FED. RD. DIV. NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	BR 2024 (767), ETC.		FM 1391
STATE	DISTRICT	COUNTY	SHEET NO.
TEXAS	DALLAS	KAUFMAN	1
CONTROL	SECTION	JOB	
1396	01	013, ETC.	

FINAL PLANS

NAME OF CONTRACTOR: ____________________

DATE OF LETTING: ____________________

DATE WORK BEGAN: ____________________

DATE WORK COMPLETED: ____________________

DATE WORK ACCEPTED: ____________________

SUMMARY OF CHANGE ORDERS:

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT
BR 2024 (767),ETC.
CCSJ: 1396-01-013,ETC.

FM 1391
KAUFMAN COUNTY

LIMITS: CCSJ: 1396-01-013 FM 1391 AT CEDAR CREEK RELIEF NO. 2
LIMITS: CSJ: 1396-01-015 FM 1391 AT CEDAR CREEK

TOTAL LENGTH OF PROJECT =

CCSJ: 1396-01-013	ROADWAY	= 726.00 FT. =	0.138 MI.
	BRIDGE	= 440.00 FT. =	0.083 MI.
	TOTAL	= 1166.00 FT. =	0.221 MI.
CSJ: 1396-01-015	ROADWAY	= 522.00 FT. =	0.099 MI.
	BRIDGE	= 200.00 FT. =	0.037 MI.
	TOTAL	= 722.00 FT. =	0.136 MI.

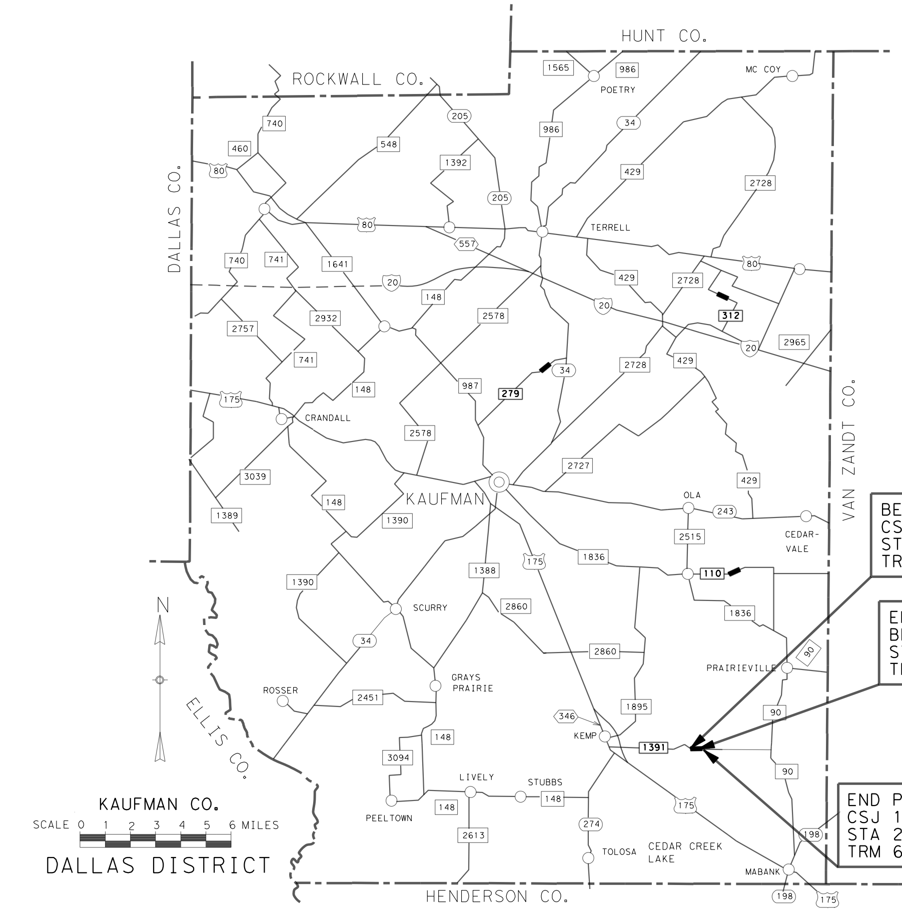
FOR THE CONSTRUCTION OF BRIDGE REPLACEMENT
CONSISTING OF: REPLACE BRIDGE AND APPROACHES

FUNCTIONAL CLASS = MINOR COLLECTOR
DESIGN SPEEDS = 55 MPH

ADT (2023): 1,000
ADT (2043): 1,400

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, OCTOBER 23, 2023)



EQUATIONS: NONE
EXCEPTIONS: NONE
RAILROAD CROSSINGS: NONE

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

SUBMITTED FOR LETTING: 11/14/2023

Rodolfo Chapa, P.E.
CONSULTANT PROJECT MANAGER

© 2024 Texas Department of Transportation

RECOMMENDED FOR LETTING: 11/17/2023
DocuSigned by: James P. Campbell, P.E.
9867C109B6A4C3...
DIRECTOR OF TRANSPORTATION PLANNING & DEVELOPMENT

RECOMMENDED FOR LETTING: 11/17/2023
DocuSigned by: Lane Selman, P.E.
29F92BAFC501498...
AREA ENGINEER

APPROVED FOR LETTING: 11/17/2023
DocuSigned by: Ceason Clemens, P.E.
A879E0D10C06464...
DISTRICT ENGINEER

WORK WAS COMPLETED ACCORDING TO THE PLANS AND CONTRACT.

________________, P.E.
Signature of Registrant & Date

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SHEET NO.	DESCRIPTION
	I. GENERAL
1	TITLE SHEET
2	INDEX OF SHEETS
3 - 4	PROJECT LAYOUT
5	TYPICAL SECTIONS
6 , 6A-6E	GENERAL NOTES
7 - 7A	ESTIMATE AND QUANTITIES
8 - 9	SUMMARY OF QUANTITIES
10	EARTHWORK QUANTITY SUMMARY
11	SUMMARY OF SMALL SIGNS
	II. TRAFFIC CONTROL PLAN
12	TRAFFIC CONTROL NARRATIVE
13	TRAFFIC CONTROL PLAN DETOUR PLAN
14 - 25	*BC(1)-21 THRU BC(12)-21
26	*WZ(RCD)-13
	III. ROADWAY DETAILS
27	SURVEY CONTROL INDEX
28	HORIZONTAL AND VERTICAL CONTROL
29	ALIGNMENT DATA
30 - 31	REMOVAL PLAN
32 - 35	ROADWAY PLAN & PROFILE
36 - 37	STONE RIPRAP DETAILS
38	*BED-14
39	*GF (31)-19
40	*GF (31)MS-19
41 - 42	*GF (31)TR TL3-20
43	*RAIL-ADJ(A)-19
44	*RAIL-ADJ(B)-19
45	*CRR
	IV. RETAINING WALL DETAILS
	NONE
	V. DRAINAGE DETAILS
46	DRAINAGE AREA MAP
47 - 50	CEDAR CREEK HYDRAULIC DATA
51	SCOUR ANALYSIS CEDAR CREEK
52 - 53	SCOUR ANALYSIS CEDAR CREEK RELIEF NO. 2
	VI. UTILITIES
	NONE
	VII. BRIDGE DETAILS
54	CEDAR CREEK ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS
55	CEDAR CREEK BRIDGE LAYOUT
56	CEDAR CREEK TYPICAL SECTIONS
57	CEDAR CREEK FRAMING PLAN
58	CEDAR CREEK SLAB DETAILS
59 - 60	CEDAR CREEK BORING LOGS
61	CEDAR CREEK RELIEF NO. 2 ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS
62 - 63	CEDAR CREEK RELIEF NO. 2 BRIDGE LAYOUT
64	CEDAR CREEK RELIEF NO. 2 TYPICAL SECTIONS
65 - 66	CEDAR CREEK RELIEF NO. 2 FRAMING PLAN
67 - 68	CEDAR CREEK RELIEF NO. 2 SLAB DETAILS
69 - 71	CEDAR CREEK RELIEF NO. 2 BORING LOGS
72 - 74	**AIG-40
75	**BAS-A
76	**BIG-40
77 - 78	**CSAB
79 - 80	**FD
81 - 82	**IGD
83 - 85	**IGEB
86 - 87	**IGMS-DAL
88	**IGND
89	**IGSK
90	**IGTS-DAL
91 - 92	**MEBR(C)
93 - 96	**PCP-DAL
97	**PCP-FAB
98 - 99	**PMDF
100	**SEJ-B
101 - 102	**SRR
103 - 105	**T223
	VIII. TRAFFIC ITEMS
106 - 107	SIGNING & PAVEMENT MARKINGS
108 - 110	*D&OM(1)-20 THRU D&OM(3)-20
111	*D&OM(5)-20
112	*PM(1)-22
113	*PM(2)-22
114	*RS(2)-23
115	*RS(4)-23
116	*SMD(GEN)-08
117	*SMD(SLIP-1)-08(DAL)
118 - 119	*SMD(SLIP-2)-08 THRU SMD(SLIP-3)-08
120 - 121	*TSR (3)-13 THRU TSR(4)-13
	IX. ENVIRONMENTAL ISSUES
122	ENVIROMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)(DAL)
123 - 124	STORM WATER POLLUTION PREVENTION PLAN (SWP3)
125 - 126	SW3P LAYOUT
127	*EC(1)-16
128	*EC(2)-16
129	*EC(3)-16
130 - 132	*EC(9)-16
133	*VEGETATION ESTABLISHMENT SHEET (DAL)
134	*SW3P SIGN SHEET
	X. MISCELLANEOUS ITEMS
	NONE

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

RAFAEL MORFIN (No. 132305) DATE: 11/14/2023

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED PROFESSIONAL ENGINEER

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

LLOYD M. WOLF (No. 73649) Lloyd M. Wolf, P.E. DATE: 11/14/2023

STATE OF TEXAS
LLOYD M. WOLF
73649
LICENSED PROFESSIONAL ENGINEER

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
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281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
INDEX OF SHEETS

SHEET 1 OF 1

		FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
DN:	RM	6	TEXAS	(SEE TITLE SHEET)			FM 1391
CK DN:	RC	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
DW:	RM	DAL	KAUFMAN	1396	01	013,ETC.	2
CK DW:	RC						

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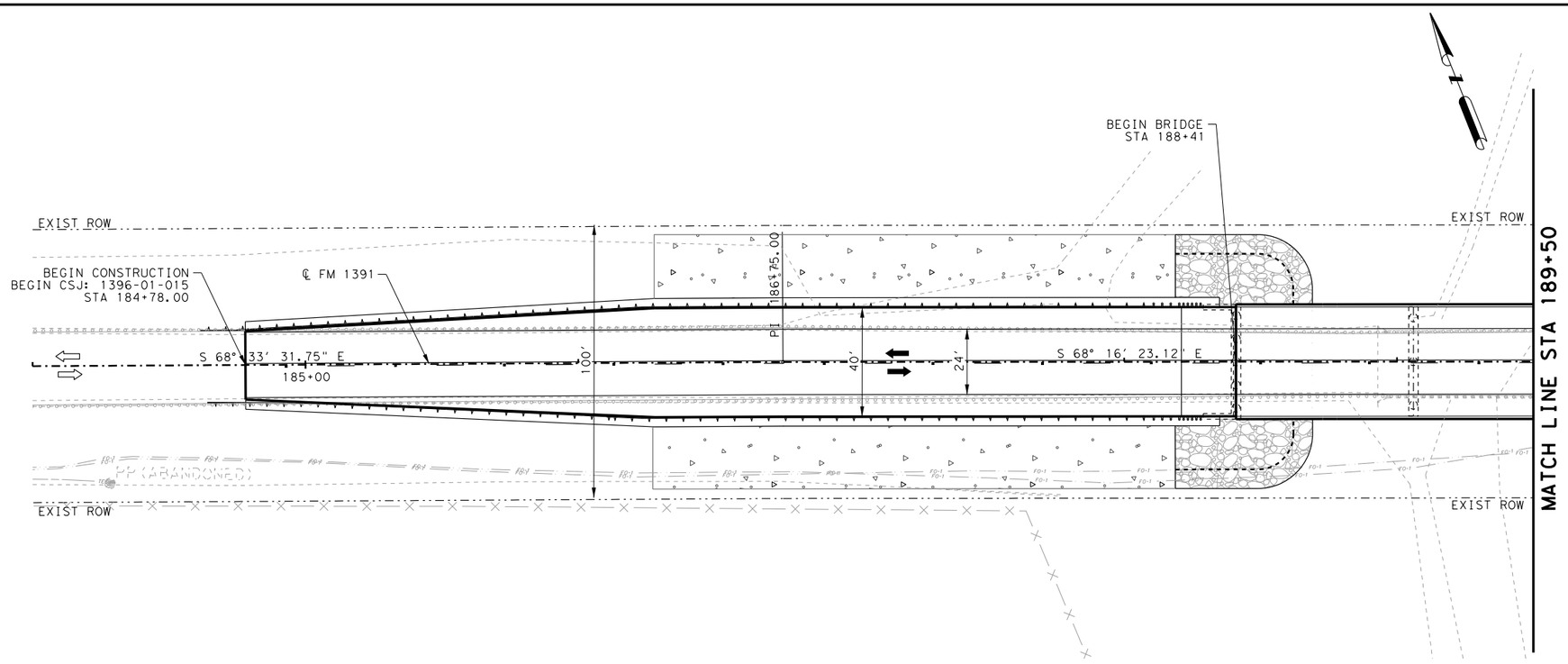

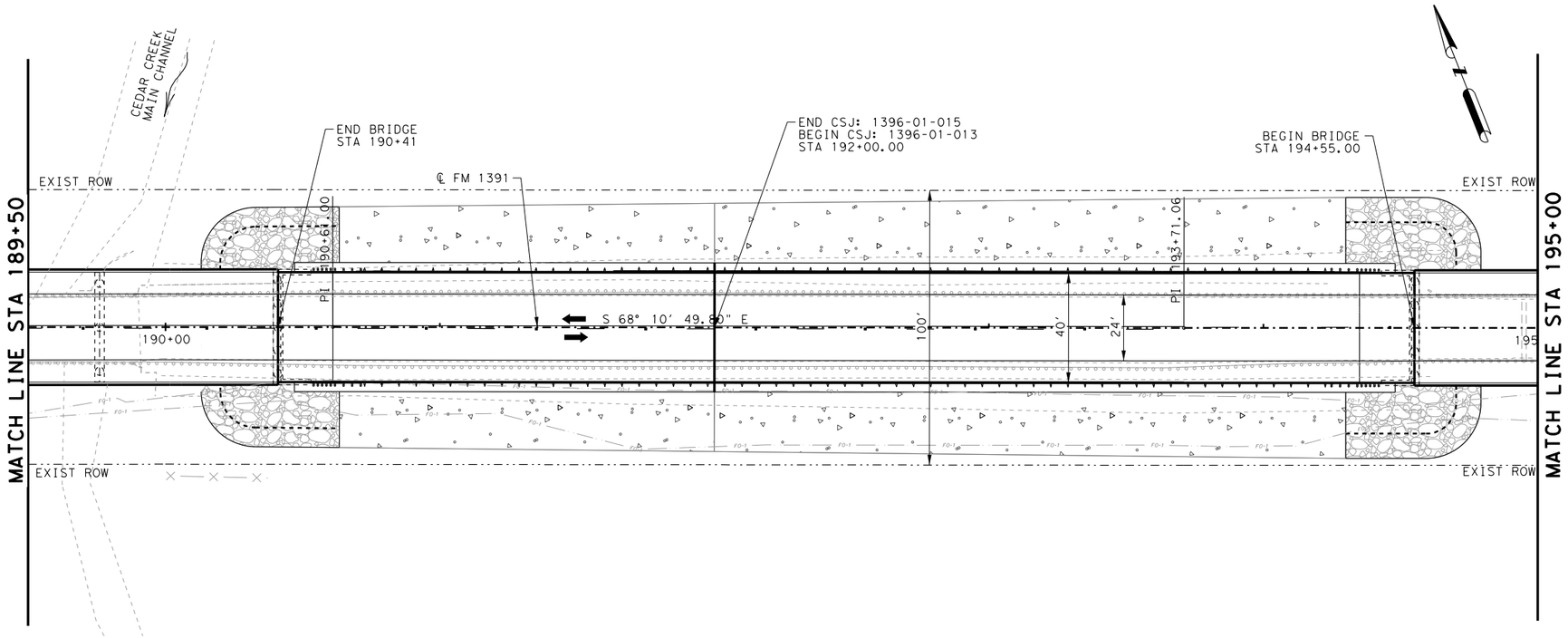

RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

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NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

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Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
PROJECT LAYOUT
BEGIN TO 195+00

SHEET 1 OF 2

DN: RM	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013, ETC.	3

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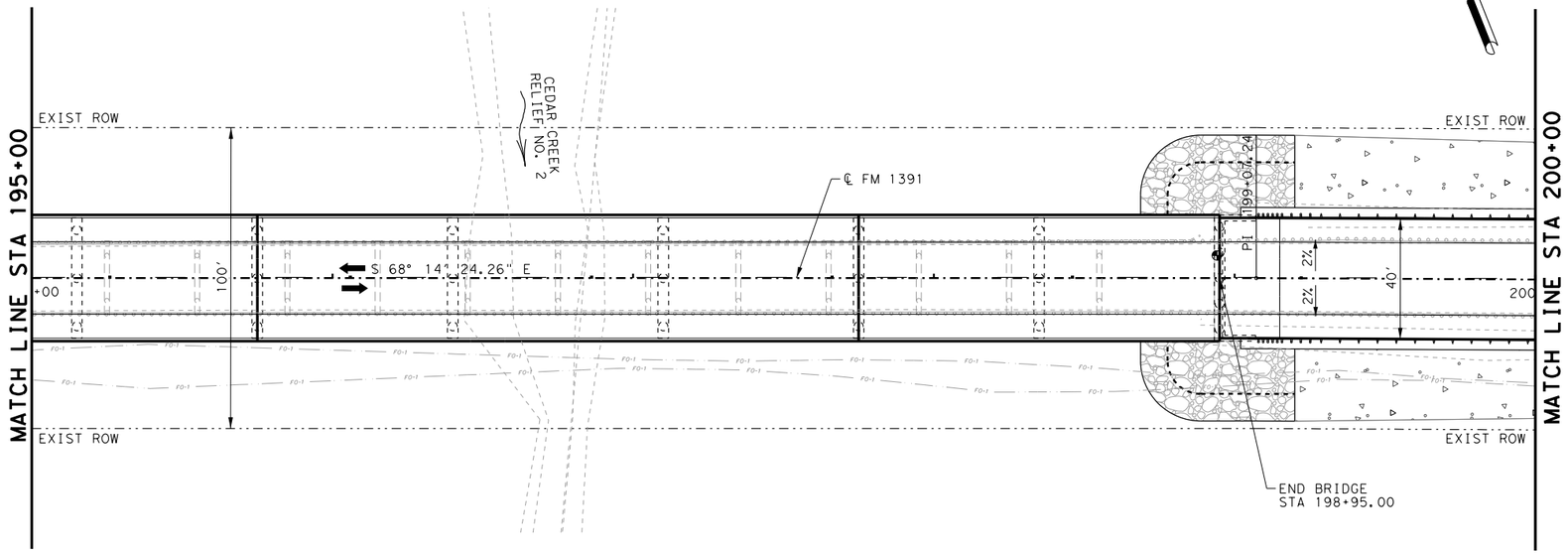

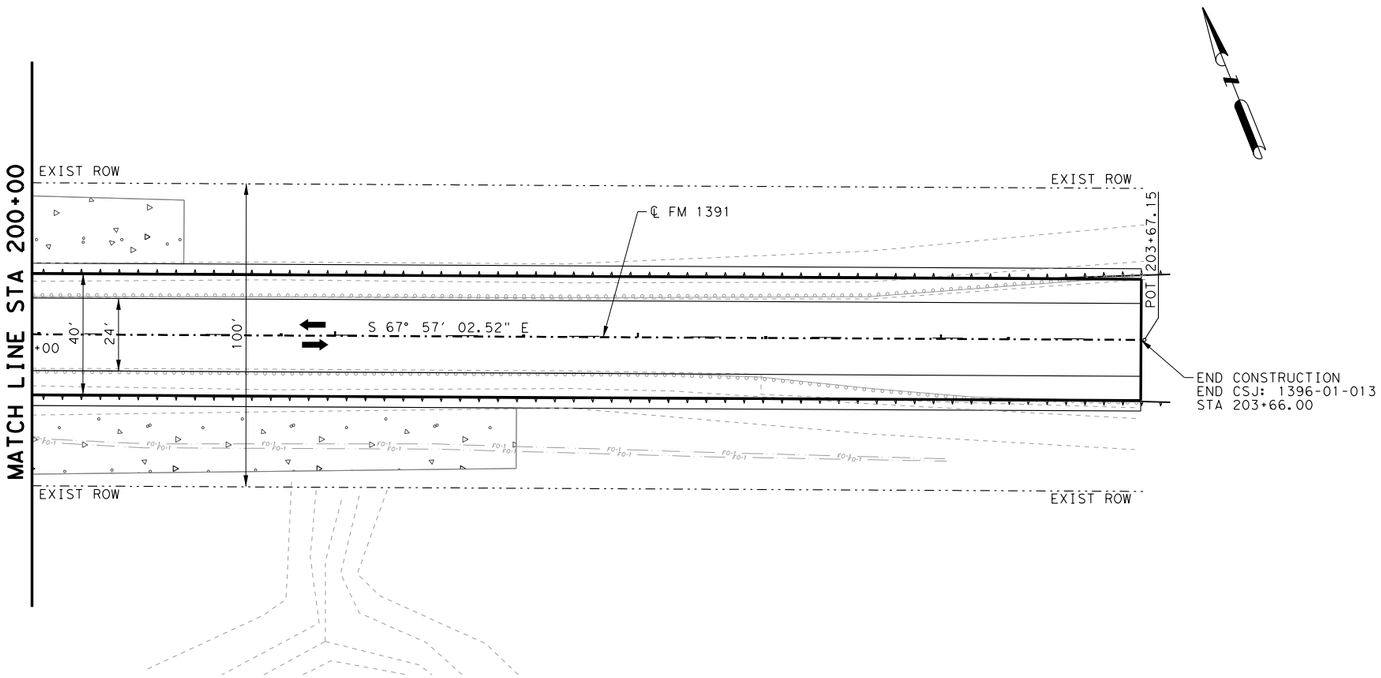

RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

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SCALE: 1"=50'

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH
CIVIL ENGINEERS, INC
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Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
PROJECT LAYOUT
195+00 TO END

SHEET 2 OF 2

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	4

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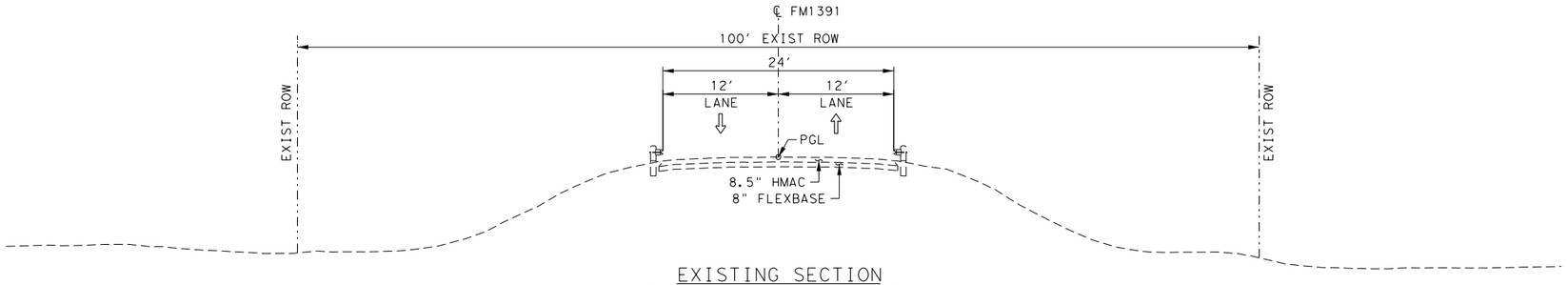
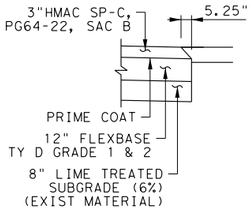
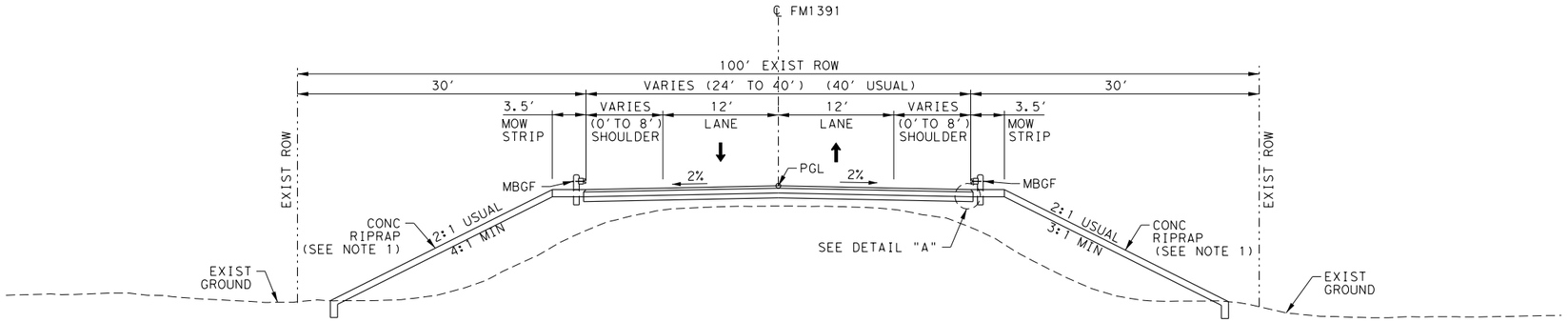


EXISTING SECTION
STA 184+78.00 TO STA 188+98.00
STA 189+88.00 TO STA 194+64.65
STA 198+84.65 TO STA 202+66.00



DETAIL A
N.T.S.



PROPOSED TYPICAL SECTION
STA 184+78.00 TO STA 186+28.00 (24' TO 40')
STA 186+28.00 TO STA 188+41.00 (40')
STA 190+41.00 TO STA 194+55.00 (40')
STA 198+95.00 TO STA 202+66.00 (40')

NOTES:

1. SEE ROADWAY PLAN & PROFILE SHEETS FOR RIPRAP LIMITS
2. EXISTING SECTION - SEE BRIDGE TYPICAL SECTION SHEETS FOR STA 188+98.00 TO STA 189+88.00 (CEDAR CREEK) AND STA 194+64.65 TO STA 198+84.65(CEDAR CREEK RELIEF NO 2).
3. PROPOSED SECTION - SEE BRIDGE TYPICAL SECTION SHEETS FOR STA 188+41.00 TO STA 190+41.00 (CEDAR CREEK) AND STA 194+55.00 TO STA 198+95.00(CEDAR CREEK RELIEF NO 2)

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

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SCALE: 1"=15'

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
TYPICAL SECTIONS

SHEET 1 OF 1

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)				FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013,ETC.		5

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SPECIFICATION DATA

Table 1: Soil Constants Requirements				
Item	Description	Plasticity Index		Note
		Max	Min	
132	Embankment (Final) (DC) (Ty C1)	40	8	1
132	Embankment (Final) (DC) (Ty C2)	25	8	2

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.

Note 2: Use as a non-select embankment backfill as defined under Item 423.2.4.1. Use as an embankment to backfill behind abutments to the extent of the approach slab or to backfill areas enclosed by an abutment and / or retaining walls or other locations as shown in the plans.

Table 2: Basis of Estimate for Permanent Construction					
Item	Description	Thickness	Rate		Quantity
162	Block Sod	N/A	See Specifications		3,738 SY
164	Broadcast Seed (R)(S)	N/A	See Specifications		2,247 SY
166 *	Fertilizer (12-6-6)	N/A	500	Lbs./Ac	0.31 Ton
168	Vegetative Watering	N/A	12	MG/Ac/Day	891 MG
260	Hydrated Lime (Slurry)			6% by wt.	103 Ton
310	Prime Coat	N/A	0.20	Gal/SY	1,041 Gal
3077	SP Mixes	See Plans	110	Lbs./SY/In	858 Ton
*For contractor's information only. **Use summer rate for calculation, adjust for actual field conditions/temperatures as necessary. See Vegetation Establishment Plan Sheet for estimated daily rates.					
Note: (1) Base material weight based on 1.50 Ton/CY (dry- compacted) (2) Asphalt weight based on 110 Lbs./SY/In (3) Subgrade weight based on 1.48 Ton/CY (dry-compacted)					

Table 3: Basis of Estimate for Temporary Erosion Control Items				
Item	Description	Rate		Quantity
164	Drill Seeding (Temp) (Warm or Cool)	See Specifications		5,985 SY
166*	Fertilizer (12-6-6)	500	Lb/Ac	0.32 Ton
168	Vegetative Watering (Warm)**	12	MG/Ac/Day	891 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.				

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 0.77 acres for FM 1391 at Cedar Creek Relief No. 2 and 0.82 acres for FM 1391 at Cedar Creek. 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 formal consultation and permitting with environmental resources agencies as outlined in the plan set Environmental Permits Issues and Commitments (EPIC) Sheet. There is a high probability that an environmentally sensitive area could be encountered on the contractor designated Project-Specific Locations (PSL) for this project (haul roads, equipment staging areas, borrow pits, disposal sites, field offices, storage areas, parking areas, etc.). Item 7.6 "Project-Specific Locations", provides a listing of regulatory agencies that may need to be contacted regarding this project.

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):

Lane Selman, P.E. Lane.Selman@txdot.gov
Nicholas Wadlington, P.E. Nicholas.Wadlington@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.

Cross sections may be requested by posting a question to the above Letting Pre-Bid Q&A web page. 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.

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

Item 6:
Contractor is responsible for the health and safety of his employees and compliance with all OSHA standards and regulations.

To comply with the latest provisions of Build America, Buy America Act (BABA Act) of the Bipartisan Infrastructure Law, the contractor must submit an 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 following link: https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7:
Repair or replace any structures and utilities that might have been damaged by negligence or a failure to have utility locates performed.

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.

Nighttime work is allowed in accordance with Article 8.3.3.

Meet weekly with the Engineer to notify him or her of planned work for the upcoming week.

Provide the Engineer with a daily work schedule of planned work.

Critical Path Method (CPM) schedule in P6 format will be required for this project. Submit baseline schedule and obtain approval prior to beginning construction. The Estimate will be held if monthly schedule update is not submitted.

Table of Milestone					
Milestone No.	Type	Daily Road User Cost	Begins	Ends	Allowable Duration
1 – FM 1391 Cedar Creek & Cedar Creek Relief No. 2	Disincentive – after allowable duration	$2,000	When FM 1391 bridges are closed to traffic as shown on the Traffic Control Plans in Phase 1.	When FM 1391 bridges are open to traffic and traffic flow is restored across the project limits as shown on the Traffic Control Plans in Phase 3.	120 working days

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.

The limits of preparing right of way will be measured at FM 1391 at Cedar Creek from Sta. 184+78.00 to Sta. 192+00.00 and at Cedar Creek Relief No. 2 from Sta. 192+00.00 to Sta. 203+66.00 along the centerline of construction.

Neatly trim trees, overhanging branches, and all underbrush at the ROW line to produce 18' vertical clear area within the limits of ROW.

Item 105:
Take possession of recycled asphalt pavement from the project and recycle the material.

Properly dispose of unsalvageable material at your own expense.

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 sleeper slabs 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 C1 and C2, are 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 160:
Sequence construction operations to salvage topsoil from one location and spread on areas ready to receive topsoil. Keep stockpiling of topsoil to a minimum.

Use fertile clay or loam from the project site not more than six inches below natural grade as topsoil.

Item 161:
Provide tickets representing quantity of compost delivered to site.

Item 247:
Construct uniform layer thickness of 12 inches, or less with the required density and moisture content. Minimum PI is equal to three (3) for all grades.

Item 260:
Furnish and distribute MS-2 smoothly and evenly at the rate of 0.20 gallons per square yard to cure lime, as directed.

Provide Hydrated Lime Slurry and apply lime by slurry placement method.

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

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

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

Item 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 416:
Provide a minimum of one core per bent, regardless of placement method.

Item 420:
Apply an ordinary surface finish to all concrete surfaces within 30 days after form removal.

Form columns to a point a minimum of one foot below the proposed future or existing bottom of channel elevation indicated on the bridge layouts by an acceptable method. This form work is not paid for directly, but is considered subsidiary to this item.

BENT NUMBERING:

For bridges with four or more spans, number every third bent (counting the abutments) on the up-station and down-station faces of the outside column(s) at approximately the mid height of the column. For structures with three columns or less per bent, place numbers on column A. Where there are four or more columns per bent, place numbers on both outside columns. Bent numbers shall be as shown on the bridge layout.

All materials, labor and incidentals associated with placing bent numbers are subsidiary to the various bid items.

For bridges with aesthetic treatments, the numbering will be incorporated into the aesthetics package.

NATIONAL BRIDGE INVENTORY NUMBERS:

Provide National Bridge Inventory (NBI) numbers on all bridge structures and bridge class culverts.

Where beam types allow access to the face of abutment backwall, place NBI numbers on the face of each abutment backwall using 3" block numbers. Locate NBI numbers between the outside beams at opposite corners of the bridge.

Where beam types do not allow access to the face of abutment backwall, place NBI numbers on the face of each abutment cap using 3" block numbers. Locate NBI numbers below the outside beams at opposite corners of the bridge.

Where a bridge begins, ends or contains a bent common to multiple structures, place NBI numbers on both faces near both ends of the common bent cap. The number placed at each of the four locations will correspond to the NBI number assigned to the bridge immediately above the number. Locate NBI numbers below the outside beam. Place using 3" Block Numbers.

For Bridge Class Culverts, place National Bridge Inventory numbers at the middle of the downstream headwall using 3" block letters.

For Bent Numbering and NBI Numbering, furnish materials that conform to the pertinent requirements of the following items:

- Stencil ink, black 11 oz., spray can (lead, CFC, and CFHC free). Black spray will be waterproof, weather resistance and dry instantly on all surfaces, without smearing, smudging or rippling and
- Die cut stencils or
- Brass stencil, 3 in., numbers and letters, adjustable interlocking stencil, set content 92 piece numbers and letters, legend height 3 in., symbol height 3 in. Stencils must be industrial grade and interlocking.

All materials, labor and incidentals associated with placing NBI numbers are subsidiary to the various bid items.

Item 421:
Furnish mix designs to the Engineer in a format compatible to the latest version of the Department's Construction Management System (Site Manager). Mix Design templates will be provided by the Engineer.

Provide High Performance Concrete (HPC) of the class specified for the following bridge components: approach slabs, abutments, bents, columns, slabs, sidewalks and medians.

Provide High Performance Concrete (HPC) of the class specified for all railing and permanent concrete traffic barrier placed on bridges or approach slabs. HPC concrete is not required for portions of rail or concrete traffic barrier not located on a bridge.

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

Strength evaluation using maturity testing, Tex-426-A, may be used for all concrete elements except drilled shafts and mass concrete pours.

Provide a digital hydraulic compression testing machine and accessories. The machine shall have a minimum testing range of 2500 pounds force to 250,000 pounds force with a hydraulic switching valve to allow for rapid advancing, hold, controlled advancing and rapid retracting. The machine shall have a load cell to measure compressive forces within the testing range and shall be calibrated and verified in accordance with ASTM latest version. The machine can meet or exceed the following when approved by the Engineer:

ELE International ACCU-TEK250 Digital Compression Tester including accessories or Forney F-250EX Standard Compression Machine including accessories or TxDOT approved equal.

Supply the Engineer with a list of certified personnel and copies of their current ACI certificates before beginning production and when personnel changes are made. Supply hard copies of calibration reports for testing equipment when required by the Engineer.

Item 425:
Repair "Safety Harness Pole Holes" in beams in accordance with Item 429 prior to placement of the bridge slab. This work is considered subsidiary to the various bid items.

Item 440:
Provide reinforcing steel with epoxy coating meeting the requirements of item 440 for the following bridge components: approach slab, slab, sidewalk, median, concrete traffic barrier, and rail.

Epoxy coated reinforcing is not required for portions of rail or concrete traffic barrier not located on a bridge.

Reinforcing for abutments, bents and columns are not required to be epoxy coated.

R-bars (I-beams, U-beams, X-Beams and TX Girders), Z-bars (boxes), and H-bars (Slab beams) are not required to be epoxy coated**.**

All ties, chairs and other appurtenances used with epoxy coated reinforcing shall be epoxy coated or non-metallic.

Fiber Reinforced Concrete (FRC) can be used as a substitute for non-structural class reinforced concrete in mow-strip and rip rap items as approved. FRC may also be used for other non-structural class reinforced concrete items as approved.

Item 442:
Use temperature Zone 1 for CVN testing.

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.

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 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.

As approved by the Engineer, provide uniformed off duty police officers and squad cars during lane or ramp closures, night time work or other situations that indicate a need for additional traffic control to protect the traveling public or the construction workforce. Provide documentation such as payroll, log sheets with signatures and badge number, or invoices from the government entity providing the officers for reimbursement. Complete the weekly tracking form provided by the department and submit invoices that agree with the tracking form for payment at the end of each month approved services were provided. Reimbursement will not be made for coordination fees charged by any party.

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

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 585:
Use Surface Test Type A.

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

Affix a sign identification decal to the back of all signs and mark out the installation date in accordance with Item 643.

Prior to taking elevations to determine lengths for fabrication of signposts 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 672:
Black adhesive will be used on asphalt pavements and white adhesive will be used on concrete pavements.

Item 730:
At the discretion of the Engineer, mow non-paved areas within the project prior to placement of permanent vegetation. Mow up to two (2) cycles per growing season.

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

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

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1396-01-013 **DISTRICT** Dallas **COUNTY** Kaufman
HIGHWAY FM 1391

			CONTROL SECTION JOB		**1396-01-013**		**1396-01-015**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00180829**		**A00191234**			
			COUNTY		**Kaufman**		**Kaufman**			
			HIGHWAY		**FM 1391**		**FM 1391**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	100-6002	PREPARING ROW		STA	11.660		7.220		18.880	
	105-6059	REMOVING STAB BASE & ASPH PAV(13"-18")		SY	2,092.000		1,657.000		3,749.000	
	110-6001	EXCAVATION (ROADWAY)		CY	207.000		71.000		278.000	
	110-6002	EXCAVATION (CHANNEL)		CY	319.000		1,149.000		1,468.000	
	132-6025	EMBANKMENT (FINAL) (DENS CONT) (TY C1)		CY	5,590.000		4,069.000		9,659.000	
	132-6026	EMBANKMENT (FINAL) (DENS CONT) (TY C2)		CY	292.000		428.000		720.000	
	161-6017	COMPOST MANUF TOPSOIL (4")		SY	1,931.000		1,807.000		3,738.000	
	162-6002	BLOCK SODDING		SY	1,931.000		1,807.000		3,738.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)		SY	2,247.000				2,247.000	
	164-6051	DRILL SEED (TEMP)(WARM OR COOL)		SY	4,178.000		1,807.000		5,985.000	
	168-6001	VEGETATIVE WATERING		MG	1,244.000		538.000		1,782.000	
	247-6313	FL BS (CMP IN PLC)(TY D GR1-2)(12")		SY	3,126.000		2,072.000		5,198.000	
	260-6002	LIME (HYDRATED LIME (SLURRY))		TON	62.000		41.000		103.000	
	260-6027	LIME TRT (EXST MATL)(8")		SY	3,126.000		2,072.000		5,198.000	
	310-6027	PRIME COAT(MC-30 OR AE-P)		GAL	626.000		415.000		1,041.000	
	402-6001	TRENCH EXCAVATION PROTECTION		LF	357.000		347.000		704.000	
	416-6004	DRILL SHAFT (36 IN)		LF	970.000		580.000		1,550.000	
	420-6014	CL C CONC (ABUT)(HPC)		CY	43.800		43.800		87.600	
	420-6030	CL C CONC (CAP)(HPC)		CY	108.000		36.000		144.000	
	420-6038	CL C CONC (COLUMN)(HPC)		CY	43.700		18.700		62.400	
	422-6002	REINF CONC SLAB (HPC)		SF	18,480.000		8,400.000		26,880.000	
	422-6016	APPROACH SLAB (HPC)		CY	65.000		65.000		130.000	
	425-6035	PRESTR CONC GIRDER (TX28)		LF	2,182.500		992.500		3,175.000	
	432-6002	RIPRAP (CONC)(5 IN)		CY	268.000		210.000		478.000	
	432-6034	RIPRAP (STONE PROTECTION)(21 IN)		CY			1,291.000		1,291.000	
	432-6036	RIPRAP (STONE PROTECTION)(30 IN)		CY	1,967.000				1,967.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	62.000		45.000		107.000	
	450-6007	RAIL (TY T223)(HPC)		LF	928.000		432.000		1,360.000	
	454-6020	SEALED EXPANSION JOINT (4 IN) (SEJ - B)		LF	168.000		84.000		252.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)		EA			1.000		1.000	
	496-6010	REMOV STR (BRIDGE 100 - 499 FT LENGTH)		EA	1.000				1.000	
	500-6001	MOBILIZATION		LS	0.630		0.370		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING		MO	8.000				8.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)		LF	80.000		84.000		164.000	
	506-6011	ROCK FILTER DAMS (REMOVE)		LF	80.000		84.000		164.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)		SY	336.000		336.000		672.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)		SY	336.000		336.000		672.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1396-01-013 **DISTRICT** Dallas **COUNTY** Kaufman
HIGHWAY FM 1391

			CONTROL SECTION JOB		**1396-01-013**		**1396-01-015**		TOTAL EST.	TOTAL FINAL
			PROJECT ID		**A00180829**		**A00191234**			
			COUNTY		**Kaufman**		**Kaufman**			
			HIGHWAY		**FM 1391**		**FM 1391**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL	EST.	FINAL		
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)		LF	2,169.000		1,591.000		3,760.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)		LF	2,169.000		1,591.000		3,760.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")		LF	1,536.000		1,001.000		2,537.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)		LF	1,536.000		1,001.000		2,537.000	
	533-6003	RUMBLE STRIPS (SHOULDER) ASPHALT		LF	1,252.000		844.000		2,096.000	
	533-6004	RUMBLE STRIPS (CENTERLINE) ASPHALT		LF	626.000		422.000		1,048.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)		LF	1,350.000		900.000		2,250.000	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)		EA	4.000		4.000		8.000	
	540-6010	MTL W-BEAM GD FEN ADJUSTMENT		LF	50.000		50.000		100.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE		LF	1,497.000		1,258.000		2,755.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)		EA	2.000		2.000		4.000	
	644-6033	IN SM RD SN SUP&AM TYS80(1)SA(U)		EA			2.000		2.000	
	644-6036	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)		EA	2.000				2.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)		EA	18.000		8.000		26.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)		EA	20.000		18.000		38.000	
	666-6225	PAVEMENT SEALER 6"		LF	520.000		240.000		760.000	
	666-6309	RE PM W/RET REQ TY I (W)6"(SLD)(100MIL)		LF	2,332.000		1,444.000		3,776.000	
	666-6318	RE PM W/RET REQ TY I (Y)6"(BRK)(100MIL)		LF	1,166.000		722.000		1,888.000	
	666-6321	RE PM W/RET REQ TY I (Y)6"(SLD)(100MIL)		LF	171.000		722.000		893.000	
	672-6009	REFL PAV MRKR TY II-A-A		EA	16.000		19.000		35.000	
	678-6002	PAV SURF PREP FOR MRK (6")		LF	520.000		240.000		760.000	
	730-6107	FULL - WIDTH MOWING		CYC	1.000		1.000		2.000	
	734-6002	LITTER REMOVAL		CYC	1.000		1.000		2.000	
	3077-6013	SP MIXES SP-C SAC-B PG64-22		TON	516.000		342.000		858.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN		EA	1.000		1.000		2.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		LAW ENFORCEMENT: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)		LS	1.000				1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)		LS	1.000				1.000	

SUMMARY OF TCP QUANTITIES		
ITEM	502	6001
DESC. CODE	6001	6002
LOCATION	BARRICADES, SIGNS AND TRAFFIC HANDLING	PORTABLE CHANGEABLE MESSAGE SIGN
	MO	EA
PROJECT TOTALS	8	2

SUMMARY OF REMOVAL QUANTITIES				
ITEM	105	496	496	542
DESC. CODE	6059	6009	6010	6001
LOCATION	REMOVING STAB BASE & ASPH PAV(13"-18")	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	REMOV STR (BRIDGE 100 - 499 FT LENGTH)	REMOVE METAL BEAM GUARD FENCE
	SY	EA	EA	LF
CSJ: 1396-01-015	1657	1		1258
CCSJ: 1396-01-013	2092		1	1496
PROJECT TOTALS	3749	1	1	2754

SUMMARY OF ROADWAY QUANTITIES																			
ITEM	100	110	110	132	132	247	260	260	310	402	422	432	432	432	432	540	540	540	3077
DESC. CODE	6002	6001	6002	6025	6026	6313	6002	6027	6027	6001	6016	6002	6034	6036	6045	6001	6006	6010	6013
LOCATION	PREP ROW	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL) (DENS CONT) (TY C1)	EMBANKMENT (FINAL) (DENS CONT) (TY C2)	FL BS (CMP IN PLC) (TY D GR1-2) (12")	LIME (HYDRATED LIME (SLURRY))	LIME TRT (EXST MATL) (8")	PRIME COAT (MC -30 OR AE-P)	TRENCH EXCAVATION PROTECTION	APPROACH SLAB (HPC)	RIPRAP (CONC) (5 IN)	RIPRAP (STONE PROTECTION) (21 IN)	RIPRAP (STONE PROTECTION) (30 IN)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	MTL W-BEAM GD FEN ADJUSTMENT	SP MIXES SP-C SAC-B PG64-22
	STA	CY	CY	CY	CY	SY	TON	SY	GAL	LF	CY	CY	CY	CY	CY	LF	EA	LF	TON
CSJ: 1396-01-015	7.22	71	1149	4069	428	2072	41	2072	415	347	65	210	1291		45	900	4	50	342
CCSJ: 1396-01-013	11.66	207	319	5590	292	3126	62	3126	626	357	65	268		1967	62	1350	4	50	516
PROJECT TOTALS	18.88	278	1468	9659	720	5198	103	5198	1041	704	130	478	1291	1967	107	2250	8	100	858

SUMMARY OF PAVEMENT MARKING QUANTITIES								
ITEM	533	533	666	666	666	666	672	678
DESC. CODE	6003	6004	6225	6309	6318	6321	6009	6002
LOCATION	RUMBLE STRIPS (SHOULDER) ASPHALT	RUMBLE STRIPS (CENTERLINE) ASPHALT	PAVEMENT SEALER 6"	RE PM W/RET REQ TY I (W)6"(SLD) (100MIL)	RE PM W/RET REQ TY I (Y)6"(BRK) (100MIL)	RE PM W/RET REQ TY I (Y)6"(SLD) (100MIL)	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")
	LF	LF	LF	LF	LF	LF	EA	LF
CSJ: 1396-01-015	844	422	240	1444	722	722	19	240
CCSJ: 1396-01-013	1252	626	520	2332	1166	171	16	520
PROJECT TOTALS	2096	1048	760	3776	1888	893	35	760

SUMMARY OF SIGNING QUANTITITES					
ITEM	644	644	644	658	658
DESC. CODE	6001	6033	6036	6014	6062
LOCATION	IN SM RD SN SUP&AM TY10BWG (1)SA(P)	IN SM RD SN SUP&AM TYS80(1)SA(U)	IN SM RD SN SUP&AM TYS80(1)SA(U-BM)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2 (BI)
	EA	EA	EA	EA	EA
CSJ: 1396-01-015	2	2		8	18
CCSJ: 1396-01-013	2		2	18	20
PROJECT TOTALS	4	2	2	26	38

SUMMARY OF SW3P QUANTITIES																	
ITEM	161	162	164	164	** 166	168	506	506	506	506	506	506	506	506	730	734
DESC. CODE	6017	6002	6001	6051	6002	6001	6003	6011	6020	6024	6038	6039	6041	6043	6107	6002
LOCATION	COMPOST MANUF TOPSOIL (4")	BLOCK SODDING	BROADCAST SEED (PERM) (RURAL) (SANDY)	DRILL SEED (TEMP) (WARM OR COOL)	FERTILIZER	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)	FULL - WIDTH MOWING	LITTER REMOVAL
	SY	SY	SY	SY	TON	MG	LF	LF	SY	SY	LF	LF	LF	LF	CYC	CYC
CSJ: 1396-01-015	1807	1807		1807	0.19	538	84	84	224	224	1515	1515	953	953	1	1
CCSJ: 1396-01-013	1931	1931	2247	4178	0.44	1244	80	80	224	224	2066	2066	1463	1463	1	1
SUBTOTAL	3738	3738	2247	5985	0.63	1782	164	164	448	448	3581	3581	2416	2416	2	2
* 5% ADDITIONAL CSJ: 1396-01-015									112	112	76	76	48	48		
* 5% ADDITIONAL CCSJ: 1396-01-013									112	112	103	103	73	73		
PROJECT TOTALS	3738	3738	2247	5985	0.63	1782	164	164	672	672	3760	3760	2537	2537	2	2

* NOTE: SW3P QUANTITIES ARE BEING INCREASED BY 5% TO ACCOUNT FOR DIFFERING SITE CONDITIONS AND REPLACEMENTS DUE TO NORMAL WEAR DURING CONSTRUCTION.

** FOR CONTRACTOR'S INFORMATION ONLY (ITEM SUBSIDIARY TO ITEMS 162 & 164)

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Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
SUMMARY OF QUANTITIES

SHEET 1 OF 2

DN: RM	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013, ETC.	8

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SUMMARY OF BRIDGE QUANTITIES								
ITEM	416	420	420	420	422	425	450	454
DESC. CODE	6004	6014	6030	6038	6002	6035	6007	6020
LOCATION	DRILL SHAFT (36 IN)	CL C CONC (ABUT) (HPC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC)	REINF CONC SLAB (HPC)	PRESTR CONC GIRDER (TX28)	RAIL (TY T223) (HPC)	SEALED EXPANSION JOINT (4 IN) (SEJ - B)
	LF	CY	CY	CY	SF	LF	LF	LF
CSJ: 1396-01-015	580	43.8	36	18.7	8400	992.5	432	84
CCSJ: 1396-01-013	970	43.8	108	43.7	18480	2182.5	928	168
PROJECT TOTALS	1550	87.6	144	62.4	26880	3175	1360	252

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CEDAR CRK & CEDAR CRK REL NO 2
SUMMARY OF QUANTITIES

SHEET 2 OF 2

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013,ETC.	9

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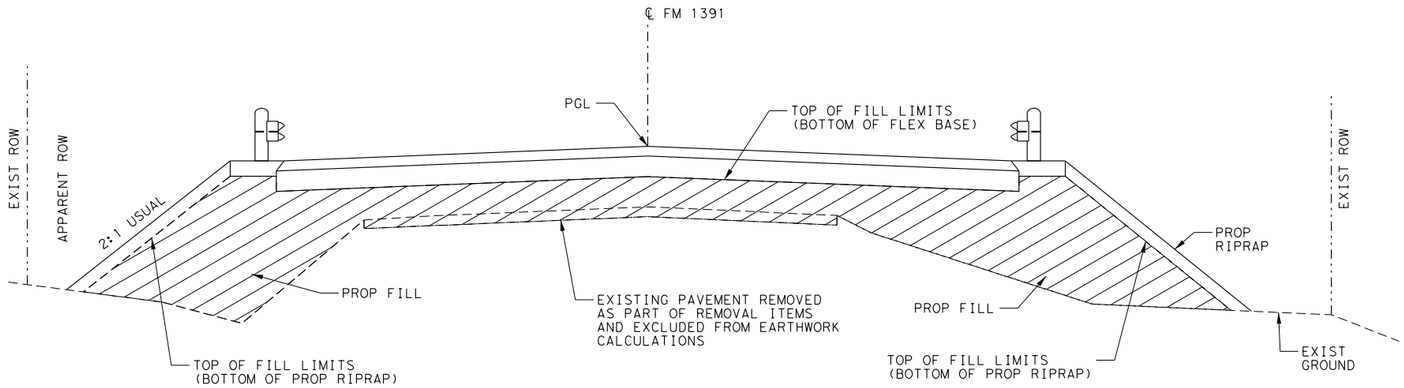

EARTHWORK QUANTITY DETAIL
N.T.S

NOTES:

1. QUANTITIES ON THIS SHEET ARE ALSO SHOWN IN "SUMMARY OF QUANTITIES"

SUMMARY OF EARTHWORK			
ITEM	110	132	132
DESC. CODE	6001	6025	6026
STATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL) (DENS CONT) (TY C1)	EMBANKMENT (FINAL) (DENS CONT) (TY C2)
	CY	CY	CY
CSJ 1396-01-015			
184+78			
185+00	12	58	
186+00	45	455	
187+00	14	608	
188+00		843	
188+41		440	204
CEDAR CREEK BRIDGE			
191+00		641	224
192+00		1024	
CSJ 1396-01-015 TOTAL	71	4069	428

CCSJ 1396-01-013			
192+00			
193+00		1035	
194+00		1187	
194+55		807	31
CEDAR CREEK RELIEF NO. 2 BRIDGE			
199+00			70
200+00		1150	191
201+00		631	
202+00	38	358	
203+00	91	305	
203+66	78	117	
CCSJ 1396-01-013 TOTAL	207	5590	292

TOTAL	278	9659	720

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FM 1391
CEDAR CRK & CEDAR CRK REL NO 2 EARTHWORK QUANTITY SUMMARY

SHEET 1 OF 1

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	10

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SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
1	1, 4, 5	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36"X36"	X		10BWG	1	SA	P		
	2	I-3	Cedar Creek	48"X30"	X		10BWG	1	SA	U		
	3	I-3	Cedar Creek	48"X30"	X		10BWG	1	SA	U		
	6	I-3	Cedar Creek Relief No 2	96"X30"	X		S80	1	SA	U	BM	
2	1	I-3	Cedar Creek Relief No 2	96"X30"	X		S80	1	SA	U	BM	
	2	W8-13aT	BRIDGE MAY ICE IN COLD WEATHER	36"X36"	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.

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).

Texas Department of Transportation

Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		1396	01	013,ETC.	FM 1391
4-16		DIST	COUNTY		SHEET NO.
8-16		DAL	KAUFMAN		11

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SEQUENCE OF CONSTRUCTION

PHASE 1

1. INSTALL ADVANCE WARNING SIGNS,BARRICADES, AND OTHER TRAFFIC CONTROL DEVICES USED FOR TRAFFIC HANDLING AS INDICATED ON THE PLANS AND AS DIRECTED BY THE ENGINEER. ALL TRAFFIC CONTROL DEVICES SHALL CONFORM TO THE BC STANDARD SHEETS AND OTHER STANDARD DETAILS FROM THE TEXAS DEPARTMENT OF TRANSPORTATION (TxDOT) AND THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).

2. DIRECT TRAFFIC AS INDICTED ON THE DETOUR PLAN SHEET.

3. INSTALL AND MAINTAIN THE DEPARTMENT'S STORM WATER POLLUTION PREVENTION PLAN (SW3P) FOR THE PROJECT SITE IN ACCORDANCE WITH THE SPECIFIC OR GENERAL STORM WATER PERMIT REQUIREMENTS. PREVENT WATER POLLUTION FROM STORM WATER ASSOCIATED WITH CONSTRUCTION ACTIVITY FROM ENTERING ANY SURFACE WATER OR PRIVATE PROPERTY ON OR ADJACENT TO THE PROJECT SITE. LIMIT THE DISTURBANCE TO THE AREA SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER WITHIN AND OUTSIDE THE DEPARTMENT'S RIGHT OF WAY.

4. REMOVE EXISTING BRIDGES AND ROADWAY APPROACHES AS INDICATED IN THE REMOVAL PLAN SHEETS.

PHASE 2

1. CONSTRUCT PROPOSED BRIDGES AND ROADWAY APPROACHES. INSTALL STONE RIPRAP AND CONCRETE RIPRAP.

2. GRADE, SEED AND SOD, AND FERTILIZE EXPOSED SOIL.

PHASE 3

1. INSTALL PERMANENT PAVEMENT MARKINGS AND SIGNS. MOVE TRAFFIC TO PERMANENT CONFIGURATION.

2. REMOVE TEMPORARY SWP3 DEVICES ONCE DISTURBED SOILS HAVE REACHED FINAL STABILIZATION IN THEIR CONTROL AREAS, AS DIRECTED OR AUTHORIZED BY ENGINEER.

3. REMOVE ALL ADVANCE WARNING SIGNS, DETOUR SIGNS, BARRICADES, AND OTHER TRAFFIC CONTROL DEVICES USED FOR TRAFFIC HANDLING.

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

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CEDAR CRK & CEDAR CRK REL NO 2
TRAFFIC CONTROL NARRATIVE

SHEET 1 OF 1

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)				FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.		12

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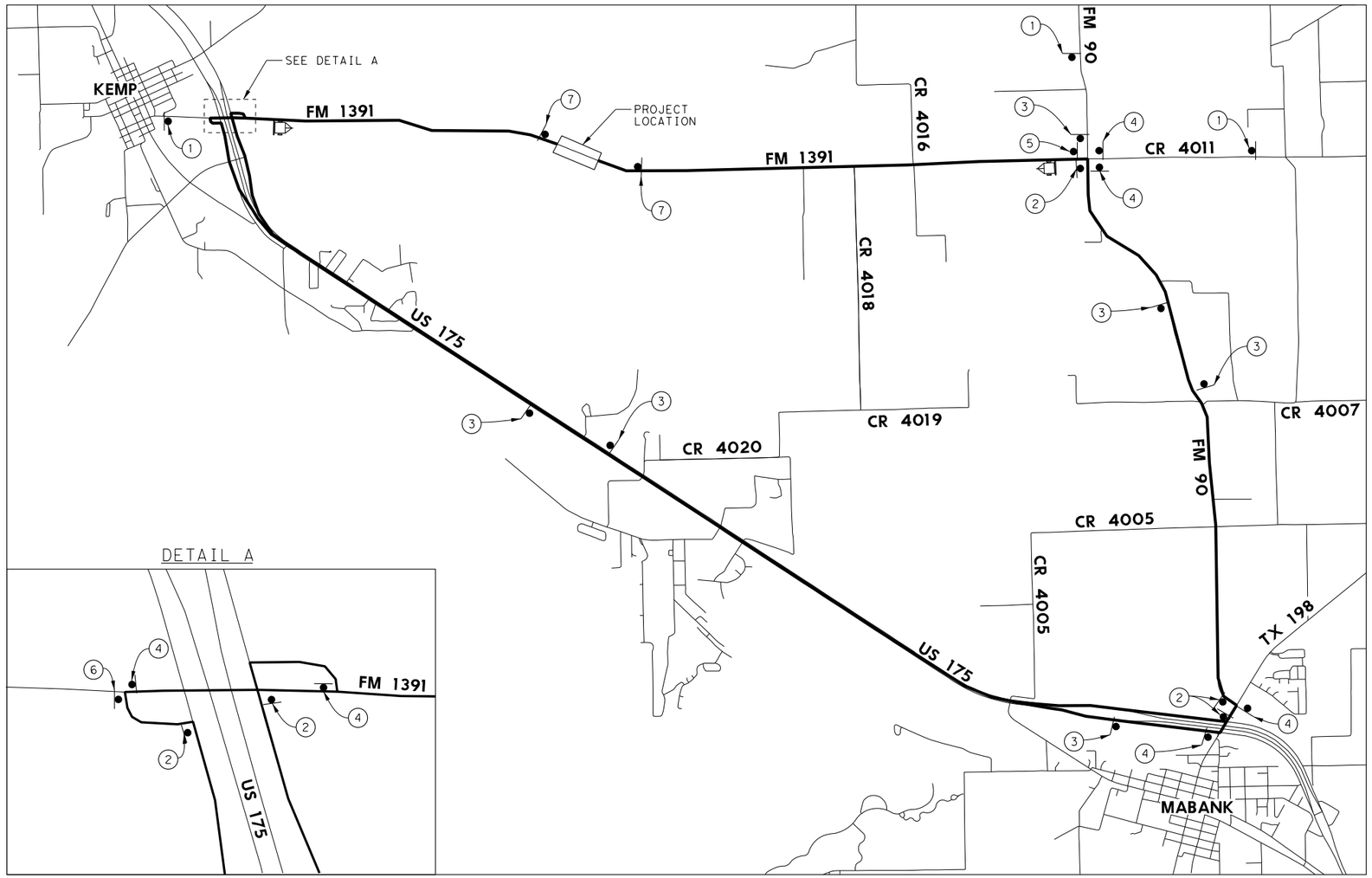
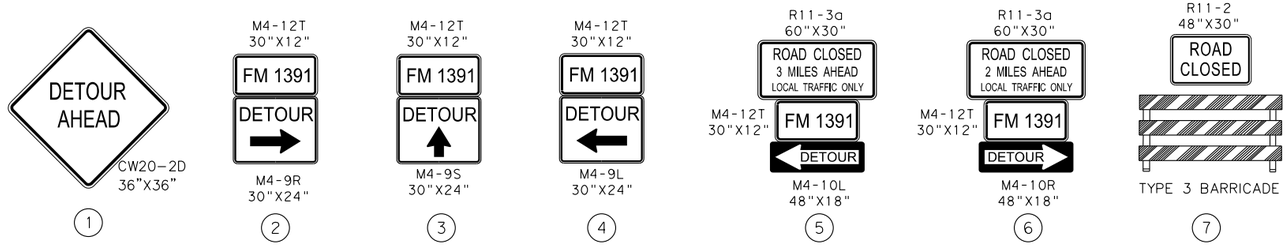


LEGEND:

- DETOUR ROUTE
- DETOUR SIGN
- PORTABLE SIGN

NOTES:

1. ALL ADVANCE WARNING SIGNS AND SPACINGS SHALL BE PLACED IN ACCORDANCE WITH THE TEXAS MUTCD, BC STANDARD SHEETS, AND AS DIRECTED BY THE ENGINEER.
2. SEE NARRATIVE FOR SEQUENCE OF CONSTRUCTION.
3. LOCATION OF PCMS SHALL BE PLACED AND VERIFIED AS PER DIRECTION OF ENGINEER.



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281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
TRAFFIC CONTROL PLAN
DETOUR PLAN

SHEET 1 OF 1

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)				FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.		13

RAFAEL MORFIN 132305 LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
11/14/2023

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		14

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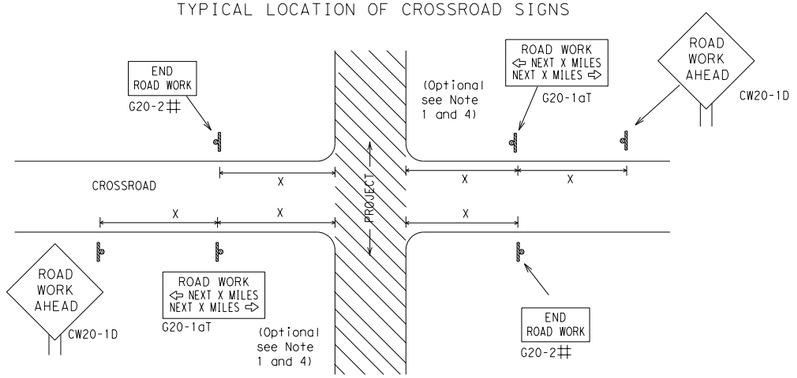
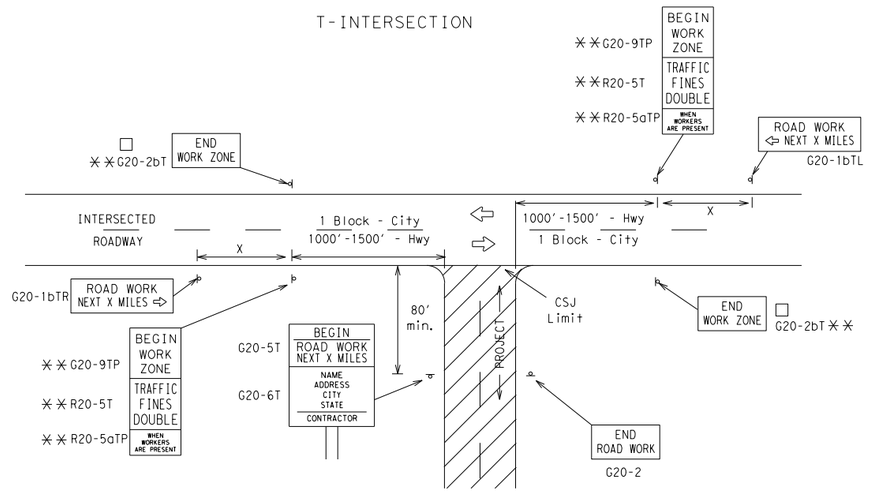
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

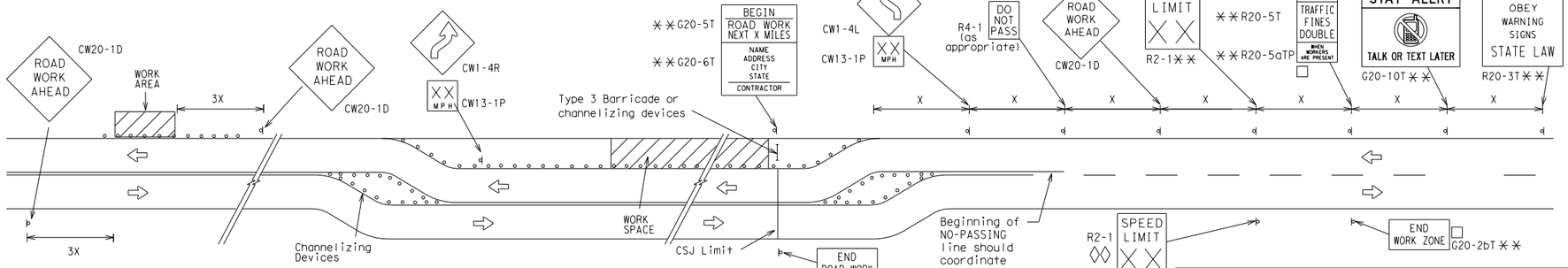
✳ For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

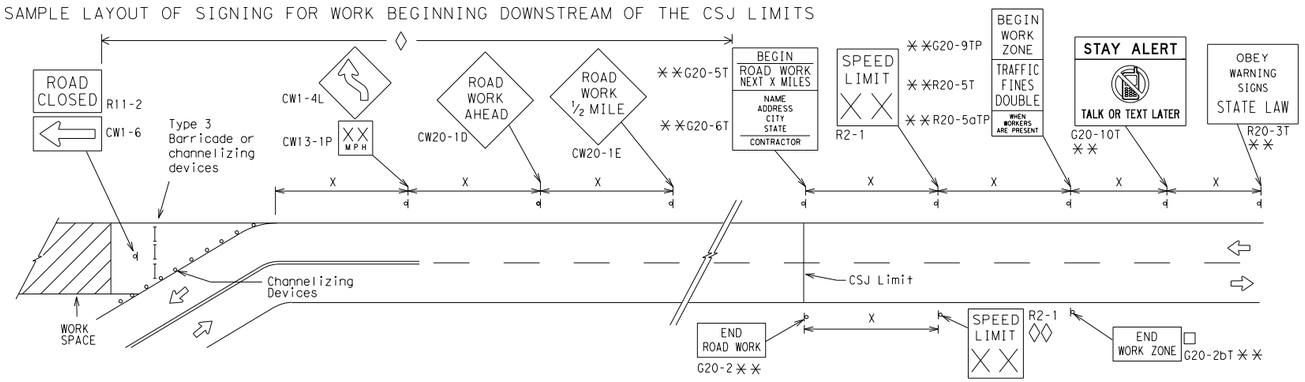
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	1396	01	013,ETC.	FM 1391
9-07 8-14	DIST	COUNTY		SHEET NO.
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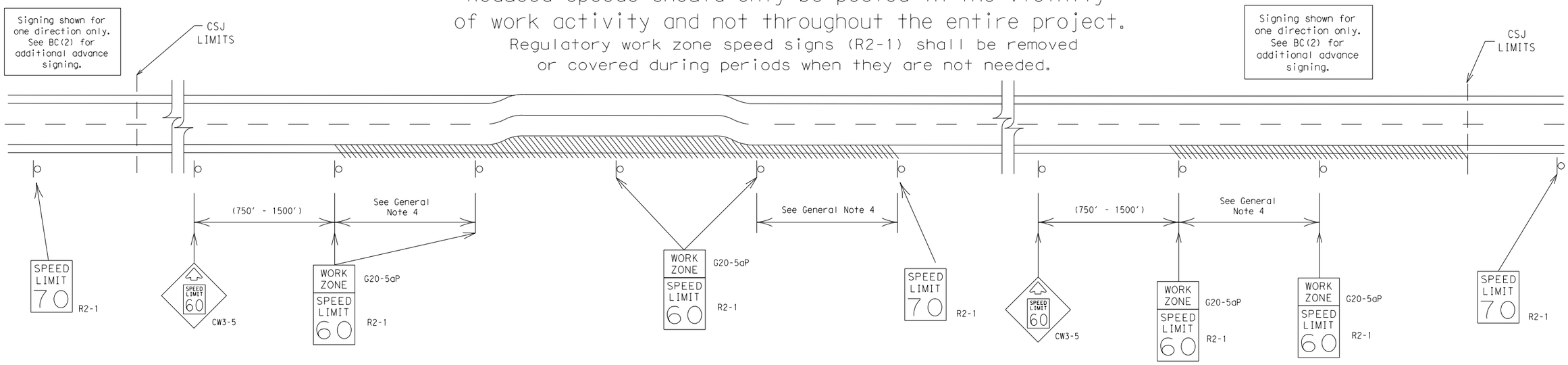
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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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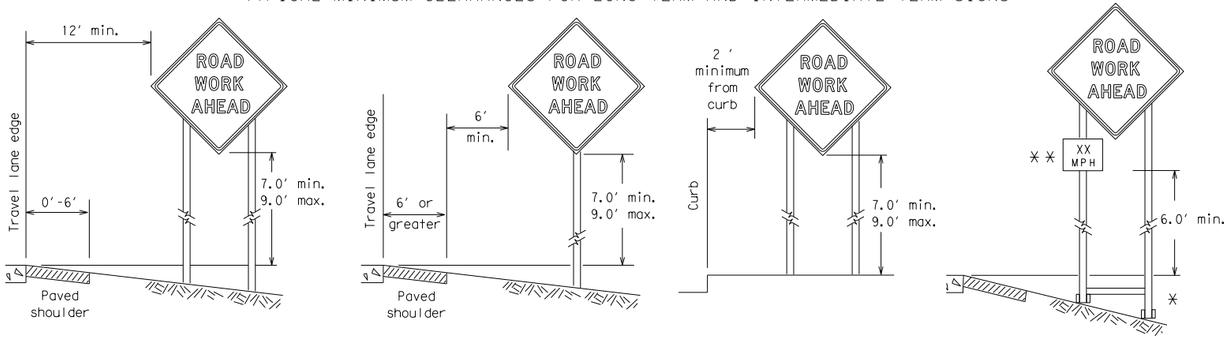
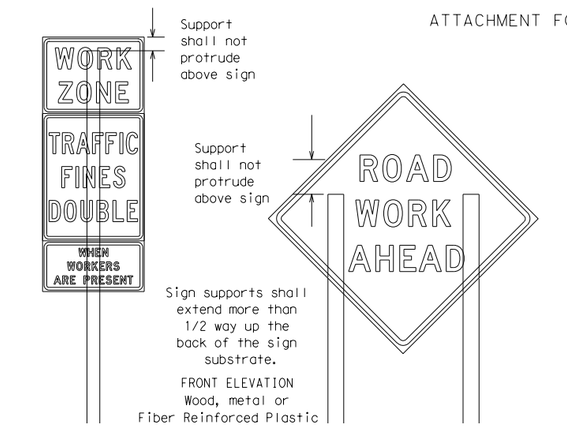
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



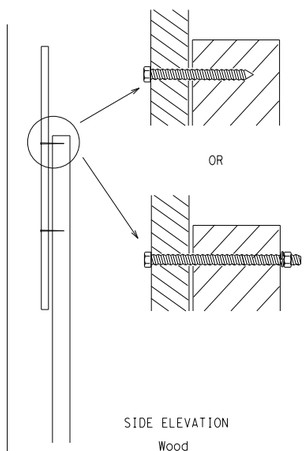
⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

⁎⁎ 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



FRONT ELEVATION
Wood, metal or
Fiber Reinforced Plastic



SIDE ELEVATION
Wood

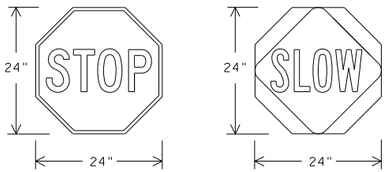
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



Background - Red
Legend & Border - White

Background - Orange
Legend & Border - Black

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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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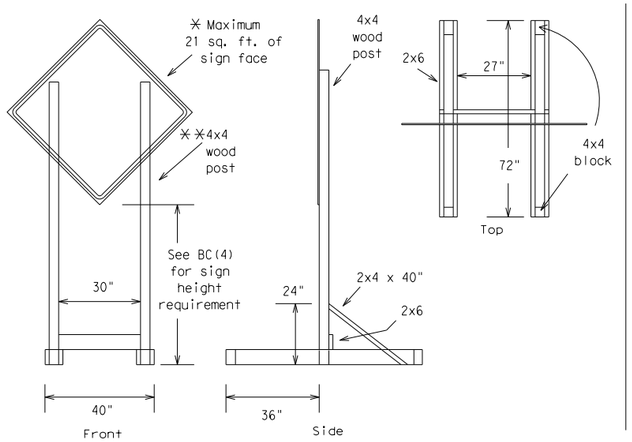
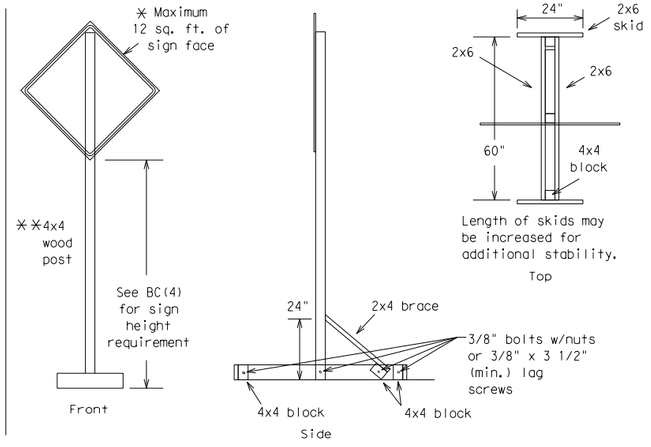
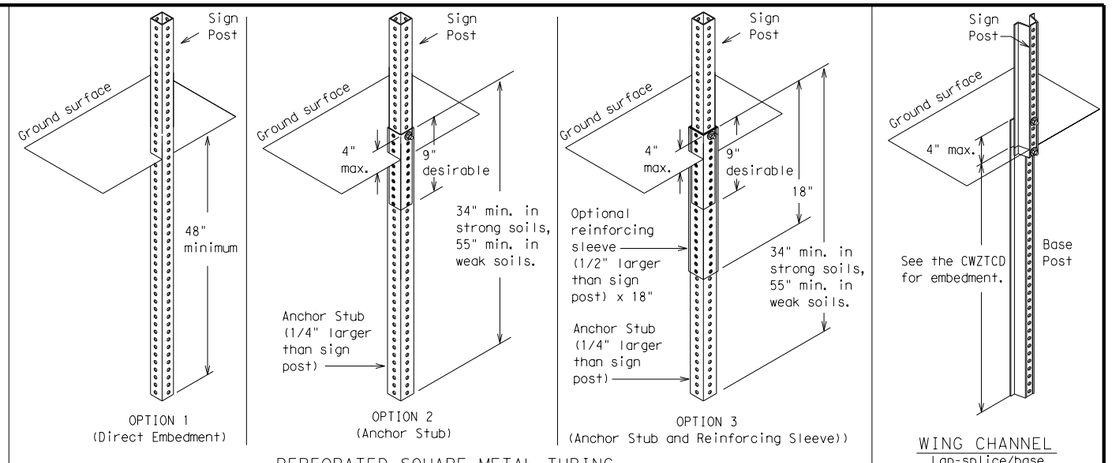




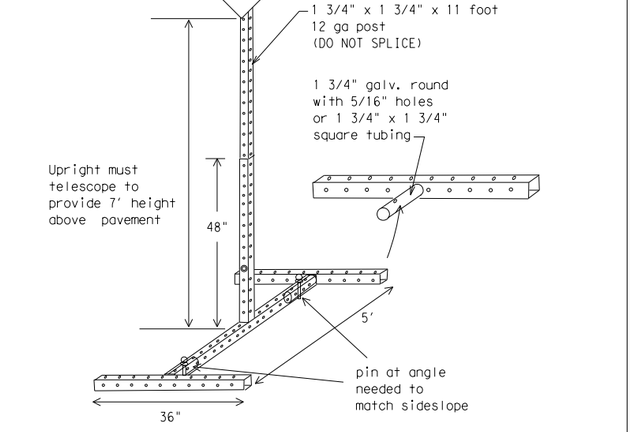
SKID MOUNTED WOOD SIGN SUPPORTS

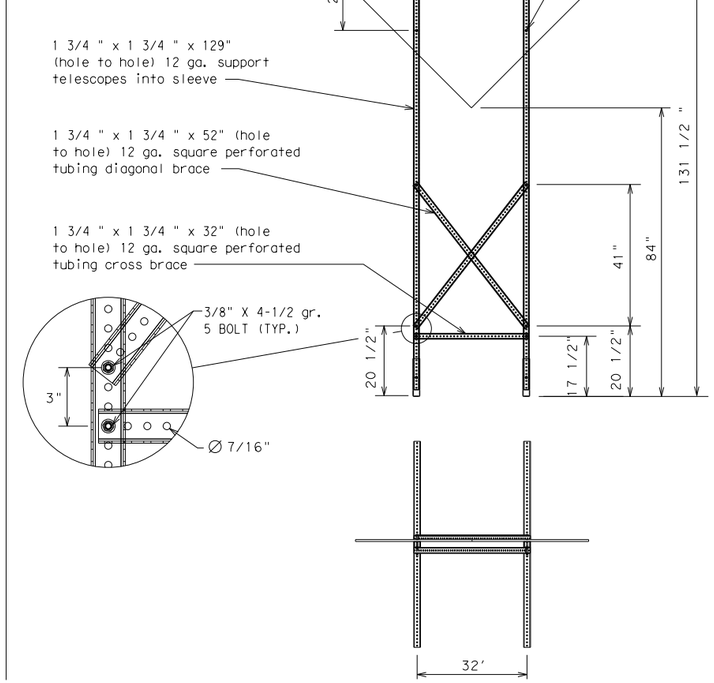
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

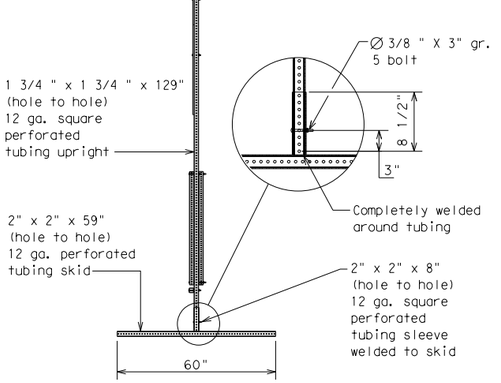


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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)

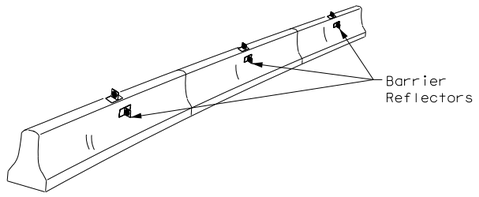
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	KAUFMAN		19

100

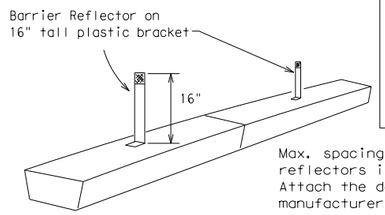
DATE: 11/14/2023 2:03:38 PM
FILE: N:\P5072-18-19-4\CADD_BR_FM 1391\DGN\02_TRAF_CONT\StdDetails\bc-21.dgn

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.

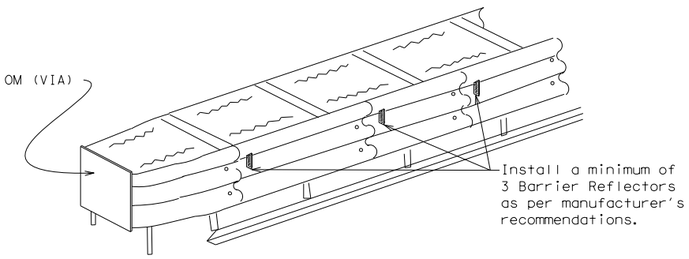


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

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.

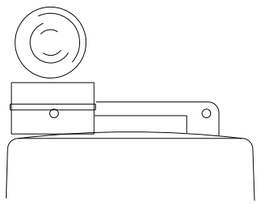


DELINEATION OF END TREATMENTS

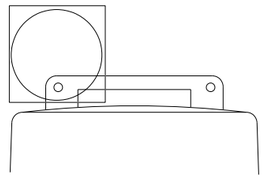
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

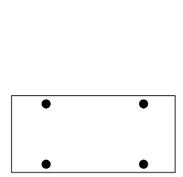
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

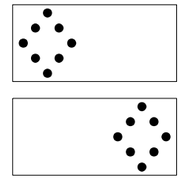
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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:

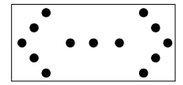


4 CORNER CAUTION

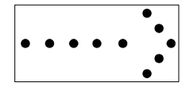
OR



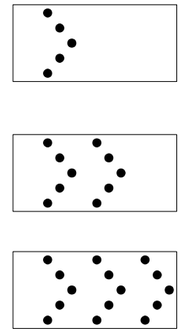
ALTERNATING DIAMOND CAUTION



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	1396	01	013,ETC.	FM 1391
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	KAUFMAN		20

101

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

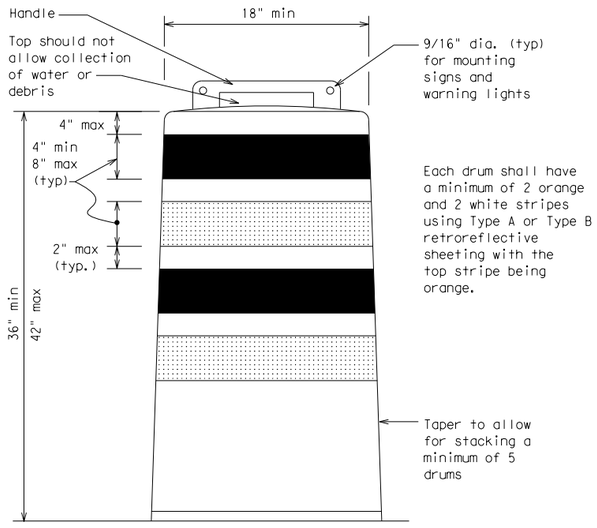
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

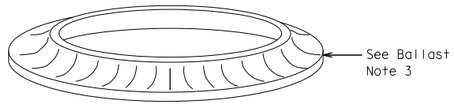
RETROREFLECTIVE SHEETING

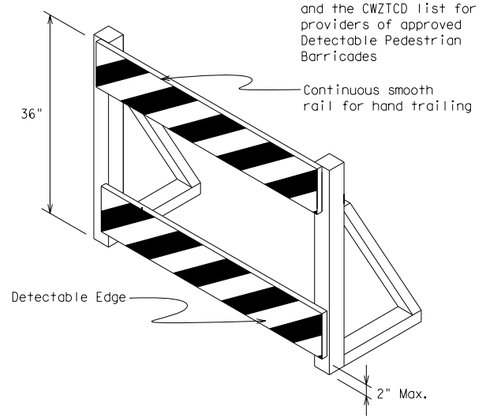
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

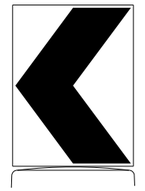




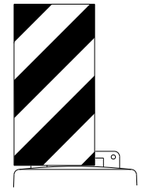


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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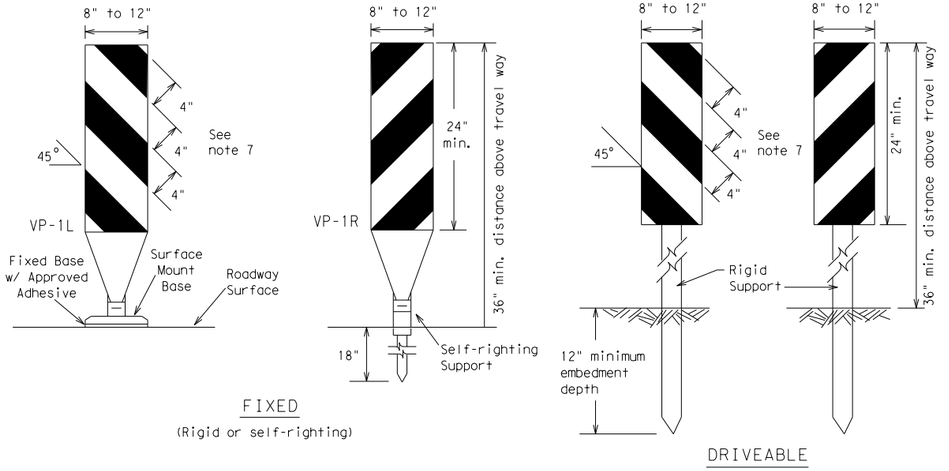
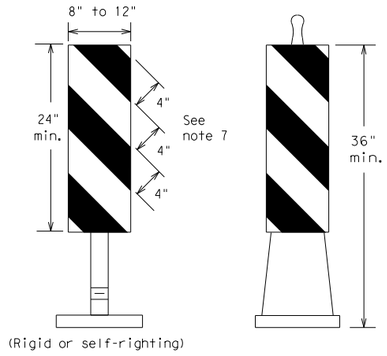


FIXED

(Rigid or self-righting)

DRIVEABLE

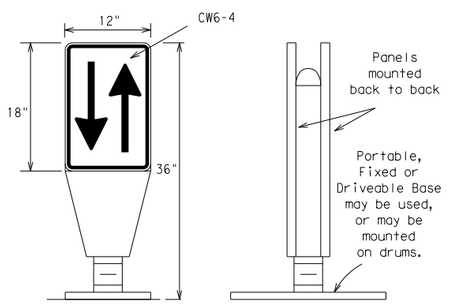


(Rigid or self-righting)

PORTABLE

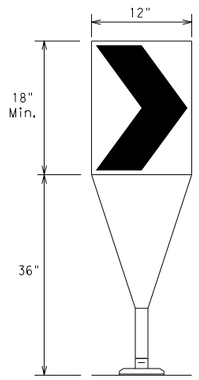
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



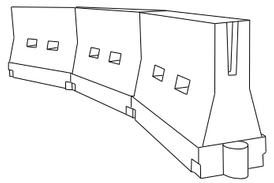
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

SHEET 9 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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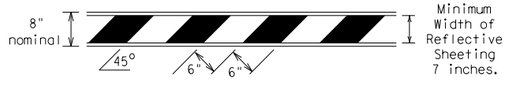
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	DAL	KAUFMAN		22

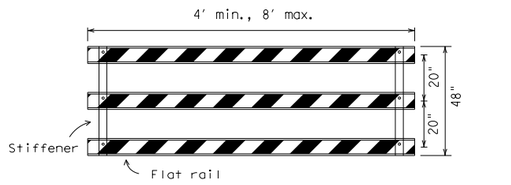
TYPE 3 BARRICADES

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.



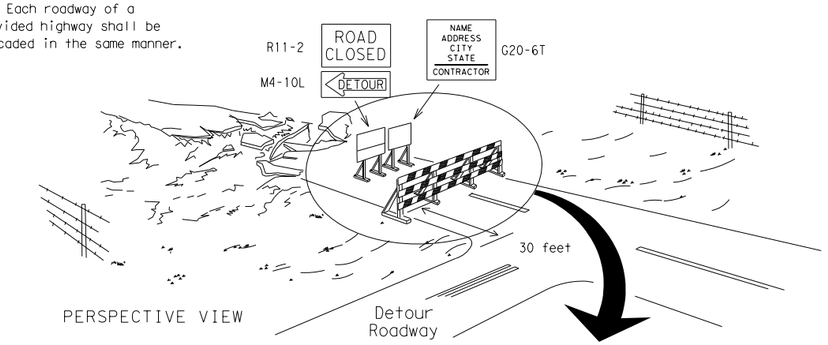
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

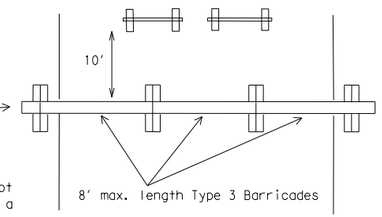
Each roadway of a divided highway shall be barricaded in the same manner.



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.

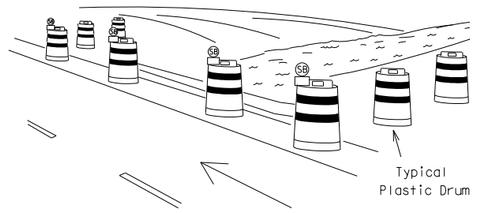
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

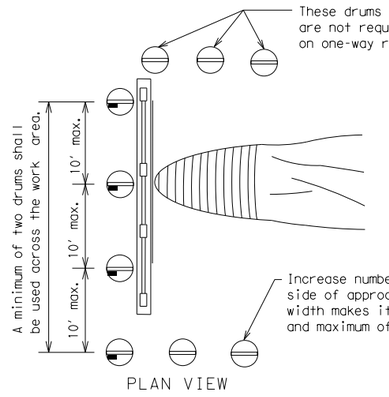
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

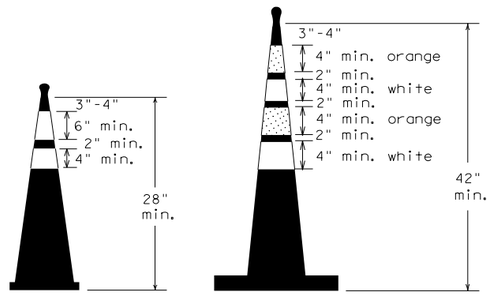
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



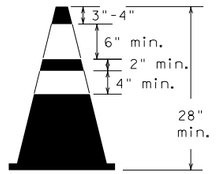
PLAN VIEW

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

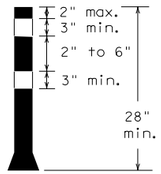
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

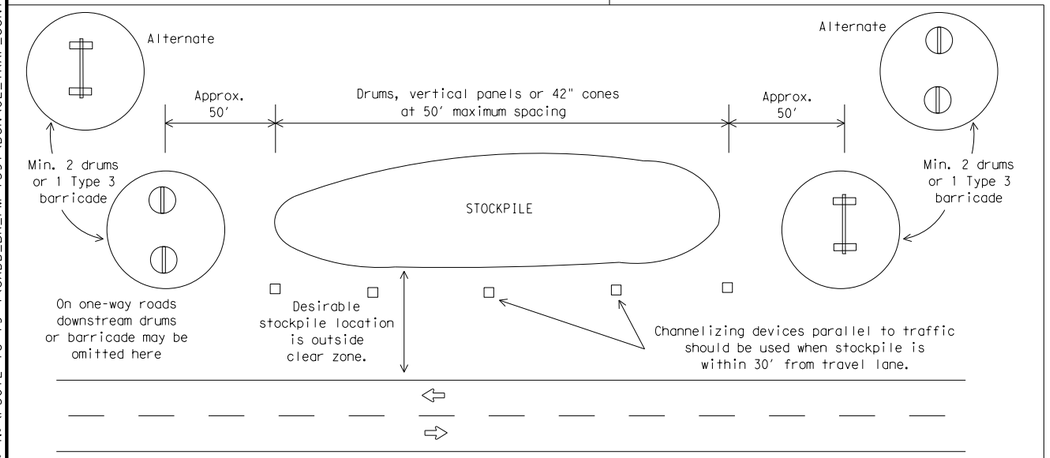


Tubular Marker

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

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Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

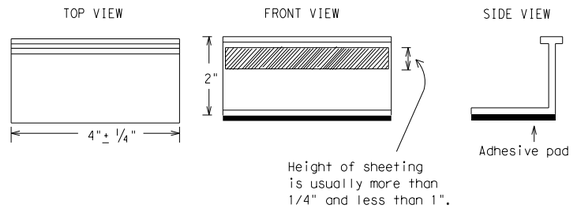
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-98 9-07 5-21	1396	01	013,ETC.	FM 1391
1-02 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	DAL	KAUFMAN		24

105

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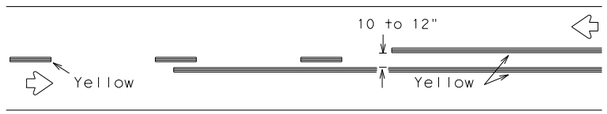
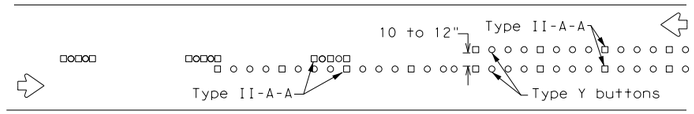
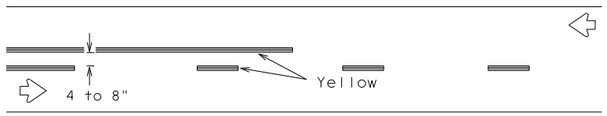
PAVEMENT MARKING PATTERNS



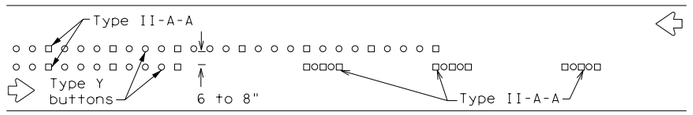
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



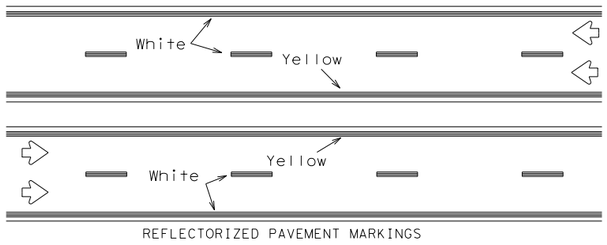
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



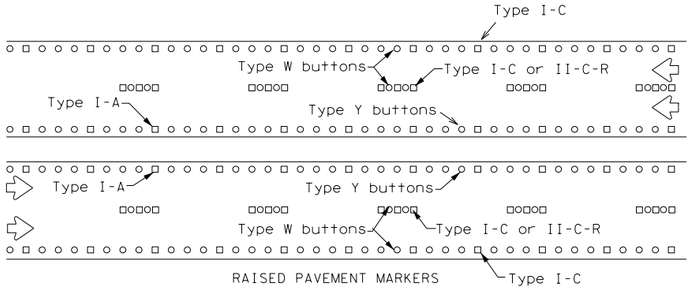
RAISED PAVEMENT MARKERS - PATTERN B

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

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



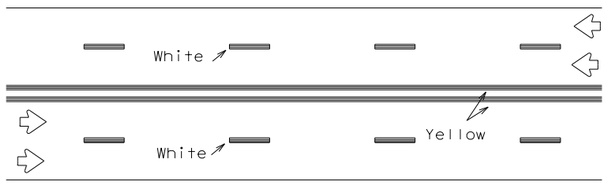
REFLECTORIZED PAVEMENT MARKINGS



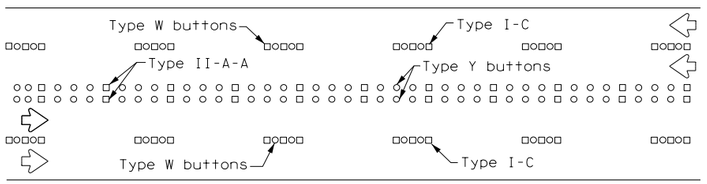
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



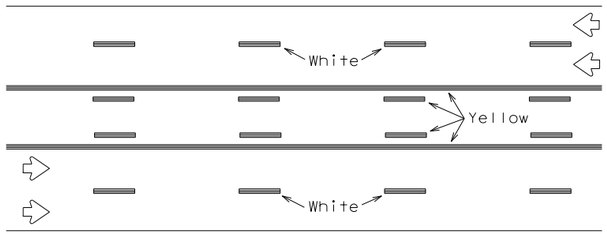
REFLECTORIZED PAVEMENT MARKINGS



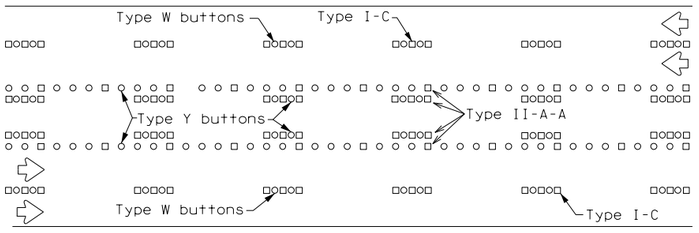
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

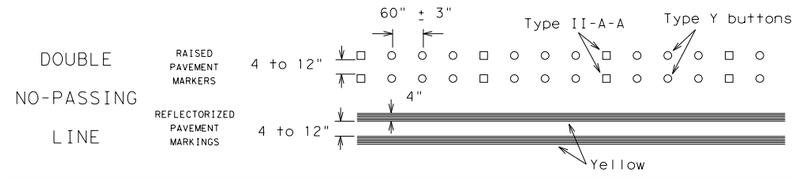
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

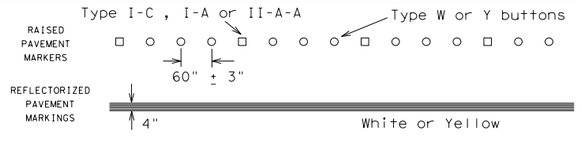
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

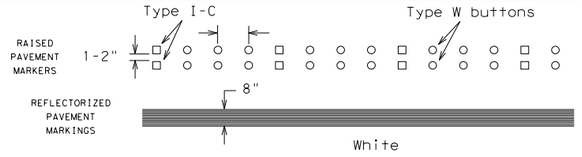


EDGE LINE OR SINGLE NO-PASSING LINE



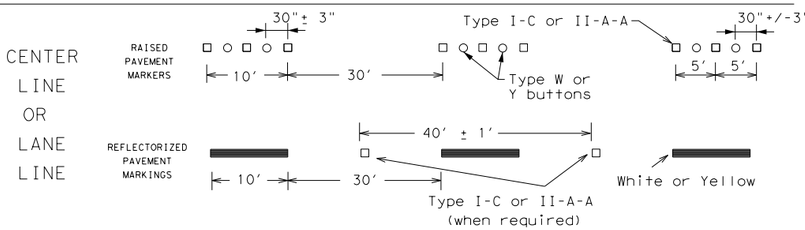
WIDE LINE

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

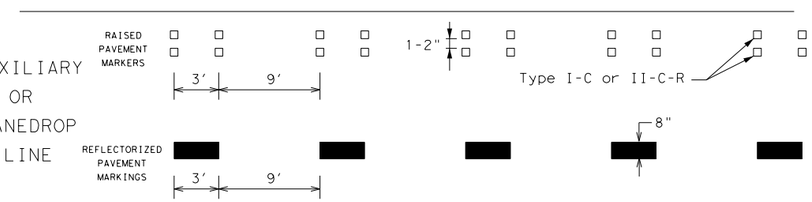


BROKEN LINES

CENTER LINE OR LANE LINE

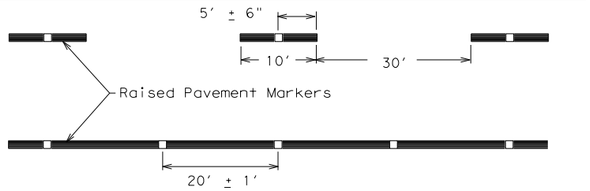


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		25

DATE: 11/14/2023 2:03:41 PM
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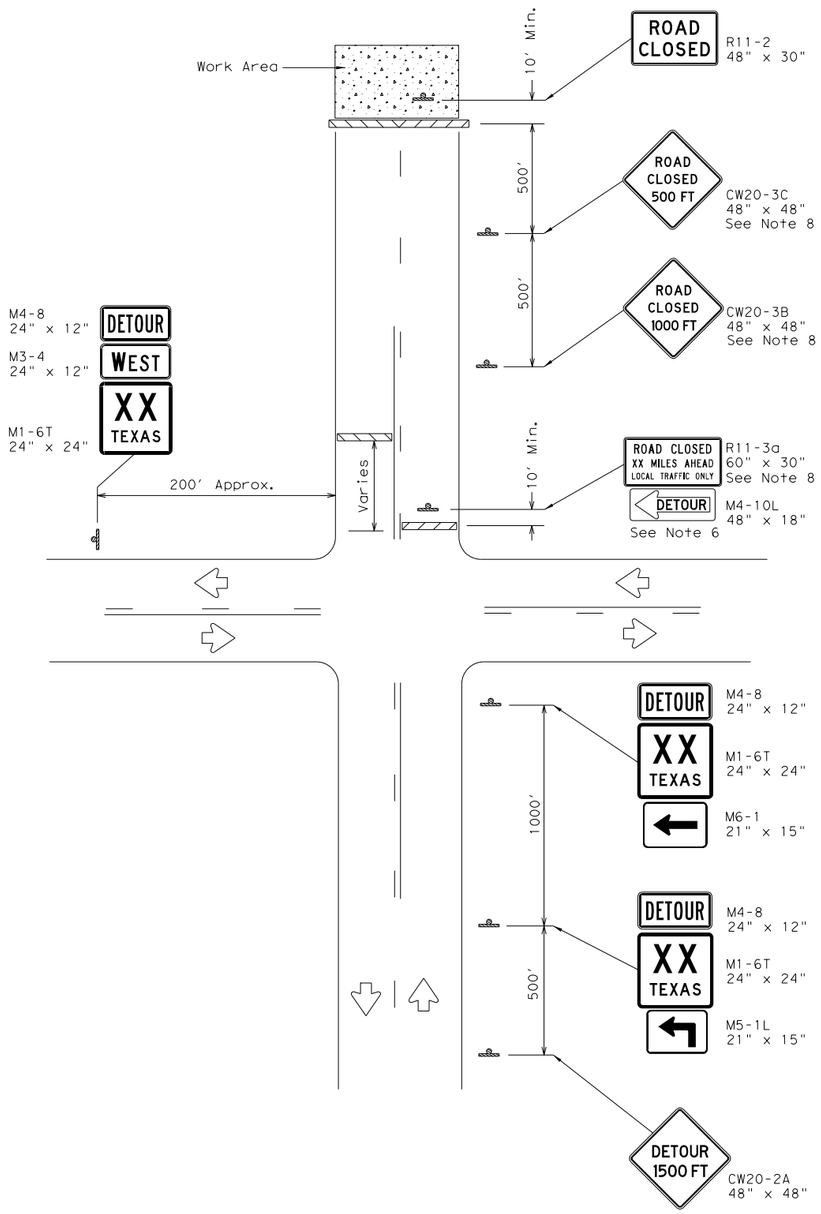
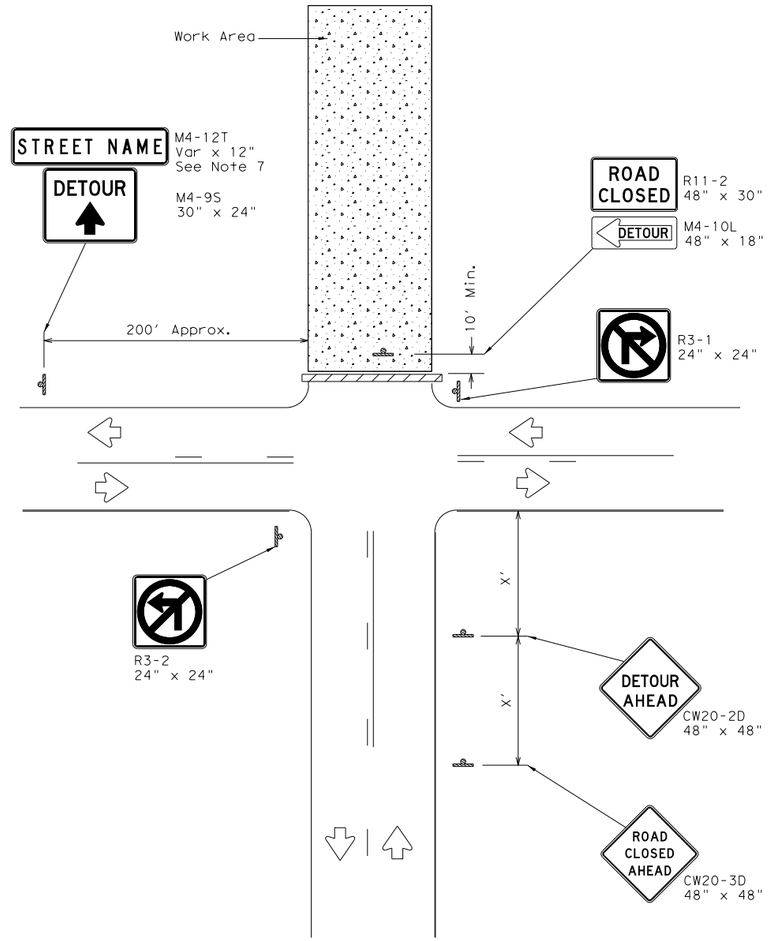


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

Signing for an Un-numbered Route with an Off-Site Detour

LEGEND	
	Type 3 Barricade
	Sign

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

GENERAL NOTES

1. This sheet is intended to provide details for temporary work zone road closures. For permanent road closure details see the D&OM standards.
2. Barricades used shall meet the requirements shown on Barricade and Construction Standard BC(10) and listed on the Compliant Work Zone Traffic Control Devices list (CWZTCD).
3. Stockpiled materials shall not be placed on the traffic side of barricades.
4. Barricades at the road closure should extend from pavement edge to pavement edge.
5. Detour signing shown is intended to illustrate the type of signing that is appropriate for numbered routes or un-numbered routes as labeled. It does not indicate the full extent of detour signing required. Detour routes should be signed as shown elsewhere in the plans.
6. If the road is open for a significant distance beyond the intersection or there are significant origin/destination points beyond the intersection, the signs and barricades at this location should be located at the edge of the traveled way.
7. The Street Name (M4-12T) sign is to be placed above the DETOUR (M4-9S) sign.
8. For urban areas where there is a shorter distance between the intersection and the actual closure location, the ROAD CLOSED XX MILES AHEAD (R11-3a) sign may be replaced with a ROAD CLOSED TO THRU TRAFFIC (R11-4) sign. If adequate space does not exist between the intersection and the closure a single ROAD CLOSED AHEAD (CW20-3D) sign spaced as per the table above may replace the ROAD CLOSED 1000 FT (CW20-3B) and ROAD CLOSED 500 FT (CW20-3C) signs.
9. Signs and barricades shown shall be subsidiary to Item 502. Locations where these details will be required shall be as shown elsewhere in the plans.

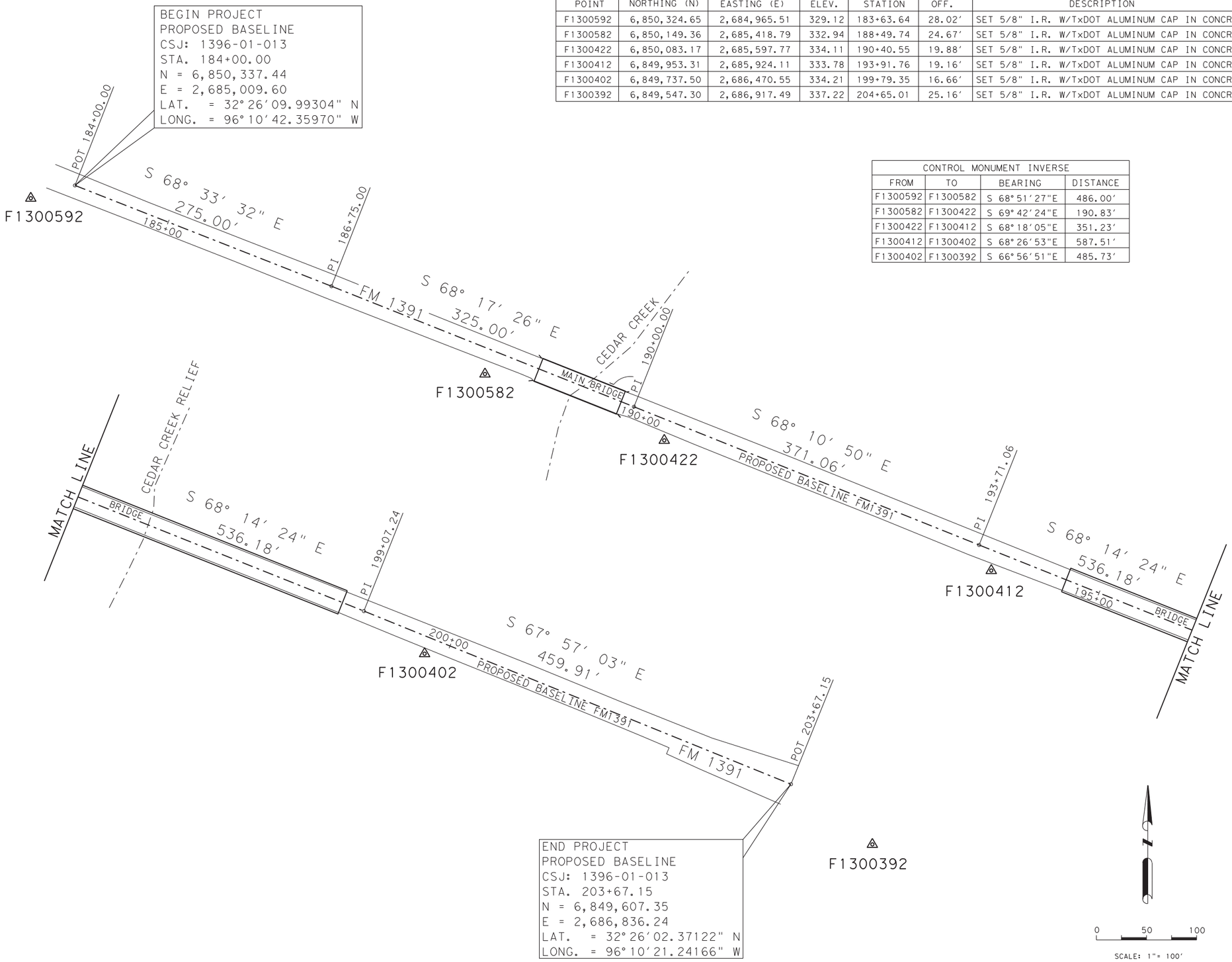
Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
1-97 4-98 7-13 2-98 3-03	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		26



CONTROL MONUMENTATION TABLE							
POINT	NORTHING (N)	EASTING (E)	ELEV.	STATION	OFF.	DESCRIPTION
F1300592	6,850,324.65	2,684,965.51	329.12	183+63.64	28.02'	SET 5/8" I.R. W/TxDOT ALUMINUM CAP IN CONCRETE
F1300582	6,850,149.36	2,685,418.79	332.94	188+49.74	24.67'	SET 5/8" I.R. W/TxDOT ALUMINUM CAP IN CONCRETE
F1300422	6,850,083.17	2,685,597.77	334.11	190+40.55	19.88'	SET 5/8" I.R. W/TxDOT ALUMINUM CAP IN CONCRETE
F1300412	6,849,953.31	2,685,924.11	333.78	193+91.76	19.16'	SET 5/8" I.R. W/TxDOT ALUMINUM CAP IN CONCRETE
F1300402	6,849,737.50	2,686,470.55	334.21	199+79.35	16.66'	SET 5/8" I.R. W/TxDOT ALUMINUM CAP IN CONCRETE
F1300392	6,849,547.30	2,686,917.49	337.22	204+65.01	25.16'	SET 5/8" I.R. W/TxDOT ALUMINUM CAP IN CONCRETE

CONTROL MONUMENT INVERSE			
FROM	TO	BEARING	DISTANCE
F1300592	F1300582	S 68°51'27"E	486.00'
F1300582	F1300422	S 69°42'24"E	190.83'
F1300422	F1300412	S 68°18'05"E	351.23'
F1300412	F1300402	S 68°26'53"E	587.51'
F1300402	F1300392	S 66°56'51"E	485.73'

NOTES

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE, (4202), NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00012.

2. HORIZONTAL CONTROL WAS DERIVED FROM TXDOT RTN (VRS) GPS OBSERVATIONS BASED ON TXDOT REGIONAL REFERENCE POINT TXKU. HORIZONTAL SURVEY METHOD: TXDOT RTN

3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

4. VERTICAL CONTROL WAS DERIVED FROM TXDOT RTN (VRS) GPS OBSERVATIONS BASED ON TXDOT REGIONAL REFERENCE POINT TXKU. VERTICAL SURVEY METHOD: DIGITAL LEVELING

5. UNIT OF MEASURE: U.S. SURVEY FEET

6. FIELD SURVEYS WERE PERFORMED BETWEEN APRIL, 2022 AND JANUARY, 2023.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
JACOB J. LUPHER
6606
PROFESSIONAL LAND SURVEYOR

JACOB J. LUPHER

REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6606

10/9/2023

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPE Registration No. F-1364; TBPLS Registration No. 10019100

FM 1391
OVER CEDAR CREEK
MAIN BRIDGE
SURVEY CONTROL INDEX

SHEET 1 OF 1

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	RC	6	TEXAS	SEE TITLE SHEET				FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013.ECT.		27

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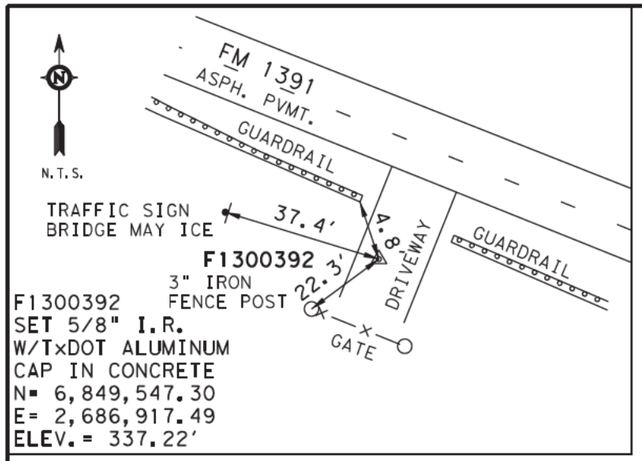
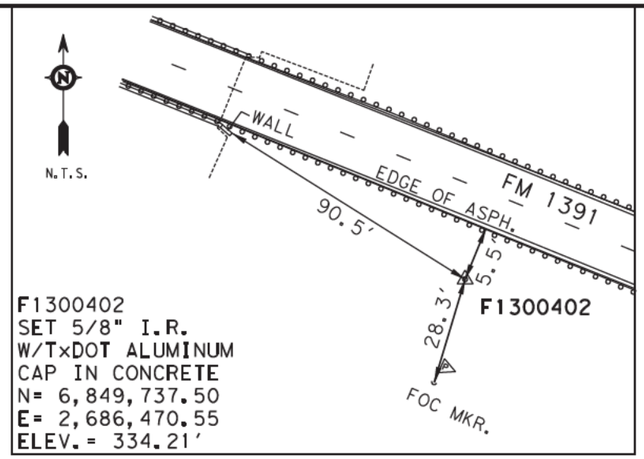
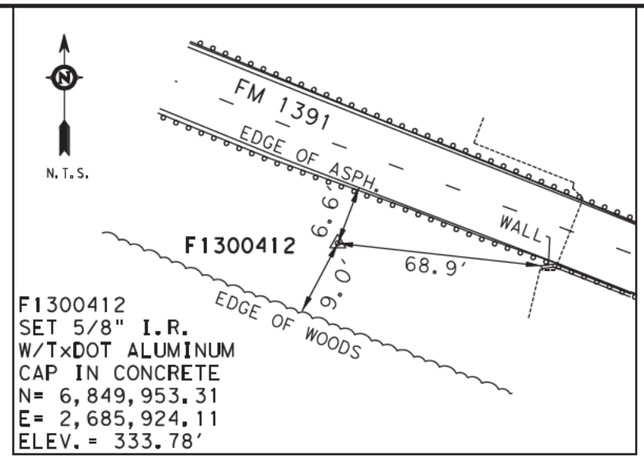


FROM CENTERLINE OF CEDAR CREEK RELIEF CHANNEL TRAVEL EAST APPROXIMATELY (0.15 MILE) 788 FEET ALONG FM 1391. F1300392 IS 4.8 FEET SOUTH OF THE ROAD.



FROM CENTERLINE OF CEDAR CREEK RELIEF CHANNEL TRAVEL EAST APPROXIMATELY (0.06 MILE) 304 FEET ALONG FM 1391. F1300402 IS 5.5 FEET SOUTH OF THE ROAD.



FROM CENTERLINE OF CEDAR CREEK RELIEF CHANNEL TRAVEL EAST APPROXIMATELY (0.05 MILE) 285 FEET ALONG FM 1391. F1300412 IS 6.6 FEET SOUTH OF THE ROAD.

NOTES

1. ALL BEARINGS AND COORDINATES ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE, (4202), NORTH AMERICAN DATUM OF 1983 (NAD 83), 2011 ADJUSTMENT, EPOCH 2010.00. ALL DISTANCES AND COORDINATES SHOWN ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY THE COMBINED ADJUSTMENT FACTOR OF 1.00012.

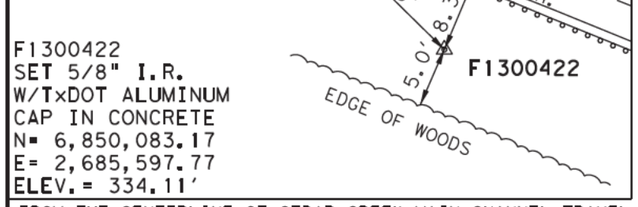
2. HORIZONTAL CONTROL WAS DERIVED FROM TXDOT RTN (VRS) GPS OBSERVATIONS BASED ON TXDOT REGIONAL REFERENCE POINT TXKU. HORIZONTAL SURVEY METHOD: TXDOT RTN

3. ALL ELEVATIONS HEREON ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

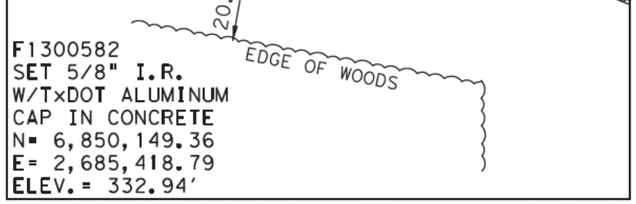
4. VERTICAL CONTROL WAS DERIVED FROM TXDOT RTN (VRS) GPS OBSERVATIONS BASED ON TXDOT REGIONAL REFERENCE POINT TXKU. VERTICAL SURVEY METHOD: DIGITAL LEVELING

5. UNIT OF MEASURE: U.S. SURVEY FEET

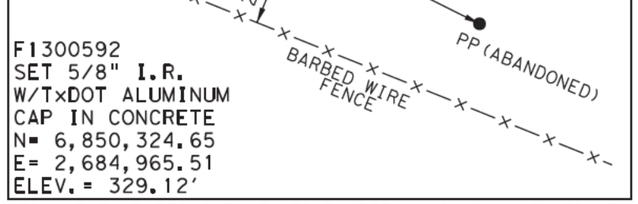
6. FIELD SURVEYS WERE PERFORMED BETWEEN APRIL, 2022 AND JANUARY, 2023.



FROM THE CENTERLINE OF CEDAR CREEK MAIN CHANNEL TRAVEL EAST APPROXIMATELY (0.02 MILE) 95 FEET. F1300422 IS 8.3 FEET SOUTH OF THE ROAD.



FROM THE CENTERLINE OF CEDAR CREEK MAIN CHANNEL TRAVEL WEST APPROXIMATELY (0.02 MILE) 95 FEET. F1300582 IS 13 FEET SOUTH OF THE ROAD.



FROM THE CENTERLINE OF CEDAR CREEK MAIN CHANNEL TRAVEL WEST APPROXIMATELY (0.11 MILE) 583 FEET. F1300592 IS 15.9 FEET SOUTH OF THE ROAD.

THE CONTROL POINTS SHOWN HEREIN WERE DETERMINED BY A SURVEY MADE ON THE GROUND UNDER MY SUPERVISION.

STATE OF TEXAS
REGISTERED
JACOB J. LUPHER
6606
PROFESSIONAL
LAND SURVEYOR

JACOB J. LUPHER

REGISTERED PROFESSIONAL LAND SURVEYOR
TEXAS REGISTRATION NO. 6606

10/9/2023

THIS SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS PS&E.

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

LANDTECH
2525 North Loop West, Suite 300,
Houston, Texas 77008
T: 713-861-7068 F: 713-861-4131
TBPE Registration No. F-1364; TBPLS Registration No. 10019100

FM 1391
OVER CEDAR CREEK
MAIN BRIDGE
HORIZONTAL AND VERTICAL CONTROL

SHEET 1 OF 1

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	RC	6	TEXAS	SEE TITLE SHEET				FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013.ECT.		28

FM 1391 (℄ FM1391)

Beginning chain FM1391 description

Point 1391000	N	6,850,373.9952	E 2,684,916.5169	Sta 183+00.00
Course from 1391000 to 1391002 S 68° 33′ 31.75" E Dist 374.9997				
Point 1391002	N	6,850,236.9156	E 2,685,265.5641	Sta 186+75.00
Course from 1391002 to 139101 S 68° 16′ 23.12" E Dist 386.0002				
Point 139101	N	6,850,094.0249	E 2,685,624.1424	Sta 190+61.00
Course from 139101 to 139102 S 68° 10′ 49.80" E Dist 310.0638				
Point 139102	N	6,849,978.7792	E 2,685,911.9930	Sta 193+71.06
Course from 139102 to 139103 S 68° 14′ 24.26" E Dist 536.1781				
Point 139103	N	6,849,780.0081	E 2,686,409.9659	Sta 199+07.24
Course from 139103 to 139104 S 67° 57′ 02.52" E Dist 459.9129				
Point 139104	N	6,849,607.3548	E 2,686,836.2413	Sta 203+67.15

Ending chain FM1391 description

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

NO.	DATE	REVISION	APPROV.
	--		
	--		
	--		
	--		

Texas Department of Transportation

F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

ENTECH
CIVIL ENGINEERS, INC

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
ALIGNMENT DATA

SHEET 1 OF 1

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)				FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013,ETC.		29

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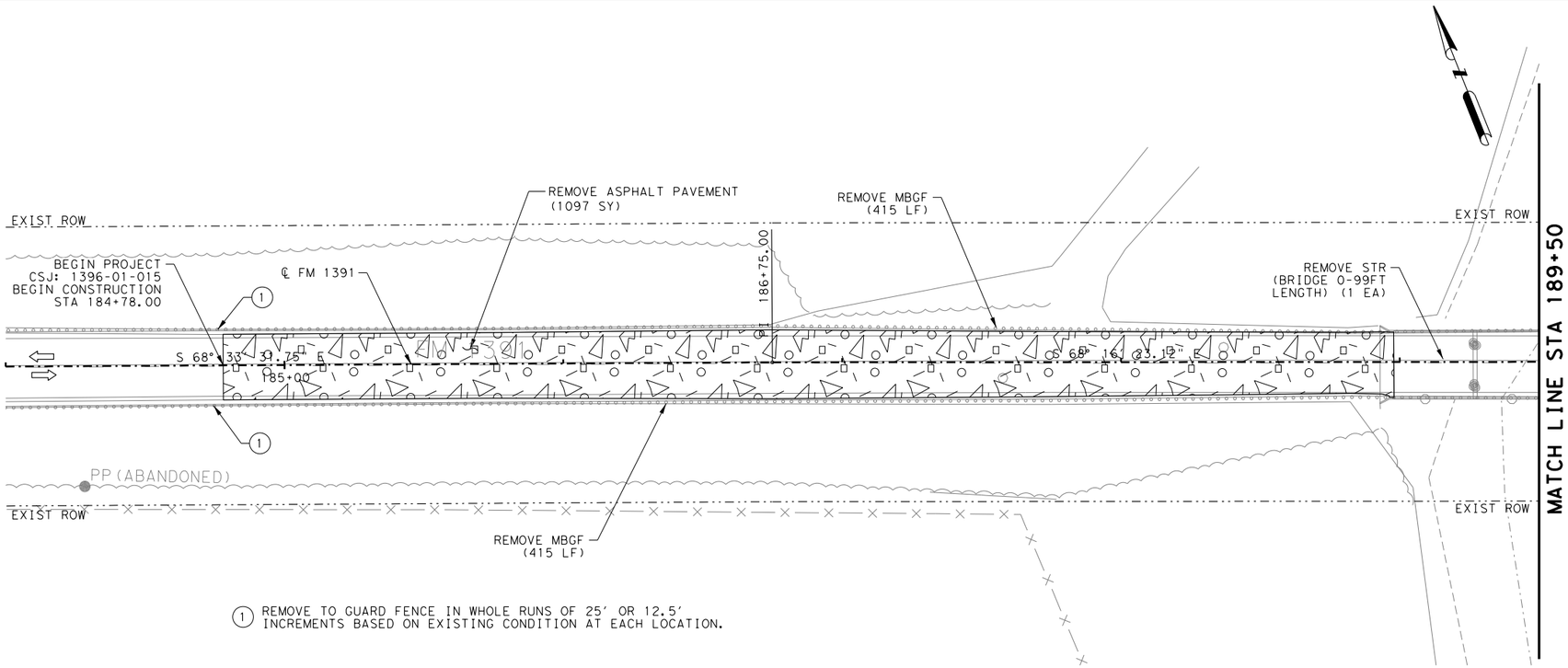
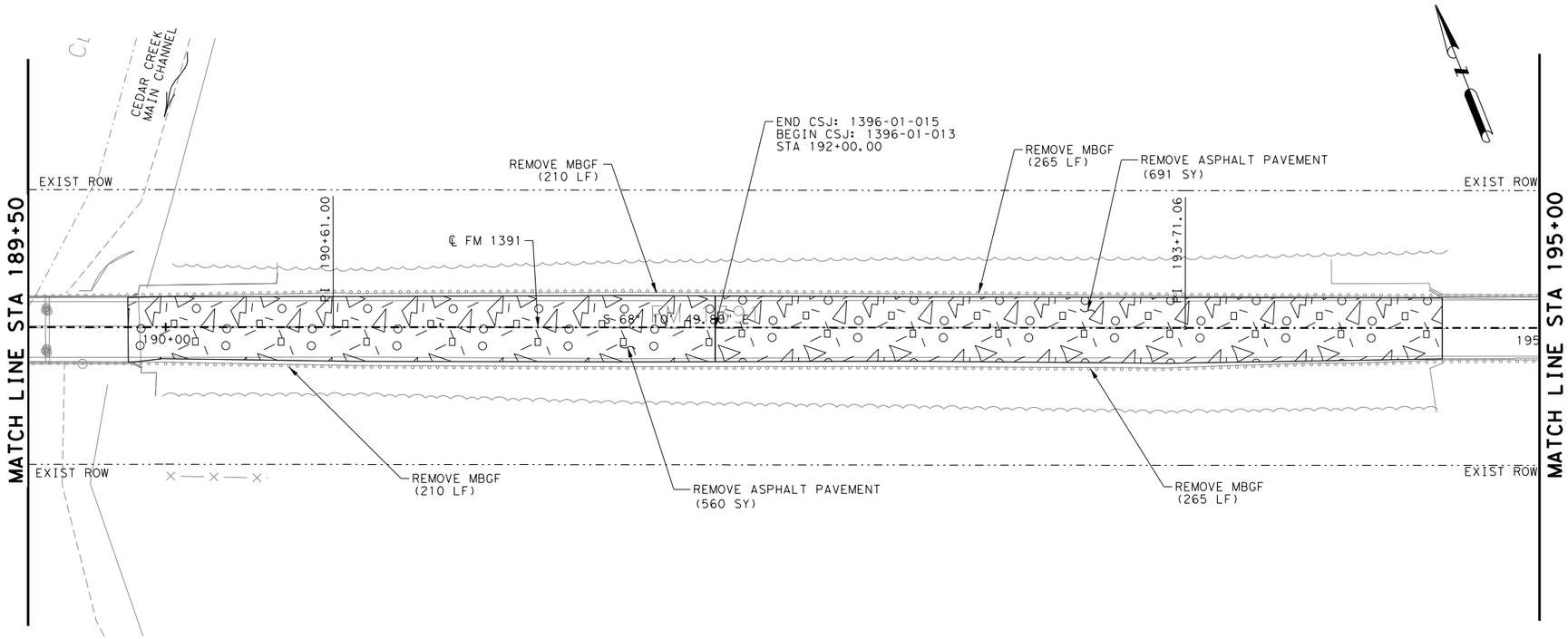
LEGEND

REMOVE STAB BASE & ASP PAV (5"-10")





STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

0 25 50
SCALE: 1"=50'

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Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
REMOVAL PLAN
BEGIN TO 195+00

SHEET 1 OF 2

DN:	RM	FED. RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	30

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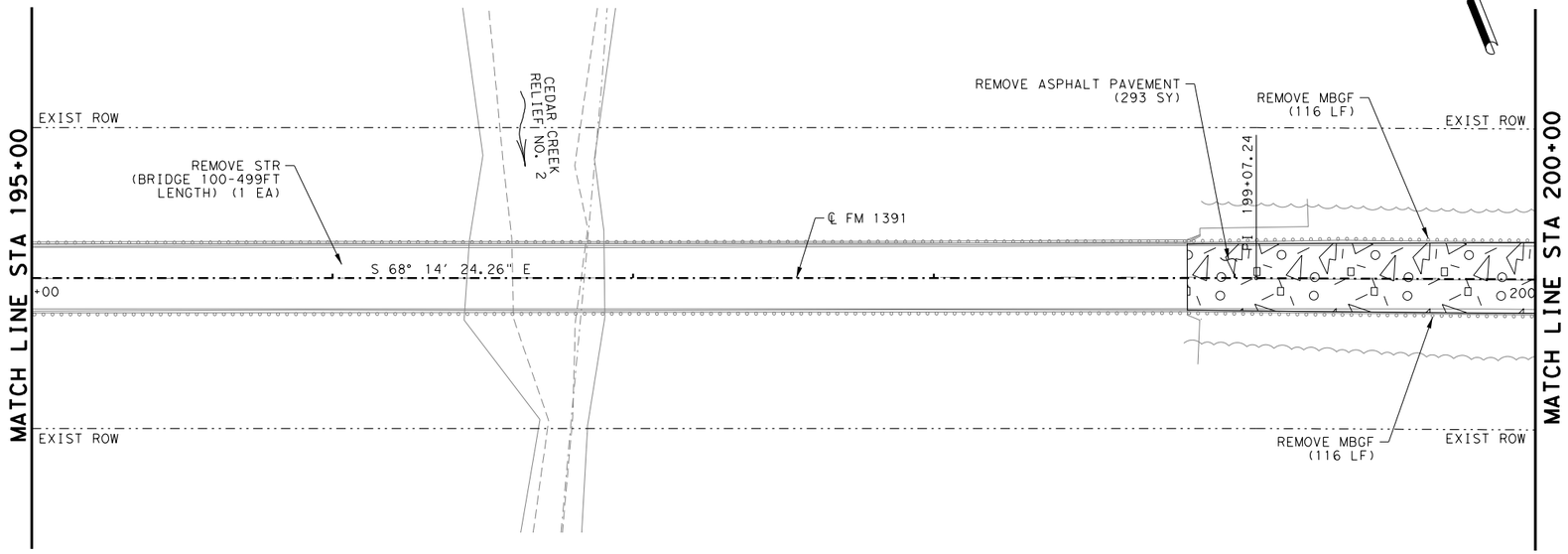
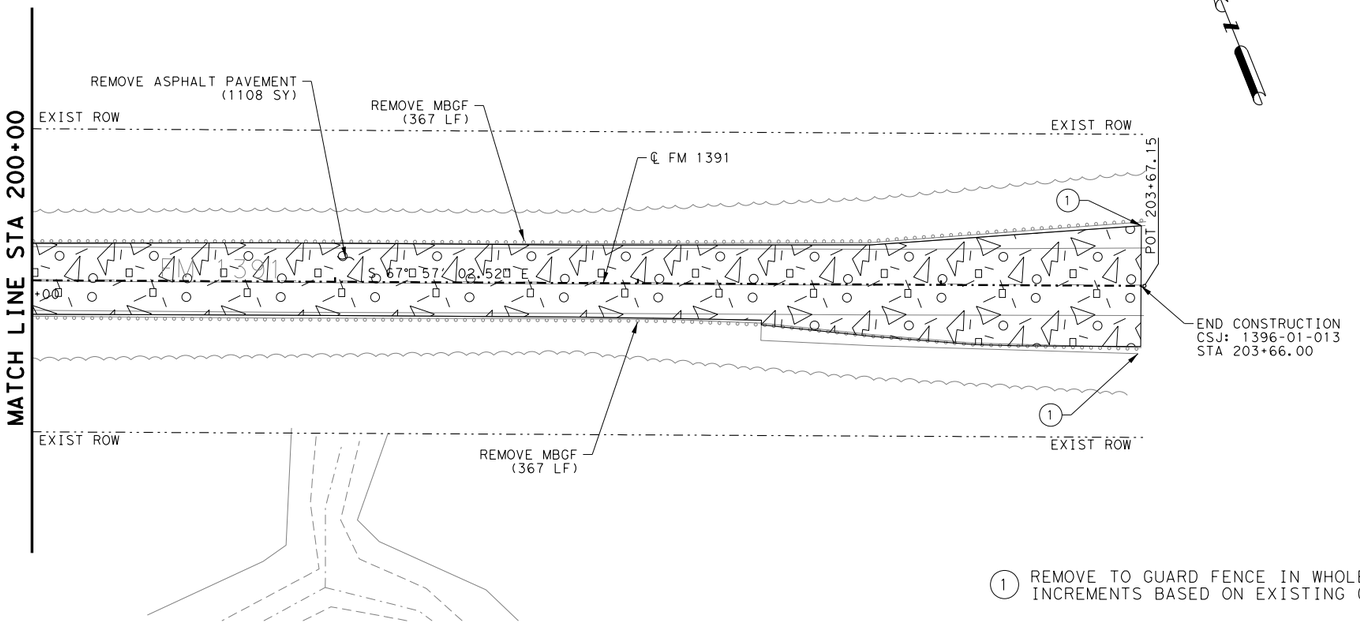
LEGEND

REMOVE STAB BASE & ASP PAV (5"-10")





(1) REMOVE TO GUARD FENCE IN WHOLE RUNS OF 25' OR 12.5' INCREMENTS BASED ON EXISTING CONDITION AT EACH LOCATION.

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0 25 50
SCALE: 1"=50'

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CEDAR CRK & CEDAR CRK REL NO 2
REMOVAL PLAN
195+00 TO END

SHEET OF 2

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013,ETC.	31

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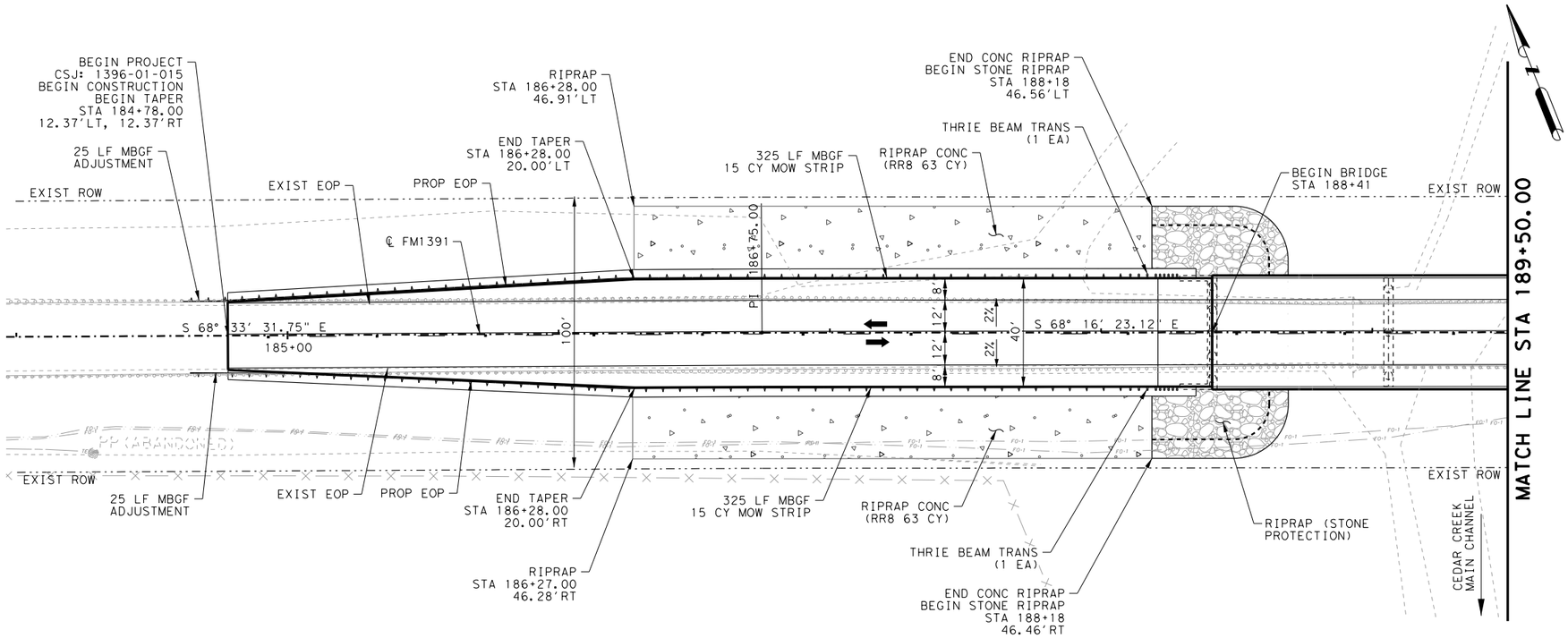
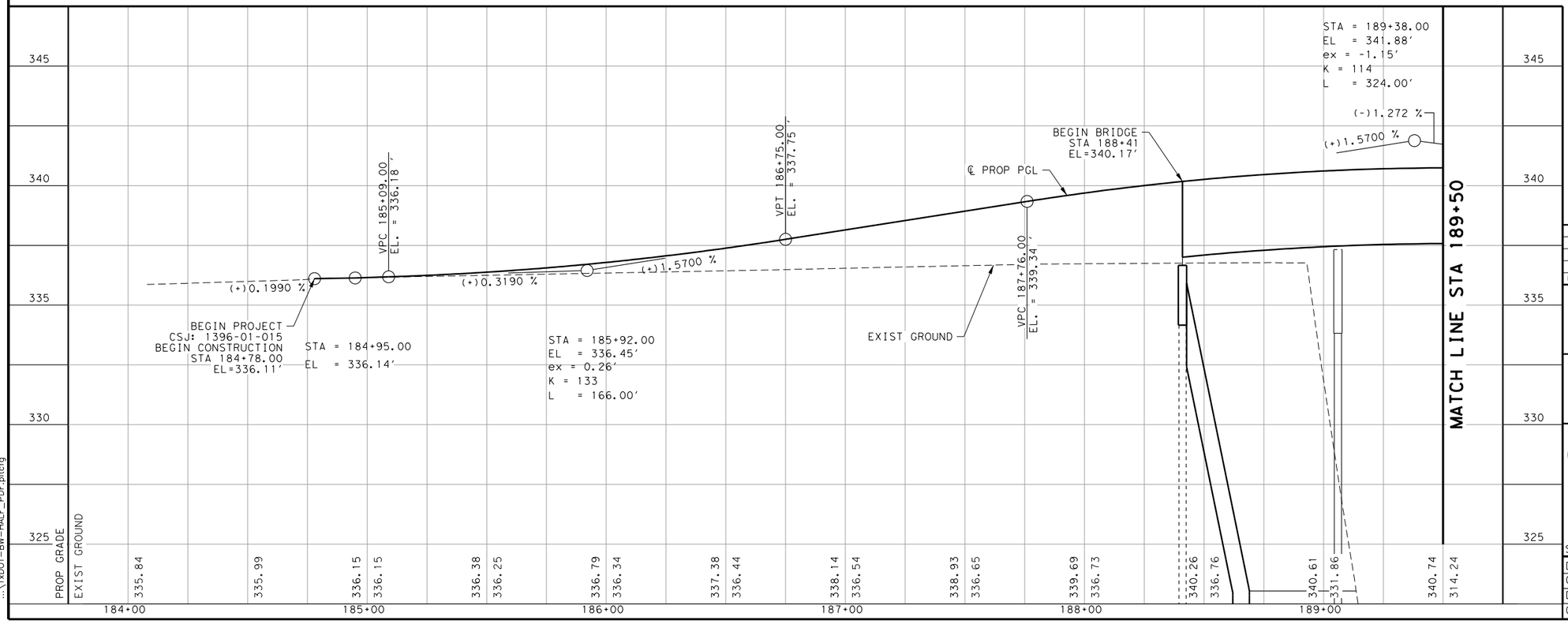


LEGEND

➡ PROP DIRECTION OF TRAFFIC

NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR HORIZONTAL ALIGNMENT DATA.
2. REFER TO HORIZONTAL & VERTICAL CONTROL SHEETS FOR BENCHMARK INFO.
3. REFER TO BRIDGE LAYOUT FOR BRIDGE DETAILS.
4. REFER TO CRR STANDARD FOR CONCRETE RIPRAP TYPE RR8 DETAILS.



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HORIZ. 0 25 50

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NO.	DATE	REVISION	APPROV.
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ROADWAY
PLAN & PROFILE
BEGIN TO 189+50

SHEET 1 OF 4

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	32

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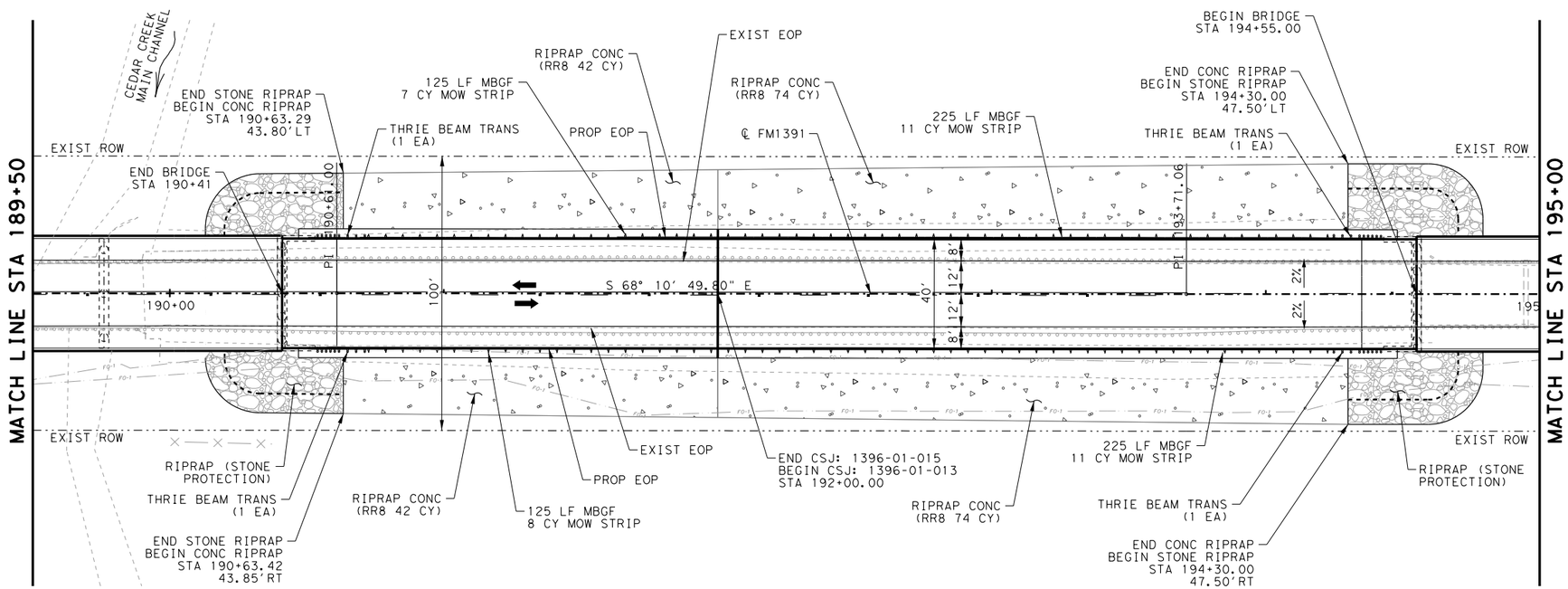

LEGEND

➡ PROP DIRECTION OF TRAFFIC

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2. REFER TO HORIZONTAL & VERTICAL CONTROL SHEETS FOR BENCHMARK INFO.
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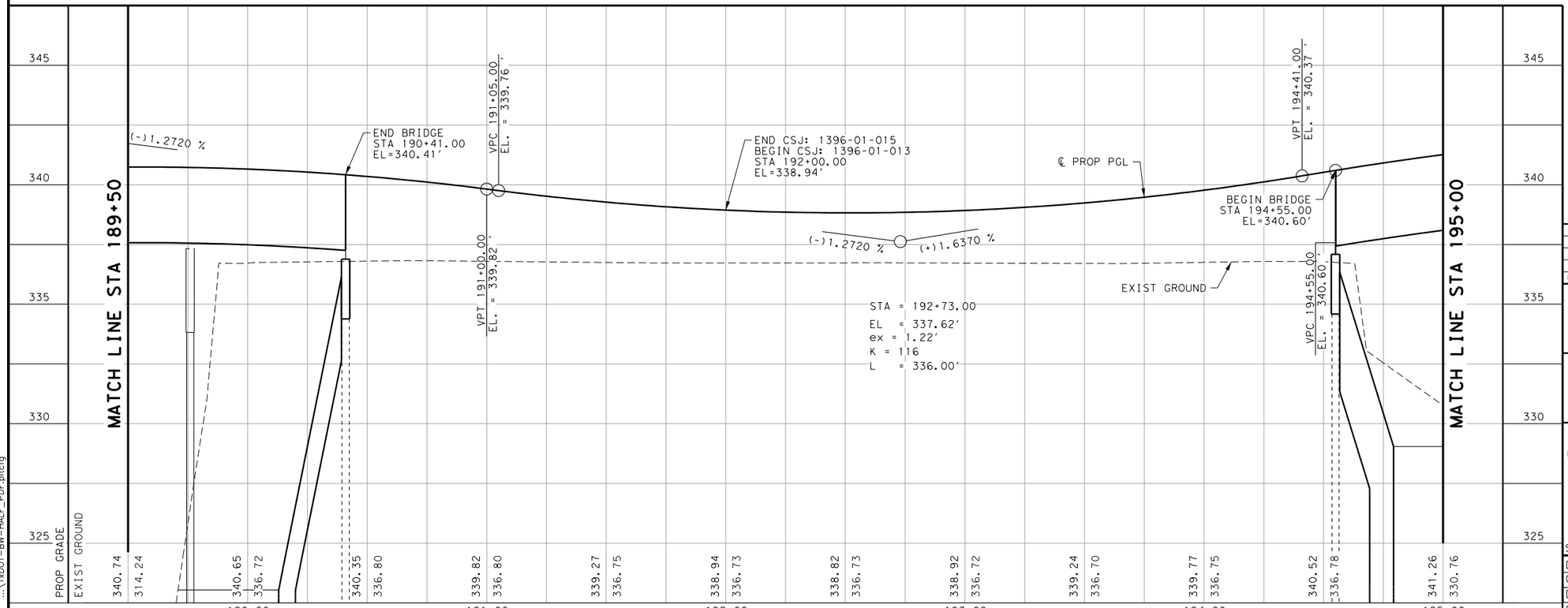

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VERT. 0 2.5 5

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ROADWAY
PLAN & PROFILE
189+50 TO 195+00

SHEET 2 OF 4

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	33

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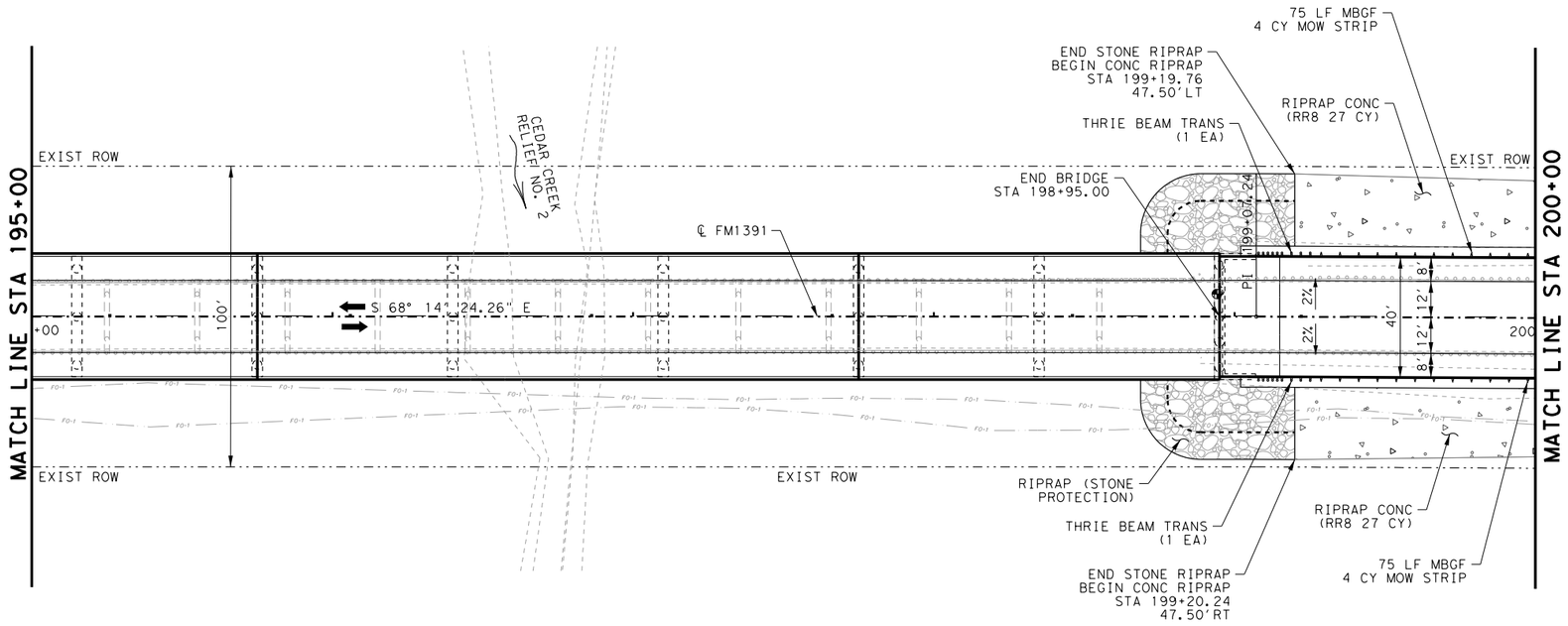
LEGEND

➡ PROP DIRECTION OF TRAFFIC



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1. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR HORIZONTAL ALIGNMENT DATA.
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3. REFER TO BRIDGE LAYOUT FOR BRIDGE DETAILS.
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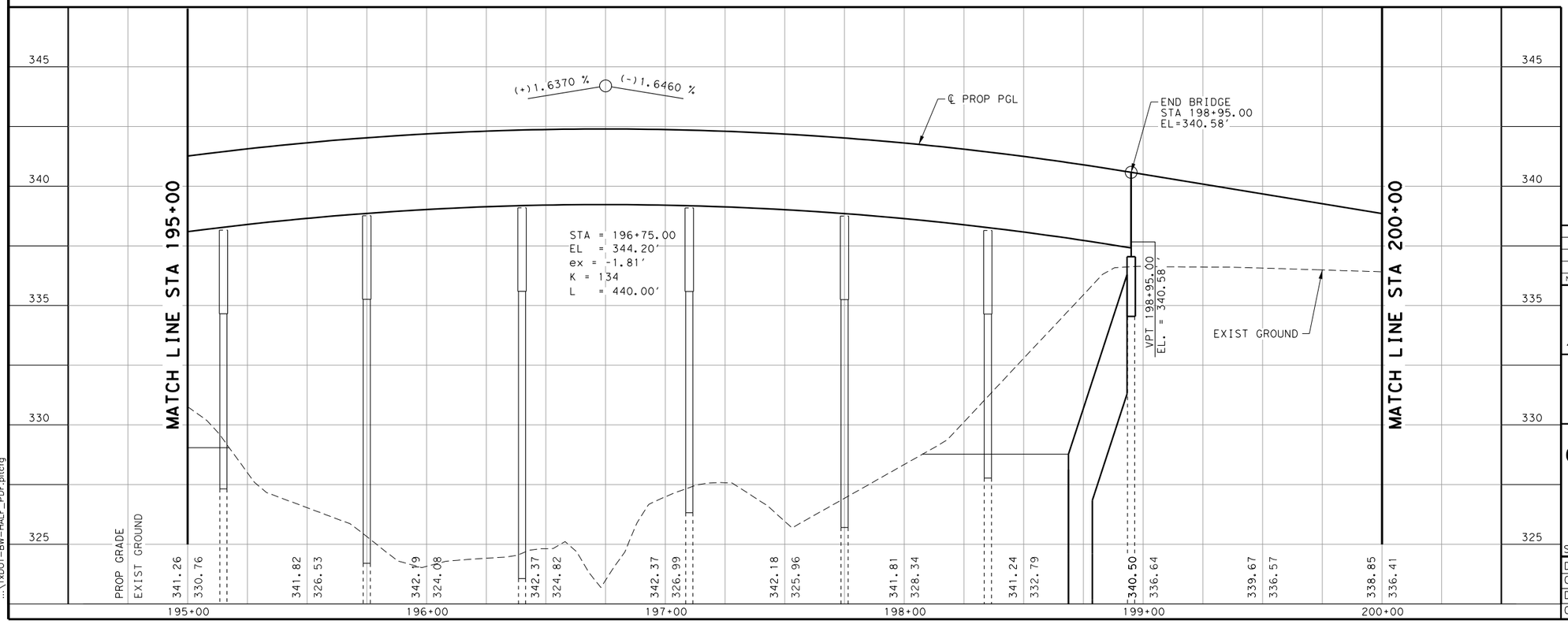

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VERT. 0 2.5 5

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281-945-0081 FX

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CEDAR CRK & CEDAR CRK REL NO 2
ROADWAY
PLAN & PROFILE
195+00 TO 200+00

SHEET 3 OF 4

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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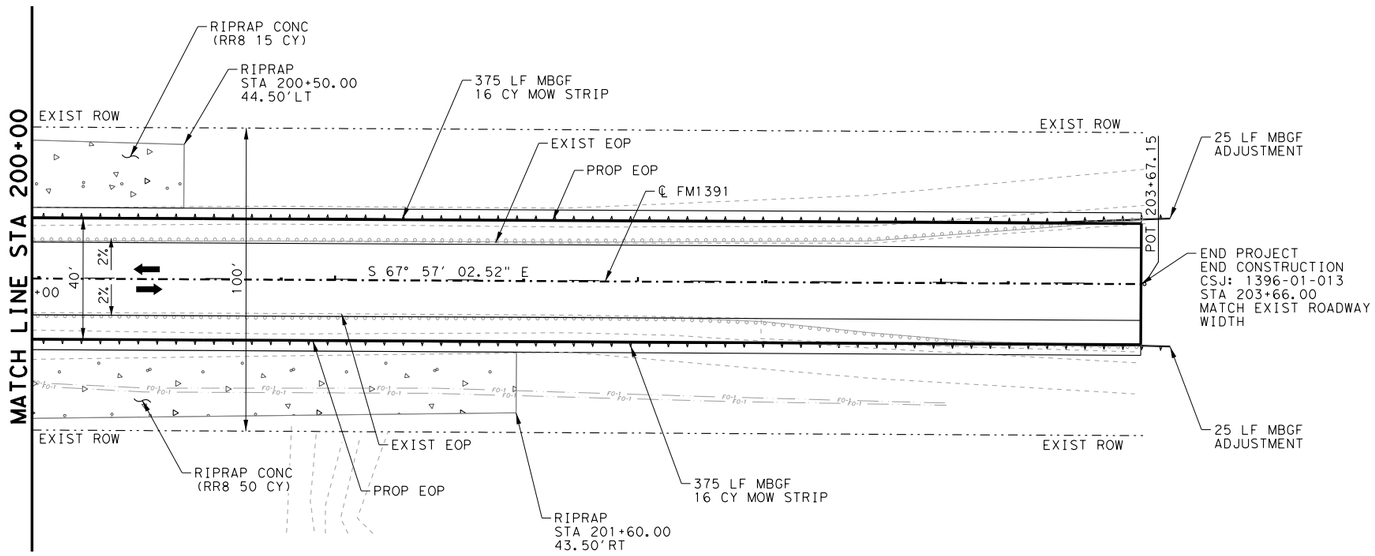
➡ PROP DIRECTION OF TRAFFIC



NOTES:

1. REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR HORIZONTAL ALIGNMENT DATA.
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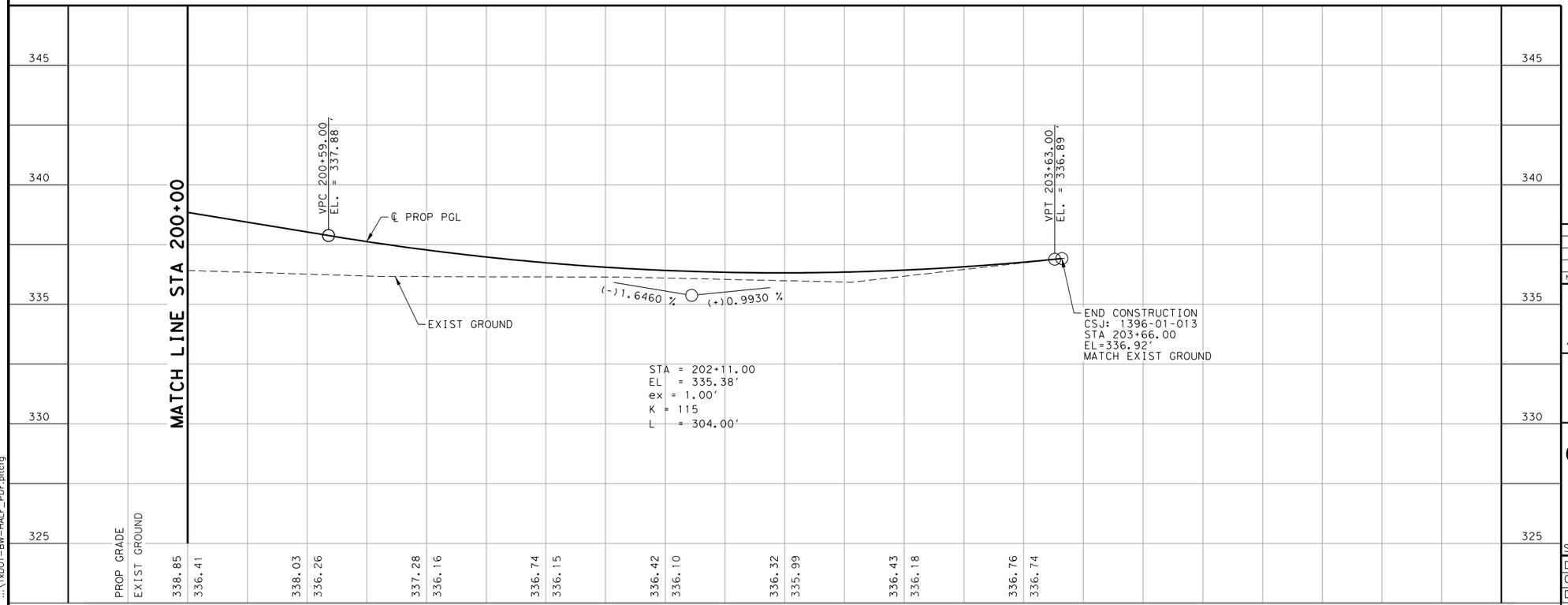

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LICENSED PROFESSIONAL ENGINEER
11/14/2023

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VERT. 0 2.5 5

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281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
ROADWAY
PLAN & PROFILE
200+00 TO END

SHEET 4 OF 4

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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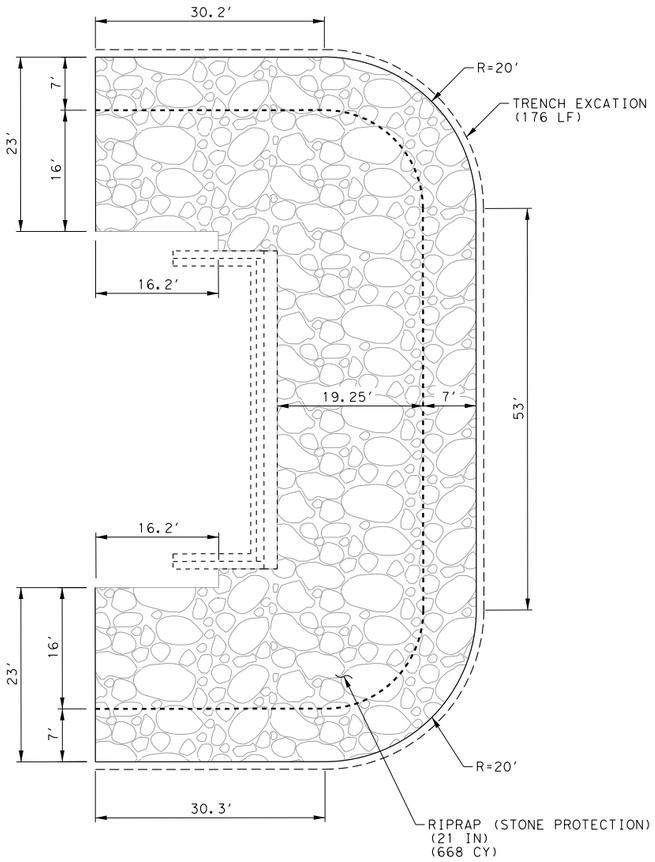

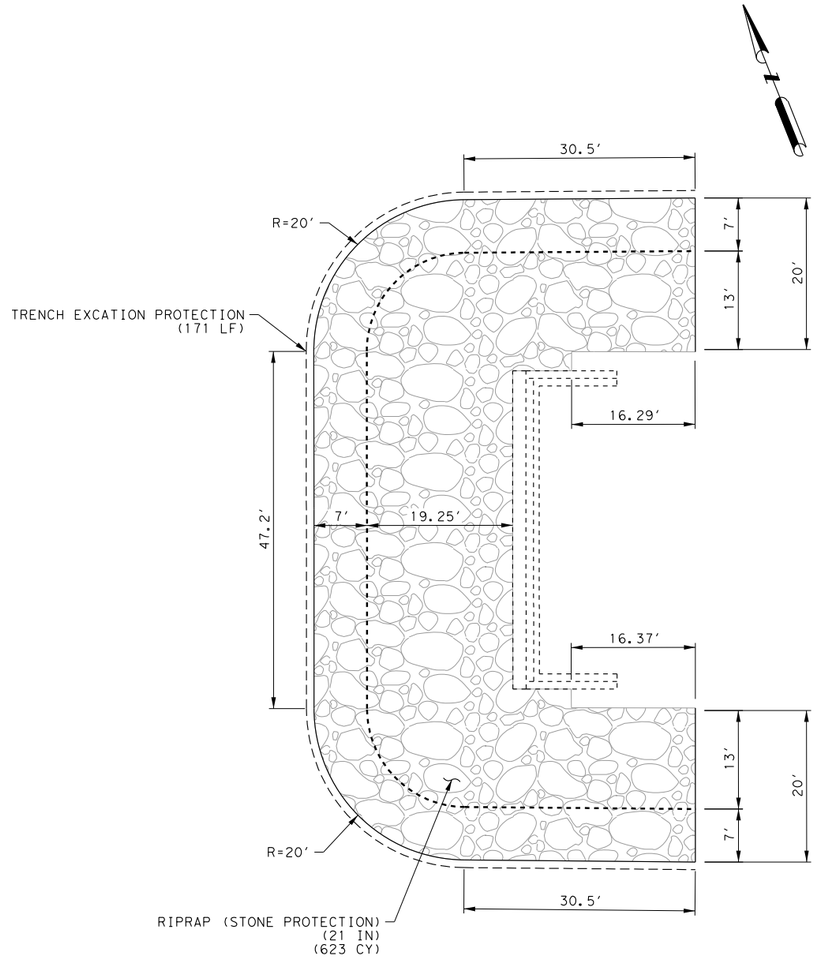

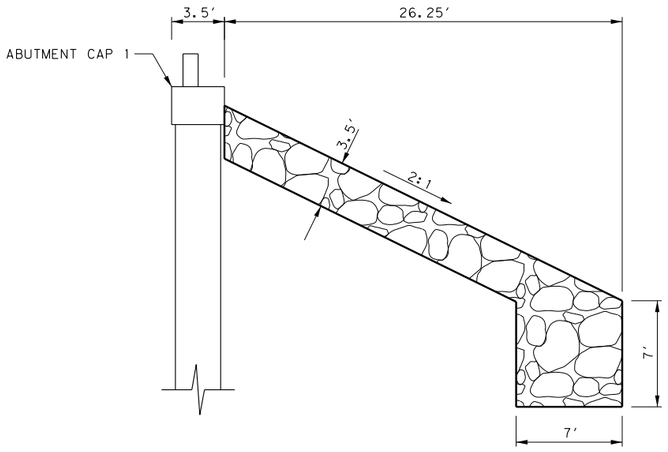

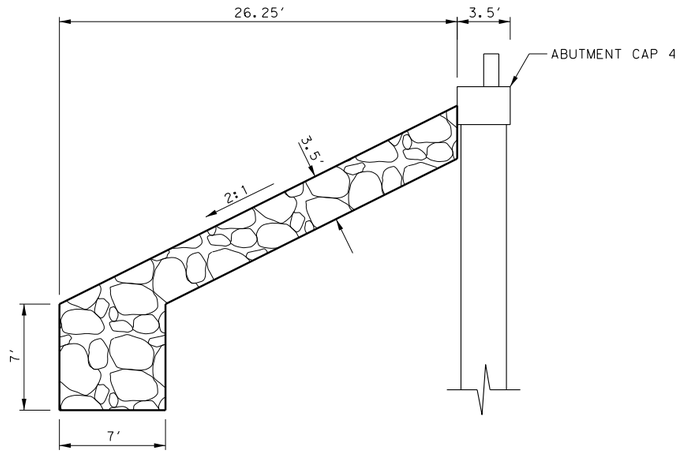

0 10 20
SCALE: 1"=20'

NO.	DATE	REVISION	APPROV.
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281-945-0081 FX

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CEDAR CRK & CEDAR CRK REL NO 2
STONE RIPRAP DETAILS
CEDAR CREEK

SHEET 1 OF 2

DN: RM	CK DN: RC	DW: RM	CK DW: RC	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
				6	TEXAS	(SEE TITLE SHEET)			FM 1391
				STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
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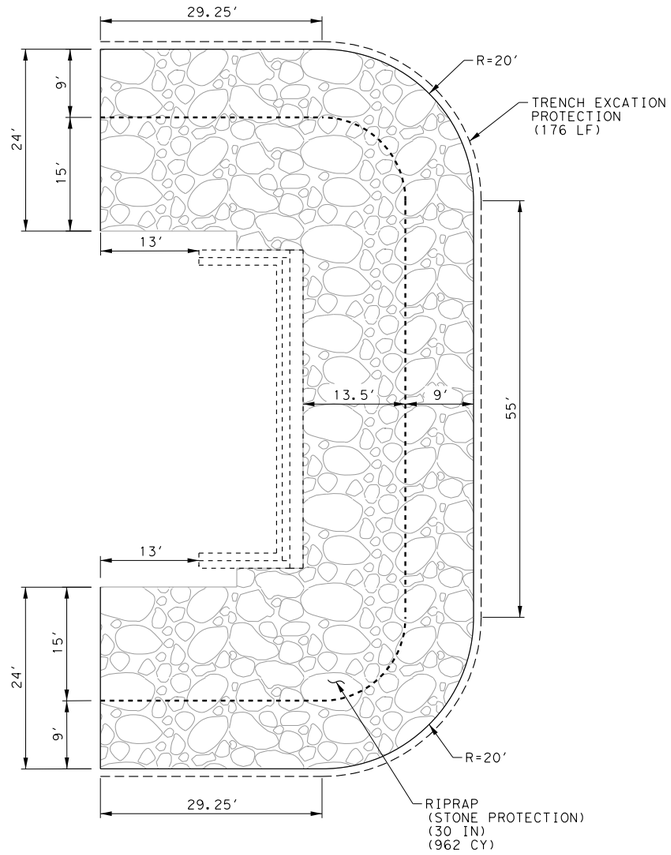

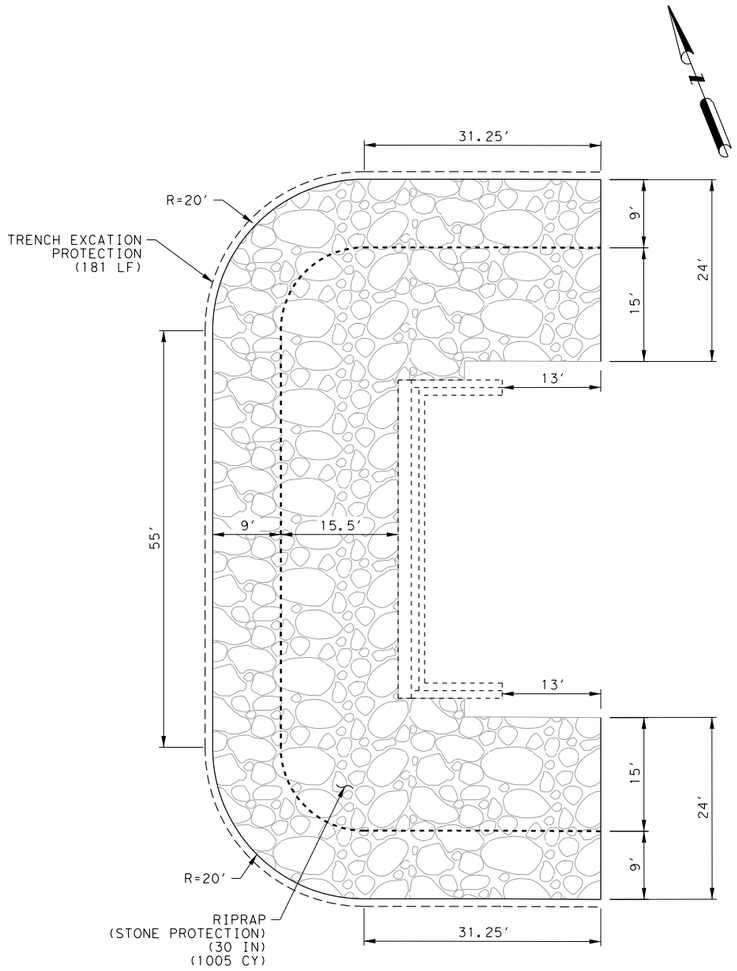

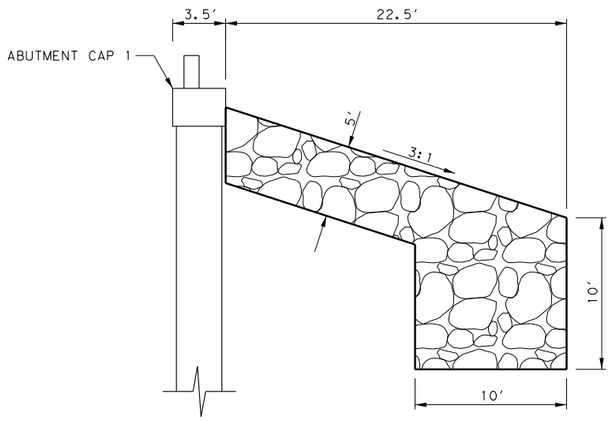

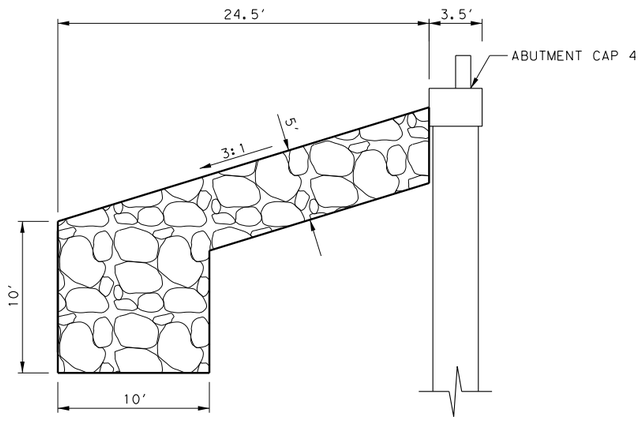

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11/14/2023

0 10 20
SCALE: 1"=20'

NO.	DATE	REVISION	APPROV.
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STONE RIPRAP DETAILS
CEDAR CREEK RELIEF NO. 2

SHEET 2 OF 2

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013,ETC.	37

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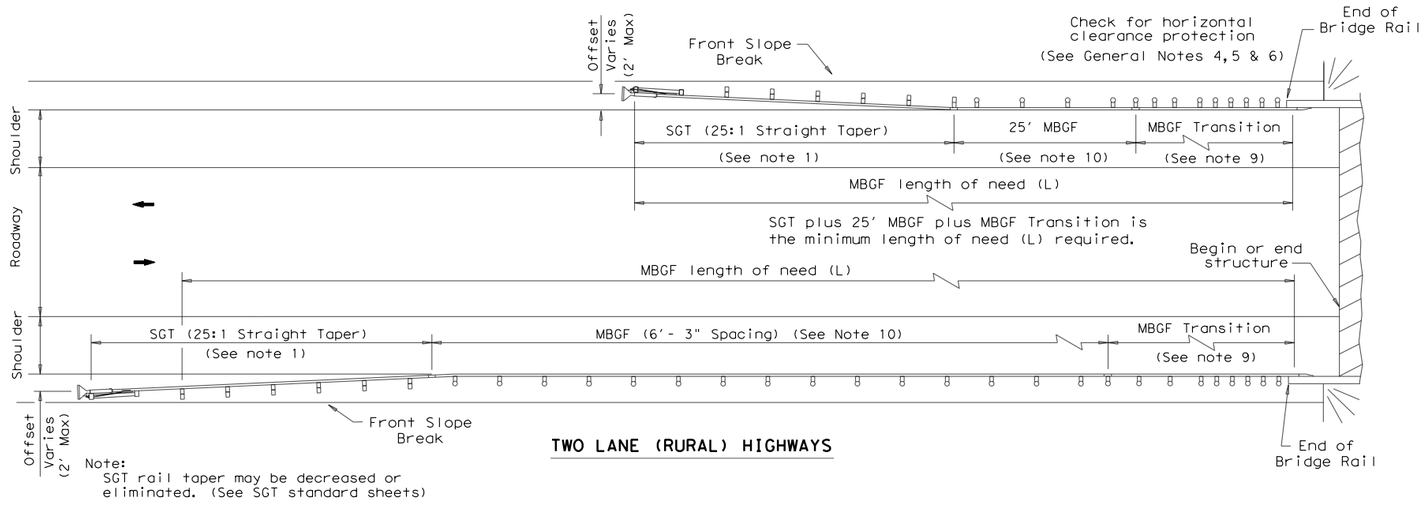
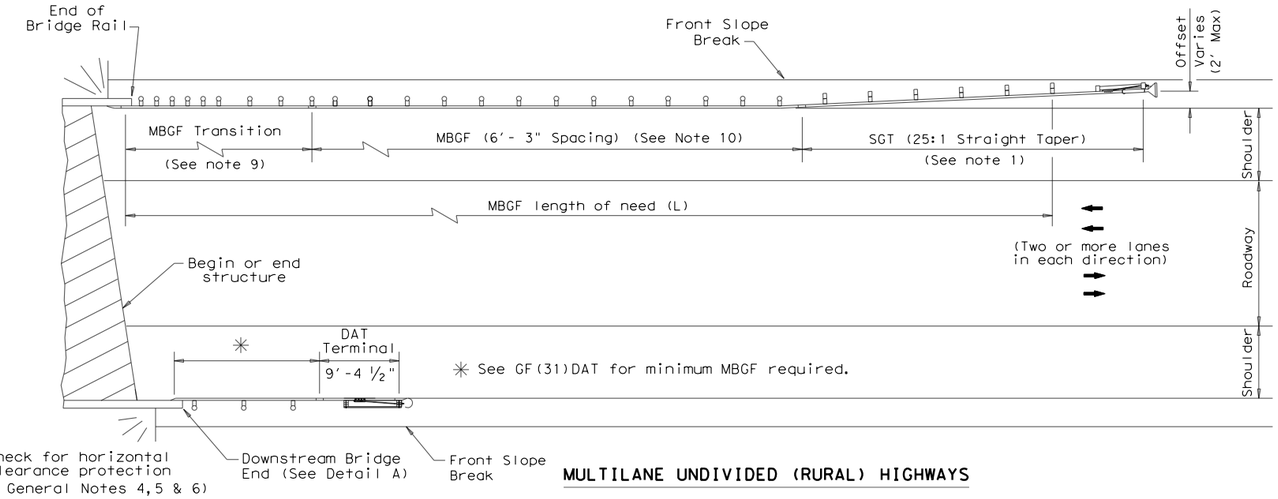
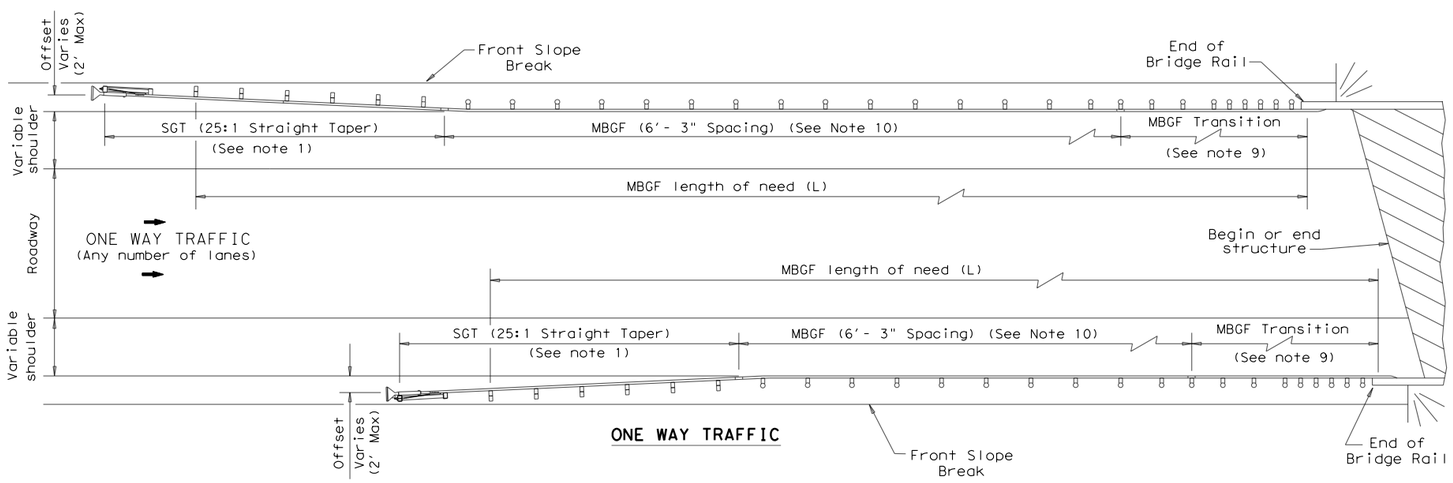


TWO LANE (RURAL) HIGHWAYS

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



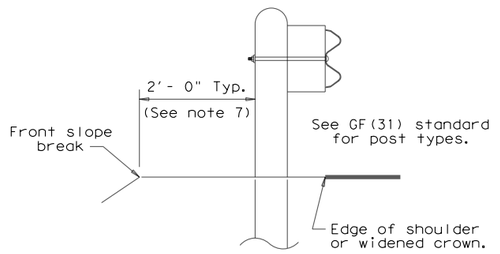
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



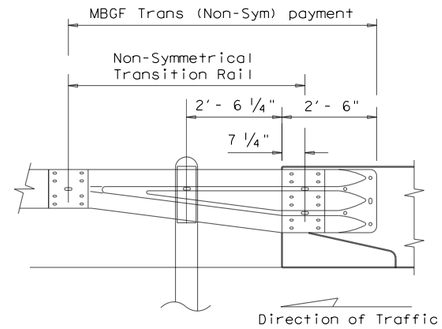
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

BRIDGE END DETAILS

(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
©TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS REVISED APRIL 2014 SEE (MEMO 0414)	1396	01	013, ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		38

DATE: 11/14/2023
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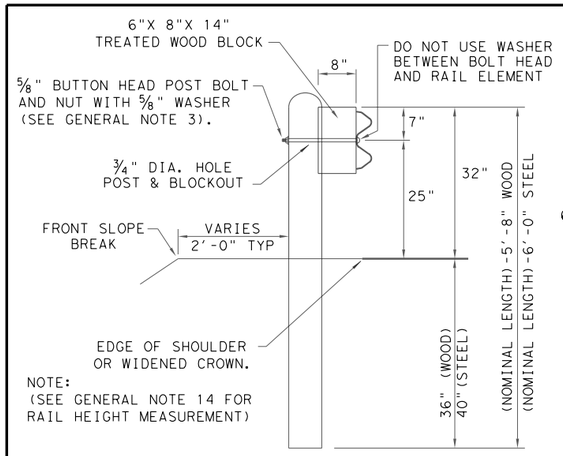
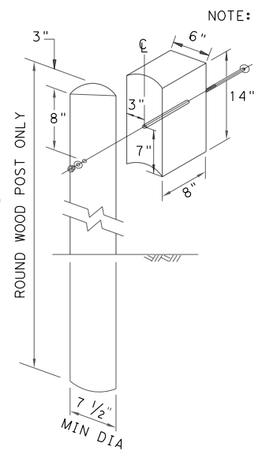
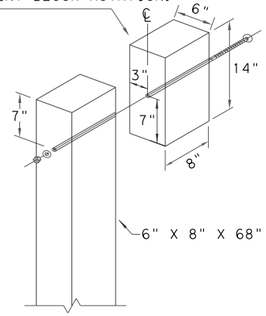


TYPICAL POST PLACEMENT

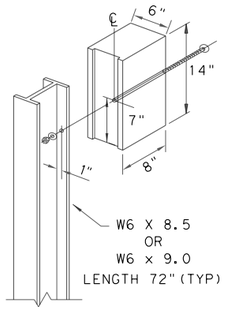


WOOD BLOCK TO ROUND WOOD POST

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

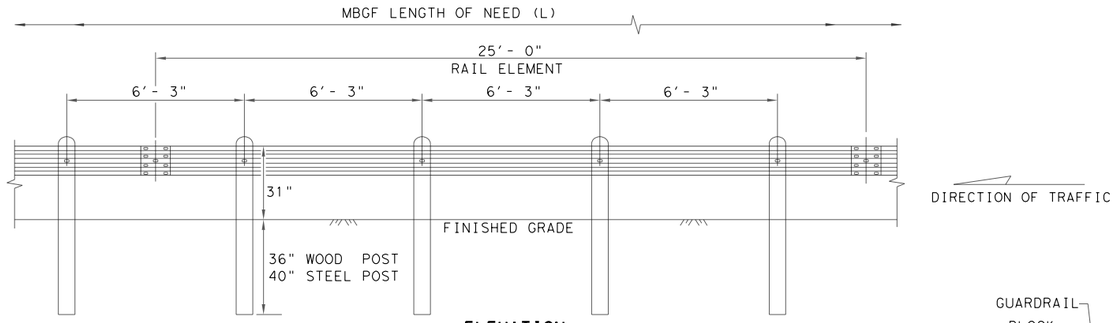


WOOD BLOCK TO RECTANGULAR WOOD POST



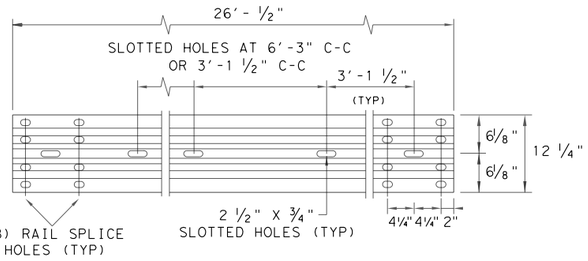
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

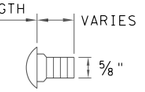
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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.

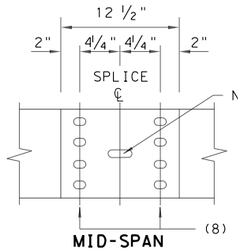


FBB01 = 1 ¼"
FBB02 = 2"

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

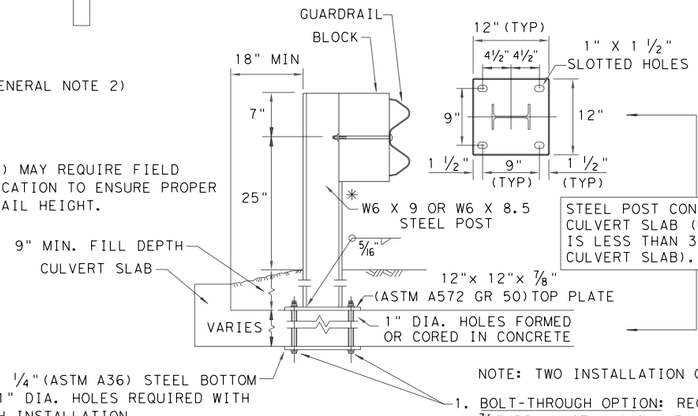
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
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	DIST	COUNTY		SHEET NO.	
	DAL	KAUFMAN		39	

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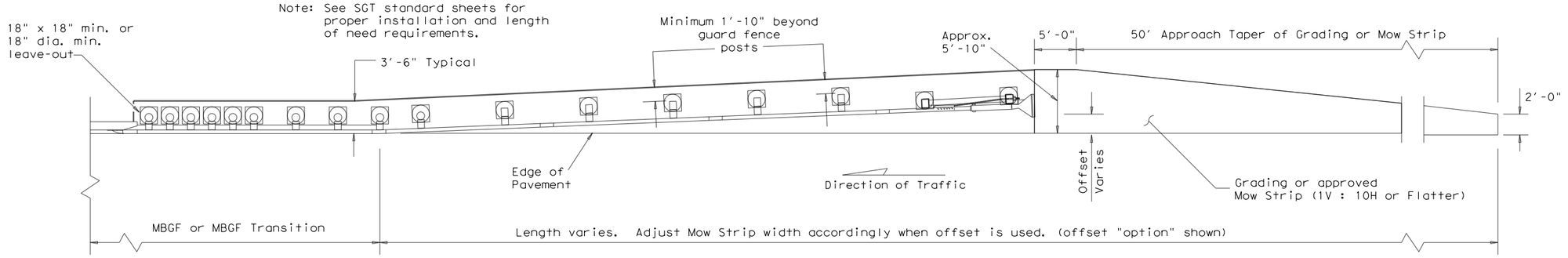
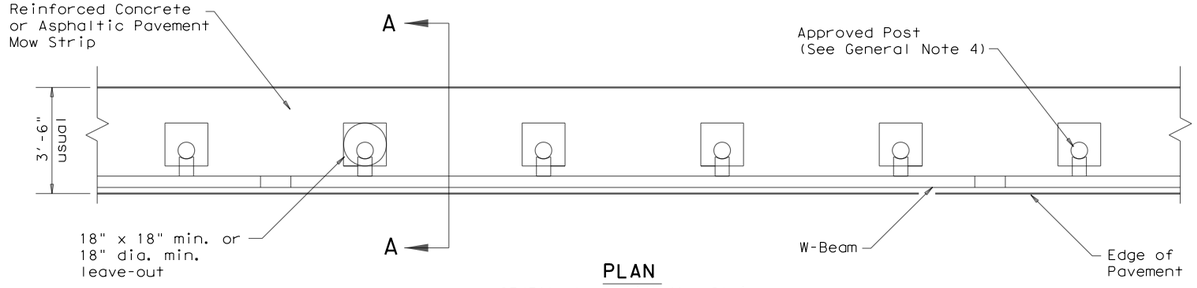
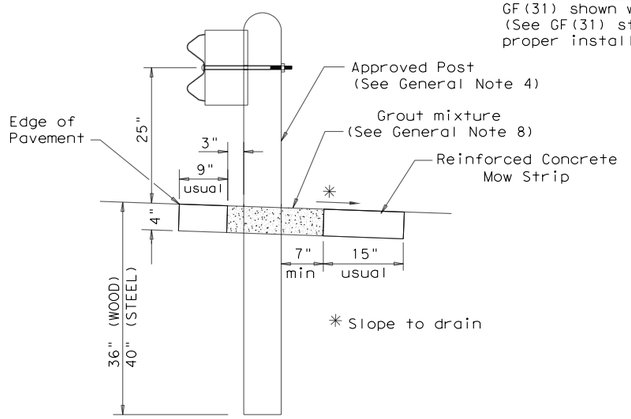


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



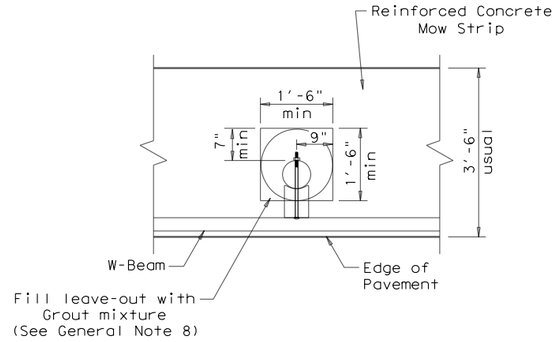
PLAN

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



SECTION A-A

Typical



MOW STRIP DETAIL

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

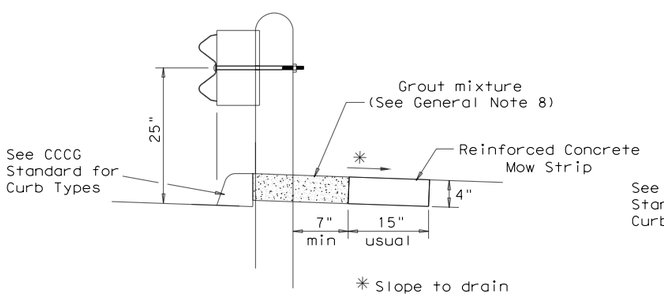
Note: Site Condition(s)

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.

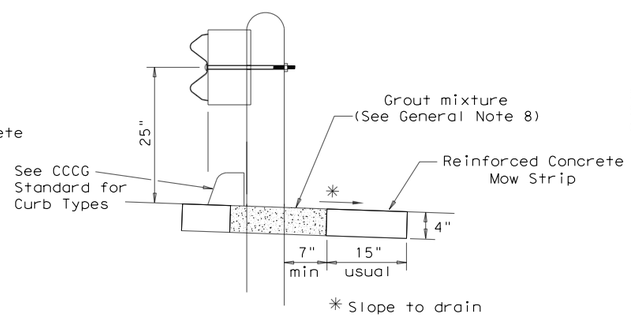
GENERAL NOTES

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.



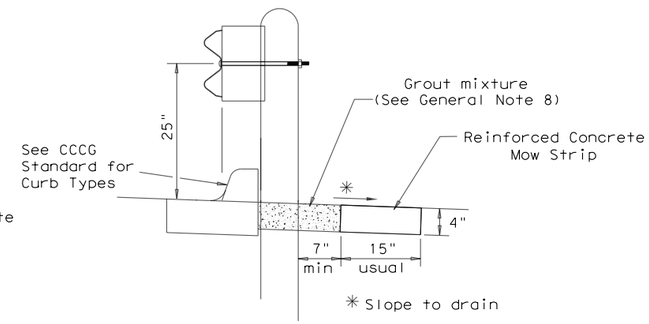
CURB OPTION (1)

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
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	DAL	KAUFMAN		40

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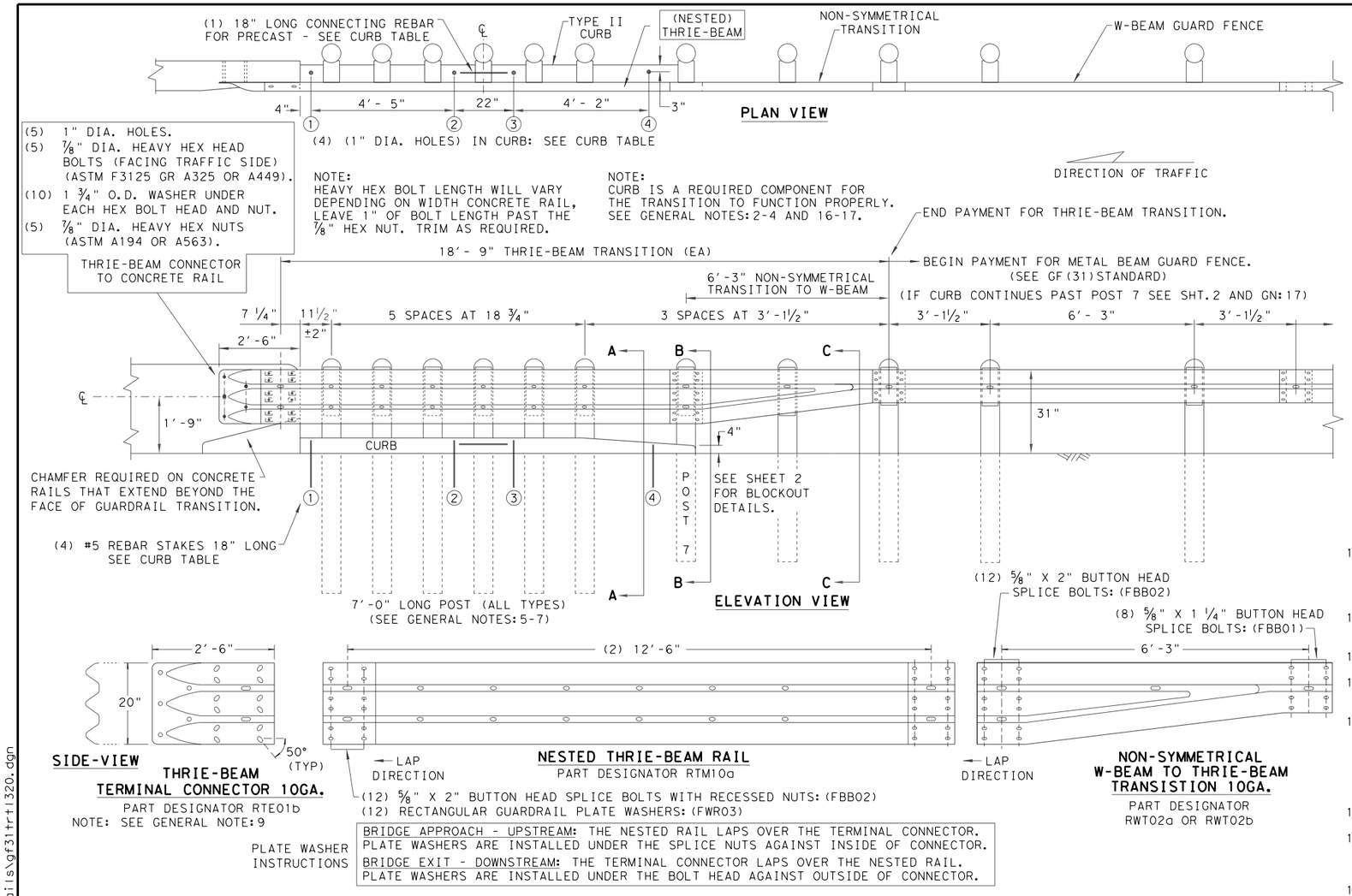
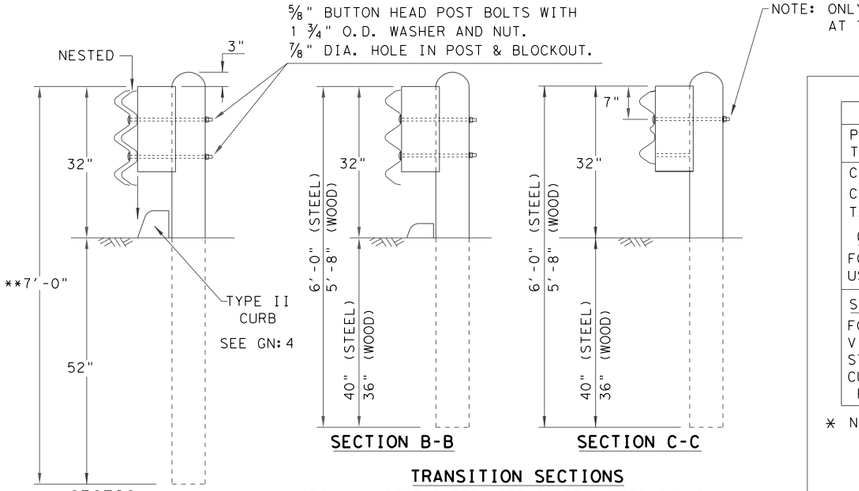
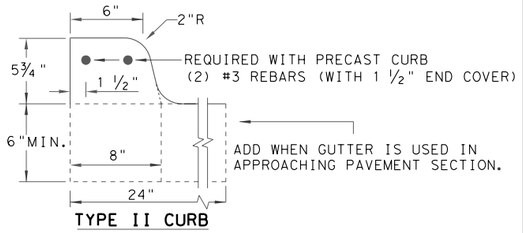




THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB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



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

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

TYPE II CURB DETAILS

GENERAL NOTES

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

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

FILE: gf31trt1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
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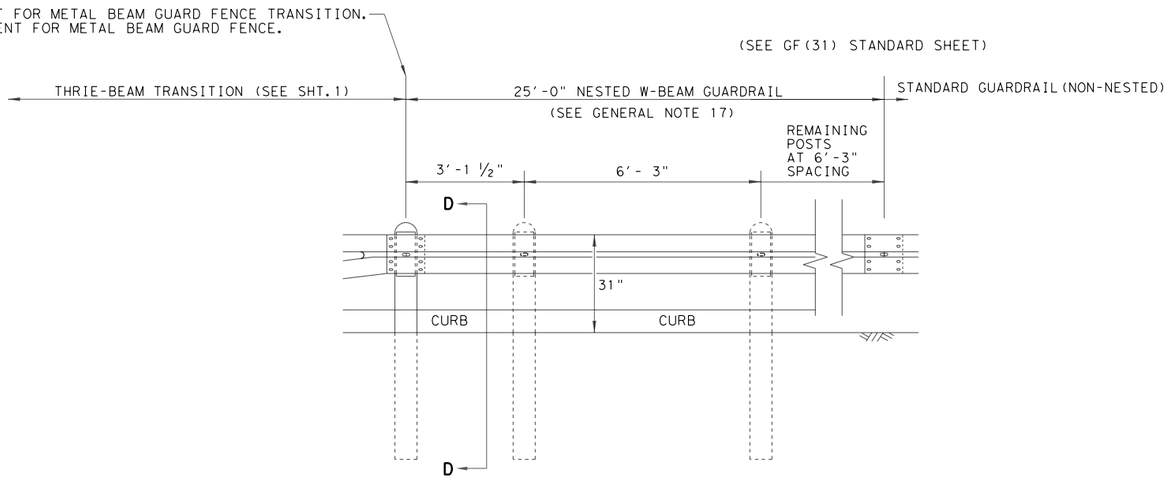
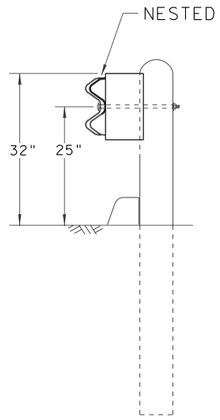
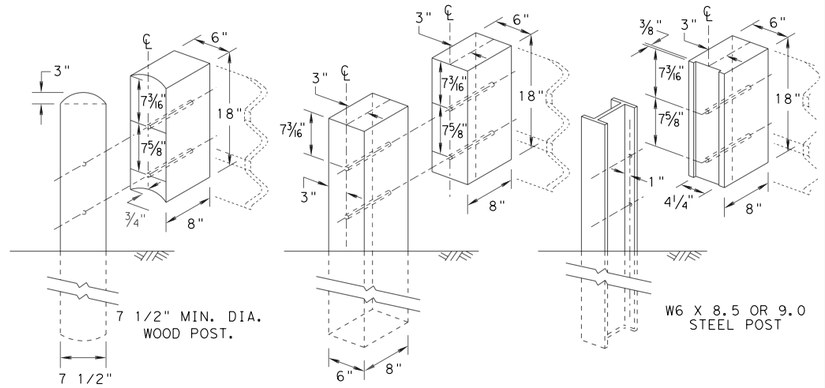
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

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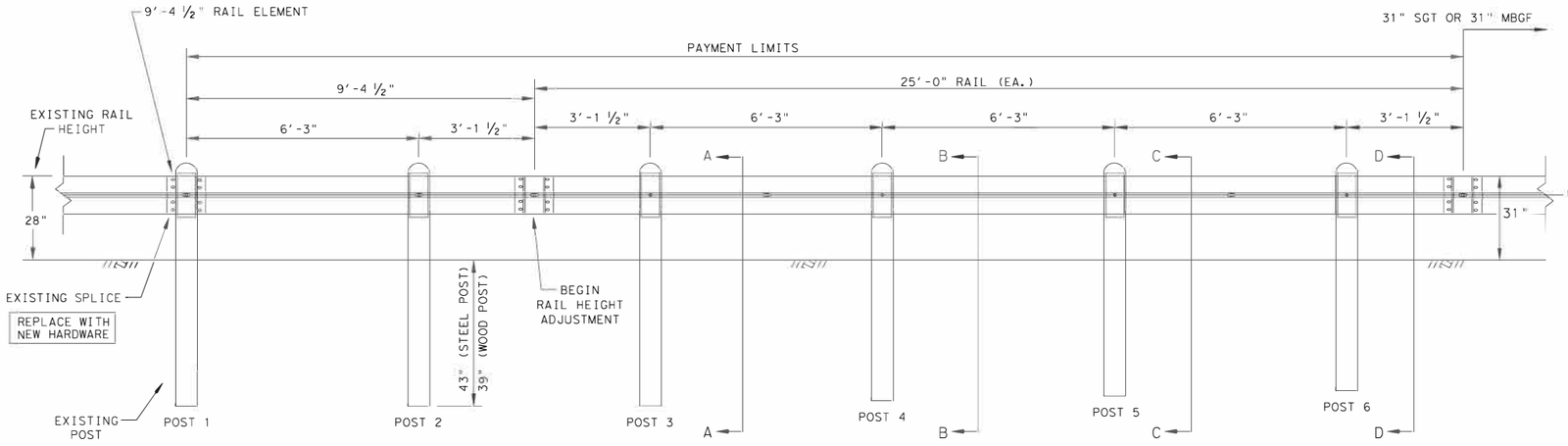
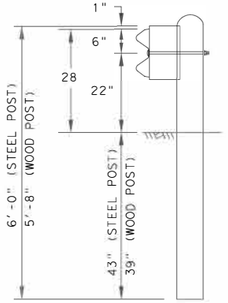
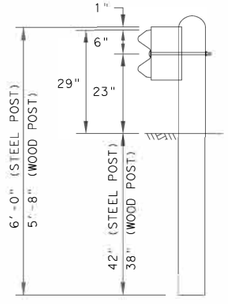


ELEVATION VIEW

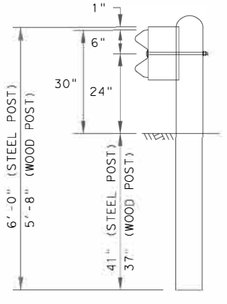
✳ "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



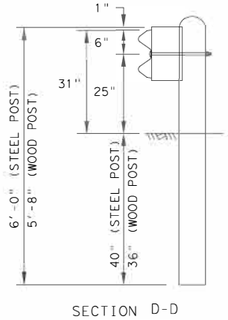
SECTION A-A



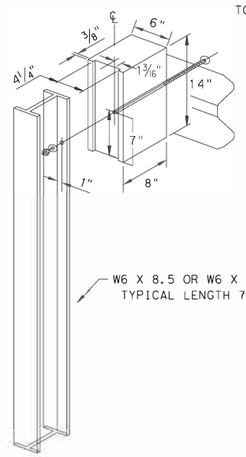
SECTION B-B



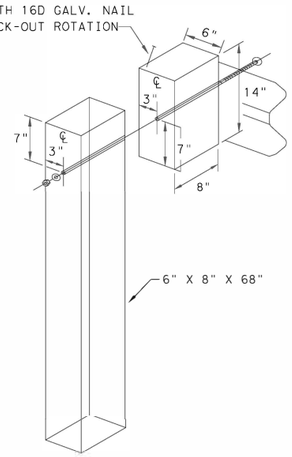
SECTION C-C



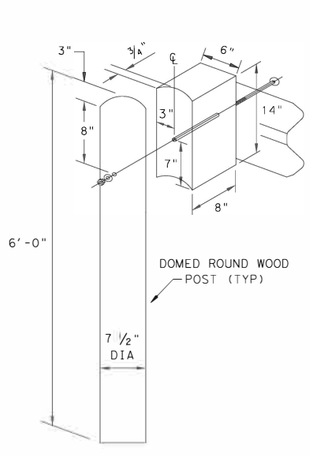
SECTION D-D



ROUTED WOOD BLOCK-OUT TO STEEL POST



WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK-OUT TO DOMED ROUND WOOD POST

POST AND BLOCK-OUT TYPES AVAILABLE

FOR WOOD POST

FOR STEEL POST

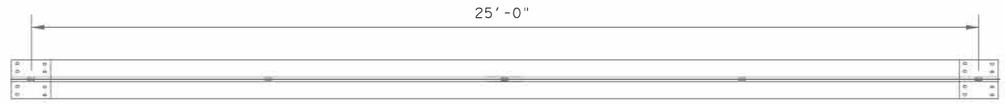
HARDWARE LIST	
QTY	DESCRIPTION
1	9'-4 ½" W-BEAM RAIL ELEMENT 12GA.
1	25'-0" W-BEAM RAIL ELEMENT 12GA. (TYP)
6	7 ½" DIA X 6'-0" DOMED ROUND WOOD POSTS (TYP)
6	6" X 8" X 68" RECTANGULAR WOOD POSTS (TYP)
6	W6 X 8.5 OR W6 X 9 X 72" STEEL POSTS (TYP)
6	6" X 8" X 14" WOOD BLOCKS OR COMPOSITE (TYP)
6	⅝" X 18" GUARDRAIL BOLTS WITH NUTS (FBB04)
6	⅝" ROUND WASHERS (ASTM F436)(FWC16a)
6	⅝" X 10" GUARDRAIL BOLTS WITH NUTS (FBB03)
24	⅝" X 1-¼" GUARDRAIL SPLICE BOLTS WITH DOUBLE RECESSED NUTS (ASTM A563) (FBB01)

NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.

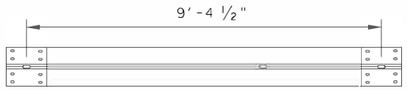
GUARDRAIL POST BOLTS (ASTM A307 GR.A)
GUARDRAIL ROUND WASHERS (ASTM F436)
GUARDRAIL DOUBLE RECESSED NUTS (ASTM A563)
GUARDRAIL SPLICE BOLTS (ASTM A307 GR.A)
GUARDRAIL SPLICE NUTS (ASTM A563)

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 AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'-0", OR 12'-6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'-1 ½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND ⅝" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE ⅝" X 1-¼" WITH ⅝" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
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. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. 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.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.



25'-0" (NOM.) W-BEAM RAIL ELEMENT



9'-4 ½" (NOM.) W-BEAM RAIL ELEMENT

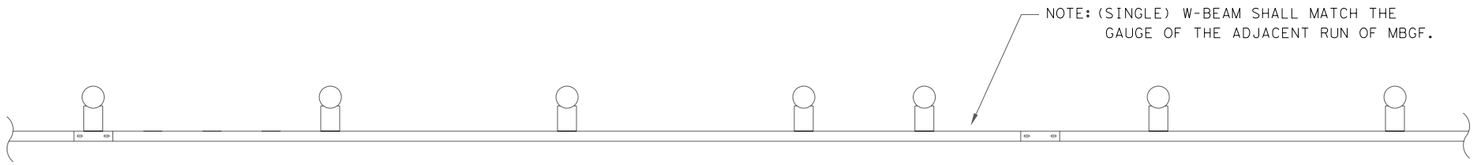
Texas Department of Transportation

Design Division Standard

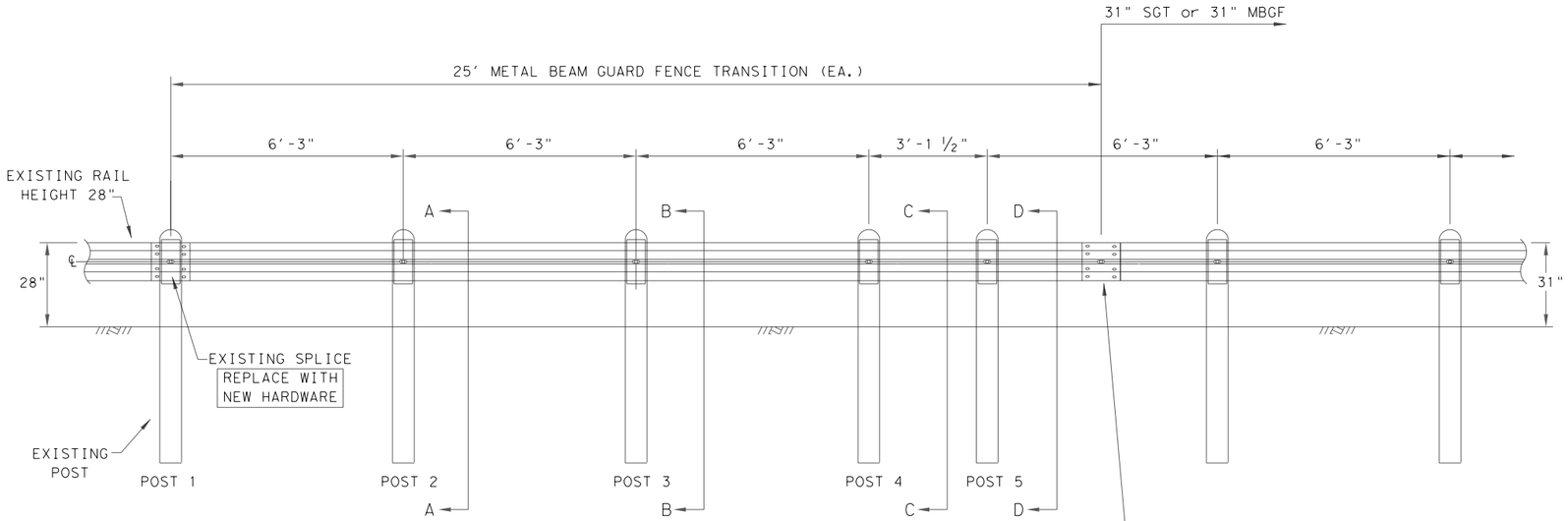
METAL BEAM GUARD FENCE RAIL HEIGHT ADJUSTMENT (28" TO 31") TL-3 MASH COMPLIANT

RAIL-ADJ(A)-19

FILE: railadja19	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		43

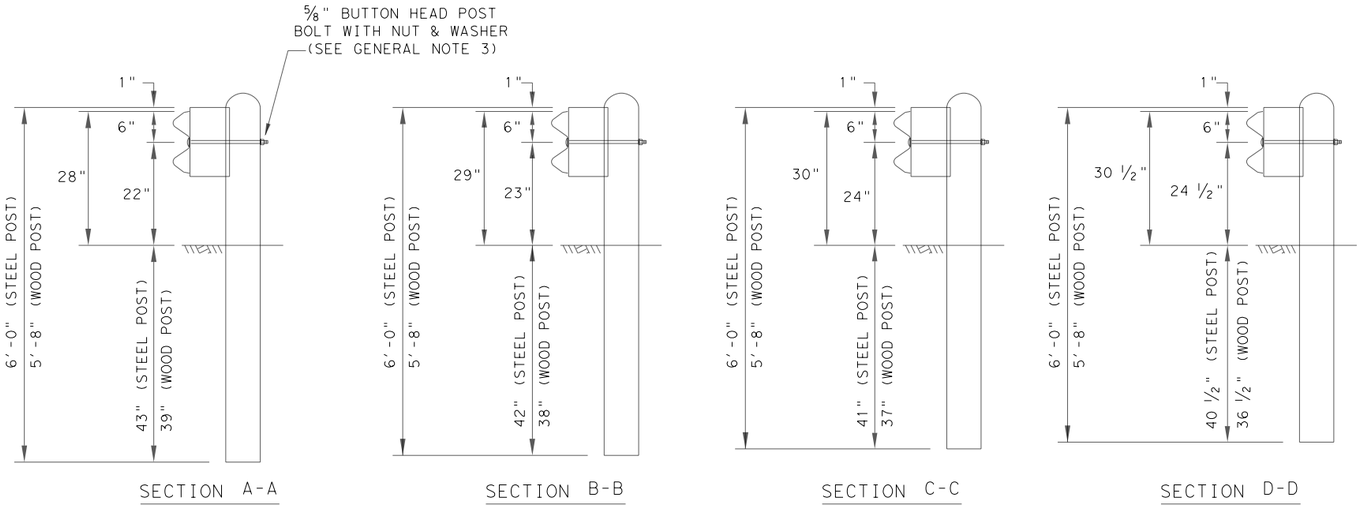


PLAN VIEW



ELEVATION VIEW

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



SECTION A-A | SECTION B-B | SECTION C-C | SECTION D-D

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 AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET 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 TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1- 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
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. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. 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.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.

HARDWARE LIST

QTY	DESCRIPTION
1	25'-0" W-BEAM RAIL ELEMENT 12GA. (TYP)
5	7 1/2" DIA X 6'-0" DOMED ROUND WOOD POSTS (TYP)
5	6" X 8" X 68" RECTANGULAR WOOD POSTS (TYP)
5	W6 X 8.5 OR W6 X 9 X 72" STEEL POSTS (TYP)
5	6" X 8" X 14" WOOD BLOCKS OR COMPOSITE (TYP)
5	5/8" X 18" GUARDRAIL BOLTS AND NUTS (FBB04)
5	5/8" ROUND WASHERS (ASTM F436)(FWC16a)
5	5/8" X 10" GUARDRAIL BOLTS AND NUTS (FBB03)
16	5/8" X 1- 1/4" GUARDRAIL SPLICE BOLTS WITH DOUBLE RECESSED NUTS (ASTM A563) (FBB01)

POST AND BLOCK-OUT TYPES AVAILABLE
FOR WOOD POST
FOR STEEL POST

NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.

GUARDRAIL POST BOLTS (ASTM A307 GR.A)
GUARDRAIL ROUND WASHERS (ASTM F436)
GUARDRAIL DOUBLE RECESSED NUTS (ASTM A563)
GUARDRAIL SPLICE BOLTS (ASTM A307 GR.A)
GUARDRAIL SPLICE NUTS (ASTM A563)

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE RAIL HEIGHT ADJUSTMENT (28" TO 31") TL-3 MASH COMPLIANT

RAIL-ADJ(B)-19

FILE: railadjb19	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1396	01	013,ETC.	FM1391	
	DIST	COUNTY		SHEET NO.	
	DAL	KAUFMAN		44	

DATE: 11/14/2023
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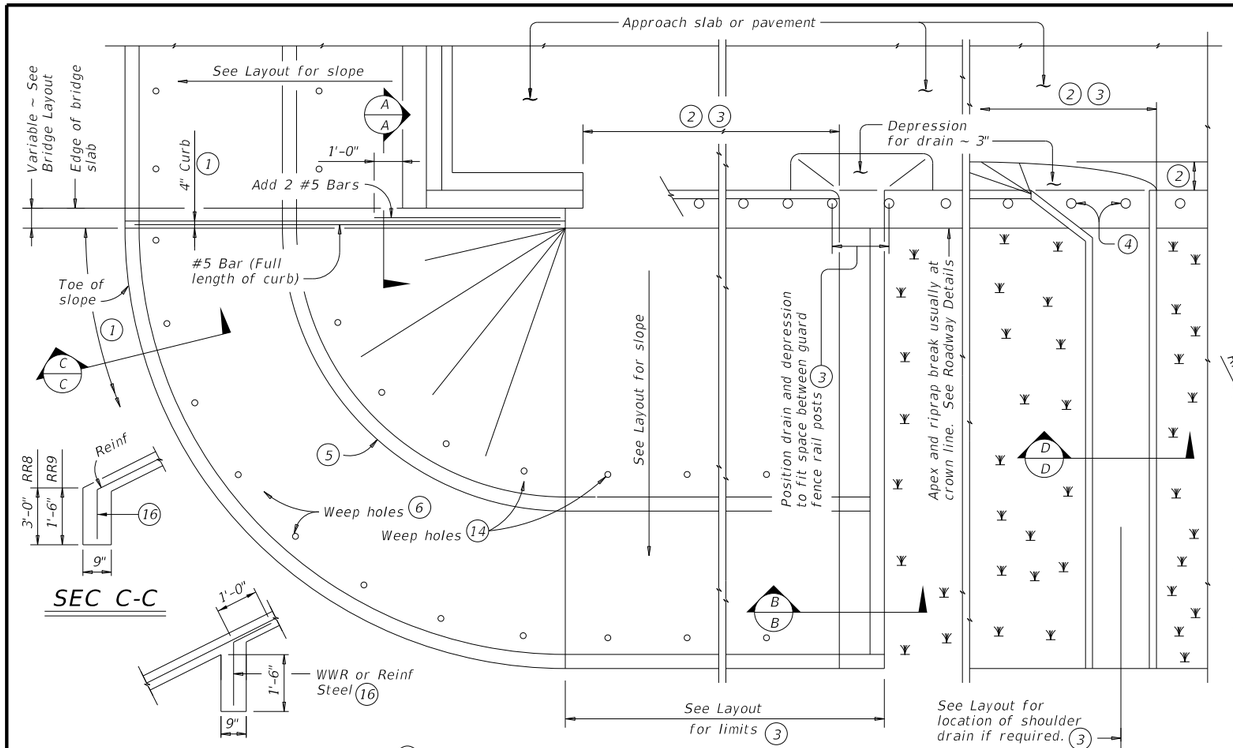
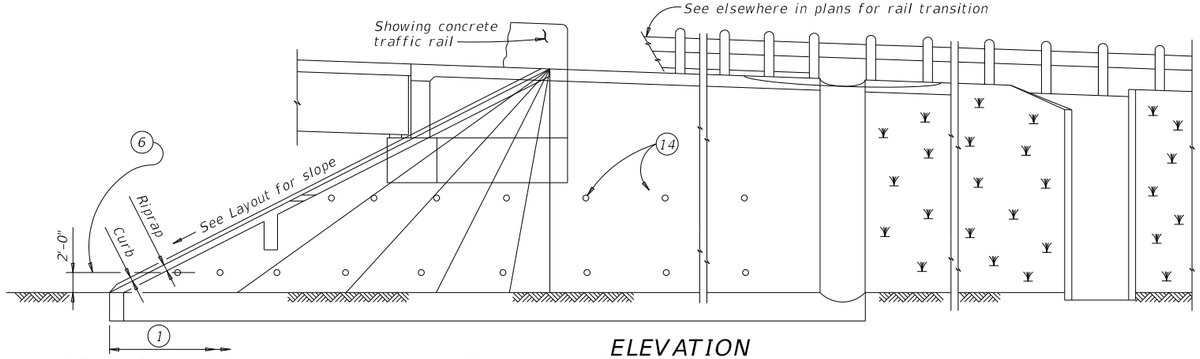


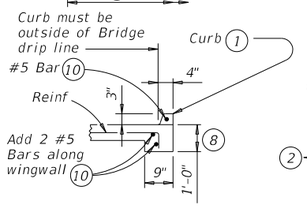
PLAN

SEC C-C

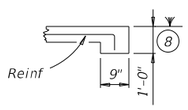
INTERMEDIATE TOEWALL (5)



ELEVATION

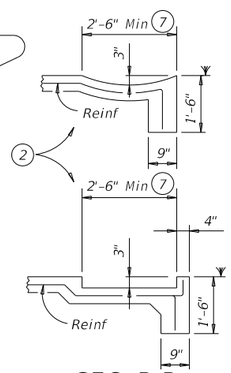


SEC A-A



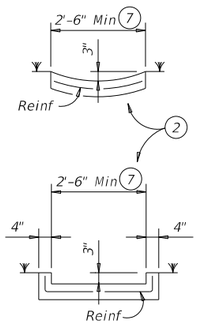
SEC B-B

(No drain)



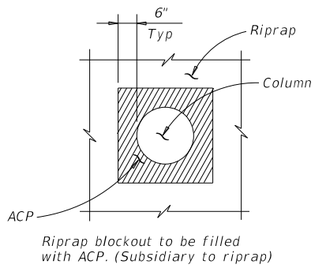
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

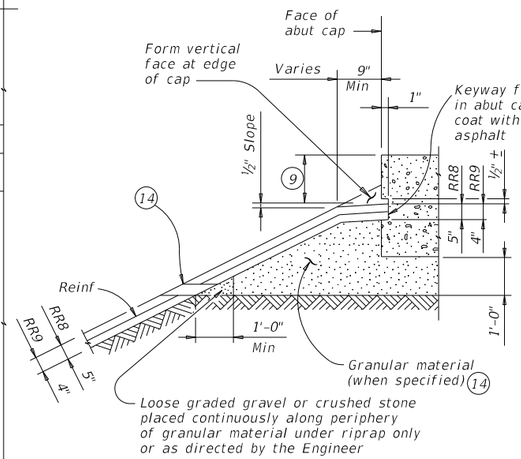
(Shoulder drain)



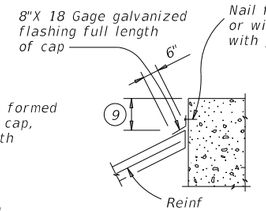
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

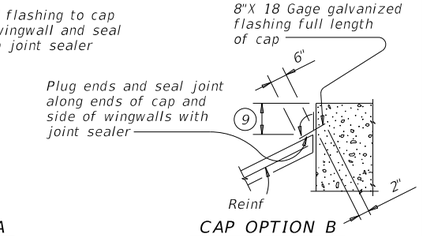
(As directed by the Engineer)



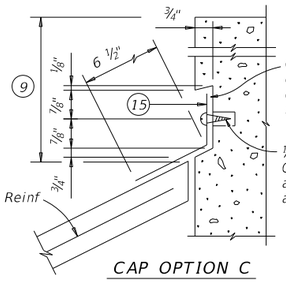
SHOWING KEYWAY OPTION



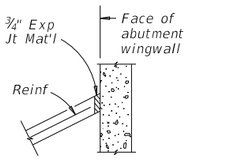
CAP OPTION A



CAP OPTION B

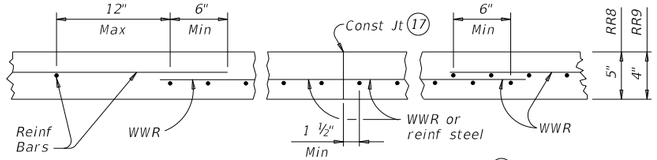


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

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

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.

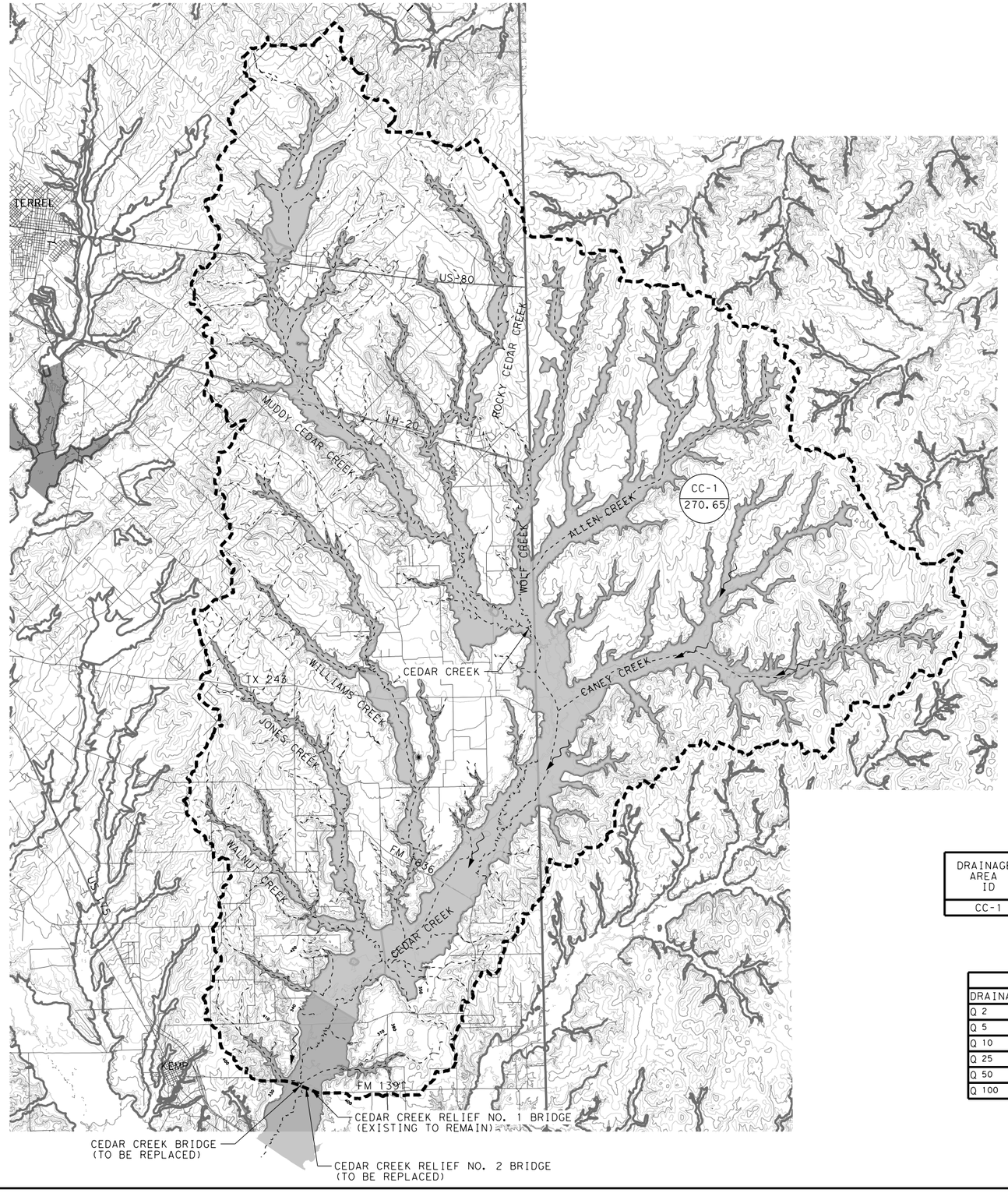
Texas Department of Transportation

Bridge Division Standard

CONCRETE RIPRAP AND SHOULDER DRAINS
EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)

CRR

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		45



0 7500 15000

SCALE: 1"=15000'

X-X / XX.XX — DRAINAGE AREA ID / DRAINAGE AREA (SQ.MI)

DRAINAGE AREA BOUNDARY

FLOW DIRECTION

COUNTY ROADS

EXISTING CONTOURS

STREAM CENTERLINE

FEMA ZONE A AREA

NOTES:

1. RUNOFF COMPUTATIONS PERFORMED WITH HEC-HMS 4.9 AND VERIFIED BY OMEGA EM REGRESSION EQUATION ANALYSIS.
2. RAINFALL DEPTHS WERE OBTAINED FROM NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) ATLAS 14, VOLUME 11.
3. STORMS WERE MODELED AS 24-HOUR DURATION EVENTS USING TEMPORAL DISTRIBUTION.
4. RUNOFF VOLUME WAS COMPUTED USING THE SCS CURVE NUMBER LOSS MODEL.
5. SOURCE OF TOPOGRAPHIC DATA NATIONAL ELEVATION DATA SET 2013 (10-METER)
6. TIME OF CONCETRATION (Tc) WAS COMPUTED USING NRCS METHOD.

DRAINAGE AREA ID	AREA (SQMI)	CURVE NUMBER	TIME OF CONCENTRATION (MIN)	LAG TIME (MIN) (Tc x 0.6)
CC-1	270.65	78	830	498

HEC-HMS SCS METHOD		REGRESSION EQUATIONS
DRAINAGE AREA	270.65 SQ.MI.	
Q 2	22,621 CFS	10,001 CFS
Q 5	33,364 CFS	24,247 CFS
Q 10	43,353 CFS	35,471 CFS
Q 25	58,294 CFS	55,093 CFS
Q 50	70,751 CFS	73,466 CFS
Q 100	84,302 CFS	96,102 CFS

STATE OF TEXAS
WAN ZHANG
98668
LICENSED PROFESSIONAL ENGINEER
11/14/2023

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2 DRAINAGE AREA MAP

SHEET 1 OF 1

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	46

FM_1391_Drainage_Area_Map.dgn

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...\TxDOT-BW-HALF_PDF.pltcfg

NOTES:

1. HEC-RAS VERSION 6.3.1 USED FOR THE ANALYSIS.
2. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
3. THE NORMAL DEPTH OF 0.001 FT/FT WAS USED AS THE DOWNSTREAM REACH BOUNDARY CONDITION.
4. SITE IS DESIGNATED AS FEMA ZONE A AS ON PANEL 48257C0475D EFECTIVE JULY 3, 2012.
5. SOURCE OF TOPOGRAPHIC DATA IS TNRIS STRATMAP20 DATA SET (1-METER).
6. COORDINATION WITH THE LOCAL FLOODPLAIN ADMINISTRATOR WAS PERFORMED ON 08/15/2022.

STATE OF TEXAS
WAN ZHANG
98668
LICENSED PROFESSIONAL ENGINEER
wanzhang
11/14/2023

NO.	DATE	REVISION	APPROV.
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Houston, Texas, 77094
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281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
CEDAR CREEK
HYDRAULIC DATA

SHEET 1 OF 4

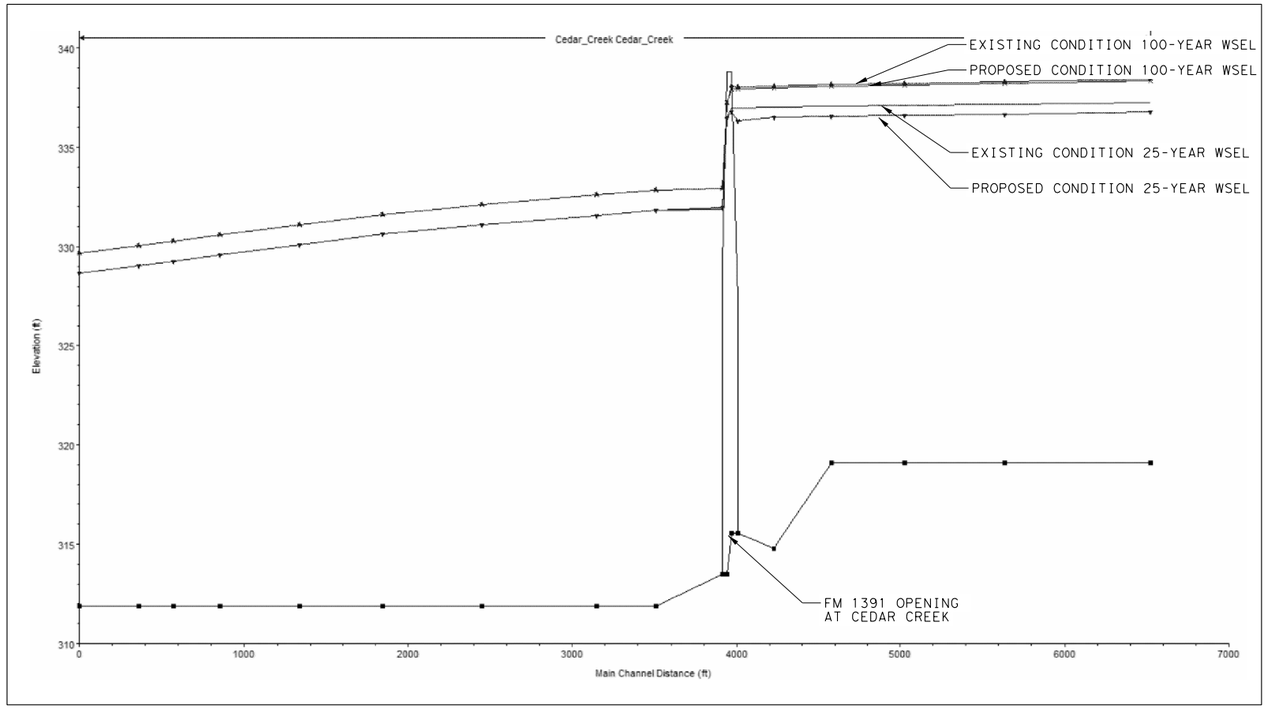
DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	47

HYDRAULIC MODEL RESULTS

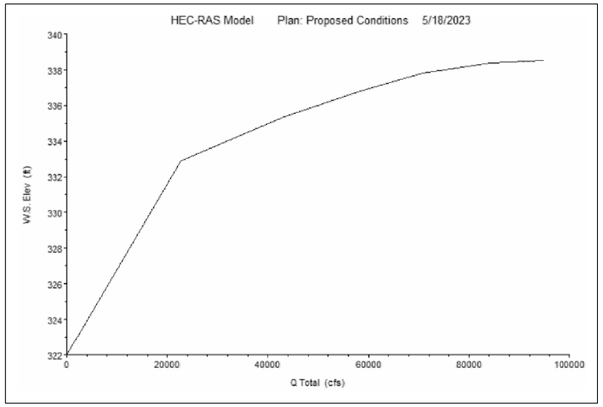
HEC-RAS STATION	25-YEAR FLOW (CFS)	25-YEAR WSEL (FT)			25-YEAR VELOCITY (FT/S)		100-YEAR FLOW (CFS)	100-YEAR WSEL (FT)			100-YEAR VELOCITY (FT/S)		
		EXISTING	PROPOSED	DIFFERENCE	EXISTING	PROPOSED		EXISTING	PROPOSED	DIFFERENCE	EXISTING	PROPOSED	DIFFERENCE
7770	58294	337.26	336.80	-0.46	2.03	2.17	84302	338.44	338.35	-0.09	2.50	2.53	0.03
6882	58294	337.15	336.67	-0.48	1.90	2.04	84302	338.28	338.19	-0.09	2.37	2.39	0.02
6272	58294	337.10	336.61	-0.49	1.59	1.69	84302	338.21	338.12	-0.09	2.00	2.03	0.03
5823	58294	337.06	336.56	-0.50	1.66	1.77	84302	338.16	338.06	-0.10	2.09	2.12	0.03
5475	58294	337.01	336.50	-0.51	1.60	1.70	84302	338.08	337.98	-0.10	2.06	2.08	0.02
5251	58294	336.98	336.31	-0.67	1.72	3.77	84302	338.04	337.94	-0.10	2.07	2.10	0.03
5200													
5159	58294	331.87	331.96	0.09	7.14	5.33	84302	332.96	332.95	-0.01	5.13	5.79	0.66
4755	58294	331.84	331.84	0.00	3.32	3.32	84302	332.85	332.85	0.00	3.52	3.52	0.00
4392	58294	331.58	331.58	0.00	3.26	3.26	84302	332.60	332.60	0.00	3.57	3.57	0.00
3693	58294	331.10	331.10	0.00	3.19	3.19	84302	332.11	332.11	0.00	3.51	3.51	0.00
3094	58294	330.63	330.63	0.00	3.59	3.59	84302	331.63	331.63	0.00	3.93	3.93	0.00
2583	58294	330.08	330.08	0.00	3.52	3.52	84302	331.08	331.08	0.00	3.75	3.75	0.00
2099	58294	329.58	329.58	0.00	3.03	3.03	84302	330.60	330.60	0.00	3.36	3.36	0.00
1819	58294	329.26	329.26	0.00	2.86	2.86	84302	330.28	330.28	0.00	3.12	3.12	0.00
1603	58294	329.03	329.03	0.00	2.71	2.71	84302	330.05	330.05	0.00	3.03	3.03	0.00
1245	58294	328.66	328.66	0.00	2.69	2.69	84302	329.68	329.68	0.00	2.99	2.99	0.00

NOTES:

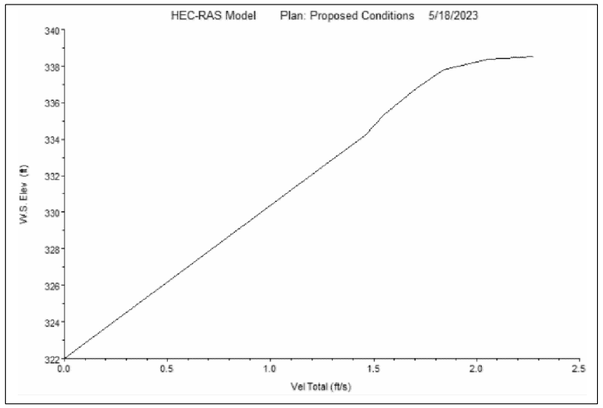
1. HEC-RAS VERSION 6.3.1 USED FOR THE ANALYSIS.
2. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
3. THE NORMAL DEPTH OF 0.001 FT/FT WAS USED AS THE DOWNSTREAM REACH BOUNDARY CONDITION.
4. SITE IS DESIGNATED AS A FEMA ZONE A AS ON PANEL 48257C0475D EFECTIVE JULY 3, 2012.
5. SOURCE OF TOPOGRAPHIC DATA NATIONAL ELEVATION DATA SET 2013 (10-METER).
6. COORDINATION WITH THE LOCAL FLOODPLAIN ADMINISTRATOR WAS PERFORMED ON 08/15/2022.



WSE (FT) vs Q (CFS) CURVE



WSE (FT) vs V (FT/S) CURVE



STATE OF TEXAS
WAN ZHANG
98668
LICENSED PROFESSIONAL ENGINEER
11/14/2023

NO.	DATE	REVISION	APPROV.
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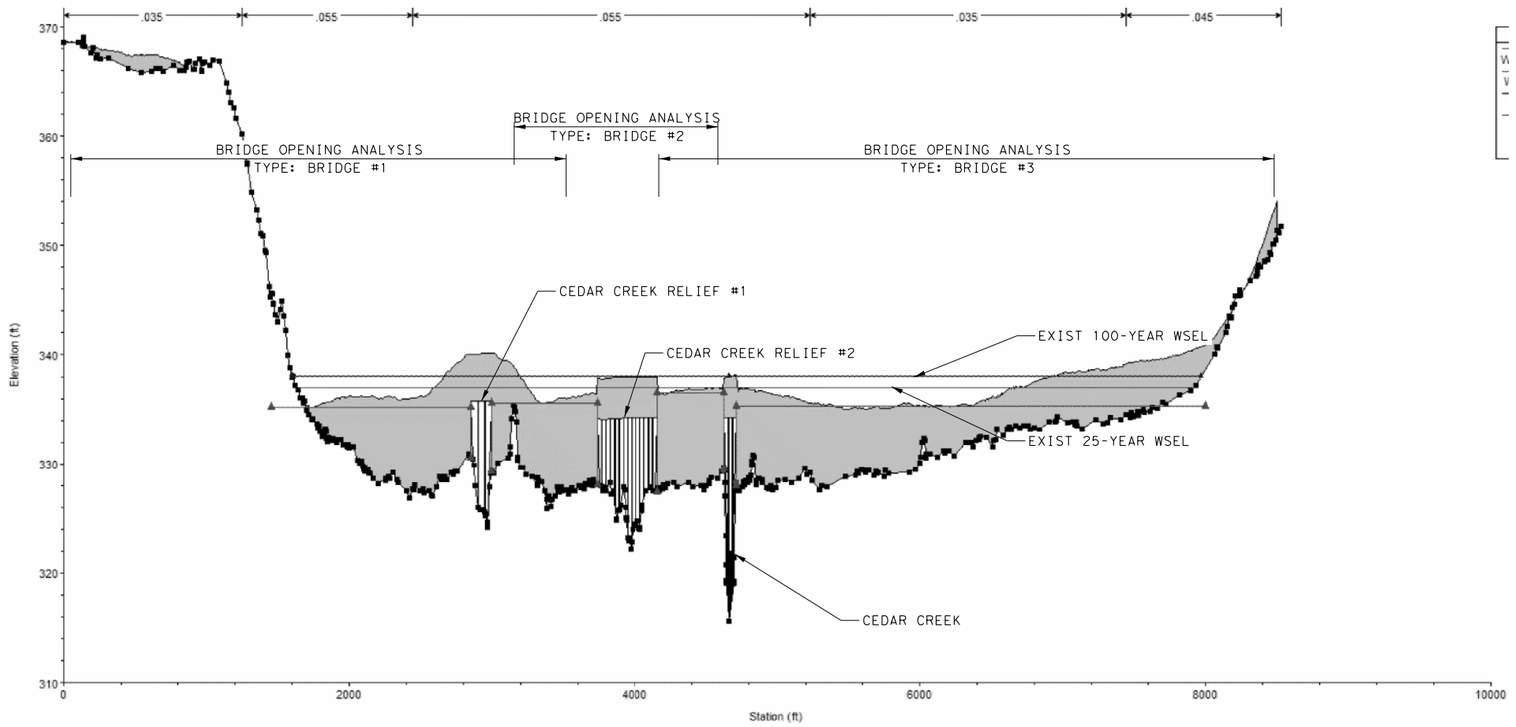
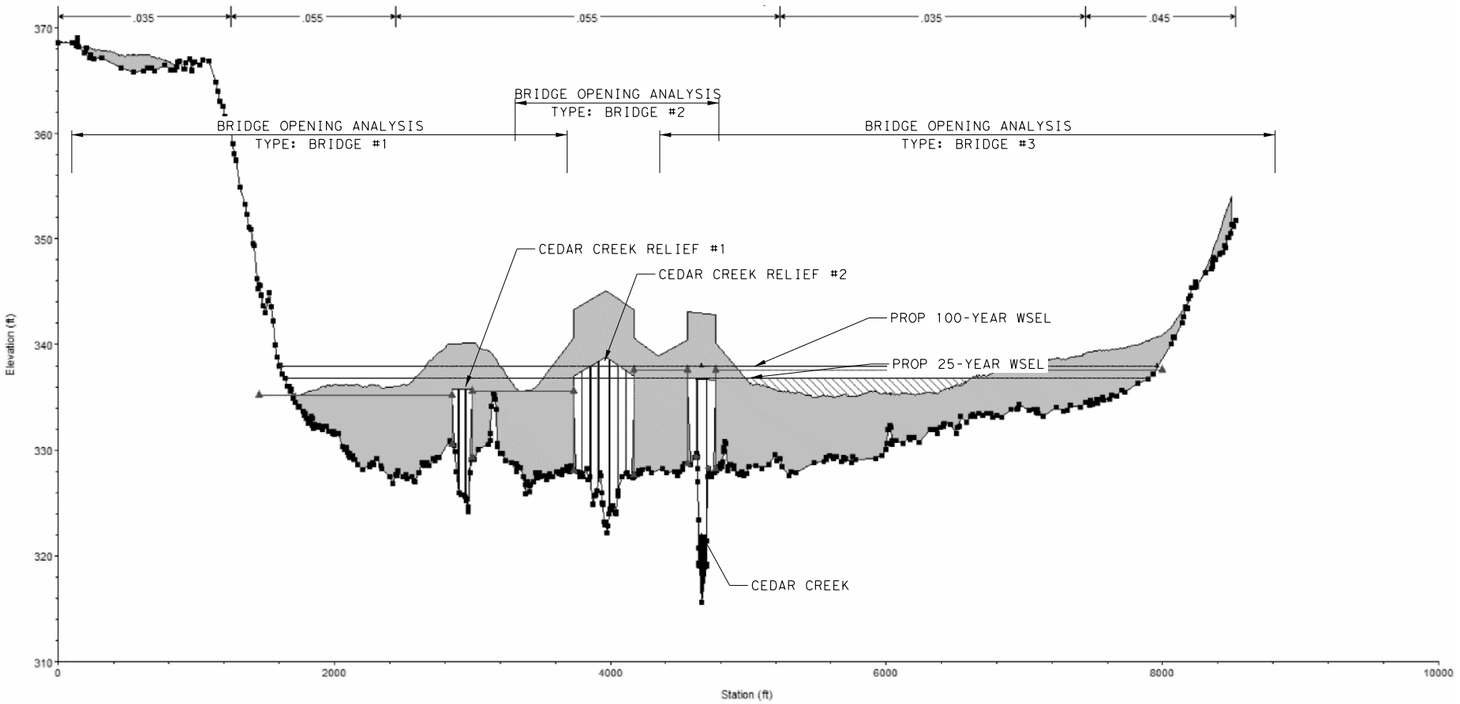
FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
CEDAR CREEK
HYDRAULIC DATA

SHEET 2 OF 4

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	48



EXISTING FM 1391 BRIDGES



PROPOSED FM 1391 BRIDGES

NOTES:

1. HEC-RAS VERSION 6.3.1 USED FOR THE ANALYSIS.
2. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
3. THE NORMAL DEPTH OF 0.001 FT/FT WAS USED AS THE DOWNSTREAM REACH BOUNDARY CONDITION.
4. SITE IS DESIGNATED AS FEMA ZONE A AS ON PANEL 48257C0475D EFECTIVE JULY 3, 2012.
5. SOURCE OF TOPOGRAPHIC DATA NATIONAL ELEVATION DATA SET 2013 (10-METER).
6. COORDINATION WITH THE LOCAL FLOODPLAIN ADMINISTRATOR WAS PERFORMED ON 08/15/2022.

STATE OF TEXAS
WAN ZHANG
98668
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

NO.	DATE	REVISION	APPROV.
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FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
CEDAR CREEK
HYDRAULIC DATA

SHEET 3 OF 4

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	49

FM_1391_Hydraulic_Data_03.dgn

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PLAN: PROPOSED CEDAR CREEK RELIEF # 1 RS: 5200 PROFILE: 25 YEAR				
E.G. US. (FT)	336.82	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US. (FT)	336.80	E.G. ELEV (FT)	336.82	336.75
Q TOTAL (CFS)	9627.25	W.S. ELEV (FT)	336.80	336.49
Q BRIDGE (CFS)	7797.75	CRIT W.S. (FT)	332.94	331.23
Q WEIR (CFS)	1829.49	MAX CHL DPTH (FT)	12.65	13.94
WEIR STA LFT (FT)	1715.93	VEL TOTAL (FT/S)	7.13	6.13
WEIR STA RGT (FT)	2619.95	FLOW AREA (SQ FT)	1093.64	1272.63
WEIR SUBMERG	0.00	FROUDE # CHL	0.35	0.29
WEIR MAX DEPTH (FT)	1.60	SPECIF FORCE (CU FT)	7726.02	9227.76
MIN EL WEIR FLOW (FT)	335.23	HYDR DEPTH (FT)		
MIN EL PRS (FT)	335.80	W.P. TOTAL (FT)	345.67	359.68
DELTA EG (FT)	4.64	CONV. TOTAL (CFS)	65413.1	83520.8
DELTA WS (FT)	4.68	TOP WIDTH (FT)		
BR OPEN AREA (SQ FT)	1093.64	FRCTN LOSS (FT)		
BR OPEN VEL (FT/S)	7.13	C & E LOSS (FT)		
BR SLUICE COEF	0.40	SHEAR TOTAL (LB/SQ FT)	4.28	2.93
BR SEL METHOD	PRESS/WEIR	POWER TOTAL (LB/FT S)	30.51	17.98

PLAN: PROPOSED CEDAR CREEK RELIEF #1 RS: 5200 PROFILE: 100 YEAR				
E.G. US. (FT)	337.99	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US. (FT)	337.96	E.G. ELEV (FT)	337.99	337.92
Q TOTAL (CFS)	16948.80	W.S. ELEV (FT)	337.96	337.23
Q BRIDGE (CFS)	10140.09	CRIT W.S. (FT)	337.00	336.82
Q WEIR (CFS)	6808.70	MAX CHL DPTH (FT)	13.80	14.68
WEIR STA LFT (FT)	1663.24	VEL TOTAL (FT/S)	9.27	7.97
WEIR STA RGT (FT)	2700.57	FLOW AREA (SQ FT)	1093.64	1272.63
WEIR SUBMERG	0.00	FROUDE # CHL	0.44	0.37
WEIR MAX DEPTH (FT)	2.77	SPECIF FORCE (CU FT)	10179.87	11198.45
MIN EL WEIR FLOW (FT)	335.23	HYDR DEPTH (FT)		
MIN EL PRS (FT)	335.80	W.P. TOTAL (FT)	345.67	359.68
DELTA EG (FT)	4.76	CONV. TOTAL (CFS)	65413.1	83520.8
DELTA WS (FT)	4.84	TOP WIDTH (FT)		
BR OPEN AREA (SQ FT)	1093.64	FRCTN LOSS (FT)		
BR OPEN VEL (FT/S)	9.27	C & E LOSS (FT)		
BR SLUICE COEF	0.47	SHEAR TOTAL (LB/SQ FT)	13.26	9.10
BR SEL METHOD	PRESS/WEIR	POWER TOTAL (LB/FT S)	122.95	72.48

PLAN: PROPOSED CEDAR CREEK RELIEF #2 RS: 5200 PROFILE: 25 YEAR				
E.G. US. (FT)	336.36	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US. (FT)	335.18	E.G. ELEV (FT)	335.93	335.05
Q TOTAL (CFS)	33624.52	W.S. ELEV (FT)	334.28	332.10
Q BRIDGE (CFS)	33402.50	CRIT W.S. (FT)	332.36	332.13
Q WEIR (CFS)	222.02	MAX CHL DPTH (FT)	12.13	10.10
WEIR STA LFT (FT)	3349.72	VEL TOTAL (FT/S)	10.31	13.76
WEIR STA RGT (FT)	3544.76	FLOW AREA (SQ FT)	3240.81	2427.02
WEIR SUBMERG	0.00	FROUDE # CHL	0.00	0.00
WEIR MAX DEPTH (FT)	0.79	SPECIF FORCE (CU FT)	24061.63	22077.01
MIN EL WEIR FLOW (FT)	335.58	HYDR DEPTH (FT)	7.71	5.90
MIN EL PRS (FT)	338.80	W.P. TOTAL (FT)	516.13	487.47
DELTA EG (FT)	3.91	CONV. TOTAL (CFS)	303051.5	196067.4
DELTA WS (FT)	4.70	TOP WIDTH (FT)	420.33	411.17
BR OPEN AREA (SQ FT)	4765.44	FRCTN LOSS (FT)	0.50	0.84
BR OPEN VEL (FT/S)	13.76	C & E LOSS (FT)	0.39	0.49
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)	4.83	9.14
BR SEL METHOD	ENERGY/WIER	POWER TOTAL (LB/FT S)	49.74	125.81

PLAN: PROPOSED CEDAR CREEK RELIEF #2 RS: 5200 PROFILE: 100 YEAR				
E.G. US. (FT)	337.99	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US. (FT)	337.84	E.G. ELEV (FT)	337.40	336.45
Q TOTAL (CFS)	43676.20	W.S. ELEV (FT)	335.47	333.04
Q BRIDGE (CFS)	41651.10	CRIT W.S. (FT)	333.51	333.28
Q WEIR (CFS)	2025.10	MAX CHL DPTH (FT)	13.32	11.04
WEIR STA LFT (FT)	3195.91	VEL TOTAL (FT/S)	11.13	14.81
WEIR STA RGT (FT)	3577.99	FLOW AREA (SQ FT)	3743.42	2813.29
WEIR SUBMERG	0.00	FROUDE # CHL	0.00	0.00
WEIR MAX DEPTH (FT)	2.42	SPECIF FORCE (CU FT)	31927.09	29404.91
MIN EL WEIR FLOW (FT)	335.58	HYDR DEPTH (FT)	8.87	6.78
MIN EL PRS (FT)	338.80	W.P. TOTAL (FT)	532.29	502.88
DELTA EG (FT)	4.41	CONV. TOTAL (CFS)	375805.9	244275.1
DELTA WS (FT)	6.61	TOP WIDTH (FT)	422.00	414.91
BR OPEN AREA (SQ FT)	4765.44	FRCTN LOSS (FT)	0.51	0.82
BR OPEN VEL (FT/S)	14.81	C & E LOSS (FT)	0.45	0.53
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)	5.93	11.17
BR SEL METHOD	ENERGY/WIER	POWER TOTAL (LB/FT S)	65.98	165.31

PLAN: PROPOSED CEDAR CREEK RS: 5200 PROFILE: 25 YEAR				
E.G. US. (FT)	336.36	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US. (FT)	335.16	E.G. ELEV (FT)	336.10	336.17
Q TOTAL (CFS)	15042.24	W.S. ELEV (FT)	334.39	333.21
Q BRIDGE (CFS)	15042.24	CRIT W.S. (FT)	332.65	333.21
Q WEIR (CFS)		MAX CHL DPTH (FT)	12.39	11.21
WEIR STA LFT (FT)		VEL TOTAL (FT/S)	10.27	12.95
WEIR STA RGT (FT)		FLOW AREA (SQ FT)	1465.30	1161.55
WEIR SUBMERG		FROUDE # CHL	0.59	0.73
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)	11729.37	11155.35
MIN EL WEIR FLOW (FT)	337.61	HYDR DEPTH (FT)	7.83	6.38
MIN EL PRS (FT)	336.82	W.P. TOTAL (FT)	230.27	220.20
DELTA EG (FT)	4.18	CONV. TOTAL (CFS)	138565.7	102433.4
DELTA WS (FT)	3.06	TOP WIDTH (FT)	187.25	182.04
BR OPEN AREA (SQ FT)	1820.05	FRCTN LOSS (FT)		
BR OPEN VEL (FT/S)	12.95	C & E LOSS (FT)		
BR SLUICE COEF		SHEAR TOTAL (LB/SQ FT)	4.68	7.10
BR SEL METHOD	MOMENTUM	POWER TOTAL (LB/FT S)	48.06	91.97

PLAN: PROPOSED CEDAR CREEK RS: 5200 PROFILE: 100 YEAR				
E.G. US. (FT)	338.01	ELEMENT	INSIDE BR US	INSIDE BR DS
W.S. US. (FT)	337.99	E.G. ELEV (FT)	337.66	336.86
Q TOTAL (CFS)	23677.01	W.S. ELEV (FT)	337.61	336.76
Q BRIDGE (CFS)	9089.11	CRIT W.S. (FT)	337.61	336.76
Q WEIR (CFS)		MAX CHL DPTH (FT)	15.61	14.76
WEIR STA LFT (FT)		VEL TOTAL (FT/S)	1.67	2.37
WEIR STA RGT (FT)		FLOW AREA (SQ FT)	5446.98	3842.68
WEIR SUBMERG		FROUDE # CHL	0.08	0.12
WEIR MAX DEPTH (FT)		SPECIF FORCE (CU FT)	16724.25	12207.74
MIN EL WEIR FLOW (FT)	337.61	HYDR DEPTH (FT)	2.89	2.28
MIN EL PRS (FT)	336.82	W.P. TOTAL (FT)	2324.14	2037.95
DELTA EG (FT)	4.78	CONV. TOTAL (CFS)	362426.1	237584.0
DELTA WS (FT)	4.86	TOP WIDTH (FT)	1881.89	1683.06
BR OPEN AREA (SQ FT)	1820.05	FRCTN LOSS (FT)	0.17	0.06
BR OPEN VEL (FT/S)	5.00	C & E LOSS (FT)	0.12	0.30
BR SLUICE COEF	0.27	SHEAR TOTAL (LB/SQ FT)	0.62	1.17
BR SEL METHOD	ENERGY	POWER TOTAL (LB/FT S)	1.04	2.77

NOTES:

1. HEC-RAS VERSION 6.3.1 USED FOR THE ANALYSIS.
2. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM.
3. SOURCE OF TOPOGRAPHIC DATA NATIONAL ELEVATION DATA SET 2013 (10-METER).
4. COORDINATION WITH THE LOCAL FLOODPLAIN ADMINISTRATOR WAS PERFORMED ON 08/15/2022.
5. MULTIPLE OPENING ANALYSIS WAS USED FOR HYDRAULIC MODELING. REFER TO HYDRAULIC REPORT FOR COMPLETE ANALYSIS.

STATE OF TEXAS
WAN ZHANG
98668
LICENSED PROFESSIONAL ENGINEER
11/14/2023

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
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15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
CEDAR CREEK
HYDRAULIC DATA

SHEET 4 OF 4

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	50

FM_1391_Hydraulic_Data_04.dgn

RMorfin
11/14/2023 2:04:17 PM
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...\TXDOT-BW-HALF_PDF.pltcfg

DESIGN HYDRAULIC DATA (50-YR)	
CONTRACTION SCOUR	
	INPUT DATA
	CHANNEL
AVERAGE DEPTH U/S (FT):	22.80
APPROACH VELOCITY (FT/S):	1.84
CRITICAL SHEAR STRESS (LB/FT^2):	0.02
DENSITY OF WATER (SLUG/FT^3):	1.94
MANNING'S N:	0.055
BR AVERAGE DEPTH (FT):	21.8
RESULTS	
SCOUR DEPTH (FT):	10.00

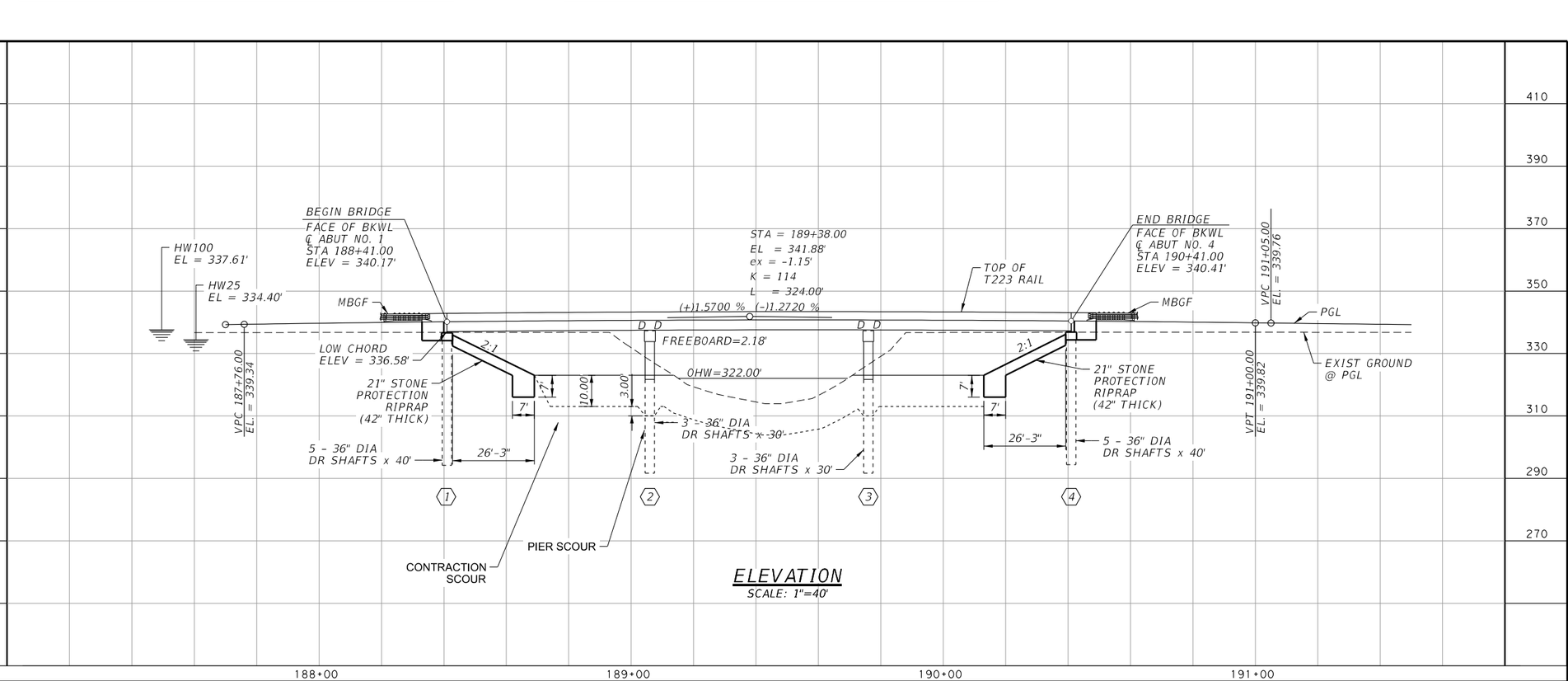
CHECK HYDRAULIC DATA (100-YR)	
CONTRACTION SCOUR	
	INPUT DATA
	CHANNEL
AVERAGE DEPTH U/S (FT):	23.40
APPROACH VELOCITY (FT/S):	1.70
CRITICAL SHEAR STRESS (LB/FT^2):	0.02
DENSITY OF WATER (SLUG/FT^3):	1.94
MANNING'S N:	0.055
BR AVERAGE DEPTH (FT):	22.30
RESULTS	
SCOUR DEPTH (FT):	1.0

DESIGN HYDRAULIC DATA (50-YR)	
PIER SCOUR	
	INPUT DATA
	CHANNEL
PIER SHAPE:	CIRCULAR CYLINDER
PIER SPACING (FT):	70
DEPTH UPSTREAM OF PIER (FT):	21.80
VELOCITY UPSTREAM OF PIER (FT/S):	10.90
WIDTH OF PIER (FT):	3.00
RESULTS	
SCOUR DEPTH (FT):	3.00

CHECK HYDRAULIC DATA (100-YR)	
PIER SCOUR	
	INPUT DATA
	CHANNEL
PIER SHAPE:	CIRCULAR CYLINDER
PIER SPACING (FT):	70
DEPTH UPSTREAM OF PIER (FT):	22.30
VELOCITY UPSTREAM OF PIER (FT/S):	1.70
WIDTH OF PIER (FT):	3.00
RESULTS	
SCOUR DEPTH (FT)*:	0.5

NOTES:

1. SCOUR ANALYSIS IS BASED ON TXDOT GEOTECHNICAL MANUAL (GM), FHWA H.E.C.-18, "EVALUATING SCOUR AT BRIDGES", 5TH EDITION, AND TXDOT "SCOUR EVALUATION GUIDE REVISED sEPTEMBER 2023", CHAPTER 2. ABUTMENT SCOUR EQUATIONS IN H.E.C.-18 TEND TO OVER ESTIMATE ABUTMENT SCOUR DEPTHS. BRIDGE ABUTMENTS WILL BE ARMORED WITH STONE PROTECTION RIPRAP. NO APPRECIABLE ABUTMENT SCOUR IS ANTICIPATED.
2. THE D50 SOIL PARTICLE SIZE USED FOR THIS PROJECT WAS 0.20 MM. THE SOIL DATA IS FROM "THE GEOTECHNICAL INVESTIGATION FOR KAUFMAN COUNTY ON & OFF-SYSTEM BRIDGE REPLACEMENT PROJECT" REPORT
3. THE PROPOSED BRIDGE IS A THREE SPAN STRUCTURE.
4. THE TOTAL MAXIMUM CALCULATED SCOUR DEPTH IS TAKEN AS THE MAXIMUM OF HORIZONTAL CONTRACTION AND VERTICAL PRESSURE SCOUR. THE MAXIMUM SCOUR DEPTH OCCURED DURING THE 50 YR DESIGN STORM UNDER PROPOSED CONDITIONS IS 13.00'.
5. SEE "HYDROLOGY/HYDRAULIC/SCOUR REPORT FOR CEDAR CREEK BRIDGE AND CEDAR CREEK RELIEF #2 BRIDGE" DATED JULY 20TH, 2023 BY ENTECH CIVIL ENGINEERS, INC FOR ADDITIONAL INFORMATION.
6. THE SCOUR CALCULATIONS WERE PERFORMED USING THE TxDOT SCOUR ANALYSIS SPREADSHEET, REVISED SEPT. 25, 2023, SRICOS METHOD.



ELEVATION
SCALE: 1"=40'

RChapa
1/3/2024
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WAN ZHANG
98668
LICENSED PROFESSIONAL ENGINEER
STATE OF TEXAS
1/3/2024

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VERT. 0 10 40

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
SCOUR ANALYSIS
CEDAR CREEK

SHEET 1 OF 1

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	51

FM_1391_Scour_01.dgn

DESIGN HYDRAULIC DATA (50-YR)	
CONTRACTION SCOUR	
	INPUT DATA
	CHANNEL
AVERAGE DEPTH U/S (FT):	23.00
APPROACH VELOCITY (FT/S):	10.90
CRITICAL SHEAR STRESS (LB/FT^2):	1.91
DENSITY OF WATER (SLUG/FT^3):	1.94
MANNING'S N:	0.055
BR AVERAGE DEPTH (FT):	15.2
RESULTS	
SCOUR DEPTH (FT):	14.00

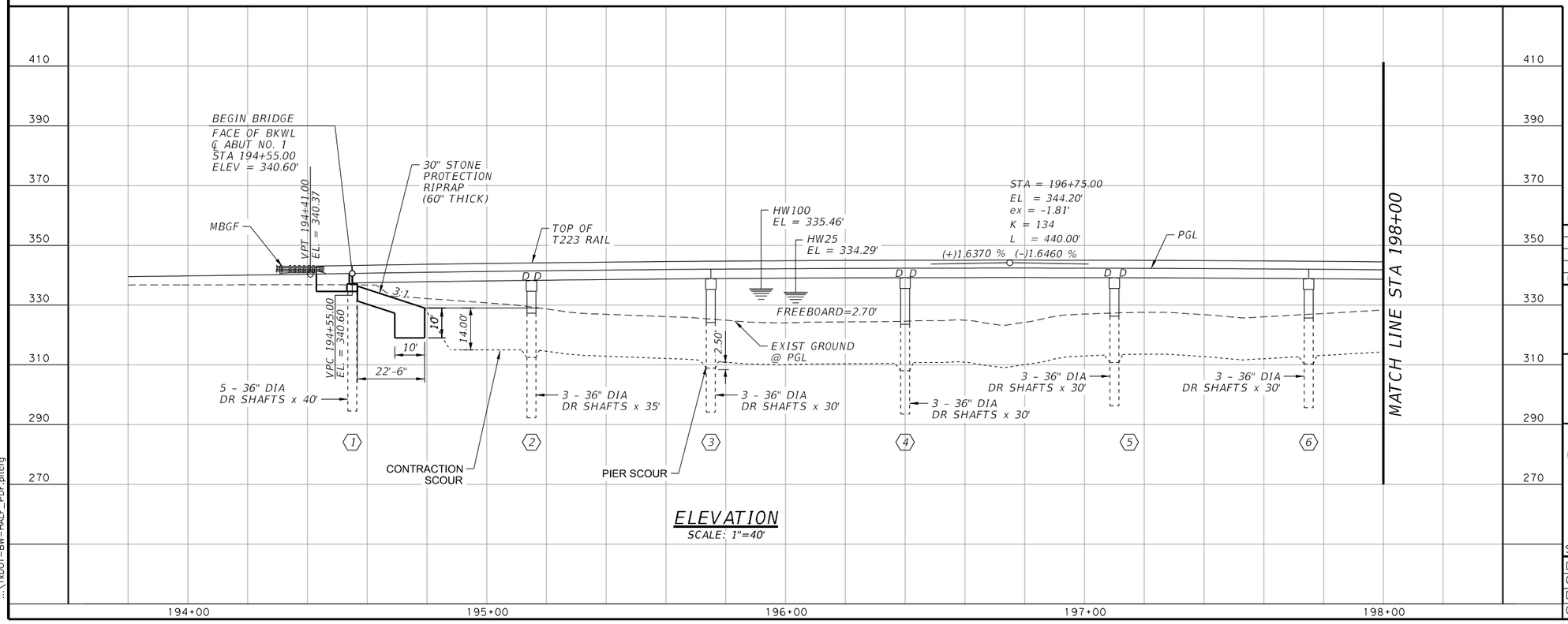
CHECK HYDRAULIC DATA (100-YR)	
CONTRACTION SCOUR	
	INPUT DATA
	CHANNEL
AVERAGE DEPTH U/S (FT):	17.60
APPROACH VELOCITY (FT/S):	11.10
CRITICAL SHEAR STRESS (LB/FT^2):	0.06
DENSITY OF WATER (SLUG/FT^3):	1.94
MANNING'S N:	0.055
BR AVERAGE DEPTH (FT):	16.00
RESULTS	
SCOUR DEPTH (FT):	13.00

DESIGN HYDRAULIC DATA (50-YR)	
PIER SCOUR	
	INPUT DATA
	CHANNEL
PIER SHAPE:	CIRCULAR CYLINDER
PIER SPACING (FT):	70
DEPTH UPSTREAM OF PIER (FT):	15.20
VELOCITY UPSTREAM OF PIER (FT/S):	10.85
WIDTH OF PIER (FT):	3.00
RESULTS	
SCOUR DEPTH (FT):	2.50

CHECK HYDRAULIC DATA (100-YR)	
PIER SCOUR	
	INPUT DATA
	CHANNEL
PIER SHAPE:	CIRCULAR CYLINDER
PIER SPACING (FT):	70
DEPTH UPSTREAM OF PIER (FT):	16.00
VELOCITY UPSTREAM OF PIER (FT/S):	11.10
WIDTH OF PIER (FT):	3.00
RESULTS	
SCOUR DEPTH (FT):	2.50

NOTES:

1. SCOUR ANALYSIS IS BASED ON TXDOT GEOTECHNICAL MANUAL (GM), AND TXDOT "SCOR ANALYSIS GUIDE" REVISED SEPT 2023, CHAPTER 2. CHAPTER 8. ABUTMENT SCOUR EQUATIONS IN H.E.C.-18 TEND TO OVER ESTIMATE ABUTMENT SCOUR DEPTHS. BRIDGE ABUTMENTS WILL BE ARMORED WITH STONE PROTECTION RIPRAP. NO APPRECIABLE ABUTMENT SCOUR IS ANTICIPATED.
2. THE D50 SOIL PARTICLE SIZE USED FOR THIS PROJECT WAS 0.20 MM. THE SOIL DATA IS FROM "THE GEOTECHNICAL INVESTIGATION FOR KAUFMAN COUNTY ON & OFF-SYSTEM BRIDGE REPLACEMENT PROJECT" REPORT
3. THE PROPOSED BRIDGE IS A SEVEN SPAN STRUCTURE.
4. THE TOTAL MAXIMUM CALCULATED SCOUR DEPTH IS TAKEN AS THE MAXIMUM OF HORIZONTAL CONTRACTION AND VERTICAL PRESSURE SCOUR. THE MAXIMUM SCOUR DEPTH OCCURED DURING THE 50 YR DESIGN STORM UNDER PROPOSED CONDITIONS IS 16.50'.
5. SEE "HYDROLOGY/HYDRAULIC/SCOUR REPORT FOR CEDAR CREEK BRIDGE AND CEDAR CREEK RELIEF #2 BRIDGE" DATED JULY 20TH, 2023 BY ENTECH CIVIL ENGINEERS, INC FOR ADDITIONAL INFORMATION.
6. THE SCOUR CALCULATIONS WERE PERFORMED USING THE TXDOT SCOUR ANALYSIS SPREADSHEET, REVISED SEPTEMBER 25, 2023.



ELEVATION
SCALE: 1"=40'

VERT. 0 10 40

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

ENTECH
CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2 SCOUR ANALYSIS
CEDAR CREEK RELIEF NO. 2

SHEET 1 OF 2

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	52

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DESIGN HYDRAULIC DATA (50-YR)	
CONTRACTION SCOUR	
	INPUT DATA
	CHANNEL
AVERAGE DEPTH U/S (FT):	23.00
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DENSITY OF WATER (SLUG/FT^3):	1.94
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BR AVERAGE DEPTH (FT):	15.2
RESULTS	
SCOUR DEPTH (FT):	14.00

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CRITICAL SHEAR STRESS (LB/FT^2):	0.06
DENSITY OF WATER (SLUG/FT^3):	1.94
MANNING'S N:	0.055
BR AVERAGE DEPTH (FT):	16.00
RESULTS	
SCOUR DEPTH (FT):	13.00

DESIGN HYDRAULIC DATA (50-YR)	
PIER SCOUR	
	INPUT DATA
	CHANNEL
PIER SHAPE:	CIRCULAR CYLINDER
PIER SPACING (FT):	70
DEPTH UPSTREAM OF PIER (FT):	15.20
VELOCITY UPSTREAM OF PIER (FT/S):	10.85
WIDTH OF PIER (FT):	3.00
RESULTS	
SCOUR DEPTH (FT):	2.50

CHECK HYDRAULIC DATA (100-YR)	
PIER SCOUR	
	INPUT DATA
	CHANNEL
PIER SHAPE:	CIRCULAR CYLINDER
PIER SPACING (FT):	70
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RESULTS	
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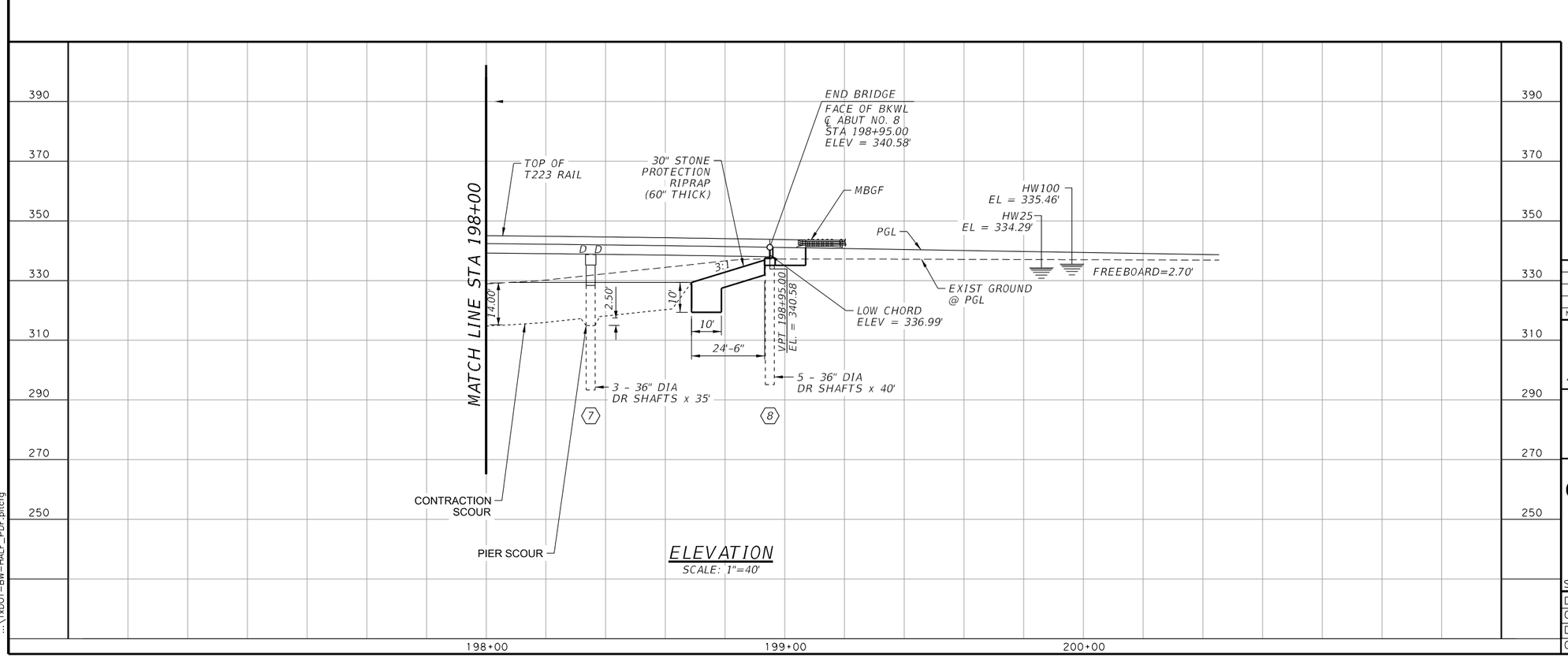

ELEVATION
SCALE: 1"=40'

VERT. 0 10 40

NO.	DATE	REVISION	APPROV.

Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2 SCOUR ANALYSIS
CEDAR CREEK RELIEF NO. 2

SHEET 2 OF 2

DN: ST	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: AV	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: BG	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: AV	DAL	KAUFMAN	1396	01	013,ETC.	53

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SUMMARY OF ESTIMATED QUANTITIES (2)

ITEM / DESCRIPTION	0416 6004	0420 6014	0420 6030	0420 6038	0422 6002	0425 6035	0450 6007	0454 6020
	DRILL SHAFT (36 IN)	CL C CONC (ABUT) (HPC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC) (1)	REINF CONC SLAB (HPC)	PRESTR CONC GIRDER (Tx28)	RAIL (TY T223) (HPC)	SEALED EXPANSION JOINT (4 IN) (SEJ-B)
	LF	CY	CY	CY	SF	LF	LF	LF
ABUTMENTS (1 AND 4)	400	43.8						84
BENTS (2 AND 3)	180		36	18.7				
200.00' PRESTR CONC I-GIRDER UNIT (SPANS 1-3)					8400	992.5	432	
TOTAL	580	43.8	36	18.7	8400	992.5	432	84

(1) COLUMN QUANTITIES ARE BASED ON HEIGHT "H" SHOWN ON BRIDGE LAYOUT. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHT BASED ON FIELD CONDITIONS.

(2) PROP NBI NUMBER: 18-130-0-1396-01-226

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5
ABUT 1 (FWD)	336.363	336.543	336.723	336.543	336.363
	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5
BENT 2 (BK)	336.814	336.994	336.174	336.994	336.814
(FWD)	336.801	336.981	336.161	336.981	336.801
	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5
BENT 3 (BK)	336.885	336.065	336.245	336.065	336.885
(FWD)	336.902	336.082	336.262	336.082	336.902
	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5
ABUT 4 (BK)	336.606	336.786	336.996	336.786	336.606

STATE OF TEXAS
LLOYD M. WOLF
73649
LICENSED
PROFESSIONAL ENGINEER

Lloyd M. Wolf, P.E.
11/14/2023

ENTECH
CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation

Dallas District Bridge

FM 1391
CEDAR CREEK
ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

Sheet 1 of 1 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		54

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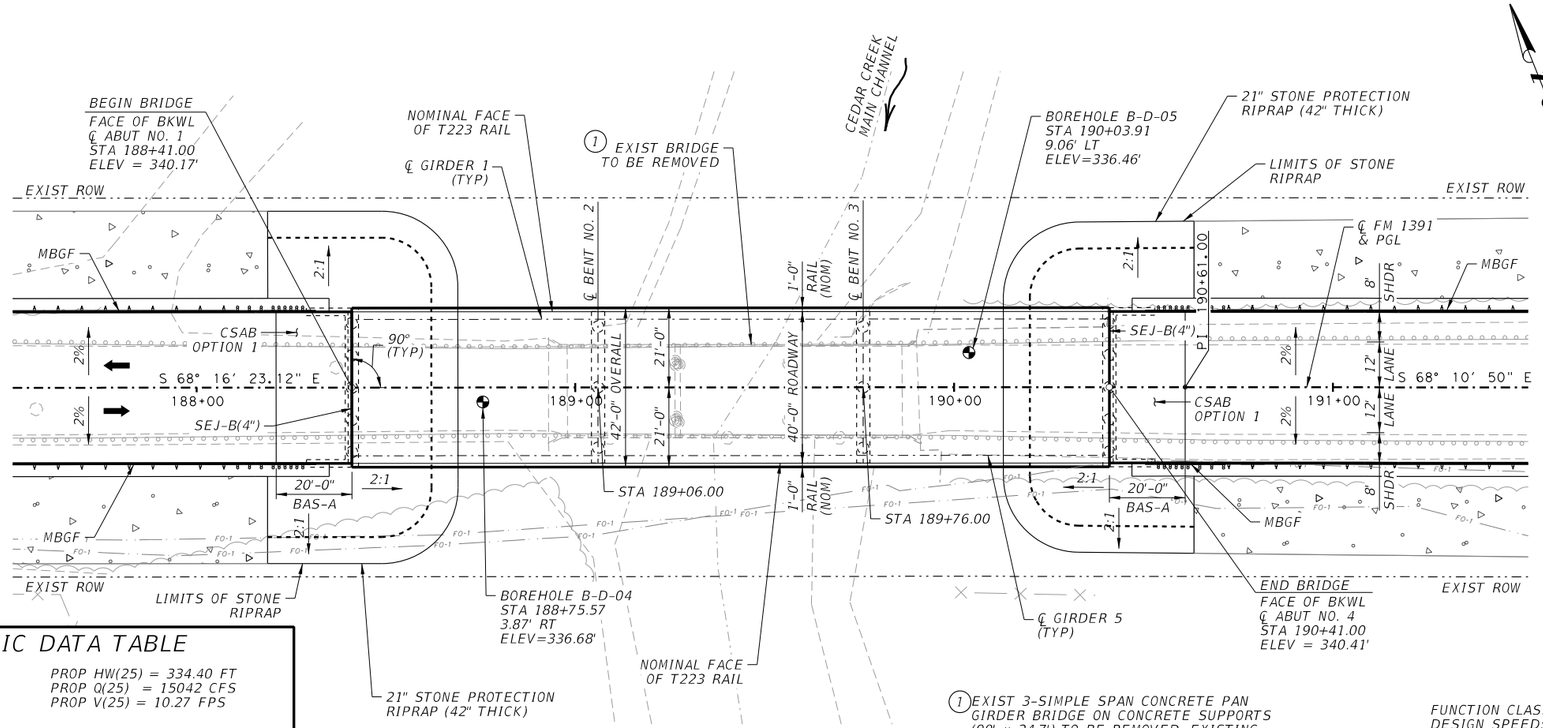


PLAN
SCALE: 1"=40'

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (HL93 LOADING) (9TH EDITION) AND MODIFIED BY THE TXDOT LRFD BRIDGE DESIGN MANUAL AND DETAILING GUIDE.
2. ALL ABUTMENTS & BENTS ARE AT BEARING N 21° 43' 37" E.
3. SHEAR KEYS ARE REQUIRED ON THE UPSTREAM END OF ALL ABUTMENTS AND BENTS. REFER TO IGSK STANDARD FOR DETAILS.
4. "D" DENOTES SLOTTED HOLE AT GIRDER END. SEE BENT DETAILS FOR LOCATIONS OF DOWELS D.
5. "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHT BASED ON FIELD CONDITIONS.
6. CONTRACTOR TO FIELD VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION, EXCAVATION OR DRILLING.
7. SAW-CUT GROOVING OF THE BRIDGE DECK AND APPROACH SLAB IS REQUIRED.
8. BORING LOG LOCATIONS ARE APPROXIMATE
9. SEE ROADWAY PLAN & PROFILE SHEET FOR MBGF & RIPRAP DETAILS.
10. FOUND DRILLED SHAFTS AT THE ELEVATION SHOWN OR DEEPER AS NECESSARY TO PROVIDE 2 SHAFT DIAMETERS OR 10-FT INTO HARD SHALE, WHICHEVER IS GREATER.

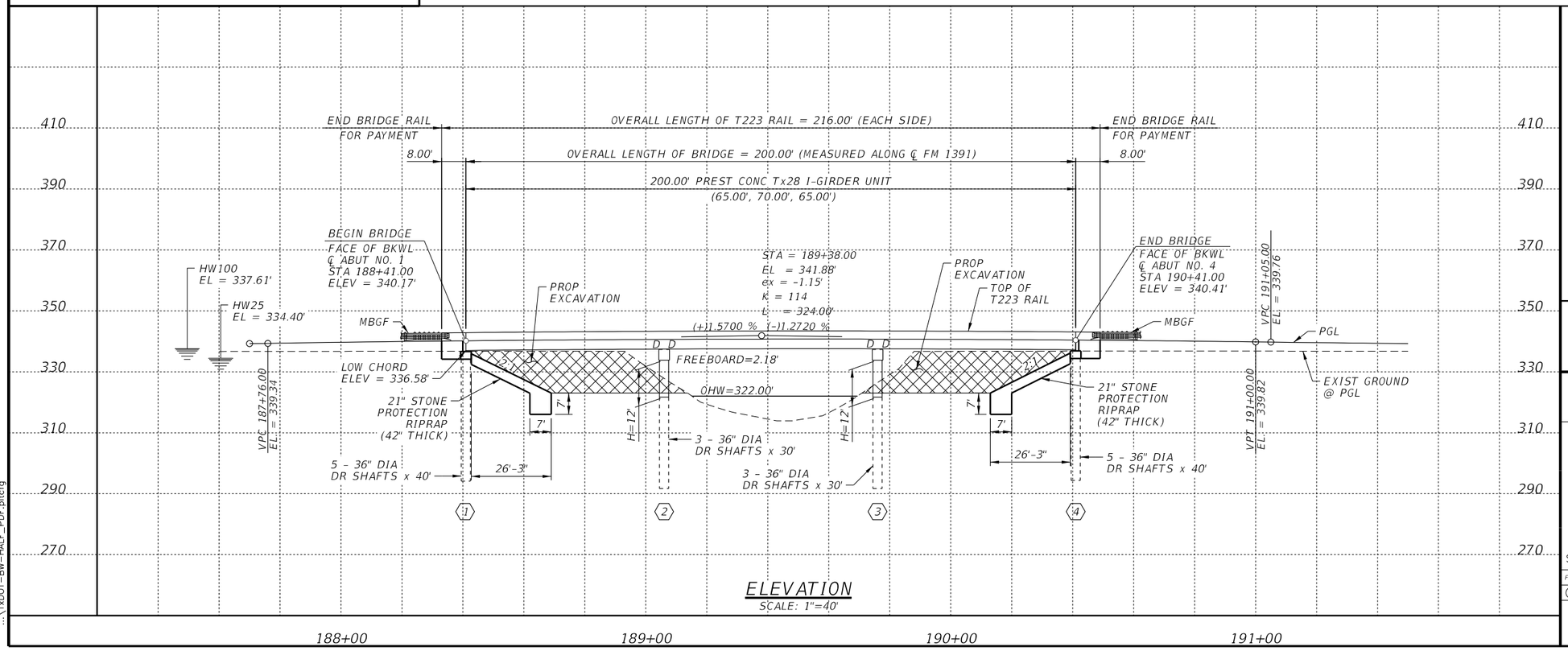
HYDRAULIC DATA TABLE

EXIST HW(25) = 336.89 FT	PROP HW(25) = 334.40 FT
EXIST Q(25) = 16422 CFS	PROP Q(25) = 15042 CFS
EXIST V(25) = 10.44 FPS	PROP V(25) = 10.27 FPS
EXIST HW(100) = 337.97 FT	PROP HW(100) = 337.61 FT
EXIST Q(100) = 28339 CFS	PROP Q(100) = 23677 CFS
EXIST V(100) = 11.60 FPS	PROP V(100) = 1.67 FPS

1 EXIST 3-SIMPLE SPAN CONCRETE PAN GIRDER BRIDGE ON CONCRETE SUPPORTS (90' x 24.7') TO BE REMOVED. EXISTING SUBSTRUCTURE TO BE REMOVED 2' BELOW FINISHED GROUND.

FUNCTION CLASSIFICATION: MINOR COLLECTOR
DESIGN SPEED: 55 MPH
EXISTING ADT: 1,000 (2023)
FUTURE ADT: 1,400 (2043)

EXIST NBI NUMBER: 18-130-0-1396-01-003
PROP NBI NUMBER: 18-130-0-1396-01-226



ELEVATION
SCALE: 1"=40'

Lloyd M. Wolf, P.E.
11/14/2023

HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS: 1.45/1.88

ENTECH CIVIL ENGINEERS, INC
F-6932
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Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

Texas Department of Transportation
Dallas District Bridge

FM 1391
CEDAR CREEK
BRIDGE LAYOUT

Sheet 1 of 1 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		55

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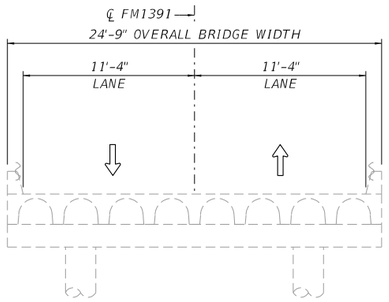
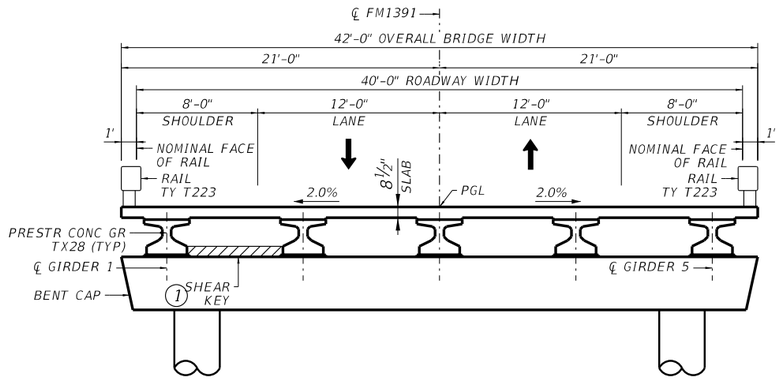
(1) SHEAR KEY ON UPSTREAM SIDE OF ABUTMENTS AND BENTS. SEE IGSK STANDARD FOR DETAILS



EXISTING BRIDGE SECTION
(TO BE REMOVED)



PROPOSED BRIDGE TYPICAL SECTION
STA 188+41 TO STA 190+41

STATE OF TEXAS
LLOYD M. WOLF
73649
LICENSED PROFESSIONAL ENGINEER

Lloyd M. Wolf, P.E.
11/14/2023

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CIVIL ENGINEERS, INC
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Houston, Texas, 77094
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281-945-0081 FX

Texas Department of Transportation

Dallas District Bridge

FM 1391
CEDAR CREEK
TYPICAL SECTIONS

Sheet 1 of 1 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		56

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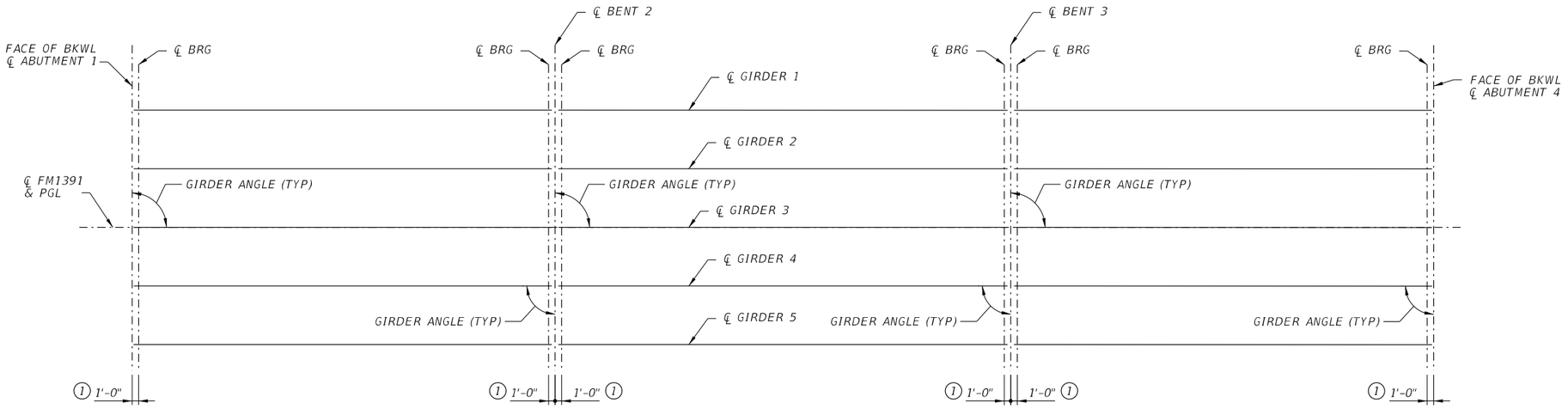

SPAN 1
(Tx28 GIRDERS)

SPAN 2
(Tx28 GIRDERS)

SPAN 3
(Tx28 GIRDERS)

FRAMING PLAN

1. SEE ELASTOMERIC BEARING AND GIRDER END DETAILS (IGEB) STANDARD SHEET FOR ORIENTATION OF DIMENSION.
2. GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

BENT REPORT

ABUT NO. 1 (N 21° 43' 37" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 2 (N 21° 43' 37" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 2	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 3 (N 21° 43' 37" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 2	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 3	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

ABUT NO. 4 (N 21° 43' 37" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 3	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BEAM REPORT

BEAM REPORT, SPAN 1

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER	1	65.000	63.000	64.502	0.0071
GIRDER	2	65.000	63.000	64.502	0.0071
GIRDER	3	65.000	63.000	64.502	0.0071
GIRDER	4	65.000	63.000	64.502	0.0071
GIRDER	5	65.000	63.000	64.502	0.0071

BEAM REPORT, SPAN 2

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER	1	70.000	68.000	69.500	0.0012
GIRDER	2	70.000	68.000	69.500	0.0012
GIRDER	3	70.000	68.000	69.500	0.0012
GIRDER	4	70.000	68.000	69.500	0.0012
GIRDER	5	70.000	68.000	69.500	0.0012

BEAM REPORT, SPAN 3

		HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER	1	65.000	63.000	64.501	-0.0047
GIRDER	2	65.000	63.000	64.501	-0.0047
GIRDER	3	65.000	63.000	64.501	-0.0047
GIRDER	4	65.000	63.000	64.501	-0.0047
GIRDER	5	65.000	63.000	64.501	-0.0047

STATE OF TEXAS
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11/14/2023

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Houston, Texas, 77094
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281-945-0081 FX

Texas Department of Transportation
Dallas District Bridge

FM 1391
CEDAR CREEK
FRAMING PLAN

Sheet 1 of 1 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		57

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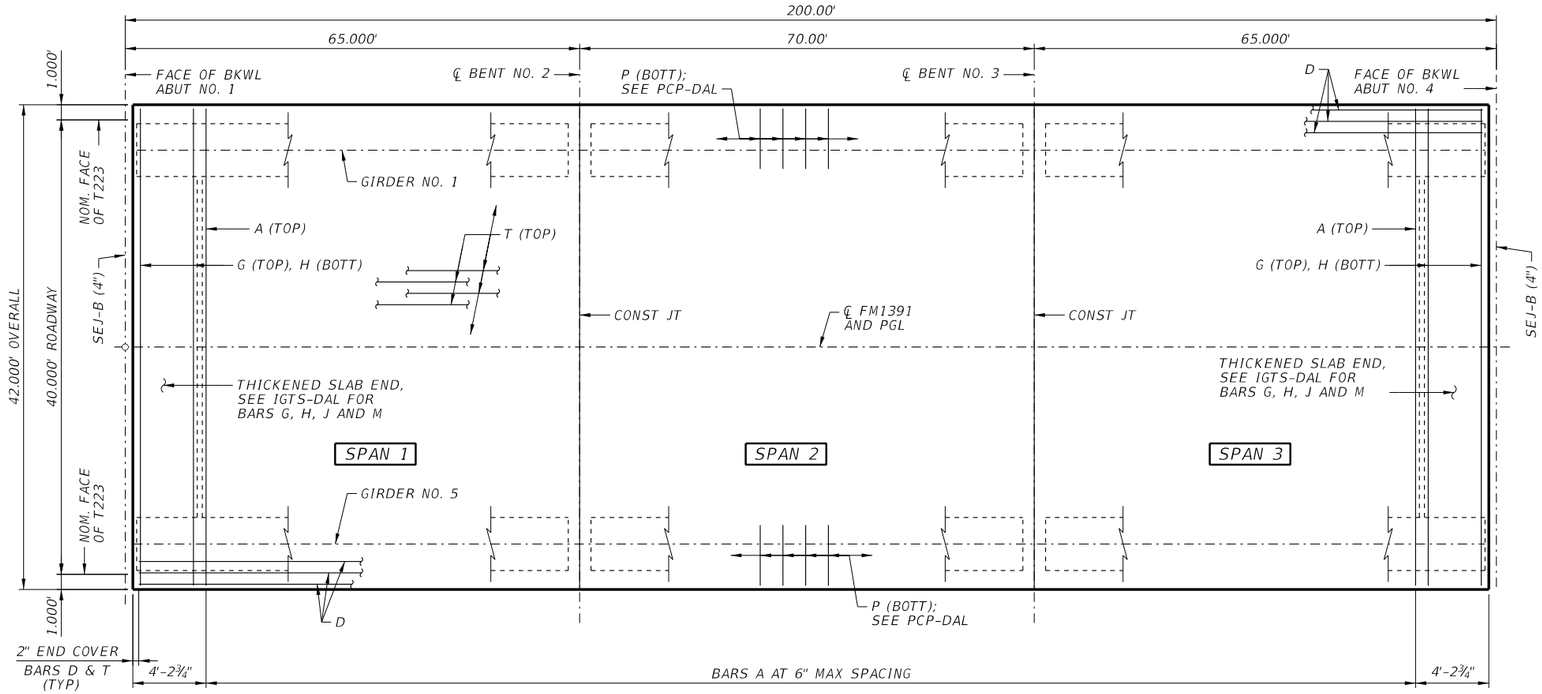


PLAN

BAR TABLE	
BAR	SIZE
A	#5
D	#5
G	#5
H	#5
J	#5
M	#5
P	#4
T	#4
UP	#4

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	① PRESTR CONCRETE BEAMS (TYPE Tx28)	② REINF STEEL
NO.	SF	LF	LB
1	2730	322.5	9282
2	2940	347.5	9996
3	2730	322.5	9282
TOTAL	8400	992.5	28560

① BEAM LENGTHS SHOWN ARE BOTTOM BEAM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE. SEE BEAM LAYOUT FOR BEAM LENGTHS.

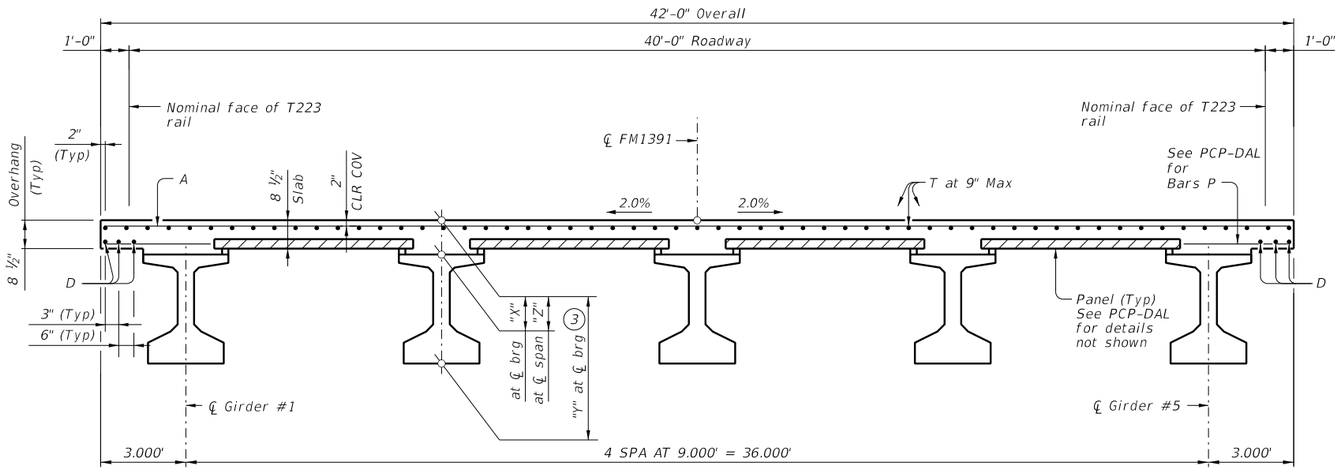
② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPOXIMATE FACTOR OF 3.4 LBS/SF.

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (NOV. 2021).
2. SEE PRESTRESSED CONCRETE PANELS (PCP)-DAL AND PRESTRESSED CONCRETE PANEL FABRICATIONS DETAILS (PCP-FAB) STANDARD SHEET FOR PANEL DETAILS NOT SHOWN.
3. SEE THICKENED SLAB END DETAILS (IGTS)-DAL STANDARD SHEET FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
4. SEE MISCELLANEOUS SLAB DETAILS (IGMS)-DAL STANDARD SHEET FOR MISCELLANEOUS DETAILS.
5. SEE RAILING STANDARD SHEETS FOR RAIL ANCHORAGE IN SLAB.
6. SEE PERMANENT METAL DECK FORMS (PMDF) STANDARD SHEET FOR DETAILS AND QUANTITY ADJUSTMENTS IF THIS OPTION IS USED.
7. COVER DIMENSIONS ARE CLEAR DIMENSION, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

1. PROVIDE CLASS S CONCRETE (f'_c = 4,000 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:
   EPOXY COATED - #4 = 2'-5"
   EPOXY COATED - #5 = 3'-0"



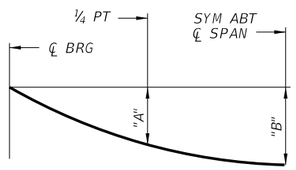
TYPICAL TRANSVERSE SECTION

TABLE OF SECTION DEPTHS

SPAN NO.	BEAM NO.	"X" AT ℄ BRG	"Y" AT ℄ BRG	"Z " AT ℄ SPAN ③
1 & 3	1 & 5	10¾	3'-2¾"	9½"
1 & 3	2-4	10¾	3'-2¾"	9⅝"
2	1 & 5	11"	3'-3"	9½"
2	2-4	11"	3'-3"	9¾"

③ THEORETICAL DIMENSION

SPAN NO.	BEAM NO.	"A"	"B"
		FT	FT
1 & 3	1 & 5	0.063	0.089
1 & 3	2-4	0.075	0107
2	1 & 5	0.085	0.121
2	2-4	0.102	0.145



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO CONCRETE SLAB ONLY ($E_c = 5x10^6$PSI). CALCULATED DEFLECTIONS SHOWN ARE THEORETICAL AND ACTUAL DIMENSION MAY BE LESS. DEFLECTIONS TO BE ADJUSTED BASED ON FIELD OBSERVATIONS.

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FM 1391
CEDAR CREEK
SLAB DETAILS

Sheet 1 of 1 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		58

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DRILLING LOG

WinCore Version 3.3

County	Kaufman	Hole	B-D-04	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	1-25-23
CSJ	1396-01-013	Station	188+75.57	Grnd. Elev.	336.68 ft
		Offset	3.87' RT	GW Elev.	317.68 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
		4 (6) 4 (6)	CLAY, Lean Clay w/ Sand, Dk. Grayish Brown, w/ Calcareous Nodules, Med. Stiff, Moist (CL)			23.3	35	19		
5										
		6 (6) 6 (6)				15.3				-200 = 73.8%
10										
321.7 15		7 (6) 7 (6)				23.7	71	54		-200 = 90.2%
			CLAY, Fat Clay, Dk. Grayish Brown, Stiff, Moist to Wet (CH)							
20		8 (6) 9 (6)				25.7				-200 = 94.1%
311.7 25		7 (6) 8 (6)				26.9	49	28		
			CLAY, Sandy Lean Clay, Dk. Grayish Brown to Lt. Grayish Brown, Stiff, Wet (CL)							
30		9 (6) 10 (6)				22.1				-200 = 50.0%
301.7 35		50 (1.5) 50 (1.5)				22.4	51	39		
			SHALE, Shale, Grayish Brown to Gray, Hard, Wet (Comprised of Fat Clay) (CH)							
40		50 (1.5) 50 (1.5)				47				-200 = 92.5%
45		50 (1) 50 (0.5)				52.2	71	48		
50		50 (1) 50 (0.5)				51.8				-200 = 97.9%
55		50 (1) 50 (1)				51.5	64	43		
60		50 (1.5) 50 (0.5)				62.6				-200 = 94.1%

Remarks: XY Coord. - 2685450.4768, 6850159.1290 (Provided By Client), Asphalt Thickness = 6 inch, Base = 8 inch

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: NR **Logger:** RR **Organization:** B2Z Engineering

B:\JOBS\Entech\TxDOT 36-8IDP5072 - On & Off-System Bridge PS&E - Statewide & Houston\WA#2 (Entech WA#4) - Kaufman County\TechProd\Borings\Info from Lab\8. Wincore\D - FM 1391\B-D-04 & B-D-05.CLG

DRILLING LOG

WinCore Version 3.3

County	Kaufman	Hole	B-D-04	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	1-25-23
CSJ	1396-01-013	Station	188+75.57	Grnd. Elev.	336.68 ft
		Offset	3.87' RT	GW Elev.	317.68 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
		50 (1.5) 50 (0.5)	SHALE, Shale, Grayish Brown to Gray, Hard, Wet (Comprised of Fat Clay) (CH)			50.2	63	42		
65										
		50 (1) 50 (0.5)				52.7				-200 = 98.2%
70										
261.7 75		50 (1) 50 (0.5)				56.2	58	37		
80										
85										
90										
95										
100										
105										
110										
115										
120										

Remarks: XY Coord. - 2685450.4768, 6850159.1290 (Provided By Client), Asphalt Thickness = 6 inch, Base = 8 inch

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Driller: NR **Logger:** RR **Organization:** B2Z Engineering

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Dallas District Bridge

FM 1391
CEDAR CREEK
BORING LOGS

Sheet 1 of 2 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		59

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DRILLING LOG

WinCore Version 3.3

County	Kaufman	Hole	B-D-05	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	1-23-23
CSJ	1396-01-013	Station	190+03.91	Grnd. Elev.	336.46 ft
		Offset	9.06' LT	GW Elev.	311.46 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CLAY, Sandy Lean Clay, Dk. Brown to Dk. Grayish Brown, Stiff to Med. Stiff, Moist (CL)							
5		9 (6) 9 (6)				13.1				-200 = 67.5%
10		7 (6) 5 (6)				12.7	27	9		
321.5 15		6 (6) 7 (6)				22.1				-200 = 79.5%
			CLAY, Fat Clay w/ Sand, Dk. Grayish Brown to Gray, Med. Stiff to Stiff, Moist to Wet (CH)							
20		8 (6) 10 (6)				20.6	51	32		-200 = 83.1%
25		7 (6) 8 (6)				21.7				-200 = 78.2%
306.5 30		7 (6) 9 (6)				29.6	43	26		
			CLAY, Lean Clay w/ Sand, Grayish Brown, Stiff, Wet (CL)							
301.5 35		50 (1) 50 (0.5)				27.6				-200 = 82.9%
			SHALE, Shale, Grayish Brown to Gray to Dark Gray, Hard, Wet (Comprised of Fat Clay w/ Sand and Fat Clay) (CH)							
40		50 (1) 50 (0.5)				47.2	52	35		
45		50 (1.5) 50 (0.5)				46.1				-200 = 94.9%
50		50 (1) 50 (0.5)				52.6	60	43		
55		50 (1) 50 (0.5)				50.3				-200 = 97.1%
60		50 (1) 50 (0.5)				56.7	71	44		

Remarks: XY Coord. - 2685574.5090, 6850123.6515 (Provided By Client), Asphalt Thickness = 11 inch, Base = 12 inch

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: NR **Logger: RR** **Organization: B2Z Engineering**

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DRILLING LOG

WinCore Version 3.3

County	Kaufman	Hole	B-D-05	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	1-23-23
CSJ	1396-01-013	Station	190+03.91	Grnd. Elev.	336.46 ft
		Offset	9.06' LT	GW Elev.	311.46 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SHALE, Shale, Grayish Brown to Gray to Dark Gray, Hard, Wet (Comprised of Fat Clay w/ Sand and Fat Clay) (CH)							
65		50 (1) 50 (0.5)				55.7				-200 = 94.5%
70		50 (1) 50 (0.5)				49.6	56	35		
261.5 75		50 (1) 50 (0.5)				64.8				-200 = 95.8%
80										
85										
90										
95										
100										
105										
110										
115										
120										

Remarks: XY Coord. - 2685574.5090, 6850123.6515 (Provided By Client), Asphalt Thickness = 11 inch, Base = 12 inch

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: NR **Logger: RR** **Organization: B2Z Engineering**

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FM 1391
CEDAR CREEK
BORING LOGS

Sheet 2 of 2 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
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REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		60

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SUMMARY OF ESTIMATED QUANTITIES (2)

ITEM / DESCRIPTION	0416 6004	0420 6014	0420 6030	0420 6038	0422 6002	0425 6035	0450 6007	0454 6020
	DRILL SHAFT (36 IN)	CL C CONC (ABUT) (HPC)	CL C CONC (CAP) (HPC)	CL C CONC (COLUMN) (HPC) (1)	REINF CONC SLAB (HPC)	PRESTR CONC GIRDER (Tx28)	RAIL (TY T223) (HPC)	SEALED EXPANSION JOINT (4 IN) (SEJ-B)
	LF	CY	CY	CY	SF	LF	LF	LF
ABUTMENTS (1 AND 8)	400	43.8						
BENTS (2 - 7)	570		108	43.7				
120' PRESTR CONC I-GIRDER UNIT 1(SPANS 1-2)					5040	595	264	42
200' PRESTR CONC I-GIRDER UNIT 2(SPANS 3-5)					8400	992.5	400	84
120' PRESTR CONC I-GIRDER UNIT 3(SPANS 6-7)					5040	595	264	42
TOTAL	970	43.8	108	43.7	18480	2182.5	928	168

(1) COLUMN QUANTITIES ARE BASED ON HEIGHT "H" SHOWN ON BRIDGE LAYOUT. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHT BASED ON FIELD CONDITIONS.

(2) PROP NBI NUMBER: 18-130-0-1396-01-227

BEARING SEAT ELEVATIONS

	BEAM 1	BEAM 2	BEAM 3	BEAM 4	BEAM 5
ABUT 1 (FWD)	336.755	336.935	337.115	336.935	336.755
BENT 2 (BK)	337.574	337.754	337.934	337.754	337.574
(FWD)	337.598	337.778	337.958	337.778	337.598
BENT 3 (BK)	338.158	338.338	338.518	338.338	338.158
(FWD)	338.173	338.353	338.533	338.353	338.173
BENT 4 (BK)	338.488	338.668	338.848	338.668	338.488
(FWD)	338.493	338.673	338.853	338.673	338.493
BENT 5 (BK)	338.490	338.670	338.850	338.670	338.490
(FWD)	338.484	338.664	338.844	338.664	338.484
BENT 6 (BK)	338.164	338.344	338.524	338.344	338.164
(FWD)	338.149	338.329	338.509	338.329	338.149
BENT 7 (BK)	337.584	337.764	337.944	337.764	337.584
(FWD)	337.560	337.740	337.920	337.740	337.560
ABUT 8 (BK)	336.735	336.915	337.095	336.915	336.735

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FM 1391
CEDAR CREEK RELIEF NO. 2
ESTIMATED QUANTITIES & BEARING SEAT ELEVATIONS

Sheet I of I Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		61

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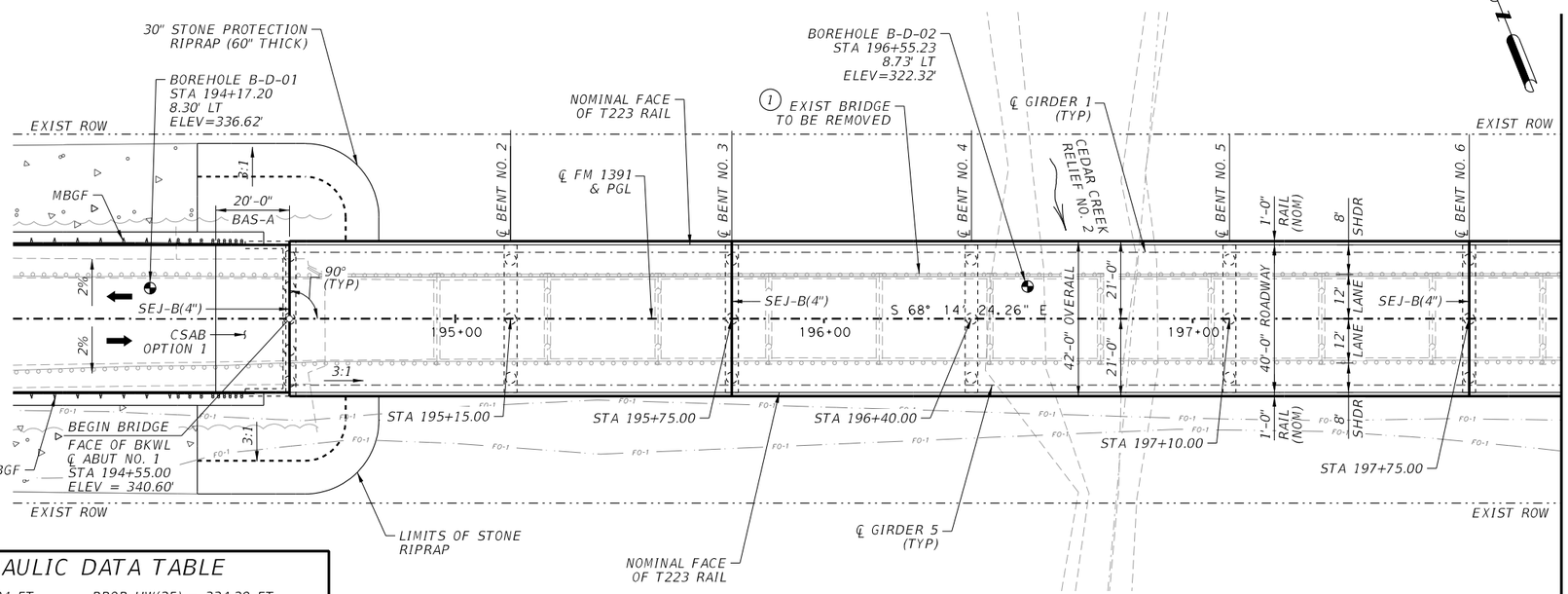


PLAN
SCALE: 1"=40'

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS (HL93 LOADING) (9TH EDITION) AND MODIFIED BY THE TXDOT LRFD BRIDGE DESIGN MANUAL AND DETAILING GUIDE.
2. ALL ABUTMENTS & BENTS ARE AT BEARING N 21° 45' 36" E.
3. SHEAR KEYS ARE REQUIRED ON THE UPSTREAM END OF ALL ABUTMENTS AND BENTS. REFER TO IGSK STANDARD FOR DETAILS.
4. "D" DENOTES SLOTTED HOLE AT GIRDER END. SEE BENT DETAILS FOR LOCATIONS OF DOWELS D.
5. "H" VALUES SHOWN ARE ESTIMATED COLUMN HEIGHTS. CONTRACTOR IS RESPONSIBLE FOR CALCULATING ACTUAL COLUMN HEIGHT BASED ON FIELD CONDITIONS.
6. CONTRACTOR TO FIELD VERIFY LOCATIONS OF ALL UTILITIES PRIOR TO CONSTRUCTION, EXCAVATION OR DRILLING.
7. SAW-CUT GROOVING OF THE BRIDGE DECK AND APPROACH SLAB IS REQUIRED.
8. BORING LOG LOCATIONS ARE APPROXIMATE
9. SEE ROADWAY PLAN & PROFILE SHEET FOR MBGF & RIPRAP DETAILS.
10. FOUND DRILLED SHAFTS AT THE ELEVATION SHOWN OR DEEPER AS NECESSARY TO PROVIDE 2 SHAFT DIAMETERS OR 10-FT INTO HARD SHALE, WHICHEVER IS GREATER.

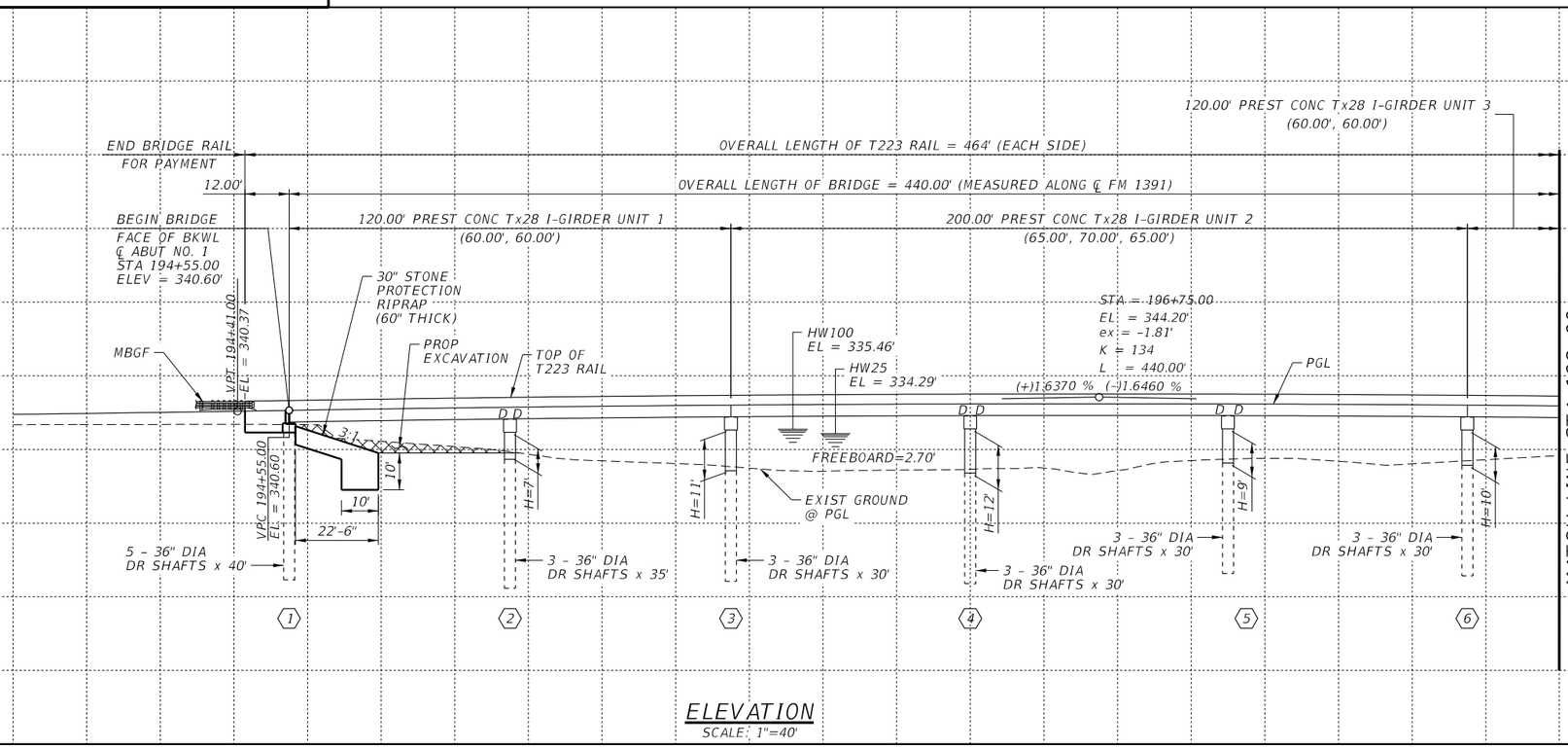
HYDRAULIC DATA TABLE

EXIST HW(25) = 336.84 FT	PROP HW(25) = 334.29 FT
EXIST Q(25) = 31392 CFS	PROP Q(25) = 33402 CFS
EXIST V(25) = 9.89 FPS	PROP V(25) = 10.31 FPS
EXIST HW(100) = 337.89 FT	PROP HW(100) = 335.46 FT
EXIST Q(100) = 38458 CFS	PROP Q(100) = 41651 CFS
EXIST V(100) = 10.97 FPS	PROP V(100) = 11.13 FPS

1 EXIST 14-SIMPLE SPAN CONCRETE PAN GIRDER BRIDGE ON CONCRETE SUPPORTS (420' x 24.7') TO BE REMOVED. EXISTING SUBSTRUCTURE TO BE REMOVED 2' BELOW FINISHED GROUND.

FUNCTION CLASSIFICATION: MINOR COLLECTOR
DESIGN SPEED: 55 MPH
EXISTING ADT: 1,000 (2023)
FUTURE ADT: 1,400 (2043)

EXIST NBI NUMBER: 18-130-0-1396-01-002
PROP NBI NUMBER: 18-130-0-1396-01-227



ELEVATION
SCALE: 1"=40'

STATE OF TEXAS
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PROFESSIONAL ENGINEER
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11/14/2023

HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS: 1.35/1.76

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Dallas District Bridge

FM 1391
CEDAR CREEK RELIEF NO. 2
BRIDGE LAYOUT

Sheet 1 of 2 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		62

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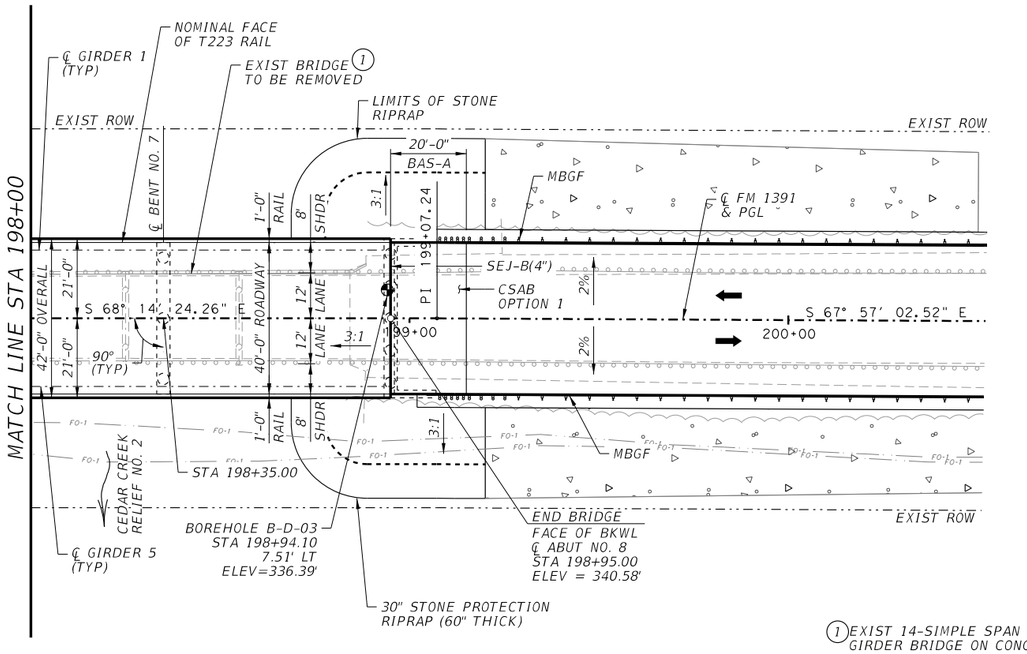
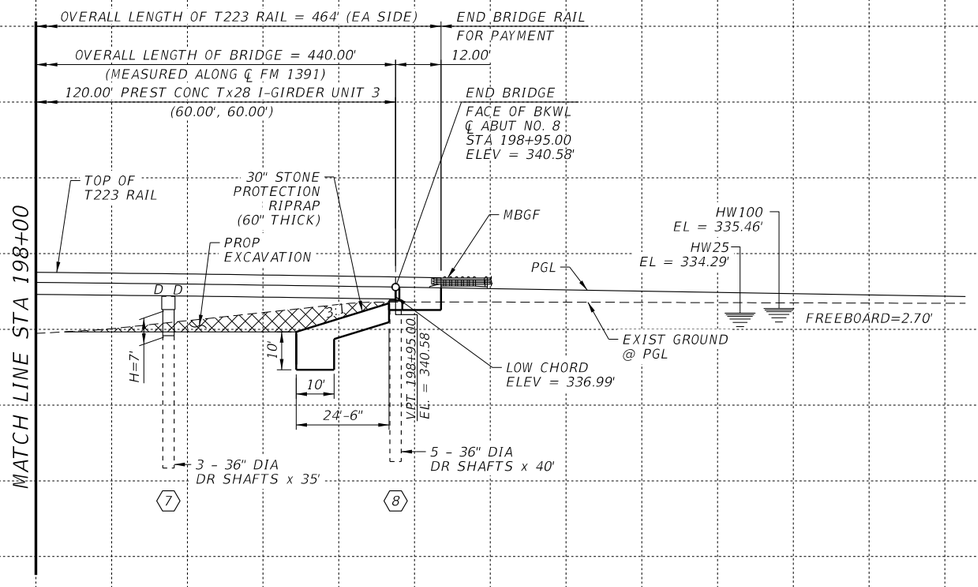


PLAN
SCALE: 1"=40'

1 EXIST 14-SIMPLE SPAN CONCRETE PAN GIRDER BRIDGE ON CONCRETE SUPPORTS (420' x 24.7') TO BE REMOVED. EXISTING SUBSTRUCTURE TO BE REMOVED 2' BELOW FINISHED GROUND.

FUNCTION CLASSIFICATION: MINOR COLLECTOR
DESIGN SPEED: 55 MPH
EXISTING ADT: 1,000 (2023)
FUTURE ADT: 1,400 (2043)

EXIST NBI NUMBER: 18-130-0-1396-01-002
PROP NBI NUMBER: 18-130-0-1396-01-227



ELEVATION
SCALE: 1"=40'

HL93 LOADING
SUPERSTRUCTURE INV/OPR RATINGS: 1.35/1.76

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11/14/2023

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FM 1391
CEDAR CREEK RELIEF NO. 2
BRIDGE LAYOUT

Sheet 2 of 2 Sheets

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	DAL	KAUFMAN		63

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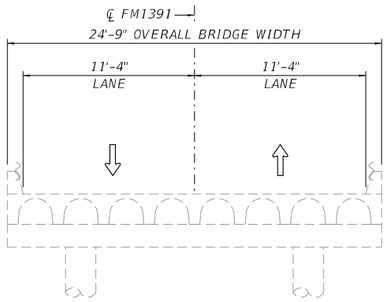
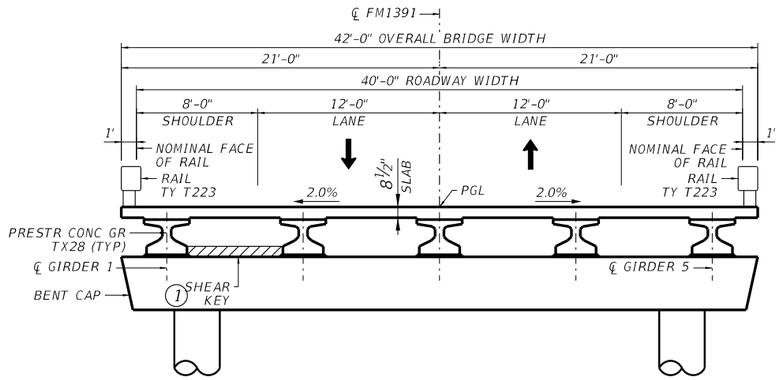
(1) SHEAR KEY ON UPSTREAM SIDE OF ABUTMENTS AND BENTS. SEE IGSK STANDARD FOR DETAILS



EXISTING BRIDGE SECTION
(TO BE REMOVED)



PROPOSED BRIDGE TYPICAL SECTION
STA 194+55 TO STA 198+95

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FM 1391
CEDAR CREEK RELIEF NO. 2
TYPICAL SECTIONS

Sheet 1 of 1 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		64

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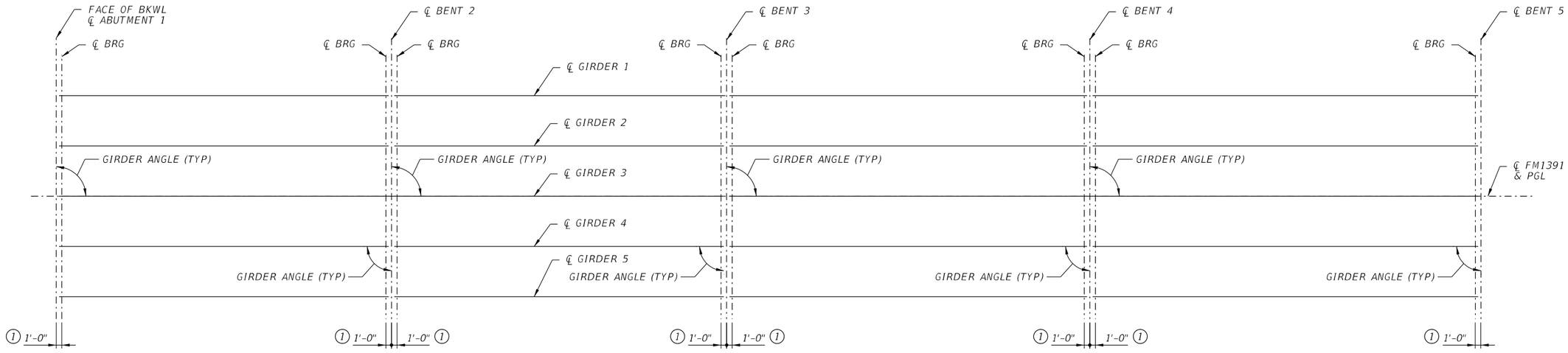

SPAN 1
(Tx28 GIRDERS)

SPAN 2
(Tx28 GIRDERS)

SPAN 3
(Tx28 GIRDERS)

SPAN 4
(Tx28 GIRDERS)

1. SEE ELASTOMERIC BEARING AND GIRDER END DETAILS (IGEB) STANDARD SHEET FOR ORIENTATION OF DIMENSION.
2. GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

FRAMING PLAN - UNIT 1 & 2

BENT REPORT

ABUT NO. 1 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 2 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 2	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 3 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 2	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 3	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 4 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 3	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 4	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 5 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 4	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	60.000	58.000	59.506	0.0141
GIRDER 2	60.000	58.000	59.506	0.0141
GIRDER 3	60.000	58.000	59.506	0.0141
GIRDER 4	60.000	58.000	59.506	0.0141
GIRDER 5	60.000	58.000	59.506	0.0141

BEAM REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	60.000	58.000	59.503	0.0097
GIRDER 2	60.000	58.000	59.503	0.0097
GIRDER 3	60.000	58.000	59.503	0.0097
GIRDER 4	60.000	58.000	59.503	0.0097
GIRDER 5	60.000	58.000	59.503	0.0097

BEAM REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	65.000	63.000	64.501	0.0050
GIRDER 2	65.000	63.000	64.501	0.0050
GIRDER 3	65.000	63.000	64.501	0.0050
GIRDER 4	65.000	63.000	64.501	0.0050
GIRDER 5	65.000	63.000	64.501	0.0050

BEAM REPORT, SPAN 4

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	70.000	68.000	69.500	0.0000
GIRDER 2	70.000	68.000	69.500	0.0000
GIRDER 3	70.000	68.000	69.500	0.0000
GIRDER 4	70.000	68.000	69.500	0.0000
GIRDER 5	70.000	68.000	69.500	0.0000

STATE OF TEXAS
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CEDAR CREEK RELIEF NO. 2
FRAMING PLAN

Sheet 1 of 2 Sheets

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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		65

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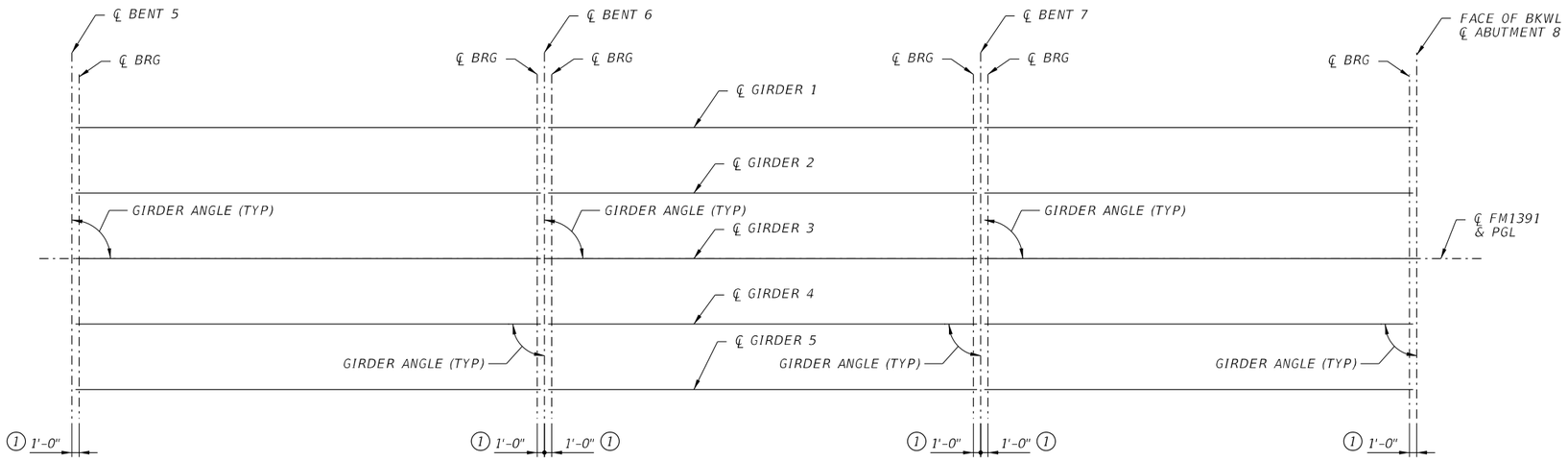

SPAN 5
(Tx28 GIRDERS)

SPAN 6
(Tx28 GIRDERS)

SPAN 7
(Tx28 GIRDERS)

FRAMING PLAN - UNIT 3

1. SEE ELASTOMERIC BEARING AND GIRDER END DETAILS (IGEB) STANDARD SHEET FOR ORIENTATION OF DIMENSION.
2. GIRDER LENGTHS SHOWN ARE BOTTOM GIRDER FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR GIRDER SLOPE.

BENT REPORT

BENT NO. 5 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 5	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 6 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 5	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 6	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BENT NO. 7 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 6	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			
SPAN 7	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

ABUT NO. 8 (N 21° 45' 36" E.)
DISTANCE BETWEEN STATION LINE AND BEAM 1, 18.00 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 7	GIRDER	1	0.000	90	00	00.00
	GIRDER	2	9.000	90	00	00.00
	GIRDER	3	9.000	90	00	00.00
	GIRDER	4	9.000	90	00	00.00
	GIRDER	5	9.000	90	00	00.00
	TOTAL		36.000			

BEAM REPORT

BEAM REPORT, SPAN 5

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	65.000	63.000	64.501	-0.0051
GIRDER 2	65.000	63.000	64.501	-0.0051
GIRDER 3	65.000	63.000	64.501	-0.0051
GIRDER 4	65.000	63.000	64.501	-0.0051
GIRDER 5	65.000	63.000	64.501	-0.0051

BEAM REPORT, SPAN 6

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	60.000	58.000	59.503	-0.0097
GIRDER 2	60.000	58.000	59.503	-0.0097
GIRDER 3	60.000	58.000	59.503	-0.0097
GIRDER 4	60.000	58.000	59.503	-0.0097
GIRDER 5	60.000	58.000	59.503	-0.0097

BEAM REPORT, SPAN 7

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG.(2)	BEAM SLOPE
GIRDER 1	60.000	58.000	59.506	-0.0142
GIRDER 2	60.000	58.000	59.506	-0.0142
GIRDER 3	60.000	58.000	59.506	-0.0142
GIRDER 4	60.000	58.000	59.506	-0.0142
GIRDER 5	60.000	58.000	59.506	-0.0142

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FRAMING PLAN

Sheet 2 of 2 Sheets

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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		66

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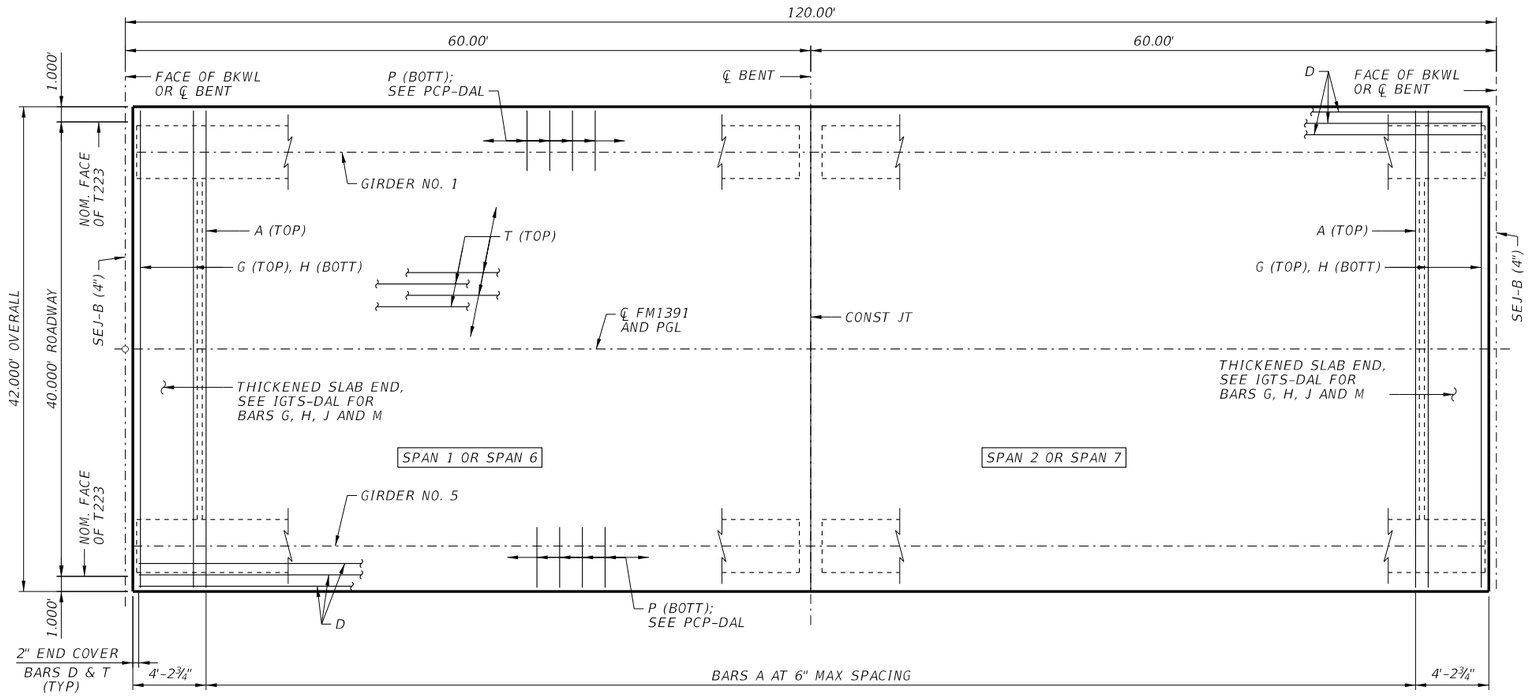


PLAN - UNIT 1 & 3

BAR TABLE	
BAR	SIZE
A	#5
D	#5
G	#5
H	#5
J	#5
M	#5
P	#4
T	#4
UP	#4

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	① PRESTR CONCRETE BEAMS (TYPE Tx28)	② REINF STEEL
NO.	SF	LF	LB
1	2520	297.5	8568
2	2520	297.5	8568
3	2730	322.5	9996
4	2940	347.5	6762
5	2730	322.5	9282
6	2520	297.5	8568
7	2520	297.5	8568
TOTAL	18480	2182.5	60312

① BEAM LENGTHS SHOWN ARE BOTTOM BEAM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE. SEE BEAM LAYOUT FOR BEAM LENGTHS.

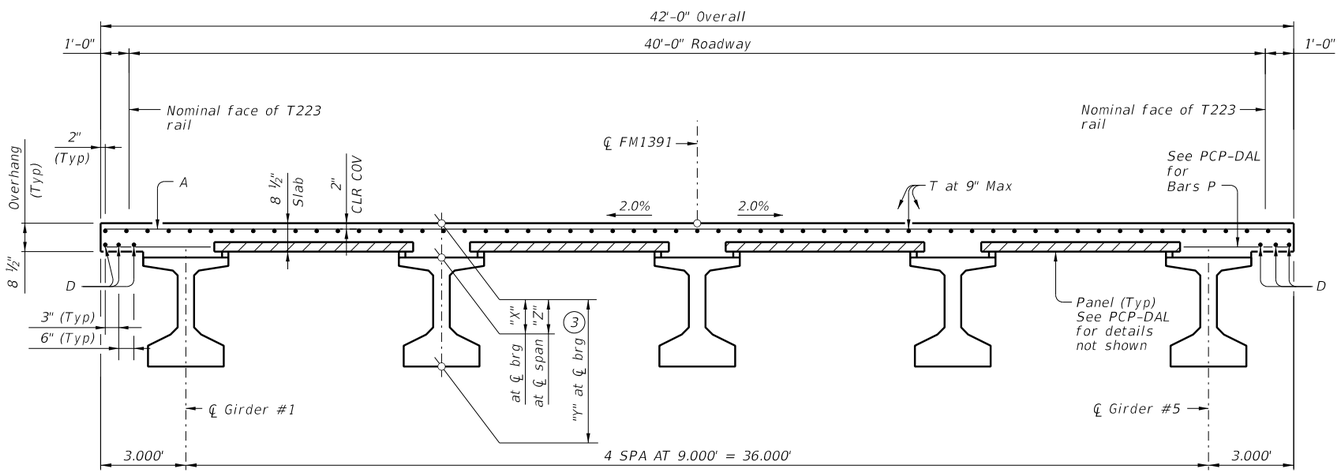
② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPOXIMATE FACTOR OF 3.4 LBS/SF.

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (NOV. 2021).
2. SEE PRESTRESSED CONCRETE PANELS (PCP)-DAL AND PRESTRESSED CONCRETE PANEL FABRICATIONS DETAILS (PCP-FAB) STANDARD SHEET FOR PANEL DETAILS NOT SHOWN.
3. SEE THICKENED SLAB END DETAILS (IGTS)-DAL STANDARD SHEET FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
4. SEE MISCELLANEOUS SLAB DETAILS (IGMS)-DAL STANDARD SHEET FOR MISCELLANEOUS DETAILS.
5. SEE RAILING STANDARD SHEETS FOR RAIL ANCHORAGE IN SLAB.
6. SEE PERMANENT METAL DECK FORMS (PMDF) STANDARD SHEET FOR DETAILS AND QUANTITY ADJUSTMENTS IF THIS OPTION IS USED.
7. COVER DIMENSIONS ARE CLEAR DIMENSION, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

1. PROVIDE CLASS S CONCRETE (f'_c = 4,000 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:
   EPOXY COATED - #4 = 2'-5"
   EPOXY COATED - #5 = 3'-0"



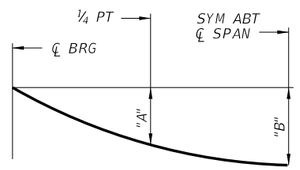
TYPICAL TRANSVERSE SECTION

TABLE OF SECTION DEPTHS

SPAN NO.	BEAM NO.	"X" AT ℄ BRG	"Y" AT ℄ BRG	"Z" AT ℄ SPAN ③
1-2 & 6-7	1 & 5	11¼"	3'-3¼"	10⅛"
1-2 & 6-7	2-3	11¼"	3'-3¼"	10¼"
3 & 5	1 & 5	11¼"	3'-3¼"	9⅞"
3 & 5	2-3	11¼"	3'-3¼"	10⅛"
4	1 & 5	11¼"	3'-3¼"	9⅝"
4	2-3	11¼"	3'-3¼"	9⅞"

③ THEORETICAL DIMENSION

SPAN NO.	BEAM NO.	"A" FT	"B" FT
1-2 & 6-7	1 & 5	0.045	0.064
1-2 & 6-7	2-3	0.054	0.077
3 & 5	1 & 5	0.063	0.089
3 & 5	2-3	0.075	0107
4	1 & 5	0.085	0.121
4	2-3	0.102	0.145



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO CONCRETE SLAB ONLY (Ec = $5x10^6$PSI). CALCULATED DEFLECTIONS SHOWN ARE THEORETICAL AND ACTUAL DIMENSION MAY BE LESS. DEFLECTIONS TO BE ADJUSTED BASED ON FIELD OBSERVATIONS.

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FM 1391
CEDAR CREEK RELIEF NO. 2
SLAB DETAILS

Sheet 1 of 2 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		67

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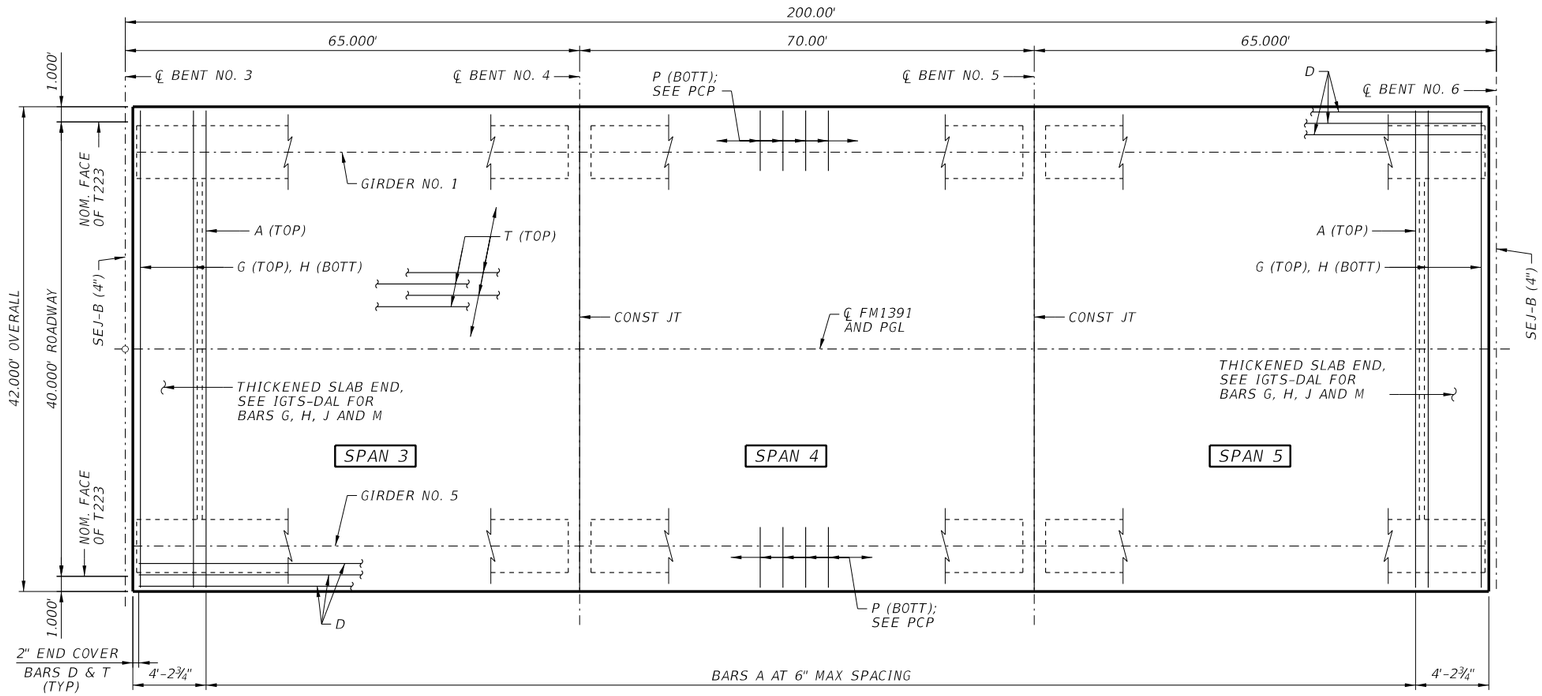


PLAN - UNIT 2

BAR TABLE	
BAR	SIZE
A	#5
D	#5
G	#5
H	#5
J	#5
M	#5
P	#4
T	#4
UP	#4

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONCRETE SLAB	① PRESTR CONCRETE BEAMS (TYPE Tx28)	② REINF STEEL
NO.	SF	LF	LB
1	2520	297.5	8568
2	2520	297.5	8568
3	2730	322.5	9996
4	2940	347.5	6762
5	2730	322.5	9282
6	2520	297.5	8568
7	2520	297.5	8568
TOTAL	18480	2182.5	60312

① BEAM LENGTHS SHOWN ARE BOTTOM BEAM FLANGE LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE. SEE BEAM LAYOUT FOR BEAM LENGTHS.

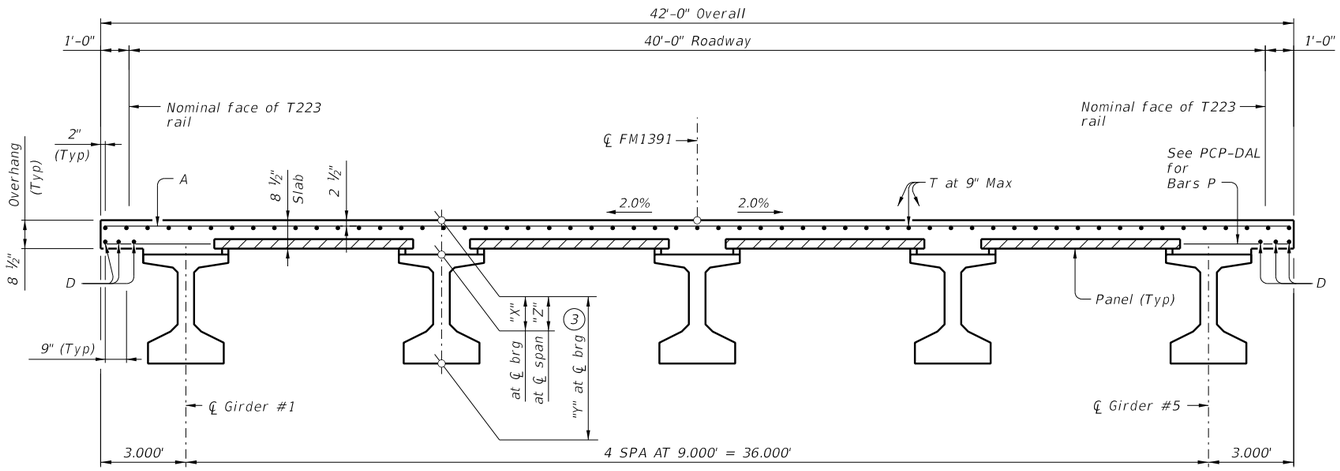
② REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPOXIMATE FACTOR OF 3.4 LBS/SF.

GENERAL NOTES:

1. DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATION, 9th EDITION (2020) AND TXDOT BRIDGE DESIGN MANUAL (NOV. 2021).
2. SEE PRESTRESSED CONCRETE PANELS (PCP)-DAL AND PRESTRESSED CONCRETE PANEL FABRICATIONS DETAILS (PCP-FAB) STANDARD SHEET FOR PANEL DETAILS NOT SHOWN.
3. SEE THICKENED SLAB END DETAILS (IGTS)-DAL STANDARD SHEET FOR THICKENED SLAB END DETAILS AND QUANTITY ADJUSTMENTS.
4. SEE MISCELLANEOUS SLAB DETAILS (IGMS)-DAL STANDARD SHEET FOR MISCELLANEOUS DETAILS.
5. SEE RAILING STANDARD SHEETS FOR RAIL ANCHORAGE IN SLAB.
6. SEE PERMANENT METAL DECK FORMS (PMDF) STANDARD SHEET FOR DETAILS AND QUANTITY ADJUSTMENTS IF THIS OPTION IS USED.
7. COVER DIMENSIONS ARE CLEAR DIMENSION, UNLESS NOTED OTHERWISE.

MATERIAL NOTES:

1. PROVIDE CLASS S CONCRETE (f'_c = 4,000 PSI)
2. PROVIDE GRADE 60 REINFORCING STEEL.
3. PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:
   EPOXY COATED - #4 = 2'-5"
   EPOXY COATED - #5 = 3'-0"



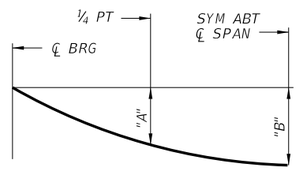
TYPICAL TRANSVERSE SECTION

TABLE OF SECTION DEPTHS

SPAN NO.	BEAM NO.	"X" AT ℄ BRG	"Y" AT ℄ BRG	"Z " AT ℄ SPAN ③
1-2 & 6-7	1 & 5	11¼"	3'-3¼"	10⅛"
1-2 & 6-7	2-3	11¼"	3'-3¼"	10¼"
3 & 5	1 & 5	11¼"	3'-3¼"	9⅞"
3 & 5	2-3	11¼"	3'-3¼"	10⅛"
4	1 & 5	11¼"	3'-3¼"	9⅝"
4	2-3	11¼"	3'-3¼"	9⅞"

③ THEORETICAL DIMENSION

SPAN NO.	BEAM NO.	"A" FT	"B" FT
1-2 & 6-7	1 & 5	0.045	0.064
1-2 & 6-7	2-3	0.054	0.077
3 & 5	1 & 5	0.063	0.089
3 & 5	2-3	0.075	0107
4	1 & 5	0.085	0.121
4	2-3	0.102	0.145



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO CONCRETE SLAB ONLY (Ec = $5x10^6$PSI). CALCULATED DEFLECTIONS SHOWN ARE THEORETICAL AND ACTUAL DIMENSION MAY BE LESS. DEFLECTIONS TO BE ADJUSTED BASED ON FIELD OBSERVATIONS.

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FM 1391
CEDAR CREEK RELIEF NO. 2
SLAB DETAILS

Sheet 2 of 2 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		68

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DRILLING LOG

WinCore
Version 3.3

County	Kaufman	Hole	B-D-01	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	8-14-22
CSJ	1396-01-013	Station	194+17.20	Grnd. Elev.	336.62 ft
		Offset	8.30' LT	GW Elev.	311.62 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CLAY, Fat Clay, Dk. Gray, Med. Stiff to Stiff, Moist (CH)							
5		4 (6) 6 (6)				26.0				-200 = 91.5%
10		7 (6) 7 (6)				23.9	66	51		-200 = 93.6%
15		7 (6) 10 (6)				23.5				-200 = 96.1%
316.6 20		8 (6) 9 (6)				17.8	46	31		
			CLAY, Sandy Lean Clay, Dk. Gray to Brown to Lt. Grayish Brown, Stiff, Moist (CL)							
25		9 (6) 10 (6)				20.5				-200 = 51.7%
30		9 (6) 10 (6)				23.7	29	13		
301.6 35		50 (2) 50 (1)				22.6				-200 = 65.0%
			SHALE, Shale, Lt. Grayish Tan to Lt. Gray, Hard, Wet (Comprised Primarily of Fat Clay) (CH)							
40		50 (1) 50 (0)				35.4	58	36		
45		50 (1) 50 (0.5)				65.2				-200 = 94.8%
50		50 (1) 50 (0.5)				86.6	63	42		
55		50 (1) 50 (0.5)				61.6				-200 = 95.7%
60		50 (1.5) 50 (0.5)				50.9	60	37		

Remarks: XY Coord. - 2685957.9208, 6849969.3824 (Provided By Client).

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: NR **Logger: JR** **Organization: B2Z Engineering**

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DRILLING LOG

WinCore
Version 3.3

County	Kaufman	Hole	B-D-01	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	8-14-22
CSJ	1396-01-013	Station	194+17.20	Grnd. Elev.	336.62 ft
		Offset	8.30' LT	GW Elev.	311.62 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SHALE, Shale, Lt. Grayish Tan to Lt. Gray, Hard, Wet (Comprised Primarily of Fat Clay) (CH)							
65		50 (1.5) 50 (0.5)				76.3				-200 = 92.3%
70		50 (2) 50 (1.5)				65.0	64	45		
75		50 (1.5) 50 (0.5)				46.0				-200 = 88.0%
256.6 80		50 (1) 50 (0.5)				54.1	64	45		
85										
90										
95										
100										
105										
110										
115										
120										

Remarks: XY Coord. - 2685957.9208, 6849969.3824 (Provided By Client).

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FM 1391
CEDAR CREEK RELIEF NO. 2
BORING LOGS

Sheet 1 of 3 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
©TxDOT	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		69

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DRILLING LOG

WinCore
Version 3.3

County	Kaufman	Hole	B-D-02	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	8-13-22
CSJ	1396-01-013	Station	196+55.23	Grnd. Elev.	322.32 ft
		Offset	8.73' LT	GW Elev.	302.32 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SAND, Clayey Sand, Gray to Grayish Brown, Loose to Med. Dense, Moist (SC)							
5		5 (6) 6 (6)				19.1	39	26		
10		11 (6) 14 (6)				22.9				-200 = 42.4%
307.3 15		50 (1.5) 50 (1.5)				22.1	66	43		-200 = 81.4%
			SHALE, Shale, Gray, Hard, Moist to Wet (Comprised Primarily of Fat Clay) (CH)							
20		50 (1) 50 (0.5)				22.9				-200 = 96.4%
25		50 (1.5) 50 (0.5)				71.7	60	39		
30		50 (1) 50 (0.5)				68.7				-200 = 94.8%
35		50 (1) 50 (0.5)				74.9	62	40		
40		50 (0.5) 50 (0.5)				67.3				-200 = 97.3%
45		50 (1) 50 (0.5)				72.4	60	41		
50		50 (1) 50 (0.5)				59.6				-200 = 96.6%
55		50 (1) 50 (0.5)				60.6	67	47		
60		50 (1.5) 50 (0.5)				71.7				-200 = 93.0%

Remarks: XY Coord. - 2686179.1502, 6849881.5366 (Provided By Client).

Any ground water elevation information provided on this boring log is representative of conditions existing on the day and for the specific location where this information was collected. The actual groundwater elevation may fluctuate due to time, climatic conditions, and/or construction activity.

Driller: NR **Logger: JR** **Organization: B2Z Engineering**

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DRILLING LOG

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Version 3.3

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Highway	FM 1391	Structure	Bridge	Date	8-13-22
CSJ	1396-01-013	Station	196+55.23	Grnd. Elev.	322.32 ft
		Offset	8.73' LT	GW Elev.	302.32 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			SHALE, Shale, Gray, Hard, Moist to Wet (Comprised Primarily of Fat Clay) (CH)							
65		50 (1) 50 (0.5)				63.1	64	44		
70		50 (1) 50 (0.5)				40.3				-200 = 89.7%
75		50 (1) 50 (0.5)								
242.3 80		50 (0.5) 50 (0.5)								
85										
90										
95										
100										
105										
110										
115										
120										

Remarks: XY Coord. - 2686179.1502, 6849881.5366 (Provided By Client).

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FM 1391
CEDAR CREEK RELIEF NO. 2
BORING LOGS

Sheet 2 of 3 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
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REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		70

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DRILLING LOG

WinCore
Version 3.3

County	Kaufman	Hole	B-D-03	District	Dallas
Highway	FM 1391	Structure	Bridge	Date	8-15-22
CSJ	1396-01-013	Station	198+94.10	Grnd. Elev.	336.39 ft
		Offset	7.51' LT	GW Elev.	309.39 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	LL	PI	Wet Den. (pcf)	Additional Remarks
			CLAY, Fat Clay, Dk. Brown to Gray, Med. Stiff to Stiff, Dry to Moist (CH)							
5		6 (6) 5 (6)				16.2				-200 = 95.8%
10		8 (6) 7 (6)				16.2	59	43		-200 = 90.6%
321.4 15		6 (6) 7 (6)				15.6				-200 = 69.7%
			CLAY, Lean Clay w/ Sand to Sandy Lean Clay, Gray, Med. Stiff to Stiff, Moist to Wet (CL)							
20		6 (6) 6 (6)				20.9	37	22		
25		5 (6) 5 (6)				23.0				-200 = 55.4%
30		8 (6) 8 (6)				22.9	37	21		
301.4 35		50 (1.5) 50 (1)				26.6				-200 = 44.8%
			SAND, Clayey Sand, Lt. Grayish Brown, Very Dense, Wet (SC)							
296.4 40		50 (1.5) 50 (0.5)				20.9	67	42		
			SHALE, Shale, Lt. Gray to Gray, Hard, Wet (Comprised of Fat Clay) (CH)							
45		50 (2) 50 (2)				56.7				-200 = 93.5%
50		50 (1.5) 50 (0)				72.8	63	44		
55		50 (1) 50 (0.5)				68.6				-200 = 95.4%
60		50 (0.5) 50 (0)				60.2	62	43		

Remarks: XY Coord. - 2686400.5420, 6849791.8566 (Provided By Client). Asphalt Thickness = 13 inch, Base = 6 inch.

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			SHALE, Shale, Lt. Gray to Gray, Hard, Wet (Comprised of Fat Clay) (CH)							
65		50 (1) 50 (0.5)				60.6				-200 = 95.1%
70		50 (1.5) 50 (0.5)				58.7	64	43		
75		50 (1) 50 (0.5)								
256.4 80		50 (1.5) 50 (0.5)								
85										
90										
95										
100										
105										
110										
115										
120										

Remarks: XY Coord. - 2686400.5420, 6849791.8566 (Provided By Client). Asphalt Thickness = 13 inch, Base = 6 inch.

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BORING LOGS

Sheet 3 of 3 Sheets

FILE: SEE PATH	DN: RM	CK: LW	DW: RM	CK: LW
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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		71

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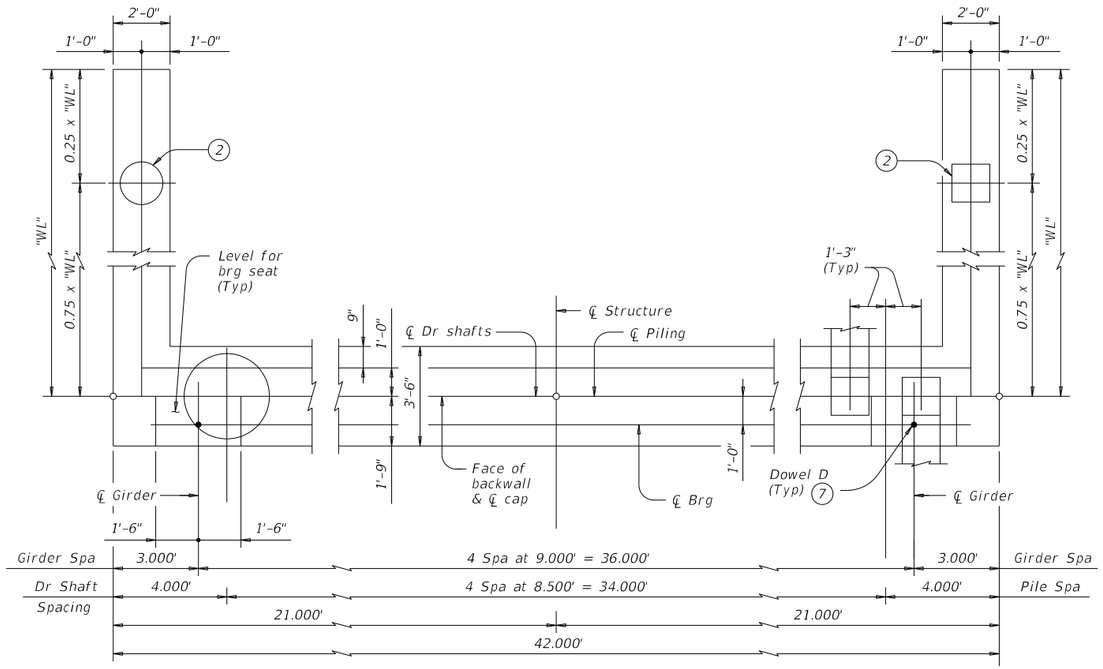
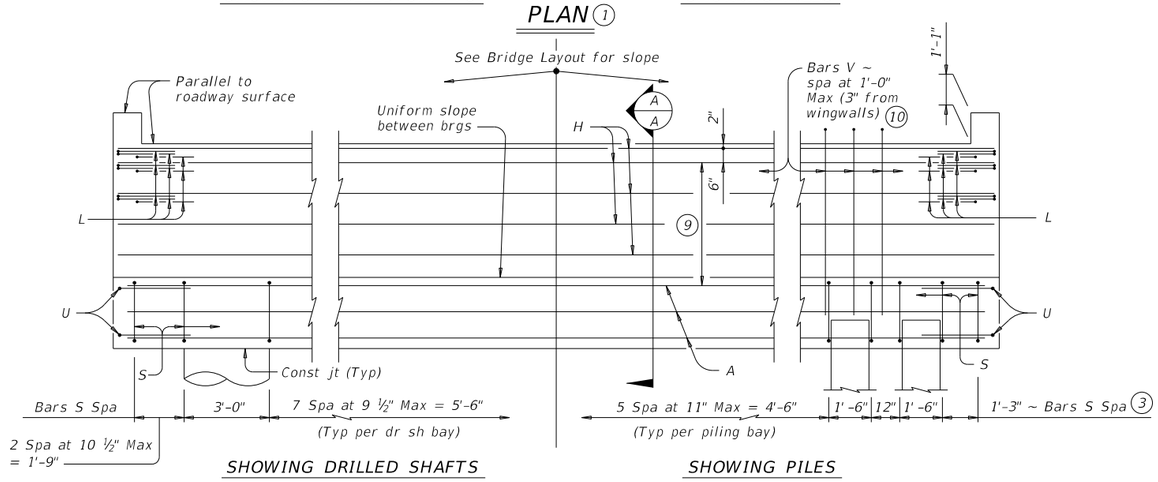


SHOWING DRILLED SHAFTS SHOWING PILES

PLAN (1)

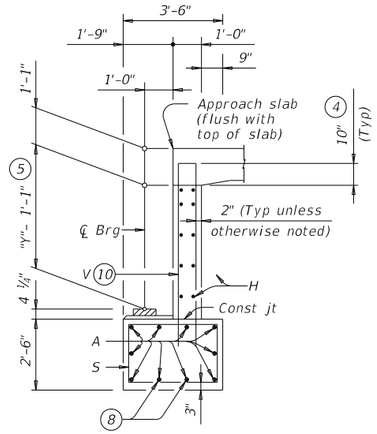


SHOWING DRILLED SHAFTS SHOWING PILES

ELEVATION

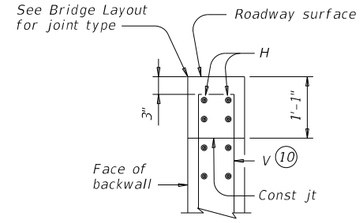
TABLE A

Header Slope	Girder Type	Wingwall Type	Wingwall Lgth "WL"
2:1	Tx28	Cantilevered	8.000'
	Tx34	Cantilevered	9.000'
	Tx40	Cantilevered	10.000'
	Tx46	Cantilevered	11.000'
	Tx54	Cantilevered	12.000'
3:1	Tx28	Cantilevered	12.000'
	Tx34	Founded	13.000'
	Tx40	Founded	15.000'
	Tx46	Founded	16.000'
	Tx54	Founded	18.000'



SECTION A-A

(With approach slab) (6)



BACKWALL DETAIL

(Without approach slab) (6)

TABLE OF FOUNDATION LOADS

Span Length	All Girder Types	
Ft	Tons/Shaft	Tons/Pile
40	51	47
45	55	48
50	58	50
55	62	52
60	65	53
65	68	55
70	71	57
75	74	58
80	77	60
85	81	62
90	84	63
95	87	65
100	90	66
105	93	68
110	96	69
115	99	71
120	102	73

(1) See Table A for variable dimensions based on header slope and girder type.

(2) See Table A to determine if wingwall foundations are required.

(3) For piling larger than 16" adjust Bars S spacing as required to avoid piling.

(4) Increase as required to maintain 3" from finished grade.

(5) See Span details for "Y" value.

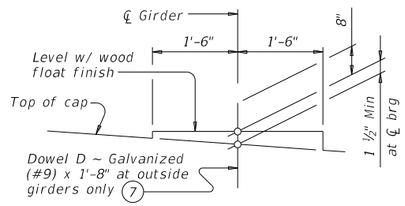
(6) See Bridge Layout to determine if approach slab is present.

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(8) With pile foundations, move Bars A shown to clear piles.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) Field bend as needed to clear piles.



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

See Bridge Layout for header slope and foundation type, size and length.

See Common Foundation Details (FD) standard sheet for all foundation details and notes.

See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.

See applicable rail details for rail anchorage in wingwalls.

These abutment details may be used with standard SIG-40 only.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Galvanize dowel bars D.

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
40' ROADWAY

AIG-40

FILE: aig45sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		72

DATE: 11/14/2023 2:36:33 PM
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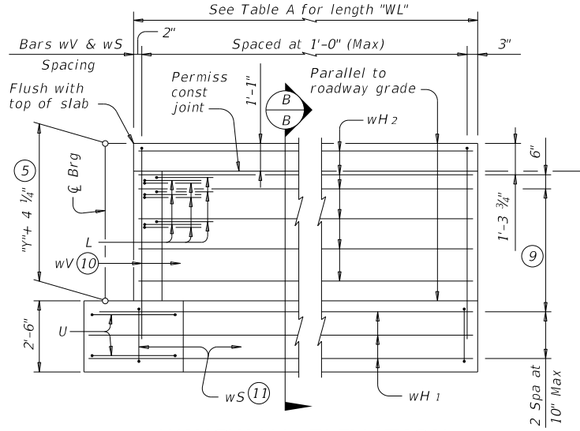
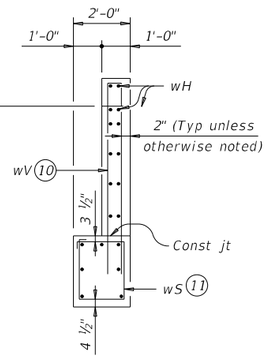
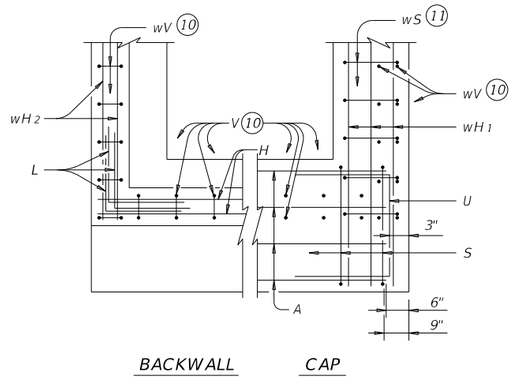


WINGWALL ELEVATION

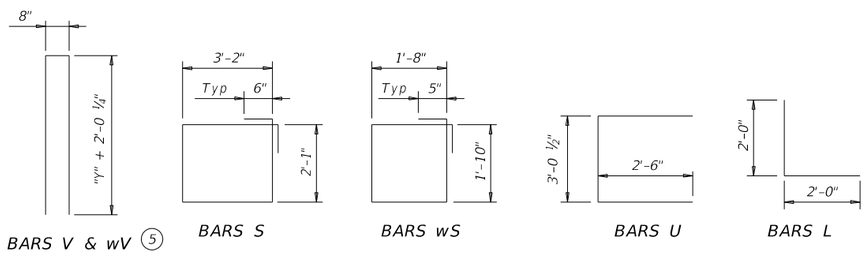


SECTION B-B



BACKWALL CAP

CORNER DETAILS



BARS V & wV (5) BARS S BARS wS BARS U BARS L

(5) See Span details for "Y" value.

(9) Spacing based on girder type:
Tx28 ~ 3 spaces at 1'-0" Max
Tx34 ~ 3 spaces at 1'-0" Max
Tx40 ~ 4 spaces at 1'-0" Max
Tx46 ~ 4 spaces at 1'-0" Max
Tx54 ~ 5 spaces at 1'-0" Max

(10) Field bend as needed to clear piles.

(11) Adjust as required to avoid piling.

HL93 LOADING SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
40' ROADWAY

AIG-40

FILE: aig45sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
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	DAL	KAUFMAN		73

DATE: 11/14/2023 2:36:33 PM
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TABLES OF ESTIMATED QUANTITIES WITH 2:1 HEADER SLOPE (12)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	8	#6	41'-8"	501
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	11'-4"	485
wH1	14	#6	9'-5"	198
wH2	20	#6	7'-8"	230
wS	18	#4	7'-10"	94
wV	18	#5	11'-4"	213
Reinforcing Steel		Lb		4,523
Class "C" Concrete		CY		21.9

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	8	#6	41'-8"	501
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	12'-4"	527
wH1	14	#6	10'-5"	219
wH2	20	#6	8'-8"	260
wS	20	#4	7'-10"	105
wV	20	#5	12'-4"	257
Reinforcing Steel		Lb		4,671
Class "C" Concrete		CY		23.6

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	10	#6	41'-8"	626
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	13'-4"	570
wH1	14	#6	11'-5"	240
wH2	24	#6	9'-8"	348
wS	22	#4	7'-10"	115
wV	22	#5	13'-4"	306
Reinforcing Steel		Lb		5,007
Class "C" Concrete		CY		25.4

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	10	#6	41'-8"	626
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	14'-4"	613
wH1	14	#6	12'-5"	261
wH2	24	#6	10'-8"	385
wS	24	#4	7'-10"	126
wV	24	#5	14'-4"	359
Reinforcing Steel		Lb		5,172
Class "C" Concrete		CY		27.3

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	12	#6	41'-8"	751
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	15'-8"	670
wH1	14	#6	13'-5"	282
wH2	28	#6	11'-8"	491
wS	26	#4	7'-10"	136
wV	26	#5	15'-8"	425
Reinforcing Steel		Lb		5,557
Class "C" Concrete		CY		29.6

TABLES OF ESTIMATED QUANTITIES WITH 3:1 HEADER SLOPE (12)

TYPE Tx28 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	8	#6	41'-8"	501
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	11'-4"	485
wH1	14	#6	13'-5"	282
wH2	20	#6	11'-8"	350
wS	26	#4	7'-10"	136
wV	26	#5	11'-4"	307
Reinforcing Steel		Lb		4,863
Class "C" Concrete		CY		24.6

TYPE Tx34 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	8	#6	41'-8"	501
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	12'-4"	527
wH1	14	#6	14'-5"	303
wH2	20	#6	12'-8"	381
wS	28	#4	7'-10"	147
wV	28	#5	12'-4"	360
Reinforcing Steel		Lb		5,021
Class "C" Concrete		CY		26.4

TYPE Tx40 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	10	#6	41'-8"	626
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	13'-4"	570
wH1	14	#6	16'-5"	345
wH2	24	#6	14'-8"	529
wS	32	#4	7'-10"	167
wV	32	#5	13'-4"	445
Reinforcing Steel		Lb		5,484
Class "C" Concrete		CY		29.0

TYPE Tx46 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	10	#6	41'-8"	626
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	14'-4"	613
wH1	14	#6	17'-5"	366
wH2	24	#6	15'-8"	565
wS	34	#4	7'-10"	178
wV	34	#5	14'-4"	508
Reinforcing Steel		Lb		5,658
Class "C" Concrete		CY		31.1

TYPE Tx54 Girders

Bar	No.	Size	Length	Weight
A	10	#11	41'-0"	2,178
D (7)	2	#9	1'-8"	11
H	12	#6	41'-8"	751
L	18	#6	4'-0"	108
S	38	#5	11'-6"	456
U	4	#6	8'-1"	49
V	41	#5	15'-8"	670
wH1	14	#6	19'-5"	408
wH2	28	#6	17'-8"	743
wS	38	#4	7'-10"	199
wV	38	#5	15'-8"	621
Reinforcing Steel		Lb		6,194
Class "C" Concrete		CY		34.4

(7) Omit Dowels D at end of multi-span unit. Adjust reinforcing steel total accordingly.

(12) Quantities shown are for one abutment only (with approach slab). With no approach slab, add 1.6 CY Class "C" concrete and 250 lbs reinforcing steel for 4 additional Bars H.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

ABUTMENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
40' ROADWAY

AIG-40

FILE: aig45sts-17.dgn	DN: TAR	CK: KCM	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		74

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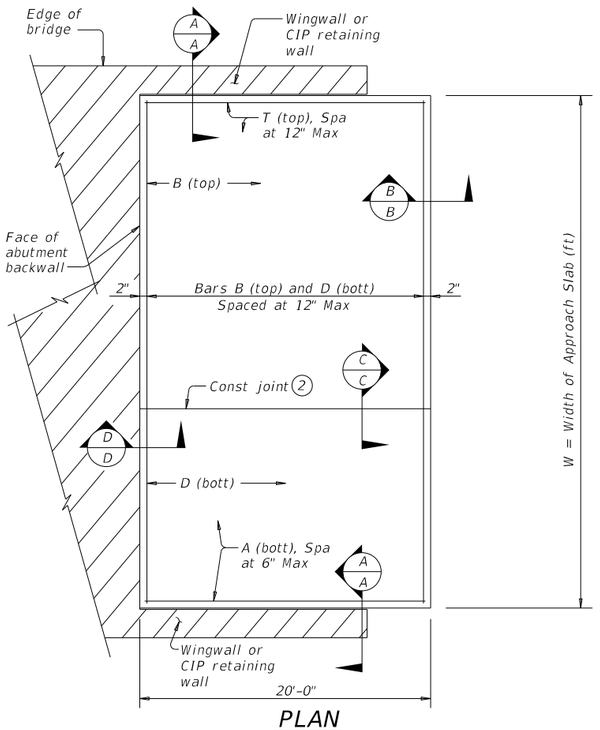
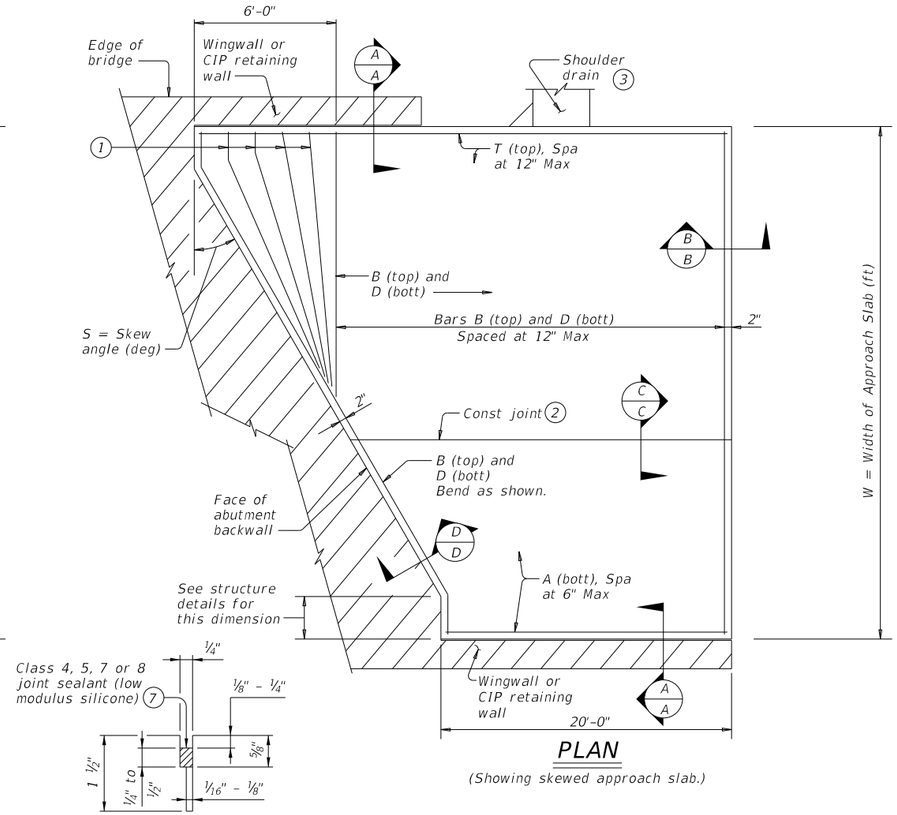


PLAN

(Showing non-skewed approach slab.)



PLAN

(Showing skewed approach slab.)

LONGITUDINAL SAW CUT JOINT DETAIL

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = 0.802W + 0.02W² Tan S

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

(1) Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.

(2) Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.

(3) See details elsewhere in plans for shoulder drain location and details.

(4) For Contractor's information only. Quantities shown are for one approach slab.

(5) Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.

(6) See details elsewhere in plans for required cross-slope.

(7) Place in accordance with Item 438.

(8) Provide backer rod that is 25% larger than joint opening and compatible with the sealant.

(9) If bridge rail is present at the wingwall or CIP retaining wall, place ½" rebonded recycled tire rubber between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

GENERAL NOTES:

Construct approach slab in accordance with Item 422.

Provide Class "S" concrete with a minimum compressive strength of 4,000 psi.

Provide Grade 60 reinforcing steel.

Provide longitudinal joints as shown on the Longitudinal Saw Cut Joint Detail at lane lines and shoulders when width between longitudinal construction joints or edges of approach slab exceeds 16 feet. Saw cut joints within 24 hours of concrete placement to a depth of 1 ½" and seal in accordance with Item 438. Alternately, provide a controlled joint consisting of 1 ½" vinyl or plastic joint former (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

Provide rebonded recycled tire rubber joint filler that meets the requirements of DMS-6310, "Joint Sealants and Fillers."

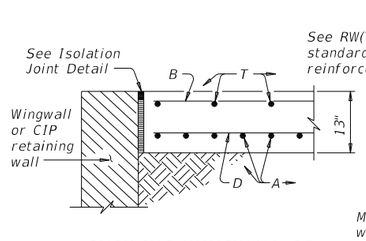
Construct the subgrade or subbase away from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans.

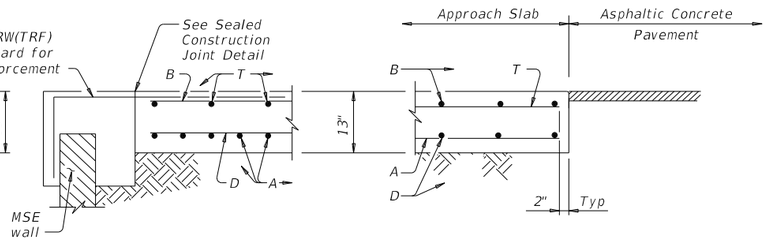
Cure for 4 days using water or membrane curing per Item 422.

All details shown herein are subsidiary to bridge approach slab.

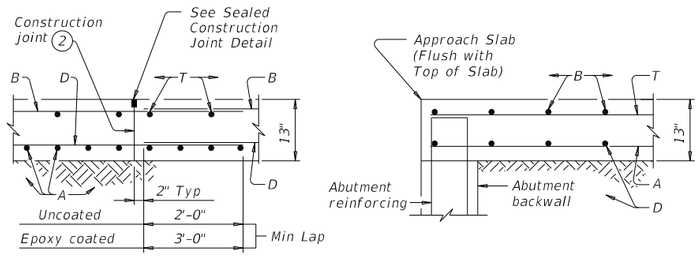
Cover dimensions are clear dimensions, unless noted otherwise.



SHOWING WINGWALL OR CIP RETAINING WALL



SHOWING MSE WALL

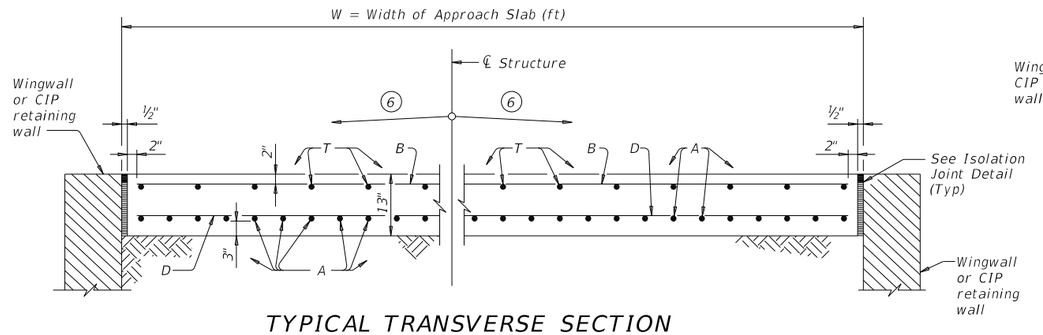


SECTION A-A

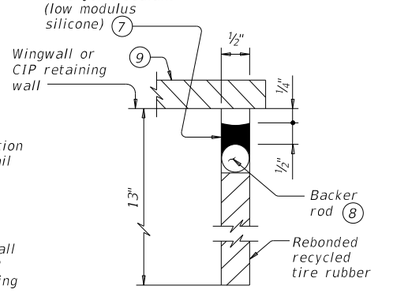
SECTION B-B

SECTION C-C (5)

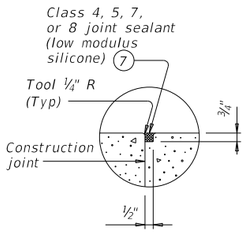
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

Texas Department of Transportation

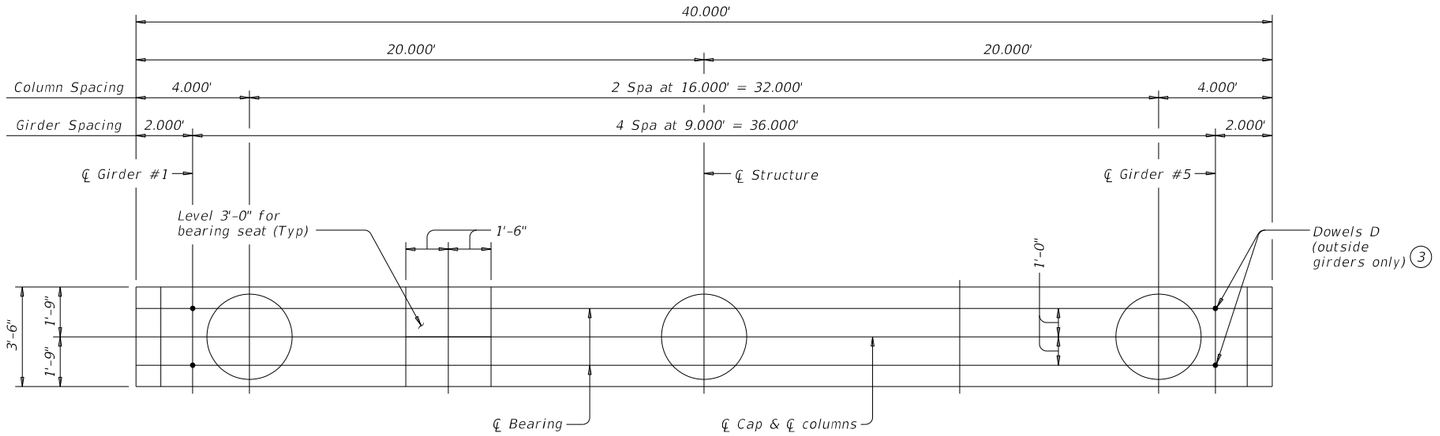
Bridge Division Standard

BRIDGE APPROACH SLAB

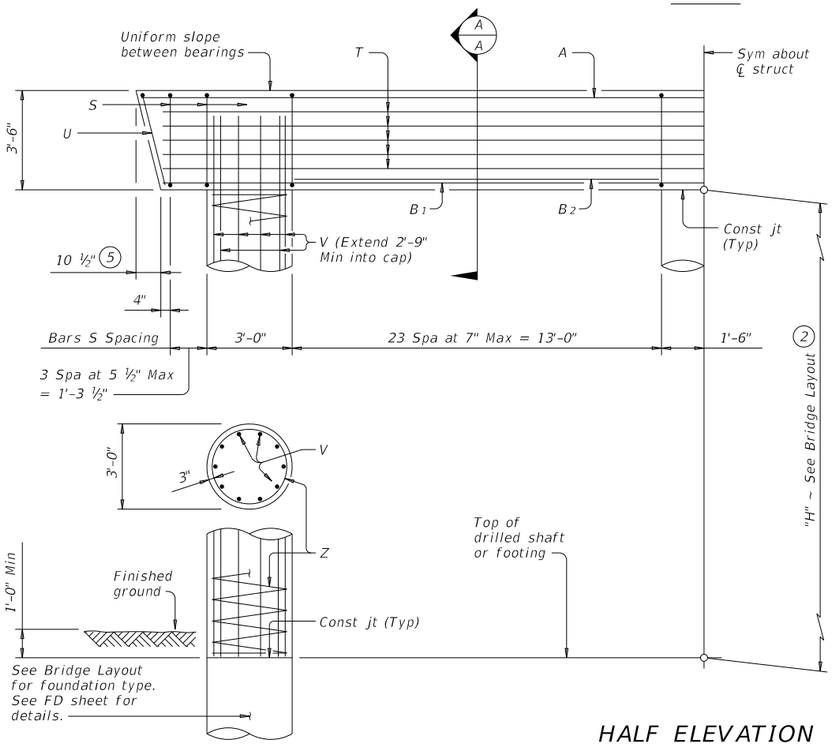
ASPHALTIC CONCRETE PAVEMENT

BAS-A

FILE: basaste1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
02-20: Removed stress relieving pad.	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		75

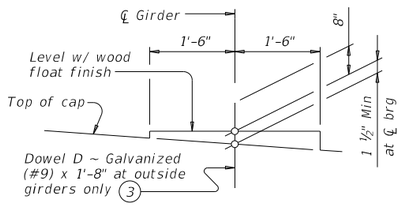


PLAN



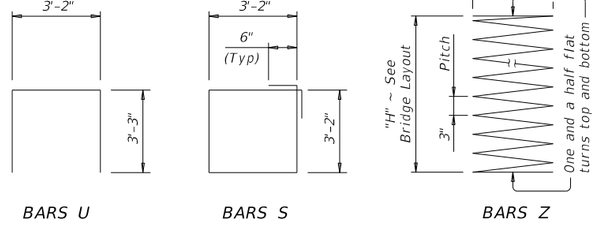
HALF ELEVATION

SECTION A-A



BEARING SEAT DETAIL

(Bearing surface must be clean and free of all loose material before placing bearing pad.)



1 Quantities shown are based on an "H" value of 36'. For each linear foot variation in "H" value, make the following adjustments:
Bars V length, 1'-0"
Bars Z length, 31'-5"
Reinforcing steel, 165 Lb
Class "C" conc (col), 0.78 CY

2 This standard may not be used for "H" heights exceeding 36'. In areas of very soft soil or where scour is anticipated, allowable "H" heights must be evaluated by the Engineer prior to the use of this standard.

3 Omit Dowels D at end of multi-span units. Adjust reinforcing steel total accordingly.

4 Foundation Loads based on "H" = 36'.

5 Measured parallel to top of cap cross-slope.

TABLE OF ESTIMATED QUANTITIES 1

Bar	No.	Size	Length	Weight
A	6	#11	39'- 6"	1,259
B 1	4	#11	38'- 0"	808
B 2	8	#11	13'- 0"	553
D 3	4	#9	1'-8"	23
S	56	#5	13'- 8"	798
T	10	#5	38'- 0"	396
U	2	#5	9'- 8"	20
V	30	#9	38'- 9"	3,953
Z	3	#4	1,154'- 7"	2,314
Reinforcing Steel			Lb	10,124
Class "C" Concrete (Cap)			CY	18.0
Class "C" Concrete (Col)			CY	28.3

FOUNDATION LOADS 4

Span Average	Drilled Shaft Loads	Pile Load (Tons/Pile)		
		3 Pile Ftg	4 Pile Ftg	5 Pile Ftg
Ft	Tons/Shaft			
40	135	48	37	30
45	146	52	40	32
50	156	55	42	34
55	167	59	45	37
60	177	62	47	39
65	187	66	50	41
70	197	69	52	43
75	207	72	55	45
80	218	76	58	47
85	228	79	60	49
90	238	83	63	51
95	248	86	65	53
100	258	89	68	55
105	268	93	70	57
110	278	96	73	59
115	288	99	75	61
120	298	103	78	63

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
See Bridge Layout for foundation type, size and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Shear Key (IGSK) standard sheet for all shear key details and notes, if applicable.
Bent selected must be based on the average span length rounded up to the next 5 ft increment.
These bent details may be used with standard SIG-40 only.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

MATERIAL NOTES:

Provide Class C concrete (f'c = 3,600 psi).
Provide Class C (HPC) concrete if shown elsewhere in the plans.
Provide Grade 60 reinforcing steel.
Galvanize dowel bars D.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

INTERIOR BENTS
TYPE TX28 THRU TX54
PRESTR CONC I-GIRDERS
40' ROADWAY

BIG-40

FILE: big45sts-17.dgn	DN: TAR	CK: SDB	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		76

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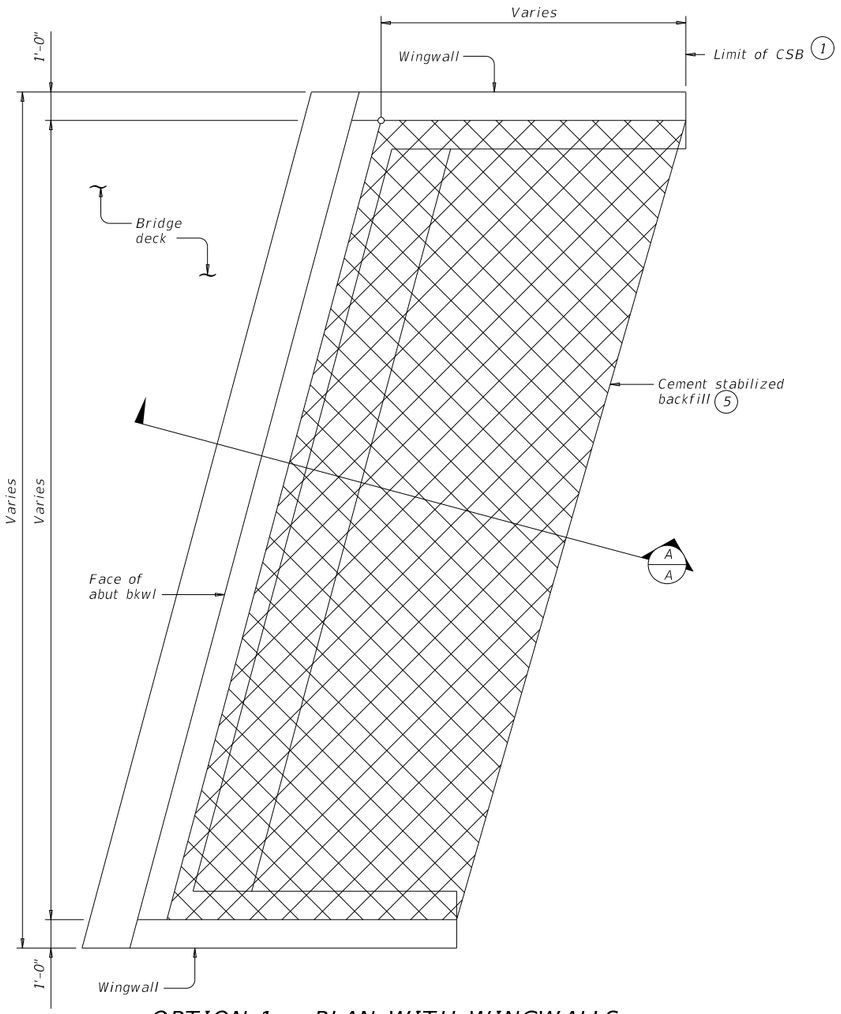
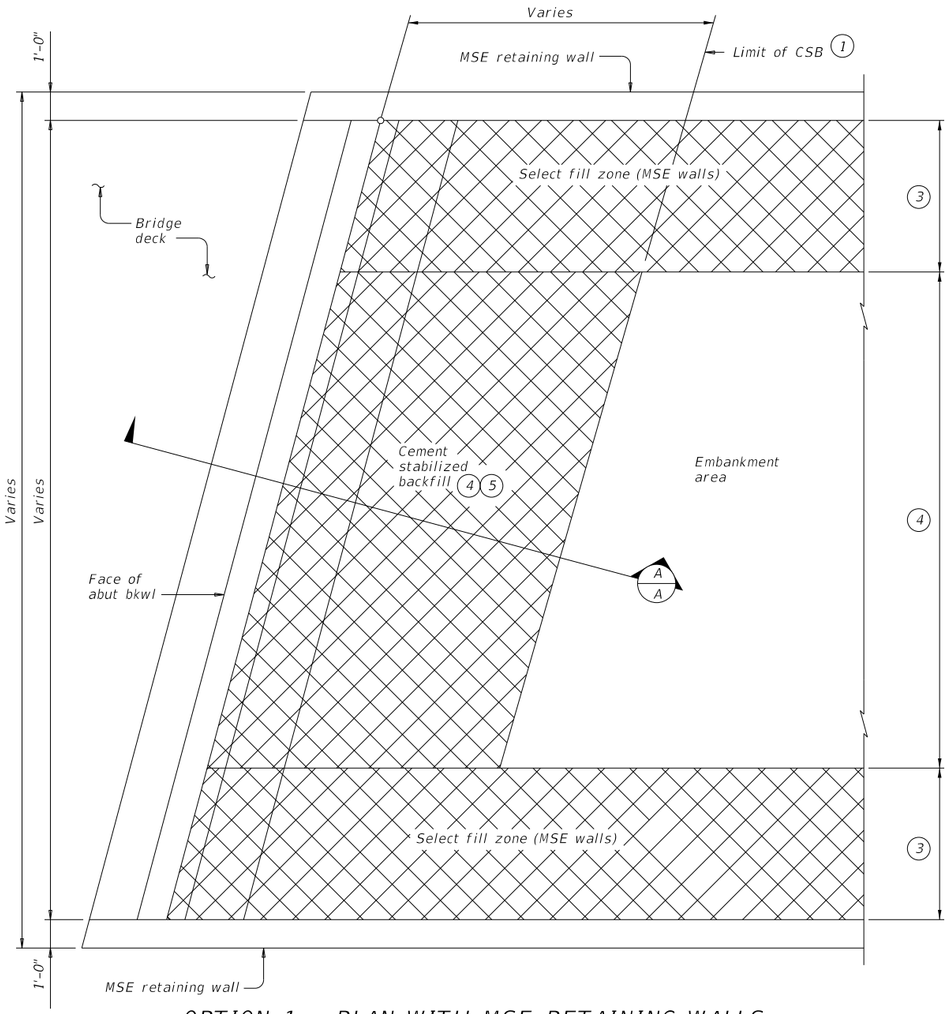
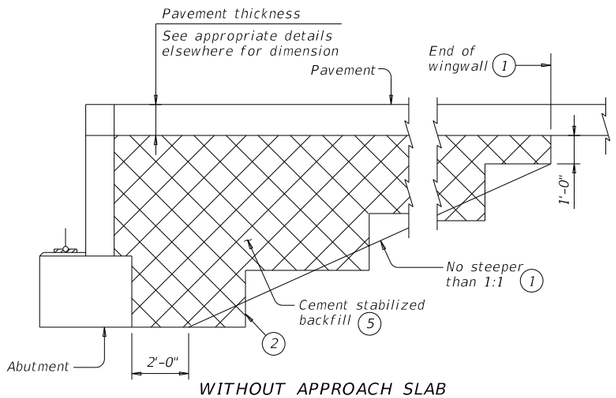


OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS



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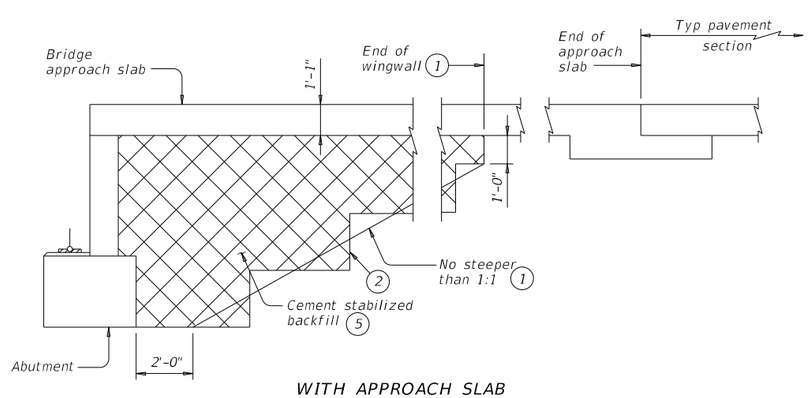

WITH APPROACH SLAB

(Showing BAS-C, BAS-A similar.)

SECTION A-A

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans, flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill, then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

GENERAL NOTES:

See the Bridge Layout for selected Option. Option 1 is intended for construction only requiring plasticity index (PI) controlled embankment fill or excavation in competent soils/rocks in order to construct the abutment. Option 2 is intended for new construction requiring high plasticity embankment fill with a PI greater than 30 or pavement built in poor native soil. Poor soils are defined as high plasticity clays or expansive clays.

Construct abutment backfill in accordance with Item 400, "Excavation and Backfill for Structures".

Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.

If required elsewhere in the plans, provide Flowable Backfill meeting the requirements of Item 401, "Flowable Backfill", to the limits shown at bridge abutments.

Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.

These details do not apply when Concrete Block retaining walls are used in lieu of wingwalls.

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		77

DATE: 11/14/2023 2:36:36 PM
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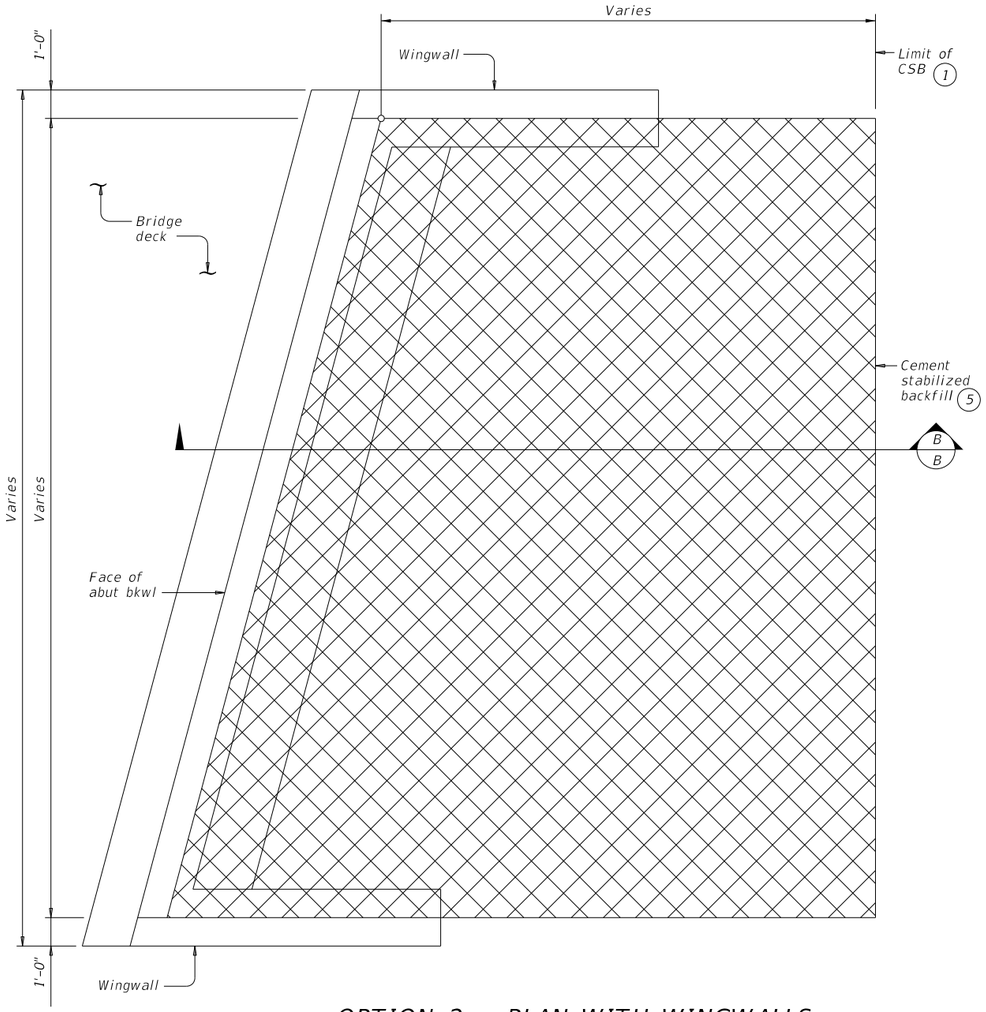
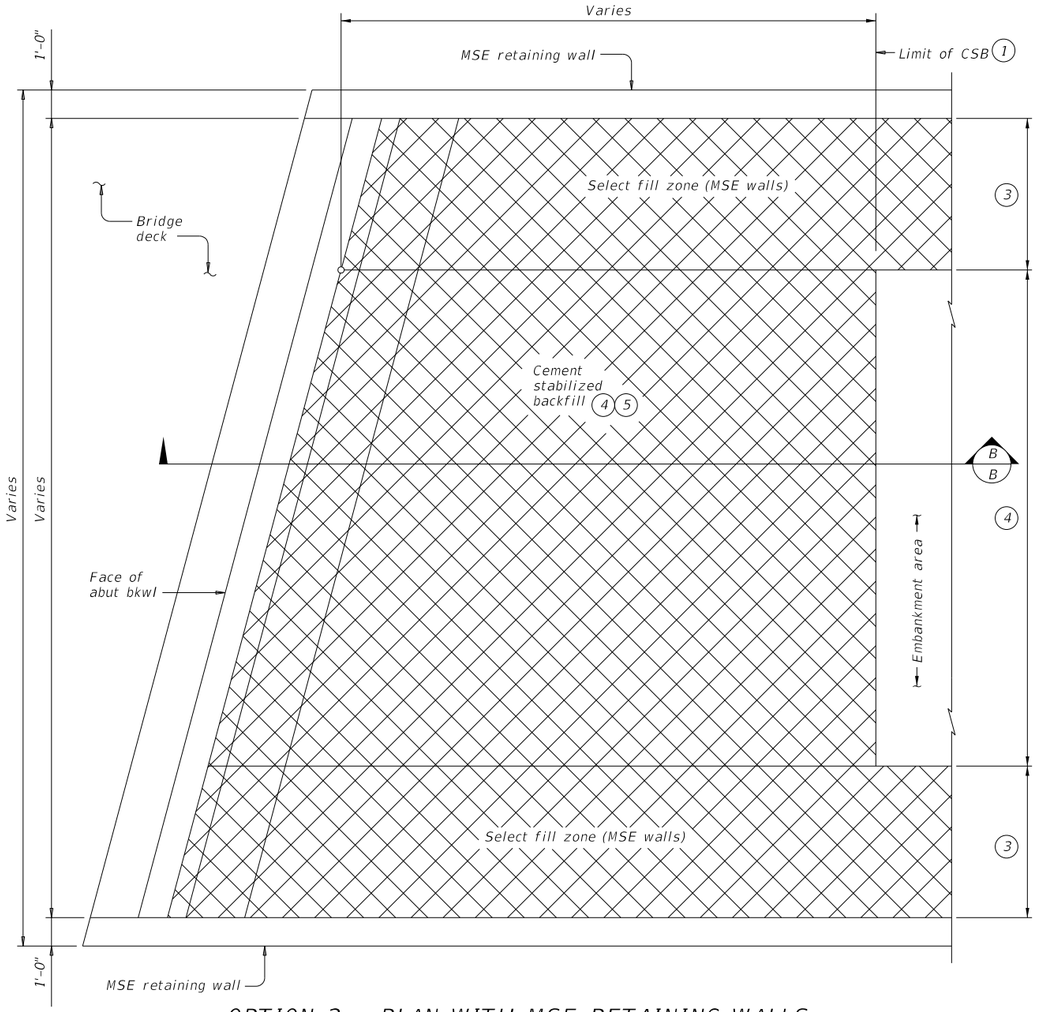


OPTION 2 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 2 ~ PLAN WITH MSE RETAINING WALLS

(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

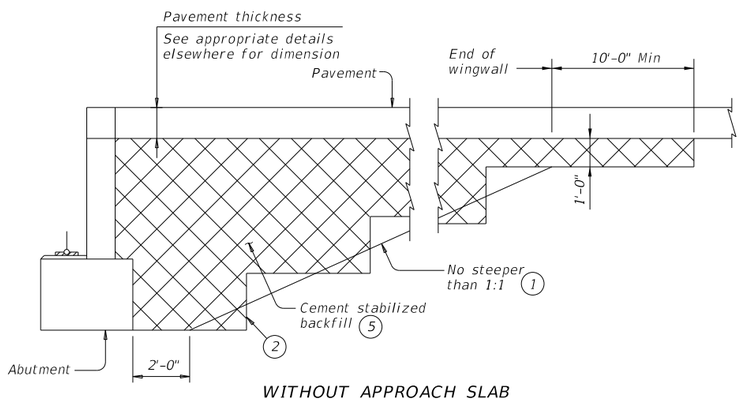
(2) Bench backfill as shown with 12" (approximate) bench depths.

(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(5) If shown in the plans, flowable backfill can be used as a substitute for cement stabilized backfill with the following constraints:
a). If flowable backfill is to be placed over MSE backfill, then a filter fabric will be placed over the MSE backfill prior to placement of the flowable fill; and
b). Place flowable fill in lifts not exceeding 2 feet in height. Place each successive lift when the previous lift has stiffened/hardened (i.e. has lost its flowability).

(6) 1'-0" for BAS-A
1'-10" for BAS-C



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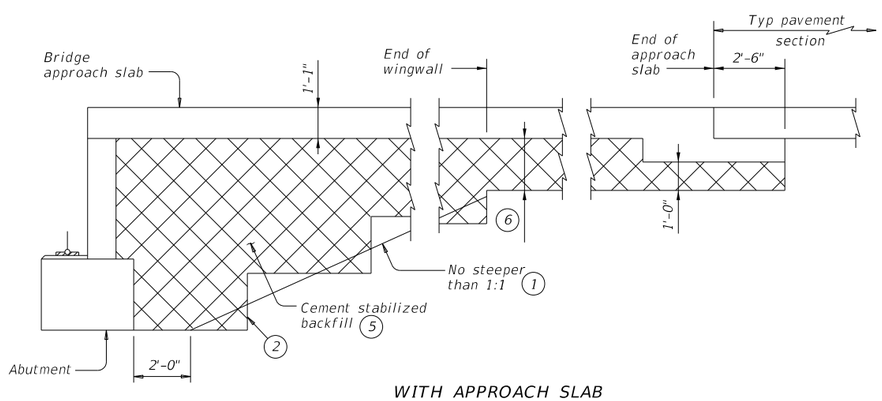

WITH APPROACH SLAB
(Showing BAS-C, BAS-A similar.)

SECTION B-B

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013, ETC.	FM 1391
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		78

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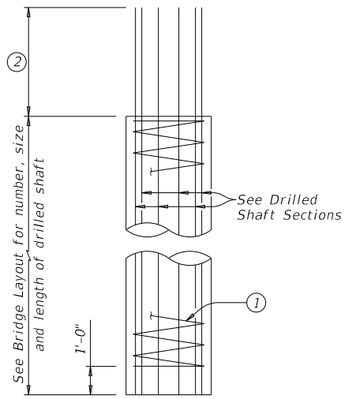
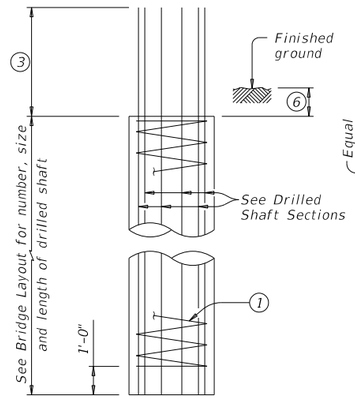
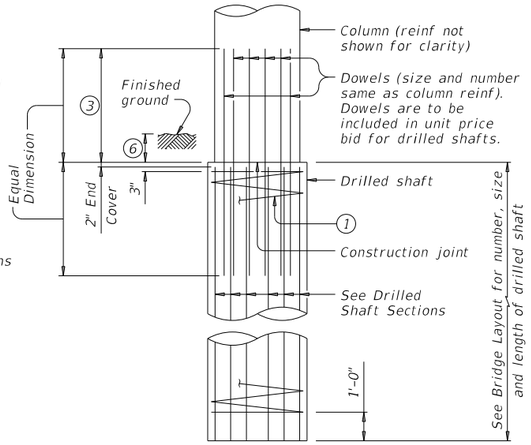


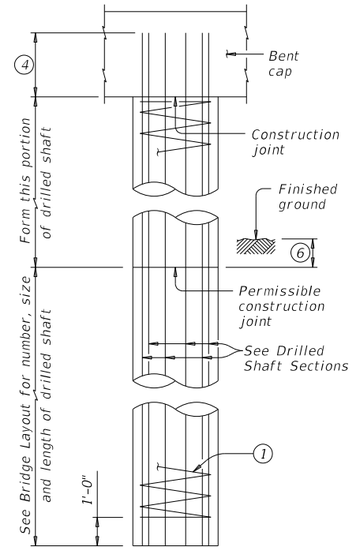
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



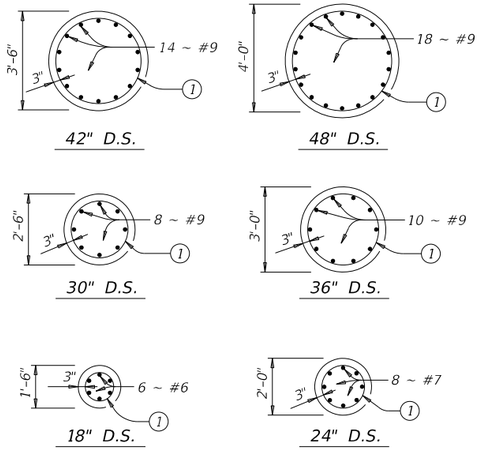
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

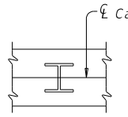


DRILLED SHAFT SECTIONS

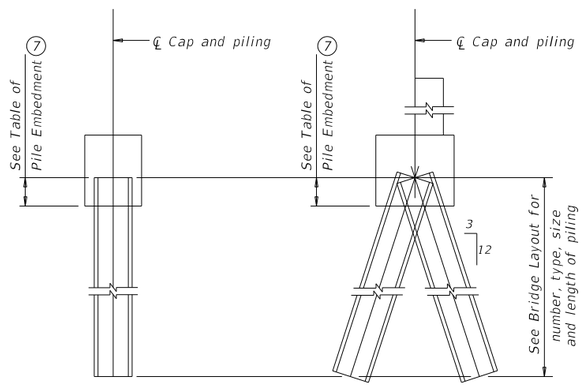
DRILLED SHAFT DETAILS

TABLE OF PILE EMBEDMENT	
Pile Type	Embedment Depth (Ft)
16" Sq Concrete 18" Sq Concrete HP14 Steel HP16 Steel	1'-0"
20" Sq Concrete 24" Sq Concrete HP18 Steel	1'-6"

See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.



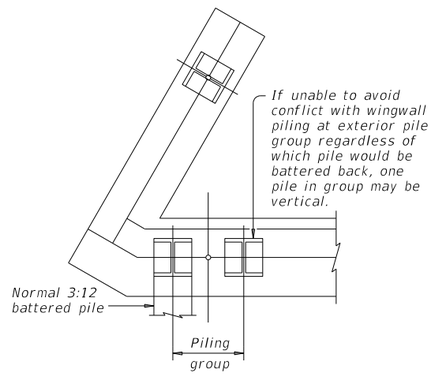
ORIENTATION OF STEEL H-PILING



VERTICAL PILE BATTERED PILE

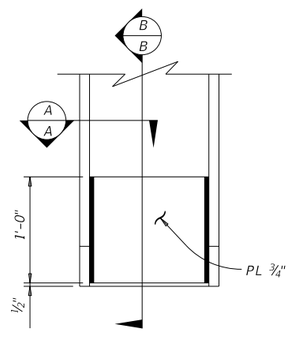
PILING DETAILS

(Concrete or steel H)

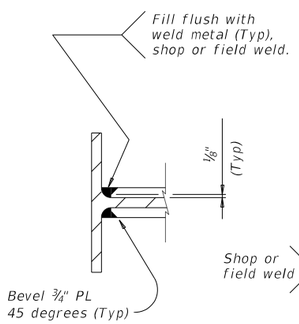


DETAIL "A"

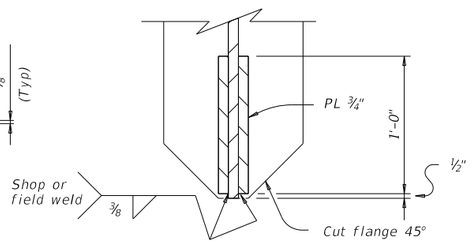
(Showing plan view of a 30° skewed abutment)



ELEVATION



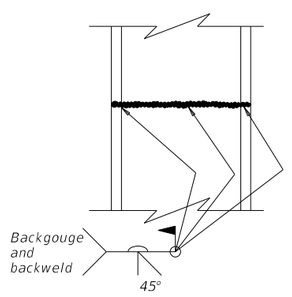
SECTION A-A

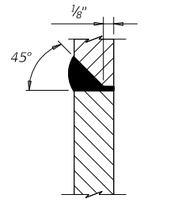


SECTION B-B

STEEL H-PILE TIP REINFORCEMENT

See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.





SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL

Use when required.

(1) #3 spiral at 6" pitch (one and a half flat turns top and bottom).

(2) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-0"
#9 Bars = 2'-3"

(3) Min lap with column reinf:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(4) Min extension into supported element:
#6 Bars = 1'-11"
#7 Bars = 2'-3"
#9 Bars = 2'-9"

(5) Drilled shafts may extend to the bottom of bent caps for "H" heights of 6 ft and less (as shown on the Bridge Layout), if approved. This option can only be used when the drilled shaft diameter equals the column diameter. Obtain approval of the forming method above the ground line prior to construction. No adjustments in payment will be made if this option is used.

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		79

DATE: 11/14/2023 2:36:37 PM
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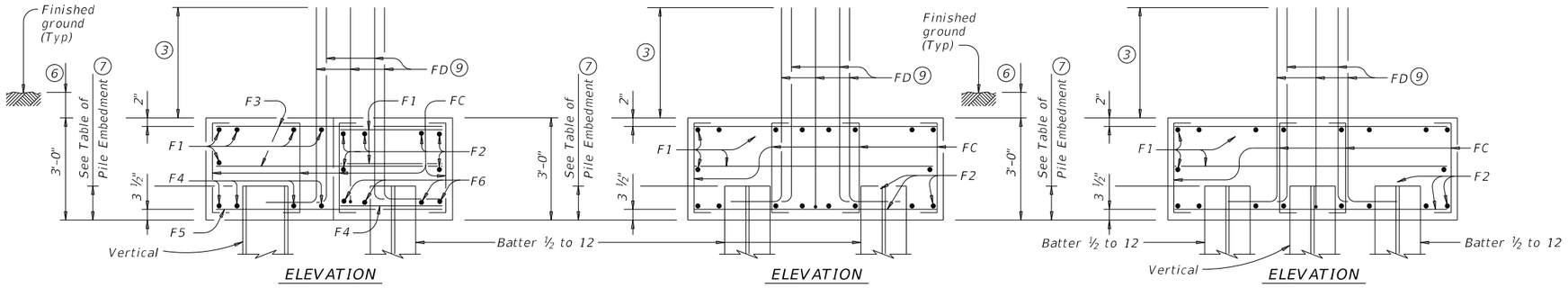
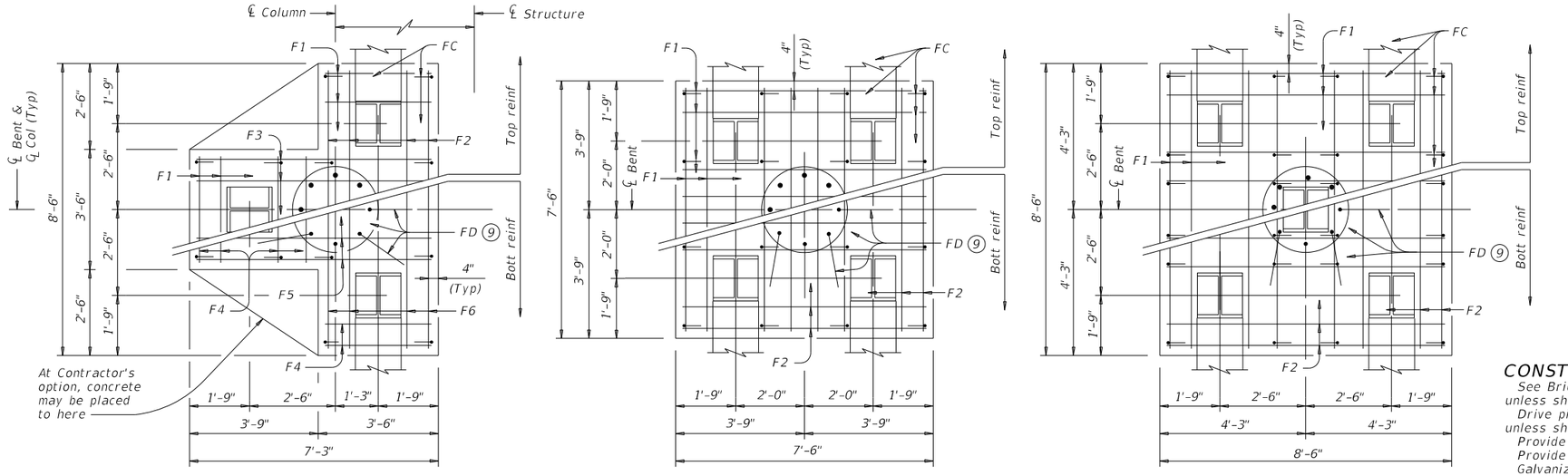


ELEVATION ELEVATION ELEVATION



PLAN PLAN PLAN

THREE PILE FOOTING (8)

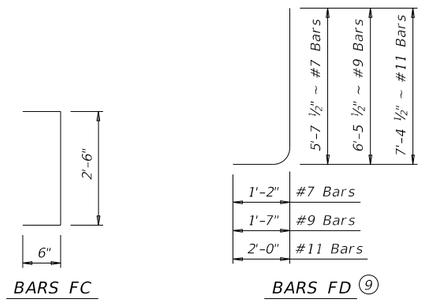
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

For 42" Dia and smaller columns.

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC BARS FD (9)

(3) Min lap with column reinforcing:
#7 Bars = 2'-11"
#9 Bars = 3'-9"
#11 Bars = 4'-8"

(6) 1'-0" Min, unless shown otherwise on plans.

(7) Or as shown on plans.

(8) See Bridge Layout for type, size and length of piling.

(9) Number and size of FD bars must match column reinforcing. Tie FD bars to the top of the bottom reinforcing mat.

(10) Adjust FD quantity, size and weight as needed to match column reinforcing.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	11	#4	3'- 2"	23
F2	6	#4	8'- 2"	33
F3	6	#4	6'- 11"	28
F4	8	#9	3'- 2"	86
F5	4	#9	6'- 11"	94
F6	4	#9	8'- 2"	111
FC	12	#4	3'- 6"	28
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	623
Class "C" Concrete			CY	4.8

ONE 4 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	20	#4	7'- 2"	96
F2	16	#8	7'- 2"	306
FC	16	#4	3'- 6"	37
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	659
Class "C" Concrete			CY	6.3

ONE 5 PILE FOOTING

Bar	No.	Size	Length	Weight
F1	20	#4	8'- 2"	109
F2	16	#9	8'- 2"	444
FC	24	#4	3'- 6"	56
FD (10)	8	#9	8'- 1"	220
Reinforcing Steel			Lb	829
Class "C" Concrete			CY	8.0

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.
Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.
Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.
Provide Grade 60 reinforcing steel.
Galvanize reinforcing if shown elsewhere in the plans.
Provide bar laps for drilled shaft reinforcing, where required, as follows:
Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.
Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.
Maximum allowable pile loads for the footings shown are:
72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		80

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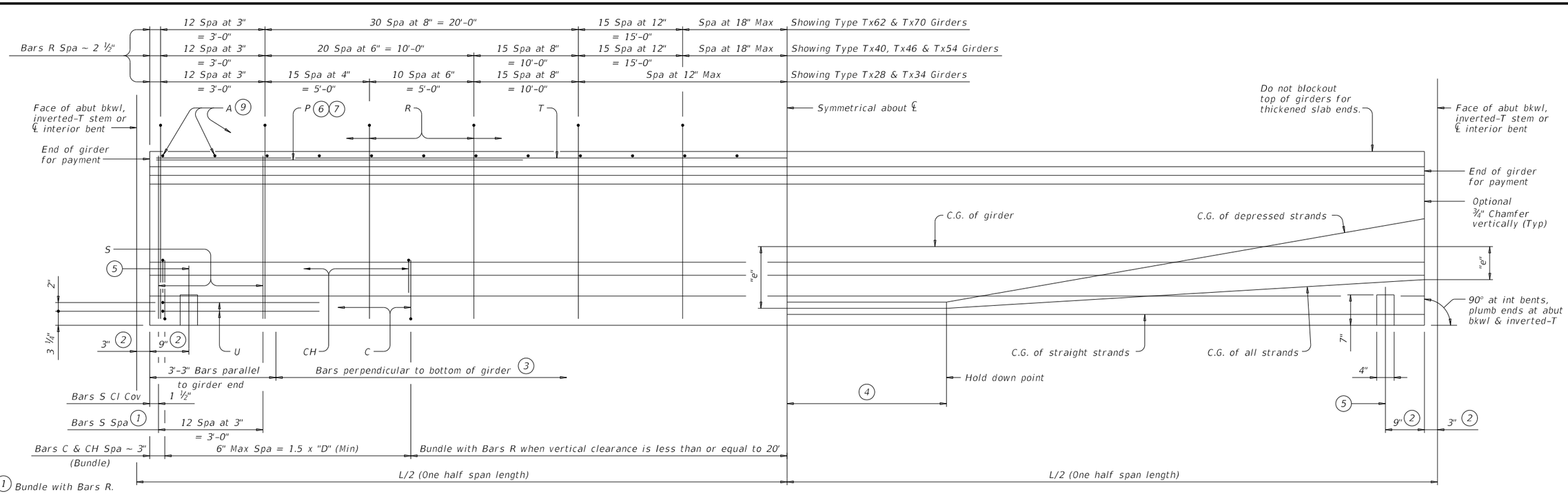


(1) Bundle with Bars R.

(2) Measured along ℄ Girder at interior bents; perpendicular to abutment bkwl or inverted-T stem.

(3) The average of the top and bottom spacing of Bars R cannot exceed the required spacing.

(4) L/20, but not less than 5'-0" (-0,+2').

(5) ℄ 4" x 1 ½" Vertical Slotted Hole at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details. Anchorage holes may be tapered (4 ¾" x 1 5/8") at base. If holes are formed with sheet metal, forms may be left in place.

GIRDER ELEVATION

(6) Bars P (#6 x 15'-0") required in Tx62 and Tx70 girders. At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

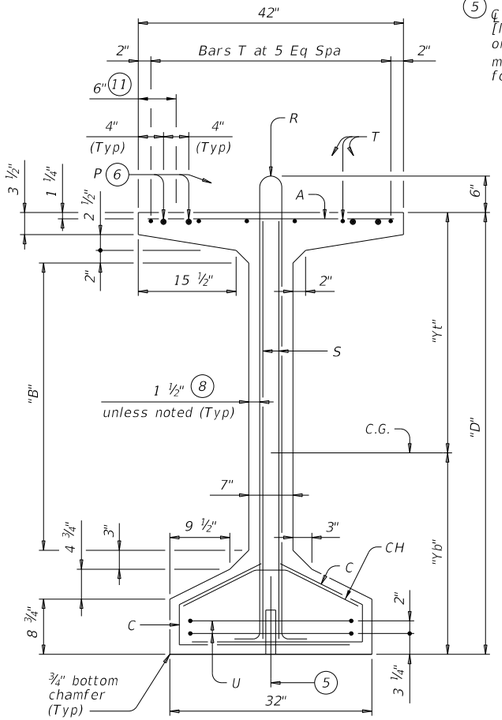
(7) Bars P (#6 x 15'-0") are only required in Tx28, Tx34, Tx40, Tx46, and Tx54 girders when "e" at girder ends exceeds 0.25 x "D". At the fabricator's option bars larger than #6 may be used. When L is less than 50 ft, Bars P are to be the same length as Bars T.

(8) 1 ⅜" Clear Cover to Bars S.

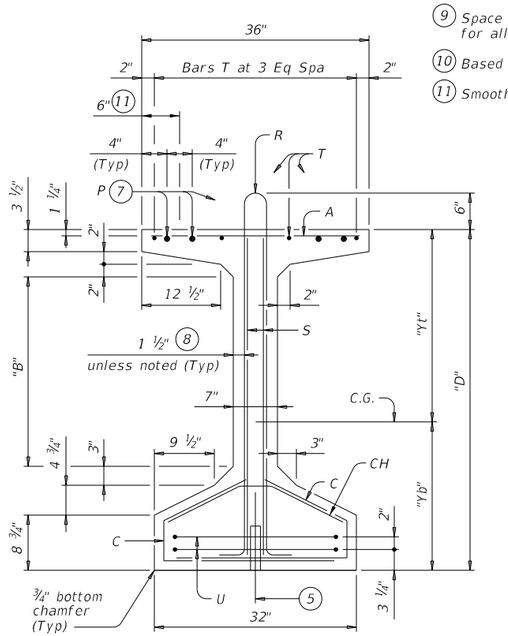
(9) Space Bars A at 6" Max for girders requiring overhang bracket hangers. Space at 12" Max for all other girders. Tie to Bars R as necessary. See standard IGMS for "Deck Forming Notes".

(10) Based on 155 pcf total weight of concrete and reinforcing steel.

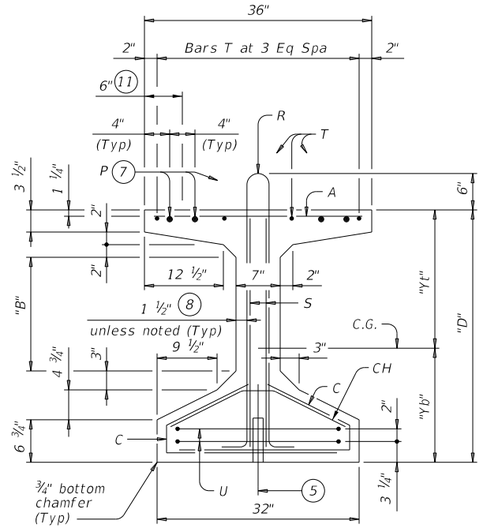
(11) Smooth trowel finish on the slab overhang side of exterior girder.



TYPE Tx62 & Tx70



TYPE Tx46 & Tx54



TYPE Tx28, Tx34 & Tx40

GIRDER DIMENSIONS AND SECTION PROPERTIES

Girder Type	"D" (in.)	"B" (in.)	"Yt" (in.)	"Yb" (in.)	Area (in.²)	"Ix" (in.⁴)	"Iy" (in.⁴)	Weight (10) (plf)
Tx28	28	6	15.02	12.98	585	52,772	40,559	630
Tx34	34	12	18.49	15.51	627	88,355	40,731	675
Tx40	40	18	21.90	18.10	669	134,990	40,902	720
Tx46	46	22	25.90	20.10	761	198,089	46,478	819
Tx54	54	30	30.49	23.51	817	299,740	46,707	880
Tx62	62	37 ½"	33.72	28.28	910	463,072	57,351	980
Tx70	70	45 ½"	38.09	31.91	966	628,747	57,579	1,040

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Provide Class H concrete.
Provide Grade 60 reinforcing steel.
An equal area of deformed Welded Wire Reinforcement (WWR) (ASTM A1064) may be substituted for Bars A, C, R or T unless otherwise noted.
It is permissible for bars or strands to come in contact with materials used in forming anchor holes.
When vertical clearance of the span is less than or equal to 20', provide additional Bars C and CH in every girder of that span.

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: IG-IGD-23.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		81

DATE: 11/14/2023 2:36:39 PM
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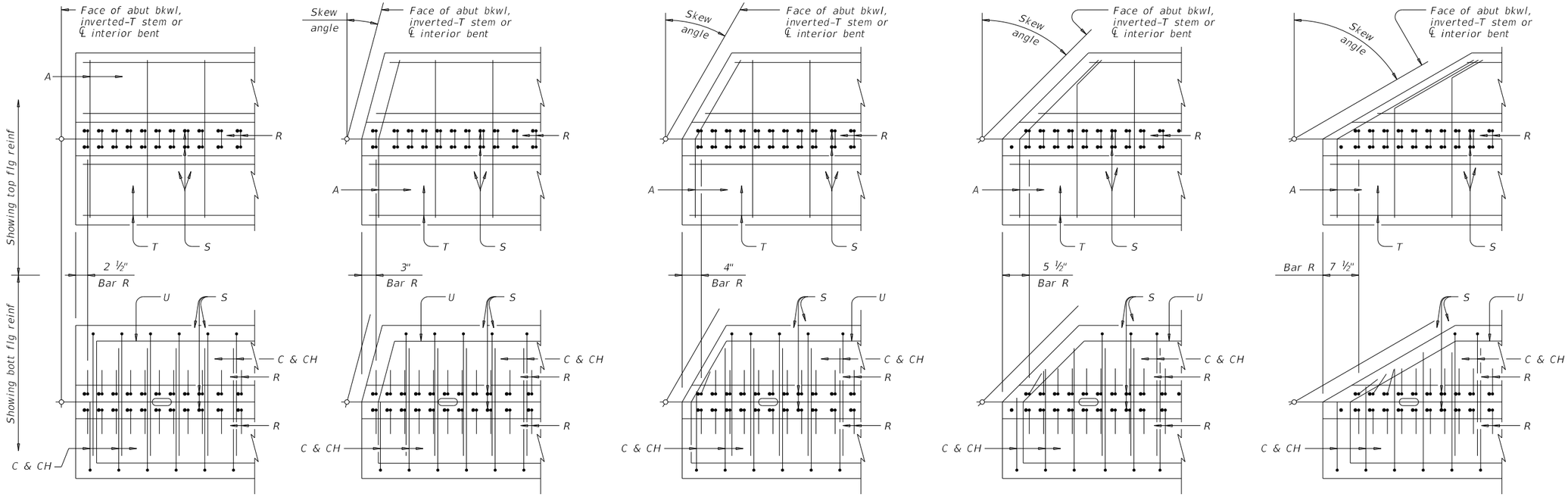
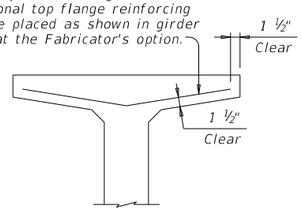
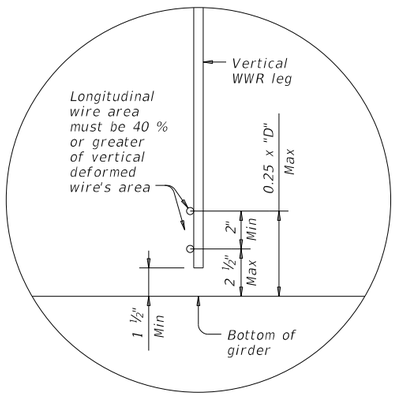


PLAN OF GIRDER ENDS (12)

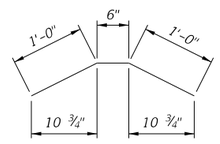
To control top flange cracking that may occur during form removal, additional top flange reinforcing may be placed as shown in girder ends at the Fabricator's option.



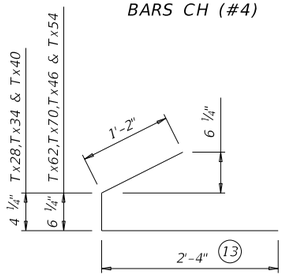
OPTIONAL TOP FLANGE REINFORCING DETAIL



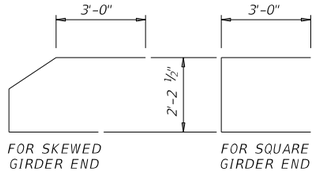
OPTIONAL WELDED WIRE REINFORCEMENT (WWR) DETAIL



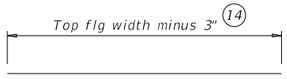
BARS CH (#4)



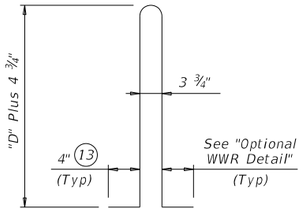
BARS C (#4)



BARS U (#5)

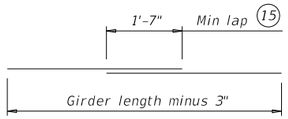


BARS A (#3)



BARS R (#4) (16)

BARS S (#6)



BARS T (#4)

(12) Reinforcing patterns shown are provided as guides to determine reinforcement placement in skewed ends. Place Bars S as close to girder end as cover requirements permit, which may prevent them to be bundled with Bars R.

(13) Bars may be cut or bent at skewed end as required.

(14) Increase as necessary for bars at skewed end.

(15) No portion of bar less than 10 ft.

(16) For Welded Wire Reinforcement (WWR) option, area of Bars R may be reduced in proportion to the increase in reinforcement yield strength over 60 ksi. Yield strength of WWR is limited to 75 ksi.

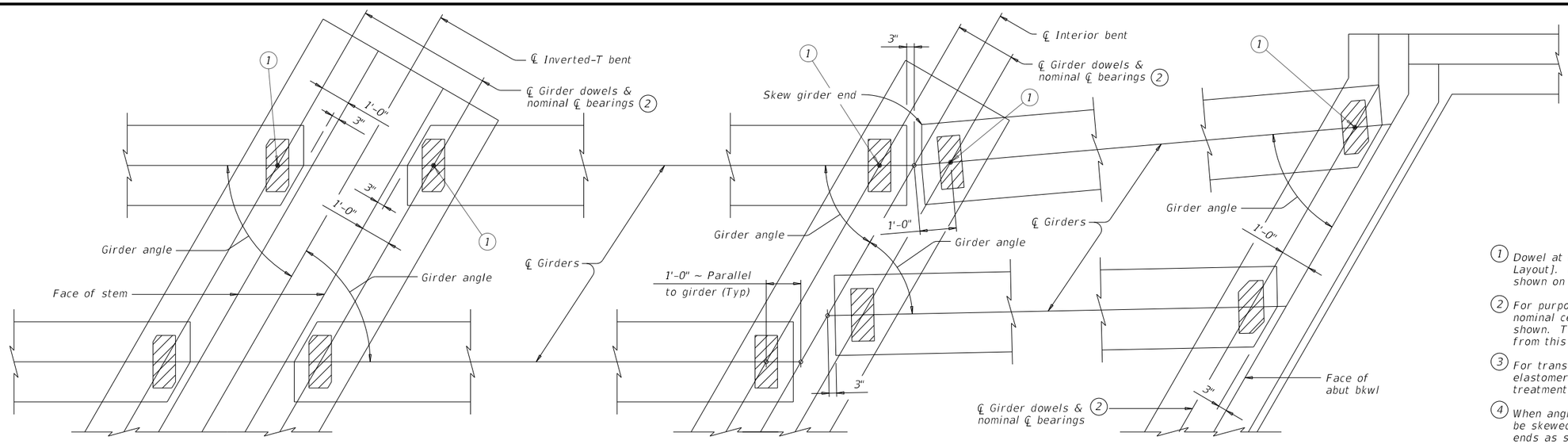
HL93 LOADING — SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DETAILS

IGD

FILE: IG-IGD-23.dgn	DN: TxDOT	CK: JMH	DW: JTR	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Added Bars C and CH full length for VC<= 20' 3-23: Clarified C and CH requirement	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		82



AT INVERTED-T BENT W/SKEW

AT CONVENTIONAL INTERIOR BENT W/SKEW

AT ABUTMENT W/SKEW (3)

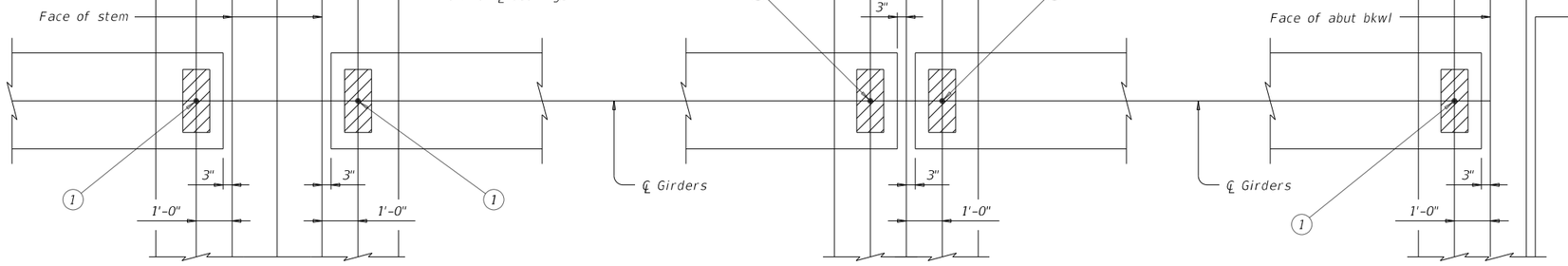
(1) Dowel at doweled girder end [labeled (D) on Bridge Layout]. Required for outside girder only or as shown on substructure details.

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(3) For transition bents with backwall, girder and elastomeric bearings must receive the same treatment as shown for abutments.

(4) When angle exceeds 0°, one or both girders ends must be skewed to maintain the clearance between girder ends as shown in view.

(5) See Table of Bearing Pad Dimensions for bearing size. Girder end skew angles in Table not applicable for this situation. Table reflects girder conflicts of this type on radial bents only.

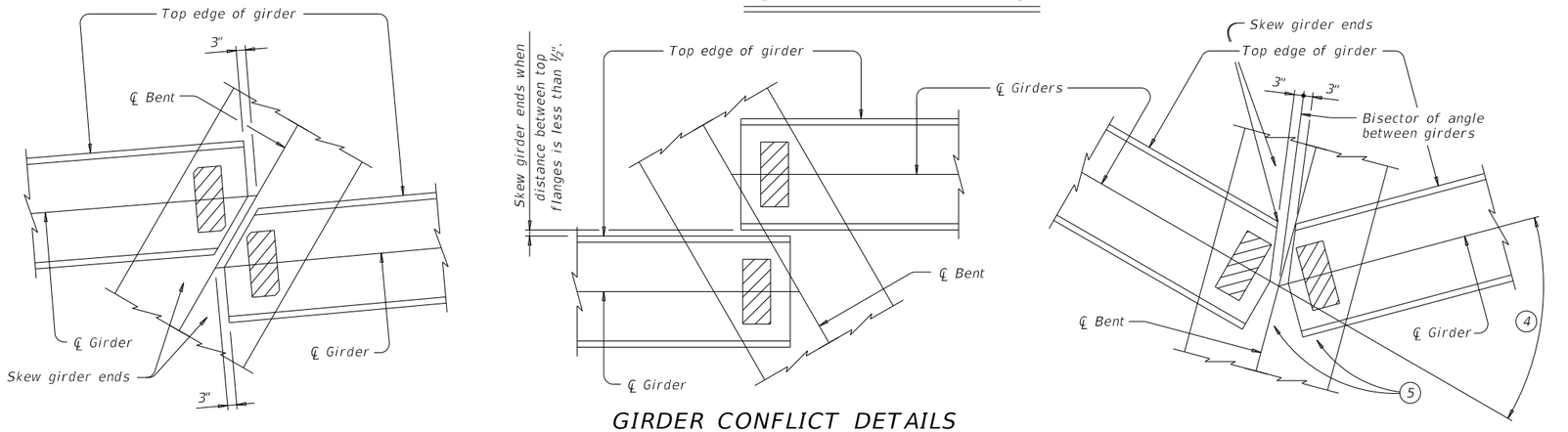


AT INVERTED-T BENT

AT CONVENTIONAL INTERIOR BENT

AT ABUTMENT (3)

GIRDER END DETAILS



GIRDER CONFLICT DETAILS

GENERAL NOTES:

These details accommodate skew angles up to 60°.

Shop drawings for approval are required.

A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer.

Cost of furnishing and installing elastomeric bearings, including beveled and embedded steel plates, must be included in unit price bid for "Prestressed Concrete Girders".

HL93 LOADING SHEET 1 OF 3

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

FILE: igebsts1-17.dgn	DN: AEE	CK: JMH	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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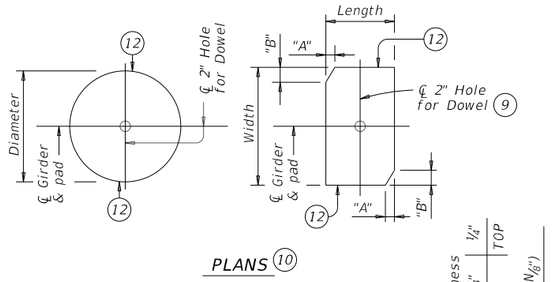
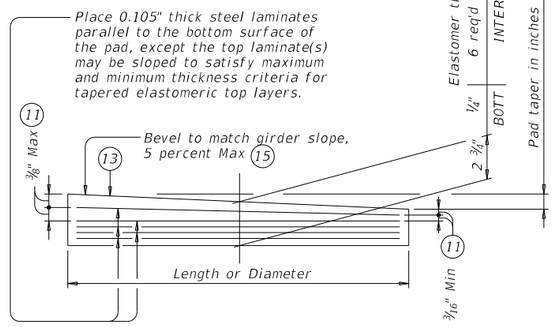


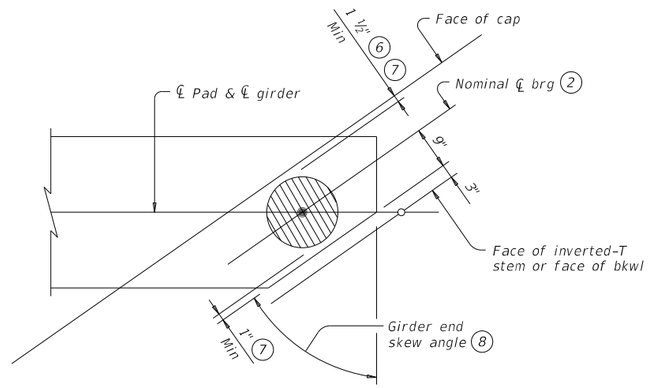
PLANS (10)



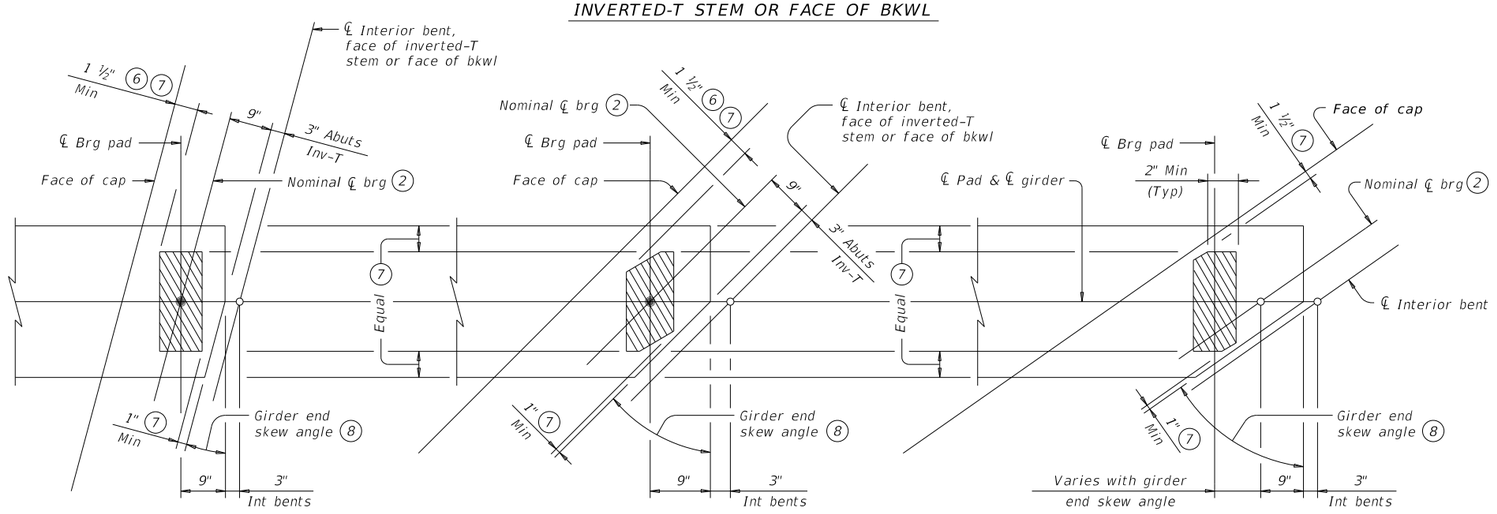
ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)



ROUND BEARINGS FOR SKEWED GIRDER ENDS AT FACE OF INVERTED-T STEM OR FACE OF BKWL



SKEWED GIRDER ENDS AT INT BENTS, FACE OF INVERTED-T STEM OR FACE OF BKWL

SKEWED GIRDER ENDS AT CONVENTIONAL INTERIOR BENTS (16)

(NO GIRDER DOWELS)

BEARING PAD PLACEMENT DIAGRAMS

TABLE OF MINIMUM SUBSTRUCTURE DIMENSIONS (14)

Girder Type	Abutments: Face of Bkwl to Face of Cap	Int Bents: Overall Cap Width	Inv-T Bents: Corbel Width
Tx28 thru Tx54	1'-9"	3'-6"	1'-10 ½"
Tx62 & Tx70	2'-0"	4'-0"	2'-1 ½"

TABLE OF BEARING PAD DIMENSIONS

Bent Type	Girder Type	Bearing Type (13)	Girder End Skew Angle Range	Pad Size Lgth x Width	Pad Clip Dimensions "A"	Pad Clip Dimensions "B"
ABUTMENTS, INVERTED-T AND TRANSITION BENTS WITH BACKWALLS	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 21°	8" x 21"	---	---
		G-2-"N"	21°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-3-"N"	30°+ thru 45°	9" x 21"	4 ½"	4 ½"
		G-4-"N"	45°+ thru 60°	15" Dia	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 21°	9" x 21"	---	---
		G-6-"N"	21°+ thru 30°	9" x 21"	1 ½"	2 ½"
		G-7-"N"	30°+ thru 45°	10" x 21"	4 ½"	4 ½"
		G-8-"N"	45°+ thru 60°	10" x 21"	7 ¼"	4 ¼"
CONVENTIONAL INTERIOR BENTS	Tx28,Tx34, Tx40,Tx46 & Tx54	---	---	---	---	---
		---	---	---	---	---
		G-1-"N"	0° thru 60°	8" x 21"	---	---
	Tx62 & Tx70	G-5-"N"	0° thru 60°	9" x 21"	---	---
CONVENTIONAL INTERIOR BENTS WITH SKEWED GIRDER ENDS (GIRDER CONFLICTS) (16)	Tx28,Tx34, Tx40,Tx46 & Tx54	G-1-"N"	0° thru 18°	8" x 21"	---	---
		G-2-"N"	18°+ thru 30°	8" x 21"	1 ½"	2 ½"
		G-9-"N"	30°+ thru 45°	8" x 21"	3"	3"
		G-10-"N"	45°+ thru 60°	9" x 21"	6"	3 ½"
	Tx62 & Tx70	G-5-"N"	0° thru 18°	9" x 21"	---	---
		G-5-"N"	18°+ thru 30°	9" x 21"	---	---
		G-11-"N"	30°+ thru 45°	9" x 21"	1 ½"	1 ½"
		G-12-"N"	45°+ thru 60°	9" x 21"	3"	1 ¾"

(2) For purposes of computing bearing seat elevations, nominal centerline of bearing must be defined as shown. The actual center of bearing pad may vary from this line.

(6) 3" for inverted-T.

(7) Place centerline pad as near nominal centerline bearing as possible between limits shown.

(8) Girder end skew angle is equal to 90° minus the girder angle except at some conflicting girders.

(9) Provide 2" dia hole only at locations required. See Substructure details for location.

(10) See Table of Bearing Pad Dimensions for dimensions.

(11) Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

(12) Locate Permanent Mark here.

(13) Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in ⅛" increments) in this mark.
Examples: N=0, (for 0" taper)
N=1, (for ⅛" taper)
N=2, (for ¼" taper)
(etc.)
Fabricated pad top surface slope must not vary from plan girder slope by more than $\left(\frac{0.0625"}{\text{Length or Dia}}\right)$ IN/IN.

(14) Substructure dimensions must satisfy the minimums provided to accommodate the elastomeric bearings shown on this standard.

(15) See sheet 3 of 3 for beveled plate use when slopes exceed 5 percent.

(16) If girder end is skewed for a girder conflict at an interior bent and a beveled sole plate is required, use bearing type for abutments at this location. Location of bearing centerline is to be set as for abutments in this case.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

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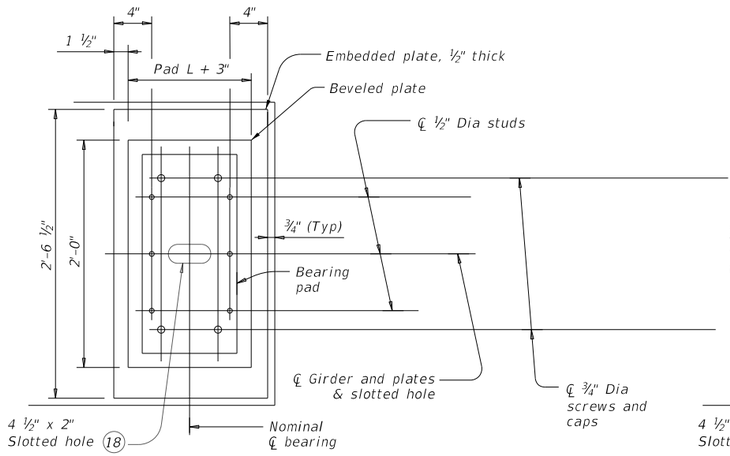
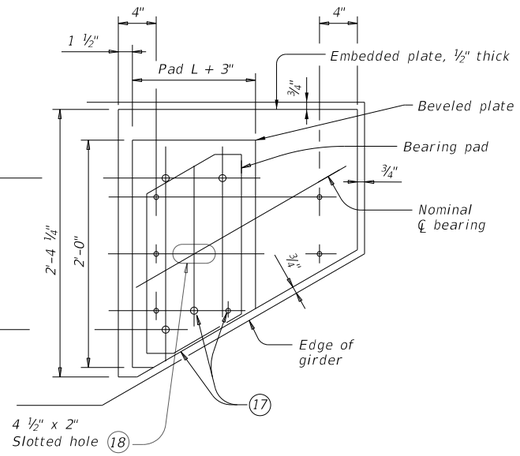
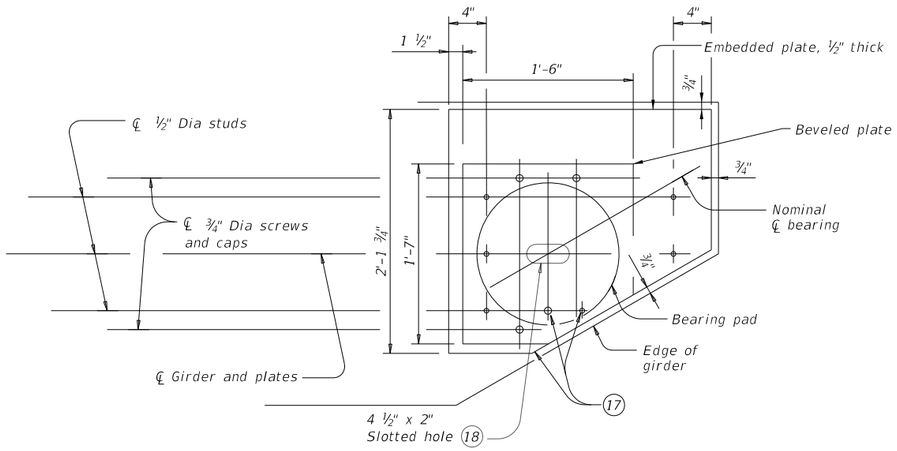


NORMAL GIRDER END
RECTANGULAR BEARING PAD

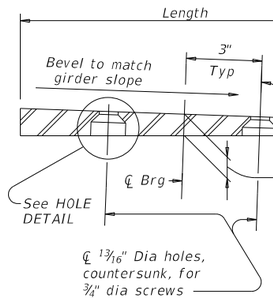


SKEWED GIRDER END
CLIPPED RECTANGULAR BEARING PAD

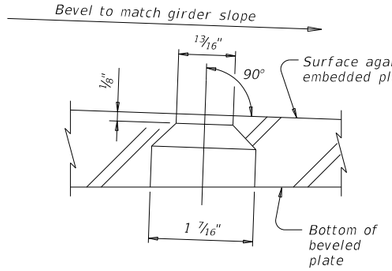


SKEWED GIRDER END
15" DIA BEARING PAD

PLAN VIEW OF SOLE PLATE DETAILS



SECTION



HOLE DETAIL

(17) Cut beveled and embedded plates to match girder end skew. Adjust location of screw and stud as shown when necessary.

(18) Slotted hole is required at doweled girder end locations.

SOLE PLATE NOTES:

Provide constant thickness elastomeric bearings with beveled and embedded steel sole plates in accordance with these details when the girder slope exceeds 5 percent or if otherwise required in the plans. Provide for all girders in the span.

On the shop drawings, dimension sole plates to the nearest 1/16" based on required thickness at centerline of bearing and slope of girder. Thickness tolerance variation from the approved shop drawings is 1/16"+/-, except variation from a plane parallel to the theoretical top surface can not exceed 1/16" total. Bearing surface tolerances listed in Item 424 apply to embedded and beveled plates.

Steel plate must conform to ASTM A36, A572 Gr 50, or A709 Gr 36 or Gr 50. Hot dip galvanize both the embedded plate and beveled sole plate after fabrication. Seal weld caps to embedded plate before galvanizing.

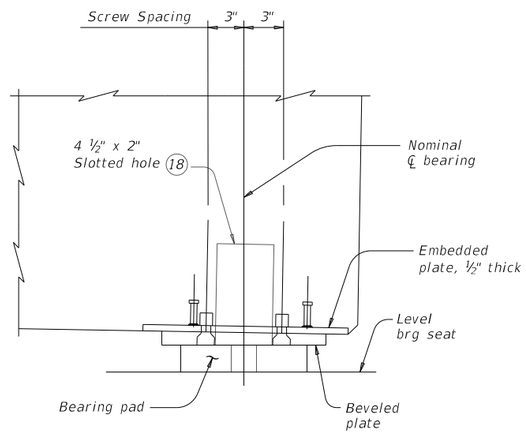
When determining if relocation of screw holes and studs are necessary for skewed girder ends, minimum clearance from screw or stud centerline to plate edge is 1.25".

Tap threads in the embedded plate only. Drill and tap prior to galvanizing.

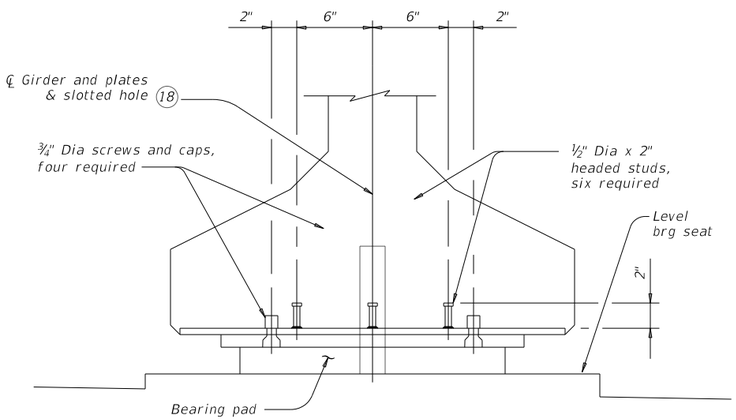
¾" Dia screws must be electroplated, socket flat head countersunk cap screws conforming to ASTM F835. Electroplating must conform to ASTM B633, SC 2, Type I. Provide screws long enough to maintain a ¾" minimum embedment into the embedded plate and galvanized cap. Provide galvanized steel caps (16 ga Min) with a nominal 1" inside diameter and deep enough to accommodate the screws, but not less than ½" deep or deeper than 1".

Install beveled sole plates prior to shipping girders. Installed screw heads must not protrude below the bottom of the beveled plate.

BEVELED PLATE DETAILS



SIDE ELEVATION



END ELEVATION
Showing normal girder end.

GIRDER DETAILS

HL93 LOADING SHEET 3 OF 3

Texas Department of Transportation — Bridge Division Standard

ELASTOMERIC BEARING AND GIRDER END DETAILS

PRESTR CONCRETE I-GIRDERS

IGEB

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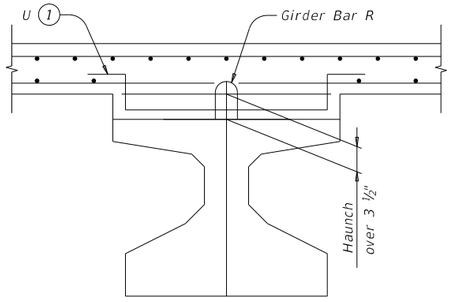
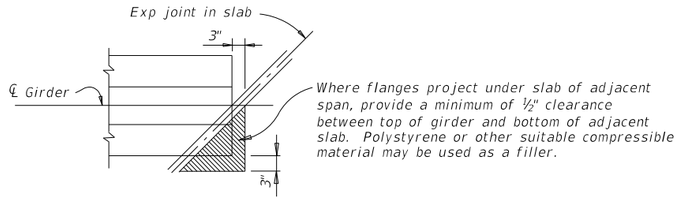
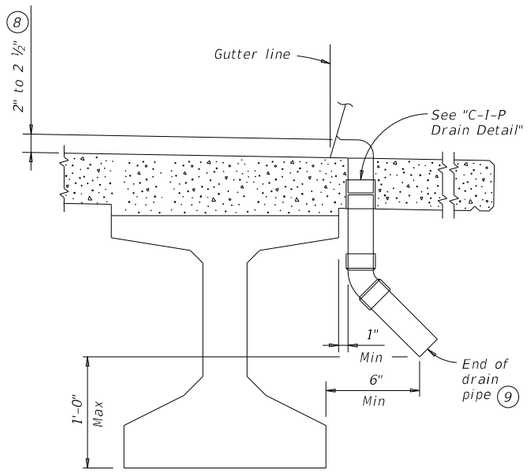


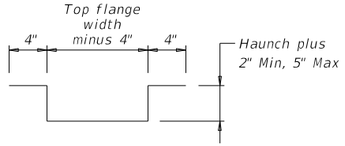
HAUNCH REINFORCING DETAIL



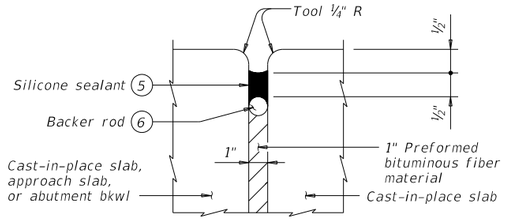
TREATMENT AT GIRDER END FOR SKEWED SPANS



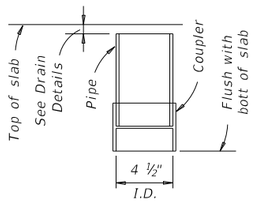
DRAIN DETAIL (10)



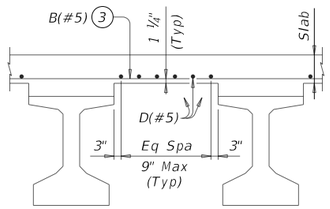
BARS U (#4)



TYPE A JOINT DETAIL (7)



C-I-P DRAIN DETAIL (2)



TYPICAL PART TRANSVERSE SLAB SECTION WITHOUT PCP (4)

Top reinforcing steel not shown for clarity.

(1) Space Bars U with girder Bars R in all areas where measured haunch exceeds 3 ½".

(2) Roughen outside of PVC with coarse rasp or equal to ensure bond with cast-in-place concrete.

(3) Bars B(#5) spaced at 6" Max with 2" end cover. Overhang option, Contractor's may end alternating bars B(#5) at centerline outside girder.

(4) Provide Grade 60 reinforcing steel. Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
~ #5 = 2'-0"
Epoxy coated ~ #4 = 2'-5"
~ #5 = 3'-0"

(5) Class 7 silicone sealant that conforms to DMS-6310. Install when ambient temperature is between 55°F and 85°F and rising. Engineer to determine allowable hours for sealant application.

(6) 1 ¼" backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(7) The maximum distance between Type A expansion joints is 100'. See Bridge Layout for location of joints.

(8) Drain entrance formed in rail or sidewalk.

(9) Water may not be discharged onto girders.

(10) All drain pipe and fittings to be 4" diameter (Sch 40) PVC. See Item 481 "Pipe for Drains" for pipe, connections and solvent welding. Bend reinforcing steel to clear PVC 1". Drain length and location is as directed by the Engineer. Drains are not permitted over roadways or railways, or within 10'-0" of bent caps. Degrease outside of exposed PVC, apply acrylic water base primer, then coat with same surface finishing material as used for outside girder face. Variations of the above designs, as required for the type of rail used and its location on the structure, may be installed with the approval and direction of the Engineer.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Payment for Type A joint will be as per Item 454, "Bridge Expansion Joints."

All other items (reinforcing steel, drains, etc.) shown on this sheet are subsidiary to other bid items.

Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

DECK FORMWORK NOTES:

Overhang bracket hangers are limited to a safe working load of 3,600 lbs, applied to and along the axis of a coil rod at 45 degrees from vertical, regardless of higher loads permitted by hanger manufacturers. Do not place a hanger less than 12" from girder end. Space hangers accordingly.

Texas Department of Transportation

Dallas District Bridge

MISCELLANEOUS SLAB DETAILS

PRESTR CONCRETE I-GIRDERS

IGMS-DAL

FILE: igmsst1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
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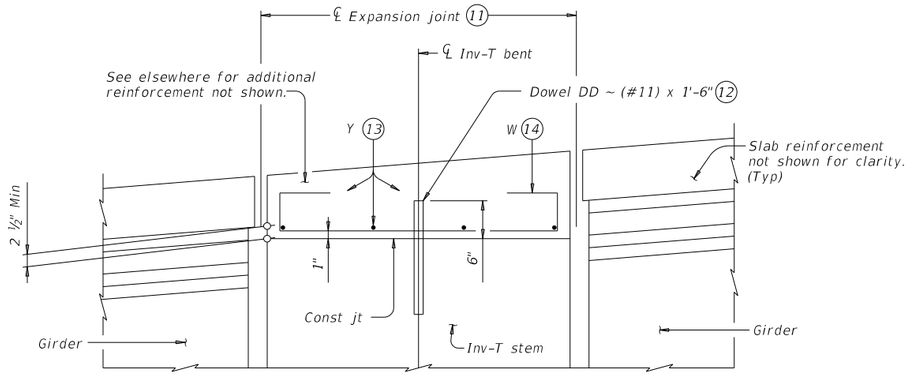
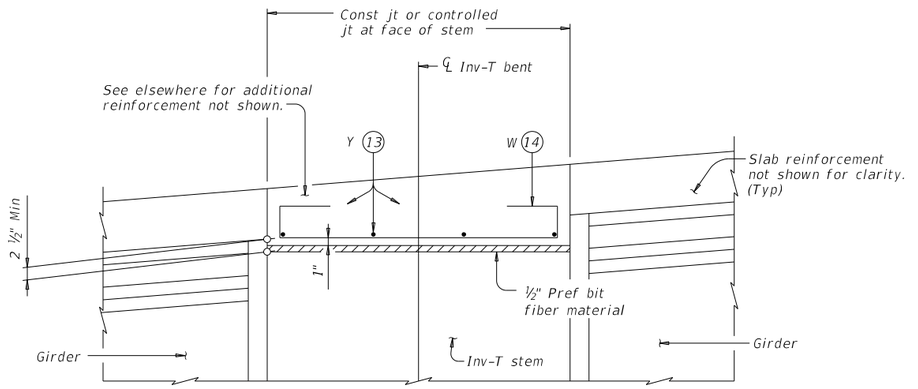
REVISIONS	1396	01	013,ETC.	FM 1391
05-22: Converts to Dallas District Standard	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		86

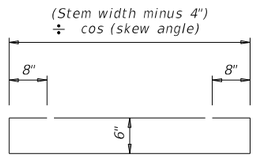


SHOWING EXPANSION JOINTS

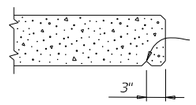


SHOWING CONST JTS OR CONTROLLED JTS

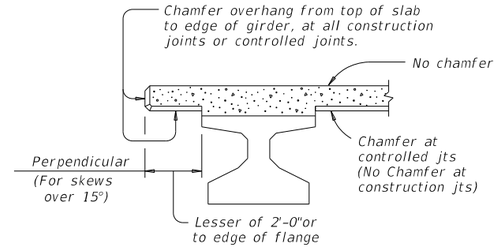
REINFORCEMENT OVER INV-T BENTS



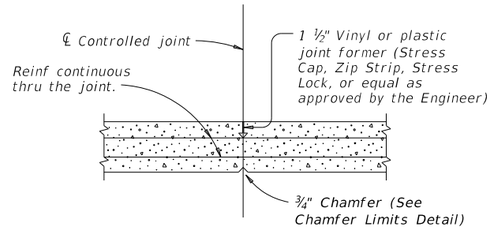
BARS W (#4)



DRIP BEAD DETAIL



CHAMFER LIMITS DETAIL (15)



CONTROLLED JOINT DETAIL

(Saw-cutting is not allowed)

(11) See Layout for joint type.

(12) Dowels DD (#11) spaced at 5 Ft Max. See Inv-T bents for quantity and location.

(13) Space Bars Y (#4) at 12" Max. Use 2" end cover. Number of Bars Y must satisfy spacing limit. Place parallel to bent.

(14) Space Bars W at 12" Max (3" from end of cap). Tilt if necessary to maintain cover requirements. Place parallel to longitudinal slab reinforcement.

(15) See Span details for type of joint and joint locations.

DATE: 11/14/2023 2:36:49 PM
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SHEET 2 OF 2

Texas Department of Transportation | Dallas District Bridge

MISCELLANEOUS SLAB DETAILS
PRESTR CONCRETE I-GIRDERS

IGMS-DAL

FILE: igmssts1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
05-22: Converts to Dallas District Standard	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		87

DATE:
FILE:

STRUCTURE	DESIGNED GIRDERS									DEPRESSED STRAND PATTERN		CONCRETE		OPTIONAL DESIGN					LOAD RATING FACTORS		
	SPAN NO.	GIRDER NO.	GIRDER TYPE	PRESTRESSING STRANDS						NO.	TO END (in)	RELEASE STRGTH (1) f'ci (ksi)	MINIMUM 28 DAY COMP STRGTH f'c (ksi)	DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct(ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb(ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR (2)		STRENGTH I		SERVICE III
				NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)								Moment	Shear	Inv	Opr	Inv
FM 1391 MAIN CHANNEL	1	1-5	TX28		24	0.6	270	9.65	6.98	4	20.5	5.000	6.200	2.975	-3.749	2868	0.696	0.884	1.33	1.88	1.04
	2	1-5	TX28		30	0.6	270	9.28	5.68	6	24.5	5.700	6.500	3.475	-4.301	3227	0.682	0.884	1.45	1.95	1.09
	3	1-5	TX28		24	0.6	270	9.65	6.98	4	20.5	5.000	6.200	2.975	-3.749	2868	0.696	0.884	1.33	1.88	1.04
FM 1391 RELIEF NO. 2	1	1-5	TX28		20	0.6	270	9.88	7.08	4	18.5	4.200	5.800	2.576	-3.285	2546	0.712	0.884	1.35	1.76	1.01
	2	1-5	TX28		20	0.6	270	9.88	7.08	4	18.5	4.200	5.800	2.576	-3.285	2546	0.712	0.884	1.35	1.76	1.01
	3	1-5	TX28		24	0.6	270	9.65	6.98	4	20.5	5.000	6.200	3.028	-3.795	2887	0.696	0.884	1.31	1.86	1.00
	4	1-5	TX28		30	0.6	270	9.28	5.68	6	24.5	5.600	6.500	3.488	-4.312	3232	0.682	0.884	1.45	1.95	1.07
	5	1-5	TX28		24	0.6	270	9.65	6.98	4	20.5	5.000	6.200	3.028	-3.795	2887	0.696	0.884	1.31	1.86	1.00
	6	1-5	TX28		20	0.6	270	9.88	7.08	4	18.5	4.200	5.800	2.576	-3.285	2546	0.712	0.884	1.35	1.76	1.01
	7	1-5	TX28		20	0.6	270	9.88	7.08	4	18.5	4.200	5.800	2.576	-3.285	2546	0.712	0.884	1.36	1.76	1.01

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF GIRDER

(1) Based on the following allowable stresses (ksi):

Compression = 0.65 f'ci

Tension = $0.24\sqrt{f'ci}$

Optional designs must likewise conform.

(2) Portion of full HL93.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Optional designs for girders 120 feet or longer must have a calculated residual camber equal to or greater than that of the designed girder.

Prestress losses for the designed girders have been calculated for a relative humidity of 60 percent. Optional designs must likewise conform.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

Use low relaxation strands, each pretensioned to 75 percent of fpu.

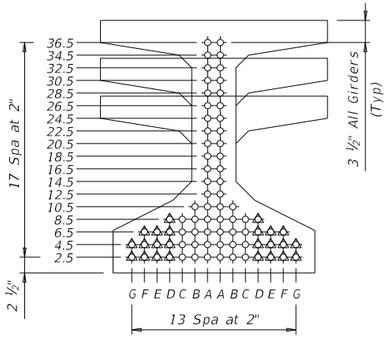
Strand debonding must comply with Item 424.4.2.2.2.4. Full-length debonded strands are only permitted in positions marked △. Double wrap full-length debonded strands in outer most position of each row.

When shown on this sheet, the Fabricator has the option of furnishing either the designed girder or an approved optional design. All optional design submittals must be signed, sealed and dated by a Professional Engineer registered in the State of Texas.

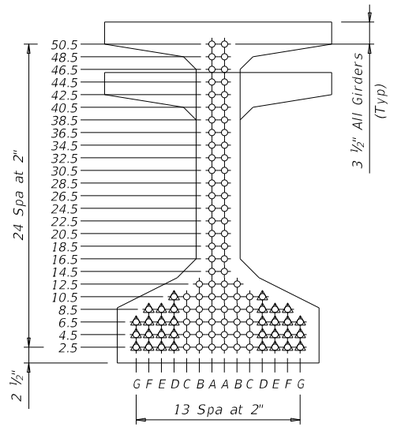
Seal cracks in girder ends exceeding 0.005" in width as directed by the Engineer. The fabricator is permitted to decrease the spacing of Bars R and S by providing additional bars to help limit crack width provided the decreased spacing results in no less than 1" clear between bars. The fabricator must take an approved corrective action if cracks greater than 0.005" form on a repetitive basis.

DEPRESSED STRAND DESIGNS:

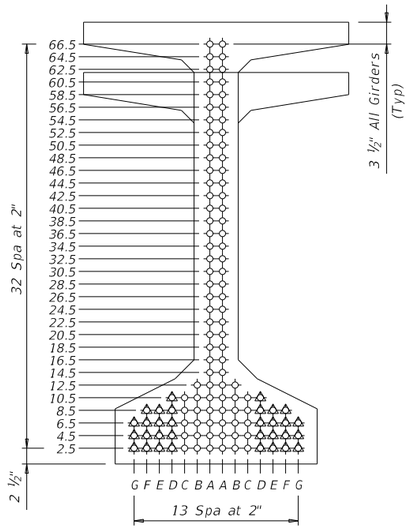
Locate strands for the designed girder as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc., beginning each row in the "A" position and working outward until the required number of strands is reached. All strands in the "A" position must be depressed, maintaining the 2" spacing so that, at the girder ends, the upper two strands are in the position shown in the table.



TYPE Tx28, Tx34 & Tx40



TYPE Tx46 & Tx54



TYPE Tx62 & Tx70

HL93 LOADING

STATE OF TEXAS
LLOYD M. WOLF
73649
REGISTERED PROFESSIONAL ENGINEER

Lloyd M. Wolf, P.E.
11/14/2023

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE I-GIRDER DESIGNS (NON-STANDARD SPANS)

IGND

FILE: IGND.dgn	DN: TxDOT	CK: TxDOT	DW: EFC	CK: TAR
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS 10-19: Modified for depressed strands only. 3-22: Added Load Rating.	1396	01	013, ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		88

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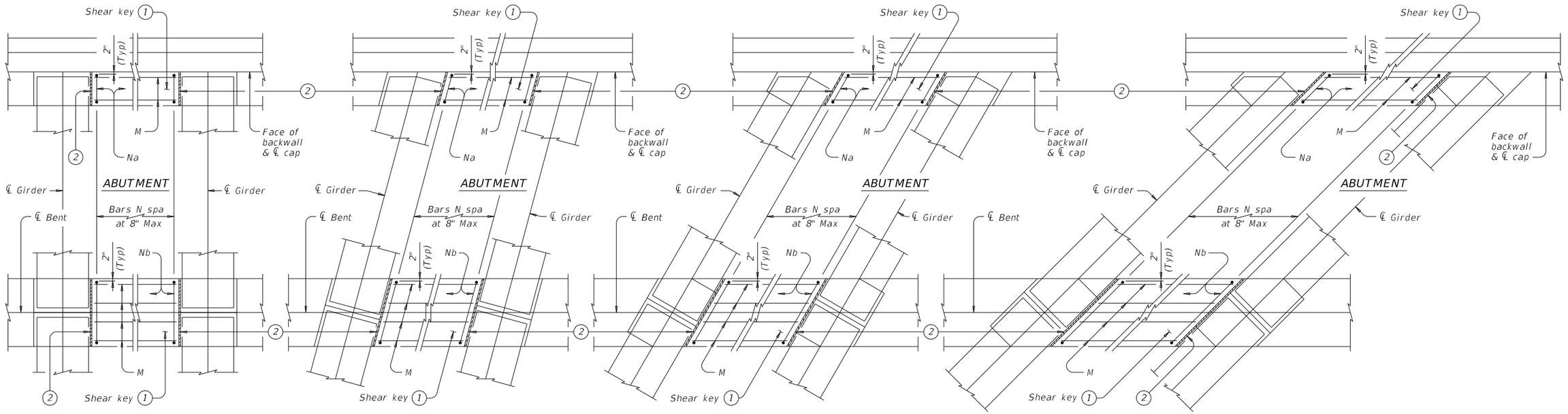


PARTIAL PLANS WITH NO SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 15° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 30° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

PARTIAL PLANS WITH 45° SKEW

Showing shear keys on 3'-6" wide caps. 4'-0" caps similar.

(1) Place shear keys on the upstream side of structure between outside girder and next adjacent girder, unless shown otherwise on plans.

(2) UHMW polyethylene wear pad. (Typ)

(3) Leave a ¼" gap plus or minus between girder and face of wear pad. Cast wear pad with shear key, smooth side facing girder. Care must be taken to keep concrete from flowing under girder. Slope top of shear keys in accordance with Item 420.4.9, "Treatment and Finishing of Horizontal Surfaces."

(4) Measure at higher bearing seat elevation forward or back. Dimension based on typical bearing pad and bearing seat. Increase as necessary to maintain 5" overlap.

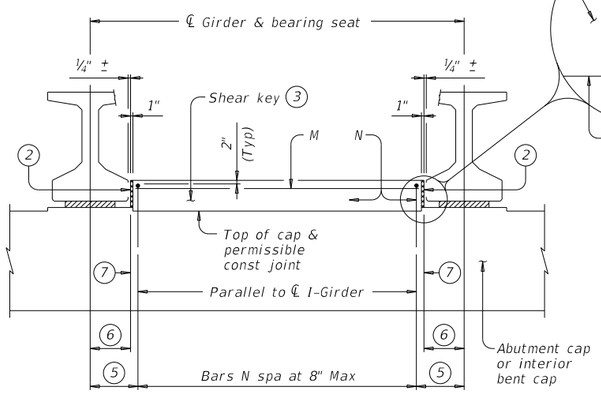
(5) With No Skew = 1'-8 ¼", measured along ℄ cap.
With Skew = 1'-8 ¼" ÷ Cos Skew, measured along ℄ cap.

(6) With No Skew = 1'-4 ¼", measured along ℄ cap.
With Skew = 1'-4 ¼" ÷ Cos Skew, measured along ℄ cap.

(7) Face of UHMW polyethylene wear pad. Smooth side of pad facing girder.

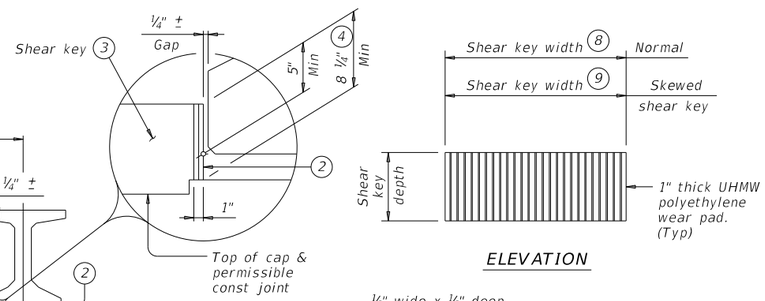
(8) Abutments = ½ Cap width.
Interior bents = Cap width.

(9) Abutments = ½ Cap width ÷ Cos Skew.
Interior bents = Cap width ÷ Cos Skew.

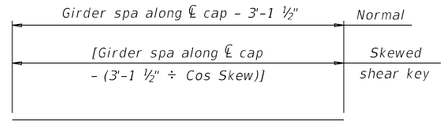


PARTIAL ELEVATION OF ABUTMENT OR INTERIOR BENT CAP (1)

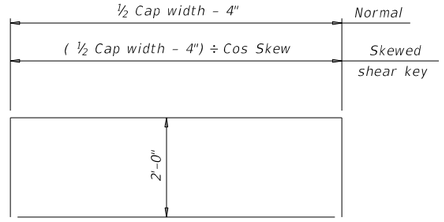
Showing shear key with girder Type Tx46.
Other I-Girder types similar.



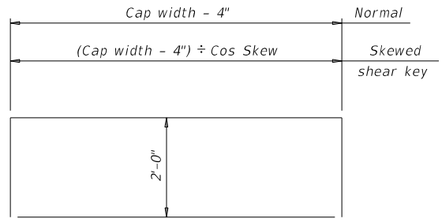
ULTRA HIGH MOLECULAR WEIGHT (UHMW) POLYETHYLENE WEAR PAD DETAILS



BARS M (#5)



BARS Na (#5)
(For abutments)



BARS Nb (#5)
(For interior bents)

CONSTRUCTION NOTES:

Provide Class "C" concrete (f'c = 3,600 psi). Provide Class "C" (HPC) if shown elsewhere on the plans.
Provide Grade 60 reinforcing steel.
Provide epoxy coated reinforcing steel for shear key if abutment or interior bent reinforcing steel is epoxy coated.
Provide Ultra High Molecular Weight (UHMW) polyethylene wear pads in accordance with ASTM D6712.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Details showing skew are drawn showing right forward skew. See Bridge Layout for actual skew direction.
These details are limited to bridges skewed 45 degrees and less.
This standard is only applicable for I-Girders.
Modify details for bearing conditions, and girder spacing not shown on this standard. Details do not account for sole plate or pedestal bearing seat.
Include shear key concrete in abutment or bent concrete for payment.
UHMW polyethylene wear pads are subsidiary to Class "C" concrete.

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

SHEAR KEY DETAILS
PRESTR CONCRETE I-GIRDERS

IGSK

FILE: igskstds-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		89

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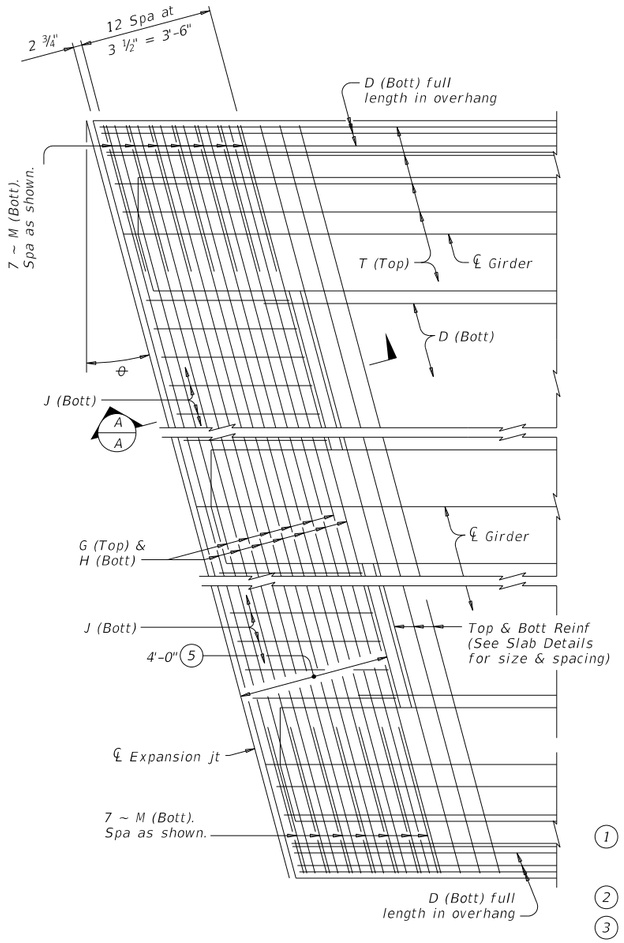
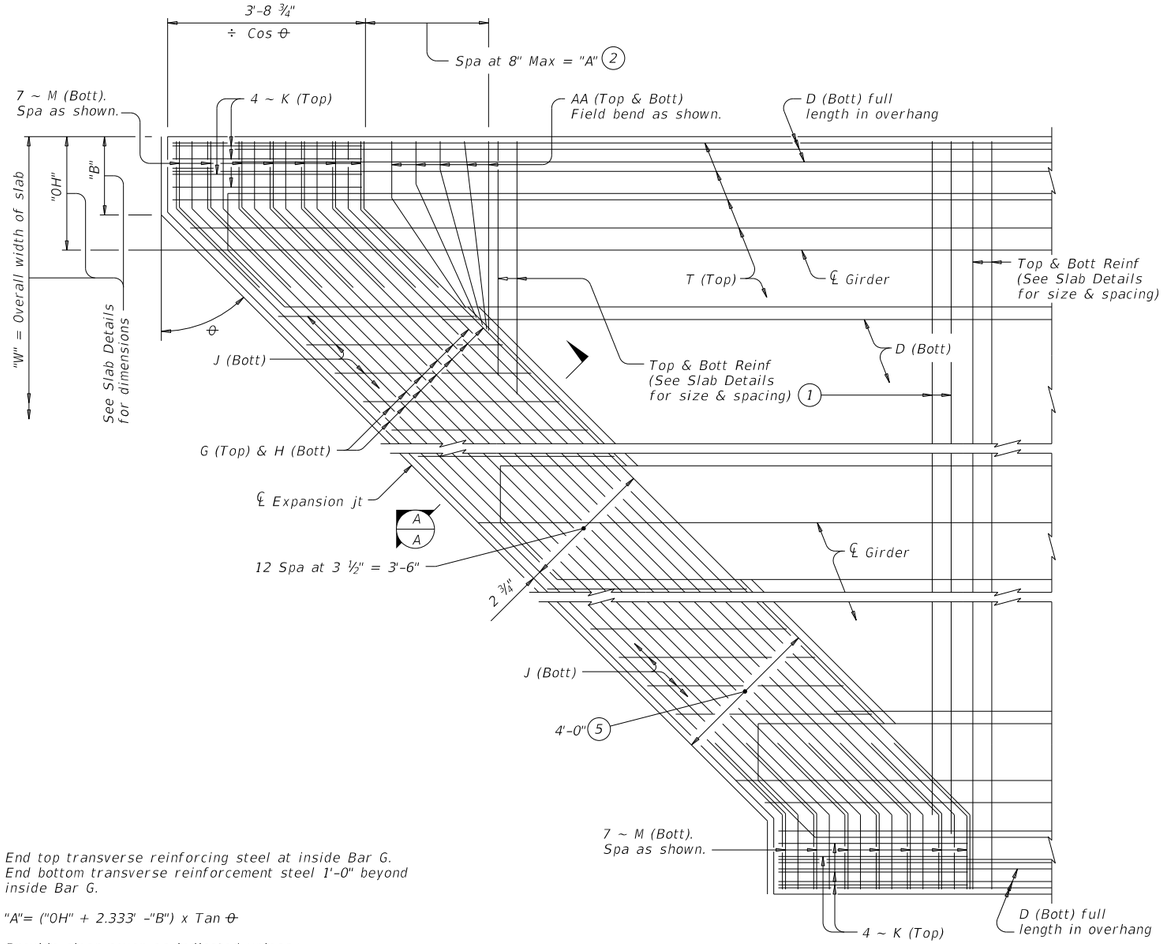
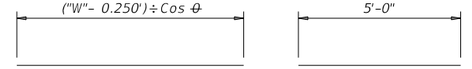


PARTIAL PLAN FOR SLABS WITHOUT BREAKBACK



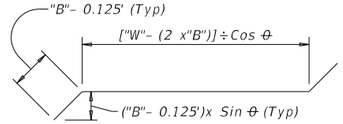
PARTIAL PLAN FOR SLABS WITH BREAKBACK

1. End top transverse reinforcing steel at inside Bar G. End bottom transverse reinforcement steel 1'-0" beyond inside Bar G.
2. "A"= ("OH" + 2.333' -"B") x Tan θ
3. Provide clear cover as indicated unless otherwise shown on Span Details.
4. Only required on slabs with breakbacks.
5. Thickened slab end dimensioned perpendicular to face of bkwl, centerline interior bent or face of inverted-T stem.

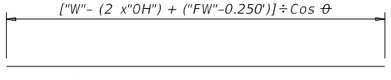


BARS G (#5)
(For slabs without breakbacks)

BARS K (#5) (4)



BARS G (#5)
(For slabs with breakbacks)

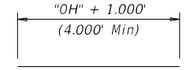


"FW" = girder's top flange width (ft)

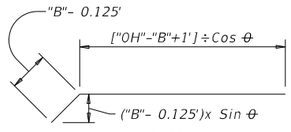
BARS H (#5)

BARS AA (#5) (4)

BARS J (#5)



BARS M (#5)
(For slabs without breakbacks)



BARS M (#5)
(For slabs with breakbacks)

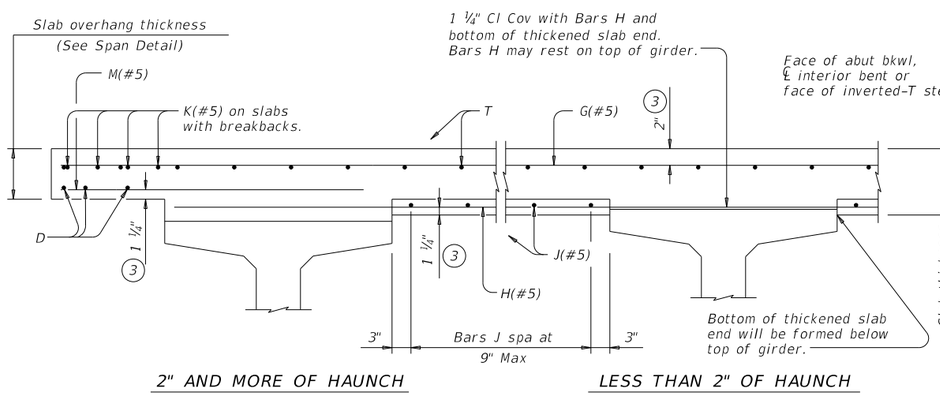
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
These details are restricted to Prestressed Concrete I-Girder Spans.
These details are to be used in conjunction with the Span Details and PCP standard (if prestressed concrete panels are used).
When Option 2 from PCP standard is used, provide Bars AA, G and K in the slab.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
If slab reinforcing steel is shown on the Slab Details to be epoxy coated, then Bars AA, G, K, H, J, M and OA must be epoxy coated.
Provide bar laps, where required, as follows:

Uncoated ~ #4 = 1'-7"
~ #5 = 2'-0"
Epoxy Coated ~ #4 = 2'-5"
~ #5 = 3'-0"

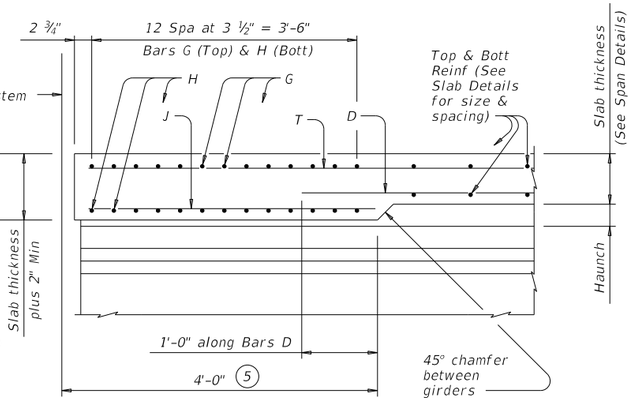


2" AND MORE OF HAUNCH

LESS THAN 2" OF HAUNCH

TYPICAL TRANSVERSE SECTION

(Showing Prestressed Conc I-Girders at ℄ Brg)



SECTION A-A

(Showing with 2" and more of haunch)

Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

HL93 LOADING

Texas Department of Transportation

Dallas District Bridge

THICKENED SLAB END DETAILS

PRESTRESSED CONCRETE I-GIRDER SPANS

IGTS-DAL

FILE: igtssts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013, ETC.	FM 1391
05-22: Converts to Dallas District Standard	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		90

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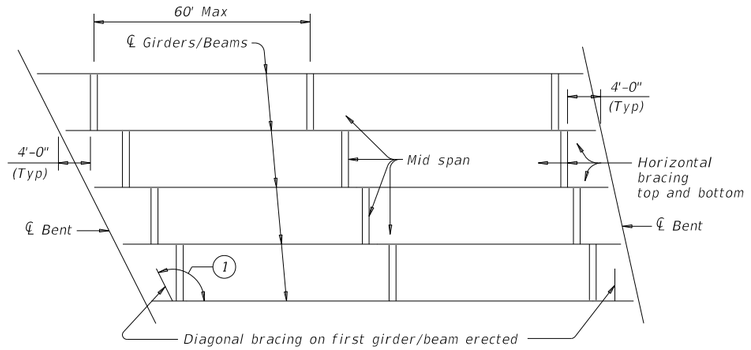
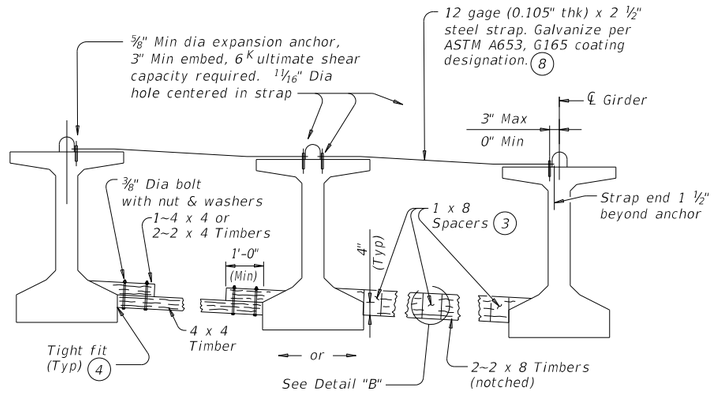
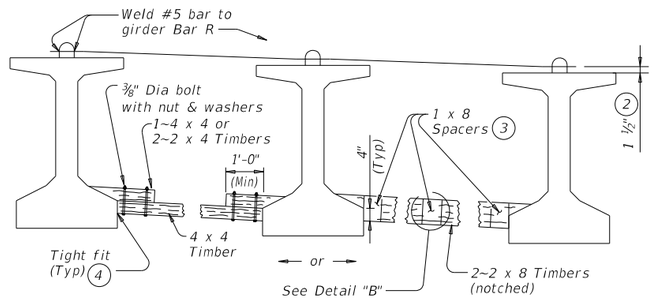


ERECTION BRACING



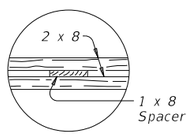
FOR ERECTION BRACING, OPTION 1

(This option is not allowed when slab is formed with PMDF or plywood.)



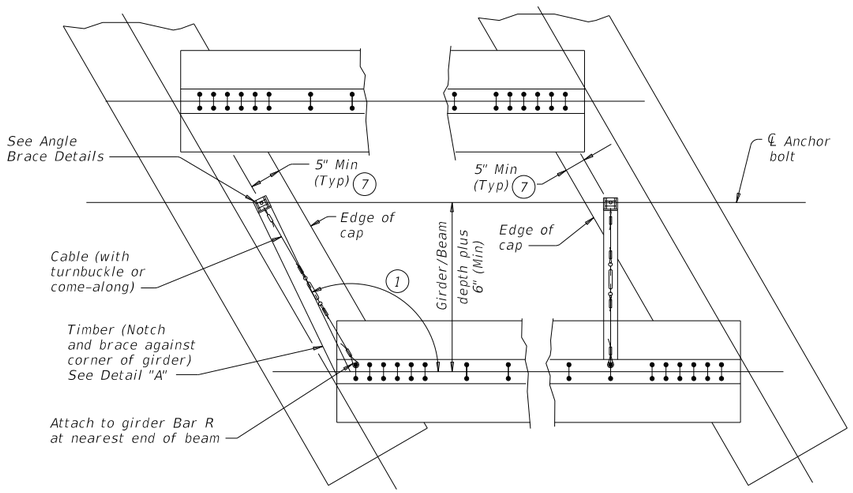
FOR ERECTION BRACING, OPTION 2

HORIZONTAL BRACING DETAILS (5)

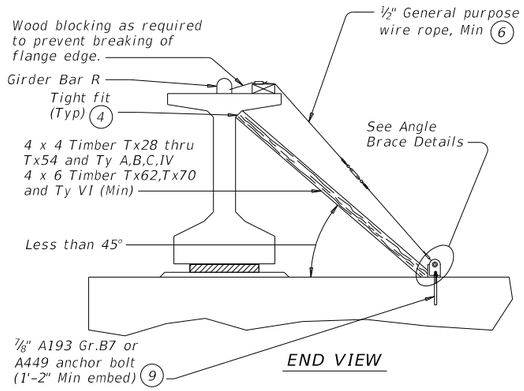


PLAN

DETAIL "B"



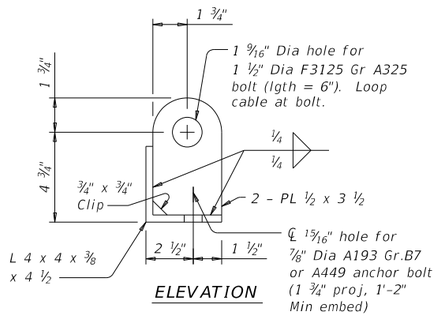
PLAN



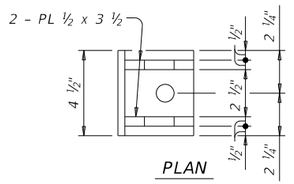
END VIEW

DIAGONAL BRACING DETAILS (5)

(To be used on both ends of the first girder/beam erected in the span in each phase.)



ELEVATION



PLAN

ANGLE BRACE DETAILS

HAULING & ERECTION:

The Contractor's attention is directed to the possible lateral instability of prestressed concrete girders and beams over 130' long, especially during hauling and erection. The use of the following methods to improve stability is encouraged: Locate lifting devices at the maximum practical distance from girder ends; use external lateral stiffening devices during hauling and erection; lift with vertical lines using two machines; and take care in handling to minimize inertial and impact forces.

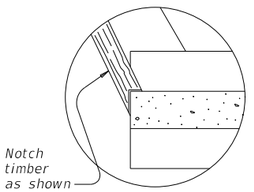
ERECTION BRACING:

Erection bracing details shown are considered the minimum for fulfilling the bracing requirements of Item 425.

Required erection bracing must be placed immediately after erection of each girder and remain in place until additional bracing as required for slab placement is in place. This standard is needed in all cases to meet requirements for Slab Placement Bracing.

PHASED CONSTRUCTION:

Place erection and slab placement bracing for all girders in a phase as shown in these details. For phases after first, also place erection and slab placement bracing between outer girder of completed phase and adjacent girder of current phase. When the phase construction joint is between girders, top bracing can be omitted.



DETAIL "A"

(1) If angle shown exceeds 120 degrees, move diagonal brace to other side of girder/beam and place square to girder/beam. This may prevent exterior girder from being erected first.

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R (See Sheet 2 of 2).

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(6) All hardware used with cable must be able to develop a minimum 25 kips breaking strength. Use thimbles at all loops in cable. Install cable clamps with saddles bearing against the live end and U-bolts bearing aginst the dead end.

(7) It is acceptable to tie anchor bolts to cap reinforcement.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(9) Anchor bolt may be drilled and epoxied in place. Provide 25k minimum pullout. Core drill hole.

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS
PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		91

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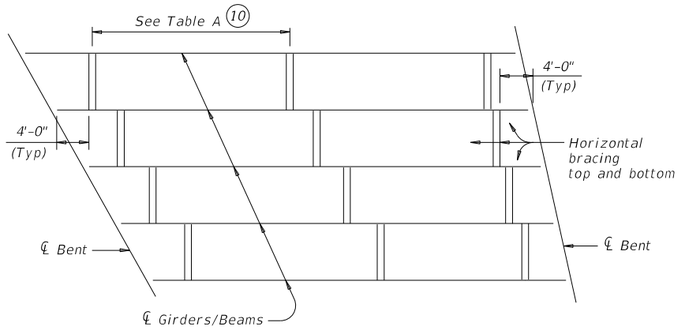


SLAB PLACEMENT BRACING

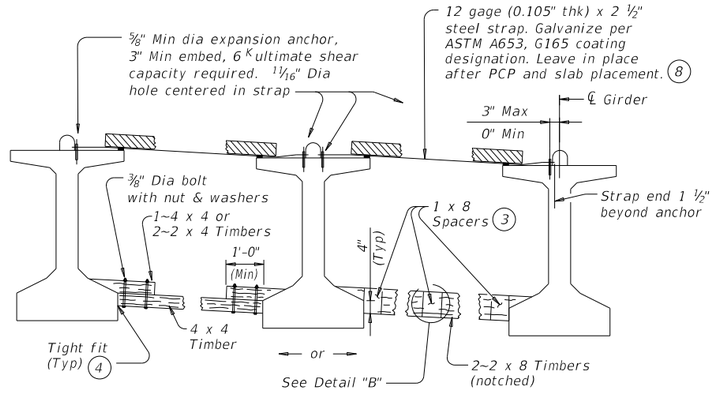
TABLE A

OPTION 1-RIGID BRACING (STEEL STRAP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	¼ points
Tx34	¼ points	¼ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	⅛ points	⅛ points
B	⅛ points	⅛ points
C	⅛ points	⅛ points
IV	¼ points	⅛ points
VI	¼ points	⅛ points

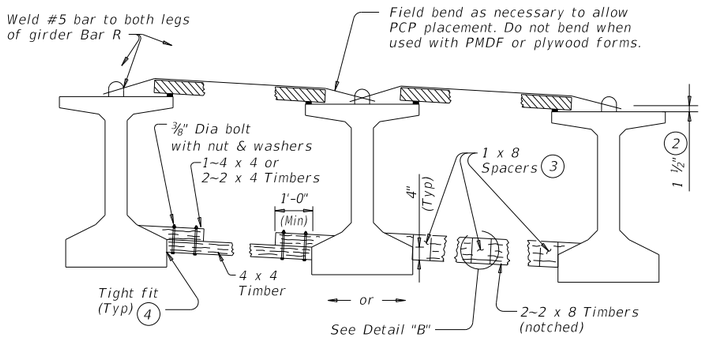
OPTION 2-FLEXIBLE BRACING (NO. 5 OVER PCP)

Girder or Beam Type	Maximum Bracing Spacing	
	Slab Overhang less than 4'-0" (11)	Slab Overhang 4'-0" and greater (11)
Tx28	¼ points	⅛ points
Tx34	¼ points	⅛ points
Tx40	¼ points	⅛ points
Tx46	¼ points	⅛ points
Tx54	¼ points	⅛ points
Tx62	¼ points	⅛ points
Tx70	¼ points	⅛ points
A	2.0 ft	1.5 ft
B	3.0 ft	2.0 ft
C	4.5 ft	2.0 ft
IV	¼ points	4.0 ft
VI	¼ points	4.0 ft



FOR SLAB PLACEMENT BRACING, OPTION 1 - RIGID

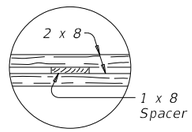
(Showing slab formed with PCP. This option is not allowed when slab is formed with PMDF or plywood.)



FOR SLAB PLACEMENT BRACING, OPTION 2 - FLEXIBLE

(Showing slab formed with PCP.)

HORIZONTAL BRACING DETAILS (5)



PLAN

DETAIL "B"

(2) Place and weld #5 bars as shown during erection. If forming deck with prestressed panels, bars can be temporarily removed, one at a time, during panel erection. Re-install bar prior to additional panel erection. Bars can rest on panels and be bent down and welded to girder Bars R.

(3) Clear distance between spacers must not exceed 3'. Nail together with 16d nails.

(4) Use wedges as necessary to obtain tight fit. Nail wedges to timbers.

(5) Pressure treated landscape timbers can not be used.

(8) Prior to installing, field bend strap to lay flush on both girders' top flange and slope between flange tips.

(10) Bracing spacing (¼ and ⅛ points) measured between first and last typical brace location.

(11) Measure slab overhang from centerline of girder or beam. When overhang varies in span, determine bracing spacing based on largest overhang.

SLAB PLACEMENT BRACING:

The details for slab placement bracing are considered minimum for fulfilling the requirements of Specification Items 422 and 425.

Required slab placement bracing must remain in place until slab concrete has attained a compressive strength of 3000 psi.

GENERAL NOTES:

Bracing details for spans longer than 150' are not provided. The Contractor must submit proposed bracing details for such conditions to the Engineer for approval prior to erection.

Systems equal to or better than those shown may be used provided details of such systems are submitted to and approved by the Engineer prior to erection.

Use of these systems or details does not relieve the Contractor of the responsibility for the adequacy of the bracing and the safety of the structure.

Removal of bracing for short periods of time to align girders and beams is permissible.

All turn-buckles, come-alongs, anchors and other connections must be capable of developing the full strength of the cable shown.

Furnish anchor bolts and nuts in accordance with Item 449, "Anchor Bolts".

Texas Department of Transportation

Bridge Division Standard

MINIMUM ERECTION AND BRACING REQUIREMENTS

PRESTRESSED CONCRETE I-GIRDERS AND I-BEAMS

MEBR(C)

FILE: mebcsts1-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 2017	CONT	SECT	JOB	HIGHWAY
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	DAL	KAUFMAN		92

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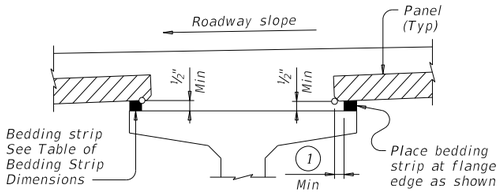
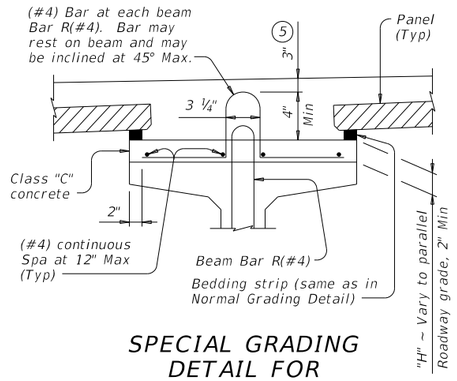


NORMAL GRADING DETAIL (3)

Showing prestressed concrete I-girders. (Other beam types similar)



SPECIAL GRADING DETAIL FOR CONCRETE BEAMS

Showing prestressed concrete I-girders. (Other beam types similar)

TABLE OF BEDDING STRIP DIMENSIONS		
WIDTH	HEIGHT (4)	
	Min	Max
1" (Min)	½"	2"
1 ¼"	½"	2 ½"
1 ½"	½"	3"
1 ¾"	½"	3 ½"
2"	½"	4"
2 ¼"	½"	4 ½" (2)
2 ½"	½"	5" (2)
2 ¾"	½"	5 ½" (2)
3" (Max)	½"	6" (2)

(1) 2" Min for I-girders, 1 ½" Min for all other beam types.

(2) Allowed for prestressed concrete I-girders, not allowed on other beam types.

(3) To reduce the quantity of cast-in-place concrete, bedding strip thickness may be increased in ¼" increments. Bedding strips must be comprised of one layer. Bond bedding strips to the beams with an adhesive compatible with bedding strips. Bedding strips over 2.5" high may need to be bonded to panels. The same thickness strip must be used under any one panel edge and the maximum change in thickness between adjacent panels is ¼". Alternatively, bedding strips may be cut to grade. Panels may be supported by an alternate method, using a commercial product, if approved by the Engineer of Bridge Design, Bridge Division. If bedding strips exceed 6" high for I-Girders, 4" high for all other beam types, use Special Grading Detail for Concrete Beams or submit an alternate method to the Bridge Division for approval.

(4) Height must not exceed twice the width.

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(7) Space Bars UP(#4) with Beam Bars R(#4) in all areas where measured haunch exceeds 3 ½" with I-girders, and 3" for all other beam types. Epoxy coating for Bars UP is not required.

(8) Do not locate construction joints on top of a panel.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

CONSTRUCTION NOTES:

Erected panels must bear uniformly on bedding strips of extruded polystyrene placed along top flange edges.

Placing panels to minimize joint openings is recommended.

If additional blocking is needed, special grading details for supporting the panels and extra reinforcing between beam and slab will be considered subsidiary to deck construction.

Bars U, shown on PCP-FAB, may be bent over or cut off if necessary.

Care must be taken to ensure proper cleaning of construction debris and consolidation of concrete material under the edges of the panels. Bedding strips must be placed at beam flange edges so that adequate space is provided for the mortar to flow a minimum of 1 ½" under the panels as the slab concrete is placed.

To allow the proper amount of mortar to flow between beam and panel, the minimum vertical opening must be at least ½". Roadway cross-slope reduces the opening available for entry of the mortar. Bedding strips varying in thickness across the beam are therefore required.

For clear span between U-beams less than or equal to 18", see Permissible Slab Forming Detail on Miscellaneous Slab Detail sheets, UBMS.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel in the cast-in-place slab. See Table of Reinforcing Steel for size and spacing of reinforcement.

If the top and bottom layer of reinforcing steel is shown on the Span Details to be epoxy coated, then the D, E, P, & Z bars must be epoxy coated.

Provide bar Laps, where required, as follows:

Uncoated	~ #4 = 1'-7"
Epoxy Coated	~ #4 = 2'-5"
Uncoated	~ #5 = 2'-0"
Epoxy Coated	~ #5 = 3'-0"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Panel placement may follow either Option 1 or Option 2 except Option 1 must be used if the skew exceeds 45 degrees.

Use of Prestressed Concrete Panels is not permitted for horizontally curved steel plate or tub girders. See Span Details for other possible restrictions on their use.

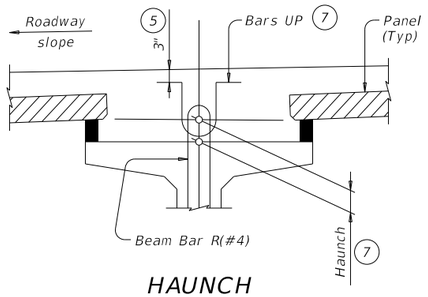
These details are to be used in conjunction with the Span Details, PCP-FAB and other applicable standard drawings.

When panel support (bedding strips) deviates from what is shown herein, provide details signed and sealed by a professional Engineer.

Any additional reinforcement or concrete required on this standard is considered subsidiary to the bid Item "Reinforced Concrete Slab".

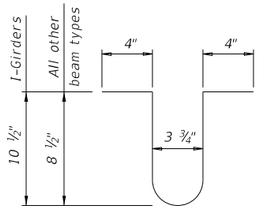
Cover dimensions are clear dimensions, unless noted otherwise.

Reinforcing bar dimensions shown are out-to-out of bar.

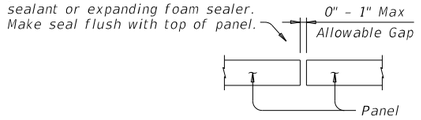


HAUNCH REINFORCING DETAIL

Showing prestressed concrete I-girders. (Other beam types similar)

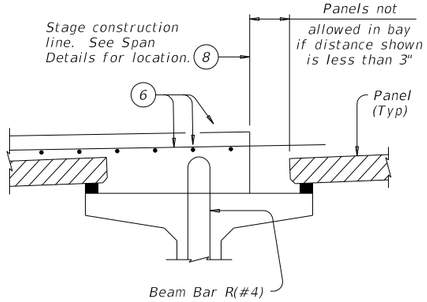


BARS UP (#4) (7)

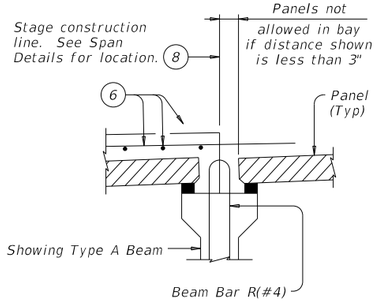


PANEL JOINTS

(Panel reinforcing not shown for clarity. The gap cannot be considered as a panel fabrication tolerance. Adjust panel placement to minimize joint openings.)



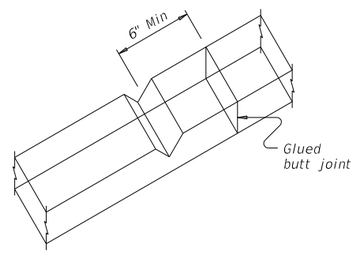
PRESTR CONC I-GIRDERS



PRESTR CONC I-BEAMS

STAGE CONSTRUCTION LIMITATIONS

(Other beam types similar)



BEDDING STRIP DETAIL (9)

HL93 LOADING

SHEET 1 OF 4

Texas Department of Transportation

Dallas District Bridge

PRESTRESSED CONCRETE PANELS DECK DETAILS

PCP-DAL

FILE: DAL-MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS: 3-23: Removed top flange tension limit. 4-23: Revised reinforcement configuration and made District Standard. 6-23: Revised bars P and Z.	1396	01	013,ETC.	FM 1391
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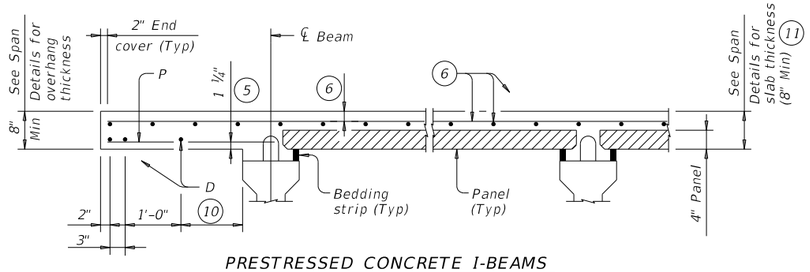
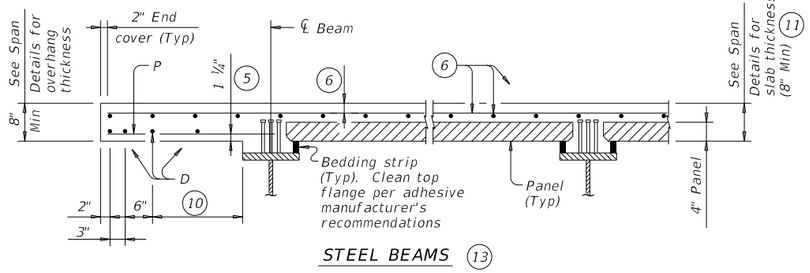
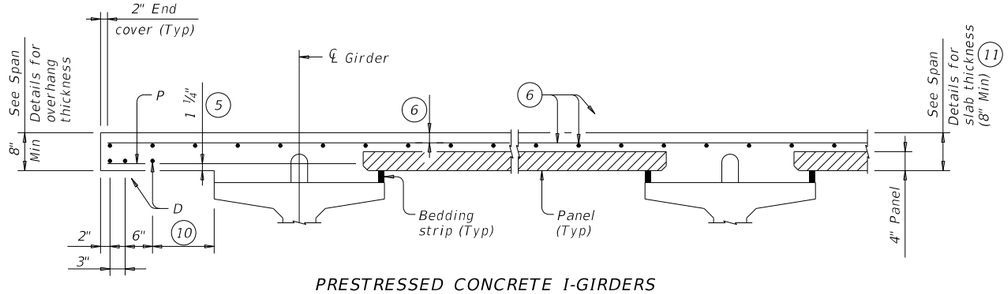


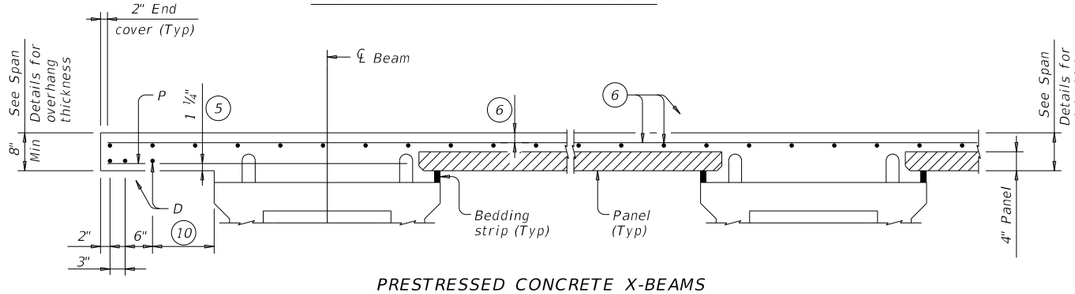
PRESTRESSED CONCRETE I-BEAMS



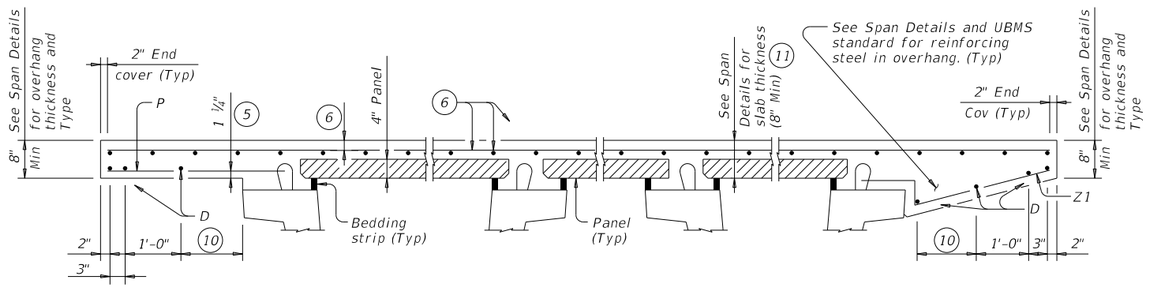
STEEL BEAMS (13)



PRESTRESSED CONCRETE I-GIRDERS



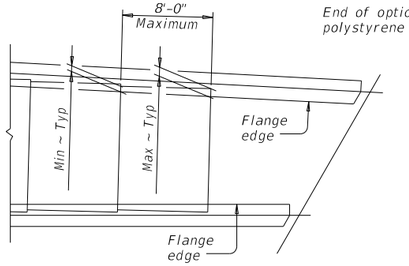
PRESTRESSED CONCRETE X-BEAMS



NORMAL OVERHANG WITH PRESTR CONC U-BEAMS

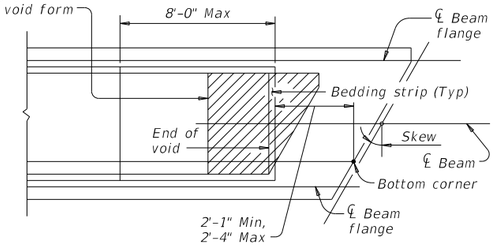
SLOPED OVERHANG WITH PRESTR CONC U-BEAMS

TYPICAL PART TRANSVERSE SECTIONS



AT FLARED BEAMS OR GIRDERS

See PCP-FAB standard for Min and Max dimensions based on beam/girder type.



OVER CONC U-BEAMS

PART PLANS OF PANEL PLACEMENT

(5) Provide clear cover as indicated unless otherwise shown on Span Details.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

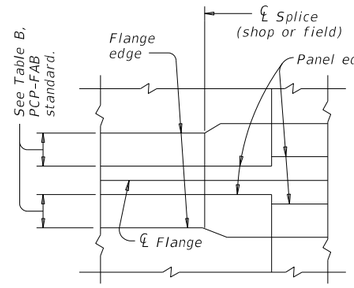
(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c..

(10) Equally space additional bar if more than 11" Max.

(11) The actual thickness constructed may exceed the slab thickness shown on the Span Details but the extra thickness may be no more than 2" (1" for prestressed concrete U-beams and steel beams). Bearing seat elevations or finished grade may be adjusted.

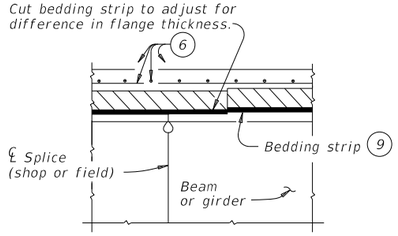
(12) Field adjust Bars Z1(#4) to match actual slope of slab overhangs. Width of slab overhang will vary along span with curved slab edges. Adjust Bar Z1(#4) dimensions to maintain proper cover. Bars Z2(#4) are located at Inverted-Tee stems only.

(13) Panels are allowed over top tension flanges, as approved by Engineer. See Span Details for additional top mat reinforcement required in tension zones. Location of concrete placement sequence boundaries and bolted field splices should be considered by the contractor in determining panel limits.



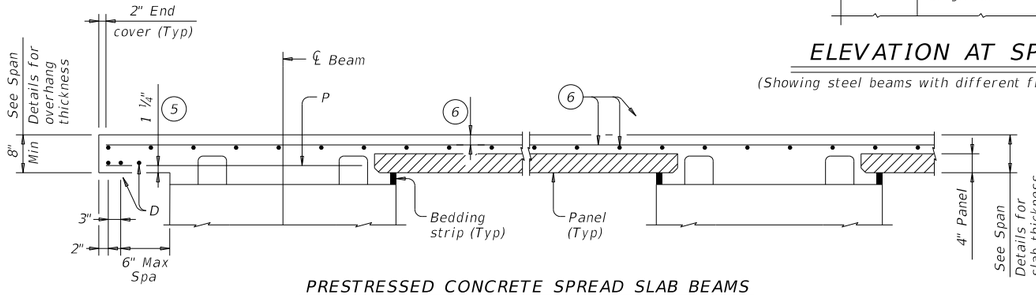
PLAN AT SPLICE

(Showing steel beams with flange width transition)



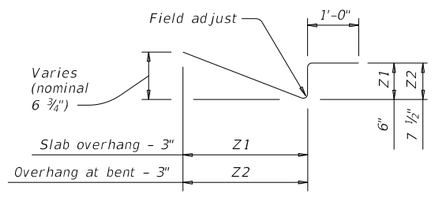
ELEVATION AT SPLICE

(Showing steel beams with different flange thickness)



PRESTRESSED CONCRETE SPREAD SLAB BEAMS

Bars P over exterior beams are still required when no overhang is used. In this case, only one Bar D, 2" from slab edge, is required.



BARS Z (#4) (12)

HL93 LOADING

Texas Department of Transportation

Dallas District Bridge

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP-DAL

FILE: DAL-MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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REVISIONS: 3-23: Removed top flange tension limit. 4-23: Revised reinforcement configuration and made District Standard. 6-23: Revised bars P and Z. 8-03: Revised lap lengths, Bar E spacing, and updated notes.	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		94

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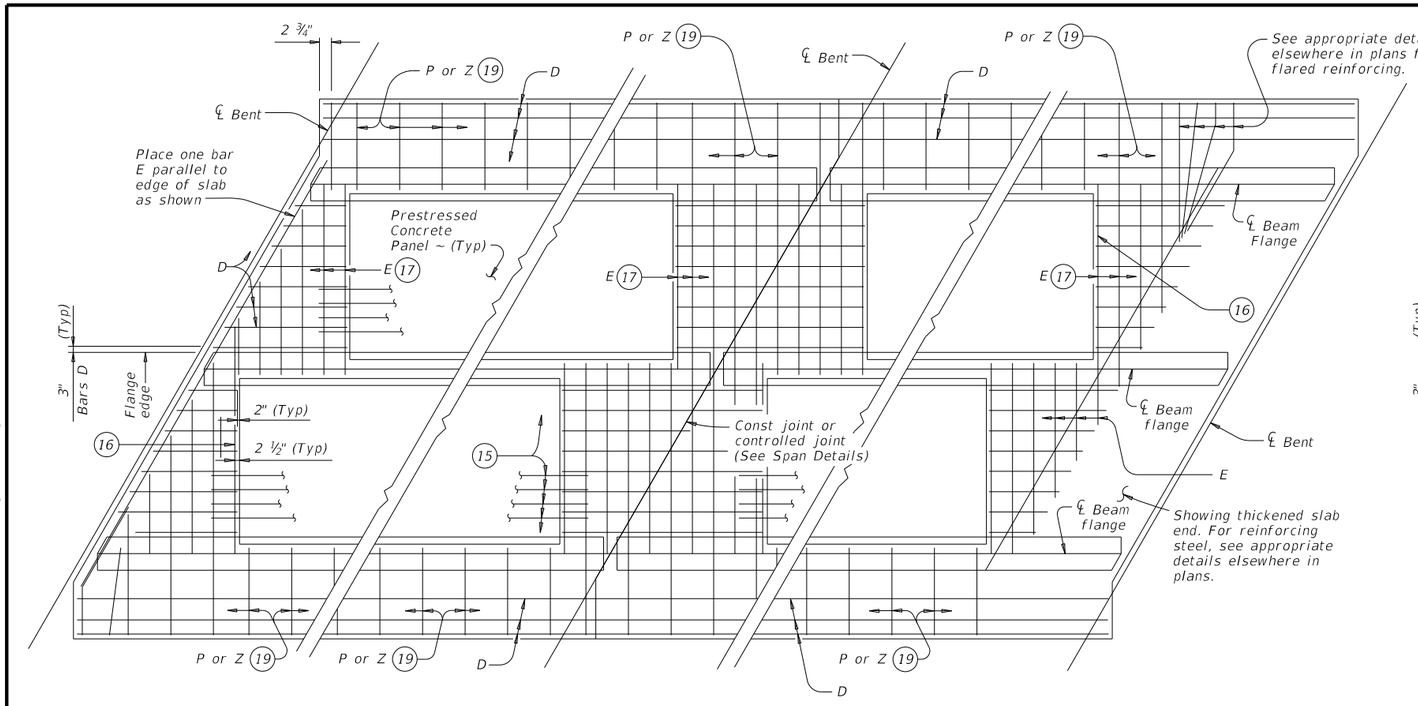
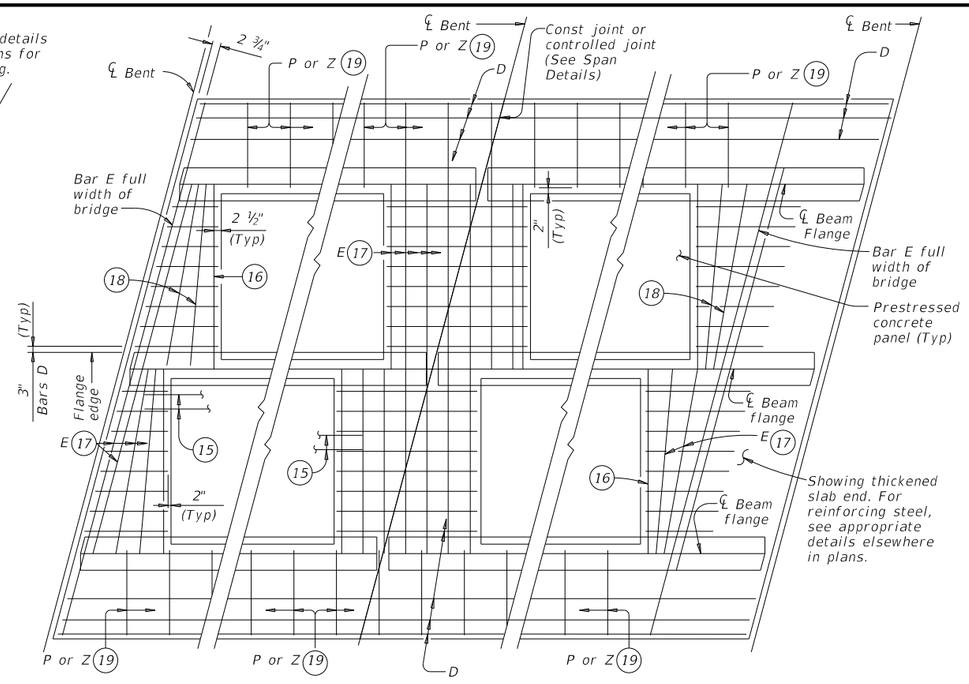


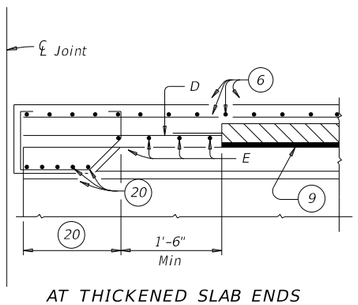
AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

OPTION 1 ~ PLAN OF SLABS WITH NORMAL REINFORCEMENT

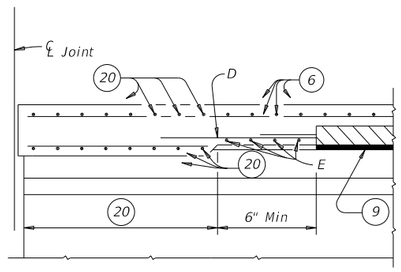


AT ALL SPAN ENDS UNLESS NOTED OTHERWISE | AT INTERIOR BENTS | AT THICKENED END SLABS

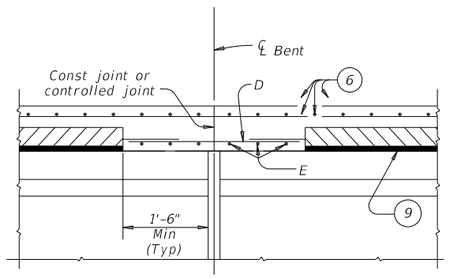
OPTION 1 ~ PLAN OF SLABS WITH SKEWED REINFORCEMENT



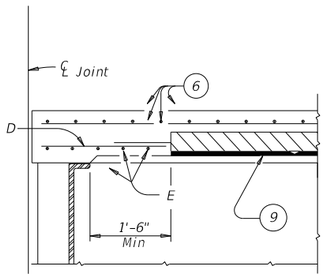
AT THICKENED SLAB ENDS FOR PRESTR CONC U-BMS



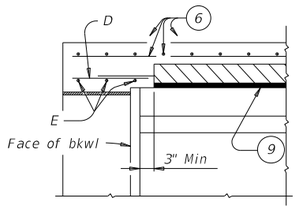
AT THICKENED SLAB ENDS FOR PRESTR CONC I-BMS AND STEEL BMS



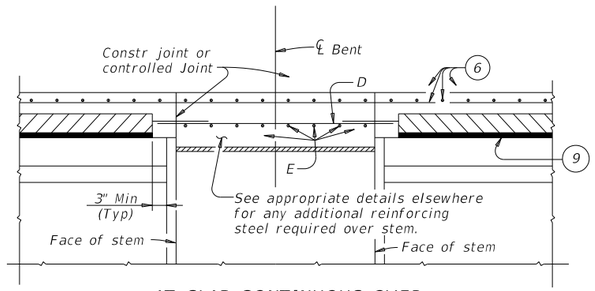
AT SLAB CONTINUOUS OVER CONVENTIONAL INTERIOR BENTS FOR ALL SIMPLE SPAN BMS



AT CONVENTIONAL END DIAPHRAGMS FOR STEEL BMS



AT SLAB OVER ABUTMENT BACKWALL FOR ALL BMS



AT SLAB CONTINUOUS OVER INVERTED-T BENTS FOR ALL BMS

OPTION 1 ~ ELEVATIONS AT BEAM ENDS

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(9) Butt adjacent bedding strips together with adhesive. Cut v-notches, approx ¼" deep, in the top of the bedding strips at 8' o.c.

(14) Max Spacing as listed unless otherwise shown.

(15) At connection with cast-in-place slab, extend longitudinal panel reinforcement. See PCP-FAB for details.

(16) Maintain one Bar E(#5) parallel to panel ends (Typ).

(17) Bars E(#5) not continuous over beam flanges must overlap beam flange 6" Min.

(18) Add flared Bars E(#5) (Min Spa = 2", Max Spa = 10") as required at panel ends.

(19) Where possible, Bars E(#5) may be extended into overhangs to replace Bars P(#4). Bars Z(#4) are required for sloped overhangs with U-Beams.

(20) See appropriate thickened slab end details for reinforcing and limits of thickened slab end.

TABLE OF REINFORCING STEEL (14)

BAR	SIZE	Max Spa (in.)
D	#5	9
E	#5	6
P	#4	18
UP	#4	~
Z	#4	18

HL93 LOADING

SHEET 3 OF 4

Texas Department of Transportation

Dallas District Bridge

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP-DAL

FILE: DAL-MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS: 3-23: Removed top flange tension limit. 4-23: Revised reinforcement configuration and made District Standard. 6-23: Revised bars P and Z.	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		95

DATE: 11/14/2023 2:36:57 PM
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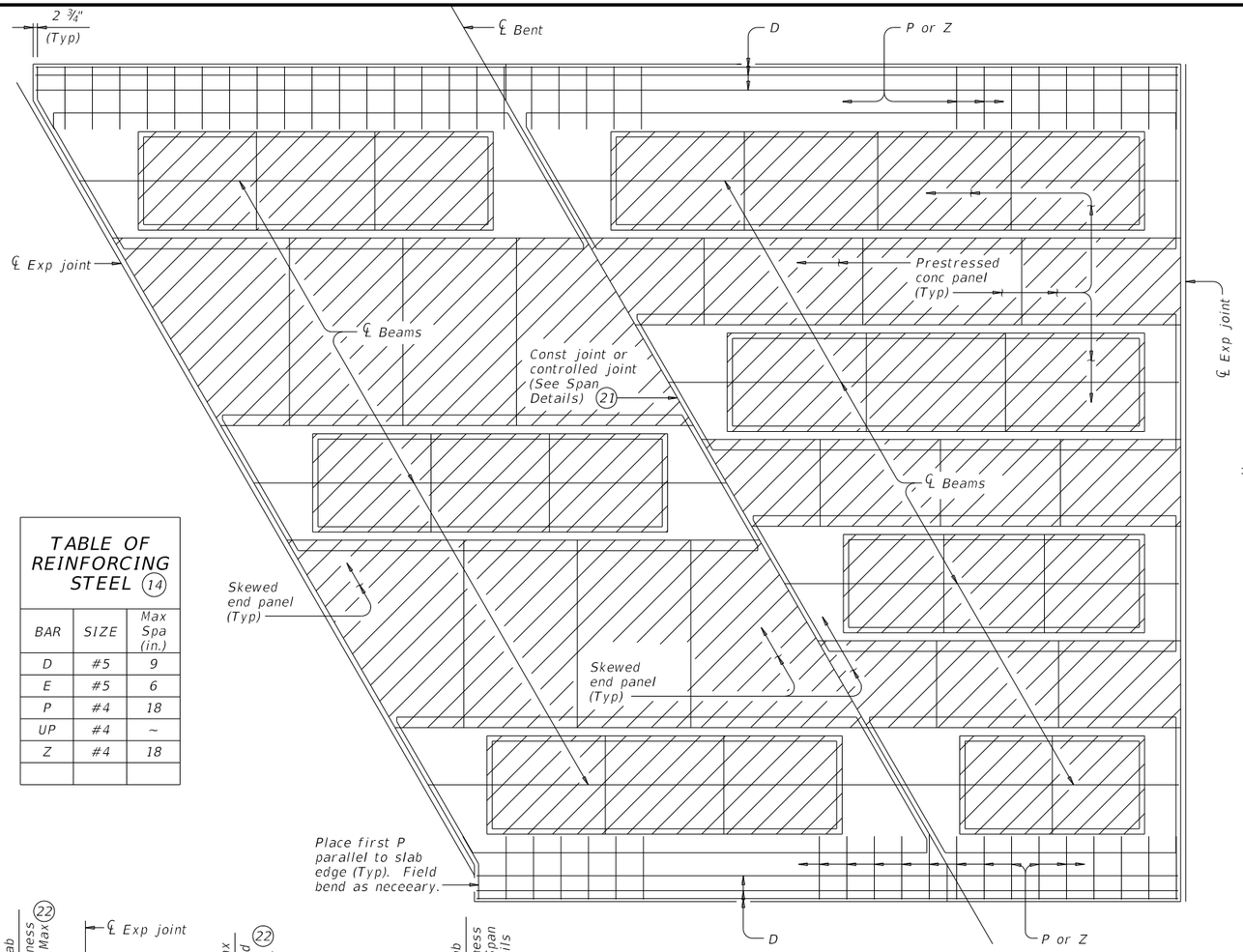
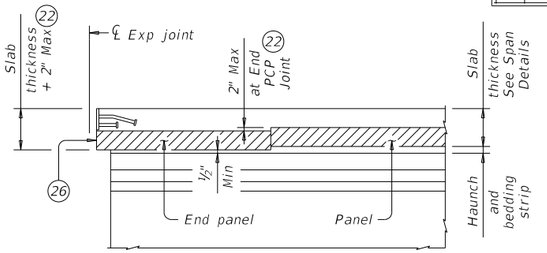


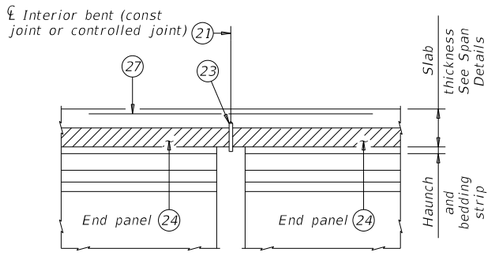
OPTION 2 ~ PLAN OF SLAB

(Showing U-Beams; other beams similar)



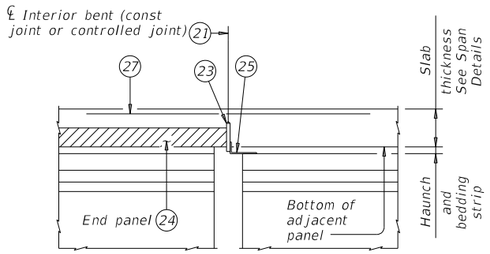
JOINTS (BETWEEN BEAMS/GIRDERS OR AT INV-T STEM)

For SEJ-B, SEJ-M, SEJ-S(0), AJ, and Type A expansion joints only.



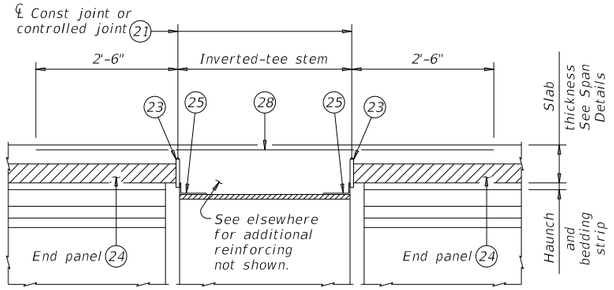
CONVENTIONAL INTERIOR BENT

Panel against panel between beams/girders.



CONVENTIONAL INTERIOR BENT

Panel against beam/girder end in adjacent span.

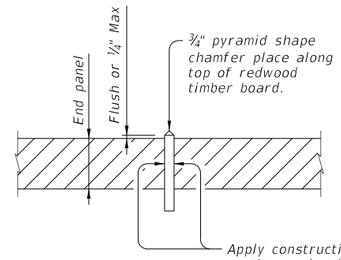


INVERTED-T BENT

Panels against inverted-tee stem

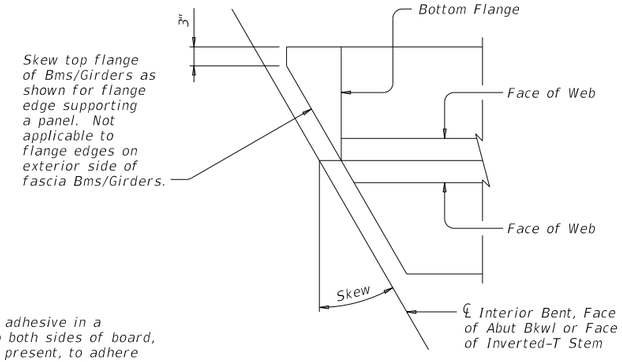
OPTION 2 ~ ELEVATIONS AT BEAM ENDS (6)

TABLE OF REINFORCING STEEL (14)		
BAR	SIZE	Max Spa (in.)
D	#5	9
E	#5	6
P	#4	18
UP	#4	~
Z	#4	18



ELEVATION EXAMPLE OF END PANEL AND TIMBER BOARD (23)

See "Option 2 ~ Elevation At Beam Ends".



OPTION 2 ~ SHOWING MODIFICATION TO BEAM/GIRDER TOP FLANGE FOR SKEWS OVER 5°

Showing I-Beam/I-Girder, U-Beams and Steel Beams similar.

(6) See Span Details and Thickened Slab End Details for top slab reinforcement and clear cover. Longitudinal top slab reinforcement may rest on top of prestressed concrete panels if necessary to maintain clear cover.

(14) Max Spacing as listed unless otherwise shown.

(21) 1 ½" Vinyl or plastic joint former at controlled joints (Stress Cap, Zip Strip, Stress Lock, or equal as approved by the Engineer.)

(22) End panel may be set up to 2" lower to accommodate expansion joint hardware, provided bedding strip is not less than ½" thick.

(23) ¾" thick redwood timber board, leave in place. Redwood timber board placed flush with top of panel or within ¼" Max above panel. Place ¾" pyramid shape chamfer along top of timber board. See "Elevation Example of End Panel and Timber Board". Place straight, within ¼" of centerline of bent or face of inverted-tee, across bridge width and end board at exterior flange edge of fascia beams/girders. Do not extend into overhang.

(24) Place panel within ½" of ¾" thick board.

(25) Permanent galvanized steel sheet form. Removable formwork is acceptable.

(26) Place end panel within ½" of expansion joint opening. End panel cannot encroach on required expansion joint opening.

(27) Place additional (#4) bar 5'-0" in length between every slab bars T. Center (#4) bar on Joint.

(28) Place additional (#4) bar continuous 2'-6" beyond each side of Inverted-T Stem between every slab bars T.

SPECIAL OPTION 2 CONSTRUCTION NOTES:

When Option 2 is chosen bottom mat of thickened end slab reinforcing is not required. Use the same top mat as shown on the Thickened Slab End Details sheet.

Placing panels adjacent to expansion joints and bent centerlines prior to completing interior panel placement is recommended. Saw cutting panels to fit is acceptable when approved by the Engineer. Minimum distance from a saw cut edge to a panel strand is 1 ½".

Do not extend the longitudinal panel reinforcement into the cast-in-place slab.

Top flanges of beams and girders on skewed bridges must be modified as shown on this drawing. The Contractor is responsible for coordinating this modification with the beam fabricator prior to submitting shop drawings for approval.

Fabricator may optionally skew the whole end. When electing to skew whole end, girder end details and bearing type at conventional interior bent must be changed to use condition at abutment. Fabricator must coordinate change in bearing type, bearing centerline location, and dowel location with Engineer and Contractor. Show appropriate changes on girder and bearing shop drawings.

Bending of anchor studs of expansion joints shown on standards AJ, SEJ-B, SEJ-M, and SEJ-S(0) is permissible if necessary to clear top of end panels. The Contractor is responsible for coordinating modifications with the joint fabricator. Submit shop drawings for approval when modifications to expansion joint hardware are made.

Bedding strips under skewed end panels must conform to the requirements of Item 422 except their minimum compressive strength must be 60 psi.

Provide Bars AA, G and K from standard IGTS-DAL in the slab.

HL93 LOADING SHEET 4 OF 4

Texas Department of Transportation — Dallas District Bridge

PRESTRESSED CONCRETE PANELS
DECK DETAILS

PCP-DAL

FILE: DAL-MS-PCP-23.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS:	1396	01	013,ETC.	FM 1391
3-23: Removed top flange tension limit. 4-23: Revised reinforcement configuration and made District Standard. 6-23: Revised bars P and Z.	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		96

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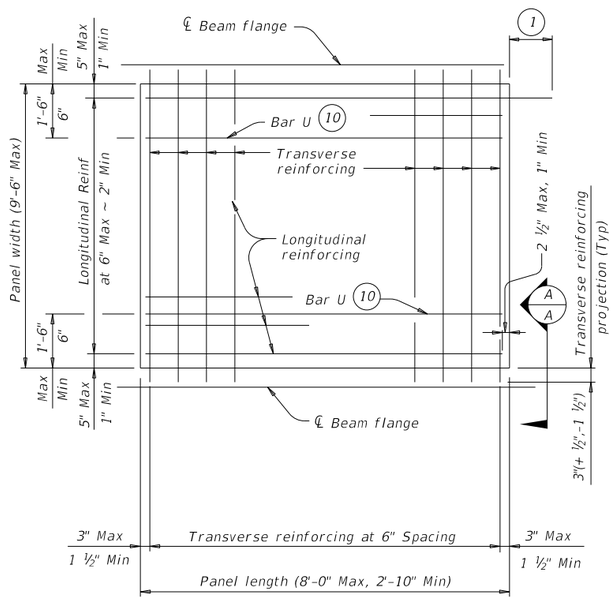
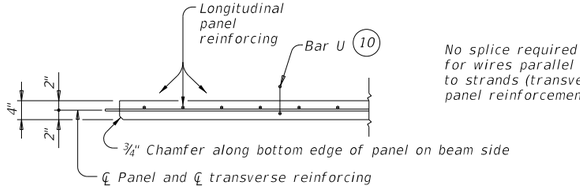
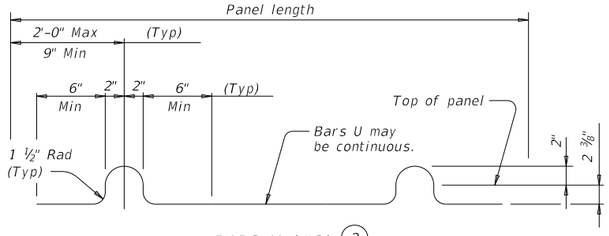


TYPICAL NON-SKEWED PANEL PLAN

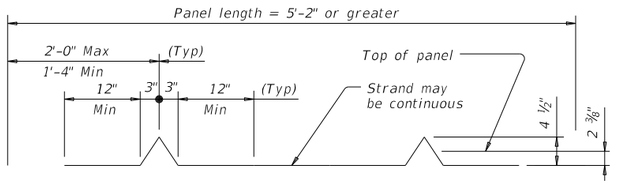


SECTION A-A

(Not showing supplemental #4 bars for skewed end panels.)

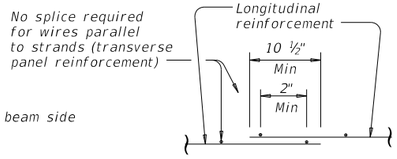


BARS U (#3) (2)



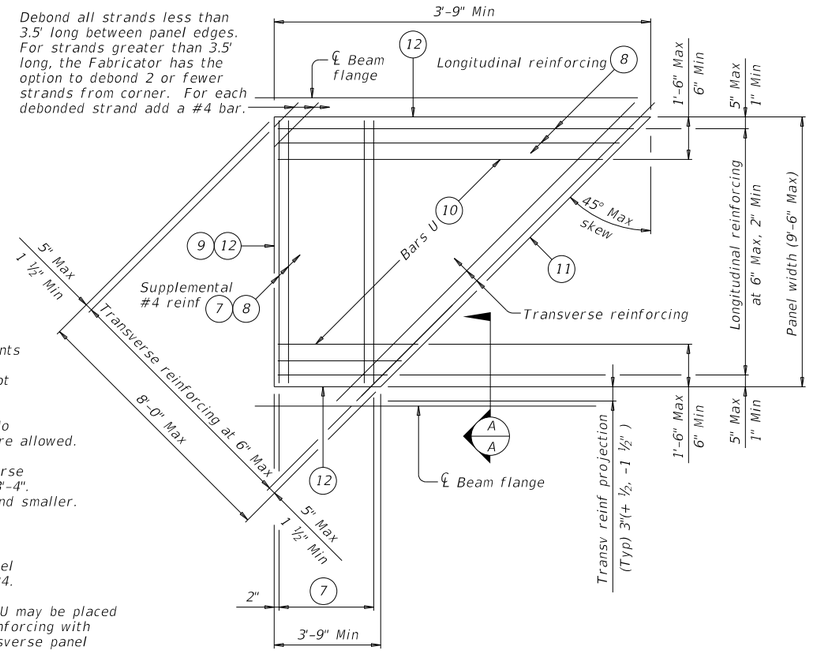
OPTIONAL STRAND FOR BARS U (3)

1. At connection with cast-in-place slab, extend longitudinal panel reinforcement 1'-0" (+2",-0") past panel end. Alternatively, provide (#3) x 2'-0" dowels at 6" Max Spacing and extend dowels 1'-0" past panel end.
2. Four loops required per panel.
3. Four loops required per panel. ⅜" or ½" strands may be used.
4. Normal dimensions must be used on spans with parallel beams. Maximum and Minimum dimensions apply only to spans with flared beams.
5. See Normal Grading Detail on PCP standard for lap requirements and bedding strip dimensions. Some laps shown in tables cannot utilize all bedding strip widths.
6. One Splice allowed per panel. No more than two sheets of WWR are allowed.
7. Provide (#4) bars under transverse reinforcing, 10 Spaces at 4" = 3'-4". Omit for 5 degree (1:12) skew and smaller.
8. End Cover 2 ½" Max, 1" Min.
9. Recess strands on indicated panel edge in accordance with Item 424.
10. At the fabricator's option, Bars U may be placed parallel to transverse panel reinforcing with horizontal legs in plane of transverse panel reinforcing.
11. Use length of indicated panel edge as panel width for purpose of determining type of transverse reinforcing.
12. Timber form work permissible this edge.



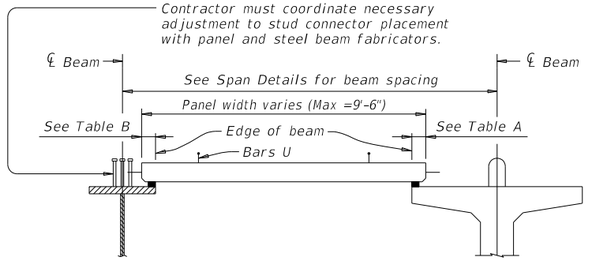
WELDED WIRE REINFORCEMENT (WWR) SPLICE DETAIL (6)

Debond all strands less than 3.5' long between panel edges. For strands greater than 3.5' long, the Fabricator has the option to debond 2 or fewer strands from corner. For each debonded strand add a #4 bar.



TYPICAL SKEWED END PANEL PLAN

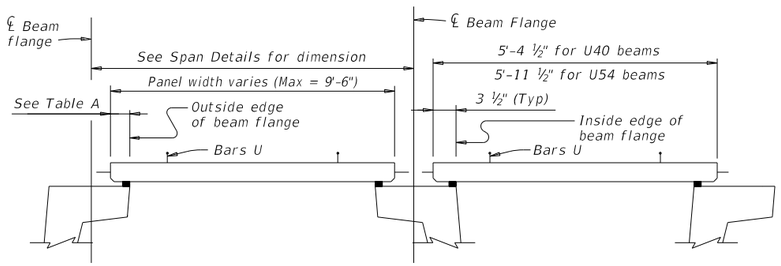
(Only to be used with details shown elsewhere in the plans.)



STEEL BEAMS

PRESTRESSED CONCRETE BEAMS OR GIRDERS

Typ unless noted otherwise



PRESTRESSED CONCRETE U-BEAMS

TYPICAL SECTIONS FOR DETERMINING PANEL WIDTH

TABLE A (4) (5)			
Beam Type	Normal (In.)	Min (In.)	Max (In.)
A	3	2 ½	3 ½
B	3	2 ½	3 ½
C	4	3	4 ½
IV	6	4	7 ½
VI	6 ½	4 ½"	8 ½
U40 – 54	5 ½	5 ½	7
Tx28-70	6	5	7 ½
XB20 – 40	4	3	4 ½
XSB12 – 15	4	3	4 ½

TABLE B (4) (5)			
Top Flange Width	Normal (In.)	Min (In.)	Max (In.)
11" to 12"	2 ¾	2 ½	2 ¾
Over 12" to 15"	3 ¼	3	3 ¼
Over 15" to 18"	4	3	4 ¾
Over 18"	5	3 ½	6 ¼

GENERAL NOTES:

Provide Class H concrete for panels. Release strength f'ci=3,500 psi. Minimum 28 day strength f'c=5,000 psi.

Provide ¾" chamfer along bottom edge of panel on beam side.

Do not use epoxy-coated reinforcing steel bar or strand in panels.

Remove laitance from top panel surface.

Finish top of panel to a roughness between a No. 6 and No. 9 concrete surface profile, inclusive, as specified by the International Concrete Repair Institute (ICRI).

Shop drawings for the fabrication of panels will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

A panel layout which identifies location of each panel must be developed by the Fabricator. Permanently mark each panel in accordance with the panel layout. A copy of the layout is to be provided to the Engineer.

TRANSVERSE PANEL REINFORCEMENT:

For panel widths over 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kips per strand.

For panel widths over 3'-6" up to and including 5', use ⅜" or ½" Dia (270k) prestressing strands with a tension of 14.4 kip per strand. Optionally, (#4) Grade 60 reinforcing bars may be used in lieu of prestressed strands.

For panel widths up to 3'-6", use (#4) Grade 60 reinforcing bars (prestressed strands alone are not allowed).

Place transverse panel reinforcement at panel centroid and space at 6" Max.

LONGITUDINAL PANEL REINFORCEMENT:

Any of the following options may be used for longitudinal panel reinforcement:

1. (#3) Grade 60 reinforcing steel at 6" Max Spacing. No splices allowed.
2. ⅜" Dia prestressing strands at 4 ½" Max Spacing (unstressed). No splices allowed.
3. ½" Dia prestressing strands at 6" Max Spacing (unstressed). No splices allowed.
4. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) providing 0.22 sq in per foot of panel width. Wires larger than D11 not permitted. Provide transverse wires to ensure proper handling of reinforcing. One splice per panel is allowed. See WWR Splice Detail.

No combination of longitudinal reinforcement options in a panel is allowed.

Place longitudinal panel reinforcement above or below transverse panel reinforcement. Must be placed above transverse panel reinforcement for skewed end panels with supplemental (#4) reinforcement.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE PANEL FABRICATION DETAILS

PCP-FAB

FILE: pcpstde2-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT April 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		97

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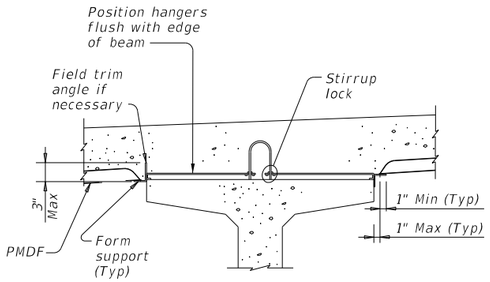
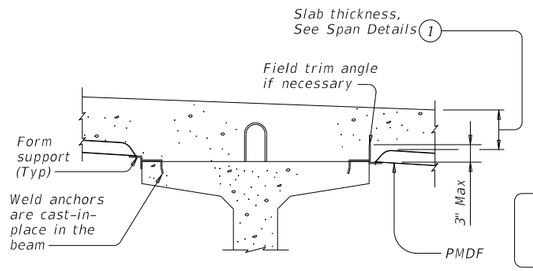
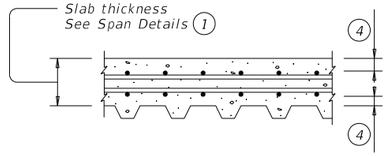


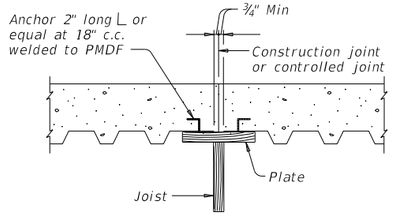
PRESTR CONC I-BEAMS AND I-GIRDERS WITH STIRRUP LOCKS



PRESTR CONC I-BEAMS AND I-GIRDERS WITH WELD ANCHORS

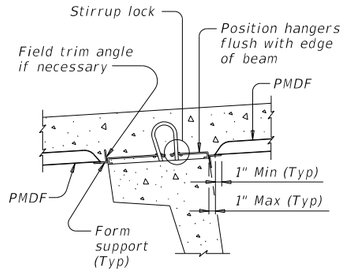


TYP LONGITUDINAL SLAB SECTION

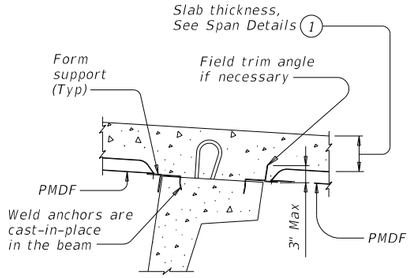


Note: In spans where PMD forms are used, timber forms must be used at construction joints. Adequate provision must be made to support edge of metal form and to provide anchorage of metal form to slab concrete where joined to wood forms.

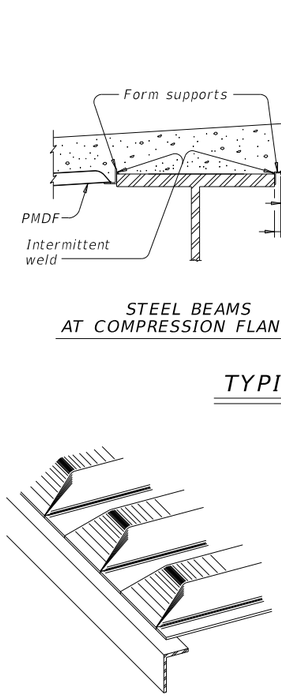
SECTION THRU CONSTRUCTION JOINT



U-BEAMS WITH STIRRUP LOCKS



U-BEAMS WITH WELD ANCHORS



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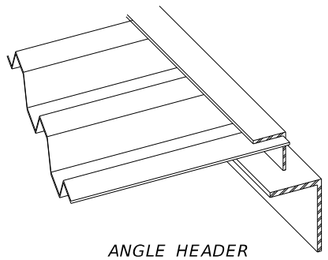
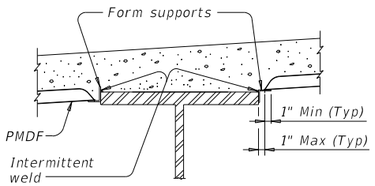


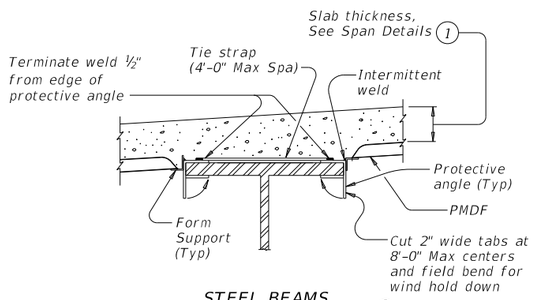
ANGLE HEADER

NOTE: This type is to be used for skewed ends only.

TYPES OF END CLOSURES

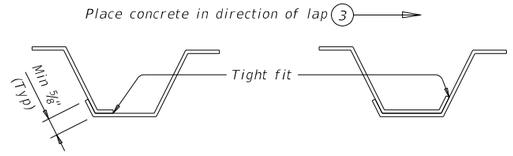


STEEL BEAMS AT COMPRESSION FLANGES



STEEL BEAMS AT TENSION FLANGES (2)

TYPICAL TRANSVERSE SECTIONS



SIDE LAP DETAILS

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars.

(2) Welding of form supports to tension flanges will not be permitted. Other methods of providing wind hold down resistance for PMDF in tension flange zones will be considered. At least one layer of sheet metal must be provided between the flange and the weld joint.

(3) The direction of concrete placement will be such that the upper layer of the form overlap is loaded first.

(4) See Span details for cover requirements.

FOR PRESTR CONC U-BEAM AND STEEL GIRDER BRIDGES:
Unless shown elsewhere in the plans, size, spacing, and orientation of bottom mat of slab reinforcement must match the top mat of reinforcing shown on the span details except all bottom mat bars are to be #5. Bottom mat reinforcement and additional concrete is subsidiary to Item 422 "Concrete Superstructures."

FOR PRESTR CONC TX-GIRDER BRIDGES:
See Miscellaneous Slab Details, Prestr Concrete I-Girders (IGMS) standard sheet for bottom mat reinforcing.

GENERAL NOTES:
Steel for Permanent Metal Deck Forms (PMDF) and support angles shall conform to ASTM A653, structural steel (SS), with coating designation G165. Steel must have a minimum yield strength of 33 ksi. Minimum thickness of PMDF is 20 gage and that of support angles and protective angles is 12 gage.

Submit two copies of forming plans for PMDF to the Engineer. These plans must show all essential details of proposed form sheets, closures, fasteners, supports, connectors, special conditions and size and location of welds. These plans must clearly show areas of tension flanges for steel beams and provisions for protecting the tension flanges from welding notch effects by inclusion of separating sheet metal or other positive method. These plans must be designed, signed, and sealed by a licensed professional engineer. Department approval of these plans is not required, but the Department reserves the right to require modifications to the plans. The Contractor is responsible for the adequacy of these plans.

The details and notes shown on this standard are to be used as a guide in preparation of the forming plans.

All material, labor, tools and incidentals necessary to form a bridge deck with Permanent Metal Deck Forms is considered subsidiary to Item 422, "Concrete Superstructures".

DESIGN NOTES:
As a minimum, PMDF and support angles must be designed for the dead load of the form, reinforcement and concrete plus 50 psf for construction loads. Flexural stresses due to these design loads must not exceed 75 percent of the yield strength of the steel. Allowable stress for weld metal must be 12,400 psi.

Maximum deflection under the weight of forms, reinforcement and concrete or 120 psf, whichever is greater, shall not exceed the following:

1/180 of the form design span, but not more than 0.50", for design spans of 10' or less.

1/240 of the form design span, but not more than 0.75", for design spans greater than 10'.

1/240 of the form design span, but not more than 0.75", for all design spans of railroad overpass bridge spans fully or partially over railroad right-of-way, and for all bridge spans of railroad underpass structures.

The form design span must not be less than the clear distance between beam flanges, measured parallel to the form flutes, minus 2".

CONSTRUCTION NOTES:
Form sheets must not be permitted to rest directly on the top of beam flanges. Form sheets must be securely fastened to form supports and must have a minimum bearing length of one inch at each end. Form supports must be placed in direct contact with beam flanges.

All attachments must be made by permissible welds, screws, bolts, clips or other means shown on the the forming plans. All sheet metal assembly screws must be installed with torque-limiting devices to prevent stripping. Only welds or bolts must be used to support vertical loads.

Welding and welds must be in accordance with the provisions of Item 448, "Structural Field Welding", pertaining to fillet welds. All welds must be made by a qualified welder in accordance with Item 448.

All permanently exposed form metal, where the galvanized coating has been damaged, must be thoroughly cleaned and repaired in accordance with Item 445, "Galvanizing". Minor heat discoloration in areas of welds need not be touched up.

Flutes must line up uniformly across the entire width of the structure where main reinforcing steel is located in the flute.

Construction joints will not be permitted unless shown on the plans. The location of and forming details for any construction joint used must be shown on the forming plans. Forms below a construction joint must be removed after curing of the slab.

A sequence for uniform vibration of concrete must be approved by the Engineer prior to concrete placement. Attention must be given to prevent damage to the forms, yet provide proper vibration to prevent voids or honeycomb in the flutes and at headers and/or construction joints.

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	DAL	KAUFMAN		98

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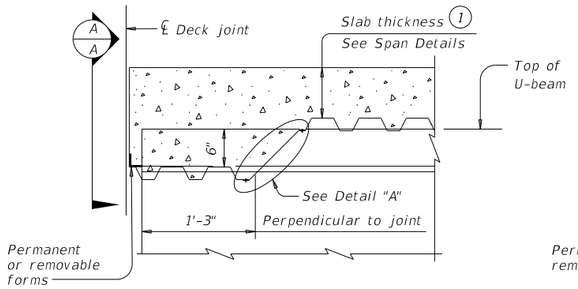
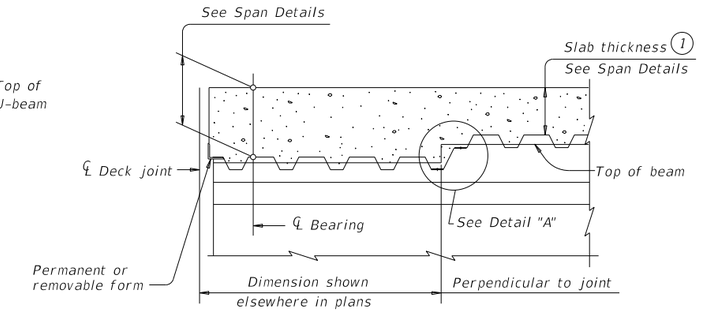
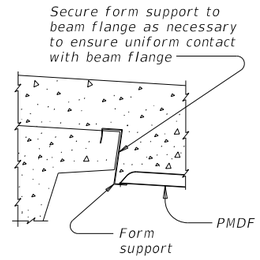


AT THICKENED SLAB END FOR U-BEAMS

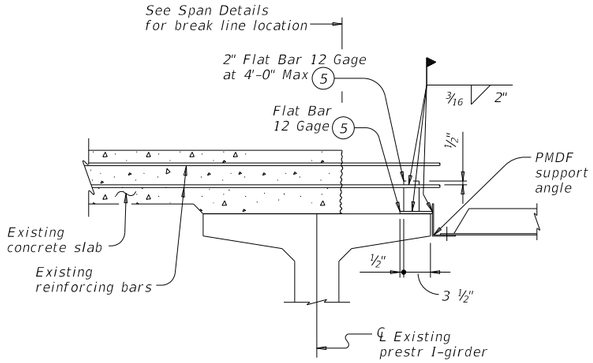


AT THICKENED SLAB END FOR PRESTRESSED I-BEAMS, I-GIRDERS AND STEEL BEAMS

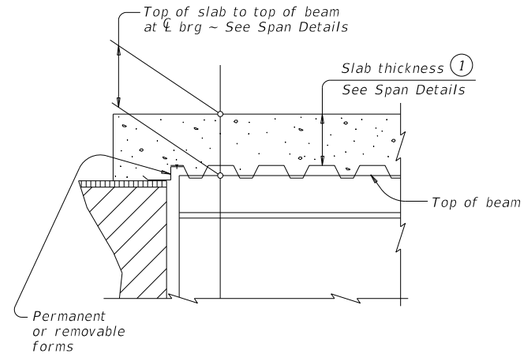
Showing I-beam block-out. No block-out for I-girders or steel beams.



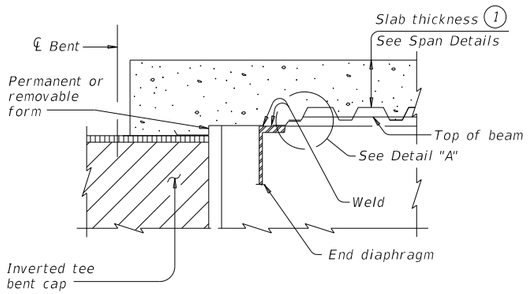
SECTION A-A



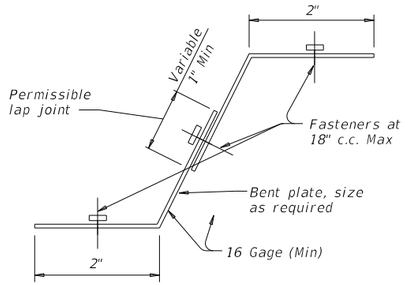
SHOWING PRESTRESSED CONCRETE I-BEAMS, I-GIRDERS AND U-BEAMS



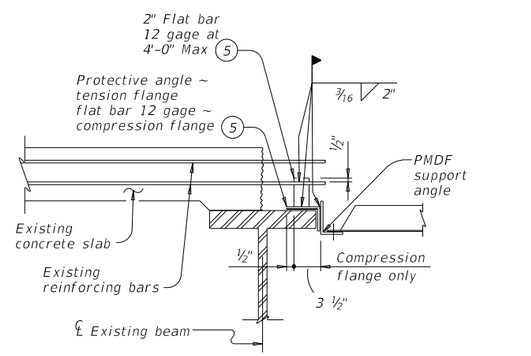
AT SLAB OVER ABUT BKWL OR INV TEE STEM FOR CONC BEAMS WITHOUT THICKENED SLAB END



AT SLAB OVER INV TEE STEM FOR STEEL BEAMS WITHOUT THICKENED SLAB END

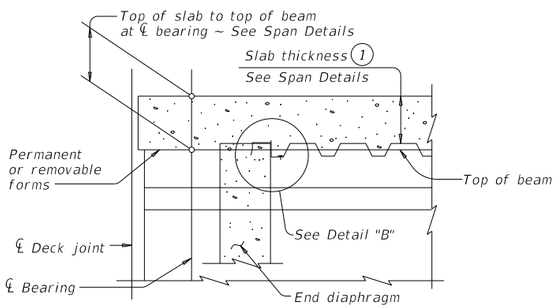


DETAIL "A"

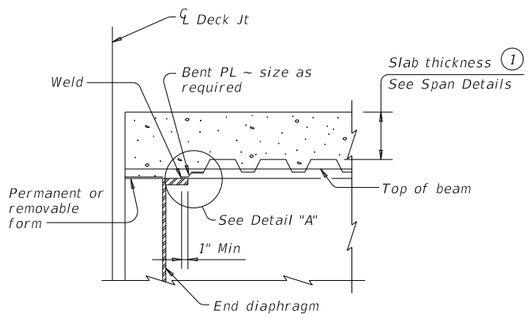


SHOWING STEEL BEAMS

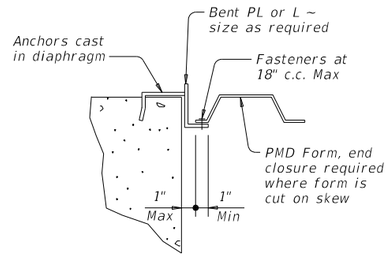
WIDENING DETAILS



AT CONC END DIAPHRAGM FOR PRESTRESSED I-BEAMS AND STEEL BEAMS



AT END DIAPHRAGM FOR STEEL BEAMS WITHOUT THICKENED SLAB END



DETAIL "B"

(1) Slab thickness minus 5/8" if corrugations match reinforcing bars

(5) Minimum yield stress of 12 gage bars shall be 40 ksi

DETAILS AT ENDS OF BEAMS

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

PERMANENT METAL DECK FORMS

PMDF

FILE: pmdfste1-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
02-20: Modified box note by adding steel beams/girders and subsidiary.	DIST	COUNTY		SHEET NO.
12-21: Updated max deflection for RR.	DAL	KAUFMAN		99

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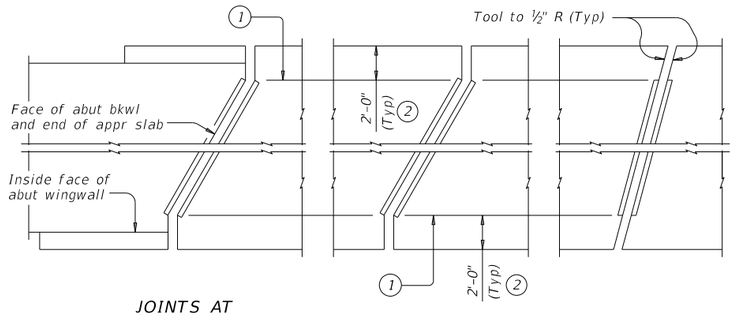
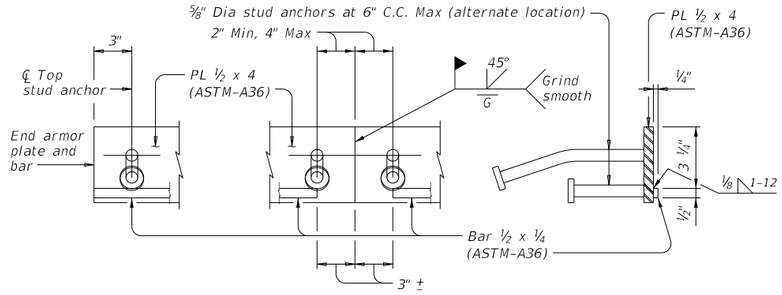


JOINTS AT ABUTMENTS — SKEWS OVER 15° — SKEWS THRU 15°

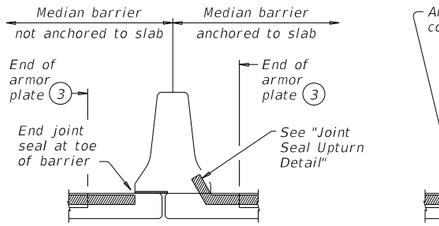
PLANS OF ARMOR PLATES



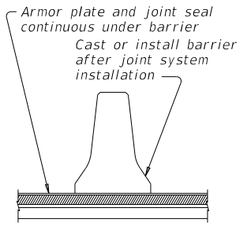
END VIEW — FIELD SPLICE — SECTION

(Studs are not shown for clarity.)

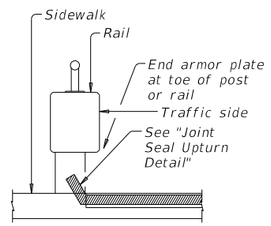
ELEVATION OF ARMOR PLATE



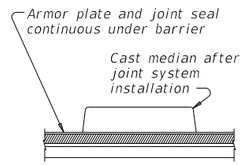
WITH OPEN DECK JOINT BELOW MEDIAN BARRIER



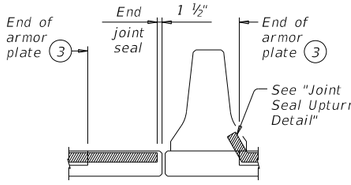
AT MEDIAN BARRIER



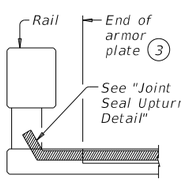
AT SIDEWALK BEHIND BRIDGE RAIL



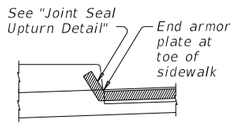
AT RAISED MEDIAN



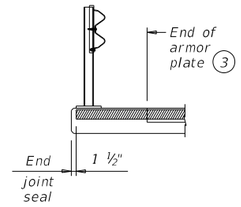
WITH OPEN DECK JOINT ADJACENT TO MEDIAN BARRIER



AT CONCRETE BRIDGE RAIL

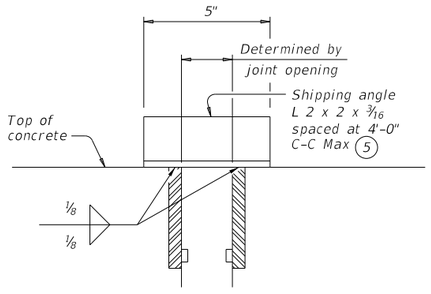


AT SIDEWALK



AT STEEL POST BRIDGE RAIL

TYPICAL SECTIONS OF ARMOR PLATES AND SEALS (4)

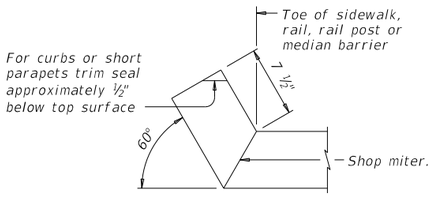


SHOWING ARMOR PLATE

(Studs not shown for clarity)

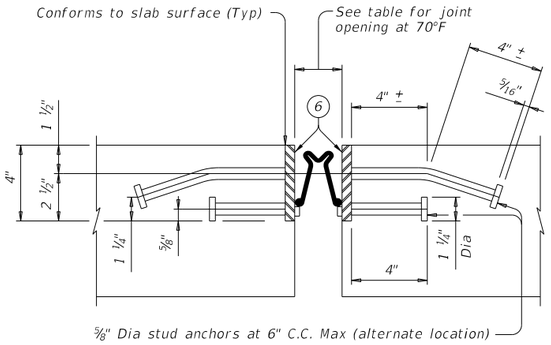
SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.



JOINT SEAL UPTURN DETAIL

Upturn seal only. Terminate armor plates as shown in "Plans of Armor Plates" and "Typical Sections of Armor Plates & Seals."



JOINT SECTION

Showing R J Watson strip seal. Other strip seals are similar.

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (7)	STRIP SEAL 4" JOINT	
		Seal Type	Joint Opening (8)
D.S. Brown	As shown	V-400	2 ¼"
R.J. Watson	As shown	SF-400	2 ½"
SSI	As shown	SSS-400	2 ½"
Watson Bowman Acme	As shown	SPS-400	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE 4"
0	4.0"
15	4.0"
30	3.5"
45	2.8"

DESIGN NOTES:

Joints installed on a skew have reduced ability to accommodate longitudinal movement. Use table values to determine the correct joint size for skewed installations.

For other skews over 25 degrees, calculate reduced movement range by multiplying joint size by cosine (skew).

(1) At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.

(2) Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.

(3) See "Plans of Armor Plates".

(4) Other conditions affecting the joint profile should be noted elsewhere.

(5) Align shipping angle perpendicular to joint.

(6) Coat with Manufacturer's supplied epoxy primer above bar before installing sealant.

(7) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(8) These openings are also the recommended minimum installation openings.

FABRICATION NOTES:

Temporarily shop assemble corresponding sections of sealed expansion joints (SEJ), check for fit, and match mark for shipment. Secure corresponding sections together for shipment with shipping angle. Do not use erection bolts.

The seal must be continuous and included in the price bid for sealed expansion joint.

Ship steel sections in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for staged construction or widenings. One shop splice is permitted in each shipping length provided no piece is less than 2'-0" long and sufficient studs are added to limit the stud to shop splice distance to 2" Min and 4" Max.

Weld studs in accordance with AWS D1.1.

Butt weld all shop and field splices and grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section with System II or IV primer in accordance with Item 446, "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Item 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of sealed expansion joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure the sealed expansion joint in position and place to the proper grade and alignment by welding braces to adjacent reinforcing steel, to prestressed beam stirrups, or to anchors cast in concrete diaphragms. Include cost of temporary bracing in the price bid for sealed expansion joint.

Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

Clean and prepare seal cavity for seal installation as per the Manufacturer's installation procedures.

Splice and install seal in accordance with the Manufacturer's directions and with the adhesive provided by the Manufacturer.

Splice in joint seal may be performed in the field.

GENERAL NOTES:

Provide sealed expansion joints in the size and at locations shown on the plans.

Minimum slab and overhang thickness required for the use of SEJ-B is 6 ½".

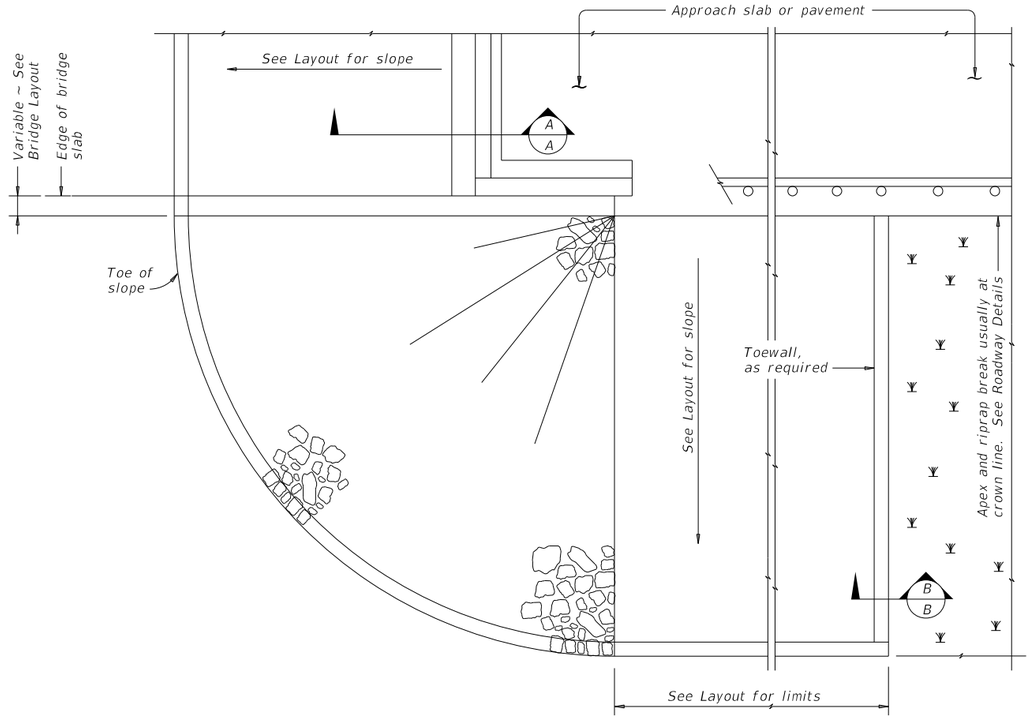
Texas Department of Transportation

Bridge Division Standard

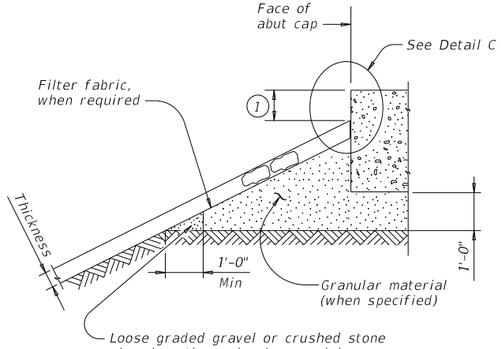
SEALED EXPANSION JOINT TYPE B WITHOUT OVERLAY

SEJ-B

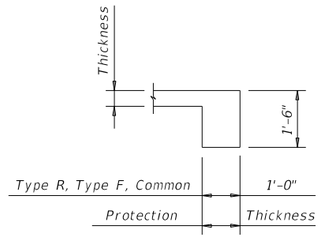
FILE: sejbste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		100



PLAN

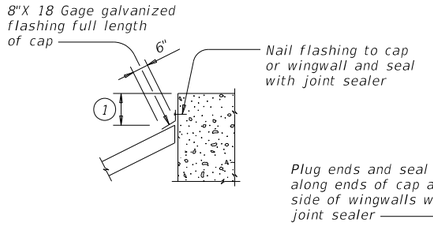


SECTION A-A AT CAP

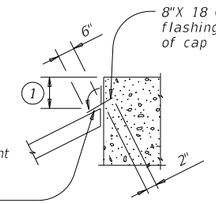


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".

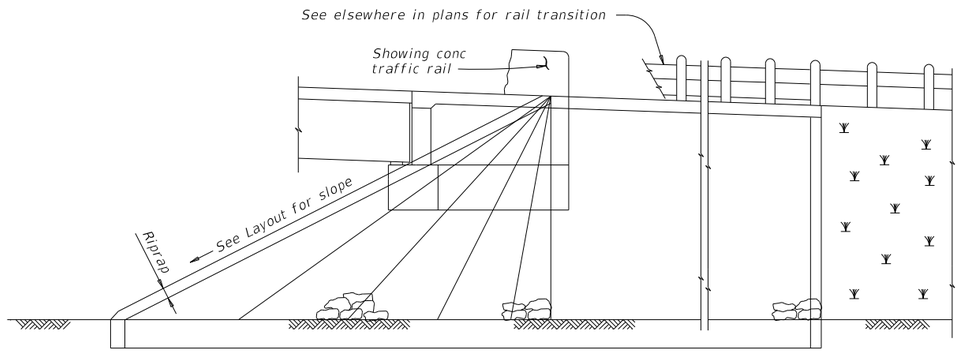


CAP OPTION A



CAP OPTION B

DETAIL C



ELEVATION

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	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		101

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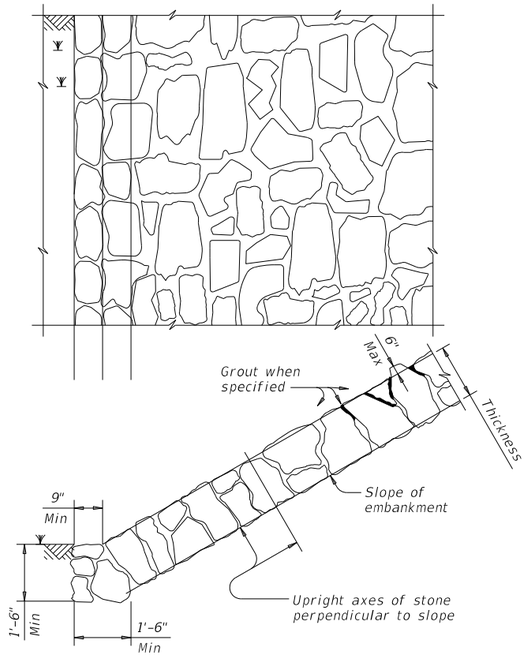


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

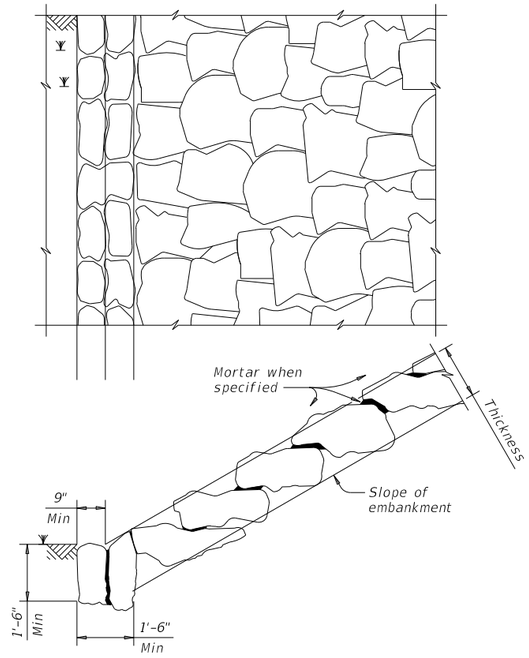


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

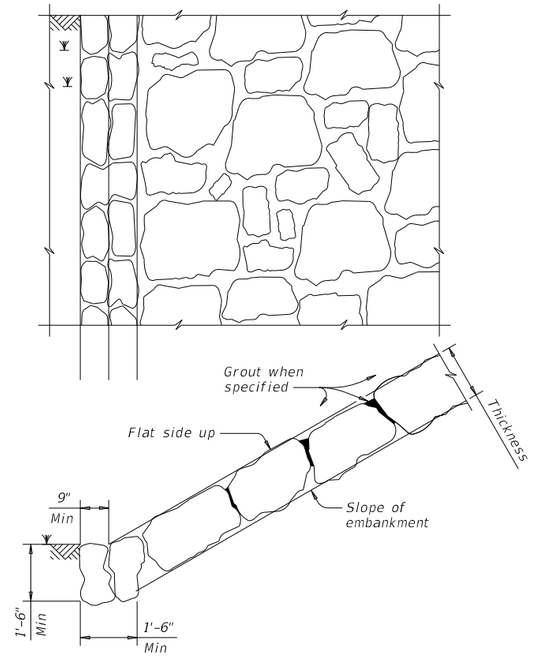


FIGURE 3 ~ TYPE F STONE RIPRAP

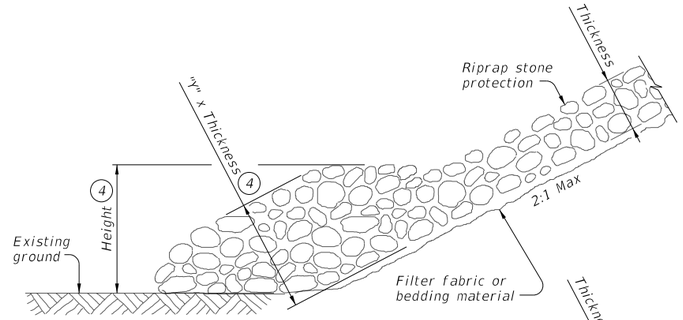
grouted

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

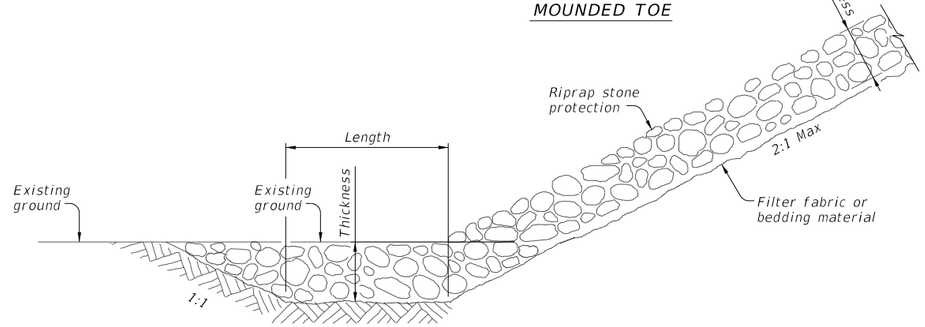
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(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)

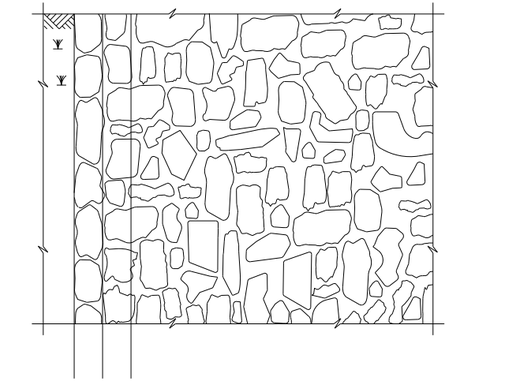


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

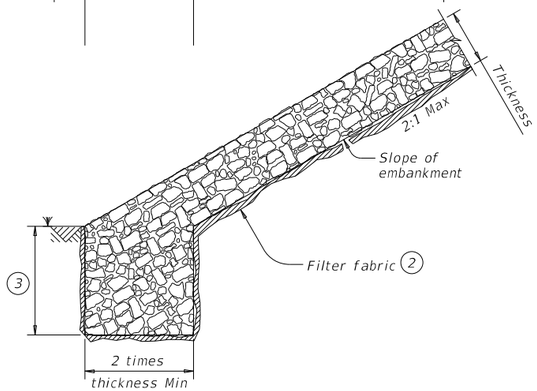


FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

SHEET 2 OF 2

Texas Department of Transportation

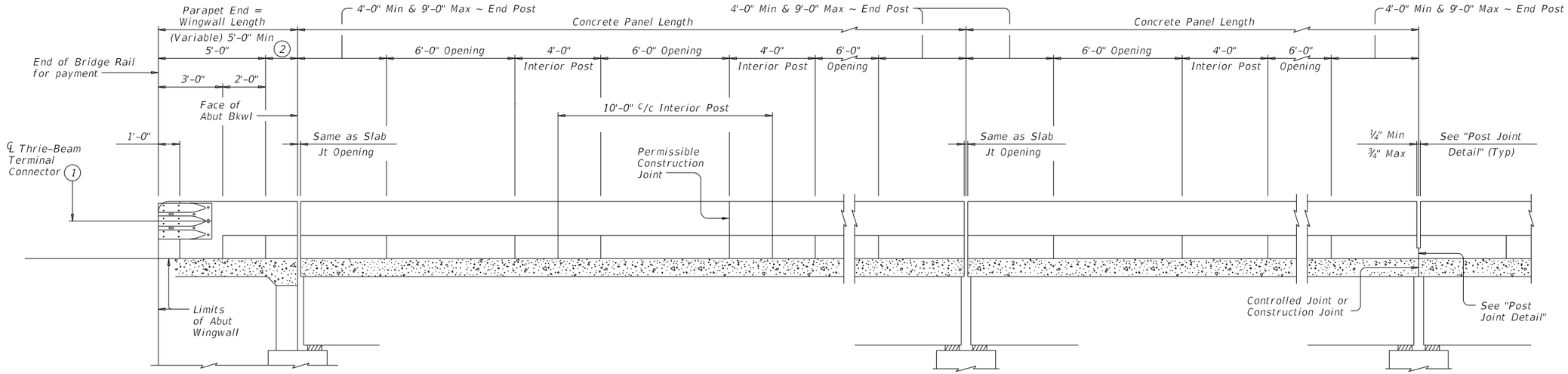
Bridge Division Standard

STONE RIPRAP

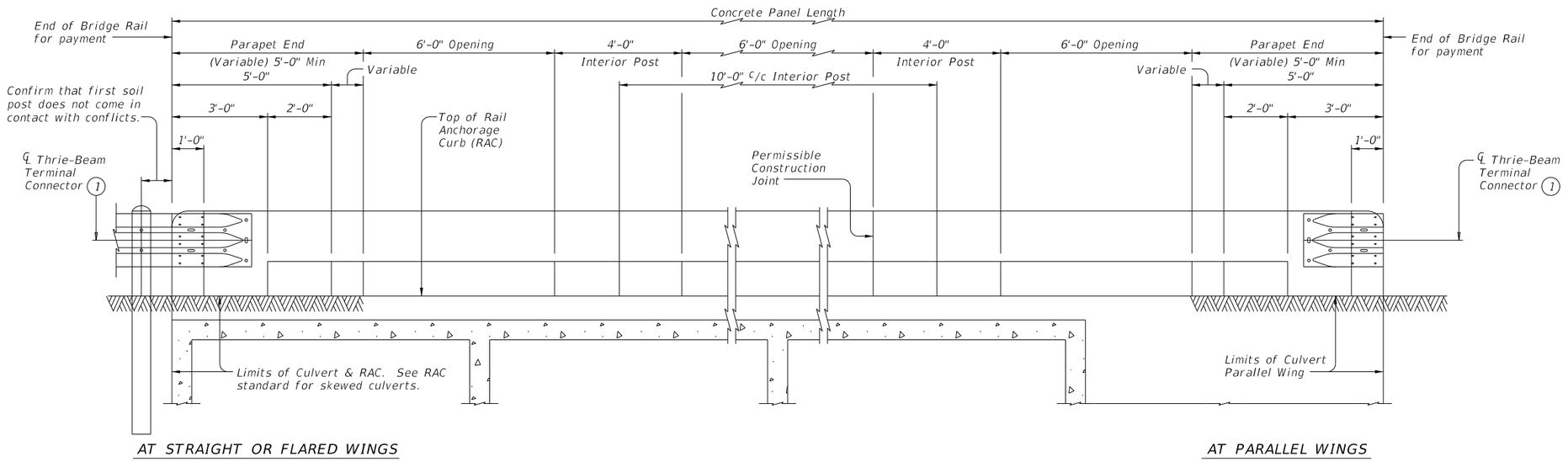
SRR

FILE: srrstde1-19.dgn	DN: AES	CK: JGD	DW: BWH	CK: AES
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		102

DATE: 11/14/2023 2:37:04 PM
FILE: N:\P5072-18-19-4\CADD_BR_FM 1391\DGN\07_BRIDGES\StdDetailsT223.dgn



ROADWAY ELEVATION OF RAIL ON BRIDGE



ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

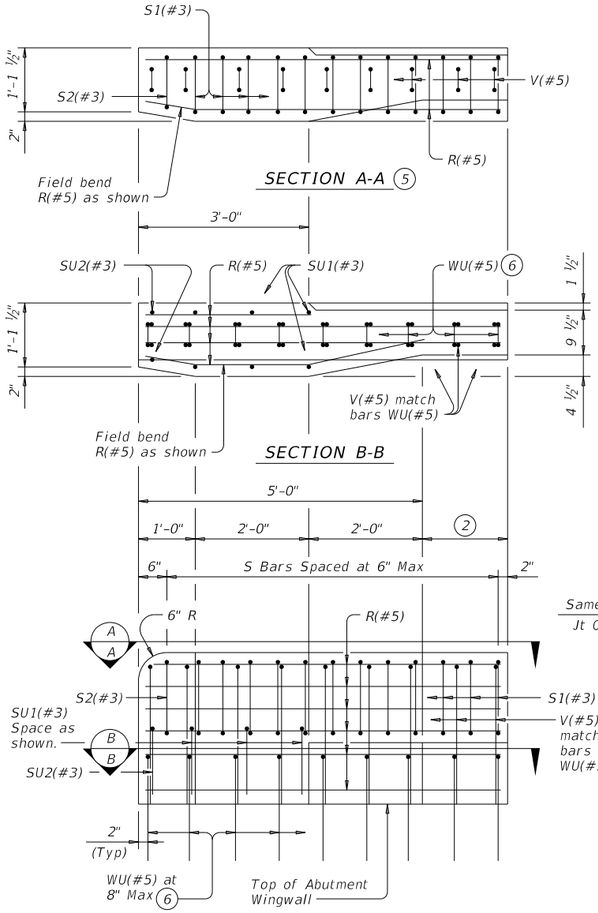
Texas Department of Transportation

Bridge Division Standard

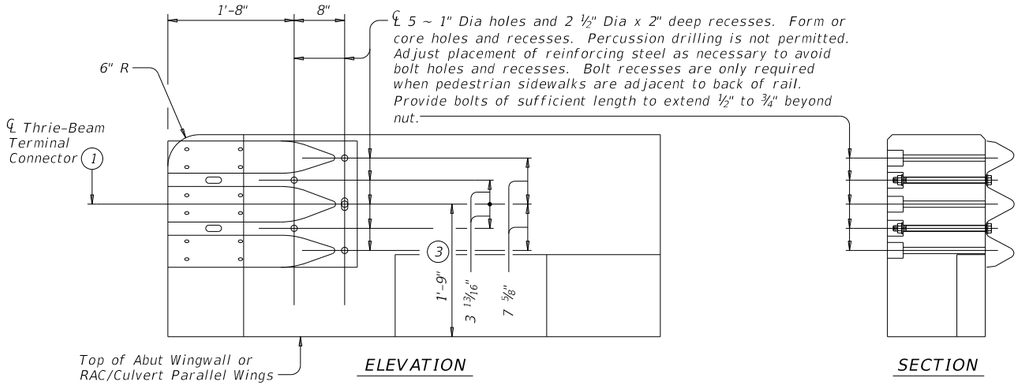
TRAFFIC RAIL

TYPE T223

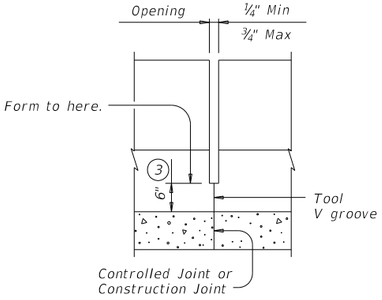
FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		103



PARAPET END AT ABUT WINGWALL (6)

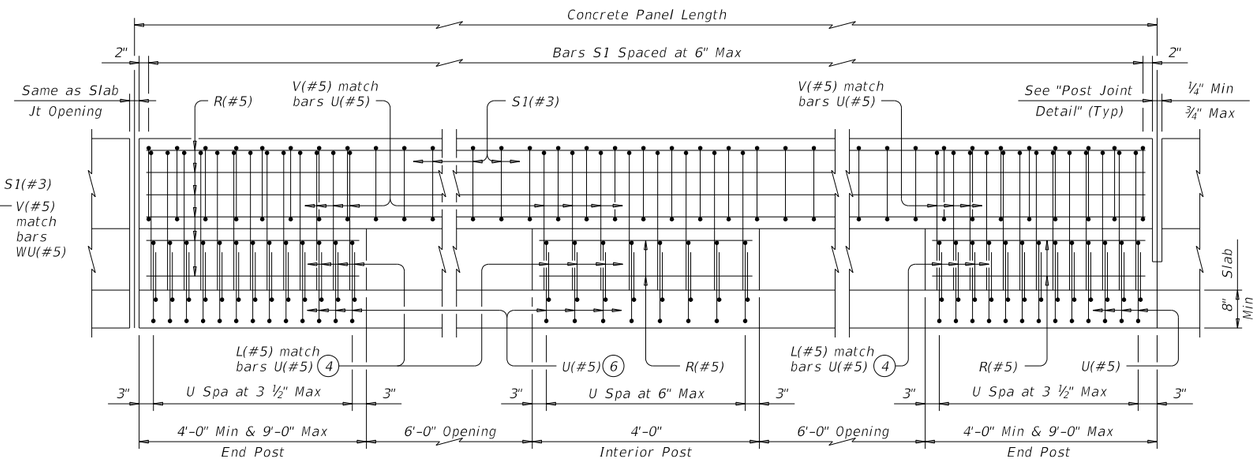


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.



AT SLAB EXPANSION JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT SLAB EXPANSION JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(5) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on achorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

DATE: 11/14/2023 2:37:04 PM
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SHEET 2 OF 3

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE: ristd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		104

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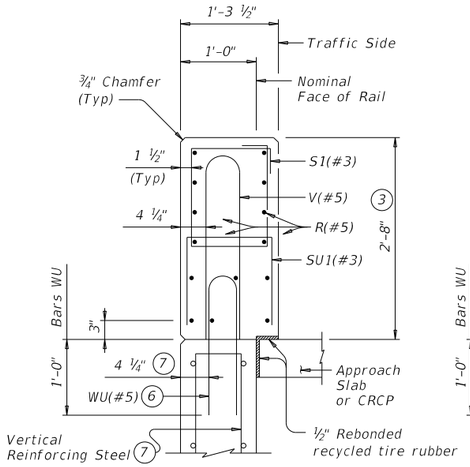
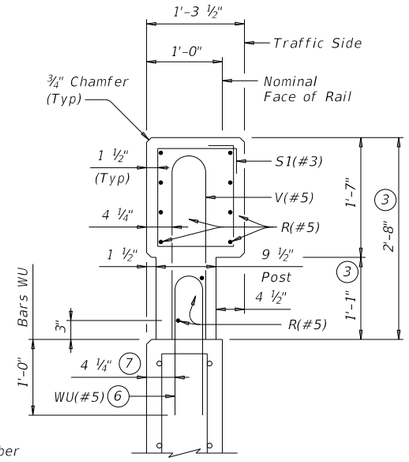
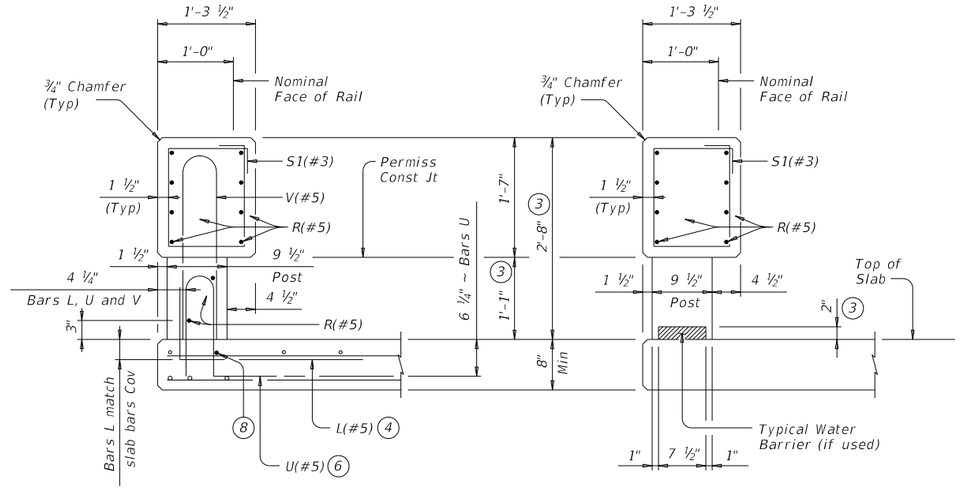


SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

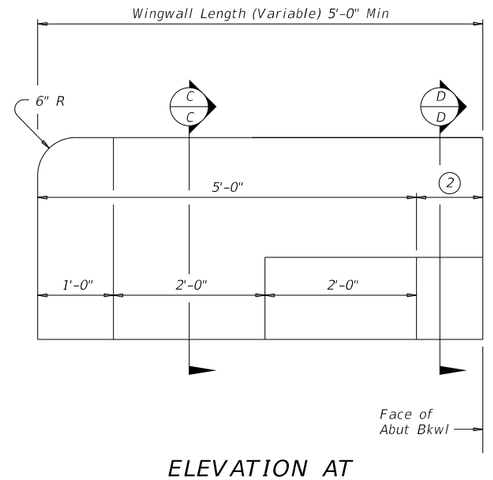


AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

SECTIONS THRU RAIL

Sections on box culverts similar.



ELEVATION AT ABUTMENT WINGWALL

Box culvert parallel wings or rail anchorage curb similar.

(2) *Wingwall Length minus 5'-0" (Varies)*

(3) *Increase 2" for structures with overlay.*

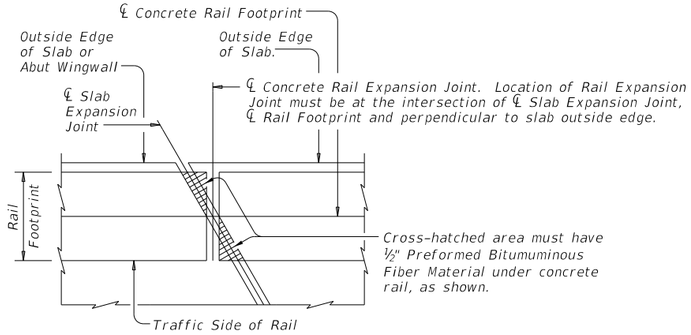
(4) *Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.*

(6) *Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.*

(7) *When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.*

(8) *Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.*

(9) *At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 ¼" above the roadway surface without overlay.*



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

Chamfer all exposed corners.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

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

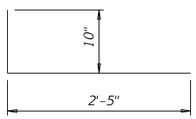
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

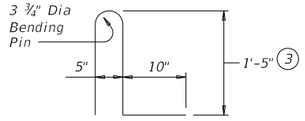
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 358 plf.

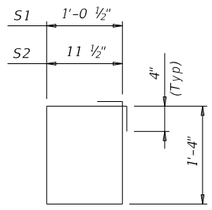
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



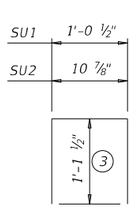
BARS L (#5)



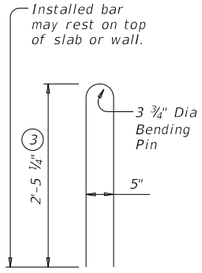
BARS U (#5) (9)



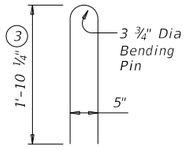
BARS S (#3)



BARS SU (#3)



BARS V (#5) (9)



BARS WU (#5)

SHEET 3 OF 3

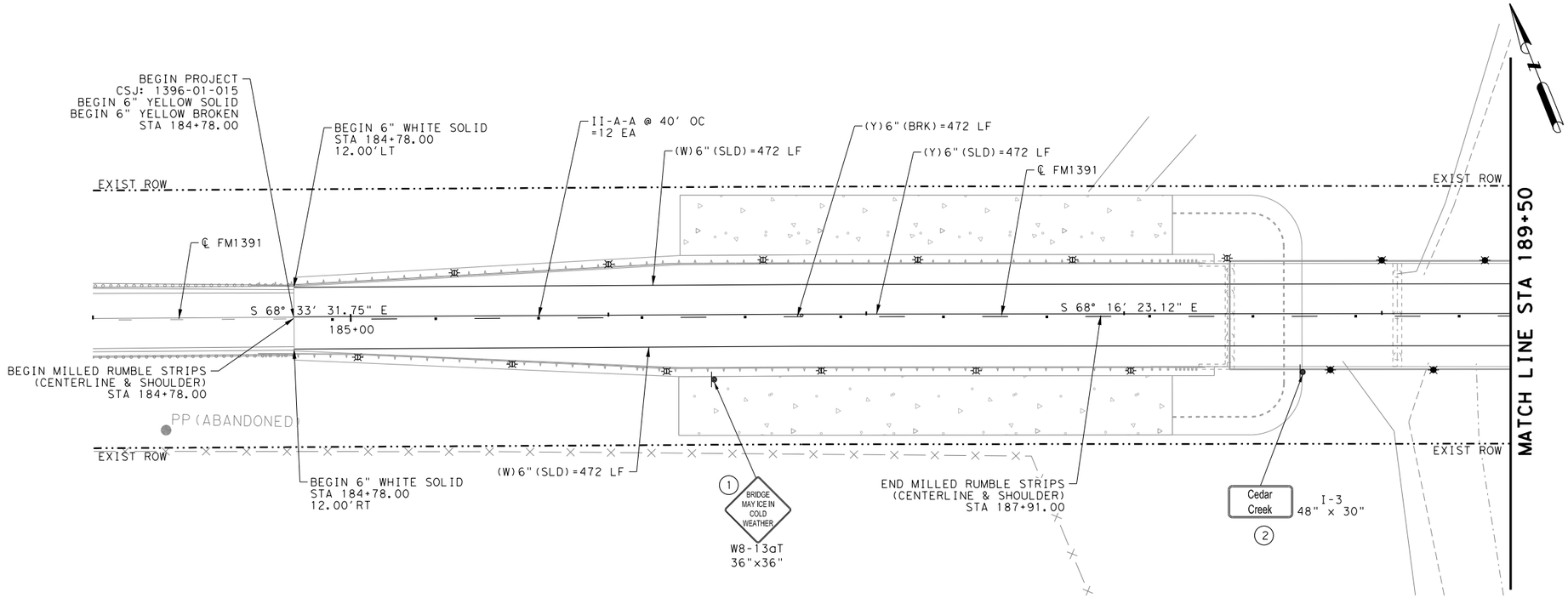
Texas Department of Transportation

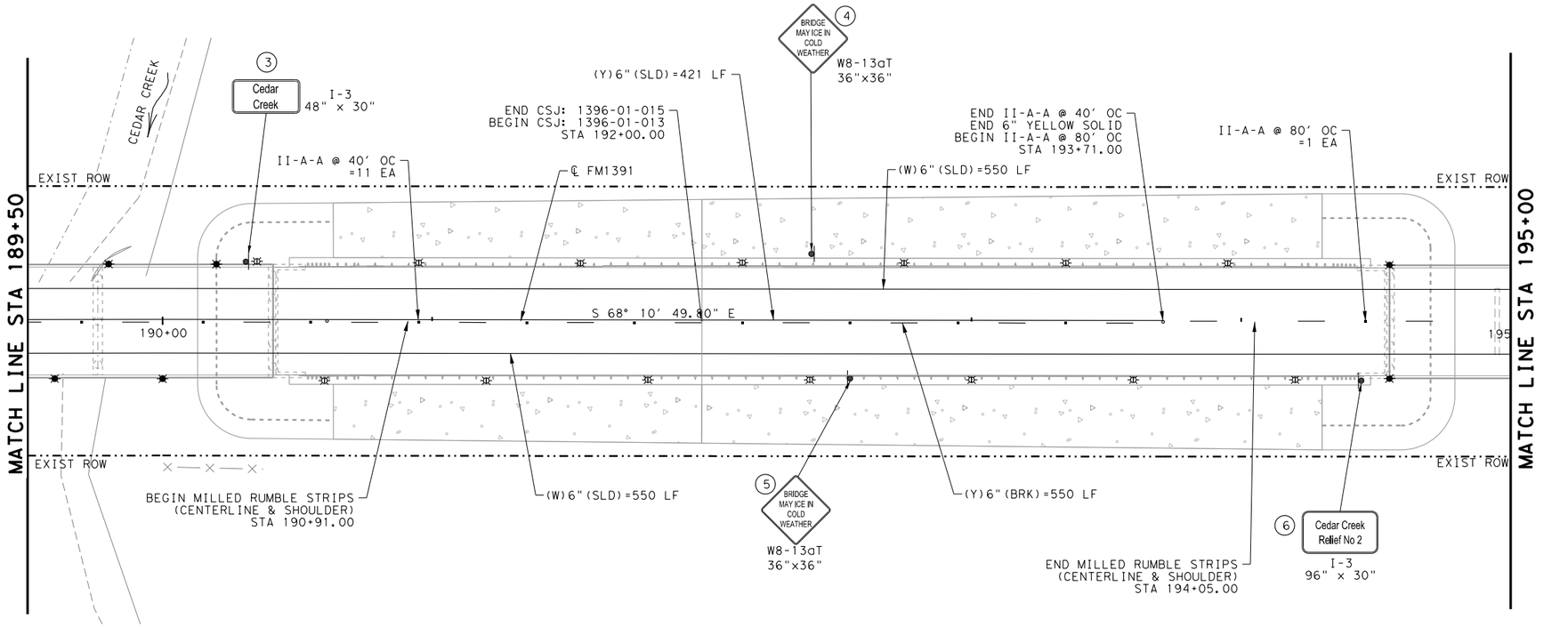
Bridge Division Standard

TRAFFIC RAIL

TYPE T223

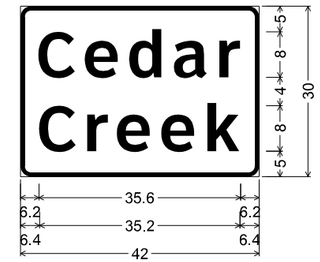
FILE:	rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		1396	01	013,ETC.	FM 1391
		DIST	COUNTY		SHEET NO.
		DAL	KAUFMAN		105





LEGEND:

- (#) PROPOSED SMALL SIGN
- DEL ASSM (D-SW)SW1(BRF)CTB(BI)
- DEL ASSM (D-SW)SW1(BRF)GF2(BI)



I-3
1.9" Radius, 0.8" Border, White on Green;
"Cedar", ClearviewHwy-5-W-R;
"Creek", ClearviewHwy-5-W-R;

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED PROFESSIONAL ENGINEER
11/14/2023

0 25 50
SCALE: 1"=50'

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2 SIGNING & PAVEMENT MARKINGS BEGIN TO 195+00

SHEET 1 OF 2

DN: RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN: RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW: RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW: RC	DAL	KAUFMAN	1396	01	013,ETC.	106

FM1391_SPML_01.dgn

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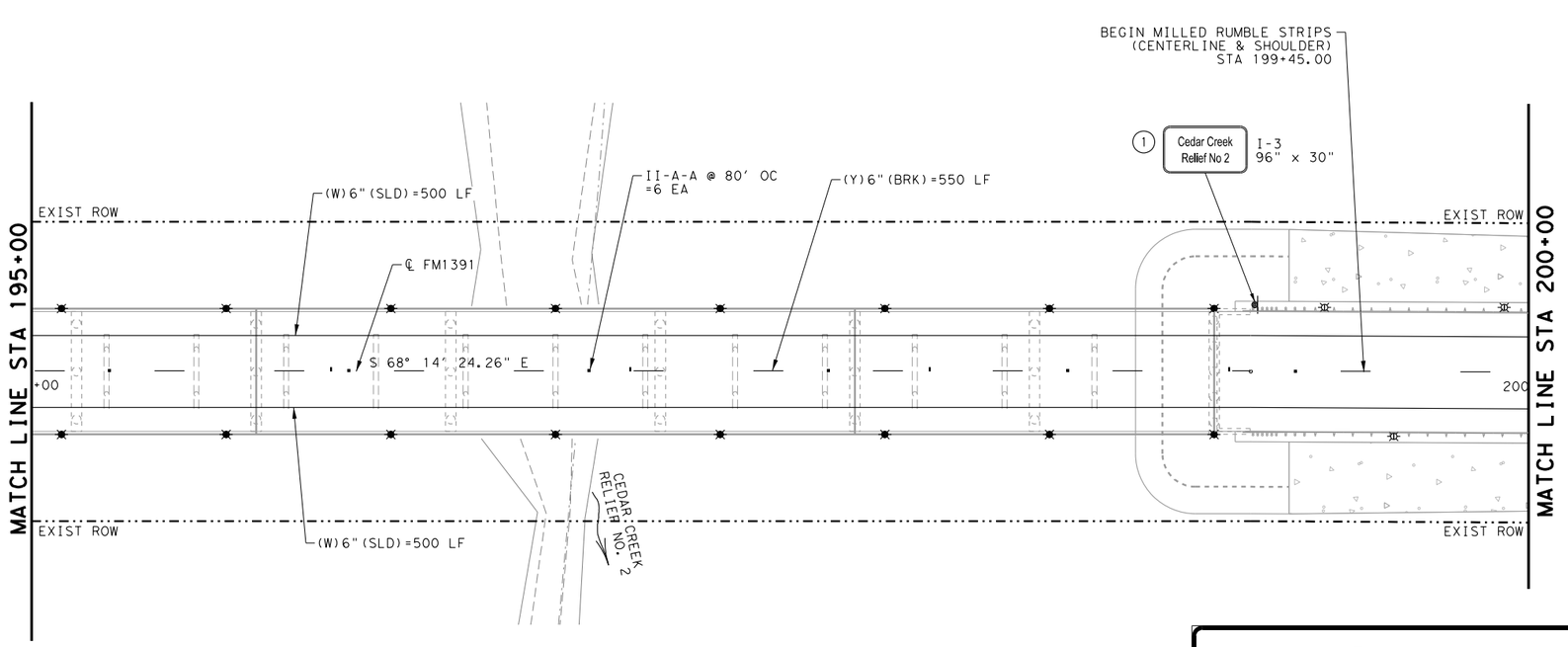
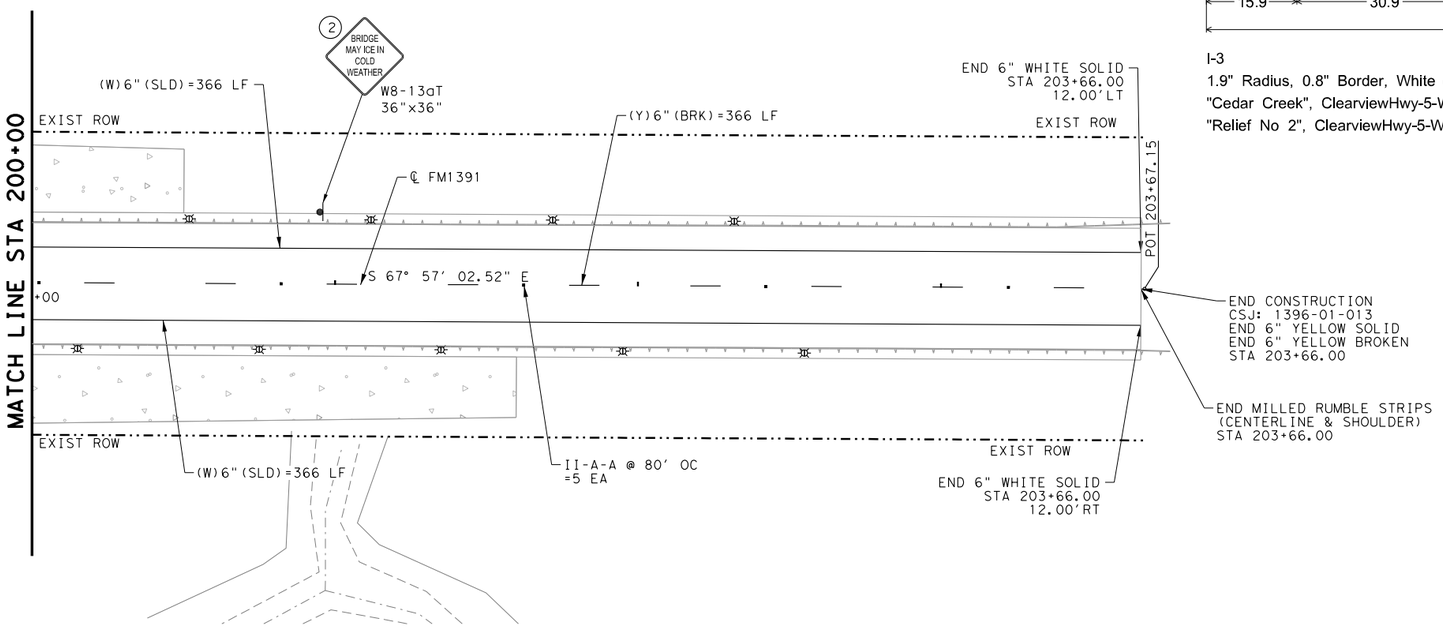
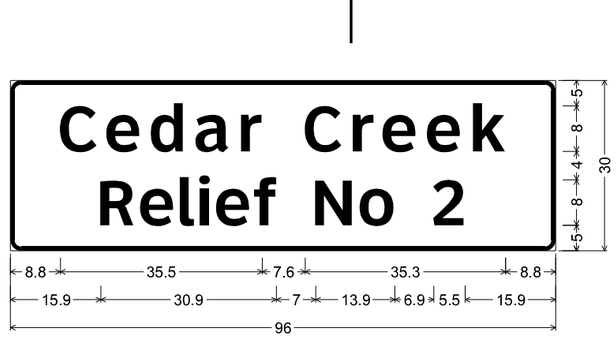




LEGEND:

- (#) PROPOSED SMALL SIGN
- DEL ASSM (D-SW)SW1(BRF)CTB(BI)
- DEL ASSM (D-SW)SW1(BRF)GF2(BI)



I-3
1.9" Radius, 0.8" Border, White on Green;
"Cedar Creek", ClearviewHwy-5-W-R;
"Relief No 2", ClearviewHwy-5-W-R;

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED
PROFESSIONAL ENGINEER
11/14/2023

0 25 50
SCALE: 1"=50'

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway,
Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
SIGNING & PAVEMENT MARKINGS
195+00 TO END

SHEET 2 OF 2

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	107

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REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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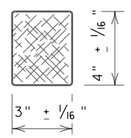
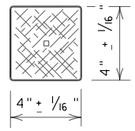
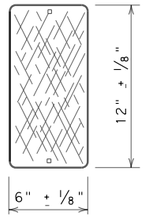
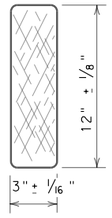
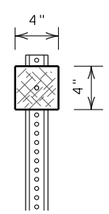
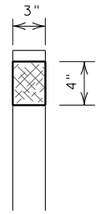
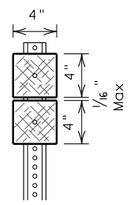
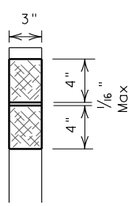
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE	 1-Size 2 reflector unit	 1-Size 1 reflector unit	 2-Size 2 reflector units	 2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
S = Single
D = Double

COLOR OF REFLECTORS
W = White
Y = Yellow
R = Red

REFLECTOR UNIT SIZE
1 or 2

TYPE OF POST OR DELINEATOR
WC = Wing Channel Post
YFLX = Yellow Flexible Post
WFLX = White Flexible Post
BRF = Barrier Reflector

TYPE OF MOUNT
GND = Embedded (drivable or set in concrete)
CTB = Concrete Barrier Mount
GF1 or GF2 = Guard Fence Attachment
SRF = Surface Mount

DIRECTION
If Required
BI = Bi-Directional
BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
1, 2, 3, or 4

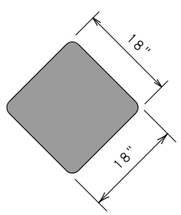
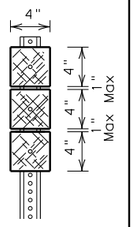
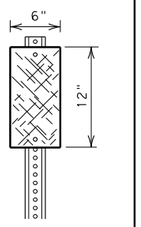
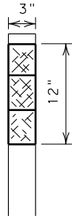
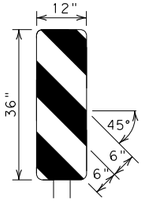
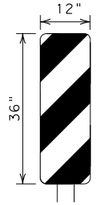
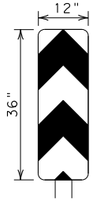
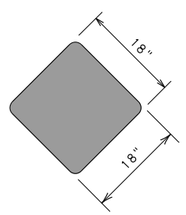
NUMBER OF REFLECTORS OR DIRECTION
X = 3-Size 2 reflector units (Type 2 only)
Y = 1-Size 3 reflector unit (Type 2 only)
Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
L = Left Side (Type 3 Object Marker only)
R = Right Side (Type 3 Object Marker only)
C = Center (Type 3 Object Marker only)

TYPE OF POST
WC = Wing Channel Post
WFLX = White Flexible Post
TWT = Thin Walled Tubing

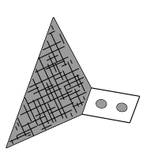
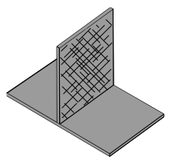
TYPE OF MOUNT
GND = Embedded (drivable)
SRF = Surface Mount
WAS = Wedge Anchor Steel
WAP = Wedge Anchor Plastic

DIRECTION
If Required
BI = Bi-Directional

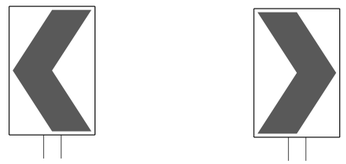
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		 3-Size 2 reflector units	 1-Size 3 reflector unit	 3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

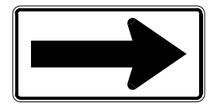
CHEVRONS

DEVICE:  W1-8

SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

NOTE
1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	DAL	KAUFMAN		108

20A

DATE: 11/14/2023 2:05:34 PM
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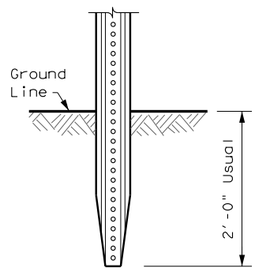
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

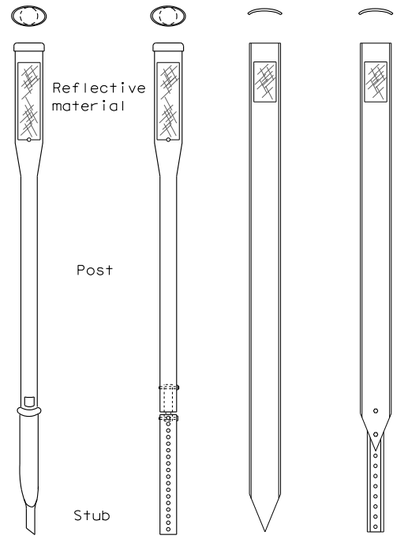


NOTES

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.

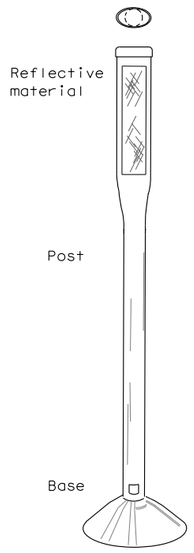
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



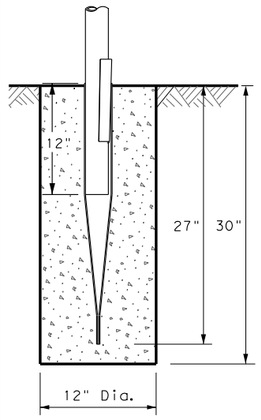
SURFACE MOUNT

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.

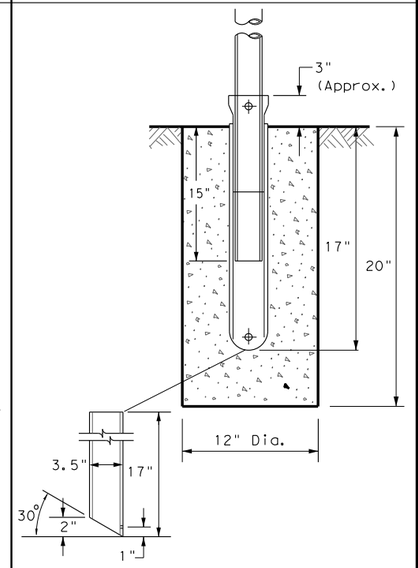
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

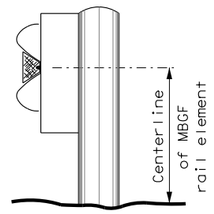
NOTE

1. Install per manufacturer's recommendations.

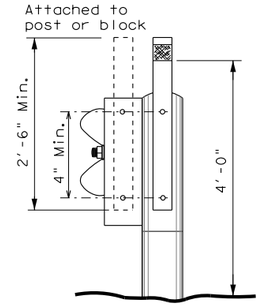
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

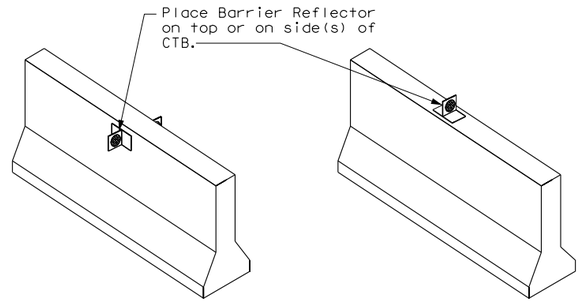
GF1



GF2



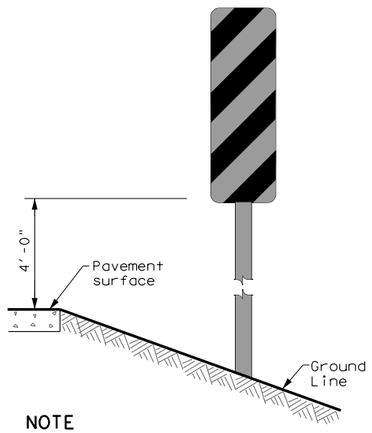
CONCRETE TRAFFIC BARRIER (CTB)



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.

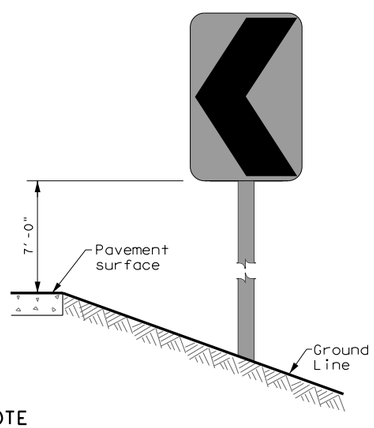
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

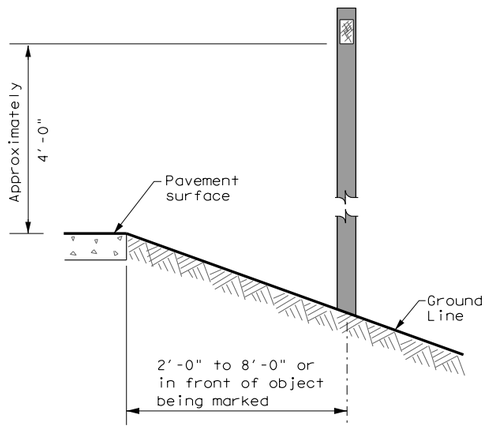
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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

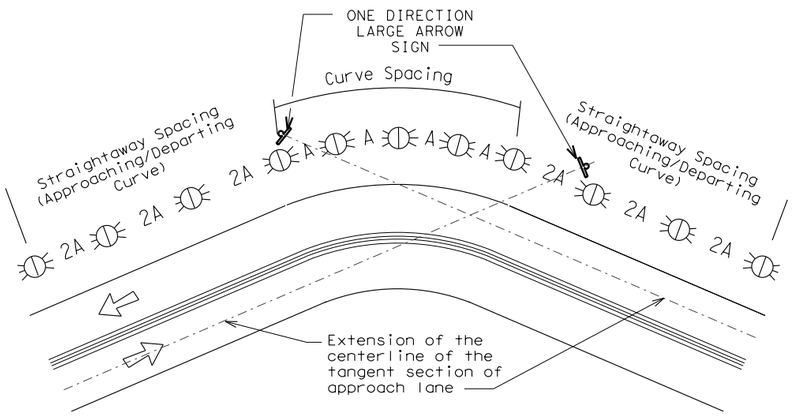
FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	DAL	KAUFMAN		109

20B

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

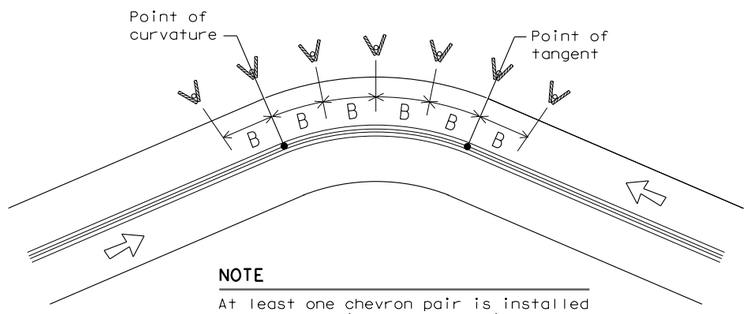
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	——
2	2865	160	320	——
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	DAL	KAUFMAN		110

20C

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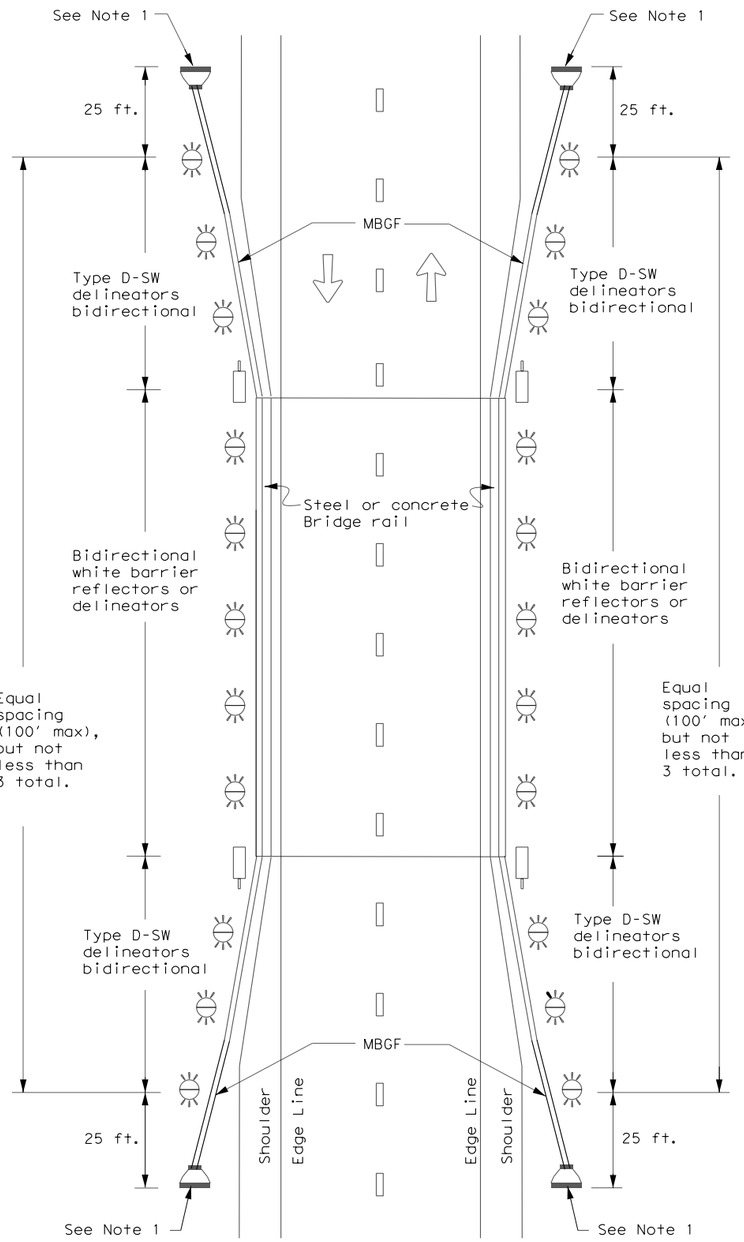
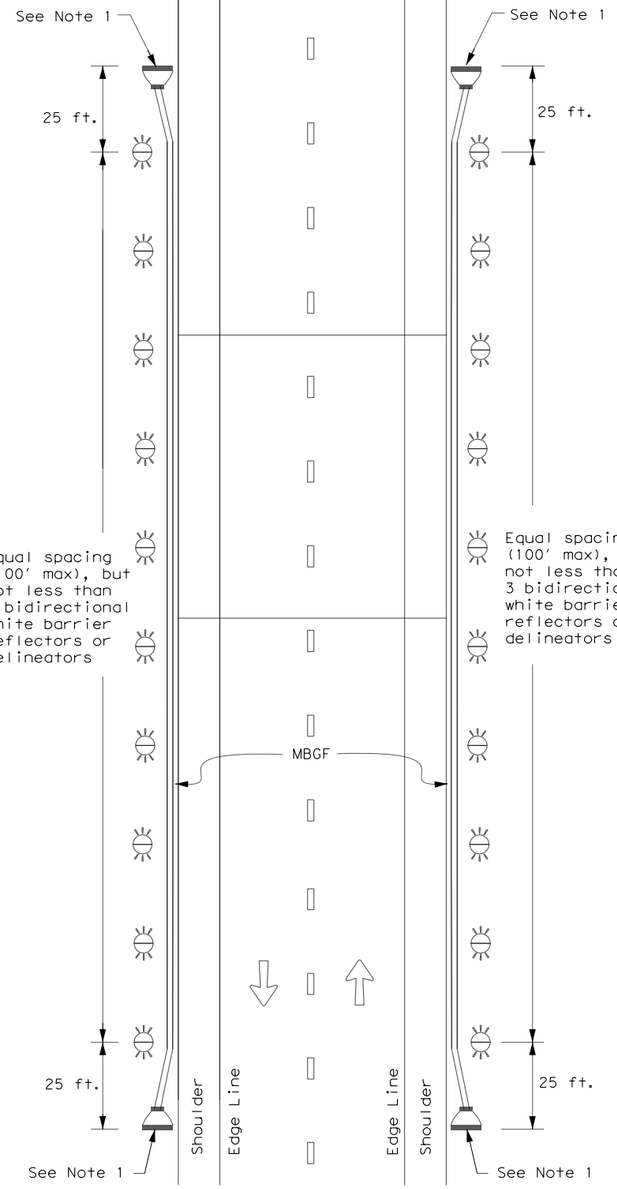
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

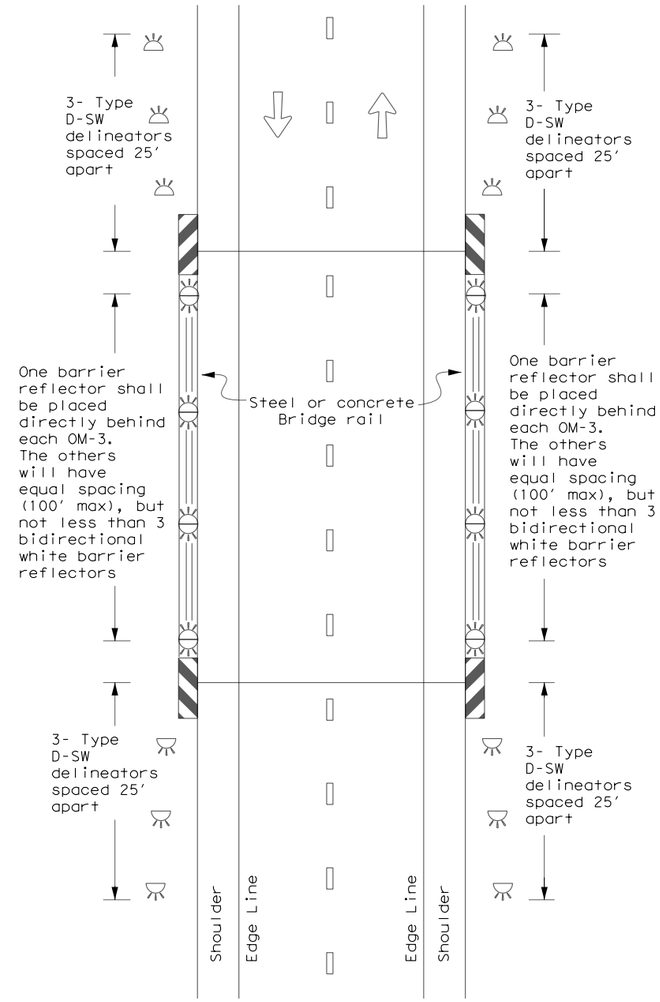
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
7-20	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		111

20E

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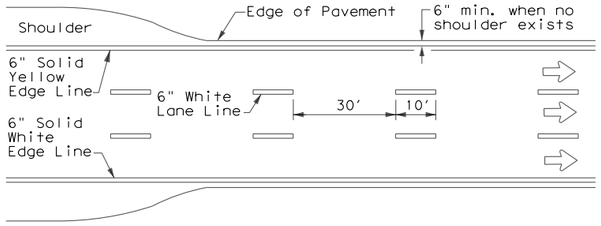
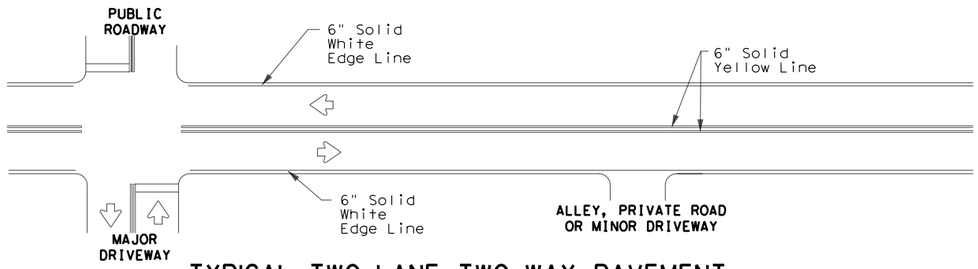
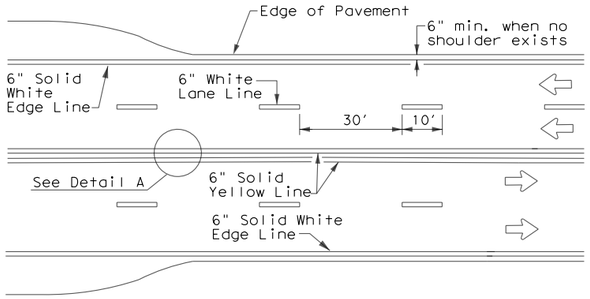
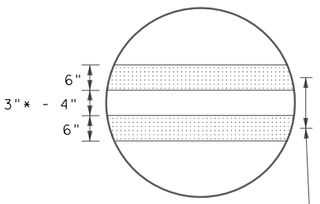


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS





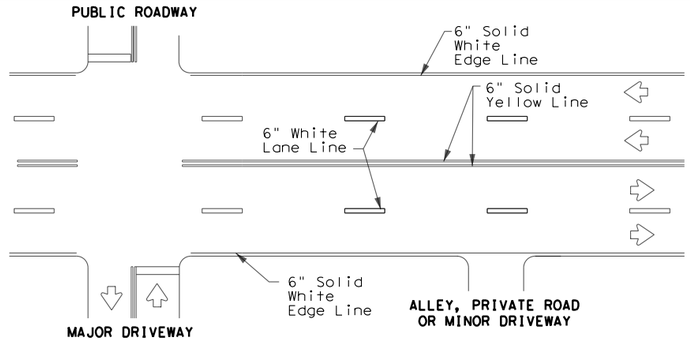
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

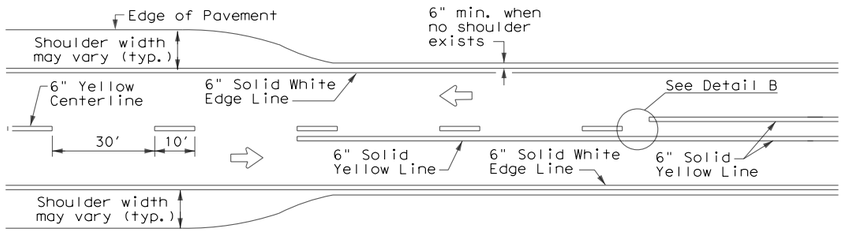
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

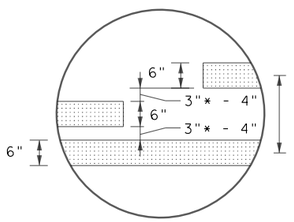
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS

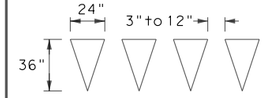


TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



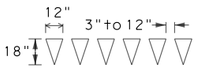
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.



For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



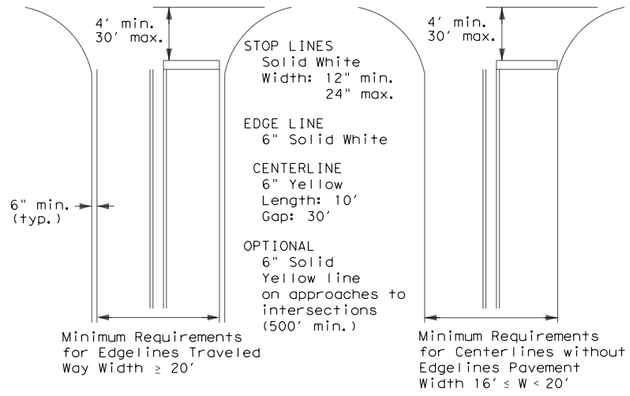
For posted speed on road being marked equal to or less than 40 MPH.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

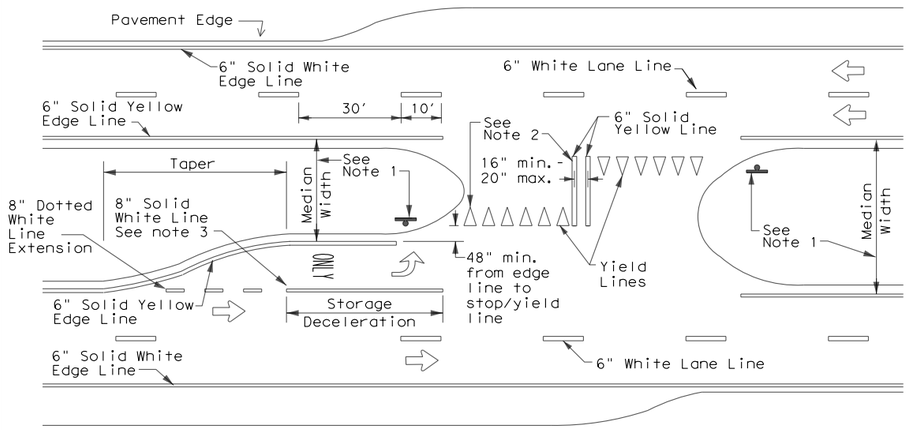
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways



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

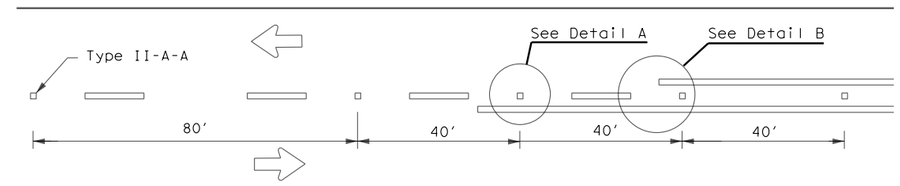
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

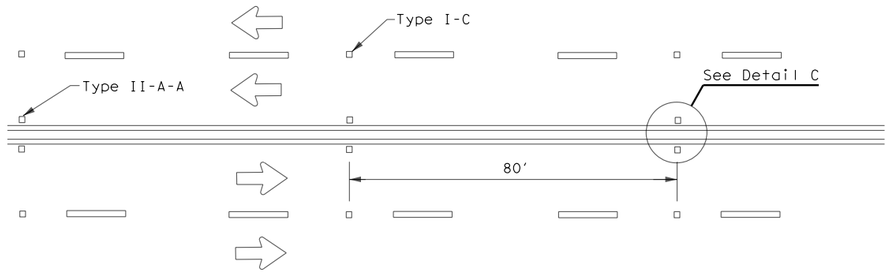
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20	1396	01	013,ETC.	FM 1391
8-95 3-03 12-22	DIST	COUNTY		SHEET NO.
5-00 2-12	DAL	KAUFMAN		112

22A

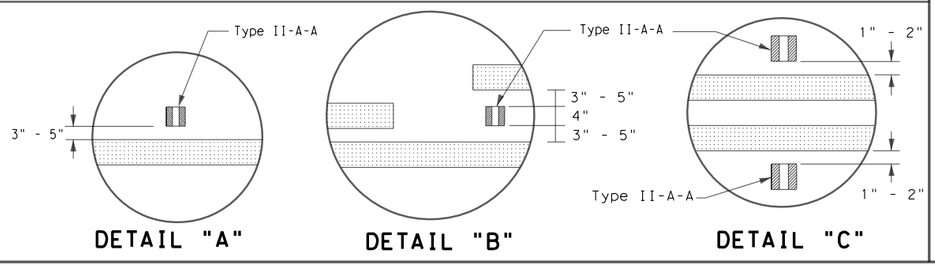
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

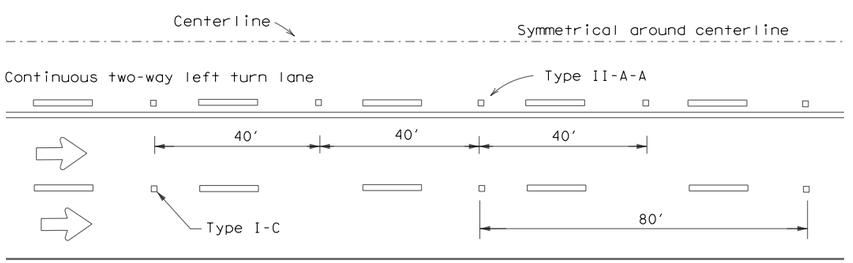


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

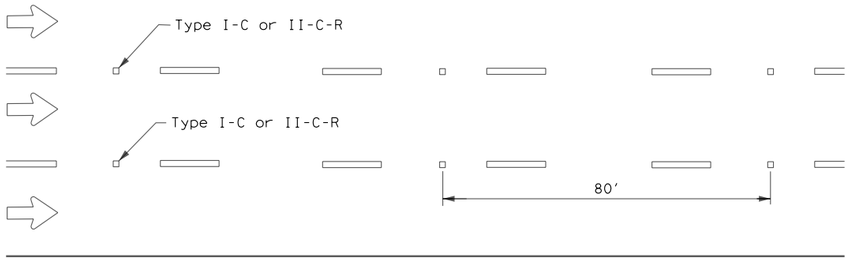


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



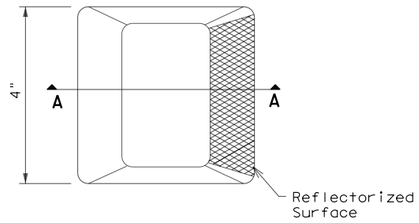
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

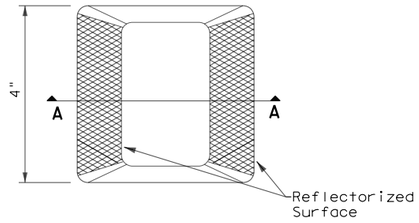
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

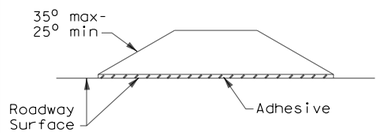
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

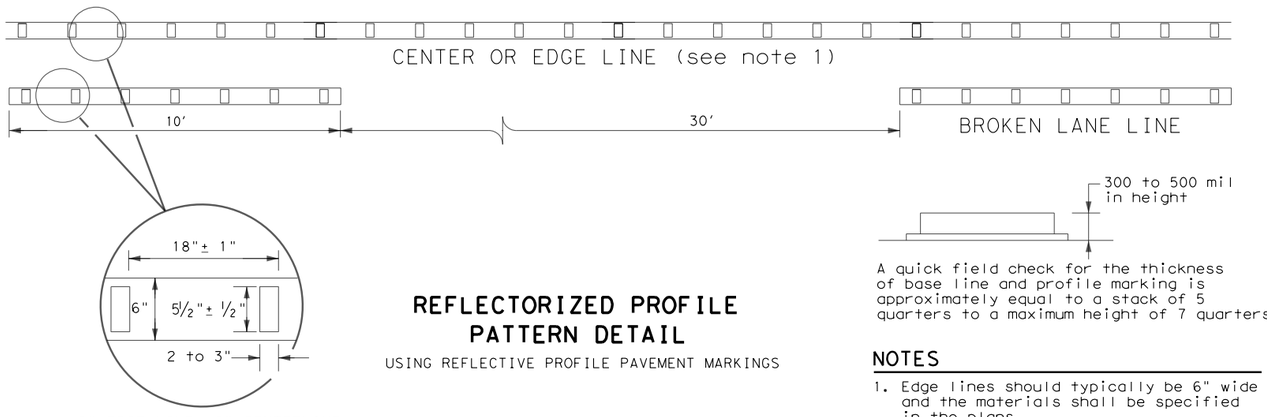


Type II (Top View)



SECTION A

RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS

A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		113

22B

DATE: 11/14/2023 2:05:40 PM
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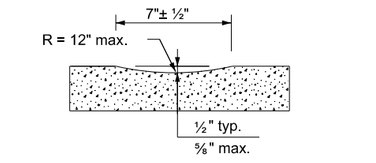
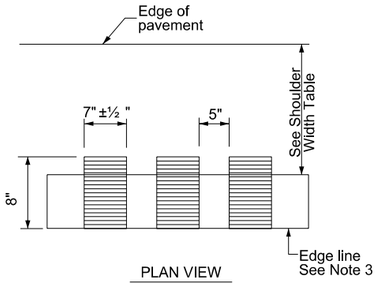
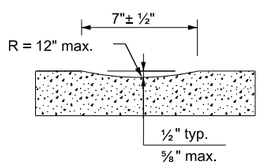


PROFILE VIEW
OPTION 1

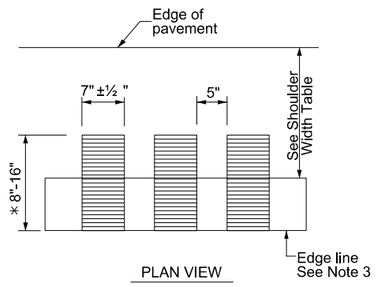


PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



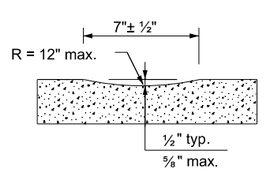
PROFILE VIEW
OPTION 2



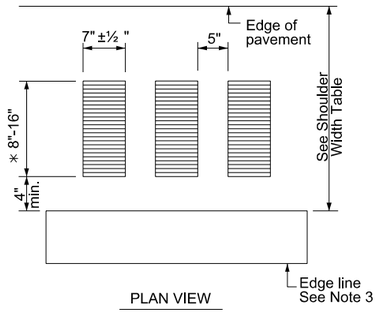
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



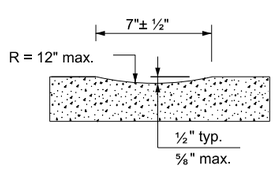
PROFILE VIEW
OPTION 3



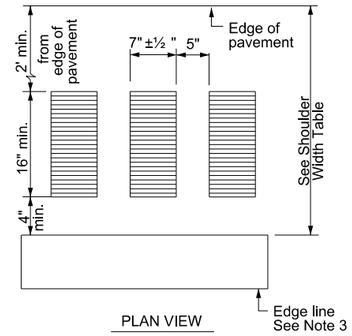
PLAN VIEW

∗ This distance may vary based on width of shoulder

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)

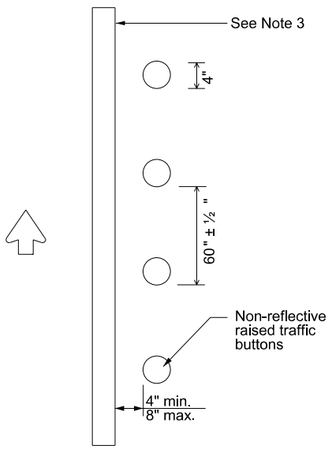


PROFILE VIEW
OPTION 4



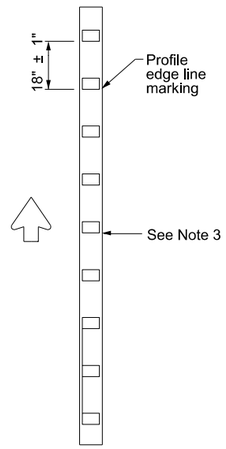
PLAN VIEW

CONTINUOUS MILLED DEPRESSIONS (Rumble Strips)



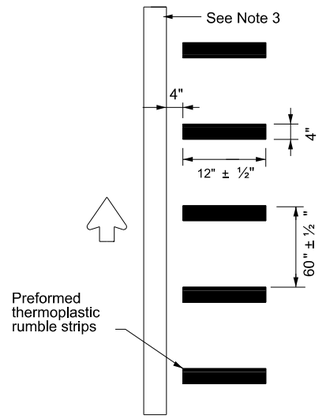
PLAN VIEW
OPTION 5

RAISED EDGE LINE (Rumble Strips)



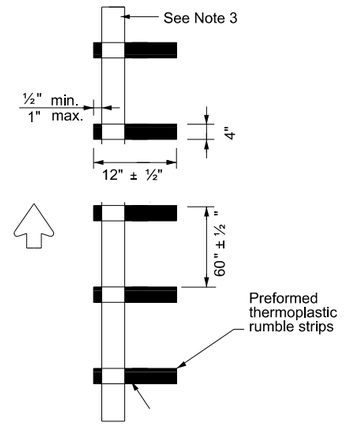
PLAN VIEW
OPTION 6

PROFILE EDGE LINE MARKINGS (Rumble Strips)



PLAN VIEW
OPTION 7

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)



PLAN VIEW
OPTION 8

PREFORMED THERMOPLASTIC EDGE LINE (Rumble Strips)

SHOULDER WIDTH TABLE		
EQUAL TO OR LESS THAN 2 FEET	GREATER THAN 2 FEET LESS THAN 4 FEET	EQUAL TO OR GREATER THAN 4 FEET
Option 1, 5, 6 or 8	Option 1, 2, 3 5, 6 or 7	Option 2, 4, 5 6 or 7

GENERAL NOTES

1. Rumble strips and profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
2. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
3. Use Standard Sheet PM(2) and FPM(1) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings, and profile markings.
4. See the Shoulder Width Table below for determining what options may be used for edge line rumble strips.
5. Breaks in edge line rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections, or driveways with high usage of large trucks when installed on conventional highways.
6. Rumble strips shall not be placed across exit or entrance ramps, acceleration or deceleration lanes, crossovers, gore areas, or intersections with other roadways.
7. Consideration should be given to noise levels when edgeline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Consideration shall be given to bicyclists. See RS(6).

WHEN INSTALLING MILLED DEPRESSION EDGE LINE RUMBLE STRIPS:

9. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
10. Pavement markings can be applied over milled shoulder rumble strips to create an edge line rumble strip.

WHEN INSTALLING RAISED OR PROFILE EDGE LINE RUMBLE STRIPS:

11. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per the manufacturer's recommendations.
12. Non-reflective traffic buttons shall be placed adjacent to the pavement marking delineating the edge line when used as a rumble strip. The color of the button should match the color of the adjacent edge line marking (white or yellow). The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
13. Non-reflective traffic buttons shall not be placed across exit or entrance ramps, acceleration and deceleration lanes, crossovers, gore areas or intersections with other roadways.
14. The minimum distance between the edge line and the buttons should be used if the shoulder is less than 8 feet in width.
15. Raised profile thermoplastic markings used as edge lines may substitute for buttons.

Texas Department of Transportation

Traffic Safety Division Standard

EDGE LINE RUMBLE STRIPS ON UNDIVIDED OR TWO LANE HIGHWAYS RS(2)-23

FILE: rs(2)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
10-13 1-23	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		114

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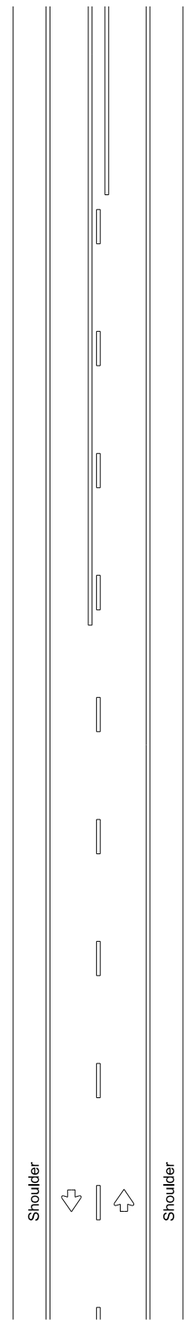
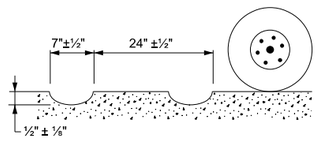
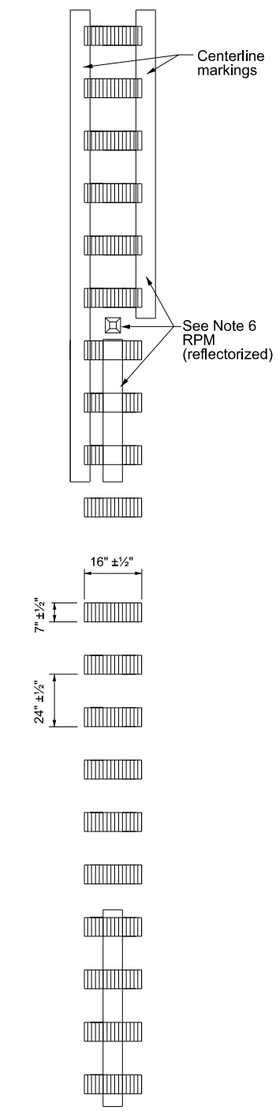
CENTERLINE RUMBLE STRIPS



TWO LANE TWO-WAY HIGHWAYS

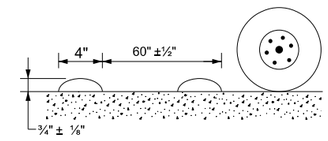


PROFILE VIEW

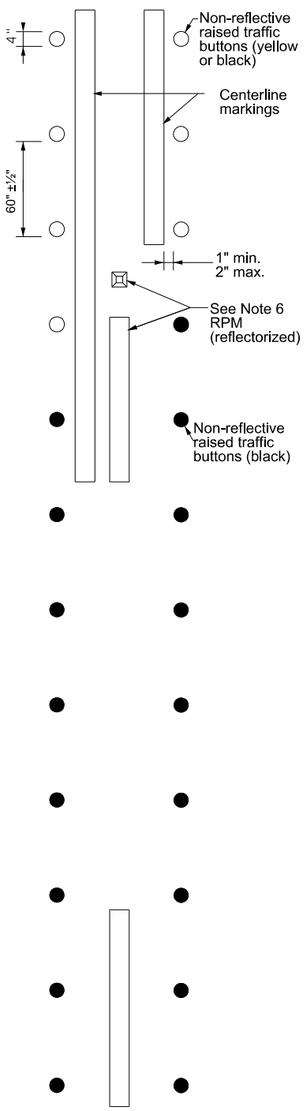


PLAN VIEW
OPTION 1

MILLED CENTERLINE RUMBLE STRIPS

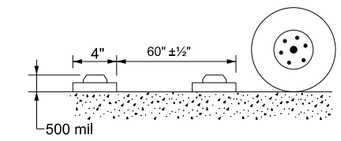


PROFILE VIEW

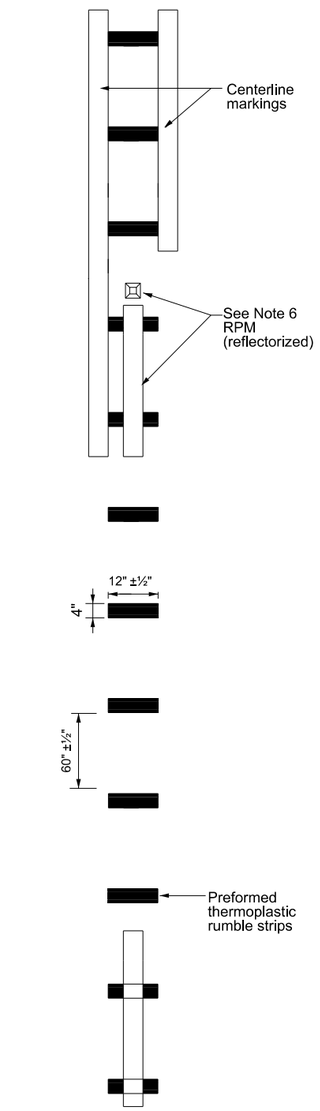


PLAN VIEW
OPTION 2

RAISED CENTERLINE RUMBLE STRIPS

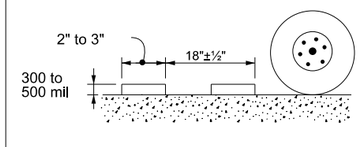


PROFILE VIEW

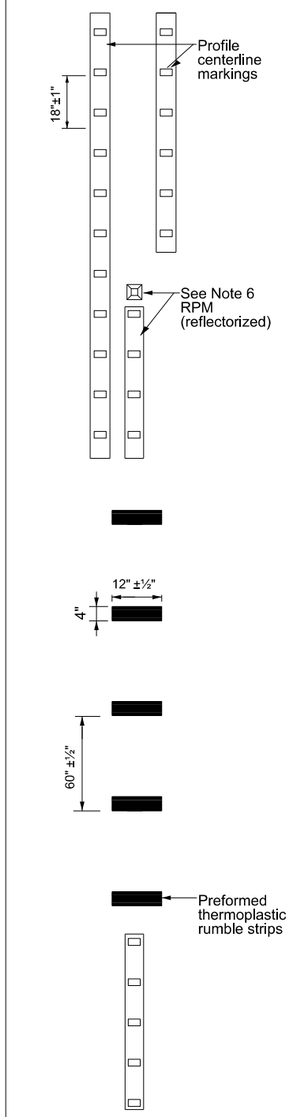


PLAN VIEW
OPTION 3

PREFORMED THERMOPLASTIC RUMBLE STRIPS



PROFILE VIEW



PLAN VIEW
OPTION 4

PROFILE CENTERLINE MARKINGS AND PREFORMED THERMOPLASTIC RUMBLE STRIPS

GENERAL NOTES

1. This standard sheet provides guidelines for installing centerline rumble strips on two-lane highways with or without shoulders.
2. Centerline and edge line rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.
3. Milled rumble strips are preferred when adequate pavement depth is available. If pavement thickness is less than 2 inches, milled rumble strips shall not be used. Rumble strips shall not be milled or depressed into bridge decks.
4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Safety Division.
5. Breaks in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in advance of bridges, railroad crossings, intersections or driveways with high usage of large trucks.
6. Use standard sheet PM(2) for positioning, dimensioning, and spacing of all reflective raised pavement markers, pavement markings and profile markings.
7. Consideration should be given to noise levels when centerline rumble strips are to be installed near residential areas, schools, churches, etc. A 3/8 inch deep (minimum) milled rumble strip may be considered in these areas.
8. Pavement markings must be applied over milled centerline rumble strips.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS:

9. Raised rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be affixed to asphalt or concrete with bitumen or adhesives, as per manufacturer's recommendations.
10. When using non-reflective raised traffic buttons as a centerline rumble strip, the button shall be placed adjacent to the pavement marking delineating the centerline. The buttons will be paid for under Item 672, "Raised Pavement Markers." Non-reflective traffic buttons must meet the requirements of DMS-4300.
11. The color of the button should be yellow for a continuous no passing roadway. Black buttons should be used in areas where passing is allowed.
12. Consideration shall be given to bicyclists. See RS(6).

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

13. See standard sheet RS(2).

Texas Department of Transportation

Traffic Safety Division Standard

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

FILE: rs(4)-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
10-13 1-23	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		115

SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
TWT = Thin-Walled Tubing (see SMD(TWT))
10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

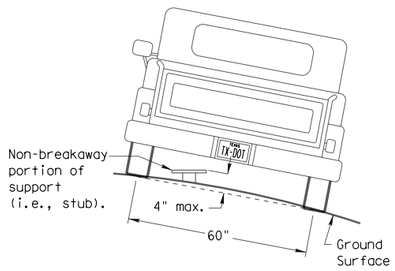
Anchor Type

UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
WS = Wedge Anchor Steel - (see SMD(TWT))
WP = Wedge Anchor Plastic (see SMD(TWT))
SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

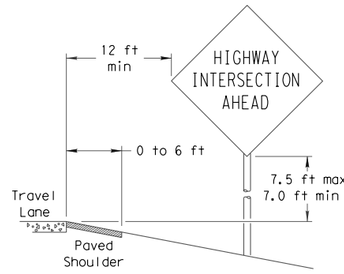
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

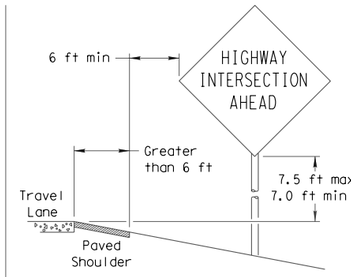
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

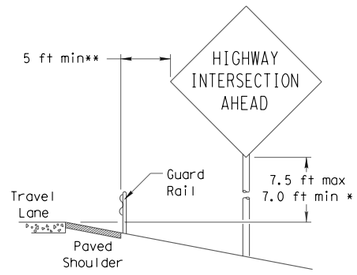
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



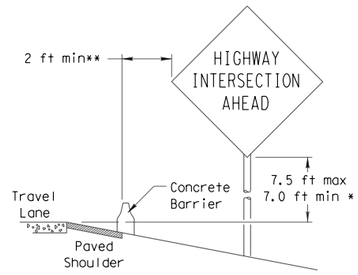
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



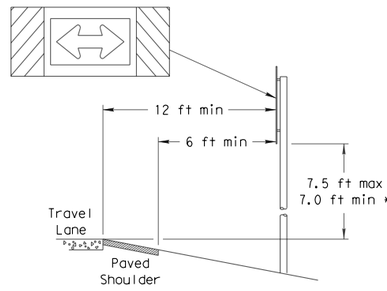
BEHIND GUARDRAIL



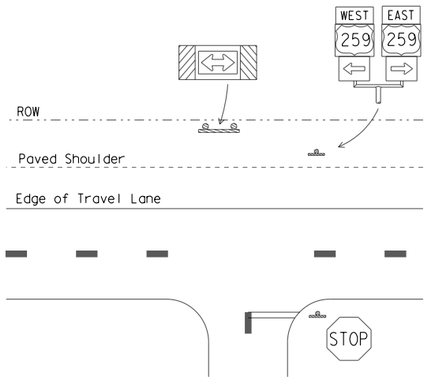
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

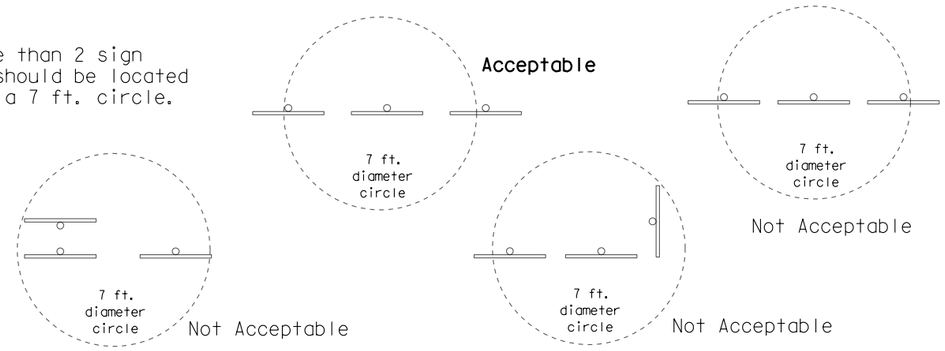
(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

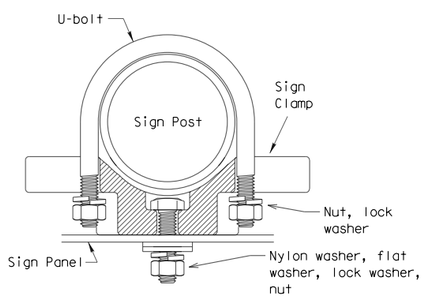
The website address is:
http://www.txdot.gov/publications/traffic.htm

No more than 2 sign posts should be located within a 7 ft. circle.



TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

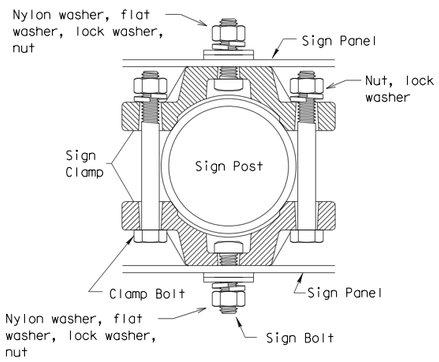


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

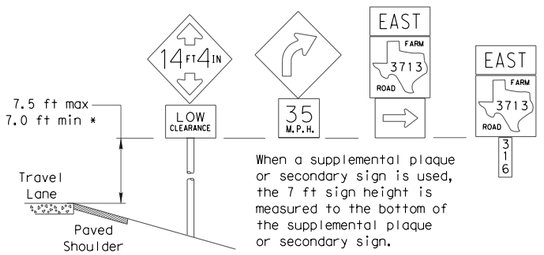
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



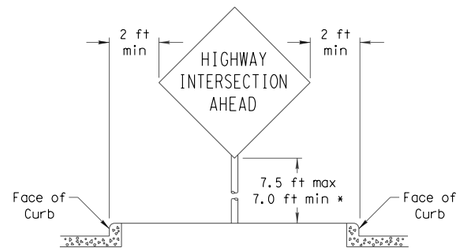
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



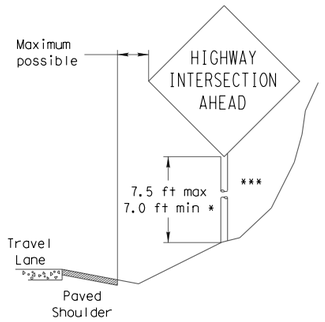
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1396	01	013,ETC.	FM 1391

DIST	COUNTY	SHEET NO.
DAL	KAUFMAN	116

DATE: 11/14/2023 2:05:43 PM
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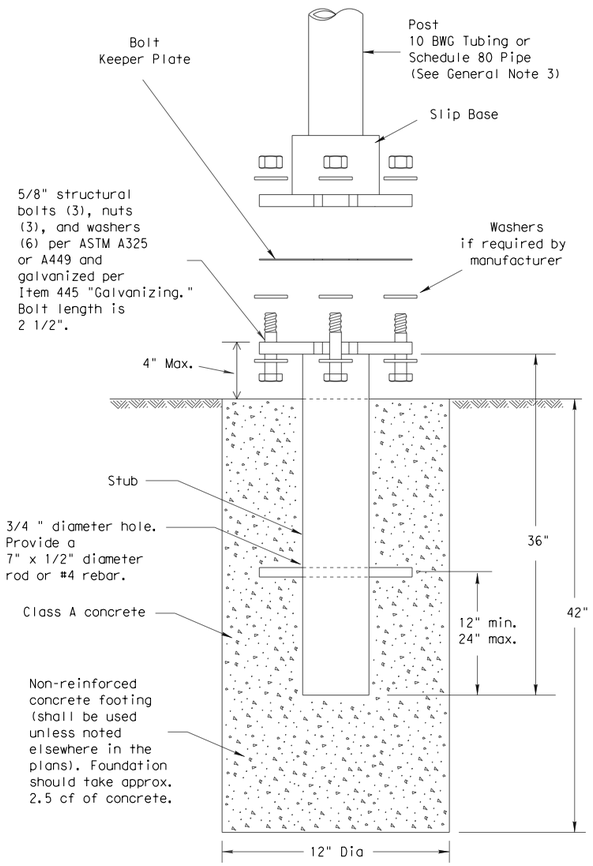
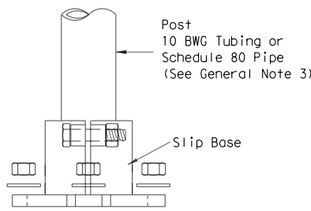
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS

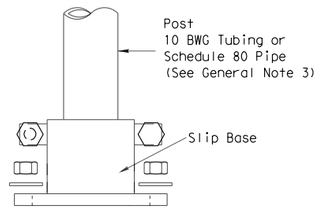


SM RD SGN ASSM TY XXXXX(X)SA(X-XXXX)

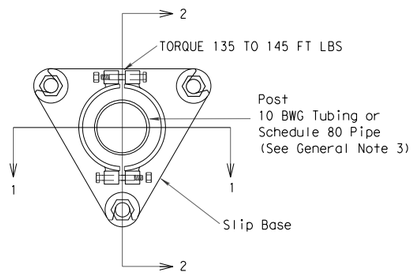
NOTE
The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.



SIDE VIEW 1-1



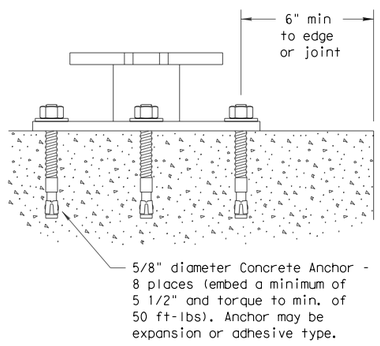
SIDE VIEW 2-2



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

Texas Department of Transportation
Dallas District Standard

SIGN MOUNTING DETAILS
SMALL ROADSIDE SIGNS
TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08(DAL)

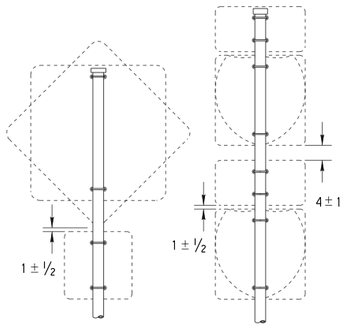
DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS
12-10 (DISTRICT) ADDED CLAMP BASE DETAIL FOR SLIP BASE INSTALLATION

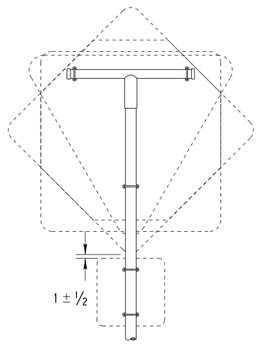
CONT	SECT	JOB	HIGHWAY
1396	01	013,ETC.	FM 1391

DIST	COUNTY	SHEET NO.
DAL	KAUFMAN	117

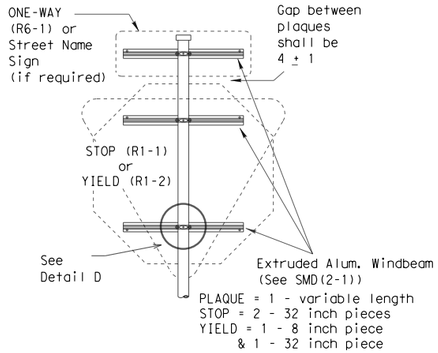
26B



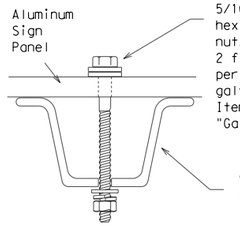
SM RD SGN ASSM TY XXXXX(1)XX(P)



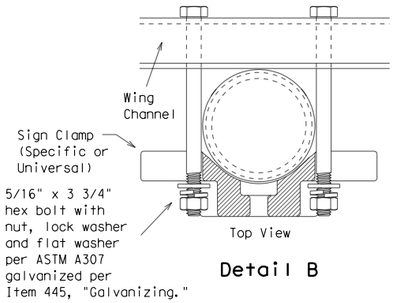
SM RD SGN ASSM TY XXXXX(1)XX(T)



SM RD SGN ASSM TY XXXXX(1)XX(P-BM)



Detail A



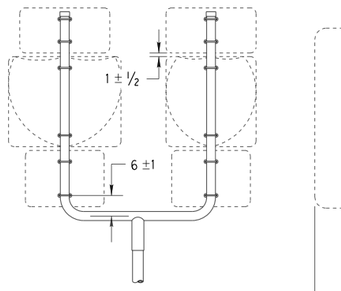
Detail B

GENERAL NOTES:

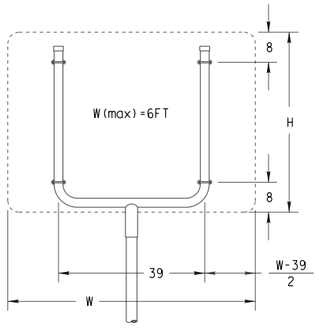
1.

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

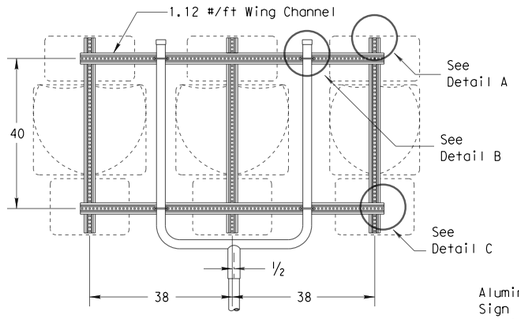
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material 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.



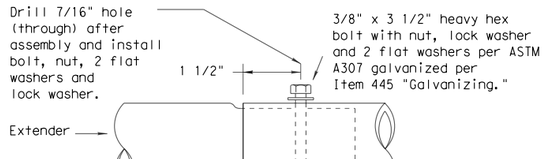
SM RD SGN ASSM TY XXXXX(1)XX(U)



SM RD SGN ASSM TY XXXXX(1)XX(U)

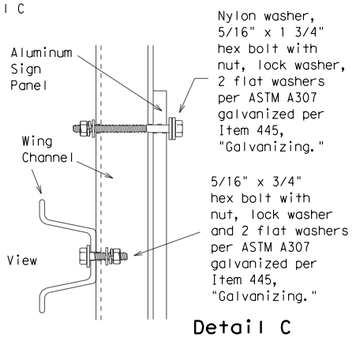


SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

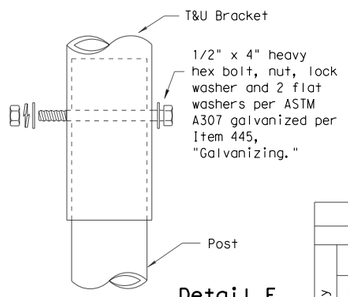


Detail F

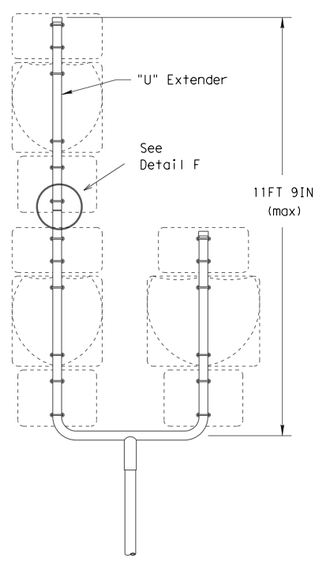
Splices shall only be allowed behind the sign substrate.



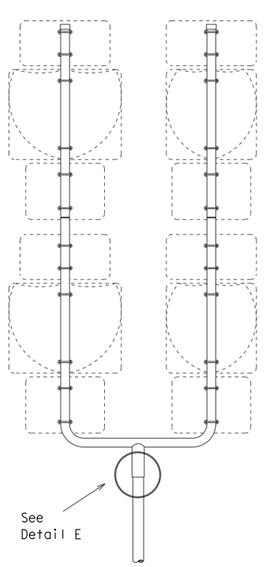
Detail C



Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)



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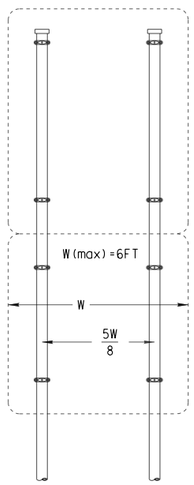
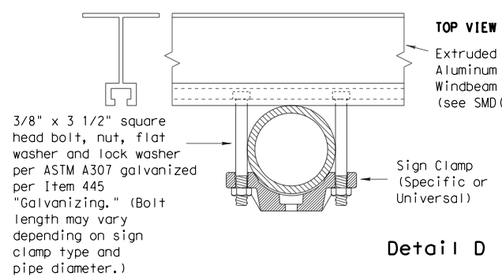
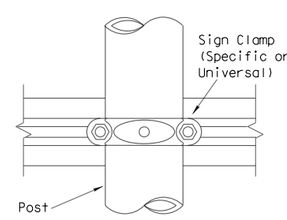


SM RD SGN ASSYM TY XXXXX(2)XX(P)

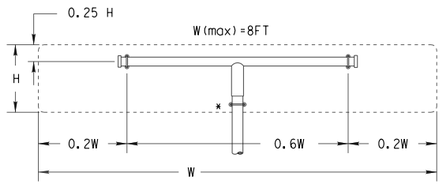
SIDE VIEW



Detail D



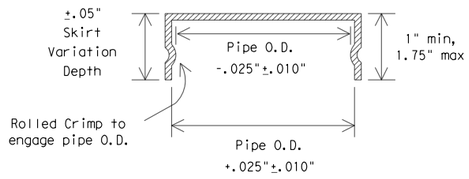
REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	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

REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		118

26C

DATE: 11/14/2023 2:05:45 PM
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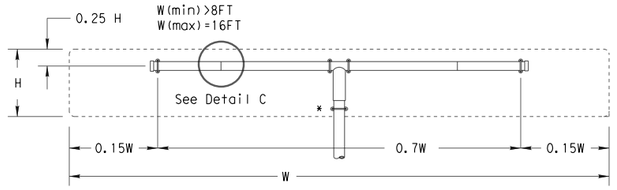
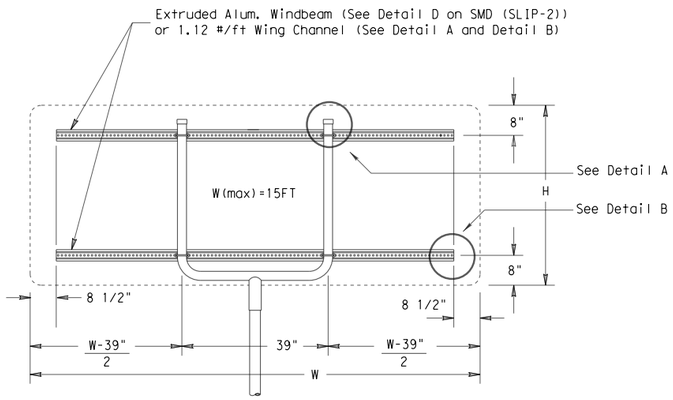
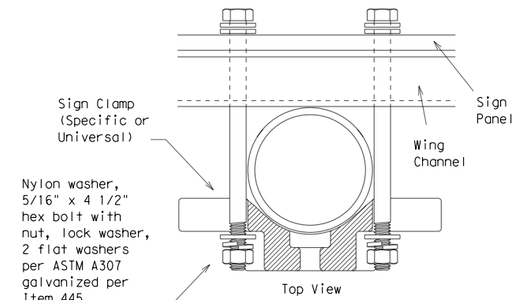


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

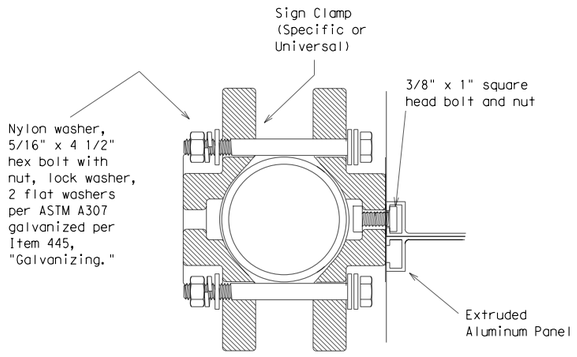
(* - See Note 12)



SM RD SGN ASSM TY XXXXX(1)XX(U-XX)

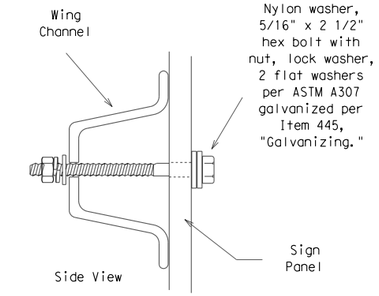


Detail A

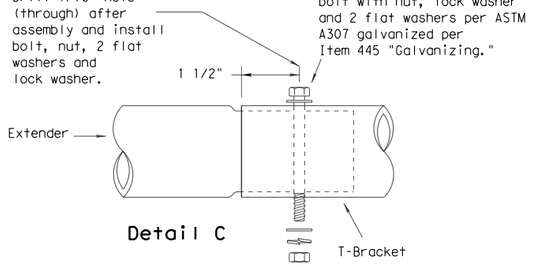


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

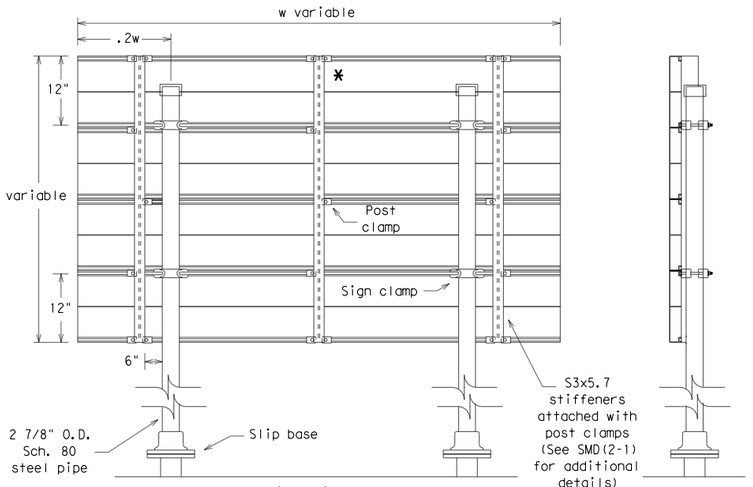


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

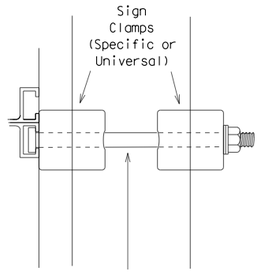


Typical Sign Mount

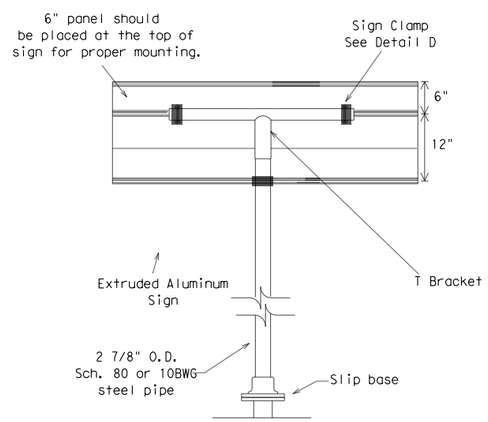
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

✱ Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

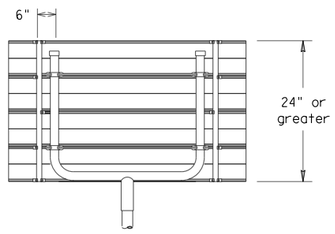
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS

9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1396	01	013,ETC.	FM 1391

DIST	COUNTY	SHEET NO.
DAL	KAUFMAN	119

26D

DATE: 11/14/2023 2:05:45 PM
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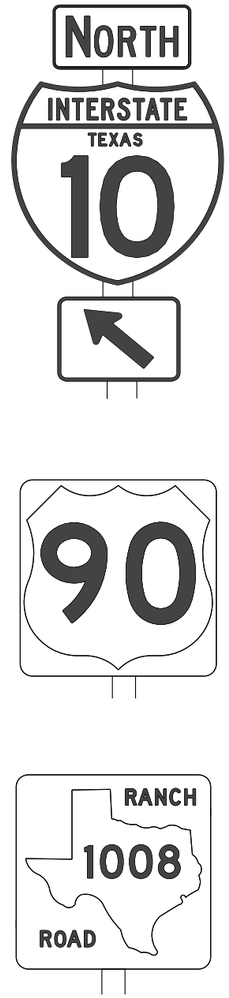
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

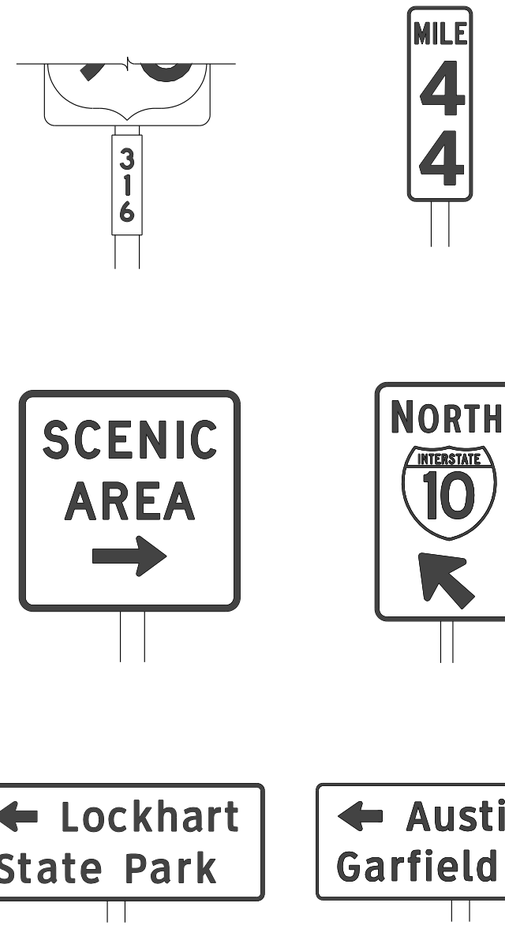
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



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	1396	01	013,ETC.	FM 1391
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	DAL	KAUFMAN		120

DATE: 11/14/2023 2:05:47 PM
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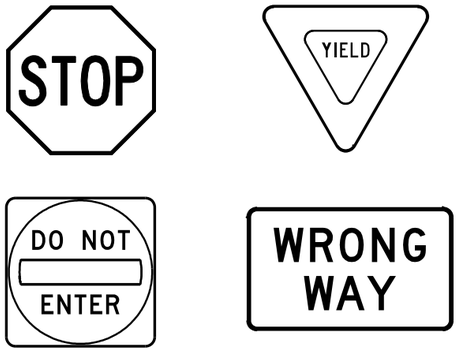
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(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

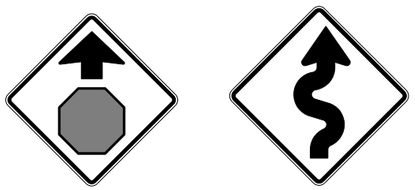
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(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	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		121

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 ony disturbed soil must protect for erosion and sedimentation in accordonce 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 Kaufman MS4 Phase II contact Garrett Moore, County Engineer

2.

☐ No Action Required ☒ Required Action

Action Number:

1. Prevent stormwoter pollution by controlling erosion ond 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:

Required Actions: List Waters of the US Permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1. Bridge - 194+55 to 198+95 - Cedar Creek Relief Adjacent Wetlands - Wetland Impacts - NWP 3a
   Bridge - 194+55 to 198+95 - Cedar Creek Relief #2 - Stream Impacts - NWP 3a

2. Bridge - 188+80 to 190+20 - Cedar Creek - Stream Impacts - NWP 14

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:Monarch butterfly, Texas fawnsfoot, Trinity pigtoe, Alligator Snapping turtle, Woodhouse's toad, Eastern spotted skunk, Long-tailed weasel, Swamp rabbit, Mountain lion, Eastern box turtle, Western box turtle, and Western chicken turtle. Follow the special note on the EPIC sheet ond the BMPs listed below to protect these species.

2. 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. Section 1.2 Vegetation BMP
   b. Section 1.4 Water Quality BMP
   c. Section 2.6.1 Aquatic Amphibian ond Reptile BMP (barrier fencing not required)
   d. Section 2.6.2 Terrestrial Amphibian and Reptile BMP

Special Notes:

1. Avoid harming all wildlife species if encountered and allow them to safely leave the project site. Due diligence should be used to ovoid 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 on 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 ony 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 retoin o DSHS licensed asbestos consultant to ossist 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 dote(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 ond/or deviations from the final design must be reported to the Engineer prior to commencement of construction activities, os additional environmental clearance may be required.

LAST REVISION: 1/15/15

 Texas Department of Transportation
Dallas District

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS (EPIC)

FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		FM 1391
STATE	DISTRICT	COUNTY	
TEXAS	DALLAS	Kaufman	
CONTROL	SECTION	JOB	SHEET NO.
1396	01	013, ETC	122

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

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.

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):
1396-01-013, etc. (FM 1391)

1.2 PROJECT LIMITS:
Cedar Creek

And: at Cedar Creek Relief No. 2

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 32.436027 ,(Long) -96.178201

END: (Lat) 32.434108 ,(Long) -96.172885

1.4 TOTAL PROJECT AREA (Acres): 4.09

1.5 TOTAL AREA TO BE DISTURBED (Acres): 1.59

1.6 NATURE OF CONSTRUCTION ACTIVITY:
Construction of bridge replacement consisting of replacing bridge and approaches.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Aufco soils, 0 to 1% Slopes	90% Aufco Soils, Somewhat poorly drained, High rate of runoff
	Poor grass throughout. 75% vegetative density

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

- [x] PSLs determined during preconstruction meeting
- [ ] PSLs determined during construction
- [ ] No PSLs planned for construction

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:
(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

- [x] Mobilization
- [x] Install sediment and erosion controls
- [ ] Blade existing topsoil into windrows, prep ROW, clear and grub
- [x] Remove existing pavement
- [x] Grading operations, excavation, and embankment
- [x] Excavate and prepare subgrade for proposed pavement widening
- [ ] Remove existing culverts, safety end treatments (SETs)
- [x] Remove existing metal beam guard fence (MBGF), bridge rail
- [x] Install proposed pavement per plans
- [ ] Install culverts, culvert extensions, SETs
- [x] Install mow strip, MBGF, bridge rail
- [x] Place flex base
- [x] Rework slopes, grade ditches
- [x] Blade windrowed material back across slopes
- [x] Revegetation of unpaved areas
- [x] Achieve site stabilization and remove sediment and erosion control measures
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- [x] Sediment laden stormwater from stormwater conveyance over disturbed area
- [x] Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- [x] Solvents, paints, adhesives, etc. from various construction activities
- [x] Transported soils from offsite vehicle tracking
- [x] Construction debris and waste from various construction activities
- [x] Contaminated water from excavation or dewatering pump-out water
- [x] Sanitary waste from onsite restroom facilities
- [x] Trash from various construction activities/receptacles
- [ ] Long-term stockpiles of material and waste
- [x]
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.11 RECEIVING WATERS:
Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
Cedar Creek (0818B*) (*bacteria in water; recreation use)	Feeds into Cedar Creek Reservoir (Segment 0818; water quality impaired by pH)

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

- [x] Development of plans and specifications
- [x] Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- [x] Post Construction Site Notice
- [x] Submit NOI/CSN to local MS4
- [x] Perform SWP3 inspections
- [x] Maintain SWP3 records and update to reflect daily operations
- [x] Complete and submit Notice of Termination to TCEQ
- [x] Maintain SWP3 records for 3 years
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

- [x] Day To Day Operational Control
- [x] Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
- [x] Post Construction Site Notice
- [x] Submit NOI/CSN to local MS4
- [x] Maintain schedule of major construction activities
- [x] Install, maintain and modify BMPs
- [x] Complete and submit Notice of Termination to TCEQ
- [x] Maintain SWP3 records for 3 years
- [ ] Other: _____
- [ ] Other: _____
- [ ] Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		123
STATE	STATE DIST.	COUNTY	
TEXAS	DAL	KAUFMAN	
CONT.	SECT.	JOB	HIGHWAY NO.
1396	01	013, ETC.	FM 1391

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

- ☐ ☐ 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
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- X X Other: Preservation of natural resources
- ☐ X Other: Compost manufactured topsoil
- ☐ X Other: Vegetation lined ditches
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- X ☐ Biodegradable Erosion Control Logs
- X ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- X ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- X ☐ Sediment Control Fence
- X ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- X ☐ Other: Rock bedding at construction exits
- ☐ ☐ 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
  - X 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
  - ☐ Required (>10 acres), but not feasible due to:
    - ☐ 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
No permanent controls are planned.		

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
- ☐ Daily street sweeping
- X Other: Dampen disturbed soil areas as needed 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
- X Sanitary Facilities
- X Other: Avoid storing portable sanitary units, concrete washouts or chemicals within 50-ft upgradient of a receiving water without adequate pollution controls.
- X Other: Capture saw cutting debris and concrete slurry for proper disposal.
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To
Cedar Creek	STA 188+41	STA 190+41
Cedar Creek Relief No. 2 No vegetative buffer for stream. Sediment fence, rock filter dams, & erosion control logs in lieu of.	STA 194+55	STA 198+95

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 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 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.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 MAINTENANCE:

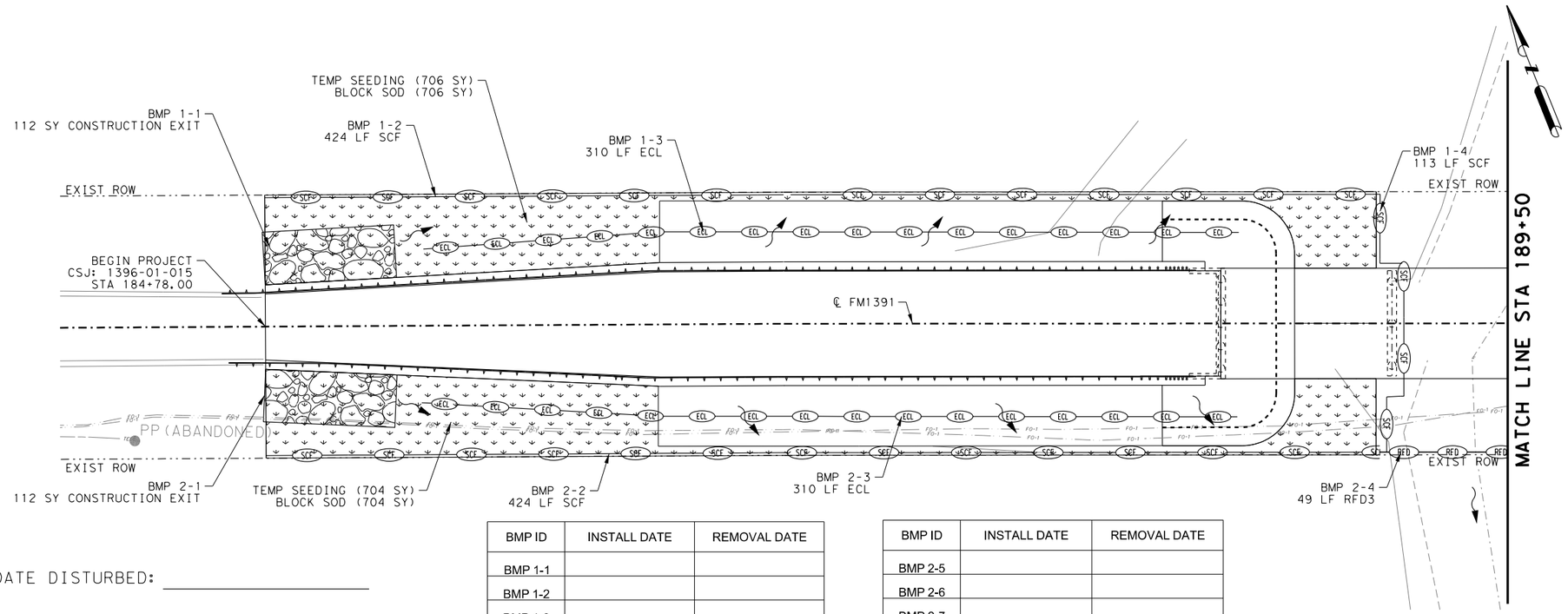
Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being 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.

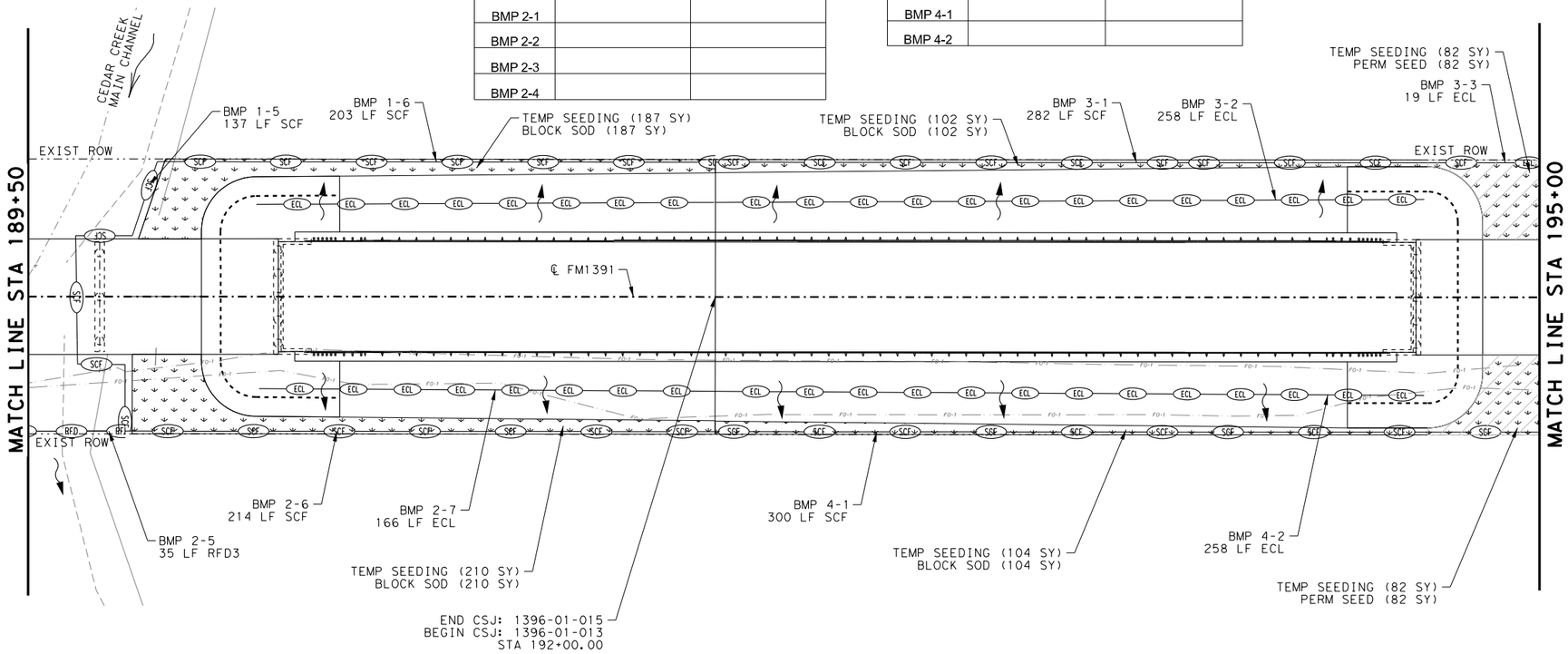
STORMWATER POLLUTION PREVENTION PLAN (SWP3)

July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		124
STATE	STATE DIST.	COUNTY	
TEXAS	DAL	KAUFMAN	
CONT.	SECT.	JOB	HIGHWAY NO.
1396	01	013, ETC.	FM 1391





DATE DISTURBED: _____

DATE STABILIZED: _____

BMP ID	INSTALL DATE	REMOVAL DATE
BMP 1-1		
BMP 1-2		
BMP 1-3		
BMP 1-4		
BMP 1-5		
BMP 1-6		
BMP 2-1		
BMP 2-2		
BMP 2-3		
BMP 2-4		

BMP ID	INSTALL DATE	REMOVAL DATE
BMP 2-5		
BMP 2-6		
BMP 2-7		
BMP 3-1		
BMP 3-2		
BMP 3-3		
BMP 4-1		
BMP 4-2		

LEGEND:

- SCF — SEDIMENT CONTROL FENCE
- ECL — EROSION CONTROL LOG
- RFD — ROCK FILTER DAM (TY 3)
- DIRECTION OF FLOW
- TEMP SEEDING & BLOCK SOD
- TEMP SEEDING & *PERM SEEDING

NOTES:

1. BMP'S SHALL BE INSTALLED NO SOONER THAN TWO WEEKS PRIOR TO SOIL DISTURBANCE OR POTENTIAL POLLUTANT -GENERATING ACTIVITIES IN THEIR CONTROL AREA.
2. CONSTRUCTION EXITS TO BE FIELD DETERMINED AND APPROVED BY ENGINEER.
3. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
4. TO THE EXTENT FEASIBLE, PRESERVE EXISTING VEGETATION AND MAINTAIN A VEGETATIVE BUFFER ALONG STREAM BANK TO MINIMIZE EXPOSURE OF DISTURBED SOILS.

*5. OBTAIN THE ENGINEERS APPROVAL PRIOR TO PROCEEDING WITH THE PERMANENT SEEDING WITHIN THE BRIDGE LIMITS.

*6. PERMANENT SEEDING MAY BE OMITTED DEPENDING ON WATER LEVELS AT THE TIME OF CONSTRUCTION AND SOIL STABILIZATION.

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED PROFESSIONAL ENGINEER
11/14/2023

0 25 50
SCALE: 1"=50'

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
F-6932
15021 Katy Freeway, Suite 500
Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
SW3P LAYOUT
BEGIN TO 195+00

SHEET 1 OF 2

DN:	RM	FED.RD. DIV.NO.	STATE	PROJECT NO.				HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)				FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.		SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.		125

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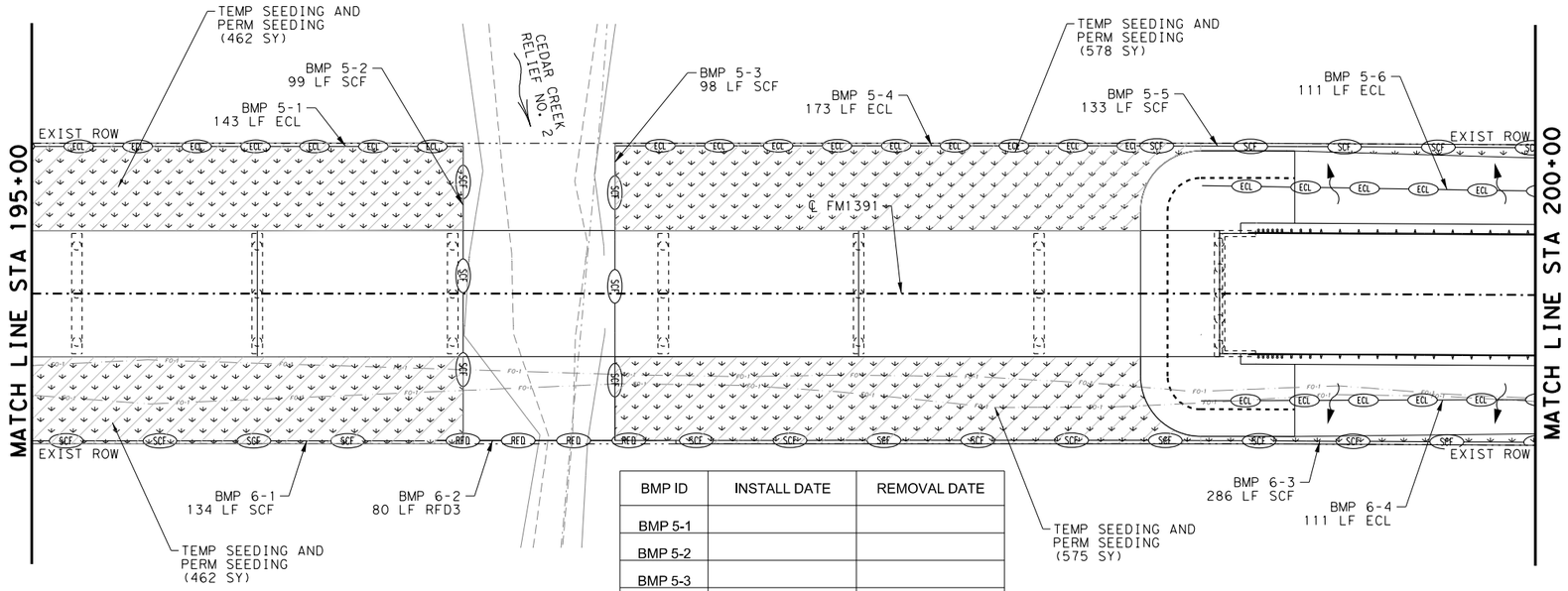
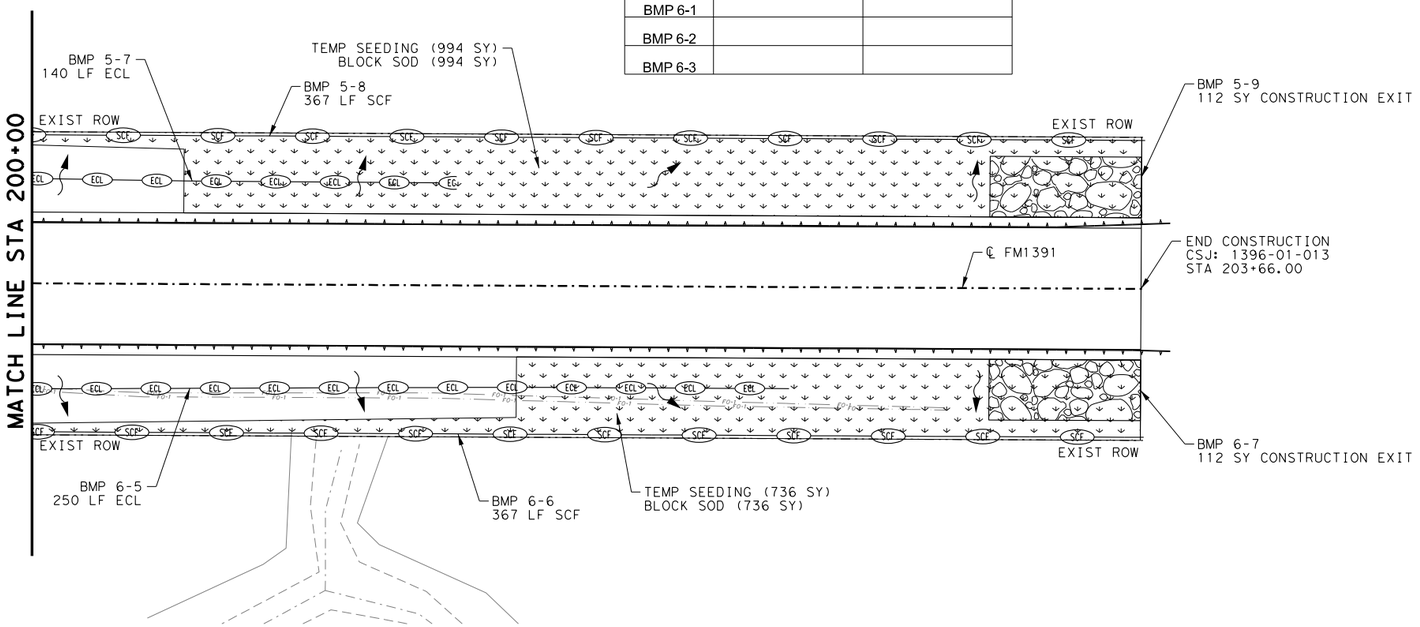


DATE DISTURBED: _____

DATE STABILIZED: _____

BMP ID	INSTALL DATE	REMOVAL DATE
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 6-1		
BMP 6-2		
BMP 6-3		

BMP ID	INSTALL DATE	REMOVAL DATE
BMP 6-4		
BMP 6-5		
BMP 6-6		
BMP 6-7		



LEGEND:

- SCF — SEDIMENT CONTROL FENCE
- ECL — EROSION CONTROL LOG
- RFD — ROCK FILTER DAM (TY 3)
- DIRECTION OF FLOW
- TEMP SEEDING & BLOCK SOD
- TEMP SEEDING & *PERM SEEDING

NOTES:

1. BMP'S SHALL BE INSTALLED NO SOONER THAN TWO WEEKS PRIOR TO SOIL DISTURBANCE OR POTENTIAL POLLUTANT -GENERATING ACTIVITIES IN THEIR CONTROL AREA.
2. CONSTRUCTION EXITS TO BE FIELD DETERMINED AND APPROVED BY ENGINEER.
3. SEE DAILY WORK REPORTS FOR INITIAL STABILIZATION TIME FRAMES.
4. TO THE EXTENT FEASIBLE, PRESERVE EXISTING VEGETATION AND MAINTAIN A VEGETATIVE BUFFER ALONG STREAM BANK TO MINIMIZE EXPOSURE OF DISTURBED SOILS.
- *5. OBTAIN THE ENGINEERS APPROVAL PRIOR TO PROCEEDING WITH THE PERMANENT SEEDING WITHIN THE BRIDGE LIMITS.
- *6. PERMANENT SEEDING MAY BE OMITTED DEPENDING ON WATER LEVELS AT THE TIME OF CONSTRUCTION AND SOIL STABILIZATION.

STATE OF TEXAS
RAFAEL MORFIN
132305
LICENSED PROFESSIONAL ENGINEER
11/14/2023

0 25 50
SCALE: 1"=50'

NO.	DATE	REVISION	APPROV.
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Texas Department of Transportation

ENTECH CIVIL ENGINEERS, INC
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Houston, Texas, 77094
281-945-0069 PH
281-945-0081 FX

FM 1391
CEDAR CRK & CEDAR CRK REL NO 2
SW3P LAYOUT
195+00 TO END

SHEET 2 OF 2

DN:	RM	FED.RD. DIV. NO.	STATE	PROJECT NO.			HIGHWAY NO.
CK DN:	RC	6	TEXAS	(SEE TITLE SHEET)			FM 1391
DW:	RM	STATE DIST.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
CK DW:	RC	DAL	KAUFMAN	1396	01	013,ETC.	126

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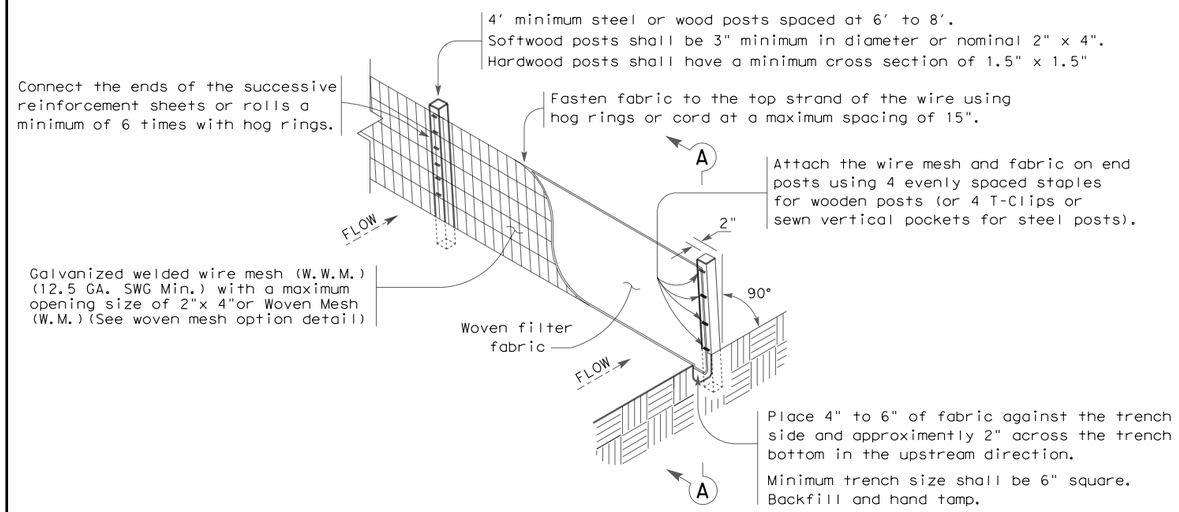
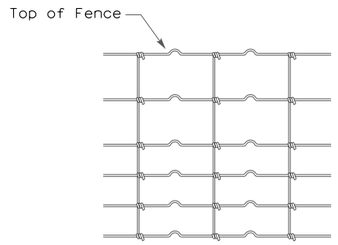
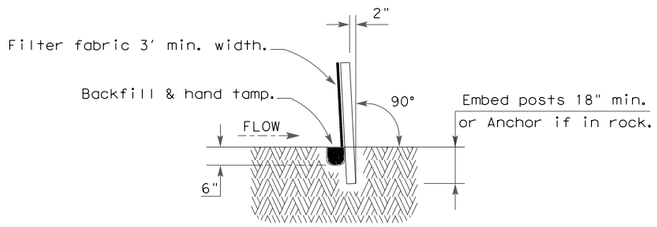


TEMPORARY SEDIMENT CONTROL FENCE

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.

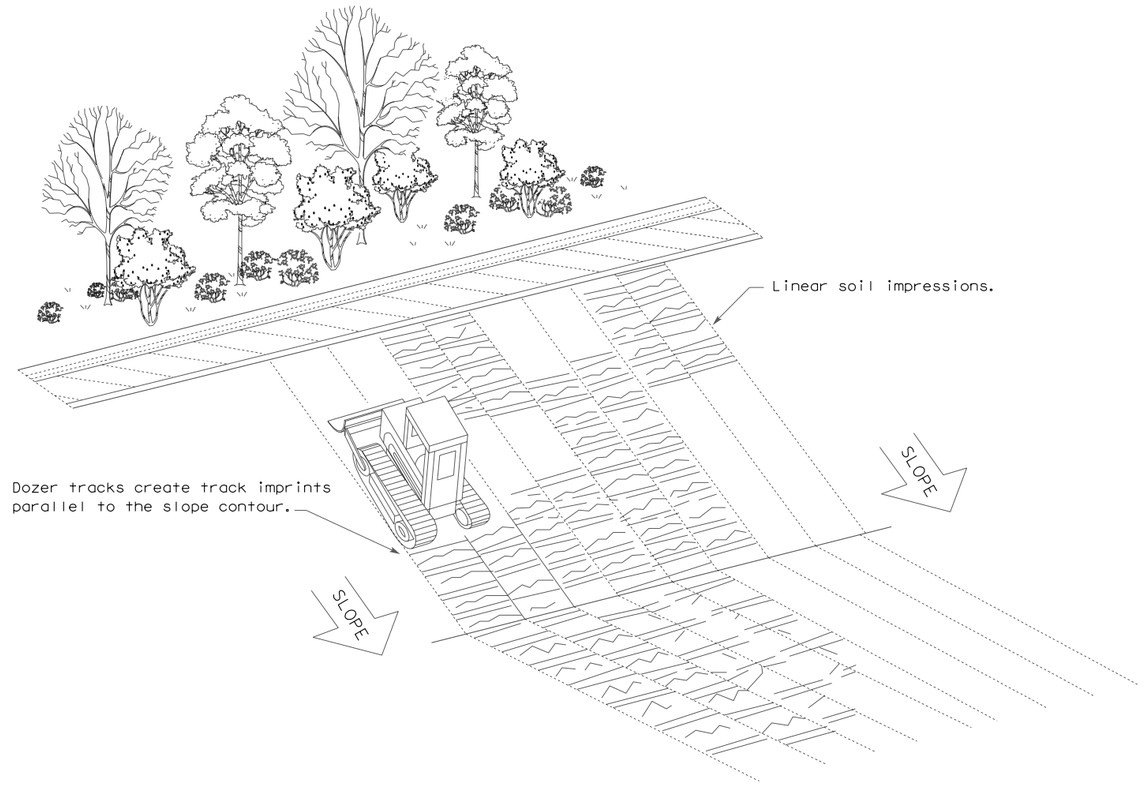
LEGEND

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	1396	01	013,ETC.	FM 1391
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	DAL	KAUFMAN		127

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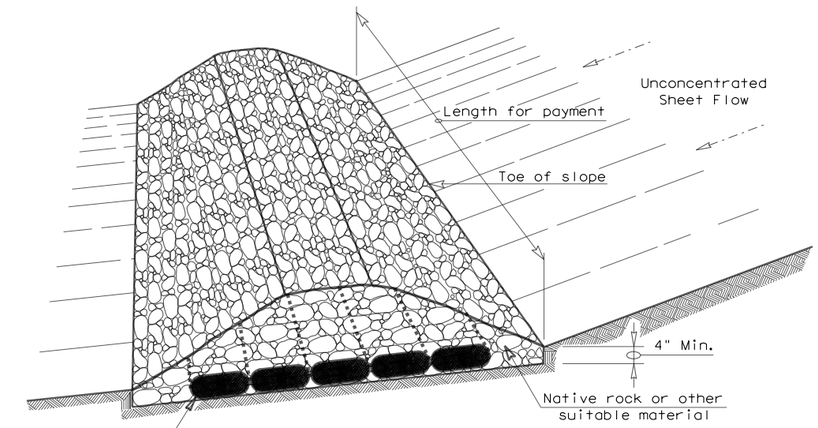
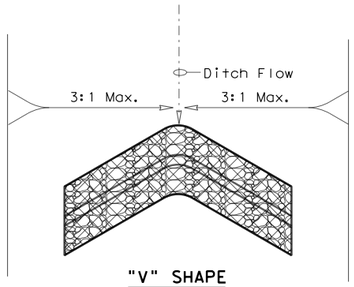
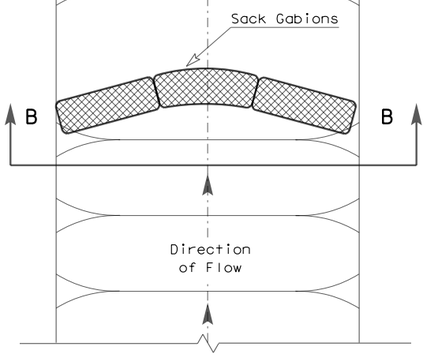


FILTER DAM AT TOE OF SLOPE

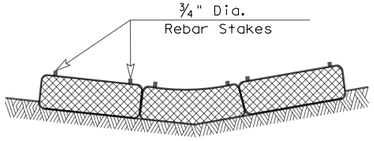
RFD1



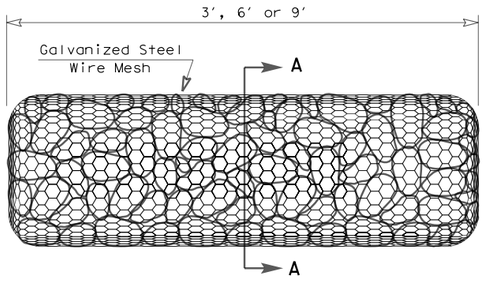
"V" SHAPE
PLAN VIEW



PLAN VIEW

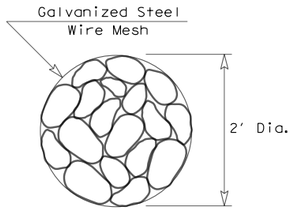


SECTION B-B

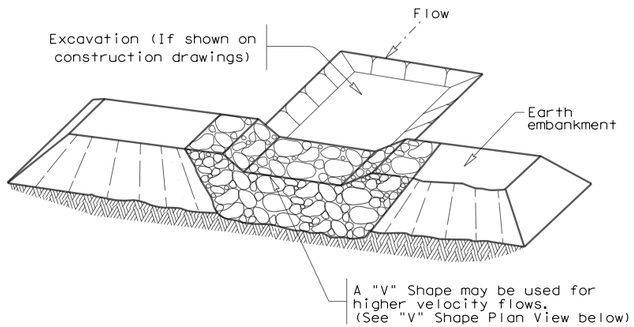


TYPE 4 (SACK GABIONS)

RFD4

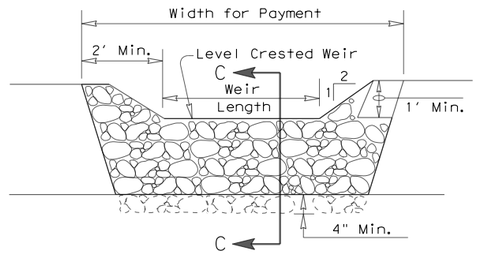


SECTION A-A

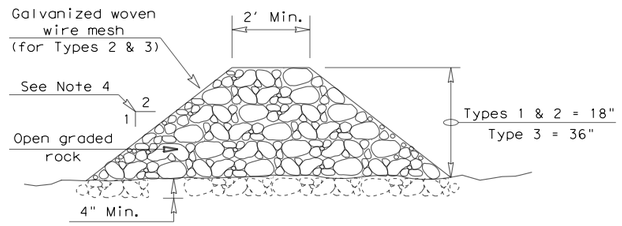


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

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.

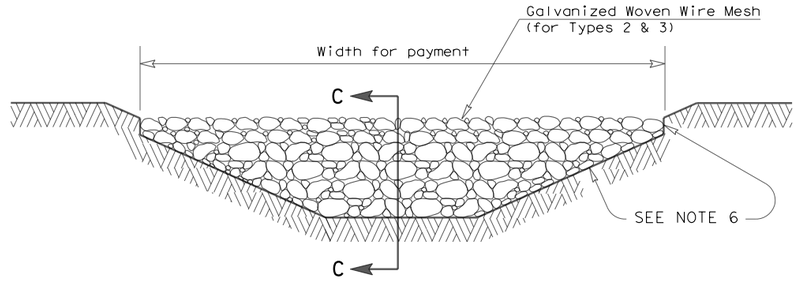
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity 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.



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.

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	1396	01	013, ETC.	FM 1391
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	DAL	KAUFMAN		128

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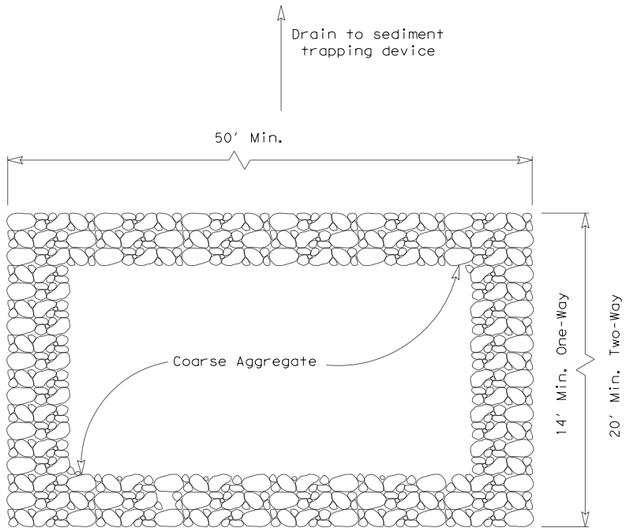
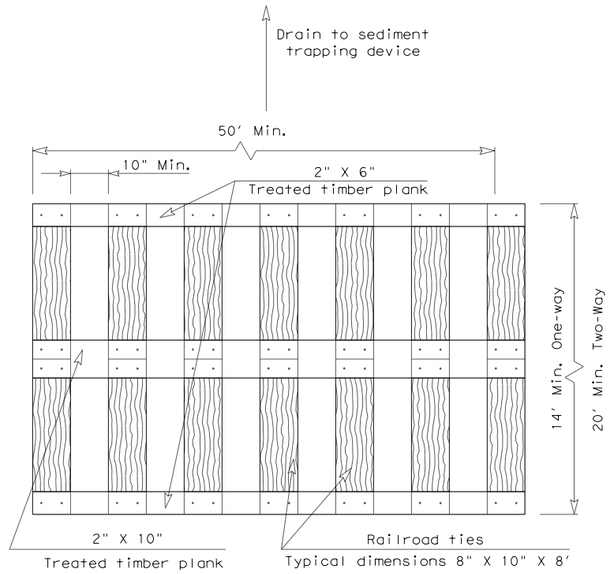


PLAN VIEW



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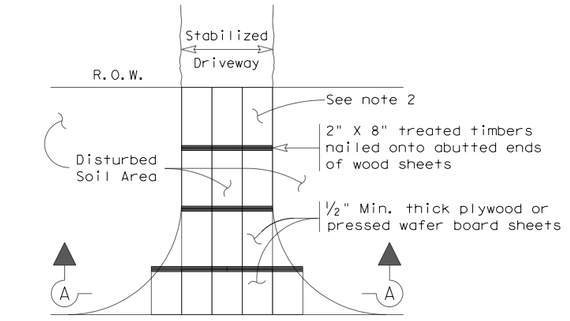

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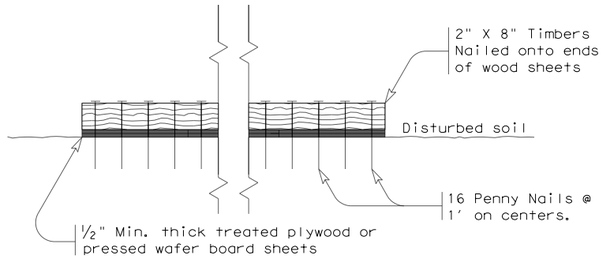
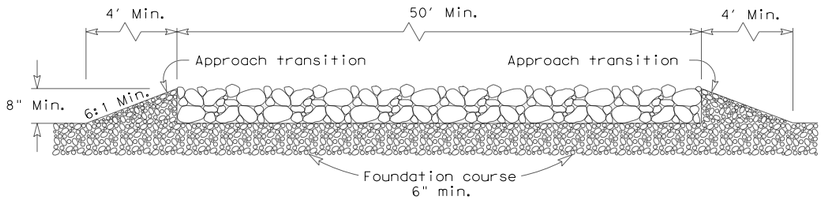


SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

SHORT TERM



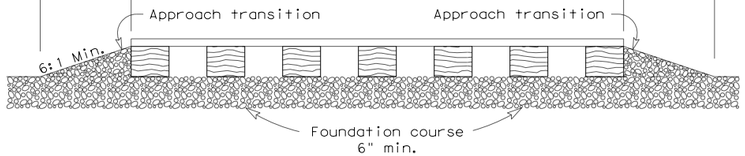
ELEVATION VIEW

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
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		129

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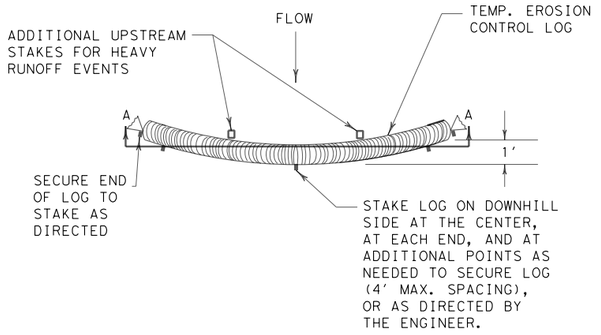

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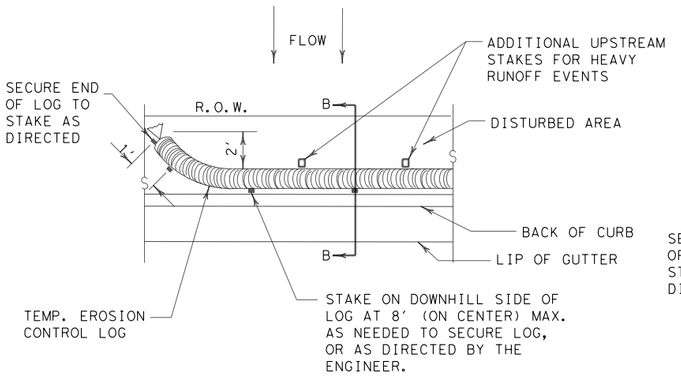

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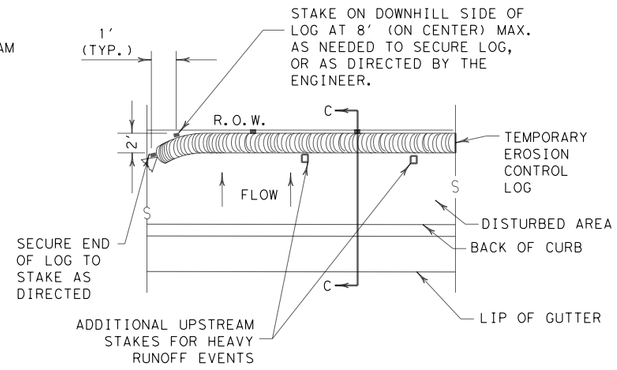

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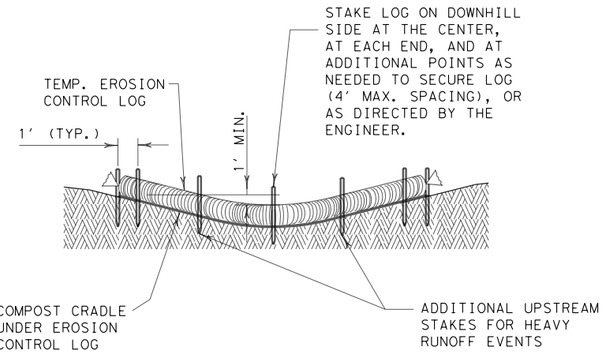
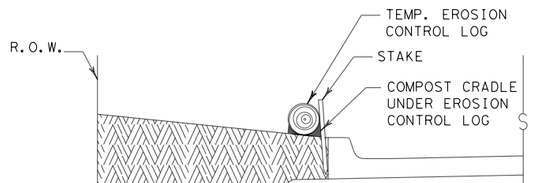


SECTION A-A

EROSION CONTROL LOG DAM

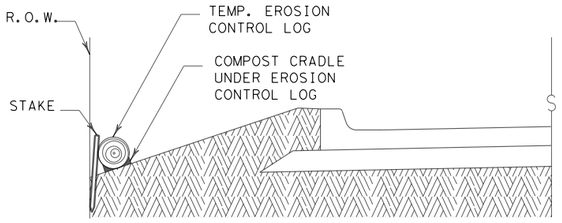
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

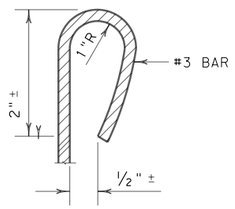
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

CL-D	EROSION CONTROL LOG DAM
CL-BOC	EROSION CONTROL LOG AT BACK OF CURB
CL-ROW	EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
CL-SST	EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
CL-SSL	EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
CL-DI	EROSION CONTROL LOG AT DROP INLET
CL-CI	EROSION CONTROL LOG AT CURB INLET
CL-GI	EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

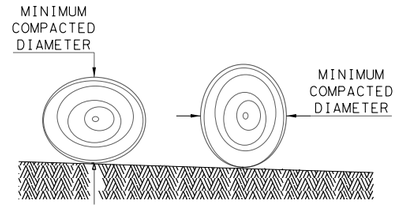
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

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		
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	DAL	KAUFMAN			130		

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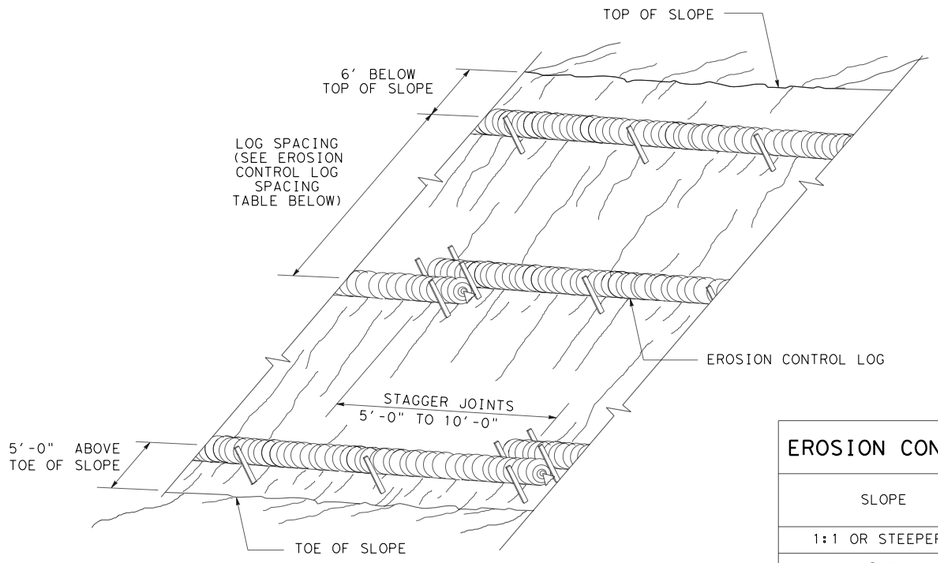
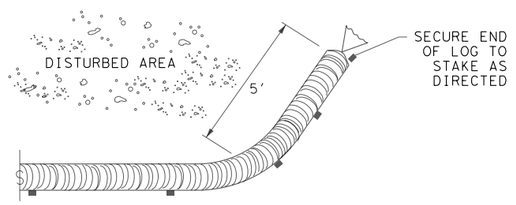


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

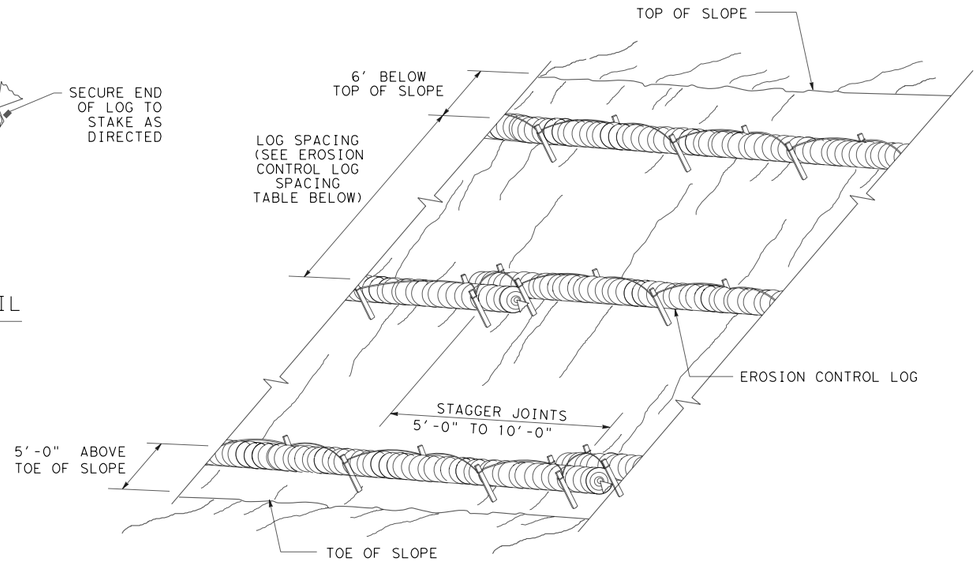
CL-SST



END SECTION RAP DETAIL

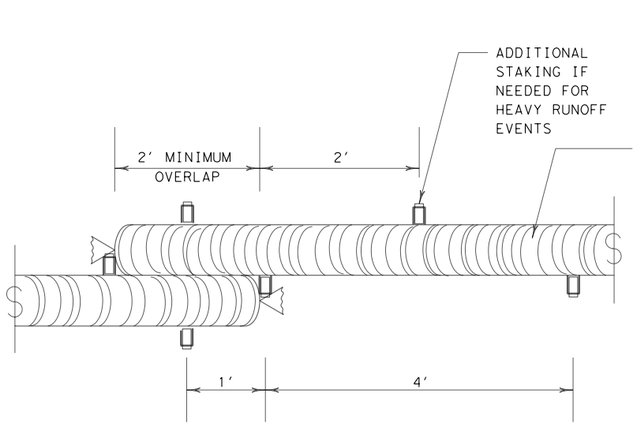
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

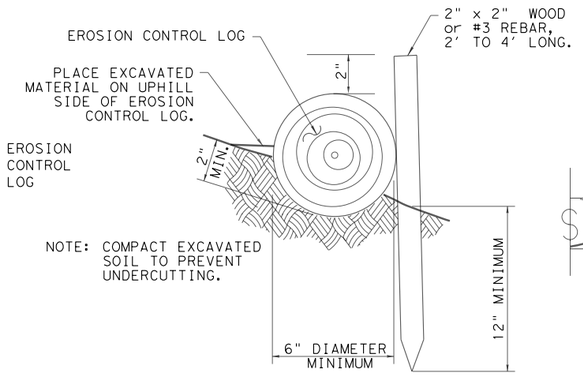
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

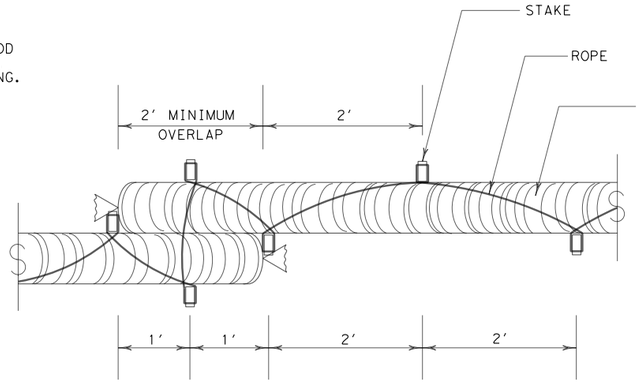




STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"



STAKE AND LASHING ANCHORING DETAIL

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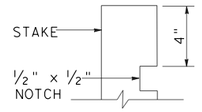
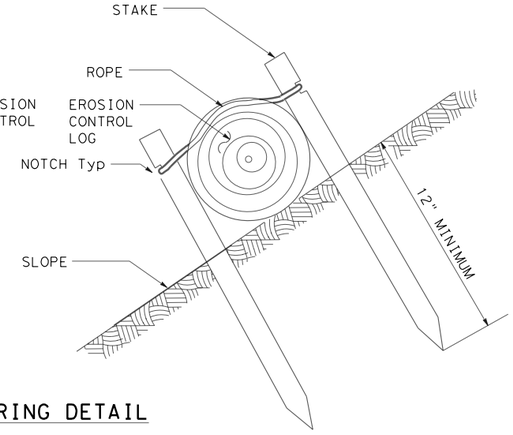


STAKE NOTCH DETAIL



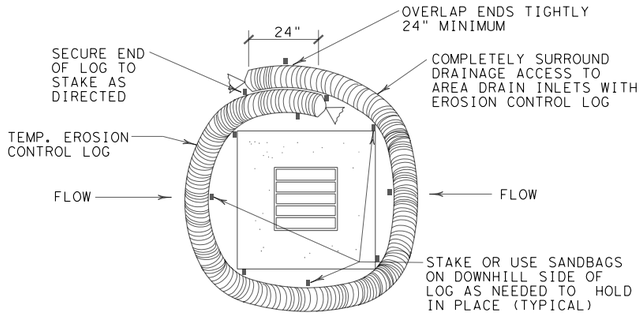
Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

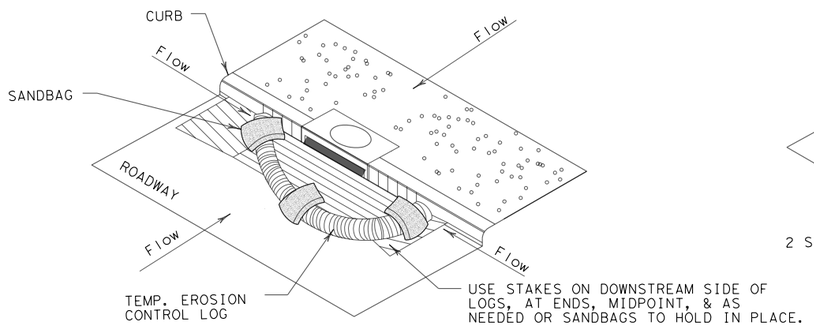
FILE: ec116	DN: TxDOT		CK: KM		DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1396	01	013,ETC.		FM 1391	
	DIST	COUNTY			SHEET NO.	
	DAL	KAUFMAN			131	

DATE: 11/14/2023
FILE: N:\P5072-18-19-4\CADD_BR_FM 1391\DGN\09_ENVIRONMENTAL\StdDetails\ec916.dgn



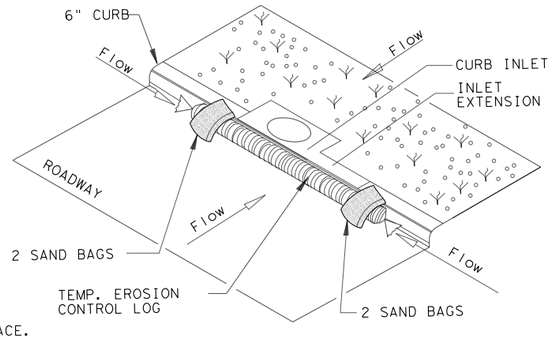
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

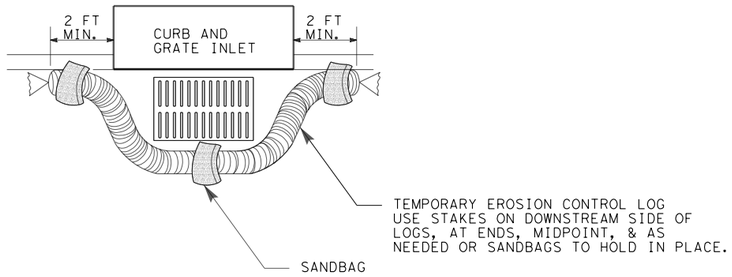
CL-CI



EROSION CONTROL LOG AT CURB INLET

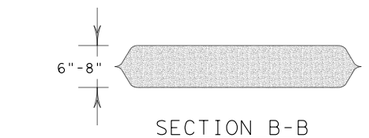
CL-CI

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.

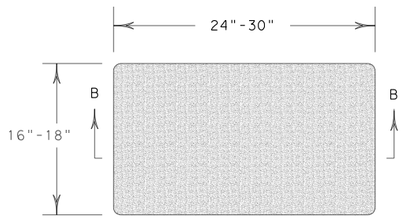


EROSION CONTROL LOG AT CURB & GRADE INLET

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	1396	01	013,ETC.	FM 1391
	DIST	COUNTY		SHEET NO.
	DAL	KAUFMAN		132

USER ID

SURFACE PREPARATION ITEM 160* TOPSOIL SY / ITEM 161* COMPOST MANUF. TOPSOIL (BOS) (4") SY

SURFACE PREPARATION

Prepare planting area surface BEFORE placing Topsoil, Compost, Fertilizer, Seed and/or Sod.
Once project area has been completed to final lines, grade and compaction, remove objectionable materials from planting area surface and cultivate existing surface to a depth of 4 inches, unless otherwise specified or directed.

Refer to Items 160 and 161 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.

TOPSOIL NOTES:
1. When Topsoil is specified under Item 160, use suitable material salvaged from the project ROW in accordance with Item 160 specifications, and/or secure additional good material from approved sources.
2. Topsoil shall include only the top 6 inches of its native surface, and be easily cultivated, fertile, erosion-resistant and free of objectionable materials.
3. Topsoil obtained from sites outside of the ROW must come from approved sources and have a pH between 5.5 and 8.5 su.
4. Place Topsoil on pre-cultivated surface, spread to a uniform loose cover at thickness specified, and shape per plans. Water and roll the finished surface with a light roller or other suitable equipment per Item 160.3; do not over-compact.

COMPOST NOTES:
1. When Compost Manufactured Topsoil (4") is specified under Item 161, use compost meeting all requirements of Item 161.2 and Table 1. Provide quality control (QC) documentation and obtain Engineer approval prior to compost delivery.
2. Contractor shall provide tickets/invoices that document material type, quantity and placement for all compost delivered.
3. Additional topsoil may be required to be imported to achieve the compost/topsoil mix ratio. Topsoil must meet Item 160 specifications.

APPLICATION OF COMPOST MANUFACTURED TOPSOIL (4")

AFTER Surface Preparation, uniformly spread a 1-inch layer of compost on-grade with 3 inches topsoil over pre-cultivated planting area. (25% compost and 75% topsoil = 1" compost and 3" topsoil.)
Then mix compost and topsoil together by cultivating the compost into the topsoil (by till or disk) to a 4-inch (4") depth.
Roll the finished surface with a light corrugated drum; do not over-compact.

FERTILIZER ITEM 166* FERTILIZER AC

SOIL ANALYSIS FOR FERTILIZER APPLICATION RATE

Unless otherwise stated in the plans, Contractor shall perform at least one soil analysis on each project before fertilization, and submit results to Engineer with recommended fertilizer rates based on soil analysis.
Engineer may direct sample location(s). Soil analysis may be waived if both compost and sod are used on entire project.

FERTILIZER NOTES:
1. Refer to Item 166 of TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown in plans. Materials and construction shall meet all specifications.
2. Apply fertilizer BEFORE seeding, or AFTER placing sod.
3. Use fertilizer containing nitrogen (N), phosphoric acid (P) and potash (K) nutrients, unless otherwise specified. At least 50% of the Nitrogen component shall be a slow-release sulfur-coated urea as described in Item 166.3. Do not apply more than 60 lbs Nitrogen per acre without Engineer concurrence.
4. Deliver fertilizer in bags, clearly labeled to show contents, unless otherwise specified or approved prior to delivery. When non-bagged, loose fertilizer is approved, provide documentation for each load of material delivered, to validate authenticity of the material.
5. Apply fertilizer uniformly, as a dry, granular material, essentially dust-free, and do not mix with water for application as a slurry.
6. When both temporary and permanent seeding are specified for the same area, apply half of the required fertilizer before the temporary seeding operation and the other half before the permanent seeding operation.

SEEDING FOR EROSION CONTROL ITEM 164* DRILL SEEDING AC

RECOMMENDED PLANTING SEASON	PERMANENT RURAL SEED MIX ITEM 164 - DRILL SEEDING (PERM) (RURAL)(CLAY)		PERMANENT URBAN SEED MIX ITEM 164 - DRILL SEEDING (PERM) (URBAN)(CLAY)		TEMPORARY DRILL SEED MIX ITEM 164 - DRILL SEEDING (TEMP) (WARM OR COOL)	
		Pure Live Seed Rate**		Pure Live Seed Rate**		Pure Live Seed Rate**
WARM SEASON Mar.15th, April, May, June, July, August, Sept. 15th	Green Sprangletop (Van Horn)	- 1.0 lbs/AC	Green Sprangletop (Leptochloa dubia)	- 0.3 lbs/AC	Foxtail Millet (Setaria italica)	- 34 lbs/AC
	Sideoats Grama (Haskell)	- 1.0 lbs/AC	Sideoats Grama (El Reno)(Bouteloua curtipendula)	- 3.6 lbs/AC		
	Texas Grama (Atascosa)	- 1.0 lbs/AC	Buffalograss (Texoka)(Buchloe dactyloides)	- 1.6 lbs/AC		
	Hairy Grama (Chaparral)	- 0.4 lbs/AC	Bermudagrass (Cynodon dactylon)	- 2.4 lbs/AC		
	Shortspike Windmillgrass (Welder)	- 0.2 lbs/AC				
	Little Bluestem (OK Select)	- 0.8 lbs/AC				
	Purple Prairie Clover (Cuero)	- 0.6 lbs/AC				
	Engelmann Daisy (Eldorado)	- 0.75lbs/AC				
	Illinois Bundleflower	- 1.3 lbs/AC				
	Awnless Bushsunflower (Plateau)	- 0.2 lbs/AC				
COOL SEASON Sept 16th, Oct, Nov, Dec, Jan, Feb, Mar 14th						Pure Live Seed Rate**
					Tall Fescue (Festuca arundinaceae)	- 4.5 lbs/AC
					Western Wheatgrass (Agropyron smithii)	- 5.6 lbs/AC
					Red Winter Wheat (Triticum aestivum)	- 34 lbs/AC
					Cereal Rye	- 34 lbs/AC

SEEDING NOTES:
1. When seeding is specified under Item 164, refer to TxDOT 2014 Standard Specifications* for specifications, dimensions, volumes, and measurements that have been modified or not shown. Materials and construction shall meet specifications.
2. Conduct seeding upon completion of each applicable construction stage (dependent upon planting season requirements), without compensation for additional move-ins.
3. Place seed AFTER preparing planting area surface. Refer to Surface Preparation detail this sheet, as well as Topsoil Item 160 and Compost Manufactured Topsoil Item 161 when specified. Apply fertilizer per Item 166 BEFORE seeding, per specifications and this sheet, to help drill the fertilizer into the soil.
4. When temporary grasses are well-established and more than 2 inches tall, mow planting area before seeding permanent grasses; mowing for this purpose will be subsidiary. When vegetation is not already well-established, cultivate planting area to a depth as described in Item 164.3, before temporary seeding and before permanent seeding.
5. Seed material must be appropriate to the location, soil type and season. Use the seed mix species and pure live seed rates designated in Tables 1-4 of the TxDOT 2014 Standard Specifications* for Item 164, unless otherwise specified.
6. All seed shall meet labeling, delivery, analysis, and testing requirements described in Item 164.2.1. Deliver seed in labeled, unopened bags or containers to Engineer prior to planting.
7. Uniformly plant seed over the designated planting area, along the contour of slopes, and drill seed to a depth as described in Item 164.3.4.
8. Hydroseeding may be allowed, when specified or Engineer concurs.
9. Implement and continue Vegetative Watering per the schedule, rate and volume specified under Item 168.

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.

**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.

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

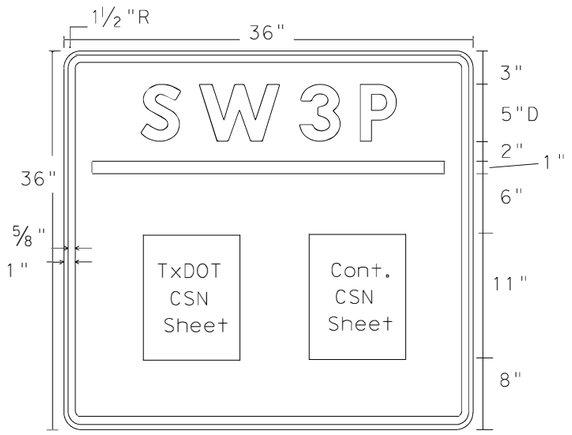
VEGETATION ESTABLISHMENT SHEET

(DALLAS DISTRICT)

TEMPLATE REVISION DATE: 02/21/19

DESIGN	FED.RD. DIV.NO.	PROJECT NO.		HIGHWAY NO.
CPB	6	(See Title Sheet)		FM 1391
GRAPHICS	STATE	DISTRICT	COUNTY	SHEET NO.
XXX	TEXAS	DALLAS	KAUFMAN	
CHECK	CONTROL	SECTION	JOB	133
XXX	1396	01	013, ETC.	
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.

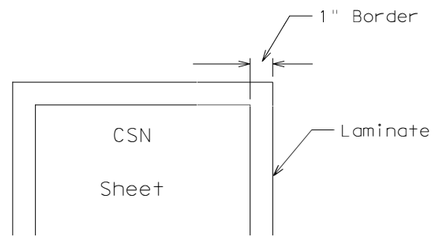
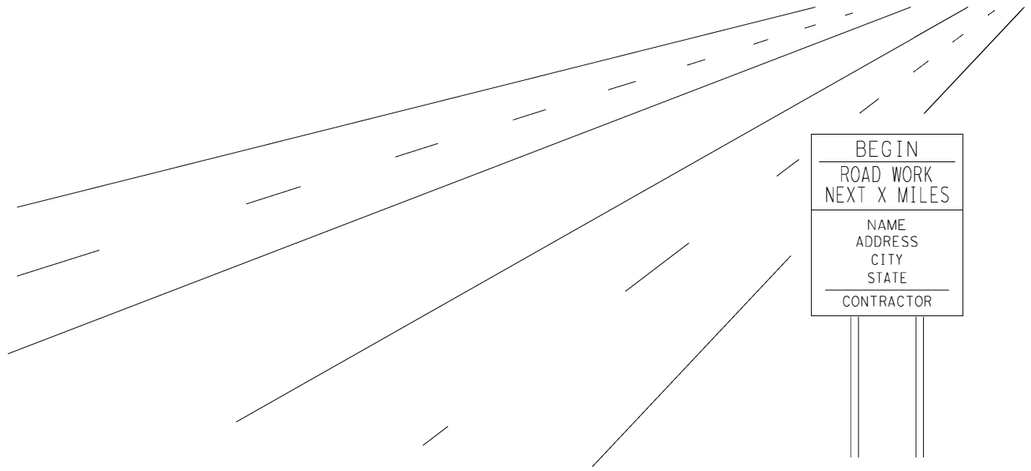
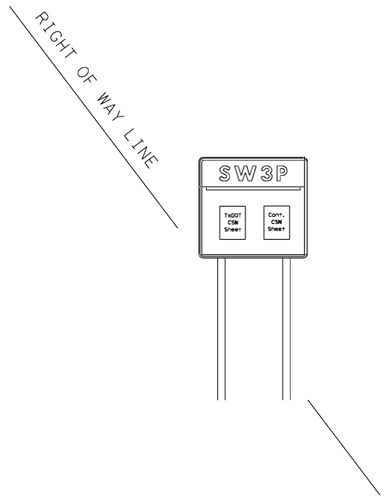


Figure 1





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
	DALLAS	SEE TITLE SHEET			134
REVISION DATE: 10-16-15	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	KAUFMAN		1396	01	DIST. ETC.	FM 1391

LEVELS DISPLAYED
PATH:
1