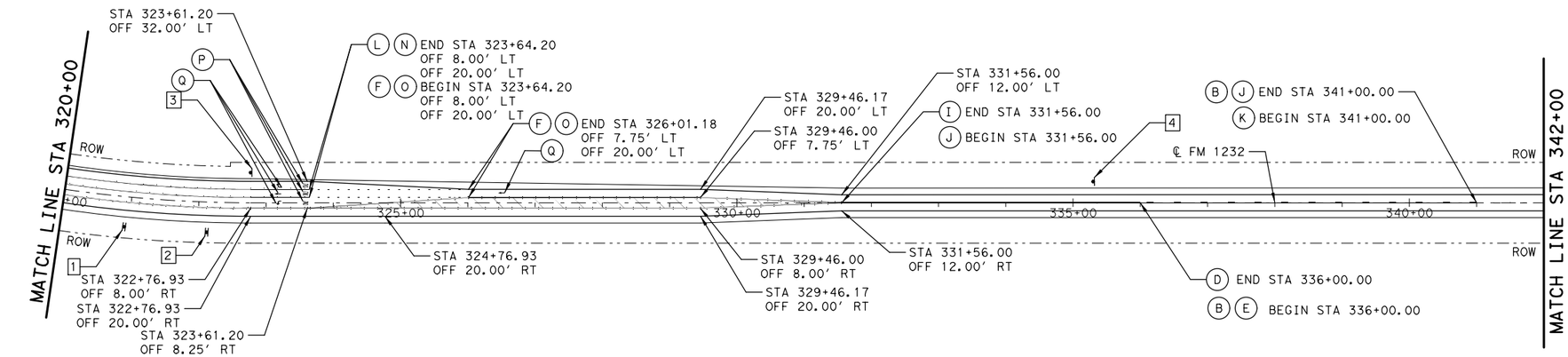
8 9

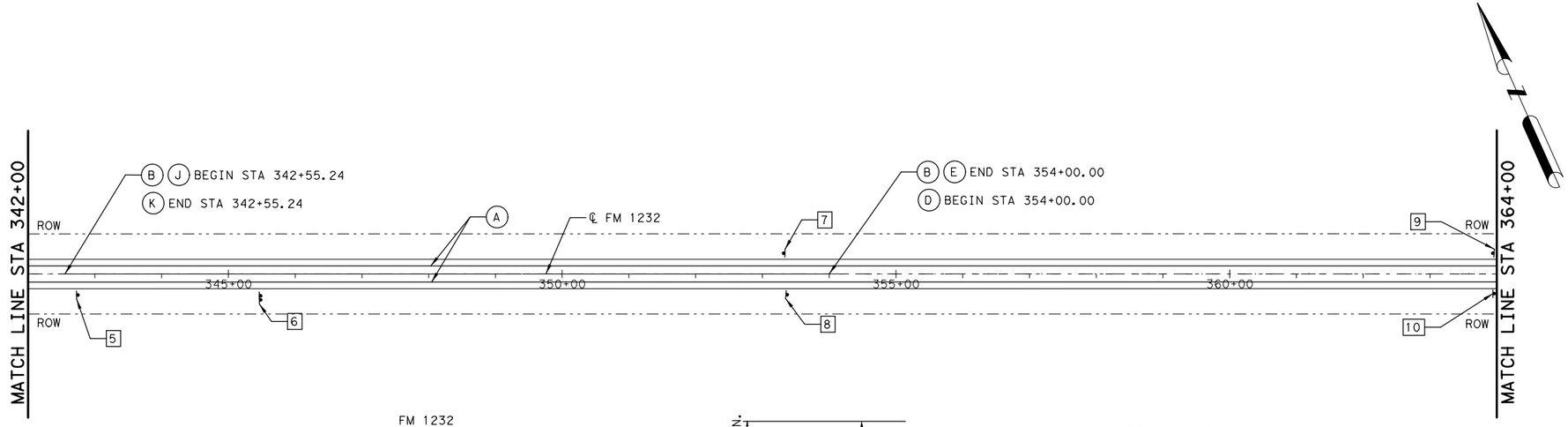
R2-1(60 MPH)
24 X 30
8-STA 353+37.20
9-STA 363+94.03

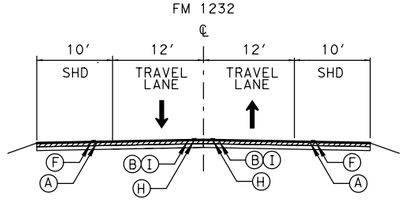
10

R2-1(50 MPH)
24 X 30
10-STA 363+94.03

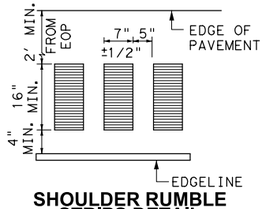




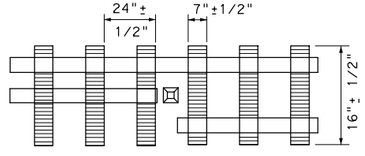




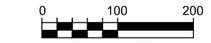
PAVEMENT MARKING TYPICAL LAYOUT
N.T.S
STA 331+56.00 TO STA 377+83.74



SHOULDER RUMBLE STRIPS DETAIL



CENTERLINE RUMBLE STRIPS DETAIL



LEGEND

- [#] PROPOSED SIGN ID
- PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
- (E) 6" YELLOW BRK
- (F) 8" WHITE DOT
- (G) RUMBLE STRIPS (SHLDR) ASPHALT
- (H) RUMBLE STRIPS (CL) ASPHALT
- (I) PAV MRKR TY II-A-A @ 20'
- (J) PAV MRKR TY II-A-A @ 40'
- (K) PAV MRKR TY II-A-A @ 80'
- (L) 8" WHITE SLD
- (M) 24" WHITE SLD
- (N) PAV MRKR TY I-C @ 20'
- (O) PAV MRKR TY I-C @ 48'
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 320+00 TO STA 364+00

SHEET 6 OF 7

		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	149
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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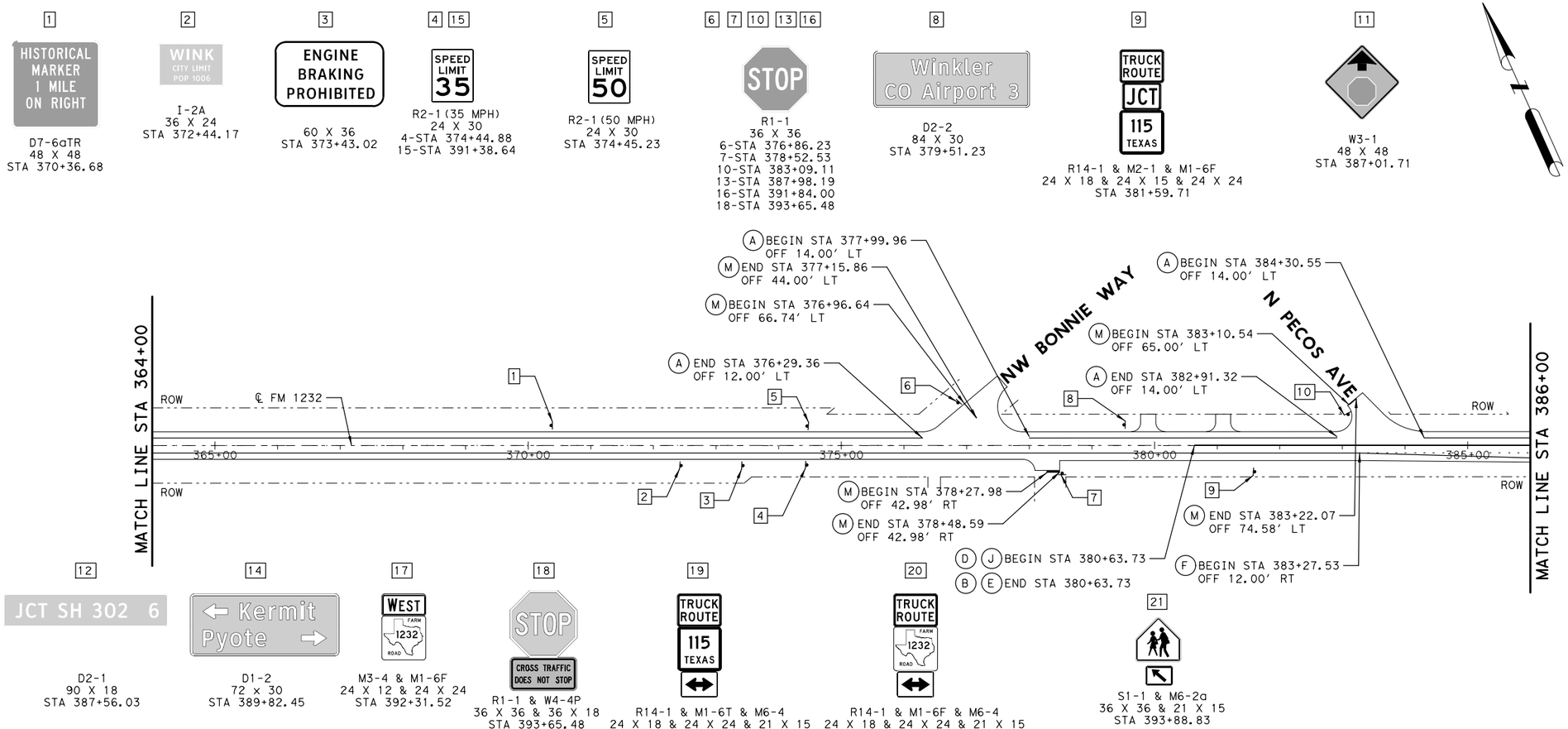

0 100 200
SCALE: 1"=200'

LEGEND

- [#] PROPOSED SIGN ID
- PROPOSED SIGN
- PROPOSED DELINEATOR & OBJECT MARKER
- (A) 6" WHITE SLD
- (B) 6" YELLOW SLD
- (C) 6" WHITE DOT
- (D) 6" YELLOW DBL
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- (K) PAV MRKR TY II-A-A @ 80'
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- (M) 24" WHITE SLD
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- (O) PAV MRKR TY I-C @ 48'
- (P) PAV MRK WORD
- (Q) PAV MRK ARROW
- (R) YIELD TRIANGLES

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
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7/17/2023

OMEGA ENGINEERS, INC.
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EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
SIGNING & PAVEMENT MARKING LAYOUT
STA 364+00 TO STA 394+00

SHEET 7 OF 7

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	150
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

7/17/2023
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10:20:58 AM

PLAN SHEET NO.	SIGN NO.	DESCRIPTION	STATION
1	1	STOP	STA 100+54.96
	2	EAST, FARM ROAD 1232	STA 101+42.26
	3	SPEED LIMIT 70	STA 104+68.92
	4	MENTONE KERMIT	STA 108+35.48
2	1	WINK 6	STA 111+23.99
	2	STOP AHEAD	STA 111+56.94
	3	WINKLER AIRPORT 2	STA 114+50.60
	4	END, FARM ROAD 1232	STA 114+79.29
	5	CATTLE CROSSING, NEXT 8 MILES	STA 118+00.04
	6	JCT 302 TEXAS	STA 118+01.29
	7	SOFT SHOULDER NETX 8 M	STA 120+23.66
7	1	NARROW BRIDGE	STA 176+63.76
8	1	MONUMENT DRAW	STA 178+38.82
	2	MONUMENT DRAW	STA 185+60.75
	3	NARROW BRIDGE	STA 187+64.11
9	1	RIGHT, 45 MPH	STA 192+35.75
10	1	CHEVRON	STA 200+10.75
	2	CHEVRON	STA 201+34.54
	3	CHEVRON	STA 202+55.94
	4	CHEVRON	STA 203+79.77
	5	CHEVRON	STA 205+02.12
	6	CHEVRON	STA 206+22.73
	7	CHEVRON	STA 207+45.58
11	1	WEST FARM 1232 ROAD	STA 211+84.79
	2	LEFT, 45 MPH	STA 215+59.20
	3	AIRPORT	STA 218+79.41
	4	STOP	STA 219+12.01
	5	CURVE 45 MPH	STA 219+60.85
12	1	CHEVRON	STA 227+29.11
	2	CHEVRON	STA 228+47.29
	3	CHEVRON	STA 229+65.90
	4	CHEVRON	STA 230+84.16
13	1	CHEVRON	STA 232+02.39
	2	CHEVRON	STA 233+20.62
	3	CHEVRON	STA 234+39.74
	4	CHEVRON	STA 236+78.47
	5	CHEVRON	STA 241+23.81
	6	CHEVRON	STA 242+42.97

PLAN SHEET NO.	SIGN NO.	DESCRIPTION	STATION
14	1	CHEVRON	STA 243+63.0
	2	CHEVRON	STA 244+82.90
	3	CHEVRON	STA 246+02.86
	4	CHEVRON	STA 247+22.52
	5	CHEVRON	STA 248+42.75
	6	CHEVRON	STA 248+92.18
	7	CHEVRON	STA 249+63.92
	8	CHEVRON	STA 250+16.28
	9	CHEVRON	STA 251+36.49
	10	CHEVRON	STA 252+57.50
	11	CHEVRON	STA 253+77.90
15	1	CURVE 45MPH	STA 262+40.15
	2	HISTORICAL MARKER 1 M	STA 263+74.68
18	1	CURVE LEFT 45MPH	STA 297+96.68
19	1	SOFT SHOULDER 8 MILES	STA 306+89.53
	2	CHEVRON	STA 307+52.90
	3	CHEVRON	STA 308+71.82
20	1	CHEVRON	STA 309+91.54
	2	YIELD	STA 309+81.27
	3	CHEVRON	STA 311+10.36
	4	EAST, FARM 1232	STA 311+22.75
	5	CHEVRON	STA 312+29.91
	6	CHEVRON	STA 313+47.92
	7	STOP	STA 315+23.79
	8	STOP	STA 315+41.85
	9	CHEVRON	STA 316+27.51
	10	HISTORICAL MARKER	STA 317+03.04
	11	CHEVRON	STA 317+47.02
	12	CHEVRON	STA 318+66.74
	13	CHEVRON	STA 319+86.37
21	1	CHEVRON	STA 321+06.58
	2	CHEVRON	STA 322+24.75
22	1	RIGHT, 45MPH	STA 335+42.40
23	1	SPEED 60 AHEAD	STA 342+79.82
	2	TRUCKS ONLY 1232	STA 345+48.20
24	1	SPEED LIMIT 70	STA 353+40.15
	2	SPEED LIMIT 60	STA 353+39.09
	3	SPEED LIMIT 60	STA 363+95.55

PLAN SHEET NO.	SIGN NO.	DESCRIPTION	STATION
25	1	HISTORICAL MARKER 1 MILE	STA 370+43.03
	2	SPEED LIMIT 35 MPH	STA 374+47.19
	3	WINK CITY LIMIT	STA 374+47.13
	4	ENGINE PROHIBITED	STA 374+47.12
	5	SPEED LIMIT 50 MPH	STA 374+47.11
26	1	STOP	STA 376+59.39
	2	STOP	STA 378+42.46
	3	WINKLER CO 3 AIRPORT	STA 379+55.57
	4	TRUCK ROUTE, JCT, 115 TX	STA 381+59.71
27	1	STOP AHEAD	STA 387+01.71
	2	JCT SH 302 6	STA 387+59.49
	3	STOP	STA 388+10.85
	4	KERMIT, PYOTE	STA 389+82.45
	5	SPEED LIMIT 35 MPH	STA 391+33.97
	6	STOP	STA 391+84.00
	7	WEST	STA 392+37.13
	8	STOP	STA 393+70.17
	9	TRUCK ROUTE,FARM 1232	STA 393+86.91
	10	TRUCK ROUTE, 115 TEXAS	STA 393+82.92

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
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7/17/2023

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EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

SIGN REMOVAL SUMMARY

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		151
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1	1	R1-1	STOP	48 X 48			10BWG	1	SA	T		
	2	M3-2 M1-6F	EAST FARM 1232 ROAD	24 X 12 24 X 24			10BWG	1	SA	P		
	3	D1-2	← Mentone Kermit →	78 X 30			10BWG	1	SA	T		
	4	M4-6 M1-6F	END FARM 1232 ROAD	24 X 12 24 X 24			10BWG	1	SA	P		
	5	M2-1 M1-6T	JCT 302 TEXAS	21 X 15 24 X 24			10BWG	1	SA	P		
	6	R2-1	SPEED LIMIT 70	24 X 30			10BWG	1	SA	P		
	7	R3-5R	ONLY	30 X 36			10BWG	1	SA	P		
	8	D2-1	Wink 6	54 X 18			10BWG	1	SA	T		
	9	W3-1		30 X 30			10BWG	1	SA	P		
	10	D2-2	Winkler CO Airport 2	84 X 30			10BWG	1	SA	T		
	11	W11-4 (Cow) W7-3aP	NEXT 8 MILES	30 X 30 24 X 18			10BWG	1	SA	P		
S&PM LAYOUT 2	1 2	I-3	MONUMENT DRAW	60 X 30			10BWG	1	SA	T		

ALUMINUM SIGN BLANKS THICKNESS

Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
http://www.txdot.gov/

NOTE:

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

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
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LICENSED PROFESSIONAL ENGINEER
7/17/2023

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Texas Department of Transportation®

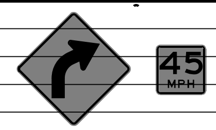
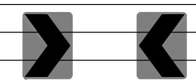
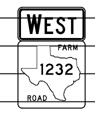
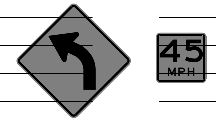
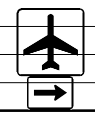
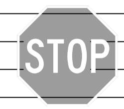
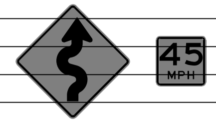
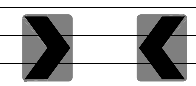
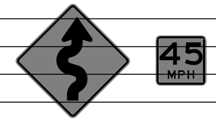
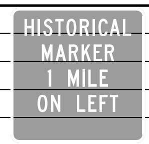
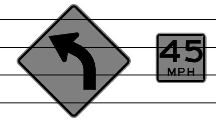
SUMMARY OF SMALL SIGNS

SOSS SHEET 1 OF 5

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		152
CHK	OEI	STATE	DIST.		COUNTY
		TEXAS	ODA		WINKLER
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	1371	01	023	FM 1232

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
S&PM LAYOUT 3	1	W1-2R W13-1P		30 X 30 18 X 18			10BWG	1	SA	P		
	2-8 14-18	W1-8R W1-8L		18 X 24 BACK TO BACK 18 X 24			10BWG	1	SA	P		
	9	M3-4 M1-6F		24 X 12 24 X 24			10BWG	1	SA	P		
	10	W1-2L W13-1P		30 X 30 18 X 18			10BWG	1	SA	P		
	11	I-5 M6-1G		24 X 24 BACK TO BACK 12 X 9			10BWG	1	SA	P		
	12	R1-1		36 X 36			10BWG	1	SA	P		
	13	W1-5R W13-1P		30 X 30 18 X 18			10BWG	1	SA	P		
S&PM LAYOUT 4	1-16	W1-8R W1-8L		18 X 24 BACK TO BACK 18 X 24			10BWG	1	SA	P		
	17	W1-5R W13-1P		30 X 30 18 X 18			10BWG	1	SA	P		
	18	D7-6aT		48 X 48			10BWG	1	SA	T		
S&PM LAYOUT 5	1	W1-2L W13-1P		30 X 30 18 X 18			10BWG	1	SA	P		

ALUMINUM SIGN BLANKS THICKNESS

Square Feet	Minimum Thickness
Less than 7.5	0.080"
7.5 to 15	0.100"
Greater than 15	0.125"

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

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

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

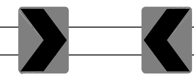
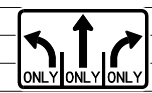
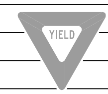
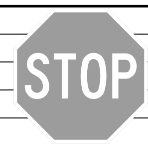
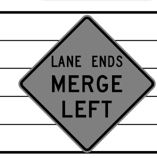
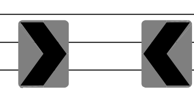
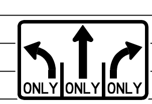
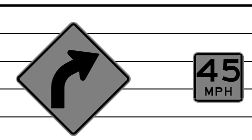
Texas Department of Transportation®

SUMMARY OF SMALL SIGNS

SOSS SHEET 2 OF 5

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		153
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
		CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	1371	01	023	FM 1232

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX): POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2)
							FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	1 or 2	UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	TY = TYPE TY N TY S
S&PM LAYOUT 5	2-3 5,7 9-10 16,18 19,21	W1-8R W1-8L		18 X 24 BACK TO BACK 18 X 24			10BWG	1	SA	P		
	4	R3-8b		48 X 30			10BWG	1	SA	T		
	6 11 15	R1-2		36 X 36 X 36			10BWG	1	SA	P		
	8	M3-2 M1-6F		24 X 12 24 X 24			10BWG	1	SA	P		
	12-13	R1-1		48 X 48			10BWG	1	SA	T		
	14	W9-1R		36 X 36			10BWG	1	SA	P		
	17	D7-7aTL/T		48 X 48 BACK TO BACK 48 X 48			10BWG	1	SA	T		
	20	W9-2TL		36 X 36			10BWG	1	SA	P		
S&PM LAYOUT 6	1-2	W1-8R W1-8L		18 X 24 BACK TO BACK 18 X 24			10BWG	1	SA	P		
	3	R3-8b		48 X 30			10BWG	1	SA	T		
	4	W1-2R W13-1P		30 X 30 18 X 18			10BWG	1	SA	P		
	5	W3-5		36 X 36			10BWG	1	SA	P		

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

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

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2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.
3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED PROFESSIONAL ENGINEER
7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

SUMMARY OF SMALL SIGNS

SOSS SHEET 3 OF 5

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
		6	SEE TITLE SHEET		154
CHK	OEI	STATE	DIST.	COUNTY	
		TEXAS	ODA	WINKLER	
DRN	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
CHK	OEI	1371	01	023	FM 1232

DATE: 7/17/2023 10:21:14 AM

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
S&PM			ALL TRUCKS MUST USE TRUCK ROUTES TEXAS 115 OR FM 1232									
LAYOUT												
6	6	M1-6T3		108 X 60			10BWG	2	SA	T		
	7	R2-1	SPEED LIMIT 70	24 X 30			10BWG	1	SA	P		
	8-9	R2-1	SPEED LIMIT 60	24 X 30			10BWG	1	SA	P		
	10	R2-1	SPEED LIMIT 50	24 X 30			10BWG	1	SA	P		
S&PM			HISTORICAL MARKER 1 MILE ON RIGHT									
LAYOUT												
7	1	D7-6aTR		48 X 48			10BWG	1	SA	T		
	2	I-2A	WINK CITY LIMIT POP 1006	36 X 24			10BWG	1	SA	P		
	3		ENGINE BRAKING PROHIBITED	60 X 36			10BWG	1	SA	T		
	4 15	R2-1	SPEED LIMIT 35	24 X 30			10BWG	1	SA	P		
	5	R2-1	SPEED LIMIT 50	24 X 30			10BWG	1	SA	P		
	6-7 10 13 16 18	R1-1	STOP	36 X 36			10BWG	1	SA	P		
	8	D2-2	Winkler CO Airport 3	84 X 30			SCH80	1	SA	T		
		R14-1	TRUCK ROUTE JCT 115 TEXAS	24 X 18								
	9	M2-1		21 X 15			10BWG	1	SA	P		
		M1-6T		24 X 24								

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

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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
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OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
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Texas Department of Transportation®

FM 1232

SUMMARY OF SMALL SIGNS

SOSS SHEET 4 OF 5

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	155
DRN	OEI	STATE	DIST.	COUNTY
		TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
S&PM												
LAYOUT												
7	11	W3-1		48 X 48			10BWG	1	SA	P		
	12	D2-1	JCT SH 302 6	90 X 18			10BWG	1	SA	T		
	14	D2-1	← Kermit Pyote →	72 X 30			10BWG	1	SA	T		
		M3-4	WEST FARM 1232 ROAD	24 X 12								
	17						10BWG	1	SA	P		
		M1-6F		24 X 24								
		R1-1	STOP	36 X 36								
	18						10BWG	1	SA	T		
		W4-4P	CROSS TRAFFIC DOES NOT STOP	36 X 18								
		R14-1		24 X 18								
	19	M1-6T	TRUCK ROUTE 115 TEXAS	24 X 24			10BWG	1	SA	P		
		M6-4		21 X 15								
		R14-1		24 X 18								
	20	M1-6F	TRUCK ROUTE FARM 1232 ROAD	24 X 24			10BWG	1	SA	P		
		M6-4		21 X 15								
		S1-1		36 X 36								
	21						10BWG	1	SA	P		
		M6-2a		21 X 15								

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

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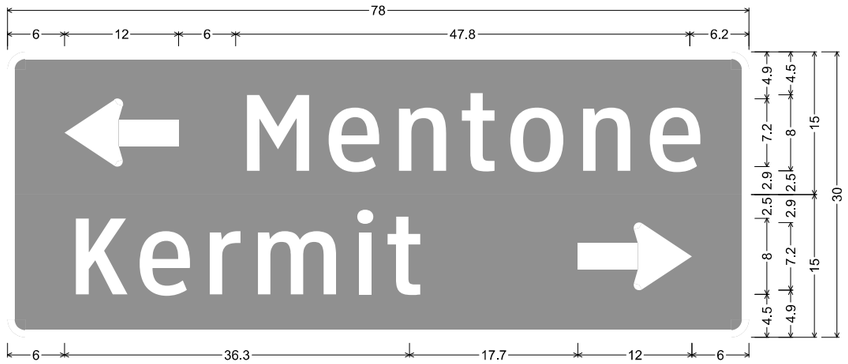
SUMMARY OF SMALL SIGNS

SOSS SHEET 5 OF 5

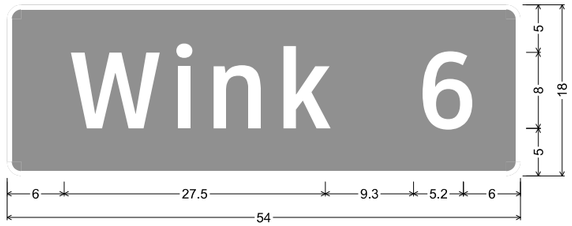
		FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
DSN	OEI	6	SEE TITLE SHEET	156
CHK	OEI	STATE	DIST.	COUNTY
DRN	OEI	TEXAS	ODA	WINKLER
CHK	OEI	CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232



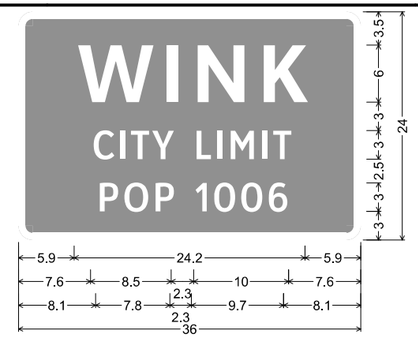
D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180'; "Mentone", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"Kermit", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';



D2-1 8in;
1.5" Radius, 0.5" Border, White on, Green;
"Wink", ClearviewHwy-3-W; "6", ClearviewHwy-3-W;

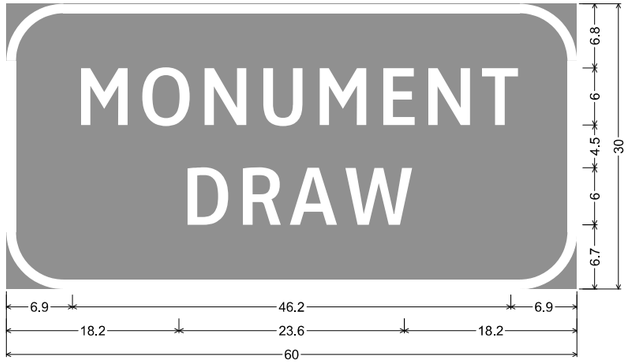


I-2aT 6in;
1.5" Radius, 0.8" Border, White on, Green;
"WINK", ClearviewHwy-5-W-R;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 1006", ClearviewHwy-3-W;

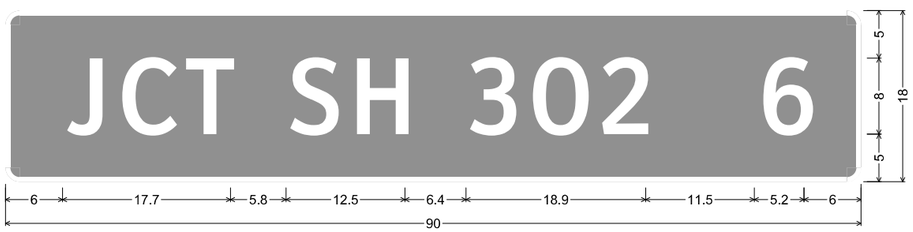
D2-2 8in;

1.9" Radius, 0.8" Border, White on, Green;
"Winkler", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;



6.0" Radius, 1.0" Border, White on, Green;
"MONUMENT", ClearviewHwy-3-W; "DRAW", ClearviewHwy-3-W;



D2-1 8in;
1.5" Radius, 0.5" Border, White on, Green;
"JCT SH 302", ClearviewHwy-3-W; "6", ClearviewHwy-3-W;

DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

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6090 SURETY DR. STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

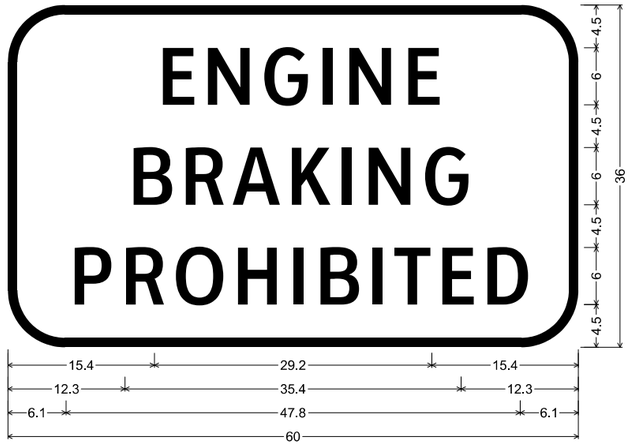
Texas Department of Transportation®

FM 1232
SH 302 TO SH 115
SMALL SIGN DETAILS

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		157
DRN	OEI	STATE	DIST.	COUNTY	
CHK	OEI	TEXAS	ODA	WINKLER	
		CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

10:21:25 AM

7/17/2023
c:\pwworking\dr\omega-app02.omegaengineers.local+omega-prod\omega+jnavarrete\dms09307\FM-1232-SSL-DTLS01.dgn

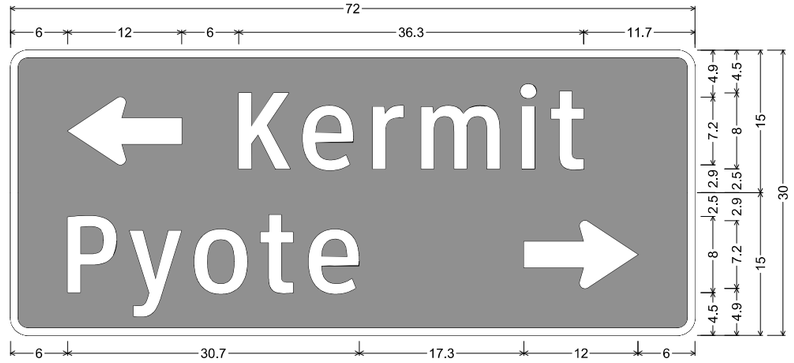


6.0" Radius, 1.0" Border, Black on, White;
"ENGINE", ClearviewHwy-3-W; "BRAKING", ClearviewHwy-3-W;
"PROHIBITED", ClearviewHwy-3-W;

D2-2 8in;

1.9" Radius, 0.8" Border, White on, Green;
"Winkler", ClearviewHwy-3-W;

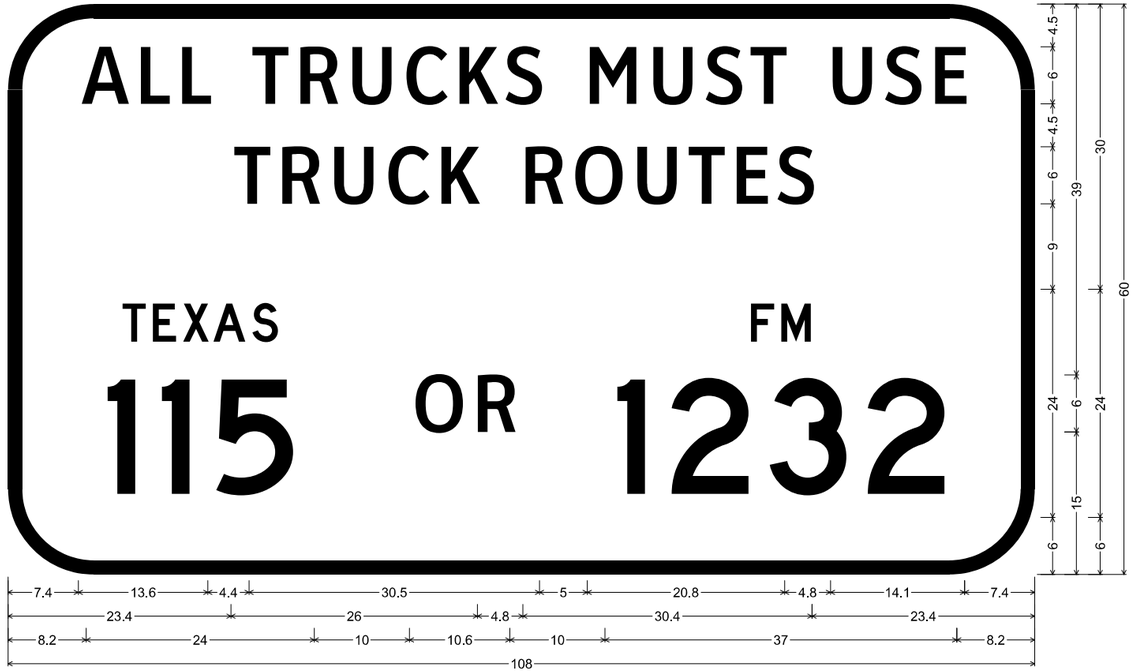
1.9" Radius, 0.8" Border, White on, Green;



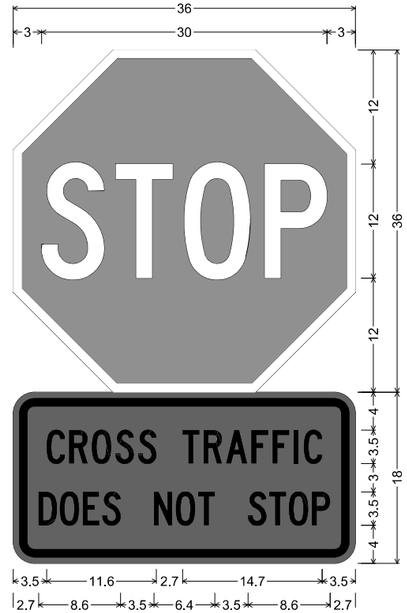
D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on, Green;
Standard Arrow Custom 12.0" X 7.1" 180"; "Kermit", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on, Green;
"Pyote", ClearviewHwy-3-W; Standard Arrow Custom 12.0" X 7.1" 0';



9.0" Radius, 1.5" Border, Black on, White;
"ALL TRUCKS MUST USE", ClearviewHwy-3-W; "TRUCK ROUTES", ClearviewHwy-3-W; State Highway 115 M1-6T3; "OR", ClearviewH
State Highway 1232 M1-6F4;



R1-1_36x36;
0.9" Border, White on, Red;
"STOP", C 60% spacing;

W4-4P_36x18;
2.3" Radius, 0.9" Border, 0.6" Indent, Black on, Yellow;
"CROSS TRAFFIC", C 79% spacing;
"DOES NOT STOP", C 54% spacing;

DATE	BY	REV	REVISION

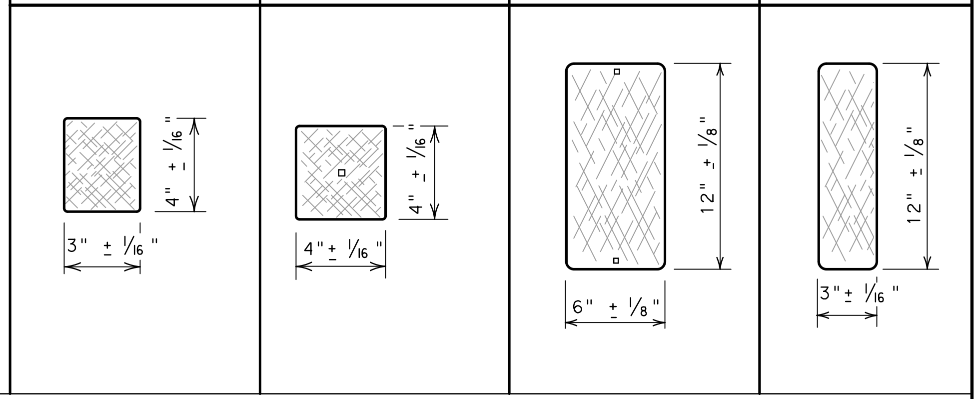
OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
SMALL
SIGN DETAILS

DSN	OEI	FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
CHK	OEI	6	SEE TITLE SHEET		158
DRN	OEI	STATE	DIST.	COUNTY	
		TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

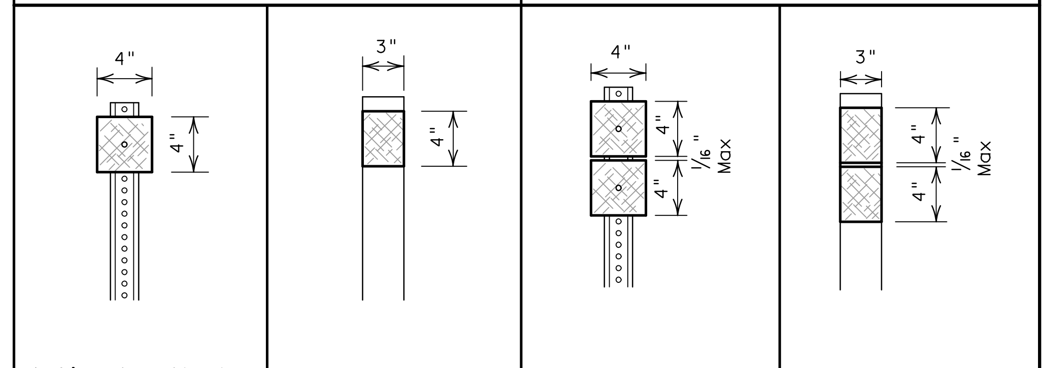
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	3" ± 1/16" × 4" ± 1/16"	4" ± 1/16" × 4" ± 1/16"	6" ± 1/8" × 12" ± 1/8"	3" ± 1/16" × 12" ± 1/8"
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			



DELINEATORS

	SINGLE		DOUBLE	
DEVICE	1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF



D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- YFLX = Yellow Flexible Post
- WFLX = White Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
- If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

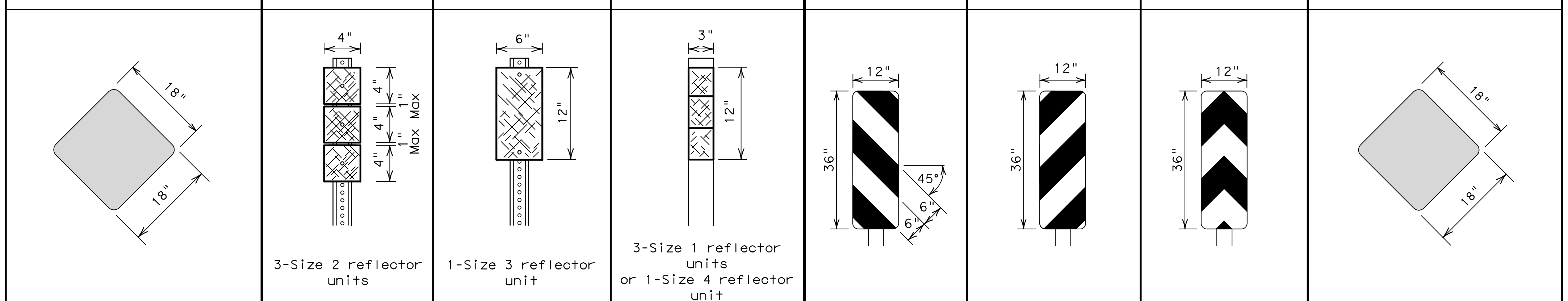
TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
- If Required
- BI = Bi-Directional

OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

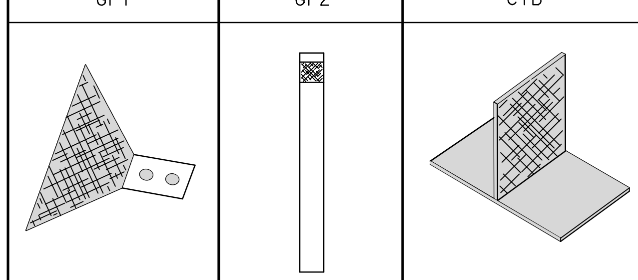


DEPARTMENTAL MATERIAL SPECIFICATIONS

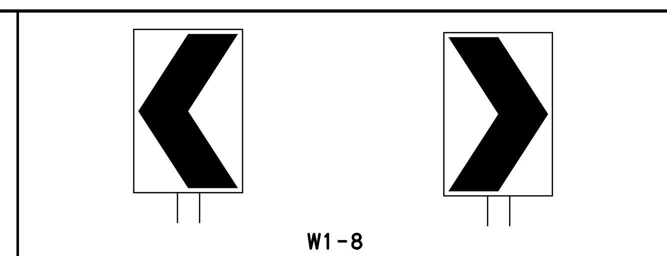
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

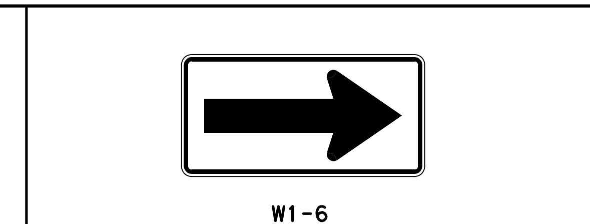


CHEVRONS



DEVICE	W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

ONE DIRECTION LARGE ARROW



DEVICE	W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	ODA		WINKLER	159

20A

DATE: 7/17/2023 10:21:32 AM
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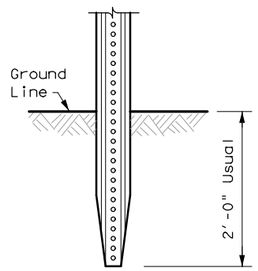
DATE: 7/17/2023 10:21:36 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnavarrete_exmsp

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

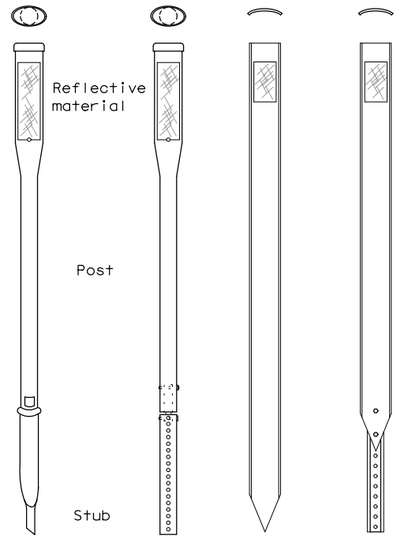


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

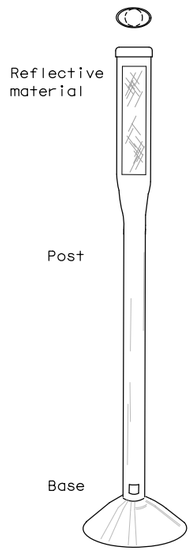
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



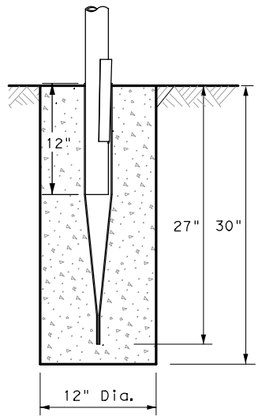
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

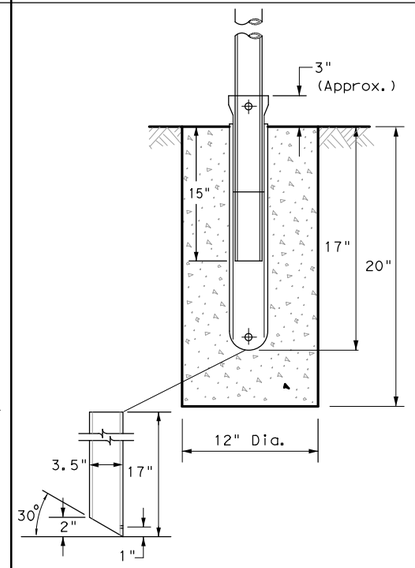
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

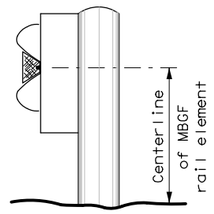
NOTE

1. Install per manufacturer's recommendations.

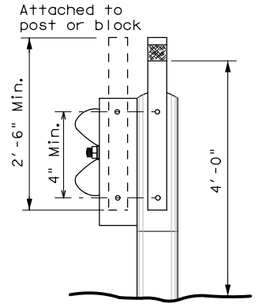
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

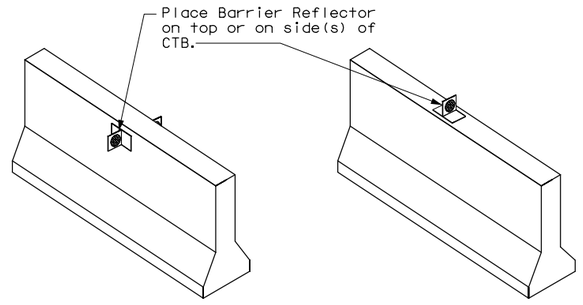
GF1



GF2



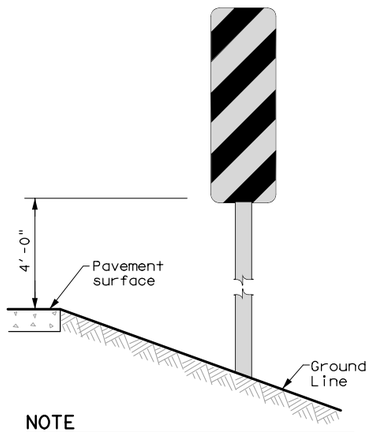
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

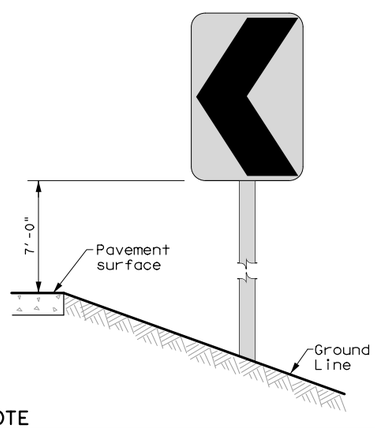
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

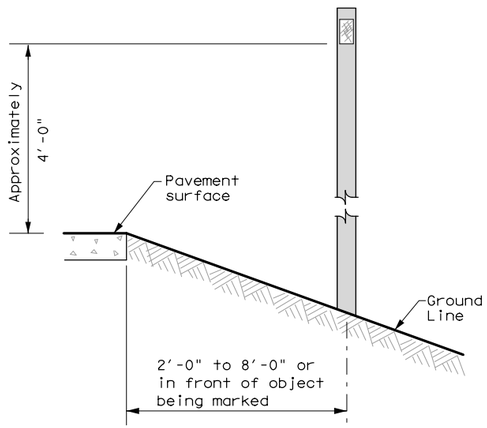
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ODA	WINKLER		160

20B

DATE: 7/17/2023 10:21:40 AM
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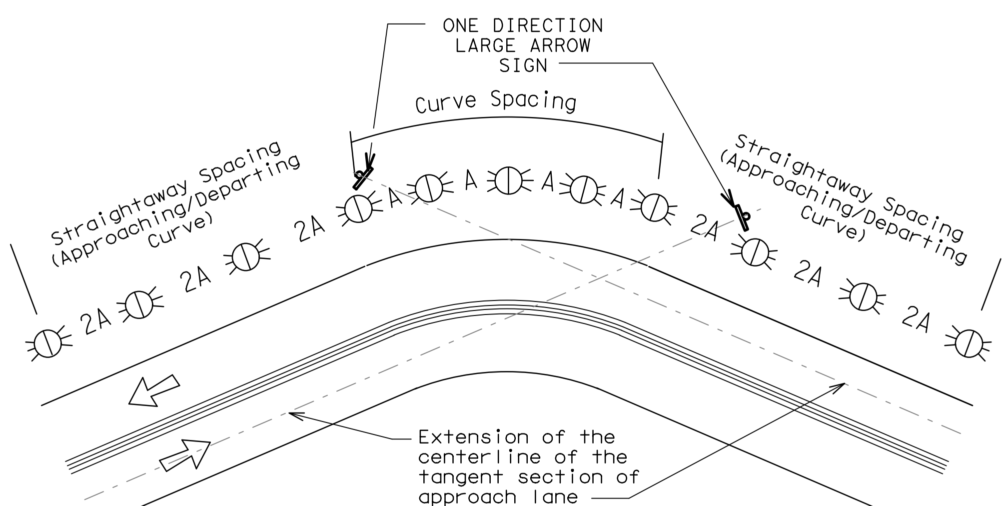
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed: Turn (30 MPH or less)	Curve Advisory Speed: Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

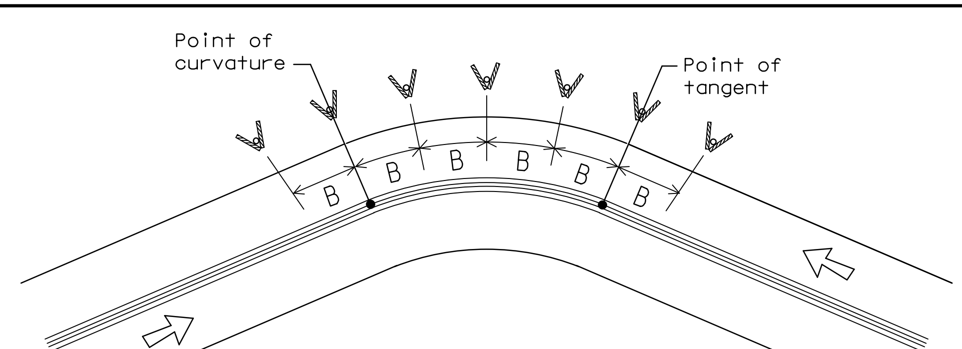
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	Radius of Curve (FEET)	Spacing in Curve (FEET)	Spacing in Straightaway (FEET)	Chevron Spacing in Curve (FEET)
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100′max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100′ max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100′max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

Symbol	Meaning
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation — Traffic Safety Division Standard

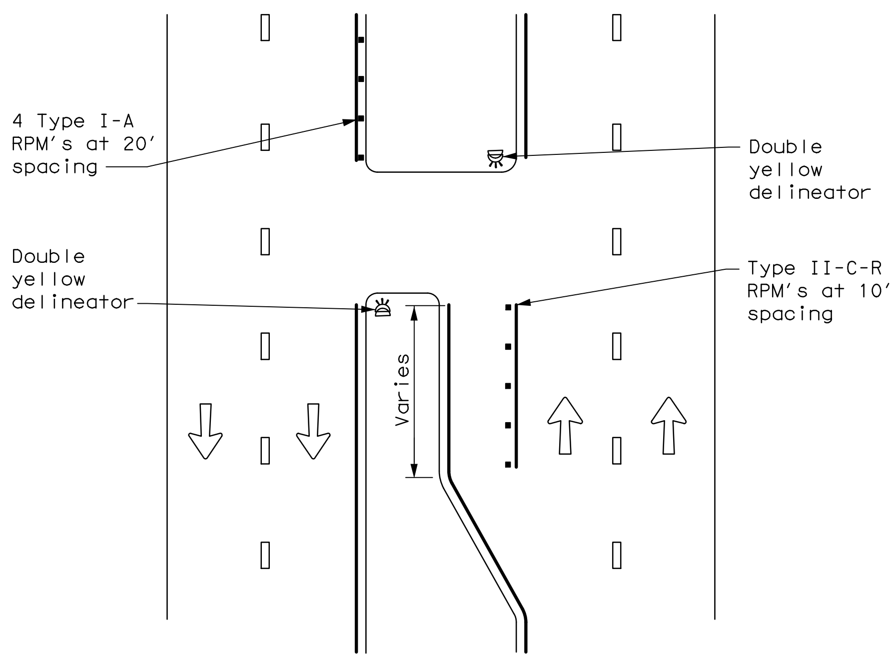
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
3-15 8-15 8-15 7-20	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	161

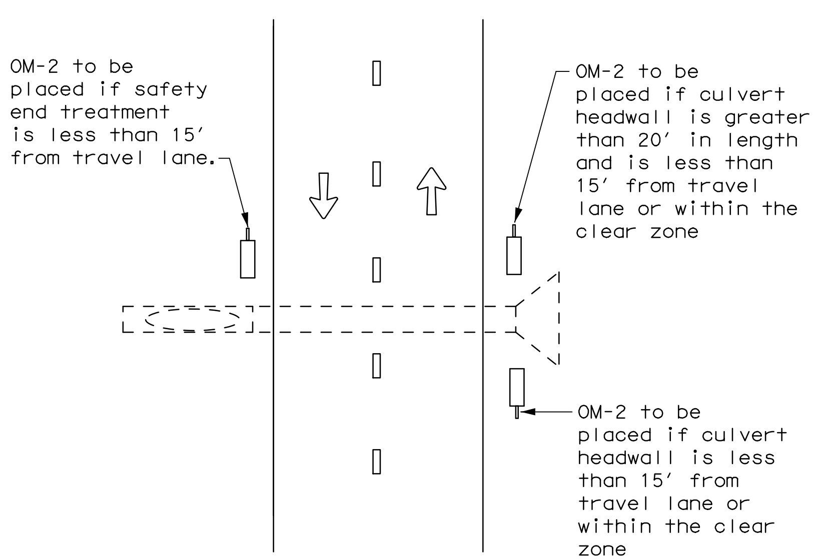
20C

CROSSOVERS



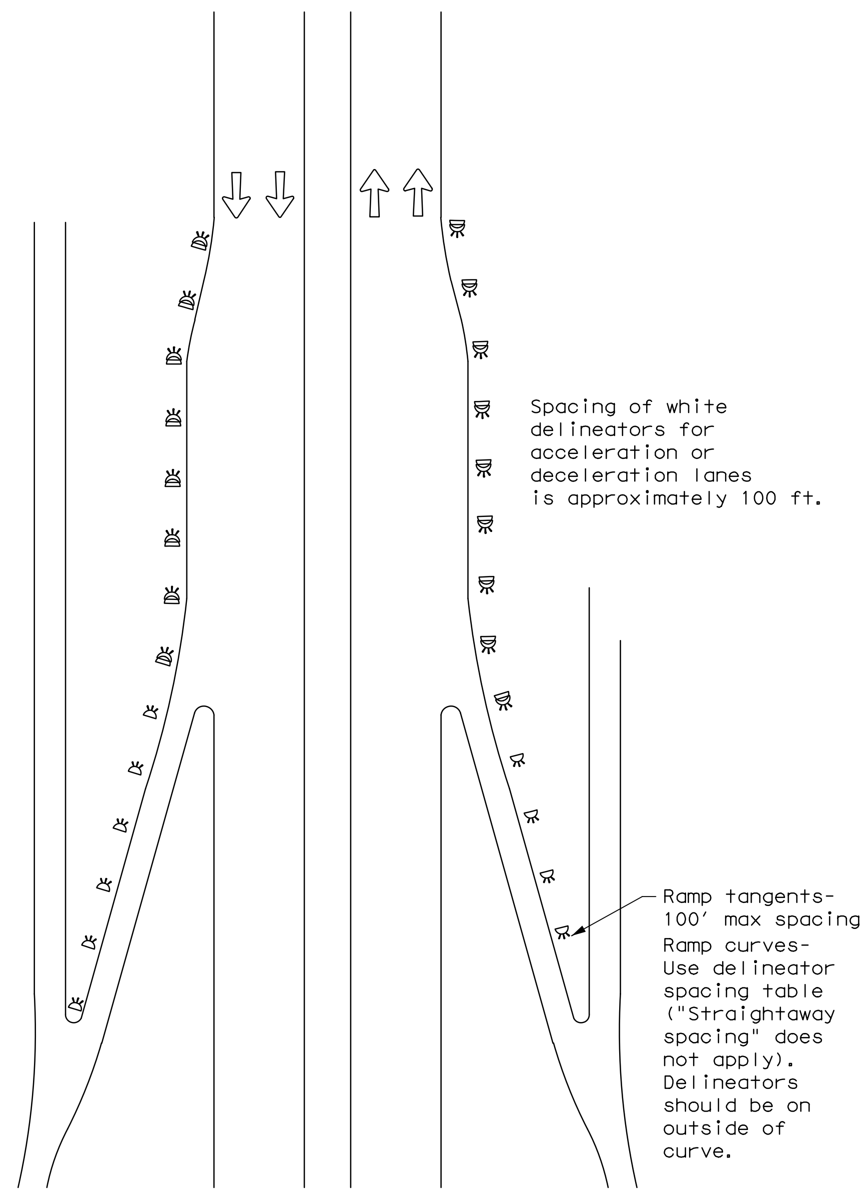
DETAIL 1

FOR CULVERTS WITHOUT MBGF



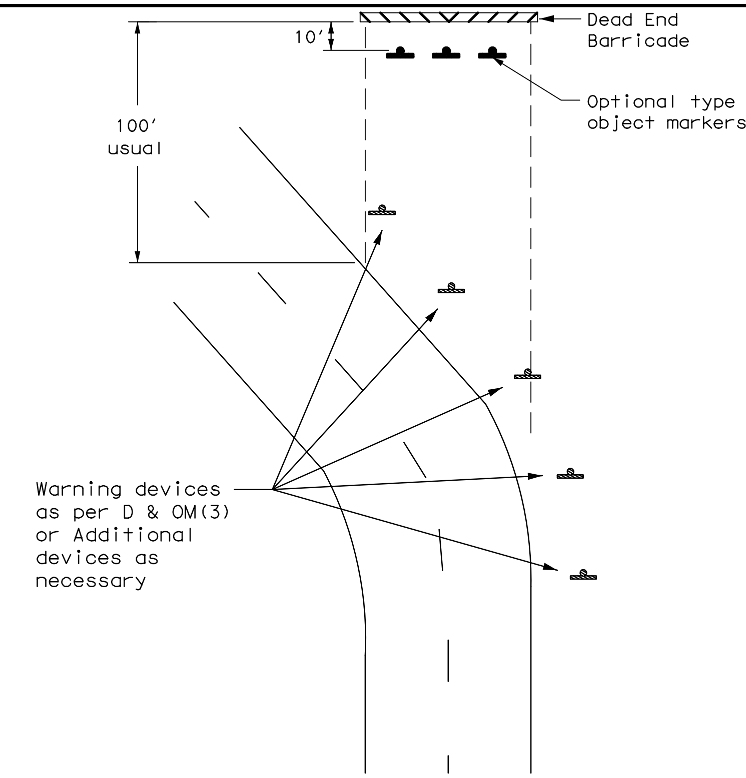
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



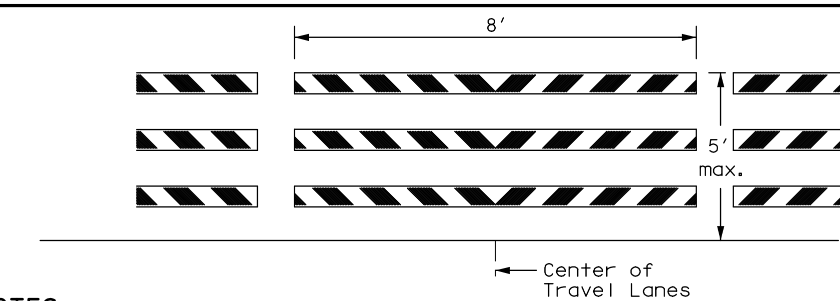
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND

Symbol	Description
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

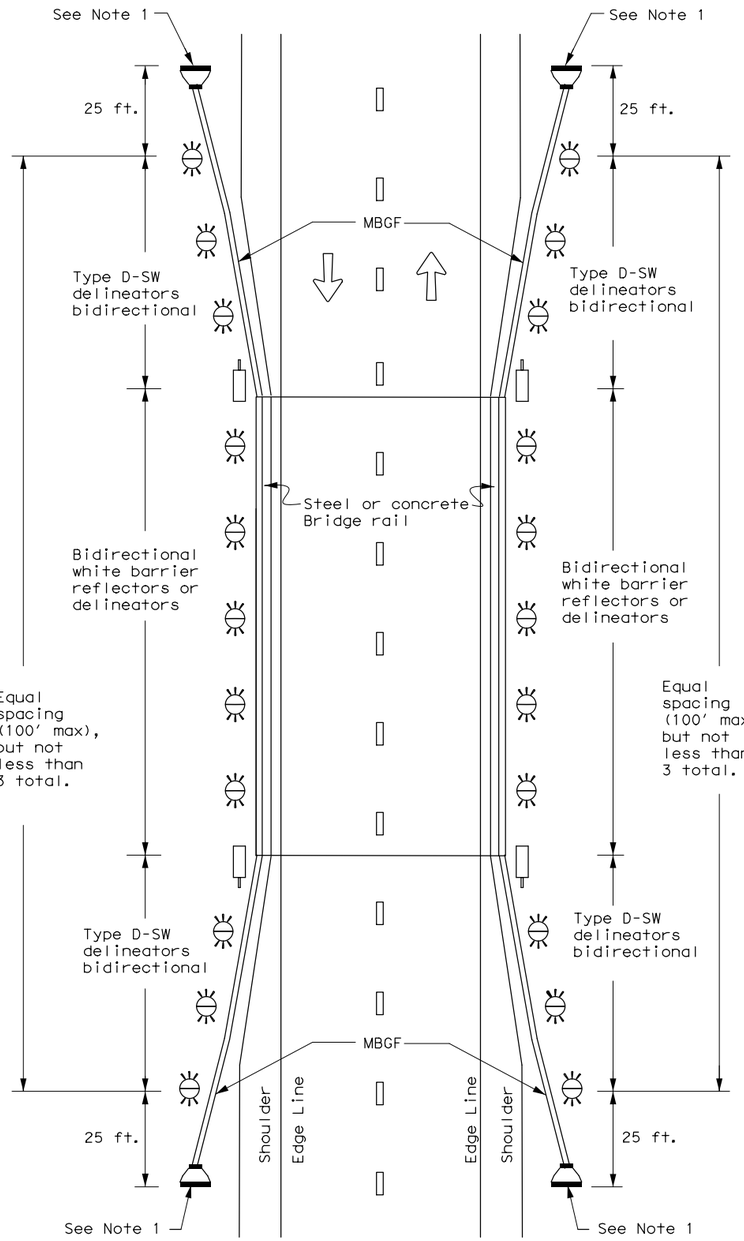
D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT		CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB		HIGHWAY
REVISIONS 3-15 7-20	1371	01	023		FM 1232
	DIST		COUNTY		SHEET NO.
	ODA		WINKLER		162

20D

DATE: 7/17/2023 10:21:47 AM
FILE: c:\pwworkingdir\omega-app02.omegaengineers.local_omega-prod\omega_jnguyen_exchange\dgn\dom5-20.dgn

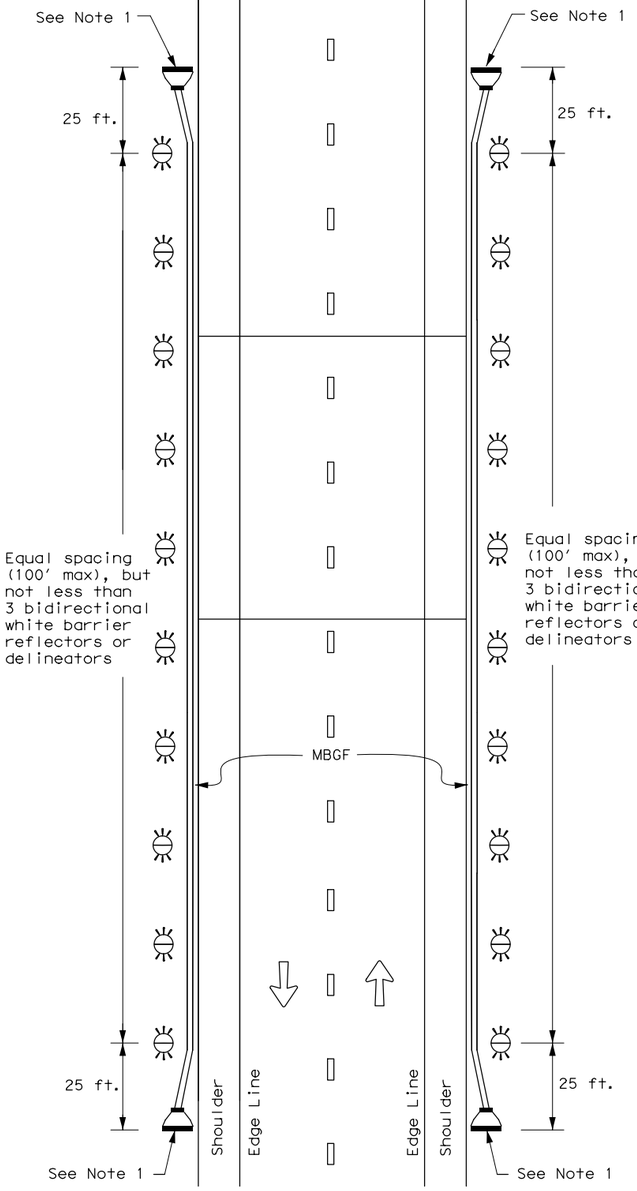
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

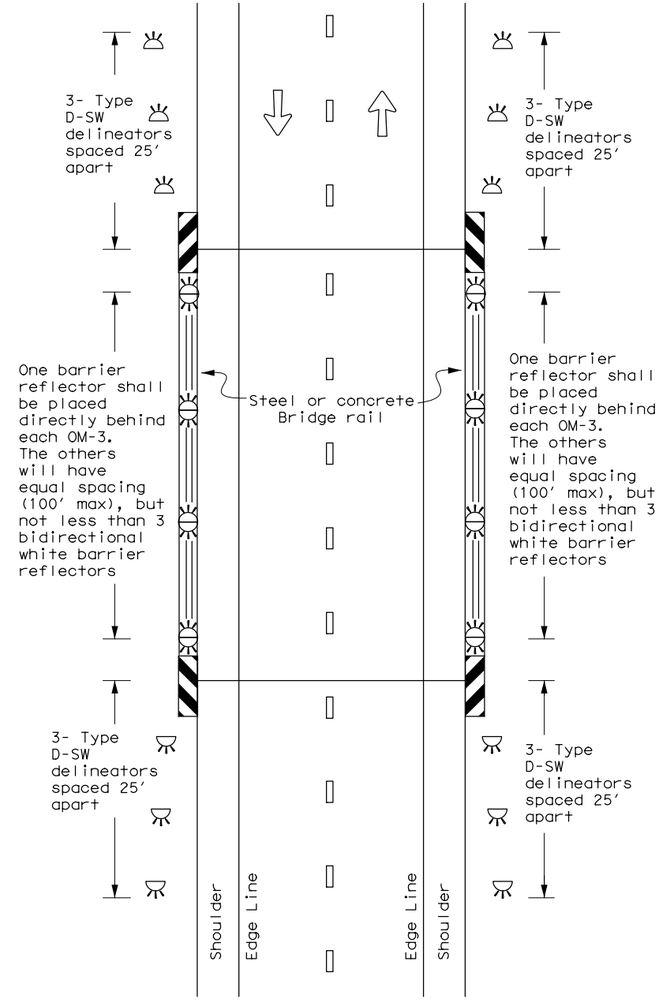
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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
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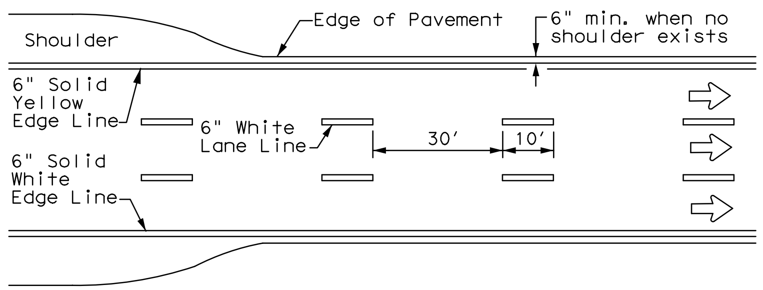
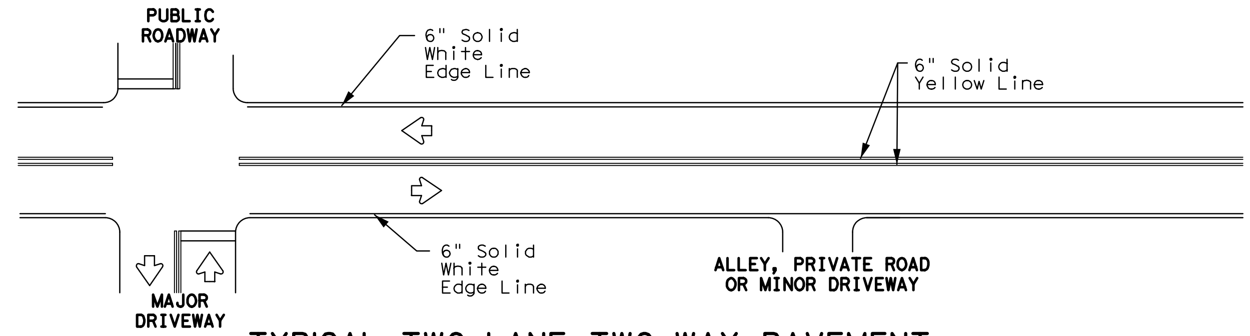
7-20	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		163

20E



EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

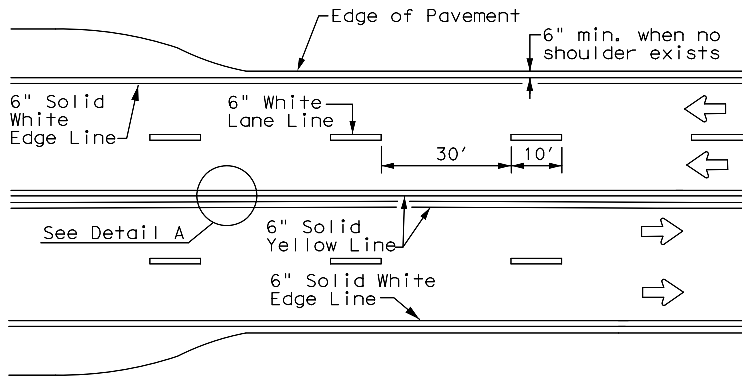
GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

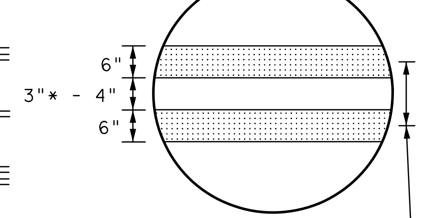
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

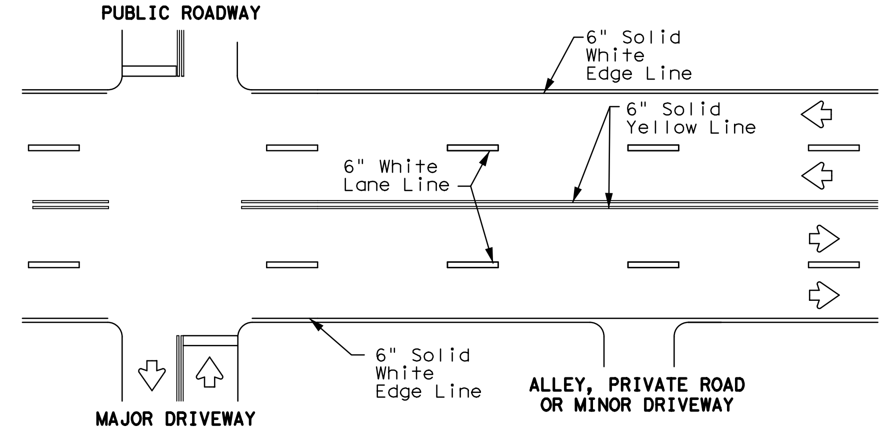


DETAIL "A"

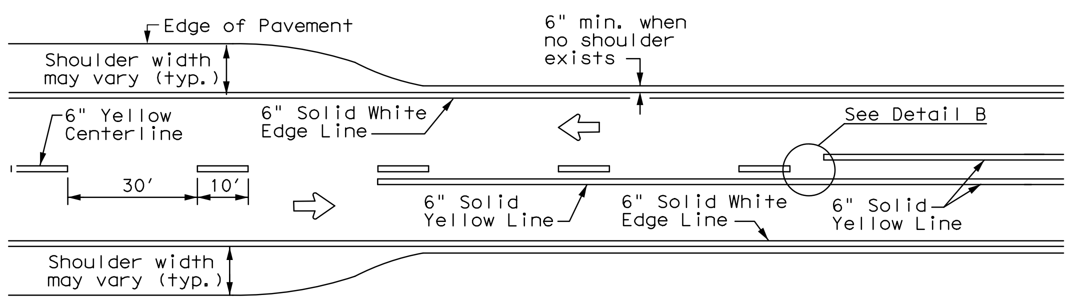
9"** min. - 10" typ. (18" max. for traveled way greater than 48' only)

* 2" minimum for restripe projects when approved by the Engineer.

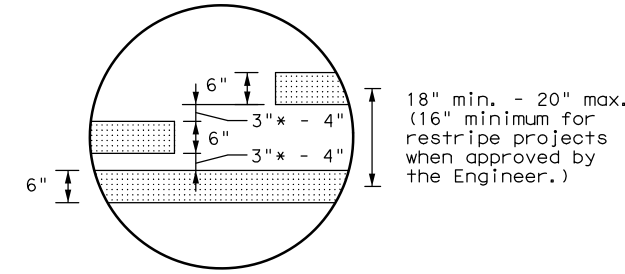
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

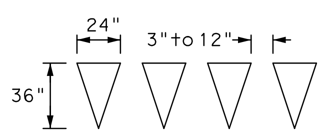


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



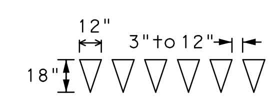
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

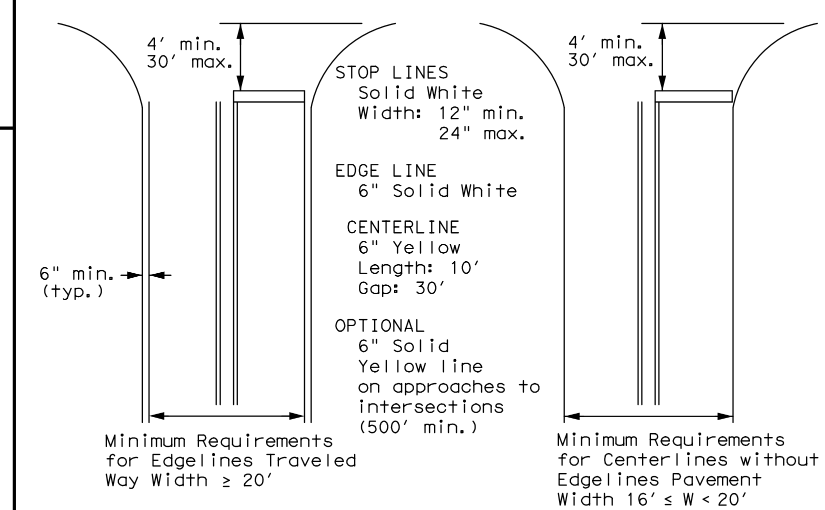


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



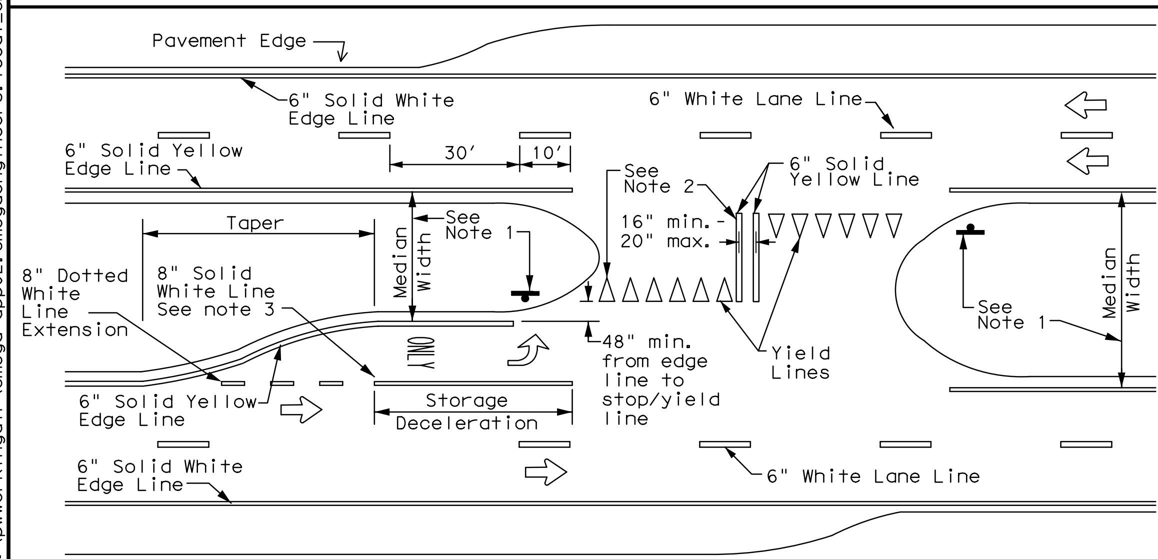
For posted speed on road being marked equal to or less than 40 MPH.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 8-95 3-03 12-22 5-00 2-12	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		164

22A

DATE: 7/17/2023 10:21:50 AM
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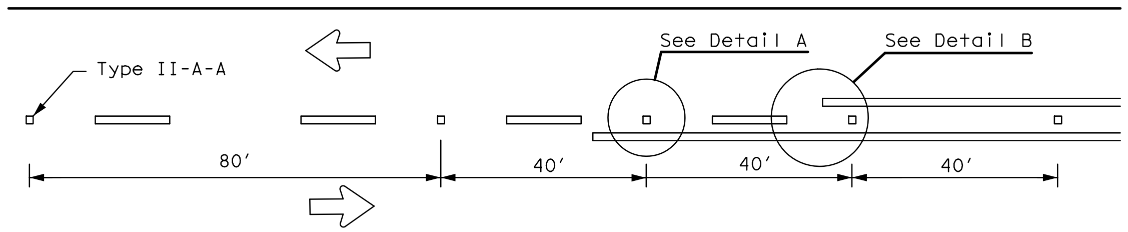
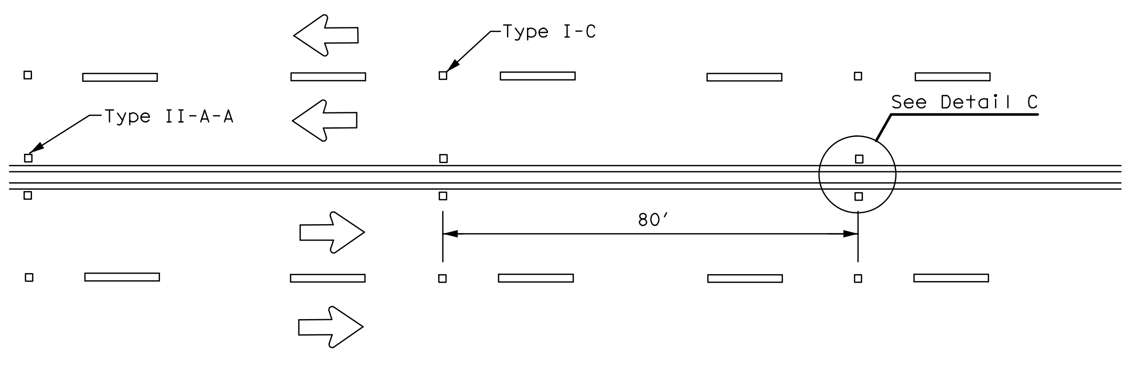
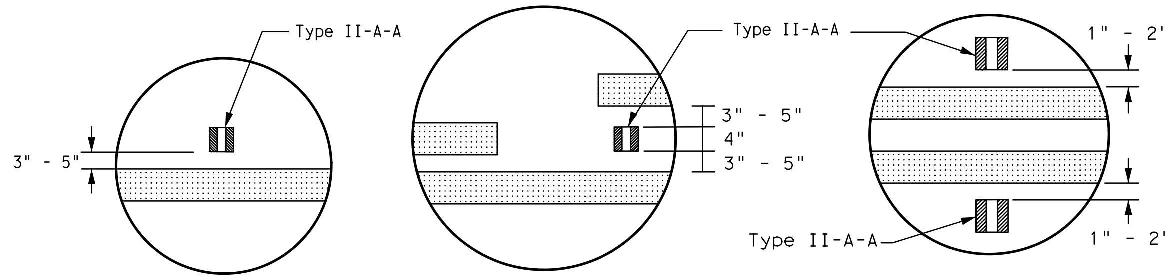
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



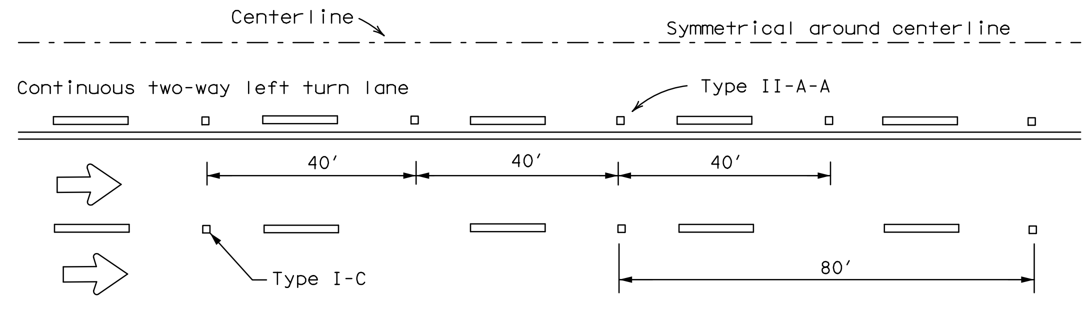
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



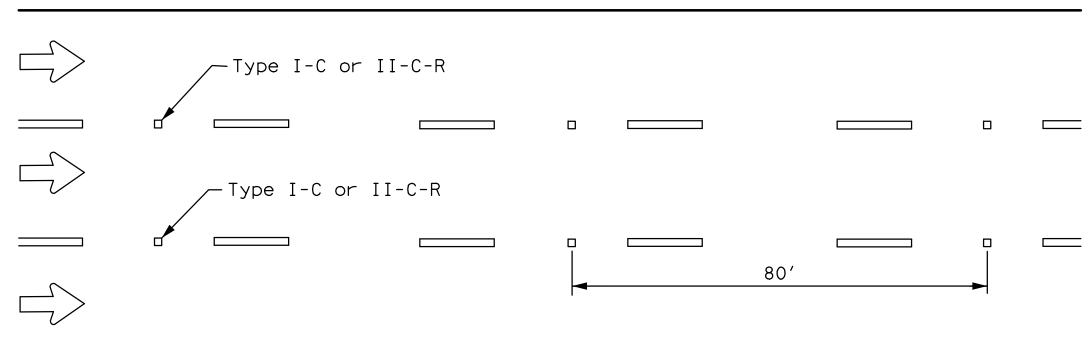
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



DETAIL "A" DETAIL "B" DETAIL "C"



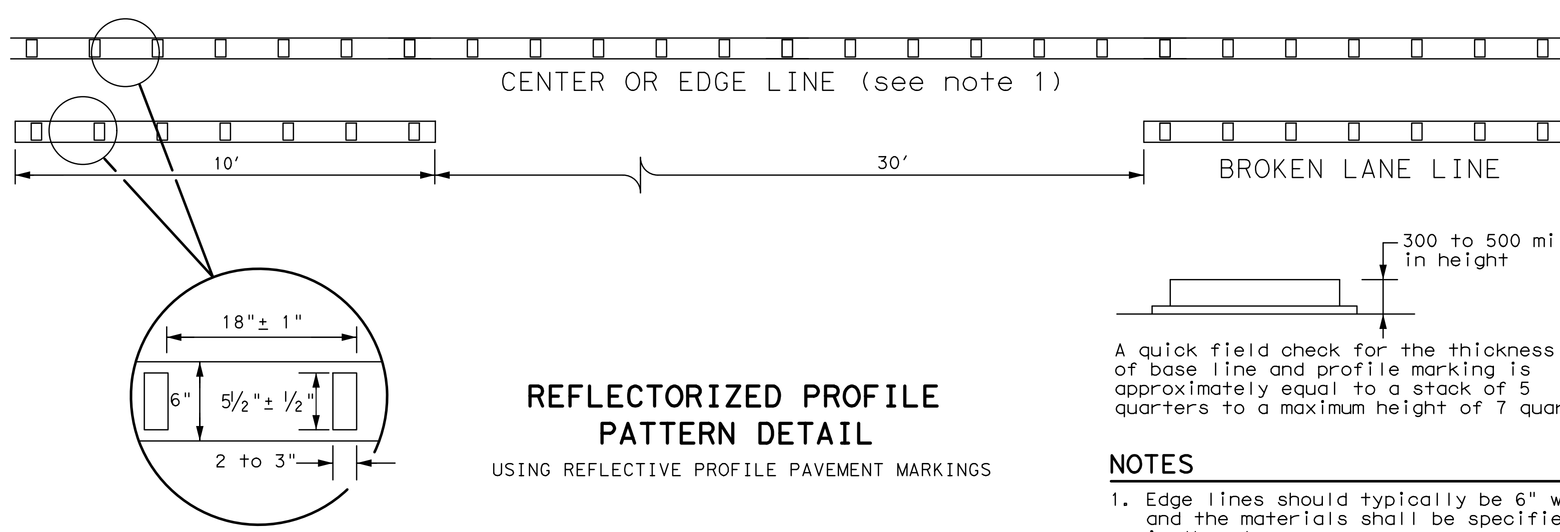
CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



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.

See Note 3.



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

300 to 500 mil in height

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

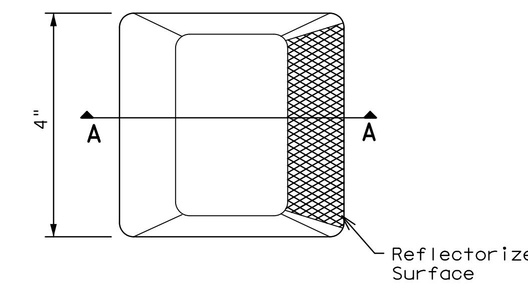
1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

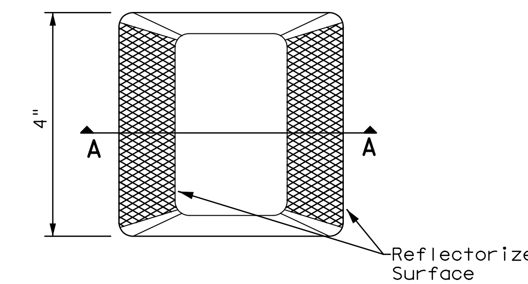
1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

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

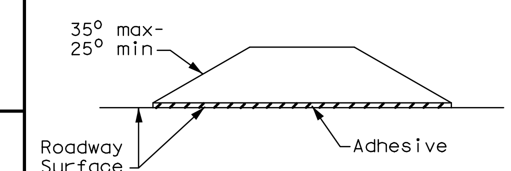
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)



Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 / 4-92 2-10 12-22 / 5-00 2-12	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	165

22B

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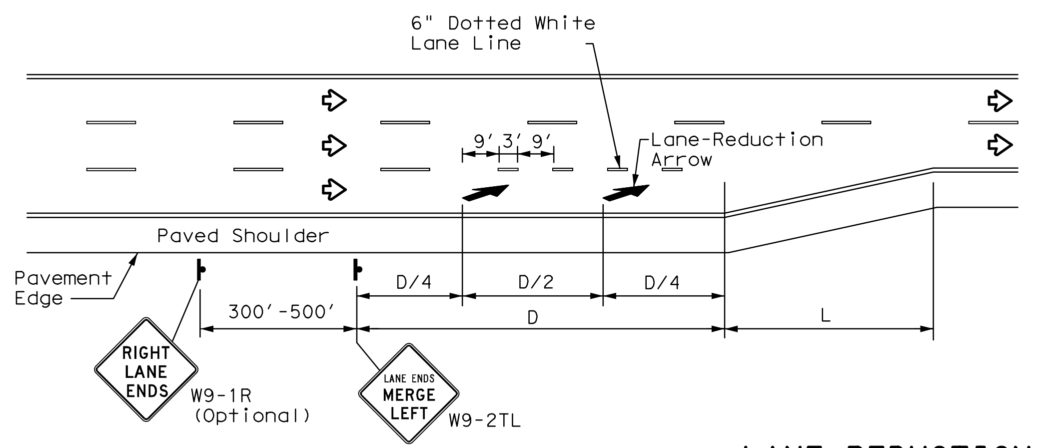


LANE REDUCTION

NOTES

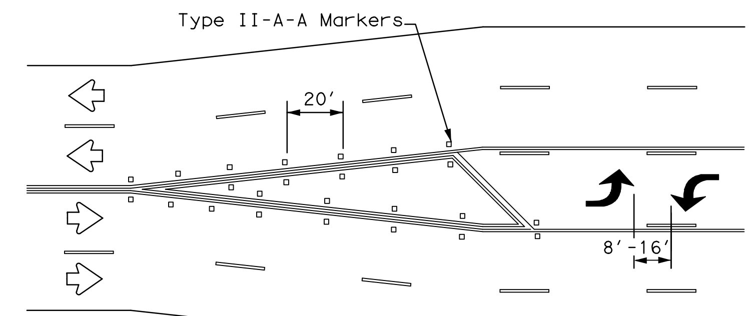
1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

ADVANCED WARNING SIGN DISTANCE (D)

Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

GENERAL NOTES

1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

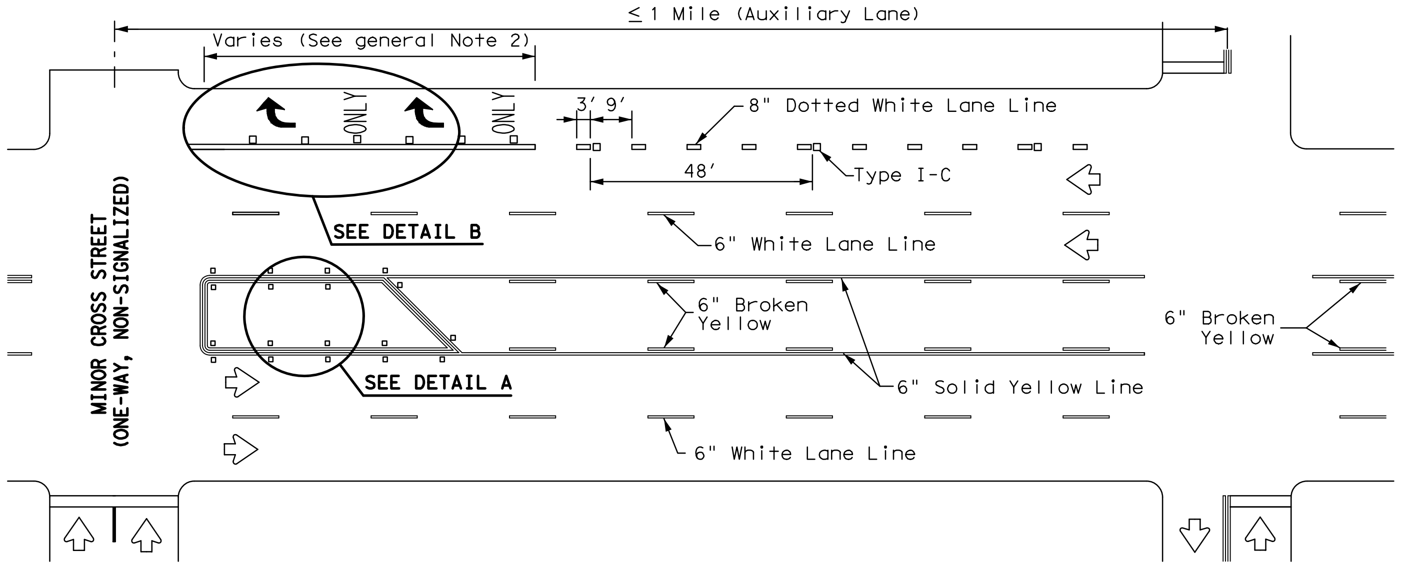


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

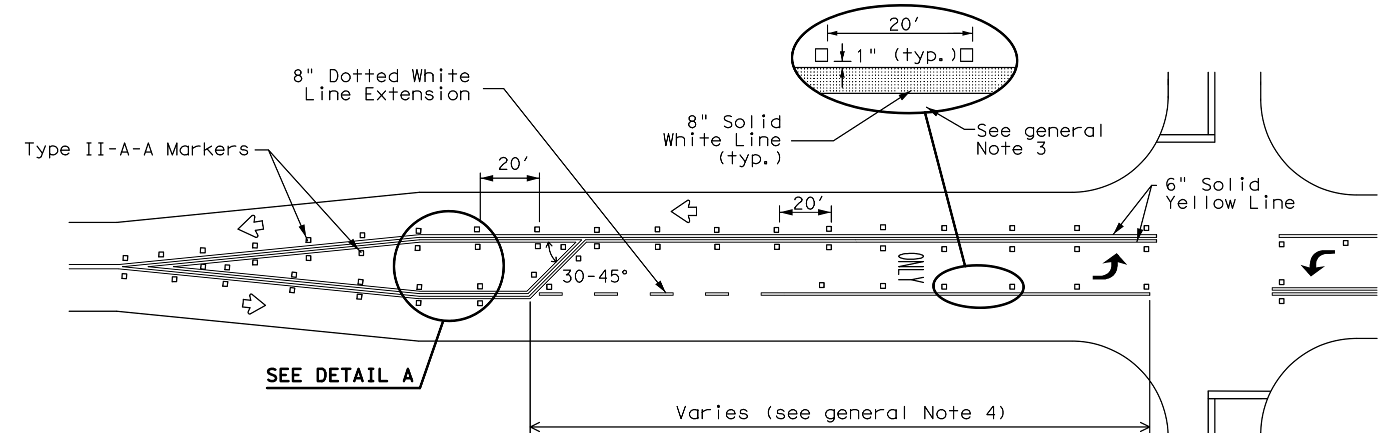
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY

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

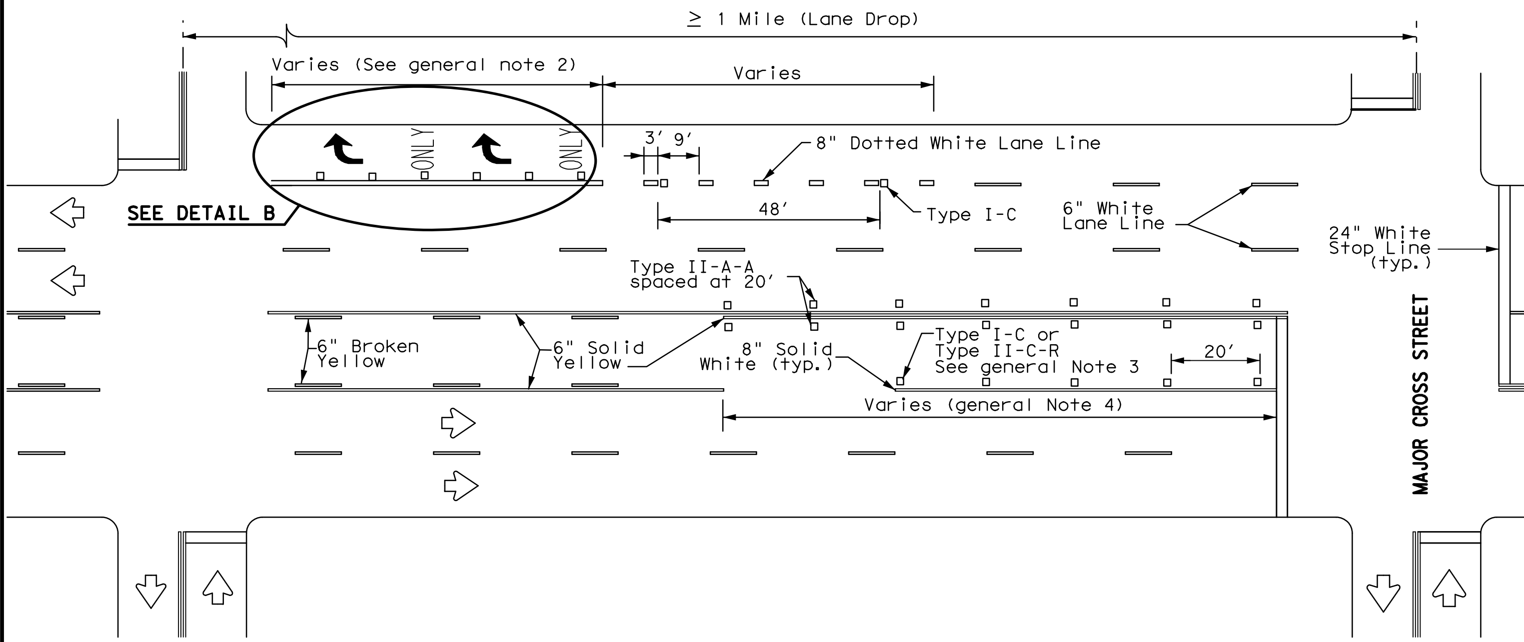
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



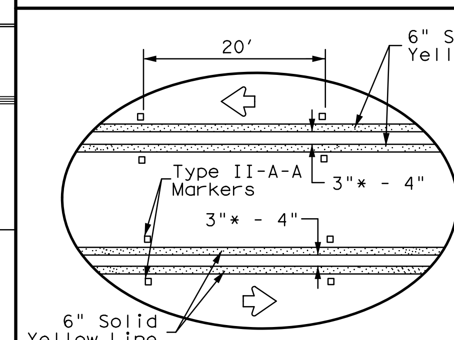
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



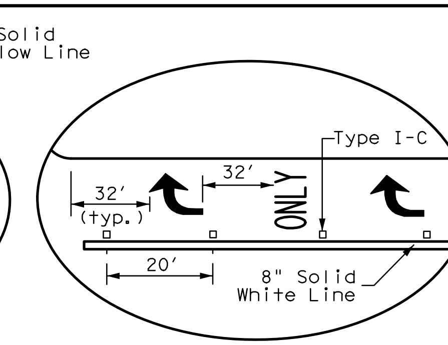
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A



DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation — Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS PM(3)-22

FILE: pm3-22.dgn	DN:	CK:	DW:		CK:
©TxDOT December 2022	CONT	SECT	JOB		HIGHWAY
REVISIONS 4-98 3-03 6-20	1371	01	023		FM 1232
5-00 2-10 12-22	DIST	COUNTY			SHEET NO.
8-00 2-12	ODA	WINKLER			166

22C

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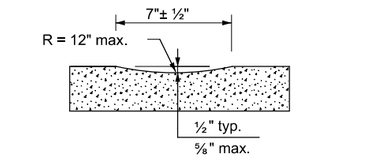
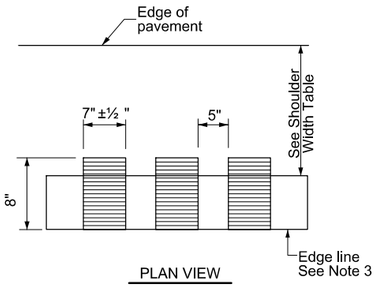
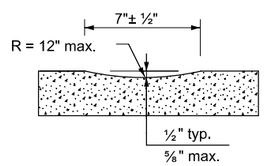


PROFILE VIEW
OPTION 1

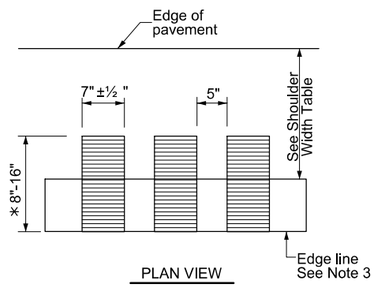


PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



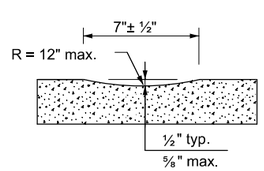
PROFILE VIEW
OPTION 2



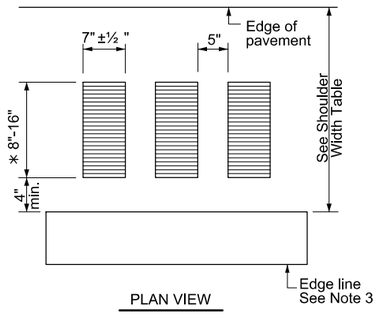
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



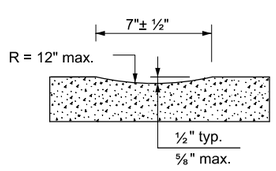
PROFILE VIEW
OPTION 3



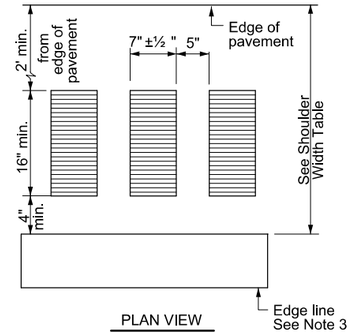
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

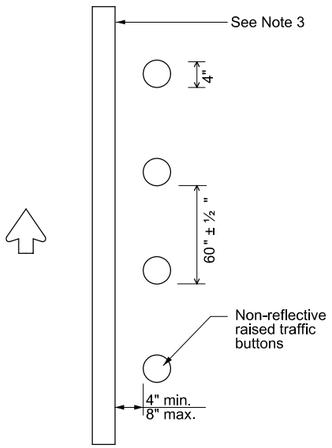


PROFILE VIEW
OPTION 4



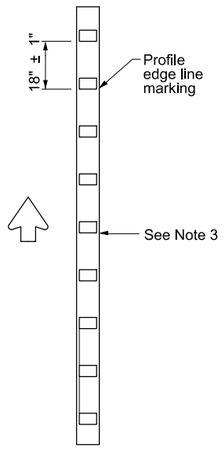
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



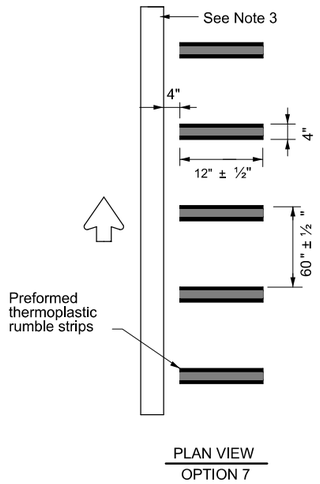
PLAN VIEW
OPTION 5

RAISED EDGE LINE (Rumble Strips)



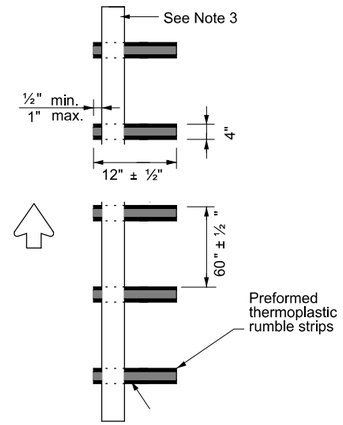
PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS (Rumble Strips)



PLAN VIEW
OPTION 7

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PLAN VIEW
OPTION 8

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
10-13 1-23	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		167

DATE: 7/17/2023 10:22:05 AM
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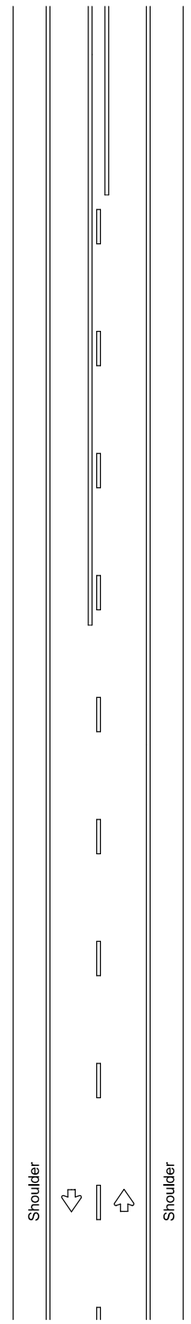
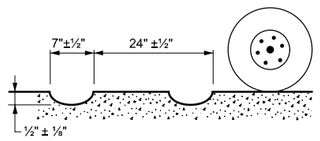
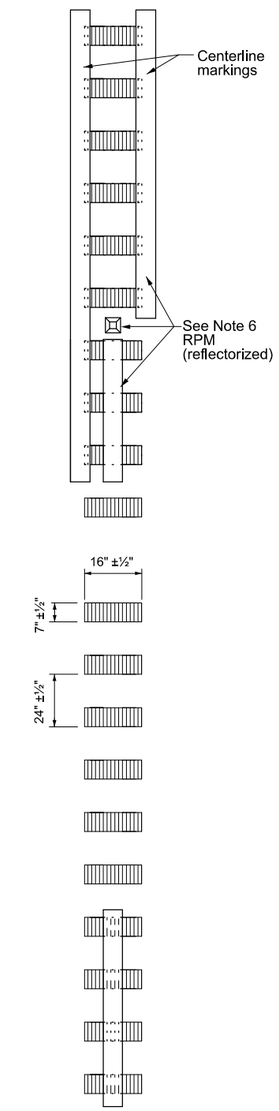
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

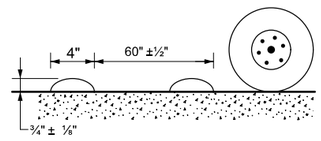


PROFILE VIEW

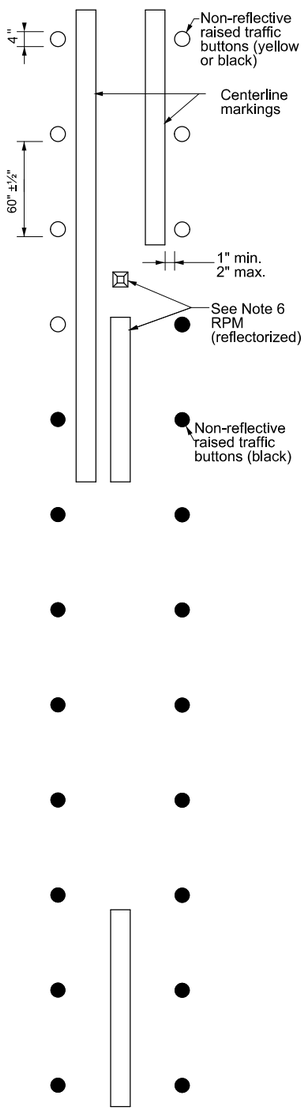


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

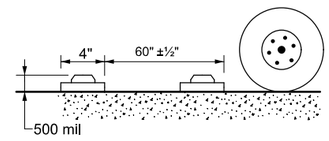


PROFILE VIEW

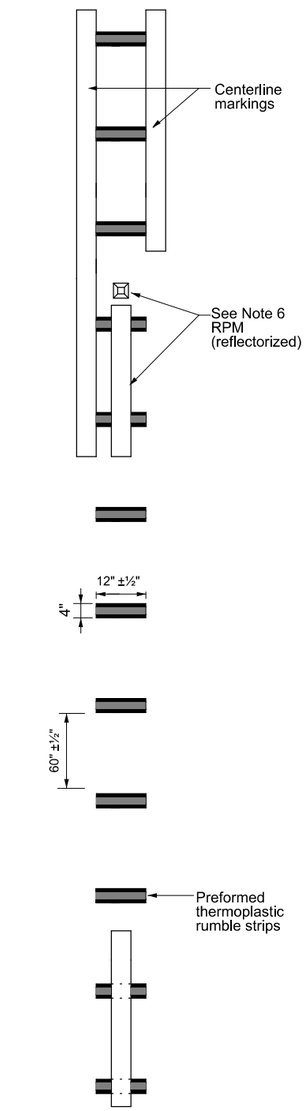


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

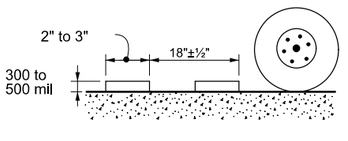


PROFILE VIEW

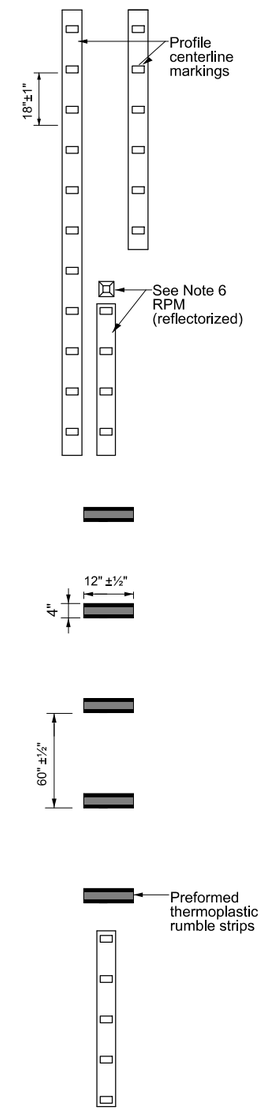


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
12. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

13. See standard sheet RS(2).

Texas Department of Transportation

Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
10-13	DIST	COUNTY		SHEET NO.
1-23	ODA	WINKLER		168

DATE: 7/17/2023 10:22:08 AM
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

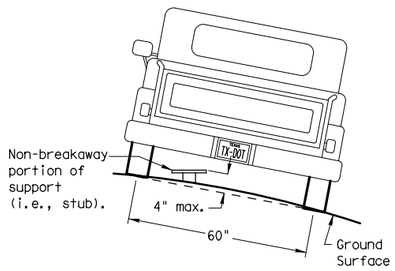
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

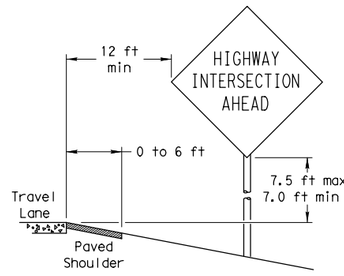
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

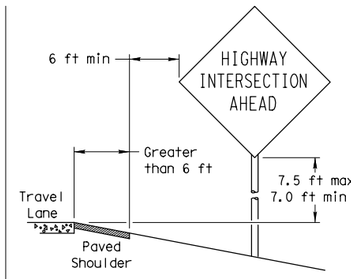
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

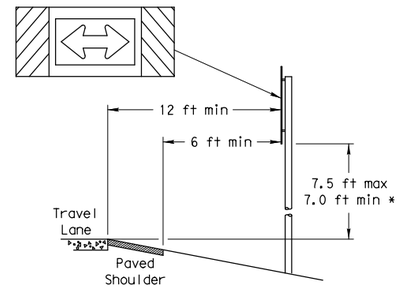
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



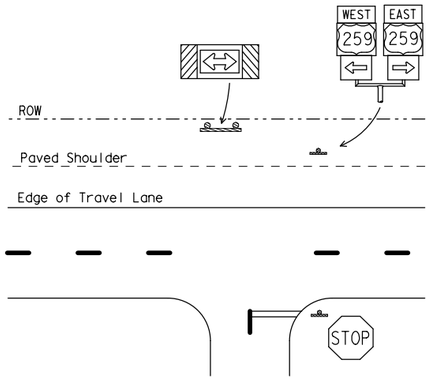
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

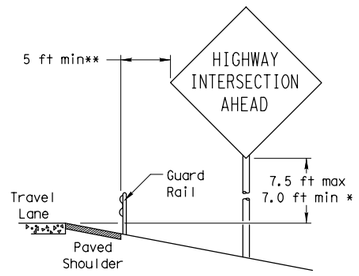
T-INTERSECTION



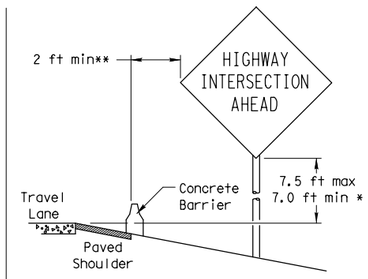
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



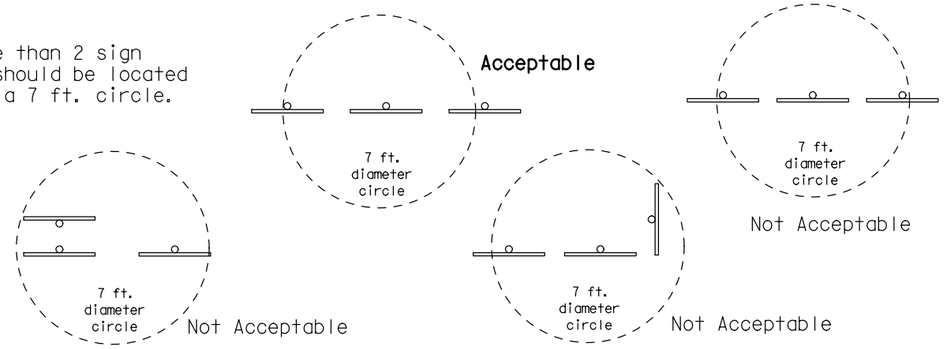
BEHIND GUARDRAIL



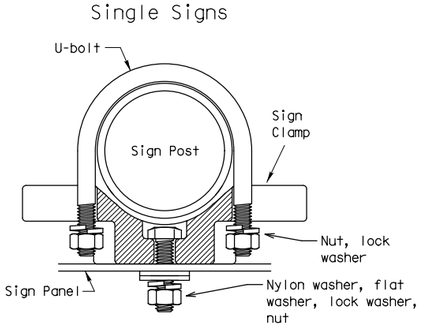
BEHIND CONCRETE BARRIER

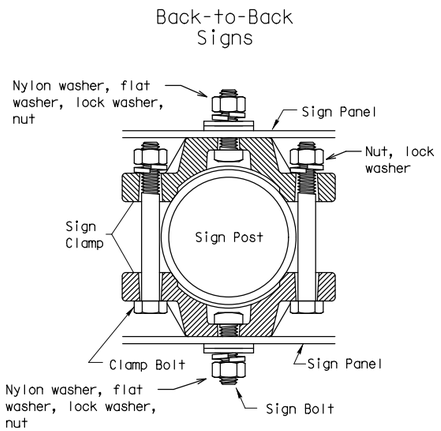
**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL





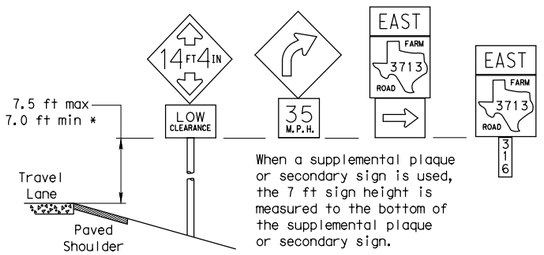
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

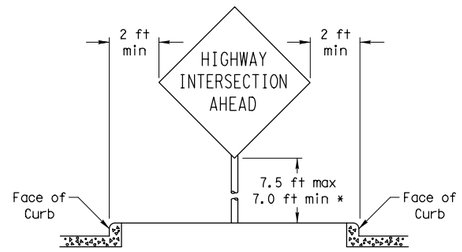
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



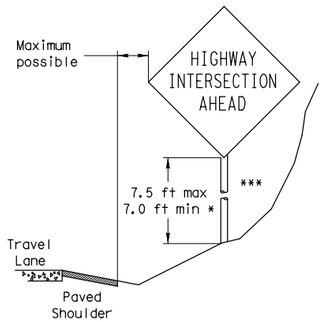
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
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	ODA	WINKLER		169

26A

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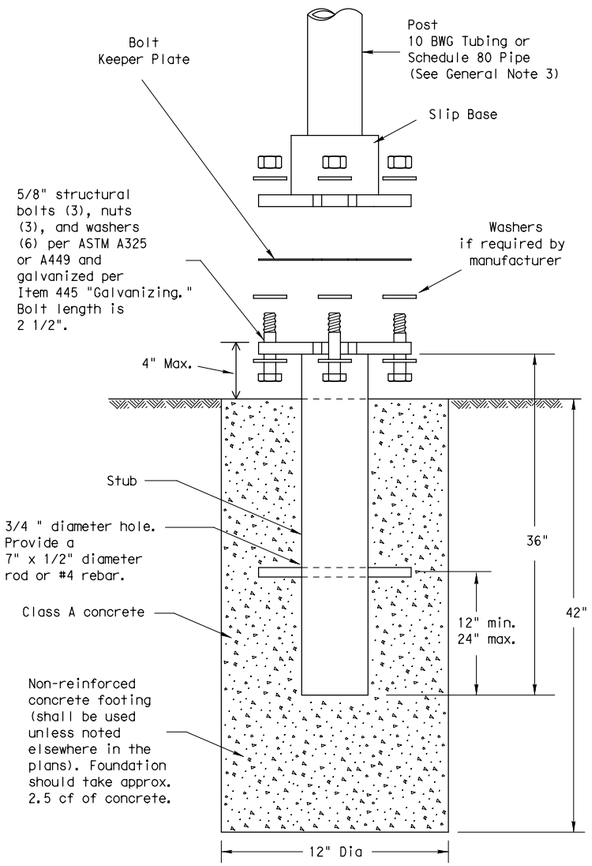
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

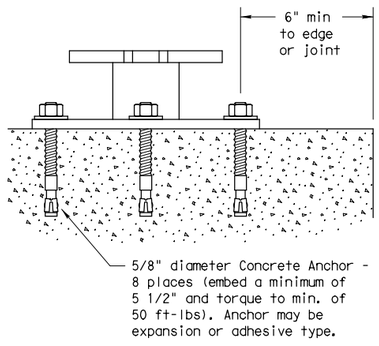
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   0.134" nominal wall thickness
   Seamless or electric-resistance welded steel tubing or pipe
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   20% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
   Schedule 80 Pipe (2.875" outside diameter)
   0.276" nominal wall thickness
   Steel tubing per ASTM A500 Gr C
   Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
   46,000 PSI minimum yield strength
   62,000 PSI minimum tensile strength
   21% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
1371	01	023	FM 1232

DIST	COUNTY	SHEET NO.
ODA	WINKLER	170

DATE: 7/17/2023 10:22:16 AM
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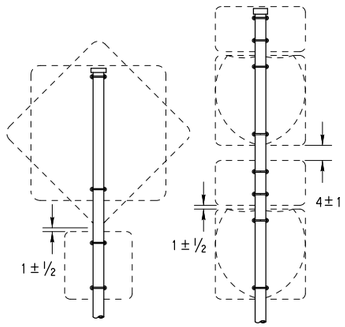
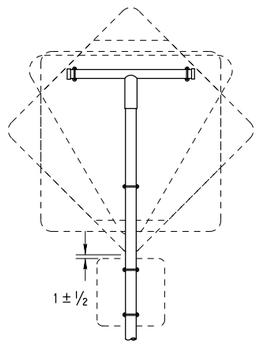
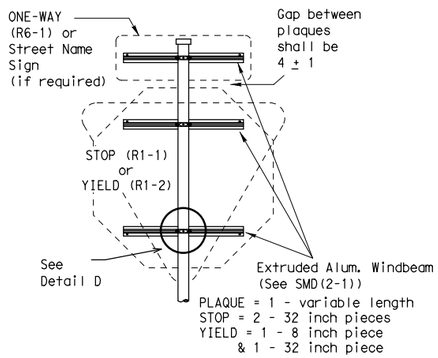


SM RD SGN ASSM TY XXXXX(1)XX(P)

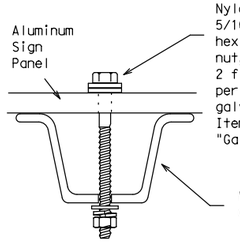


SM RD SGN ASSM TY XXXXX(1)XX(T)

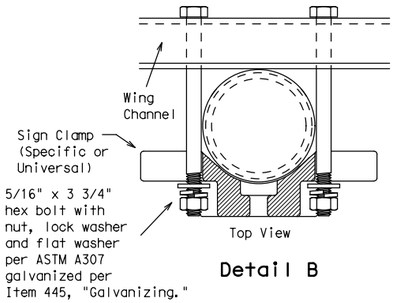


PLAQUE = 1 - variable length
STOP = 2 - 32 inch pieces
YIELD = 1 - 8 inch piece
& 1 - 32 inch piece

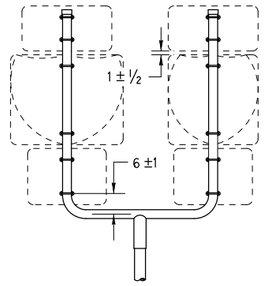
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



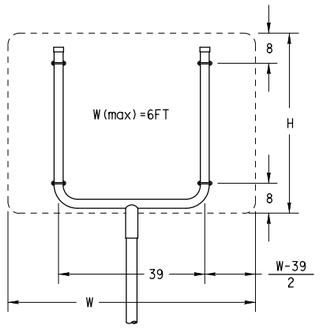
Detail A



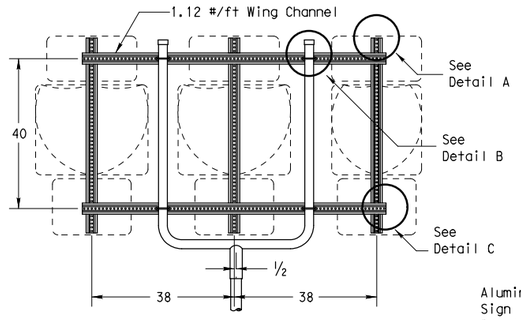
Detail B



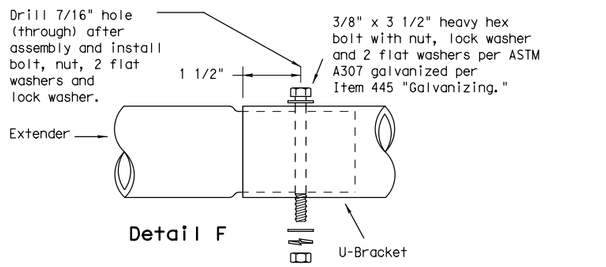
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

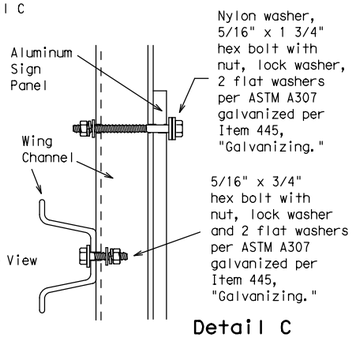


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

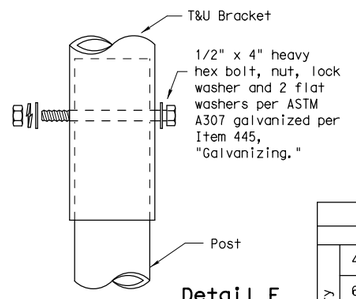


Detail F

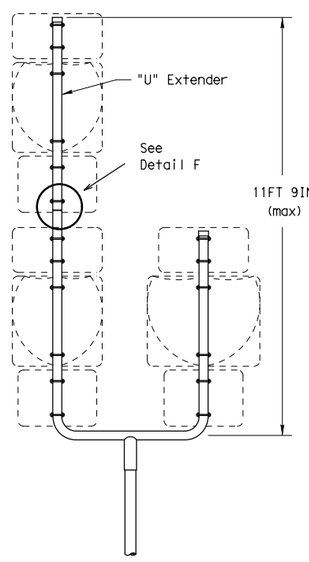
Splices shall only be allowed behind the sign substrate.



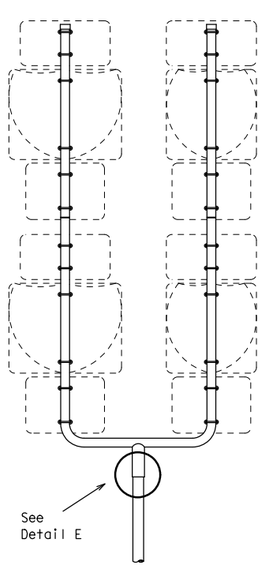
Detail C



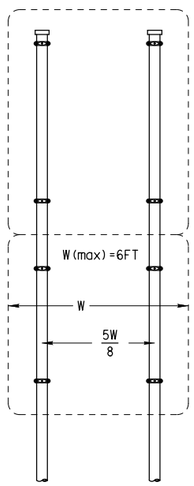
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

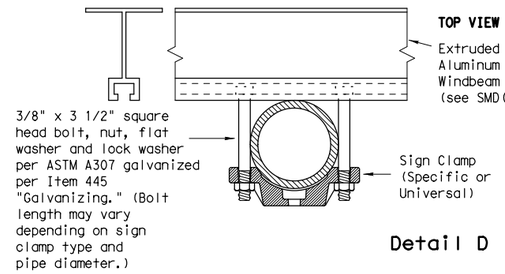


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

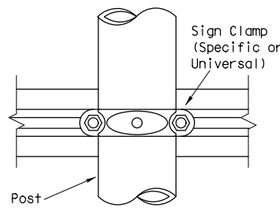


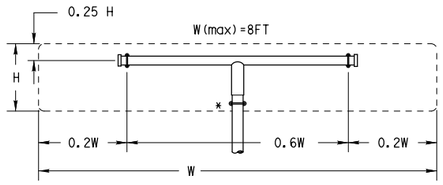
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

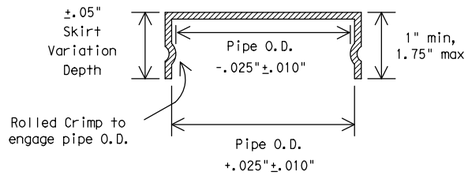




SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

All dimensions are in english unless detailed otherwise.

FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		171

26C

DATE: 7/17/2023 10:22:19 AM
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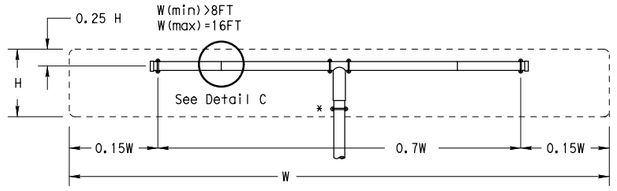
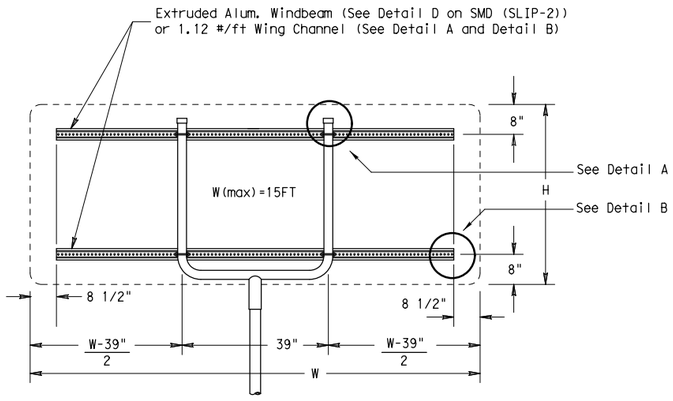
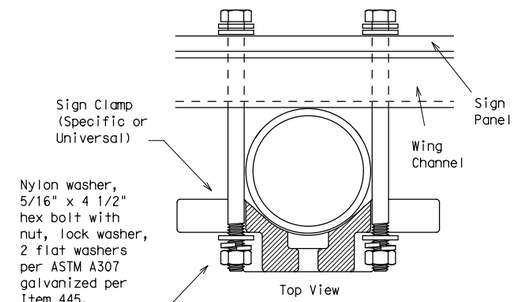


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

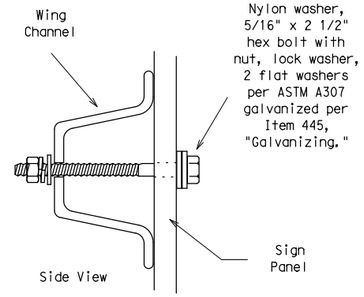


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

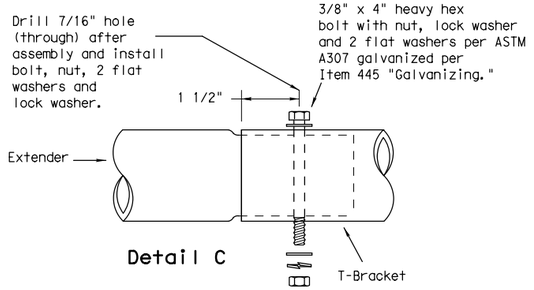


Top View

Detail A



Detail B



Detail C

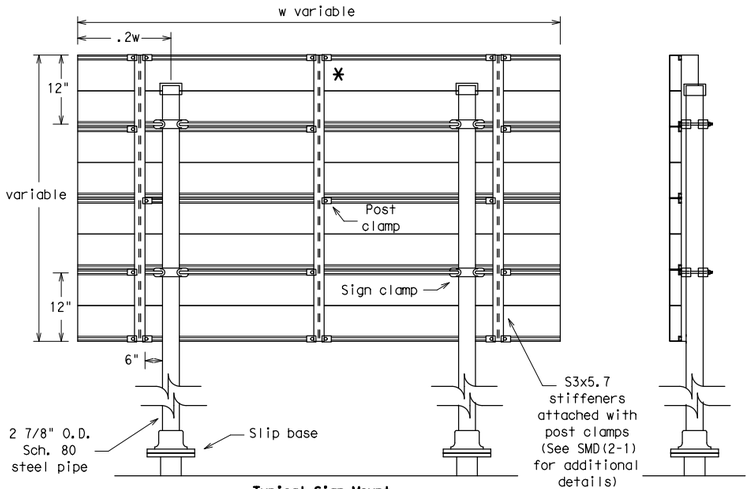
Splices shall only be allowed behind the sign substrate.

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. 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.

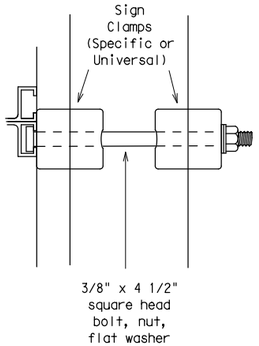


Typical Sign Mount

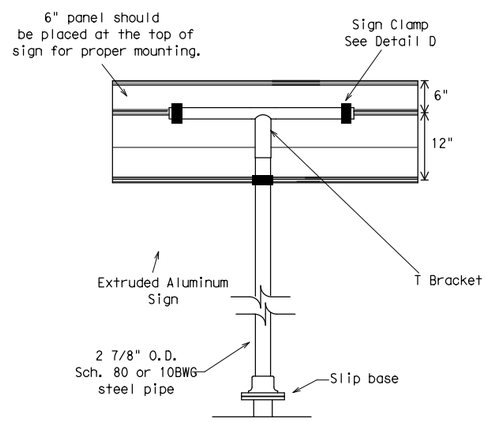
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10′.

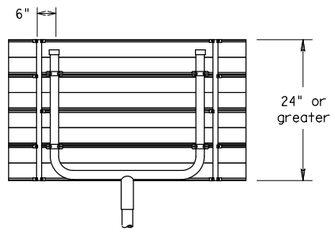
See Detail E
for clamp installation



Detail E

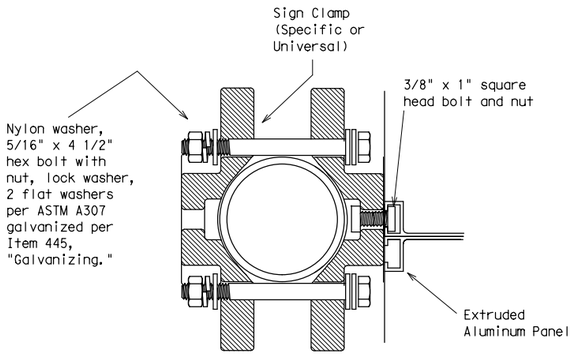


Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

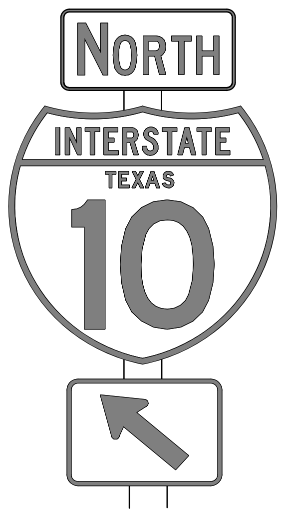
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

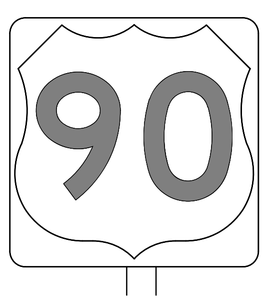
REVISIONS
9-08

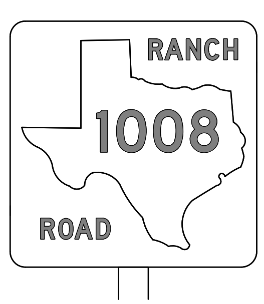
CONT	SECT	JOB	HIGHWAY
1371	01	023	FM 1232
DIST	COUNTY		SHEET NO.
ODA	WINKLER		172

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



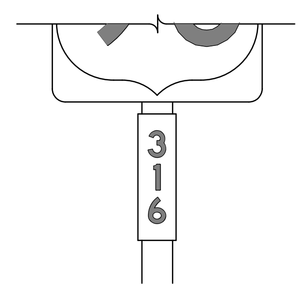


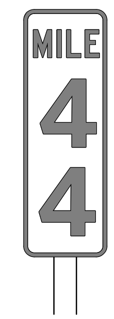


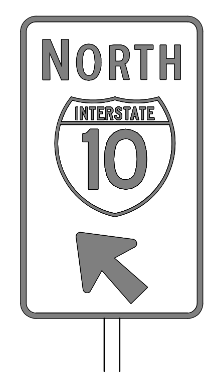
TYPICAL EXAMPLES

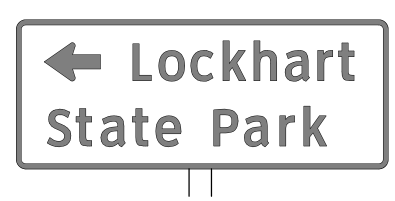
REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

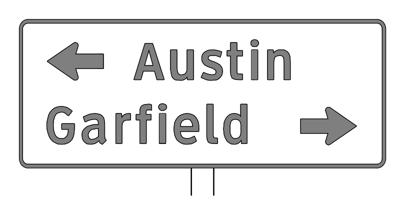
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING











TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).
4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.
6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation | Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

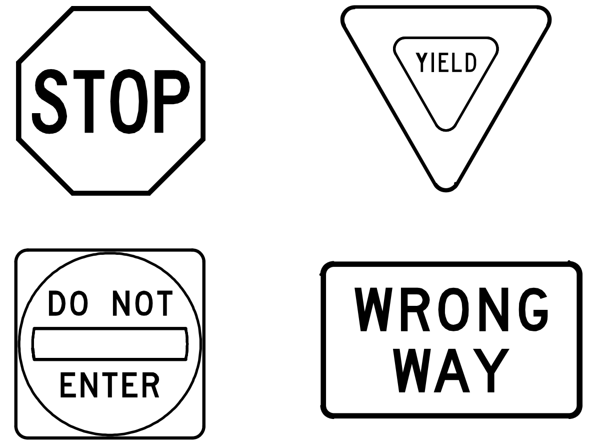
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	173

3

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

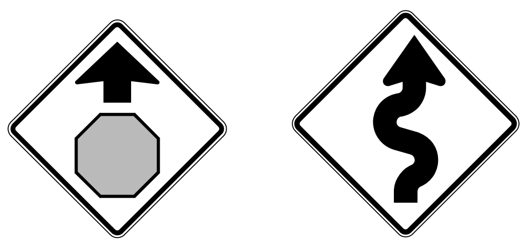
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

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

The Standard Highway Sign Designs for Texas (SHSD) can be found at the following website.
http://www.txdot.gov/

Texas Department of Transportation — Traffic Operations Division Standard

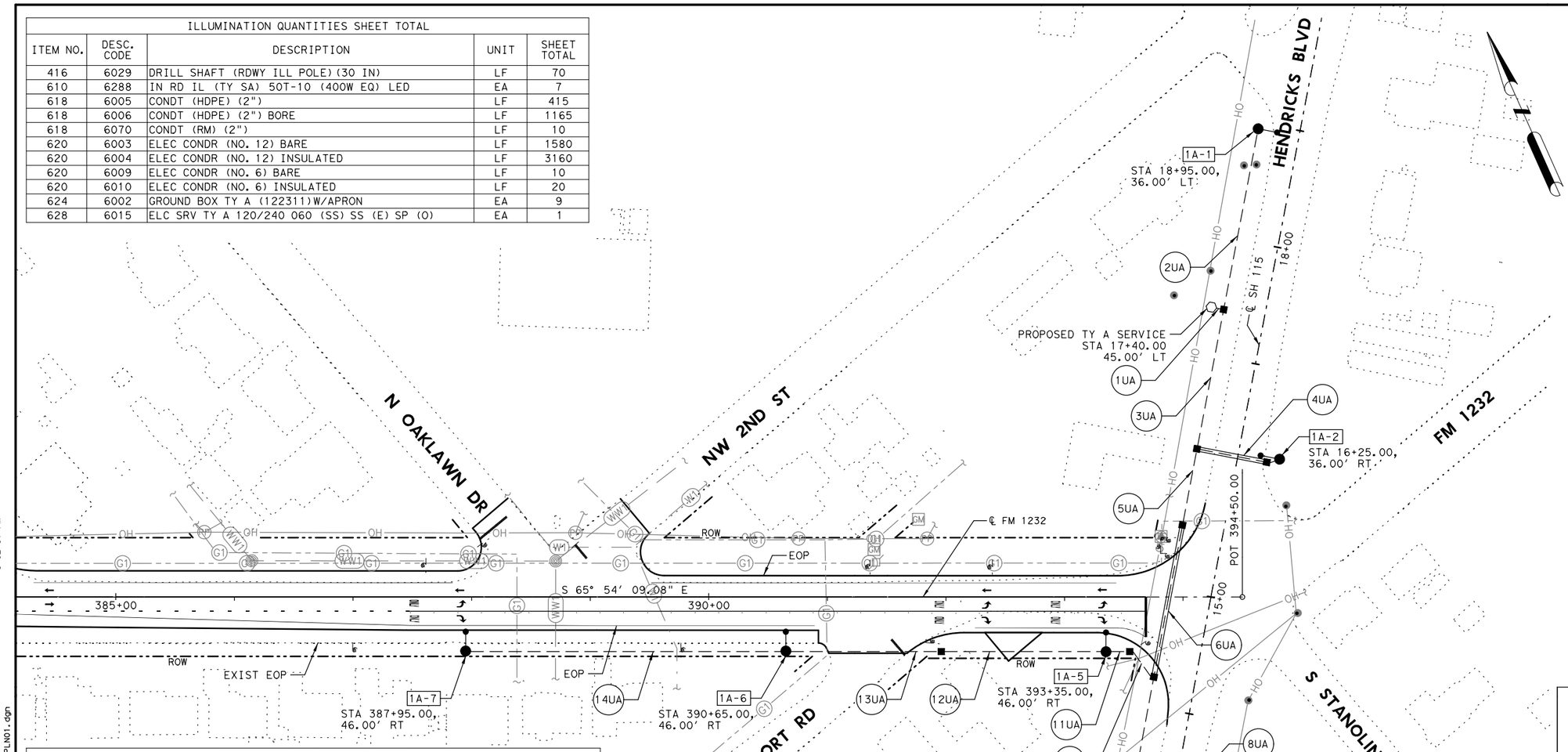
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT 1371	SECT 01	JOB 023	HIGHWAY FM 1232
REVISIONS 12-03 7-13 9-08	DIST ODA		COUNTY WINKLER	SHEET NO. 174

4

ILLUMINATION QUANTITIES SHEET TOTAL				
ITEM NO.	DESC. CODE	DESCRIPTION	UNIT	SHEET TOTAL
416	6029	DRILL SHAFT (RDWY ILL POLE)(30 IN)	LF	70
610	6288	IN RD IL (TY SA) 50T-10 (400W EQ) LED	EA	7
618	6005	CONDT (HDPE) (2")	LF	415
618	6006	CONDT (HDPE) (2") BORE	LF	1165
618	6070	CONDT (RM) (2")	LF	10
620	6003	ELEC CONDR (NO. 12) BARE	LF	1580
620	6004	ELEC CONDR (NO. 12) INSULATED	LF	3160
620	6009	ELEC CONDR (NO. 6) BARE	LF	10
620	6010	ELEC CONDR (NO. 6) INSULATED	LF	20
624	6002	GROUND BOX TY A (122311)W/APRON	EA	9
628	6015	ELC SRV TY A 120/240 060 (SS) SS (E) SP (O)	EA	1



0 50 100
SCALE: 1"=100' H

ILLUMINATION LEGEND

- HIGH MAST WITH AIMING ARROW
- RDWY ILL ASSEMBLY (TY SA 40S-10)(250W EQ)LED
- RDWY ILL ASSEMBLY (TY SA 50S-10)(400W EQ)LED
- RDWY ILL ASSEMBLY (TY SA 40T-10-10)(250W EQ)LED
- RDWY ILL ASSEMBLY (TY SA 50T-10-10)(400W EQ)LED
- RDWY ILL AM (U/P)
- ELECTRICAL SERVICE
- CONDUIT & CONDUCTOR (TRENCHED)
- CONDUIT & CONDUCTOR (BORED)
- RIGID METAL CONDUIT
- (1) CONDUIT RUN NUMBER
- GROUND BOX TY A
- JUNCTION BOX
- FUSED DISCONNECT
- [1A-1] POLE DESIGNATION
  - POLE OR LUMINAIRE NO.
  - CIRCUIT NO.
  - SERVICE NO.

CONDUCTOR AND CONDUIT RUNS							
RUN NO.	GROUND SIZE & LENGTH		CONDUCTOR SIZE & LENGTH (FT)		CONDUIT SIZE & LENGTH		
	#6 BARE	#12 BARE	#6 INSULATED	#12 INSULATED	CONDT (HDPE) (2")	CONDT (HDPE) (2") (BORE)	CONDT (RM) (2")
1UA	10		20				10
2UA		155		310	0	155	
3UA		115		230	0	115	
4UA		70		140		70	
5UA		75		150	0	75	
6UA		140		280		140	
7UA		85		170	85		
8UA		70		140		70	
9UA		270		540	270		
10UA		35		70	35		
11UA		25		50	25		
12UA		135		270	0	135	
13UA		135		270	0	135	
14UA		270		540	0	270	

ROADWAY ILLUMINATION ASSEMBLY SHEET SUMMARY								
FIXT. NO.	STATION	OFFSET (FT)		REFERENCE CENTERLINE	LAMP WATT	LAMP TYPE	STANDARD TYPE	DRILL SHAFT DIA./LENGTH
1A-1	18+95	36	LT	C-L SH 115	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT
1A-2	16+25	36	RT	C-L SH 115	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT
1A-3	13+30	36	RT	C-L SH 115	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT
1A-4	10+60	36	LT	C-L SH 115	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT
1A-5	393+35	46	RT	C-L SH 1232	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT
1A-6	390+65	46	RT	C-L SH 1232	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT
1A-7	387+95	46	RT	C-L SH 1232	400 EQ	LED	IN RD IL (TY SA) 50T-10 (400W EQ) LED	30 IN/10 FT

NOTES:

1. JUNCTION BOXES SHALL BE UNDER ITEM 624-6002 AND NOT BE SUBSIDIARY TO THE CONDUIT BIT ITEMS.
2. INSTALL CONDUIT BETWEEN NEW LIGHT POLES AND RIGHT-OF-WAY.
3. THE CONTRACTOR SHALL CONTACT AND COORDINATE WITH ALL COMPANIES PRIOR TO BEGINNING CONSTRUCTION. IT IS THE CONTRACTORS'S RESPONSIBILITY TO VERIFY THE EXACT LOCATION OF EXISTING AND/OR PROPOSED UNDERGROUND UTILITIES IN ORDER TO AVOID CONFLICTS OR DAMAGE TO THESE UTILITIES.
4. ALL LENGTHS IN THE CONDUIT AND CONDUCTOR SUMMARY ARE HORIZONTAL. CONTRACTOR SHALL ADJUST LENGTHS ACCORDINGLY FOR VERTICAL AND SPLICING TO ACCOUNT FOR CONSTRUCTABILITY RELATED REQUIREMENTS BY THE CONTRACTOR. NO ADDITIONAL PAYMENT WILL BE ALLOWED FOR THESE ADJUSTMENTS.

STATE OF TEXAS
RUDY L. GOMEZ
58664
REGISTERED PROFESSIONAL ENGINEER
9/6/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
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TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115
ILLUMINATION SAFETY LIGHTING
STA 385+00 TO STA 394+23

SHEET 1 OF 1

DSN	OEI	FED.RD. DIV.NO.	PROJECT NO.	SHEET NO.
CHK	OEI	6	SEE TITLE SHEET	175
DRN	OEI	STATE	DIST.	COUNTY
CHK	OEI	TEXAS	ODA	WINKLER
		CONT.	SECT.	JOB / HIGHWAY NO.
		1371	01	023 / FM 1232

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ELECTRICAL SERVICE DATA													
ELECTRICAL SERVICE ID	PLAN SHEET NUMBER	ELECTRICAL SERVICE DESCRIPTION	SERVICE CONDUIT SIZE	SERVICE CONDUCTORS NO./SIZE	SAFETY SWITCH AMPS	MAIN CKT. BKR. POLE/AMP	TWO-POLE CONTRACTOR AMPS	PANEL BD/ LOADCENTER AMP RATING	BRANCH CIRCUIT ID	BRANCH CIRCUIT BREAKER POLE/AMPS	BRANCH CIRCUIT AMPS	KVA LOAD	NOTES
1A		ELC SRV TY A 120/240 60(SS)(SS) SP (O)	1 1/2 inch	3/#6	60	2P/60	60	N/A	A	2P/30	6	1.75	

STATE OF TEXAS
RUDY L. GOMEZ
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REGISTERED PROFESSIONAL ENGINEER
7/17/2023

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P:915 308 6413 F:281 647 9184

Texas Department of Transportation®

FM 1232
SH 302 TO SH 115

ELECTRICAL SERVICE DATA
STA 385+00 TO STA 394+23

SHEET 1 OF 1

		FED.RD. DIV.NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		176
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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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.

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Texas Department of Transportation
Traffic Operations Division Standard

ELECTRICAL DETAILS
CONDUITS & NOTES

ED(1)-14

FILE: ed1-14.dgn	DN:	CK:	DW:	CK:
© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST	COUNTY		SHEET NO.
	ODA	WINKLER		177

71A

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.

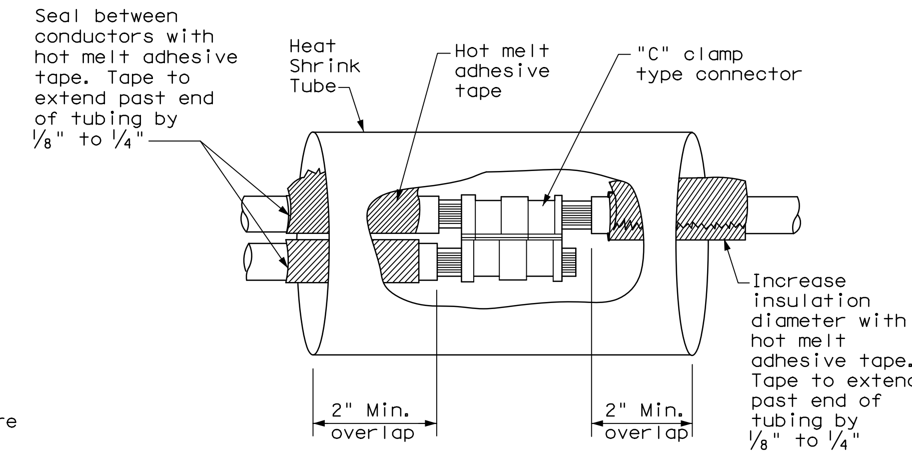
GROUND RODS & GROUNDING ELECTRODES

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.



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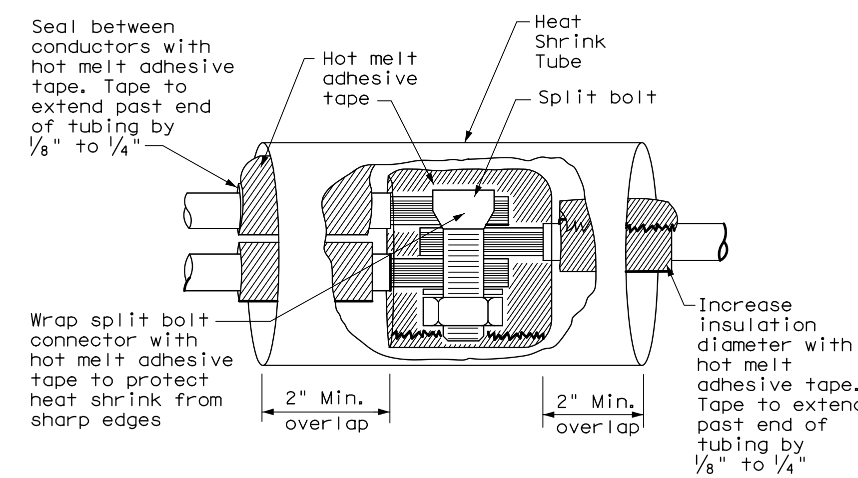
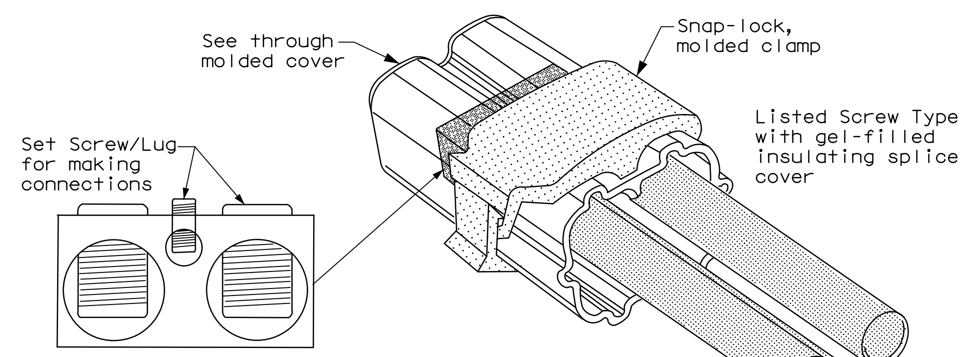


SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

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Texas Department of Transportation
Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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© TxDOT	CONT	SECT	JOB	HIGHWAY
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	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	178

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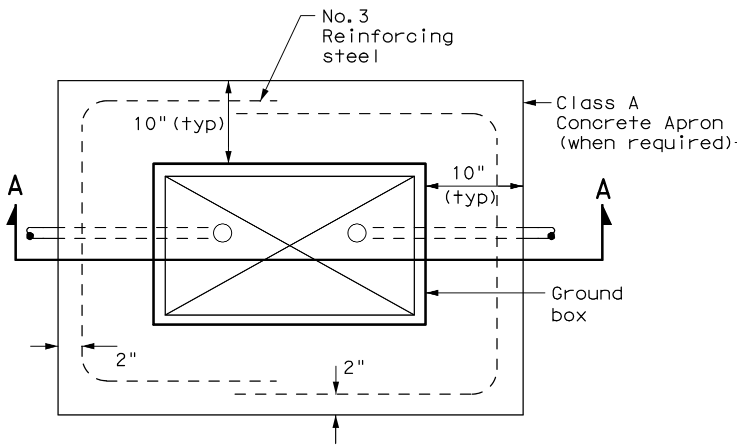
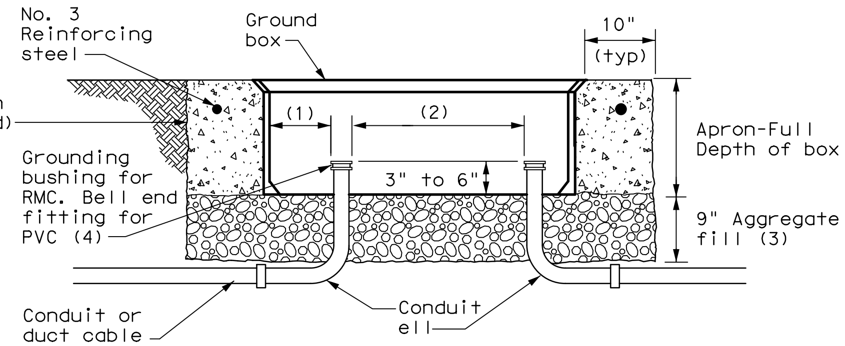


PLAN VIEW



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 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

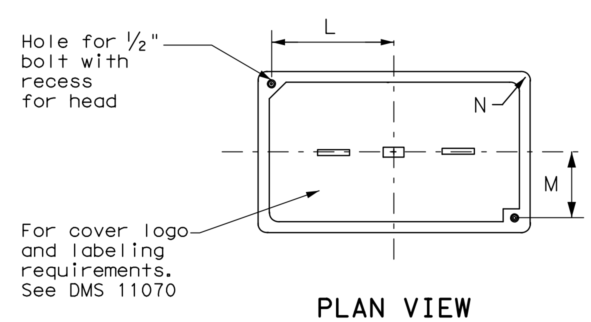
1. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure aggregate bed is in place and at least 9 inches deep, prior to setting the 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.

GROUND BOX DIMENSIONS

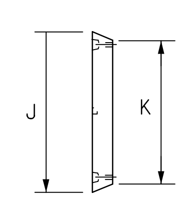
TYPE	OUTSIDE DIMENSIONS (INCHES) (Width x Length X Depth)
A	12 X 23 X 11
B	12 X 23 X 22
C	16 X 29 X 11
D	16 X 29 X 22
E	12 X 23 X 17

GROUND BOX COVER DIMENSIONS

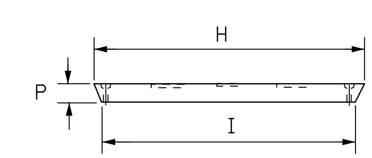
TYPE	DIMENSIONS (INCHES)							
	H	I	J	K	L	M	N	P
A, B & E	23 1/4	23	13 3/4	13 1/2	9 7/8	5 1/8	1 3/8	2
C & D	30 1/2	30 1/4	17 1/2	17 1/4	13 1/4	6 3/4	1 3/8	2



PLAN VIEW



END



SIDE

GROUND BOX COVER

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS GROUND BOXES

ED(4)-14

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© TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	179

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ELECTRICAL SERVICES NOTES

1. Provide new materials. Ensure installation and materials comply with the applicable provisions of the National Electrical Code (NEC) and National Electrical Manufacturers Association (NEMA) standards. Ensure material is Underwriters Laboratories (UL) listed. Provide and install electrical service conduits, conductors, disconnects, contactors, circuit breaker panels, and branch circuit breakers as shown on the Electrical Service Data chart in the plans. Faulty fabrication or poor workmanship in material, equipment, or installation is justification for rejection. Where manufacturers provide warranties and guarantees as a customary trade practice, furnish these to the State.

2. Provide electrical services in accordance with Electrical Details standard sheets, Departmental Material Specification (DMS) 11080 "Electrical Services," DMS 11081 "Electrical Services-Type A," DMS 11082 "Electrical Services-Type C," DMS 11083 "Electrical Services-Type D," DMS 11084 "Electrical Services-Type T," DMS 11085 "Electrical Services-Pedestal (PS)", and Item 628 "Electrical Services" of the Standard Specifications. Provide electrical service types A, C, and D, as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies," Item 628. Provide other service types as detailed on the plans.

3. Provide all work, materials, services, and any incidentals needed to install a complete electrical service as specified in the plans.

4. Coordinate with the Engineer and the utility provider for metering and compliance with utility requirements. Primary line extensions, connection charges, meter charges, and other charges by the utility company to provide power to the location are paid for in accordance with Item 628. Get approval for the costs associated with these charges prior to engaging the utility company to do the work. Consult with the utility provider to determine costs and requirements, and coordinate the work as approved.

5. The enclosure manufacturer will provide Master Lock Type 2 with brass tumblers keyed #2195 for all custom electrical enclosures. Installing Contractor is to provide Master Lock #2195 Type 2 with brass tumblers for "off the shelf" enclosures. Master Lock #2195 keys and locks become property of the State. Unless otherwise approved, do not energize electrical service equipment until locks are installed.

6. Enclosures with external disconnects that de-energize all equipment inside the enclosure do not need a dead front trim. Protect incoming line terminations from incidental contact as required by the NEC.

7. When galvanized is specified for nuts, screws, bolts or miscellaneous hardware, stainless steel may be used.

8. Provide wiring and electrical components rated for 75°C. Provide red, black, and white colored XHHW service entrance conductors of minimum size 6 American Wire Gauge (AWG). Identify size 6 AWG conductors by continuous color jacket. Identify electrical conductors sized 4 AWG and larger by continuous color jacket or by colored tape. Mark at least 6 inches of the conductor's insulation with half laps of colored tape, when identifying conductors. Ensure each service entrance conductor exits through a separately bushed non-metallic opening in the weatherhead. The lengths of the conductors outside the weatherhead are to be 12 inches minimum, 18 inches maximum, or as required by utility.

9. All electrical service conduit and conductors attached to the electrical service including the riser or the elbow below ground are subsidiary to the electrical service. For an underground utility feed, all service conduit and conductors after the elbow, including service conduit and conductors for the utility pole riser when furnished by the Contractor, will be paid for separately.

10. Provide rigid metal conduit (RMC) for all conduits on service, except for the ½ in. PVC conduit containing the electrical service grounding electrode conductor. Size the service entrance conduit as shown in the plans. Ensure conduit for branch circuit entry to enclosure is the same size as that shown on the layout sheets for branch circuit conduit. Extend all rigid metal conduits a minimum of 6 inches underground and then couple to the type and schedule of the conduit shown on the layout for that particular branch circuit. Install a grounding bushing on the RMC where it terminates in the service enclosure.

11. Use of liquidtight flexible metal conduit (LFMC) is allowed between the meter and service enclosure when they are mounted 90 to 180 degrees to each other. Size the LFMC the same size as service entrance conduit. LFMC must not exceed 3 feet in length. Strap LFMC within 1 foot of each end. LFMC less than 12 inches in length need not be strapped. Each end of LFMC must have a grounding bushing or be terminated with a grounding fitting. The LFMC must contain a grounded (neutral) conductor. Ensure any bend in LFMC never exceeds 180 degrees. A pull test is required on all installed conductors, with at least six inches of free conductor movement demonstrated to the satisfaction of the Engineer.

12. Ensure all mounting hardware and installation details of services conform to utility company specifications.

13. For all electrical service enclosures listed under Item 628 on the MPL, the UL 508 enclosure manufacturers will prepare and submit a schematic drawing unique to each service. Before shipment to the job site, place the applicable laminated schematic drawings and the laminated plan sheet showing the electrical service data chart used to build the enclosure in the enclosure's data pocket. The installing contractor will copy and laminate the actual project plan sheets detailing all equipment and branch circuits supplied by that service. The laminated plan sheets are to be placed in the service enclosure's document pocket. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in. before laminating. If the installation differs from the plan sheets, the installing contractor is to redline plan sheets before laminating.

14. When providing an "Off The Shelf" Type D or Type T service, provide laminated plan sheets detailing equipment and branch circuits supplied by that service. Reduce 11 in. x 17 in. plan sheets to 8 ½ in. x 11 in before laminating. Deliver these drawings before completion of the work to the Engineer, instead of placing in enclosure that has no door pocket.

15. Do not install conduit in the back wall of a service enclosure where it would penetrate the equipment mounting panel inside the enclosure. Provide grounding bushings on all metal conduits, and terminate bonding jumpers to grounding bus. Grounding bushings are not required when the end of the metal conduit is fitted with a conduit sealing hub or threaded boss, such as a meter base hub.

SERVICE ASSEMBLY ENCLOSURE

1. Provide threaded hub for all conduit entries into the top of enclosure.

2. Type galvanized steel (GS) enclosures may be used for Type C panelboards and for Type D and T services that do not use an enclosure mounted photocell or lighting contactor. Provide GS enclosures in accordance with DMS 11080, 11082, 11083, and 11084.

3. Provide aluminum (AL) and stainless steel (SS) enclosures for Types A, C, and D in accordance with DMS 11080, 11081, 11082, 11083, and 11084. Do not paint stainless steel.

4. Provide pedestal service (PS) enclosures in accordance with ED(9) and DMS 11080 and 11085. Do not provide GS pedestal services. If GS is shown in the PS descriptive code, provide an AL enclosure.

MAIN DISCONNECT & BRANCH CIRCUIT BREAKERS

1. Field drill flange-mounted remote operator handle if needed, to ensure handle is lockable in both the "On" and "Off" positions.

2. When the utility company provides a transformer larger than 50 KVA, verify that the available fault current is less than the circuit breaker's ampere interrupting capacity (AIC) rating and provide documentation from the electric utility provider to the Engineer.

PHOTOELECTRIC CONTROL

1. Provide photocell as listed on the MPL. Move, adjust, or shield the photocell from stray or ambient night time light to ensure proper operation. Mount photocell facing north when practical. Mount top of pole photocells as shown on Top Mounted Photocell Detail.

* ELECTRICAL SERVICE DATA

Elec. Service ID	Plan Sheet Number	Electrical Service Description	Service Conduit **Size	Service Conductors No./Size	Safety Switch Amps	Main Ckt. Bkr. Pole/Amps	Two-Pole Contractor Amps	Panelbd/ Loadcenter Amp Rating	Branch Circuit ID	Branch Ckt. Bkr. Pole/Amps	Branch Circuit Amps	KVA Load
SB 183	289	ELC SRV TY A 240/480 100(SS)AL(E)SF(U)	2"	3/#2	100	2P/100	100	N/A	Lighting NB	2P/40	26	28.1
									Lighting SB	2P/40	25	
									Underpass	1P/20	15	
NB Access	30	ELC SRV TY D 120/240 060(NS)SS(E)TS(O)	1 ¼"	3/#6	N/A	2P/60		100	Sig. Controller	1P/30	23	5.3
							30		Luminaires	2P/20	9	
									CCTV	1P/20	3	
2nd & Main	58	ELC SRV TY T 120/240 000(NS)GS(N)SP(O)	1 ¼"	3/#6	N/A	N/A	N/A	70	Flashing Beacon 1	1P/20	4	1.0
									Flashing Beacon 2	1P/20	4	

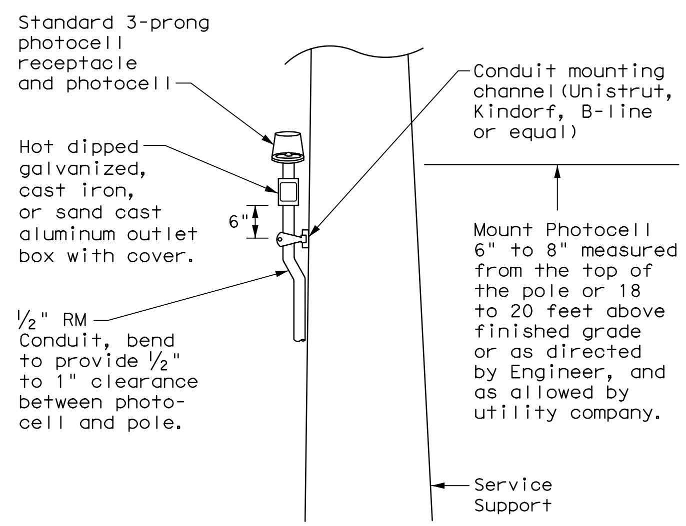
* Example only, not for construction. All new electrical services must have electrical service data chart specific to that service as shown in the plans.

** Verify service conduit size with utility. Size may change due to utility meter requirements. Ensure conduit size meets the National ELectrical Code.

EXPLANATION OF ELECTRICAL SERVICE DESCRIPTIVE CODE

ELEC SERV TY X XXX/XXX XXX (XX) XX (X) XX (X)

- Schematic Type
- Service Voltage V / V
- Disconnect Amp Rating
  000 indicates main lug only/ Typically Type T
- (SS)= Safety Switch Ahead of Meter-Check with Utility
  (NS)= No safety Switch Ahead of Meter-Check with Utility
- Enclosure Type
  GS= Galvanized steel("off the shelf")
  SS= Stainless steel(Custom Enclosure)See MPL
  AL= Aluminum (Custom Enclosure)See MPL
- Photocell Mounting Location
  (E)= Inside Service/Enclosure Mounted
  (T)= Top of pole
  (L)= Luminaire mounted
  (N)= None/No Photocell or Lighting Contactor Required
- Service Support Type
  GC= Granite concrete
  OC= Other concrete
  TP= Timber pole
  SP= Steel pole
  SF= Steel frame
  OT= Pole by others or paid for separately
  EX= Existing pole
  TS= Service on traffic signal pole
  PS= Pedestal Service
- O= Overhead Service Feed from Utility
  U= Underground Service Feed from Utility



TOP MOUNTED PHOTOCELL

Install conduit strap maximum 3 feet from box. 5 foot maximum spacing between straps supporting conduit.

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

ED(5)-14

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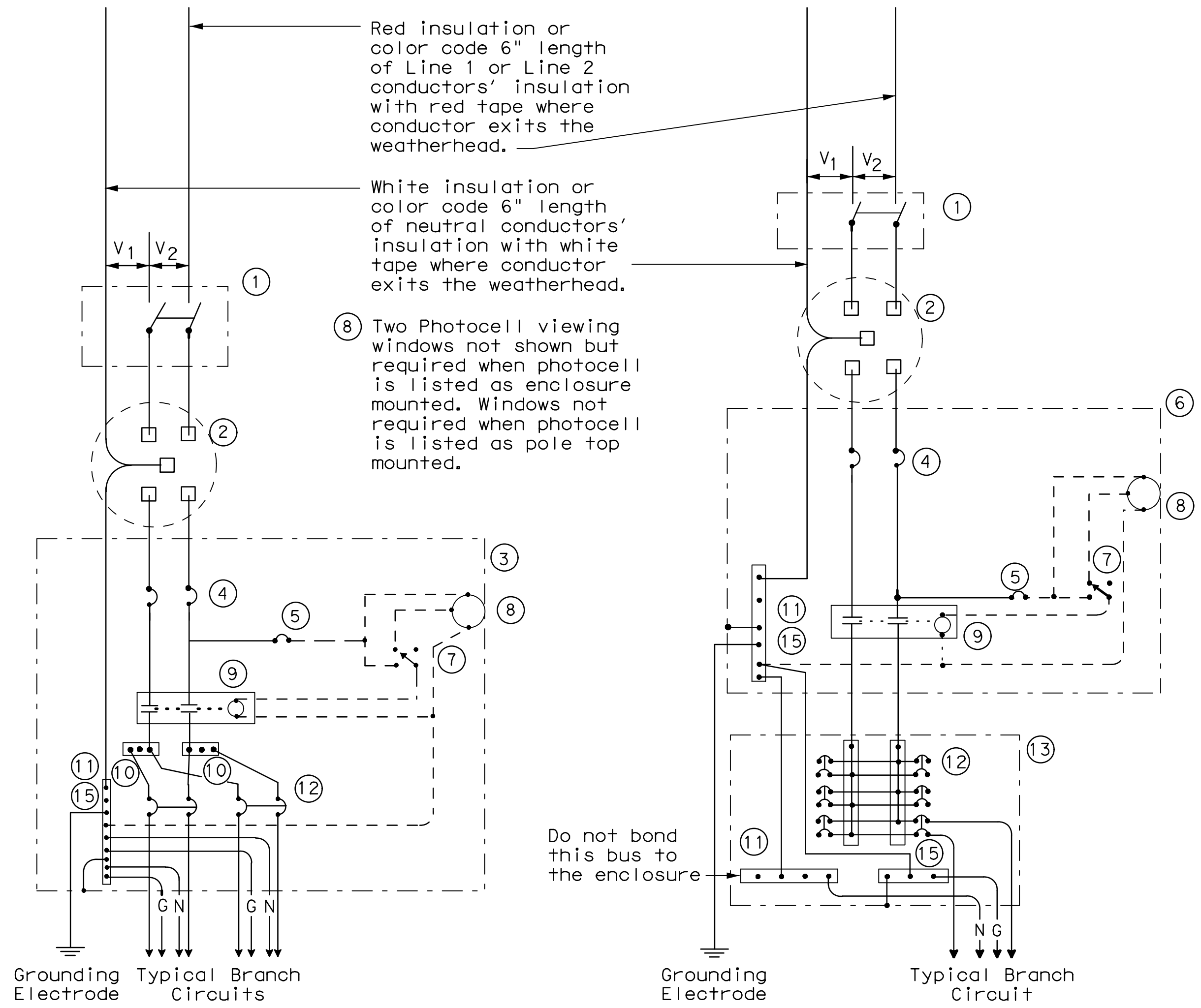
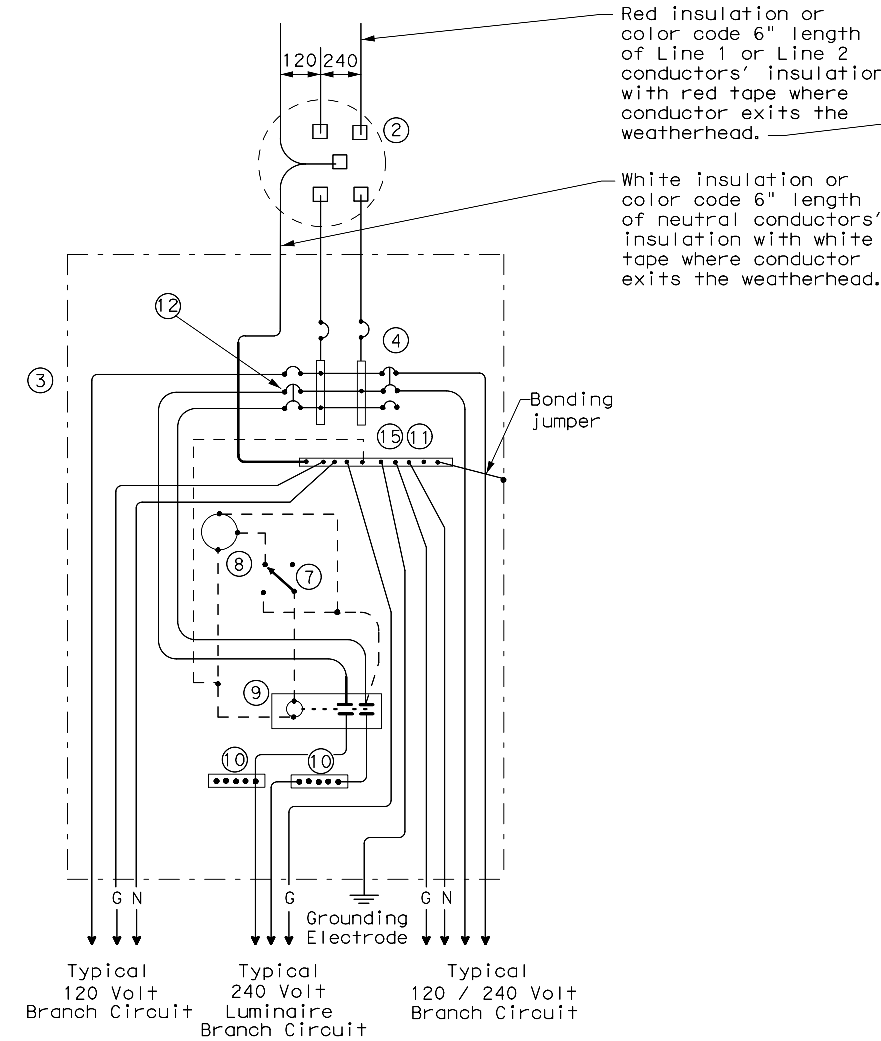
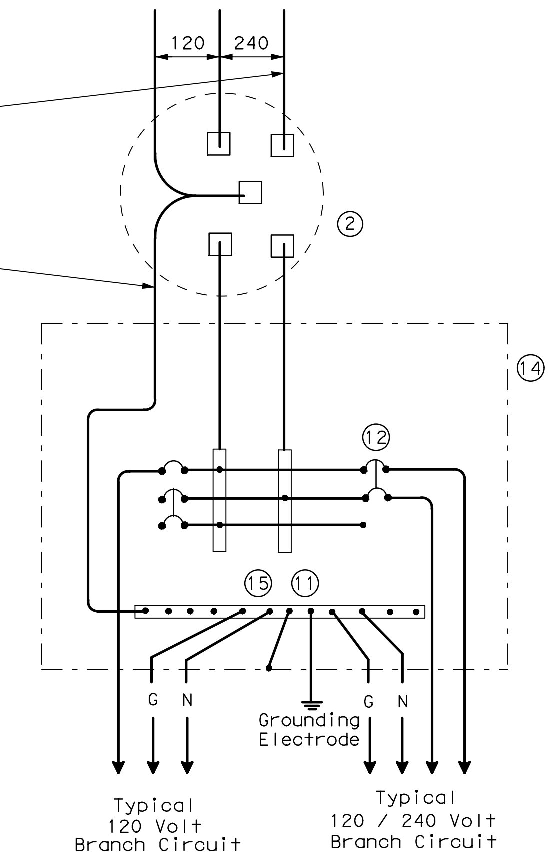


SCHEMATIC TYPE A
THREE WIRE

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.

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

WIRING LEGEND

———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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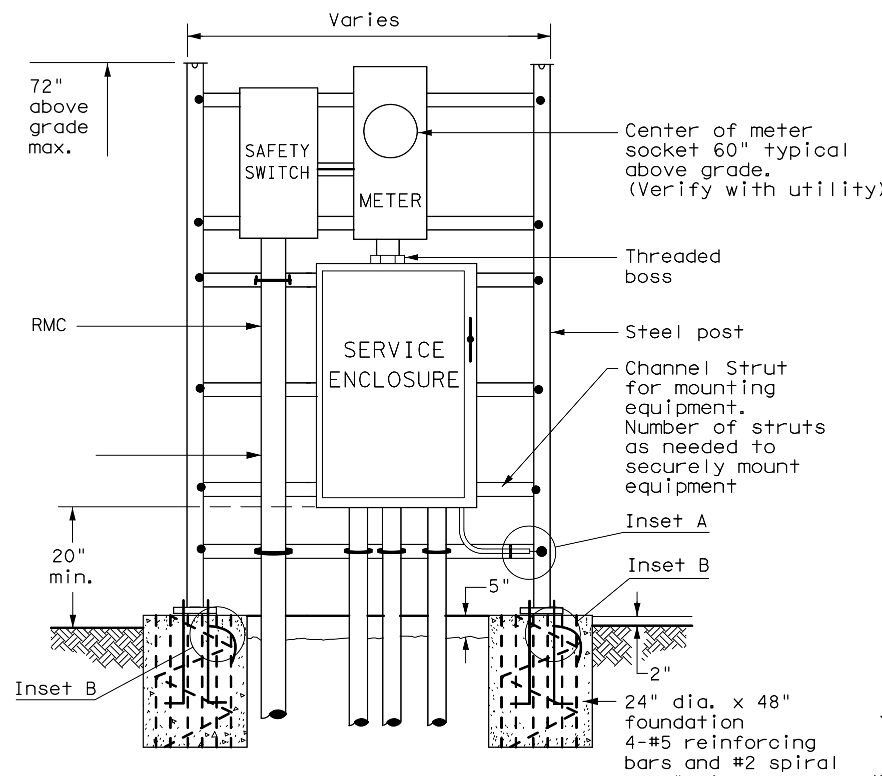
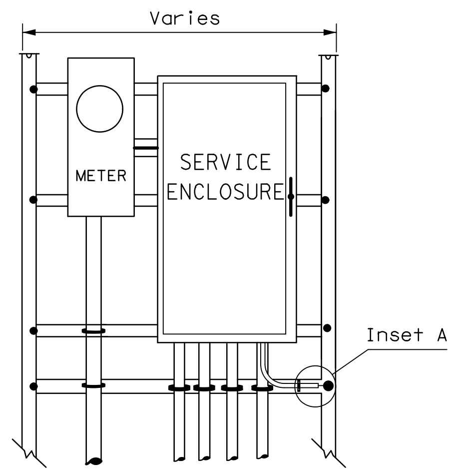
SUPPORT TYPE STEEL POLE (SP) AND STEEL FRAME (SF)

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 1/2 in. or 1 5/8 in. wide by 1 in. up to 3 3/4 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 3/4 in. x 18 in. x 4 in. (dia. x length x hook length) anchor bolts for underground service supports. Provide and install galvanized 3/4 in. x 56 in. x 4 in. anchor bolts for overhead service supports. Ensure anchor bolts have 3 in of thread, with 3 1/4 in. to 3 1/2 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 1/2 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 1/4" - 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.



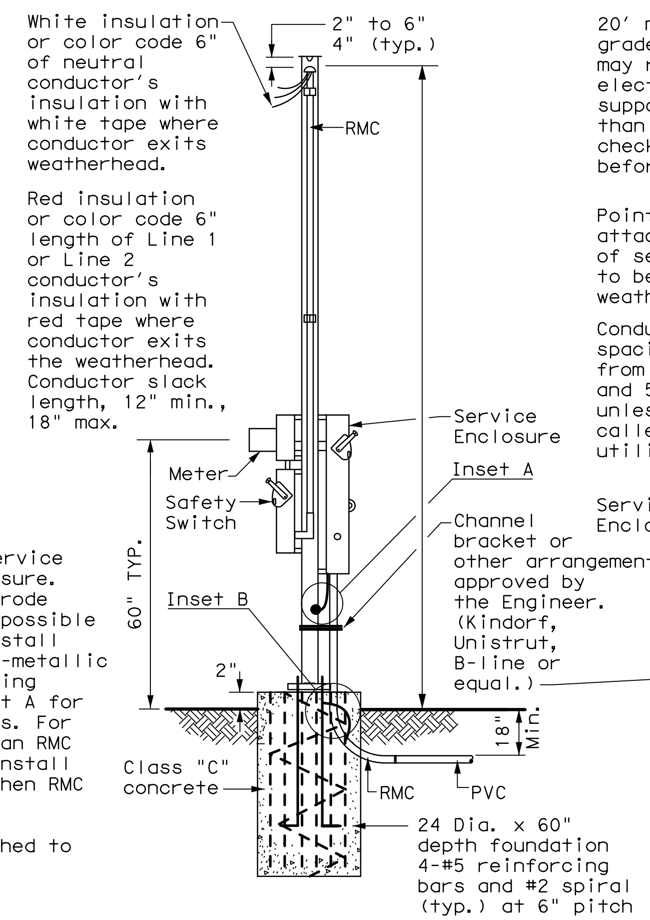
WITH SAFETY SWITCH



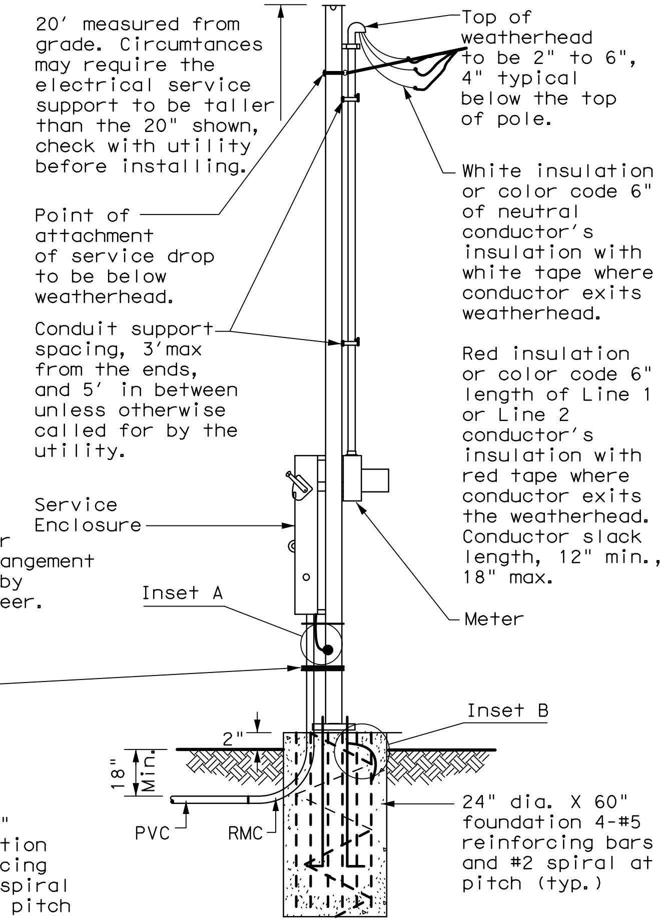
WITHOUT SAFETY SWITCH

FRONT VIEW

SERVICE SUPPORT TYPE SF(U) - UNDERGROUND SERVICE

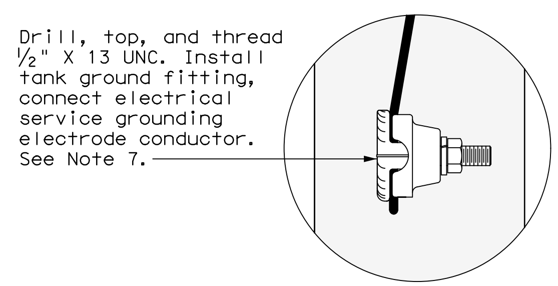


WITH SAFETY SWITCH



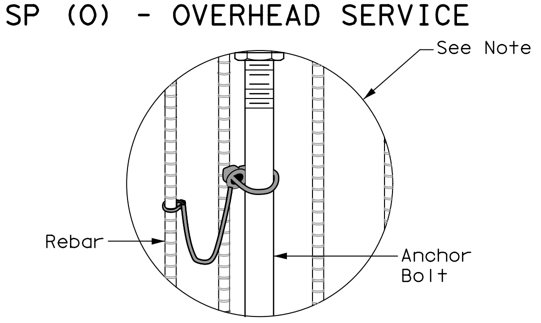
WITHOUT SAFETY SWITCH

SERVICE SUPPORT TYPE SP (O) - OVERHEAD SERVICE

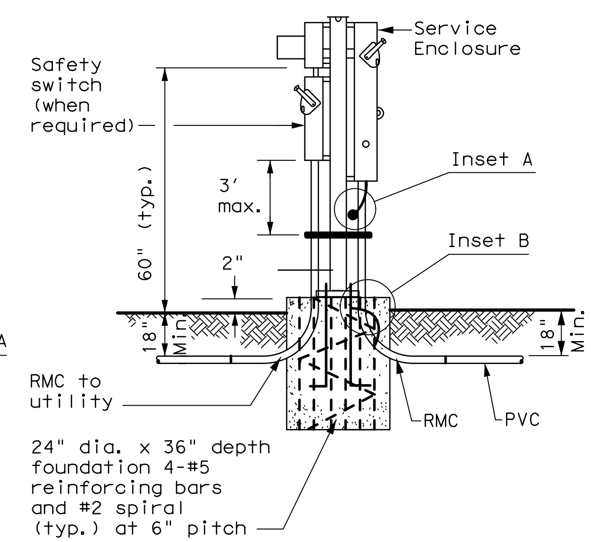


FRONT VIEW

INSET A

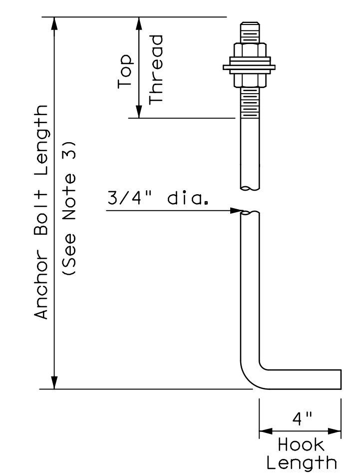


INSET B

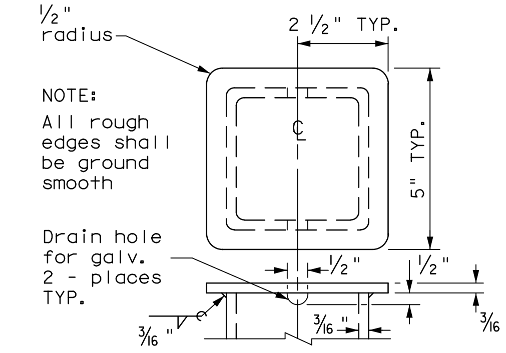


WITH SAFETY SWITCH

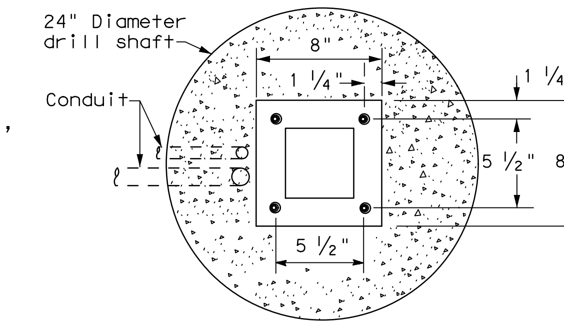
SERVICE SUPPORT TYPE SP(U) - UNDERGROUND SERVICE



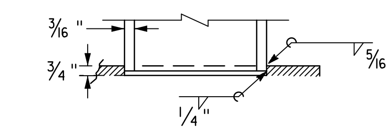
HOOKED ANCHOR DETAIL



POLE TOP PLATE

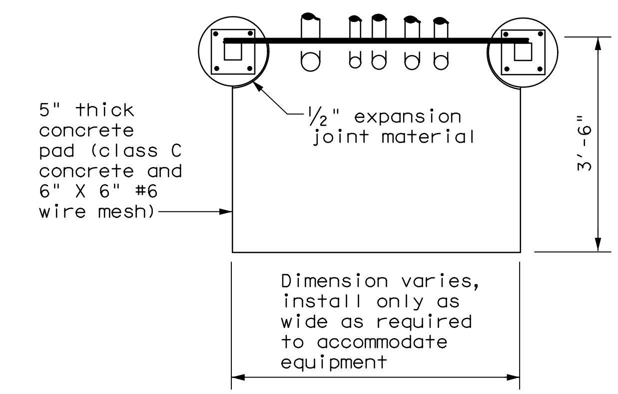


BASE PLATE DETAIL



BOTTOM OF POLE

SERVICE SUPPORT TYPE SF & SP



TOP VIEW

SERVICE SUPPORT TY SF (O) & SF (U)

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES SF & SP

ED(7)-14

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TIMBER POLE (TP) SERVICE SUPPORT NOTES

1. Ensure electrical service support is a class 5 treated timber pole as per Item 627 "Treated Timber Poles." Embed timber pole to depth required in Item 627.
2. Conduit and electrical conductors attached to the electrical service pole and underground within 12 in. of service pole are not paid for directly but are subsidiary to the electrical service.
3. Install pole-top mounted photocell (T) on north side of pole, or in service enclosure (E) as required. See Electrical Service Data chart in plan set.
4. Gain pole as required to provide flat surface for each channel. Gain timber pole to ⅝ in. max. depth and 1 ⅞ in. max. height. Gain pole in a neat and workmanlike manner.
5. Mount meter and service equipment on stainless steel or galvanized channel (Unistrut, Kindorf, or equal). Provide channel sized 1 in. to 3 ¾ in. maximum depth, and 1½ in. to 1⅝ in. maximum width. File smooth the cut ends of galvanized channel and paint with zinc rich paint before installing on pole. Secure each channel section to timber pole with two galvanized or SS lag bolts, ¼ in. minimum diameter by 1½ in. minimum length. Use a galvanized or SS flat washer on each lag bolt. Do not stack channel.
6. When excess length must be trimmed from poles, trim from the top end only.

(1) Class 5 pole, height as required

(2) Service drop from utility company (attached below weatherhead)

(3) Service conduit (RMC) and service entrance conductors - One Red, One Black, One White (See Electrical Service Data)

(4) Safety switch (when required)

(5) Meter (when required)

(6) Service enclosure

(7) 6 AWG bare grounding electrode conductor in ½ in. PVC to ground rod - extend ½ in. PVC 6 in. underground.

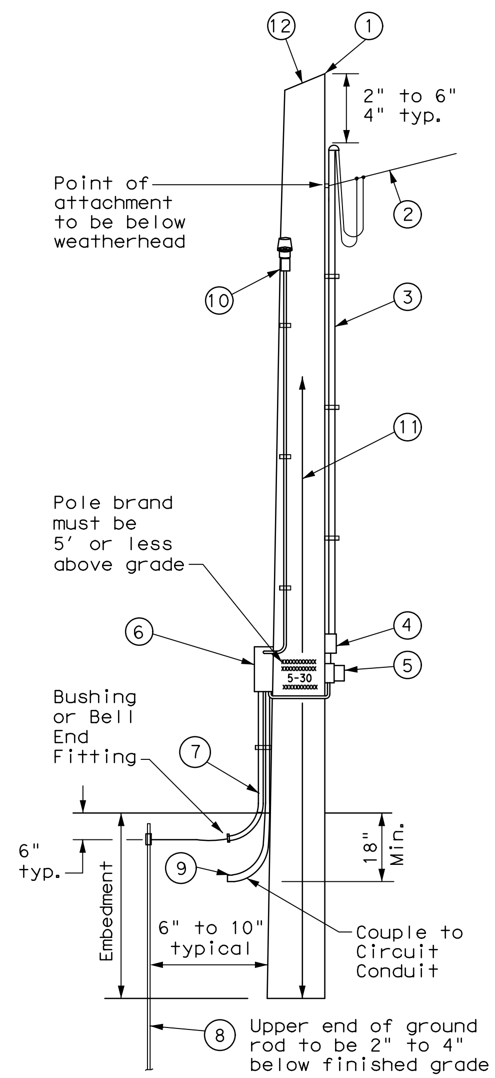
(8) ⅝ in. x 8 ft. Copper clad ground rod - drive ground rod to a depth of 2 in. to 4 in. below grade.

(9) RMC same size as branch circuit conduit.

(10) See pole-top mounted photocell detail on ED(5).

(11) When required by the serving utility provide bare 6 AWG copper conductor. Run wire from pole top to butt wrap or copper butt plate. Protect conductor with non-conductive material to a height of 8 ft. above finished grade.

(12) When required by utility, cut top of pole at an angle to enhance rain run off.

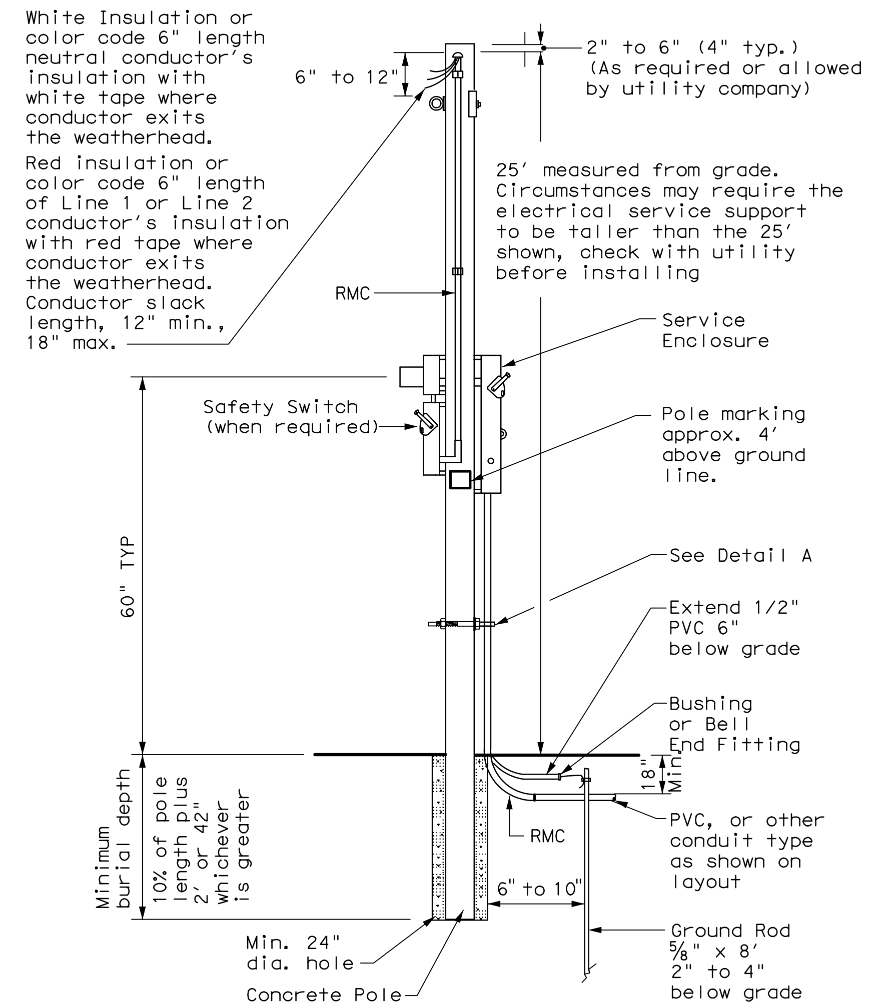


SERVICE SUPPORT TYPE TP (O)

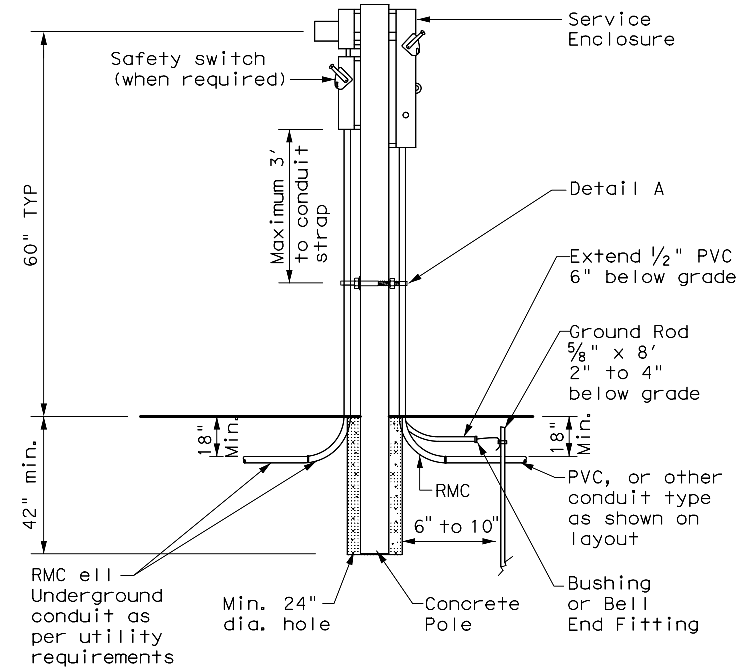
GRANITE CONCRETE (GC) & OTHER CONCRETE (OC) NOTES

Ensure electrical service support structures bid as type Granite Concrete (GC) or Other Concrete (OC) meet the following requirements.

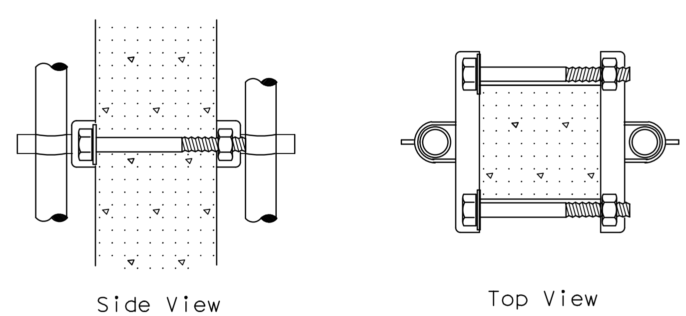
1. Provide GC and OC poles that meet the requirements of DMS 11080 "Electrical Services."
2. Provide prestressed concrete poles suitable for direct embedment into the ground without special foundations.
3. Verify poles are marked as required on DMS 11080. Location of marking should be approximately 4' above final grade. Use the two-point pickup locations when handling pole in horizontal position, and one-point pickup location for use in raising the pole to a vertical position. These marks are small but conspicuous.
4. Embed poles 42 in. or 10% of the length plus 2 ft., whichever is greater.
5. Ensure all installation details of services are in accordance with utility company specifications.
6. Install a one point rack or eye bolt bracket 6 inches to 12 inches below the weatherhead as an overhead service drop anchoring point for the electric utility.
7. Furnish and install galvanized 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). Attach channel strut with stainless steel concrete anchors (max. 1" depth), square U-bolts or back to back channel strut with long bolts, or other secure mounting as approved by the Engineer. Ensure bolts are galvanized in accordance with ASTM A153. Do not stack channel struts.
8. Backfill the holes thoroughly by tamping in 6 in. lifts. After tamping to grade, place additional backfill material in a 6 inch high cone around the pole to allow for settling. Use material equal in composition and density to the surrounding area. Backfilling will not be paid for directly but is subsidiary to various bid items.



CONCRETE SERVICE SUPPORT
Overhead (O)



CONCRETE SERVICE SUPPORT
Underground (U)



DETAIL A

See Note 7. Before installing channel that has been cut, file sharp edges and paint with zinc-rich paint. Ensure there is no paint splatter on the pole.

Texas Department of Transportation | Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE SUPPORT TYPES GC, OC, & TP

ED(10)-14

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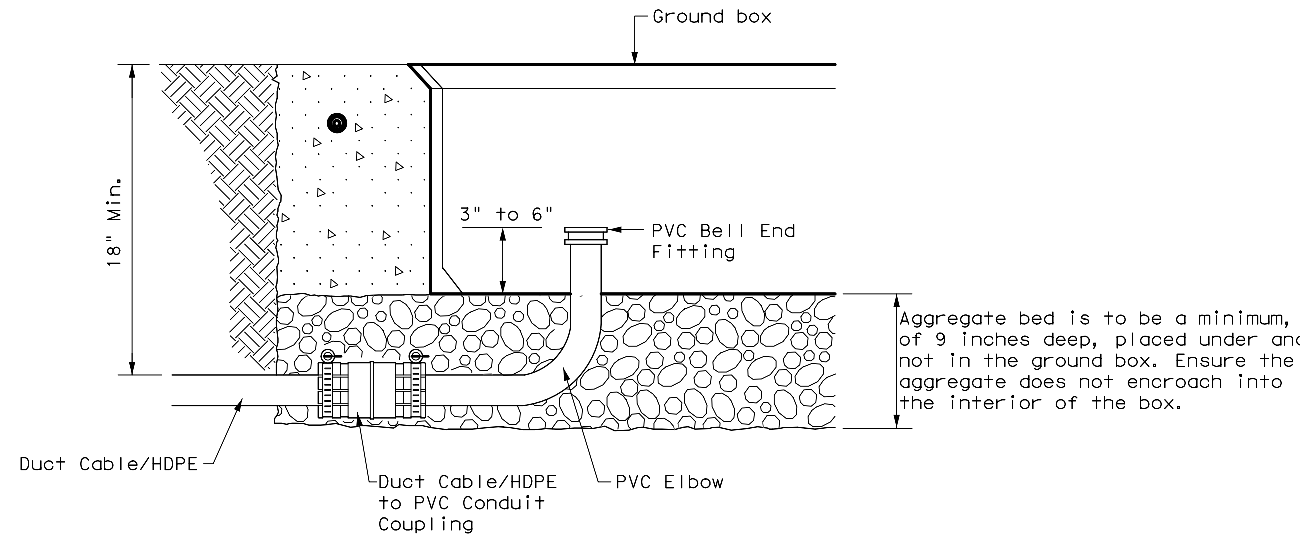
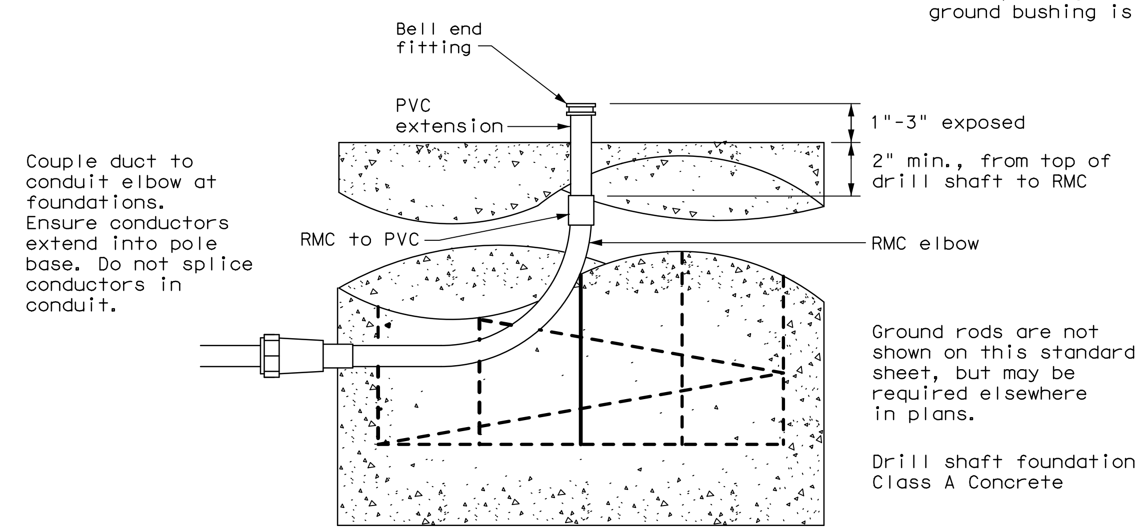
DUCT CABLE & HDPE CONDUIT NOTES

1. Provide duct cable in accordance with Departmental Material Specification (DMS) 11060 "Duct Cable" and Item 622 "Duct Cable." Provide duct cable as listed on the Material Producer List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 622.
2. Provide High-Density Polyethylene (HDPE) conduit in accordance with DMS 11060 and Item 618, "Conduit." Provide HDPE as listed on the MPL on the Department web site under "Roadway Illumination and Electrical Supplies," Item 618.
3. Supply duct cable with a minimum 2 in. diameter, unless otherwise shown in the plans. Provide duct cable and HDPE conduit as shown by descriptive code or on the plans. Bend duct cable and HDPE conduit as recommended by the manufacturer, with a minimum bending radius of 26 in. for 2 in. duct. Follow manufacturers' recommendations when handling duct cable and HDPE conduit reels and during installation of duct cable and HDPE conduit.
4. Do not splice conductors within duct cable or HDPE conduit. Couple duct cable and HDPE entering a ground box or foundation to a PVC elbow. When galvanized steel RMC elbows are called for in the plans and any portion of the RMC elbow is buried less than 18" from possible contact, ground the RMC elbow.
5. Furnish and install duct cable with factory installed conductors, sized as shown in the plans and as required by the National Electrical Code (NEC). The NEC contains specific requirements for duct cable in Article, "Nonmetallic Underground Conduit with Conductors: Type NUCC."
6. When conduit casing is called for in the plans, extend duct cable or HDPE conduit through the conduit casing in one continuous length without connection to the casing.
7. Seal the ends of duct cable or HDPE conduit with duct seal, expandable foam, or other approved method after completing the pull tests required by Item 622.
8. Provide minimum cover of 24 in. under roadways, 18 in. in other locations, or as shown on the plans.
9. Furnish and install listed fittings to couple duct cable or HDPE conduit to other types of conduit. Duct cable and HDPE conduit may be field-threaded and spliced with PVC or RMC threaded couplings; connected with listed tie-wrap fittings; connected using listed coupling made of HDPE with stainless steel external banding clamps and locking rings; connected with approved electrofusion conduit couplings; or connected using an approved chemical fusion method using an epoxy or adhesive specifically designed for HDPE couplings and connectors all installed in accordance with their manufacturer's instructions. Do not use PVC glue on HDPE. Do not use water pipe fittings, or connect conduit with heat shrink tubing.

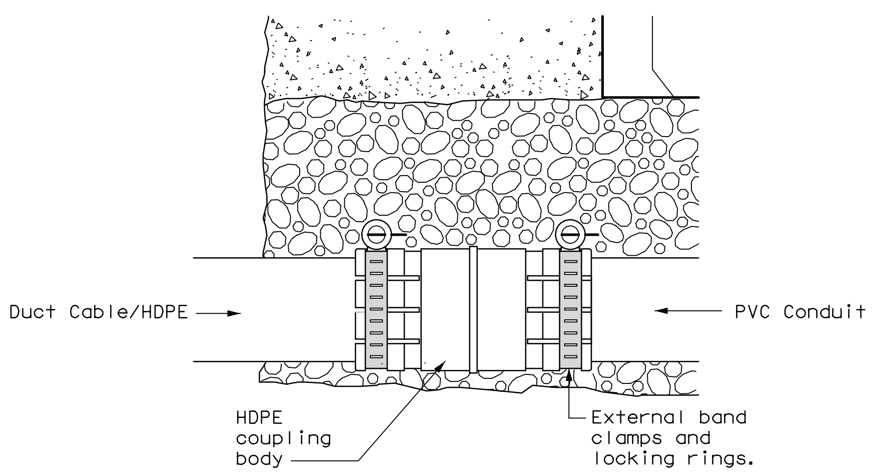


DUCT CABLE/HDPE AT GROUND BOX

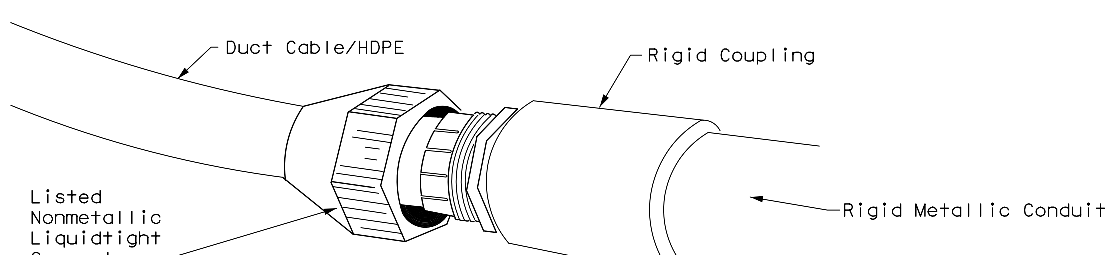
When the upper end of an RMC Ell does not enter the ground box, it may be extended with a SCH-40 PVC conduit nipple and bell end, provided there is a minimum of 18" of cover over all parts of the elbow. If not, a rigid extension and ground bushing is required.



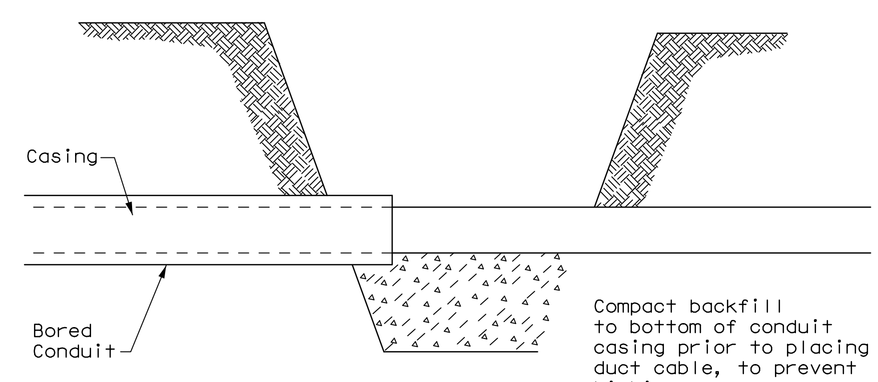
DUCT CABLE / HDPE AT FOUNDATION



DUCT CABLE/HDPE TO PVC



DUCT CABLE/HDPE TO RMC



BORE PIT DETAIL

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS DUCT CABLE/ HDPE CONDUIT

ED(11)-14

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	ODA		WINKLER	184

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ROADWAY ILLUMINATION ASSEMBLY NOTES

1. Details apply to roadway lighting installations bid or referenced under Item 610, "Roadway Illumination Assemblies." Provide, furnish, and install all other materials not shown on the plans which may be necessary for complete and proper construction. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the State such warranties or guarantees.

2. The locations of poles and fixtures may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. 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, Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection.

4. Provide Roadway Illumination Light Fixtures as per TxDOT Departmental Material Specification (DMS) 11010, Item 610, and as shown on the Material Producers List (MPL) for Roadway Illumination and Electrical Supplies.

5. Fabricate steel roadway illumination poles in accordance with Roadway Illumination Poles (RIP) standards and Item 610. Poles fabricated according to RIP standards do not require shop drawing submittals.

   a. Alternate designs to RIP standards or the use of aluminum to fabricate poles will require the submission of shop drawings electronically. For instructions on submitting shop drawings electronically see "Guide to Electronic Shop Drawing Submittal" on the TxDOT web site.

   b. Limitations on use of the RIP standard: The RIP standard details were developed for installations in locations where the 3-second gust basic maximum wind speed is 110 mph, and where the elevation of the base of the pole is less than (i.e. not more than) 25′ above the elevation of the surrounding terrain, in accordance with the "AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals," 6th Edition (2013) of the AASHTO Design Specifications. For poles to be installed in regions where the maximum basic wind speed exceeds 110 mph or to be mounted more than 25′ above the surrounding terrain, provide poles meeting the following requirements:

      i. Submittals. Following the electronic shop drawing submittal process (see Guide to Electronic Shop Drawing Submittal on the TxDOT web site), submit to the Engineer for approval fabrication drawings and calculations for the poles, sealed by a Texas licensed professional engineer (P.E.).

      ii. Luminaire Structural Support Requirements. Provide light poles, arms, and anchor bolt assemblies with a 25 year design life to safely resist dead loads, ice loads and the required basic wind speeds at the location of installation in accordance with the 6th edition (2013) of the AASHTO Design Specifications. For transformer base poles, include transformer base and connecting hardware in calculations and shop drawing submittals. Structurally test all transformer bases to resist the theoretical plastic moment capacity of the pole. Submit certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished with the shop drawings. Show breakaway base model number, manufacturer′s name, and logo on shop drawings. Include on manufacturer′s shop drawings the ASTM designations for all materials to be used.

6. For both transformer and shoe-base type illumination poles, provide and install double-pole breakaway fuse holders as specified by DMS-11040. Breakaway fuse holders are listed on the MPL for Roadway Illumination and Electrical Supplies under Items 610 & 620. Provide 10 amp time delay fuses for breakaway connectors in light poles, or inside the light fixture for underpass luminaires. In each pole, connect luminaires to the breakaway connector with continuous stranded 12 AWG copper conductors as listed on the MPL. Bond all equipment grounding conductors together and to the ground lug in the transformer base or hand hole.

7. Tighten anchor bolts for shoe base, concrete traffic barrier base, and bridge mount roadway illumination poles, in accordance with Item 449.

8. Install T-Base with following procedure:

   a. Anchor Bolt Tightening.

      i. Coat the threads of the anchor bolts with electrically conductive lubricant.

      ii. Place the T-base over the anchor bolts. Foundation must be level and flat. The maximum permissible gap under any one corner of the t-base is 1/8" before nuts are tightened.

      iii. Coat the bearing surfaces of the nuts and washers with electrically conductive lubricant. Install (1) 1/2" hold down washer, (1) lock washer, and (1) nut on each anchor bolt. Turn the nuts onto the bolts so that each is hand-tight against the washer.

      iv. Using a torque wrench, tighten each nut to 150 ft-lb. Uniform contact is required between the foundation and the T-base in the corner regions of the T-base, and all corner gaps must be closed after applying torque. If a gap still exists after torquing to 150 ft-lbs, continue torquing each bolt incrementally until gap is closed or maximum allowable torque of 250 ft. pound is reached, whichever comes first. If 250 ft-lbs is not enough to close the gap the foundation must be leveled. Gaps along the straight sides of the T-bases and the foundation are permissible. Ensure that no high point of contact occurs between the straight sides of the T-base and the foundation.

      v. Check top of T-base for level. If not level then foundation must be leveled.

   b. Top Bolt Procedure

      i. Erect pole over T-base with crane. Coat bolts, nuts, washers, and lock washers with electrically conductive lubricant.

      ii. Install bolts and 1/2" connecting washers from the inside of the T-base, thread up through the pole base. Install flat washers, lock washers and nuts snug tight according to Item 447, "Structural Bolting."

      iii. Tighten each nut to 150 ft-lb. using a torque wrench.

   c. Level and Plumb

      i. Ensure pole is plumb and mast arm is perpendicular to the roadway according to plans to within 5 degrees.

9. Construct luminaire pole foundations in accordance with Item 416, "Drilled Shaft Foundations," and TxDOT standard sheet RID(2).

10. Provide and install underpass luminaires in accordance with Item 610, DMS-11010, and TxDOT standard sheet RID(3). Typical luminaire size for underpass luminaires is 150W HPS or 150W EQ LED.

11. Mount luminaires on arms level as shown by the luminaire level indicator.

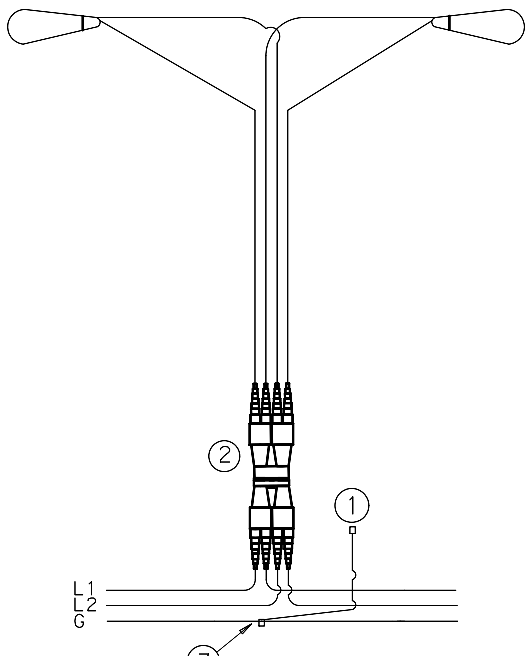
12. Orient luminaires perpendicular to the roadway intended to be lit unless otherwise shown on the plans.

Wiring Diagram Notes:

(1) Use 1/2 in.-13 UNC threaded, copper or tin-plated copper, pole bonding connector, sized appropriately for conductors, bonded to T-base, or use ground lug in handhole as available.

(2) Use pre-qualified two-pole breakaway connectors for all luminaire pole installations. For luminaires fed by a circuit with a neutral conductor, use double pole breakaway connectors with the neutral side unfused and marked white.

(3) Split Bolt or other connector.



L1,L2 = Hot Conductors
G = Grounding Conductor

TYPICAL WIRING DIAGRAM

LUMINAIRES SERVED AT 480V ON 240/480 VOLT SERVICE OR LUMINAIRES SERVED AT 240V FOR 120/240 VOLT SERVICE.

Decorative LED Lighting Notes:

1. LED Drivers in Remote Outdoor enclosures (for drivers that do not include an enclosure as part of a factory assembly):

   a. Provide NEMA 3R outdoor enclosure or as approved.

   b. Install enclosure at least 12" above ground or other horizontal surface. Mount vertically or on ceiling, and avoid direct sun where possible.

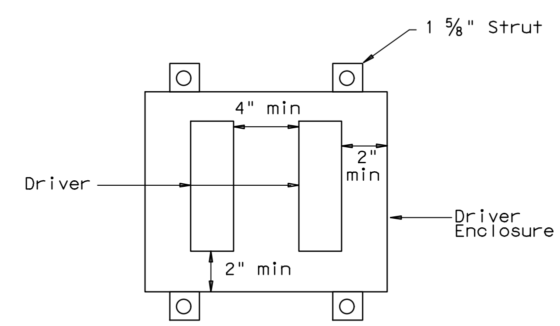
   c. Install drivers with at least 2 inches of space from enclosure walls.

   d. For multiple drivers in an enclosure, provide at least 4 inches side to side and 1 inch end to end from other drivers or electronic equipment

   e. For drivers mounted on back wall of enclosure, mount enclosure on 1 5/8" strut or other standoff to dissipate heat, or mount driver to side of the enclosure or to the metal cover.

   f. Provide remote drivers with a maximum of 100 watts

   g. Provide drivers with documentation of 100,000 hr lifetime at Tcase of 65C or higher.



Driver Spacing In Remote Enclosure

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Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION DETAILS

RID(1)-20

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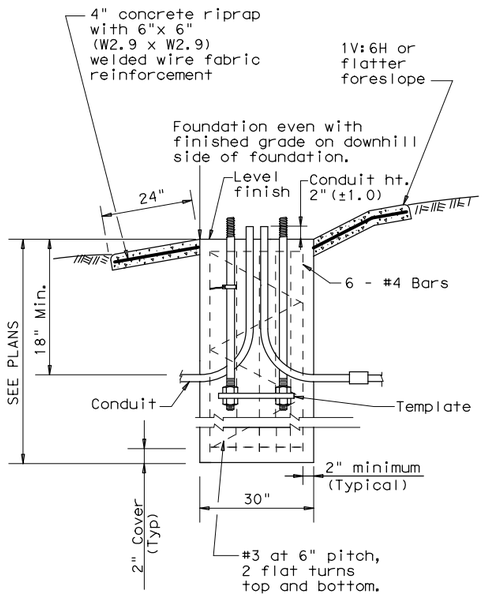
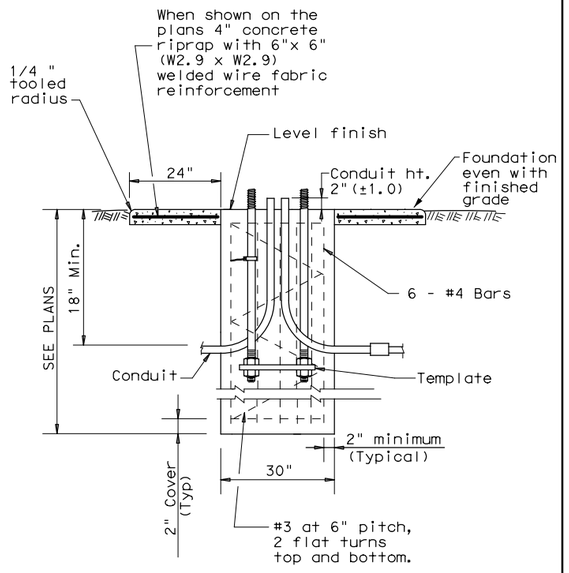


SECTION A-A
SHOWING SLOPED GRADE



SECTION A-A
SHOWING CONSTANT GRADE

TABLE 1

ANCHOR BOLTS

POLE MOUNTING HEIGHT	BOLT CIRCLE		ANCHOR BOLT SIZE
	Shoe Base	T-Base	
<40 ft.	13 in.	14 in.	1in. x 30in.
40-50 ft.	15 in.	17 ¼in.	1 ¼in. x 30in.

TABLE 2

RECOMMENDED FOUNDATION LENGTHS (See note 1)

MOUNTING HEIGHT	TEXAS CONE PENETROMETER N Blows/ft		
	10	15	40
≤20 ft.	6′	6′	6′
>20 ft. to 30 ft.	8′	6′	6′
>30 ft. to 40 ft.	8′	8′	6′
>40 ft. to 50 ft.	10′	8′	6′

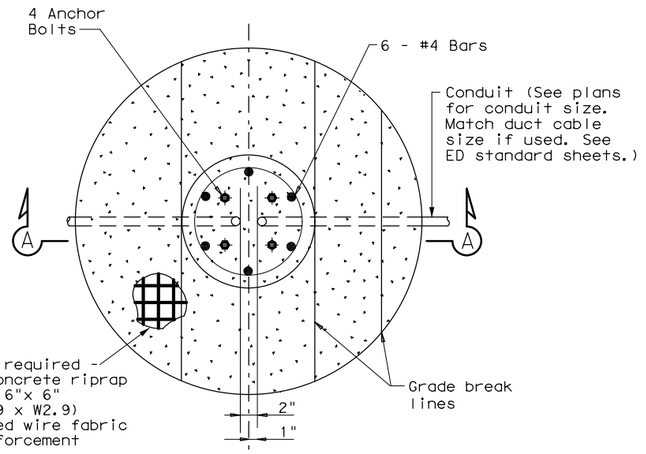
TABLE 3

PAY QUANTITY OF RIPRAP PER FOUNDATION (Install only when shown on the plans)

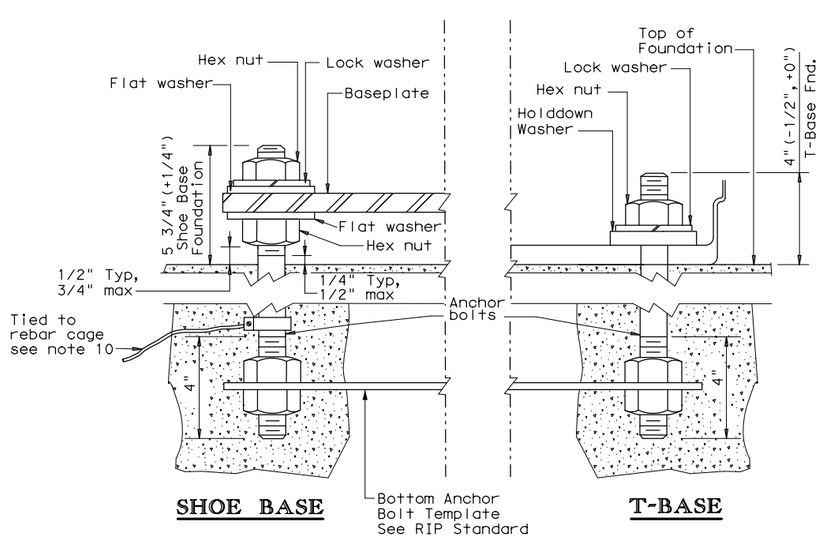
Foundation Diameter	RIPRAP DIAMETER	RIPRAP (CONC) (CL B)
30 in.	78 in.	0.35 CY

GENERAL NOTES:

1. "Recommended Foundation Lengths" table is for information purposes only. Foundation lengths shall be as shown on the plans, or as directed by the Engineer. Foundations will be paid for under Item 416, "Drilled Shaft Foundations," unless otherwise shown on the plans.
2. Erect roadway illumination assembly poles plumb and true. Form and level the top 6" of the foundation so the pole will be plumb. Use leveling nuts to plumb shoe base poles. Do not use shims or leveling nuts under transformer bases. Do not grout between baseplate and the foundation.
3. Ensure Class 2A and 2B fit for anchor bolts and nuts. Tap and chase nuts after galvanizing. Anchor bolt body with rolled threads need not be full size.
4. Use appropriate class of concrete as specified in Items 416 and 432. Concrete for riprap may be upgraded to Class C at no extra cost to the Department.
5. Place riprap around the foundation when called for elsewhere in the plans. Riprap will be paid for under Item 432.
6. Locate breakaway roadway illumination assemblies as shown in the placement table, unless otherwise dimensioned on the plans. Protect non-breakaway illumination assemblies from vehicular impact (i.e. 2.5 ft. behind guard rail or mounted on traffic barrier), or located outside the clear zone, except that 2.5 ft. from curb face is minimum desired for light poles on city streets, 45 mph or less. See Roadway Design Manual for further information.
7. Use 4 hold down and 4 connecting washers on transformer base poles as recommended by the manufacturer and supplied with base.
8. Install a minimum of 2 conduits in each foundation. See lighting layout sheets for locations of foundations with more than 2 conduits. Cap unused conduits in foundations on both ends.
9. Conduit location in foundations is critical for breakaway devices. Place conduits 2 in. apart on centerline as shown.
10. Bond anchor bolt to rebar cage with #6 bare stranded copper conductor. Use listed mechanical connectors rated for embedment in concrete. The bonded steel in the foundation creates a concrete encased grounding electrode which replaces the ground rod.
11. Grade earthwork around T-base foundations even with the finished grade as shown in Section A-A to ensure proper function of the breakaway device. Use riprap on T-base foundations that are located on sloped grades, and as shown on the plans for level grades.



FOUNDATION DETAIL



ANCHOR BOLT DETAIL

TABLE 4

BREAKAWAY POLE PLACEMENT (See note 6)

ROADWAY FUNCTIONAL CLASSIFICATION	** POLE OFFSET (DISTANCE TO FACE OF TRANSFORMER BASE)
Freeway Mainlanes (roadway with full control of access)	15 ft. (minimum and typical) from lane edge
All curbed, 45 mph or less design speed	2.5 ft. minimum (15 ft. desirable) from curb face
All others	10 ft. minimum*(15 ft. desirable) from lane edge

* or as close to ROW line as is practical

** provide 2/5 of the luminaire mounting height behind the pole for "falling area" to prevent encroachment on the other travel lanes. See design guidelines.

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ROADWAY ILLUMINATION DETAILS (RDWY ILLUM FOUNDATIONS)

RID(2)-20

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SHIPPING PARTS LIST - POLES AND LUMINAIRE ARMS

Nominal Mounting Ht. (ft)	Shoe Base Designation Pole	A1	A2	Luminaire	Quantity	T-Base Designation Pole	A1	A2	Luminaire	Quantity	CSB/SSCB Mounted Designation Pole	A1	A2	Luminaire	Quantity
20	(Type SA 20 S - 4)			(150W EQ) LED		(Type SA 20 T - 4)			(150W EQ) LED						
	(Type SA 20 S - 4 - 4)			(150W EQ) LED		(Type SA 20 T - 4 - 4)			(150W EQ) LED						
30	(Type SA 30 S - 4)			(250W EQ) LED		(Type SA 30 T - 4)			(250W EQ) LED		(Type SP 28 S - 4)			(250W EQ) LED	
	(Type SA 30 S - 4 - 4)			(250W EQ) LED		(Type SA 30 T - 4 - 4)			(250W EQ) LED		(Type SP 28 S - 4 - 4)			(250W EQ) LED	
	(Type SA 30 S - 8)			(250W EQ) LED		(Type SA 30 T - 8)			(250W EQ) LED		(Type SP 28 S - 8)			(250W EQ) LED	
	(Type SA 30 S - 8 - 8)			(250W EQ) LED		(Type SA 30 T - 8 - 8)			(250W EQ) LED		(Type SP 28 S - 8 - 8)			(250W EQ) LED	
40	(Type SA 40 S - 4)			(250W EQ) LED		(Type SA 40 T - 4)			(250W EQ) LED		(Type SP 38 S - 4)			(250W EQ) LED	
	(Type SA 40 S - 4 - 4)			(250W EQ) LED		(Type SA 40 T - 4 - 4)			(250W EQ) LED		(Type SP 38 S - 4 - 4)			(250W EQ) LED	
	(Type SA 40 S - 8)			(250W EQ) LED		(Type SA 40 T - 8)			(250W EQ) LED		(Type SP 38 S - 8)			(250W EQ) LED	
	(Type SA 40 S - 8 - 8)			(250W EQ) LED		(Type SA 40 T - 8 - 8)			(250W EQ) LED		(Type SP 38 S - 8 - 8)			(250W EQ) LED	
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	(Type SA 40 S - 10 - 10)			(250W EQ) LED		(Type SA 40 T - 10 - 10)			(250W EQ) LED		(Type SP 38 S - 10 - 10)			(250W EQ) LED	
	(Type SA 40 S - 12)			(250W EQ) LED		(Type SA 40 T - 12)			(250W EQ) LED		(Type SP 38 S - 12)			(250W EQ) LED	
	(Type SA 40 S - 12 - 12)			(250W EQ) LED		(Type SA 40 T - 12 - 12)			(250W EQ) LED		(Type SP 38 S - 12 - 12)			(250W EQ) LED	
50	(Type SA 50 S - 4)			(400W EQ) LED		(Type SA 50 T - 4)			(400W EQ) LED		(Type SP 48 S - 4)			(400W EQ) LED	
	(Type SA 50 S - 4 - 4)			(400W EQ) LED		(Type SA 50 T - 4 - 4)			(400W EQ) LED		(Type SP 48 S - 4 - 4)			(400W EQ) LED	
	(Type SA 50 S - 8)			(400W EQ) LED		(Type SA 50 T - 8)			(400W EQ) LED		(Type SP 48 S - 8)			(400W EQ) LED	
	(Type SA 50 S - 8 - 8)			(400W EQ) LED		(Type SA 50 T - 8 - 8)			(400W EQ) LED		(Type SP 48 S - 8 - 8)			(400W EQ) LED	
	(Type SA 50 S - 10)			(400W EQ) LED		(Type SA 50 T - 10)			(400W EQ) LED		(Type SP 48 S - 10)			(400W EQ) LED	
	(Type SA 50 S - 10 - 10)			(400W EQ) LED		(Type SA 50 T - 10 - 10)			(400W EQ) LED		(Type SP 48 S - 10 - 10)			(400W EQ) LED	
	(Type SA 50 S - 12)			(400W EQ) LED		(Type SA 50 T - 12)			(400W EQ) LED		(Type SP 48 S - 12)			(400W EQ) LED	
	(Type SA 50 S - 12 - 12)			(400W EQ) LED		(Type SA 50 T - 12 - 12)			(400W EQ) LED		(Type SP 48 S - 12 - 12)			(400W EQ) LED	

OTHER Designation Pole	A1	A2	Luminaire	Quantity

GENERAL NOTES:

1. All work, materials and services not shown on the plans which may be necessary for complete and proper construction shall be performed, furnished and installed by the Contractor. Faulty fabrication or poor workmanship in any material, equipment or installation will be considered justification for rejection. Where manufacturers provide warranties or guarantees as a customary trade practice, furnish to the Department such warranties or guarantees.

2. The location of poles and fixtures are diagrammatic only and may be shifted by the Engineer to accommodate local conditions. Install or remove poles and luminaires located near overhead electrical lines using established industry and utility safety practices and in accordance with laws governing such work. Consult with the appropriate utility company prior to beginning such work.

3. Standard Steel Pole Designs. Steel poles fabricated in accordance with the details and dimensions shown herein, shall be considered standard designs. Submission of shop drawings and design calculations for standard designs is not required.

4. Optional Steel Pole Designs. Multi-sided steel poles may be allowed as optional designs, if steel poles are permitted or required, pending approval by the Department as outlined below.

   a. Shop Drawings. Optional designs require submission of shop drawings and design calculations bearing the seal of an engineer licensed in the State of Texas, in accordance with Item 441, "Steel Structures." The Department may elect to pre-approve some shop drawings for optionally designed poles. Submission of shop drawings and design calculations is not required for structures fabricated in accordance with the details of shop drawings on the pre-approved list maintained by the TxDOT Traffic Operations Division. Any deviation from the pre-approved shop drawings will require submission of shop drawings of the complete assembly and design calculations as described above.
   b. Structural Support Design for Luminaires. Lighting support structures shall be designed for a 25 year design life in accordance with the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto. All poles shall be designed for 110 mph 3-second gust wind speeds. The Gust Factor, G, and Wind Importance Factor, Ir, shall be applied as per the AASHTO Specifications assuming a 25-year design life. The design wind pressure for hurricane wind velocities greater than 100 mph shall not be less than the design wind pressure using 100 mph with the non-hurricane Wind Importance Factor, Ir, value. For transformer base poles, fabricator shall include transformer base and connecting hardware in design calculations and shop drawing submittals. All transformer bases shall have been structurally tested to resist the theoretical plastic moment capacity of the pole. Certification of the plastic moment load test and FHWA breakaway requirement test of the model of base being furnished shall be submitted with the shop drawings. Shop drawings shall show breakaway base model number, and manufacturer's name and logo. Manufacturer's shop drawings shall include the ASTM designations for all materials to be used.
   c. Mast Arm Attachments. All poles and attachments shall be structurally designed to support two 12-foot mast arms and luminaires. Poles shall be supplied with mast arm combinations as shown in the plans. All mast arms shall be designed for a 60-pound luminaire having an effective projected area of 1.6 square feet.
   d. Anchor Bolt Assembly. Anchor bolt assemblies for optionally designed poles shall be the same as those shown herein.

5. Aluminum Pole Designs. Aluminum pole designs may be allowed, if aluminum poles are permitted or required, pending approval by the Department as outlined below.

   a. Meet all of the requirements stated above for optional steel pole designs and the following:
      1. Aluminum poles shall be fabricated in accordance with "Structural Welding Code-Aluminum" AWS D1.2.
      2. Aluminum pole designs shall use the same anchor bolt assembly and be subject to the same geometric restraints and other requirements for steel poles specified herein.
      3. Aluminum poles shall be equipped with vibration mitigation devices, as approved by the engineer.
      4. Pole components shall be constructed using the following material:
         Shaft: ASTM B221 or B241 Alloy 6063-T6, ASTM B209 Alloy 5086-H34, ASTM B221 Alloy 6005-T5.
         Base Flange: ASTM B26 Alloy 356.0-T6 or ASTM B108 Alloy 356.0-T6 (Yield strength test required).
         Mast Arm Fitting: ASTM B209 Alloy 6061-T6 or ASTM B221 Alloy 6005-T5.
         Mast Arms: ASTM B241 Alloy 6061-T6 or Alloy 6063-T6.
         Pole Cap: ASTM B209 Alloy 5086-H32 or ASTM B108 or B26 Alloy 356.0-T6.
         Bolts: Stainless Steel AISI 300 series. Bolts threading into aluminum threads shall be treated with anti-seize compound, Never-Seez Compound, Permatex 133K or equal.

6. Special Designs. Poles with architectural treatments shall meet the requirements shown elsewhere in the plans.

7. Luminaire Mounting Height. Actual luminaire mounting height shall be the nominal mounting height given on RIP(2) for all pole-arm combinations except for poles with 4 ft. luminaire arms, which shall be 3'-0" lower than the nominal height, unless otherwise shown or directed.

EXPLANATION OF ROADWAY ILLUMINATION ASSEMBLY DESIGNATIONS

(TYPE SA 50 T - X - X) (400W EQ) LED

SA: Pole and mast arm may be steel or aluminum.
ST: Pole and mast arm must be steel.
AL: Pole and mast arm must be aluminum.
SP: Special (ovalized) steel or aluminum pole for installing on CSB or SSCB. See standard sheet CSB (4), or SSCB (4).

Two numerical digits denote nominal mounting height in feet.

Next letter denotes type of base, (S-Shoe Base, T-Transformer Base, or B-Bridge/Ret.Wall Mount)

First number denotes length of mast arm in feet.

Use of second mast arm is indicated by second dashed number which denotes length in feet.

Luminaire rating in watts (i.e. 400W). Equivalent wattage LED fixtures will include EQ (i.e. 400W EQ)

Last letters indicate light source (S - High Pressure Sodium; LED - LED luminaire)

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ROADWAY ILLUMINATION POLES

RIP(1)-19

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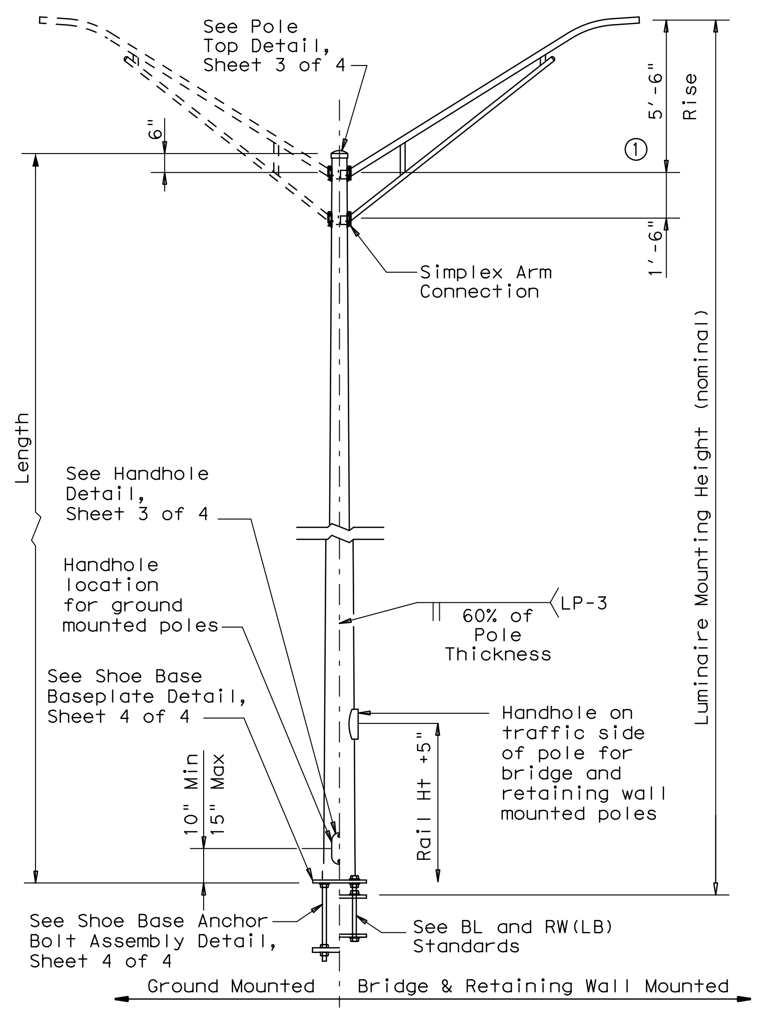
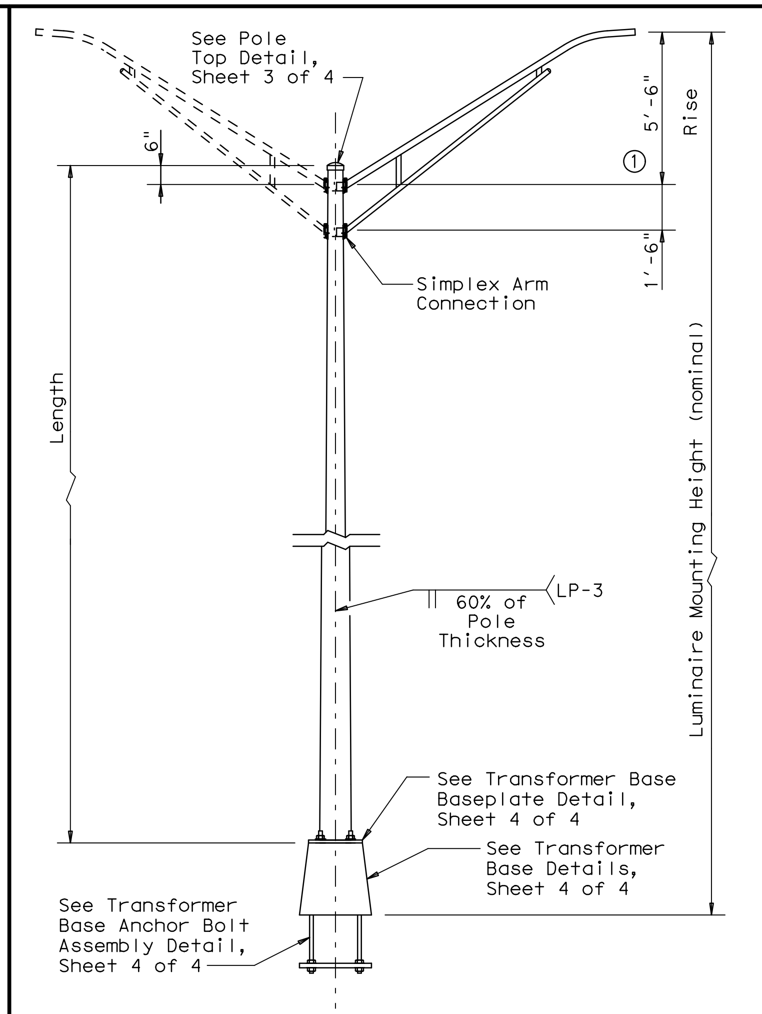
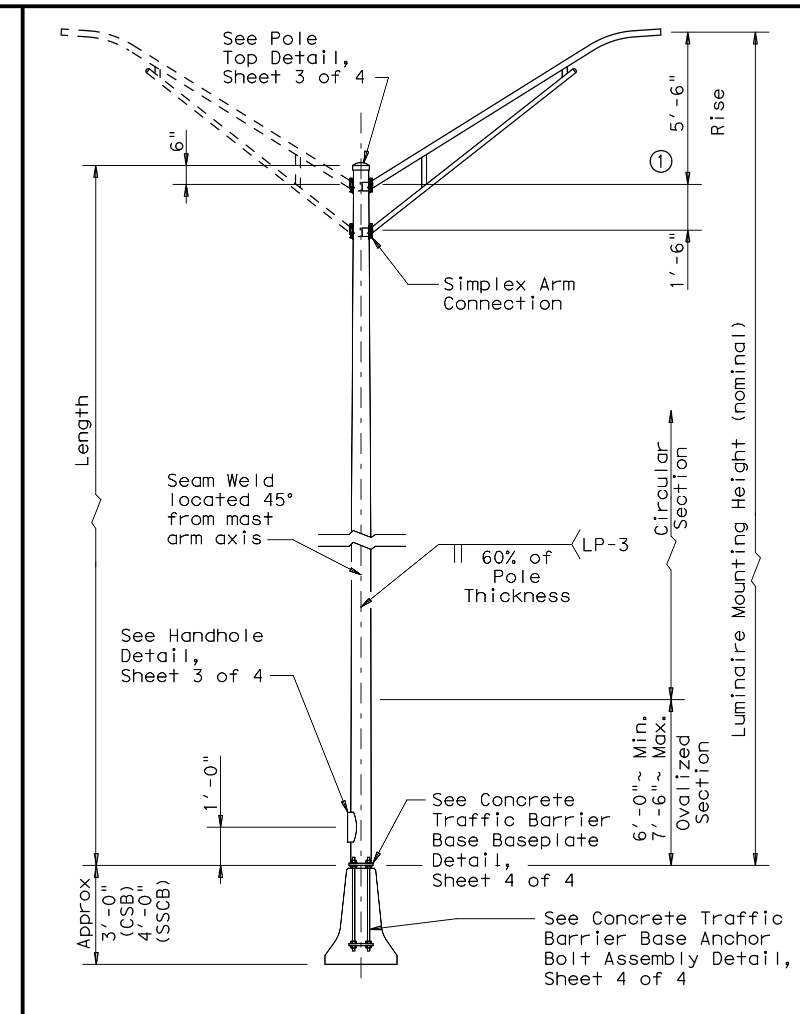


SHOE BASE POLE



TRANSFORMER BASE POLE



CONCRETE TRAFFIC BARRIER BASE POLE

MATERIAL DATA

COMPONENT	ASTM DESIGNATION	MIN. YIELD (ksi)
Pole Shaft (0.14"/ft. Taper)	A572 Gr 50, A595 Gr A, A1011 HSLAS Gr 50 Cl 2 (3), or A1008 HSLAS Gr 50 Cl 2	50
Base Plate and Handhole Frame	A572 Gr.50, or A36	36
T-Base Connecting Bolts	F3125 Gr A325	92
Anchor Bolts	F1554 Gr 55, A193-B7 or A321	55 105
Anchor Bolt Templates	A36	36
Heavy Hex (H.H.) Nuts	A194 Gr 2H,or A563 Gr DH	
Flat Washers	F436	

NOTES:

(1) 2'-6" rise for 4 ft. luminaire arms.

(2) Before ovalized as shown on Concrete Traffic Barrier Base Baseplate details, Sheet 4 of 4.

(3) A1011 SS Gr 50 may be used instead of HSLAS, provided the material meets the elongation requirements for HSLAS.

SHOE BASE POLE

Luminaire Mounting Height (Nominal)(ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	4.90	15.00	0.1196	7.1
30.00	7.50	4.00	25.00	0.1196	13.2
31.00-39.00	8.00	4.36-3.24	26.00-34.00	0.1196	20.7
40.00	8.50	3.60	35.00	0.1196	20.7
50.00	10.50	4.20	45.00	0.1196	30.3

TRANSFORMER BASE POLE

Luminaire Mounting Height (Nominal)(ft)	Base Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft)
20.00	7.00	5.11	13.50	0.1196	7.1
30.00	7.50	4.21	23.50	0.1196	13.2
31.00-39.00	8.00	4.57-3.45	24.50-32.50	0.1196	20.7
40.00	8.50	3.81	33.50	0.1196	20.7
50.00	10.00	3.91	43.50	0.1196	30.3

CONCRETE TRAFFIC BARRIER BASE POLE (CSB/SSCB)

Luminaire Mounting Height (Nominal)(ft)	Base (2) Diameter (in)	Top Diameter (in)	Length (ft)	Pole Thickness (in)	Design Moment (K-ft) About ℄ of Rail	Design Moment (K-ft) Perp. to Rail
28.00	9.00	5.78	23.00	0.1196	10.3	13.2
38.00	9.00	4.38	33.00	0.1196	16.6	20.8
48.00	10.50	4.48	43.00	0.1345	25.1	30.5

POLE ASSEMBLY FABRICATION TOLERANCES TABLE

DIMENSION	TOLERANCE
Shaft length	+1"
I.D. of outside piece of slip fitting pieces	+1/8", -1/16"
O.D. of inside piece of slip fitting pieces	+1/32", -1/8"
Shaft diameter: other	+3/16"
Out of "round"	1/4"
Straightness of shaft	±1/4" in 10 ft
Twist in multi-sided shaft	4° in 50 ft
Perpendicular to baseplate	1/8" in 24"
Pole centered on baseplate	±1/4"
Location of Attachments	±1/4"
Bolt hole spacing	±1/16"

GENERAL NOTES:

1. Designs conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals , 6th Edition (2013) and Interim Revisions thereto. Design 3-Second Gust Wind Speed equals 110 mph with a 1.14 gust factor. A wind importance factor of 0.80 is applied to adjust the wind speed to a 25 year recurrence interval. Design moments listed in tables assume base of pole is 25' above natural ground level.

2. Structures are designed to support two 12' luminaire mast arms and luminaires. Mast arms are designed to support a 60-pound luminaire having an effective projected area of 1.6 square feet.

3. Fabrication shall be in accordance with the Specifications and with the details, dimensions, and weld procedures shown herein. Do not submit shop drawings for roadway illumination pole assemblies fabricated in accordance 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 these sheets and the Specifications. In the absence of specified fabrication tolerances, dimensions shall be within the tolerances generally obtainable in normal fabrication practice.

4. For mounting heights between values shown in the tables, use base diameter and thickness values for the larger height.

5. Unless otherwise noted, all steel parts shall be galvanized in accordance with Item 445, "Galvanizing."

6. Steel poles shall be fabricated in accordance with Item 441,"Steel Structures." Longitudinal seam welds for pole sections shall have 60% minimum penetration. All welding shall be in accordance with AWS D1.1, Structural Welding Code-Steel.

7. Two-section poles joined by circumferential welds will not be permitted, unless otherwise shown on the plans. Poles may be fabricated in two sections and field-assembled by the lap-joint method. The two sections shall telescope together with a lap length of not less than 1-1/2 times the shaft diameter at the lap joint.

8. Alternate material equal to or better than material specified may be substituted with the approval of the Engineer.

9. Lubricate and tighten anchor bolts, when erecting shoe base poles and concrete traffic barrier base poles, in accordance with Item 449, "Anchor Bolts."

10. All poles, except Transformer Base Poles, shall have hand holes with reinforcing frames and covers. For ground mounted shoe base poles, hand holes shall be placed 90 degrees to mast arm unless otherwise noted on the plans. For poles mounted on a concrete traffic barrier with one luminaire arm, hand holes shall be located 180 degrees from luminaire arm. For poles mounted on a concrete traffic barrier with two luminaire arms, all hand holes shall be on the same side of the barrier. For poles mounted on a bridge lighting bracket or a retaining wall lighting bracket, hand hole shall be on traffic side of the pole, at a height that will clear the barrier.

11. The finished pole shall have a smooth, uniform finish free of pits, blisters, or other defects. Scratched, chipped, and other damaged galvanized areas on poles and mast arms shall be repaired in accordance with Item 445, "Galvanizing."

12. Pole length is based on a 5'-6" luminaire arm rise. 4 ft. luminaire arms have a 2'-6" rise. A pole with 4 ft. luminaire arms will have an actual mounting height 3'-0" less than the nominal mounting height. Increasing the pole length to meet the nominal mounting height is allowed, but unnecessary unless otherwise directed by the engineer.

13. Erect transformer base poles in accordance with sheet RID(1).

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ROADWAY ILLUMINATION POLES

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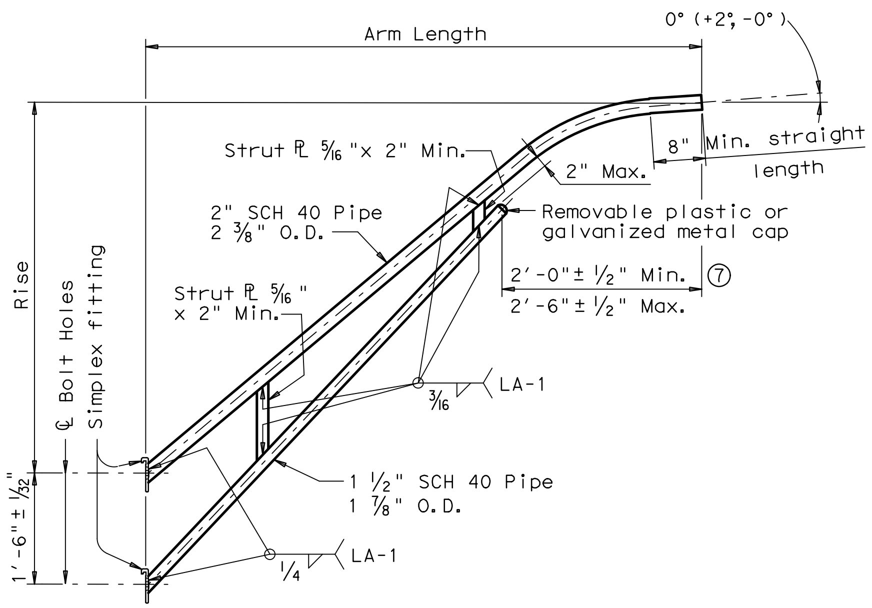
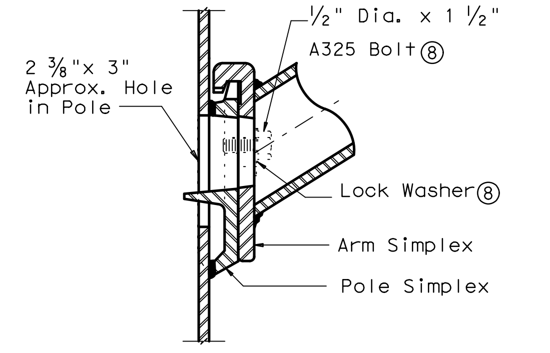


LUMINAIRE ARM

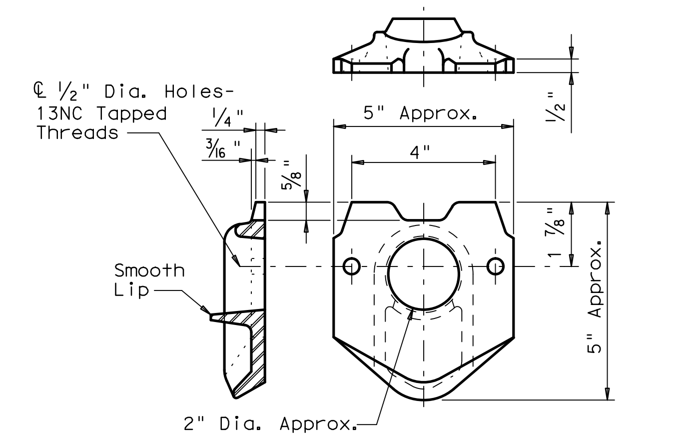
LUMINAIRE ARM DIMENSIONS		
Nominal Arm Length	Arm Length	Rise
4'-0"	3'-6"	2'-6"
6'-0"	5'-6"	5'-6"
8'-0"	7'-6"	5'-6"
10'-0"	9'-6"	5'-6"
12'-0"	11'-6"	5'-6"

ARM ASSEMBLY FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Arm Length	±1"
Arm Rise	±1"
Deviation from flat	1/8" in 12"
Spacing between holes	±1/32"

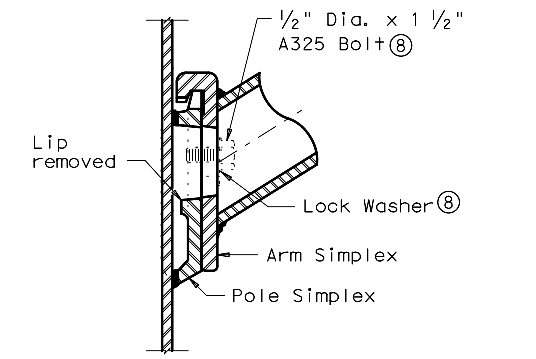


UPPER SIMPLEX FITTING

(Gusset not shown for clarity)



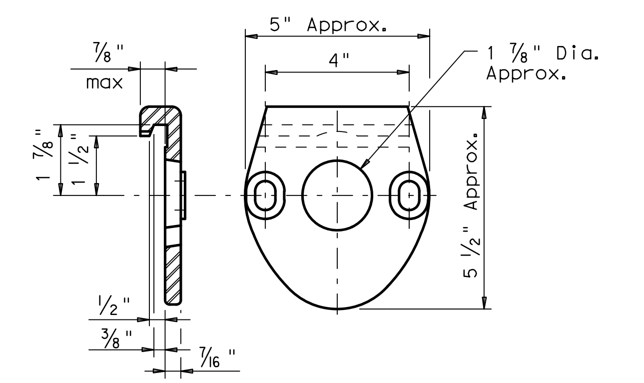
POLE SIMPLEX DETAIL 9



LOWER SIMPLEX FITTING

(Gusset not shown for clarity)

SECTION B-B



ARM SIMPLEX DETAIL 9

NOTES:

4 Any of the materials listed for plates may be used where the drawings do not specify a particular ASTM designation.

5 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.

6 A572, A1008 HSLAS-F, and A1011 HSLAS-F materials may have higher yield strengths but shall not have less elongation than the grade indicated.

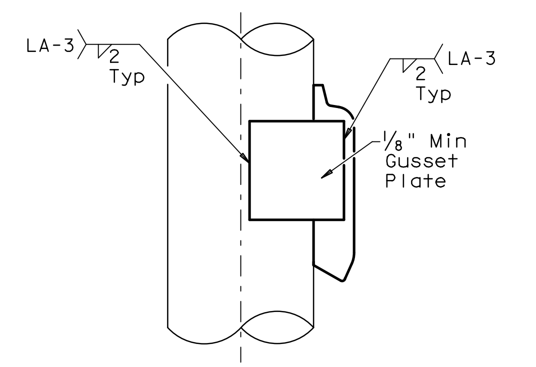
7 Dimensional limits are given to show acceptable variation in design. All of a Fabricator's production of a particular arm length shall have the same dimensions within specified tolerances.

8 Each pole simplex fitting shall be supplied with 2 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.

9 Proposed deviations in arm simplex dimensions or materials must be submitted to the Department for approval.

10 A welded handhole frame is permissible. Maximum of two (2) CJP weld splices is allowed.

MATERIALS	
Pole or Arm Simplex	ASTM A27 Gr 65-35 or Gr 70-36, A148 Gr 80-50, A576 Gr 1021 5, or A36 (Arm only)
Arm Pipes	ASTM A53 Gr A or B, A500 Gr B, A501, A 1008 HSLAS-F Gr 50 6, or A1011 HSLAS-F Gr 50 6
Arm Struts and Gusset Plates 4	ASTM A36, A572 Gr 50 6, or A588
Misc.	ASTM designations as noted



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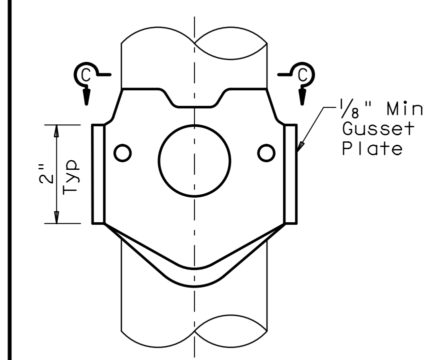
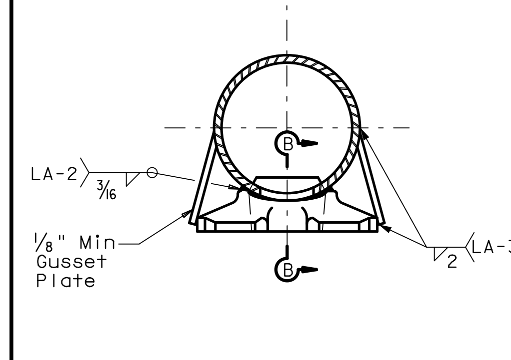
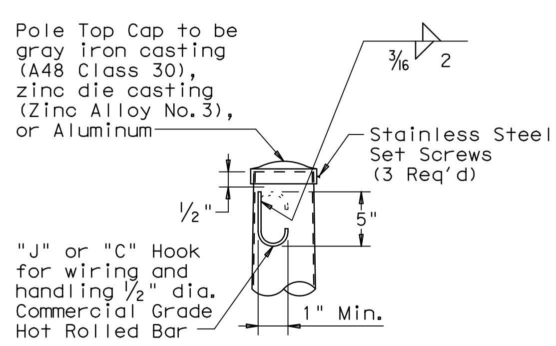


ELEVATION

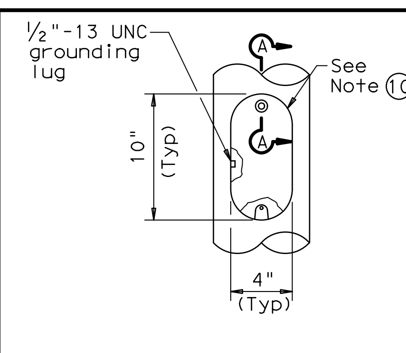


SECTION C-C

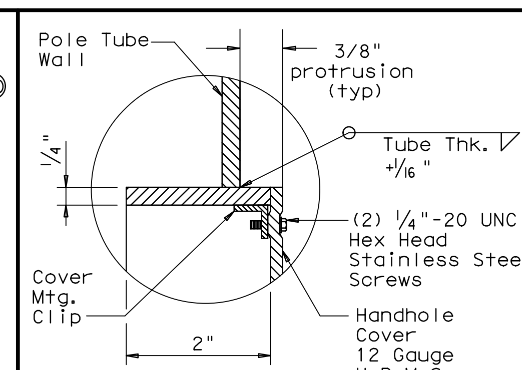
SIMPLEX ATTACHMENT DETAIL



POLE TOP



ELEVATION



SECTION A-A

HANDHOLE

SHEET 3 OF 4

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ROADWAY ILLUMINATION POLES

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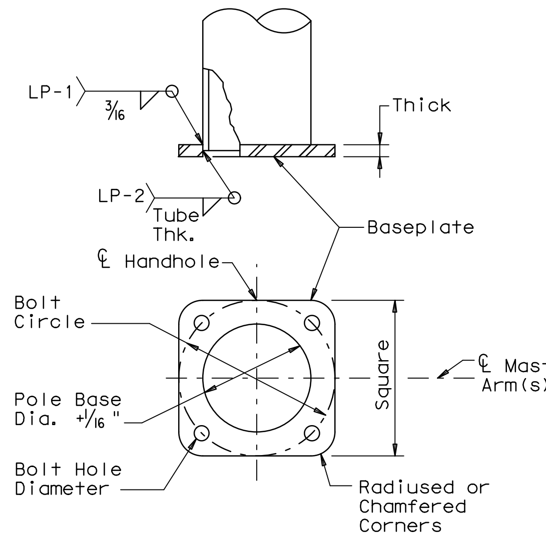
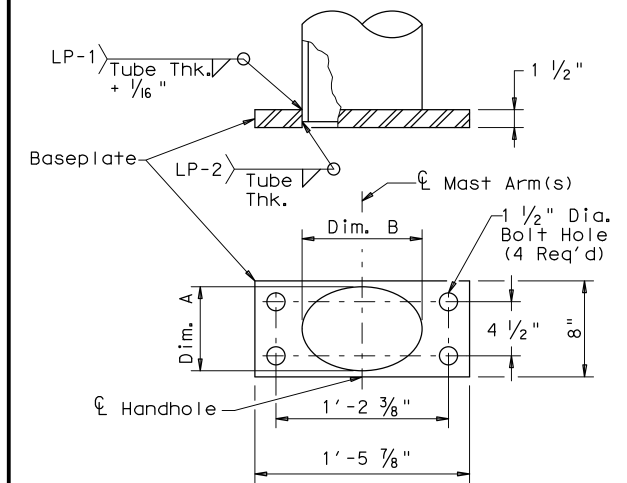


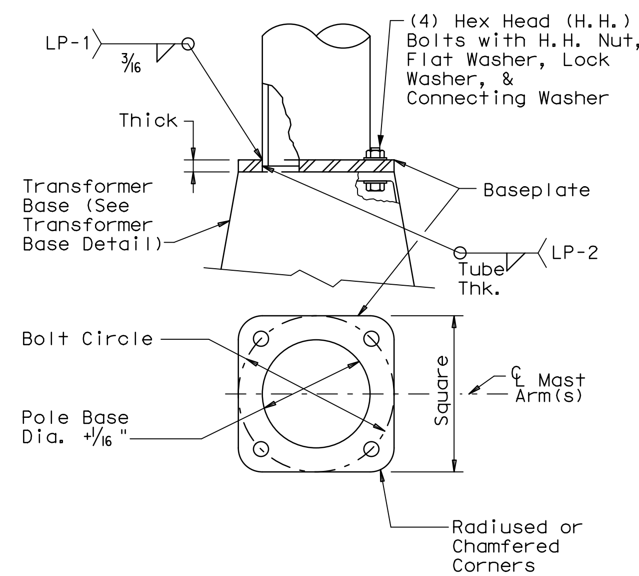
SHOE BASE BASEPLATE

SHOE BASE BASEPLATE TABLE				
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	BOLT HOLE DIAMETER
20′- 39′	13"	13"	1 1/4"	1 1/4"
40′	15"	15"	1 1/4"	1 1/2"
50′	15"	15"	1 1/2"	1 1/2"



CONCRETE TRAFFIC BARRIER BASE BASEPLATE

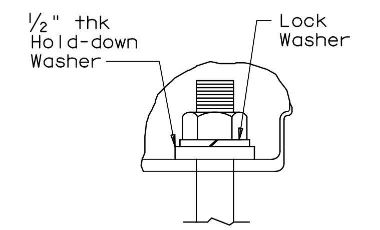
CONCRETE TRAFFIC BARRIER BASE BASEPLATE TABLE			
MOUNTING HEIGHTS (nominal)	POLE DIA. (12)	DIM. A	DIM. B
28′- 38′	9"	7"± 1/4"	10"± 1/4"
48′	10 1/2"	7"± 1/4"	13"± 1/4"



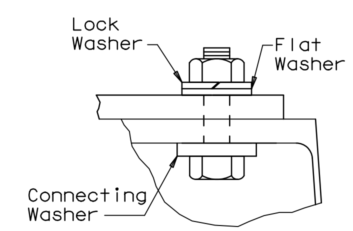
TRANSFORMER BASE BASEPLATE

TRANSFORMER BASE BASEPLATE TABLE						
MOUNTING HEIGHTS (nominal)	BOLT CIRCLE	SQUARE	THICK	CONNECTING BOLT DIA.	BOLT HOLE DIAMETER	TRANSFORMER BASE TYPE
20′- 39′	13"	13"	1 1/4"	1"	1 1/4"	A
40′	15"	15"	1 1/4"	1 1/4"	1 1/2"	B
50′	15"	15"	1 1/2"	1 1/4"	1 1/2"	B

TRANSFORMER BASE TABLE		
TYPE	TOP B.C.	BTM. B.C.
A	13"	14"
B	15"	17 1/4"



DETAIL A



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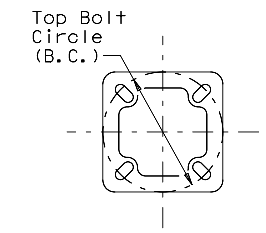
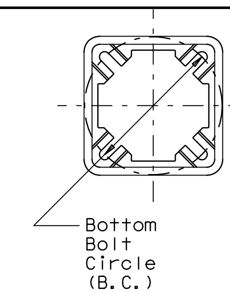


TOP PLAN



BOTTOM PLAN

GENERAL NOTES:

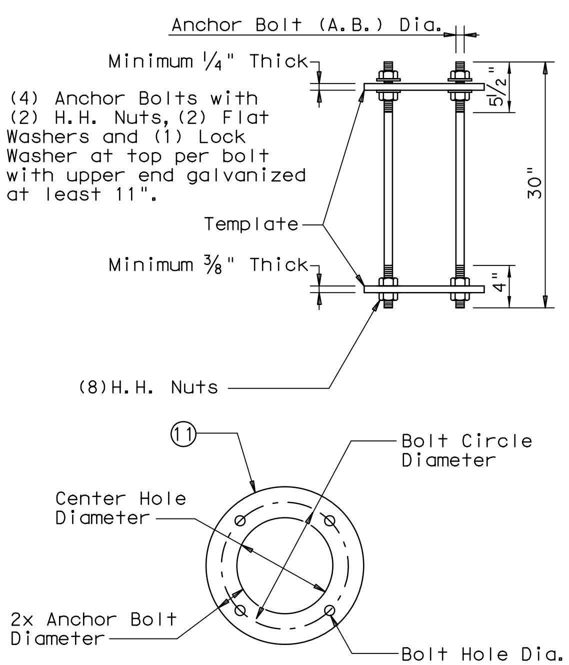
1. For mounting heights between those shown in the table, use the values in the table for the larger mounting height.
2. All breakaway bases shall meet the breakaway requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 6th Edition (2013) and Interim Revisions thereto, and shall have been tested by FHWA-approved methods. All bases shall have been structurally tested to resist 150% of the design moment.
3. Transformer bases shall be cast from aluminum, ASTM B108 or B26 Alloy 356.0-T6, or other material approved by the Engineer. Four Hex Head (H.H.) bolts with four H.H. nuts, four lock washers, four flat washers,and connecting and hold-down washers as recommended by the manufacturer, galvanized to ASTM A153 Class C or D, or B695 Class 50, shall be provided with each transformer base for connecting the pole. Bolts shall be ASTM A325 or approved equal. Nuts shall be ASTM A563 grade DH galvanized.
4. Bases shall be stamped, incised or by other approved permanent means, marked to show fabricator's name or logo, and model number. Such information shall be placed in a readily seen location, inside or outside the base, but shall not be placed on the door.
5. Doors for transformer bases shall be made of plastic, fiberglass or other non-metallic material approved by the Engineer and shall be attached with stainless steel screws or bolts. Transformer bases shall be cleaned by grit blast cleaning after heat treatment. Certification by the manufacturer of heat treatment shall be furnished with transformer bases. The certification shall show the metal alloy and temper and that the base meets those requirements, chemical and physical. The certification shall also show the material ASTM specification. Transformer bases shall be cast with a removable tab bar for material testing. Some bars may have been removed by the manufacturer for testing.

NOTES:

(11) Anchor Bolt Templates do not need to be galvanized.

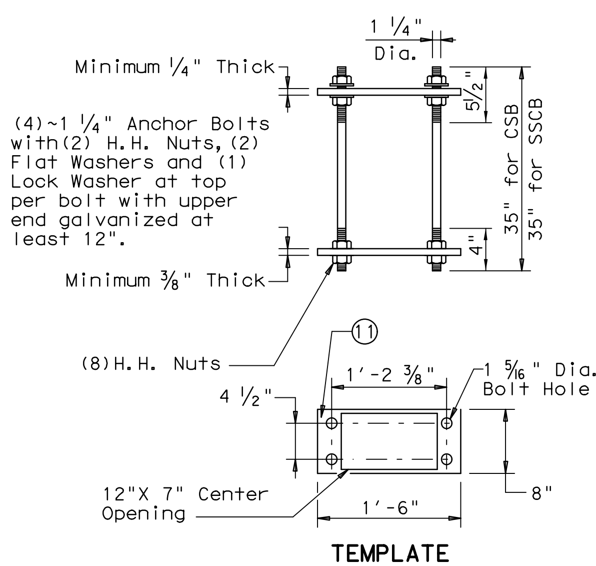
(12) Pole diameter before ovalized.

ANCHOR BOLT FABRICATION TOLERANCES TABLE	
DIMENSION	TOLERANCE
Length	± 1/2"
Threaded length	± 1/2"
Galvanized length (if required)	- 1/4"



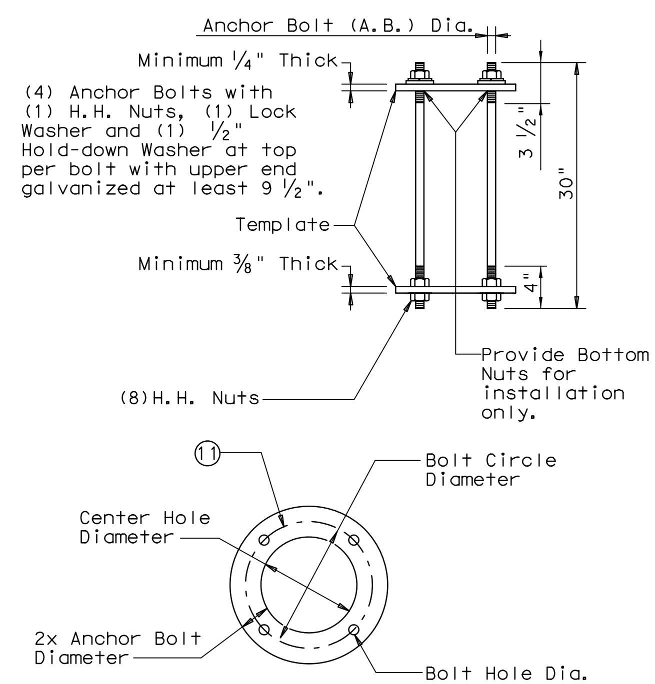
SHOE BASE ANCHOR BOLT ASSEMBLY

SHOE BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′-39′	1"	13"	11"	1 1/16"
40′-50′	1 1/4"	15"	12 1/2"	1 5/16"

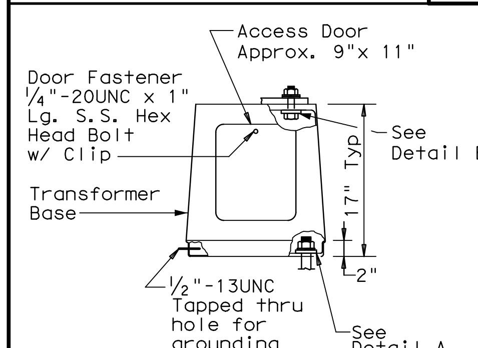


CONCRETE TRAFFIC BARRIER BASE ANCHOR BOLT ASSEMBLY

TRANSFORMER BASE ANCHOR BOLT ASSEMBLY TABLE				
MOUNTING HEIGHTS (nominal)	A.B. Dia.	BOLT CIRCLE DIAMETER	CTR. HOLE DIAMETER	BOLT HOLE DIAMETER
20′- 39′	1"	14"	12"	1 1/16"
40′- 50′	1 1/4"	17 1/4"	14 3/4"	1 5/16"



TRANSFORMER BASE ANCHOR BOLT ASSEMBLY



ELEVATION

TRANSFORMER BASE DETAILS

SHEET 4 OF 4

Texas Department of Transportation

Traffic Safety Division Standard

ROADWAY ILLUMINATION POLES

RIP(4)-19

FILE: rip-19.dgn	DN:	CK:	DW:	CK:
©TxDOT January 2007	CONT	SECT	JOB	HIGHWAY
REVISIONS 7-17 12-19	1371	01	023	FM 1232
	DIST		COUNTY	SHEET NO.
	ODA		WINKLER	190

730

DATE: 7/17/2023
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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

2.

☐ No Action Required ☒ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SWP3 and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SWP3 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. Monument Draw

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	☒ Biodegradable Erosion Control Logs
☒ Biodegradable Erosion Control Logs	☒ Biodegradable Erosion Control Logs	☐ Vegetation Lined Ditches
(SEE TCP SHEETS)	☐ 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. The contractor shall only disturb the vegetation necessary for construction.
2. Re-vegetation of disturbed areas would be compliance with EO 13112 on Invasive Species.
3. Any landscaping shall be in compliance with the Executive Memorandum on Beneficial Landscaping.
4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

☐ No Action Required ☒ Required Action

Action No.

1. Avoid the Texas horned lizard if encountered in the project area, and avoid harvester ant mounds where feasible.

2. Avoid harm to migratory birds, eggs, and active nests;
   * Do not disturb, destroy, or remove active nests, including ground nesting birds, during the nesting season.
   * Inactive nests and/or vegetation suspected to contain nests should be removed outside of nesting season (nesting season is typically March 15 to September 15).

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	SWP3:	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.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

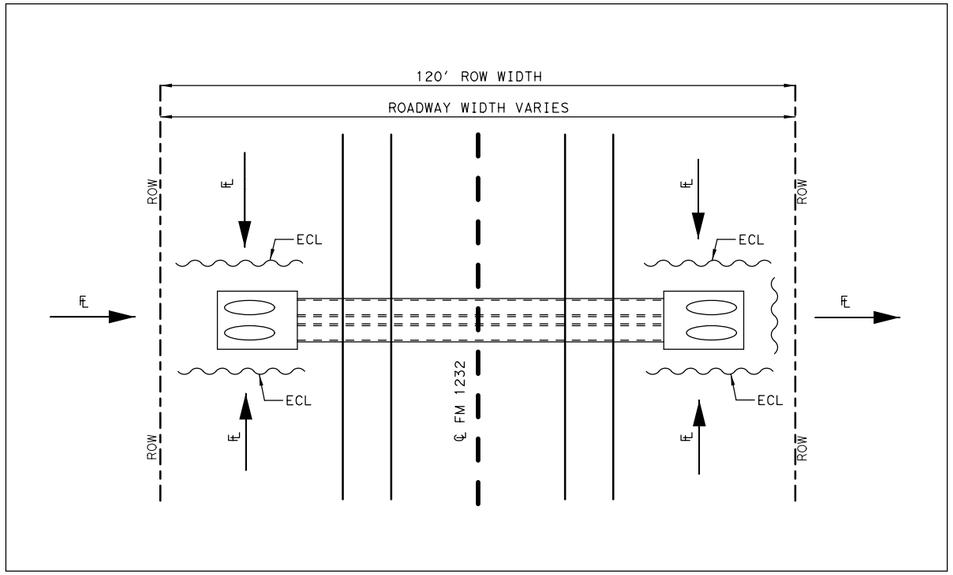
3.

Texas Department of Transportation — Design Division Standard

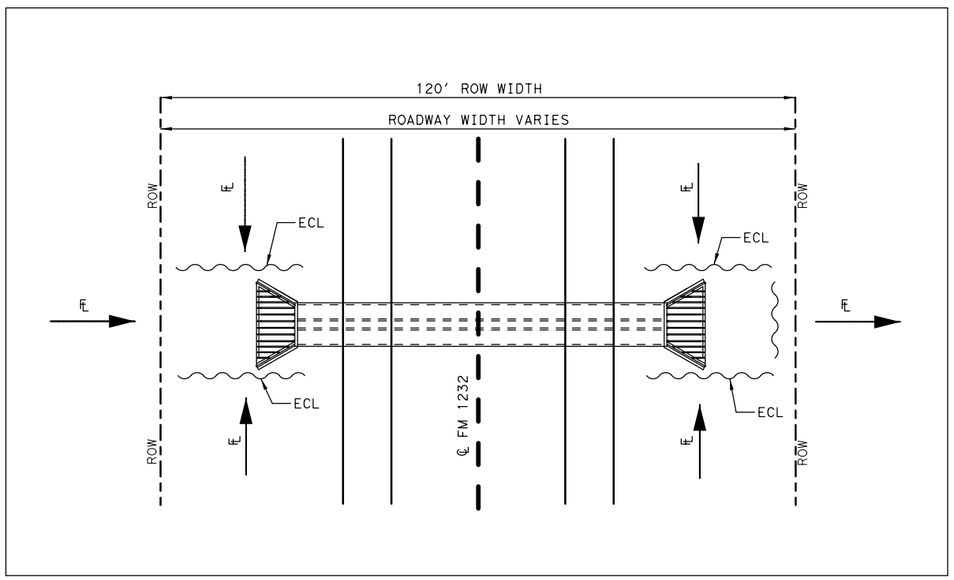
ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR	
©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY	
REVISIONS 12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	1371	01	023	FM 1232	
	DIST	COUNTY		SHEET NO.	
	ODA	WINKLER		191	

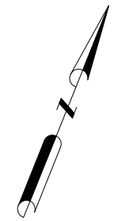


EROSION CONTROL LOG DETAIL FOR PIPES

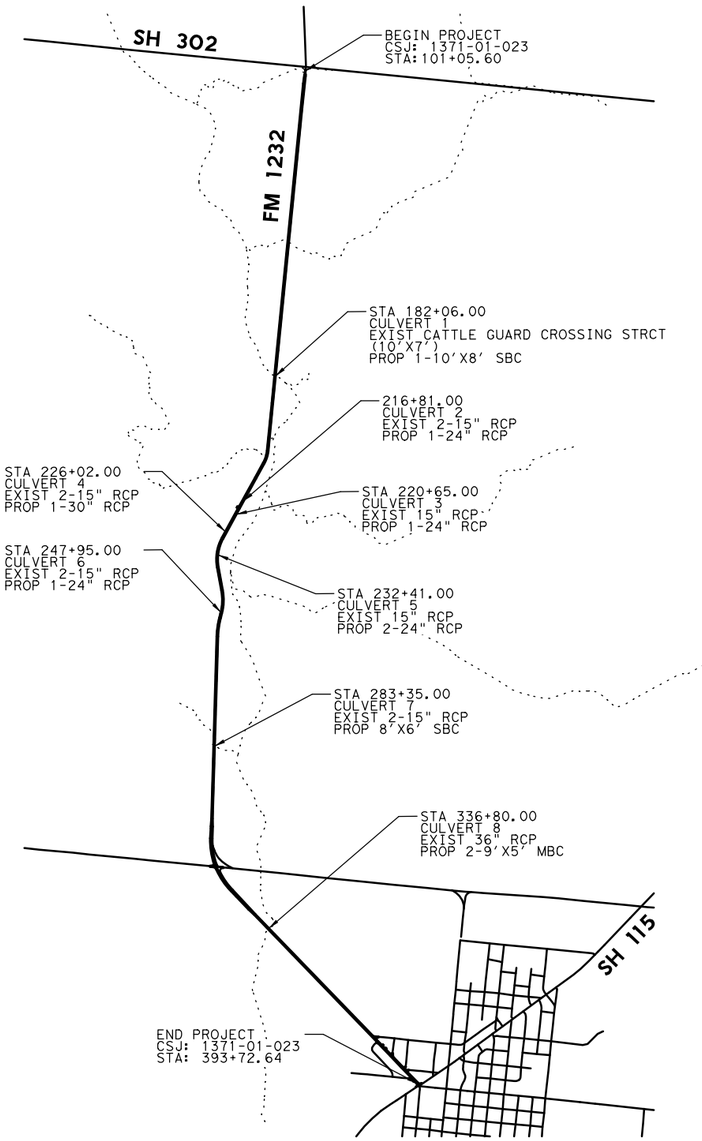


EROSION CONTROL LOG DETAIL FOR BOX CULVERT

	0506 6042	0506 6043	DATE INSTALLED:	DATE REMOVED:
	BIODEG EROSN CONT LOGS (INSTL) (18")	BIODEG EROSN CONT LOGS (REMOVE)		
	LF	LF		
CULVERT 1	180	180		
CULVERT 2	180	180		
CULVERT 3	180	180		
CULVERT 4	180	180		
CULVERT 5	180	180		
CULVERT 6	180	180		
CULVERT 7	180	180		
CULVERT 8	180	180		
TOTALS:	1,440	1,440		



NOT TO SCALE



DATE	BY	REV	REVISION

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER

7/17/2023

OMEGA ENGINEERS, INC.
6090 SURETY DR, STE #104
EL PASO, TEXAS 79905
OMEGAENGINEERS.COM
TX PE Firm Reg. No. F-2147
P:915 308 6413 F:281 647 9184

FM 1232
SH 302 TO SH 115

SW3P

SHEET 1 OF 1

		FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
DSN	OEI	6	SEE TITLE SHEET		192
CHK	OEI	STATE	DIST.	COUNTY	
DRN	OEI	TEXAS	ODA	WINKLER	
CHK	OEI	CONT.	SECT.	JOB	HIGHWAY NO.
		1371	01	023	FM 1232

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7/17/2023
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STORM WATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TPDES General Permit TXR150000. The operator, The Texas Department of Transportation ensures that: Project specifications provide that adequate BMPs have been developed for this project. The contractor shall be the party responsible for implementing the BMPs described herein. The contractor shall implement changes approved by the Project Engineer to the SWP3 within the times specified in the SWP3 or the TPDES General Permit. Operators affected by modifications to specifications will be notified in a timely manner.

1. SITE OR PROJECT DESCRIPTION:

NATURE OF THE CONSTRUCTION ACTIVITY: SEE TITLE SHEET

POTENTIAL POLLUTANTS AND	SOURCES:
Sediment laden storm water	*Storm water conveyance over disturbed areas*
Fuels, oils, and lubricants	*Construction vehicles and storage areas*
Construction debris and waste	*Various construction activities*
Sanitary waste	*Restroom facilities*
Trash	*Construction site and Receptacles*

SEQUENCE OF ACTIVITIES THAT WILL DISTURB SOILS:

1. *Blade existing topsoil into windrows, prep ROW, clear and grub*
2. *Grading operations, excavation, and embankment*
3. *Remove existing culverts, install proposed culverts*
4. *Rework slopes, grade ditches*
5.
6.
7.
8.

AREAS:

TOTAL AREA OF PROJECT: 80.91 ACRES

TOTAL AREA OF SOIL DISTURBANCE: 32 ACRES

TOTAL AREA OFF-SITE: ACREAGE AND DESCRIPTION TO BE ATTACHED

WEIGHTED RUNOFF COEFFICIENT (BEFORE AND AFTER CONSTRUCTION):

C (BEFORE): 0.7 *CN (BEFORE): N/A*

C (AFTER): 0.9 *CN (AFTER): N/A*

DATA DESCRIBING THE SOIL: *Existing soils consist primarily of Bluepoint soil types. The project is within the Bluepoint association. The Bluepoint soils are described as deep, gently to strongly sloping soils that have a loomy sand underlying material on the Rio Grande floodplain. The Bluepoint association rolling soil is made up of very pale brown, loose, alkaline loamy fine sand to a depth of at least 60-in.*

GENERAL LOCATION MAP: *SEE TITLE SHEET*

DETAILED SITE MAP: *SEE PROJECT LAYOUTS*

THE LOCATION AND DESCRIPTION OF CONCRETE AND ASPHALT PLANTS:

Supporting Asphalt Plant Facilities will be located off site.

Supporting Concrete Plant Facilities will be located off site.

NAME OF RECEIVING WATERS: *The runoff plus surrounding watershed will be handled primarily by surface flows discharging into catch basins, conveyed by concrete culverts, and ultimately discharged of existing natural streams. The Rio Grande is located approximately 3.75 miles southwest of project limits.*

A COPY OF TPDES CGP TXR150000 IS INCLUDED IN THE SWP3 FILE.

See SWP3 Notebook for environmental, archeological and historical documentation

401 WATER QUALITY CERTIFICATION: YES____ NO__X__

2. BEST MANAGEMENT PRACTICES (BMPs):

EROSION AND SEDIMENT CONTROLS: Erosion and sediment controls have been designed to retain sediment on-site. Controls shall be utilized to reduce off site transport of suspended sediments and pollutants if it is necessary to pump water from the site. Control measures shall be installed per specifications or as directed. Sediment must be removed from controls per the plan requirements or manufacturers recommendations, but no later than the time that design capacity has been reduced by 50%. If sediment escapes the site, accumulations will be removed to minimize further negative effects. Controls will be developed to limit the off site transportation of litter, construction debris, and construction materials.

INTERIM (INT), PERMANENT (PER), AND 401 CERTIFICATION BMP'S:

EROSION CONTROLS:	401	INT	PER
☐ *Blankets and Matting*	__	__	X
☐ *Diversion Dike*	__	__	__
☐ *Preserve Existing Vegetation*	__	__	X
☐ *Soil Stabilization*	__	X	__
☐ *Permanent Vegetation*	__	__	X
☐ *No Erosion Controls are Required.*			

SEDIMENT CONTROLS:	401	INT	PER
☐ *Silt Fence*	__	__	__
☐ *Rock Berm*	__	__	__
☐ *Erosion Control Logs*	__	X	__
☐ *Vegetative Filter Strips*	__	__	__
☐ *Ditch Block*	__	__	__
☐ *No Sediment Controls are Required.*			

POST CONSTRUCTION TSS CONTROL (401 CERTIFICATION ONLY):

- ☐ *Vegetation Lined Drainage Ditch*
- ☐ *Retention/Irrigation*
- ☐ *Erosion Control Compost*
- ☐ *Grassy Swales*
- ☐ *Vegetative Filter Strips*
- ☒ *No Post Construction TSS Control Required.*

SEQUENCE OR SCHEDULE OF IMPLEMENTATION:

1. *Install erosion control measures as shown on plans.*
2. *Excavation, embankment, and trenching for roadway construction.*
3. *Perform periodic inspections of SWP3 to recommend maintenance, adjustments or replacement as approved by the engineer.*
4. *Remove all SWP3 measures before final project clean-up.*
5.

The El Paso District of the Texas Department of Transportation uses Site-Manager, a computer based construction record-keeping system. Documentation describing major grading activities, temporary or permanent cessation of construction, and stabilization measures is a part of this system and is incorporated by reference into this SWPPP.

Stabilization measures must be initiated within 14 days when practicable in portions of the site where construction has temporarily or permanently ceased, if earth disturbing activities will not be resumed within 21 days.

3. STRUCTURAL CONTROL PRACTICES:

Structural control practices for this project are listed elsewhere herein.

4. PERMANENT STORM WATER CONTROLS:

Structural control practices installed during construction will be maintained and inspected after construction has ceased on the site and until final stabilization is attained. Unless specified in the plans, after project acceptance TxDOT will assume maintenance responsibilities for the controls and measures. Other permanent controls include existing and proposed; riprap at culvert inlets and outlets, diversion dikes, swales, retaining walls, and other similar devices.

5. OTHER CONTROLS:

OFF-SITE VEHICLE TRACKING OF SEDIMENTS AND THE GENERATION OF DUST: The off site vehicle tracking of sediments shall be minimized by removal of excess dirt from the road and at entrances to the work site. The generation of dust will be minimized as directed by the Project Engineer by dampening haul roads and covering haul trucks with a tarpaulin.

CONSTRUCTION AND WASTE MATERIALS: The contractor will maintain a clean, orderly construction site. Construction waste including trash, rubble, scrap and vegetation shall be disposed of in lidded dumpsters or in a manner approved by the Project Engineer. Disposal methods must meet Federal, State, and Local waste management guidelines. No construction waste will be buried or burned on site. Spoils disposal, material storage, and materials resulting from the destruction of existing roads and structures shall be stored in areas designated by the Project Engineer and protected from run-off. All waterways shall be cleared of temporary embankment, temporary bridges, matting, false work, piling, debris, or other obstructions placed during construction operations, that are not part of the finished work, as soon as practicable. All excess soil generated by the construction will be collected and disposed of by the contractor. 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, water body, or stream bed.

POLLUTANT SOURCES FROM AREAS OTHER THAN CONSTRUCTION: Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants. If potential pollutant sources are identified after the start of construction, controls and measures shall be implemented as directed by the Project Engineer.

5. OTHER CONTROLS (CONT):

DEDICATED ASPHALT PLANTS: Asphalt or asphaltic material for this project will be produced off site. If the project requires a dedicated asphalt plant and the plant within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer.

DEDICATED CONCRETE PLANTS: Cement or Concrete material for this project will be produced off site. If the project requires a dedicated concrete plant and the plant is within 1 mile of the project limits it will be considered an off site PSL. Consideration shall be given to on site plant and storage facilities and measures implemented as directed by the Project Engineer. Concrete trucks shall be wasted or washed out in locations designated by the Project Engineer. The locations shall be protected by a berm sufficient to contain all waste and wash water. Wash water shall not be allowed to enter any storm drainage system or waterway. The residual material and contaminated soil shall be collected and disposed of in accordance with Federal, State, and Local guidelines. Staging areas and vehicle maintenance areas shall be located and constructed in a manner to minimize the runoff of pollutants.

HAZARDOUS MATERIALS AND SPILL REPORTING: The contractor shall take appropriate measures to prevent, minimize, and control the spillage or leakage of hazardous materials and any associated wastes on site and in maintenance and staging areas. hazardous materials shall include but are not limited to paints, acids, solvents, asphalt products, chemical additives, curing compounds, oils, fuels, and lubricants. Hazardous materials shall not be stored, accumulated, or transported in open containers subject to precipitation or spillage, but shall be stored, accumulated, or transported in closed containers of the type recommended by the manufacturer. In the event of a spill the Project Engineer should be contacted immediately. All spills shall be immediately cleaned and any contaminated soil removed and disposed of in accordance with Local, State, and Federal laws. Fuel tanks shall be protected by a secondary containment, such as a lined berm, capable of containing 1.5 times the capacity of the tank, or as approved by the Project Engineer.

OFF SITE PSLs: All off site project specific locations including dedicated asphalt plants, concrete plants, or utility installations, required by the contractor, are the contractor's responsibility. The contractor shall secure all permits required by local, state, or federal laws for off site PSLs. The contractor shall provide diagrams and areas of disturbance for all PSL's within 1 mile of the project.

SANITARY FACILITIES: All sanitary or septic wastes that are generated onsite shall be treated and disposed of in accordance with state and local regulations. Raw sewage or septage shall not be discharged or buried on site. Precaution shall be taken to prevent illicit discharges to storm water. Licensed waste management contractors shall be required to dispose of sanitary waste. Porta johns will be required for the construction site or as directed by the Project Engineer.

VELOCITY DISSIPATION DEVICES: Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel as shown in the plans or as directed by the Project Engineer to provide a non-erosive flow velocity from the structure to a watercourse so that the natural physical and biological characteristics and functions are maintained and protected.

6. APPROVED STATE AND LOCAL PLANS:

This SWP3 is consistent with requirements specified in applicable sediment and erosion site plans or site permits, or storm water management site plans or permits approved by federal, state, or local officials.

7. MAINTENANCE:

Control measures shall be properly installed according to specifications. If inspections or other information indicates a control has been installed, used, or is performing inadequately, the contractor must replace or modify the control as soon as practicable after discovery. Control measures shall be maintained in effective operating condition. If inspections determine that BMPs are not operating effectively maintenance will be performed as necessary to continue the effectiveness of the controls. Maintenance must be accomplished as soon as practicable. Controls adjacent to creeks, culverts, bridges, and water crossings shall have priority. Controls that have been disabled, run over, removed, or otherwise rendered ineffective must be corrected immediately upon discovery.

8. INSPECTION OF CONTROLS:

A TxDOT inspector will inspect disturbed areas of the site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, and structural controls for evidence of, or the potential for, pollutants entering the drainage system. Sediment and erosion controls measures identified in the SWP3 will be inspected to ensure that they are operating correctly. Locations where vehicles enter or exit the site will be inspected for evidence of off-site vehicle tracking. Inspections will be conducted every 14 calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater. The SWP3 will be modified based on the result of these inspections. Revisions will be completed within 7 Calendar days following the inspection. Revised implementation schedules will be described in the SWP3 and implemented as soon as practicable. Rain gages will be maintained on site for the duration of the project. Reports summarizing the scope of the inspections are included in the SWP3 file.

9. NON-STORM WATER COMPONENTS:

The contractor shall be required to implement appropriate pollution prevention controls and measures for all eligible non-storm water components of the discharge as approved and directed by the Project Engineer.

STATE OF TEXAS
OSCAR J. GUTIERREZ
95690
LICENSED
PROFESSIONAL ENGINEER
7/17/2023

TxDOT STORM WATER POLLUTION PREVENTION PLAN (SWP3)

FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	SEE TITLE SHEET			193
STATE	STATE DIST.	COUNTY		
TEXAS	ODA	WINKLER		
CONT.	SECT.	JOB	HIGHWAY NO.	
1371	01	023	FM 1232	

REV: 07-2014

DATE: 7/17/2023
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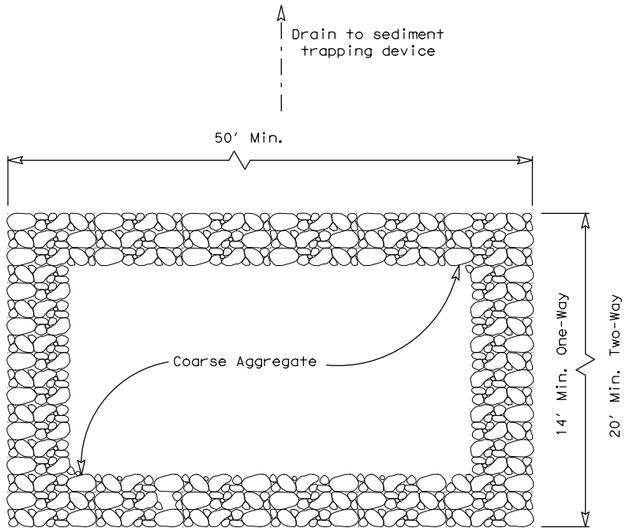
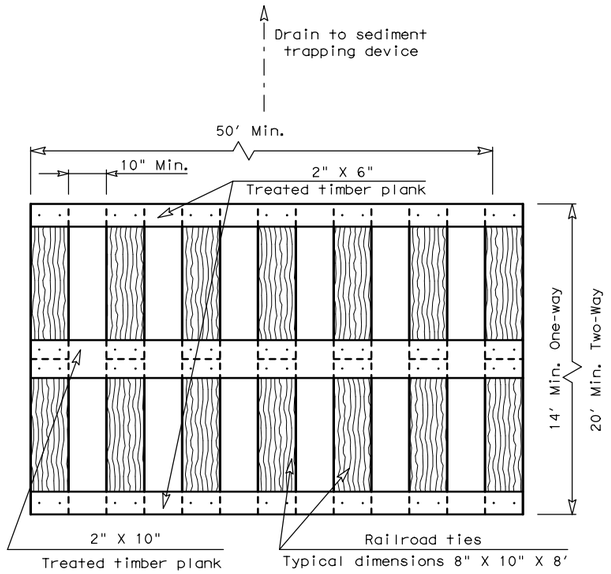


PLAN VIEW



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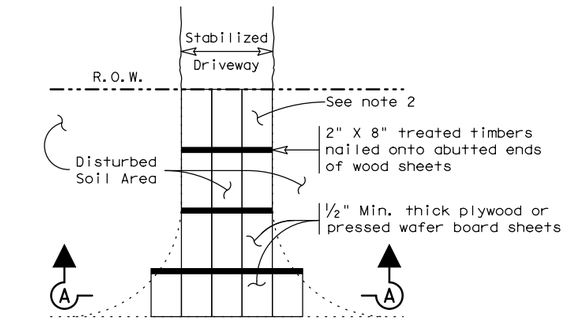
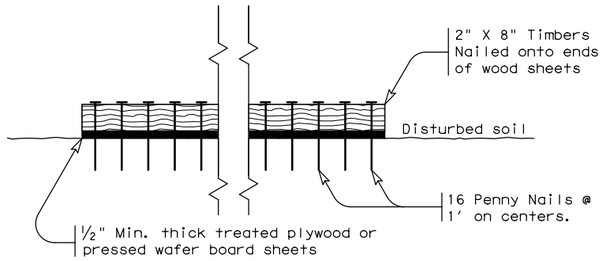


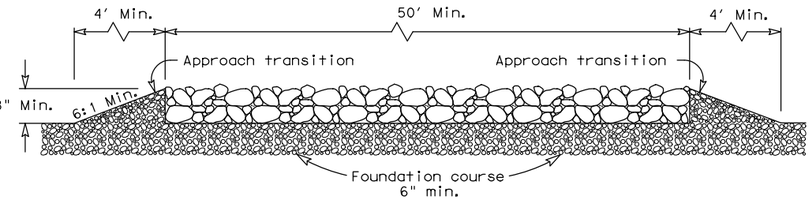
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



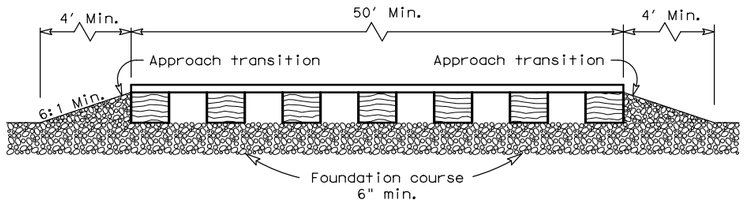
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK 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.



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

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
	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1371	01	023		FM 1232	
	DIST	COUNTY			SHEET NO.	
	ODA	WINKLER			194	

DATE: 7/17/2023
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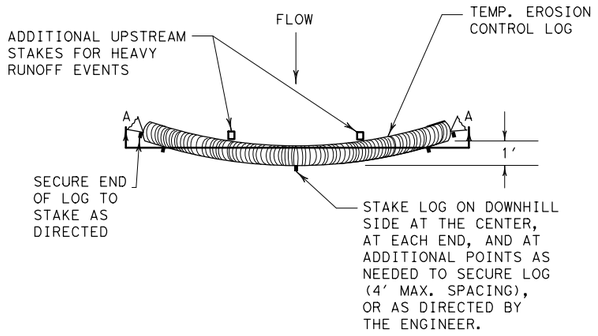
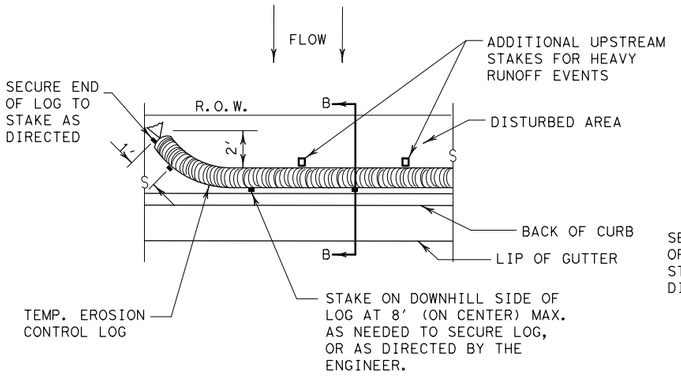
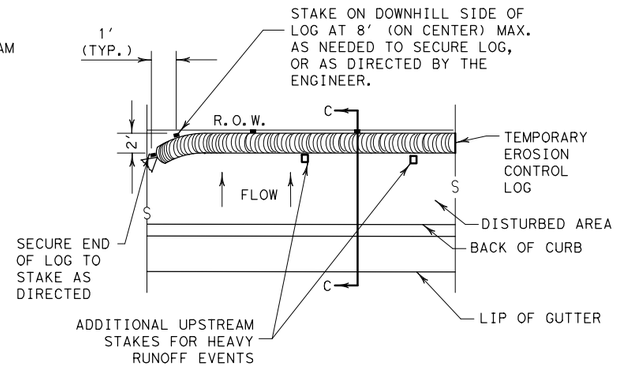


PLAN VIEW



PLAN VIEW



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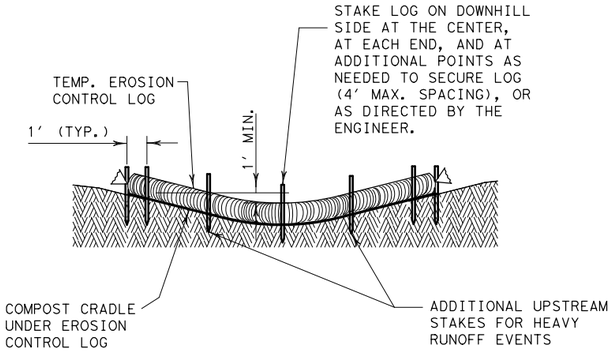
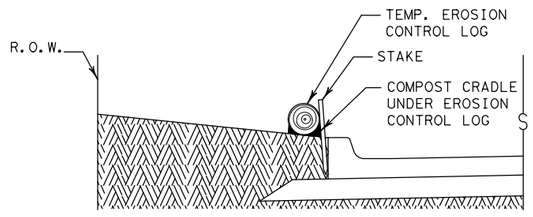


SECTION A-A

EROSION CONTROL LOG DAM

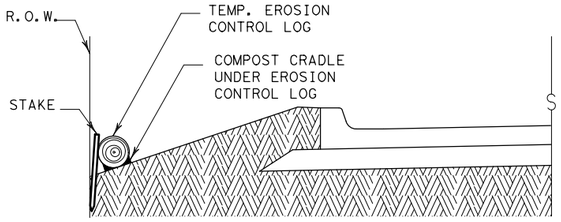
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

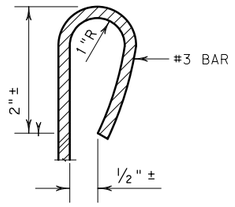
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

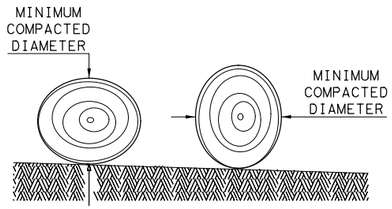
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916		DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016		CONT	SECT	JOB		HIGHWAY	
REVISIONS		1371	01	023		FM 1232	
		DIST		COUNTY			SHEET NO.
		ODA		WINKLER			195

DATE: 7/17/2023
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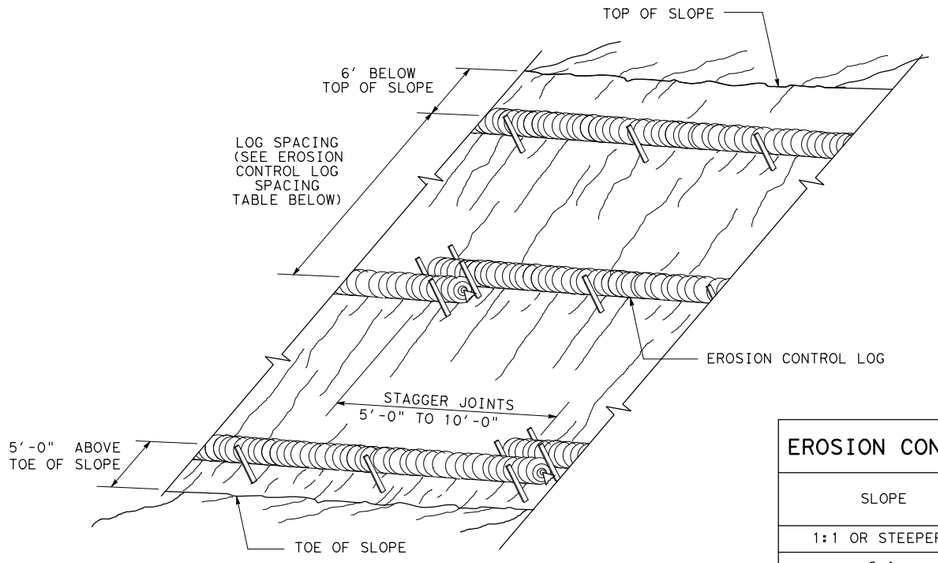
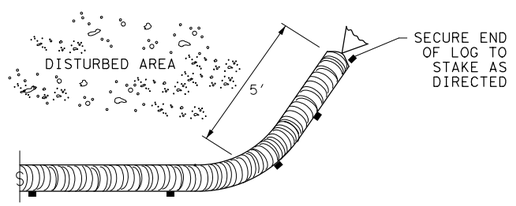


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

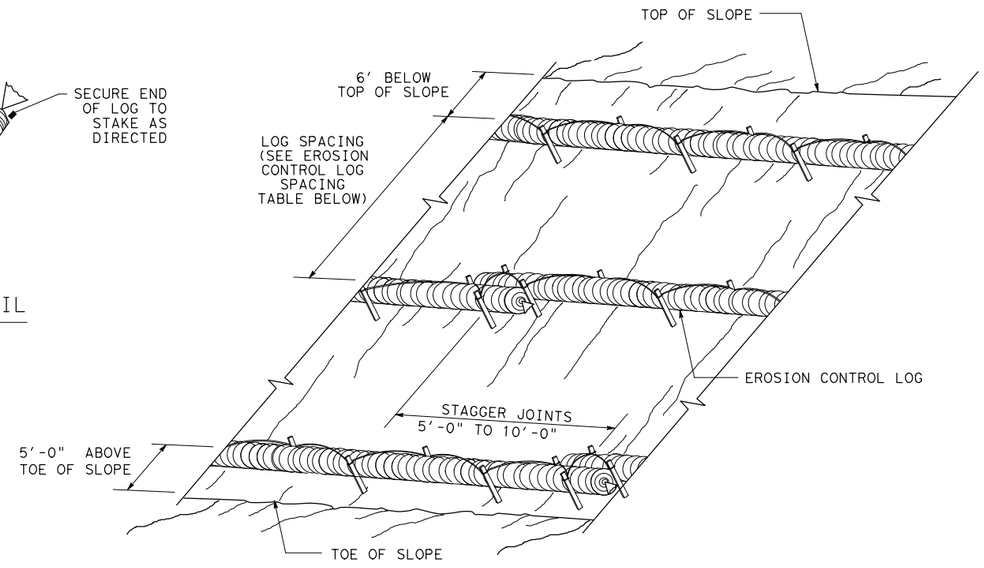
CL-SST



END SECTION RAP DETAIL

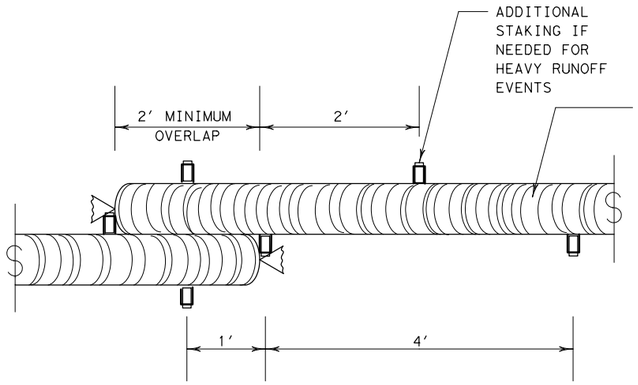
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

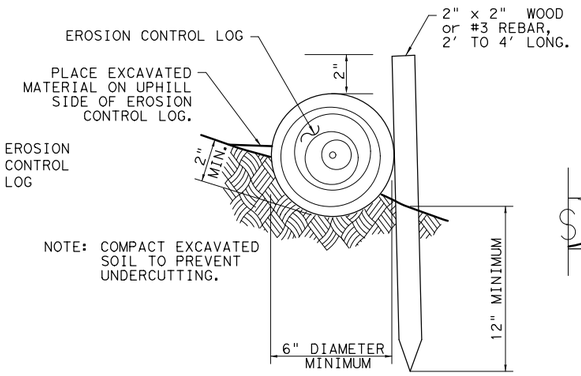
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

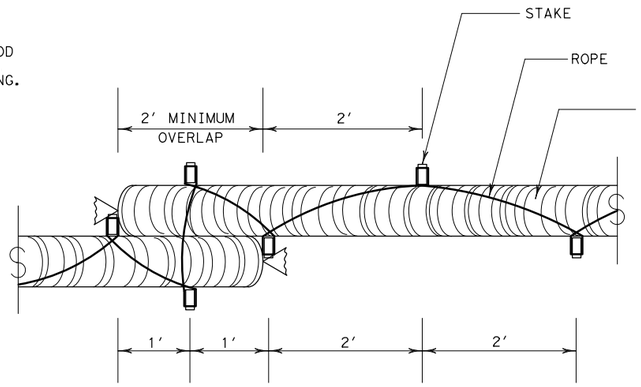


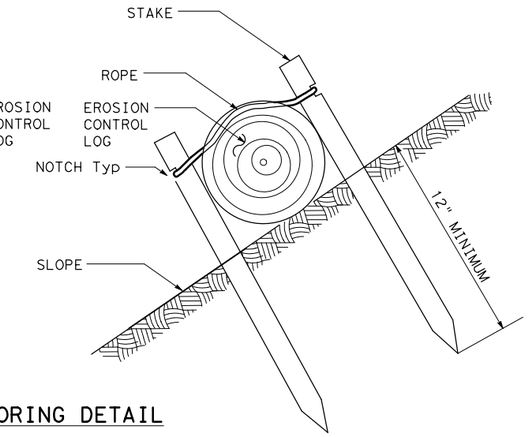


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

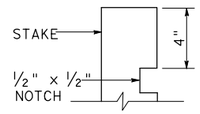
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
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	DIST	COUNTY			SHEET NO.	
	ODA	WINKLER			196	