DESIGN	FED.RD. DIV.NO.	FEDERAL AID PROJECT			
TE	6	STP 2B23(110)HES			
GRAPHICS	STATE	CONT	SECT	JOB	HIGHWAY NO.
TE	TEXAS	2351	02	017	FM 2478
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
STP 2B23(110)HES
CSJ: 2351-02-017

FM 2478

COLLIN COUNTY

DESIGN SPEED = 40 MPH
FUNCTIONAL CLASSIFICATION = RURAL MINOR COLLECTOR

ADT 5,300 (2022)
8,300 (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 NORTH OF FM 1461
TO FM 455

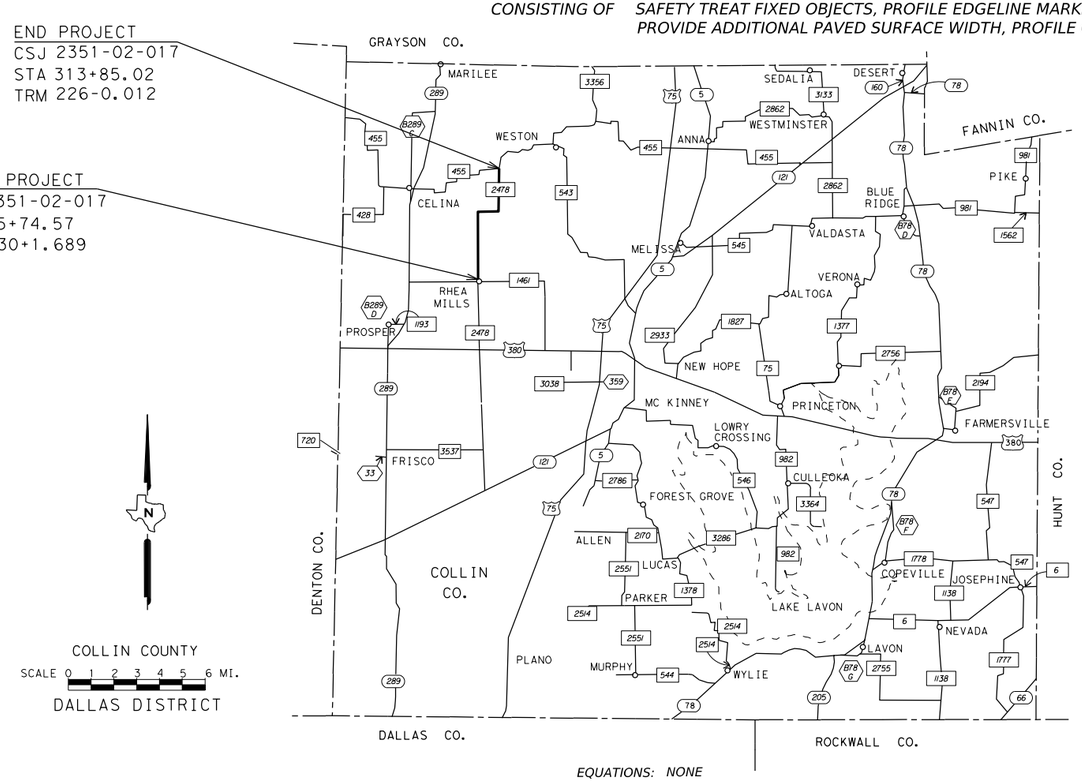
TOTAL LENGTH OF PROJECT =

ROADWAY =	29,810.45	FT. =	5.646 MI.
BRIDGE =	0.00	FT. =	0.000 MI.
TOTAL =	29,810.45	FT. =	5.646 MI.

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

END PROJECT
CSJ 2351-02-017
STA 313+85.02
TRM 226-0.012

BEGIN PROJECT
CSJ 2351-02-017
STA 15+74.57
TRM 230+1.689



EQUATIONS: NONE
EXCEPTIONS: NONE
RAILROAD CROSSINGS: NA

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED FOR LETTING 5/25/2023
Thaden Eggs , P.E.
DESIGN ENGINEER

RECOMMENDED FOR LETTING: 5/26/2023
DocuSigned by: James V. Campbell , P.E.
98674C1655BA4C5...
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

RECOMMENDED FOR LETTING: 5/26/2023
DocuSigned by: Jennifer Vorster , P.E.
4DB68ED93[illegible]
DISTRICT ENGINEER

APPROVED FOR LETTING: 5/26/2023
DocuSigned by: Cesson Clemens , P.E.
A879E0D16CD6464...
DISTRICT ENGINEER

WORK WAS COMPLETED ACCORDING TO THE PLANS AND CONTRACT.

_____ , P.E.
Signature of Registrant & Date

DATE: _____

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DATE: 5/17/2023 9:34:10 AM
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I. GENERAL

1	TITLE SHEET
2	INDEX OF SHEETS
3	PROJECT LAYOUT
4-7	TYPICAL SECTIONS
8, 8A-8D	GENERAL NOTES
9, 9A-8B	ESTIMATE & QUANTITY SHEET
10-16	SUMMARY SHEETS
17-20	SURVEY CONTROL

II. TRAFFIC CONTROL PLAN

21	TCP SEQUENCE OF WORK & GENERAL NOTES
22	TCP TYPICAL SECTIONS
23	TCP CULVERT REPLACEMENT TYPICAL SECTIONS
24	TCP CULVERT EXTENSION TYPICAL SECTIONS
25	CRASH CUSHION SUMMARY

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38	* TCP (2-1)-18
39	* TCP (2-2)-18
40	* TCP (3-1)-13
41	* TCP (3-3)-14
42	* TCP (7-1)-13
43	* WZ (STPM)-23
44	* WZ (TD)-17
45	* WZ (UL)-13
46	* WZ (RS)-22
47	* TREATMENT FOR VARIOUS EDGE CONDITIONS
48-49	* CSB(1)-10
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53	SUPERELEVATION TABLE
54	VERTICAL ALIGNMENT DATA
55-67	ROADWAY PLANS
68-69	MISCELLANEOUS ROADWAY DETAILS
70	CORE DATA

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72	* RS(4)-23
73	* LJD(1-1)-07 (DAL)
74	* TE(HMAC)-11
75-78	* MB(1)-21 THRU MB(4)-21
79	* GF(31)-19
80	* GF(31)MS-19
81	* SGT(10S)31-16
82	* SGT(11S)31-18
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IV. RETAINING WALL DETAILS

NONE

V. DRAINAGE DETAIL

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88-89	HYDROLOGIC AND HYDRAULIC CALCULATIONS
90-113	CULVERT LAYOUTS

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122-123	* SCC-3 & 4
124-125	* SCC-8
126-128	* SCC-10
129	* MC-MD
130	* ECD
131	* FW-S
132	* PW
133	* CH-PW-0
134	* CH-PW-S
135-136	* SETP-CD
137	* SETP-PD
138	* PSET-SC
139	* PSET-SP
140	* PSET-RC
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142-143	* SRR
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VI. UTILITIES

NONE

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NONE

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147-151	SUMMARY OF SMALL SIGNS
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181	* D & OM (VIA) - 20
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IX. ENVIRONMENTAL ISSUES

183-184	STORMWATER POLLUTION PREVENTION PLAN (SW3P)
185, 185A	ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC) (DAL)
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205	* VEGETATION ESTABLISHMENT SHEET (DAL)
206	* SW3P SIGN SHEET (DAL)

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

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

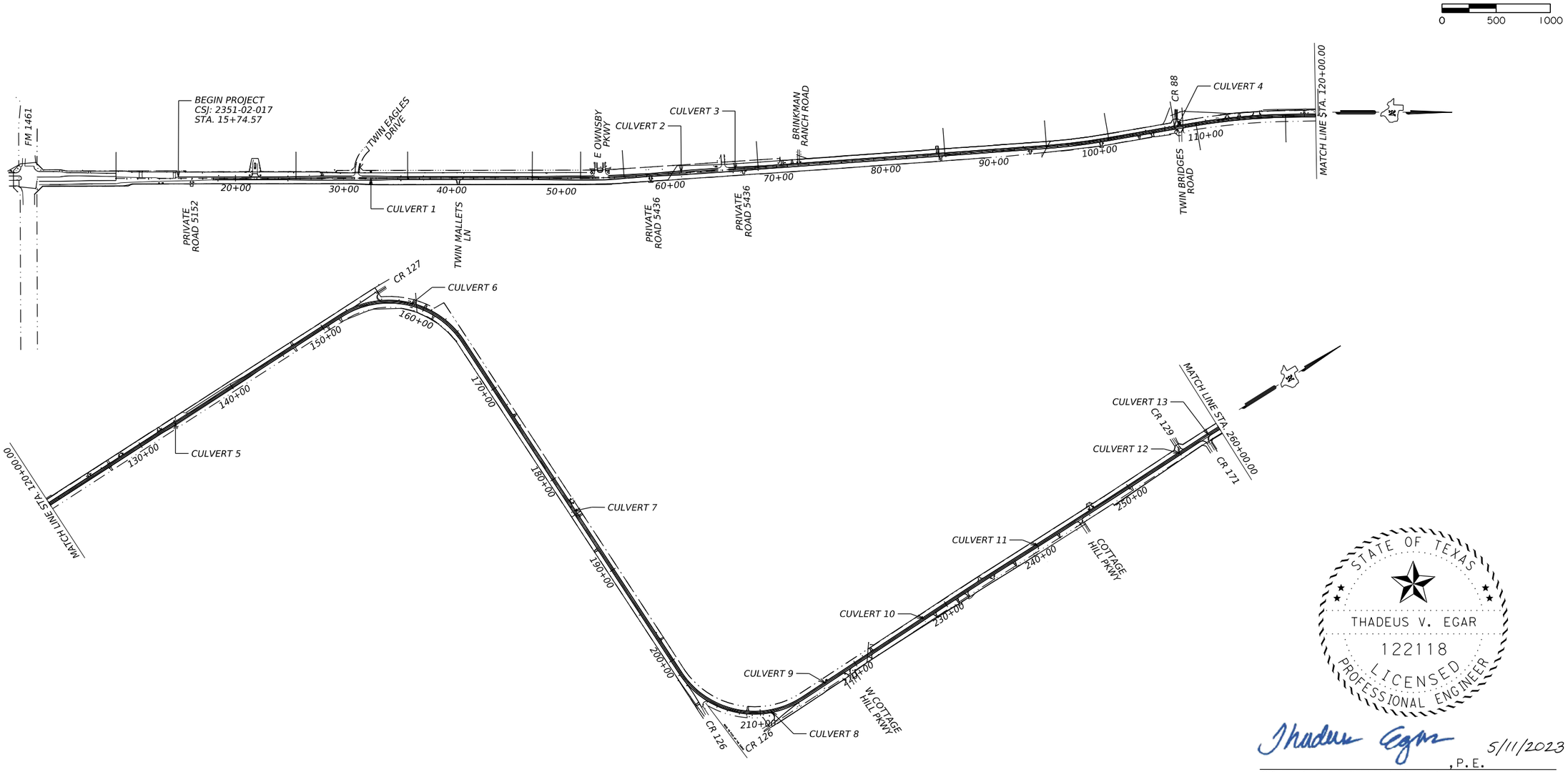
Texas Department of Transportation

FM 2478

INDEX OF SHEETS

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		2



STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
, P.E.
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

PROJECT LAYOUT

SCALE: 1"=1000' SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		3

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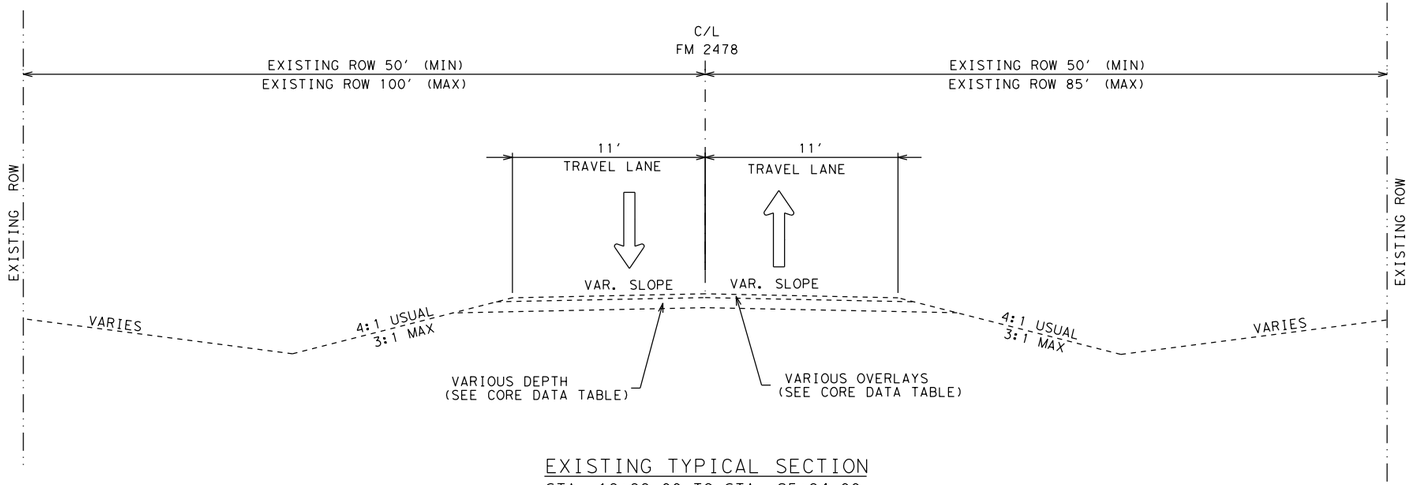
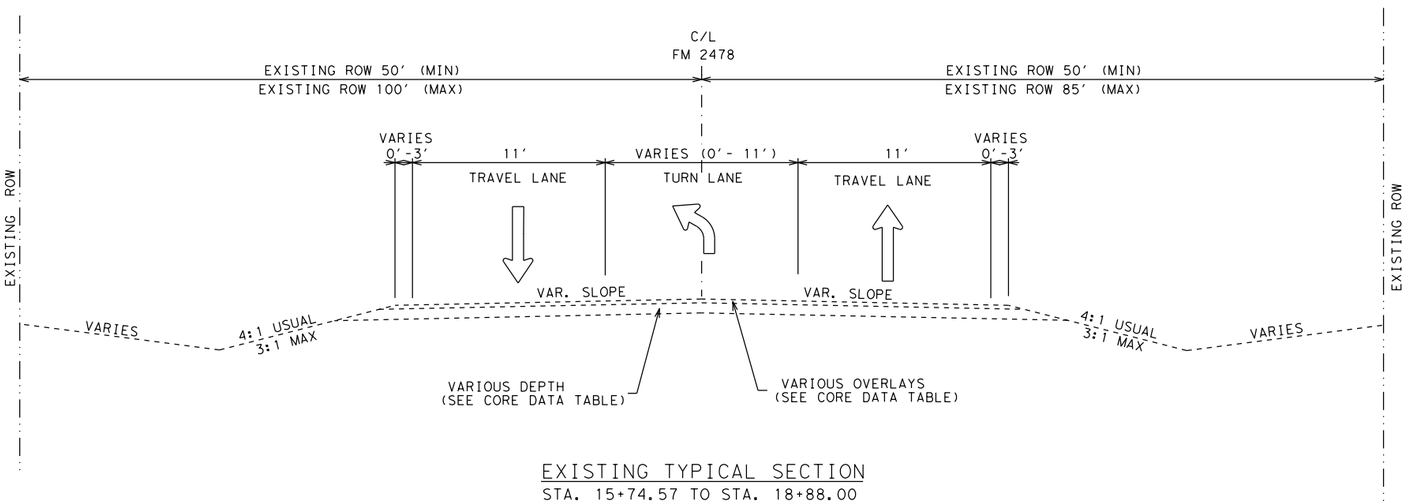


EXISTING TYPICAL SECTION

STA. 18+88.00 TO STA. 25+84.00
STA. 36+25.00 TO STA. 48+60.00
STA. 59+04.00 TO STA. 59+33.00
STA. 69+86.00 TO STA. 136+91.21
STA. 142+41.21 TO STA. 313+85.02



EXISTING TYPICAL SECTION

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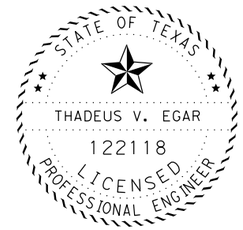
STA. 48+60.00 TO STA. 59+04.00
STA. 59+33.00 TO STA. 69+86.00



Thadeus Egar 5/11/2023
,P.E.
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

TYPICAL SECTIONS (EXISTING)

SHEET 1 OF 4

CONT.	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		4

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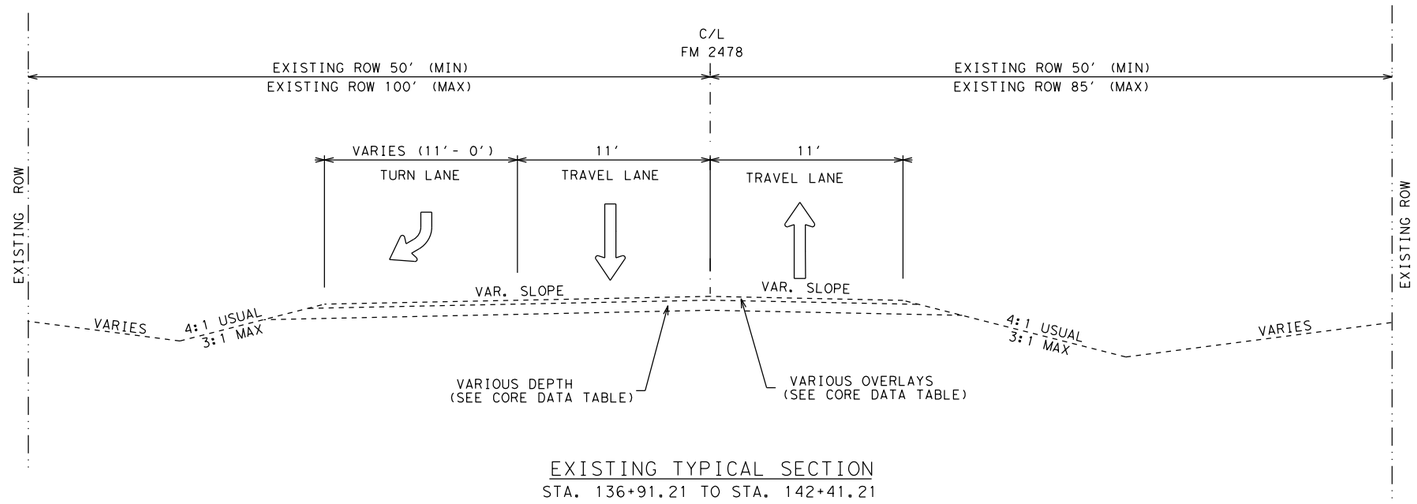

EXISTING TYPICAL SECTION

STA. 136+91.21 TO STA. 142+41.21

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023

Signature of Registrant & Date

Texas Department of Transportation

FM 2478

TYPICAL SECTIONS
(EXISTING)

SHEET 2 OF 4

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		5

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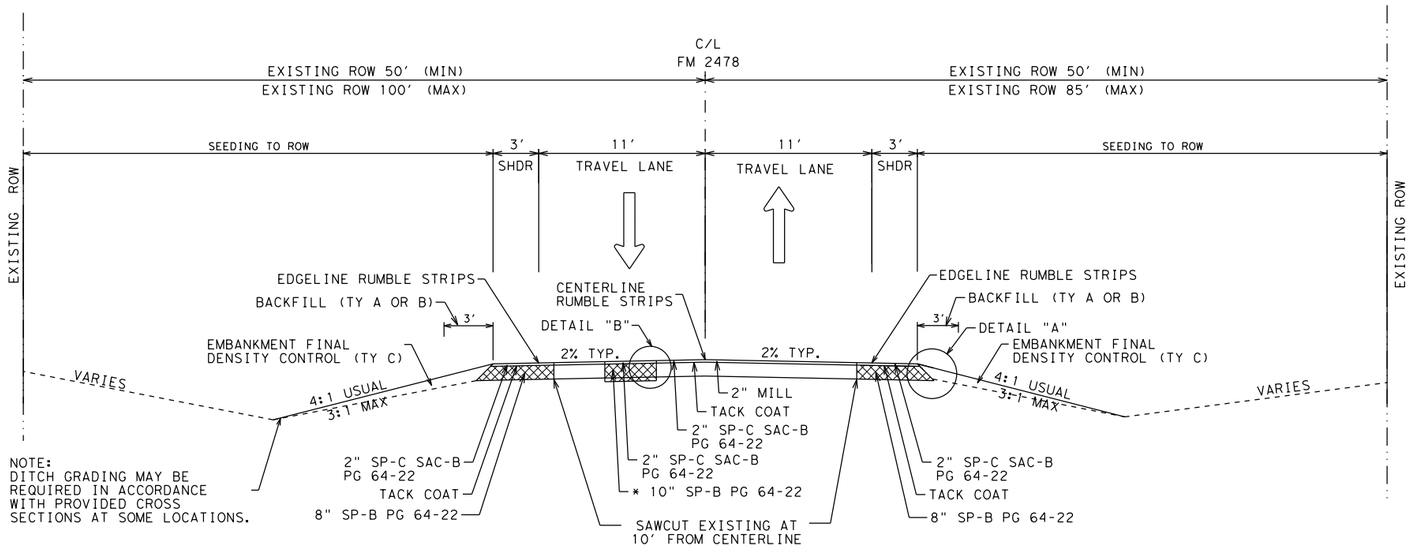

PROPOSED TYPICAL SECTION

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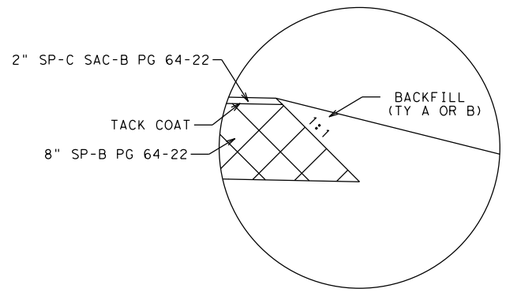
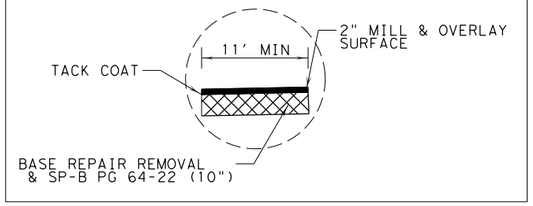
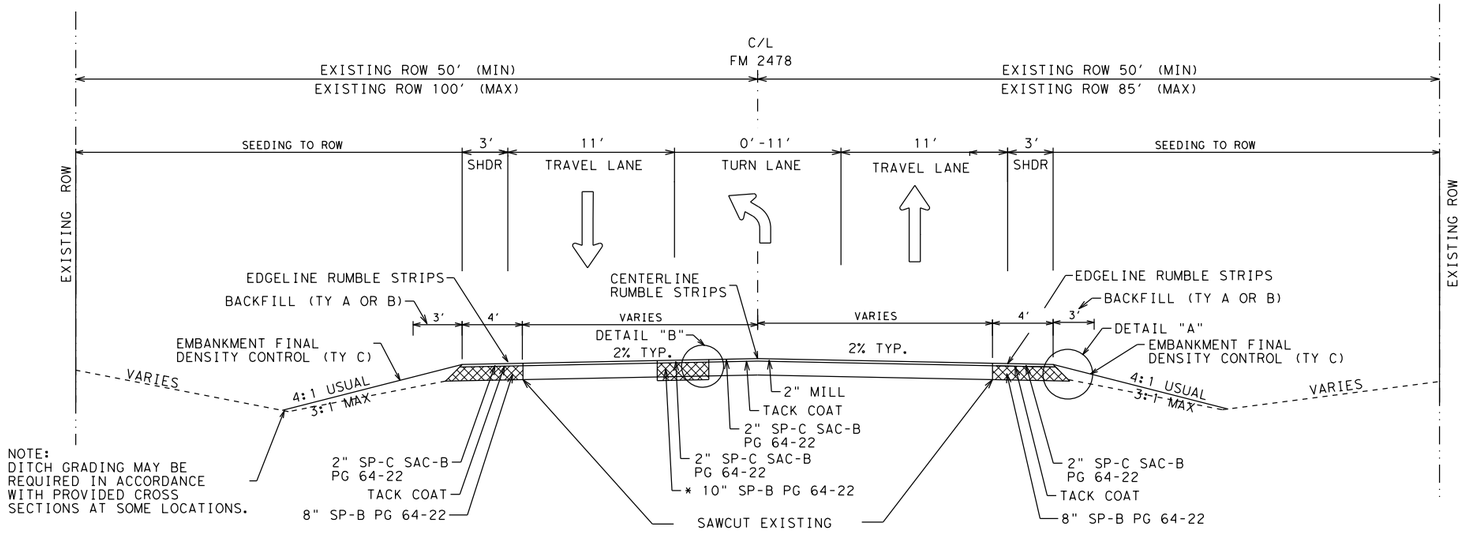
STA. 36+25.00 TO STA. 48+60.00
STA. 59+04.00 TO STA. 59+33.00
STA. 69+86.00 TO STA. 136+91.21
STA. 142+41.21 TO STA. 313+85.02



DETAIL A



DETAIL "B"

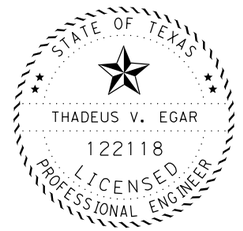


PROPOSED TYPICAL SECTION

STA. 15+74.57 TO STA. 18+88.00
STA. 25+84.00 TO STA. 36+25.00
STA. 48+60.00 TO STA. 59+04.00
STA. 59+33.00 TO STA. 69+86.00

NOTE:

* FLEXIBLE PAVEMENT STRUCTURE REPAIR
- AT VARIOUS LOCATIONS AS DIRECTED BY THE ENGINEER.



Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

Texas Department of Transportation

FM 2478

TYPICAL SECTIONS
(PROPOSED)

SHEET 3 OF 4

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		6

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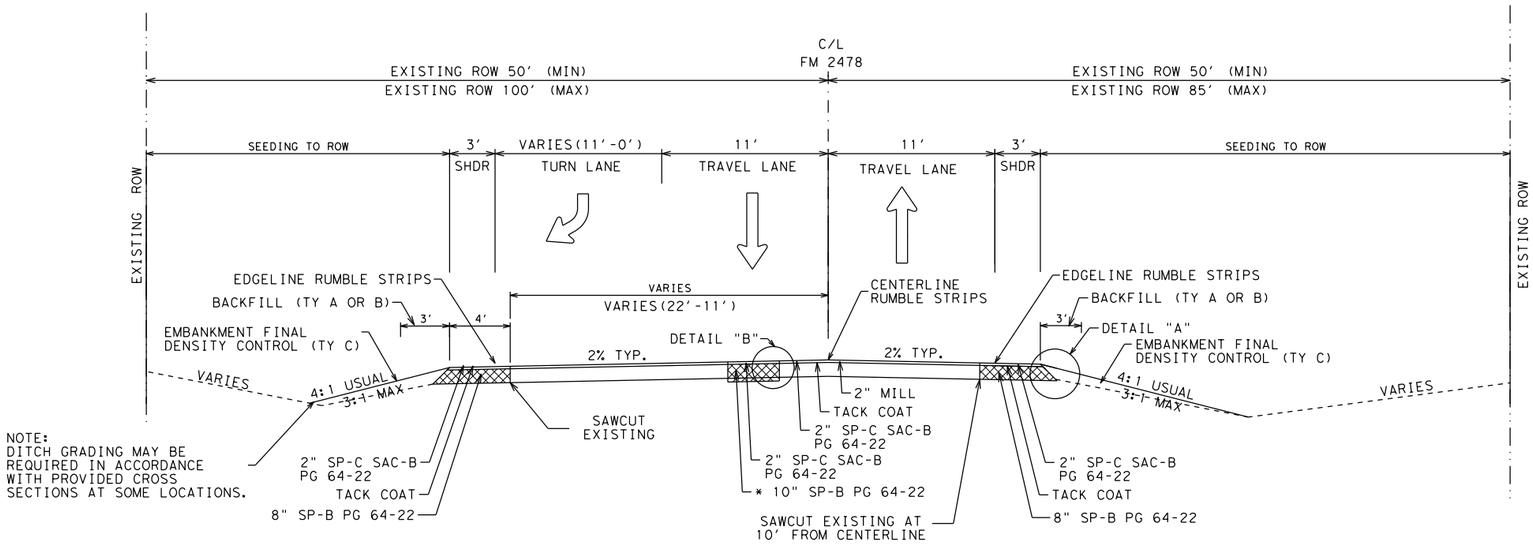
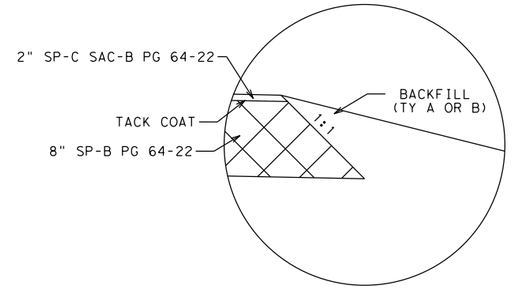
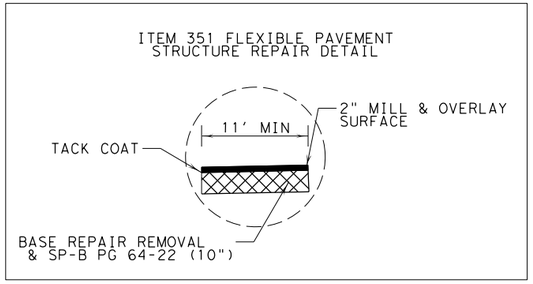


PROPOSED TYPICAL SECTION

STA. 136+91.21 TO STA. 142+41.21



DETAIL A



DETAIL "B"

NOTE:

* FLEXIBLE PAVEMENT STRUCTURE REPAIR
- AT VARIOUS LOCATIONS AS DIRECTED BY THE ENGINEER.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date ,P.E.

Texas Department of Transportation

FM 2478

TYPICAL SECTIONS
(PROPOSED)

SHEET 4 OF 4

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478

DIST	COUNTY	SHEET NO.
DAL	COLLIN	7

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SPECIFICATION DATA

Table 1: Soil Constants Requirements				
Item	Description	Plasticity Index		Note
		Max	Min	
132	EMBANKMENT (FINAL)(DC)(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		269,665 SY
166 *	Fertilizer (12-6-6)	N/A	500	Lbs./Ac	13.92 Ton
168	Vegetative Watering (Warm)**	N/A	12	MG/Ac/Day	40,115 MG
3077	SP MIXES SP-B SP MIXES SP-C	See Plans See Plans	110 110	Lbs./SY/In Lbs./SY/In	13,146Ton 11,771Ton
3077	Tack Coat (Undiluted Application Rate)	New HMA Milled HMA	0.06 0.11	Gal/SY Gal/SY	754 Gal 10,702 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. ***Portland Concrete Cement					
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 1.50Ton/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		269,665 SY
166*	Fertilizer (12-6-6)	500	Lb/Ac	13.92 Ton
168	Vegetative Watering (Warm)**	12	MG/Ac/Day	40,115 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: 2351-02-017 Sheet 8

County: Collin

Highway: FM 2478

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 60.74 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 permtting with environmental resources agencies. 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 sealcoat 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):

AE Name Jennifer Vorster Email address: Jennifer.Vorster@txdot.gov
AAE Name Gerald Waltman Email Address: 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.

CSJ: 2351-02-017 **Sheet 8A**

County: Collin

Highway: FM 2478

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 (5 am on December 31 thru 10:00 pm 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.

Tree removal is subsidiary to Prep ROW.

The limits of preparing right of way will be measured from Sta.15+74.57 to Sta.313+85.02 along the centerline of construction.

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

Items 105, 251, 305, and 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.

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 A). 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 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.

Use embankment material Type C2 described in Table 1 “Soil Constants Requirements” for embankments behind bridge abutments to the extent of the bridge approach slabs, and other embankments enclosed by an abutment and / or retaining walls.

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

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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. Rap is considered suitable Type “A” or “B” material.

Blade the existing vegetation into a neat wind-row prior to overlay. After placing Ty 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 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 314:
Apply MS-2 or SS-1 as a prime, dilute the asphalt with base finish water, distribute in successive applications, and work into the top 1/4” of flex base. Residual asphalt 0.20 Gal/SY.

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:
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.

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

When placing concrete storm drain pipe on slopes of greater than 10 percent, provide cement stabilized backfill to a depth shown on the plans.

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.

At locations where storm drains dead-end, plug with a concrete plug of a thickness equal to 1 ½ inches per foot of diameter of pipe with a minimum thickness of 3 inches. The cost of the plugs shall be included in the unit price bid per foot of the various storm drain pipes.

Item 465:
All manholes, junction boxes and inlets will require inverts unless otherwise directed.

Item 471:
Tackweld all inlet grates and manhole covers to the frame with two 1-inch welds. Supply un-painted cast iron inlet grate and frame and/or cast iron manhole frame and cover.

Item 496:
Inlet grates and manhole covers become the property of the contractor for disposal.

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.

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When excavation is required next to a pavement lane carrying traffic and the widening is not completed by the end of the work day, 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.

Limit lane closures along FM 2478 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.

Traffic Control Plans with Lane Closures causing backups of 15 minutes or greater in duration will be modified by the Engineer up to and including removal of the lane closure and adjustment of lane closure times.

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 over flow. 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 542:
Metal beam guard fence becomes the property of the contractor for disposal. The work involved in hauling this material will not be paid for directly, but will be considered subsidiary to this item.

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.

Item 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.

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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.

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.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2351-02-017 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 2478

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	100-6002	PREPARING ROW	STA	298.100	
	104-6009	REMOVING CONC (RIPRAP)	SY	43.000	
	104-6017	REMOVING CONC (DRIVEWAYS)	SY	682.000	
	110-6001	EXCAVATION (ROADWAY)	CY	5,265.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)	CY	17,070.000	
	134-6004	BACKFILL (TY A OR B)	STA	298.100	
	150-6001	BLADING	STA	298.100	
	164-6035	DRILL SEEDING (PERM) (RURAL) (CLAY)	SY	269,665.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)	SY	269,665.000	
	168-6001	VEGETATIVE WATERING	MG	80,230.000	
	351-6008	FLEXIBLE PAVEMENT STRUCTURE REPAIR(12")	SY	300.000	
	354-6045	PLANE ASPH CONC PAV (2")	SY	82,993.000	
	400-6005	CEM STABIL BKFL	CY	430.000	
	400-6006	CUT & RESTORING PAV	SY	796.000	
	401-6001	FLOWABLE BACKFILL	CY	26.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	794.000	
	403-6001	TEMPORARY SPL SHORING	SF	2,422.000	
	432-6001	RIPRAP (CONC)(4 IN)	CY	2.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	8.000	
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	579.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	153.000	
	462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	269.000	
	462-6067	CONC BOX CULV (8 FT X 8 FT)(EXTEND)	LF	38.000	
	462-6074	CONC BOX CULV (10 FT X 6 FT)(EXTEND)	LF	12.000	
	464-6003	RC PIPE (CL III)(18 IN)	LF	1,166.000	
	464-6005	RC PIPE (CL III)(24 IN)	LF	456.000	
	464-6007	RC PIPE (CL III)(30 IN)	LF	327.000	
	464-6008	RC PIPE (CL III)(36 IN)	LF	117.000	
	464-6009	RC PIPE (CL III)(42 IN)	LF	420.000	
	464-6010	RC PIPE (CL III)(48 IN)	LF	188.000	
	465-6158	INLET(COMPL)(PAZD)(FG)(3FTX3FT-3FTX3FT)	EA	1.000	
	465-6162	INLET(COMPL)(PAZD)(FG)(5FTX5FT-4FTX4FT)	EA	2.000	
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	5.000	
	466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	3.000	
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	3.000	
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	3.000	
	466-6103	HEADWALL (CH - PW - 0) (DIA= 48 IN)	EA	2.000	
	466-6132	HEADWALL (CH - PW - S) (DIA= 30 IN)	EA	1.000	
	466-6135	HEADWALL (CH - PW - S) (DIA= 42 IN)	EA	3.000	
	466-6136	HEADWALL (CH - PW - S) (DIA= 48 IN)	EA	2.000	
	466-6169	WINGWALL (FW - S) (HW=8 FT)	EA	2.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2351-02-017 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 2478

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	466-6173	WINGWALL (PW - 1) (HW=12 FT)	EA	1.000	
	466-6174	WINGWALL (PW - 1) (HW=13 FT)	EA	1.000	
	466-6181	WINGWALL (PW - 1) (HW=6 FT)	EA	2.000	
	466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA	1.000	
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	1.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)	EA	72.000	
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	2.000	
	467-6395	SET (TY II) (24 IN) (RCP) (6: 1) (P)	EA	16.000	
	467-6417	SET (TY II) (30 IN) (RCP) (3: 1) (C)	EA	2.000	
	496-6002	REMOV STR (INLET)	EA	4.000	
	496-6004	REMOV STR (SET)	EA	18.000	
	496-6005	REMOV STR (WINGWALL)	EA	5.000	
	496-6006	REMOV STR (HEADWALL)	EA	8.000	
	496-6007	REMOV STR (PIPE)	LF	2,930.000	
	500-6001	MOBILIZATION	LS	1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	13.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	820.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	820.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	172.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	172.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	4,989.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	4,989.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	3,234.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	3,234.000	
	512-6005	PORT CTB (FUR & INST)(F-SHAPE)(TY 1)	LF	270.000	
	512-6053	PORT CTB (REMOVE)(F-SHAPE)(TY 1)	LF	270.000	
	530-6004	DRIVEWAYS (CONC)	SY	656.000	
	530-6005	DRIVEWAYS (ACP)	SY	7,275.000	
	533-6001	RUMBLE STRIPS (SHOULDER)	LF	55,590.000	
	533-6002	RUMBLE STRIPS (CENTERLINE)	LF	25,308.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	2,112.500	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	1,400.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	12.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	14.000	
	545-6005	CRASH CUSH ATTEN (REMOVE)	EA	4.000	
	545-6007	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	EA	4.000	
	560-6011	MAILBOX INSTALL-S (TWW-POST) TY 4	EA	13.000	
	560-6012	MAILBOX INSTALL-D (TWW-POST) TY 4	EA	2.000	
	560-6013	MAILBOX INSTALL-M (TWW-POST) TY 4	EA	1.000	
	636-6007	REPLACE EXISTING ALUMINUM SIGNS(TY A)	SF	27.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	57.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 2351-02-017 **DISTRICT** Dallas **COUNTY** Collin
HIGHWAY FM 2478

ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL
	644-6004	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	EA	3.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)	EA	1.000	
	644-6036	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	EA	1.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	33.000	
	658-6099	INSTL OM ASSM (OM-2Z)(WFLX)GND	EA	38.000	
	662-6035	WK ZN PAV MRK NON-REMOV (Y)6"(BRK)	LF	2,910.000	
	662-6037	WK ZN PAV MRK NON-REMOV (Y)6"(SLD)	LF	47,685.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	3,045.000	
	666-6018	REFL PAV MRK TY I (W)6"(DOT)(100MIL)	LF	666.000	
	666-6030	REFL PAV MRK TY I (W)8"(DOT)(100MIL)	LF	108.000	
	666-6036	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	LF	1,155.000	
	666-6048	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	LF	262.000	
	666-6054	REFL PAV MRK TY I (W)(ARROW)(100MIL)	EA	10.000	
	666-6078	REFL PAV MRK TY I (W)(WORD)(100MIL)	EA	8.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)	LF	57,524.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)	LF	2,910.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)	LF	47,685.000	
	672-6007	REFL PAV MRKR TY I-C	EA	68.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	1,224.000	
	3077-6001	SP MIXESSP-BPG64-22	TON	13,146.000	
	3077-6013	SP MIXESSP-CSAC-B PG64-22	TON	11,771.000	
	3077-6075	TACK COAT	GAL	11,456.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	3.000	
	6185-6002	TMA (STATIONARY)	DAY	275.000	
	6185-6003	TMA (MOBILE OPERATION)	HR	168.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000	

PLAN SHEET NO.	LOCATION	100 6002	134 6004 *	150 6001	351 6008	354 6045	432 6045	512 6005	512 6053	533 6001	533 6002	540 6001	542 6001	544 6001	544 6003	545 6005	545 6007	560 6011	560 6012	560 6013	3077 6001**	3077 6013**
		PREPARING ROW	BACKFILL (TY A OR B)	BLADING	FLEXIBLE PAVEMENT STRUCTURE REPAIR(12")	PLANE ASPH CONC PAV (2")	RIPRAP (MOW STRIP)(4 IN)	PORT CTB (FUR & INST)(F-SHAPE)(TY 1)	PORT CTB (REMOVE) (F-SHAPE) (TY 1)	RUMBLE STRIPS (SHOULDER)	RUMBLE STRIPS (CENTERLINE)	MTL W-BEAM GD FEN (TIM POST)	REMOVE METAL BEAM GUARD FENCE	GUARDRAIL END TREATMENT (INSTALL)	GUARDRAIL END TREATMENT (REMOVE)	CRASH CUSH ATTEN (REMOVE)	CRASH CUSH ATTEN (INSTL)(L)(N)(TL3)	MAILBOX INSTALL-S (TWW-POST) TY 4	MAILBOX INSTALL-D (TWW-POST) TY 4	MAILBOX INSTALL-M (TWW-POST) TY 4	SP MIXES SP-B PG64-22	SP MIXES SP-C SAC-B PG64-22
		STA	STA	STA	SY	SY	CY	LF	LF	LF	LF	LF	LF	EA	EA	EA	EA	EA	EA	EA	TON	TON
SHEET 1	BEGIN PROJECT TO STA. 34+00	18.25	18.25	18.25		6416				2836	995										414	739
SHEET 2	STA. 34+00 TO STA. 58+00	24	24	24		8512				4545	1194										630	1116
SHEET 3	STA. 58+00 TO STA. 82+00	24	24	24		7702				4372	1243							1			904	1057
SHEET 4	STA. 82+00 TO STA. 106+00	24	24	24		6004				4800	2400							3			1164	904
SHEET 5	STA. 106+00 TO STA. 130+00	24	24	24		6131		270	270	4404	2400					4	4	2	1		1164	904
SHEET 6	STA. 130+00 TO STA. 154+00	24	24	24		7427				4722	2200										1116	1030
SHEET 7	STA. 154+00 TO STA. 178+00	24	24	24		6198				4216	2050										1164	904
SHEET 8	STA. 178+00 TO STA. 202+00	24	24	24		6102				4800	2400							1			1164	904
SHEET 9	STA. 202+00 TO STA. 226+00	24	24	24		6372				3902	1895		50		2						1164	904
SHEET 10	STA. 226+00 TO STA. 250+00	24	24	24		6124				4600	2275							2		1	1164	904
SHEET 11	STA. 250+00 TO STA. 274+00	24	24	24		6060				4423	2440										1164	904
SHEET 12	STA. 274+00 TO STA. 298+00	24	24	24		5996	103			4800	2230	1512.5	1250	8	8			3	1		1164	904
SHEET 13	STA. 298+00 TO END PROJECT	15.85	15.85	15.85		3949	50			3170	1586	600	100	4	4			1			770	597
	PROJECT TOTALS	298.1	298.1	298.1	300	82993	153	270	270	55590	25308	2112.5	1400	12	14	4	4	13	2	1	13146	11771

PLAN SHEET NO.	LOCATION	3077 6075	6001 6002	6185 6002	6185 6003
		TACK COAT	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION)
		GAL	EA	DAY	HR
SHEET 1	BEGIN PROJECT TO STA. 34+00	720			
SHEET 2	STA. 34+00 TO STA. 58+00	1058			
SHEET 3	STA. 58+00 TO STA. 82+00	1025			
SHEET 4	STA. 82+00 TO STA. 106+00	886			
SHEET 5	STA. 106+00 TO STA. 130+00	886			
SHEET 6	STA. 130+00 TO STA. 154+00	1000			
SHEET 7	STA. 154+00 TO STA. 178+00	886	3	275	168
SHEET 8	STA. 178+00 TO STA. 202+00	886			
SHEET 9	STA. 202+00 TO STA. 226+00	886			
SHEET 10	STA. 226+00 TO STA. 250+00	886			
SHEET 11	STA. 250+00 TO STA. 274+00	886			
SHEET 12	STA. 274+00 TO STA. 298+00	886			
SHEET 13	STA. 298+00 TO END PROJECT	565			
	PROJECT TOTALS	11456	3	275	168

NOTE:

* TOP SOIL ONLY

** ADDED 10% ON THE QUANTITIES

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(ROADWAY)

SHEET 1 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		10

DATE: 5/10/2023 9:22:16 AM
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CK: DW: CK: DW:

DRIVEWAY NO.	PLAN SHEET NO.	EXISTING MATERIAL/TYPE	WIDTH	RADII	104 6017 REMOVING CONC (DRIVEWAYS)	464 6003 RC PIPE (CL III)(18 IN)	464 6005 RC PIPE (CL III)(24 IN)	464 6009 RC PIPE (CL III)(42 IN)	466 6102 HEADWALL (CH - PW - Ø) (DIA= 42 IN)	467 6363 SET (TY II) (18 IN) (RCP) (6: 1) (P)	467 6395 SET (TY II) (24 IN) (RCP) (6: 1) (P)	496 6004 REMOV STR (SET)	496 6006 REMOV STR (HEADWALL)	496 6007 REMOV STR (PIPE)	530 6004 DRIVEWAYS (CONC)	530 6005 DRIVEWAYS (ACP)
			FT	FT	SY	LF	LF	LF	EA	EA	EA	EA	EA	LF	SY	SY
1	1	CONCRETE (MEADOW LANE)	MATCH	MATCH	206										190	
2	1	ASPHALT	MATCH	MATCH			24				2			23		50
3	1	ASPHALT (TWIN EAGLES DRIVE)														
4	2	ASPHALT (TWIN MALLETS LANE)	MATCH	MATCH		33				2			2	27		116
5	2	ASPHALT (OWNSBY PARKWAY)														
6	3	ASPHALT TO GRAVEL (RD 5436)	MATCH	15		32				2			2	27		82
7	3	ASPHALT TO CONCRETE (BELMONT WAY)														
8	3	ASPHALT (RD 5436)	MATCH	MATCH		50				2				50		82
9	3	GRASS	MATCH	MATCH			50				2	2		50		69
10	3	ASPHALT & GRASS	11	15			22				2			19		55
11	3	ASPHALT (BRINKMAN RANCH ROAD)	MATCH	MATCH			28				2	2		25		71
12	4	ASPHALT & DIRT	MATCH	15		22				2				21		65
13	4	ASPHALT & GRAVEL	11	MATCH		24				2				22		75
14	4	CONCRETE	MATCH	MATCH	88	34				2		2		33	74	
15	4	ASPHALT	MATCH	MATCH		30				2		2		27		87
16	4	ASPHALT & DIRT	MATCH	15		26				2				24		57
17	4	GRAVEL	MATCH	MATCH		30				2				28		81
18	5	ASPHALT (CR 88)	MATCH	40				43	1					39		159
19	5	ASPHALT (TWIN BRIDGES RØAD)	MATCH	30, 40												166
20	5	GRAVEL	MATCH	MATCH		38				2				37		91
21	5	GRAVEL TO ASPHALT	MATCH	15		26				2				25		63
22	5	GRAVEL	MATCH	MATCH		74				2				74		249
23	5	GRAVEL	11	15		63				2				63		53
24	5	CONCRETE	11	MATCH	72	34				2		2		33	70	
25	5	GRAVEL	MATCH	15												69
26	5	GRAVEL	11	15												66
27	5	CONCRETE	MATCH	MATCH	89	40				2		2		34	82	
28	6	GRAVEL	MATCH	MATCH		46					2			46		110
29	6	ASPHALT (OUTER LOOP)														
30	6	ASPHALT & DIRT	14	15												64
31	6	GRAVEL	14	15												70
32	6	ASPHALT & GRASS	11	15		22				2				22		58
33	6	ASPHALT & GRASS	14	15		22				2				22		71
34	7	ASPHALT (CR 127)	MATCH	MATCH												1006
35	7	DIRT	11	15		20				2				20		52
36	7	ASPHALT & DIRT	11	15		20				2				20		59
37	7	ASPHALT	11	15			24				2			24		54
38	8	ASPHALT TO CONCRETE	MATCH	MATCH												39
39	8	DIRT	11	15		20				2				15		55
40	8	DIRT	14	15			22				2			20		68
41	8	ASPHALT	11	15												55
42	9	GRAVEL	MATCH	15		22				2				20		78
43	9	ASPHALT (PRIVATE RD. 5341)	MATCH	MATCH												765
44	9	DIRT	11	15		18				2				16		62
45	9	ASPHALT (CR 1261)	MATCH	MATCH												1021
46	9	ASPHALT (COTTAGE HILL PARKWAY)	MATCH	MATCH		54				2		2		50		180
47	9	CONCRETE	MATCH	MATCH	56										58	
48	9	DIRT	14	15												65
49	10	ASPHALT	MATCH	MATCH		24				2				21		68
50	10	GRAVEL	11	15		24				2				20		68
51	10	GRAVEL	MATCH	MATCH												98
52	10	DIRT	MATCH	MATCH		30				2				21		99
53	10	DIRT	MATCH	MATCH		32				2		2		32		101
54	10	ASPHAL & GRAVEL	11	15		20				2				20		56
55	10	ASPHAL & GRAVEL	11	15		20				2				20		56
56	10	ASPHALT	MATCH	MATCH		40				2				34		114
57	10	ASPHALT	MATCH	MATCH		48				2			2	43		105
58	11	ASPHAL & GRASS	MATCH	MATCH		20				2				18		68
59	11	ASPHAL & GRAVEL (CR 129)	MATCH	MATCH												112
60	11	ASPHAL (CR 171)	MATCH	MATCH												230
61	11	ASPHAL & GRASS	MATCH	MATCH		20				2				19		57
62	12	ASPHALT TO CONCRETE	MATCH	MATCH												33
63	12	CONCRETE	MATCH	MATCH	121		57				2		2	26	117	
64	12	ASPHALT	MATCH	15	12										34	
65	12	CONCRETE	MATCH	MATCH	38										31	
66	12	ASPHALT	11	15		24				2				21		55
67	13	GRAVEL	MATCH	MATCH		32				2				32		59
68	13	GRAVEL	MATCH	MATCH		32				2		2		32		96
69	13	GRAVEL	MATCH	MATCH												62
		PROJECT TOTALS			682	1166	227	43	1	72	16	18	8	1315	656	7275

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. NO ADDITIONAL COST FOR CUTTING PIPE AT DRIVEWAY CROSSING
5. MILL 2" & OVERLAY 2" FOR DRIVEWAY 3, 5, 7 & 29.

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(DRIVEWAY)

SHEET 2 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		11

DATE: 5/23/2023 10:24:51 AM
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CK: DW: CK: DW:

LOCATION	104 6009	400 6005	400 6006	401 6001	402 6001	403 6001	432 6001	432 6002	432 6030	462 6005	462 6067	462 6074	464 6005	464 6007	464 6008	464 6009	464 6010	465 6158	465 6162	466 6097
	REMOVING CONC (RIPRAP)	CEM STABIL BKFL	CUT & RESTORING PAV	FLOWABLE BACKFILL	TRENCH EXCAVATION PROTECTION	TEMPORARY SPL SHORING	RIPRAP (CONC)(4 IN)	RIPRAP (CONC)(5 IN)	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CONC BOX CULV (4 FT X 4 FT)	CONC BOX CULV (8 FT X 8 FT)(EXTEND)	CONC BOX CULV (10 FT X 6 FT)(EXTEND)	RC PIPE (CL III)(24 IN)	RC PIPE (CL III)(30 IN)	RC PIPE (CL III)(36 IN)	RC PIPE (CL III)(42 IN)	RC PIPE (CL III)(48 IN)	INLET(COMPL)(PAZD)(FG)(3FTX3FT-3FTX3FT)	INLET(COMPL)(PAZD)(FG)(5FTX5FT-4FTX4FT)	HEADWALL (CH - PW - Ø)(DIA=24 IN)
	SY	CY	SY	CY	LF	SF	CY	CY	CY	LF	LF	LF	LF	LF	LF	LF	LF	EA	EA	EA
CULVERT 2, STA. 62+18.65		36	87		60				26							80				
CULVERT 3, STA. 67+13.63		47	82		67				27								80			
CULVERT 4, STA. 108+24.83	43					814		8	27			12								
CULVERT 5, STA. 134+84.85		23	34		48				44					177						
CULVERT 6, STA. 159+72.40		72	37		42				67	186										
CULVERT 7, STA. 184+50.93		34	26		43				48								108			
CULVERT 8, STA. 212+18.83		23	50	22	62				25					96						
CULVERT 9, STA. 217+72.98		43	72		74		2		82							192				
CULVERT 10, STA. 228+55.59		20	43		43				21						56					
CULVERT 11, STA. 240+95.96		19	46		54				10						61				1	
CULVERT 12, STA. 256+72.88		15	20		18				8				54							1
CULVERT 13, STA. 259+80.27		14	19						8				53							1
CULVERT 14, STA. 267+29.08		13	52	4	57				8				71					1		1
CULVERT 15, STA. 285+76.50						1608			98		38									
CULVERT 16, STA. 293+91.50		27	91		89				25							105			1	
CULVERT 17, STA. 299+20.14		13	28		31				16				51							2
CULVERT 18, STA. 305+93.64		14	82		73				33	83										
CULVERT 19, STA. 313+26.68		17	27		33				6					54						
PROJECT TOTALS	43	430	796	26	794	2422	2	8	579	269	38	12	229	327	117	377	188	1	2	5

LOCATION	466 6099	466 6101	466 6102	466 6103	466 6132	466 6135	466 6136	466 6169	466 6173	466 6174	466 6181	466 6182	466 6183	467 6388	467 6417	496 6002	496 6005	496 6007
	HEADWALL (CH - PW - Ø)(DIA=30 IN)	HEADWALL (CH - PW - Ø)(DIA=36 IN)	HEADWALL (CH - PW - Ø)(DIA=42 IN)	HEADWALL (CH - PW - Ø)(DIA=48 IN)	HEADWALL (CH - PW - S)(DIA=30 IN)	HEADWALL (CH - PW - S)(DIA=42 IN)	HEADWALL (CH - PW - S)(DIA=48 IN)	WINGWALL (FW - S)(HW=8 FT)	WINGWALL (PW - 1)(HW=12 FT)	WINGWALL (PW - 1)(HW=13 FT)	WINGWALL (PW - 1)(HW=6 FT)	WINGWALL (PW - 1)(HW=7 FT)	WINGWALL (PW - 1)(HW=8 FT)	SET (TY II)(24 IN)(RCP)(3:1)(C)	SET (TY II)(30 IN)(RCP)(3:1)(C)	REMOV STR (INLET)	REMOV STR (WINGWALL)	REMOV STR (PIPE)
	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	EA	LF
CULVERT 2, STA. 62+18.65			2															68
CULVERT 3, STA. 67+13.63							2											73
CULVERT 4, STA. 108+24.83								2									2	
CULVERT 5, STA. 134+84.85	2																1	192
CULVERT 6, STA. 159+72.40											2							244
CULVERT 7, STA. 184+50.93				2														102
CULVERT 8, STA. 212+18.83	1				1													88
CULVERT 9, STA. 217+72.98						2										1		156
CULVERT 10, STA. 228+55.59		2														1		51
CULVERT 11, STA. 240+95.96		1														1		53
CULVERT 12, STA. 256+72.88														1				49
CULVERT 13, STA. 259+80.27														1				45
CULVERT 14, STA. 267+29.08																		56
CULVERT 15, STA. 285+76.50									1	1							2	
CULVERT 16, STA. 293+91.50						1												89
CULVERT 17, STA. 299+20.14																1		45
CULVERT 18, STA. 305+93.64												1	1					252
CULVERT 19, STA. 313+26.68															2			52
PROJECT TOTALS	3	3	2	2	1	3	2	2	1	1	2	1	1	2	2	4	5	1615

NOTE:

- NO EXTENSION WILL BE DONE TO CULVERT 1.

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(DRAINAGE)

SHEET 3 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		12

DATE: 4/29/2023 10:07:34 AM
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DW: CK: DW: CK:

SUMMARY OF PAVEMENT MARKING ITEMS

PLAN SHEET NO.	LOCATION	662 6035	662 6037	662 6111	666 6018	666 6030	666 6036	666 6048	666 6054	666 6078	666 6309	666 6318	666 6321	672 6007	672 6009
		WK ZN PAV MRK NON-REMOV (Y)6"(BRK)	WK ZN PAV MRK NON-REMOV (Y)6"(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)8"(DOT)(100MIL)	REFL PAV MRK TY I (W)8"(SLD)(100MIL)	REFL PAV MRK TY I (W)24"(SLD)(100MIL)	REFL PAV MRK TY I (W)(ARROW)(100MIL)	REFL PAV MRK TY I (W)(WORD)(100MIL)	RE PM W/RET REQ TY I (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 I-C	REFL PAV MRKR TY II-A-A
		LF	LF	EA	LF	LF	LF	LF	EA	EA	LF	LF	LF	EA	EA
SHEET 1	BEGIN PROJECT TO STA. 34+00	0	3928	193		24	200	38	2	2	3140		3928	11	163
SHEET 2	STA. 34+00 TO STA. 58+00	0	6536	329		24	175	24	2	2	4645		6536	10	217
SHEET 3	STA. 58+00 TO STA. 82+00	310	3714	281		24	200	14	2	2	4572	310	3714	11	260
SHEET 4	STA. 82+00 TO STA. 106+00	310	3161	218							4800	310	3161		57
SHEET 5	STA. 106+00 TO STA. 130+00	590	2511	305				29			4604	590	2511		63
SHEET 6	STA. 130+00 TO STA. 154+00	550	2475	75		36	580	58	4	2	4822	550	2475	36	75
SHEET 7	STA. 154+00 TO STA. 178+00	330	2375	220	69			13			4513	330	2375		48
SHEET 8	STA. 178+00 TO STA. 202+00	520	1712	244							4800	520	1712		49
SHEET 9	STA. 202+00 TO STA. 226+00	0	4800	242	597			43			4235		4800		62
SHEET 10	STA. 226+00 TO STA. 250+00	0	4800	242				15			4800		4800		62
SHEET 11	STA. 250+00 TO STA. 274+00	0	4800	242				28			4623		4800		62
SHEET 12	STA. 274+00 TO STA. 298+00	220	3972	267							4800	220	3972		62
SHEET 13	STA. 298+00 TO END PROJECT	80	2901	187							3170	80	2901		44
	PROJECT TOTALS	2910	47685	3045	666	108	1155	262	10	8	57524	2910	47685	68	1224

SUMMARY OF SIGNING ITEMS

PLAN SHEET NO.	LOCATION	636 6007	644 6001	644 6004	644 6033	644 6036	658 6062	658 6099
		REPLACE EXISTING ALUMINUM SIGNS(TY A)	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TY10BWG(1)SA(T)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	INSTL DEL ASSM (D-SW)SZ1(BRF)GF2(BI)	INSTL OM ASSM (OM-2Z)(WFLX)GND
		SF	EA	EA	EA	EA	EA	EA
SHEET 1	BEGIN PROJECT TO STA. 34+00	9	1					2
SHEET 2	STA. 34+00 TO STA. 58+00	9	1					
SHEET 3	STA. 58+00 TO STA. 82+00	9	1	1				4
SHEET 4	STA. 82+00 TO STA. 106+00		1					
SHEET 5	STA. 106+00 TO STA. 130+00		4	2				2
SHEET 6	STA. 130+00 TO STA. 154+00		6			1		2
SHEET 7	STA. 154+00 TO STA. 178+00		12					2
SHEET 8	STA. 178+00 TO STA. 202+00		2					2
SHEET 9	STA. 202+00 TO STA. 226+00		16					4
SHEET 10	STA. 226+00 TO STA. 250+00		3					4
SHEET 11	STA. 250+00 TO STA. 274+00		2					6
SHEET 12	STA. 274+00 TO STA. 298+00		2				23	4
SHEET 13	STA. 298+00 TO END PROJECT		6		1		10	6
	PROJECT TOTALS	27	57	3	1	1	33	38

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(SIGN AND PAVEMENT MARKINGS)

SHEET 4 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		13

DATE: 5/10/2023 12:51:45 PM
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PLAN SHEET NO.	LOCATION	164 6035 DRILL SEEDING (PERM) (RURAL) (CLAY) SY	164 6051 DRILL SEED (TEMP)(WARM OR COOL) SY	168 6001 VEGETATIVE WATERING MG	506 6002 ROCK FILTER DAMS (INSTALL) (TY 2) LF	506 6011 ROCK FILTER DAMS (REMOVE) LF	506 6020 CONSTRUCTION EXITS (INSTALL) (TY 1) SY	506 6024 CONSTRUCTION EXITS (REMOVE) SY	506 6038 TEMP SEDMT CONT FENCE (INSTALL) LF	506 6039 TEMP SEDMT CONT FENCE (REMOVE) LF	506 6041 BIODEG EROSN CONT LOGS (INSTL) (12") LF	506 6043 BIODEG EROSN CONT LOGS (REMOVE) LF
SHEET 1	BEGIN PROJECT TO STA. 34+00	14968	14968	4453	40	40	78	78		0	50	50
SHEET 2	STA. 34+00 TO STA. 58+00	26092	26092	7763		0				0	80	80
SHEET 3	STA. 58+00 TO STA. 82+00	24184	24184	7195	80	80			80	80	250	250
SHEET 4	STA. 82+00 TO STA. 106+00	20722	20722	6165		0				0	110	110
SHEET 5	STA. 106+00 TO STA. 130+00	18965	18965	5642	50	50			235	235	280	280
SHEET 6	STA. 130+00 TO STA. 154+00	18556	18556	5521	40	40			1585	1585	195	195
SHEET 7	STA. 154+00 TO STA. 178+00	21448	21448	6381	50	50			405	405	150	150
SHEET 8	STA. 178+00 TO STA. 202+00	19445	19445	5785	40	40			900	900	150	150
SHEET 9	STA. 202+00 TO STA. 226+00	19632	19632	5841	90	90			80	80	285	285
SHEET 10	STA. 226+00 TO STA. 250+00	19278	19278	5736	80	80			60	60	175	175
SHEET 11	STA. 250+00 TO STA. 274+00	23820	23820	7087	120	120			315	315	135	135
SHEET 12	STA. 274+00 TO STA. 298+00	29826	29826	8874	110	110			795	795	900	900
SHEET 13	STA. 298+00 TO END PROJECT	12729	12729	3787	120	120	78	78	80	80	180	180
	* 10% ADDITIONAL QUANTITY						16	16	454	454	294	294
	PROJECT TOTALS	269665 **	269665 **	80230	820	820	172	172	4989	4989	3234	3234

* 10 % ADDITIONAL QUANTITIES ARE ALLOTED FOR PERIODIC REPLACEMENTS OF PERISHABLE BMP's DUE TO NORMAL WEAR AND CHANGING SITE CONDITIONS.

** ADDED 3.07% ON THE QUANTITY DUE TO SLOPE

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(SW3P)

SHEET 5 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		14

DATE: 4/29/2023 10:07:36 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/1. General/Summary Sheet.dgn

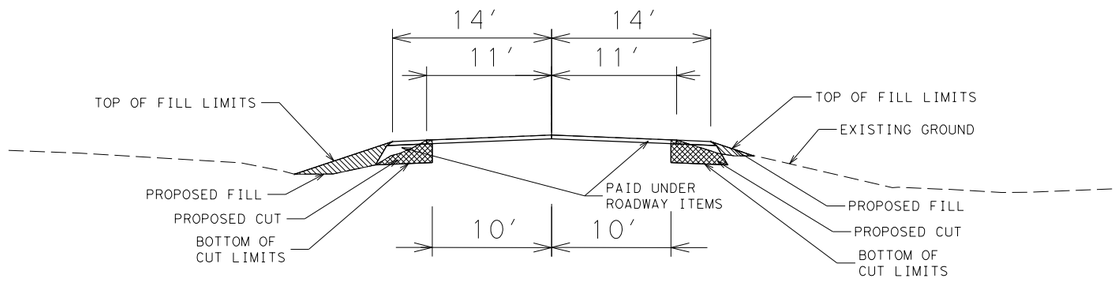
CK: DW: CK: DW:

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
15+75.00	0	0
16+00.00	6	0
17+00.00	60	0
18+00.00	58	0
19+00.00	30	1
20+00.00	33	4
21+00.00	22	10
22+00.00	19	17
23+00.00	22	16
24+00.00	22	31
25+00.00	19	59
26+00.00	11	45
27+00.00	4	32
28+00.00	5	34
29+00.00	5	13
30+00.00	6	2
31+00.00	7	4
32+00.00	19	3
33+00.00	24	8
34+00.00	11	7
35+00.00	8	1
36+00.00	8	1
37+00.00	13	41
37+92.47	17	101
38+00.00	17	106
39+00.00	16	111
40+00.00	18	92
41+00.00	18	83
42+00.00	17	91
43+00.00	18	109
44+00.00	21	108
45+00.00	19	102
46+00.00	17	109
47+00.00	16	122
48+00.00	16	113
49+00.00	11	65
50+00.00	5	18
51+00.00	5	5
52+00.00	5	3
53+00.00	5	31
54+00.00	4	67
55+00.00	7	66
56+00.00	14	63
57+00.00	16	62
58+00.00	14	40

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
59+00.00	18	31
60+00.00	32	17
61+00.00	48	0
62+00.00	49	52
63+00.00	44	78
64+00.00	35	60
65+00.00	29	47
66+00.00	29	26
67+00.00	33	75
68+00.00	33	62
69+00.00	31	1
70+00.00	26	21
71+00.00	17	38
72+00.00	17	33
73+00.00	20	34
74+00.00	22	47
75+00.00	20	58
76+00.00	18	50
77+00.00	16	41
78+00.00	15	34
79+00.00	19	27
80+00.00	20	38
81+00.00	17	53
82+00.00	18	54
83+00.00	16	50
84+00.00	13	45
85+00.00	14	35
86+00.00	19	23
87+00.00	20	30
88+00.00	19	32
89+00.00	21	25
90+00.00	20	30
91+00.00	19	30
92+00.00	17	30
93+00.00	16	34
94+00.00	17	43
95+00.00	18	48
96+00.00	19	43
97+00.00	14	51
98+00.00	11	57
99+00.00	11	66
100+00.00	9	78
101+00.00	9	65
102+00.00	9	69
103+00.00	10	73

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
104+00.00	14	52
105+00.00	16	48
106+00.00	18	49
107+00.00	21	71
108+00.00	15	130
109+00.00	13	128
110+00.00	16	99
111+00.00	13	81
112+00.00	11	53
113+00.00	12	38
114+00.00	15	31
115+00.00	15	37
116+00.00	11	50
117+00.00	9	64
118+00.00	9	77
119+00.00	14	75
120+00.00	19	39
121+00.00	20	35
122+00.00	19	58
123+00.00	17	63
124+00.00	16	70
125+00.00	18	62
126+00.00	20	38
127+00.00	18	21
128+00.00	18	14
129+00.00	19	8
130+00.00	20	6
131+00.00	19	15
132+00.00	18	27
133+00.00	22	16
134+00.00	23	8
135+00.00	18	10
136+00.00	19	3
137+00.00	18	8
138+00.00	14	21
139+00.00	15	25
140+00.00	16	23
141+00.00	16	23
142+00.00	31	14
143+00.00	53	7
144+00.00	40	20
145+00.00	21	28
146+00.00	20	24
147+00.00	16	25
148+00.00	14	20

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
149+00.00	15	23
150+00.00	16	34
151+00.00	16	37
152+00.00	15	42
153+00.00	16	51
154+00.00	16	56
155+00.00	14	51
156+00.00	13	52
157+00.00	12	58
158+00.00	11	51
159+00.00	13	34
160+00.00	17	65
161+00.00	20	58
162+00.00	18	28
163+00.00	13	38
164+00.00	11	28
165+00.00	14	20
166+00.00	16	28
167+00.00	19	23
168+00.00	21	11
169+00.00	21	23
170+00.00	24	26
171+00.00	25	26
172+00.00	21	34
173+00.00	17	47
174+00.00	19	45
175+00.00	24	35
176+00.00	23	39
177+00.00	19	57
178+00.00	15	71
179+00.00	12	89
180+00.00	11	104
181+00.00	13	100
182+00.00	17	76
183+00.00	20	48
184+00.00	22	37
185+00.00	20	47
186+00.00	17	47
187+00.00	17	34
188+00.00	19	41
189+00.00	20	46
190+00.00	21	39
191+00.00	23	34
192+00.00	23	28
193+00.00	25	14



EARTHWORK CALCULATION DETAILS
N.T.S.

CONTRACTOR'S INFORMATION:

EARTHWORK QUANTITY CALCULATIONS WERE DONE USING OPEN ROAD DESIGN SOFTWARE

LEGEND:

EXCAVATION (CUT)

EMBANKMENT (FILL)

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(EARTHWORK)

SHEET 6 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		15

DATE: 4/29/2023 10:07:38 AM
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DW:
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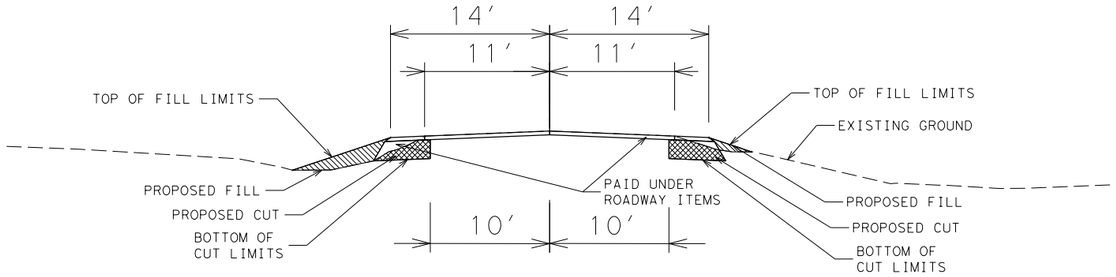
DW:

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
194+00.00	25	9
195+00.00	23	11
196+00.00	19	20
197+00.00	16	37
198+00.00	15	51
199+00.00	19	45
200+00.00	21	32
201+00.00	19	29
202+00.00	17	37
203+00.00	13	45
204+00.00	16	31
205+00.00	21	23
206+00.00	21	24
207+00.00	17	68
208+00.00	13	115
209+00.00	12	100
210+00.00	14	46
211+00.00	12	48
212+00.00	14	62
213+00.00	19	34
214+00.00	20	26
215+00.00	18	56
216+00.00	8	45
217+00.00	10	31
218+00.00	18	106
219+00.00	18	99
220+00.00	22	27
221+00.00	23	11
222+00.00	23	10
223+00.00	26	3
224+00.00	21	25
225+00.00	13	61
226+00.00	14	75
227+00.00	17	49
228+00.00	20	30
229+00.00	23	35
230+00.00	23	34
231+00.00	19	42
232+00.00	21	25
233+00.00	19	19
234+00.00	13	42
235+00.00	14	42
236+00.00	11	48
237+00.00	10	68
238+00.00	12	63

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
239+00.00	14	49
240+00.00	14	49
241+00.00	11	137
242+00.00	12	147
243+00.00	15	42
244+00.00	15	16
245+00.00	12	19
246+00.00	12	27
247+00.00	19	18
248+00.00	18	22
249+00.00	13	40
250+00.00	15	38
251+00.00	17	35
252+00.00	17	35
253+00.00	20	28
254+00.00	25	19
255+00.00	26	17
256+00.00	23	34
257+00.00	20	54
258+00.00	19	53
259+00.00	18	34
260+00.00	20	21
261+00.00	21	18
262+00.00	21	14
263+00.00	21	13
264+00.00	20	19
265+00.00	20	21
266+00.00	21	17
267+00.00	20	100
268+00.00	22	97
269+00.00	23	15
270+00.00	17	38
271+00.00	14	46
272+00.00	14	20
273+00.00	16	5
274+00.00	20	3
275+00.00	21	5
276+00.00	20	9
277+00.00	19	18
278+00.00	14	170
279+00.00	12	211
280+00.00	12	132
281+00.00	12	186
282+00.00	14	195
283+00.00	13	365

LOCATION	110 6001	132 6006
	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)
	CY	CY
284+00.00	12	552
285+00.00	11	709
286+00.00	11	687
287+00.00	14	331
288+00.00	14	145
289+00.00	12	119
290+00.00	12	93
291+00.00	12	67
292+00.00	12	41
293+00.00	12	53
294+00.00	13	112
295+00.00	14	105
296+00.00	13	76
297+00.00	13	90
298+00.00	14	73
299+00.00	14	95
300+00.00	15	103
301+00.00	15	68
302+00.00	14	53
303+00.00	13	56
304+00.00	12	62
305+00.00	10	138
306+00.00	12	212
307+00.00	16	253
308+00.00	17	230
309+00.00	19	98
310+00.00	18	32
311+00.00	15	25
312+00.00	18	18
313+00.00	20	35
313+85.00	16	30
PROJECT TOTALS	5265	17070



EARTHWORK CALCULATION DETAILS
N.T.S.

CONTRACTOR'S INFORMATION:

EARTHWORK QUANTITY CALCULATIONS WERE DONE USING OPEN ROAD DESIGN SOFTWARE

LEGEND:

EXCAVATION (CUT)

EMBANKMENT (FILL)

Texas Department of Transportation

FM 2478

SUMMARY SHEETS
(EARTHWORK)

SHEET 7 OF 7

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		16

DATE: 4/29/2023 10:07:39 AM
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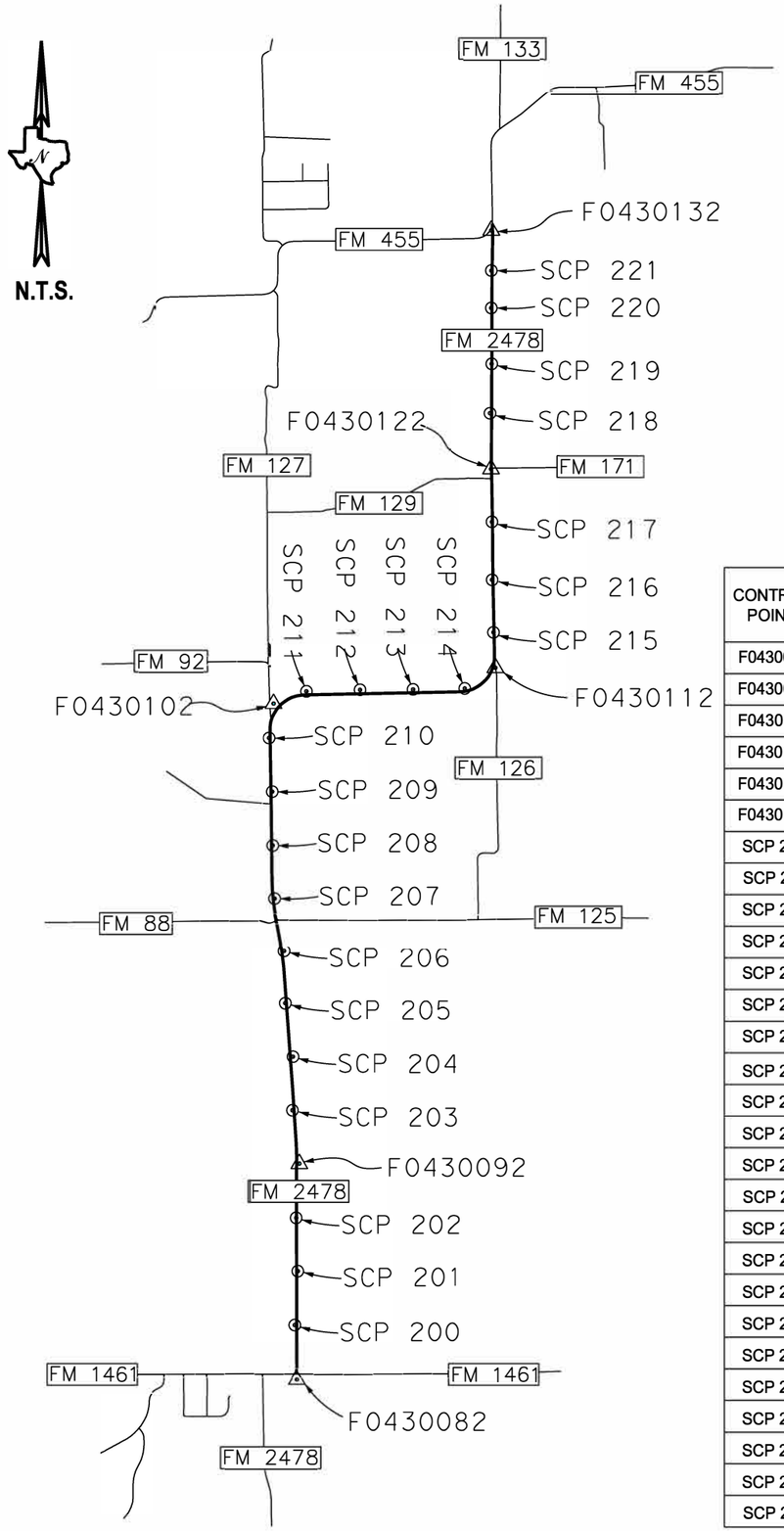
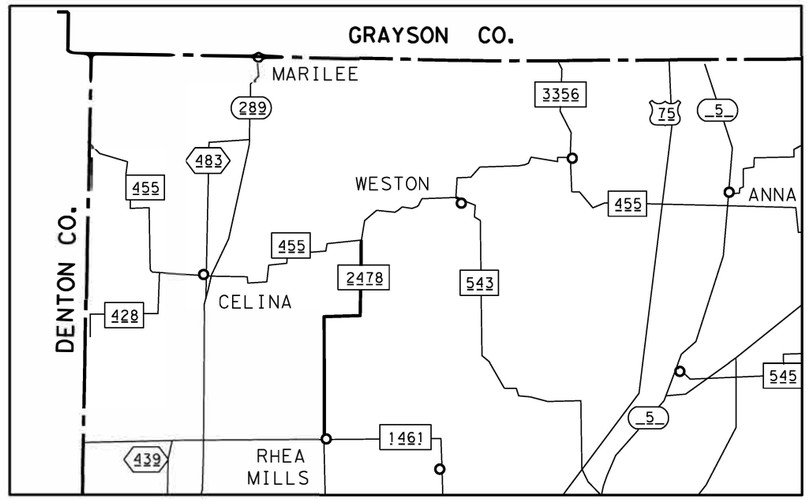




LOCATION MAP

CONTROL POINT	SURFACE COORDINATES		NAVD 88 ELEVATION	GRID COORDINATES		DESCRIPTION
	NORTHING	EASTING		NORTHING	EASTING	
F0430082	7,147,653.546	2,509,766.787	760.195	7,146,562.194	2,509,383.579	3.5" ALUM. DISK IN CONC. STAMPED F0430082
F0430092	7,152,696.495	2,509,825.001	756.772	7,151,604.373	2,509,441.784	3.5" ALUM. DISK IN CONC. STAMPED F0430092
F0430102	7,163,428.225	2,509,221.600	769.653	7,162,334.465	2,508,838.476	3.5" ALUM. DISK IN CONC. STAMPED F0430102
F0430112	7,164,263.462	2,514,401.437	754.428	7,163,169.574	2,514,017.521	3.5" ALUM. DISK IN CONC. STAMPED F0430112
F0430122	7,168,900.636	2,514,298.822	738.633	7,167,806.040	2,513,914.922	3.5" ALUM. DISK IN CONC. STAMPED F0430122
F0430132	7,174,463.262	2,514,305.627	713.294	7,173,367.817	2,513,921.726	3.5" ALUM. DISK IN CONC. STAMPED F0430132
SCP 200	7,148,934.790	2,509,718.510	758.965	7,147,843.243	2,509,335.310	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 201	7,150,190.646	2,509,789.132	759.558	7,149,098.907	2,509,405.921	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 202	7,151,432.964	2,509,751.095	757.166	7,150,341.036	2,509,367.890	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 203	7,153,939.706	2,509,664.737	760.155	7,152,847.395	2,509,281.544	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 204	7,155,187.335	2,509,678.023	772.805	7,154,094.834	2,509,294.828	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 205	7,156,429.458	2,509,498.682	779.654	7,155,336.767	2,509,115.515	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 206	7,157,646.408	2,509,467.781	765.861	7,156,553.530	2,509,084.619	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 207	7,158,876.942	2,509,248.206	754.412	7,157,783.877	2,508,865.077	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 208	7,160,116.090	2,509,203.877	775.234	7,159,022.836	2,508,820.754	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 209	7,161,373.606	2,509,192.378	776.234	7,160,280.160	2,508,809.257	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 210	7,162,625.115	2,509,117.316	778.123	7,161,531.478	2,508,734.207	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 211	7,163,714.170	2,509,989.915	768.653	7,162,620.366	2,509,606.673	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 212	7,163,749.624	2,511,241.652	760.000	7,162,655.814	2,510,858.218	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 213	7,163,759.067	2,512,479.222	762.962	7,162,665.256	2,512,095.600	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 214	7,163,781.544	2,513,685.472	765.010	7,162,687.730	2,513,301.666	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 215	7,165,090.762	2,514,355.946	755.216	7,163,996.748	2,513,972.037	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 216	7,166,315.046	2,514,324.008	762.584	7,165,220.845	2,513,940.105	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 217	7,167,669.093	2,514,320.767	745.390	7,166,574.686	2,513,936.864	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 218	7,170,202.686	2,514,275.767	739.582	7,169,107.892	2,513,891.870	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 219	7,171,349.144	2,514,314.867	685.785	7,170,254.174	2,513,930.965	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 220	7,172,653.234	2,514,304.806	688.187	7,171,558.066	2,513,920.905	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"
SCP 221	7,173,524.786	2,514,305.890	687.076	7,172,429.485	2,513,921.989	5/8" IRON ROD W/ PINK CAP "TXDOT CONTROL"

NOTES:
HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A COLLIN COUNTY SURFACE ADJUSTMENT OF 1.000152710(GRID X 1.000152710 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

GEOID 2018

LEGEND:
PRIMARY CONTROL POINT (PCP)
SECONDARY CONTROL POINT (SCP)
ASPHALT EDGE
OVERHEAD ELECTRIC
FENCE
RAILROAD TRACKS
BRIDGE
POWER POLE
CORNER
SIGN
FIRE HYDRANT
N.T.S = NOT TO SCALE

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS REGISTERED BRIAN KEITH KIDD 6494 PROFESSIONAL LAND SURVEYOR

BRIAN KEITH KIDD
RPLS NO. 6494
DATE: 6/15/2022

CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305

2022 © TEXAS DEPARTMENT OF TRANSPORTATION

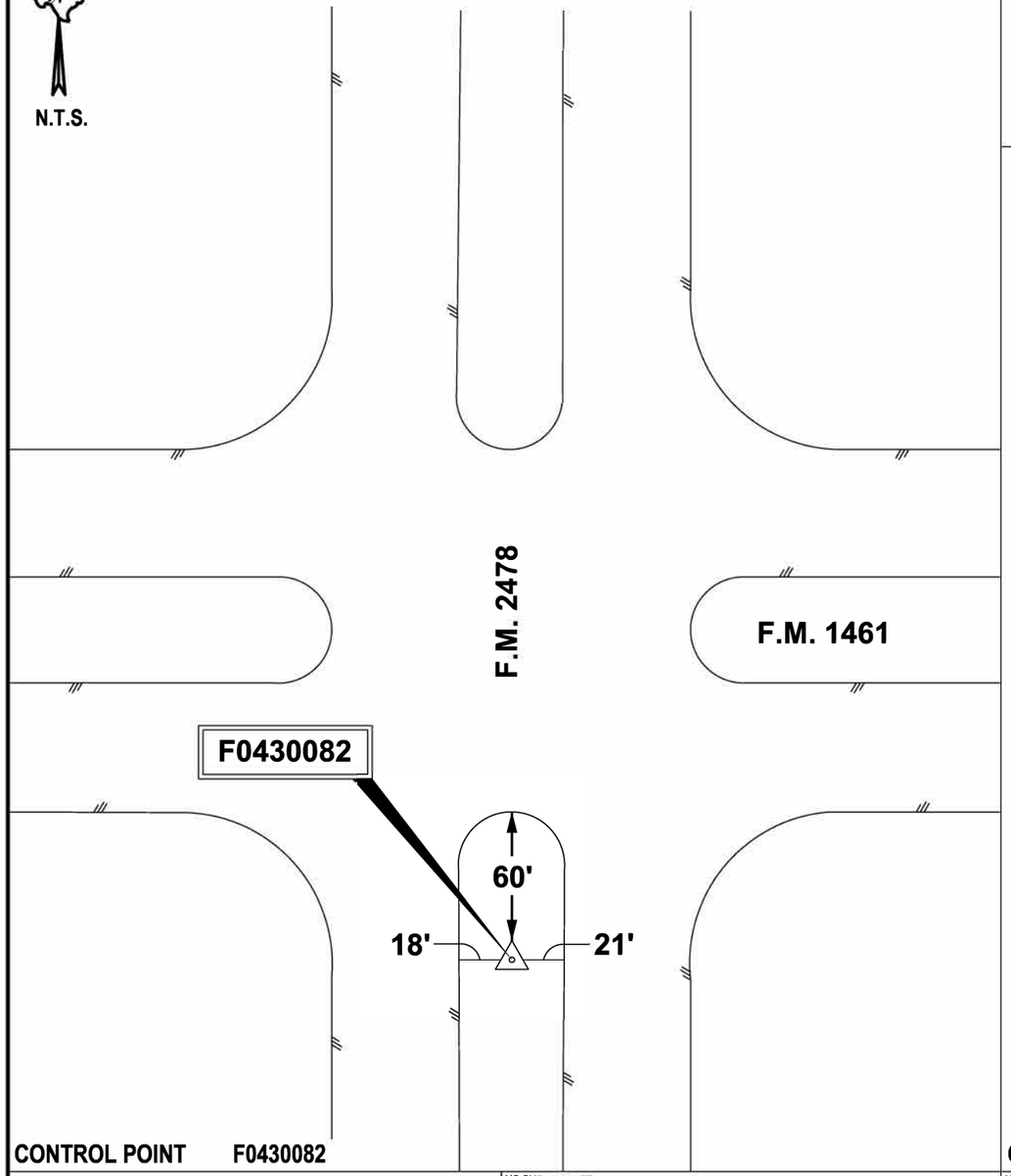
HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S. SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AND PROJECT NO.			HIGHWAY NO.
6	SEE TITLE SHEET			FM 2478
STATE	DIST.	COUNTY		SHEET NO.
TEXAS	DAL	COLLIN		17
CONTROL	SECTION	JOB	FUNCTION	
2351	02	017	160(150)	

GENERAL DESCRIPTION:
3.5" ALUMINUM TRIANGULATION DISK ON 5/8" IRON ROD SET IN CONCRETE STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL POINT F0430082"

N.T.S.



CONTROL POINT F0430082

ALUMINUM DISK NO. F0430082 ON 5/8" IRON ROD SET IN CONCRETE, FLUSH WITH GROUND. BEING LOCATED 115' +/- SOUTH OF THE INTERSECTION OF FM 1461 AND FM 2478 IN THE MEDIAN OF FM 2478. AND BEING FURTHER LOCATED 60' +/- SOUTH OF THE BACK OF CURB AT THE NOSE OF THE MEDIAN, 21' +/- WEST OF THE BACK OF THE EAST CURB OF SAID MEDIAN, AND 18' +/- EAST OF THE BACK OF THE WEST CURB OF SAID MEDIAN.

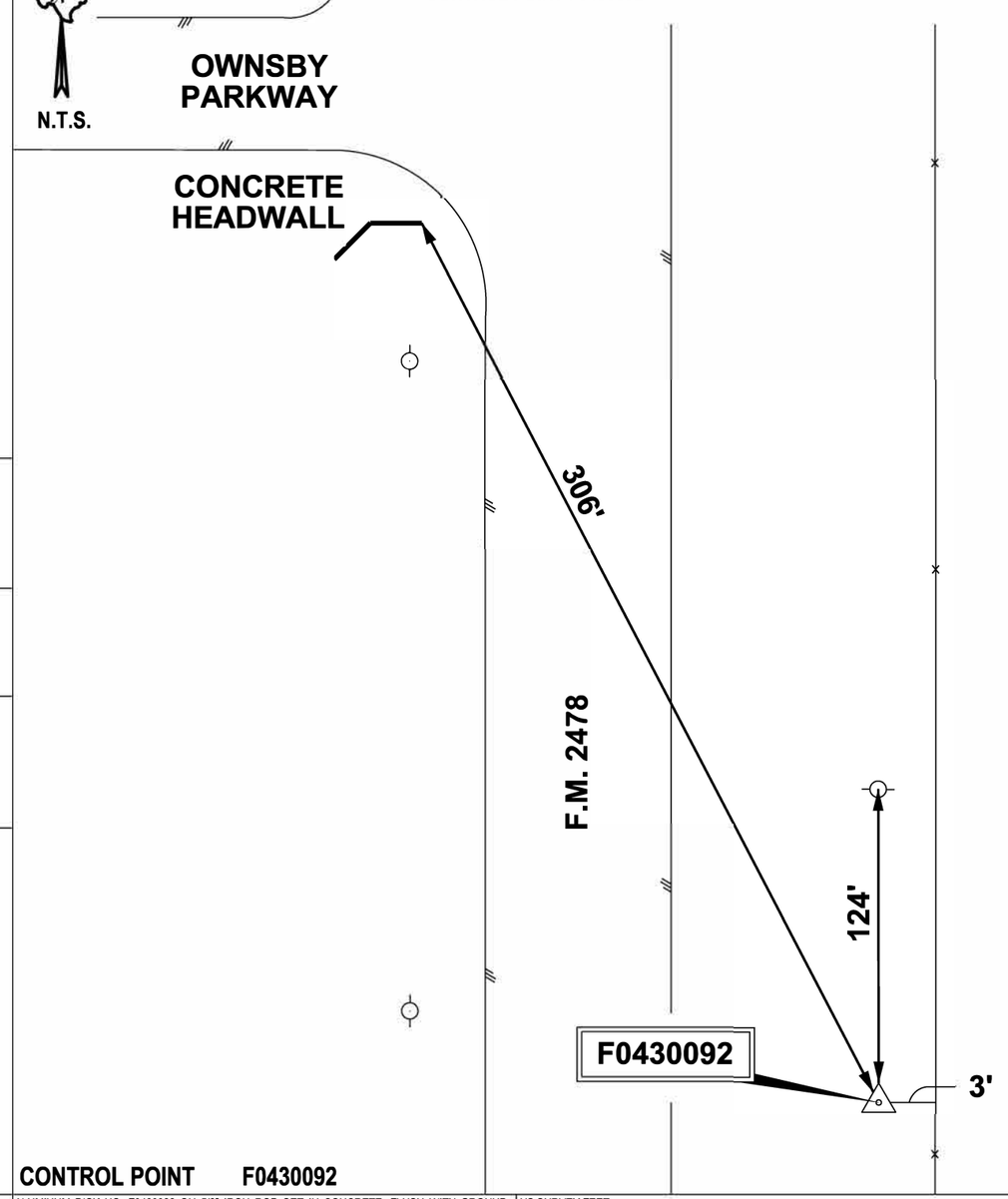
SURFACE NORTHING: 7,147,653.546
SURFACE EASTING: 2,509,766.787
ELEVATION: 760.195

US SURVEY FEET
DATE SET: MARCH 7, 2022
MONUMENT: 3.5" ALUMINUM TRIANGULATION DISK SET IN CONCRETE
COLLIN COUNTY SURFACE ADJUSTMENT FACTOR 1.000152710
ELEVATIONS ARE NAVD 88 BASED UPON GEOID 2018
TXDOT VRS NETWORK

GRID NORTHING: 7,146,562.194
GRID EASTING: 2,509,383.579

GENERAL DESCRIPTION:
3.5" ALUMINUM TRIANGULATION DISK ON 5/8" IRON ROD SET IN CONCRETE STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL POINT F0430092"

N.T.S.



CONTROL POINT F0430092

ALUMINUM DISK NO. F0430092 ON 5/8" IRON ROD SET IN CONCRETE, FLUSH WITH GROUND. BEING LOCATED ON THE EAST SIDE OF F.M. 2478, 350' +/- SOUTH OF THE INTERSECTION OF OWNSBY PARKWAY AND F.M. 2487, 306' SOUTHEAST OF THE SOUTHEAST END OF A WINGWALL OF AN OUTFALL LOCATED AT THE SOUTHWEST CORNER OF THE OWNSBY PARKWAY AND F.M. 2478 INTERSECTION, 124' +/- SOUTH OF A POWER POLE LOCATED EAST OF F.M. 2478, AND 3' +/- WEST OF A HOGWIRE FENCE .

SURFACE NORTHING:7,152,696.495
SURFACE EASTING: 2,509,825.001
ELEVATION: 756.77

US SURVEY FEET
DATE SET: MARCH 7, 2022
MONUMENT: 3.5" ALUMINUM TRIANGULATION DISK SET IN CONCRETE
COLLIN COUNTY SURFACE ADJUSTMENT FACTOR 1.000152710
ELEVATIONS ARE NAVD 88 BASED UPON GEOID 2018
TXDOT VRS NETWORK

GRID NORTHING: 7,151,604.373
GRID EASTING: 2,509,441.784

NOTES:
HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A COLLIN COUNTY SURFACE ADJUSTMENT OF 1.000152710(GRID X 1.000152710 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

GEOID 2018

LEGEND:
PRIMARY CONTROL POINT (PCP)
SECONDARY CONTROL POINT (SCP)
ASPHALT EDGE
OVERHEAD ELECTRIC
FENCE
RAILROAD TRACKS
BRIDGE
POWER POLE
CORNER
SIGN
FIRE HYDRANT
N.T.S = NOT TO SCALE

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS REGISTERED BRIAN KEITH KIDD 6494 PROFESSIONAL LAND SURVEYOR

BRIAN KEITH KIDD
RPLS NO. 6494
DATE: 6/15/2022

CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305

2022 © TEXAS DEPARTMENT OF TRANSPORTATION

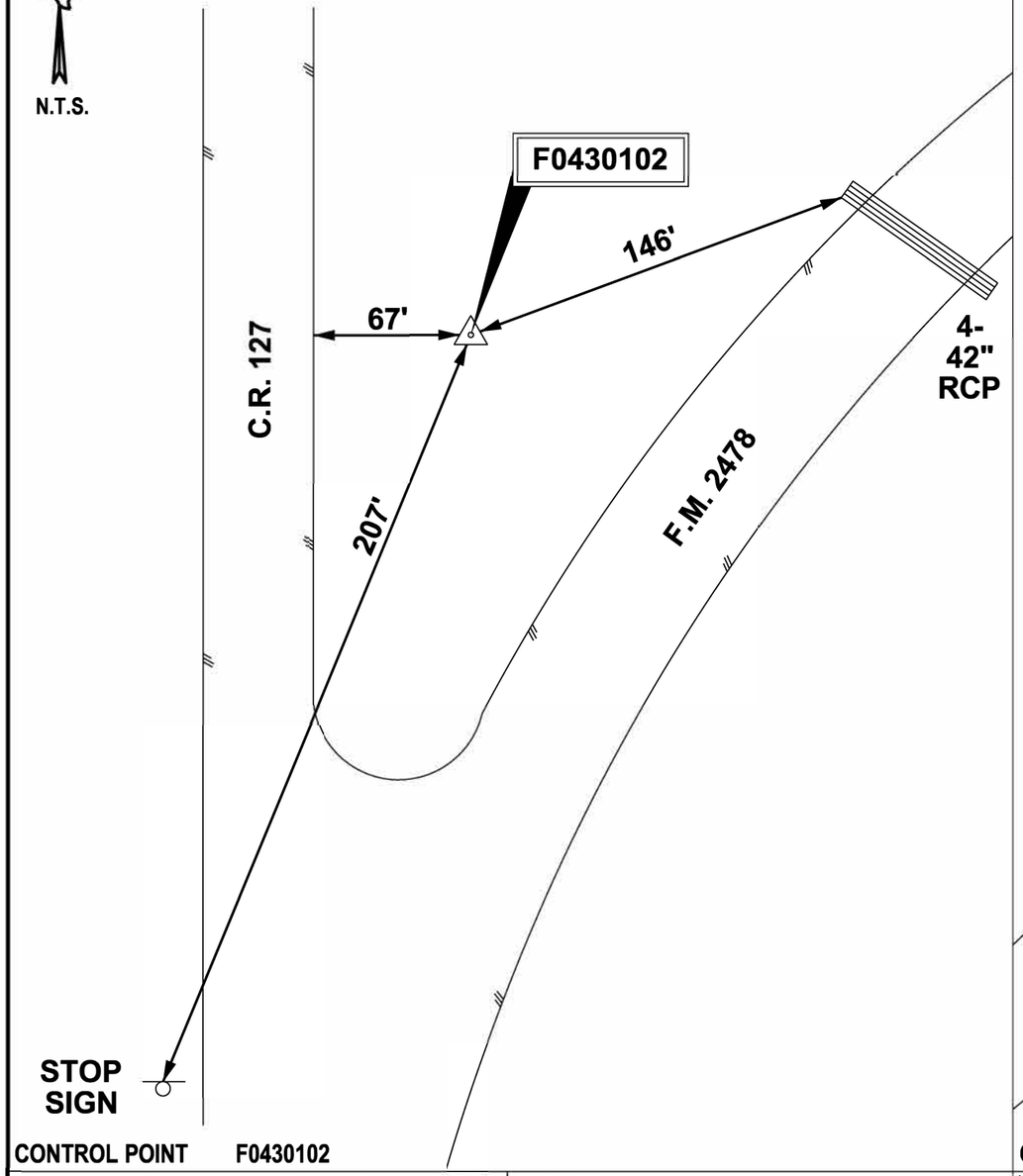
HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S. SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AND PROJECT NO.			HIGHWAY NO.
6	SEE TITLE SHEET			FM 2478
STATE	DIST.	COUNTY		SHEET NO.
TEXAS	DAL	COLLIN		18
CONTROL	SECTION	JOB	FUNCTION	
2351	02	017	160(150)	

GENERAL DESCRIPTION:
3.5" ALUMINUM TRIANGULATION DISK ON 5/8" IRON ROD SET IN CONCRETE STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL POINT F0430102"

N.T.S.



CONTROL POINT F0430102

ALUMINUM DISK NO. F0430102 ON 5/8" IRON ROD SET IN CONCRETE, FLUSH WITH GROUND. BEING 367' +/- NORTH OF THE FORK IN THE ROAD AT F.M. 2478 AND C.R. 127, AND SOUTH 93' +/- FROM THE INTERSECTION OF C.R. 127 AND STOVER CREEK. FURTHER BEING LOCATED 67' +/- EAST OF THE EDGE OF ASPHALT OF SAID C.R. 127, 207' +/- NORTHEAST OF A STOP SIGN LOCATED WEST OF THE INTERSECTION OF F.M. 2478 AND C.R. 127, AND 146' +/- SOUTHWEST OF THE SOUTHWESTERN-MOST FLOW-LINE OF FOUR 42" REINFORCED CONCRETE PIPES RUNNING ALONG STOVER CREEK UNDER F.M. 2478.

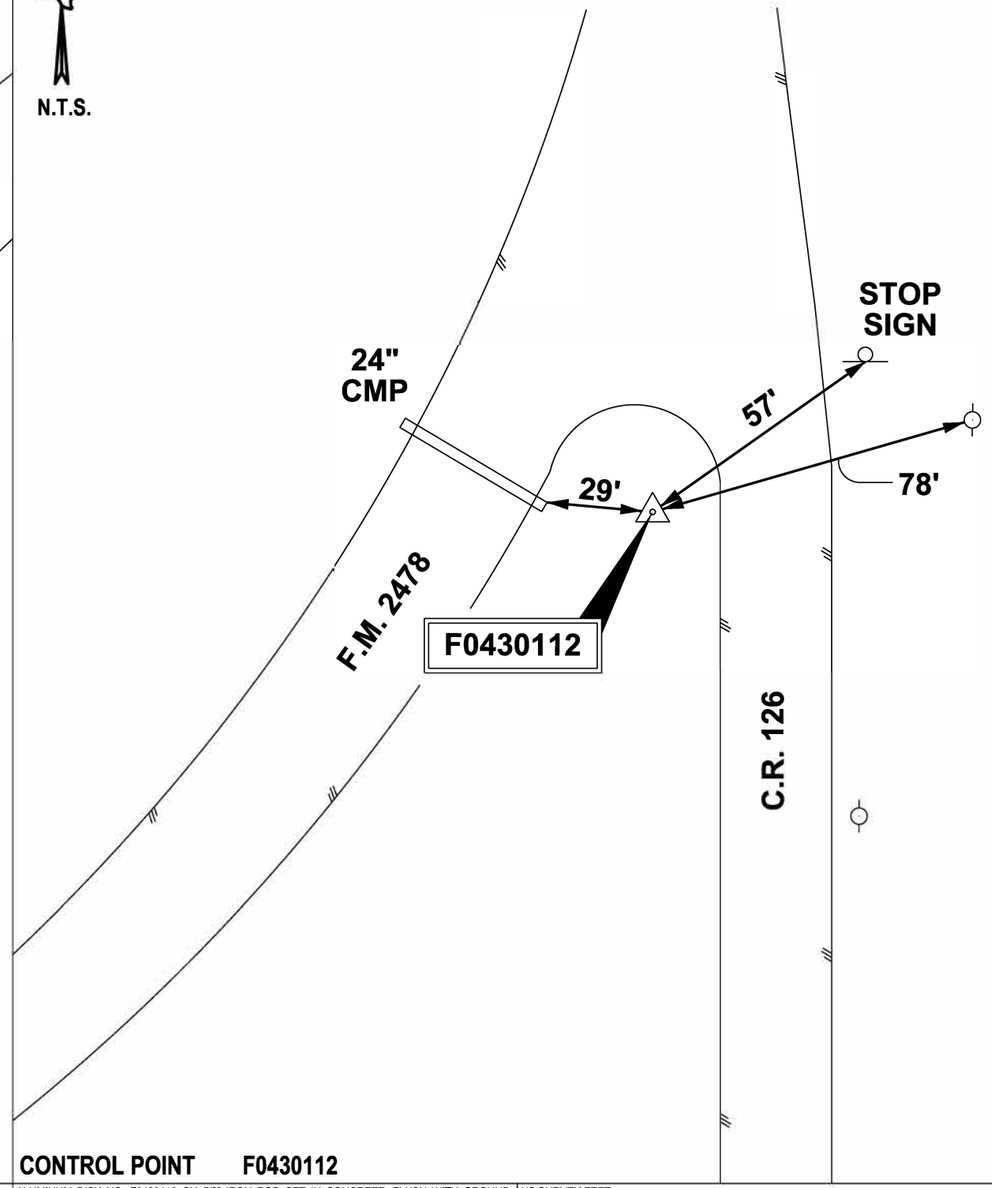
SURFACE NORTHING: 7,163,428.225
SURFACE EASTING: 2,509,221.600
ELEVATION: 769.65

US SURVEY FEET
DATE SET: MARCH 7, 2022
MONUMENT: 3.5" ALUMINUM TRIANGULATION DISK SET IN CONCRETE
COLLIN COUNTY SURFACE ADJUSTMENT FACTOR 1.000152710
ELEVATIONS ARE NAVD 88 BASED UPON GEOID 2018
TXDOT VRS NETWORK

GRID NORTHING: 7,162,334.465
GRID EASTING: 2,508,838.476

GENERAL DESCRIPTION:
3.5" ALUMINUM TRIANGULATION DISK ON 5/8" IRON ROD SET IN CONCRETE STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL POINT F0430112"

N.T.S.



CONTROL POINT F0430112

ALUMINUM DISK NO. F0430112 ON 5/8" IRON ROD SET IN CONCRETE, FLUSH WITH GROUND. BEING 800' +/- SOUTH OF THE INTERSECTION OF F.M. 2478 AND C.R. 126. AND SOUTH 22' +/- FROM THE EDGE OF ASPHALT OF THE FORK IN THE ROAD OF F.M. 2478 AND C.R. 126 AND BEING 29' +/- EAST OF THE SOUTHEAST END OF A 24" CORRUGATED METAL PIPE CROSSING UNDER F.M. 2478, AND 57' +/- SOUTHWEST FROM A STOP SIGN LOCATED ON THE EAST SIDE OF C.R. 126, AND 78' +/- WEST FROM A POWER POLE LOCATED ON THE EAST SIDE OF C.R. 126.

SURFACE NORTHING:7,164,263.462
SURFACE EASTING: 2,514,401.437
ELEVATION: 754.43

US SURVEY FEET
DATE SET: MARCH 7, 2022
MONUMENT: 3.5" ALUMINUM TRIANGULATION DISK SET IN CONCRETE
COLLIN COUNTY SURFACE ADJUSTMENT FACTOR 1.000152710
ELEVATIONS ARE NAVD 88 BASED UPON GEOID 2018
TXDOT VRS NETWORK

GRID NORTHING: 7,163,169.574
GRID EASTING: 2,514,017.521

NOTES:
HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A COLLIN COUNTY SURFACE ADJUSTMENT OF 1.000152710(GRID X 1.000152710 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

GEOID 2018

LEGEND:
PRIMARY CONTROL POINT (PCP)
SECONDARY CONTROL POINT (SCP)
ASPHALT EDGE
OVERHEAD ELECTRIC
FENCE
RAILROAD TRACKS
BRIDGE
POWER POLE
CORNER
SIGN
FIRE HYDRANT
N.T.S = NOT TO SCALE

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS REGISTERED BRIAN KEITH KIDD 6494 PROFESSIONAL LAND SURVEYOR

BRIAN KEITH KIDD
RPLS NO. 6494
DATE: 6/15/2022

CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305

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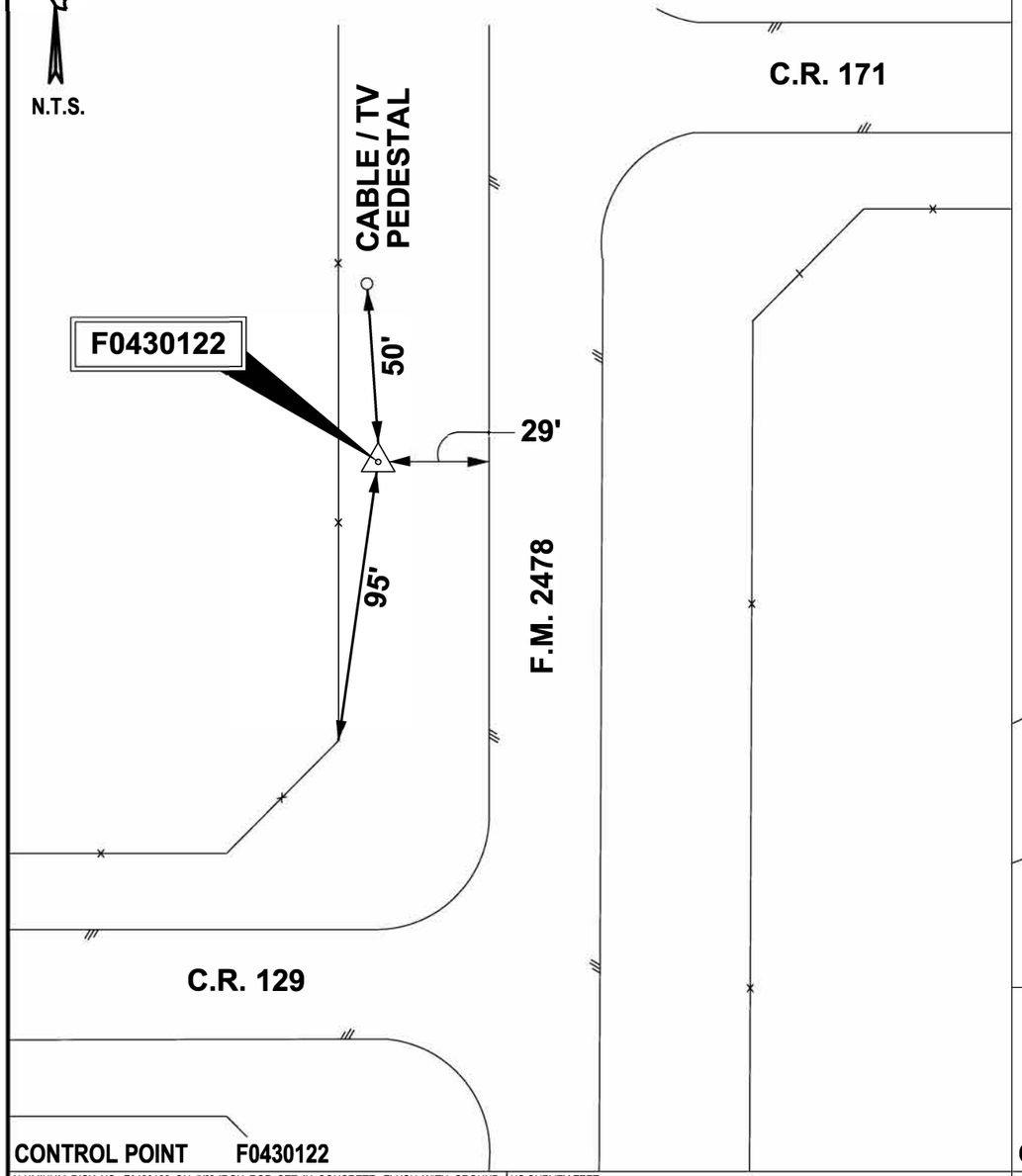
HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S. SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL AND PROJECT NO.			HIGHWAY NO.
6	SEE TITLE SHEET			FM 2478
STATE	DIST.	COUNTY		SHEET NO.
TEXAS	DAL	COLLIN		
CONTROL	SECTION	JOB	FUNCTION	19
2351	02	017	160(150)	

GENERAL DESCRIPTION:
3.5" ALUMINUM TRIANGULATION DISK ON 5/8" IRON ROD SET IN CONCRETE STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL POINT F0430122"

N.T.S.



CONTROL POINT F0430122

ALUMINUM DISK NO. F0430122 ON 5/8" IRON ROD SET IN CONCRETE, FLUSH WITH GROUND. BEING 130' +/- NORTH OF THE INTERSECTION OF F.M. 2478 AND C.R. 129, AND SOUTH 110' +/- SOUTH OF C.R. 171, AND BEING LOCATED 29' +/- WEST OF THE WEST EDGE OF ASPHALT OF F.M. 2478, 50' +/- SOUTH OF A CABLE/TV PEDESTAL, AND 95' +/- NORTHEAST OF A FENCE CORNER POST AT THE NORTHEAST END OF A CORNER CLIP LOCATED AT THE NORTHWEST CORNER OF THE INTERSECTION OF F.M. 2478 AND C.R. 129.

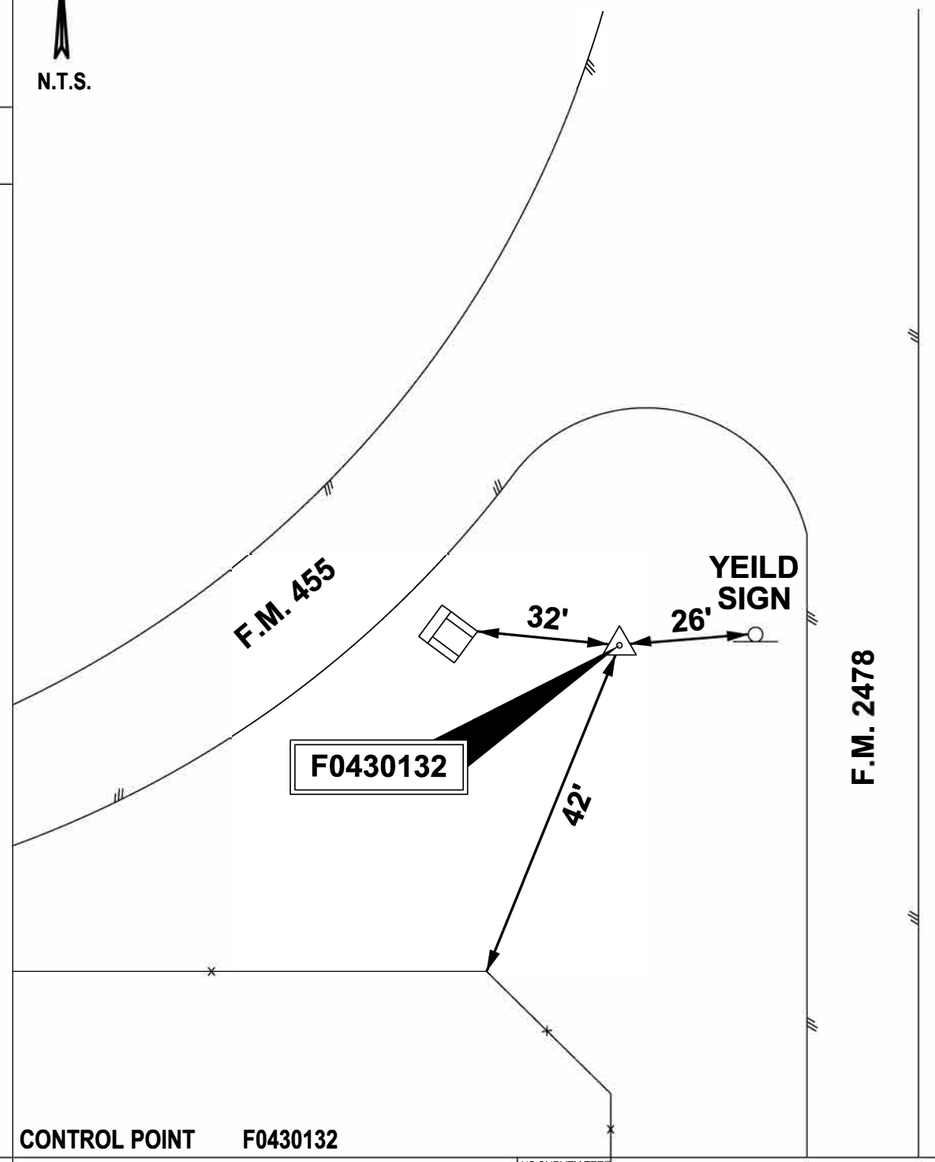
SURFACE NORTHING: 7,168,900.636
SURFACE EASTING: 2,514,298.822
ELEVATION: 738.63

US SURVEY FEET
DATE SET: MARCH 7, 2017
MONUMENT: 3.5" ALUMINUM TRIANGULATION DISK SET IN CONCRETE
COLLIN COUNTY SURFACE ADJUSTMENT FACTOR 1.000152710
ELEVATIONS ARE NAVD 88 BASED UPON GEOID 2018
TXDOT VRS NETWORK

GRID NORTHING: 7,167,806.040
GRID EASTING: 2,513,914.922

GENERAL DESCRIPTION:
3.5" ALUMINUM TRIANGULATION DISK ON 5/8" IRON ROD SET IN CONCRETE STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL POINT F0430092"

N.T.S.



CONTROL POINT F0430132

ALUMINUM DISK NO. F0430132 ON 5/8" IRON ROD SET IN CONCRETE, FLUSH WITH GROUND, BEING 30' +/- SOUTH OF THE EDGE OF ASPHALT OF THE INTERSECTION OF F.M. 455 AND F.M. 2478. BEING FURTHER LOCATED 32' +/- EAST OF THE EAST CORNER OF A WINGWALL ATTACHED TO A HEADWALL, 26' +/- WEST OF A YEILD SIGN LOCATED ON THE WEST SIDE OF F.M. 2478, AND 42' +/- NORTHEAST FROM A FENCE CORNER POST.

SURFACE NORTHING:7,174,463.262
SURFACE EASTING: 2,514,305.627
ELEVATION: 713.29

US SURVEY FEET
DATE SET: MARCH 7, 2017
MONUMENT: 3.5" ALUMINUM TRIANGULATION DISK SET IN CONCRETE
COLLINCOUNTY SURFACE ADJUSTMENT FACTOR 1.000152710
ELEVATIONS ARE NAVD 88 BASED UPON GEOID 2018
TXDOT VRS NETWORK

GRID NORTHING: 7,173,367.817
GRID EASTING: 2,513,921.726

NOTES:
HORIZONTAL COORDINATES SHOWN ARE IN U.S. SURVEY FEET, AND ARE BASED UPON THE TEXAS COORDINATE SYSTEM OF 1983 (NAD83 STATE PLANE), TEXAS NORTH CENTRAL ZONE 4202, WITH A COLLIN COUNTY SURFACE ADJUSTMENT OF 1.000152710(GRID X 1.000152710 = SURFACE COORDINATES) VALUES WERE DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

ELEVATIONS ARE BASED UPON NAVD88 DATUM DERIVED FROM UTILIZING THE STATE VIRTUAL REFERENCE NETWORK IN MARCH 2022.

GEOID 2018

LEGEND:
PRIMARY CONTROL POINT (PCP)
SECONDARY CONTROL POINT (SCP)
ASPHALT EDGE
OVERHEAD ELECTRIC
FENCE
RAILROAD TRACKS
BRIDGE
POWER POLE
CORNER
SIGN
FIRE HYDRANT
N.T.S = NOT TO SCALE

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE VRS GPS OBSERVATIONS IN MARCH 2022 AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS REGISTERED BRIAN KEITH KIDD 6494 PROFESSIONAL LAND SURVEYOR

BRIAN KEITH KIDD
RPLS NO. 6494
DATE: 6/15/2022

CP&Y an STV Company
TEXAS REGISTERED ENGINEERING FIRM F-1741
SURVEY FIRM 10194305

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HORIZONTAL AND VERTICAL CONTROL

SCALE:N.T.S. SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL AND PROJECT NO.			HIGHWAY NO.
6	SEE TITLE SHEET			FM 2478
STATE	DIST.	COUNTY		SHEET NO.
TEXAS	DAL	COLLIN		20
CONTROL	SECTION	JOB	FUNCTION	
2351	02	017	160(150)	

DW: | CE: | DW: | CE:

GENERAL SEQUENCE OF WORK:

1.) ERECT PROJECT LIMIT AND ADVANCE WARNING SIGNS AS SHOWN IN THE 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 DISTURBANCE IS EXPECTED TO OCCUR WITHIN TWO WEEKS.

3.) USING DAILY LANE CLOSURES, CUT/RESTORE CULVERT REPLACEMENTS. BLADE EDGES. (SEE CULVERT EXTENSION TYPICAL SECTIONS FOR PHASING). CONCURRENTLY, CONSTRUCT DRIVEWAY CULVERTS FOR THE ENTIRE LENGTH OF THE PROJECT.

4.) 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.

5.) NOTCH DOWN BESIDE EXISTING PAVEMENT AND CONSTRUCT SUBGRADE WIDENING (8" SP-B PG 64-22). CONCURRENTLY, CONSTRUCT FLEXIBLE PAVEMENT REPAIR AS DIRECTED BY THE ENGINEER FOR THE ENTIRE LENGTH OF PROJECT.

6.) MILL 2" OF THE EXISTING PAVEMENT AND OVERLAY 2" (SP-C SAC-B PG 64-22) FOR THE PROPOSED FULL WIDTH OF THE ROAD (UP TO 1 MILE 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.

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

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

9.) ESTABLISH PERMANENT VEGETATIVE COVER.

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

11.) 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.

5.) TEMPORARY SW3P EROSION CONTROL MEASURES SHALL ONLY BE PLACED IN AREAS WHERE SOIL DISTURBANCE OR POTENTIAL POLLUTANT-GENERATING ACTIVITIES ARE EXPECTED TO OCCURE WITHIN TWO WEEKS.

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

7.) KEEP ALL DRIVEWAYS OPEN DURING CONSTRUCTION IN ALL PHASES.

8.) ALL TCP DEVICES AND SIGNS SHOWN ON TCP PLAN ARE CONSIDERED MINIMUM, ADDITIONAL DEVICES AND SIGNS MAY BE NECESSARY AND SUBSIDIARY TO ITEM 502.

9.) ALL TRAFFIC CONTROL SHALL CONFORM TO THE TEXAS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES, ALL APPLICABLE TXDOT STANDARDS AND AS DIRECTED BY ENGINEER.

10.) PAVEMENT EDGE DROP-OFFS STEEPER THAN 3:1 WILL NOT BE ALLOWED TO REMAIN AFTER WORK SHIFT. USE SUITABLE MATERIAL TO FORM 3:1 SLOPE OR FLATTER.

11.) MAINTAIN POSITIVE DRAINAGE AT ALL TIMES.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

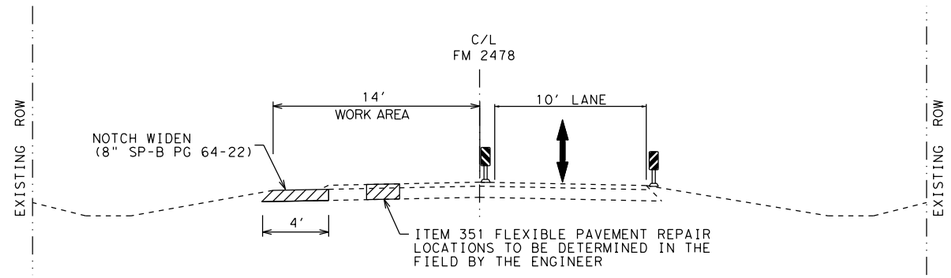
Texas Department of Transportation

FM 2478

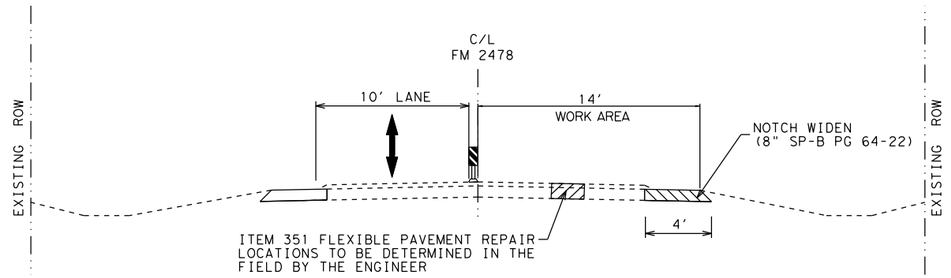
TRAFFIC CONTROL PLAN
SEQUENCE OF WORK & GENERAL NOTES

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		21

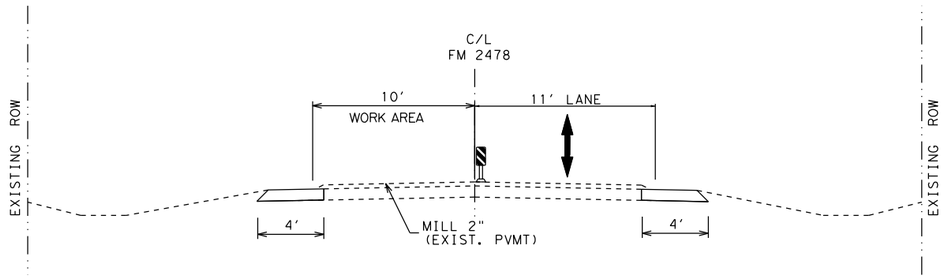
DATE: 4/29/2023 10:08:01 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/2. TCP/SEQUENCE OF WORK.dgn



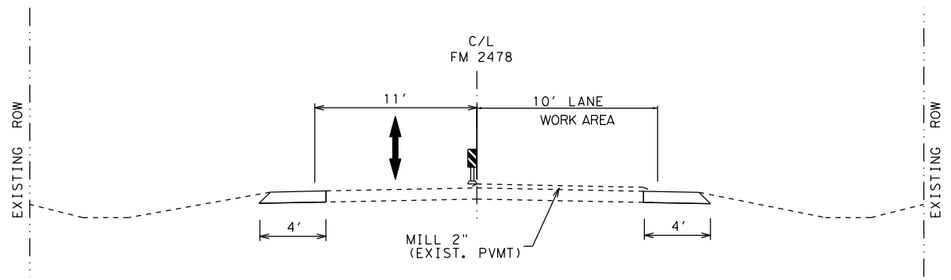
STEP 1
CONSTRUCTION OPERATION PRESENT



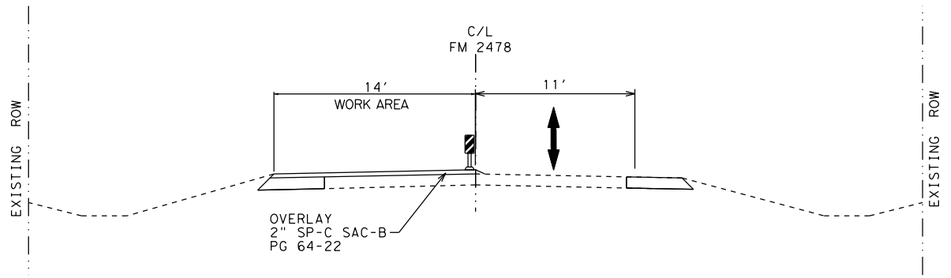
STEP 1A
CONSTRUCTION OPERATION PRESENT



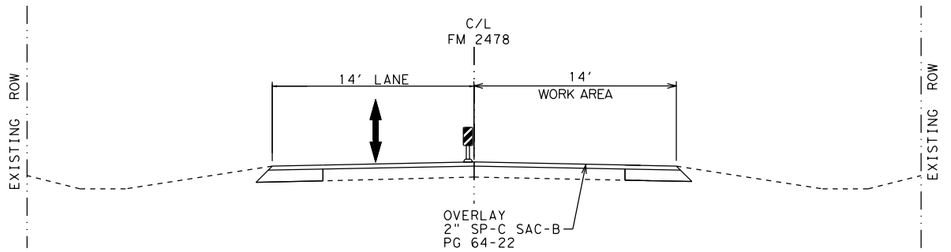
STEP 2
CONSTRUCTION OPERATION PRESENT



STEP 2A
CONSTRUCTION OPERATION PRESENT



STEP 3
CONSTRUCTION OPERATION PRESENT



STEP 3A
CONSTRUCTION OPERATION PRESENT

VERTICAL PANEL

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.
3. WHERE FEASIBLE, TEMPORARY BARRIERS WILL NEED TO BE PLACED WITH THE PREFERRED 2′ OFFSET FROM TRAFFIC LANE EDGE TO PROVIDE SHY DISTANCE AND BETTER OPERATIONS.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

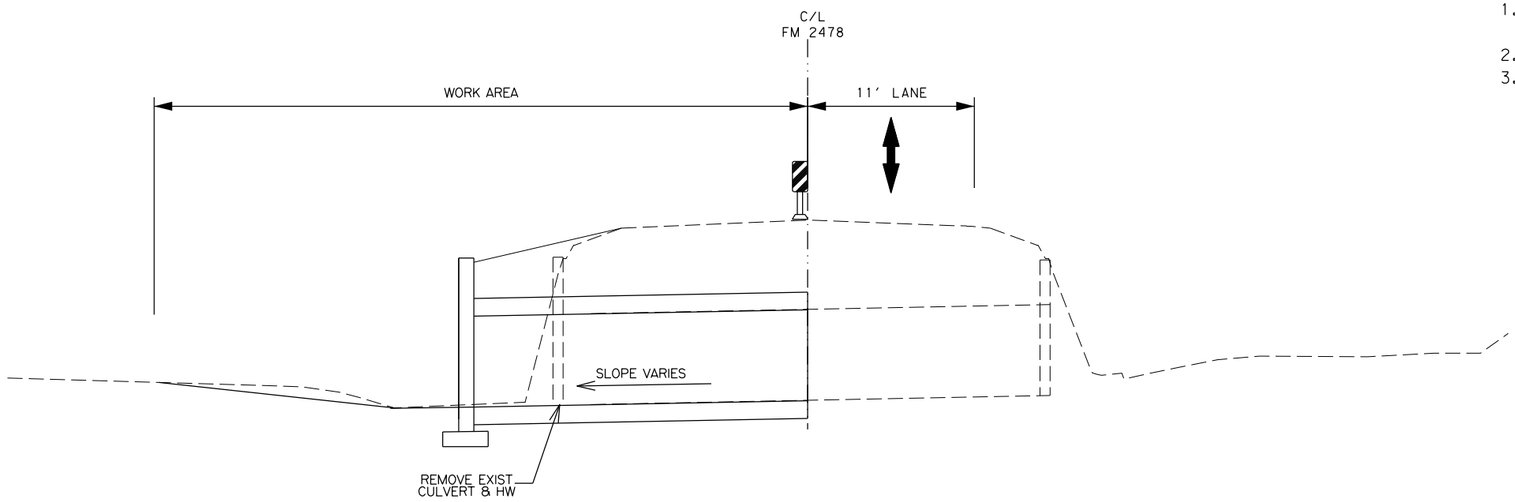
FM 2478

TRAFFIC CONTROL PLAN
TYPICAL SECTIONS

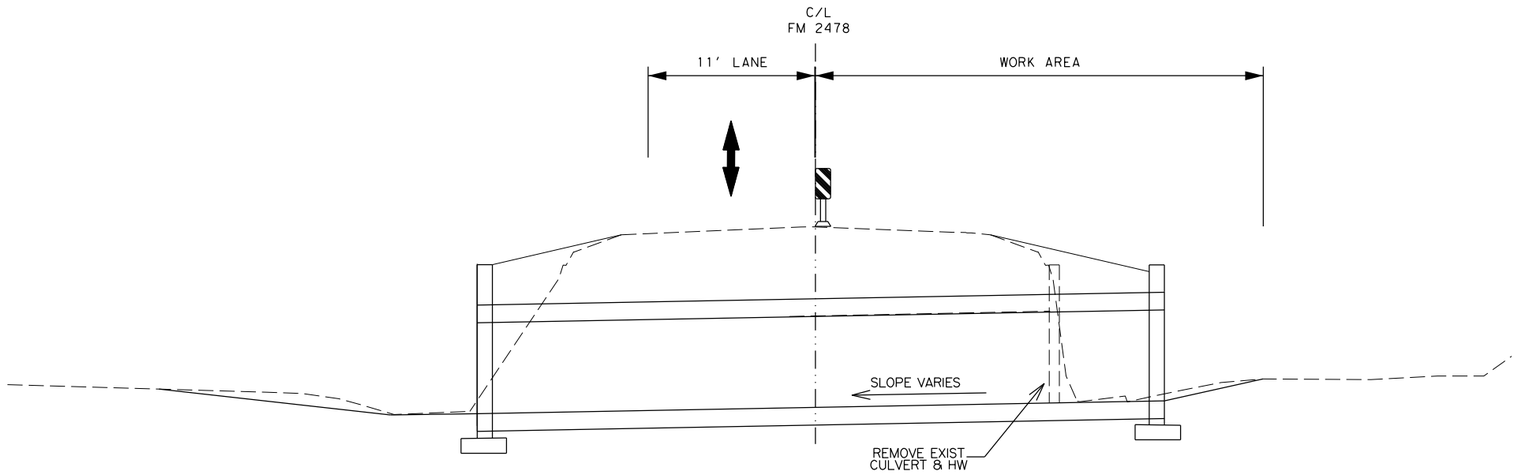
CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		22

DW: DW: DW: CK:

DATE: 4/29/2023 10:08:21 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/2. TCP/TCP Typical Sections.dgn



CULVERT REPLACEMENT
PHASE 1



CULVERT REPLACEMENT
PHASE 2

VERTICAL PANEL

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.
3. WHERE FEASIBLE, TEMPORARY BARRIES WILL NEED TO BE PLACED WITH THE PREFERRED 2' OFFSET FROM TRAFFIC LANE EDGE TO PROVIDE SHY DISTANCE AND BETTER OPERAIONS.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

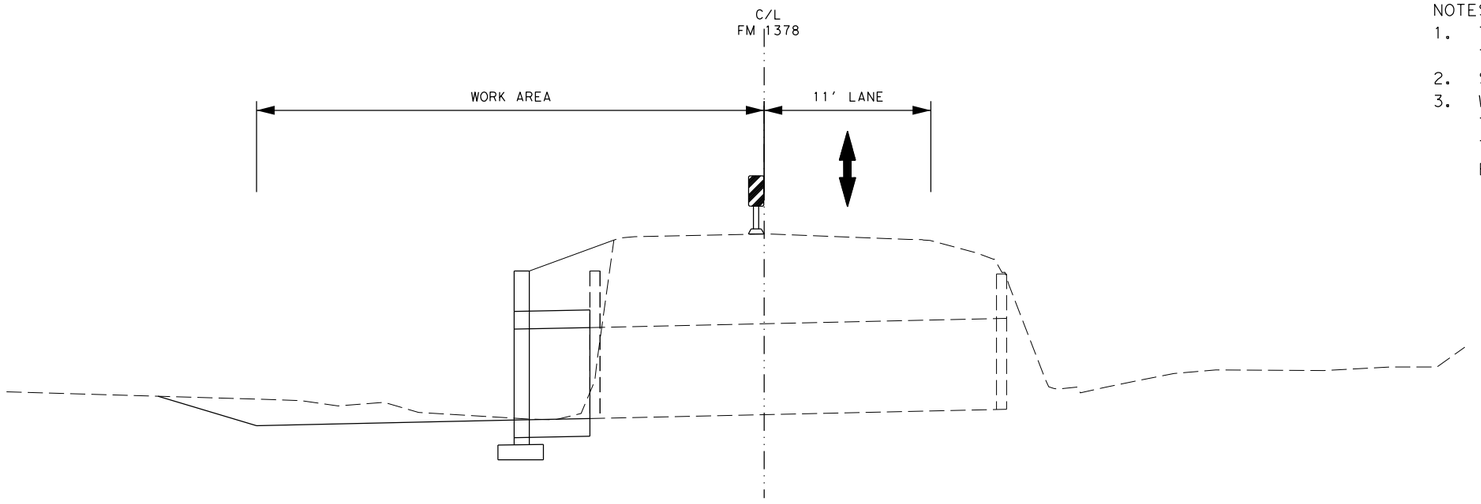
FM 2478

TRAFFIC CONTROL PLAN
CULVERT REPLACEMENT
TYPICAL SECTIONS

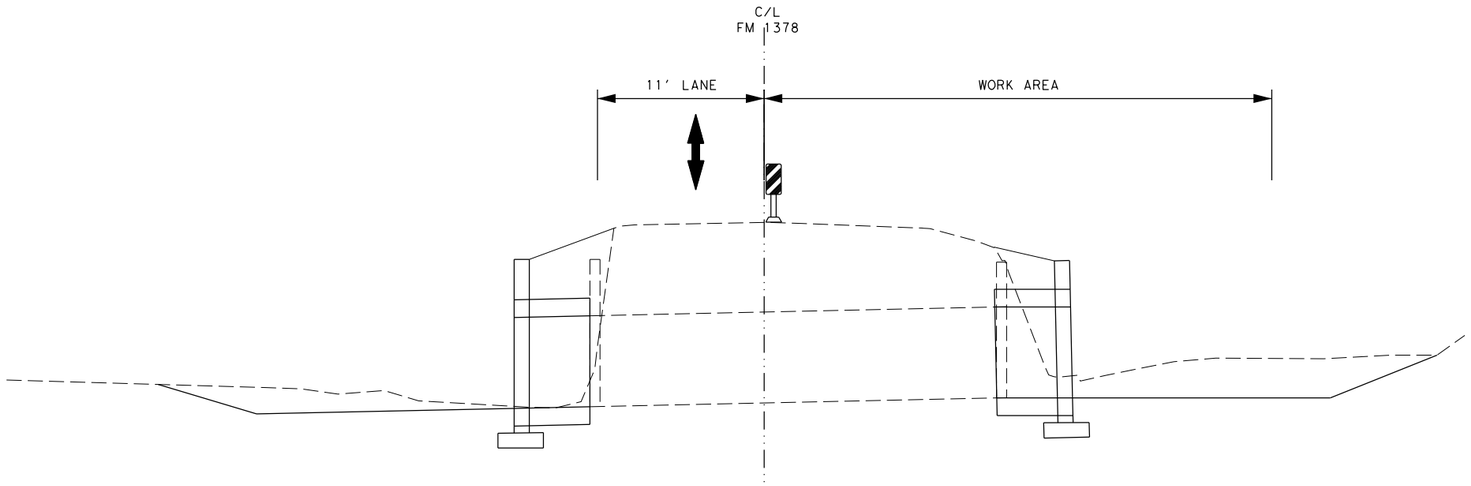
CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		23

DW: CK: DW: CK:

DATE: 4/29/2023 10:08:40 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020017/4 - Design/Plan Set/2. TCP/Culvert Replacement Typical Sections.dgn



CULVERT EXTENSION
PHASE 1



CULVERT EXTENSION
PHASE 2

VERTICAL PANEL

NOTES:
1. TWO WAY TRAFFIC SHALL BE ESTABLISHED AT THE END OF EACH WORK DAY.
2. SEE CULVERT LAYOUTS FOR ADDITIONAL DETAIL.
3. WHERE FEASIBLE, TEMPORARY BARRIES WILL NEED TO BE PLACED WITH THE PREFERRED 2' OFFSET FROM TRAFFIC LANE EDGE TO PROVIDE SHY DISTANCE AND BETTER OPERAIONS.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

TRAFFIC CONTROL PLAN
CULVERT EXTENSION
TYPICAL SECTIONS

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		24

DW: CK: DW: CK:

DATE: 4/29/2023 10:09:01 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020017/4 - Design/Plan Set/2. TCP/Culvert Extension1 Typical Sections.dgn

CK:
DW:
CK:
DW:

WORKZONE CRASH CUSHIONS

ROADWAY SHEET LOCATION NUMBER	TCP PHASE	LOCATION	STA.	TEST LEVEL	DIRECTION OF TRAFFIC (UNI/BI)	FOUNDATION PAD		BACKUP SUPPORT			AVAILABLE SITE LENGTH	CRASH CUSHION ATTENUATOR CLASS									
						MATERIAL	THICKNESS	DESCRIPTION	WIDTH	HEIGHT				MOVE / RESET		L	L	R	R	S	S
												INSTALL	REMOVE	MOVE/RESET	FROM LOC. #	N	W	N	W	N	W
1. SHEET 5 OF 13	PH 1	FM 2478	107+23.00, 17' RT	TL-3	UNI	SEE STD		PRECAST TRAFFIC BARRIER	24"	32"	35'	1	1							X	
2. SHEET 5 OF 13	PH 1	FM 2478	108+19.00, 81' RT	TL-3	UNI	SEE STD		PRECAST TRAFFIC BARRIER	24"	32"	35'	1	1							X	
3. SHEET 5 OF 13	PH 1	FM 2478	108+38.00, 76' LT	TL-3	UNI	SEE STD		PRECAST TRAFFIC BARRIER	24"	32"	35'	1	1							X	
4. SHEET 5 OF 13	PH 1	FM 2478	109+14.00, 17' LT	TL-3	UNI	SEE STD		PRECAST TRAFFIC BARRIER	24"	32"	35'	1	1							X	
											TOTAL	4	4								

LEGEND:

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

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023

,P.E.
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

CRASH CUSHION SUMMARY

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		25

DATE: 5/8/2023 11:55:01 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/2. TCP/Crash Cushion Summary.dgn

DATE: 4/29/2023 10:10:31 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/2. TCP/Standards/bc-21.dgn

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	2351	02	017	FM 2478
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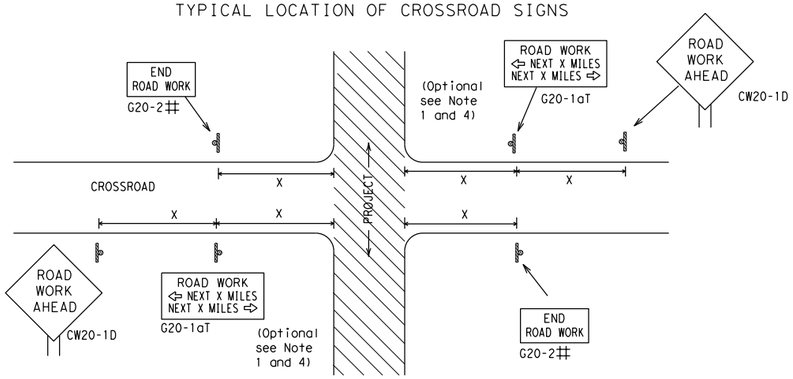
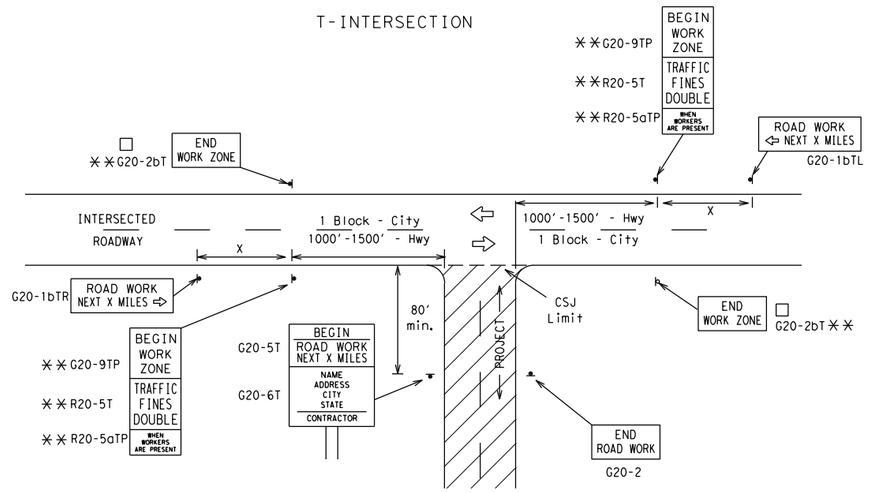
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE			SPACING	
Sign Number or Series	Conventional Road	Expressway/ Freeway	Posted Speed	Sign △ Spacing "X"
			MPH	Feet (Apprx.)
CW20[4] CW21 CW22 CW23 CW25	48" x 48"	48" x 48"	30	120
			35	160
			40	240
			45	320
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	50	400
			55	500[2]
			60	600[2]
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	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.

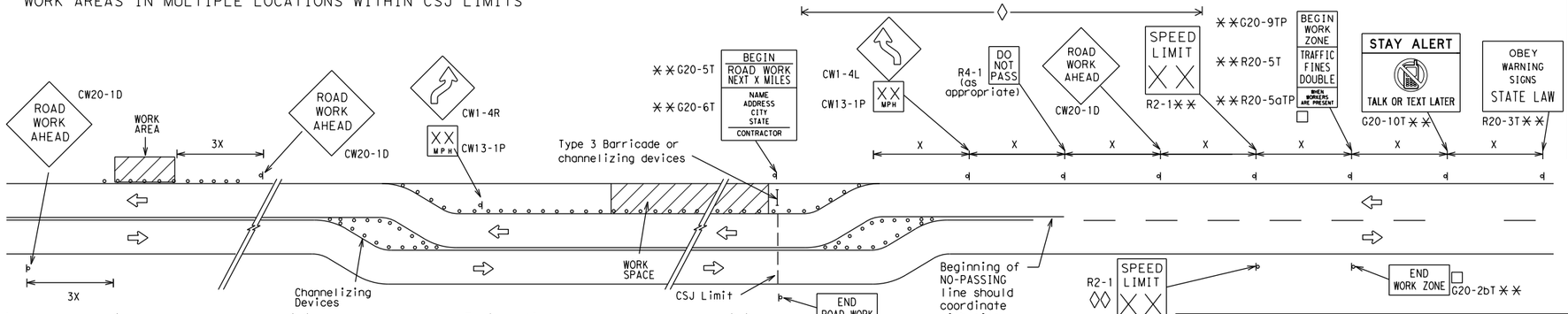
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

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.

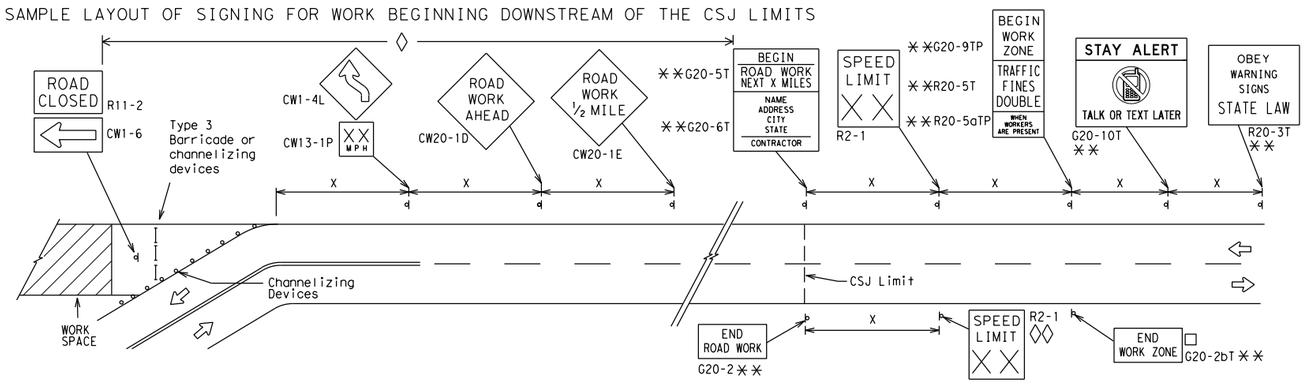
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

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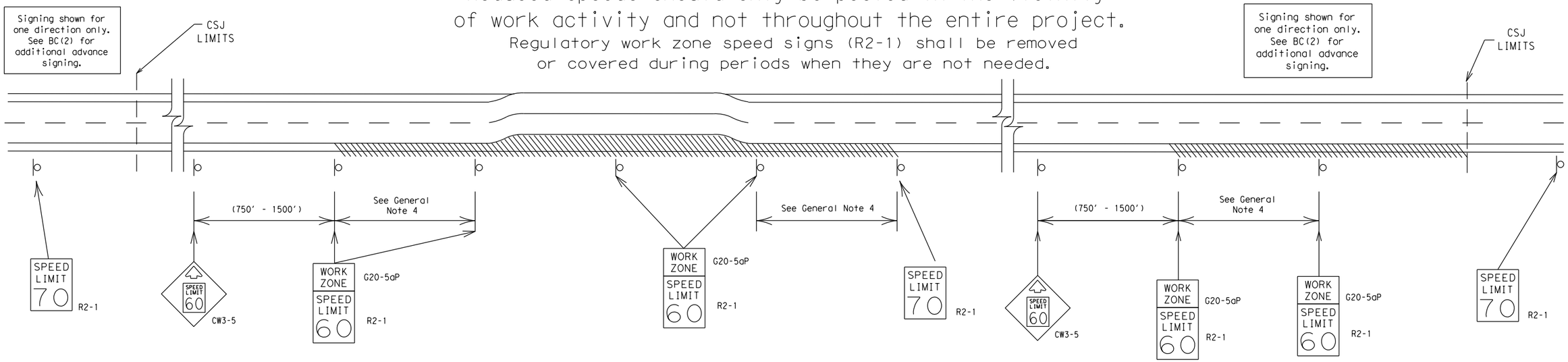
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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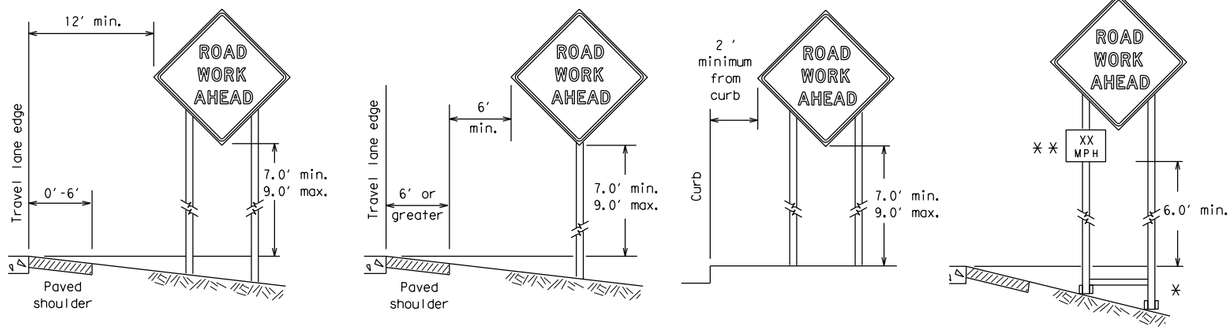
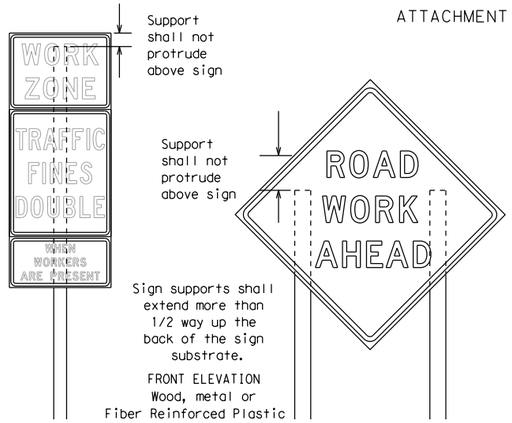
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

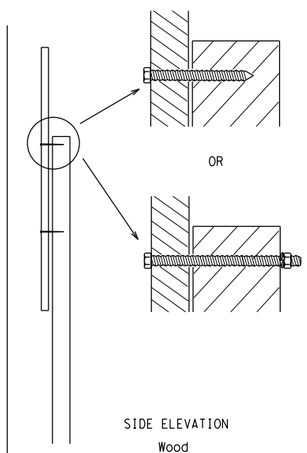


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





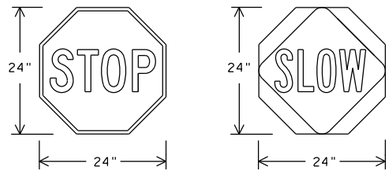
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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REVISIONS	2351	02	017	FM 2478
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		29

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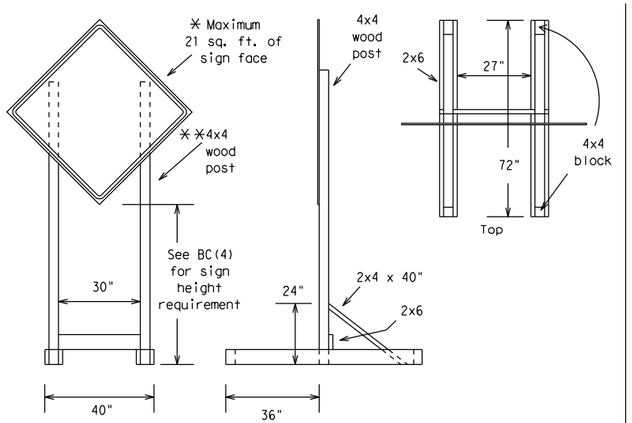
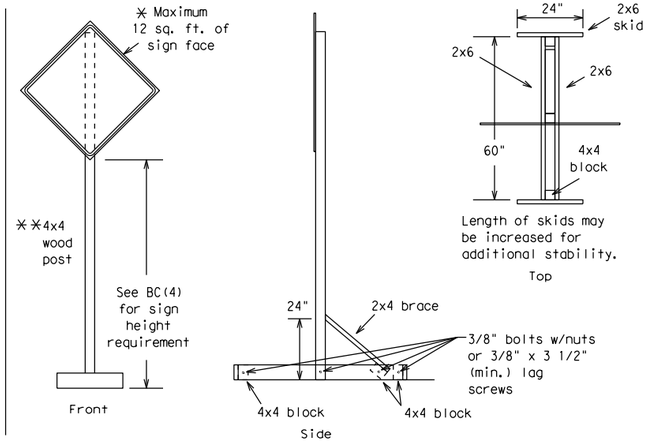
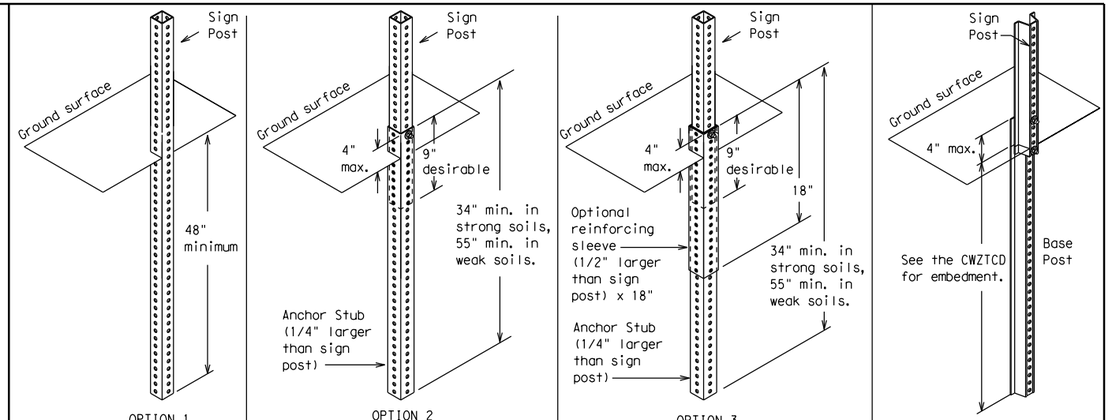




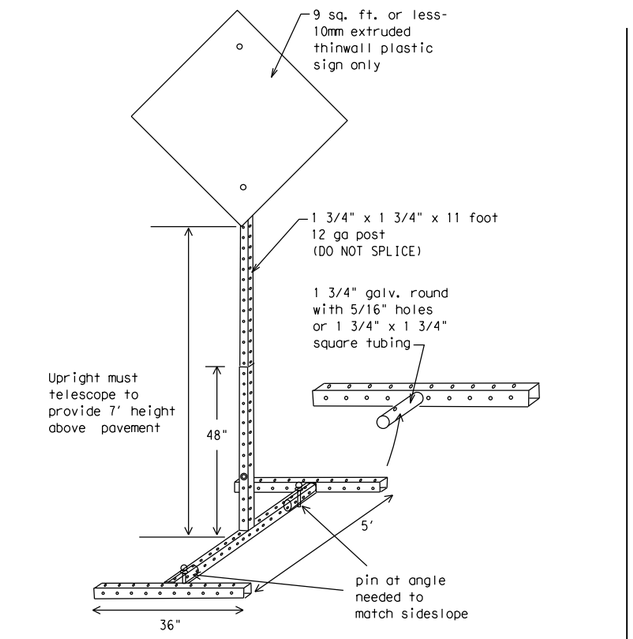
SKID MOUNTED WOOD SIGN SUPPORTS

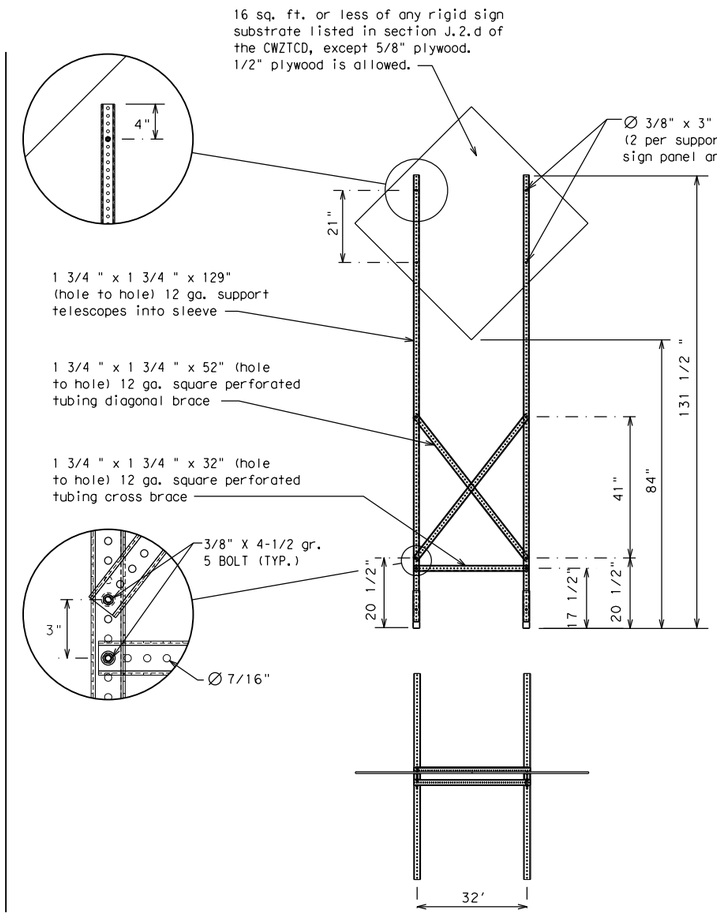
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

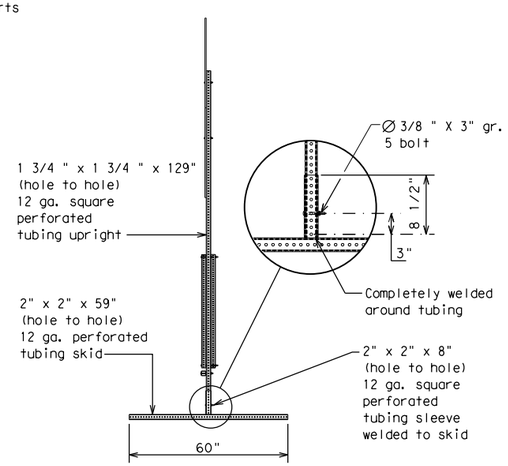


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		30

DATE: 4/29/2023 10:10:38 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/2. TCP/Standards/bc-21.dgn

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

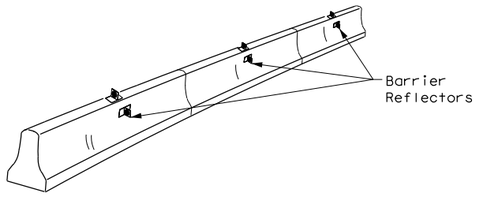
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		31

100

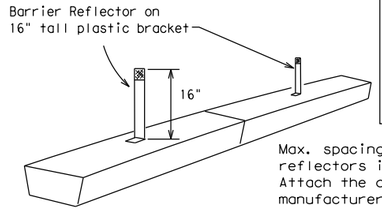
DATE: 4/29/2023 10:10:40 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102/17/4 - Design/Plan Set/2. TCP/Standards/bc-21.dgn

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.

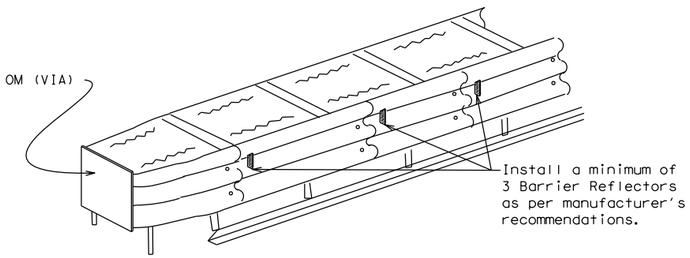


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

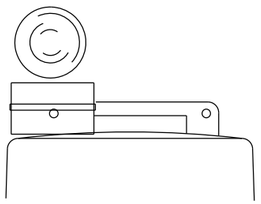


DELINEATION OF END TREATMENTS

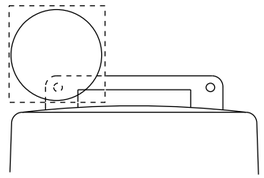
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

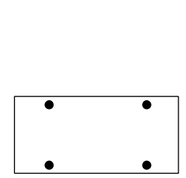
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

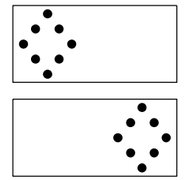
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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

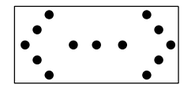


4 CORNER CAUTION

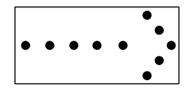
OR



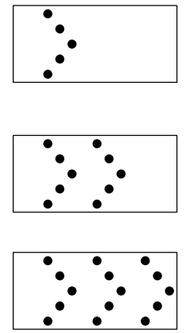
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



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



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

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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		32

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

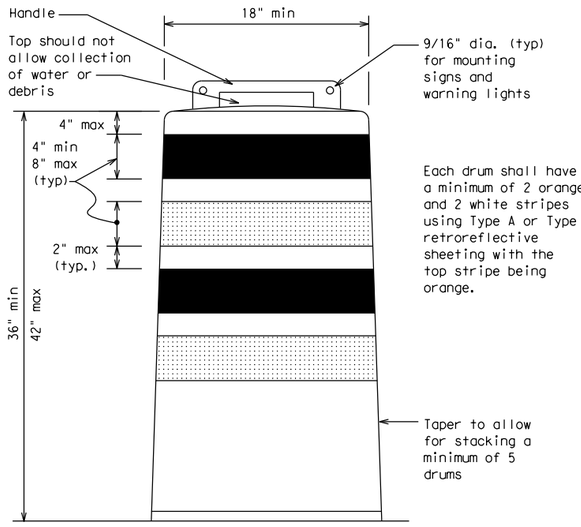
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

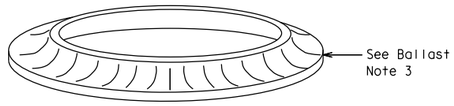
RETROREFLECTIVE SHEETING

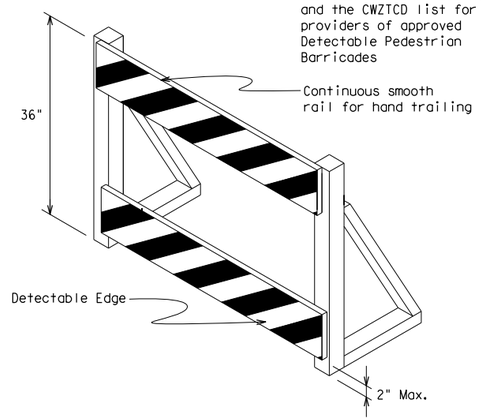
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

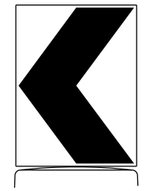




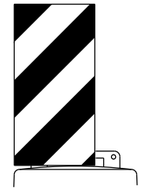


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

.

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	DAL	COLLIN		33
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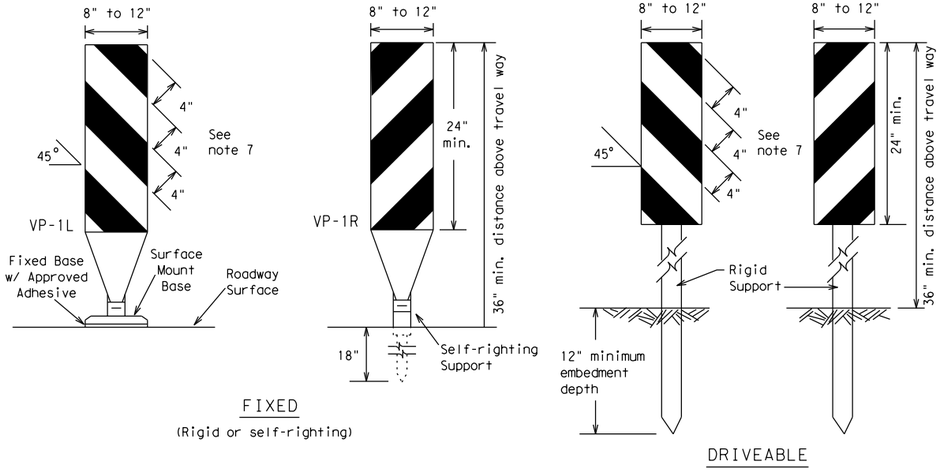
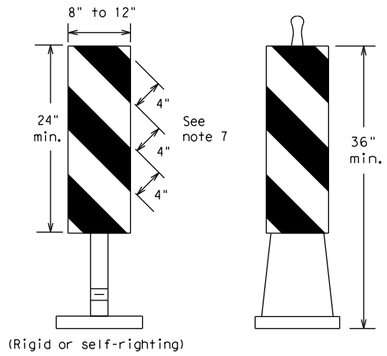


FIXED

(Rigid or self-righting)

DRIVEABLE

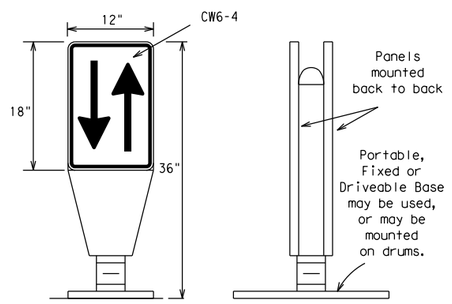


(Rigid or self-righting)

PORTABLE

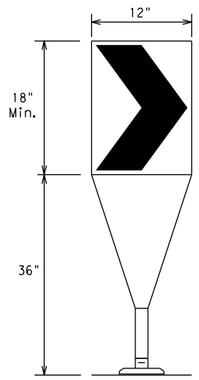
VERTICAL PANELS (VPs)

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



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

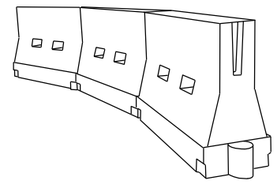
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



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

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

CHEVRONS



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

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.

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

SHEET 9 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	2351	02	017	FM 2478
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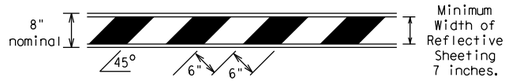
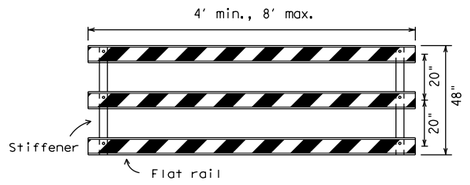
TYPE 3 BARRICADES

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.



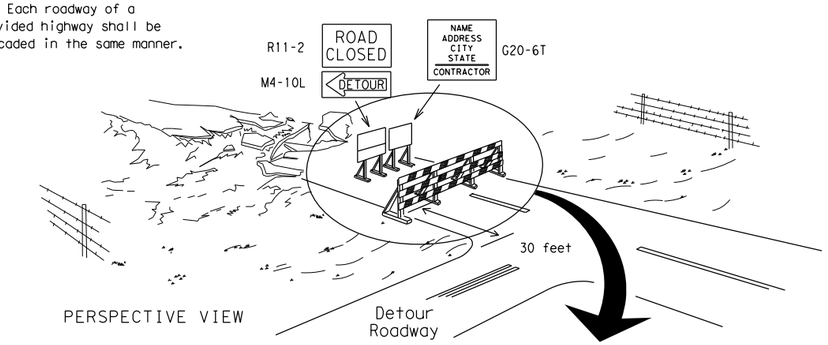
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

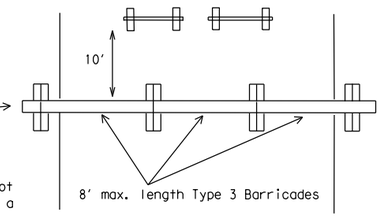
Each roadway of a divided highway shall be barricaded in the same manner.



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.

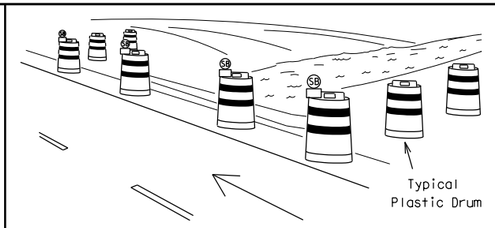
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

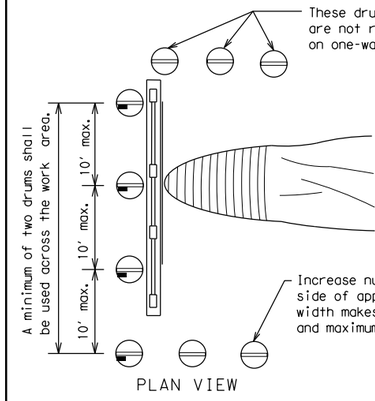
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

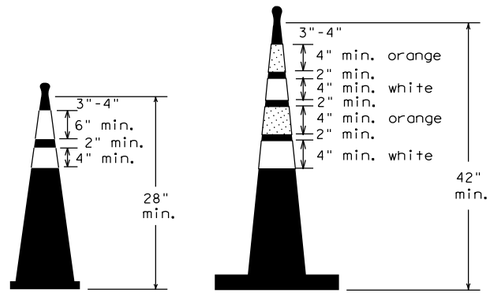
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



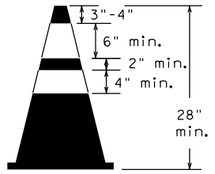
PLAN VIEW

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

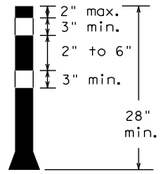
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

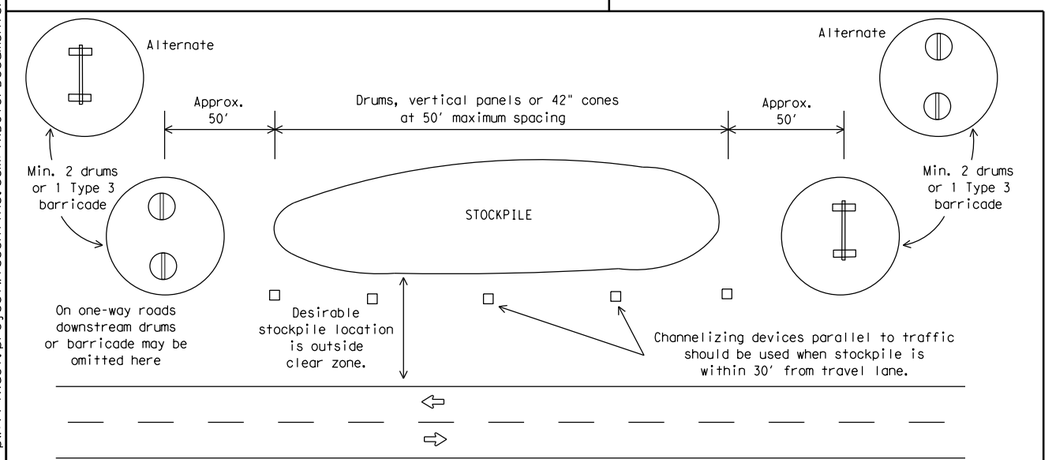


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	COLLIN		35

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

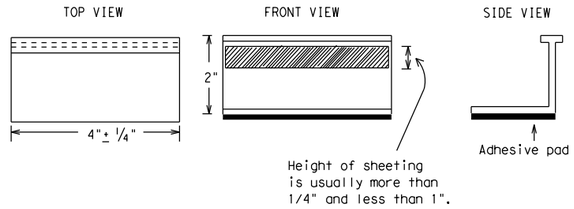
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
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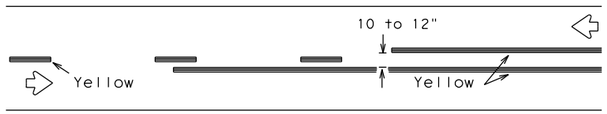
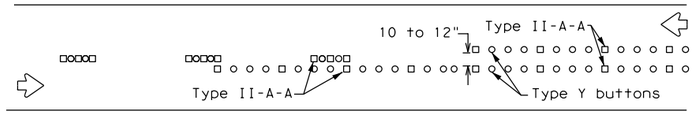
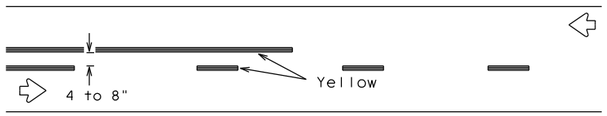
PAVEMENT MARKING PATTERNS



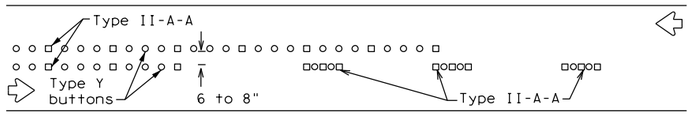
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



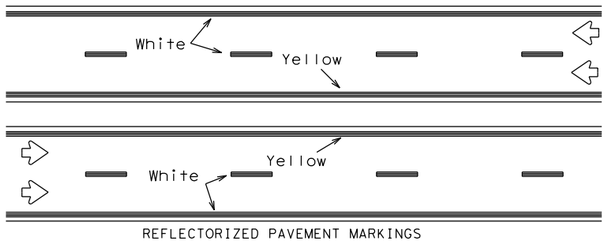
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



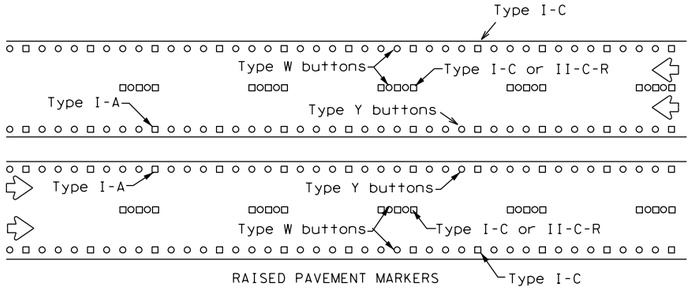
RAISED PAVEMENT MARKERS - PATTERN B

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

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



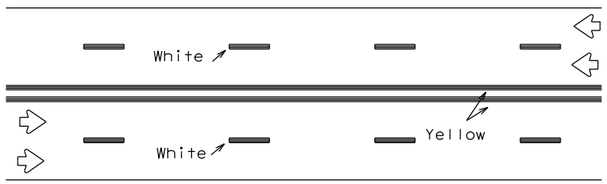
REFLECTORIZED PAVEMENT MARKINGS



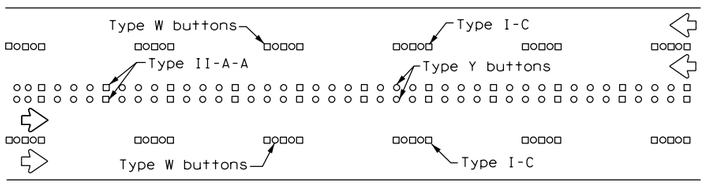
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



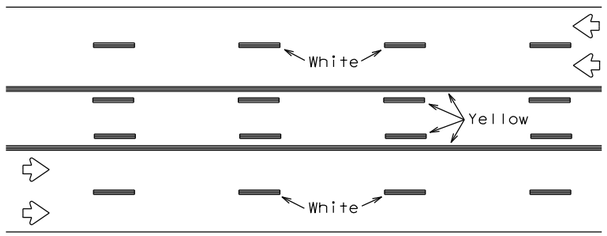
REFLECTORIZED PAVEMENT MARKINGS



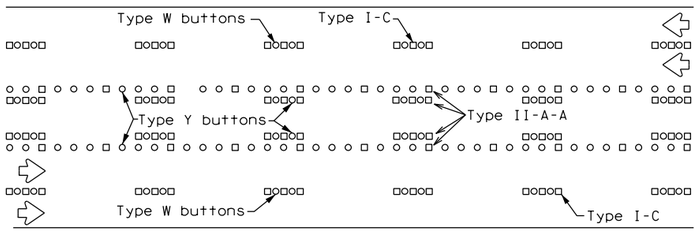
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

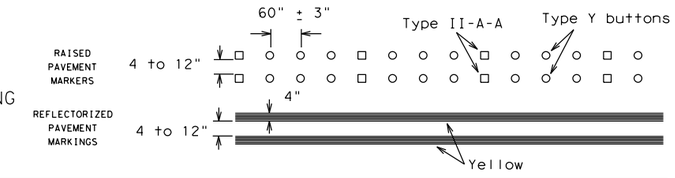
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

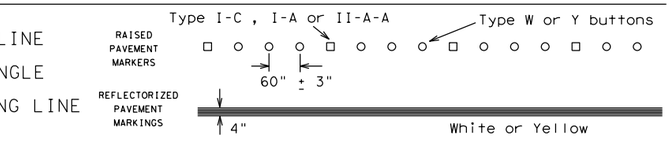
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

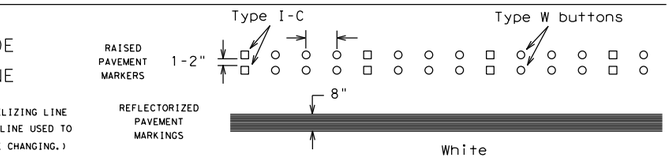


EDGE LINE OR SINGLE NO-PASSING LINE



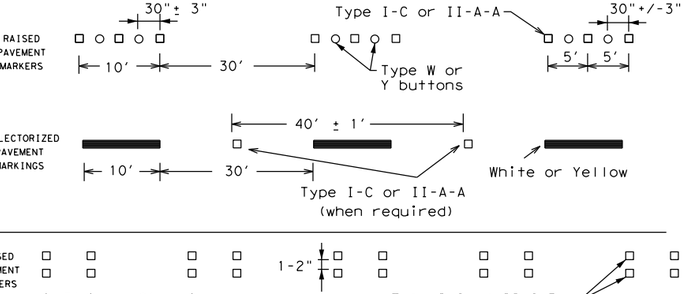
WIDE LINE

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

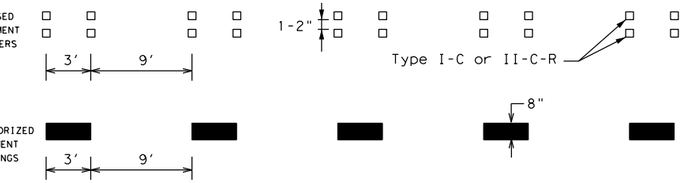


BROKEN LINES

CENTER LINE OR LANE LINE

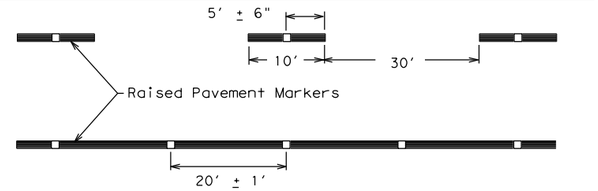


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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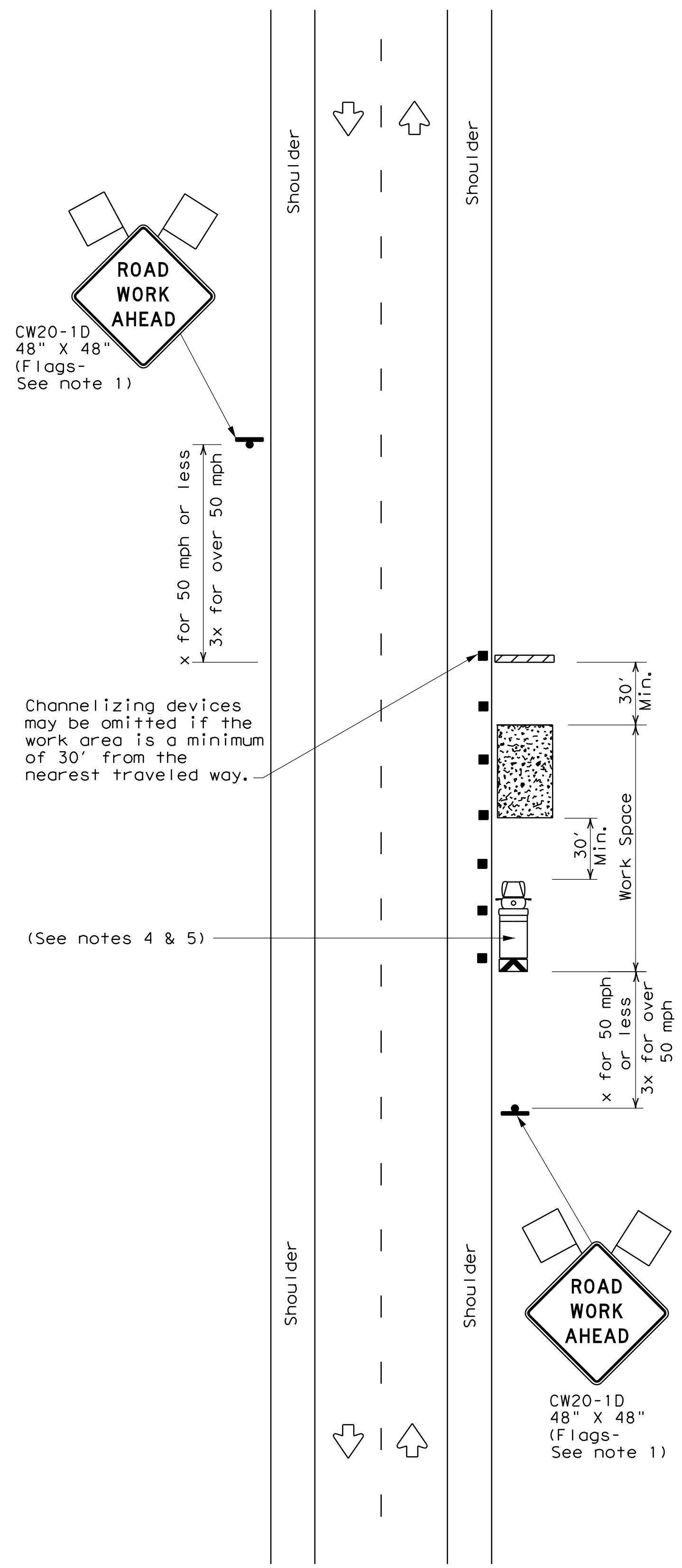
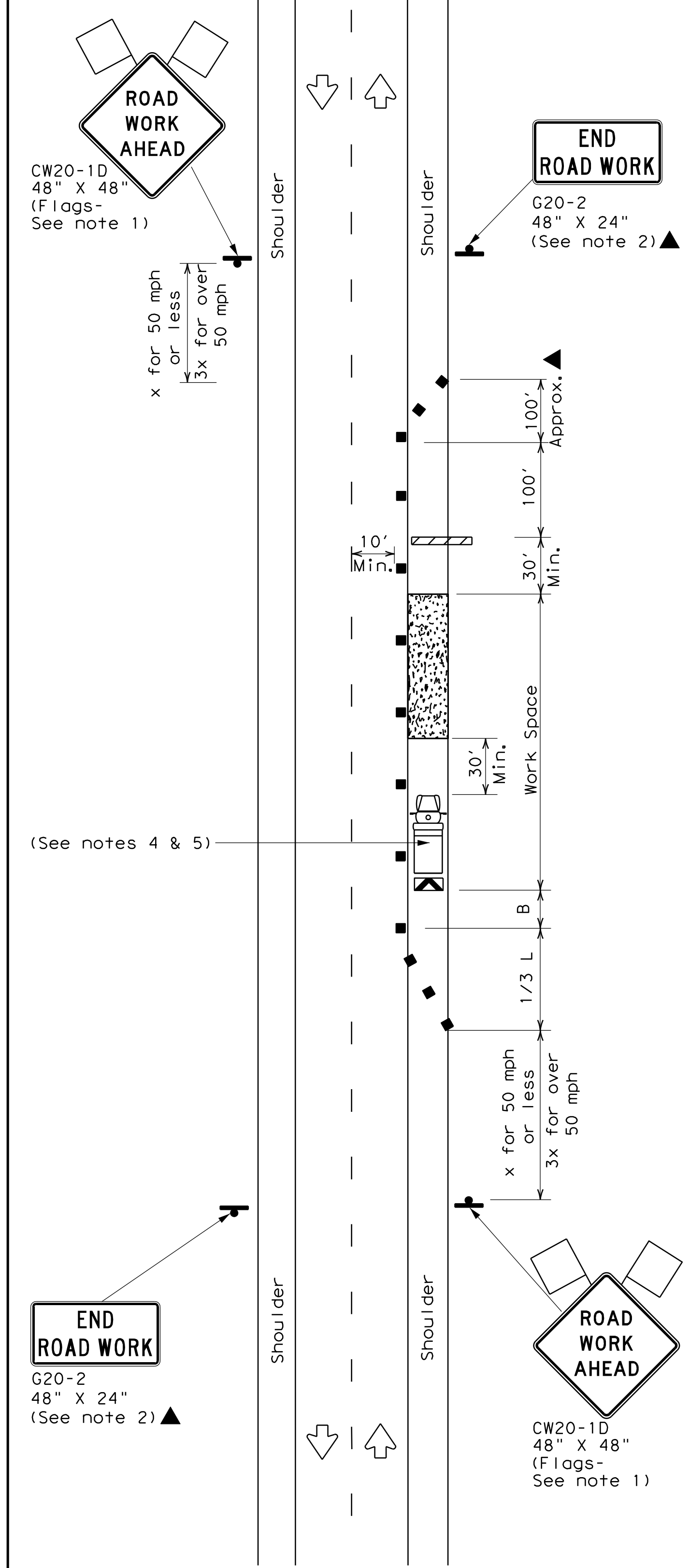


TCP (2-1a)

WORK SPACE NEAR SHOULDER

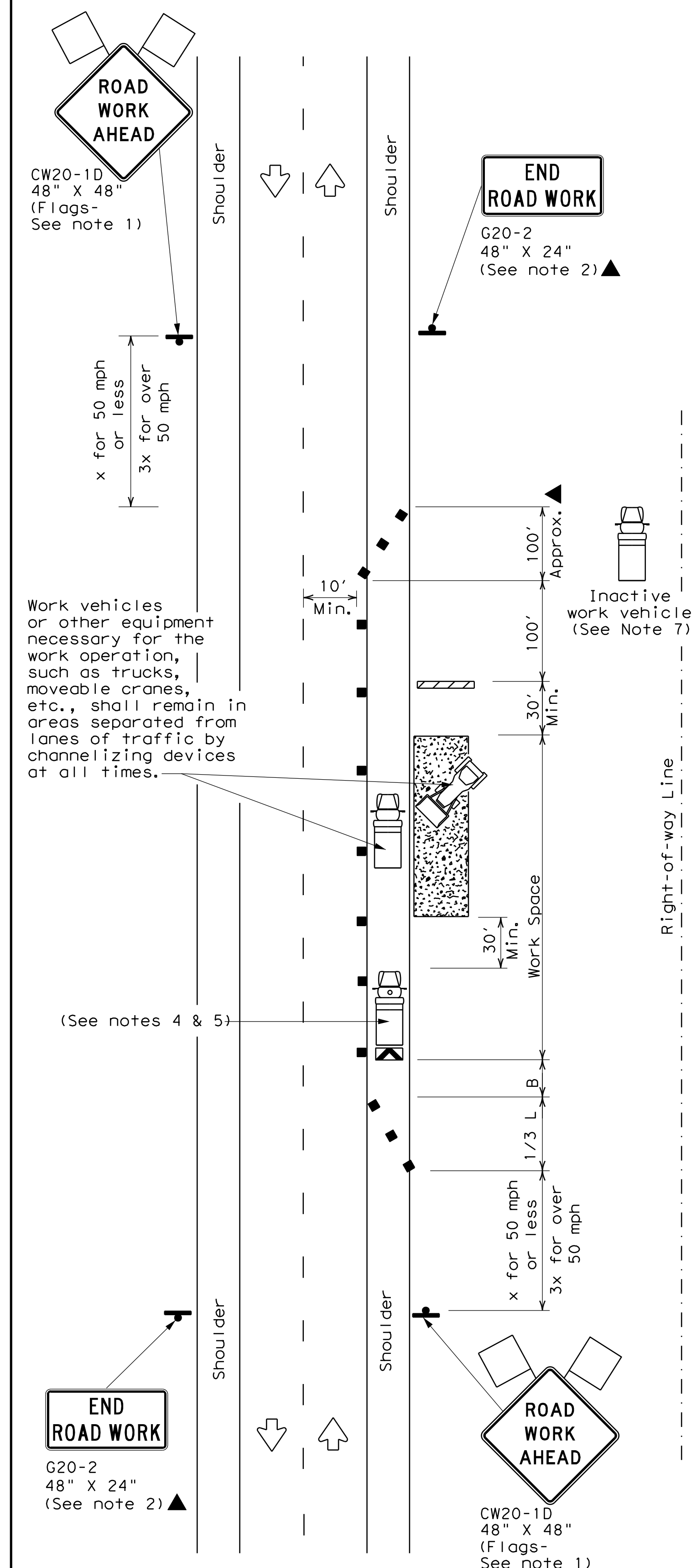
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER

Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER

Conventional Roads

LEGEND

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:	
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REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18	2351	02	017	FM 2478	
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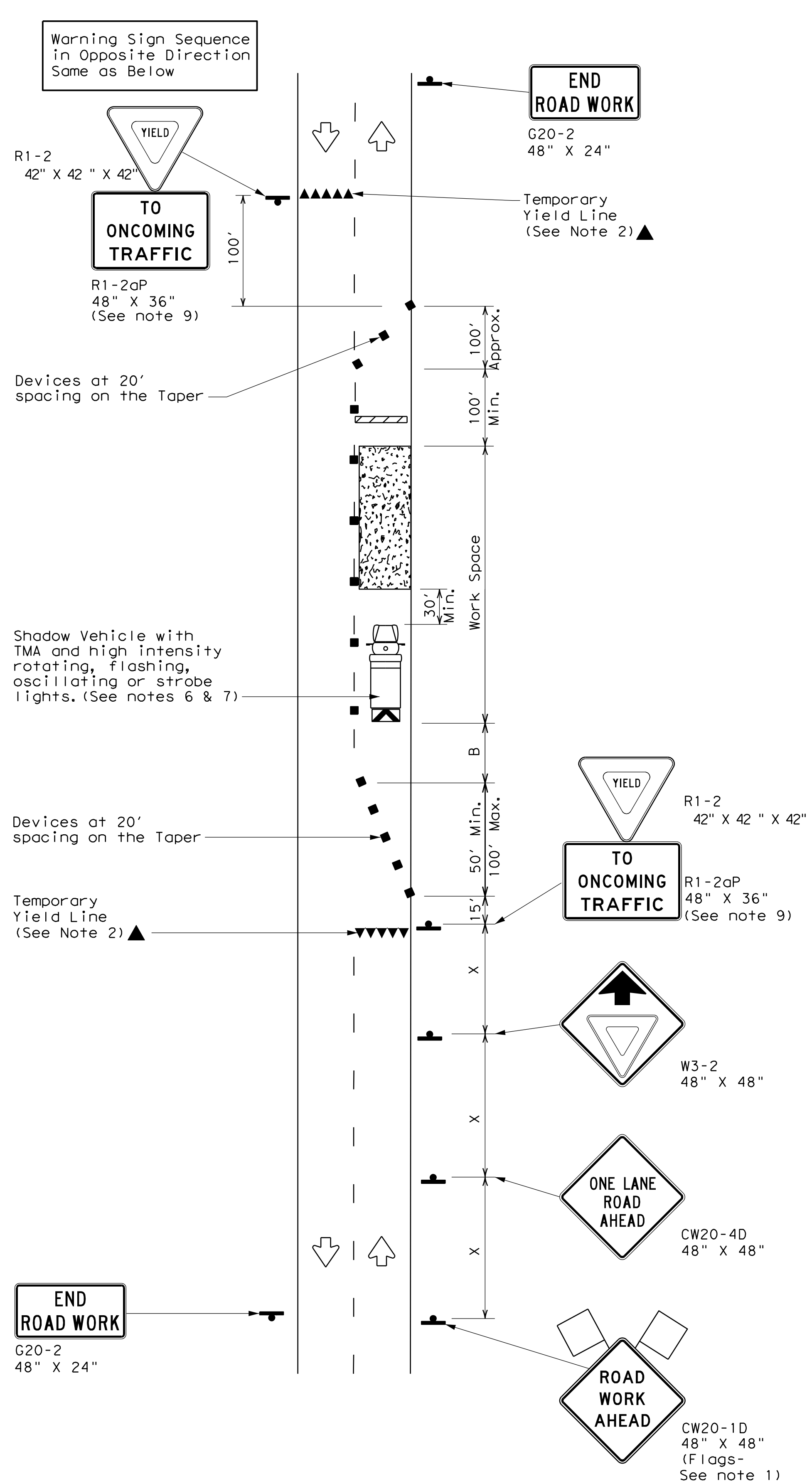
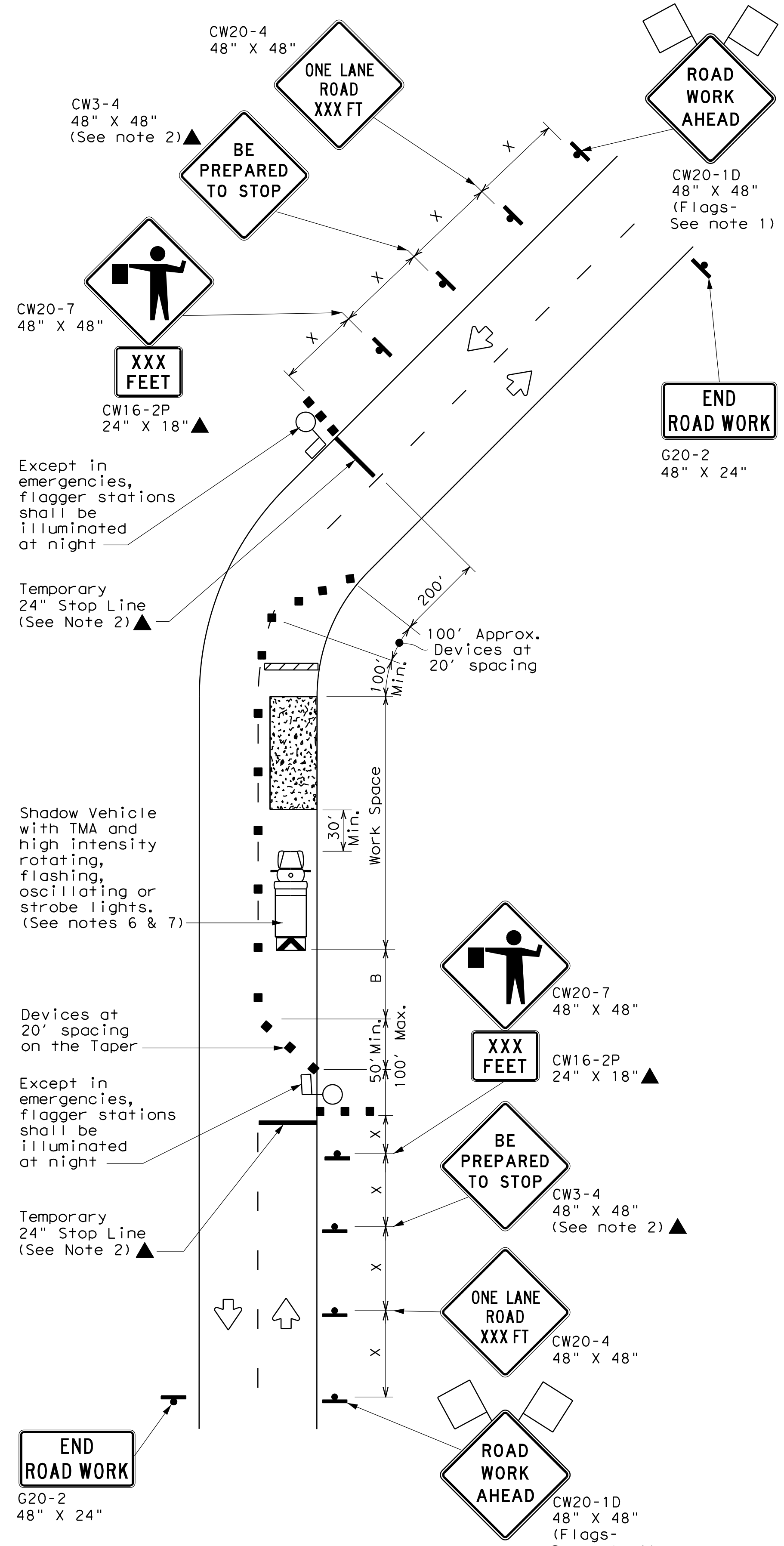


TCP (2-2a)
2-LANE ROADWAY WITHOUT PAVED SHOULDERS
ONE LANE TWO-WAY
CONTROL WITH YIELD SIGNS
(Less than 2000 ADT - See Note 9)



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

LEGEND

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

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

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

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

GENERAL NOTES

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

TCP (2-2a)

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

TCP (2-2b)

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

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(2-2)-18

FILE: tcp2-2-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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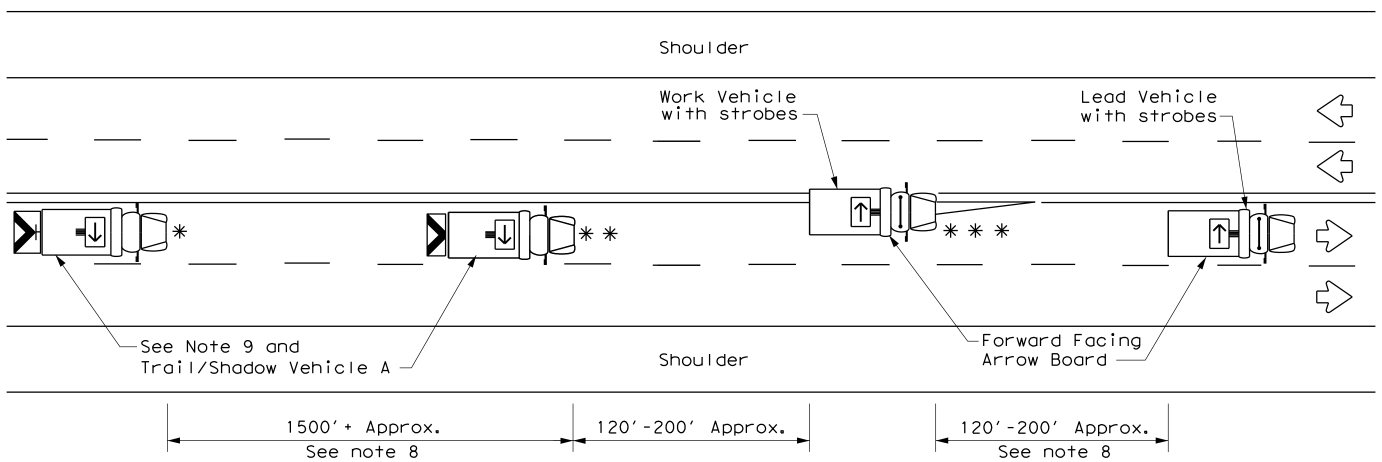
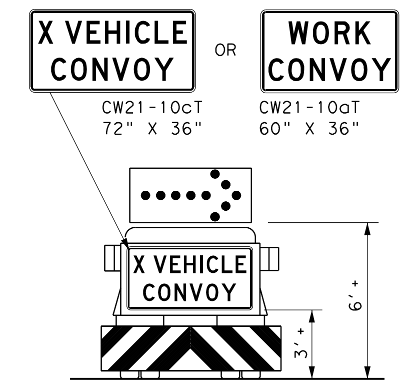


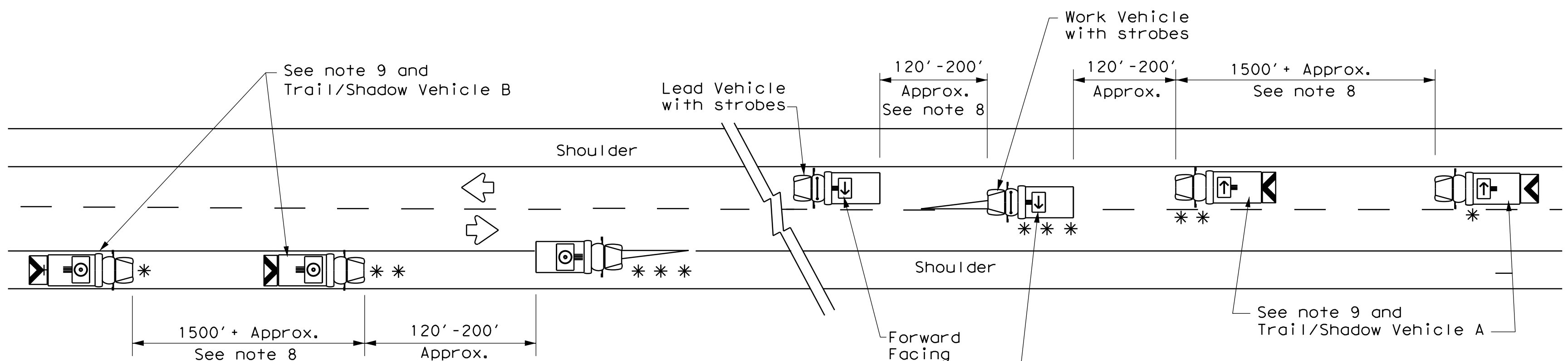
TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

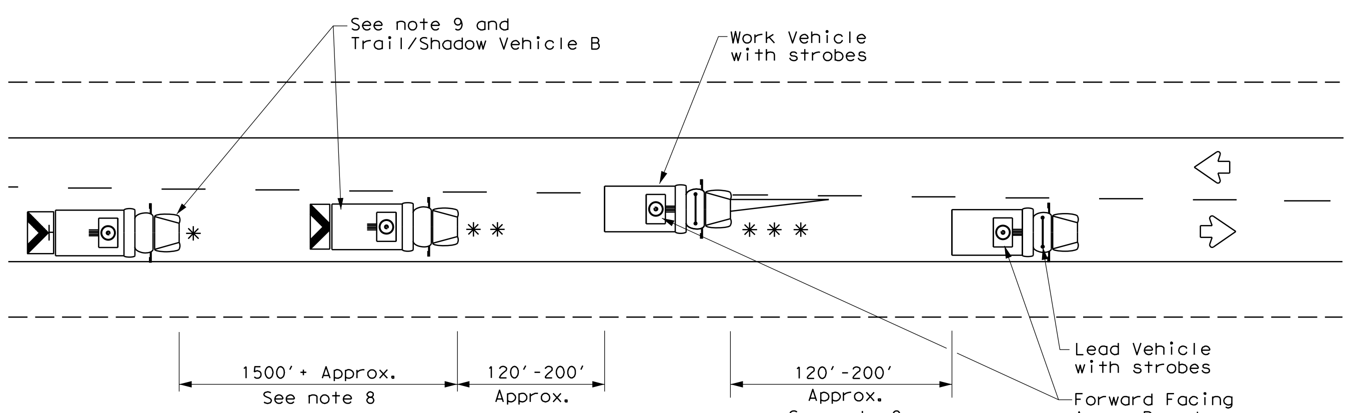


WORK ON SHOULDER

WORK ON TRAVEL LANE

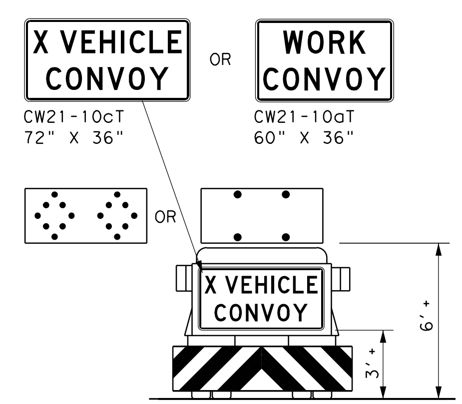
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display

LEGEND

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

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

GENERAL NOTES

1. TRAIL, SHADOW, and LEAD vehicles shall be equipped with arrow boards as illustrated. When a LEAD vehicle is not used the WORK vehicle must be equipped with an arrow board. The Engineer will determine if the LEAD VEHICLE and/or TRAIL VEHICLE are required based on prevailing roadway conditions, traffic volume, and sight distance restrictions.

2. The use of amber high intensity rotating, flashing, oscillating, or strobe lights on vehicles are required. Blue high intensity rotating, flashing, oscillating or strobe lights when mounted on the driver's side of the vehicle may be operated simultaneously with the amber beacons or strobe lights.

3. The use of truck mounted attenuators (TMA) on the SHADOW VEHICLE and TRAIL VEHICLE are required.

4. Reflective sheeting on the rear of the TMA shall meet or exceed the reflectivity and color requirements of DEPARTMENTAL MATERIAL SPECIFICATION DMS 8300, Type A.

5. Flashing arrow boards shall be Type B or Type C as per the Barricade and Construction (BC) standards. The board shall be controlled from inside the vehicle.

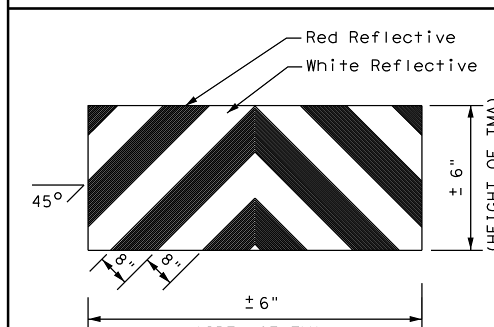
6. Each vehicle shall have two-way radio communication capability.

7. When work convoys must change lanes, the TRAIL VEHICLE should change lanes first to shadow the other convoy vehicles.

8. Vehicle spacing between the TRAIL VEHICLE and the SHADOW VEHICLE will vary depending on sight distance restrictions. Motorists approaching the work convoy should be able to see the TRAIL VEHICLE in time to slow down and/or change lanes as they approach the TRAIL VEHICLE. Vehicle spacing between the WORK VEHICLE and SHADOW VEHICLE and vehicle spacing between WORK VEHICLE and LEAD VEHICLE may vary according to terrain, work activity and other factors.

9. "X VEHICLE CONVOY" (CW21-10cT) or "WORK CONVOY" (CW21-10aT) signs shall be used on TRAIL VEHICLES and SHADOW VEHICLES as shown. As an option 48" X 48" diamond shaped "WORK CONVOY"(CW21-10T) or "X VEHICLE CONVOY" (CW21-10bT) signs may be used where adequate mounting space exists. When used, the X VEHICLE CONVOY sign shall have the number of the convoy vehicles displayed on the sign in the number designation "X" location. The "X VEHICLE CONVOY" sign shall not be used on the SHADOW VEHICLE if a TRAIL VEHICLE is used.

10. On two-lane two-way roadways, the work and protection vehicles should pull over periodically to allow motor vehicle traffic to pass. If motorists are not allowed to pass the work convoy, a "DO NOT PASS" (R4-1) sign should be placed on the back of the rearmost protection vehicle.



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
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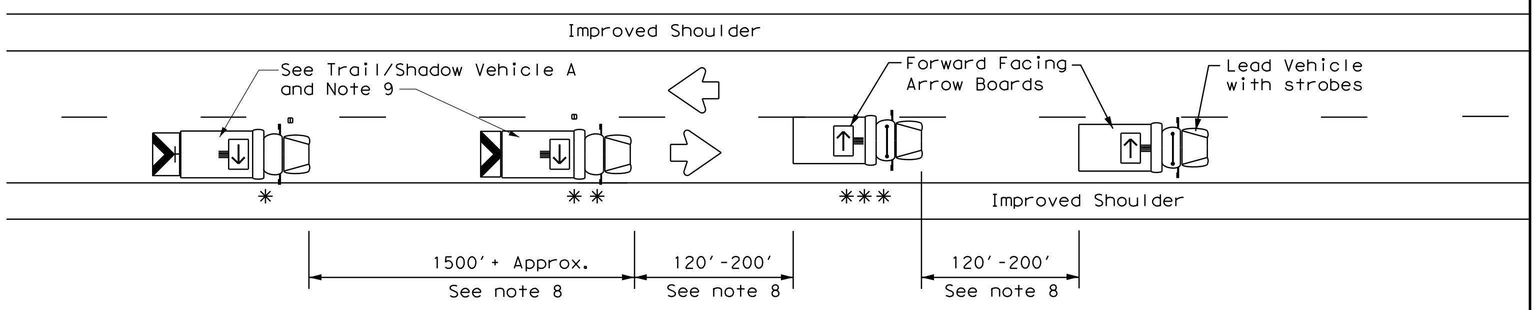
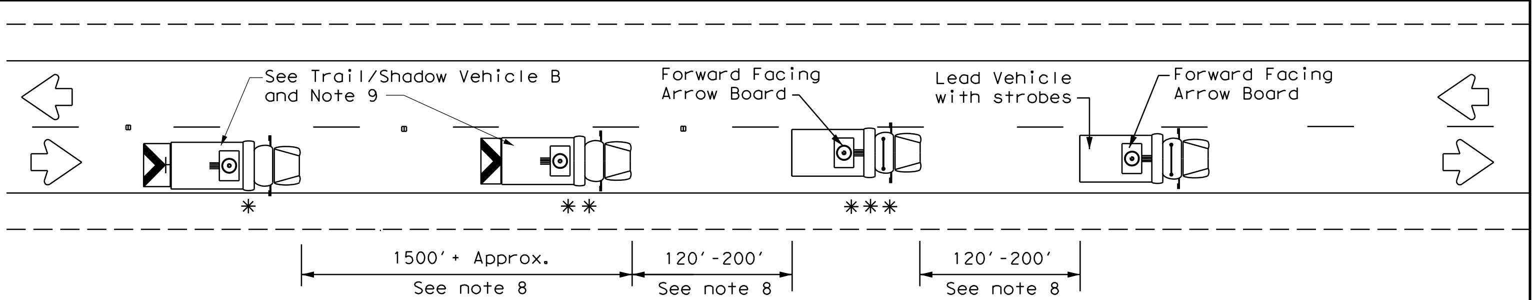


TCP (3-3a)

TWO LANE HIGHWAY WITH PAVED SHOULDERS

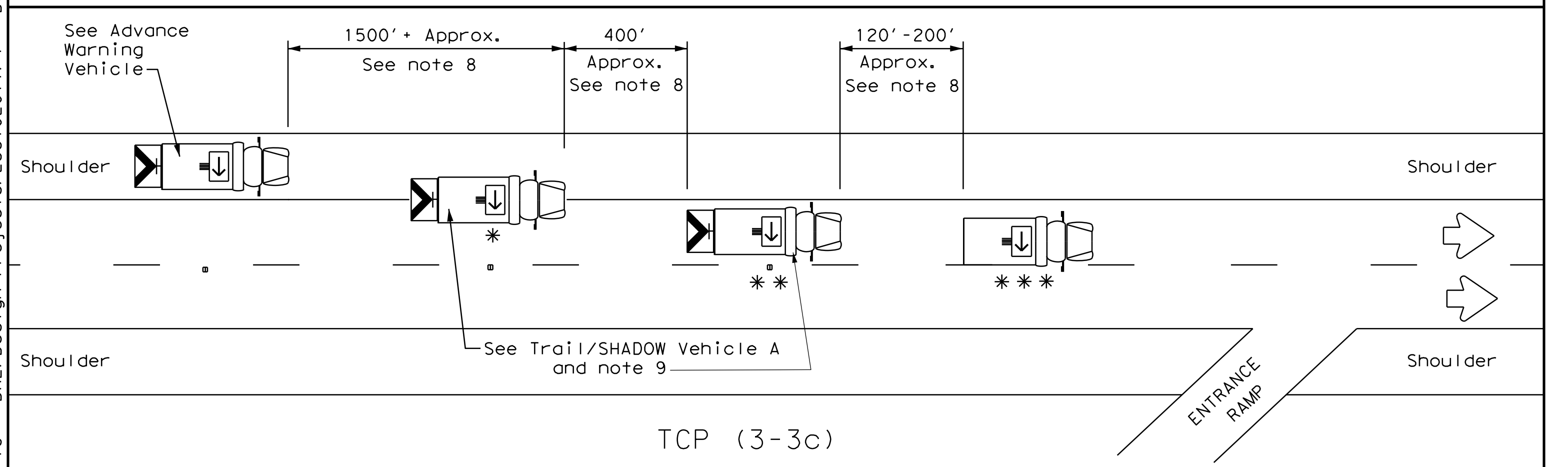
(WORK ON TRAVEL LANE)



TCP (3-3b)

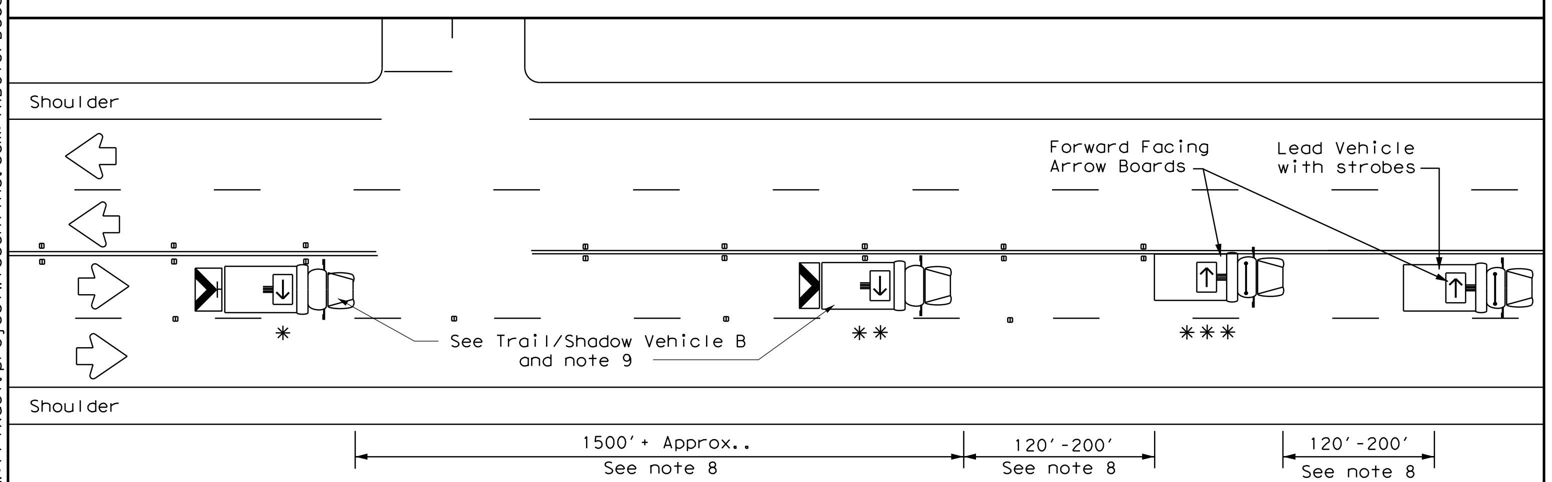
TWO LANE HIGHWAY WITHOUT PAVED SHOULDERS

(WORK ON TRAVEL LANE)



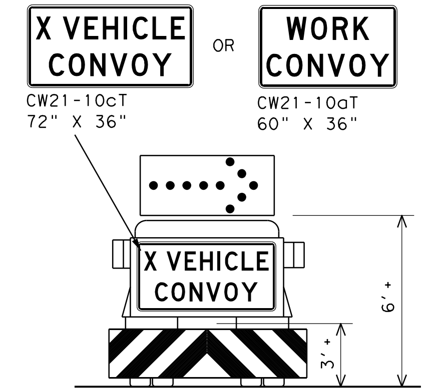
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



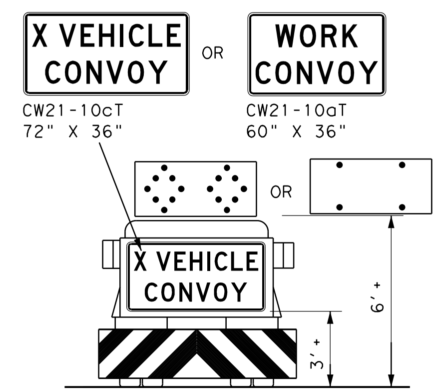
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



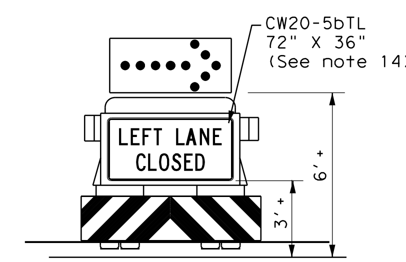
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display Flashing Arrow Board

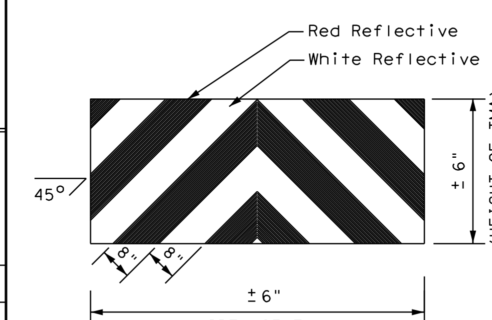


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

LEGEND

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

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

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© TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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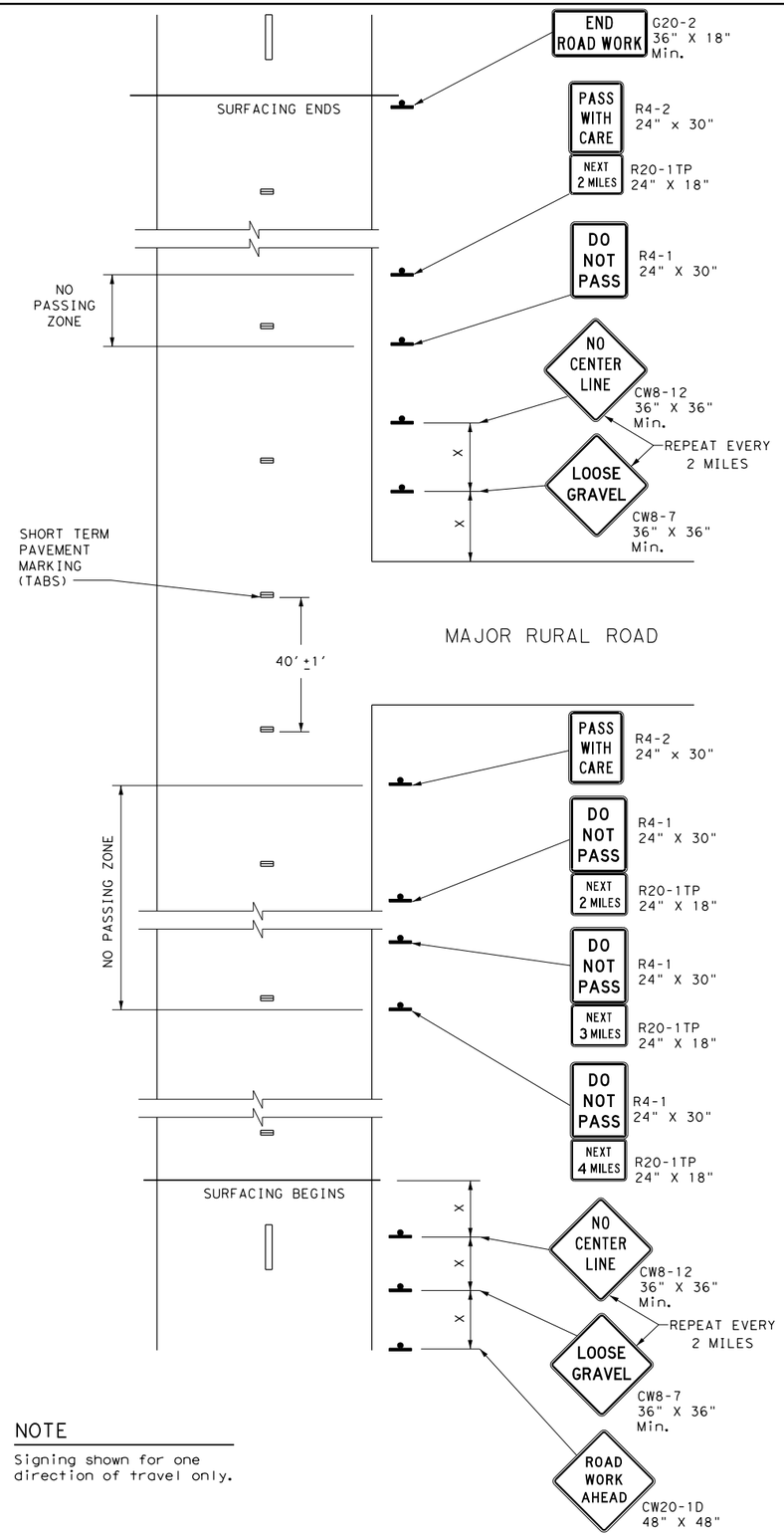
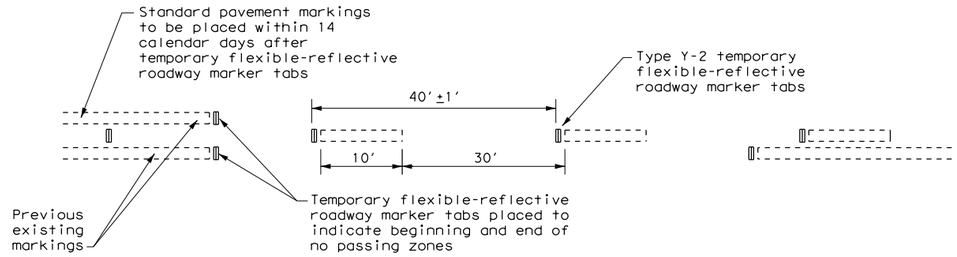


NOTE

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

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©TxDOT March 1991	CONT	SECT	JOB	HIGHWAY
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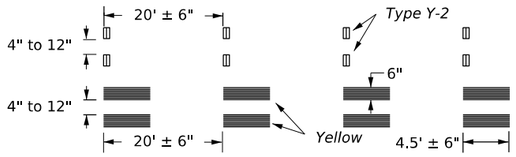
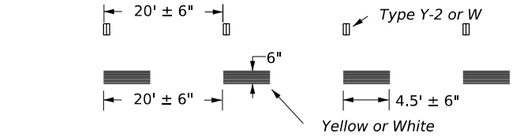
WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

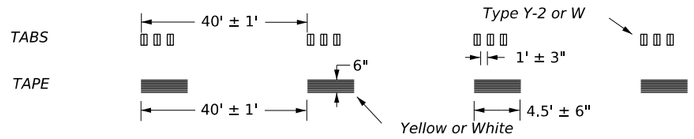


SINGLE NO-PASSING LINE or CHANNELIZATION LINE



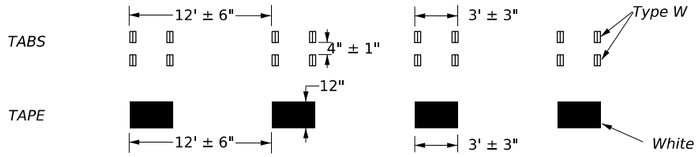
BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

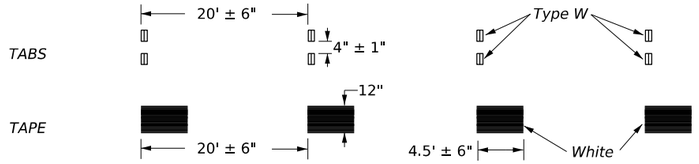


WIDE DOTTED LINES

(FOR LANE DROP LINES)



WIDE GORE MARKINGS



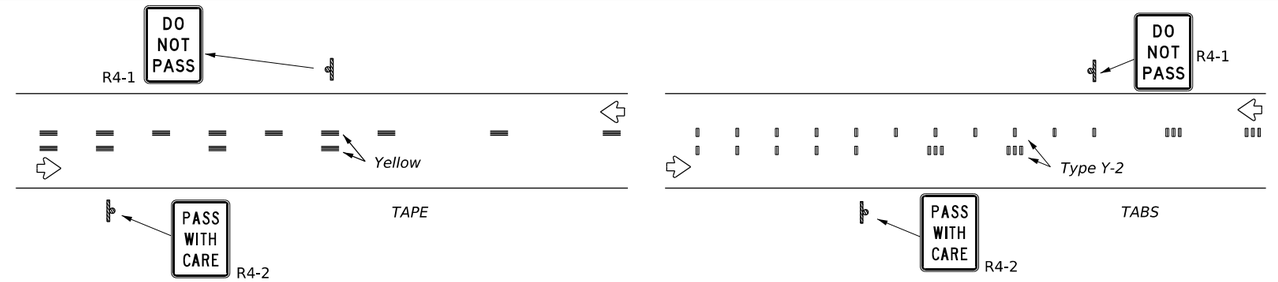
NOTES:

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.

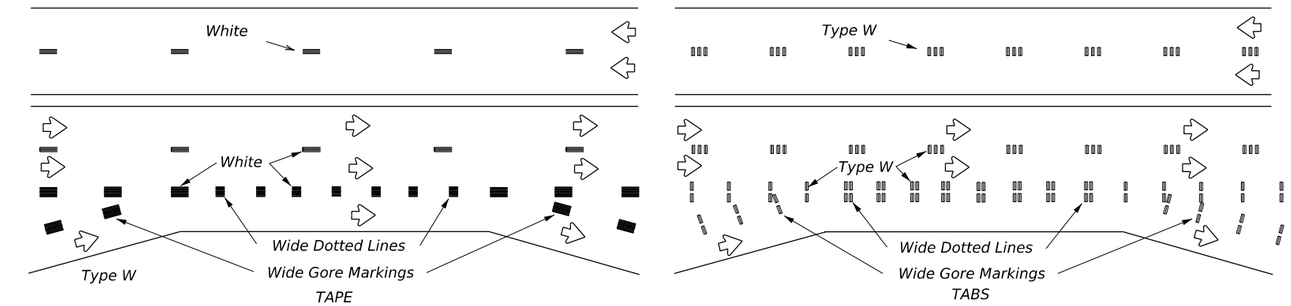
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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.

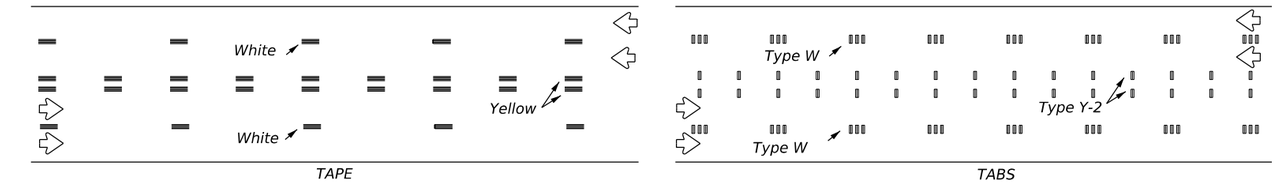
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



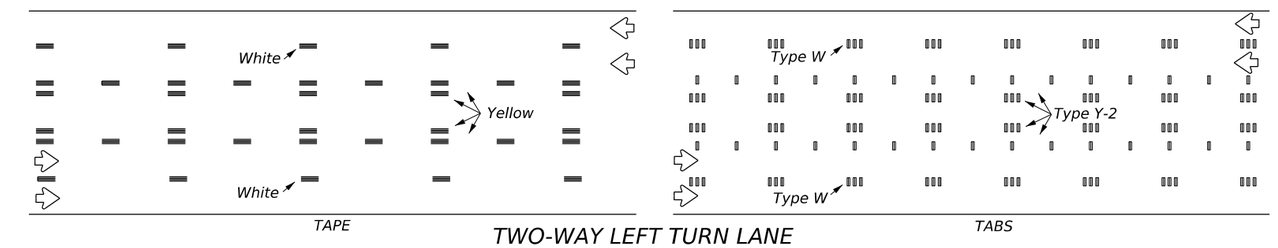
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



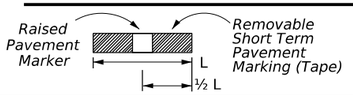
LANE LINES FOR DIVIDED HIGHWAY



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

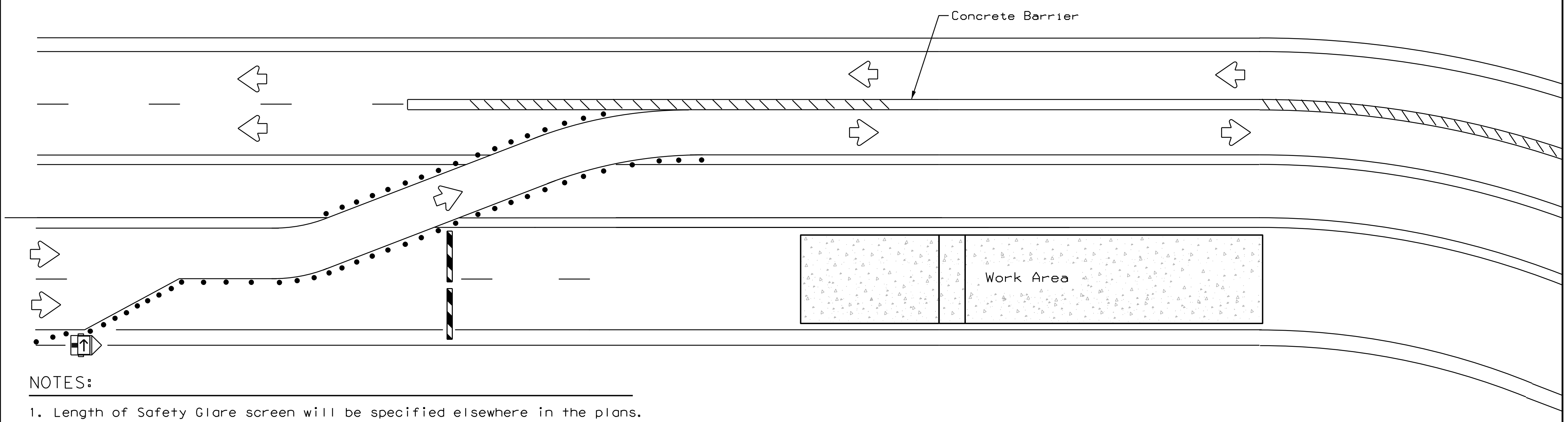
Traffic Safety Division Standard

WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

FILE: wzstpm-23.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
4-92 7-13	DIST	COUNTY		SHEET NO.
1-97 2-23	DAL	COLLIN		43
3-03				

111



LEGEND

Symbol	Description
(barricade symbol)	Type 3 Barricade
• • •	Channelizing Devices
(arrow board symbol)	Trailer Mounted Flashing Arrow Board
(sign symbol)	Sign
\ \ \ \	Safety glare screen

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

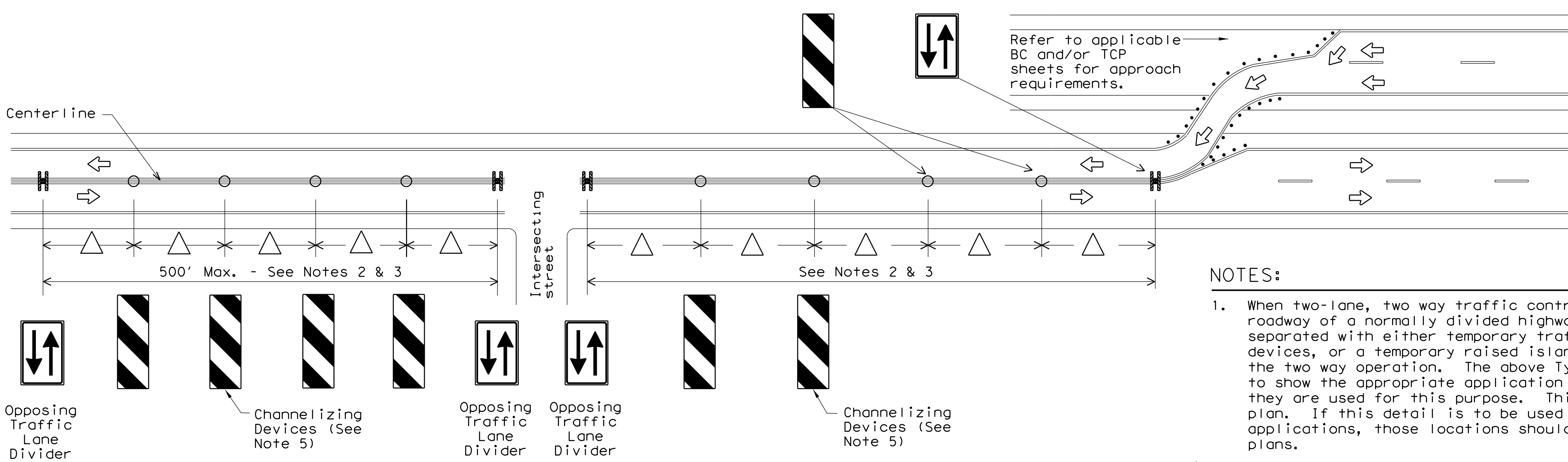
Only pre-qualified products shall be used. A copy of the Compliant Work Zone Traffic Control Devices List" CWZTCD)describes pre-qualified products and their sources and may be found at the following web address:

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

BARRIER DELINEATION WITH MODULAR GLARE SCREENS

NOTES:

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



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

NOTES:

1. When two-lane, two way traffic control must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated with either temporary traffic barriers, channelizing devices, or a temporary raised island throughout the length of the two way operation. The above Typical Application is intended to show the appropriate application of channelizing devices when they are used for this purpose. This is not a traffic control plan. If this detail is to be used for other types of roads or applications, those locations should be stated elsewhere in the plans.
2. △ Space devices according to the Tangent Spacing shown on the Device Spacing table on BC(9) but not exceeding 100'.
3. Every fifth device should be an OTLD except when spaced closer to accommodate an intersection. An OTLD should be the first device on each side of intersecting streets or roads.
4. Locations where surface mount bases with adhesives or self-righting devices will be required in order to maintain them in their proper position should be noted elsewhere in the plans.
5. Channelizing devices are to be vertical panels, 42" cones or tubular markers that are at least 36" tall. Tubular markers used to separate traffic should have a rubber base weighing at least 30 pounds. Tubular markers that are 42" tall or more shall have four bands of reflective material as detailed for 42" cones on BC(10). Tubular markers less than 42" but at least 36" tall shall have three bands of 3" wide white reflective material spaced 2" apart. Reflective material shall meet DMS-8300, Type A.

Texas Department of Transportation | Traffic Operations Division Standard

TRAFFIC CONTROL PLAN TYPICAL DETAILS

WZ(TD)-17

FILE: wztd-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-98 2-17 3-03 7-13	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	44

110

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DATE: 4/29/2023 10:13:22 AM
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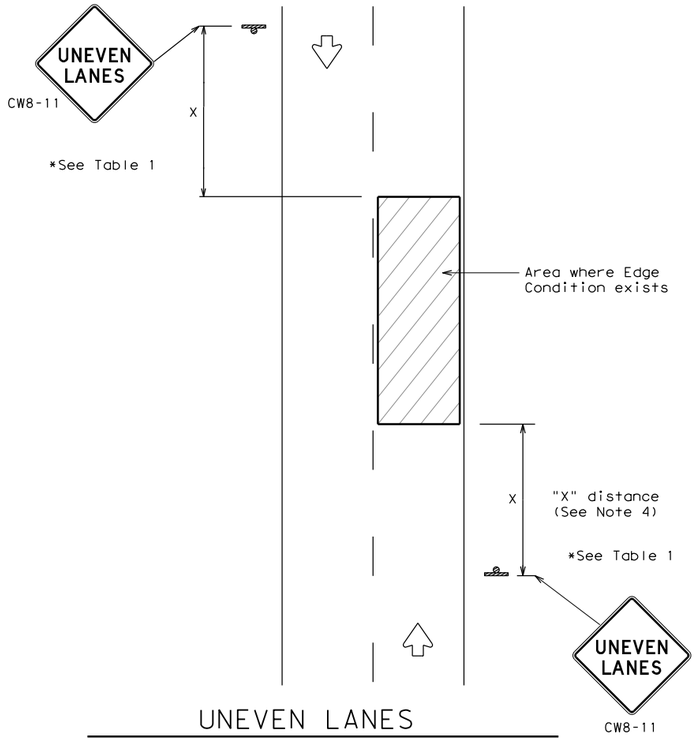
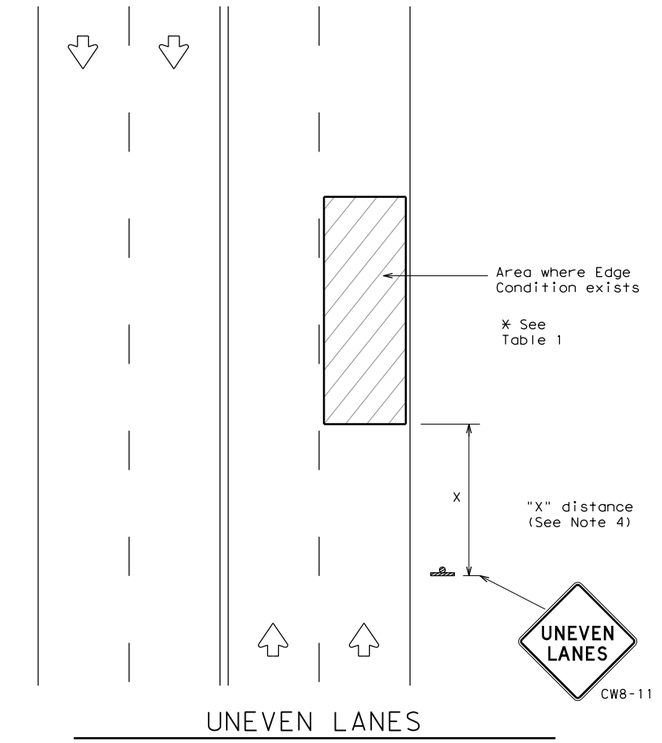
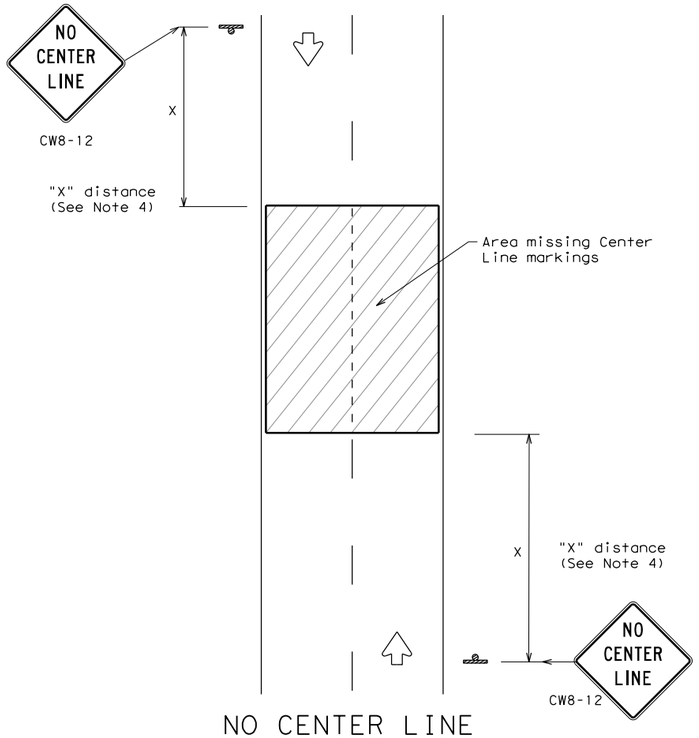


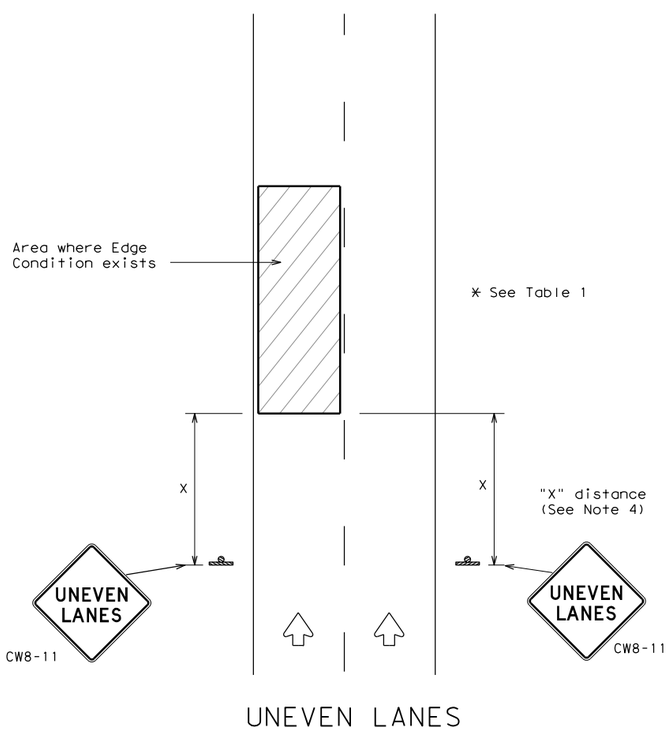
UNEVEN LANES
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
FOUR LANE CONVENTIONAL ROAD



NO CENTER LINE
TWO LANE CONVENTIONAL ROAD



UNEVEN LANES
DIVIDED ROADWAY

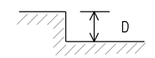
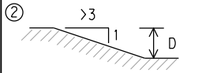
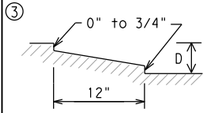
DEPARTMENTAL MATERIAL SPECIFICATIONS	
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY (REMOVABLE) PREFABRICATED PAVEMENT MARKINGS	DMS-8241
SIGN FACE MATERIALS	DMS-8300

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: wzu!-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 1992	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
8-95 2-98 7-13	DIST	COUNTY		SHEET NO.
1-97 3-03	DAL	COLLIN		45

112

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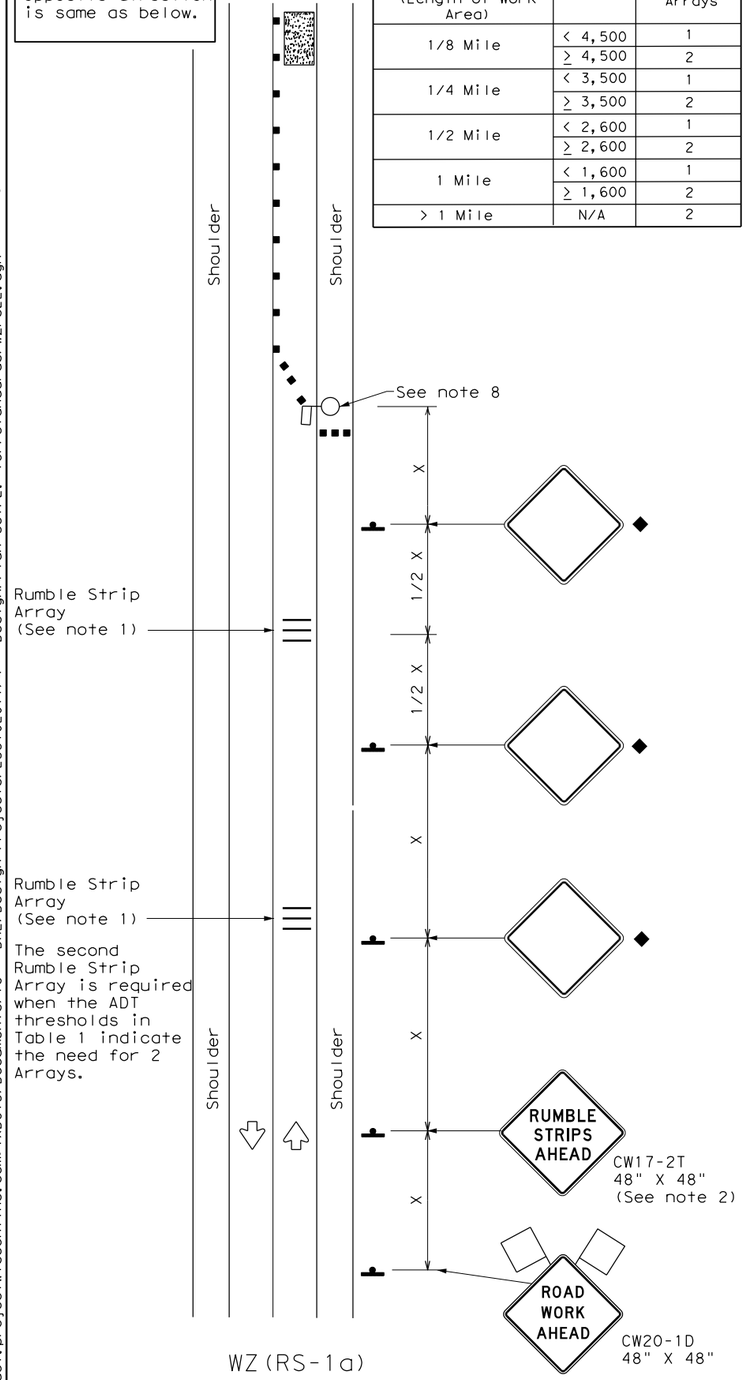
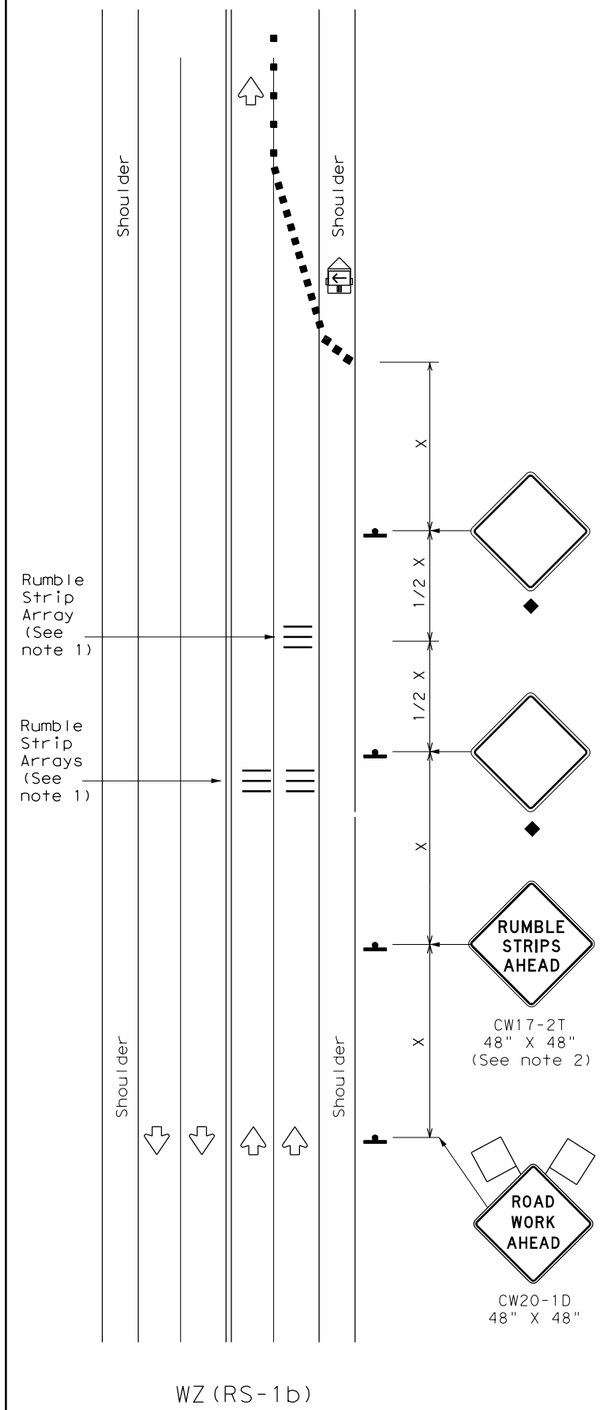
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation — Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-14 1-22 4-16	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		46

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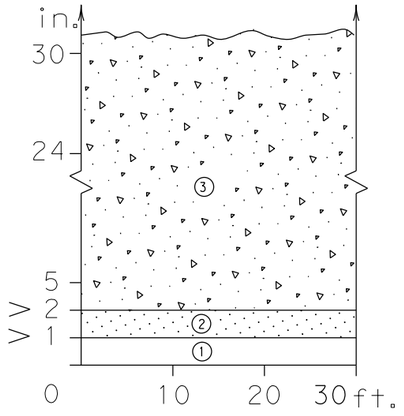
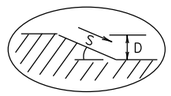
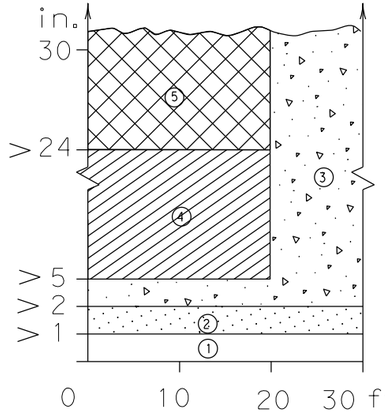
DEFINITION OF TREATMENT ZONES FOR VARIOUS EDGE CONDITIONS

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

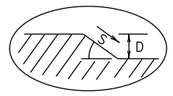


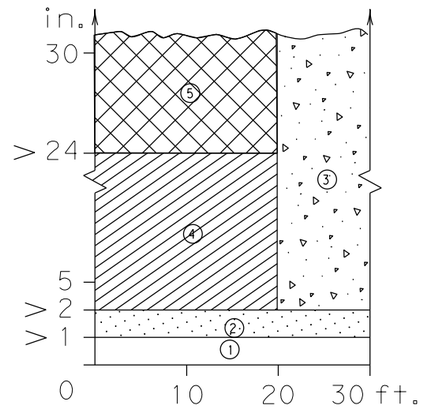
Edge Condition I
S = (3:1) (or flatter)



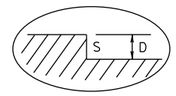


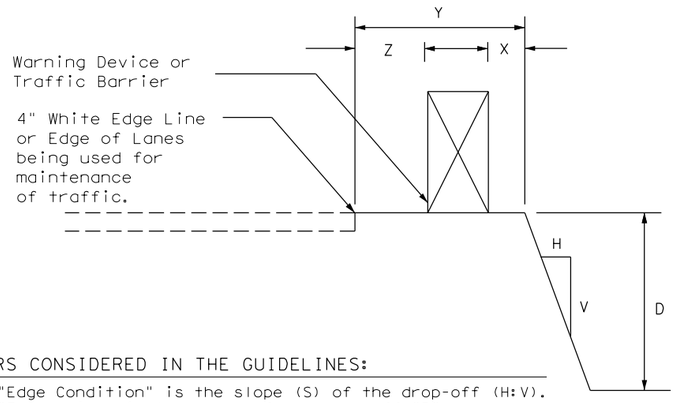
Edge Condition II
S = ((2.99):1) to (1:1)





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





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:

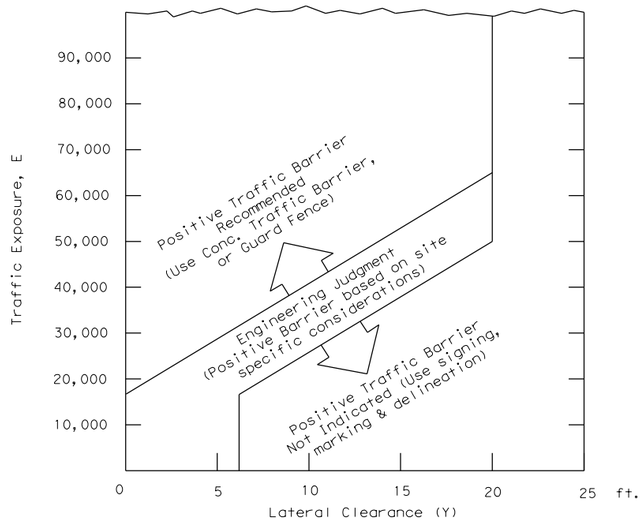
1. Edge Condition I: Most vehicles are able to traverse an edge condition with a slope rate of (3 to 1) or flatter. The slope must be constructed with a compacted material capable of supporting vehicles.

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
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
,P.E.
Signature of Registrant & Date

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	2351	02	017	FM 2478
03-01 08-01 9-21	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		47

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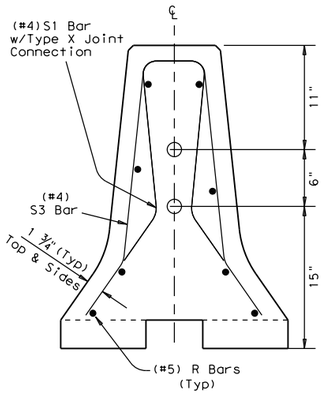
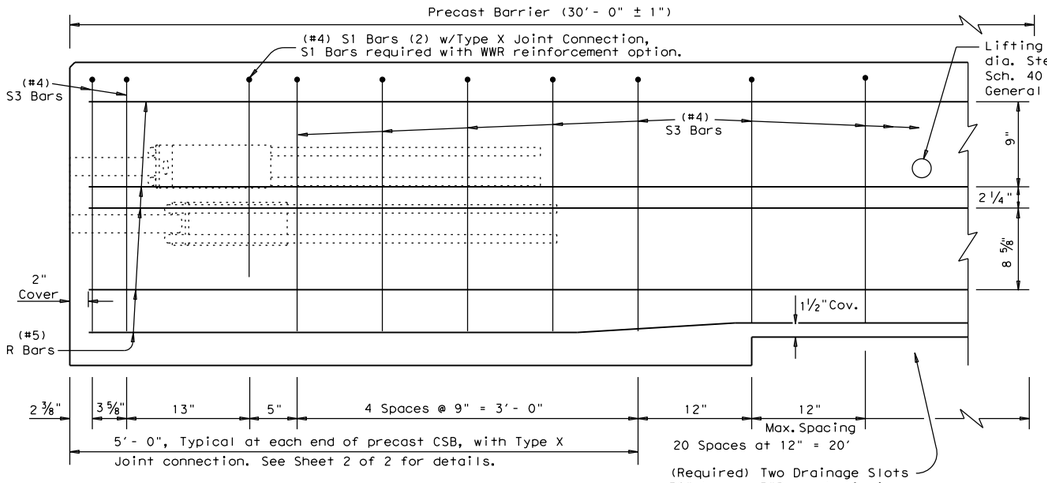


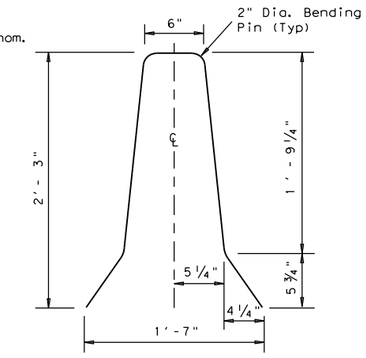
End View
Precast Barrier

See sheet 2 of 3 for Joint connection Type X

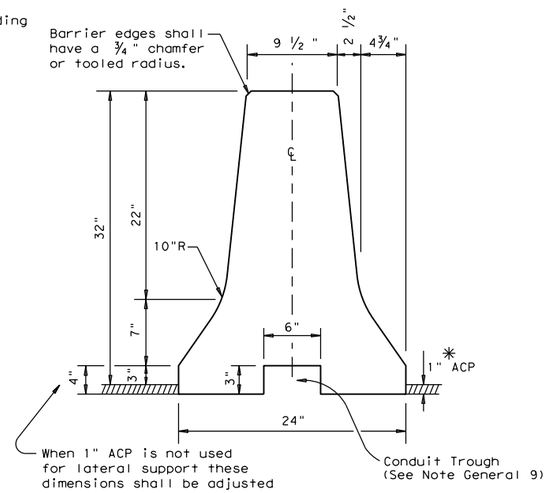


Reinforcement for Precast (CSB)
Concrete Safety Barrier (Type 1)

Showing reinforcement for Joint Type X

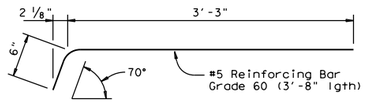


S3 Bar
#4 Bar



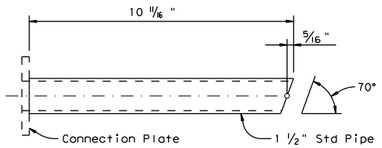
Concrete Safety Barrier

✳ When 1" ACP is "not" used as lateral support for permanent barrier placement. A permissible method of attaining the equivalent lateral support may be used, See CSB(6) sheet.



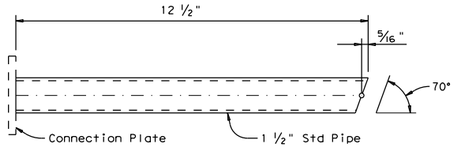
DEFORMED BAR ANCHOR DETAILS

Two (2) Bars required per assembly.
Eight (8) required per Joint.



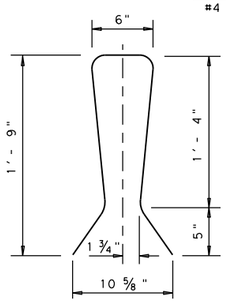
UPPER CONNECTION PIPE DETAILS

One (1) Steel Pipe required per Upper Assembly.
Two (2) required per Joint.



LOWER CONNECTION PIPE DETAILS

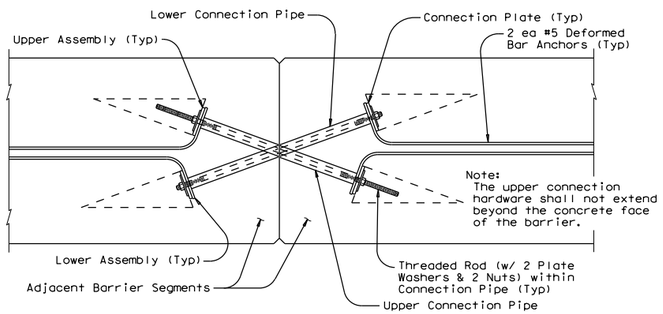
One (1) Steel Pipe required per Lower Assembly.
Two (2) required per Joint.



S1 Bar
#4 Bar (2)
(Joint Type X)

GENERAL NOTES

1. Concrete shall be Class H with a minimum compressive strength of 3,600 psi.
2. Where used, rebar reinforcement shall be Grade 60 and conform to ASTM A615.
3. Precast barrier length shall be 30 ft. unless otherwise specified on the plans.
4. All precast barrier edges shall have a ¾" chamfer or tooled radius.
5. All concrete, reinforcement, joint connection systems, grout etc. as shown, are considered as part of the barrier payment.
6. All steel assemblies for joint shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."
7. Regardless of the method of handling, barrier lifting points shall be approx. 7.5 feet from the ends of the barrier. Lifting devices and attachments to barrier sections shall be approved by the Engineer.
8. Surface finishing and grouting (where required) shall be two parts sand one part cement with enough water to make the mixture plastic. Grouting shall be done in a manner that will assure a smooth surface. Surface finishing shall be considered subsidiary to the various bid items involved.
9. Conduit trough when required shall be shown elsewhere on the plans, or as directed by the Engineer.



TYPE X JOINT INSTALLATION DETAIL

Barrier reinforcing and Type X Joint Leave-Out dimensions not shown for clarity.

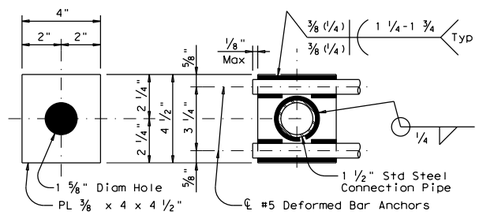
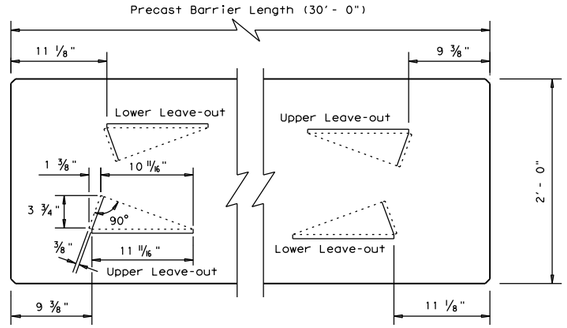


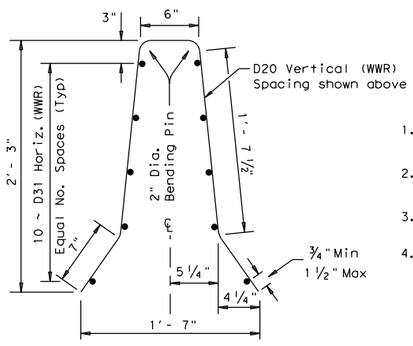
PLATE DIMENSIONS WELDING DETAILS

CONNECTION PLATE DETAILS

One (1) Plate required per assembly.
Four (4) required per Joint. All steel fittings for joint Type X shall be galvanized after fabrication in accordance with Item 445.



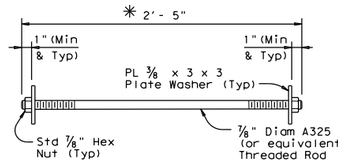
BARRIER PLAN AT END JOINTS



Welded Wire Reinforcement
(WWR) Option for Bars R and S3

(WWR) General Notes

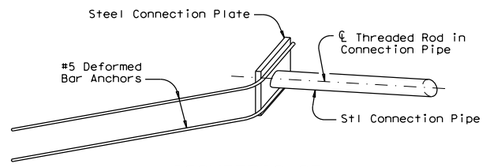
1. Deformed Welded Wire Reinforcement (WWR) shall conform to ASTM A497.
2. Welded wire cage may be cut or bent to accommodate the Type X joint connection and drainage slots, as directed by the Engineer.
3. All reinforcement shall comply with Item 440, "Reinforcing Steel."
4. Combinations of reinforcing steel and WWR will be permitted, as directed by the Engineer. The dimension from the end of the barrier section to the first wire shall not exceed 3".



CONNECTION BOLT OR THREADED ROD DETAIL

Two (2) Threaded Rods (Or Equivalent Hex Hd. Bolts)
(w/ Two (2) PL ⅜ x 3 x 3 Plate Washers & Two (2) Std Hex Nuts) required per Joint.

✳ The connection hardware shall not extend beyond the concrete face of the barrier. Hex head bolts may be provided. The proper length of all hardware should be verified.



ISOMETRIC OF TYPICAL WELDED ASSEMBLY

Four (4) [2 Upper & 2 Lower] Assemblies required per Joint.

Weight of one Precast 30 ft. (CSB) segment = Approx. 6.5 Tons or 440 lbs per ft.

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
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REVISIONS	2351	02	017	FM 2478
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	DAL	COLLIN		48

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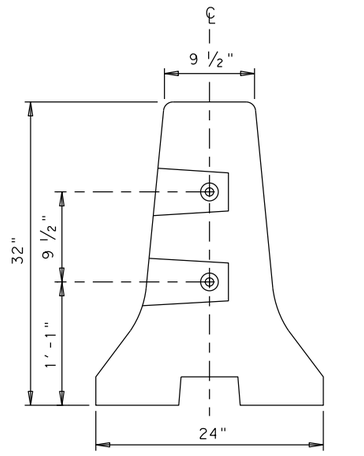
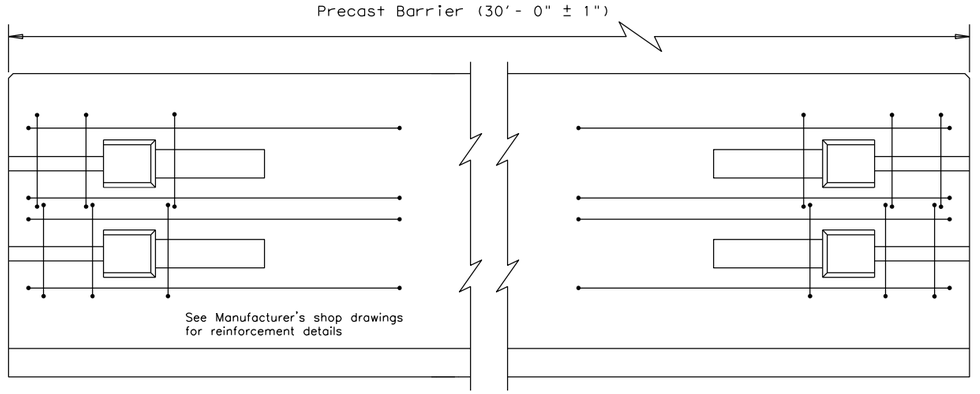
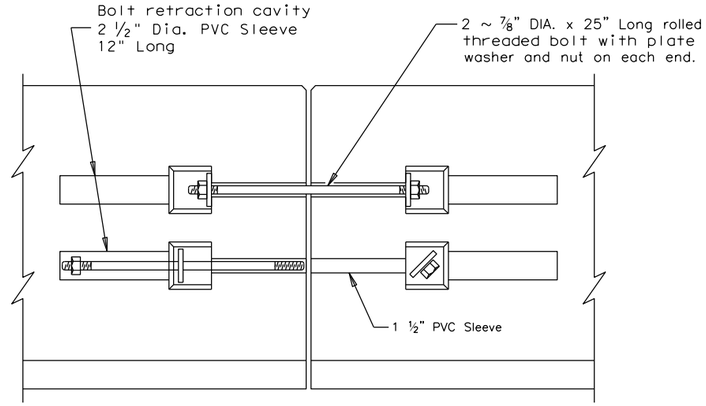


END VIEW (CSB) QUICK-BOLT
QUICK-BOLT POCKET LOCATIONS

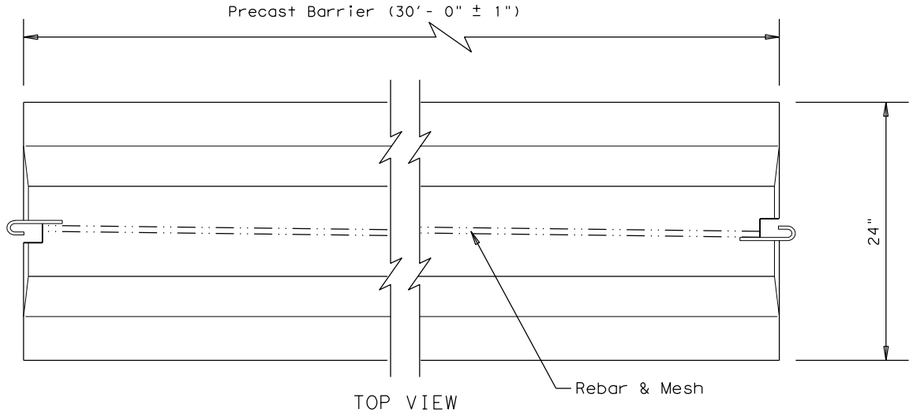


ELEVATION (CSB) QUICK-BOLT
See Manufacturer's shop drawing for additional details

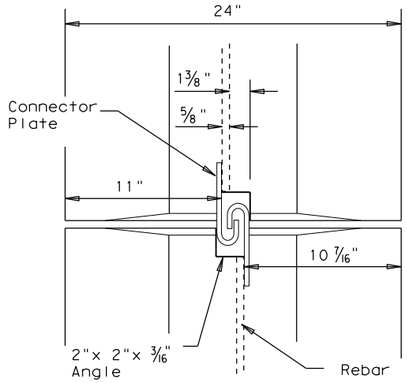


ELEVATION VIEW SHOWING JOINT CONNECTION
"QUICK-BOLT"

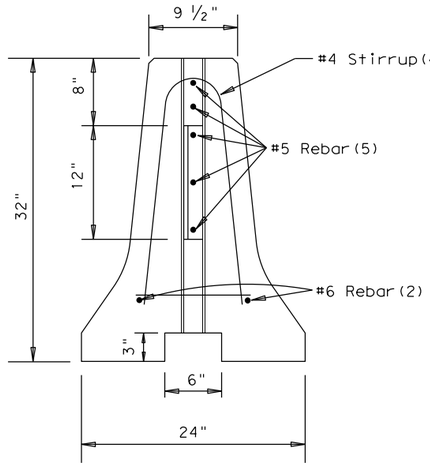
Joint Connection (Type Q)



TOP VIEW
PRECAST (CSB) WITH J-J HOOKS
See Manufacturer's shop drawing for additional details



VIEW FROM ABOVE
J-J HOOK CONNECTION



END VIEW
J-J HOOK CONNECTION

Joint Connection (Type J)

Proprietary Joint Connections (CSB)

Two proprietary joint connections are acceptable as alternates to the (Type X) connection shown, here on. These joint connections types are:

J-J Hooks by Easi-Set Industries, (800)547-4045
Quick-Bolt by Bexar Concrete, (210)497-3773

If one of these connection systems are exclusively specified in the plans, prior approval for sole source use must be obtained. Details of the connection components and barrier reinforcement for these systems, will be shown on the manufacturer's shop drawing(s) furnished to the Engineer.

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

CONCRETE SAFETY BARRIER (F-SHAPE)

PRECAST BARRIER
(TYPE 1)

CSB(1)-10

FILE: csb110.dgn	DN: TxDOT	CK: AM	DW: BD	CK: VP
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REVISIONS	2351	02	017	FM 2478
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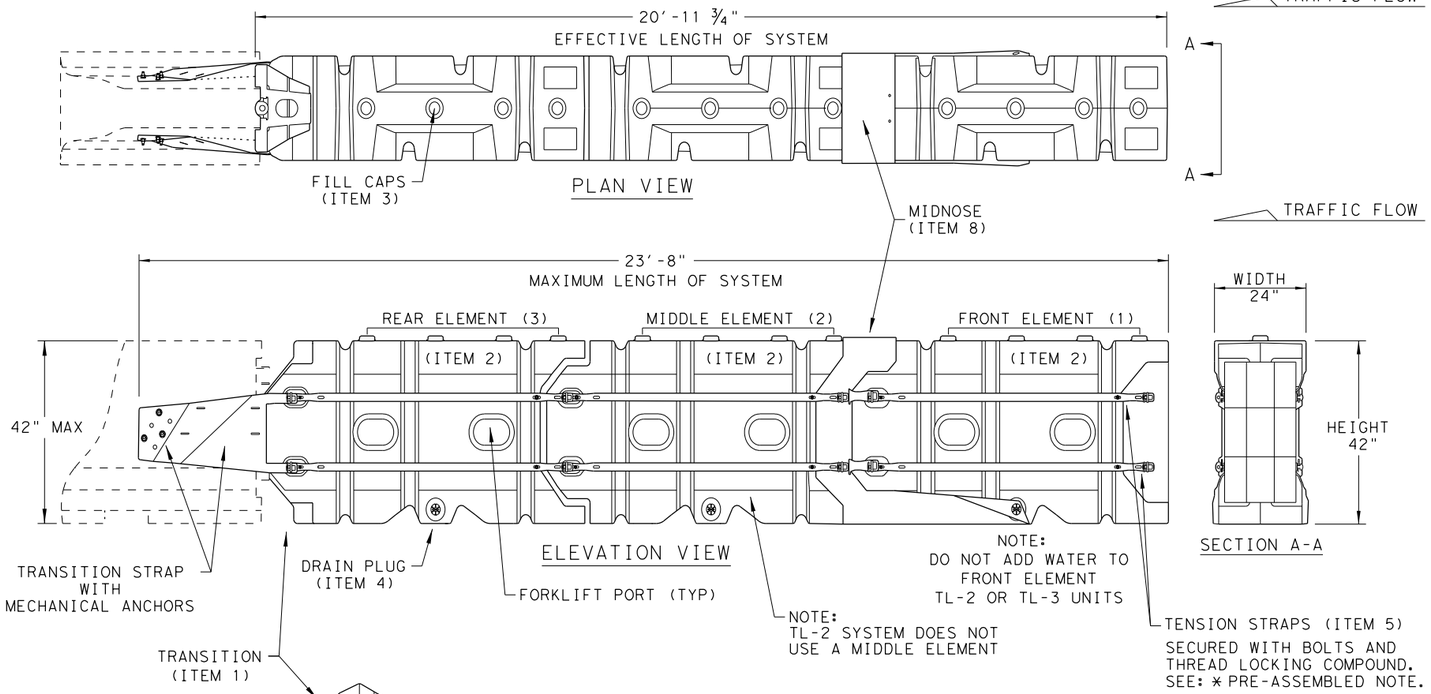
SYSTEM SHOWN - ABSORB-M TL-3



THE ABSORB-M IS A NON-REDIRECTIVE, GATING, CRASH CUSHION DESIGNED TO MEET THE LATEST TL-3 & TL-2 MASH REQUIREMENTS.

THE SYSTEM IS DESIGNED TO ACCOMMODATE A VARIETY OF F-SHAPE AND SINGLE SLOPE CONCRETE BARRIERS. CONTACT THE MANUFACTURER FOR GUIDANCE REGARDING OTHER ALLOWABLE SHAPES.

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

NOTE:
CROSS SLOPES OF UP TO 8% (OR 1:12 SLOPE) CAN BE ACCOMMODATED WITH STANDARD HARDWARE SHOWN WITHIN THE INSTRUCTIONS MANUAL. FOR SLOPES WITH EXCESS OF 8% (OR 1:12) CONTACT, LINDSAY TRANSPORTATION SOLUTIONS.

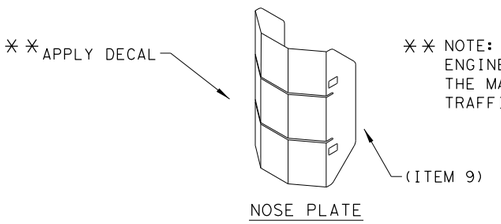
GENERAL NOTES

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

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

*COMPONENTS PRE-ASSEMBLED WITH ELEMENT ASSEMBLY

DELINEATION DECAL PLACEMENT GUIDE



NOSE PLATE

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

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

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

SACRIFICIAL

Texas Department of Transportation — Design Division Standard

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

FILE: absorbm19	DN: TxDOT	CK: KM	DW: VP	CK:
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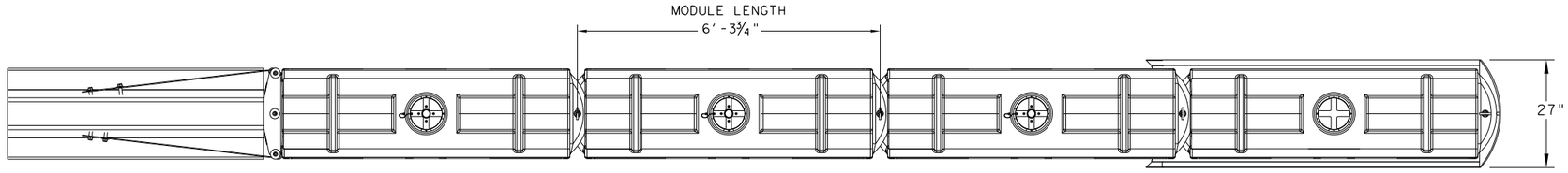
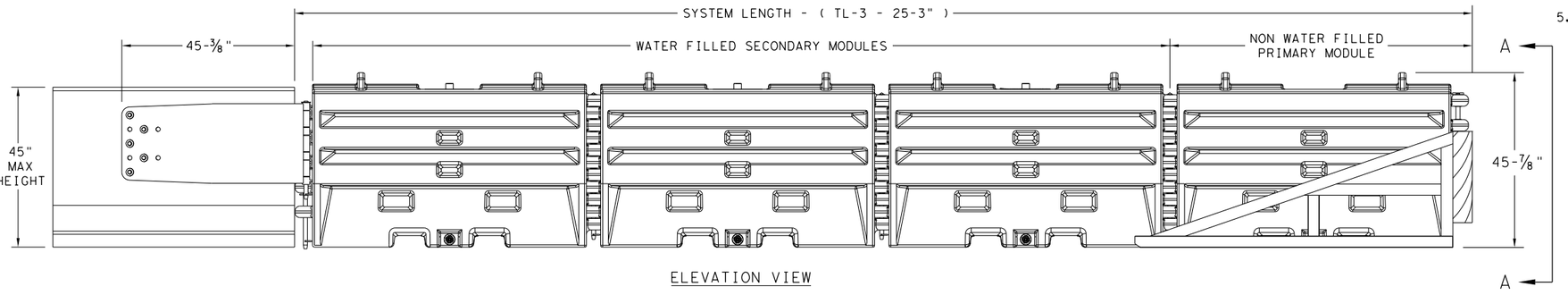
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		50



PLAN VIEW



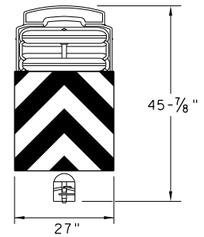
ELEVATION VIEW

GENERAL NOTES

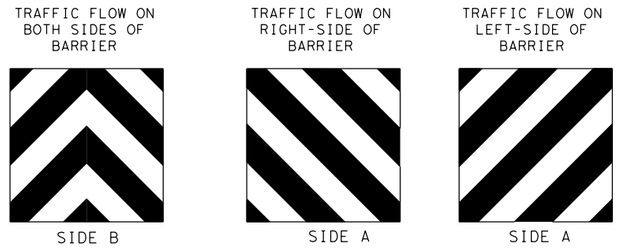
1. REFER TO THE INSTALLATION MANUAL FOR SPECIFIC SYSTEM ASSEMBLY AND MODULE ORIENTATION. FOR ADDITIONAL INFORMATION, CONTACT TRAFFIX, INC. AT (949) 361-5663.
2. THE SLED SYSTEM IS A MASH APPROVED TEST LEVEL 3 (TL-3) CRASH CUSHION APPROVED FOR USE IN TEMPORARY WORK ZONES. THE SLED SYSTEM IS A NON-REDIRECTIVE, GATING CRASH CUSHION THAT DOES NOT NEED TO BE ATTACHED TO THE GROUND AND CAN BE INSTALLED ON CONCRETE, ASPHALT, GRAVEL OR COMPACTED SOIL.
3. MAXIMUM PERMISSIBLE CROSS SLOPE IS 8° (DEGREES) (14%).
4. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
5. THE SLED SYSTEM CAN BE ATTACHED TO:

- CONCRETE BARRIER, TEMPORARY OR PERMANENT, 45" MAXIMUM HEIGHT
- STEEL BARRIER
- PLASTIC BARRIER
- CONCRETE BRIDGE ABUTMENTS
- W-BEAM GUARD RAIL
- THRIE BEAM GUARD RAIL

TEST LEVEL	NUMBER OF SECONDARY MODULES	SYSTEM LENGTH
TL-3	3	25′ 3"

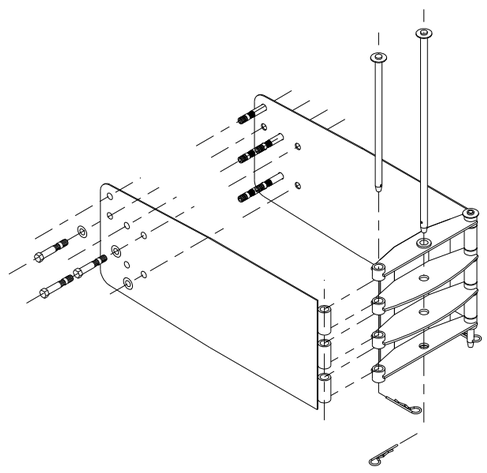


SECTION A-A



NOSE SHEETING PANEL DELINEATION

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



SLED TRANSITION COMPONENTS FOR ATTACHMENT TO CMB

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

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

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

SACRIFICIAL

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

Texas Department of Transportation

Design Division Standard

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

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© TxDOT: DECEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		51

DATE: 4/29/2023
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/2. TCP/Standards/sled19.dgn

Horizontal Alignment Review Report
Report Created: Monday, November 21, 2022
Time: 12:56:32 PM

Project: Default
Description:
File Name: c:\txdot\pw_online\txdot5\thadeus.egar\d0747085\Horizontal Alignment Data.dgn
Last Revised: 11/21/2022 12:46:38
Note: All units in this report are in feet unless specified otherwise.

Alignment Name: FM 2478 CL
Alignment Description:
Alignment Style: Alignment\Baseline
Station Northing Easting

Element: Linear
POT ( ) 10+00.000 R1 7148587.681 2509771.242
PI ( ) 26+60.559 R1 7150248.239 2509769.211
Tangential Direction: N00°04'12.278"W
Tangential Length: 1660.559

Element: Linear
PI ( ) 26+60.559 R1 7150248.239 2509769.211
PI ( ) 36+91.191 R1 7151278.870 2509767.439
Tangential Direction: N00°05'54.616"W
Tangential Length: 1030.632

Element: Linear
PI ( ) 36+91.191 R1 7151278.870 2509767.439
PI ( ) 48+41.899 R1 7152429.577 2509766.423
Tangential Direction: N00°03'02.066"W
Tangential Length: 1150.708

Element: Linear
PI ( ) 48+41.899 R1 7152429.577 2509766.423
PC ( ) 52+87.736 R1 7152875.412 2509767.729
Tangential Direction: N00°10'04.250"E
Tangential Length: 445.837

Element: Circular
PC ( ) 52+87.736 R1 7152875.412 2509767.729
PI ( ) 54+88.276 R1 7153075.952 2509768.317
CC ( ) 7152892.110 2504067.754
PT ( ) 56+88.651 R1 7153276.037 2509754.809
Radius: 5700.000
Delta: 04°01'47.843" Left
Degree of Curvature (Arc): 01°00'18.681"
Length: 400.915

Tangent: 200.540
Chord: 400.833
Middle Ordinate: 3.524
External: 3.527
Back Tangent Direction: N00°10'04.250"E
Back Radial Direction: S89°49'55.750"E
Chord Direction: N01°50'49.671"W
Ahead Radial Direction: N86°08'16.408"E
Ahead Tangent Direction: N03°51'43.592"W

Element: Linear
PT ( ) 56+88.651 R1 7153276.037 2509754.809
PI ( ) 69+29.810 R1 7154514.377 2509671.211
Tangential Direction: N03°51'43.592"W
Tangential Length: 1241.159

Element: Linear
PI ( ) 69+29.810 R1 7154514.377 2509671.211
PI ( ) 86+57.453 R1 7156237.657 2509548.515
Tangential Direction: N04°04'21.068"W
Tangential Length: 1727.642

Element: Linear
PI ( ) 86+57.453 R1 7156237.657 2509548.515
PC ( ) 95+97.281 R1 7157174.972 2509479.833
Tangential Direction: N04°11'27.234"W
Tangential Length: 939.828

Element: Circular
PC ( ) 95+97.281 R1 7157174.972 2509479.833
PI ( ) 98+87.284 R1 7157464.199 2509458.639
CC ( ) 7156751.840 2503705.315
PT ( ) 101+76.802 R1 7157749.862 2509408.652
Radius: 5790.000
Delta: 05°44'05.052" Left
Degree of Curvature (Arc): 00°59'22.432"
Length: 579.521

Tangent: 290.003
Chord: 579.279
Middle Ordinate: 7.249
External: 7.258
Back Tangent Direction: N04°11'27.234"W
Back Radial Direction: N85°48'32.766"E
Chord Direction: N07°03'29.760"W
Ahead Radial Direction: N80°04'27.714"E
Ahead Tangent Direction: N09°55'32.286"W

Element: Linear
PT ( ) 101+76.802 R1 7157749.862 2509408.652
PI ( ) 107+93.186 R1 7158357.020 2509302.406
Tangential Direction: N09°55'32.286"W
Tangential Length: 616.384

Element: Linear
PI ( ) 107+93.186 R1 7158357.020 2509302.406
PC ( ) 109+94.772 R1 7158555.803 2509268.908
Tangential Direction: N09°33'54.293"W
Tangential Length: 201.586

Element: Circular
PC ( ) 109+94.772 R1 7158555.803 2509268.908
PI ( ) 114+10.472 R1 7158965.724 2509199.833
CC ( ) 7159469.726 2514692.445
PT ( ) 118+24.593 R1 7159381.369 2509193.154
Radius: 5500.000
Delta: 08°38'40.528" Right
Degree of Curvature (Arc): 01°02'30.269"
Length: 829.821

Tangent: 415.699
Chord: 829.034
Middle Ordinate: 15.643
External: 15.687
Back Tangent Direction: N09°33'54.293"W
Back Radial Direction: N80°26'05.707"E
Chord Direction: N05°14'34.029"W
Ahead Radial Direction: N89°04'46.235"E
Ahead Tangent Direction: N00°55'13.765"W

Element: Linear
PT ( ) 118+24.593 R1 7159381.369 2509193.154
PI ( ) 121+26.982 R1 7159683.719 2509188.297
Tangential Direction: N00°55'13.765"W
Tangential Length: 302.388

Element: Linear
PI ( ) 121+26.982 R1 7159683.719 2509188.297
PI ( ) 127+55.627 R1 7160312.318 2509180.648
Tangential Direction: N00°41'49.531"W
Tangential Length: 628.646

Element: Linear
PI ( ) 127+55.627 R1 7160312.318 2509180.648
PI ( ) 132+82.111 R1 7160838.763 2509174.275
Tangential Direction: N00°41'37.119"W
Tangential Length: 526.484

Element: Linear
PI ( ) 132+82.111 R1 7160838.763 2509174.275
PC ( ) 153+01.679 R1 7162858.156 2509147.672
Tangential Direction: N00°45'17.132"W
Tangential Length: 2019.568

Element: Circular
PC ( ) 153+01.679 R1 7162858.156 2509147.672
PI ( ) 161+17.361 R1 7163673.767 2509136.927
CC ( ) 7162868.958 2509967.600
PT ( ) 165+85.403 R1 7163688.818 2509952.470
Radius: 820.000
Delta: 89°41'50.926" Right
Degree of Curvature (Arc): 06°59'14.245"
Length: 1283.723

Tangent: 815.682
Chord: 1156.590
Middle Ordinate: 238.644
External: 336.606
Back Tangent Direction: N00°45'17.132"W
Back Radial Direction: N89°14'42.868"E
Chord Direction: N44°05'38.330"E
Ahead Radial Direction: S01°03'26.207"E
Ahead Tangent Direction: N88°56'33.793"E

Element: Linear
PT ( ) 165+85.403 R1 7163688.818 2509952.470
PI ( ) 175+15.504 R1 7163705.980 2510882.413
Tangential Direction: N88°56'33.793"E
Tangential Length: 930.101

Element: Linear
PI ( ) 175+15.504 R1 7163705.980 2510882.413
PI ( ) 188+82.766 R1 7163732.231 2512249.422
Tangential Direction: N88°53'59.497"E
Tangential Length: 1367.262

Element: Linear
PI ( ) 188+82.766 R1 7163732.231 2512249.422
PC ( ) 202+40.340 R1 7163759.471 2513606.723
Tangential Direction: N88°51'01.002"E
Tangential Length: 1357.574

Element: Circular
PC ( ) 202+40.340 R1 7163759.471 2513606.723
PI ( ) 210+55.589 R1 7163775.829 2514421.808
CC ( ) 7164574.307 2513590.370
PT ( ) 215+20.788 R1 7164590.910 2514405.201
Radius: 815.000
Delta: 90°01'03.171" Left
Degree of Curvature (Arc): 07°01'48.565"
Length: 1280.449

Tangent: 815.250
Chord: 1152.761
Middle Ordinate: 238.796
External: 337.761
Back Tangent Direction: N88°51'01.002"E
Back Radial Direction: S01°08'58.998"E
Chord Direction: N43°50'29.417"E
Ahead Radial Direction: N88°49'57.831"E
Ahead Tangent Direction: N01°10'02.169"W

Element: Linear
PT ( ) 215+20.788 R1 7164590.910 2514405.201
PI ( ) 233+34.219 R1 7166403.964 2514368.259
Tangential Direction: N01°10'02.169"W
Tangential Length: 1813.431

Element: Linear
PI ( ) 233+34.219 R1 7166403.964 2514368.259
PI ( ) 235+91.943 R1 7166661.678 2514366.009
Tangential Direction: N00°30'00.393"W
Tangential Length: 257.724

Element: Linear
PI ( ) 235+91.943 R1 7166661.678 2514366.009
PI ( ) 242+53.751 R1 7167323.479 2514362.853
Tangential Direction: N00°16'23.593"W
Tangential Length: 661.808

Element: Linear
PI ( ) 242+53.751 R1 7167323.479 2514362.853
PI ( ) 250+41.955 R1 7168111.633 2514353.982
Tangential Direction: N00°38'41.593"W
Tangential Length: 788.203

Element: Linear
PI ( ) 250+41.955 R1 7168111.633 2514353.982
PI ( ) 259+42.630 R1 7169012.167 2514338.042
Tangential Direction: N01°00'50.729"W
Tangential Length: 900.675

Element: Linear
PI ( ) 259+42.630 R1 7169012.167 2514338.042
PI ( ) 263+35.775 R1 7169405.311 2514337.762
Tangential Direction: N00°02'26.486"W
Tangential Length: 393.145

Element: Linear
PI ( ) 263+35.775 R1 7169405.311 2514337.762
PI ( ) 273+48.683 R1 7170418.202 2514343.760
Tangential Direction: N00°20'21.411"E
Tangential Length: 1012.908

Element: Linear
PI ( ) 273+48.683 R1 7170418.202 2514343.760
PI ( ) 289+70.969 R1 7172040.483 2514348.033
Tangential Direction: N00°09'03.213"E
Tangential Length: 1622.287

Element: Linear
PI ( ) 289+70.969 R1 7172040.483 2514348.033
PI ( ) 301+97.228 R1 7173266.733 2514352.571
Tangential Direction: N00°12'43.398"E
Tangential Length: 1226.259

Element: Linear
PI ( ) 301+97.228 R1 7173266.733 2514352.571
POT ( ) 316+36.684 R1 7174706.109 2514367.745
Tangential Direction: N00°36'14.383"E
Tangential Length: 1439.456

NOTES:

1. THE HORIZONTAL ALIGNMENT DATA SHOWN ON THIS PAGE IS FOR DESIGN PURPOSES ONLY. DO NOT USE THIS INFORMATION FOR CONSTRUCTION. PERFORME THE WIDENING OFF THE EXISTING ROADWAY ACCORDING TO THE TYPICAL SECTIONS.

2. TO VERIFY THE GEOMETRIC DATA SEE AS-BUILT CSJ: 2351-02-001

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
, P.E.
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		52

DATE: 4/29/2023 10:15:23 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020174 - Design/Plan Set/3. Roadway/Horizontal Alignment Data.dgn

CK:
DW:
CK:
DW:

SUPERELEVATION TABLE

PC STA.	PI STA.	PT STA.	BEGIN SUPER TRANSITION STA.	END SUPER TRANSITION BEGIN FULL SUPER STA.	END FULL SUPER BEGIN SUPER TRANSITION STA.	END SUPER TRANSITION STA.	SUPERELEVATION RATE e %
153+01.68	161+17.36	165+85.40	152+19.74	153+22.16	165+64.91	166+67.33	5.3
202+40.34	210+55.59	215+20.79	201+61.44	202+60.06	215+01.06	215+99.68	5.3

NOTES:

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STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023

Signature of Registrant & Date

Texas Department of Transportation

FM 2478

SUPERELEVATION TABLE

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		53

DW: CK: DW: CK:

DATE: 4/29/2023 10:15:45 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020174 - Design/Plan Set/3. Roadway/SuperelevationTable.dgn

VERTICAL CURVE INFORMATION

VPI	ELEVATION (FT)	G1 (%)	G2 (%)	A	L (FT)	K	CREST/SAG	DESIGN SPEED (MPH)
67+80	767.27	0.2948	1.0558	0.7610	500	657	SAG	80
77+17	77.17	1.0558	0.3459	0.7099	400	563	CREST	80
94+11	783.03	0.3459	-2.2808	2.6267	450	171	CREST	60
108+40	750.43	-2.2808	1.5612	3.8420	500	130	SAG	60
126+93	779.36	1.5612	-0.3672	1.9284	325	169	CREST	60
135+20	776.33	-0.3672	0.4816	0.8488	300	353	SAG	80
149+27	783.10	0.4816	-1.1338	1.6154	600	371	CREST	80
160+73	770.11	-1.1338	0.3537	1.4875	300	202	SAG	75
164+81	771.56	0.3537	-0.5798	0.9335	250	268	CREST	70
185+95	759.30	-0.5798	1.0990	1.6788	350	208	SAG	75
197+87	772.40	1.0990	-1.0541	2.1531	475	221	CREST	65
217+54	751.67	-1.0541	1.9644	3.0185	300	99	SAG	50
223+01	762.42	1.9644	-1.1335	3.0979	350	113	CREST	55
227+77	757.02	-1.1335	1.2523	2.3858	325	136	SAG	60
233+43	764.11	1.2523	-3.0647	4.3170	600	139	CREST	55
240+94	741.09	-3.0647	0.8235	3.8882	510	131	SAG	60
249+13	747.84	0.8235	-1.0029	1.8264	410	224	CREST	65
256+67	740.28	-1.0029	0.7335	1.7364	525	302	SAG	80
261+73	743.99	0.7335	-1.8580	2.5915	300	116	CREST	55
265+22	737.50	-1.8580	-0.2542	1.6038	175	109	SAG	50
270+99	736.04	-0.2542	-4.4465	4.1923	675	161	CREST	60
284+78	674.72	-4.4465	1.4355	5.8820	1200	204	SAG	75
300+90	697.86	1.4355	-1.3400	2.7755	475	171	CREST	60
307+69	688.76	-1.3400	4.5212	5.8612	475	81	SAG	45
313+23	713.81	4.5212	2.9540	1.5672	100	64	CREST	45

Thadeus Egar ,P.E. 5/11/2023

Signature of Registrant & Date

NOTES:

1. THIS VERTICAL ALIGNMENT DATA SHWON ON THIS PAGE IS FOR CONTRACTORS' INFORMATION ONLY. DO NOT USE THIS INFORMATION FOR CONSTRUCTION. PERFORM THE WIDENING OFF THE EXISTING ROADWAY ACCORDING TO THE TYPICAL SECTION.
2. TO VERIFY THE GEOMETRIC DATA, SEE AS-BUILT CSJ: 2351-02-001

Texas Department of Transportation

FM 2478

VERTICAL ALIGNMENT DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		54

DW: CK: DW: CK:

DATE: 4/29/2023 10:16:06 AM
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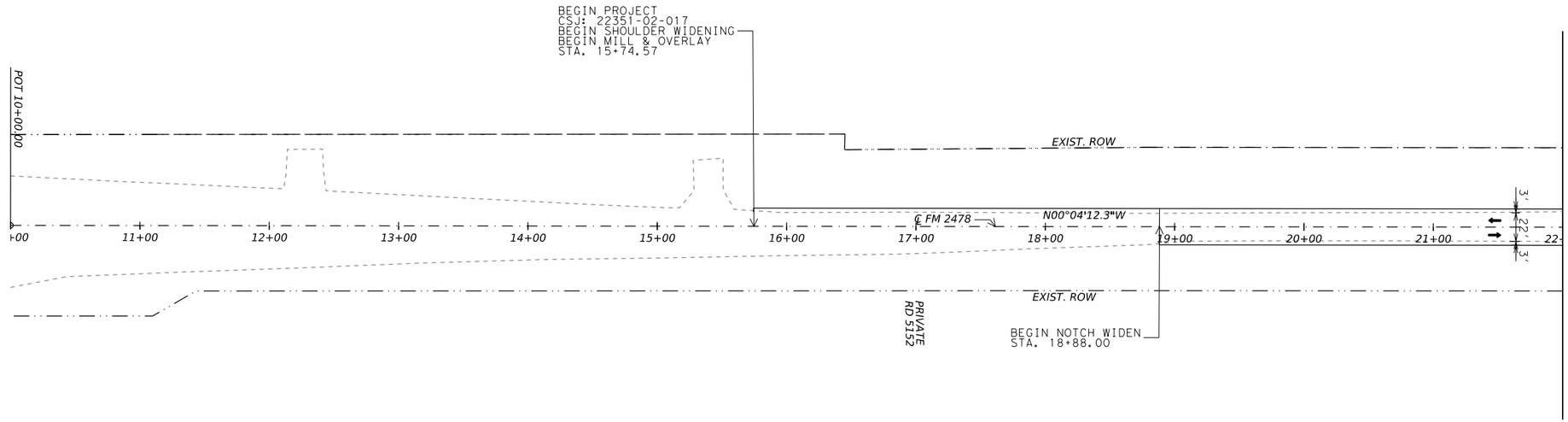
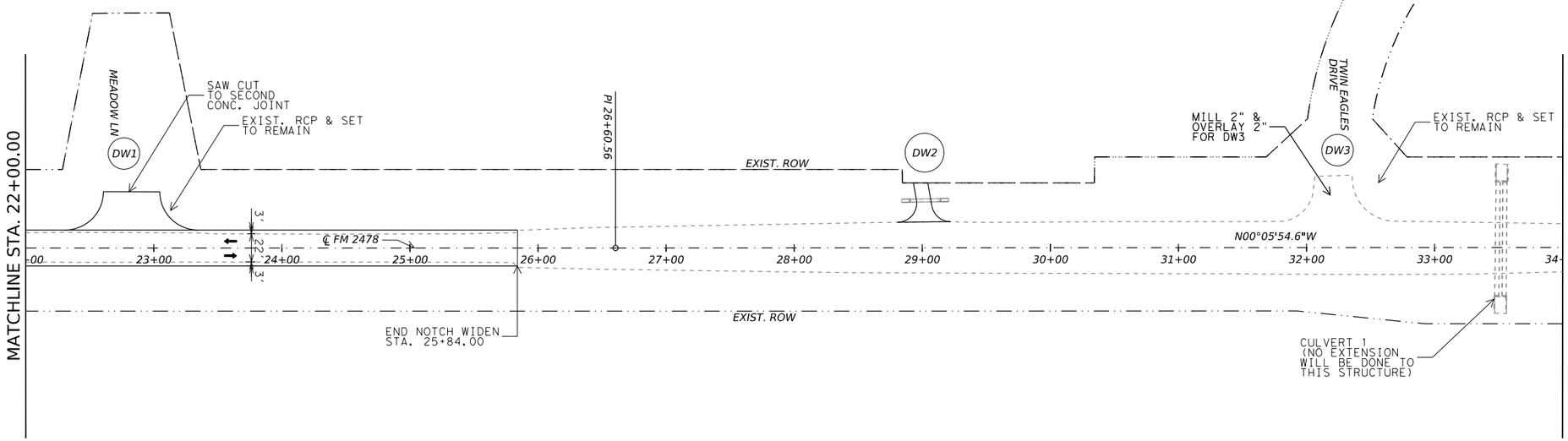


NOTES:

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



Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

BEGIN PROJECT TO STA. 34+00.00

SCALE: 1" = 100' SHEET 1 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		55

DATE: 4/29/2023 10:16:34 AM
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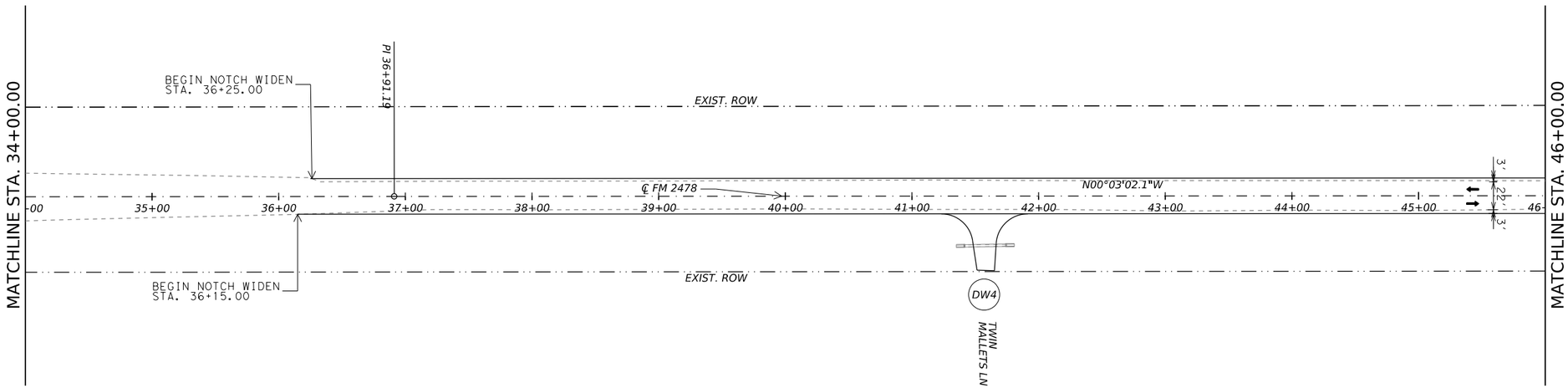
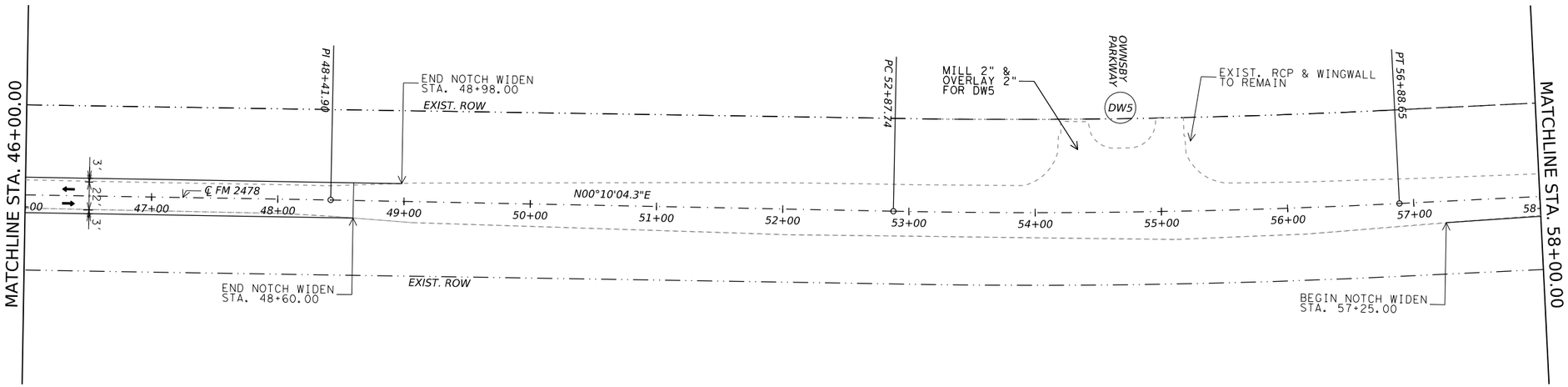




0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

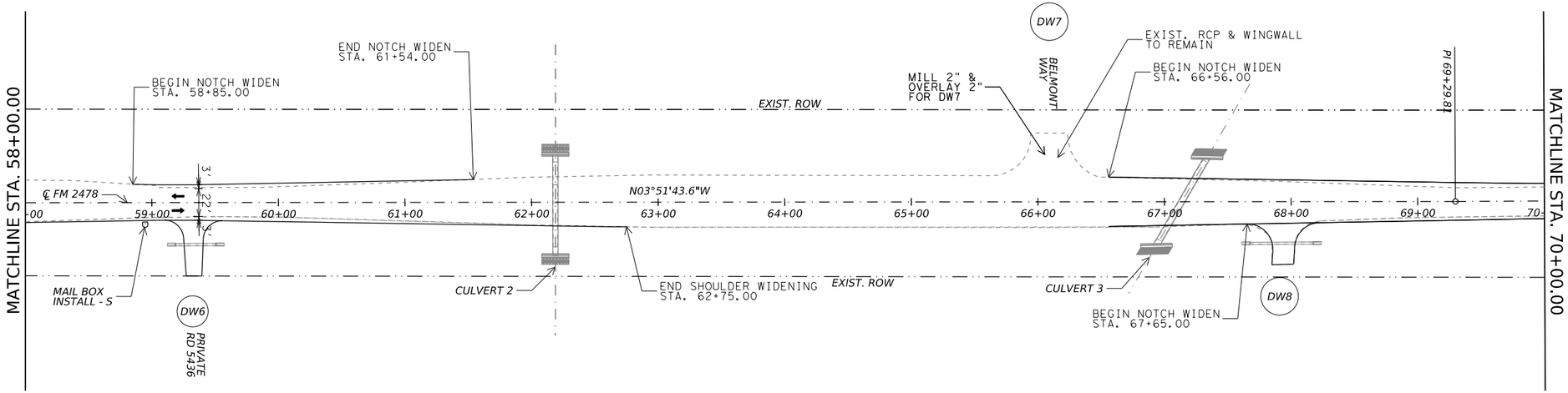
ROADWAY PLANS

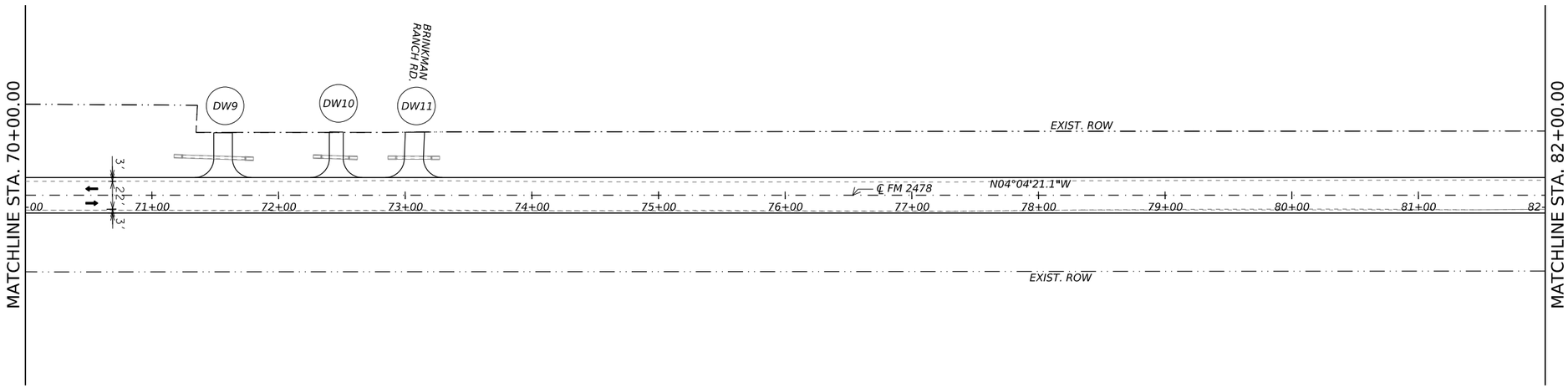
STA. 34+00.00 TO STA. 58+00.00

SCALE: 1" = 100' SHEET 2 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		56

DATE: 4/29/2023 10:16:35 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020017/4 - Design/Plan Set/3. Roadway/Roadway Plans Sheets.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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

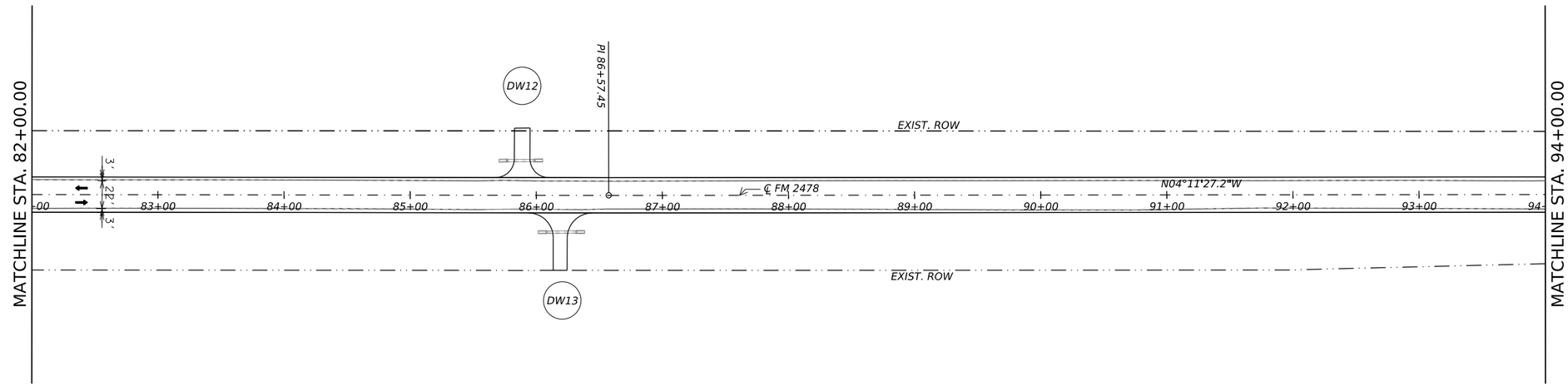
ROADWAY PLANS

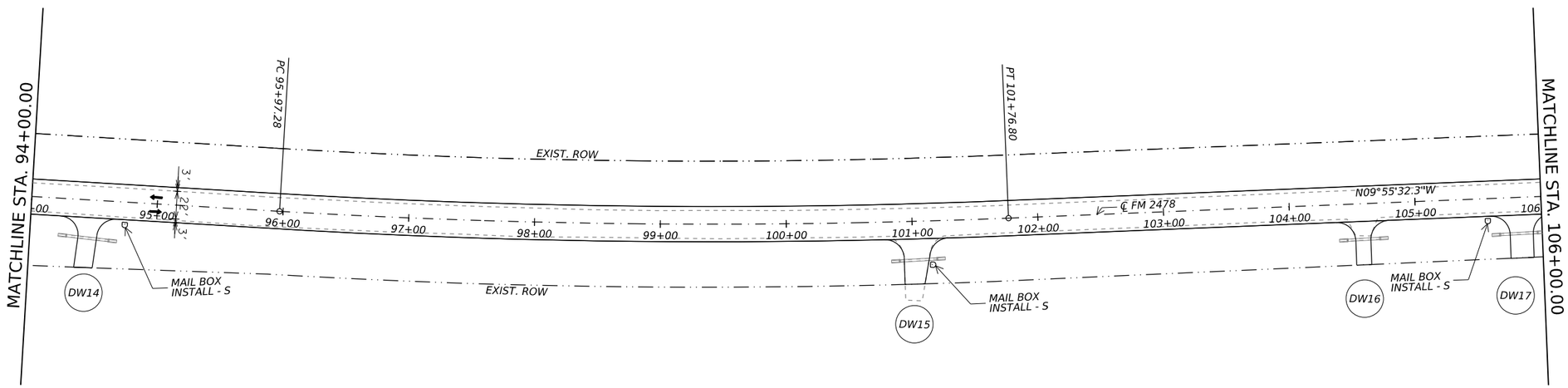
STA. 58+00.00 TO STA. 82+00.00

SCALE: 1" = 100' SHEET 3 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		57

DATE: 4/29/2023 10:16:37 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020017/4 - Design/Plan Set/3. Roadway/Roadway Plans Sheets.dgn





0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
THADEUS V. EGAR
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PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

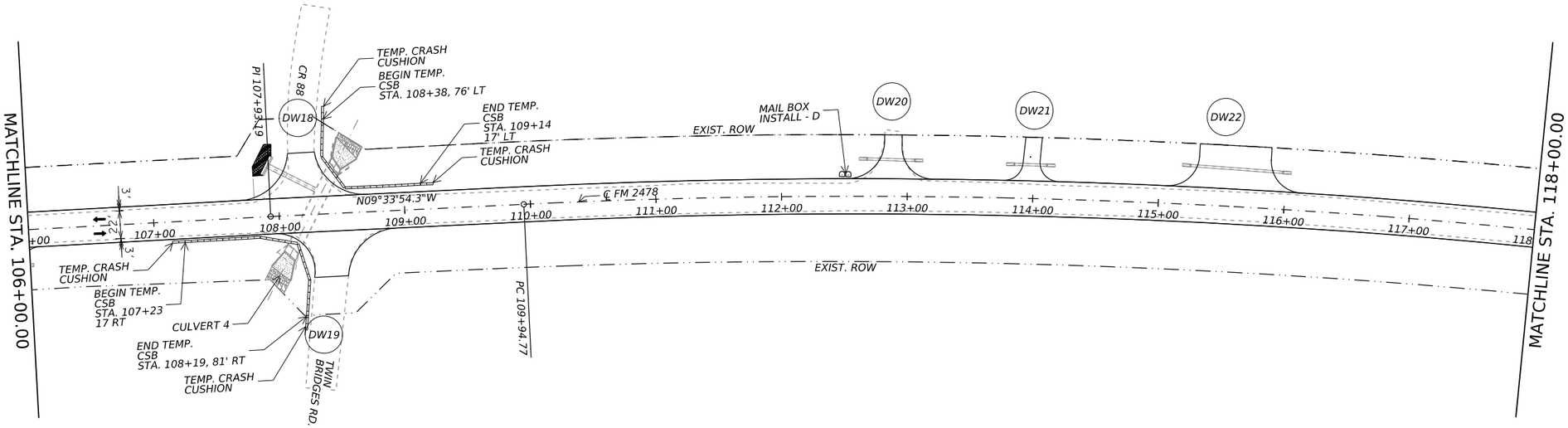
ROADWAY PLANS

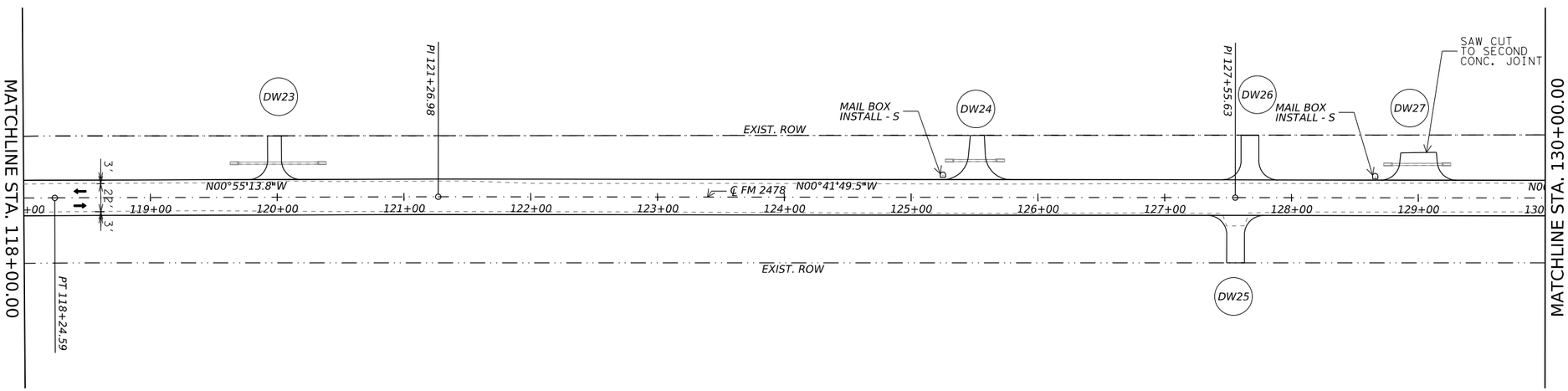
STA. 82+00.00 TO STA. 106+00.00

SCALE: 1" = 100' SHEET 4 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		58

DATE: 4/29/2023 10:16:38 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020017/4 - Design/Plan Set/3. Roadway/Roadway Plans Sheets.dgn





0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 106+00.00 TO STA. 130+00.00

SCALE: 1" = 100' SHEET 5 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		59

DATE: 5/10/2023 9:36:11 AM
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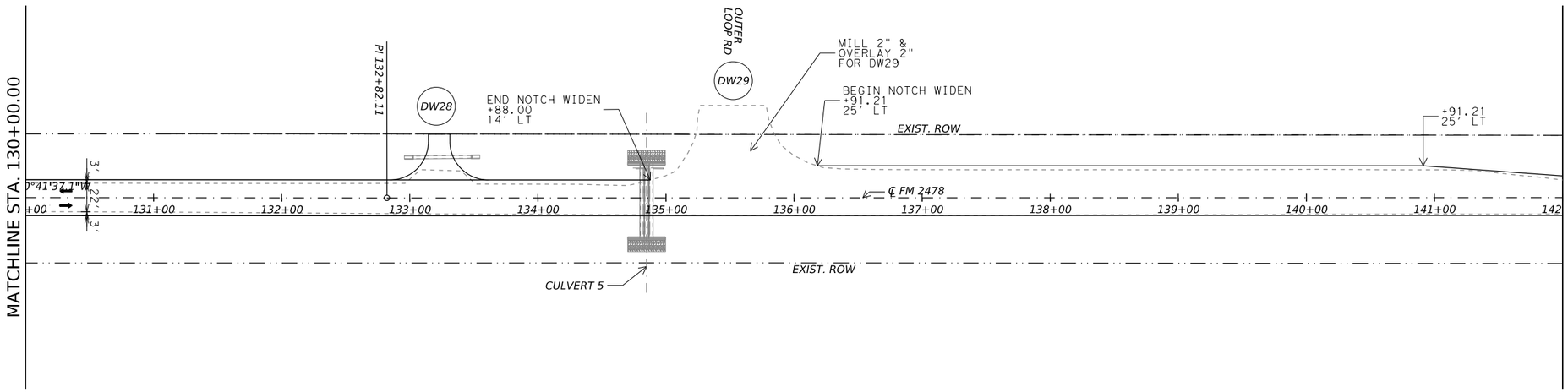

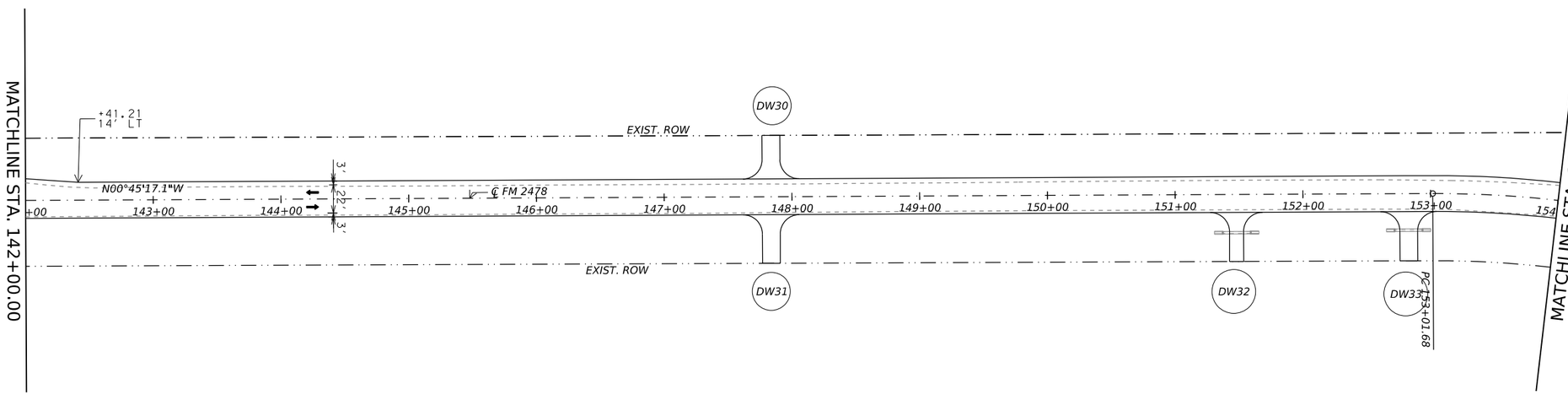

NOTES:

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

STATE OF TEXAS
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Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 130+00.00 TO STA. 154+00.00

SCALE: 1" = 100' SHEET 6 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		60

DATE: 4/29/2023 10:16:41 AM
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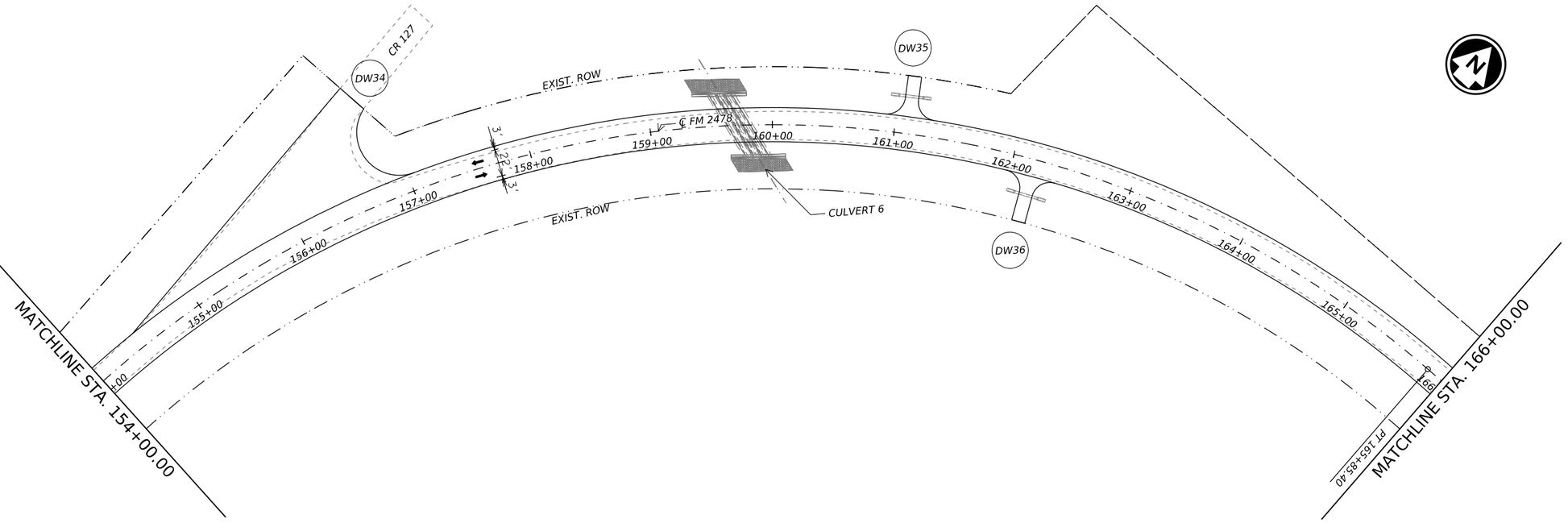

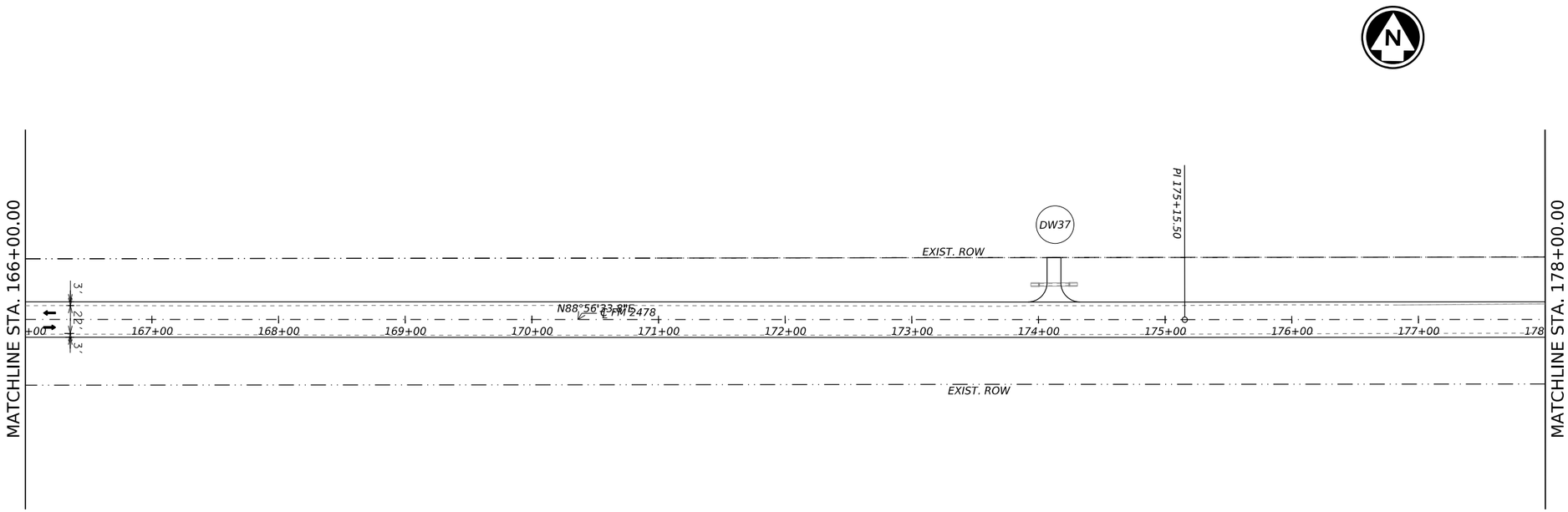

NOTES:

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

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 154+00.00 TO STA. 178+00.00

SCALE: 1" = 100' SHEET 7 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		61

DATE: 4/29/2023 10:16:42 AM
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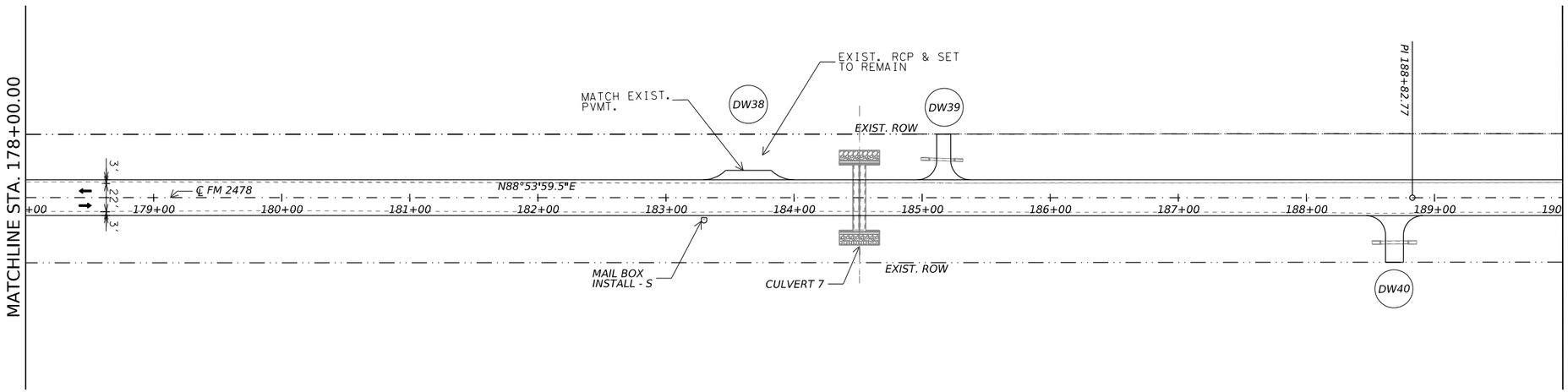

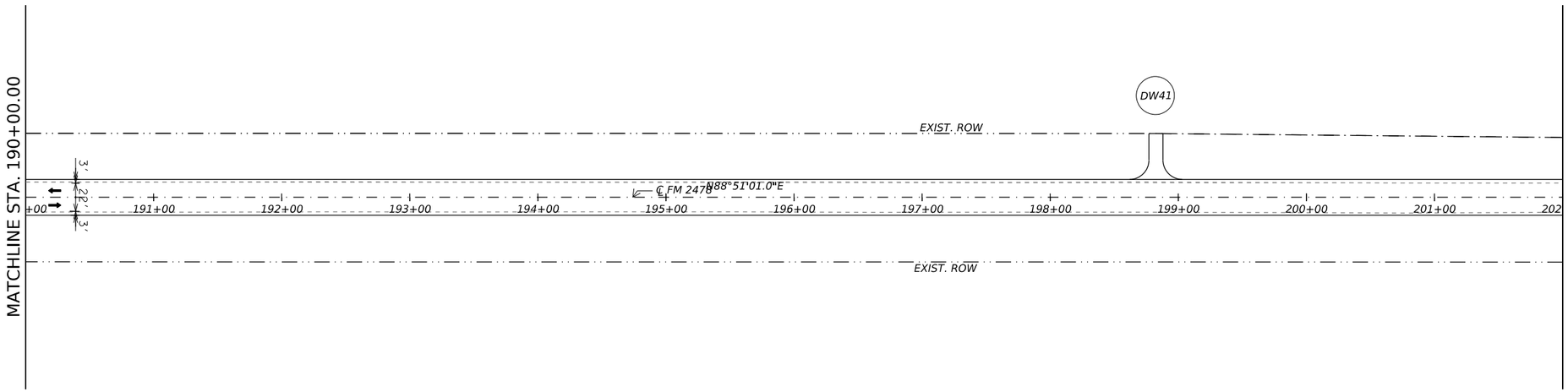

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NOTES:

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

STATE OF TEXAS
THADEUS V. EGAR
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PROFESSIONAL ENGINEER

Thadeus Egar, P.E 05/11/2023
Signature of Registrant , P.E. & Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 178+00.00 TO STA. 202+00.00

SCALE: 1" = 100' SHEET 8 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		62

DATE: 5/23/2023 11:24:04 AM
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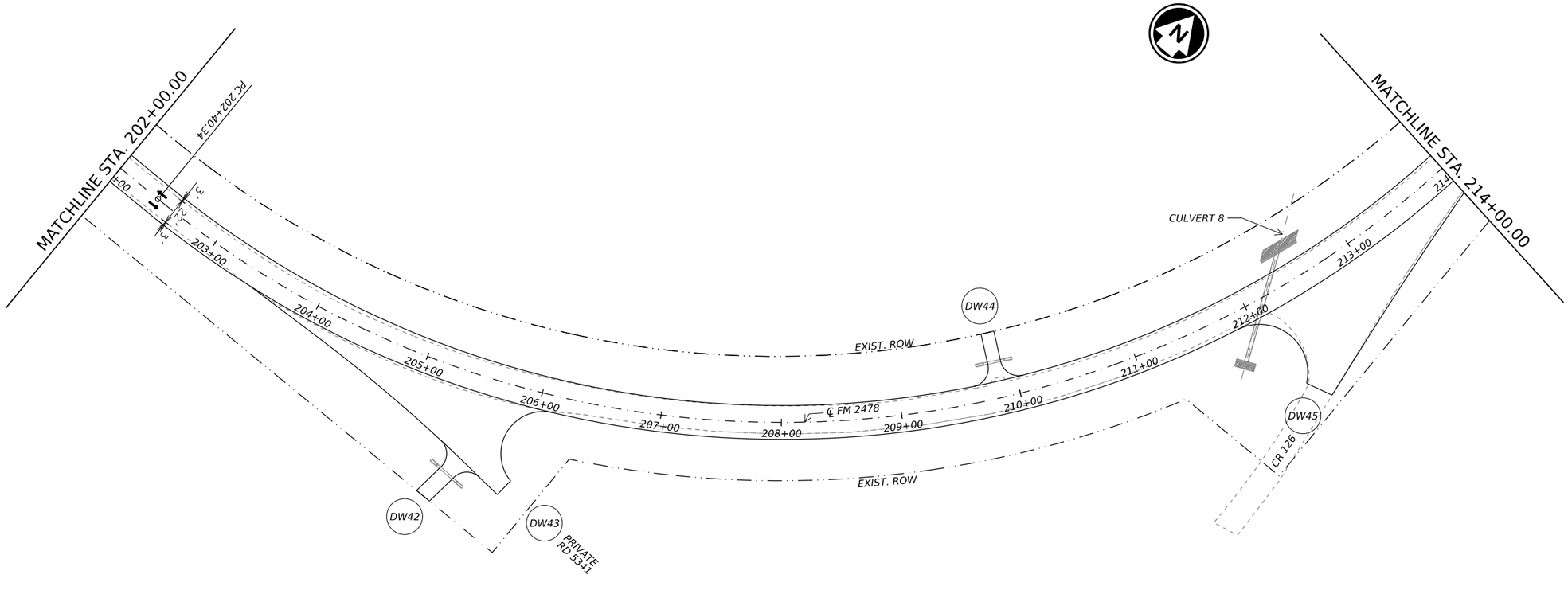

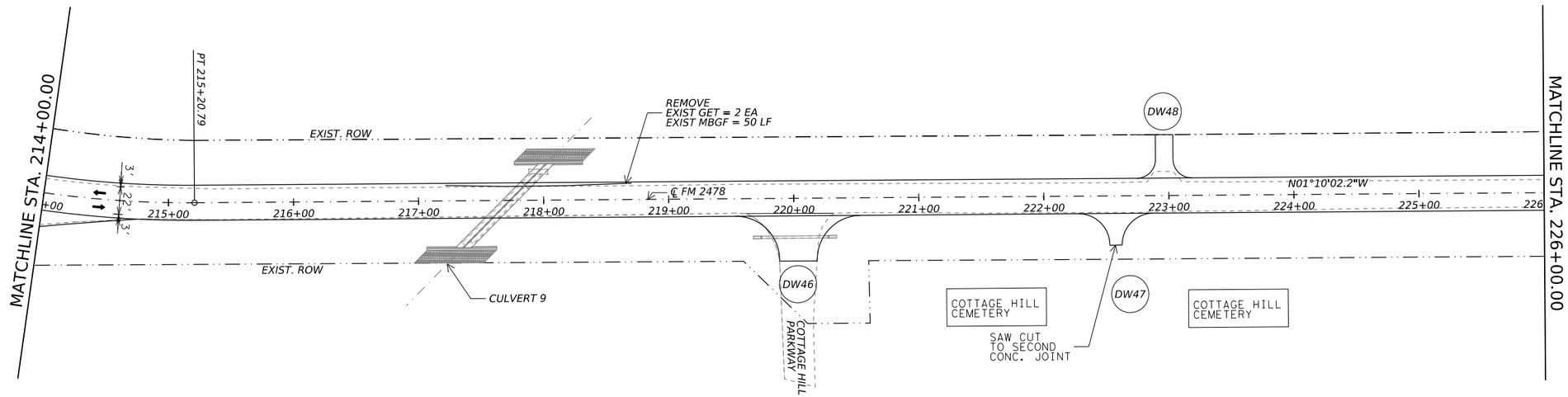

0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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Thadeus Egar 5/11/2023
Signature of Registrant & P.E. Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 202+00.00 TO STA. 226+00.00

SCALE: 1" = 100' SHEET 9 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		63

DATE: 4/29/2023 10:16:45 AM
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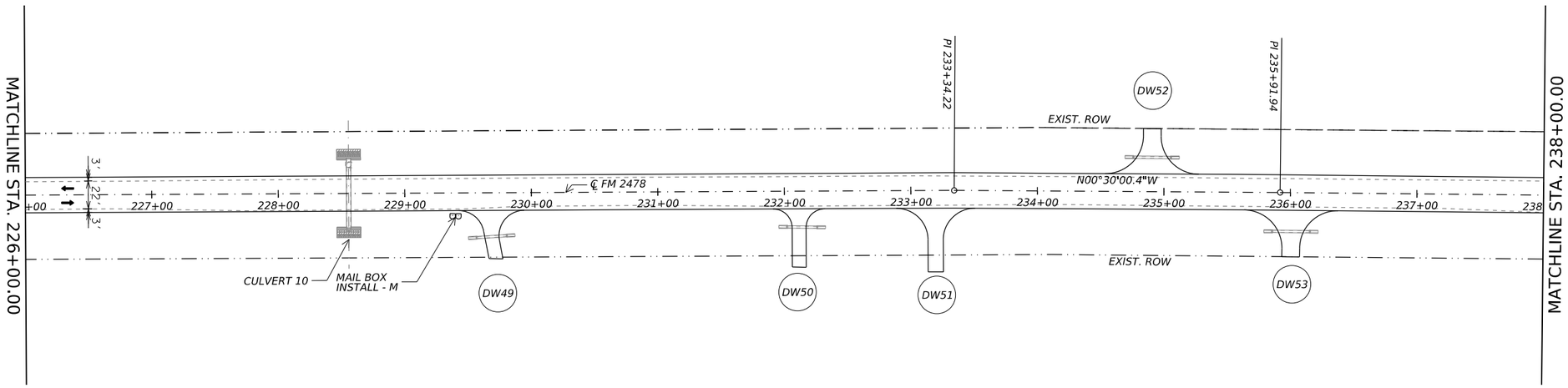

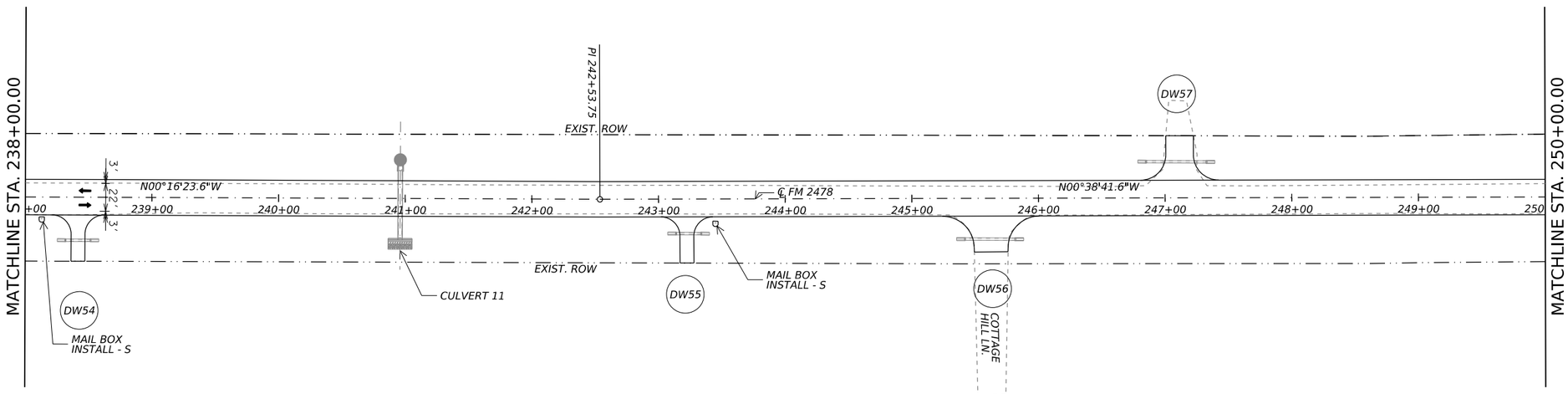

0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
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Thadeus Egar 5/11/2023
Signature of Registrant & P.E. Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 226+00.00 TO STA. 250+00.00

SCALE: 1" = 100' SHEET 10 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		64

DATE: 4/29/2023 10:16:47 AM
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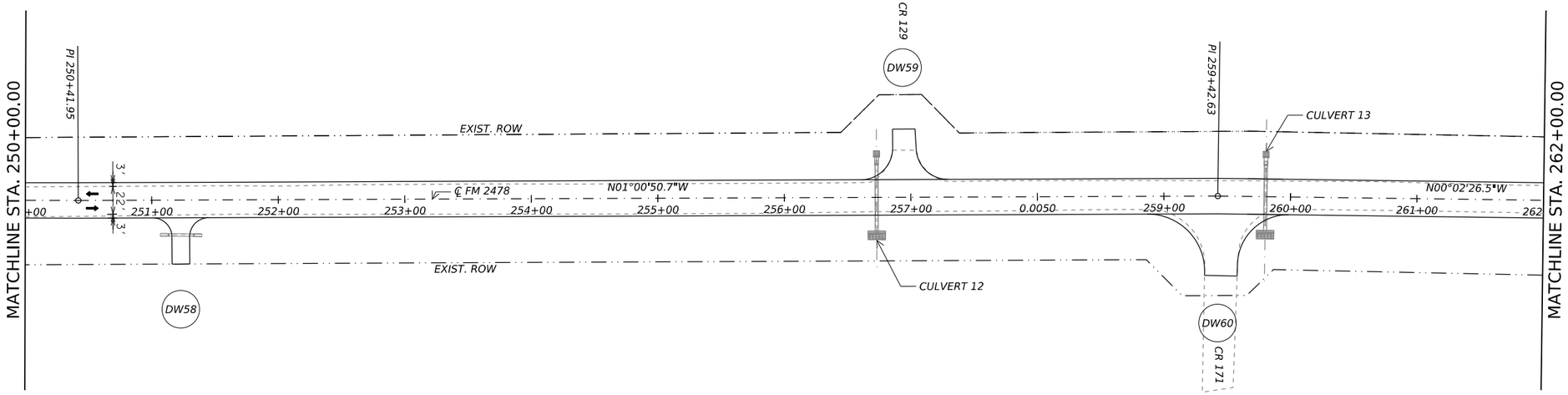

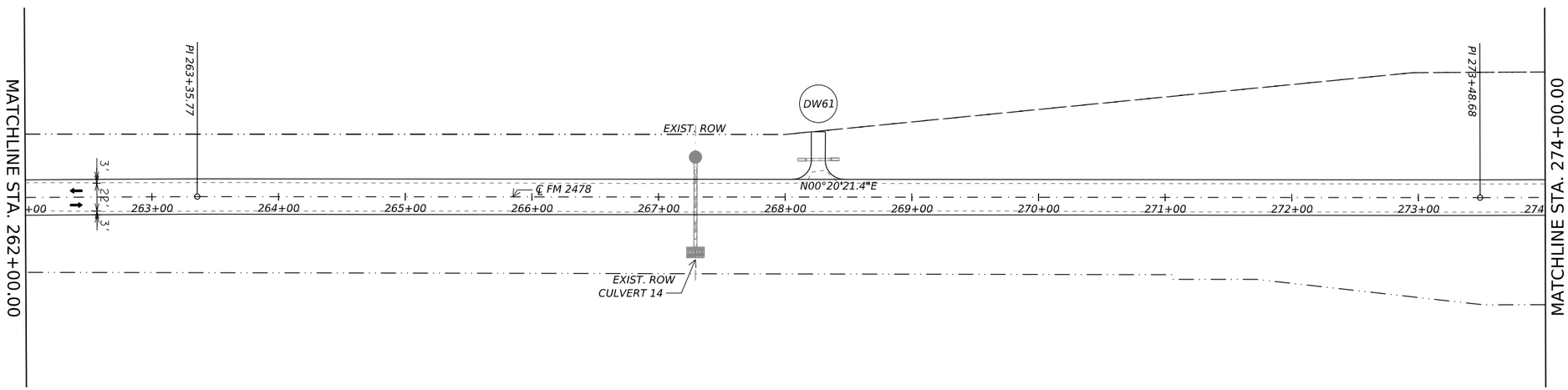

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NOTES:

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

STATE OF TEXAS
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Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 250+00.00 TO STA. 274+00.00

SCALE: 1" = 100' SHEET 11 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		65

DATE: 4/29/2023 10:16:48 AM
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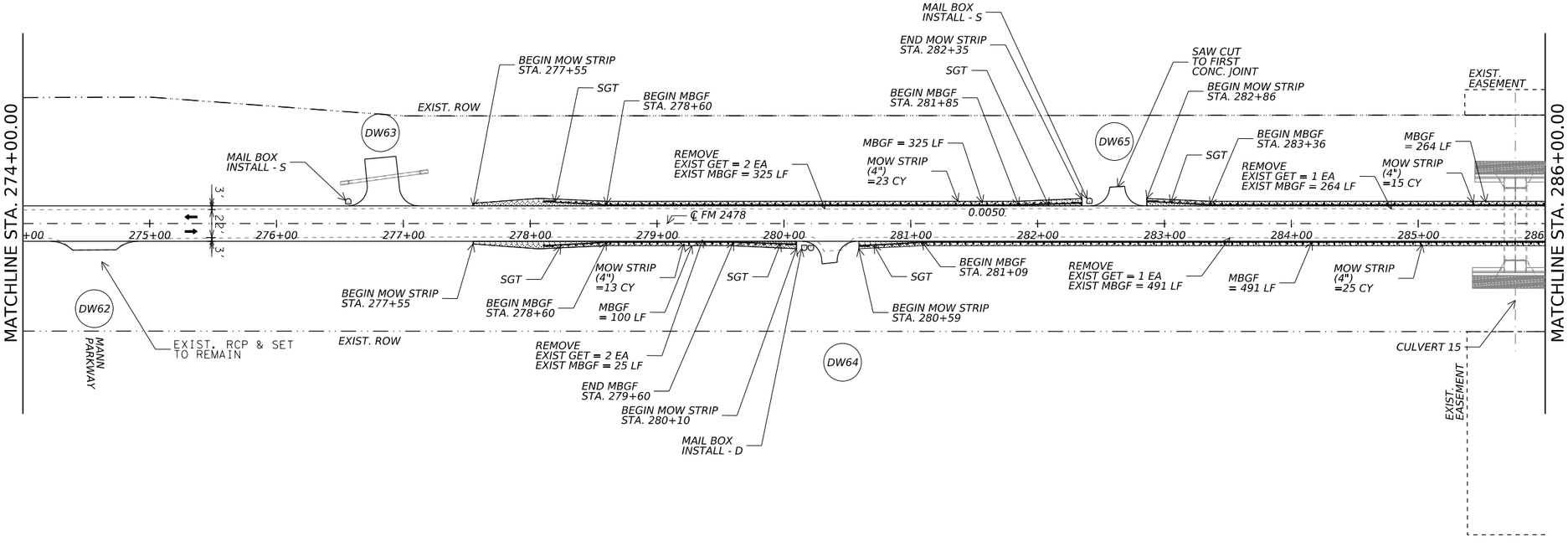

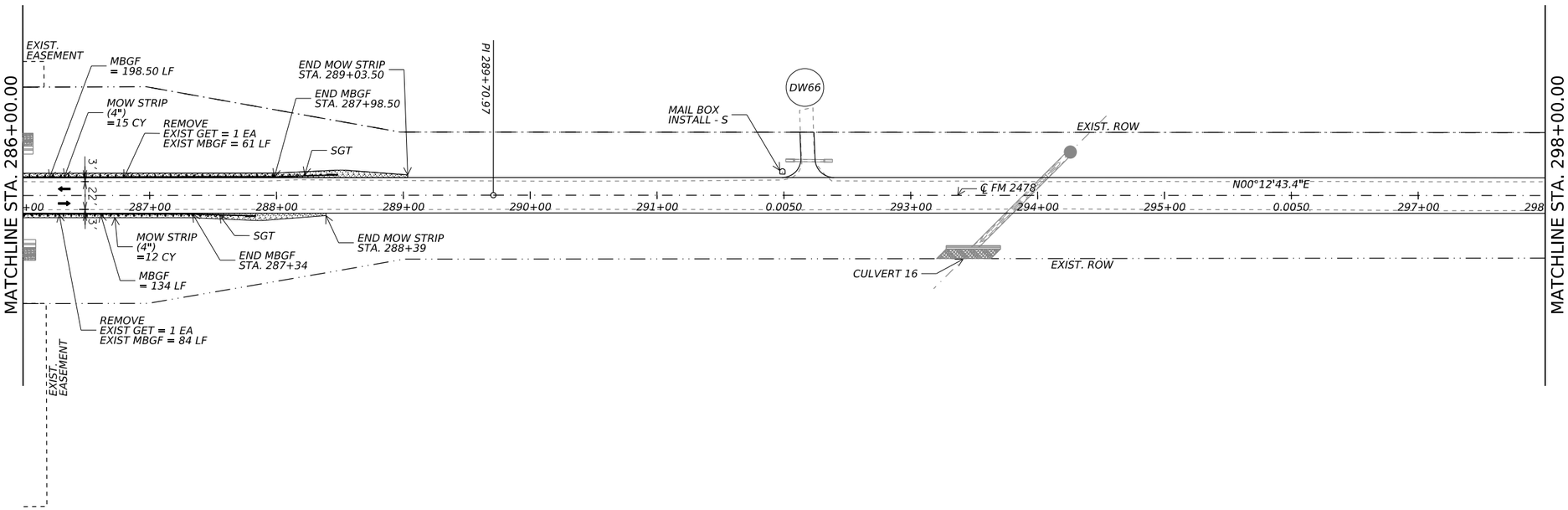

0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant , P.E. & Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 274+00.00 TO STA. 298+00.00

SCALE: 1" = 100' SHEET 12 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		66

DATE: 4/29/2023 10:16:49 AM
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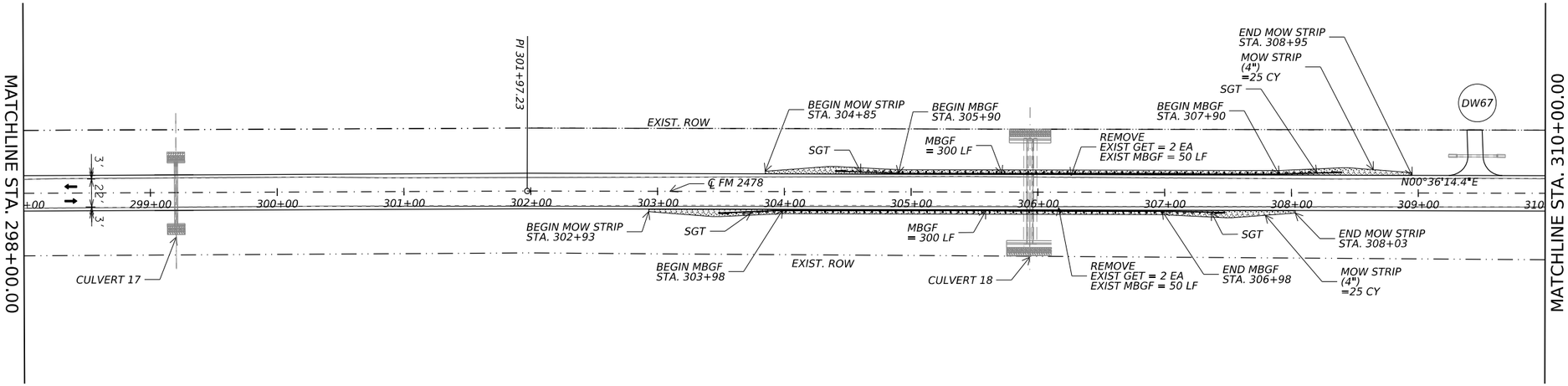

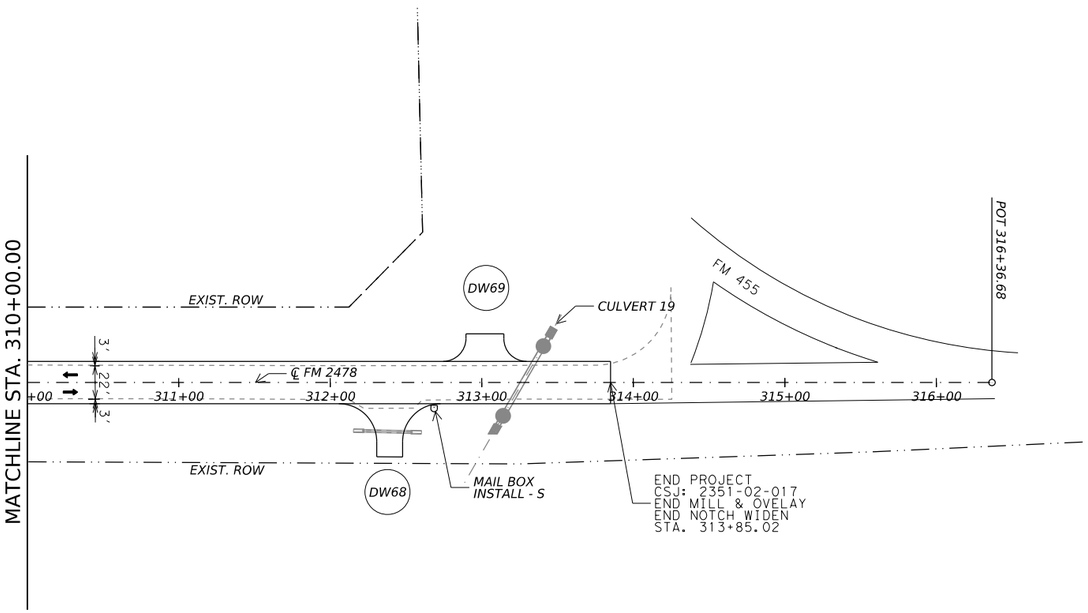

0 50 100

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 FOR ADDITIONAL INFORMATION.
4. SEE "MISCELLANEOUS ROADWAY DETAILS" SHEET AND "DRIVEWAY SUMMARY" SHEET FOR ADDITIONAL INFORMATION.

STATE OF TEXAS
THADEUS V. EGAR
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PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant , P.E. & Date

Texas Department of Transportation

FM 2478

ROADWAY PLANS

STA. 298+00.00 TO END PROJECT

SCALE: 1" = 100' SHEET 13 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		67

DATE: 4/29/2023 10:16:51 AM
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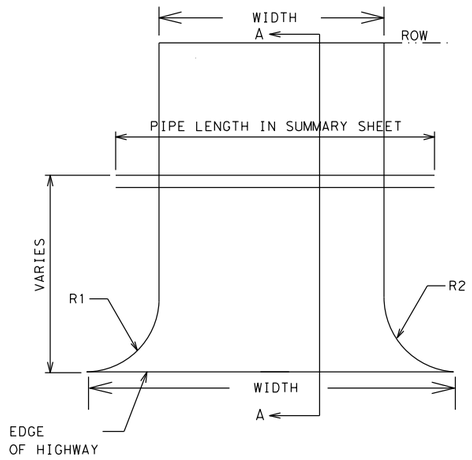
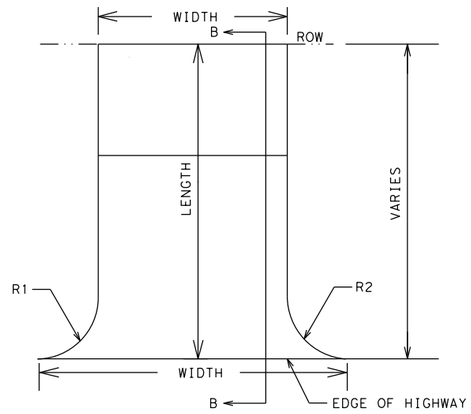
CK
DW
CK
DW

ASPHALT DRIVEWAY OVERLAY DETAILS W/PIPE REPLACEMENT



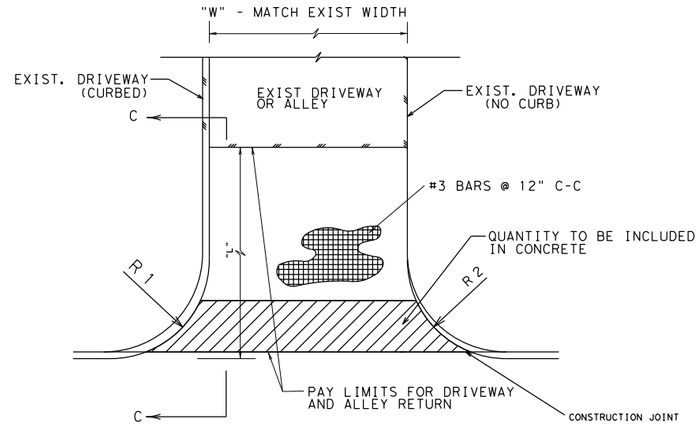
PLAN VIEW

ASPHALT DRIVEWAY OVERLAY DETAILS WITHOUT PIPE REPLACEMENT

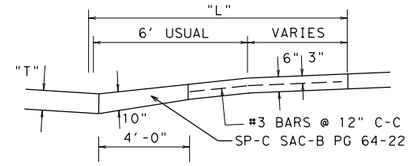


PLAN VIEW

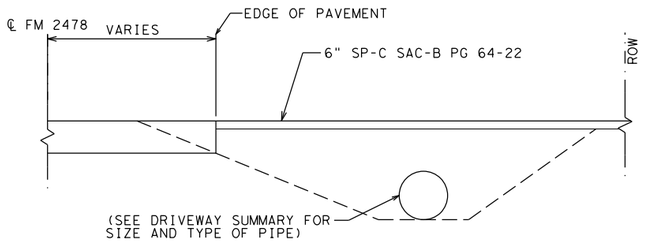
CONCRETE DRIVEWAYS



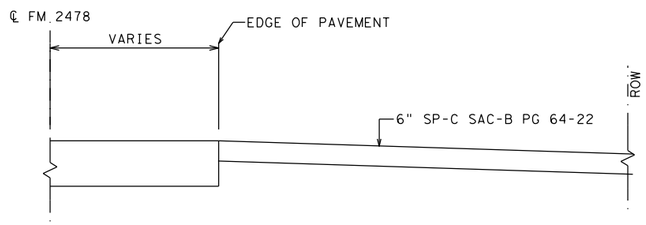
PLAN VIEW



SECTION C-C



SECTION A-A



SECTION B-B

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

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 2478

MISCELLANEOUS ROADWAY DETAILS

SCALE: NTS SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		68

DATE: 4/29/2023 10:17:14 AM
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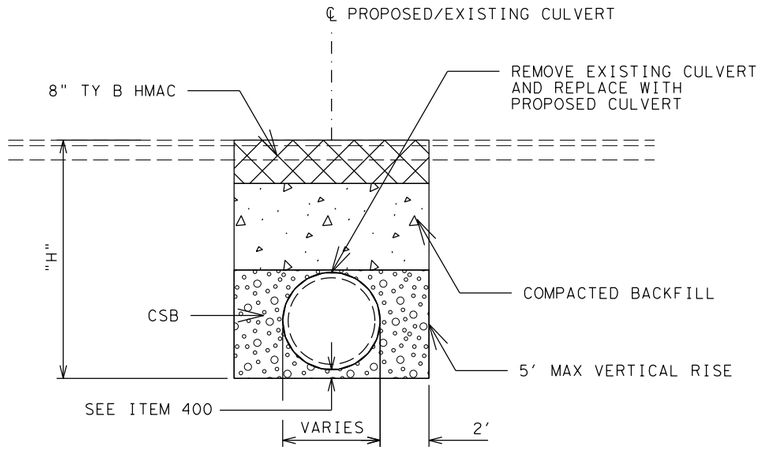
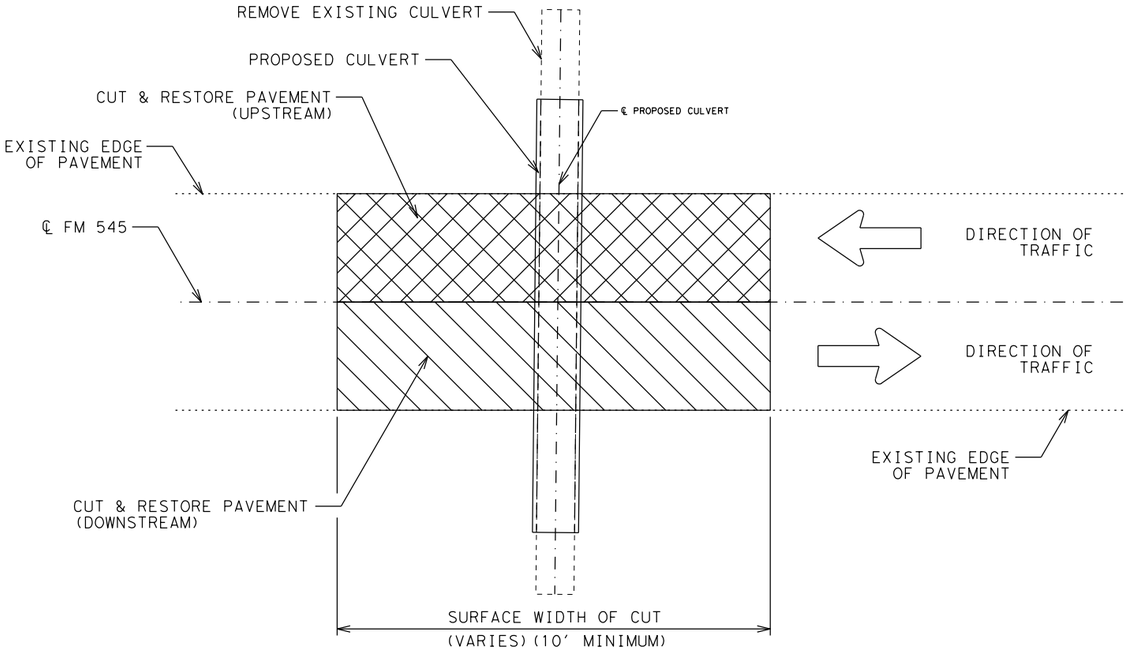
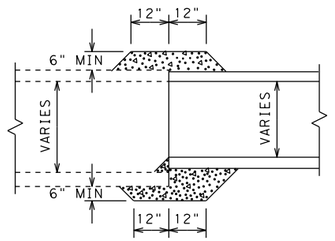


CUT & RESTORE DETAIL
SIDE VIEW



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 2478 TO TWO-WAY TRAFFIC AT THE CONCLUSION OF EACH DAY'S WORK.

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

MISCELLANEOUS ROADWAY DETAILS

SCALE: NTS SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		69

DATE: 4/29/2023 10:17:16 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/3. Roadway/Miscellaneous Roadway Details.dgn

DW: CK: DW: CK:

FM 2478 (CSJ 2351-02-017)

Pavement Core Thickness Summary

Boring ID	Latitude	Longitude	Asphalt Thickness (inches)	Flexible Base (inches)	Untreated Base Thickness (inches)
C-02	N 33.266244	W 96.730245	10.50		
C-03	N 33.270315	W 96730220	14.50		
C-04	N 33.274433	W 96.730084	12.00		
C-05	N 33.278562	W 96.730185	12.00		
C-06	N 33.282730	W 96.730408	12.00		
C-07	N 33.286846	W 96730713	7.00	8.00	
C-08	N 33.290953	W 96.731211	2.00		
C-09	N 33.295054	W 96.731601	11.50		
C-10	N 33.299175	W 96.731545	12.00		
C-11	N 33.303329	W 96731571	13.00		
C-12	N 33.305875	W 96728426	12.50		
C-13	N 33.305915	W 96.723511	13.00		
C-14	N 33.305890	W 96.718593	13.00		
C-15	N 33.307427	W 96.714419	12.50		
C-16	N 33.311542	W 96.714232	13.00		
C-17	N 33.315664	W 96.714250	5.75	8.00	
C-18	N 33.319784	W 96.714199	13.00		
C-19	N 33.323909	W 96.714139	5.50		
C-20	N 33.328046	W 96.714010	3.50		
C-21	N 33.332168	W 96.713940	6.00		
C-22	N 33.335813	W 96.713800	5.00		

STATE OF TEXAS
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PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

CORE DATA

SHEET 1 OF 1

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478

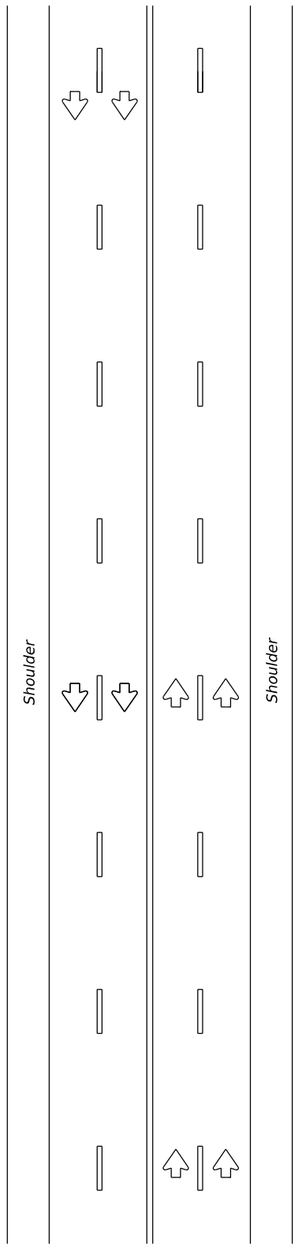
DIST	COUNTY	SHEET NO.
DAL	COLLIN	70

DW: CK: DW: CK:

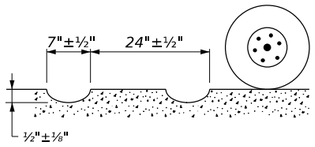
DATE: 4/29/2023 10:17:35 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020174 - Design/Plan Set/3. Roadway/Core Data.dgn

DATE: 4/29/2023 10:17:53 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/251020174 - Design Set/3. Roadway Standards/rs(3)-23.dgn

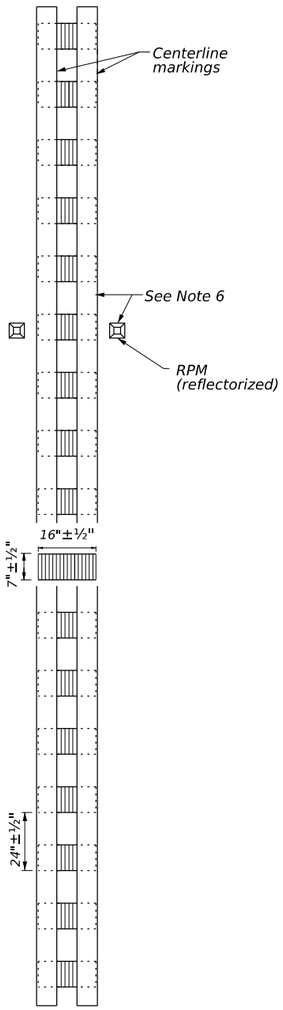
CENTERLINE RUMBLE STRIPS



MULTILANE UNDIVIDED HIGHWAY WITH SHOULDER

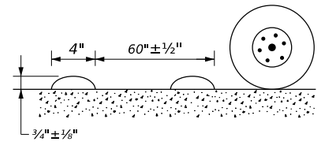


PROFILE VIEW

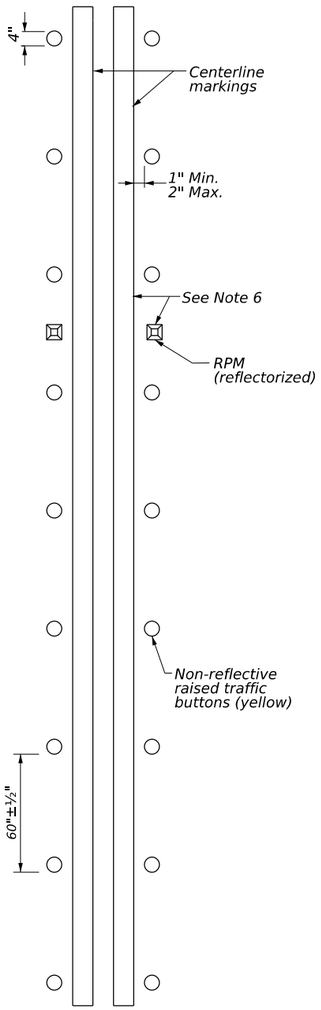


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

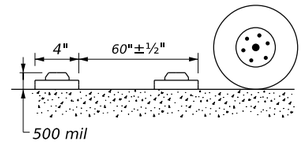


PROFILE VIEW

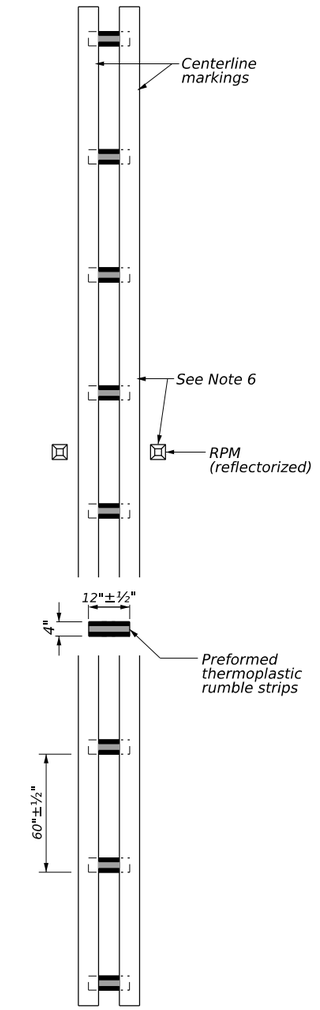


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

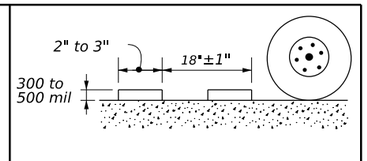


PROFILE VIEW

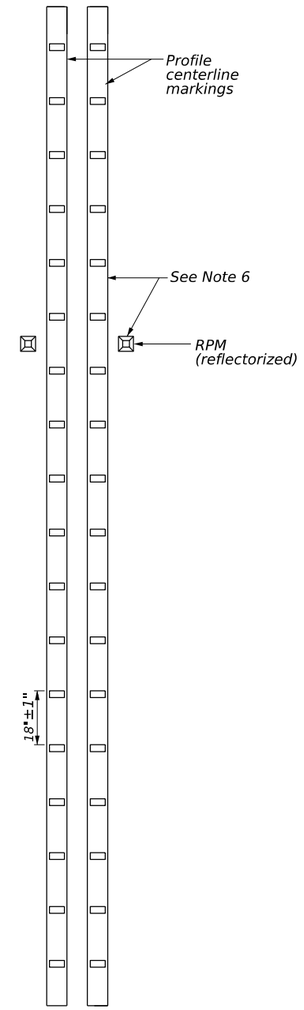


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS

GENERAL NOTES

1. *This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.*
2. *Centerline and edge line rumble strips or profile markings shall not be placedon 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 beused if approved by the Traffic Safety Division.*
5. *Breaks in milled centerline rumble strips shall occur at least 50 feet and nomore than 150 feet in advance of bridges, railroad crossing, intersections ordriveways 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 for normal centerline spacing. For wider medians, specify in the plans the exact placement of the rumble strips. Place the rumble strips under each centerline marking or centered in the middle of the median.*

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 color of the button should be yellow for a continuous no passing roadway. The button will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.*
11. *Consideration shall be given to bicyclists. See RS(6).*

WHEN INSTALLING EDGE LINE RUMBLE STRIPS WITH OR WITHOUT CENTERLINE RUMBLE STRIPS ON UNDIVIDED HIGHWAYS:

12. *See standard sheet RS(2).*

Texas Department of Transportation

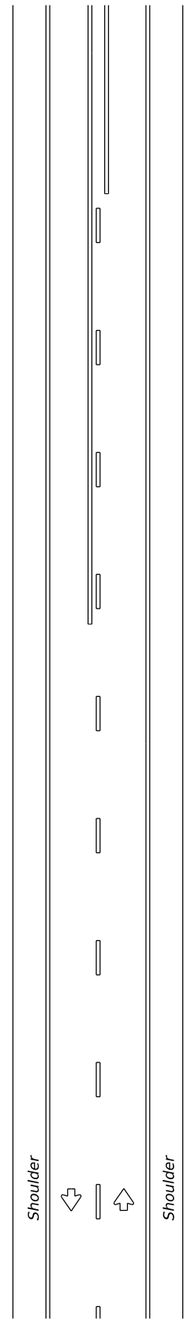
Traffic Safety Division Standard

CENTERLINE RUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS RS(3)-23

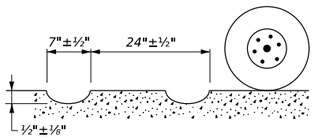
FILE: rs(3)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
10-13 1-23	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		71

DATE: 5/1/2023 2:01:02 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/P1 on Set/3. Roadway Standards/rs(4)-23.dgn

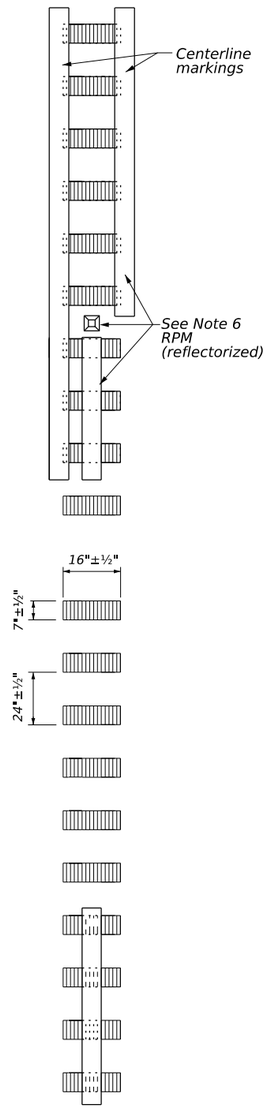
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

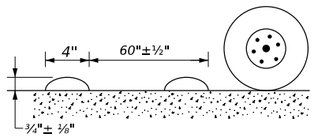


PROFILE VIEW

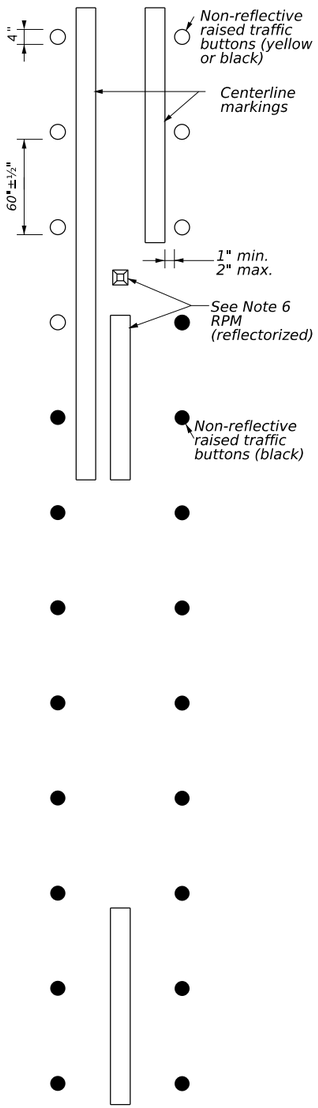


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

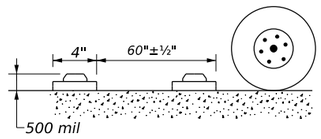


PROFILE VIEW

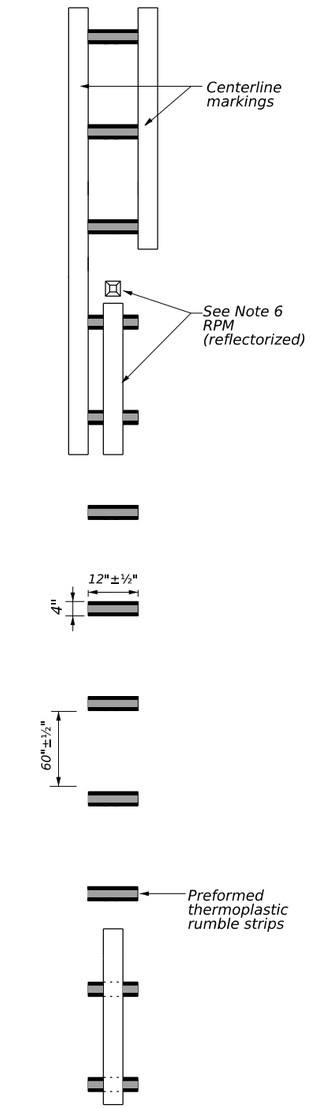


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

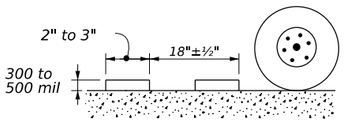


PROFILE VIEW

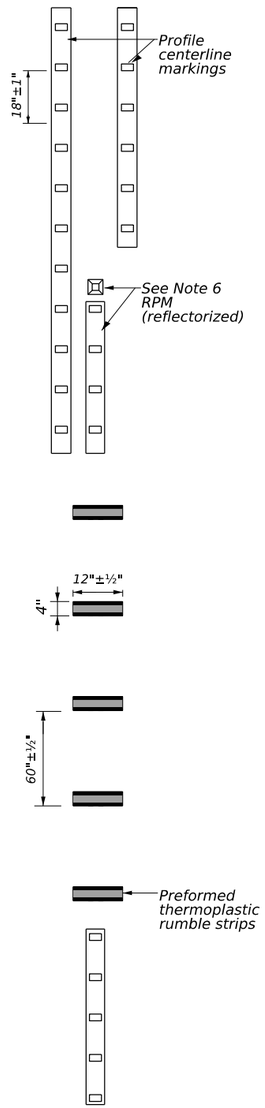


PLAN VIEW
OPTION 3

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:

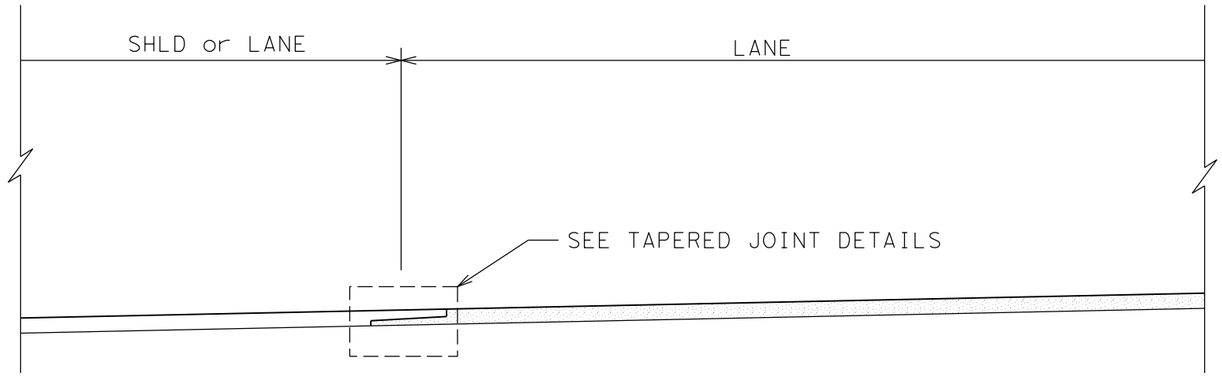
13. See standard sheet RS(2).

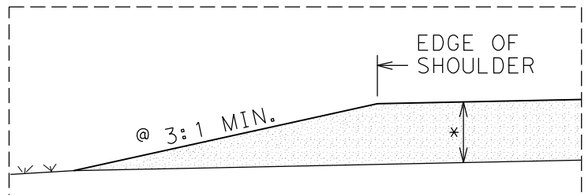
Texas Department of Transportation

Traffic Safety Division Standard

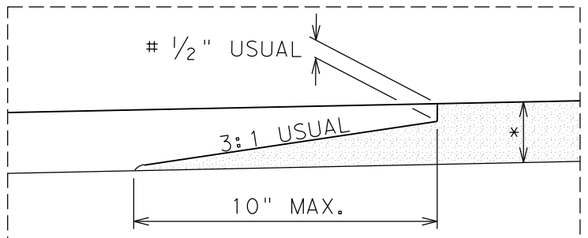
CENTERLINE RUMBLE STRIPS ON TWO LANE TWO-WAY HIGHWAYS RS(4)-23

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-13 1-23	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		72

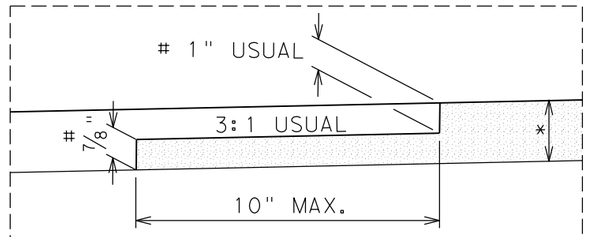




TAPERED OUTSIDE EDGE DETAIL



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.

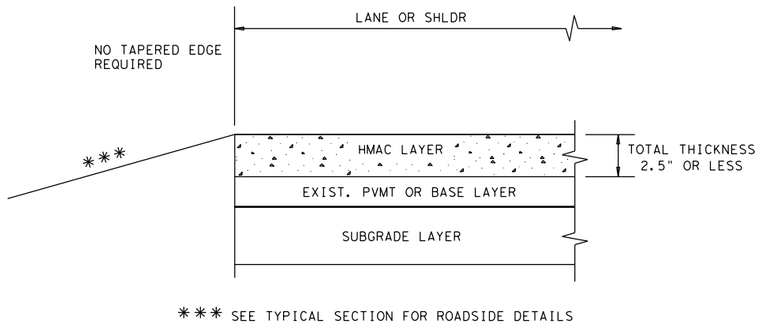
REVISED ON 9/10/08

HOT MIX EDGE AND LONGITUDINAL JOINT DETAILS DALLAS DISTRICT STANDARD

LJD(1-1)-07

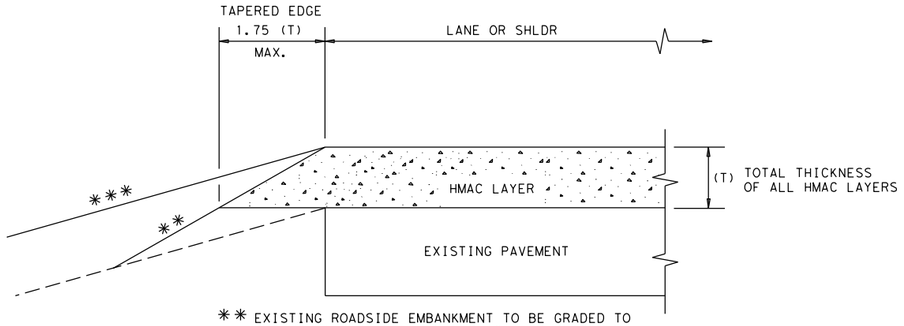
FED. RD. DIV. NO.	PROJECT NUMBER		SHEET NUMBER
18	SEE TITLE SHEET		73
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	COLLIN	
CONTROL	SECTION	SECTION	HIGHWAY NUMBER
2351	02	017	FM 2478

DATE: 4/29/2023
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/3. Roadway/Standards/tehmac11.dgn



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

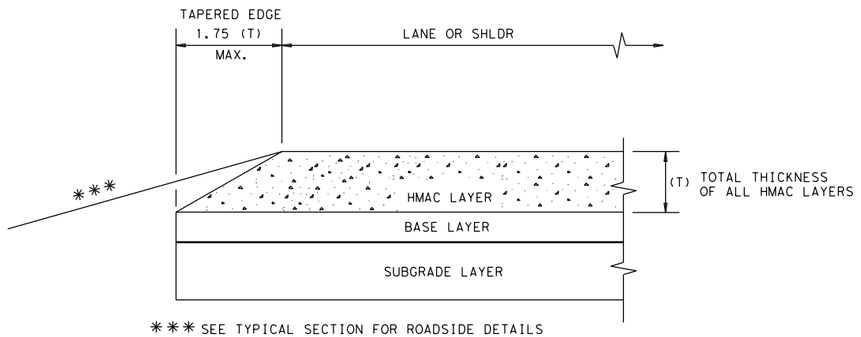
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



** 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.

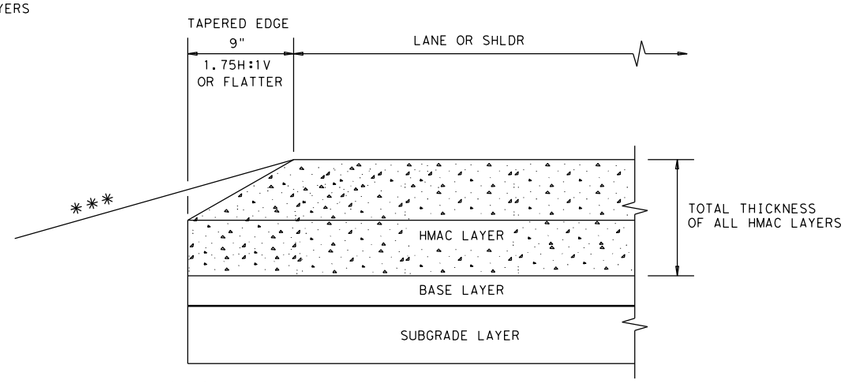
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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.

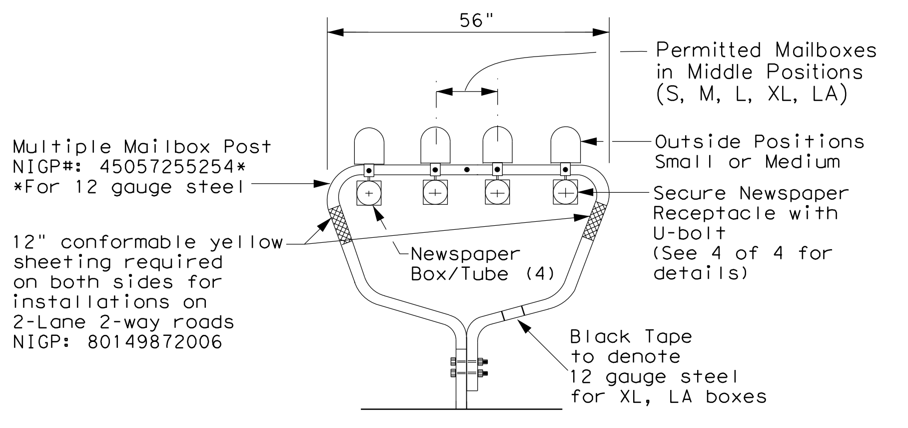
Texas Department of Transportation | Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

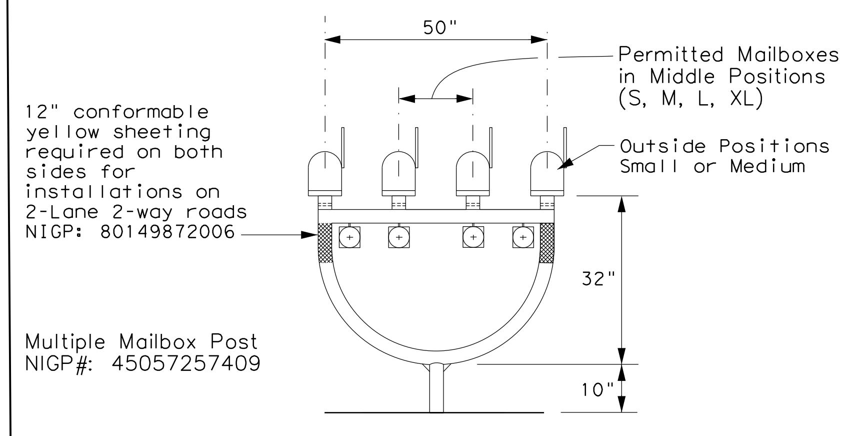
TE(HMAC)-11

FILE: tehmac11.dgn	DN: TxDOT	CK: RL	DW: KB	CK:
©TxDOT January 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		74

TYPE 1 - MULTIPLE



TYPE 4 - MULTIPLE



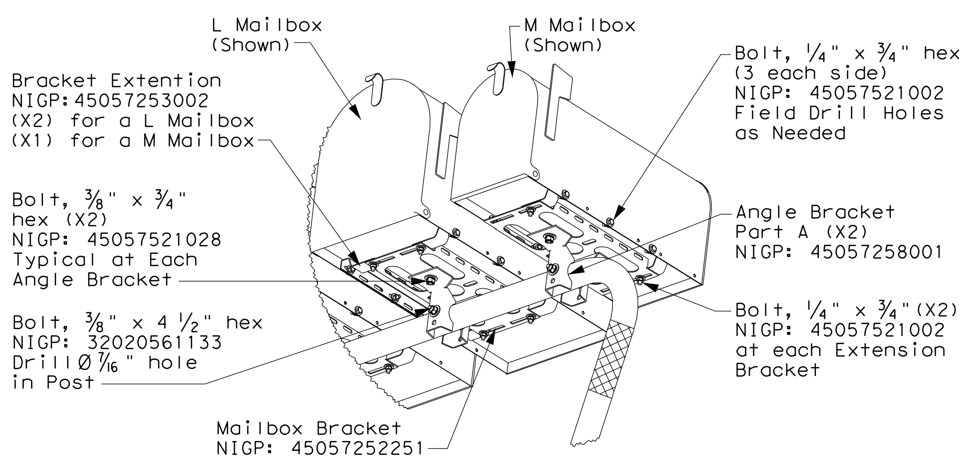
MAILBOX SIZES

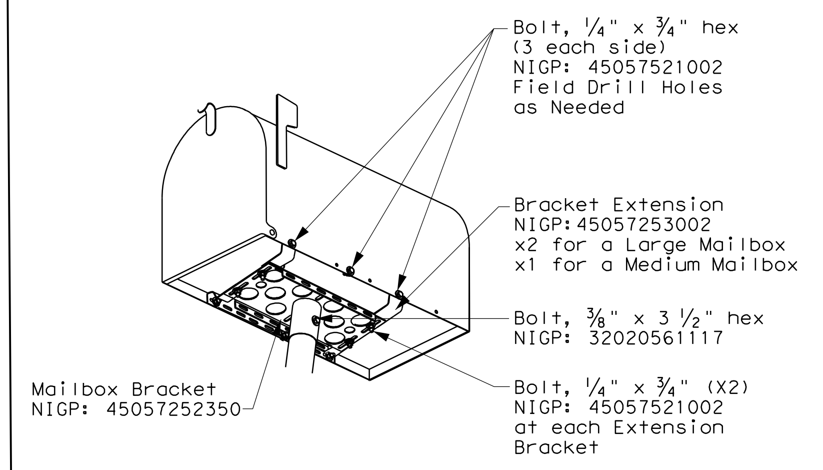
MAILBOX SIZE	TYPICAL DIMENSIONS LENGTH	WIDTH	HEIGHT	MAX ** WEIGHT
SMALL	19 1/2"	6"	7"	6 LBS
MEDIUM	22 1/2" *	8" *	11 1/2" *	8 LBS
LARGE	23 1/2"	11 1/2"	13 1/2"	11 LBS
EXTRA LARGE	18"	14"	12"	13 LBS
LOCKABLE	18"	11 1/2"	15"	23 LBS

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

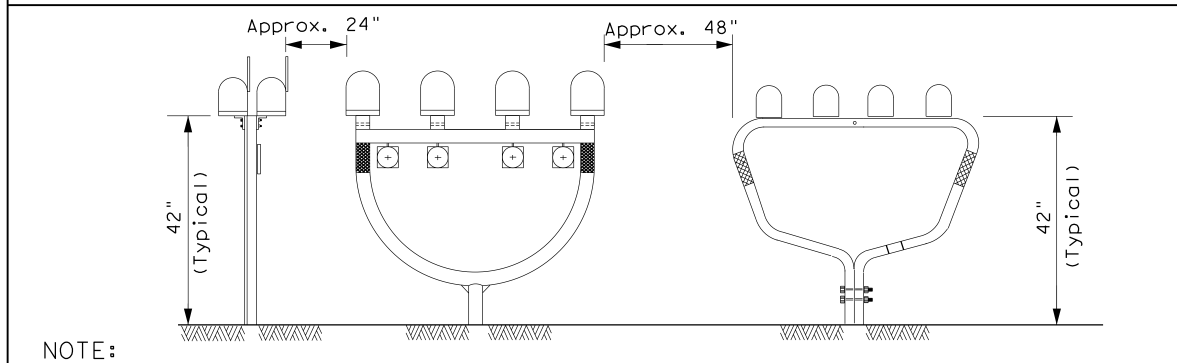
GENERAL NOTES:

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.



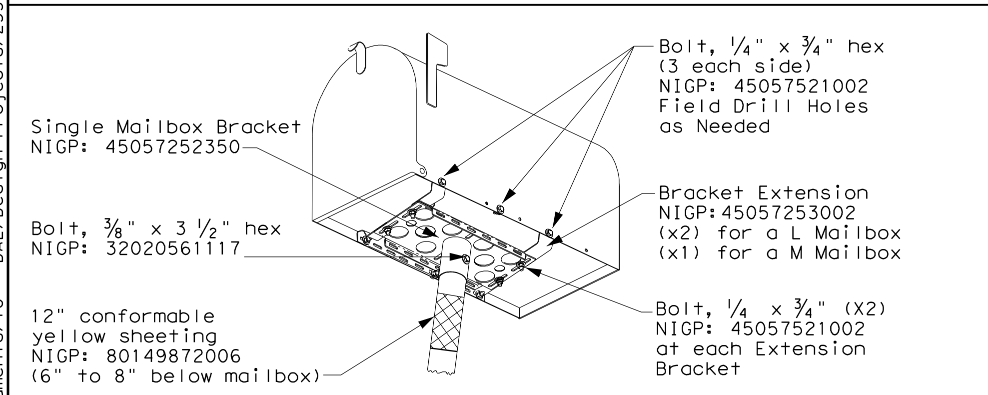


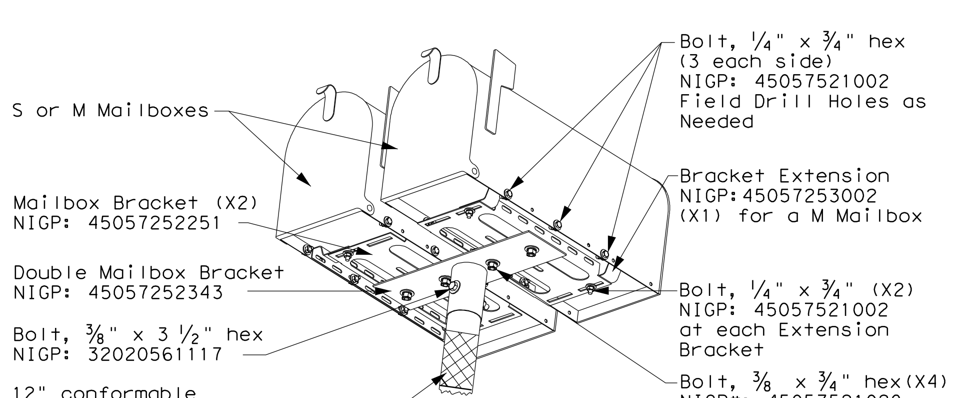
TYPICAL INSTALLATION MEASUREMENTS



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

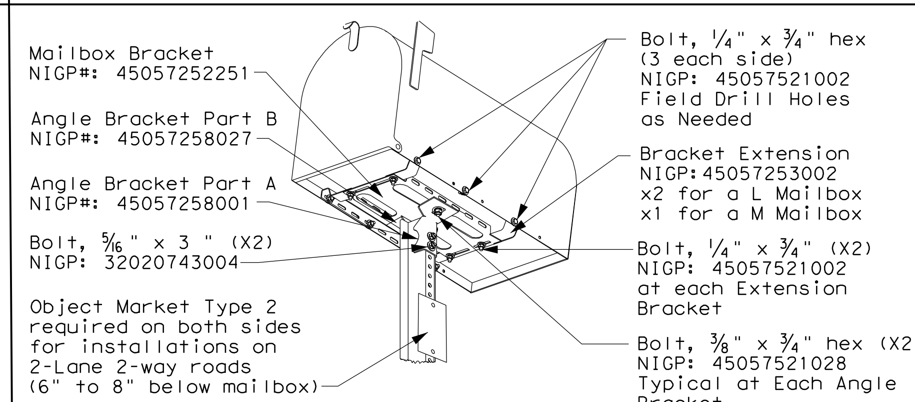
TYPE 2 and 4 - SINGLE/DOUBLE

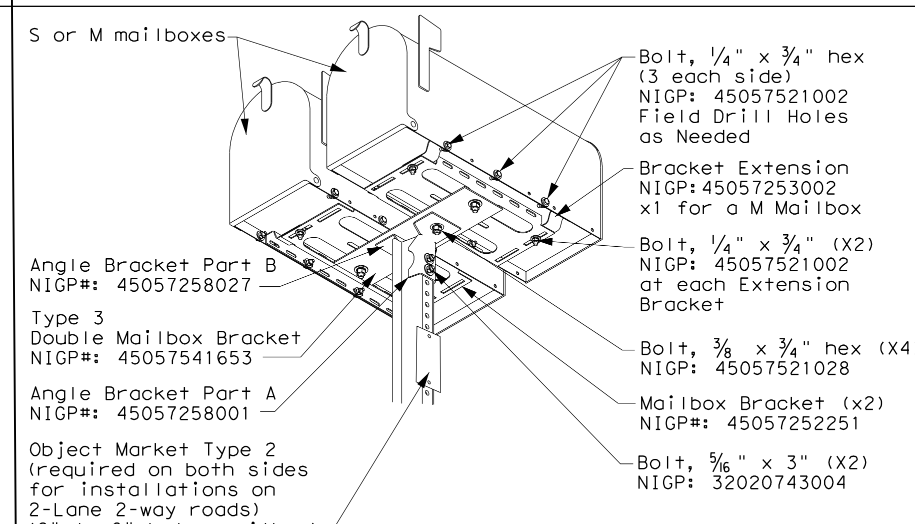




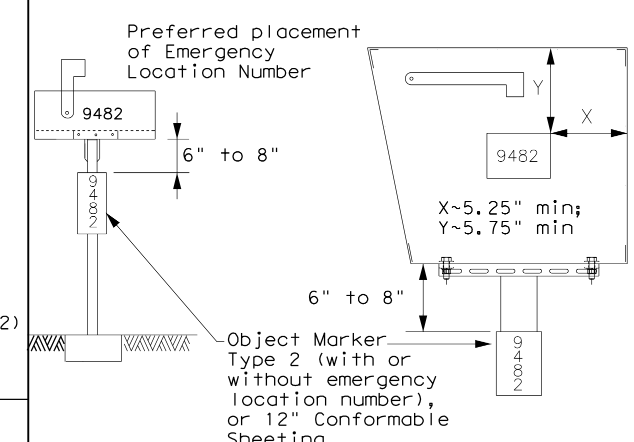
NOTE:
Double mailbox mounts are not allowed with a type 4 multiple mailbox installation

TYPE 3 - SINGLE/DOUBLE





PLACEMENT OF EMERGENCY LOCATION NUMBER

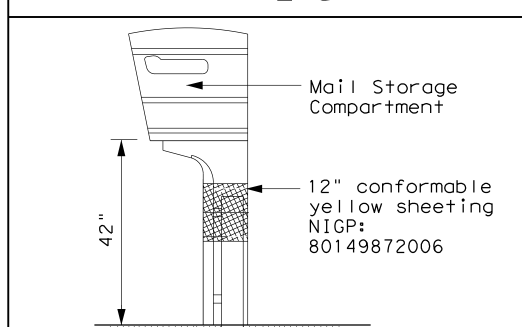


NOTES:

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

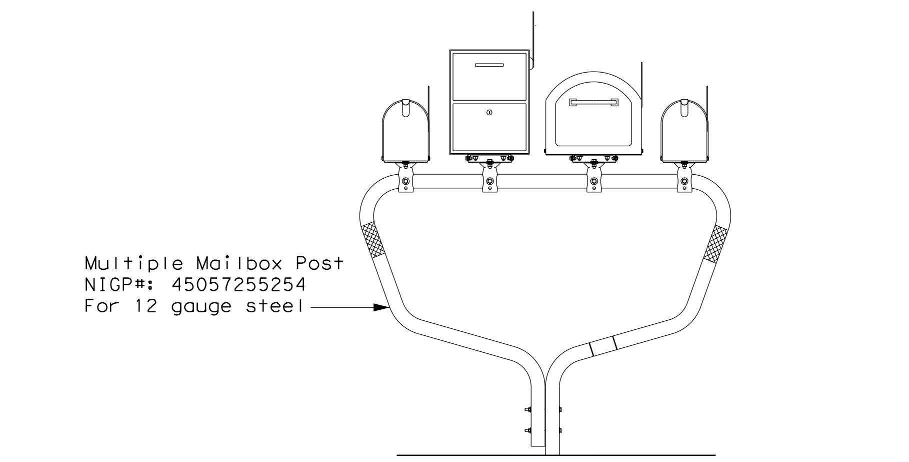
MAILBOX MOUNTING AND ASSEMBLY

MB(1)-21

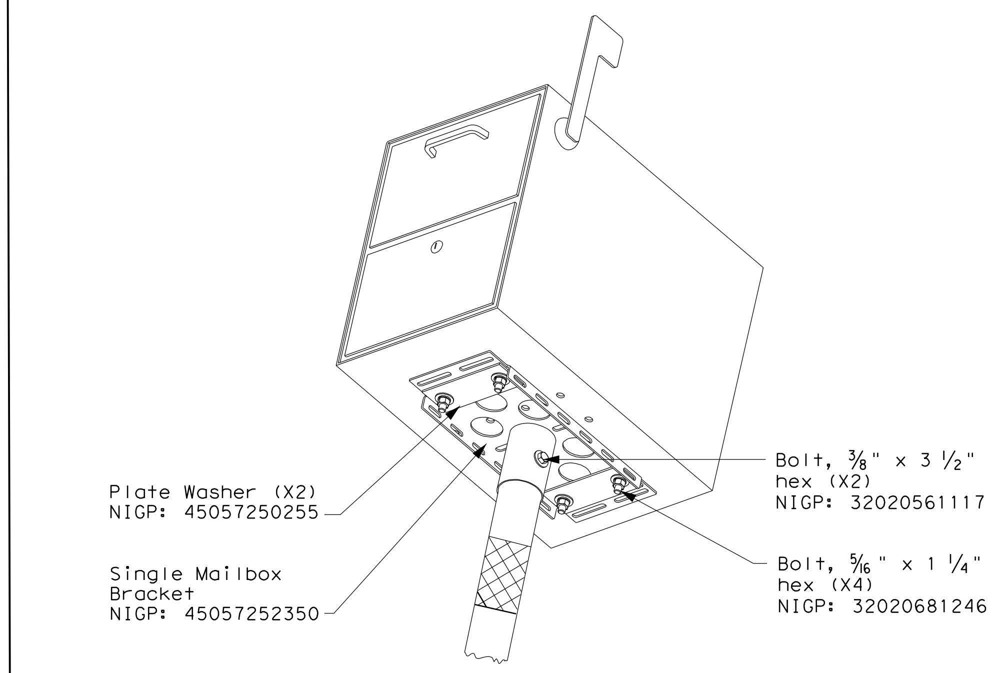
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	75

DATE: 5/1/2023 2:20:51 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/...

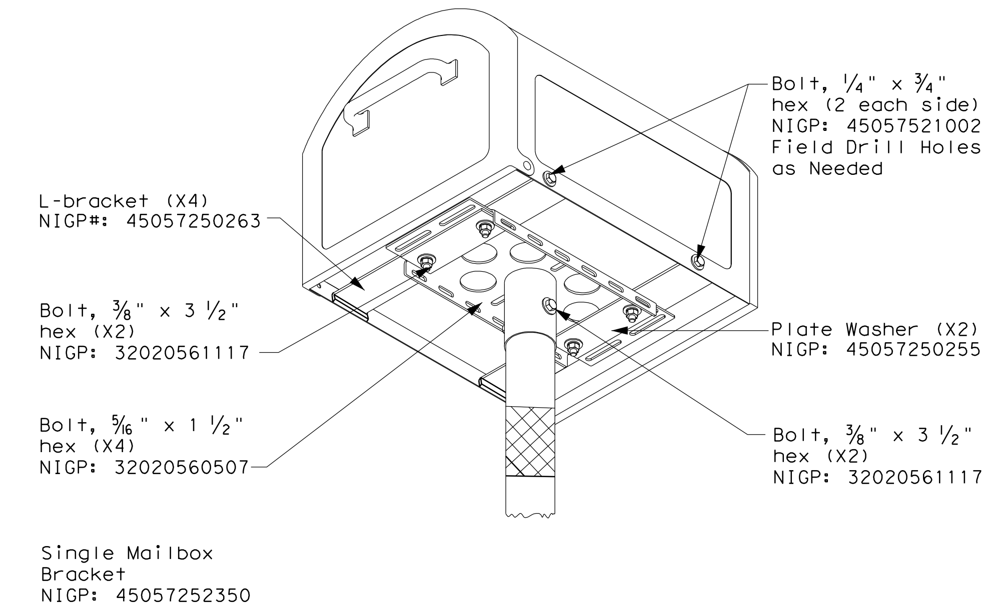
TYPE I- MULTI LOCKABLE AND XL MAILBOX



TYPE 2/4 - SINGLE LOCKABLE MAILBOX



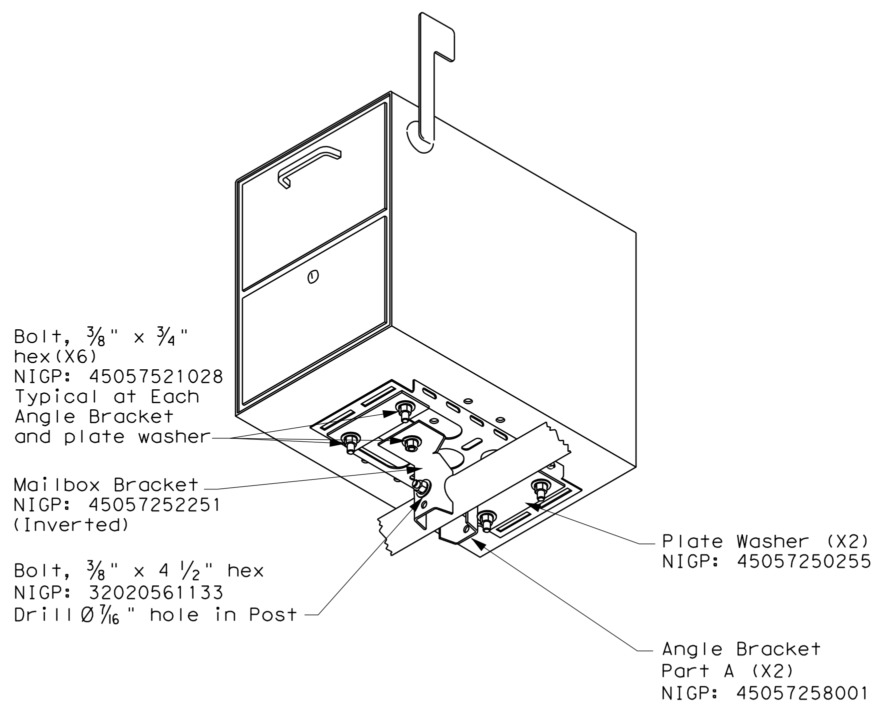
TYPE 2/4 - SINGLE XL MAILBOX



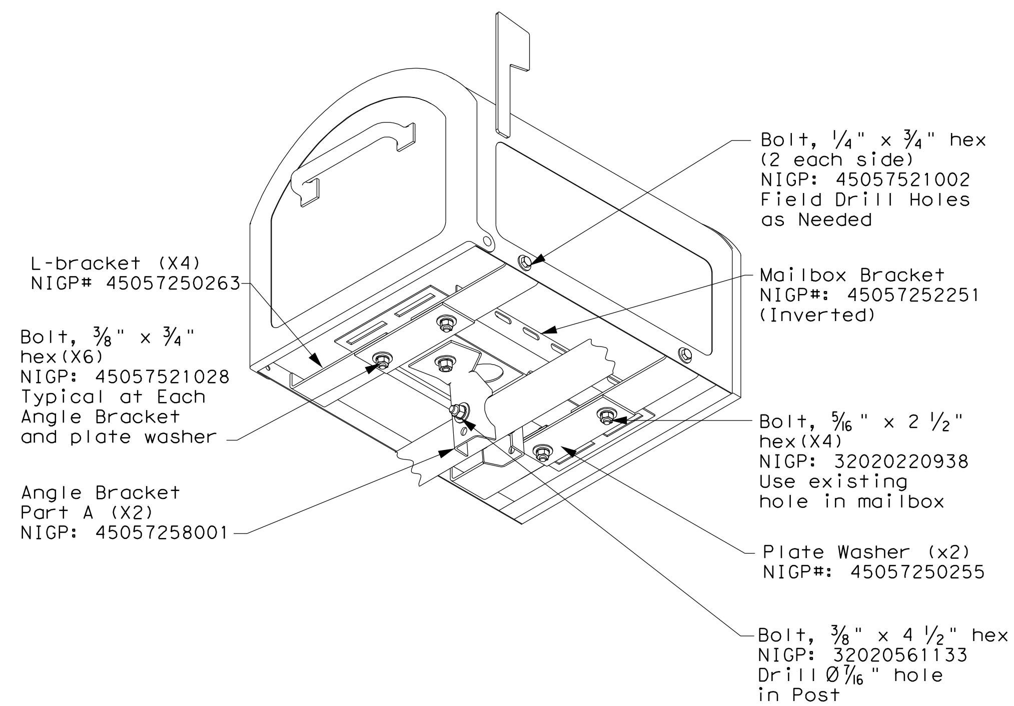
NOTE:

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

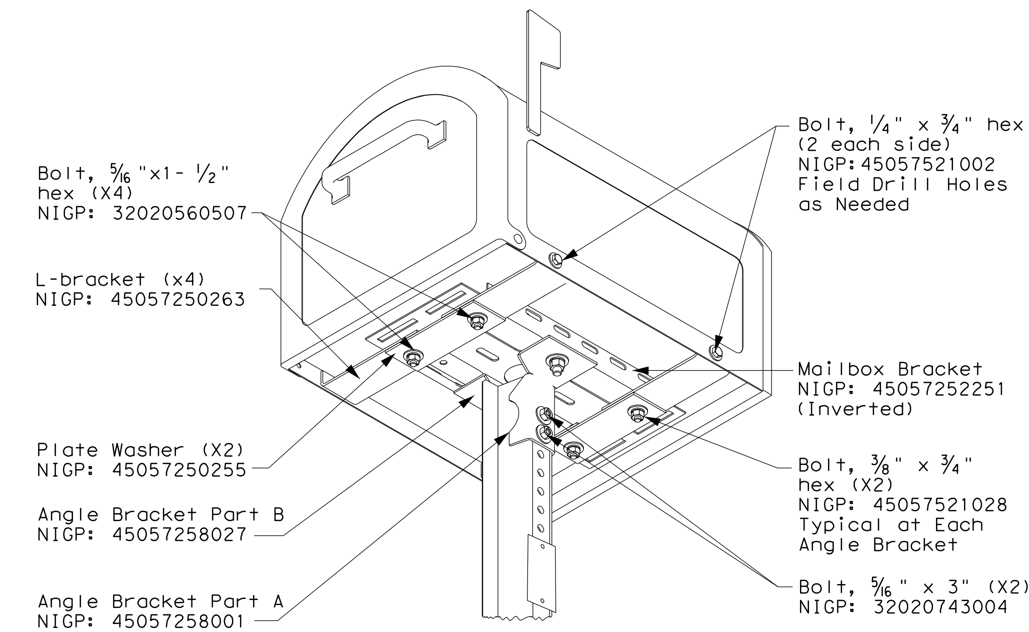
TYPE 1 MULTI – LOCKABLE ARCHITECTURAL (LA)



TYPE 1 MULTI – XL MAILBOX



TYPE 3 - XL MAILBOX MOUNTING



SHEET 2 OF 4

Texas Department of Transportation

Maintenance Division Standard

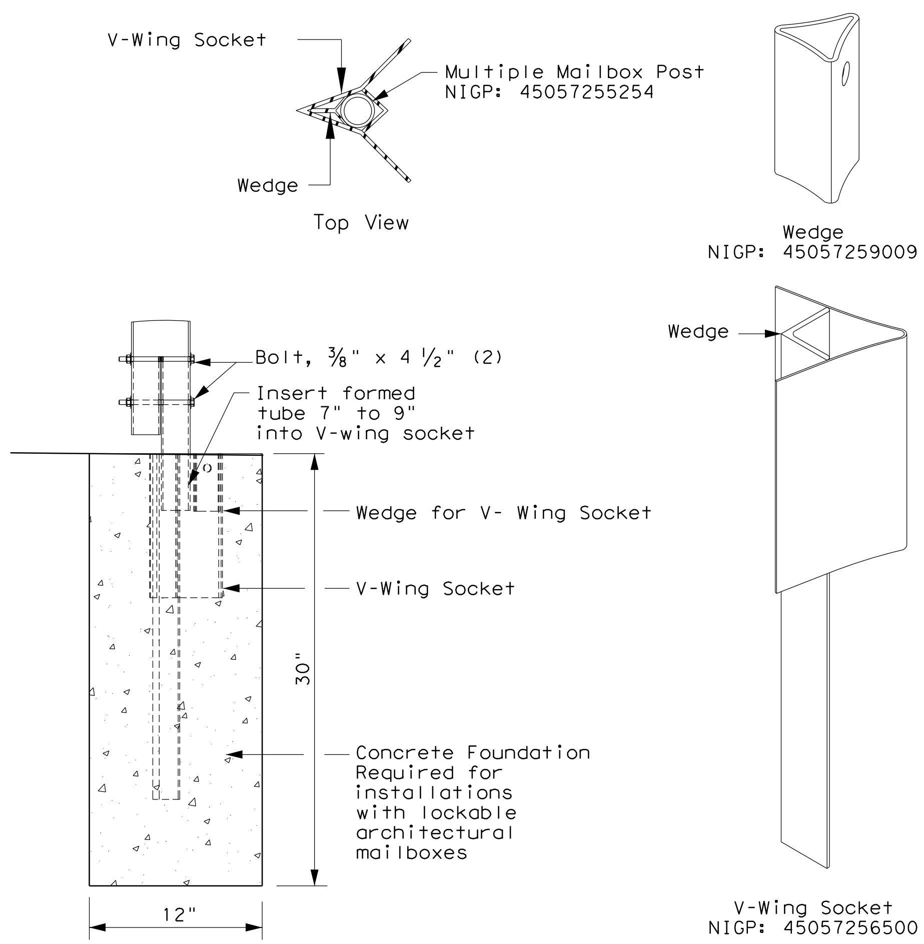
XL AND LOCKABLE ARCHITECTURAL MAILBOX ASSEMBLY

MB(2)-21

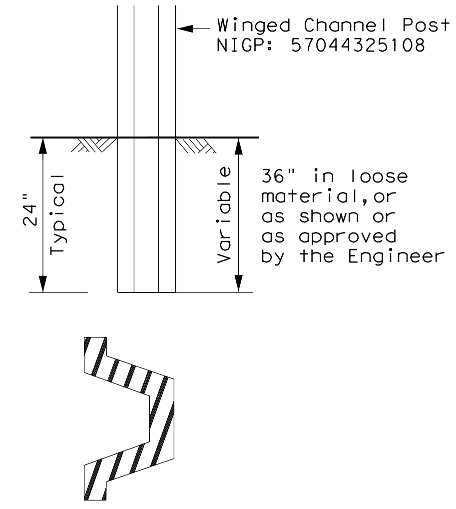
FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015	2351	02	017	FM 2478
6/2005 1/2011	DIST		COUNTY	SHEET NO.
11/2006 7/2014	DAL		COLLIN	76

DATE: 5/1/2023 2:21:48 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/...

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



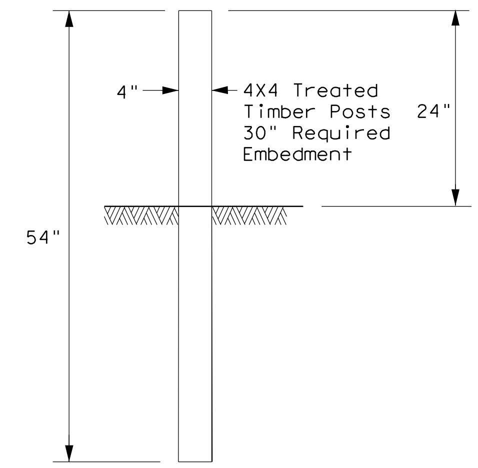
TYPE 3 - SUPPORT/FOUNDATION



NOTES:

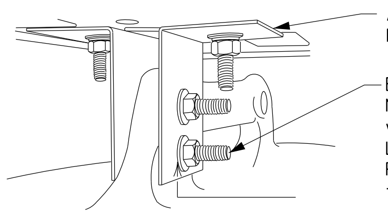
1. Attach Object Marker(OM) facing direction of traffic.
2. OM will also be required on opposite side if installed on a 2-Lane, 2-Way roadway.

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

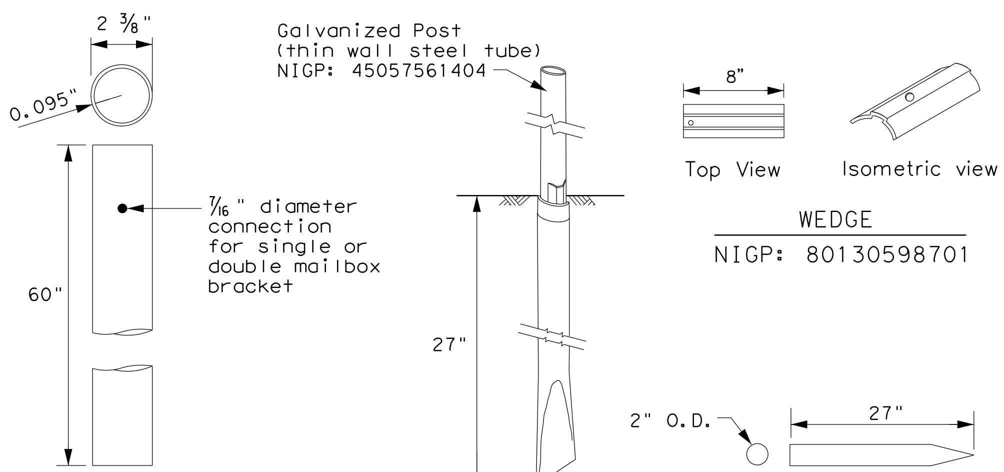
NOTES:

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

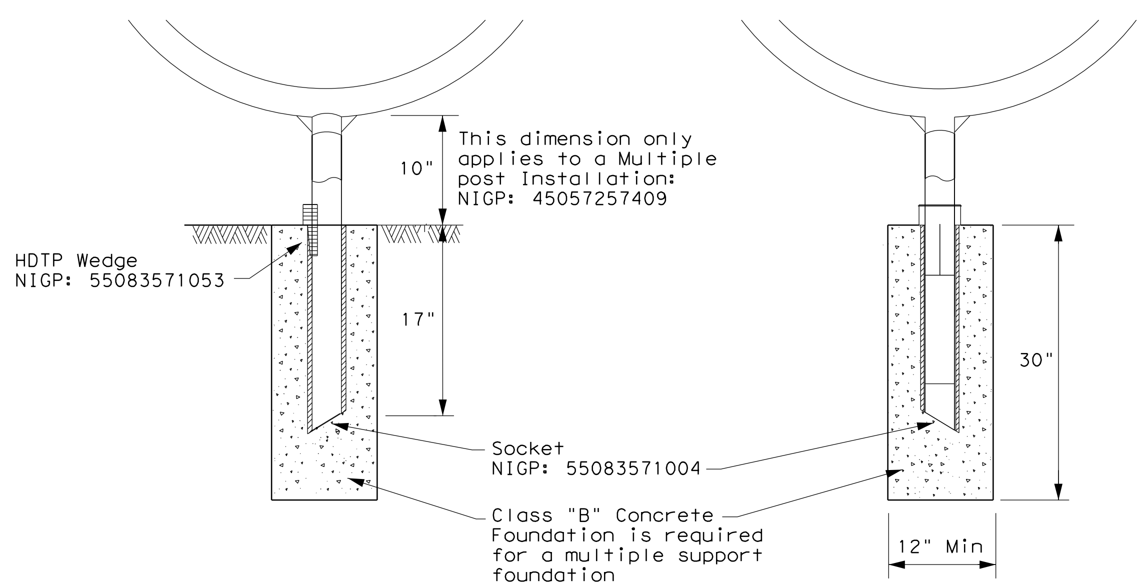


WEDGE
NIGP: 80130598701

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



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SHEET 3 OF 4

Texas Department of Transportation | Maintenance Division Standard

MAILBOX SUPPORT AND FOUNDATION

MB(3)-21

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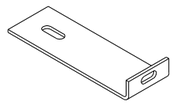
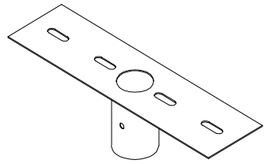
©TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015	2351	02	017	FM 2478
6/2005 1/2011	DIST		COUNTY	SHEET NO.
11/2006 7/2014	DAL		COLLIN	77

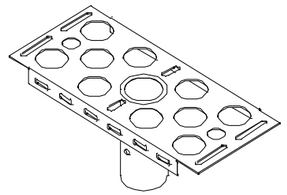
TYPE	TYPE 1	TYPE 2	TYPE 3	TYPE 4			TYPE 5	TYPE 6
Configuration	Multiple	Single or Double	Single or Double	Single	Double	Multiple	Single	Single
Mailbox Size NIGP #	Outside Position: S or M Inside Position: S, M, L, XL, or LA	Single: S, M, L, XL, or LA Double: SS, SM, MM	Single: S, M, L, or XL Double: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



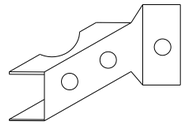
NIGP: 45057250263
L-Bracket x4 for
XL sized mailboxes



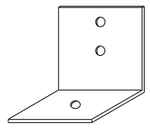
NIGP: 45057252343
Double Mailbox Bracket
For Type 2 and Type 4
double mount



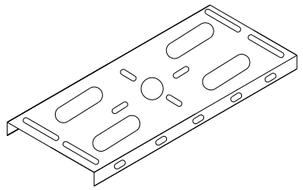
NIGP: 45057252350
Single Mailbox Bracket
For Type 2 single and for
Type 4 single and multi mount



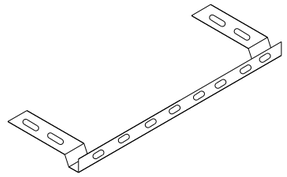
NIGP: 45057258001
Part "A" Angle Bracket
For Type 1 multi (2 per mailbox)
and Type 3 single and double



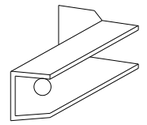
NIGP: 45057251055
Type 6 Angle Bracket
(2 per mailbox)



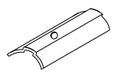
NIGP: 45057252251
Mailbox Bracket
For Type 1 multi and
any double mount (use 2)



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



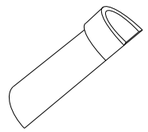
NIGP: 45057258027
Part "B" Angle Bracket
For Type 3 single
and double



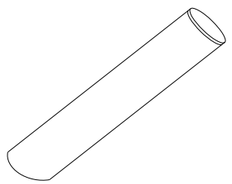
NIGP: 80130598701
Wedge for Type 2

NIGP: 45057250255
Plate Washer for Architecural
and XL Mailboxes

NIGP: 45057541653
Type 3 double mailbox bracket

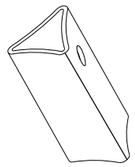


NIGP: 55083571053
Type 4 Mailbox Wedge

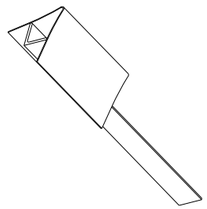


NIGP: 55083571004
Type 4 Mailbox Socket

NIGP: 80130238407
Type 2 Wedge Anchor



NIGP: 45057259009
Wedge for Type 1 V-wing Socket



NIGP: 45057256500
V-wing Socket for
Type 1 Foundation

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

NOTES:

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

BID CODES FOR CONTRACTS

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

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

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

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

Texas Department of Transportation

Maintenance Division Standard

NIGP PARTS LIST AND COMPATIBILITY

MB(4)-21

FILE: MB-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT March 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS 2/2005 11/2009 4/2015 6/2005 1/2011 11/2006 7/2014	2351	02	017	FM 2478
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	DAL	COLLIN		78

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DATE: 4/29/2023
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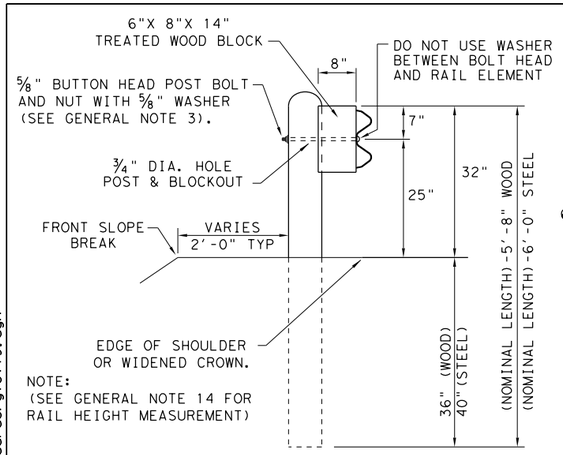
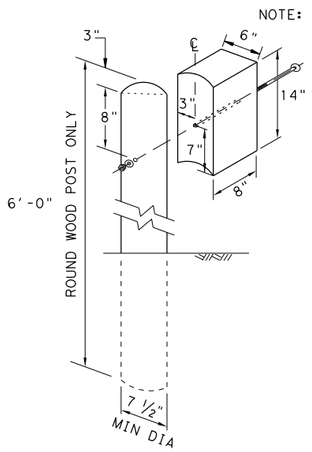
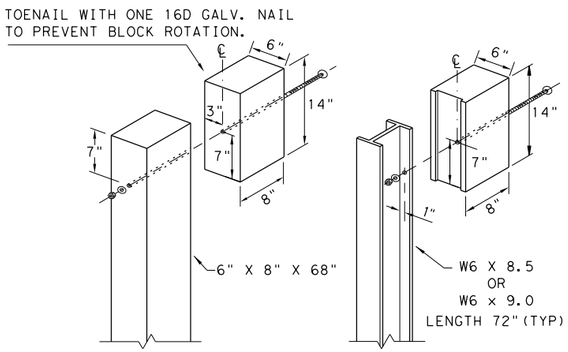


TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

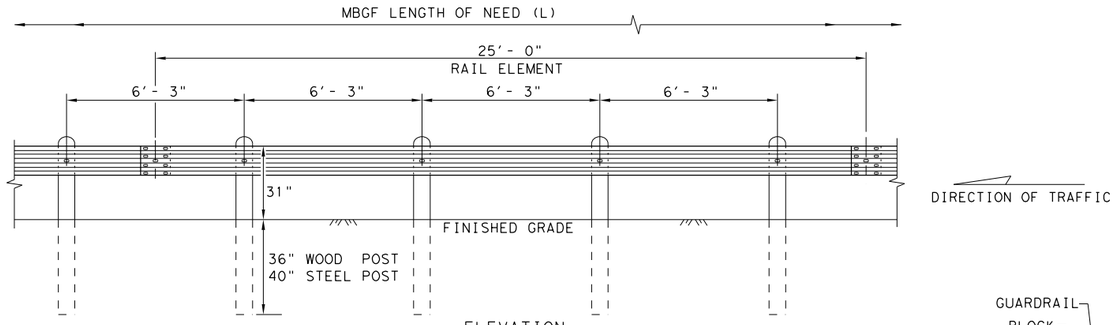
NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



WOOD BLOCK TO RECTANGULAR WOOD POST

ROUTED WOOD BLOCK TO I-BEAM STEEL POST

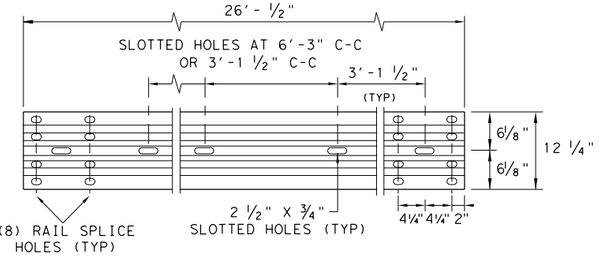
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



ELEVATION MID-SPAN RAIL SPLICE

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

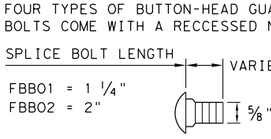
DIRECTION OF TRAFFIC



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

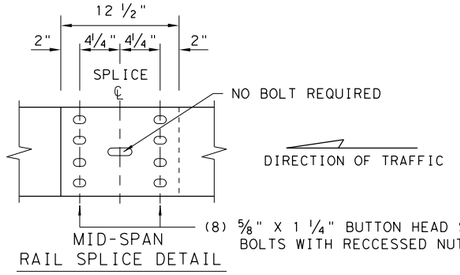
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



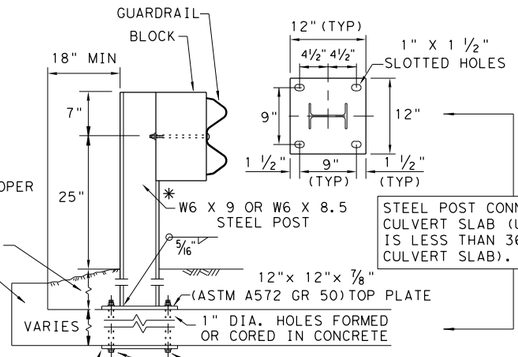
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



* 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).

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.

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.

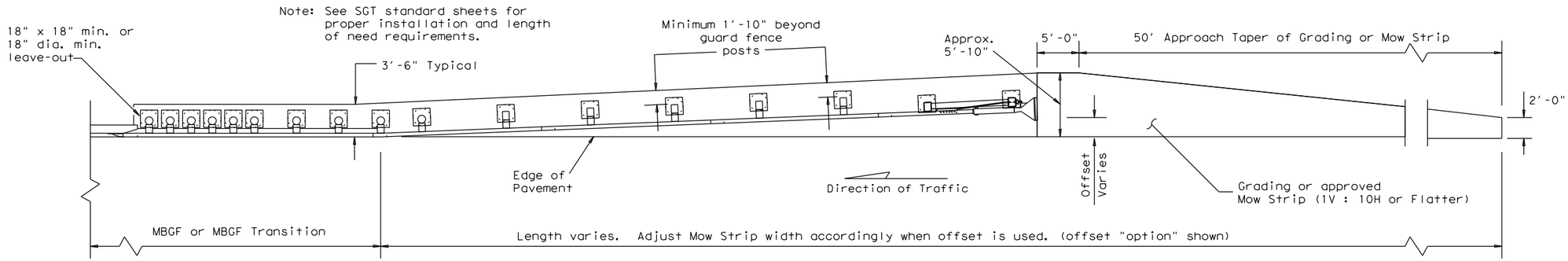
Texas Department of Transportation

Design Division Standard

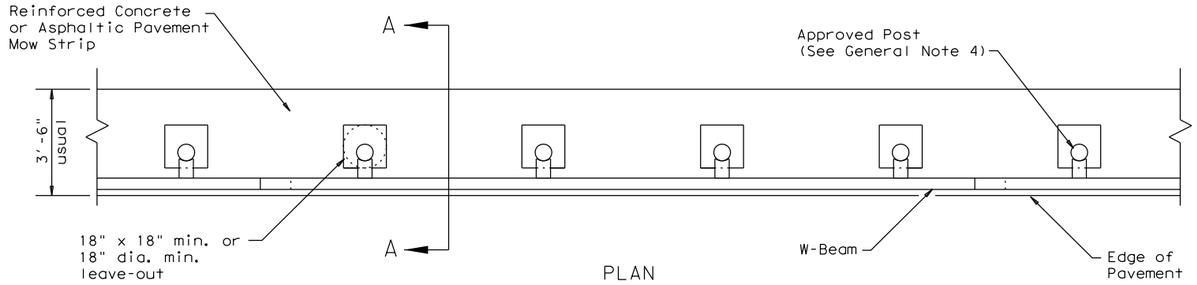
METAL BEAM GUARD FENCE
TL-3 MASH COMPLIANT
GF(31)-19

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		79

DATE: 4/29/2023
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/3. Roadway/Standards/gf31ms19.dgn

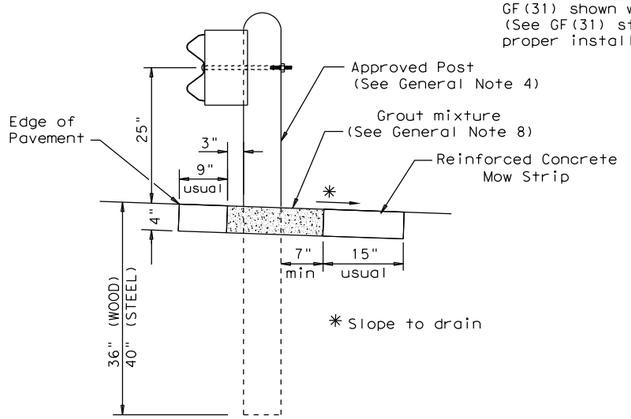


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



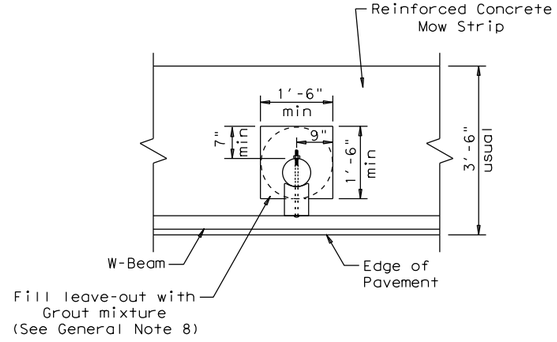
PLAN

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.

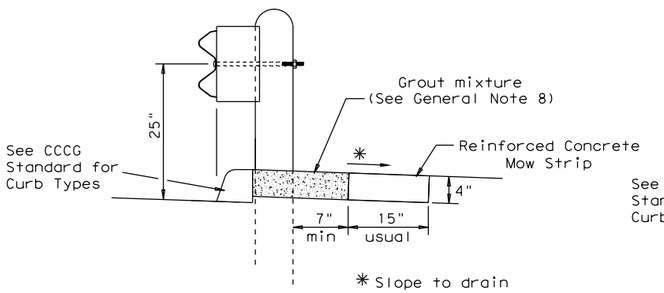
Note: Site Condition(s)

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.

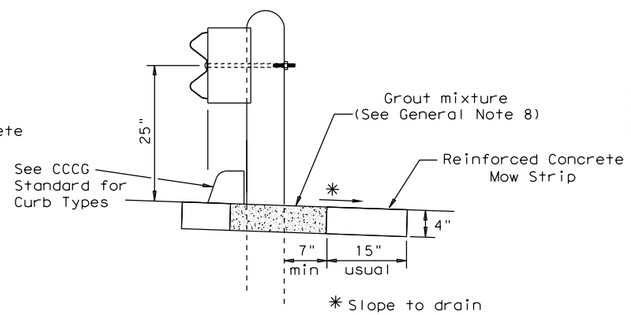
GENERAL NOTES

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.



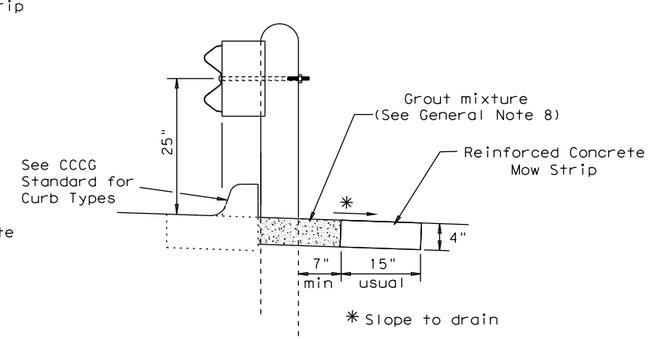
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Texas Department of Transportation

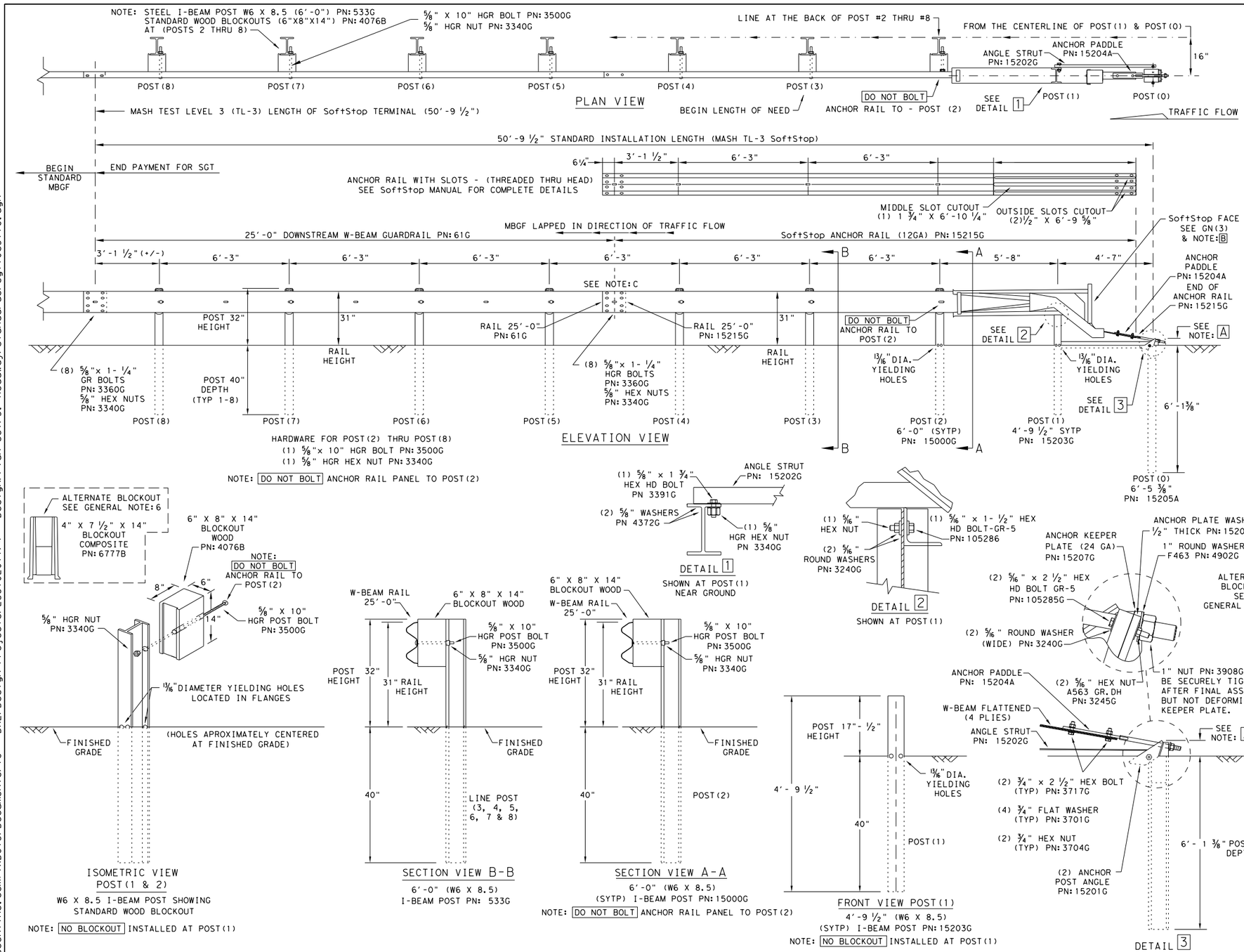
Design Division Standard

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	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		80

DATE: 5/1/2023
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/3. Roadway/Standards/sgt10s3116.dgn



GENERAL NOTES

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

NOTE: A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" 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.

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

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	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		81

DATE: 4/29/2023
FILE: dw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Profiles/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

PLAN VIEW

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.

INSTALL GUARD FENCE RECESSED
HEX NUTS ON TRAFFIC-SIDE

MBGF
RAIL 2

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 ⅝"

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)

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

RAIL
HEIGHT
31"

HEAD
HEIGHT

DETAIL
(B)

32-¼"

68-⅛"

FINISHED
GRADE

CABLES

FINISHED
GRADE

ITEM (10)
CABLE
ASSEMBLY

ITEM (2)
GROUNDSTRUT

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

TOP OF POST

32-¼"

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

(RAIL 1)

ITEM (22)
BRACKET
SHIPPED FLAT

ITEM (3)

ITEM (16)
4X

✳ 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"

TRAFFIC FLOW

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

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.

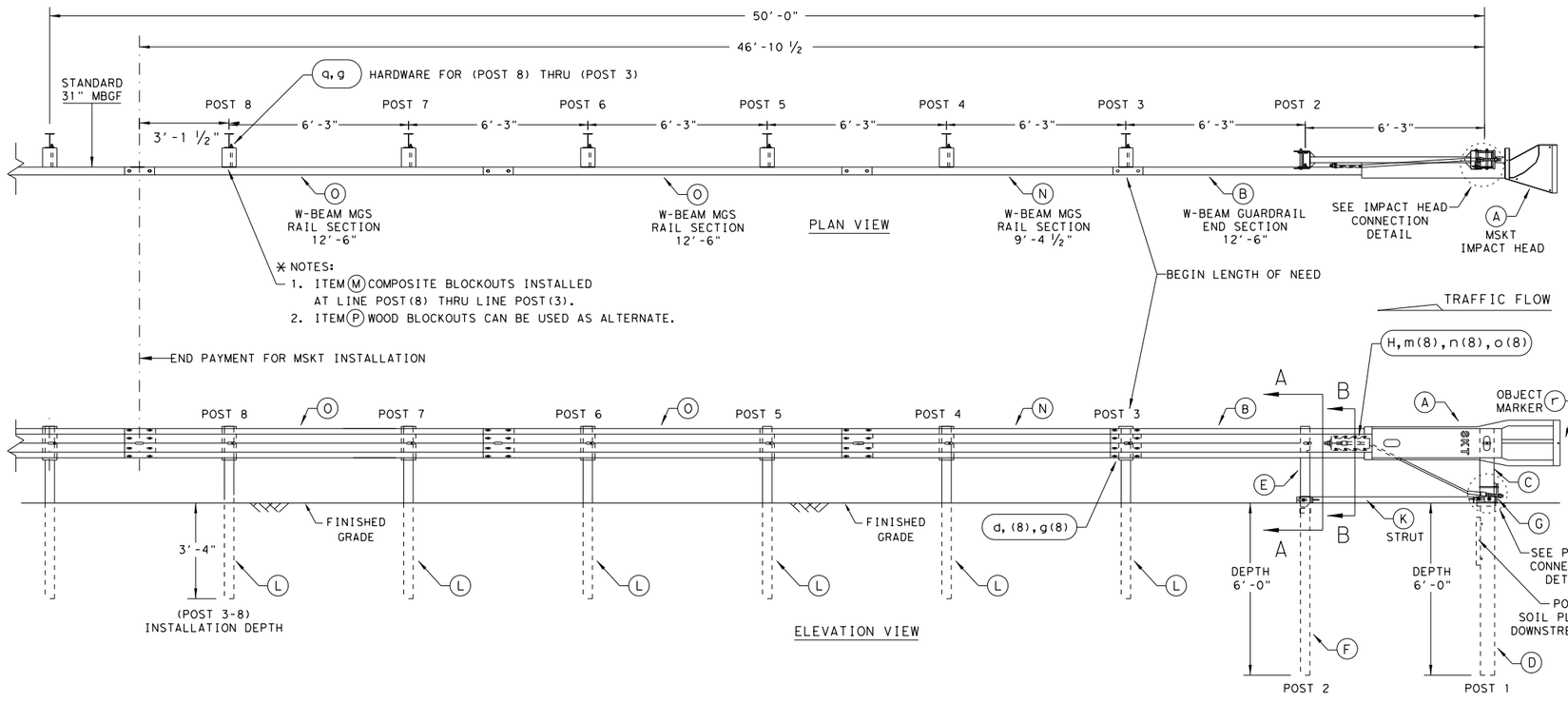
ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER 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

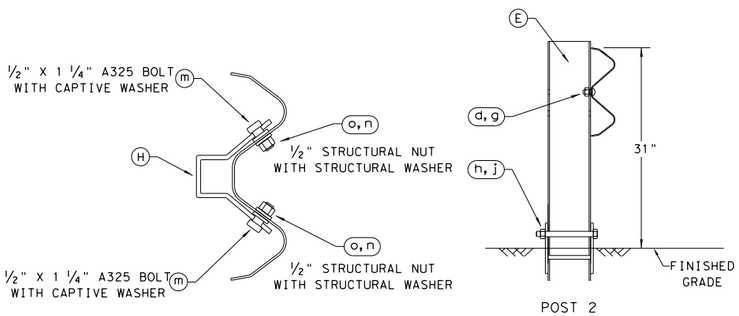
Design Division Standard

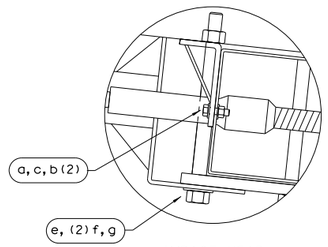
MAX-TENSION END TERMINAL
MASH - TL-3
SGT(11S)31-18

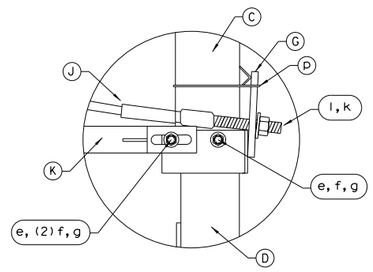
FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		82



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

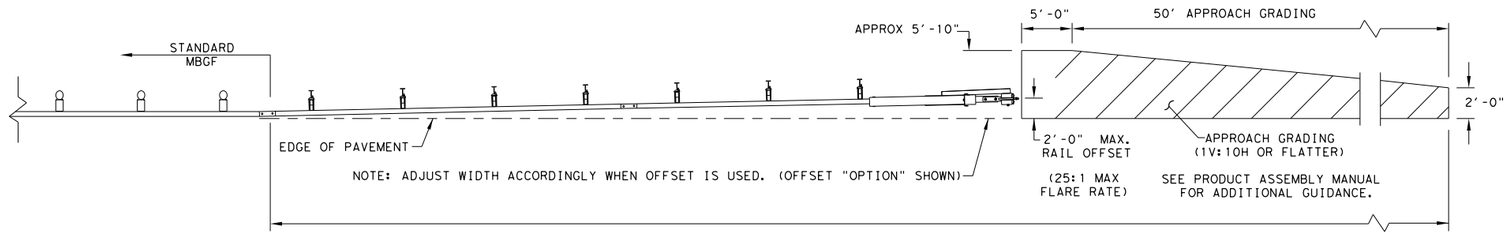






SEE NOTES: ✳

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.

GENERAL NOTES

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		83

DATE: 4/29/2023
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/3. Roadway/Standards/sgt12s3118.dgn

DATE: 4/29/2023
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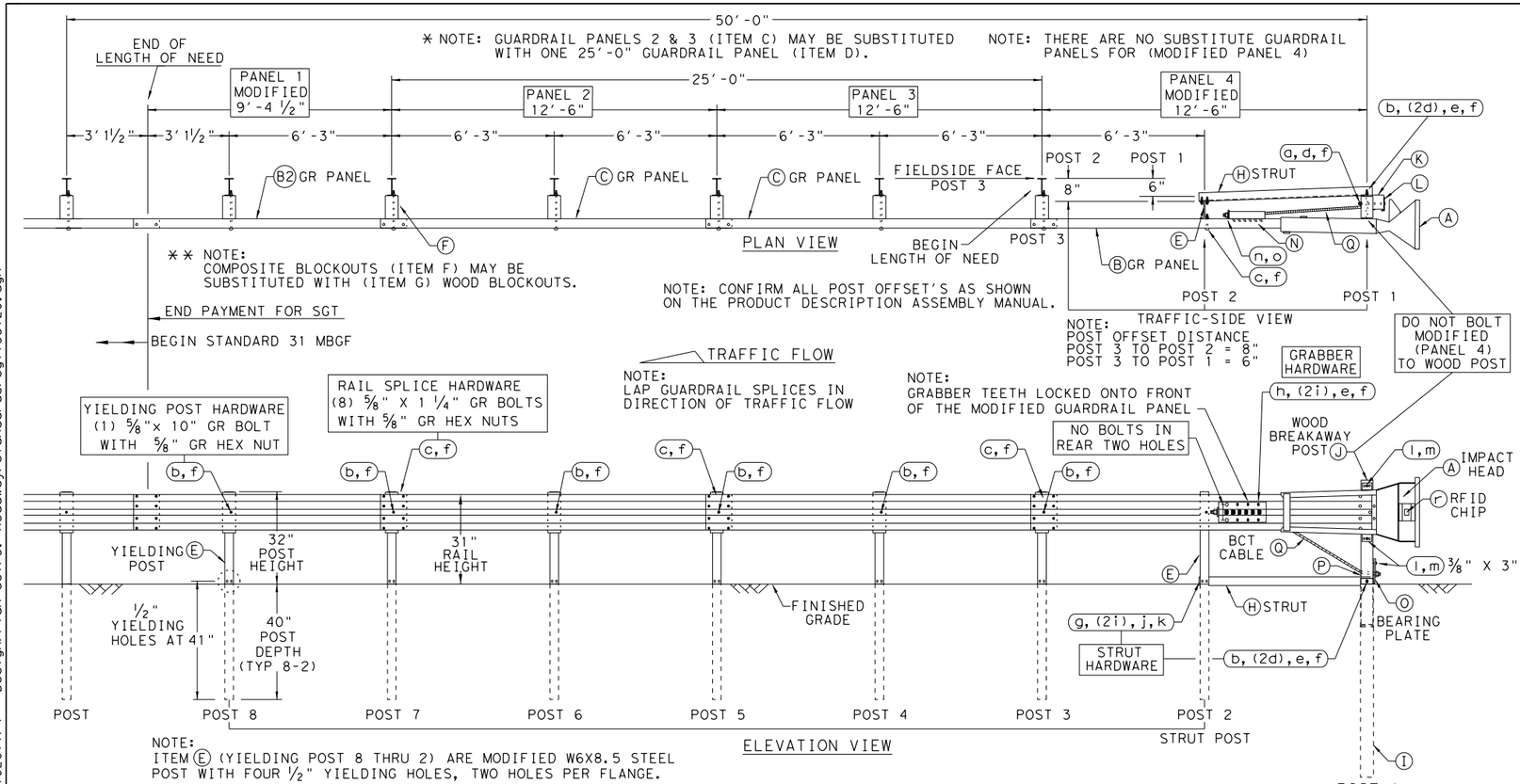
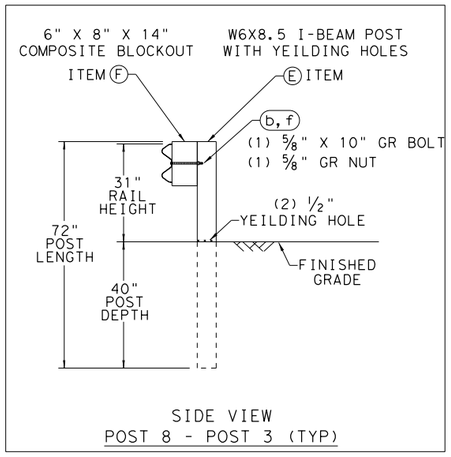


GENERAL NOTES

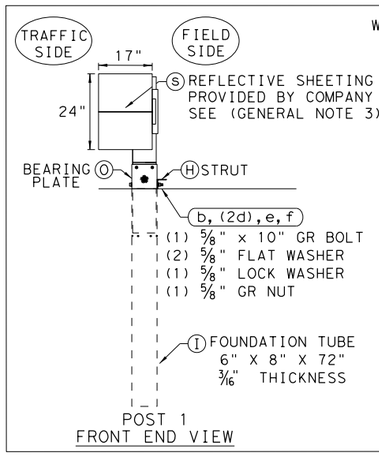
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL.
3. MANUFACTURER WILL APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" TO THE FACE PLATE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. THE OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. THE NOMINAL HEIGHT OF THE GUARDRAIL BEAM IS 31 INCHES WITH A TOLERANCE OF +/- ONE INCH.
5. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
6. (POST 2 THROUGH POST 8) ARE MODIFIED STEEL-YIELDING POSTS WITH YIELDING HOLES AT GROUND LEVEL. THERE ARE NO SUBSTITUTE POSTS.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. IF SOLID ROCK IS ENCOUNTERED FOR ANY OF THE POSTS IN THE SYSTEM, CONTACT THE MANUFACTURER FOR SPECIFIC INSTALLATION GUIDANCE.
9. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
10. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS DMS-7210 REQUIREMENTS MAY BE SUBSTITUTED FOR AN APPROVED WOOD BLOCKOUT. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
11. THE ENTIRE SYSTEM MUST BE INSTALLED IN A STRAIGHT LINE WITHOUT ANY CURVE. HOWEVER, THE SYSTEM CAN BE OFFSET BY TWO FEET AS SHOWN ON THE APPROACH GRADING DETAIL TO HELP OFF-SET THE IMPACT HEAD FROM SHOULDER OF THE ROAD.

ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM #
A	1	SGET IMPACT HEAD	SIH1A
B	1	MODIFIED GUARDRAIL PANEL 12'-6" 12GA	126SPZGP
B2	1	MODIFIED GUARDRAIL PANEL 9'-4 1/2" 12GA	GP94
C	2	STANDARD GUARDRAIL PANEL 12'-6" 12GA	GP126
D *	1	STANDARD GUARDRAIL PANEL 25'-0" 12GA	GP25
E	7	MODIFIED YIELDING I-BEAM POST W6x8.5	YP6MOD
F	6	COMPOSITE BLOCKOUT 6" X 8" X 14"	CBO8
G **	6	WOOD BLOCKOUT 6" X 8" X 14"	WBO8
H	1	STRUT 3" X 3" X 80" x 1/4" A36 ANGLE	STR80
I	1	FOUNDATION TUBE 6" X 8" X 72" x 3/16"	FNDT6
J	1	WOOD BREAKAWAY POST 5 1/2" x 7 1/2" x 50"	WBRK50
K	1	WOOD STRIKE BLOCK	WSBLK14
L	1	STRIKE PLATE 1/4" A36 BENT PLATE	SPLT8
M	1	REINFORCEMENT PLATE 12 GA. GR55	REPLT17
N	1	GUARDRAIL GRABBER 2 1/2" X 2 1/2" X 16 1/2"	GGR17
O	1	BEARING PLATE 8" X 8 5/8" X 5/8" A36	BPLT8
P	1	PIPE SLEEVE 4 1/4" X 2 3/8" O.D. (2 1/8" I.D.)	PSLV4
Q	1	BCT CABLE 3/4" X 81" LENGTH	CBL81
SMALL HARDWARE			
a	1	5/8" X 12" GUARDRAIL BOLT 307A HDG	12GRBLT
b	7	5/8" X 10" GUARDRAIL BOLT 307A HDG	10GRBLT
c	33	5/8" X 1 1/4" GR SPLICE BOLTS 307A HDG	1GRBLT
d	3	5/8" FLAT WASHER F436 A325 HDG	58FW436
e	1	5/8" LOCK WASHER HDG	58LW
f	39	5/8" GUARDRAIL HEX NUT HDG	58HN563
g	2	1/2" X 2" STRUT BOLT A325 HDG	2BLT
h	6	1/2" X 1 1/4" PLATE BOLT A325 HDG	125BLT
i	16	1/2" FLAT WASHER F436 A325 HDG	12FWF436
j	8	1/2" LOCK WASHER HDG	12LW
k	8	1/2" HEX NUT A563 HDG	12HN563
l	4	3/8" X 3" HEX LAG SCREW GR5 HDG	38LS
m	4	3/8" FLAT WASHER F436 A325 HDG	38FW844
n	2	1" FLAT WASHER F436 A325 HDG	1FWF436
o	2	1" HEX NUT A563DH HDG	1HN563
p	1	18" TO 24" LONG ZIP TIE RATED 175-200LB	ZPT18
q	1	1 1/2" X 4" SCH-40 PVC PIPE	PSPCR4
r	1	RFID CHIP RATED MIL-STD-810F	RFID810F
s	1	IMPACT HEAD REFLECTIVE SHEETING	RS30M

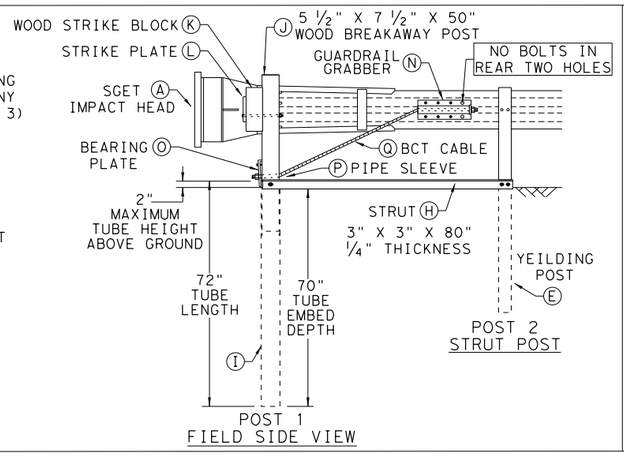
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



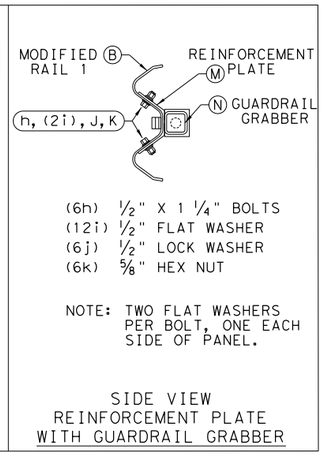
SIDE VIEW
POST 8 - POST 3 (TYP)



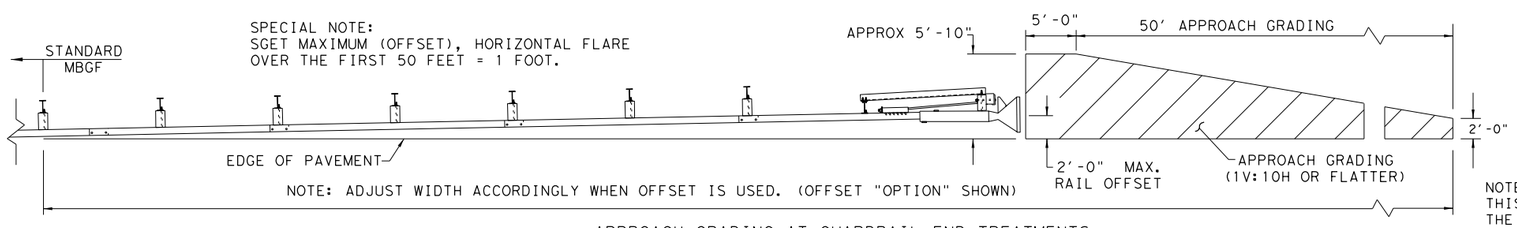
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		84

NOTE:

1. CONTOUR DATA IS BASED ON THE 2019 USGS MAP.

2. FOR CULVERT 4 & 15
   - HEC-HMS 4.2 WAS USED FOR THE RUNOFF ANALYSIS USING THE UNIT HYDROGRAPH METHOD. HY8 WAS USED FOR THE CULVERT PERFORMANCE ANALYSIS.
   - ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.
   - TIME OF CONCENTRATION (TC) WAS COMPUTED USING THE KIRBY KIRPICH METHOD. LAG TIME = 0.6 X TC

DA ID	CULVERT	ROADWAY	CURVE NUMBER	TIME OF CONCENTRATION (MIN)	AREA (SQ. MI)	AREA (ACRES)	FREQUENCY (CFS)	
							10-YR	100-YR
4	4	FM 2478	84	55	0.389	249.52	461.30	744.60

DA ID	CULVERT	ROADWAY	CURVE NUMBER	TIME OF CONCENTRATION (MIN)	AREA (SQ. MI)	AREA (ACRES)	FREQUENCY (CFS)	
							10-YR	100-YR
15	15	FM 2478	78	86	2.976	1905.24	1856.10	3290.60

STATE OF TEXAS
GAURAB ADHIKARI
140607
LICENSED
PROFESSIONAL ENGINEER

Signature of Registrant , P.E. & Date 5/18/2023

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Signature of Registrant , P.E. & Date 05/18/2023

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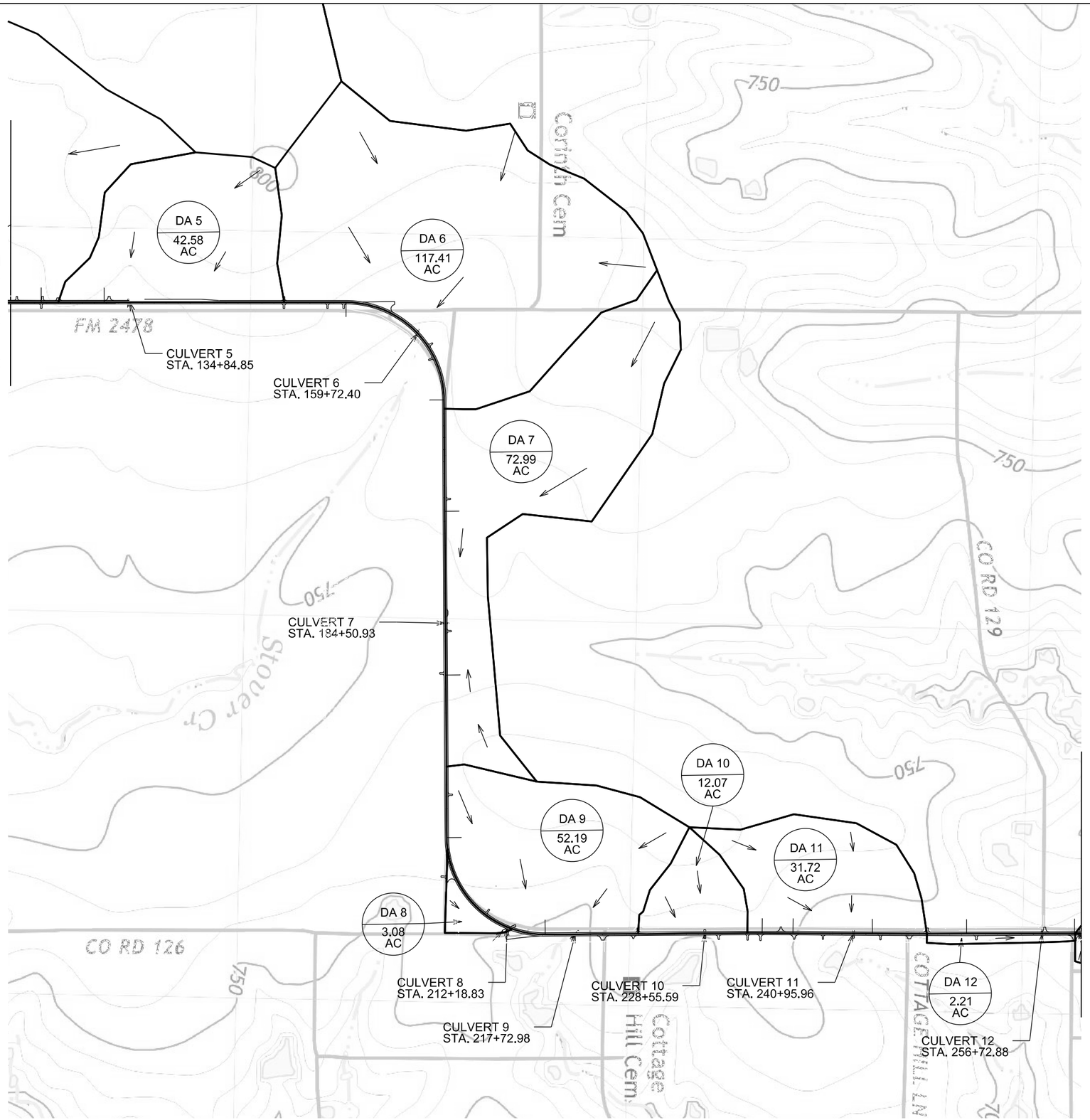
FM 2478

EXTERIOR DRAINAGE AREA MAP

SCALE: 1=900' SHEET 1 OF 3

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	85
CHECK	CONTROL	SECTION	JOB	
MS / JRV	2351	02	017	



0 450 900

XX / XX — DRAINAGE AREA (ACRES) / DRAINAGE AREA NUMBER

STRUCTURE LOCATION

DIRECTION OF FLOW

DRAINAGE AREA BOUNDARY

NOTE:

1. CONTOUR DATA IS BASED ON THE 2019 USGS MAP.
2. FOR CULVERT 4 & 15
   - HEC-HMS 4.2 WAS USED FOR THE RUNOFF ANALYSIS USING THE UNIT HYDROGRAPH METHOD. HY8 WAS USED FOR THE CULVERT PERFORMANCE ANALYSIS.
   - ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.
   - TIME OF CONCENTRATION (TC) WAS COMPUTED USING THE KIRBY KIRPICH METHOD. LAG TIME = 0.6 X TC

STATE OF TEXAS
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Signature of Registrant & ,P.E. Date: 5/18/2023

STATE OF TEXAS
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Signature of Registrant & ,P.E. Date: 05/18/2023

Texas Department of Transportation

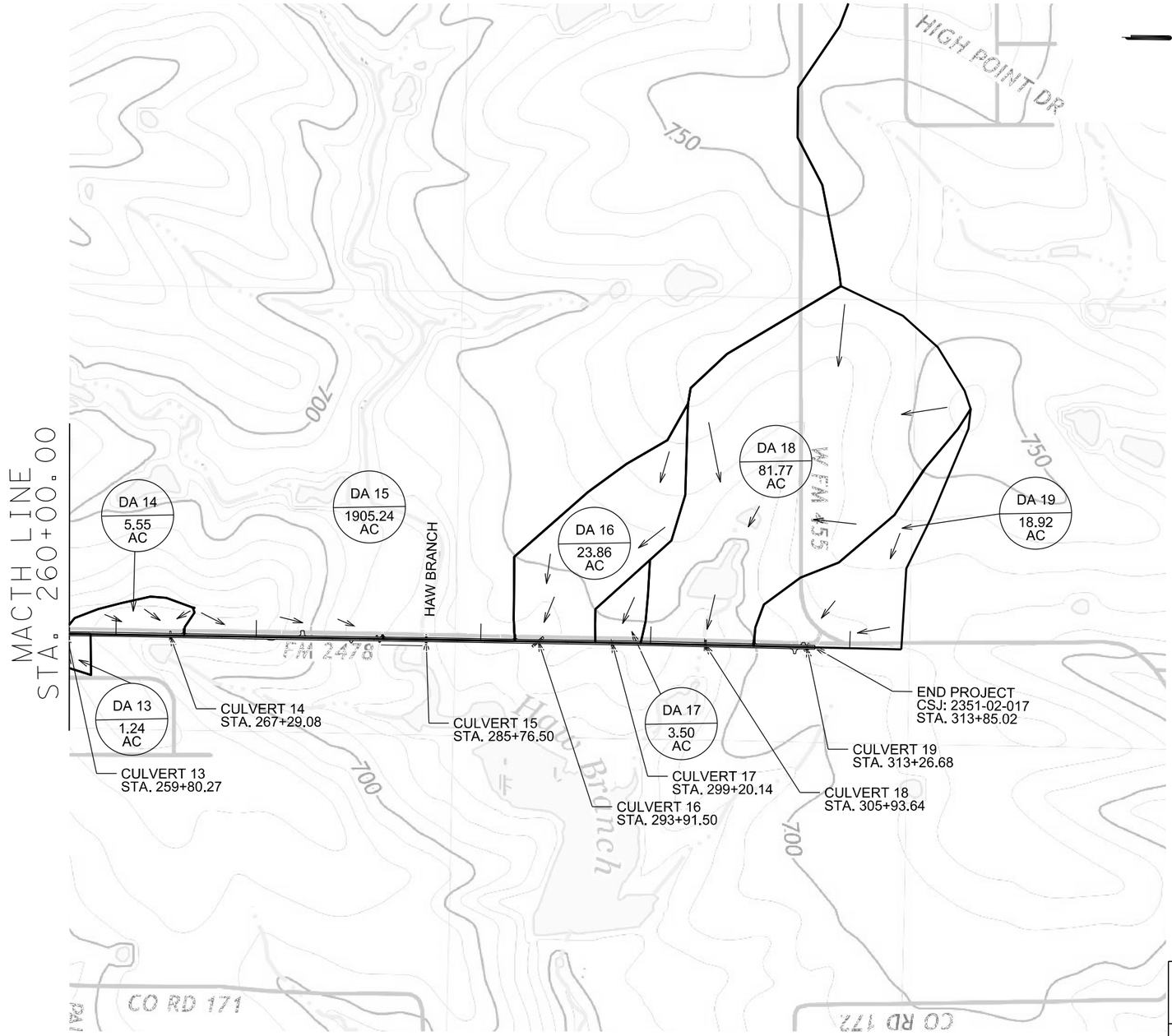
FM 2478

EXTERIOR DRAINAGE AREA MAP

SCALE: 1=900' SHEET 2 OF 3

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	86
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	

DATE: 5/18/2023 TIME: 3:58:32 PM FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/5. Drainage/Drainage Area



NOTE:

1. CONTOUR DATA IS BASED ON THE 2019 USGS MAP.
2. FOR CULVERT 4 & 15
   - HEC-HMS 4.2 WAS USED FOR THE RUNOFF ANALYSIS USING THE UNIT HYDROGRAPH METHOD. HY8 WAS USED FOR THE CULVERT PERFORMANCE ANALYSIS.
   - ALL ELEVATIONS BASED ON NAVD88 VERTICAL DATUM.
   - TIME OF CONCENTRATION (TC) WAS COMPUTED USING THE KIRBY KIRPICH METHOD. LAG TIME = 0.6 X TC

STATE OF TEXAS
GAURAB ADHIKARI
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LICENSED
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Signature of Registrant ,P.E. & Date 5/18/2023

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122118
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PROFESSIONAL ENGINEER

Signature of Registrant ,P.E. & Date 05/18/2023

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FM 2478

EXTERIOR DRAINAGE AREA MAP

SCALE: 1=900' SHEET 3 OF 3

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	87
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	

RATIONAL METHOD RUNOFF CALCULATIONS

DESCRIPTION	STATION	DA I.D.	Cr	C_1	Cv	Cs	C	A (acres)	T_c (min)	10-YEAR(DESIGN) I_{10} (in/hr)	10-YEAR(DESIGN) Q_{10} (cfs)	100-YEAR(CHECK) I_{100} (in/hr)	100-YEAR(CHECK) Q_{100} (cfs)
CULVERT NO. 2	62+18.65	DA 2	0.10	0.11	0.12	0.11	0.44	17.29	22.0	4.74	36.10	7.15	54.36
CULVERT NO. 3	67+13.63	DA 3	0.10	0.11	0.12	0.11	0.44	63.90	34.0	3.68	103.46	5.56	156.19
CULVERT NO. 5	134+84.85	DA 5	0.10	0.10	0.12	0.11	0.43	42.58	34.0	3.68	67.37	5.56	101.71
CULVERT NO. 6	159+72.40	DA 6	0.11	0.10	0.12	0.11	0.44	117.41	30.0	3.97	205.07	5.99	309.34
CULVERT NO. 7	184+50.93	DA 7	0.10	0.10	0.12	0.11	0.43	72.99	53.0	2.77	86.97	4.20	131.72
CULVERT NO. 8	212+18.83	DA 8	0.11	0.10	0.12	0.11	0.44	3.08	18.0	5.28	7.16	7.95	10.77
CULVERT NO. 9	217+72.98	DA 9	0.11	0.10	0.12	0.11	0.44	52.19	28.0	4.14	94.96	6.24	143.18
CULVERT NO. 10	228+55.59	DA 10	0.11	0.10	0.12	0.11	0.44	12.07	20.0	5.00	26.54	7.52	39.95
CULVERT NO. 11	240+95.96	DA 11	0.11	0.10	0.12	0.11	0.44	31.72	31.0	3.89	54.32	5.87	81.96
CULVERT NO. 12	256+72.88	DA 12	0.10	0.1	0.12	0.12	0.44	2.21	24.0	4.52	4.39	6.81	6.62
CULVERT NO. 13	259+80.27	DA 13	0.10	0.1	0.12	0.12	0.44	1.24	31.0	3.89	2.12	5.87	3.20
CULVERT NO. 14	267+59.08	DA 14	0.10	0.1	0.12	0.12	0.44	5.55	18.0	5.28	12.90	7.95	19.41
CULVERT NO. 16	293+91.50	DA 17	0.11	0.1	0.12	0.12	0.45	23.86	27.0	4.22	45.35	6.37	68.37
CULVERT NO. 17	299+20.14	DA 18	0.11	0.1	0.12	0.12	0.45	3.50	18.0	5.28	8.32	7.95	12.52
CULVERT NO. 18	305+93.64	DA 19	0.11	0.1	0.12	0.12	0.45	81.77	28.0	4.14	152.16	6.24	229.44
CULVERT NO. 19	313+26.68	DA 20	0.11	0.1	0.12	0.08	0.41	18.92	29.0	4.05	31.42	6.11	47.39

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Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

NOTES:

1. DRAINAGE ANALYSIS PERFORMED IN COMFORMANCE WITH THE TXDOT HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019 PROCEDURES).
2. RATIONAL METHOD USED TO ANALYZE DRAINAGE BASIN LESS THAN 200 ACRES.
3. NO EXTENSION/WORK TO BE DONE IN CULVERT 1.

Texas Department of Transportation

FM 2478

HYDROLOGIC AND HYDRAULIC CALCULATIONS

SHEET 1 OF 2

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		88

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DATE: 4/29/2023 10:22:20 AM
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CULVERT HYDRAULIC CALCULATIONS
(HY-8.7.30 WAS USED TO ANALYZE THE CULVERTS)

						10 YEAR (DESIGN)						100 YEAR (CHECK)					
CULVERT	STATION	DESCRIPTION		DRAINAGE AREA	ALLOWABLE HEADWATER	RUNOFF CFS	HW ELEV (FT)	TW ELEV (FT)	TW DEPTH (FT)	OUTLET VELOCITY (FPS)	TW VELOCITY (FPS)	RUNOFF CFS	HW ELEV (FT)	TW ELEV (FT)	TW DEPTH (FT)	OUTLET VELOCITY (FPS)	TW VELOCITY (FPS)
CULVERT 2	62+18.65	EXISTING	1 - 42" X 68' CMP	2	765.72	36.10	759.39	754.58	1.10	6.94	4.95	54.36	760.44	754.77	1.29	8.10	5.48
		PROPOSED	1 - 42" X 80' RCP	2	765.72	36.10	758.33	754.58	1.10	11.51	4.95	54.36	759.18	754.77	1.29	12.85	5.48
CULVERT 3	67+13.63	EXISTING	1 - 48" x 73' CMP	3	767.42	103.46	763.74	758.56	1.64	9.98	6.44	156.19	767.51	758.83	1.91	12.50	7.14
		PROPOSED	1 - 48" x 80' RCP	3	767.42	103.46	762.58	758.56	1.64	9.98	6.44	156.19	765.99	758.83	1.91	13.01	758.83
CULVERT 5	134+84.85	EXISTING	3 - 30" x 64' CMP	5	776.58	67.37	773.73	772.12	1.50	6.73	4.99	101.71	775.47	772.37	1.75	8.14	5.53
		PROPOSED	3 - 30" X 59' RCP	5	776.58	67.37	773.45	772.12	1.50	6.73	4.99	101.71	774.39	772.37	1.75	8.14	5.53
CULVERT 6	159+72.40	EXISTING	4 -42" X 61' CMP	6	771.30	205.07	768.81	765.63	1.08	7.91	7.48	309.34	770.81	765.90	1.35	9.55	8.48
		PROPOSED	3 -4' X 4' x 62' MBC	6	771.30	205.07	768.39	765.63	1.08	8.19	7.48	309.34	769.51	765.90	1.35	9.40	8.48
CULVERT 7	184+50.93	EXISTING	2 -48" X 51' CMP	7	760.20	86.97	756.54	754.34	1.34	7.05	6.92	131.72	757.51	754.57	1.57	8.18	7.68
		PROPOSED	2 -48" X 54' RCP	7	760.20	86.97	756.13	754.34	1.34	7.68	6.92	131.72	756.98	754.57	1.57	8.57	7.68
CULVERT 8	212+18.83	EXISTING	1 -30 X 88' CMP	8	757.26	7.16	751.80	750.60	0.60	4.62	3.30	10.77	752.20	750.70	0.70	5.19	3.66
		PROPOSED	1 -30" X 96' RCP	8	757.26	7.16	752.79	751.80	0.60	4.74	3.30	10.77	753.15	751.90	0.70	5.29	3.66
CULVERT 9	217+72.98	EXISTING	2 -36" X 78' CMP	9	752.85	94.96	749.75	742.32	1.39	8.38	8.14	143.18	750.07	742.56	1.63	10.62	9.02
		PROPOSED	2 -42" X 96' RCP	9	752.85	94.96	746.47	742.32	1.39	11.93	8.14	143.18	747.71	742.56	1.63	13.38	9.02
CULVERT 10	228+55.59	EXISTING	1 - 36" X 51' CMP	10	758.26	26.54	755.19	750.78	0.86	6.60	5.34	39.95	755.39	750.92	1.00	7.74	5.70
		PROPOSED	1 - 36" X 56' RCP	10	758.26	26.54	752.78	750.78	0.86	6.60	5.34	39.95	753.52	750.92	1.00	7.74	7.70
CULVERT 11	240+95.96	EXISTING	1 -36" X 53' CMP	11	743.62	54.32	740.42	734.68	1.13	8.99	7.08	81.96	740.68	734.87	1.32	11.97	7.84
		PROPOSED	1 -36" X 61' RCP	11	743.62	54.32	740.42	734.68	1.13	8.99	7.08	81.96	740.68	734.87	1.32	11.97	7.84
CULVERT 12	256+72.88	EXISTING	1 - 18" X 49' CMP	12	741.44	4.39	738.32	736.33	0.44	4.99	3.28	6.62	738.78	736.40	0.51	5.47	3.64
		PROPOSED	1 - 24" X 54' RCP	12	741.44	4.39	738.15	736.33	0.44	7.46	3.28	6.62	738.43	736.40	0.51	8.28	6.34
CULVERT 13	259+80.27	EXISTING	1 -18" X 45' CMP	13	742.68	2.12	739.97	738.81	0.53	3.82	1.26	3.20	740.19	738.90	0.62	4.27	1.40
		PROPOSED	1 -24" X 53' RCP	13	742.68	2.12	739.89	738.81	0.53	5.57	1.26	3.20	740.07	738.90	0.62	6.25	1.40
CULVERT 14	267+29.08	EXISTING	1 - 18" X 56' CMP	14	737.01	12.90	735.06	726.22	0.57	15.31	4.48	19.41	737.04	726.31	0.66	16.98	4.96
		PROPOSED	1 - 24" X 71' RCP	14	737.01	12.90	732.95	726.22	0.57	10.57	4.48	19.41	733.10	726.31	0.66	11.64	4.96
CULVERT 16	293+91.50	EXISTING	1 - 24" X 89' CMP	16	687.63	45.35	684.52	674.56	1.00	18.10	5.69	68.37	685.68	674.72	1.16	20.09	6.31
		PROPOSED	1 - 42" X 105' RCP	16	687.63	45.35	682.98	674.56	1.00	10.05	5.69	68.37	683.20	674.72	1.16	11.28	6.31
CULVERT 17	299+20.14	EXISTING	1 -18" X 45' CMP	17	695.44	8.32	692.52	689.77	0.89	5.92	1.31	12.52	692.65	689.92	1.04	7.54	1.44
		PROPOSED	1 -24" X 51' RCP	17	695.44	8.32	690.69	689.77	0.89	5.12	1.31	12.52	691.13	689.92	1.04	5.95	1.45
CULVERT 18	305+93.64	EXISTING	3 - 30" X 84' CMP	18	691.57	152.16	685.51	677.09	1.51	10.71	5.93	229.44	691.76	677.41	1.83	13.95	6.61
		PROPOSED	1 - 4' X 4' x 83' SBC	18	691.57	152.16	682.83	677.31	1.73	11.19	4.80	229.44	687.53	677.67	2.09	14.34	5.34
CULVERT 19	313+26.68	EXISTING	1 -30" X 52' CMP	19	713.91	31.42	712.61	709.17	0.99	7.82	5.39	47.39	714.00	709.33	1.15	8.88	5.97
		PROPOSED	1 -30" X 54' RCP	19	713.91	31.42	712.02	709.17	0.99	7.82	5.39	47.39	713.96	709.33	1.15	9.54	5.97

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FM 2478

HYDROLOGIC AND HYDRAULIC CALCULATIONS

SHEET 2 OF 2

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		89

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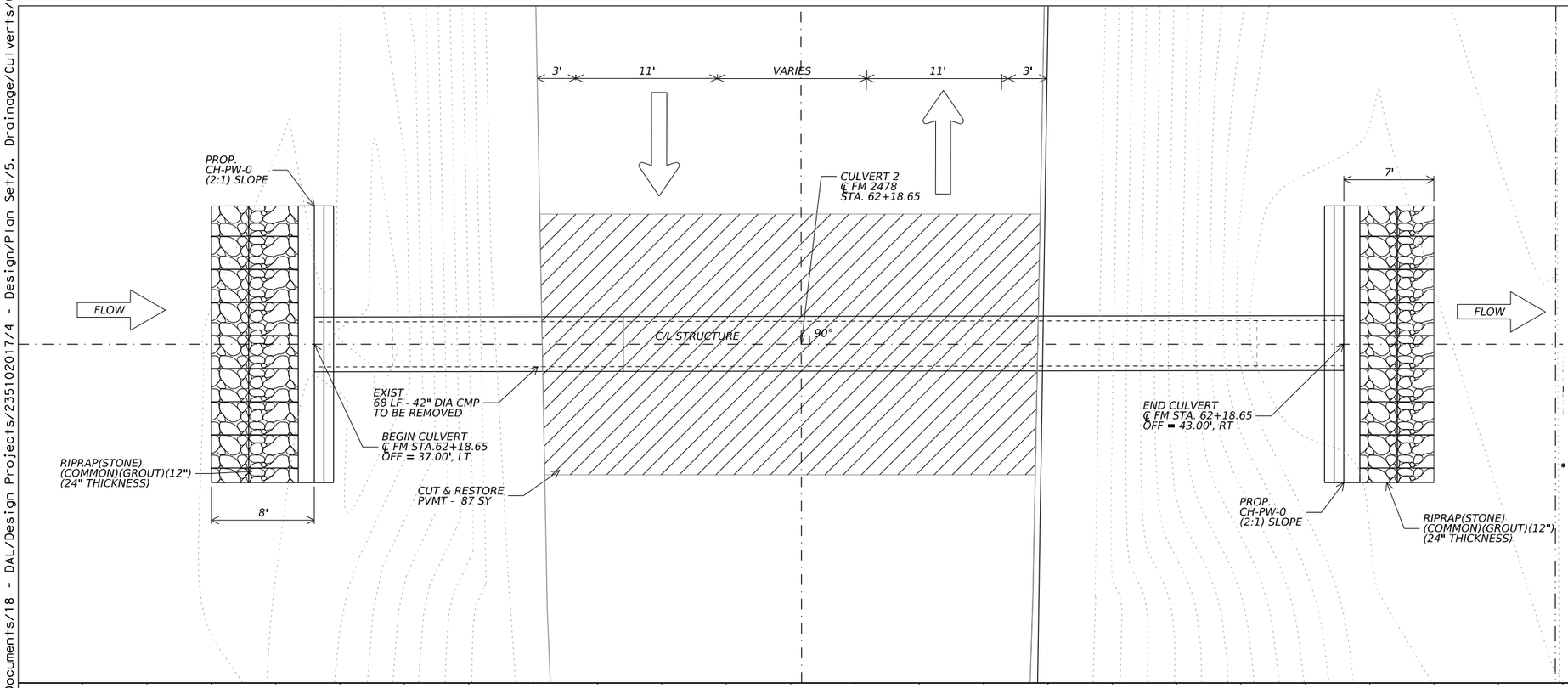

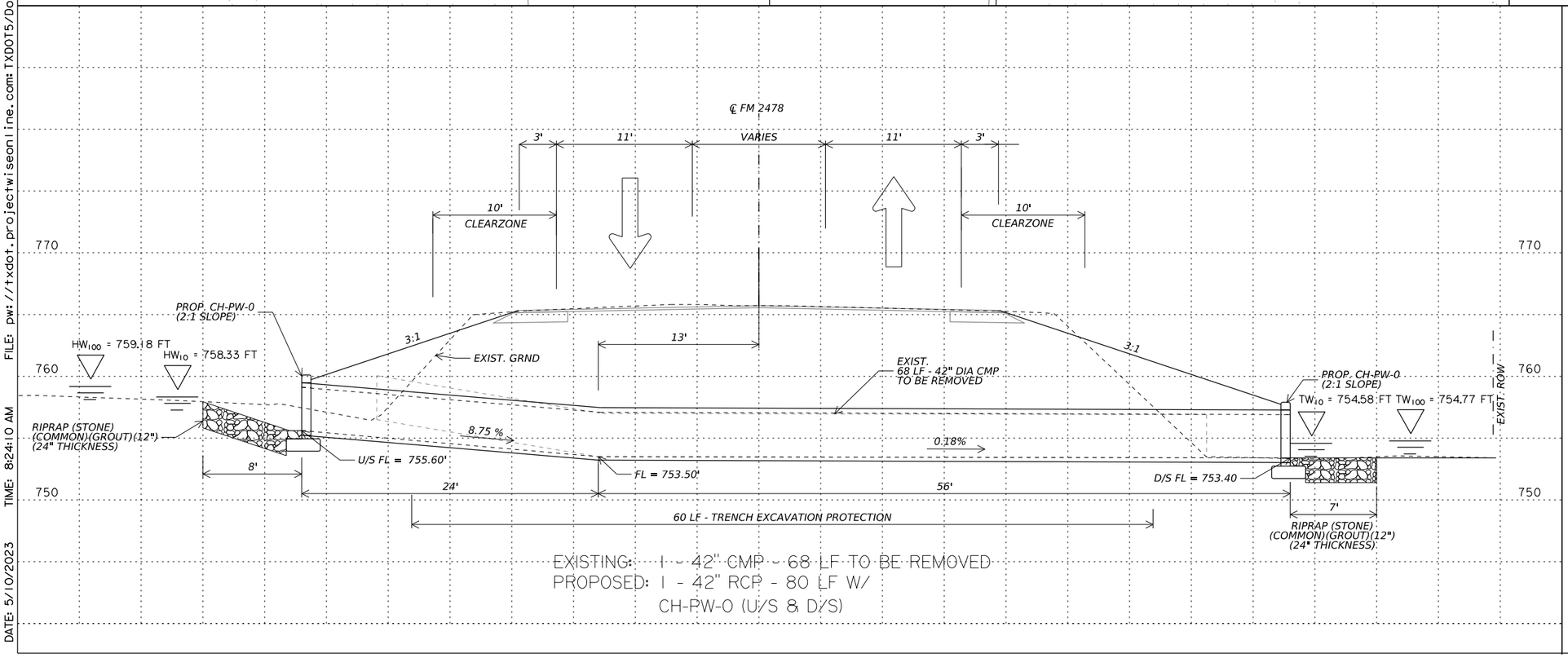

EXISTING: 1 - 42" CMP - 68 LF TO BE REMOVED
PROPOSED: 1 - 42" RCP - 80 LF W/
CH-PW-0 (U/S & D/S)

0 5 10

HYDRAULIC DATA

DRAINAGE AREA = 17.29 ACRE

Q_{10} = 36.10 CFS	Q_{100} = 54.36 CFS
HW_{10} = 758.33 FT	HW_{100} = 759.18 FT
TW_{10} = 754.58 FT	TW_{100} = 754.77 FT
V_{10} = 11.51 FPS	V_{100} = 12.85 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	36
	400-6006	CUT & RESTORING PAV	SY	87
	402-6001	TRENCH EXCAVATION PROTECTION	LF	60
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	26
	464-6009	RC PIPE (CL III)(42 IN)	LF	80
	466-6102	HEADWALL (CH - PW - 0) (DIA= 42 IN)	EA	2
	496-6007	REMOV STR (PIPE)	LF	68

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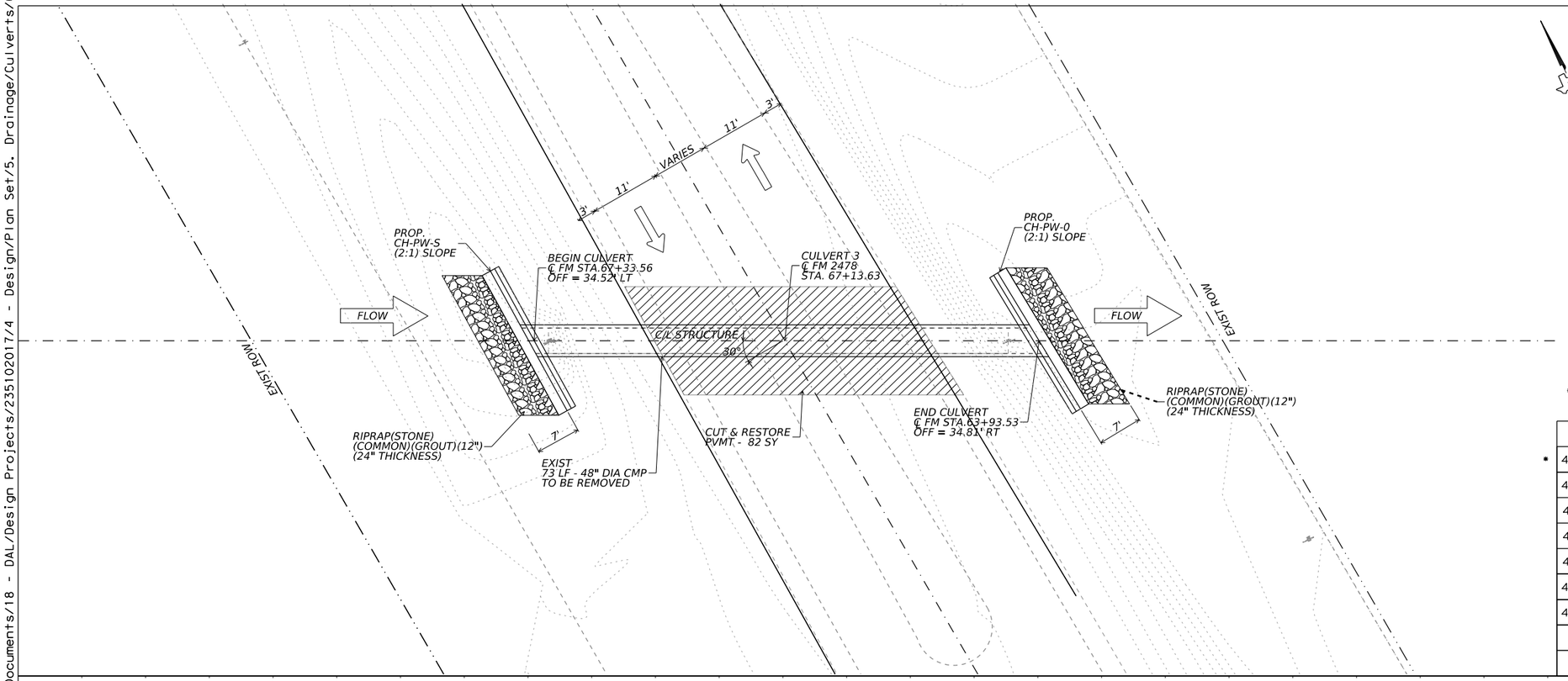
Texas Department of Transportation

FM 2478
CULVERT 2 LAYOUT
STA 62+18.65

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

SHEET 1 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	90
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				



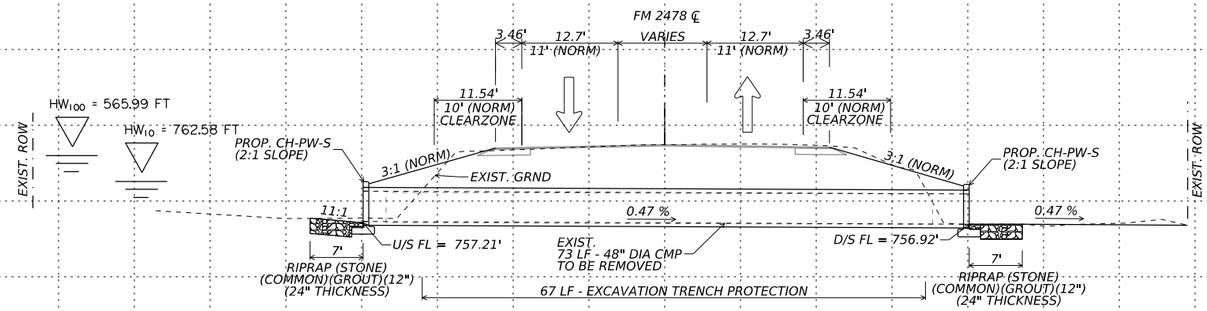
HYDRAULIC DATA

DRAINAGE AREA = 63.90 ACRE

Q_{10} = 103.46 CFS	Q_{100} = 156.19 CFS
HW_{10} = 762.58 FT	HW_{100} = 765.99 FT
TW_{10} = 758.56 FT	TW_{100} = 758.83 FT
V_{10} = 9.98 FPS	V_{100} = 13.01 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	47
	400-6006	CUT & RESTORING PAV	SY	82
	402-6001	TRENCH EXCAVATION PROTECTION	LF	67
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	27
	464-6010	RC PIPE (CL III)(48 IN)	LF	80
	466-6136	HEADWALL (CH - PW - S) (DIA= 48 IN)	EA	2
	496-6007	REMOV STR (PIPE)	LF	73



EXISTING: 1 - 48" DIA CMP - 73 LF
PROPOSED: 1 - 48" DIA. RCP - 80 LF W/ CH-PW-S (2:1 SLOPE) (U/S & D/S)

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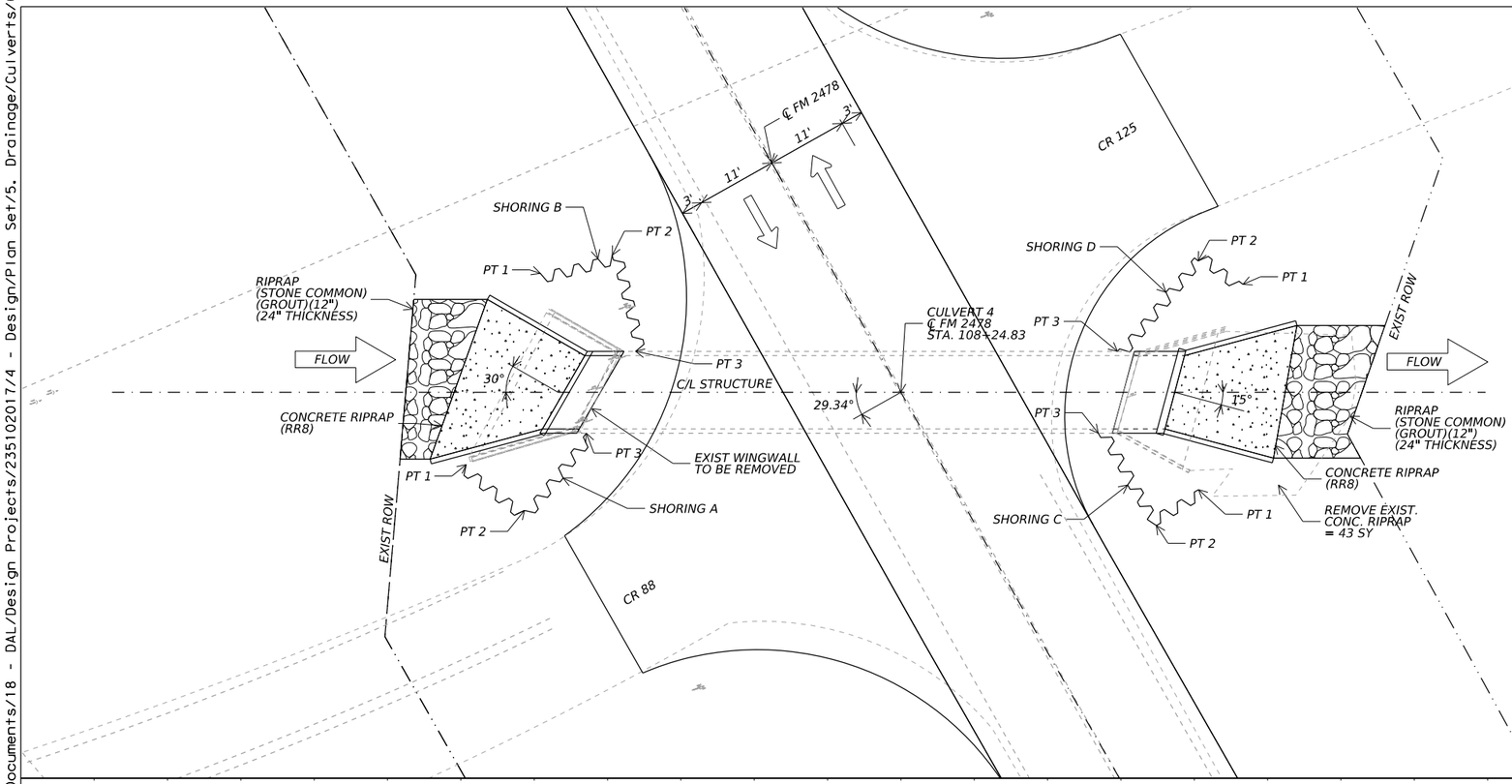
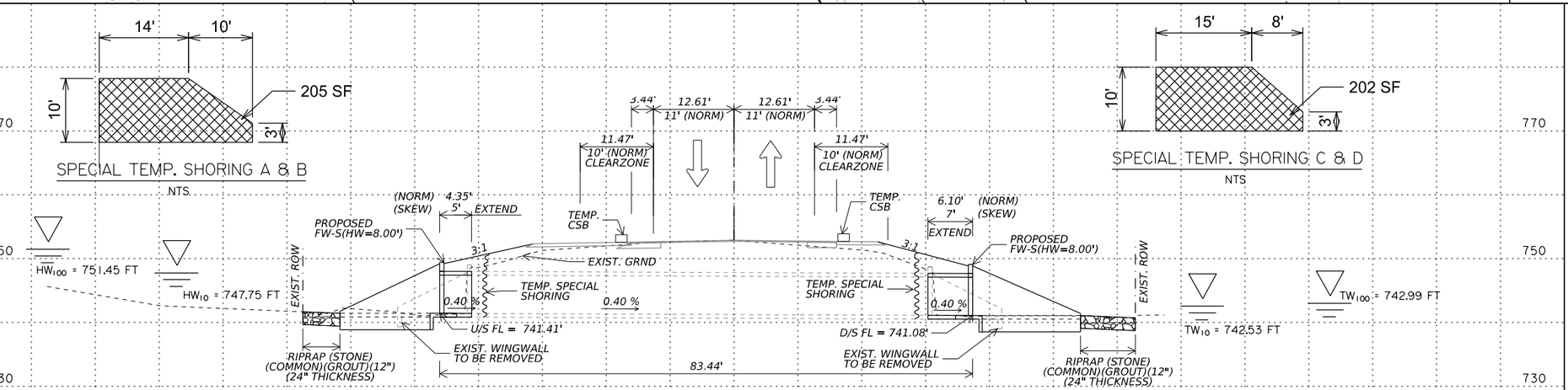
FM 2478
CULVERT 3 LAYOUT
STA 67+13.63

SCALE: 1"=20'-H
1"=20'-V

SHEET 2 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	91
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	





EXISTING: 1 - 10' x 6' SBC WITH WINGWALL (U/S & D/S)
PROPOSED: U/S: EXTEND 5' W/ FW-S (HW=8.00') - TOTAL EXTENSION - 5 LF
D/S: EXTEND 7' W/ FW-S (HW=8.00') - TOTAL EXTENSION - 7 LF
REMOVE EXISTING WINGWALL (U/S & D/S)

HYDRAULIC DATA

DRAINAGE AREA = 249.52 ACRES

Q_{10} = 461.30 CFS	Q_{100} = 744.60 CFS
HW_{10} = 747.75 FT	HW_{100} = 751.45 FT
TW_{10} = 742.53 FT	TW_{100} = 742.99 FT
V_{10} = 11.84 FPS	V_{100} = 13.80 FPS

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
104-6009	REMOVING CONC (RIPRAP)	SY	43
403-6001	TEMPORARY SPL SHORING	SF	814
432-6002	RIPRAP (CONC)(5 IN)	CY	8
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	27
462-6074	CONC BOX CULV (10 FT X 6 FT)(EXTEND)	LF	12
466-6169	WINGWALL (FW - S) (HW=8 FT)	EA	2
496-6005	REMOV STR (WINGWALL)	EA	2

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Signature of Registrant & Date

STATE OF TEXAS
GAURAB ADHIKARI
140607
LICENSED
PROFESSIONAL ENGINEER

Gaurab Adhikari, P.E. 5/18/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478
CULVERT 4 LAYOUT
STA 108+24.83

SCALE: 1"=20'-H
1"=20'-V

SHEET 3 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	92
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				

PROPOSED & EXISTING WSEL PROFILE

1) HY8 VERSION 7.70 UTILIZED FOR THE ANALYSIS.
2) HY8 MODELS WERE DEVELOPED USING PROJECT SURVEY DATA AND FEMA SUPPLEMENTAL MATERIALS.
3) THIS SITE IS DESIGNATED AS ZONE X AS SHOWN IN FEMA MAP FIRM PANELS # 48085C0140J EFF 6/2/2009
4) ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
5) HEC-HMS 4.2 WAS ANALYZED TO CALCULATE FLOWS.
6) THE CULVERT WAS DESIGNED AND ANALYZED FORDESIGN THE 10-YR.
THE 100-YEAR FLOOD YEAR EVENT WAS CHECKED.

REFERENCES:
1) TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019).
2) TOPOGRAPHIC DATA SOURCE (TNRIS, DENTON COUNTY DIGITAL ELEVATIONS)

EXISTING CONDITION CULVERT #4

TOTAL DISCHARGE	CULVERT DISCHARGE	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	TAILWATER ELEVATION (FT)
461.3	461.3	747.76	6.34	5.13	742.56
490.46	490.46	748.07	6.66	5.49	742.61
519.62	519.62	748.39	6.98	5.84	742.66
548.79	548.79	748.73	7.31	6.94	742.7
577.95	577.95	749.07	7.65	7.24	742.75
607.11	607.11	749.43	8.01	7.55	742.8
636.27	636.27	749.8	8.38	7.86	742.84
665.43	665.43	750.19	8.77	8.19	742.88
694.59	694.59	750.6	9.18	8.52	742.93
723.76	723.76	751.02	9.6	8.87	742.97
752.92	752.92	751.46	10.04	9.23	743.01

PROPOSED CONDITION CULVERT #4

TOTAL DISCHARGE	CULVERT DISCHARGE	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	TAILWATER ELEVATION (FT)
461.3	461.3	747.75	6.34	5.14	742.53
490.46	490.46	748.07	6.66	5.49	742.58
519.62	519.62	748.39	6.98	5.85	742.63
548.79	548.79	748.72	7.31	6.95	742.68
577.95	577.95	749.06	7.65	7.25	742.73
607.11	607.11	749.42	8.01	7.56	742.77
636.27	636.27	749.8	8.39	7.88	742.82
665.43	665.43	750.18	8.77	8.21	742.86
694.59	694.59	750.59	9.18	8.55	742.9
723.76	723.76	751.01	9.6	8.9	742.95
752.92	752.92	751.45	10.04	9.26	742.99

STATE OF TEXAS
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5/18/2023

Texas Department of Transportation

FM 2478
CULVERT 4 LAYOUT

(DRAINAGE
CULVERT HYDRAULIC DATA)

SHEET 4 OF 24

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		93

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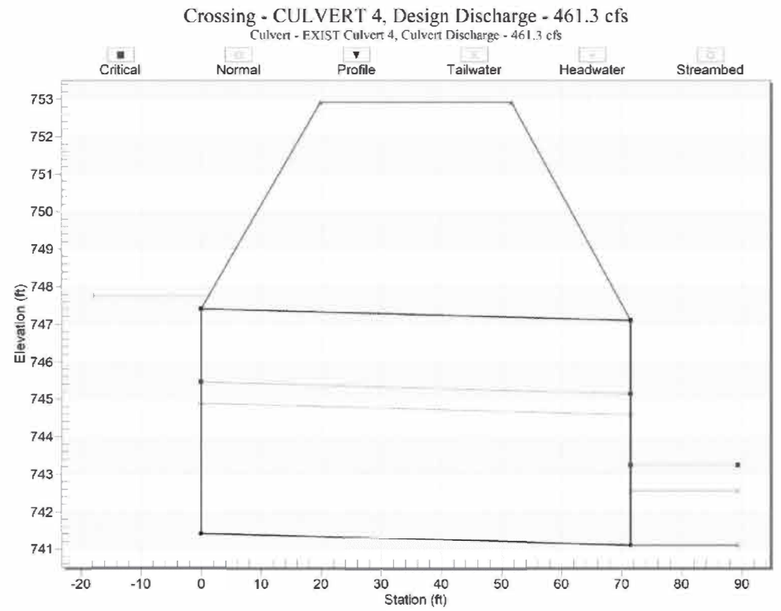
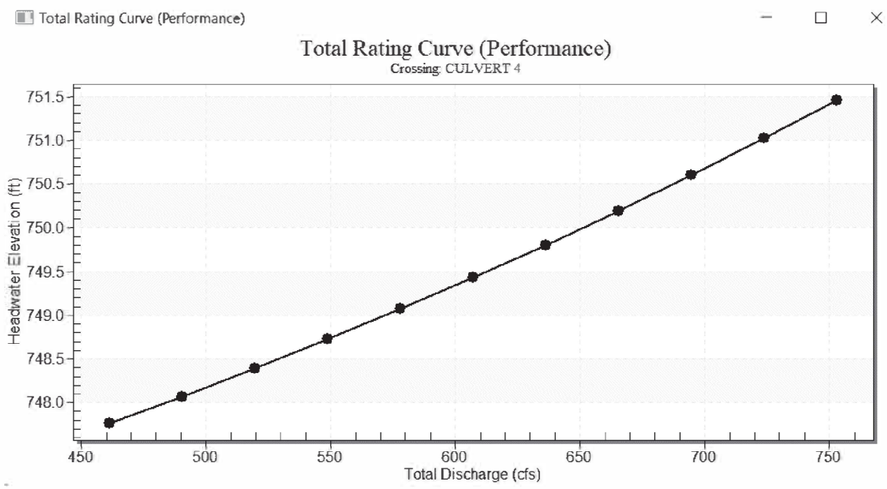
FILE: $FILE$

HY8 EXISTING HYDRAULIC INFORMATION





STATE OF TEXAS
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5/18/2023

Texas Department of Transportation

FM 2478
CULVERT 4 LAYOUT

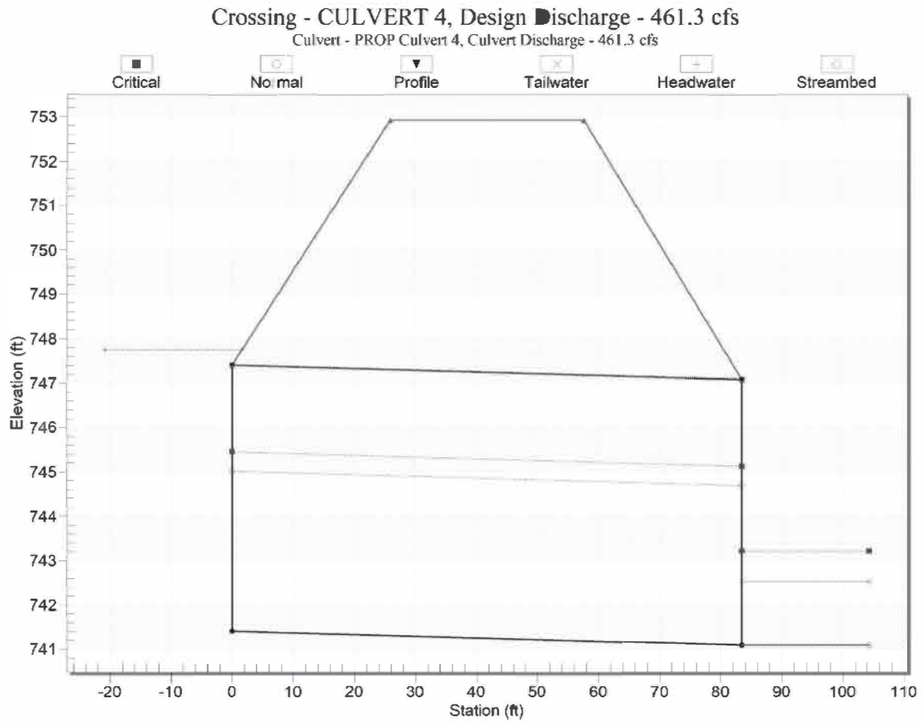
(DRAINAGE
CULVERT HYDRAULIC DATA)

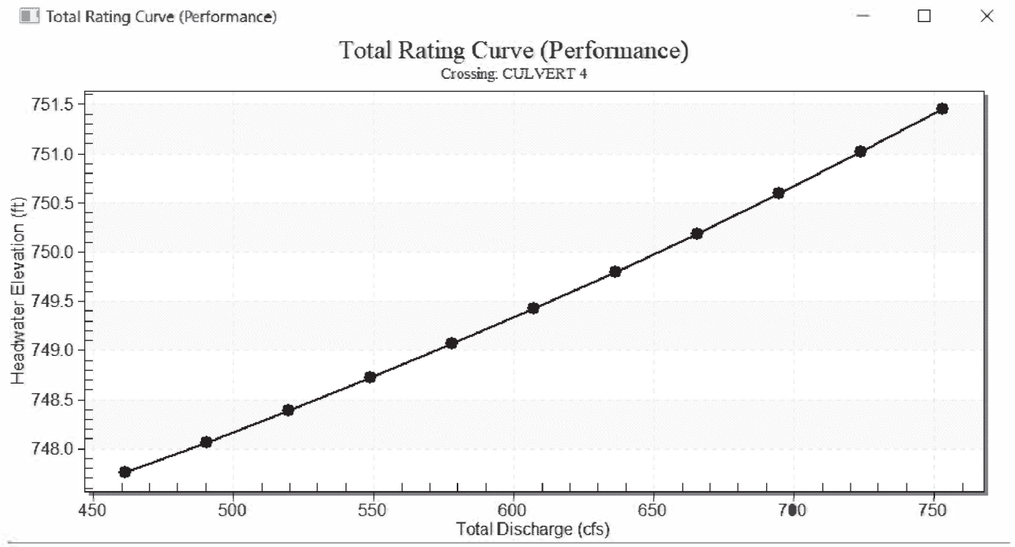
SHEET 5 OF 24

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		94

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

HY8 PROPOSED HYDRAULIC INFORMATION





GAURAB ADHIKARI
140607
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

5/18/2023

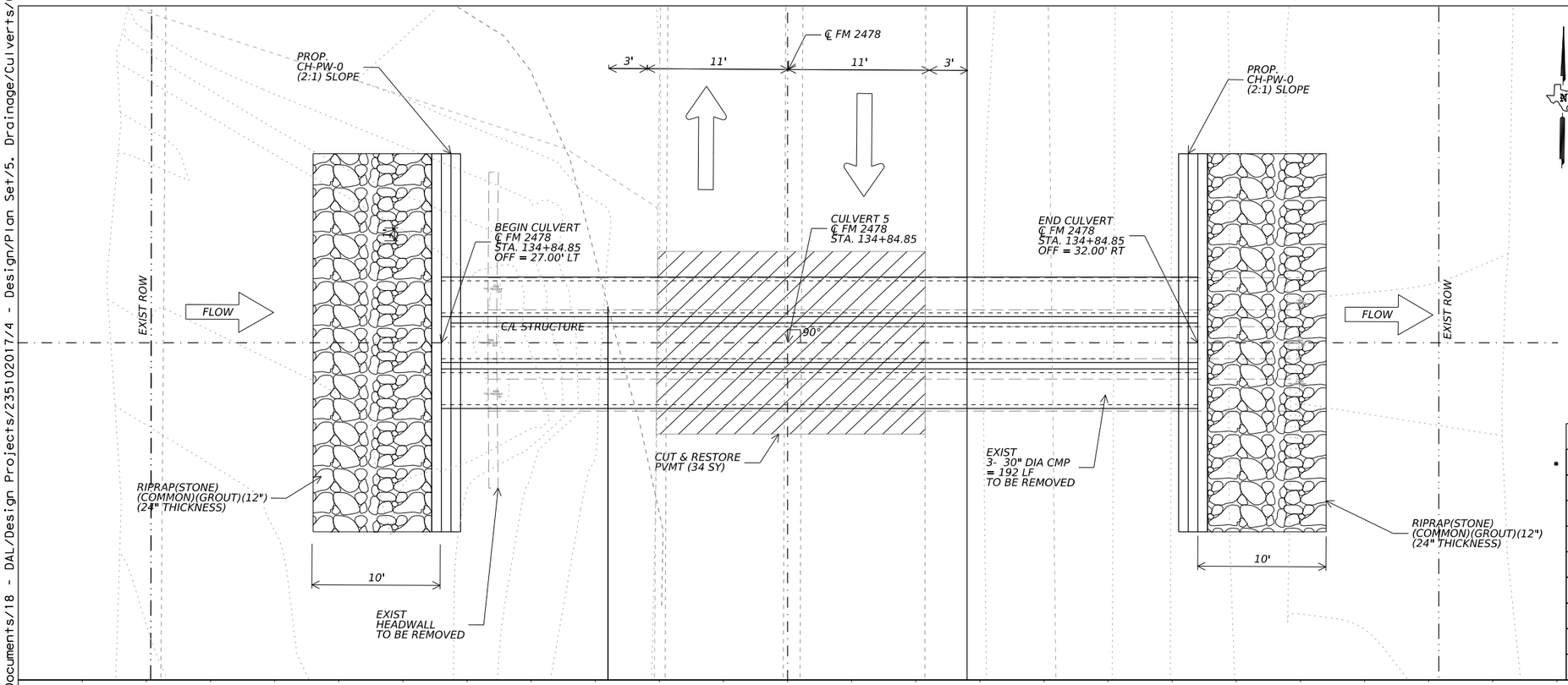
Texas Department of Transportation

FM 2478
CULVERT 4 LAYOUT

(DRAINAGE
CULVERT HYDRAULIC DATA)

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		95

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



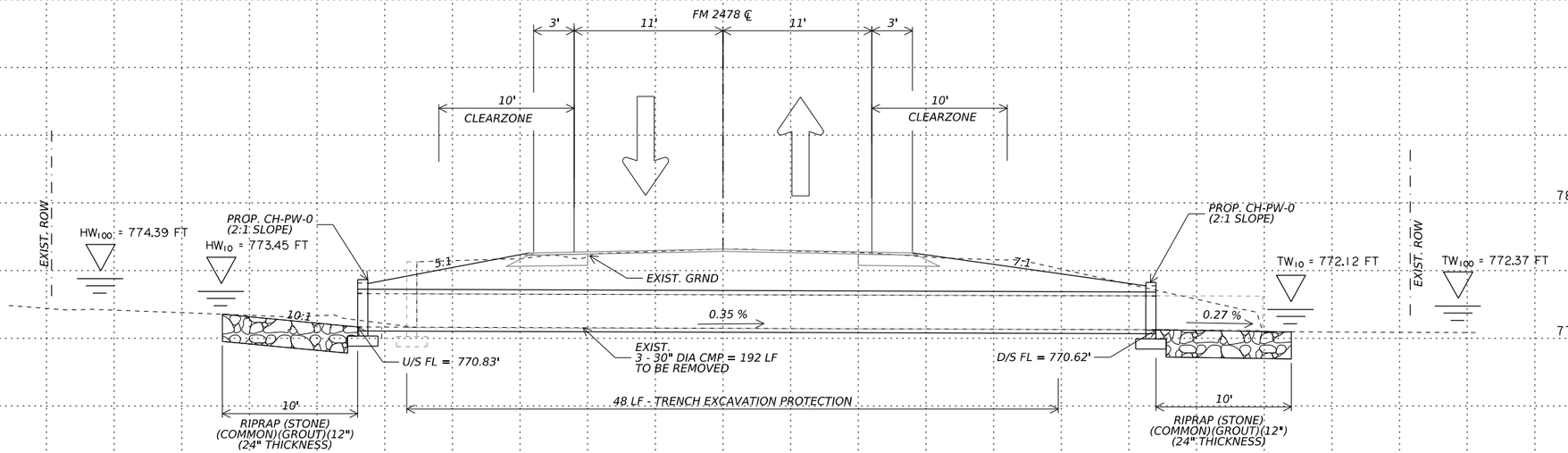
HYDRAULIC DATA

DRAINAGE AREA = 42.58 ACRE

Q_{10} = 67.37 CFS	Q_{100} = 101.71 CFS
HW_{10} = 773.45 FT	HW_{100} = 774.39 FT
TW_{10} = 772.12 FT	TW_{100} = 772.37 FT
V_{10} = 6.73 FPS	V_{100} = 8.14 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
400-6005	CEM STABIL BKFL	CY	23
400-6006	CUT & RESTORING PAV	SY	34
402-6001	TRENCH EXCAVATION PROTECTION	LF	48
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	44
464-6007	RC PIPE (CL III)(30 IN)	LF	177
466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	2
496-6005	REMOV STR (WINGWALL)	EA	1
496-6007	REMOV STR (PIPE)	LF	192



EXISTING: 3 - 30" DIA. CMP - 64 LF = TOTAL = 192 LF TO BE REMOVED
PROPOSED: 3 - 30" DIA. RCP - 59 LF = TOTAL 177 LF W/ CH-PW-0 (U/S & D/S)

THADEUS V. EGAR
122118
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS

Thadeus Egar 5/11/2023
, P.E.
Signature of Registrant & Date

Texas Department of Transportation

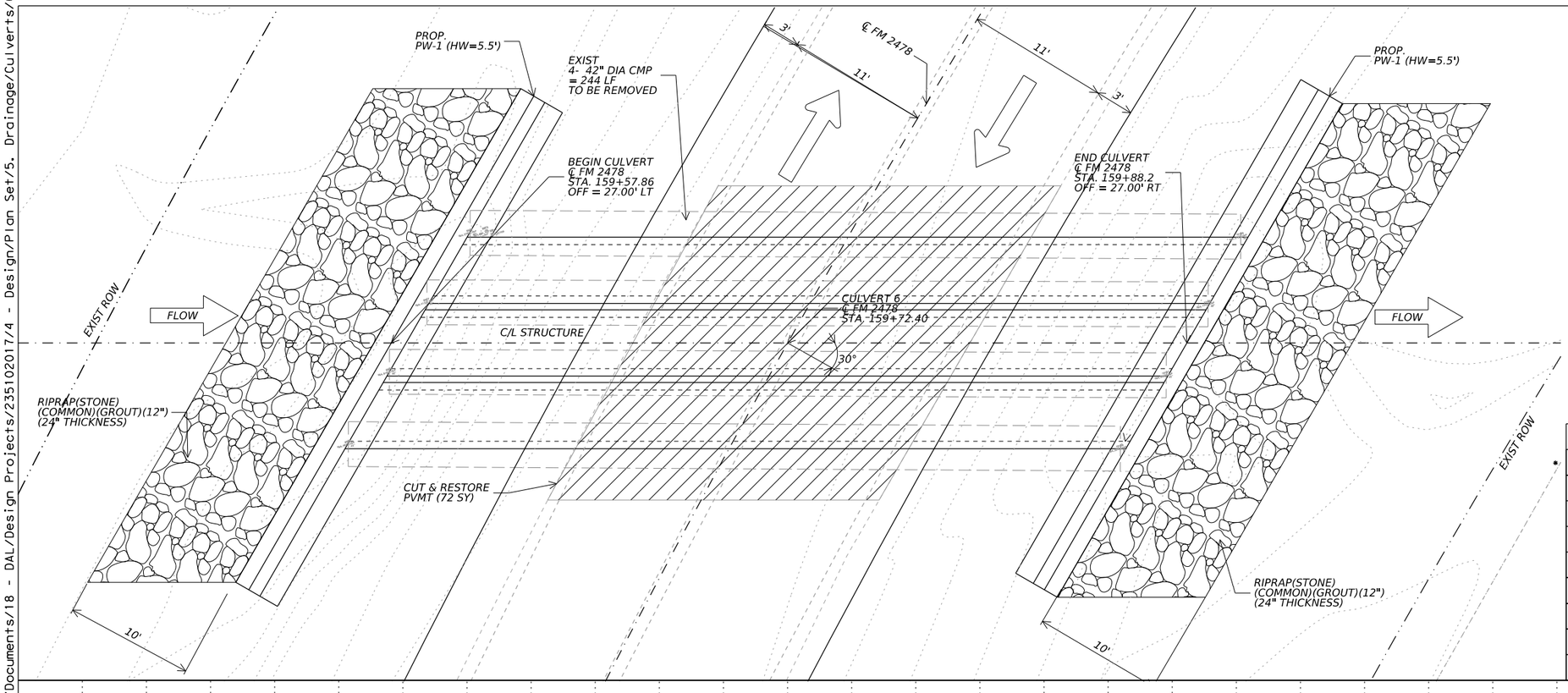
FM 2478
CULVERT 5 LAYOUT
STA 134+84.85

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

SHEET 7 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	96
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/5. Drainage/Culverts/Cul
TIME: 10:14:30 AM
DATE: 5/9/2023



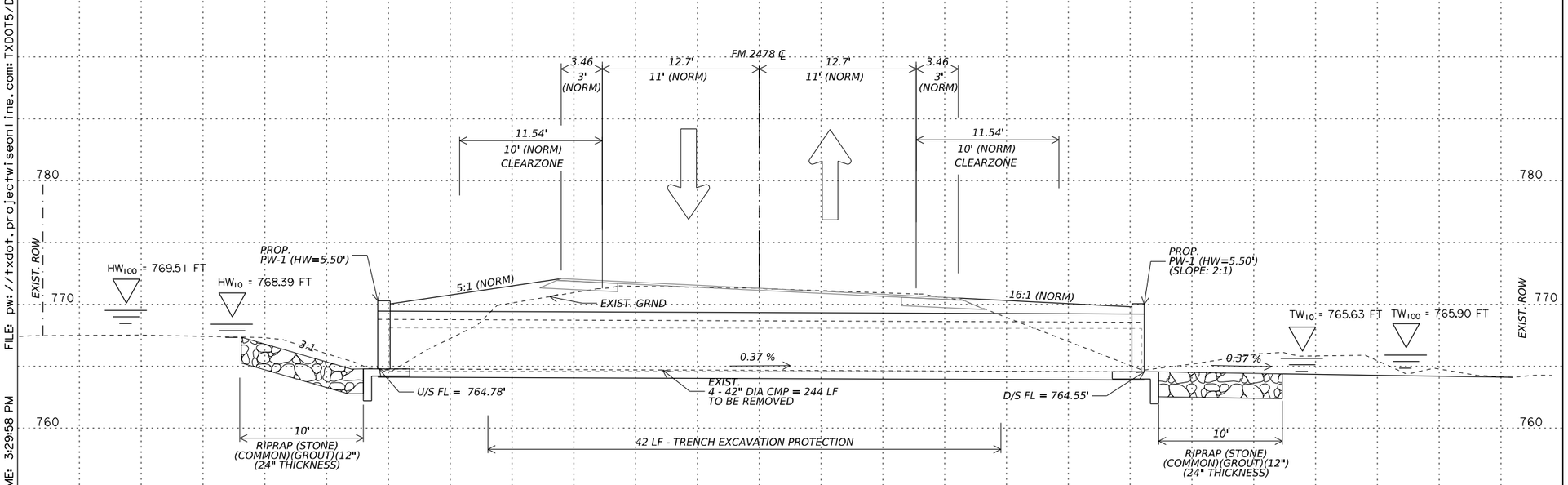
HYDRAULIC DATA

DRAINAGE AREA = 117.41 ACRE

Q_{10} = 205.07 CFS	Q_{100} = 309.34 CFS
HW_{10} = 768.39 FT	HW_{100} = 769.51 FT
TW_{10} = 765.63 FT	TW_{100} = 765.90 FT
V_{10} = 8.19 FPS	V_{100} = 9.40 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
400-6005	CEM STABIL BKFL	CY	72
400-6006	CUT & RESTORING PAV	SY	37
402-6001	TRENCH EXCAVATION PROTECTION	LF	42
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	67
462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	186
466-6181	WINGWALL (PW - 1) (HW=6 FT)	EA	2
496-6007	REMOV STR (PIPE)	LF	244



EXISTING: 4 - 42" DIA. CMP - 61 LF = TOTAL 244 LF TO BE REMOVED
PROPOSED: 3 - 4' X 4' MBC - 62 LF = TOTAL 186 LF W/ PW-1 (HW=5.50') (U/S & D/S)

Thadeus Egar 5/11/2023
Signature of Registrant , P.E. & Date

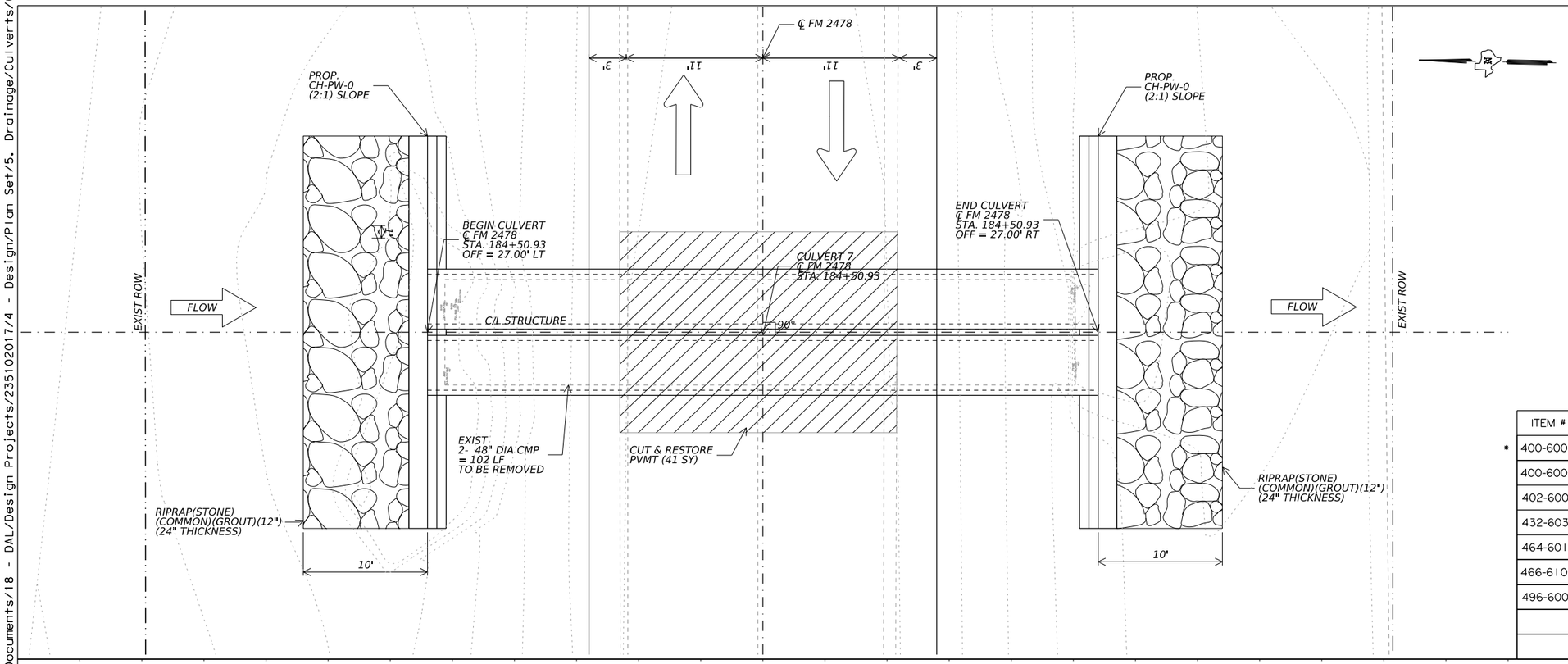
Texas Department of Transportation

FM 2478
CULVERT 6 LAYOUT
STA 159+72.40

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

SHEET 8 OF 24

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	
CHECK	CONTROL	SECTION	JOB	97
MS	2351	02	017	
CHECK				
JRV				

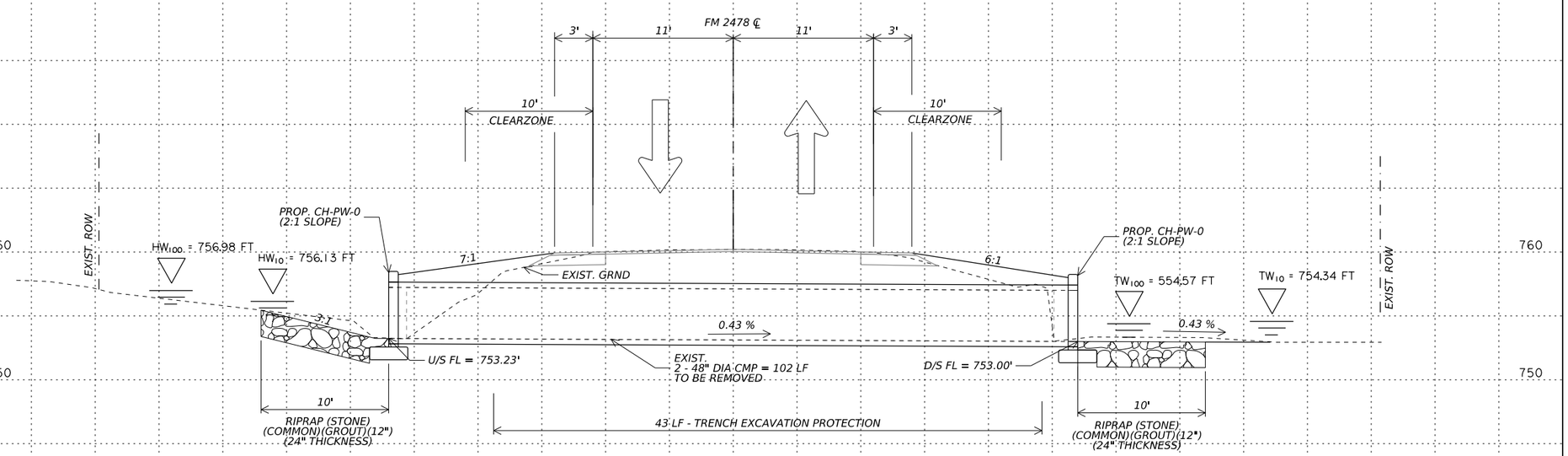


HYDRAULIC DATA

DRAINAGE AREA = 72.99 ACRE	
Q_{10} = 86.97 CFS	Q_{100} = 131.72 CFS
HW_{10} = 756.13.01 FT	HW_{100} = 756.98 FT
TW_{10} = 754.34 FT	TW_{100} = 754.57 FT
V_{10} = 7.68 FPS	V_{100} = 8.57 FPS

• SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
•	400-6005	CEM STABIL BKFL	CY	34
	400-6006	CUT & RESTORING PAV	SY	26
	402-6001	TRENCH EXCAVATION PROTECTION	LF	43
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	48
	464-6010	RC PIPE (CL III)(48 IN)	LF	108
	466-6103	HEADWALL (CH - PW - 0) (DIA= 48 IN)	EA	2
	496-6007	REMOV STR (PIPE)	LF	102



EXISTING: 2 - 48" DIA. CMP - 51 LF = TOTAL = 102 LF TO BE REMOVED
PROPOSED: 2 - 48" DIA. RCP - 54 LF = TOTAL 108 LF W/
CH-PW-0 (U/S & D/S)

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

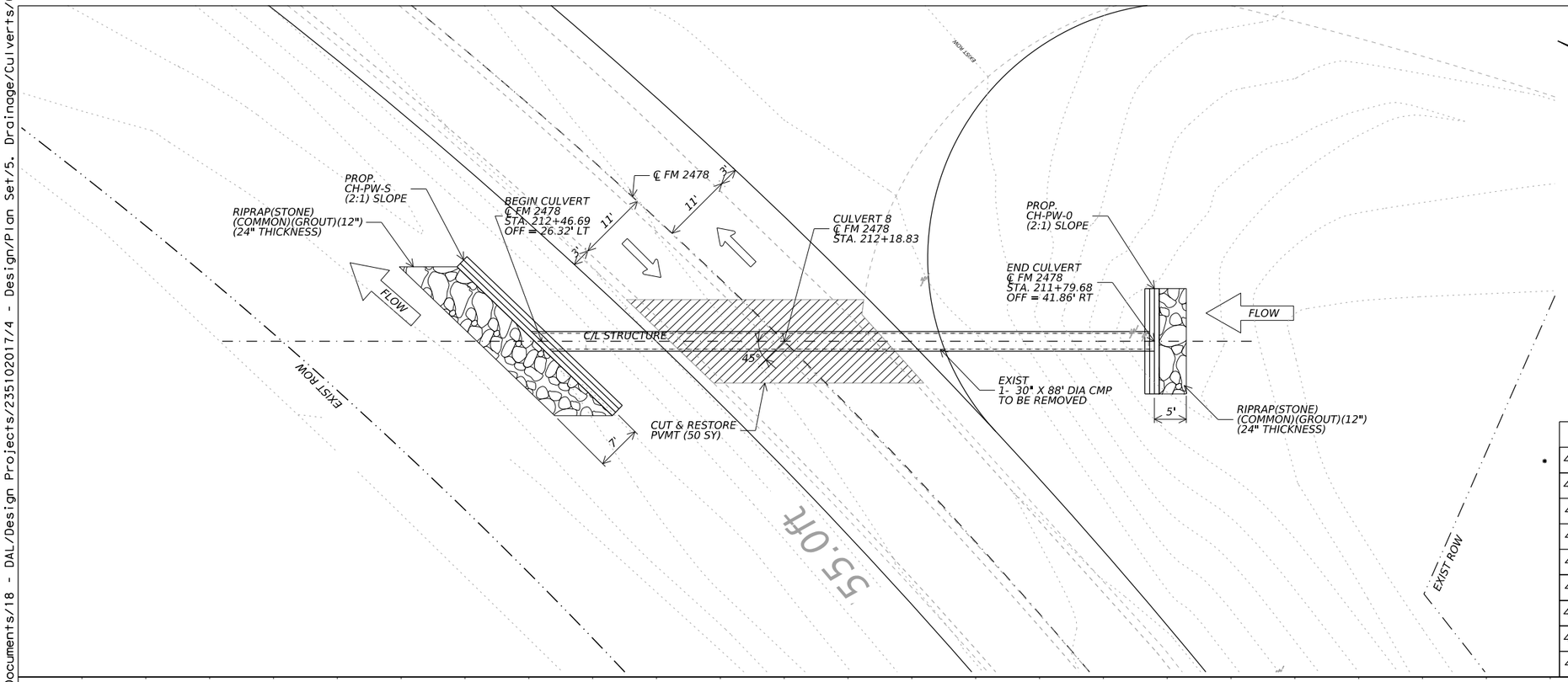
Texas Department of Transportation

FM 2478
CULVERT 7 LAYOUT
STA 184+50.93

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

SHEET 9 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	98
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				



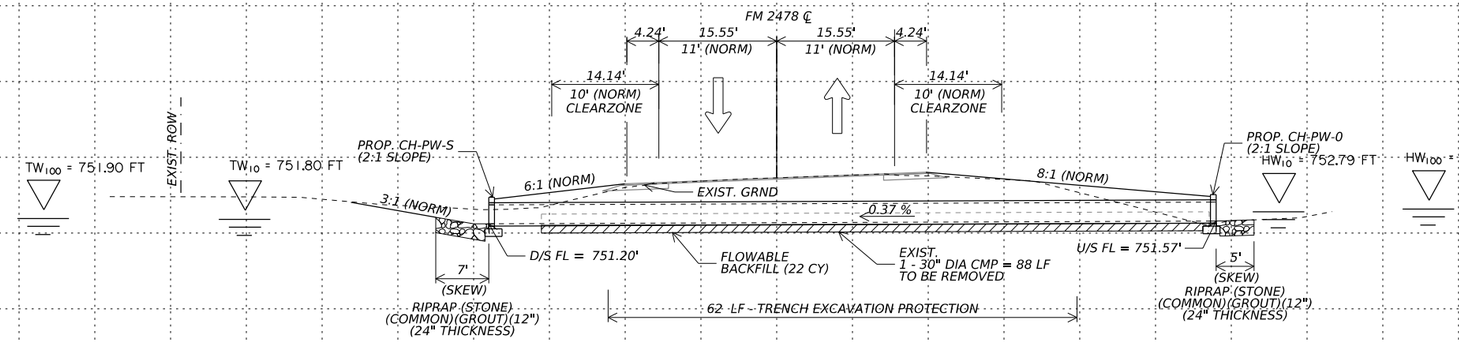
HYDRAULIC DATA

DRAINAGE AREA = 3.08 ACRE

Q_{10} = 7.16 CFS	Q_{100} = 10.77 CFS
HW_{10} = 752.79 FT	HW_{100} = 753.15 FT
TW_{10} = 751.80 FT	TW_{100} = 751.90 FT
V_{10} = 4.74 FPS	V_{100} = 5.29 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
400-6005	CEM STABIL BKFL	CY	23
400-6006	CUT & RESTORING PAV	SY	50
401-6001	FLOWABLE BACKFILL	CY	22
402-6001	TRENCH EXCAVATION PROTECTION	LF	62
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	25
464-6007	RC PIPE (CL III)(30 IN)	LF	96
466-6099	HEADWALL (CH - PW - 0) (DIA= 30 IN)	EA	1
466-6132	HEADWALL (CH - PW - S) (DIA= 30 IN)	EA	1
496-6007	REMOV STR (PIPE)	LF	88



EXISTING: 1 - 30" DIA CMP = 88 LF
PROPOSED: 1 - 30" DIA. RCP = 96 LF
W/ CH-PW-0 (U/S) &
CH-PW-S (D/S)

STATE OF TEXAS
THADEUS V. EGAR
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Thadeus Egar 5/11/2023
, P.E.
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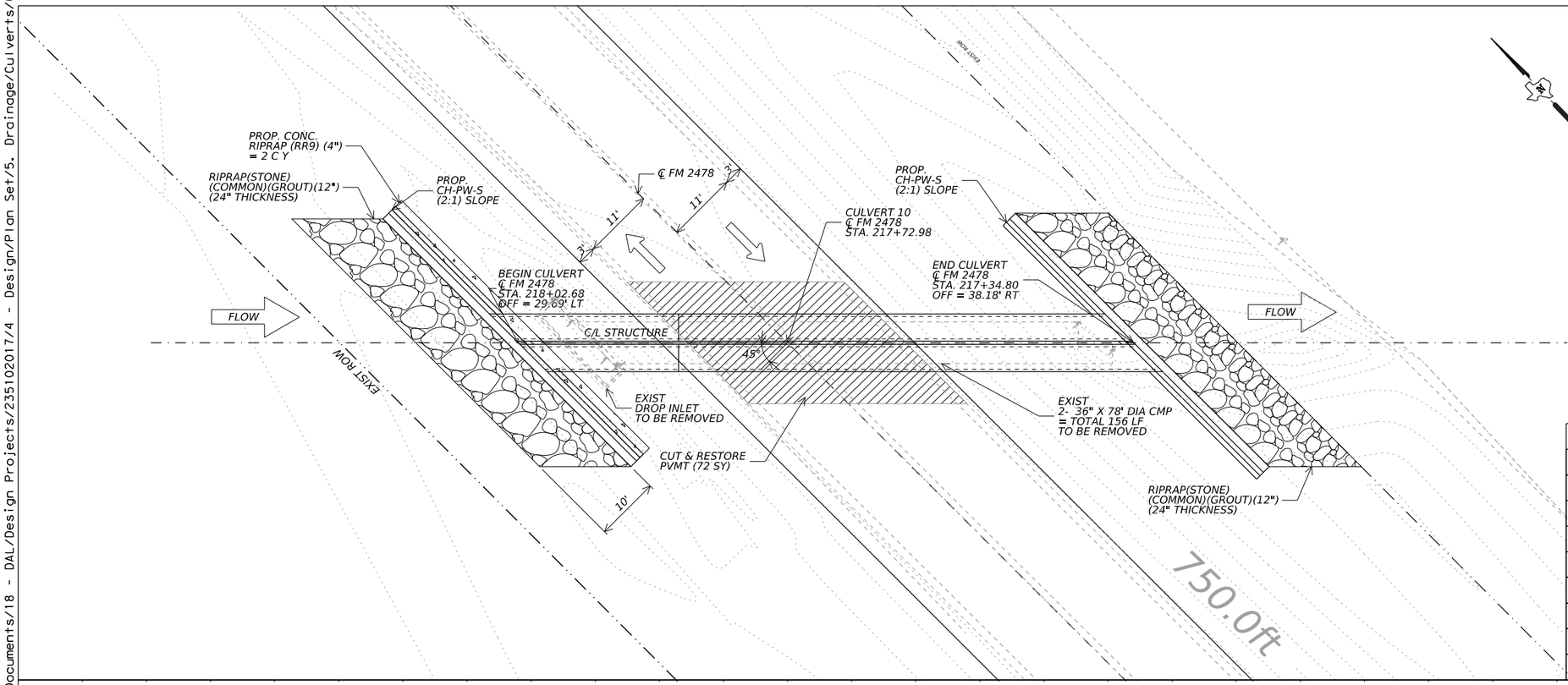
FM 2478
CULVERT 8 LAYOUT
STA 212+18.83

SCALE: 1"=20'-H
1"=20'-V

SHEET 10 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	99
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	



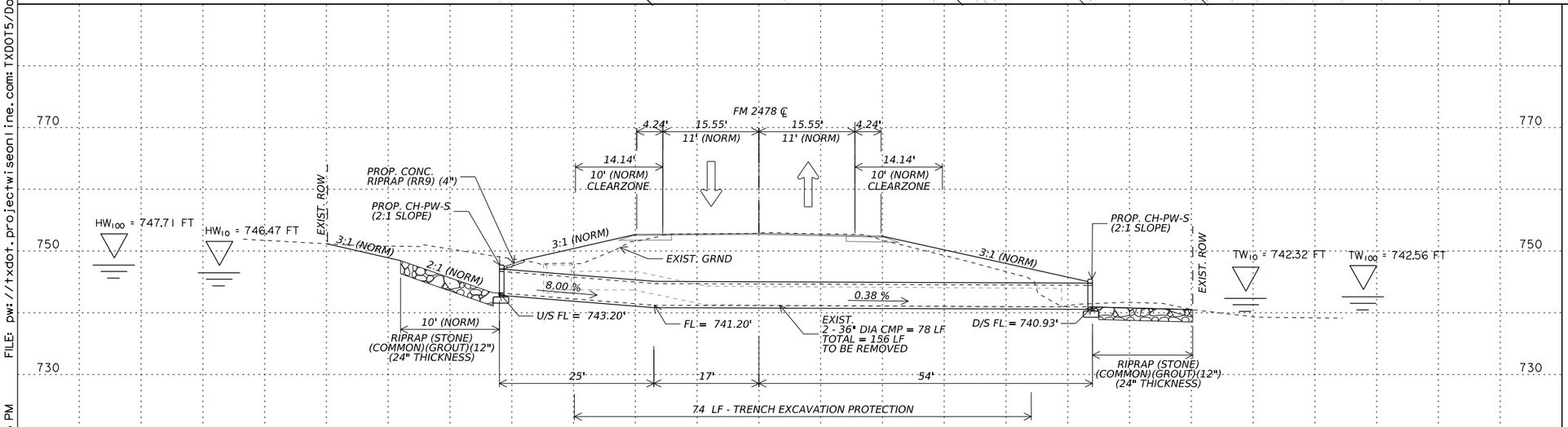
HYDRAULIC DATA

DRAINAGE AREA = 52.19 ACRE

Q_{10} = 94.96 CFS	Q_{100} = 143.18 CFS
HW_{10} = 746.47 FT	HW_{100} = 747.71 FT
TW_{10} = 742.32 FT	TW_{100} = 742.56 FT
V_{10} = 11.93 FPS	V_{100} = 13.38 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
400-6005	CEM STABIL BKFL	CY	43
400-6006	CUT & RESTORING PAV	SY	72
402-6001	TRENCH EXCAVATION PROTECTION	LF	74
432-6001	RIPRAP (CONC)(4 IN)	CY	2
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	82
464-6009	RC PIPE (CL III)(42 IN)	LF	192
466-6135	HEADWALL (CH - PW - S) (DIA= 42 IN)	EA	2
496-6002	REMOV STR (INLET)	EA	1
496-6007	REMOV STR (PIPE)	LF	156



EXISTING: 2 - 36" DIA CMP X 78 LF = TOTAL 156 LF TO BE REMOVED
PROPOSED: 2 - 42" DIA RCP X 96 LF = TOTAL 192 LF
W/ CH-PW-S (U/S & D/S)
REMOVE EXISTING DROP INLET

STATE OF TEXAS
THADEUS V. EGAR
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Thadeus Egar 5/11/2023
, P.E.
Signature of Registrant & Date

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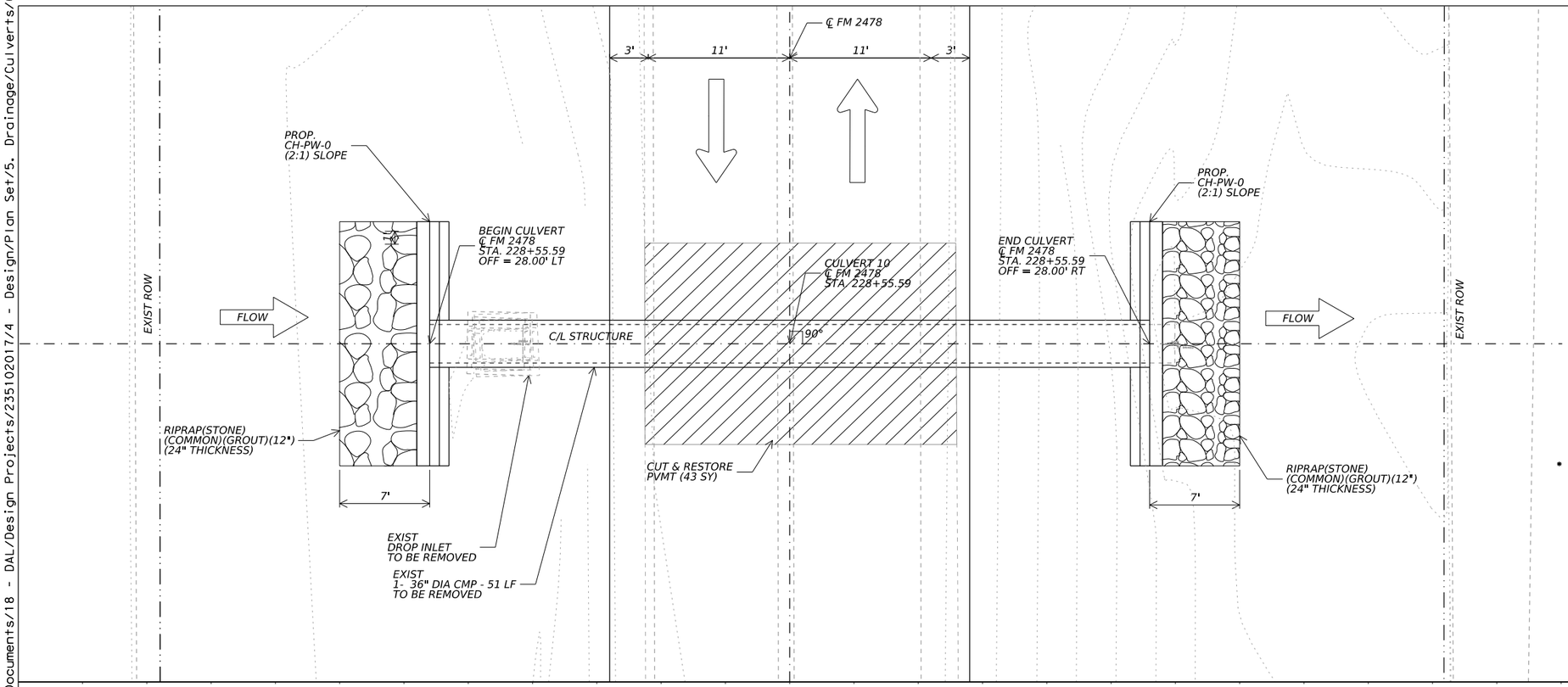
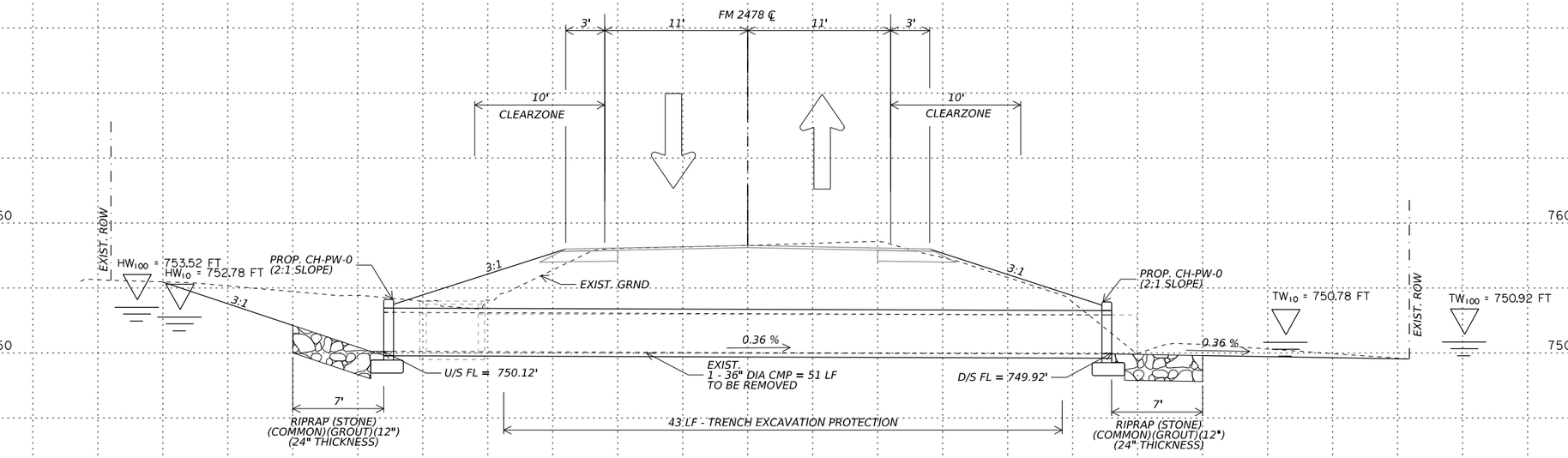
FM 2478
CULVERT 9 LAYOUT
STA 217+72.98

SCALE: 1"=20'-H
1"=20'-V

SHEET 11 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	100
CHECK MS	CONTROL	SECTION	JOB	
CHECK JRV	2351	02	017	





EXISTING: 1 - 36" DIA. CMP - 51 LF TO BE REMOVED
PROPOSED: 1 - 36" DIA. RCP - 56 LF W/
CH-PW-0 (U/S & D/S)
EXIST DROP INLET TO BE REMOVED

0 5 10

HYDRAULIC DATA

DRAINAGE AREA = 12.07 ACRE

Q_{10} = 26.54 CFS	Q_{100} = 39.95 CFS
HW_{10} = 752.78 FT	HW_{100} = 753.52 FT
TW_{10} = 750.78 FT	TW_{100} = 750.92 FT
V_{10} = 6.60 FPS	V_{100} = 7.74 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	20
	400-6006	CUT & RESTORING PAV	SY	43
	401-6001	TRENXH EXCAVATION PROTECTION	LF	43
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	21
	464-6008	RC PIPE (CL III)(36 IN)	LF	56
	466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	2
	496-6002	REMOV STR (INLET)	EA	1
	496-6007	REMOV STR (PIPE)	LF	51

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

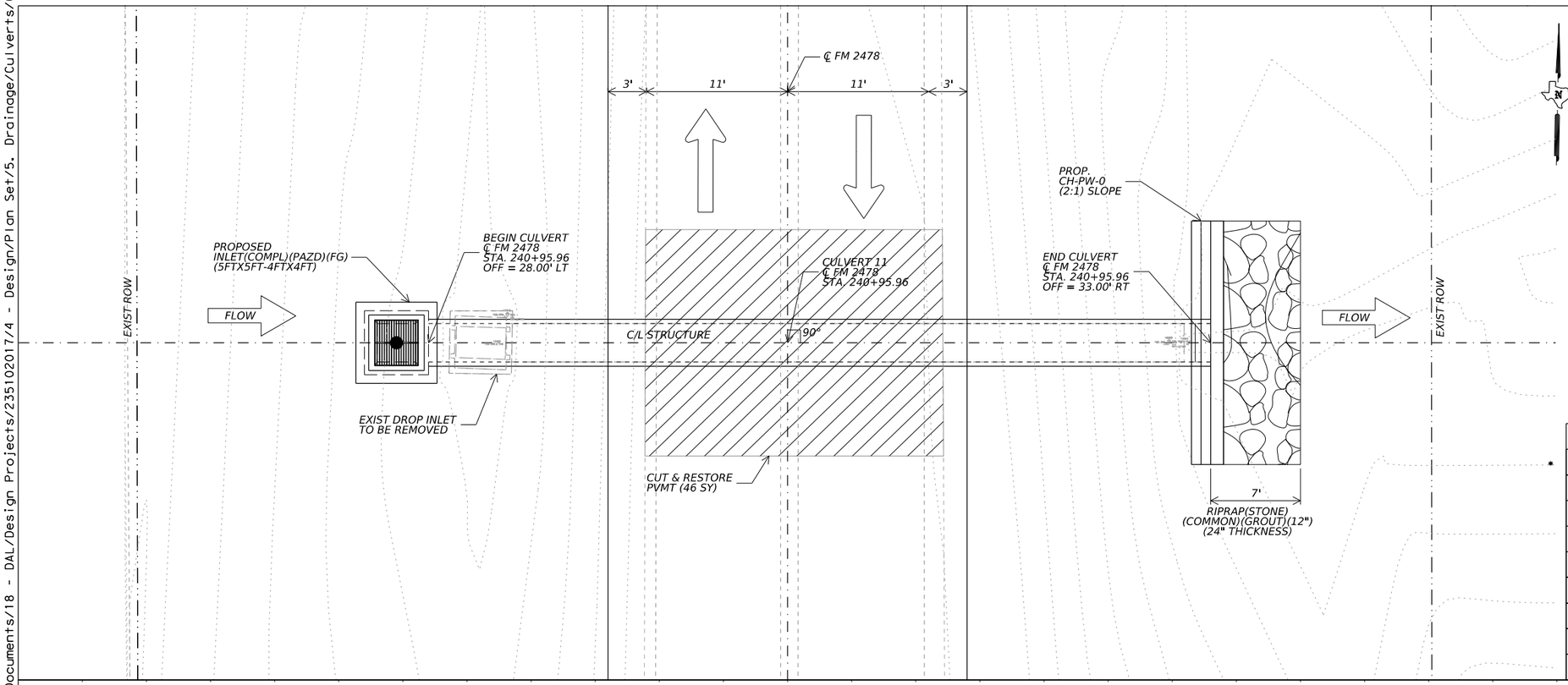
Texas Department of Transportation

FM 2478
CULVERT 10 LAYOUT
STA 228+55.59

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

SHEET 12 OF 24

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	101
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	



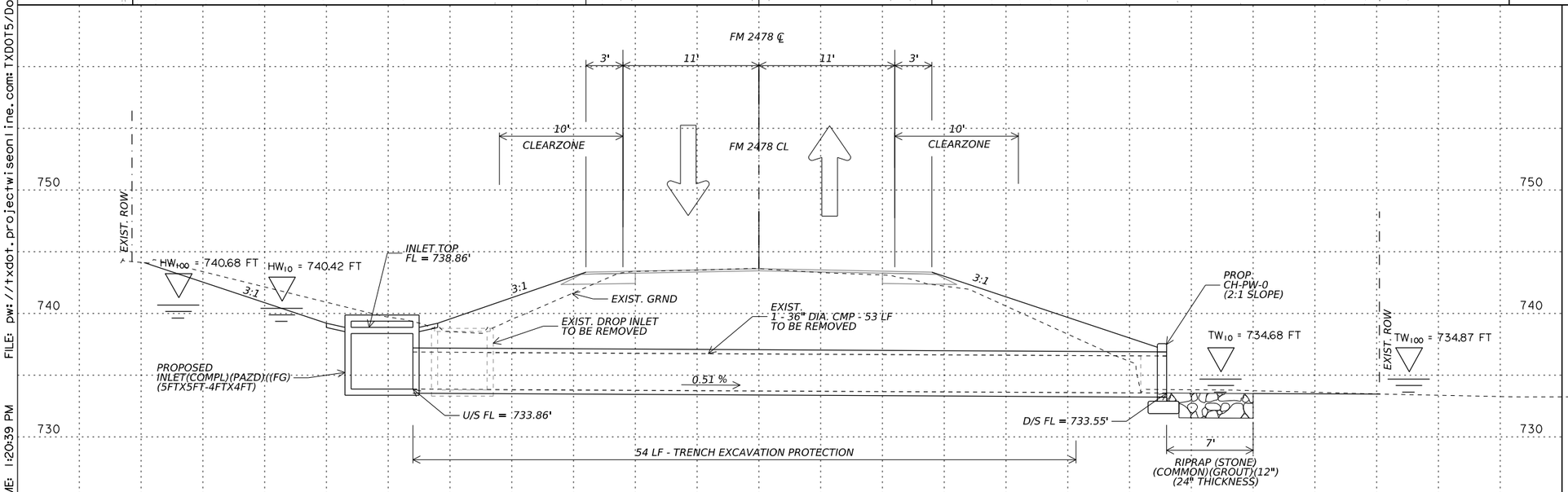
HYDRAULIC DATA

DRAINAGE AREA = 31.72 ACRE

Q_{10} = 54.32 CFS	Q_{100} = 81.96 CFS
HW_{10} = 740.42 FT	HW_{100} = 740.68 FT
TW_{10} = 734.68 FT	TW_{100} = 734.87 FT
V_{10} = 8.99 FPS	V_{100} = 11.97 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
400-6005	CEM STABIL BKFL	CY	19
400-6006	CUT & RESTORING PAV	SY	46
402-6001	TRENCH EXCAVATION PROTECTION	SY	54
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	10
464-6008	RC PIPE (CL III)(36 IN)	LF	61
465-6162	INLET(COMPL)(PAZD)(FG)(5FTX5FT-4FTX4FT)	EA	1
466-6101	HEADWALL (CH - PW - 0) (DIA= 36 IN)	EA	1
496-6002	REMOV STR (INLET)	EA	1
496-6007	REMOV STR (PIPE)	LF	53



EXISTING: 1 - 36" DIA. CMP - 53 LF TO BE REMOVED
PROPOSED: 1 - 36" DIA. RCP - 61 LF W/
U/S: INLET(COMPL)(PAZD)(FG)(5FTX5FT-4FTX4FT)
D/S: CH-PW-0 (2:1 SLOPE)
EXIST. DROP INLET TO BE REMOVED

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
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Thadeus Egar 5/11/2023
, P.E.
Signature of Registrant & Date

Texas Department of Transportation

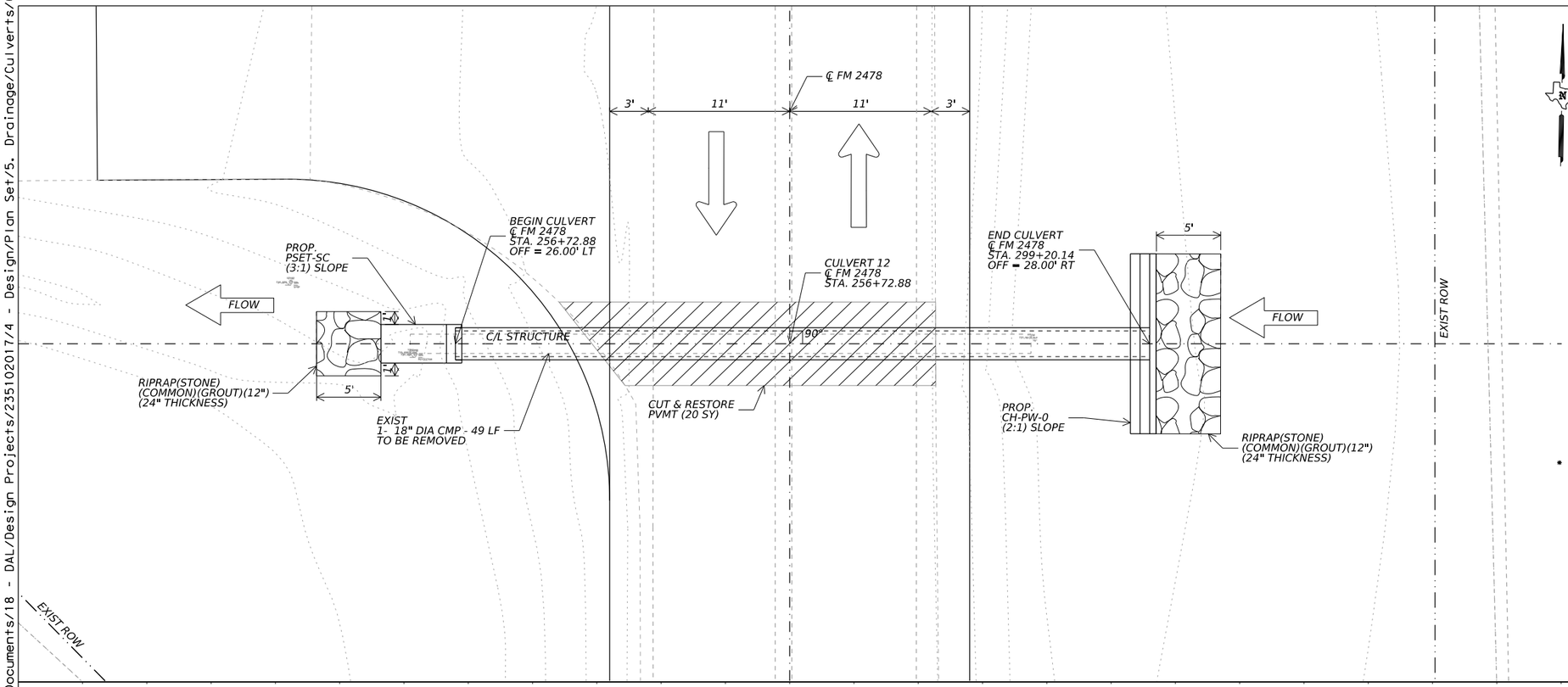
FM 2478
CULVERT 11 LAYOUT
STA 240+95.96

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

SHEET 13 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	102
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/5. Drainage/Culverts/Cul
TIME: 1:20:39 PM
DATE: 5/9/2023



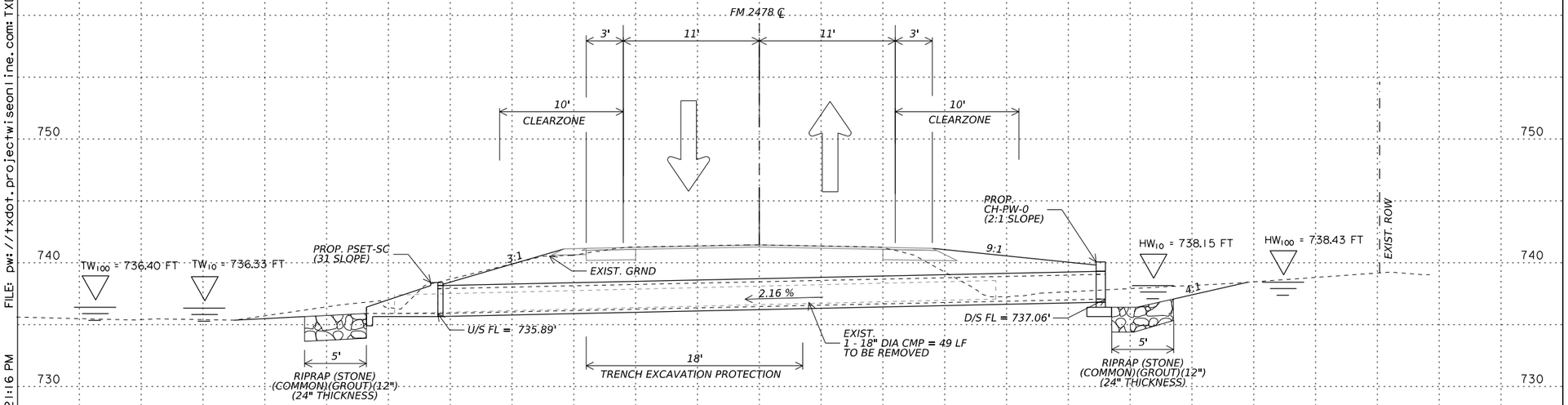
HYDRAULIC DATA

DRAINAGE AREA = 2.21 ACRE

Q_{10} = 4.39 CFS	Q_{100} = 6.62 CFS
HW_{10} = 738.15 FT	HW_{100} = 738.43 FT
TW_{10} = 736.33 FT	TW_{100} = 736.40 FT
V_{10} = 7.46 FPS	V_{100} = 8.28 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	15
	400-6006	CUT & RESTORING PAV	SY	20
	402-6001	TRENCH EXCAVATION PROTECTION	LF	18
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	8
	464-6005	RC PIPE (CL III)(24 IN)	LF	54
	466-6097	HEADWALL (CH-PW-0) (DIA=24 IN)	EA	1
	467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	1
	496-6007	REMOV STR (PIPE)	LF	49



EXISTING: 1 - 18" DIA. CMP - 49 LF TO BE REMOVED
PROPOSED: 1 - 24" DIA. RCP - 54 LF W/
PSET-SC (D/S)
CH-PW-0 (U/S)

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

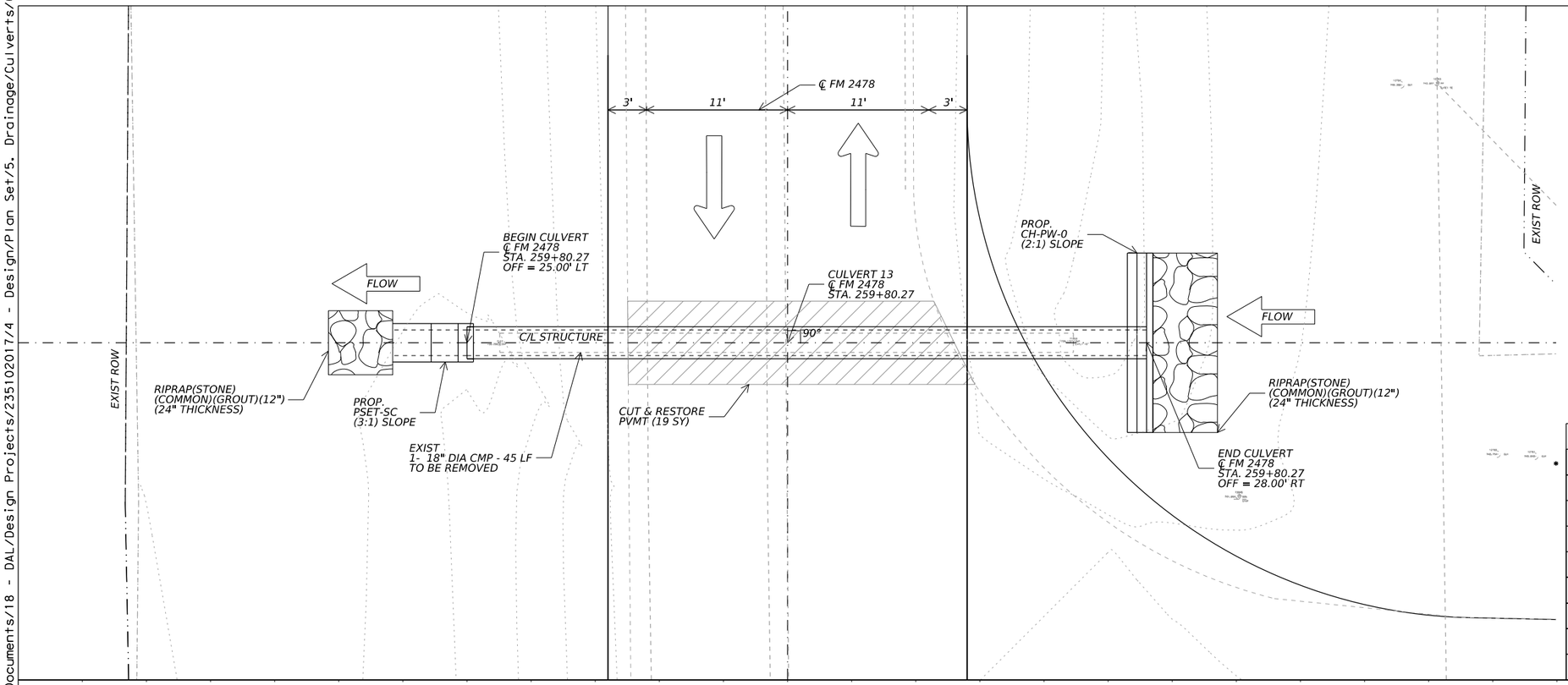
Texas Department of Transportation

FM 2478
CULVERT 12 LAYOUT
STA 256+72.88

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

SHEET 14 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	103
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				



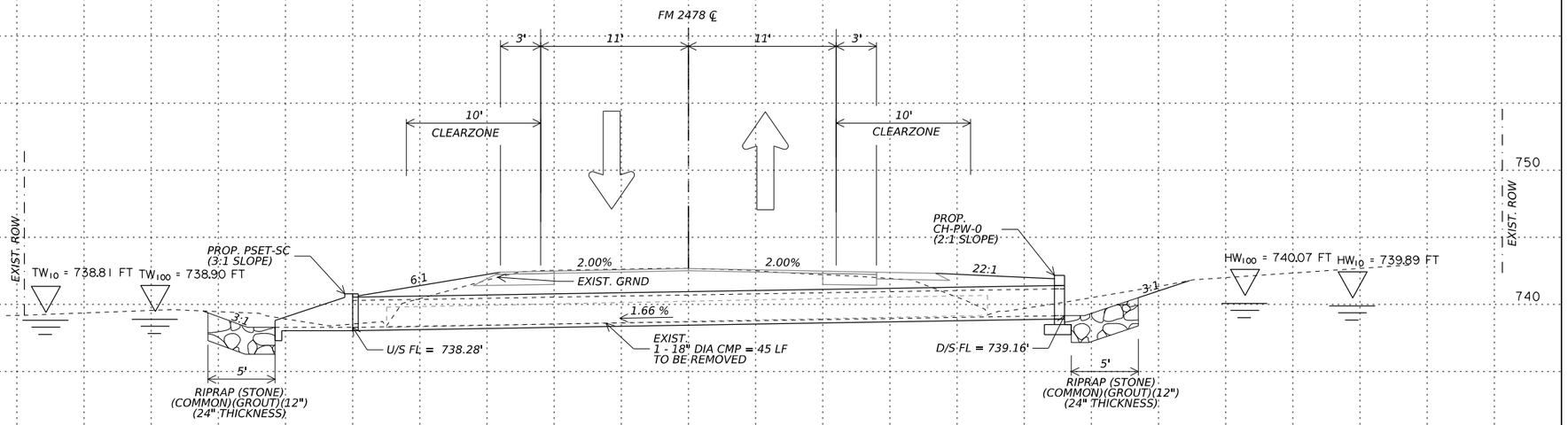
HYDRAULIC DATA

DRAINAGE AREA = 1.24 ACRE

Q_{10} = 2.12 CFS	Q_{100} = 3.20 CFS
HW_{10} = 739.89 FT	HW_{100} = 740.07 FT
TW_{10} = 738.81 FT	TW_{100} = 738.90 FT
V_{10} = 5.62 FPS	V_{100} = 6.25 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
400-6005	CEM STABIL BKFL	CY	14
400-6006	CUT & RESTORING PAV	SY	19
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	8
464-6005	RC PIPE (CL III)(24 IN)	LF	53
466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	1
467-6388	SET (TY II) (24 IN) (RCP) (3: 1) (C)	EA	1
496-6007	REMOV STR (PIPE)	LF	45



EXISTING: 1 - 18" DIA. CMP - 45 LF TO BE REMOVED
PROPOSED: 1 - 24" DIA. RCP - 53 LF W/
PSET-SC (D/S)
CH-PW-0 (U/S)

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

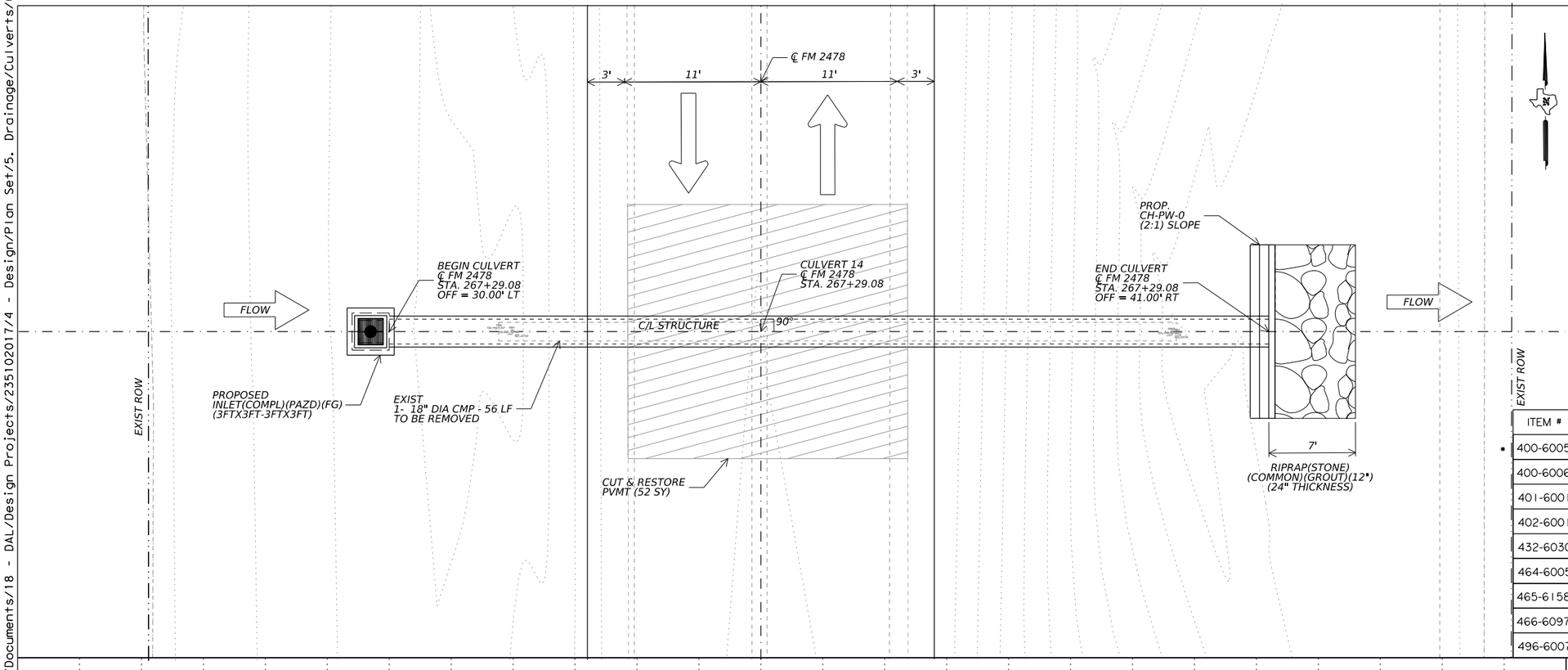
Texas Department of Transportation

FM 2478
CULVERT 13 LAYOUT
STA 259+80.27

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

SHEET 15 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	104
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				



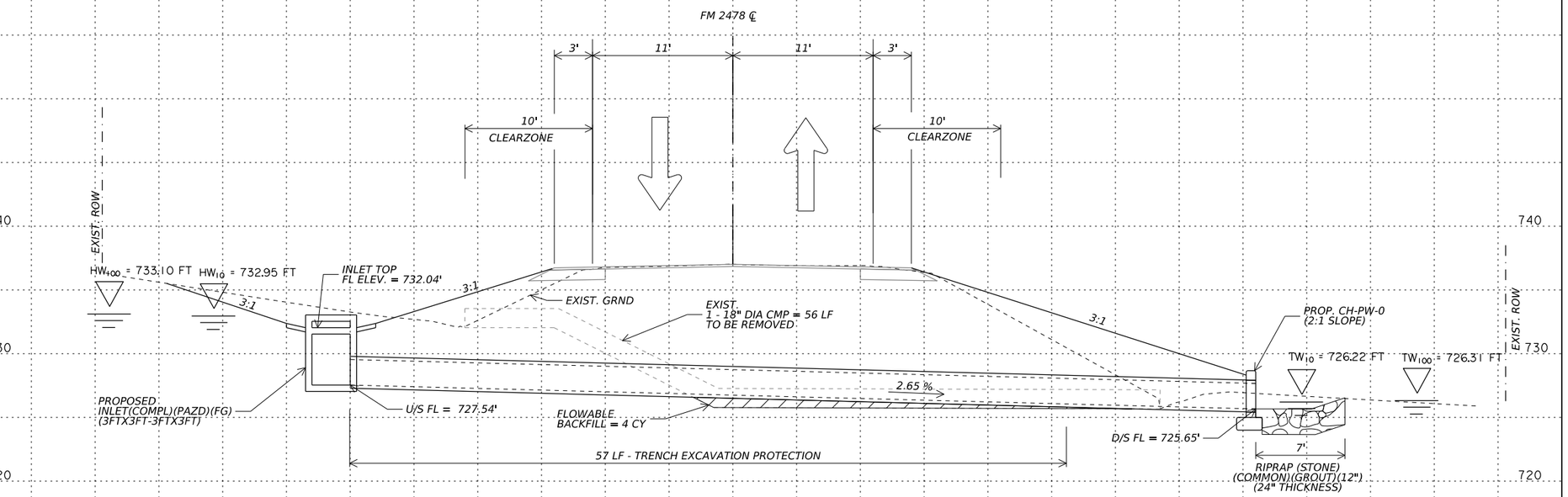
HYDRAULIC DATA

DRAINAGE AREA = 5.55 ACRE

Q_{10} = 12.90 CFS	Q_{100} = 19.41 CFS
HW_{10} = 732.95 FT	HW_{100} = 733.10 FT
TW_{10} = 726.22 FT	TW_{100} = 726.31 FT
V_{10} = 10.57 FPS	V_{100} = 11.64 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
* 400-6005	CEM STABIL BKFL	CY	13
400-6006	CUT & RESTORING PAV	SY	52
401-6001	FLOWABLE BACKFILL	CY	4
402-6001	TRENCH EXCAVATION PROTECTION	LF	57
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	8
464-6005	RC PIPE (CL III)(24 IN)	LF	71
465-6158	INLET(COMPL)(PAZD)(FG)(3FTX3FT-3FTX3FT)	EA	1
466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	1
496-6007	REMOV STR (PIPE)	LF	56



EXISTING: 1 - 18" DIA. CMP - 56 LF TO BE REMOVED
PROPOSED: 1 - 24" DIA. RCP - 71 LF W/
U/S: INLET(COMP)((PAZD)(FG)(3FTX3FT-3FTX3FT)
D/S: CH-PW-0

STATE OF TEXAS
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Thadeus Egar 5/11/2023
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Texas Department of Transportation

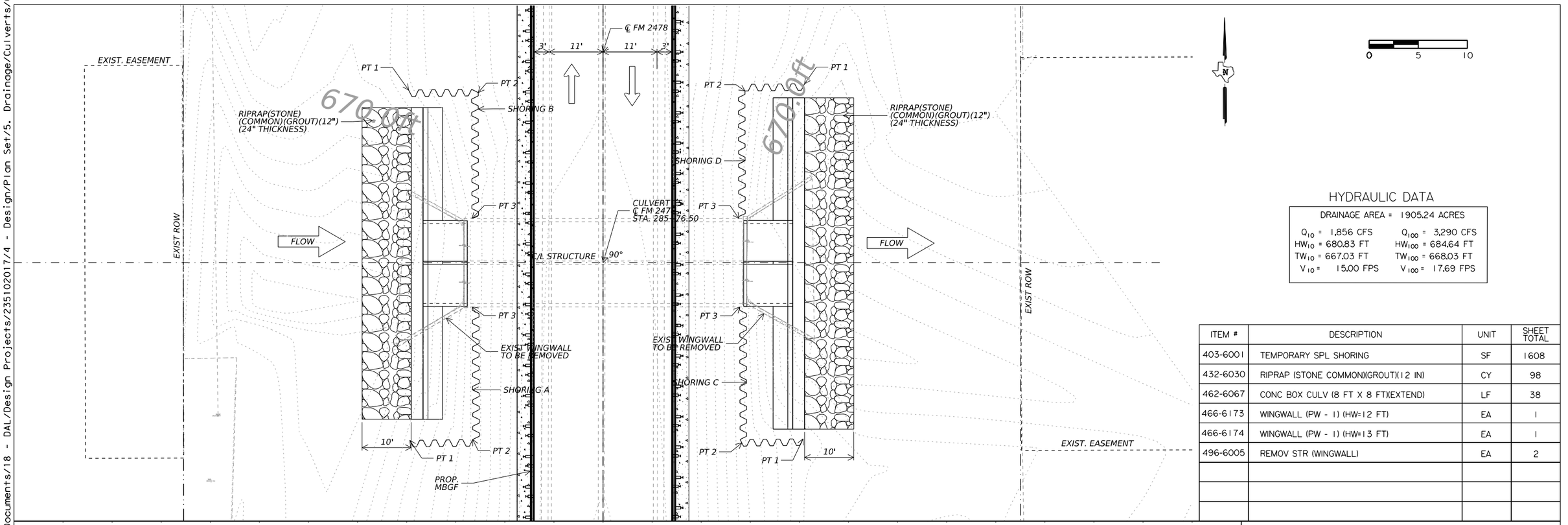
FM 2478
CULVERT 14 LAYOUT
STA 267+29.08

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

SHEET 16 OF 24

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	105
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	

FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/5. Drainage/Culverts/Cul
TIME: 1:22:49 PM
DATE: 5/9/2023

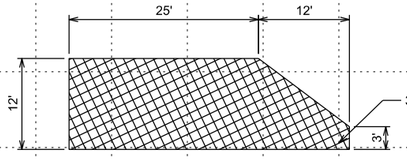


HYDRAULIC DATA

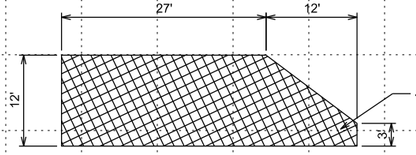
DRAINAGE AREA = 1905.24 ACRES

Q_{10} = 1,856 CFS	Q_{100} = 3,290 CFS
HW_{10} = 680.83 FT	HW_{100} = 684.64 FT
TW_{10} = 667.03 FT	TW_{100} = 668.03 FT
V_{10} = 15.00 FPS	V_{100} = 17.69 FPS

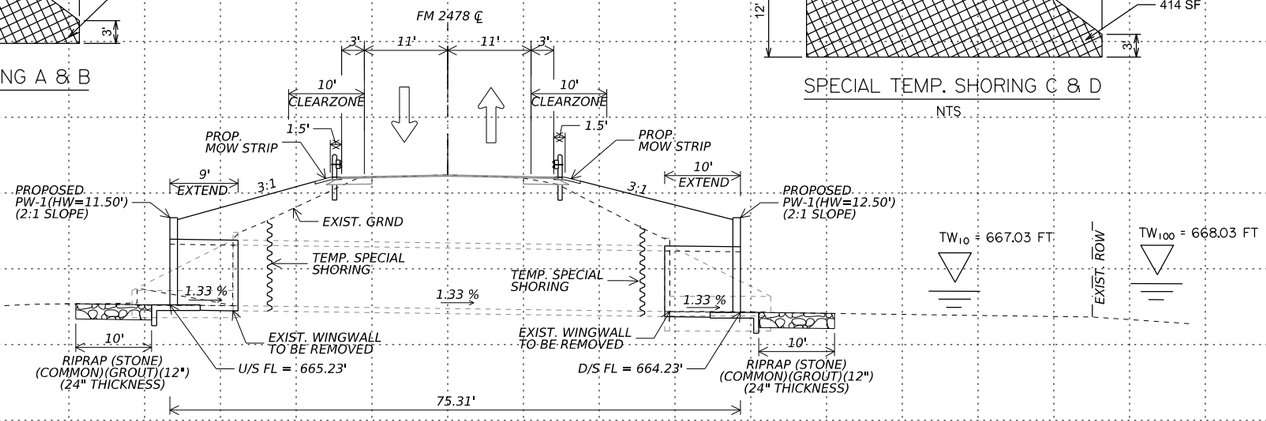
ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
403-6001	TEMPORARY SPL SHORING	SF	1608
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	98
462-6067	CONC BOX CULV (8 FT X 8 FT)(EXTEND)	LF	38
466-6173	WINGWALL (PW - 1) (HW=12 FT)	EA	1
466-6174	WINGWALL (PW - 1) (HW=13 FT)	EA	1
496-6005	REMOV STR (WINGWALL)	EA	2



SPECIAL TEMP. SHORING A & B
NTS



SPECIAL TEMP. SHORING C & D
NTS



EXISTING: 2 - 8' x 8' MBC WITH WINGWALL (U/S & D/S)
PROPOSED: U/S: EXTEND 9' W/ PW-1(HW=11.50') - TOTAL EXTENSION - 18 LF
D/S: EXTEND 10' W/ PW-1(HW=15.50') - TOTAL EXTENSION - 20 LF
REMOVE EXISTING WINGWALL (U/S & D/S)

STATE OF TEXAS
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122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 05/18/2023
Signature of Registrant , P.E. & Date

STATE OF TEXAS
GAURAB ADHIKARI
140607
LICENSED
PROFESSIONAL ENGINEER

5/18/2023
Signature of Registrant , P.E. & Date

Texas Department of Transportation

FM 2478
CULVERT 15 LAYOUT
STA 285+76.50

SCALE: 1"=20'-H
1"=20'-V

SHEET 17 OF 24

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	
CHECK	CONTROL	SECTION	JOB	106
MS	2351	02	017	
CHECK				
JRV				

PROPOSED & EXISTING WSEL PROFILE

1) HY8 VERSION 7.70 UTILIZED FOR THE ANALYSIS.
2) HY8 MODELS WERE DEVELOPED USING PROJECT SURVEY DATA AND FEMA SUPPLEMENTAL MATERIALS.
3) THIS SITE IS DESIGNATED AS ZONE X AS SHOWN IN FEMA MAP FIRM PANELS # 48085C0140J EFF 6/2/2009
4) ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
5) HEC-HMS 4.2 WAS ANALYZED TO CALCULATE FLOWS.
6) THE CULVERT WAS DESIGNED AND ANALYZED FOR THE 10-YR EVENT.
THE 100-YEAR FLOOD YEAR EVENT WAS CHECKED.

REFERENCES:
1) TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019).
2) TOPOGRAPHIC DATA SOURCE (TNRIS, DENTON COUNTY DIGITAL ELEVATIONS)

EXISTING CONDITION CULVERT #15

TOTAL DISCHARGE	CULVERT DISCHARGE	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	TAILWATER ELEVATION (FT)
1856.1	1856.1	680.83	15.68	12.8	667.03
1999.55	1999.55	682.41	17.27	13.93	667.15
2143	2062.25	683.15	18	14.44	667.26
2286.45	2084.35	683.41	18.27	14.59	667.37
2429.9	2102.59	683.63	18.49	14.72	667.47
2573.35	2118.72	683.83	18.68	14.84	667.57
2716.8	2133.44	684.01	18.86	14.94	667.67
2860.25	2147.1	684.18	19.03	15.04	667.76
3003.7	2159.93	684.34	19.19	15.14	667.85
3147.15	2172.1	684.49	19.35	15.23	667.94
3290.6	2183.72	684.64	19.49	15.31	668.03

PROPOSED CONDITION CULVERT #15

TOTAL DISCHARGE	CULVERT DISCHARGE	HEADWATER ELEVATION (FT)	INLET CONTROL DEPTH (FT)	OUTLET CONTROL DEPTH (FT)	TAILWATER ELEVATION (FT)
1856.1	1856.1	680.91	15.68	12.7	667.03
1999.55	1999.55	682.5	17.27	13.84	667.15
2143	2056.22	683.16	17.93	14.31	667.26
2286.45	2078.09	683.42	18.19	14.47	667.37
2429.9	2096.25	683.64	18.41	14.6	667.47
2573.35	2112.35	683.84	18.61	14.72	667.57
2716.8	2127.06	684.02	18.79	14.82	667.67
2860.25	2140.72	684.19	18.96	14.93	667.76
3003.7	2153.56	684.35	19.12	15.02	667.85
3147.15	2165.73	684.5	19.27	15.11	667.94
3290.6	2177.36	684.65	19.42	15.2	668.03

STATE OF TEXAS
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140607
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PROFESSIONAL ENGINEER
5/18/2023

Texas Department of Transportation

FM 2478
CULVERT 15 LAYOUT

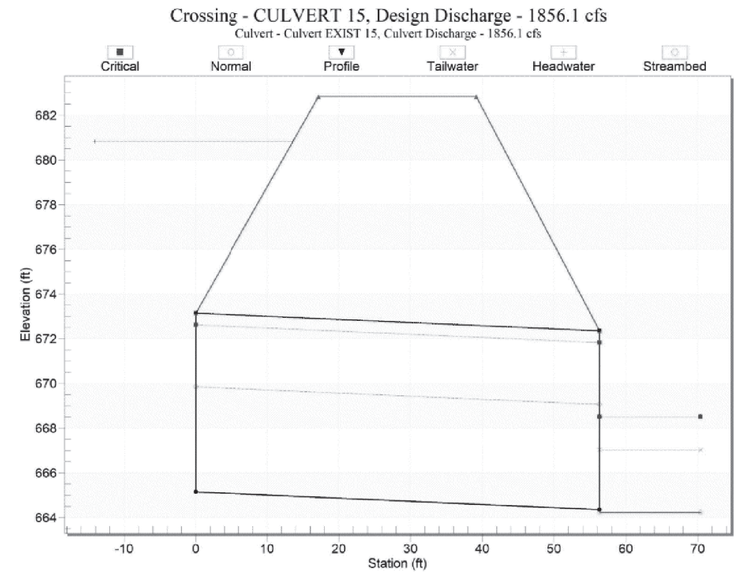
(DRAINAGE
CULVERT HYDRAULIC DATA)

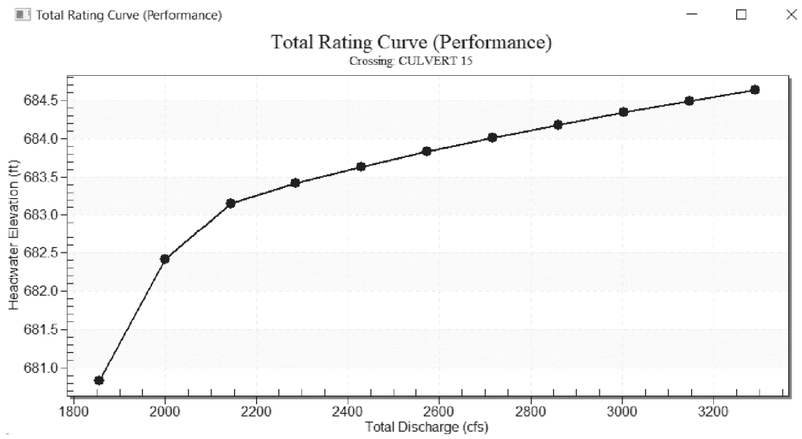
SHEET 18 OF 24

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		107

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

HY8 EXISTING HYDRAULIC INFORMATION





STATE OF TEXAS
GAURAB ADHIKARI
140607
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PROFESSIONAL ENGINEER

5/18/2023

Texas Department of Transportation

FM 2478
CULVERT 15 LAYOUT

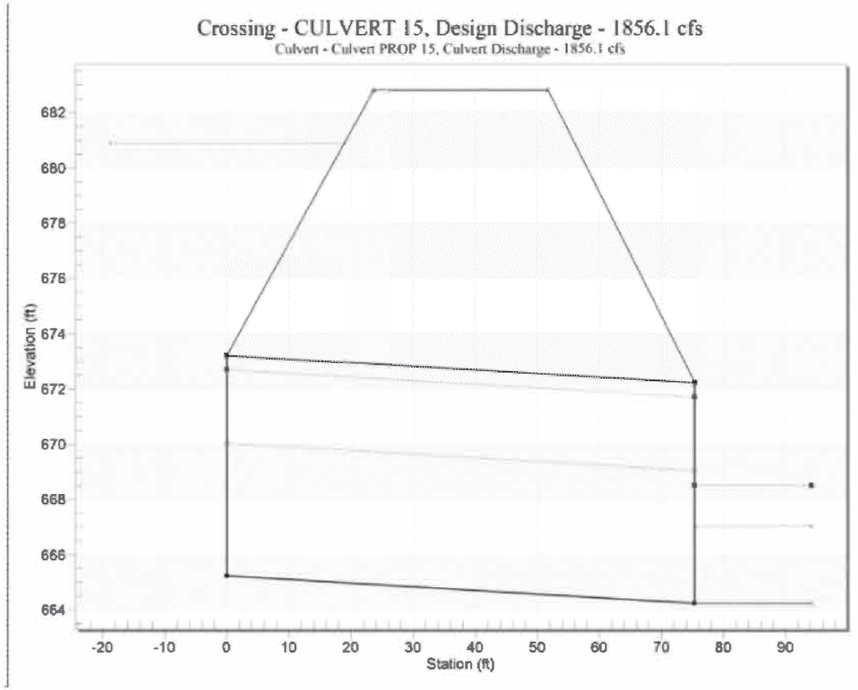
(DRAINAGE
CULVERT HYDRAULIC DATA)

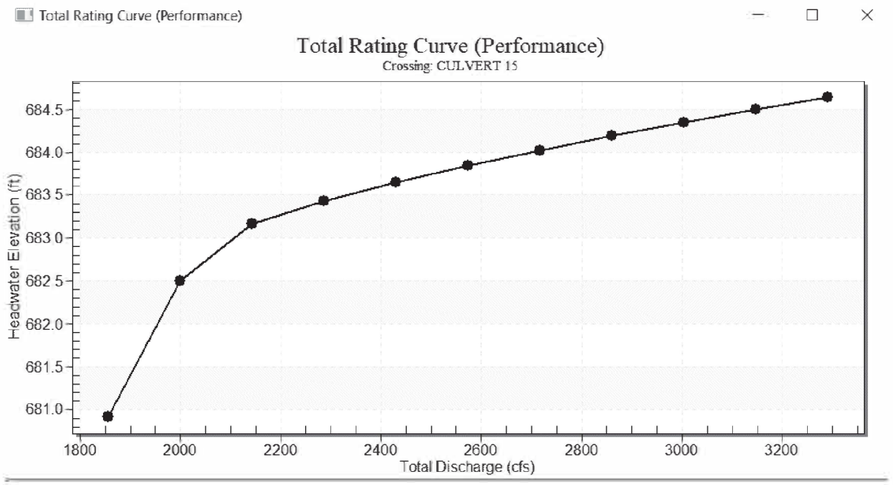
SHEET 19 OF 24

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		108

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

HY8 PROPOSED HYDRAULIC INFORMATION





STATE OF TEXAS
GAURAB ADHIKARI
140607
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PROFESSIONAL ENGINEER

5/18/2023

Texas Department of Transportation

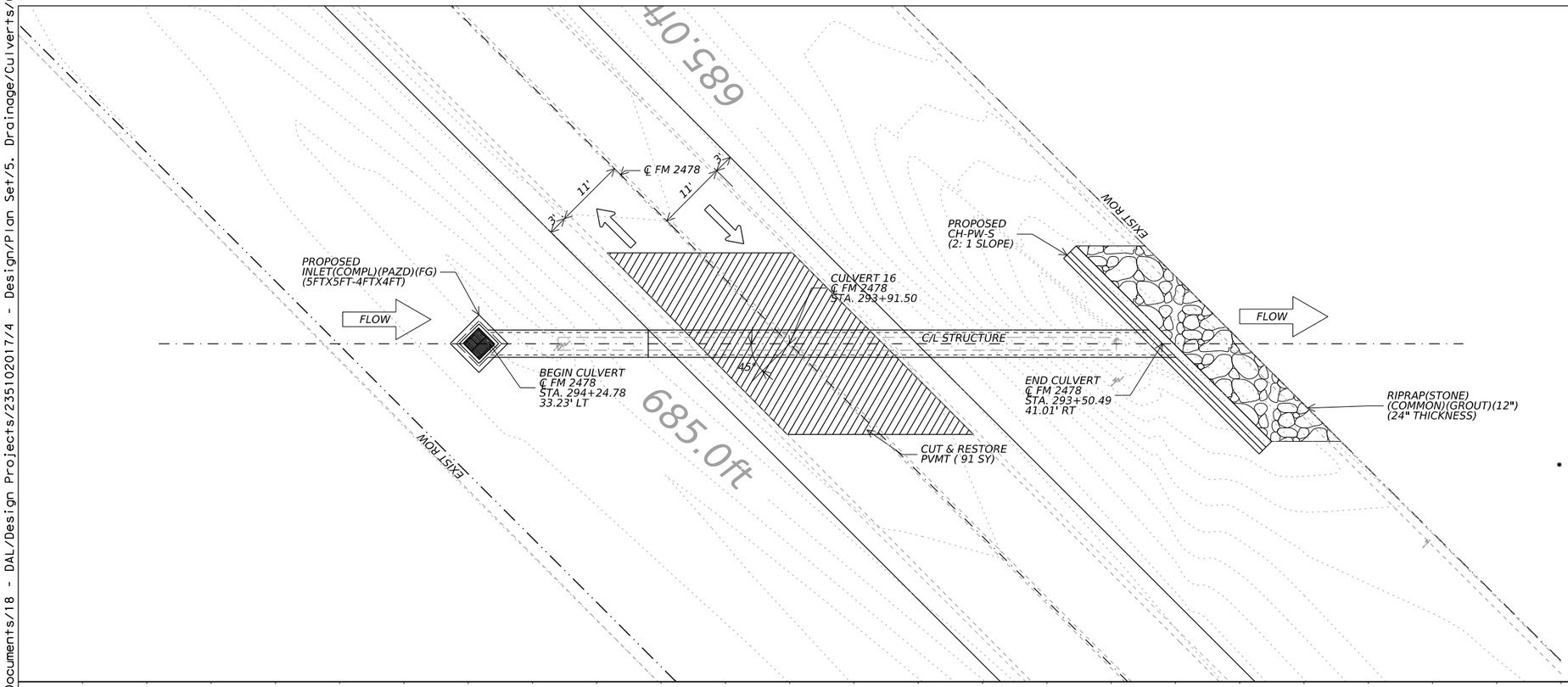
FM 2478
CULVERT 15 LAYOUT

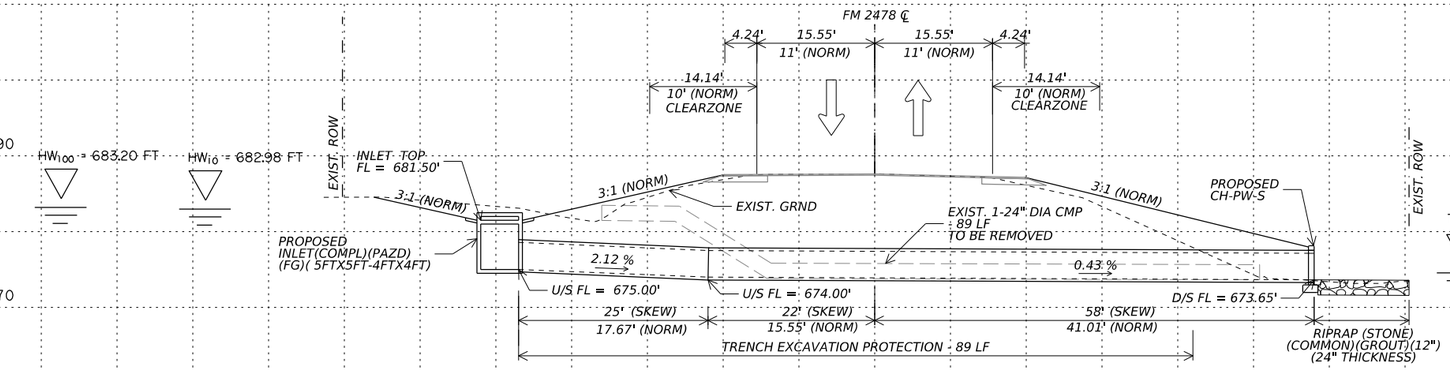
(DRAINAGE
CULVERT HYDRAULIC DATA)

SHEET 20 OF 24

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		109

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





EXISTING: 1 - 24" DIA. CMP - 89 LF
PROPOSED: 1 - 42" DIA. RCP - 105 LF (SKEWED LENGTH) W/
U/S: INLET(COMPL)(PAZD)(GF)(5FTX5FT-4FTX4FT)
D/S: CH-PW-S (2:1 SLOPE)

HYDRAULIC DATA

DRAINAGE AREA = 23.86 ACRE

Q_{10} = 45.35 CFS	Q_{100} = 68.37 CFS
HW_{10} = 682.98 FT	HW_{100} = 683.20 FT
TW_{10} = 674.56 FT	TW_{100} = 674.72 FT
V_{10} = 10.05 FPS	V_{100} = 11.28 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	27
	400-6006	CUT & RESTORING PAV	SY	91
	402-6001	TRENCH EXCAVATION PROTECTION	LF	89
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	25
	464-6009	RC PIPE (CL III)(42 IN)	LF	105
	465-6162	INLET(COMPL)(PAZD)(FG)(5FTX5FT-4FTX4FT)	EA	1
	466-6135	HEADWALL (CH - PW - S) (DIA= 42 IN)	EA	1
	496-6007	REMOV STR (PIPE)	LF	89

STATE OF TEXAS
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PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

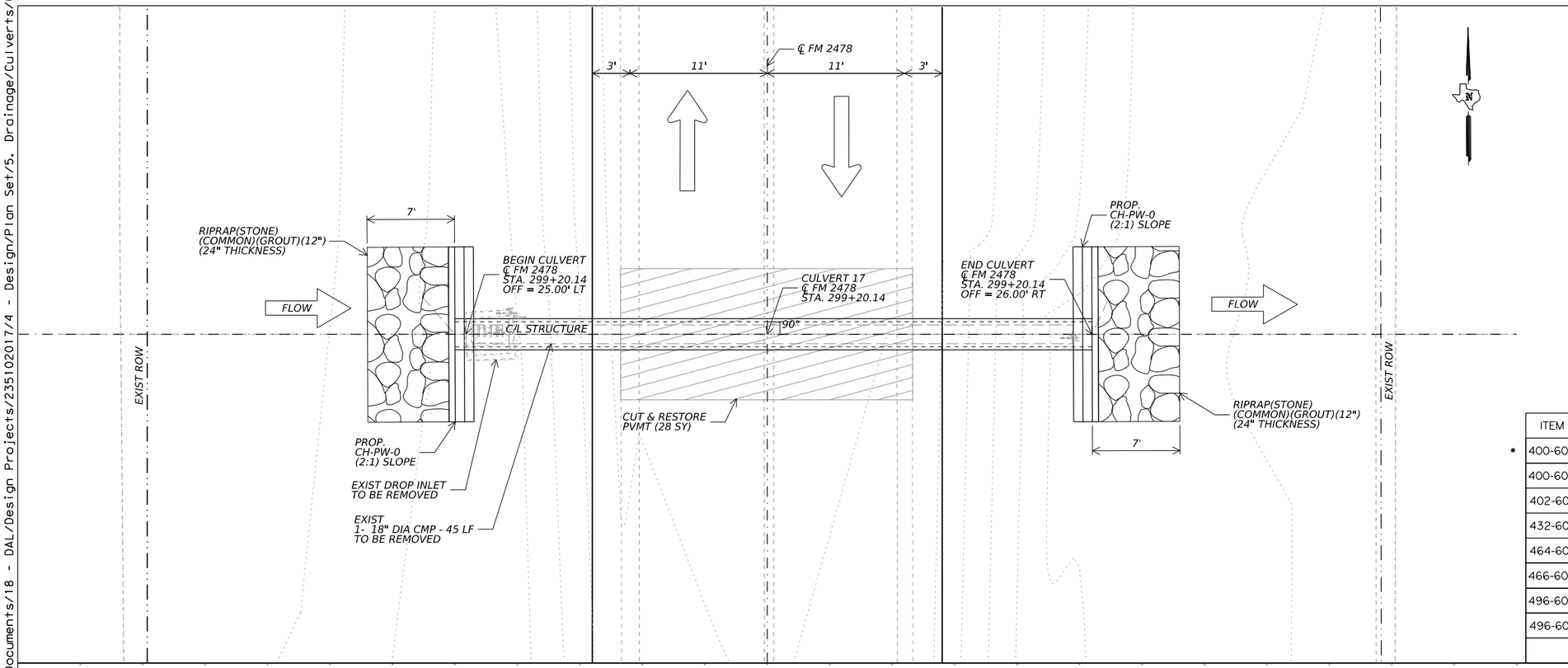
Texas Department of Transportation

FM 2478
CULVERT 16 LAYOUT
STA 293+91.50

SCALE: 1"=20'-H
1"=20'-V

SHEET 21 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	110
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				



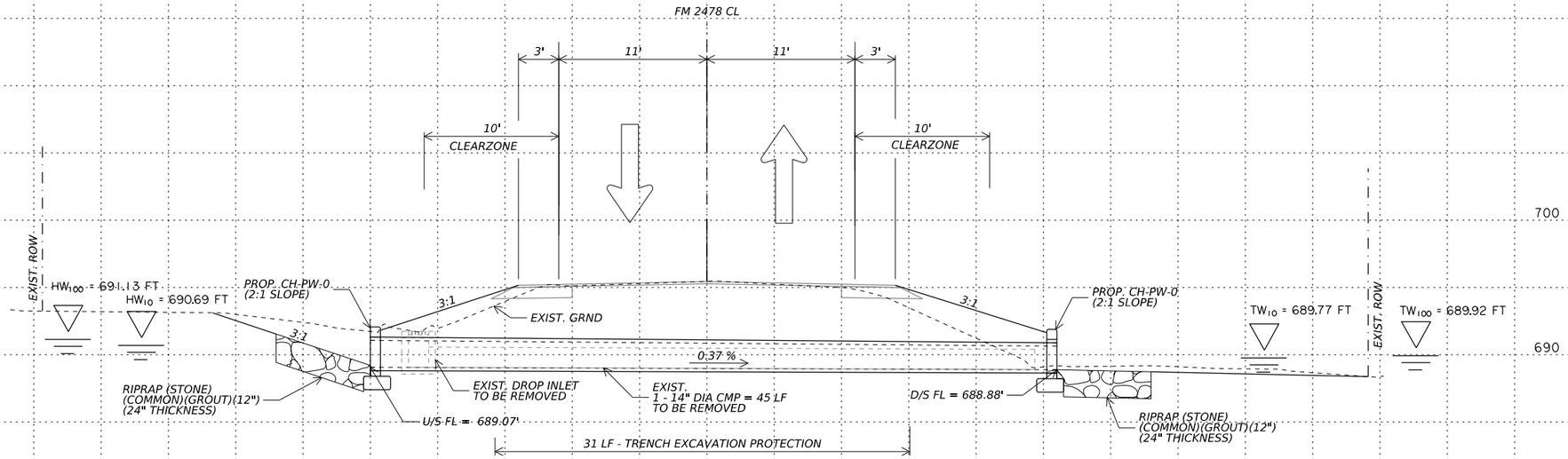
HYDRAULIC DATA

DRAINAGE AREA = 3.50 ACRE

Q_{10} = 8.32 CFS	Q_{100} = 12.52 CFS
HW_{10} = 690.69 FT	HW_{100} = 691.13 FT
TW_{10} = 689.77 FT	TW_{100} = 689.92 FT
V_{10} = 5.12 FPS	V_{100} = 5.95 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	13
	400-6006	CUT & RESTORING PAV	SY	28
	402-6001	TRENCH EXCAVATION PROTECTION	LF	31
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	16
	464-6005	RC PIPE (CL III)(24 IN)	LF	51
	466-6097	HEADWALL (CH - PW - 0) (DIA= 24 IN)	EA	2
	496-6002	REMOV STR (INLET)	EA	1
	496-6007	REMOV STR (PIPE)	LF	45



EXISTING: 1 - 18" DIA. CMP - 45 LF TO BE REMOVED
PROPOSED: 1 - 24" DIA. RCP - 51 LF W/
CH-PW-0 (U/S & D/S)

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

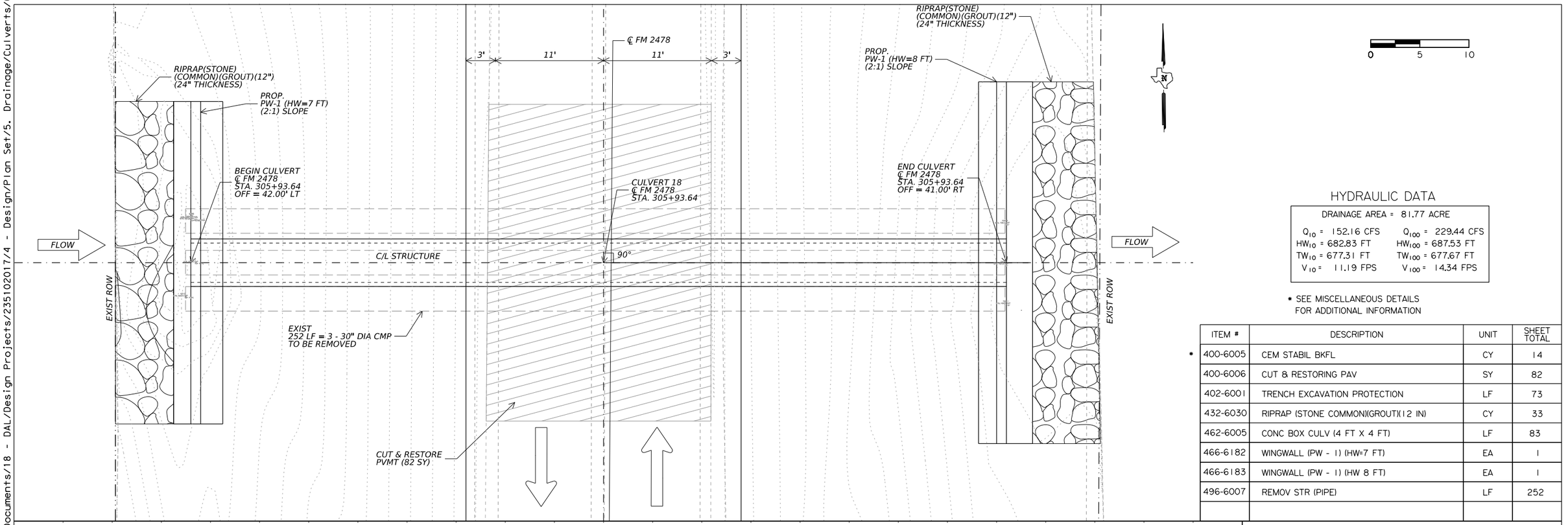
Texas Department of Transportation

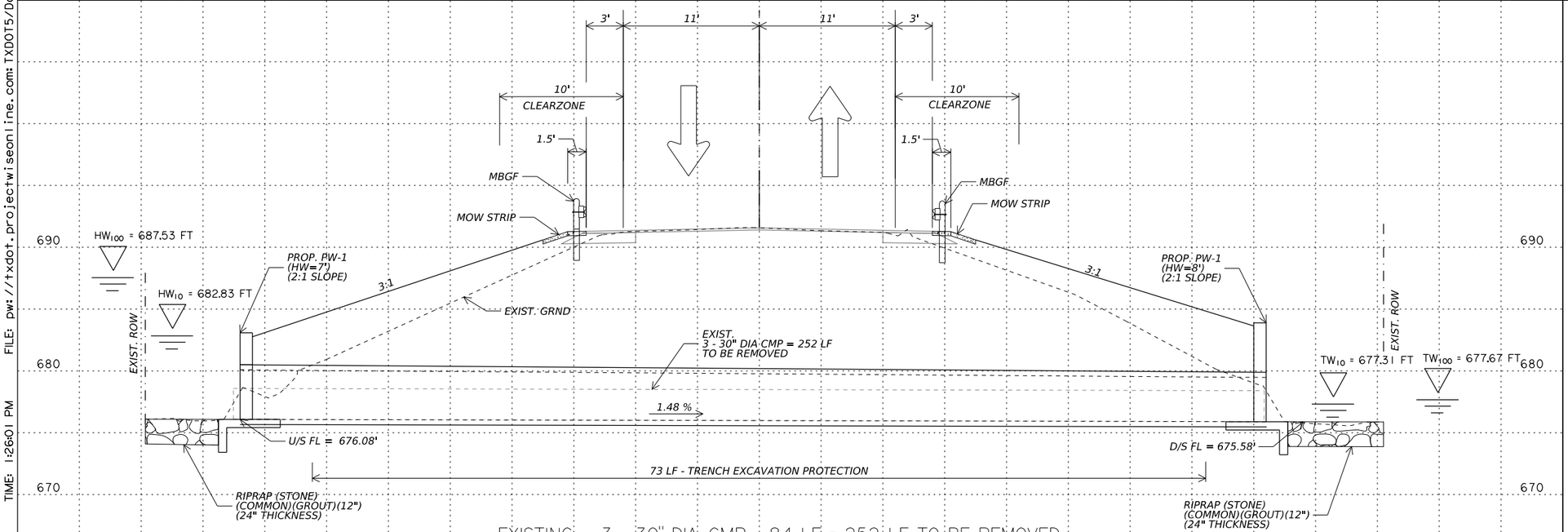
FM 2478
CULVERT 17 LAYOUT
STA 299+20.14

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

SHEET 22 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				





EXISTING: 3 - 30" DIA. CMP - 84 LF = 252 LF TO BE REMOVED
PROPOSED: 1 - 4' X 4' X 83 LF
W/ (PW-1)(HW=7 FT) U/S)
(PW-1)(HW=8 FT) D/S)

HYDRAULIC DATA

DRAINAGE AREA = 81.77 ACRE

Q_{10} = 152.16 CFS	Q_{100} = 229.44 CFS
HW_{10} = 682.83 FT	HW_{100} = 687.53 FT
TW_{10} = 677.31 FT	TW_{100} = 677.67 FT
V_{10} = 11.19 FPS	V_{100} = 14.34 FPS

• SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
• 400-6005	CEM STABIL BKFL	CY	14
400-6006	CUT & RESTORING PAV	SY	82
402-6001	TRENCH EXCAVATION PROTECTION	LF	73
432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	33
462-6005	CONC BOX CULV (4 FT X 4 FT)	LF	83
466-6182	WINGWALL (PW - 1) (HW=7 FT)	EA	1
466-6183	WINGWALL (PW - 1) (HW 8 FT)	EA	1
496-6007	REMOV STR (PIPE)	LF	252

STATE OF TEXAS
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Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

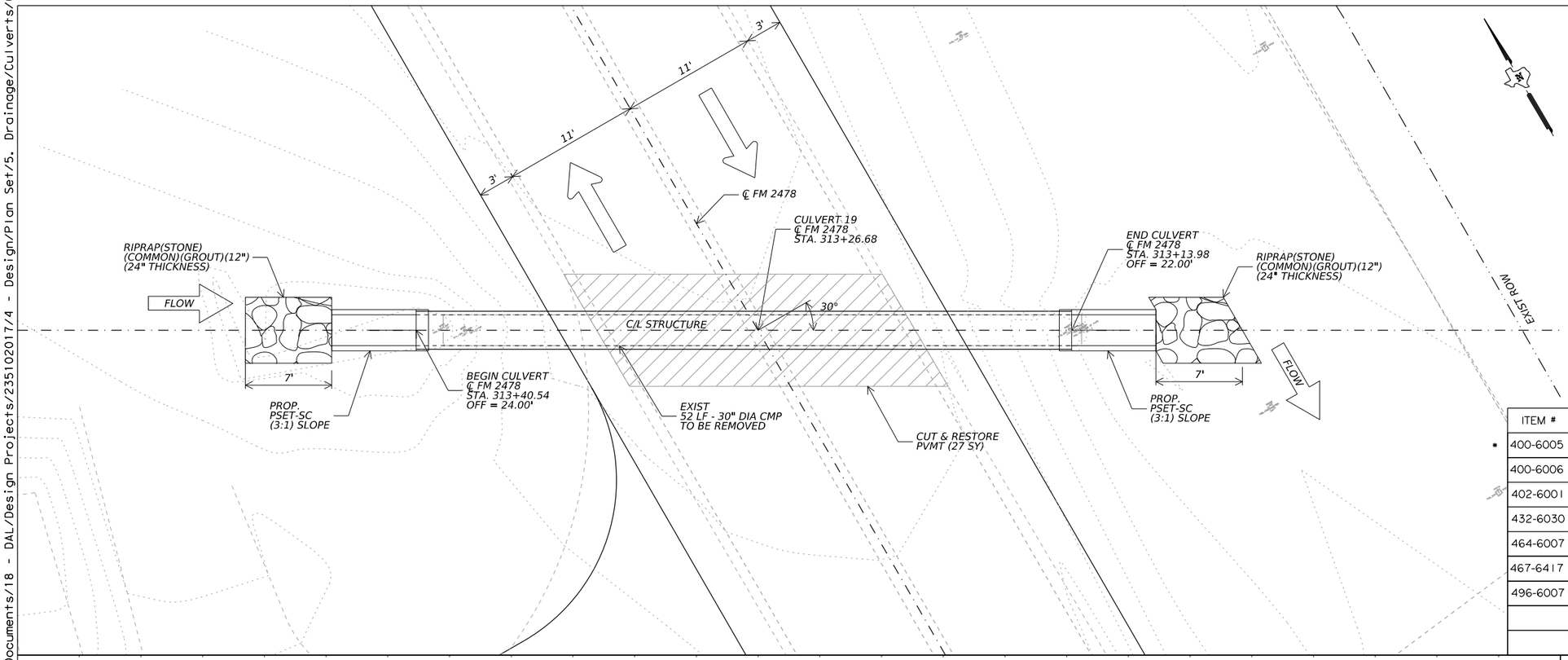
Texas Department of Transportation

FM 2478
CULVERT 18 LAYOUT
STA 305+93.64

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

SHEET 23 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
TE	TEXAS	DAL	COLLIN	112
CHECK	CONTROL	SECTION	JOB	
MS	2351	02	017	
CHECK				
JRV				



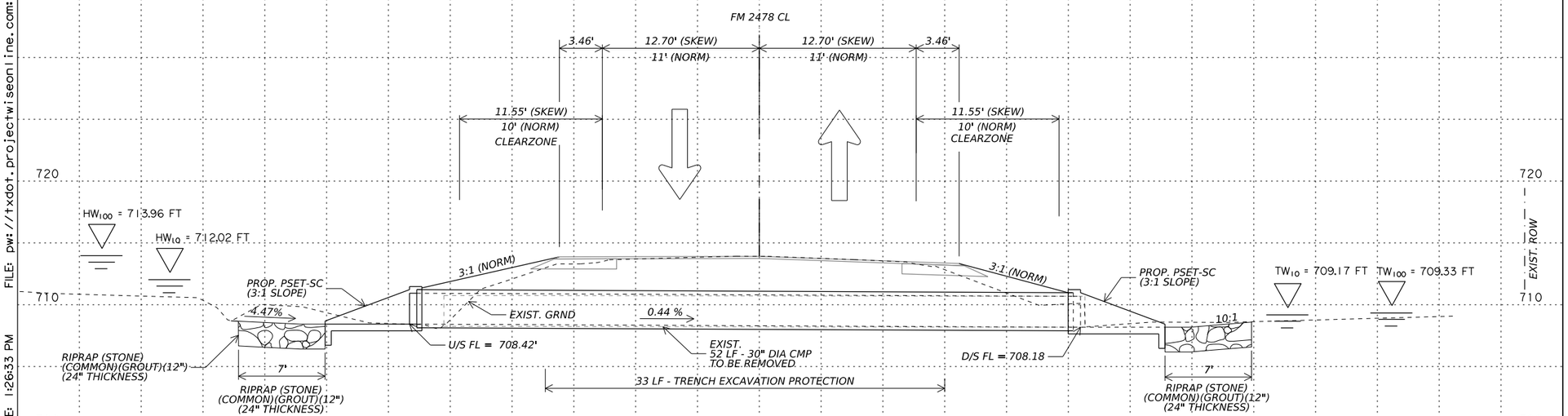
HYDRAULIC DATA

DRAINAGE AREA = 18.92 ACRE

Q_{10} = 31.42 CFS	Q_{100} = 47.39 CFS
HW_{10} = 712.02 FT	HW_{100} = 713.96 FT
TW_{10} = 709.17 FT	TW_{100} = 709.33 FT
V_{10} = 7.82 FPS	V_{100} = 9.54 FPS

* SEE MISCELLANEOUS DETAILS FOR ADDITIONAL INFORMATION

	ITEM #	DESCRIPTION	UNIT	SHEET TOTAL
*	400-6005	CEM STABIL BKFL	CY	17
	400-6006	CUT & RESTORING PAV	SY	27
	402-6001	TRENCH EXCAVATION PROTECTION	SY	33
	432-6030	RIPRAP (STONE COMMON)(GROUT)(12 IN)	CY	6
	464-6007	RC PIPE (CL III)(30 IN)	LF	54
	467-6417	SET (TY II) (30 IN) (RCP) (3: 1) (C)	EA	2
	496-6007	REMOV STR (PIPE)	LF	52



EXISTING: 1 - 30" DIA. CMP - 52 LF TO BE REMOVED
PROPOSED: 1 - 30" DIA. RCP - 54 LF W/
PSET-SC (U/S & D/S)

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant , P.E. & Date

Texas Department of Transportation

FM 2478
CULVERT 19 LAYOUT
STA 313+26.68

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

SHEET 24 OF 24

DESIGN	FED. RD. DIV. NO.	PROJECT NO.		HIGHWAY NO.
TE	6	SEE TITLE SHEET		FM 2478
GRAPHICS TE	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MS	TEXAS	DAL	COLLIN	113
CHECK JRV	CONTROL	SECTION	JOB	
	2351	02	017	

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 Height of Wingwall (1) (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
Culvert 4 at Sta. 108+24.83 (Left)	1 ~ 10'x 6'	5.04'	SCC-10	FW-S	30°	2:1	8"	7"	1.583'	8.000'	15.333	15.333'	21.685'	N/A	N/A	4.2	0.8	9.0	154
Culvert 4 at Sta. 108+24.83 (Right)	1 ~ 10'x 6'	5.04'	SCC-10	FW-S	15°	2:1	8"	7"	1.583'	8.000'	15.333	8.853'	17.705'	N/A	N/A	3.1	0.7	8.0	138
Culvert 6 at Sta. 159+72.40 (Both)	3 ~ 4'x 4'	2.69'	SCP-4	PW-1	30°	2:1	5"	5"	1.083'	5.500'	N/A	N/A'	12.702'	17.898'	N/A	0.0	1.4	19.5	280
Culvert 15 at Sta. 285+76.50 (Left)	1 ~ 8'x 8'	8.97'	SCP-8	PW-1	0°	2:1	8"	7"	2.833'	11.500'	N/A	N/A'	23.000'	9.167'	N/A	0.0	1.0	34.4	529
Culvert 15 at Sta. 285+76.50 (Right)	1 ~ 8'x 8'	8.97'	SCP-8	PW-1	0°	2:1	8"	7"	3.833'	12.500'	N/A	N/A'	25.000'	9.167'	N/A	0.0	1.3	41.2	625

NOTES:
Skew = 0° on SW-0, FW-0, SETB-CD, SETB-SW-0, and SETB-FW-0 standard sheets;
30° maximum for safety end treatment

SL:1 = Horizontal : 1 Vertical
- Side slope at culvert for flared or straight wingwalls.
- Channel slope for parallel wingwalls.
- Slope must be 3:1 or flatter for safety end treatments.

T = Box culvert top slab thickness. Dimension can be found on the applicable box culvert standard sheet.

U = Box culvert wall thickness. Dimension can be found on the applicable box culvert standard sheet.

C = Curb height

See applicable wing or end treatment standard sheets for calculations of Hw, A, B, Lw, Ltw, Atw, and Total Wingwall Area.

Hw = Height of wingwall

A = Distance from face of curb to end of wingwall (not applicable to parallel or straight wingwalls)

B = Offset of end of wingwall (not applicable to parallel or straight wingwalls)

Lw = Length of longest wingwall.

Ltw = Length of culvert toewall (not applicable when using riprap apron)

Atw = Length of anchor toewall (applicable to safety end treatment only)
Total Wingwall Area = Wingwall area in sq. ft. for two wingwalls (one structure end) if Lt or Rt.
Area for four wingwalls (two structure ends) if Both.

(1) Round the wall heights shown to the nearest foot for bidding purposes.

(2) Concrete volume shown is for box culvert curb only. For curbs using the Box Culvert Rail Mounting Details (RAC) standard sheet quantities shown must be increased by a factor of 2.25. If Class S concrete is required for the top slab of the culvert, also provide Class S concrete for the curb. Curb concrete is considered part of the Box Culvert for payment.

(3) Concrete volume shown is total of wings, footings, culvert toewall (if any), anchor toewalls (if any) and wingwall toewalls. Riprap aprons, culverts, and curb quantities are not included.

(4) Regardless of the type of culvert shown on this sheet, the Contractor has the option of furnishing cast-in-place or precast culverts unless otherwise shown elsewhere on the plans. If the Contractor elects to provide culverts of a different type than those shown on this sheet, it is the Contractor's responsibility to make the necessary adjustments to the dimensions and quantities shown.

SPECIAL NOTE:

This sheet is a supplement to the box culvert standards. It is to be filled out by the culvert specifier and provides dimensions for the construction of the box culvert wingwalls and safety end treatments.

An Excel 2010 spreadsheet to assist in completing this table can be downloaded from the Bridge Standards (English) web page on the TxDOT web site. The completed sheet must be signed, sealed, and dated by a licensed Professional Engineer.

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

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	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		114

DATE: 4/29/2023 10:29:29 AM
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DATE: 4/29/2023 10:29:48 AM
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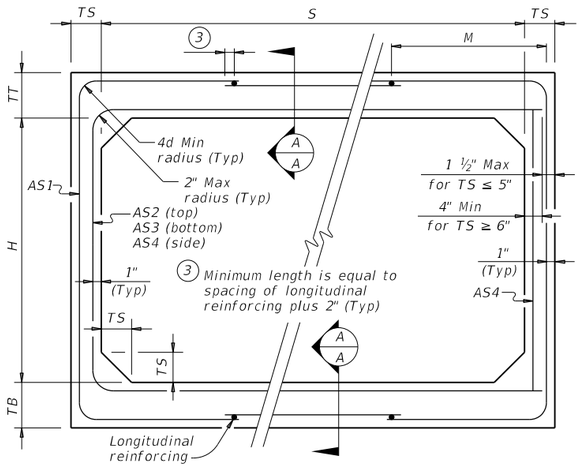
BOX DATA

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)
4	2	7.5	6	5	< 2	–	0.18	0.27	0.15	0.12	0.18	0.18	0.14	4.5
4	2	5	5	5	2 < 3	38	0.18	0.19	0.17	0.12	–	–	–	3.6
4	2	5	5	5	3 – 5	38	0.13	0.13	0.13	0.12	–	–	–	3.6
4	2	5	5	5	10	38	0.12	0.12	0.12	0.12	–	–	–	3.6
4	2	5	5	5	15	38	0.14	0.16	0.16	0.12	–	–	–	3.6
4	2	5	5	5	20	38	0.18	0.20	0.21	0.12	–	–	–	3.6
4	2	5	5	5	25	38	0.23	0.25	0.25	0.12	–	–	–	3.6
4	2	5	5	5	30	38	0.28	0.30	0.30	0.12	–	–	–	3.6
4	3	7.5	6	5	< 2	–	0.18	0.31	0.18	0.12	0.18	0.18	0.14	5.0
4	3	5	5	5	2 < 3	38	0.15	0.23	0.20	0.12	–	–	–	4.1
4	3	5	5	5	3 – 5	38	0.12	0.16	0.16	0.12	–	–	–	4.1
4	3	5	5	5	10	38	0.12	0.14	0.14	0.12	–	–	–	4.1
4	3	5	5	5	15	38	0.12	0.18	0.18	0.12	–	–	–	4.1
4	3	5	5	5	20	38	0.14	0.23	0.24	0.12	–	–	–	4.1
4	3	5	5	5	25	38	0.17	0.29	0.29	0.12	–	–	–	4.1
4	3	5	5	5	30	38	0.21	0.35	0.35	0.12	–	–	–	4.1
4	4	7.5	6	5	< 2	–	0.18	0.33	0.20	0.12	0.18	0.18	0.14	5.5
4	4	5	5	5	2 < 3	38	0.12	0.26	0.23	0.12	–	–	–	4.6
4	4	5	5	5	3 – 5	38	0.12	0.18	0.18	0.12	–	–	–	4.6
4	4	5	5	5	10	38	0.12	0.15	0.15	0.12	–	–	–	4.6
4	4	5	5	5	15	38	0.12	0.19	0.20	0.12	–	–	–	4.6
4	4	5	5	5	20	38	0.12	0.25	0.25	0.12	–	–	–	4.6
4	4	5	5	5	25	38	0.14	0.31	0.31	0.12	–	–	–	4.6
4	4	5	5	5	30	38	0.17	0.37	0.37	0.12	–	–	–	4.6

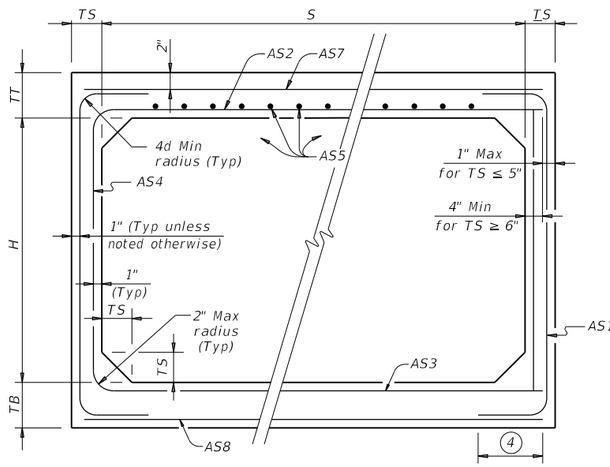
(1) For box length = 8'-0"

(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"

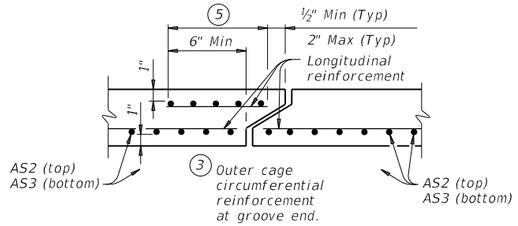
FILL HEIGHT 2 FT AND GREATER



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

4'-0" SPAN

SCP-4

FILE: scp04sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		115

DATE: 4/29/2023 10:30:08 AM
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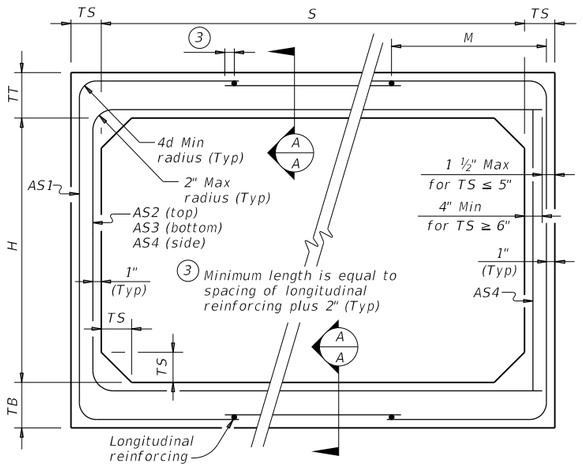
BOX DATA

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

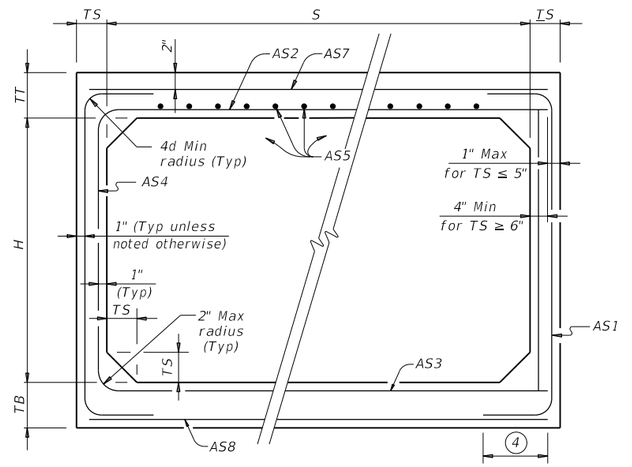
(1) For box length = 8'-0"

(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"

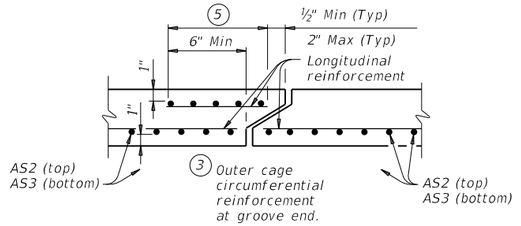
FILL HEIGHT 2 FT AND GREATER



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.)

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GENERAL NOTES:

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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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	DAL	COLLIN		116

DATE: 4/29/2023 10:30:27 AM
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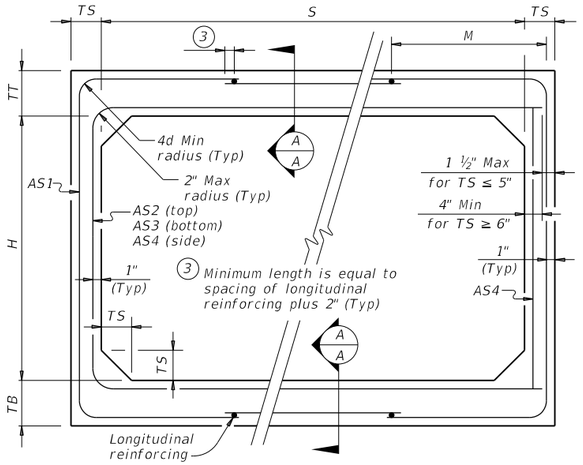
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
10	4	10	10	10	< 2	–	0.33	0.34	0.27	0.24	0.24	0.24	0.24	16.5
10	4	10	10	10	2 < 3	58	0.38	0.35	0.30	0.24	–	–	–	16.5
10	4	10	10	10	3 – 5	53	0.31	0.28	0.27	0.24	–	–	–	16.5
10	4	10	10	10	10	52	0.36	0.32	0.33	0.24	–	–	–	16.5
10	4	10	10	10	15	52	0.47	0.42	0.43	0.24	–	–	–	16.5
10	4	10	10	10	20	52	0.61	0.54	0.55	0.24	–	–	–	16.5
10	4	10	10	10	25	52	0.75	0.67	0.68	0.24	–	–	–	16.5
10	5	10	10	10	< 2	–	0.30	0.36	0.30	0.24	0.24	0.24	0.24	17.5
10	5	10	10	10	2 < 3	58	0.35	0.39	0.34	0.24	–	–	–	17.5
10	5	10	10	10	3 – 5	52	0.28	0.31	0.30	0.24	–	–	–	17.5
10	5	10	10	10	10	52	0.33	0.35	0.36	0.24	–	–	–	17.5
10	5	10	10	10	15	47	0.42	0.46	0.47	0.24	–	–	–	17.5
10	5	10	10	10	20	47	0.55	0.59	0.61	0.24	–	–	–	17.5
10	5	10	10	10	25	47	0.68	0.73	0.75	0.24	–	–	–	17.5
10	6	10	10	10	< 2	–	0.28	0.38	0.33	0.24	0.24	0.24	0.24	18.5
10	6	10	10	10	2 < 3	58	0.32	0.42	0.37	0.24	–	–	–	18.5
10	6	10	10	10	3 – 5	53	0.26	0.34	0.33	0.24	–	–	–	18.5
10	6	10	10	10	10	52	0.30	0.38	0.39	0.24	–	–	–	18.5
10	6	10	10	10	15	47	0.39	0.49	0.51	0.24	–	–	–	18.5
10	6	10	10	10	20	47	0.50	0.63	0.65	0.24	–	–	–	18.5
10	6	10	10	10	25	47	0.61	0.78	0.80	0.24	–	–	–	18.5
10	7	10	10	10	< 2	–	0.25	0.40	0.36	0.24	0.24	0.24	0.24	19.5
10	7	10	10	10	2 < 3	58	0.30	0.45	0.40	0.24	–	–	–	19.5
10	7	10	10	10	3 – 5	58	0.24	0.36	0.35	0.24	–	–	–	19.5
10	7	10	10	10	10	52	0.28	0.40	0.42	0.24	–	–	–	19.5
10	7	10	10	10	15	47	0.36	0.52	0.54	0.24	–	–	–	19.5
10	7	10	10	10	20	47	0.46	0.67	0.69	0.24	–	–	–	19.5
10	7	10	10	10	25	47	0.56	0.82	0.85	0.24	–	–	–	19.5
10	8	10	10	10	< 2	–	0.24	0.41	0.38	0.24	0.24	0.24	0.24	20.5
10	8	10	10	10	2 < 3	64	0.27	0.47	0.43	0.24	–	–	–	20.5
10	8	10	10	10	3 – 5	58	0.24	0.38	0.38	0.24	–	–	–	20.5
10	8	10	10	10	10	52	0.26	0.42	0.44	0.24	–	–	–	20.5
10	8	10	10	10	15	47	0.34	0.54	0.57	0.24	–	–	–	20.5
10	8	10	10	10	20	47	0.43	0.69	0.72	0.24	–	–	–	20.5
10	9	10	10	10	< 2	–	0.24	0.42	0.41	0.24	0.24	0.24	0.24	21.5
10	9	10	10	10	2 < 3	70	0.26	0.50	0.46	0.24	–	–	–	21.5
10	9	10	10	10	3 – 5	64	0.24	0.40	0.40	0.24	–	–	–	21.5
10	9	10	10	10	10	58	0.25	0.43	0.46	0.24	–	–	–	21.5
10	9	10	10	10	15	52	0.32	0.56	0.59	0.24	–	–	–	21.5
10	9	10	10	10	20	47	0.40	0.71	0.75	0.24	–	–	–	21.5
10	10	10	10	10	< 2	–	0.24	0.44	0.44	0.24	0.24	0.24	0.24	22.5
10	10	10	10	10	2 < 3	79	0.25	0.52	0.48	0.24	–	–	–	22.5
10	10	10	10	10	3 – 5	70	0.24	0.42	0.43	0.24	–	–	–	22.5
10	10	10	10	10	10	64	0.24	0.44	0.48	0.24	–	–	–	22.5
10	10	10	10	10	15	52	0.30	0.57	0.61	0.24	–	–	–	22.5
10	10	10	10	10	20	52	0.38	0.73	0.77	0.24	–	–	–	22.5

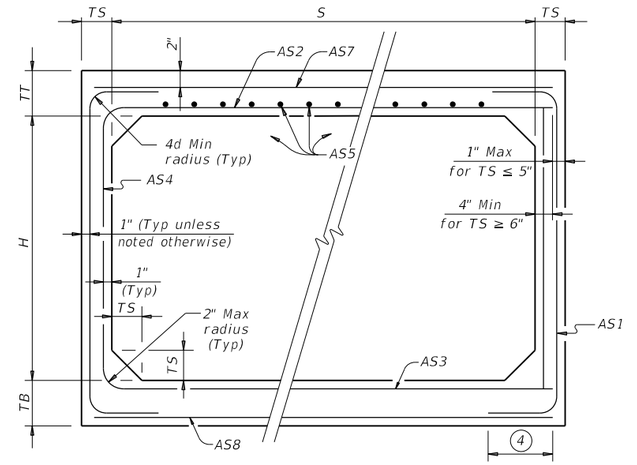
(1) For box length = 8'-0"

(2) AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS5 is minimum required area of reinforcement per linear foot of box width.



CORNER OPTION "A" CORNER OPTION "B"

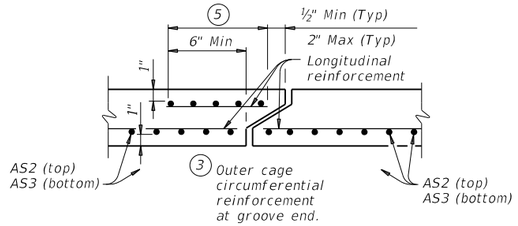
FILL HEIGHT 2 FT AND GREATER



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

10'-0" SPAN

SCP-10

FILE: scp10sts-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		117

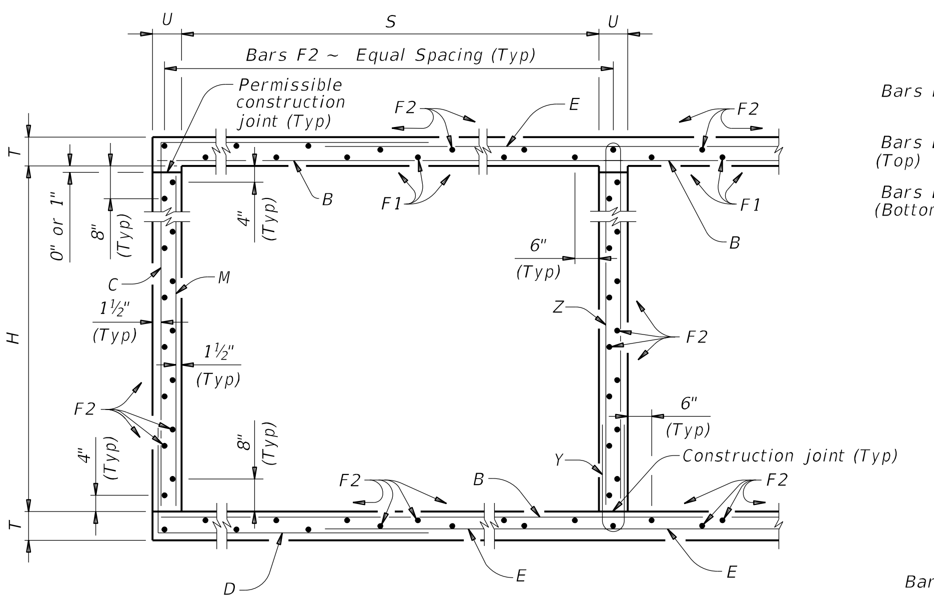
(1) 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (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.

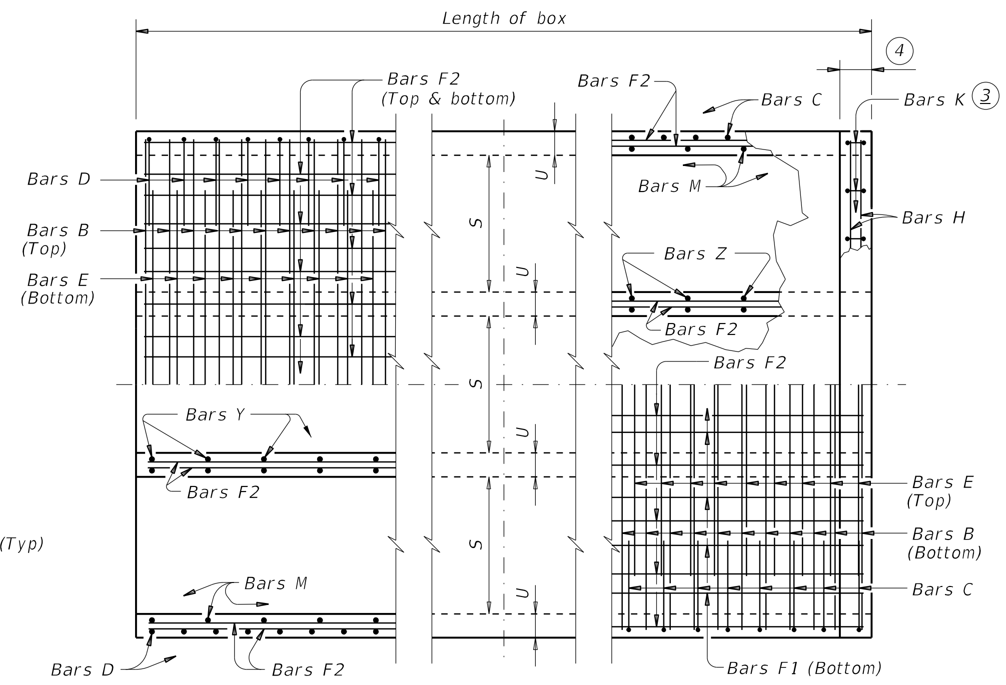
Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(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.



TYPICAL SECTION



BOTTOM SLAB

TOP SLAB

PART 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, and Bars Y and Z may be reversed.

MATERIAL NOTES:

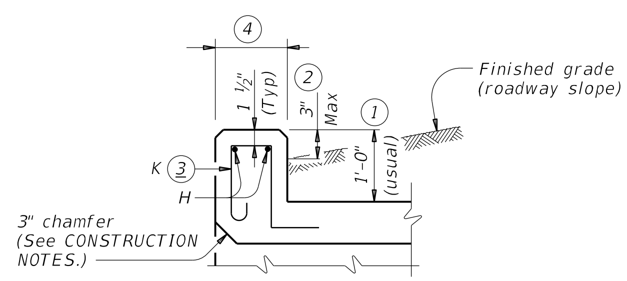
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts with 1-to-2 course surface treatment, or
- culverts with the top slab as the final riding surface.

Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Multiple Box Culverts Cast-In-Place Miscellaneous Detail (MC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

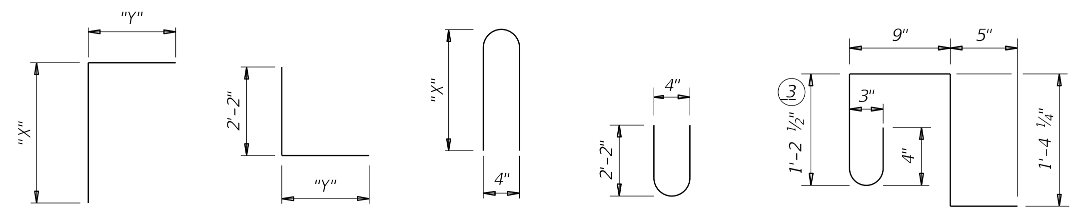


SECTION THRU CURB

TABLE OF BAR DIMENSIONS

H	"X"	"Y"
2'-0"	2'-6 ½"	3'-0"
3'-0"	3'-6 ½"	3'-0"
4'-0"	4'-0 ½"	3'-0"

Use this standard only when lengthening existing multiple box culverts.



BARS C BARS D BARS Z BARS Y BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
4'-0" SPAN 0' TO 23' FILL FOR LENGTHENING ONLY
MC-4-23

FILE: mc423ste-20.dgn	DN: TBE	CK: TAR	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	118

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NUMBER OF SPANS	SECTION DIMENSIONS				BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																																QUANTITIES					
					Bars B					Bars C & D							Bars E					Bars F1 ~ #4				Bars F2 ~ #4				Bars M ~ #4				Bars Y & Z ~ #4								Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
												Bars C		Bars D																				Bars Y		Bars Z											
	S	H	T	U	No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	Length	Wt	No.	Size	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	No.	Spa	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)	Conc (CY)	Renf (Lb)
2	4' – 0"	2' – 0"	8"	7"	108	#5	9"	9' – 6"	1,070	162	#4	6"	5' – 8"	613	5' – 4"	577	108	#5	9"	7' – 4"	826	6	18"	39' – 9"	159	36	18"	39' – 9"	956	108	9"	2' – 0"	144	54	9"	4' – 7"	165	5' – 3"	189	9' – 6"	25	22	61	0.611	117.5	0.7	86	25.2	4,785
3	4' – 0"	2' – 0"	8"	7"	108	#5	9"	14' – 1"	1,586	162	#4	6"	5' – 8"	613	5' – 4"	577	108	#5	9"	11' – 11"	1,342	9	18"	39' – 9"	239	51	18"	39' – 9"	1,354	108	9"	2' – 0"	144	108	9"	4' – 7"	331	5' – 3"	379	14' – 1"	38	32	89	0.881	164.1	1.1	127	36.3	6,692
4	4' – 0"	2' – 0"	8"	7"	108	#5	9"	18' – 8"	2,103	162	#4	6"	5' – 8"	613	5' – 4"	577	108	#5	9"	16' – 6"	1,859	12	18"	39' – 9"	319	66	18"	39' – 9"	1,752	108	9"	2' – 0"	144	162	9"	4' – 7"	496	5' – 3"	568	18' – 8"	50	40	111	1.150	210.8	1.4	161	47.4	8,592
5	4' – 0"	2' – 0"	8"	7"	108	#5	9"	23' – 3"	2,619	162	#4	6"	5' – 8"	613	5' – 4"	577	108	#5	9"	21' – 1"	2,375	15	18"	39' – 9"	398	81	18"	39' – 9"	2,151	108	9"	2' – 0"	144	216	9"	4' – 7"	661	5' – 3"	758	23' – 3"	62	50	139	1.420	257.4	1.7	201	58.5	10,497
6	4' – 0"	2' – 0"	8"	7"	108	#5	9"	27' – 10"	3,135	162	#4	6"	5' – 8"	613	5' – 4"	577	108	#5	9"	25' – 8"	2,891	18	18"	39' – 9"	478	96	18"	39' – 9"	2,549	108	9"	2' – 0"	144	270	9"	4' – 7"	827	5' – 3"	947	27' – 10"	74	58	161	1.689	304.0	2.1	235	69.6	12,396
2	4' – 0"	3' – 0"	8"	7"	108	#5	9"	9' – 6"	1,070	162	#4	6"	6' – 8"	721	5' – 4"	577	108	#5	9"	7' – 4"	826	6	18"	39' – 9"	159	42	18"	39' – 9"	1,115	108	9"	3' – 0"	216	54	9"	4' – 7"	165	7' – 3"	262	9' – 6"	25	22	61	0.676	127.8	0.7	86	27.8	5,197
3	4' – 0"	3' – 0"	8"	7"	108	#5	9"	14' – 1"	1,586	162	#4	6"	6' – 8"	721	5' – 4"	577	108	#5	9"	11' – 11"	1,342	9	18"	39' – 9"	239	59	18"	39' – 9"	1,567	108	9"	3' – 0"	216	108	9"	4' – 7"	331	7' – 3"	523	14' – 1"	38	32	89	0.967	177.6	1.1	127	39.7	7,229
4	4' – 0"	3' – 0"	8"	7"	108	#5	9"	18' – 8"	2,103	162	#4	6"	6' – 8"	721	5' – 4"	577	108	#5	9"	16' – 6"	1,859	12	18"	39' – 9"	319	76	18"	39' – 9"	2,018	108	9"	3' – 0"	216	162	9"	4' – 7"	496	7' – 3"	785	18' – 8"	50	40	111	1.258	227.4	1.4	161	51.7	9,255
5	4' – 0"	3' – 0"	8"	7"	108	#5	9"	23' – 3"	2,619	162	#4	6"	6' – 8"	721	5' – 4"	577	108	#5	9"	21' – 1"	2,375	15	18"	39' – 9"	398	93	18"	39' – 9"	2,469	108	9"	3' – 0"	216	216	9"	4' – 7"	661	7' – 3"	1,046	23' – 3"	62	50	139	1.549	277.1	1.7	201	63.7	11,283
6	4' – 0"	3' – 0"	8"	7"	108	#5	9"	27' – 10"	3,135	162	#4	6"	6' – 8"	721	5' – 4"	577	108	#5	9"	25' – 8"	2,891	18	18"	39' – 9"	478	110	18"	39' – 9"	2,921	108	9"	3' – 0"	216	270	9"	4' – 7"	827	7' – 3"	1,308	27' – 10"	74	58	161	1.841	326.9	2.1	235	75.7	13,309
2	4' – 0"	4' – 0"	8"	7"	108	#5	9"	9' – 6"	1,070	162	#4	6"	7' – 8"	830	5' – 4"	577	108	#5	9"	7' – 4"	826	6	18"	39' – 9"	159	42	18"	39' – 9"	1,115	108	9"	4' – 0"	289	54	9"	4' – 7"	165	9' – 3"	334	9' – 6"	25	22	61	0.741	134.1	0.7	86	30.4	5,451
3	4' – 0"	4' – 0"	8"	7"	108	#5	9"	14' – 1"	1,586	162	#4	6"	7' – 8"	830	5' – 4"	577	108	#5	9"	11' – 11"	1,342	9	18"	39' – 9"	239	59	18"	39' – 9"	1,567	108	9"	4' – 0"	289	108	9"	4' – 7"	331	9' – 3"	667	14' – 1"	38	32	89	1.053	185.7	1.1	127	43.2	7,555
4	4' – 0"	4' – 0"	8"	7"	108	#5	9"	18' – 8"	2,103	162	#4	6"	7' – 8"	830	5' – 4"	577	108	#5	9"	16' – 6"	1,859	12	18"	39' – 9"	319	76	18"	39' – 9"	2,018	108	9"	4' – 0"	289	162	9"	4' – 7"	496	9' – 3"	1,001	18' – 8"	50	40	111	1.366	237.3	1.4	161	56.0	9,653
5	4' – 0"	4' – 0"	8"	7"	108	#5	9"	23' – 3"	2,619	162	#4	6"	7' – 8"	830	5' – 4"	577	108	#5	9"	21' – 1"	2,375	15	18"	39' – 9"	398	93	18"	39' – 9"	2,469	108	9"	4' – 0"	289	216	9"	4' – 7"	661	9' – 3"	1,335	23' – 3"	62	50	139	1.679	288.8	1.7	201	68.9	11,754
6	4' – 0"	4' – 0"	8"	7"	108	#5	9"	27' – 10"	3,135	162	#4	6"	7' – 8"	830	5' – 4"	577	108	#5	9"	25' – 8"	2,891	18	18"	39' – 9"	478	110	18"	39' – 9"	2,921	108	9"	4' – 0"	289	270	9"	4' – 7"	827	9' – 3"	1,668	27' – 10"	74	58	161	1.992	340.4	2.1	235	81.8	13,851

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Use this standard only when lengthening existing multiple box culverts.

HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE
4'-0" SPAN
0' TO 23' FILL
FOR LENGTHENING ONLY
MC-4-23

FILE: mc423ste-20.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		119

DATE: 4/29/2023 10:31:10 AM
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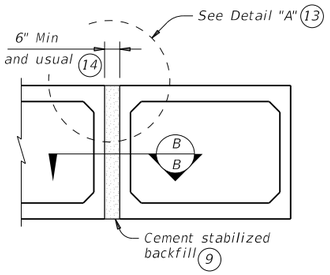
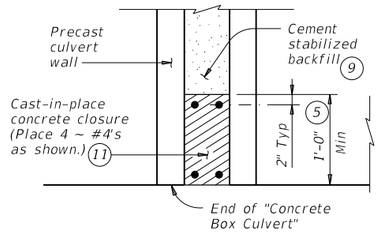
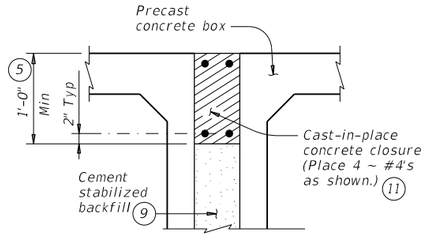


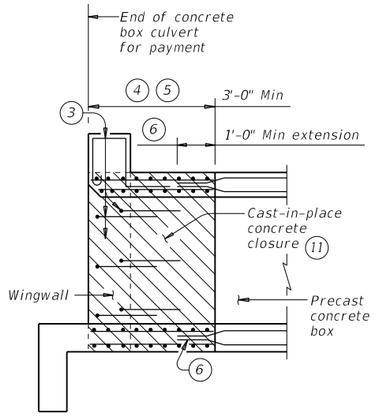
MULTIPLE UNIT PLACEMENT



SECTION B-B

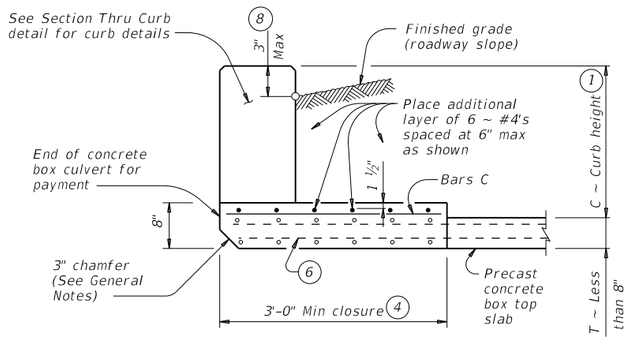


DETAIL "A" (13)

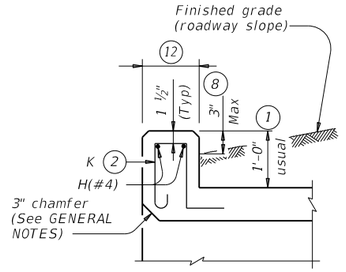


WINGWALL CONNECTION

(Also applies to safety end treatment.)

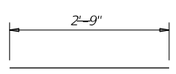


SECTION THRU TOP SLABS LESS THAN 8"

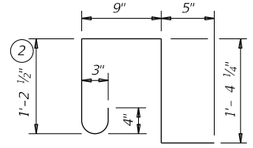


SECTION THRU CURB

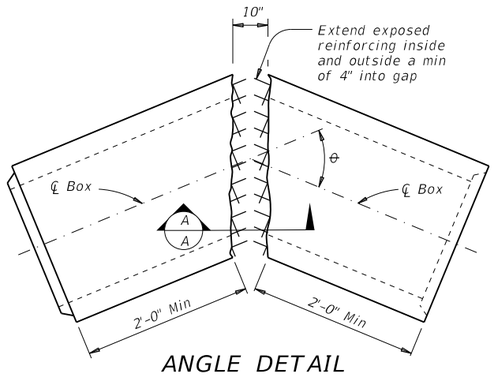
QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



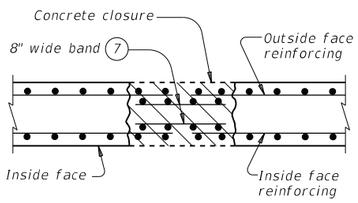
BARS C (#4)
(Spa = 1'-0" Max)



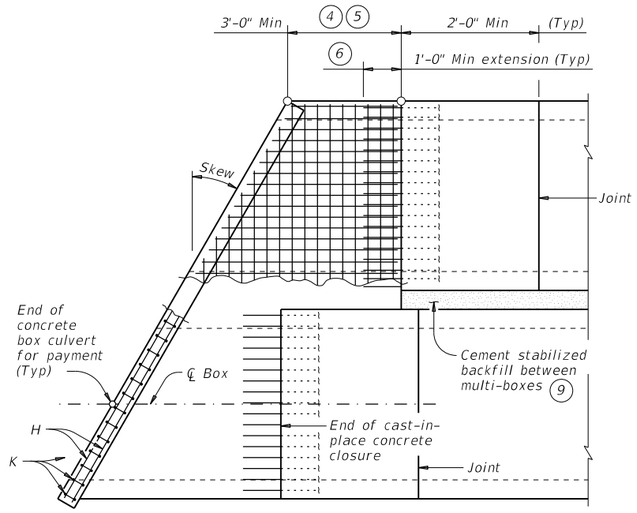
BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
4. Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
6. Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is considered part of the box culvert for payment.
11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
12. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bars dimensions are out-to-out of bars.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE: scpmdsts-20.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
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DATE: 4/29/2023 10:31:31 AM
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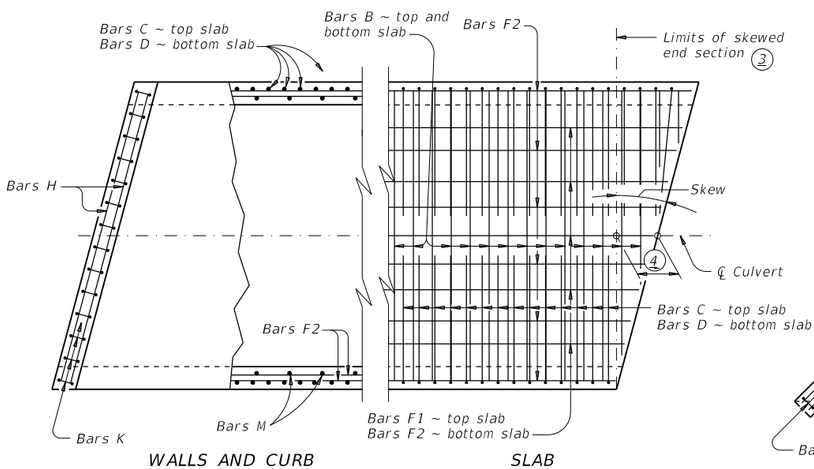
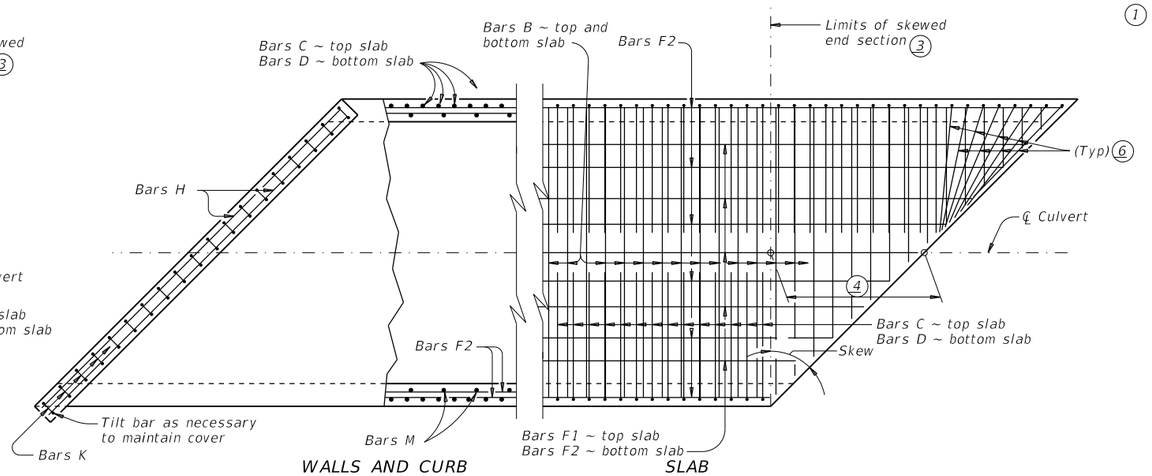
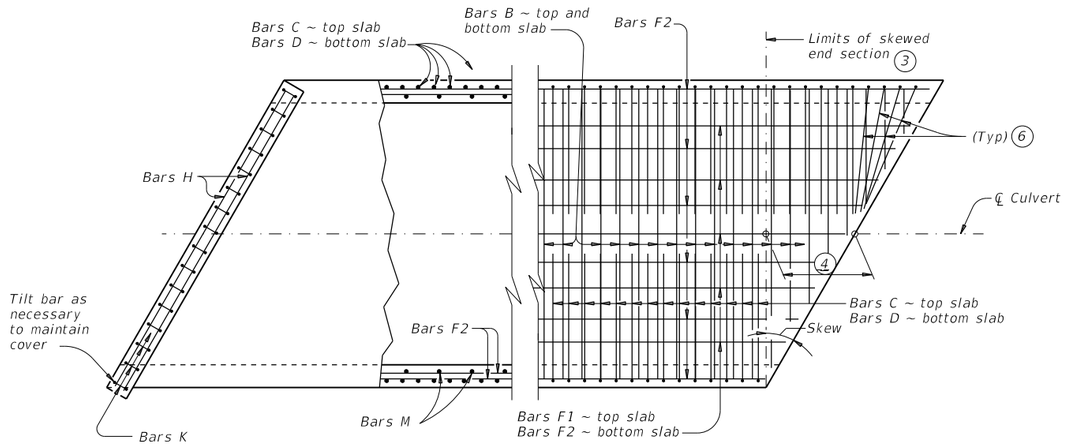


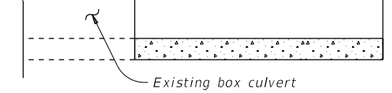
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° (7)



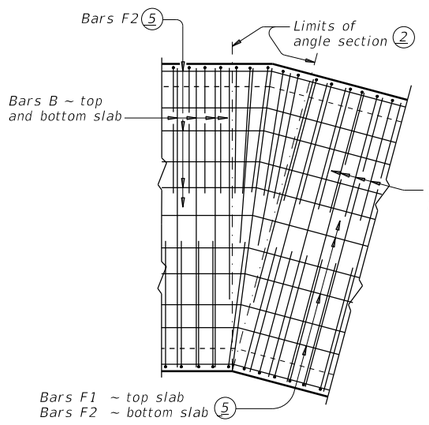
PLAN OF SKEWED ENDS ~ OVER 30° TO 45°



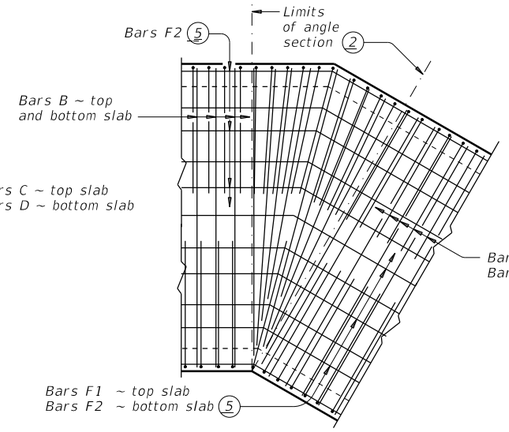
PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



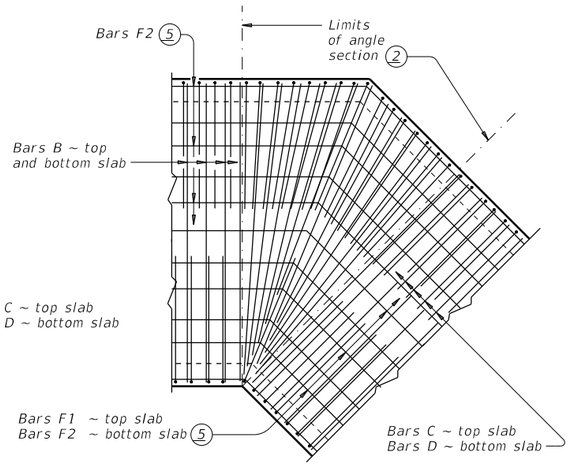
LENGTHENING DETAIL (1)



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 with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, C, D , E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

(2) When the spacing between Bars B becomes less than half of the normal spacing, cut bars to avoid conflict.

(3) The length of Bars B vary in the skewed end sections.

(4) [One half of overall width] x [tangent of the skew angle]

(5) Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

(6) When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

(7) At the Contractor's option, for skews of 15° or less, place Bars B, C, and D parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B shown on the Single Box Culverts Cast-In-Place (SCC) standards sheets to accommodate the skew.

CONSTRUCTION NOTES:

Do not use permanent forms.
When required, lap Bars H 1'-8" for uncoated or galvanized bars.
Provide a minimum of 1 ½" clear cover.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel, if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) with these exceptions:
provide Class S concrete (f'c = 4,000 psi) for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for details of straight sections of culvert.

For skewed sections and angle sections, refer to Single Box Culverts Cast-in-Place (SCC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.

For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the culvert Single Box Culverts Cast-In-Place (SCC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

SCC-MD

FILE: sccmdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		121

DATE: 5/2/2023 11:20:05 AM
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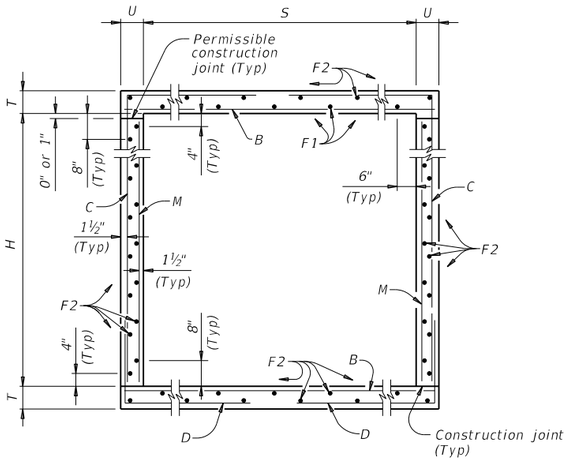
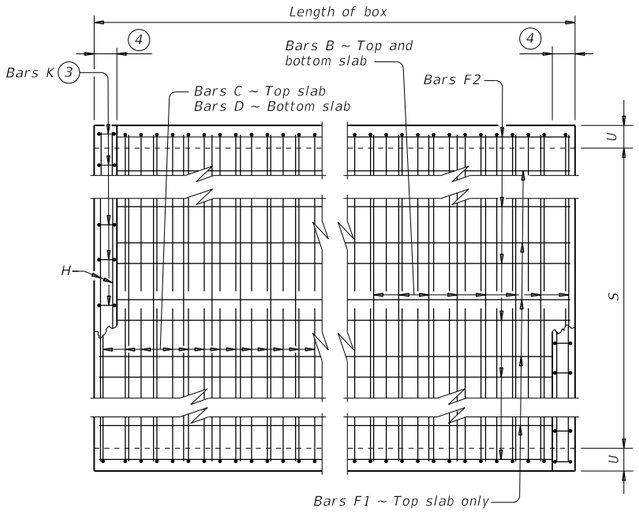
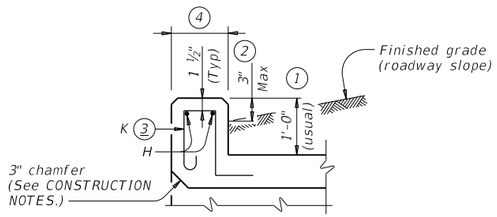


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4. 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. 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.

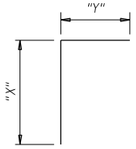
Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min

GENERAL NOTES:

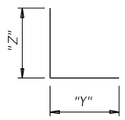
Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.

See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

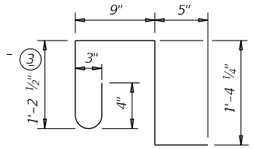
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



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-3 & 4

FILE: scc34sle-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		122

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)
3' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	5' – 4"	385	2' – 6"	2' – 10"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80	19	39' – 9"	505	3' – 11"	10	10	28	0.292	48.1	0.3	38	12.0	1,960
3' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	3' – 11"	441	108	#4	9"	6' – 4"	457	3' – 6"	2' – 10"	108	#4	9"	5' – 1"	367	2' – 10"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80	23	39' – 9"	611	3' – 11"	10	10	28	0.335	54.3	0.3	38	13.7	2,210
4' – 0"	2' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	5' – 8"	613	2' – 6"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	2' – 0"	144	3	39' – 9"	80	21	39' – 9"	558	4' – 11"	13	12	33	0.342	63.4	0.4	46	14.1	2,581
4' – 0"	3' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	6' – 8"	721	3' – 6"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	3' – 0"	216	3	39' – 9"	80	25	39' – 9"	664	4' – 11"	13	12	33	0.385	70.5	0.4	46	15.8	2,867
4' – 0"	4' – 0"	8"	7"	30'	108	#5	9"	4' – 11"	554	162	#4	6"	7' – 8"	830	4' – 6"	3' – 2"	162	#4	6"	5' – 5"	586	3' – 2"	2' – 3"	108	9"	4' – 0"	289	3	39' – 9"	80	25	39' – 9"	664	4' – 11"	13	12	33	0.428	75.1	0.4	46	17.5	3,049

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

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HL93 LOADING SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-3 & 4

FILE: scc34ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
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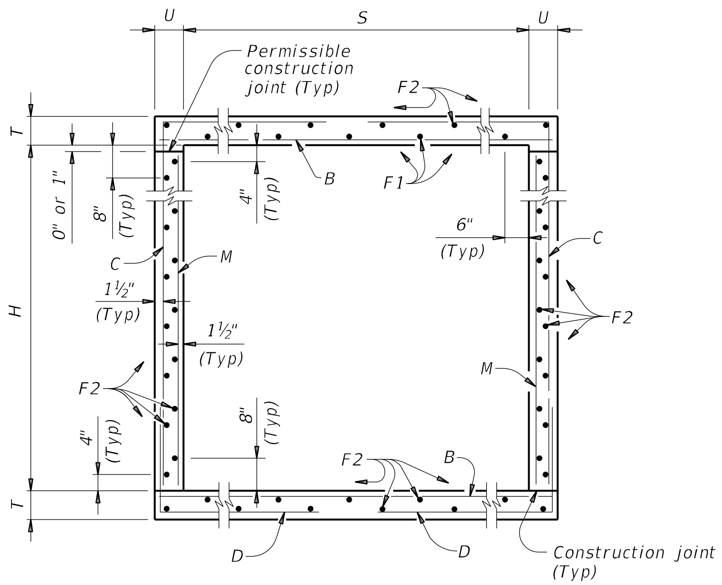
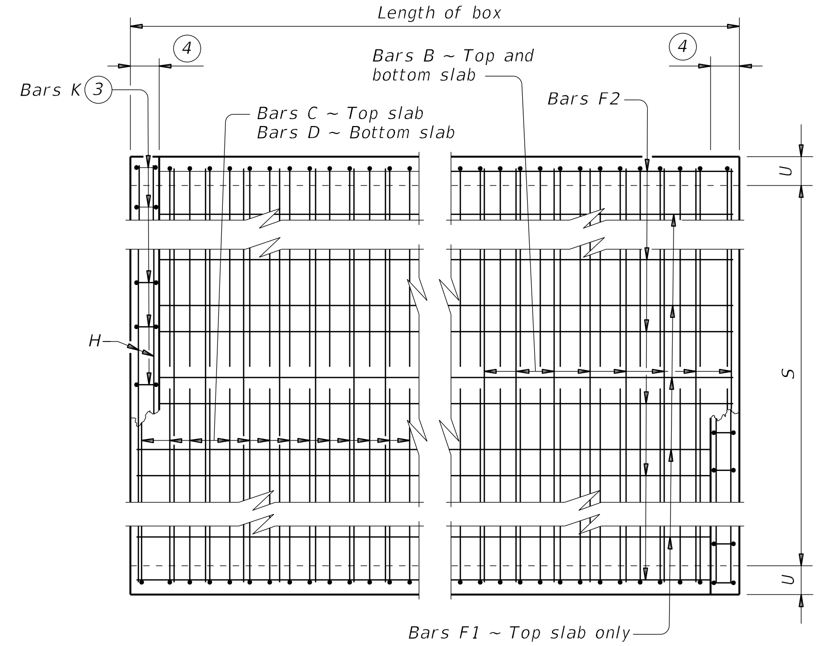
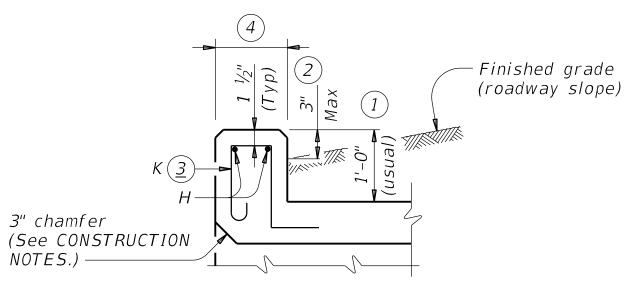
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		123



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).

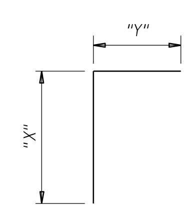
CONSTRUCTION NOTES:
Do not use permanent forms.
Chamfer the bottom edge of the top slab 3" at the entrance.
Optionally, raise construction joints shown at the flow line by a maximum of 6". If this option is taken, Bars M may be cut off or raised, Bars C and D may be reversed.

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.

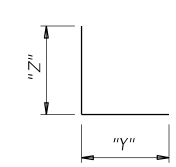
Provide bar laps, where required, as follows:
- Uncoated or galvanized ~ #4 = 1'-8" Min
- Uncoated or galvanized ~ #5 = 2'-1" Min
- Uncoated or galvanized ~ #6 = 2'-6" Min

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.

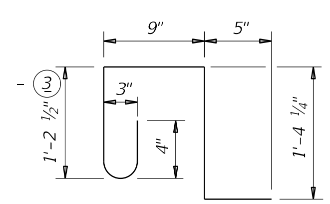
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



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: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
04/2021 Updated X values.	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	124

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DATE: 5/2/2023 11:38:47 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351-02-017/4 Design/P1 ... scc08ste-21.dgn

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
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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
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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
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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
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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
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(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

DATE: 5/2/2023 11:45:48 AM
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HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-8

FILE: scc08ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		125

DATE: 5/2/2023 11:47:17 AM
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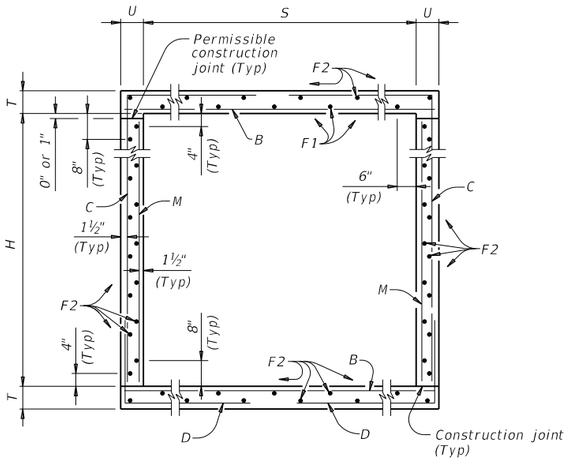
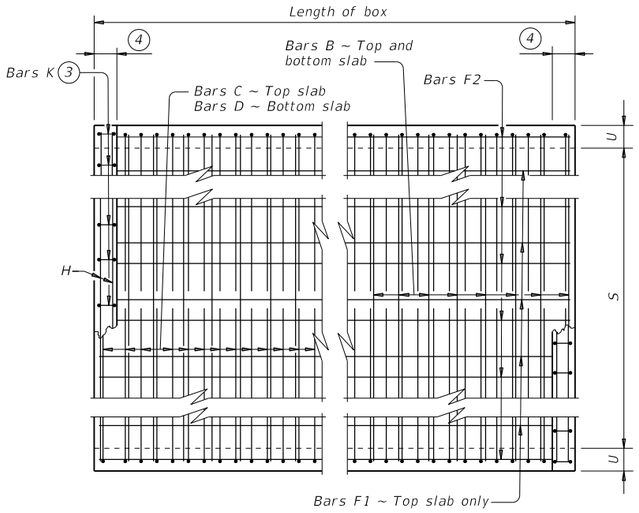
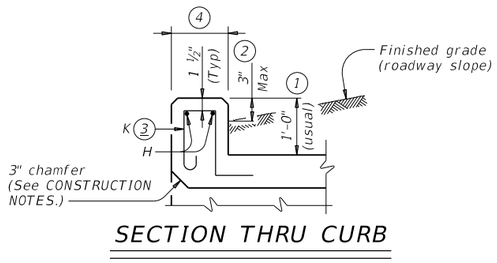


TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB

1 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0", refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Rail Anchorage Curb (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.

2 For vehicle safety, the following requirements must be met:
- For structures without bridge rail, construct curbs no more than 3" above finished grade.
- For structures with bridge rail, construct curbs flush with finished grade.

Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

3 For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.

4 1'-0" typical. 2'-3" when the Rail Anchorage Curb (RAC) standard sheet is referred to elsewhere in the plans.

The Contractor may replace Bars B, C, D, E, F1, F2, M, Y, and/or Z with deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes. The lap length required for WWR is never less than the lap length required for uncoated #4 bars.

Example conversion: Replacing No. 6 Gr 60 at 6" Spacing with WWR.
Required WWR = (0.44 sq. in. per 0.5 ft.) x (60 ksi / 70 ksi) = 0.755 sq. in. per ft.
If D30.6 wire is used to meet the 0.755 sq. in. 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:

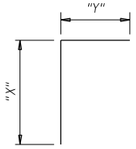
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
Provide Class C concrete (f'c = 3,600 psi) for culvert barrel and curb, with the following exceptions: provide Class S concrete (f'c = 4,000 psi) for top slabs of:
- culverts with overlay,
- culverts 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
- Uncoated or galvanized ~ #7 = 3'-3" Min

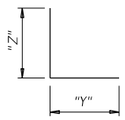
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications for the range of fill heights shown.
See the Single Box Culverts Cast-In-Place Miscellaneous Detail (SCC-MD) standard sheet for details pertaining to skewed ends, angle sections, and lengthening.

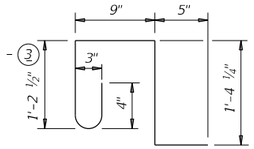
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.



BARS C



BARS D



BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TxDOT	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		126

DATE: 5/2/2023 11:54:46 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/SCC10ste-21.dgn

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	Wt	No.	Length	Wt	No.	Length	Weight	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' – 0"	4' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	10' – 4"	2,514	4' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	10' – 11"	29	24	67	0.724	219.9	0.8	96	29.8	8,893
10' – 0"	4' – 0"	9"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	10' – 5"	2,535	4' – 7"	5' – 10"	162	#6	6"	9' – 0"	2,190	5' – 10"	3' – 2"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	10' – 11"	29	24	67	0.793	221.0	0.8	96	32.5	8,934
10' – 0"	4' – 0"	10"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	10' – 7"	2,575	4' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	4' – 0"	219	7	39' – 9"	186	37	39' – 9"	982	11' – 1"	30	26	72	0.897	222.2	0.8	102	36.7	8,991
10' – 0"	4' – 0"	11"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	10' – 8"	2,595	4' – 9"	5' – 11"	162	#6	6"	9' – 3"	2,251	5' – 11"	3' – 4"	82	12"	4' – 0"	219	7	39' – 9"	186	37	39' – 9"	982	11' – 1"	30	26	72	0.967	223.3	0.8	102	39.5	9,032
10' – 0"	4' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	10' – 10"	2,636	4' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 3"	30	26	72	1.074	228.0	0.8	102	43.8	9,223
10' – 0"	4' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	10' – 11"	2,656	4' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 5"	31	26	72	1.183	230.1	0.9	103	48.2	9,306
10' – 0"	4' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	11' – 1"	2,697	5' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 7"	31	26	72	1.294	233.1	0.9	103	52.6	9,428
10' – 0"	4' – 0"	15"	12"	30'	162	#6	6"	11' – 9"	2,859	162	#6	6"	11' – 3"	2,737	5' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	4' – 0"	289	7	39' – 9"	186	37	39' – 9"	982	11' – 9"	31	26	72	1.407	236.2	0.9	103	57.2	9,549
10' – 0"	5' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	11' – 4"	2,758	5' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	10' – 11"	29	24	67	0.767	230.5	0.8	96	31.5	9,316
10' – 0"	5' – 0"	9"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	11' – 5"	2,778	5' – 7"	5' – 10"	162	#6	6"	9' – 0"	2,190	5' – 10"	3' – 2"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	10' – 11"	29	24	67	0.836	231.5	0.8	96	34.3	9,356
10' – 0"	5' – 0"	10"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	11' – 7"	2,819	5' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	5' – 0"	274	7	39' – 9"	186	41	39' – 9"	1,089	11' – 1"	30	26	72	0.947	232.4	0.8	102	38.7	9,397
10' – 0"	5' – 0"	11"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	11' – 8"	2,839	5' – 9"	5' – 11"	162	#6	6"	9' – 3"	2,251	5' – 11"	3' – 4"	82	12"	5' – 0"	274	7	39' – 9"	186	41	39' – 9"	1,089	11' – 1"	30	26	72	1.016	233.4	0.8	102	41.5	9,438
10' – 0"	5' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	11' – 10"	2,879	5' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 3"	30	26	72	1.130	238.6	0.8	102	46.0	9,645
10' – 0"	5' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	11' – 11"	2,900	5' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 5"	31	26	72	1.245	240.7	0.9	103	50.7	9,729
10' – 0"	5' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	12' – 1"	2,940	6' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 7"	31	26	72	1.362	243.7	0.9	103	55.4	9,850
10' – 0"	5' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	12' – 3"	2,981	6' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	5' – 0"	361	7	39' – 9"	186	41	39' – 9"	1,089	11' – 9"	31	26	72	1.481	272.5	0.9	103	60.1	11,004
10' – 0"	6' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	12' – 4"	3,001	6' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.811	241.0	0.8	96	33.3	9,737
10' – 0"	6' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	12' – 4"	3,001	6' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.811	241.0	0.8	96	33.3	9,737
10' – 0"	6' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	12' – 6"	3,042	6' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	82	12"	6' – 0"	329	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	0.926	241.5	0.8	102	37.9	9,761
10' – 0"	6' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	12' – 7"	3,062	6' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	6' – 0"	329	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	0.996	242.5	0.8	102	40.7	9,801
10' – 0"	6' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	12' – 10"	3,123	6' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 3"	30	26	72	1.185	249.1	0.8	102	48.2	10,067
10' – 0"	6' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	12' – 11"	3,143	6' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 5"	31	26	72	1.307	251.2	0.9	103	53.1	10,150
10' – 0"	6' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	13' – 1"	3,183	7' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 7"	31	26	72	1.430	254.2	0.9	103	58.1	10,271
10' – 0"	6' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	13' – 3"	3,224	7' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	6' – 0"	433	7	39' – 9"	186	45	39' – 9"	1,195	11' – 9"	31	26	72	1.556	283.1	0.9	103	63.1	11,425
10' – 0"	7' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	13' – 4"	3,244	7' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.854	248.9	0.8	96	35.0	10,052
10' – 0"	7' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	13' – 4"	3,244	7' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	10' – 11"	29	24	67	0.854	248.9	0.8	96	35.0	10,052
10' – 0"	7' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	13' – 6"	3,285	7' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	82	12"	7' – 0"	383	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	0.975	248.9	0.8	102	39.8	10,058
10' – 0"	7' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	13' – 7"	3,305	7' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	7' – 0"	383	7	39' – 9"	186	45	39' – 9"	1,195	11' – 1"	30	26	72	1.045	249.9	0.8	102	42.6	10,098
10' – 0"	7' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	13' – 10"	3,366	7' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 3"	30	26	72	1.241	257.0	0.8	102	50.5	10,382
10' – 0"	7' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	13' – 11"	3,386	7' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 5"	31	26	72	1.368	259.1	0.9	103	55.6	10,465
10' – 0"	7' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	14' – 1"	3,427	8' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 7"	31	26	72	1.498	262.1	0.9	103	60.8	10,587
10' – 0"	7' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	14' – 3"	3,467	8' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	7' – 0"	505	7	39' – 9"	186	45	39' – 9"	1,195	11' – 9"	31	26	72	1.630	290.9	0.9	103	66.1	11,740
10' – 0"	8' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	14' – 4"	3,488	8' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	10' – 11"	29	24	67	0.897	259.5	0.8	96	36.7	10,474
10' – 0"	8' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	14' – 4"	3,488	8' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	10' – 11"	29	24	67	0.897	259.5	0.8	96	36.7	10,474
10' – 0"	8' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	14' – 6"	3,528	8' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	82	12"	8' – 0"	438	7	39' – 9"	186	49	39' – 9"	1,301	11' – 1"	30	26	72	1.025	259.0	0.8	102	41.8	10,462
10' – 0"	8' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	14' – 7"	3,548	8' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	82	12"	8' – 0"	438	7	39' – 9"	186	49	39' – 9"	1,301	11' – 1"	30	26	72	1.095	260.0	0.8	102	44.6	10,502
10' – 0"	8' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	14' – 10"	3,609	8' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 3"	30	26	72	1.296	267.5	0.8	102	52.7	10,803
10' – 0"	8' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	14' – 11"	3,630	8' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 5"	31	26	72	1.430	269.6	0.9	103	58.1	10,887
10' – 0"	8' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	15' – 1"	3,670	9' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 7"	31	26	72	1.566	272.6	0.9	103	63.5	11,008
10' – 0"	8' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	15' – 3"	3,711	9' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	108	9"	8' – 0"	577	7	39' – 9"	186	49	39' – 9"	1,301	11' – 9"	31	26	72	1.704	301.5	0.9	103	69.0	12,162

(5) For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation — Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TBE	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		127

SECTION DIMENSIONS				⑤ FILL HEIGHT	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																												QUANTITIES					
					Bars B					Bars C							Bars D							Bars M ~ #4				Bars F1 ~ #4 at 18" Spa			Bars F2 ~ #4 at 18" Spa			Bars H 4 ~ #4		Bars K		Per Foot of Barrel		Curb		Total	
S	H	T	U		No.	Size	Spa	Length	Wt	No.	Size	Spa	Length	Wt	" X "	" Y "	No.	Size	Spa	Length	Wt	" Y "	" Z "	No.	Spa	Length	Wt	No.	Length	Wt	No.	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)
10' – 0"	9' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	15' – 4"	3,731	9' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	9' – 0"	649	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.940	270.0	0.8	96	38.4	10,895
10' – 0"	9' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	15' – 4"	3,731	9' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	108	9"	9' – 0"	649	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.940	270.0	0.8	96	38.4	10,895
10' – 0"	9' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	15' – 6"	3,772	9' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	108	9"	9' – 0"	649	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.074	273.0	0.8	102	43.8	11,023
10' – 0"	9' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	15' – 7"	3,792	9' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.144	282.2	0.8	102	46.6	11,388
10' – 0"	9' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	15' – 10"	3,853	9' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 3"	30	26	72	1.352	286.2	0.8	102	54.9	11,550
10' – 0"	9' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	15' – 11"	3,873	9' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 5"	31	26	72	1.492	288.3	0.9	103	60.5	11,633
10' – 0"	9' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	16' – 1"	3,913	10' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 7"	31	26	72	1.634	291.3	0.9	103	66.2	11,754
10' – 0"	9' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	16' – 3"	3,954	10' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	162	6"	9' – 0"	974	7	39' – 9"	186	53	39' – 9"	1,407	11' – 9"	31	26	72	1.778	320.1	0.9	103	72.0	12,908
10' – 0"	10' – 0"	8"	7"	7'	162	#6	6"	10' – 11"	2,656	162	#6	6"	16' – 4"	3,974	10' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.984	286.9	0.8	96	40.2	11,571
10' – 0"	10' – 0"	8"	7"	10'	162	#6	6"	10' – 11"	2,656	162	#6	6"	16' – 4"	3,974	10' – 6"	5' – 10"	162	#6	6"	8' – 11"	2,170	5' – 10"	3' – 1"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	10' – 11"	29	24	67	0.984	286.9	0.8	96	40.2	11,571
10' – 0"	10' – 0"	9"	8"	13'	162	#6	6"	11' – 1"	2,697	162	#6	6"	16' – 6"	4,015	10' – 7"	5' – 11"	162	#6	6"	9' – 1"	2,210	5' – 11"	3' – 2"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.123	289.9	0.8	102	45.8	11,699
10' – 0"	10' – 0"	10"	8"	16'	162	#6	6"	11' – 1"	2,697	162	#6	6"	16' – 7"	4,035	10' – 8"	5' – 11"	162	#6	6"	9' – 2"	2,230	5' – 11"	3' – 3"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 1"	30	26	72	1.193	290.9	0.8	102	48.6	11,739
10' – 0"	10' – 0"	12"	9"	20'	162	#6	6"	11' – 3"	2,737	162	#6	6"	16' – 10"	4,096	10' – 10"	6' – 0"	162	#6	6"	9' – 5"	2,291	6' – 0"	3' – 5"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 3"	30	26	72	1.407	295.0	0.8	102	57.1	11,901
10' – 0"	10' – 0"	13"	10"	23'	162	#6	6"	11' – 5"	2,778	162	#6	6"	16' – 11"	4,116	10' – 11"	6' – 0"	162	#6	6"	9' – 6"	2,312	6' – 0"	3' – 6"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 5"	31	26	72	1.553	297.0	0.9	103	63.0	11,984
10' – 0"	10' – 0"	14"	11"	26'	162	#6	6"	11' – 7"	2,819	162	#6	6"	17' – 1"	4,157	11' – 0"	6' – 1"	162	#6	6"	9' – 8"	2,352	6' – 1"	3' – 7"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 7"	31	26	72	1.702	300.1	0.9	103	69.0	12,106
10' – 0"	10' – 0"	15"	12"	30'	162	#7	6"	11' – 9"	3,891	162	#6	6"	17' – 3"	4,197	11' – 1"	6' – 2"	162	#6	6"	9' – 10"	2,393	6' – 2"	3' – 8"	162	6"	10' – 0"	1,082	7	39' – 9"	186	53	39' – 9"	1,407	11' – 9"	31	26	72	1.852	328.9	0.9	103	75.0	13,259

⑤ For direct traffic culverts (fill height ≤ 2 ft.), identify the required box size and select the option with the minimum fill height.

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS CAST-IN-PLACE
0' TO 30' FILL

SCC-10

FILE: scc10ste-21.dgn	DN: TxDOT	CK: BMP	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
04/2021 Updated X values.	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		128

DATE: 5/2/2023 12:37:40 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017#4 / ords/scc10ste-21.dgn

DATE: 4/29/2023 10:32:57 AM
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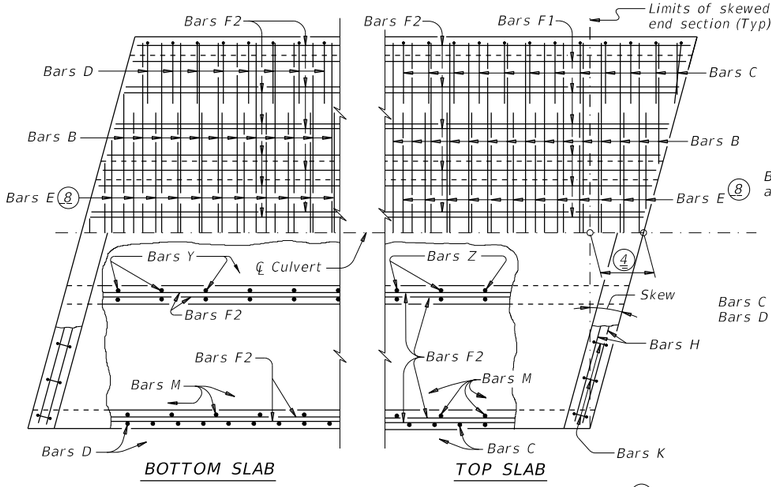
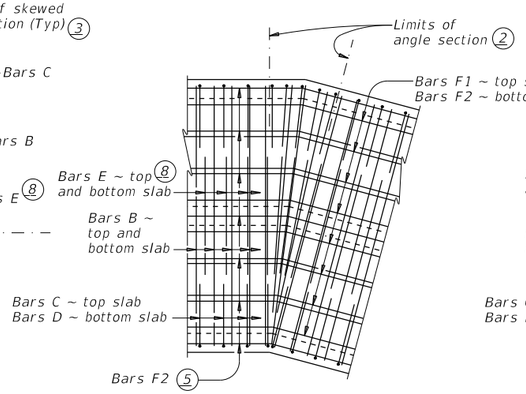
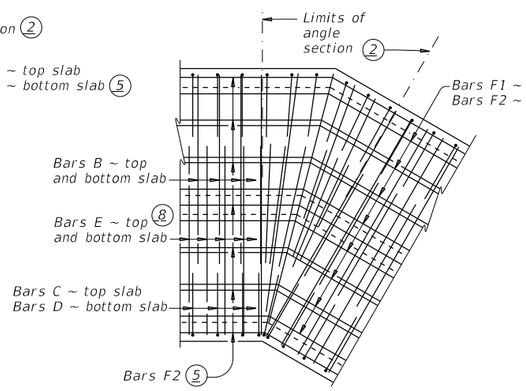


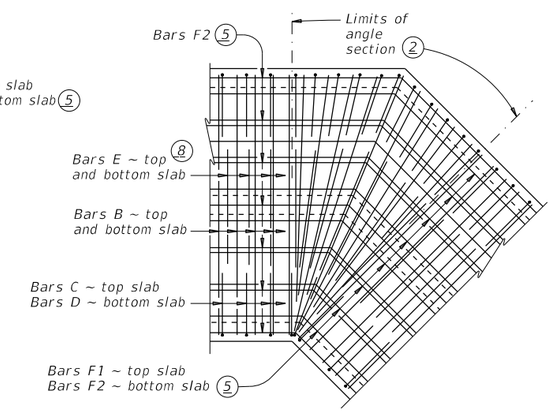
PLAN OF SKEWED ENDS ~ FROM 0° TO 15° 7



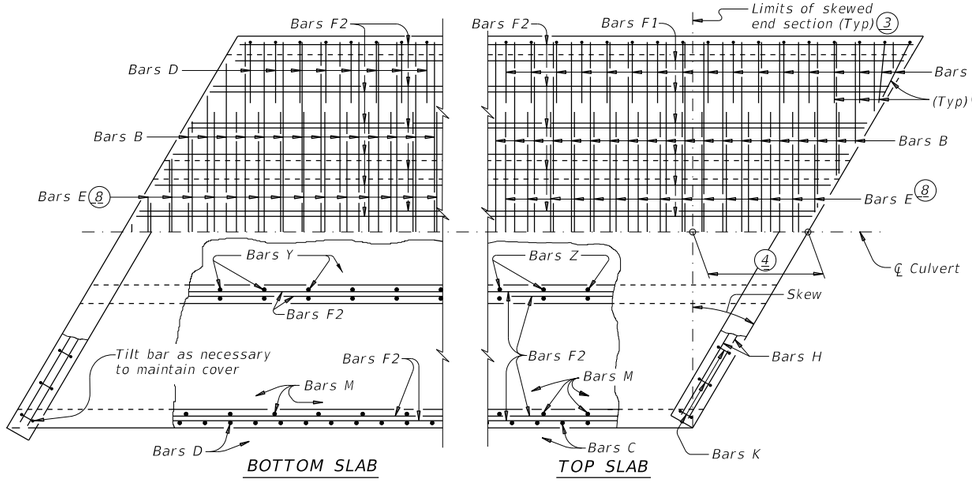
PLAN OF ANGLE SECTION ~ FROM 0° TO 15°



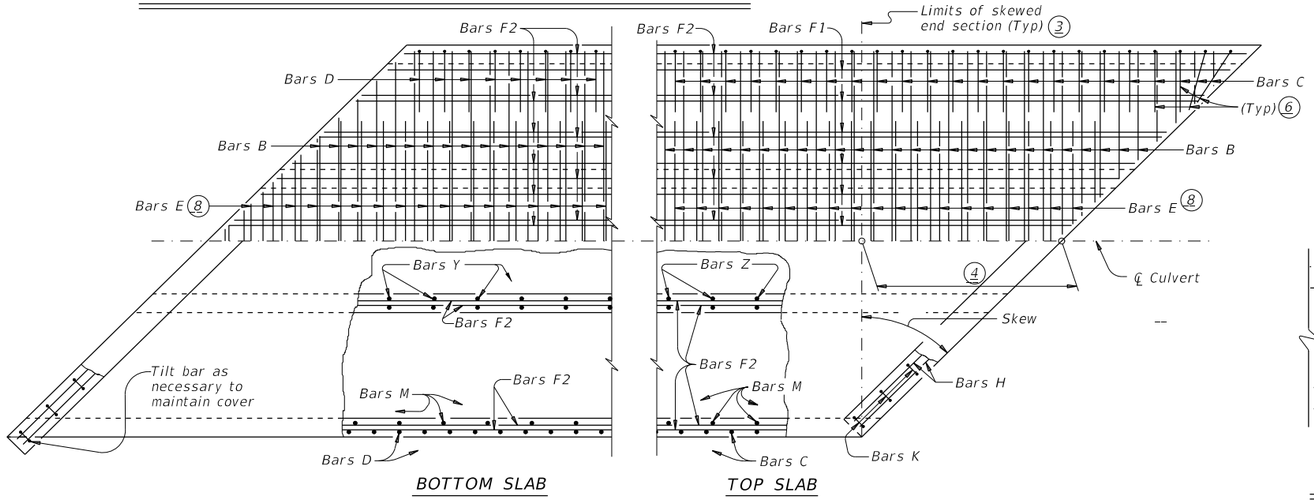
PLAN OF ANGLE SECTION ~ OVER 15° TO 30°



PLAN OF ANGLE SECTION ~ OVER 30° TO 45°



PLAN OF SKEWED ENDS ~ OVER 15° TO 30°



PLAN OF SKEWED ENDS ~ OVER 30° TO 45°

1 For skewed box culverts with less than 2'-0" of fill, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension.

For non-skewed box culverts with less than 2'-0" of fill and for skewed or non-skewed culverts with a fill depth of 2'-0" or greater, break back the top slab to provide a 1'-10" minimum lap of the existing longitudinal bars with the longitudinal bars in the extension. Alternatively, if the box is non-skewed, embed #6 anchor bars with a Type III, Class C, D, E, or F anchor adhesive into the existing walls, top and bottom slab at 1'-6" center-to-center spacing. Minimum embedment depth is 8". Anchor adhesive chosen must be able to achieve a basic bond strength in tension, Nba, of 26.4 kips. Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing." Test adhesive anchors in accordance with Item 450.3.3, "Tests." Test 3 anchors per 100 anchors installed.

Break back wings and apron as necessary to install the extension. Clean and extend the exposed wingwall and apron reinforcing into the extension. When lengthening existing box culverts with dimensions different than current standard dimensions, form horizontal and vertical transitions as directed by the Engineer. Match bottom slabs to maintain an uninterrupted flow line. Field bend existing and new reinforcing into transitions and maintain specified cover requirements. For top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface, adjust the "H" dimension to provide a smooth riding surface.

2 When the spacing between Bars B or Bars E becomes less than half of the normal spacing, cut bars to avoid conflict.

3 The length of Bars B and Bars E will vary in the skewed end sections.

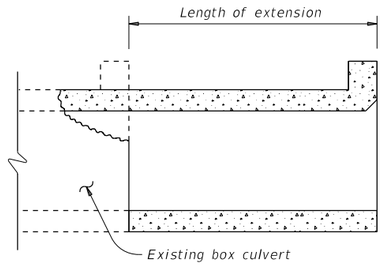
4 [One half of overall width] x [tangent of the skew angle]

5 Place Bars F1 and F2 continuously through the angle section. Bend Bars F1 and F2 to remain parallel to the walls of the box culvert.

6 When necessary to avoid conflict in acute corners, shorten the slab extension leg of Bars C and Bars D to a minimum of 1'-6" for skews of 30° thru 45°.

7 At the Contractor's option, for skews of 15° or less, place Bars B, C, D, and E parallel to the skewed end while maintaining spacing along centerline of box. Increase lengths of Bars B and Bars E shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets to accommodate the skew.

8 Extend Bars E as shown on the MC standard sheet for direct traffic culverts.



LENGTHENING DETAIL 1

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 Multiple Box Culverts Cast-in-Place (MC) standard sheets for details of straight sections of culvert.
For skewed sections and angle sections, refer to Multiple Box Culverts Cast-in-Place (MC) standard sheets for slab and wall dimensions, bar sizes, maximum bar spacing, and any other details not shown.
For skewed ends with curbs, adjust length of Bars H, number of Bars K, curb concrete volume, and reinforcing steel weight by dividing the values shown on the Multiple Box Culverts Cast-In-Place (MC) standard sheets by the cosine of the skew angle.

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

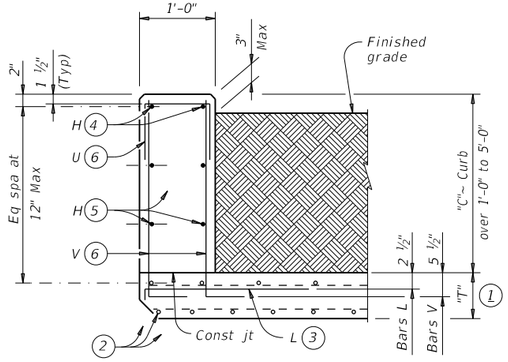
Texas Department of Transportation

Bridge Division Standard

MULTIPLE BOX CULVERTS CAST-IN-PLACE MISCELLANEOUS DETAILS

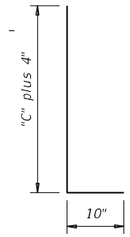
MC-MD

FILE: mc-mdste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		129



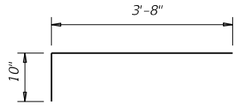
TYPICAL SECTION

Used for curbs over 1'–0" to 5'–0"



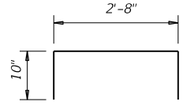
BARS V (#5) (6)

Spaced at 12" Max



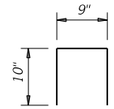
BARS L (#5) (3)

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	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		130

DATE: 4/29/2023 10:33:39 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/255102001/fw-sstde-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing length (2~wings) (3)	
					Bars J1		Bars J2			
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	33.73	0.248
3'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.07	0.261
3'-6"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	37.74	0.273
4'-0"	2'-5"	1'-0"	9"	7"	#4	1'-0"	#4	1'-0"	38.41	0.285
4'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	41.75	0.330
5'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.09	0.343
5'-6"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	45.75	0.355
6'-0"	3'-2"	1'-6"	1'-0"	7"	#4	1'-0"	#4	1'-0"	46.42	0.367
7'-0"	3'-8"	1'-9"	1'-3"	7"	#4	1'-0"	#4	1'-0"	52.77	0.414
8'-0"	4'-2"	2'-0"	1'-6"	8"	#5	1'-0"	#4	1'-0"	60.19	0.486
9'-0"	4'-8"	2'-3"	1'-9"	8"	#4	6"	#4	6"	81.49	0.535
10'-0"	5'-2"	2'-6"	2'-0"	8"	#5	6"	#4	6"	97.25	0.584
11'-0"	5'-8"	2'-9"	2'-3"	8"	#6	6"	#5	6"	133.65	0.634
12'-0"	6'-2"	3'-0"	2'-6"	9"	#7	6"	#5	6"	162.29	0.721
13'-0"	6'-8"	3'-3"	2'-9"	11"	#7	6"	#5	6"	178.80	0.856
14'-0"	7'-2"	3'-6"	3'-0"	1'-0"	#8	6"	#5	6"	216.78	0.959
15'-0"	7'-8"	4'-0"	3'-0"	1'-1"	#9	6"	#6	6"	283.06	1.068
16'-0"	8'-2"	4'-6"	3'-0"	1'-3"	#9	6"	#6	6"	297.02	1.234

TABLE OF WINGWALL REINFORCING
(2~wings)

Bar	Size	No.	Spa
DL	#5	~	1'-0"
DS	#5	~	1'-0"
E	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	4	~
M	#4	4	~
P	#4	~	1'-0"
RS	#5	3	~
RL	#5	3	~
V	#4	~	1'-0"

TABLE OF ESTIMATED CULVERT TOEWALL QUANTITIES

Bar	Size	No.	Spa
L	#4	~	1'-6"
Q	#4	1	~
Reinf (Lb/Ft)			2.45
Conc (CY/Ft)			0.037

WING DIMENSION FORMULAS:
(All values are in feet.)

Hw = H + T + C - 0.250'
A = (Hw - 0.333')(SL)
B = (A) [tanget (θ + 15°)]
Lw = (A) ÷ [cosine (θ + 15°)]

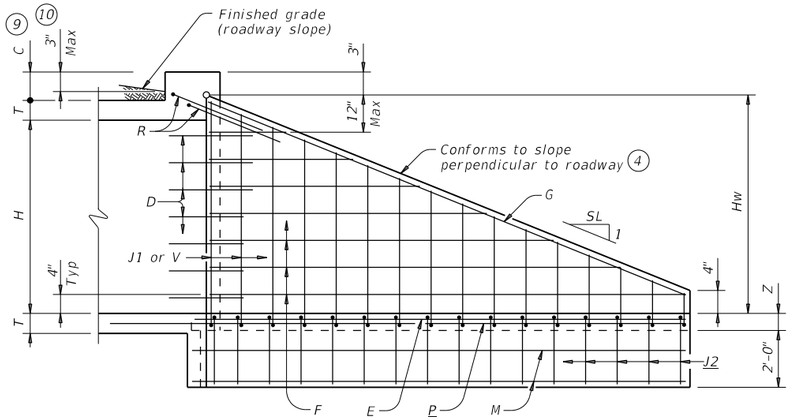
For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine θ

For precast culverts:
Ltw = [(N) (2U + S) + (N - 1) (0.5')] ÷ cosine θ

Total wingwall area (two wings ~ SF) = 0.5 (Hw + 0.333') (Lw + A)

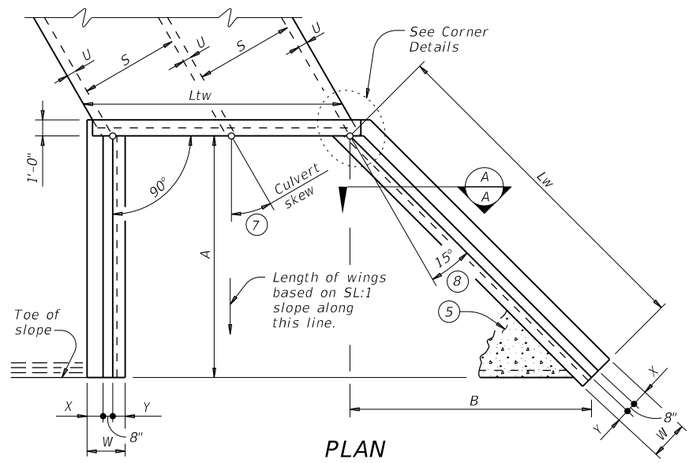
Hw = Height of wingwall
SL:1 = Side slope ratio (horizontal:1 vertical)
A = Length of short wingwalls
Lw = Length of long wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
θ = Culvert skew

See applicable box culvert standard sheet for H, S, T, and U values.



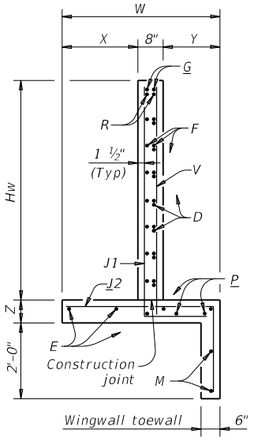
INSIDE ELEVATION

(Showing reinforcing. Culvert and culvert toewall reinforcing not shown for clarity.)

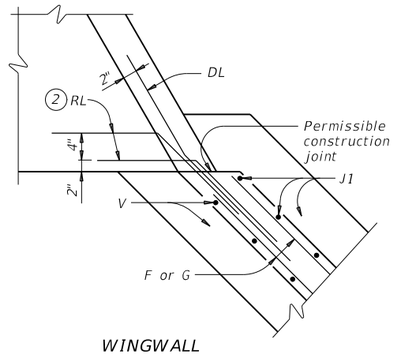


PLAN

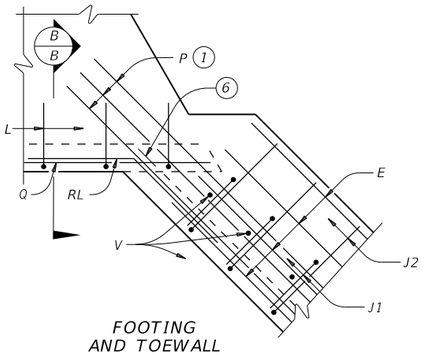
(Showing dimensions and 30° skew.)



SECTION A-A



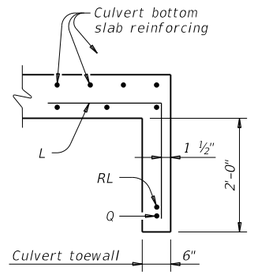
WINGWALL



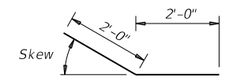
FOOTING AND TOEWALL

CORNER DETAILS

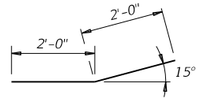
(Culvert and culvert toewall reinforcing not shown for clarity.)



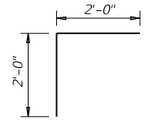
SECTION B-B (5)



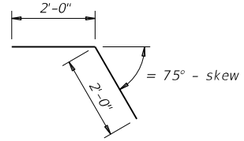
BARS DS
(Short wing)



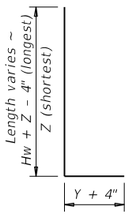
BARS DL
(Long wing)



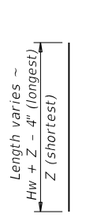
BARS RS
(Short wing)



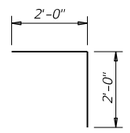
BARS RL
(Long wing)



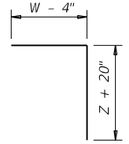
BARS J1



BARS V



BARS L



BARS J2

(1) Extend Bars P 3'-0" minimum into bottom slab of box culvert.

(2) Adjust as necessary to maintain 1 1#2" clear cover and 4" minimum between bars.

(3) Quantities shown are based on an average wing height for two wings (one structure end). To determine total quantities for two wings, multiply the tabulated values by 0.5 x (A + Lw).

(4) Recommended values of side slope are: 2:1, 3:1, 4:1, and 6:1.

(5) When shown elsewhere on the plans, construct 5" deep concrete riprap. Payment for riprap is as required by Item 432, "Riprap". Unless otherwise shown on the plans or directed by the Engineer, provide a 6" wide by 1'-6" deep reinforced concrete toewall along all edges of the riprap adjacent to natural ground; reinforce the toewall by extending typical riprap reinforcing into the toewall; and extend construction joints or grooved joints oriented in the direction of flow across the full distance of the riprap at intervals of approximately 20'. When such riprap is provided, the culvert toewall shown in SECTION B-B will not be required.

(6) At Contractor's option, culvert toewall may be ended flush with wingwall toewall. Adjust reinforcing as needed.

(7) Applicable values of skew are: 15°, 30°, and 45°.

(8) Typical wingwall angle for all skews.

(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.

MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.
In riprap concrete, 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.

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
When structure is founded on solid rock, depth of toewalls for culverts and wingwalls may be reduced or eliminated as directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for additional dimensions and information.
The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for 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 FLARED WINGS FOR SKEWED BOX CULVERTS

FW-S

FILE: fw-sstde-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		131

DATE: 4/29/2023 10:33:58 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/pwstde01-20.dgn

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

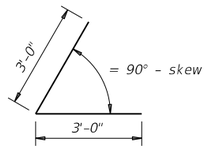
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
Maximum Wingwall Height Hw	W	X	Y	Z	Bars J1		Bars J2					
					Size	Spa	Size	Spa	Reinf (Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#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)

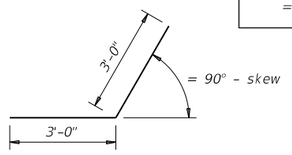
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

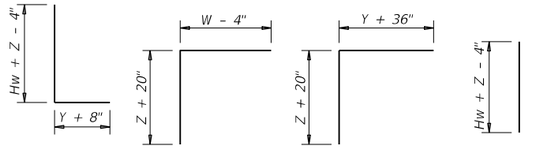
Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2



BARS J1 BARS J2 BARS J3 BARS V

WING DIMENSION FORMULAS:
(All values are in feet.)

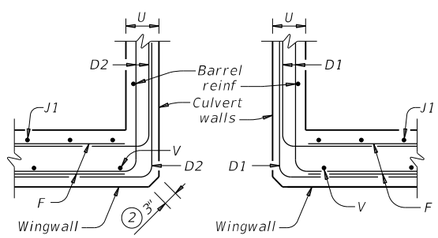
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

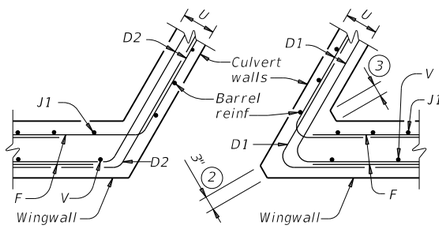
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

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

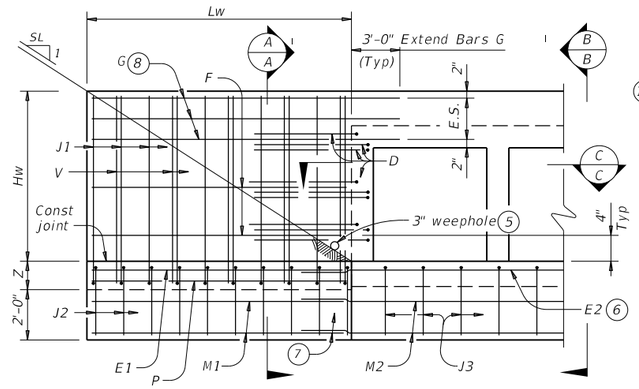
See applicable box culvert standard sheet for S, H, T, and U values.



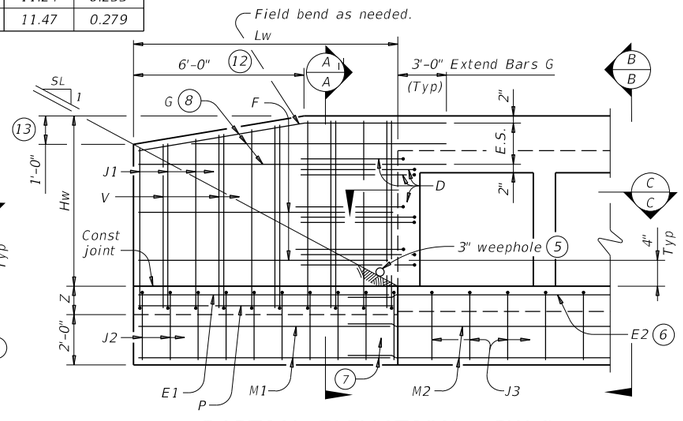
SECTION C-C - PW-1



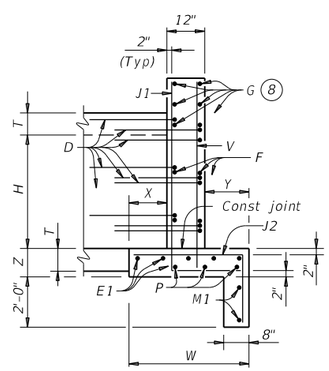
SECTION C-C - PW-2



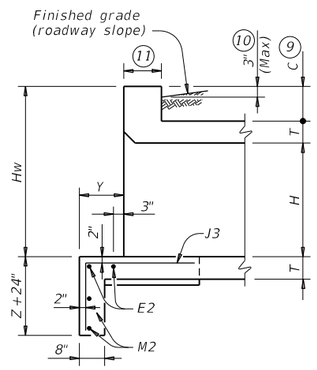
PARTIAL ELEVATION - PW-1



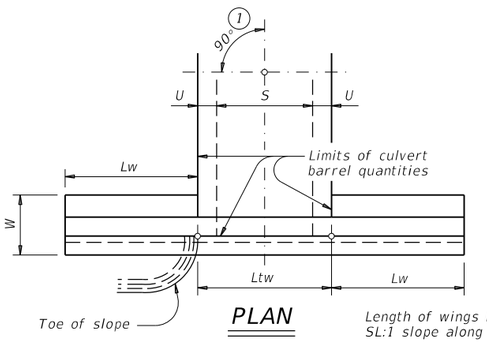
PARTIAL ELEVATION - PW-2



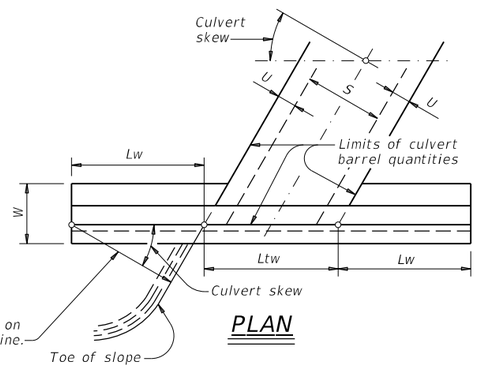
SECTION A-A
(Showing wing reinforcement.)



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

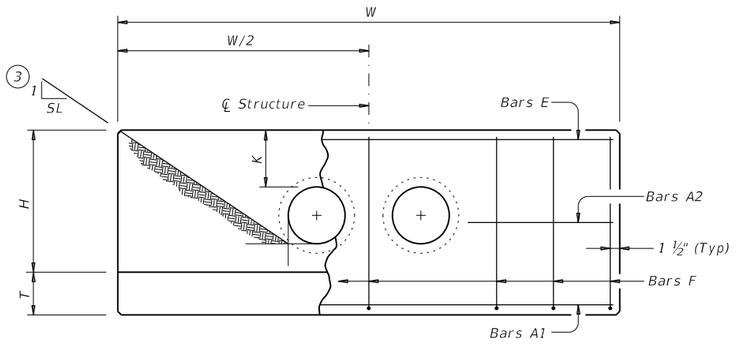
CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS
TYPES PW-1 AND PW-2

PW

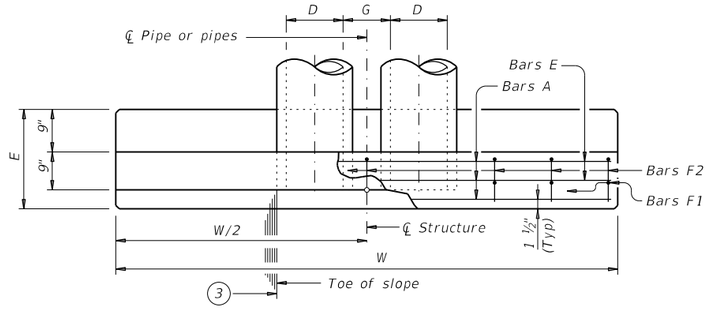
FILE: pwstde01-20.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		132

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

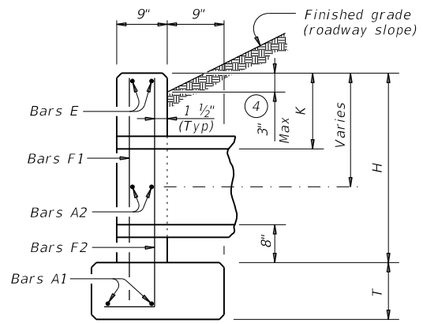
Slope	Dia of Pipe (D)	Values for One Pipe			Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' – 0"	122	1.1	1' – 9"	15	0.2
	15"	10' – 3"	136	1.3	2' – 2"	16	0.2
	18"	11' – 6"	163	1.5	2' – 8"	19	0.3
	21"	12' – 9"	200	1.8	3' – 1"	31	0.4
	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



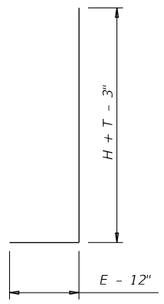
ELEVATION



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

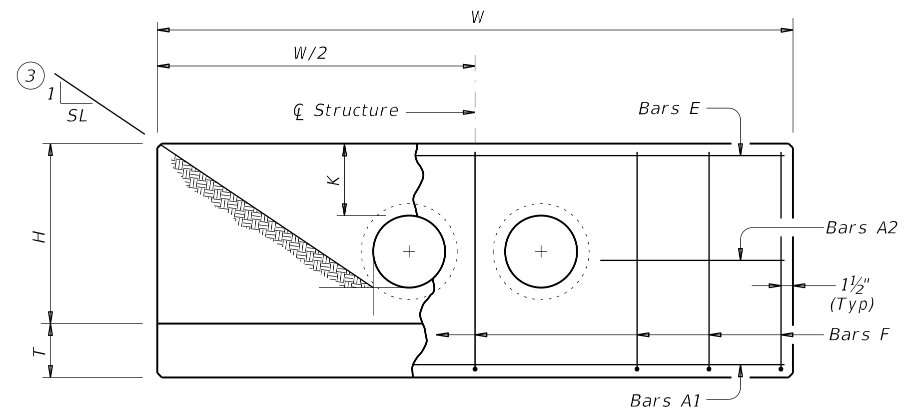
CH-PW-0

FILE:	chpw0ste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS		2351	02	017	FM 2478
		DIST	COUNTY		SHEET NO.
		DAL	COLLIN		133

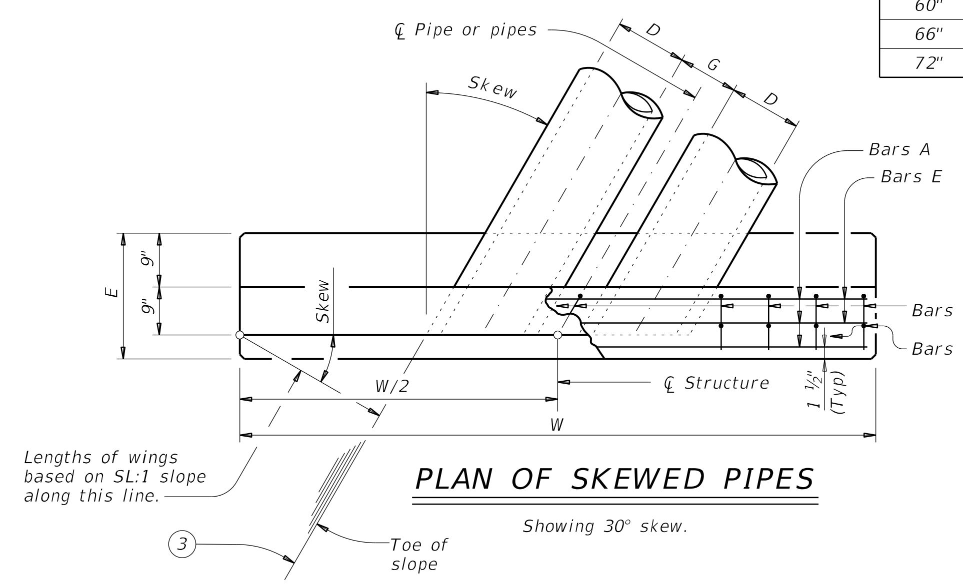
DATE: 4/29/2023 10:34:22 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/251702817/4 - Design Sheets/chpw0ste-20.dgn

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (5)

Slope	Dia of Pipe (D)	15° Skew: Values for One Pipe			15° Skew: Values To Be Added for Each Addt'l Pipe			30° Skew: Values for One Pipe			30° Skew: Values To Be Added for Each Addt'l Pipe			45° Skew: Values for One Pipe			45° Skew: Values To Be Added for Each Addt'l Pipe		
		W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)	W	Reinf (Lbs) (1)	Conc (CY) (2)
2:1	12"	9' - 4"	124	1.1	1' - 9 3/4"	15	0.2	10' - 5"	130	1.2	2' - 0"	16	0.2	12' - 9"	159	1.5	2' - 5 3/4"	17	0.3
	15"	10' - 7"	136	1.3	2' - 3"	17	0.2	11' - 10"	159	1.5	2' - 6"	18	0.2	14' - 6"	191	1.8	3' - 0 3/4"	20	0.3
	18"	11' - 11"	165	1.5	2' - 9"	19	0.3	13' - 3"	174	1.7	3' - 1"	29	0.3	16' - 3"	207	2.1	3' - 9 1/4"	33	0.4
	21"	13' - 2"	203	1.9	3' - 2 1/4"	31	0.4	14' - 9"	233	2.1	3' - 6 3/4"	33	0.4	18' - 0"	276	2.6	4' - 4 1/4"	36	0.5
	24"	14' - 6"	240	2.1	3' - 8 1/4"	34	0.4	16' - 2"	251	2.4	4' - 1 3/4"	36	0.5	19' - 10"	318	2.9	5' - 0 3/4"	39	0.6
	27"	15' - 9"	258	2.5	4' - 0 3/4"	38	0.5	17' - 7"	292	2.8	4' - 6 1/4"	39	0.6	21' - 7"	342	3.4	5' - 6 1/4"	44	0.7
	30"	17' - 1"	297	2.8	4' - 5 3/4"	40	0.6	19' - 1"	311	3.1	5' - 0"	42	0.6	23' - 4"	388	3.8	6' - 1 3/4"	47	0.8
	33"	18' - 5"	320	3.3	4' - 9 3/4"	43	0.6	20' - 6"	358	3.6	5' - 4 3/4"	46	0.7	25' - 1"	439	4.4	6' - 7 1/4"	51	0.9
	36"	19' - 8"	401	4.0	5' - 3"	47	0.9	21' - 11"	422	4.5	5' - 10 3/4"	50	0.9	26' - 10"	517	5.5	7' - 2 1/4"	55	1.2
	42"	22' - 3"	476	5.0	6' - 0 3/4"	53	1.1	24' - 10"	528	5.6	6' - 8 3/4"	56	1.2	30' - 5"	634	6.9	8' - 3"	76	1.4
	48"	25' - 11"	577	6.6	6' - 9 3/4"	60	1.3	28' - 10"	637	7.3	7' - 7 1/4"	79	1.5	35' - 4"	791	9.0	9' - 3 3/4"	88	1.8
	54"	28' - 6"	711	7.8	7' - 9"	83	1.6	31' - 9"	781	8.7	8' - 8"	81	1.8	38' - 11"	958	10.7	10' - 7 1/4"	97	2.2
	60"	31' - 1"	805	9.2	8' - 6 1/4"	91	1.9	34' - 8"	881	10.2	9' - 6 1/4"	97	2.1	42' - 5"	1,113	12.5	11' - 8"	124	2.6
	66"	33' - 8"	907	10.6	9' - 0 3/4"	98	2.1	37' - 6"	1,028	11.8	10' - 1 1/4"	102	2.4	46' - 0"	1,235	14.5	12' - 4 1/4"	132	2.9
	72"	36' - 3"	1,071	12.1	9' - 8"	105	2.4	40' - 5"	1,207	13.5	10' - 9 1/4"	110	2.6	49' - 6"	1,446	16.6	13' - 2 1/4"	141	3.2
3:1	12"	13' - 6"	178	1.6	1' - 9 3/4"	15	0.2	15' - 0"	189	1.8	2' - 0"	15	0.2	18' - 5"	237	2.2	2' - 5 3/4"	17	0.2
	15"	15' - 3"	212	1.9	2' - 3"	17	0.2	17' - 0"	223	2.1	2' - 6"	17	0.3	20' - 10"	276	2.6	3' - 0 3/4"	20	0.3
	18"	17' - 1"	231	2.3	2' - 9"	19	0.3	19' - 1"	259	2.5	3' - 1"	29	0.3	23' - 4"	318	3.1	3' - 9 1/4"	32	0.4
	21"	18' - 11"	306	2.7	3' - 2 1/4"	31	0.4	21' - 1"	339	3.0	3' - 6 3/4"	33	0.4	25' - 10"	413	3.7	4' - 4 1/4"	36	0.5
	24"	20' - 8"	345	3.1	3' - 8 3/4"	35	0.4	23' - 1"	384	3.5	4' - 1 3/4"	36	0.5	28' - 3"	462	4.2	5' - 0 3/4"	40	0.6
	27"	22' - 6"	376	3.7	4' - 0 3/4"	38	0.5	25' - 1"	438	4.1	4' - 6 1/4"	39	0.6	30' - 9"	522	5.0	5' - 6 1/4"	44	0.7
	30"	24' - 4"	422	4.1	4' - 5 3/4"	40	0.6	27' - 2"	466	4.6	5' - 0"	42	0.6	33' - 3"	578	5.6	6' - 1 3/4"	47	0.8
	33"	26' - 2"	476	4.8	4' - 10"	43	0.6	29' - 2"	522	5.3	5' - 4 3/4"	46	0.7	35' - 9"	644	6.5	6' - 7 1/4"	51	0.9
	36"	27' - 11"	590	5.9	5' - 3"	47	0.8	31' - 2"	645	6.6	5' - 10 3/4"	50	0.9	38' - 2"	787	8.0	7' - 2 1/4"	56	1.2
	42"	31' - 7"	684	7.3	6' - 0 1/4"	53	1.1	35' - 3"	776	8.2	6' - 8 3/4"	56	1.2	43' - 2"	933	10.0	8' - 3"	79	1.4
	48"	36' - 9"	880	9.6	6' - 9 3/4"	61	1.3	41' - 0"	953	10.7	7' - 7 1/4"	81	1.5	50' - 2"	1,166	13.1	9' - 3 3/4"	88	1.8
	54"	40' - 5"	1,065	11.4	7' - 9"	85	1.6	45' - 0"	1,185	12.7	8' - 8"	89	1.8	55' - 2"	1,435	15.5	10' - 7 1/4"	97	2.2
	60"	44' - 0"	1,224	13.3	8' - 6 1/4"	93	1.9	49' - 1"	1,356	14.8	9' - 6 1/4"	96	2.1	60' - 1"	1,635	18.2	11' - 8"	124	2.6
	66"	47' - 7"	1,357	15.4	9' - 1"	98	2.1	53' - 1"	1,497	17.2	10' - 1 1/4"	103	2.3	65' - 1"	1,892	21.1	12' - 4 1/4"	130	2.9
	72"	51' - 3"	1,624	17.7	9' - 8"	105	2.3	57' - 2"	1,787	19.7	10' - 9 1/4"	109	2.6	70' - 0"	2,218	24.1	13' - 2 1/4"	139	3.2
4:1	12"	17' - 7"	232	2.1	1' - 9 3/4"	15	0.2	19' - 8"	259	2.4	2' - 0"	16	0.2	24' - 0"	314	2.9	2' - 5 3/4"	18	0.2
	15"	19' - 11"	272	2.5	2' - 3"	17	0.2	22' - 3"	301	2.8	2' - 6"	18	0.3	27' - 3"	361	3.5	3' - 0 3/4"	21	0.3
	18"	22' - 3"	313	3.0	2' - 9"	19	0.3	24' - 10"	344	3.3	3' - 1"	29	0.3	30' - 5"	427	4.0	3' - 9 1/4"	32	0.4
	21"	24' - 7"	407	3.6	3' - 2 1/4"	31	0.4	27' - 5"	446	4.0	3' - 6 3/4"	33	0.4	33' - 7"	549	4.9	4' - 4 1/4"	36	0.5
	24"	26' - 11"	455	4.1	3' - 8 3/4"	35	0.4	30' - 0"	499	4.5	4' - 1 3/4"	36	0.5	36' - 9"	609	5.6	5' - 0 3/4"	40	0.6
	27"	29' - 3"	514	4.8	4' - 0 3/4"	38	0.5	32' - 7"	562	5.4	4' - 6 1/4"	40	0.6	39' - 11"	703	6.6	5' - 6 1/4"	43	0.7
	30"	31' - 7"	568	5.4	4' - 5 3/4"	40	0.6	35' - 3"	620	6.0	5' - 0"	42	0.6	43' - 2"	768	7.4	6' - 1 3/4"	49	0.8
	33"	33' - 11"	634	6.2	4' - 10"	43	0.7	37' - 10"	710	7.0	5' - 4 3/4"	46	0.7	46' - 4"	848	8.5	6' - 7 1/4"	52	0.9
	36"	36' - 3"	776	7.7	5' - 3"	48	0.9	40' - 5"	868	8.6	5' - 10 3/4"	49	0.9	49' - 6"	1,058	10.6	7' - 2 1/4"	56	1.1
	42"	40' - 11"	921	9.6	6' - 0 1/4"	53	1.0	45' - 7"	1,022	10.7	6' - 8 3/4"	57	1.2	55' - 10"	1,262	13.1	8' - 3"	78	1.4
	48"	47' - 7"	1,152	12.6	6' - 10"	61	1.3	53' - 1"	1,268	14.0	7' - 7 1/4"	80	1.5	65' - 1"	1,587	17.2	9' - 3 3/4"	86	1.8
	54"	52' - 3"	1,416	14.9	7' - 9 1/4"	86	1.6	58' - 4"	1,589	16.6	8' - 8"	89	1.8	71' - 5"	1,924	20.4	10' - 7 1/4"	95	2.2
	60"	56' - 11"	1,606	17.5	8' - 6 3/4"	92	1.9	63' - 6"	1,806	19.5	9' - 6 1/4"	95	2.1	77' - 9"	2,192	23.9	11' - 8"	122	2.6
	66"	61' - 7"	1,819	20.2	9' - 0 3/4"	97	2.1	68' - 8"	2,019	22.5	10' - 1 1/4"	101	2.4	84' - 2"	2,472	27.6	12' - 4 1/4"	131	2.9
	72"	66' - 3"	2,150	23.2	9' - 8"	104	2.4	73' - 11"	2,379	25.9	10' - 9 1/4"	108	2.6	90' - 6"	2,937	31.7	13' - 2 1/4"	138	3.2
6:1	12"	25' - 11"	342	3.1	1' - 9 3/4"	15	0.2	28' - 10"	374	3.5	2' - 0"	16	0.2	35' - 4"	456	4.3	2' - 5 3/4"	17	0.2
	15"	29' - 3"	390	3.7	2' - 3"	17	0.2	32' - 7"	442	4.2	2' - 6"	18	0.2	39' - 11"	549	5.1	3' - 0 3/4"	20	0.3
	18"	32' - 7"	459	4.4	2' - 9"	20	0.3	36' - 4"	515	4.9	3' - 1"	29	0.3	44' - 7"	629	6.0	3' - 9 1/4"	33	0.4
	21"	36' - 0"	608	5.3	3' - 2 1/4"	31	0.4	40' - 2"	660	5.9	3' - 6 3/4"	33	0.4	49' - 2"	823	7.2	4' - 4 1/4"	38	0.5
	24"	39' - 4"	672	6.0	3' - 8 3/4"	35	0.4	43' - 11"	748	6.7	4' - 1 3/4"	36	0.5	53' - 9"	920	8.2	5' - 0 3/4"	42	0.6
	27"	42' - 8"	770	7.1	4' - 0 3/4"	38	0.5	47' - 8"	852	8.0	4' - 6 1/4"	41	0.5	58' - 4"	1,039	9.7	5' - 6 1/4"	45	0.7
	30"	46' - 1"	839	8.0	4' - 5 3/4"	40	0.6	51' - 5"	949	8.9	5' - 0"	44	0.6	62' - 11"	1,162	10.9	6' - 1 3/4"	48	0.8
	33"	49' - 5"	947	9.2	4' - 10"	45	0.7	55' - 2"	1,040	10.3	5' - 4 3/4"	48	0.7	67' - 6"	1,292	12.6	6' - 7 1/4"	50	0.9
	36"	52' - 10"	1,151	11.4	5' - 3"	49	0.8	58' - 11"	1,287	12.7	5' - 10 3/4"	51	1.0	72' - 1"	1,583	15.6	7' - 2 1/4"	55	1.1
	42"	59' - 6"	1,365	14.2	6' - 0 1/4"	55	1.0	66' - 5"	1,530	15.8	6' - 8 3/4"	57	1.2	81' - 4"	1,875	19.4	8' - 3"	76	1.4
	48"	69' - 4"	1,737	18.5	6' - 10"	59	1.3	77' - 4"	1,942	20.7	7' - 7 1/4"	79	1.5	94' - 9"	2,368	25.3	9' - 3 3/4"	86	1.8
	54"	76' - 1"	2,138	22.0	7' - 9 1/4"	83	1.6	84' - 10"	2,378	24.6	8' - 8"	87	1.8	103' - 11"	2,912	30.1	10' - 7 1/4"	95	2.2
	60"	82' - 10"	2,426	25.8	8' - 6 3/4"	90	1.9	92' - 5"	2,681	28.8	9' - 6 1/4"	94	2.1	113' - 2"	3,294	35.3	11' - 8"	122	2.6
	66"	89' - 7"	2,730	29.9	9' - 0 3/4"	96	2.1	99' - 11"	3,038	33.3	10' - 1 1/4"	101	2.4	122' - 4"	3,697	40.8	12' - 4 1/4"	130	2.9
	72"	96' - 3"	3,218	34.2	9' - 8"	102	2.4	107' - 5"	3,580	38.2	10' - 9 1/4"	108	2.6	131' - 6"	4,372	46.8	13' - 2 1/4"	139	3.2

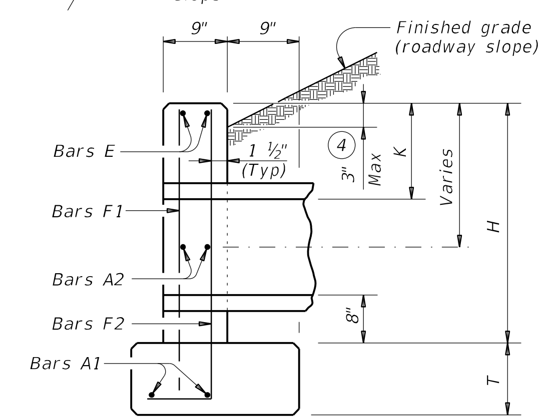


ELEVATION



PLAN OF SKEWED PIPES

Showing 30° skew.



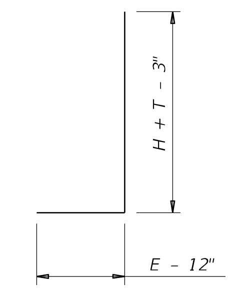
SECTION AT CENTER OF PIPE

TABLE OF CONSTANT DIMENSIONS

Dia of Pipe (D)	G	K (5)	H	T	E
12"	0' - 9"	1' - 0"	2' - 8"	0' - 9"	1' - 9"
15"	0' - 11"	1' - 0"	2' - 11"	0' - 9"	1' - 9"
18"	1' - 2"	1' - 0"	3' - 2"	0' - 9"	1' - 9"
21"	1' - 4"	1' - 0"	3' - 5"	0' - 9"	2' - 0"
24"	1' - 7"	1' - 0"	3' - 8"	0' - 9"	2' - 0"
27"	1' - 8"	1' - 0"	3' - 11"	0' - 9"	2' - 3"
30"	1' - 10"	1' - 0"	4' - 2"	0' - 9"	2' - 3"
33"	1' - 11"	1' - 0"	4' - 5"	0' - 9"	2' - 6"
36"	2' - 1"	1' - 0"	4' - 8"	1' - 0"	2' - 6"
42"	2' - 4"	1' - 0"	5' - 2"	1' - 0"	2' - 9"
48"	2' - 7"	1' - 3"	5' - 11"	1' - 0"	3' - 0"
54"	3' - 0"	1' - 3"	6' - 5"	1' - 0"	3' - 3"
60"	3' - 3"	1' - 3"	6' - 11"	1' - 0"	3' - 6"
66"	3' - 3"	1' - 3"	7' - 5"	1' - 0"	3' - 9"
72"	3' - 4"	1' - 3"	7' - 11"	1' - 0"	4' - 0"

TABLE OF REINFORCING STEEL (6)

Bar	Size	Spa	No.
A1	#5	~	2
A2	#5	1' - 6"	~
E	#5	~	2
F	#5	1' - 0"	~



BARS F2

MATERIAL NOTES:
Provide Grade 60 reinforcing steel.
Provide Class C concrete (f'c = 3,600 psi).

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Do not mount bridge rails of any type directly to these culvert headwalls.
This standard may not be used for wall heights, H, exceeding the values shown.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing dimensions are out-to-out of bars.

(1) Total quantites include one 3'-1" lap for bars over 60' in length.

(2) Quantities shown are for concrete pipe and will increase slightly for metal pipe installations.

(3) Indicated slope is perpendicular to centerline pipe or pipes.

(4) For vehicle safety, construct curbs no more than 3" above finished grade. Reduce curb heights, if necessary, to meet these requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.

(5) Dimensions shown are usual and maximum.

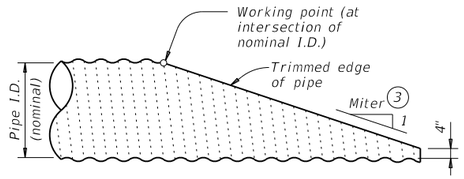
(6) Quantities shown are for one structure end only (one headwall).

Texas Department of Transportation | Bridge Division Standard

CONCRETE HEADWALLS WITH PARALLEL WINGS FOR SKEWED PIPE CULVERTS

CH-PW-S

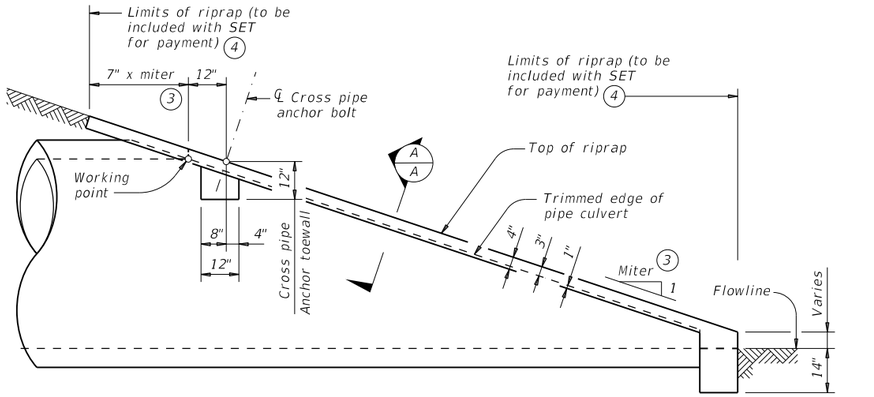
FILE: chpwsste-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	134



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.

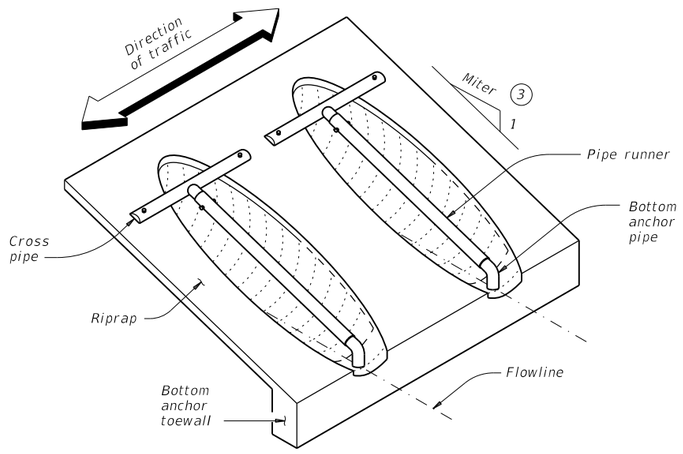
SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

(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.

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	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		135

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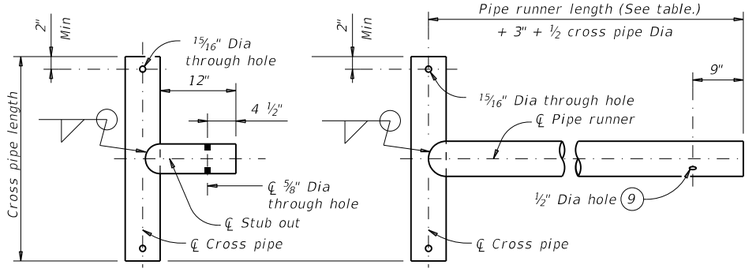
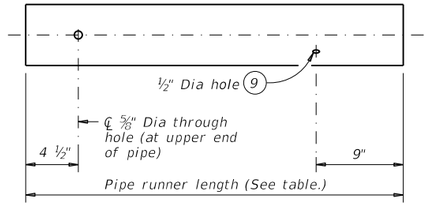


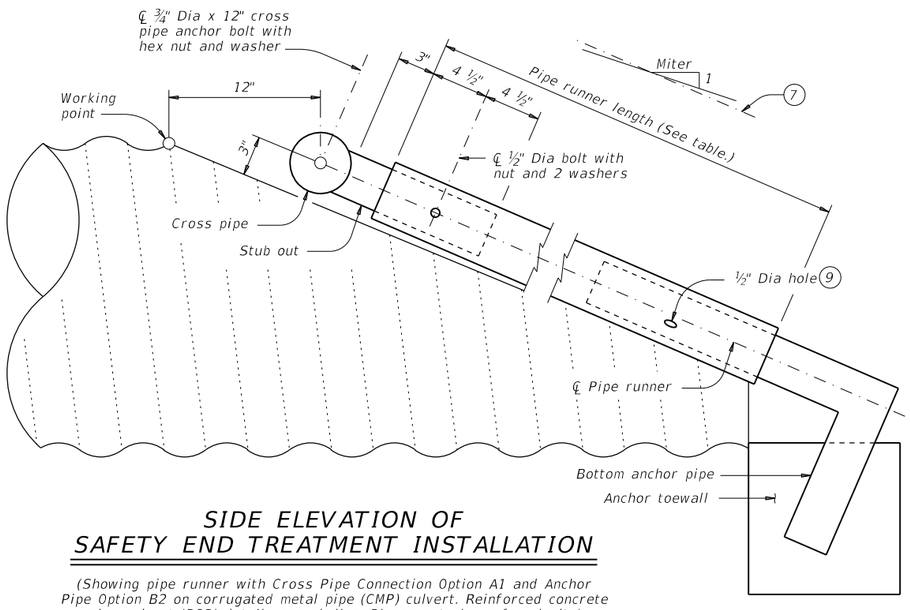
OPTION A1 OPTION A2

CROSS PIPE AND CONNECTIONS DETAILS



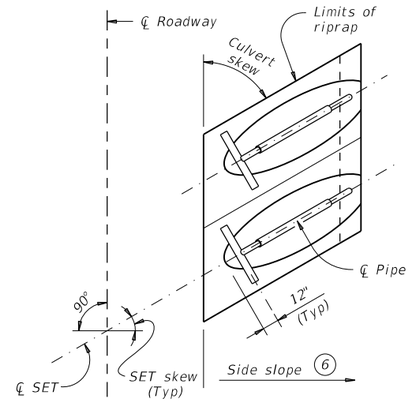
NOTE: The separate pipe runner shown is required when Cross Pipe Connection Option A1 is used.

PIPE RUNNER DETAILS

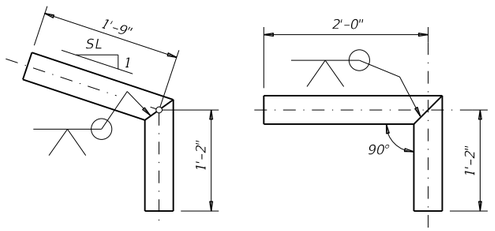


SIDE ELEVATION OF SAFETY END TREATMENT INSTALLATION

(Showing pipe runner with Cross Pipe Connection Option A1 and Anchor Pipe Option B2 on corrugated metal pipe (CMP) culvert. Reinforced concrete pipe culvert (RCP) details are similar. Riprap not shown for clarity)

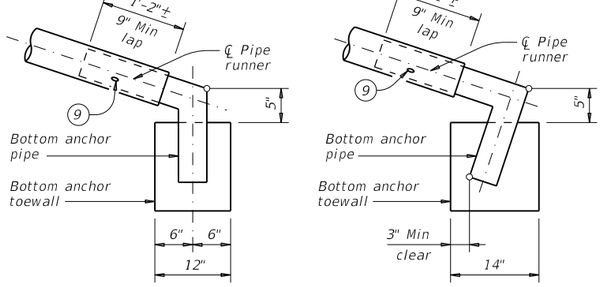


PLAN OF SKEWED INSTALLATION



OPTION B1 OPTION B2

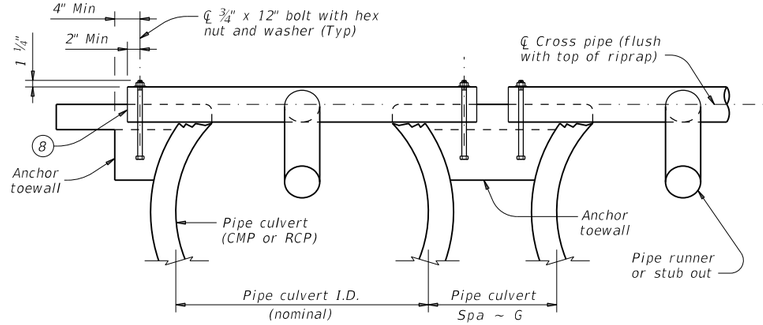
BOTTOM ANCHOR PIPE DETAILS (10)



OPTION B1 OPTION B2

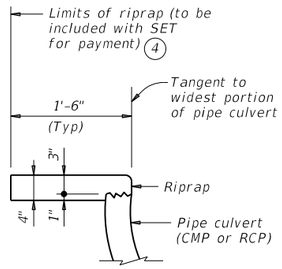
BOTTOM ANCHOR TOEWALL DETAILS

(Culvert and riprap not shown for clarity.)



SHOWING CROSS PIPE AND ANCHOR TOEWALL

SECTION A-A



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

(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

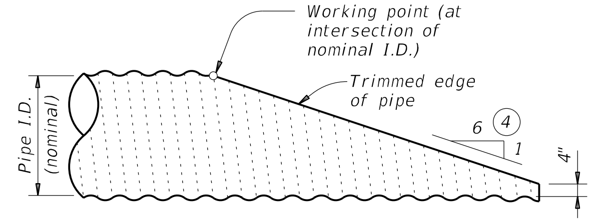
Bridge Division Standard

SAFETY END TREATMENT

FOR 12" DIA TO 60" DIA PIPE CULVERTS
TYPE II ~ CROSS DRAINAGE

SETP-CD

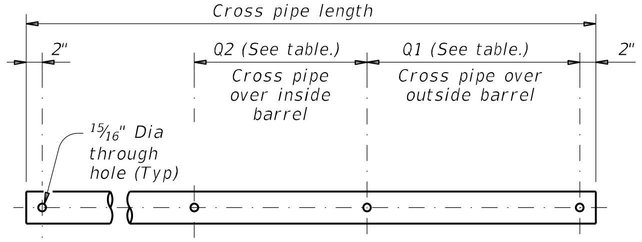
FILE: setpcdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		136



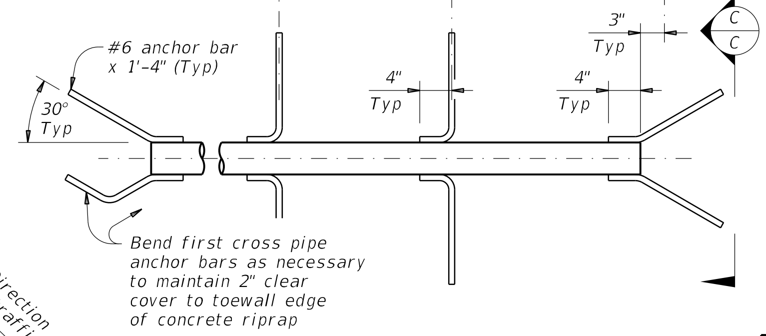
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

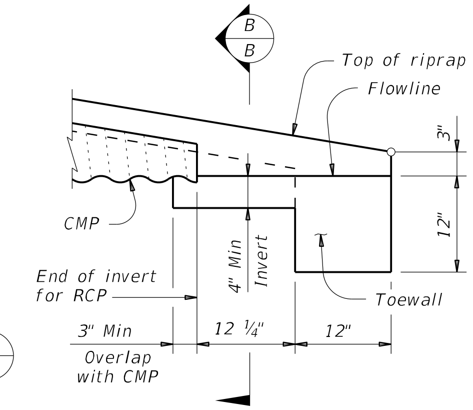
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR



PIPE WITH ANCHOR BARS

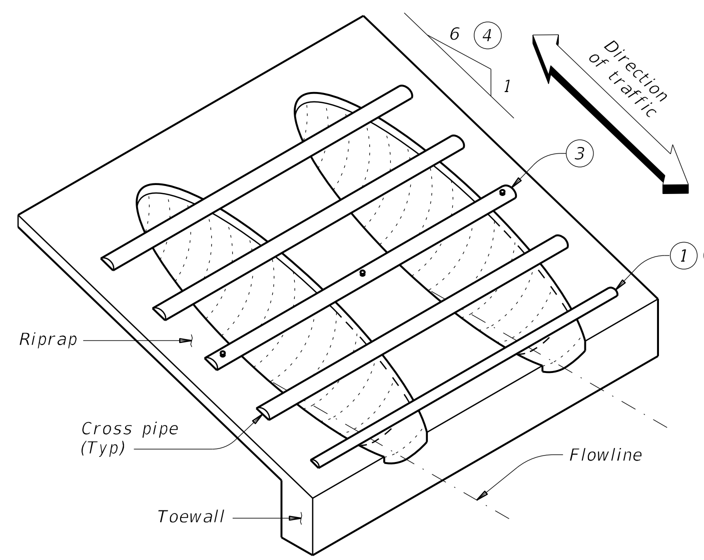


DETAIL "A"

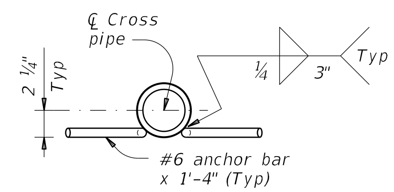
(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)

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 1/2" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

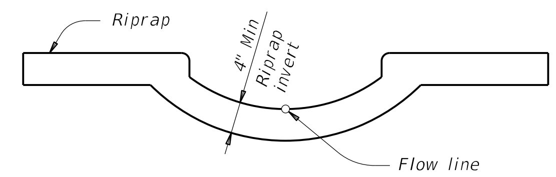


ISOMETRIC VIEW OF TYPICAL INSTALLATION



SECTION C-C

CROSS PIPE DETAILS



SECTION B-B

(Cross pipes not shown for clarity.)

(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.

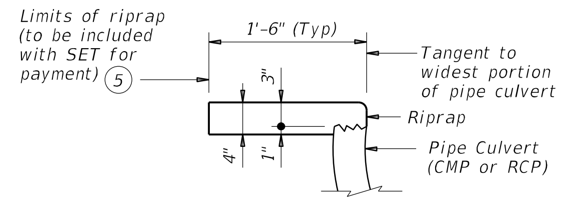
GENERAL NOTES:

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.

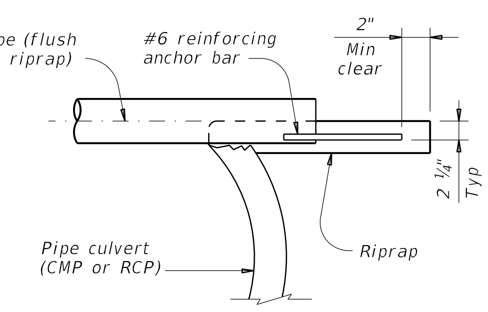
Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap".

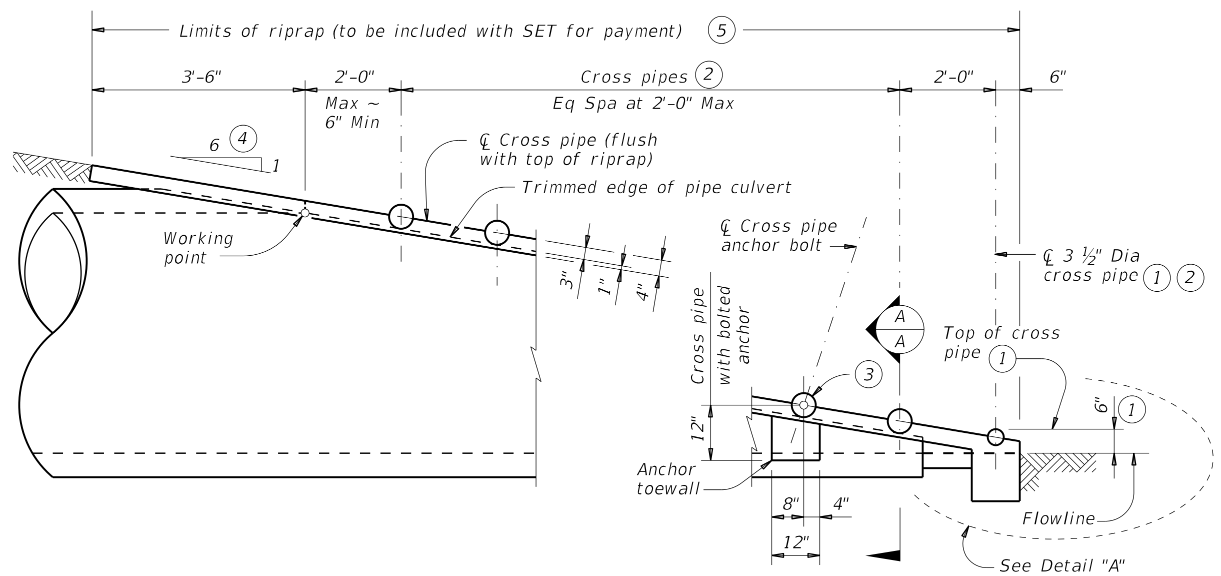
Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

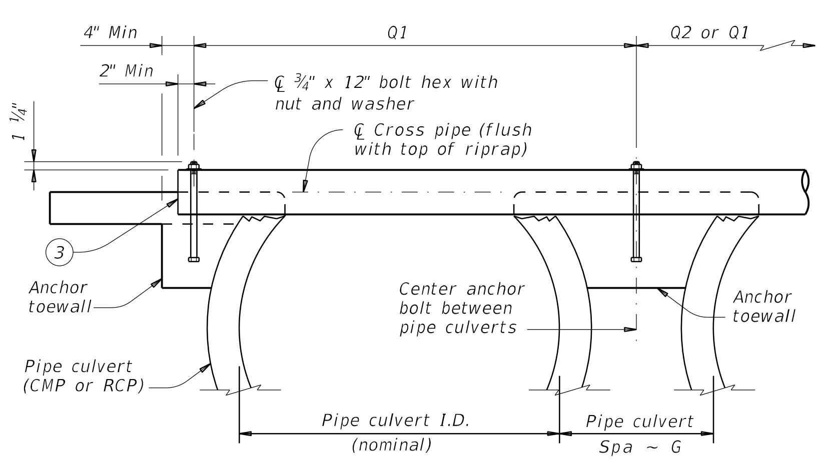


SHOWING CROSS PIPE WITH ANCHOR BAR



SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING CROSS PIPE WITH BOLTED ANCHOR

SECTION A-A

Texas Department of Transportation | Bridge Division Standard

SAFETY END TREATMENT

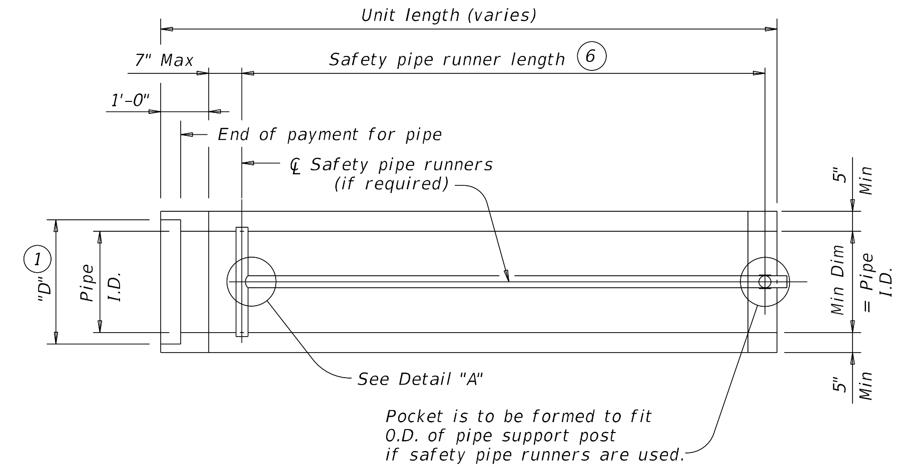
FOR 12" DIA TO 72" DIA PIPE CULVERTS TYPE II ~ PARALLEL DRAINAGE

SETP-PD

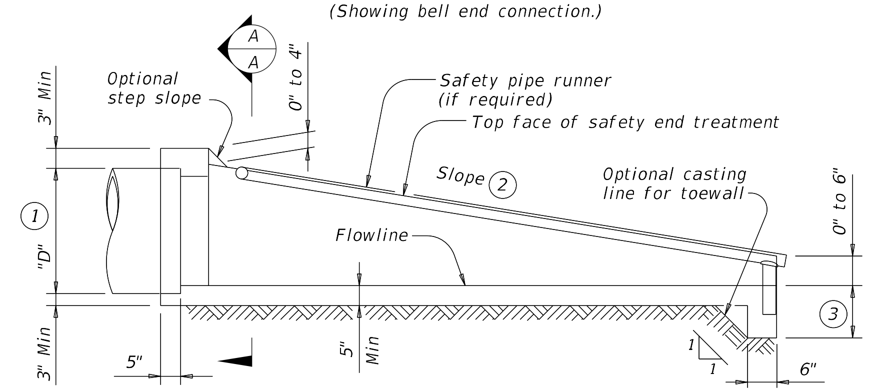
FILE: setppdse-20.dgn	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020	CONT 2351	SECT 02	JOB 017	HIGHWAY FM 2478
REVISIONS	DIST DAL	COUNTY COLLIN		SHEET NO. 137

REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

Pipe I.D.	RCP Wall "B" Thickness	TP Wall Thickness (8)	"D" (1)	Slope	Min Length of Unit	Single Pipe Skew	Single Pipe Pipe Runners Required	Multiple Pipes Skew	Multiple Pipes Pipe Runners Required
12"	2"	1.15"	17.00"	3:1	2' - 11"	≤ 45°	No	≤ 45°	No
				4:1	3' - 6"				
				6:1	4' - 9"				
15"	2 1/4"	1.30"	20.50"	3:1	3' - 8"	≤ 45°	No	≤ 45°	No
				4:1	4' - 7"				
				6:1	6' - 5"				
18"	2 1/2"	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 1/2"	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 1/2"	2.7"	52.50"	3:1	11' - 1"	≥ 0°	Yes	≥ 0°	Yes
				4:1	14' - 5"				
				6:1	21' - 2"				



PLAN
(Showing bell end connection.)



LONGITUDINAL ELEVATION
(Showing bell end connection.)

SAFETY PIPE RUNNER DIMENSIONS

Max Safety Pipe Runner Length	Required Pipe Runner Size: Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" 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.

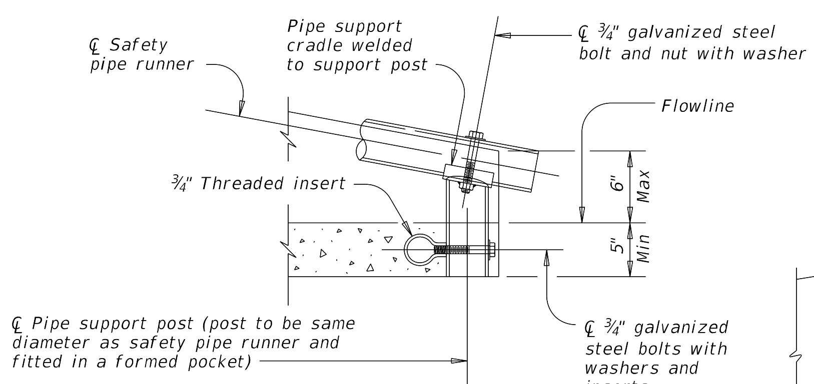
(4) Fill the top 4" of void between precast end treatments with concrete riprap. Concrete riprap is considered subsidiary to the Item 467, "Safety End Treatment".

(5) Adjust clear distance between pipes to provide for the minimum distance between safety end treatments.

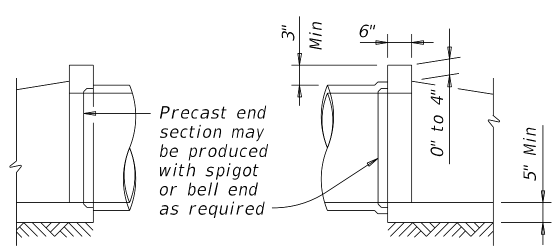
(6) Measured along slope.

(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.

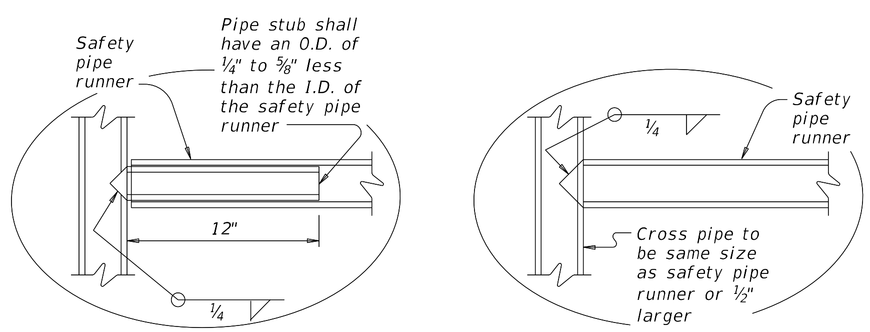
(8) Thermoplastic pipe wall thickness may vary. Adjust accordingly. Thermoplastic pipe requires the safety end treatments to have a bell end for grouted connections.



END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS
(If required)



OPTIONAL JOINT FOR RCP
(Showing joint between RCP and precast safety end treatment)



OPTION A

DETAIL A
(If required)

OPTION B

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).

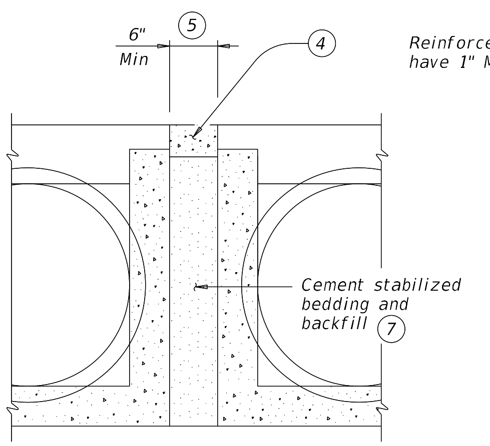
At the option and expense of the Contractor, the next larger size of safety end treatment may be furnished as long as the "D" dimension cast is that of the required size of pipe.

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.

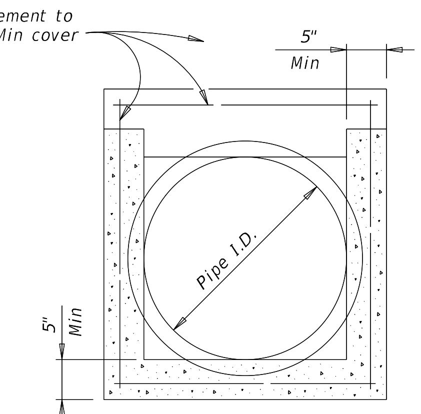
Provide safety pipe runners, cross pipes, pipe support posts, and pipe stubs meeting the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

Galvanize all steel components except reinforcing steel after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

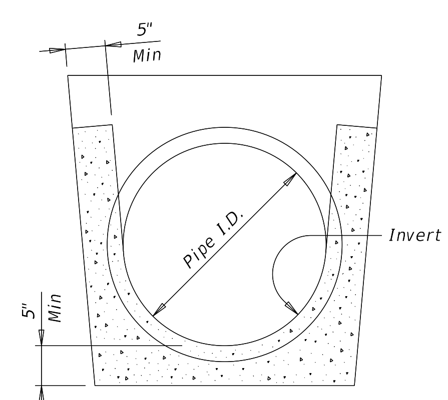
Connect RCP using the Optional Joint for RCP detail shown or in accordance with Item 464 "Reinforced Concrete Pipe". Connect TP by grouting. See Pipe and Box Grouted Connections (PBGC) standard for grouted connections with TP and precast safety end treatment.



MULTIPLE PIPE INSTALLATION

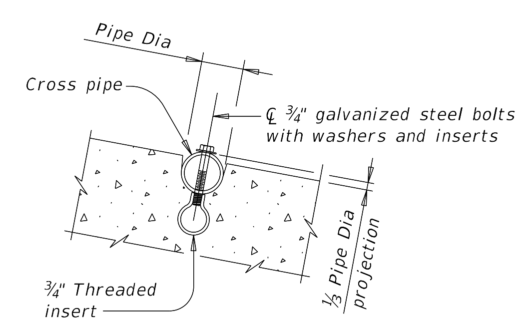


OPTION WITH SQUARE BOTTOM



OPTION WITH INVERT BOTTOM

SECTION A-A



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS
(If required)

Texas Department of Transportation | Bridge Division Standard

PRECAST SAFETY END TREATMENT
TYPE II ~ CROSS DRAINAGE
PSET-SC

FILE: pssetscss-21.dgn	DN: RLW	CK: KLR	DW: JTR	CK: GAF
©TxDOT February 2020	CONT 2351	SECT 02	JOB 017	HIGHWAY FM 2478
REVISIONS 12-21: Added 42" TP	DIST DAL	COUNTY COLLIN		SHEET NO. 138

DATE: 4/29/2023 10:36:06 AM
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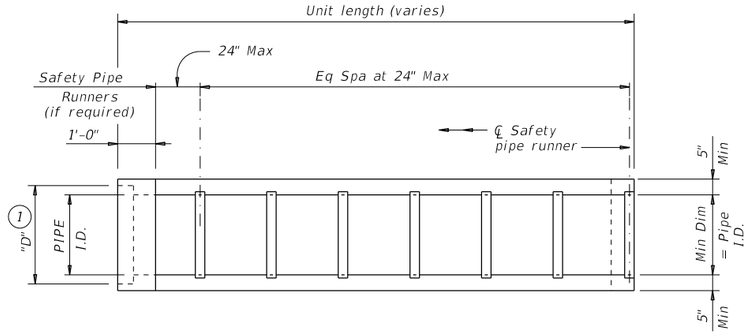
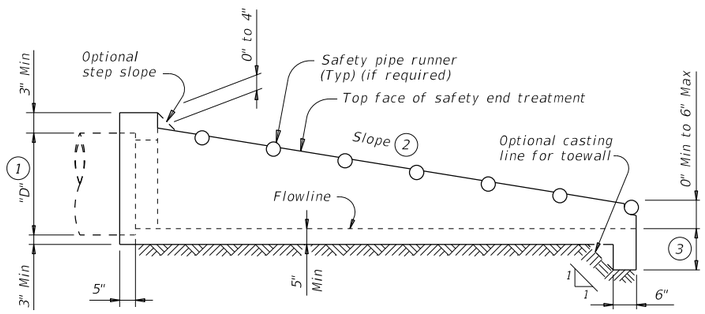


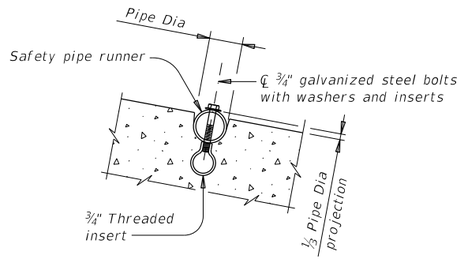
PLAN

(Showing bell end connection.)



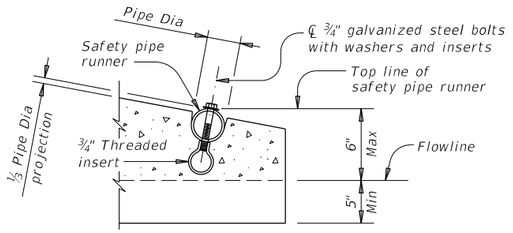
LONGITUDINAL ELEVATION

(Showing bell end connection.)

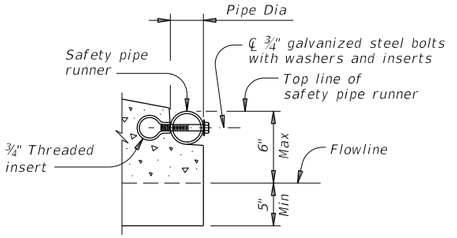


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



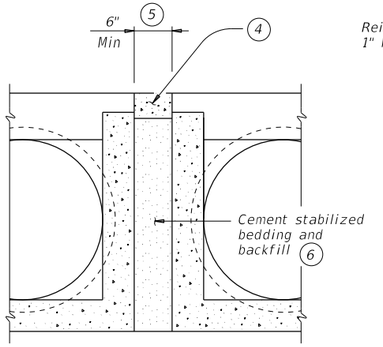
OPTION A



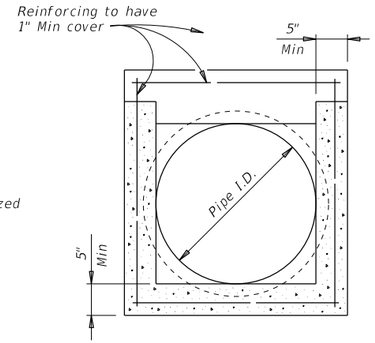
OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

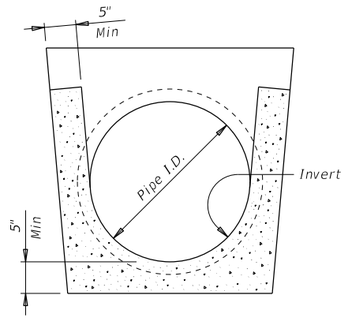
(If required)



MULTIPLE PIPE INSTALLATION

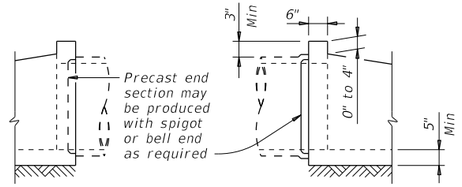


OPTION WITH SQUARE BOTTOM



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	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		139

DATE: 4/29/2023 10:36:27 AM
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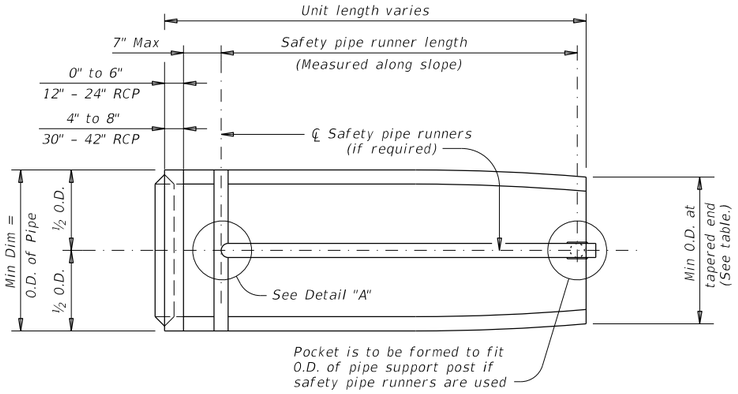
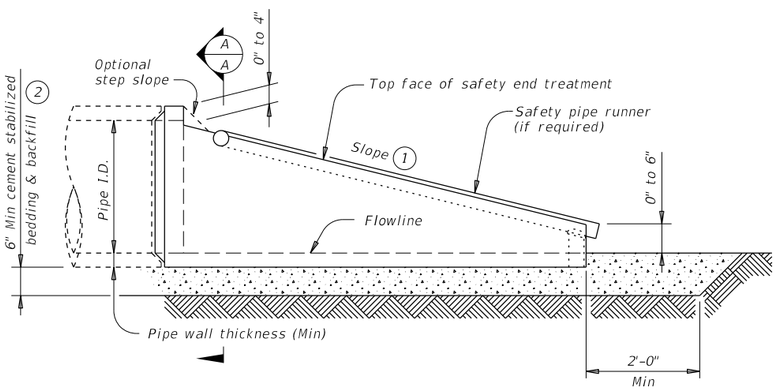


PLAN VIEW

(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.

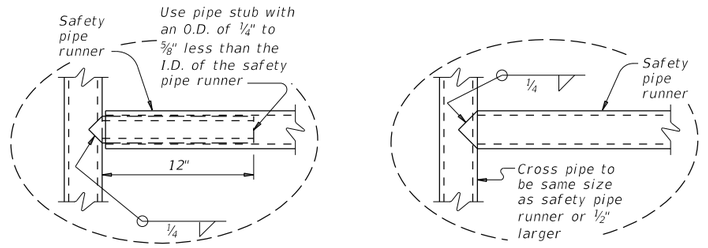
(2) Provide cement stabilized bedding and backfill in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill is considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill as directed by Engineer.

(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.

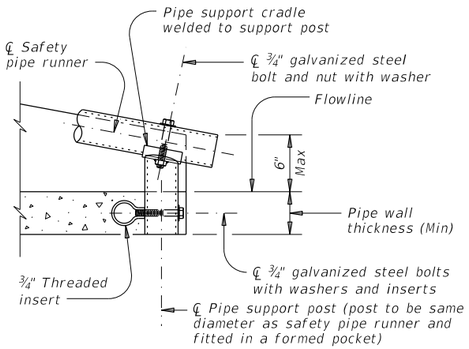
REQUIREMENTS FOR CULVERT PIPES AND SAFETY PIPE RUNNERS

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"				



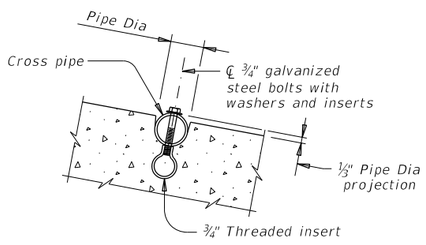
OPTION A OPTION B

DETAIL A



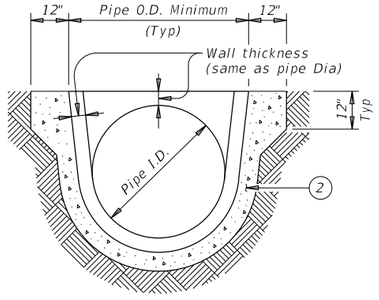
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

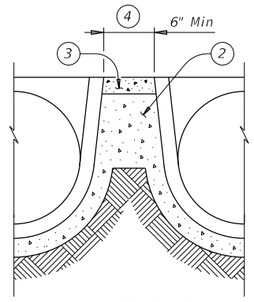


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-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	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		140

DATE: 4/29/2023 10:36:46 AM
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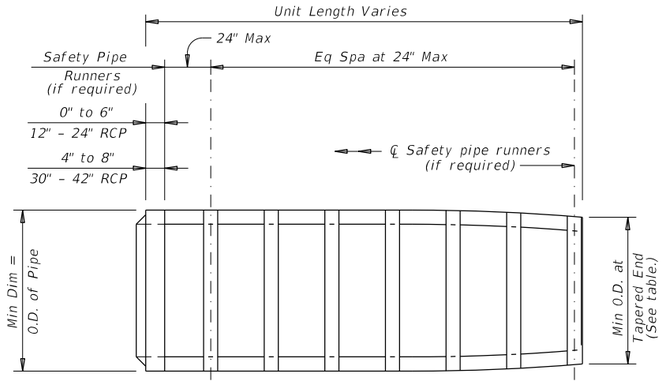
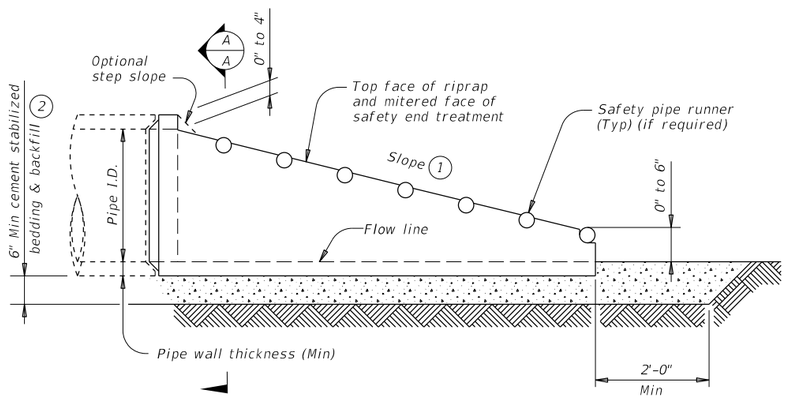


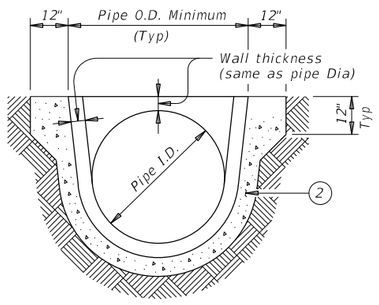
PLAN VIEW – 12" THRU 24"

(Showing spigot end connection.)

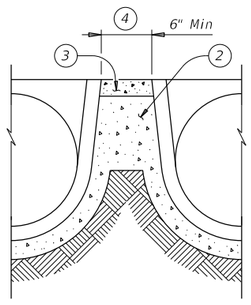


LONGITUDINAL ELEVATION - 12" THRU 24"

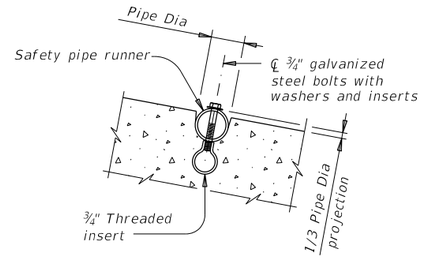
(Showing spigot end connection.)



SECTION A-A

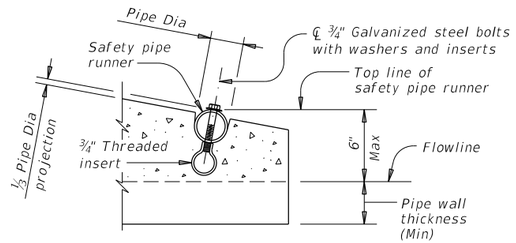


MULTIPLE PIPE INSTALLATION

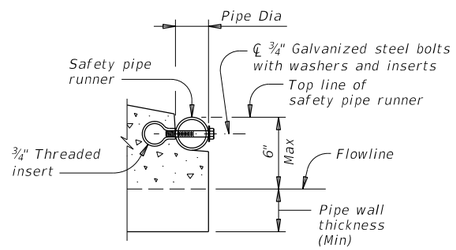


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



OPTION A



OPTION B

END DETAILS FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

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.

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.

Texas Department of Transportation

Bridge Division Standard

PRECAST SAFETY END TREATMENT

TYPE II ~ PARALLEL DRAINAGE

PSET-RP

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©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		141

DATE: 5/2/2023 1:15:36 PM
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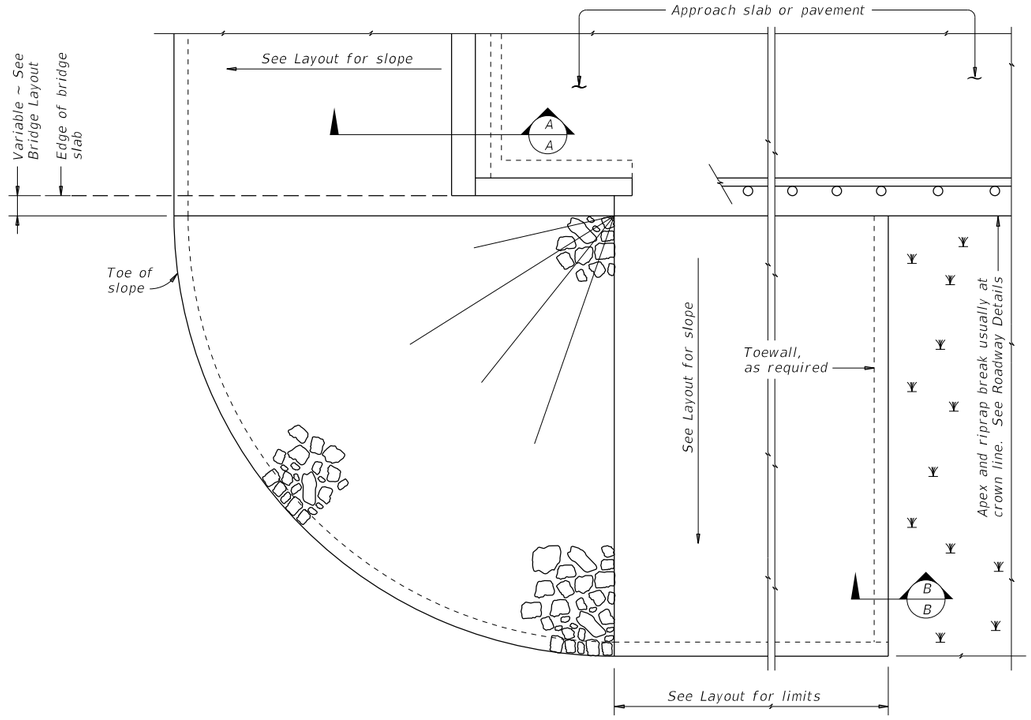
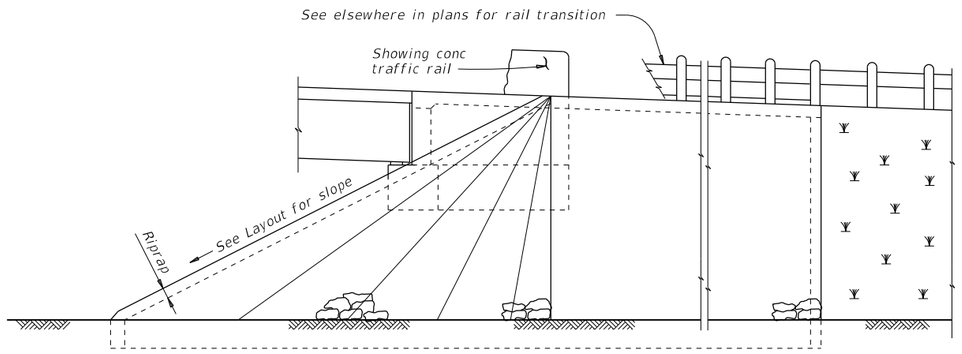
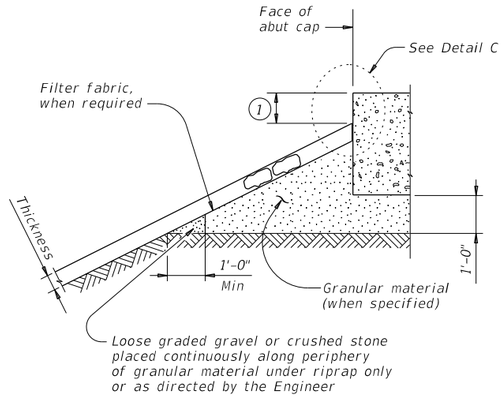


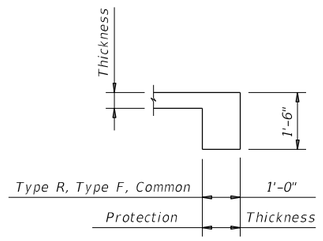
PLAN



ELEVATION

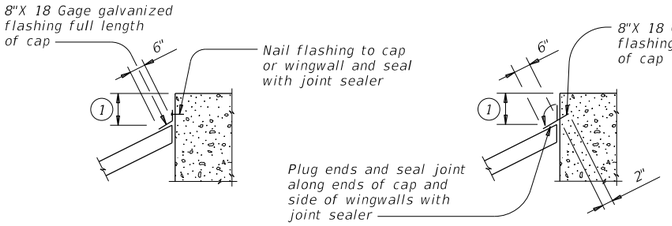


SECTION A-A AT CAP



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

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.

(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.

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		142

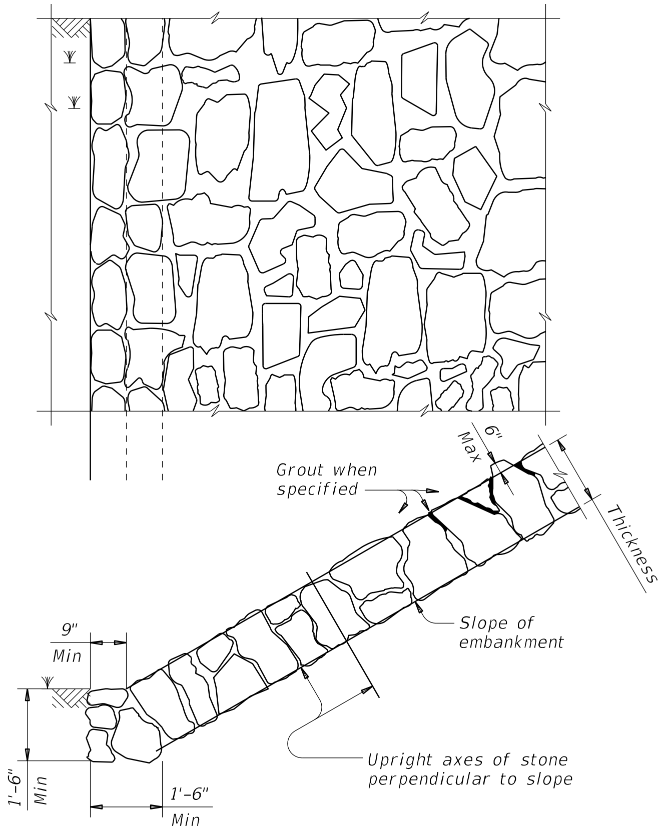


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

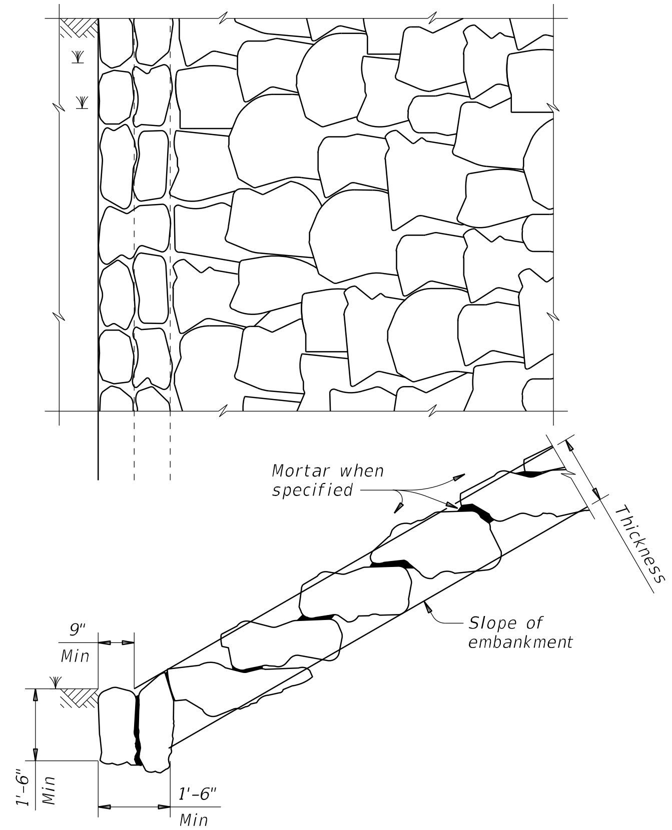


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

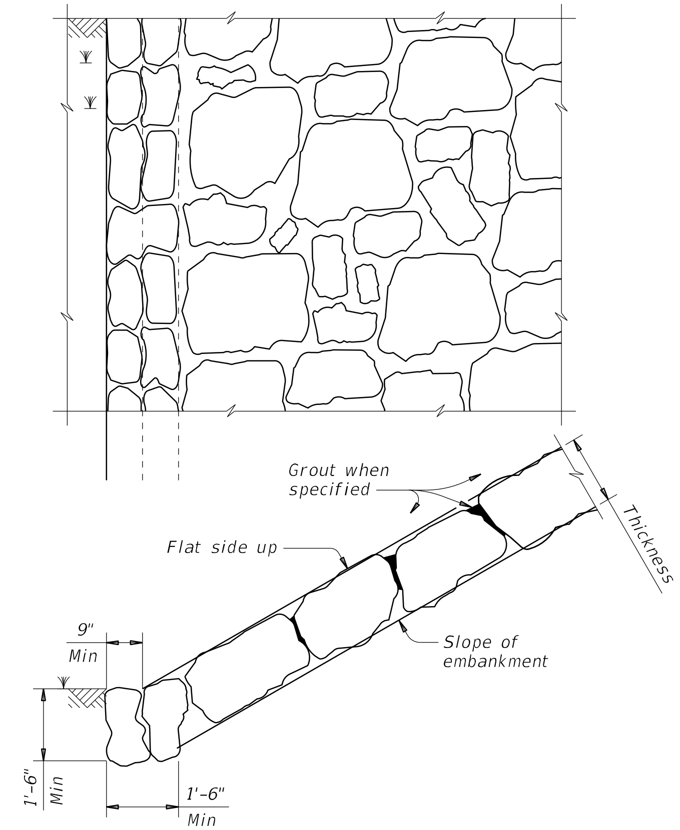


FIGURE 3 ~ TYPE F STONE RIPRAP

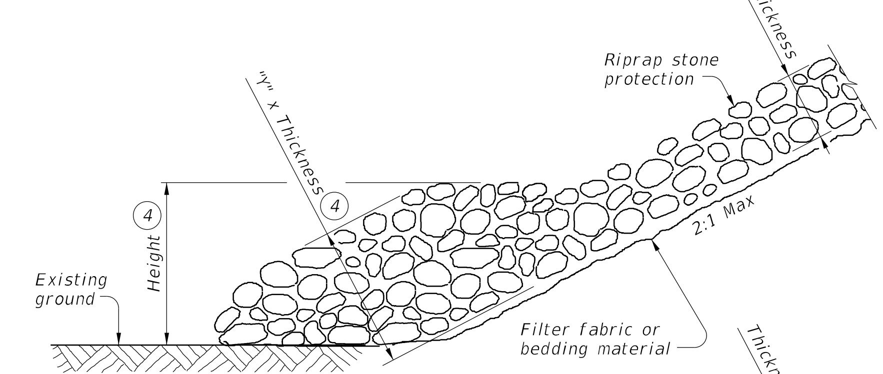
grouted

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

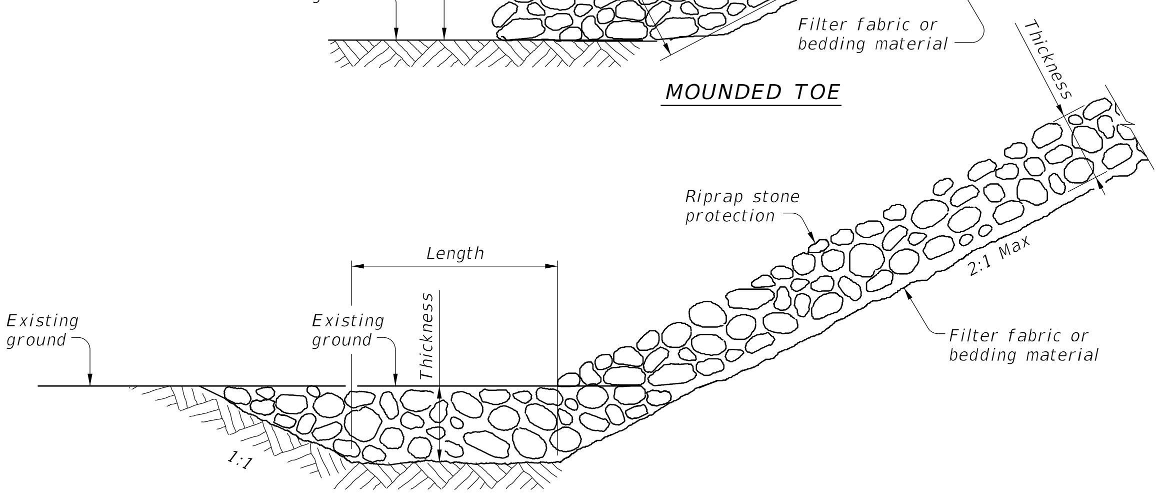
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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)

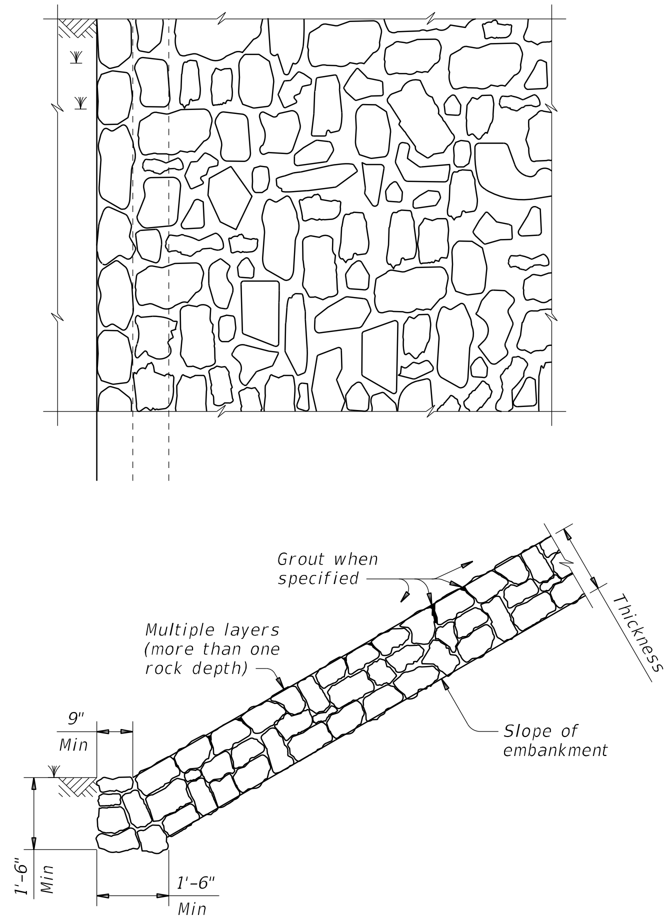


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

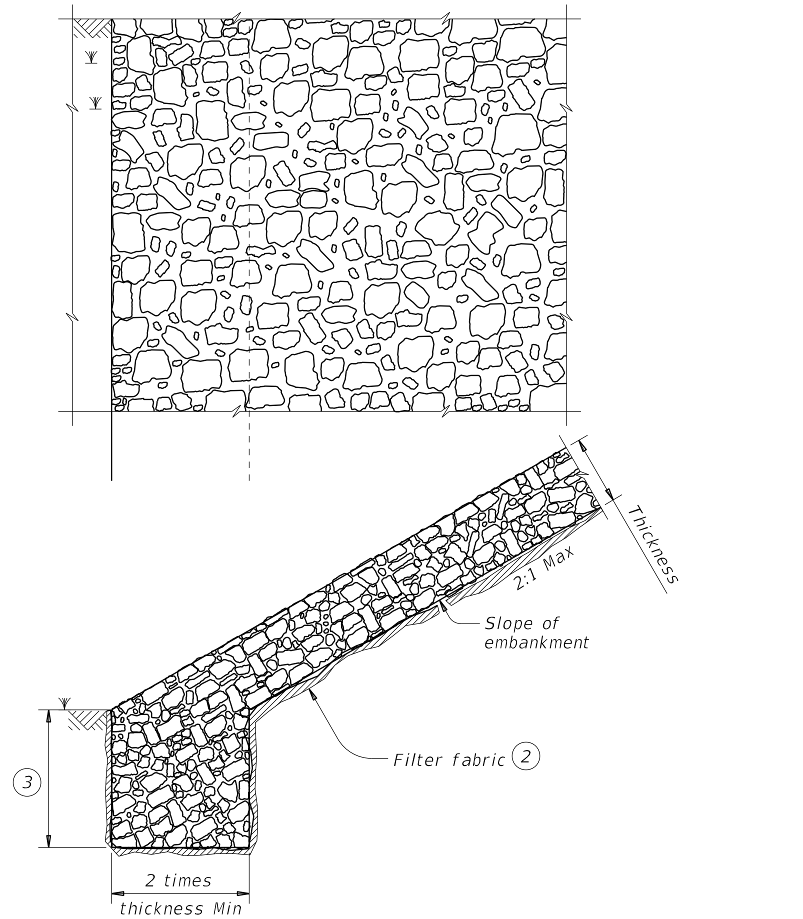


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

Texas Department of Transportation | Bridge Division Standard

STONE RIPRAP

SRR

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©TxDOT April 2019	CONT 2351	SECT 02	JOB 017	HIGHWAY FM 2478
REVISIONS	DIST DAL	COUNTY COLLIN		SHEET NO. 143

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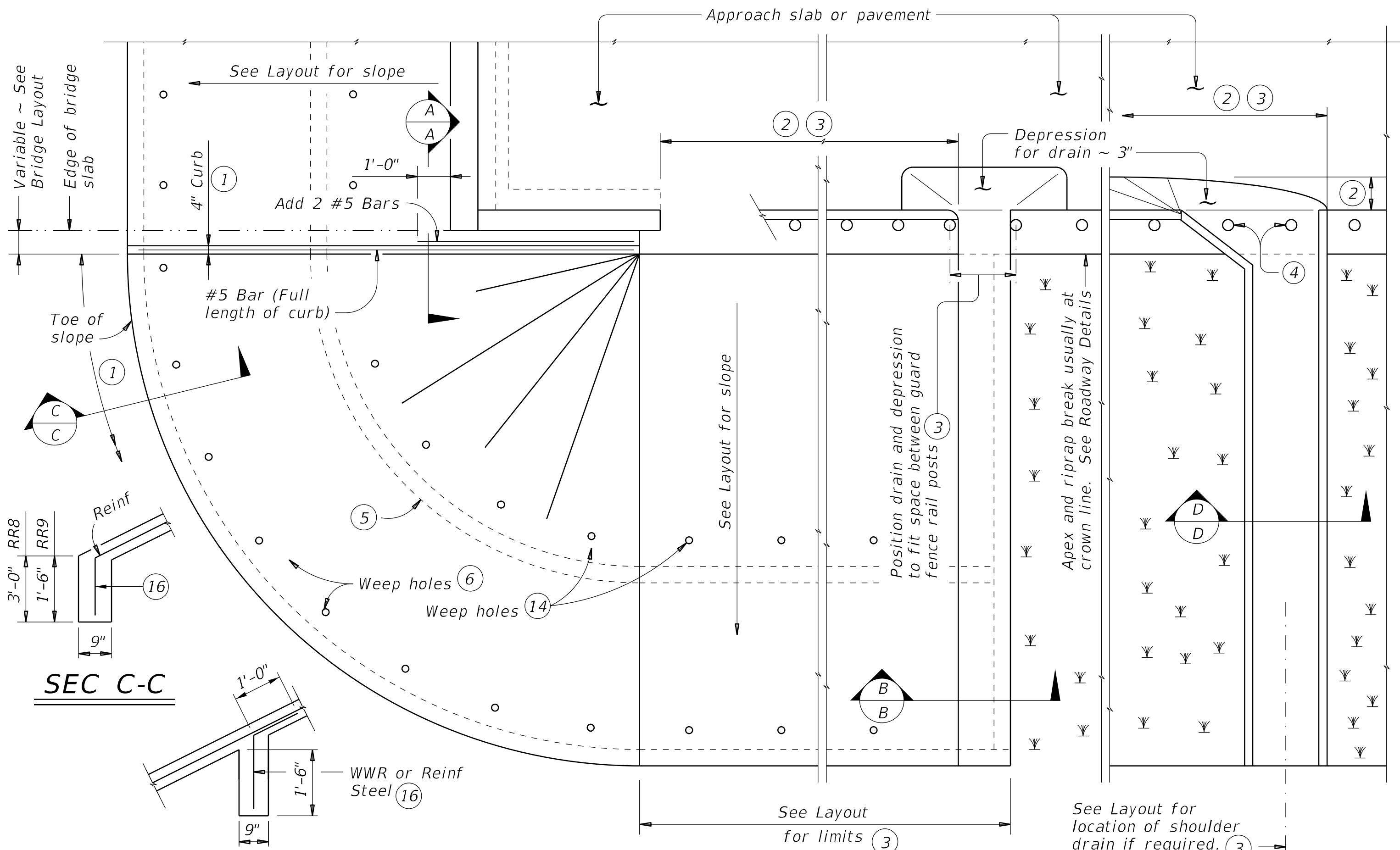
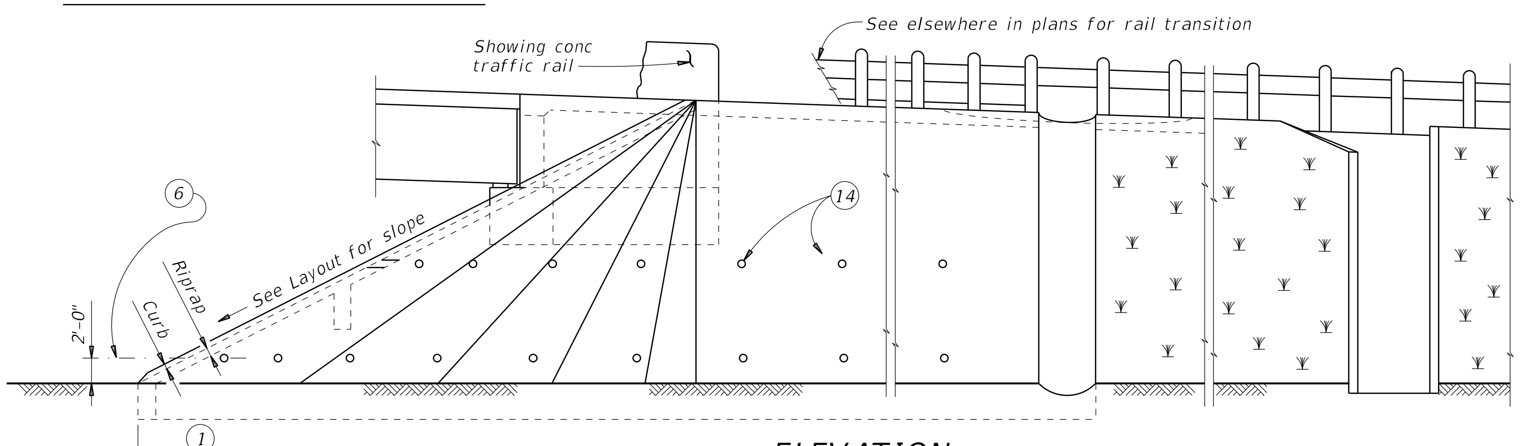


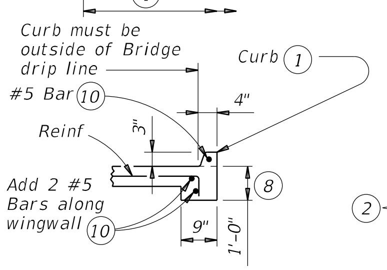
PLAN

SEC C-C

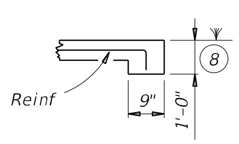
INTERMEDIATE TOEWALL (5)



ELEVATION

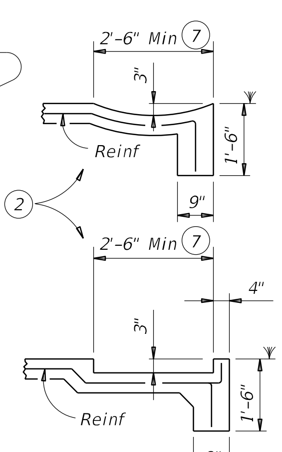


SEC A-A



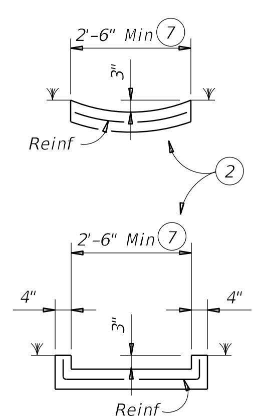
SEC B-B

(No drain)



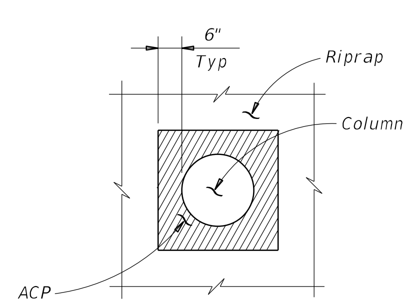
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

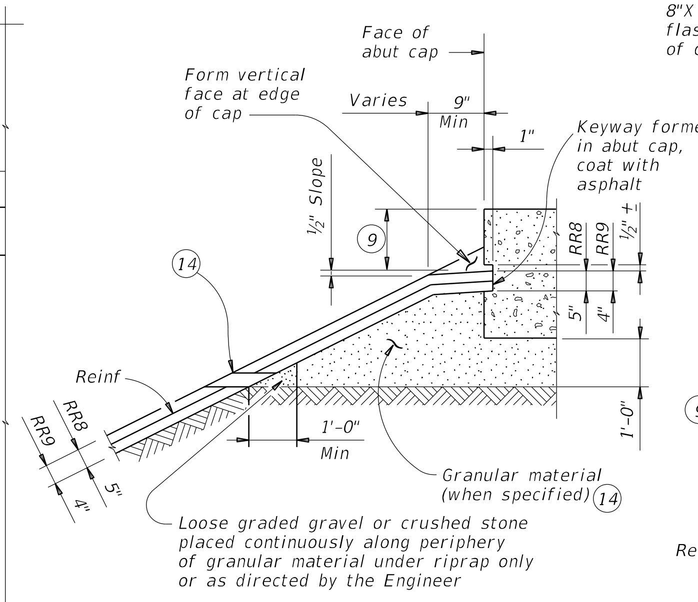
(Shoulder drain)



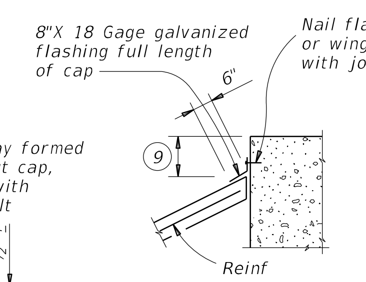
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

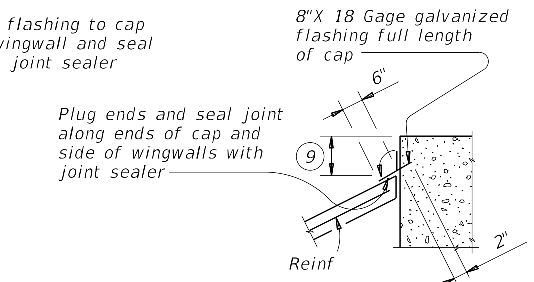
(As directed by the Engineer)



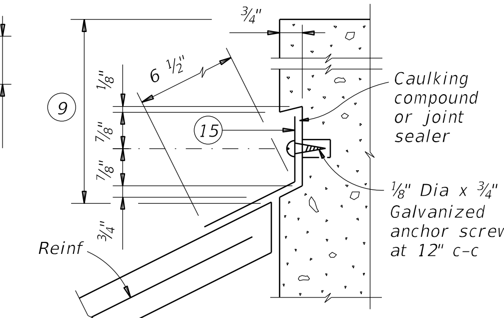
SHOWING KEYWAY OPTION



CAP OPTION A

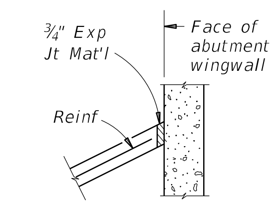


CAP OPTION B



CAP OPTION C

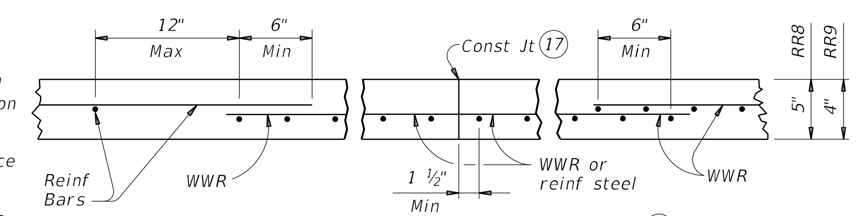
SECTIONS THRU RIPRAP AT CAP (11)



SECT THRU RIPRAP AT WINGWALL (12)

1. When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
2. Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
3. Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
4. See details elsewhere in plans for installation of guard fence posts through concrete riprap.
5. Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
6. Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
7. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
8. Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
9. Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
10. #5 bars shown are required even when synthetic fiber reinforcing option is selected.
11. Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
12. Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
13. Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
14. If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
15. 8" x 18 Gage Galv Sheet Metal
16. Provide WWR or #3 bars, with 1'-0" extension into slope.
17. WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.
Provide Grade 60 reinforcing steel.
Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.
Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.
Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.
Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.
Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".
See Layout for limits of riprap.
RR8 is to be used on stream crossings.
RR9 is to be used on other embankments.

Texas Department of Transportation — Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE: crrstde1-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	144

DATE: 4/29/2023 10:37:26 AM
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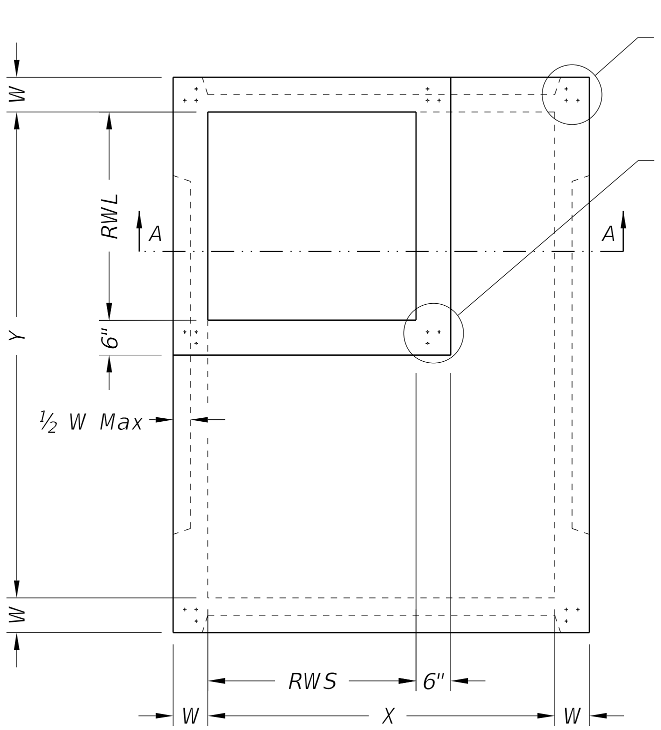
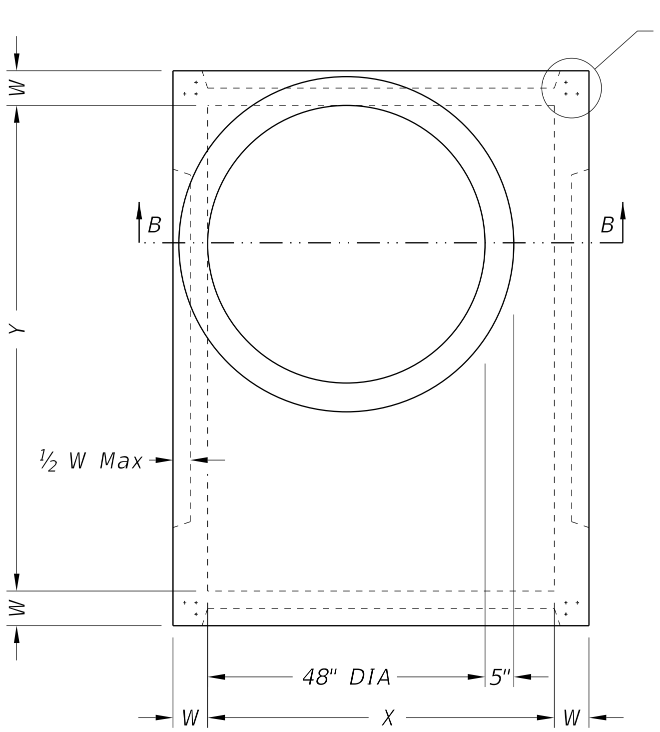


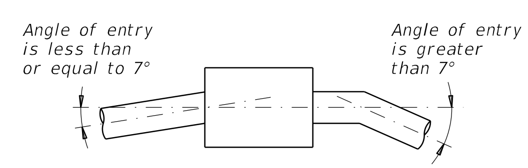
PLAN VIEW "A"

SQUARE REDUCED RISER OPTION



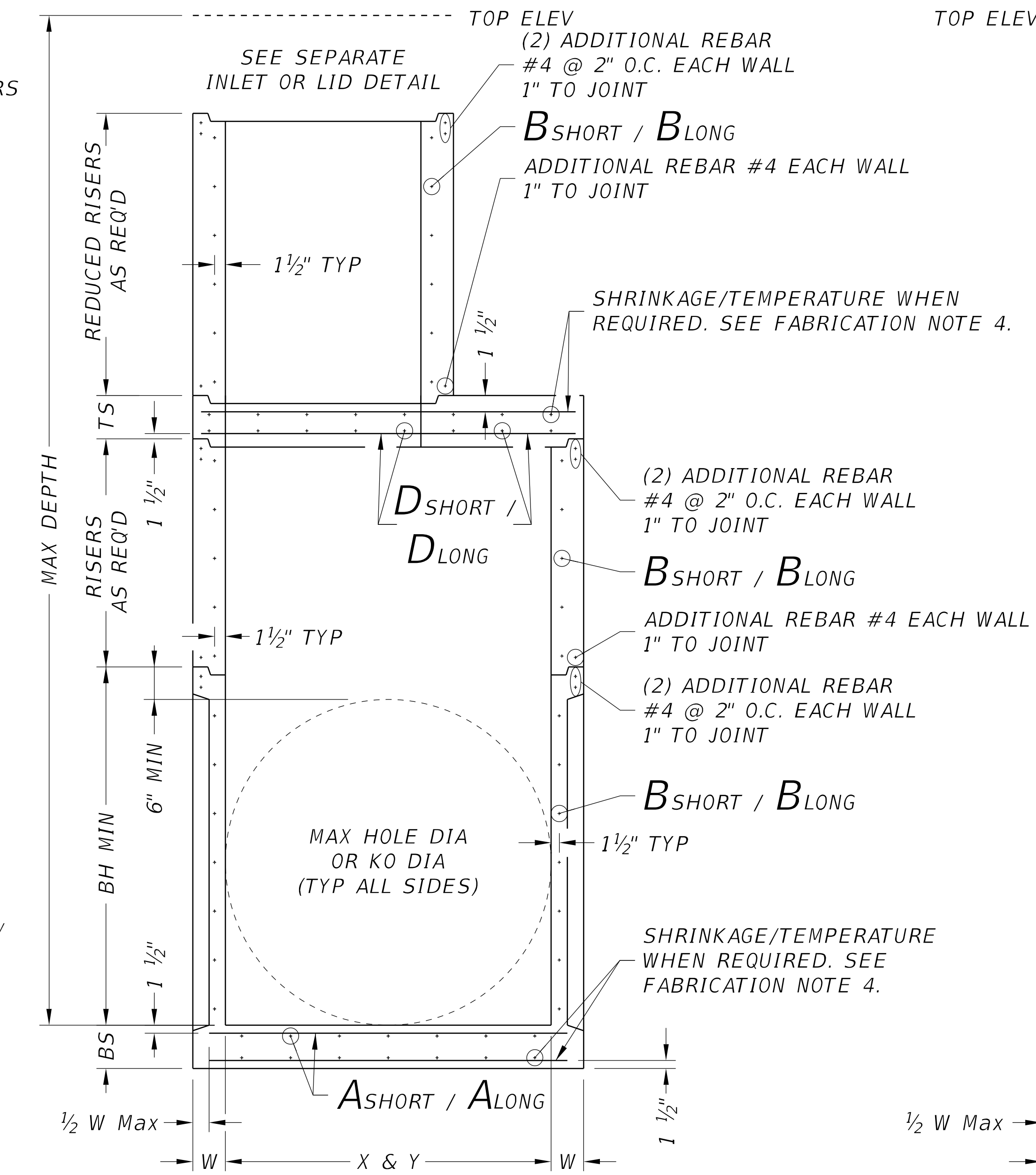
PLAN VIEW "B"

ROUND REDUCED RISER OPTION



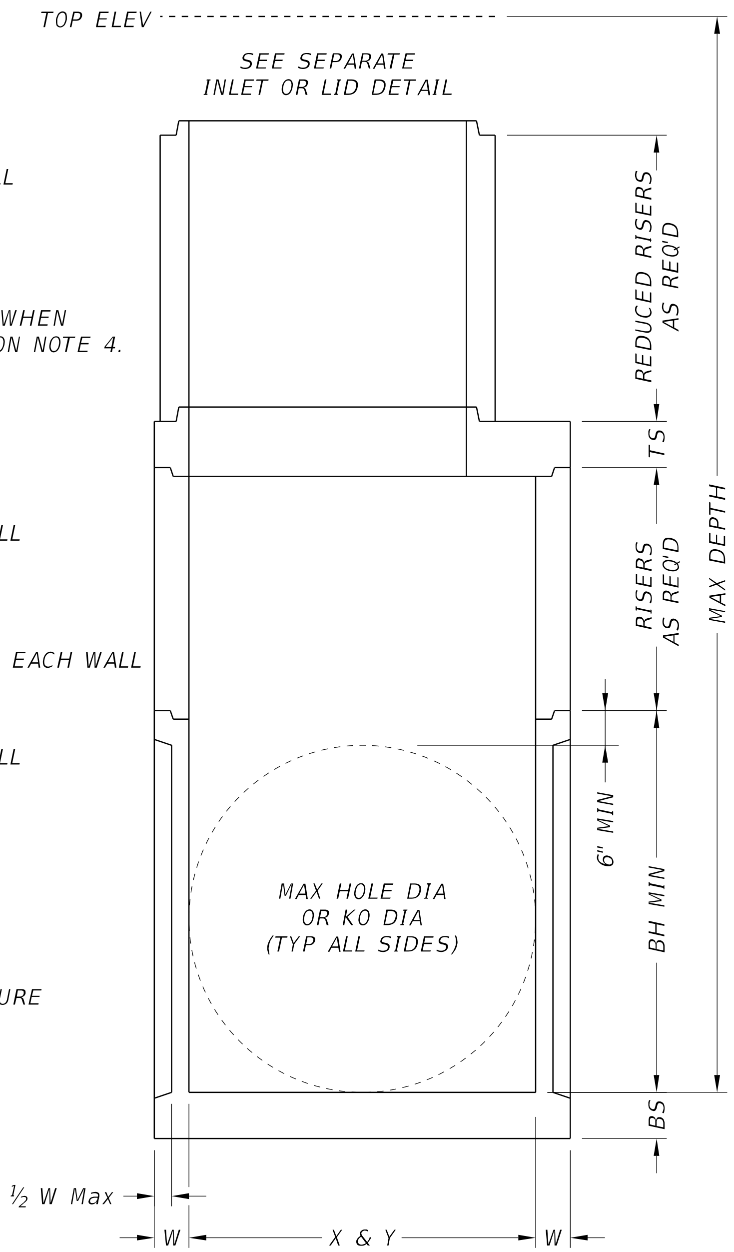
PIPE CONNECTION DETAIL

Connect pipes within 7° of normal to PB wall.
If necessary, use pipe elbow or curved approach alignment to stay within this limit.



SECTION A-A

SQUARE REDUCED RISER OPTION



SECTION B-B

ROUND REDUCED RISER OPTION

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide typical clear cover of 1 ½" to reinforcing steel at interior or exterior walls.
4. Walls or slabs with a thickness of 8" or greater require shrinkage and temperature reinforcing steel. Provide steel area = 0.11 in²/ft each way.
5. No substitution is allowed for vertical and horizontal #4 bars in corners.
6. Manufacture base and risers to nearest 3" increment.
7. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
8. Provide lifting devices in conformance with Manufacturer's recommendations.
9. See sheet PDD for sizes, dimensions, and reinforcing steel not shown.

INSTALLATION NOTES:

1. If required elsewhere. Inverts (benching) to be provided by Contractor. Concrete or mortar used for invert is subsidiary to specified inlet or manhole.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.
4. For rigid pipe, cut hole in thin wall panel (KO) 4" Max, 2" Min larger than pipe OD.
5. For flexible pipe, consult boot/seal Manufacturer's specification for placement tolerance and hole size. Center pipe in hole and install boot/seal per Manufacturer's specification.

GENERAL NOTES:

1. Precast Base consists of base slab, base unit, risers (as required), reducing slab (as required), and reduced risers (as required). See sheet PDD for sizes.
2. Designed according to ASTM C913.
3. Payment for precast base is subsidiary to the specified inlet, per Item 465, "Junction Boxes, Manholes, and Inlets."

Cover dimensions are clear dimensions, unless noted otherwise.

HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

PRECAST BASE

PB

FILE: prestd01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		145

DATE: 4/29/2023 10:37:51 AM
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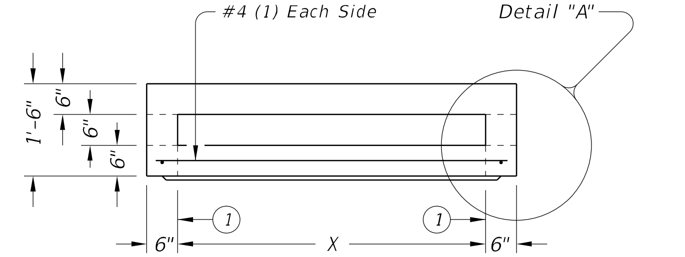
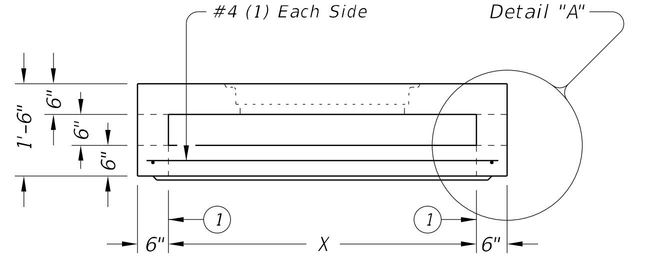
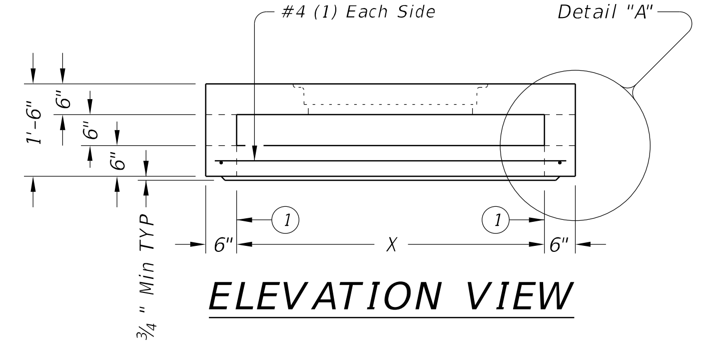


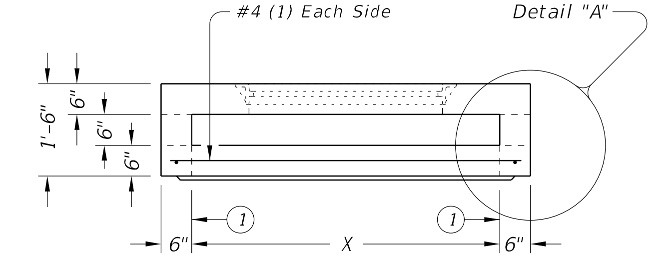
ELEVATION VIEW



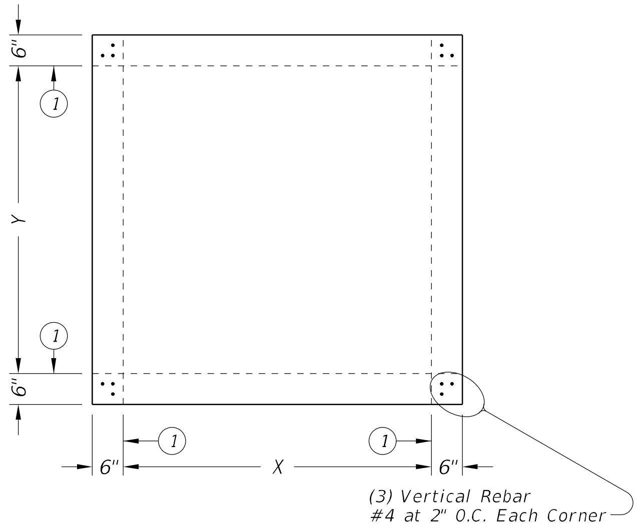
ELEVATION VIEW



ELEVATION VIEW



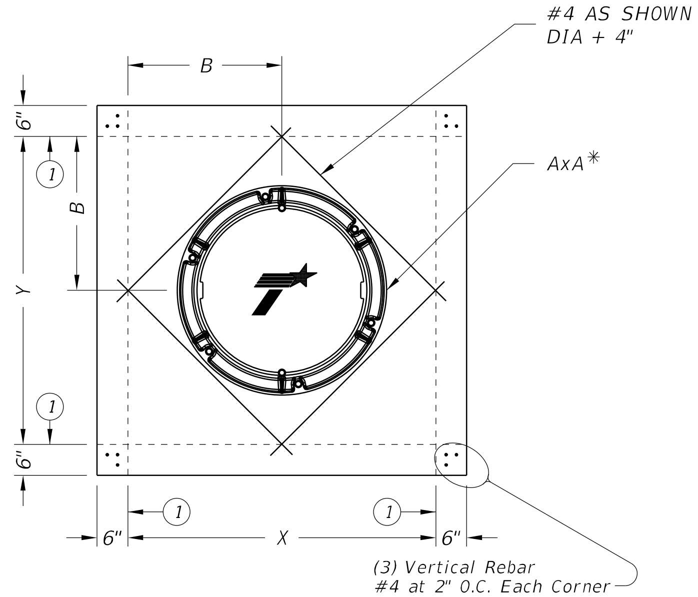
ELEVATION VIEW



PLAN VIEW

NO OPENINGS

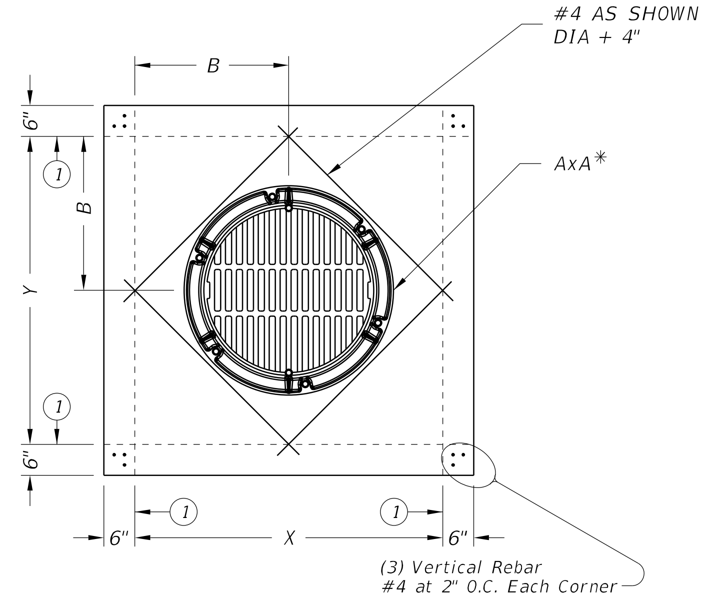
STYLE 'SL'



PLAN VIEW

32" DIA CAST-IN RING & COVER

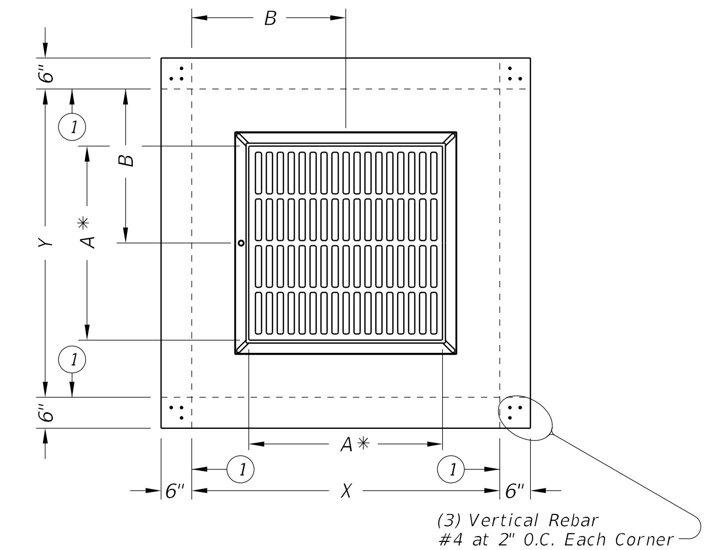
STYLE 'RC'



PLAN VIEW

32" DIA CAST-IN RING & GRATE

STYLE 'RG'



PLAN VIEW

CAST-IN FRAME & GRATE

STYLE 'FG'

Style	Size (X x Y)	A x A*	B x B	Short Span Reinf Steel Area	Long Span Reinf Steel Area
SL	3'x3'	n/a	n/a	0.37 in^2/ft	0.37 in^2/ft
RC,RG	3'x3'	32" Dia	1.5'x1.5'	0.37 in^2/ft	0.37 in^2/ft
FG	3'x3'	3'x3'	1.5'x1.5'	0.37 in^2/ft	0.37 in^2/ft
SL	4'x4'	n/a	n/a	0.34 in^2/ft	0.34 in^2/ft
RC,RG	4'x4'	32" Dia	2'x2'	0.34 in^2/ft	0.34 in^2/ft
FG	4'x4'	3'x3'	2'x2'	0.34 in^2/ft	0.34 in^2/ft
FG	4'x4'	4'x4'	2'x2'	0.34 in^2/ft	0.34 in^2/ft
SL	5'x5'	n/a	n/a	0.43 in^2/ft	0.43 in^2/ft
RC,RG	5'x5'	32" Dia	2.5'x2.5'	0.68 in^2/ft	0.68 in^2/ft
FG	5'x5'	3'x3'	2.5'x2.5'	0.43 in^2/ft	0.43 in^2/ft
FG	5'x5'	4'x4'	2.5'x2.5'	0.43 in^2/ft	0.43 in^2/ft

* Nominal frame/grate or ring/cover size.

(1) Matches inside face of wall of precast base or riser below inlet.

FABRICATION NOTES:

1. Provide Class "H" concrete in accordance with Item 421 and having a minimum compressive strength of 5,000 psi.
2. Provide Grade 60 reinforcing steel or equivalent area of WWR.
3. Provide clear cover of ¾" to reinforcing from bottom of slab for structural reinforcement. Place short span reinforcing closest to surface.
4. No substitution is allowed for diagonal #4 bars around openings.
5. Design tongue and groove joints for full closure on both shoulders. Minimum spigot depth is ¾".
6. Provide lifting devices in conformance with Manufacturer's recommendations.

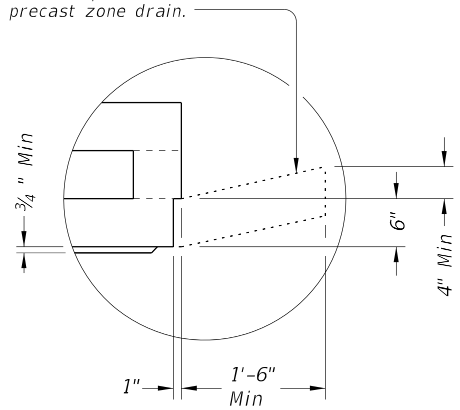
INSTALLATION NOTES:

1. PAZD is for use in ditches and medians outside of the horizontal clearance (clear zone). Precast Area Zone Drain is not intended for direct traffic and may not be placed in roadway.
2. Seal tongue and groove joints with preformed or bulk mastic in conformance with Manufacturer's recommendations. Tongue and groove joints may be grouted no more than 1" between each section, or ½ the joint depth, whichever is greater.
3. Do not grout rubber gasket joints without Manufacturer's recommendation.

GENERAL NOTES:

1. Designed according to ASTM C913.
2. Payment for inlet is per Item 465, "Junction Boxes, Manholes, and Inlets" by type, style, size, and opening size (when applicable).

Construct cast-in-place reinforced concrete apron when shown elsewhere in plans. Use Class "A" concrete. Apron is subsidiary to PAZD. Apron is 1'-6" Min width around precast zone drain.



DETAIL "A"

(Reinforcing not shown for clarity)

When an apron is to be cast around PAZD, use detail above to create an apron ledge on all 4 sides.

Texas Department of Transportation

Bridge Division Standard

PRECAST AREA ZONE DRAIN

PAZD

FILE: prestd08-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	146

DATE: 4/29/2023 10:38:10 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020174 ... prestd08-20.dgn

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	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	REPLACE ALUM TYPE A (SF)
							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"		
1	1	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
1	2	D3-1 *	(STREET NAME)	VAR x 12	X		MOUNT ON EXISTING SIGN POST					
		D3-1 *	(STREET NAME)	VAR x 12	X							
		R1-1 ***	STOP	36 x 36	X							9.0
2	1	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
2	2	D3-1 *	(STREET NAME)	VAR x 12	X		MOUNT ON EXISTING SIGN POST					
		D3-1 *	(STREET NAME)	VAR x 12	X							
		R1-1 ***	STOP	36 x 36	X							9.0
3	1	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
3	2	D3-1 *	(STREET NAME)	VAR x 12	X		MOUNT ON EXISTING SIGN POST					
		D3-1 *	(STREET NAME)	VAR x 12	X							
		R1-1 ***	STOP	36 x 36	X							9.0
3	3	W1-7	<BI-DIRECTIONAL LARGE ARROW>	48 x 24	X		10BWG	1	SA	T		
4	1	M3-3	SOUTH <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		MOUNTED BACK-TO-BACK					
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
5	1	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
5	2	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
5	3	W1-7	<BI-DIRECTIONAL LARGE ARROW>	48 x 24	X		10BWG	1	SA	T		
5	4	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
5	5	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
5	6	D14-4T	ADOPT A HWY NEXT (MI) MILES (GROUP NAME)	48 x 48	X		10BWG	1	SA	T		
6	1	M3-3	SOUTH <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
6	2	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							
		W4-4P	CROSS TRAFFIC DOES NOT STOP (PLAQUE)	24 x 12	X							9.0

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).

* EXISTING SIGN TO REMAIN

** SALVAGED SIGN

*** REPLACE EXISTING ALUMINUM SIGN (TY A) & MOUNT ON EXISTING SIGN POST (WORK WILL BE PAID FOR UNDER ITEM 636-6007)

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SHEET 1 OF 5

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-16 8-16	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		147

18

DATE: 5/2/2023 1:59:14 PM
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DATE:
FILE:

SUMMARY OF SMALL SIGNS

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

- XXXXX: POST TYPE — FRP = Fiberglass; TWT = Thin-Wall; 10BWG = 10 BWG; S80 = Sch 80
- (X): POSTS — 1 or 2
- XX: ANCHOR TYPE — UA=Universal Conc; UB=Universal Bolt; SA=Slipbase-Conc; SB=Slipbase-Bolt; WS=Wedge Steel; WP=Wedge Plastic
- (X-XXXX): 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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE	POSTS	ANCHOR TYPE	MOUNTING DESIGNATION: PREFABRICATED	MOUNTING DESIGNATION: 1EXT or 2EXT	REPLACE ALUM TYPE A (SF)
6	3	W1-7T	<BI-DIRECTIONAL LRG ARRW w/ CHEVRONS>	96 x 36	X		S80	1	SA	U	BM	
6	4	M3-1	NORTH <AUXILIARY SIGN>	24 x 12	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
6	5	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	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							
7	1	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	2	D3-1 **	(STREET NAME)	??? x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	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	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	10	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).

* EXISTING SIGN TO REMAIN

** SALVAGED SIGN

*** REPLACE EXISTING ALUMINUM SIGN (TY A) & MOUNT ON EXISTING SIGN POST (WORK WILL BE PAID FOR UNDER ITEM 636-6007)

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SHEET 2 OF 5

SOSS

FILE: sums16.dgn	DN: _TxDOT_	CK: TxDOT	DW: _TxDOT_	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
4-16	DIST	COUNTY		SHEET NO.
8-16	DAL	COLLIN		148

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 (INCHES)	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	REPLACE ALUM TYPE A (SF)
7	11	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
7	12	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
8	1	W1-2L	SYMBOL - HORIZ CURVE LEFT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
8	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	1	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	2	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	3	D3-1 **	(STREET NAME)	??? x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
9	4	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	5	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	6	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	7	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	8	M3-1	NORTH <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		MOUNTED BACK-TO-BACK					
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
9	9	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	10	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30								
9	11	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R**	<CHEVRON RIGHT>	24 x 30	X							
9	12	D3-1	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
9	13	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).

* EXISTING SIGN TO REMAIN

** SALVAGED SIGN

*** REPLACE EXISTING ALUMINUM SIGN (TY A) & MOUNT ON EXISTING SIGN POST (WORK WILL BE PAID FOR UNDER ITEM 636-6007)

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SHEET 3 OF 5

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
4-16 8-16	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		149

18

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS (INCHES)	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	REPLACE ALUM TYPE A (SF)
9	14	W1-8L	<CHEVRON LEFT>	24 x 30	X		10BWG	1	SA	P		
		W1-8R	<CHEVRON RIGHT>	24 x 30	X							
9	15	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
9	16	W1-2R	SYMBOL - HORIZ CURVE RIGHT	36 x 36	X		10BWG	1	SA	P		
		W13-1P	(SPEED) MPH <ADVISORY SPEED PLAQUE>	18 x 18	X							
10	1	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
10	2	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
10	3	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
11	1	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
11	2	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
12	1	D3-1 **	(STREET NAME)	VAR x 12	X		10BWG	1	SA	P		
		R1-1	STOP	36 x 36	X							
12	2	M2-1	JCT <AUXILIARY SIGN>	21 x 15	X		10BWG	1	SA	P		
		M1-6F	<FM SHIELD> FARM ROAD (ROUTE #)	24 x 24	X							
13	1	W3-1	SYMBOL - STOP AHEAD	36 x 36	X		10BWG	1	SA	P		
13	2	D2-1	(DESTINATION) (DISTANCE) <1 LINE>	78 x 18	X		10BWG	1	SA	P		
13	3	D1-2	(DESTINATION - 2 LINE)	72 x 30	X		10BWG	1	SA	P		
13	4	R2-1	SPEED LIMIT (SPEED)	30 x 36	X		10BWG	1	SA	P		
13	5	**	PROHIBITED HANDHELD DEVICE WHILE OPERATING A MOTOR VEHICLE BY CITY ORDINANCE UP TO $500 FINE		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"
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).

* EXISTING SIGN TO REMAIN

** SALVAGED SIGN

*** REPLACE EXISTING ALUMINUM SIGN (TY A) & MOUNT ON EXISTING SIGN POST (WORK WILL BE PAID FOR UNDER ITEM 636-6007)

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SHEET 4 OF 5

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
4-16 8-16	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		150

DATE:
FILE:

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

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 (INCHES)	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	REPLACE ALUM TYPE A (SF)
13	6	M3-3	SOUTH <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		MOUNTED BACK-TO-BACK					
		D10-7aT	<3 DIGIT VERTICAL NUMBER>	3 x 10	X							
13	7	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							
		M6-3	<ARROW - VERTICAL STRGHT> <AUX. SIGN>	21 x 15	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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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.
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3. For Sign Support Descriptive Codes, see Sign Mounting Details Small Roadside Signs General Notes & Details SMD(GEN).

* EXISTING SIGN TO REMAIN

** SALVAGED SIGN

*** REPLACE EXISTING ALUMINUM SIGN (TY A) & MOUNT ON EXISTING SIGN POST (WORK WILL BE PAID FOR UNDER ITEM 636-6007)

Texas Department of Transportation

Traffic Operations Division Standard

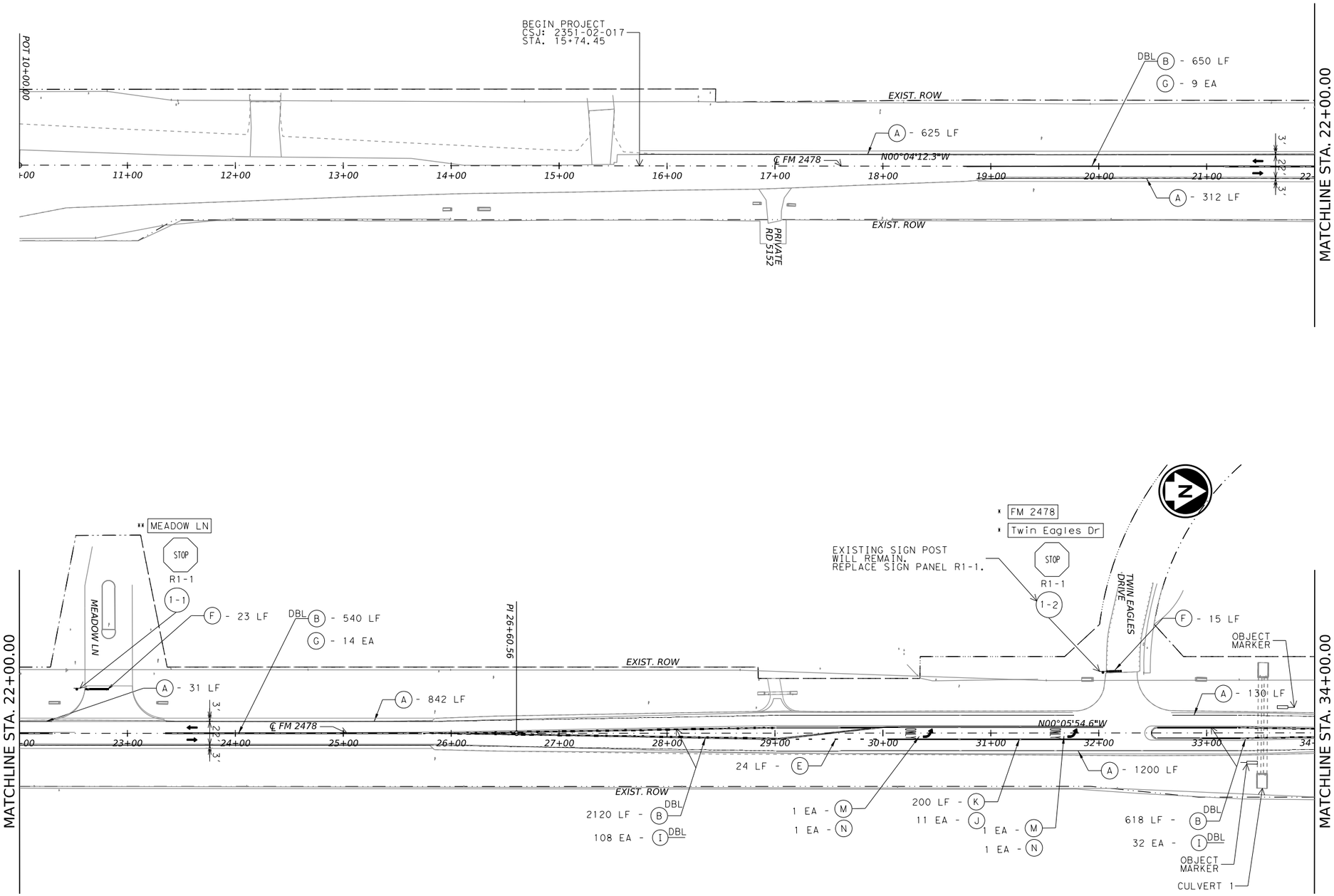
SUMMARY OF SMALL SIGNS

SHEET 5 OF 5

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
4-16 8-16	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		151

18



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NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

BEGIN PROJECT TO STA. 34+00.00

SCALE: 1" = 100' SHEET 1 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		152

DATE: 4/29/2023 10:39:46 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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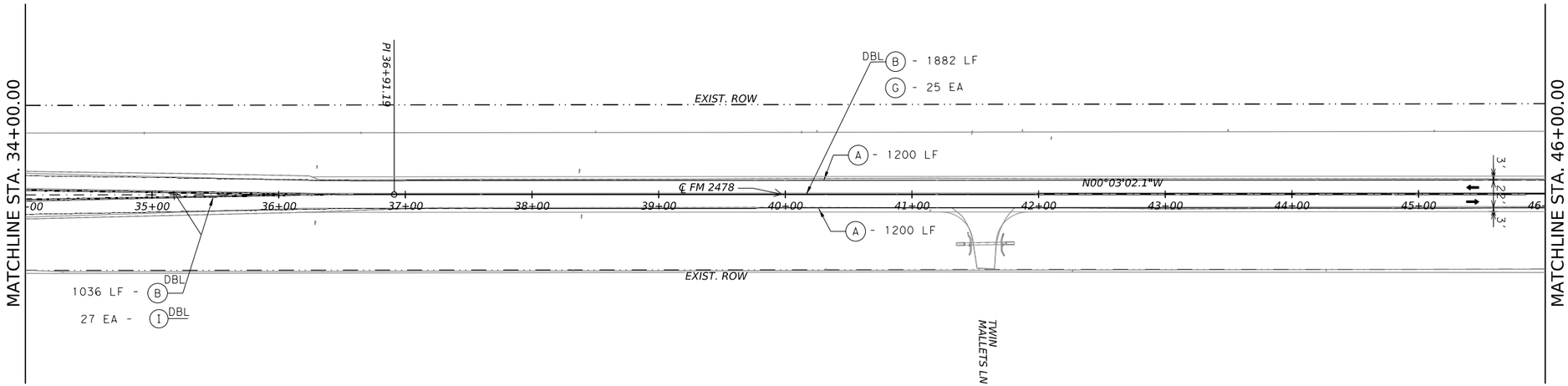

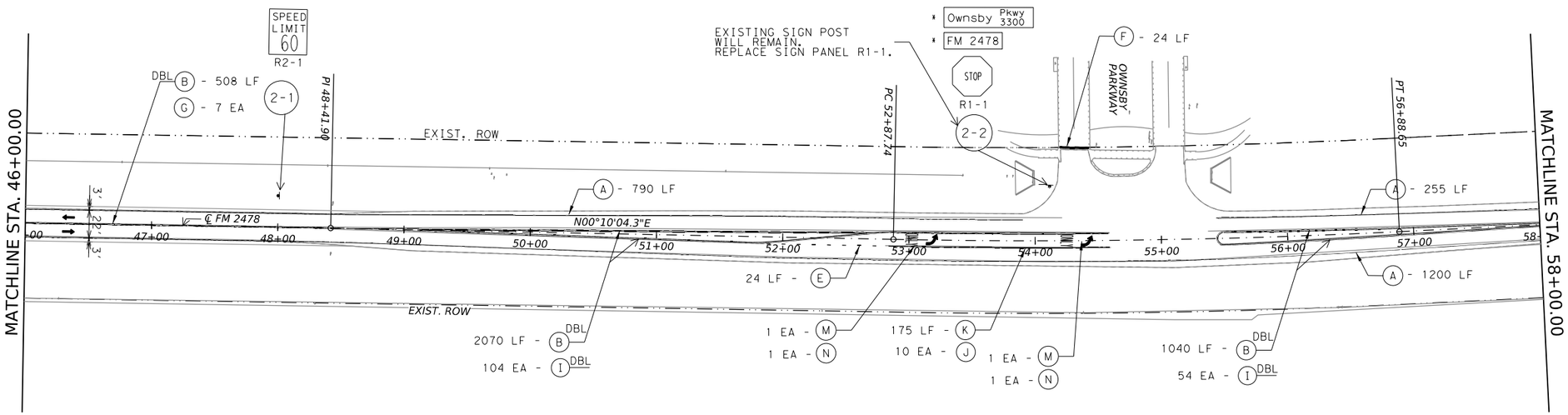

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NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 34+00.00 TO STA. 58+00.00

SCALE: 1" = 100' SHEET 2 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		153

DATE: 4/29/2023 10:39:48 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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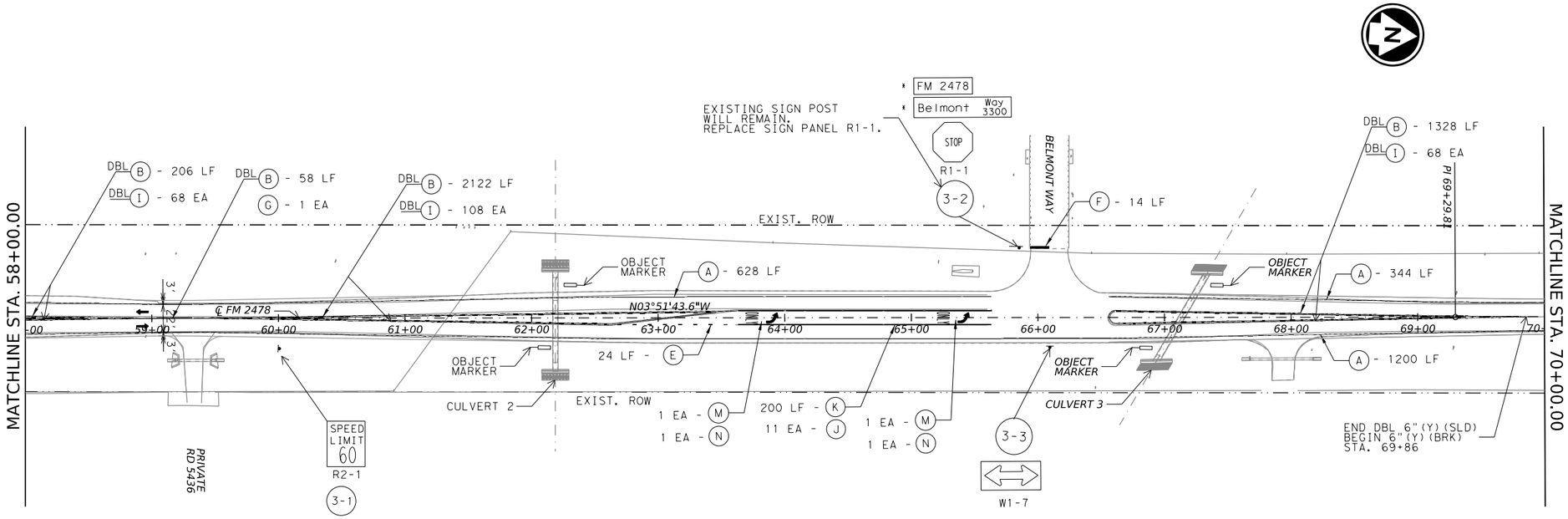

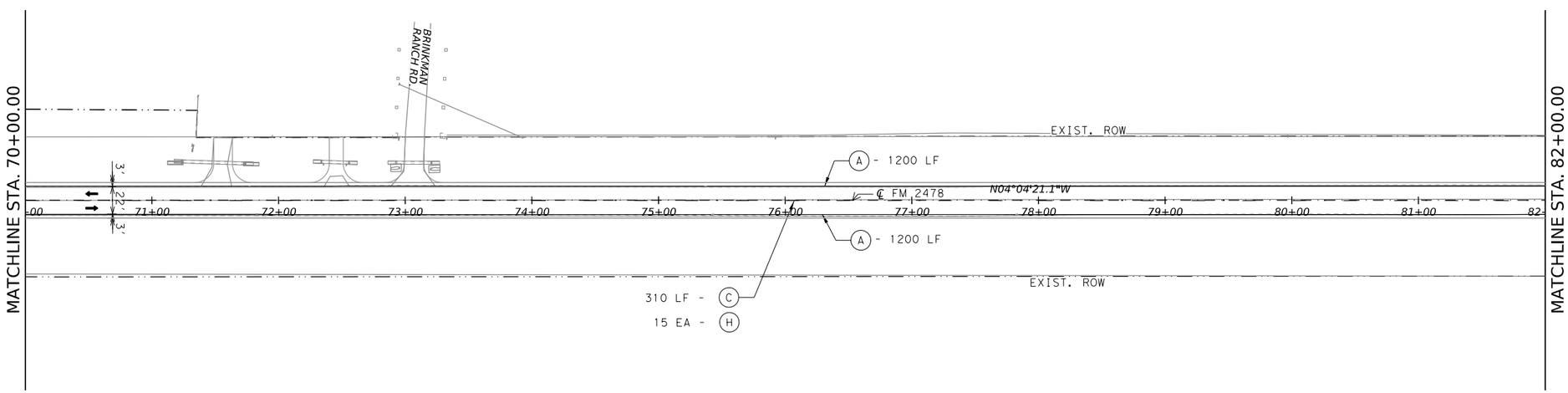

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NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 58+00.00 TO STA. 82+00.00

SCALE: 1" = 100'

SHEET 3 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		154

DATE: 4/29/2023 10:39:49 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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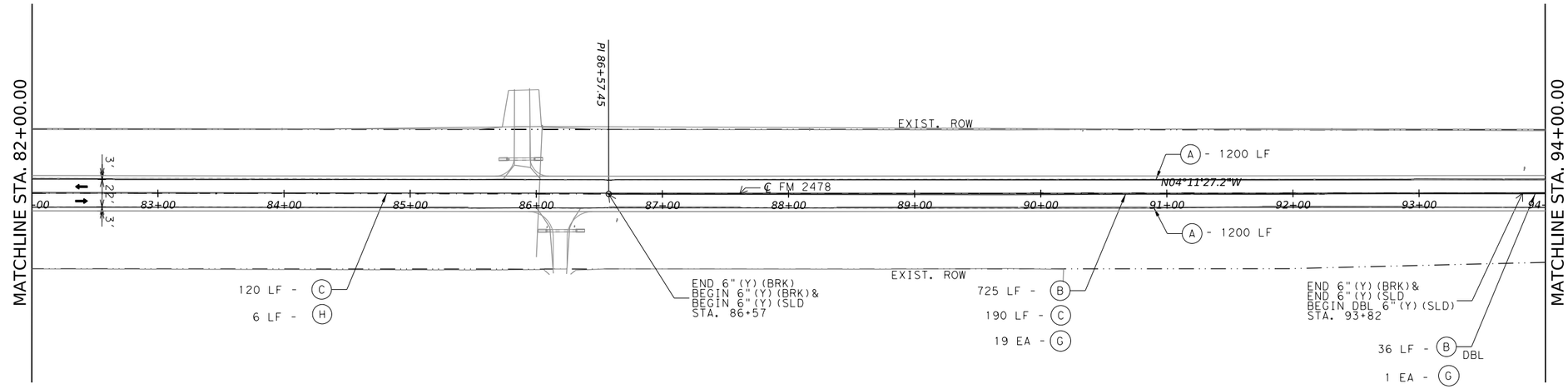

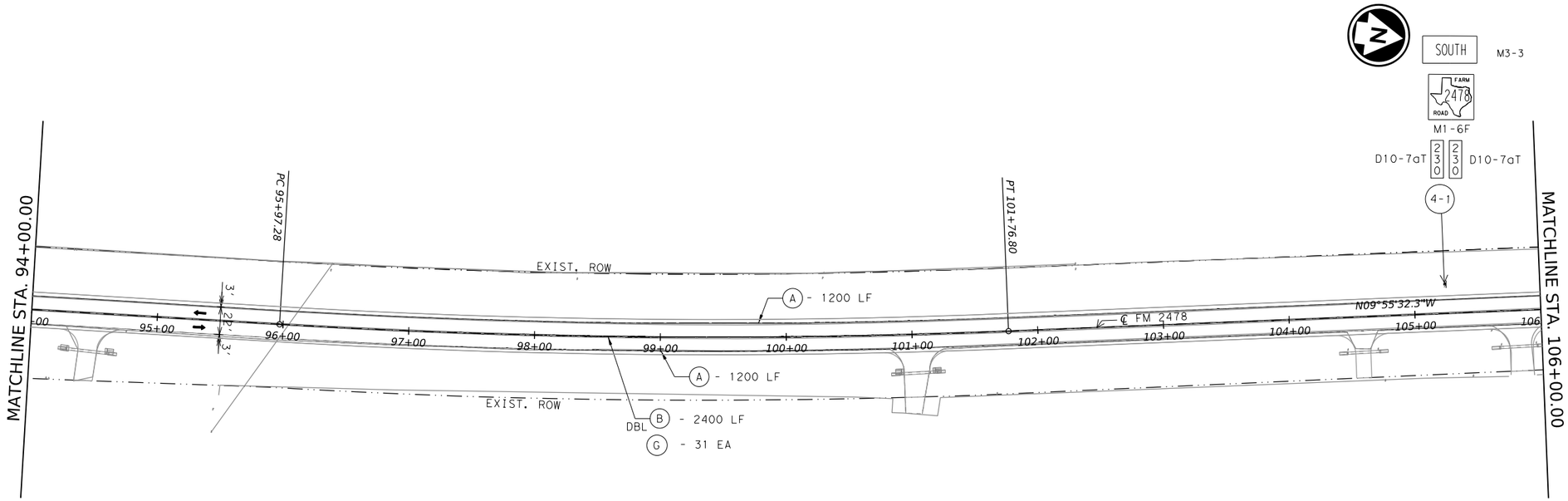

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NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 82+00.00 TO STA. 106+00.00

SCALE: 1" = 100' SHEET 4 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		155

DATE: 4/29/2023 10:39:50 AM
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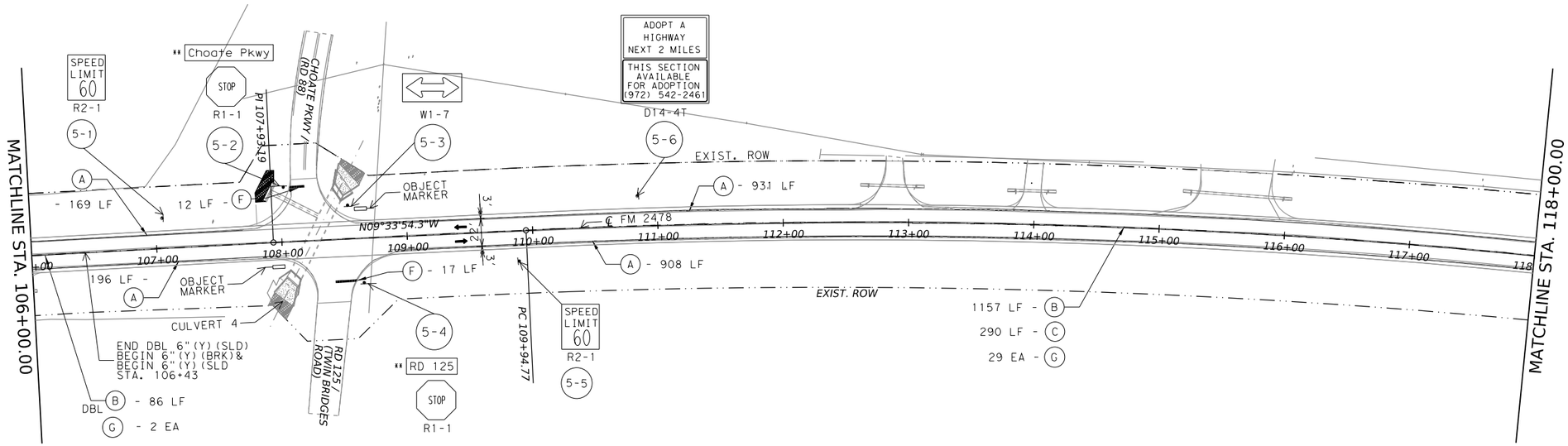

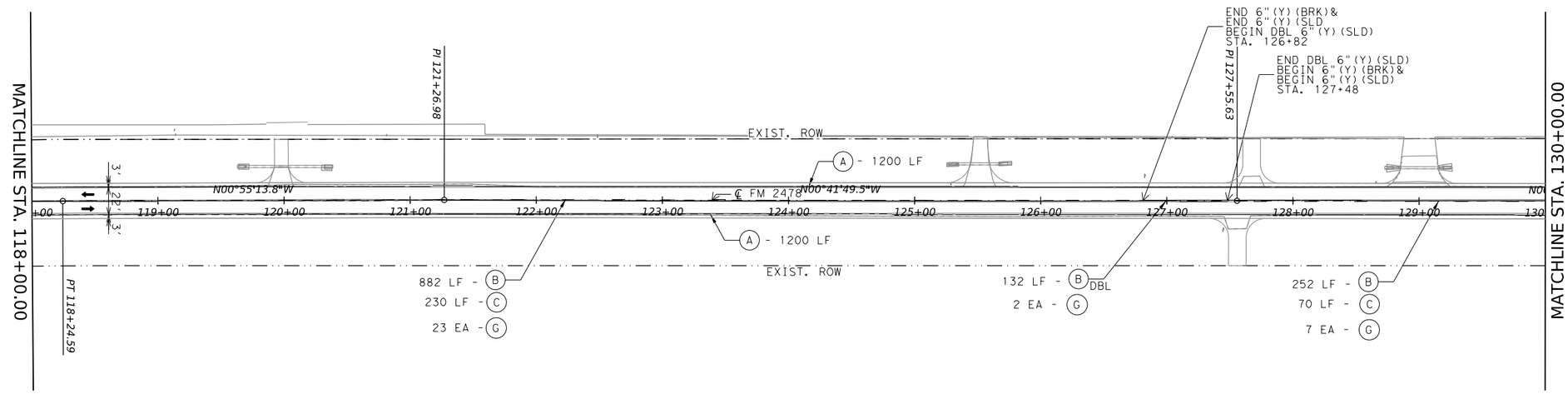

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NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

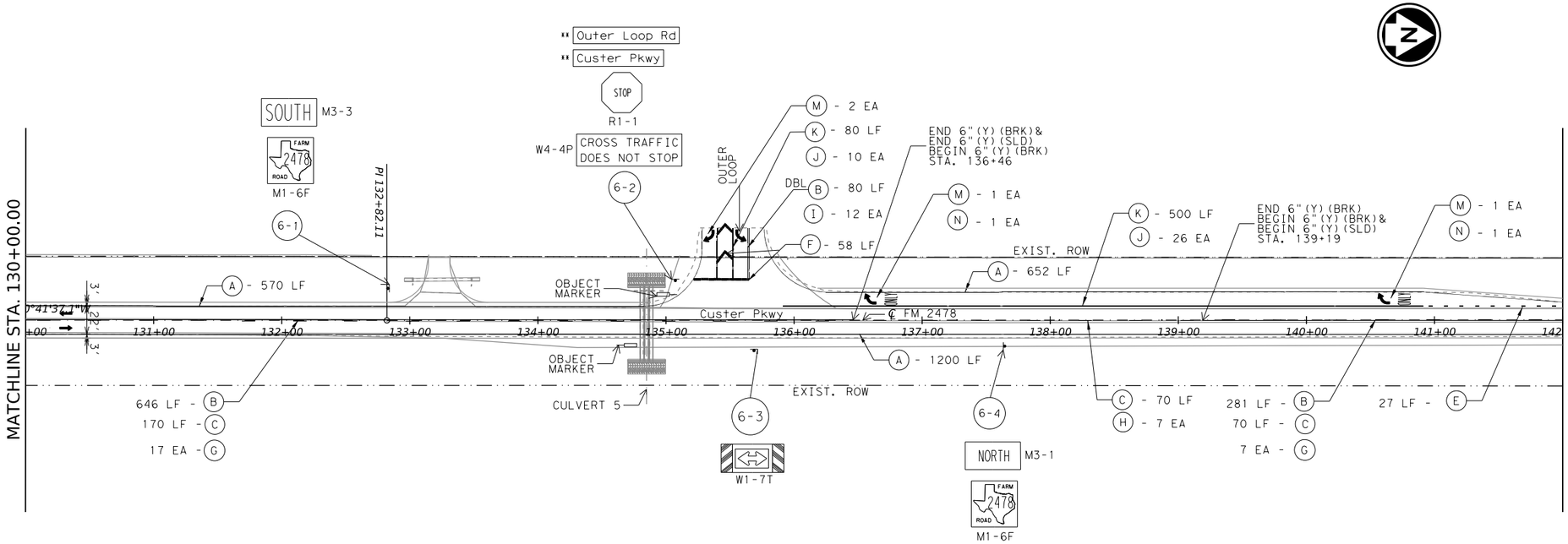
SIGNING AND PAVEMENT MARKING LAYOUT

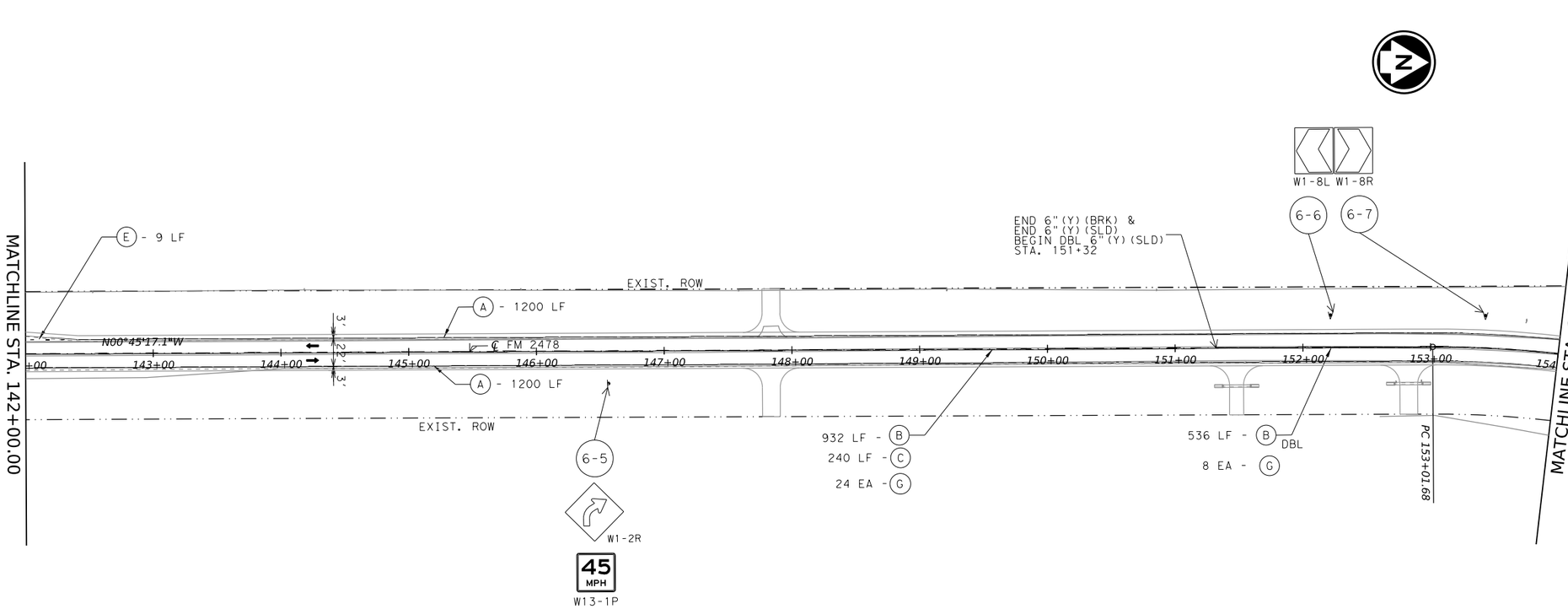
STA. 106+00.00 TO STA. 130+00.00

SCALE: 1" = 100' SHEET 5 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		156

DATE: 4/29/2023 10:39:52 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn





0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

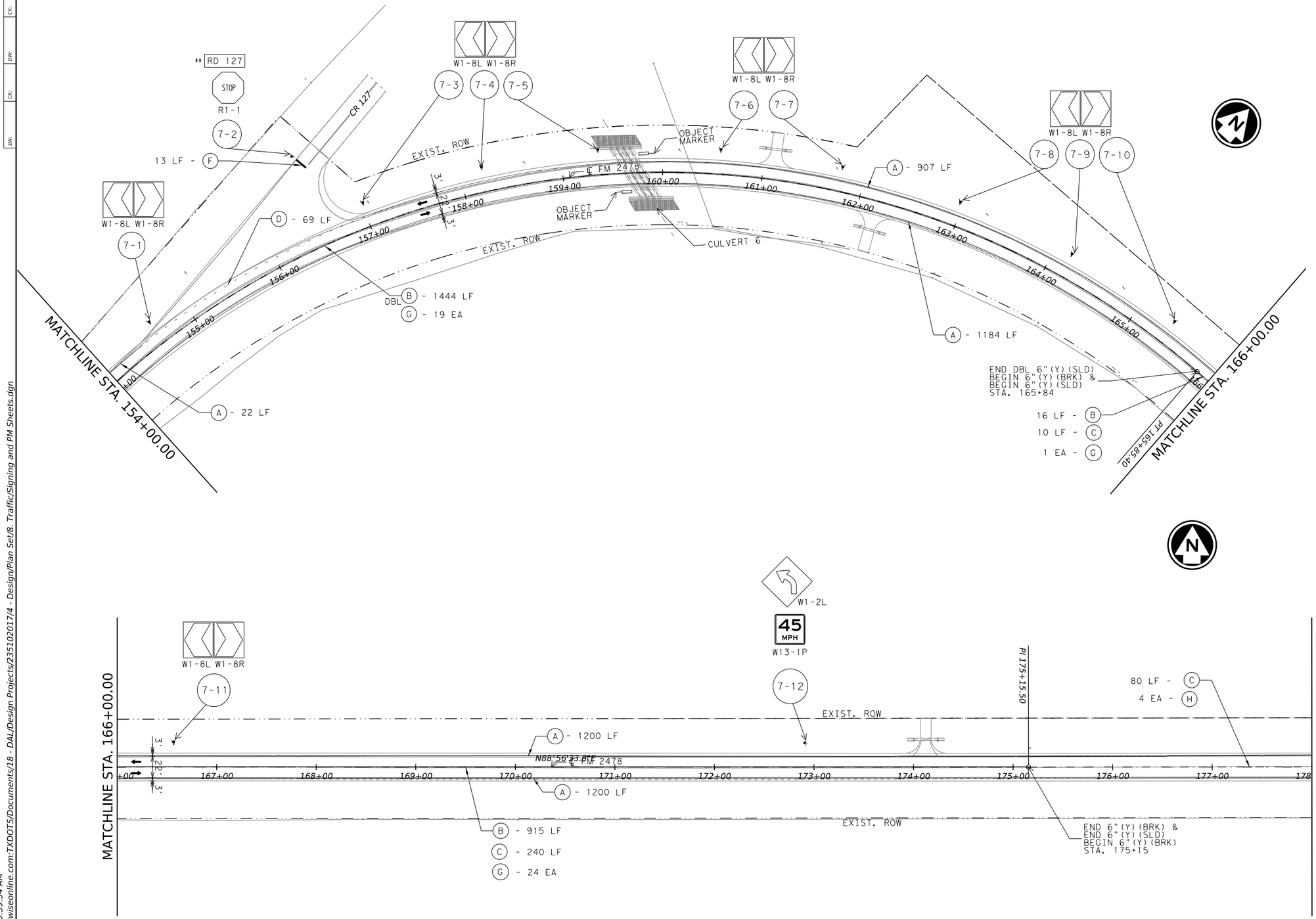
SIGNING AND PAVEMENT MARKING LAYOUT

STA. 130+00.00 TO STA. 154+00.00

SCALE: 1" = 100' SHEET 6 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		157

DATE: 4/29/2023 10:39:53 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn



0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 154+00.00 TO STA. 178+00.00

SCALE: 1" = 100' SHEET 7 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		158

DATE: 4/29/2023 10:39:54 AM
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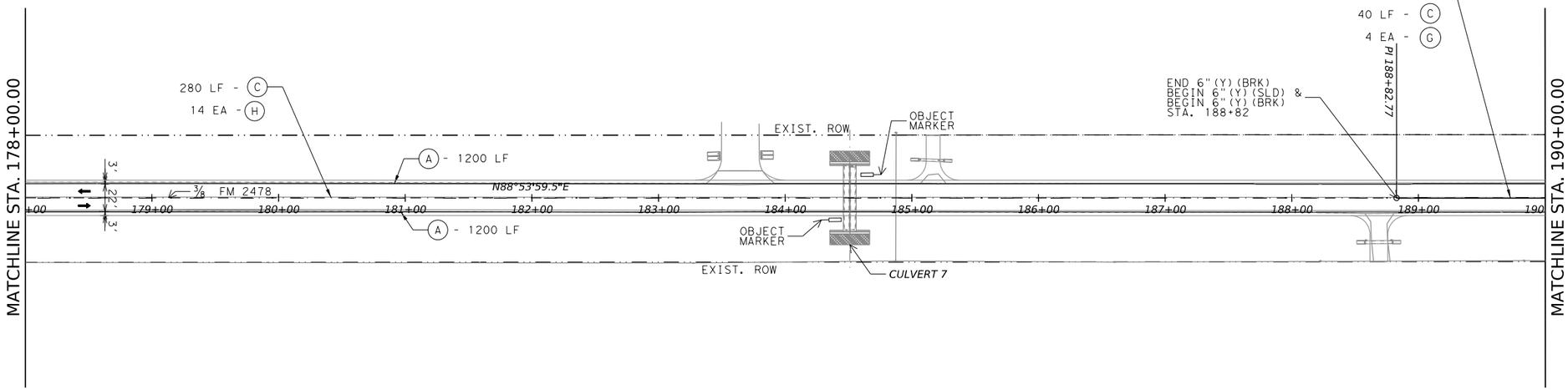

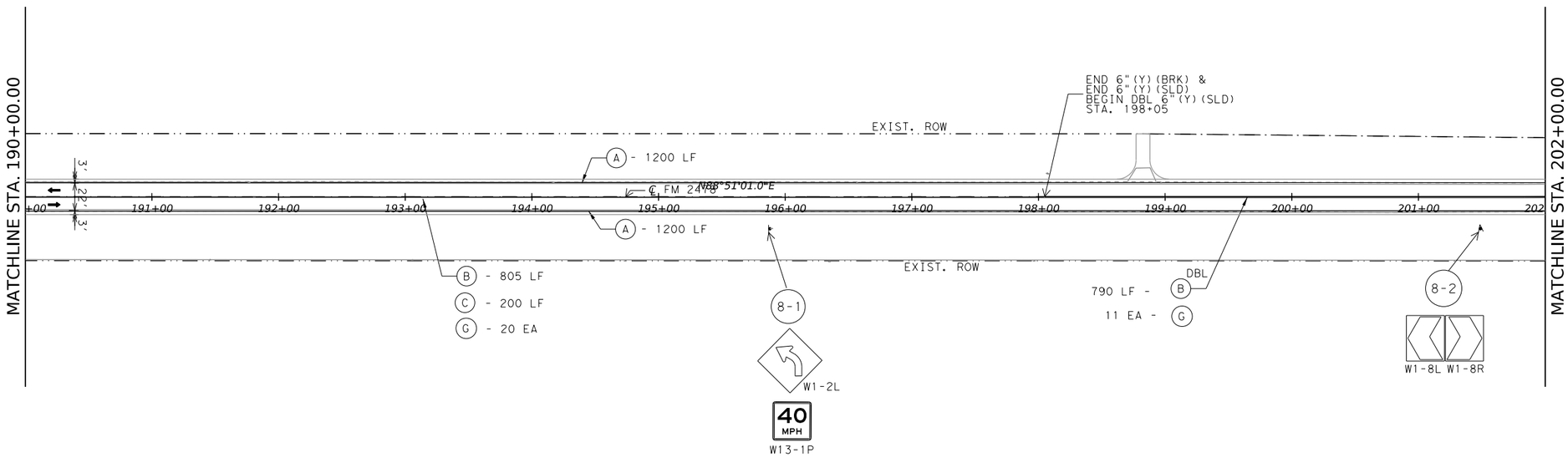

0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date ,P.E.

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 178+00.00 TO STA. 202+00.00

SCALE: 1" = 100' SHEET 8 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		159

DATE: 4/29/2023 10:39:56 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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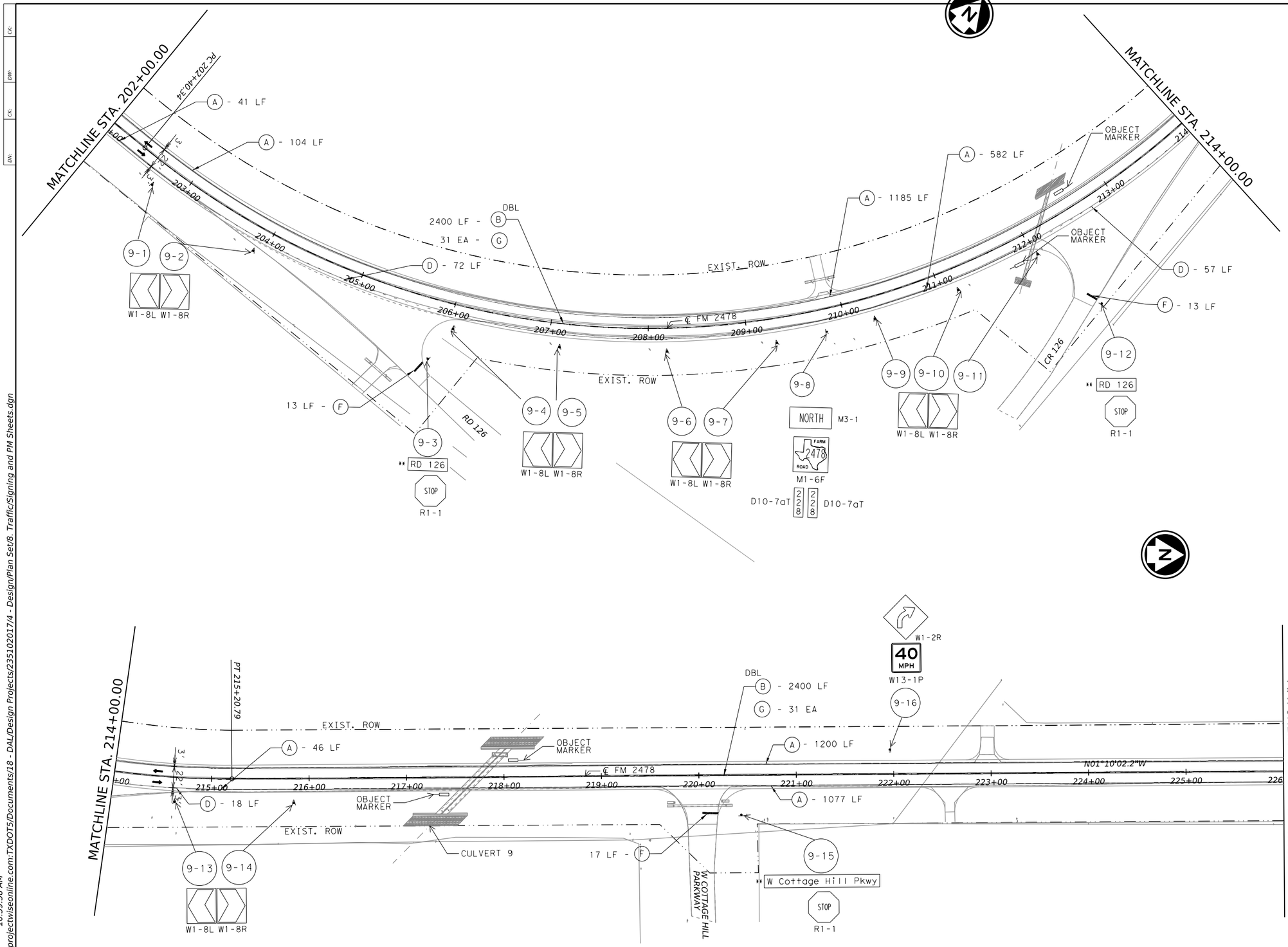


0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

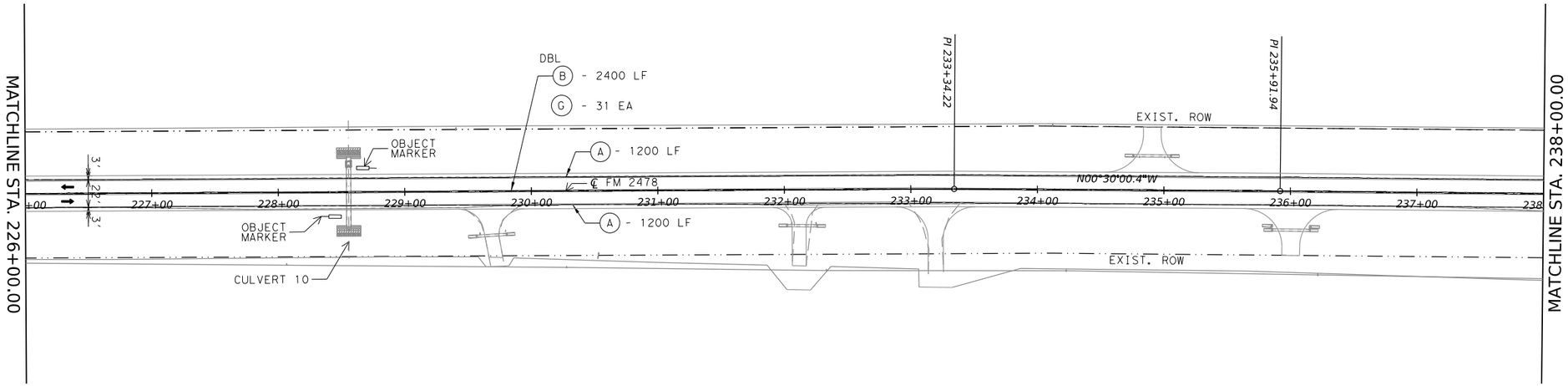
SIGNING AND PAVEMENT MARKING LAYOUT

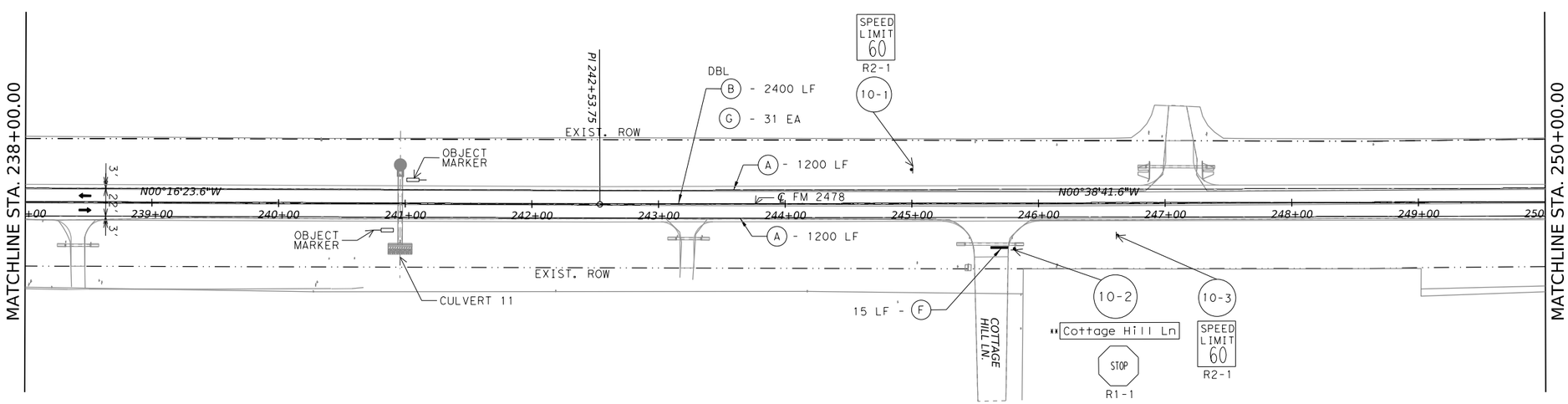
STA. 202+00.00 TO STA. 226+00.00

SCALE: 1" = 100' SHEET 9 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		160

DATE: 4/29/2023 10:39:58 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn





0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 226+00.00 TO STA. 250+00.00

SCALE: 1" = 100'

SHEET 10 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		161

DATE: 4/29/2023 10:39:59 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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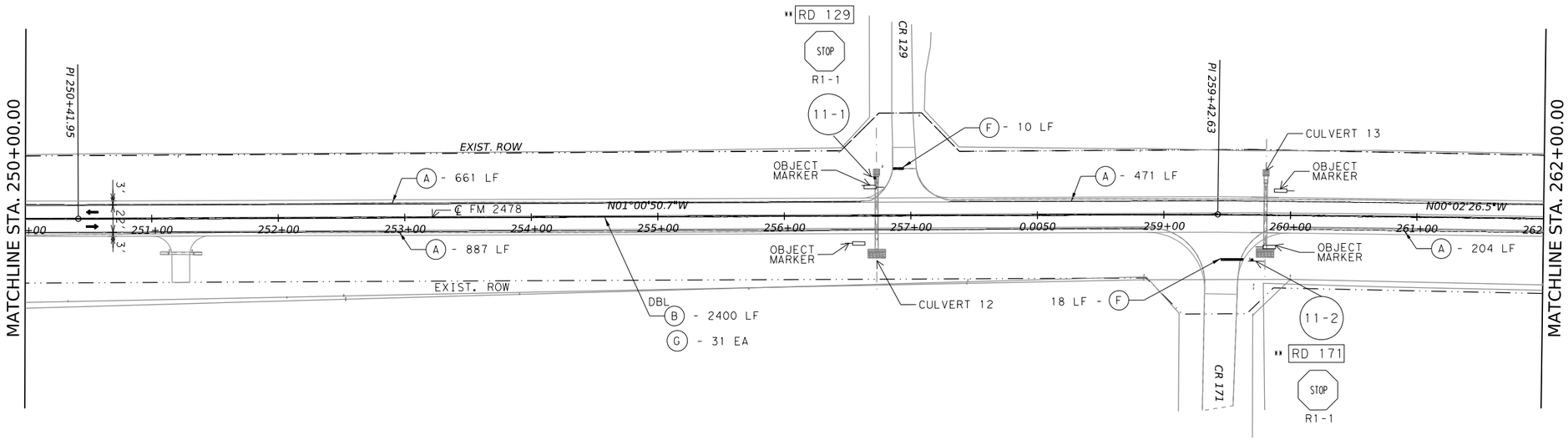
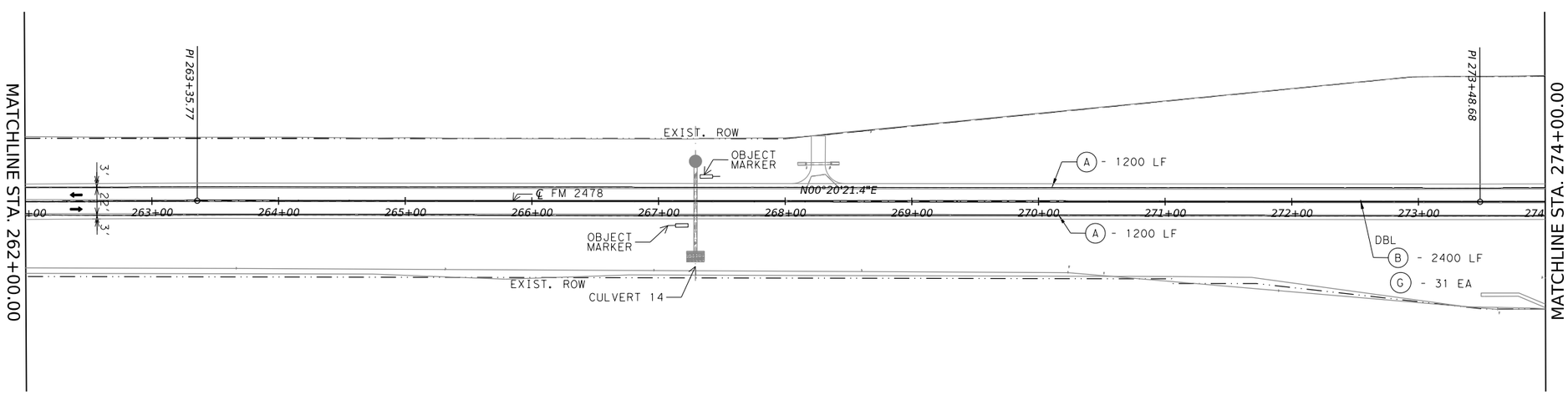




0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

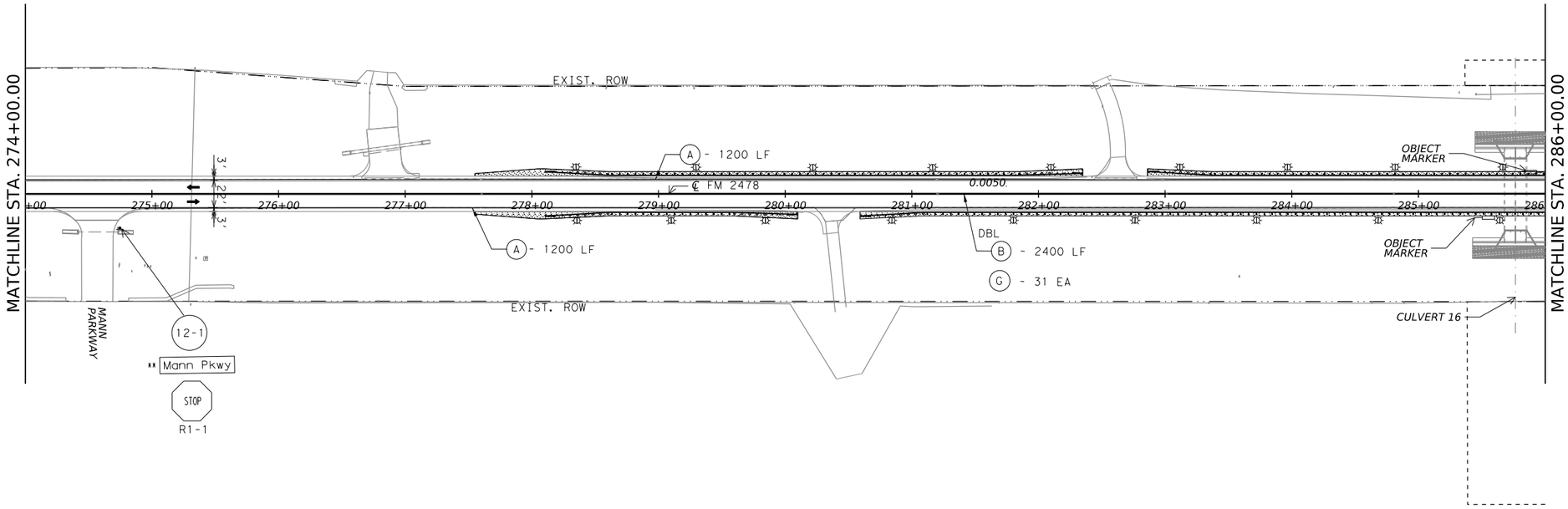
STA. 250+00.00 TO STA. 174+00.00

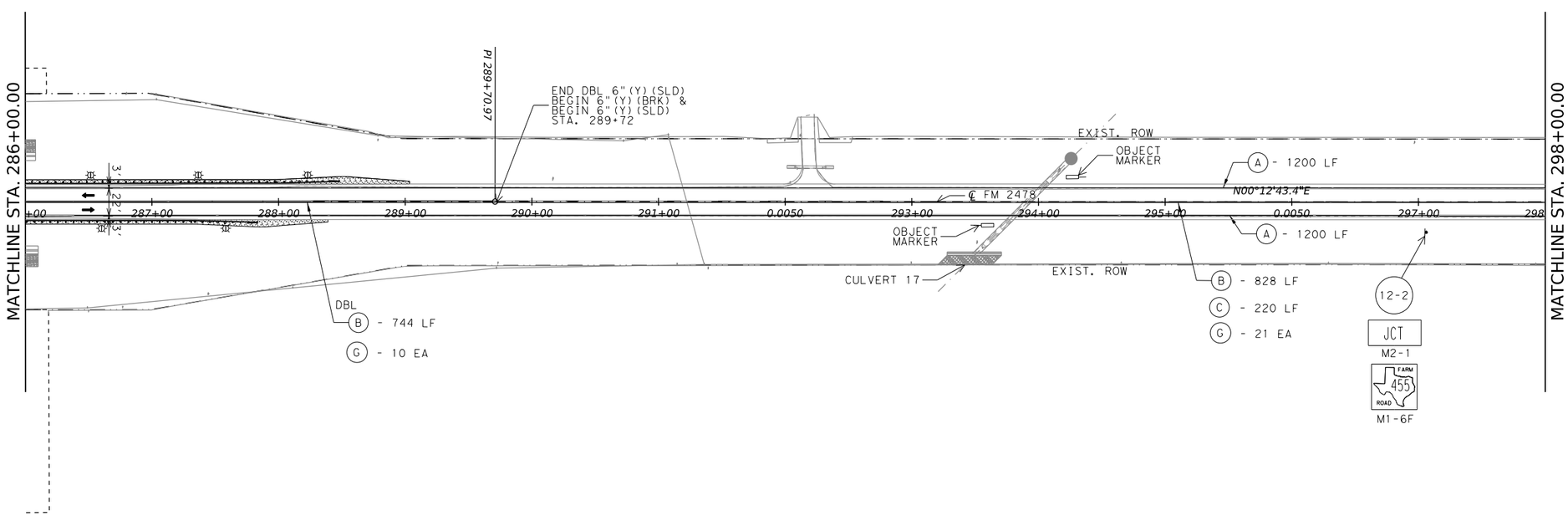
SCALE: 1" = 100' SHEET 11 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		162

CK: DW: CK: DW:

DATE: 4/29/2023 10:40:01 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn





0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(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.

(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 274+00.00 TO STA. 298+00.00

SCALE: 1" = 100' SHEET 12 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		163

DATE: 4/29/2023 10:40:02 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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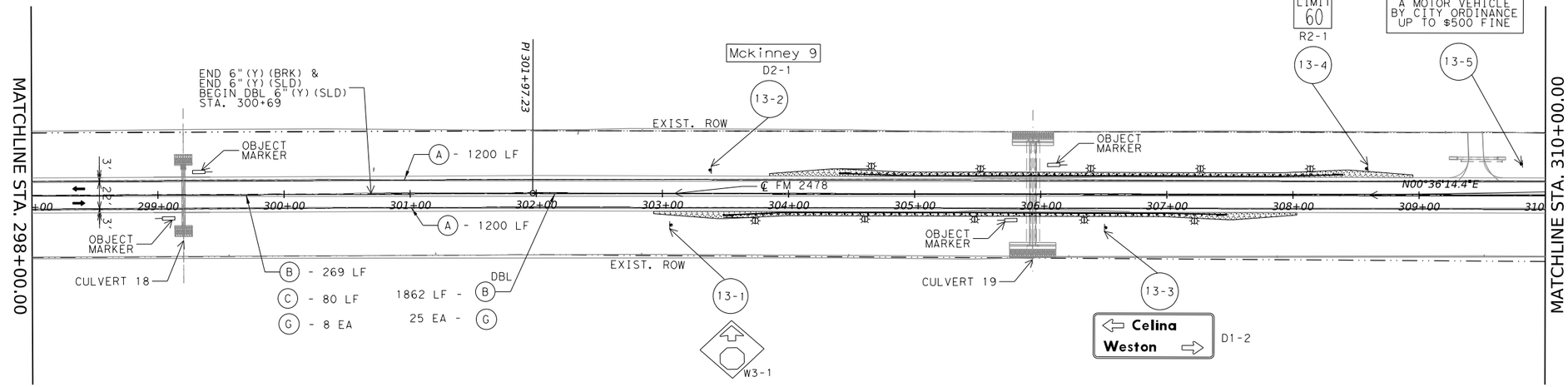

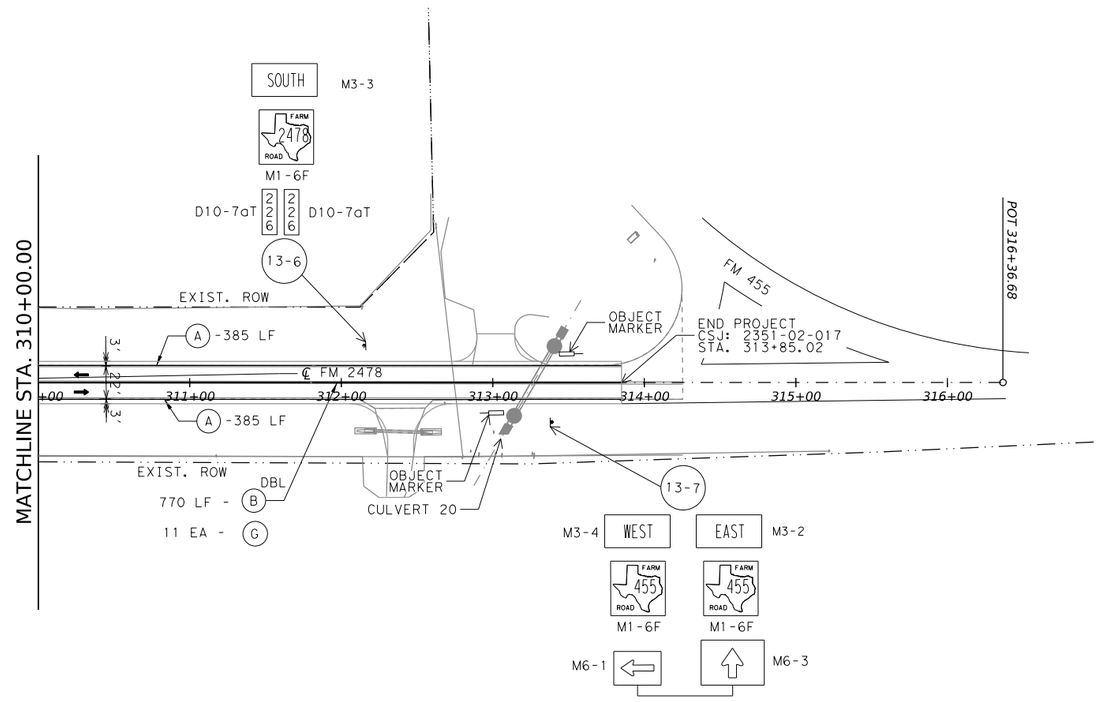

0 50 100

NOTE: ALL SIGNS WILL BE PLACED ACCORDING TO THE SIGNING STANDARDS.

LEGEND:

* EXISTING SIGN 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)8" (DOT)(100MIL)

(F) - REFL PAV MRK TY I (W)24" (SLD)(100MIL)

(G) - REFL PAV MRKR TY II-A-A SPACED AT 40' O.C.

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(I) - REFL PAV MRKR TY II-A-A SPACED AT 20' O.C.

(J) - REFL PAV MRKR TY I-C SPACED AT 20' O.C.

(K) - REFL PAV MRK TY I (W) 8"(SLD)(100MIL)

(M) - REFL PAV MRK TY I (W) (ARROW)(100MIL)

(N) - REFL PAV MRK TY I (W) (WORD)(100MIL)

(#-#) - PROPOSED SIGN

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SIGNING AND PAVEMENT MARKING LAYOUT

STA. 298+00.00 TO END PROJECT

SCALE: 1" = 100' SHEET 13 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		164

DATE: 4/29/2023 10:40:05 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Signing and PM Sheets.dgn

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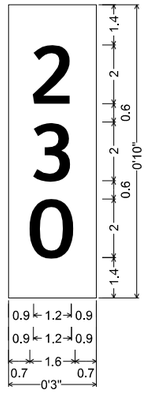
$DATE$



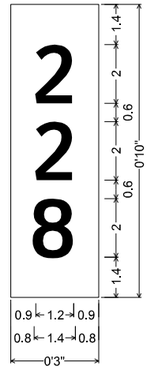
D10-7aT 3in;
No border, White on Green;
"2", ClearviewHwy-4-W;
"3", ClearviewHwy-4-W;
"0", ClearviewHwy-4-W;

SHEET 4 SIGN 1

D14-4T-4_48x48;
3.0" Radius, 1.0" Border, White on Blue;
"ADOPT A", C; "HIGHWAY", C;
"NEXT 2 MILES", C;

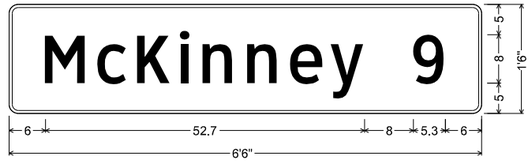
D14-4TP_MOD_48x24;
3.0" Radius, 0.6" Border, 0.4" Indent, Blue on White;
"THIS SECTION", C; "AVAILABLE", C;
"FOR ADOPTION", C;
"(972) 542-2461", C;

SHEET 5 SIGN 6



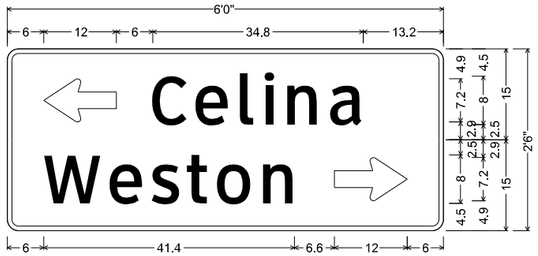
D10-7aT 3in;
No border, White on Green;
"2", ClearviewHwy-4-W;
"2", ClearviewHwy-4-W;
"8", ClearviewHwy-4-W;

SHEET 9 SIGN 6



D2-1 8in;
1.5" Radius, 0.5" Border, White on Green;
"McKinney", ClearviewHwy-3-W; "9", ClearviewHwy-3-W;

SHEET 13 SIGN 2

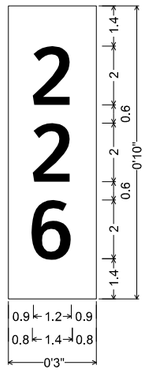


D1-2 8in LT-RT;

1.9" Radius, 0.8" Border, White on Green;
Standard Arrow Custom 12.0" X 7.1" 180°;
"Celina", ClearviewHwy-3-W;

1.9" Radius, 0.8" Border, White on Green;
"Weston", ClearviewHwy-3-W;
Standard Arrow Custom 12.0" X 7.1" 0°;

SHEET 13 SIGN 3



D10-7aT 3in;
No border, White on Green;
"2", ClearviewHwy-4-W;
"2", ClearviewHwy-4-W;
"6", ClearviewHwy-4-W;

SHEET 13 SIGN 6

STATE OF TEXAS
MATTHEW RYAN MESTRE
142175
LICENSED
PROFESSIONAL ENGINEER

Matthew Ryan Mestre ,P.E. 4/28/2023
Signature of Registrant Date

Texas Department of Transportation
©2023

GUIDE SIGN DETAILS

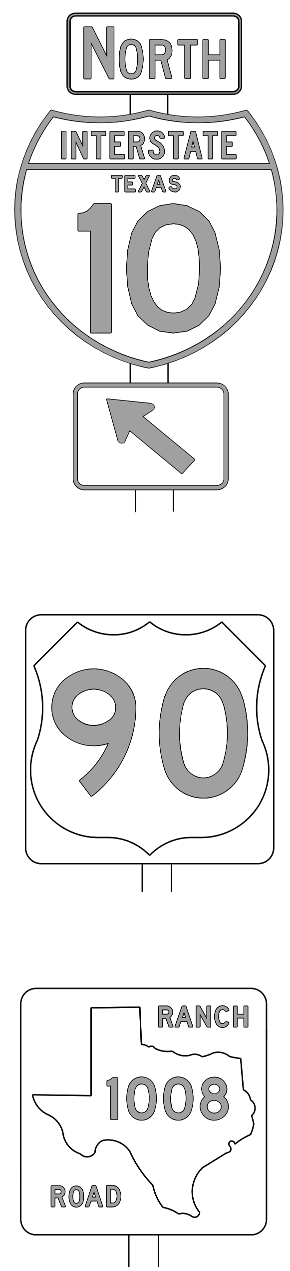
SCALE: NTS SHEET 1 OF 1

DESIGN/CK	FED.RD. DIV.NO.	FEDERAL-AID PROJECT NUMBER		HIGHWAY NO.
MRM	6	SEE TITLE SHEET		FM 2478
CHECK BLS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK MAA	TEXAS	DAL	COLLIN	165
CHECK BA	CONTROL	SECTION	JOB	
	2351	02	017	

$FILE$

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

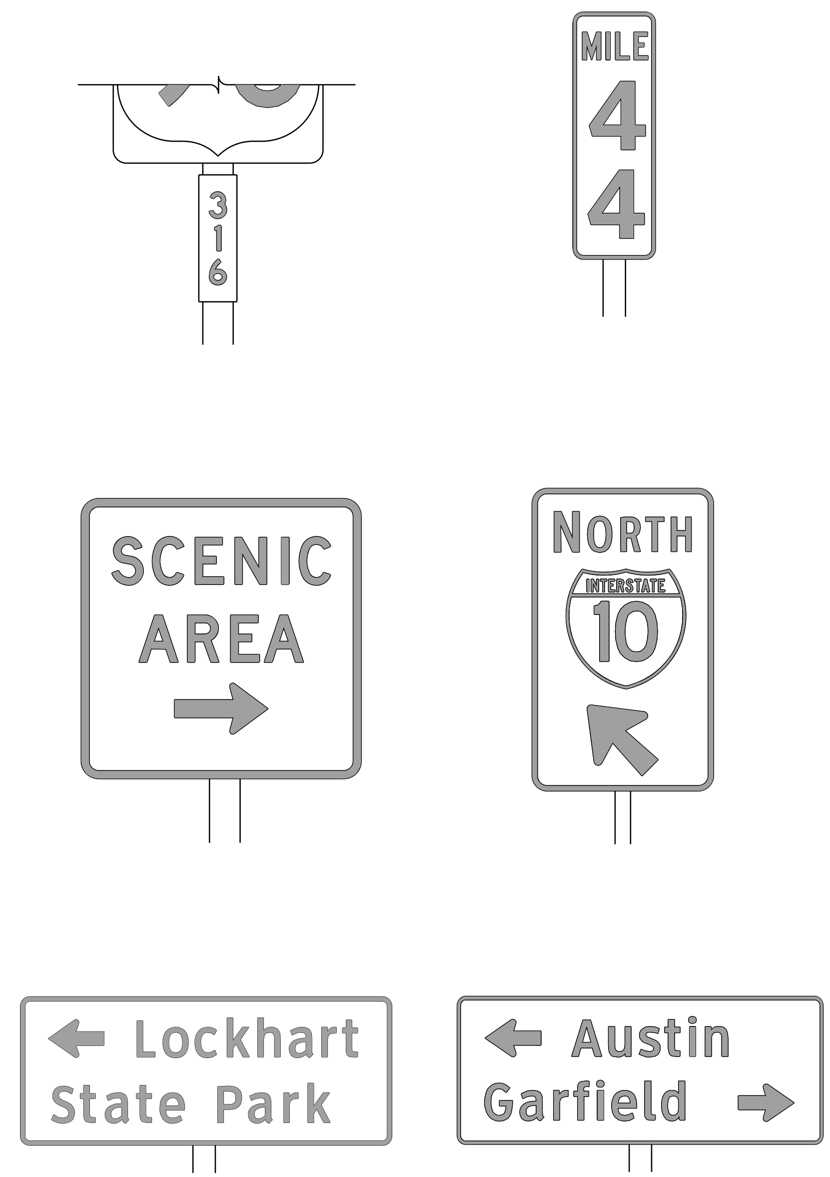
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
12-03 7-13 9-08	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	166

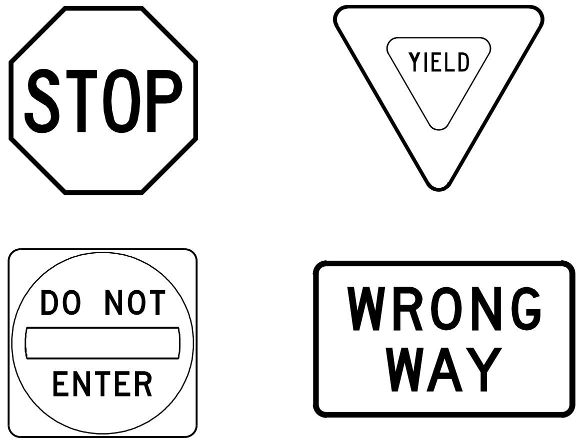
3

DATE: 4/29/2023 10:40:27 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020174/Design/...

DATE: 4/29/2023 10:40:48 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/

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

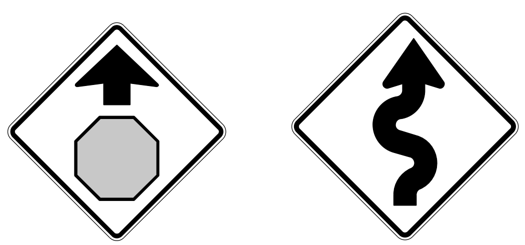
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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

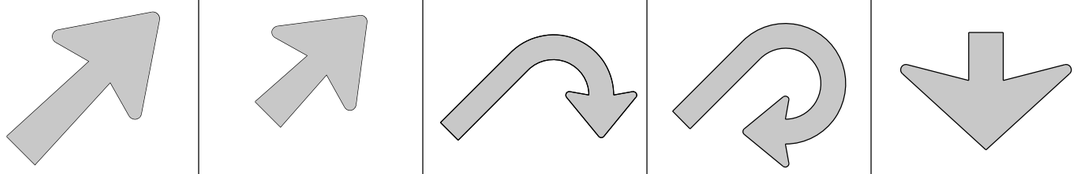
TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-03 7-13 9-08	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		167

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

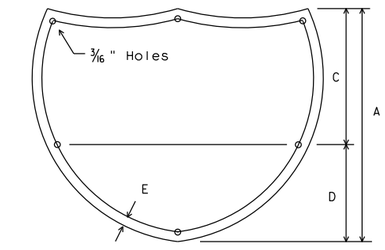
NOTE

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.

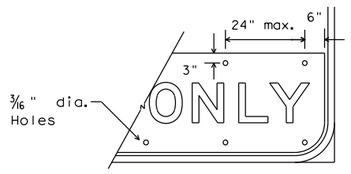
http://www.txdot.gov/

SIGN BLANK PUNCHING DETAILS FOR ATTACHMENTS WHEN SPECIFIED TO BE TYPE A ALUMINUM SIGNS (FOR MOUNTING TO GUIDE SIGN FACE)

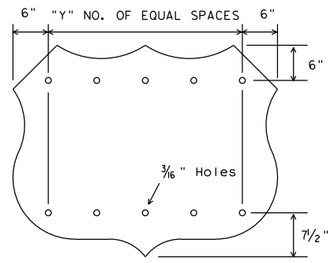


INTERSTATE ROUTE MARKERS

A	C	D	E
36	21	15	1 1/2
48	28	20	1 3/4

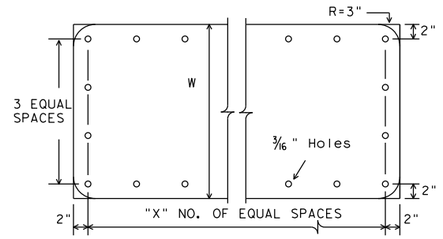


EXIT ONLY PANEL



U.S. ROUTE MARKERS

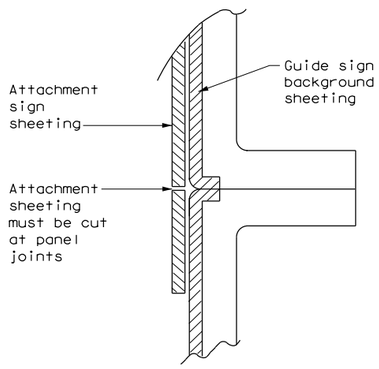
Sign Size	"Y"
24x24	2
30x24	3
36x36	3
45x36	4
48x48	4
60x48	5



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

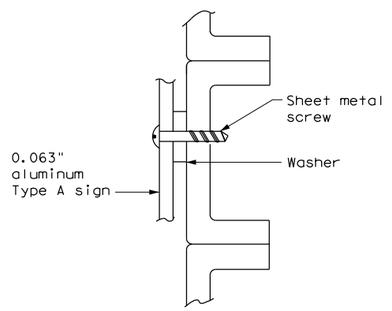
MOUNTING DETAILS OF ATTACHMENTS TO GUIDE SIGN FACE ("EXIT ONLY" AND "LEFT EXIT" PANELS, ROUTE MARKERS AND OTHER ATTACHMENTS)



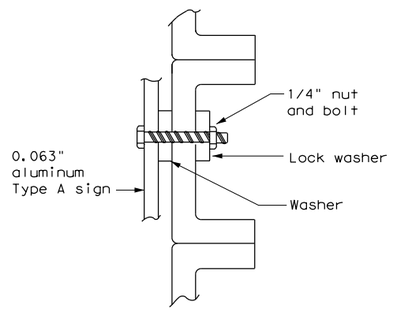
DIRECT APPLIED ATTACHMENT

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



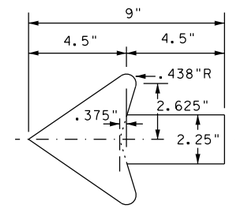
NUT/BOLT ATTACHMENT

NOTE:

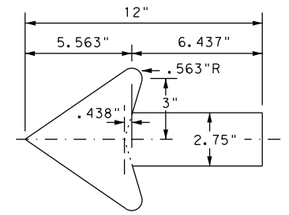
Furnish Type A aluminum sign attachments only when specified in the plans. These signs will be paid for under "Aluminum Signs".

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	2351	02	017	FM 2478
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	DAL	COLLIN		168

DATE: 4/29/2023 10:41:29 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Standards/smdgen.dgn

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))

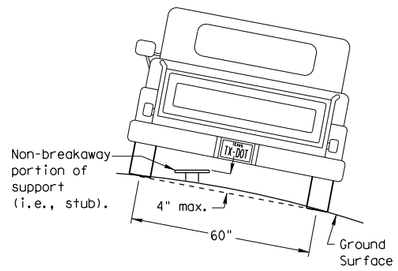
Number of Posts (1 or 2)

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-3))

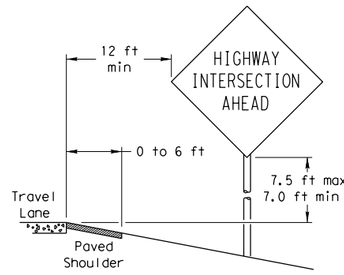
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



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).

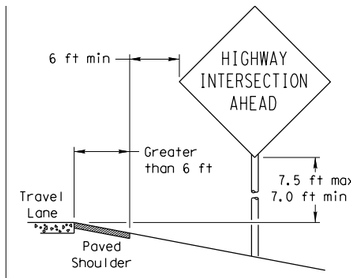
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

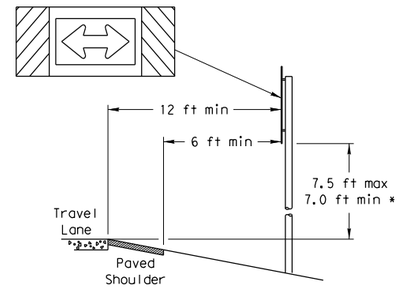
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



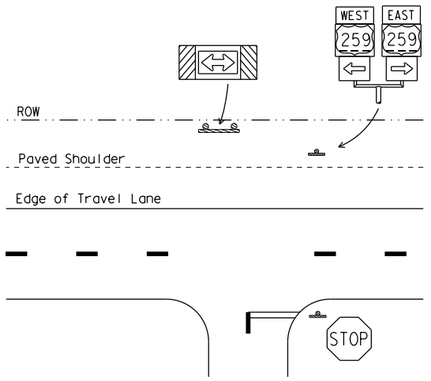
GREATER THAN 6 FT. WIDE

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.

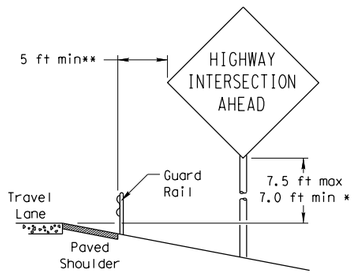
T-INTERSECTION



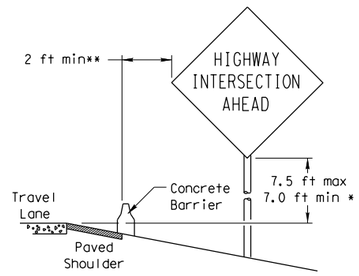
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



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

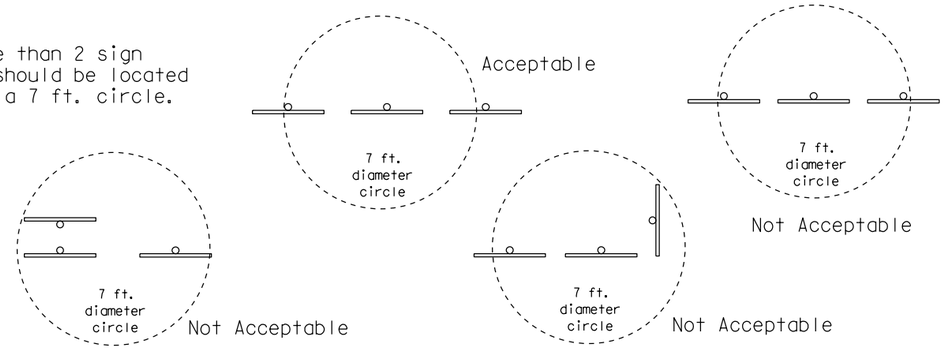
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

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.

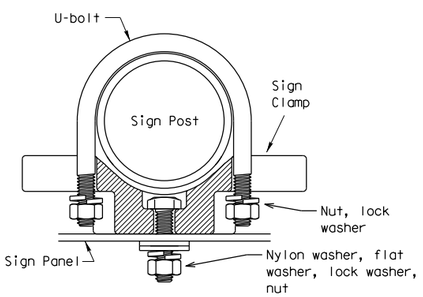
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

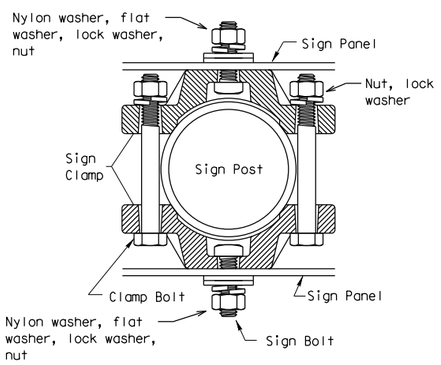


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

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.

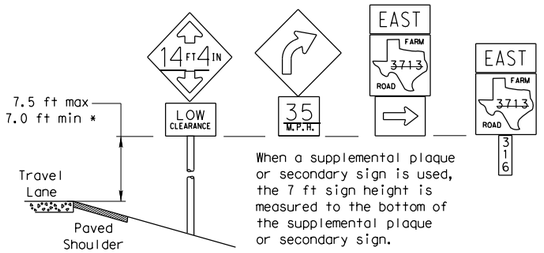
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



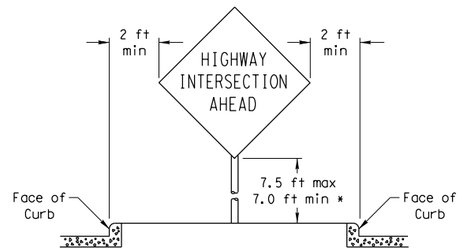
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



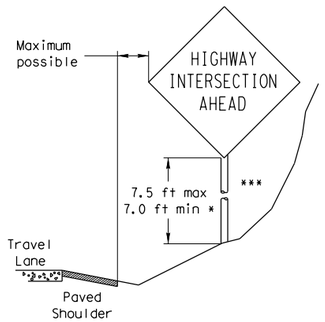
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

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.

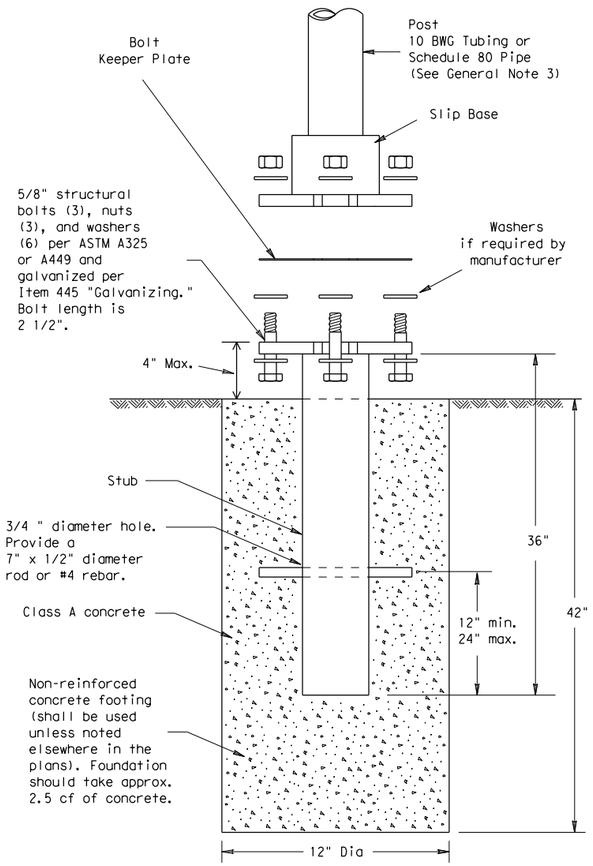
Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

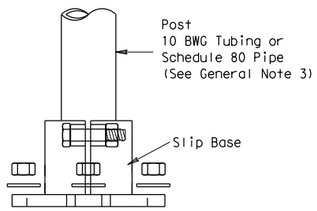
REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		169

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS

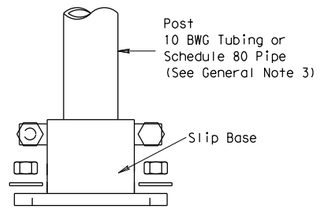


SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

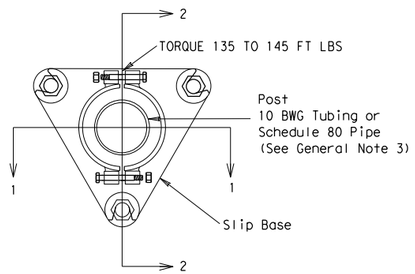
NOTE
The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.



SIDE VIEW 1-1



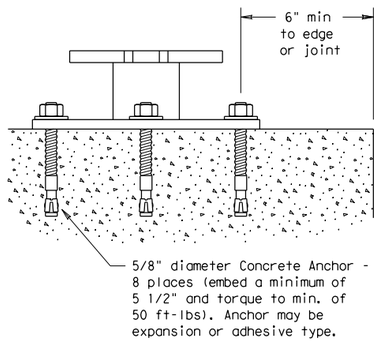
SIDE VIEW 2-2



TOP VIEW

DETAIL A

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.

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.

ADDED DETAIL A FOR CLAMP BASE
10-2010

DATE:
FILE:

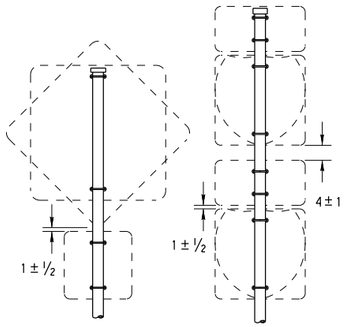
Texas Department of Transportation
Dallas District Standard

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

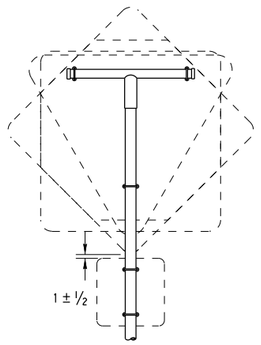
SMD(SLIP-1)-08(DAL)

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	2351	02	017	FM 2478
12-10 (DISTRICT) ADDED CLAMP BASE DETAIL FOR SLIP BASE INSTALLATION	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		170



SM RD SGN ASSM TY XXXXX(1)XX(P)



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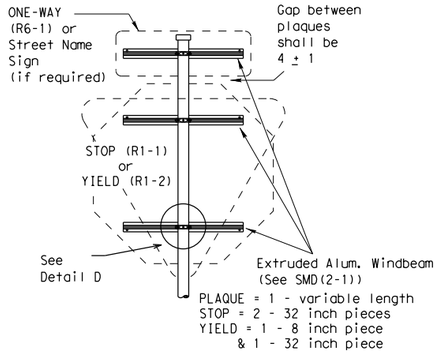
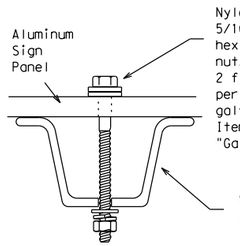
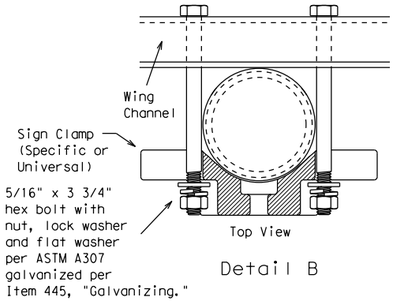


SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



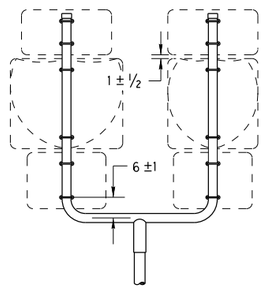
Detail B

GENERAL NOTES:

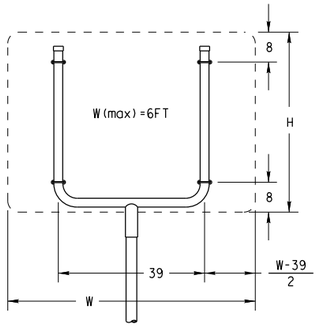
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

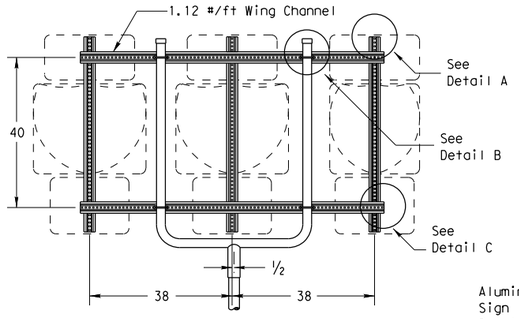
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.



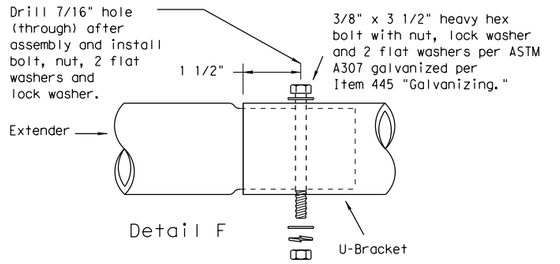
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

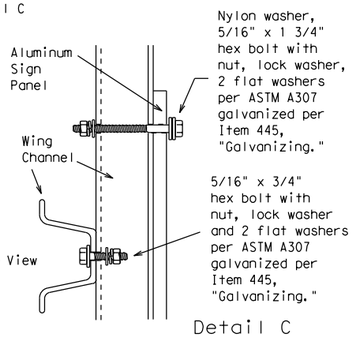


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

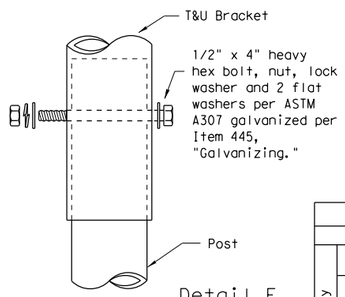


Detail F

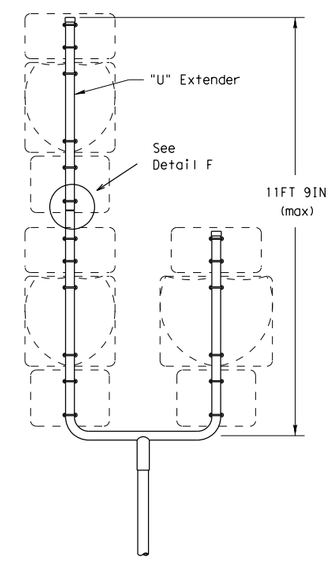
Splices shall only be allowed behind the sign substrate.



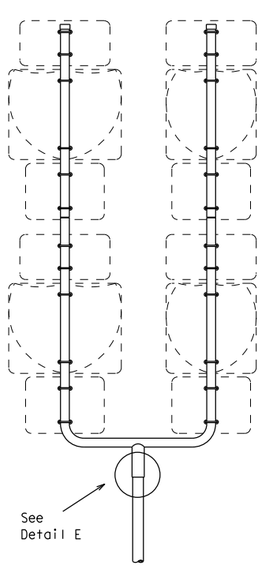
Detail C



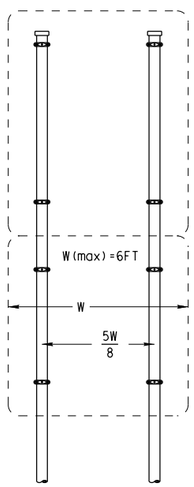
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

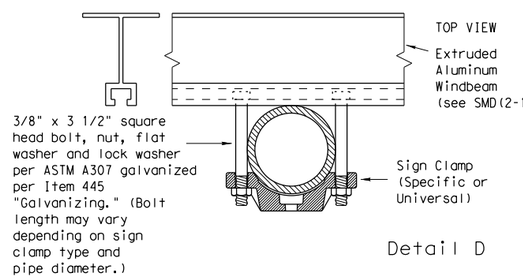


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

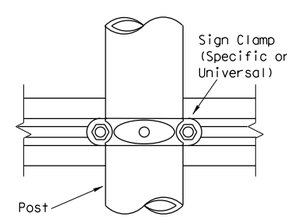


SM RD SGN ASSYM TY XXXXX(2)XX(P)

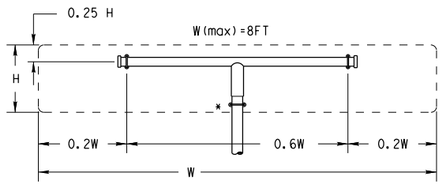
SIDE VIEW



Detail D



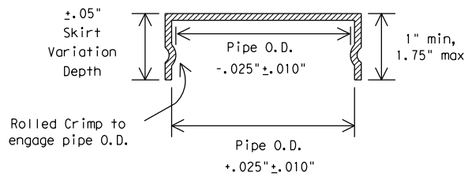
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478

DIST	COUNTY	SHEET NO.
DAL	COLLIN	171

9-08 REVISIONS

26C

DATE: 5/2/2023 3:36:41 PM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/8. Traffic/Standards/smds2.dgn

DATE: 4/29/2023 10:42:27 AM
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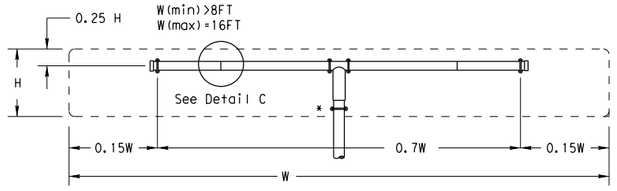
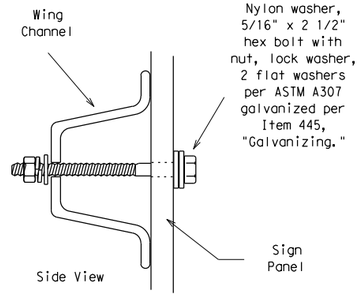
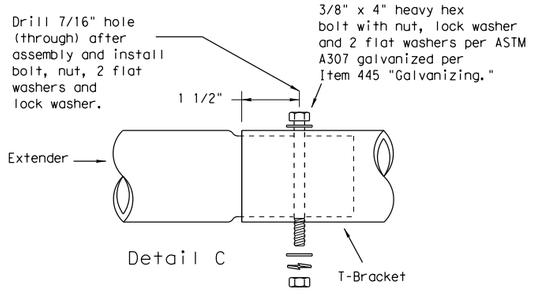


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)
(* - See Note 12)

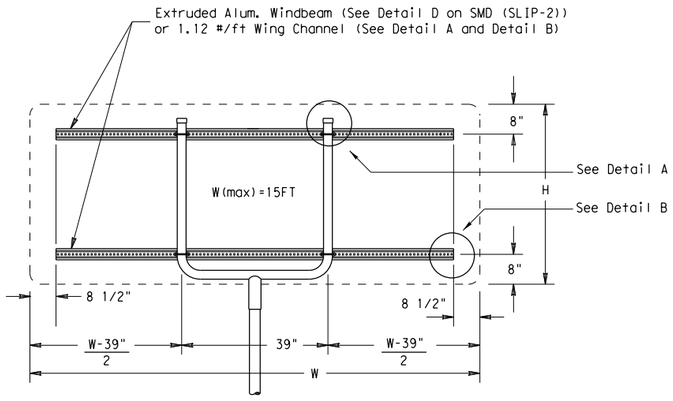


Detail B

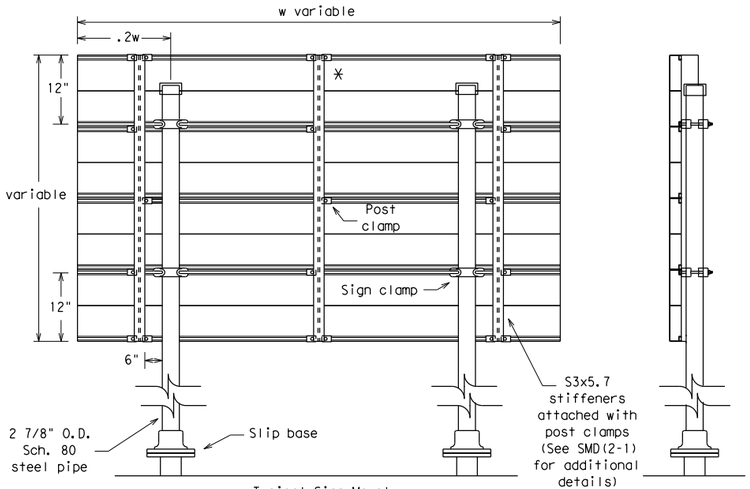


Detail C

Splices shall only be allowed behind the sign substrate.



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

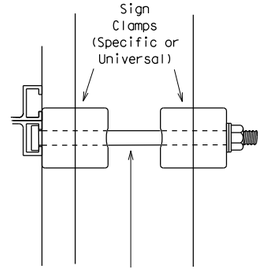


Typical Sign Mount

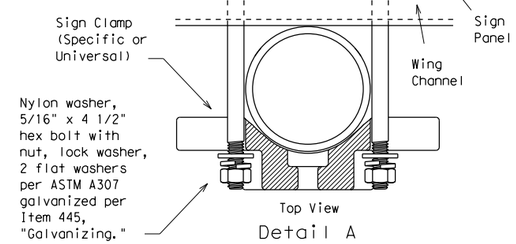
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

See Detail E for clamp installation

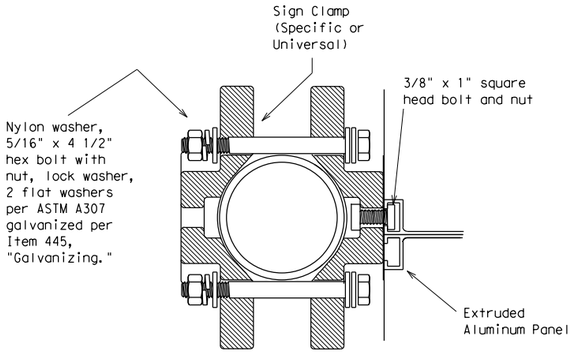


Detail E

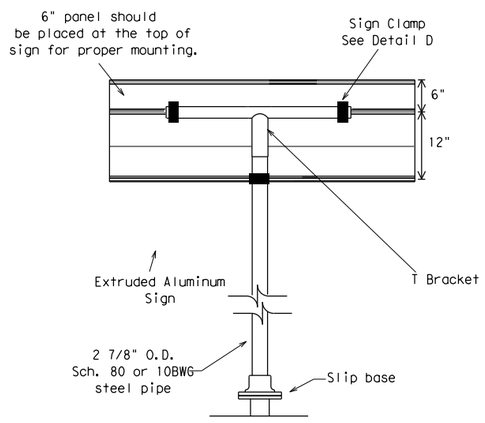


Top View

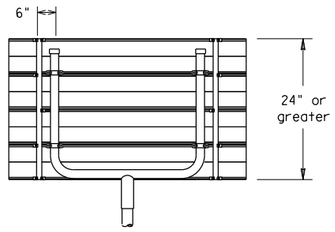
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET



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

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478

DIST	COUNTY	SHEET NO.
DAL	COLLIN	172

DATE: 4/29/2023 10:42:50 AM
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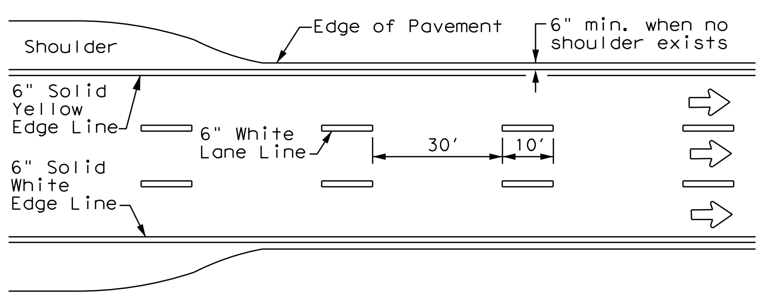
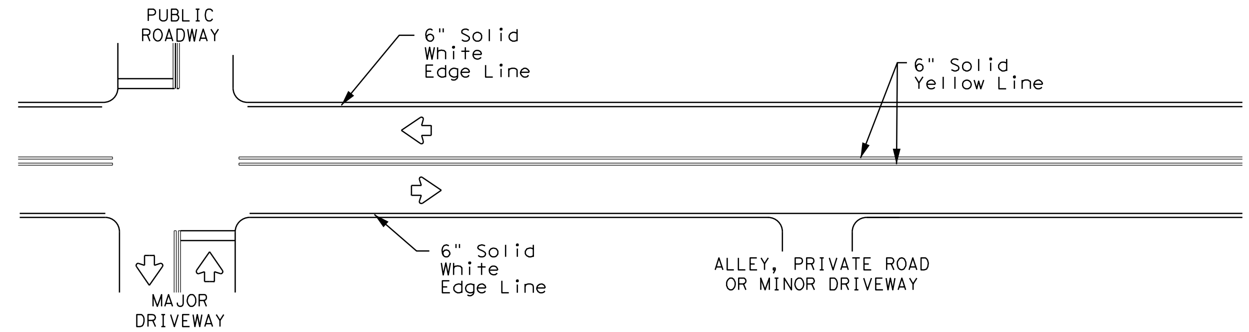


EDGE LINE AND LANE LINES
ONE-WAY ROADWAY
WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

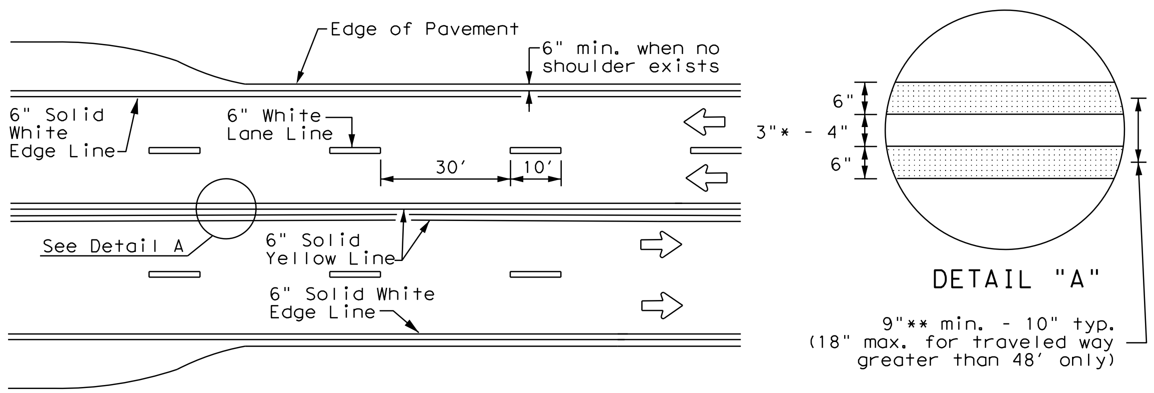
GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.

2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

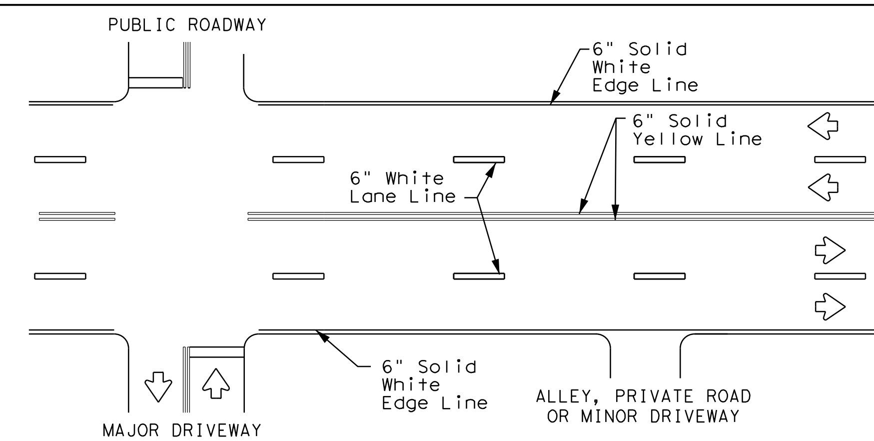
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

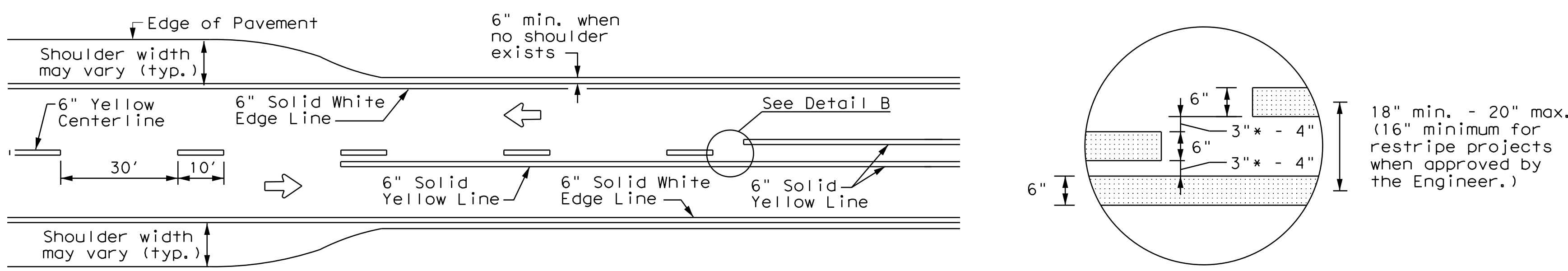


CENTERLINE AND LANE LINES
FOUR LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.
** 8" minimum for restripe projects when approved by the Engineer.

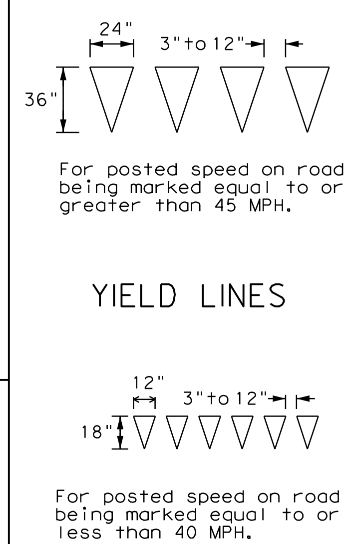


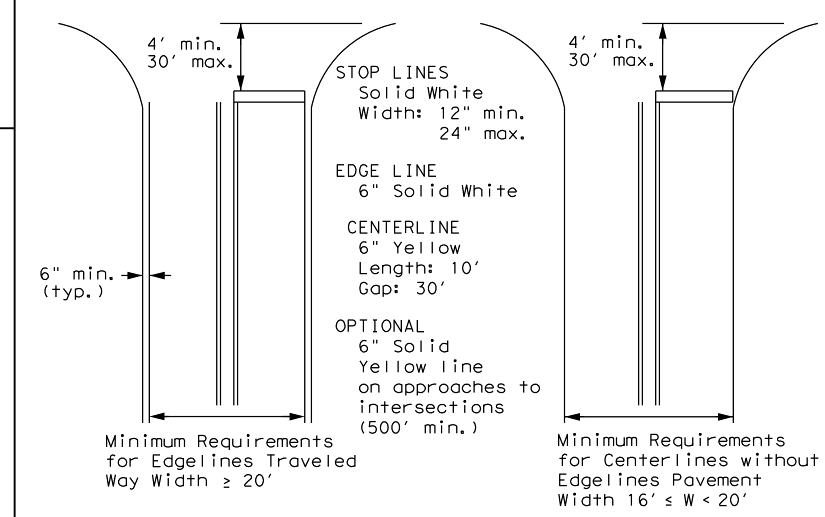
TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



TWO LANE TWO-WAY ROADWAY
WITH OR WITHOUT SHOULDERS

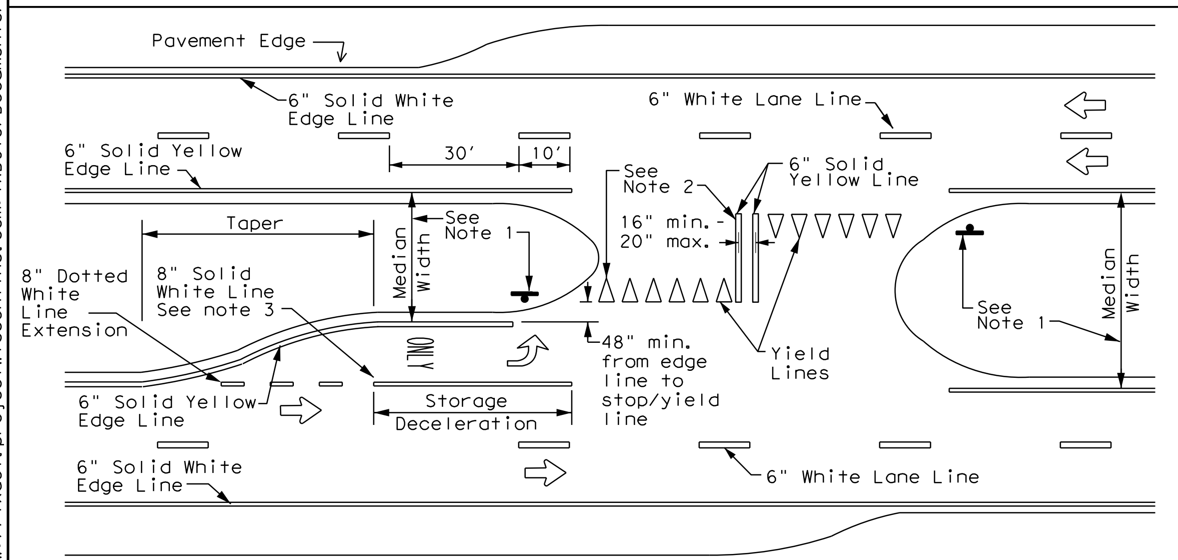
* 2" minimum for restripe projects when approved by the Engineer.





NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE
Based on Traveled Way and Pavement Widths for Undivided Roadways



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections.
Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.

2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.

3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

Texas Department of Transportation — Traffic Safety Division Standard

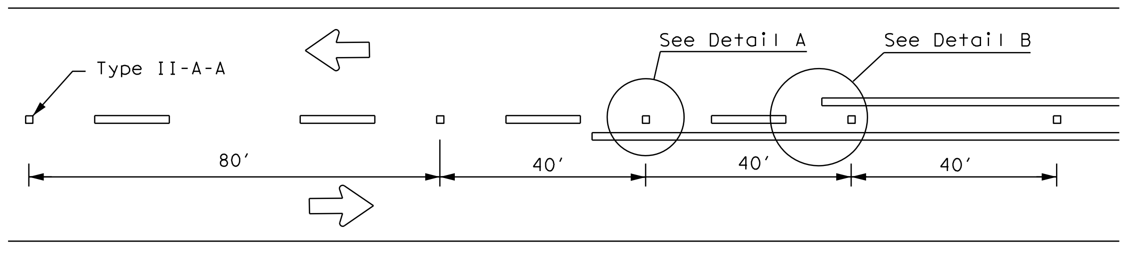
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

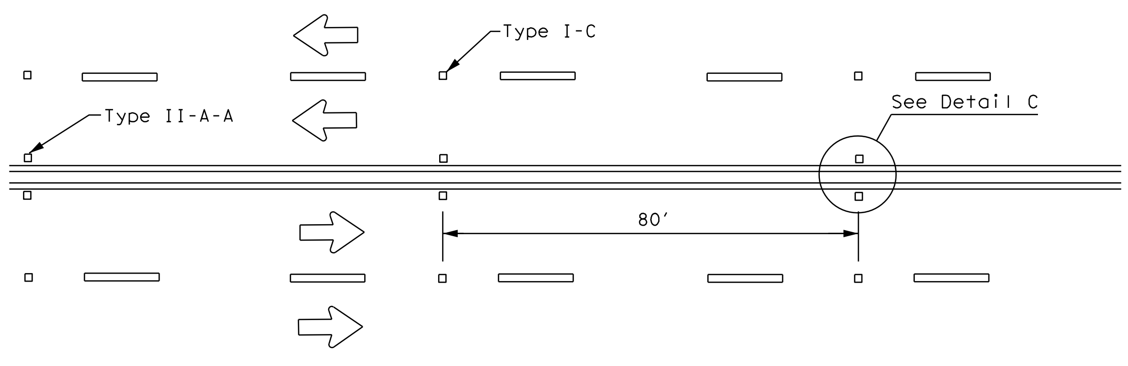
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20; 8-95 3-03 12-22; 5-00 2-12	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	173

22A

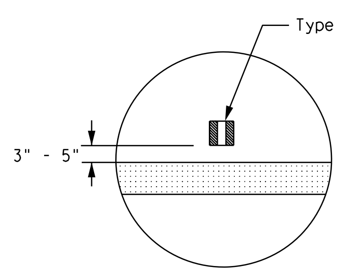
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



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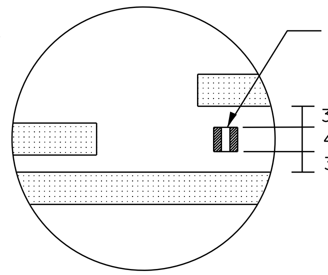

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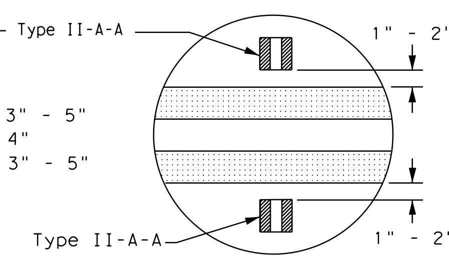
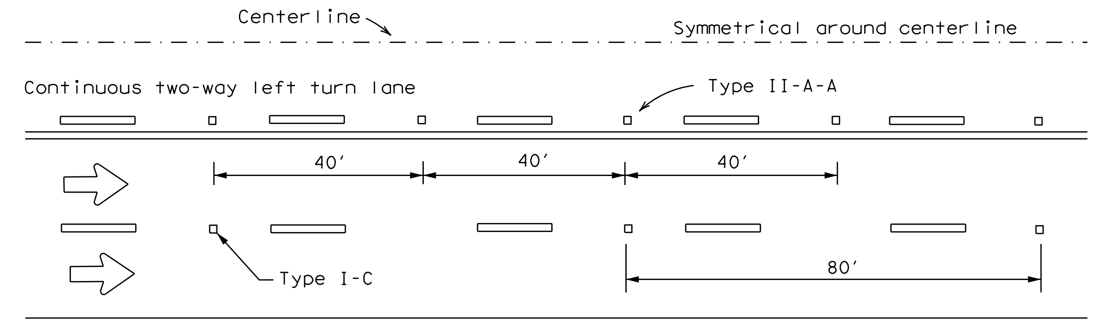
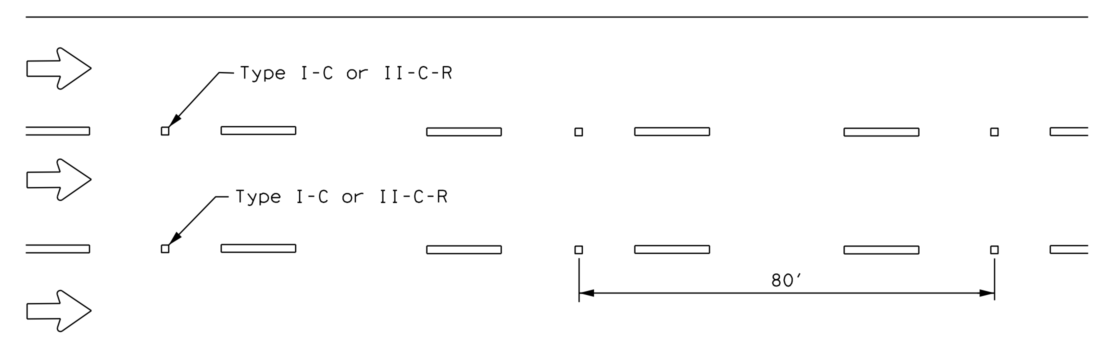


DETAIL "C"



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



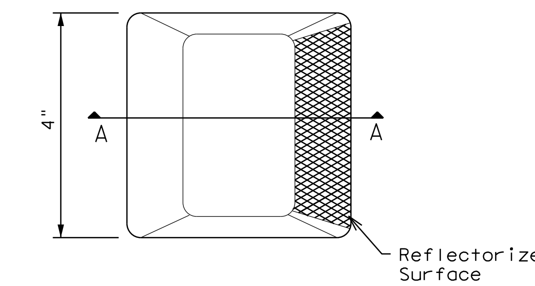
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

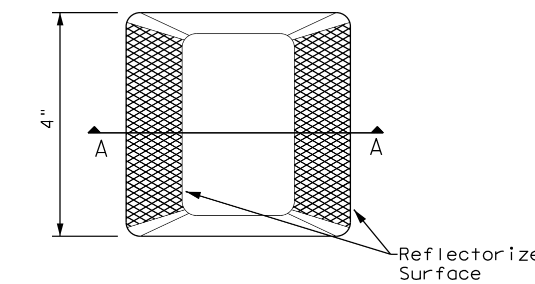
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

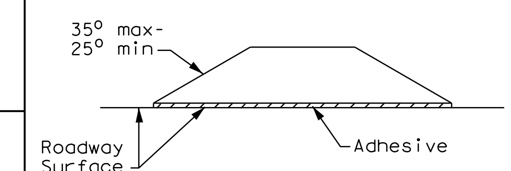
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

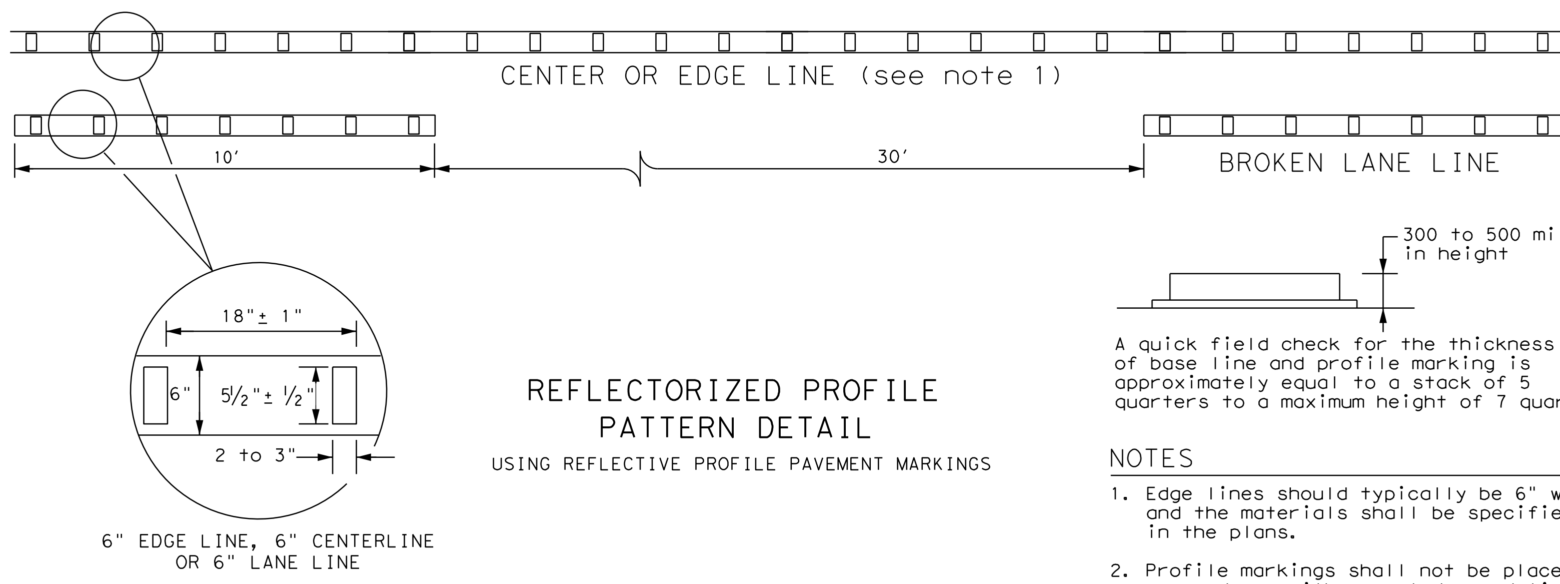


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

300 to 500 mil in height

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	2351	02	017	FM 2478
	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	174

22B

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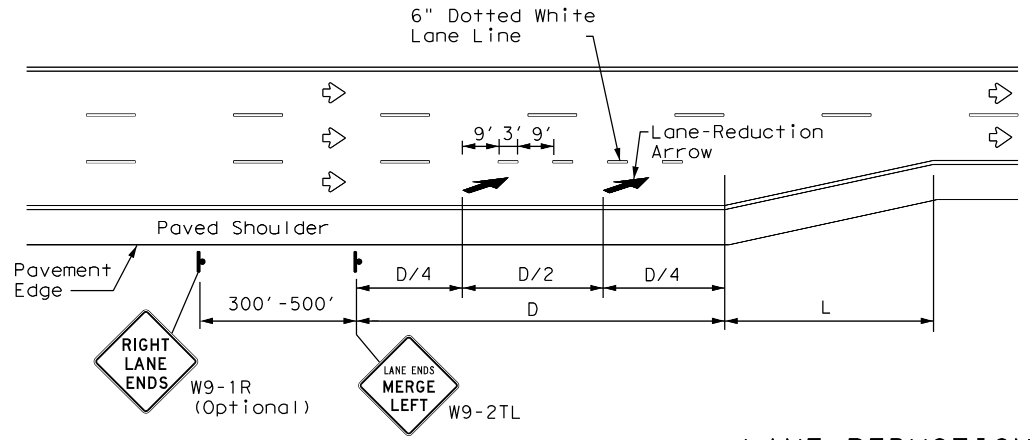


LANE REDUCTION

NOTES

1. Lane reduction pavement markings are used where the number of through lanes is reduced because of narrowing of the roadway or because of a section of on-street parking in what would otherwise be a through lane. For Texas Super 2 Passing Lanes, see TS2(PL) standard sheets.
2. On divided highways, an additional RIGHT LANE ENDS (W9-1R) sign may be installed in the median aligned with the W9-1R sign on the right side of the highway.
3. Lane reduction arrows are required for speeds of 45 mph or greater. An optional third lane reduction arrow may be added based on engineering judgement. If used, the optional third lane reduction arrow should be centered between the first and last lane reduction arrows.
4. For lane reductions on Freeways and Expressways, signing shall conform to the TxDOT Freeway Signing Handbook.

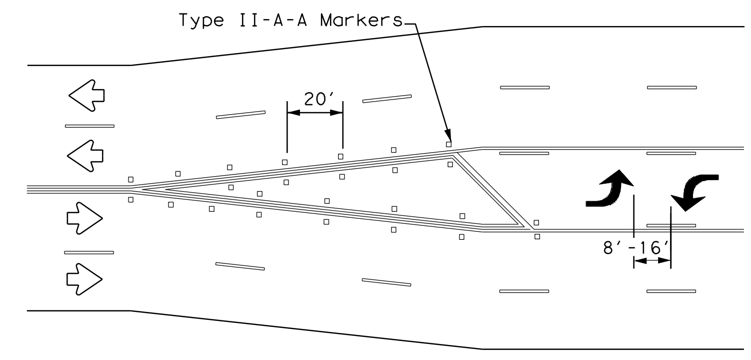
ADVANCED WARNING SIGN DISTANCE (D)		
Posted Speed	D (ft)	L (ft)
30 MPH	460	$L = \frac{WS^2}{60}$
35 MPH	565	
40 MPH	670	
45 MPH	775	L=WS
50 MPH	885	
55 MPH	990	
60 MPH	1,100	
65 MPH	1,200	
70 MPH	1,250	
75 MPH	1,350	

GENERAL NOTES

1. Lane use word and arrow markings shall be used where through lanes approaching an intersection become mandatory turn lanes. Lane use word and arrow markings should be used in auxiliary lanes of substantial length. Lane use arrow markings or word and arrow markings may be used in other lanes and turn bays for emphasis. Details for words and arrows are as shown in the Standard Highway Sign Designs for Texas.
2. When lane-use words and arrow markings are used, two sets of arrows should be used if the length of the bay is greater than 180 feet. When a single lane use arrow or word and arrow marking is used for a short turn lane, it should be located at or near the upstream end of the full-width turn lane.
3. Use raised pavement marker Type I-C with undivided highways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.
4. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer. See Chapter 3 of the Roadway Design Manual for additional information on turning lanes or storage lengths.

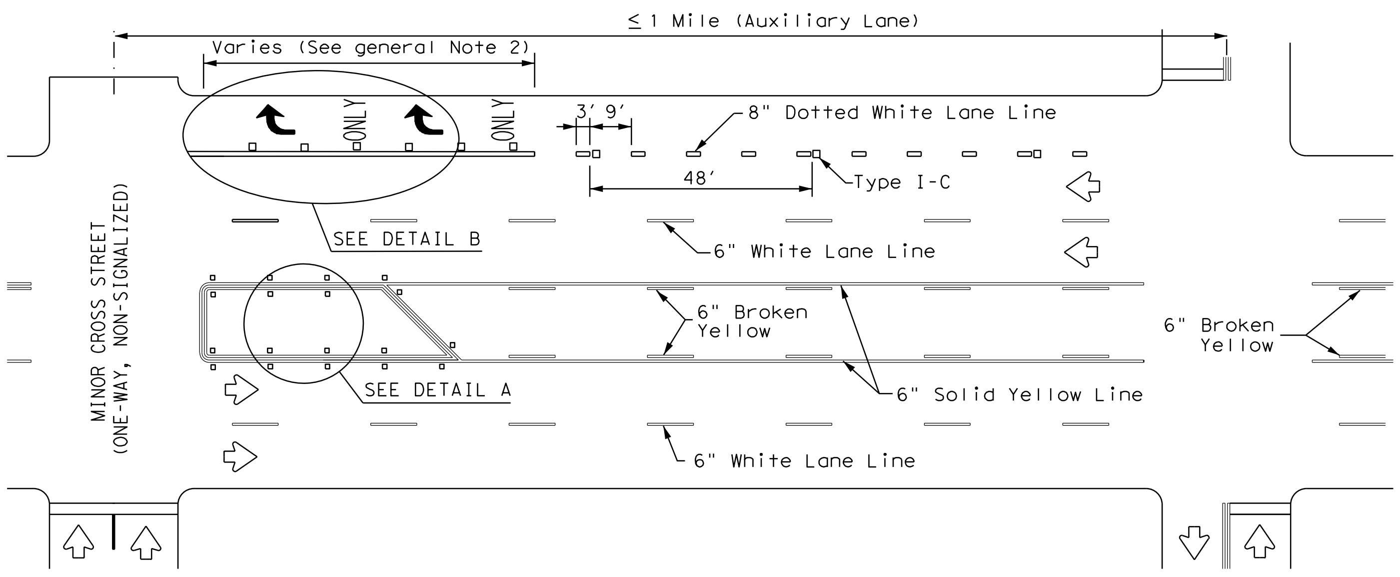
MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.

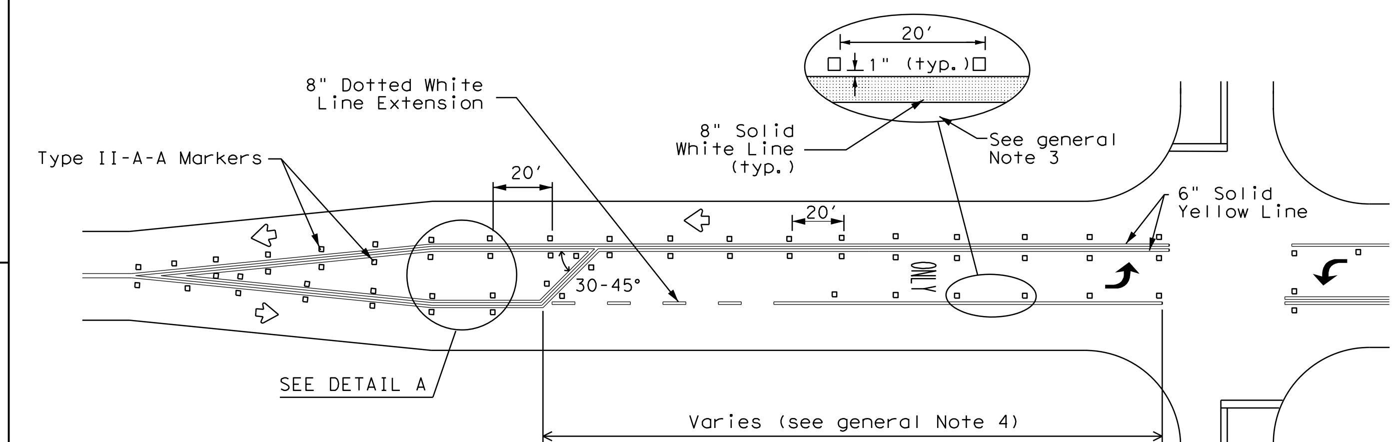


A two-way left-turn (TWLT) lane-use arrow pavement marking should be used at or just downstream from the beginning of a two-way left-turn lane within a corridor. Repeating the marking after each intersection or dedicated turn bay is not required unless stated elsewhere in the plans.

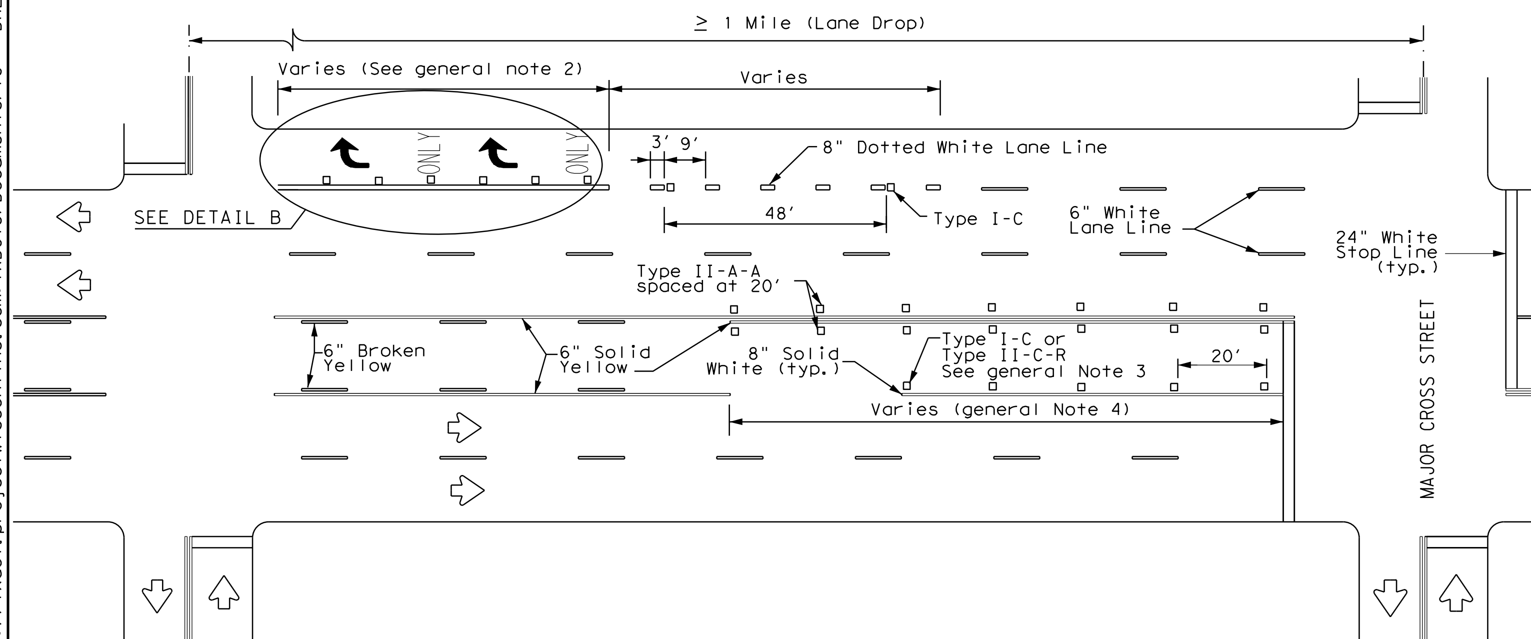
TYPICAL TRANSITION FOR TWLTL AND DIVIDED HIGHWAY



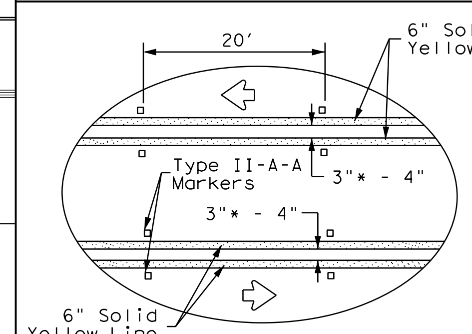
TYPICAL TWLTL AT ONE-WAY STREET AND RIGHT TURN AUXILIARY LANE



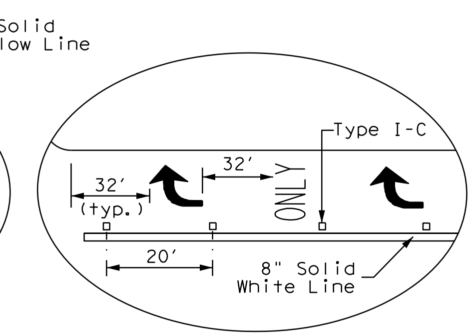
TYPICAL TWO-LANE ROADWAY INTERSECTION WITH LEFT TURN BAYS



TYPICAL TWLTL AT TWO-WAY CROSS STREET AND RIGHT TURN LANE DROP



DETAIL A



DETAIL B

* 2" minimum allowed for restripe projects when approved by the Engineer.

Texas Department of Transportation

Traffic Safety Division Standard

TWO-WAY LEFT TURN LANES, RURAL LEFT TURN BAYS, AND LANE REDUCTION PAVEMENT MARKINGS

PM(3)-22

FILE: pm3-22.dgn | DN: | CK: | DW: | CK:

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CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478

REVISIONS: 4-98 3-03 6-20; 5-00 2-10 12-22; 8-00 2-12

DIST	COUNTY	SHEET NO.
DAL	COLLIN	175

22C

DATE: 4/29/2023 10:43:31 AM
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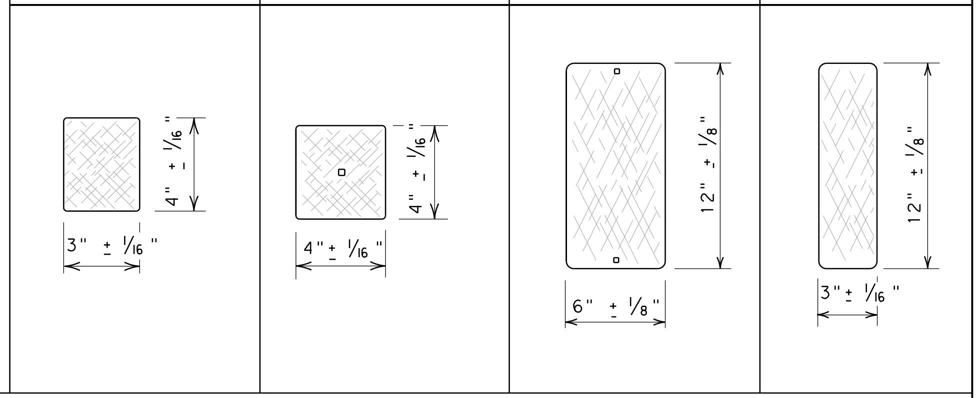
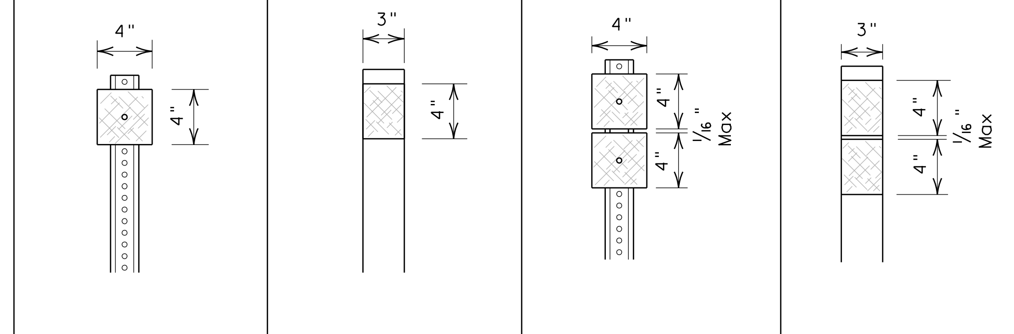
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS



	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE	(see drawing)			
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)

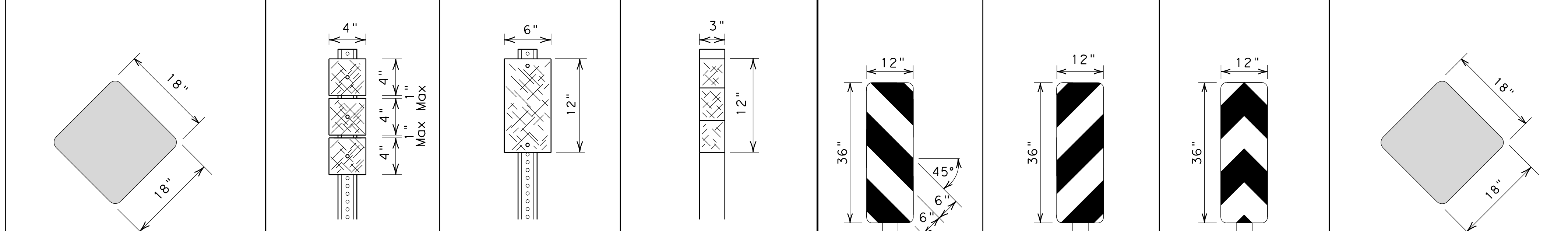
TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
- If Required
- BI = Bi-Directional

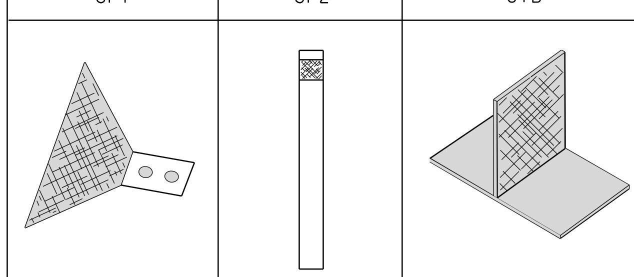
DEPARTMENTAL MATERIAL SPECIFICATIONS	
FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

OBJECT MARKERS



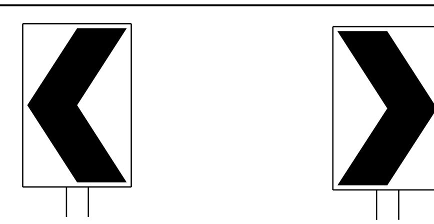
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating 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)



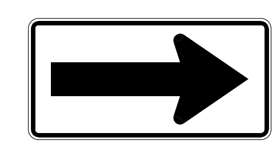
	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches 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	

ONE DIRECTION LARGE ARROW



DEVICE	W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	DAL		COLLIN	176

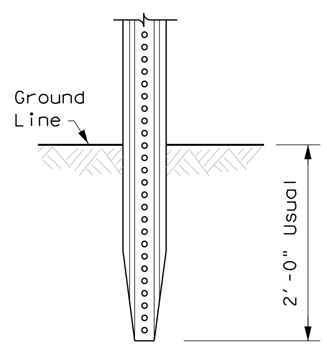
20A

DATE: 4/29/2023 10:43:52 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/...

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

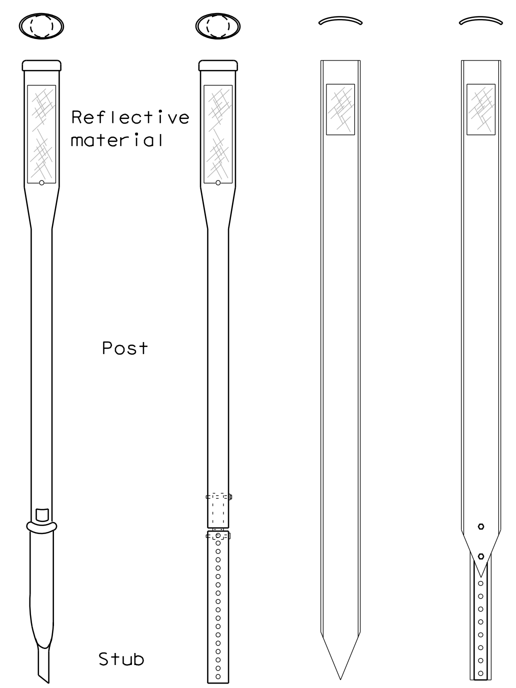


NOTES

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.

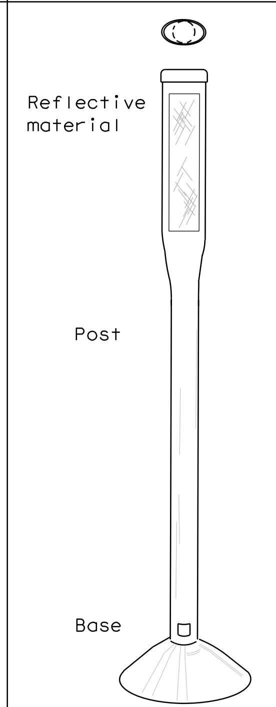
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



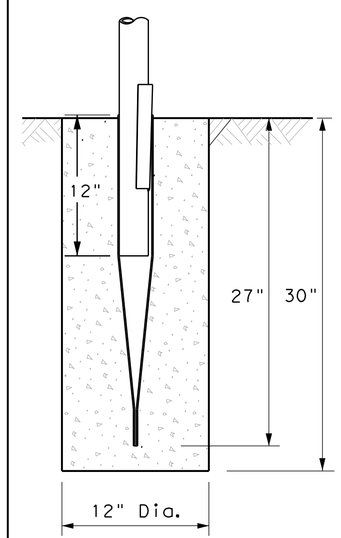
SURFACE MOUNT

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.

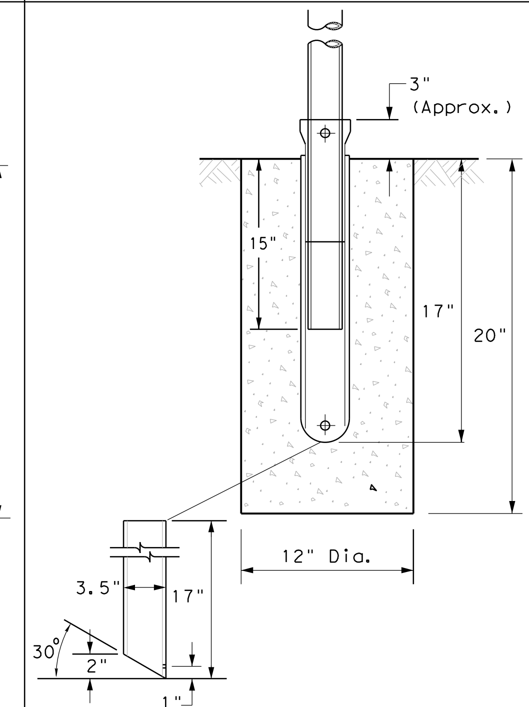
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

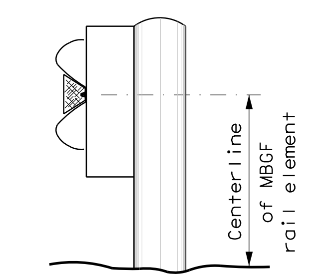
NOTE

1. Install per manufacturer's recommendations.

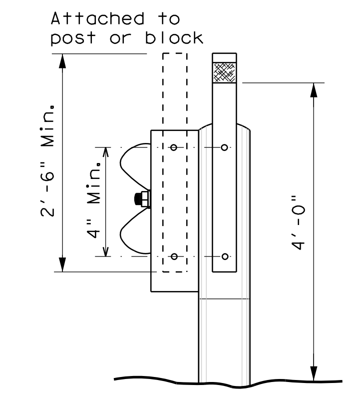
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

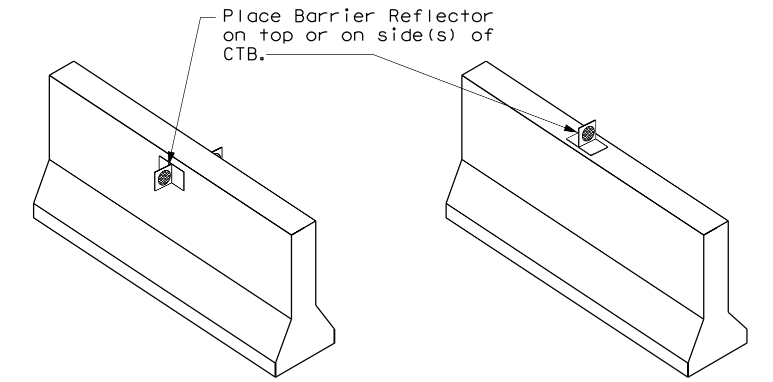
GF1



GF2



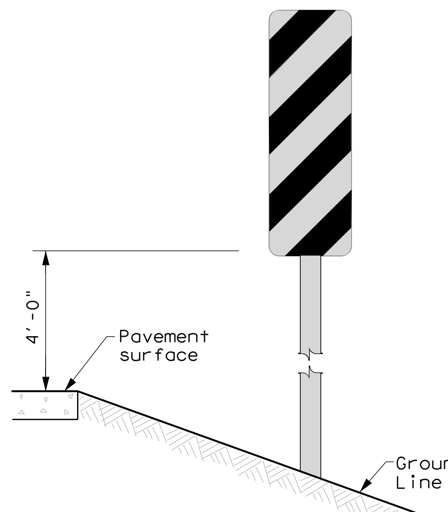
CONCRETE TRAFFIC BARRIER (CTB)



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.

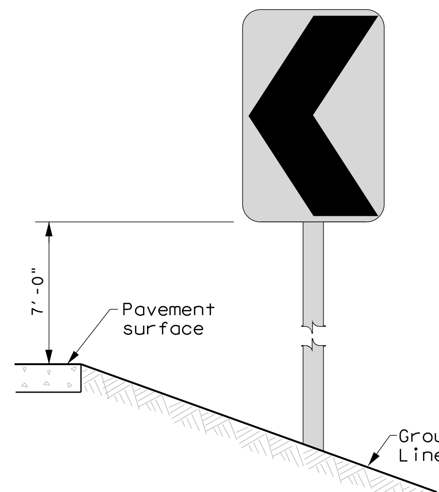
TYPES 1,3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

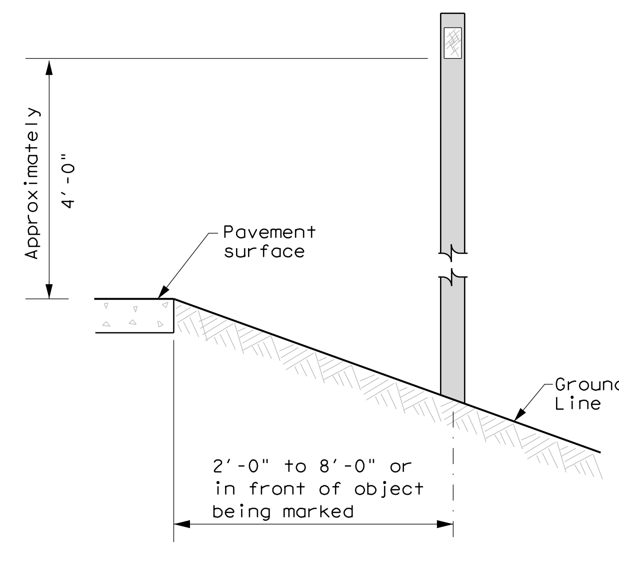
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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	2351	02	017	FM 2478
10-09 3-15	DIST		COUNTY	SHEET NO.
4-10 7-20	DAL		COLLIN	177

20B

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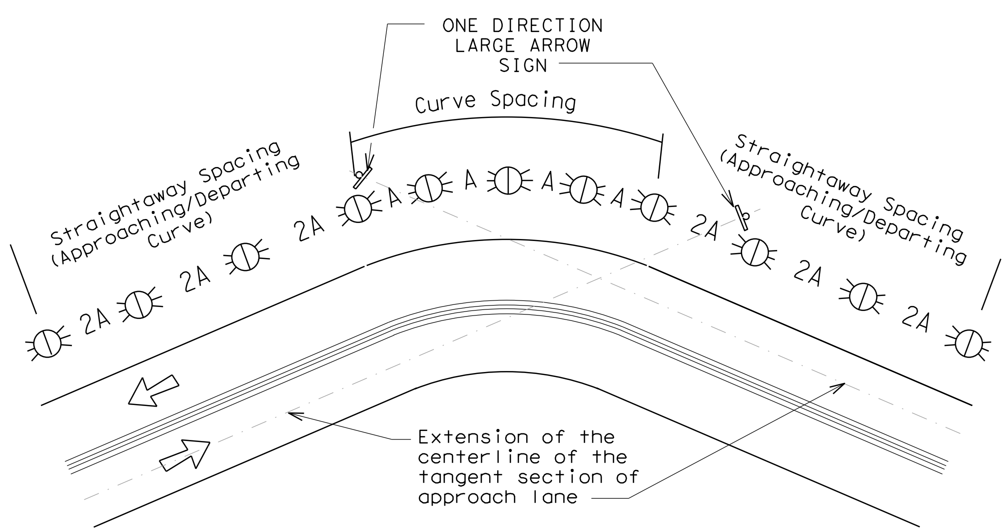
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	● RPMs	● RPMs
15 MPH & 20 MPH	● RPMs and One Direction Large Arrow sign	● RPMs and Chevrons; or ● RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	● RPMs and Chevrons; or ● RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	● RPMs and Chevrons

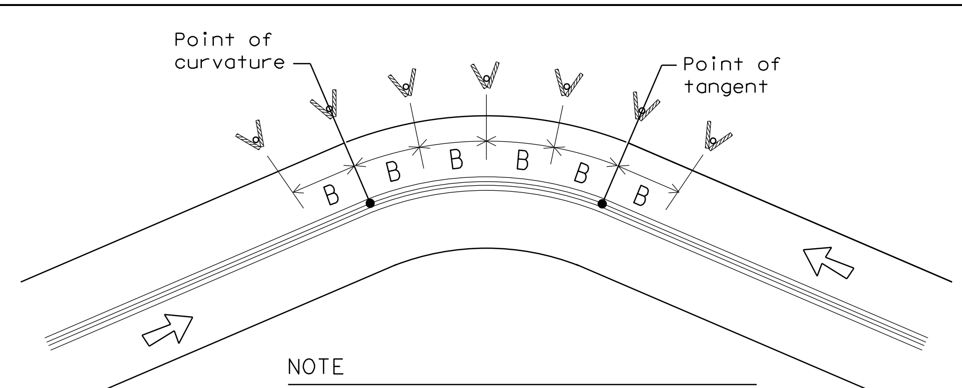
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND

Symbol	Description
	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	2351	02	017	FM 2478
3-15 8-15 8-15 7-20	DIST		COUNTY	SHEET NO.
	DAL		COLLIN	178

20C

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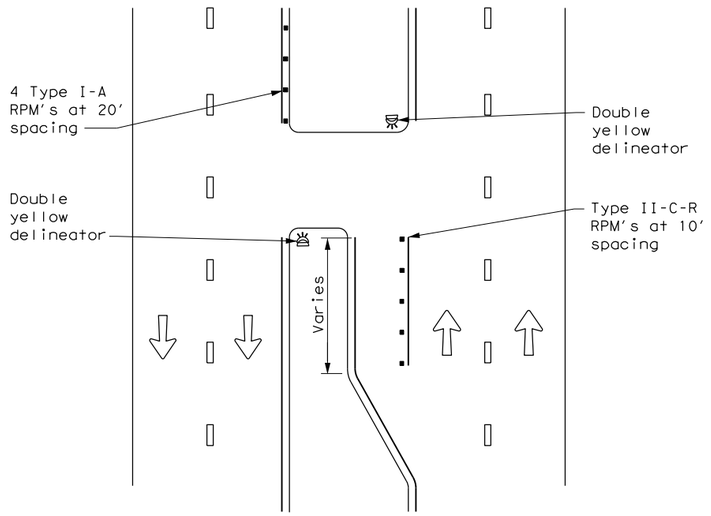
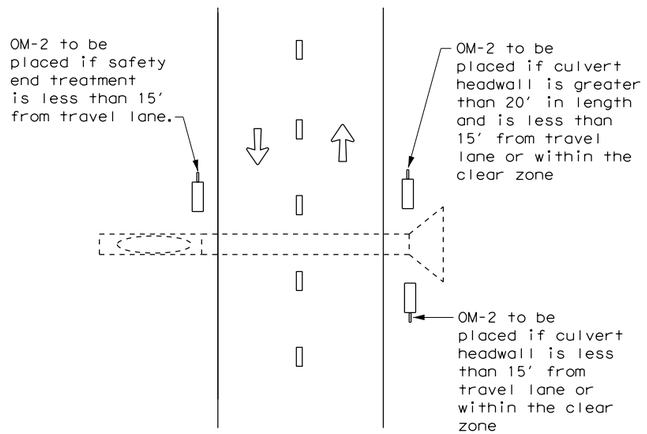
CROSSOVERS



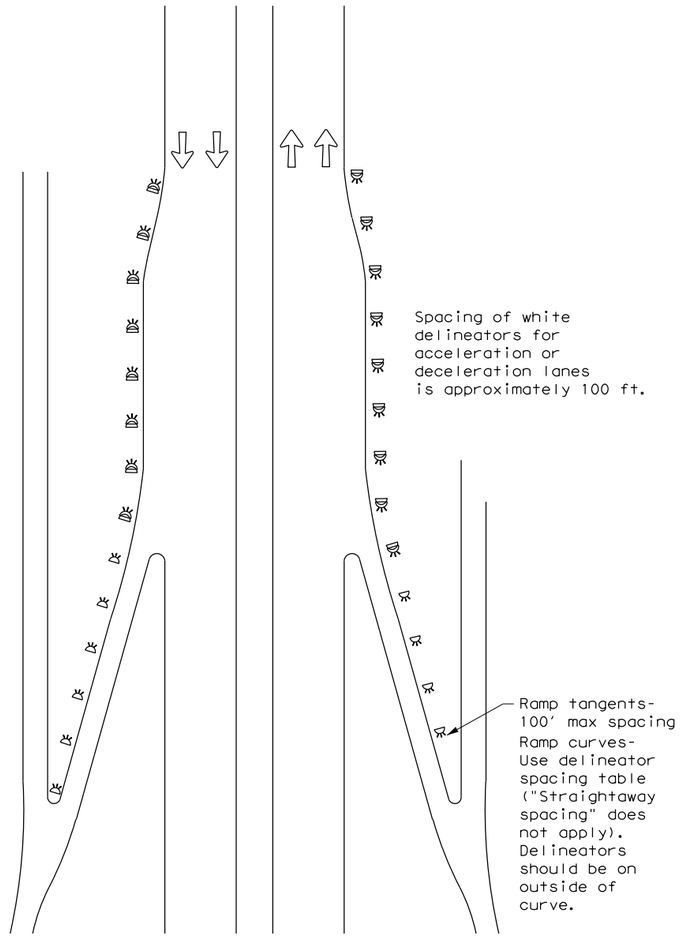
DETAIL 1

FOR CULVERTS WITHOUT MBGF



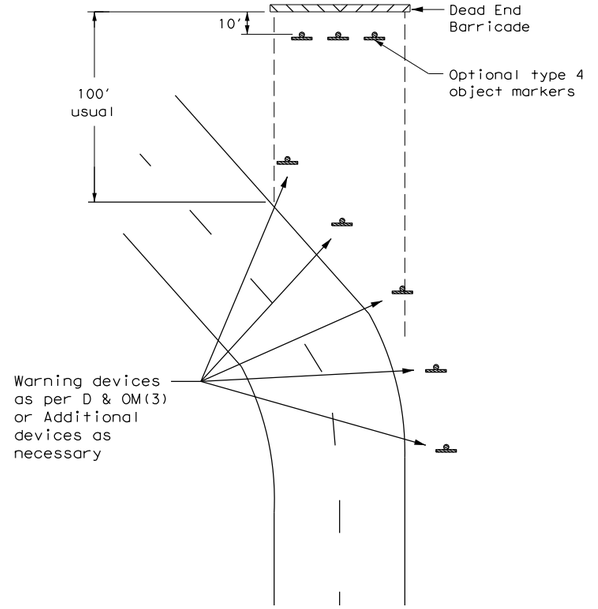
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



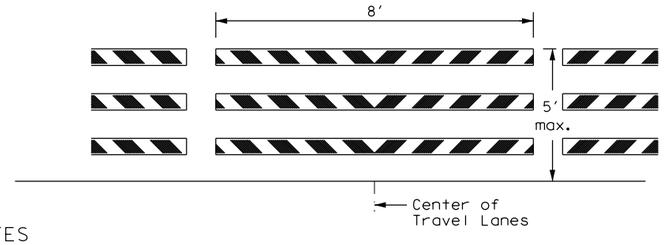
DETAIL 3

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

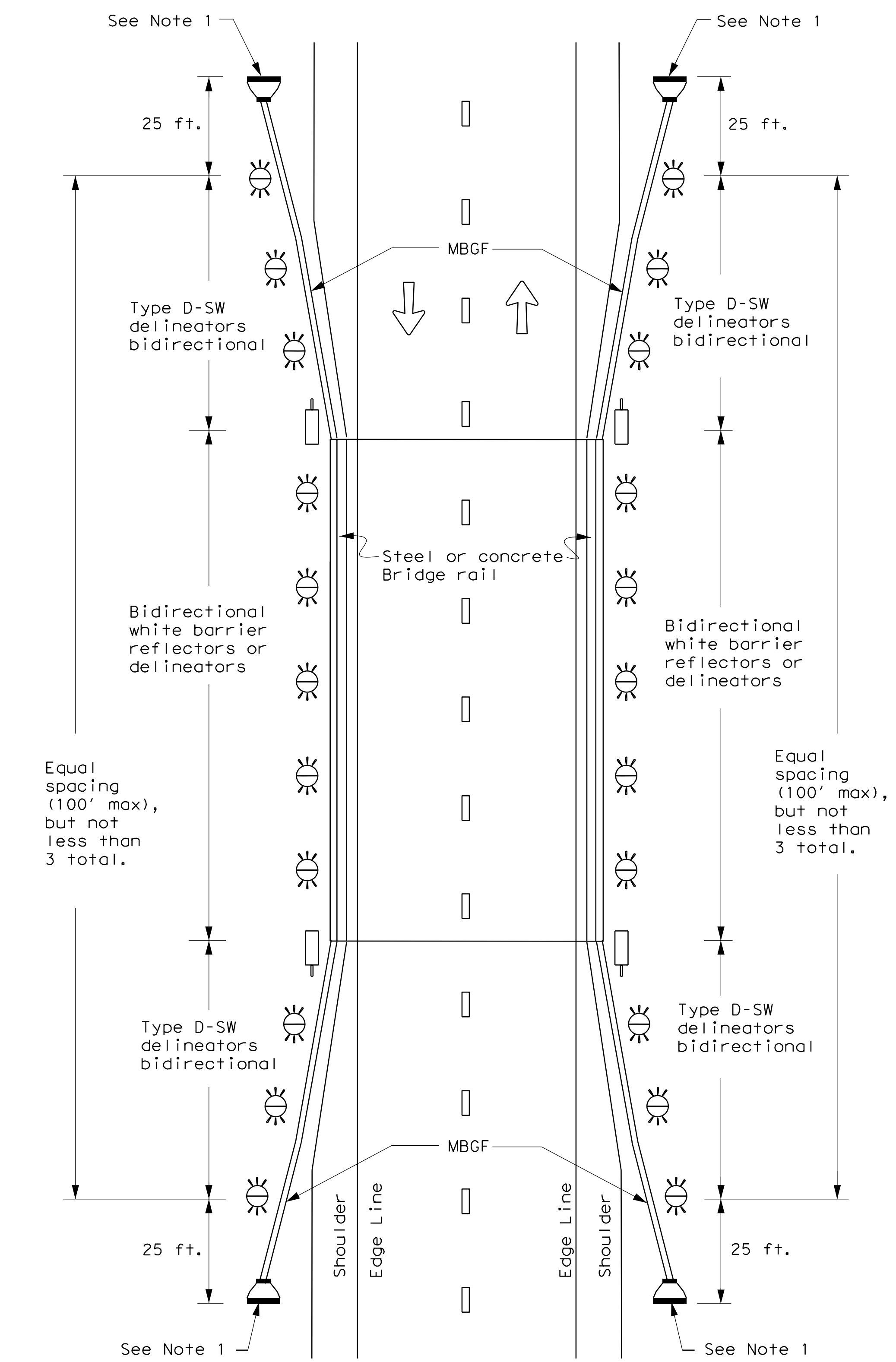
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dgm4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
3-15	DIST	COUNTY		SHEET NO.
7-20	DAL	COLLIN		179

20D

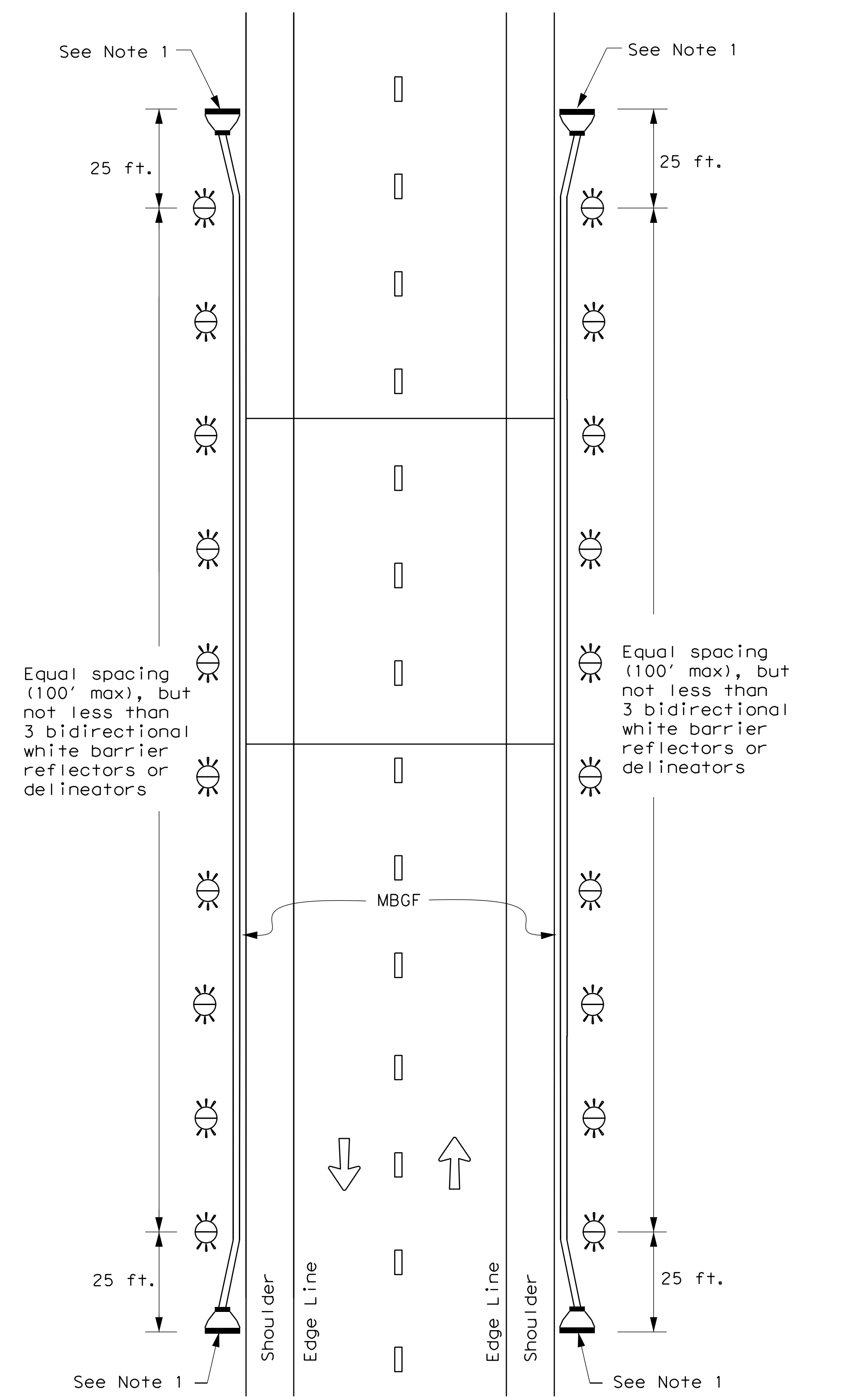
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

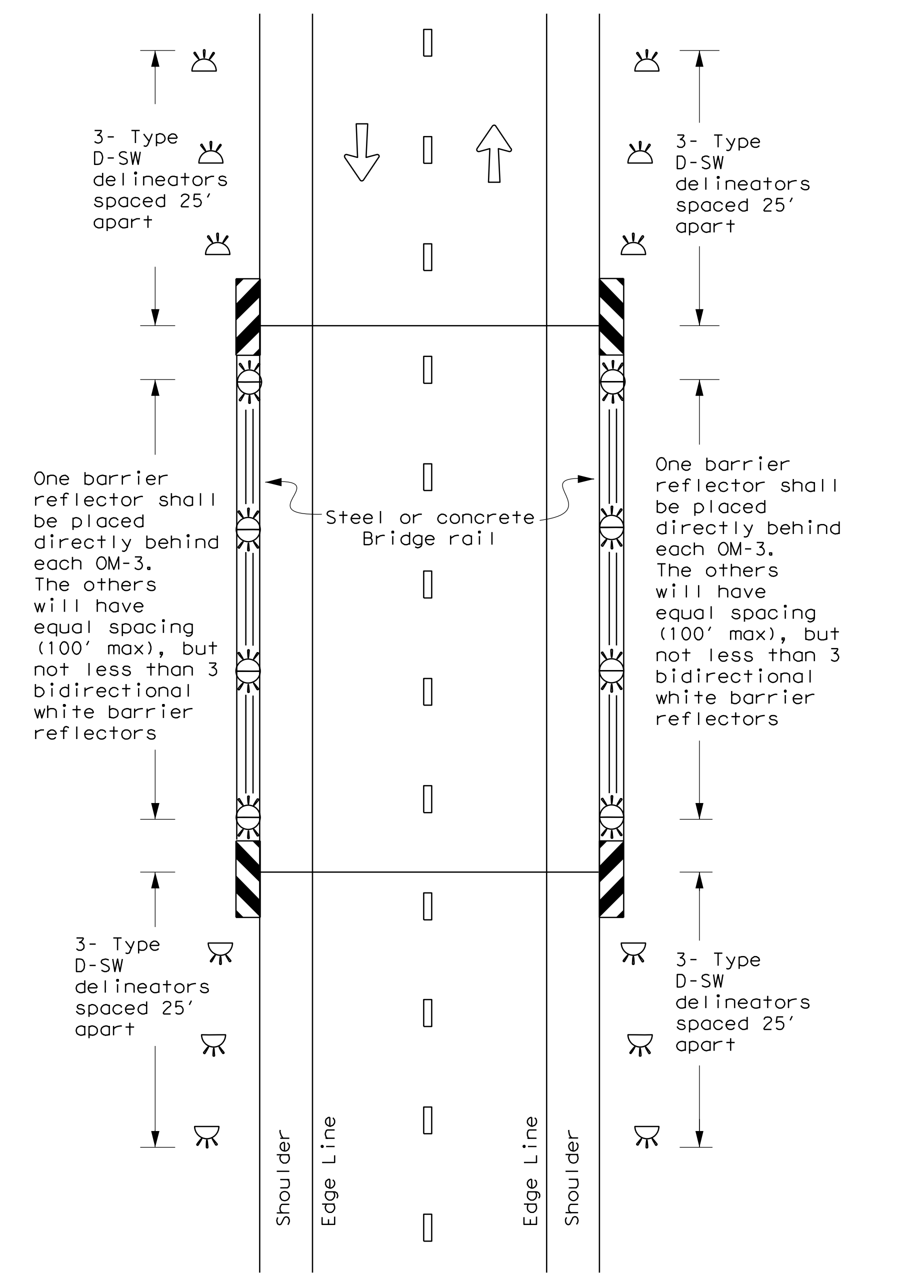
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

Symbol	Description
(symbol)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	OM-2
(symbol)	Terminal End
(symbol)	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS 7-20	2351	02	017	FM 2478
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	DAL	COLLIN		180

20E

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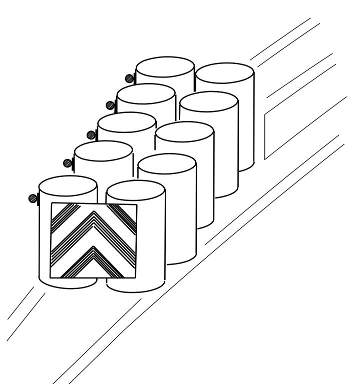
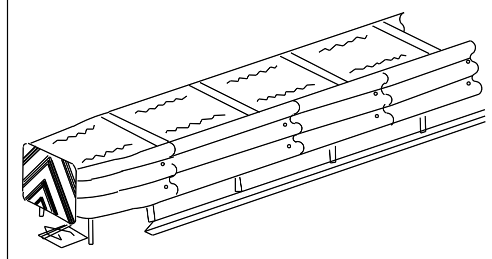
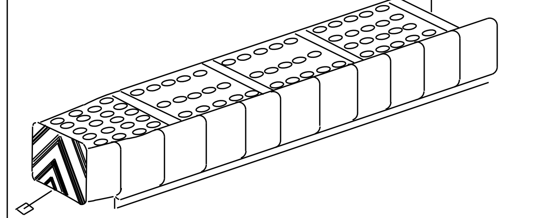
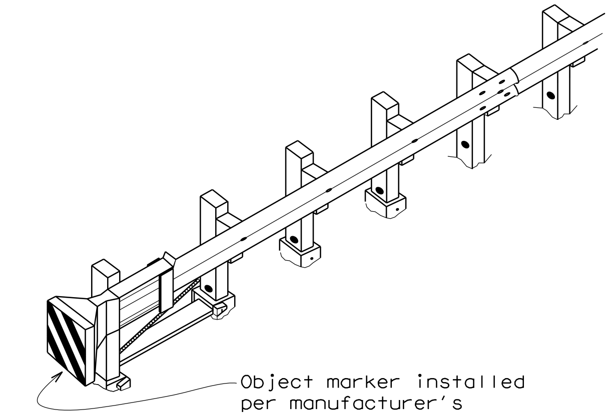
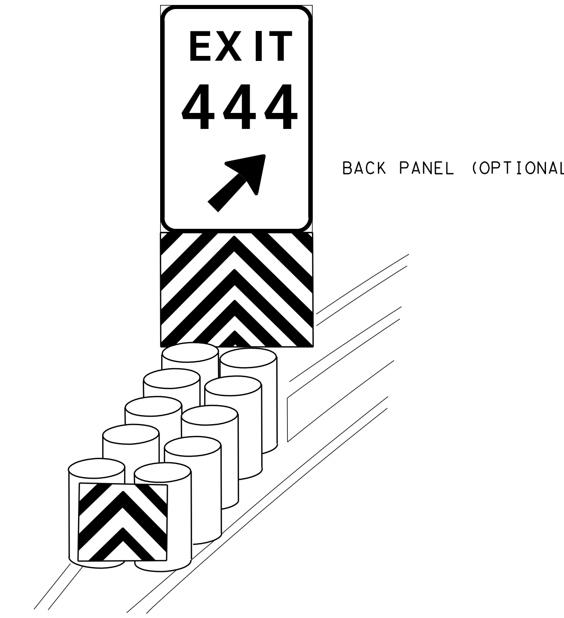




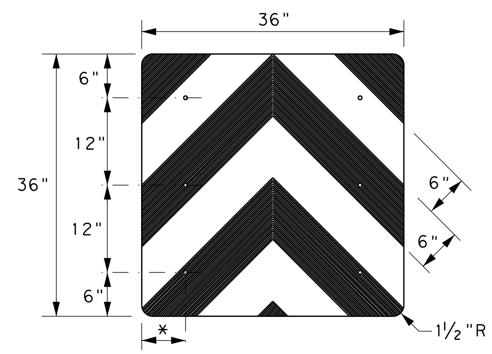


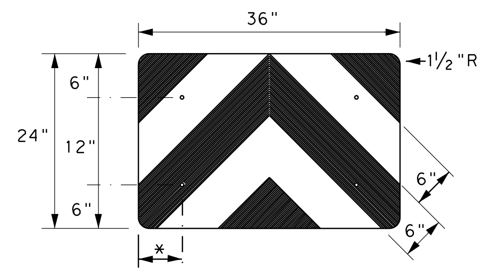


Object marker installed per manufacturer's recommendations.

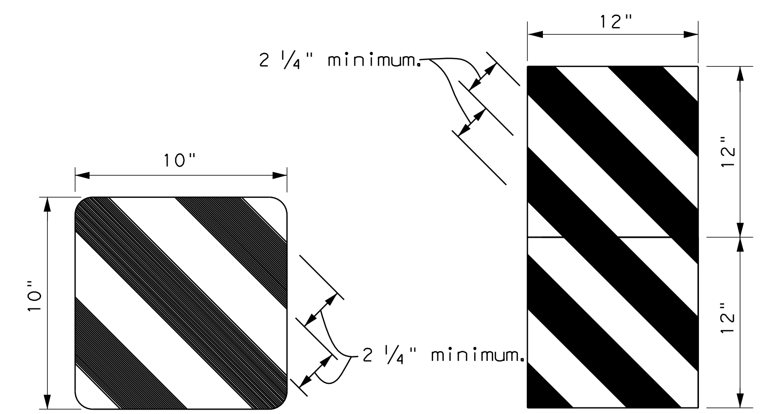


BACK PANEL (OPTIONAL)

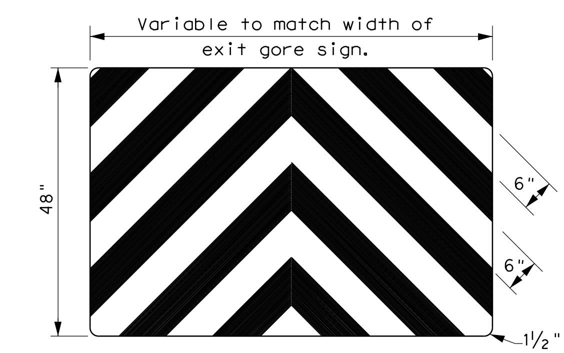


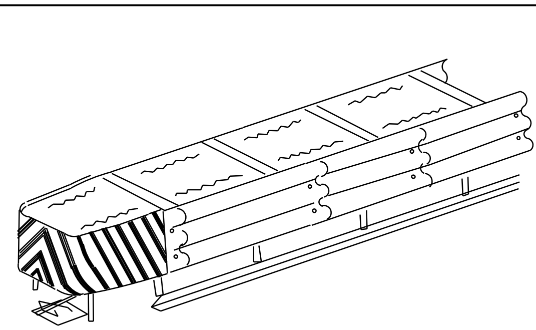


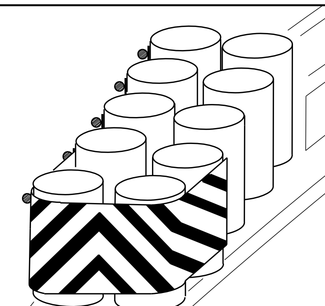
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

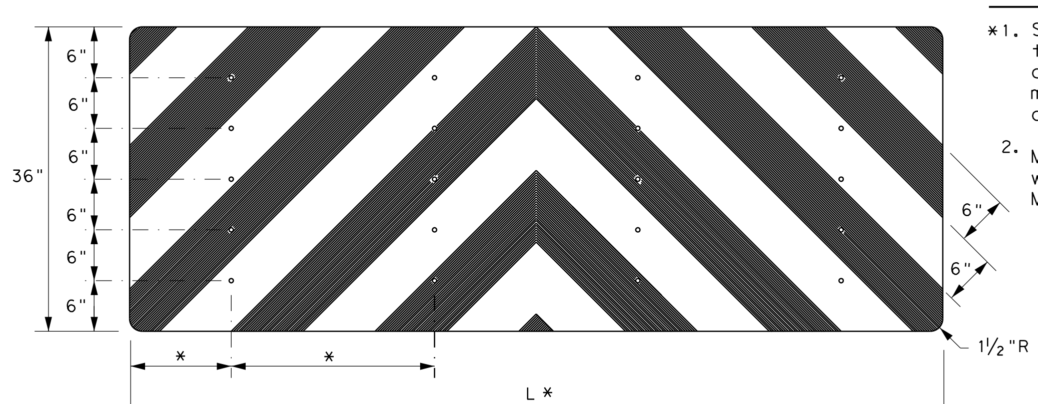


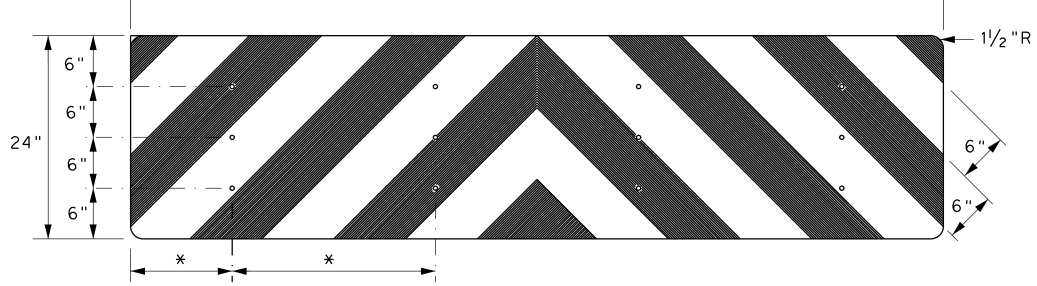
OBJECT MARKERS SMALLER THAN 3 FT²











NOTES

*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".

NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

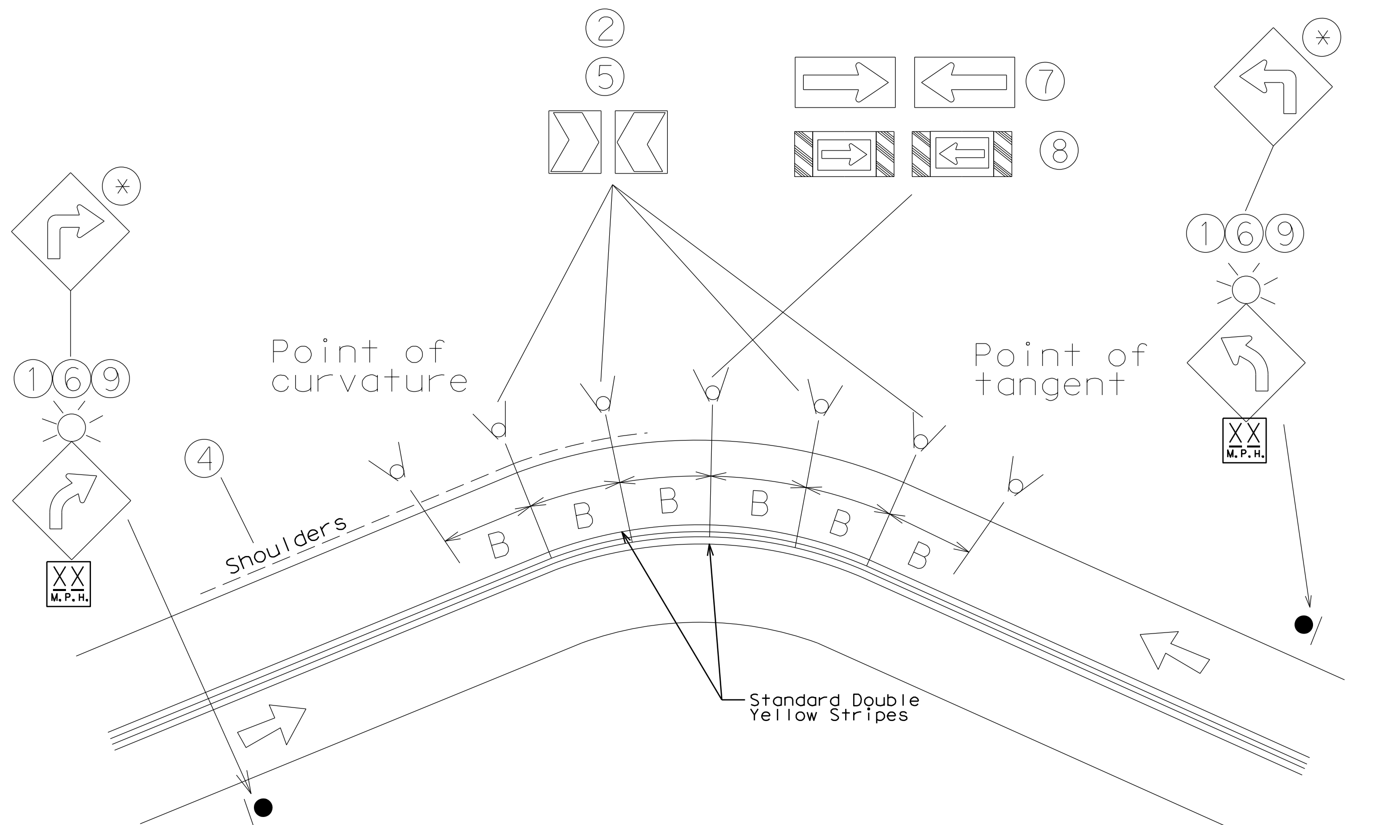
DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

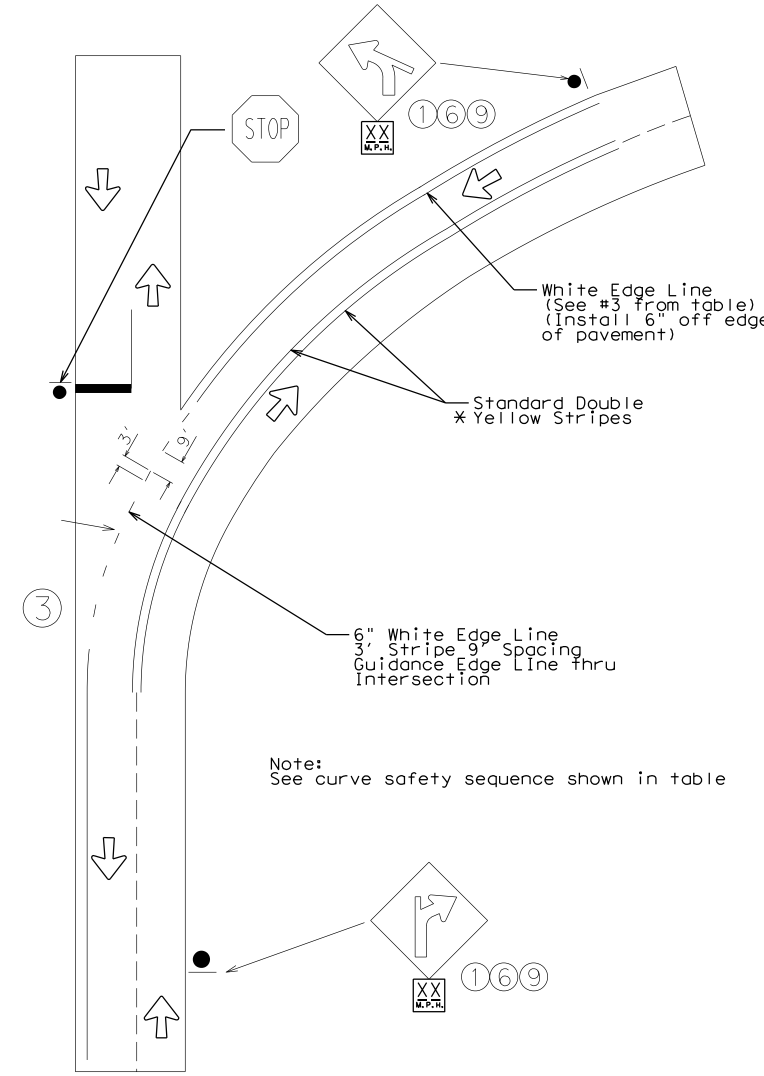
FILE: domvia20.dgn	DN: TXDOT		CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB		HIGHWAY
REVISIONS	2351	02	017		FM 2478
4-92 8-04 8-95 3-15 4-98 7-20	DIST		COUNTY		SHEET NO.
	DAL		COLLIN		181

20G

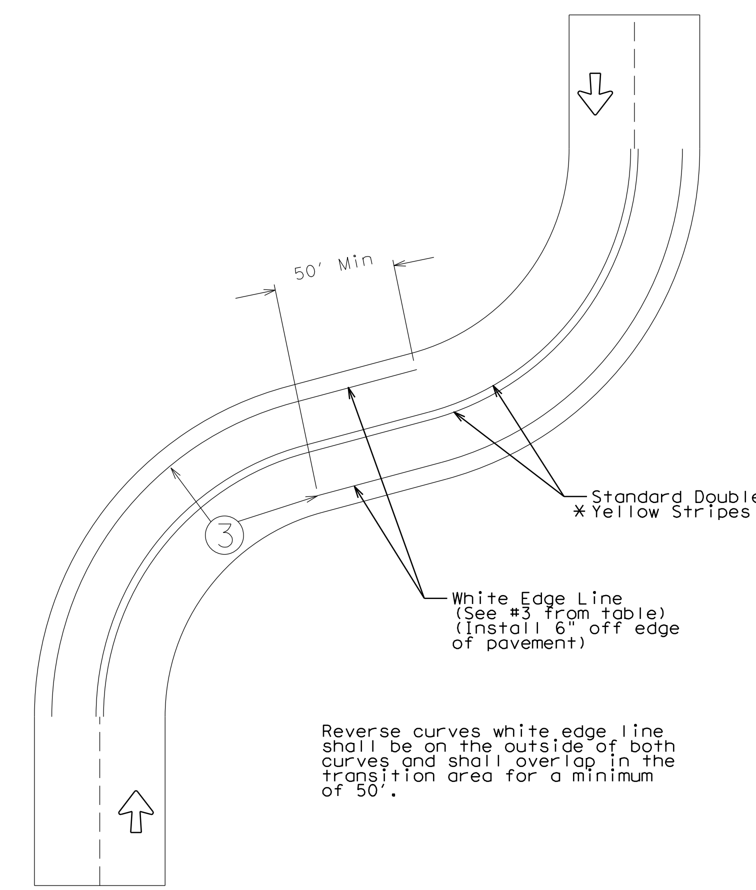
Dallas District Standard for Two-Lane Highway Curve Signing/Markings



Typical Curve Treatment with Intersection



Typical Reverse Curve Edge Line Treatment



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

* 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.

+ = 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

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 2478
CHECK BLS	STATE	DISTRICT	COUNTY	SHEET NO.
CHECK FRC	TEXAS	DALLAS	VARIOUS	182
CHECK ARO	CONTROL 2351	SECTION 02	JOB 017	

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):
2351-02-017 (FM 2478)

1.2 PROJECT LIMITS:

From: **NORTH OF FM 1461**

To: **FM 455**

1.3 PROJECT COORDINATES:

BEGIN: (Lat) **33.2658611** ,(Long) **- 96.7302527**

END: (Lat) **33.3352527** ,(Long) **- 96.7138250**

1.4 TOTAL PROJECT AREA (Acres): **77.48**

1.5 TOTAL AREA TO BE DISTURBED (Acres): **60.74**

1.6 NATURE OF CONSTRUCTION ACTIVITY:
HAZARD ELIMINATION AND SAFETY

1.7 MAJOR SOIL TYPES:

Soil Type	Description
HoB, HoB2, HoA	HOUSTON BLACK CLAY
AuB, AuC2, AuD2	AUSTIN SILTY CLAY
EdD2	EDDY GRAVELLY CLAY LOAM
HcD2	HEIDEN CLAY

The Vegetative Covert 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:

- ☒ 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.)

- ☒ Mobilization
- ☒ Install sediment and erosion controls
- ☒ Blade existing topsoil into windrows, prep ROW, clear and grub
- ☒ Remove existing pavement
- ☒ Grading operations, excavation, and embankment
- ☒ Excavate and prepare subgrade for proposed pavement widening
- ☒ Remove existing culverts, safety end treatments (SETs)
- ☒ Remove existing metal beam guard fence (MBGF), bridge rail
- ☒ Install proposed pavement per plans
- ☒ Install culverts, culvert extensions, SETs
- ☒ Install mow strip, MBGF, bridge rail
- ☐ Place flex base
- ☒ Rework slopes, grade ditches
- ☒ Blade windrowed material back across slopes
- ☒ Revegetation of unpaved areas
- ☒ Achieve site stabilization and remove sediment and erosion control measures
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- ☒ Sediment laden stormwater from stormwater conveyance over disturbed area
- ☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- ☒ Solvents, paints, adhesives, etc. from various construction activities
- ☒ Transported soils from offsite vehicle tracking
- ☒ Construction debris and waste from various construction activities
- ☐ Contaminated water from excavation or dewatering pump-out water
- ☒ Sanitary waste from onsite restroom facilities
- ☒ Trash from various construction activities/receptacles
- ☒ Long-term stockpiles of material and waste
- ☒ Other: Concrete Pouring
- ☒ 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
Tributary to Sister Grove Creek (Segment 0821B) and Haw Branch	**Lake Lavon (Segment 0821) with no water quality impairment**

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- ☒ Development of plans and specifications
- ☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- ☒ Post Construction Site Notice
- ☒ Submit NOI/CSN to local MS4
- ☒ Perform SWP3 inspections
- ☒ Maintain SWP3 records and update to reflect daily operations
- ☒ Complete and submit Notice of Termination to TCEQ
- ☒ Maintain SWP3 records for 3 years
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- ☒ Day To Day Operational Control
- ☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- ☒ Post Construction Site Notice
- ☒ Submit NOI/CSN to local MS4
- ☒ Maintain schedule of major construction activities
- ☒ Install, maintain and modify BMPs
- ☒ Complete and submit Notice of Termination to TCEQ
- ☒ 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
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & , P.E. Date

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		183
STATE	STATE DIST.	COUNTY	
TEXAS	DAL	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.
2351	02	017	FM 2478

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
- [ ] [ ] 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
- [x] [ ] Dewatering Controls
- [x] [ ] 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
    - [ ] Other: _____

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
Permanent Drill Seed	**Sta. 15+74.57**	**Sta. 313+85.02**

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: Capture saw-cutting debris and slurry for proper disposal
- [x] Other: Maintain roadways, active pedestrian and adjacent properties free of project sedimentation and loose materials
- [ ] Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- [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.

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

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		184
STATE	STATE DIST.	COUNTY	
TEXAS	DAL	COLLIN	
CONT.	SECT.	JOB	HIGHWAY NO.
2351	02	017	FM 2478

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.

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. County of Collin - Phase II MS4 - 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.

PCN required for authorization under NWP 14:

1. Wetland 1 - STA 109+00 to 110+00 Lt - Unnamed Tributary to Stover Creek
   Adjacent Wetland - Wetland Impacts

See page 2 for continuation

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

Action Number:

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: Texas fawnsfoot, Alligator snapping turtle, southern crawfish frog, Woodhouses toad, eastern spotted skunk, long-tailed weasel, swamp rabbit, western hog-nosed skunk, eastern box turtle, slender glass lizard, timber (canebrake) rattlesnake, western box turtle, and Texas garter snake. Follow the special note on the EPIC sheet and the BMPs listed below to protect these species.

2. Freshwater mussel survey is required at Haw Branch (STA 285+76.50). TxDOT to complete the survey during the months of April to October prior to the start of construction.

3. Contractor to implement the following BMPs from Beneficial Management Practices: Avoiding, Minimizing, and Mitigating Impacts of Transportation Projects on State Natural Resources available at https://ftp.txdot.gov/pub/txdot-info/env/toolkit/300-01-bmp.pdf.
a. Minimize impacts to wetland and riverine habitats
b. Minimize impacts to wetland habitats including isolated ephemeral pools
c. Section 1.2 Vegetation BMP
d. Section 1.4 Water Quality BMP
e. Section 2.4.3 Freshwater Mussel BMP
f. Section 2.6.1 Aquatic Amphibian and Reptile BMP
g. Section 2.6.2 Terrestrial Amphibian and Reptile BMP1.

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

Dallas District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM2478
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	COLLIN	
CONTROL	SECTION	JOB	SHEET NO.
2351	02	017	185

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

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404 CONTINUED:

PCN required for authorization under NWP 14:

2. Wetland 2 - STA 158+25 to 159+50 Lt - Stover Creek Adjacent Wetland - Wetland Impacts

3. Wetland 3 - STA 160+00 to 162+00 Rt - Stover Creek Adjacent Wetland - Wetland Impacts

4. Wetland 4 - STA 239+25 to 242+00 Rt - Unnamed Tributary to Honey Creek Adjacent Wetland - Wetland Impacts

5. Wetland 5 - STA 304+50 to 305+50 Lt - Unnamed Tributary to Haw Branch Adjacent Wetland - Wetland Impacts

6. Wetland 6 - STA 306+20 to 307+50 Lt - Unnamed Tributary to Haw Branch Adjacent Wetland - Wetland Impacts

Non-reportable crossings authorized under NWP 14:

1. Culvert 1 STA 33+50 Unnamed Tributary to Stover Creek Temporary Stream Impacts

2. Culvert 2 STA 62+18.65 Unnamed Tributary to Stover Creek Stream Impacts

3. Culvert 3 STA 67+13.63 Unnamed Tributary to Stover Creek Stream Impacts

4. Culvert 4 STA 108+24.83 Unnamed Tributary to Stover Creek Stream Impacts

5. Culvert 5 STA 134+84.85 Unnamed Tributary to Stover Creek Stream Impacts

6. Culvert 6 STA 159+72.40 Stover Creek Stream Impacts

7. Culvert 9 STA 217+72.98 Unnamed Tributary to Honey Creek Stream Impacts

8. Culvert 11 STA 240+95.96 Unnamed Tributary to Honey Creek Stream Impacts

9. Culvert 15 STA 285+76.50 Haw Branch Stream Impacts

10. Culvert 18 STA 305+93.64 Unnamed Tributary to Haw Branch Stream Impacts

Notes To Designer:

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Filled Out: xx/xx/xxxx
Prepared by: Name/Section

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

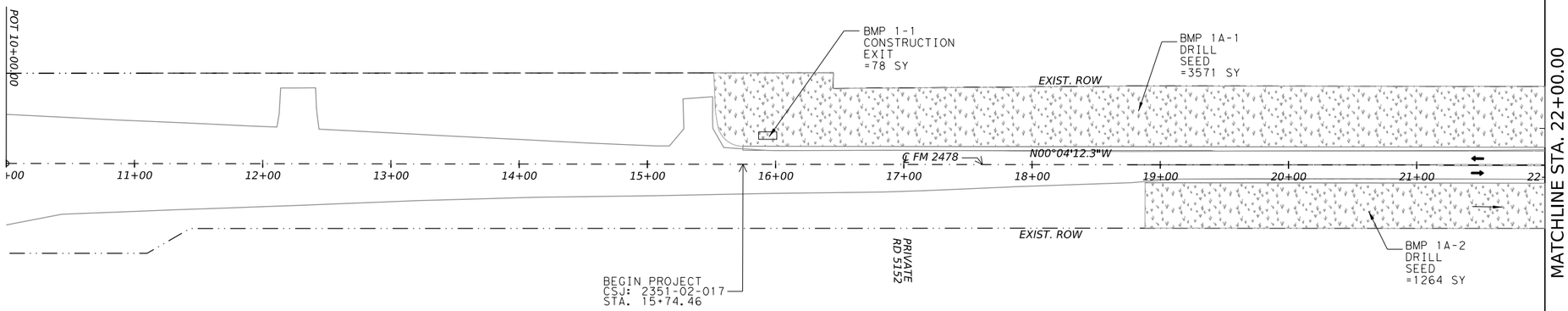
GENERAL NOTE:

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

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM2478
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	COLLIN	
CONTROL	SECTION	JOB	SHEET NO.
2351	02	017	185A



LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT
- AVOIDED WETLANDS
- PERMANENTLY IMPACTED WETLANDS

NOTES:

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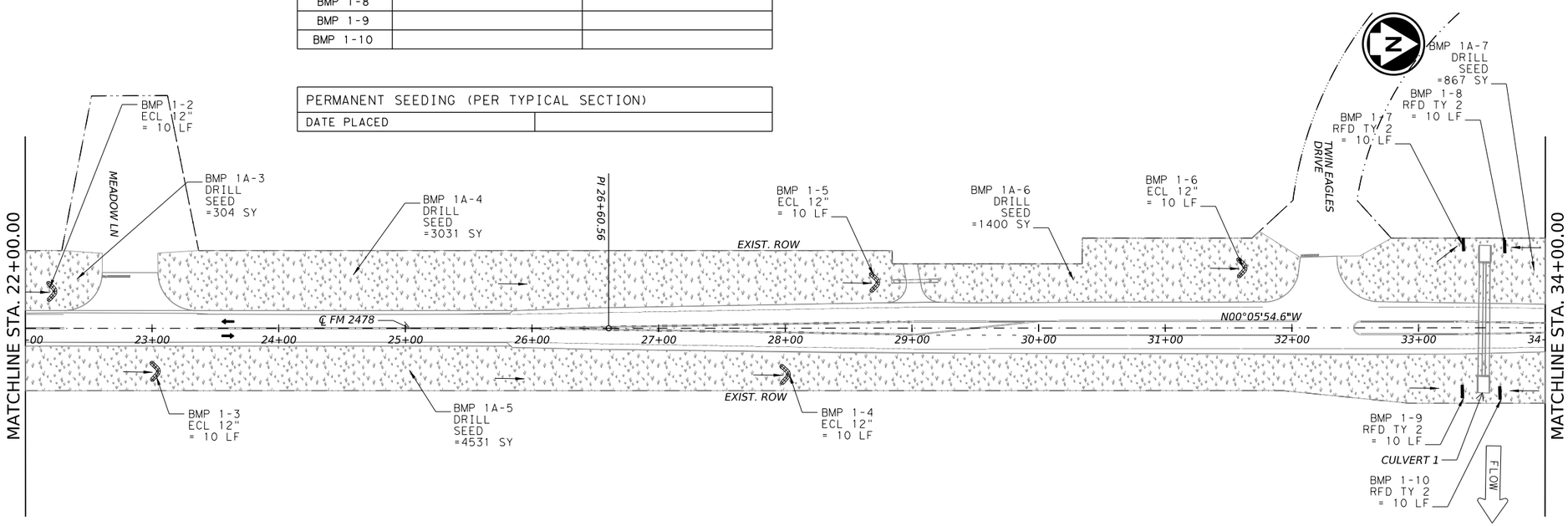
5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.

BMP #	DATE INSTALLED	DATE REMOVED
BMP 1-1		
BMP 1-2		
BMP 1-3		
BMP 1-4		
BMP 1-5		
BMP 1-6		
BMP 1-7		
BMP 1-8		
BMP 1-9		
BMP 1-10		

DRILL SEED BMP #	DATE INSTALLED
BMP 1A-1	
BMP 1A-2	
BMP 1A-3	
BMP 1A-4	
BMP 1A-5	
BMP 1A-6	
BMP 1A-7	

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DATE DISTURBED: _____

DATE STABILIZED: _____

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

Texas Department of Transportation

FM 2478

SW3P SITE MAP

BEGIN PROJECT TO STA. 34+00.00

SCALE: 1" = 100' *SHEET 1 OF 13*

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		186

DATE: 5/11/2023 11:33:37 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020174 - Design/Plan Set/9. Environmental/SW3P Site Map Sheets.dgn

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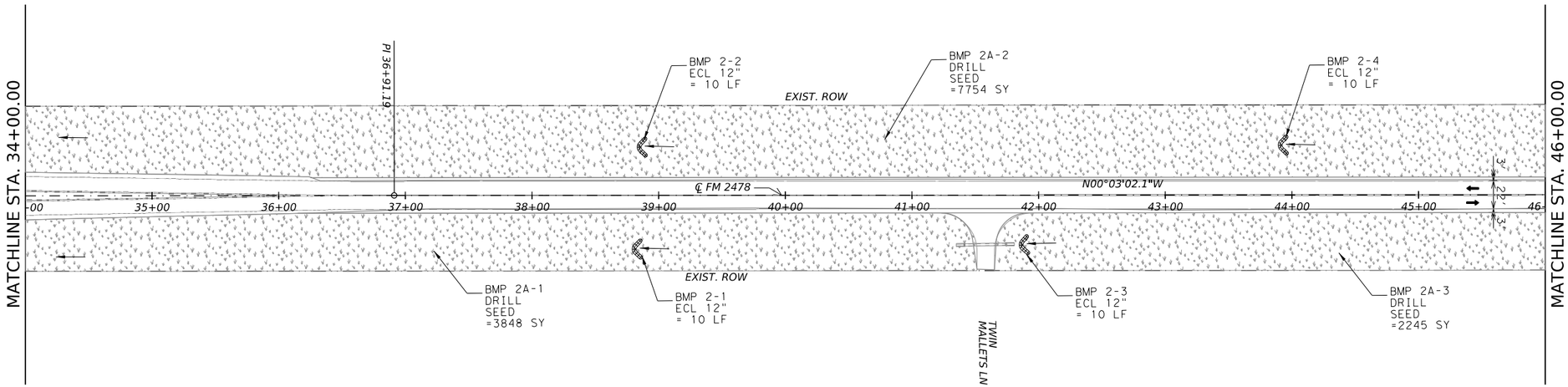

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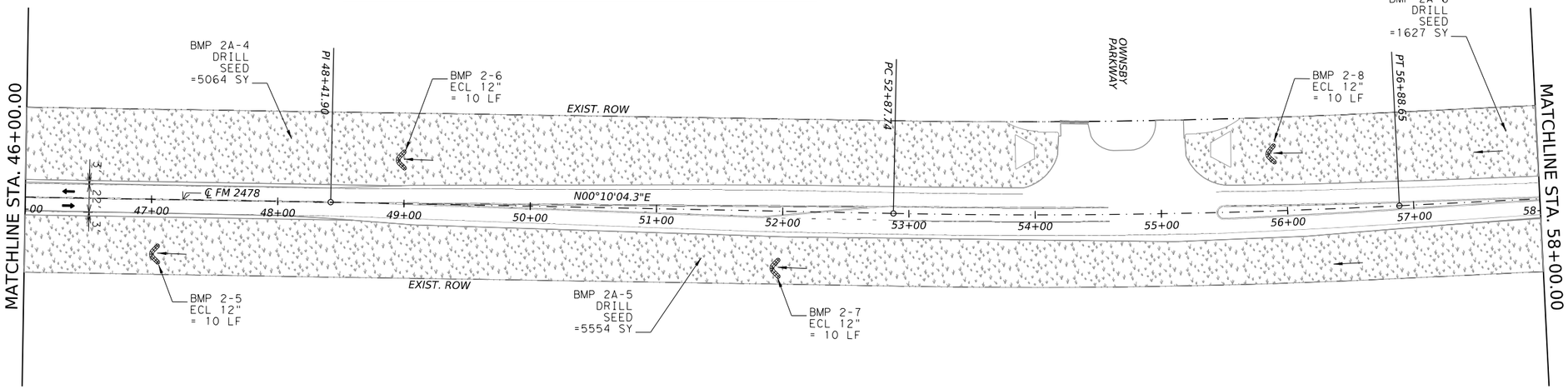
BMP 2-2		
BMP 2-3		
BMP 2-4		
BMP 2-5		
BMP 2-6		
BMP 2-7		
BMP 2-8		

DRILL SEED BMP #	DATE INSTALLED
BMP 2A-1	
BMP 2A-2	
BMP 2A-3	
BMP 2A-4	
BMP 2A-5	
BMP 2A-6	

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DATE DISTURBED: _____

DATE STABILIZED: _____

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
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STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 34+00.00 TO STA. 58+00.00

SCALE: 1" = 100' SHEET 2 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		187

DATE: 5/11/2023 11:33:38 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/2351020017/4 - Design/Plan Set/9. Environmental/SW3P Site Map Sheets.dgn

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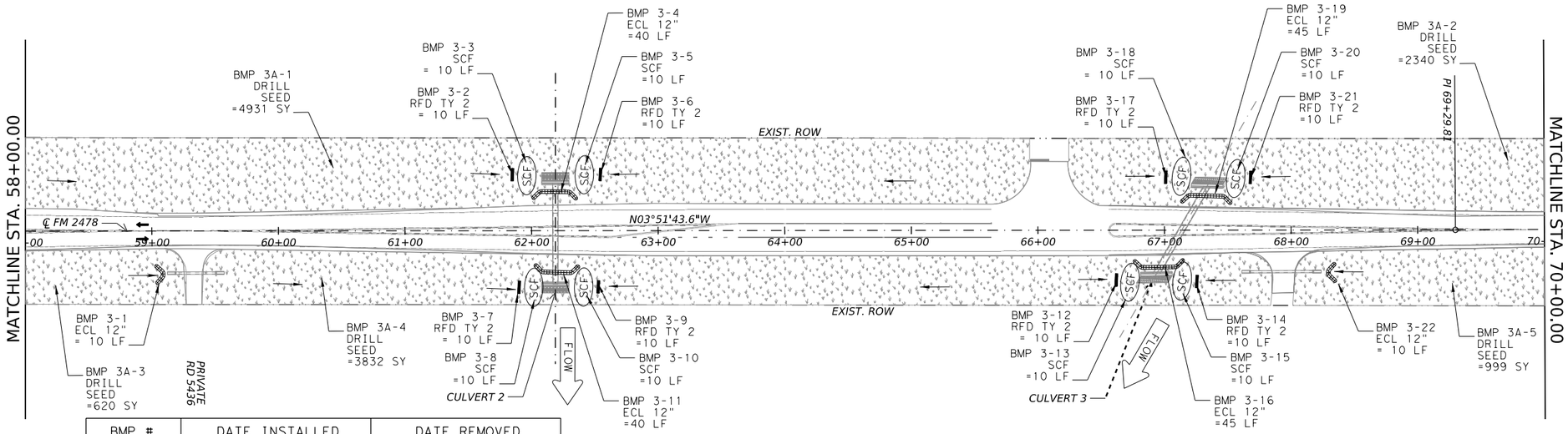

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BMP 3-2		
BMP 3-3		
BMP 3-4		
BMP 3-5		
BMP 3-6		
BMP 3-7		
BMP 3-8		
BMP 3-9		
BMP 3-10		
BMP 3-11		
BMP 3-12		
BMP 3-13		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 14-14		
BMP 3-15		
BMP 3-16		
BMP 3-17		
BMP 3-18		
BMP 3-19		
BMP 3-20		
BMP 3-21		
BMP 3-22		
BMP 3-23		
BMP 3-24		
BMP 3-25		
BMP 3-26		
BMP 3-26		

0 50 100

LEGEND:

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- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
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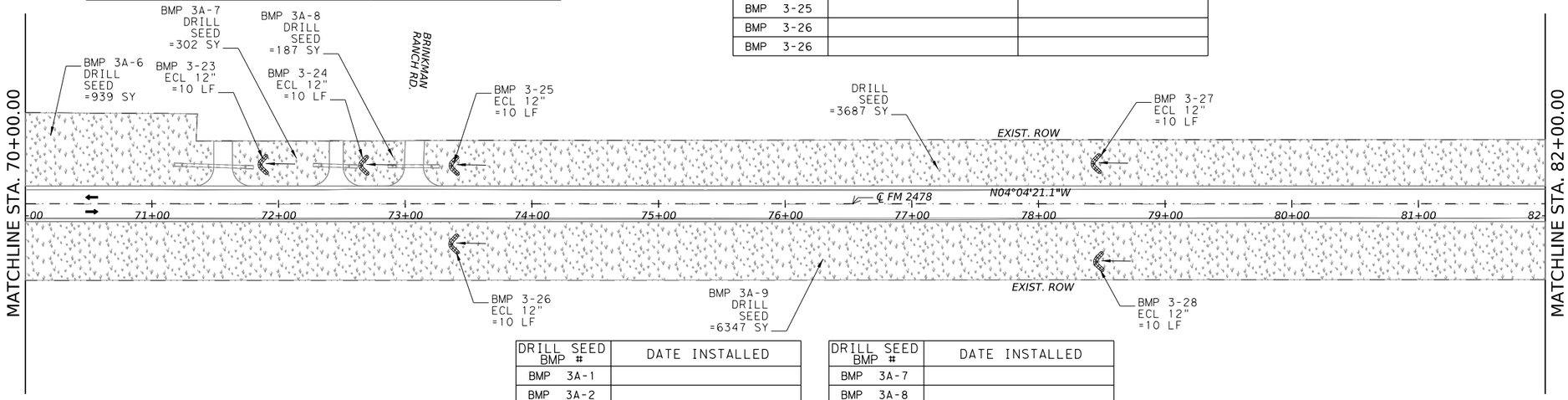

DRILL SEED BMP #	DATE INSTALLED
BMP 3A-1	
BMP 3A-2	
BMP 3A-3	
BMP 3A-4	
BMP 3A-5	
BMP 3A-6	

DRILL SEED BMP #	DATE INSTALLED
BMP 3A-7	
BMP 3A-8	
BMP 3A-9	

DATE DISTURBED: _____

DATE STABILIZED: _____

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 58+00.00 TO STA. 82+00.00

SCALE: 1" = 100' SHEET 3 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		188

DATE: 5/11/2023 11:33:39 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/9. Environmental/SW3P Site Map Sheets.dgn

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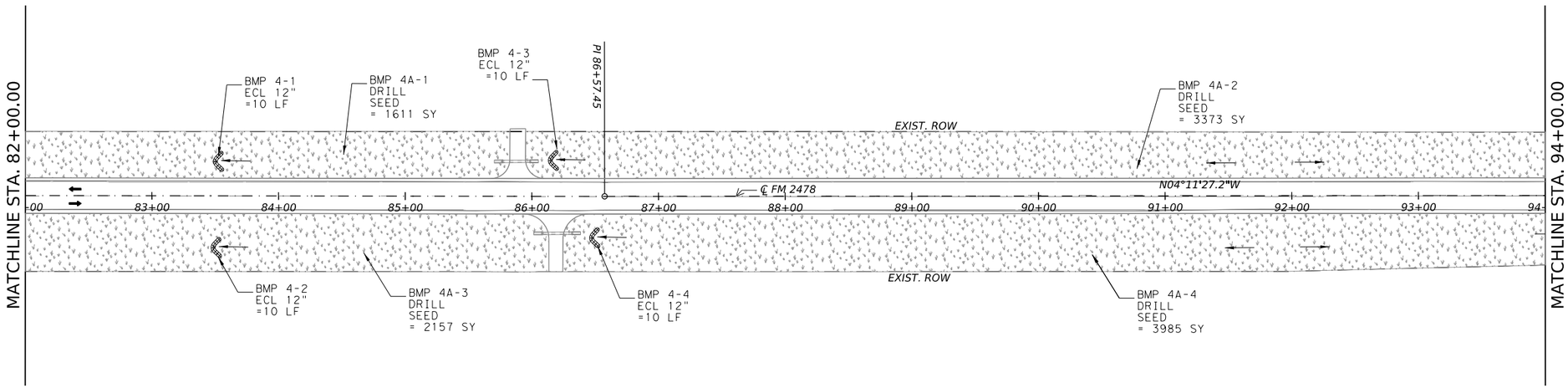

BMP #	DATE INSTALLED	DATE REMOVED
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BMP 4-2		
BMP 4-3		
BMP 4-4		
BMP 4-5		
BMP 4-6		
BMP 4-7		
BMP 4-8		
BMP 4-9		
BMP 4-10		
BMP 4-11		

DRILL SEED BMP #	DATE INSTALLED
BMP 4A-1	
BMP 4A-2	
BMP 4A-3	
BMP 4A-4	
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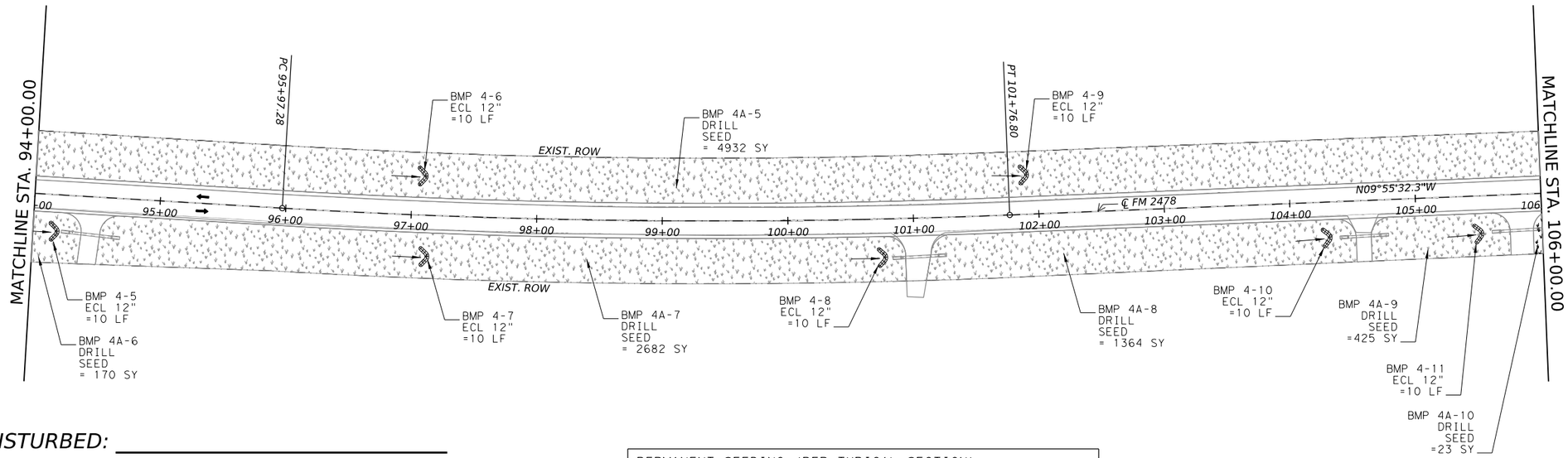
BMP 4A-10	



DATE DISTURBED: _____

DATE STABILIZED: _____

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
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STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 82+00.00 TO STA. 106+00.00

SCALE: 1" = 100' SHEET 4 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		189

DATE: 5/11/2023 11:34:43 AM
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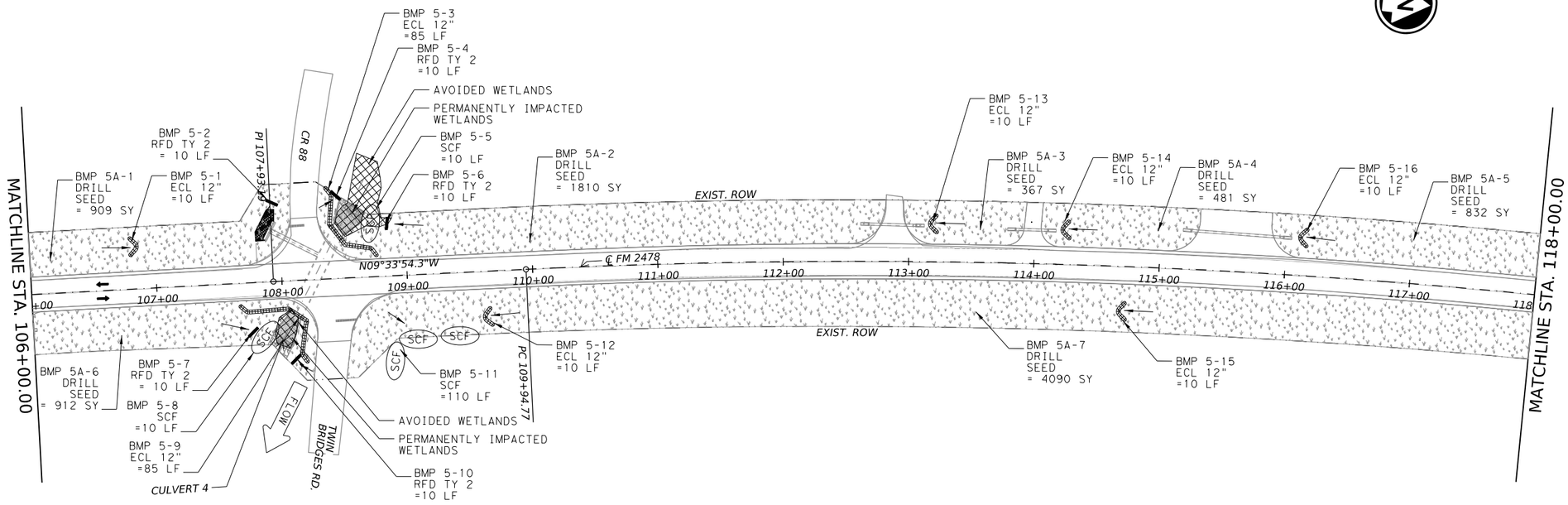

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- RFD — ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT
- AVOIDED WETLANDS
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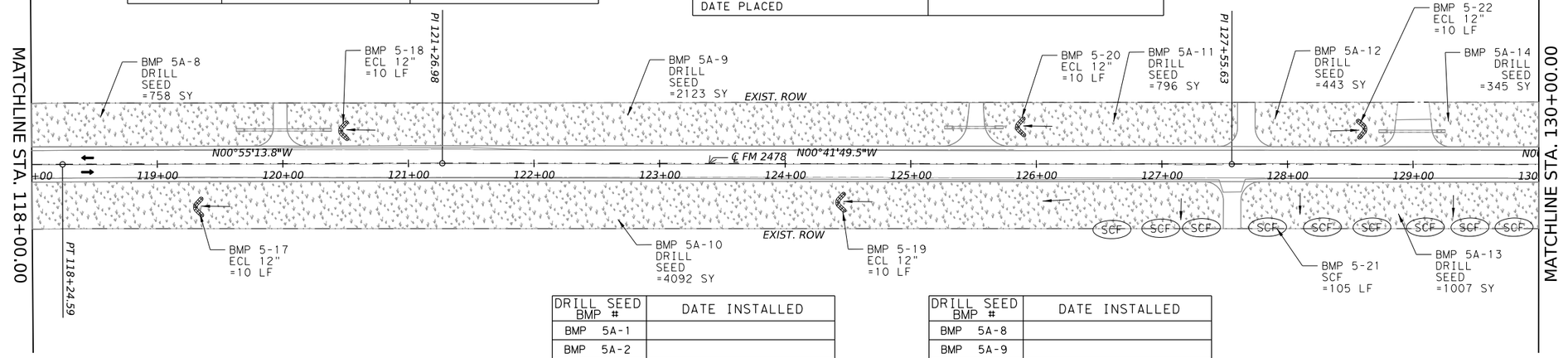
BMP #	DATE INSTALLED	DATE REMOVED
BMP 5-1		
BMP 5-2		
BMP 5-3		
BMP 5-4		
BMP 5-5		
BMP 5-6		
BMP 5-7		
BMP 5-8		
BMP 5-9		
BMP 5-10		
BMP 5-11		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 5-12		
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		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DRILL SEED BMP #	DATE INSTALLED
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BMP 5A-2	
BMP 5A-3	
BMP 5A-4	
BMP 5A-5	
BMP 5A-6	
BMP 5A-7	

DRILL SEED BMP #	DATE INSTALLED
BMP 5A-8	
BMP 5A-9	
BMP 5A-10	
BMP 5A-11	
BMP 5A-12	
BMP 5A-13	
BMP 5A-14	

DATE DISTURBED: _____

DATE STABILIZED: _____

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 106+00.00 TO STA. 130+00.00

SCALE: 1" = 100' *SHEET 5 OF 13*

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		190

CK DW CK DW

DATE: 5/11/2023 11:35:45 AM
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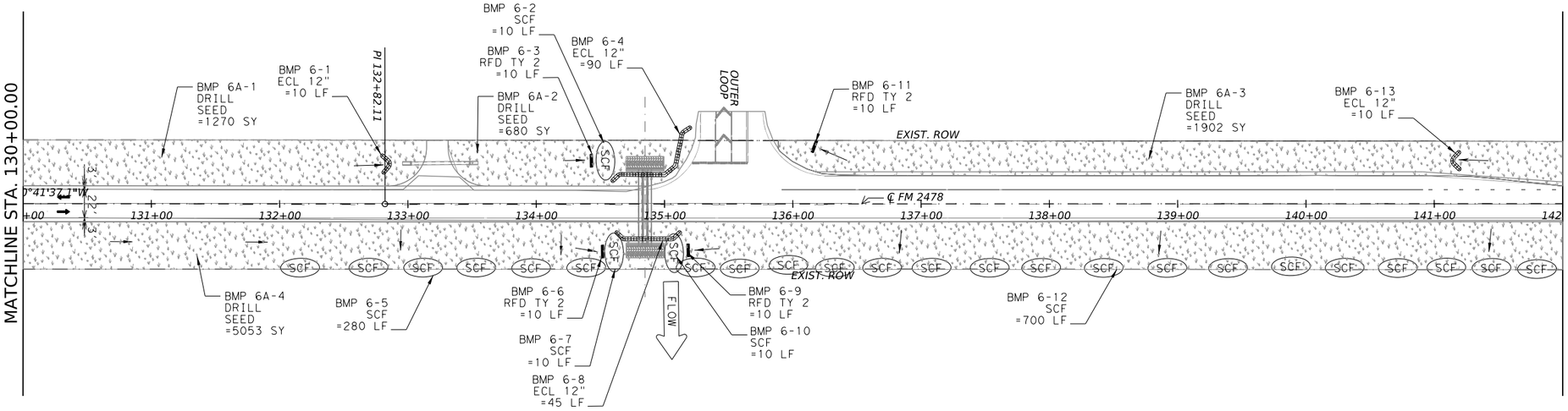

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
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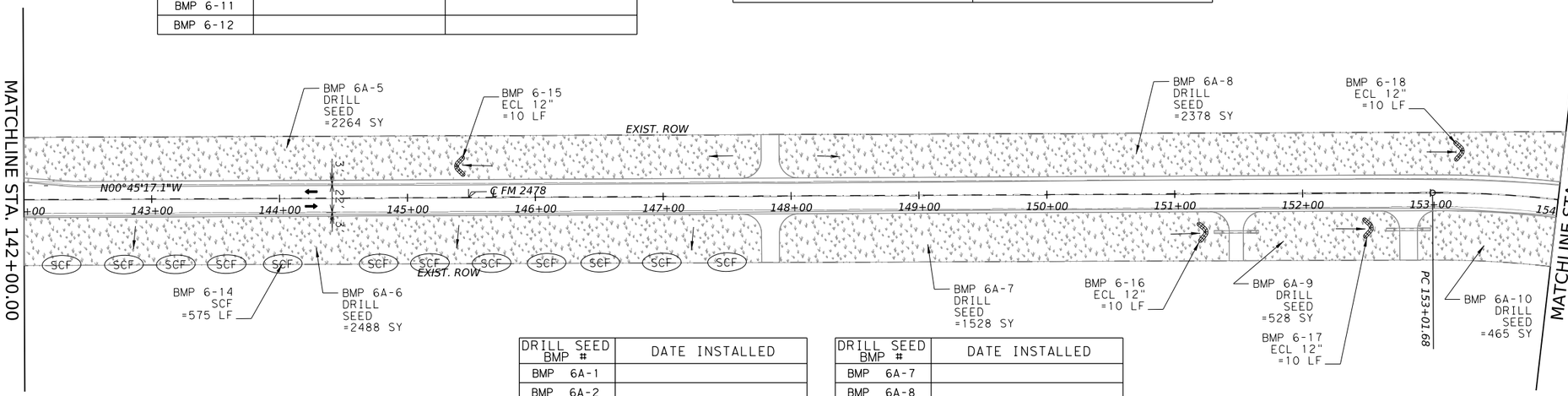
BMP #	DATE INSTALLED	DATE REMOVED
BMP 6-1		
BMP 6-2		
BMP 6-3		
BMP 6-4		
BMP 6-5		
BMP 6-6		
BMP 6-7		
BMP 6-8		
BMP 6-9		
BMP 6-10		
BMP 6-11		
BMP 6-12		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 6-13		
BMP 6-14		
BMP 6-15		
BMP 6-16		
BMP 6-17		
BMP 6-18		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DRILL SEED BMP #	DATE INSTALLED
BMP 6A-1	
BMP 6A-2	
BMP 6A-3	
BMP 6A-4	
BMP 6A-5	
BMP 6A-6	

DRILL SEED BMP #	DATE INSTALLED
BMP 6A-7	
BMP 6A-8	
BMP 6A-9	
BMP 6A-10	

DATE DISTURBED: _____

DATE STABILIZED: _____

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 130+00.00 TO STA. 154+00.00

SCALE: 1" = 100' SHEET 6 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		191

DATE: 5/11/2023 11:36:59 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/9. Environmental/SW3P Site Map Sheets.dgn

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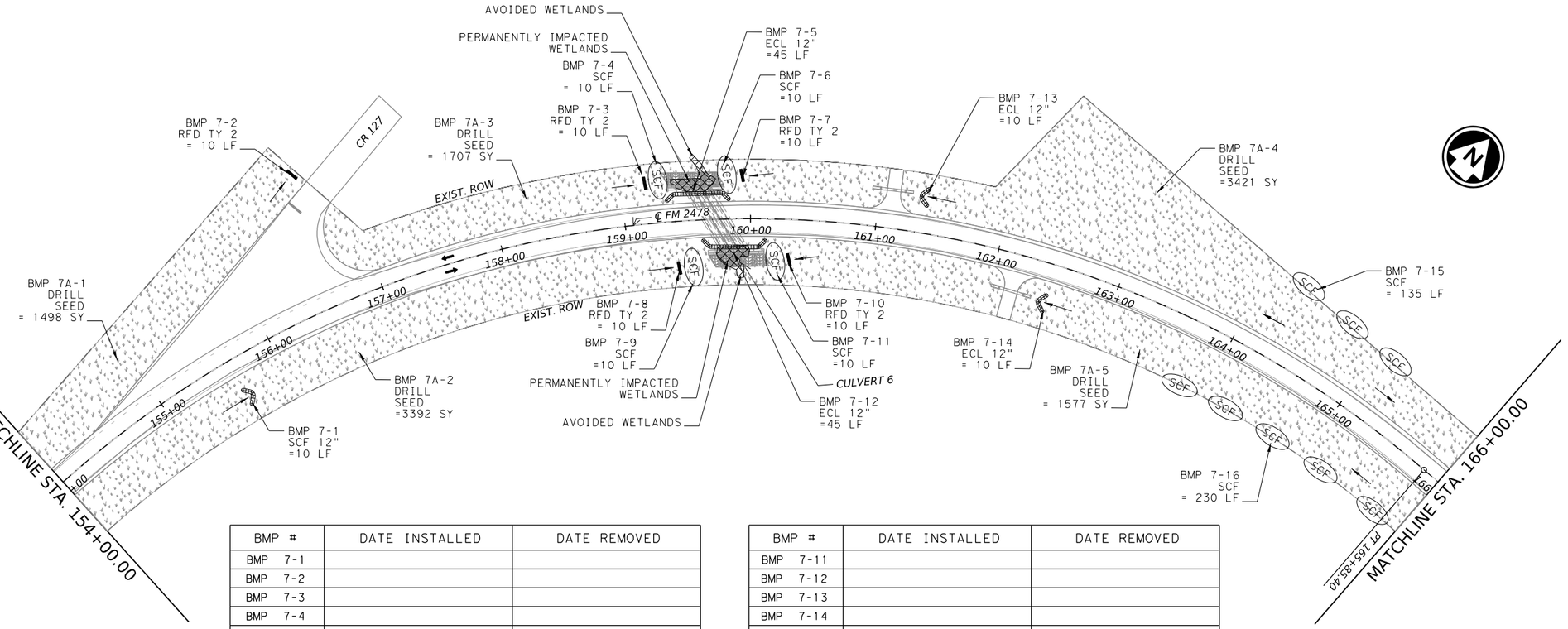

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- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
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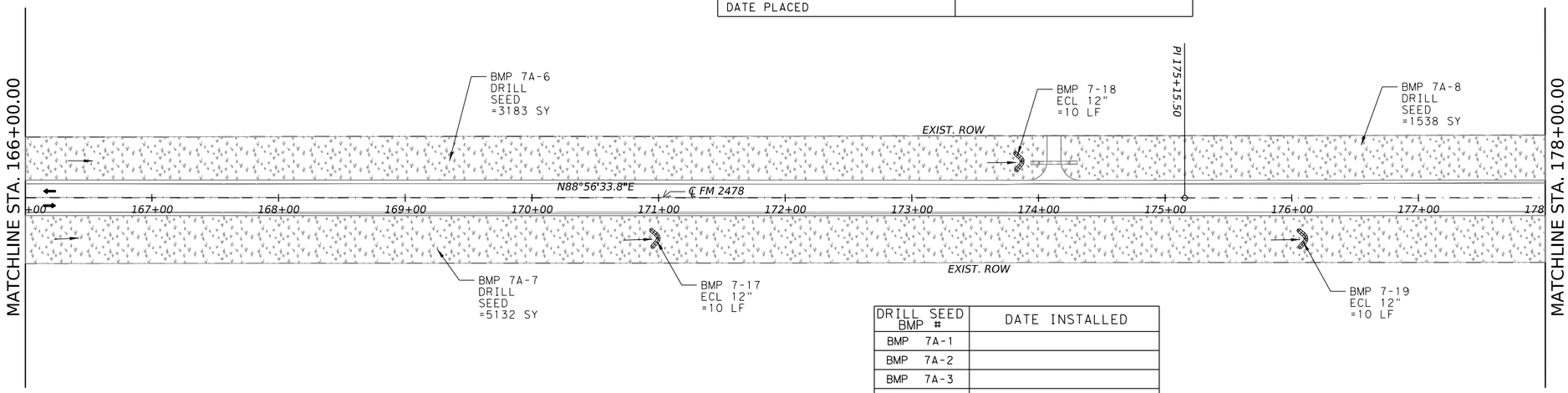
BMP #	DATE INSTALLED	DATE REMOVED
BMP 7-1		
BMP 7-2		
BMP 7-3		
BMP 7-4		
BMP 7-5		
BMP 7-6		
BMP 7-7		
BMP 7-8		
BMP 7-9		
BMP 7-10		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 7-11		
BMP 7-12		
BMP 7-13		
BMP 7-14		
BMP 7-15		
BMP 7-16		
BMP 7-17		
BMP 7-18		
BMP 7-19		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DRILL SEED BMP #	DATE INSTALLED
BMP 7A-1	
BMP 7A-2	
BMP 7A-3	
BMP 7A-4	
BMP 7A-5	
BMP 7A-6	
BMP 7A-7	
BMP 7A-8	

DATE DISTURBED: _____

DATE STABILIZED: _____

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122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar, P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

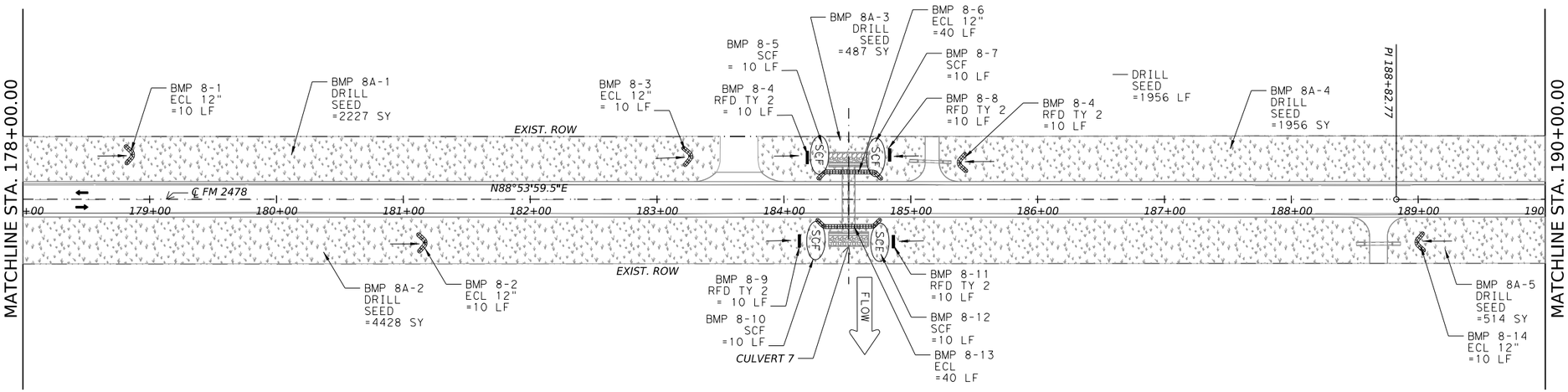
SW3P SITE MAP

STA. 154+00.00 TO STA. 178+00.00

SCALE: 1" = 100' SHEET 7 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		192

DATE: 5/11/2023 11:38:02 AM
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/23510201?4 - Design/Plan Set/9. Environmental/SW3P Site Map Sheets.dgn



0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT
- AVOIDED WETLANDS
- PERMANENTLY IMPACTED WETLANDS

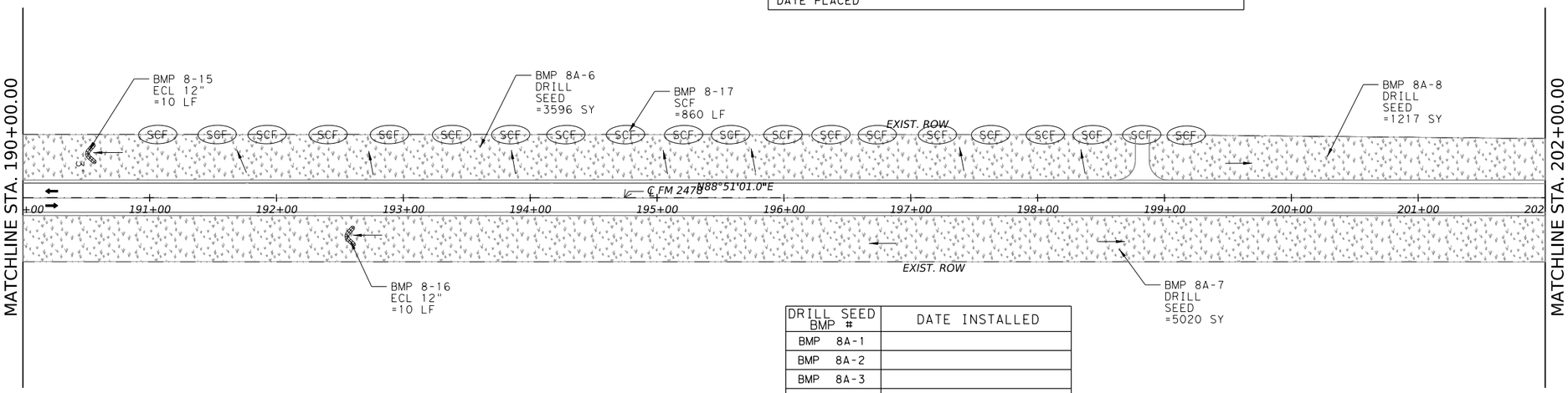
NOTES:

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.

BMP #	DATE INSTALLED	DATE REMOVED
BMP 8-1		
BMP 8-2		
BMP 8-3		
BMP 8-4		
BMP 8-5		
BMP 8-6		
BMP 8-7		
BMP 8-8		
BMP 8-9		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 8-10		
BMP 8-11		
BMP 8-12		
BMP 8-13		
BMP 8-14		
BMP 8-15		
BMP 8-16		
BMP 8-17		

PERMANENT SEEDING (PER TYPICAL SECTION)
DATE PLACED



DRILL SEED BMP #	DATE INSTALLED
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BMP 8A-2	
BMP 8A-3	
BMP 8A-4	
BMP 8A-5	
BMP 8A-6	
BMP 8A-7	
BMP 8A-8	

DATE DISTURBED: _____

DATE STABILIZED: _____

STATE OF TEXAS
THADEUS V. EGAR
122118
LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar 5/11/2023
Signature of Registrant & Date, P.E.

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 178+00.00 TO STA. 202+00.00

SCALE: 1" = 100' *SHEET 8 OF 13*

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		193

DATE: 5/11/2023 11:39:05 AM
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CK DW CK DW

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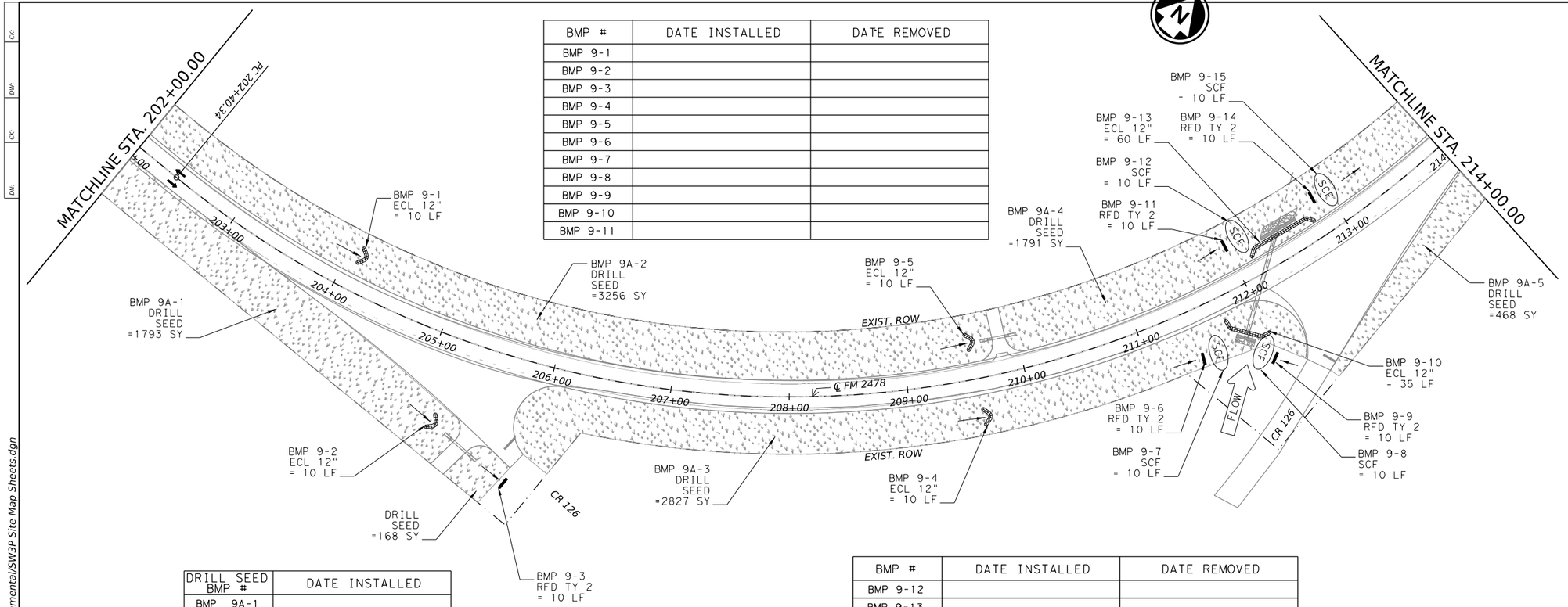
BMP 9-2		
BMP 9-3		
BMP 9-4		
BMP 9-5		
BMP 9-6		
BMP 9-7		
BMP 9-8		
BMP 9-9		
BMP 9-10		
BMP 9-11		



0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT
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DRILL SEED BMP #	DATE INSTALLED
BMP 9A-1	
BMP 9A-2	
BMP 9A-3	
BMP 9A-4	
BMP 9A-5	
BMP 9A-6	
BMP 9A-7	
BMP 9A-8	
BMP 9A-9	
BMP 9A-10	

BMP #	DATE INSTALLED	DATE REMOVED
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BMP 9-13		
BMP 9-14		
BMP 9-15		
BMP 9-16		
BMP 9-17		
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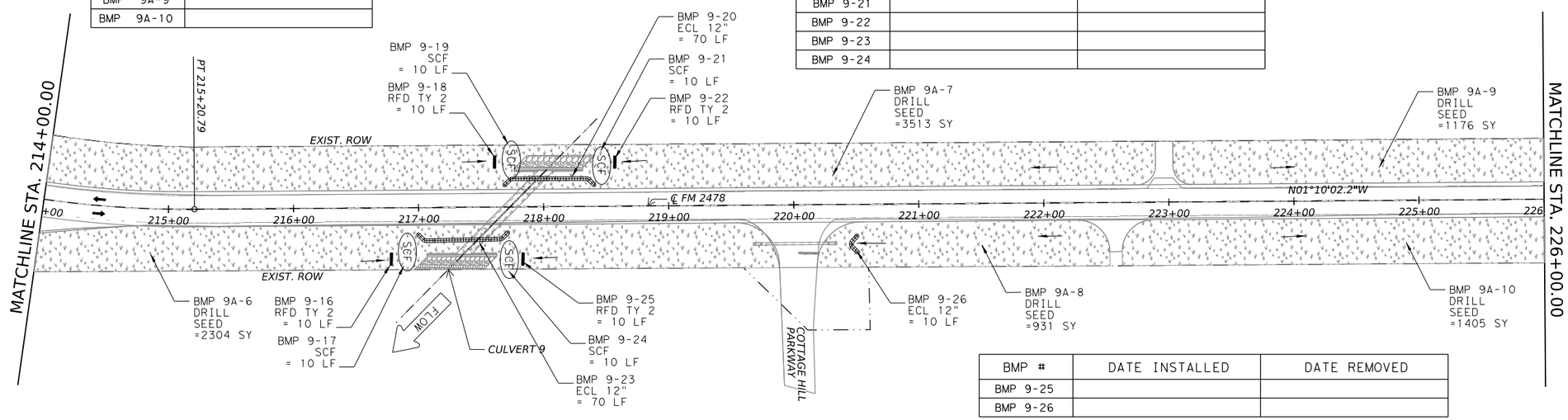
BMP 9-22		
BMP 9-23		
BMP 9-24		



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BMP 9-25		
BMP 9-26		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	

DATE DISTURBED: _____

DATE STABILIZED: _____

STATE OF TEXAS
THADEUS V. EGAR
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Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 202+00.00 TO STA. 226+00.00

SCALE: 1" = 100' SHEET 9 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		194

DATE: 5/11/2023 11:40:18 AM
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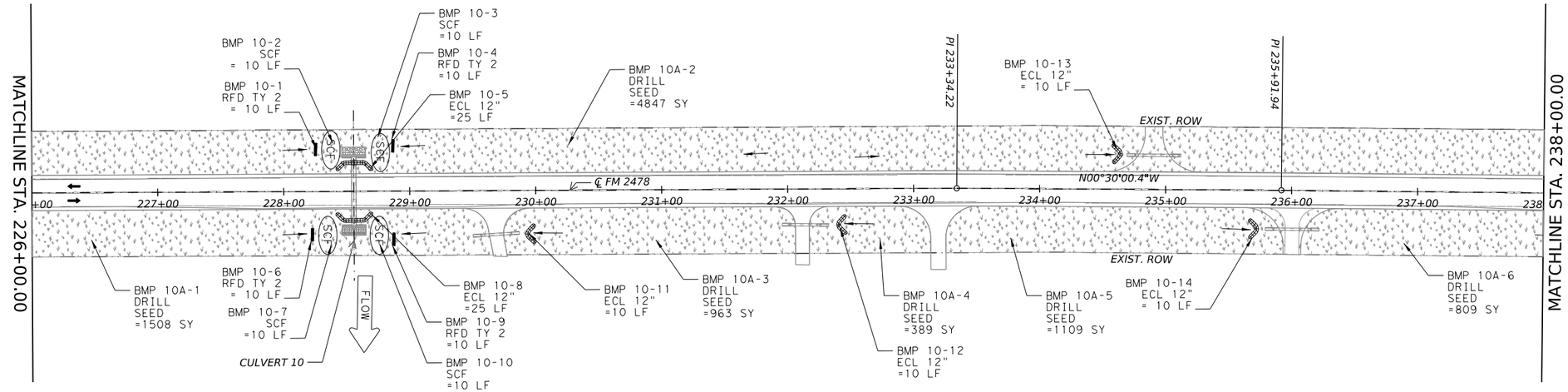

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
- CONSTRUCTION EXIT
- AVOIDED WETLANDS
- PERMANENTLY IMPACTED WETLANDS

NOTES:

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5. SEE TYPICAL SECTIONS FOR THE DISTURBANCE AND SEEDING LIMITS.

BMP #	DATE INSTALLED	DATE REMOVED
BMP 10-1		
BMP 10-2		
BMP 10-3		
BMP 10-4		
BMP 10-5		
BMP 10-6		
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 #	DATE INSTALLED	DATE REMOVED
BMP 10-15		
BMP 10-16		
BMP 10-17		
BMP 10-18		
BMP 10-19		
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BMP 10-23		
BMP 10-24		
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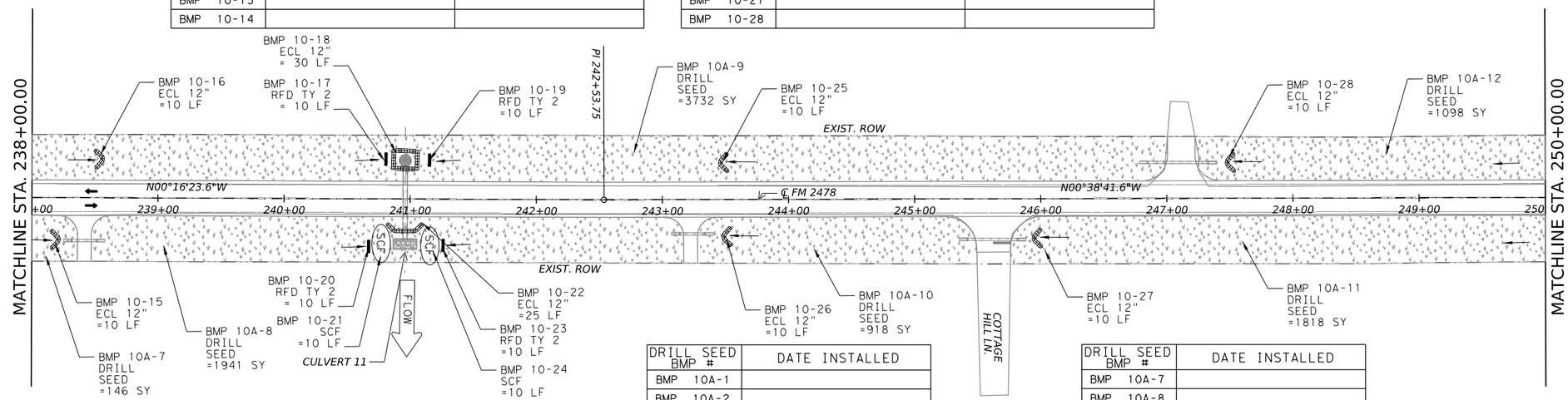
BMP 10-28		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DRILL SEED BMP #	DATE INSTALLED
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BMP 10A-2	
BMP 10A-3	
BMP 10A-4	
BMP 10A-5	
BMP 10A-6	

DRILL SEED BMP #	DATE INSTALLED
BMP 10A-7	
BMP 10A-8	
BMP 10A-9	
BMP 10A-10	
BMP 10A-11	
BMP 10A-12	

DATE DISTURBED: _____

DATE STABILIZED: _____

STATE OF TEXAS
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LICENSED
PROFESSIONAL ENGINEER

Thadeus Egar ,P.E. 5/11/2023
Signature of Registrant & Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 226+00.00 TO STA. 250+00.00

SCALE: 1" = 100' *SHEET 10 OF 13*

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		195

DATE: 5/11/2023 11:41:21 AM
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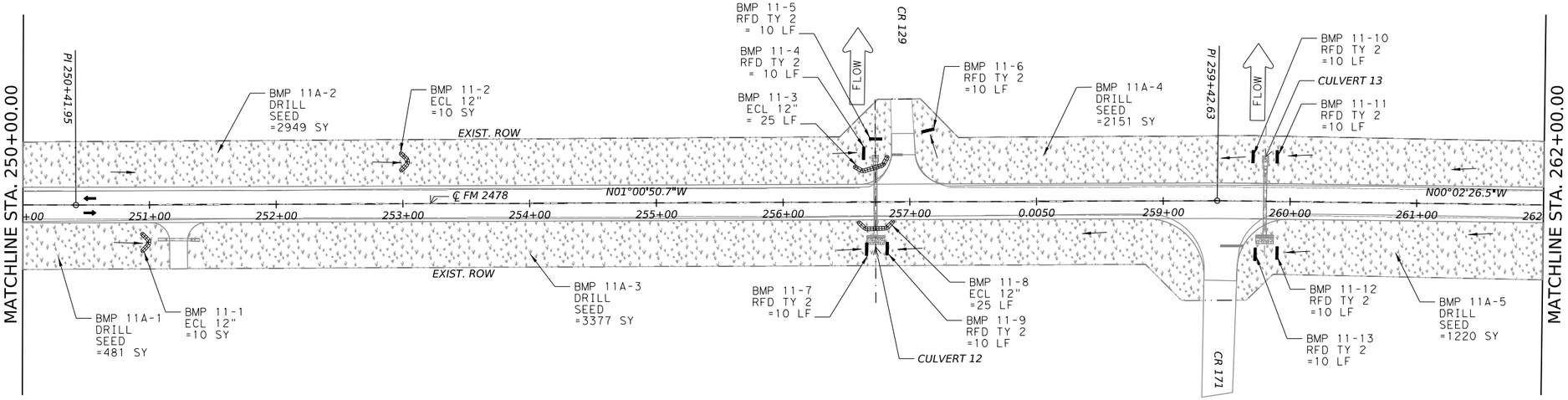

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BMP 11-5		
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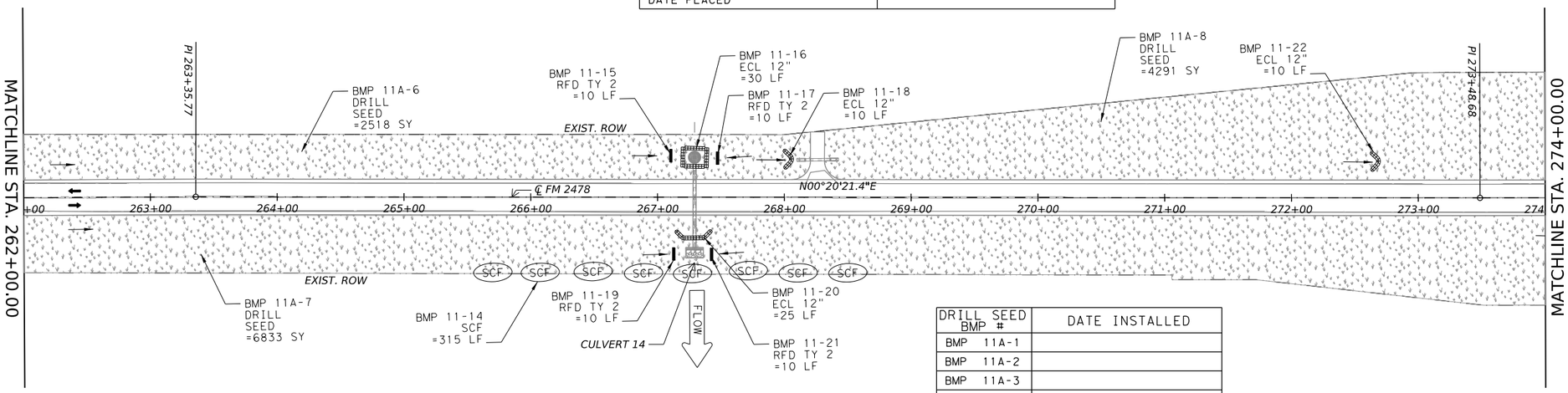
BMP 11-7		
BMP 11-8		
BMP 11-9		
BMP 11-10		
BMP 11-11		
BMP 11-12		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 11-13		
BMP 11-14		
BMP 11-15		
BMP 11-16		
BMP 11-17		
BMP 11-18		
BMP 11-19		
BMP 11-20		
BMP 11-21		
BMP 11-22		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



DRILL SEED BMP #	DATE INSTALLED
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BMP 11A-2	
BMP 11A-3	
BMP 11A-4	
BMP 11A-5	
BMP 11A-6	
BMP 11A-7	
BMP 11A-8	

DATE DISTURBED: _____

DATE STABILIZED: _____

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
- ROCK FILTER DAM (TY 2)
- SCF — SEDIMENT CONTROL FENCE
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Thadeus Egar 5/11/2023
Signature of Registrant & ,P.E. Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 250+00.00 TO STA. 174+00.00

SCALE: 1" = 100' SHEET 11 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		196

DATE: 5/11/2023 11:42:24 AM
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CK: DW: CK: DW:

BMP #	DATE INSTALLED	DATE REMOVED
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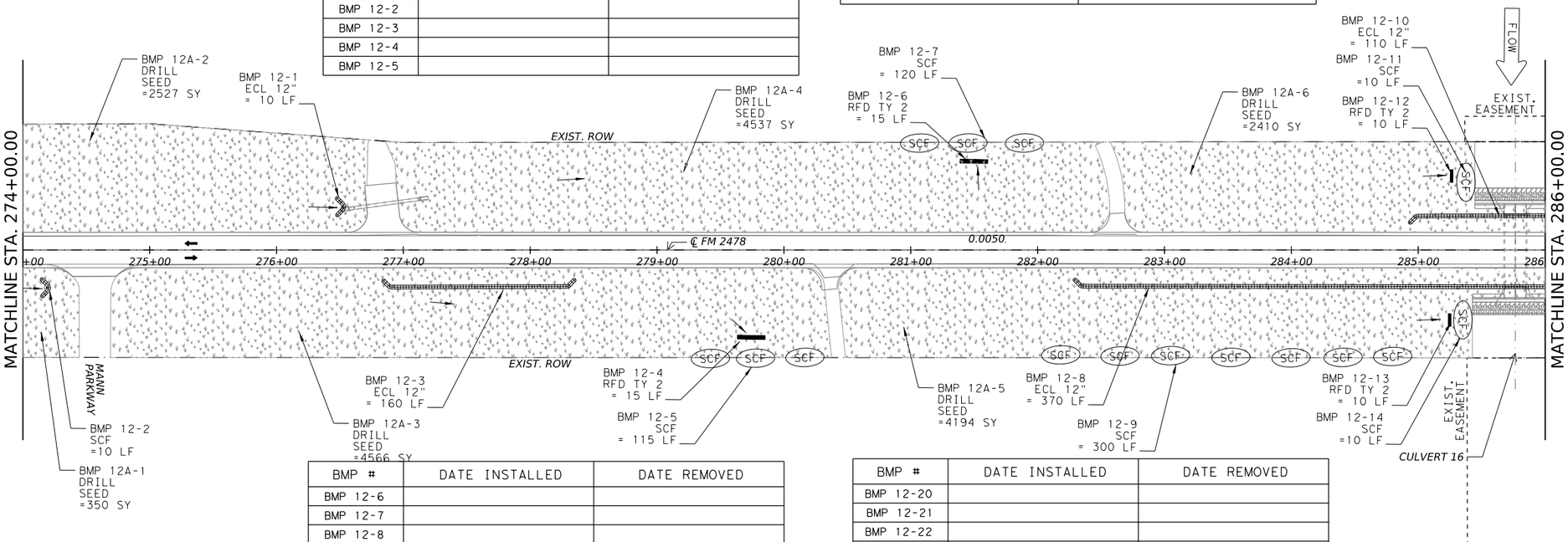
BMP 12-2		
BMP 12-3		
BMP 12-4		
BMP 12-5		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	



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BMP 12-7		
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BMP 12-9		
BMP 12-10		
BMP 12-11		
BMP 12-12		
BMP 12-13		
BMP 12-14		
BMP 12-15		
BMP 12-16		
BMP 12-17		
BMP 12-18		
BMP 12-19		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 12-20		
BMP 12-21		
BMP 12-22		
BMP 12-23		
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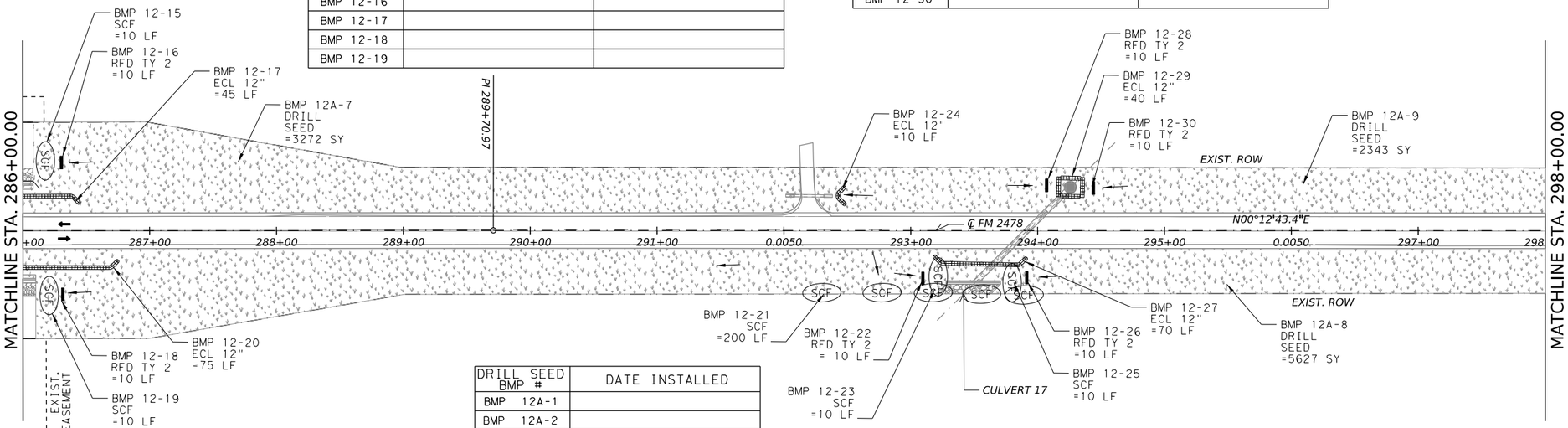
BMP 12-28		
BMP 12-29		
BMP 12-30		



DRILL SEED BMP #	DATE INSTALLED
BMP 12A-1	
BMP 12A-2	
BMP 12A-3	
BMP 12A-4	
BMP 11A-5	
BMP 12A-6	
BMP 12A-7	

DRILL SEED BMP #	DATE INSTALLED
BMP 12A-8	
BMP 12A-9	

DATE DISTURBED: _____

DATE STABILIZED: _____

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
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Thadeus Egar 5/11/2023
Signature of Registrant , P.E. & Date

Texas Department of Transportation

FM 2478

SW3P SITE MAP

STA. 274+00.00 TO STA. 298+00.00

SCALE: 1" = 100' SHEET 12 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		197

DATE: 5/11/2023 11:43:27 AM
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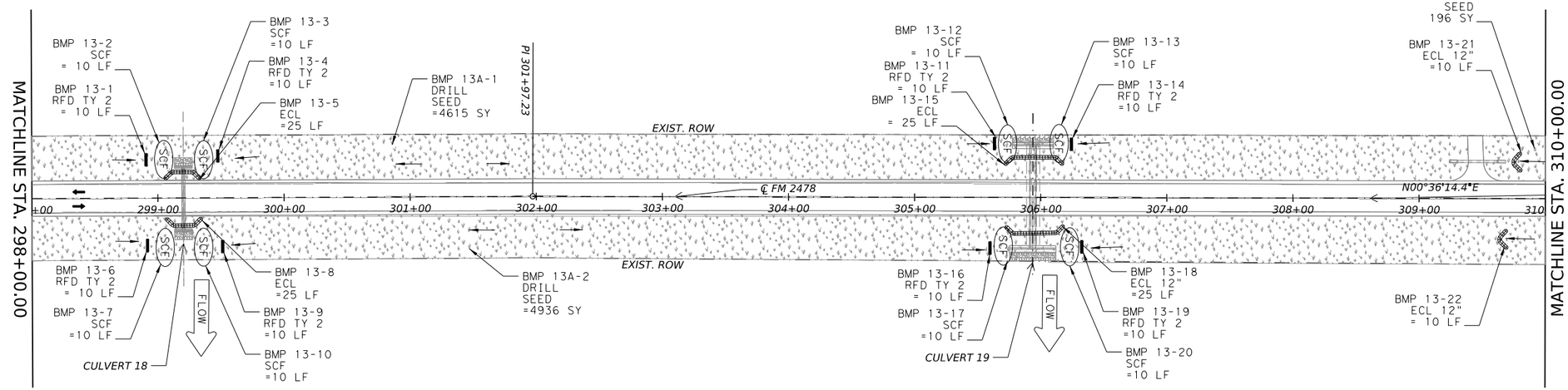

0 50 100

LEGEND:

- WATER FLOW DIRECTION
- EROSION CONTROL LOG
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BMP #	DATE INSTALLED	DATE REMOVED
BMP 13-1		
BMP 13-2		
BMP 13-3		
BMP 13-4		
BMP 13-5		
BMP 13-6		
BMP 13-7		
BMP 13-8		
BMP 13-9		
BMP 13-10		
BMP 13-11		
BMP 13-12		

BMP #	DATE INSTALLED	DATE REMOVED
BMP 13-13		
BMP 13-14		
BMP 13-15		
BMP 13-16		
BMP 13-17		
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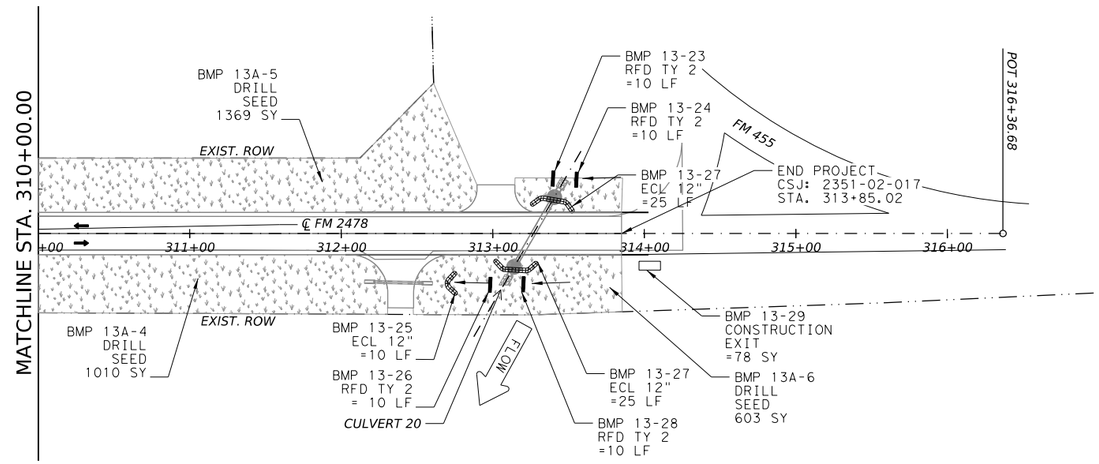
BMP 13-23		
BMP 13-24		



BMP #	DATE INSTALLED	DATE REMOVED
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BMP 13-26		
BMP 13-27		
BMP 13-28		
BMP 13-29		

PERMANENT SEEDING (PER TYPICAL SECTION)	
DATE PLACED	

DRILL SEED BMP #	DATE INSTALLED
BMP 13A-1	
BMP 13A-2	
BMP 13A-3	
BMP 13A-4	
BMP 13A-5	
BMP 13A-6	

DATE DISTURBED: _____

DATE STABILIZED: _____

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SW3P SITE MAP

STA. 298+00.00 TO END PROJECT

SCALE: 1" = 100' SHEET 13 OF 13

CONT	SECT	JOB	HIGHWAY
2351	02	017	FM 2478
DIST	COUNTY		SHEET NO.
DAL	COLLIN		198

DATE: 5/11/2023 11:45:01 AM
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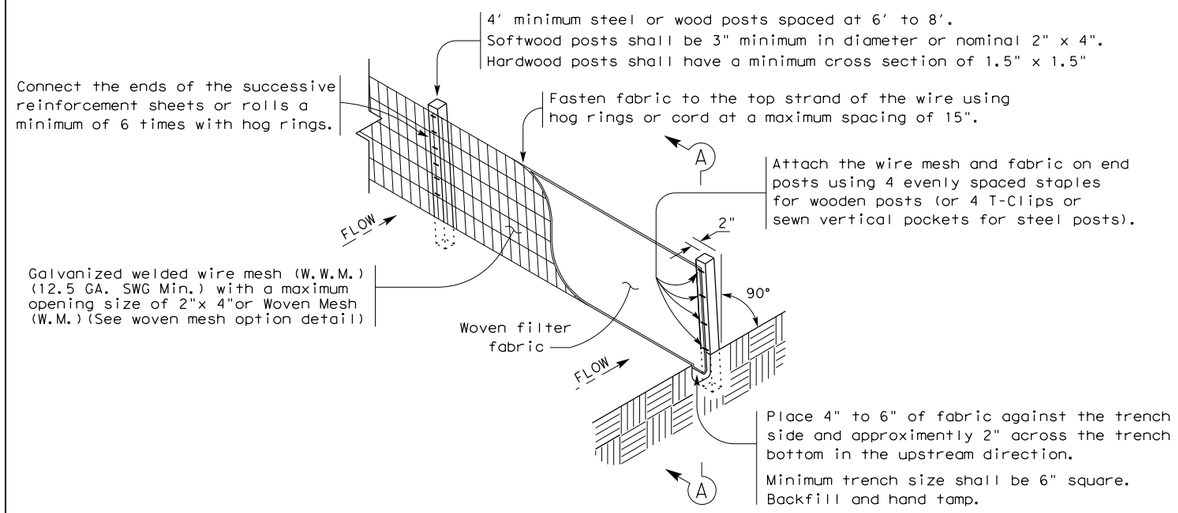
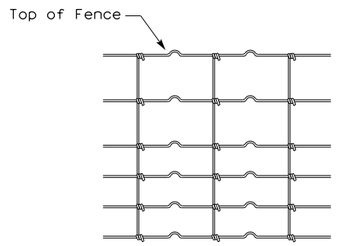
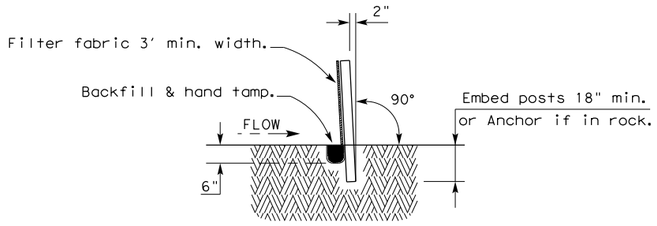


TEMPORARY SEDIMENT CONTROL FENCE

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.

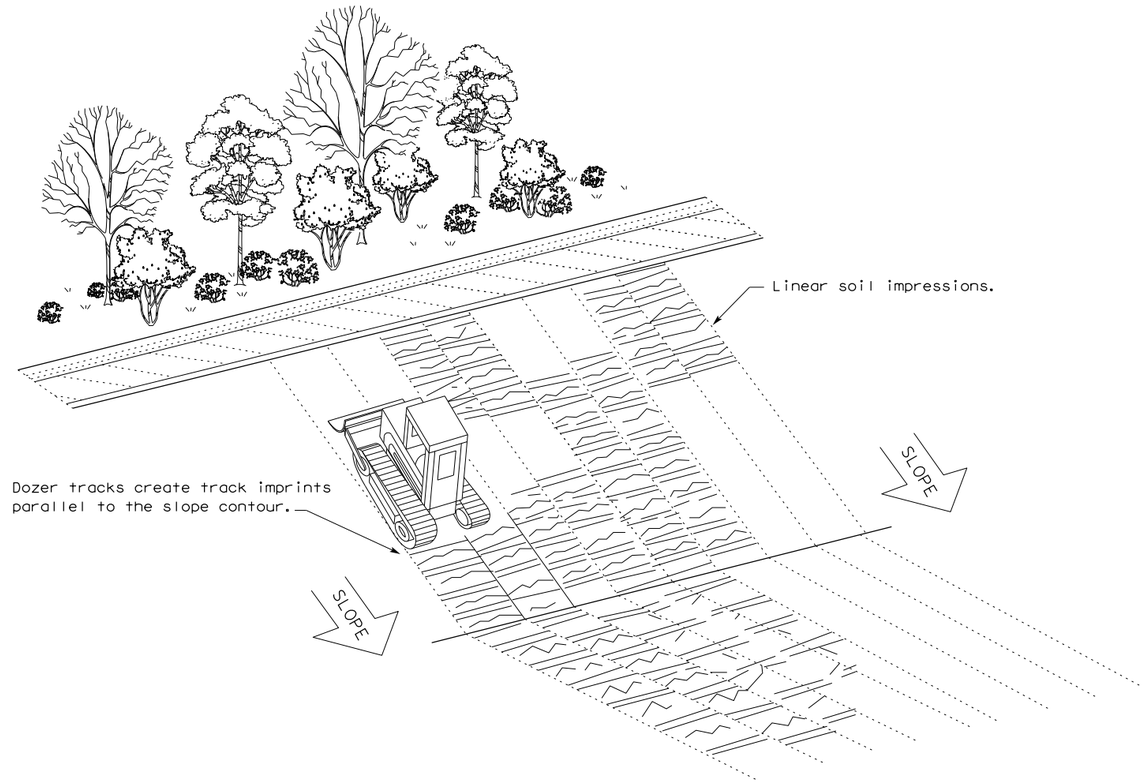
LEGEND

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

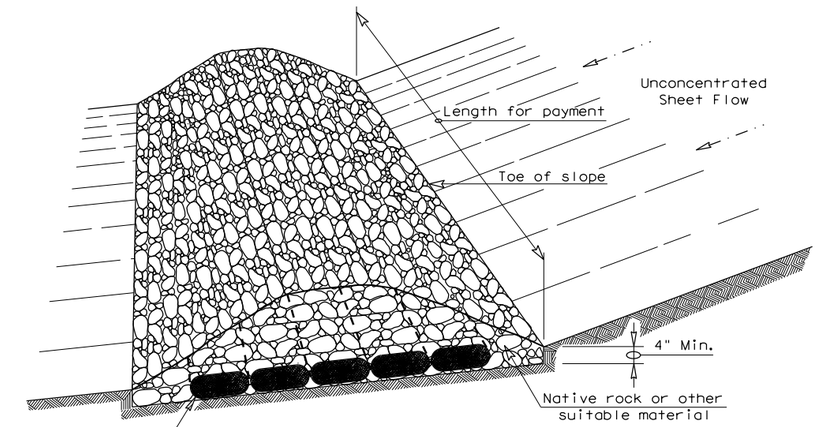
FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		199

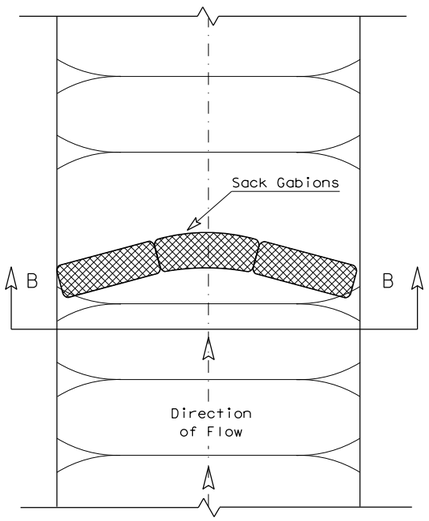
DATE
FILE

DATE:
FILE:

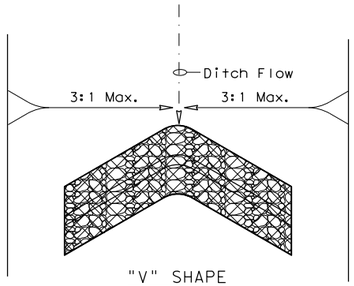


FILTER DAM AT TOE OF SLOPE

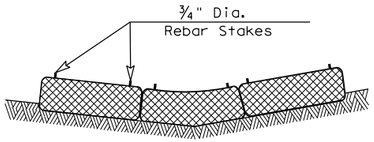
RFD1



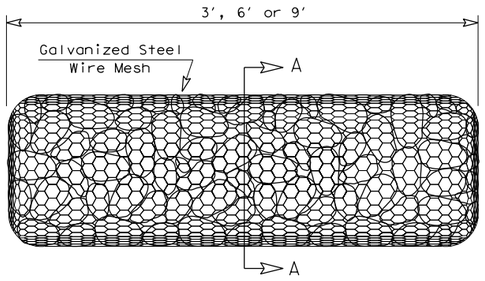
PLAN VIEW



"V" SHAPE
PLAN VIEW

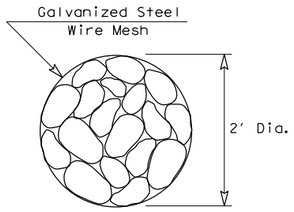


SECTION B-B

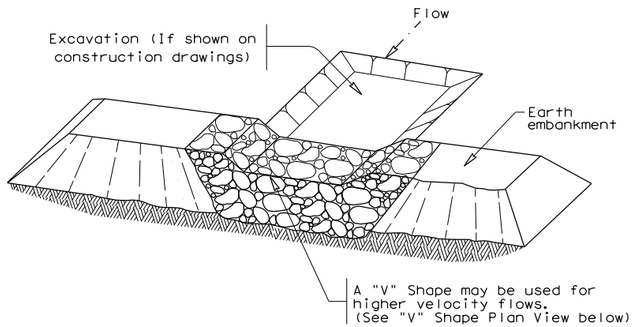


TYPE 4 (SACK GABIONS)

RFD4

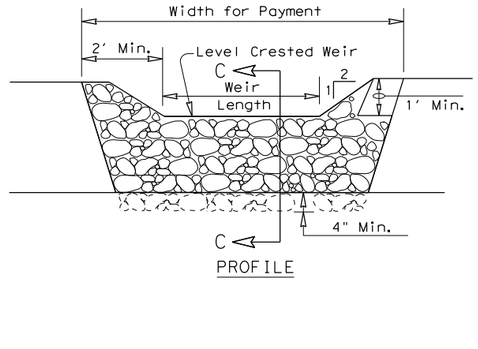


SECTION A-A

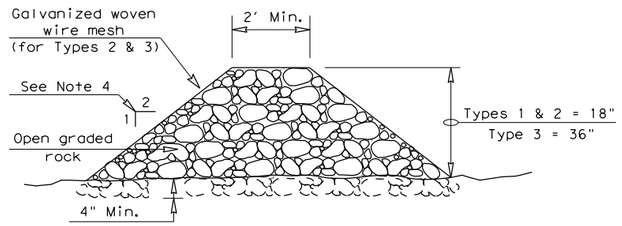


FILTER DAM AT SEDIMENT TRAP

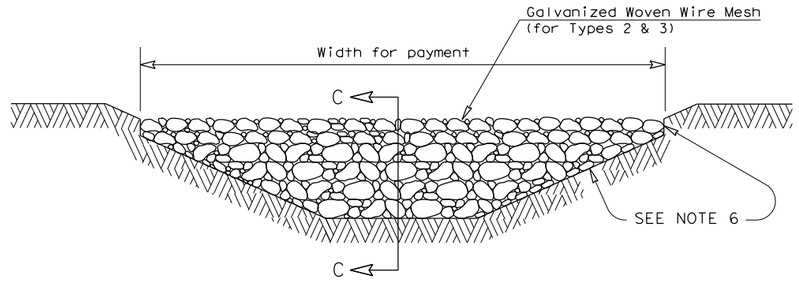
RFD1 OR RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

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.

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.

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

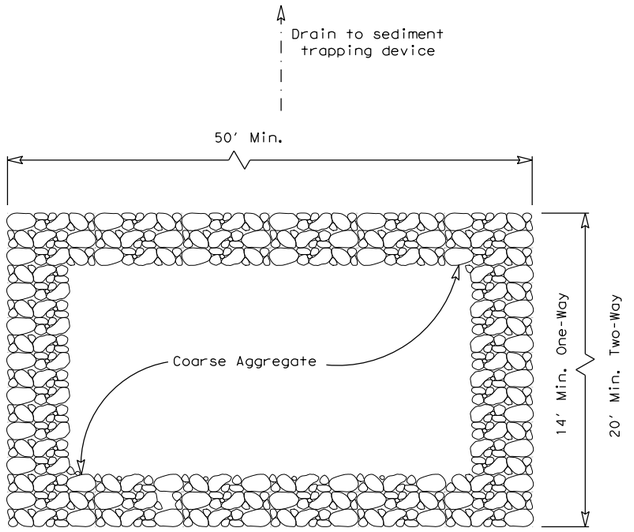
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

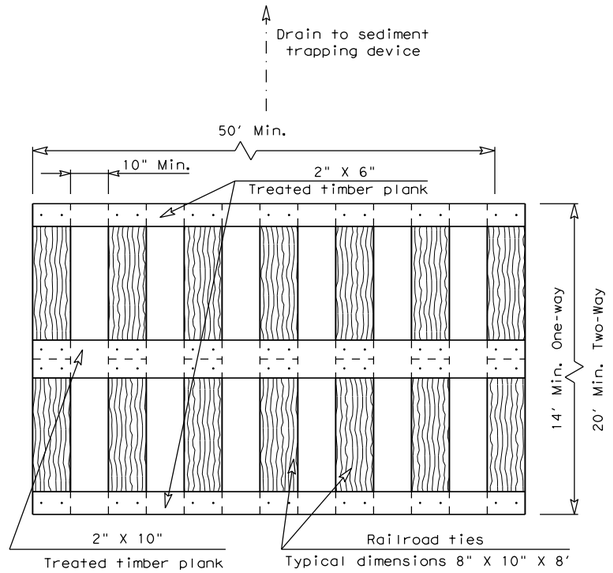
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		200

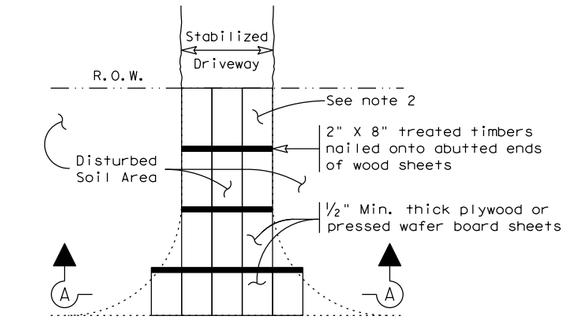
DATE: 4/29/2023
FILE: pw://txdot.projectwiseonline.com:TXDOT5/Documents/18 - DAL/Design Projects/235102017/4 - Design/Plan Set/9. Environmental/Standards/ec316.dgn



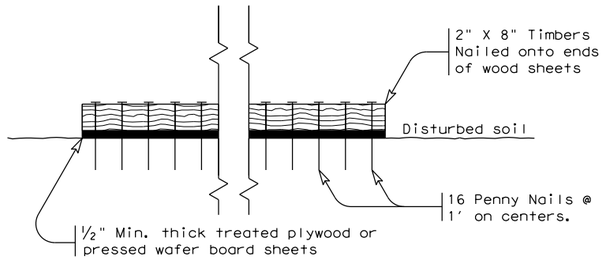
PLAN VIEW



PLAN VIEW



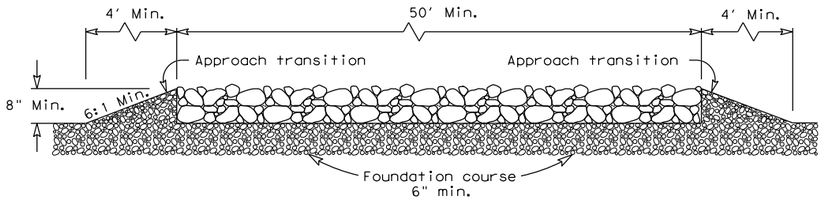
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



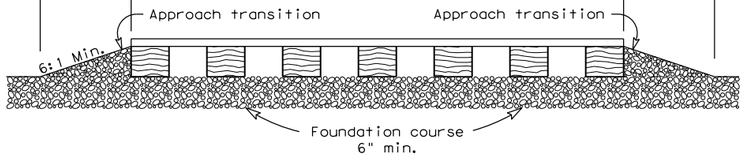
ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

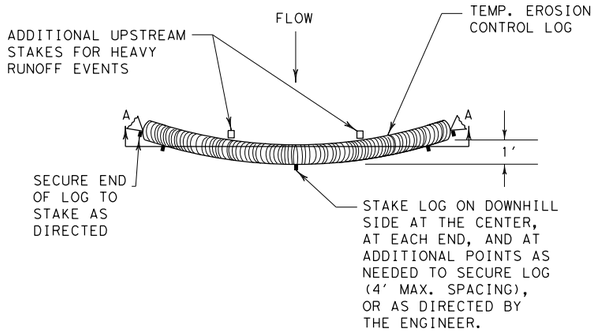
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

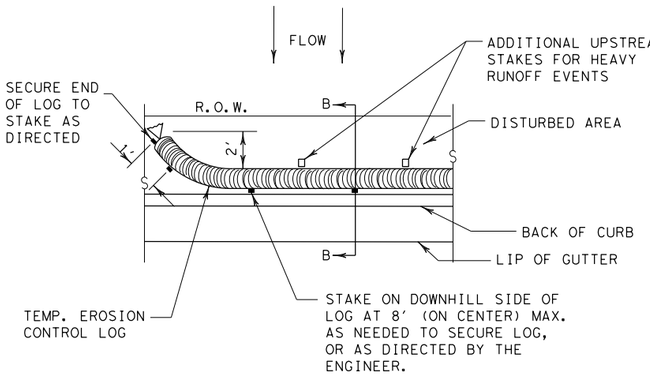
EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		201

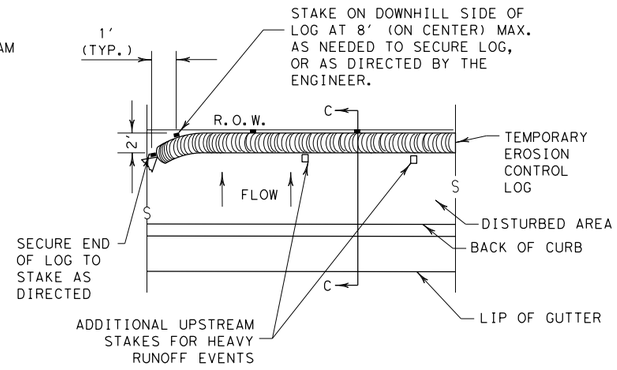
DATE:
FILE:



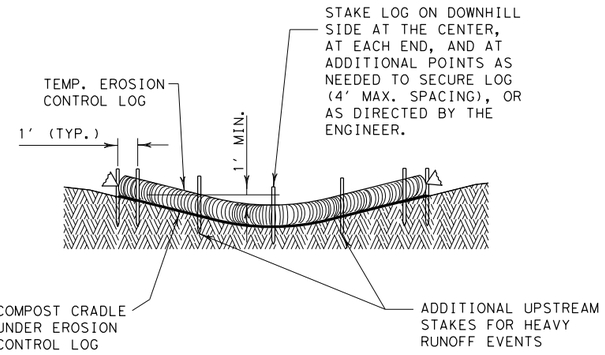
PLAN VIEW



PLAN VIEW



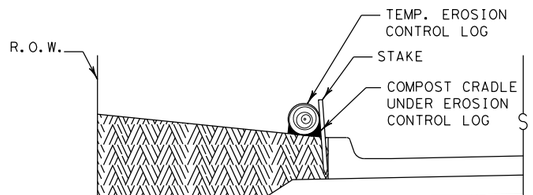
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

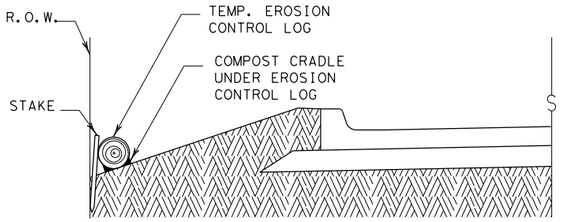
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

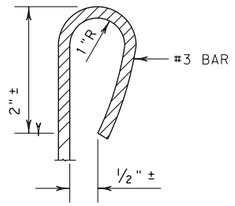
CL-BOC



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.

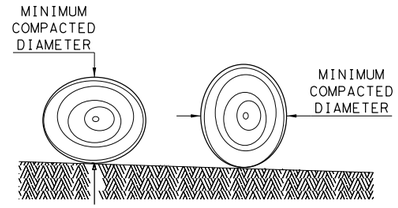
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

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

SHEET 1 OF 3

Texas Department of Transportation

Design Division Standard

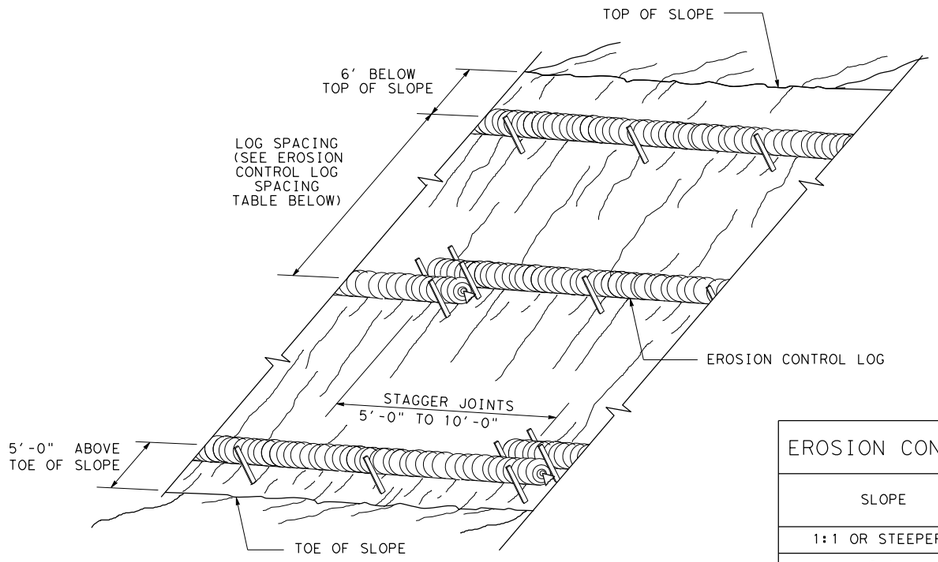
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

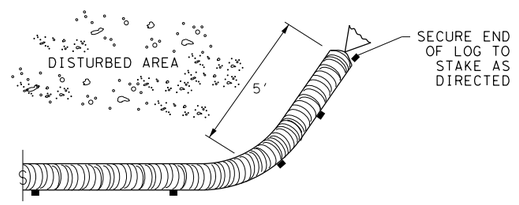
FILE: ec916	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	2351	02	017	FM 2478
	DIST	COUNTY		SHEET NO.
	DAL	COLLIN		202

DATE:
FILE:



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

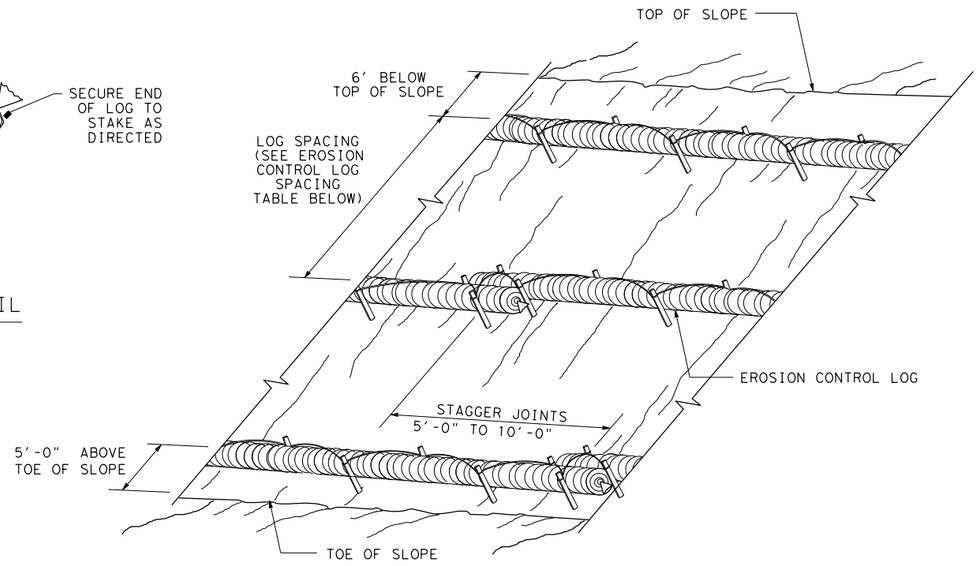
CL-SST



END SECTION RAP DETAIL

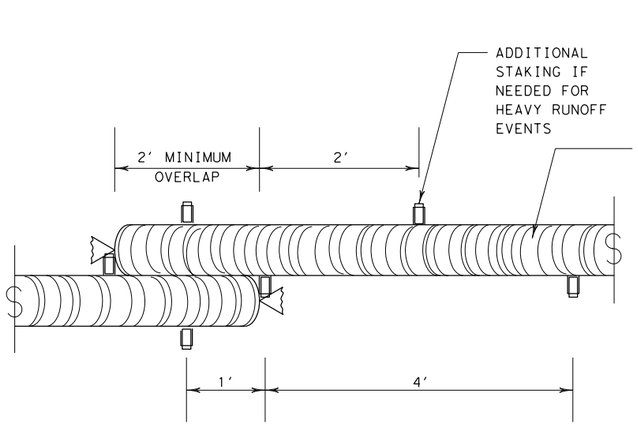
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5′	10′	15′	20′
2:1	10′	20′	30′	40′
3:1	15′	30′	45′	60′
4:1 OR FLATTER	20′	40′	60′	80′

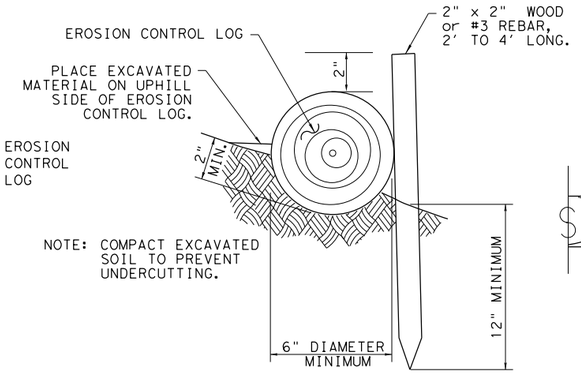
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

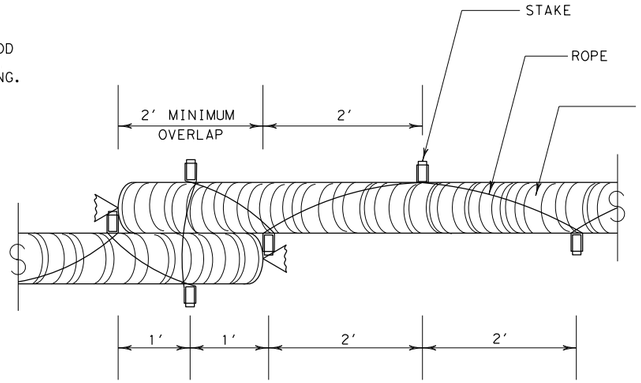


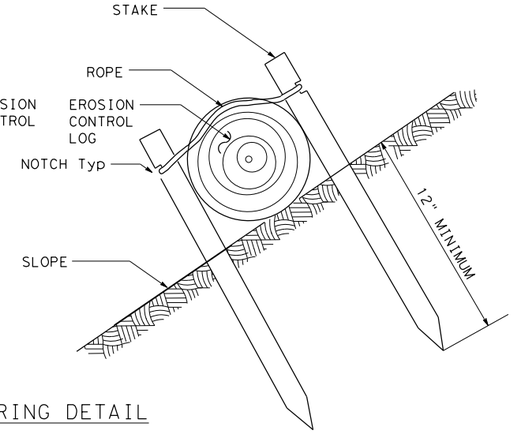


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

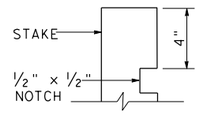
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

Texas Department of Transportation

Design Division Standard

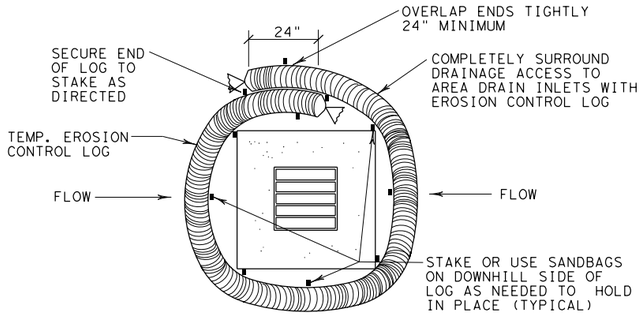
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

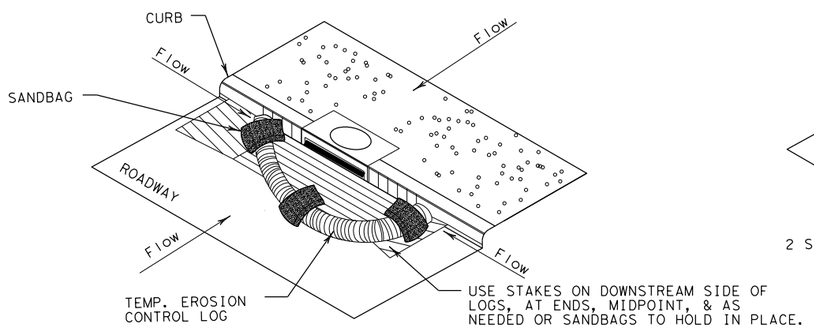
FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	2351	02	017		FM 2478	
	DIST	COUNTY			SHEET NO.	
	DAL	COLLIN			203	

DATE:
FILE:



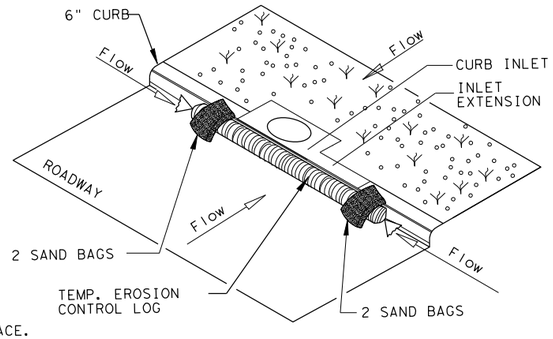
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

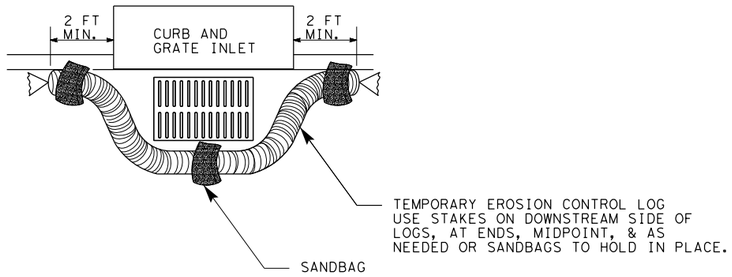
CL-CI



EROSION CONTROL LOG AT CURB INLET

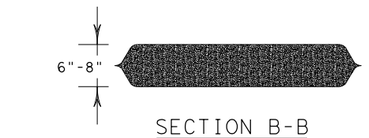
CL-CI

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.

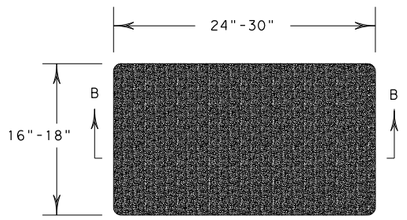


EROSION CONTROL LOG AT CURB & GRADE INLET

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	2351	02	017		FM 2478		
	DIST	COUNTY			SHEET NO.		
	DAL	COLLIN			204		

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

**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.

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.

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

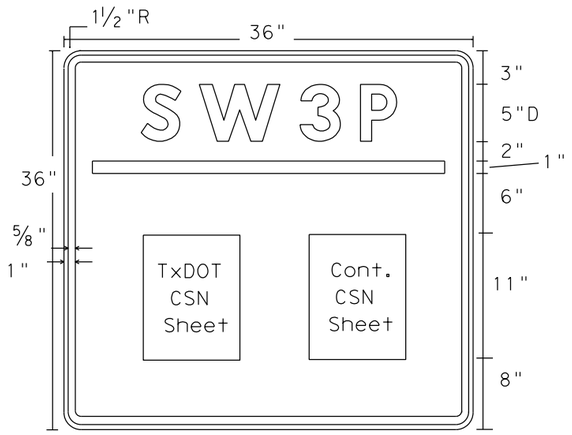
VEGETATION ESTABLISHMENT SHEET

(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	205
CHECK	CONTROL	SECTION	JOB	
XXX	2351	02	017	
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.

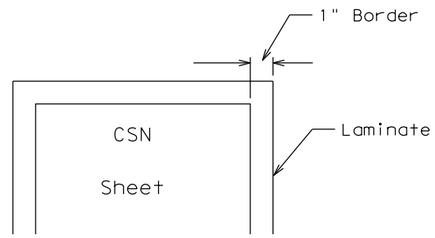
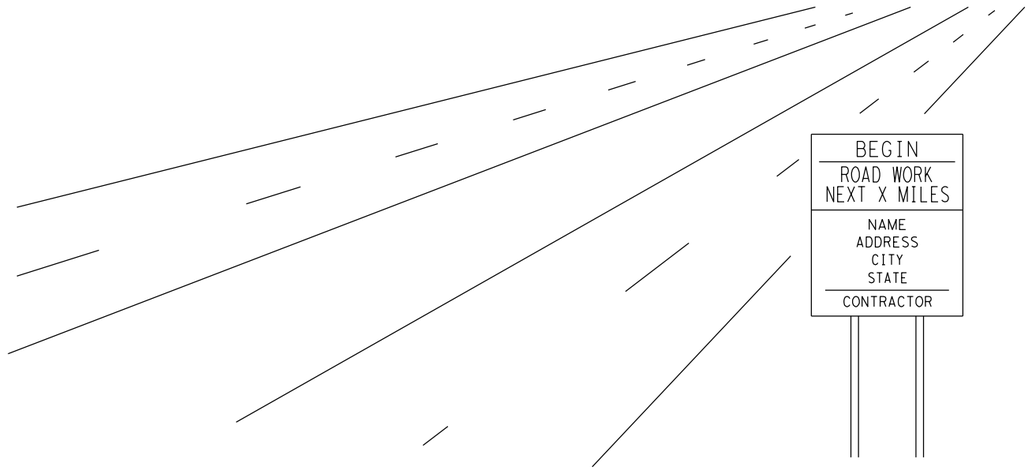
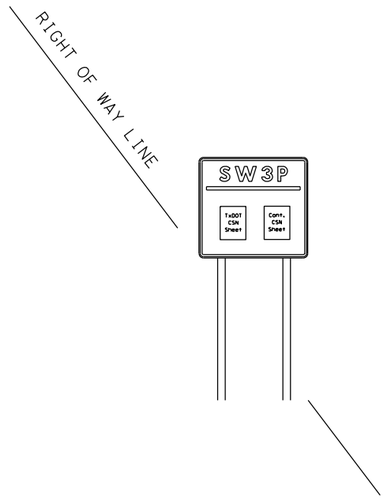


Figure 1





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		206
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	COLLIN	2351	02	017	FM 2478

LEVELS DISPLAYED
PATH: