DESIGN	FED.RD. DIV.NO.	PROJECT NO.			
MA	6	STP 2023(916)HES			
GRAPHICS	STATE	CONT	SECT	JOB	HIGHWAY NO.
MA	TEXAS	0816	05	025	FM 2862
CHECK	CHECK	DIST	COUNTY		SHEET NO.
MS	JRV	DAL	COLLIN		1

FINAL PLANS

NAME OF CONTRACTOR: _____

DATE OF LETTING: _____

DATE WORK BEGAN: _____

DATE WORK COMPLETED: _____

DATE WORK ACCEPTED: _____

SUMMARY OF CHANGE ORDERS:

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT

STP 2023(916)HES

CSJ: 0816-05-025

FM 2862

COLLIN COUNTY

DESIGN SPEEDS = 40 MPH
FUNCTIONAL CLASSIFICATION -RURAL MAJOR COLLECTOR

ADT 1,200 (2022)
1,700 (2042)

NOTE:

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014, AND THE CONTRACT PROVISIONS LISTED AND DATED AS FOLLOWS SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, July 5, 2022)

LIMITS: FROM SH 5
TO WESTOVER LANE

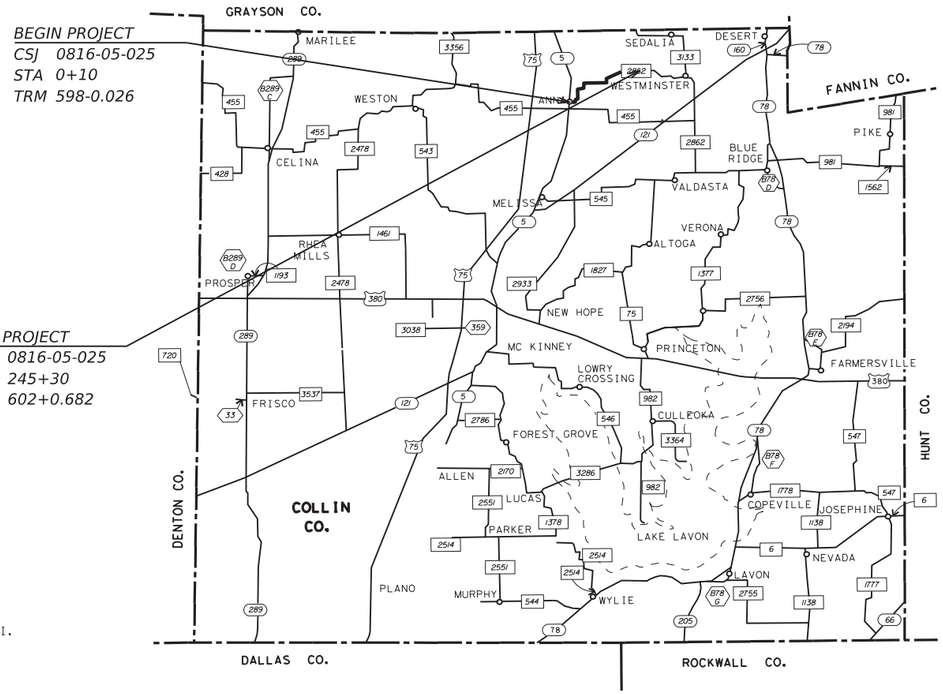
TOTAL LENGTH OF PROJECT =

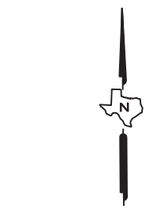
ROADWAY	= 24,048.00 FT.	= 4.555	MI.
BRIDGE	= 472.0 FT.	= 0.089	MI.
TOTAL	= 24,520.0 FT.	= 4.644	MI.

FOR THE CONSTRUCTION OF SAFETY IMPROVEMENT PROJECTS
CONSISTING OF SAFETY TREAT FIXED OBJECTS, PROFILE EDGELINE MARKINGS, PROVIDE ADDITIONAL PAVED SURFACE WIDTH, PROFILE CENTERLINE MARKINGS

BEGIN PROJECT
CSJ 0816-05-025
STA 0+10
TRM 598-0.026

END PROJECT
CSJ 0816-05-025
STA 245+30
TRM 602+0.682





COLLIN COUNTY
SCALE 0 1 2 3 4 5 6 MI.
DALLAS DISTRICT

EQUATIONS: NONE
EXCEPTIONS: NONE
RAILROAD CROSSINGS: DGNO AT STA. 7+59

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING 3/22/2023
Matthew Aldhamawy, P.E.
DESIGN ENGINEER

RECOMMENDED 3/23/2023
DocuSigned by: James P. Campbell , P.E.
98671C109B6A4C3...
RTATION
PLANNING & DEVELOPMENT

RECOMMENDED 3/23/2023
DocuSigned by: Jennifer Vorster , P.E.
4DB68ED9336D4F7...

APPROVED 3/23/2023
DocuSigned by: Casson Clemens , P.E.
A879E0D10CD6464...
ER

WORK WAS COMPLETED ACCORDING TO THE PLANS AND CONTRACT.

_____ , P.E.
Signature of Registrant & Date

CK
DW
CK
DW

I. GENERAL

1	TITLE SHEET
2	INDEX OF SHEETS
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7	CORE DATA
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12-19	SUMMARY SHEETS
20-27	SUMMARY OF SMALL SIGNS

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31	CULVERT REPLACEMENT TYPICAL SECTIONS

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45	*TCP (2-2)-18
46	*TCP (3-1)-13
47	*TCP (3-3)-14
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55	SUPERELEVATION TABLE
56-58	VERTICAL ALIGNMENT DATA
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73	*TE(HMAC)-11
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79	*GF(31)MS-19
80-81	*GF(31) TR TL 3-20
82	*SGT(10S)31-16
83	*SGT(11S)31-18
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116	*SETP-PD
117	*PSET-SC
118	*PSET-SP
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VI. UTILITIES

NONE

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NONE

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154	*ED(6)-14
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Madiha Alshammry, P.E. 3/23/2023

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

** STATEWIDE STANDARDS*
*** DALLAS DISTRICT STANDARDS*

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

Texas Department of Transportation

FM 2862

INDEX OF SHEETS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		2

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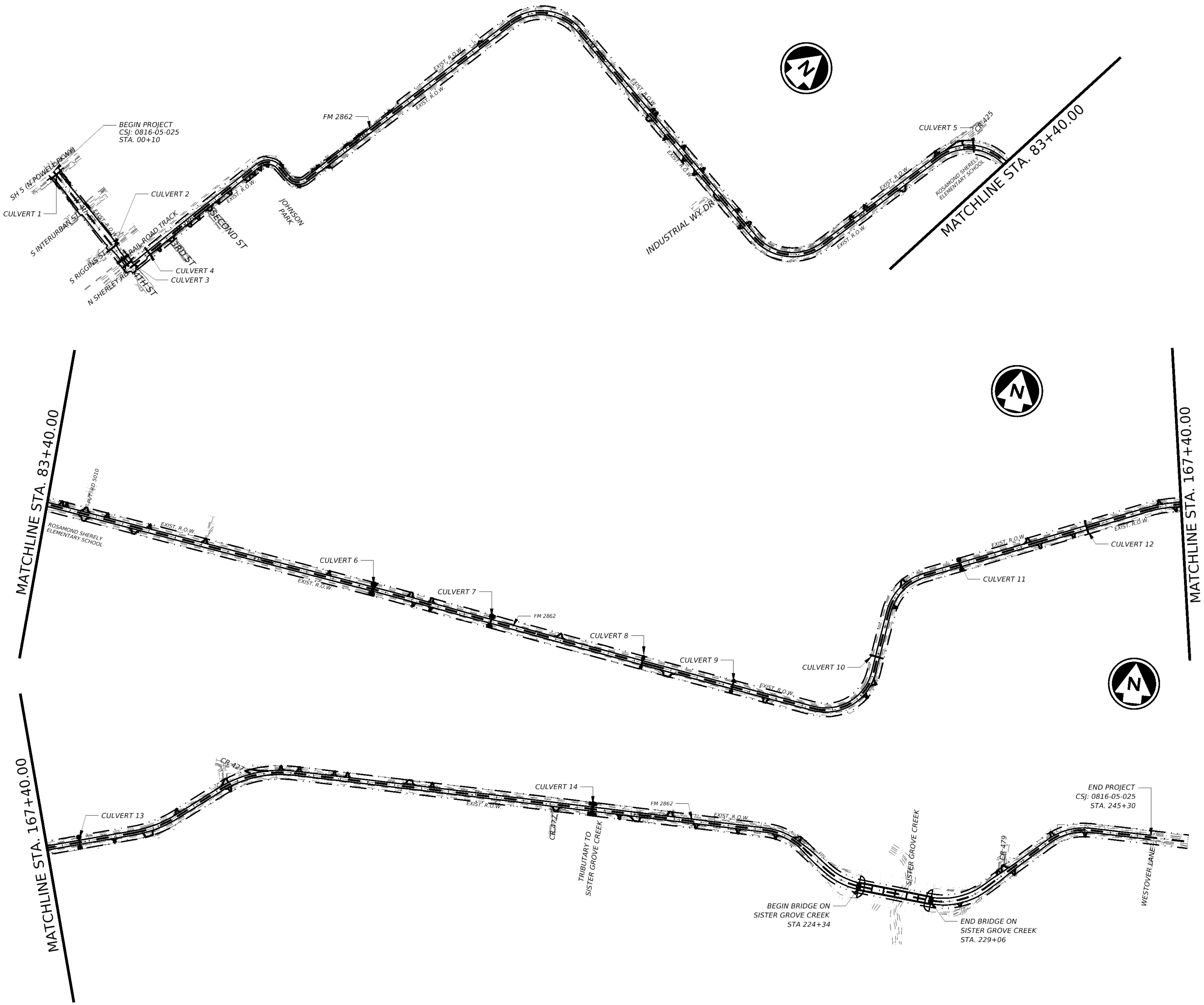

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

PROJECT LAYOUT

SCALE: 1"= 700 ' SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		3

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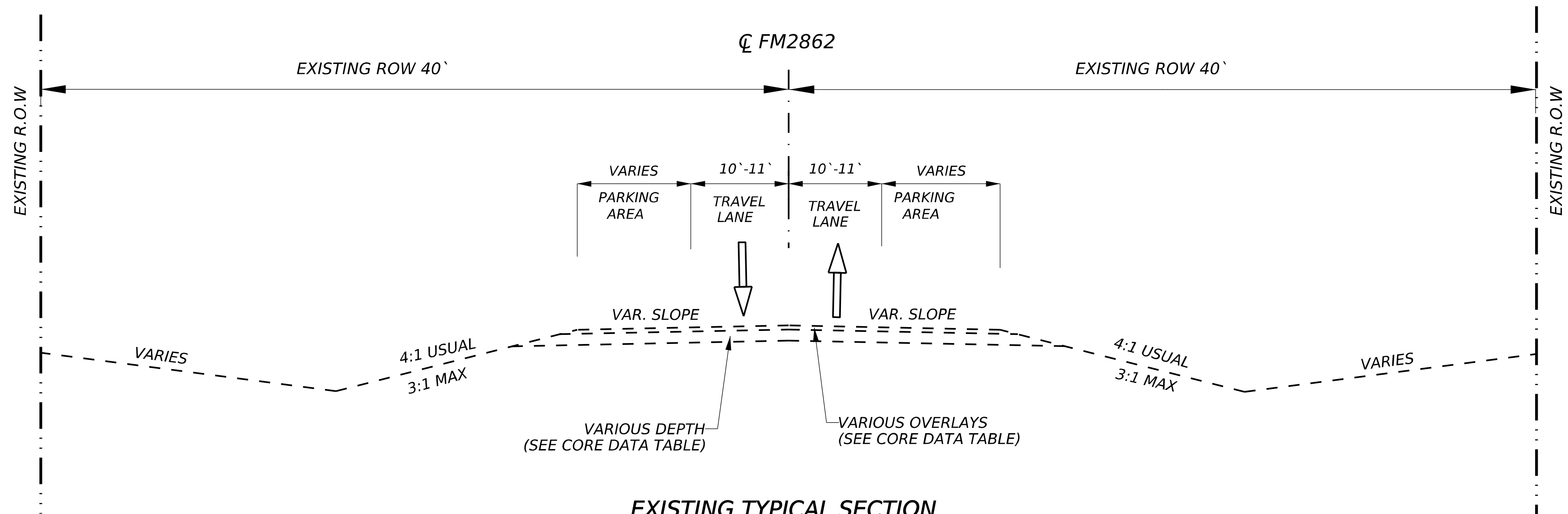
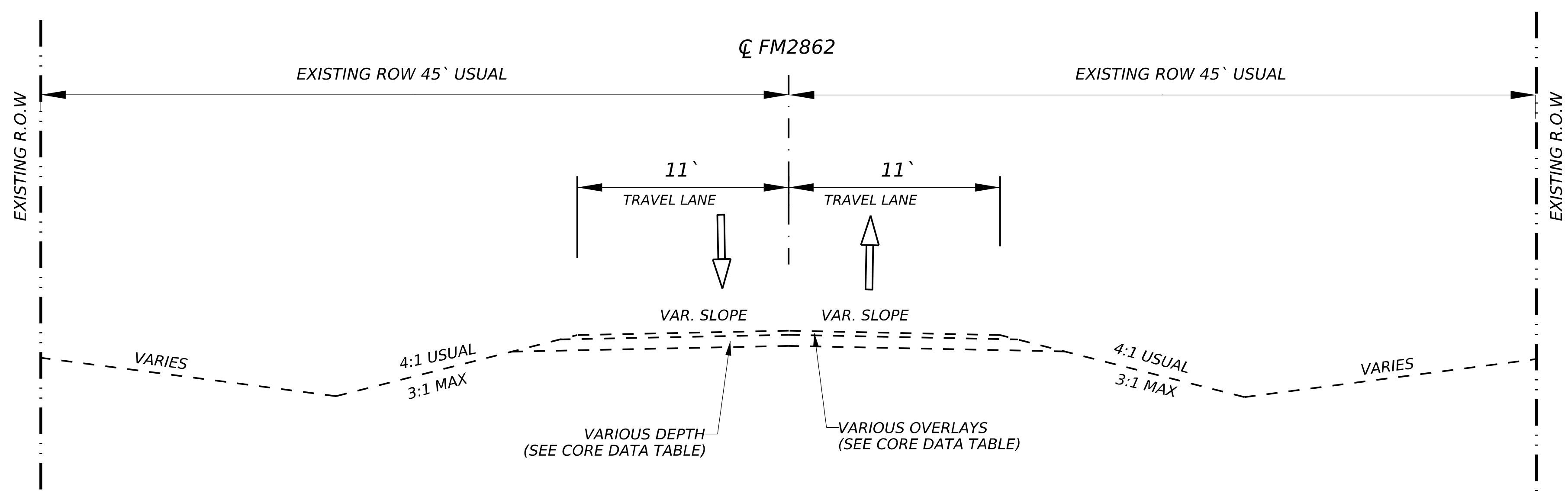


EXISTING TYPICAL SECTION

STA. 0+10 TO STA. 9+71



EXISTING TYPICAL SECTION

STA. 9+71 TO STA. 245+30

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

TYPICAL SECTIONS

N.T.S.

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		4

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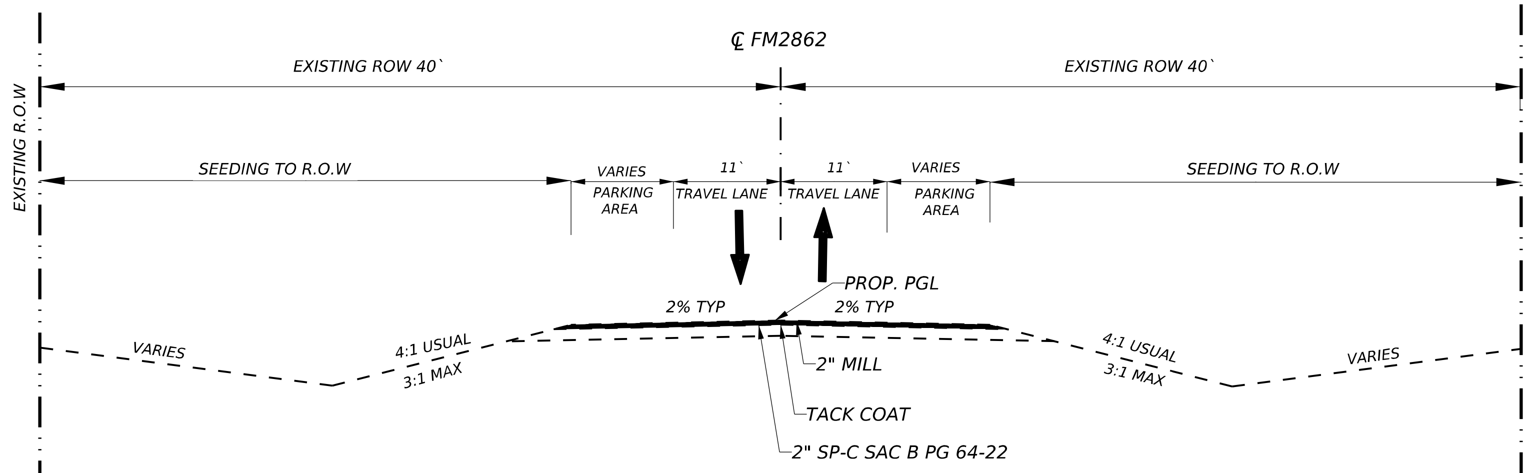
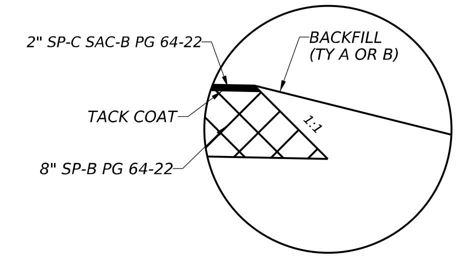


PROPOSED TYPICAL SECTION

STA. 00+10 STA. 8+91



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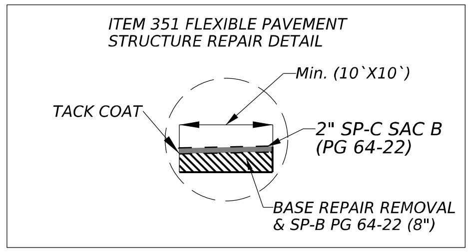

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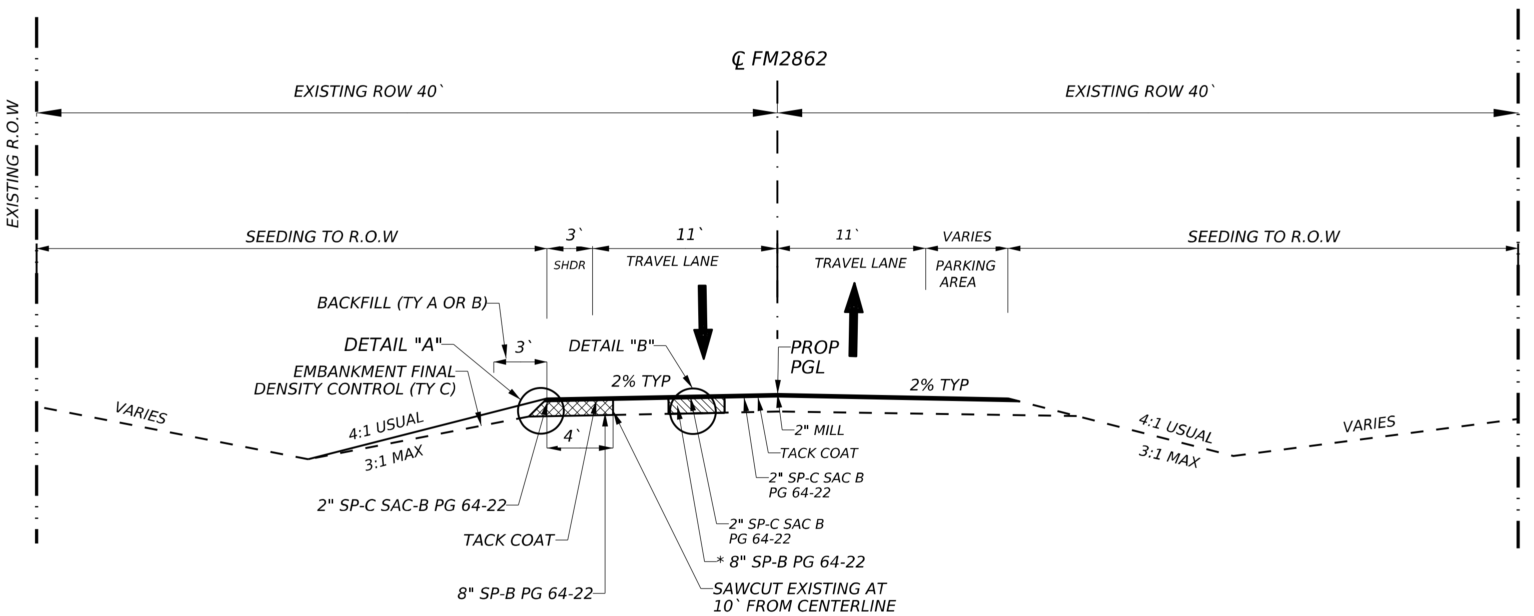

PROPOSED TYPICAL SECTION

STA. 8+91 TO STA. 9+71

NOTE:

1.PGL WILL MATCH THE EXISTING
2.* FLEXIBLE PAVEMENT STRUCTURE REPAIR-AT VARIOUS LOCATIONS AS DIRECTED BY THE ENGINEER.
3.NO WIDENING FROM STA. 0+10 TO STA. 8+91, MILL AND OVERLAY AREAS ARE SHOWN IN PLANS.
4. ADD SHOULDER ON SOUTHBOUND AND NO WIDENING ON NORTHBOUND FROM STA. 8+91 TO STA. 9+71, AS SHOWN IN PLANS .
5.AVOID UNNECESSARY SOIL DISTURBANCE BEYOND THE SHOWN SEEDING LIMITS.

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

TYPICAL SECTIONS

N.T.S

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		5

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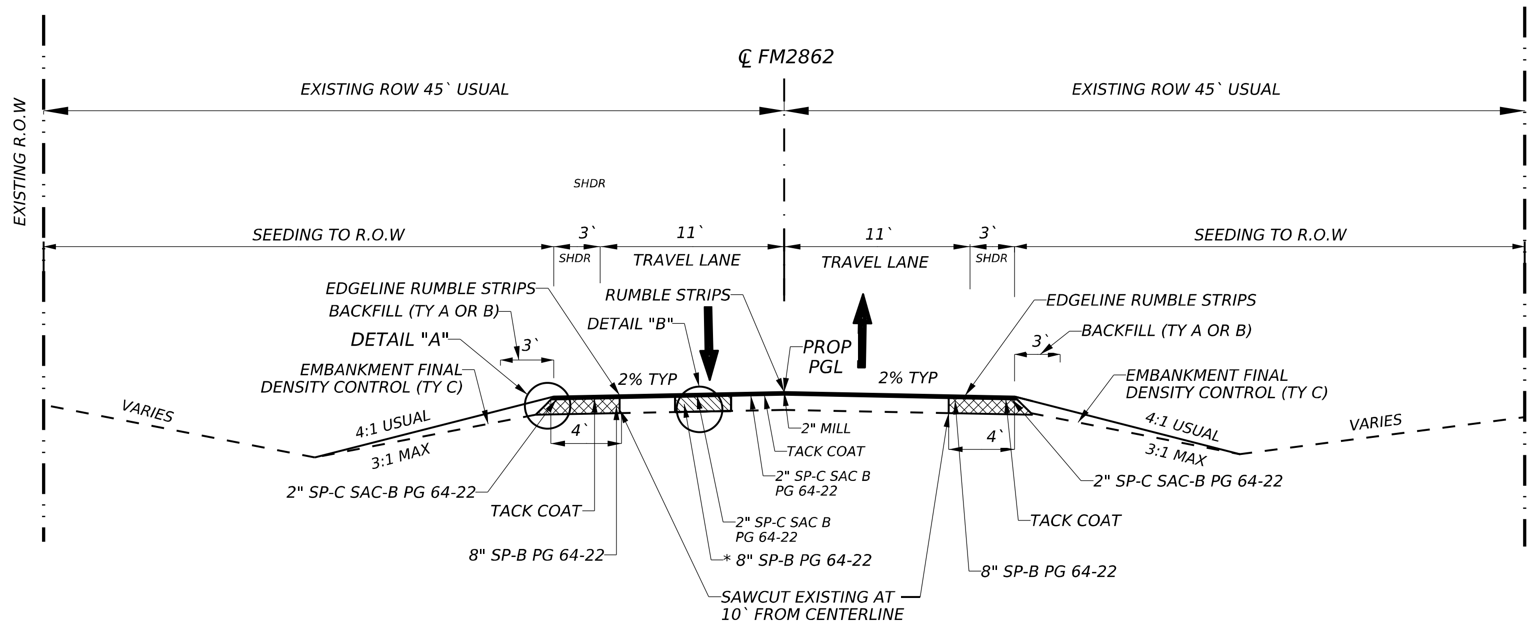
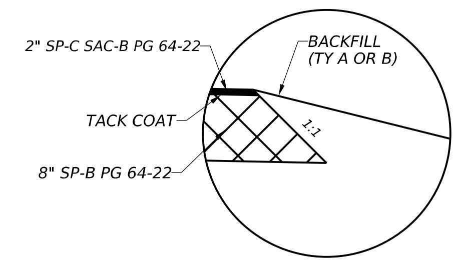


PROPOSED TYPICAL SECTION

STA. 9+71 TO STA. 219+32
STA. 235+40 TO STA. 245+30



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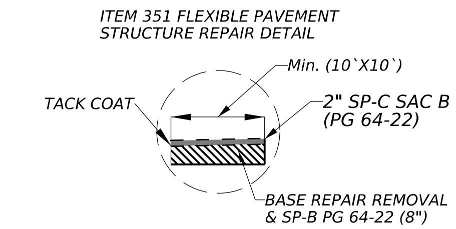

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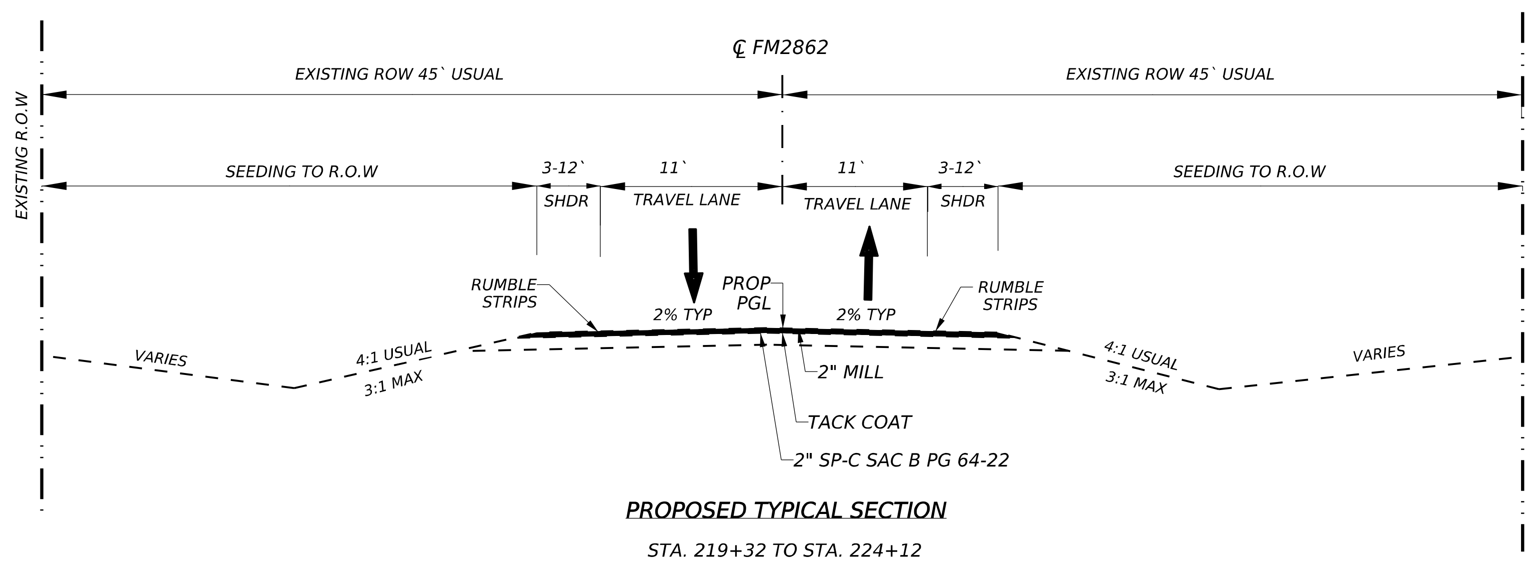

PROPOSED TYPICAL SECTION

STA. 219+32 TO STA. 224+12
STA. 229+27 TO STA. 235+40

NOTE:

1. PGL WILL MATCH THE EXISTING
2.* FLEXIBLE PAVEMENT STRUCTURE REPAIR-AT VARIOUS LOCATIONS AS DIRECTED BY THE ENGINEER.
3. NO WIDENING FROM STA. 219+32 TO STA. 224+12, AND FROM STA. 229+27 TO STA 235+40 AS SHOWN IN PLANS. MILL AND OVERLAY AREAS ARE SHOWN IN PLANS.
5. AVOID UNNECESSARY SOIL DISTURBANCE BEYOND THE SHOWN SEEDING LIMITS.

STATE OF TEXAS — MADIHA ALSHAMMRY — 142597 — LICENSED PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

TYPICAL SECTIONS

N.T.S

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		6

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TEXAS DEPARTMENT OF TRANSPORTATION

EST

Core Drilling Report

SAMPLE ID:	See Below	SAMPLED DATE:	01/17/2022 - 02/08/2022
TEST NUMBER:	N/A	REPORT DATE:	03/14/2022
STATUS:	Complete	CONTROLLING CSJ:	0816-05-025
COUNTY:	Collin County	SPEC YEAR:	
SAMPLED BY:	EST, Inc.	SPEC ITEM:	
SAMPLE LOCATION:	FM 2862	SPECIAL PROVISION:	
MATERIAL:	Existing Roadway	GRADE:	
PRODUCER:	N/A		
AREA ENGINEER:		PROJECT MANAGER:	

Sample Number	Location With Coordinates	Depths/ Materials	Notes
C-01	FM 2862 WB MAIN LANE AT WESTOVER LN AND FM 2862 INTERSECTION 33.369108, -96.489310	ACP: 13.00" SUBGRADE	
C-02	FM 2862 EB MAIN LANE 400 FT WEST OF CR 479 33.367562, -96.493537	ACP: 9.00" SUBGRADE	
C-03	FM 2862 WB MAIN LANE 900 FT EAST OF CR 477 33.368602, -96.499448	ACP: 5.50" SUBGRADE	
C-04	FM 2862 EB MAIN LANE 630-FT WEST OF CR 477 33.368678, -96.504477	ACP: 2.50" TREATED BASE: 5.50" SUBGRADE	
C-05	FM 2862 WB MAIN LANE 0.40-MILE WEST OF CR 477 33.368579, -96.509367	ACP: 5.00" SUBGRADE	
C-06	FM 2862 EB MAIN LANE 0.24-MILE WEST OF CR 427 33.366946, -96.513454	ACP: 5.00" SUBGRADE	
C-07	FM 2862 WB MAIN LANE 0.55-MILE WEST OF CR 427 33.365070, -96.517853	ACP: 5.00" SUBGRADE	

TEXAS DEPARTMENT OF TRANSPORTATION

EST

Core Drilling Report

SAMPLE ID:	See Below	SAMPLED DATE:	01/17/2022 - 02/08/2022
TEST NUMBER:	N/A	REPORT DATE:	03/14/2022
STATUS:	Complete	CONTROLLING CSJ:	0816-05-025
COUNTY:	Collin County	SPEC YEAR:	
SAMPLED BY:	EST, Inc.	SPEC ITEM:	
SAMPLE LOCATION:	FM 2862	SPECIAL PROVISION:	
MATERIAL:	Existing Roadway	GRADE:	
PRODUCER:	N/A		
AREA ENGINEER:		PROJECT MANAGER:	

Sample Number	Location With Coordinates	Depths/ Materials	Notes
C-08	FM 2862 EB MAIN LANE 1.03-MILE EAST OF CR 425 33.361870, -96.520999	ACP: 1.00" TREATED FLEX: 10.00" SUBGRADE	
C-09	FM 2862 WB MAIN LANE 0.79-MILE EAST OF CR 425 33.362085, -96.525212	ACP: 6.00" SUBGRADE	
C-10	FM 2862 EB MAIN LANE 0.51-MILE EAST OF CR 425 33.362294, -96.530104	ACP: 7.00" SUBGRADE	
C-11	FM 2862 WB MAIN LANE 0.23-MILE EAST OF CR 425 33.362500, -96.535014	ACP: 7.00" SUBGRADE	
C-12	FM 2862 NB MAIN LANE 300 FT SOUTH OF CR 425 33.361259, -96.538852	ACP: 7.00" SUBGRADE	
C-13	FM 2862 WB MAIN LANE 0.34-MILE SOUTH OF CR 425 33.358211, -96.540777	ACP: 7.00" SUBGRADE	
C-14	FM 2862 EB MAIN LANE 0.60-MILE NORTH OF E SECOND STREET 33.358199, -96.545690	ACP: 7.00" SUBGRADE	

TEXAS DEPARTMENT OF TRANSPORTATION

EST

Core Drilling Report

SAMPLE ID:	See Below	SAMPLED DATE:	01/17/2022 - 02/08/2022
TEST NUMBER:	N/A	REPORT DATE:	03/14/2022
STATUS:	Complete	CONTROLLING CSJ:	0816-05-025
COUNTY:	Collin County	SPEC YEAR:	
SAMPLED BY:	EST, Inc.	SPEC ITEM:	
SAMPLE LOCATION:	FM 2862	SPECIAL PROVISION:	
MATERIAL:	Existing Roadway	GRADE:	
PRODUCER:	N/A		
AREA ENGINEER:		PROJECT MANAGER:	

Sample Number	Location With Coordinates	Depths/ Materials	Notes
C-15	FM 2862 SB MAIN LANE 0.29-MILE NORTH OF E SECOND STREET 32.578722, -96.228295	ACP: 9.00" SUBGRADE	
C-16	FM 2862 NB MAIN LANE 35 FT NORTH OF E SECOND STREET 33.351008, -96.548433	ACP: 8.50" SUBGRADE	
C-17	W 4TH STREET WB MAIN LANE 100 FT EAST OF N POWELL PKWY 33.349183, -96.550901	ACP: 9.50" SUBGRADE	

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

CORE DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		7

SPECIFICATION DATA

Table 1: Soil Constants Requirements				
Item	Description	Plasticity Index		Note
		Max	Min	
132	EMBANKMENT (FINAL)(DENS CONT)(TY C)	40	8	1

Note 1: Material excavated from the project must meet the PI requirements when used in the top 10 feet of embankment that supports the pavement structure or other locations shown in the plans. Do not use shale and obtain approval to incorporate shaley clay produced by the construction project.

Table 2: Basis of Estimate for Permanent Construction					
Item	Description	Thickness	Rate		Quantity
164	Drill Seed (Perm) (R) (C)	N/A	See Specifications		149554 SY
166 *	Fertilizer (12-6-6)	N/A	500	Lbs./Ac	7.75 Ton
168	Vegetative Watering (Warm)**	N/A	12	MG/Ac/Day	22247.5 MG
3077	SP MIXES SP-B	See Plans	110	Lbs./SY/In	10566 Ton
	SP MIXES SP-C	See Plans	110	Lbs./SY/In	9551 Ton
3077	**Tack Coat (Undiluted Application Rate)**	New HMA	0.06	Gal/SY	2352 GAL
		Milled HMA	0.11		6545 GAL
*For contractor's information only **Use Summer rate for calculation, adjust for actual field conditions/temperatures as necessary. See Vegetation Establishment Plan Sheet for estimated daily rates.					
Note: (1) Base material weight based on 1.50 Ton/CY (dry- compacted) (2) Asphalt weight based on 110 Lbs./SY/In (3) Subgrade weight based on 1.5 Ton/CY (dry-compacted)					

Table 3: Basis of Estimate for Temporary Erosion Control Items				
Item	Description	Rate		Quantity
164	Drill Seeding (Temp) (Warm or Cool)	See Specifications		149554 SY
166*	Fertilizer (12-6-6)	500	Lb/Ac	7.75 Ton
168	Vegetative Watering (Warm)**	12	MG/Ac/Day	22247.5 MG
*For Contractor's Information Only. **Use Summer rate for calculation, adjust for Actual Field Conditions/Temperatures as Necessary. See Vegetation Establishment Sheet for estimated daily rates.				

CSJ: 0816-05-025

Sheet 8

County: Collin

Highway: FM 2862

GENERAL

The construction, operation and maintenance of the proposed project will be consistent with the state implementation plan as prepared by the Texas Commission on Environmental Quality.

The disturbed area for this project, as shown on the plans is 31 acres. However, the Total Disturbed Area (TDA) will establish the required authorization for storm water discharges. The TDA of this project will be determined by the sum of the disturbed area in all project locations in the contract, and all disturbed area on all Project-Specific Locations (PSL) located in the project limits and/or within 1 mile of the project limits. The department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction site as shown on the plans, according to the TDA of the project. The contractor will obtain any required authorization from the TCEQ for the discharge of storm water from any PSL for construction support activities on or off of the project row according to the TDA of the project. When the TDA for the project exceeds 1 acre, provide a copy of the appropriate application of permit (NOI, or Construction Site Notice) to the engineer, for any PSL located in the project limits or within 1 mile of the project limits. Follow the directives and adhere to all requirements set forth in the TCEQ, Texas Pollution Discharge Elimination System, Construction General Permit (TPDES, CGP).

This project required permitting with environmental resources agencies, as summarized in the plan set Environmental Permits, Issues, and Commitments (EPIC) Sheet. There is a high probability that an environmentally sensitive area could be encountered on the contractor designated Project-Specific Locations (PSL) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). Item 7.6 "Project-Specific Locations" provides a listing of regulatory agencies that may need to be contacted regarding this project.

Install traffic marking signs prior to HMAC application and remove within three days after placement of traffic markings.

Leave all right of way areas undisturbed until actual construction is to be performed in said areas.

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

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

Jennifer Vorster Email: Jennifer.Vorster@txdot.gov
Gerald Waltman Email: Gerald.Waltman@txdot.gov

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

All contractor questions will be reviewed by the Engineer. All questions and any corresponding responses that are generated will be posted through the same Letting Pre-Bid Q&A web page.

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

Paper copies of cross-sections may be produced by using the provided .pdf file located on the above FTP Website at the bidders' expense and at copying companies. This data is for non-construction purposes only and it is the responsibility of the prospective bidder to validate the enclosed data with appropriate plans, specifications and estimate for the project(s).

Item 5:

Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way on this project. For signal, illumination, surveillance, and communications & control maintained by TxDOT, call the TxDOT Traffic Signal Office (214-320-6682) for locates a minimum of 48 hours in advance of excavation. For irrigation systems, call TxDOT Landscape Office (214-320-6205) for locates a minimum of 48 hours in advance of excavation. If city or town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages when utilities are damaged due to Contractor's negligence including, but not limited to, repair or replacement at the Contractor's expense.

For the project to be deemed complete, permanently stabilize all unpaved disturbed areas of the project with a vegetative cover at a minimum of 70% density for the control of erosion.

Place construction stakes/station markings at intervals of no more than 100 feet or as directed by the Engineer. Place stakes and markings so as not to interfere with normal construction operations.

Submit all shop drawings, working drawings, or other documents which require review sufficiently in advance of scheduled construction to allow no less than thirty (30) calendar days for review and response.

Item 6:

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:

Repair or replace any structures and utilities that might have been damaged by negligence or a failure to have utility locates performed.

Perform all electrical work in accordance with the National Electrical Code and Texas Department of Transportation Specifications.

Consult with appropriate electric company representatives according to their respective area to coordinate electrical services installations.

Holiday restrictions – The Engineer may decide that no lane closures or construction operations shall be allowed during the restricted periods listed in the following holiday schedule. TxDOT has the right to lengthen, shorten, or otherwise modify these restricted periods as actual, or expected, traffic conditions may warrant. Working days will not be charged for these restricted periods. No additional compensation will be allowed for these closures (i.e., overhead, delays, stand-by, barricades or any other associated cost impacts).

- New Year's Eve and Day (5am on December 31 thru 10:00pm January 1)
- Easter Holiday weekend (5 am on Friday thru 10:00 pm Sunday)
- Memorial Day weekend (5 am on Friday thru 10:00pm Monday)
- Independence Day (5 am on July 3 thru 10:00 pm on July 5)
- Labor Day weekend (5 am on Friday thru 10:00 pm Monday)
- Thanksgiving Holiday (5 am on Wednesday thru 10:00 pm Sunday)
- Christmas Holiday (5 am on December 23 thru 10:00 pm December 26)

No significant traffic generator events identified.

Item 8:

This Project will be a Standard Workweek.

Item 100:
Remove the existing roadway small signs, delineators and object markers as shown on the plans, or as directed, during construction within the right of way. Small sign, delineator and object marker removals are subsidiary to this Item.

Neatly trim trees, overhanging branches and all underbrush at the ROW line to produce an 18" vertical clear area within the limits of ROW. This work is subsidiary to various bid items.

The limits of preparing right of way will be measured from Sta. 0+10.00 to Sta. 245+30.00 along the centerline of construction except for Sta. 224+12 to Sta. 229+27.

Item 104:
Sawing of concrete is not paid for directly, but is considered subsidiary to this item.

Item 110:
Excavated shale is not an acceptable material for embankment.

Items 110 and 132:
Scarify and loosen the excavated areas, unpaved surface areas, except rock, to a depth of at least 8 inches and compact in accordance with the specifications.

Excavation and embankment for driveways, sleeper slabs, alleys and intersections will not be paid for directly, but will be considered subsidiary to these items.

Item 132:
Excavated material from the project site has not been determined to be suitable for embankment. The bidder assumes all risk for the use of excavated materials for embankment and is expected to meet all material requirements for embankment regardless of the source.

Perform Tex-106-E (Plasticity Index) by an approved laboratory on excavated soils from sources outside right of way when used in roadway embankment. Provide the test results at no expense to the department. The engineer will sample and test soils produced by the construction project for specification requirements or material sources specified in the plans.

Earth embankment Type C is mainly composed of material other than shale. Furnish material that is free from vegetation or other objectionable material and that conforms to the requirements of Table 1 (Sheet B). If necessary, treat material with lime slurry in accordance with Item 260, "Lime Treatment (Road-Mixed)" in order to meet these requirements. Use Tex-121-E, figure 1, page 4 to calculate the amount of lime required. When lime treated subgrade is specified, 3000 PPM is the maximum allowed sulfate content in the top 3 feet when material comes from borrow source. Follow

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recommendations of 260.4.4 for mixing and mellowing. The engineer will test material placed or excavated to a depth of one foot below and laterally to one foot outside the proposed treatment limit. Lime treatment of this material will not be paid for directly, but will be considered subsidiary to this item.

Do not use shaley clays in embankment unless approved in writing.

Item 134:
Start backfilling pavement edges as soon as possible after the surface course is started.

Backfill and compact the pavement edges to produce a smooth surface adjacent to the pavement with no vertical edges.

Use Type "A" or "B" material to backfill pavement edges as shown in plans. Type "A" or "B" material shall consist of suitable material that when compacted will support the pavement edge.

Blade the existing vegetation into a neat wind-row prior to overlay. After placing Type A or Ty B backfill and placing seeding, the material from the wind-row shall be replaced on the completed slopes. Emulsion shall be placed at a 50/50 solution of water to emulsion over disturbed area. Emulsion rate=0.15 Gal/SY residual. This work, materials and equipment shall be subsidiary to Item 134.

Item 301:
Provide liquid antistripping agents unless otherwise directed. Add the minimum dosage determined by the manufacturer or higher dosage determined by design requirement and try subsequent trials at 0.25% increments.

Item 320:
Use a self-propelled wheel mounted MTV capable of receiving mix from the haul trucks, separate from the paver. It shall have a minimum storage capacity of approximately 25 tons. It shall be equipped with a pivoting discharge conveyor and shall completely and thoroughly remix the material prior to placement. The effectiveness of the MTV's remixing ability is subject to the approval of the Engineer. In addition, the paver shall have a surge storage insert with a minimum capacity of 20 tons.

The use of windrow pick-up equipment is allowed except on the first course of roadway material placed over the subgrade.

Item 354:
Saw existing asphalt along neat lines where portions are to be left in place temporarily or permanently. Sawing is not paid for directly but is subsidiary to this item.

Separate the asphalt pavement from the base material. Stockpile the asphalt pavement at Collin County Area Office, 2205 State Hwy 5, McKinney, TX 75069. Place the asphalt

pavement material in a stockpile that meets the dimensions and requirements designated by the engineer.

Stockpile materials in uniform piles up to 15 feet in height unless otherwise instructed. Furnish adequate equipment at the stockpile to keep and leave the materials in a neat and orderly manner.

Remove the loose material from the roadway before opening to traffic.

Patch pavement cut to excessive depth by equipment failure with an approved epoxy material.

Re-plane patched area to an acceptable approved ride quality. Payment for these corrections is subsidiary to this item.

Properly dispose of unsalvageable material at your own expense.

Slope longitudinal faces greater than 1 ¼" to a minimum of 1:1 slope at the end of the work period if traffic is able to traverse the joint. Slope transverse tapers to a minimum of 36:1 at the end of the workday. Remove the taper prior to continuing the milling.

For open shoulder sections, plane the asphalt so the flow of water is not impeded at the shoulder edge or across the surface. Added planing up to three feet in width outside the lines and grades of the plans, necessary to provide proper drainage, will be subsidiary to the bid item.

Item 400:
Structural Excavation is not paid for directly but is considered subsidiary to pertinent Items.

Item 421:
Furnish mix designs to the Engineer in a format compatible to the latest version of the Department's Construction Management System (Site Manager).

Provide sulfate resistant concrete for box culverts and all drilled shafts.

Item 440:
Fiber Reinforced Concrete (FRC) can be used as a substitute for Non-Structural Class Reinforced Concrete in Mow-Strip and Rip Rap Items as approved. FRC may also be used for other Non-Structural Class Reinforced Concrete Items as approved.

Item 442:
Use temperature Zone 1 for CVN testing.

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Item 464:
The concrete collars and the connections of pipes to existing or proposed concrete boxes or pipe will not be paid for directly but will be considered subsidiary to the various bid items.

Item 500:
Material On Hand (MOH) will not be used in calculating partial payments for Mobilization.

Item 502:
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.

Access will be provided to all business and residences at all times. Where turning radii are limited during phased construction at intersections, provide all weather surfaces such as RAP or base in turning movements to accommodate and to protect the traffic from edge drop-offs. Materials, labor, maintenance and removal for these temporary accesses and radii will not be paid for directly but will be considered subsidiary to the various bid items.

Provide written proposed lane closure information by 1:00 pm on the business day prior to the proposed closures. Do not close lanes when this requirement is not met.

When excavation is required next to a pavement lane carrying traffic and the widening is not completed by the end of the workday, backfill against the edge of the pavement with at least a 3:1 slope using an acceptable material to support vehicular traffic. Carefully remove and dispose of this material when work resumes. Backfilling pavement edges, and the materials required for the work will be subsidiary to this item.

Place barricades and signs in locations that do not obstruct the sight distance of drivers entering the highway from driveways or side streets.

Do not commence work on the road before sunrise. Do not operate or park any equipment/machinery closer than 30 feet from the traveled roadway after sunset unless authorized by the engineer.

When moving unlicensed equipment on or across any pavement or public highways, protect the pavement from all damage using an acceptable method.

Traffic Control Plans with Lane Closures causing backups of 8 minutes or greater in duration will be modified by the Engineer.

Limit lane closures along FM 2862 to the hours between 9:00 am and 3:30 pm. Work in other areas of the project is not restricted to this time frame.

Additional lanes may be closed, started earlier, or extended later with written permission of the Engineer.

Item 506:
Take all practicable precautions to prevent debris from being discharged into the Waters of Texas or a designated wetland. Install Best Management Practices before demolition begins and maintain them during the demolition. Remove any debris or construction material that escapes containment devices and are discharged into the restricted areas, before the next rain event or within 24 hours of the discharge.

If temporary construction stream crossings are allowed under a Nationwide Permit, submit in writing for approval the type and location of each temporary stream crossing. Use temporary bridges, timber mats, or other structurally sound and non-eroding material for temporary stream crossings. A temporary culvert crossing will consist of storm sewer pipes and 4- to 8-inch nominal size rock. Temporary stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream, increase flooding, or cause more than minimal degradation of water quality. Remove the temporary stream crossings in their entirety and return the affected areas to their pre-existing elevation. All work and materials use for temporary construction stream crossings will not be paid for directly but are subsidiary to pertinent Items.

Provide SW3P Signs. Obtain from the Engineer a copy of the project's completed TPDES Storm Water Program Construction Site Notice and Contractor Site Notice. Laminate the sheets and bond with adhesive to 36" X 36" plywood sign blanks. Ensure the sheets remain dry. Apply Type C Blue reflective sheeting as the background and add the text "SW3P" in 5" white lettering, centered at the top. Attach the signs to approved temporary mounts and locate at each of the project limits just inside the right of way line at a readable height or as directed by the Engineer. If the sign cannot be placed outside the clear zone, it must adhere to the TMUTCD. SW3P signs, maintenance, and reposting (for replacement or as needed to ensure readability) will be subsidiary to Item 502.

Concrete Washouts are required per the CGP. The Concrete Washout Area(s) structural controls must consist of temporary berms, temporary shallow pits, and/or temporary storage tanks to prevent contaminated runoff and must be lined as to prevent contamination of underlying soil. Ensure pits properly maintained including removal of concrete as not to allow overflow. The location(s) of washout area will be approved by the Engineer. When washout pits are no longer needed, they will be removed, and area will be restored to original condition. This work, materials and labor will not be measured or paid for directly but will be subsidiary to Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls."

Item 540:
Furnish one type of post throughout the project except as specifically noted in the plans.

Item 585:
Use Surface Test Type A on all intersections and driveways.

Use Surface Test Type B pay adjustment schedule 3 on the travel lanes.

Items 644:
Provide two (2) sets of shop drawings for signs. The shop drawings shall conform to the details shown on the plans. The shop drawings shall show the details of the panels, wind beams, stiffeners, joint backing plates, splices, fasteners, brackets, and sign support connections.

The shop drawings shall show letter types and sizes, interline spacing and message arrangements.

Affix a sign identification decal to the back of all signs in accordance with Item 643.

Prior to taking elevations to determine lengths for fabrication of sign posts and/or sign support towers, obtain verification of all proposed locations.

All sign mounts shall have a clamp base system for all small roadside sign assemblies.

Item 662 and 672
Black adhesive will be used on asphalt pavements and white adhesive will be used on concrete pavements.

Item 3077:
Use aggregate that meets the Surface Aggregate Classification (SAC) requirement of Class B.

Provide PG binder 64-22 in Type SP-C and SP-B mixture.

Item 6185:
The total number of truck mounted attenuators (TMAs) or trailer attenuators (TAs) required when utilizing the traffic control standards are shown in the tables below.

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TCP 2 Series	Scenario	Required TMA/TA
(2-1)-18 / (2-2)-18	All	1

TCP 3 Series	Scenario			Required TMA/TA
(3-1)-13	All			2
(3-3)-14	A	B	D	2
	C			3

The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMAs/TAs needed for the project. Additional TMAs/TAs used that are not specified in the plans in which the contractor expects compensation will require prior approval from the Engineer.

General Notes

Sheet K

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0816-05-025 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 2862

			CONTROL SECTION JOB		**0816-05-025**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00176962**		
			COUNTY		**Collin**		
			HIGHWAY		**FM 2862**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	240.050		240.050	
	104-6015	REMOVING CONC (SIDEWALKS)	SY	22.000		22.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	749.000		749.000	
	110-6001	EXCAVATION (ROADWAY)	CY	4,451.000		4,451.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	9,369.000		9,369.000	
	134-6004	BACKFILL (TY A OR B)	STA	240.050		240.050	
	150-6001	BLADING	STA	240.050		240.050	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	149,554.000		149,554.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	149,554.000		149,554.000	
	168-6001	VEGETATIVE WATERING	MG	44,495.000		44,495.000	
	351-6006	FLEXIBLE PAVEMENT STRUCTURE REPAIR(10")	SY	803.000		803.000	
	354-6045	PLANE ASPH CONC PAV (2")	SY	67,013.000		67,013.000	
	400-6005	CEM STABIL BKFL	CY	366.000		366.000	
	400-6006	CUT & RESTORING PAV	SY	323.000		323.000	
	401-6001	FLOWABLE BACKFILL	CY	4.000		4.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	154.000		154.000	
	432-6003	RIPRAP (CONC)(6 IN)	CY	1.000		1.000	
	432-6024	RIPRAP (STONE COMMON)(DRY)(12 IN)	CY	158.000		158.000	
	432-6026	RIPRAP (STONE COMMON)(DRY)(18 IN)	CY	592.000		592.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	51.000		51.000	
	462-6021	CONC BOX CULV (8 FT X 6 FT)	LF	58.000		58.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	1,846.000		1,846.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	658.000		658.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	195.000		195.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	67.000		67.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	108.000		108.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	9.000		9.000	
	464-6018	RC PIPE (CL IV)(24 IN)	LF	205.000		205.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	4.000		4.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	4.000		4.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	2.000		2.000	
	466-6103	HEADWALL (CH - PW - 0) (DIA= 48 IN)	EA	2.000		2.000	
	466-6172	WINGWALL (PW - 1) (HW=11 FT)	EA	1.000		1.000	
	466-6173	WINGWALL (PW - 1) (HW=12 FT)	EA	1.000		1.000	
	467-6359	SET (TY II) (18 IN) (RCP) (4: 1) (P)	EA	4.000		4.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	116.000		116.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	14.000		14.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0816-05-025 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 2862

		CONTROL SECTION JOB		**0816-05-025**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00176962**			
		COUNTY		**Collin**			
		HIGHWAY		**FM 2862**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	467-6391	SET (TY II) (24 IN) (RCP) (4: 1) (P)	EA	2.000		2.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	30.000		30.000	
	467-6423	SET (TY II) (30 IN) (RCP) (6: 1) (P)	EA	8.000		8.000	
	496-6004	REMOV STR (SET)	EA	20.000		20.000	
	496-6007	REMOV STR (PIPE)	LF	2,611.000		2,611.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	14.000		14.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	1,670.000		1,670.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	1,670.000		1,670.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	172.000		172.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	172.000		172.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	22,370.000		22,370.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	22,370.000		22,370.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	1,584.000		1,584.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	1,584.000		1,584.000	
	530-6004	DRIVEWAYS (CONC)	SY	919.000		919.000	
	530-6005	DRIVEWAYS (ACP)	SY	5,895.000		5,895.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	37,009.000		37,009.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	18,183.000		18,183.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	312.500		312.500	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	180.000		180.000	
	542-6004	RM MTL BM GD FENCE TRANS (THRIE-BEAM)	EA	4.000		4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	6.000		6.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	5.000		5.000	
	560-6011	MAILBOX INSTALL-S (TWW-POST) TY 4	EA	38.000		38.000	
	560-6012	MAILBOX INSTALL-D (TWW-POST) TY 4	EA	2.000		2.000	
	560-6013	MAILBOX INSTALL-M (TWW-POST) TY 4	EA	3.000		3.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	123.000		123.000	
	644-6002	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	EA	2.000		2.000	
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	1.000		1.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	2.000		2.000	
	644-6036	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	EA	1.000		1.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	17.000		17.000	
	658-6099	INSTL OM ASSM (OM-2Z)(WFLX)GND	EA	28.000		28.000	
	662-6032	WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	LF	1,181.000		1,181.000	
	662-6034	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	LF	41,955.000		41,955.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0816-05-025 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 2862

			CONTROL SECTION JOB		**0816-05-025**	TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00176962**		
			COUNTY		**Collin**		
			HIGHWAY		**FM 2862**		
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	2,454.000		2,454.000	
	666-6018	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	LF	96.000		96.000	
	666-6042	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	LF	44.000		44.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	268.000		268.000	
	666-6196	REFL PAV MRK TY II (W) (RR XING)	EA	2.000		2.000	
	666-6225	PAVEMENT SEALER 6"	LF	2,056.000		2,056.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	47,967.000		47,967.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	1,181.000		1,181.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	41,955.000		41,955.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	589.000		589.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	2,056.000		2,056.000	
	685-6005	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)	EA	2.000		2.000	
	3077-6001	SP MIXESSP-BPG64-22	TON	10,566.000		10,566.000	
	3077-6013	SP MIXESSP-CSAC-B PG64-22	TON	9,551.000		9,551.000	
	3077-6075	TACK COAT	GAL	8,897.000		8,897.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6185-6002	TMA (STATIONARY)	DAY	200.000		200.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	200.000		200.000	
	18	RAILROAD FLAGGING: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		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	

SUMMARY OF ROADWAY ITEMS

PLAN SHEET NO.	LOCATION	100 6002 PREPARING ROW	134 6004 BACKFILL (TY A OR B)	150 6001 BLADING	351 6006 FLEXIBLE PAVEMENT STRUCTURE REPAIR(10")	354 6045 PLANE ASPH CONC PAV (2")	432 6045 RIPRAP (MOW STRIP)(4 IN)	533 6001 RUMBLE STRIPS (SHOULDER)	533 6002 RUMBLE STRIPS (CENTERLINE)	540 6001 MTL W-BEAM GD FEN (TIM POST)	540 6006 MTL BEAM GD FEN TRANS (THRIE-BEAM)	542 6001 REMOVE METAL BEAM GUARD FENCE	542 6004 RM MTL BM GD FENCE TRANS (THRIE-BEAM)
		STA	STA	STA	SY	SY	CY	LF	LF	LF	EA	LF	EA
SHEET 1	BEGIN PROJECT TO STA. 23+60	23.50	23.50	23.50	112	9074	11			12.5		60	
SHEET 2	STA. 23+60 TO STA. 47+60	24.00	24.00	24.00		6049		16	8				
SHEET 3	STA. 47+60 TO STA. 71+60	24.00	24.00	24.00		6108		4800	2400				
SHEET 4	STA. 71+60 TO STA. 95+60	24.00	24.00	24.00	34	6229		4513	2400				
SHEET 5	STA. 95+60 TO STA. 119+60	24.00	24.00	24.00		6125		4800	2400				
SHEET 6	STA. 119+60 TO STA. 143+60	24.00	24.00	24.00	434	6145		4800	2400				
SHEET 7	STA. 143+60 TO STA. 167+60	24.00	24.00	24.00	223	6145		4800	2400				
SHEET 8	STA. 167+60 TO STA. 191+60	24.00	24.00	24.00		6125		4321	1921				
SHEET 9	STA. 191+60 TO STA. 215+60	24.00	24.00	24.00		6141		4567	2167				
SHEET 10	STA. 215+60 TO STA. 239+60	18.85	18.85	18.85		7377	40	3252	1517	300	4	120	4
SHEET 11	STA. 239+60 TO PROJECT END	5.70	5.70	5.70		1495		1140	570				
	PROJECT TOTALS	**240.05**	**240.05**	**240.05**	**803**	**67013**	**51**	**37009**	**18183**	**312.5**	**4**	**180**	**4**

SUMMARY OF ROADWAY ITEMS (CONT.)

PLAN SHEET NO.	LOCATION	544 6001 GUARDRAIL END TREATMENT (INSTALL)	544 6003 GUARDRAIL END TREATMENT (REMOVE)	560 6011 MAILBOX INSTALL-S (TWW-POST) TY 4	560 6012 MAILBOX INSTALL-D (TWW-POST) TY 4	560 6013 MAILBOX INSTALL-M (TWW-POST) TY 4	3077 6001 ** SP MIXES SP-B PG64-22	3077 6013 ** SP MIXES SP-C SAC-B PG64-22	3077 6075 TACK COAT	6001 6002 PORTABLE CHANGEABLE MESSAGE SIGN	6185 6002 TMA (STATIONARY)	6185 6003 TMA (MOBILE OPERATION)
		EA	EA	EA	EA	EA	TON	TON	GAL	EA	DAY	HR
SHEET 1	BEGIN PROJECT TO STA. 23+60	2	1	4			687	1179	1093			
SHEET 2	STA. 23+60 TO STA. 47+60			4			1153	904	844			
SHEET 3	STA. 47+60 TO STA. 71+60			8	1	1	1153	904	844			
SHEET 4	STA. 71+60 TO STA. 95+60			5		2	1153	904	844			
SHEET 5	STA. 95+60 TO STA. 119+60			1	1		1153	904	844			
SHEET 6	STA. 119+60 TO STA. 143+60			1			1153	904	844			
SHEET 7	STA. 143+60 TO STA. 167+60			6			1153	904	844	2	200	200
SHEET 8	STA. 167+60 TO STA. 191+60			3			1153	904	844			
SHEET 9	STA. 191+60 TO STA. 215+60			4			1153	904	844			
SHEET 10	STA. 215+60 TO STA. 239+60	4	4	1			381	925	850			
SHEET 11	STA. 239+60 TO PROJECT END			1			274	215	202			
	PROJECT TOTALS	**6**	**5**	**38**	**2**	**3**	**10566**	**9551**	**8897**	**2**	**200**	**200**

NOTES:
** TOP SOIL ONLY*
*** ADDED 10% ON THE QAUNTITIES*

Texas Department of Transportation

FM 2862

SUMMARY SHEETS
ROADWAY

SHEET 1 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	12

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SUMMARY OF DRIVEWAY ITEMS

DRIVEWAY NO.	PLAN SHEET NO.	EXISTING MATERIAL/TYPE	WIDTH	RADII	104 6015 REMOVING CONC (SIDEWALKS)	104 6017 REMOVING CONC (DRIVEWAYS)	464 6003 RC PIPE (CL III)(18 IN)	464 # 6005 RC PIPE (CL III)(24 IN)	464 # 6007 RC PIPE (CL III)(30 IN)	467 6359 SET (TY II) (18 IN) (RCP) (4: 1) (P)	467 6363 SET (TY II) (18 IN) (RCP) (6: 1) (P)	467 6391 SET (TY II) (24 IN) (RCP) (4: 1) (P)	467 6395 SET (TY II) (24 IN) (RCP) (6: 1) (P)	467 6423 SET (TY II) (30 IN) (RCP) (6: 1) (P)	496 6004 REMOV STR (SET)	496 # 6007 REMOV STR (PIPE)	530 6004 DRIVEWAYS (CONC)	530 6005 DRIVEWAYS (ACP)
			FT	FT	SY	SY	LF	LF	LF	EA	EA	EA	EA	EA	EA	LF	SY	SY
1	1	ASPHALT	MATCH	15,15			48				2							75
2	1	CONCRETE	MATCH	15,15		28	26				2						37	
3	1	ASPHALT	MATCH	15,15			66				2					52		70
4	1	ASPHALT	MATCH	15,15			66				2					41		54
5	1	ASPHALT (S INTERURBAN ST) *	MATCH	MATCH														
6	1	ASPHALT (S INTERURBAN ST)	MATCH	15,25			50				2							40
7	1	ASPHALT (N RIGGINS ST) *	MATCH	MATCH														
8	1	ASPHALT (N RIGGINS ST) *	MATCH	MATCH														
9	1	ASPHALT (FM2862) *	MATCH	MATCH														
9A	1	ASPHALT (4TH ST) *	MATCH	MATCH														
10	1	GRAVEL	MATCH	15,15				32					2			25		52
11	1	ASPHALT (3RD ST)	MATCH	30,30				58					2			31		104
12	1	CONCRETE TO GRAVEL	MATCH	15,15		39		32					2			25	65	
13	1	GRAVEL	14	15,15	13		28				2					7		52
14	1	ASPHALT (2ND ST)	MARCH	30,30				52					2			30		98
15	1	GRAVEL	11	15,15			30				2					31		43
16	1	ASPHALT	MATCH	15,15			30				2					17		55
17	1	GRAVEL	MATCH	15,15			42				2				2	40		95
18	1	CONCRETE	11	15,15		27	22								2	32	43	
19	1	GRAVEL	11	15,15			24				2					12		42
20	1	CONCRETE	MATCH	15,15		24	30				2				2	34	37	
21	1	GRAVEL	MATCH	15,15				32					2			30		33
22	1	GRAVEL	11	MATCH,15				26					2			21		37
23	2	GRAVEL	11	15,15			20				2					17		31
24	2	GRAVEL	11	15,15			20					1	1			16		31
25	2	GRAVEL	11	15,15			32				2					17		30
26	2	GRAVEL	11	15,15			28				2					28		25
27	2	GRAVEL	MATCH	15,15				42					2			37		47
28	2	GRAVEL**	32	20,20	9				50					2		67		53
29	2	GRAVEL	MATCH	15,15				28					2			32		33
30	2	GRAVEL	MATCH	15,15			32				2				2	36		39
31	3	GRAVEL	MATCH	15,15			22			1	1					20		56
32	3	GRAVEL	MATCH	15,15			22			1	1					30		52
33	3	CONCRETE	MATCH	15,15			42				2					25		101
34	3	GRAVEL	11	15,15			26				2					35		49
35	3	GRAVEL	11	15,15				20					2			20		50
36	3	GRAVEL	11	15,15			20				2					17		49
37	3	GRAVEL	11	15,15			26				2					24		56
38	3	GRAVEL	11	15,15				24					2			41		49
39	3	GRAVEL	MATCH	MATCH			50				2				2	57		85
40	3	GRAVEL	11	15,15				24					2			18		50
41	3	CONCRETE	MATCH	15,15		47		30					2		2	40	66	
42	3	GRAVEL	11	15,15			24				2					30		52
43	3	GRAVEL	MATCH	15,15			28				6					108		60
44	4	GRAVEL	MATCH	15,15			28				6					93		56
45	4	CONCRETE	MATCH	30,30		122											128	
46	4	GRAVEL	MATCH	15,15					60					4	2	80		61
47	4	ASPHALT (CR 425)	MATCH	MATCH														245
48	4	GRAVEL	MATCH	15, MATCH			24			1	1					21		61
49	4	GRAVEL	11	MATCH,15			22			1	1					22		46
50	4	GRAVEL (OAK CR 5010)	MATCH	30,30			42				2					35		103

NOTE:

1. MATCH EXISTING DRIVEWAY WIDTH WITH A MINIMUM OF 11`.
2. MATCH EXISTING DRIVEWAY RADIUS WITH A MINIMUM OF 15`.
3. SEE "PLAN SHEET" AND "MISCELLANEOUS ROADWAY DETAILS SHEET" FOR DRIVEWAY AND DRIVEWAY PIPE LOCATIONS AND DETAILS.
4. REMOVAL OF ASPHALT DRIVEWAY IS SUBSIDIARY TO ITEM 530.
5. NO ADDITIONAL COST FOR CUTTING PIPE AT ROADWAY CROSSING.

NOTE:

6. * MILL AND OVERLAY WORK.
7. ** DW28 CONSISTS OF TWO EXISTING DRIVEWAYS COMBINED IN ONE DRIVEWAY.
   EXISTING CMP PIPES, TREES, AND SIDEWALK BELONG TO PROPERTY OWNER, AND SHOULD BE RETURNED TO PROPERTY OWNER AFTER REMOVAL.
8. # BID ITEM IS SHOWN IN MULTIPLE SUMMARY BOXES.

Texas Department of Transportation

FM 2862

SUMMARY SHEETS (DRIVEWAY)

SHEET 2 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		13

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SUMMARY OF DRIVEWAY ITEMS (CONT.)

DRIVEWAY NO.	PLAN SHEET NO.	EXISTING MATERIAL/TYPE	WIDTH	RADII	104 6015	104 6017	464 6003	464 # 6005	464 # 6007	467 6359	467 6363	467 6391	467 6395	467 6423	496 6004	496 # 6007	530 6004	530 6005
					REMOVING CONC (SIDEWALKS)	REMOVING CONC (DRIVEWAYS)	RC PIPE (CL III)(18 IN)	RC PIPE (CL III)(24 IN)	RC PIPE (CL III)(30 IN)	SET (TY II)(18 IN)(RCP)(4: 1)(P)	SET (TY II)(18 IN)(RCP)(6: 1)(P)	SET (TY II)(24 IN)(RCP)(4: 1)(P)	SET (TY II)(24 IN)(RCP)(6: 1)(P)	SET (TY II)(30 IN)(RCP)(6: 1)(P)	REMOV STR (SET)	REMOV STR (PIPE)	DRIVEWAYS (CONC)	DRIVEWAYS (ACP)
			FT	FT	SY	SY	LF	LF	LF	EA	EA	EA	EA	EA	EA	LF	SY	SY
51	4	CONCRETE	MATCH	30, 30		151											133	
52	4	GRAVEL	11	15, 15			24				2					21		49
53	4	CONCRETE	MATCH	30, 30		137											131	
54	4	GRAVEL	11	15, 15			22				2					32		49
55	4	GRAVEL	MATCH	MATCH			28				2					22		68
56	5	GRAVEL	11	15, 15				26					2			23		50
57	5	GRAVEL	MATCH	15, 15			34				2							86
58	5	GRAVEL	11	15, 15			32				2							54
59	5	GRAVEL	11	15, 15			36				2					21		49
60	5	GRAVEL	MATCH	15, 15			32				2							72
61	5	GRAVEL	MATCH	MATCH														101
62	6	GRAVEL	MATCH	MATCH														195
63	6	GRAVEL	MATCH	15, 15			36				2							94
64	6	GRAVEL	11	15, 15			26				2					20		48
65	6	GRAVEL	11	MATCH			34				2					30		76
66	7	GRAVEL	11	15, 15														51
67	7	GRAVEL	MATCH	MATCH														96
68	7	CONCRETE	11	15, MATCH		47											74	
69	7	GRAVEL	MATCH	15, 15														64
69A	7	GRAVEL	MATCH	15, 15			32				2					25		58
70	7	GRAVEL	11	MATCH, 15			28				2					32		51
71	7	GRAVEL	11	MATCH, 15			36				2							71
72	8	GRAVEL	11	MATCH, 15			28				2					20		53
73	8	GRAVEL	56	15, 15														202
74	8	GRAVEL	MATCH	15, 15			34				2					25		68
75	8	GRAVEL	MATCH	MATCH			38				2				2	38		66
76	8	ASPHALT	MATCH	MATCH														111
77	8	ASPHALT (CR 427)	MATCH	MATCH														213
78	8	GRAVEL	11	MATCH, 15														54
79	8	GRAVEL	14	15, 15			26				2							60
80	8	GRAVEL	11	15, MATCH			26				2					33		53
81	8	GRAVEL	14	15, 15			28				2					22		62
82	9	CONCRETE	MATCH	15, 15		82		66					2			77	150	
83	9	GRAVEL	MATCH	15, 15			34				2					32		60
84	9	ASPHALT (CR 477)	MATCH	30, 30					50					2		37		122
85	9	GRAVEL	MATCH	MATCH, 15			34				2							58
86	9	GRAVEL	MATCH	MATCH, 15														186
87	9	GRAVEL	MATCH	MATCH			40				2				2	43		113
88	9	GRAVEL	MATCH	MATCH			32				2				2	54		60
89	9	GRAVEL	11	15, 15			26				2					25		50
90	10	CONCRETE	11	MATCH, 15		45	28				2					21	55	
91	10	GRAVEL	MATCH	15, MATCH			38				2					19		96
92	10	ASPHALT	MATCH	15, MATCH														43
93	10	GRAVEL	MATCH	MATCH														51
94	10	ASPHALT (CR 479)	MATCH	MATCH				38				1	1			44		130
95	10	ASPHALT	MATCH	15, 15			36				2					31		64
96	10	ASPHALT	MATCH	15, 15														68
97	11	GRAVEL	11	15, 15			28				2					35		50
		PROJECT TOTALS			**22**	**749**	**1846**	**530**	**160**	**4**	**116**	**2**	**30**	**8**	**20**	**2176**	**919**	**5895**

NOTE:

1. MATCH EXISTING DRIVEWAY WIDTH WITH A MINIMUM OF 11`.
2. MATCH EXISTING DRIVEWAY RADIUS WITH A MINIMUM OF 15`.
3. SEE "PLAN SHEET" AND "MISCELLANEOUS ROADWAY DETAILS SHEET" FOR DRIVEWAY AND DRIVEWAY PIPE LOCATIONS AND DETAILS.
4. REMOVAL OF ASPHALT DRIVEWAY IS SUBSIDIARY TO ITEM 530.
5. NO ADDITIONAL COST FOR CUTTING PIPE AT ROADWAY CROSSING.
6. # BID ITEM IS SHOWN IN MULTIPLE SUMMARY BOXES.

Texas Department of Transportation

FM 2862

SUMMARY SHEETS (DRIVEWAY)

SHEET 3 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		14

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SUMMARY OF DRAINAGE ITEMS

LOCATION	400 6005 CEM STABIL BKFL (CY)	400 6006 CUT & RESTORING PAV (SY)	401 6001 FLOWABLE BACKFILL (CY)	402 6001 TRENCH EXCAVATION PROTECTION (LF)	432 6003 RIPRAP (CONC)(6 IN) (CY)	432 6024 RIPRAP (STONE COMMON)(DRY)(12 IN) (CY)	432 6026 RIPRAP (STONE COMMON)(DRY)(18 IN) (CY)	462 6021 CONC BOX CULV (8 FT X 6 FT) (LF)	464 6005 # RC PIPE (CL III)(24 IN) (LF)	464 6007 # RC PIPE (CL III)(30 IN) (LF)	464 6008 RC PIPE (CL III)(36 IN) (LF)	464 6009 RC PIPE (CL III)(42 IN) (LF)	464 6010 RC PIPE (CL III)(48 IN) (LF)
CULVERT 1, STA. 00+38.03	40	39				4							
CULVERT 2, STA. 06+56.30	41	40				4							
CULVERT 3, STA. 08+03.98	31	29			1				56				
CULVERT 4, STA. 09+97.74						4							
CULVERT 5, STA. 80+96.95	25	17				4							
CULVERT 6, STA. 105+94.57	78	43		31			136					108	
CULVERT 7, STA. 114+13.39							128						9
CULVERT 8, STA. 124+65.02							90			17			
CULVERT 9, STA. 130+91.13							78				13		
CULVERT 10, STA. 142+83.55	30	23		27		4			54				
CULVERT 11, STA. 152+04.45						61				18			
CULVERT 12, STA. 160+87.63						4			18				
CULVERT 13, STA. 169+60.47	43	41	4	40		69					54		
CULVERT 14, STA. 205+12.92	78	91		56			160	58					
PROJECT TOTALS	**366**	**323**	**4**	**154**	**1**	**154**	**592**	**58**	**128**	**35**	**67**	**108**	**9**

SUMMARY OF DRAINAGE ITEMS (CONT.)

LOCATION	464 6018 RC PIPE (CL IV)(24 IN) (LF)	466 6099 HEADWALL (CH - PW - 0) (DIA= 30 IN) (EA)	466 6101 HEADWALL (CH - PW - 0) (DIA= 36 IN) (EA)	466 6102 HEADWALL (CH - PW - 0) (DIA= 42 IN) (EA)	466 6103 HEADWALL (CH - PW - 0) (DIA= 48 IN) (EA)	466 6172 WINGWALL (PW - 1) (HW=11 FT) (EA)	466 6173 WINGWALL (PW - 1) (HW=12 FT) (EA)	467 6388 SET (TY II) (24 IN) (RCP) (3: 1) (C) (EA)	496 6007 # REMOV STR (PIPE) (LF)
CULVERT 1, STA. 00+38.03	72							2	53
CULVERT 2, STA. 06+56.30	76							2	76
CULVERT 3, STA. 08+03.98								2	56
CULVERT 4, STA. 09+97.74	10							2	4
CULVERT 5, STA. 80+96.95	47							2	36
CULVERT 6, STA. 105+94.57				2					45
CULVERT 7, STA. 114+13.39					2				4
CULVERT 8, STA. 124+65.02		2							3
CULVERT 9, STA. 130+91.13			2						8
CULVERT 10, STA. 142+83.55								2	36
CULVERT 11, STA. 152+04.45		2							4
CULVERT 12, STA. 160+87.63								2	4
CULVERT 13, STA. 169+60.47			2						48
CULVERT 14, STA. 205+12.92						1	1		58
PROJECT TOTALS	**205**	**4**	**4**	**2**	**2**	**1**	**1**	**14**	**435**

BID ITEM IS SHOWN IN MULTIPLE SUMMARY BOXES.

Texas Department of Transportation

FM 2862

SUMMARY SHEETS (DRAINAGE)

SHEET 4 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		15

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SUMMARY OF PAVEMENT MARKING ITEMS

PLAN SHEET NO.	LOCATION	662 6032	662 6034	662 6111	666 6018	666 6042	666 6048	666 6196	666 6225	666 6309	666 6318	666 6321	672 6009	678 6002
		WK ZN PAV MRK NON-REMOV (Y)4"(BRK)	WK ZN PAV MRK NON-REMOV (Y)4"(SLD)	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	REFL PAV MRK TY I (W)12"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY II (W)(RR XING)	PAVEMENT SEALER 6"	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")
		LF	LF	EA	LF	LF	LF	EA	LF	LF	LF	LF	EA	LF
SHEET 1	BEGIN PROJECT TO STA. 23+60		4008	201			186	2		4139		4008	53	
SHEET 2	STA. 23+60 TO STA. 47+60		4800	240						4802		4800	60	
SHEET 3	STA. 47+60 TO STA. 71+60		4800	240						4802		4800	60	
SHEET 4	STA. 71+60 TO STA. 95+60	300	3368	259	50	44	29			4603	300	3368	57	
SHEET 5	STA. 95+60 TO STA. 119+60	600	960	228						4800	600	960	42	
SHEET 6	STA. 119+60 TO STA. 143+60		4800	240						4802		4800	60	
SHEET 7	STA. 143+60 TO STA. 167+60		4800	240						4802		4800	60	
SHEET 8	STA. 167+60 TO STA. 191+60		4800	240	46		23			4623		4800	60	
SHEET 9	STA. 191+60 TO STA. 215+60	281	3679	269			17			4720	281	3679	62	
SHEET 10	STA. 215+60 TO STA. 239+60		4800	240			13		2056	4734		4800	60	2056
SHEET 11	STA. 239+60 TO PROJECT END		1140	57						1140		1140	15	
	PROJECT TOTALS	**1181**	**41955**	**2454**	**96**	**44**	**268**	**2**	**2056**	**47967**	**1181**	**41955**	**589**	**2056**

SUMMARY OF PAVEMENT SIGNING ITEMS

PLAN SHEET NO.	LOCATION	644 6001	644 6002	644 6004	644 6033	644 6036	658 6062	658 6099
		IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(P-BM)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	INSTL OM ASSM (OM-2Z)(WFLX)GND
		EA	EA	EA	EA	EA	EA	EA
SHEET 1	BEGIN PROJECT TO STA. 23+60	29	2	1	2	1	3	8
SHEET 2	STA. 23+60 TO STA. 47+60	14						
SHEET 3	STA. 47+60 TO STA. 71+60	12						
SHEET 4	STA. 71+60 TO STA. 95+60	14						2
SHEET 5	STA. 95+60 TO STA. 119+60	1						4
SHEET 6	STA. 119+60 TO STA. 143+60	9						6
SHEET 7	STA. 143+60 TO STA. 167+60	9						4
SHEET 8	STA. 167+60 TO STA. 191+60	3						2
SHEET 9	STA. 191+60 TO STA. 215+60	2						2
SHEET 10	STA. 215+60 TO STA. 239+60	25					14	
SHEET 11	STA. 239+60 TO PROJECT END	5						
	PROJECT TOTALS	**123**	**2**	**1**	**2**	**1**	**17**	**28**

SUMMARY OF SCHOOL FLASHER ITEM

LOCATION	685 6005
	RELOCT RDSD FLSH BCN AM (SOLAR PWRD)
	EA
ROSAMOND-SHERLEY ELEMENTARY SCHOOL	2
PROJECT TOTALS	**2**

Texas Department of Transportation

FM 2862

SUMMARY SHEETS
(PAVEMENT MARKINGS, SIGNS, AND SCHOOL FLASHER)

SHEET 5 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	16

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SUMMARY OF EROSION CONTROL ITEMS

PLAN SHEET NO.	LOCATION	164 6035 DRILL SEEDING (PERM) (RURAL) (CLAY)	164 6051 DRILL SEED (TEMP)(WARM OR COOL)	166 ** FERTILIZER	168 6001 VEGETATIVE WATERING	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2)	506 6011 ROCK FILTER DAMS (REMOVE)	506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1)	506 6024 CONSTRUCTION EXITS (REMOVE)	506 6038 TEMP SEDMT CONT FENCE (INSTALL)	506 6039 TEMP SEDMT CONT FENCE (REMOVE)	506 6041 BIODEG EROSN CONT LOGS (INSTL) (12")	506 6043 BIODEG EROSN CONT LOGS (REMOVE)
		SY	SY	TON	MG	LF	LF	SY	SY	LF	LF	LF	LF
SHEET 1	BEGIN PROJECT TO STA. 23+60	4358	4358	0.5	1297	350	350	78	78	446	446	170	170
SHEET 2	STA. 23+60 TO STA. 47+60	7980	7980	0.8	2374					1464	1464	160	160
SHEET 3	STA. 47+60 TO STA. 71+60	27841	27841	2.9	8283					982	982	180	180
SHEET 4	STA. 71+60 TO STA. 95+60	15127	15127	1.6	4501	140	140			2085	2085	180	180
SHEET 5	STA. 95+60 TO STA. 119+60	13066	13066	1.4	3887	280	280					110	110
SHEET 6	STA. 119+60 TO STA. 143+60	15964	15964	1.6	4750	380	380			2533	2533	110	110
SHEET 7	STA. 143+60 TO STA. 167+60	19592	19592	2.0	5829	240	240			2881	2881	130	130
SHEET 8	STA. 167+60 TO STA. 191+60	15495	15495	1.6	4610	140	140			2862	2862	130	130
SHEET 9	STA. 191+60 TO STA. 215+60	16155	16155	1.7	4806	140	140			2185	2185	120	120
SHEET 10	STA. 215+60 TO STA. 239+60	10099	10099	1.0	3005					3710	3710	110	110
SHEET 11	STA. 239+60 TO PROJECT END	3877	3877	0.4	1153			78	78	1188	1188	40	40
	* 10% ADDITIONAL QUANTITY							16	16	2034	2034	144	144
	PROJECT TOTALS	**149554**	**149554**	**15.5**	**44495**	**1670**	**1670**	**172**	**172**	**22370**	**22370**	**1584**	**1584**

** ADDITIONAL 10% QUANTITY FOR BMP`S ITEMS PROVIDED TO ALLOW FOR PERIODIC REPLACEMENTS DUE TO NORMAL WEAR AND CHANGING SITE CONDITIONS.*
*** FOR CONTRACTOR`S INFORMATION ONLY.*

Texas Department of Transportation

FM 2862

SUMMARY SHEETS
SW3P

SHEET 6 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		17

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SUMMARY OF EARTHWORK QUANTITIES

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY
8+91.000 R1	0	0
9+00.000 R1	1	0
9+03.203 R1	1	1
10+00.000 R1	13	45
11+00.000 R1	14	65
12+00.000 R1	14	39
13+00.000 R1	16	41
14+00.000 R1	17	35
15+00.000 R1	19	23
16+00.000 R1	20	31
17+00.000 R1	19	35
18+00.000 R1	21	31
19+00.000 R1	17	43
20+00.000 R1	23	32
21+00.000 R1	27	33
22+00.000 R1	23	41
23+00.000 R1	17	52
24+00.000 R1	14	57
25+00.000 R1	21	45
26+00.000 R1	23	38
27+00.000 R1	21	34
28+00.000 R1	21	23
29+00.000 R1	20	14
30+00.000 R1	19	17
31+00.000 R1	19	14
32+00.000 R1	18	18
33+00.000 R1	19	19
34+00.000 R1	19	18
35+00.000 R1	18	20
36+00.000 R1	17	22
37+00.000 R1	17	21
38+00.000 R1	20	15
39+00.000 R1	20	14
40+00.000 R1	18	17
41+00.000 R1	22	17
42+00.000 R1	29	19
43+00.000 R1	31	25
44+00.000 R1	30	33
45+00.000 R1	27	29
46+00.000 R1	22	21
47+00.000 R1	21	21
48+00.000 R1	20	24
49+00.000 R1	20	31
50+00.000 R1	20	27

SUMMARY OF EARTHWORK QUANTITIES (CONT.)

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY
51+00.000 R1	21	15
52+00.000 R1	23	14
53+00.000 R1	25	9
54+00.000 R1	24	11
55+00.000 R1	23	13
56+00.000 R1	26	6
57+00.000 R1	25	13
58+00.000 R1	26	10
59+00.000 R1	26	12
60+00.000 R1	24	16
61+00.000 R1	24	9
62+00.000 R1	21	9
63+00.000 R1	19	16
64+00.000 R1	18	24
65+00.000 R1	25	29
66+00.000 R1	29	32
67+00.000 R1	28	23
68+00.000 R1	26	20
69+00.000 R1	25	26
70+00.000 R1	25	23
71+00.000 R1	25	11
72+00.000 R1	25	5
73+00.000 R1	23	5
74+00.000 R1	23	6
75+00.000 R1	21	7
76+00.000 R1	20	6
77+00.000 R1	19	6
78+00.000 R1	19	11
79+00.000 R1	24	12
80+00.000 R1	33	30
81+00.000 R1	35	71
82+00.000 R1	31	62
83+00.000 R1	27	28
84+00.000 R1	23	18
85+00.000 R1	12	6
86+00.000 R1	12	4
87+00.000 R1	20	13
88+00.000 R1	15	21
89+00.000 R1	13	22
90+00.000 R1	16	17
91+00.000 R1	19	15
92+00.000 R1	19	19
93+00.000 R1	20	18
94+00.000 R1	17	19

SUMMARY OF EARTHWORK QUANTITIES (CONT.)

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY
95+00.000 R1	12	34
96+00.000 R1	10	56
97+00.000 R1	9	67
98+00.000 R1	9	62
99+00.000 R1	11	61
100+00.000 R1	11	68
101+00.000 R1	12	68
102+00.000 R1	14	60
103+00.000 R1	15	58
104+00.000 R1	16	54
105+00.000 R1	16	54
106+00.000 R1	15	142
107+00.000 R1	16	131
108+00.000 R1	19	23
109+00.000 R1	24	6
110+00.000 R1	29	0
111+00.000 R1	26	13
112+00.000 R1	20	31
113+00.000 R1	20	36
114+00.000 R1	17	95
115+00.000 R1	17	103
116+00.000 R1	22	43
117+00.000 R1	24	29
118+00.000 R1	23	21
119+00.000 R1	21	12
120+00.000 R1	22	18
121+00.000 R1	23	30
122+00.000 R1	22	30
123+00.000 R1	20	39
124+00.000 R1	19	52
125+00.000 R1	18	62
126+00.000 R1	21	53
127+00.000 R1	24	46
128+00.000 R1	21	79
129+00.000 R1	14	106
130+00.000 R1	12	102
131+00.000 R1	11	154
132+00.000 R1	15	138
133+00.000 R1	22	46
134+00.000 R1	22	25
135+00.000 R1	21	24
136+00.000 R1	21	22
137+00.000 R1	19	22
138+00.000 R1	20	23

Texas Department of Transportation

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SUMMARY SHEETS
EARTHWORK

SHEET 7 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		18

CK:
DW:
CK:
DW:

SUMMARY OF EARTHWORK QUANTITIES (CONT.)

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY
139+00.000 R1	25	25
140+00.000 R1	23	27
141+00.000 R1	22	30
142+00.000 R1	23	43
143+00.000 R1	18	107
144+00.000 R1	16	116
145+00.000 R1	18	72
146+00.000 R1	20	72
147+00.000 R1	24	59
148+00.000 R1	30	31
149+00.000 R1	25	34
150+00.000 R1	14	68
151+00.000 R1	13	88
152+00.000 R1	14	100
153+00.000 R1	14	93
154+00.000 R1	14	70
155+00.000 R1	16	51
156+00.000 R1	18	38
157+00.000 R1	21	24
158+00.000 R1	20	23
159+00.000 R1	18	42
160+00.000 R1	16	73
161+00.000 R1	17	123
162+00.000 R1	24	111
163+00.000 R1	30	53
164+00.000 R1	27	34
165+00.000 R1	12	16
166+00.000 R1	18	0
167+00.000 R1	33	8
168+00.000 R1	25	22
169+00.000 R1	19	61
170+00.000 R1	16	85
171+00.000 R1	17	74
172+00.000 R1	22	47
173+00.000 R1	23	23
174+00.000 R1	20	21
175+00.000 R1	20	29
176+00.000 R1	23	36
177+00.000 R1	23	42
178+00.000 R1	20	53
179+00.000 R1	19	48
180+00.000 R1	20	49
181+00.000 R1	21	51
182+00.000 R1	22	34

SUMMARY OF EARTHWORK QUANTITIES (CONT.)

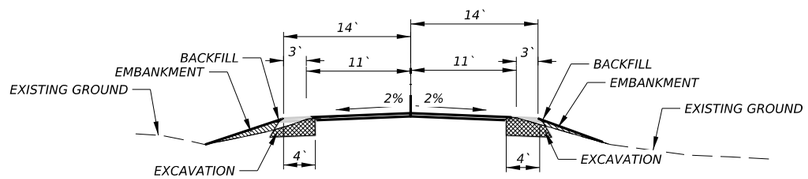
LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY
183+00.000 R1	22	17
184+00.000 R1	23	21
185+00.000 R1	22	32
186+00.000 R1	19	32
187+00.000 R1	19	24
188+00.000 R1	19	18
189+00.000 R1	17	18
190+00.000 R1	17	25
191+00.000 R1	15	50
192+00.000 R1	15	58
193+00.000 R1	21	42
194+00.000 R1	22	52
195+00.000 R1	17	55
196+00.000 R1	16	62
197+00.000 R1	16	82
198+00.000 R1	17	77
199+00.000 R1	19	79
200+00.000 R1	19	87
201+00.000 R1	20	91
202+00.000 R1	21	126
203+00.000 R1	16	155
204+00.000 R1	12	211
205+00.000 R1	10	342
206+00.000 R1	13	245
207+00.000 R1	21	45
208+00.000 R1	24	12
209+00.000 R1	23	25
210+00.000 R1	20	32
211+00.000 R1	19	20
212+00.000 R1	21	17
213+00.000 R1	22	24
214+00.000 R1	21	22
215+00.000 R1	25	9
216+00.000 R1	27	15
217+00.000 R1	25	17
218+00.000 R1	28	23
219+00.000 R1	31	27
220+00.000 R1	16	8
221+00.000 R1	0	0
222+00.000 R1	0	0
223+00.000 R1	0	0
224+00.000 R1	0	0
225+00.000 R1	0	0
226+00.000 R1	0	0

SUMMARY OF EARTHWORK QUANTITIES (CONT.)

LOCATION	110 6001 EXCAVATION (ROADWAY) CY	132 6006 EMBANKMENT (FINAL)(DENS CONT)(TY C) CY
227+00.000 R1	0	0
228+00.000 R1	0	0
229+00.000 R1	0	0
230+00.000 R1	0	0
231+00.000 R1	0	0
232+00.000 R1	0	0
233+00.000 R1	0	0
234+00.000 R1	0	0
235+00.000 R1	0	0
236+00.000 R1	9	19
237+00.000 R1	19	37
238+00.000 R1	19	33
239+00.000 R1	21	31
240+00.000 R1	26	33
241+00.000 R1	23	27
242+00.000 R1	17	37
243+00.000 R1	17	58
244+00.000 R1	17	59
245+00.000 R1	19	55
245+30.000 R1	7	16
PROJECT TOTALS	**4451**	**9369**

LEGEND:

- *EXCAVATION (CUT)*
- *EMBANKMENT (FILL)*
- *BACKFILL*



EARTHWORK CALCULATION DETAILS
N.T.S.

CONTRACTOR'S INFORMATION:

EARTHWORK QUANTITY CALCULATIONS WERE DONE USING OPEN ROAD DESIGN SOFTWARE

Texas Department of Transportation

FM 2862

SUMMARY SHEETS
EARTHWORK

SHEET 8 OF 8

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		19

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: FRP = Fiberglass, TWT = Thin-Wall, 10BWG = 10 BWG, S80 = Sch 80	POSTS: 1 or 2	ANCHOR TYPE: UA=Universal Conc, UB=Universal Bolt, SA=Slipbase-Conc, SB=Slipbase-Bolt, WS=Wedge Steel, WP=Wedge Plastic	MOUNTING DESIGNATION: PREFABRICATED: P = "Plain", T = "T", U = "U"	1EXT or 2EXT = # of Ext, BM = Extruded Wind Beam, WC = 1.12 #/ft Wing Channel, EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE: TY N, TY S
1	1	M3-1	NORTH <AUXILIARY SIGN>	24 x 12	X		S80	1	SA	U		
		M1-6T	(ROUTE #) TEXAS	24 x 24	X							
		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15	X							
		M3-2	EAST <AUXILIARY SIGN>	24 x 12	X							
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15	X							
1	2	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
1	3	W10-1	SYMBOL - GRADE XING ADVANCED WARNING	36 diameter	X		10BWG	1	SA	P		
1	4	D1-2	(DESTINATION - 2 LINE)	??? x 30	X		S80	1	SA	U	BM	
1	5	D3-1**	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		D3-1**	(STREET NAME)	VAR x 12	X							
		R1-1	STOP	36 x 36	X							
1	6	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
1	7	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
1	8	D3-1**	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		D3-1**	(STREET NAME)	VAR x 12								
		R1-1	STOP	36 x 36								
1	9	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
1	10	R8-8	DO NOT STOP ON TRACKS	24 x 30	X		10BWG	1	SA	P		
1	10A	R8-8	DO NOT STOP ON TRACKS	24 x 30	X		10BWG	1	SA	P		
1	11	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		R1-3P	ALL WAY	18 x 6	X		10BWG	1	SA	P		
1	12	M4-5	TO <AUXILIARY SIGN>	24 x 12			10BWG		SA	P		
		M1-6T	(ROUTE #) TEXAS	24 x 24	X							
		M3-4	WEST <AUXILIARY SIGN>	24 x 12								
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15	X							
1	12A	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		R1-3P	ALL WAY	18 x 6	X							
1	13	M3-4	WEST <AUXILIARY SIGN>	24 x 12	X		S80	1	SA	U		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15	X							
		M3-2	EAST <AUXILIARY SIGN>	24 x 12	X							
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
		M6-1	<ARROW - HORIZ. STRGHT> <AUXILIARY SIGN>	21 x 15	X							
1	14	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		R1-3P	ALL WAY	18 x 6	X							

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

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

http://www.txdot.gov/

NOTE:

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

** SALVAGED SIGN

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 1 OF 8

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		0816	05	025	FM 2862
4-16		DIST	COUNTY		SHEET NO.
8-16		DAL	COLLIN		20

18

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DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1	15	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		R1-3P	ALL WAY	18 x 6	X							
1	16	D2-1	(DESTINATION) (DISTANCE) <1 LINE>	96 x 18	X		10BWG	1	SA	T		
1	17	M3-2	EAST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
1	18	D3-1	(STREET NAME)	42 x 12	X		S80	1	SA	P	BM	
		D3-1	(STREET NAME)	48 x 12	X							
		R1-1	STOP	36 x 36	X							
1	19	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
1	20	M1-6T	(ROUTE #) TEXAS	24 x 24	X		10BWG	1	SA	P		
		M2-1	JCT <AUXILIARY SIGN>	21 x 15	X							
1	20A	W3-1	SYMBOL - STOP AHEAD	36 X36	X		10BWG	1	SA	P		
1	21	D3-1	(STREET NAME)	42 x 12	X		S80	1	SA	P	BM	
		D3-1	(STREET NAME)	48 x 12	X							
		R1-1	STOP	36 x 36	X							
1	22	W10-1	SYMBOL - GRADE XING ADVANCED WARNING	36 diameter	X		10BWG	1	SA	P		
1	23	W1-3R	SYMBOL - REVERSE TURN RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
1	24	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
1	25	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
1	26	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
1	27	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
1	28	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
1	29	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							

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

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 2 OF 8

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16	DIST	COUNTY		SHEET NO.
8-16	DAL	COLLIN		21

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE: 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	30	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
1	31	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	1	W1-3R	SYMBOL - REVERSE TURN RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
2	1A	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
2	1B	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
2	2	W1-1R	SYMBOL - HORIZ ALN TURN RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
2	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	8	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	10	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
2	11	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
2	12	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
3	1	W1-1L	SYMBOL - HORIZ ALN TURN LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
3	2	W3-5	<SYMBOL - REDUCED SPEED AHD> (SPEED)	36 x 36	X		10BWG	1	SA	P		

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

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

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SHEET 3 OF 8

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8-16		DAL	COLLIN		22

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION: 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
							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"		TY N TY S
3	3	W1-1L	SYMBOL - HORIZ ALN TURN LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
3	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	8	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	10	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	11	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
3	12	W1-1R	SYMBOL - HORIZ ALN TURN RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
4	1	S5-1	SCHOOL / SPEED LIMIT (SPEED) WHEN FLASHING	24 x 48	X		10BWG	1	SA	P		
		S7-1T	CELL PHONE USE PROHIBITED UP TO $200 FINE	24 x 18	X							
4	2	W1-1R	SYMBOL - HORIZ ALN TURN RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
4	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							

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Square Feet	Minimum Thickness
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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 4 OF 8

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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8-16	DAL	COLLIN		23

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SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE (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)
4	6	D1-1**	(DESTINATION - 1 LINE)	VAR x 18	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
4	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	8	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	10	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	11	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
4	12	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
4	13	W1-1L	SYMBOL - HORIZ ALN TURN LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
4	14	S5-1	SCHOOL / SPEED LIMIT (SPEED) WHEN FLASHING	24 x 48	X							
		S7-1T	CELL PHONE USE PROHIBITED UP TO $200 FINE	24 x 18	X		10BWG	1	SA	P		
5	1	M3-4	WEST <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
6	1	W1-3L	SYMBOL - REVERSE TURN LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
6	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
6	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
6	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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7.5 to 15	0.100"
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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 5 OF 8

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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4-16		DIST	COUNTY		SHEET NO.
8-16		DAL	COLLIN		24

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
6	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
6	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
6	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
6	8	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
6	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	1	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	8	W1-3L	SYMBOL - REVERSE TURN LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
7	9	W1-5R	SYMBOL - WINDING ROAD RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
8	1	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
8	1A	R1-1	STOP	36 x 36	X		10BWG	1	SA	P		
		D3-1	(STREET NAME)	??? x 12	X							

ALUMINUM SIGN BLANKS THICKNESS	
Square Feet	Minimum Thickness
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7.5 to 15	0.100"
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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

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SHEET 6 OF 8

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	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
8	2	W1-5L	SYMBOL - WINDING ROAD LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
9	1	W14-2aR	NO OUTLET <ARROW RIGHT> <PLAQUE>	36 x 8	X		10BWG	1	SA	P		
		W14-2aL	<ARROW LEFT> NO OUTLET <PLAQUE>	36 x 8	X							
		D3-1**	(STREET NAME)	VAR x 12	X							
		R1-1	STOP	36 x 36	X							
9	2	W1-3R	SYMBOL - REVERSE TURN RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
10	1	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	5	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	X		10BWG	1	SA	P		
10	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	8	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	10	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	11	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	12	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							

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

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

http://www.txdot.gov/

NOTE:

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

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 7 OF 8

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
4-16 8-16	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		26

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
10	13	1-2aT	(CITY NAME) CITY LIMIT	36x24	X		10BWG	1	SA	P		
10	14	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	15	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	16	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	17	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	18	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	19	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
10	20	D3-1**	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
					X							
10	20A	W8-13at	BRIDGE MAY ICE IN COLD WEATHER	36 x 36	X		10BWG	1	SA	P		
					X		10BWG	1	SA	P		
10	20B	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X							
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X		10BWG	1	SA	P		
					X							
10	21	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
10	22	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
10	23	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
11	1	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
11	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
11	3	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
11	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
11	5	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		

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DATE:
FILE:

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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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

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Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

SHEET 8 OF 8

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
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4-16 8-16	DIST	COUNTY		SHEET NO.
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GENERAL SEQUENCE OF WORK:

1.) ERECT PROJECT LIMIT AND ADVANCE WARNING SIGNS AS SHOWN IN THE PLANS, BC, TCP, AND WZ STANDARDS AND AS DIRECTED BY THE ENGINEER.

2.) PLACE AND MAINTAIN SW3P DEVICES AS SHOWN IN THE PLANS AND AS DIRECTED BY THE ENGINEER. TEMPORARY SW3P EROSION CONTROL MEASURES SHALL ONLY BE PLACED IN AREAS WHERE SOIL DISTRUBANCE OR OTHER POTENTIAL POLLUTANT-GENERATING ACTIVITIES ARE EXPECTED TO OCCUR WITHIN TWO WEEKS.

3.) BLADE THE TOPSOIL OFF THE SLOPE, SALVAGE/WINDROW OUT OF THE WAY OF WORK. PLACE SW3P CONTROL MEASURES AT STOCKPILE AS APPROPRIATE TO PROTECT SOIL QUALITY AND PREVENT SEDIMENTATION OF DOWNSLOPE PERIMETER, ROADWAYS, CULVERTS AND WATERWAYS

4.) USING DAILY LANE CLOSURES, PERFORM CULVERT EXTENSIONS, CUT/RESTORE CULVERT REPLACEMENTS, AND BLADE EDGES.

5.) CONSTRUCT FLEXIBLE PAVEMENT REPAIR AS DIRECTED BY THE ENGINEER.

6.) SAW CUT AND REMOVE 1 FEET OF EXISTING PAVEMENT AND CONSTRUCT SUBGRADE WIDENING 8" SP-B. BACKFILL PAVEMENT EDGES AT THE END OF EACH WORK DAY.

7.) MILL 2", PLACE WORKZONE NON-REMOVABLE PAVEMENT MARKINGS, AND OVERLAY 2" SP-C IN SECTIONS OF ROADWAY FOR THE HALF WIDTH OF THE ROAD (UP TO 2000 LF MAX OR AS APPROVED BY THE ENGINEER BASED UPON THE DAILY PRODUCTION RATE OF THE CONTRACTOR) ON THE SAME DAY. REPEAT THE SAME PROCEDURE FOR THE ENTIRE LENGTH OF THE PROJECT.

8.) PLACE TABS FOR THE ENTIRE LENGTH OF THE PROJECT.

9.) CONSTRUCT DRIVEWAYS AND DRIVEWAY DRAINAGE STRUCTURES .

10.) BACKFILL/ EMBANKMENT EDGES AND GRADE TO DRAIN IN ACCORDANCE WITH CROSS-SECTIONS AND THE EXISTING TOPOGRAPHY. PULL TOPSOIL BACK UP THE SLOPE.

11.) ERECT PERMANENT SIGNS AND PLACE PERMANENT PAVEMENT MARKINGS.

12.) ESTABLISH PERMANENT VEGETATIVE COVER.

13.) TEMPORARY SW3P EROSION CONTROL MEASURES SHALL BE REMOVED WITHIN TWO WEEKS OF VEGETATION ESTABLISHMENT IN THEIR CONTROL AREA OR AS APPROVED BY THE ENGINEER.

14.) PERFORM FINAL SITE CLEAN UP AS DIRECTED BY THE ENGINEER AND REMOVE PROJECT LIMIT/ADVANCE WARNING SIGNS.

TCP GENERAL NOTES:

1.) INTERMITTENT ONE-WAY TRAFFIC CONTROL (LANE CLOSURES) WILL BE IN ACCORDANCE WITH THE TCP STANDARDS AND AS DIRECTED BY THE ENGINEER.

2.) OVERNIGHT LANE CLOSURES WILL NOT BE PERMITTED.

3.) THE CONTRACTOR WILL PROVIDE AND MAINTAIN SKILLED FLAGGERS EQUIPPED WITH TWO-WAY RADIOS TO HANDLE TRAFFIC THROUGH THE WORK AREAS.

4.) COMPLY WITH TCP(7-1)-13 WHICH INCLUDES PROVISIONS FOR CERTAIN SIGNS TO BE INSTALLED AND TO REMAIN UNTIL PERMANENT PAVEMENT MARKINGS ARE IN PLACE. THESE SIGNS ARE IN ADDITION TO SIGNS THAT MAY BE REQUIRED BY THE VARIOUS TCP AND BC STANDARDS.

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

TCP SEQUENCE OF WORK & GENERAL NOTES

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		28

DATE: 3/23/2023 2:21:39 PM
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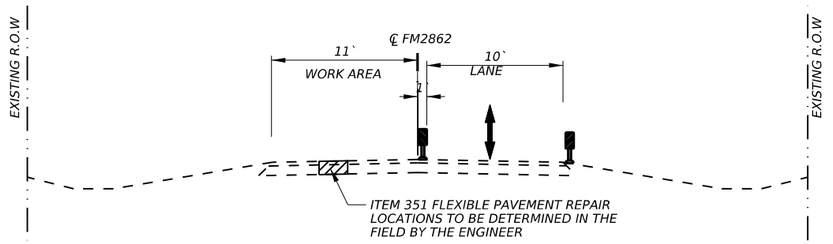
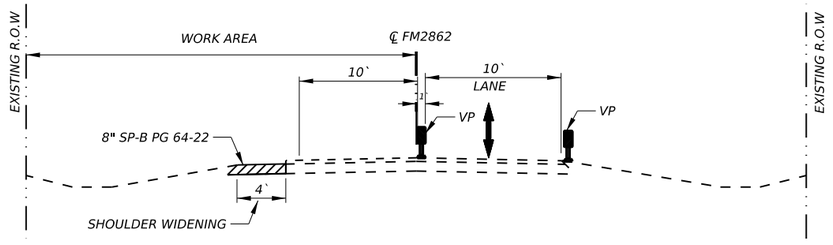
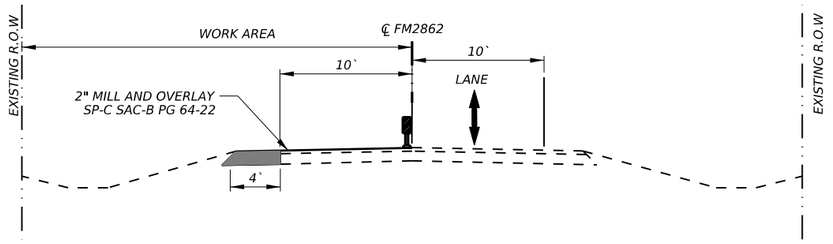


* STEP 1
CONSTRUCTION OPERATION PRESENT



* STEP 2
CONSTRUCTION OPERATION PRESENT



* STEP 3
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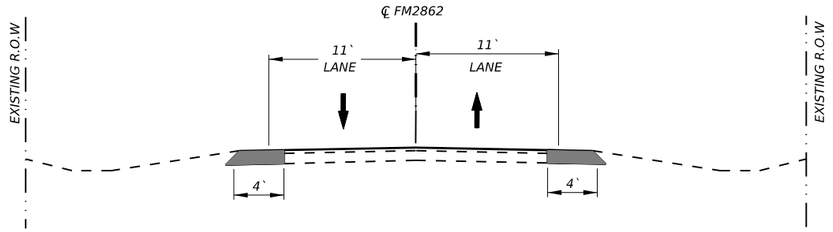

STEP 4
CONSTRUCTION OPERATION NOT PRESENT

VERTICAL PANEL

CONSTRUCTED IN PREVIOUS STEP

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.
3. * OPERATION WILL REFLECT ON OPPOSITE TRAVEL LANE OF CONSTRUCTION

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madihaa Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

TCP TYPICAL SECTIONS

N.T.S

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CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		29

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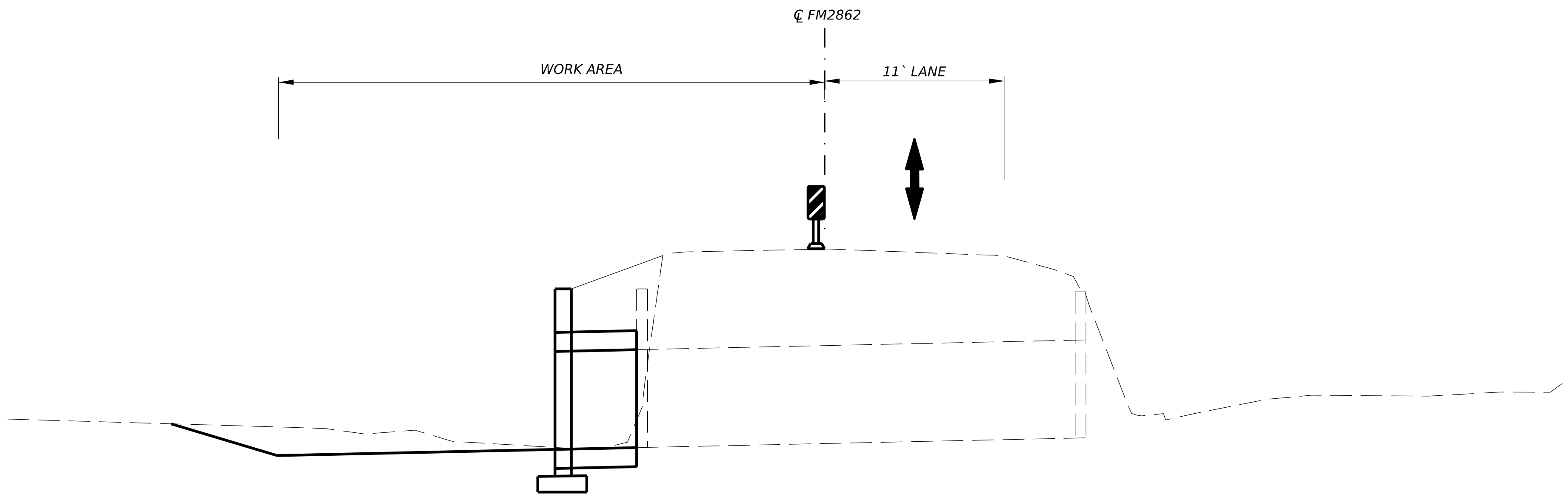

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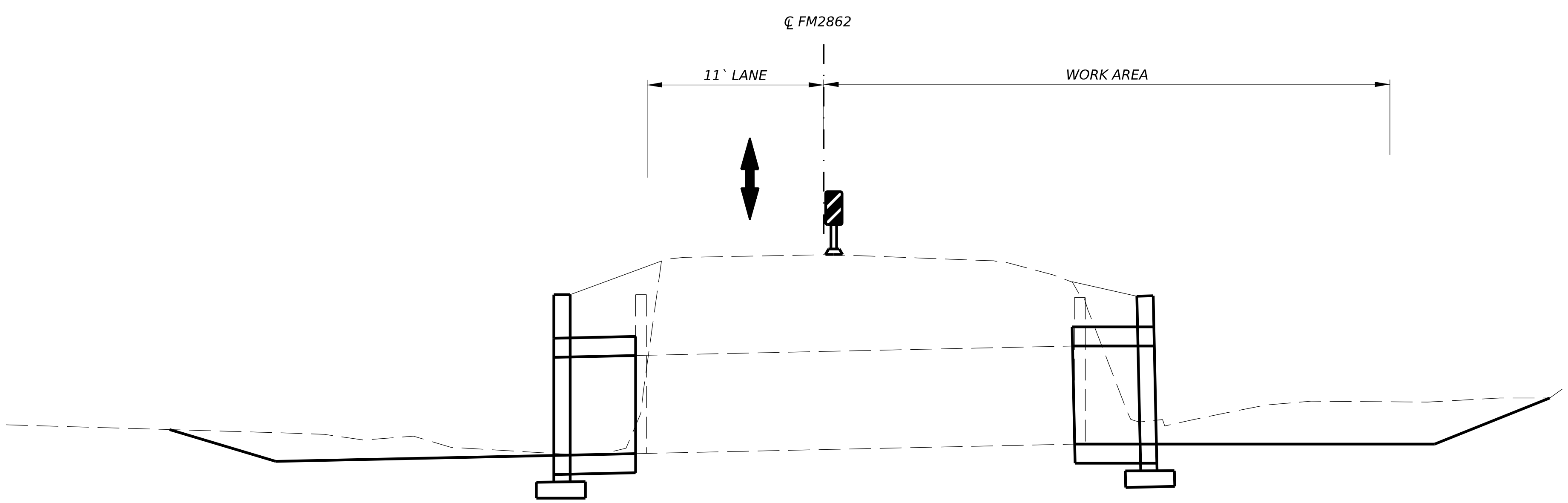
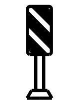


CULVERT EXTENSION

 VERTICAL PANEL

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.

STATE OF TEXAS
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CULVERT EXTENSION
TYPICAL SECTIONS

N.T.S

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		30

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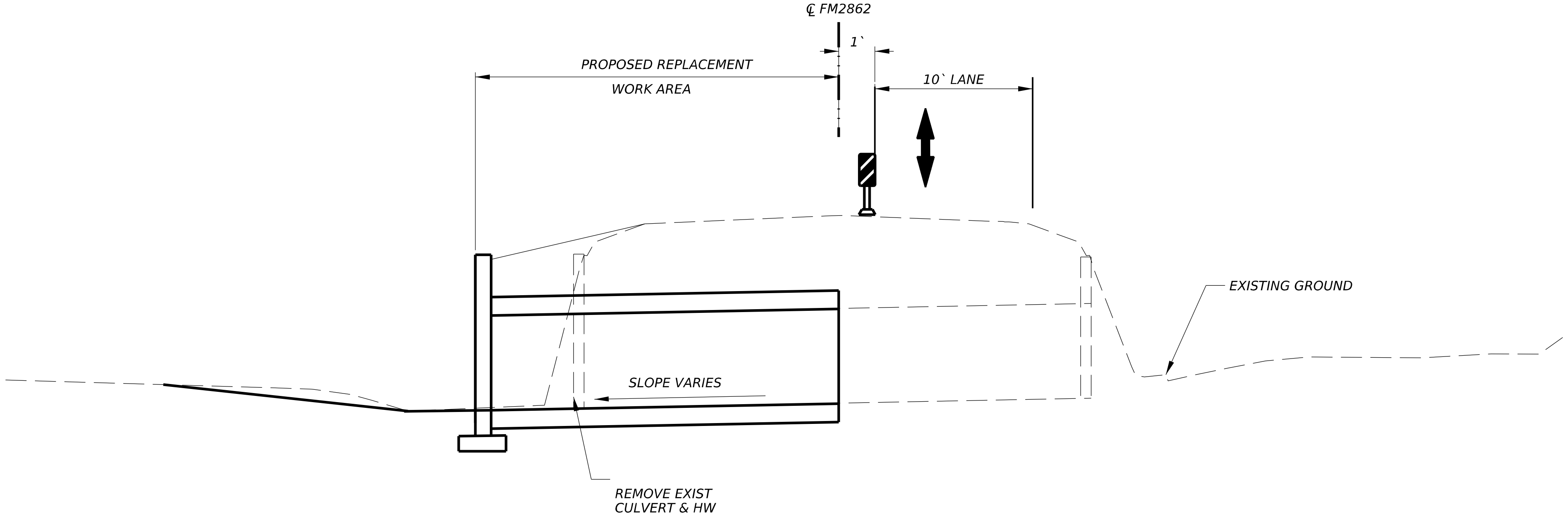
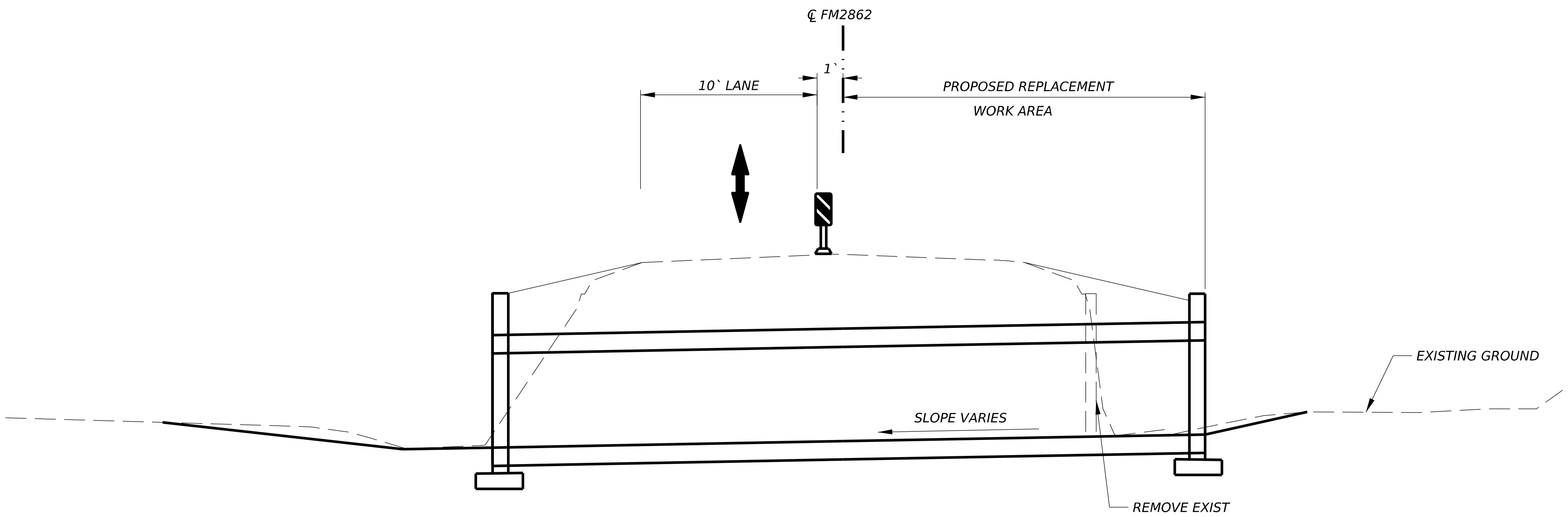
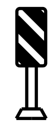


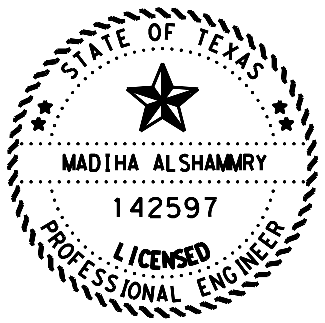
CULVERT REPLACEMENT



CULVERT REPLACEMENT


VERTICAL PANEL

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.



Madiha Alshammry, P.E. 3/17/2023

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FM 2862

CULVERT REPLACEMENT
TYPICAL SECTIONS

N.T.S

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		31

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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
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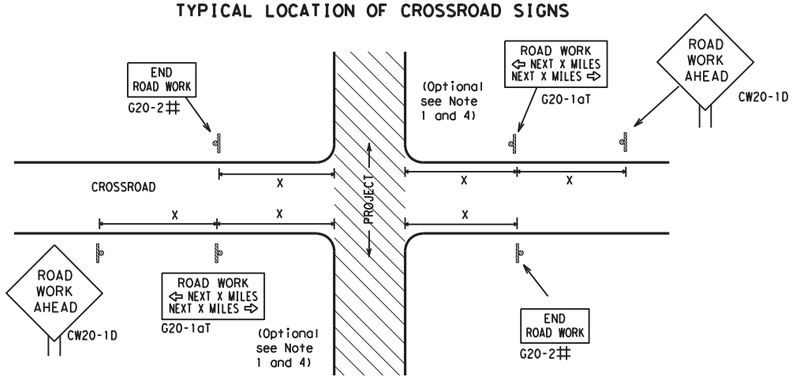
REVISIONS 4-03 7-13	0816	05	025	FM 2862
9-07 8-14	DIST	COUNTY		SHEET NO.
5-10 5-21	DAL	COLLIN		32

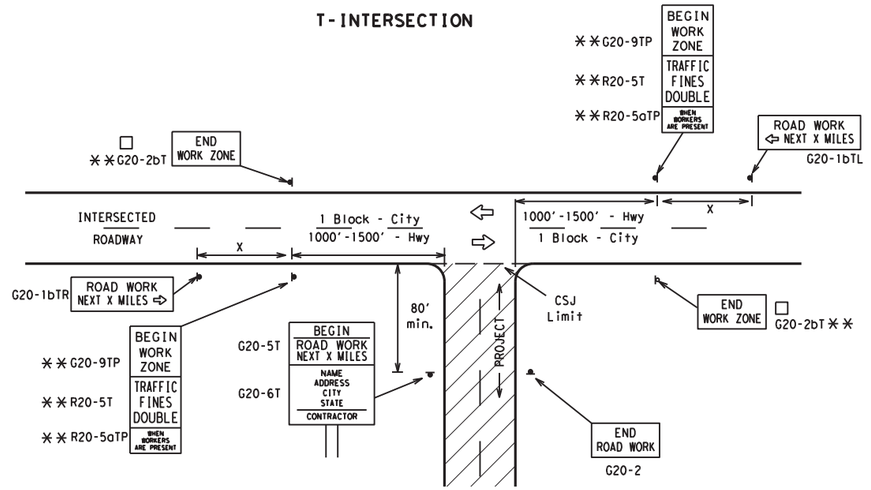
TYPICAL LOCATION OF CROSSROAD SIGNS



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]

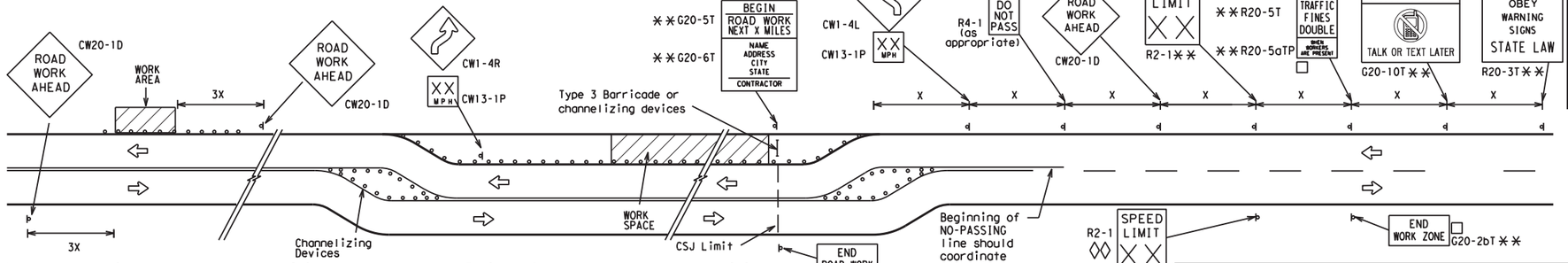
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

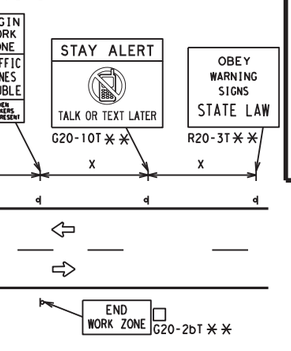
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may 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

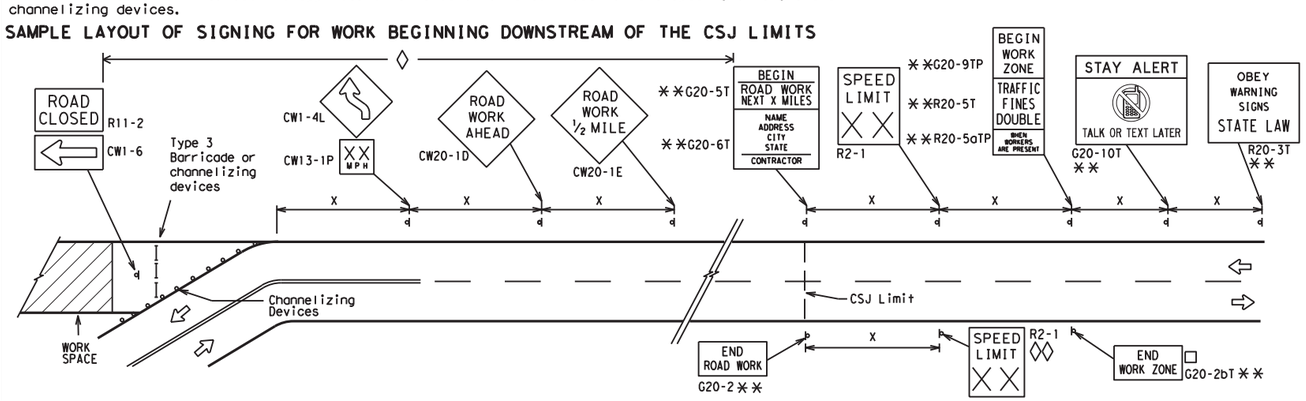


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing 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	0816	05	025	FM 2862
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		33

DATE: 3/16/2023 9:14:02 PM
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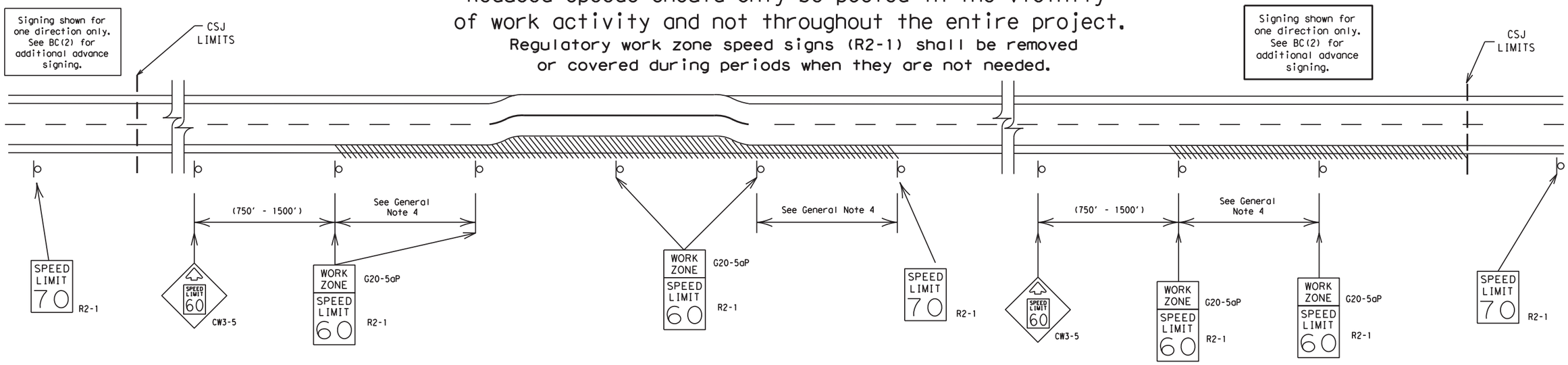
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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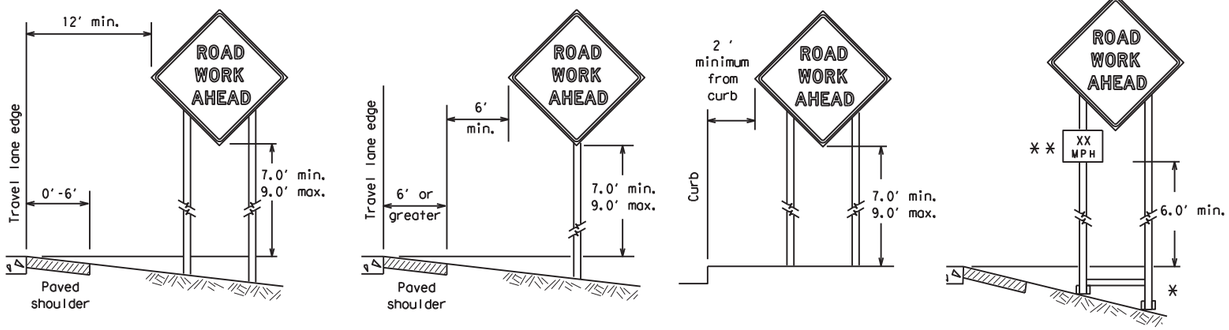
REVISIONS 9-07 8-14 7-13 5-21	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		34

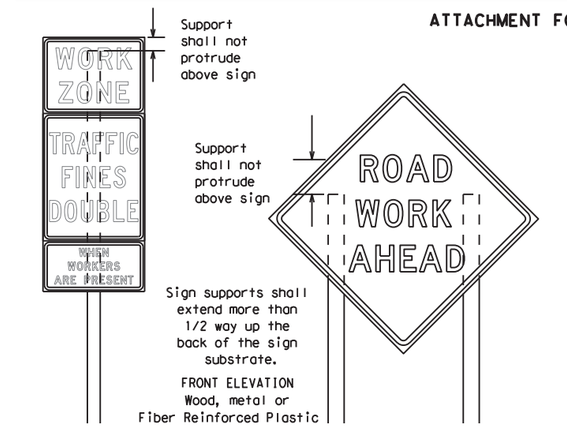
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

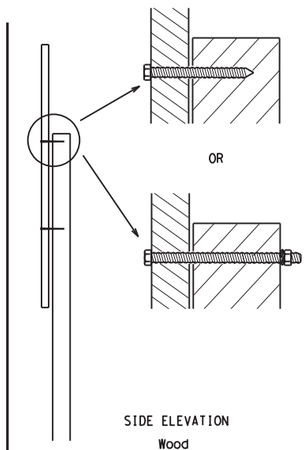


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





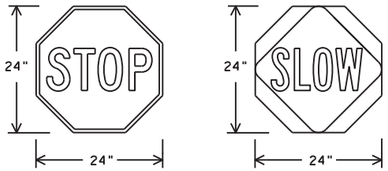
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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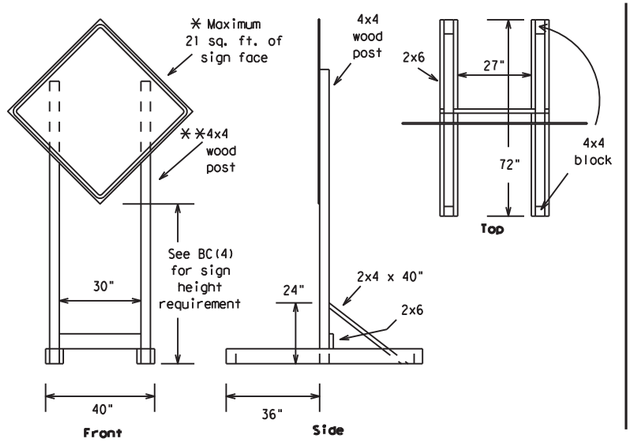
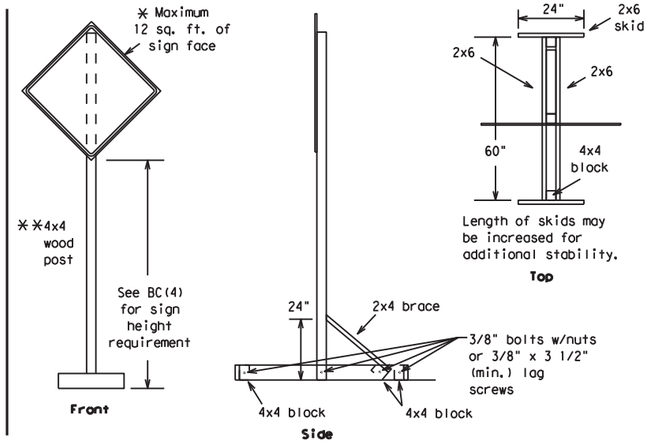
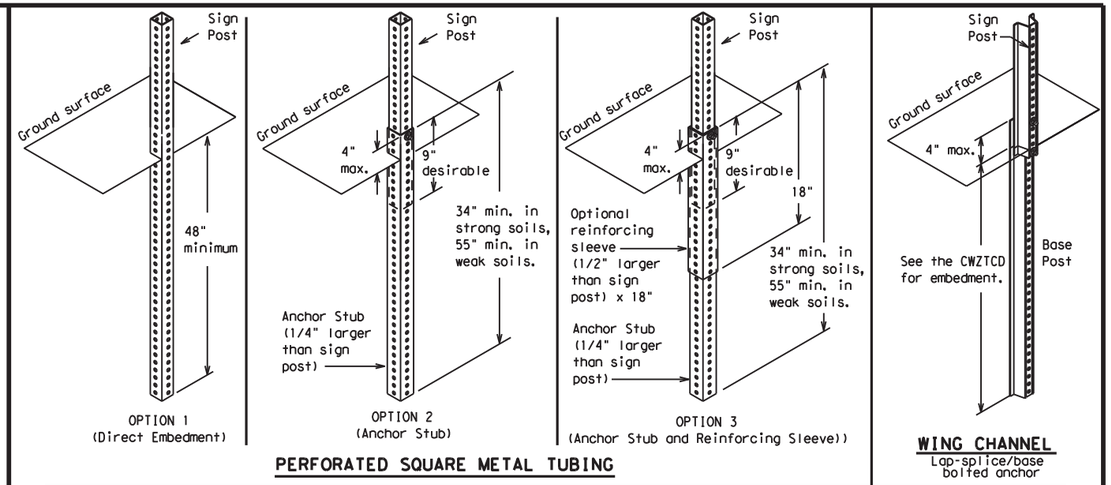




SKID MOUNTED WOOD SIGN SUPPORTS

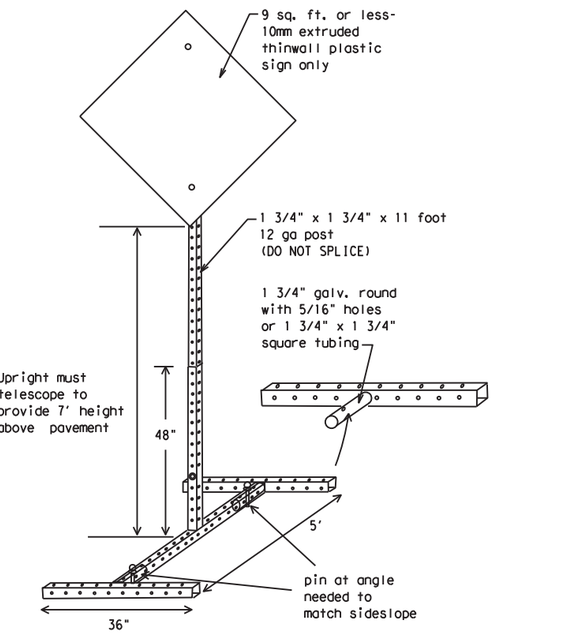
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

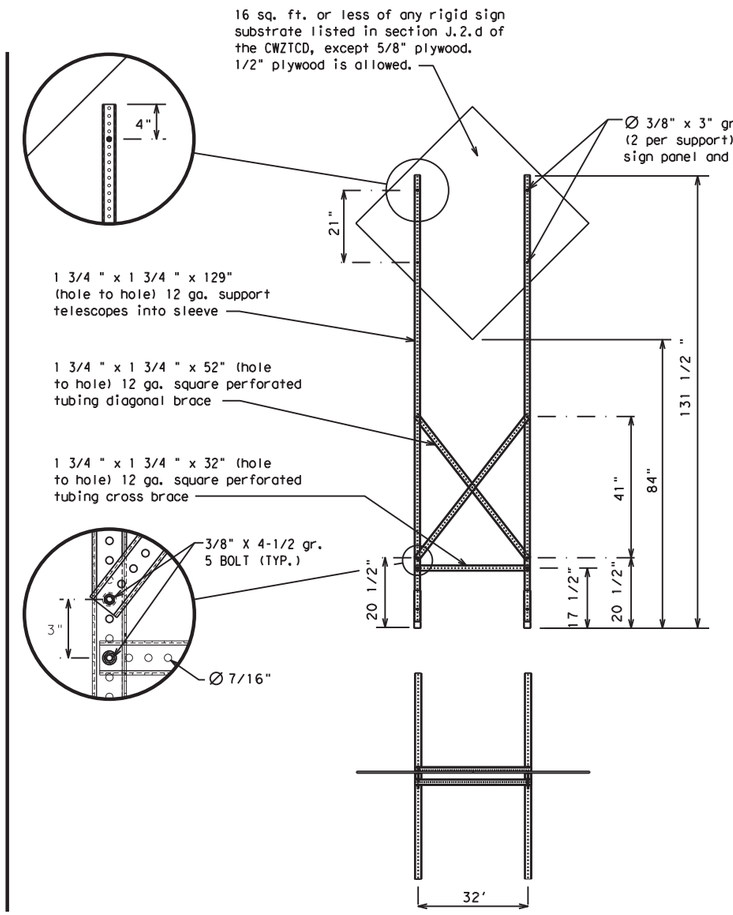


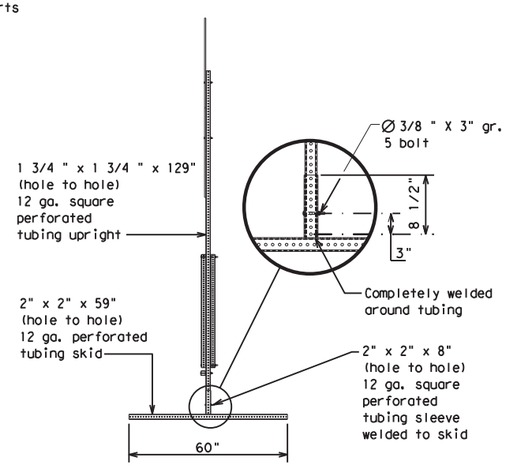
PERFORATED SQUARE METAL TUBING

GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21	DAL	COLLIN		36

DATE: 3/16/2023 9:14:03 PM
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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

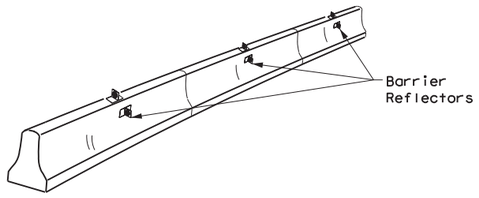
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		37

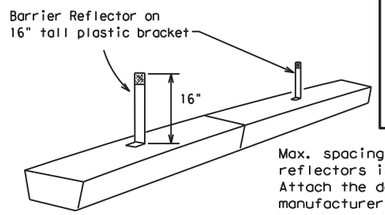
DATE: 3/16/2023 9:14:03 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshamry\d0872524\bc-21.dgn

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.



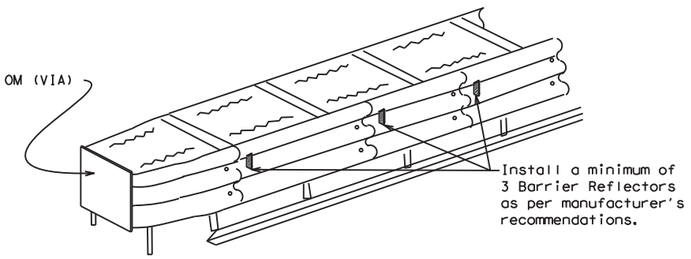
CONCRETE TRAFFIC BARRIER (CTB)

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)



DELINEATION OF END TREATMENTS

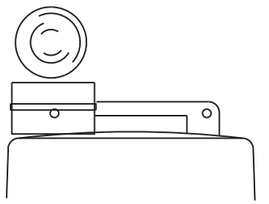
LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

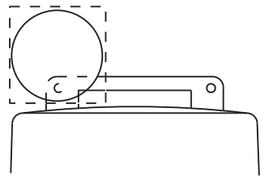
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

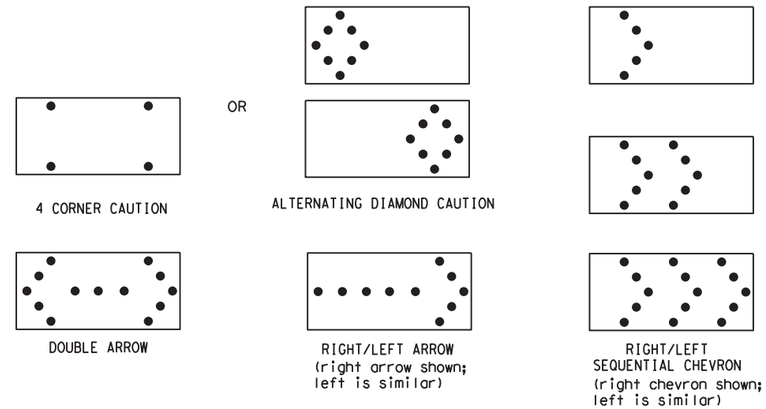
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		38

DATE: 3/16/2023 9:14:03 PM
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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

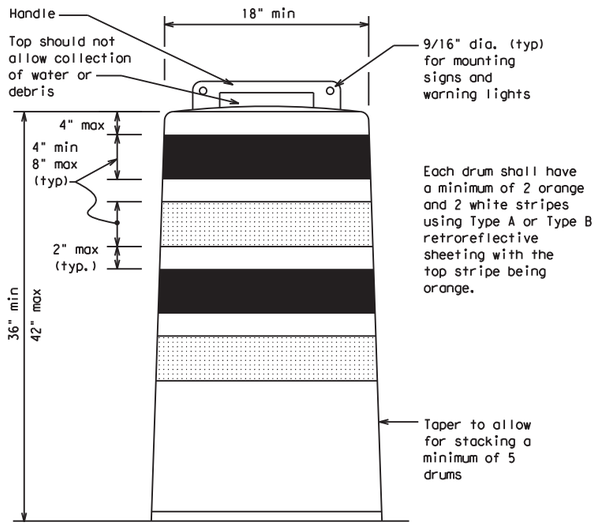
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

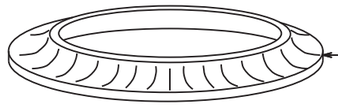
RETROREFLECTIVE SHEETING

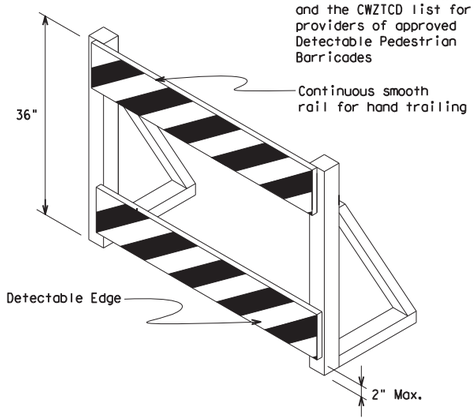
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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



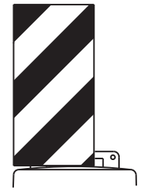




DETECTABLE PEDESTRIAN BARRICADES

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

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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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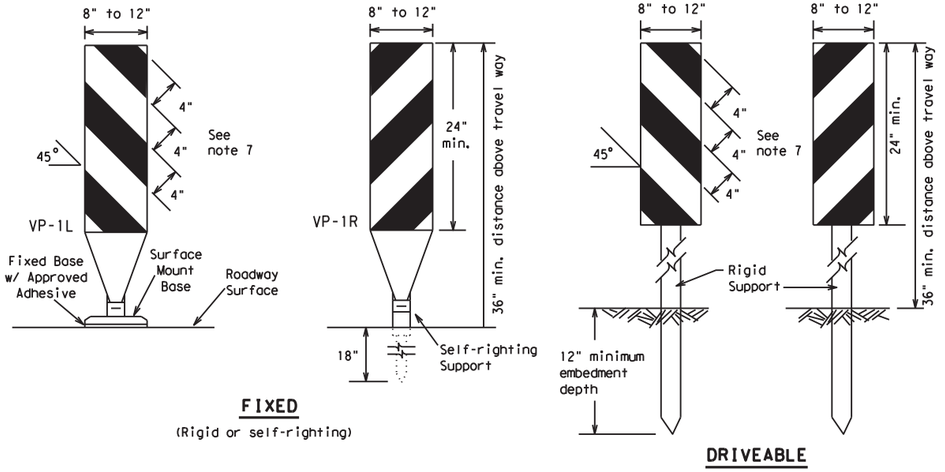
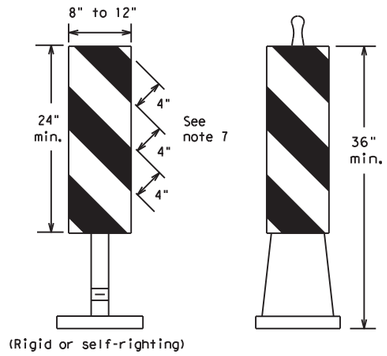


FIXED
(Rigid or self-righting)

DRIVEABLE

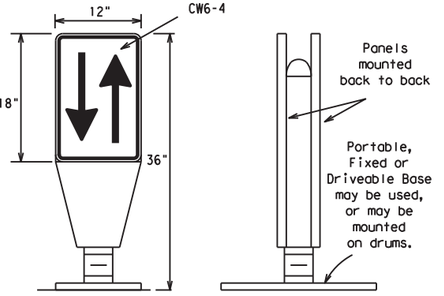


(Rigid or self-righting)

PORTABLE

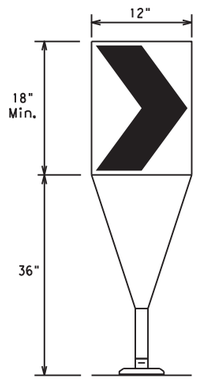
VERTICAL PANELS (VPs)

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



OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

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.



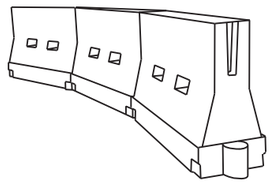
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

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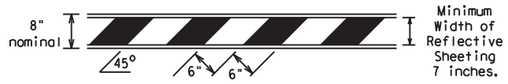
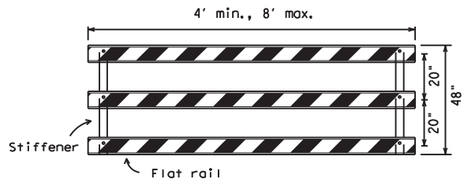
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



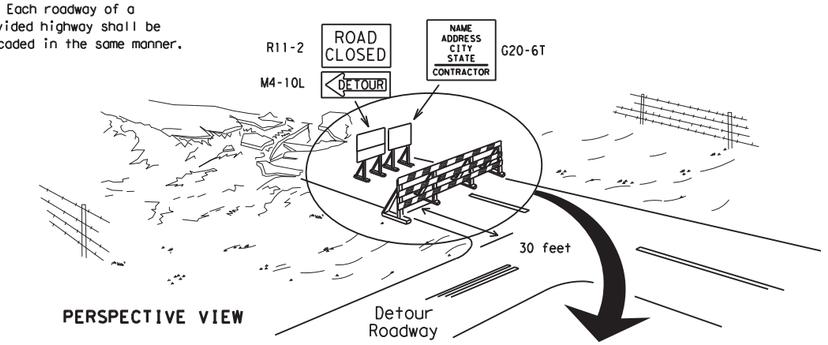
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

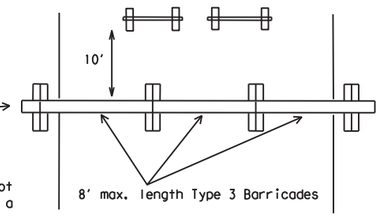
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

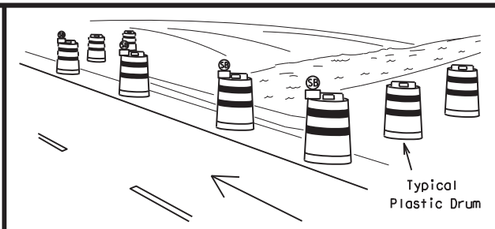
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

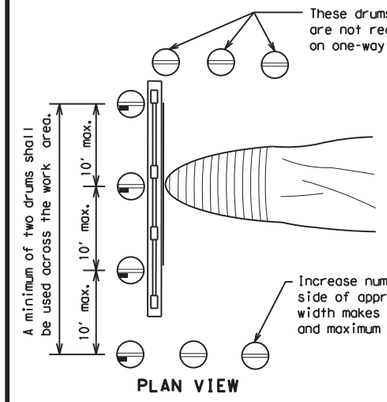
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

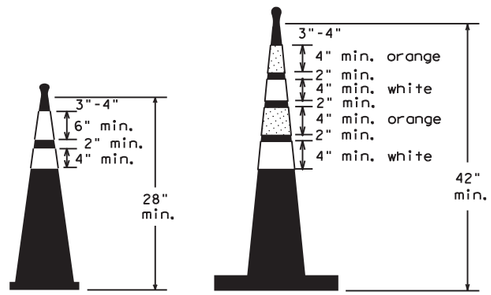
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

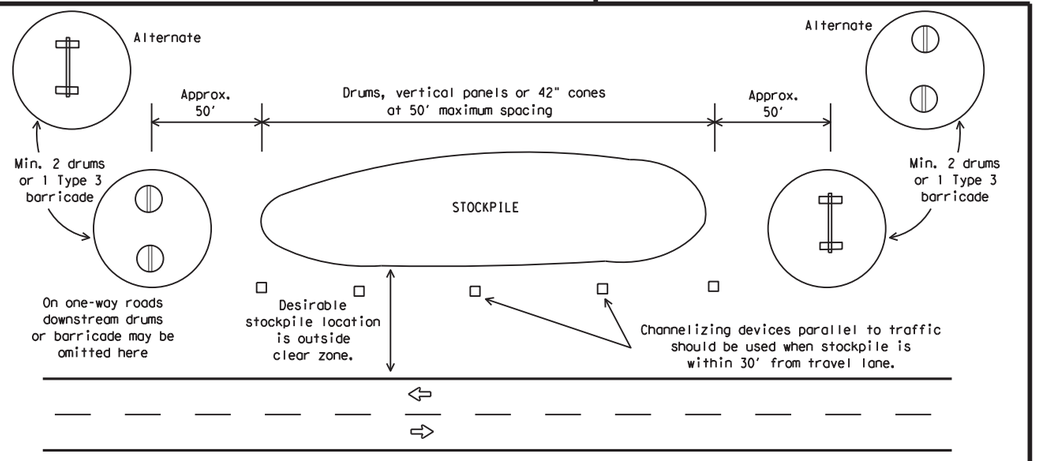
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

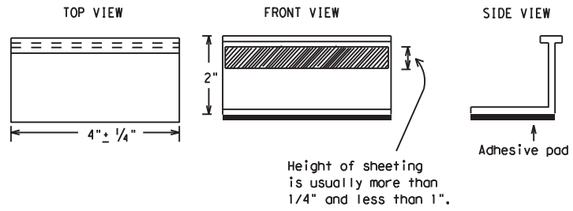
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

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2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	DAL	COLLIN		42
11-02 8-14				

DATE: 3/16/2023 9:14:04 PM
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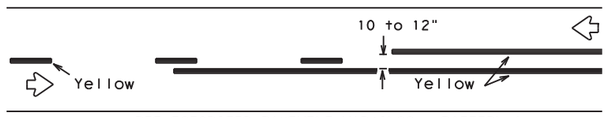
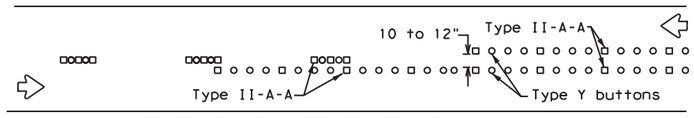
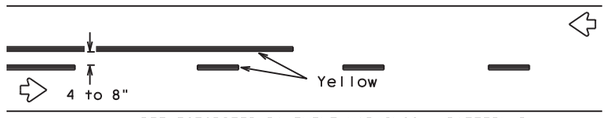
PAVEMENT MARKING PATTERNS



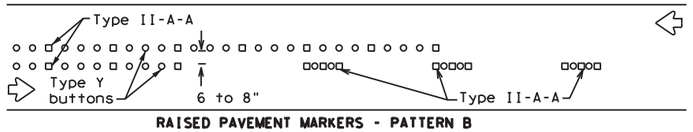
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



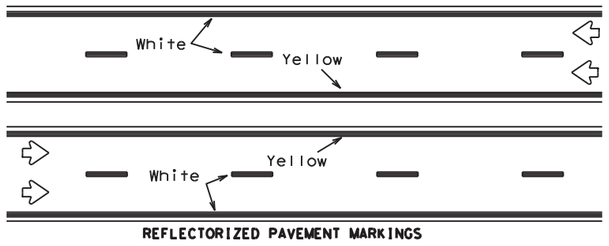
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



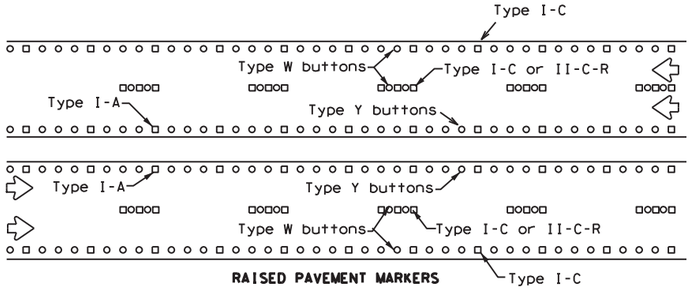
RAISED PAVEMENT MARKERS - PATTERN B

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



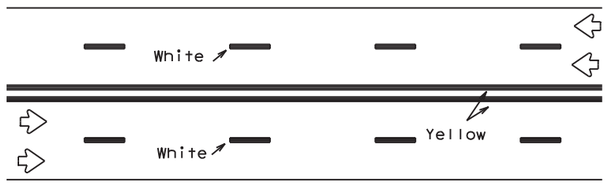
REFLECTORIZED PAVEMENT MARKINGS



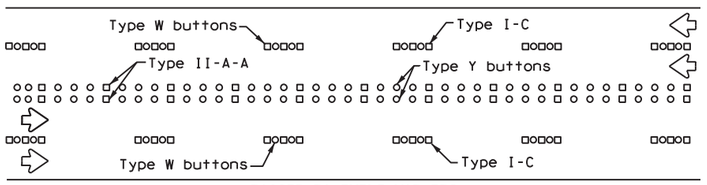
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



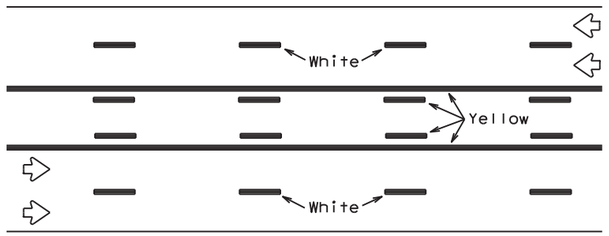
REFLECTORIZED PAVEMENT MARKINGS



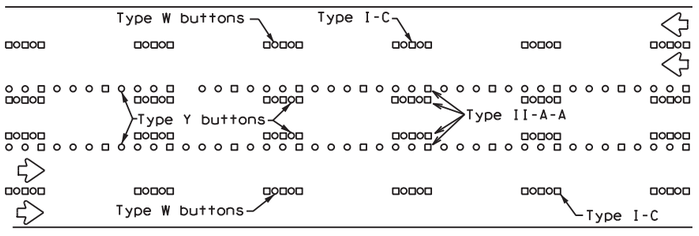
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

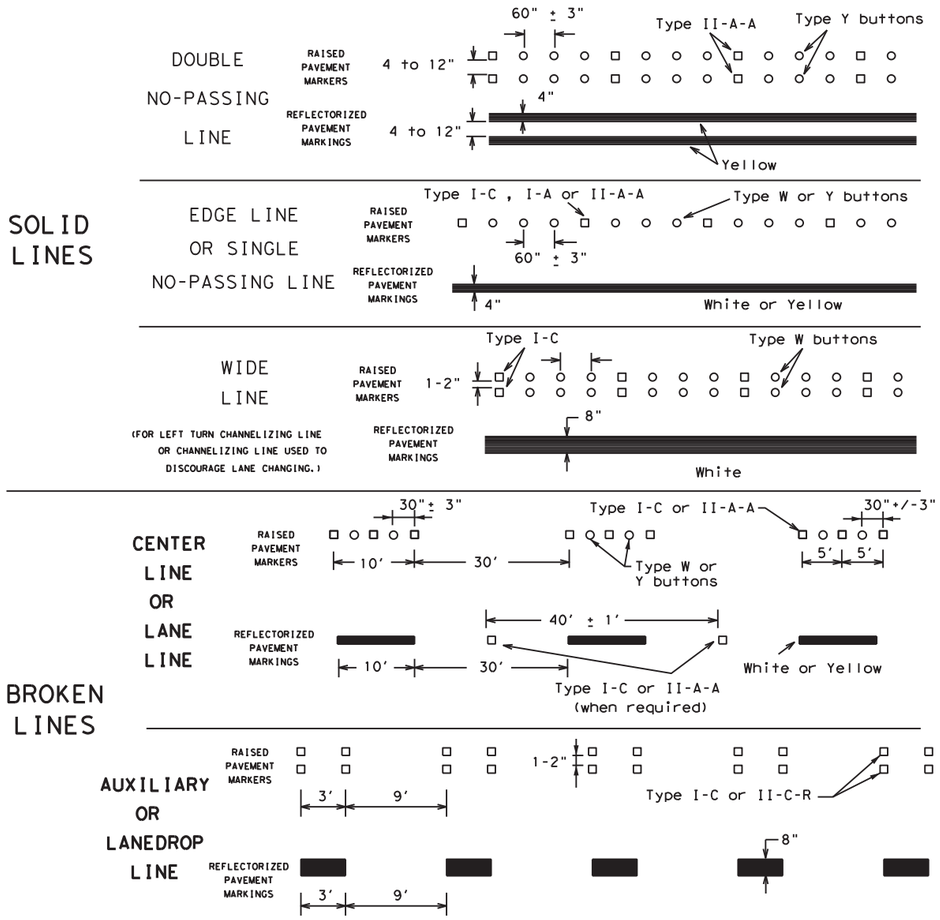


RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

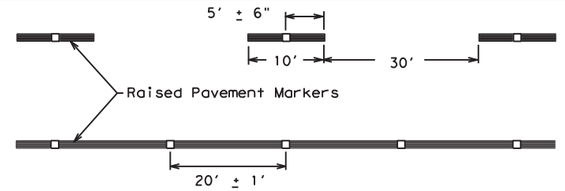
TWO-WAY LEFT TURN LANE

STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



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	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		43

DATE: 3/16/2023 9:14:16 PM
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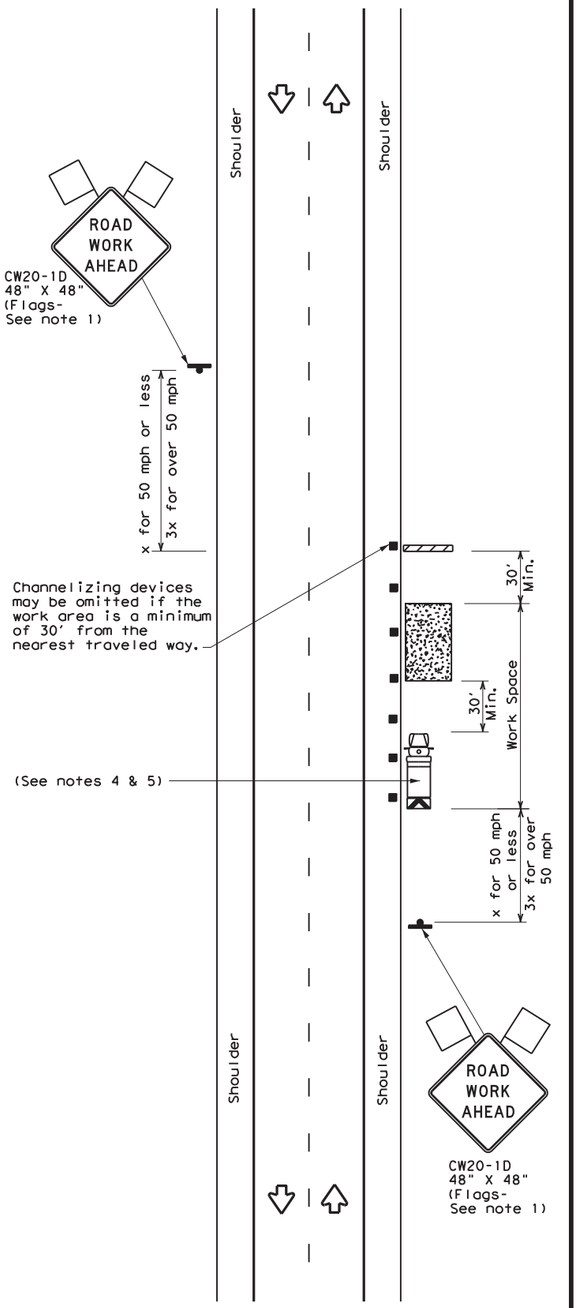
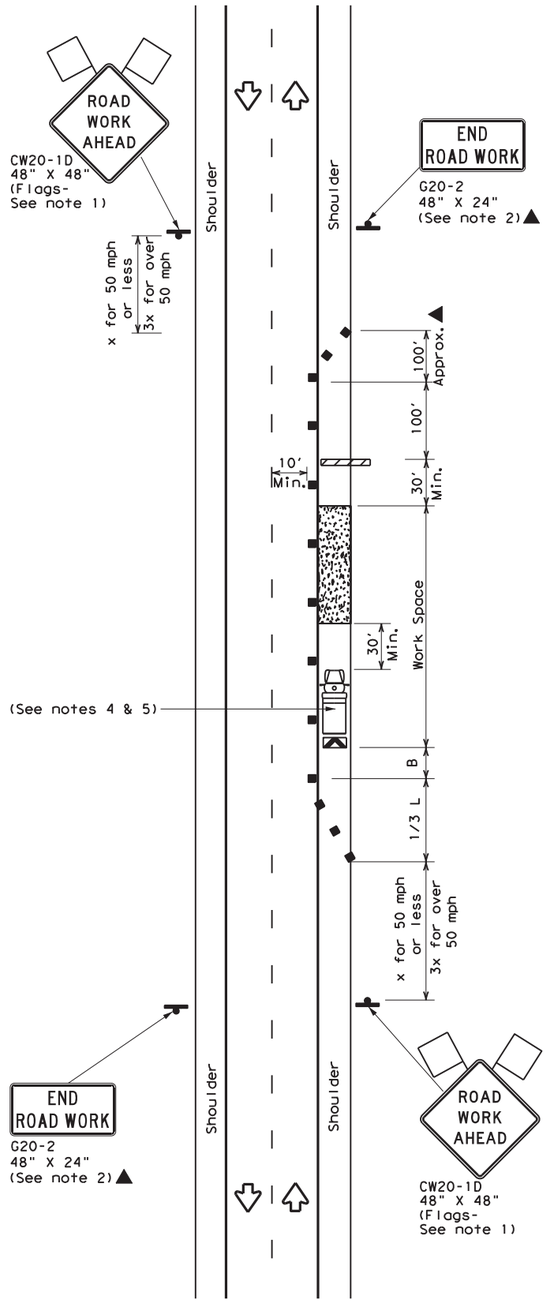


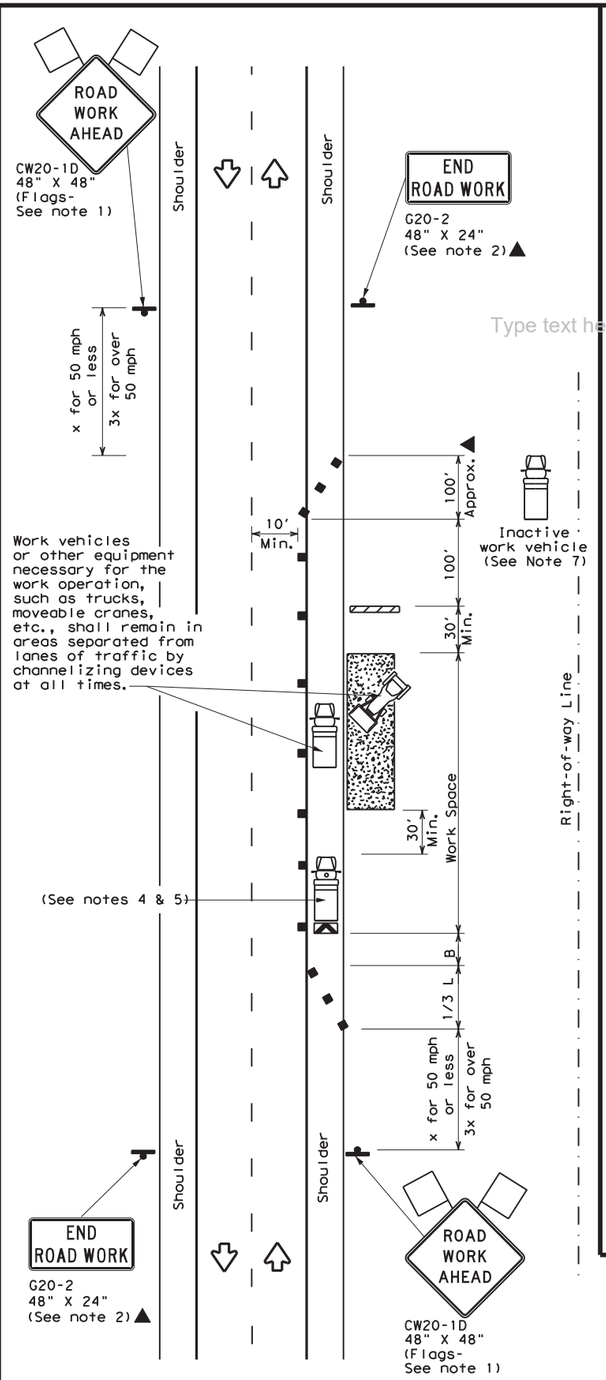
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

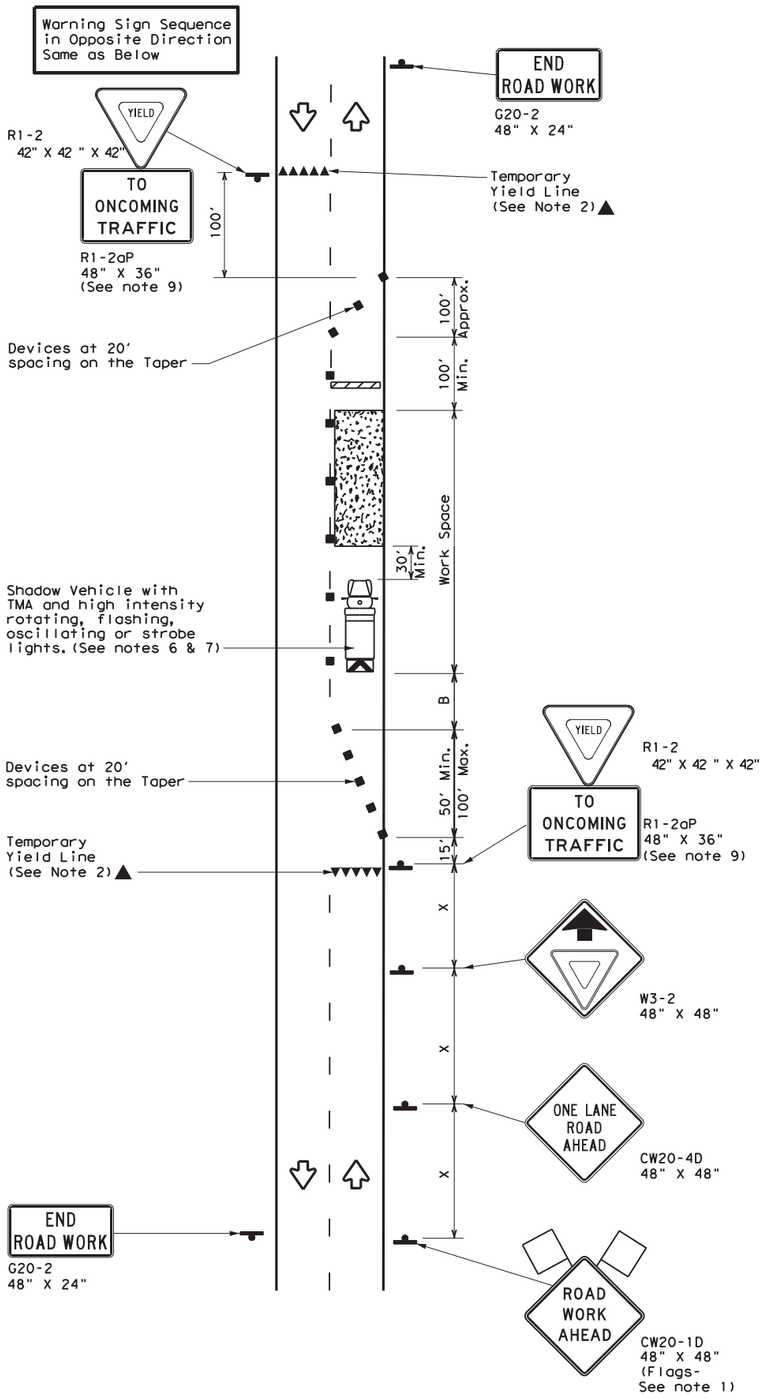
Texas Department of Transportation

Traffic Operations Division Standard

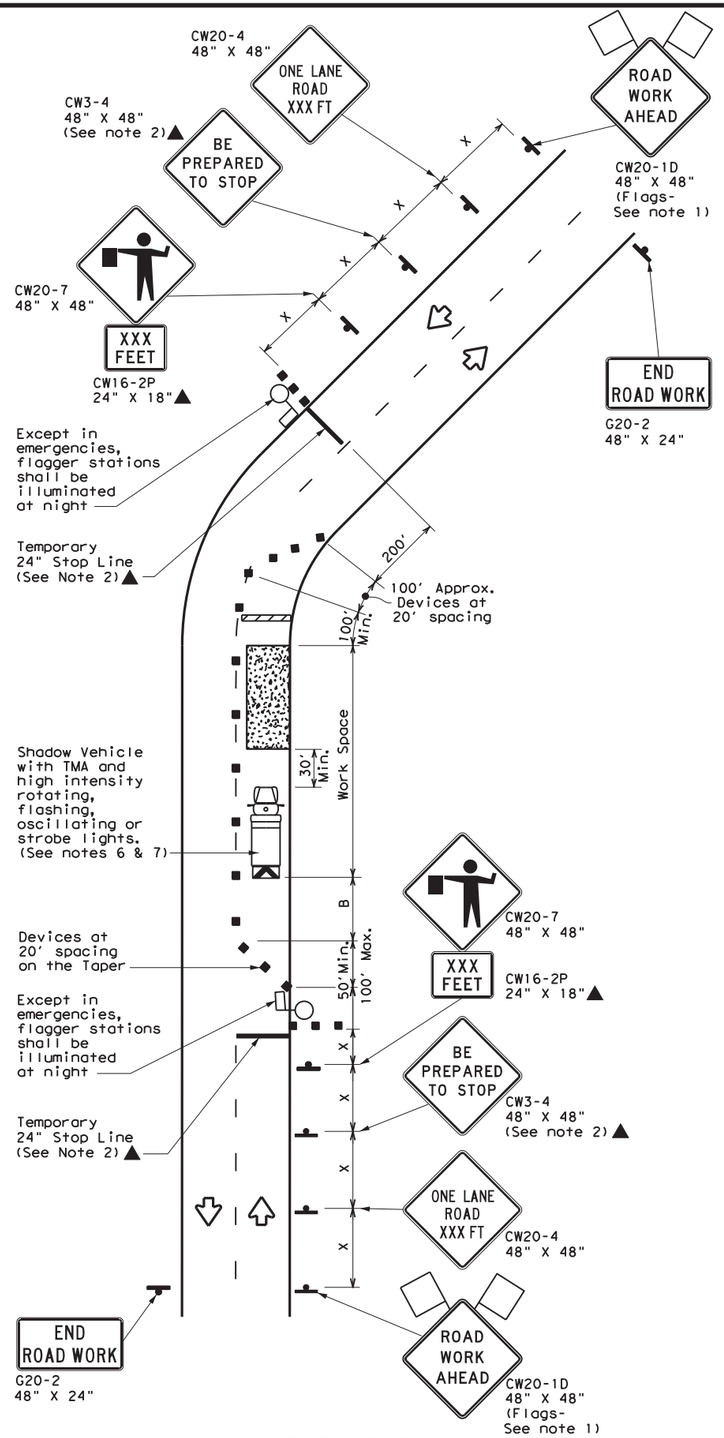
TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	DAL	COLLIN		44
1-97 2-18				



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



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

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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8-95 3-03	DIST	COUNTY		SHEET NO.
1-97 2-12	DAL	COLLIN		45
4-98 2-18				

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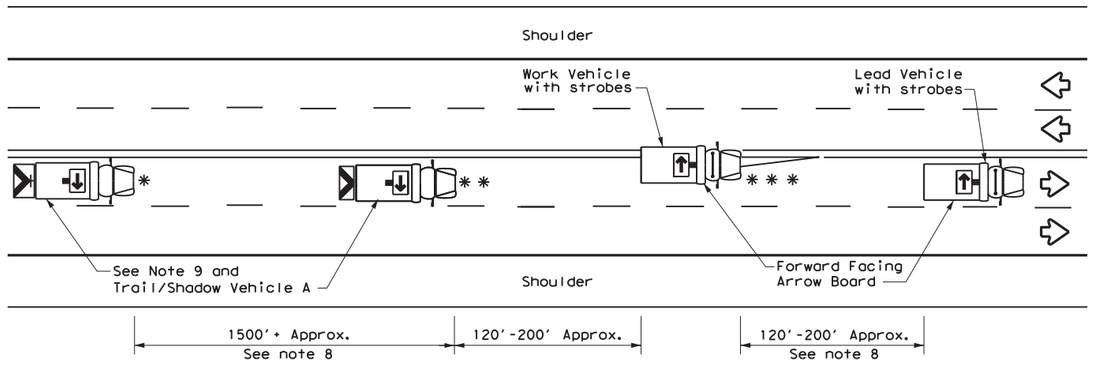
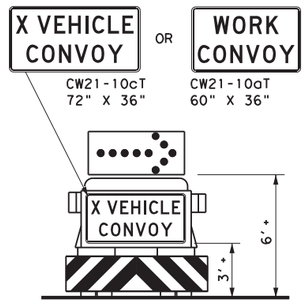


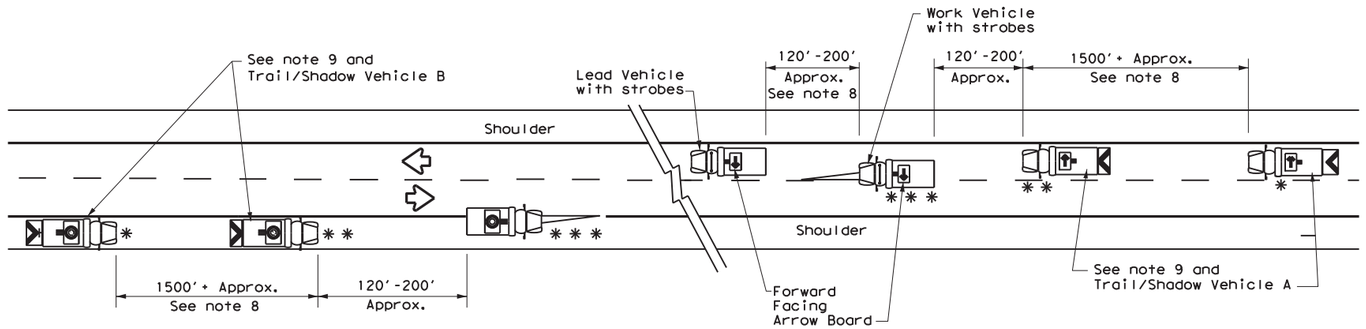
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

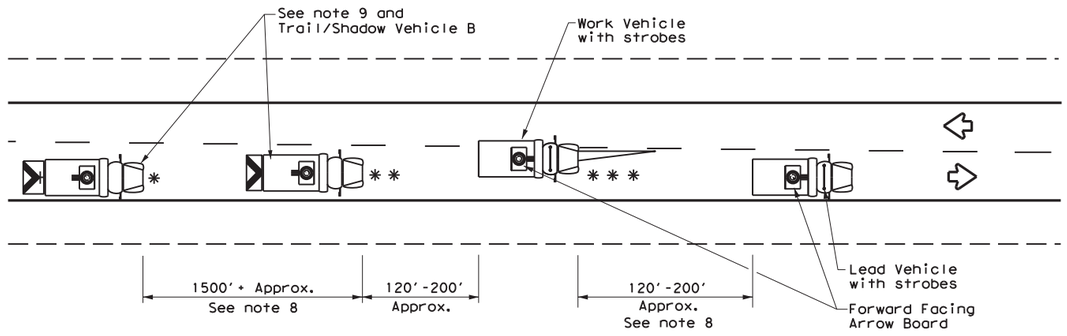


WORK ON SHOULDER

WORK ON TRAVEL LANE

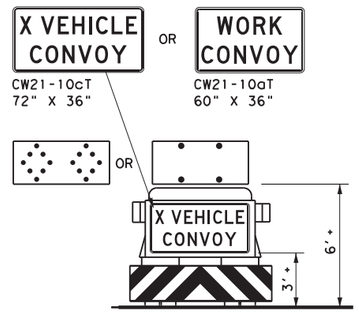
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

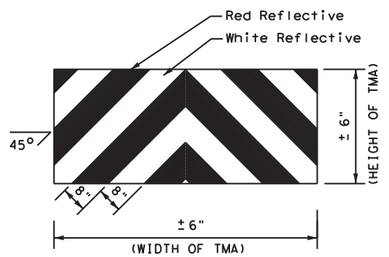
with Flashing Arrow Board in CAUTION display

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

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

GENERAL NOTES

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



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

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©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	DAL	COLLIN		46
1-97				

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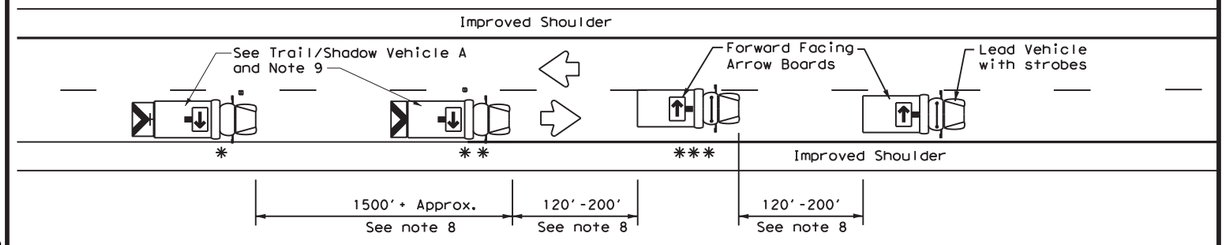
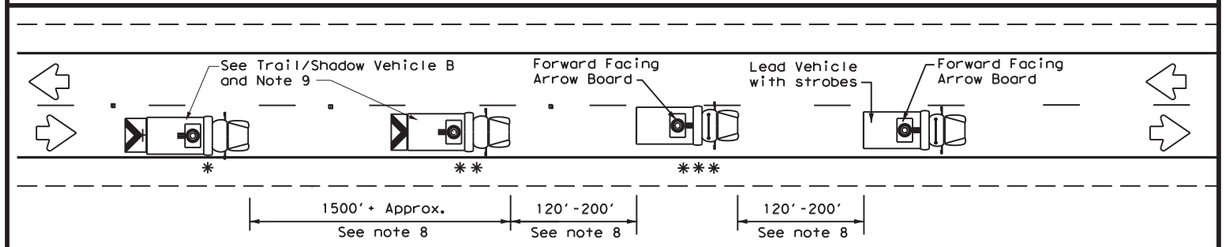


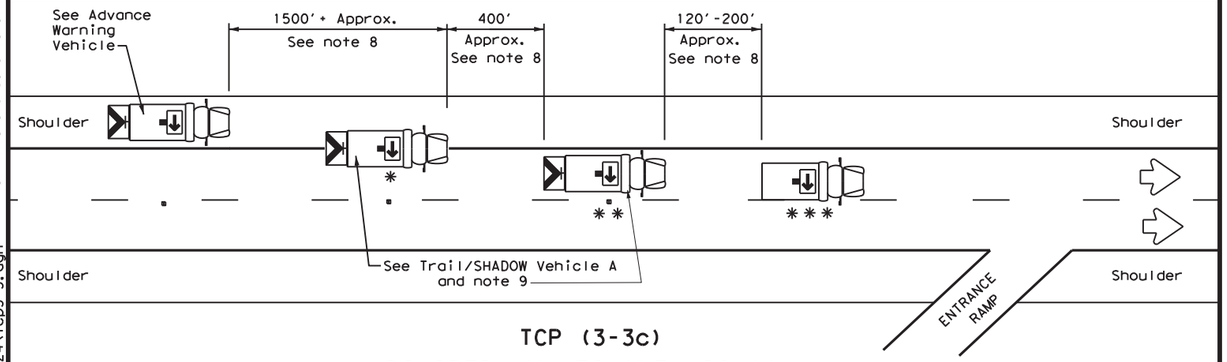
TCP (3-3a)

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



TCP (3-3b)

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

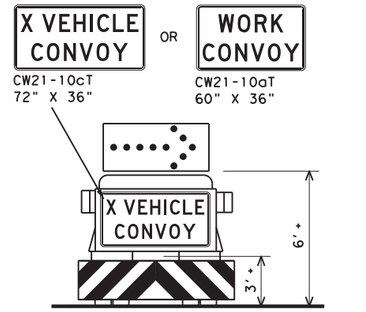


TCP (3-3c)

DIVIDED MULTILANE HIGHWAY

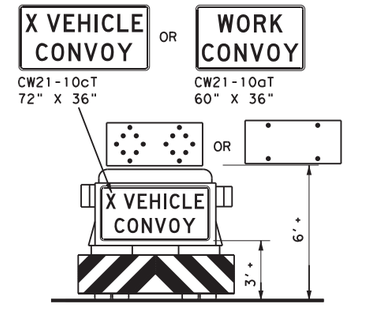
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



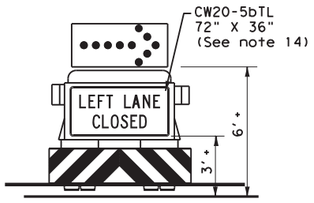
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

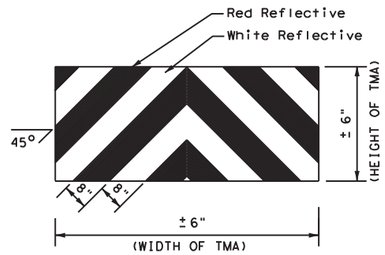


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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8-95 7-13	DAL	COLLIN		47
1-97 7-14				

DATE: 3/16/2023 9:14:53 PM
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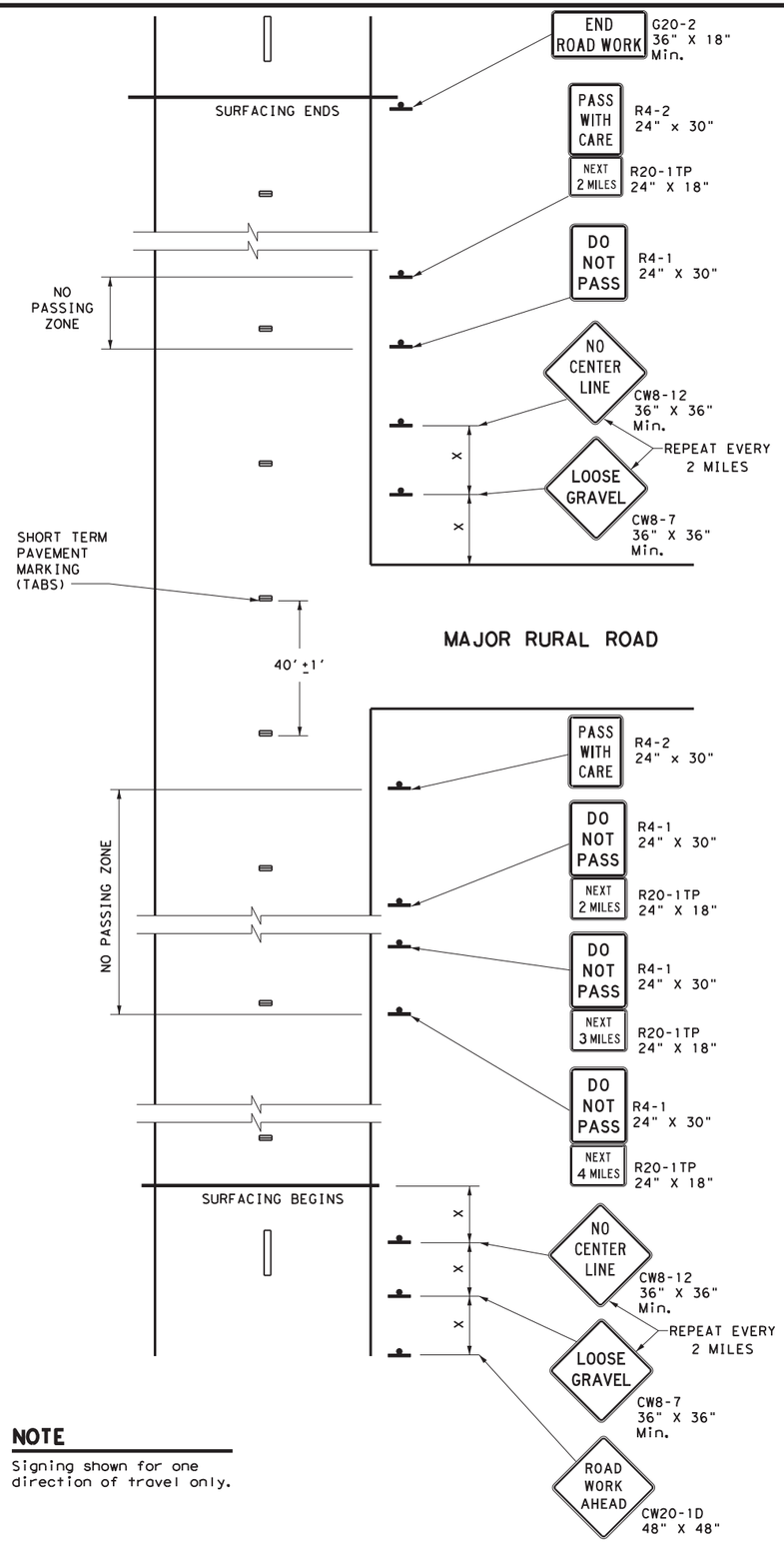
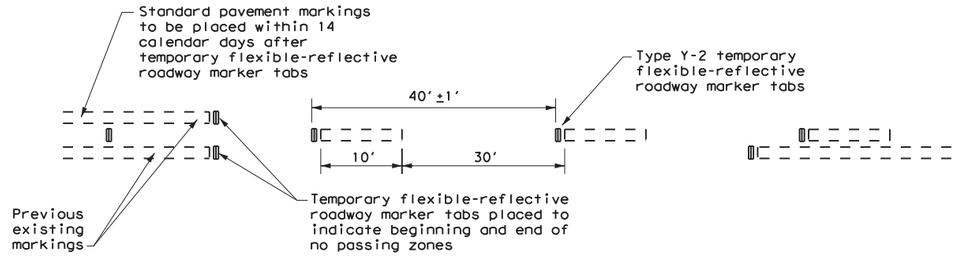


NOTE

Signing shown for one direction of travel only.

NO PASSING ZONES ON TWO-LANE TWO-WAY ROADS



TABS ON CENTERLINES OF TWO-LANE TWO-WAY ROADS

For seal coat, micro-surface or similar operations

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

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

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

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

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

"NO CENTER LINE" SIGN (CW8-12)

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

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

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

"LOOSE GRAVEL" SIGN (CW8-7)

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

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

PAVEMENT MARKINGS

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

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

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

COORDINATION OF SIGN LOCATIONS

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

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

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

* Conventional Roads Only

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL DETAILS FOR SURFACING OPERATIONS

TCP(7-1)-13

FILE: tcp7-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
4-92 4-98	DIST	COUNTY		SHEET NO.
1-97 7-13	DAL	COLLIN		48

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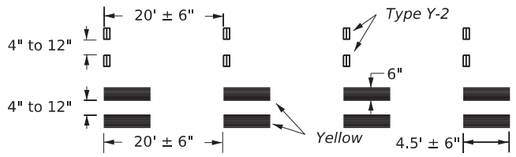
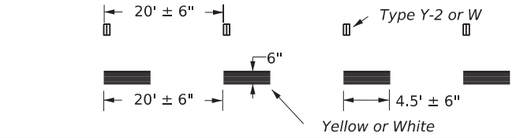
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

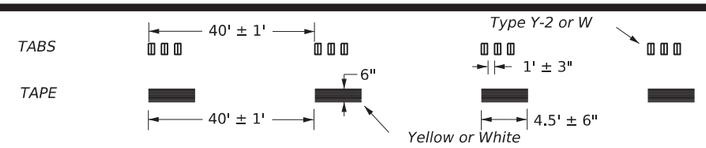


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



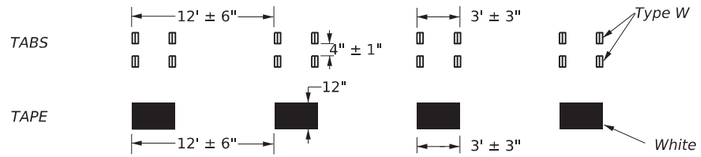
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

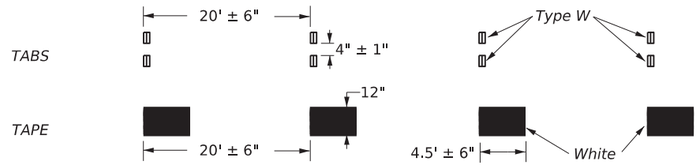


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



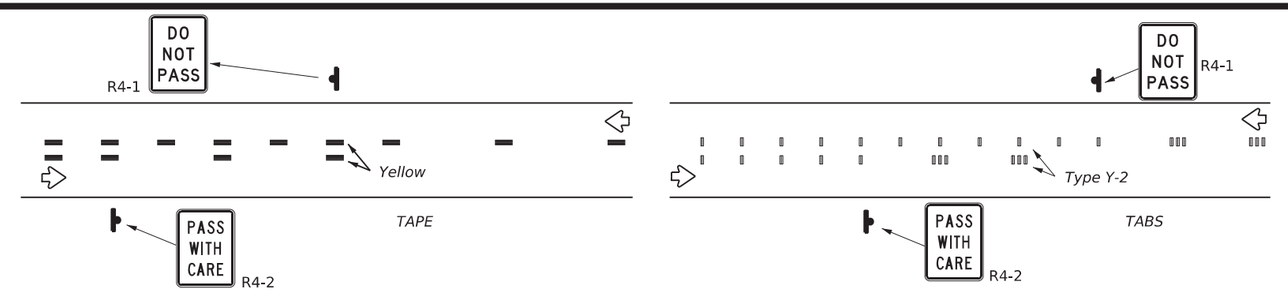
NOTES:

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.

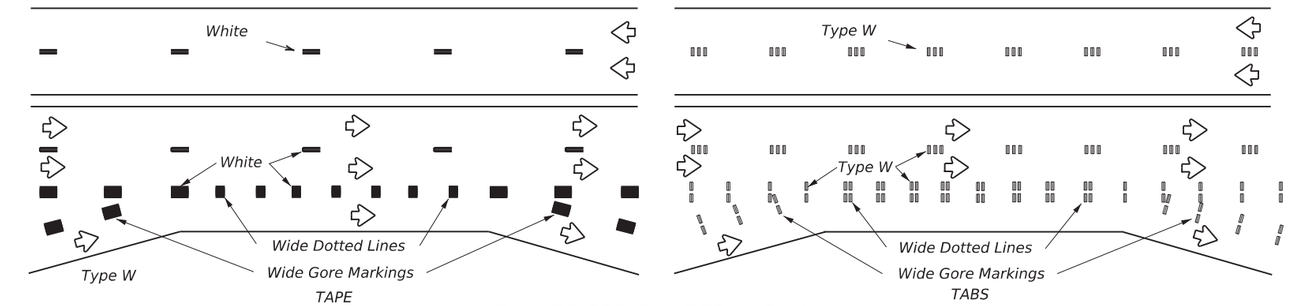
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

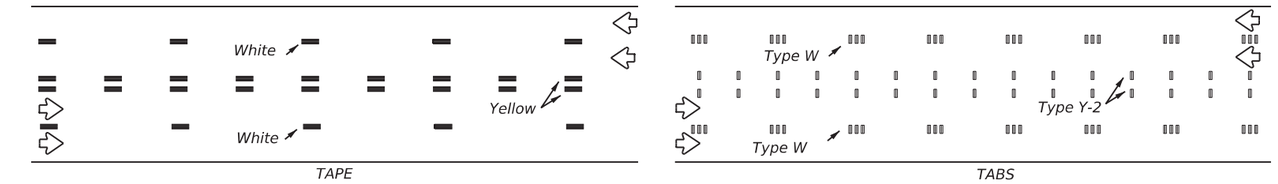
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



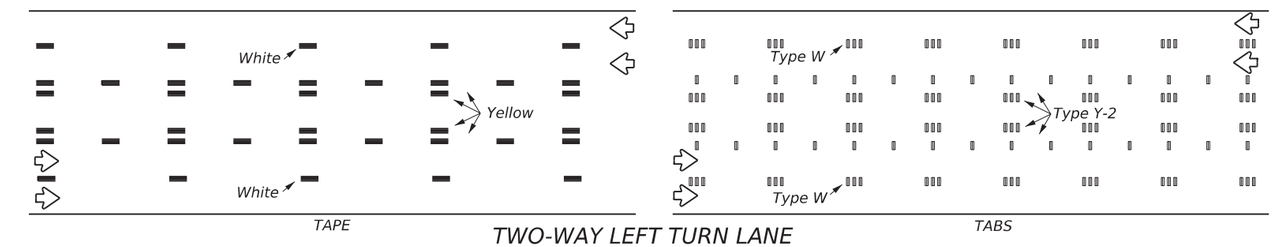
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



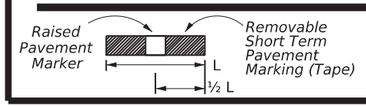
LANE LINES FOR DIVIDED HIGHWAY



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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4-92 7-13	DIST	COUNTY		SHEET NO.
1-97 2-23	DAL	COLLIN		49
3-03				

DATE: 2023/02/22
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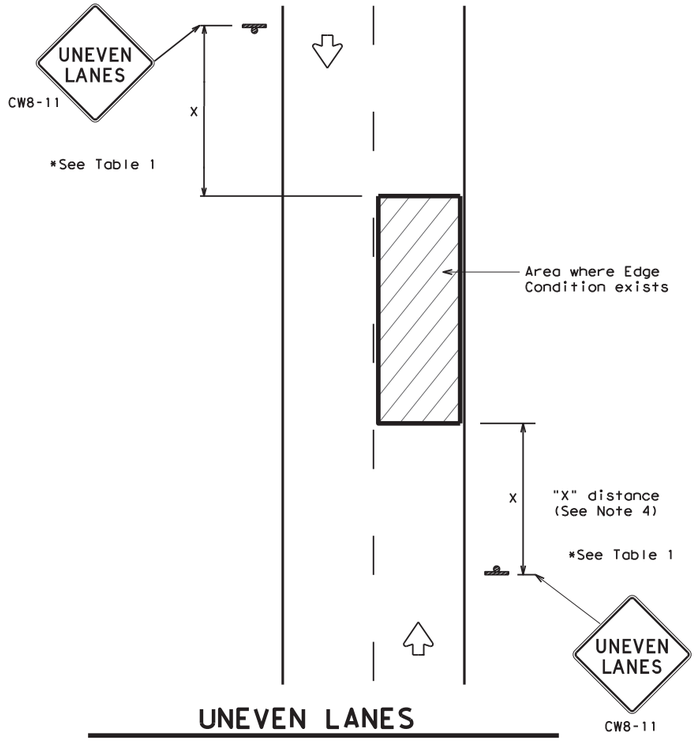
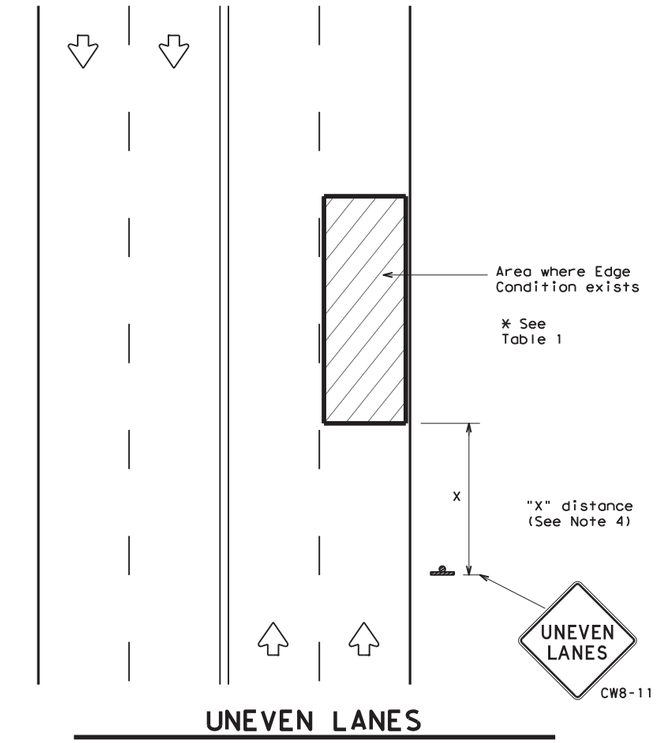
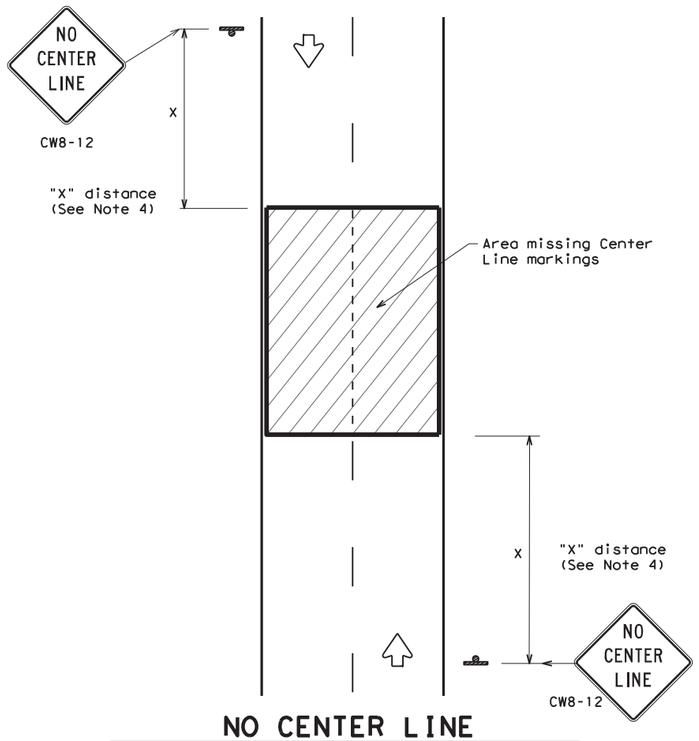


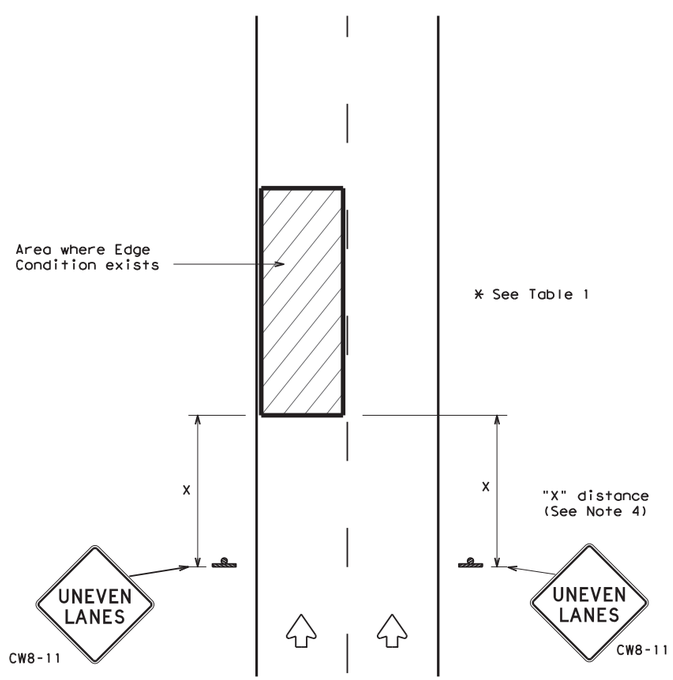
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

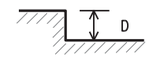
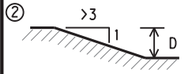
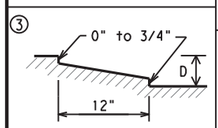
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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

GENERAL NOTES

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

TABLE 1

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

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

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

Texas Department of Transportation

Traffic Operations Division Standard

SIGNING FOR UNEVEN LANES

WZ(UL)-13

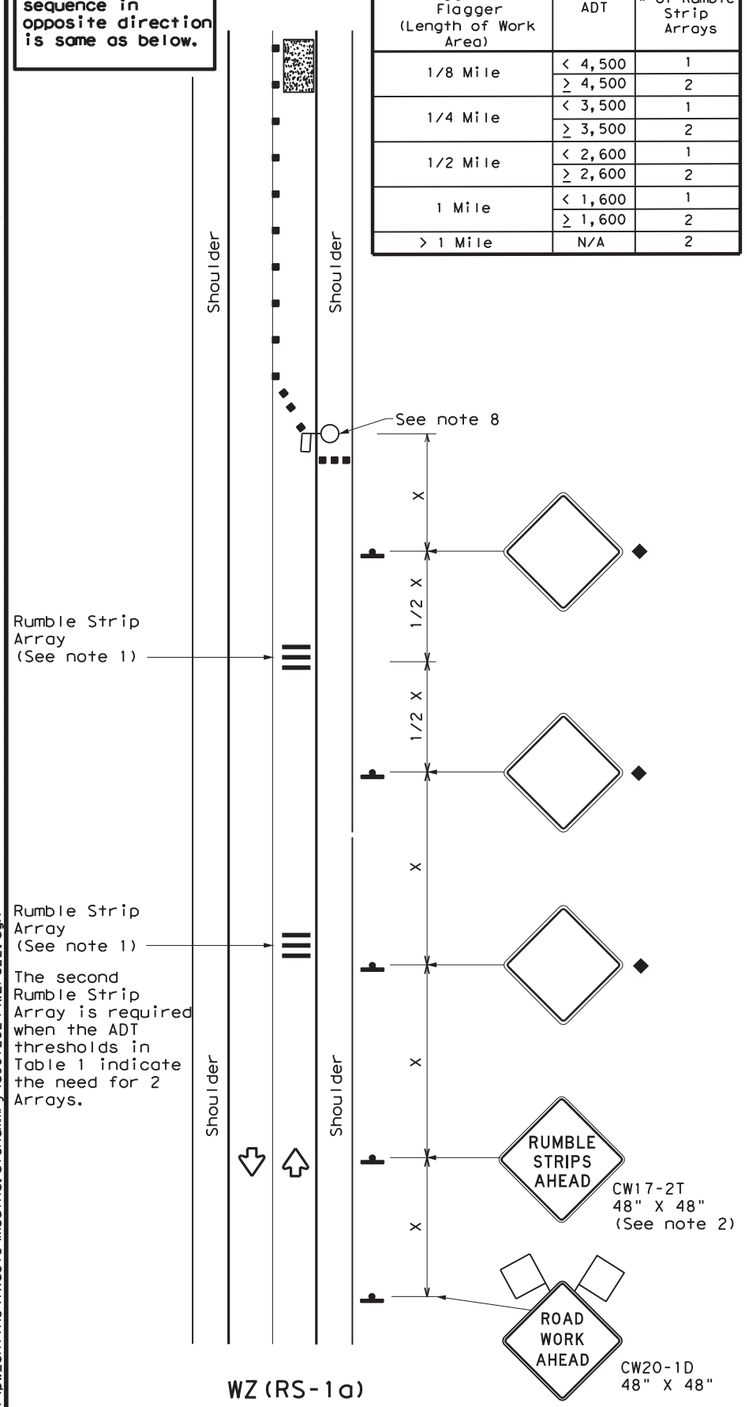
FILE: wzul-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	DAL	COLLIN		50

DATE: 3/16/2023 9:15:29 PM
FILE: c:\txdot\pw_online\txdot5\madina.alshamry\d0872524\wzul-13.dgn

DATE: 3/16/2023 9:15:42 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshamry\d0872524\wzrs22.dgn

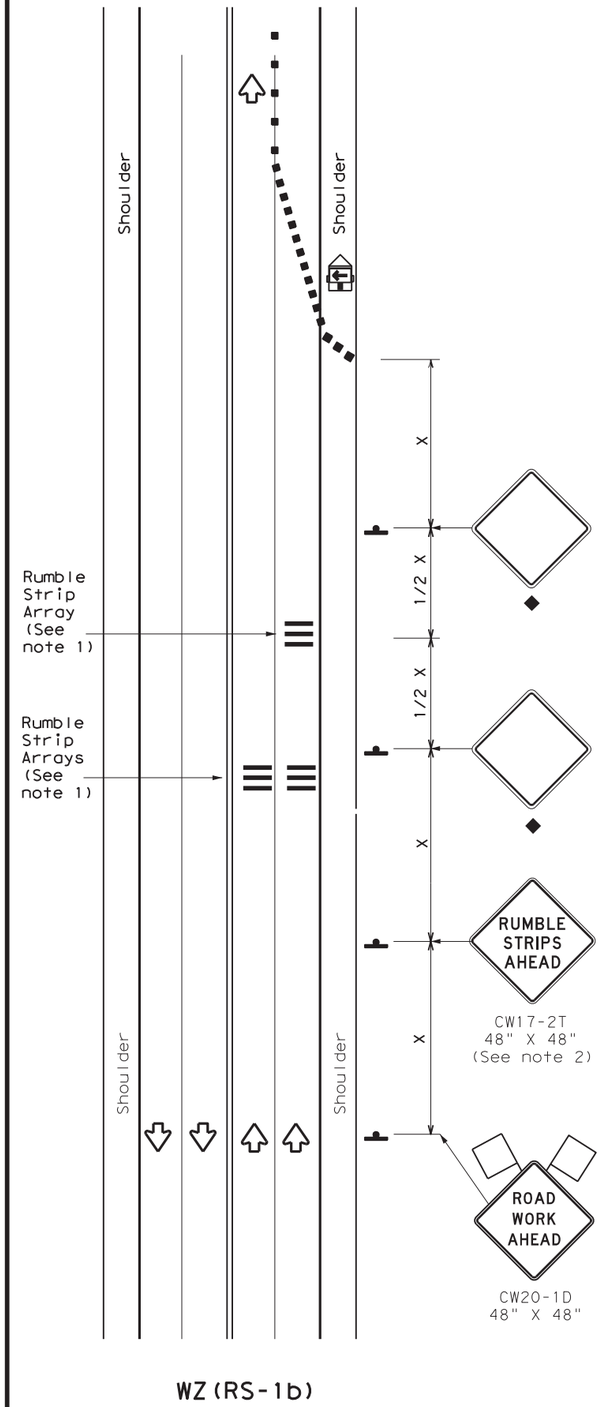
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

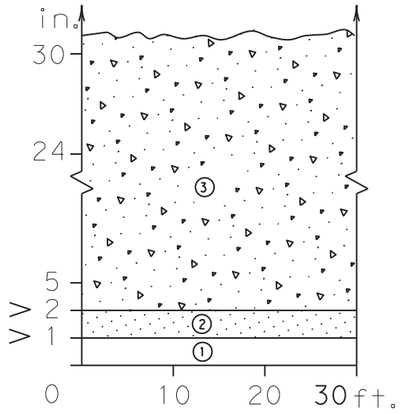
TEMPORARY RUMBLE STRIPS

WZ(RS)-22

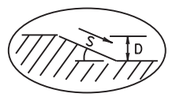
FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		51

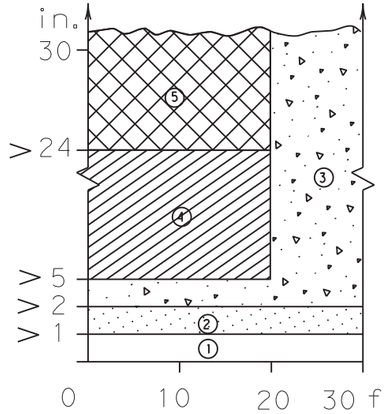
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

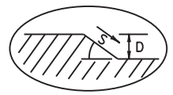


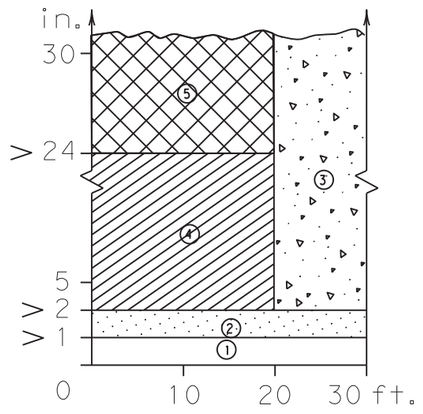
Edge Condition I
S = (3:1) (or flatter)



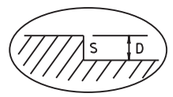


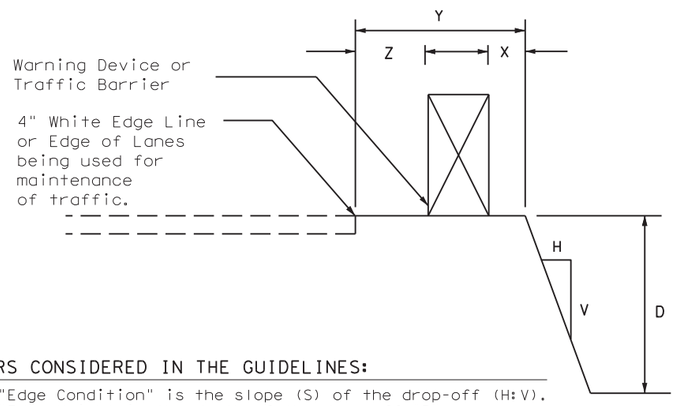
Edge Condition II
S = ((2.99):1) to (1:1)





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





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.

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.

Edge Condition Notes:

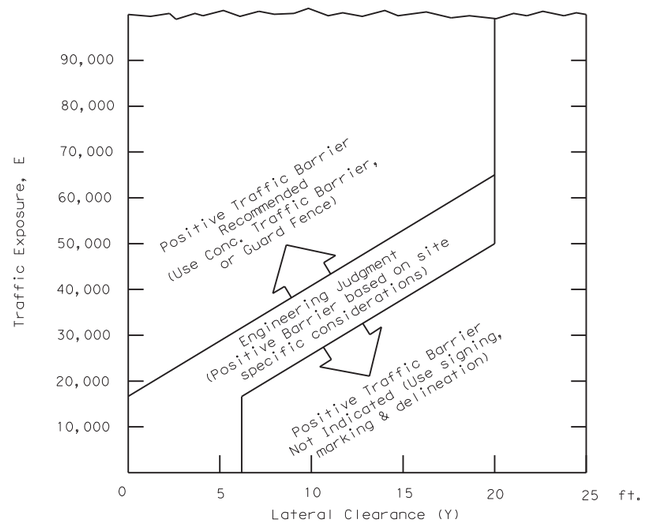
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

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.

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.

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.

Engineer's Seal

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E.

3/17/2023

Texas Department of Transportation

Traffic Safety Division Standard

TREATMENT FOR VARIOUS EDGE CONDITIONS

FILE: edgecon.dgn	DN:	CK:	DW:	CK:
©TxDOT August 2000	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
03-01 08-01 9-21	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		52

DATE: 3/16/2023 9:15:54 PM
FILE: c:\txdot\pw_online\txdot5\madina.alshammry\d0872524\edgecon-21.dgn

HORIZONTAL ALIGNMENT REPORT

Alignment name: FM2862_BL CL-2
Alignment description:
Report Created: Wednesday, February 1, 2023
Time: 10:02:23 AM

	STATION	X	Y
POT	0+10.000 R1	2563930.350	7180399.802
PI	8+34.941 R1	2564755.133	7180383.672

Tangential Direction: S88.880°E
Tangential Length: 824.941

PI	8+34.941 R1	2564755.133	7180383.672
PI	14+35.353 R1	2564761.076	7180984.055

Tangential Direction: N0.567°E
Tangential Length: 600.412

PI	14+35.353 R1	2564761.076	7180984.055
PC	19+36.329 R1	2564770.509	7181484.942

Tangential Direction: N1.079°E
Tangential Length: 500.976

PC	19+36.329 R1	2564770.509	7181484.942
PI	20+31.450 R1	2564772.300	7181580.046
CC		2564870.491	7181483.059
PT	20+88.408 R1	2564867.374	7181583.011

Radius: 100.000
Delta: 87.135° Right
Degree of Curvature(Arc): 57.296°
Length: 152.079
Tangent: 95.121
Chord: 137.842
Middle Ordinate: 27.544
External: 38.014
Tangent Back Direction: N1.079°E
Radial Direction: S88.921°E
Chord Direction: N44.646°E
Radial Direction: S1.786°E
Tangent Ahead Direction: N88.214°E

PT	20+88.408 R1	2564867.374	7181583.011
PC	21+84.613 R1	2564963.532	7181586.010

Tangential Direction: N88.214°E
Tangential Length: 96.205

PC	21+84.613 R1	2564963.532	7181586.010
PI	22+66.964 R1	2565045.843	7181588.576
CC		2564960.789	7181673.967
PT	23+17.009 R1	2565048.735	7181670.876

Radius: 88.000
Delta: 86.201° Left
Degree of Curvature(Arc): 65.109°
Length: 132.395
Tangent: 82.351
Chord: 120.257
Middle Ordinate: 23.746
External: 32.522
Tangent Back Direction: N88.214°E
Radial Direction: S1.786°E
Chord Direction: N45.113°E
Radial Direction: S87.987°E
Tangent Ahead Direction: N2.013°E

PT	23+17.009 R1	2565048.735	7181670.876
PC	40+42.593 R1	2565109.341	7183395.396

Tangential Direction: N2.013°E
Tangential Length: 1725.584

PC	40+42.593 R1	2565109.341	7183395.396
PI	43+61.479 R1	2565120.541	7183714.085
CC		2565444.134	7183383.630
PT	45+52.302 R1	2565439.395	7183718.596

Radius: 335.000
Delta: 87.177° Right
Degree of Curvature(Arc): 17.103°
Length: 509.709
Tangent: 318.886
Chord: 461.946
Middle Ordinate: 92.355
External: 127.508
Tangent Back Direction: N2.013°E
Radial Direction: S87.987°E
Chord Direction: N45.601°E
Radial Direction: S0.811°E
Tangent Ahead Direction: N89.189°E

PT	45+52.302 R1	2565439.395	7183718.596
PC	63+68.612 R1	2567255.523	7183744.292

Tangential Direction: N89.189°E
Tangential Length: 1816.310

PC	63+68.612 R1	2567255.523	7183744.292
PI	66+85.472 R1	2567572.351	7183748.775
CC		2567250.784	7184079.259
PT	68+76.189 R1	2567585.496	7184065.362

Radius: 335.000
Delta: 86.812° Left
Degree of Curvature(Arc): 17.103°
Length: 507.577
Tangent: 316.860
Chord: 460.399
Middle Ordinate: 91.621
External: 126.113
Tangent Back Direction: N89.189°E
Radial Direction: S0.811°E
Chord Direction: N45.783°E
Radial Direction: S87.623°E
Tangent Ahead Direction: N2.377°E

PT	68+76.189 R1	2567585.496	7184065.362
PC	78+45.609 R1	2567625.710	7185033.948

Tangential Direction: N2.377°E
Tangential Length: 969.420

PC	78+45.609 R1	2567625.710	7185033.948
PI	81+75.021 R1	2567639.375	7185363.076
CC		2567960.422	7185020.051
PT	83+66.191 R1	2567968.686	7185354.949

Radius: 335.000
Delta: 89.036° Right
Degree of Curvature(Arc): 17.103°
Length: 520.582
Tangent: 329.412
Chord: 469.760
Middle Ordinate: 96.135
External: 134.827
Tangent Back Direction: N2.377°E
Radial Direction: S87.623°E
Chord Direction: N46.896°E
Radial Direction: S1.414°W
Tangent Ahead Direction: S88.586°E

PT	83+66.191 R1	2567968.686	7185354.949
PI	107+32.132 R1	2570333.908	7185296.578

Tangential Direction: S88.586°E
Tangential Length: 2365.942

PI	107+32.132 R1	2570333.908	7185296.578
PI	117+33.113 R1	2571334.076	7185256.260

Tangential Direction: S87.692°E
Tangential Length: 1000.980

PI	117+33.113 R1	2571334.076	7185256.260
PI	125+32.431 R1	2572132.882	7185227.644

Tangential Direction: S87.948°E
Tangential Length: 799.318

PI	125+32.431 R1	2572132.882	7185227.644
PC	136+50.899 R1	2573250.820	7185193.226

Tangential Direction: S88.237°E
Tangential Length: 1118.468

PC	136+50.899 R1	2573250.820	7185193.226
PI	139+86.311 R1	2573586.073	7185182.905
CC		2573260.975	7185523.070
PT	141+74.629 R1	2573590.941	7185518.281

Radius: 330.000
Delta: 90.932° Left
Degree of Curvature(Arc): 17.362°
Length: 523.730
Tangent: 335.412
Chord: 470.470
Middle Ordinate: 98.560
External: 140.533
Tangent Back Direction: S88.237°E
Radial Direction: S1.763°W
Chord Direction: N46.297°E
Radial Direction: S89.169°E
Tangent Ahead Direction: N0.831°E

PT	141+74.629 R1	2573590.941	7185518.281
PC	145+96.030 R1	2573597.056	7185939.638

Tangential Direction: N0.831°E
Tangential Length: 421.401

PC	145+96.030 R1	2573597.056	7185939.638
PI	147+90.958 R1	2573599.885	7186134.544
CC		2573937.296	7185934.700
PT	149+50.066 R1	2573769.447	7186230.697

Radius: 340.276
Delta: 59.613° Right
Degree of Curvature(Arc): 16.838°
Length: 354.035
Tangent: 194.927
Chord: 338.281
Middle Ordinate: 45.015
External: 51.878
Tangent Back Direction: N0.832°E
Radial Direction: S89.168°E
Chord Direction: N30.638°E
Radial Direction: S29.556°E
Tangent Ahead Direction: N60.444°E

PT	149+50.066 R1	2573769.447	7186230.697
PI	157+30.575 R1	2574448.392	7186615.702

Tangential Direction: N60.444°E
Tangential Length: 780.510

PI	157+30.575 R1	2574448.392	7186615.702
PC	165+05.945 R1	2575121.965	7186999.757

Tangential Direction: N60.309°E
Tangential Length: 775.370

PC	165+05.945 R1	2575121.965	7186999.757
PI	166+08.983 R1	2575211.475	7187050.794
CC		2575560.322	7186230.948
PT	167+11.098 R1	2575310.317	7187079.901

Radius: 885.000
Delta: 13.282° Right
Degree of Curvature(Arc): 6.474°
Length: 205.153
Tangent: 103.038
Chord: 204.694
Middle Ordinate: 5.938
External: 5.978
Tangent Back Direction: N60.309°E
Radial Direction: S29.691°E
Chord Direction: N66.950°E
Radial Direction: S16.409°E
Tangent Ahead Direction: N73.591°E

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madihaa Alshammry, P.E. 3/17/2023

NOTE:
1.THE HORIZONTAL ALIGNMENT DATA SHOWN IN THIS PAGE IS FOR DESIGN PURPOSES ONLY. DO NOT USE THIS INFORMATION FOR CONSTRUCTION. PERFORM THE WIDENING OFF THE EXISTING ROADWAY ACCORDING TO THE TYPICAL SECTIONS.
2.TO VERIFY THE GEOMETRIC DATA SEE AS BUILT CSJ 0816-05-001.

Texas Department of Transportation

FM 2862

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		53

DATE: 3/17/2023 9:16:08 PM
FILE: c:\documents and settings\madiha.alshammry\desktop\fm2862_alignment data.dgn

PT	167+11.098 R1	2575310.317	7187079.901
PC	173+31.788 R1	2575905.726	7187255.241

Tangential Direction: N73.591°E
Tangential Length: 620.690

PC	173+31.788 R1	2575905.726	7187255.241
PI	174+88.285 R1	2576055.849	7187299.450
CC		2575679.732	7188022.657
PT	176+40.880 R1	2576178.247	7187396.971

Radius: 800.000
Delta: 22.137° Left
Degree of Curvature(Arc): 7.162°
Length: 309.092
Tangent: 156.498
Chord: 307.173
Middle Ordinate: 14.881
External: 15.163
Tangent Back Direction: N73.591°E
Radial Direction: S16.409°E
Chord Direction: N62.522°E
Radial Direction: S38.546°E
Tangent Ahead Direction: N51.454°E

PT	176+40.880 R1	2576178.247	7187396.971
PC	179+79.865 R1	2576443.370	7187608.208

Tangential Direction: N51.454°E
Tangential Length: 338.986

PC	179+79.865 R1	2576443.370	7187608.208
PI	182+49.090 R1	2576653.933	7187775.973
CC		2576920.075	7187009.895
PT	184+97.604 R1	2576923.156	7187774.889

Radius: 765.000
Delta: 38.777° Right
Degree of Curvature(Arc): 7.490°
Length: 517.739
Tangent: 269.225
Chord: 507.914
Middle Ordinate: 43.383
External: 45.991
Tangent Back Direction: N51.454°E
Radial Direction: S38.546°E
Chord Direction: N70.842°E
Radial Direction: S0.231°W
Tangent Ahead Direction: S89.769°E

PT	184+97.604 R1	2576923.156	7187774.889
PI	197+30.973 R1	2578156.515	7187769.922

Tangential Direction: S89.769°E
Tangential Length: 1233.369

PIBL CL-140	197+30.973 R1	2578156.515	7187769.922
PI	209+31.488 R1	2579356.999	7187761.349

Tangential Direction: S89.591°E
Tangential Length: 1200.515

PI	209+31.488 R1	2579356.999	7187761.349
PC	216+81.656 R1	2580107.154	7187756.942

Tangential Direction: S89.663°E
Tangential Length: 750.168

PC	216+81.656 R1	2580107.154	7187756.942
PI	218+26.434 R1	2580251.930	7187756.092
CC		2580104.569	7187316.950
PT	219+61.393 R1	2580367.914	7187669.441

Radius: 440.000
Delta: 36.427° Right
Degree of Curvature(Arc): 13.022°
Length: 279.737
Tangent: 144.778
Chord: 275.049
Middle Ordinate: 22.044
External: 23.207
Tangent Back Direction: S89.663°E
Radial Direction: S0.337°W
Chord Direction: S71.450°E
Radial Direction: S36.763°W
Tangent Ahead Direction: S53.237°E

PT	219+61.393 R1	2580367.914	7187669.441
PC	221+66.048 R1	2580531.866	7187546.952

Tangential Direction: S53.237°E
Tangential Length: 204.656

PC	221+66.048 R1	2580531.866	7187546.952
PI	223+02.676 R1	2580641.321	7187465.179
CC		2580816.159	7187927.482
PT	224+32.121 R1	2580777.495	7187454.058

Radius: 475.000
Delta: 32.094° Left
Degree of Curvature(Arc): 12.062°
Length: 266.073
Tangent: 136.628
Chord: 262.608
Middle Ordinate: 18.509
External: 19.259
Tangent Back Direction: S53.237°E
Radial Direction: S36.763°W
Chord Direction: S69.284°E
Radial Direction: S4.669°W
Tangent Ahead Direction: S85.331°E

PT	224+32.121 R1	2580777.495	7187454.058
PC	229+08.027 R1	2581251.822	7187415.321

Tangential Direction: S85.331°E
Tangential Length: 475.906

PC	229+08.027 R1	2581251.822	7187415.321
PI	231+15.951 R1	2581459.056	7187398.397
CC		2581290.259	7187885.982
PT	232+99.751 R1	2581611.469	7187539.827

Radius: 472.228
Delta: 47.528° Left
Degree of Curvature(Arc): 12.133°
Length: 391.724
Tangent: 207.924
Chord: 380.589
Middle Ordinate: 40.039
External: 43.748
Tangent Back Direction: S85.331°E
Radial Direction: S4.669°W
Chord Direction: N70.905°E
Radial Direction: S42.859°E
Tangent Ahead Direction: N47.141°E

PT	232+99.751 R1	2581611.469	7187539.827
PC	238+25.669 R1	2581996.980	7187897.557

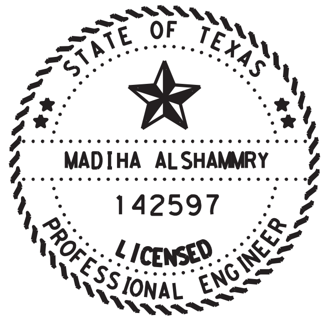
Tangential Direction: N47.141°E
Tangential Length: 525.918

PC	238+25.669 R1	2581996.980	7187897.557
PI	239+83.131 R1	2582112.404	7188004.663
CC		2582269.061	7187604.347
PT	241+25.689 R1	2582269.867	7188004.346

Radius: 400.000
Delta: 42.975° Right
Degree of Curvature(Arc): 14.324°
Length: 300.021
Tangent: 157.462
Chord: 293.037
Middle Ordinate: 27.801
External: 29.877
Tangent Back Direction: N47.141°E
Radial Direction: S42.859°E
Chord Direction: N68.628°E
Radial Direction: S0.115°W
Tangent Ahead Direction: S89.885°E

PT	241+25.689 R1	2582269.867	7188004.346
POT	247+82.180 R1	2582926.356	7188003.024

Tangential Direction: S89.885°E
Tangential Length: 656.491



Madiha Alshammry, P.E. 3/17/2023

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Texas Department of Transportation

FM 2862

HORIZONTAL ALIGNMENT DATA

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		54

DATE: 3/17/2023 9:16:09 PM
FILE: c:\...\madiha.alshammry\d0747292\FM2862 ALIGNMENT DATA.dgn

SUPERELEVATION TABLE

PC	PI	PT	BEGIN SUPER TRANSITION	END SUPER TRANSITION BEGIN FULL SUPER	END FULL SUPER BEGIN SUPER TRANSITION	END SUPER TRANSITION	SUPERELEVATION RATE e
STA.	STA.	STA.	STA.	STA.	STA.	STA.	%
19+36.33	20+31.45	20+88.41	16+02.29	19+95.26	20+29.46	21+36.51	-6.0
21+84.61	22+66.96	23+17.01	21+36.51	22+43.56	22+58.00	26+51.04	6.0
40+42.59	43+61.48	45+52.30	37+08.56	41+01.54	44+93.35	48+86.34	-6.0
63+68.61	66+85.47	68+76.19	60+34.58	64+27.56	68+17.24	72+10.22	6.0
78+45.61	81+75.02	83+66.19	75+11.57	79+04.56	83+07.25	87+00.23	-6.0
136+50.90	139+86.31	141+74.63	133+16.86	137+09.85	141+15.68	142+85.33	6.0
145+96.03	147+90.96	149+50.07	142+85.33	146+54.98	148+91.12	152+84.10	-6.0
165+05.95	166+08.98	167+11.10	162+08.46	165+55.76	166+61.22	170+08.59	-5.1
173+31.79	174+88.23	176+40.88	170+25.65	173+83.76	175+88.91	178+08.94	5.2
179+79.87	182+49.09	184+97.60	178+08.94	180+32.72	184+44.75	188+07.77	-5.4
216+81.66	218+26.43	219+61.39	213+47.62	217+40.80	219+02.45	220+63.72	-6.0
221+66.05	223+02.63	224+32.12	220+63.72	222+25.00	223+73.17	226+67.91	6.0
229+08.03	231+15.95	232.99.75	226+67.91	229+66.57	232+40.80	235+62.71	6.0
238+25.67	239+83.13	241+25.69	235+62.71	238+84.62	240+66.74	244+58.72	-6.0

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

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Texas Department of Transportation

FM 2862

SUPERELEVATION TABLE

SHEET 1 OF 1

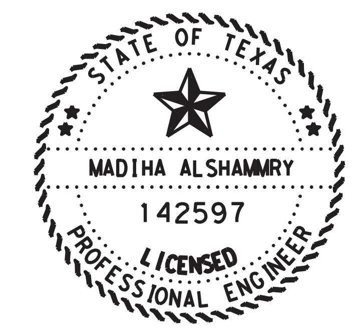
CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		55

DATE: 3/16/2023 9:16:11 PM
FILE: c:\pwworking\txdot5\madiha.alshammry\d0747292\FM2862_ALIGNMENT DATA.dgn

VERTICAL ALIGNMENT REPORT

Alignment name: BL CL-FM2862PROF
Alignment description:
Report Created: Wednesday, February 1, 2023
Time: 10:04:50 AM

	STATION	ELEVATION
POT	0+10.000 R1	707.200
VPI	13+10.000 R1	715.650
Tangent Grade:	0.006	
Tangent Length:	1300.000	
VPI	13+10.000 R1	715.650
VPI	34+40.000 R1	725.800
Tangent Grade:	0.005	
Tangent Length:	2130.000	
VPI	34+40.000 R1	725.800
VPC	43+40.000 R1	728.492
Tangent Grade:	0.003	
Tangent Length:	900.000	
VPC	43+40.000 R1	728.492
VPI	45+40.000 R1	729.091
VPT	47+40.000 R1	727.422
VHP	44+45.591 R1	728.650
Length:	400.000	
Entrance Grade:	0.003	
Exit Grade:	-0.008	
K Value =:	352.974	
Middle Ordinate (E):	-0.567	
VPT	47+40.000 R1	727.422
VPC	54+50.000 R1	721.500
Tangent Grade:	-0.008	
Tangent Length:	710.000	
VPC	54+50.000 R1	721.500
VPI	55+10.000 R1	721.000
VPT	55+70.000 R1	720.250
Length:	120.000	
Entrance Grade:	-0.008	
Exit Grade:	-0.013	
K Value =:	288.519	
Middle Ordinate (E):	-0.062	
VPT	55+70.000 R1	720.250
VPC	60+50.000 R1	714.250
Tangent Grade:	-0.013	
Tangent Length:	480.000	
VPC	60+50.000 R1	714.250
VPI	61+10.000 R1	713.500
VPT	61+70.000 R1	713.010
Length:	120.000	
Entrance Grade:	-0.013	
Exit Grade:	-0.008	
K Value =:	277.087	
Middle Ordinate (E):	0.065	
VPT	61+70.000 R1	713.010
VPC	65+50.000 R1	709.906
Tangent Grade:	-0.008	
Tangent Length:	380.000	
VPC	65+50.000 R1	709.906
VPI	66+10.000 R1	709.415
VPT	66+70.000 R1	709.325
Length:	120.000	
Entrance Grade:	-0.008	
Exit Grade:	-0.002	
K Value =:	179.931	
Middle Ordinate (E):	0.100	
VPT	66+70.000 R1	709.325
VPC	79+00.000 R1	707.480
Tangent Grade:	-0.002	
Tangent Length:	1230.000	
VPC	79+00.000 R1	707.480
VPI	79+60.000 R1	707.390
VPT	80+20.000 R1	706.748
Length:	120.000	
Entrance Grade:	-0.002	
Exit Grade:	-0.011	
K Value =:	130.380	
Middle Ordinate (E):	-0.138	
VPT	80+20.000 R1	706.748
VPC	81+00.000 R1	705.892
Tangent Grade:	-0.011	
Tangent Length:	80.000	
VPC	81+00.000 R1	705.892
VPI	81+60.000 R1	705.250
VPT	82+20.000 R1	705.036
Length:	120.000	
Entrance Grade:	-0.011	
Exit Grade:	-0.004	
K Value =:	167.941	
Middle Ordinate (E):	0.107	
VPT	82+20.000 R1	705.036
VPC	83+50.000 R1	704.574
Tangent Grade:	-0.004	
Tangent Length:	130.000	
VPC	83+50.000 R1	704.574
VPI	84+10.000 R1	704.360
VPT	84+70.000 R1	703.969
Length:	120.000	
Entrance Grade:	-0.004	
Exit Grade:	-0.007	
K Value =:	405.978	
Middle Ordinate (E):	-0.044	
VPT	84+70.000 R1	703.969
VPI	91+10.000 R1	699.800
Tangent Grade:	-0.007	
Tangent Length:	640.000	
VPI	91+10.000 R1	699.800
VPI	102+10.000 R1	694.211
Tangent Grade:	-0.005	
Tangent Length:	1100.000	
VPI	102+10.000 R1	694.211
VPC	107+10.000 R1	690.985
Tangent Grade:	-0.006	
Tangent Length:	500.000	
VPC	107+10.000 R1	690.985
VPI	108+10.000 R1	690.340
VPT	109+10.000 R1	688.917
Length:	200.000	
Entrance Grade:	-0.006	
Exit Grade:	-0.014	
K Value =:	257.009	
Middle Ordinate (E):	-0.195	
VPT	109+10.000 R1	688.917
VPC	112+85.000 R1	683.579
Tangent Grade:	-0.014	
Tangent Length:	375.000	
VPC	112+85.000 R1	683.579
VPI	114+10.000 R1	681.800
VPT	115+35.000 R1	683.389
VLP	114+17.062 R1	682.639
Length:	250.000	
Entrance Grade:	-0.014	
Exit Grade:	0.013	
K Value =:	92.784	
Middle Ordinate (E):	0.842	
VPT	115+35.000 R1	683.389
VPC	117+60.000 R1	686.249
Tangent Grade:	0.013	
Tangent Length:	225.000	
VPC	117+60.000 R1	686.249
VPI	118+60.000 R1	687.520
VPT	119+60.000 R1	686.335
VHP	118+63.487 R1	686.907
Length:	200.000	
Entrance Grade:	0.013	
Exit Grade:	-0.012	
K Value =:	81.414	
Middle Ordinate (E):	-0.614	
VPT	119+60.000 R1	686.335
VPC	123+50.000 R1	681.711
Tangent Grade:	-0.012	
Tangent Length:	390.000	
VPC	123+50.000 R1	681.711
VPI	124+10.000 R1	681.000
VPT	124+70.000 R1	681.000
Length:	120.000	
Entrance Grade:	-0.012	
Exit Grade:	0.000	
K Value =:	101.227	
Middle Ordinate (E):	0.178	
VPT	124+70.000 R1	681.000
VPC	125+40.000 R1	681.000
Tangent Grade:	0.000	
Tangent Length:	70.000	
VPC	125+40.000 R1	681.000
VPI	126+40.000 R1	681.000
VPT	127+40.000 R1	677.857
Length:	200.000	
Entrance Grade:	0.000	
Exit Grade:	-0.031	
K Value =:	63.636	
Middle Ordinate (E):	-0.786	
VPT	127+40.000 R1	677.857
VPC	128+10.000 R1	675.657
Tangent Grade:	-0.031	
Tangent Length:	70.000	
VPC	128+10.000 R1	675.657
VPI	130+60.000 R1	667.800
VPT	133+10.000 R1	673.915
VLP	130+91.164 R1	671.239
Length:	500.000	
Entrance Grade:	-0.031	
Exit Grade:	0.024	
K Value =:	89.461	
Middle Ordinate (E):	3.493	
VPT	133+10.000 R1	673.915
VPC	135+60.000 R1	680.031
Tangent Grade:	0.024	
Tangent Length:	250.000	
VPC	135+60.000 R1	680.031
VPI	137+10.000 R1	683.700
VPT	138+60.000 R1	683.700
Length:	300.000	
Entrance Grade:	0.024	
Exit Grade:	0.000	
K Value =:	122.642	
Middle Ordinate (E):	-0.917	
VPT	138+60.000 R1	683.700
VPC	145+90.000 R1	683.700
Tangent Grade:	0.000	
Tangent Length:	730.000	
VPC	145+90.000 R1	683.700
VPI	146+50.000 R1	683.700
VPT	147+10.000 R1	682.890
Length:	120.000	
Entrance Grade:	0.000	
Exit Grade:	-0.013	
K Value =:	88.894	
Middle Ordinate (E):	-0.202	
VPT	147+10.000 R1	682.890
VPC	150+15.000 R1	678.773
Tangent Grade:	-0.013	
Tangent Length:	305.000	
VPC	150+15.000 R1	678.773
VPI	151+90.000 R1	676.410
VPT	153+65.000 R1	677.635
VLP	152+45.484 R1	677.217
Length:	350.000	
Entrance Grade:	-0.013	
Exit Grade:	0.007	
K Value =:	170.738	
Middle Ordinate (E):	0.897	
VPT	153+65.000 R1	677.635
VPC	155+30.000 R1	678.790
Tangent Grade:	0.007	
Tangent Length:	165.000	
VPC	155+30.000 R1	678.790
VPI	155+90.000 R1	679.210
VPT	156+50.000 R1	679.018
VHP	156+12.353 R1	679.079
Length:	120.000	
Entrance Grade:	0.007	
Exit Grade:	-0.003	
K Value =:	117.647	
Middle Ordinate (E):	-0.153	



Madiha Alshammry, P.E. 3/17/2023

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Texas Department of Transportation

FM 2862

VERTICAL ALIGNMENT DATA

SHEET 1 OF 3

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		56

CK: DW: CK: DW:

DATE: 3/16/2023 9:16:12 PM
FILE: c:\pwworking\txdot5\madiha.alshammry\d0747292\FM2862 ALIGNMENT DATA.dgn

VPT 156+50.000 R1 679.018
VPC 160+50.000 R1 677.738
Tangent Grade: -0.003
Tangent Length: 400.000

VPC 160+50.000 R1 677.738
VPI 162+00.000 R1 677.258
VPT 163+50.000 R1 680.018
VLP 160+94.444 R1 677.667
Length: 300.000
Entrance Grade: -0.003
Exit Grade: 0.018
K Value =: 138.889
Middle Ordinate (E): 0.810

VPT 163+50.000 R1 680.018
VPC 165+05.000 R1 682.870
Tangent Grade: 0.018
Tangent Length: 155.000

VPC 165+05.000 R1 682.870
VPI 166+10.000 R1 684.802
VPT 167+15.000 R1 683.353
VHP 166+25.000 R1 683.974
Length: 210.000
Entrance Grade: 0.018
Exit Grade: -0.014
K Value =: 65.217
Middle Ordinate (E): -0.845

VPT 167+15.000 R1 683.353
VPC 167+80.000 R1 682.456
Tangent Grade: -0.014
Tangent Length: 65.000

VPC 167+80.000 R1 682.456
VPI 168+40.000 R1 681.628
VPT 169+00.000 R1 681.587

Length: 120.000
Entrance Grade: -0.014
Exit Grade: -0.001
K Value =: 91.499
Middle Ordinate (E): 0.197

VPT 169+00.000 R1 681.587
VPC 169+80.000 R1 681.532
Tangent Grade: -0.001
Tangent Length: 80.000

VPC 169+80.000 R1 681.532
VPI 170+80.000 R1 681.464
VPT 171+80.000 R1 682.614
VLP 169+91.245 R1 681.529
Length: 200.000
Entrance Grade: -0.001
Exit Grade: 0.011
K Value =: 164.134
Middle Ordinate (E): 0.305

VPT 171+80.000 R1 682.614
VPC 173+30.000 R1 684.339
Tangent Grade: 0.011
Tangent Length: 150.000

VPC 173+30.000 R1 684.339
VPI 174+30.000 R1 685.489
VPT 175+30.000 R1 683.339
VHP 173+99.697 R1 684.740
Length: 200.000
Entrance Grade: 0.011
Exit Grade: -0.021
K Value =: 60.606
Middle Ordinate (E): -0.825

VPT 175+30.000 R1 683.339
VPC 176+50.000 R1 680.759
Tangent Grade: -0.021
Tangent Length: 120.000

VPC 176+50.000 R1 680.759
VPI 177+10.000 R1 679.469
VPT 177+70.000 R1 678.947

Length: 120.000
Entrance Grade: -0.021
Exit Grade: -0.009
K Value =: 93.750
Middle Ordinate (E): 0.192

VPT 177+70.000 R1 678.947
VPC 178+70.000 R1 678.077
Tangent Grade: -0.009
Tangent Length: 100.000

VPC 178+70.000 R1 678.077
VPI 179+70.000 R1 677.207
VPT 180+70.000 R1 673.307

Length: 200.000
Entrance Grade: -0.009
Exit Grade: -0.039
K Value =: 66.007
Middle Ordinate (E): -0.758

VPT 180+70.000 R1 673.307
VPC 181+20.000 R1 671.357
Tangent Grade: -0.039
Tangent Length: 50.000

VPC 181+20.000 R1 671.357
VPI 182+00.000 R1 668.237
VPT 182+80.000 R1 666.837

Length: 160.000
Entrance Grade: -0.039
Exit Grade: -0.018
K Value =: 74.419
Middle Ordinate (E): 0.430

VPT 182+80.000 R1 666.837
VPC 183+10.000 R1 666.312
Tangent Grade: -0.017
Tangent Length: 30.000

VPC 183+10.000 R1 666.312
VPI 184+20.000 R1 664.387
VPT 185+30.000 R1 658.887

Length: 220.000
Entrance Grade: -0.018
Exit Grade: -0.050
K Value =: 67.692
Middle Ordinate (E): -0.894

VPT 185+30.000 R1 658.887
VPC 185+80.000 R1 656.387
Tangent Grade: -0.050
Tangent Length: 50.000

VPC 185+80.000 R1 656.387
VPI 187+80.000 R1 646.387
VPT 189+80.000 R1 644.887

Length: 400.000
Entrance Grade: -0.050
Exit Grade: -0.007
K Value =: 94.118
Middle Ordinate (E): 2.125

VPT 189+80.000 R1 644.887
VPC 191+40.000 R1 643.687
Tangent Grade: -0.007
Tangent Length: 160.000

VPC 191+40.000 R1 643.687
VPI 192+40.000 R1 642.937
VPT 193+40.000 R1 639.137

Length: 200.000
Entrance Grade: -0.007
Exit Grade: -0.038
K Value =: 65.574
Middle Ordinate (E): -0.762

VPT 193+40.000 R1 639.137
VPC 194+20.000 R1 636.097
Tangent Grade: -0.038
Tangent Length: 80.000

VPC 194+20.000 R1 636.097
VPI 195+10.000 R1 632.677
VPT 196+00.000 R1 631.450

Length: 180.000
Entrance Grade: -0.038
Exit Grade: -0.014
K Value =: 73.881
Middle Ordinate (E): 0.548

VPT 196+00.000 R1 631.450
VPC 198+30.000 R1 628.313
Tangent Grade: -0.014
Tangent Length: 230.000

VPC 198+30.000 R1 628.313
VPI 199+30.000 R1 626.950
VPT 200+30.000 R1 623.762

Length: 200.000
Entrance Grade: -0.014
Exit Grade: -0.032
K Value =: 109.678
Middle Ordinate (E): -0.456

VPT 200+30.000 R1 623.762
VPC 200+95.000 R1 621.691
Tangent Grade: -0.032
Tangent Length: 65.000

VPC 200+95.000 R1 621.691
VPI 202+20.000 R1 617.707
VPT 203+45.000 R1 617.798
VLP 203+39.412 R1 617.796
Length: 250.000
Entrance Grade: -0.032
Exit Grade: 0.001
K Value =: 76.686
Middle Ordinate (E): 1.019

VPT 203+45.000 R1 617.798
VPC 205+20.000 R1 617.925
Tangent Grade: 0.001
Tangent Length: 175.000

VPC 205+20.000 R1 617.925
VPI 206+20.000 R1 617.998
VPT 207+20.000 R1 620.498

Length: 200.000
Entrance Grade: 0.001
Exit Grade: 0.025
K Value =: 82.402
Middle Ordinate (E): 0.607

VPT 207+20.000 R1 620.498
VPC 208+20.000 R1 622.998
Tangent Grade: 0.025
Tangent Length: 100.000

VPC 208+20.000 R1 622.998
VPI 210+20.000 R1 627.998
VPT 212+20.000 R1 622.758
VHP 210+15.313 R1 625.440
Length: 400.000
Entrance Grade: 0.025
Exit Grade: -0.026
K Value =: 78.125
Middle Ordinate (E): -2.560

VPT 212+20.000 R1 622.758
VPC 217+75.000 R1 608.217
Tangent Grade: -0.026
Tangent Length: 555.000

VPC 217+75.000 R1 608.217
VPI 220+00.000 R1 602.322
VPT 222+25.000 R1 609.297
VLP 219+81.119 R1 605.517
Length: 450.000
Entrance Grade: -0.026
Exit Grade: 0.031
K Value =: 78.671
Middle Ordinate (E): 3.217

VPT 222+25.000 R1 609.297
VPC 222+60.000 R1 610.382
Tangent Grade: 0.031
Tangent Length: 35.000

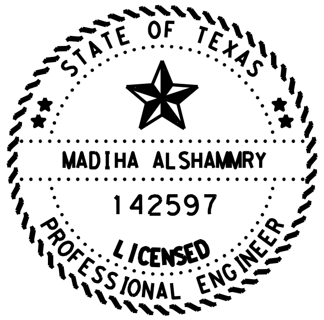
VPC 222+60.000 R1 610.382
VPI 223+50.000 R1 613.172
VPT 224+40.000 R1 613.910

Length: 180.000
Entrance Grade: 0.031
Exit Grade: 0.008
K Value =: 78.947
Middle Ordinate (E): -0.513

VPT 224+40.000 R1 613.910
VPC 230+20.000 R1 618.666
Tangent Grade: 0.008
Tangent Length: 580.000

VPC 230+20.000 R1 618.666
VPI 232+10.000 R1 620.224
VPT 234+00.000 R1 631.624

Length: 380.000
Entrance Grade: 0.008
Exit Grade: 0.060
K Value =: 73.359
Middle Ordinate (E): 2.460



Madiha Alshammry, P.E. 3/23/2023

NOTE:
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2. TO VERIFY THE GEOMETRIC DATA SEE AS BUILT CSJ 0816-05-001.

Texas Department of Transportation

FM 2862

VERTICAL ALIGNMENT DATA

SHEET 2 OF 3

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		57

DATE: 3/23/2023 2:25:43 PM
FILE: c:\pwworking\txdot5\madiha.alshammry\d0747292\FM2862_ALIGNMENT DATA.dgn

DN: CK: DW: CK:

VPT	234+00.000 R1	631.624
VPC	235+20.000 R1	638.824
Tangent Grade:	0.060	
Tangent Length:	120.000	

VPC	235+20.000 R1	638.824
VPI	237+70.000 R1	653.824
VPT	240+20.000 R1	651.599
VHP	239+55.414 R1	651.887
Length:	500.000	
Entrance Grade:	0.060	
Exit Grade:	-0.009	
K Value =:	72.569	
Middle Ordinate (E):	-4.306	

VPT	240+20.000 R1	651.599
VPC	243+80.000 R1	648.395
Tangent Grade:	-0.009	
Tangent Length:	360.000	

VPC	243+80.000 R1	648.395
VPI	245+30.000 R1	647.060
VPT	246+80.000 R1	642.860
Length:	300.000	
Entrance Grade:	-0.009	
Exit Grade:	-0.028	
K Value =:	157.068	
Middle Ordinate (E):	-0.716	

VPT	246+80.000 R1	642.860
POT	247+82.289 R1	639.996
Tangent Grade:	-0.028	
Tangent Length:	102.289	

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

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Texas Department of Transportation

FM 2862

VERTICAL ALIGNMENT DATA

SHEET 3 OF 3

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		58

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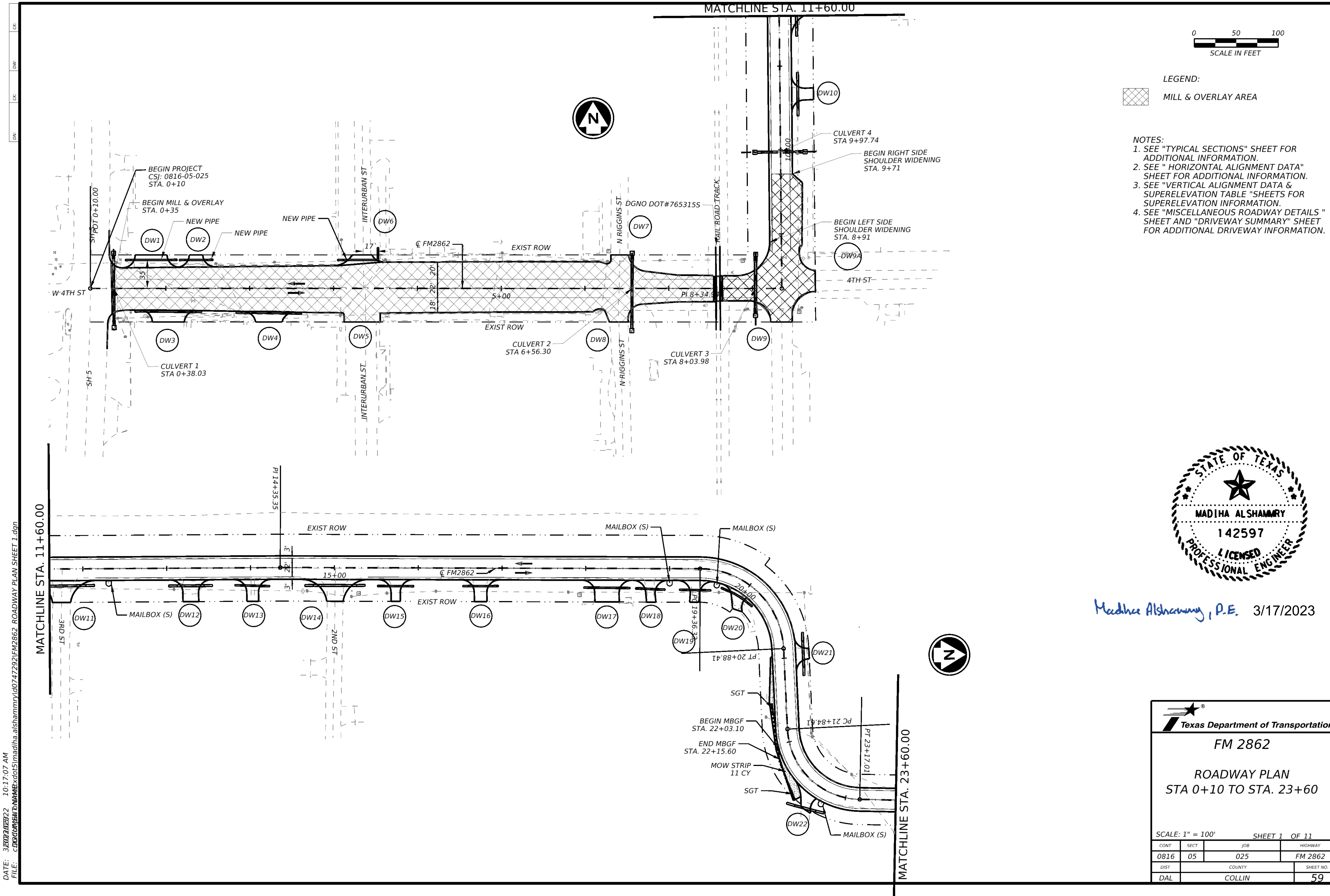
MATCHLINE STA. 11+60.00
0 50 100
SCALE IN FEET
LEGEND:
MILL & OVERLAY AREA
NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.
BEGIN PROJECT
CSJ: 0816-05-025
STA. 0+10
BEGIN MILL & OVERLAY
STA. 0+35
NEW PIPE
NEW PIPE
NEW PIPE
INTERURBAN ST
DGNO DOT#765315S
N RIGGINS ST
RAIL ROAD TRACK
CULVERT 4
STA 9+97.74
BEGIN RIGHT SIDE
SHOULDER WIDENING
STA. 9+71
BEGIN LEFT SIDE
SHOULDER WIDENING
STA. 8+91
4TH ST
W 4TH ST
SH 5
POT 0+10.00
EXIST ROW
EXIST ROW
5+00
PI 8+34.9
CULVERT 1
STA 0+38.03
CULVERT 2
STA 6+56.30
CULVERT 3
STA 8+03.98
DW1 DW2 DW3 DW4 DW5 DW6 DW7 DW8 DW9 DW9A DW10
PI 14+35.35
EXIST ROW
MAILBOX (S)
MAILBOX (S)
15+00
℄ FM2862
EXIST ROW
MAILBOX (S)
3RD ST
2ND ST
DW11 DW12 DW13 DW14 DW15 DW16 DW17 DW18 DW19 DW20 DW21 DW22
PC 19+36.39
20+00
PT 20+88.41
SGT
BEGIN MBGF
STA. 22+03.10
END MBGF
STA. 22+15.60
MOW STRIP
11 CY
SGT
PC 21+84.61
PT 23+17.01
MAILBOX (S)
MATCHLINE STA. 11+60.00
MATCHLINE STA. 23+60.00
STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER
Madiha Alshammry, P.E. 3/17/2023
Texas Department of Transportation
FM 2862
ROADWAY PLAN
STA 0+10 TO STA. 23+60
SCALE: 1" = 100'
SHEET 1 OF 11
CONT 0816 SECT 05 JOB 025 HIGHWAY FM 2862
DIST DAL COUNTY COLLIN SHEET NO. 59
DATE: 3/20/2023 10:17:07 AM
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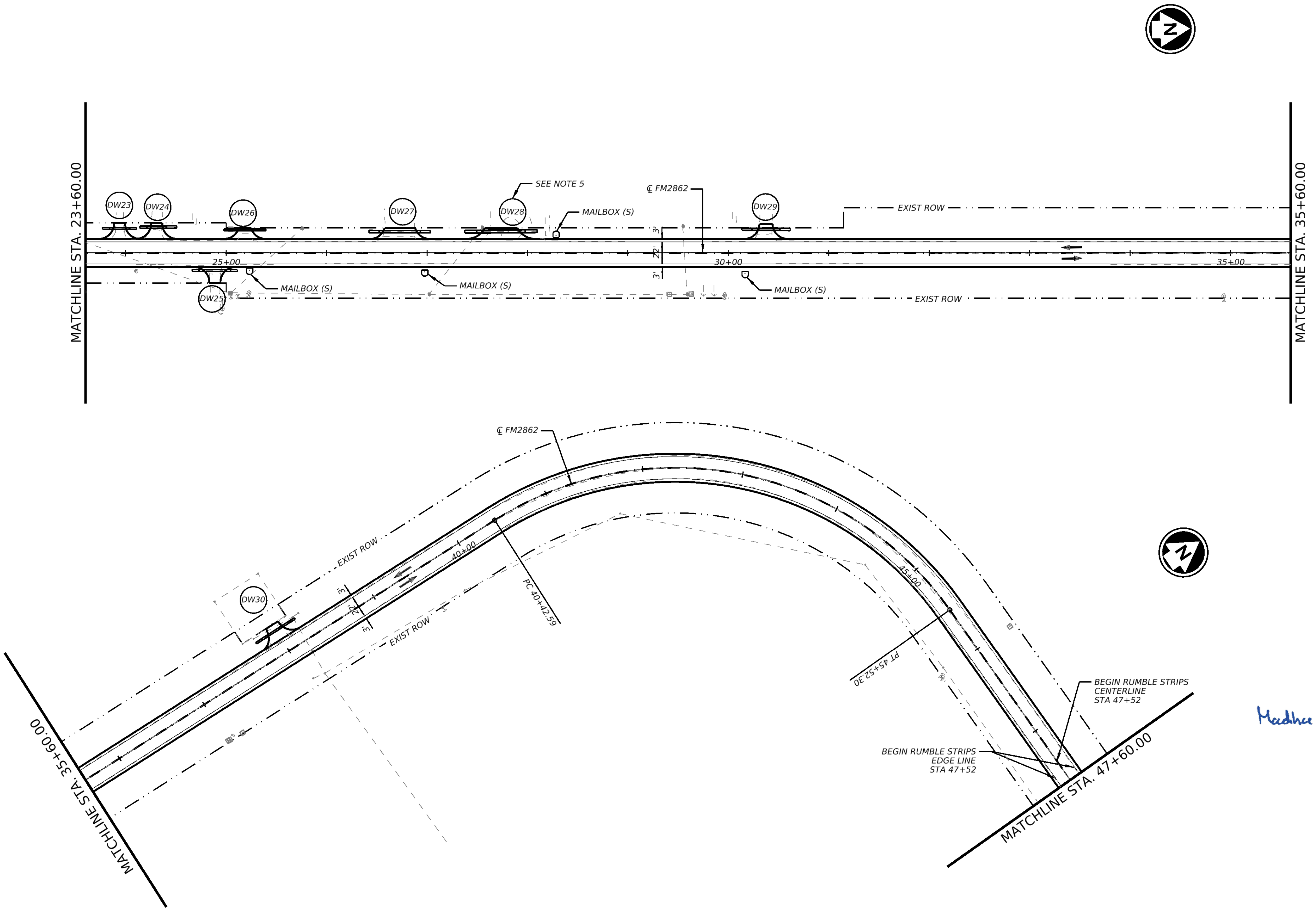

NOTES:
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2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.
5. DW28 CONSISTS OF TWO EXISTING DRIVEWAYS COMBINED IN ONE DRIVEWAY. EXISTING CMP PIPES, TREES, AND SIDEWALK BELONG TO PROPERTY OWNER, AND SHOULD BE RETURNED TO PROPERTY OWNER AFTER REMOVAL.

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
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Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

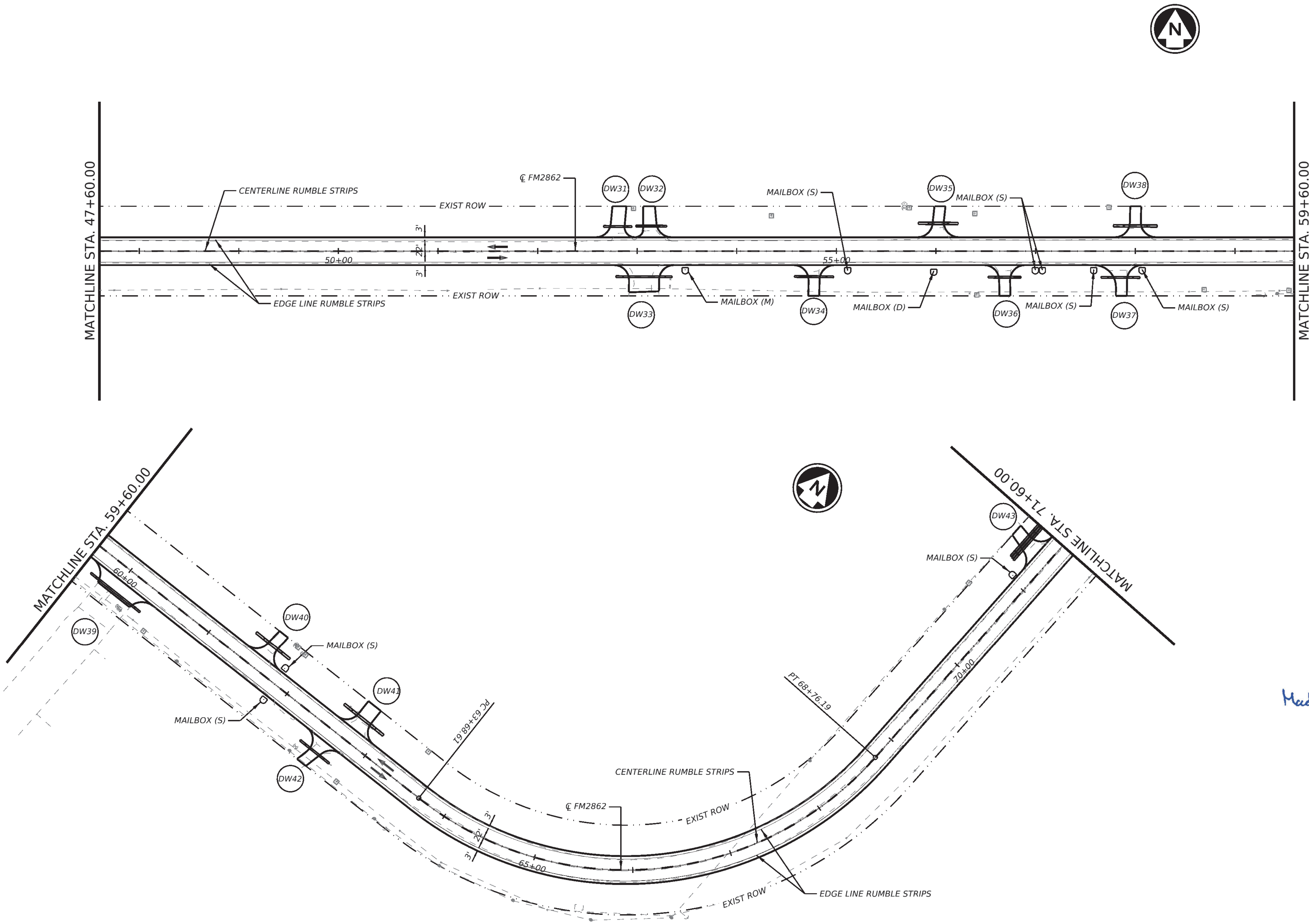
ROADWAY PLAN
STA. 23+60 TO STA. 47+60

SCALE: 1" = 100'   SHEET 2 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862

DIST	COUNTY	SHEET NO.
DAL	COLLIN	60

FILE: c:\pwworking\txdot5\madiha.alshammry\d0747292\FM2862 ROADWAY PLAN SHEET 2.dgn



NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 47+60 TO STA. 71+60

SCALE: 1" = 100'   SHEET 3 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		61

DATE: 3/20/2023 9:17:09 PM
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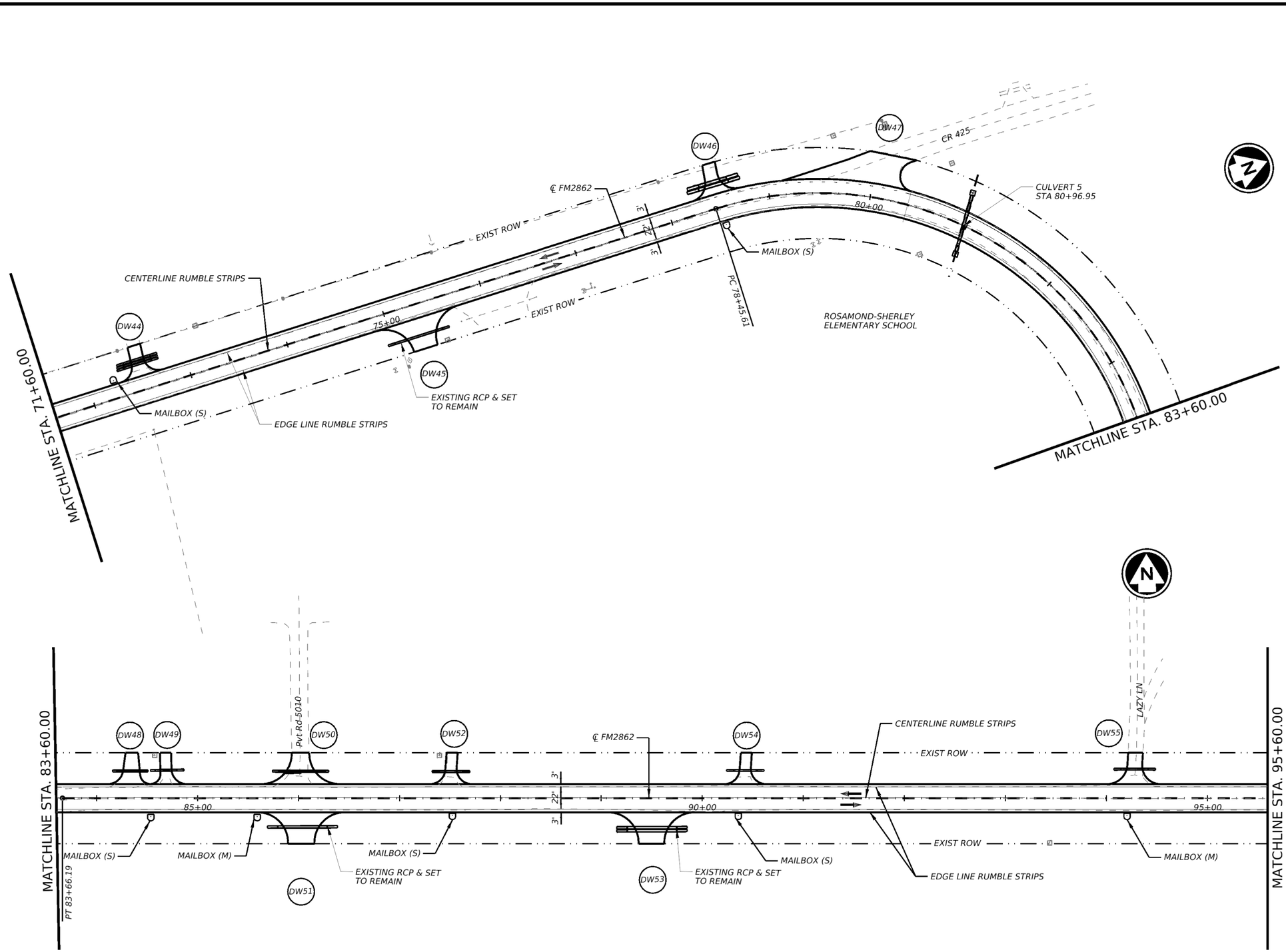

STATE OF TEXAS
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Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 71+60 TO STA. 95+60

SCALE: 1" = 100' SHEET 4 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		62

DATE: 3/23/2023 2:33:08 PM
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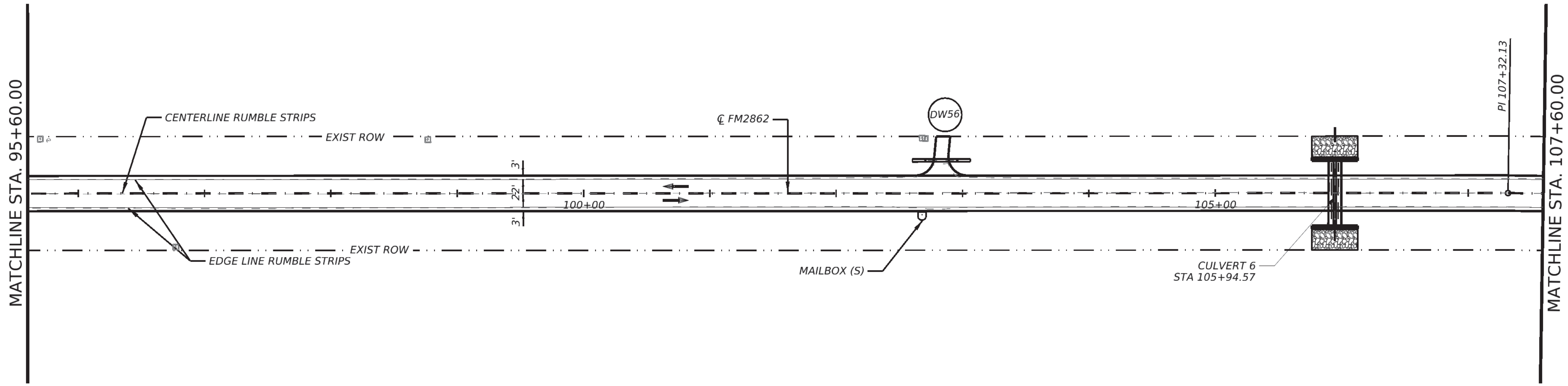

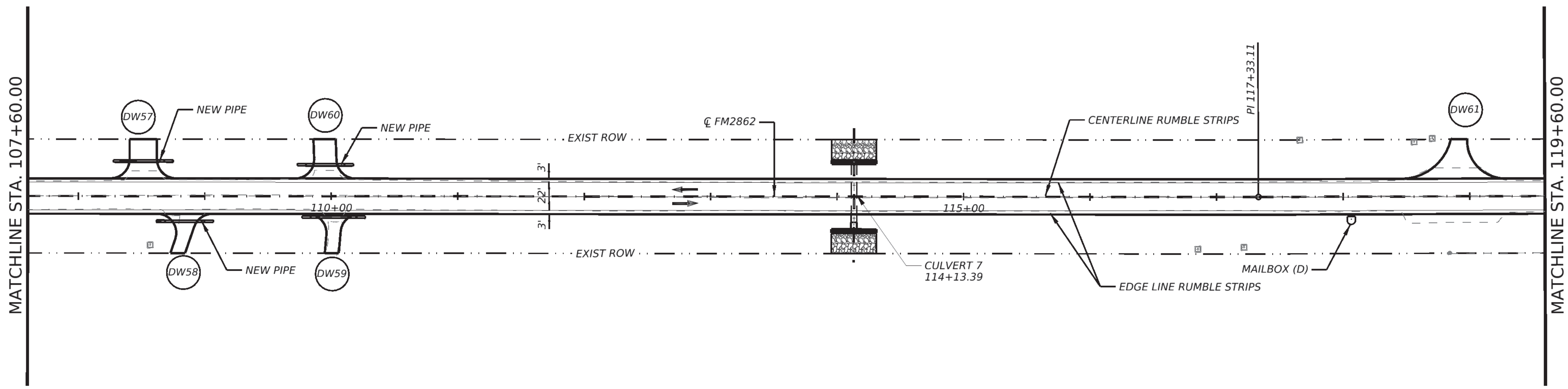

0 50 100
SCALE IN FEET

NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

STATE OF TEXAS
MADIHA ALSHAMMRY
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 95+60 TO STA. 119+60

SCALE: 1" = 100' SHEET 5 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		63

DATE: 3/17/2023 9:17:41 PM
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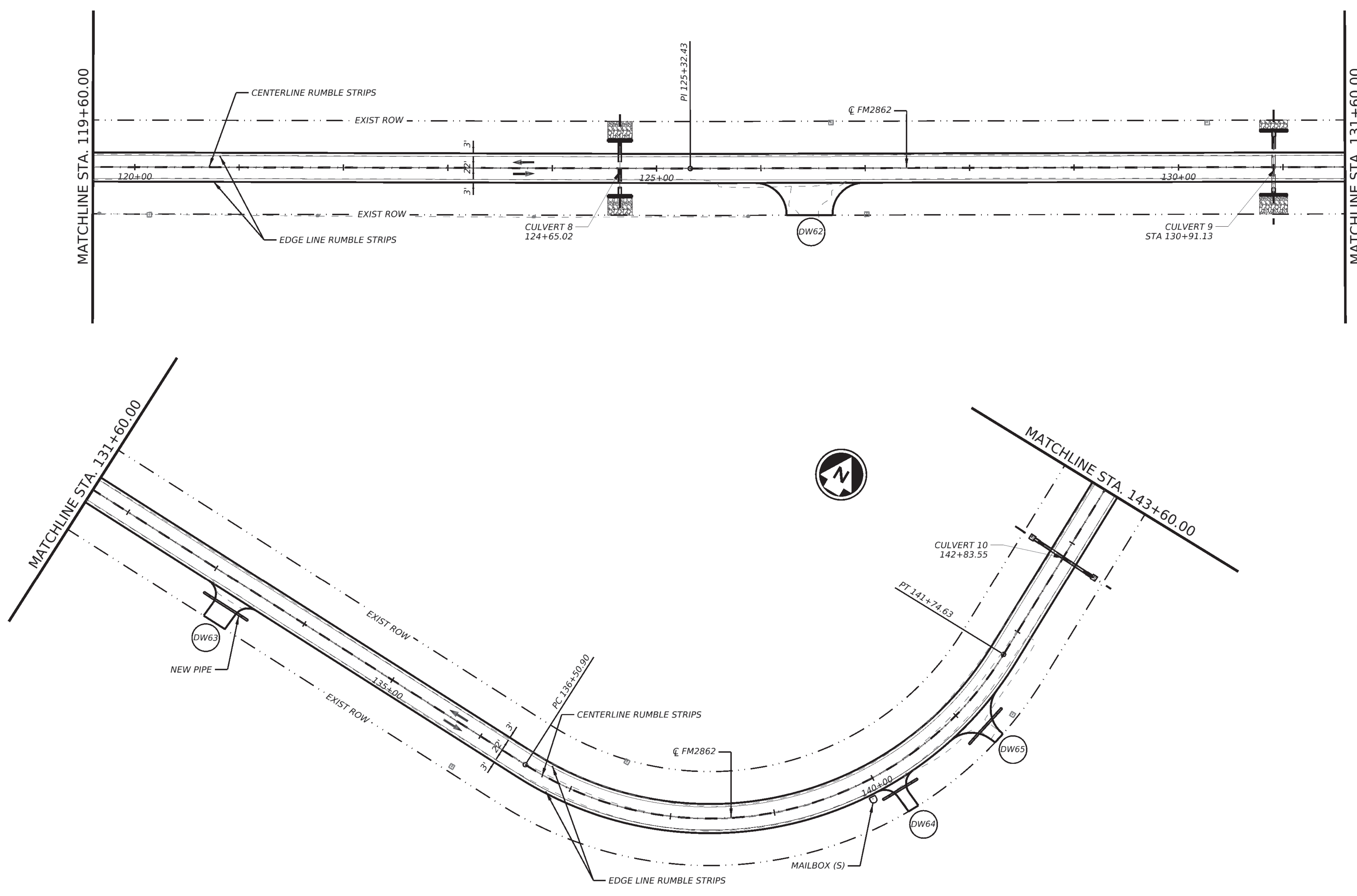
0 50 100
SCALE IN FEET



NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

STATE OF TEXAS
MADIHA ALSHAMMRY
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 119+60 TO STA. 143+60

SCALE: 1" = 100' SHEET 6 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		64

DATE: 3/20/2023 9:17:58 PM
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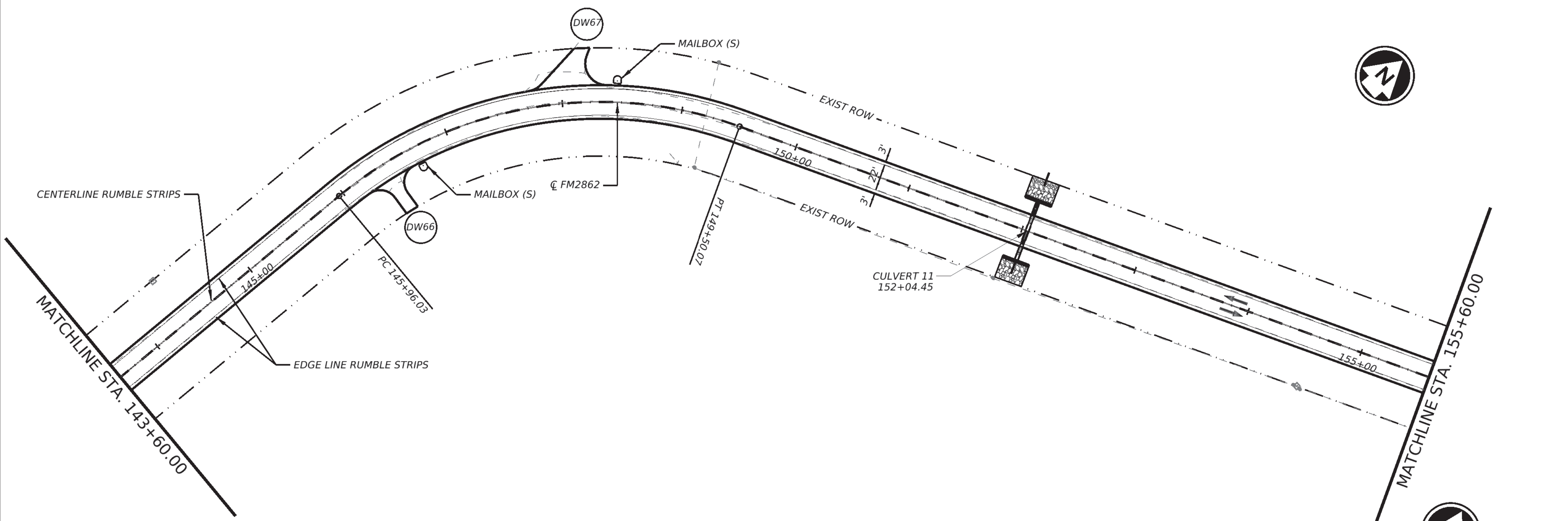
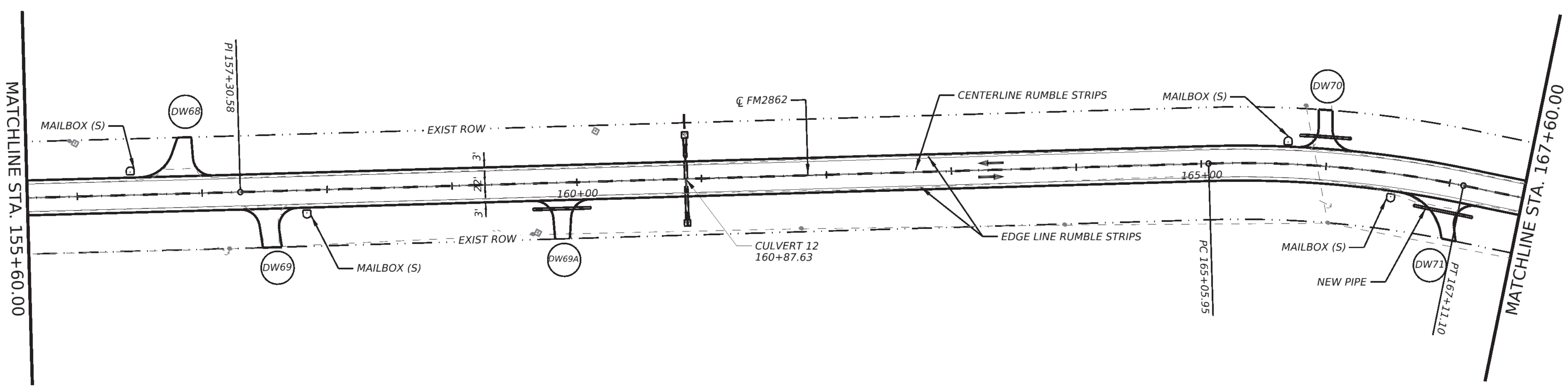
0 50 100
SCALE IN FEET

NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.





STATE OF TEXAS
MADIHA ALSHAMMRY
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Madiha Alshammry, P.E.

3/17/2023

Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 143+60 TO STA. 167+60

SCALE: 1" = 100'
SHEET 7 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	65

DATE: 3/17/2023 9:18:14 PM
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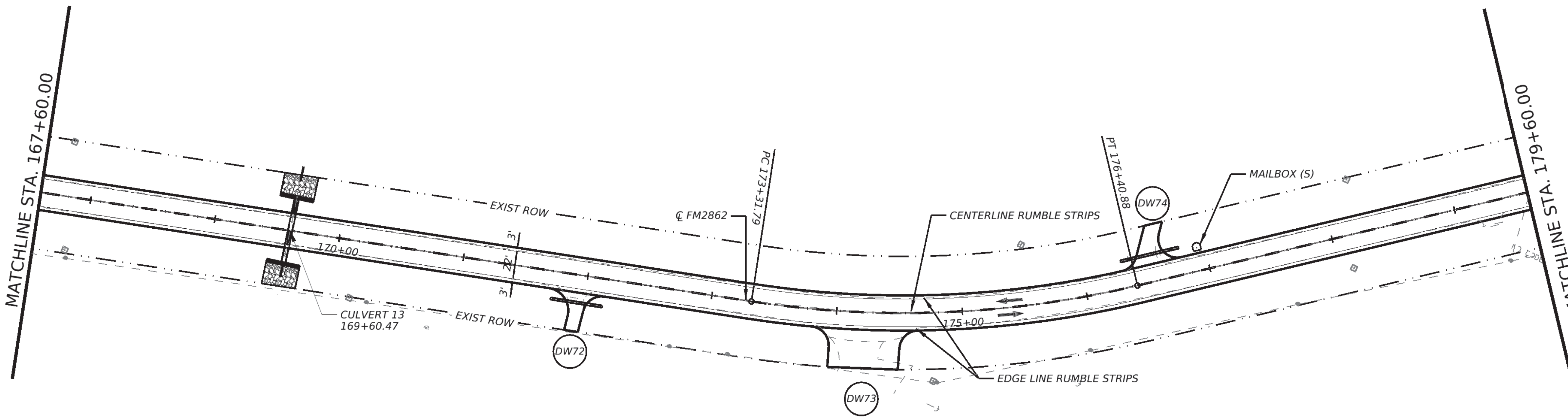

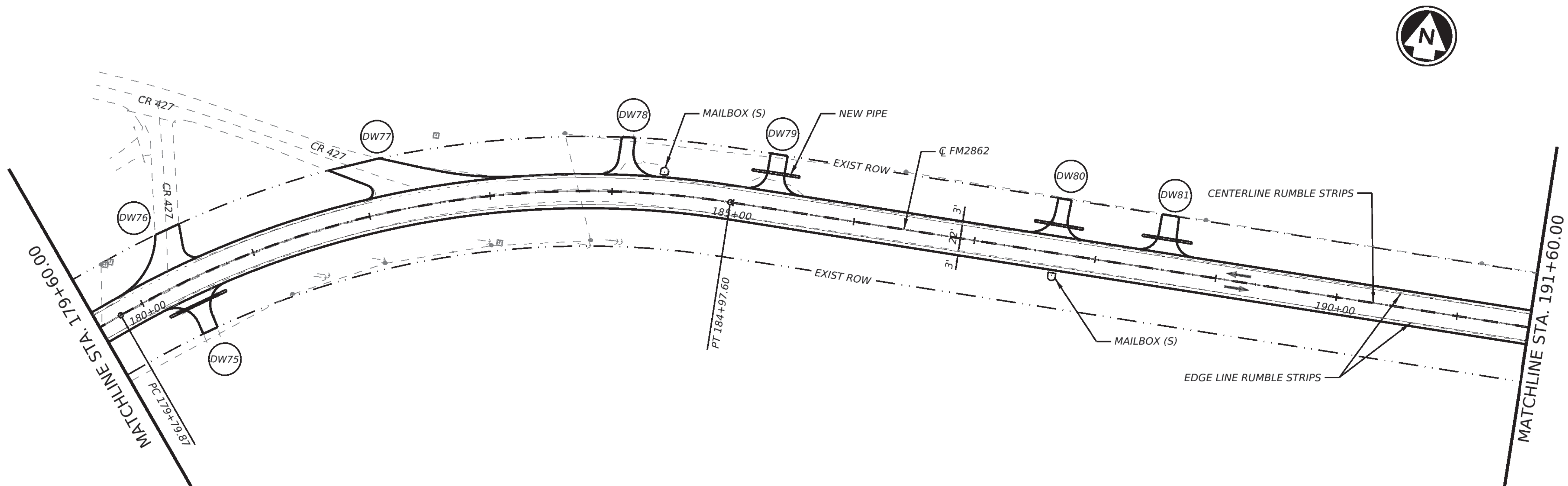

0 50 100
SCALE IN FEET

NOTES:
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2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

STATE OF TEXAS
MADIHA ALSHAMMRY
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 167+60 TO STA. 191+60

SCALE: 1" = 100' SHEET 8 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	66

DATE: 3/17/2023 9:18:30 PM
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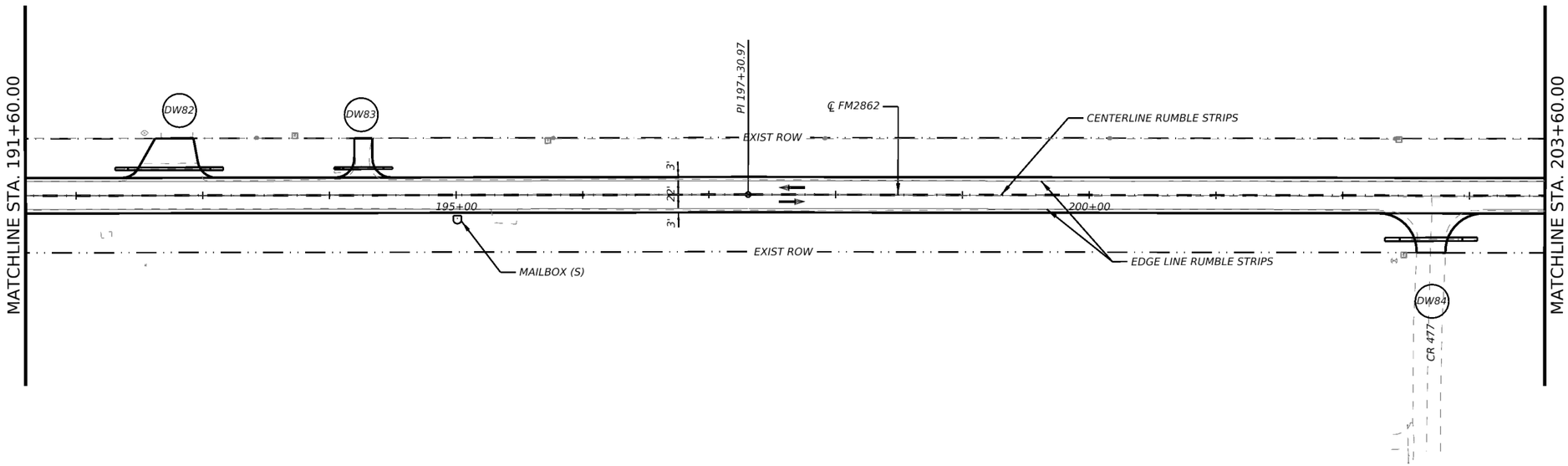

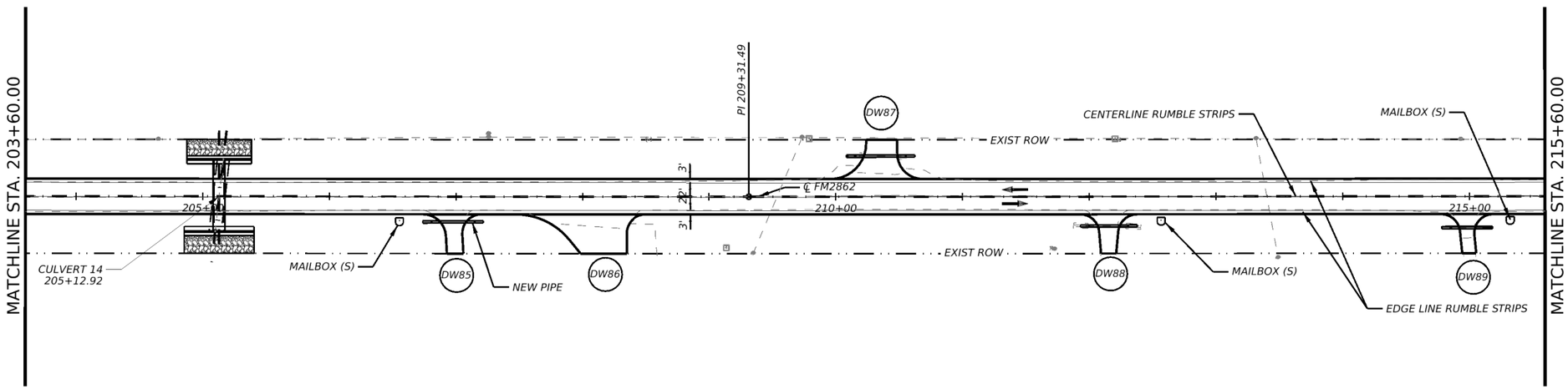

NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

0 50 100
SCALE IN FEET

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
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Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

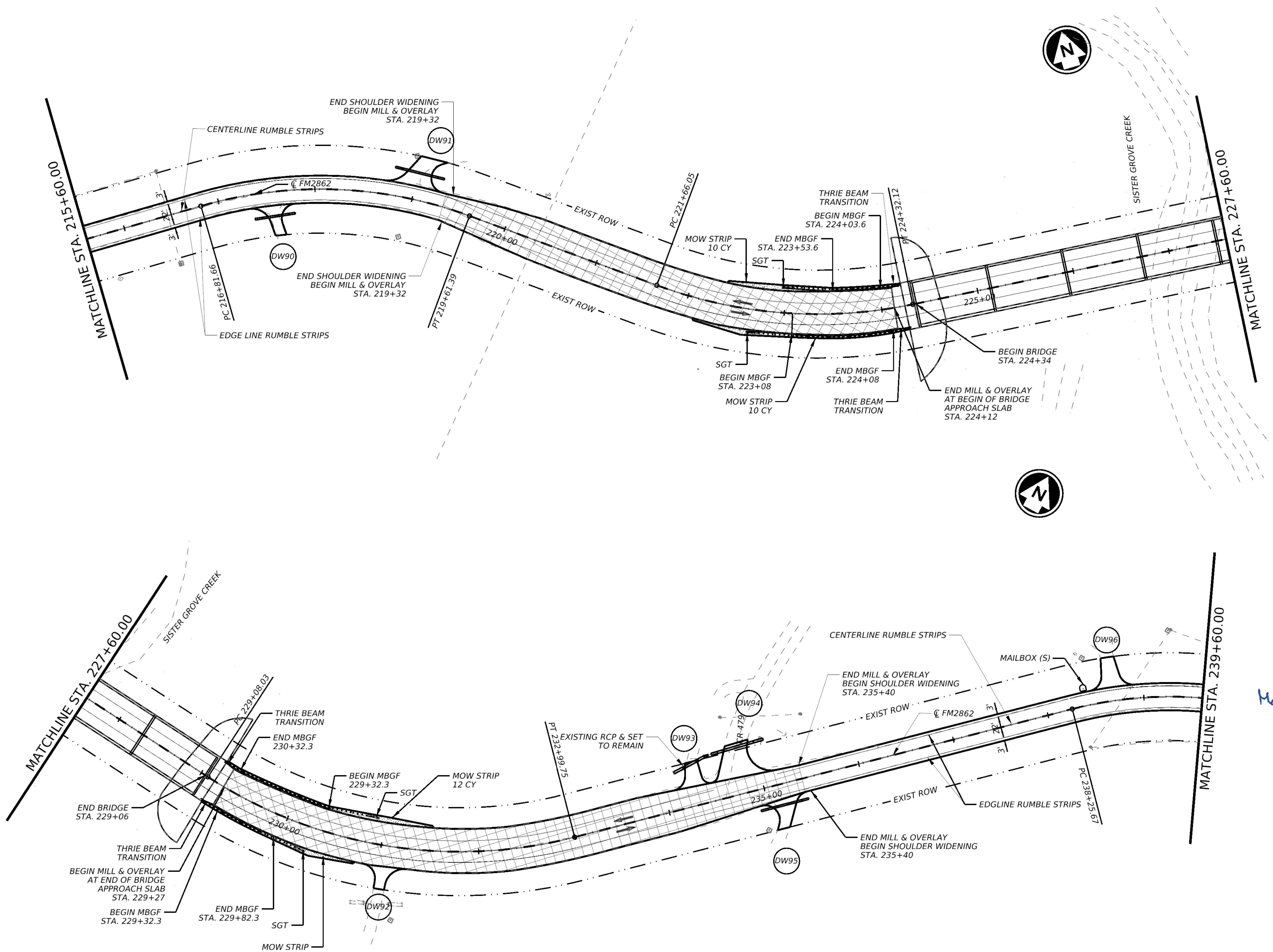
FM 2862

ROADWAY PLAN
STA. 191+60 TO STA. 215+60

SCALE: 1" = 100' SHEET 9 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		67

DATE: 3/23/2023 2:36:08 PM
FILE: c:\projects\0747292\fm2862 roadway plan sheet 9.dgn



0 50 100
SCALE IN FEET

LEGEND:

MILL & OVERLAY AREA

NOTES:
1. SEE "TYPICAL SECTIONS" SHEET FOR ADDITIONAL INFORMATION.
2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

STATE OF TEXAS
MADIHA ALSHAMMARY
142597
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Madiha Alshammary, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

ROADWAY PLAN
STA. 215+60 TO STA. 239+60

SCALE: 1" = 100' SHEET10 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	68

DATE: 3/22/2023 2:38:30 PM
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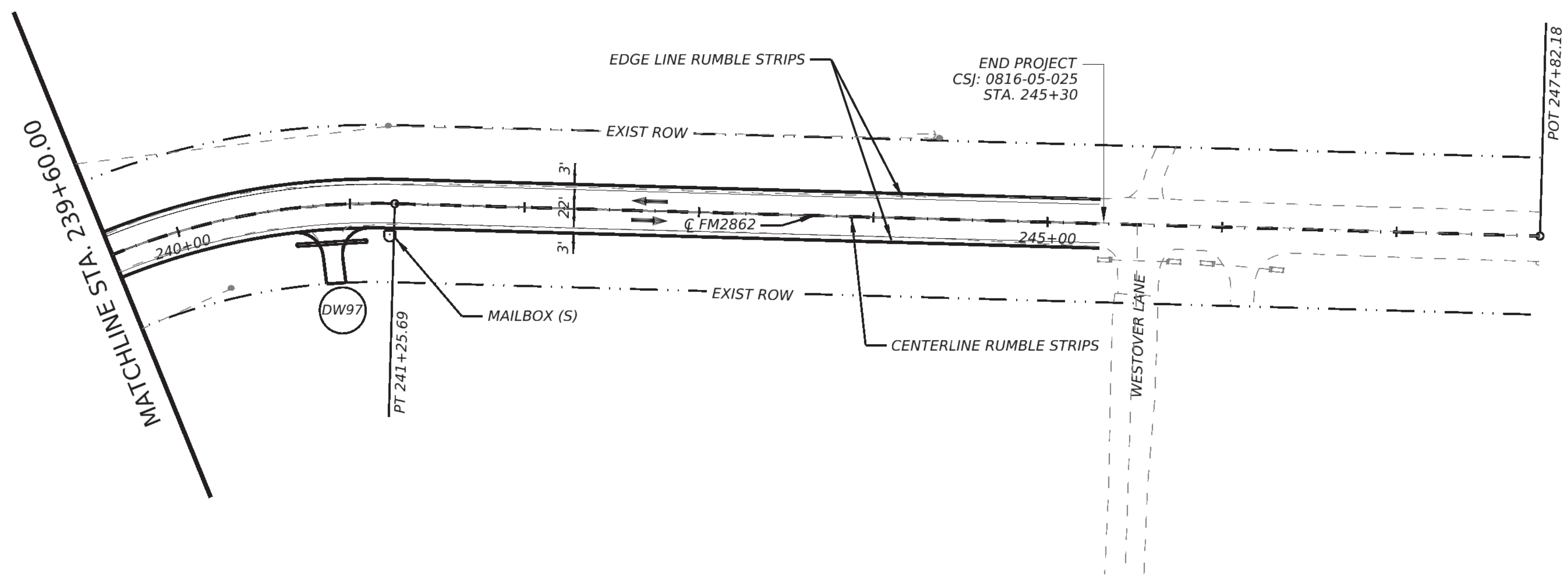

0 50 100
SCALE IN FEET

NOTES:
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2. SEE " HORIZONTAL ALIGNMENT DATA" SHEET FOR ADDITIONAL INFORMATION.
3. SEE "VERTICAL ALIGNMENT DATA & SUPERELEVATION TABLE "SHEETS FOR SUPERELEVATION INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS " SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL DRIVEWAY INFORMATION.

STATE OF TEXAS
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

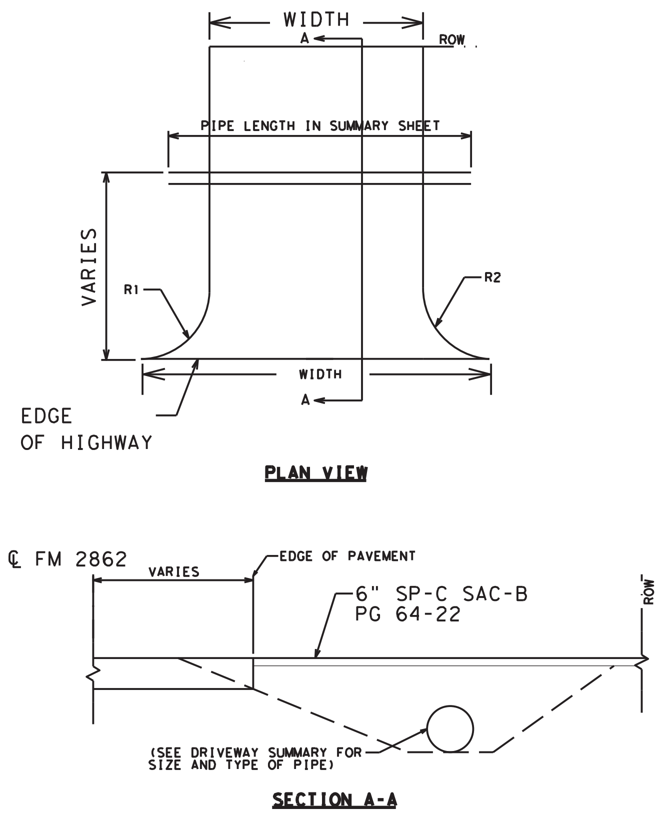
ROADWAY PLAN
STA. 239+60 TO STA 245+30

SCALE: 1" = 100'   SHEET 11 OF 11

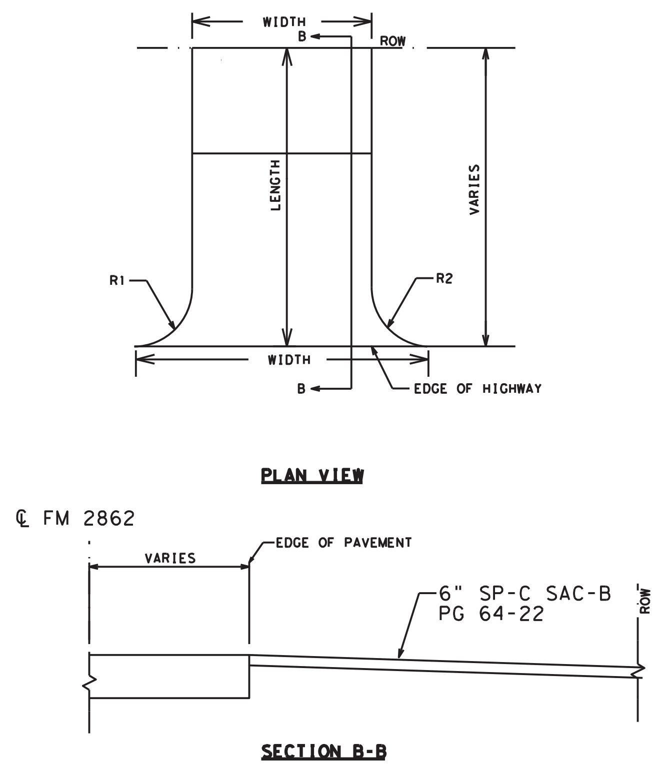
CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		69

DATE: 3/20/2023 9:19:19 PM
FILE: c:\pwworking\txdot5\madiha.alshammry\d0747292\FM2862 ROADWAY PLAN SHEET 11.dgn

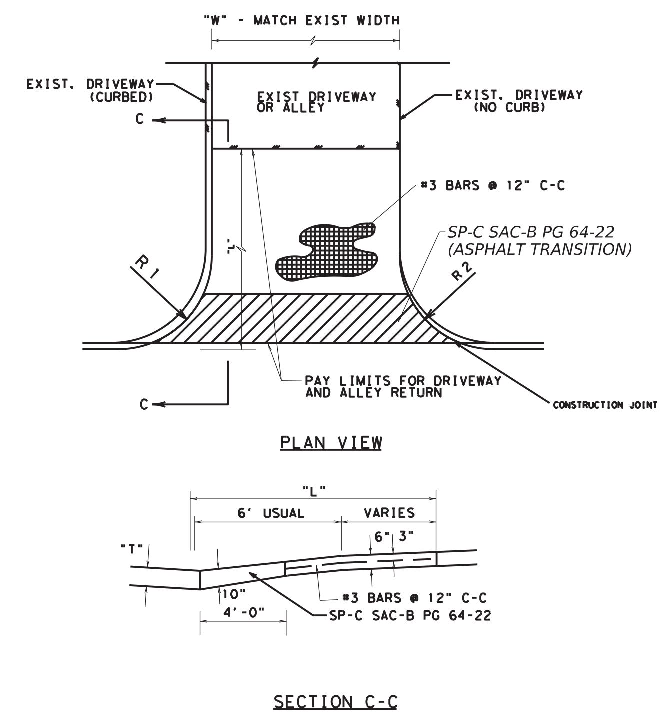
ASPHALT DRIVEWAY OVERLAY DETAILS W/PIPE REPLACEMENT



ASPHALT DRIVEWAY OVERLAY DETAILS WITHOUT PIPE REPLACEMENT



CONCRETE DRIVEWAYS



STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

NOTES:

1) DRIVEWAY LOCATIONS MAY BE SHIFTED AT TIME OF CONSTRUCTION AS DIRECTED BY THE ENGINEER TO MATCH EXISTING CONDITIONS.
2) MATCH EXISTING DRIVEWAY WIDTH WITH A MINIMUM OF 11'.
3) MATCH EXISTING DRIVEWAY RADIUS WITH A MINIMUM OF 15'.
4) SEE "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

Texas Department of Transportation

FM 2862

MISCELLANEOUS ROADWAY DETAILS

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		70

DATE: 3/16/2023 9:19:33 PM
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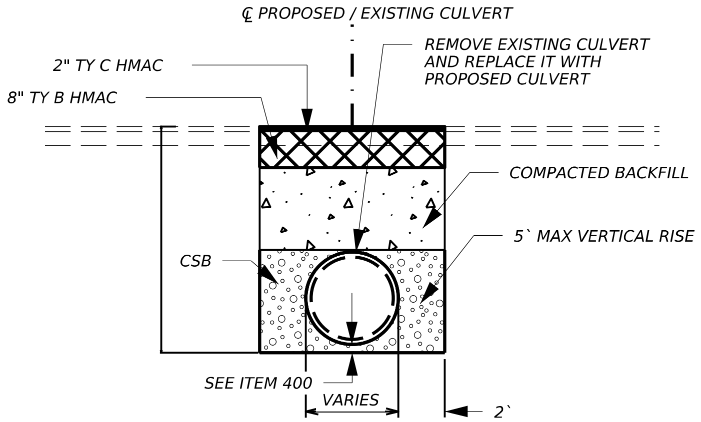
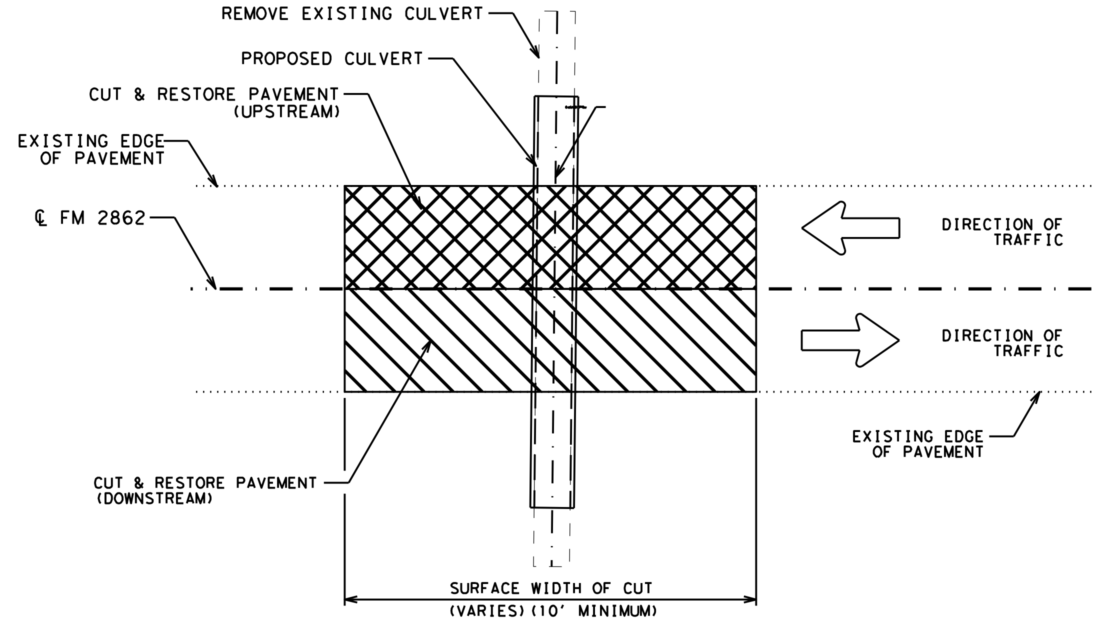


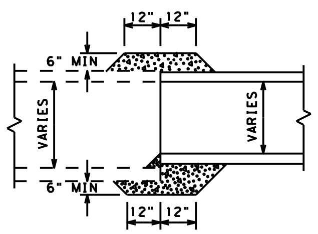
CUT & RESTORE DETAIL

SIDE VIEW



CUT & RESTORE DETAIL

PLAN VIEW

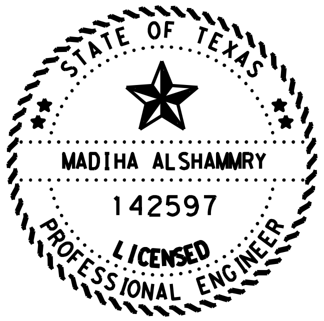


CONCRETE COLLAR FOR PIPE CONNECTION DETAIL

THIS DETAIL IS TO ALSO BE USED ON ALL CONNECTIONS BETWEEN NEW AND EXISTING PIPES.

NOTES:

1. SEE THE TxDOT BARRICADE AND CONSTRUCTION AND TRAFFIC CONTROL PLAN STANDARDS FOR ADDITIONAL INFORMATION.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL INFORMATION.
3. CULVERTS SHALL BE CONSTRUCTED FROM DOWNSTREAM TO UPSTREAM.
4. MAINTAIN POSITIVE DRAINAGE DURING CULVERT CONSTRUCTION.
5. MATCH EXISTING CROSS SLOPES AND ELEVATIONS.
6. PROVIDE DAYTIME ONE-WAY TRAFFIC CONTROL AS NECESSARY FOR PHASED CONSTRUCTION. RE-OPEN FM 2862 TO TWO-WAY TRAFFIC AT THE CONCLUSION OF EACH DAY'S WORK.



Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

MISCELLANOUS ROADWAY DETAILS

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		71

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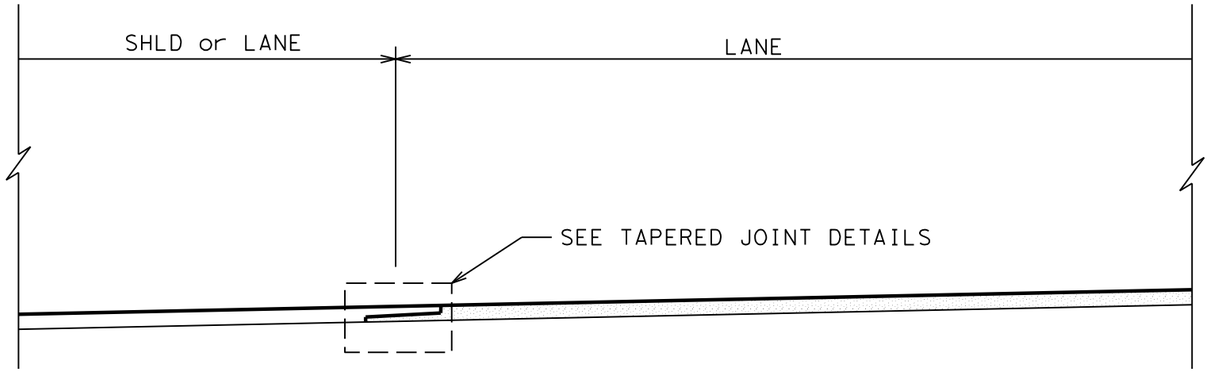
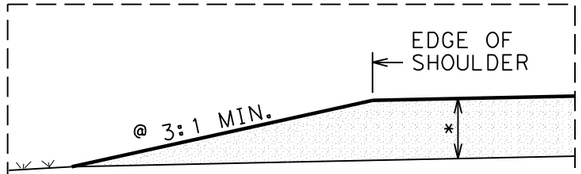
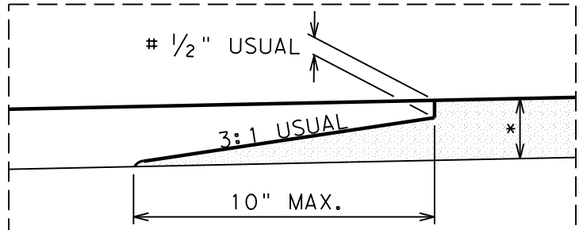
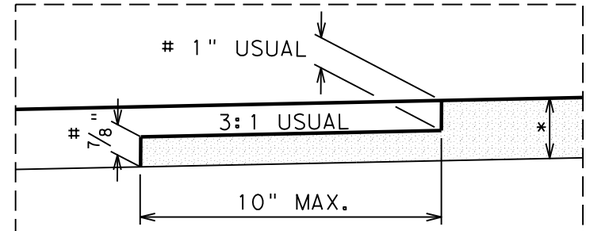




TAPERED OUTSIDE EDGE DETAIL



TAPERED JOINT DETAIL 1.5" TO 4" LIFTS



TAPERED JOINT DETAIL OVER 4" LIFTS

@ IF BACKFILLED SLOPE IS LESS THAN 3:1, COVER WEDGE WITH APPROVED BACKFILL.

* SEE TYPICAL SECTION FOR DEPTH AND TYPE OF HMA.
\# NOTCH DEPTH SHALL NOT BE LESS THAN NOMINAL AGGREGATE SIZE.

NOTES:

1. THE ABOVE DETAILS SHALL BE CONSTRUCTED BY TAPERING THE BITUMINOUS MAT. THE TAPERED PORTION SHALL EXTEND BEYOND THE NORMAL LANE WIDTH AND BE LAID MONOLITHICALLY WITH ADJOINING MAT. THE TAPERED PORTION OF THE MAT SHALL BE CONSTRUCTED BY THE USE OF AN APPROVED STRIKE-OFF DEVICE THAT WILL PROVIDE A UNIFORM SLOPE AND WILL NOT RESTRICT THE MAIN SCREED. CLEAN WEDGE PRIOR TO PLACEMENT OF TACK COAT. TACK COAT SHALL BE APPLIED UNIFORMLY TO THE IN-PLACE TAPER WITH A DISTRIBUTOR BEFORE THE ADJACENT MAT IS PLACED. FINAL DENSITY REQUIREMENTS FOR THE ENTIRE PAVEMENT, INCLUDING THE TAPER AREA, WILL REMAIN UNCHANGED. COMPACTION OF THE INITIAL TAPER SECTION WILL BE REQUIRED AS NEAR TO FINAL DENSITY AS POSSIBLE. ROLL ADJACENT MAT FROM HOT SIDE TO COLD.

2. THE TYPE OF DEVICE TO PRODUCE ABOVE REFERENCED DETAILS SHALL PROVIDE INITIAL COMPACTION EQUIVALENT TO LAYDOWN MACHINE, WITH FINAL DENSITY ADHERING TO NOTE 1, AND BE APPROVED BY THE ENGINEER.

3. HOT MIX MATERIAL AND PLACEMENT SHALL BE PAID FOR UNDER THE PERTINENT ITEM. ANY ADDITIONAL SURFACE PREPARATION, TACK COAT, TACK COAT PLACEMENT, EQUIPMENT, LABOR, TOOLS AND INCIDENTALS TO PRODUCE TAPERED EDGE AND JOINTS AS DESCRIBED ABOVE SHALL BE CONSIDERED SUBSIDIARY TO THE HOT MIX ITEM.

4. THE TAPERED JOINT DETAIL IS NOT INTENDED FOR USE ON 2 WAY 2 LANE ROADBED CENTERLINE WITH LESS THAN 22' OVERALL WIDTH.

5. FULL PAVING OF ALL LANES AND SHOULDRS BY THE END OF EACH DAY PRODUCTION WILL NOT REQUIRE A TAPERED JOINT.

HOT MIX EDGE AND LONGITUDINAL JOINT DETAILS DALLAS DISTRICT STANDARD

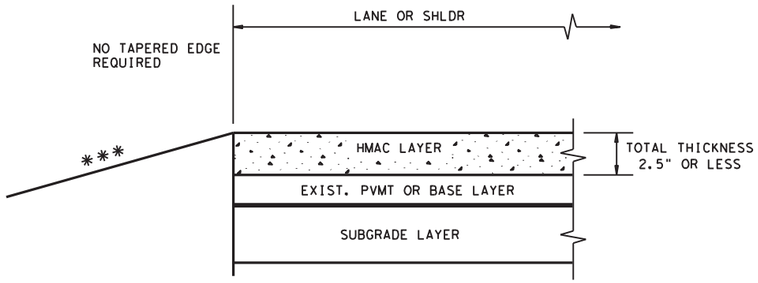
LJD(1-1)-07

FED. RD. DIV. NO.	PROJECT NUMBER		SHEET NUMBER
18	SEE TITLE SHEET		72
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	COLLIN	
CONTROL	SECTION	SECTION	HIGHWAY NUMBER
0816	05	025	FM 2862

REVISED ON 9/10/08

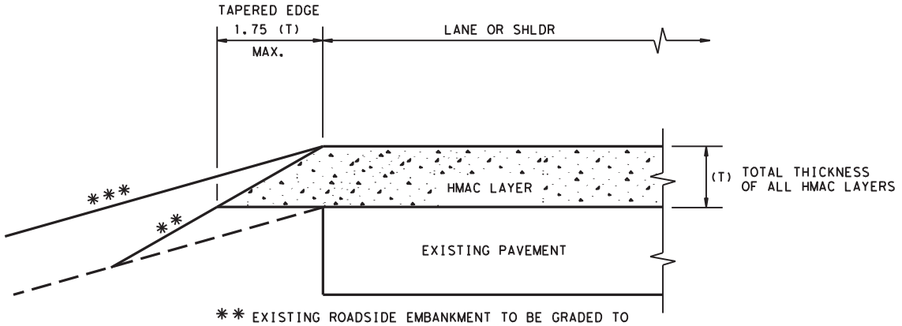
FILENAME: $FILE$

DATE: 3/16/2023
FILE: c:\txdot\pw_online\txdot5\madina.alshamry\d0872525\tehmac11.dgn



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

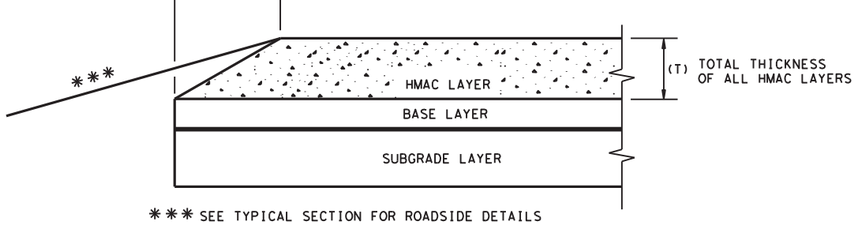
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY WITH THICKNESS OF 2.5" OR LESS



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

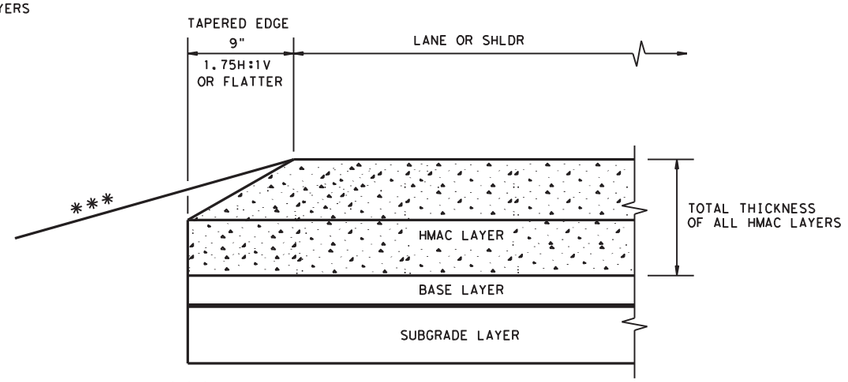
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

Texas Department of Transportation | Design Division Standard

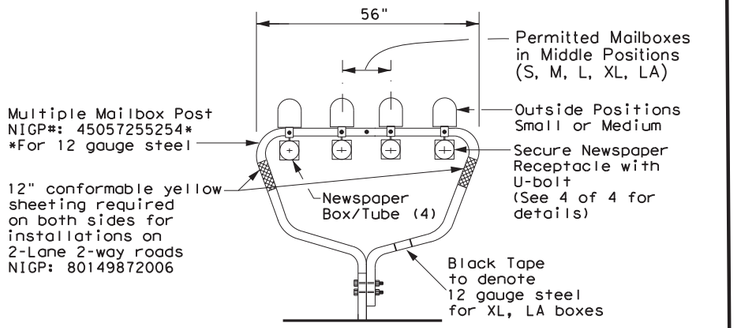
TAPERED EDGE DETAILS
HMAC PAVEMENT

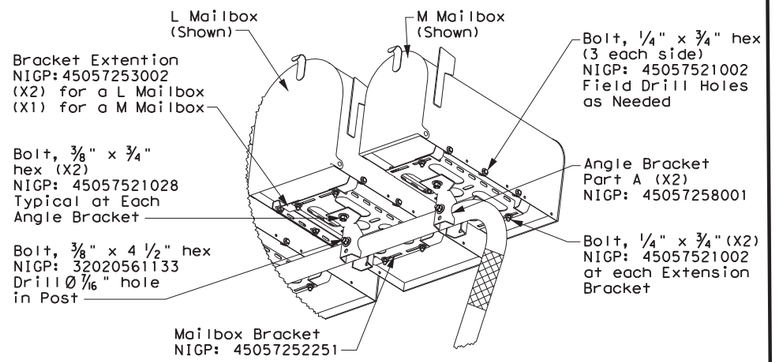
TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:		
©TxDOT January 2011	CONT	SECT	JOB		HIGHWAY	
REVISIONS	0816	05	025		FM 2862	
	DIST	COUNTY			SHEET NO.	
	DAL	COLLIN			73	

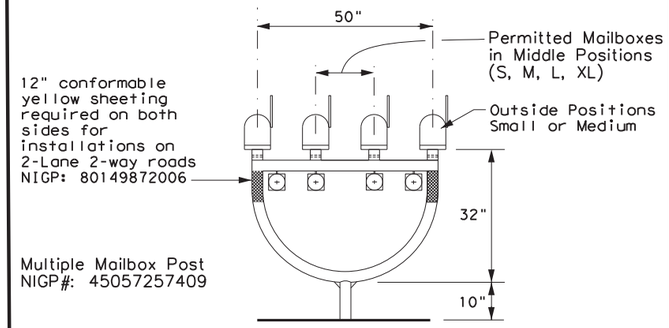
DATE: 3/16/2023 9:20:11 PM
FILE: c:\txdot\pw_online\txdot5\nadiha.alshammry\d0872525\mb-21(1).dgn

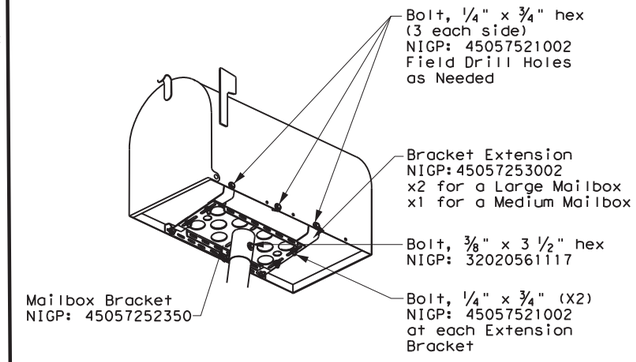
TYPE 1 - MULTIPLE





TYPE 4 - MULTIPLE





MAILBOX SIZES

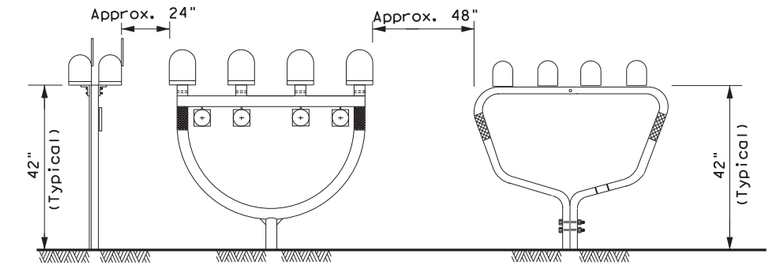
MAILBOX SIZE	TYPICAL DIMENSIONS			MAX **
	LENGTH	WIDTH	HEIGHT	WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

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

GENERAL NOTES:

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

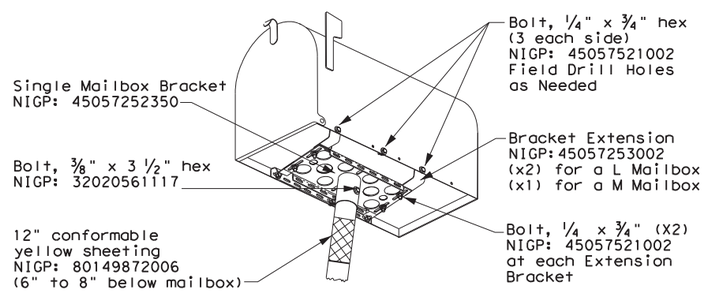
TYPICAL INSTALLATION MEASUREMENTS

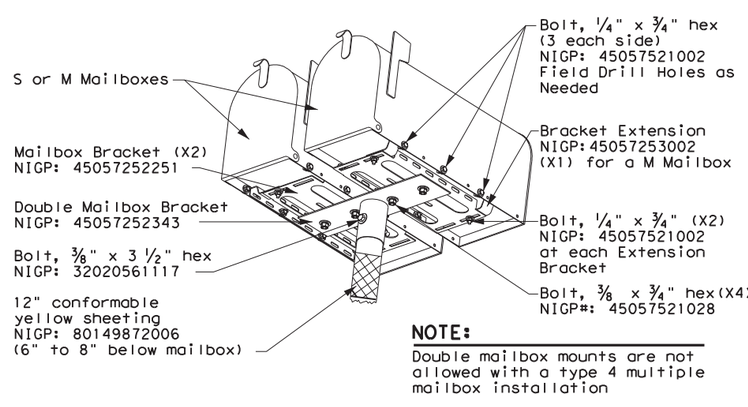


NOTE:

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

TYPE 2 and 4 - SINGLE/DOUBLE

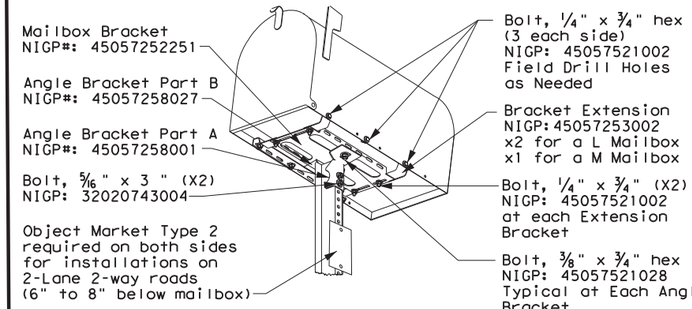


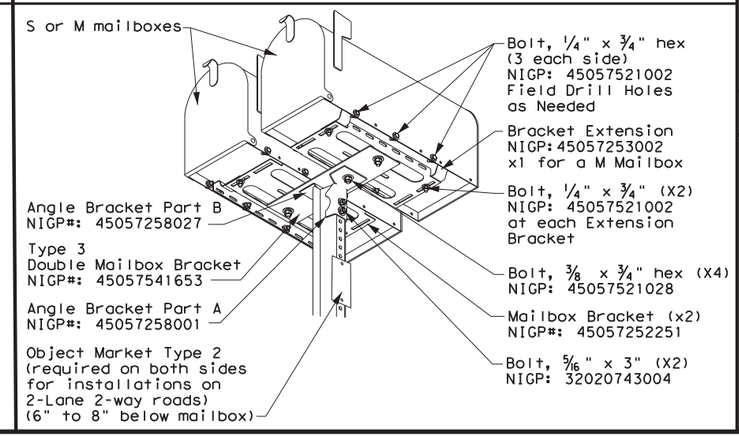


NOTE:

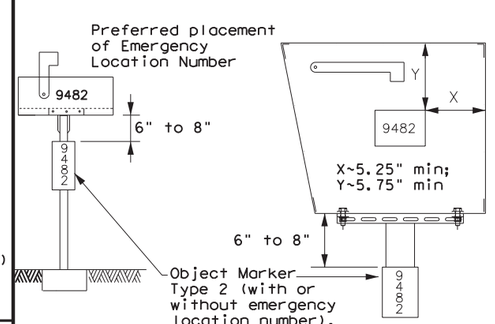
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

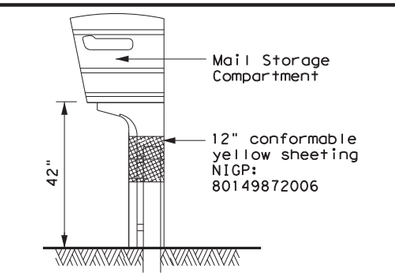


NOTES:

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

SHEET 1 OF 4

TYPE 5



Typical Molded Plastic Mailbox

Texas Department of Transportation — Maintenance Division Standard

MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		74

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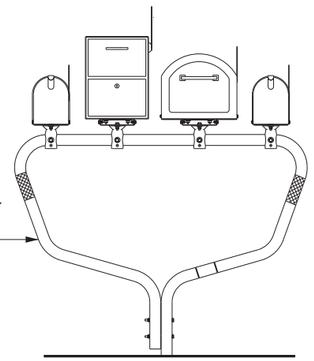
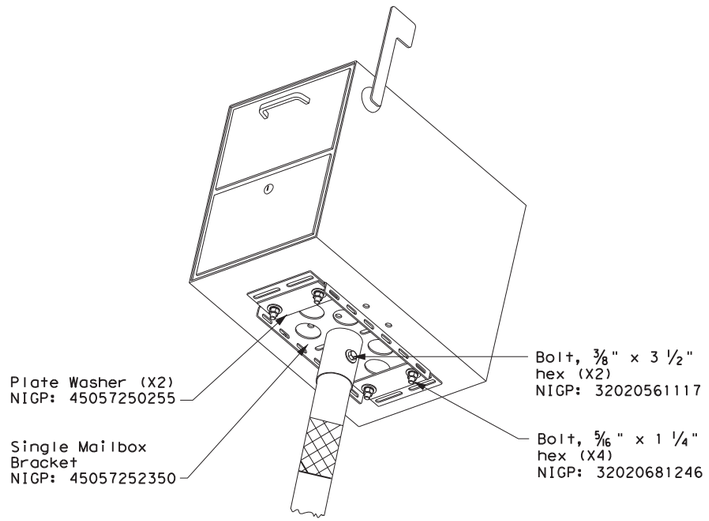
DATE: 3/16/2023 9:20:11 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshammry\d0872525\mb-21(1).dgn

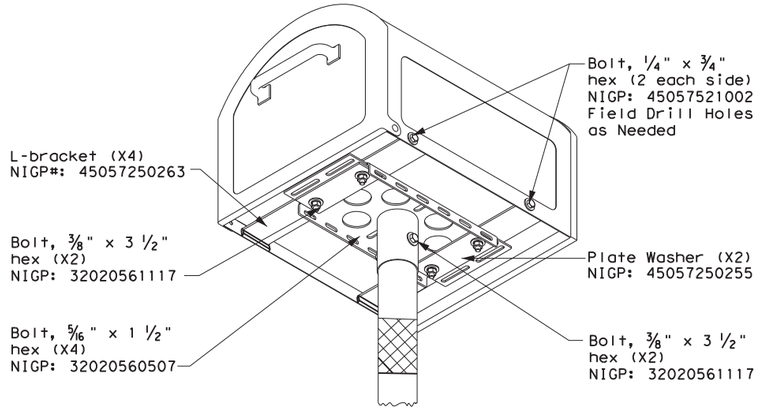
TYPE 1- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX

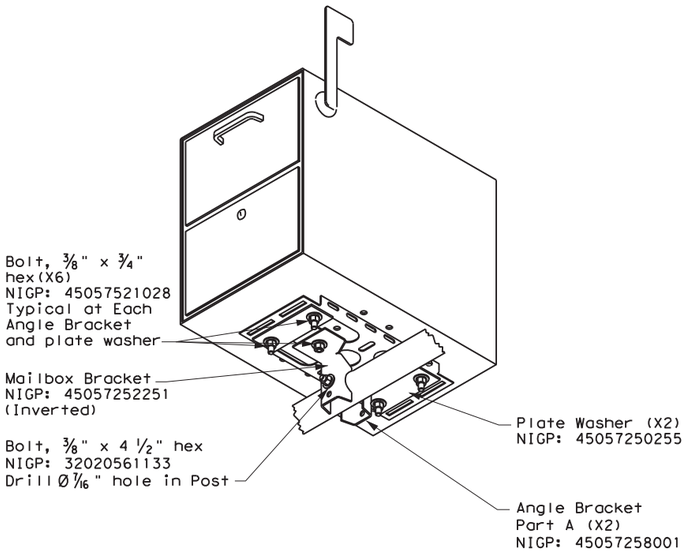


TYPE 2/4 - SINGLE XL MAILBOX

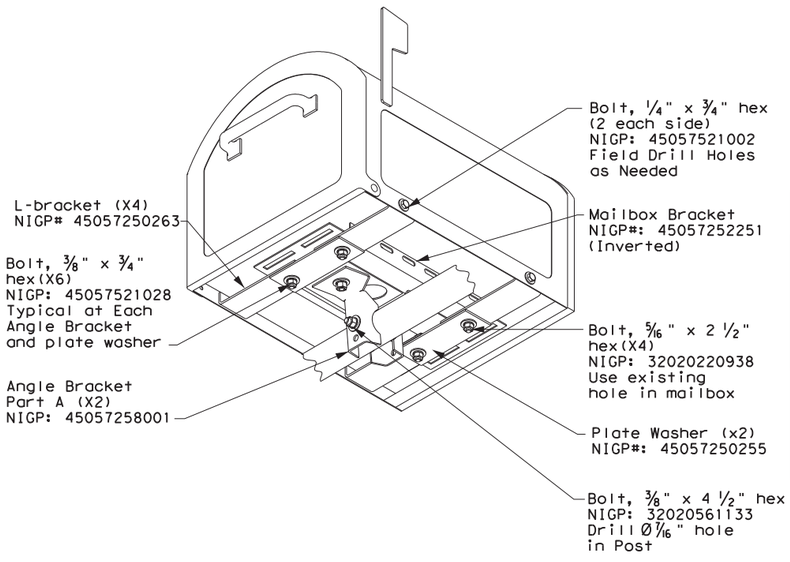


NOTE:
Follow same configuration when mounting an XL mailbox on a Type 4 multi post.

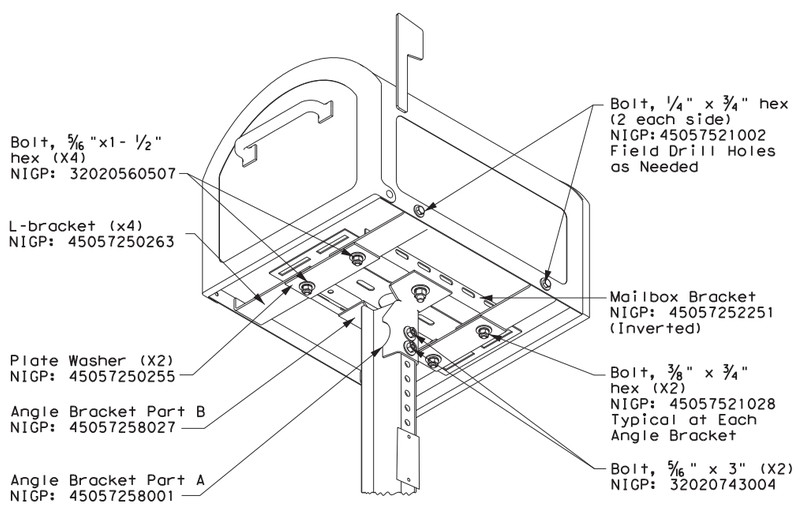
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



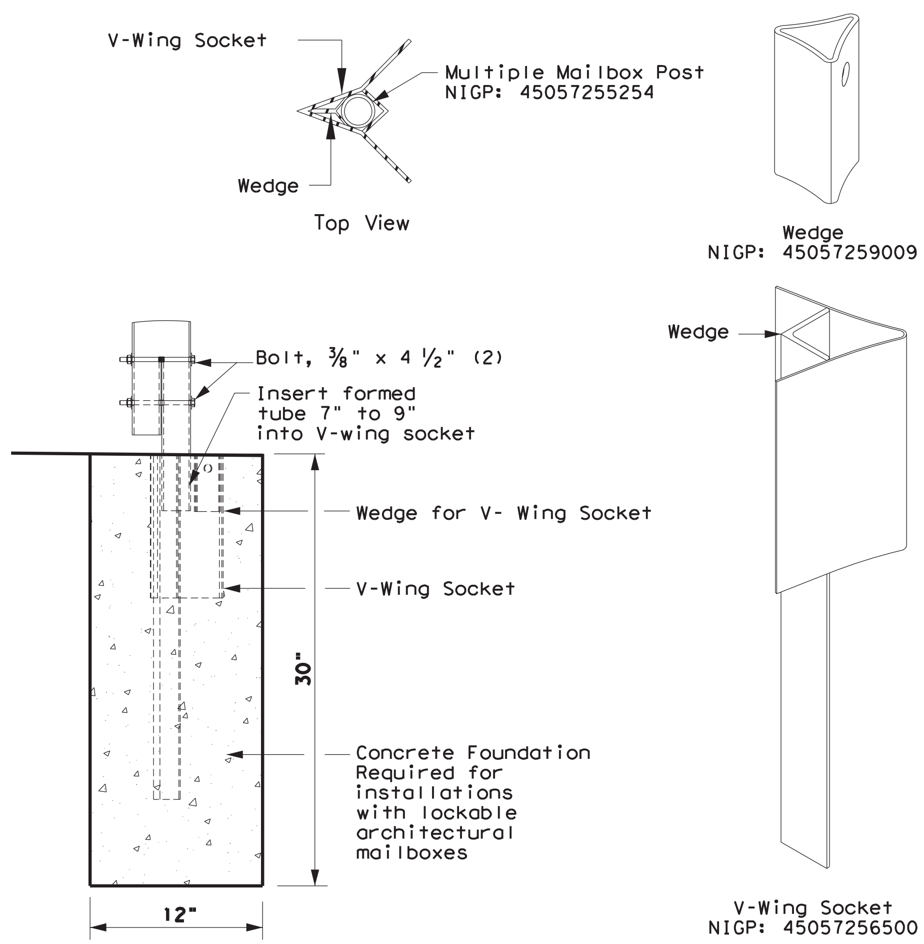
Texas Department of Transportation | Maintenance Division Standard

XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

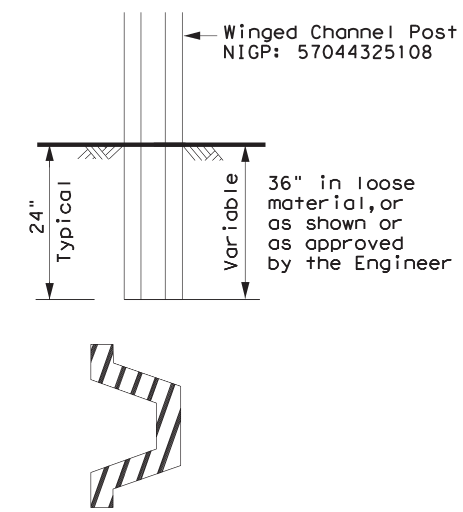
MB(2)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		75

TYPE 1 - SUPPORT/FOUNDATION
Thin Wall Tube w/ V-LOC Anchorage



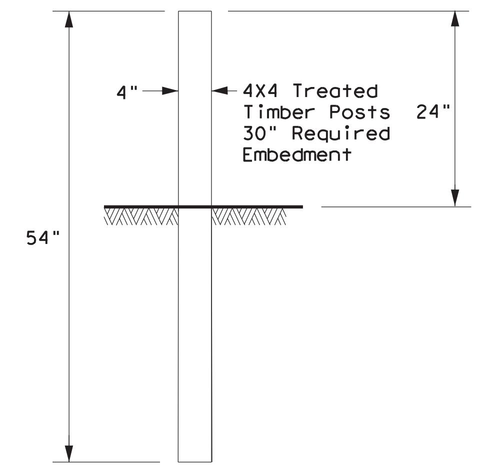
TYPE 3 - SUPPORT/FOUNDATION



NOTES:

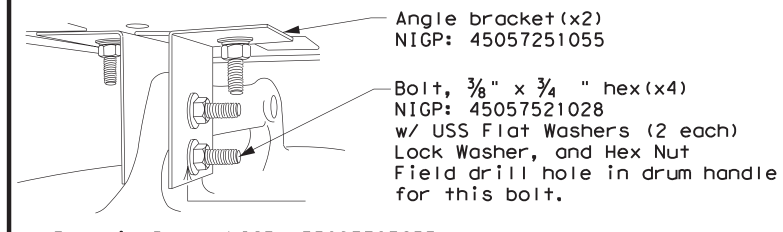
1. Attach Object Marker (OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

TYPE 5 - SUPPORT/FOUNDATION



Molded Plastic Mailboxes shall be installed on 4"x4" treated timber posts only. The use of steel pipe or structural tubing in place of timber post is prohibited.

TYPE 6 - TEMPORARY MAILBOX SUPPORT



Plastic Drum NIGP: 55093383655
Rubber Collar NIGP: 55093387102

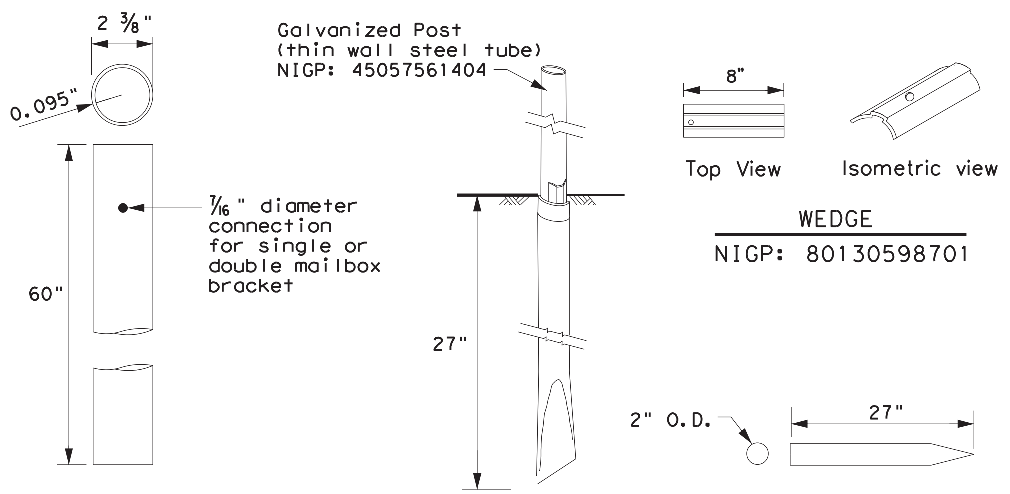
NOTES:

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

GENERAL NOTES:

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

TYPE 2 - SUPPORT/FOUNDATION
Thin Wall Steel Tube w/Wedge Anchor System

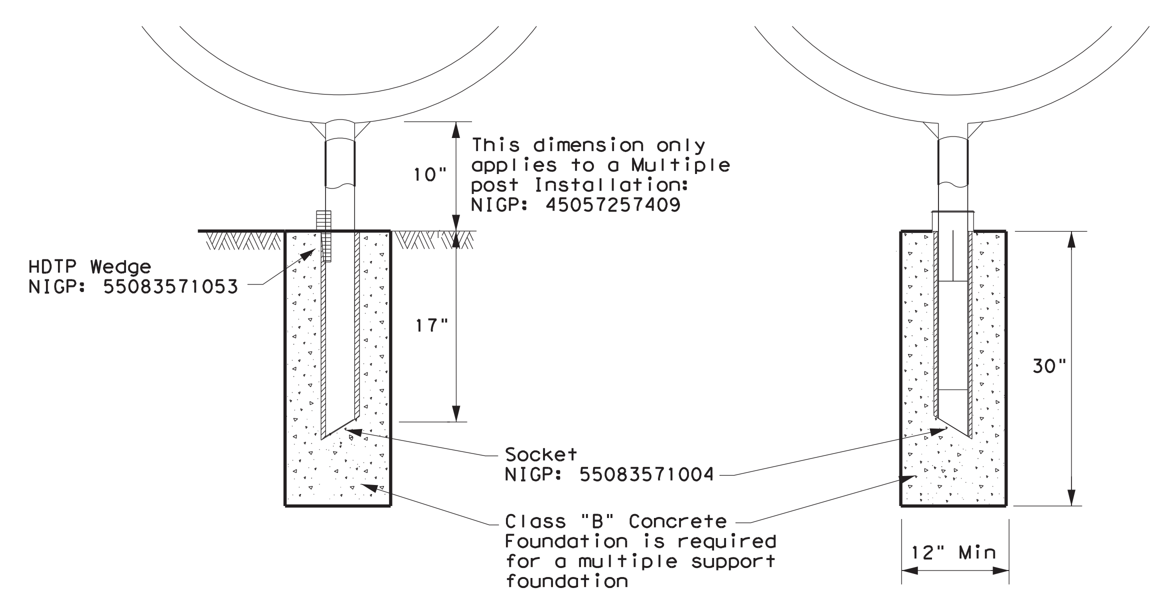


WEDGE
NIGP: 80130598701

MAILBOX POST

WEDGE ANCHOR
NIGP: 80130238407

TYPE 4 - SUPPORT/FOUNDATION
Whitecoated steel post NIGP: 45057561107
Multiple post NIGP: 45057257409
Recycled Rubber post (RR) NIGP: 45057561057



Texas Department of Transportation — Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

FILE: MB-21.dgn	DN:	CK:	DW:	CK:
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015	0816	05	025	FM 2862
6/2005 1/2011	DIST		COUNTY	SHEET NO.
11/2006 7/2014	DAL		COLLIN	76

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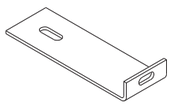
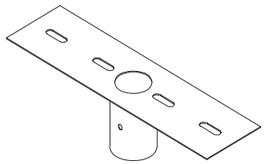
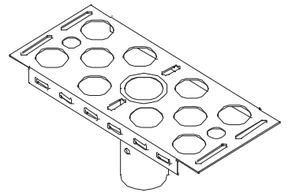
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: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



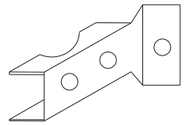
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



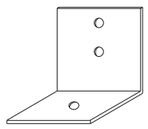
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



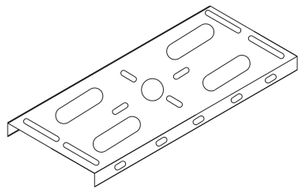
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



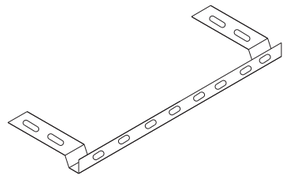
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



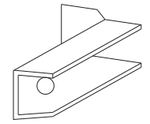
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



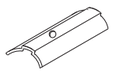
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



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



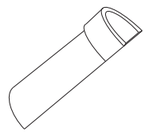
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



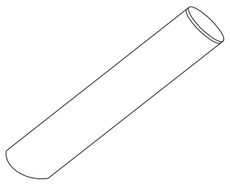
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

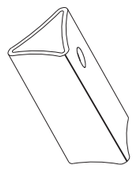


NIGP: 55083571053
Type 4 Mailbox Wedge

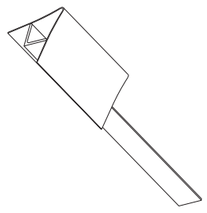


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

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

NOTES:

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

BID CODES FOR CONTRACTS

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

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

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

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

Texas Department of Transportation — Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	DIST	COUNTY		SHEET NO.
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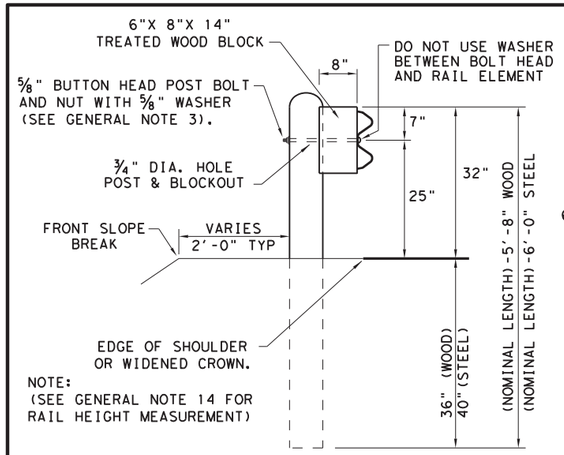
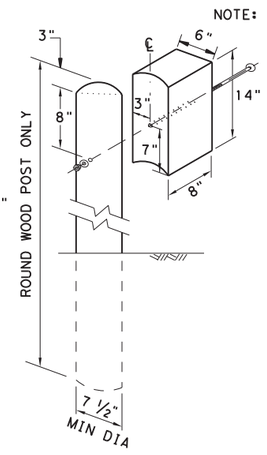
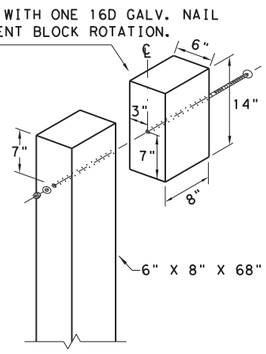


TYPICAL POST PLACEMENT

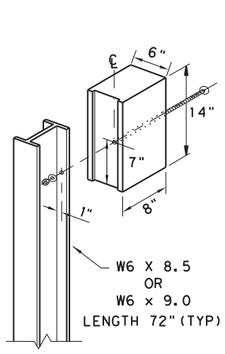


WOOD BLOCK TO ROUND WOOD POST

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

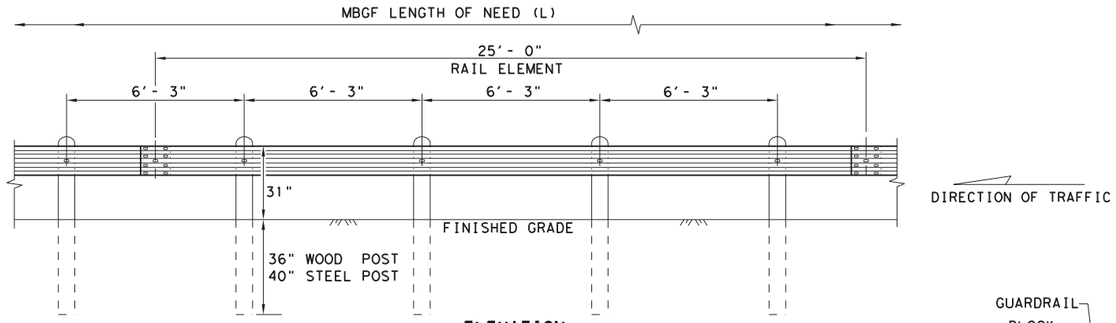


WOOD BLOCK TO RECTANGULAR WOOD POST



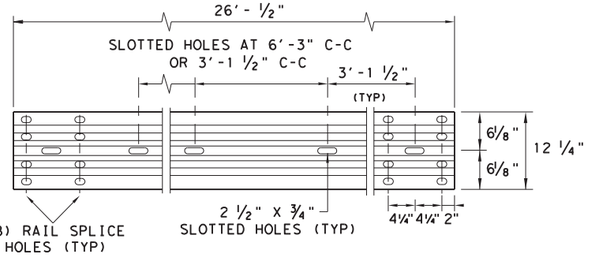
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



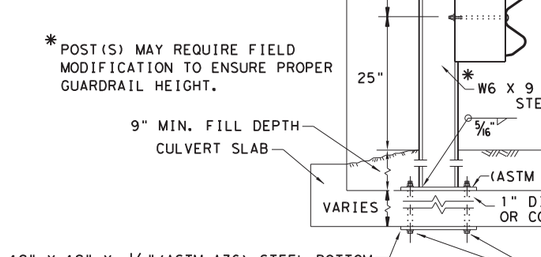
ELEVATION MID-SPAN RAIL SPLICE

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



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

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



* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

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

12" X 12" X 1/4" (ASTM A36) STEEL BOTTOM PLATE WITH 1" DIA. HOLES REQUIRED WITH BOLT-THROUGH INSTALLATION.

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

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

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

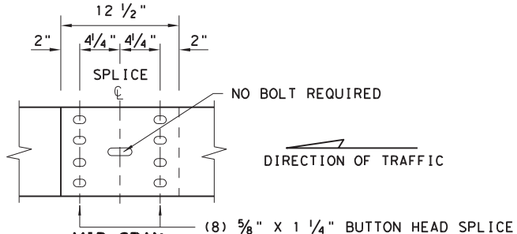
NOTE:
FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECCESSED NUT.

SPLICE BOLT LENGTH — VARIES
FBB01 = 1 1/4"
FBB02 = 2"
5/8"

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

BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
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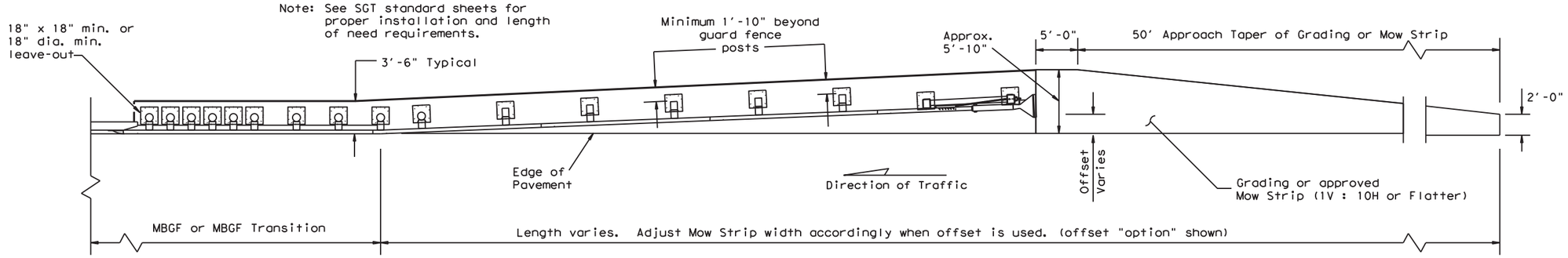
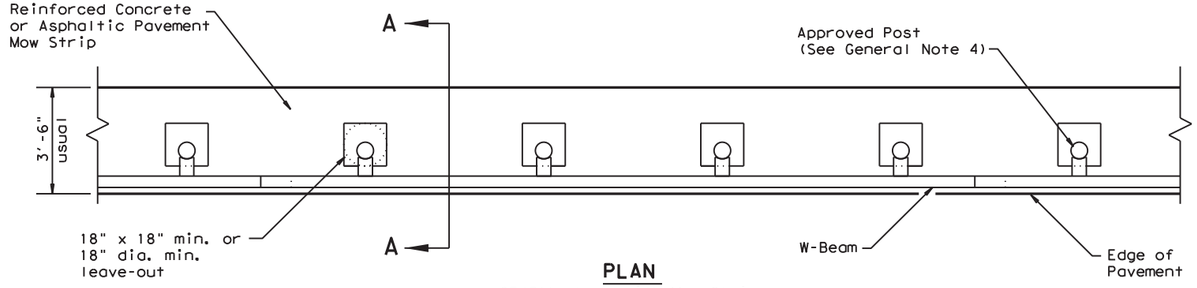
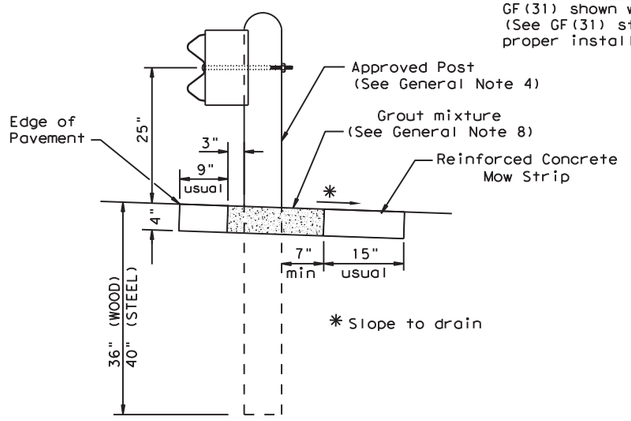


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



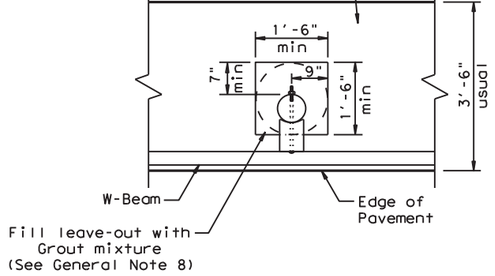
PLAN

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



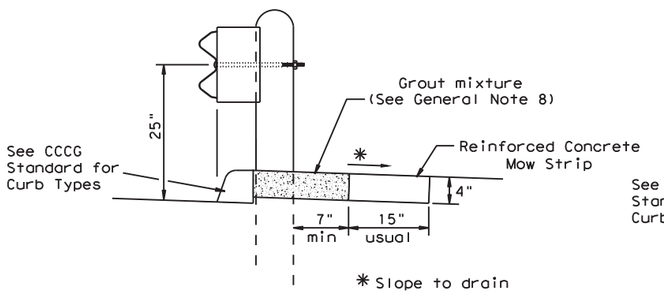
SECTION A-A

Typical



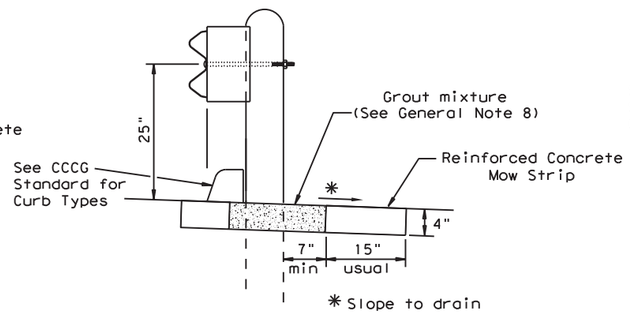
MOW STRIP DETAIL

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



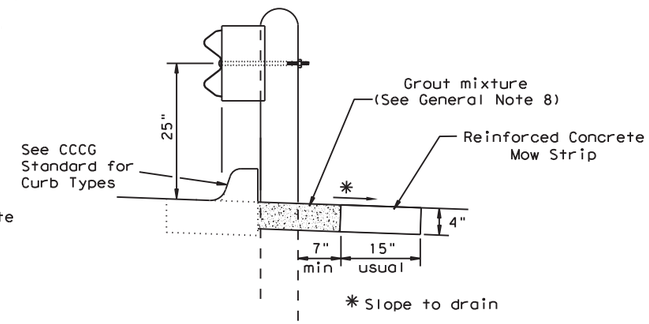
CURB OPTION (1)

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	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		79

DATE: 3/16/2023
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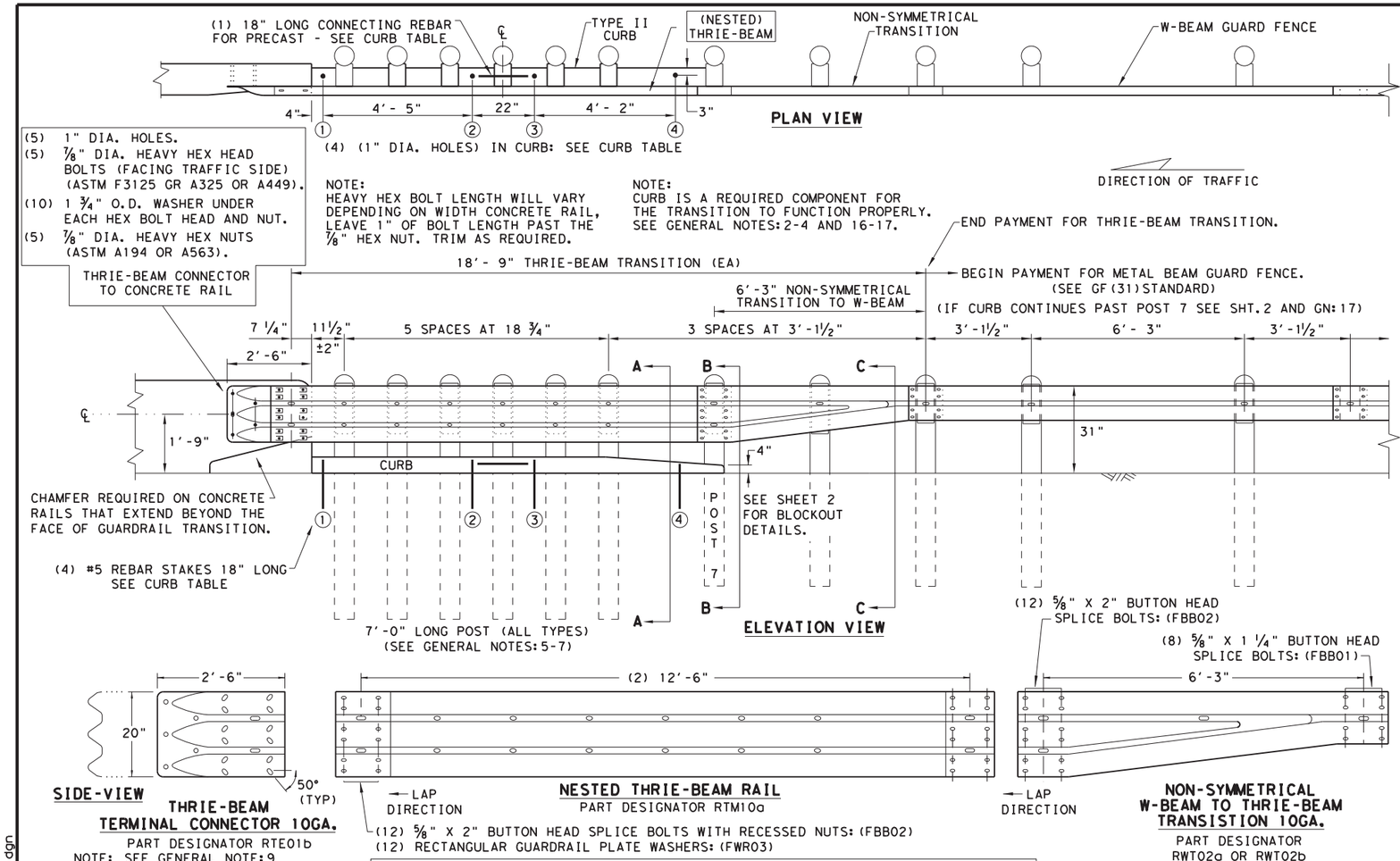


GENERAL NOTES

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

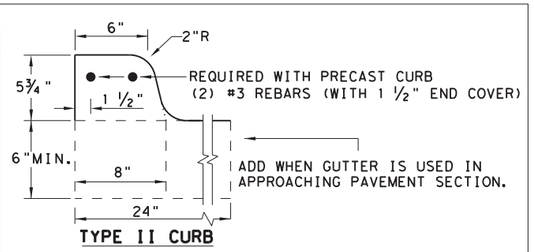
THRIE-BEAM TERMINAL - CURB TABLE

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

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

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

SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *:
FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND 1/2" BELOW TOP OF CURB.
FILL HOLES WITH APPROVED GROUT MIXTURE.



TYPE II CURB

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

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

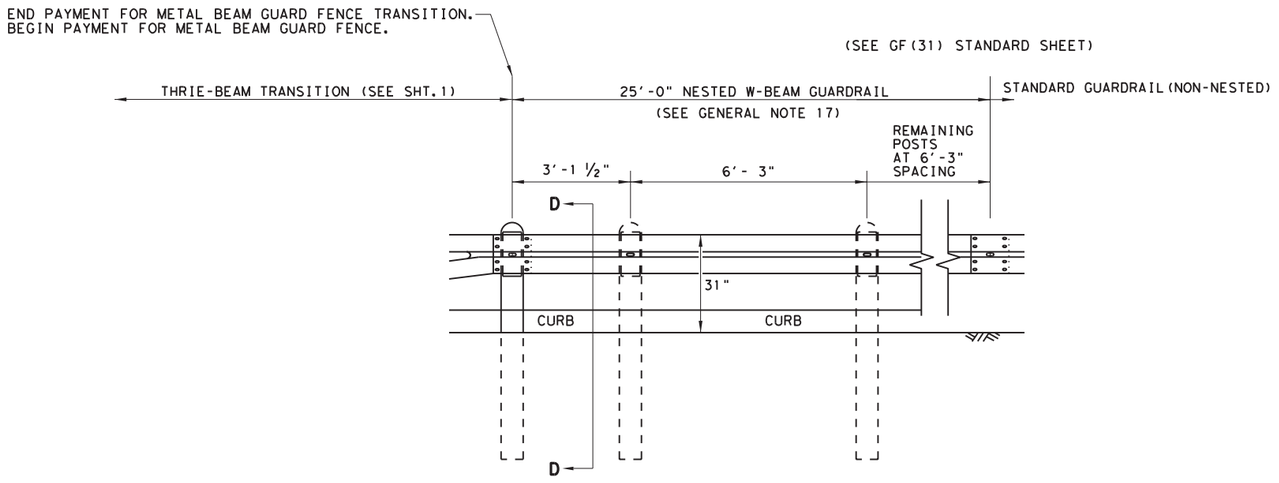
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

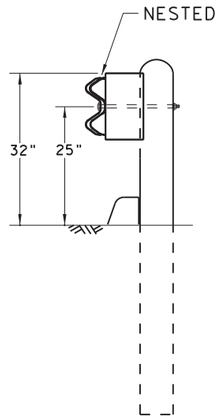
FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		80

DATE: 3/16/2023
FILE: c:\txdot\pw_online\txdot5\madiha.alshammry\d0872525\gf31trt1320.dgn

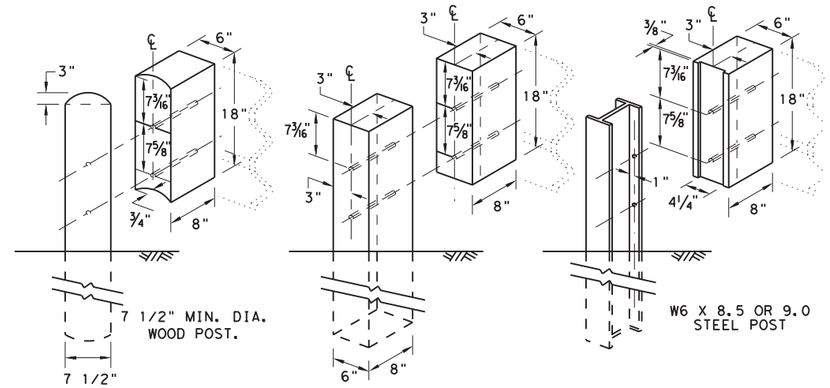
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0816	05	025	FM 2862	
	DIST	COUNTY		SHEET NO.	
	DAL	COLLIN		81	

DATE: 3/16/2023
FILE: c:\txdot\pw_online\txdot5\madiha.alshamry\d0872525\sgt10s3116.dgn

NOTE: STEEL I-BEAM POST W6 X 8.5 (6'-0") PN: 533G
STANDARD WOOD BLOCKOUTS (6"X8"X14") PN: 4076B
AT (POSTS 2 THRU 8)

⅝" X 10" HGR BOLT PN: 3500G
⅝" HGR NUT PN: 3340G

LINE AT THE BACK OF POST #2 THRU #8

FROM THE CENTERLINE OF POST(1) & POST(0)

ANCHOR PADDLE PN: 15204A

ANGLE STRUT PN: 15202G

16"

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(1) POST(0)

DO NOT BOLT ANCHOR RAIL TO - POST (2)

SEE DETAIL 1

BEGIN LENGTH OF NEED

PLAN VIEW

TRAFFIC FLOW

MASH TEST LEVEL 3 (TL-3) LENGTH OF SoftStop TERMINAL (50'-9 ½")

50'-9 ½" STANDARD INSTALLATION LENGTH (MASH TL-3 SoftStop)

BEGIN STANDARD MBGF

END PAYMENT FOR SGT

6¼" 3'-1 ½" 6'-3" 6'-3"

ANCHOR RAIL WITH SLOTS - (THREADED THRU HEAD)
SEE SoftStop MANUAL FOR COMPLETE DETAILS

MIDDLE SLOT CUTOUT (1) 1 ¾" X 6'-10 ¼"

OUTSIDE SLOTS CUTOUT (2) 1½" X 6'-9 ⅝"

MBGF LAPPED IN DIRECTION OF TRAFFIC FLOW

25'-0" DOWNSTREAM W-BEAM GUARDRAIL PN: 61G

SoftStop ANCHOR RAIL (12GA) PN: 15215G

SoftStop FACE SEE GN(3) & NOTE: B

3'-1 ½"(+/-) 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 6'-3" 5'-8" 4'-7"

ANCHOR PADDLE PN: 15204A

END OF ANCHOR RAIL PN: 15215G

SEE NOTE: A

SEE NOTE: C

POST 32" HEIGHT

31"

RAIL HEIGHT

RAIL 25'-0" PN: 61G

RAIL 25'-0" PN: 15215G

DO NOT BOLT ANCHOR RAIL TO POST(2)

SEE DETAIL 2

SEE DETAIL 3

13/16" DIA. YIELDING HOLES

13/16" DIA. YIELDING HOLES

(8) ⅝"x 1- ¼" GR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

(8) ⅝"x 1- ¼" HGR BOLTS PN: 3360G
⅝" HEX NUTS PN: 3340G

POST 40" DEPTH (TYP 1-8)

POST(8) POST(7) POST(6) POST(5) POST(4) POST(3) POST(2) 6'-0" (SYTP) PN: 15000G POST(1) 4'-9 ½" SYTP PN: 15203G POST(0) 6'-5 ⅜" PN: 15205A

6'-1⅜"

ELEVATION VIEW

HARDWARE FOR POST(2) THRU POST(8)
(1) ⅝"x 10" HGR BOLT PN: 3500G
(1) ⅝" HGR HEX NUT PN: 3340G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

NOTE	
NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE: B	PART PN: 5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN: 5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE: C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN: 61G ANCHOR RAIL 25'-0" PN: 15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

GENERAL NOTES

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

PART	QTY	MAIN SYSTEM COMPONENTS
620237B	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE: B

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

4" X 7 ½" X 14" BLOCKOUT COMPOSITE PN: 6777B

6" X 8" X 14" BLOCKOUT WOOD PN: 4076B

NOTE: DO NOT BOLT ANCHOR RAIL TO POST(2)

8" 6" 14"

⅝" HGR NUT PN: 3340G

⅝" X 10" HGR POST BOLT PN: 3500G

13/16" DIAMETER YIELDING HOLES LOCATED IN FLANGES

FINISHED GRADE

(HOLES APROXIMATELY CENTERED AT FINISHED GRADE)

ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

(1) ⅝" x 1 ¾" HEX HD BOLT PN 3391G

ANGLE STRUT PN: 15202G

(2) ⅝" WASHERS PN 4372G

(1) ⅝" HGR HEX NUT PN 3340G

DETAIL 1

SHOWN AT POST(1) NEAR GROUND

(1) ⅝" HEX NUT

(1) ⅝" x 1- ½" HEX HD BOLT-GR-5 PN: 105286

(2) ⅝" ROUND WASHERS PN: 3240G

DETAIL 2

SHOWN AT POST(1)

ANCHOR KEEPER PLATE (24 GA) PN: 15207G

ANCHOR PLATE WASHER ½" THICK PN: 15206G

1" ROUND WASHER F463 PN: 4902G

(2) ⅝" x 2 ½" HEX HD BOLT GR-5 PN: 105285G

ALTERNATE BLOCKOUT SEE GENERAL NOTE: 6

(2) ⅝" ROUND WASHER (WIDE) PN: 3240G

ANCHOR PADDLE PN: 15204A

(2) ⅝" HEX NUT A563 GR.DH PN: 3245G

1" NUT PN: 3908G SHALL BE SECURELY TIGHTENED AFTER FINAL ASSEMBLY, BUT NOT DEFORMING THE KEEPER PLATE.

W-BEAM FLATTENED (4 PLIES)

ANGLE STRUT PN: 15202G

SEE NOTE: A

(2) ¾" x 2 ½" HEX BOLT (TYP) PN: 3717G

(4) ¾" FLAT WASHER (TYP) PN: 3701G

(2) ¾" HEX NUT (TYP) PN: 3704G

6'- 1 ⅜" POST DEPTH

(2) ANCHOR POST ANGLE PN: 15201G

DETAIL 3 AT POST(0)

6'-5 ⅜" (W6 X 15) I-BEAM POST PN: 15205A

TRAFFIC FLOW

W-BEAM RAIL 25'-0"

6" X 8" X 14" BLOCKOUT WOOD

⅝" X 10" HGR POST BOLT PN: 3500G

⅝" HGR NUT PN: 3340G

POST HEIGHT 32"

31" RAIL HEIGHT

40"

LINE POST (3, 4, 5, 6, 7 & 8)

FINISHED GRADE

SECTION VIEW B-B

6'-0" (W6 X 8.5) I-BEAM POST PN: 533G

POST(2)

SECTION VIEW A-A

6'-0" (W6 X 8.5) (SYTP) I-BEAM POST PN: 15000G

NOTE: DO NOT BOLT ANCHOR RAIL PANEL TO POST(2)

POST 17"- ½" HEIGHT

4'- 9 ½"

13/16" DIA. YIELDING HOLES

40"

POST(1)

FRONT VIEW POST(1)

4'-9 ½" (W6 X 8.5) (SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

APPROX 5'-10"

5'-0"

50' APPROACH GRADING

2'-0"

STANDARD MBGF

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX. RAIL OFFSET

APPROACH GRADING (1V:10H OR FLATTER) SEE PRODUCT ASSEMBLY MANUAL FOR ADDITIONAL GUIDANCE.

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		82

DATE: 3/16/2023
FILE: c:\txdot\pw_online\txdot5\madiha.alshamry\d0872525\sgt11s3118.dgn

(SEE GN NOTE 15)
STANDARD 31" MBGF

ITEM (6)
INNER SIDE SLIDER
(ISS) PANEL FOR RAIL 3

FIELD-SIDE
(RAIL 3)

NOTE:
RECESSED HEX NUTS FACING
TRAFFIC-SIDE **SEE DETAIL (C)**

REFERENCE LINE USED TO INSTALL
LINE POST(9) THRU POST(2)

POST 1 OFFSET DISTANCE MEASURED
7-⅝" FROM REFERENCE LINE

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

NO BLOCKOUT
AT (POST 1)

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2

RAIL 4 | RAIL 3 | RAIL 2 | RAIL 1

CABLES

NOTES:
1. ITEM (12) COMPOSITE BLOCKOUTS INSTALLED AT LINE POST(9) THRU LINE POST(2).
2. DO NOT INSTALL A BLOCKOUT AT LINE POST(1).

ITEM (5)
TRAFFIC SIDE SLIDER
(TSS) PANEL FOR RAIL 2

NOTE: SECURE THE (TSS) PANEL TO OUTSIDE OF RAIL 2 WITH THE PANEL ARROWS POINTING TOWARDS THE HEAD.

PLAN VIEW

MBGF RAIL 2 | INSTALL GUARD FENCE RECESSED HEX NUTS ON TRAFFIC-SIDE | MBGF RAIL 1

DETAIL (C)

TRAFFIC FLOW

END PAYMENT (SGT) BY EACH

DO NOT BOLT
RAIL TO POST 6

BEGIN LENGTH OF NEED

INSTALLATION LENGTH 55'- ½"

49'-8 9/16"

6'-3" | 6'-3" | 6'-3" | 6'- ¾" | 6'-3" | 6'-3" | 6'-3" | 37 ½" | 5'-3 11/16"

ITEM (25)
MAX-TENSION HEAD
SEE DETAIL (A)

RAIL HEIGHT 31"

ARROWS

DETAIL (D)

HEAD HEIGHT

DETAIL (B)

32-¼"

ITEM (13) RAIL 4 | ITEM (13) RAIL 3 | ITEM (13) RAIL 2 | ITEM (13) RAIL 1

CABLES

FINISHED GRADE

ITEM (10)
CABLE ASSEMBLY

ITEM (2)
GROUNDSTRUT

68-⅛"

POST 9 | POST 8 | POST 7 | POST 6 | POST 5 | POST 4 | POST 3 | POST 2 | POST 1
ITEM (4)
I-BEAM
W6 X 9

NO BLOCKOUT
AT (POST 1)

SOIL
ANCHOR POST
ITEM (1)

(8) X-LITE LINE POST - ITEM (11)

ELEVATION VIEW

A

A

TSS PANEL
GALVANIZED
ITEM (5)

RSS PLATE
GALVANIZED
ITEM (8)

INSTALL THE TSS AND RSS
WITH THE ARROWS POINTING
TOWARDS THE MAX-HEAD

TSS PANEL AND RSS PLATE

DETAIL (D)

HEAD HEIGHT 32-¼"

TOP OF POST

31-⅞"

FINISHED GRADE

40-⅛"

68-⅛"
ANCHOR POST
DEPTH

ITEM (1)
ANCHOR

ITEM (11)
LINE POSTS
2 THRU 9
(NOTE: ITEM (4) POST 1 (NOT SHOWN), TO BE INSTALLED AT SAME DEPTH AS LINE POSTS.)

SOIL ANCHOR, POST 1 & LINE POST 2 THRU 9

SECTION VIEW A-A

NOTE:
USE THE MASH APPROVED
X-TENSION CABLE ASSEMBLY.

7 5/16"

2 ⅛"

UPPER CABLE
(BACK SIDE)

LOWER CABLE
(TRAFFIC SIDE)

DETAIL (B)

CABLE
FRICTION PLATE
HEAD UNIT
ITEM (9)

NOTE:
INSTALL ⅝" RECESSED HEX
NUTS ON TRAFFIC SIDE.

ITEM (24)
ITEM (21)

ITEM (20)
8X

ITEM (17)
8X

ITEM (23)
6X
3 SCREWS
EACH SIDE

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

(RAIL 1)

* ITEM (25)
HIGH INTENSITY
REFLECTIVE SHEETING

NOTE: DELINEATION MARKER IN ACCORDANCE WITH TEXAS MUTCD.

SPLICE FOR IMPACT-HEAD
TO GUARD FENCE (RAIL1)

DETAIL (A)

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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

APPROX 5'-10" | 5'-0" | 50' APPROACH GRADING

STANDARD
MBGF

2'-0"

EDGE OF PAVEMENT

NOTE: ADJUST WIDTH ACCORDINGLY WHEN OFFSET IS USED. (OFFSET "OPTION" SHOWN)

2'-0" MAX.
RAIL OFFSET

APPROACH GRADING
(1V:10H OR FLATTER)
SEE PRODUCT ASSEMBLY MANUAL
FOR ADDITIONAL GUIDANCE.

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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

TRAFFIC FLOW

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

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	4001115	⅝" X 1 ¼" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
* 25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
** 26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
** 27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

Texas Department of Transportation

Design Division Standard

MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		83

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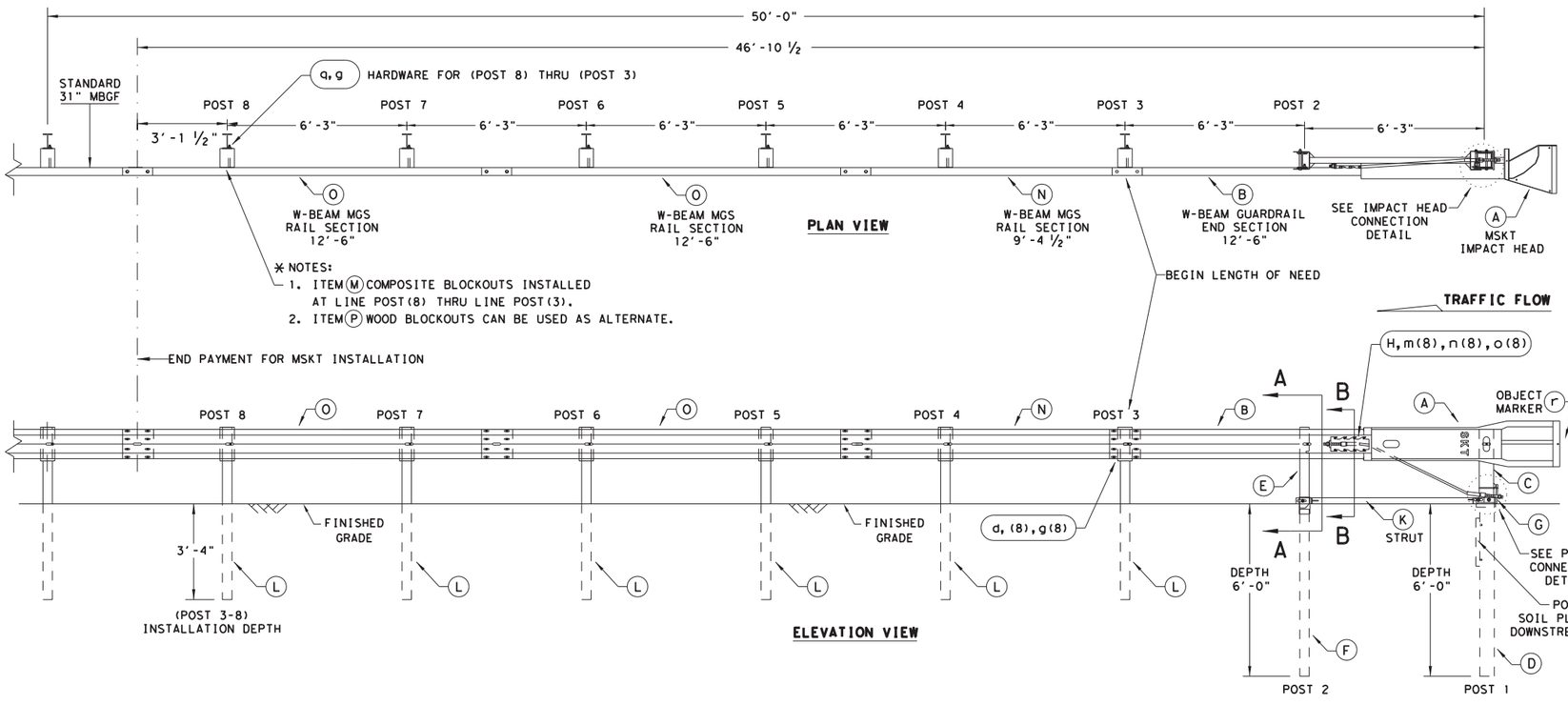
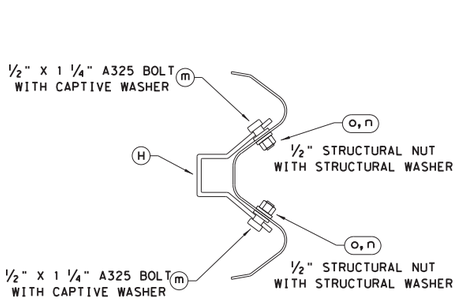
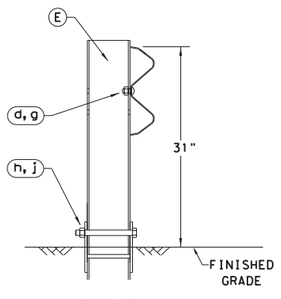
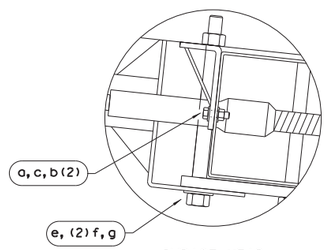
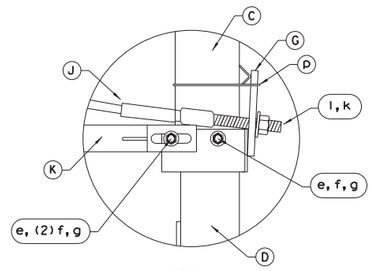


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.









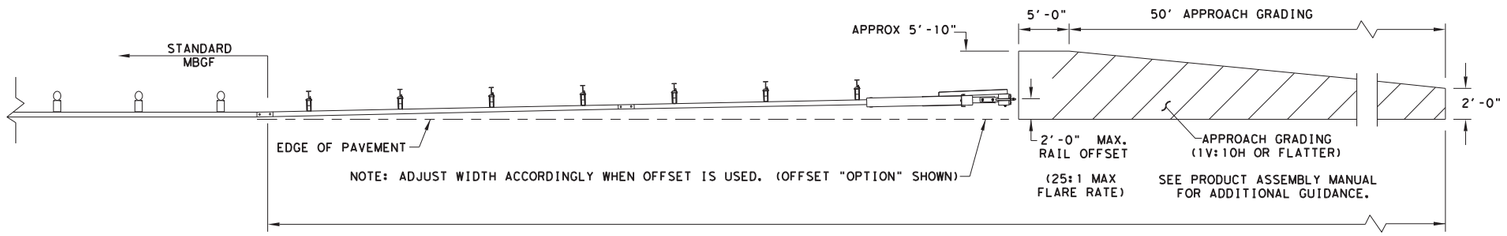
GENERAL NOTES

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

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 ½")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209
		SMALL HARDWARE	
a	2	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1 ¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1 ¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
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	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		84

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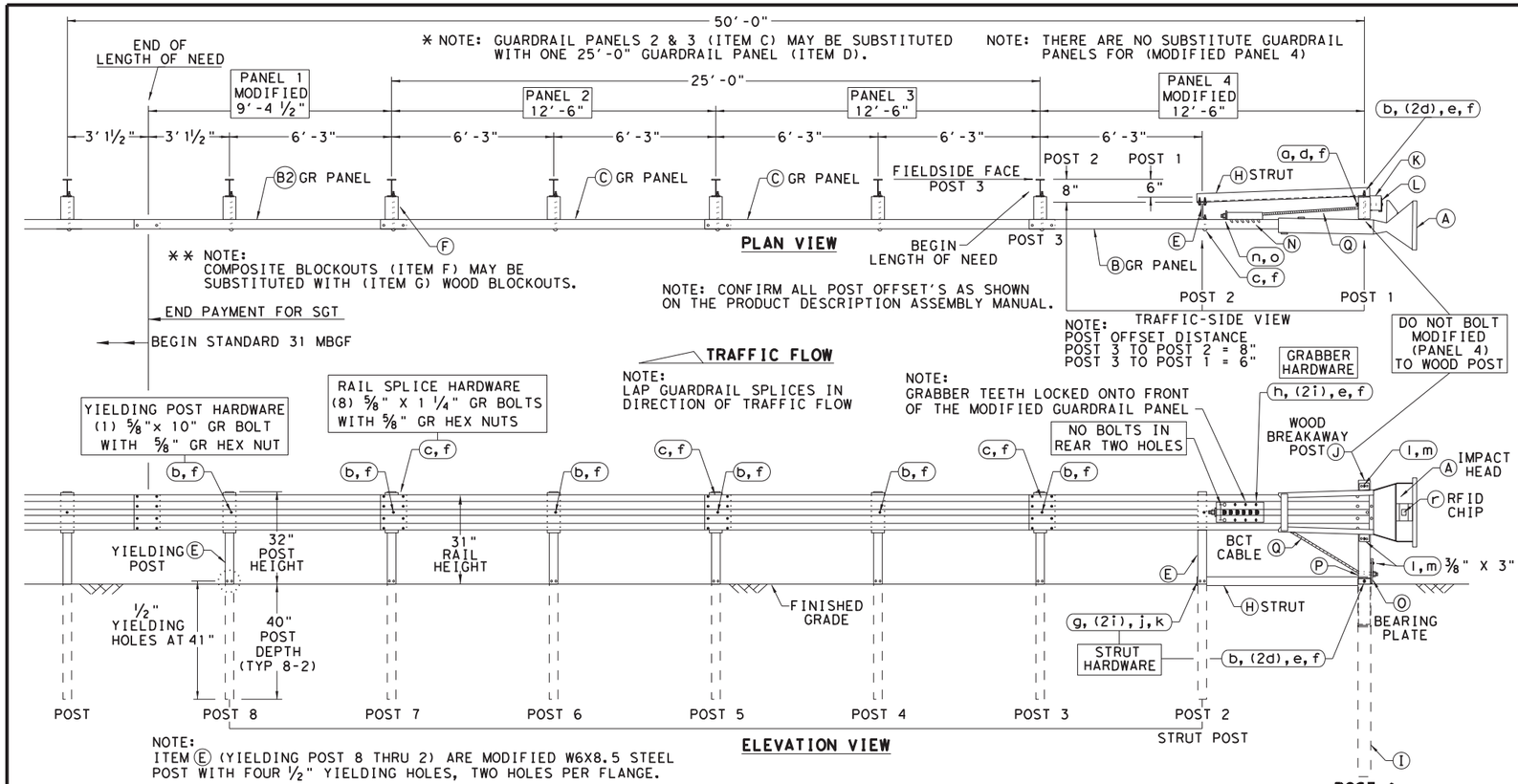
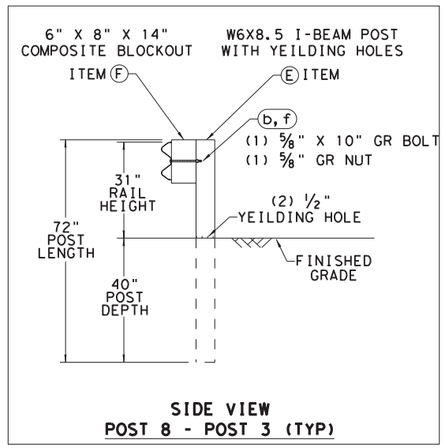


GENERAL NOTES

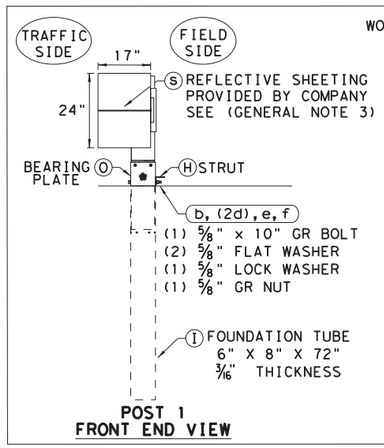
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

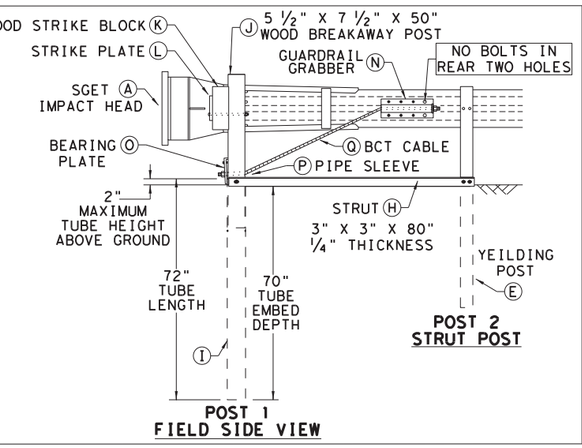
ALTERNATIVE ITEMS * **
NOTE: SEE PLAN VIEW



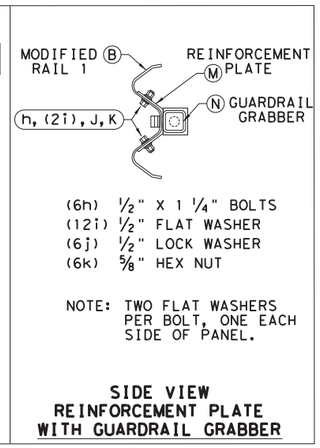
SIDE VIEW
POST 8 - POST 3 (TYP)



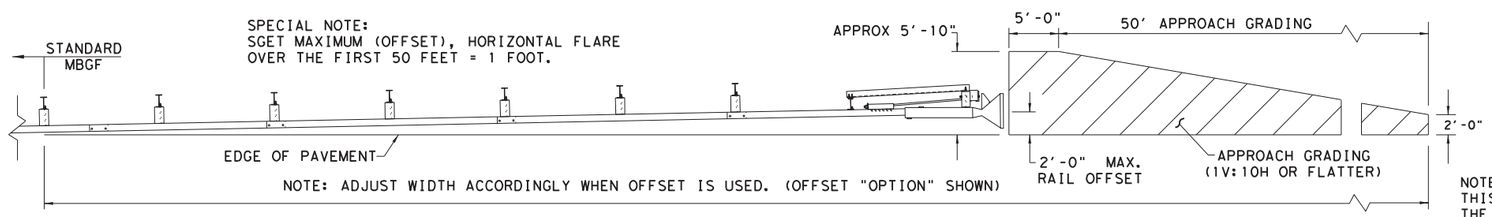
POST 1
FRONT END VIEW



POST 2
STRUT POST
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	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		85

DATE: 3/16/2023 11:27:54 PM
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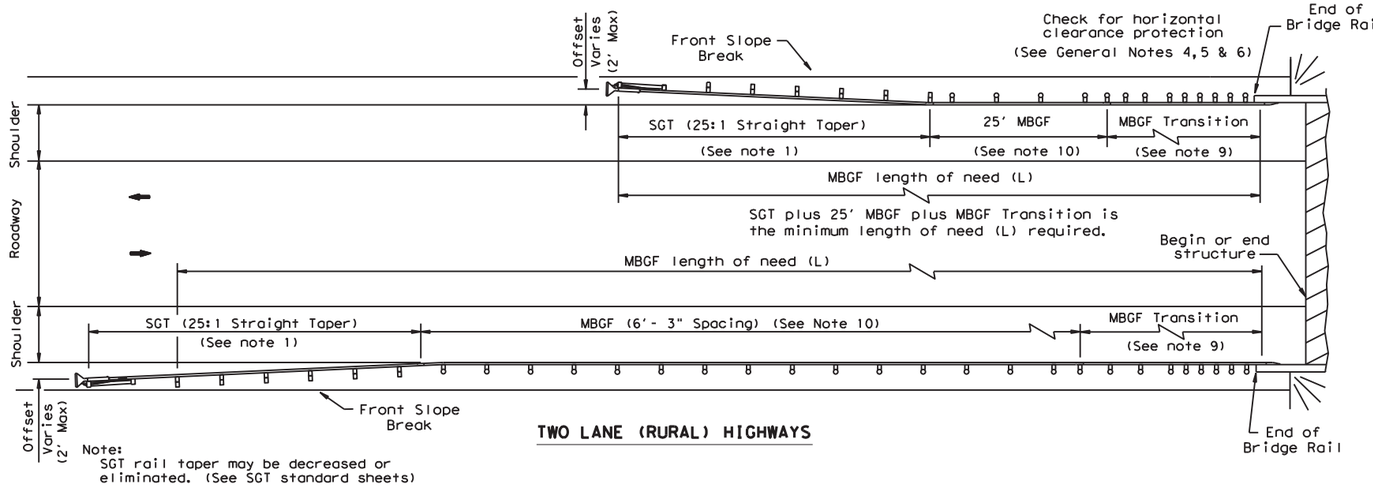
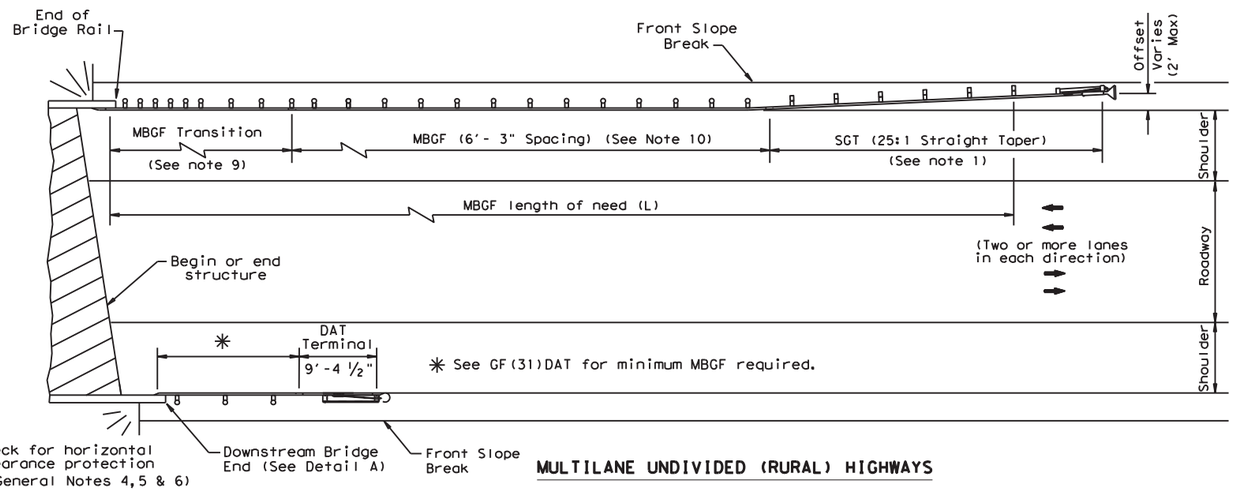
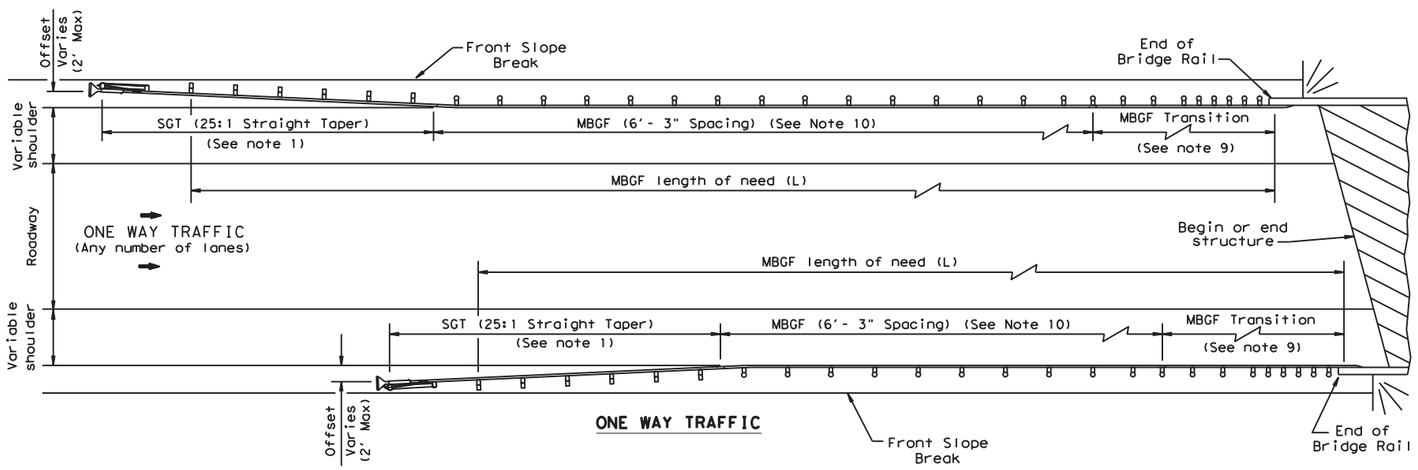


Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)

TWO LANE (RURAL) HIGHWAYS



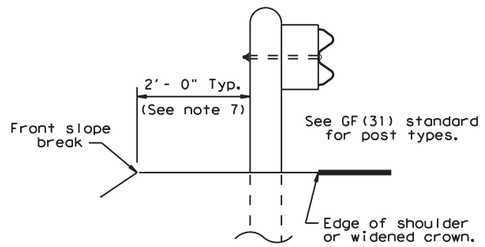
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



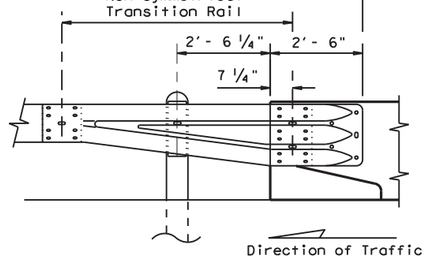
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

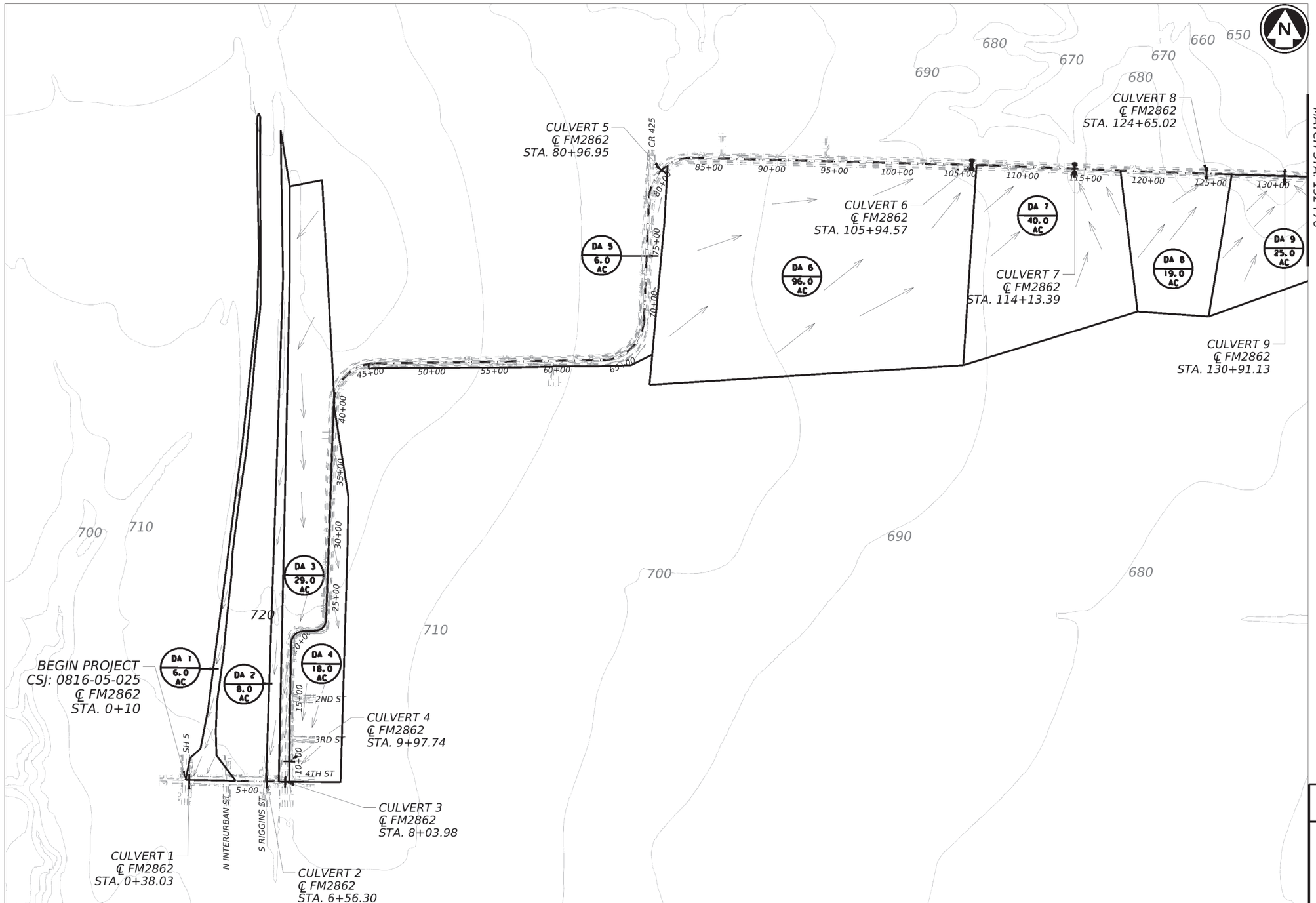
Texas Department of Transportation | Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
REVISED APRIL 2014 SEE MEMO 04141	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		86



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Madiha Alshammry, P.E.

3/17/2023

Texas Department of Transportation

FM 2862

DRAINAGE AREA MAP

SCALE 1"= 9500`

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		87

DATE: 3/16/2023 9:22:12 PM
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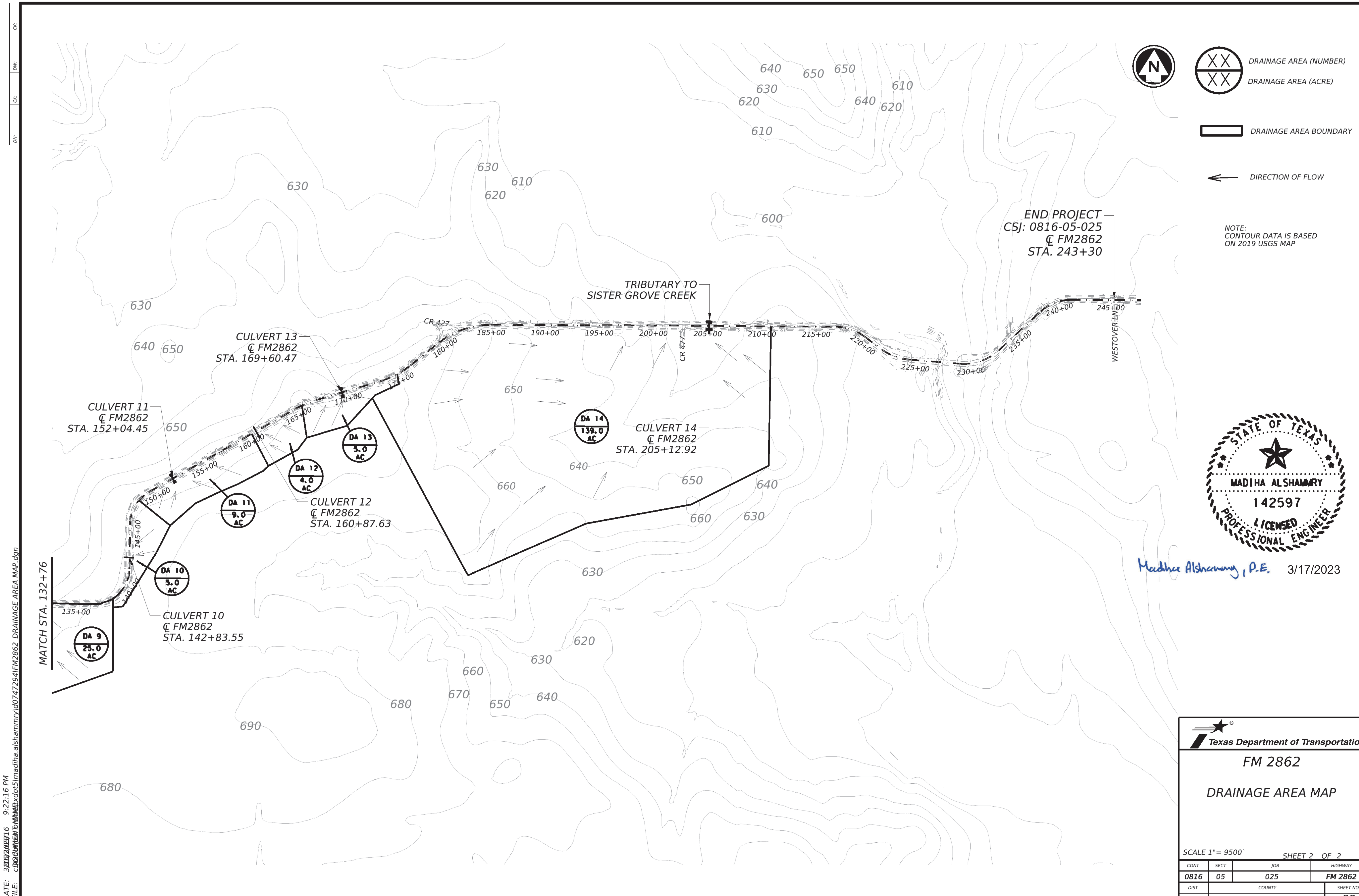
DRAINAGE AREA (NUMBER)
DRAINAGE AREA (ACRE)
DRAINAGE AREA BOUNDARY
DIRECTION OF FLOW
NOTE:
CONTOUR DATA IS BASED ON 2019 USGS MAP
END PROJECT
CSJ: 0816-05-025
℄ FM2862
STA. 243+30
TRIBUTARY TO
SISTER GROVE CREEK
CULVERT 13
℄ FM2862
STA. 169+60.47
CULVERT 11
℄ FM2862
STA. 152+04.45
CULVERT 14
℄ FM2862
STA. 205+12.92
CULVERT 12
℄ FM2862
STA. 160+87.63
CULVERT 10
℄ FM2862
STA. 142+83.55
MATCH STA. 132+76
DA 9 25.0 AC
DA 10 5.0 AC
DA 11 9.0 AC
DA 12 4.0 AC
DA 13 5.0 AC
DA 14 139.0 AC
CR 427
WESTOVER LN
STATE OF TEXAS
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3/17/2023
Texas Department of Transportation
FM 2862
DRAINAGE AREA MAP
SCALE 1"= 9500`
SHEET 2 OF 2
CONT 0816
SECT 05
JOB 025
HIGHWAY FM 2862
DIST DAL
COUNTY COLLIN
SHEET NO. 88

RATIONAL METHOD RUNOFF CALCULATIONS

DESCRIPTION	STATION	DA I.D.	Cr	Ci	Cv	Cs	C	A (acres)	Tc (min)	10-YEAR I10 (in/hr)	10-YEAR Q10 (cfs)	100-YEAR I100 (in/hr)	100-YEAR Q100 (cfs)
CULVERT NO. 1	0+38.03	DA 1	0.50	0.50	0.50	0.50	0.50	6	70.0	2.28	6.85	3.40	10.19
CULVERT NO. 2	6+56.30	DA 2	0.50	0.50	0.50	0.50	0.50	8	74.0	2.20	8.80	3.28	13.10
CULVERT NO. 3	8+03.98	DA 3	0.30	0.30	0.30	0.30	0.30	29	53.0	2.74	23.83	4.06	35.30
CULVERT NO. 4	9+97.74	DA 4	0.30	0.30	0.30	0.30	0.30	18	31.0	3.80	20.51	5.57	30.09
CULVERT NO. 5	80+96.95	DA 5	0.1	0.08	0.08	0.12	0.38	6	28.0	4.02	9.18	5.89	13.43
CULVERT NO. 6	105+94.57	DA 6	0.11	0.08	0.08	0.10	0.37	96	52.0	2.77	98.49	4.11	145.82
CULVERT NO. 7	114+13.39	DA 7	0.1	0.08	0.08	0.08	0.34	40	63.0	2.45	33.29	3.64	49.45
CULVERT NO. 8	124+65.02	DA 8	0.1	0.08	0.08	0.08	0.34	19	28.0	4.02	26.00	5.89	38.06
CULVERT NO. 9	130+91.13	DA 9	0.11	0.08	0.08	0.08	0.35	25	19.0	4.94	43.21	7.18	62.81
CULVERT NO. 10	142+83.55	DA 10	0.12	0.08	0.08	0.12	0.40	5	23.0	4.48	8.96	6.53	13.07
CULVERT NO. 11	152+04.45	DA 11	0.1	0.08	0.08	0.10	0.36	9	27.0	4.11	13.31	6.01	19.47
CULVERT NO. 12	160+87.63	DA 12	0.1	0.08	0.08	0.12	0.38	4	24.0	4.38	6.66	6.39	9.72
CULVERT NO. 13	169+60.47	DA 13	0.11	0.08	0.08	0.10	0.37	5	15.0	5.52	10.22	7.99	14.79
CULVERT NO. 14	205+12.92	DA 14	0.09	0.08	0.08	0.08	0.33	139	32.0	3.73	171.08	5.47	251.11

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Madiha Alshammry, P.E. 3/17/2023

NOTE:
1-DRAINAGE ANALYSIS PERFORMED IN CONFORMANCE WITH TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019) PROCEDURES FOR THE RATIONAL METHOD WITH TC DETERMINED BY THE NRCS METHOD.

Texas Department of Transportation

FM 2862

HYDROLOGIC AND HYDRAULIC CALCULATIONS

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		89

DATE: 9:22:31 PM
FILE: ...\madiha.alshammry\d0747294\FM2862 CULVERT HYDRAULIC CALCULATIONS.dgn

CULVERT HYDRAULICS CALCULATIONS

CULVERT	STATION	DESCRIPTION		DRAINAGE AREA NO.	ALLOWABLE HEADWATER	10 YEAR (DESIGN) RUNOFF (CFS)	HW ELEV (FT)	TW ELEV (FT)	TW DEPTH (FT)	OUTLET VELOCITY (FPS)	TW VELOCITY (FPS)	100 YEAR (CHECK) RUNOFF (CFS)	HW ELEV (FT)	TW ELEV (FT)	TW DEPTH (FT)	OUTLET VELOCITY (FPS)	TW VELOCITY (FPS)
CULVERT 1	0+38.03	EXISTING	1 - 18" X 53` CMP	1	706.57	6.78	706.43	704.24	0.57	5.37	2.59	10.10	706.83	704.33	0.66	5.82	2.86
		PROPOSED	1 - 24" X 72` RCP	1	706.57	6.78	704.87	703.49	0.57	6.21	2.59	10.10	705.24	703.58	0.66	6.88	2.86
CULVERT 2	6+56.30	EXISTING	1 - 18" X 76` CMP	2	712.09	8.64	711.70	708.71	0.75	6.01	2.58	12.87	712.32	708.83	0.87	6.35	2.85
		PROPOSED	1 - 24" X 76` RCP	2	712.09	8.64	710.33	708.71	0.75	7.20	2.58	12.87	710.79	708.83	0.87	7.94	2.85
CULVERT 3	8+03.98	EXISTING	1 - 24" X 56` CMP	3	713.70	24.73	713.07	709.86	1.18	8.47	2.96	36.60	713.79	710.05	1.37	9.33	3.26
		PROPOSED	1-24" X 56` RCP	3	713.70	24.73	713.07	709.86	1.18	8.47	2.96	36.60	713.79	710.05	1.37	9.33	3.26
CULVERT 4	9+97.74	EXISTING	1 - 24" X 37` RCP	4	714.09	20.51	713.70	711.68	1.25	7.51	3.42	30.09	714.40	711.91	1.48	8.39	3.77
		PROPOSED	1 - 24" X 43` RCP	4	714.09	20.51	713.72	711.65	1.25	7.51	3.42	30.09	714.36	711.88	1.48	8.32	3.77
CULVERT 5	80+96.95	EXISTING	1 - 30" X 15" X 36` ARCH CMP	5	706.24	9.18	703.83	702.76	0.70	5.11	2.31	13.43	704.42	702.87	0.81	5.97	2.54
		PROPOSED	1-24" X 46 RCP	5	706.24	9.18	703.87	702.76	0.70	5.30	2.31	13.43	704.42	702.87	0.81	6.11	2.54
CULVERT 6	105+94.57	EXISTING	1 - 58" X36" X 45` ARCH CMP	6	691.91	98.49	691.67	687.31	1.87	9.74	7.02	145.82	692.88	687.61	2.17	10.64	7.75
		PROPOSED	2 - 42" X 54 ` RCP	6	691.91	98.49	689.71	687.26	1.87	11.43	7.01	145.82	690.95	687.56	2.17	12.57	7.74
CULVERT 7	114+13.39	EXISTING	1 - 48" X 50` RCP	7	682.54	33.29	677.23	674.80	1.22	11.20	5.60	49.45	677.91	674.99	1.41	12.11	6.18
		PROPOSED	1 - 48" X 55` RCP	7	682.54	33.29	677.36	674.80	1.22	11.39	5.60	49.45	678.04	674.99	1.41	12.31	6.18
CULVERT 8	124+65.02	EXISTING	1 - 30" X 40` RCP	8	680.91	26.00	679.15	676.85	1.01	9.27	4.05	38.06	680.39	677.00	1.16	10.32	4.45
		PROPOSED	1 - 30" X 54` RCP	8	680.91	26.00	679.25	676.77	1.01	9.52	4.05	38.06	680.49	676.92	1.16	10.51	4.45
CULVERT 9	130+91.13	EXISTING	1 - 36" X 57` RCP	9	671.20	43.21	667.81	661.62	1.12	16.91	6.38	62.81	669.42	661.79	1.29	18.18	7.00
		PROPOSED	1 - 36" X 62` RCP	9	671.20	43.21	667.86	661.64	1.12	16.58	6.38	62.81	669.47	661.81	1.29	17.89	7.00
CULVERT 10	142+83.55	EXISTING	1 - 24" X 36` CMP	10	683.80	8.96	680.20	678.96	0.69	5.25	2.93	13.07	680.78	679.07	0.80	6.04	3.22
		PROPOSED	1 - 24" X 54` RCP	10	683.80	8.96	679.73	678.45	0.64	5.25	3.41	13.07	680.15	678.55	0.74	6.04	3.75
CULVERT 11	152+04.45	EXISTING	1 - 30" X 40`RCP	11	677.26	13.31	674.55	672.85	0.65	8.95	3.94	19.47	675.03	672.95	0.75	9.93	4.33
		PROPOSED	1 - 30" X 54`RCP	11	677.26	13.31	674.64	672.74	0.65	8.30	3.94	19.47	675.12	672.84	0.75	9.06	4.33
CULVERT 12	160+87.63	EXISTING	1 - 24" X 40` RCP	12	677.62	6.66	674.07	672.49	0.59	8.76	3.22	9.72	674.41	672.58	0.68	9.73	3.54
		PROPOSED	1 - 24" X 54` RCP	12	677.62	6.66	674.64	672.33	0.59	8.29	3.22	9.72	675.12	672.42	0.68	9.02	3.54
CULVERT 13	169+60.47	EXISTING	1 - 36" X 48` CMP	13	681.61	10.22	677.61	673.59	0.69	12.37	3.58	14.79	677.95	673.69	0.79	13.13	3.93
		PROPOSED	1 - 36" X 54` RCP	13	681.61	10.22	677.67	676.16	0.69	7.82	3.58	14.79	678.01	676.27	0.79	8.51	3.93
CULVERT 14	205+12.92	EXISTING	1 - 108" X 72" X 58` ARCH CMP	14	617.87	171.08	606.91	604.67	1.93	7.75	7.68	251.11	607.92	604.97	2.23	8.77	8.45
		PROPOSED	1 - 8` X 6` X 58` BC	14	617.87	171.08	607.10	604.67	1.93	9.86	7.68	251.11	608.28	604.97	2.23	11.03	8.45

NOTE:
1-HY-8 V7.5 USED TO ANALYZE CULVERTS.

STATE OF TEXAS
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

HYDROLOGIC AND HYDRAULIC CALCULATIONS

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	90

DATE: 3/20/2024 2:53:55 PM
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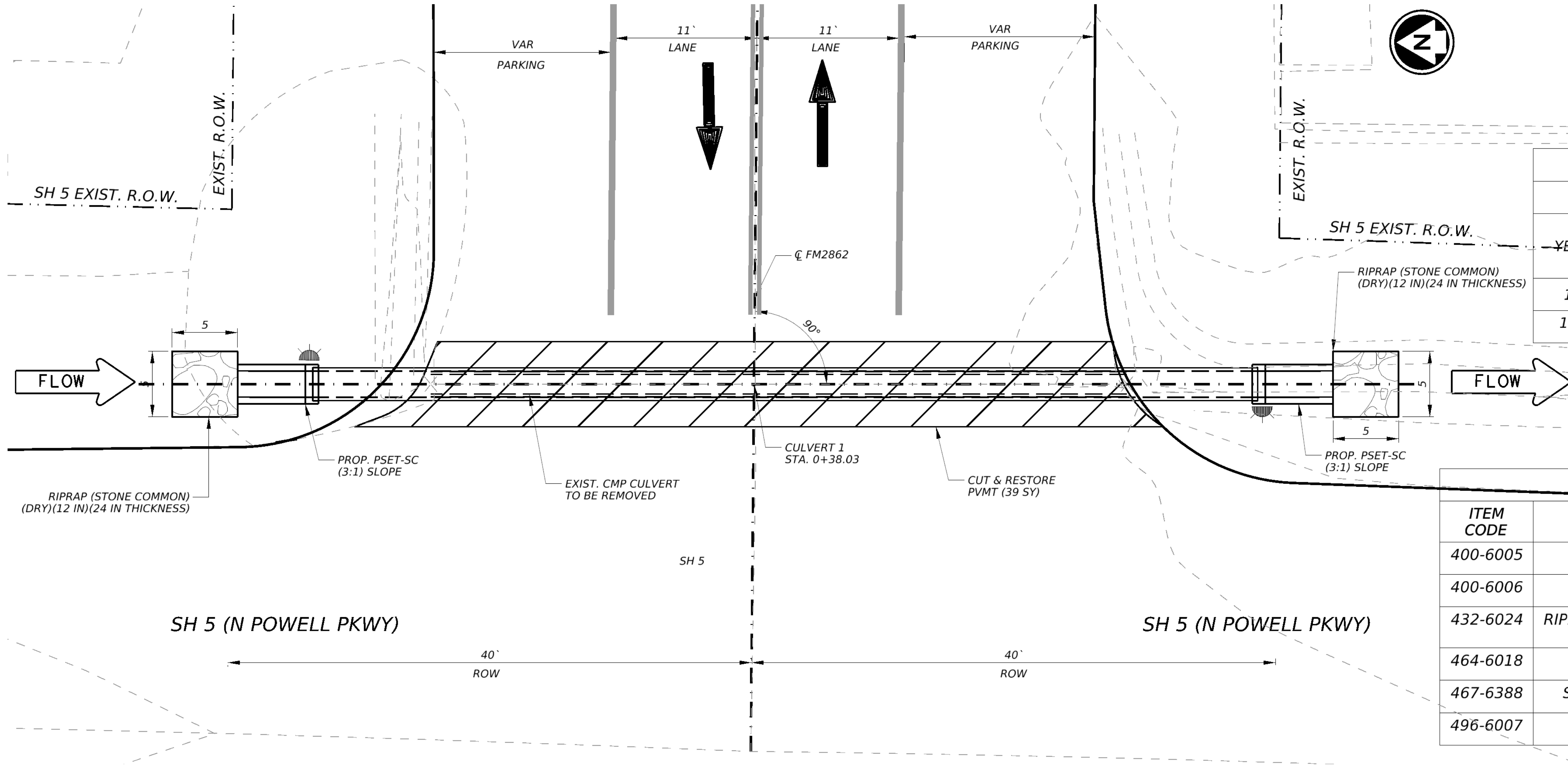


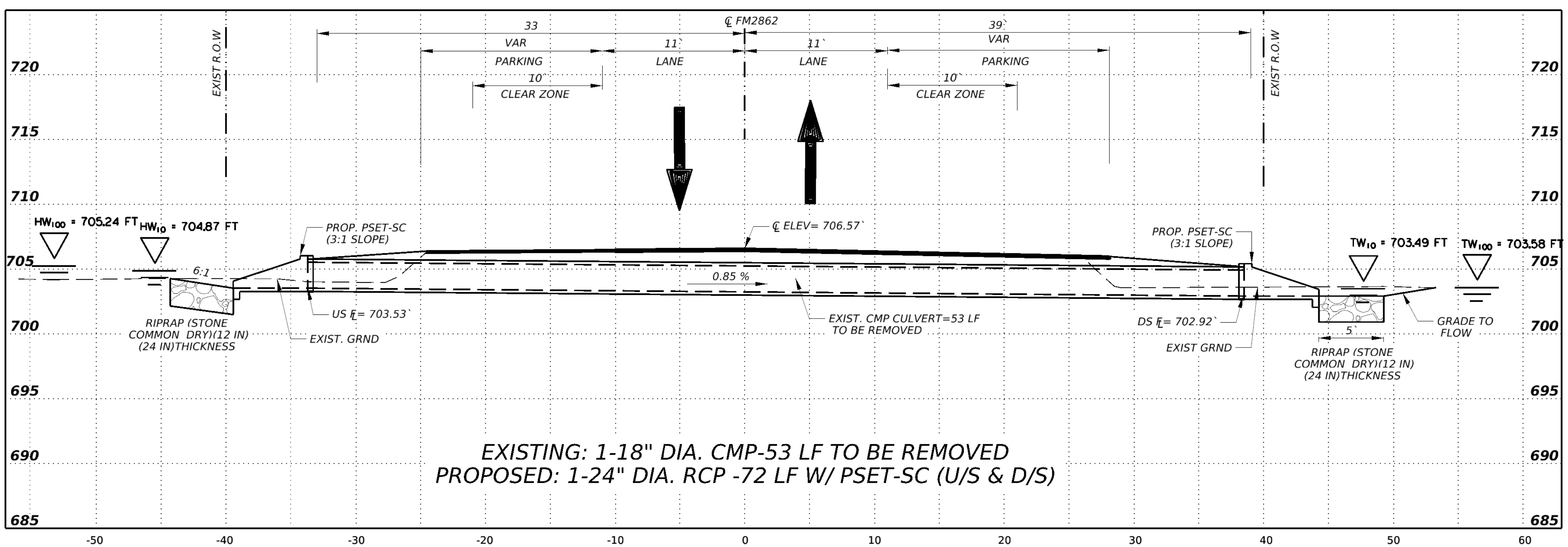
HYDRAULIC DATA

PROPOSED STRUCTURE

YEAR	Q CFS	V FPS	HW EL. FT	TW EL. FT
10	6.78	6.21	704.87	703.49
100	10.10	6.88	705.24	703.58

ESTIMATED QUANTITIES

ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	40
400-6006	CUT & RESTORE PAV	SY	39
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	4
464-6018	RC PIPE (CL IV)(24 IN)	LF	72
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	53



EXISTING: 1-18" DIA. CMP-53 LF TO BE REMOVED
PROPOSED: 1-24" DIA. RCP -72 LF W/ PSET-SC (U/S & D/S)

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FM 2862

CULVERT NO. 1 LAYOUT
STA. 0+38.03

SCALE: 1"=10`-H
1"=10`-V

SHEET 1 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	91

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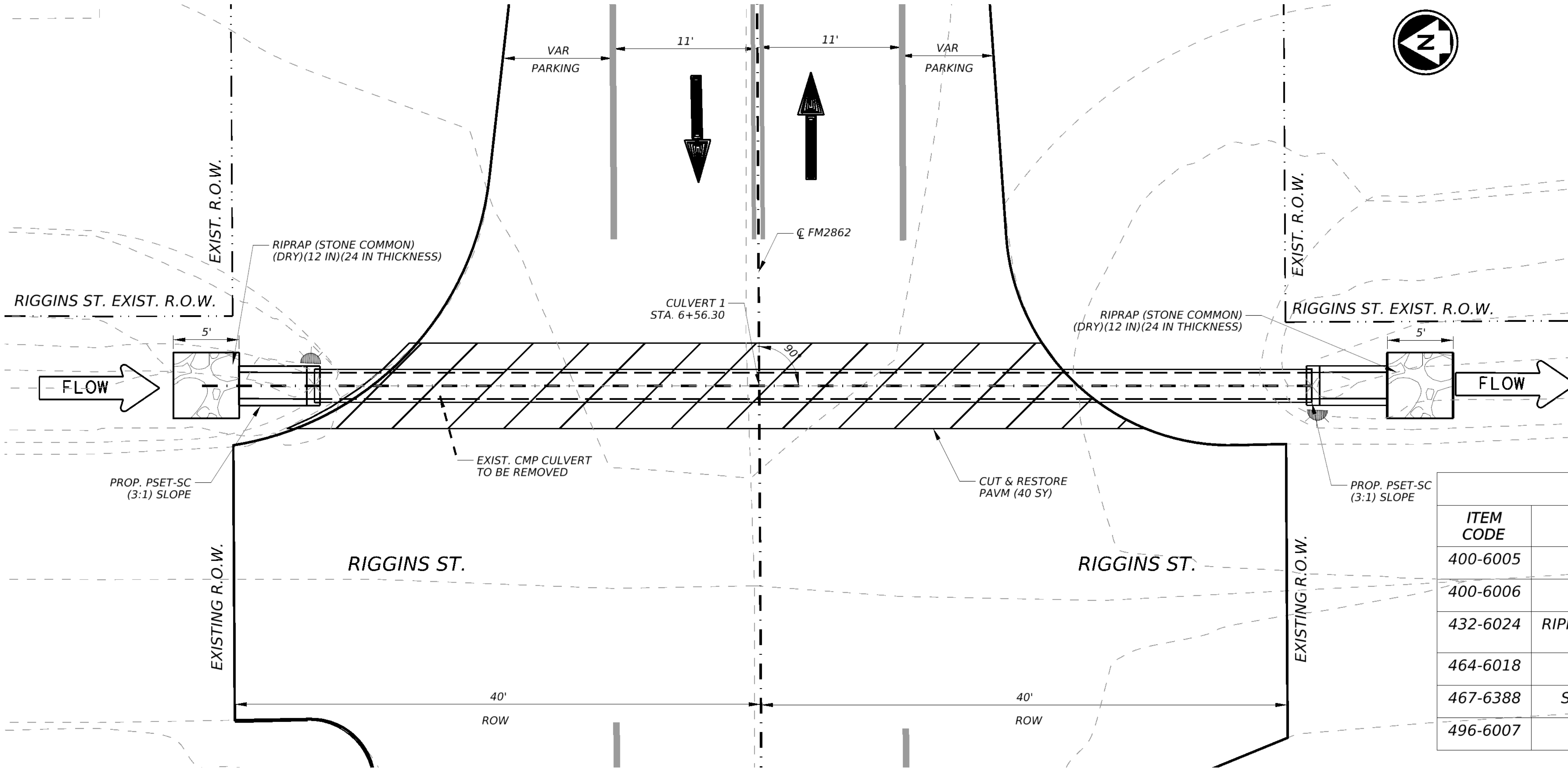


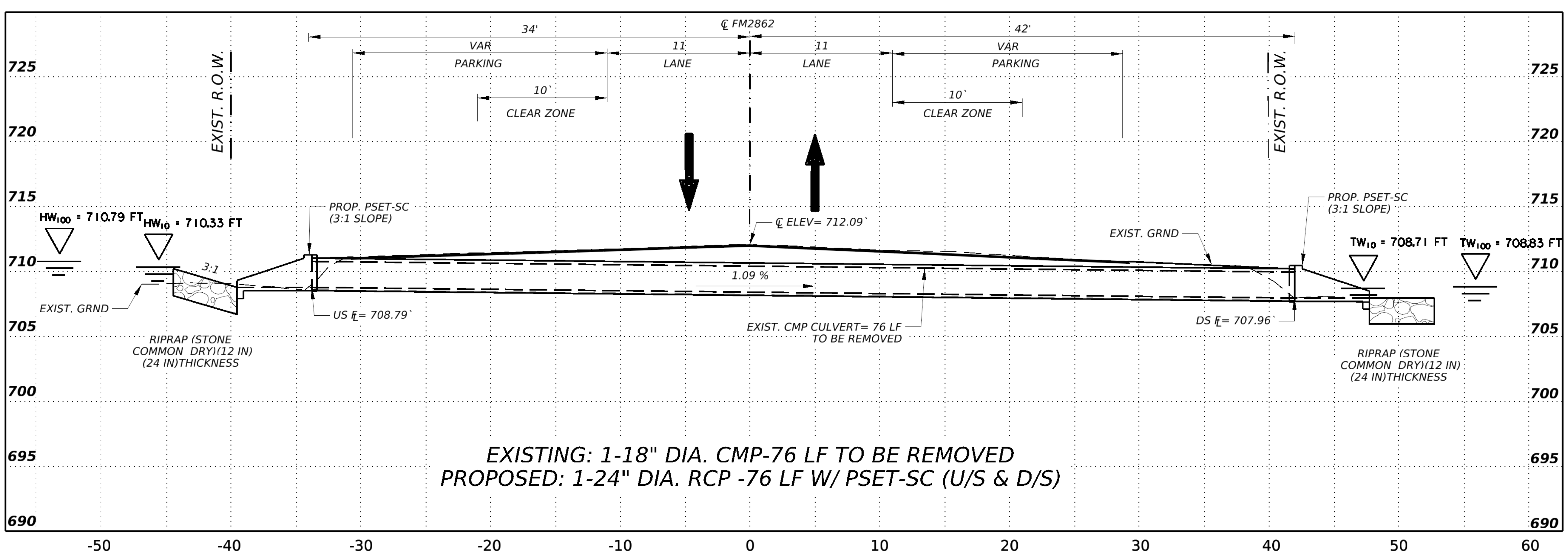
HYDRAULIC DATA

PROPOSED STRUCTURE

YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	8.64	7.20	710.33	708.71
100	12.87	7.94	710.79	708.83

ESTIMATED QUANTITES

ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	41
400-6006	CUT & RESTORE PAV	SY	40
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	4
464-6018	RC PIPE (CL IV)(24 IN)	LF	76
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	76



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Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 2 LAYOUT
STA. 6+56.30

SCALE: 1"=10`-H
1"=10`-V

SHEET 2 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		92

DATE: 3/20/2024 3:05:43 PM
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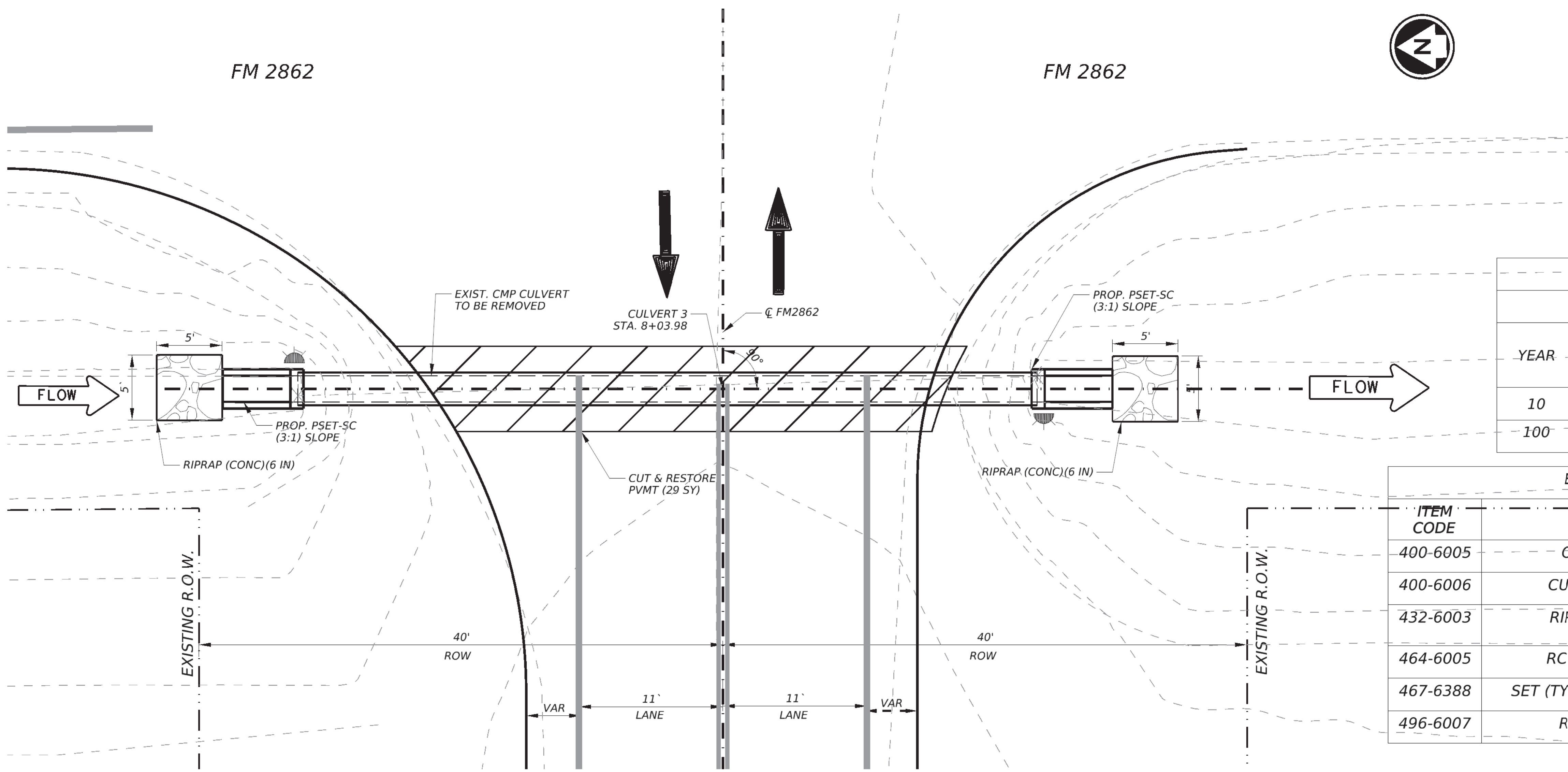
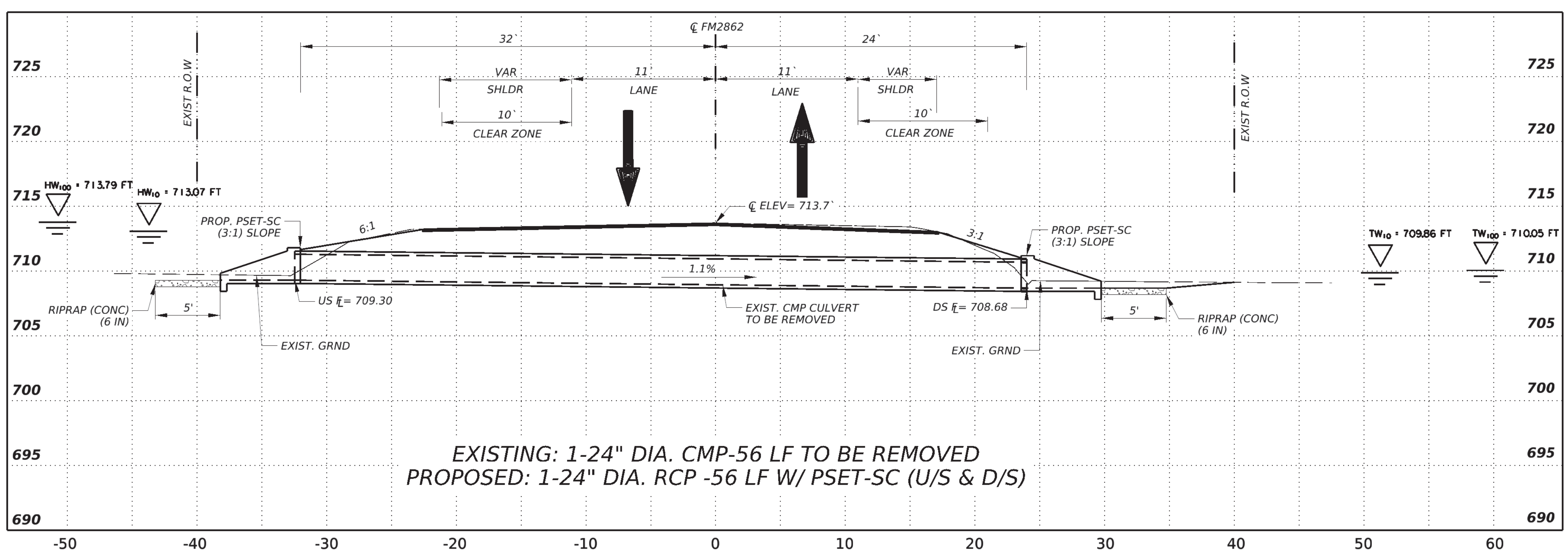


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	24.73	8.47	713.07	709.86
100	36.6	9.33	713.79	710.05

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	31
400-6006	CUT & RESTORE PAV	SY	29
432-6003	RIPRAP (CONC)(6 IN)	CY	1
464-6005	RC PIPE (CL III)(24 IN)	LF	56
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	56



EXISTING: 1-24" DIA. CMP-56 LF TO BE REMOVED
PROPOSED: 1-24" DIA. RCP -56 LF W/ PSET-SC (U/S & D/S)

STATE OF TEXAS
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Madiha Alshammry, P.E. 4/7/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 3 LAYOUT
STA. 8+03.98

SCALE: 1"=10`-H
1"=10`-V

SHEET 3 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	93

DATE: 4/7/2023 8:35:38 AM
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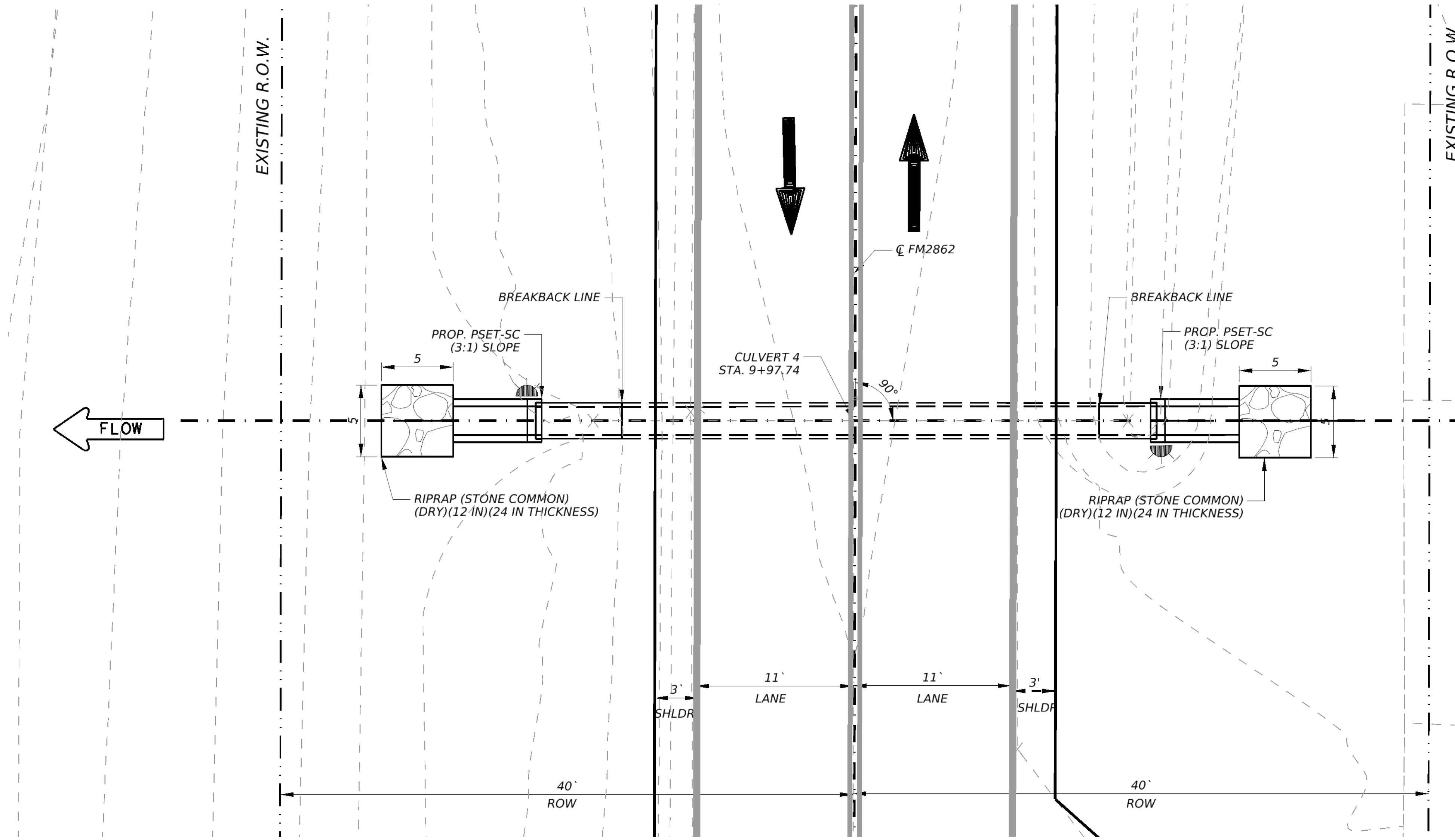
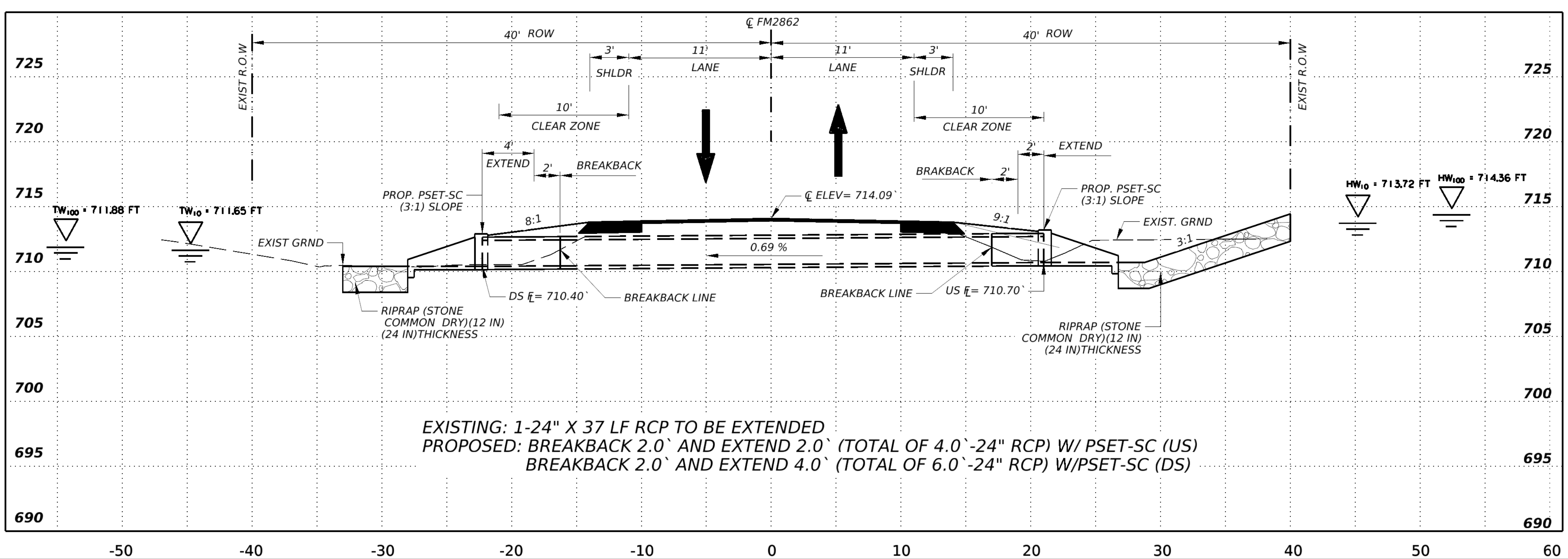


0 2 4 6 8 10
SCALE IN FEET

EXISTING R.O.W.				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	20.51	7.51	713.72	711.65
100	30.09	8.32	714.36	711.88

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	4
464-6018	RC PIPE (CL IV)(24 IN)	LF	10
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	4



EXISTING: 1-24" X 37 LF RCP TO BE EXTENDED
PROPOSED: BREAKBACK 2.0` AND EXTEND 2.0` (TOTAL OF 4.0`-24" RCP) W/ PSET-SC (US)
BREAKBACK 2.0` AND EXTEND 4.0` (TOTAL OF 6.0`-24" RCP) W/PSET-SC (DS)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

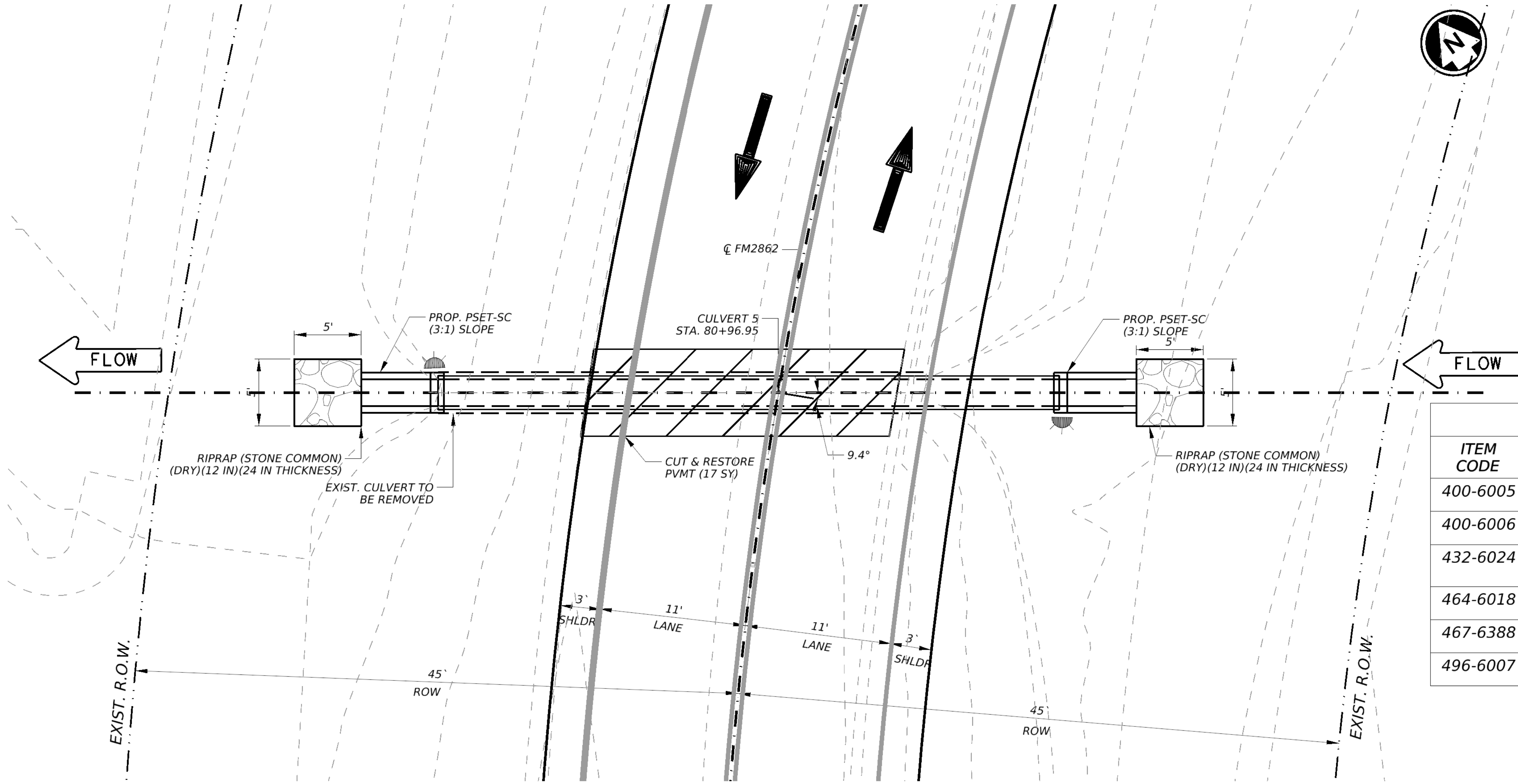
FM 2862

CULVERT NO. 4 LAYOUT
STA. 9+97.74

SHEET 4 OF 14

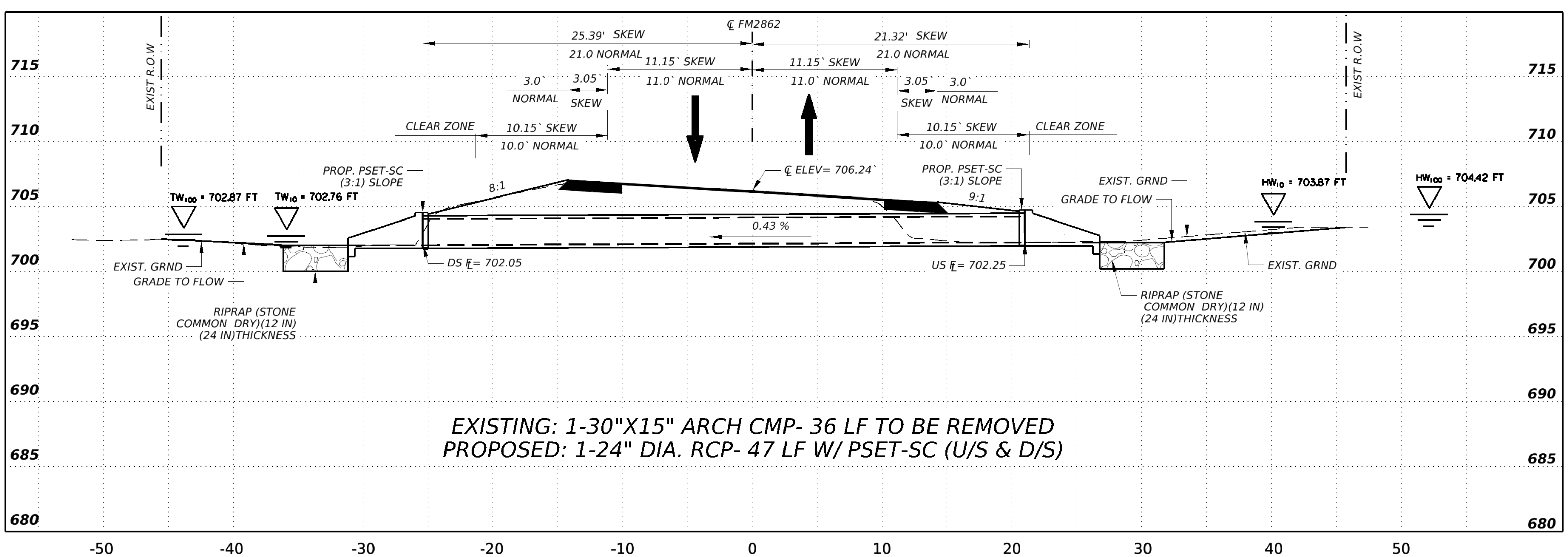
CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		94

DATE: 3/23/2023 3:11:21 PM
FILE: FM2862 CULVERT 4 LAYOUT SHEET.dgn



HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	9.18	5.30	703.87	702.76
100	13.43	6.11	704.42	702.87

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	25
400-6006	CUT & RESTORE PAV	SY	17
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	4
464-6018	RC PIPE (CL IV)(24 IN)	LF	47
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	36



EXISTING: 1-30"X15" ARCH CMP- 36 LF TO BE REMOVED
PROPOSED: 1-24" DIA. RCP- 47 LF W/ PSET-SC (U/S & D/S)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 5 LAYOUT
STA. 80+96.95

SCALE: 1"=10`-H
1"=10`-V

SHEET 5 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		95

DATE: 3/23/2023 3:43:53 PM
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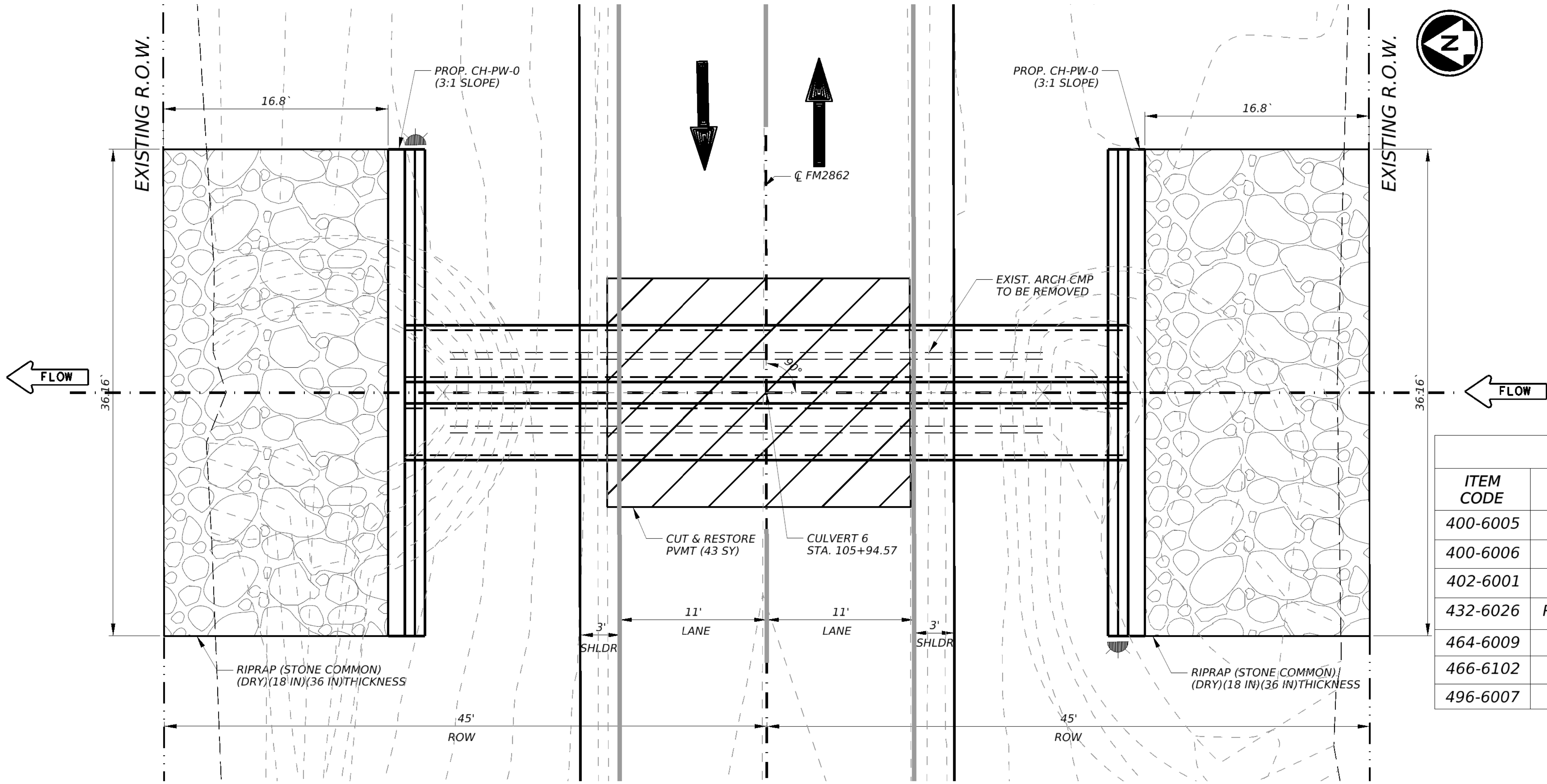
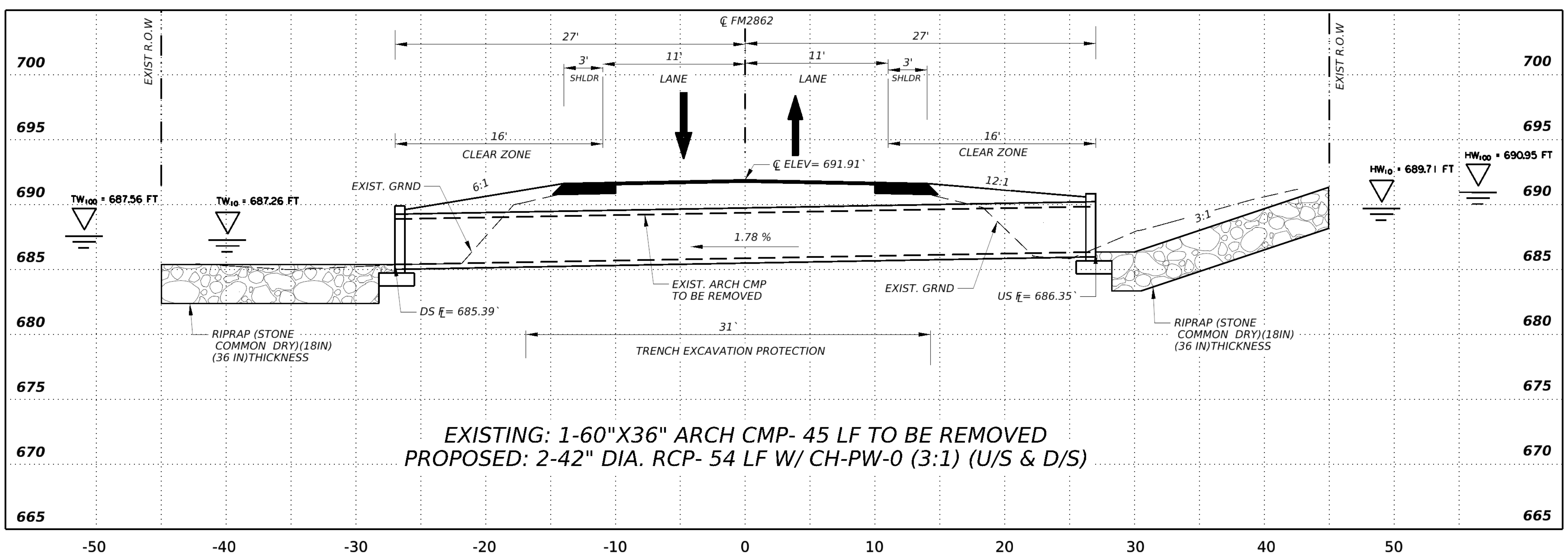


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	98.49	11.43	689.71	687.26
100	145.82	12.57	690.95	687.56

ESTIMATED QUANTITES

ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	78
400-6006	CUT & RESTORE PAV	SY	43
402-6001	TRENCH EXCAVATION PROTECTION	LF	31
432-6026	RIPRAP (STONE COMMON)(DRY) (18 IN)	CY	136
464-6009	RC PIPE (CL III)(42 IN)	LF	108
466-6102	HEADWALL (CH-PW-0)(DIA= 42 IN)	EA	2
496-6007	REMOV STR (PIPE)	LF	45



EXISTING: 1-60"X36" ARCH CMP- 45 LF TO BE REMOVED
PROPOSED: 2-42" DIA. RCP- 54 LF W/ CH-PW-0 (3:1) (U/S & D/S)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 6 LAYOUT
STA. 105+94.57

SCALE: 1"=10`-H
1"=10`-V

SHEET 6 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		96

DATE: 3/23/2023 3:48:27 PM
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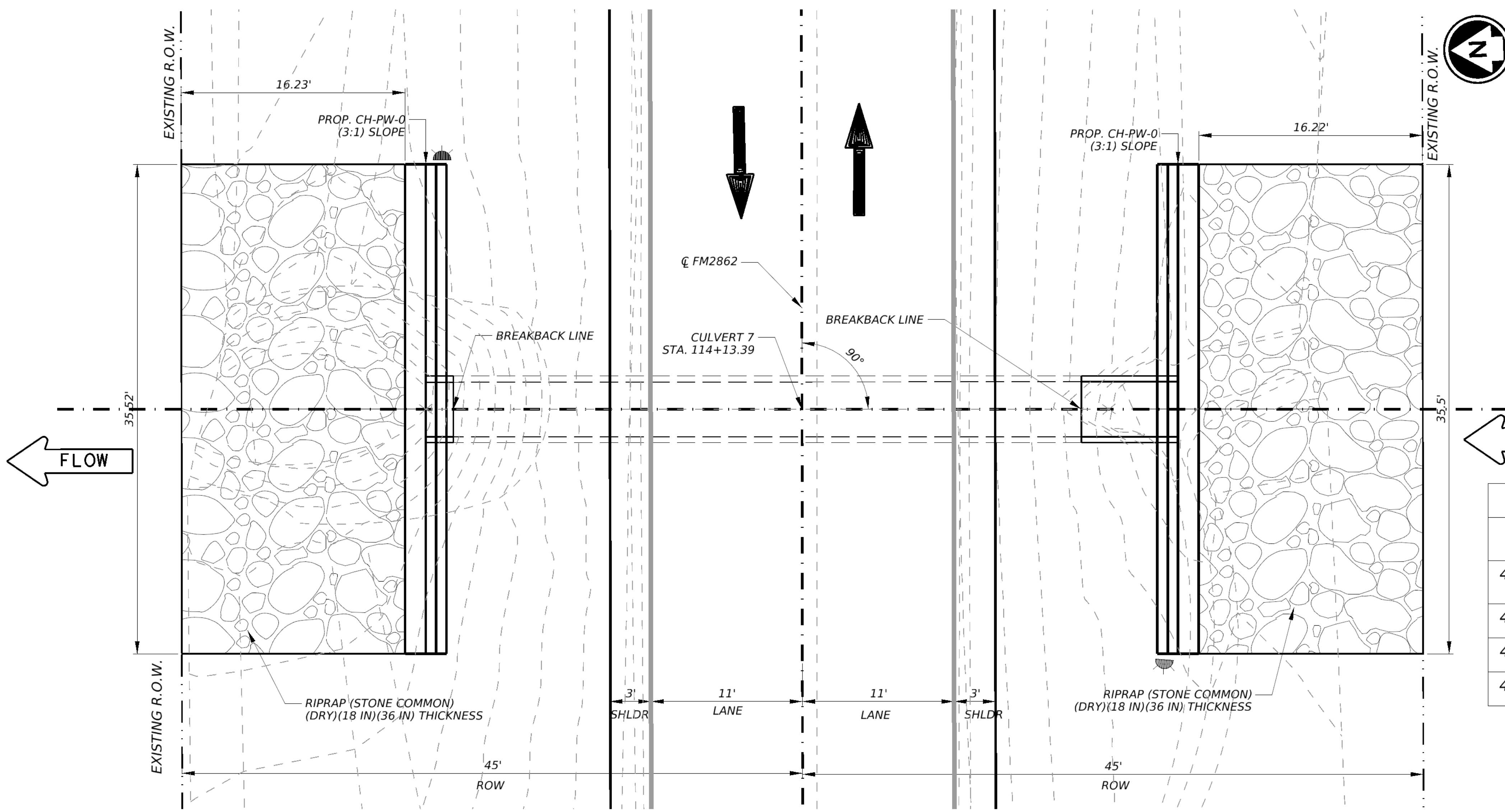
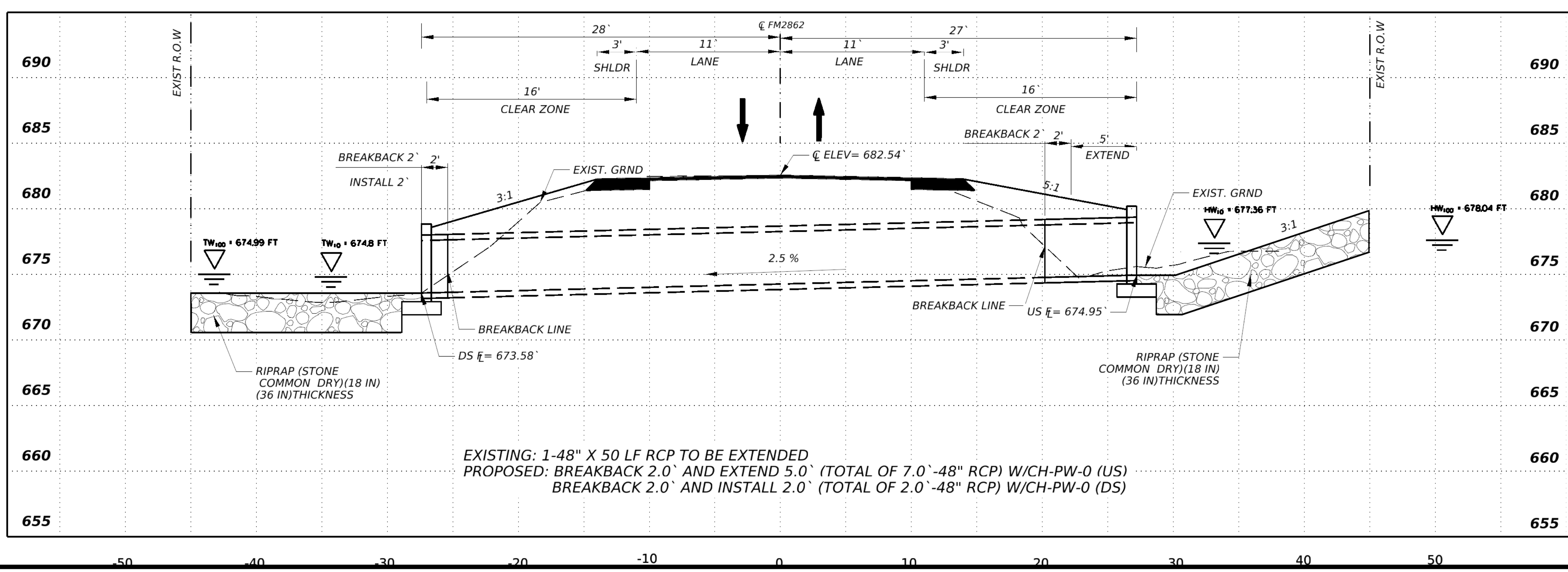


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	33.29	11.39	677.36	674.80
100	49.45	12.31	678.04	674.99

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
432-6026	RIPRAP (STONE COMMON)(DRY) (18 IN)	CY	128
464-6010	RC PIPE (CL III)(48 IN)	LF	9
466-6103	HEADWALL (CH-PW-0)(DIA=48 IN)	EA	2
496-6007	REMOV STR (PIPE)	LF	4



STATE OF TEXAS
MADIHA ALSHAMMRY
142597
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Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 7 LAYOUT
STA. 114+13.39

SCALE: 1"=10`-H
1"=10`-V

SHEET 7 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	97

DATE: 3/23/2023 3:51:45 PM
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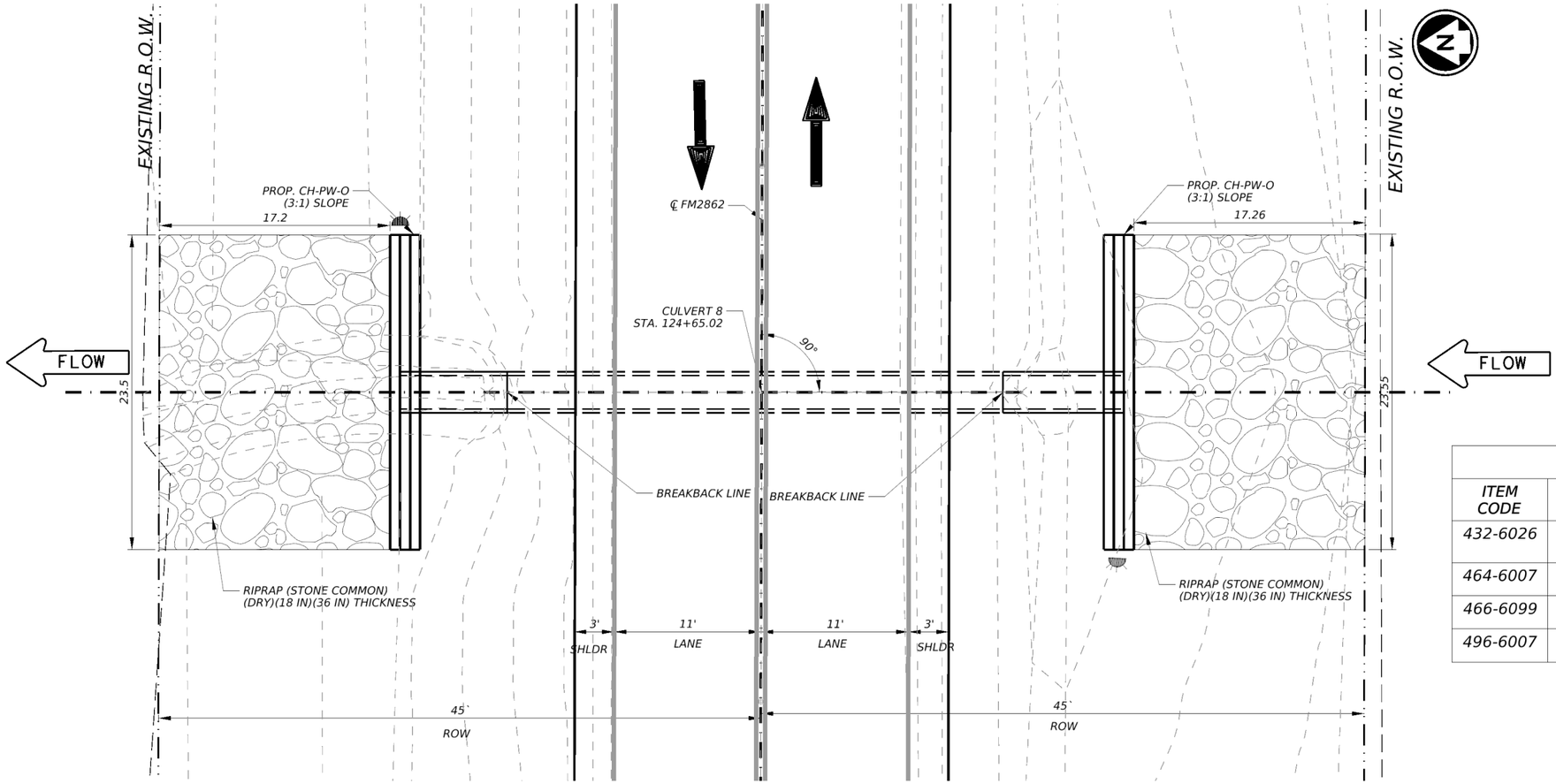
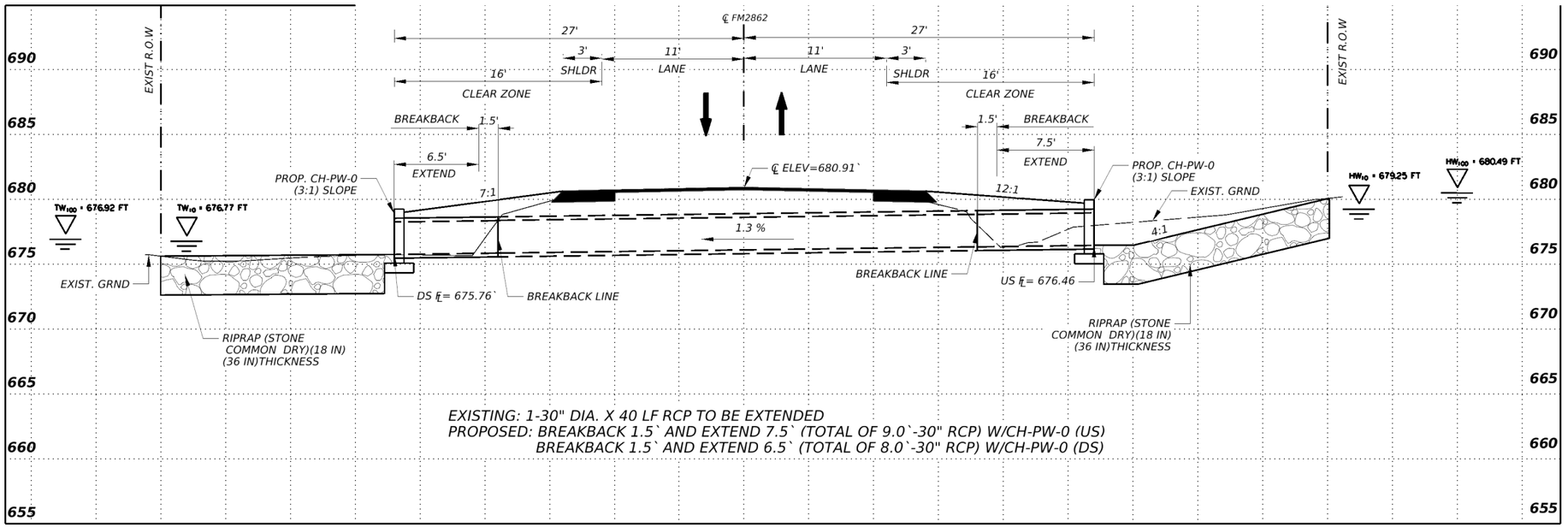


0 2 4 6 8 10

SCALE IN FEET

HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	26.00	9.52	679.25	676.77
100	38.06	10.51	680.49	676.92

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
432-6026	RIPRAP (STONE COMMON)(DRY) (18 IN)	CY	90
464-6007	RC PIPE (CL III)(30 IN)	LF	17
466-6099	HEADWALL (CH-PW-0)(DIA=30 IN)	EA	2
496-6007	REMOV STR (PIPE)	LF	3



EXISTING: 1-30" DIA. X 40 LF RCP TO BE EXTENDED
PROPOSED: BREAKBACK 1.5` AND EXTEND 7.5` (TOTAL OF 9.0`-30" RCP) W/CH-PW-0 (US)
BREAKBACK 1.5` AND EXTEND 6.5` (TOTAL OF 8.0`-30" RCP) W/CH-PW-0 (DS)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

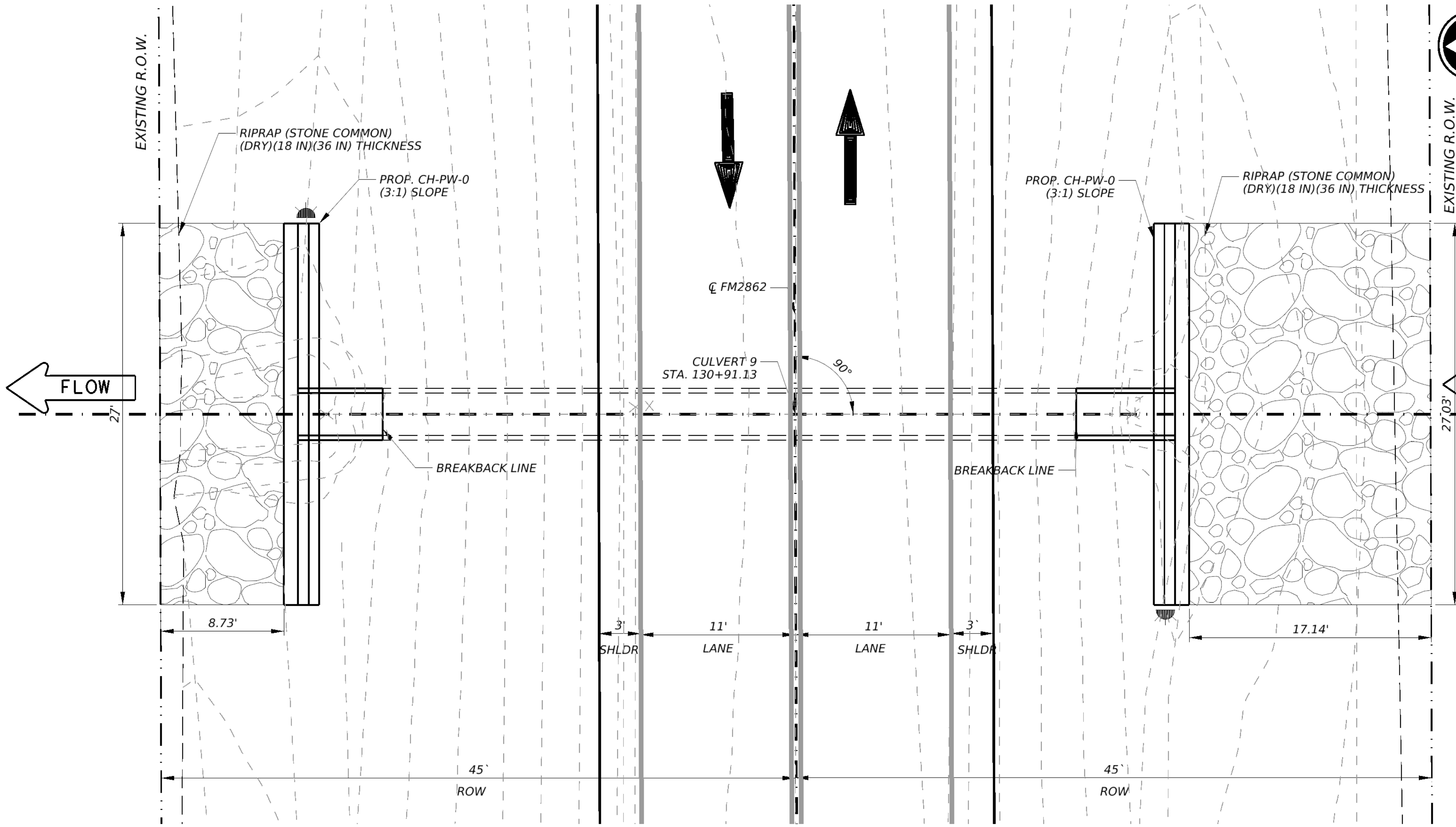
CULVERT NO. 8 LAYOUT
STA. 124+65.02

SCALE: 1"=10`-H
1"=10`-V

SHEET 8 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		98

DATE: 2023/03/24
FILE: DOCUMENT NAME

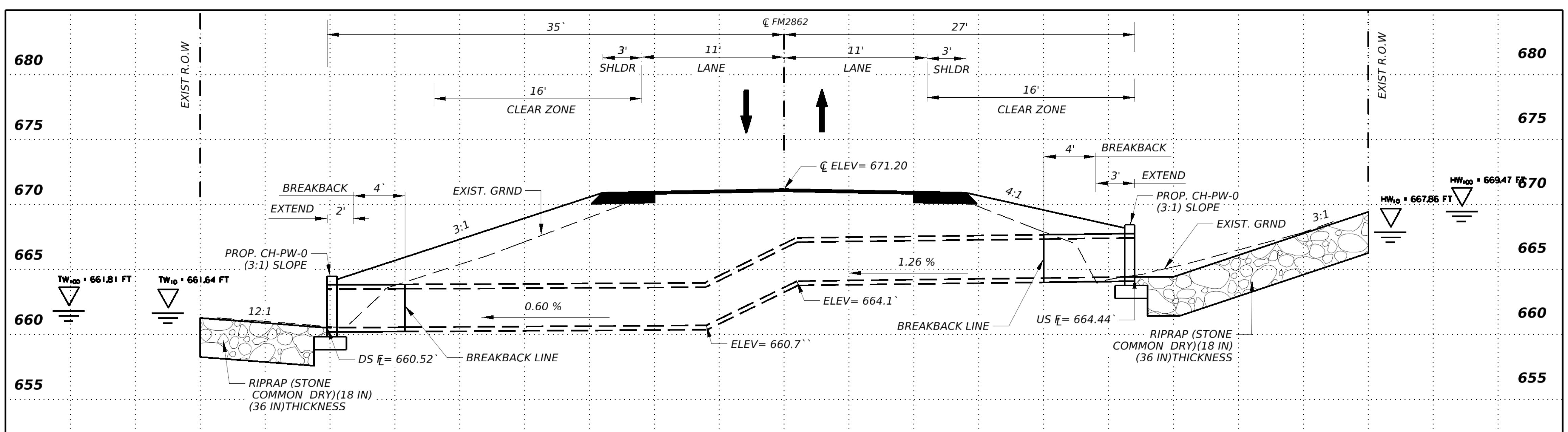


HYDRAULIC DATA

PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	43.21	16.58	667.86	661.64
100	62.81	17.89	669.47	661.81

ESTIMATED QUANTITES

ITEM CODE	DESCRIPTION	UNIT	QUANTITY
432-6026	RIPRAP (STONE COMMON)(DRY) (18 IN)	CY	78
464-6008	RC PIPE (CL III)(36 IN)	LF	13
466-6101	HEADWALL (CH-PW-0)(DIA=36 IN)	EA	2
496-6007	REMOV STR (PIPE)	LF	8



EXISTING: 1-36" DIA. X 57 LF RCP TO BE EXTENDED
PROPOSED: BREAKBACK 4.0' AND EXTEND 3.0' (TOTAL OF 7.0'-36" RCP) W/CH-PW-0 (US)
BREAKBACK 4.0' AND EXTEND 2.0' (TOTAL OF 6.0'-36" RCP) W/CH-PW-0 (DS)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 9 LAYOUT
STA. 130+91.13

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

SHEET 9 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	99

DATE: 3/23/2023 3:57:56 PM
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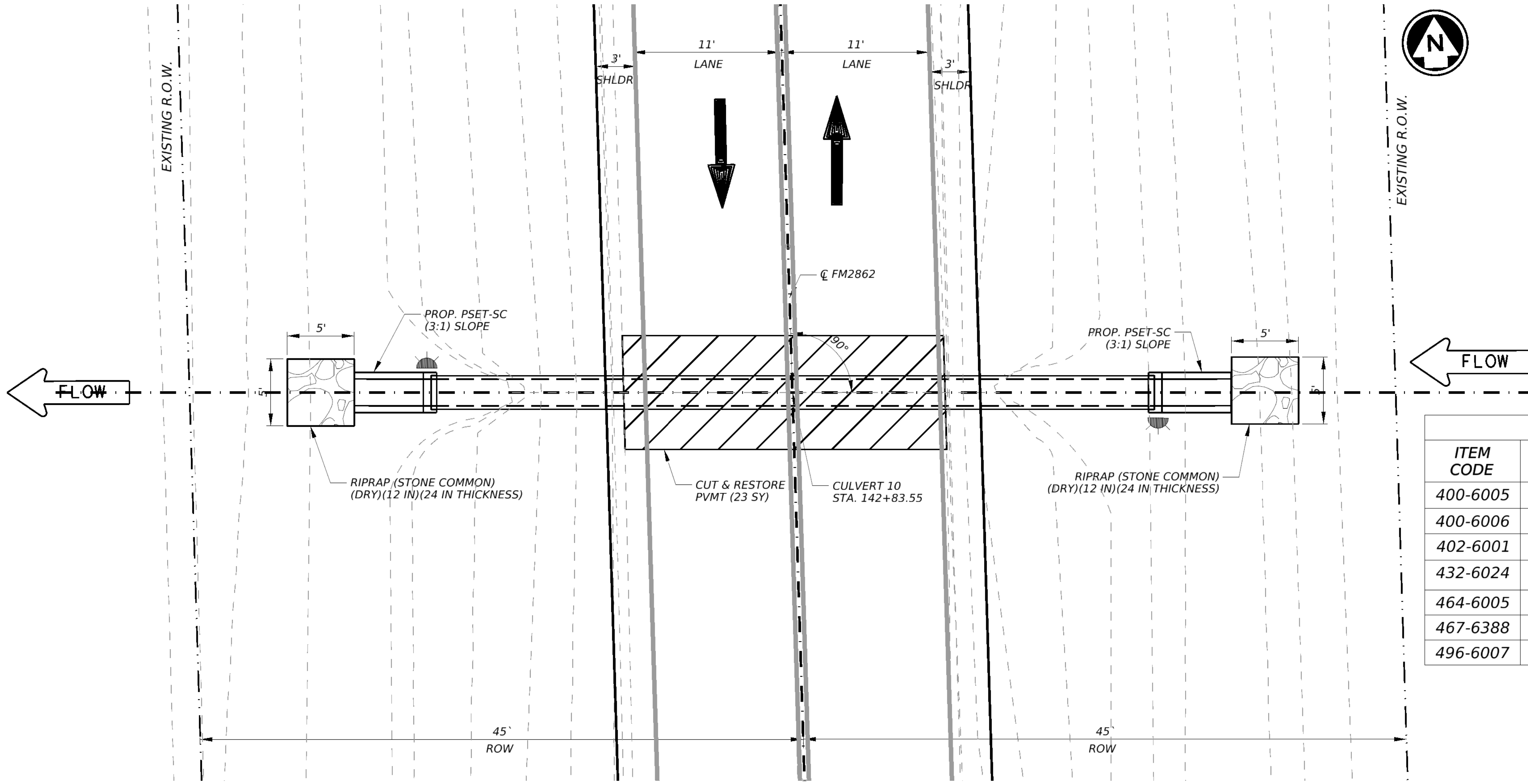
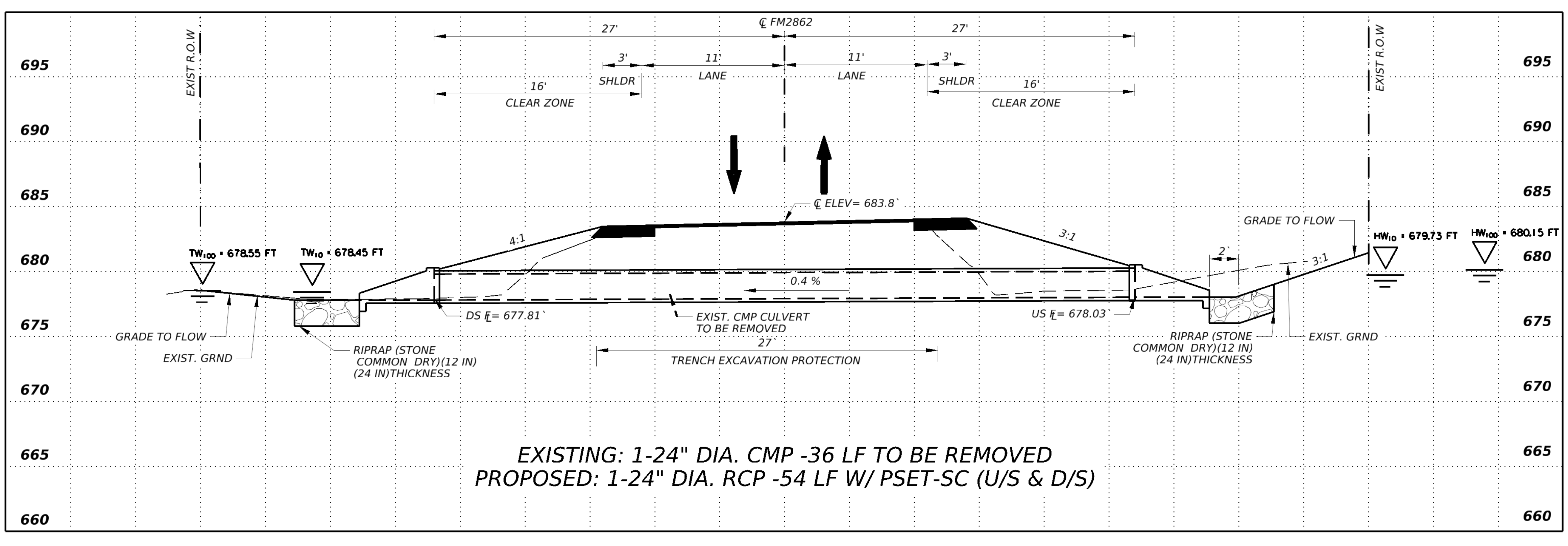


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	8.96	5.25	679.73	678.45
100	13.07	6.04	680.15	678.55

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	30
400-6006	CUT & RESTORE PAV	SY	23
402-6001	TRENCH EXCAVATION PROTECTION	LF	27
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	4
464-6005	RC PIPE (CL III)(24 IN)	LF	54
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	36



EXISTING: 1-24" DIA. CMP -36 LF TO BE REMOVED
PROPOSED: 1-24" DIA. RCP -54 LF W/ PSET-SC (U/S & D/S)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 10 LAYOUT
STA. 142+83.55

SCALE: 1"=10`-H
1"=10`-V

SHEET 10 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		100

DATE: 3/23/2023 4:00:17 PM
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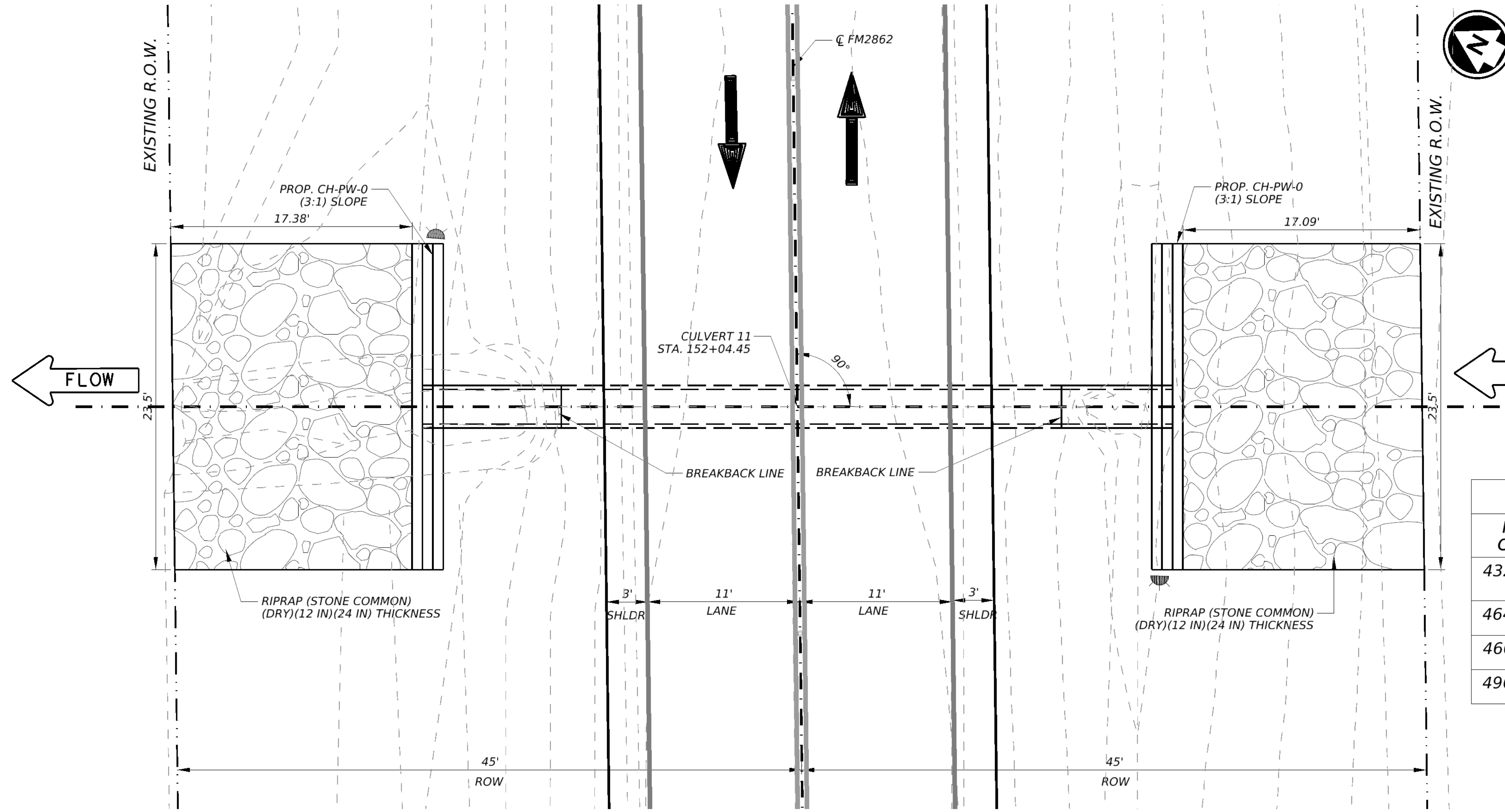
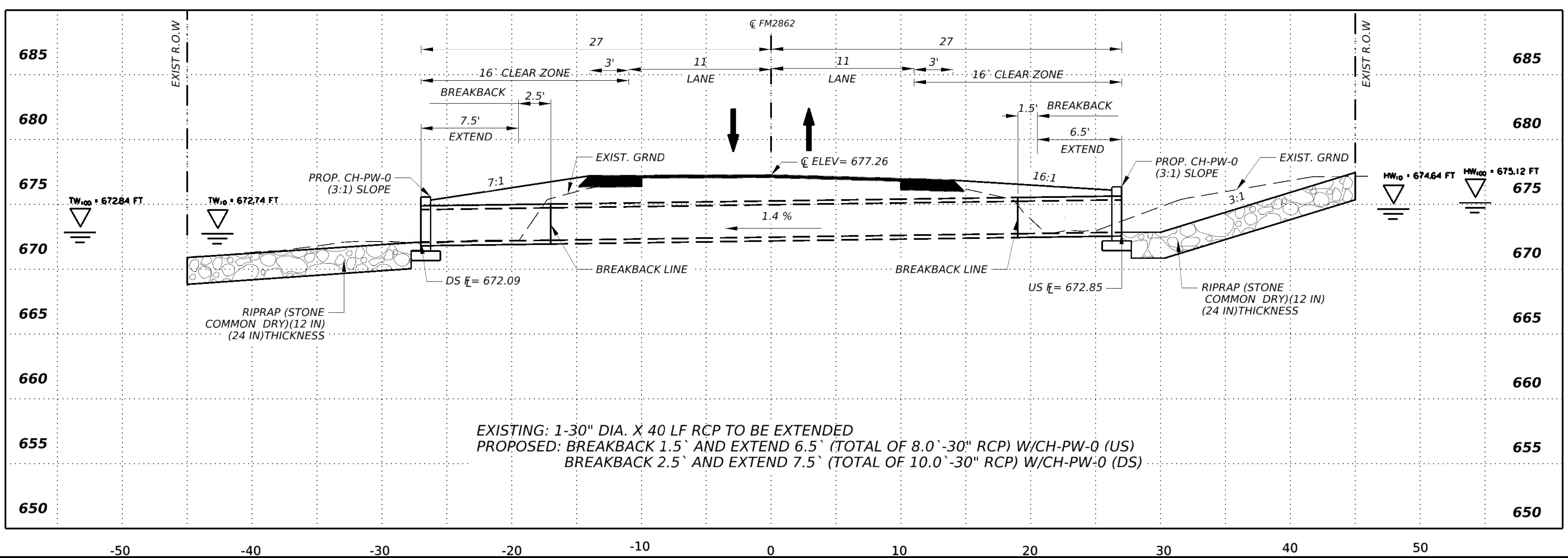


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	13.31	8.30	674.64	672.74
100	19.47	9.06	675.12	672.84

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	61
464-6007	RC PIPE (CL III)(30 IN)	LF	18
466-6099	HEADWALL (CH-PW-0)(DIA=30 IN)	EA	2
496-6007	REMOV STR (PIPE)	LF	4



EXISTING: 1-30" DIA. X 40 LF RCP TO BE EXTENDED
PROPOSED: BREAKBACK 1.5` AND EXTEND 6.5` (TOTAL OF 8.0`-30" RCP) W/CH-PW-0 (US)
BREAKBACK 2.5` AND EXTEND 7.5` (TOTAL OF 10.0`-30" RCP) W/CH-PW-0 (DS)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

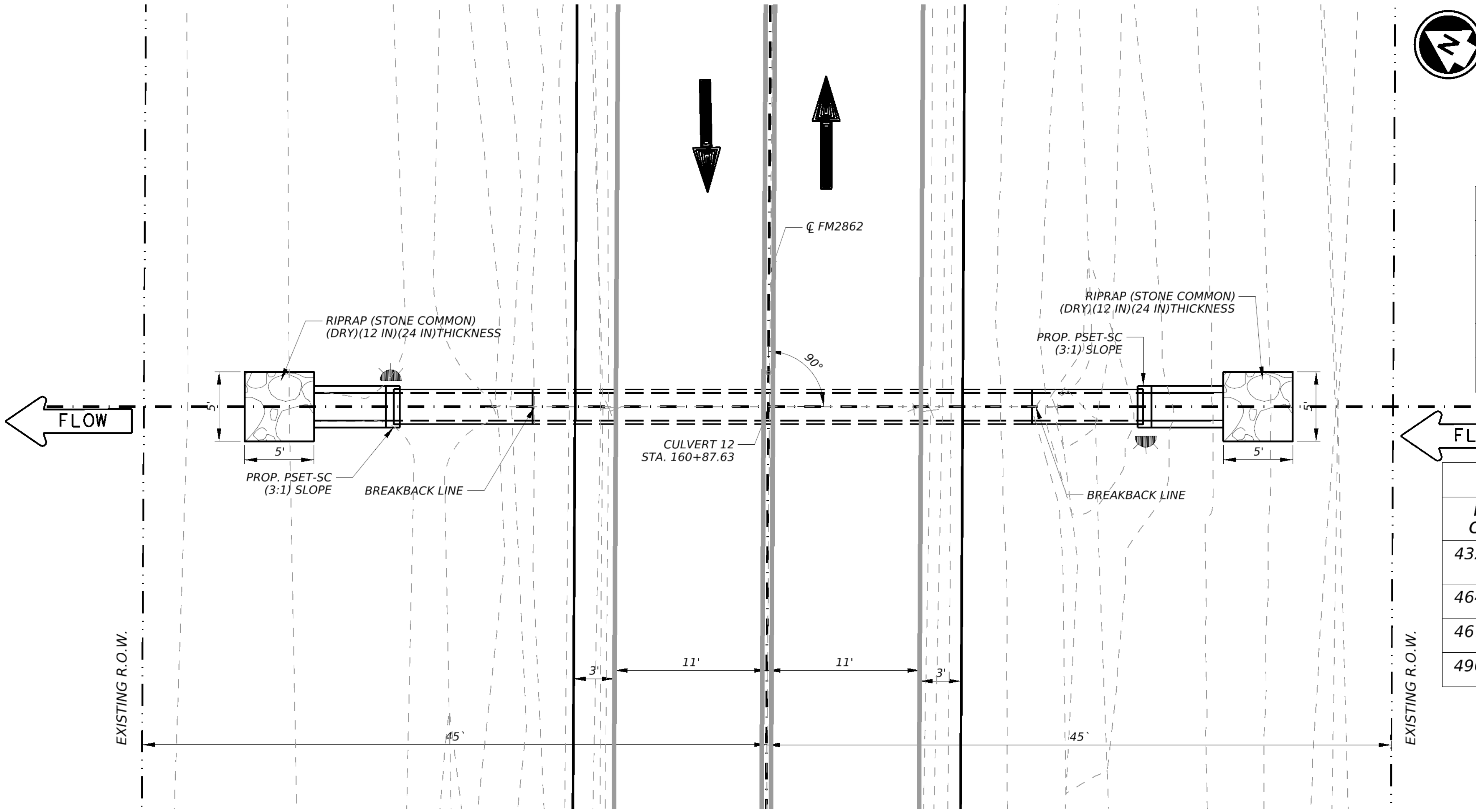
CULVERT NO. 11 LAYOUT
STA. 152+04.45

SCALE: 1"=10`-H
1"=10`-V

SHEET 11 OF 14

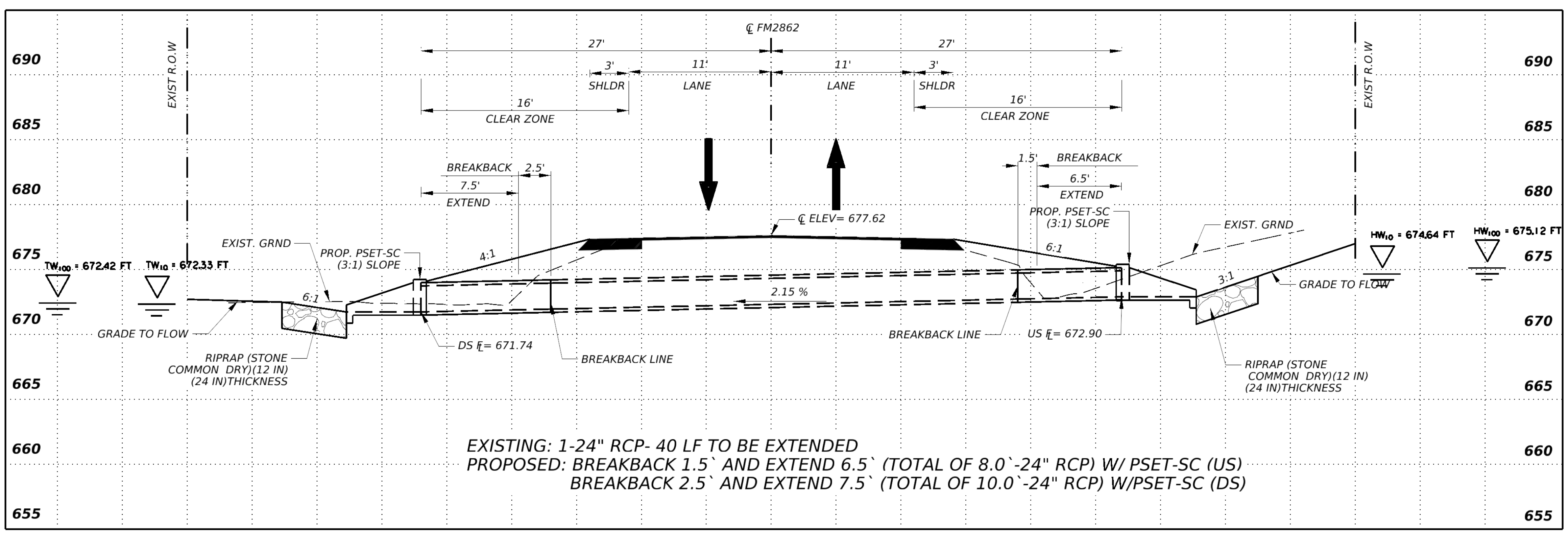
CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		101

DATE: 3/23/2023 4:02:44 PM
FILE: c:\...\txdot5\madiha.alshammry\d0747294\FM2862 CULVERT 11 LAYOUT SHEET.dgn



HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	6.66	8.29	674.64	672.33
100	36.6	9.02	675.12	672.42

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	4
464-6005	RC PIPE (CL III)(24 IN)	LF	18
467-6388	SET (TY II)(24 IN)(RCP)(3:1) (C)	EA	2
496-6007	REMOV STR (PIPE)	LF	4



EXISTING: 1-24" RCP- 40 LF TO BE EXTENDED
PROPOSED: BREAKBACK 1.5` AND EXTEND 6.5` (TOTAL OF 8.0`-24" RCP) W/ PSET-SC (US)
BREAKBACK 2.5` AND EXTEND 7.5` (TOTAL OF 10.0`-24" RCP) W/PSET-SC (DS)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 12 LAYOUT
STA. 160+87.63

SCALE: 1"=10`-H
1"=10`-V

SHEET12 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		102

DATE: 3/23/2023 4:05:03 PM
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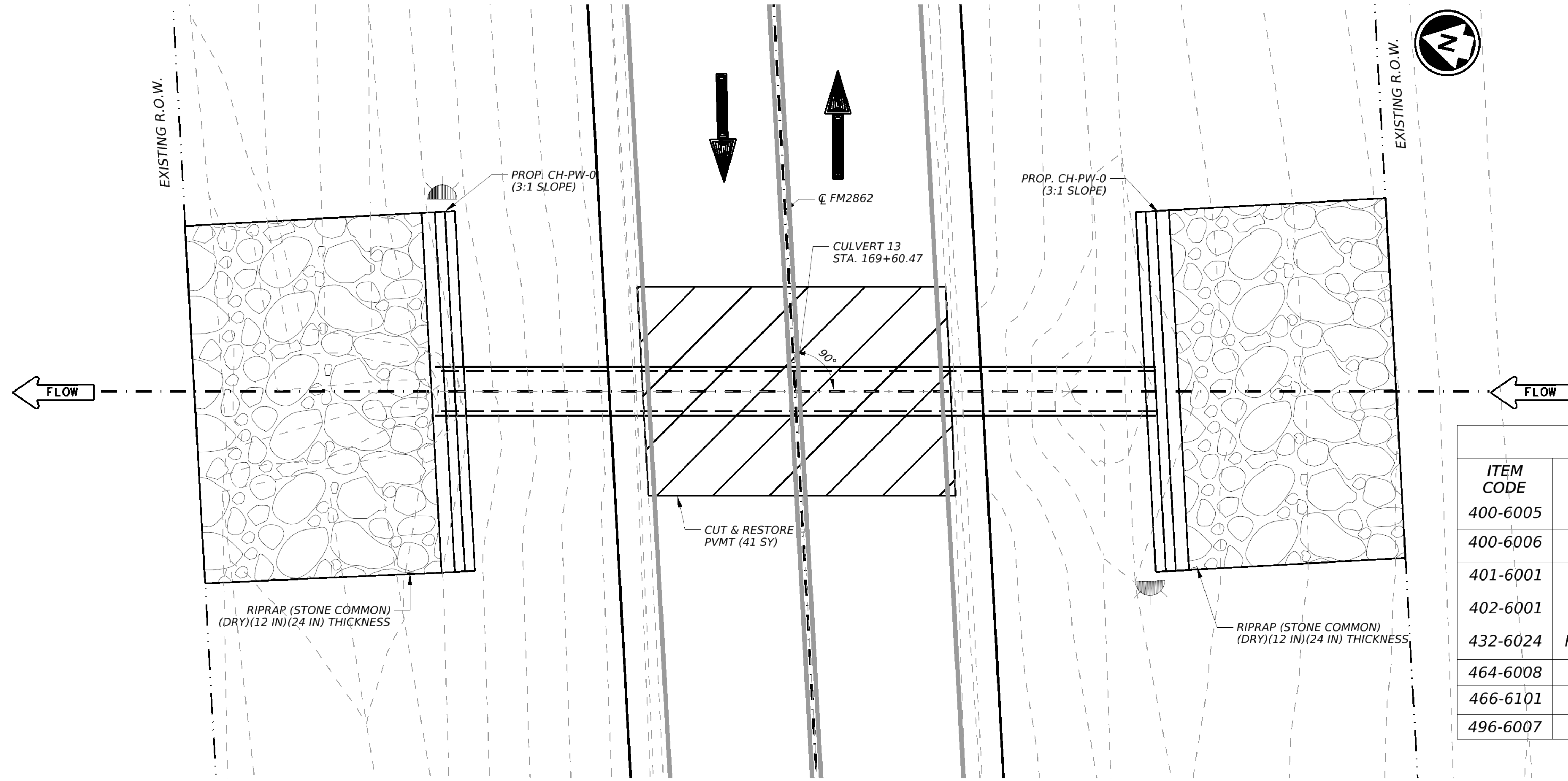
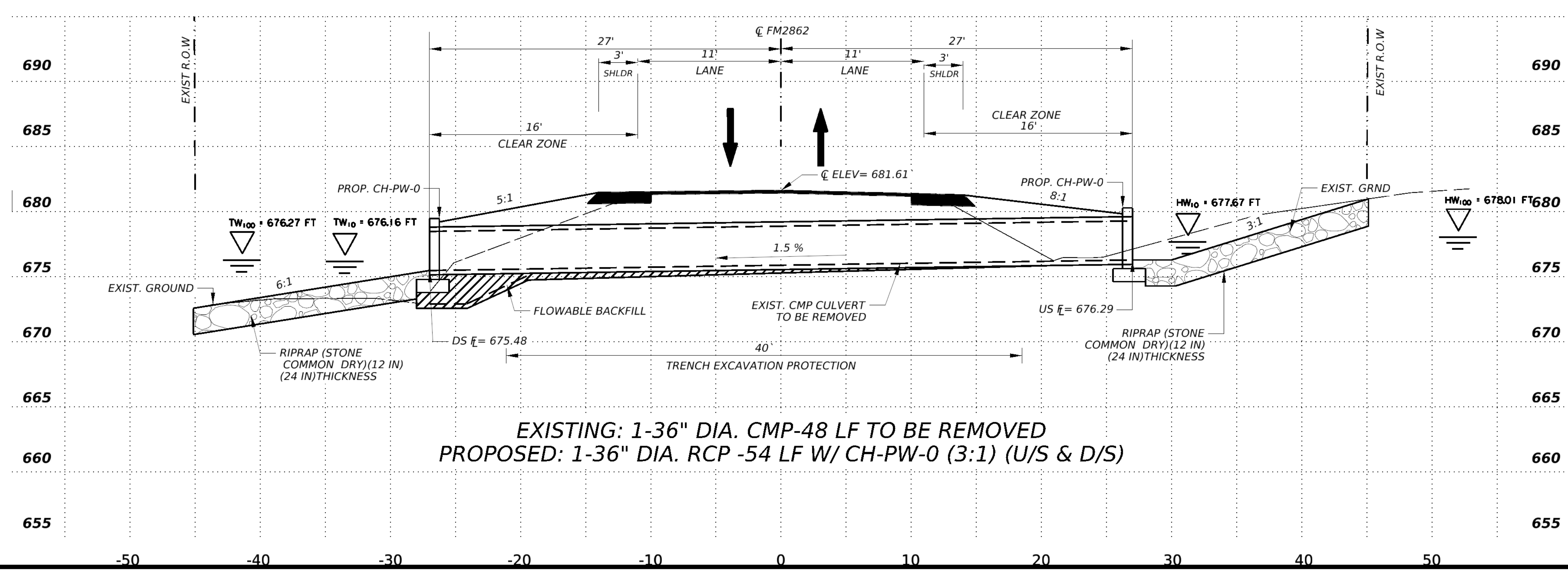


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	10.22	7.82	677.67	676.16
100	14.79	8.51	678.01	676.27

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	43
400-6006	CUT & RESTORE PAV	SY	41
401-6001	FLOWABLE BACKFILL	CY	4
402-6001	TRENCH EXCAVATION PROTECTION	LF	40
432-6024	RIPRAP (STONE COMMON)(DRY) (12 IN)	CY	69
464-6008	RC PIPE (CL III)(36 IN)	LF	54
466-6101	HEADWALL (CH-PW-0)(DIA= 36 IN)	EA	2
496-6007	REMOV STR (PIPE)	LF	48



EXISTING: 1-36" DIA. CMP-48 LF TO BE REMOVED
PROPOSED: 1-36" DIA. RCP -54 LF W/ CH-PW-0 (3:1) (U/S & D/S)

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 13 LAYOUT
STA. 169+60.47

SCALE: 1"=10`-H
1"=10`-V

SHEET13 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	103

DATE: 3/23/2023 4:08:12 PM
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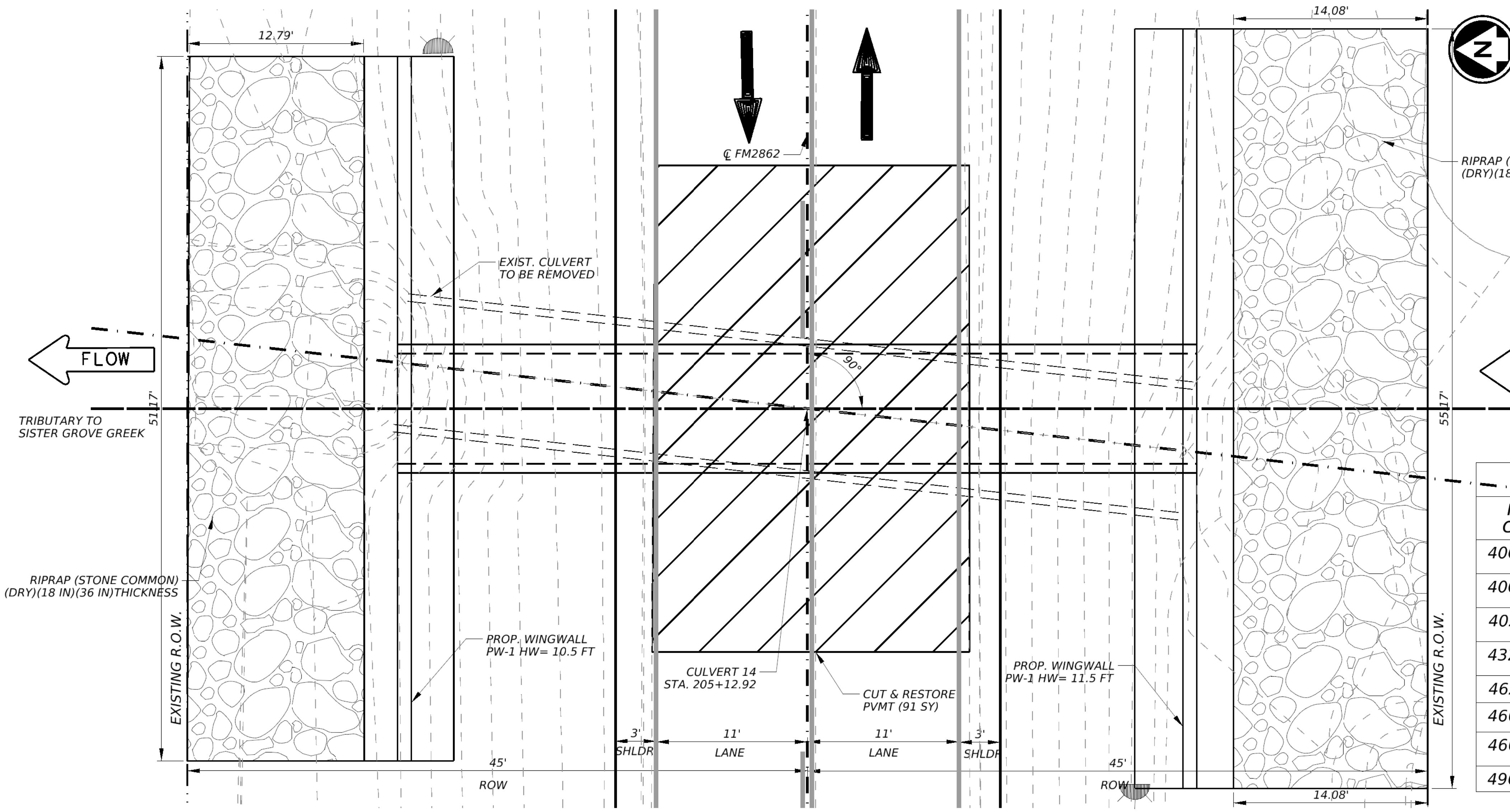
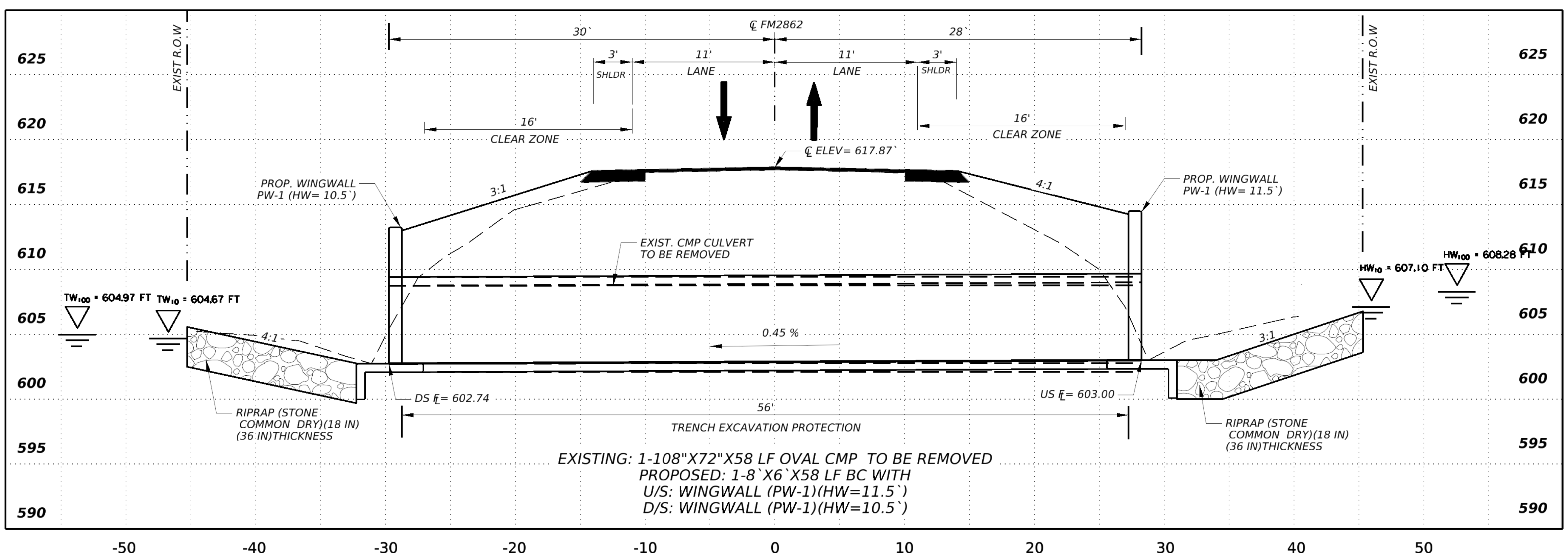


HYDRAULIC DATA				
PROPOSED STRUCTURE				
YEAR	Q	V	HW EL.	TW EL.
	CFS	FPS	FT	FT
10	171.08	9.86	607.10	604.67
100	251.11	11.03	608.28	604.97

ESTIMATED QUANTITES			
ITEM CODE	DESCRIPTION	UNIT	QUANTITY
400-6005	CEM STABIL BKFL	CY	78
400-6006	CUT & RESTORE PAV	SY	91
402-6001	TRENCH EXCAVATION PROTECTION	LF	56
432-6026	RIPRAP (STONE COMMON)(DRY)(18 IN)	CY	160
462-6021	CONC BOX CULV (8 FTX6 FT)	LF	58
466-6172	WINGWALL (PW-1)(HW=11 FT)	EA	1
466-6173	WINGWALL (PW-1)(HW=12 FT)	EA	1
496-6007	REMOV STR (PIPE)	LF	58



STATE OF TEXAS
MADIHA ALSHAMMRY
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Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

CULVERT NO. 14 LAYOUT
STA. 205+12.92

SCALE: 1"=10`-H
1"=10`-V

SHEET14 OF 14

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	104

DATE: 3/23/2023 4:11:04 PM
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Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw (1) Height of Wingwall (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
205+12.92 (LT)	1 ~ 8'x 6'	8.3'	SCC-8	PW-1	0°	2:1	8"	7"	3.840'	10.500'	N/A	N/A	21.000'	9.167'	N/A	0.0	1.3	27.0	441
205+12.92 (RT)	1 ~ 8'x 6'	8.3'	SCC-8	PW-1	0°	2:1	8"	7"	4.840'	11.500'	N/A	N/A	23.000'	9.167'	N/A	0.0	1.6	34.4	529

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.

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madihaa Alshammry, P.E. 3/17/2023

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE: bcsstde1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		105

DATE: 3/16/2023 9:26:44 PM
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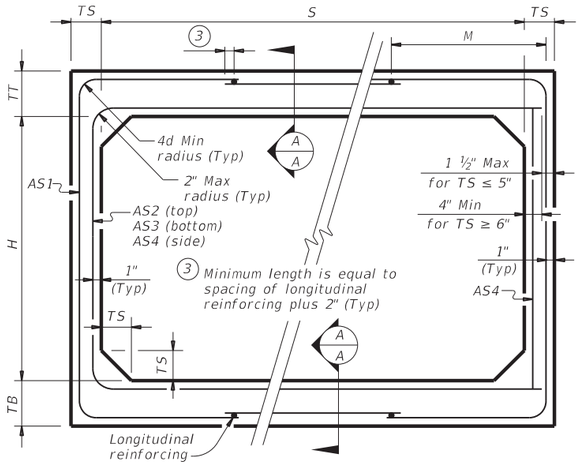
BOX DATA

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)
8	3	8	8	8	< 2	–	0.31	0.35	0.25	0.19	0.19	0.19	0.19	10.4
8	3	8	8	8	2 < 3	55	0.35	0.29	0.28	0.19	–	–	–	10.4
8	3	8	8	8	3 – 5	50	0.28	0.23	0.24	0.19	–	–	–	10.4
8	3	8	8	8	10	45	0.29	0.25	0.26	0.19	–	–	–	10.4
8	3	8	8	8	15	45	0.39	0.33	0.34	0.19	–	–	–	10.4
8	3	8	8	8	20	45	0.51	0.43	0.44	0.19	–	–	–	10.4
8	3	8	8	8	25	45	0.63	0.53	0.54	0.19	–	–	–	10.4
8	4	8	8	8	< 2	–	0.27	0.38	0.29	0.19	0.19	0.19	0.19	11.2
8	4	8	8	8	2 < 3	50	0.31	0.34	0.32	0.19	–	–	–	11.2
8	4	8	8	8	3 – 5	50	0.25	0.27	0.27	0.19	–	–	–	11.2
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	–	–	–	11.2
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	–	–	–	11.2
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	–	–	–	11.2
8	5	8	8	8	< 2	–	0.24	0.40	0.32	0.19	0.19	0.19	0.19	12.0
8	5	8	8	8	2 < 3	50	0.28	0.37	0.35	0.19	–	–	–	12.0
8	5	8	8	8	3 – 5	45	0.23	0.29	0.30	0.19	–	–	–	12.0
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	–	–	–	12.0
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	–	–	–	12.0
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	–	–	–	12.0
8	6	8	8	8	< 2	–	0.22	0.42	0.35	0.19	0.19	0.19	0.19	12.8
8	6	8	8	8	2 < 3	50	0.25	0.40	0.38	0.19	–	–	–	12.8
8	6	8	8	8	3 – 5	50	0.21	0.32	0.33	0.19	–	–	–	12.8
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	–	–	–	12.8
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	–	–	–	12.8
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	–	–	–	12.8
8	7	8	8	8	< 2	–	0.20	0.44	0.37	0.19	0.19	0.19	0.19	13.6
8	7	8	8	8	2 < 3	55	0.23	0.43	0.41	0.19	–	–	–	13.6
8	7	8	8	8	3 – 5	55	0.19	0.34	0.35	0.19	–	–	–	13.6
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	–	–	–	13.6
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	–	–	–	13.6
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	–	–	–	13.6
8	8	8	8	8	< 2	–	0.20	0.45	0.40	0.19	0.19	0.19	0.19	14.4
8	8	8	8	8	2 < 3	65	0.21	0.45	0.44	0.19	–	–	–	14.4
8	8	8	8	8	3 – 5	65	0.19	0.36	0.38	0.19	–	–	–	14.4
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	–	–	–	14.4
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	–	–	–	14.4
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	–	–	–	14.4

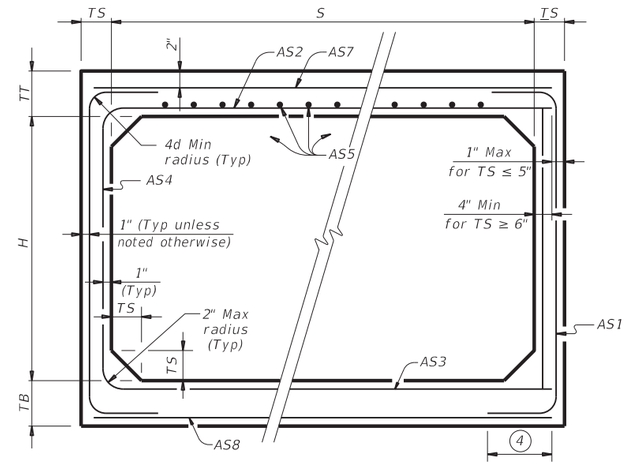
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

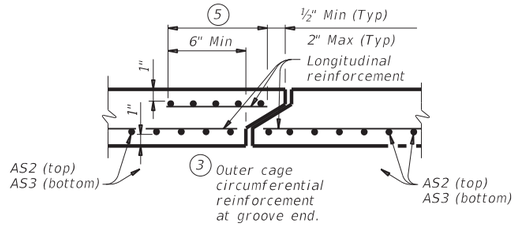
FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

8'-0" SPAN

SCP-8

FILE: scp08sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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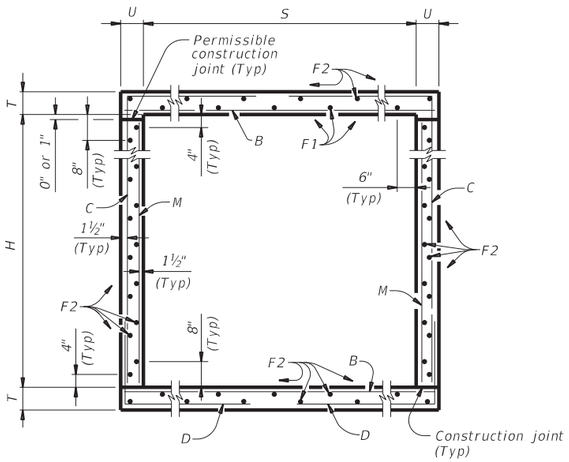
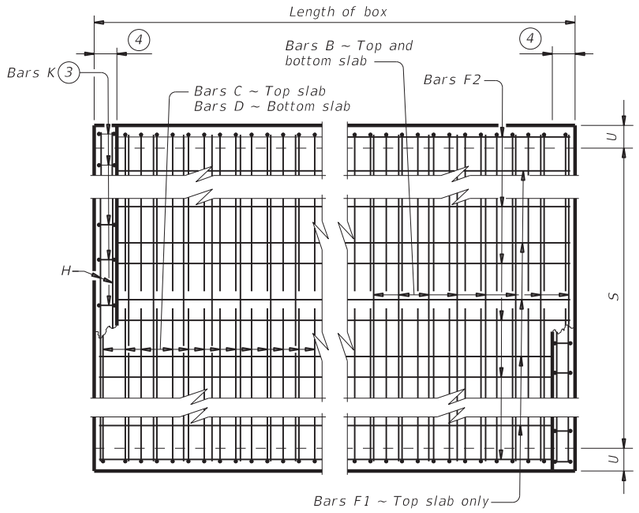
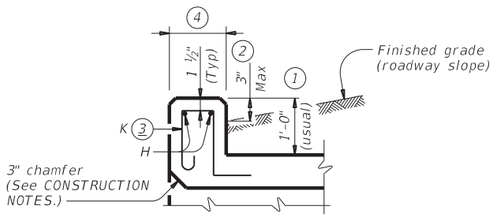


TYPICAL SECTION



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. per ft. requirement in this example, the required spacing = (0.306 sq. in.) / (0.755 sq. in. per ft.) x (12 in. per ft.) = 4.86" Max spacing. Required lap length for the provided D30.6 wire is 2'-1" (the same minimum lap length required for uncoated #5 bars, as listed under MATERIAL NOTES).

CONSTRUCTION NOTES:

Do not use permanent forms.

Chamfer the bottom edge of the top slab 3" at the entrance.

Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

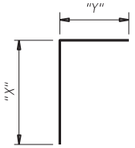
Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

GENERAL NOTES:

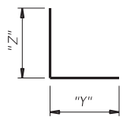
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.

See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

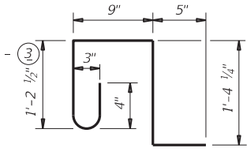
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08sle-21.dgn	DN: TRE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		107

DATE: 3/16/2023 10:23:53 PM
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SECTION DIMENSIONS				FILL HEIGHT ⑤	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																														QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Weight	No.	Size	Spa	Length	Weight	" X "	" Y "	No.	Size	Spa	Length	Weight	" Y "	" Z "	No.	Spa	Length	Weight	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
8' – 0"	3' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	8' – 8"	1,406	3' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.582	153.5	0.7	80	24.0	6,219
8' – 0"	3' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 10"	1,433	3' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.724	154.5	0.7	85	29.6	6,266
8' – 0"	3' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	8' – 11"	1,446	3' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	3' – 0"	164	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.782	155.2	0.7	85	32.0	6,293
8' – 0"	3' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	9' – 2"	1,487	3' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	3' – 0"	216	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.929	159.6	0.7	86	37.9	6,468
8' – 0"	4' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	9' – 8"	1,568	4' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	8' – 11"	24	20	56	0.626	159.4	0.7	80	25.7	6,454
8' – 0"	4' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 10"	1,595	4' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.774	160.0	0.7	85	31.6	6,483
8' – 0"	4' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	9' – 11"	1,609	4' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	4' – 0"	219	6	39' – 9"	159	32	39' – 9"	850	9' – 1"	24	22	61	0.831	160.7	0.7	85	33.9	6,511
8' – 0"	4' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	10' – 2"	1,649	4' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	4' – 0"	289	6	39' – 9"	159	32	39' – 9"	850	9' – 3"	25	22	61	0.985	165.4	0.7	86	40.1	6,703
8' – 0"	5' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	10' – 8"	1,730	5' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	8' – 11"	24	20	56	0.669	167.9	0.7	80	27.4	6,794
8' – 0"	5' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 10"	1,757	5' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.823	168.0	0.7	85	33.6	6,806
8' – 0"	5' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	10' – 11"	1,771	5' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	5' – 0"	274	6	39' – 9"	159	36	39' – 9"	956	9' – 1"	24	22	61	0.881	168.7	0.7	85	35.9	6,834
8' – 0"	5' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	11' – 2"	1,811	5' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	5' – 0"	361	6	39' – 9"	159	36	39' – 9"	956	9' – 3"	25	22	61	1.040	173.9	0.7	86	42.3	7,043
8' – 0"	6' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	108	#6	9"	11' – 8"	1,893	6' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.712	176.4	0.7	80	29.2	7,135
8' – 0"	6' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 10"	1,920	6' – 8"	5' – 2"	108	#6	9"	8' – 5"	1,365	5' – 2"	3' – 3"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.872	176.1	0.7	85	35.6	7,130
8' – 0"	6' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	108	#6	9"	11' – 11"	1,933	6' – 9"	5' – 2"	108	#6	9"	8' – 6"	1,379	5' – 2"	3' – 4"	82	12"	6' – 0"	329	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.930	176.8	0.7	85	37.9	7,157
8' – 0"	6' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	108	#6	9"	12' – 2"	1,974	6' – 11"	5' – 3"	108	#6	9"	8' – 9"	1,419	5' – 3"	3' – 6"	108	9"	6' – 0"	433	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.096	182.5	0.7	86	44.5	7,384
8' – 0"	7' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	12' – 8"	2,055	7' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	182.2	0.7	80	30.9	7,369
8' – 0"	7' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	12' – 8"	3,082	7' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	8' – 11"	24	20	56	0.755	224.6	0.7	80	30.9	9,065
8' – 0"	7' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 10"	3,123	7' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.922	224.6	0.7	85	37.6	9,070
8' – 0"	7' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	12' – 11"	3,143	7' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	82	12"	7' – 0"	383	6	39' – 9"	159	40	39' – 9"	1,062	9' – 1"	24	22	61	0.979	225.6	0.7	85	39.8	9,110
8' – 0"	7' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	13' – 2"	3,204	7' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	108	9"	7' – 0"	505	6	39' – 9"	159	40	39' – 9"	1,062	9' – 3"	25	22	61	1.151	232.8	0.7	86	46.7	9,396
8' – 0"	8' – 0"	8"	7"	13'	162	#6	6"	8' – 11"	2,170	108	#6	9"	13' – 8"	2,217	8' – 6"	5' – 2"	108	#6	9"	8' – 3"	1,338	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	190.7	0.7	80	32.6	7,709
8' – 0"	8' – 0"	8"	7"	16'	162	#6	6"	8' – 11"	2,170	162	#6	6"	13' – 8"	3,325	8' – 6"	5' – 2"	162	#6	6"	8' – 3"	2,007	5' – 2"	3' – 1"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	8' – 11"	24	20	56	0.798	235.2	0.7	80	32.6	9,486
8' – 0"	8' – 0"	10"	8"	20'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 10"	3,366	8' – 8"	5' – 2"	162	#6	6"	8' – 5"	2,048	5' – 2"	3' – 3"	108	9"	8' – 0"	577	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	0.971	238.2	0.7	85	39.5	9,613
8' – 0"	8' – 0"	11"	8"	23'	162	#6	6"	9' – 1"	2,210	162	#6	6"	13' – 11"	3,386	8' – 9"	5' – 2"	162	#6	6"	8' – 6"	2,068	5' – 2"	3' – 4"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 1"	24	22	61	1.029	246.4	0.7	85	41.8	9,942
8' – 0"	8' – 0"	13"	9"	30'	162	#6	6"	9' – 3"	2,251	162	#6	6"	14' – 2"	3,447	8' – 11"	5' – 3"	162	#6	6"	8' – 9"	2,129	5' – 3"	3' – 6"	162	6"	8' – 0"	866	6	39' – 9"	159	44	39' – 9"	1,168	9' – 3"	25	22	61	1.207	250.5	0.7	86	49.0	10,106

⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		108

DATE: 3/16/2023 9:27:22 PM
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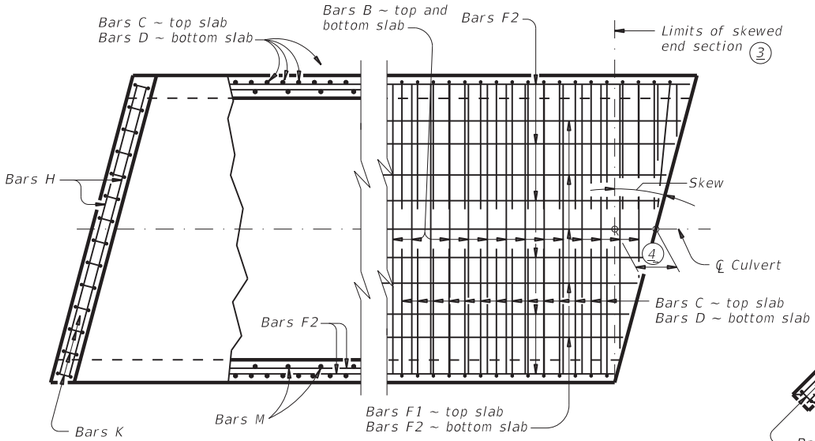
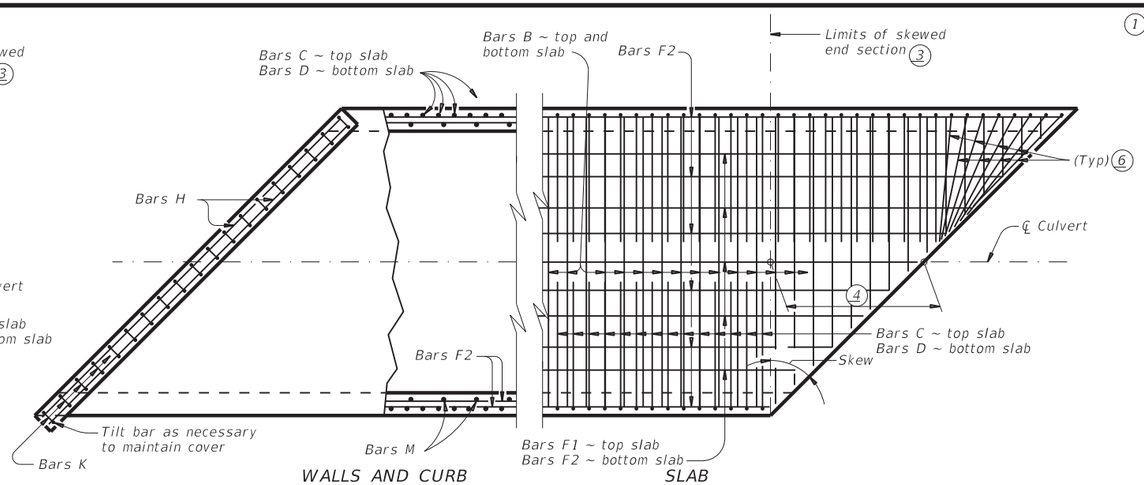
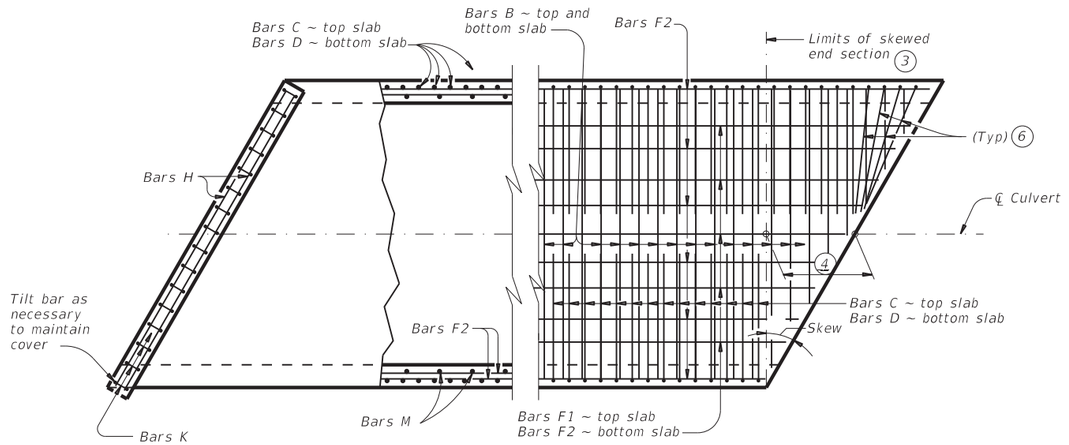


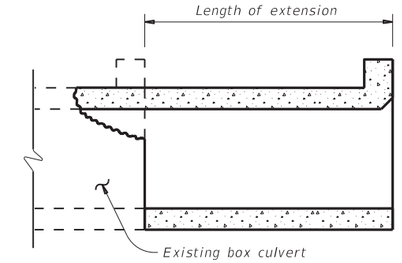
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



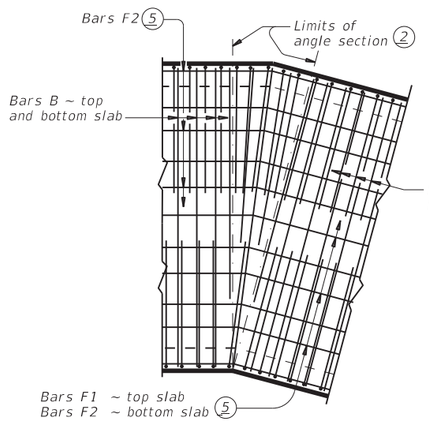
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



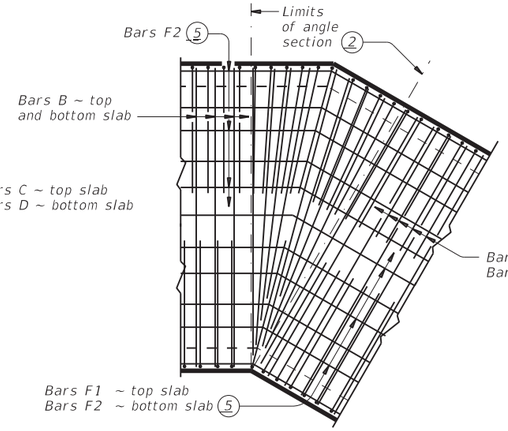
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



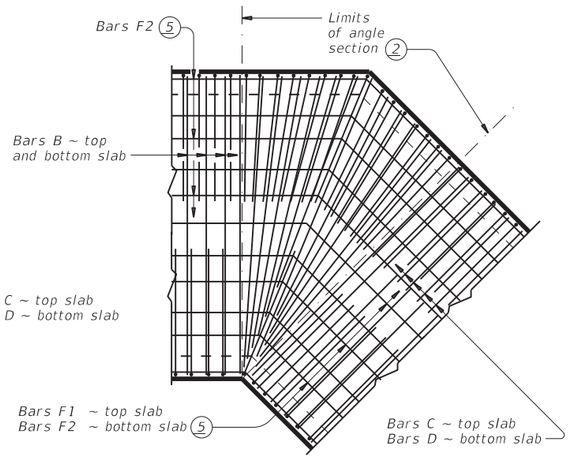
LENGTHENING DETAIL (1)



PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°

(1) For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars 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

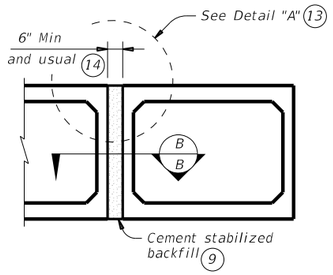
Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

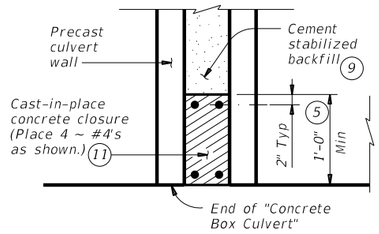
SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		109

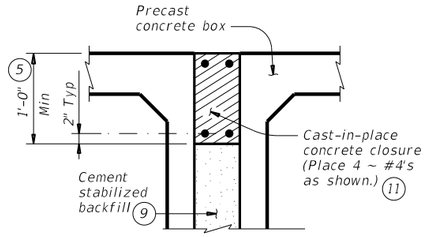
DATE: 2023/0%
FILE: DOCUMENT NAME



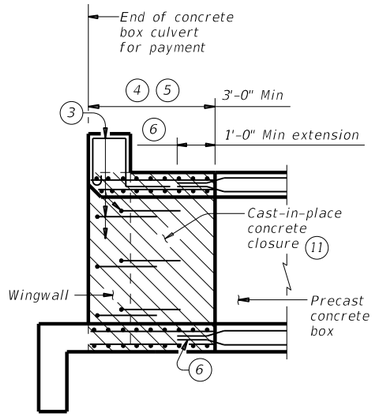
MULTIPLE UNIT PLACEMENT



SECTION B-B

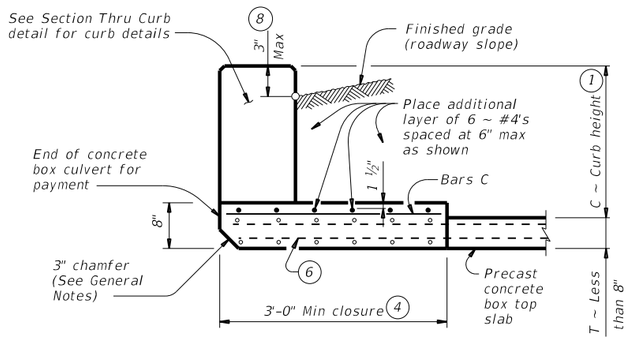


DETAIL "A" (13)

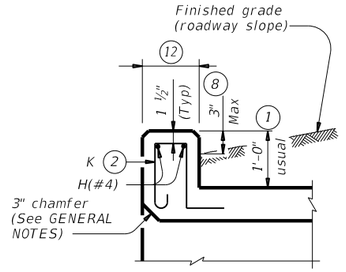


WINGWALL CONNECTION

(Also applies to safety end treatment.)

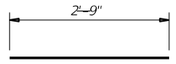


SECTION THRU TOP SLABS LESS THAN 8"

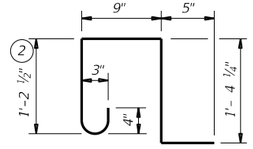


SECTION THRU CURB

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 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.

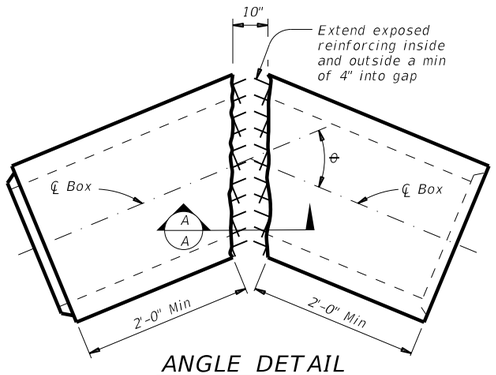
10 All curb concrete and reinforcing is considered part of the box culvert for payment.

11 Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.

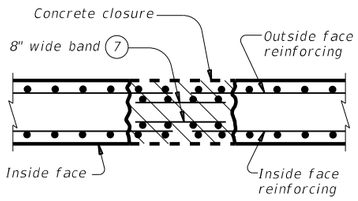
12 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.

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".

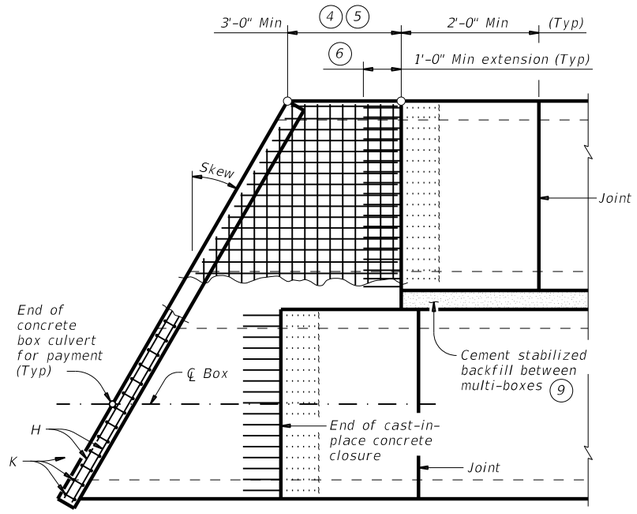
14 This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.

HL93 LOADING

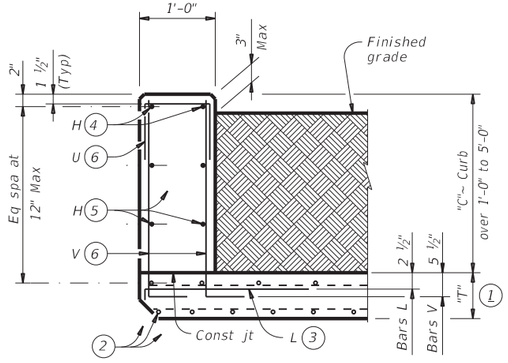
Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

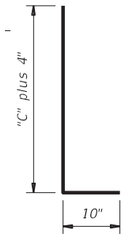
SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		110



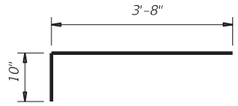
TYPICAL SECTION

Used for curbs over 1'–0" to 5'–0"



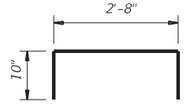
BARS V (#5) (6)

Spaced at 12" Max



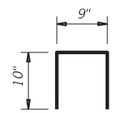
BARS L (#5) (3)

Spaced at 12" Max



OPTIONAL BARS L (#5) (3) (7)

Spaced at 12" Max



BARS U (#4) (6)

Spaced at 12" Max

(1) "T" is equal to the culvert top slab thickness. For precast boxes with slabs less than 8" thick, see SCP-MD standard for additional details.

(2) Adjust normal culvert slab bars as necessary to clear obstructions.

(3) Place bars L as shown. Tilt hook as necessary to maintain cover.

(4) Place normal culvert curb bars H(#4) as shown. Adjust as necessary to clear obstructions.

(5) Additional bars H(#4) as required to maintain 12" Max spacing.

(6) Replace normal culvert curb bars K with one bar U and two bars V as shown spaced at 12" Max. Adjust length of bars V as necessary to maintain clear cover.

(7) Optional bars L are to be used only for precast box culverts with 3'–0" closure pour.

(8) Quantities shown are for Contractor's information only. Quantities are per linear foot of curb length. The value in table can be interpolated for intermediate values of curb height, "C". Quantity includes bars K (when applicable).

--TABLE OF ESTIMATED CURB QUANTITIES (8)

Curb Height "C"	Conc (CY/LF)	Reinf Steel (Lb/LF)
1'–0"	0.037	10.4
1'–6"	0.056	14.5
2'–0"	0.074	15.6
2'–6"	0.093	18.0
3'–0"	0.111	19.0
3'–6"	0.130	21.3
4'–0"	0.148	22.4
4'–6"	0.167	24.8
5'–0"	0.185	25.9

CONSTRUCTION NOTES:

Adjust reinforcing steel as necessary to provide 1 ¼" cover.

For vehicle safety, top of the curb must not project more than 3" above the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Provide galvanized reinforcing steel if required elsewhere in the plans.

Provide Class "C" concrete (f'c = 3,600 psi) minimum for curbs.

Provide bar laps, where required, as follows:

- Uncoated or galvanized ~ #4 = 1'–8" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

These extended curb details have sufficient strength to allow for future retrofit of Type T631 or T631LS railing. These details are suitable for use with PR11, PR22 and PR3 type rails. These details are not suitable for the mounting of other rail types. For new construction using T631 or T631LS railing, use the T631-CM standard.

This Curb is considered as part of the Box Culvert for payment.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

Texas Department of Transportation

Bridge Division Standard

EXTENDED CURB DETAILS

FOR BOX CULVERTS WITH CURBS OVER 1'-0" TO 5'-0" TALL

ECD

FILE: ecdstde1-20.dgn	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		111

DATE: 3/16/2023 10:28:19 PM
FILE: c:\txdot\pw_online\txdot5\madiha.olshamry\d0872528\ecdstde1-20_5A.dgn

DATE: 2023/0%
FILE: DOCUMENT NAME

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

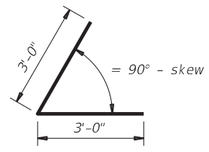
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

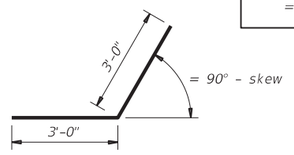
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2

WING DIMENSION FORMULAS:
(All values are in feet.)

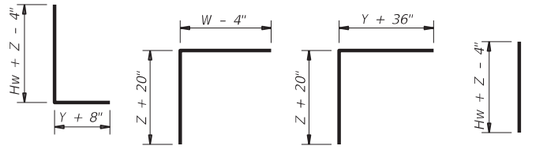
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

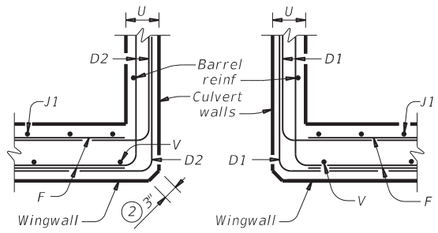
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

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

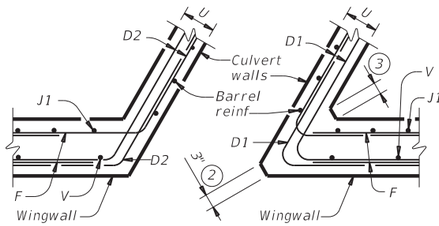
See applicable box culvert standard sheet for S, H, T, and U values.



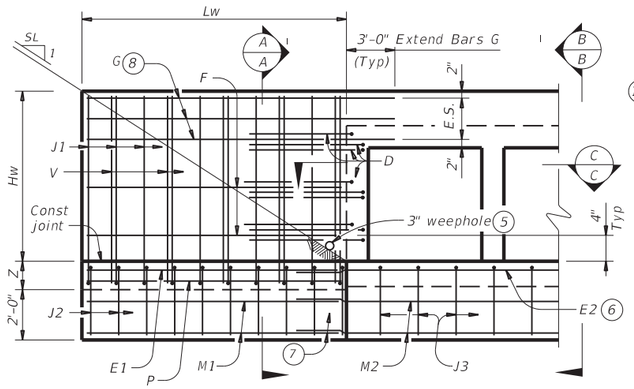
BARS J1 BARS J2 BARS J3 BARS V



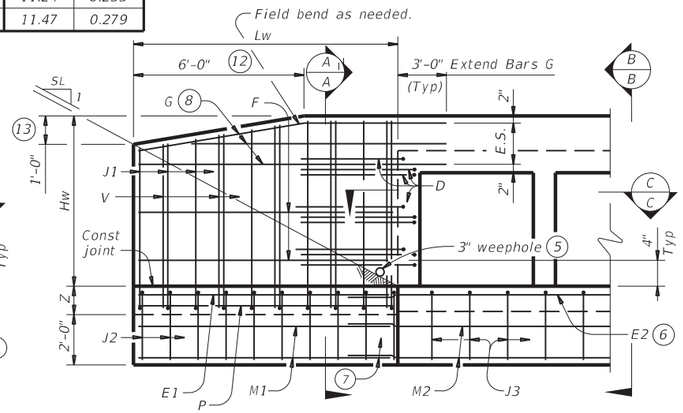
SECTION C-C - PW-1



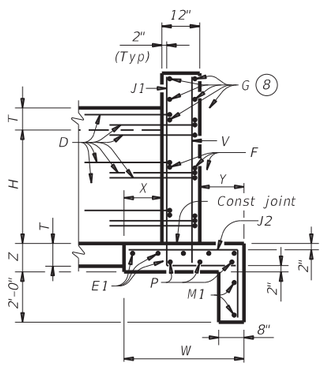
SECTION C-C - PW-2



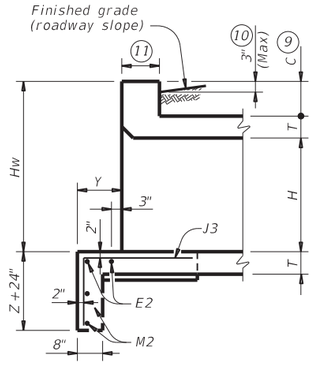
PARTIAL ELEVATION - PW-1



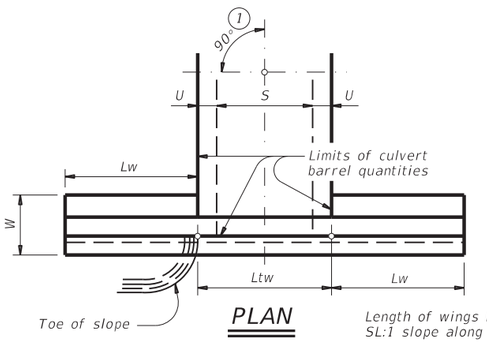
PARTIAL ELEVATION - PW-2



SECTION A-A
(Showing wing reinforcement.)

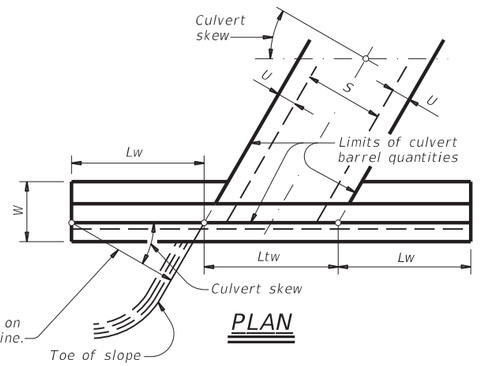


SECTION B-B
(Showing wing reinforcement.)



PLAN

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 reinforing 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

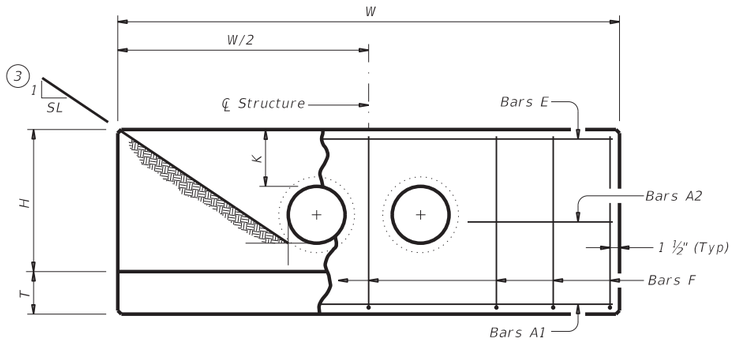
CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS
TYPES PW-1 AND PW-2

PW

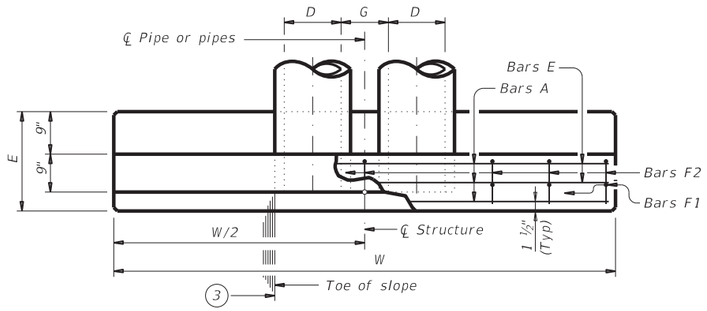
FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		112

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

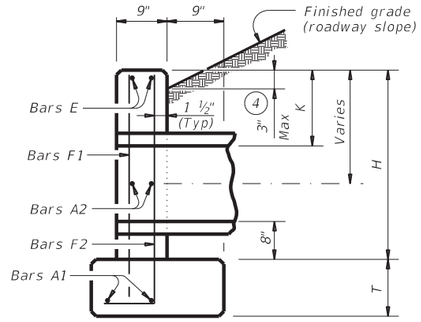
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	24"	14' – 0"	217	2.1	3' – 7"	34	0.4
	27"	15' – 3"	254	2.4	3' – 11"	37	0.5
	30"	16' – 6"	272	2.7	4' – 4"	40	0.6
	33"	17' – 9"	314	3.1	4' – 8"	43	0.6
	36"	19' – 0"	371	3.9	5' – 1"	46	0.8
	42"	21' – 6"	442	4.9	5' – 10"	52	1.0
	48"	25' – 0"	569	6.4	6' – 7"	59	1.3
	54"	27' – 6"	701	7.5	7' – 6"	82	1.6
	60"	30' – 0"	794	8.8	8' – 3"	90	1.8
	66"	32' – 6"	894	10.2	8' – 9"	96	2.0
	72"	35' – 0"	1,055	11.7	9' – 4"	103	2.3
3:1	12"	13' – 0"	175	1.6	1' – 9"	14	0.2
	15"	14' – 9"	193	1.9	2' – 2"	17	0.2
	18"	16' – 6"	228	2.2	2' – 8"	19	0.3
	21"	18' – 3"	299	2.6	3' – 1"	31	0.4
	24"	20' – 0"	323	3.0	3' – 7"	33	0.4
	27"	21' – 9"	371	3.5	3' – 11"	37	0.5
	30"	23' – 6"	415	4.0	4' – 4"	40	0.5
	33"	25' – 3"	469	4.6	4' – 8"	43	0.6
	36"	27' – 0"	556	5.7	5' – 1"	46	0.8
	42"	30' – 6"	675	7.1	5' – 10"	52	1.0
	48"	35' – 6"	837	9.2	6' – 7"	59	1.3
	54"	39' – 0"	1,015	11.0	7' – 6"	84	1.6
	60"	42' – 6"	1,171	12.9	8' – 3"	91	1.8
	66"	46' – 0"	1,298	14.9	8' – 9"	98	2.0
	72"	49' – 6"	1,561	17.1	9' – 4"	103	2.3
4:1	12"	17' – 0"	229	2.0	1' – 9"	15	0.2
	15"	19' – 3"	266	2.4	2' – 2"	17	0.2
	18"	21' – 6"	308	2.9	2' – 8"	19	0.3
	21"	23' – 9"	382	3.5	3' – 1"	31	0.3
	24"	26' – 0"	430	3.9	3' – 7"	34	0.4
	27"	28' – 3"	486	4.7	3' – 11"	37	0.5
	30"	30' – 6"	539	5.2	4' – 4"	40	0.6
	33"	32' – 9"	603	6.0	4' – 8"	42	0.6
	36"	35' – 0"	738	7.5	5' – 1"	47	0.8
	42"	39' – 6"	881	9.3	5' – 10"	52	1.0
	48"	46' – 0"	1,102	12.1	6' – 7"	61	1.3
	54"	50' – 6"	1,364	14.4	7' – 6"	84	1.6
	60"	55' – 0"	1,547	16.9	8' – 3"	91	1.8
	66"	59' – 6"	1,741	19.5	8' – 9"	98	2.0
	72"	64' – 0"	2,077	22.4	9' – 4"	102	2.3
6:1	12"	25' – 0"	336	3.0	1' – 9"	14	0.2
	15"	28' – 3"	384	3.6	2' – 2"	17	0.2
	18"	31' – 6"	452	4.2	2' – 8"	19	0.3
	21"	34' – 9"	581	5.1	3' – 1"	31	0.4
	24"	38' – 0"	644	5.8	3' – 7"	34	0.4
	27"	41' – 3"	737	6.9	3' – 11"	37	0.5
	30"	44' – 6"	807	7.7	4' – 4"	39	0.6
	33"	47' – 9"	912	8.9	4' – 8"	44	0.6
	36"	51' – 0"	1,108	11.0	5' – 1"	48	0.8
	42"	57' – 6"	1,318	13.7	5' – 10"	54	1.0
	48"	67' – 0"	1,682	17.9	6' – 7"	59	1.3
	54"	73' – 6"	2,072	21.3	7' – 6"	83	1.6
	60"	80' – 0"	2,351	24.9	8' – 3"	89	1.8
	66"	86' – 6"	2,643	28.9	8' – 9"	96	2.0
	72"	93' – 0"	3,121	33.1	9' – 4"	101	2.3



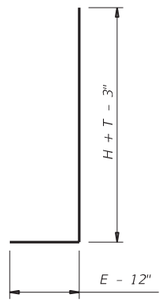
ELEVATION



PLAN OF NON-SKEWED PIPES



SECTION AT CENTER OF PIPE



BARS F2

(1) Total quantities 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).

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"	~

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.

Texas Department of Transportation

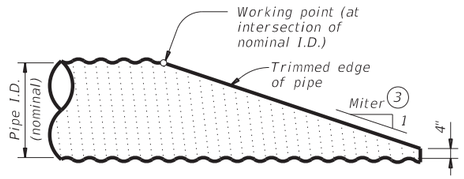
Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR NON-SKEWED PIPE CULVERTS

CH-PW-0

FILE: chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		113

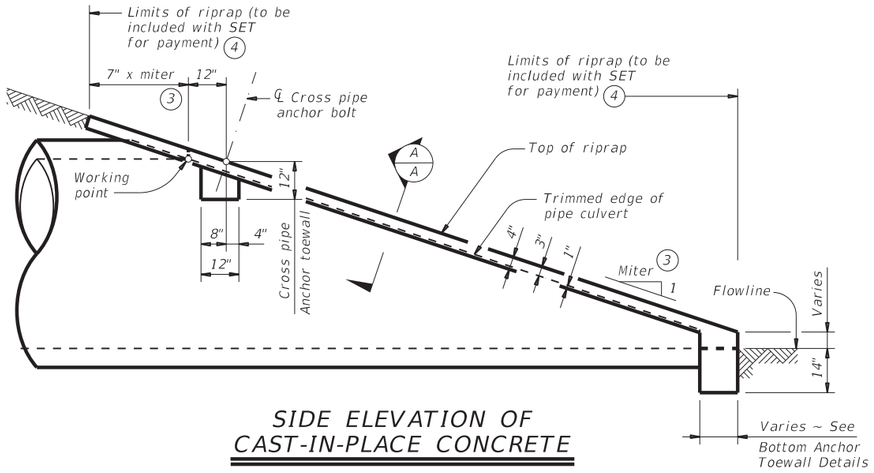
DATE:
FILE:



NOTE: All pipe runners, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

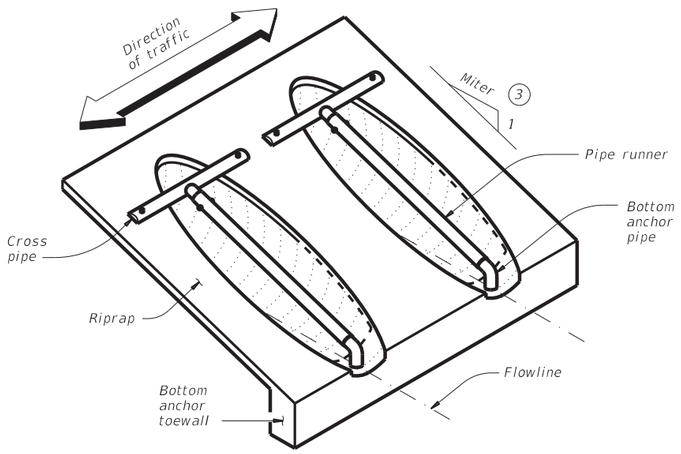
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(Showing corrugated metal pipe (CMP) culvert.
Details of reinforced concrete pipe (RCP) culvert are similar.)



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert.
Details of corrugated metal pipe (CMP) culvert
are similar. Pipe runners not shown for clarity)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

(Showing installation with no skew.)

CROSS PIPE LENGTHS AND PIPE RUNNER LENGTHS (1) (2)

Nominal Culvert I.D.	Pipe Culvert Spa ~ G	Cross Pipe Length	Pipe Runner Length											
			3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
			0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
24"	1' – 7"	3' – 5"	N/A	N/A	N/A	5' – 10"	N/A	N/A	N/A	8' – 1"	N/A	N/A	N/A	12' – 9"
27"	1' – 8"	3' – 8"	N/A	N/A	5' – 5"	6' – 11"	N/A	N/A	7' – 7"	9' – 7"	N/A	N/A	11' – 11"	14' – 11"
30"	1' – 10"	3' – 11"	N/A	N/A	6' – 4"	8' – 0"	N/A	N/A	8' – 9"	11' – 0"	N/A	N/A	13' – 8"	17' – 0"
33"	1' – 11"	4' – 2"	6' – 2"	6' – 5"	7' – 3"	9' – 1"	8' – 6"	8' – 10"	10' – 0"	12' – 5"	13' – 3"	13' – 9"	15' – 5"	19' – 2"
36"	2' – 1"	4' – 5"	6' – 11"	7' – 3"	8' – 2"	10' – 2"	9' – 6"	9' – 11"	11' – 2"	13' – 10"	14' – 9"	15' – 3"	17' – 2"	21' – 3"
42"	2' – 4"	4' – 11"	8' – 6"	8' – 10"	9' – 11"	12' – 4"	11' – 7"	12' – 0"	13' – 6"	16' – 8"	17' – 9"	18' – 5"	20' – 8"	25' – 7"
48"	2' – 7"	5' – 5"	10' – 1"	10' – 5"	11' – 9"	N/A	13' – 7"	14' – 2"	15' – 10"	N/A	20' – 9"	21' – 6"	24' – 2"	N/A
54"	3' – 0"	5' – 11"	11' – 8"	12' – 1"	N/A	N/A	15' – 8"	16' – 3"	N/A	N/A	23' – 10"	24' – 8"	N/A	N/A
60"	3' – 3"	6' – 5"	13' – 3"	N/A	N/A	N/A	17' – 9"	N/A	N/A	N/A	26' – 10"	N/A	N/A	N/A

TYPICAL PIPE CULVERT MITERS (3)

Side Slope	0° Skew	15° Skew	30° Skew	45° Skew
3:1	3:1	3.106:1	3.464:1	4.243:1
4:1	4:1	4.141:1	4.619:1	5.657:1
6:1	6:1	6.212:1	6.928:1	8.485:1

CONDITIONS WHERE PIPE RUNNERS ARE NOT REQUIRED (2)

Nominal Culvert I.D.	Single Pipe Culvert	Multiple Pipe Culverts
12" thru 21"	Skews thru 45°	Skews thru 45°
24"	Skews thru 45°	Skews thru 30°
27"	Skews thru 30°	Skews thru 15°
30"	Skews thru 15°	Skews thru 15°
33"	Skews thru 15°	Always required
36"	Normal (no skew)	Always required
42" thru 60"	Always required	Always required

STANDARD PIPE SIZES AND MAX PIPE RUNNER LENGTHS (1)

Pipe Size	Pipe O.D.	Pipe I.D.	Max Pipe Runner Length
2" STD	2.375"	2.067"	N/A
3" STD	3.500"	3.068"	10' – 0"
4" STD	4.500"	4.026"	19' – 8"
5" STD	5.563"	5.047"	34' – 2"

ESTIMATED CONCRETE RIPRAP QUANTITIES (CY) (5)

Nominal Culvert I.D.	3:1 Side Slope				4:1 Side Slope				6:1 Side Slope			
	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew	0° Skew	15° Skew	30° Skew	45° Skew
12"	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.7	0.7	0.7	0.8
15"	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9
18"	0.5	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.9	1.0
21"	0.6	0.6	0.6	0.7	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.2
24"	0.6	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.0	1.0	1.1	1.3
27"	0.7	0.7	0.8	0.9	0.8	0.9	0.9	1.1	1.1	1.1	1.2	1.4
30"	0.8	0.8	0.8	0.9	0.9	0.9	1.0	1.2	1.2	1.2	1.3	1.6
33"	0.8	0.8	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.4	1.5	1.7
36"	0.9	0.9	0.9	1.1	1.1	1.1	1.2	1.4	1.4	1.5	1.6	1.8
42"	1.0	1.0	1.1	1.3	1.2	1.3	1.3	1.6	1.6	1.7	1.8	2.1
48"	1.1	1.1	1.2	N/A	1.4	1.4	1.5	N/A	1.9	1.9	2.1	N/A
54"	1.3	1.3	N/A	N/A	1.6	1.6	N/A	N/A	2.1	2.1	N/A	N/A
60"	1.4	N/A	N/A	N/A	1.7	N/A	N/A	N/A	2.3	N/A	N/A	N/A

(1) Provide pipe runner of the size shown in the tables. Provide cross pipe of the same size as the pipe runner. Provide cross pipe stub out and bottom anchor pipe of the next smaller size pipe as shown in the Standard Pipe Sizes and Max Pipe Runner Lengths table.

(2) This standard allows for the placement of only one pipe runner across each culvert pipe opening. In order to limit the clear opening to be traversed by an errant vehicle, the following conditions must be met:

For 60" culvert pipes, the skew must not exceed 0°.
For 54" culvert pipes, the skew must not exceed 15°.
For 48" culvert pipes, the skew must not exceed 30°.
For all culvert pipe sizes 42" and less, the skew must not exceed 45°.

If the above conditions cannot be met, the designer should consider using a safety end treatment with flared wings. For further information, refer to the TxDOT Roadway Design Manual.

(3) Miter = slope of mitered end of pipe culvert.

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(5) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for Contractor's information only.

DATE: 2023/02/23
FILE: DOCUMENT NAME

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

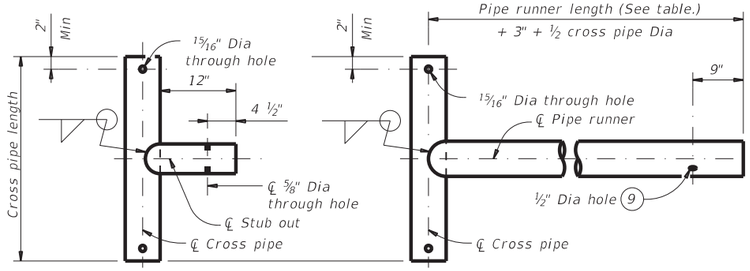
SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

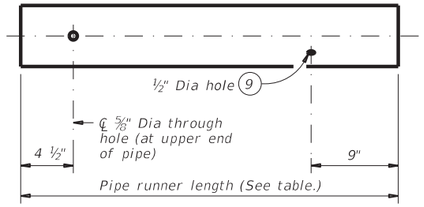
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		114

DATE: 2023/02/23
FILE: DOCUMENT NAME



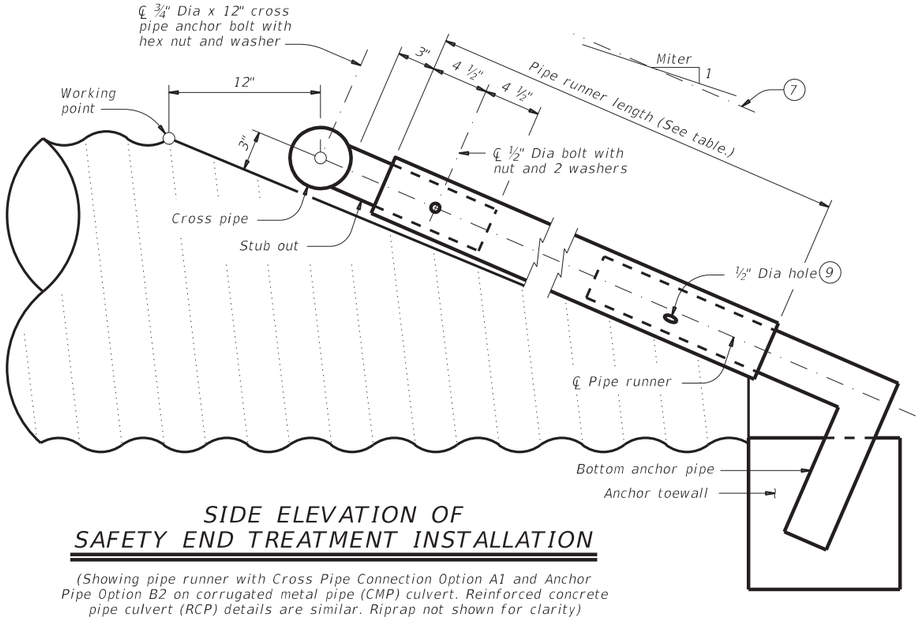
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



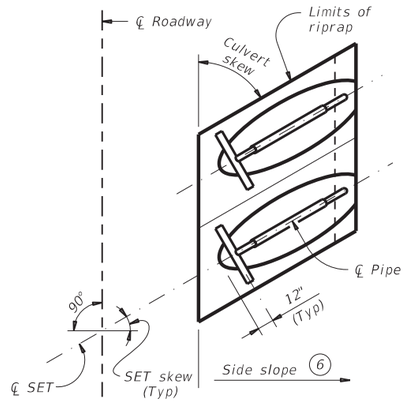
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

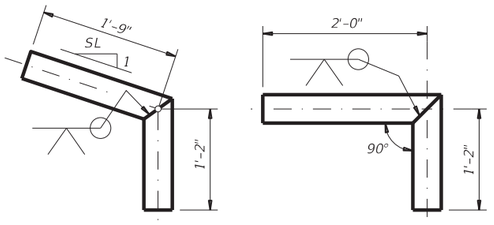


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

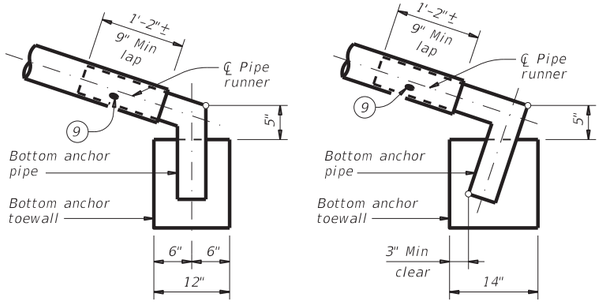


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

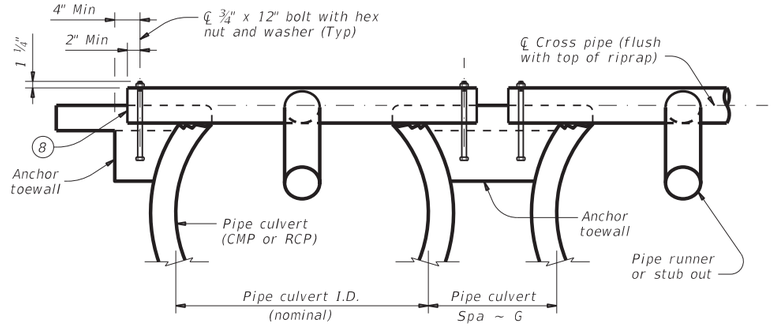
BOTTOM ANCHOR PIPE DETAILS (10)



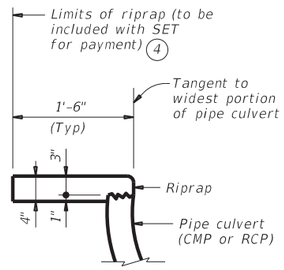
OPTION B1 OPTION B2

BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

(4) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Recommended values of side slope are 3:1, 4:1, and 6:1. All quantities, calculations, and dimensions shown herein are based on these recommended values. Slope of 3:1 or flatter is required for vehicle safety.

(7) Note that actual slope of pipe runner may vary slightly from side slope of riprap and trimmed culvert pipe edge.

(8) Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access.

(9) After installation, inspect the 1/2" hole to ensure that the lap of the pipe runner with the bottom anchor pipe is adequate.

(10) At fabricator's option, a heat bend to a smooth 5" radius or a manufactured elbow (of the same material as the runner) may be substituted for the mitered and welded joint in the bottom anchor pipe.

MATERIAL NOTES:
Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.
Provide pipe runners, cross pipes, and anchor pipes conforming to the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.
Provide ASTM A307 bolts and nuts.
Galvanize all steel components, except concrete reinforcing, after fabrication.
Repair galvanizing damaged during transport or construction in accordance with the specifications.

GENERAL NOTES:
Pipe runners are designed for a traversing load of 1,800 pounds at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the pipe runners.
Payment for riprap and toewall is included in the price bid for each safety end treatment.
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

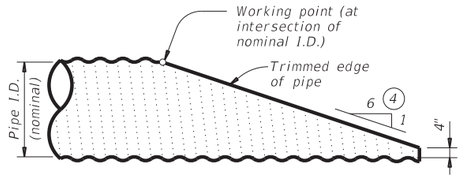
Texas Department of Transportation
Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA
PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

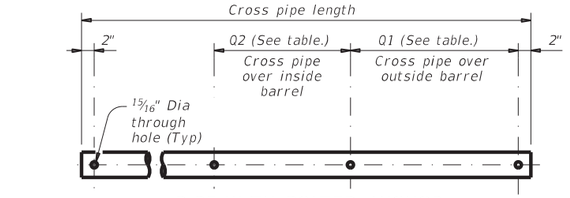
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		115



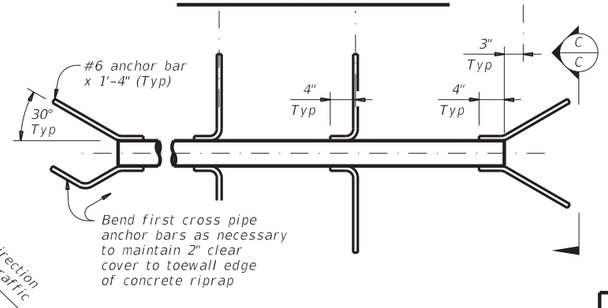
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

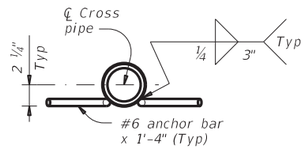
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

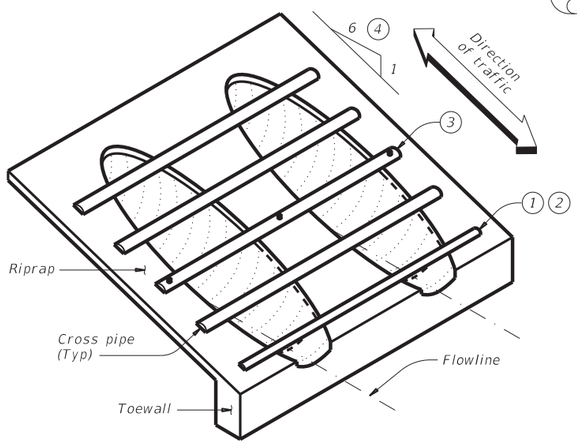


PIPE WITH ANCHOR BARS

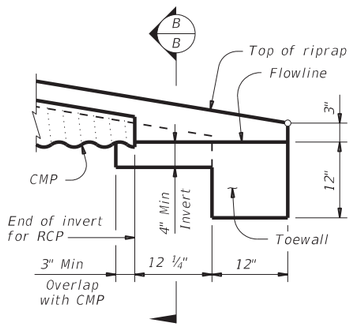


SECTION C-C

CROSS PIPE DETAILS

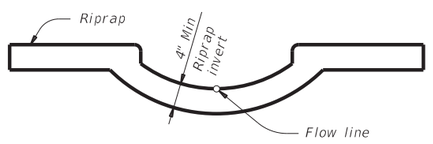


ISOMETRIC VIEW OF TYPICAL INSTALLATION



DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap".

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

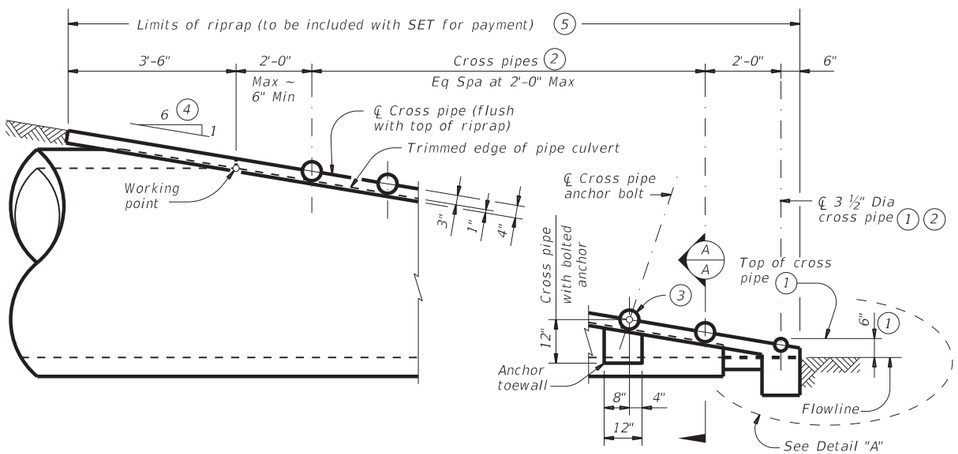
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

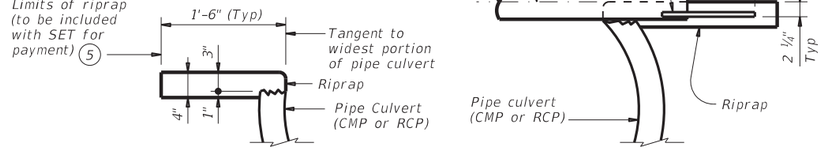
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.

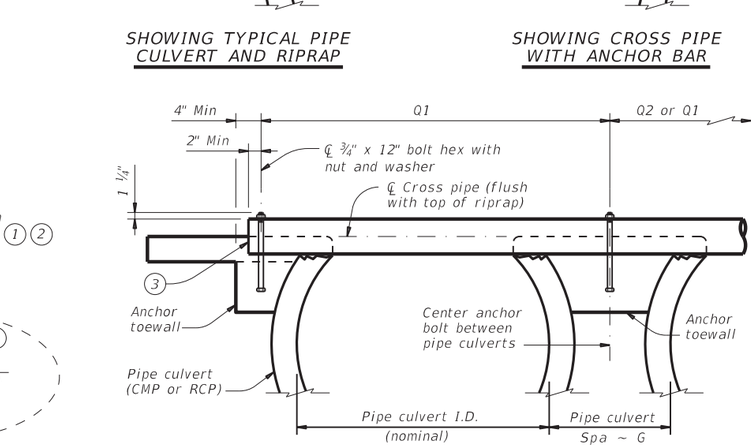


SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
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	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		116

DATE: 3/16/2023 9:28:42 PM
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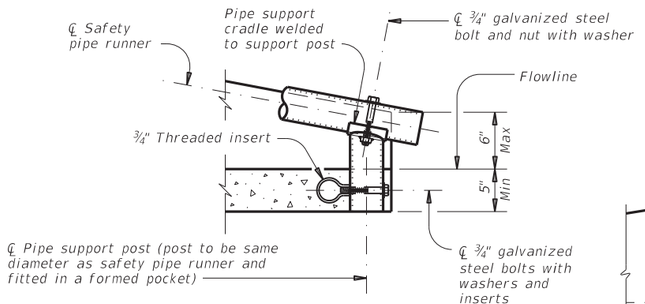
DATE: 2023/02/22
FILE: DOCUMENT NAME

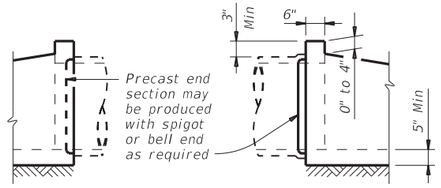
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe		Multiple Pipes	
						Skew	Pipe Runners Required	Skew	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"				



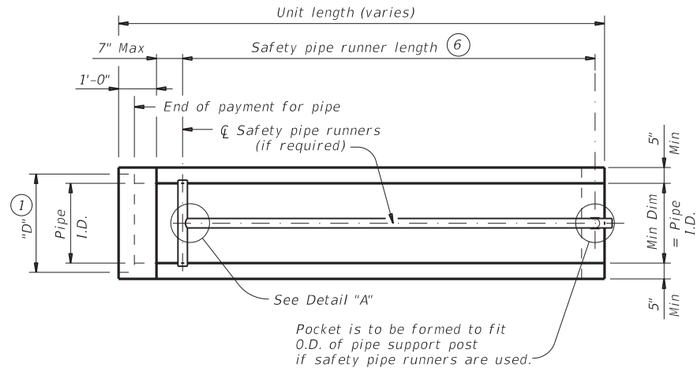
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)



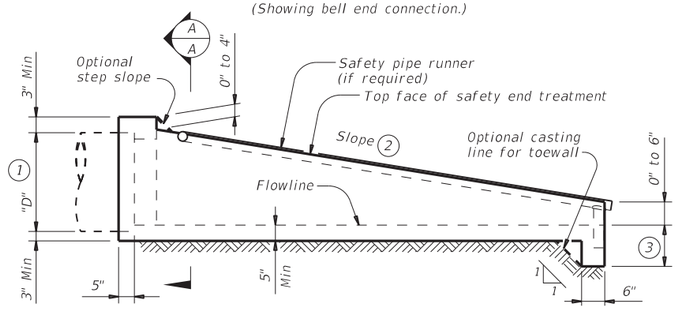
OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment)



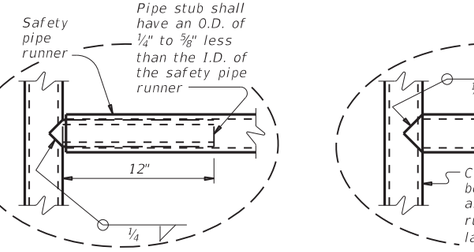
PLAN

(Showing bell end connection.)

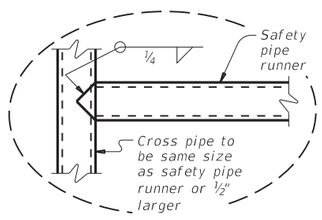


LONGITUDINAL ELEVATION

(Showing bell end connection.)



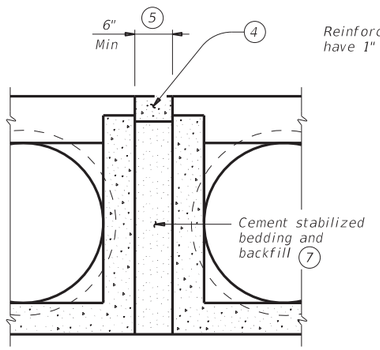
OPTION A



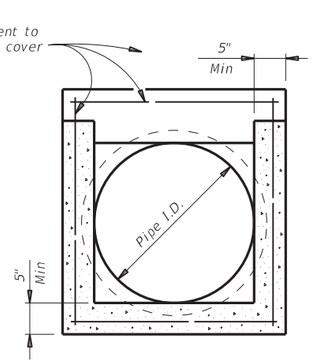
OPTION B

DETAIL A

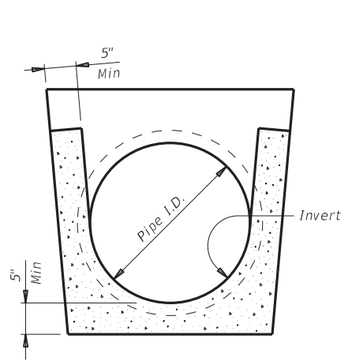
(If required)



MULTIPLE PIPE INSTALLATION

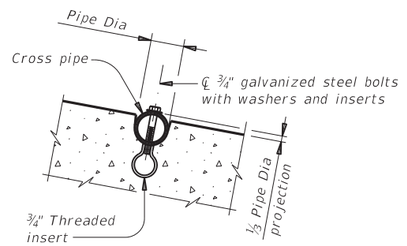


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

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.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ CROSS DRAINAGE

PSET-SC

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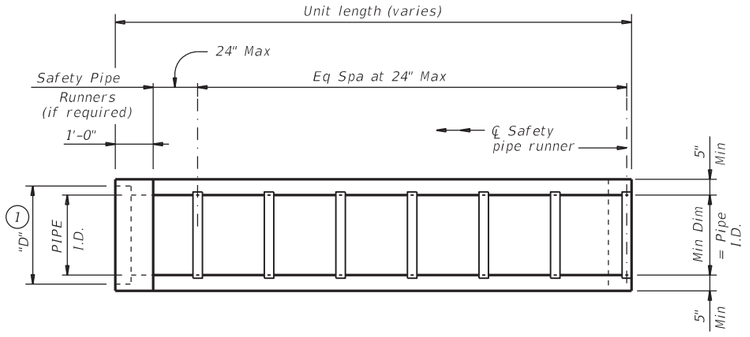
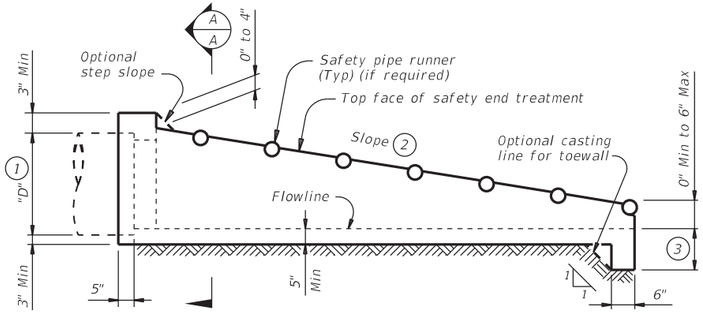


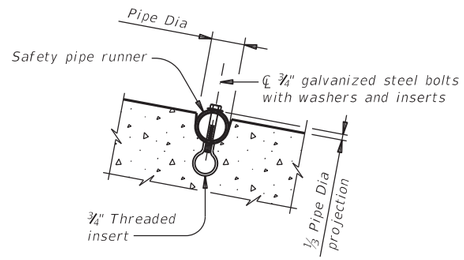
PLAN

(Showing bell end connection.)



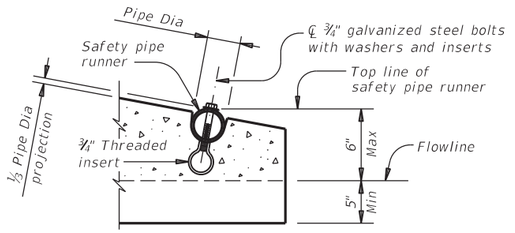
LONGITUDINAL ELEVATION

(Showing bell end connection.)

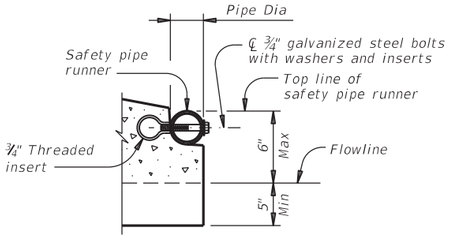


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



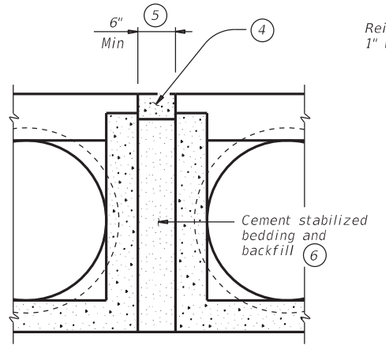
OPTION A



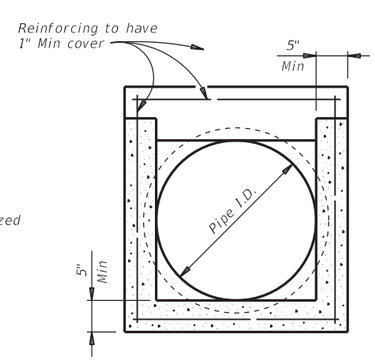
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

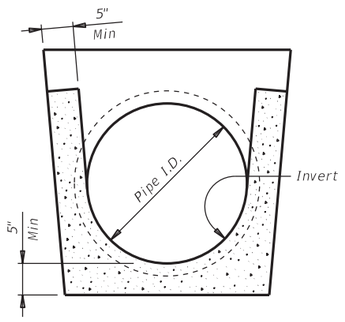
(If required)



MULTIPLE PIPE INSTALLATION

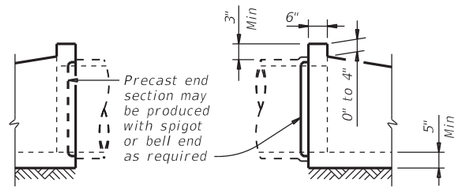


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



OPTIONAL JOINT FOR RCP

(Showing joint between RCP and precast safety end treatment.)

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (7)	"D" (1)	Slope	Min Length	Pipe Runners Required		Required Pipe Runner Size		
						Single Pipe	Multiple Pipe	Nominal Dia.	O.D.	I.D.
12"	2"	1.15"	17.00"	6:1	4' – 9"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
15"	2 ¼"	1.30"	20.50"	6:1	6' – 5"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
18"	2 ½"	1.60"	24.00"	6:1	8' – 0"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
24"	3"	1.95"	31.00"	6:1	11' – 3"	No	Yes, for > 2 pipes	3" STD	3.500"	3.068"
30"	3 ½"	2.65"	38.50"	6:1	14' – 8"	No	Yes	4" STD	4.500"	4.026"
36"	4"	2.75"	45.50"	6:1	17' – 11"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	2.7"	52.50"	6:1	21' – 2"	Yes	Yes	4" STD	4.500"	4.026"

(1) Dimension "D" is based on reinforced concrete pipe (RCP) meeting the requirements of ASTM C-76, Class III, (RCP Wall "B" thickness). Adjust "D" for any other wall thickness used. For thermoplastic pipe (TP) take into account the annular space requirements for grouted connections.

(2) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(3) Toewall to be used only when dimension is shown elsewhere in the plans.

(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(6) Provide cement stabilized bedding and backfill in accordance with the Item 400, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item 467, "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(7) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe (RCP), and thermoplastic pipe (TP) may be used for TYPE II end treatment as specified in Item "Safety End Treatment".

When precast safety end treatment is used as a Contractor's alternate to mitered RCP, riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Manufacture this product in accordance with Item 467, "Safety End Treatment" except as noted below :

A. Provide minimum reinforcing of #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6"x6" – D12 x D12 or 5"x5" – D10 x D10 welded wire reinforcement (WWR).

B. For precast (steel formed) sections, provide Class "C" concrete (f'c = 3,600 psi).

At the option and expense of the Contractor the next larger size of safety end treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe.

Pipe runners are designed for a traversing load of 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464, "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-SP

FILE: psetspss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-21: Added 42" TP	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		118

DATE: 2023/02/23
FILE: DOCUMENT NAME

DATE: 3/16/2023 9:29:21 PM
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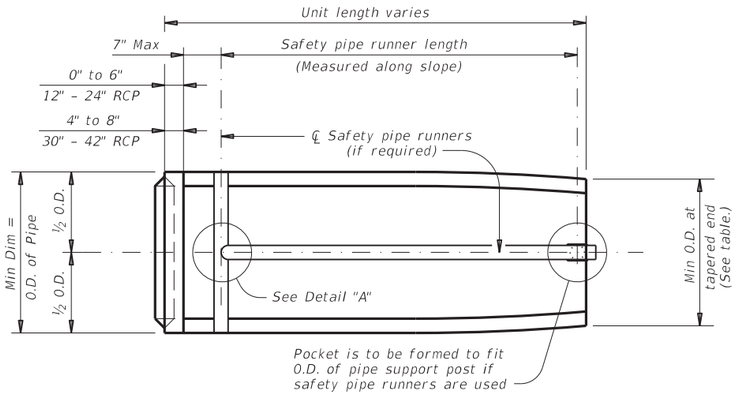
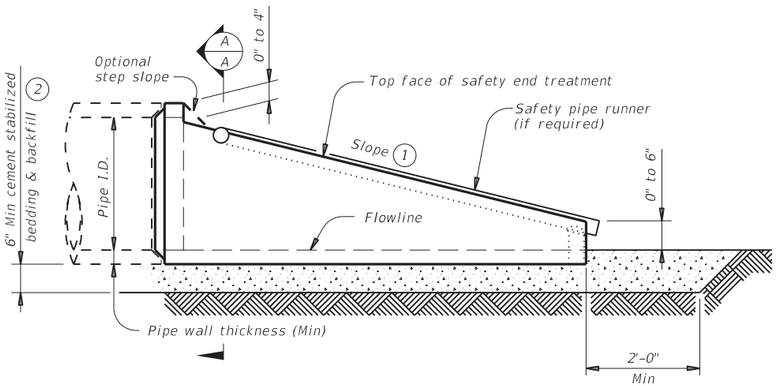


PLAN VIEW

(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.

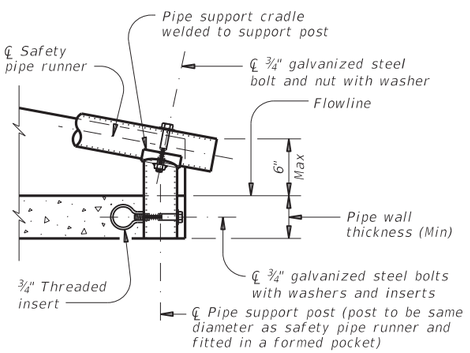
(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(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.

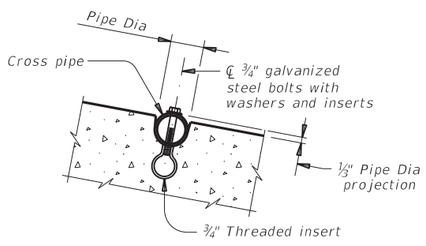
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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		Multiple Pipe	
							Skew	Pipe Runners Required	Skew	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"				



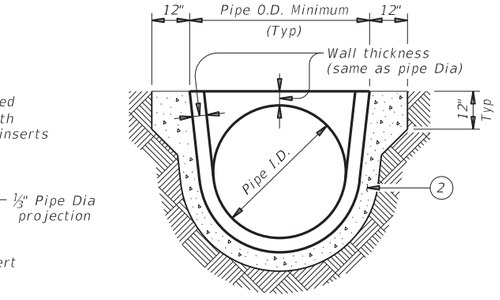
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

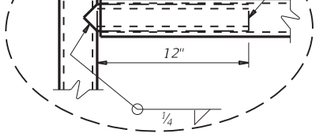


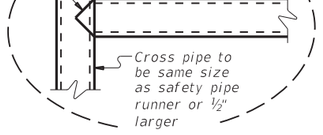
INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



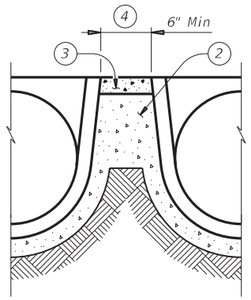
SECTION A-A





OPTION A OPTION B

DETAIL A



MULTIPLE PIPE INSTALLATION

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.

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 REVISIONS	CONT	SECT	JOB	HIGHWAY
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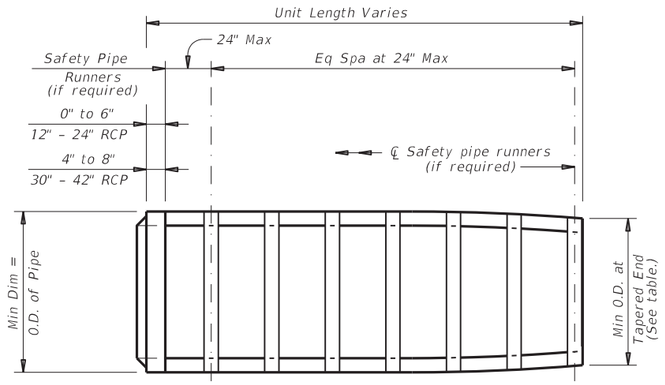
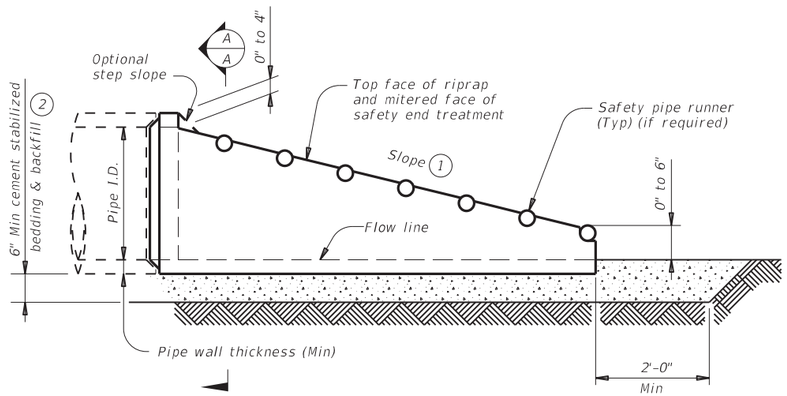
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		119



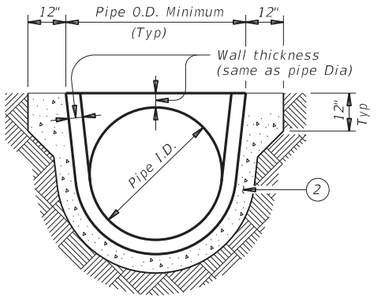
PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)

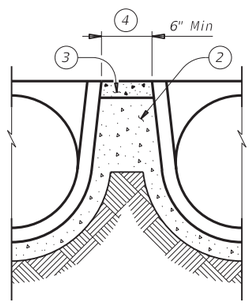


LONGITUDINAL ELEVATION - 12" THRU 24"

(Showing spigot end connection.)



SECTION A-A



MULTIPLE PIPE INSTALLATION

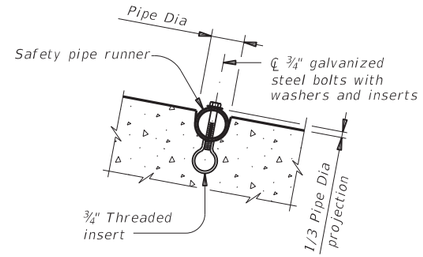
(1) Slope as shown elsewhere in the plans. Slope of 6:1 or flatter is required for vehicle safety.

(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 467, "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 is considered subsidiary to the Item 467, "Safety End Treatment".

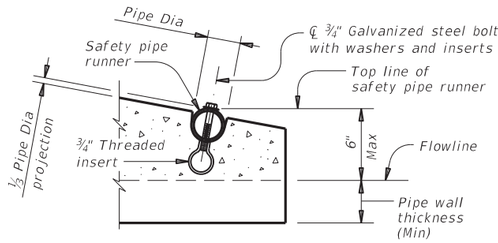
(4) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

(5) Safety pipe runners are required for multiple pipe culverts with more than two pipes.

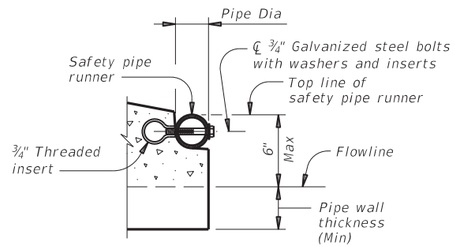


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

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. per ft. of Pipe)	Max Slope	Min Length of Unit	Pipe Runner Requirements		Required Pipe Runner Sizes		
							Single Pipe	Multiple Pipe	Nominal Dia	O.D.	I.D.
12"	2"	16"	16"	0.07 Circ.	6:1	4'–0"	No	(5)	3" STD	3.500"	3.068"
15"	2 ¼"	19 ½"	19"	0.07 Circ.	6:1	5'–8"	No	(5)	3" STD	3.500"	3.068"
18"	2 ½"	23"	21 ½"	0.07 Circ.	6:1	7'–3"	No	(5)	3" STD	3.500"	3.068"
24"	3"	30"	27"	0.07 Circ.	6:1	10'–6"	No	(5)	3" STD	3.500"	3.068"
30"	3 ½"	37"	31"	0.18 Circ.	6:1	12'–1"	No	Yes	4" STD	4.500"	4.026"
36"	4"	44"	36"	0.19 Ellip.	6:1	15'–4"	Yes	Yes	4" STD	4.500"	4.026"
42"	4 ½"	51"	41 ½"	0.23 Ellip.	6:1	18'–7"	Yes	Yes	4" STD	4.500"	4.026"

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide pipe runners meeting the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 Gr B, or API 5LX52.

Galvanize 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 (RCP) 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 10,000 Lbs at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

DATE: 2023/0%
FILE: DOCUMENT NAME

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

FILE: psetrpss-20.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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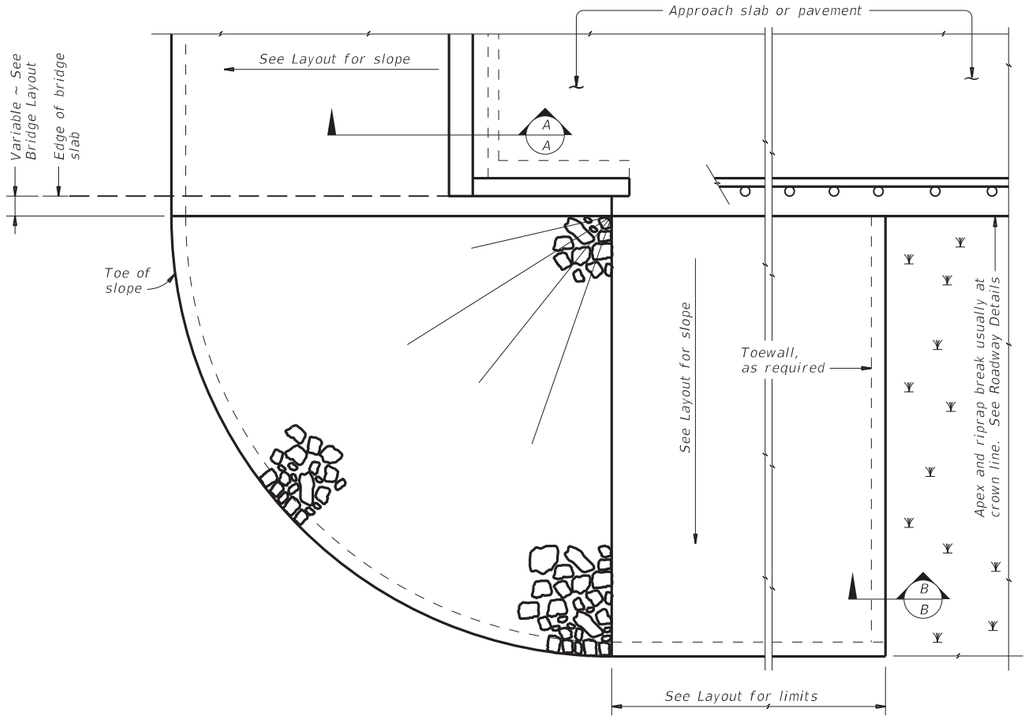
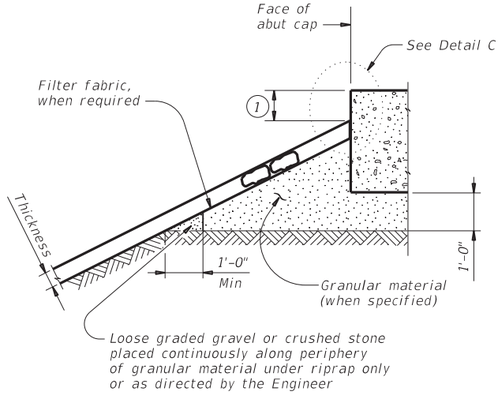
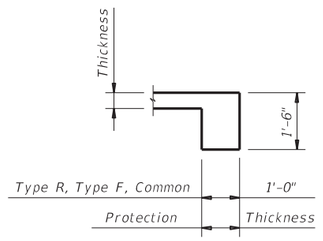
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		120



PLAN

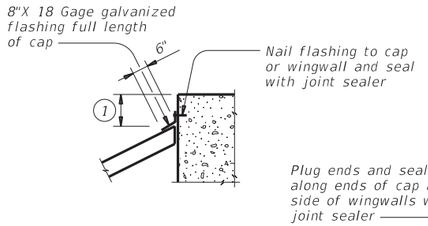


SECTION A-A AT CAP

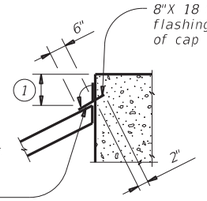


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".

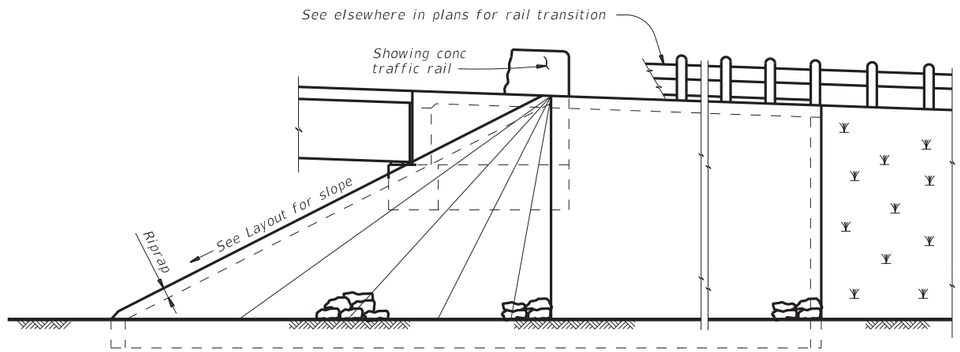


CAP OPTION A



CAP OPTION B

DETAIL C



ELEVATION

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES			
©TxDOT April 2019	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0816	05	025		FM 2862		
	DIST	COUNTY			SHEET NO.		
	DAL	COLLIN			121		

DATE: 2023/02/21
FILE: DOCUMENT NAME

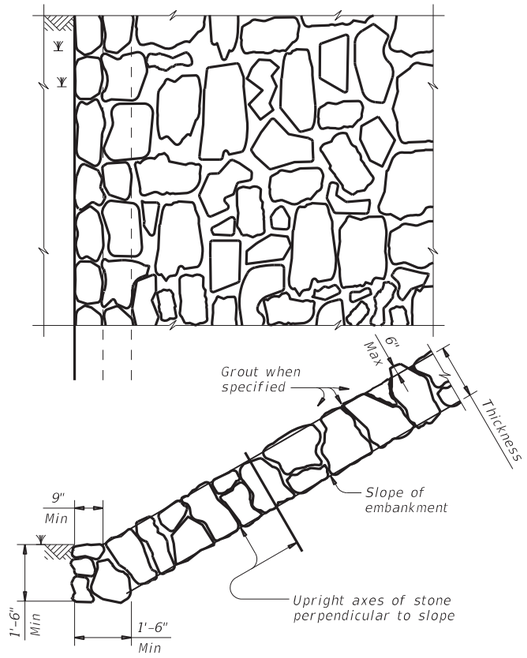


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

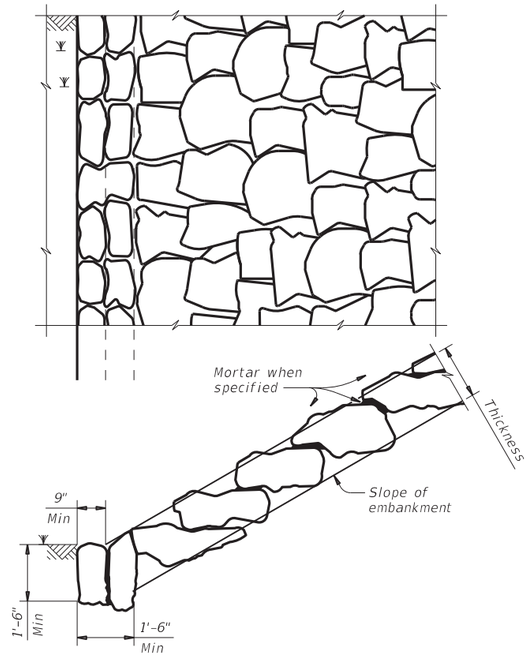


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

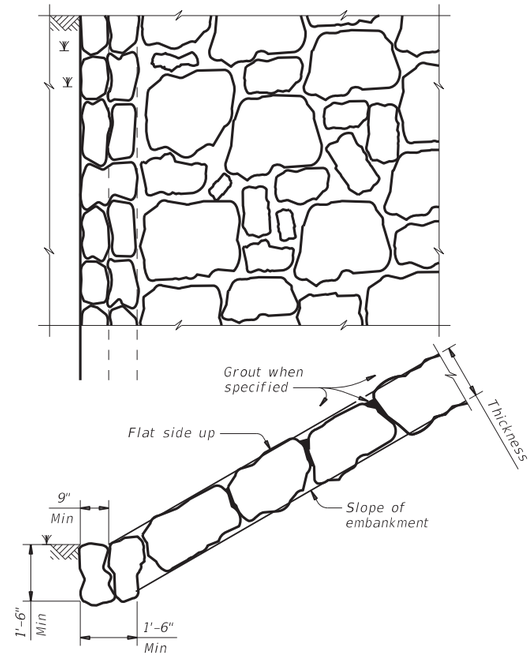


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

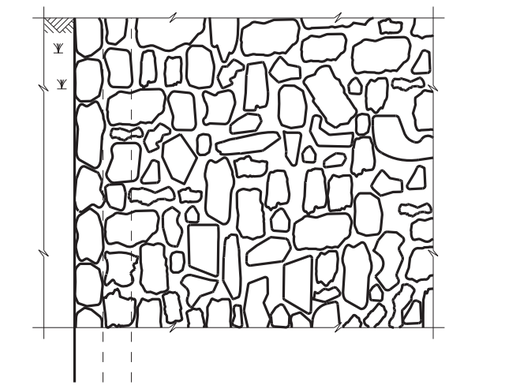


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

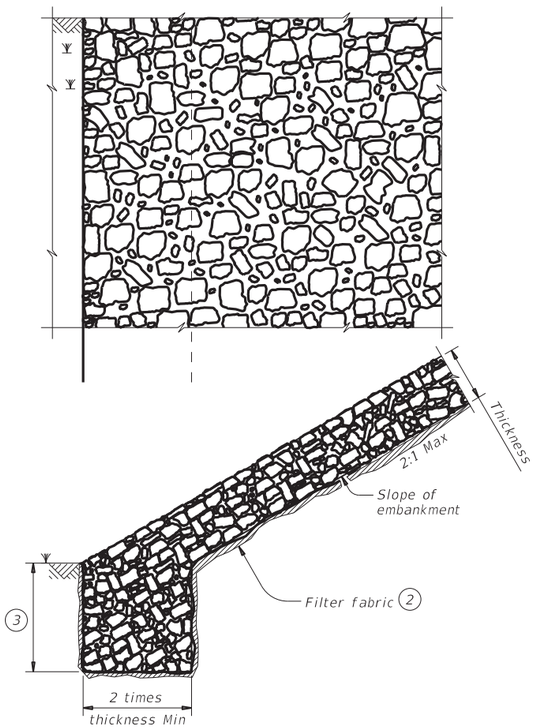


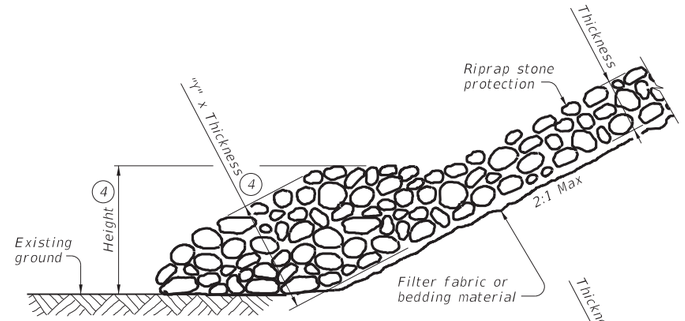
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

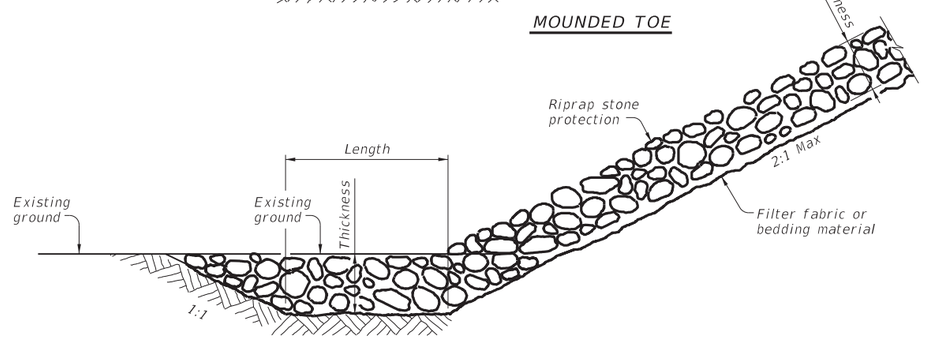
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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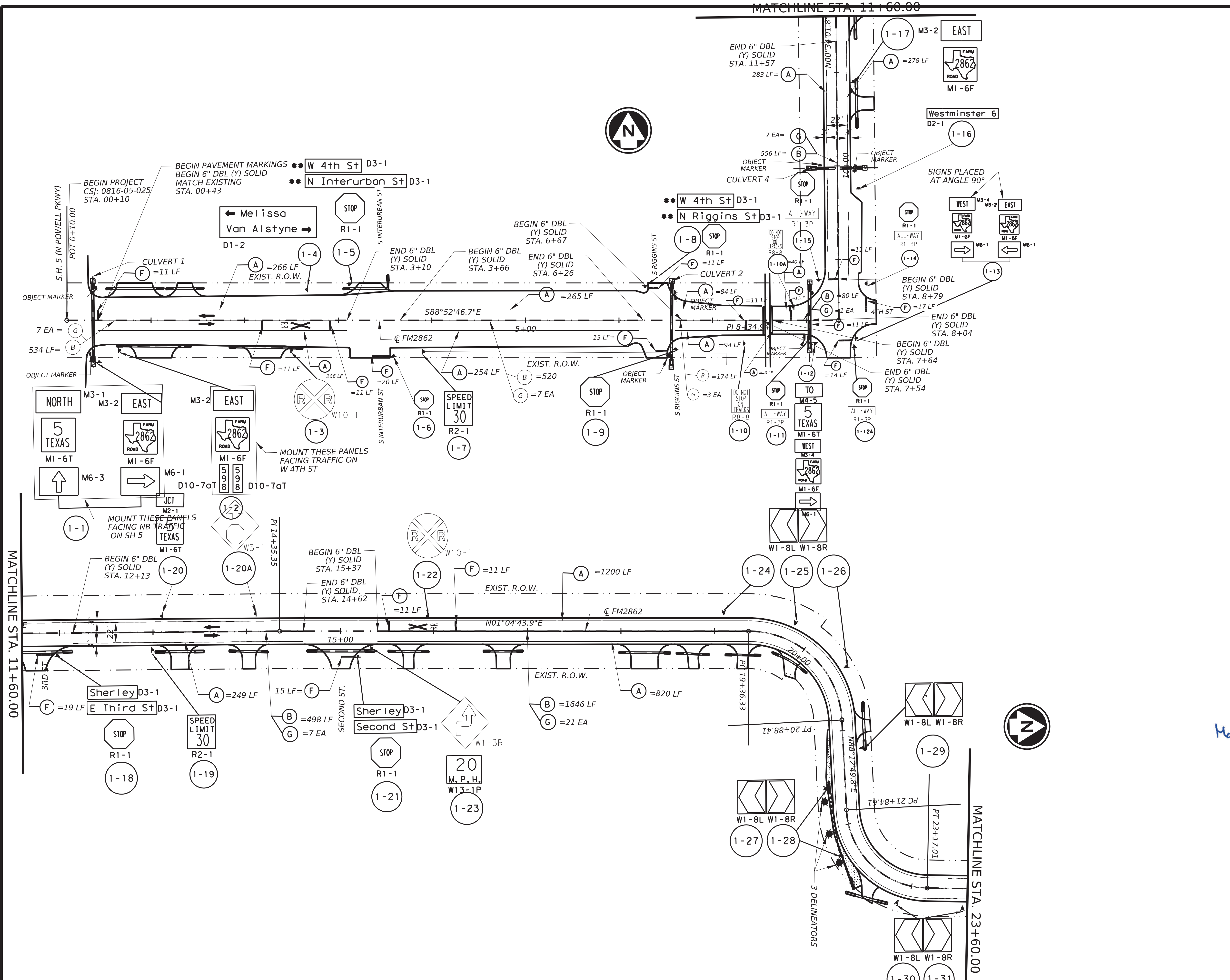
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		122

DATE: 2023/02/21
FILE: DOCUMENT NAME



0 50 100
SCALE IN FEET

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR

- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.

(#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

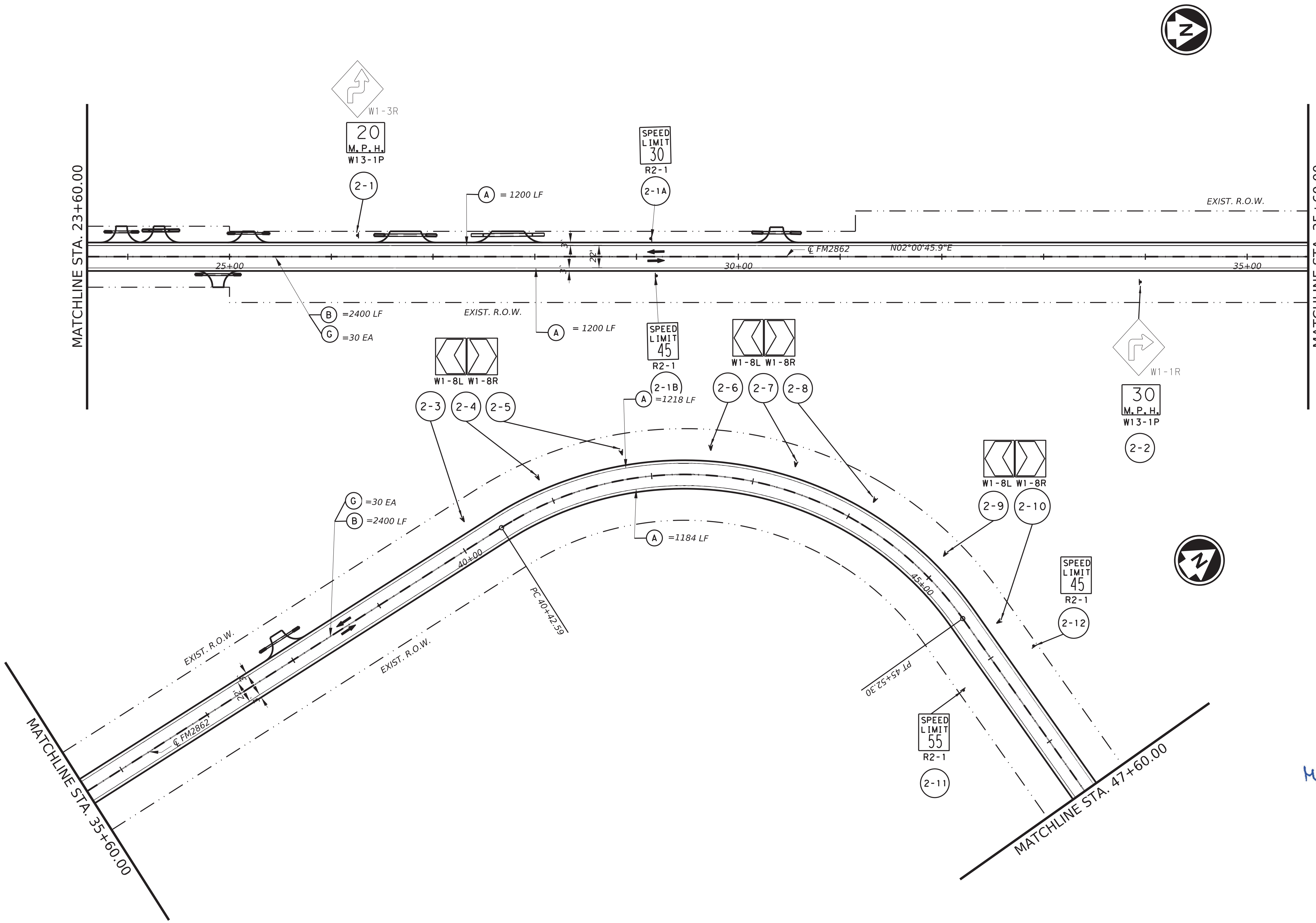
SIGNING AND PAVEMENT MARKING LAYOUT

BEGIN PROJECT TO STA. 23+60

SCALE: 1" = 100' SHEET 1 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	123

DATE: 3/20/2023 9:30:05 PM
FILE: c:\pwworking\txdot5\madiha.alshammry\d0747297\FM2862 SIGNING & PM SHEET 1.dgn



NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR
- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.
- (#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 23+60 TO STA. 47+60

SCALE: 1" = 100' SHEET 2 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	124

DATE: 3/17/2023 9:30:19 PM
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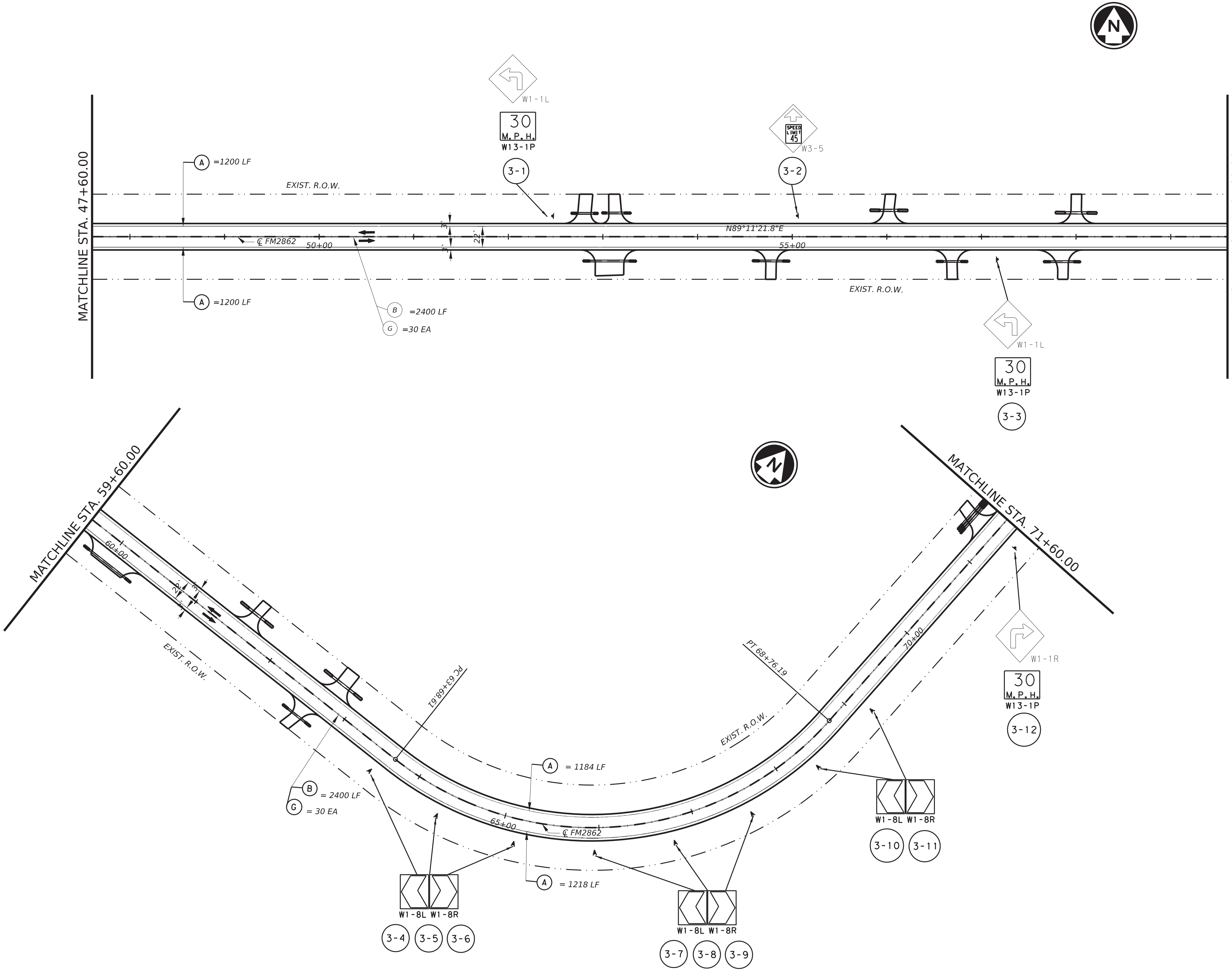

0 50 100
SCALE IN FEET

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR

- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.

- (#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 47+60 TO STA. 71+60

SCALE: 1" = 100' SHEET 3 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	125

DATE: 3/20/2023 9:30:33 PM
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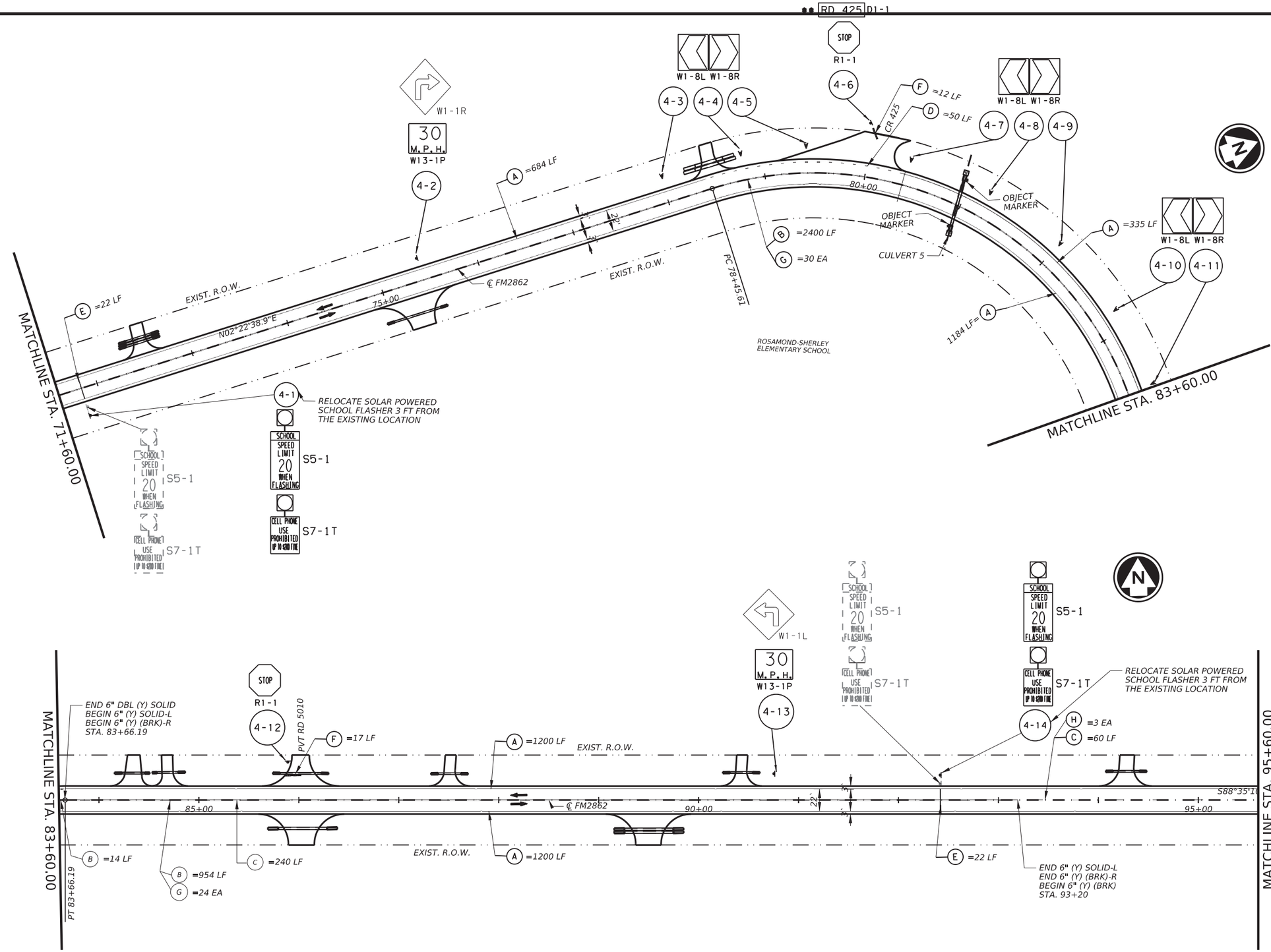
RD 425 D1-1



NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* SIGNS TO REMAIN

** SALVAGED SIGNS

OBJECT MARKER (OM-2Z)(WFLX)GRND

DELINEATOR

(A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)

(B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)

(C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)

(D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)

(E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)

(F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)

(G) - REFL PAV MRK TY II-A-A SPACED AT 40' O.C.

(H) - REFL PAV MRK TY II-A-A SPACED AT 80' O.C.

(#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 71+60 TO STA. 95+60

SCALE: 1" = 100' SHEET 4 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		126

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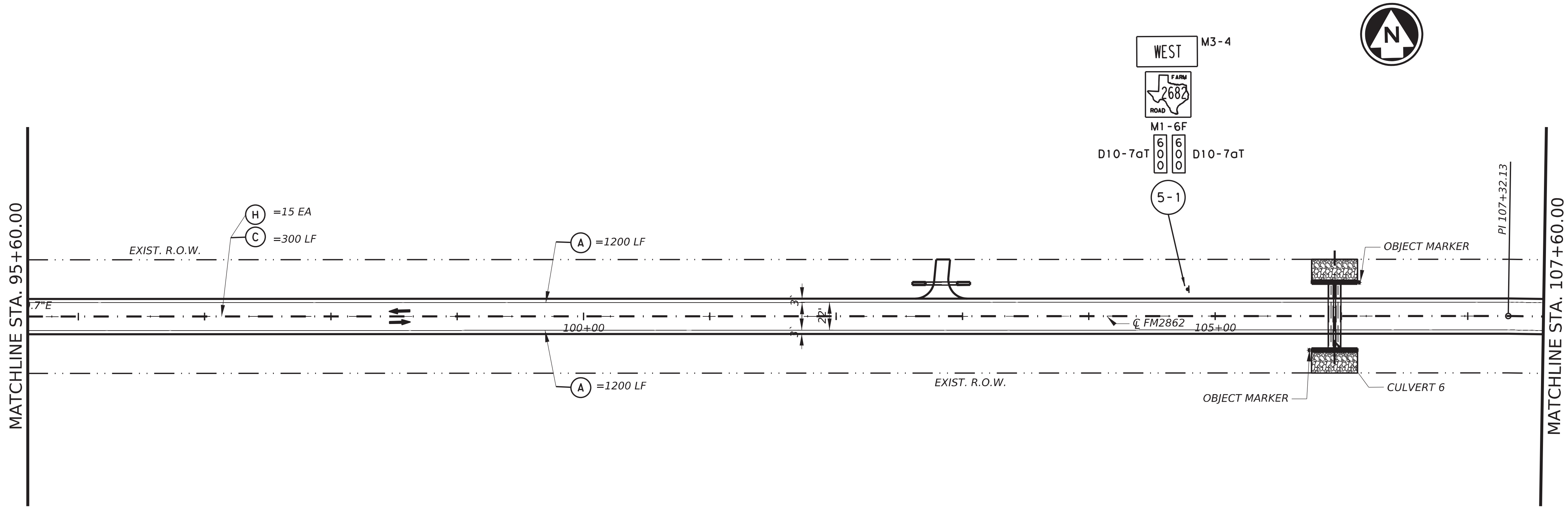
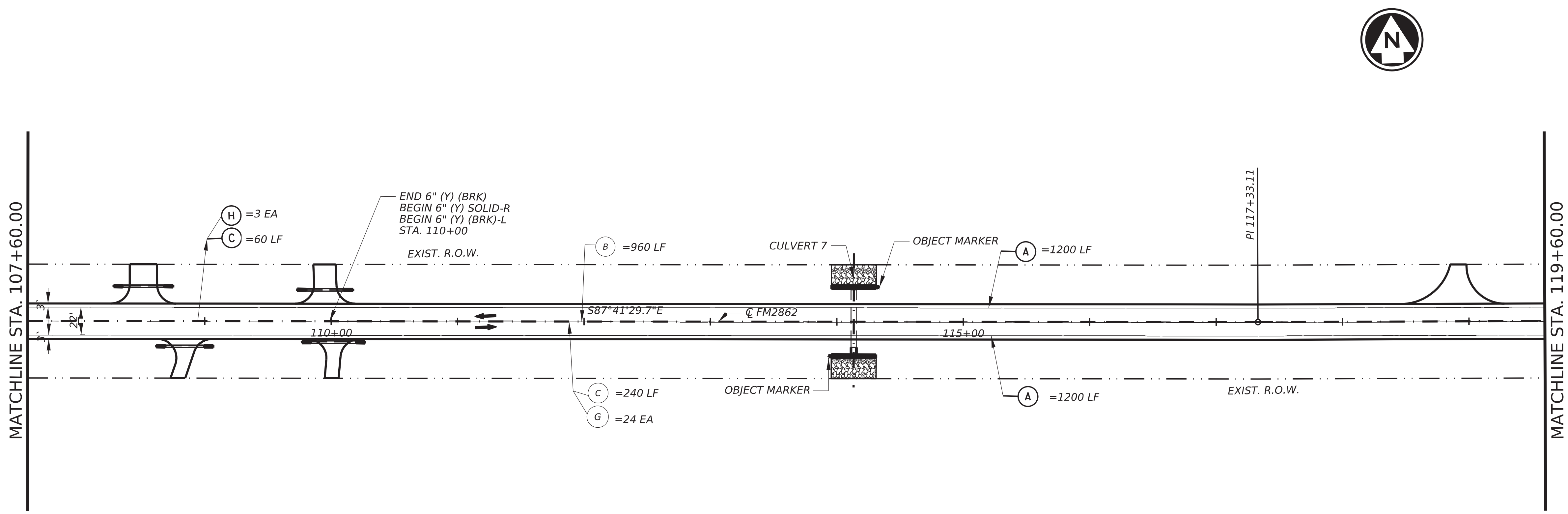
FILE: $DOCUMENT NAME$



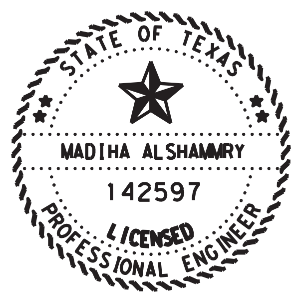


SCALE IN FEET: 0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR
- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.
- (#-#) - PROPOSED SIGN



Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 95+60 TO STA. 119+60

SCALE: 1" = 100' SHEET 5 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		127

DATE: 3/17/2023 9:31:01 PM
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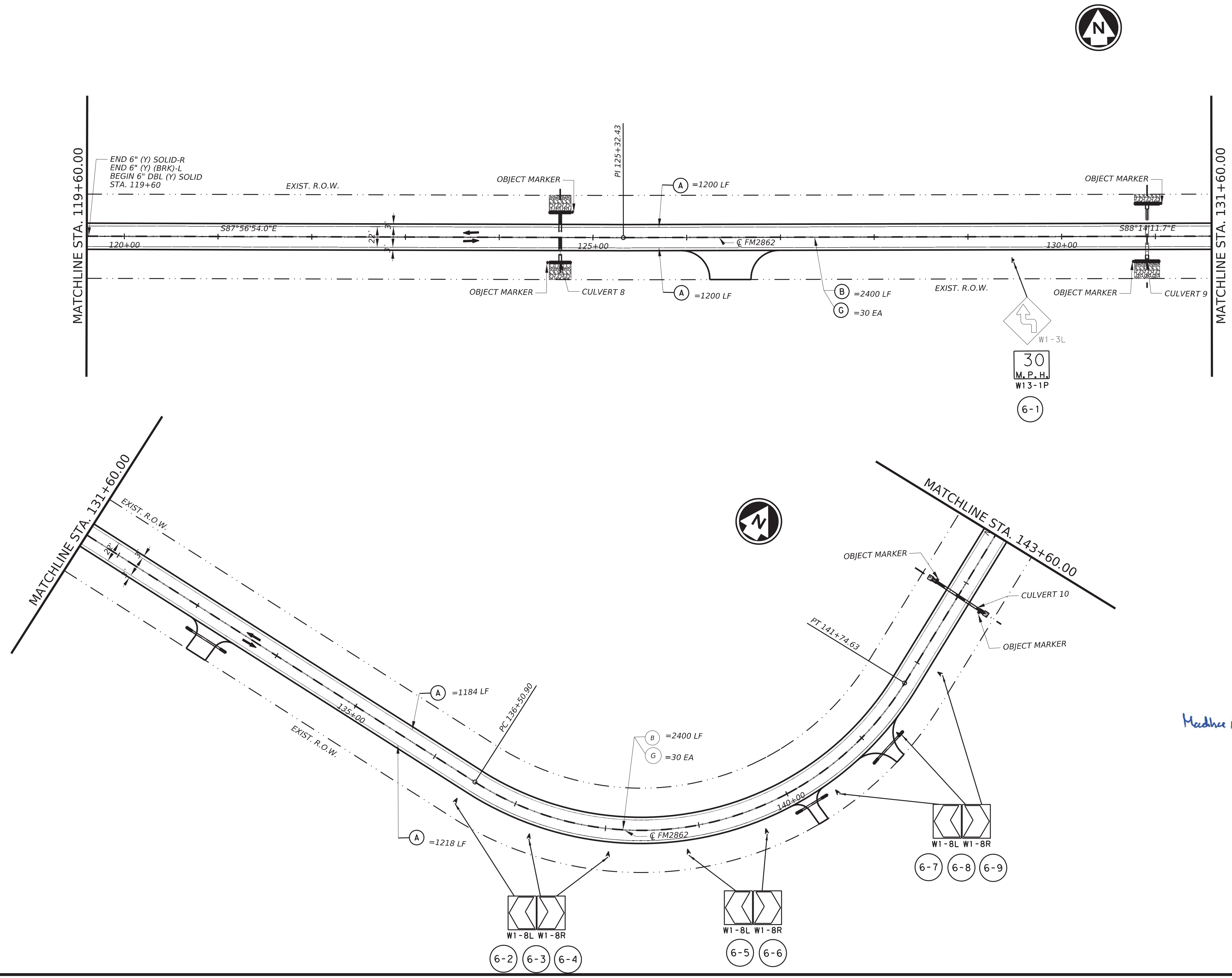

0 50 100
SCALE IN FEET

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR

- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.

(#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 119+60 TO STA. 143+60

SCALE: 1" = 100' SHEET 6 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	128

DATE: 3/20/2023 9:31:15 PM
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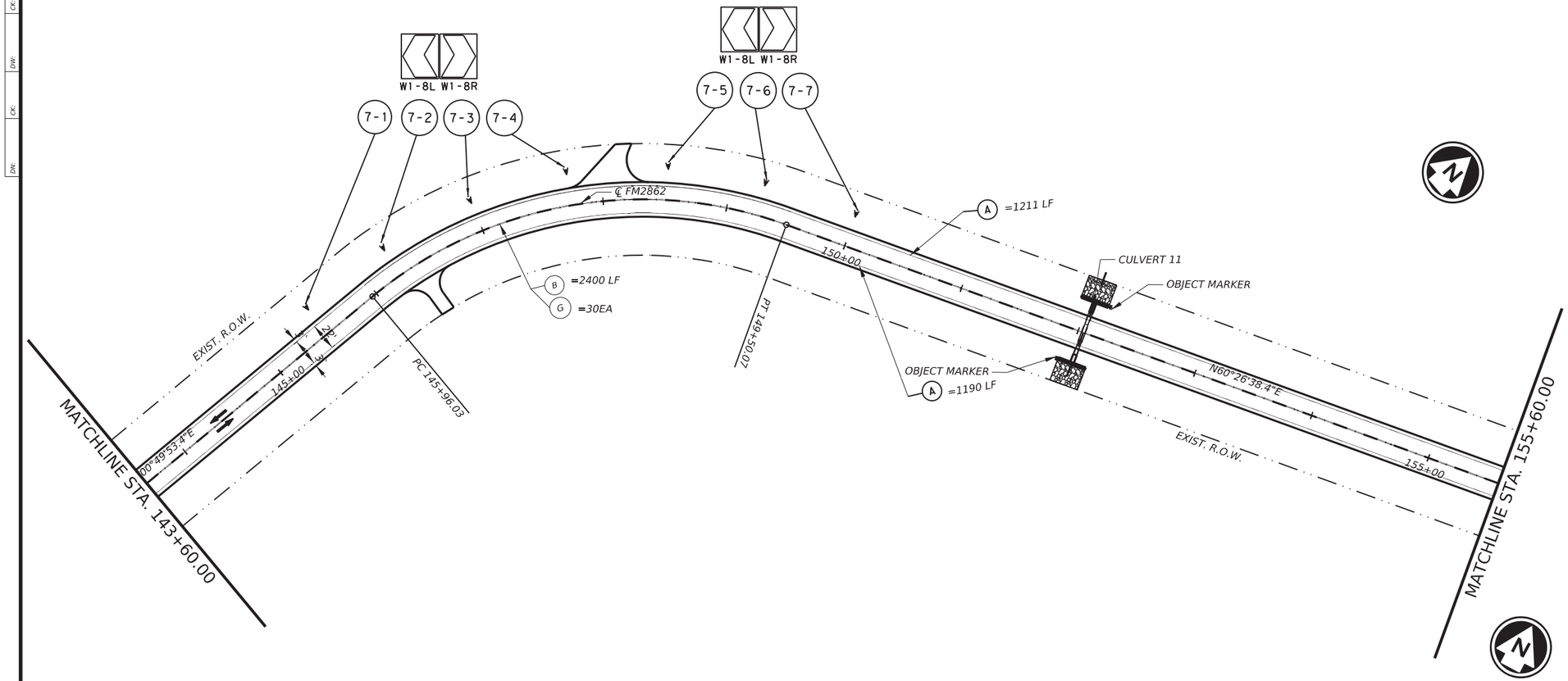

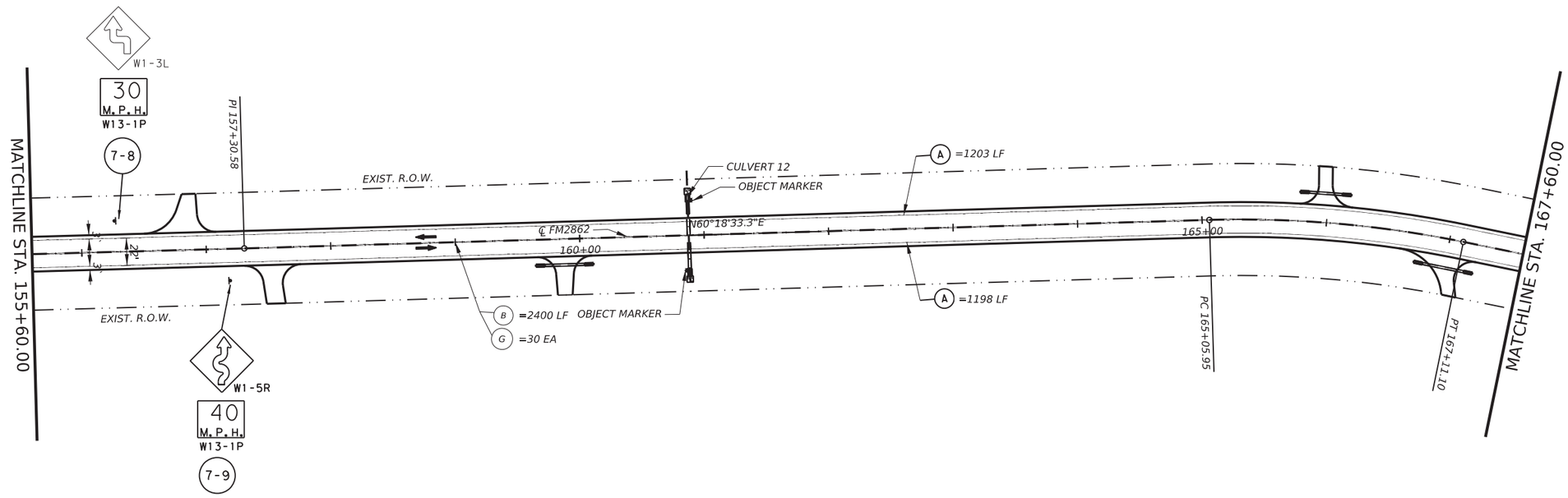

0 50 100
SCALE IN FEET

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* SIGNS TO REMAIN

** SALVAGED SIGNS

OBJECT MARKER (OM-2Z)(WFLX)GRND

DELINEATOR

(A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
(B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
(C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
(D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
(E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
(F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
(G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
(H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.

(#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 143+60 TO STA. 167+60

SCALE: 1" = 100' SHEET 7 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		129

DATE: 3/16/2023 9:31:30 PM
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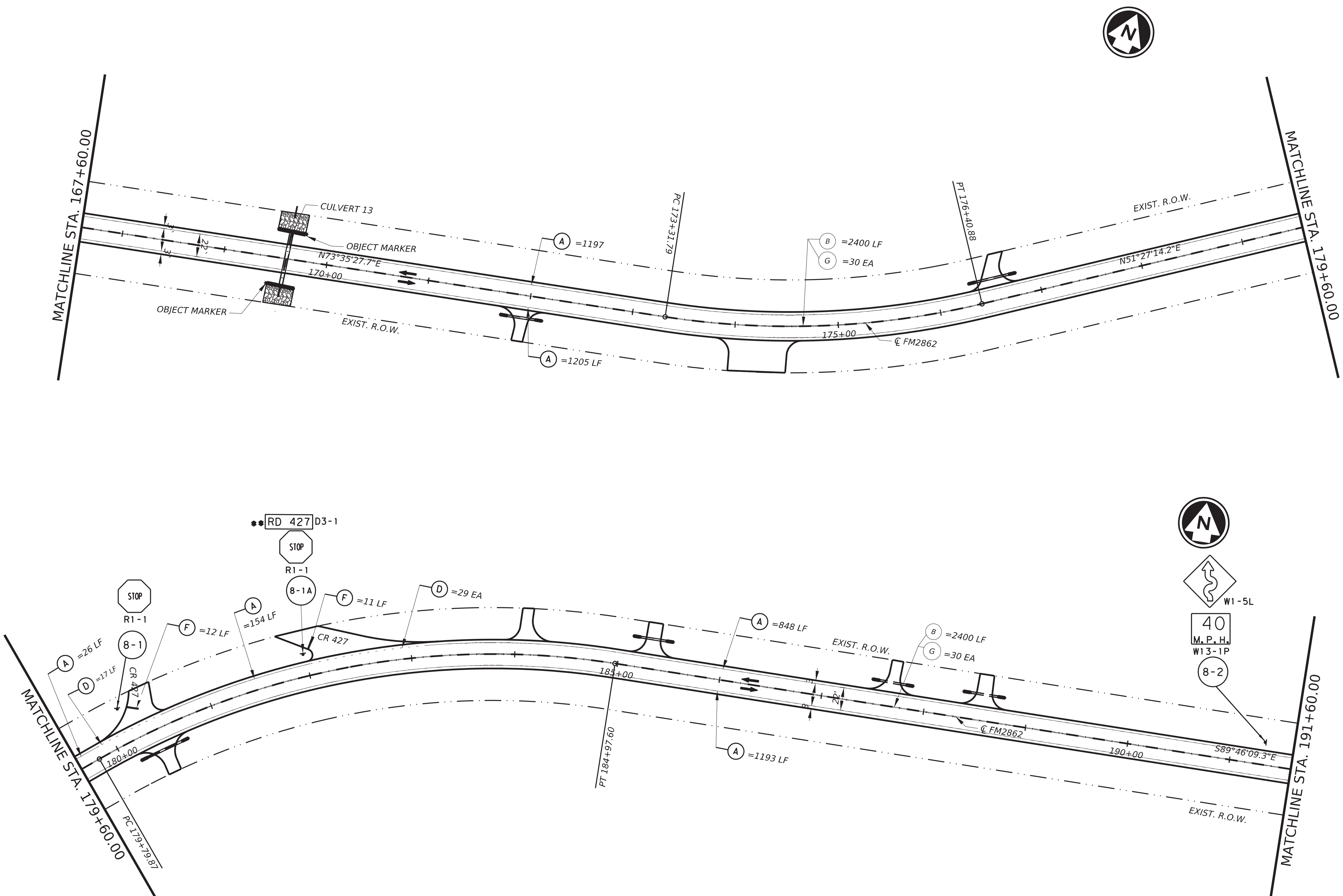
DGN: C:\Users\madiha.alshammry\d0747297\FM2862_SIGNING & PM SHEET 7.dgn



0 50 100
SCALE IN FEET

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR

- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.

- (#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
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Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 167+60 TO STA. 191+60

SCALE: 1" = 100' SHEET 8 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		130

DATE: 3/20/2023 9:31:46 PM
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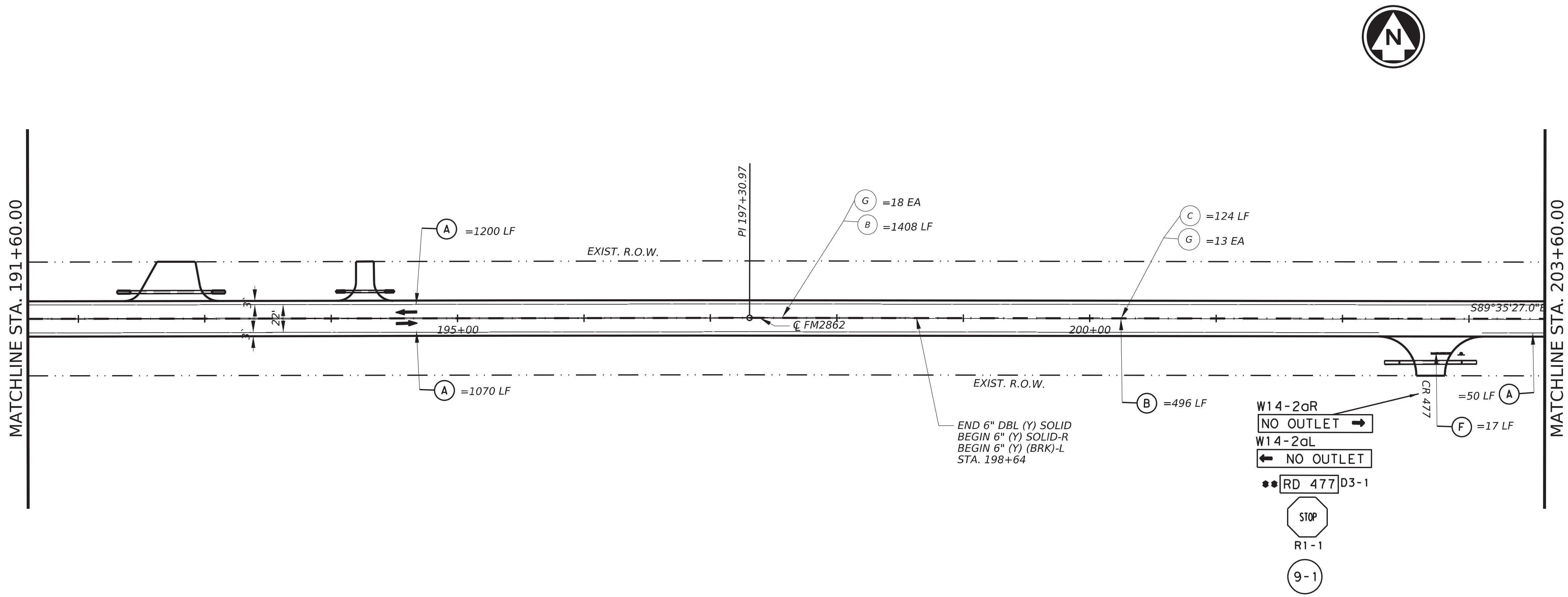
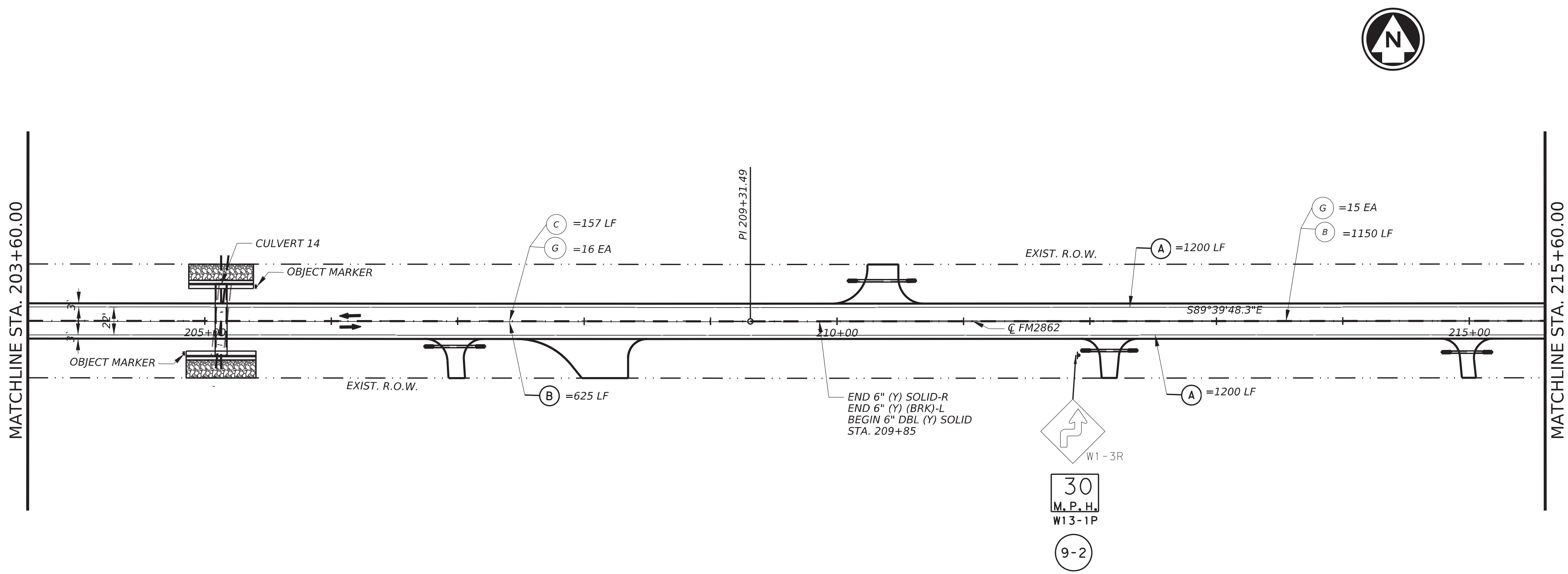


NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR
- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.
- (#-#) - PROPOSED SIGN

0 50 100
SCALE IN FEET



STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

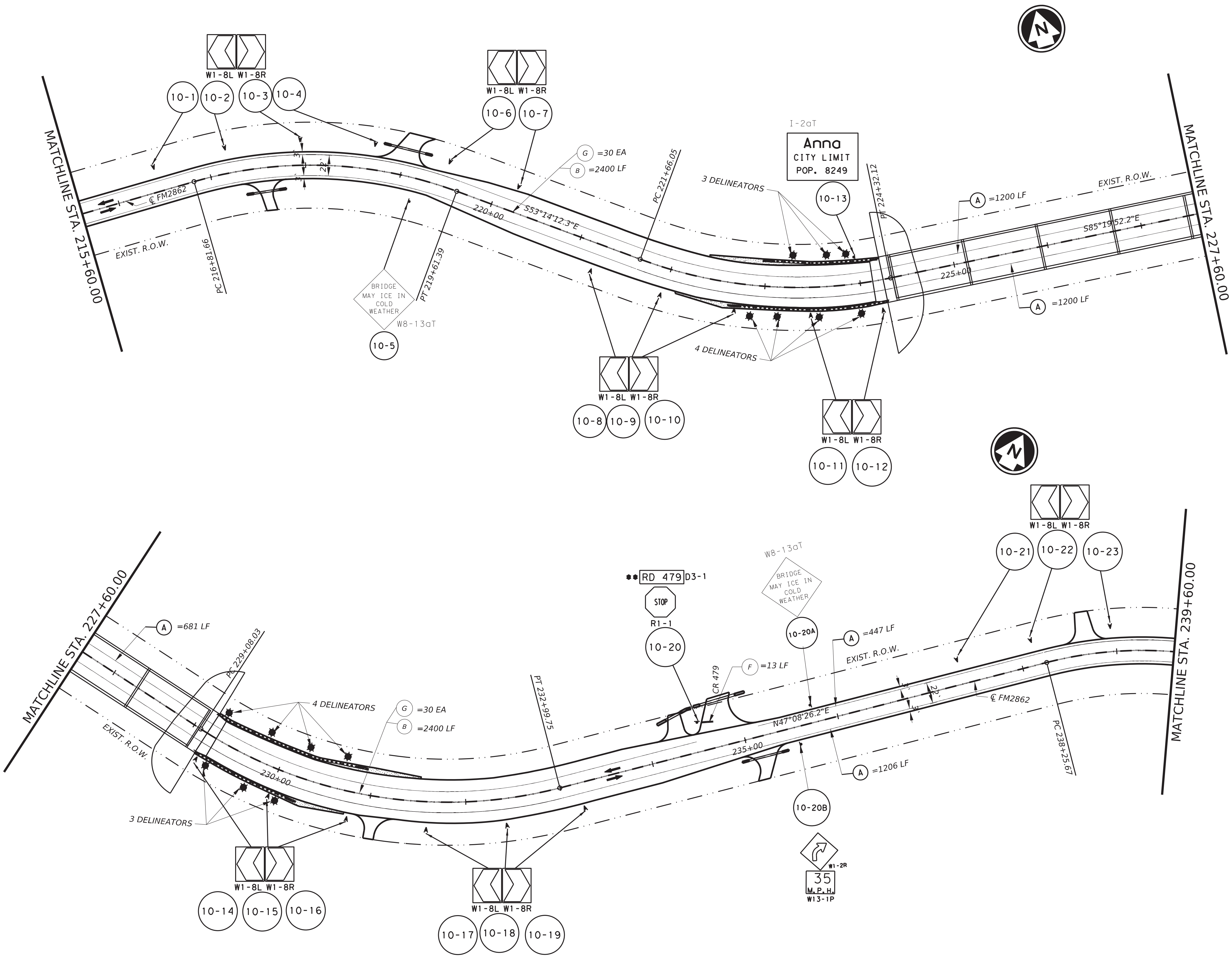
STA. 191+60 TO STA. 215+60

SCALE: 1" = 100' SHEET 9 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862

DIST	COUNTY	SHEET NO.
DAL	COLLIN	131

DATE: 3/20/2023 9:32:00 PM
FILE: c:\pwworking\txdot5\madiha.alshammry\d0747297\FM2862 SIGNING & PM SHEET 9.dgn



0 50 100
SCALE IN FEET

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR
- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.
- (#-#) - PROPOSED SIGN

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 215+60 TO STA. 239+60

SCALE: 1" = 100' SHEET10 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		132

DATE: 3/20/2023 9:32:14 PM
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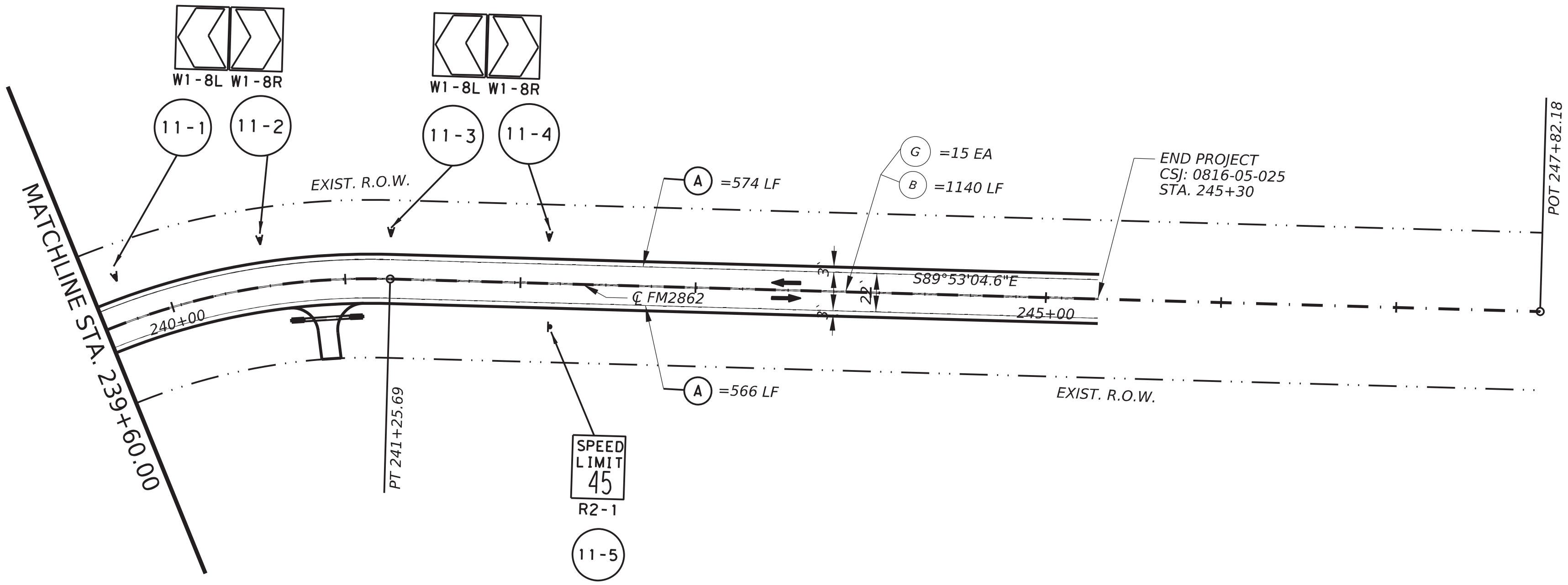


SCALE IN FEET (0, 50, 100)

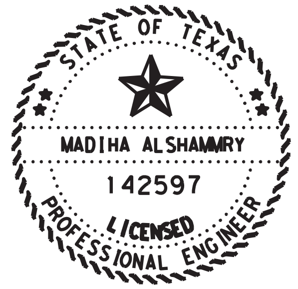
NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

- * SIGNS TO REMAIN
- ** SALVAGED SIGNS
- OBJECT MARKER (OM-2Z)(WFLX)GRND
- DELINEATOR

- (A) - RE PM W/RET REQ TY I (W)6" (SLD)(100MIL)
- (B) - RE PM W/RET REQ TY I (Y)6" (SLD)(100MIL)
- (C) - RE PM W/RET REQ TY I (Y)6" (BRK)(100MIL)
- (D) - REFL PAV MRK TY I (W)6" (DOT)(100MIL)
- (E) - REFL PAV MRK TY I (W)12" (SLD)(100MIL)
- (F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)
- (G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.
- (H) - REFL PAV MRKR TY II-A-A SPACED AT 80' O.C.

- (#-#) - PROPOSED SIGN



Madiha Alshammry, P.E. 3/17/2023

Texas Department of Transportation

FM 2862

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 239+60 TO PROJECT END

SCALE: 1" = 100'   SHEET 11 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		133

DATE: 3/20/2023 9:32:28 PM
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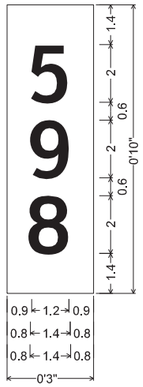
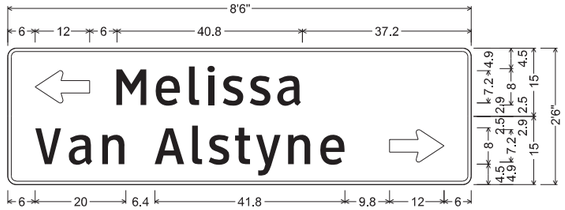


D10-7aT 3in;
No border, White on Green;
"5", ClearviewHwy-4-W;
"9", ClearviewHwy-4-W;
"8", ClearviewHwy-4-W;

SHEET 1 SIGN 2



D1-2 8in LT-RT;

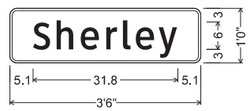
1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°; "Melissa", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"Van Alstyne", ClearviewHwy-3-W;
Standard Arrow Custom 12.0" X 7.1" 0°;

SHEET 1 SIGN 5

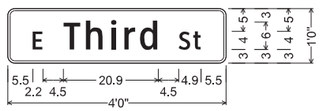
D2-1 8in;
1.5" Radius, 0.5" Border, White on Green;
"Westminster", ClearviewHwy-3-W; "6", ClearviewHwy-3-W;

SHEET 1 SIGN 10



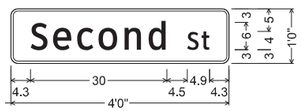
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on Green;
"Sherley", ClearviewHwy-3-W;

SHEET 1 SIGN 18
SHEET 1 SIGN 21



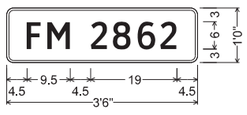
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on Green;
"E", ClearviewHwy-3-W;
"Third", ClearviewHwy-3-W;
"St", ClearviewHwy-3-W;

SHEET 1 SIGN 18



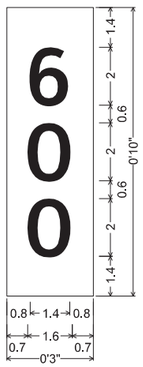
D3-1G(1) 6in;
1.5" Radius, 0.5" Border, White on Green;
"Second", ClearviewHwy-3-W;
"St", ClearviewHwy-3-W;

SHEET 1 SIGN 21



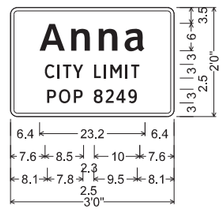
D3-1G(2) 6in;
1.5" Radius, 0.5" Border, White on Green;
"FM", ClearviewHwy-3-W;
"2862", ClearviewHwy-3-W;

SHEET 4 SIGN 12



D10-7aT 3in;
No border, White on Green;
"6", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

SHEET 5 SIGN 1



I-2aT 6in;
1.5" Radius, 0.8" Border, White on Green;
"Anna", ClearviewHwy-5-W-R;
"CITY LIMIT", ClearviewHwy-3-W;
"POP 8249", ClearviewHwy-3-W;

SHEET 10 SIGN 13

STATE OF TEXAS
MATTHEW RYAN MESTRE
142175
LICENSED
PROFESSIONAL ENGINEER

Matthew Ryan Mestre ,P.E. 03/09/2023
Signature of Registrant Date

GUIDE SIGN DETAILS

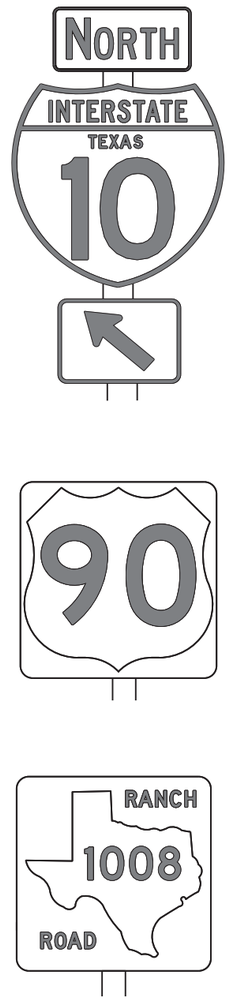
SCALE: NTS SHEET 1 OF 1

DESIGN/CK	FED.RD. DIV.NO.	FEDERAL-AID PROJECT NUMBER		HIGHWAY NO.
MRM	6	SEE TITLE SHEET		FM 2862
CHECK BLS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MAA	TEXAS	DAL	COLLIN	134
CHECK BA	CONTROL	SECTION	JOB	
	0816	05	025	

DATE: 3/16/2023 9:32:54 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshammry\d0872526\tsr3-13.dgn

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

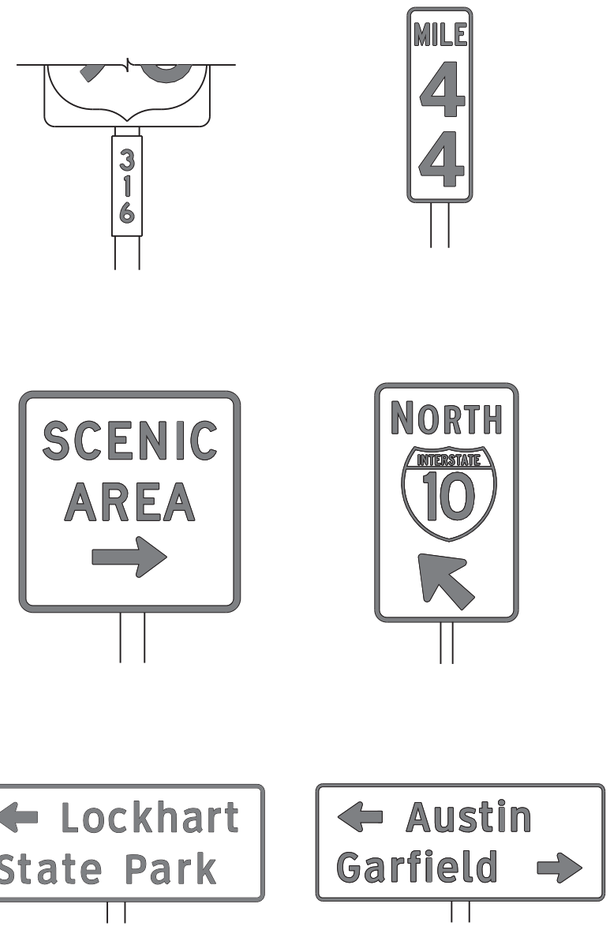
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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

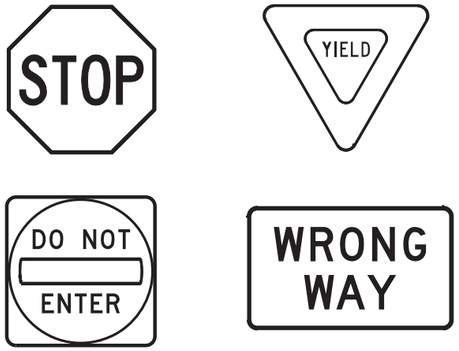
TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	DAL	COLLIN		135

DATE: 3/16/2023 9:33:06 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshammry\d0872526\tsr4-13.dgn

REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

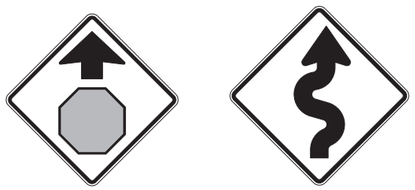
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

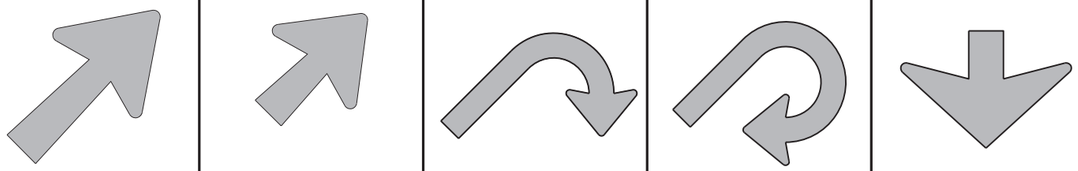
TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		136

DATE: 3/16/2023 9:33:21 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshamry\d0872526\tsr5-13.dgn

ARROW DETAILS

for Large Ground-Mounted and Overhead Guide Signs



TYPE	LETTER SIZE	USE
A-1	10.67" U/L and 10" Caps	Single Lane Exits
A-2	13.33" U/L and 12" Caps	
A-3	16" & 20" U/L	
B-1	10.67" U/L and 10" Caps	Multiple Lane Exits
B-2	13.33" U/L and 12" Caps	
B-3	16" & 20" U/L	

CODE	USED ON SIGN NO.
E-3	E5-1aT
E-4	E5-1bT

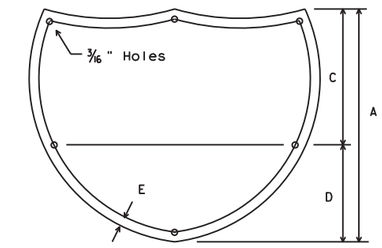
NOTE

Arrow dimensions are shown in the "Standard Highway Sign Designs for Texas" manual.

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

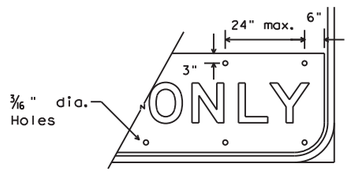
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

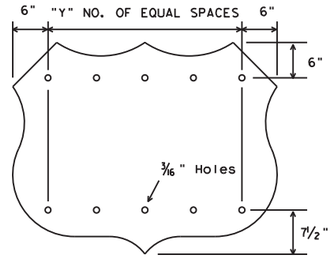


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

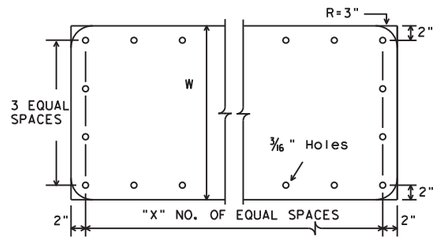


EXIT ONLY PANEL



U.S. ROUTE MARKERS

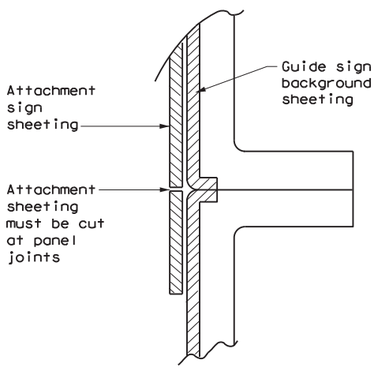
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



STATE ROUTE MARKERS

No. of Digits	W	X
4	24	4
4	36	5
4	48	6
3	24	3
3	36	4
3	48	5

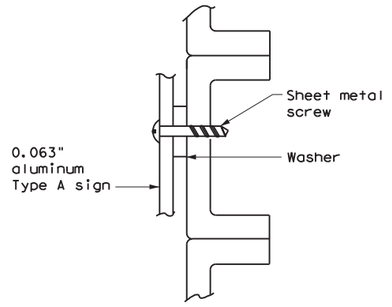
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



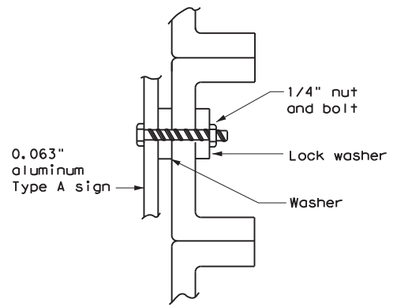
DIRECT APPLIED ATTACHMENT

NOTE:

1. Sheeting for legend, symbols, and borders must be cut at panel joints.
2. Direct applied attachment signs will be subsidiary to "Aluminum Signs" or "Fiberglass Signs".



SCREW ATTACHMENT



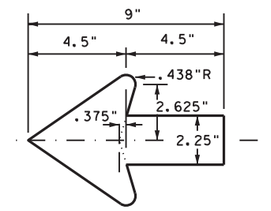
NUT/BOLT ATTACHMENT

NOTE:

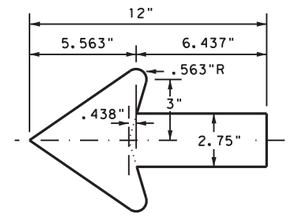
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

ARROW DETAILS

for Destination Signs (Type D)



Standard arrow to be used with 6 inch letters.



Standard arrow to be used with 8 inch letters.

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(5)-13

FILE: tsr5-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	DAL	COLLIN		137

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)

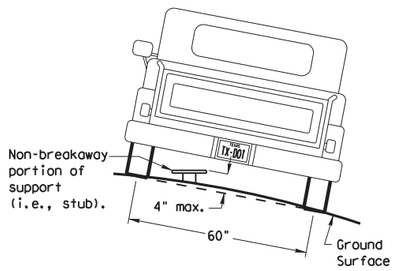
Anchor Type

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))

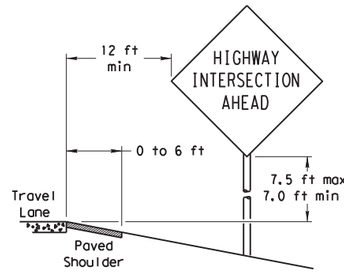
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

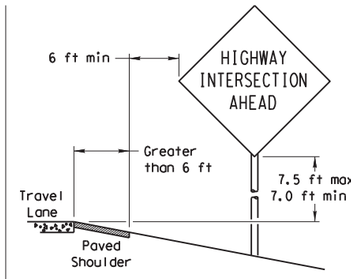
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

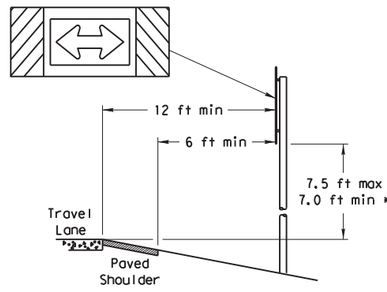
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



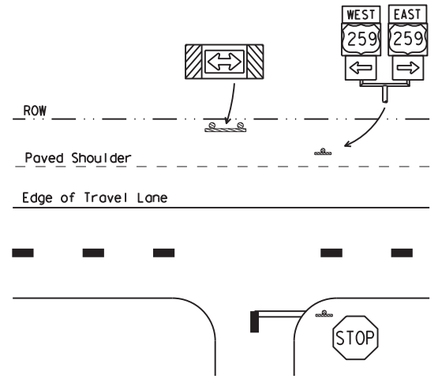
GREATER THAN 6 FT. WIDE

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.

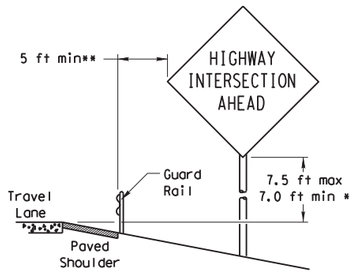
T-INTERSECTION



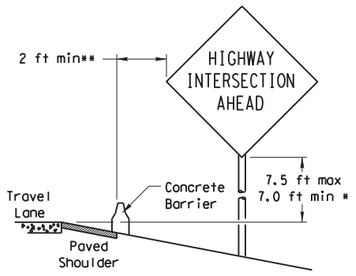
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

****Sign clearance based on distance required for proper guard rail or concrete barrier performance.**

* 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

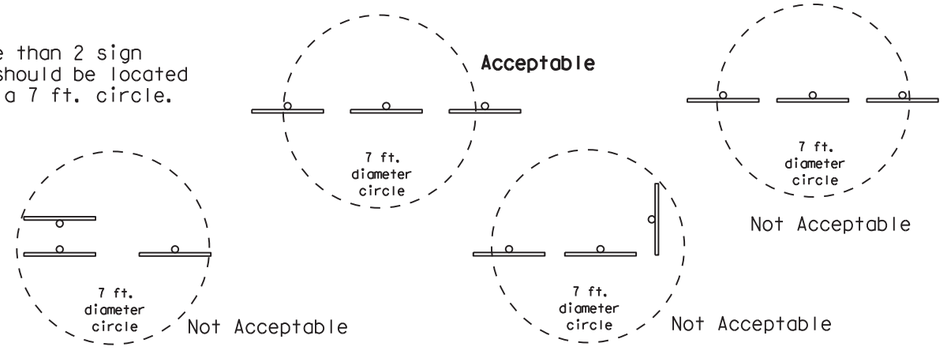
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

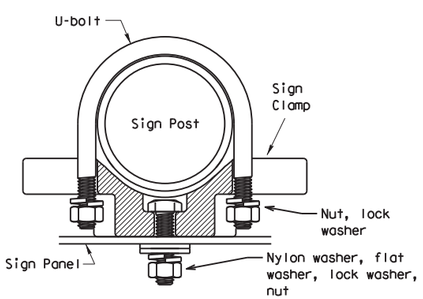
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

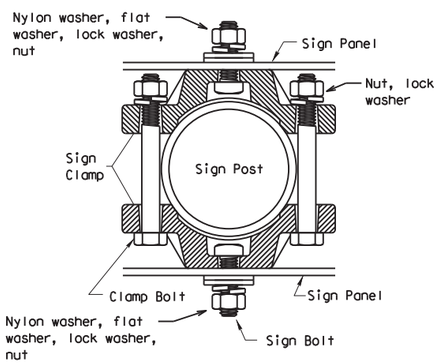


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

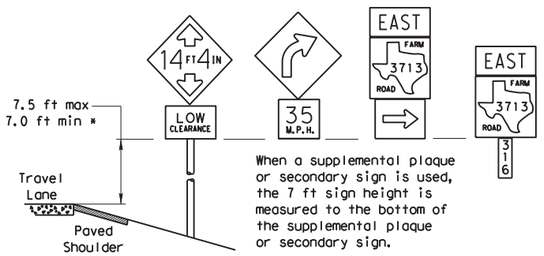
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



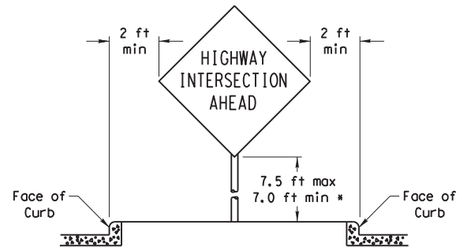
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



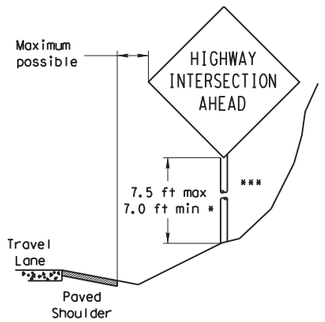
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS
9-08

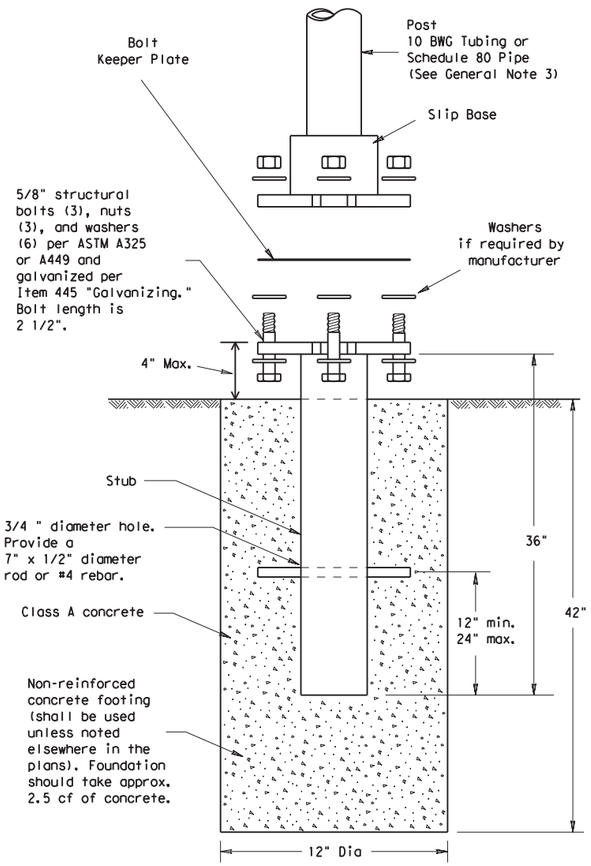
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862

DIST	COUNTY	SHEET NO.
DAL	COLLIN	138

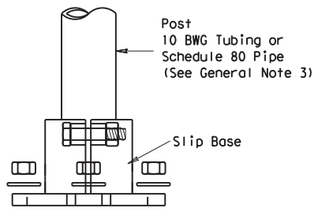
DATE: 3/16/2023 9:33:34 PM
FILE: c:\txdot\pw#online\txdot5\madiha.alshamry\d0872526\smdgen.dgn

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS

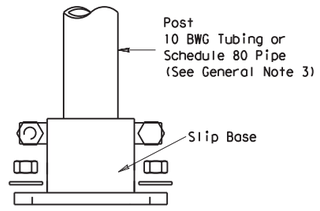


SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

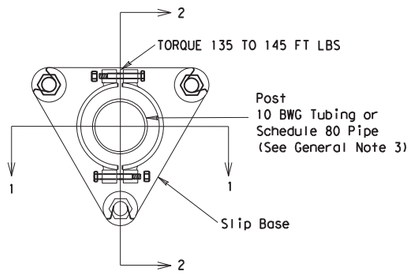
NOTE
The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.



SIDE VIEW 1-1



SIDE VIEW 2-2



TOP VIEW

DETAIL A

GENERAL NOTES:

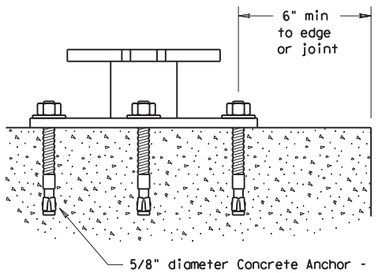
1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   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.

ADDED DETAIL A FOR CLAMP BASE
10-2010

DATE:
FILE:

Texas Department of Transportation
Dallas District Standard

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

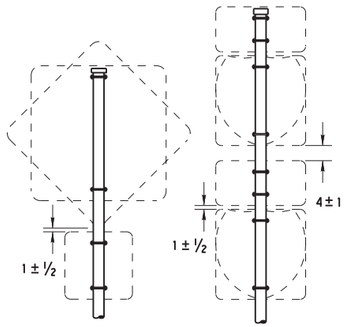
SMD(SLIP-1)-08(DAL)

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

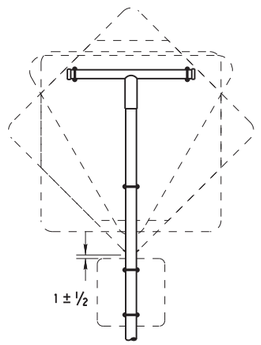
9-08 REVISIONS
12-10 (DISTRICT) ADDED CLAMP BASE DETAIL FOR SLIP BASE INSTALLATION

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862

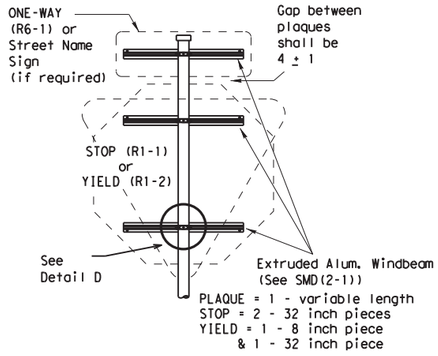
DIST	COUNTY	SHEET NO.
DAL	COLLIN	139



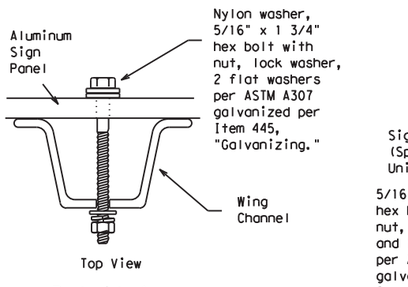
SM RD SGN ASSM TY XXXXX(1)XX(P)



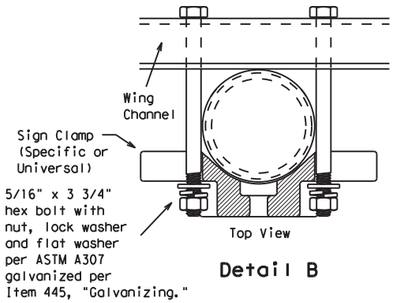
SM RD SGN ASSM TY XXXXX(1)XX(T)



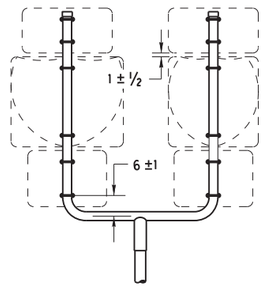
SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



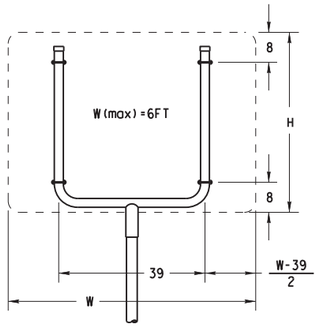
Detail A



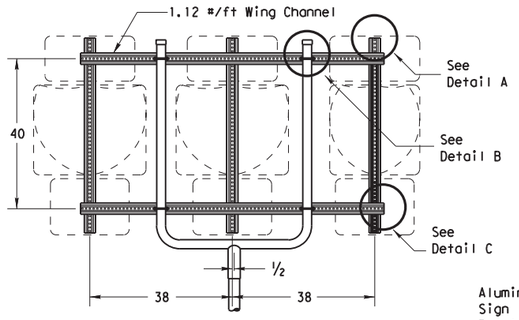
Detail B



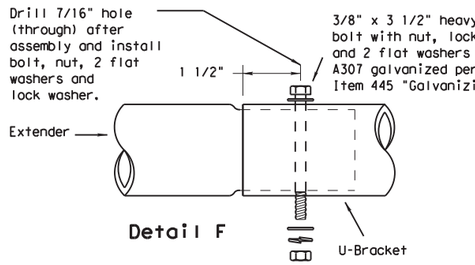
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

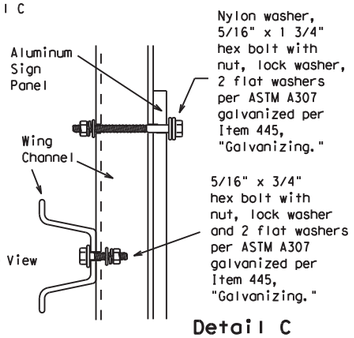


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

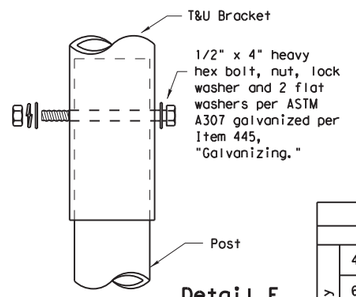


Detail F

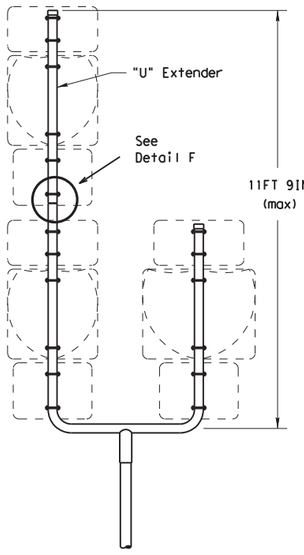
Splices shall only be allowed behind the sign substrate.



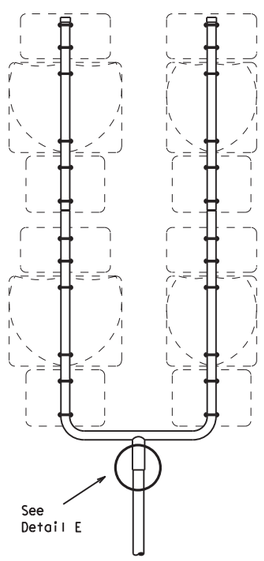
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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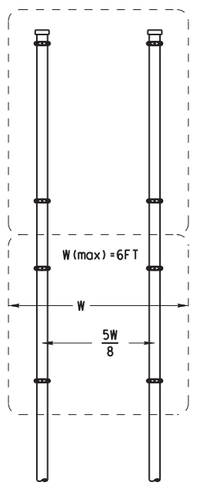
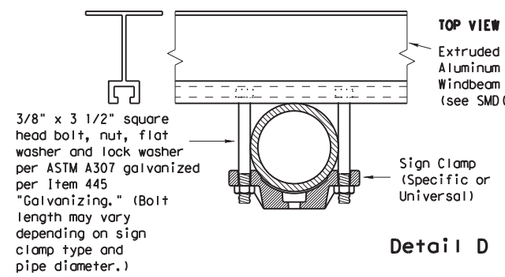
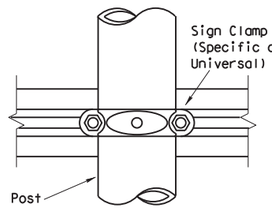


SM RD SGN ASSYM TY XXXXX(2)XX(P)



Detail D



GENERAL NOTES:

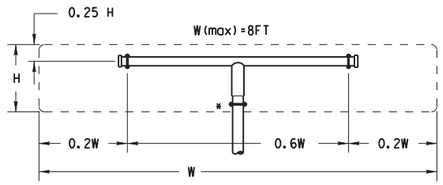
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

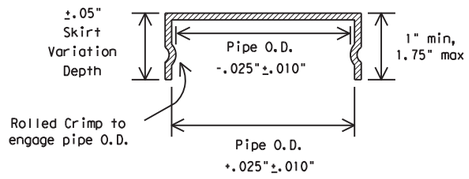
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)



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.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		140

DATE: 3/16/2023 9:33:59 PM
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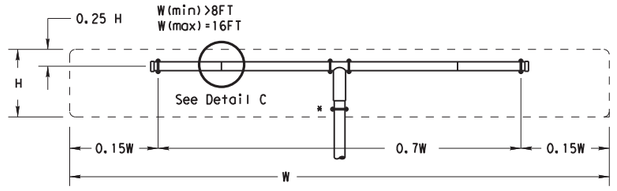
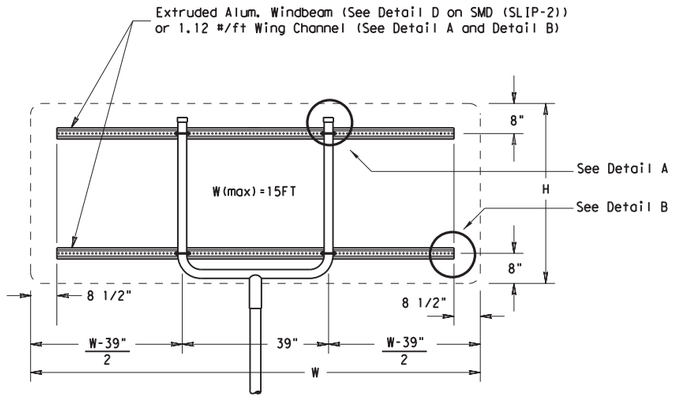
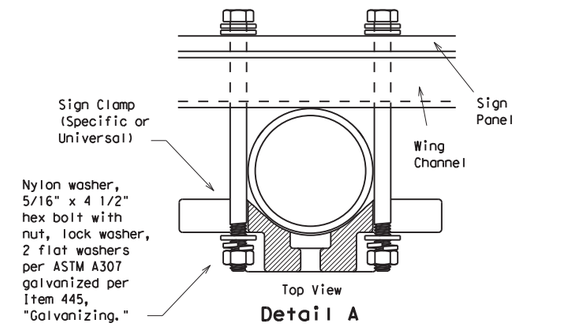


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

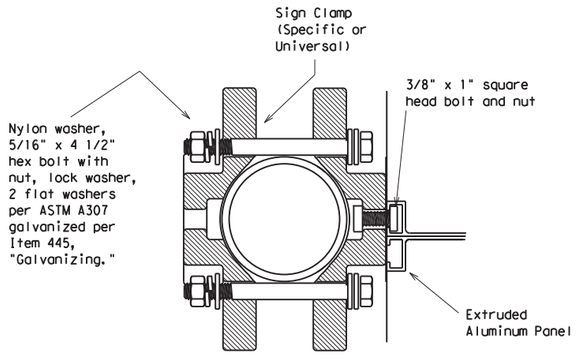


SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

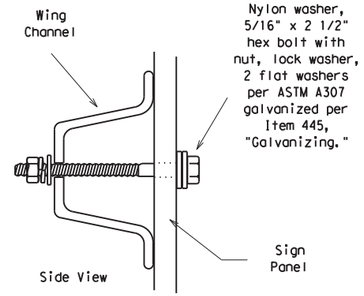


Top View

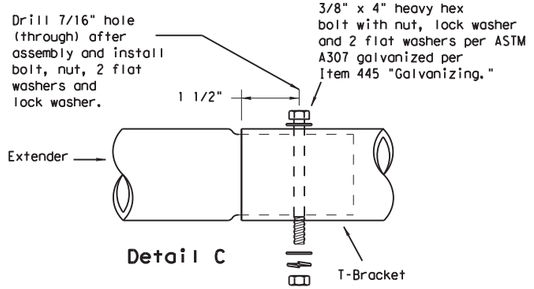
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

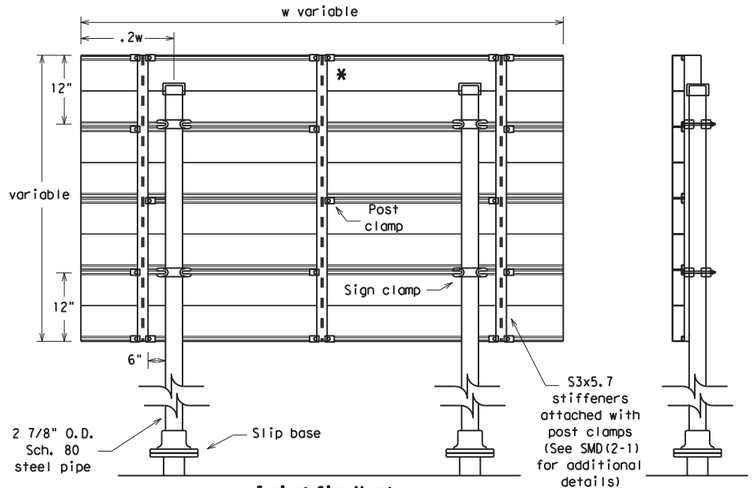


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

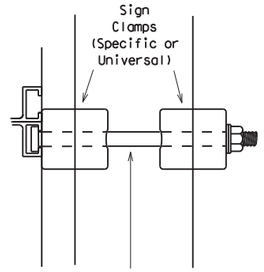


Typical Sign Mount

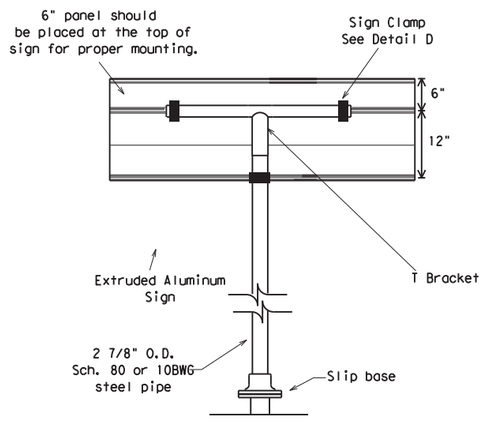
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

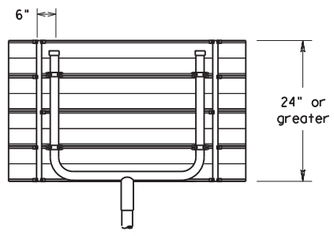
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862

DIST	COUNTY	SHEET NO.
DAL	COLLIN	141

DATE: 3/16/2023 9:34:24 PM
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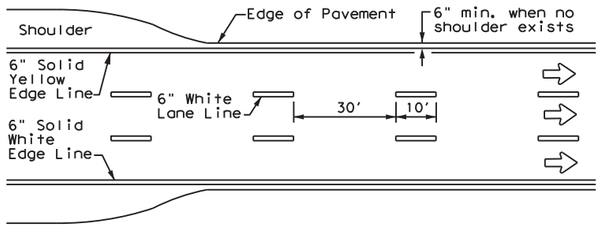
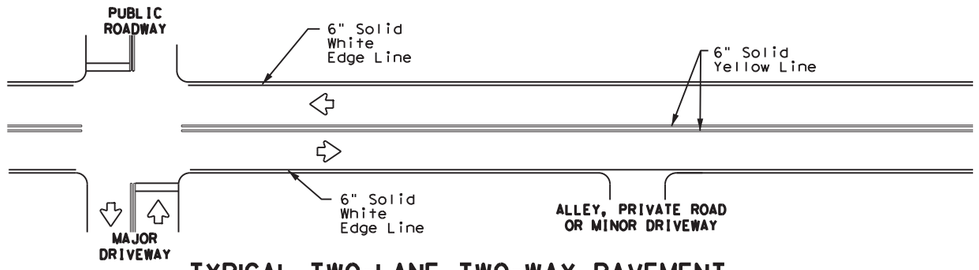
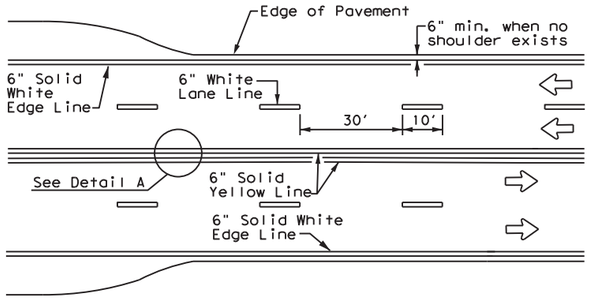
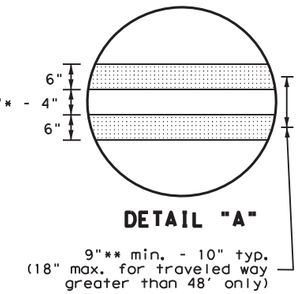


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

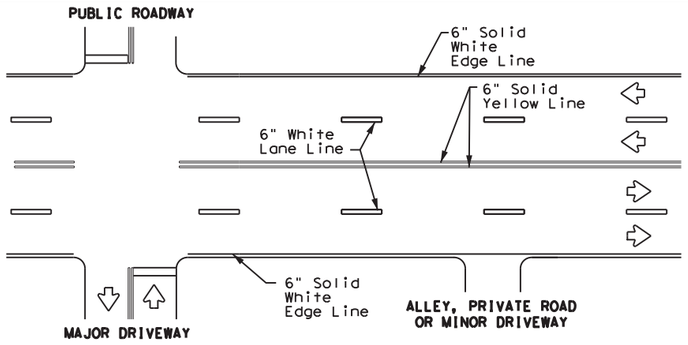




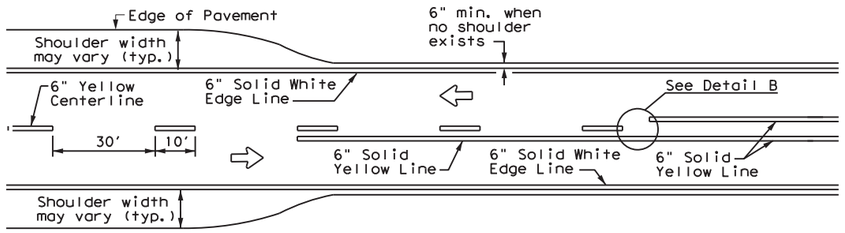
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

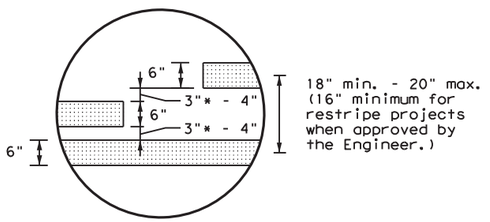
** 8" minimum for restripe projects when approved by the Engineer.



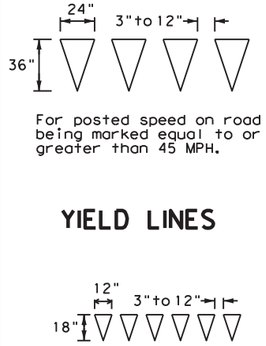
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

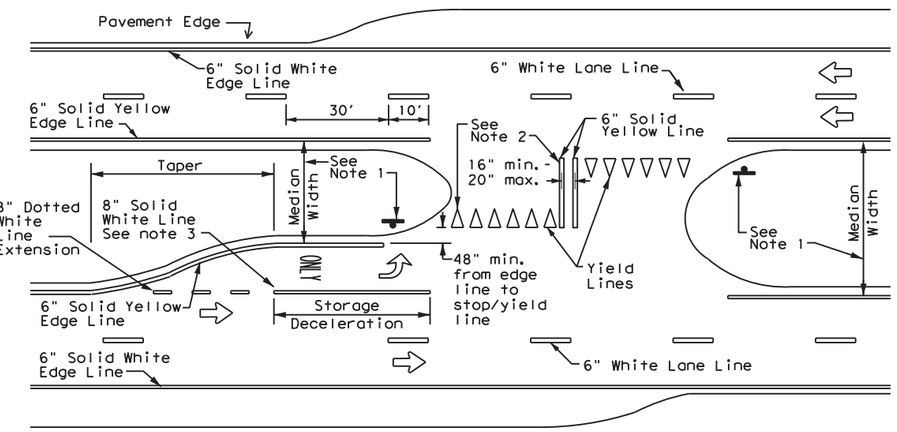


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



* 2" minimum for restripe projects when approved by the Engineer.





FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
   Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
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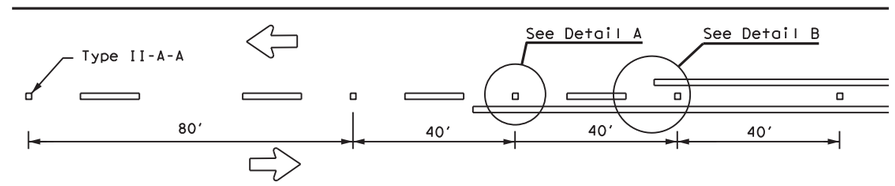
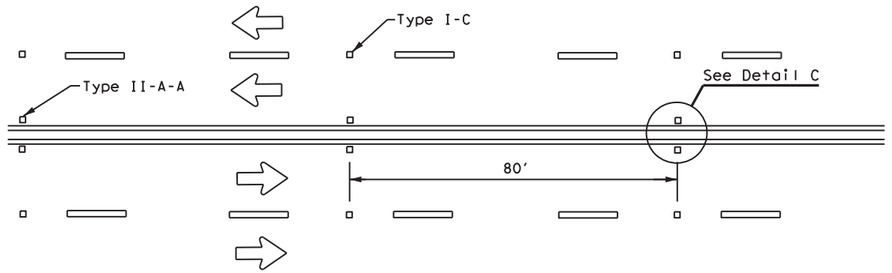
11-78 8-00 6-20	DIST	COUNTY		SHEET NO.
8-95 3-03 12-22	DAL	COLLIN		142
5-00 2-12				

22A

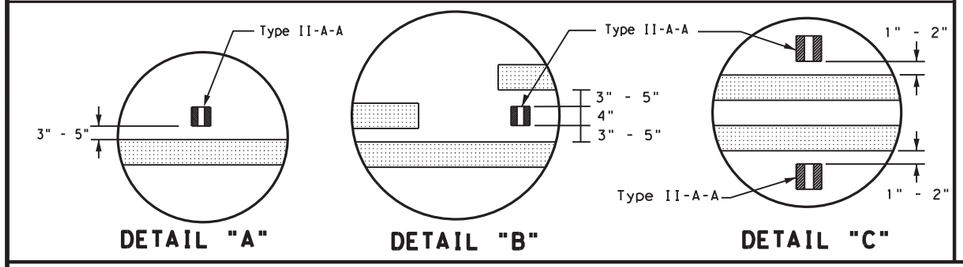
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

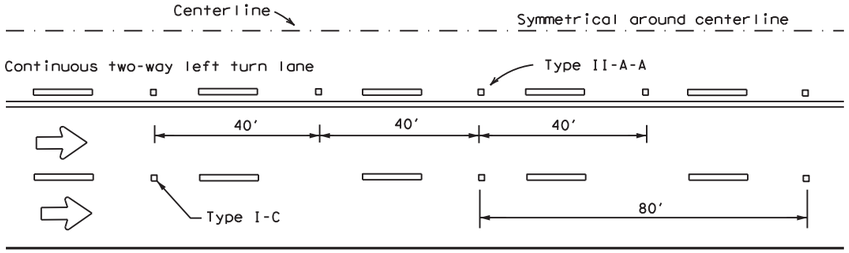


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

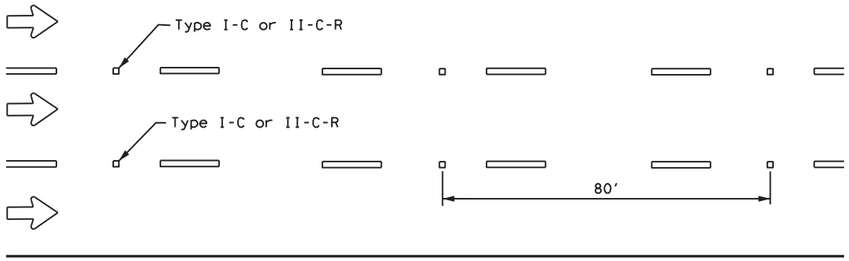


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



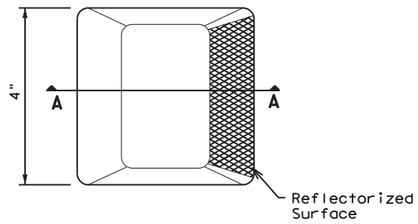
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

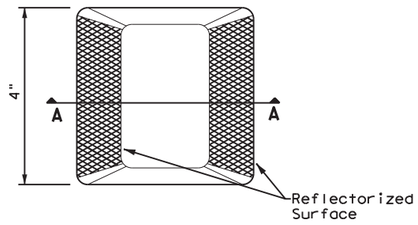
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

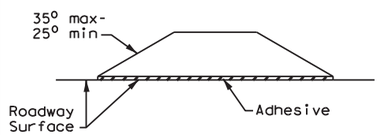
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

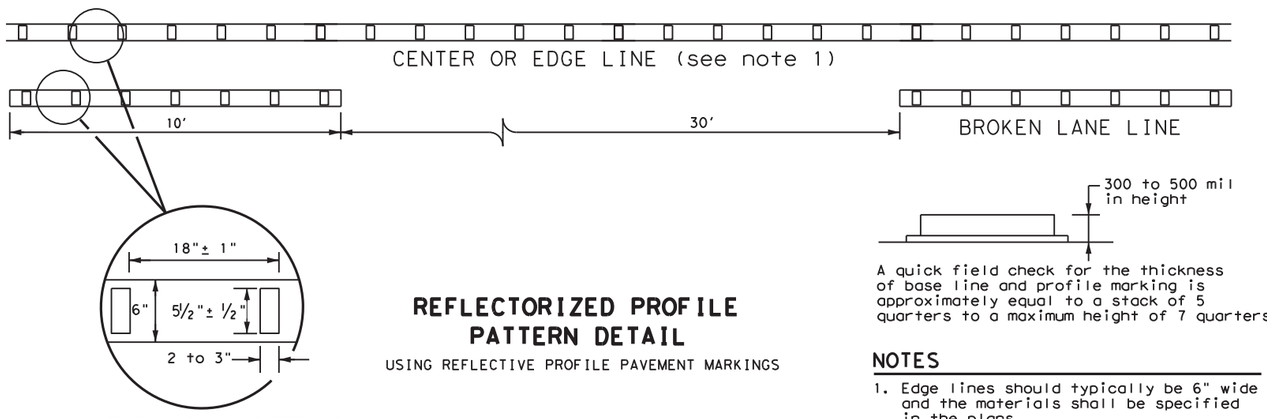


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
4-77 8-00 6-20	DIST	COUNTY		SHEET NO.
4-92 2-10 12-22	DAL	COLLIN		143
5-00 2-12				

22B

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DATE: 2023/02/22
FILE: DOCUMENT NAME

DATE: 3/16/2023 9:34:50 PM
FILE: c:\txdot\pw_online\txdot5\madiha.alshamry\d0872526\dam1-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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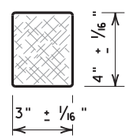
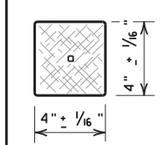
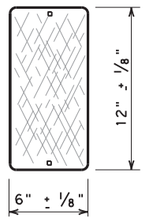
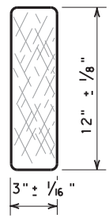
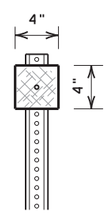
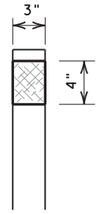
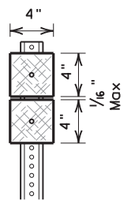
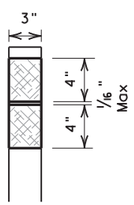
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE	 1-Size 2 reflector unit	 1-Size 1 reflector unit	 2-Size 2 reflector units	 2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

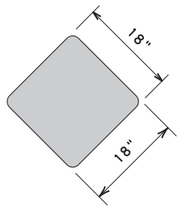
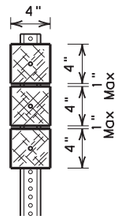
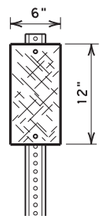
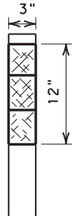
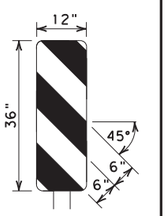
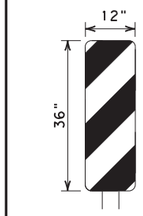
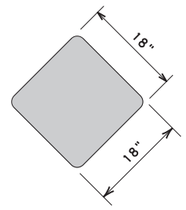
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s) (Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

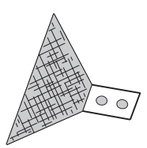
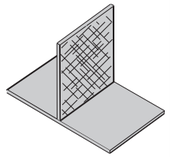
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

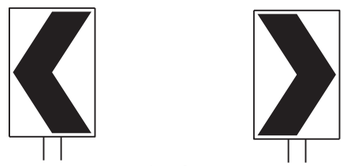
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		 3-Size 2 reflector units	 1-Size 3 reflector unit	 3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

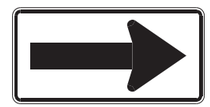
DEVICE: 

W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE: 

W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

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.

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

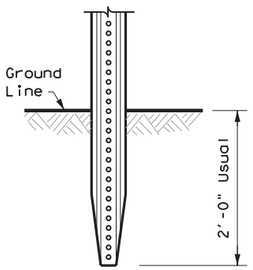
FILE: dam1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	DAL	COLLIN		144

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

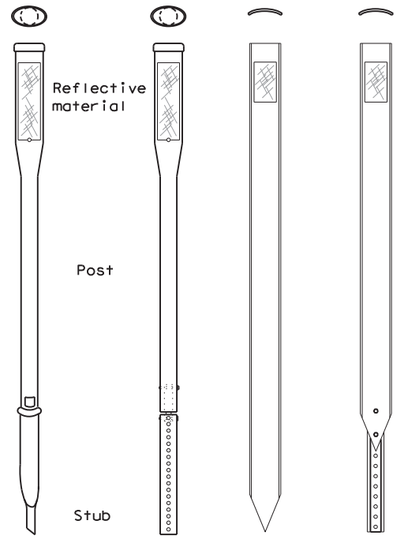


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

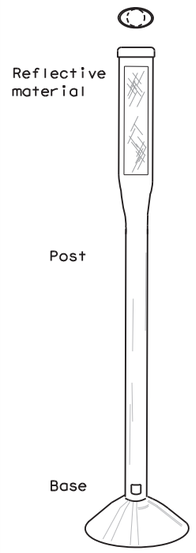
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



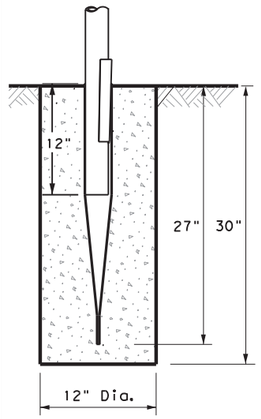
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

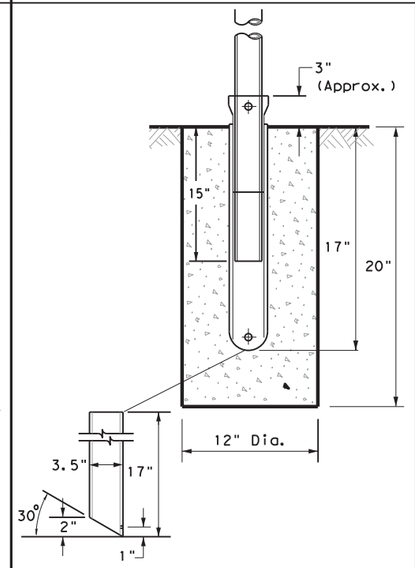
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

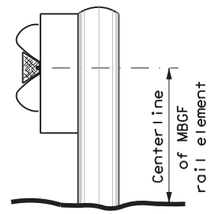
NOTE

1. Install per manufacturer's recommendations.

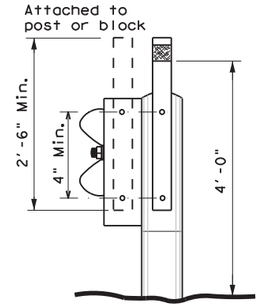
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

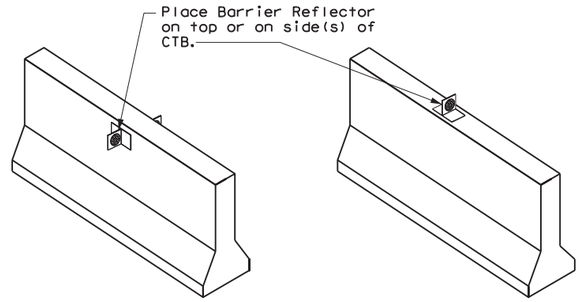
GF1



GF2



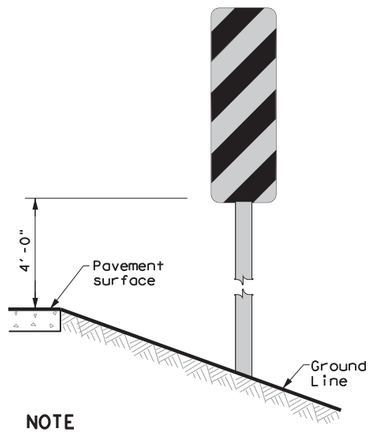
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

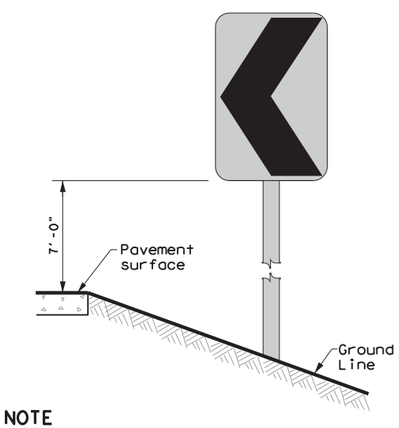
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

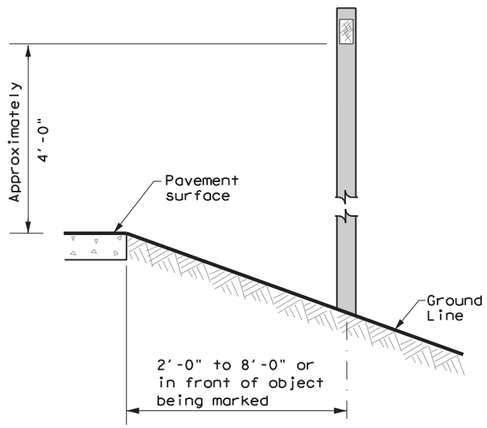
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

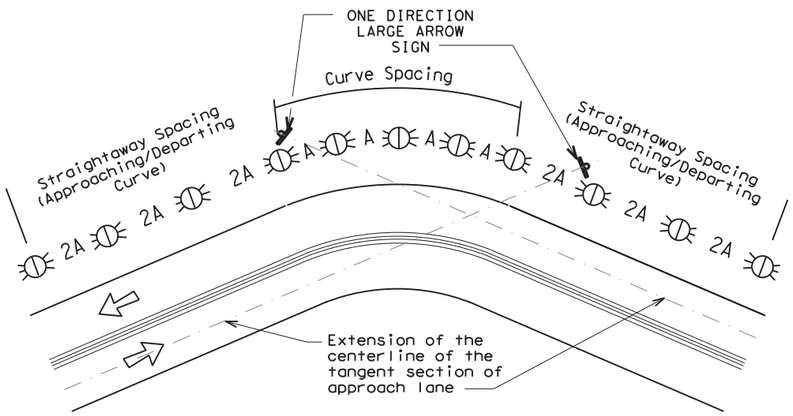
FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	DAL	COLLIN		145

20B

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

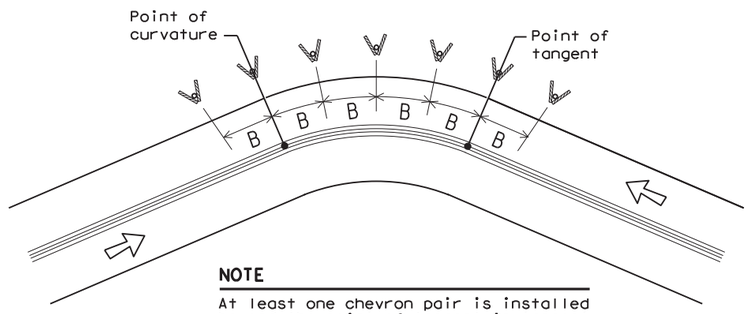
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		146

20C

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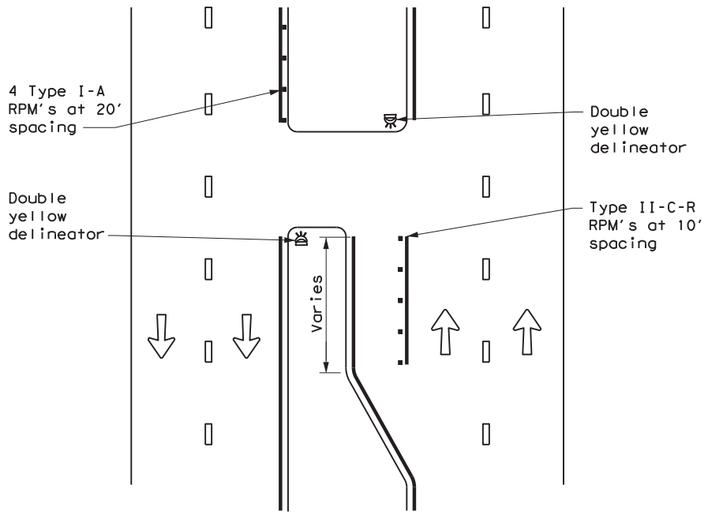
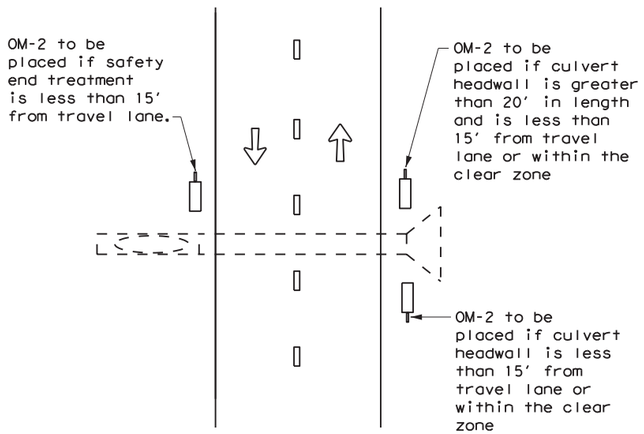
CROSSOVERS



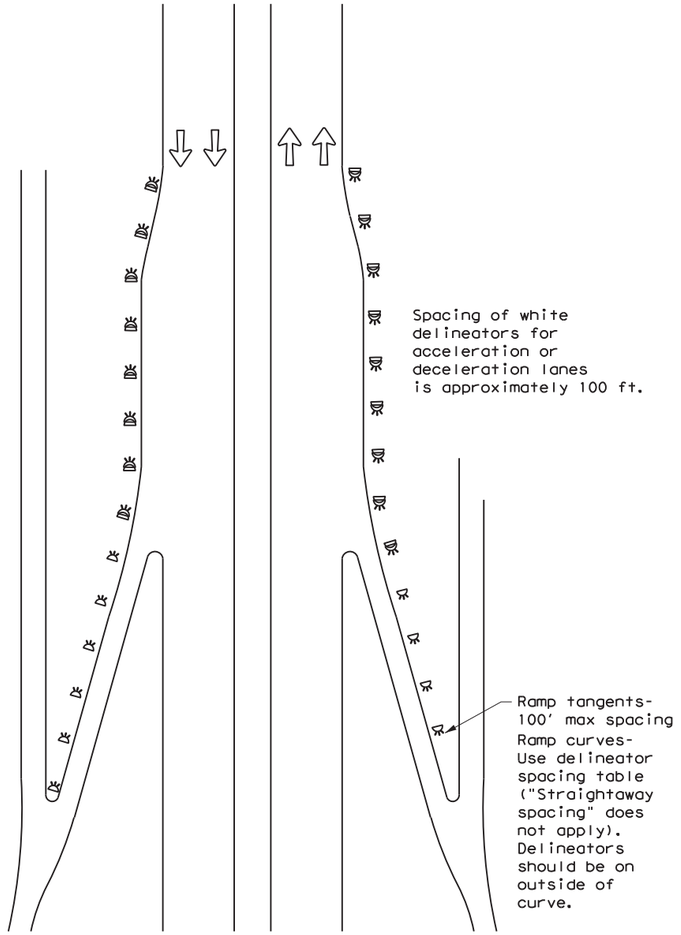
DETAIL 1

FOR CULVERTS WITHOUT MBGF



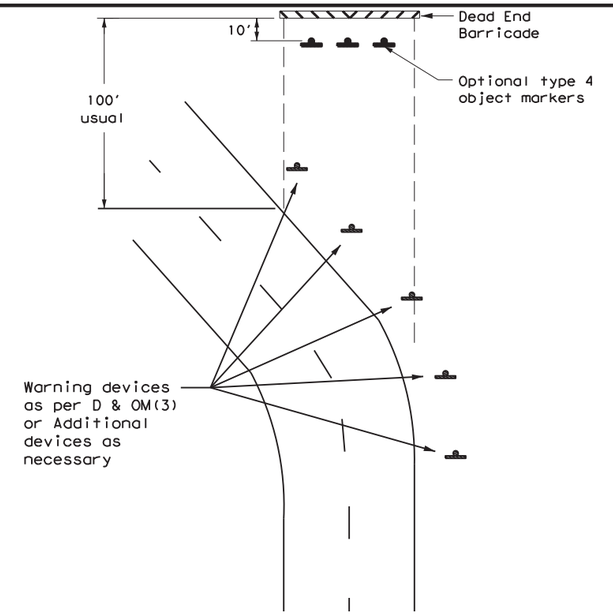
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



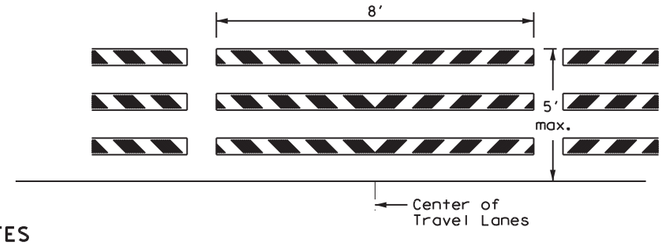
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

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
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3-15 7-20	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		147

20D

DATE: 3/16/2023 9:35:30 PM
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DATE: 3/16/2023 9:35:42 PM
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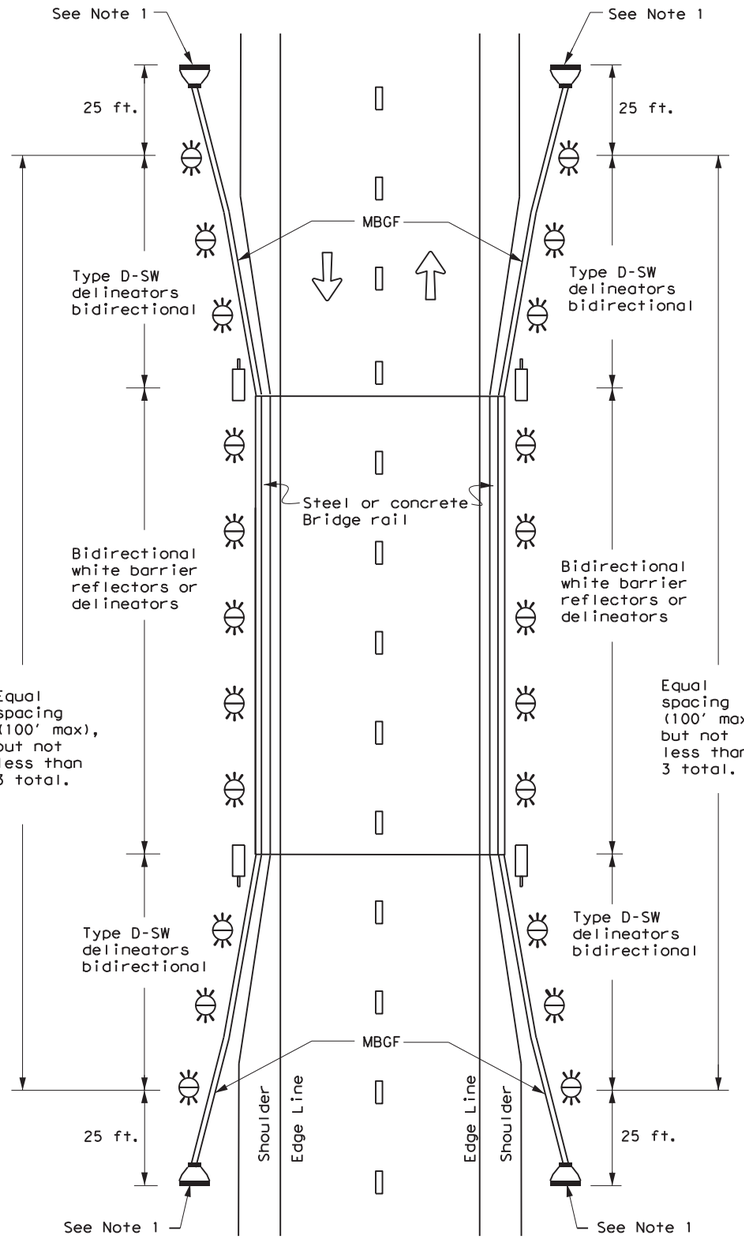
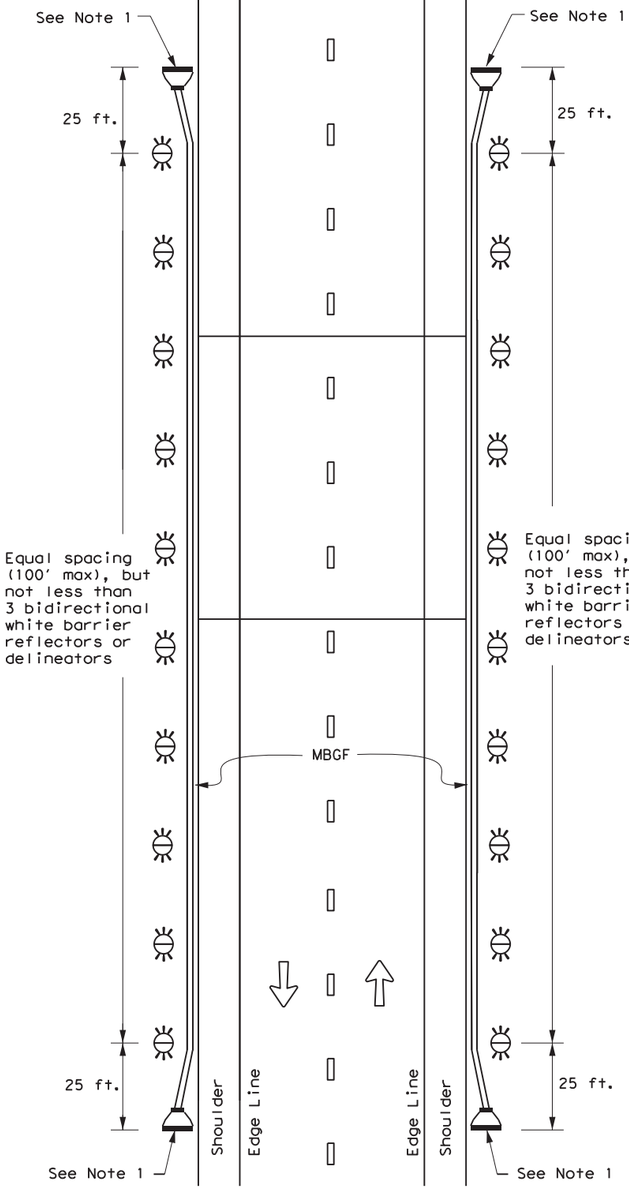
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

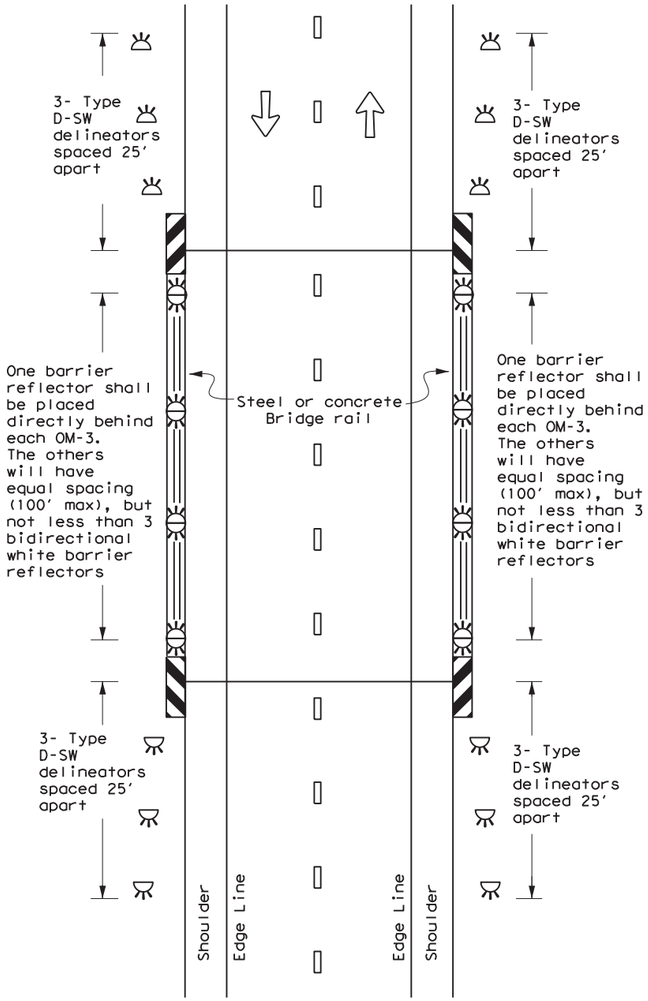
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
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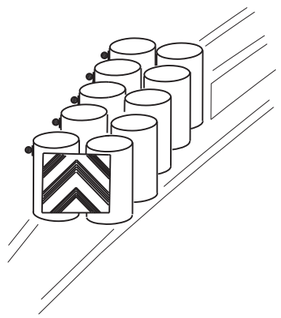
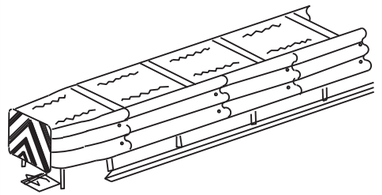
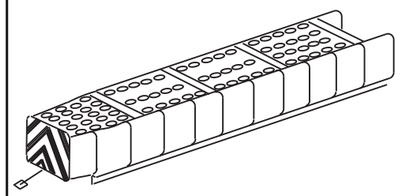
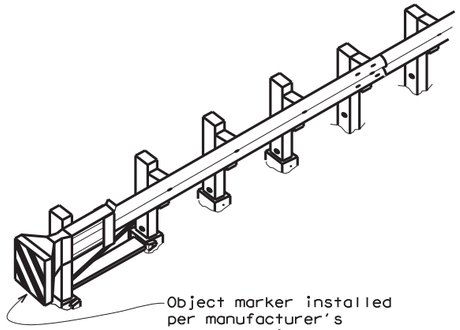
7-20	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		148

20E

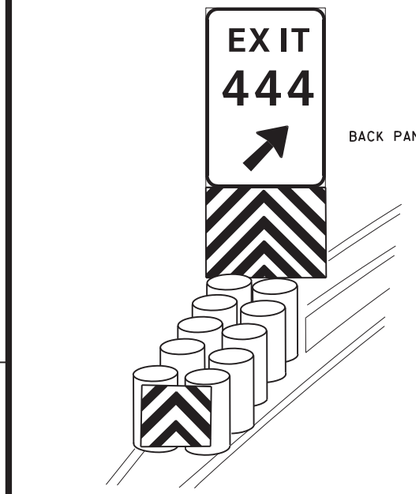




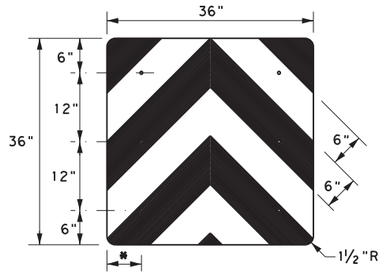


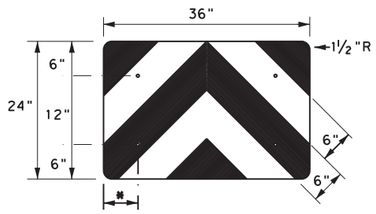


Object marker installed per manufacturer's recommendations.

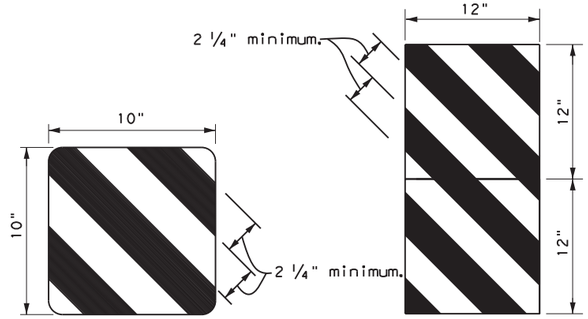


BACK PANEL (OPTIONAL)

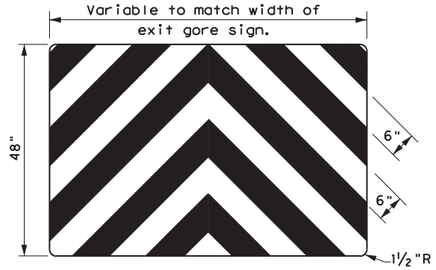


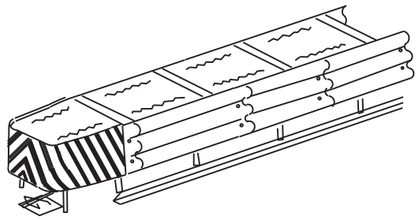


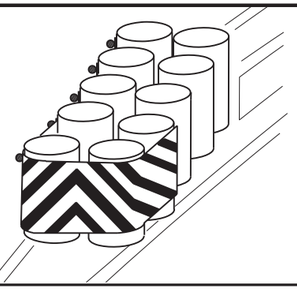
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

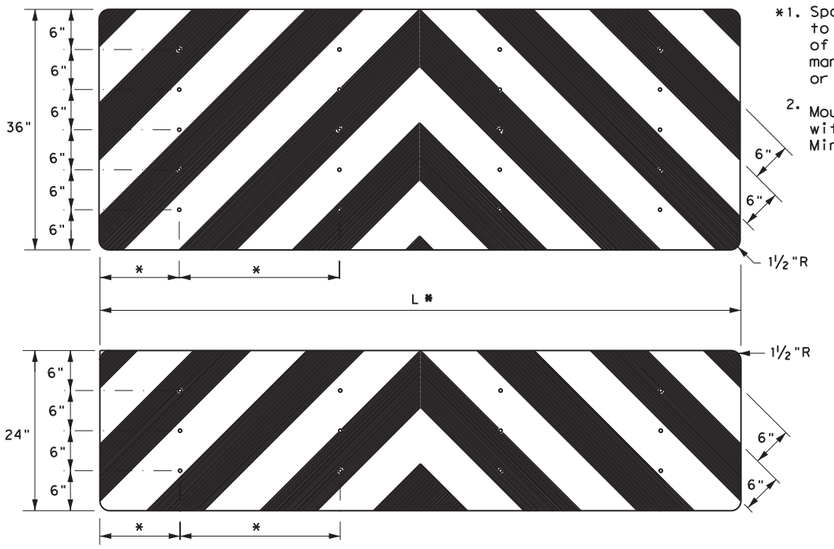


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
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4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	DAL	COLLIN		149
4-98 7-20				

20G

DATE: 3/16/2023 9:35:55 PM
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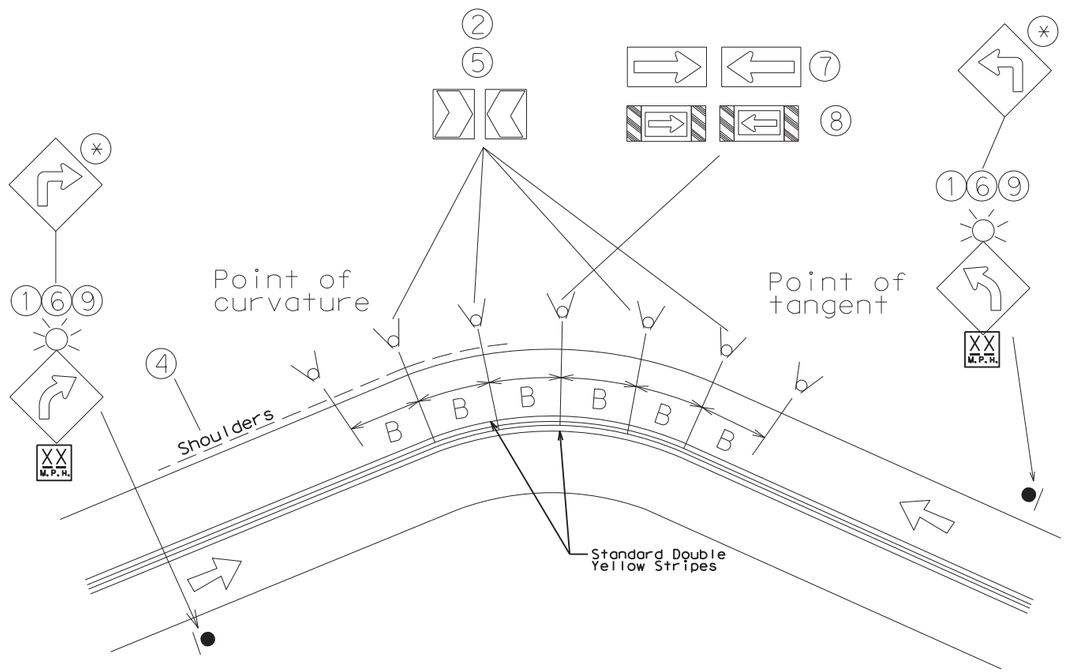
Dallas District Standard for Two-Lane Highway Curve Signing/Markings



Curve Safety Sequence

Applicable Minimum Measures

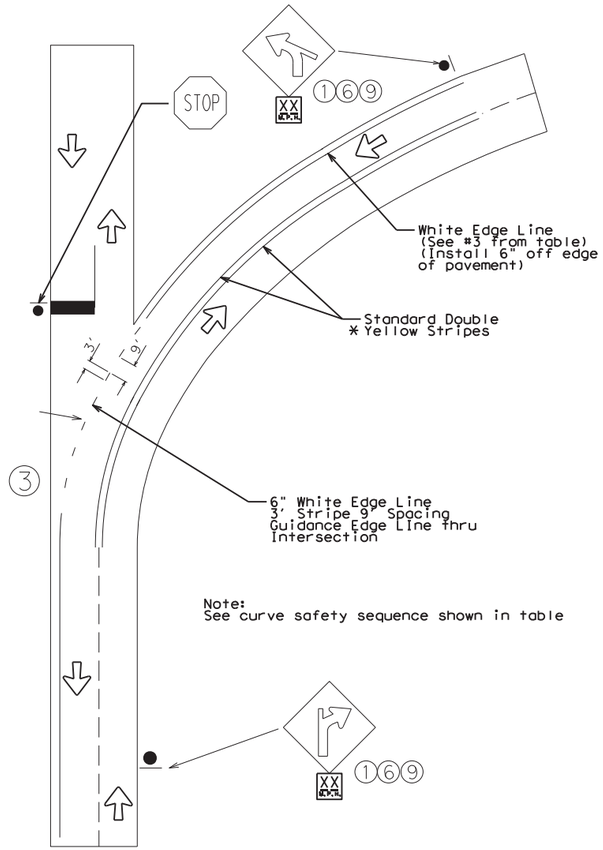
Advisory Speed 55 mph or higher	Advisory Speed 40-50 mph	Advisory speed 35 mph or less		Curve signing, delineation and pavement markings (listed in order from minimum to maximum level of treatment as needed)
+	+	+	1	Advance warning (36" x 36") and advisory mph (18" x 18")
+	+	+	2	Chevron alignment signs if advisory speed is 15 mph or greater than posted speed
	+	+	3	Edge lines
			3a	Pavement width 24' or greater 6" solid white edge line
			3b	Pavement width 20' - 24' 4" solid white edge line
			3c	Pavement width 20' or less no edge line
		Supplemental Measures		
		#	4	Add shoulders and edge line (see #3a)
		#	5	Yellow high intensity flourescent chevron alignment signs - add reflective sheeting to sign support from bottom edge of sign
#	#	#	6	Large advance warning (48" x 48") and advisory mph (30" x 30")
#	#	#	7	Arrow sign (48" x 24")
		#	8	Large arrow sign with diagonals (96" x 36")
		#	9	Add flashers to advance warning signs
#	#	#	10	Surface treatment to improve friction
			**	The W1-1R or L sign shall only be used when the advisory speed is
				30 mph or less

\+ = required
\# = optional

Applications 4 - 10 are additional supplemental applications which may be added as directed by the Area Engineer.

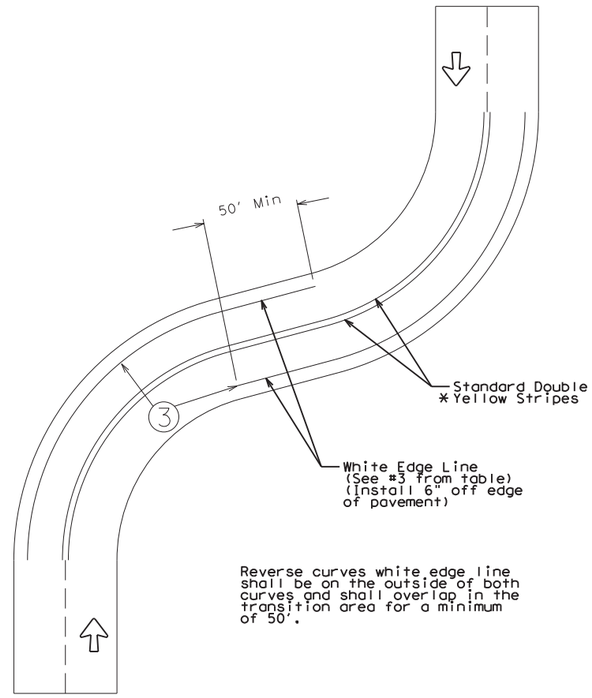
Note:
"B" - Chevron Spacing
referenced from D&OM(3)-15B

Typical Curve Treatment with Intersection



Note:
See curve safety sequence shown in table

Typical Reverse Curve Edge Line Treatment



Reverse curves white edge line shall be on the outside of both curves and shall overlap in the transition area for a minimum of 50'.

* Standard Double Yellow Stripes shall be dropped through a non-signalized intersection within the city limit. Outside the city limit, the Standard Double Yellow Strip shall be carried through all non-signalized intersections.

Notes:
1. Two methods will be used to determine the appropriate advisory speed for curves, the GPS Method(existing curves) and the Design Method (new curves).
2. Notify the Traffic Engineering Section for all requests on advisory speeds for existing curves.

OCT-2014 UPDATED NOTES
JAN-2016 NOTE ADDED
SEPT-2016 NOTE ADDED FOR STRIPING IN CURVE
MAR-2017 REMOVED REFERENCE TO DELINEATORS
MAY-2019 MODIFIED SIGN SIZE

TWO-LANE HIGHWAY CURVE SIGNING & MARKINGS

DALLAS DISTRICT STANDARD

SCALE: NTS SHEET 1 OF 1

DESIGN/CK	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
BLS	6	SEE TITLE SHEET		FM 2862
CHECK BLS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK FRC	TEXAS	DALLAS	COLLIN	150
CHECK ARO	CONTROL 0816	SECTION 05	JOB 025	

DATE: 2023/02/22
FILE: DOCUMENT NAME

GENERAL NOTES FOR ALL ELECTRICAL WORK

1. The location of all conduits, junction boxes, ground boxes, and electrical services is diagrammatic and may be shifted to accommodate field conditions.

2. Provide new and unused materials. Ensure that all materials and installations comply with the applicable articles of the National Electrical Code (NEC), TxDOT standards and specifications, National Electrical Manufacturers Association (NEMA), and are listed by Underwriters Laboratories (UL) or a Nationally Recognized Testing Lab (NRTL). NRTLs such as Canadian Standard Association (CSA), Intertek Testing Services NA Inc., or FM Approvals LLC can be considered equivalent to UL. Where reference is made to NEMA listed devices, International Electrotechnical Commission (IEC) listed devices will not be considered an acceptable equal to a NEMA listed device. Acceptable devices may have both a NEMA and IEC listing. Faulty fabrication or poor workmanship in any material, equipment, or installation is justification for rejection. Replace or reinstall rejected material or equipment at no additional cost to the Department.

3. Miscellaneous nuts, bolts and hardware, except for high strength bolts, may be stainless steel when plans specify galvanized, provided the bolt size is ½ in. or less in diameter.

4. Provide the following test equipment as required by the Engineer to confirm compliance with the contract and the NEC: voltmeter, ammeter, megohm meter (1000 volt DC), ground resistance tester, torque wrenches, and torque screwdrivers. Ensure all equipment has been properly calibrated within the last year. Provide calibration certification to the Engineer upon request. Operate test equipment during inspection as requested by the Engineer.

5. Install grounding as shown on the plans and in accordance with the NEC. Ensure all metallic conduits; metal poles; luminaires; and metal enclosures are bonded to the equipment grounding conductor. Provide stranded bare copper or green insulated grounding conductors. Ground rods, connectors, and bonding jumpers are subsidiary to the various bid items.

6. When required by the Engineer, notify the Department in writing of materials from the Material Producers List (MPL) intended for use on each project. Prequalified materials are listed on the MPL on TxDOT's website under "Roadway Illumination and Electrical Supplies." No substitutions will be allowed for materials on this list.

CONDUIT

A. MATERIALS

1. Provide conduit, junction boxes, fittings, and hardware as per TxDOT Departmental Material Specification (DMS) 11030 "Conduit" and Item 618 "Conduit" of TxDOT's "Standard Specifications For Construction And Maintenance Of Highways, Streets, And Bridges," latest edition. Provide conduits listed under Item 618 on the MPL under "Roadway Illumination and Electrical Supplies." Provide conduit types according to the descriptive code or as shown on the plans. Do not substitute other types of conduits for those shown. Provide liquidtight flexible metal conduit (LFMC) when flexible conduit is called for on galvanized steel rigid metallic conduit (RMC) systems. Provide liquidtight flexible nonmetallic conduit (LFNC) when flexible conduit is called for on polyvinyl chloride (PVC) systems.

2. Provide galvanized steel RMC for all exposed conduits, unless otherwise shown on the plans. Properly bond all metal conduits.

3. Unless otherwise shown on the plans, provide junction boxes with a minimum size as shown in the following table, which applies to the greatest number of conductors entering the box through one conduit with no more than four conduits per box. When a mixture of conductor sizes is present, count the conductors as if all are of the larger size. For situations not applicable to the table, size junction boxes in accordance with NEC.

AWG	3 CONDUCTORS	5 CONDUCTORS	7 CONDUCTORS
#1	10" x 10" x 4"	12" x 12" x 4"	16" x 16" x 4"
#2	8" x 8" x 4"	10" x 10" x 4"	12" x 12" x 4"
#4	8" x 8" x 4"	10" x 10" x 4"	10" x 10" x 4"
#6	8" x 8" x 4"	8" x 8" x 4"	10" x 10" x 4"
#8	8" x 8" x 4"	8" x 8" x 4"	8" x 8" x 4"

4. Junction boxes with an internal volume of less than 100 cu. in. and supported by entering raceways must have threaded entries or hubs identified for the intended purpose and supported by connection of two or more rigid metal conduits. Secure conduit within 3 ft. of the enclosure or within 18 in. of the enclosure if all conduit entries are on the same side. Mechanically secure all junction boxes with an internal volume greater than 100 cu. inches.

5. Provide hot dipped galvanized cast iron or sand cast aluminum outlet boxes for junction boxes containing only 10 AWG or 12 AWG conductors. Do not use die cast aluminum boxes. Size outlet boxes according to the NEC.

6. Do not use intermediate metal conduit (IMC) or electrical metallic tubing (EMT) unless specifically required by the plan sheets. When EMT is called for, provide junction boxes made from galvanized steel sheeting, listed and approved for outdoor use, unless otherwise noted on the plans. Size all galvanized steel junction boxes in accordance with the NEC. Provide junction boxes for IMC conduit systems that meet the same requirements for junction boxes used with RMC systems.

7. Provide PVC junction boxes intended for outdoor use on PVC conduit systems, unless otherwise noted on the plans.

8. Provide PVC elbows in PVC conduit systems, unless otherwise shown on the plans. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the PVC conduit system. When galvanized steel RMC elbows are specifically called for in the plans and any portion of the RMC elbow is buried less than 18 in., ground the RMC elbow by means of a grounding bushing on a rigid metal extension. Grounding of the rigid metal elbow is not required if the entire RMC elbow is encased in a minimum of 2 in. of concrete. PVC extensions are allowed on these concrete encased rigid metal elbows. RMC or PVC elbows are subsidiary to various bid items.

9. When required, provide High-Density Polyethylene (HDPE) conduit with factory installed internal conductors according to Item 622 "Duct Cable." At the Contractor's request and with approval by the Engineer, substitute HDPE conduit with no conductors for bored schedule 40 or schedule 80 PVC conduit bid under Item 618. Ensure bored HDPE substituted for PVC is schedule 40 and of the same size PVC called for in the plans. Ensure the substituted HDPE meets the requirements of Item 622, except that the conduit is supplied without factory-installed conductors. Make the transition of the HDPE conduit to PVC (or RMC elbow when required) at the bore pit. Provide conduit of the size and schedule as shown on the plans. Do not extend substituted conduit into ground boxes or foundations. Provide PVC or galvanized steel RMC elbows as called for at all ground boxes and foundations.

10. Use two-hole straps when supporting 2 in. and larger conduits. On electrical service poles, properly sized stainless steel or hot dipped galvanized one-hole standoff straps are allowed on the service riser conduit.

B. CONSTRUCTION METHODS

1. Provide and install expansion joint conduit fittings on all structure-mounted conduits at the structure's expansion joints to allow for movement of the conduit. In addition, provide and install expansion joint fittings on all continuous runs of galvanized steel RMC conduit externally exposed on structures such as bridges at maximum intervals of 150 ft. When requested by the project Engineer, supply manufacturer's specification sheet for expansion joint conduit fittings. Repair or replace expansion joint fittings that do not allow for movement at no additional cost to the Department. Provide the method of determining the amount of expansion to the Engineer upon request. Do not use LFMC or LFNC as a substitute for the required expansion conduit fittings.

2. Space all conduit supports at maximum intervals of 5 ft. Install conduit spacers when attaching metal conduit to surface of concrete structures. See "Conduit Mounting Options" on ED(2). Install conduit support within 3 ft. of all enclosures and conduit terminations.

3. Do not attach conduit supports directly to pre-stressed concrete beams except as shown specifically in the plans or as approved by the Engineer.

4. Unless otherwise shown on the plans, jack or bore conduit placed beneath existing roadways, driveways, sidewalks, or after the base or surfacing operation has begun. Backfill and compact the bore pits below the conduit per Item 476 "Jacking, Boring, or Tunneling Pipe or Box" prior to installing conduit or duct cable to prevent bending of the connections.

5. When placing conduit in the sub-grade of new roadways, backfill all trenches with excavated material unless otherwise noted on the plans. When placing conduit in the sub-base of new roadways, backfill all trenches with cement-stabilized base as per requirements of Items 110 "Excavation", 400 "Excavation and Backfill for Structures", 401 "Flowable Backfill", 402 "Trench Excavation Protection", and 403 "Temporary Special Shoring."

6. Provide and place warning tape approximately 10 in. above all trenched conduit as per Item 618.

7. During construction, temporarily cap or plug open ends of all conduit and raceways immediately after installation to prevent entry of dirt, debris and animals. Temporary caps constructed of durable duct tape are allowed. Tightly fix the tape to the conduit opening. Clean out the conduit and prove it clear in accordance with Item 618 prior to installing any conductors.

8. Ensure conduit entry into the top of any enclosure is waterproof by installing conduit sealing hubs or using boxes with threaded bosses. This includes surface mounted safety switches, meter cans, service enclosures, auxiliary enclosures and junction boxes. Grounding bushings on water tight sealing hubs are not required.

9. Fit the ends of all PVC conduit terminations with bushings or bell end fittings. Provide and install a grounding type bushing on all metal conduit terminations.

10. Install a bonding jumper from each grounding bushing to the nearest ground rod, grounding lug, or equipment grounding conductor. Ensure all bonding jumpers are the same size as the equipment grounding conductor. Bonding of conduit used as a casing under roadways for duct cable is not required, if the duct extends the full length through the casing.

11. At all electrical services, install a 6 AWG solid copper grounding electrode conductor.

12. Place conduits entering ground boxes so that the conduit openings are between 3 in. and 6 in. from the bottom of the box. See the ground box detail on sheet ED(4).

13. Seal ends of all conduits with duct seal, expandable foam, or by other methods approved by the Engineer. Seal conduit immediately after completion of conductor installation and pull tests. Do not use duct tape as a permanent conduit sealant. Do not use silicone caulk as a conduit sealant.

14. File smooth the cut ends of all mounting strut and conduit. Before installing, paint the field cut ends of all mounting strut and RMC (threaded or non-threaded) with zinc rich paint (94% or more zinc content) to alleviate overspray. Use zinc rich paint to touch up galvanized material as allowed under Item 445 "Galvanizing." Do not paint non-galvanized material with a zinc rich paint as an alternative for materials required to be galvanized.

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUITS & NOTES

ED(1)-14

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		DAL	COLLIN		151

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ELECTRICAL CONDUCTORS

A. MATERIAL INFORMATION

1. Provide Type XHHW insulated conductors in accordance with Departmental Material Specification (DMS)11040 "Conductors" and Item 620 "Electrical Conductors." Provide conductors as listed on the Material Producers List (MPL) on the Department web site under "Roadway Illumination and Electrical Supplies" Item 620. Color code insulated conductors in conformance with the NEC. Identify grounded (neutral) conductors with white insulation. Identify grounding conductors (ground wires) with green insulation or bare conductors. Identify ungrounded (hot) conductors with any color insulation except green, white, or gray. Keep color scheme consistent throughout the wiring system. Identify conductors 6 American Wire Gauge (AWG) and smaller by continuous color jacket. Identify electrical conductors 4 AWG and larger by continuous color jacket or by colored tape. When identifying conductors with colored tape, mark at least 6 in. of the conductor's insulation with half laps of tape.

2. Provide a solid copper 6 AWG grounding electrode conductor to bond the electrical service equipment to the concrete encased grounding electrode or the ground rod at the service location. Connect the grounding electrode conductor to the ground rod with a UL listed connector in accordance with DMS 11040. Connect the grounding electrode conductor to the concrete encased grounding electrode as shown in the plans.

3. Where two or more circuits are present in one conduit or enclosure, permanently identify the conductors of each branch circuit by attaching a non-metallic tag around both circuit conductors at each accessible location. Provide tags with two straps, large enough to indicate circuit number, letter, or other identification as shown in the plans. Print circuit identification on the tag with a permanent marker.

4. Use listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors for splicing as specified in DMS 11040. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Provide UL listed gel-filled insulating splice covers. Splicing materials, insulating materials, breakaway disconnects, splice covers, and fuse holders are subsidiary to various bid items.

B. CONSTRUCTION METHODS

1. Use only a flat, high tensile strength polyester fiber pull tape for pulling conductors through the conduit system. After installing conductors in conduit, perform conductor pull test. If a conductor cannot be freely pulled, make any needed alterations or repairs at no additional cost to the department. Perform insulation resistance tests in accordance with Item 620. Coordinate with the Engineer to witness the tests.

2. Leave 2 ft. minimum, 3 ft. maximum length for each conductor up to the splice in ground boxes. Leave 3 ft. minimum, 4 ft. maximum length of conductor in ground boxes when pulled through with no splice. Leave 1 ft. minimum, 1.5 ft. maximum length of conductor at enclosures, weatherheads and pole bases.

3. Make splices only in junction boxes, ground boxes, pole bases, or electrical enclosures and use only listed compression or screw type pressure connectors, terminal blocks, or split bolt connectors. Insulate splices with heavy wall heat shrink tubing or gel-filled insulating splice covers to provide a watertight splice. Overlap conductor insulation with heat shrink tubing a minimum of 2 in. past both sides of the splice. Where heat shrink tubing may not shrink sufficiently to provide a watertight seal around the individual conductors, prior to heating the tubing, increase the diameter of the conductor insulation using hot melt adhesive tape to provide a watertight seal between the individual conductors and the heat shrink tubing. Ensure the tape extends past the heat shrink tubing. Use hot melt adhesive tape to fill the gap and seal the ends of heat shrink tubing. Heat shrink tubing that appears to have been burned, or overheated, is considered defective and must be replaced.

4. Size and install gel-filled insulating splice covers according to manufacturer's specifications when used in place of heat shrink tubing.

5. Wire nuts with factory applied waterproof sealant may be used for 8 AWG or smaller conductors in above ground junction boxes, but not in pole bases or ground boxes. Install wire nuts in an upright position to prevent the accumulation of water.

6. Support conductors in illumination poles with a J-hook at the top of the pole.

7. When terminating conductors, remove the insulation and jacketing material without nicking the individual strands of the conductor. Conductors with nicked individual conductor strands or removed strands will be considered damaged.

8. Replace conductors and cables that are damaged beyond repair or that fail an insulation resistance test at no additional cost to the department.

9. Do not repair damaged conductors with duct tape, electrical tape, or wire nuts. Use only approved splicing methods.

10. Do not terminate more than one conductor under a single connector, unless the connector is rated for multiple conductors. Do not exceed the pressure connector's listing for maximum number and size of conductors allowed.

11. Install breakaway connectors on conductors bid under Item 620 whenever those conductors pass through a breakaway support device. Follow manufacturer's instructions when terminating conductors to breakaway connectors. Properly torque threaded connections. Proper terminations are critical to the safe operation of breakaway devices. Trim waterproofing boots on breakaway connectors to fit snugly around the conductor to ensure waterproof connection. Only one conductor may enter a single opening in a boot. Provide waterproof boots with the correct number of openings. Leave unused openings factory sealed. Use prequalified breakaway connectors as shown on the MPL.

12. Provide and install a separate stranded equipment grounding conductor (EGC) in all conduits that contain circuit wiring of 50 volts or more. Unless shown elsewhere, size the EGC to be the same size as the largest current carrying conductor contained in the conduit. Ensure all EGCs are bonded together at every accessible location. For traffic signal installations, provide a minimum size 8 AWG EGC. The EGC is paid for under Item 620.

C. TEMPORARY WIRING

1. Install temporary conductors and electrical equipment in accordance with the NEC article "Temporary Installations" and Department standard sheets.

2. Provide a ground fault circuit interrupter (GFCI) for power outlets for portable electrical equipment, power tools, ice machines, ice storage bins and refrigerators located outdoors at grade. GFCI may be any one of the following: molded cord and plug set, receptacle, or circuit breaker type.

3. Use listed wire nuts with factory applied sealant for temporary wiring where approved.

4. Enclose conductor splices within a listed enclosure or ground box, or ensure the splices are more than 10 ft. above grade vertically and more than 5 ft. horizontally from any metal structure. Where installing temporary conductors in areas subject to vehicle traffic or mobile construction equipment, ensure the vertical clearance to ground is at least 18 ft. when measured at the lowest point. Ground messenger wires that support power conductors in conformance with the NEC.

5. Protect and when necessary repair any existing electrical conduits uncovered during the construction process in a timely manner and in conformance with the NEC.

GROUND RODS & GROUNDING ELECTRODES

A. MATERIAL INFORMATION

1. Provide and install a grounding electrode at electrical services. Provide ground rods according to DMS 11040 and the plans. Larger diameter or longer length rods may be called for in some specific locations, see the individual plans sheets. Concrete encased grounding electrodes may be called for in specific locations including electrical service, see individual plan sheets.

B. CONSTRUCTION METHODS

1. Furnish auxiliary ground rods for lightning protection and install in soil, concrete, or both, as called for in the plans. For ground rods installed in concrete, ensure the connection of the conductor to the ground rod is readily accessible for inspection or repairs. For ground rods installed in soil, ensure that the upper end is between 2 to 4 in. below finished grade.

2. Do not place ground rods in the same drilled hole as a timber pole.

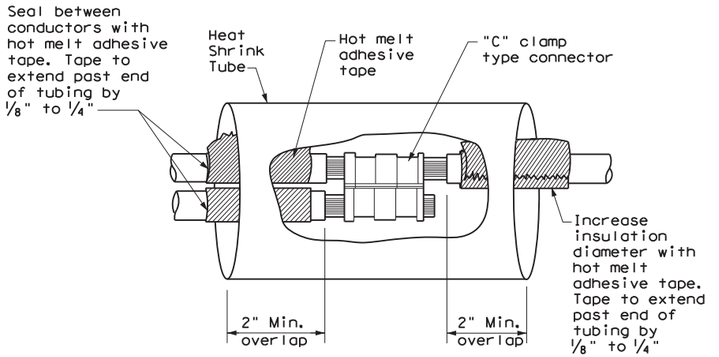
3. Install ground rods so the imprinted part number is at the upper end of the rod.

4. Remove all non-conductive coatings such as concrete splatter from the rod at the clamp location.

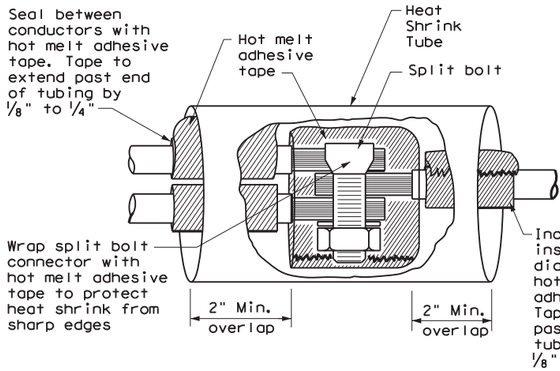
5. Route all conductors as short and straight as possible for connection to lightning protection ground rods. When a bend is required, ensure a minimum radius bend of four inches for these conductors.

6. Unless otherwise called for in the plans, protect grounding electrode conductors with non-metallic conduit. When protecting grounding electrode conductors with metal conduit, provide and install a grounding type bushing and properly sized bonding jumper on each end of the metal conduit.

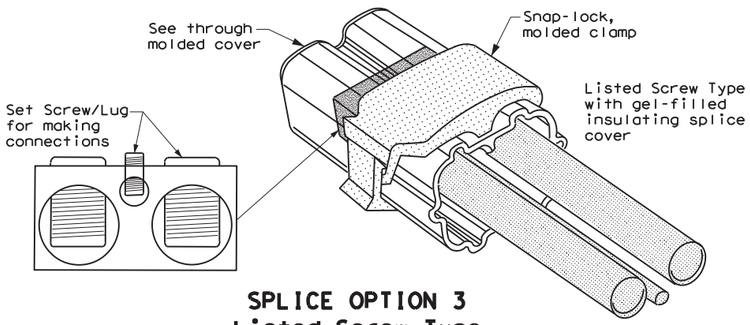
7. Written authorization is required before installing a ground rod in a horizontal trench for rocky soil or a solid rock bottom.



SPLICE OPTION 1
Compression Type



SPLICE OPTION 2
Split Bolt Type



SPLICE OPTION 3
Listed Screw Type

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS CONDUCTORS

ED(3)-14

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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

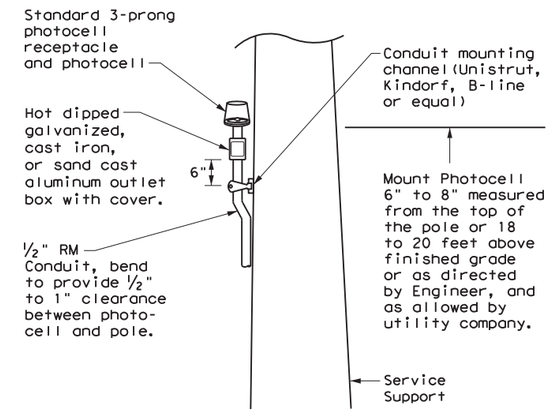
(SS)= Safety Switch Ahead of Meter-Check with Utility
(NS)= No safety Switch Ahead of Meter-Check with Utility

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.

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Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE NOTES & DATA

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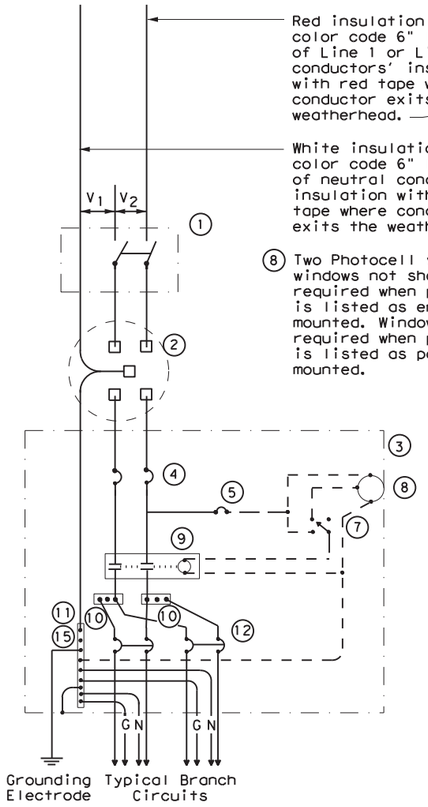
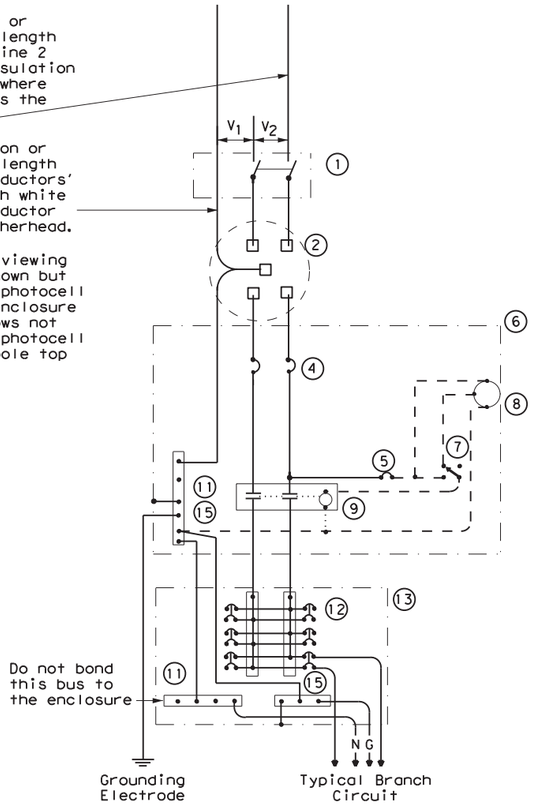
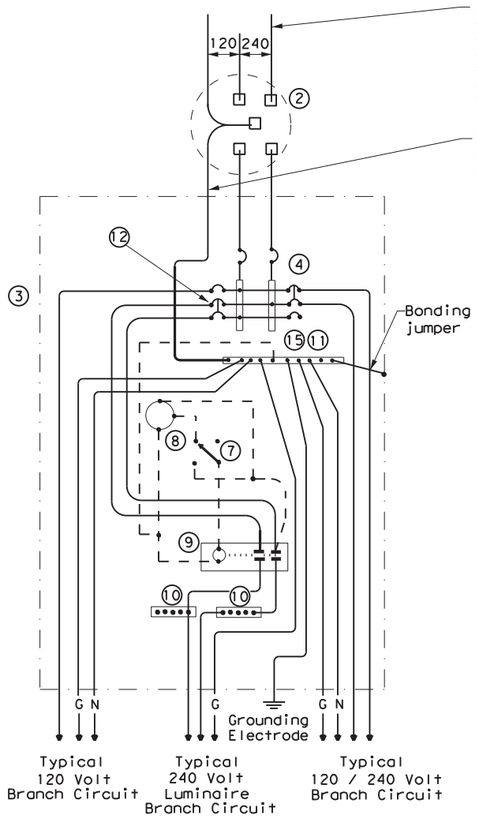


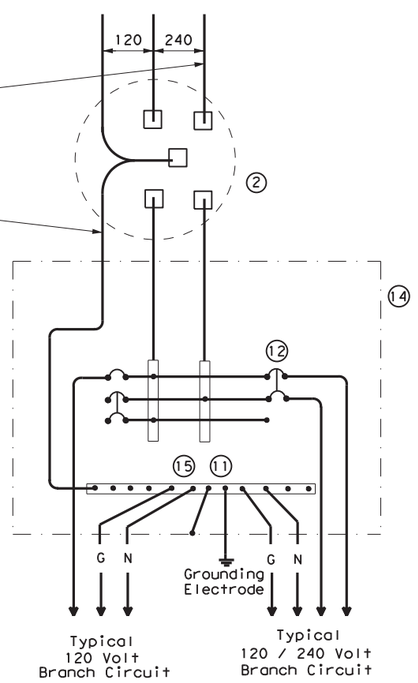
SCHEMATIC TYPE A
THREE WIRE



SCHEMATIC TYPE C
THREE WIRE



SCHEMATIC TYPE D - CUSTOM
120/240 VOLTS - THREE WIRE



SCHEMATIC TYPE T
120/240 VOLTS - THREE WIRE

Galvanized steel-"Buy Off The Shelf" only. When required install photocell top of the pole or on luminaire only, no lighting contractor will be installed.

WIRING LEGEND	
———	Power Wiring
- - - -	Control Wiring
—N—	Neutral Conductor
—G—	Equipment grounding conductor-always required

SCHEMATIC LEGEND	
1	Safety Switch (when required)
2	Meter (when required-verify with electric utility provider)
3	Service Assembly Enclosure
4	Main Disconnect Breaker (See Electrical Service Data)
5	Circuit Breaker, 15 Amp (Control Circuit)
6	Auxiliary Enclosure
7	Control Station ("H-O-A" Switch)
8	Photo Electric Control (enclosure-mounted shown)
9	Lighting Contactor
10	Power Distribution Terminal Blocks
11	Neutral Bus
12	Branch Circuit Breaker (See Electrical Service Data)
13	Separate Circuit Breaker Panelboard
14	Load Center
15	Ground Bus

Texas Department of Transportation

Traffic Operations Division Standard

ELECTRICAL DETAILS SERVICE ENCLOSURE AND NOTES

ED(6)-14

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BATTERY BOX GROUND BOXES NOTES

A. MATERIALS

1. Provide polymer concrete or fiberglass reinforced plastic (FRP) battery box ground box and cover in accordance with Departmental Material Specification (DMS) 11071 "Battery Box Ground Boxes." Battery box will accommodate up to 4 batteries, each measuring 8 in. x 13.5 in. x 10 in. (W x L x D). Label battery box ground box cover in accordance with DMS 11071.

2. Supply a marine grade batteries with covers. Secure the marine grade batteries with covers to the stainless steel rack in the bottom of the ground box with tie down straps.

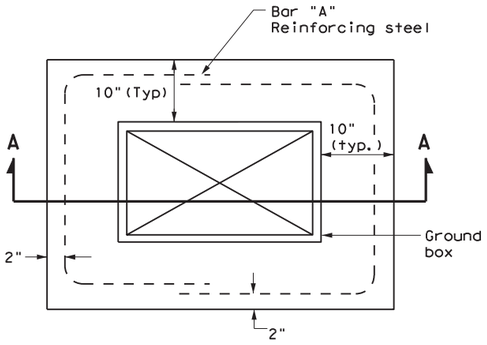
B. CONSTRUCTION METHODS

1. Ensure conduit entry will not interfere with placement of the batteries in the battery box ground box.

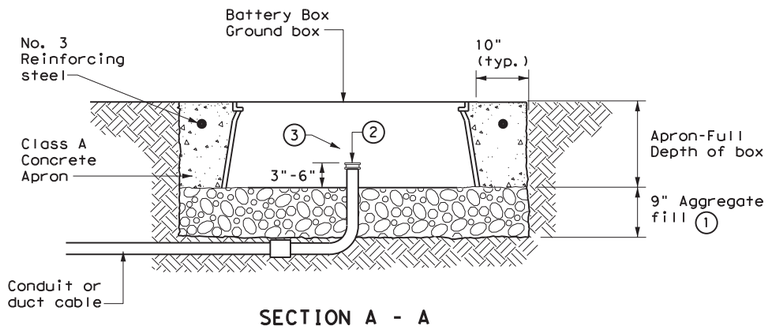
2. Remove all gravel and dirt from conduit. Cap all conduits prior to placing aggregate and setting battery box ground box. Provide Grade 3 or 4 coarse aggregate as shown on Table 2 of Item 302 "Aggregates for Surface Treatments." Ensure the aggregate bed is in place and is a minimum of 9 in. deep prior to setting the box. Install battery box ground box on top of aggregate.

3. Cast battery 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. Battery box ground box aprons, including concrete and reinforcing steel, are subsidiary to battery box ground boxes when called for by descriptive code.

4. Bolt covers down when not working in battery box ground boxes. Keep bolt holes in the box clear of dirt.



PLAN VIEW



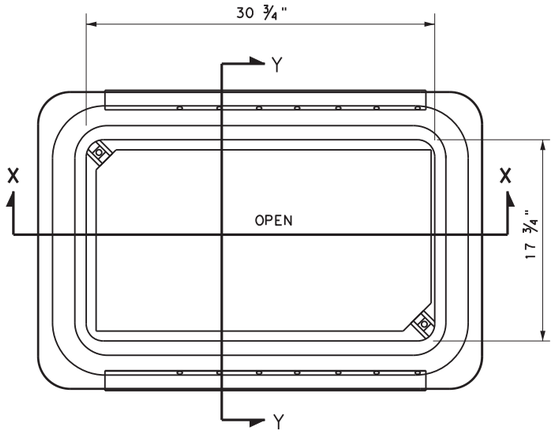
SECTION A - A

APRON FOR BATTERY BOX GROUND BOXES

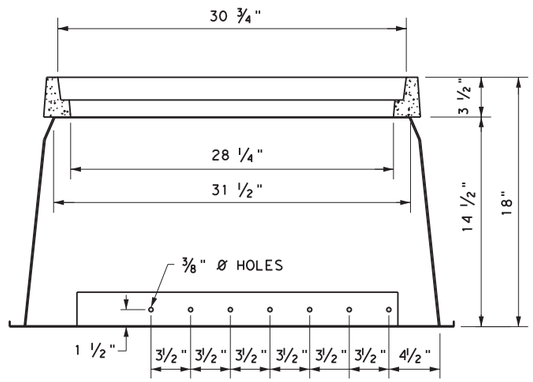
(1) Place aggregate under the box and not in the box. Aggregate should not encroach on the interior volume of the box.

(2) Install bushing or bell end fitting on the upper end of all ells.

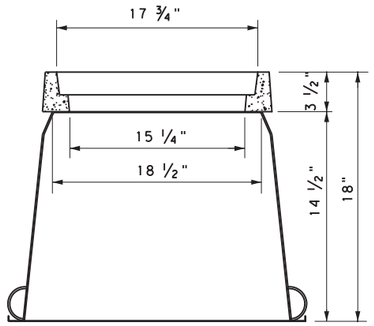
(3) Install all conduits in a neat and workmanlike manner.



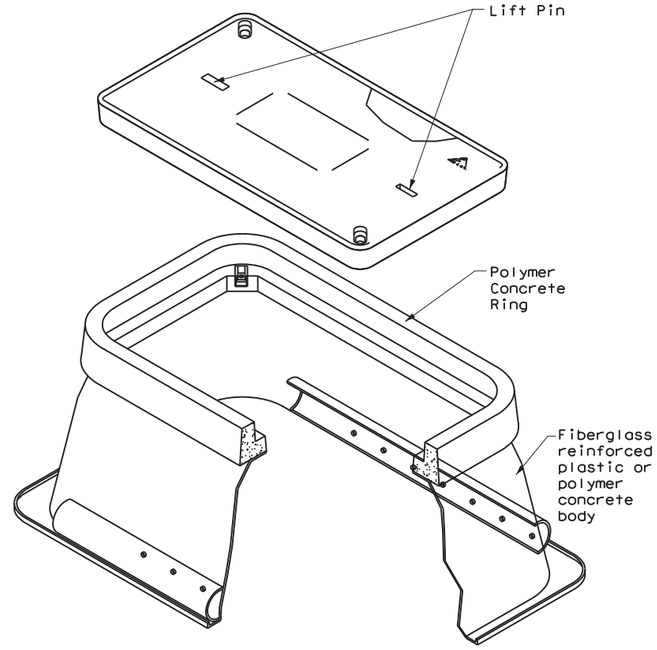
BATTERY BOX TOP VIEW



SECTION X-X



SECTION Y-Y



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ELECTRICAL DETAILS
BATTERY BOX GROUND BOXES

ED(12)-14

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FOUNDATION DESIGN TABLE

FDN TYPE	DRILLED SHAFT DIA	REINFORCING STEEL		EMBEDDED DRILLED SHAFT LENGTH-ft ④, ⑤, ⑥			ANCHOR BOLT DESIGN ①				FOUNDATION DESIGN LOAD ②		TYPICAL APPLICATION
		VERT BARS	SPIRAL & PITCH	TEXAS CONE PENETROMETER N blows/ft			ANCHOR BOLT DIA	Fy (ksi)	BOLT CIR DIA	ANCHOR TYPE	MOMENT K-ft	SHEAR Kips	
				10	15	40							
24-A	24"	4- #5	#2 at 12"	5.7	5.3	4.5	¾"	36	12 ¾"	1	10	1	Pedestal pole, pedestal mounted controller.
30-A	30"	8- #9	#3 at 6"	11.3	10.3	8.0	1 ½"	55	17"	2	87	3	Mast arm assembly. (see Selection Table)
36-A	36"	10- #9	#3 at 6"	13.2	12.0	9.4	1 ¾"	55	19"	2	131	5	Mast arm assembly. (see Selection Table) 30' strain pole with or without luminaire.
36-B	36"	12- #9	#3 at 6"	15.2	13.6	10.4	2"	55	21"	2	190	7	Mast arm assembly. (see Selection Table) Strain pole taller than 30' & strain pole with mast arm
42-A	42"	14- #9	#3 at 6"	17.4	15.6	11.9	2 ¼"	55	23"	2	271	9	Mast arm assembly. (see Selection Table)

NOTES:

① Anchor bolt design develops the foundation capacity given under Foundation Design Loads.

② Foundation Design Loads are the allowable moments and shears at the base of the structure.

③ Foundations may be listed separately or grouped according to similarity of location and type. Quantities are for the Contractor's information only.

④ Field Penetrometer readings at a depth of approximately 3 to 5 feet may be used to adjust shaft lengths.

⑤ If rock is encountered, the Drilled Shaft shall extend a minimum of two diameters into solid rock.

⑥ Decimal lengths in Design Table are to allow interpolation for other penetrometer values. Round to nearest foot for entry into Summary Table.

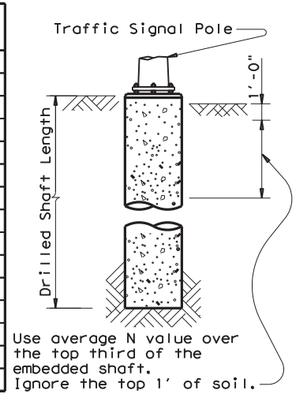
FOUNDATION SUMMARY TABLE ③

LOCATION IDENTIFICATION	AVG. N BLOW /ft.	FDN TYPE	NO. EA	DRILLED SHAFT LENGTH ⑥ (FEET)				
				24-A	30-A	36-A	36-B	42-A
SCHOOL FLASHER	*10*	*24-A*	*2*	*6 **				
TOTAL DRILLED SHAFT LENGTHS				*12*				

** SUBSIDIARY TO ITEM 685*

FOUNDATION SELECTION TABLE FOR STANDARD MAST ARM PLUS ILSN SUPPORT ASSEMBLIES (ft)

		FDN 30-A	FDN 36-A	FDN 36-B	FDN 42-A
80 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH	32'	48'		
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS	24' X 24'			
		28' X 28'			
		32' X 28'	32' X 32'		
			36' X 36'		
			40' X 36'		
			44' X 28'	44' X 36'	
100 MPH DESIGN WIND SPEED	MAX SINGLE ARM LENGTH		36'	44'	
	MAXIMUM DOUBLE ARM LENGTH COMBINATIONS		24' X 24'		
			28' X 28'		
			32' X 24'	32' X 32'	
				36' X 36'	
				40' x24'	40' X 36'
					44' x 36'



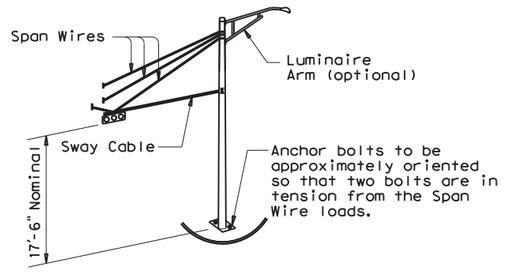
Use average N value over the top third of the embedded shaft. Ignore the top 1' of soil.

ANCHOR BOLT & TEMPLATE SIZES

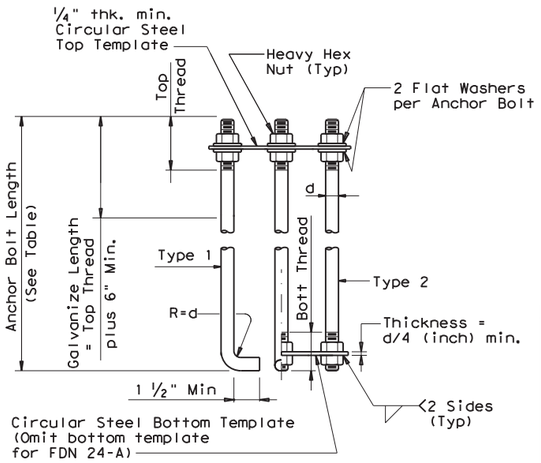
BOLT DIA IN.	⑦ BOLT LENGTH	TOP THREAD	BOTTOM THREAD	BOLT CIRCLE	R2	R1
¾"	1'-6"	3"	—	12 ¾"	7 ⅛"	5 ⅝"
1 ½"	3'-4"	6"	4"	17"	10"	7"
1 ¾"	3'-10"	7"	4 ½"	19"	11 ¼"	7 ¾"
2"	4'-3"	8"	5"	21"	12 ½"	8 ½"
2 ¼"	4'-9"	9"	5 ½"	23"	13 ¾"	9 ¼"

⑦ Min dimensions given, longer bolts are acceptable.

EXAMPLE:
1. For 80mph design wind speed, foundation 30-A can support up to a 32' arm with another arm up to 28'
2. For 100mph design wind speed, foundation 36-A can support a single 36' mast arm.



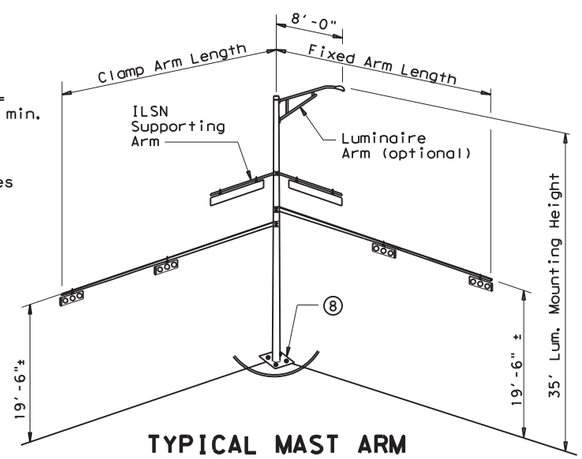
TYPICAL STRAIN POLE ASSEMBLY



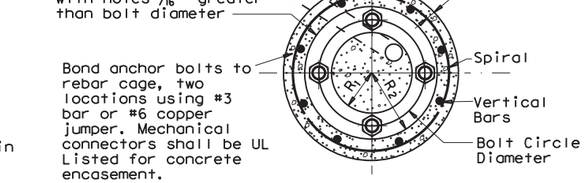
HOOKED ANCHOR (TYPE 1) NUT ANCHOR (TYPE 2)

ANCHOR BOLT ASSEMBLY

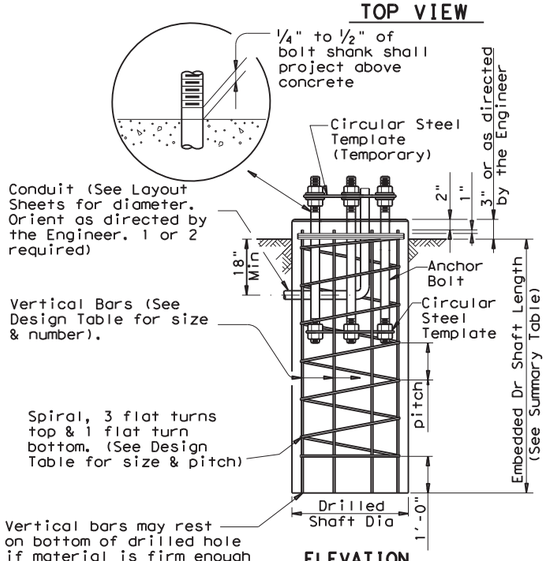
⑧ Orient anchor bolts orthogonal with the fixed arm direction to ensure that two bolts are in tension under dead load.



TYPICAL MAST ARM ASSEMBLY



TOP VIEW



ELEVATION

FOUNDATION DETAILS

GENERAL NOTES:

Design conforms to 1994 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and interim revisions thereto.

Reinforcing steel shall conform to Item 440, "Reinforcing Steel".

Concrete shall be Class "C".

Threads for anchor bolts and nuts shall be rolled or cut threads of 8UN series up to 2" in diameter or UNC series for all sizes. Bolts and nuts shall have Class 2A and 2B fit tolerances. Galvanized nuts shall be tapped after galvanizing.

Anchor bolts that are larger than 1" in diameter shall conform to "alloy steel" or "medium-strength mild steel" per Item 449, "Anchor Bolts". Anchor bolts that are 1" in diameter or less shall conform to ASTM A36. Galvanize a minimum of the top end thread length plus 6" for all anchor bolts unless otherwise noted. Exposed washers and exposed nuts shall be galvanized. All galvanizing shall be in accordance with Item 445, "Galvanizing".

Templates and embedded nuts need not be galvanized. Lubricate and tighten anchor bolts when erecting the structure in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation
Traffic Operations Division

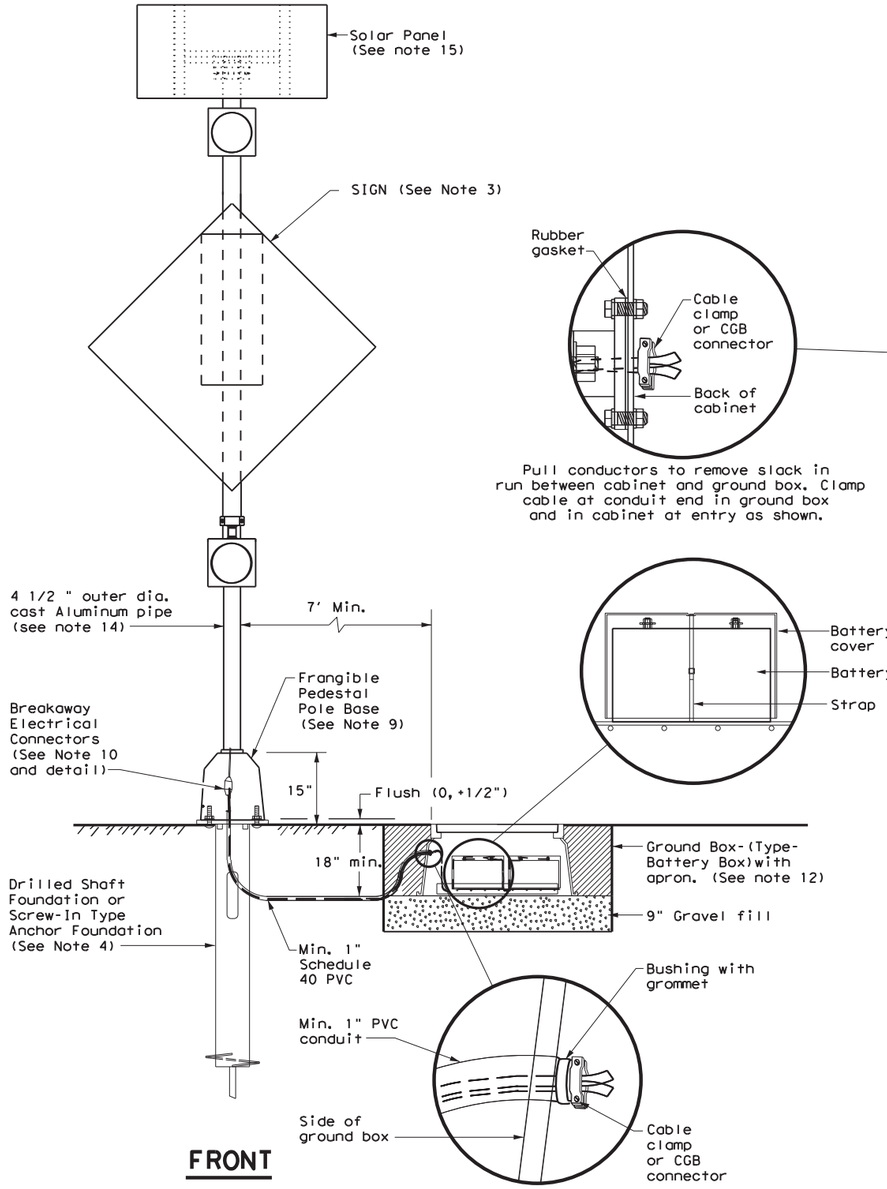
TRAFFIC SIGNAL POLE FOUNDATION

TS-FD-12

REVISIONS	DN: MS	CK: JSY	DW: MAQ/MMF	CK: JSY/TEB
5-96 11-99 1-12	CONT	SECT	JOB	HIGHWAY
	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		156

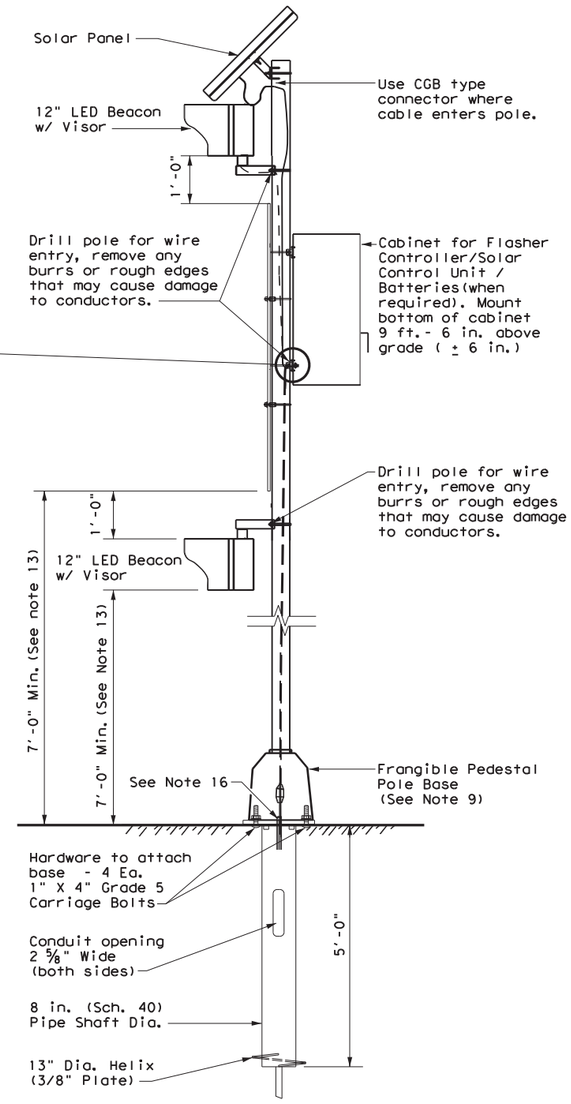
GENERAL NOTES:

1. Details show a typical warning sign with two flashing beacon heads, other arrangements are possible. When only one beacon is required, install the upper beacon.
2. See Item 685, "Roadside Flashing Beacon Assemblies" for further requirements.
3. See SMD standard sheets for lateral and vertical clearances and sign mounting details. Install signs as shown on the sign layout sheets.
4. Use either a Screw-In Type Anchor Foundation or a Drilled Shaft Foundation as shown elsewhere in the plans. When plans require a Drilled Shaft Foundation, see standard sheet TS-FD. Install the Screw-In Type Anchor Foundation as per manufacturer's recommendations. On a slope, install one edge at ground level. Screw-In/Drilled Shaft Foundation is subsidiary to Item 685. Installation of a ground rod is not required for solar powered flashing beacon assemblies.
5. When used, provide Screw-In Type Anchor Foundations as shown on TxDOT's Material Producer List (MPL) in the file "Highway Traffic Signals".
6. Use materials specifically designed for attaching cabinets, beacon heads, solar panels, etc., to poles.
7. Install beacon heads as shown here, as shown elsewhere on the plans, or as directed. Use hardware specifically designed for mounting beacon heads on poles.
8. Conduit in foundation and within 6 in. of foundation is subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies."
9. Per manufacturer's recommendations, engage all threads on the pedestal pole base and pipe unless the pipe is fully seated into base. In high winds, use a pole and base collar assembly to add strength and prevent loosening on connection.
10. Provide single pole non-fused watertight breakaway electrical connectors for frangible pedestal pole bases, as shown on TxDOT's MPL in the file "Roadway Illumination and Electrical Supplies." Approved models are listed under Item 685. For ungrounded (hot) conductors, install a breakaway connector with a dummy fuse slug). For grounded (neutral) conductors, install a breakaway connector with a white colored marking and a permanently installed dummy fuse (slug).
11. Install the batteries in a battery box. Place the batteries on a 3/16" thick plastic sheet and connect together. Place a plastic cover (battery bell jar) over the top of each battery and secure the battery bell jar to the battery with a strap. The batteries, bell jars, straps and 3/16" plastic sheet are subsidiary to the Item 685, "Roadside Flashing Beacon Assemblies." When required, install batteries in the flasher cabinet. Wire batteries according to manufacturers recommendations. Provide the number of batteries as required by the manufacturer.
12. See standard sheet Electrical Details (ED) for additional requirements regarding the installation of ground boxes/battery boxes, conduit, and cabinets.
13. Provide clearance as shown above the sidewalk or pavement grade at the edge of the road. When a bottom beacon is not used, mount the bottom of the sign at least 7 ft. above the sidewalk or pavement grade at the edge of the road.
14. Unless otherwise shown on the plans, pole shaft shall be one piece, Schedule 40 Aluminum pipe, ASTM B429 or B221 (Alloy 6061-T6 only). Aluminum conduit will not develop the necessary strength and will not be allowed.
15. Orient solar panel for optimum exposure to sunlight (face to the south). Prior to installation, check the location to ensure there is no overhead obstruction that would block the solar panel from receiving full sunlight. Unless specified elsewhere, mount a minimum of 14' above grade.
16. Ensure height of conduit is below top of anchor bolts.

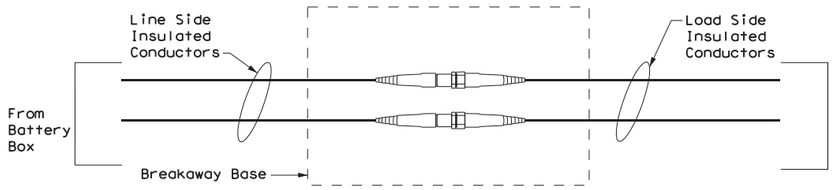


FRONT

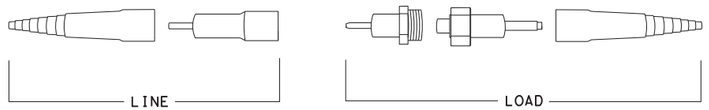
Pull conductors to remove slack in run between cabinet and ground box. Clamp cable at conduit end in ground box and in cabinet at entry as shown.



SIDE



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS



NON-FUSED BREAKAWAY ELECTRICAL CONNECTORS
EXPLODED VIEW

Texas Department of Transportation

Traffic Operations Division Standard

SOLAR POWERED ROADSIDE FLASHING BEACON ASSEMBLY DETAILS

SPRFBA(1)-13

FILE: spb1-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
12-04 3-13	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		157

75A

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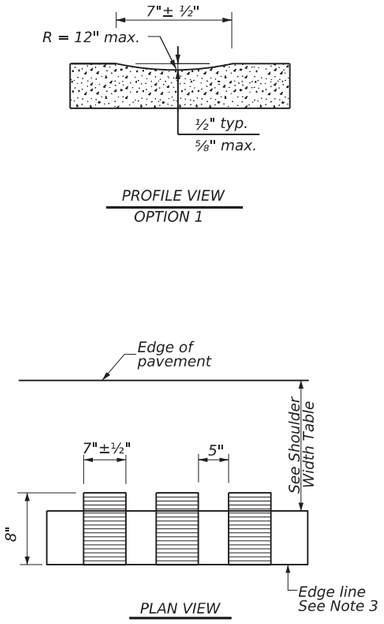
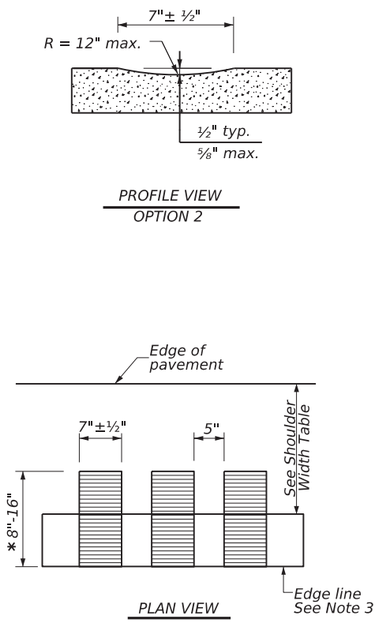
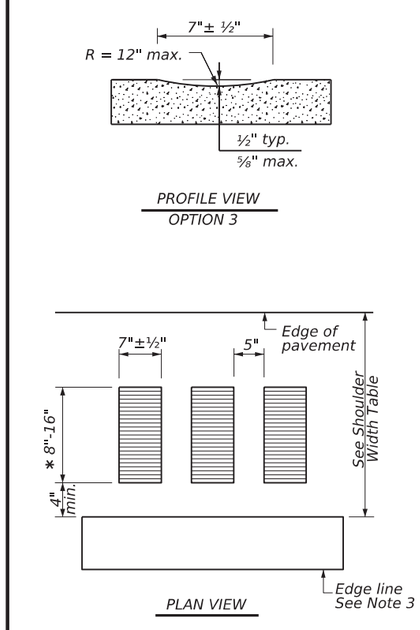
FILE: DOCUMENT NAME



CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



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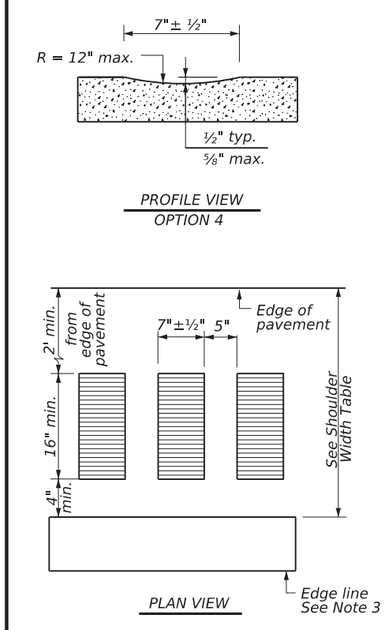
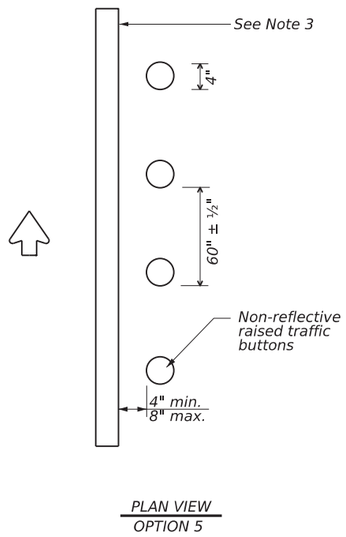
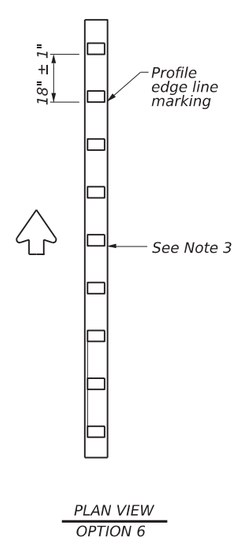


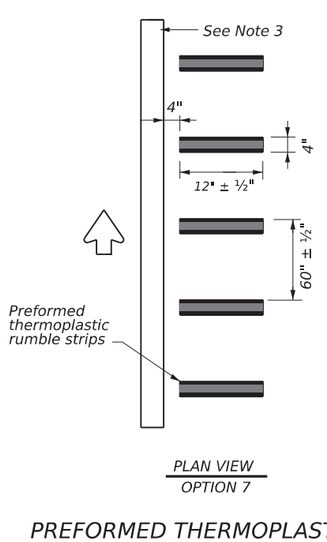
CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



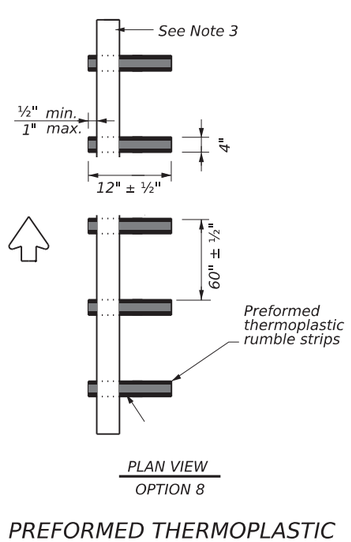
RAISED EDGE LINE (Rumble Strips)



PROFILE EDGE LINE MARKINGS (Rumble Strips)



PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
10-13 1-23	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		158

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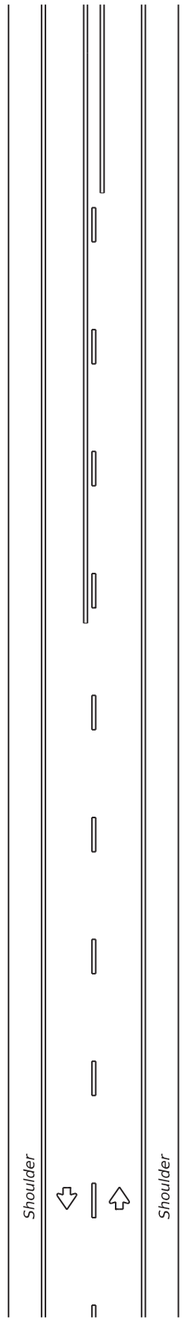
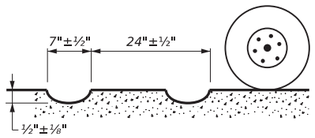
DATE: 2023/03/13
FILE: DOCUMENT NAME

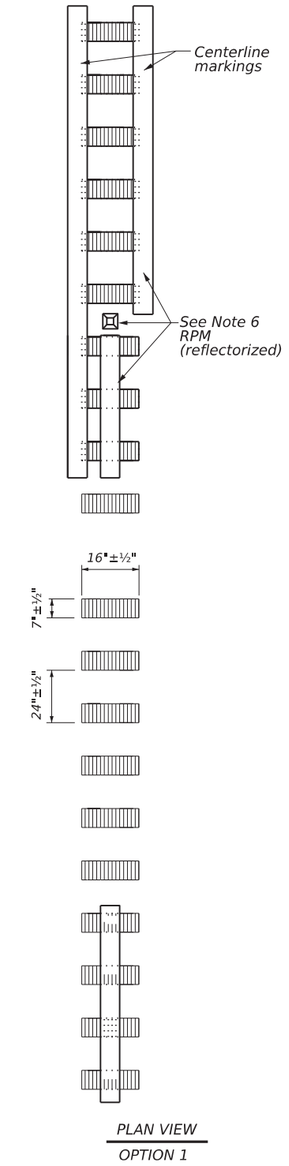
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

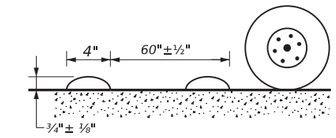


PROFILE VIEW

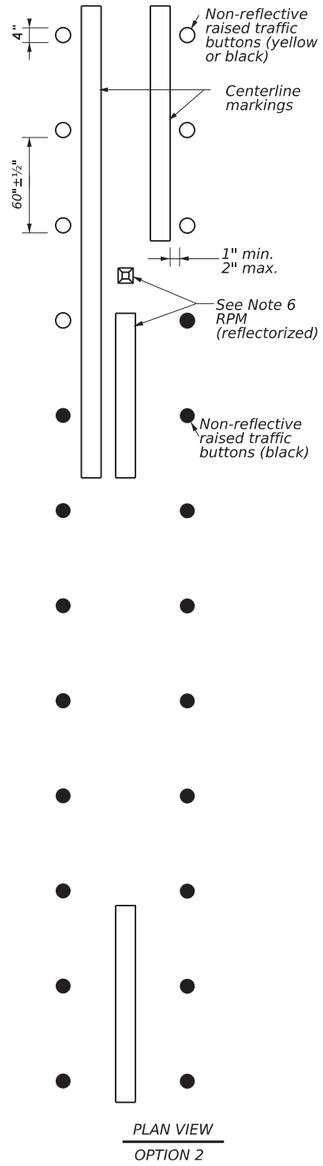


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

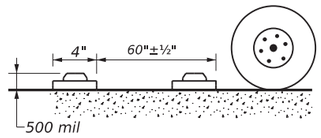


PROFILE VIEW

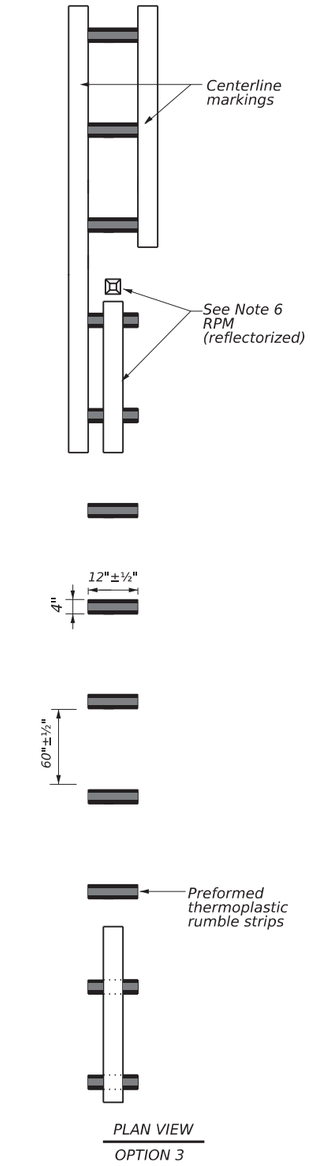


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

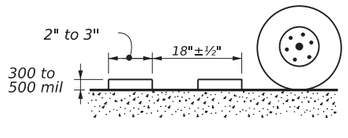


PROFILE VIEW

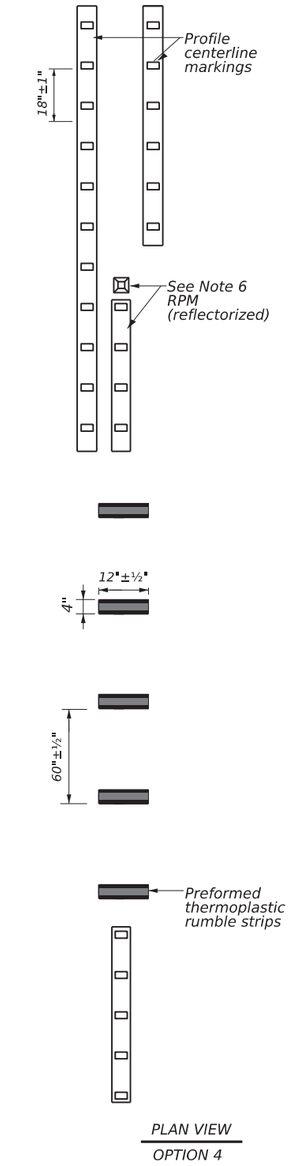


PLAN VIEW
OPTION 3

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:

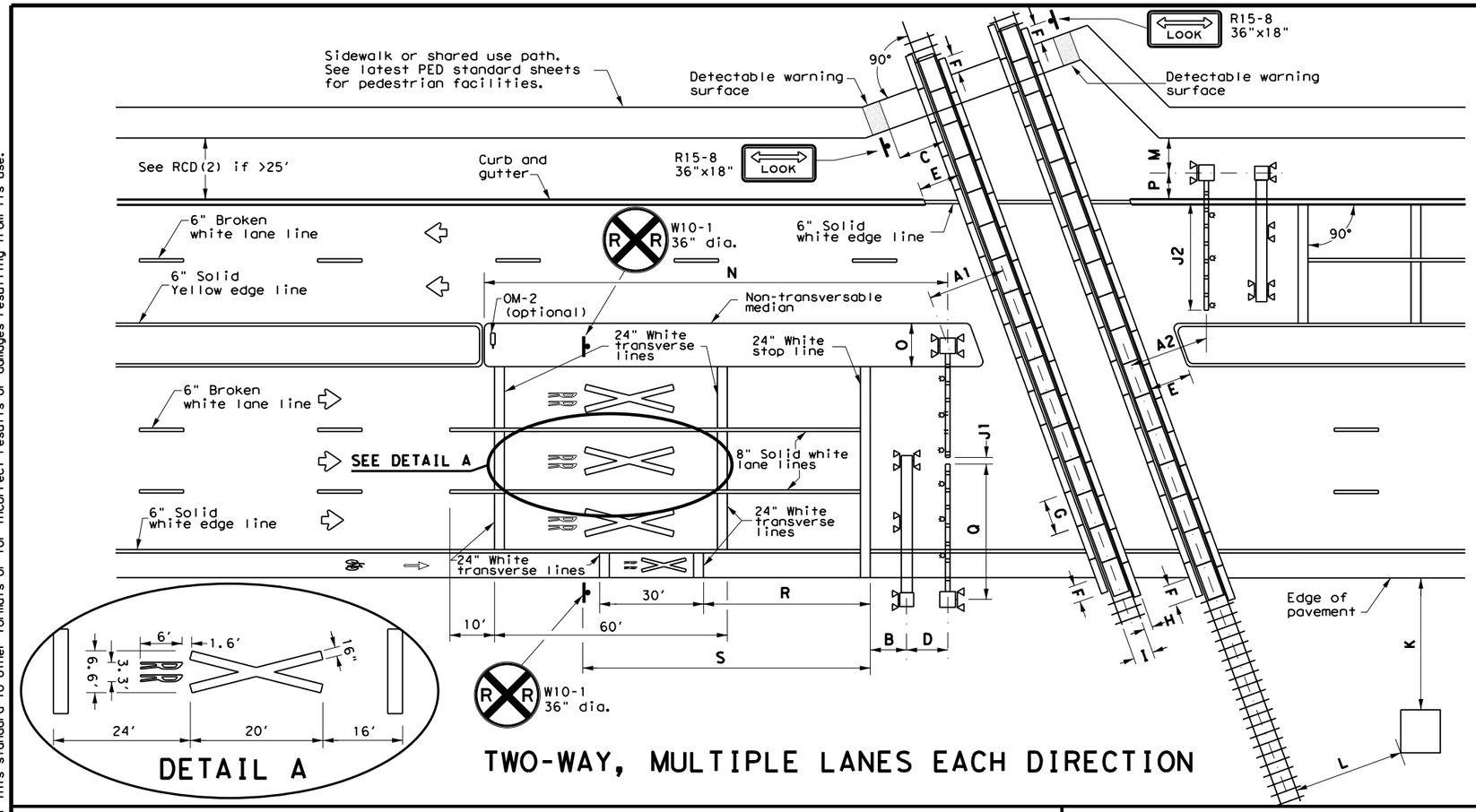
13. See standard sheet RS(2).

Texas Department of Transportation

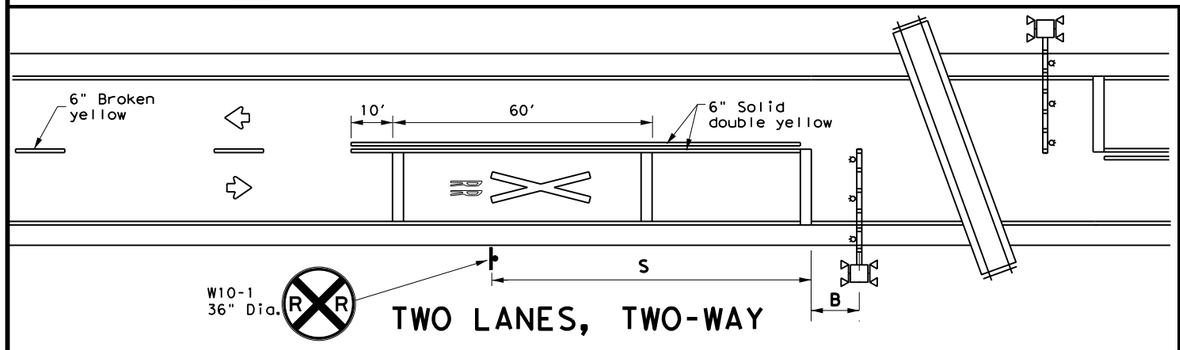
Traffic Safety Division Standard

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	0816	05	025	FM 2862
10-13	DIST	COUNTY		SHEET NO.
1-23	DAL	COLLIN		159



TWO-WAY, MULTIPLE LANES EACH DIRECTION



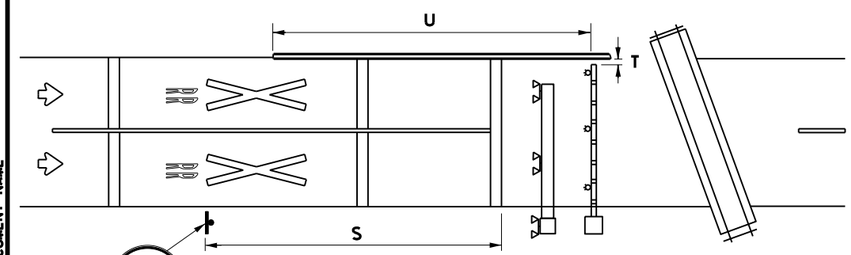
TWO LANES, TWO-WAY

TABLE 1	
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

LEGEND	
	Sign
	Object Marker
	Traffic Flow
	Cantilever
	Gate Assembly
	Mast Flasher Pair

GENERAL NOTES

1. Medians and curbs must be non-traversable to qualify as a Quiet Zone Supplementary Safety Measure (SSM). Non-traversable curbs in Quiet Zones are 6" tall minimum and used on roadways where speed does not exceed 40 mph.
2. Raised pavement markers may be used to supplement striping. See PM(2) and PM(3) standard sheets.
3. Medians preferred whenever possible to prevent vehicles from driving around gates.
4. Longitudinal edge striping may be continued thru crossing as needed. Illumination may also be considered for nighttime visibility.
5. See SMD standard sheets for sign mounting details.
6. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

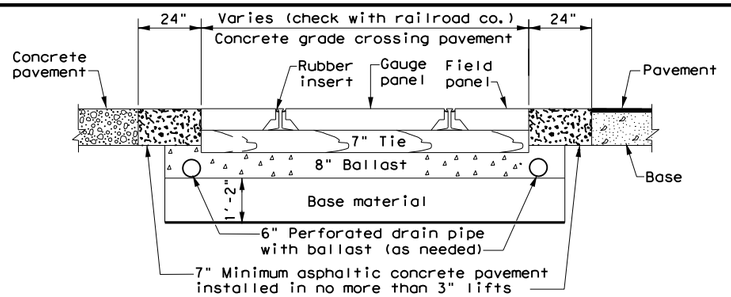


ONE-WAY STREET WITH CURB

NOTES

T: Tip of gate to edge of curb: 1' maximum for Quiet Zone SSM, 90% of traveled way covered by gates for all other locations.

U: Non-traversable curb length from gate: 100' minimum for a Quiet Zone SSM, 10' minimum for all other locations.



CROSSING SURFACE CROSS SECTION

NOTES

A1: Center of RR mast to center of rail: 12' minimum, 15' typical.

A2: Tip of gate to center of rail: 12' minimum, 15' typical.

B: Center of mast (cantilever, gate, or mast flasher) of nearest active traffic control device to stop line: 8' (NOTE: Stop line may be moved as needed, but should be at least 8' back from gates, if present).

C: Near edge of detectable warning surface to nearest rail: 12' minimum.

D: Center of gate mast to center of cantilever mast: 6' typical. NOTE: Cantilever may be located in front or behind gates.

E: Edge of median or curb to nearest rail: 10' typical. NOTE: Design median edge to be parallel with rail.

F: Edge of planking panel from edge of pavement or sidewalk: 3' minimum. NOTE: Field panels need not be in line with gauge panels.

G: Length of panels along rail: 8' typical.

H: Width of field panel: 2' typical (check with railroad company).

I: Distance between rails: 4'- 8'1/2".

J1: Tip of gate to tip of gate: 2' maximum.

J2: 90% of traveled roadway to be covered by gate.

K: Nearest edge of RR cabinet from edge of pavement: 30' typical. NOTE: Cabinet not required to be parallel to edge of pavement.

L: Nearest edge of RR cabinet from nearest rail: 25' typical.

M: Center of RR mast to edge of sidewalk: 6' minimum.

N: Center of gate mast to leading edge of non-traversable median: 100' minimum to qualify as a Quiet Zone SSM. NOTE: 60'will suffice if there is a street intersection within the 100' and all street intersections within 60' are closed.

O: Width of median for RR gate assembly: 8'-6" minimum, 10' typical when using median gates. NOTE: Center of gate mast minimum 4'-3" from face of curb.

P: Center of RR mast to face of curb: 5'-3" minimum.
Center of RR mast to edge of pavement (with shoulder): 7' minimum.
Center of RR mast to edge of pavement (no shoulder): 9'-3" minimum.
NOTE: Final location determined by the railroad company.

Q: Gate length: 28' or less typical, but railroad company may allow up to 32' under special circumstances.

R: Stop line to first RR Crossing transverse line (bike lane): 50' typical.

S: Stop line to GRADE CROSSING ADVANCE WARNING (W10-1) sign and adjacent RR Crossing pavement markings. See Table 1. See RCD(2) for other signs.

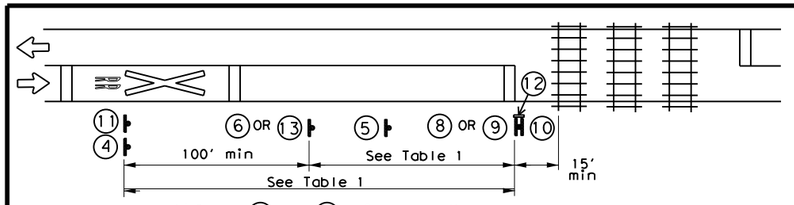
Texas Department of Transportation

Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING, STRIPING, AND DEVICE PLACEMENT RCD(1)-22

FILE: rcd1-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
2-16	DIST	COUNTY		SHEET NO.
11-22	DAL	COLLIN		160

DATE: 2023/0/6
FILE: DOCUMENT NAME

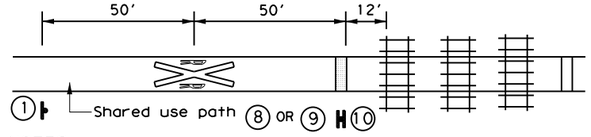


(if no (6) or (13) sign used)

PASSIVE CROSSING

NOTES

1. STOP or YIELD sign may also be installed to the left of the crossbuck sign, rather than below it.
2. A 2" white retroreflective strip shall be installed on front and back of crossbuck sign post.
3. See the Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings section of the TMUTCD for further details about sign mounting arrangements.



NOTES

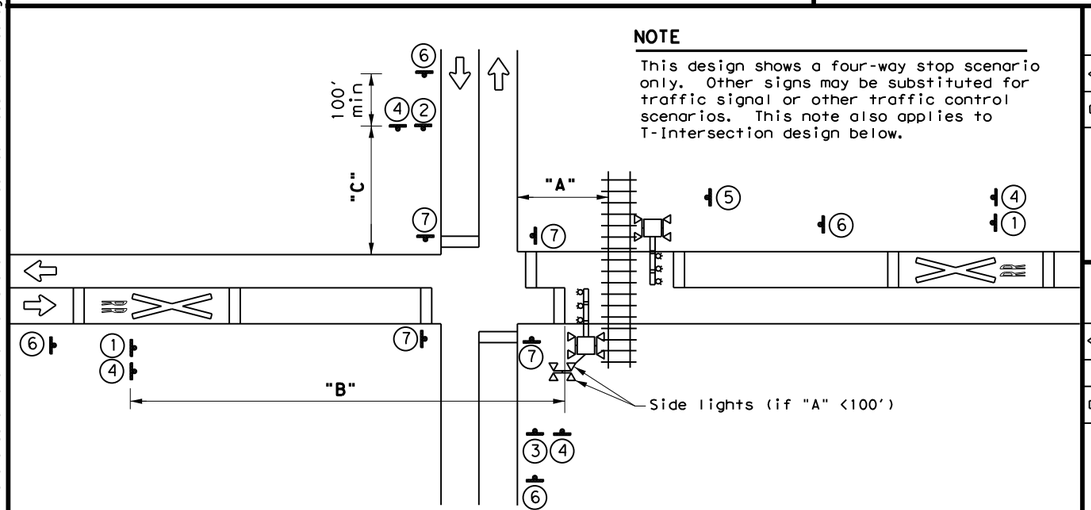
1. A shared use path is considered a separate pathway crossing when more than 25' from traveled way of adjacent roadway.
2. Detectable warning used at stop bar.
3. Smaller signs preferred. See the Design of Bicycle Signs section within the TMUTCD for sizing details.

PATHWAY CROSSING

TABLE 1	
Approach Speed (mph)	Desirable Placement (feet)
20	100
25	100
30	100
35	100
40	125
45	175
50	250
55	325
60	400
65	475
70	550
75	650

GENERAL NOTES

1. Railroad company to provide active traffic control devices, CROSSBUCK (R15-1), NUMBER OF TRACKS (R15-2P) plaque (if more than 1 track), and EMERGENCY NOTIFICATION (I-13) signs.
2. LOW GROUND CLEARANCE (W10-5) signs may be relocated further upstream of crossing to provide advance warning of alternate route.
3. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2) signs may be modified as needed to fit roadway geometry.
4. Table 1 placement distances may vary per the Placement of Warning Signs section of the TMUTCD.
5. See Table 1 to determine placement of STOP AHEAD (W3-1) and YIELD AHEAD (W3-2) signs unless shown otherwise.
6. DO NOT STOP ON TRACKS (R8-8) signs installed when potential for vehicles stopping on tracks is significant as determined by sealing engineer. Install so sign does not block view of RR mast.
7. See the Standard Highway Sign Design for Texas (SHSD) manual for sign and pavement marking details.

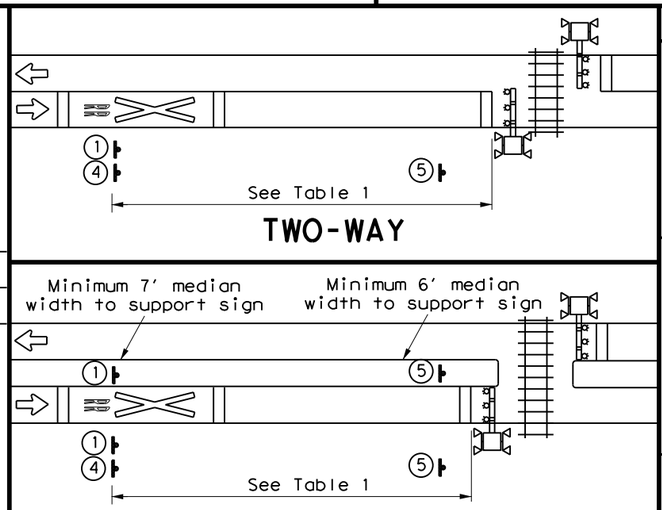


NOTE

This design shows a four-way stop scenario only. Other signs may be substituted for traffic signal or other traffic control scenarios. This note also applies to T-Intersection design below.

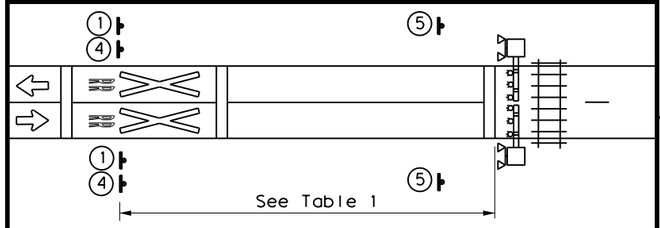
	"A" <100'	"A" ≥100'
"B"	See Table 1. Place pavement markings and signs on opposite side of intersection from rail if spacing from Table 1 would put markings within intersection.	See Table 1. Place pavement markings and signs between rail and intersection if spacing from Table 1 would put markings within intersection.
"C"	See Table 1.	GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-2, W10-3, W10-4) signs should only be installed if W10-1 sign is not between intersection and railroad crossing. If needed, see Table 1.

GRADE CROSSING NEAR A PARALLEL STREET

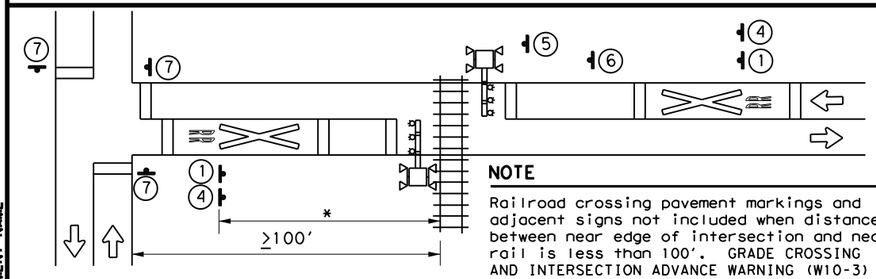


TWO-WAY

TWO-WAY WITH MEDIAN



ONE-WAY

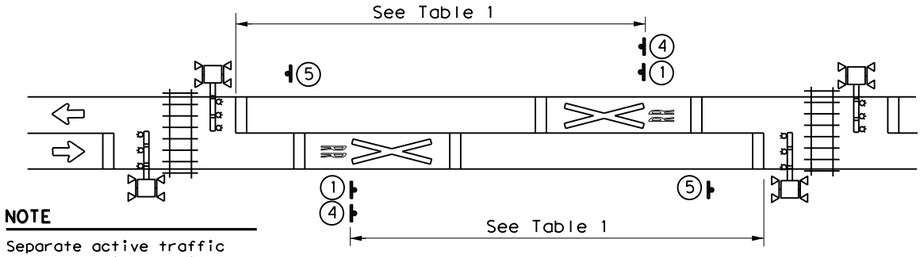


*Use Table 1 if sufficient space exists.

NOTE

Railroad crossing pavement markings and adjacent signs not included when distance between near edge of intersection and near rail is less than 100'. GRADE CROSSING AND INTERSECTION ADVANCE WARNING (W10-3) signs installed on roadway parallel with rail in this case.

T-INTERSECTION

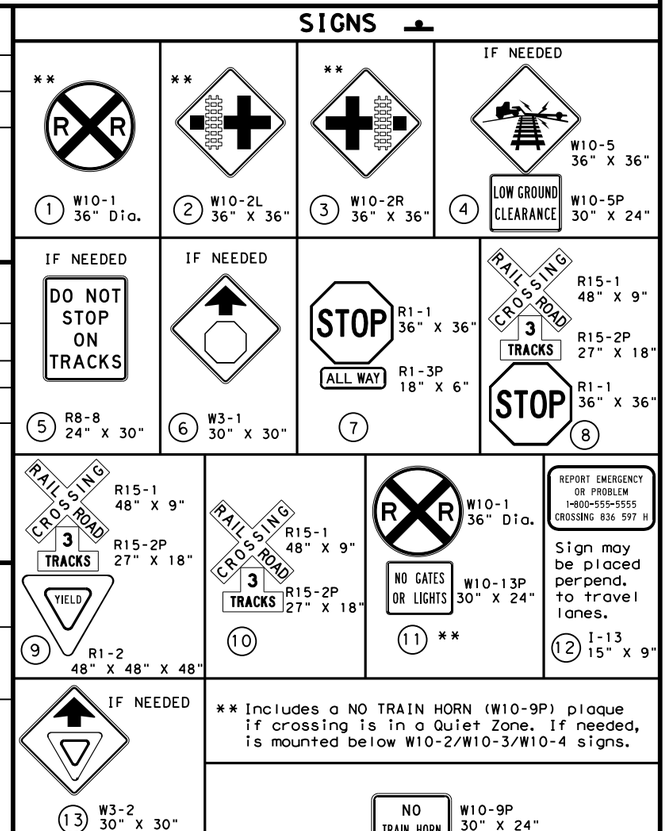


NOTE

Separate active traffic control devices, railroad crossing pavement markings, and adjacent signs required when tracks are more than 100' apart.

TWO ADJACENT CROSSINGS

SIGNS



** Includes a NO TRAIN HORN (W10-9P) plaque if crossing is in a Quiet Zone. If needed, is mounted below W10-2/W10-3/W10-4 signs.

NO TRAIN HORN W10-9P 30" X 24"

Texas Department of Transportation

Traffic Safety Division Standard

RAILROAD CROSSING DETAILS SIGNING & STRIPING

RCD(2)-22

FILE: rcd2-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
2-16	DIST	COUNTY		SHEET NO.
11-22	DAL	COLLIN		161

DATE: 2023/0%
FILE: DOCUMENT NAME

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept in the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0816-05-025 (FM 2862)

1.2 PROJECT LIMITS:

From: **SH 5**

To: **WESTOVER LANE**

1.3 PROJECT COORDINATES:

BEGIN: (Lat) **33.3491676** ,(Long) **-96.5512151**

END: (Lat) **33.3690930** ,(Long) **-96.4893021**

1.4 TOTAL PROJECT AREA (Acres): **50**

1.5 TOTAL AREA TO BE DISTURBED (Acres): **31**

1.6 NATURE OF CONSTRUCTION ACTIVITY:
SAFETY TREAT FIXED OBJECTS, PROFILE EDGELINE MARKINGS, PROVIDE ADDITIONAL PAVED SURFACE WIDTH, PROFILE CENTERLINE MARKINGS

1.7 MAJOR SOIL TYPES:

Soil Type	Description
HoB	Houston Black Clay, 1 to 3% Slopes
EdD2	Eddy Gravelly Clay Loam 3 to 8% Slopes
HoA	Houston Black Clay, 0 to 1% Slopes
AuB	Austin Silty Clay 1 to 3% Slopes
AlD2	Altoga Silty Clay, 5 To 8% Slopes, Eroded
AUC2	Austin Silty Clay 3 to 5% Slopes
The Vegetative Cover is in good condition with approximately 95% density.	

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- X PSLs determined during preconstruction meeting
- ☐ PSLs determined during construction
- ☐ No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

- X Mobilization
- X Install sediment and erosion controls
- X Blade existing topsoil into windrows, prep ROW, clear and grub
- X Remove existing pavement
- X Grading operations, excavation, and embankment
- X Excavate and prepare subgrade for proposed pavement widening
- X Remove existing culverts, safety end treatments (SETs)
- X Remove existing metal beam guard fence (MBGF), bridge rail
- X Install proposed pavement per plans
- X Install culverts, culvert extensions, SETs
- X Install mow strip, MBGF, bridge rail
- ☐ Place flex base
- X Rework slopes, grade ditches
- X Blade windrowed material back across slopes
- X Revegetation of unpaved areas
- X Achieve site stabilization and remove sediment and erosion control measures
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- X Sediment laden stormwater from stormwater conveyance over disturbed area
- X Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- X Solvents, paints, adhesives, etc. from various construction activities
- X Transported soils from offsite vehicle tracking
- X Construction debris and waste from various construction activities
- ☐ Contaminated water from excavation or dewatering pump-out water
- X Sanitary waste from onsite restroom facilities
- X Trash from various construction activities/receptacles
- X Long-term stockpiles of material and waste
- X Other: **CONCRETE POURING**
- X Other: **CONCRETE WASHOUT**
- ☐ Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
DRAINAGE TO SISTER GROVE CREEK	SISTER GROVE CREEK ABOVE LAKE LAVON (0821B)

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- X Development of plans and specifications
- X Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- X Post Construction Site Notice
- X Submit NOI/CSN to local MS4
- X Perform SWP3 inspections
- X Maintain SWP3 records and update to reflect daily operations
- X Complete and submit Notice of Termination to TCEQ
- X Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- X Day To Day Operational Control
- X Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- X Post Construction Site Notice
- X Submit NOI/CSN to local MS4
- X Maintain schedule of major construction activities
- X Install, maintain and modify BMPs
- X Complete and submit Notice of Termination to TCEQ
- X Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity
COLLIN COUNTY PHASE II MS4 CONTACT TRACY HAMFIELD

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		162
STATE	STATE DIST.	COUNTY	
TEXAS	DAL	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.
0816	05	025	FM 2862

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- X ☐ Protection of Existing Vegetation
- X ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- X ☐ Temporary Seeding
- ☐ X Permanent Planting, Sodding or Seeding
- X ☐ Biodegradable Erosion Control Logs
- X ☐ Rock Filter Dams/ Rock Check Dams
- X ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ X Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ X Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- X ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- X ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- X ☐ Sediment Control Fence
- X ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- ☐ ☐ Sediment Trap
  - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - ☐ 3,600 cubic feet of storage per acre drained
- ☐ ☐ Sedimentation Basin
  - ☐ Not required (<10 acres disturbed)
  - ☐ Required (>10 acres) and implemented.
    - ☐ Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - ☐ 3,600 cubic feet of storage per acre drained
  - X Required (>10 acres), but not feasible due to:
    - X Available area/Site geometry
    - ☐ Site slope/Drainage patterns
    - ☐ Site soils/Geotechnical factors
    - ☐ Public safety
    - X Other: **Alternate BMP's are provided in SW3P for equivalent sedimentation control.**

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
SEEDING	0+10	245+30

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- X Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- X Loaded haul trucks to be covered with tarpaulin
- X Stabilized construction exit
- X Other: **SITE DAMPENED FOR DUST CONTROL**
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- X Chemical Management
- X Concrete and Materials Waste Management
- X Debris and Trash Management
- X Dust Control
- ☐ Sanitary Facilities
- X Other: **Avoid storing portable sanitary units, concrete washouts or chemicals within 50 feet upgradient of a receiving water or drainage conveyance without adequate pollution controls.**
- X Other: **Maintain roadways, active pedestrian facilities and adjacent properties free of project sedimentation and loose materials.**

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

There are no surface waters located within the ROW of the project.

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- X Fire hydrant flushings
- X Irrigation drainage
- X Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- X Potable water sources
- X Springs
- X Uncontaminated groundwater
- X Water used to wash vehicles or control dust
- X Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/17/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		163
STATE	STATE DIST.	COUNTY	
TEXAS	DAL	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.
0816	05	025	FM 2862

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damage resulting from its use.

Notes To Designer:
1. Do not alter Sheet Design or Font style, size or weight - match text attributes.
2. If additional space is needed for a numbered section, fence and adjust sections up or down as needed for proportioning and readability but do not relocate from its relative position.
3. All areas should be addressed thoroughly and verify the necessary pay items are set up to support actions needed.

Filled Out: XX/XX/XXXX
Prepared by: Name/Section

I. STORMWATER POLLUTION PREVENTION PLAN-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 adjacent MS 4 Operator(s) that receive discharges from this project. They need to be notified prior to construction activities.
(Note: Leave blank only if no adjacent MS 4 Operator(s) are affected.)

1. Collin County Phase II MS 4-Contact Tracy Homfeld

2.

☐ No Action Required ☒ Required Action

Action Number:

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas. No equipment is allowed in any sream channel below the ordinary High Water Mark except on approved temporary stream crossings or drill pads.

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# 3(a)

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. Culvert 6-STA 105+94.57-Unnamed Tributary to Sister Grove Creek-Stream Impacts

2. Culvert 7-STA 114+13.36-Unnamed Tributary to Sister Grove Creek-Stream Impacts

3. Culvert 14-STA 205+12.92-Unnamed Tributary to Sister Grove Creek-Stream Impacts

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 for applicable 401 General Conditions:
(Note: If CORP Permit not required, do not check boxes.)

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☒ Silt Fence	☒ Vegetative Filter Strips
☒ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action Number:

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

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS TREATY ACT.

☐ No Action Required ☒ Required Action

Action Number:

1. The following species could occur in the project area: Monarch butterfly, Southern crawfish frog, Long tailed weasel, Eastern spotted Skunk, Eastern box turtle, Texas garter snake, and American bumblebee. Follow the special notes on EPIC sheet and the BMPs listed below to protect these species.

2. Conctractor to implement the following BMPs from "Beneficial Management Practices: Avoiding, Minimizing, and Mitigating Impacts of Transportation Projects on State atural Resoruces" available at https://ftp.txdot.gov/pub/txdot-info/env/toolkit/300-01-bmp.pdf

   a. Minimize impacts to wetland habitats and isolated ephemeral pools.
   b. Section 2.6.1 Aquatic Amphibian and Reptile BMP (barrier fencing not required)
   c. Section 2.6.2 Terrestrial Amphibian and Reptile BMP
   d. Section 2.4.4 Insect Pollinator BMP
   e. Section 1.4 Water Quality BMP
   f. Section 1.2 BMP

Special Notes:

1. Avoid harming all wildlife species if encountered and allow them to safely leave the project site. Due diligence should be used to avoid killing or harming any wildlife species in the implementation of transportation projects.

2. 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 immediated area, and contact the Engineer immediately.

3. The Migratory Bird Act of 1918 states that it is unlawful to kill, capture, collect, possess, buy, sell, trade or transport any migratory bird, nest, young, feather or egg in part or in whole, without a federal permit issued in accordance within the Act's policies and regulations. The contractor would remove all old migratory bird nests from any structure or trees where work would be done from October 1 to February 15. In addition, the contractor would be prepared to prevent migratory birds from building nest(s) between February 15 to October 1. In the event that migratory birds are encountered on-site during project construction, efforts to avoid adverse impacts on protected birds, active nests, eggs and/or young would be observed.

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corp 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 Safety Data Sheets (SDS) 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 SDS. In the event of a spill, take actions to mitigate the spill as indicated in the SDS, 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, canisters, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation(s) or replacement(s) (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 Number:

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action Number:

1.

GENERAL NOTE:

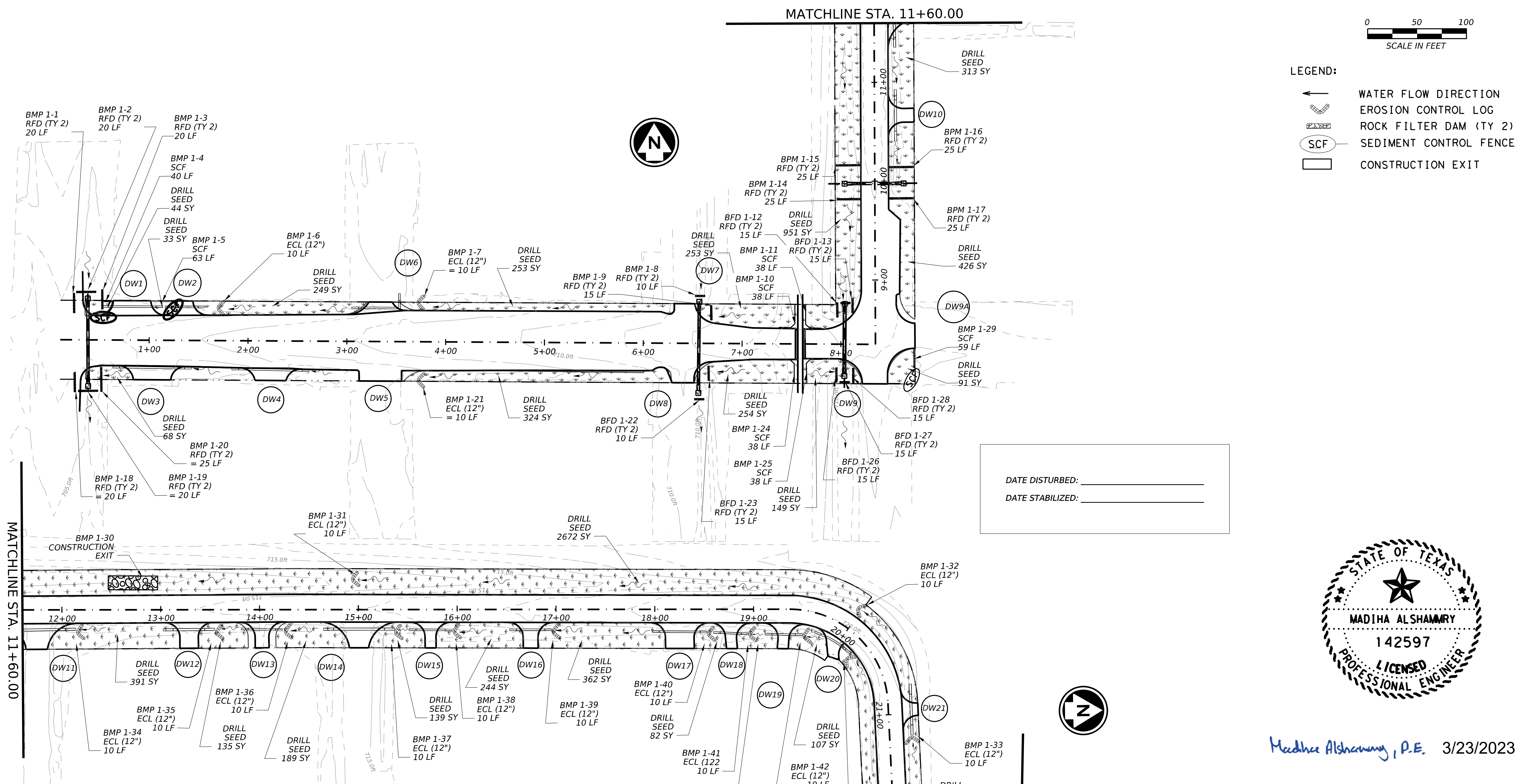
Any change orders and/or deviations from the final design must be reported to the Engineer prior to commencement of construction activities, as additional environmental clearance may be required.

LAST REVISION: 1/15/15

 Texas Department of Transportation
Dallas District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 2862
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	Collin	
CONTROL	SECTION	JOB	SHEET NO.
0816	05	025	164



DATE DISTURBED: ______________________

DATE STABILIZED: ______________________

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

BMP NUMBER	DATE INSTALLED	DATE REMOVED	BMP NUMBER	DATE INSTALLED	DATE REMOVED
BMP 1-1			BMP 1-19		
BMP 1-2			BMP 1-20		
BMP 1-3			BMP 1-21		
BMP 1-4			BMP 1-22		
BMP 1-5			BMP 1-23		
BMP 1-6			BMP 1-24		
BMP 1-7			BMP 1-25		
BMP 1-8			BMP 1-26		
BMP 1-9			BMP 1-27		
BMP 1-10			BMP 1-28		
BMP 1-11			BMP 1-29		
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BMP 1-13			BMP 1-31		
BMP 1-14			BMP 1-32		
BMP 1-15			BMP 1-33		
BMP 1-16			BMP 1-34		
BMP 1-17			BMP 1-35		
BMP 1-18			BMP 1-36		

BMP NUMBER	DATE INSTALLED	DATE REMOVED
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BMP 1-38		
BMP 1-39		
BMP 1-40		
BMP 1-41		
BMP 1-42		
BMP 1-43		
BMP 1-44		
BMP 1-45		

NOTES:

1. BMP'S SHALL NOT BE INSTALLED IN THEIR CONTROL AREAS ANY SOONER THAN 2 WEEKS PRIOR TO SOIL DISTURBING OF THAT AREA.
2. ACTUAL LOCATION OF THE EROSION CONTROL LOG TO BE DETERMINED BY THE ENGINEER.
3. CONSTRUCTION EXIT LOCATIONS TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER.
4. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.

Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 00+00 TO 23+60

SCALE: 1" = 100' SHEET 1 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	165

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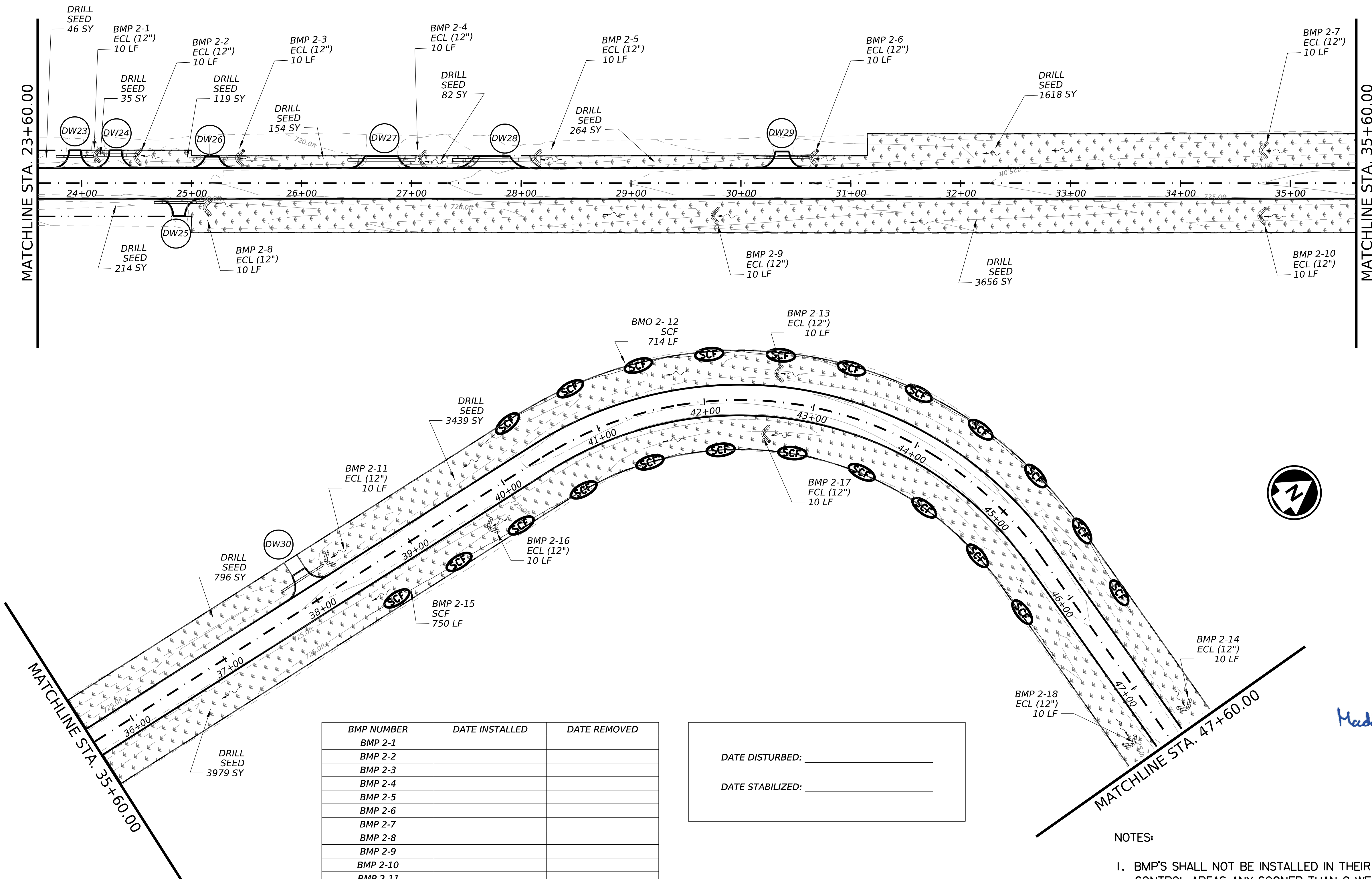

0 50 100
SCALE IN FEET

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT

BMP NUMBER	DATE INSTALLED	DATE REMOVED
BMP 2-1		
BMP 2-2		
BMP 2-3		
BMP 2-4		
BMP 2-5		
BMP 2-6		
BMP 2-7		
BMP 2-8		
BMP 2-9		
BMP 2-10		
BMP 2-11		
BMP 2-12		
BMP 2-13		
BMP 2-14		
BMP 2-15		
BMP 2-16		
BMP 2-17		
BMP 2-18		

DATE DISTURBED: ____________________

DATE STABILIZED: ____________________

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 23+60 TO 47+60

SCALE: 1" = 100' SHEET 2 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		166

DATE: 3/23/2023 4:20:11 PM
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LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT

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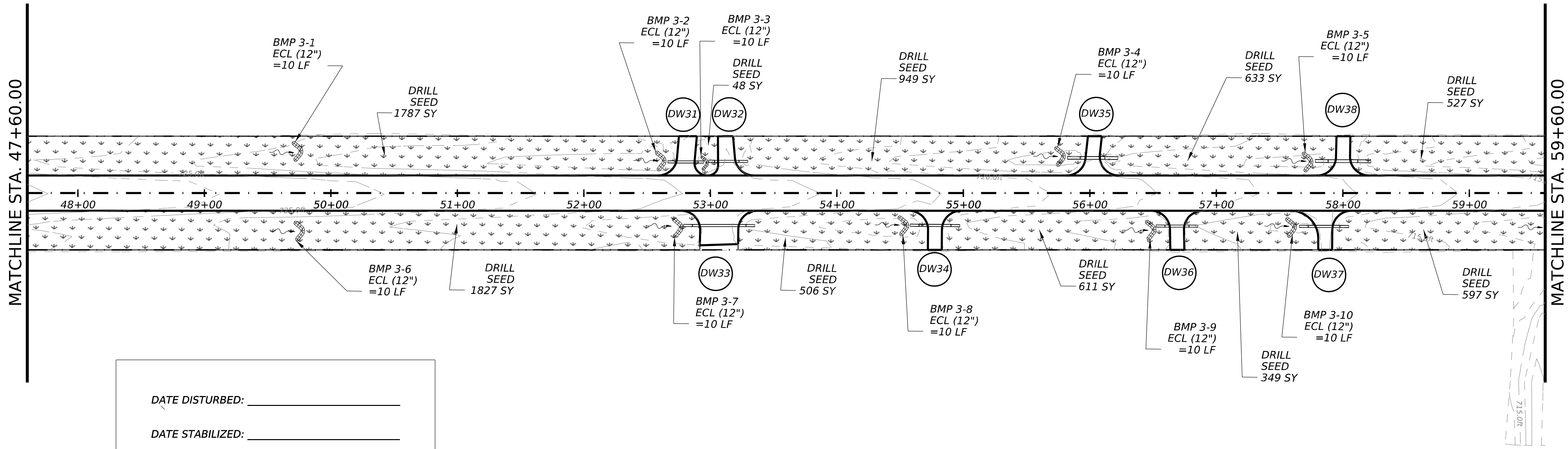
SCALE IN FEET



DATE DISTURBED: ______________________

DATE STABILIZED: ______________________

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BMP 3-4		
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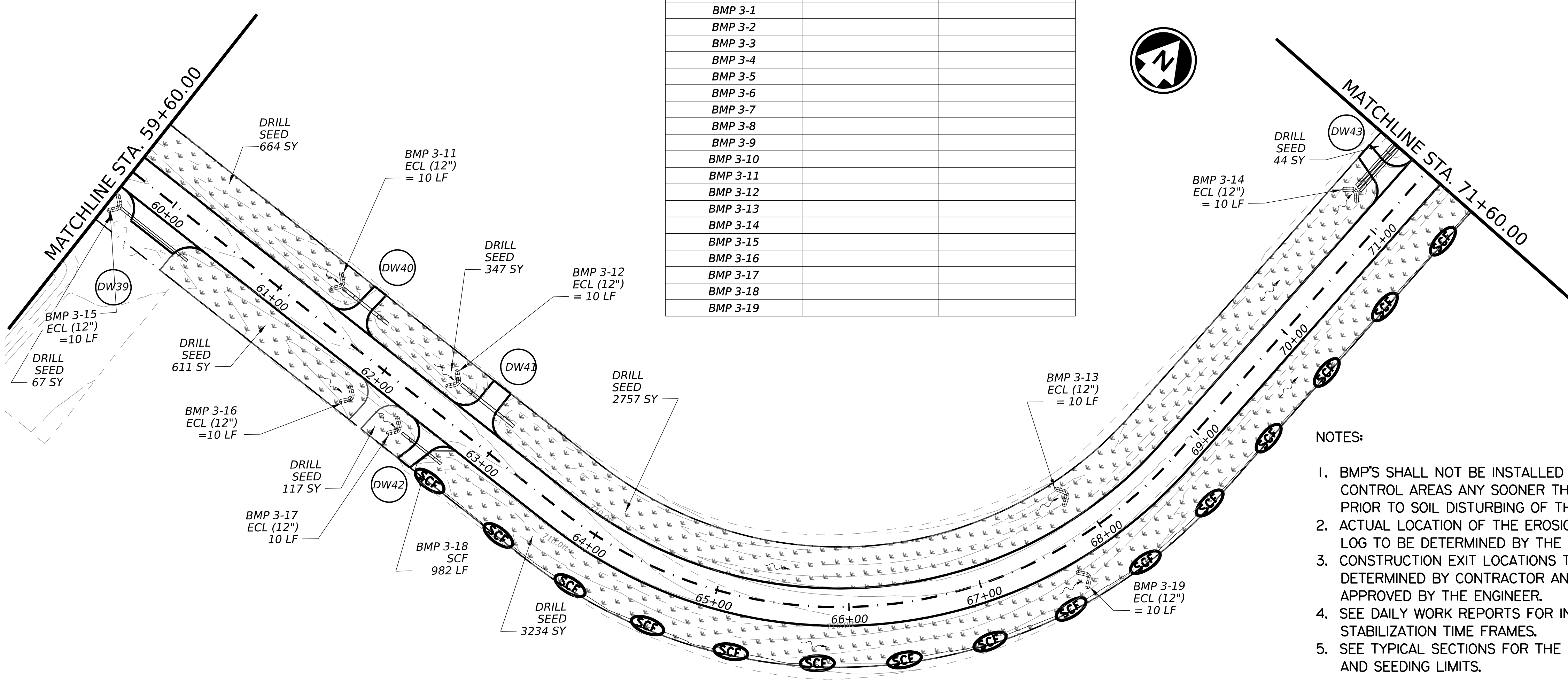
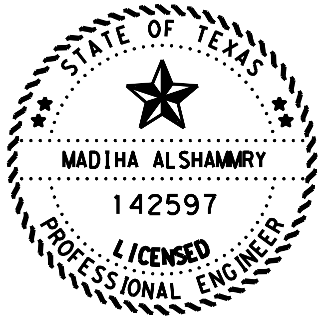
BMP 3-19		





Madiha Alshammry, P.E. 3/23/2023

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 47+60 TO 71+60

SCALE: 1" = 100' SHEET 3 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	167

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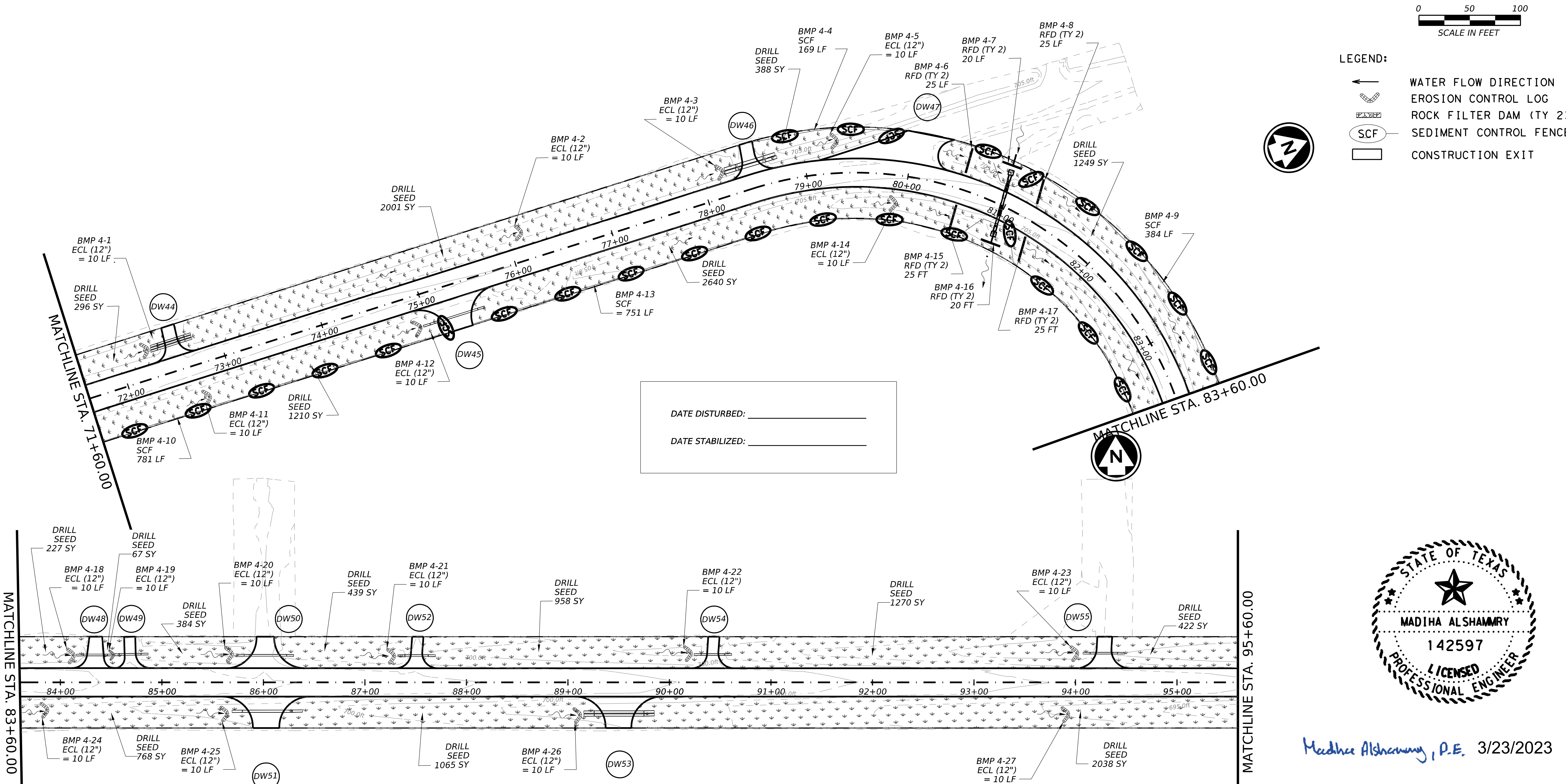

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BMP 4-2		
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BMP 4-15		
BMP 4-16		
BMP 4-17		

BMP NUMBER	DATE INSTALLED	DATE REMOVED
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BMP 4-19		
BMP 4-20		
BMP 4-21		
BMP 4-22		
BMP 4-23		
BMP 4-24		
BMP 4-25		
BMP 4-26		
BMP 4-27		

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 71+60 TO 95+60

SCALE: 1" = 100' SHEET 4 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		168

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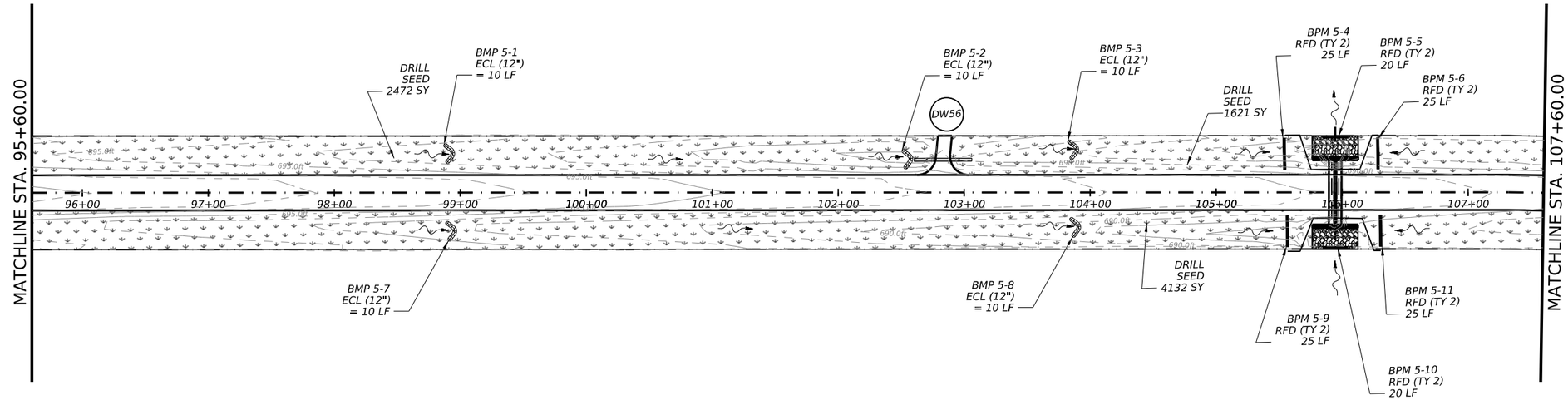

0 50 100
SCALE IN FEET

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT

DATE DISTURBED: _____

DATE STABILIZED: _____

BMP NUMBER	DATE INSTALLED	DATE REMOVED
BMP 5-1		
BMP 5-2		
BMP 5-3		
BMP 5-4		
BMP 5-5		
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BMP 5-10		
BMP 5-11		
BMP 5-12		
BMP 5-13		

BMP NUMBER	DATE INSTALLED	DATE REMOVED
BMP 5-13		
BMP 5-14		
BMP 5-15		
BMP 5-16		
BMP 5-17		
BMP 5-18		
BMP 5-19		
BMP 5-20		
BMP 5-21		
BMP 5-22		
BMP 5-23		

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STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 95+60 TO 119+60

SCALE: 1" = 100' SHEET 5 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		169

DATE: 3/23/2023 4:40:15 PM
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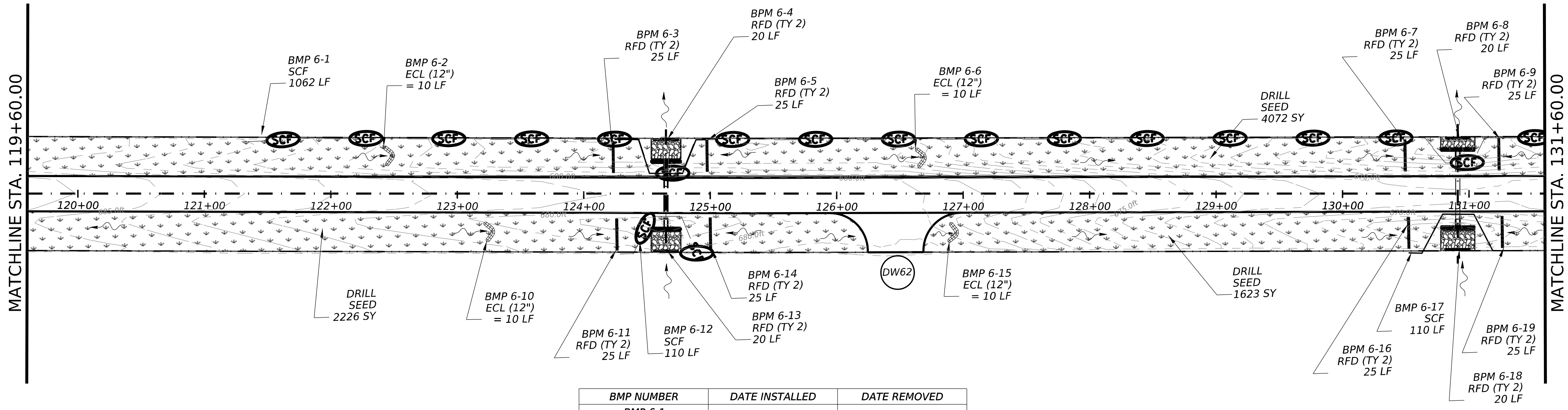

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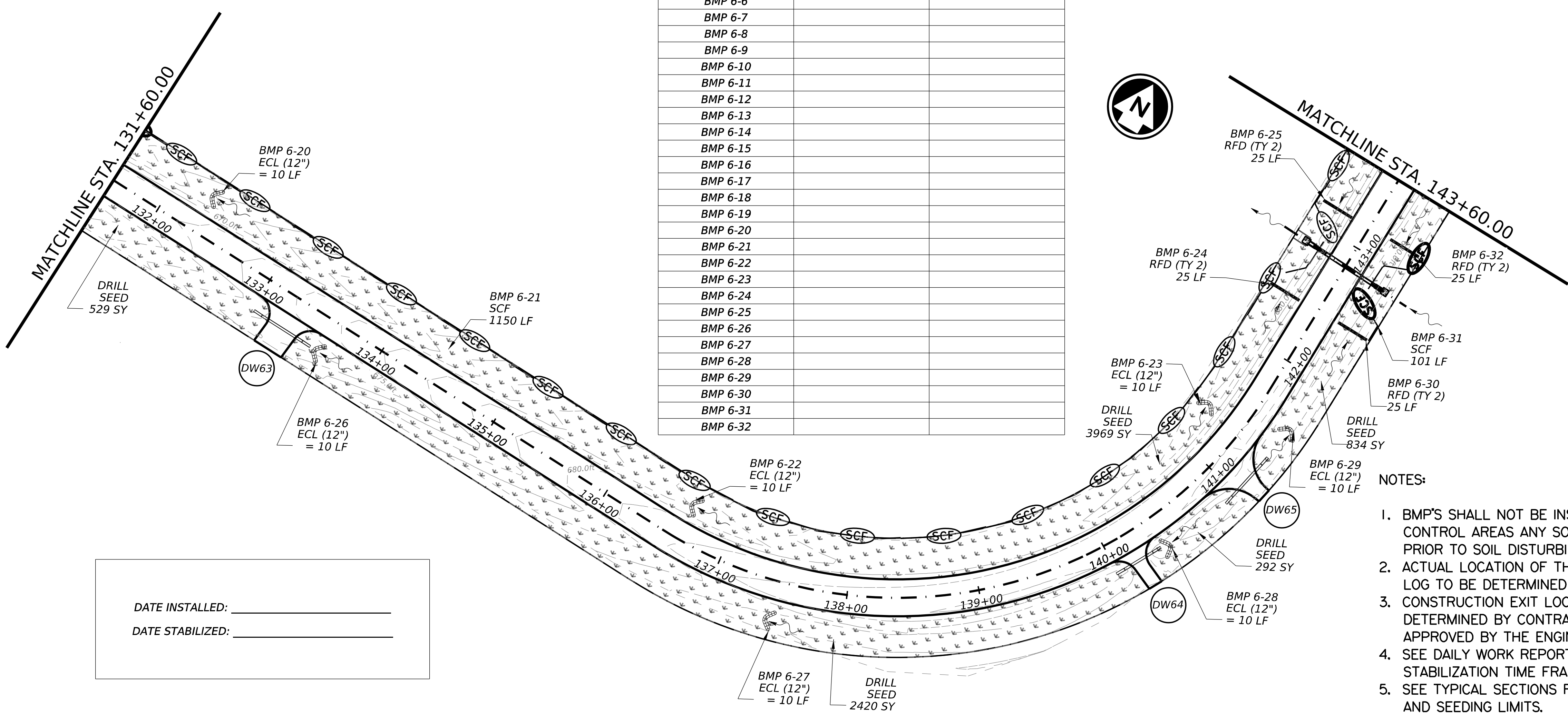
BMP 6-32		



DATE INSTALLED: ____________________

DATE STABILIZED: ____________________

0 50 100
SCALE IN FEET

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT

STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 119+60 TO 143+60

SCALE: 1" = 100' SHEET 6 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	170

DATE: 3/23/2023 4:43:31 PM
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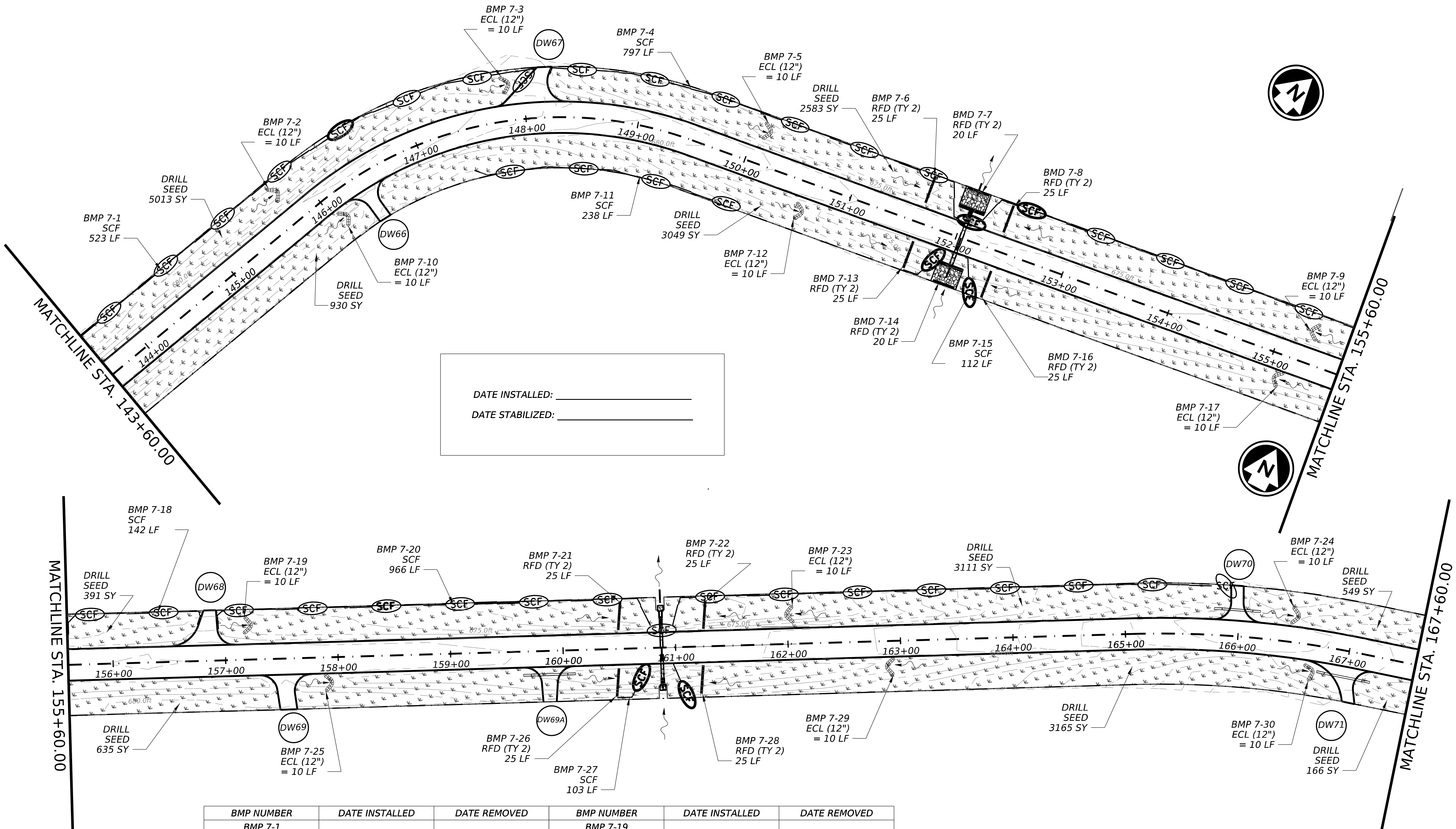
SCALE IN FEET: 0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT



STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

BMP NUMBER	DATE INSTALLED	DATE REMOVED	BMP NUMBER	DATE INSTALLED	DATE REMOVED
BMP 7-1			BMP 7-19		
BMP 7-2			BMP 7-20		
BMP 7-3			BMP 7-21		
BMP 7-4			BMP 7-22		
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BMP 7-10			BMP 7-28		
BMP 7-11			BMP 7-29		
BMP 7-12			BMP 7-30		
BMP 7-13					
BMP 7-14					
BMP 7-15					
BMP 7-16					
BMP 7-17					
BMP 7-18					

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 143+60 TO 167+60

SCALE: 1" = 100' SHEET 7 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		171

DATE: 3/23/2023 4:46:31 PM
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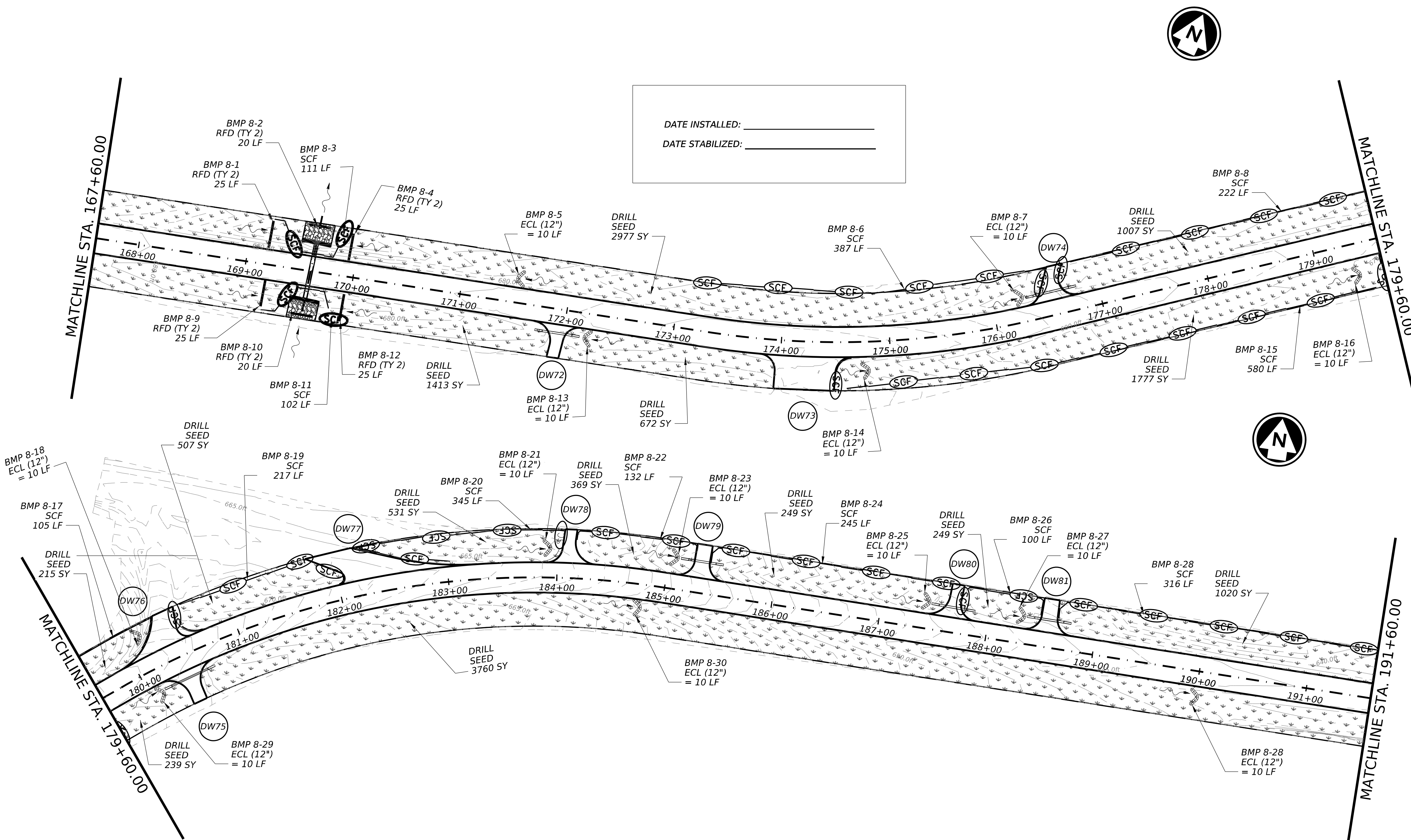
LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT

0 50 100
SCALE IN FEET

DATE INSTALLED: ____________________

DATE STABILIZED: ____________________



STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

BMP NUMBER	DATE INSTALLED	DATE REMOVED
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BMP 8-2		
BMP 8-3		
BMP 8-4		
BMP 8-5		
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BMP 8-9		
BMP 8-10		
BMP 8-11		
BMP 8-12		
BMP 8-13		
BMP 8-14		

BMP NUMBER	DATE INSTALLED	DATE REMOVED
BMP 8-15		
BMP 8-16		
BMP 8-17		
BMP 8-18		
BMP 8-19		
BMP 8-20		
BMP 8-21		
BMP 8-22		
BMP 8-23		
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BMP 8-25		
BMP 8-26		
BMP 8-27		
BMP 8-28		

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 167+60 TO 191+60

SCALE: 1" = 100' SHEET 8 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST		COUNTY	SHEET NO.
DAL		COLLIN	172

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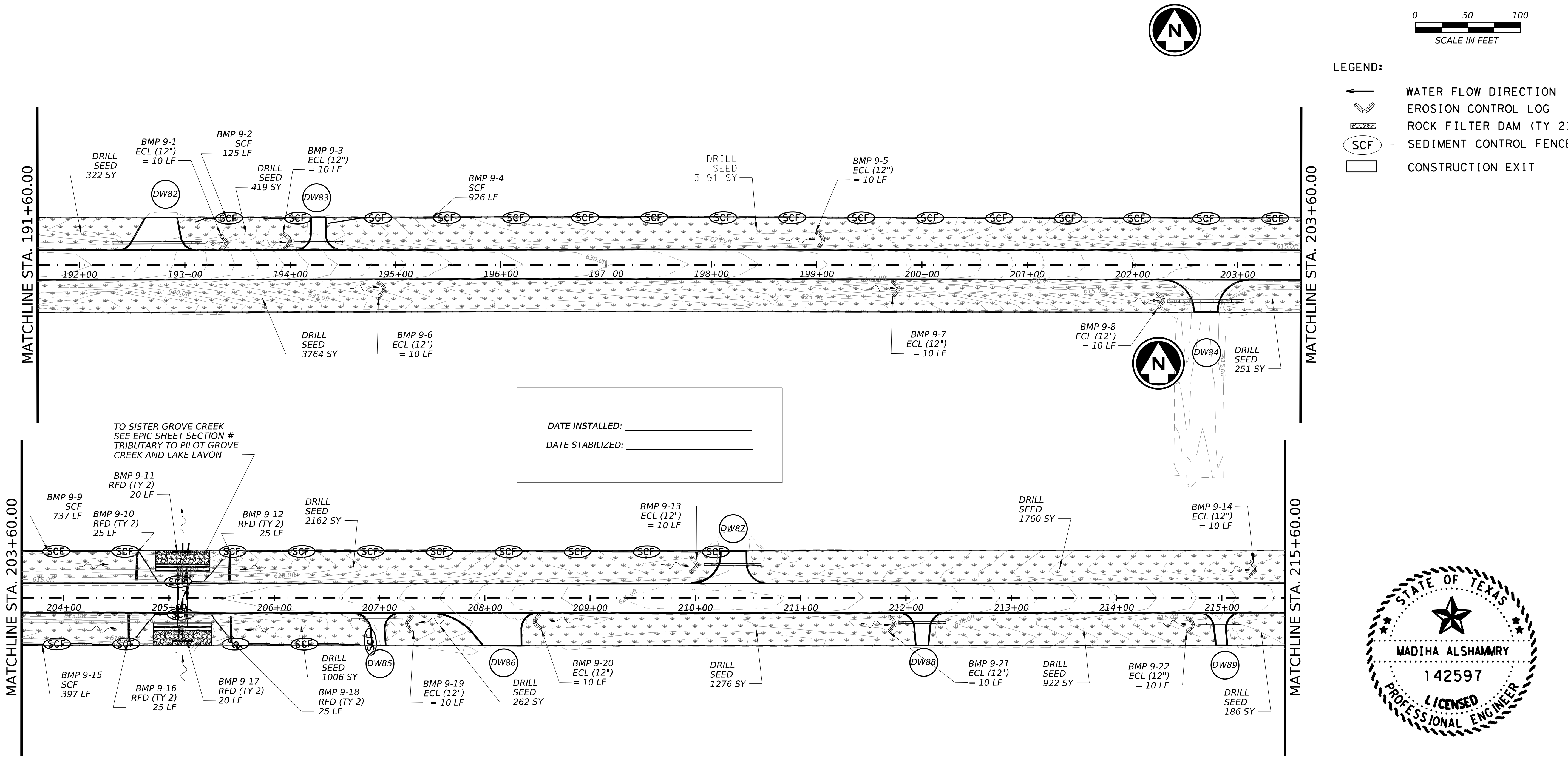

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BMP 9-17		
BMP 9-18		
BMP 9-19		
BMP 9-20		
BMP 9-21		
BMP 9-22		

Madiha Alshammry, P.E. 3/23/2023

NOTES:

1. BMP'S SHALL NOT BE INSTALLED IN THEIR CONTROL AREAS ANY SOONER THAN 2 WEEKS PRIOR TO SOIL DISTURBING OF THAT AREA.
2. ACTUAL LOCATION OF THE EROSION CONTROL LOG TO BE DETERMINED BY THE ENGINEER.
3. CONSTRUCTION EXIT LOCATIONS TO BE DETERMINED BY CONTRACTOR AND APPROVED BY THE ENGINEER.
4. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.

Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 191+60 TO STA 215+60

SCALE: 1" = 100' SHEET 9 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		173

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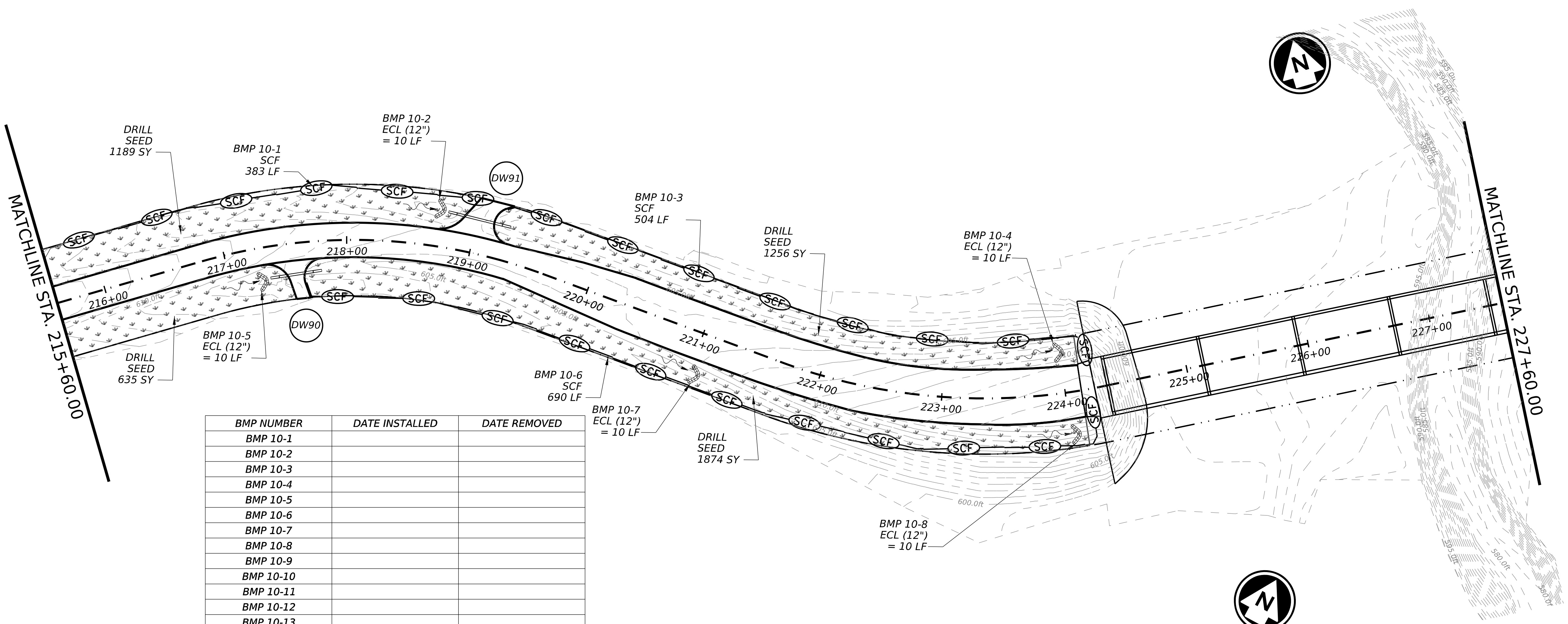

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BMP 10-4		
BMP 10-5		
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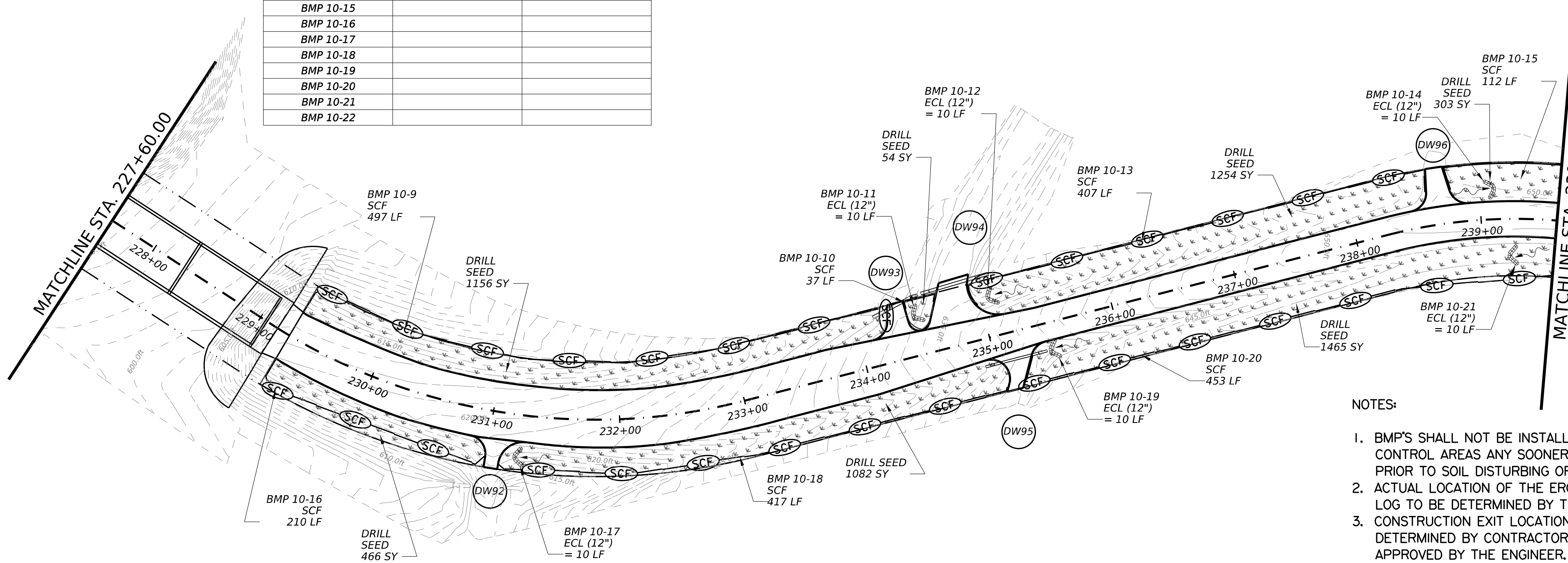
BMP 10-7		
BMP 10-8		
BMP 10-9		
BMP 10-10		
BMP 10-11		
BMP 10-12		
BMP 10-13		
BMP 10-14		
BMP 10-15		
BMP 10-16		
BMP 10-17		
BMP 10-18		
BMP 10-19		
BMP 10-20		
BMP 10-21		
BMP 10-22		

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT



STATE OF TEXAS
MADIHA ALSHAMMRY
142597
LICENSED
PROFESSIONAL ENGINEER

Madiha Alshammry, P.E. 3/23/2023

NOTES:

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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 215+60 TO STA 239+60

SCALE: 1" = 100' SHEET10 OF 11

CONT	SECT	JOB	HIGHWAY
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DIST		COUNTY	SHEET NO.
DAL		COLLIN	174

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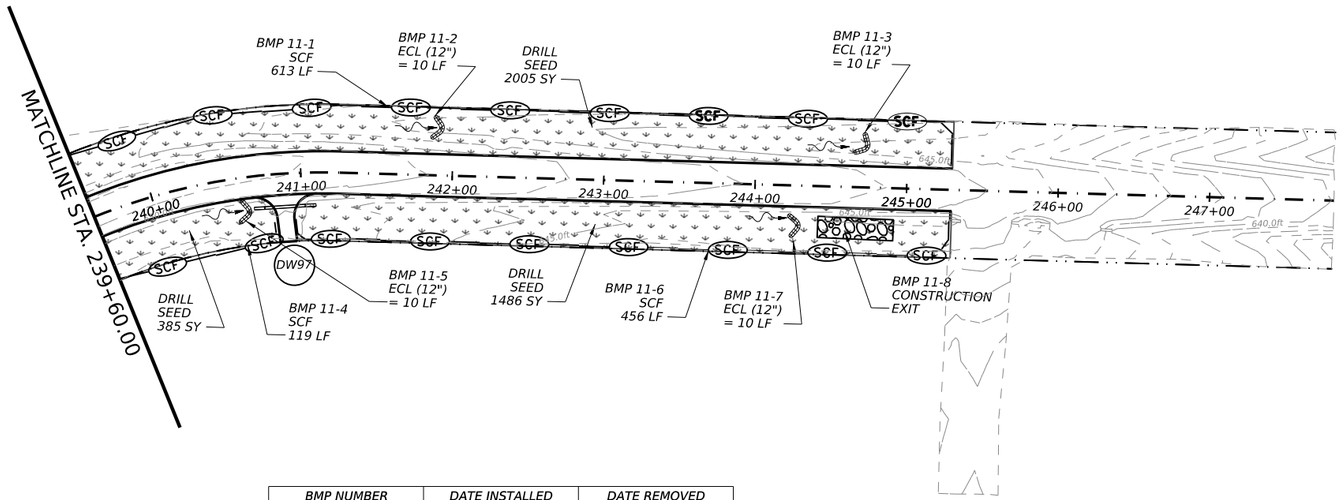

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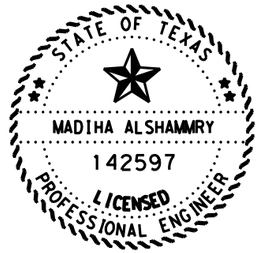
BMP 11-3		
BMP 11-4		
BMP 11-5		
BMP 11-6		
BMP 11-7		
BMP 11-8		

0 50 100
SCALE IN FEET

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT



Madiha Alshammry, P.E. 3/23/2023

NOTES:

1. BMP'S SHALL NOT BE INSTALLED IN THEIR CONTROL AREAS ANY SOONER THAN 2 WEEKS PRIOR TO SOIL DISTURBING OF THAT AREA.
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Texas Department of Transportation

FM 2862

SW3P SITE MAP
STA 239+60 TO 245+30

SCALE: 1" = 100' SHEET 11 OF 11

CONT	SECT	JOB	HIGHWAY
0816	05	025	FM 2862
DIST	COUNTY		SHEET NO.
DAL	COLLIN		175

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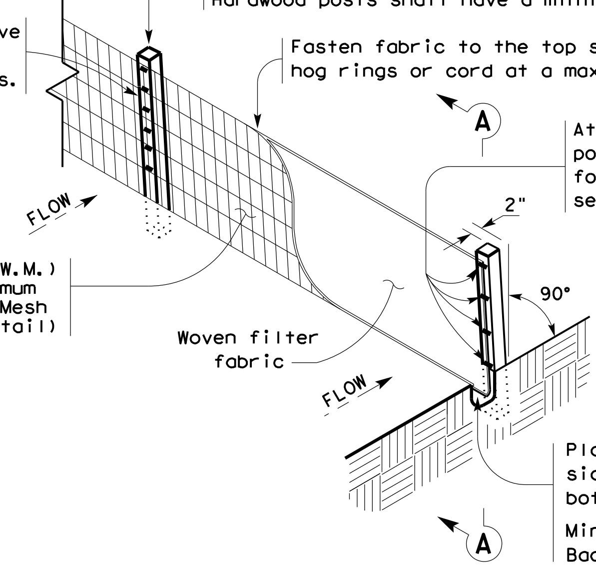
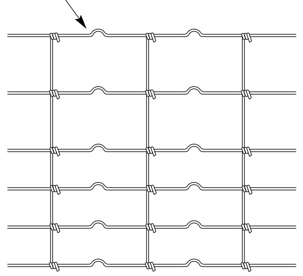
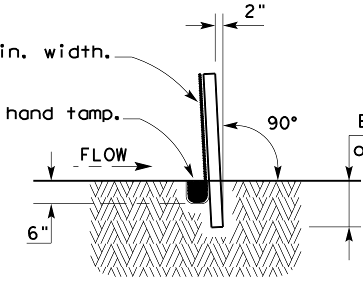


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

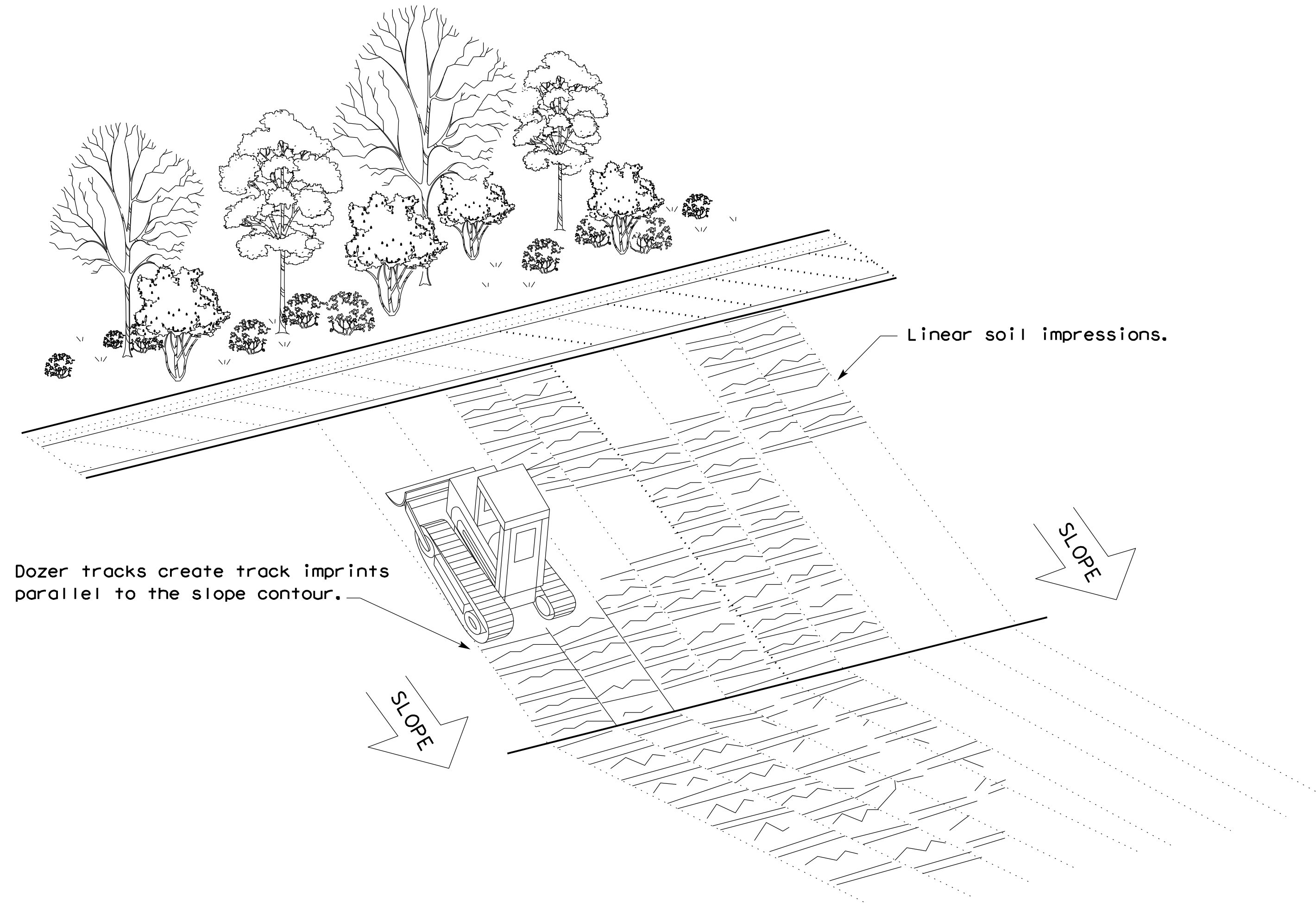
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	176

DATE:
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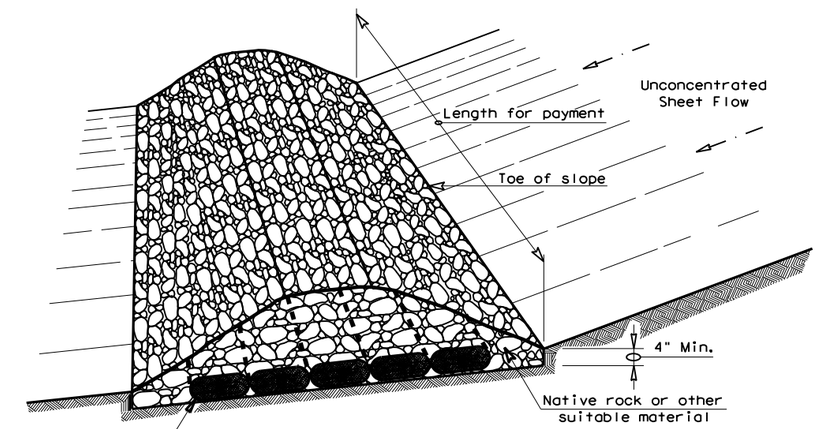
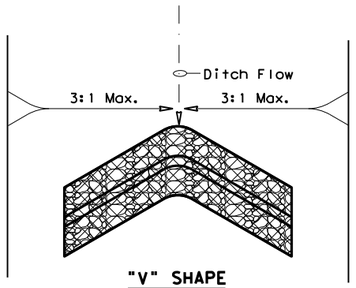


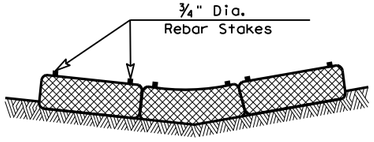
FILTER DAM AT TOE OF SLOPE

RFD1

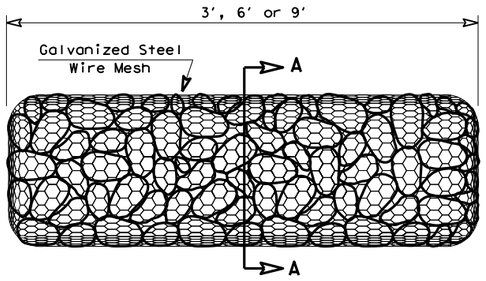


"V" SHAPE PLAN VIEW

PLAN VIEW

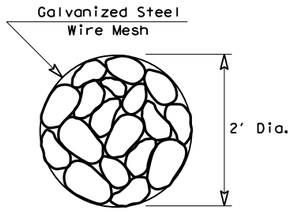


SECTION B-B

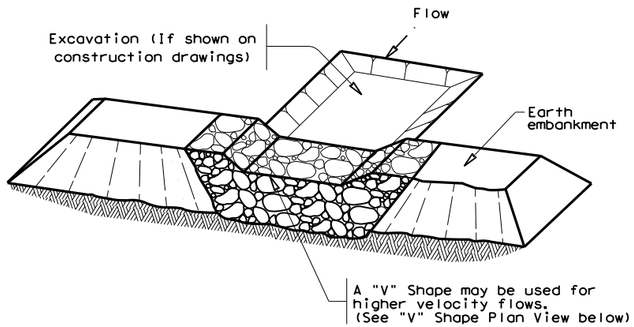


TYPE 4 (SACK GABIONS)

RFD4

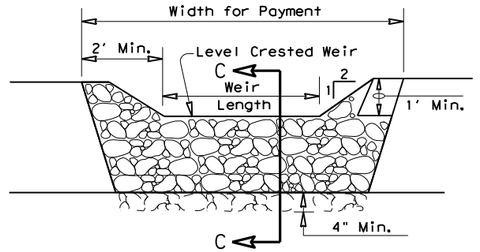


SECTION A-A

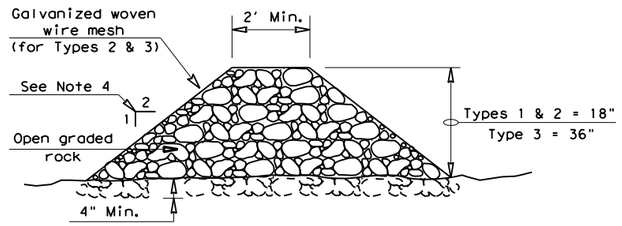


FILTER DAM AT SEDIMENT TRAP

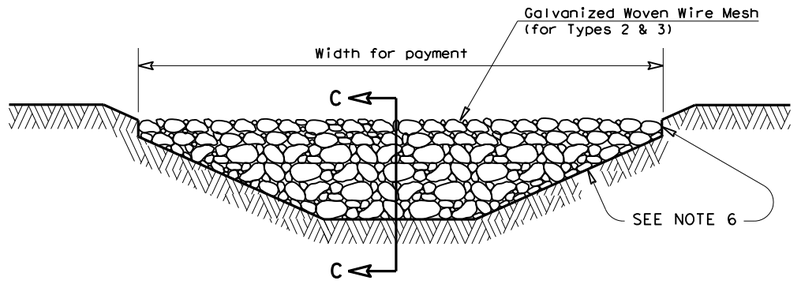
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation

Design Division Standard

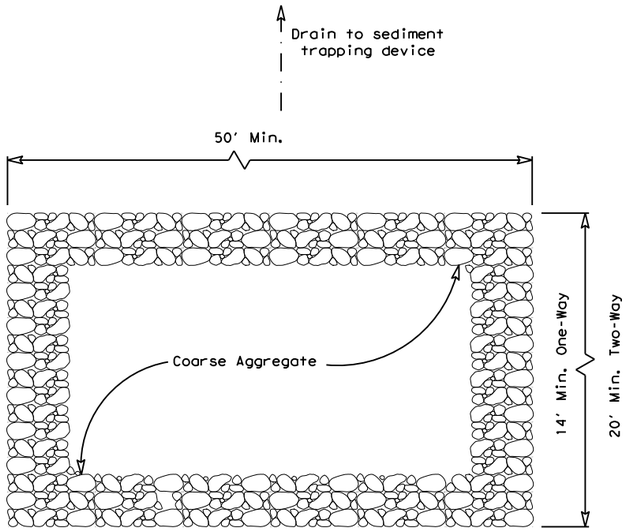
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

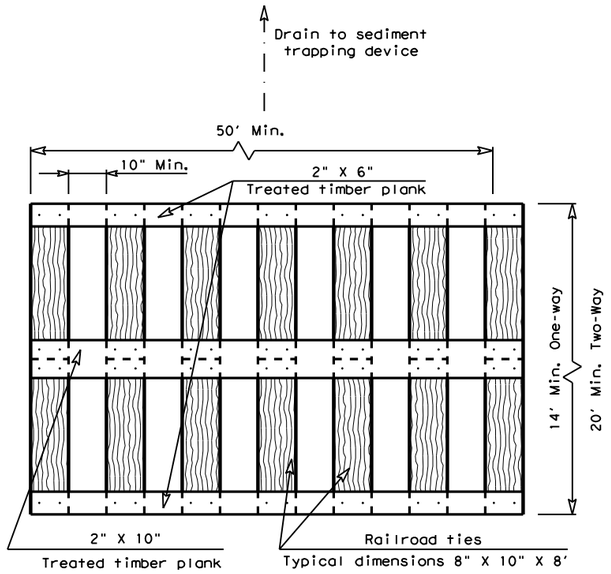
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		177

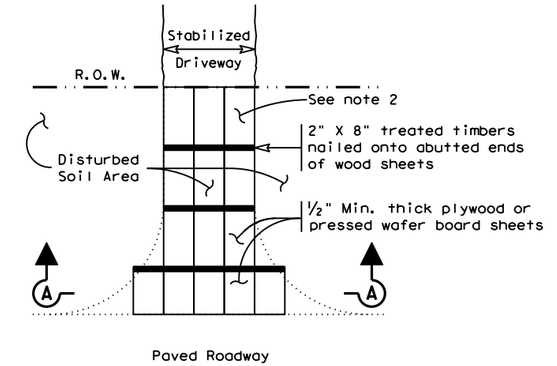
DATE: $DATE$
FILE: $FILE$



PLAN VIEW



PLAN VIEW



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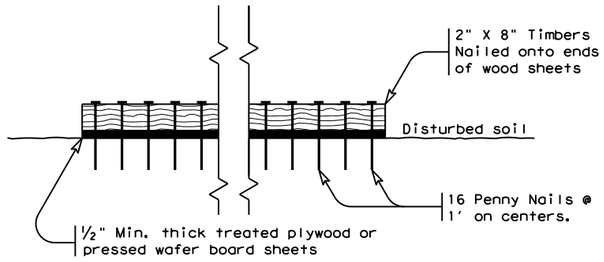
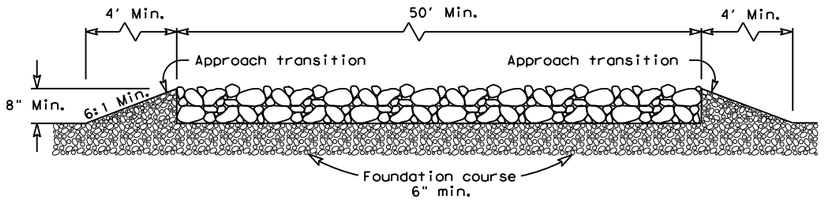


SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

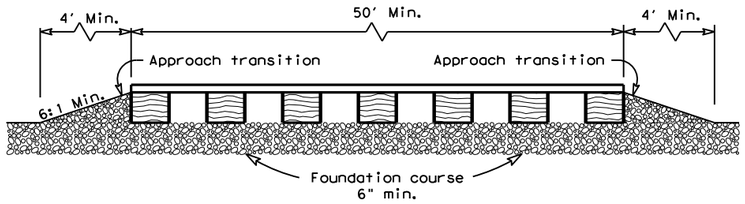
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

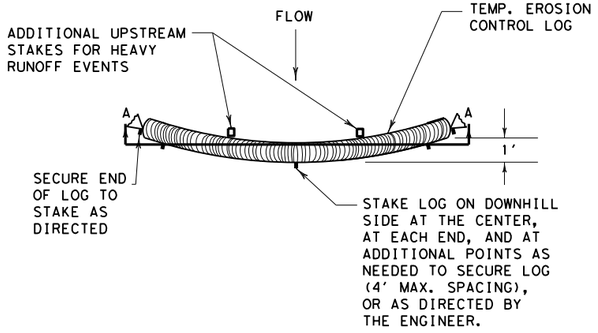
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

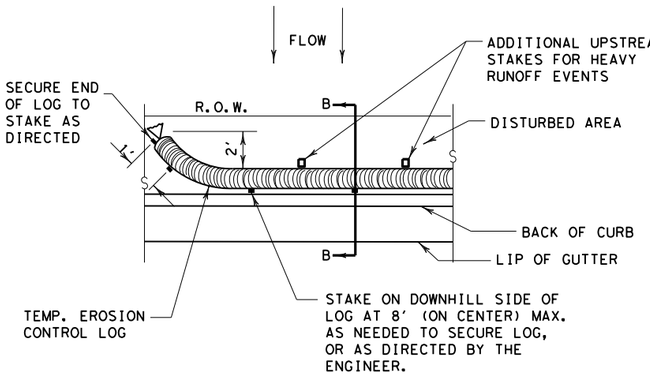
EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		178

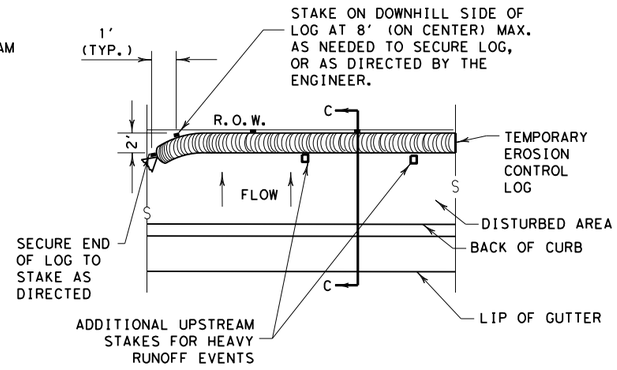
DATE:
FILE:



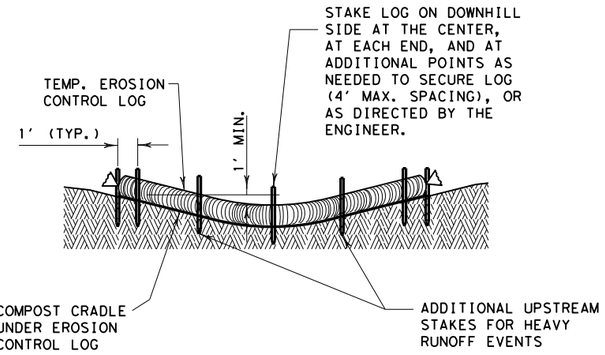
PLAN VIEW



PLAN VIEW



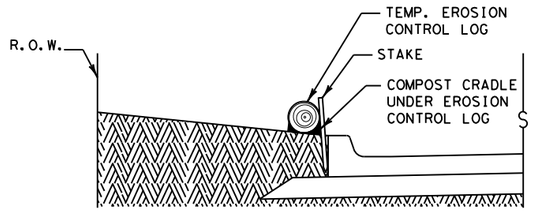
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

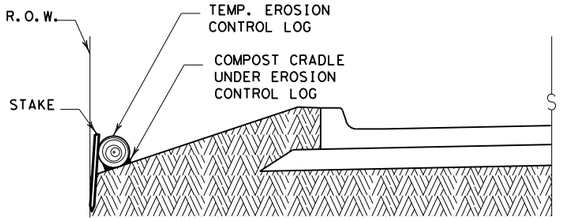
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

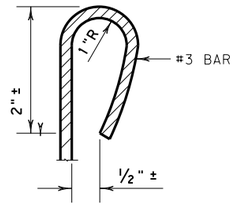
CL-BOC



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.

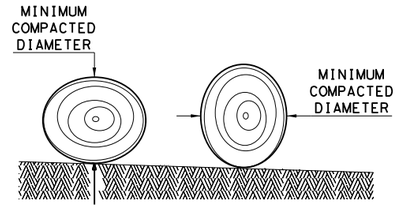
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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

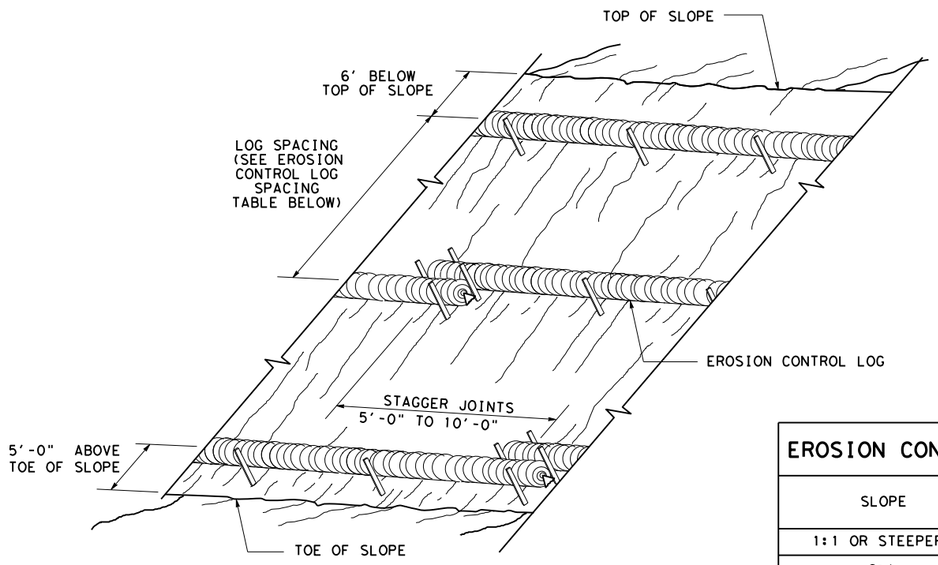
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

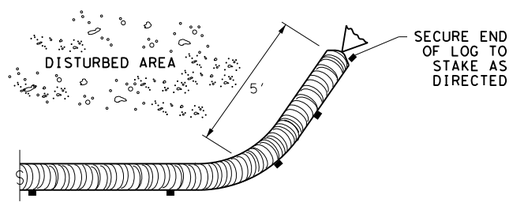
FILE: ec916	DN: TxDOT		CK: KM		DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY		
REVISIONS	0816	05	025		FM 2862		
	DIST	COUNTY			SHEET NO.		
	DAL	COLLIN			179		

DATE:
FILE:



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

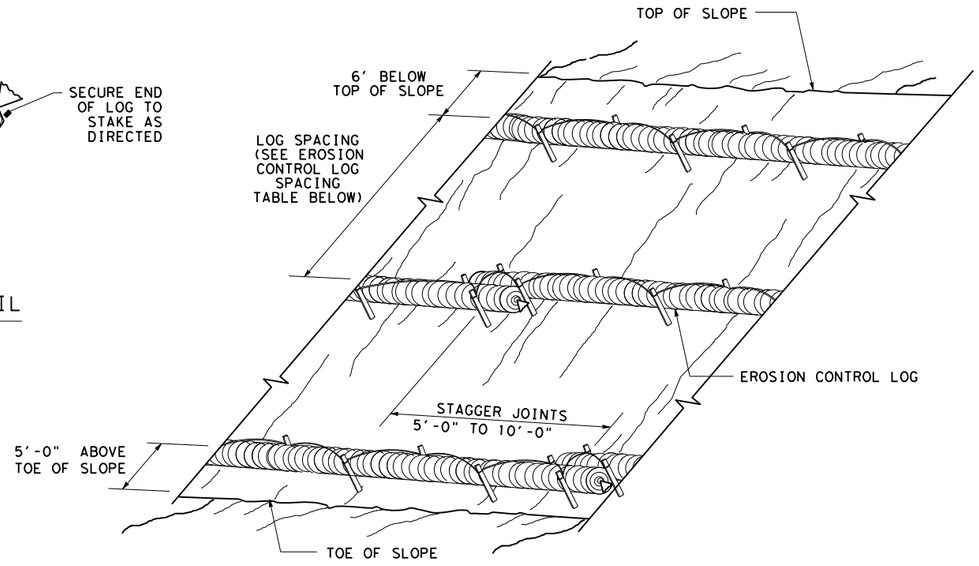
CL-SST



END SECTION RAP DETAIL

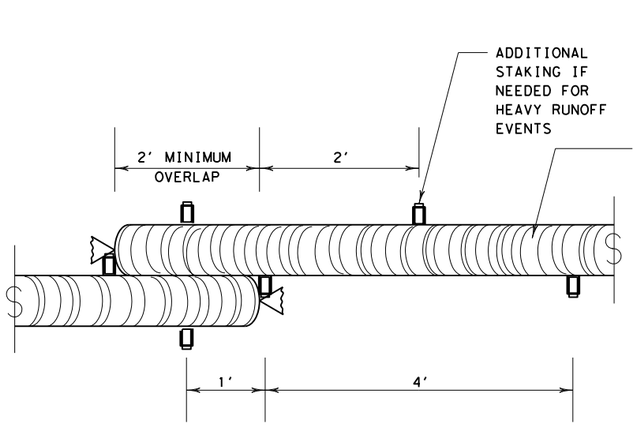
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

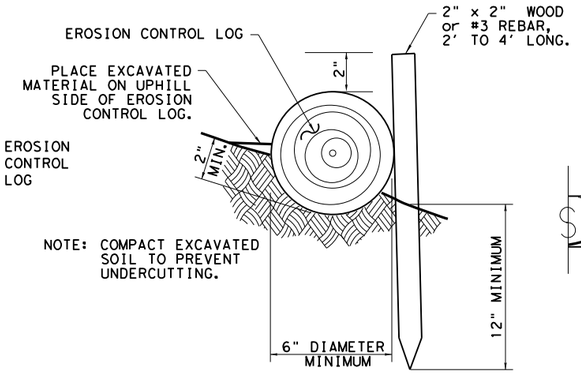
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

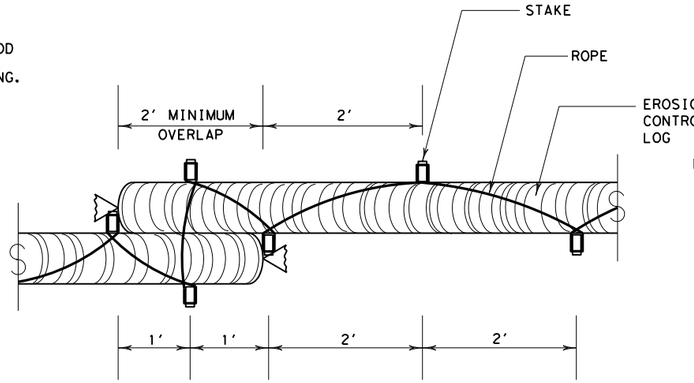


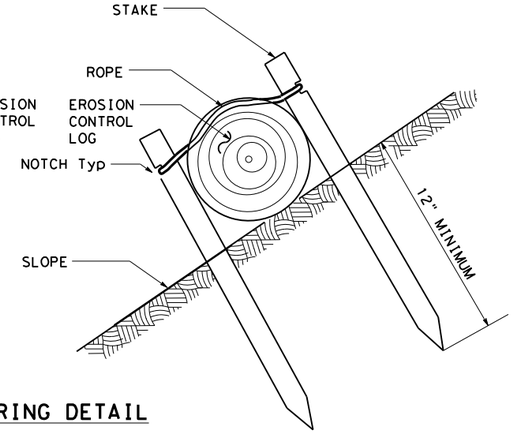


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

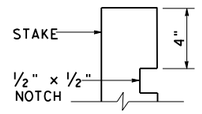
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



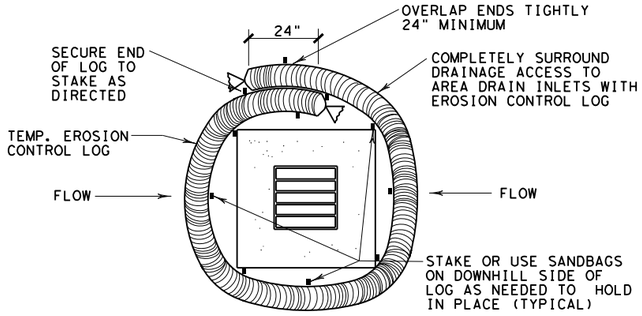
STAKE NOTCH DETAIL

Texas Department of Transportation | Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

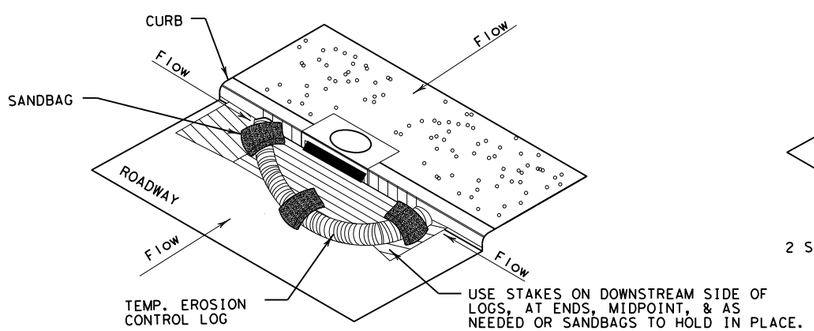
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
	CONT	SECT	JOB	HIGHWAY
REVISIONS	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		180

DATE:
FILE:



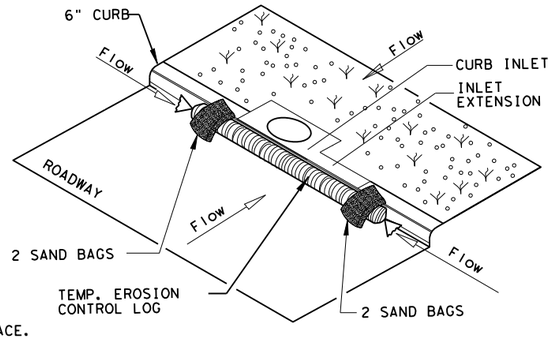
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

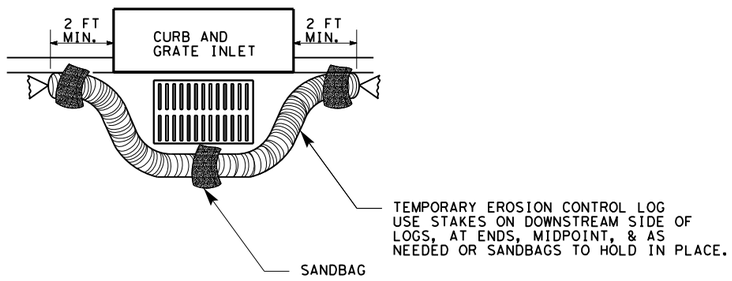
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

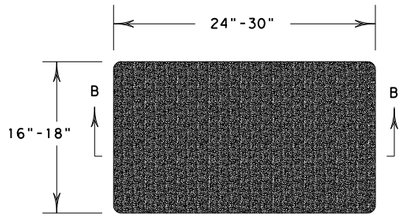
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

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	0816	05	025		FM 2862		
	DIST	COUNTY			SHEET NO.		
	DAL	COLLIN			181		

USER ID

SURFACE PREPARATION ITEM 160* TOPSOIL SY / ITEM 161* COMPOST MANUF. TOPSOIL (BOS) (4") SY

SURFACE PREPARATION

Prepare planting area surface BEFORE placing Topsoil, Compost, Fertilizer, Seed and/or Sod.
Once project area has been completed to final lines, grade and compaction, remove objectionable materials from planting area surface and cultivate existing surface to a depth of 4 inches, unless otherwise specified or directed.

Refer to Items 160 and 161 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.

TOPSOIL NOTES:
1. When Topsoil is specified under Item 160, use suitable material salvaged from the project ROW in accordance with Item 160 specifications, and/or secure additional good material from approved sources.
2. Topsoil shall include only the top 6 inches of its native surface, and be easily cultivated, fertile, erosion-resistant and free of objectionable materials.
3. Topsoil obtained from sites outside of the ROW must come from approved sources and have a pH between 5.5 and 8.5 su.
4. Place Topsoil on pre-cultivated surface, spread to a uniform loose cover at thickness specified, and shape per plans. Water and roll the finished surface with a light roller or other suitable equipment per Item 160.3; do not over-compact.

COMPOST NOTES:
1. When Compost Manufactured Topsoil (4") is specified under Item 161, use compost meeting all requirements of Item 161.2 and Table 1. Provide quality control (QC) documentation and obtain Engineer approval prior to compost delivery.
2. Contractor shall provide tickets/invoices that document material type, quantity and placement for all compost delivered.
3. Additional topsoil may be required to be imported to achieve the compost/topsoil mix ratio. Topsoil must meet Item 160 specifications.

APPLICATION OF COMPOST MANUFACTURED TOPSOIL (4")

AFTER Surface Preparation, uniformly spread a 1-inch layer of compost on-grade with 3 inches topsoil over pre-cultivated planting area. (25% compost and 75% topsoil = 1" compost and 3" topsoil.)
Then mix compost and topsoil together by cultivating the compost into the topsoil (by till or disk) to a 4-inch (4") depth.
Roll the finished surface with a light corrugated drum; do not over-compact.

FERTILIZER ITEM 166* FERTILIZER AC

SOIL ANALYSIS FOR FERTILIZER APPLICATION RATE

Unless otherwise stated in the plans, Contractor shall perform at least one soil analysis on each project before fertilization, and submit results to Engineer with recommended fertilizer rates based on soil analysis.
Engineer may direct sample location(s). Soil analysis may be waived if both compost and sod are used on entire project.

FERTILIZER NOTES:
1. Refer to Item 166 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Apply fertilizer BEFORE seeding, or AFTER placing sod.
3. Use fertilizer containing nitrogen (N), phosphoric acid (P) and potash (K) nutrients, unless otherwise specified. At least 50% of the Nitrogen component shall be a slow-release sulfur-coated urea as described in Item 166.3. Do not apply more than 60 lbs Nitrogen per acre without Engineer concurrence.
4. Deliver fertilizer in bags, clearly labeled to show contents, unless otherwise specified or approved prior to delivery. When non-bagged, loose fertilizer is approved, provide documentation for each load of material delivered, to validate authenticity of the material.
5. Apply fertilizer uniformly, as a dry, granular material, essentially dust-free, and do not mix with water for application as a slurry.
6. When both temporary and permanent seeding are specified for the same area, apply half of the required fertilizer before the temporary seeding operation and the other half before the permanent seeding operation.

SEEDING FOR EROSION CONTROL ITEM 164* DRILL SEEDING AC

RECOMMENDED PLANTING SEASON	PERMANENT RURAL SEED MIX ITEM 164 - DRILL SEEDING (PERM) (RURAL)(CLAY)		PERMANENT URBAN SEED MIX ITEM 164 - DRILL SEEDING (PERM) (URBAN)(CLAY)		TEMPORARY DRILL SEED MIX ITEM 164 - DRILL SEEDING (TEMP) (WARM OR COOL)	
		Pure Live Seed Rate**		Pure Live Seed Rate**		Pure Live Seed Rate**
WARM SEASON Mar.15th, April, May, June, July, August, Sept. 15th	Green Sprangletop (Van Horn)	- 1.0 lbs/AC	Green Sprangletop (Leptochloa dubia)	- 0.3 lbs/AC	Foxtail Millet (Setaria italica)	- 34 lbs/AC
	Sideoats Grama (Haskell)	- 1.0 lbs/AC	Sideoats Grama (El Reno)(Bouteloua curtipendula)	- 3.6 lbs/AC		
	Texas Grama (Atascosa)	- 1.0 lbs/AC	Buffalograss (Texoka)(Buchloe dactyloides)	- 1.6 lbs/AC		
	Hairy Grama (Chaparral)	- 0.4 lbs/AC	Bermudagrass (Cynodon dactylon)	- 2.4 lbs/AC		
	Shortspike Windmillgrass (Welder)	- 0.2 lbs/AC				
	Little Bluestem (OK Select)	- 0.8 lbs/AC				
	Purple Prairie Clover (Cuero)	- 0.6 lbs/AC				
	Engelmann Daisy (Eldorado)	- 0.75lbs/AC				
	Illinois Bundleflower	- 1.3 lbs/AC				
	Awnless Bushsunflower (Plateau)	- 0.2 lbs/AC				
COOL SEASON Sept 16th, Oct, Nov, Dec, Jan, Feb, Mar 14th						Pure Live Seed Rate**
					Tall Fescue (Festuca arundinaceae)	- 4.5 lbs/AC
					Western Wheatgrass (Agropyron smithii)	- 5.6 lbs/AC
					Red Winter Wheat (Triticum aestivum)	- 34 lbs/AC
					Cereal Rye	- 34 lbs/AC

SEEDING NOTES:
1. When seeding is specified under Item 164, refer to TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown. Materials and construction shall meet specifications.
2. Conduct seeding upon completion of each applicable construction stage (dependent upon planting season requirements), without compensation for additional move-ins.
3. Place seed AFTER preparing planting area surface. Refer to Surface Preparation detail this sheet, as well as Topsoil Item 160 and Compost Manufactured Topsoil Item 161 when specified. Apply fertilizer per Item 166 BEFORE seeding, per specifications and this sheet, to help drill the fertilizer into the soil.
4. When temporary grasses are well-established and more than 2 inches tall, mow planting area before seeding permanent grasses; mowing for this purpose will be subsidiary. When vegetation is not already well-established, cultivate planting area to a depth as described in Item 164.3, before temporary seeding and before permanent seeding.
5. Seed material must be appropriate to the location, soil type and season. Use the seed mix species and pure live seed rates designated in Tables 1-4 of the TxDOT 2014 Standard Specifications* for Item 164, unless otherwise specified.
6. All seed shall meet labeling, delivery, analysis, and testing requirements described in Item 164.2.1. Deliver seed in labeled, unopened bags or containers to Engineer prior to planting.
7. Uniformly plant seed over the designated planting area, along the contour of slopes, and drill seed to a depth as described in Item 164.3.4.
8. Hydroseeding may be allowed, when specified or Engineer concurs.
9. Implement and continue Vegetative Watering per the schedule, rate and volume specified under Item 168.

****Note:** The amount of Pure Live Seed (PLS) in one pound of bulk seed is based on three factors: % Purity, % Germination, and % Dormant. Use the following formula to calculate PLS in bulk seed: PLS = % Purity X (% Germination + % Dormant) Ensure that the specified amount of pure live seed is placed.

TXDOT REFERENCE MATERIALS:

- * "STANDARD SPECIFICATIONS FOR CONSTRUCTION AND MAINTENANCE OF HIGHWAYS, STREETS, AND BRIDGES" 2014
- "A GUIDANCE TO ROADSIDE VEGETATION ESTABLISHMENT" 2004
- ONLINE TRAINING COURSE: MNT415 REVEGETATION DURING CONSTRUCTION
- DALLAS DISTRICT "VEGETATION ESTABLISHMENT GUIDELINES"

SODDING FOR EROSION CONTROL ITEM 162* BLOCK SOD (BERMUDA) SY

BLOCK OR ROLL SOD	COMMON NAME	BOTANICAL NAME
	Common Bermuda Grass	Cynodon dactylon

SODDING NOTES:
1. Refer to Item 162 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Place sod between the average date of the last freeze in the Spring and 6 weeks before the average date of the first freeze in the Fall, per the Texas Almanac for the project area.
3. Place sod only AFTER soil surface preparation is complete as detailed in this sheet. Dry soil may require pre-watering.
4. Place all sod (blocks or rolls) within 24 hours of delivery to the site, and keep moist from the time it is dug up until it is planted. Sod with dried roots will not be accepted.
5. Place sod with joints alternating on each row to prevent all joints from lining up, and place blocks firmly against adjacent blocks. Roll, tamp and trim sod per Item 162.3.
6. Place fertilizer promptly AFTER sodding operation is complete in each area.
7. Water sod immediately following placement, and continue Vegetative Watering per Item 168.

VEGETATIVE WATERING FOR ESTABLISHING SEED AND SOD ITEM 168* VEGETATIVE WATERING MG

WATERING SCHEDULE

SEASON (Usual Months)	RATE	TIME SCHEDULE	TOTAL WATER ESTIMATE
SPRING & FALL (March, April, May, October)	7,000 gallons/acre per working day	Vegetative watering for seed shall begin on the day after rainfall described below and continue for 60 consecutive working days; vegetative watering for sod shall begin on the day the sod is placed and continue for a minimum of 15 consecutive working days.	420,000 gallons/acre (60 working days)
SUMMER (June, July, August, September)	12,000 gallons/acre per working day		720,000 gallons/acre (60 working days)
WINTER (November through February)	1,000 gallons/acre per working day	Vegetative watering for seed and/or sod shall begin on the day after placement for 15 consecutive working days	15,000 gallons/acre (15 working days)

Notes: Rate and frequency may be adjusted, with the approval of the Engineer, to meet site conditions (especially with sod).
For informational purposes only: 1,000 gallons equals 1 MG

VEGETATIVE WATERING NOTES:
1. Refer to Item 168 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Use clean water free of industrial waste and other substances harmful to vegetation growth, per Item 168.2.
3. Use Vegetative Watering to keep the seed bed moist during germination; not to provide initial watering. After drill seeding, postpone watering operations until site receives at least 1/2-inch of natural rainfall in a single day. Delay watering operations for warm season grasses until soil temperature exceeds 70 degrees F.
4. For sod, water immediately.
5. All water distribution equipment shall be furnished and operated to provide water at a uniform and controllable rate. Use a metering device on all watering equipment.
6. Evenly distribute water over entire area designated for seeding and/or sodding, using even spray patterns that do not disturb seed bed and/or dislodge seed from seed bed.
7. Do not water between the hours of 12:00 p.m. and 6:00 p.m. when daytime temperatures exceed 95 degrees F.
8. After initial establishment period, continue intermittent watering of newly established seed or sod at a rate of approximately 1-inch water/week, during summer months until end of contract.
9. If 1/4-inch or more of rainfall occurs on site on any given working day, no vegetative watering will be needed on that working day. (Note: 1/4-inch rain equals 7,000 gallons of water per acre.)
10. Should the Contractor fail to apply the specified amount of water within the time allowed, any seed or sod in poor condition shall be replaced, fertilized, and watered at Contractor's expense.

ROADSIDE MOWING ITEM 730* PROJECT MAINTENANCE AC

MOWING NOTES:
1. During project construction, once seed is established, use mowing to promote permanent grasses by mowing any remaining temporary grasses.
2. Also mow established turf and ROW grasses in designated areas of project limits as specified or directed by Engineer.
3. Remove litter and debris prior to mowing.
4. Do not mow on wet ground when soil rutting can occur.
5. Hand-trim around obstructions and stormwater control devices as needed.
6. Maintain paved surfaces free of tracked soils and clipped vegetation.

SEQUENCE OF WORK:

- CULTIVATE SURFACE SOIL.
- PREPARE / PLACE TOPSOIL, OR
- PREPARE / PLACE COMPOST MANUFACTURED TOPSOIL.
- APPLY FERTILIZER AND THEN PLACE SEEDING, OR
- PLACE SOD AND THEN APPLY FERTILIZER.
- CONDUCT VEGETATIVE WATERING.
- CONDUCT ROADSIDE MOWING, AS DIRECTED.

Texas Department of Transportation

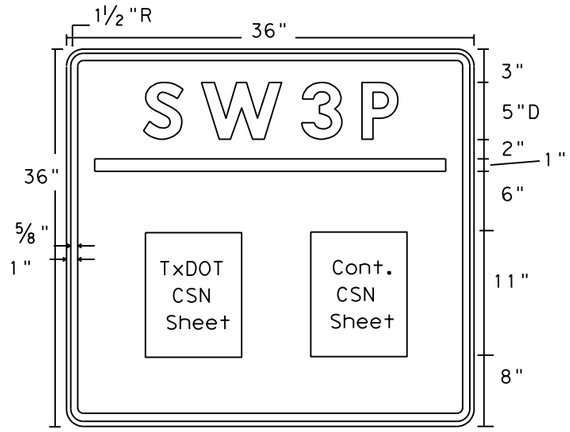
VEGETATION ESTABLISHMENT SHEET

(DALLAS DISTRICT)

TEMPLATE REVISION DATE: 02/21/19

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CPB	6	(See Title Sheet)		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
XXX	TEXAS	DALLAS	COLLIN	182
CHECK	CONTROL	SECTION	JOB	
XXX	0816	05	025	
CHECK				
XXX				

DATE



SW3P SIGN

TxDOT & Contractor Construction Site Note (CSN)

Sign Dimensions

36" X 36"

Letters - White
Numbers - White
Border - White
Background - Blue

GENERAL NOTES:

1. The alphabets and lateral spacing between letters and numerals shall conform with the "Texas Manual on Uniform Traffic Control Devices for Streets and Highways", (TMUTCD) latest edition, and the "Compliant Work Zone Traffic Control Devices List". Lateral spacing of text shall provide a balanced appearance. All materials shall conform to Department Specifications.
2. Legend and border may be applied by reverse screening process with transparent colored ink, cut-out white reflective sheeting applied to colored background or combination thereof. Background shall be reflective sheeting Type C.
3. CSN Sheets will be laminated and attached to the sign with an adhesive. Ensure sheets remain dry. (See Figure 1).
4. SW3P Signs should be placed just inside the ROW line at the project limits at a readable height. It may be placed perpendicular or parallel to ROW line. If the sign cannot be placed outside the clear zone, it will be mounted per TMUTCD requirements.
5. Final location of the signs will be as approved by the Engineer.

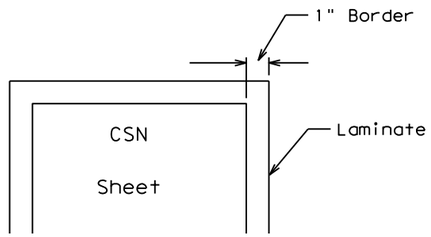
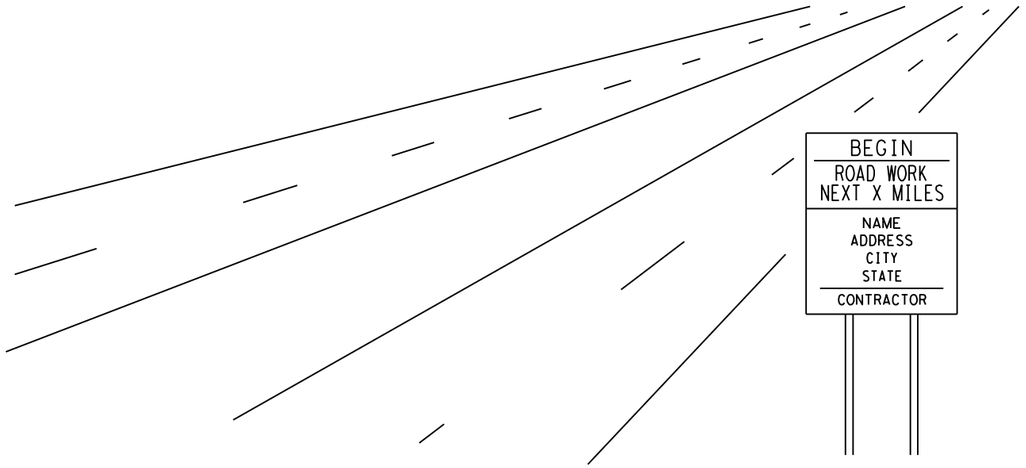
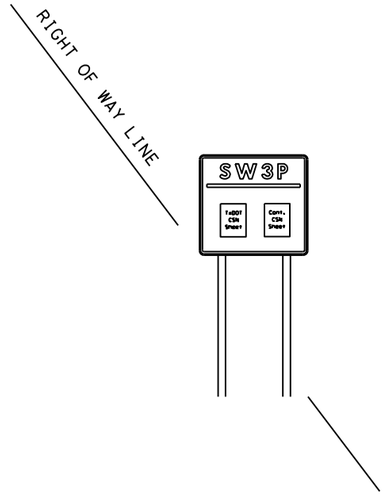


Figure 1





DEPARTMENT MATERIAL SPECIFICATIONS	
PLYWOOD SIGN BLANKS	DMS-7100
FLAT SURFACE REFLECTIVE SHEETING	DMS-8300
VINYL NON-REFLECTIVE DECAL SHEETING	DMS-8320

COLOR	USAGE	REFLECTIVE SHEETING OR OTHER MATERIAL
BLUE	BACKGROUND	TYPE C (FLUORESCENT PRISMATIC)
WHITE	LEGEND & BORDERS	VINYL NON-REFLECTIVE DECAL SHEETING

Texas Department of Transportation
DALLAS DISTRICT STANDARD

SW3P SIGN SHEET

FILE:	DN: TxDOT	CK:	DW:	CK:
© TxDOT 2016	DISTRICT	PROJECT NO.		SHEET
REVISION DATE: 10-16-15	18	SEE TITLE SHEET		183
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	COLLIN	0816	05	025	FM 2862

LEVELS DISPLAYED
PATH:
1

DATE:
FILE:

I. WORK AT CROSSING LOCATIONS (AT GRADE, HIGHWAY OVERPASS, HIGHWAY UNDERPASS, PEDESTRIAN, OR CLOSED/ABANDONED)

DOT #: 765315S
Crossing Type: At-grade
RR Company Owning Track at Crossing: DGNO
Operating RR Company at Track: DGNO
RR MP: 307.500
RR Subdivision: Plano
City: Anna
County: Collin
CSJ at this Crossing: 0816-05-025
Highway/Roadway name crossing the railroad: FM 2862
# of regularly scheduled trains per day at this crossing: 4
# of switching movements per day at this crossing: 0
% of estimated contract cost of work within railroad ROW: <1%

Scope of Work at this Crossing to Be Performed by State Contractor:

State contractor will be performing mill and overlay work and pavement marking installation within the RR ROW.There will not be any widening in the RR ROW.

Scope of Work at this Crossing to Be Performed by Railroad Company:

None.

** Choose: Highway Overpass, Highway Underpass, At Grade, Pedestrian, or Closed/Abandoned

II. OTHER PROJECT WORK WITHIN RAILROAD RIGHTS-OF-WAY (ROW)

Trafic control.

III. FLAGGING & INSPECTION

of Days of Railroad Flagging Expected: 3

On this project, night or weekend flagging is:

☐ Expected
☒ Not Expected

Flagging services will be provided by:

☐ Railroad Company: TxDOT will pay flagging invoices
☒ Outside Party: Contractor will pay flagging invoices, to be reimbursed by TxDOT

Contractor must incorporate flaggers into anticipated construction schedule. The Railroad requires a 30 day notice if their flaggers are to be utilized. If Contractor falls behind schedule due to their own negligence and is not ready for scheduled flaggers, any flagging charges will be paid by Contractor.

Contact Information for Flagging:

☐ UPRR - UP.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ BNSF - BNSF.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging

☐ KCS - KCS.info@railpros.com
Call Center 877-315-0513, Select #1 for flagging
- Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

☒ OTHERS DGNO
Bottom Line On-Track Safety Services
bottomline076@aol.com, 903-767-7630

IV. CONSTRUCTION WORK TO BE PERFORMED BY THE RAILROAD

On this project, construction work to be performed by a railroad company is:

☐ Required
☒ Not Required

Coordinate with TxDOT for any work to be performed by the Railroad Company. TxDOT must issue a work order for any work done by the Railroad Company prior to the work being performed.

V. RAILROAD INSURANCE REQUIREMENTS

Railroad reference number shall be provided by TxDOT CST or DO.

The Contractor shall confirm the insurance requirements with the Railroad as the insurance limits are subject to change without notice.

Insurance policies must be issued for and on behalf of the Railroad. Where more than one Railroad Company is operating on the same right of way or where several Railroad Companies are involved and operate on their own separate rights of way, provide separate insurance policies in the name of each Railroad Company.

No direct compensation will be made to the Contractor for providing the insurance coverages shown below or any deductibles. These costs are incidental to the various bid items.

Type of Insurance	Amount of Coverage (Minimum)
Workers Compensation	$500,000 / $500,000 / $500,000
Commercial General Liability	$2,000,000 / $4,000,000
Business Automobile	$2,000,000 combined single limit

Railroad Protective Liability		
☐	Not Required	
☒	Non - Bridge Projects	$2,000,000 / $6,000,000
☐	Bridge Projects	$5,000,000 / $10,000,000
☐	Other	

VI. CONTRACTOR'S RIGHT OF ENTRY (ROE) AGREEMENT

On this project, an ROE agreement is:

☐ Not Required
☐ Required: TxDOT CST to assist in obtaining with the UPRR (see Item 5, Article 8.3)
☐ Required: UPRR Maintenance Consent Letter. TxDOT CST to assist.
☒ Required: Contractor to obtain (see Item 5, Article 8.4)
With the following railroad companies: DGNO

https://www.gwrr.com/real-estate/accessing-property/

To view previously approved ROE Agreement templates agreed upon between the State and Railroad, see:

http://www.txdot.gov/inside-txdot/division/rail/samples.html

Approved ROE Agreement templates are not to be modified by the Contractor.

Contractor shall not operate within Railroad Right of Way without an executed Construction & Maintenance Agreement between the State and the Railroad and an executed ROE agreement between the Contractor and the Railroad if required on project.

Contractor must incorporate Construction Inspection into anticipated construction schedule.

☒ Not Required
☐ Required: Contact Information for Construction Inspection:

VII. RAILROAD COORDINATION MEETING

On this project, a Railroad Coordination Meeting is:

☒ Not Required
☐ Required

See Item 5, Article 8.1 for more details.

VIII. SUBCONTRACTORS

Contractor shall not subcontract work without written consent of TxDOT. Subcontractors are required to maintain the same insurance coverage as required of the Contractor.

IX. EMERGENCY NOTIFICATION

In Case of Railroad Emergency
Callthe DGNO Railroad Emergency Line
at 800-979-4958
Location: DOT# 765315S
RR Milepost 307.500
Subdivision Plano

Texas Department of Transportation — Rail Division

RAILROAD SCOPE OF WORK

PROJECT SPECIFIC DETAILS

FILE: RR Scope of Work.dgn	DN: TxDOT	CK:	DW:	CK:	
© TxDOT June 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0816	05	025	FM 2862	
9/2021	DIST	COUNTY		SHEET NO.	
	DAL	COLLIN		184	

PART 1 - GENERAL

1.01 DESCRIPTION

This project includes construction work within the right of way and/or properties of the Railroad and adjacent to its tracks, wire lines and other facilities. These sheets describe the minimum special requirements for coordination with the Railroad when working upon, over or under Railroad Right of Way or when impacting current or future Railroad operations. Coordinate with the Railroad while performing the work outlined herein, and afford the same cooperation with the Railroad as with TxDOT. Complete all submittals and work in accordance with TxDOT Standard Specifications, Railroad Guidelines and AREMA recommendations as modified by these minimum special requirements or as directed in writing by the Railroad Designated Representative.

For purposes of this project, the Railroad Designated Representative is the person or persons designated by the Railroad Manager of Industry and Public Projects to handle specific tasks related to the project.

1.02 REQUEST FOR INFORMATION / CLARIFICATION

Submit Requests for Information ("RFI") involving work within any Railroad Right of Way to the TxDOT Engineer. The TxDOT Engineer will submit the RFI to the Railroad Designated Representative for review and approval for RFI's corresponding to work within Railroad Right of Way. Allow six (6) weeks total time for review and approval, which includes four (4) weeks for review and approval by the Railroad.

1.03 PLANS / SPECIFICATIONS

TxDOT has received written Railroad approval of the plans and specifications for this project. Any revisions or changes in the plans after award of the Contract must have the approval of TxDOT and the Railroad.

PART 2 - UTILITIES AND FIBER OPTIC

Construct all utility installations in accordance with current AREMA recommendations, Railroad, TxDOT and owning utility specifications and requirements. Railroad general guidelines can be found on the Railroad website or by contacting the Railroad Designated Representative.

PART 3 - CONSTRUCTION

3.01 GENERAL

A. Perform all work in compliance with all applicable Railroad, Federal Railroad Administration (FRA), and TxDOT rules and regulations. Arrange and conduct work in a manner that does not endanger or interfere with the safe operation of the tracks and property of the Railroad and the traffic moving on such tracks, or the wires, signals and other property of the Railroad, its tenants or licensees, at or in the vicinity of the Work. The safe operation of railroad train movements takes precedence over any work to be performed by the Contractor. The Contractor is responsible for train delay cost and lost revenue claims due to any delays or interruption of train operations resulting from Contractor's construction or other activities.

B. Construction activities within 15 feet of the operational tracks will only be allowed if absolutely necessary and the Railroad's Designated Representative grants approval. Construction activities within 15 feet of the operational track(s) preferably allow the tracks to stay operational. In such cases, coordination and approval by the Railroad Track Manager is required with regard to schedule, flagging, and slow orders. See Sections 3.07 and 3.08 for additional information.

C. Provide track protection for all work equipment (including rubber tired equipment) operating within 25 feet from nearest rail. When not in use, keep Contractor machinery and materials at least 50 feet from the Railroad's nearest track.

D. Vehicular crossings of railroad track are allowed only at existing crossings, or haul road crossings developed with Railroad approval.

E. The Contractor is also advised that new railroad facilities within the project may be built by the Railroad. If applicable, these facilities are delineated in the plans. Be aware of the limits of responsibilities and coordinate efforts with the Railroad and TxDOT.

F. Railroad requirements do not allow work within 50 feet of track centers when a train passes the work site and all personnel must clear the area within 50 feet of the track centerline and secure all equipment. Additional allowances may be pursued as outlined in 3.02 and 3.03.

G. All permanent clearances shall be verified before project closing.

3.02 RAILROAD OPERATIONS

A. Trains and/or equipment are expected on any track, at any time, in either direction. Become familiar with the train schedules in this location and structure bid assuming intermittent track windows in this period, as defined in Paragraph B that follows.

B. All railroad tracks within and adjacent to the contract site are active, and rail traffic over these facilities shall be maintained throughout the Project. Activities may include both through moves and switching moves to local customers. railroad traffic and operations will occur continuously throughout the day and night on these tracks and shall be maintained at all times as defined herein. Coordinate and schedule the work so that construction activities do not interfere with railroad operations.

C. Coordinate work windows with TxDOT and the Railroad's Designated Representative. Types of work windows include Conditional Work Windows and Absolute Work Windows, as defined below:

1. Conditional Work Window: A Conditional Work Window is a period of time that railroad operations have priority over construction activities. When construction activities may occur on and/or adjacent to the railroad tracks within 25 feet of the nearest track, a railroad flag person will be required. At the direction of the railroad flag person, upon approach of a train, and when trains are present on the tracks, the tracks must be cleared (i.e., no construction equipment, materials or personnel within 25 feet, or as directed by the Railroad Designated Representative, from the tracks). Conditional Work Windows are available for the Project.

2. Absolute Work Window: An Absolute Work Window is a period of time that construction activities are given priority over railroad operations. During this time frame, the designated railroad track(s) will be inactive for train movements and may be fouled by the Contractor. At the end of an Absolute Work Window, the railroad tracks and/or signals must be completely operational for train operations and all Railroad, Public Utilities Commission (PUC) and FRA requirements, codes and regulations for operational tracks must be satisfied. In the situation where the operating tracks and/or signals have been affected, the Railroad will perform inspections of the work prior to placing that track back into service. Railroad flag persons will be required for construction activities requiring an Absolute Work Window. Absolute Work Windows will not generally be granted. Any request will require a detailed explanation for Railroad review.

3.03 RIGHT OF ENTRY, ADVANCE NOTICE AND WORK STOPPAGES

A. Do not perform any work within Railroad Right of Way without a valid executed Right of Entry Agreement if required on this project.

B. Give advance notice to the Railroad as required in the "Contractor's Right of Entry Agreement" before commencing work in connection with construction upon or over Railroad Right of Way and observe the Railroad's rules and regulations with respect thereto.

C. Perform all work upon Railroad Right of Way in a manner to avoid interference with or endanger the operations of the Railroad. Whenever work may affect the operations or safety of trains, submit the work method to the Railroad Designated Representative for approval. Approval does not relieve the Contractor from liability. Do not commence any work which requires flagging service or inspection service until the flagging protection required by the Railroad is available at the job site. See Section 3.15 for railroad flagging requirements.

D. Make requests in writing for both Absolute and Conditional Work Windows, at least 30 days in advance of any work. Include in the written request:
1. Exactly what the work entails.
2. The days and hours that work will be performed.
3. The exact location of work, and proximity to the tracks.
4. The type of window requested and the amount of time requested.
5. The designated contact person.

Provide a written confirmation notice to the Railroad at least 48 hours before commencing work in connection with approved work windows when work is within 25 feet of nearest rail. Perform all work in accordance with previously approved work plans.

E. Make provisions to protect operations and property of the Railroad should a condition arising from, or in connection with the work, require immediate and unusual action. If in the judgment of the Railroad Designated Representative such provisions are insufficient, the Railroad Designated Representative may require or provide such provisions as deemed necessary. In any event, such provisions shall be at the Contractor's expense and without cost to the Railroad or TxDOT. The Railroad or TxDOT shall have the right to order the Contractor to temporarily cease operations in the event of an emergency or, if in the opinion of the Railroad Designated Representative, the Contractor's operations could endanger railroad operations. In the event of such an order, immediately notify TxDOT of the order.

3.04 INSURANCE

Do not begin work upon or over Railroad Right of Way until furnishing the Railroad with the insurance policies, binders, certificates and endorsements required by the "Contractor's Right of Entry Agreement", and until the Railroad Designated Representative has advised TxDOT that such insurance is in accordance with the Agreement.

3.05 RAILROAD SAFETY ORIENTATION

A. Complete the railroad course "Orientation for Contractor's Safety", and maintain current registration prior to working on railroad property. This course is required to be completed annually by Contractor and Subcontractor personnel working on site.

"UPRR, BNSF, KCS/TEXMEX will not accept on-track safety training certificates from other railroads. Refer to Railroad specific contractor right of entry for training information."

B. Know and follow the "Contractor's Right of Entry Agreement" EXHIBIT D, MINIMUM SAFETY REQUIREMENTS regarding clothing, personal protective equipment, and general safety requirements.

3.06 COOPERATION

The Railroad will cooperate with Contractor so that work may be conducted in an efficient manner, and will cooperate with Contractor in enabling use of Railroad Right of Way in performing the work.

3.07 MINIMUM CONSTRUCTION CLEARANCES FOR FALSEWORK AND OTHER TEMPORARY STRUCTURES

Abide by the following minimum temporary clearances during the course of construction:
A. 15' - 0" (BNSF)(UPRR)and 14'-0" (KCS) horizontal from centerline of track
B. 22' (KCS) and 21' - 6" (UPRR & BNSF) vertically above top of rail.

For construction clearance less than listed above, obtain local Railroad Operating Unit review and approval.

3.08 APPROVAL OF REDUCED CLEARANCES

A. Maintain minimum track clearances during construction as specified in Section 3.07.

B. Submit any proposed infringement on the specified minimum clearances to the Railroad Designated Representative through TxDOT at least 30 days in advance of the work. Do not proceed with such infringement without written approval by the Railroad Designated Representative.

C. Do not commence work involving an approved infringement without receiving written assurance from the Railroad Designated Representative that arrangements have been made for any necessary flagging service.

DATE:
FILE:

SHEET 1 OF 2

Texas Department of Transportation | Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	18	COLLIN		185

3.09 MAINTENANCE OF RAILROAD FACILITIES

A. Maintain all ditches and drainage structures free of silt or other obstructions resulting from Contractor's operations. Repair eroded areas and any other damage within Railroad Right of Way and repair any other damage to the property of the Railroad, or its tenants.

B. Perform all such maintenance and repair of damages due to the Contractors's operations at Contractor's expense.

C. Submit a proposed method of erosion control for review by the Railroad prior to beginning any grading on the project site. Comply with all applicable local, state and federal regulations when developing and implementing such erosion control.

3.10 SITE INSPECTIONS BY RAILROAD's DESIGNATED REPRESENTATIVE

A. In addition to the office reviews of construction submittals, site inspections may be performed by the Railroad Designated Representative at significant points during construction, including the following if applicable:
   1. Pre-construction meetings.
   2. Pile driving/drilling of caissons or drilled shafts.
   3. Reinforcement and concrete placement for railroad bridge substructure and/or superstructure.
   4. Erection of precast concrete or steel bridge superstructure.
   5. Placement of waterproofing (prior to placing ballast on bridge deck).
   6. Completion of the bridge structure.

B. Site inspection is not limited to the milestone events listed above. Site visits to check progress of the work may be performed at any time throughout the construction as deemed necessary by the Railroad.

C. Provide a detailed construction schedule, including the proposed temporary horizontal and vertical clearances and construction sequence for all work to TxDOT for submittal to the Railroad Designated Representative for review prior to commencement of work. Include the anticipated dates when the above listed events will occur. Update this schedule for the above listed events as necessary and each month at a minimum to allow the Railroad to schedule site inspections.

3.11 RAILROAD REPRESENTATIVES

Railroad representatives, conductors, flag person or watch person will be provided by the Railroad at expense of TxDOT to protect Railroad facilities, property and movements of its trains or engines. In general, the Railroad will furnish such personnel or other protective services as follows:

A. When any part of any equipment is standing or being operated within 25 feet, measured horizontally, from nearest rail of any track on which trains may operate, or when any object is off the ground and any dimension thereof could extend inside the 25 foot limit, or when any erection or construction activities are in progress within such limits, regardless of elevation above or below track.

B. For any excavation below elevation of track subgrade if, in the opinion of the Railroad Designated Representative, track or other railroad facilities may be subject to settlement or movement.

C. During any clearing, grubbing, excavation or grading in proximity to railroad facilities, which, in the opinion of the Railroad Designated Representative, may endanger railroad facilities or operations.

D. During any Contractor's operations when, in the opinion of the Railroad Designated Representative, railroad facilities, including, but not limited to, tracks, buildings, signals, wire lines, or pipe lines, may be endangered.

E. Arrange with the Railroad Designated Representative to provide the adequate number of flag persons to accomplish the work.

3.12 COMMUNICATIONS AND SIGNAL LINES

If required, the Railroad will rearrange its communications and signal lines, its grade crossing warning devices, train signals and tracks, and facilities that are in use and maintained by the Railroad's forces in connection with its operation at expense of TxDOT. This work by the Railroad will be done by its own forces and it is not a part of the Work under this Contract.

3.13 TRAFFIC CONTROL

Coordinate any operations that control traffic across or around railroad facilities with the Railroad Designated Representative.

3.14 CONSTRUCTION EXCAVATIONS AND BORING ACTIVITIES UNDER TRACK

A. Take special precaution and care in connection with excavating and shoring. Excavations for construction of footings, piers, columns, walls or other facilities that require shoring shall comply with requirements of TxDOT, OSHA, AREMA and Railroad "Guidelines for Temporary Shoring".

B. The project plans indicate whether there are fiber optic lines or other such telecommunications systems that require consideration. Regardless, contact the necessary call center to determine if such cable systems are present:

   UPRR 1-800-336-9193
   7:00 AM to 9:00 PM CST Monday-Friday except holidays,
   staffed 24 hrs/day for emergencies
   48 hrs notice required

   BNSF 1-800-533-2891
   24 hour number
   5 working days notice required

   KCS 1-800-344-8377
   Texas One Call, a 24 hour number
   48 hrs notice required, excluding weekends and holidays

   If a telecommunications system is buried anywhere on or near railroad property, coordinate with TxDOT, the Railroad and the Telecommunication Company(ies) to arrange for relocation or protective measures prior to beginning work on or near railroad property. Refer to the project General Notes for additional information.

C. Projects involving a boring or jack and bore operation under track such as drainage pipes or culverts and utilities require an installation plan reviewed and approved by the Railroad and TxDOT prior to proceeding with such construction. A railroad inspector and contractor assisted monitoring of ground and track movement is required to maintain safe passage of rail traffic. Stop installation and do not allow passage of trains if movements in excess of ¼ inch vertical or horizontal is detected in the tracks. Immediately repair the damage to the satisfaction of TxDOT and the Railroad before proceeding.

3.15 RAILROAD FLAGGING

Per the Right of Entry Agreement for flagging, notify the Railroad Representative at least 10 working days in advance of Contractor's work and at least 30 working days in advance of any Contractor's work in which any person or equipment will be within 25 feet of nearest rail or as specified in the Contractor Right of Entry (CROE).

3.16 CLEANING OF RIGHT-OF-WAY

When work is complete, remove all tools, implements, and other materials brought into Railroad Right of Way and leave the right of Way in a clean and presentable condition to the satisfaction of TxDOT and the Railroad.

Texas Department of Transportation — Rail Division

RAILROAD REQUIREMENTS FOR NON-BRIDGE CONSTRUCTION PROJECTS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
October 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS March 2020	0816	05	025	FM 2862
	DIST	COUNTY		SHEET NO.
	18	COLLIN		186

DATE:
FILE: