STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

PROJECT NO. BR 2023(941)

NET LENGTH OF ROADWAY= 300.00 ft = 00.057 mi
NET LENGTH OF BRIDGE = 65.00 ft = 00.012 mi
NET LENGTH OF PROJECT= 365.00 ft = 00.069 mi

CR 316
KENT COUNTY

LIMITS: *AT COOPER CREEK*

FOR THE CONSTRUCTION OF: *BRIDGE REPLACEMENT*

CONSISTING OF: *REPLACE BRIDGE*

DESIGN SPEED = MOIEC
CURRENT A.D.T. (2020) = 10 AADT
PROJECTED A.D.T. (2042) = 30 AADT
FUNCTIONAL CLASS = RURAL LOCAL
EXISTING NBI# =08-132-0-AA01-13-001
PROPOSED NBI# =08-132-0-AA01-13-003

FHWA TEXAS DIVISION	PROJECT NO.		SHEET NO.
	BR 2023(941)		1
STATE	DISTRICT	COUNTY	
TEXAS	ABL	KENT	
CONTROL	SECTION	JOB	HIGHWAY NO.
0908	27	006	CR 316

FINAL PLANS

LETTING DATE: DECEMBER 2023

DATE CONTRACTOR BEGAN WORK: _____

DATE WORK WAS COMPLETED: _____

DATE WORK WAS ACCEPTED: _____

FINAL CONTRACT COST: $ _____

CONTRACTOR : _____

CERTIFICATION FOR FINAL PLANS

THIS PROJECT WAS BUILT ACCORDING TO THE PLANS AND SPECIFICATIONS. THESE FINAL PLANS REFLECT THE WORK DONE AND THE QUANTITIES SHOWN THEREON AND ON THE FINAL ESTIMATE ARE FINAL QUANTITIES.

AREA ENGINEER DATE

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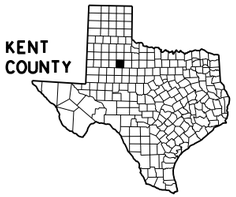
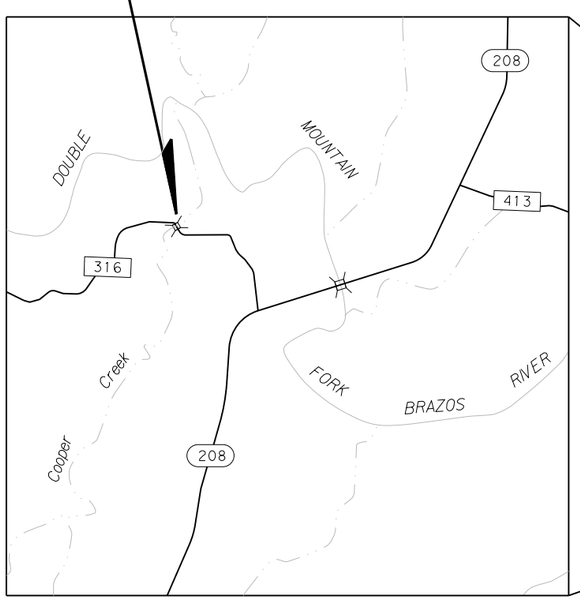
SEE SHEET 2



CR 316
CSJ: 0908-27-006
BEGIN STA. 100+00.00
END STA. 103+65.00



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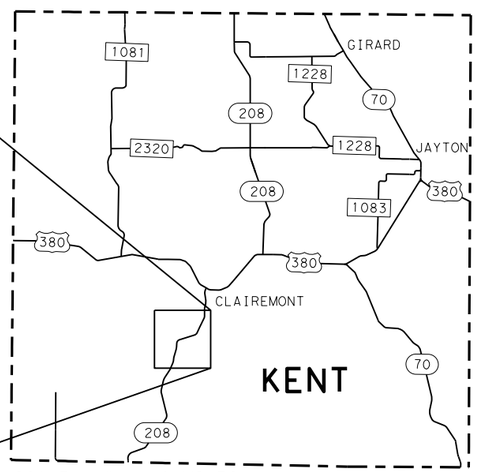

SCALE: 1" = 10 MILES

THE DISTRICT TRAFFIC SAFETY COMMITTEE HAS REVIEWED THE TRAFFIC CONTROL PLAN FOR THIS PROJECT AND IT IS IN COMPLIENCE WITH CURRENT TRAFFIC CONTROL STANDARDS.

DocuSigned by: Michael Wittie, P.E. 9/26/2023
62A1B05BE662415... COMMITTEE CHAIRMAN DATE

Texas Department of Transportation

RECOMMENDED FOR LETTING: 9/26/2023
DocuSigned by: Stewart J. Chapman, P.E.
40878C8F50864A9... STEWART J. CHAPMAN, P.E.
AREA ENGINEER

CONCURRENCE: 9/20/2023
DocuSigned by: Layne Coulter
6TE6E0B03E354FB... HONORABLE LAYNE COULTER
KENT COUNTY JUDGE

RECOMMENDED FOR LETTING: 9/26/2023
DocuSigned by: Michael Haithcock
575F2287B84FD... MICHAEL A. HAITHCOCK, P.E.
DIRECTOR OF T P & D

SUBMITTED FOR LETTING: 9/20/2023
DocuSigned by: Megan C. Mayfield, P.E.
MEGAN C. MAYFIELD, P.E.
TxDOT PROJECT MANAGER

APPROVED FOR LETTING: 9/26/2023
DocuSigned by: Thomas S. Allbritton, P.E.
THOMAS S. ALLBRITTON, P.E.
DISTRICT ENGINEER

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 AND SPECIFICATION ITEMS LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS PROJECT: REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA 1273, OCTOBER 23, 2023).

EXCEPTIONS: *N/A*
EQUATIONS: *N/A*
RAILROAD CROSSINGS: *N/A*

PENTABLE:
DATE: 9/14/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0908270064 - Design/Plan Set/1. General/001 TITLE SHEET

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STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

THE STANDARD SHEETS SPECIFICALLY IDENTIFIED ON THIS SHEET WITH A # HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

Megan C. Mayfield (NAME), P.E. 10/20/2023 (DATE)

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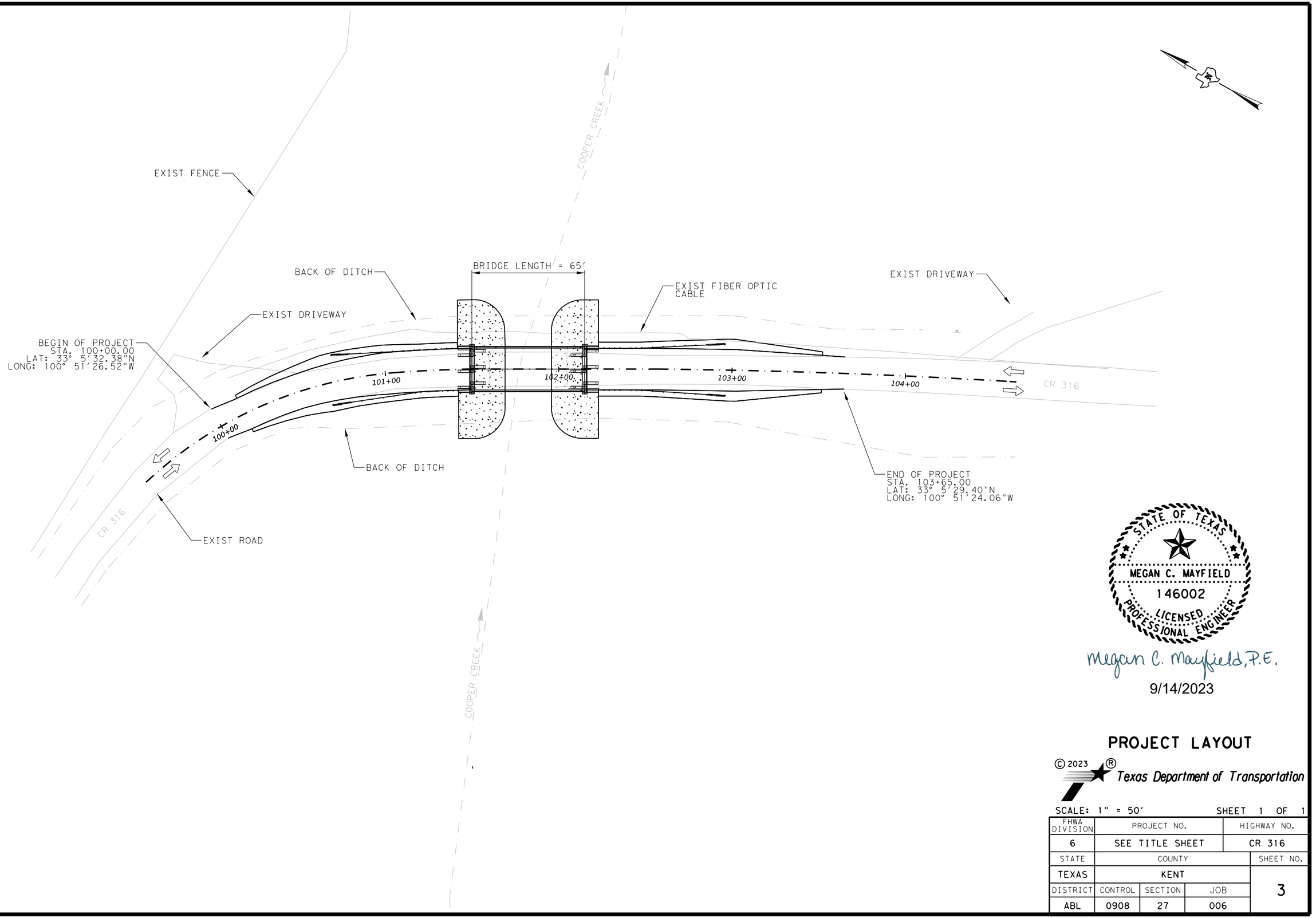
ABL	0908	27	006



STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

PROJECT LAYOUT

Texas Department of Transportation

SCALE: 1" = 50' SHEET 1 OF 1

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ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/1. General/003 PROJECT LAYOUT
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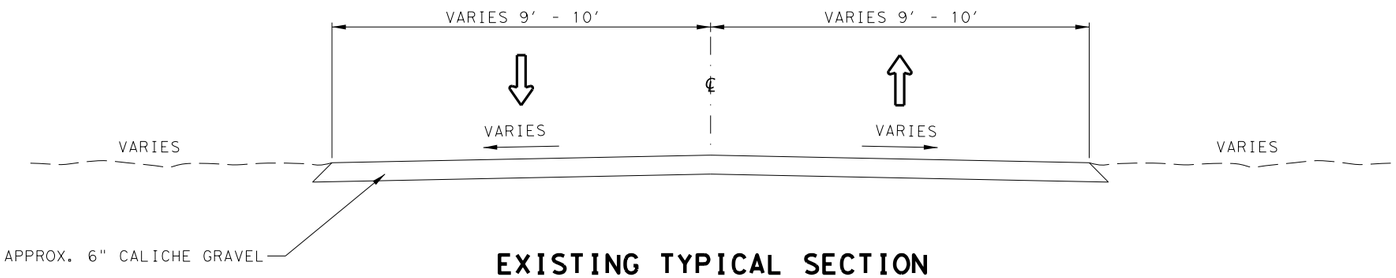

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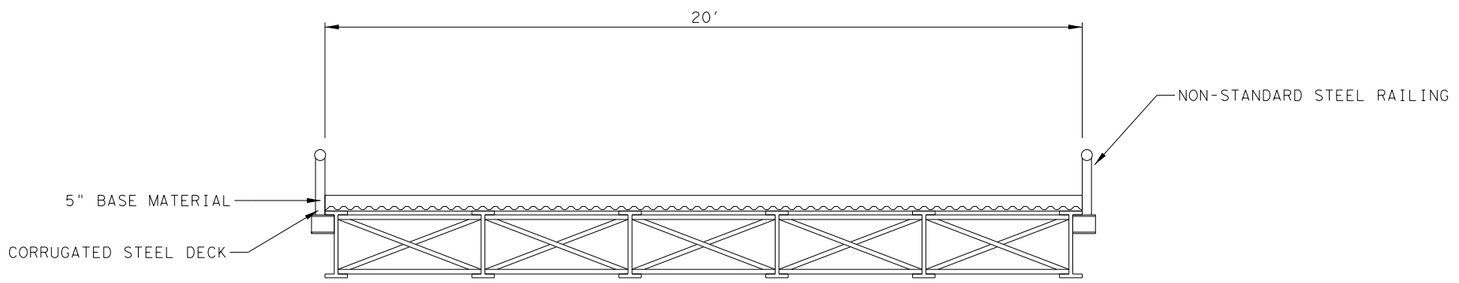
STA. 100+00.00 TO 101+60.00
STA. 102+05.00 TO 103+65.00



EXISTING TYPICAL SECTION

STA. 101+60.00 TO 102+05.00

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED
PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
TYPICAL SECTION

 Texas Department of Transportation

SCALE: 1" = 4′ SHEET 1 OF 2

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ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0908270006/4 - Design/Plan Set/1. General/004-005 TYPICAL SECTION
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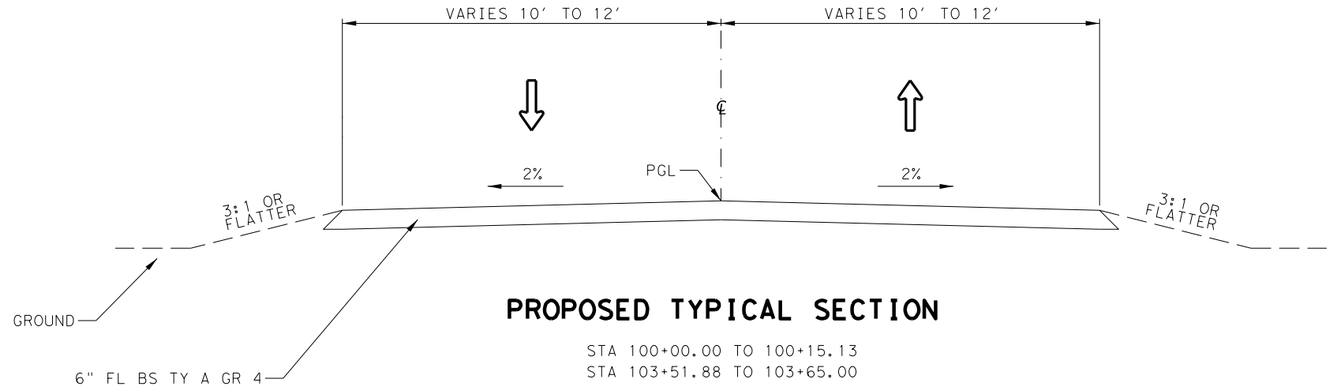
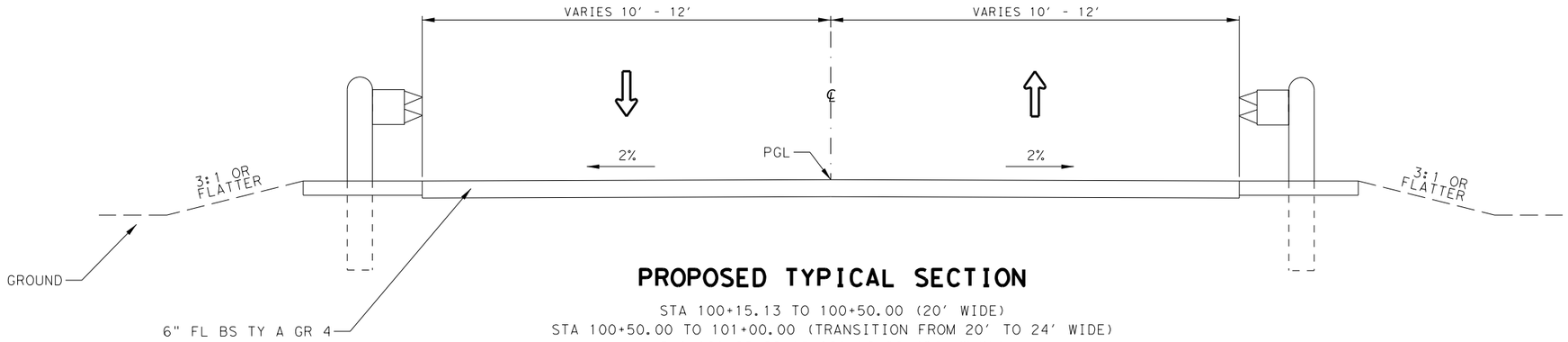


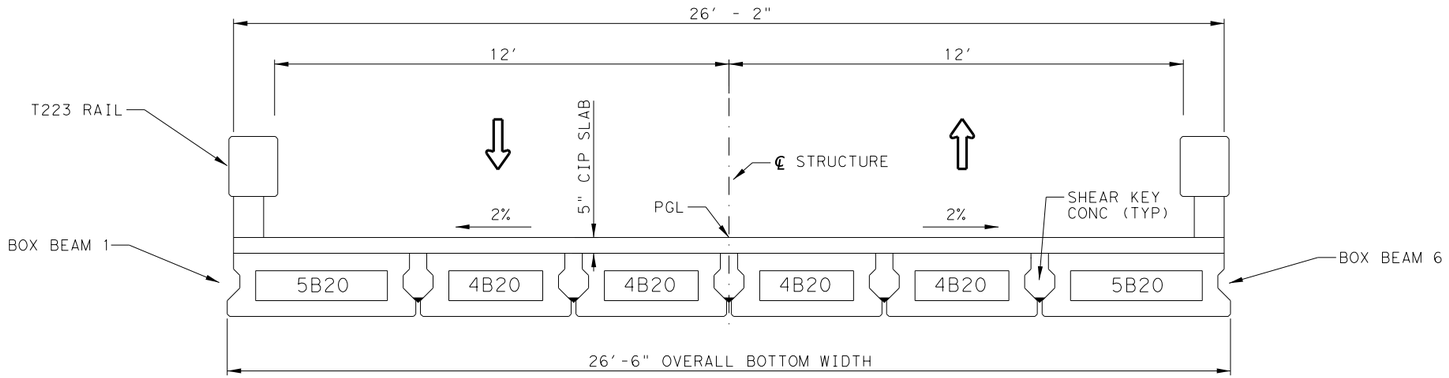
PROPOSED TYPICAL SECTION

STA 100+00.00 TO 100+15.13
STA 103+51.88 TO 103+65.00



PROPOSED TYPICAL SECTION

STA 100+15.13 TO 100+50.00 (20' WIDE)
STA 100+50.00 TO 101+00.00 (TRANSITION FROM 20' TO 24' WIDE)
STA 101+00.00 TO 101+50.00 (24' WIDE)
STA 102+15.00 TO 103+02.00 (24' WIDE)
STA 103+02.00 TO 103+51.88 (TRANSITION FROM 24' TO 20'WIDE)



PROPOSED TYPICAL SECTION

STA. 101+50.00 TO 102+15.00

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
TYPICAL SECTION

SCALE: 1" = 4'

SHEET 2 OF 2

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DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

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ABILENE DISTRICT GENERAL NOTES
2014 SPECIFICATIONS

General

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

Stewart Chapman, P.E. / Phone: 325-573-0143 / Stewart.Chapman@txdot.gov
Maxie Allen, P.E. / Phone: 325-573-0142 / Maxie.Allen@txdot.gov
Jose Cabrera, P.E. / Phone: 325-573-0143 / Jose.Cabrera@txdot.gov
(Snyder Area Office)

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

For Q&A's on Proposals navigate to
https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors
Use 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.

All relevant project documentation including contract time, cross sections,etc will be posted on the districts FTP website. https://ftp.dot.state.tx.us/pub/txdot-info/Pre-Letting%20Responses/

Failure to make necessary corrections to SW3P based on SW3P inspections will be cause for withholding the monthly estimate until such corrections have been made.

Failure to make necessary corrections to traffic control items based on barricade inspections will be cause for withholding the monthly estimate until such corrections have been made.

Provide ingress/egress to the adjacent properties in areas under construction. Phased construction of driveways and streets shall be required to provide uninterrupted access to adjacent properties. Coordinate work with the property owners before beginning any construction in the vicinity of the drive.

Environmental

Endangered and Protected Species

1. Migratory Bird Treaty Act (MBTA) - Establishment of a Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the

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terms of this Convention . . . for the protection of migratory birds . . . or any part, nest, or egg of any such bird." (16 U.S.C. 703)

Best Management Practices

1. Comply with the SW3P and associated sheets.
2. Migratory Birds:
   a. Bird nesting season is typically 15Feb through 15Sep annually.
   b. The Contractor will avoid disturbing, destroying, removing, or relocating migratory birds and active nests found in trees, culverts, bridges, on the ground, or anywhere they are encountered.
   c. Perform all tree trimming and other vegetation clearing activities during the non-breeding season (typically 15Sep-15Feb annually). Perform any inactive nest removal and bird exclusion methods to prevent birds from establishing nests. Phasing of work during construction may be necessary to stay in compliance.
   d. When active nests are unexpectedly encountered on-site during construction, the Contractor will stop work and immediately notify the Engineer. Take measures to avoid disturbance of these birds, their occupied nest, eggs, and/or young, in accordance with the Migratory Bird Treaty Act, Texas Parks and Wildlife Code, and TxDOT policy.
   e. The Engineer will notify the Contractor when work may resume.
   f. The Contractor should be prepared to prevent migratory birds from building nests by utilizing nest prevention methods, such as bird-deterrent netting and bird-repelling sprays and/or gels, between 15Feb and 15Sep. The Contractor can discuss other preventative measures with the Engineer and/or District Environmental Staff.
3. Other Best Management Practices for State Protected Species
   a. If Black Tailed Prairie Dog (BTPD) burrows or pocket gopher mounds are found near or within the project area, place barrier fencing to discourage the individual animals of moving into or through the construction area.
   b. While seeding or revegetating, if BTPD or pocket gopher mounds are discovered near or within the planned area, a vegetative barrier should be planted to discourage the dispersal of the species within the TxDOT ROW.
   c. If any animals are within the project area, avoid harming when encountered. Let them leave the area without harassment. Avoid any unnecessary impacts to dens or burrows.
   d. Examine heavy equipment stored on site before use, particularly after rain events when reptile and amphibian movements occur more often, to ensure use will not harm individuals that might be seeking temporary refuge.
   e. Avoid or minimize disturbing or removing downed trees, rotting stumps, and leaf litter where feasible.

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f. For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for the presence of wildlife prior to backfilling.
g. Rubbish found near bridges on TxDOT ROW should be removed and disposed of properly to minimize the risk of pollution. Rubbish does not include brush piles or snags.
h. If Texas tortoises (Gopherus berlandieri) or box turtles (Terrepene spp.) are present in a project area, they should be removed from the area and relocated between 100 and 200 meters from the project area.
i. Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided.

Item 5, "Control of Work"
Use Method C for construction surveying.

All known utilities are identified in the plans, including the crossing of power lines. Use this information to identify potential issues with power poles and power lines prior to bidding.

Make necessary arrangements with utility owners regarding temporary protections such as bracing power poles, and de-energizing power lines. The Department will not reimburse the cost of such temporary protections to the Contractor, unless the Engineer determines that inadequate information was available at the time the project was bid. **"Call Before You Dig" "Call 811"**

Drilled shaft locations or excavation areas must be staked prior to the notification so that the underground utilities can be located in relationship to the proposed work. Preserve and document the marked utility locations to prevent unnecessary secondary notifications. Notify the Engineer of conflicts between proposed work and underground utilities.

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

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

The Buy America Material Classification Sheet is located at the below link.

https://www.txdot.gov/business/resources/materials/buy-america-material-classification-sheet.html for clarification on material categorization.

Item 7, "Legal Relations and Responsibilities"
Provide one SW3P Notification Board for this project. Notification Boards are to be placed at locations within the right-of-way but outside the clear zone as directed by the Engineer. Consider this work to be subsidiary to the various bid items of the contract.

The Contractor's attention is directed to the Texas Aggregate Quarry Pit Safety Act. Any pit or quarry meeting the definition of an unacceptable unsafe location as defined in the Act is subject to regulations set forth in this Act. A copy of the Texas Administrative Code, Title 43, Part, 1, Chapter 21, Subchapter M may be viewed at
https://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=5&ti=43&pt=1&ch=21&sch=M&rl=Y

No significant traffic generator events identified.

Hard hats are required at all times during construction when construction personnel are in TxDOT Right-of-Way.

Item 8 "Prosecution and Progress"
Each contract awarded by the Department stands on its own and as such, is separate from other contracts. A Contractor awarded multiple contracts must be capable and sufficiently staffed to concurrently process and/or execute all contracts at the same time.

Coordinate and update the work schedule with the project inspector daily. Give a minimum of 24 hours of notice to project inspector if work requiring inspection or testing is to be performed. Failure to do so may cause that work to be delayed or postponed if TxDOT personnel are not available. Work performed without suitable inspection, as determined by the Engineer, may be ordered removed and replaced at Contractor's expense.

Item 9, "Measurement and Payment"
The progress payment period shall end on the 25th of each month, unless directed by the Area Office Engineer. Material on Hand (MOH) is due two business days before estimate cut off.

Item 100, "Preparing Right of Way"
The Contractor's attention is directed to potential regulations against burning within the project limits. Abide by all local ordinances and county imposed burn bans. When burning is prohibited, dispose of material in accordance with regulations set forth by other regulatory

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GENERAL NOTES

agencies including the Texas Commission for Environmental Quality. The cost of burning or disposal of any product is subsidiary to various bid items.

Item 247, "Flexible Base"
Provide flexible base with a minimum Plasticity index of 4.

Ride quality is waved for this project.

The flexible base material in this contract has been estimated to be ***128*** cubic yards (compacted). The estimated quantity of flexible base is for the roadway. The measured area for payment is the crown width only. The tapers, etc., are not included in the measurements for the flexible base and are considered subsidiary to this item.

Item 416, "Drilled Shaft Foundations"
Riprap will be paid for under item 432.

All soil, water, and slurry removed from drilled shafts shall be captured and disposed of properly. No discharge of these materials into, or in close proximity to, the surrounding water will be allowed.

Item 420, "Concrete Substructures"
In addition to the elements shown in table 1, the following elements are Plans Quantity Elements.

- Bent Concrete

Item 421, "Hydraulic Cement Concrete"
Use a cement meeting the requirements of Ty II when Mix Design Option 7 is selected for cast in place concrete.

Class C fly ash and Type I cement will not be allowed for any mix unless approved by the Engineer.

As a minimum, curing facility includes concrete curing tank, heater and a concrete recording thermometer. Provide a recorder with the capability to chart temperatures for 24 hours, 7 days and 30 day periods of time.

Air Entrainment requirements are waived with exception to bridge deck concrete, and rails, top slabs of direct traffic culverts and approach slabs. Air Entrainment is required for all slip formed concrete (bridge rail, concrete traffic barrier, pavement, etc.).

Item 422, "Concrete Superstructures"
Saw-cut groves are not required.

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Provide either a carpet drag or broom finish for micro-texture to deck and approach slabs.

Item 440, "Reinforcement for Concrete"
Provide epoxy coated reinforcement for all reinforcement in abutment caps, wingwalls, and backwalls (drilled shaft reinforcement excluded); interior bent caps (column and drilled shaft reinforcement excluded); cast-in-place portions of bridge deck (PCP reinforcement and bridge girder reinforcement excluded); bridge railing; and approach slab.

Item 496, "Removing Structures"
The contractor will be required to provide a demo plan for bridge structures to be approved by the engineer.

Item 502, "Barricades, Signs and Traffic Handling"
Provide the Engineer with written notification seven (7) days in advance of major traffic changes. A major traffic change is defined as the temporary (greater than one day) or permanent relocation of traffic lanes typically in an urban setting. The notice will, at a minimum, include the expected date, time and scope of the traffic change. The Department will utilize the information provided to inform the traveling public of the changes. Failure to provide advance notice, or to provide accurate information, will result in delaying the work until such time that the public has been notified.

Additional signs, barricades and traffic handling may be necessary to complete the work shown herein and will be provided by the contractor as required and will be considered subsidiary to this item.

Relocate existing roadside signs to temporary supports as approved by the engineer.

All safety appurtenances such as signs, delineators, object markers and route markers will be in place prior to opening each phase of the construction to traffic, unless otherwise directed.

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.

The Contractor's person responsible for TCP compliance must be available by local telephone and have a response time within 45 minutes.

Equip all work vehicles within 30 feet of the traveled way with a functioning amber strobe light or rotating beacon visible from all directions.

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Repair barricades within the timeline shown on the barricade inspection report. Failure to comply will cease all work until barricades are repaired to the satisfaction of the Department. Replace all damaged traffic control devices immediately. Remove any damaged traffic control devices from the project within 24 hours.

Conflicting guide signs shall be covered as approved by the Engineer. This work shall be subsidiary to Item 502.

Item 506, "Temporary Erosion, Sedimentation, and Environmental Controls"
On site concrete washout shall be allowed on this project as shown in the Environmental Layout Sheet, or as directed, in writing, by the Engineer.

Item 644, "Small Roadside Sign Supports and Assemblies"
Remove entire small sign foundation.

Item 658, "Delineator and Object Marker Assemblies"
Delineators and object marker assemblies will use winged channel posts. The winged channel posts will be 1.12 lb/ft and 6.5 ft in length.

All MBGF delineation shall be GF2 mounted on posts.

Use a minimum 2 inch long lag screws with washers to attach flexible GF2 barrier reflectors to wooden post. For steel posts, use an approved adhesive, or other method approved by Engineer.

Concrete Barrier Reflectors shall be equivalent to Shure-tite CTB "Cup Mount" Delineator (8"). Attach delineators to concrete rail with concrete anchors as approved by the Engineer.

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GENERAL NOTES

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 0908-27-006 **DISTRICT** Abilene **COUNTY** Kent
HIGHWAY CR 316

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**0908-27-006**			
		PROJECT ID		**A00190600**			
		COUNTY		**Kent**			
		HIGHWAY		**CR 316**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6001	PREPARING ROW	AC	1.000		1.000	
	110-6001	EXCAVATION (ROADWAY)	CY	16.000		16.000	
	110-6002	EXCAVATION (CHANNEL)	CY	824.000		824.000	
	132-6004	EMBANKMENT (FINAL)(DENS CONT)(TY B)	CY	558.000		558.000	
	150-6002	BLADING	HR	16.000		16.000	
	247-6237	FL BS (CMP IN PLC)(TY A OR B GR 4)(6")	SY	948.000		948.000	
	400-6005	CEM STABIL BKFL	CY	49.000		49.000	
	409-6002	PRESTR CONC PIL (18 IN SQ)	LF	360.000		360.000	
	420-6013	CL C CONC (ABUT)	CY	27.200		27.200	
	420-6066	CL C CONC (RAIL FOUNDATION)	CY	18.600		18.600	
	422-6005	REINF CONC SLAB (BOX BEAM)	SF	1,723.000		1,723.000	
	425-6001	PRESTR CONC BOX BEAM (4B20)	LF	260.000		260.000	
	425-6002	PRESTR CONC BOX BEAM (5B20)	LF	130.000		130.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	54.000		54.000	
	434-6002	ELASTOMERIC BEARING (LAMINATED)	EA	18.000		18.000	
	450-6006	RAIL (TY T223)	LF	162.000		162.000	
	454-6018	SEALED EXPANSION JOINT (4 IN) (SEJ - M)	LF	52.000		52.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	EA	1.000		1.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	5.000		5.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	578.000		578.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	578.000		578.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	370.000		370.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	370.000		370.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	50.000		50.000	
	540-6007	MTL BEAM GD FEN TRANS (TL2)	EA	4.000		4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	3.000		3.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	12.000		12.000	
	658-6062	INSTL DEL ASSM (D-SW)SZ 1(BRF)GF2(BI)	EA	12.000		12.000	
	18	EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	
		SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	

SUMMARY OF ROADWAY ITEMS									
LOCATION	100	110	110	132	150	247	540	540	544
	6001	6001	6002	6004	6002	6237	6001	6007	6001
	PREPARING ROW	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL) (DENS CONT) (TY B)	BLADING	FL BS (CMP IN PLC) (TY A OR B GR 4) (6")	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (TL2)	GUARDRAIL END TREATMENT (INSTALL)
	AC	CY	CY	CY	HR	SY	LF	EA	EA
COOPER CREEK	1	16	824	558	16	948	50	4	4
PROJECT TOTALS	**1**	**16**	**824**	**558**	**16**	**948**	**50**	**4**	**4**

SUMMARY OF EROSION CONTROL ITEMS				
LOCATION	506	506	506	506
	6038	6039	6041	6043
	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12')	BIODEG EROSN CONT LOGS (REMOVE)
	LF	LF	LF	LF
COOPER CREEK	578	578	370	370
PROJECT TOTALS	**578**	**578**	**370**	**370**

SUMMARY OF SIGNING ITEMS		
LOCATION	658	658
	6014	6062
	INSTL DEL ASSM (D-SW) SZ (BRF) CTB (BI)	INSTL DEL ASSM (D-SW) SZ 1 (BRF) GF2 (BI)
	EA	EA
COOPER CREEK	12	12
PROJECT TOTALS	**12**	**12**

SUMMARY OF REMOVAL ITEMS	
LOCATION	644
	6076
	REMOVE SM RD SN SUP&AM
	EA
COOPER CREEK	3
PROJECT TOTALS	3

QUANTITY SUMMARY

Texas Department of Transportation

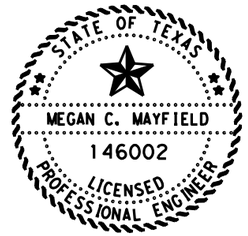
SCALE: N/A

SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		11
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

CSJ	PLAN PROFILE SHEET	BRIDGE NBI #		DESIGN		BRIDGE LOCATION	STATION		LENGTH	CLEAR RDWY WIDTH	LOADING	400-6005 CEM STABIL BKFL	409-6002 PRESTR CONC PIL (18 IN SQ)	420-6013 CL C CONC (ABUT)
		EXISTING	PROPOSED	EXISTING	PROPOSED		BEGIN	END	FT	FT		CY	LF	CY
0908-27-006	48	08-132-0-AA01-13-001	08-132-0-AA01-13-003	SINGLE SPAN STEEL GIRDER & STRINGER BRIDGE ON STEEL SUBSTRUCTURE	65' CONC. BOX BEAM BRIDGE	CR 316 AT COOPER CREEK	101+50.00	102+15.00	65	24	HL-93	49	360	27.2
TOTALS												**49**	**360**	**27.2**

CSJ (CONT'D FROM ABOVE)	420-6066 CL C CONC (RAIL FOUNDATION)	422-6005 REFIN CONC SLAB (BOX BEAM)	425-6001 PRESTR CONC BOX BEAM (4B20)	425-6002 PRESTR CONC BOX BEAM (5B20)	432-6002 RIPRAP (CONC) (5IN)	434-6002 ELASTOMERTIC BEARING (LAMINATED)	450-6006 RAIL (TY T223)	454-6018 SEALED EXPANSION JOINT (4IN) (SEJ-M)	496-6009 REMOV STR (BRIDGE 0-99FT LENGTH)
	CY	SF	LF	LF	CY	EA	LF	LF	EA
0908-27-006	18.6	1723	260	130	54	18	162	52	1
TOTALS	**18.6**	**1723**	**260**	**130**	**54**	**18**	**162**	**52**	**1**



Megan C. Mayfield, P.E.

9/14/2023

BRIDGE SUMMARY

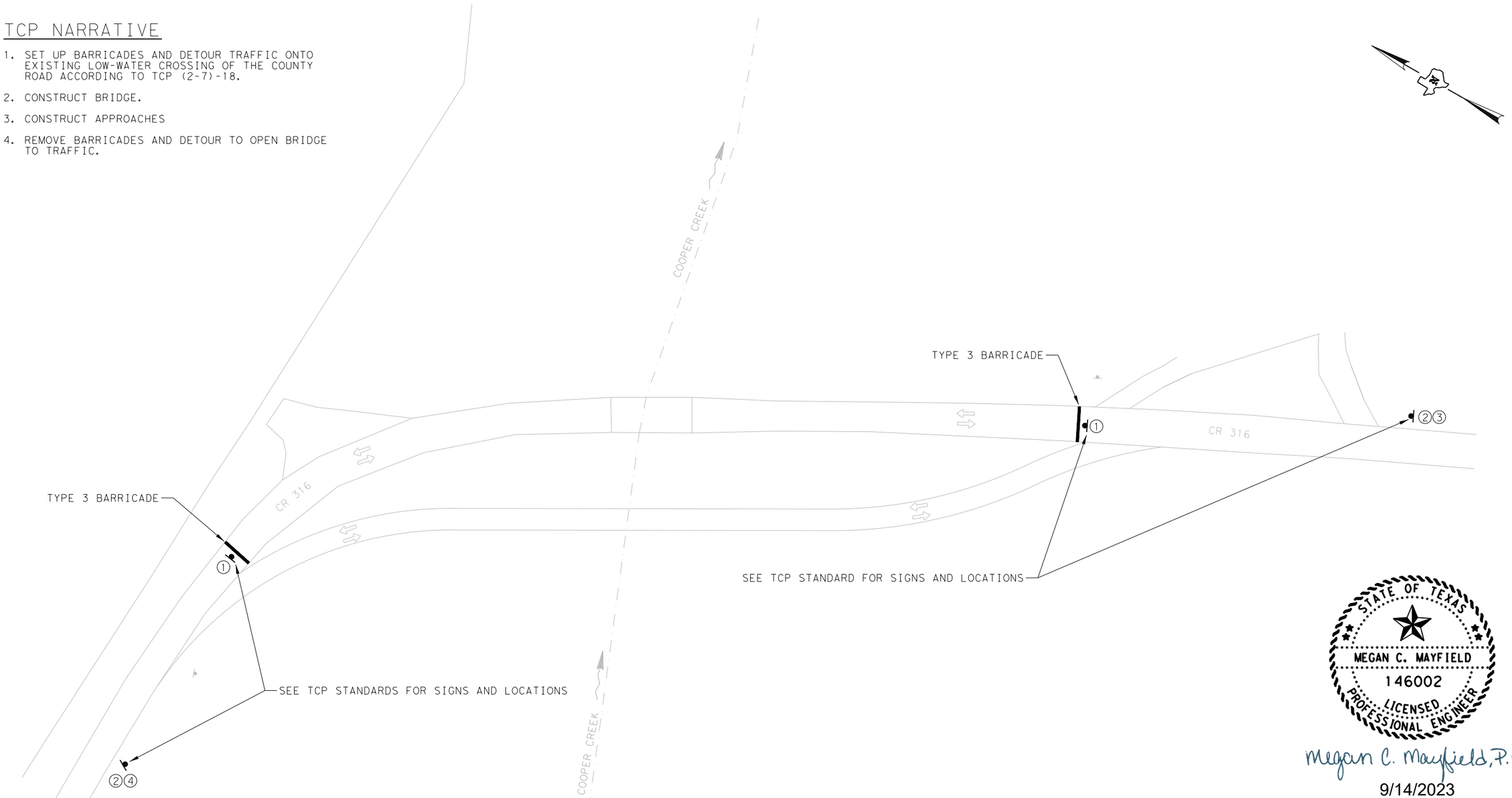
 Texas Department of Transportation

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		12
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

TCP NARRATIVE

1. SET UP BARRICADES AND DETOUR TRAFFIC ONTO EXISTING LOW-WATER CROSSING OF THE COUNTY ROAD ACCORDING TO TCP (2-7)-18.
2. CONSTRUCT BRIDGE.
3. CONSTRUCT APPROACHES
4. REMOVE BARRICADES AND DETOUR TO OPEN BRIDGE TO TRAFFIC.



BRIDGE CLOSED R11-2aT ①

DETOUR M4-8 ②

CW1-6L ③

CW1-6R ④

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

DETOUR LAYOUT/ TCP NARRATIVE

Texas Department of Transportation

SCALE: 1" = 60' SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		13
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

DATE: 9/14/2023 6:10:15 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0902700674 - Design/Plan Set/2. TCP/014-025 BC (1)-(12) -21

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

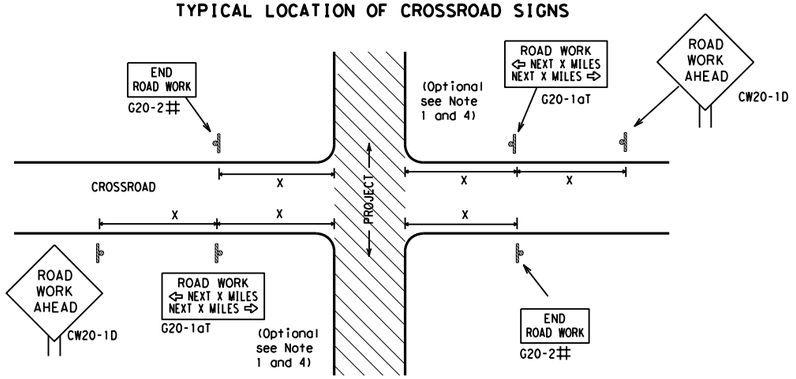
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	ABL	KENT		14
5-10 5-21				

DATE: 9/14/2023 6:10:15 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0908270622/Design/Plan Set/2. TCP701-025 BC (1)-(12) -21

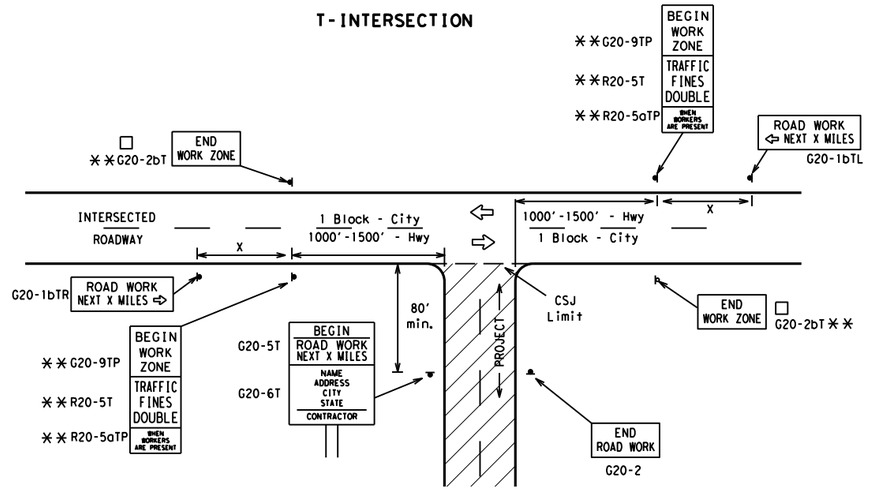
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

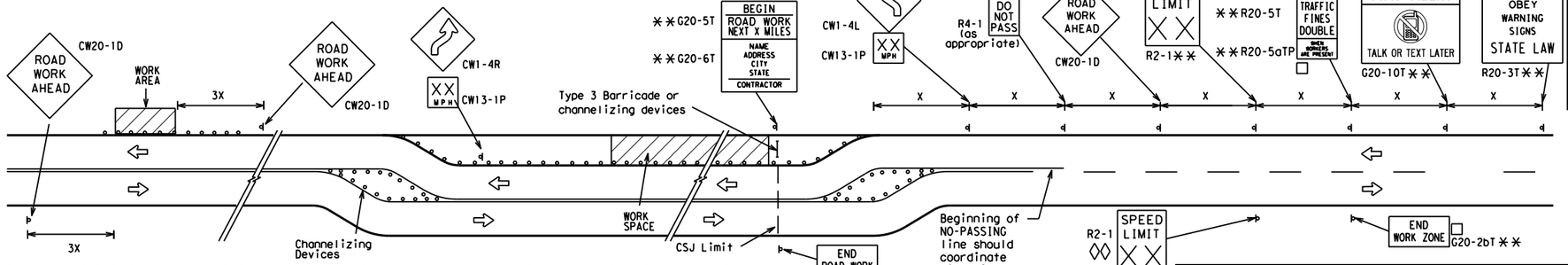
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

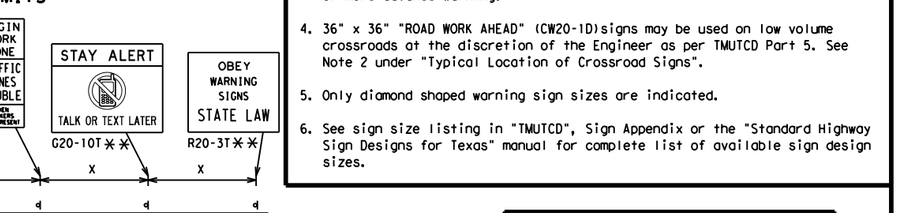
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

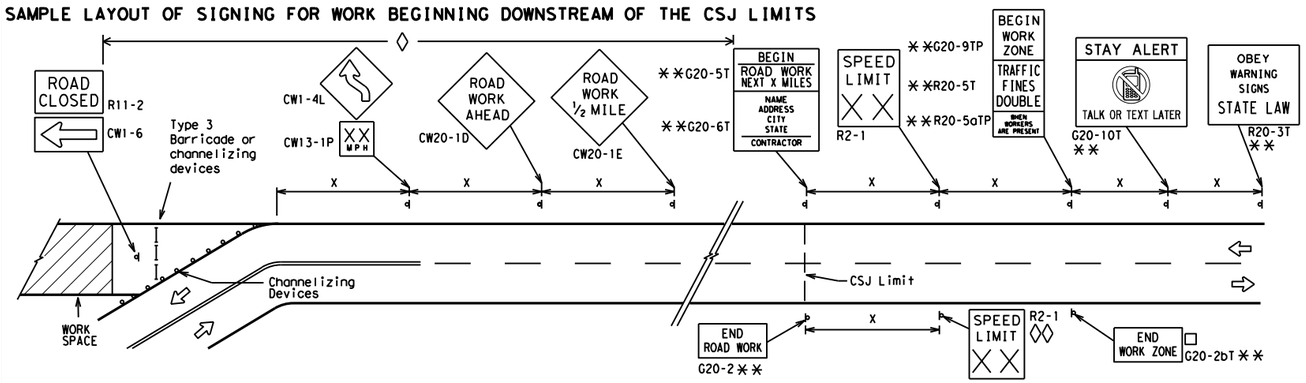


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD"(CW20-1D)signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing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

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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



NOTES

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

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

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

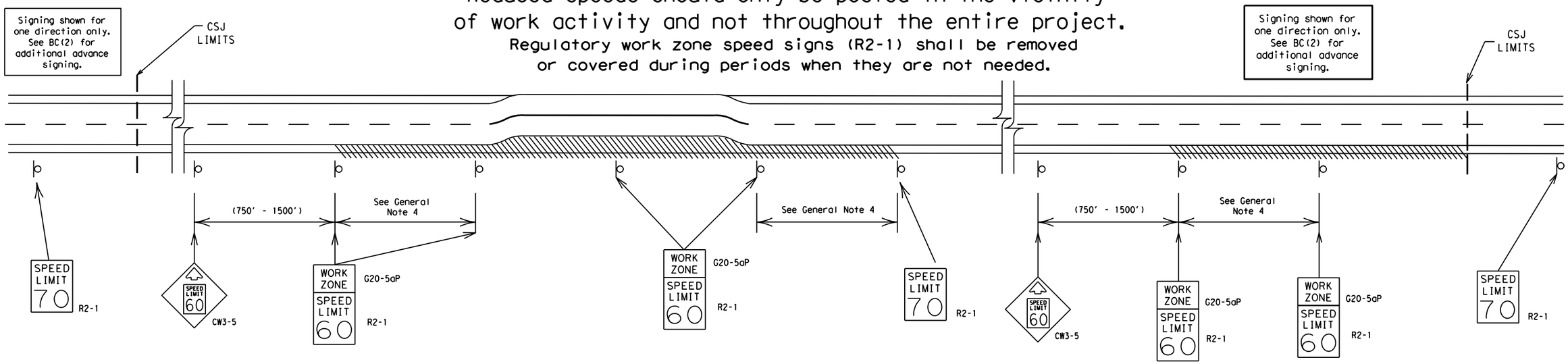
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ABL	KENT		15

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.

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Texas Department of Transportation

Traffic Safety Division Standard

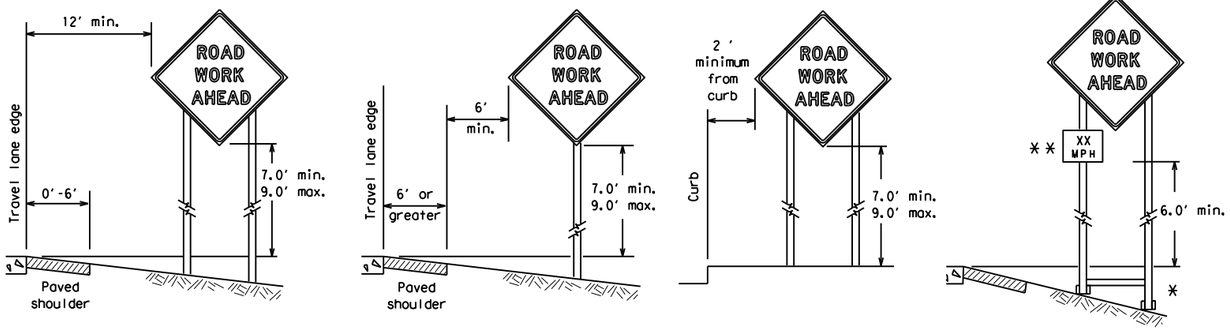
BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ABL	KENT		16

DATE: 9/14/2023 6:10:16 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/2. TCP/014-025 BC (1)-(12) -21

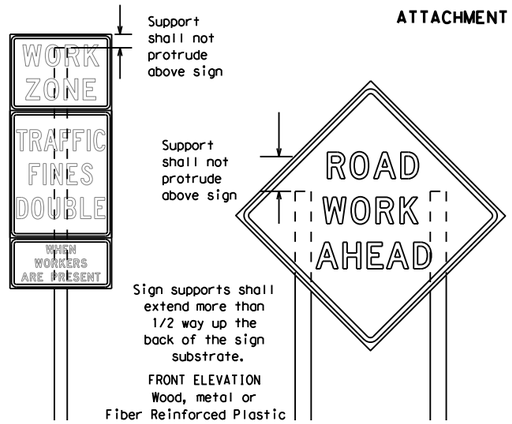
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

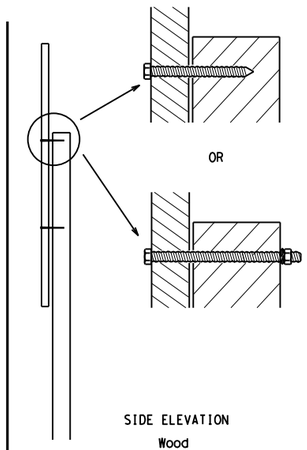


* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





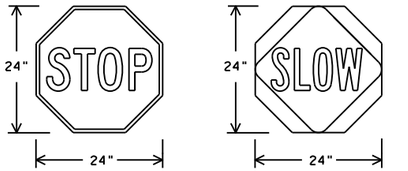
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ABL	KENT		17

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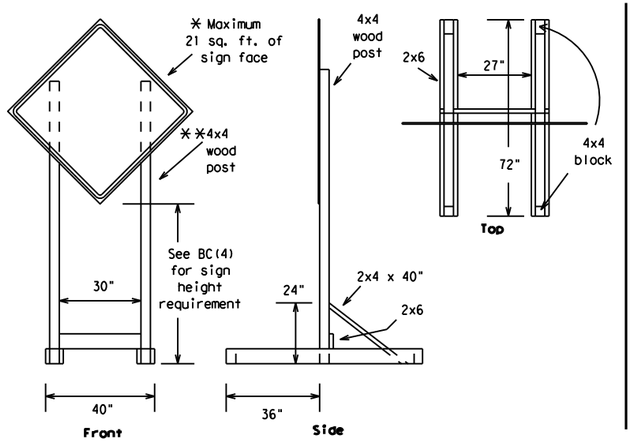
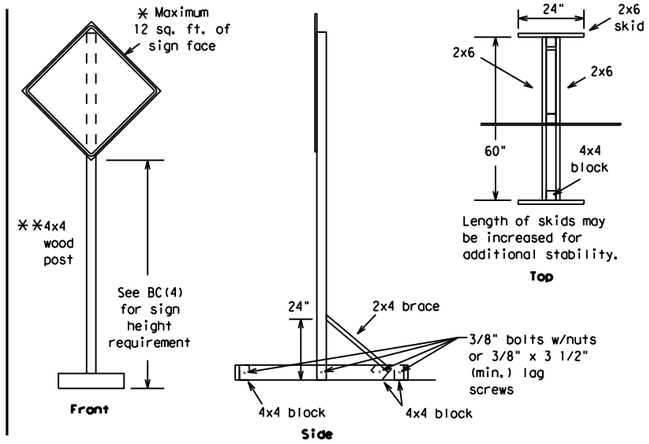
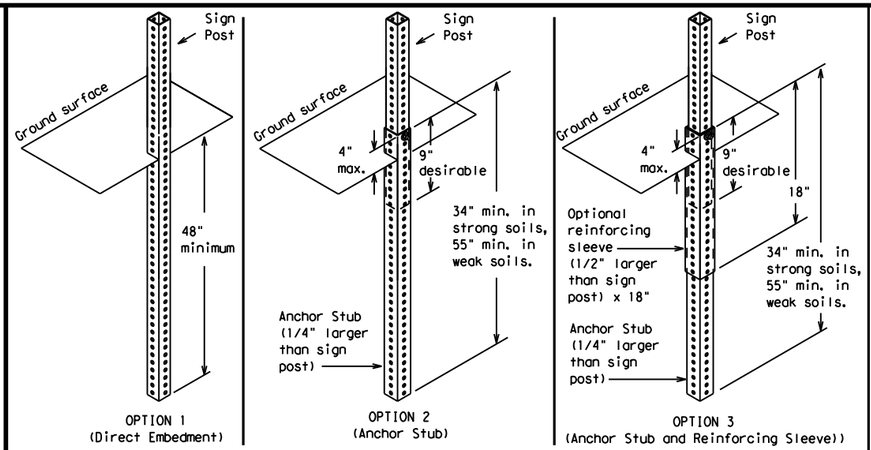




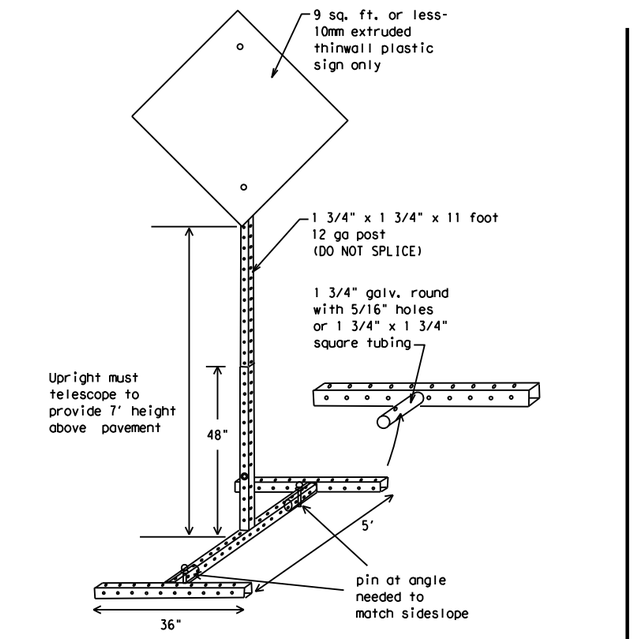
SKID MOUNTED WOOD SIGN SUPPORTS

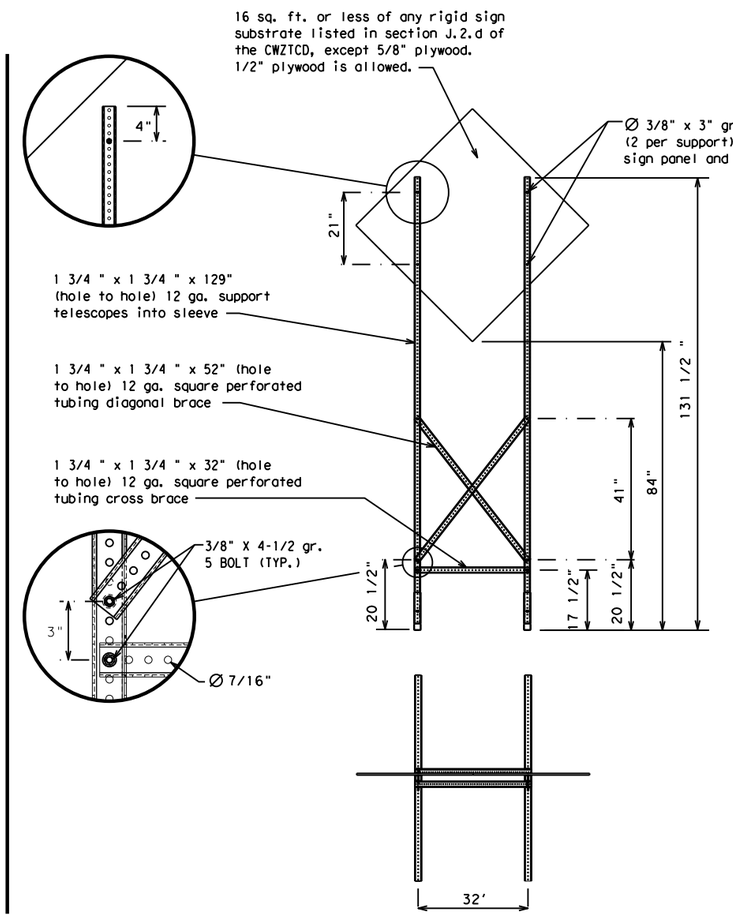
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

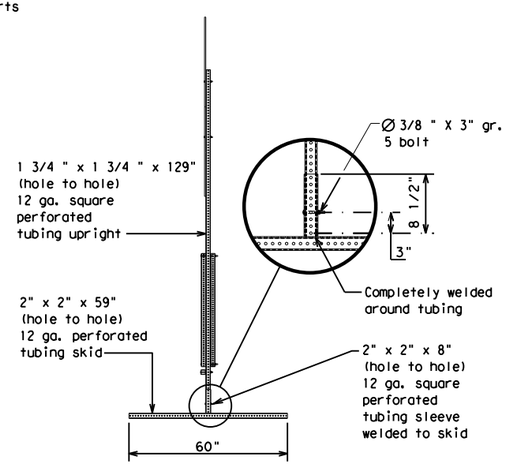


GROUND MOUNTED SIGN SUPPORTS

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.

SHEET 5 OF 12

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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7-13 5-21	ABL	KENT		18

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FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0908270064 - Design/Plan Set/2. TCP/014-025 BC (1)-(12) -21

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

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7-13 5-21	ABL	KENT		19

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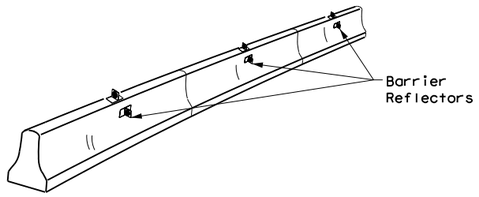
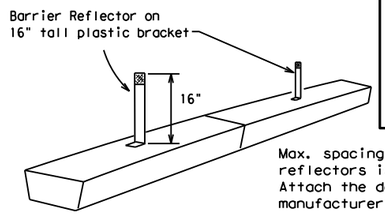
1. Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
2. Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost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

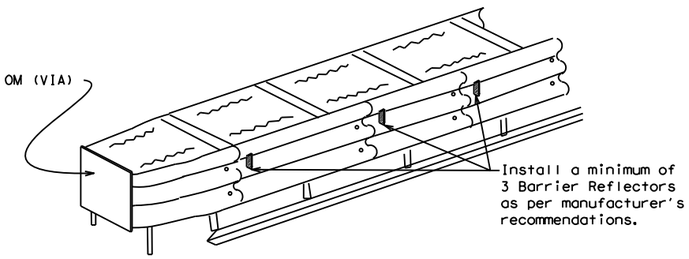


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) 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.

LOW PROFILE CONCRETE BARRIER (LPCB)

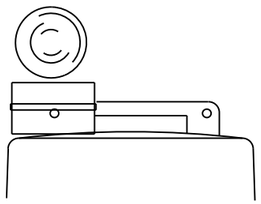


DELINEATION OF END TREATMENTS

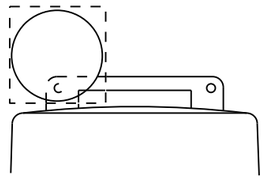
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

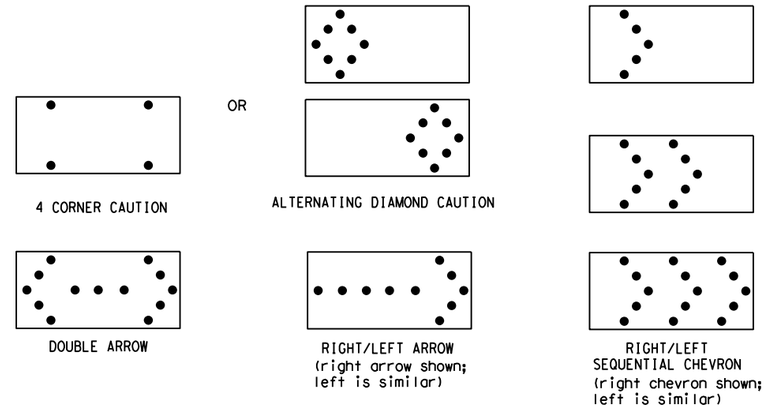
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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



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	0908	27	006	CR 316
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ABL	KENT		20

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

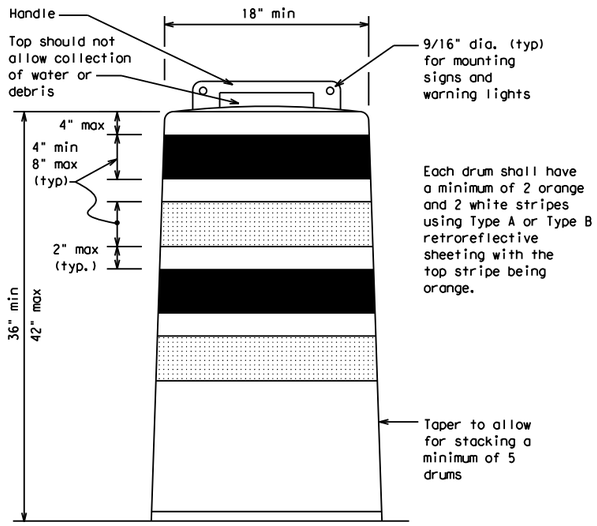
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

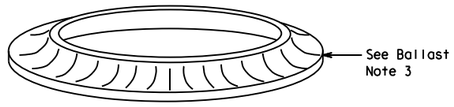
RETROREFLECTIVE SHEETING

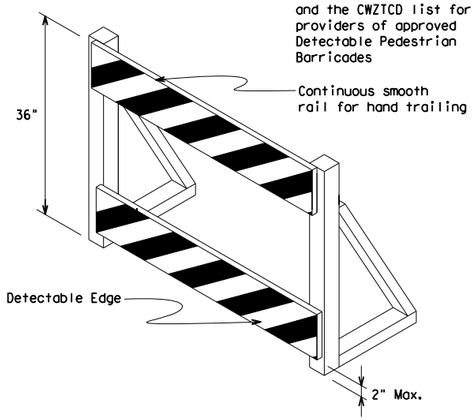
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials," Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

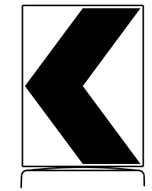




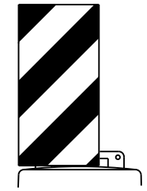


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
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4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	ABL	KENT		21
7-13				

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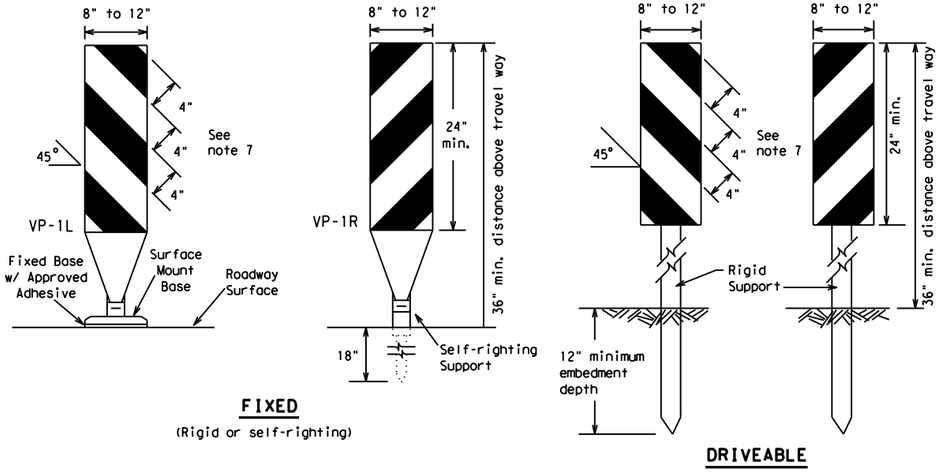
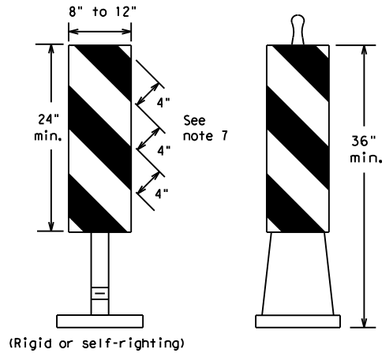


FIXED
(Rigid or self-righting)

DRIVEABLE

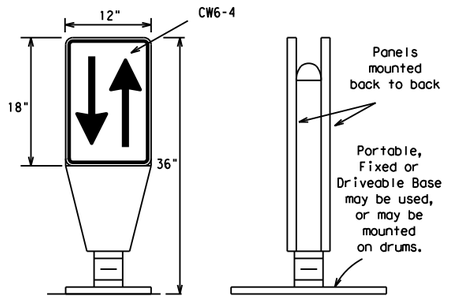


(Rigid or self-righting)

PORTABLE

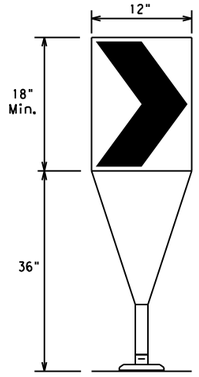
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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)



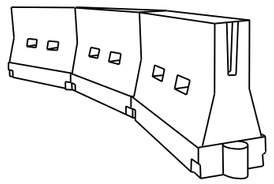
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

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Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS	0908	27	006	CR 316
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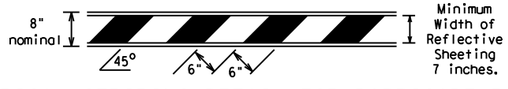
7-13 5-21	ABL	KENT		22

DATE: 9/14/2023 6:10:18 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0908270064 - Design/Plan Set/2. TCP/014-025 BC (1)-(12) -21

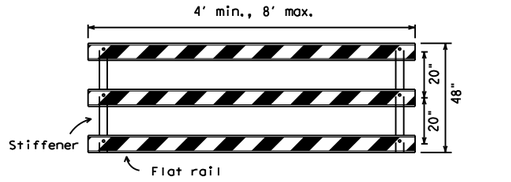
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



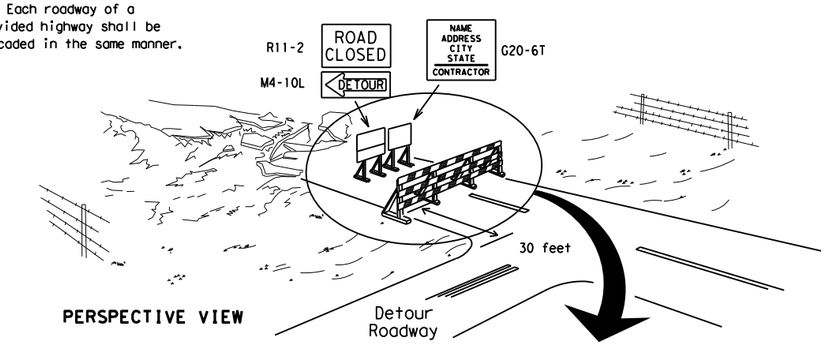
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

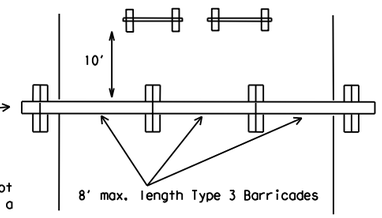
TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES

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



PERSPECTIVE VIEW

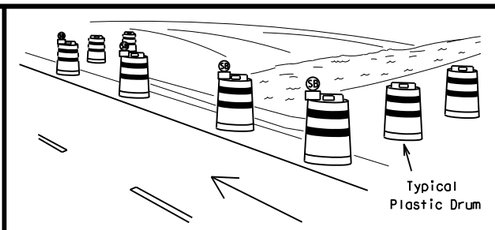
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

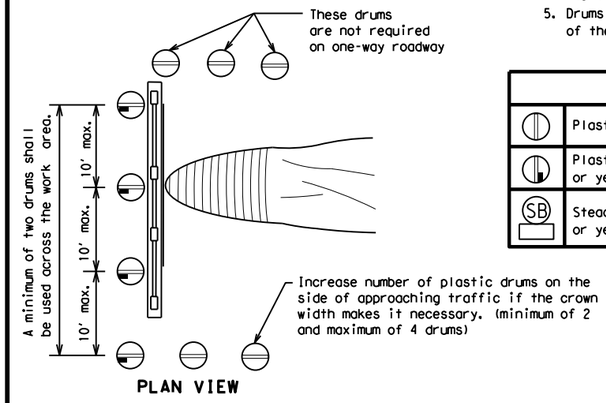
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

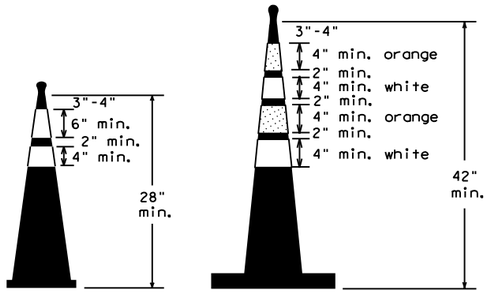
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



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

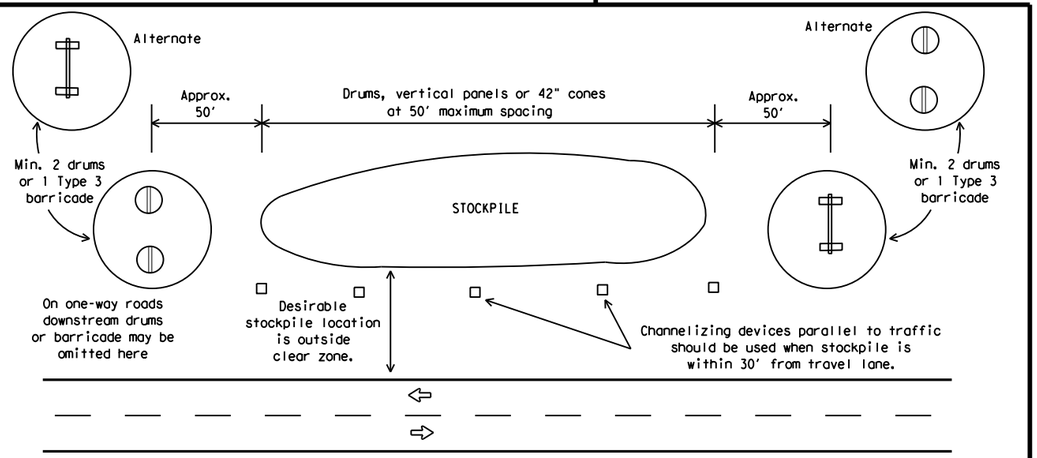
PLAN VIEW

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

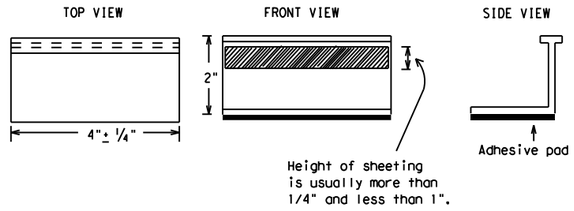
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

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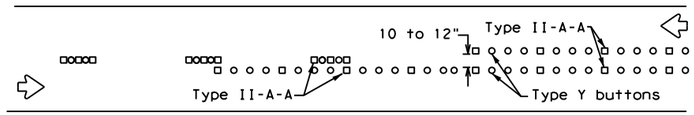
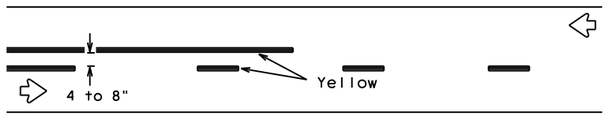
PAVEMENT MARKING PATTERNS

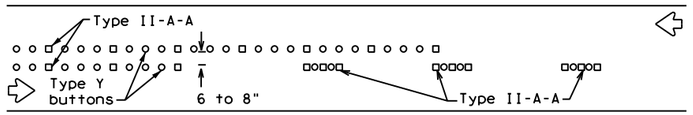
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



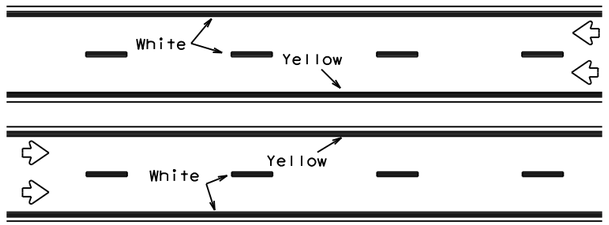
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



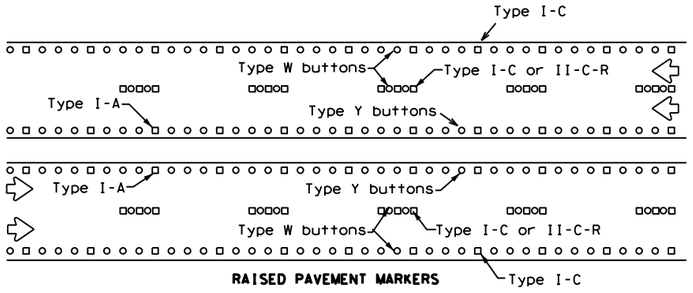
RAISED PAVEMENT MARKERS - PATTERN B

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

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



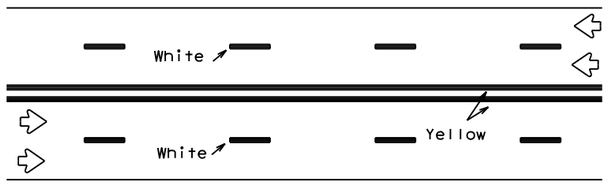
REFLECTORIZED PAVEMENT MARKINGS



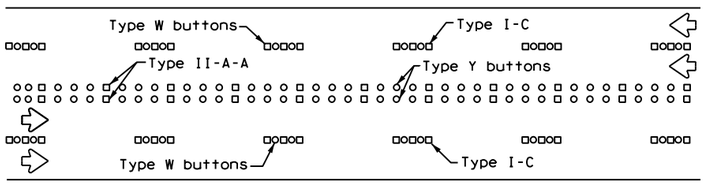
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



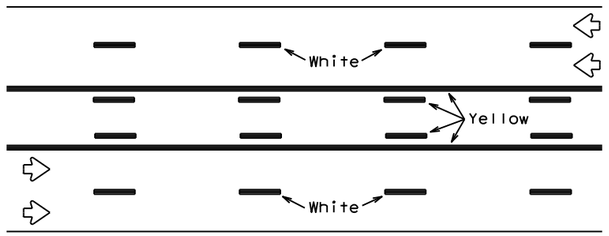
REFLECTORIZED PAVEMENT MARKINGS



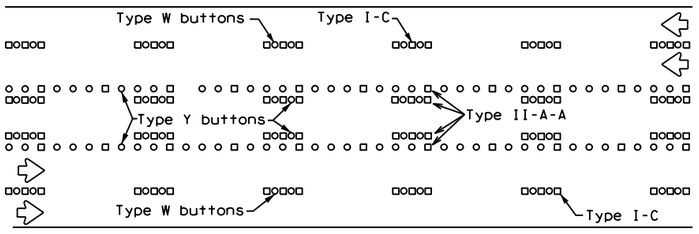
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

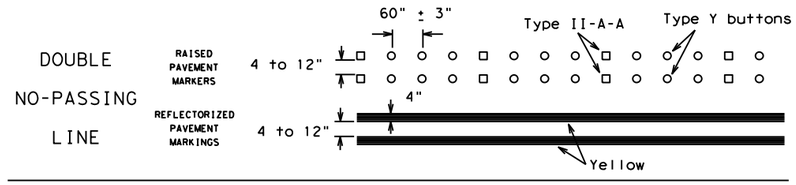
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

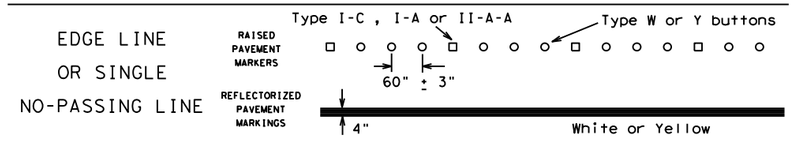
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

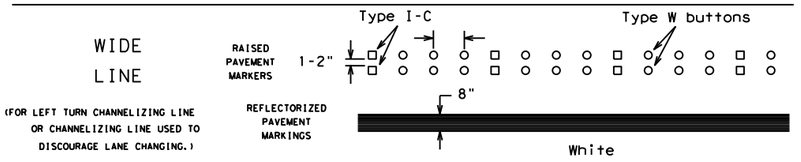


EDGE LINE OR SINGLE NO-PASSING LINE



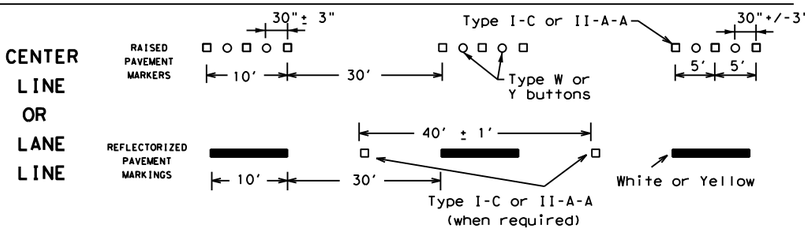
WIDE LINE

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

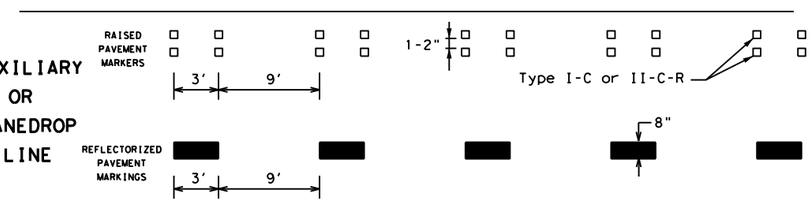


BROKEN LINES

CENTER LINE OR LANE LINE

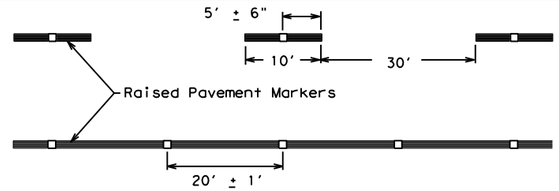


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

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Texas Department of Transportation

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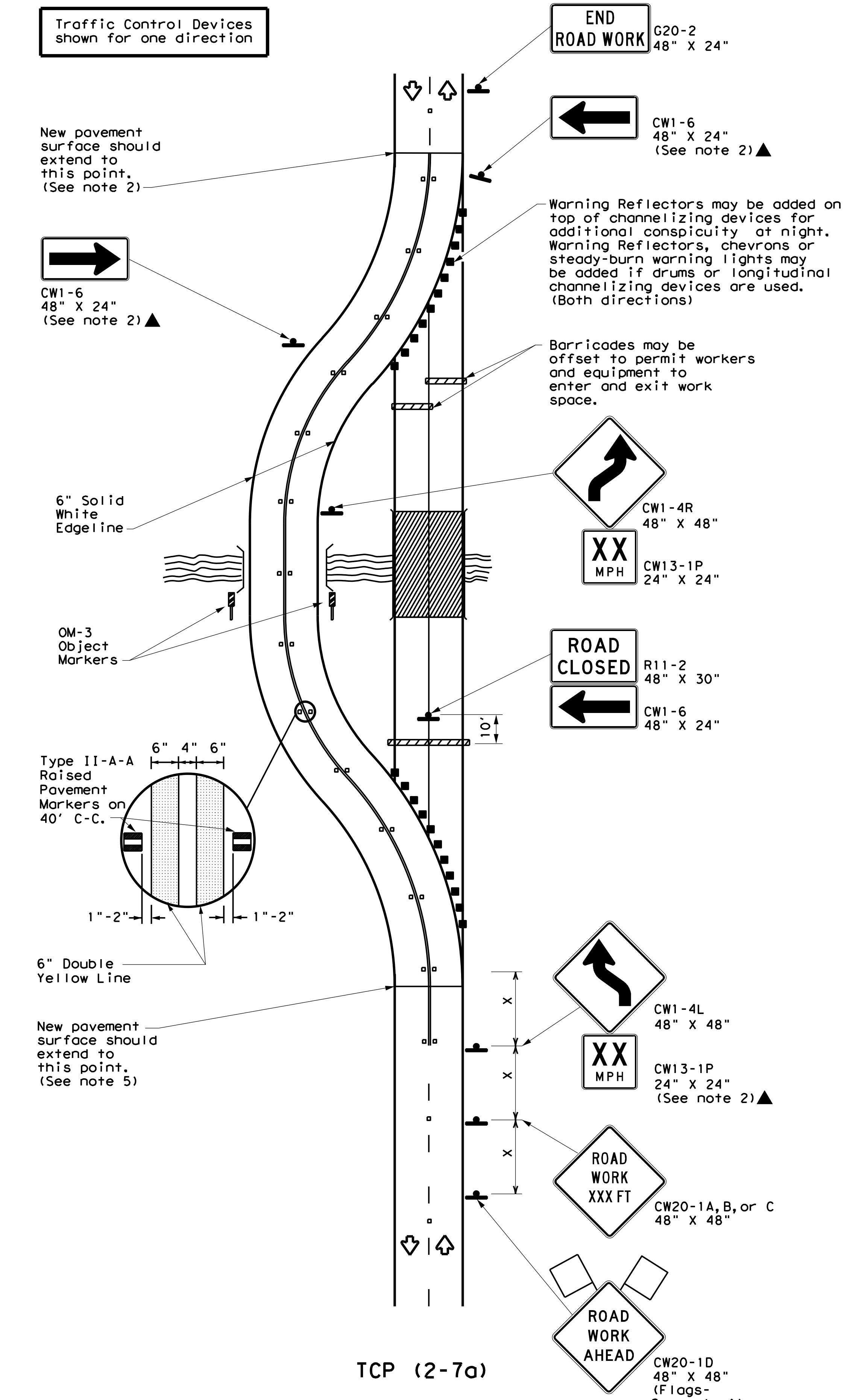
BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

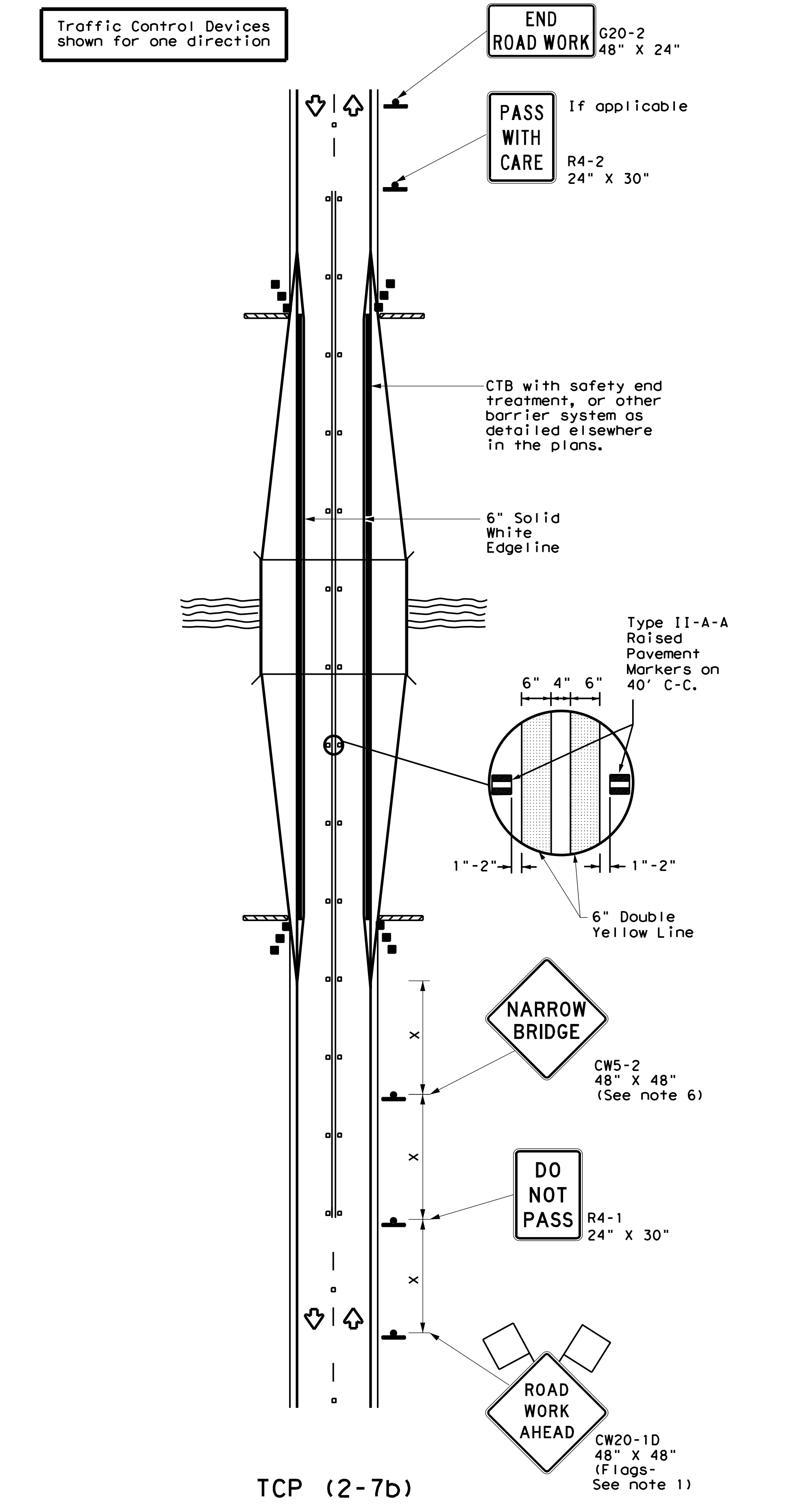
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21	0908	27	006	CR 316
2-98 7-13	DIST	COUNTY		SHEET NO.
11-02 8-14	ABL	KENT		25

106



TCP (2-7a)

ROADWAY DIVERSION



TCP (2-7b)

BRIDGE WIDENING

LEGEND

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

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

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.

TCP (2-7a)

3. Raised pavement markers shall be placed 40 feet c-c on centerline throughout project.
4. Roadway diversion design requirements should be based on posted speed limit or prevailing speed.
5. New pavement surface should be extended across existing roadway edge to a point where existing pavement markings left in place during project do not conflict with construction area pavement marking.

TCP (2-7b)

6. The CW5-2 "Narrow Bridge" sign may be omitted if lane and shoulder widths are maintained.

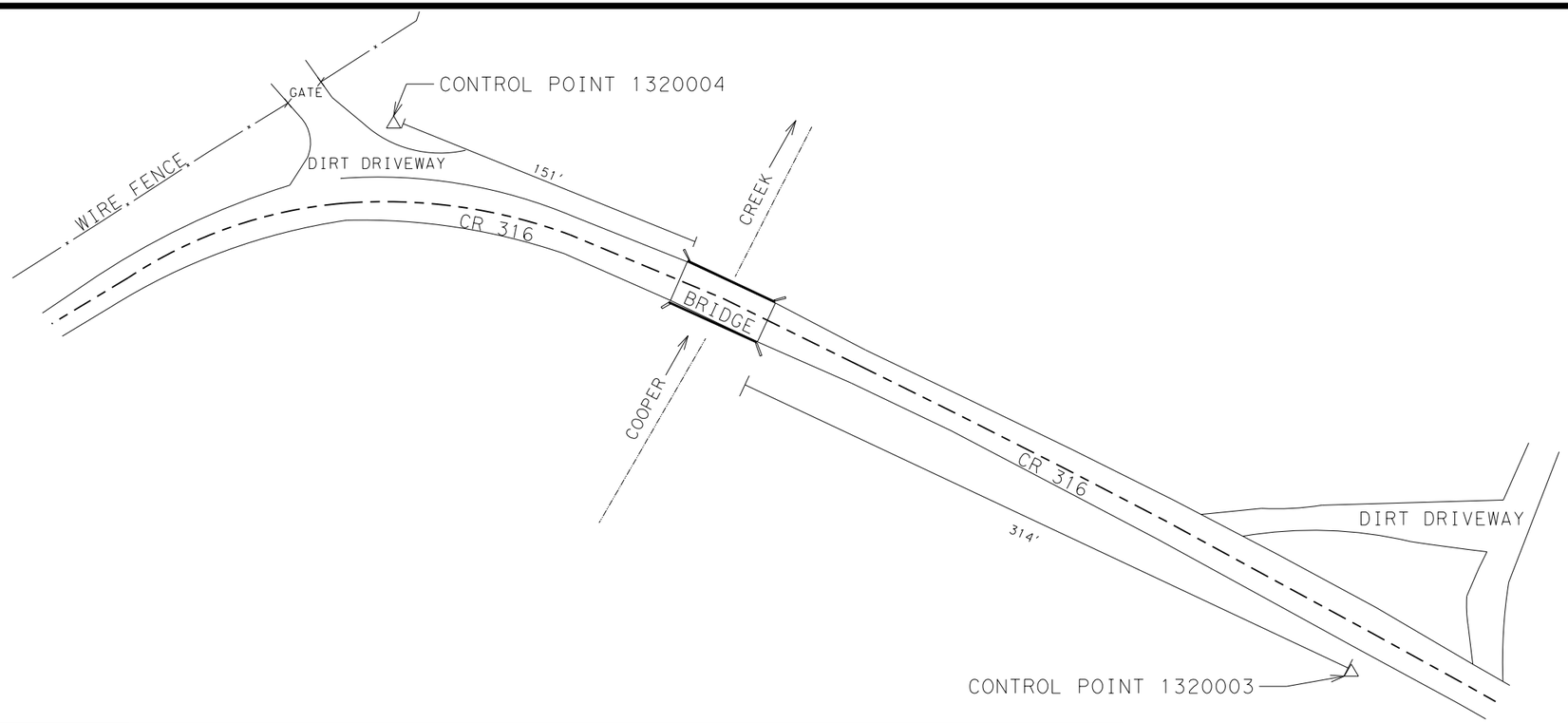
Texas Department of Transportation — Traffic Safety Division Standard

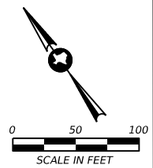
TRAFFIC CONTROL PLAN DIVERSIONS AND NARROW BRIDGES

TCP(2-7)-23

FILE: tcp2-7-23.dgn	DN:	CK:	DW:	CK:
©TxDOT April 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS 12-85 4-98 2-18 8-95 3-03 4-23 1-97 2-12	0908	27	006	CR 316
	DIST		COUNTY	SHEET NO.
	ABL		KENT	26

167





NOTES:

ALL BEARINGS AND COORDINATES SHOWN ARE BASED ON THE TEXAS COORDINATE SYSTEM, NORTH CENTRAL ZONE (4202) NORTH AMERICAN DATUM OF 1983 (NAD 1983) 2011, ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.00021.

UNIT OF MEASURE IS U.S. SURVEY FEET

HORIZONTAL CONTROL OF THIS PROJECT WAS ESTABLISHED BY TxDOT VIRTUAL REFERENCE SYSTEM NETWORK BASED ON AVERAGED THREE 180 EPOCH OBSERVATIONS

VERTICAL CONTROL IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88); GEOID 12B; TxDOT VRS NETWORK BASED ON THREE 180 EPOCH OBSERVATIONS

FIELD SURVEYS WERE PERFORMED IN NOVEMBER 2022

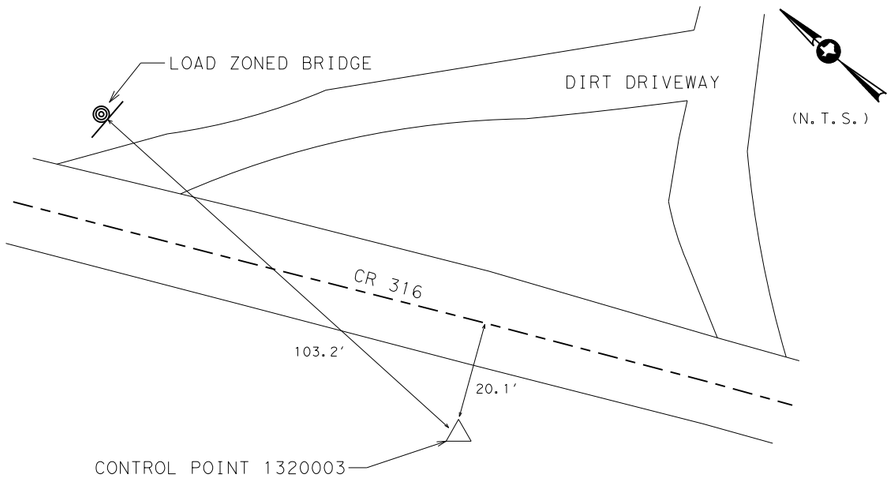
LEGEND

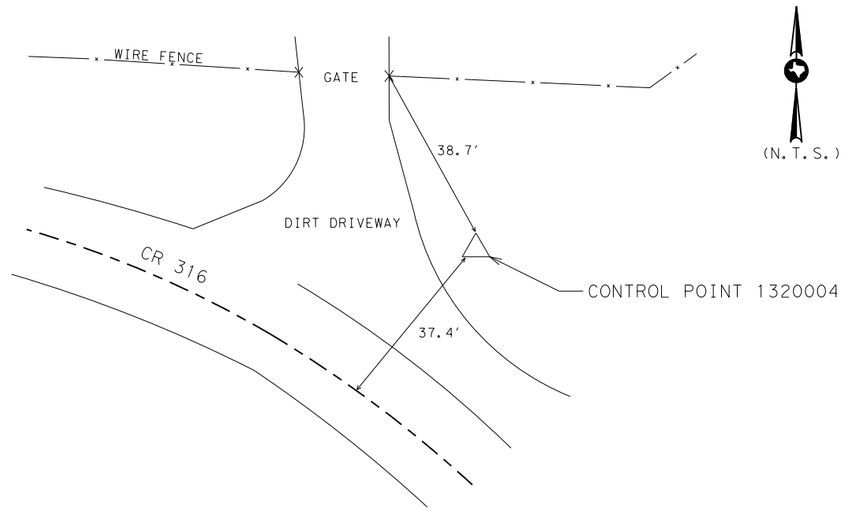
CENTER LINE

FENCE

CONTROL POINT

GATE





CONTROL POINT: 1320003

CP# 1320003 IS A 5/8"REBAR WITH A TXDOT ALUMINUM CAP IN CONCRETE. LOCATED ON THE WEST SIDE OF CR 316 AND BEING ± 314′ FEET FROM END OF BRIDGE OVER COOPER CREEK.

GRID COORDINATES		SURFACE COORDINATES		LATITUDE	LONGITUDE
NORTHING	7,087,987.47	NORTHING	7,089,475.95	33°05′27.9879"	100°51′23.3512"
EASTING	1,246,886.61	EASTING	1,247,148.46		
ELEVATION	2,041.49				

CONTROL POINT: 1320004

CP# 1320004 IS A 5/8"REBAR WITH A TXDOT ALUMINUM CAP IN CONCRETE. LOCATED NORTH EAST OF CR 316 AND BEING ± 151′ FROM END OF BRIDGE OVER COOPER CREEK.

GRID COORDINATES		SURFACE COORDINATES		LATITUDE	LONGITUDE
NORTHING	7,088,450.99	NORTHING	7,089,939.56	33°05′32.5256"	100°51′25.9996"
EASTING	1,246,671.66	EASTING	1,246,933.46		
ELEVATION	2,033.72				

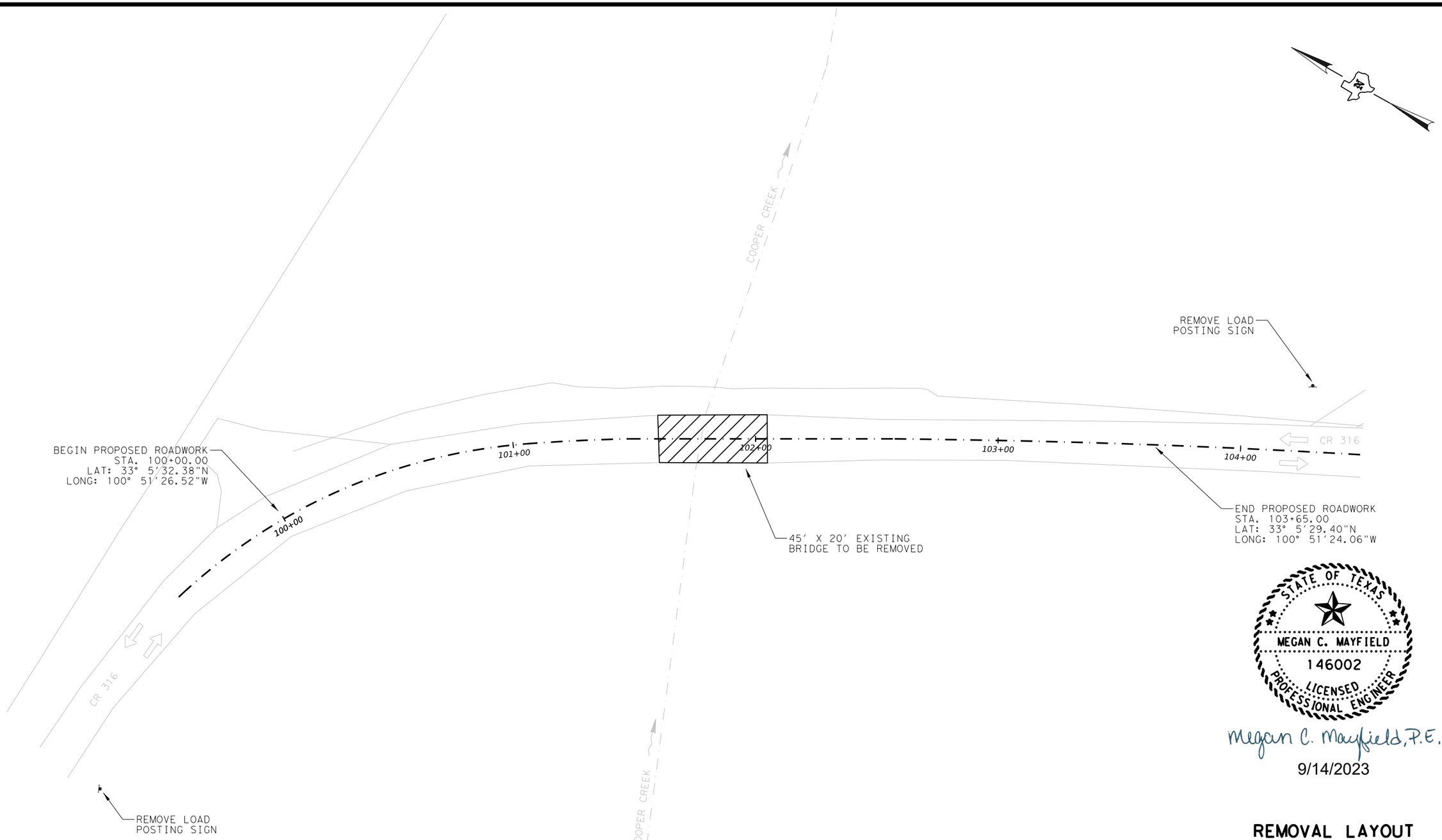
STATE OF TEXAS
REGISTERED
KEITH L. RAYBURN
5665
PROFESSIONAL
LAND SURVEYOR

9/14/2023

TEXAS DEPARTMENT OF TRANSPORTATION
ABILENE DISTRICT
4250 North Clack Street
Abilene, Texas 79601
PHONE: (325) 676 - 6800

CR 316 COOPER CREEK SURVEY CONTROL DATA

FED. RD. DIV. NO.	STATE	FEDERAL AID PROJECT NO.			HIGHWAY NO.
6	TEXAS	SEE TITLE SHEET			CR 316
STATE DISTRICT NO.	COUNTY	CONTROL NO.	SECTION NO.	JOB NO.	SHEET NO.
8	KENT	0908	27	006	27



STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED
PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

NOTE: REMOVE LOAD POSTING SIGN NEAR THE INTERSECTION OF CR 316 AND SH 208

REMOVAL LAYOUT

 Texas Department of Transportation

SCALE: 1" = 40′ SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		28
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/3. Roadway/028 REMOVAL LAYOUT
DATE: 9/14/2023 5:57:01 PM

HORIZONTAL ALIGNMENT REPORT
Alignment name: CR 316 ALIGN
Alignment description: CR 316 Horizontal Alignment
Report Created: Friday, June 2, 2023
Time: 05:28:11 PM

	STATION	X	Y
PC	99+45.750 R1	1246843.935	7089942.997
PI	100+28.684 R1	1246923.156	7089918.458
CC		1246774.392	7089718.490
PCC	101+05.207 R1	1246969.432	7089849.635
Radius:	235.031		
Delta:	38°52'20.439" Right		
Degree of Curvature(Arc):	24°22'40.805"		
Length:	159.457		
Tangent:	82.934		
Chord:	156.416		
Middle Ordinate:	13.394		
External:	14.203		
Tangent Back Direction:	S72°47'21.147"E		
Radial Direction:	S17°12'38.853"W		
Chord Direction:	S53°21'10.928"E		
Radial Direction:	S56°04'59.292"W		
Tangent Ahead Direction:	S33°55'00.708"E		

PCCBL CL-4	101+05.207 R1	1246969.432	7089849.635
PI	101+26.501 R1	1246981.333	7089831.977
CC		1246357.303	7089437.086
PTBL CL-	101+47.783 R1	1246992.196	7089813.662
Radius:	738.172		
Delta:	03°18'17.045" Right		
Degree of Curvature(Arc):	07°45'42.644"		
Length:	42.577		
Tangent:	21.294		
Chord:	42.571		
Middle Ordinate:	0.307		
External:	0.307		
Tangent Back Direction:	S33°58'41.954"E		
Radial Direction:	S56°01'18.046"W		
Chord Direction:	S32°19'33.431"E		
Radial Direction:	S59°19'35.092"W		
Tangent Ahead Direction:	S30°40'24.908"E		

PT	101+47.783 R1	1246992.196	7089813.662
PC	102+57.325 R1	1247046.196	7089718.355
Tangential Direction:	S29°32'08.473"E		
Tangential Length:	109.542		

PC	102+57.325 R1	1247046.196	7089718.355
PI	103+60.720 R1	1247096.304	7089627.914
CC		1243590.655	7087803.850
PT	104+64.067 R1	1247141.613	7089534.975
Radius:	3950.455		
Delta:	02°59'54.628" Right		
Degree of Curvature(Arc):	01°27'01.292"		
Length:	206.742		
Tangent:	103.395		
Chord:	206.719		
Middle Ordinate:	1.352		
External:	1.353		
Tangent Back Direction:	S28°59'17.417"E		
Radial Direction:	S61°00'42.583"W		
Chord Direction:	S27°29'20.104"E		
Radial Direction:	S64°00'37.210"W		
Tangent Ahead Direction:	S25°59'22.790"E		

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
ALIGNMENT DATA

Texas Department of Transportation

SCALE: N/A SHEET 1 OF 2

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		29
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

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DATE: 9/14/2023 5:31:31 PM

VERTICAL ALIGNMENT REPORT
Alignment name: CR 316 PROFILE
Alignment description:
Report Created: Friday, July 21, 2023
Time: 3:05:57 PM

	STATION	ELEVATION
POT	99+45.750 R1	2033.728
VPI	99+57.140 R1	2033.494
Tangent Grade:	-0.021	
Tangent Length:	11.390	
VPI	99+57.140 R1	2033.494
VPI	99+60.130 R1	2033.422
Tangent Grade:	-0.024	
Tangent Length:	2.990	
VPI	99+60.130 R1	2033.422
VPI	99+68.530 R1	2033.442
Tangent Grade:	0.002	
Tangent Length:	8.399	
VPI	99+68.530 R1	2033.442
VPI	99+79.919 R1	2033.447
Tangent Grade:	0.000	
Tangent Length:	11.390	
VPI	99+79.919 R1	2033.447
VPI	99+88.905 R1	2033.435
Tangent Grade:	-0.001	
Tangent Length:	8.986	
VPI	99+88.905 R1	2033.435
VPI	99+91.309 R1	2033.754
Tangent Grade:	0.034	
Tangent Length:	9.335	
VPI	99+98.240 R1	2033.754
VPC	100+01.461 R1	2033.798
Tangent Grade:	0.014	
Tangent Length:	3.221	
VPC	100+01.461 R1	2033.798
VPI	100+37.470 R1	2034.290
VPT	100+73.479 R1	2036.148
Length:	72.018	
Entrance Grade:	0.014	
Exit Grade:	0.052	
K Value =:	19.003	
Middle Ordinate (E):	0.341	
VPT	100+73.479 R1	2036.148
VPC	100+79.512 R1	2036.459
Tangent Grade:	0.052	
Tangent Length:	6.033	
VPC	100+79.512 R1	2036.459
VPI	101+16.660 R1	2038.375
VPT	101+53.808 R1	2038.515

	STATION	ELEVATION
Length:	74.296	
Entrance Grade:	0.052	
Exit Grade:	0.004	
K Value =:	15.543	
Middle Ordinate (E):	-0.444	
VPT	101+53.808 R1	2038.515
VPC	102+21.399 R1	2038.770
Tangent Grade:	0.004	
Tangent Length:	67.591	
VPC	102+21.399 R1	2038.770
VPI	102+55.280 R1	2038.898
VPT	102+89.161 R1	2037.990
VHP	102+29.767 R1	2038.786
Length:	67.761	
Entrance Grade:	0.004	
Exit Grade:	-0.027	
K Value =:	22.158	
Middle Ordinate (E):	-0.259	
VPT	102+89.161 R1	2037.990
VPC	102+94.108 R1	2037.858
Tangent Grade:	-0.027	
Tangent Length:	4.948	
VPC	102+94.108 R1	2037.858
VPI	103+29.500 R1	2036.909
VPT	103+64.892 R1	2037.385
VLP	103+41.229 R1	2037.226
Length:	70.783	
Entrance Grade:	-0.027	
Exit Grade:	0.013	
K Value =:	17.580	
Middle Ordinate (E):	0.356	
VPT	103+64.892 R1	2037.385
VPI	103+73.140 R1	2037.496
Tangent Grade:	0.013	
Tangent Length:	8.248	
VPI	103+73.140 R1	2037.496
VPI	104+11.170 R1	2038.177
Tangent Grade:	0.018	
Tangent Length:	38.030	
VPI	104+11.170 R1	2038.177
POT	104+64.067 R1	2039.771
Tangent Grade:	0.030	
Tangent Length:	52.897	

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
ALIGNMENT DATA

Texas Department of Transportation

SCALE: N/A SHEET 2 OF 2

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		30
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

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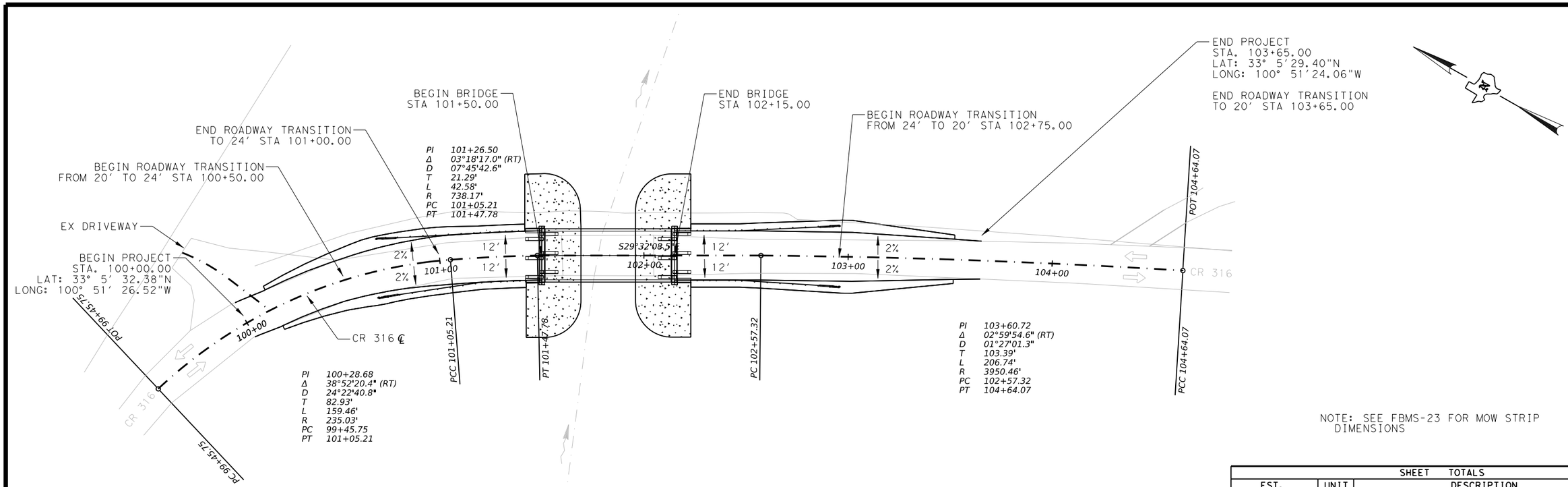
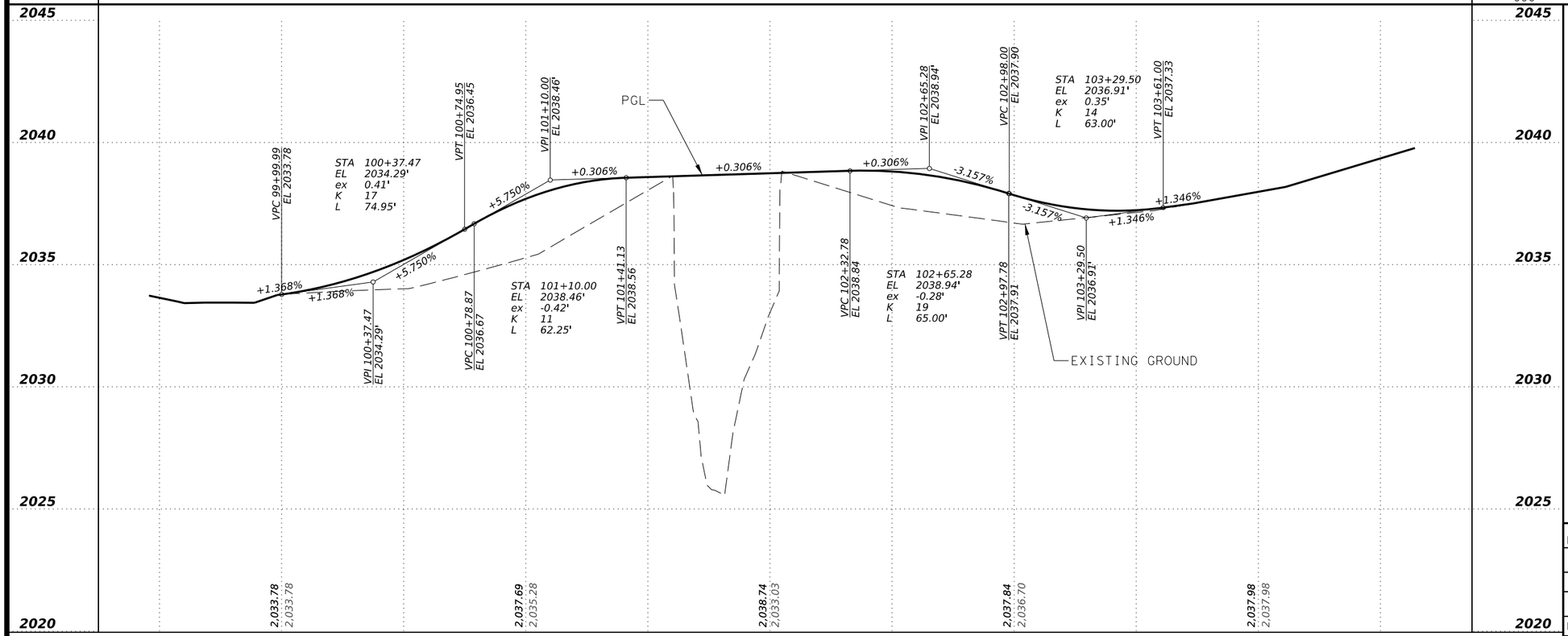
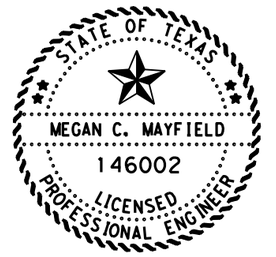


NOTE: SEE FBMS-23 FOR MOW STRIP DIMENSIONS

SHEET TOTALS		
EST.	UNIT	DESCRIPTION
16	CY	110 6001 EXCAVATION (ROADWAY)
824	CY	110 6002 EXCAVATION (CHANNEL)
558	CY	132 6004 EMBANKMENT(FINAL)(DENS CONT)(TY B)





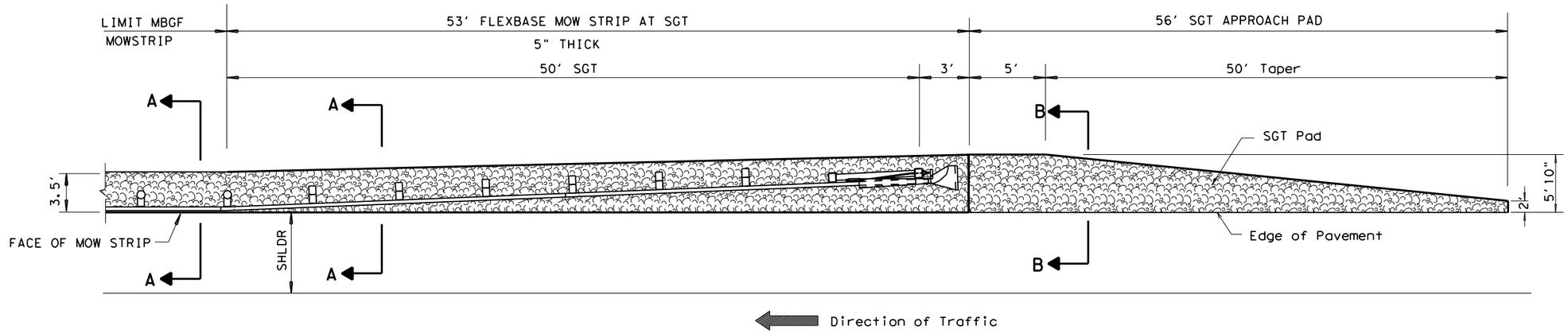
Megan C. Mayfield, P.E.
9/14/2023

PLAN AND PROFILE

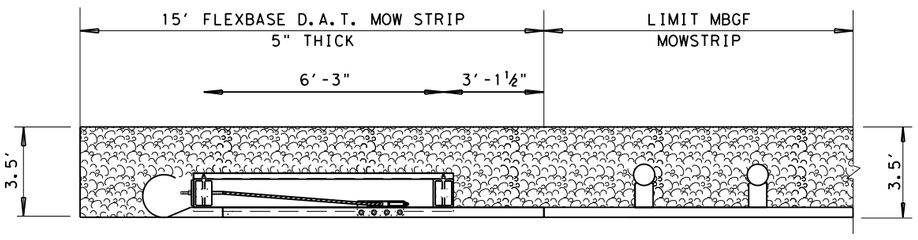
 Texas Department of Transportation

SCALE: H: 1"=50' V: 1"=5' SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		31
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

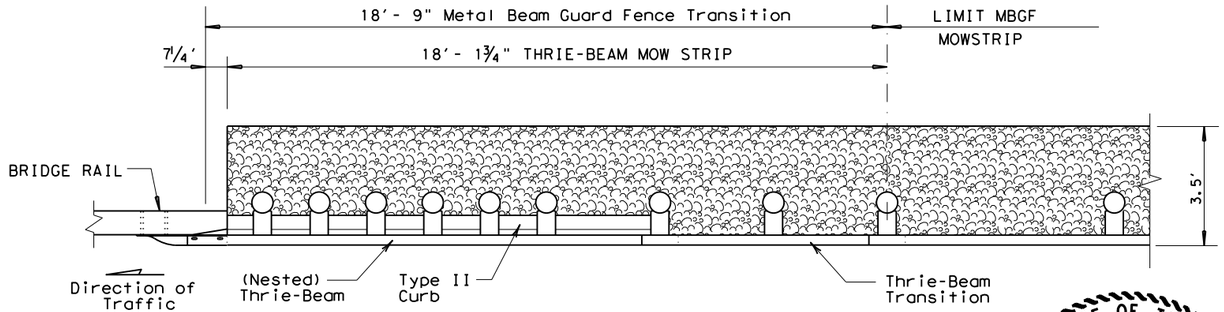


PLAN VIEW OF MOW STRIP AT SGT



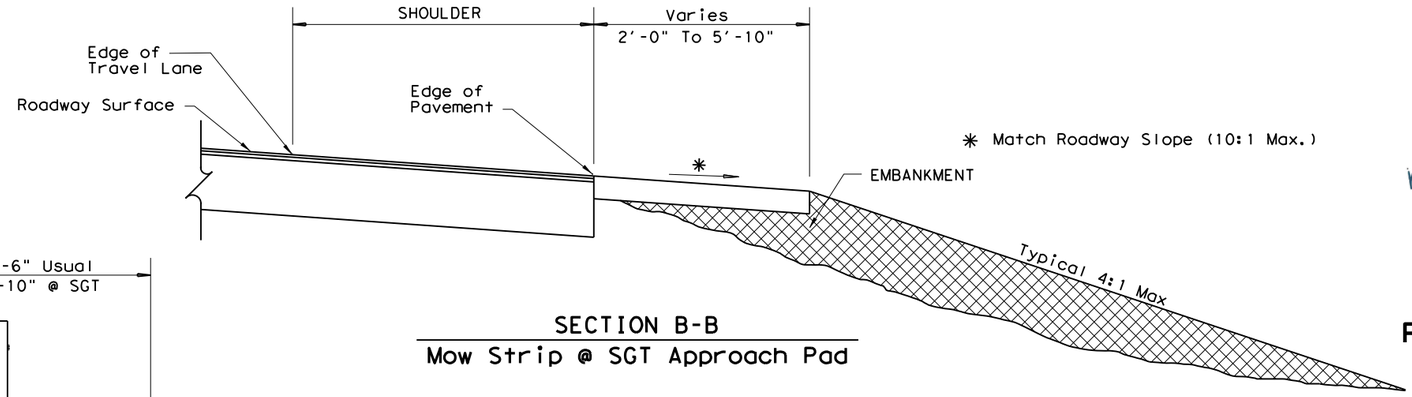
PLAN VIEW OF MOW STRIP AT DAT

18'- 1¾" THRIE-BEAM MOW STRIP

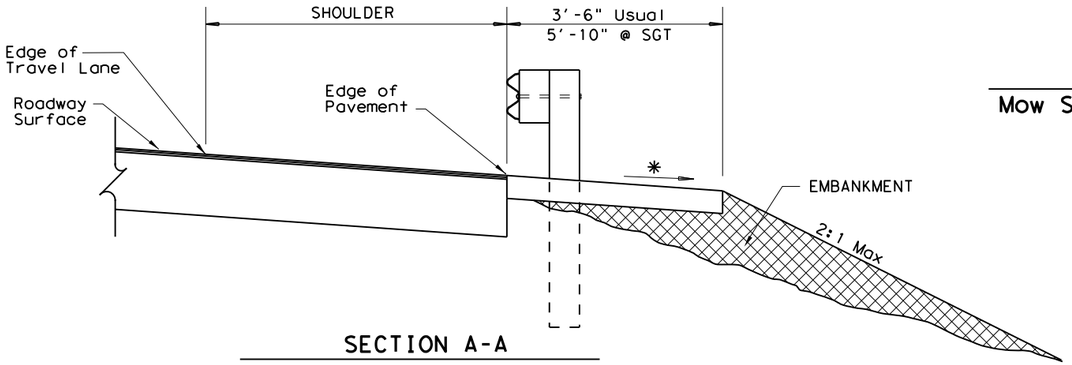


PLAN VIEW OF SGT APPROACH PAD

PLAN VIEW OF THRIE-BEAM MOW STRIP



SECTION B-B
Mow Strip @ SGT Approach Pad



SECTION A-A
Mow Strip @ MBGF & SGT

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

ROADWAY DETAILS
FLEXBASE MOW STRIPS
FBMS-23

Texas Department of Transportation

NO SCALE

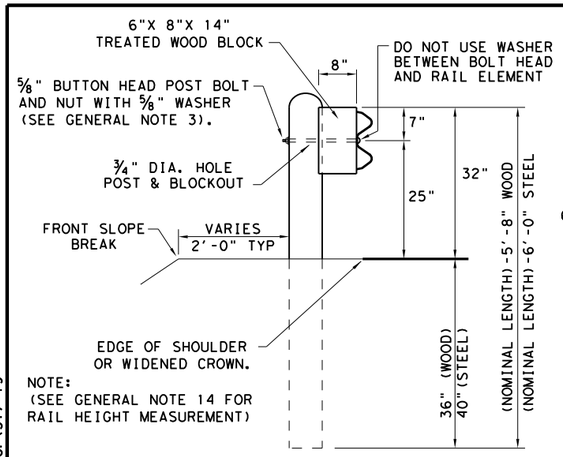
SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		32
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

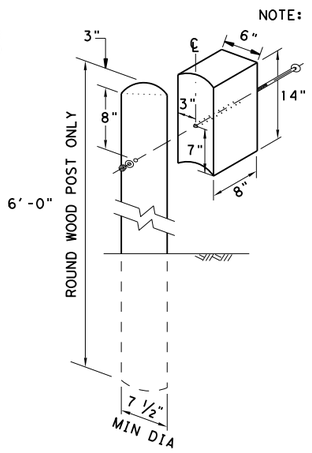
REV. DATE: 02/2014

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/3. Roadway/032 FBMS-23.dgn
DATE: 9/14/2023 6:35:57 PM

DATE: 9/14/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/3. Roadway/033 GF(31)-19

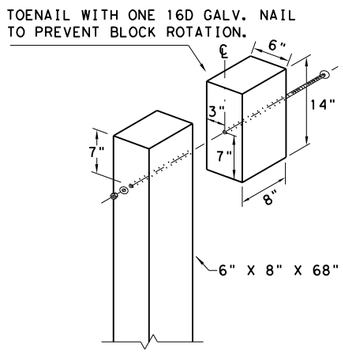


TYPICAL POST PLACEMENT

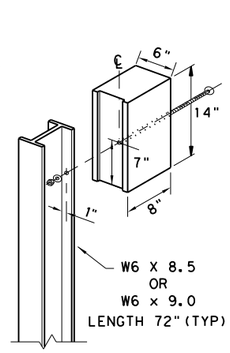


WOOD BLOCK TO ROUND WOOD POST

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

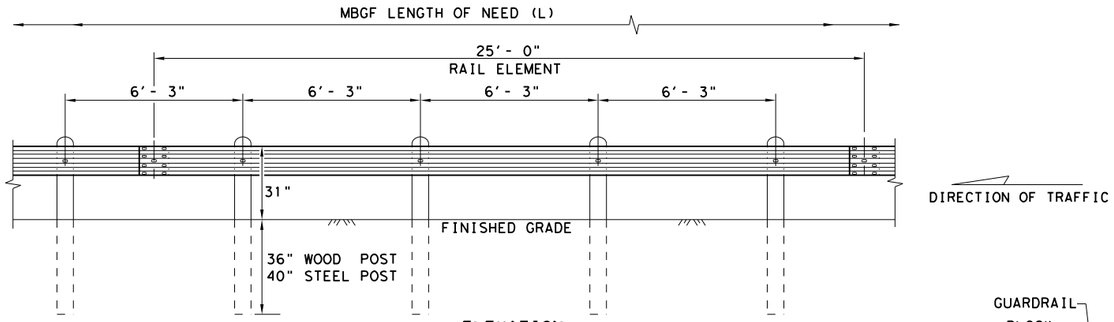


WOOD BLOCK TO RECTANGULAR WOOD POST



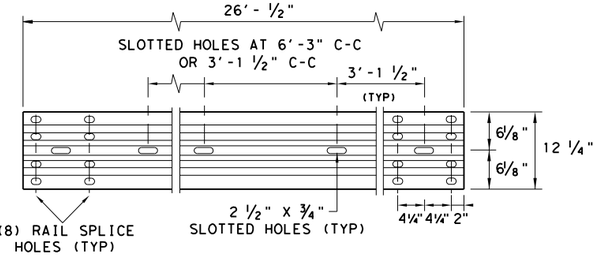
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

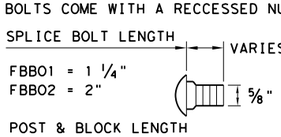
SHOWING A 25'- 0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

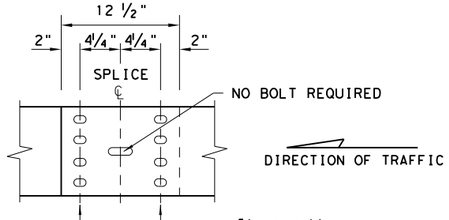
NOTES: SEE GENERAL NOTE 2 FOR ALLOWABLE RAIL TYPES.
SEE RAIL SPLICE DETAIL FOR REQUIRED HARDWARE.

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



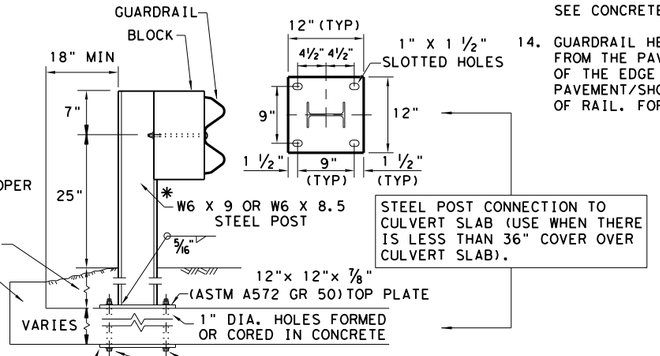
BUTTON HEAD BOLT

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
REVISIONS	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		33

DATE: 9/14/2023 6:12:21 PM
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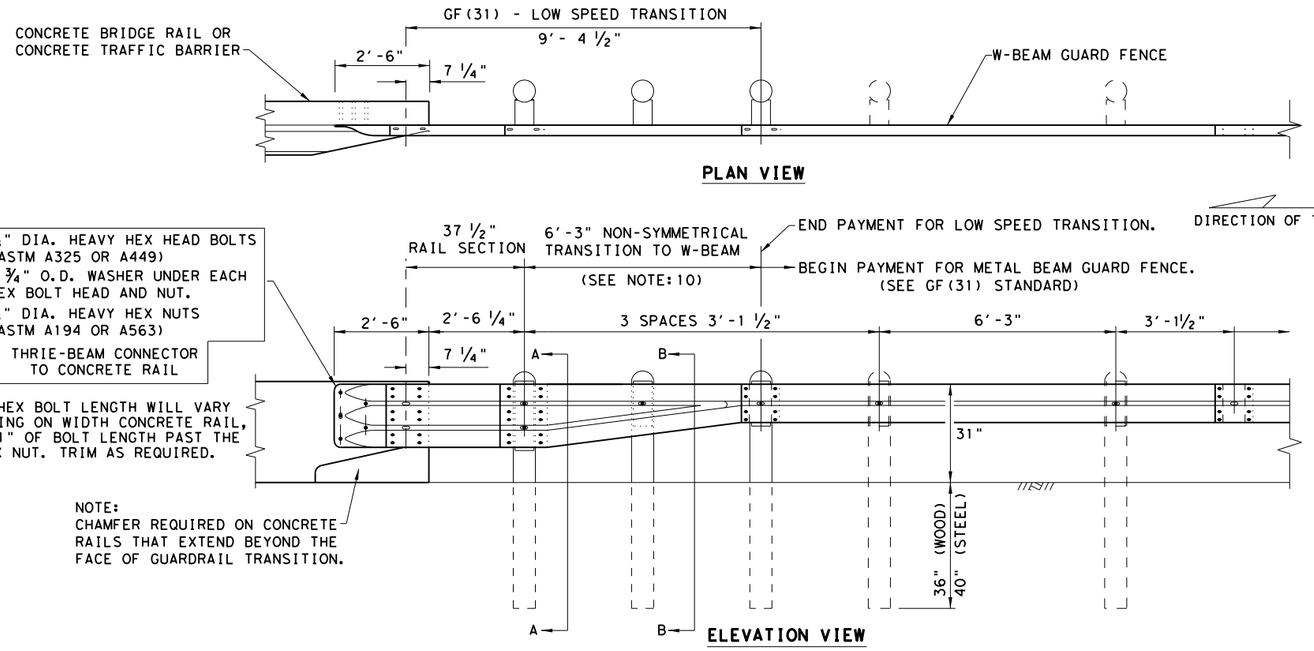
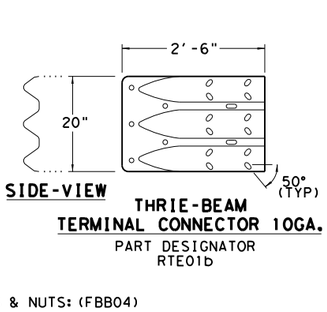
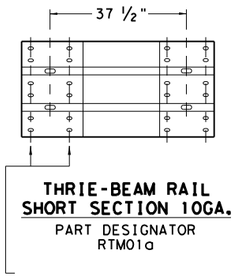
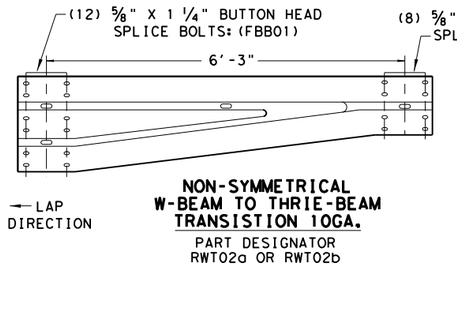


GENERAL NOTES

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 TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. REFER TO GF(31)STANDARD SHEET.
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS.
3. 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.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM BOLT LENGTH TO MEET REQUIRED LENGTH.
5. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
7. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
8. 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 CAN FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO GF(31)STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
10. FOR ROUND WOOD POSTS SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE TRANSITION.







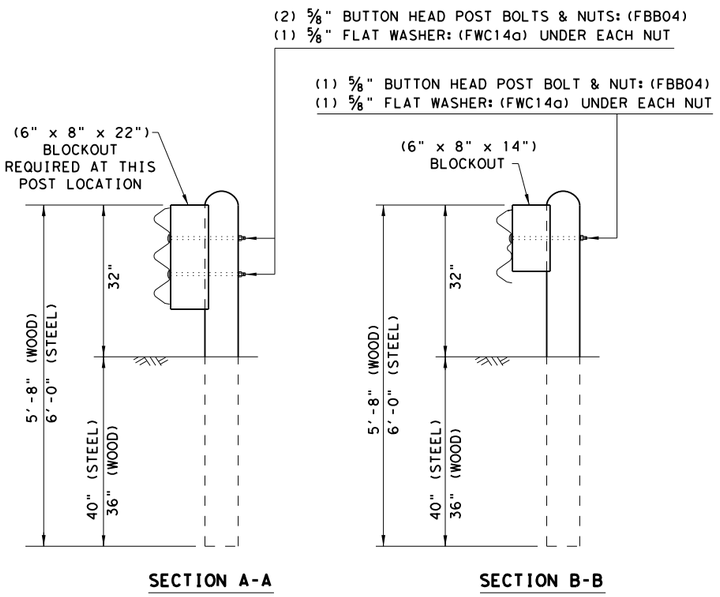
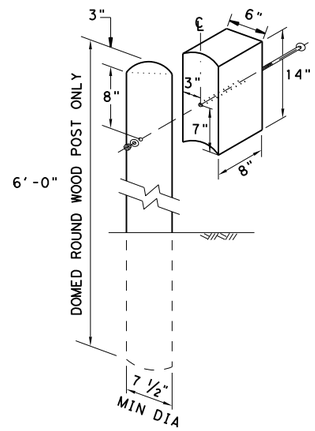
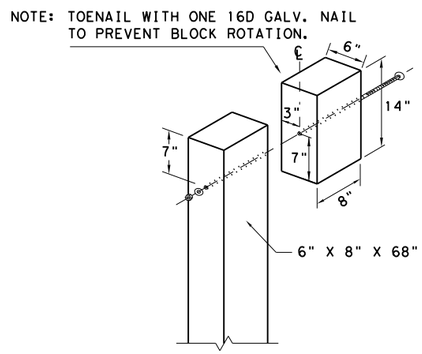
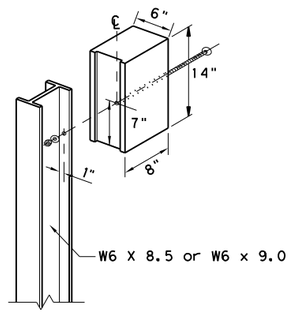


PLATE WASHER INSTRUCTIONS

BRIDGE APPROACH - UPSTREAM: THE SHORT RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.







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

LOW-SPEED TRANSITION

Texas Department of Transportation | Design Division Standard

METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-2 MASH COMPLIANT

GF(31)TR TL2-19

FILE: gf31trtl219.dgn		DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB		HIGHWAY	
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	ABL	KENT			34	

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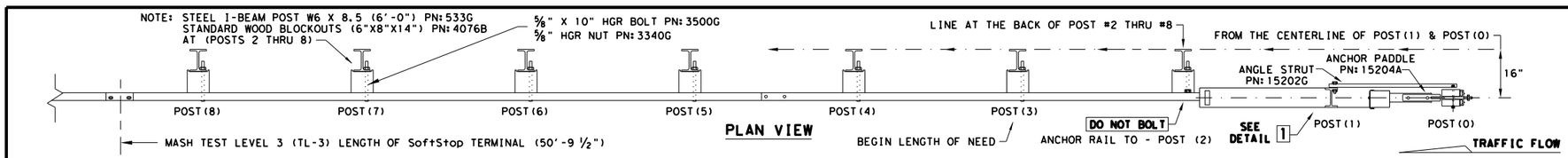
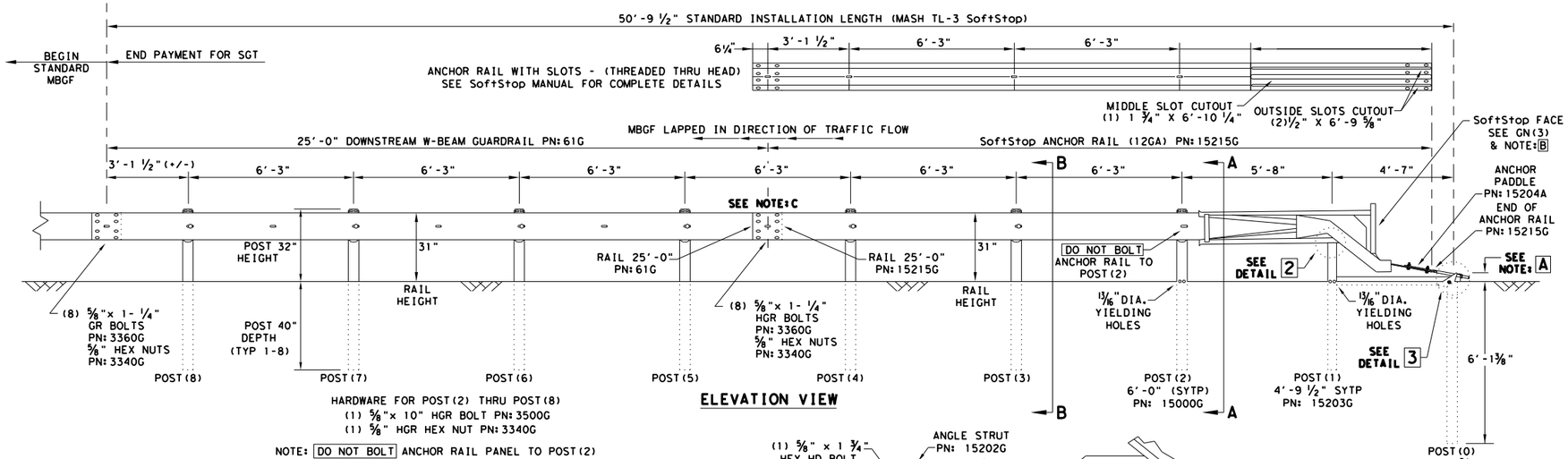
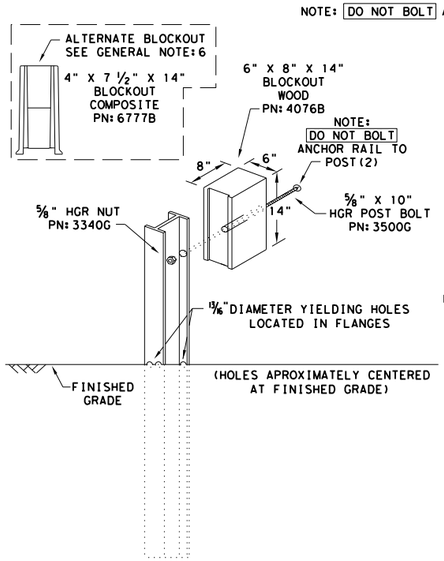


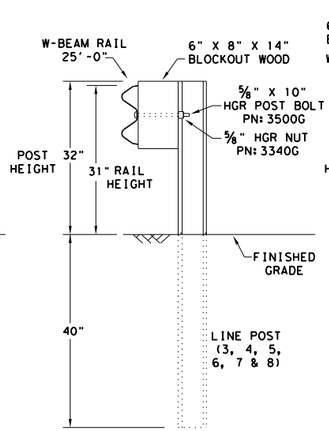




ISOMETRIC VIEW POST(1 & 2)

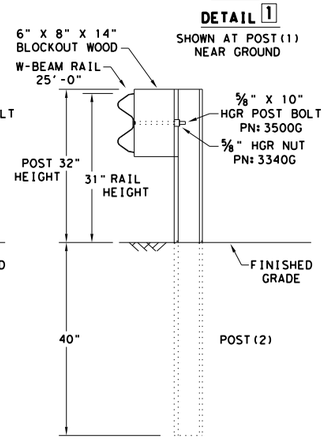
W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)



SECTION VIEW B-B

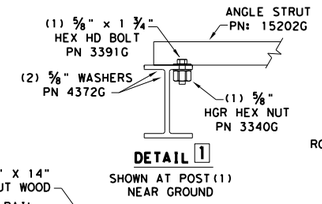
6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G



SECTION VIEW A-A

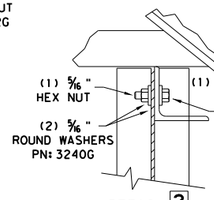
6'-0" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15000G

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



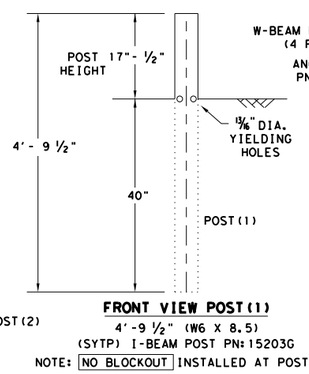
DETAIL 1

SHOWN AT POST(1) NEAR GROUND



DETAIL 2

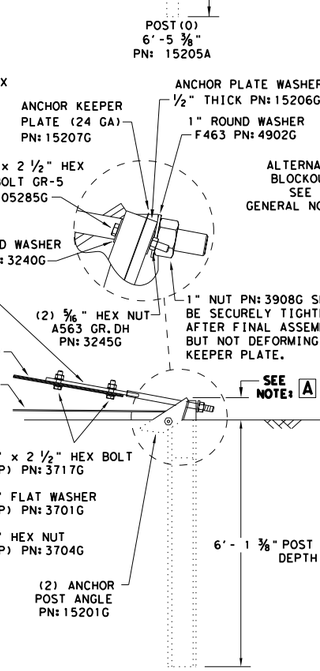
SHOWN AT POST(1)



FRONT VIEW POST(1)

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

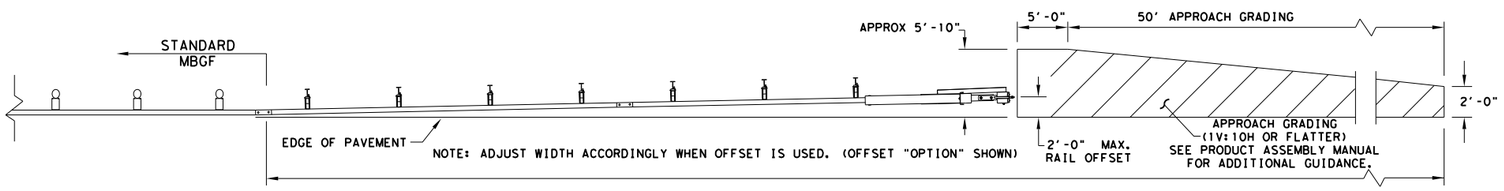
NOTE: NO BLOCKOUT INSTALLED AT POST(1)



DETAIL 3 AT POST(0)

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

TRAFFIC FLOW



APPROACH GRADING AT GUARDRAIL END TREATMENTS

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
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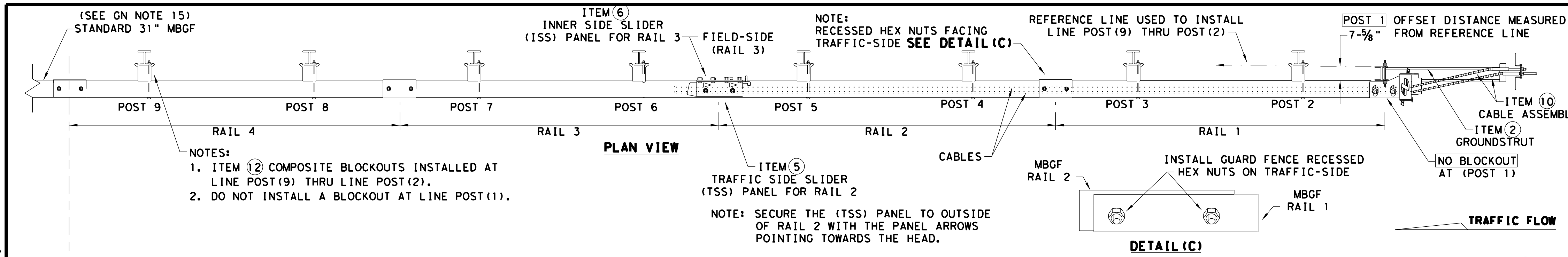
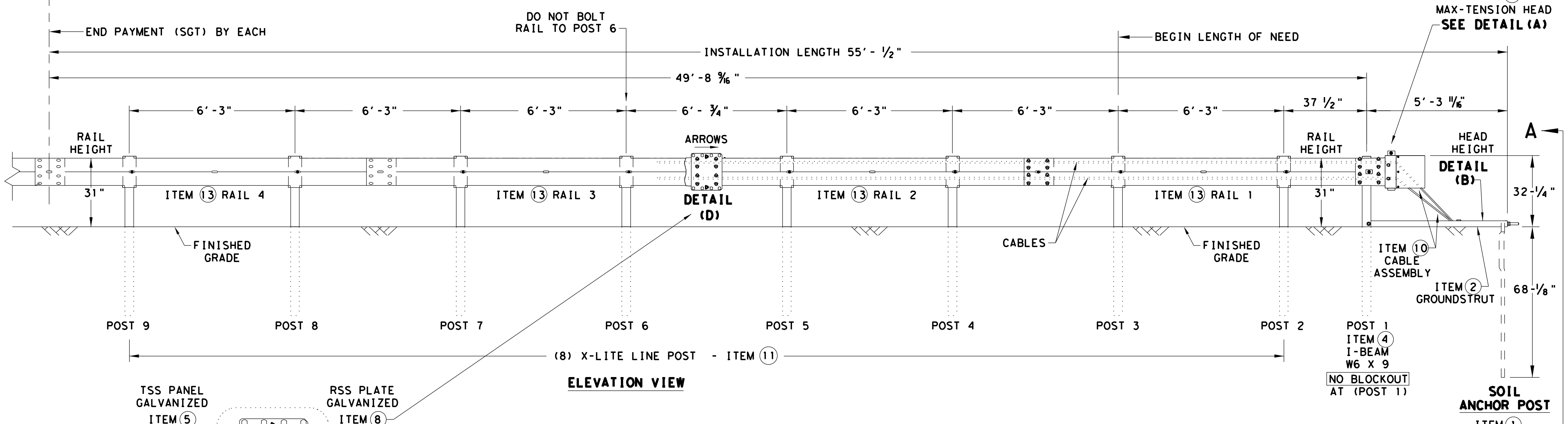
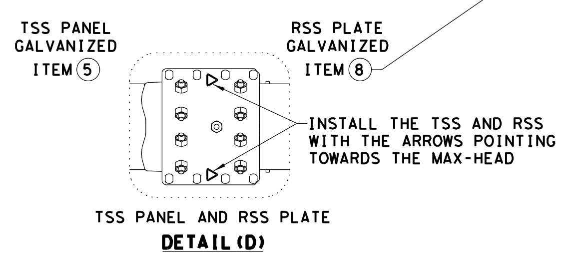
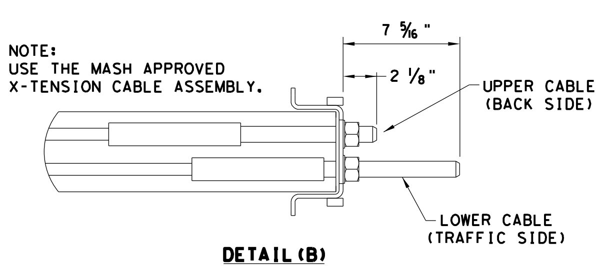
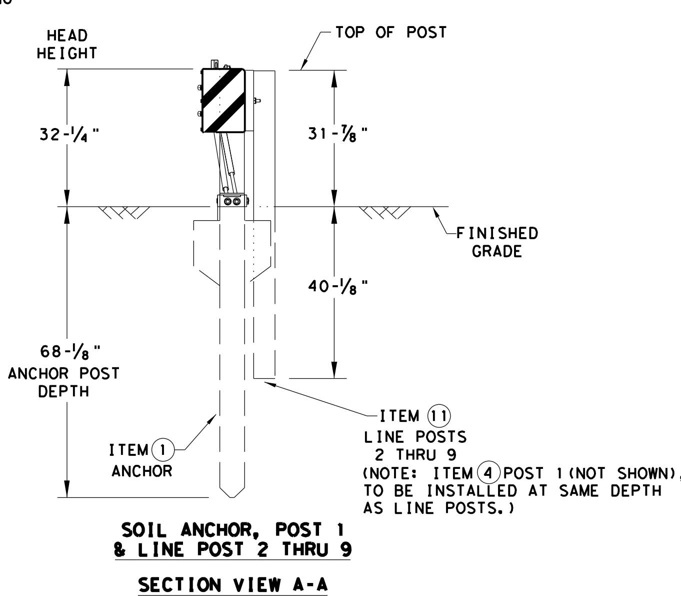
	ABL	KENT		35

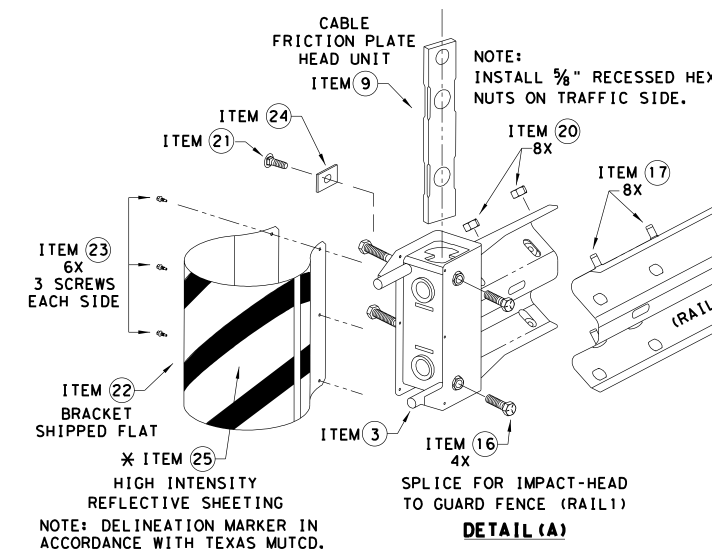












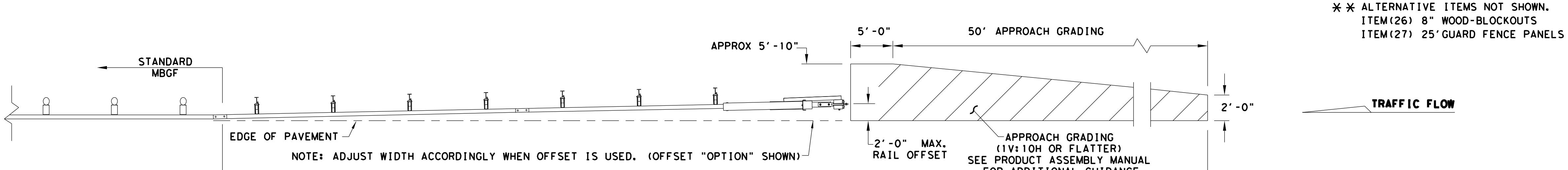
GENERAL NOTES

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

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

* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation — Design Division Standard

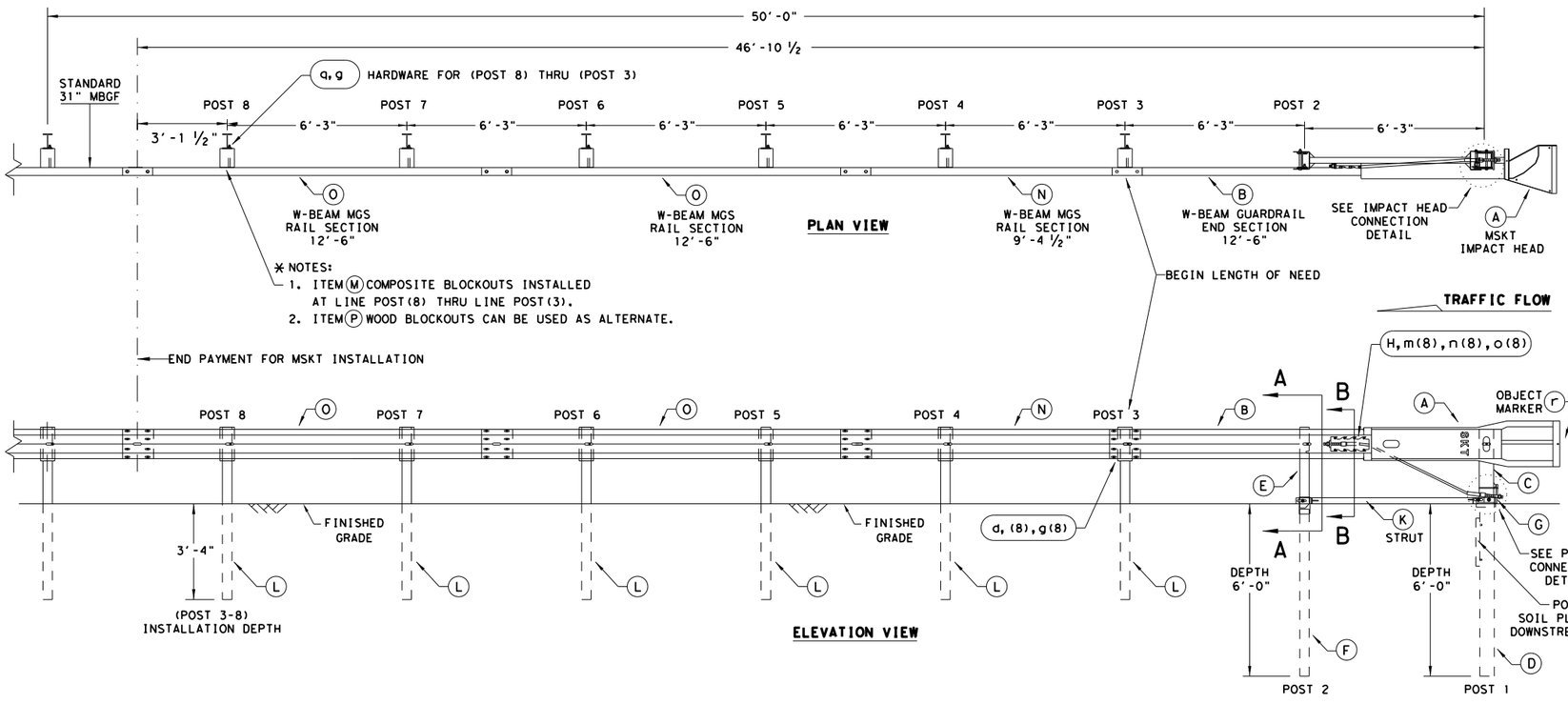
MAX-TENSION END TERMINAL MASH - TL-3

SGT(11S)31-18

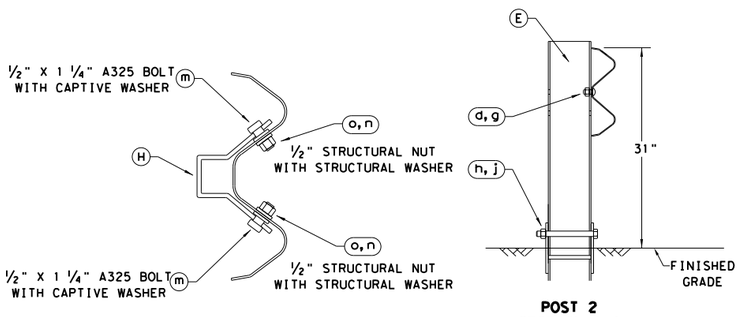
FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	CK: CL
© TxDOT: FEBRUARY 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
	DIST		COUNTY	SHEET NO.
	ABL		KENT	36

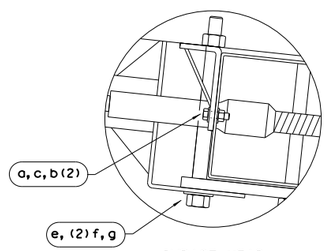
DATE: 9/14/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/...

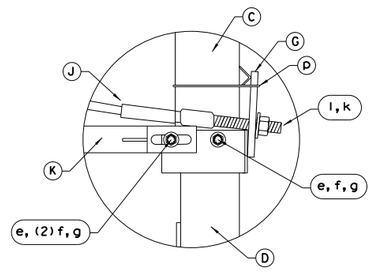
DATE: 9/14/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/3. Roadway/037 SGT (12S)31-18



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







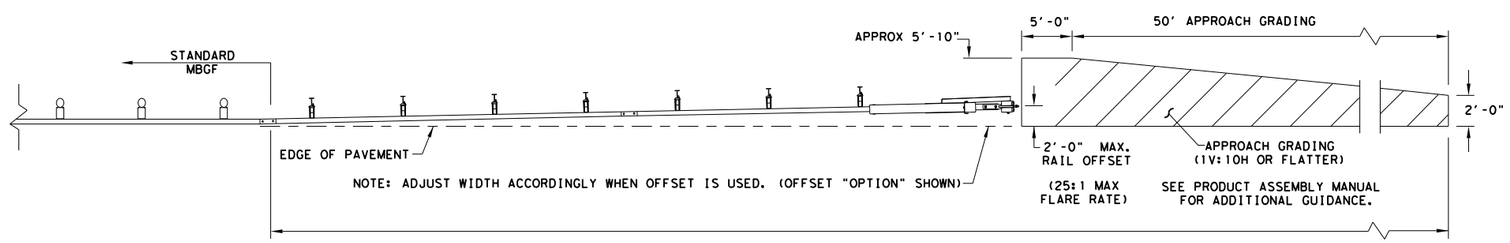
GENERAL NOTES

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

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

SEE NOTES: *

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



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

APPROACH GRADING AT GUARDRAIL END TREATMENTS

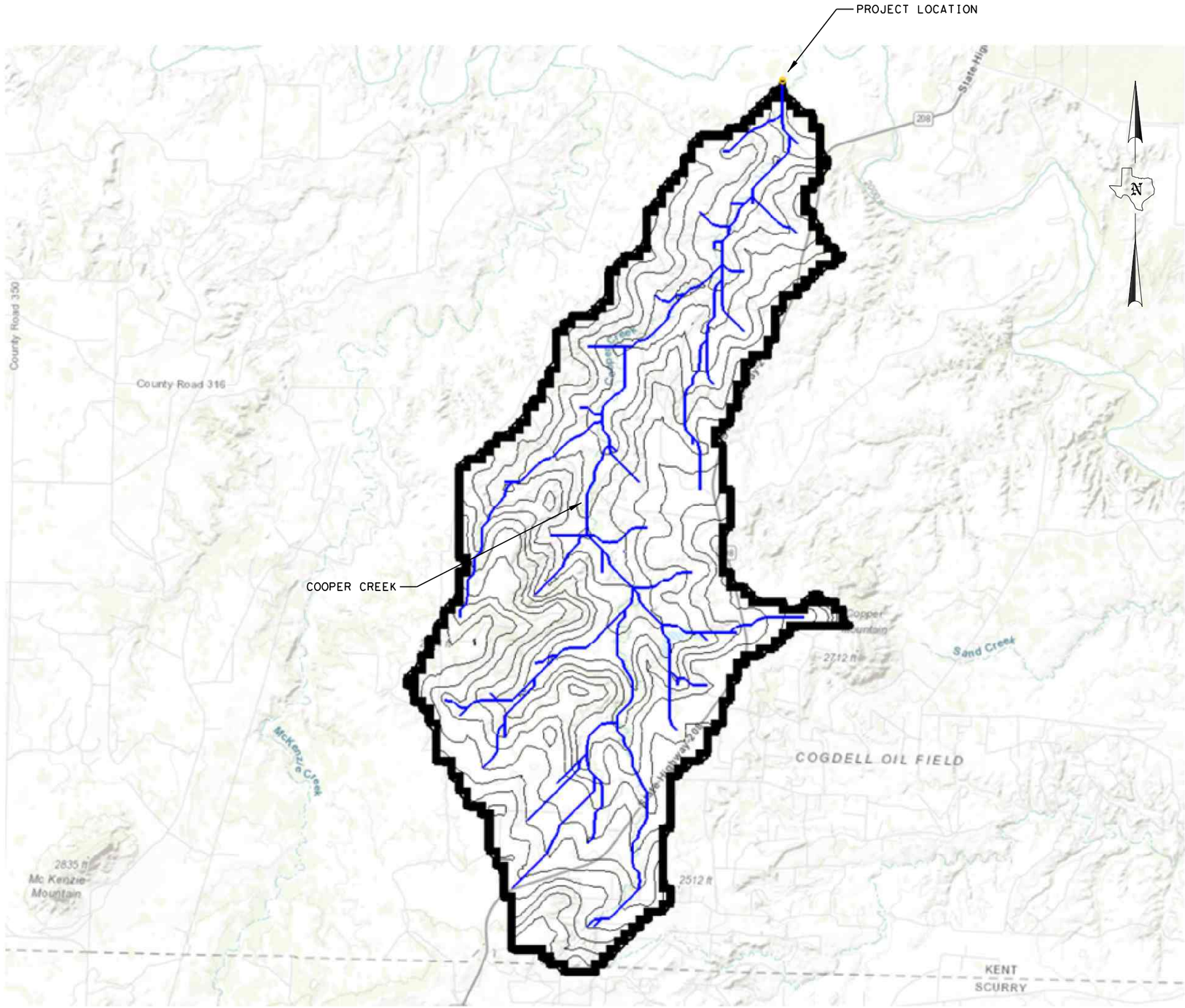
NOTE: TXDOT GENERIC APPROACH GRADING LAYOUT USED FOR ALL TANGENT TYPE END TREATMENTS.

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

Texas Department of Transportation — Design Division Standard

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

FILE: sgt12s3118.dgn	DN:TxDOT	CK:KM	DW:VP	CK:CL	
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS	0908	27	006	CR 316	
	DIST	COUNTY		SHEET NO.	
	ABL	KENT		37	



WMS PEAK FLOWS	
EVENT	PEAK DISCHARGE FLOW (CFS)
2 YR	41.18
10 YR	330.24
25 YR	653.95
50 YR	970.27
100 YR	1372.57

NOTES:
1. DRAINAGE AREA ANALYSIS DONE IN WMS 11.1.6
2. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM
3. TIME OF CONCENTRATION IS 17.675 HOURS
4. MAX STREAM LENGTH IS 10.78 MILES
5. CURVE NUMBER IS 48.393 BASED ON LAND USE DATA
6. AREA OF WATERSHED IS 19.21 SQ. MI

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

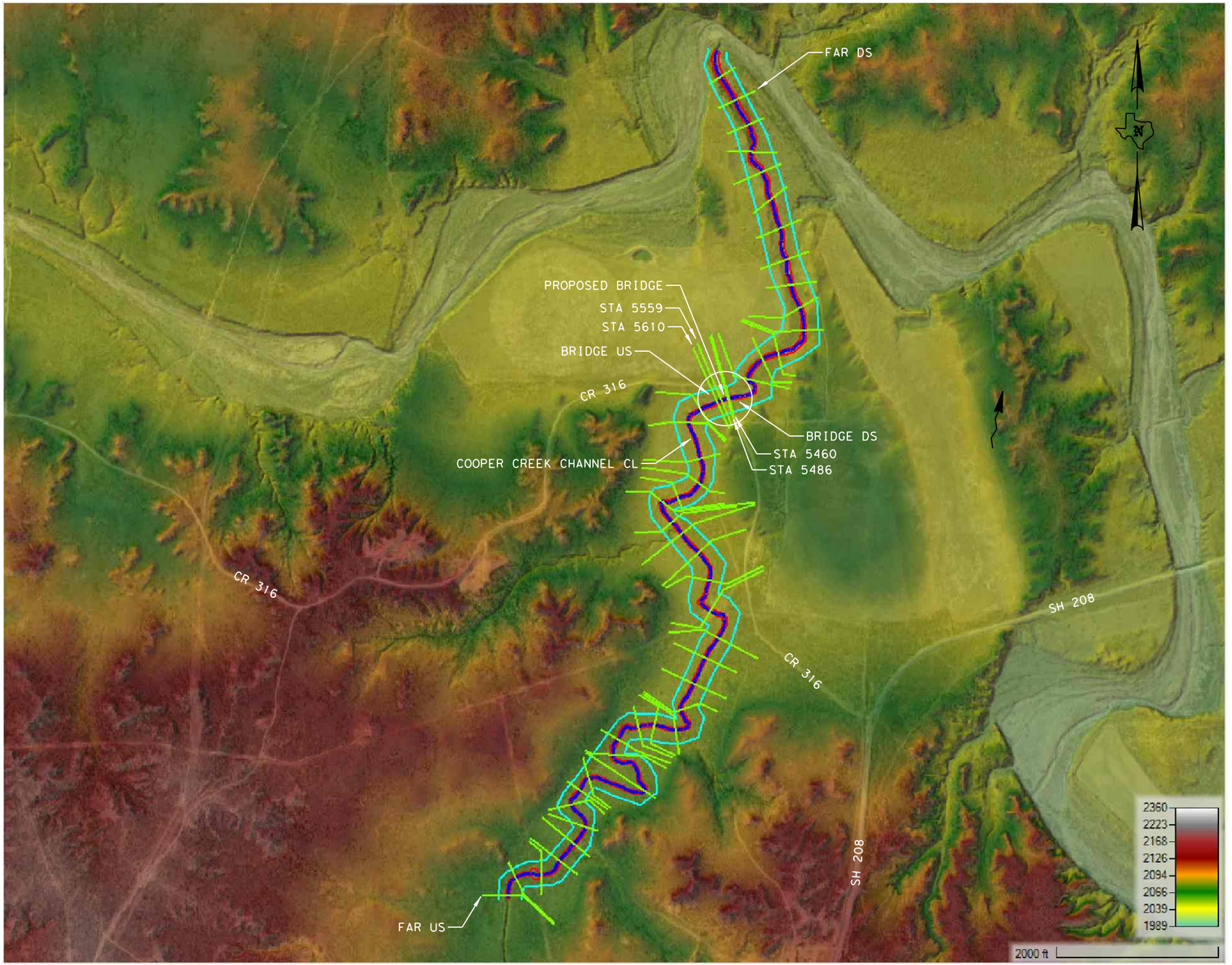
Megan C. Mayfield, P.E.
9/14/2023

CR 316
DRAINAGE AREA MAP

SCALE: N/A SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		38
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/5. Drainage/038 DRAINAGE AREA MAP
DATE: 9/14/2023 5:33:32 PM



NOTES:

1. HEC-RAS VERSION 6.3.1 WAS USED TO MODEL STORMWATER FLOWS AT THIS BRIDGE SITE FOR EXISTING AND PROPOSED CONDITIONS
2. CRITICAL HYDRAULIC DATA CALCULATED FOR EXISTING AND PROPOSED STRUCTURES ARE PROVIDED IN THE TABLES ON THE FOLLOWING HYDRAULIC DATA SHEETS
3. THIS SITE IS LOCATED IN A UNMAPPED FEMA ZONE

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
BRIDGE HYDRAULIC DATA

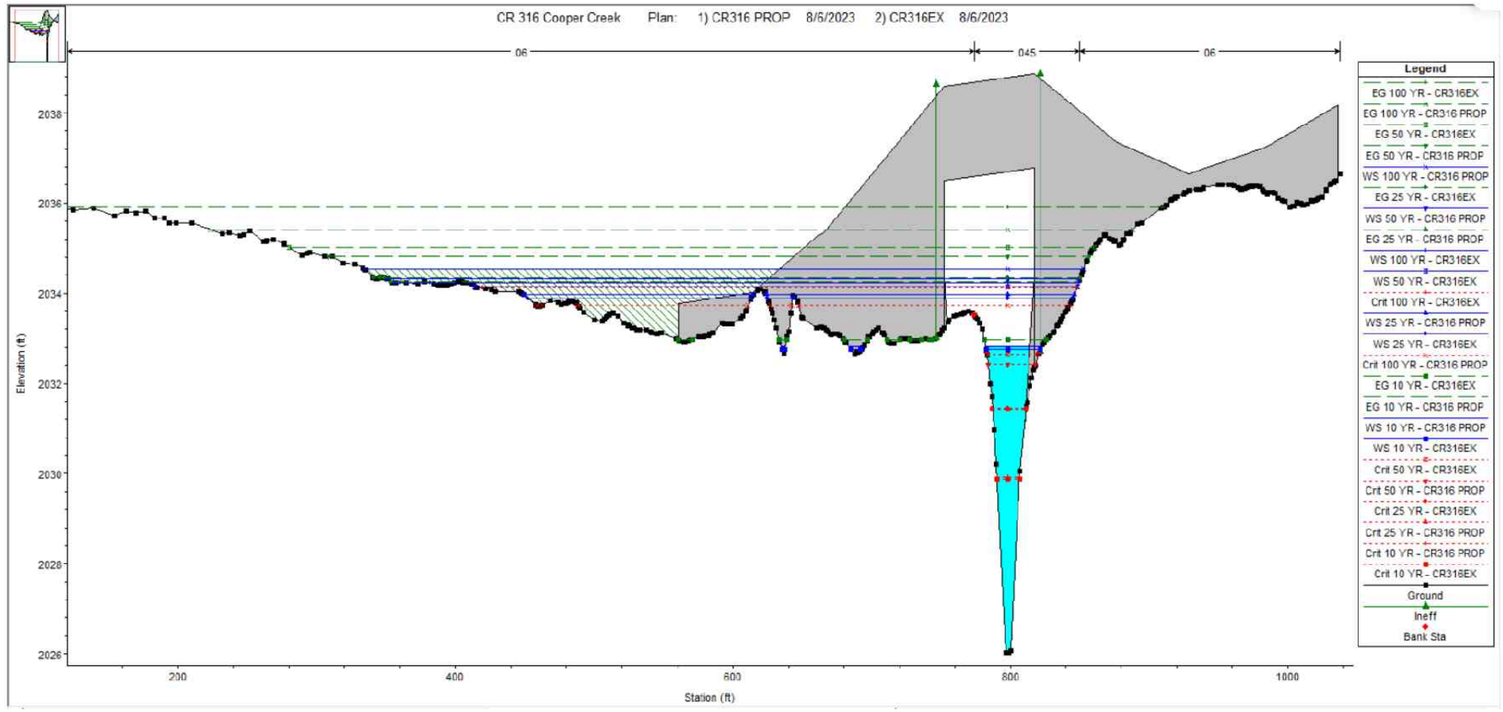
Texas Department of Transportation

SCALE: N/A

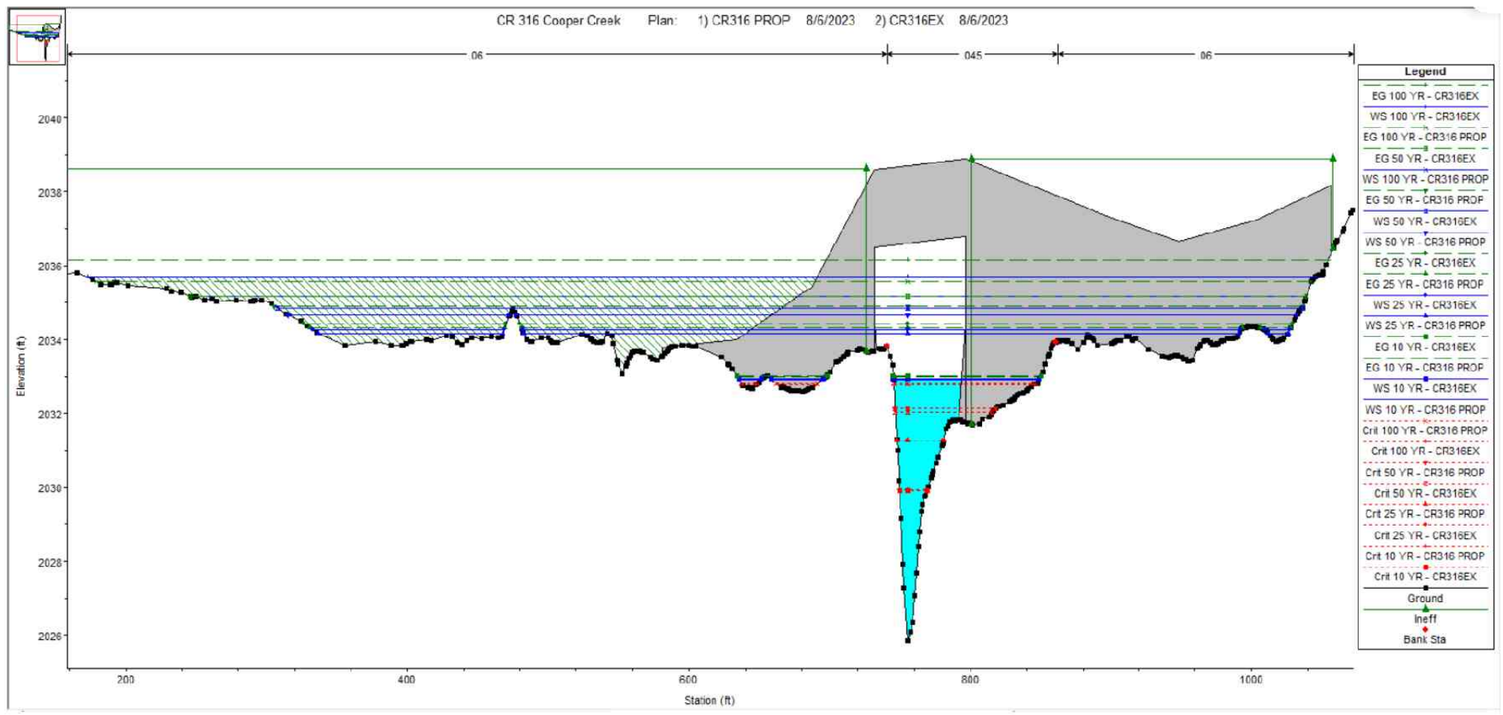
FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		39
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/5. Drainage/039-044 BRIDGE HYDRAULIC DATA
DATE: 9/14/2023 5:33:50 PM

BRG US



BRG DS



NOTES:
1. DATA COMES FROM HYDRAULIC ANALYSIS PREFORMED ON HEC-RAS VERSION 6.3.1

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

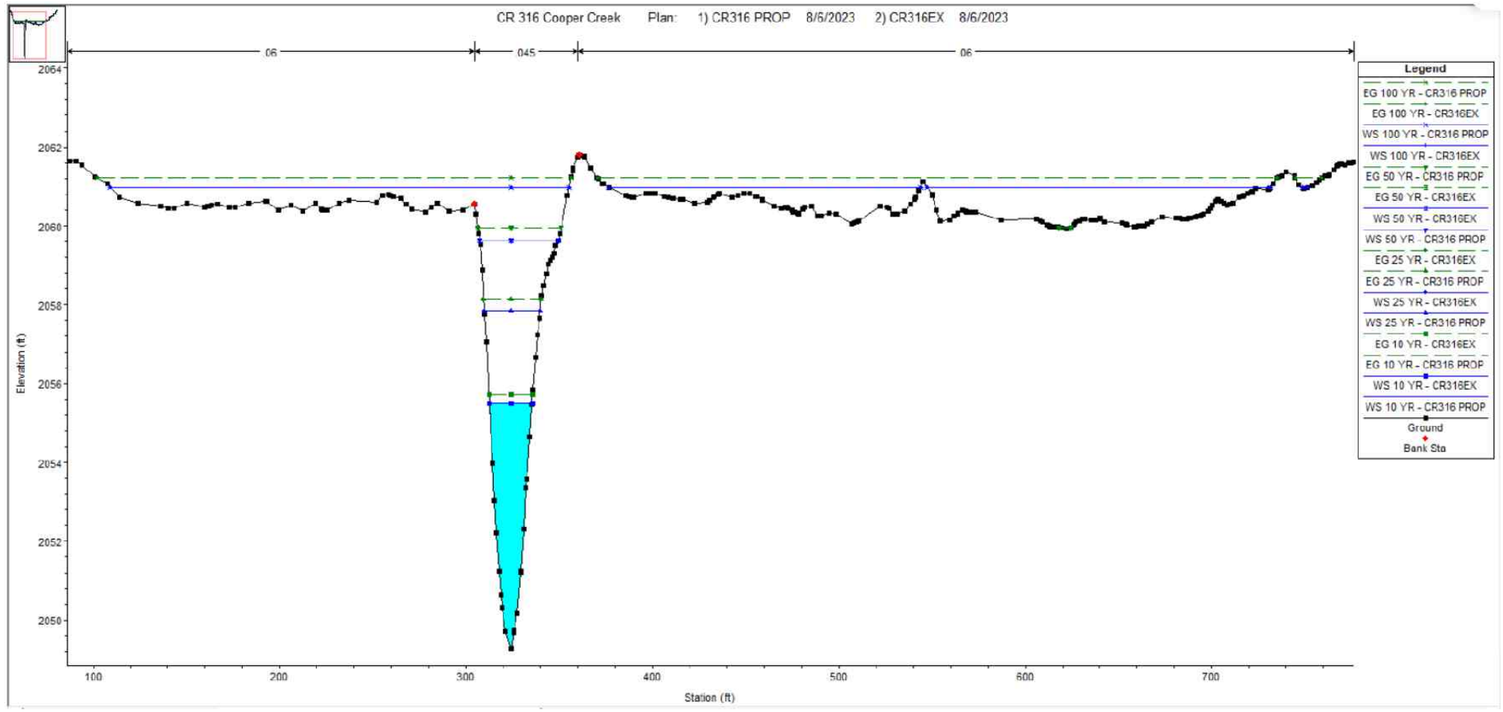
Megan C. Mayfield, P.E.
9/14/2023

CR 316
BRIDGE HYDRAULIC DATA

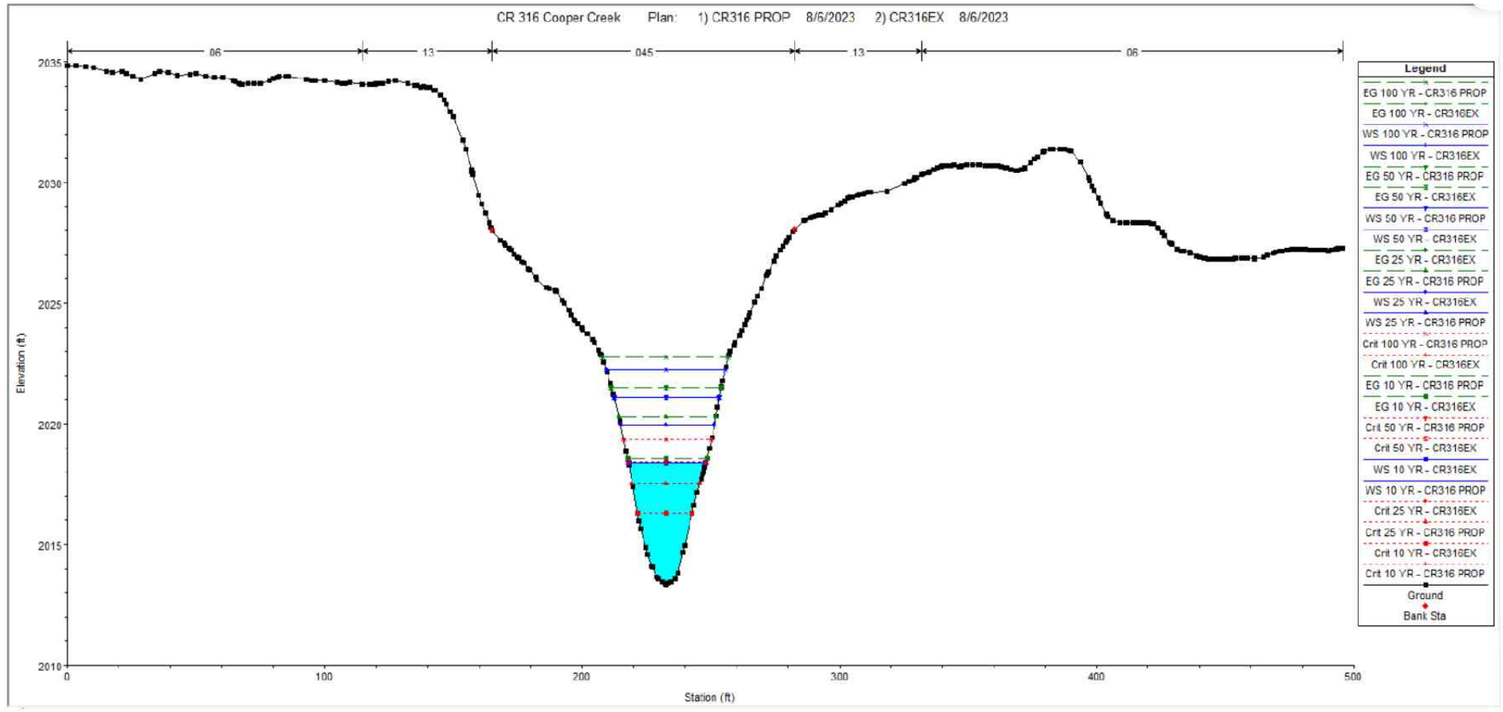
SCALE: N/A SHEET 2 OF 6

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		40
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

PROFILE AT FAR US



PROFILE AT FAR DS



STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED
PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

CR 316
BRIDGE HYDRAULIC DATA

Texas Department of Transportation

SCALE: N/A SHEET 3 OF 6

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		41
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

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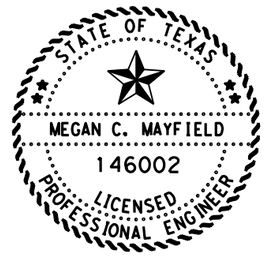
DATE: 9/14/2023 5:33:50 PM

Standard Table for Cooper Creek

Reach	River Sta	Profile	Q Total (cfs)		Min Ch Elev (ft)		W.S. Elev (ft)		Crit W.S. (ft)		E.G. Elev (ft)		E.G. Slope (ft/ft)		Vel Chnl (ft/s)		Flow Area (sq ft)		Top Width (ft)		Froude # Chl	
			CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP
Cooper Creek	15579	10 YR	330.24	330.24	2049.28	2049.28	2055.48	2055.48			2055.71	2055.71	0.002709	0.002709	3.80	3.80	86.88	86.88	22.73	22.73	0.34	0.34
Cooper Creek	15579	50 YR	970.27	970.27	2049.28	2049.28	2059.62	2059.62			2059.95	2059.95	0.002756	0.002756	4.63	4.63	209.64	209.64	42.08	42.08	0.37	0.37
Cooper Creek	15579	100 YR	1372.57	1372.57	2049.28	2049.28	2060.97	2060.97			2061.21	2061.21	0.002053	0.002053	4.25	4.25	555.60	555.60	599.50	599.50	0.32	0.32
Cooper Creek	15324	10 YR	330.24	330.24	2049.09	2049.09	2054.70	2054.70			2054.96	2054.96	0.003138	0.003138	4.09	4.09	80.70	80.70	20.43	20.43	0.36	0.36
Cooper Creek	15324	50 YR	970.27	970.27	2049.09	2049.09	2058.73	2058.73			2059.18	2059.18	0.003245	0.003245	5.39	5.39	179.94	179.94	29.95	29.95	0.39	0.39
Cooper Creek	15324	100 YR	1372.57	1372.57	2049.09	2049.09	2059.97	2059.97	2056.07	2056.07	2060.50	2060.50	0.003899	0.003899	5.97	5.97	285.61	285.61	268.23	268.23	0.43	0.43
Cooper Creek	15004	10 YR	330.24	330.24	2047.47	2047.47	2053.80	2053.80			2054.03	2054.03	0.002657	0.002657	3.82	3.82	86.34	86.34	21.42	21.42	0.34	0.34
Cooper Creek	15004	50 YR	970.27	970.27	2047.47	2047.47	2057.79	2057.79			2058.20	2058.20	0.002828	0.002828	5.12	5.12	189.35	189.35	30.80	30.80	0.36	0.36
Cooper Creek	15004	100 YR	1372.57	1372.57	2047.47	2047.47	2058.97	2058.97	2054.89	2054.89	2059.37	2059.37	0.002901	0.002901	5.35	5.35	399.85	399.85	375.08	375.08	0.37	0.37
Cooper Creek	14688	10 YR	330.24	330.24	2046.39	2046.39	2053.04	2053.04			2053.24	2053.24	0.002298	0.002298	3.61	3.61	91.49	91.49	22.10	22.10	0.31	0.31
Cooper Creek	14688	50 YR	970.27	970.27	2046.39	2046.39	2056.94	2056.94			2057.33	2057.33	0.002633	0.002633	5.00	5.00	196.06	196.06	55.50	55.50	0.35	0.35
Cooper Creek	14688	100 YR	1372.57	1372.57	2046.39	2046.39	2057.95	2057.95	2053.91	2053.91	2058.42	2058.42	0.003185	0.003185	5.70	5.70	311.35	311.35	267.62	267.62	0.39	0.39
Cooper Creek	14419	10 YR	330.24	330.24	2045.49	2045.49	2052.30	2052.30			2052.48	2052.48	0.003448	0.003448	3.42	3.42	96.48	96.48	22.11	22.11	0.29	0.29
Cooper Creek	14419	50 YR	970.27	970.27	2045.49	2045.49	2056.00	2056.00			2056.40	2056.40	0.004729	0.004729	5.04	5.04	193.15	193.15	54.65	54.65	0.35	0.35
Cooper Creek	14419	100 YR	1372.57	1372.57	2045.49	2045.49	2057.25	2057.25			2057.48	2057.48	0.003264	0.003264	4.34	4.34	535.31	535.31	527.12	527.12	0.30	0.30
Cooper Creek	14167	10 YR	330.24	330.24	2044.95	2044.95	2051.44	2051.44			2051.67	2051.67	0.002967	0.002967	3.89	3.89	84.80	84.80	22.82	22.82	0.36	0.36
Cooper Creek	14167	50 YR	970.27	970.27	2044.95	2044.95	2054.97	2054.97			2055.41	2055.41	0.003311	0.003311	5.28	5.28	183.75	183.75	33.74	33.74	0.40	0.40
Cooper Creek	14167	100 YR	1372.57	1372.57	2044.95	2044.95	2056.12	2056.12	2052.69	2052.69	2056.60	2056.60	0.003638	0.003638	5.74	5.74	332.28	332.28	371.15	371.15	0.42	0.42
Cooper Creek	13829	10 YR	330.24	330.24	2043.90	2043.90	2050.00	2050.00			2050.35	2050.35	0.005292	0.005292	4.76	4.76	69.32	69.32	20.80	20.80	0.46	0.46
Cooper Creek	13829	50 YR	970.27	970.27	2043.90	2043.90	2053.48	2053.48			2054.05	2054.05	0.004893	0.004893	6.07	6.07	165.00	165.00	59.77	59.77	0.47	0.47
Cooper Creek	13829	100 YR	1372.57	1372.57	2043.90	2043.90	2054.91	2054.91	2051.96	2051.96	2055.37	2055.37	0.003767	0.003767	5.78	5.78	360.08	360.08	370.47	370.47	0.42	0.42
Cooper Creek	13598	10 YR	330.24	330.24	2043.67	2043.67	2049.19	2049.19			2049.42	2049.42	0.00296	0.00296	3.86	3.86	85.45	85.45	24.08	24.08	0.36	0.36
Cooper Creek	13598	50 YR	970.27	970.27	2043.67	2043.67	2052.69	2052.69			2053.12	2053.12	0.003086	0.003086	5.24	5.24	185.28	185.28	32.97	32.97	0.39	0.39
Cooper Creek	13598	100 YR	1372.57	1372.57	2043.67	2043.67	2053.95	2053.95			2054.50	2054.50	0.003535	0.003535	5.98	5.98	233.61	233.61	63.72	63.72	0.42	0.42
Cooper Creek	13410	10 YR	330.24	330.24	2043.15	2043.15	2048.71	2048.71			2048.91	2048.91	0.002426	0.002426	3.63	3.63	91.09	91.09	24.04	24.04	0.33	0.33
Cooper Creek	13410	50 YR	970.27	970.27	2043.15	2043.15	2052.12	2052.12			2052.53	2052.53	0.003117	0.003117	5.09	5.09	190.65	190.65	36.22	36.22	0.39	0.39
Cooper Creek	13410	100 YR	1372.57	1372.57	2043.15	2043.15	2053.29	2053.29			2053.81	2053.81	0.003695	0.003695	5.77	5.77	245.18	245.18	77.66	77.66	0.43	0.43
Cooper Creek	12678	10 YR	330.24	330.24	2040.72	2040.72	2047.17	2047.17			2047.31	2047.31	0.001924	0.001924	2.98	2.98	110.74	110.74	34.45	34.45	0.29	0.29
Cooper Creek	12678	50 YR	970.27	970.27	2040.72	2040.72	2050.75	2050.75			2050.94	2050.94	0.00149	0.00149	3.45	3.45	281.37	281.37	59.14	59.14	0.28	0.28
Cooper Creek	12678	100 YR	1372.57	1372.57	2040.72	2040.72	2051.77	2051.77			2052.00	2052.00	0.00167	0.00167	3.88	3.88	417.18	417.18	299.60	299.60	0.30	0.30
Cooper Creek	11979	10 YR	330.24	330.24	2039.76	2039.76	2045.74	2045.74			2045.91	2045.91	0.002088	0.002088	3.31	3.31	99.70	99.70	27.59	27.59	0.31	0.31
Cooper Creek	11979	50 YR	970.27	970.27	2039.76	2039.76	2049.45	2049.45			2049.73	2049.73	0.001998	0.001998	4.26	4.26	228.16	228.16	57.27	57.27	0.32	0.32
Cooper Creek	11979	100 YR	1372.57	1372.57	2039.76	2039.76	2050.48	2050.48			2050.73	2050.73	0.00206	0.00206	4.34	4.34	500.96	500.96	514.11	514.11	0.33	0.33
Cooper Creek	11776	10 YR	330.24	330.24	2038.76	2038.76	2045.33	2045.33			2045.49	2045.49	0.002019	0.002019	3.23	3.23	102.13	102.13	28.67	28.67	0.30	0.30
Cooper Creek	11776	50 YR	970.27	970.27	2038.76	2038.76	2049.06	2049.06			2049.33	2049.33	0.001896	0.001896	4.17	4.17	233.61	233.61	57.18	57.18	0.31	0.31
Cooper Creek	11776	100 YR	1372.57	1372.57	2038.76	2038.76	2050.04	2050.04			2050.30	2050.30	0.001959	0.001959	4.33	4.33	513.55	513.55	541.97	541.97	0.32	0.32
Cooper Creek	11415	10 YR	330.24	330.24	2037.77	2037.77	2044.53	2044.53			2044.72	2044.72	0.00226	0.00226	3.44	3.44	95.89	95.89	25.71	25.71	0.31	0.31
Cooper Creek	11415	50 YR	970.27	970.27	2037.77	2037.77	2048.27	2048.27			2048.58	2048.58	0.002262	0.002262	4.44	4.44	221.03	221.03	57.18	57.18	0.34	0.34
Cooper Creek	11415	100 YR	1372.57	1372.57	2037.77	2037.77	2049.07	2049.07	2045.38	2045.38	2049.46	2049.46	0.002941	0.002941	5.13	5.13	358.37	358.37	335.67	335.67	0.39	0.39
Cooper Creek	11216	10 YR	330.24	330.24	2037.28	2037.28	2043.99	2043.99			2044.21	2044.21	0.002799	0.002799	3.82	3.82	86.56	86.56	22.78	22.78	0.35	0.35
Cooper Creek	11216	50 YR	970.27	970.27	2037.28	2037.28	2047.65	2047.65			2048.05	2048.05	0.003086	0.003086	5.05	5.05	201.25	201.25	111.85	111.85	0.39	0.39
Cooper Creek	11216	100 YR	1372.57	1372.57	2037.28	2037.28	2048.54	2048.54			2048.85	2048.85	0.002936	0.002936	4.98	4.98	496.18	496.18	542.73	542.73	0.38	0.38
Cooper Creek	10953	10 YR	330.24	330.24	2037.08	2037.08	2043.40	2043.40			2043.57	2043.57	0.002051	0.002051	3.31	3.31	99.87	99.87	26.81	26.81	0.30	0.30
Cooper Creek	10953	50 YR	970.27	970.27	2037.08	2037.08	2047.04	2047.04			2047.34	2047.34	0.002172	0.002172	4.42	4.42	234.12	234.12	105.80	105.80	0.33	0.33
Cooper Creek	10953	100 YR	1372.57	1372.57	2037.08	2037.08	2047.95	2047.95			2048.19	2048.19	0.002088	0.002088	4.37	4.37	604.47	604.47	735.96	735.96	0.33	0.33
Cooper Creek	10537	10 YR	330.24	330.24	2036.01	2036.01	2042.60	2042.60			2042.76	2042.76	0.001846	0.001846	3.22	3.22	102.59	102.59	26.49	26.49	0.29	0.29
Cooper Creek	10537	50 YR	970.27	970.27	2036.01	2036.01	2046.10	2046.10			2046.40	2046.40	0.002382	0.002382	4.42	4.42	225.83	225.83	99.92	99.92	0.35	0.35
Cooper Creek	10537	100 YR	1372.57	1372.57	2036.01	2036.01	2046.86	2046.86			2047.17	2047.17	0.002928	0.002928	4.75	4.75	426.48	426.48	382.24	382.24	0.38	0.38



Megan C. Mayfield, P.E.

9/14/2023

CR 316
BRIDGE HYDRAULIC DATA

SCALE: N/A

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		42
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

Standard Table for Cooper Creek

Reach	River Sta	Profile	Q Total (cfs)		Min Ch Elev (ft)		W.S. Elev (ft)		Crit W.S. (ft)		E.G. Elev (ft)		E.G. Slope (ft/ft)		Vel Chnl (ft/s)		Flow Area (sq ft)		Top Width (ft)		Froude # Chl	
			CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP
Cooper Creek	10163	10 YR	330.24	330.24	2035.56	2035.56	2041.85	2041.85			2042.03	2042.03	0.002058	0.002058	3.39	3.39	97.53	97.53	25.23	25.23	0.30	0.30
Cooper Creek	10163	50 YR	970.27	970.27	2035.56	2035.56	2045.12	2045.12			2045.46	2045.46	0.002683	0.002683	4.80	4.80	247.52	247.52	226.22	226.22	0.36	0.36
Cooper Creek	10163	100 YR	1372.57	1372.57	2035.56	2035.56	2045.87	2045.87			2046.15	2046.15	0.002703	0.002703	4.76	4.76	547.21	547.21	558.85	558.85	0.37	0.37
Cooper Creek	9818	10 YR	330.24	330.24	2034.75	2034.75	2041.00	2041.00			2041.22	2041.22	0.002697	0.002697	3.68	3.68	89.68	89.68	25.18	25.18	0.34	0.34
Cooper Creek	9818	50 YR	970.27	970.27	2034.75	2034.75	2044.02	2044.02			2044.41	2044.41	0.003451	0.003451	5.11	5.11	233.59	233.59	179.86	179.86	0.41	0.41
Cooper Creek	9818	100 YR	1372.57	1372.57	2034.75	2034.75	2045.03	2045.03	2042.07	2042.07	2045.23	2045.23	0.002494	0.002494	4.22	4.22	636.44	636.36	640.95	640.94	0.35	0.35
Cooper Creek	9526	10 YR	330.24	330.24	2034.18	2034.18	2040.01	2040.01			2040.27	2040.27	0.003879	0.003879	4.09	4.09	80.75	80.75	26.06	26.06	0.41	0.41
Cooper Creek	9526	50 YR	970.27	970.27	2034.18	2034.18	2042.66	2042.66			2043.19	2043.19	0.004977	0.004977	5.89	5.89	164.79	164.79	37.04	37.04	0.49	0.49
Cooper Creek	9526	100 YR	1372.57	1372.57	2034.18	2034.18	2043.20	2043.20	2041.47	2041.47	2044.01	2044.01	0.007157	0.007158	7.29	7.29	212.41	212.39	176.86	176.82	0.60	0.60
Cooper Creek	9057	10 YR	330.24	330.24	2033.63	2033.63	2039.51	2039.51			2039.56	2039.56	0.000702	0.000702	1.90	1.90	173.82	173.82	52.32	52.32	0.18	0.18
Cooper Creek	9057	50 YR	970.27	970.27	2033.63	2033.63	2042.25	2042.25			2042.32	2042.32	0.000709	0.000709	2.30	2.30	614.76	614.76	443.34	443.34	0.19	0.19
Cooper Creek	9057	100 YR	1372.57	1372.57	2033.63	2033.63	2042.82	2042.82			2042.90	2042.90	0.00079	0.00079	2.51	2.51	1029.85	1029.98	1047.05	1047.12	0.21	0.21
Cooper Creek	8602	10 YR	330.24	330.24	2032.14	2032.14	2038.92	2038.92			2039.07	2039.07	0.001791	0.001791	3.15	3.15	104.70	104.70	27.36	27.36	0.28	0.28
Cooper Creek	8602	50 YR	970.27	970.27	2032.14	2032.14	2041.25	2041.25	2038.40	2038.40	2041.69	2041.69	0.003762	0.003762	5.35	5.35	205.93	205.93	183.50	183.50	0.43	0.43
Cooper Creek	8602	100 YR	1372.57	1372.57	2032.14	2032.14	2041.84	2041.84	2039.43	2039.43	2042.25	2042.25	0.003903	0.003906	5.62	5.63	465.27	464.92	718.41	718.03	0.44	0.44
Cooper Creek	8213	10 YR	330.24	330.24	2031.59	2031.59	2038.22	2038.22			2038.37	2038.37	0.001786	0.001786	3.13	3.13	105.67	105.66	28.27	28.27	0.28	0.28
Cooper Creek	8213	50 YR	970.27	970.27	2031.59	2031.59	2040.07	2040.07			2040.31	2040.31	0.002754	0.002754	4.46	4.46	386.16	386.16	396.70	396.70	0.37	0.37
Cooper Creek	8213	100 YR	1372.57	1372.57	2031.59	2031.59	2040.49	2040.49			2040.72	2040.72	0.003134	0.003124	4.78	4.77	597.03	598.12	596.55	597.22	0.39	0.39
Cooper Creek	7906	10 YR	330.24	330.24	2030.96	2030.96	2037.47	2037.47			2037.68	2037.68	0.002867	0.002868	3.69	3.69	89.55	89.54	26.15	26.14	0.35	0.35
Cooper Creek	7906	50 YR	970.27	970.27	2030.96	2030.96	2039.39	2039.39			2039.53	2039.53	0.002257	0.002257	3.83	3.83	540.68	540.68	566.99	566.99	0.32	0.32
Cooper Creek	7906	100 YR	1372.57	1372.57	2030.96	2030.96	2039.80	2039.80			2039.91	2039.91	0.002139	0.002143	3.81	3.81	810.20	809.56	754.43	754.14	0.32	0.32
Cooper Creek	7708	10 YR	330.24	330.24	2030.54	2030.54	2036.95	2036.95			2037.14	2037.14	0.002548	0.002549	3.48	3.48	94.80	94.79	28.47	28.47	0.34	0.34
Cooper Creek	7708	50 YR	970.27	970.27	2030.54	2030.54	2039.00	2039.00			2039.12	2039.12	0.001799	0.001799	3.54	3.54	575.16	575.16	540.49	540.49	0.30	0.30
Cooper Creek	7708	100 YR	1372.57	1372.57	2030.54	2030.54	2039.38	2039.37			2039.50	2039.49	0.001993	0.002013	3.78	3.80	825.56	821.59	793.63	791.26	0.31	0.31
Cooper Creek	7417	10 YR	330.24	330.24	2029.87	2029.87	2036.51	2036.51			2036.59	2036.59	0.001314	0.001315	2.24	2.24	147.32	147.29	54.05	54.05	0.24	0.24
Cooper Creek	7417	50 YR	970.27	970.27	2029.87	2029.87	2038.71	2038.71			2038.79	2038.79	0.001061	0.001061	2.62	2.62	627.16	627.16	614.49	614.49	0.23	0.23
Cooper Creek	7417	100 YR	1372.57	1372.57	2029.87	2029.87	2039.04	2039.03			2039.14	2039.13	0.001326	0.001331	3.02	3.03	873.12	867.28	903.72	901.21	0.26	0.26
Cooper Creek	7197	10 YR	330.24	330.24	2029.07	2029.07	2036.03	2036.02			2036.20	2036.20	0.002358	0.00236	3.35	3.35	98.66	98.63	29.26	29.26	0.32	0.32
Cooper Creek	7197	50 YR	970.27	970.27	2029.07	2029.07	2038.13	2038.13	2035.87	2035.87	2038.41	2038.41	0.003667	0.003667	4.64	4.64	370.27	370.27	652.98	652.98	0.42	0.42
Cooper Creek	7197	100 YR	1372.57	1372.57	2029.07	2029.07	2038.49	2038.48			2038.70	2038.69	0.003784	0.003813	4.54	4.55	675.81	667.66	956.64	951.80	0.42	0.42
Cooper Creek	6865	10 YR	330.24	330.24	2028.31	2028.31	2035.47	2035.46			2035.56	2035.55	0.001444	0.001448	2.68	2.68	172.33	172.09	100.51	100.41	0.25	0.25
Cooper Creek	6865	50 YR	970.27	970.27	2028.31	2028.31	2037.69	2037.69			2037.74	2037.74	0.001039	0.001039	2.35	2.35	771.77	771.67	828.22	828.20	0.22	0.22
Cooper Creek	6865	100 YR	1372.57	1372.57	2028.31	2028.31	2038.11	2038.05			2038.14	2038.09	0.000848	0.000947	2.28	2.39	1124.35	1076.41	894.99	882.97	0.20	0.21
Cooper Creek	6547	10 YR	330.24	330.24	2027.97	2027.97	2034.89	2034.89			2035.05	2035.05	0.001551	0.001554	3.22	3.22	102.65	102.55	27.88	27.86	0.30	0.30
Cooper Creek	6547	50 YR	970.27	970.27	2027.97	2027.97	2036.72	2036.71	2034.47	2034.47	2037.13	2037.12	0.003661	0.003703	5.36	5.39	275.31	272.18	375.83	366.74	0.47	0.47
Cooper Creek	6547	100 YR	1372.57	1372.57	2027.97	2027.97	2036.88	2037.06	2035.55	2035.55	2037.52	2037.51	0.005873	0.004309	6.92	6.09	348.97	451.46	528.31	663.76	0.60	0.51
Cooper Creek	6080	10 YR	330.24	330.24	2027.07	2027.07	2034.06	2034.06			2034.21	2034.21	0.002079	0.002091	3.10	3.10	107.39	107.09	41.75	41.29	0.30	0.30
Cooper Creek	6080	50 YR	970.27	970.27	2027.07	2027.07	2035.83	2035.85			2035.93	2035.94	0.001703	0.001653	3.11	3.07	671.38	681.35	807.11	810.88	0.28	0.28
Cooper Creek	6080	100 YR	1372.57	1372.57	2027.07	2027.07	2036.46	2036.15			2036.51	2036.23	0.000872	0.001676	2.47	3.26	1212.63	936.37	878.30	868.27	0.21	0.29
Cooper Creek	5830	10 YR	330.24	330.24	2026.65	2026.65	2033.43	2033.42			2033.63	2033.62	0.002628	0.00265	3.58	3.59	92.35	92.03	26.52	26.46	0.34	0.34
Cooper Creek	5830	50 YR	970.27	970.27	2026.65	2026.65	2035.40	2035.20		2033.37	2035.52	2035.43	0.002403	0.004151	3.56	4.50	621.56	438.90	966.92	821.64	0.33	0.43
Cooper Creek	5830	100 YR	1372.57	1372.57	2026.65	2026.65	2036.34	2035.83			2036.36	2035.90	0.000524	0.001581	1.95	3.12	1593.44	1051.66	1067.06	1041.19	0.16	0.28
Cooper Creek	5610	10 YR	330.24	330.24	2026.14	2026.14	2033.01	2032.99			2033.13	2033.12	0.00176	0.00179	2.84	2.86	125.42	124.21	65.99	65.24	0.28	0.28
Cooper Creek	5610	50 YR	970.27	970.27	2026.14	2026.14	2035.27	2035.00			2035.30	2035.04	0.000449	0.000757	1.86	2.32	1170.45	948.43	845.38	804.58	0.15	0.20
Cooper Creek	5610	100 YR	1372.57	1372.57	2026.14	2026.14	2036.28	2035.69			2036.29	2035.71	0.000201	0.000453	1.42	1.98	2110.62	1534.96	1018.30	930.12	0.11	0.16
Cooper Creek	5559	10 YR	330.24	330.24	2025.84	2025.84	2032.97	2032.96	2029.91	2029.91	2033.05	2033.03	0.001053	0.001049	2.24	2.07	147.70	159.24	163.00	161.83	0.22	0.22
Cooper Creek	5559	50 YR	970.27	970.27	2025.84	2025.84	2035.00	2034.77	2032.12	2032.20	2035.23	2034.97	0.001813	0.001752	3.90	3.59	252.93	281.21	736.57	721.60	0.31	0.30
Cooper Creek	5559	100 YR	1372.57	1372.57	2025.84	2025.84	2035.90	2035.34	2032.78	2032.75	2036.23	2035.64	0.002041	0.002293	4.63	4.45	302.67	323.59	912.46	810.30	0.34	0.35
Cooper Creek	5521		Bridge	Bridge																		

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

CR 316
BRIDGE HYDRAULIC DATA

SCALE: N/A SHEET 5 OF 6

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		43
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

Standard Table for Cooper Creek

Reach	River Sta	Profile	Q Total (cfs)		Min Ch Elev (ft)		W.S. Elev (ft)		Crit W.S. (ft)		E.G. Elev (ft)		E.G. Slope (ft/ft)		Vel Chnl (ft/s)		Flow Area (sq ft)		Top Width (ft)		Froude # Chl	
			CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP	CR316 EX	CR316 PROP
Cooper Creek	5486	10 YR	330.24	330.24	2026.03	2026.03	2032.73	2032.76	2029.91	2029.91	2032.89	2032.90	0.001951	0.002328	3.22	3.03	102.41	108.86	45.50	47.77	0.30	0.32
Cooper Creek	5486	50 YR	970.27	970.27	2026.03	2026.03	2034.08	2034.21	2032.35	2032.54	2034.72	2034.65	0.006724	0.005149	6.46	5.41	157.78	195.38	418.17	451.11	0.57	0.50
Cooper Creek	5486	100 YR	1372.57	1372.57	2026.03	2026.03	2033.91	2034.32	2033.71	2033.58	2035.33	2035.13	0.015714	0.009226	9.60	7.38	148.54	203.60	381.27	499.17	0.87	0.67
Cooper Creek	5460	10 YR	330.24	330.24	2025.84	2025.84	2032.65	2032.65			2032.83	2032.83	0.002868	0.002868	3.39	3.39	99.00	99.00	47.30	47.30	0.35	0.35
Cooper Creek	5460	50 YR	970.27	970.27	2025.84	2025.84	2034.38	2034.38			2034.46	2034.46	0.001819	0.001819	3.12	3.12	626.27	626.27	574.06	574.06	0.29	0.29
Cooper Creek	5460	100 YR	1372.57	1372.57	2025.84	2025.84	2034.73	2034.73			2034.82	2034.82	0.00182	0.00182	3.33	3.33	840.95	840.95	629.25	629.25	0.30	0.30
Cooper Creek	4952	10 YR	330.24	330.24	2023.99	2023.99	2030.45	2030.45			2030.68	2030.68	0.00683	0.00683	3.84	3.84	85.98	85.98	30.11	30.11	0.40	0.40
Cooper Creek	4952	50 YR	970.27	970.27	2023.99	2023.99	2033.18	2033.18			2033.33	2033.33	0.004108	0.004108	3.46	3.46	383.90	383.90	358.18	358.18	0.33	0.33
Cooper Creek	4952	100 YR	1372.57	1372.57	2023.99	2023.99	2033.76	2033.76			2033.88	2033.88	0.003022	0.003022	3.30	3.30	629.53	629.53	485.34	485.34	0.29	0.29
Cooper Creek	4629	10 YR	330.24	330.24	2022.98	2022.98	2029.10	2029.10			2029.29	2029.29	0.0029	0.0029	3.51	3.51	94.10	94.10	31.46	31.46	0.36	0.36
Cooper Creek	4629	50 YR	970.27	970.27	2022.98	2022.98	2031.75	2031.75			2032.09	2032.09	0.003447	0.003447	4.75	4.75	238.36	238.36	123.54	123.54	0.41	0.41
Cooper Creek	4629	100 YR	1372.57	1372.57	2022.98	2022.98	2032.49	2032.49			2032.85	2032.85	0.003464	0.003464	5.14	5.14	377.01	377.01	230.88	230.88	0.42	0.42
Cooper Creek	4424	10 YR	330.24	330.24	2022.54	2022.54	2028.30	2028.30			2028.54	2028.54	0.004747	0.004747	3.95	3.95	83.66	83.66	33.93	33.93	0.44	0.44
Cooper Creek	4424	50 YR	970.27	970.27	2022.54	2022.54	2030.97	2030.97			2031.32	2031.32	0.00404	0.00404	4.82	4.82	227.71	227.71	114.99	114.99	0.44	0.44
Cooper Creek	4424	100 YR	1372.57	1372.57	2022.54	2022.54	2031.74	2031.74			2032.11	2032.11	0.003687	0.003687	5.21	5.21	361.70	361.70	232.33	232.33	0.43	0.43
Cooper Creek	3946	10 YR	330.24	330.24	2020.20	2020.20	2026.80	2026.80			2026.95	2026.95	0.002382	0.002382	3.08	3.08	107.13	107.13	36.69	36.69	0.32	0.32
Cooper Creek	3946	50 YR	970.27	970.27	2020.20	2020.20	2029.71	2029.71			2029.95	2029.95	0.002086	0.002086	3.98	3.98	279.98	279.98	117.00	117.00	0.32	0.32
Cooper Creek	3946	100 YR	1372.57	1372.57	2020.20	2020.20	2030.51	2030.51			2030.79	2030.79	0.002187	0.002187	4.47	4.47	378.72	378.72	126.93	126.93	0.34	0.34
Cooper Creek	3659	10 YR	330.24	330.24	2019.75	2019.75	2026.15	2026.15			2026.30	2026.30	0.002181	0.002181	3.11	3.11	106.04	106.04	34.41	34.41	0.31	0.31
Cooper Creek	3659	50 YR	970.27	970.27	2019.75	2019.75	2029.02	2029.02			2029.22	2029.22	0.003048	0.003048	3.61	3.61	269.13	269.13	93.31	93.31	0.37	0.37
Cooper Creek	3659	100 YR	1372.57	1372.57	2019.75	2019.75	2029.83	2029.83			2030.08	2030.08	0.002881	0.002881	3.94	3.94	348.01	348.01	101.13	101.13	0.37	0.37
Cooper Creek	3352	10 YR	330.24	330.24	2019.87	2019.87	2025.10	2025.10			2025.32	2025.32	0.005008	0.005008	3.74	3.74	88.23	88.23	41.63	41.63	0.45	0.45
Cooper Creek	3352	50 YR	970.27	970.27	2019.87	2019.87	2028.17	2028.17			2028.39	2028.39	0.002427	0.002427	3.80	3.80	272.81	272.81	122.08	122.08	0.35	0.35
Cooper Creek	3352	100 YR	1372.57	1372.57	2019.87	2019.87	2029.11	2029.11			2029.35	2029.35	0.002022	0.002022	4.04	4.04	402.03	402.03	149.05	149.05	0.33	0.33
Cooper Creek	3039	10 YR	330.24	330.24	2017.97	2017.97	2023.93	2023.93			2024.14	2024.14	0.002961	0.002961	3.60	3.60	91.83	91.83	29.54	29.54	0.36	0.36
Cooper Creek	3039	50 YR	970.27	970.27	2017.97	2017.97	2027.36	2027.36			2027.62	2027.62	0.002476	0.002476	4.06	4.06	244.78	244.78	87.20	87.20	0.35	0.35
Cooper Creek	3039	100 YR	1372.57	1372.57	2017.97	2017.97	2028.42	2028.42			2028.70	2028.70	0.002084	0.002084	4.33	4.33	368.05	368.05	128.12	128.12	0.33	0.33
Cooper Creek	2633	10 YR	330.24	330.24	2015.84	2015.84	2022.55	2022.55			2022.81	2022.81	0.003622	0.003622	4.03	4.03	82.03	82.03	24.00	24.00	0.38	0.38
Cooper Creek	2633	50 YR	970.27	970.27	2015.84	2015.84	2026.05	2026.05			2026.42	2026.42	0.003492	0.003492	4.93	4.93	196.81	196.81	43.07	43.07	0.41	0.41
Cooper Creek	2633	100 YR	1372.57	1372.57	2015.84	2015.84	2027.39	2027.39			2027.69	2027.69	0.002993	0.002993	4.62	4.62	406.08	406.08	283.69	283.69	0.38	0.38
Cooper Creek	2261	10 YR	330.24	330.24	2014.59	2014.59	2021.56	2021.56			2021.74	2021.74	0.002229	0.002229	3.39	3.39	97.41	97.41	26.45	26.45	0.31	0.31
Cooper Creek	2261	50 YR	970.27	970.27	2014.59	2014.59	2025.04	2025.04			2025.32	2025.32	0.002444	0.002444	4.25	4.25	228.16	228.16	49.29	49.29	0.35	0.35
Cooper Creek	2261	100 YR	1372.57	1372.57	2014.59	2014.59	2026.40	2026.40			2026.72	2026.72	0.002288	0.002288	4.52	4.52	313.48	313.48	87.51	87.51	0.35	0.35
Cooper Creek	1906	10 YR	330.24	330.24	2013.74	2013.74	2020.81	2020.81			2020.97	2020.97	0.002119	0.002119	3.20	3.20	103.24	103.24	30.07	30.07	0.30	0.30
Cooper Creek	1906	50 YR	970.27	970.27	2013.74	2013.74	2024.23	2024.23			2024.48	2024.48	0.002241	0.002241	3.97	3.97	244.27	244.27	55.56	55.56	0.33	0.33
Cooper Creek	1906	100 YR	1372.57	1372.57	2013.74	2013.74	2025.63	2025.63			2025.89	2025.89	0.002262	0.002262	4.10	4.10	334.75	334.75	74.38	74.38	0.34	0.34
Cooper Creek	1602	10 YR	330.24	330.24	2013.76	2013.76	2019.98	2019.98			2020.20	2020.20	0.002943	0.002943	3.78	3.78	87.27	87.27	24.87	24.87	0.36	0.36
Cooper Creek	1602	50 YR	970.27	970.27	2013.76	2013.76	2023.37	2023.37			2023.68	2023.68	0.003055	0.003055	4.46	4.46	217.49	217.49	51.99	51.99	0.38	0.38
Cooper Creek	1602	100 YR	1372.57	1372.57	2013.76	2013.76	2024.84	2024.84			2025.07	2025.07	0.003201	0.003201	3.80	3.80	361.23	361.23	119.14	119.14	0.38	0.38
Cooper Creek	1240	10 YR	330.24	330.24	2012.97	2012.97	2019.19	2019.19			2019.35	2019.35	0.001878	0.001878	3.19	3.19	103.52	103.52	27.83	27.83	0.29	0.29
Cooper Creek	1240	50 YR	970.27	970.27	2012.97	2012.97	2022.27	2022.27			2022.59	2022.59	0.002951	0.002951	4.56	4.56	212.88	212.88	48.12	48.12	0.38	0.38
Cooper Creek	1240	100 YR	1372.57	1372.57	2012.97	2012.97	2023.55	2023.55			2023.92	2023.92	0.003058	0.003058	4.86	4.86	282.54	282.54	60.38	60.38	0.40	0.40
Cooper Creek	896	10 YR	330.24	330.24	2013.34	2013.34	2018.39	2018.39	2016.29	2016.29	2018.58	2018.58	0.00265	0.00265	3.49	3.49	94.57	94.57	30.06	30.06	0.35	0.35
Cooper Creek	896	50 YR	970.27	970.27	2013.34	2013.34	2021.09	2021.09	2018.43	2018.43	2021.50	2021.50	0.003392	0.003392	5.09	5.09	190.60	190.60	40.91	40.91	0.42	0.42
Cooper Creek	896	100 YR	1372.57	1372.57	2013.34	2013.34	2022.25	2022.25	2019.34	2019.34	2022.76	2022.76	0.003673	0.003673	5.70	5.70	240.96	240.96	46.33	46.33	0.44	0.44
Cooper Creek	565	10 YR	330.24	330.24	2013.17	2013.17	2015.58	2015.58	2015.58	2015.58	2016.49	2016.49	0.025856	0.025856	7.65	7.65	43.16	43.16	24.12	24.12	1.01	1.01
Cooper Creek	565	50 YR	970.27	970.27	2013.17	2013.17	2017.54	2017.54	2017.54	2017.54	2019.07	2019.07	0.021849	0.021849	9.92	9.92	97.86	97.86	32.04	32.04	1.00	1.00
Cooper Creek	565	100 YR	1372.57	1372.57	2013.17	2013.17	2018.43	2018.43	2018.43	2018.43	2020.21	2020.21	0.020889	0.020889	10.71	10.71	128.11	128.11	35.94	35.94	1.00	1.00

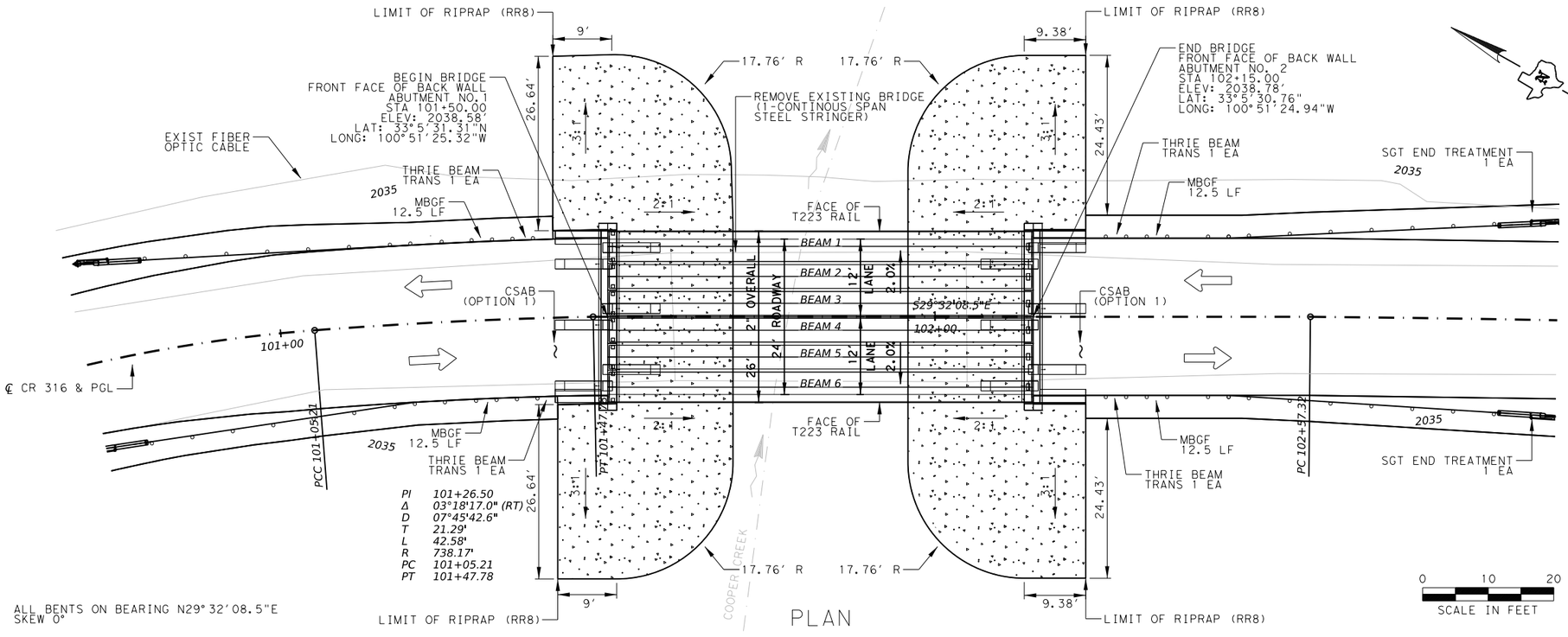
STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
BRIDGE HYDRAULIC DATA

SCALE: N/A SHEET 6 OF 6

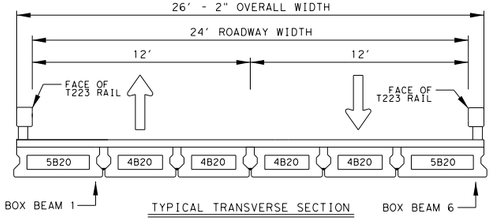
FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		44
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006



LEGEND

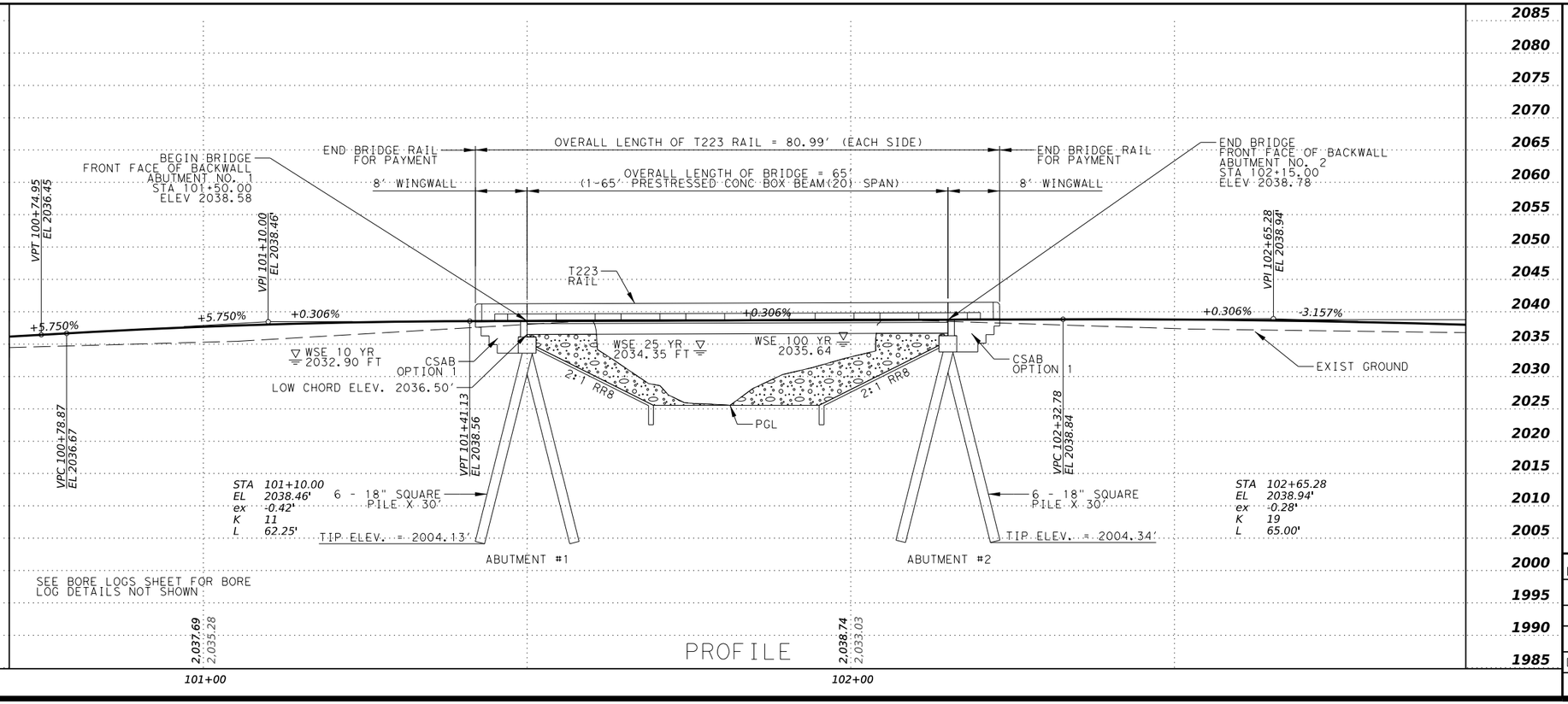
EXCAVATE AREA

FUNCTIONAL CLASS - LOCAL ROAD
MOIEC
ADT (2020) - 10 VDP
ADT (2042) - 30 VDP
OLD NBI NO: 08-132-0-AA01-13-001
NEW NBI NO: 08-132-0-AA01-13-003



TYPICAL TRANSVERSE SECTION

SUPERSTRUCTURE LOADING: HL 93



STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

BRIDGE LAYOUT

SCALE: 1" = 20' SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		45
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/7. Bridge/045 BRIDGE LAYOUT
DATE: 9/14/2023 6:14:04 PM

DRILLING LOG

WinCore Version 3.3	County	Kent	Hole	B-1	District	Abilene
	Highway	CR 316	Structure	Bridge	Date	5/30/2023
	CSJ	0908-27-006	Station	101+55.70	Grnd. Elev.	2038.58 ft
			Offset	4.6 RT	GW Elev.	2012.58 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, w/ sand, soft to stiff, moist, reddish brown (CL)			16	33	18		SS: 5-5-5, -200% = 75
5		13 (6) 9 (6)								SS: 2-3-6
						11				SS: 3-2-3
										SS: 2-3-3
10		6 (6) 12 (6)								
										SS: 7-8-7
2025.6						1				SS: 12-17-18, -200% = 24
15		35 (6) 47 (6)	SAND, clayey, dense, dry, light gray, w/ gravel (SC)							
										SS: 20-17-11
2020.6						19	37	18		SS: 3-4-7, -200% = 80
20		6 (6) 8 (6)	CLAY, w/ sand, soft to stiff, moist to wet, dark brown (CL)							
										SS: 7-9-10
25		15 (6) 15 (6)								
						13				SS: 6-2-3
30		5 (6) 3 (6)								
2005.6			SAND, clayey, very loose to loose, water-bearing, brown (SC)			27	31	12		SS: 5-2-3, -200% = 40
35		3 (6) 4 (6)								
										SS: 3-3-3
40		15 (6) 6 (6)								

Remarks:
1. Groundwater was encountered at a depth of 28 ft and rose to a depth of 26 ft after 15 minutes.
2. Boring drilled using straight flight auger method to a depth of 28 ft and mud rotary method from 28 ft to 80 ft.
3. Boring backfilled with cement bentonite grout.
4. Split-spoon values are not standard (170-lb hammer). (Latitude, Longitude): (33.092018, -100.857042).
5. The boring station, offset, and elevation are estimated based on preliminary bridge layout, and are approximate.

Driller: ETTL Logger: Mohammad Dehqan Organization: Raba Kistner, Inc.

O:\Active Projects\Houston\2023\AHA23-046-00 TxDOT Contract No. 88-1IDP5010_WA1_TO1-8\WinCore\Borings B1, B2.clg

Figure A-1

DRILLING LOG

WinCore Version 3.3	County	Kent	Hole	B-1	District	Abilene
	Highway	CR 316	Structure	Bridge	Date	5/30/2023
	CSJ	0908-27-006	Station	101+55.70	Grnd. Elev.	2038.58 ft
			Offset	4.6 RT	GW Elev.	2012.58 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, very loose to loose, water-bearing, brown (SC)			25				SS: 3-3-4
1995.6										
45		3 (6) 4 (6)	CLAY, very soft, wet, dark brown (CL)							
										SS: 3-3-7
1990.6										
50		7 (6) 8 (6)	CLAY, sandy, soft, wet, dark brown (CL)							
1985.6						15				SS: 6-6-7, -200% = 19
55		16 (6) 33 (6)	SAND, clayey, compact to dense, water-bearing, brown, w/ gravel (SC)							
										SS: 11-9-7
60		45 (6) 47 (6)								
1975.6			GRAVEL, poorly graded w/ clay, compact to very dense, water-bearing, brown, w/ sand (GP-GC)			14				SS: 19-13-10, -200% = 10
65		21 (6) 50 (6)								
										SS: 7-30-41
70		28 (6) 13 (6)								
						17				SS: 42-50/3"
75		50 (1) 50 (1.5)								
										SS: 39-48-50/2"
1958.680		50 (1) 50 (0.5)								

Remarks:
1. Groundwater was encountered at a depth of 28 ft and rose to a depth of 26 ft after 15 minutes.
2. Boring drilled using straight flight auger method to a depth of 28 ft and mud rotary method from 28 ft to 80 ft.
3. Boring backfilled with cement bentonite grout.
4. Split-spoon values are not standard (170-lb hammer). (Latitude, Longitude): (33.092018, -100.857042).
5. The boring station, offset, and elevation are estimated based on preliminary bridge layout, and are approximate.

Driller: ETTL Logger: Mohammad Dehqan Organization: Raba Kistner, Inc.

O:\Active Projects\Houston\2023\AHA23-046-00 TxDOT Contract No. 88-1IDP5010_WA1_TO1-8\WinCore\Borings B1, B2.clg

Figure A-2

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED
PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

CR 316
SOIL BORING DATA

 Texas Department of Transportation

SCALE: N/A SHEET 1 OF 2

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		46
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

DRILLING LOG

WinCore Version 3.3	County	Kent	Hole	B-2	District	Abilene
	Highway	CR 316	Structure	Bridge	Date	5/31/2023
	CSJ	0908-27-006	Station	102+14.40	Grnd. Elev.	2038.87 ft
			Offset	5.8 LT	GW Elev.	2008.87 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, w/ sand, soft to stiff, moist, brown (CL)							SS: 7-7-10
5		7 (6) 7 (6)								SS: 8-6-6
						14				SS: 3-4-6
										SS: 6-9-8
10		11 (6) 15 (6)								
										SS: 9-8-9
2025.9						7				SS: 4-5-4, -200% = 59
			CLAY, sandy, stiff, moist, brown (CL)							
15		16 (6) 16 (6)								
										SS: 6-4-6
2020.9						2				SS: 10-15-11, -200% = 22
			SAND, silty, slightly compact, dry, brown, w/ grave (SM)							
20		13 (6) 16 (6)								
2015.9						16	25	11		SS: 2-3-5, -200% = 72
			CLAY, w/ sand, very soft to soft, moist to wet, brown (CL)							
25		10 (6) 10 (6)								
										SS: 2-3-3
30		3 (6) 8 (6)								
										SS: 8-11-13, w/ gravel to 35'
35		3 (6) 3 (6)								
2000.9						11				SS: 14-13-10, -200% = 9
			SAND, poorly graded w/ silt, loose to compact, water-bearing, brown and light gray, w/ gravel (SP-SM)							
40		4 (6) 10 (6)								

Remarks:
1. Groundwater was encountered at a depth of 33 ft and rose to a depth of 30 ft after 15 minutes.
2. Boring drilled using straight flight auger method to a depth of 33 ft and mud rotary method from 33 ft to 80 ft.
3. Boring backfilled with cement bentonite grout.
4. Split-spoon values are not standard (170-lb hammer). (Latitude, Longitude): (33.091894, -100.856919).
5. The boring station, offset, and elevation are estimated based on preliminary bridge layout, and are approximate.

Driller: ETTL Logger: Mohammad Dehqan Organization: Raba Kistner, Inc.

O:\Active Projects\Houston\2023\AHA23-046-00 TxDOT Contract No. 88-1IDP5010_WA1_TO1-8\WinCore\Borings B1, B2.clg

Figure A-3

DRILLING LOG

WinCore Version 3.3	County	Kent	Hole	B-2	District	Abilene
	Highway	CR 316	Structure	Bridge	Date	5/31/2023
	CSJ	0908-27-006	Station	102+14.40	Grnd. Elev.	2038.87 ft
			Offset	5.8 LT	GW Elev.	2008.87 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, poorly graded w/ silt, loose to compact, water-bearing, brown and light gray, w/ gravel (SP-SM)							SS: 10-19-32
45		8 (6) 18 (6)								
						12				SS: 29-23-7
50		27 (6) 43 (6)								
										SS: 4-6-15
55		24 (6) 14 (6)								
1980.9										SS: 3-6-9
			CLAY, sandy, very hard, wet, brown, w/ gravel (CL)							
60		50 (0.5) 50 (2)								
1975.9						11				SS: 7-6-10, -200% = 8
			SAND, poorly graded w/ silt and gravel, compact, water-bearing, brown (SP-SM)							
65		18 (6) 23 (6)								
1970.9						21	29	14		SS: 15-23-35, -200% = 60
			CLAY, sandy, very stiff to hard, wet, brown (CL)							
70		30 (6) 32 (6)								
										SS: 37-39-50/3"
75		35 (6) 40 (6)								
										SS: 50/3"
1958.980		50 (4) 50 (3)								

Remarks:
1. Groundwater was encountered at a depth of 33 ft and rose to a depth of 30 ft after 15 minutes.
2. Boring drilled using straight flight auger method to a depth of 33 ft and mud rotary method from 33 ft to 80 ft.
3. Boring backfilled with cement bentonite grout.
4. Split-spoon values are not standard (170-lb hammer). (Latitude, Longitude): (33.091894, -100.856919).
5. The boring station, offset, and elevation are estimated based on preliminary bridge layout, and are approximate.

Driller: ETTL Logger: Mohammad Dehqan Organization: Raba Kistner, Inc.

O:\Active Projects\Houston\2023\AHA23-046-00 TxDOT Contract No. 88-1IDP5010_WA1_TO1-8\WinCore\Borings B1, B2.clg

Figure A-4

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED
PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

CR 316
SOIL BORING DATA

Texas Department of Transportation

SCALE: N/A SHEET 2 OF 2

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		47
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

BRIDGE DESCRIPTION

ROADWAY WIDTH: 24 FT
SUPERSTRUCTURE TYPE: PRESTRESSED BOX BEAMS
BEAM TYPE: B20
SKEW: 0°
ROADWAY TYPE: 5" SLAB
RAIL TYPE" TY 223

NUMBER OF SPANS: 1

BENT 1 STA: 101+50.00 SPAN 1 LENGTH: 65 FT
BENT 2 STA: 102+15.00

Bearing Seats

Elevation

Support Line Name	Bearing Line	Girder1(')	Girder2(')	Girder3(')	Girder4(')	Girder5(')	Girder6(')	Girder7(')	Girder8(')	Girder9(')	Girder10(')	Girder11(')	Girder12(')
Abutment1	Ahead	#1	#1	#2	#2	#3	#3	#4	#4	#5	#5	#6	#6
		2035.8532	2035.9328	2035.9553	2036.0148	2036.0373	2036.0969	2036.0969	2036.0373	2036.0148	2035.9553	2035.9328	2035.8532
Abutment2	Back	#1	#2	#3	#4	#5	#6						
		2036.1735	2036.2656	2036.3477	2036.3477	2036.2656	2036.1735						

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

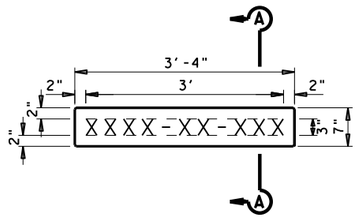
Megan C. Mayfield, P.E.
9/14/2023

CR 316
BEARING SEAT ELEVATIONS

SCALE: N/A SHEET 1 OF 1

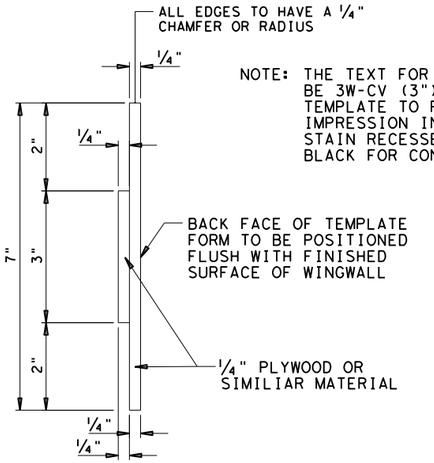
FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		48
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

STRUCTURE ID TEMPLATES



NOTE: THE SYMBOLS XXXX-XX-XXX REPRESENT THE STRUCTURE NUMBER WHICH IS SHOWN IN THE TABLE TO THE RIGHT.

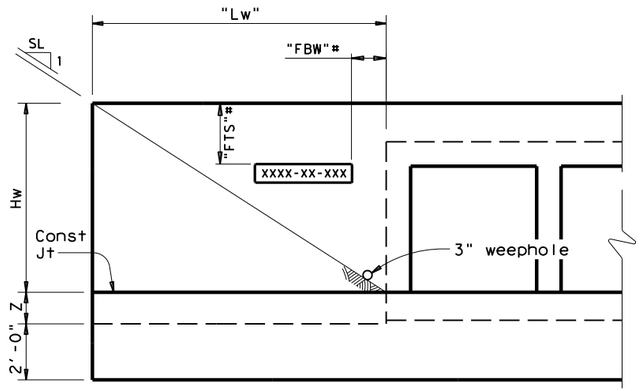
ALL CHARACTERS ARE REQUIRED, AND ARE TO BE FORMATTED EXACTLY AS SHOWN IN THE STRUCTURE NUMBER COLUMN TO THE RIGHT.



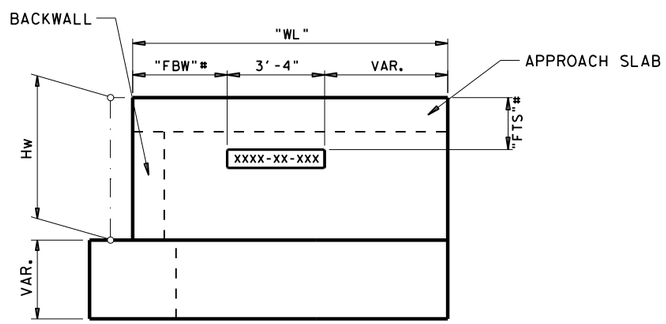
SECTION A-A

NOTE: THE TEXT FOR ALL TEMPLATES SHOULD BE 3W-CV (3") CLEAR VIEW FONT. TEMPLATE TO PROVIDE A RECESSED IMPRESSION INTO CAST CONCRETE. STAIN RECESSED NUMERAL SURFACES BLACK FOR CONTRAST.

STRUCTURE ID TEMPLATE NUMBERS							
NBI NUMBER	LOCATION	STRUCTURE NUMBER	"WL"	"Lw"	"Hw"	"FBW"#	"FTS"#
08-132-0-AA01-13-003	CR 316 OVER COOPER CREEK	AA03-13-003	8'	NA	2'	VARIOUS	

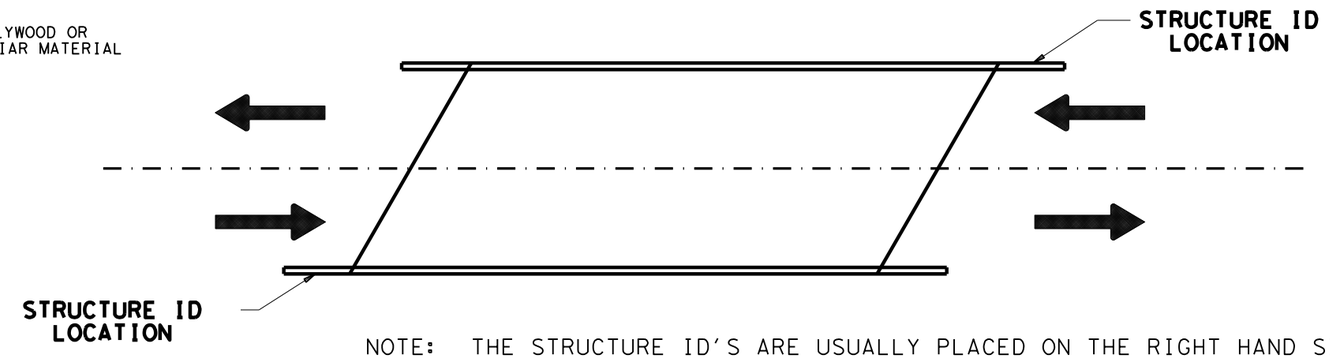


PARALLEL WING ELEVATION

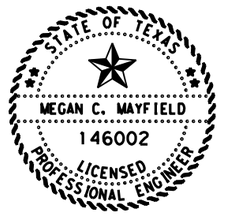


WINGWALL ELEVATION

FIELD LOCATE TO AVOID CONFLICT WITH REINFORCEMENT AND RIPRAP. THE ENGINEER SHALL APPROVE INSTALLATION LOCATION PRIOR TO PLACEMENT.



NOTE: THE STRUCTURE ID'S ARE USUALLY PLACED ON THE RIGHT HAND SIDE OF APPROACHES. THIS PLACES THE ID'S ON DIAGONAL CORNERS. THE STRUCTURE ID'S WILL NOT BE PAID FOR DIRECTLY, BUT WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BRIDGE ITEMS.



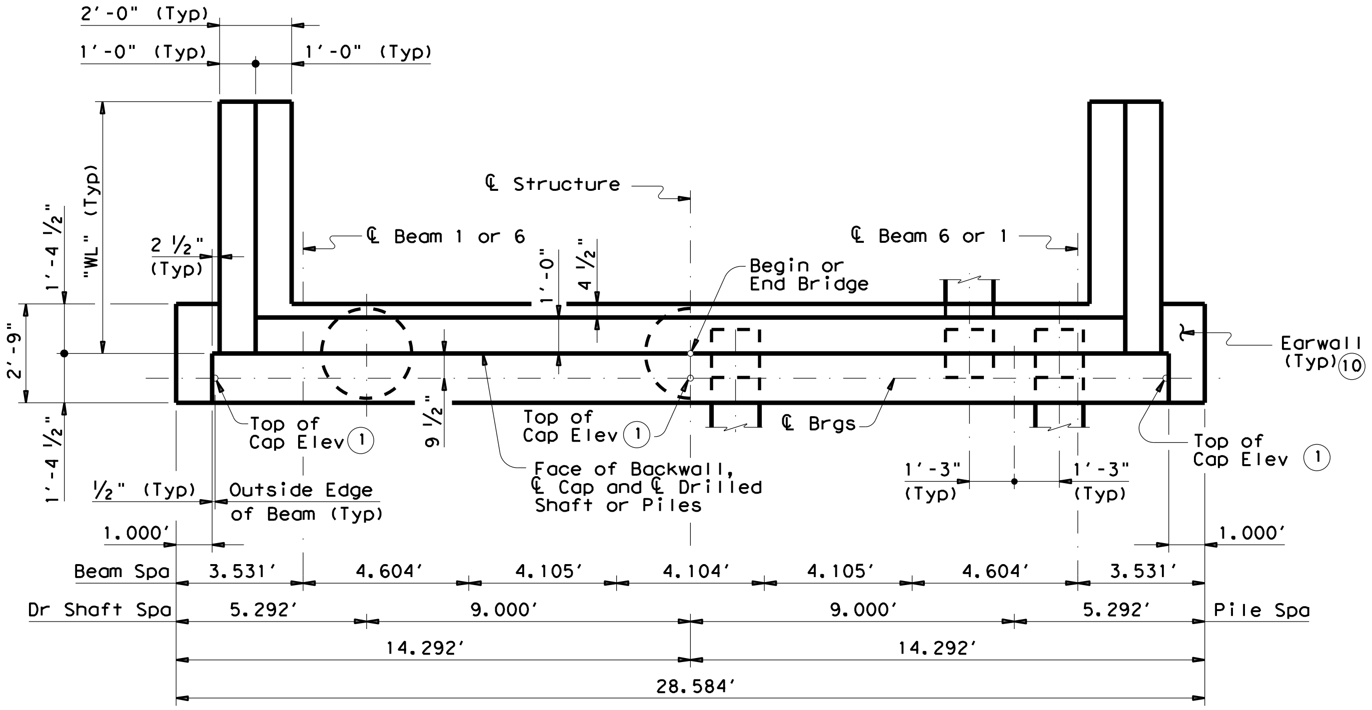
Megan C. Mayfield, P.E.
9/14/2023

STRUCTURE ID DETAILS SIDD-14

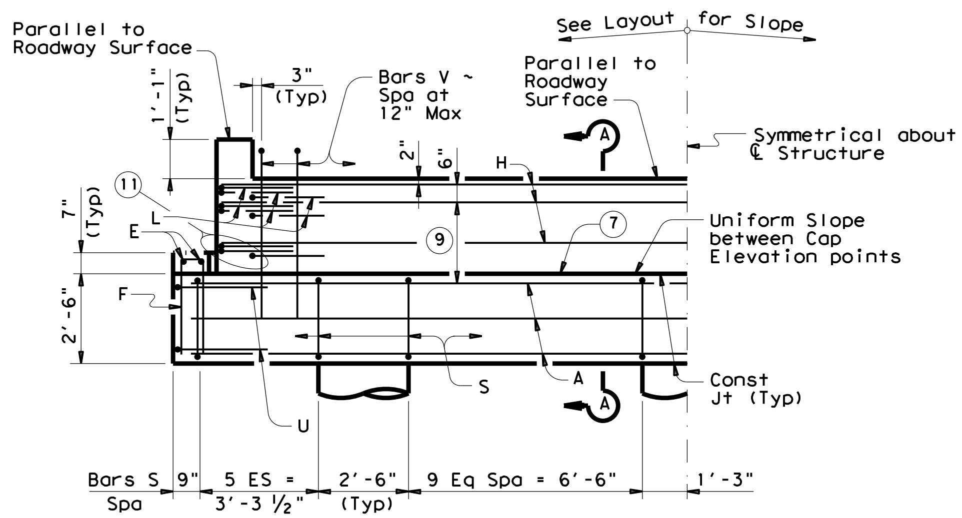
Texas Department of Transportation

NO SCALE SHEET 1 OF 1

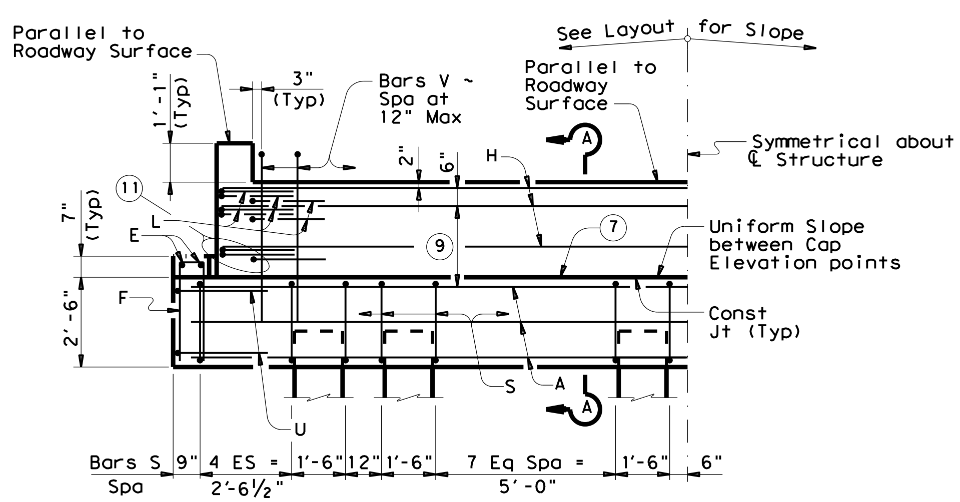
FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		49
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006



PLAN

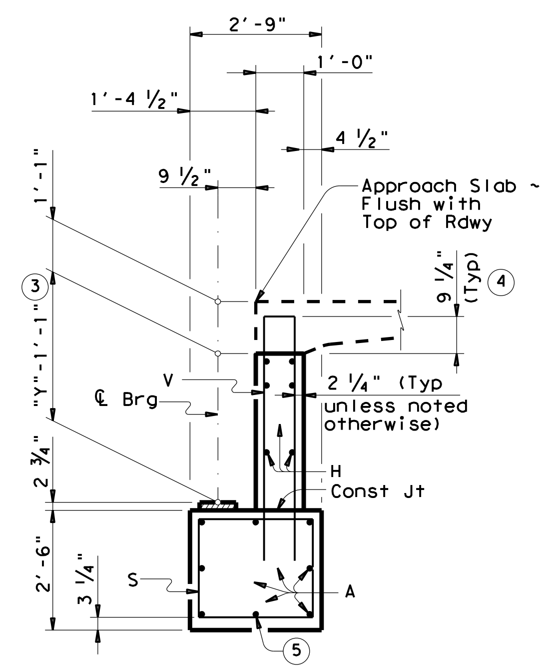


HALF ELEVATION ~ DRILLED SHAFT ABUTMENT



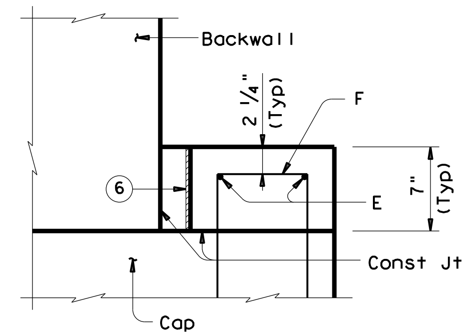
HALF ELEVATION ~ PILE ABUTMENT

(Showing 16" Piles ~ for Piles larger than 16", adjust Bars S spacing as required to avoid Piling)



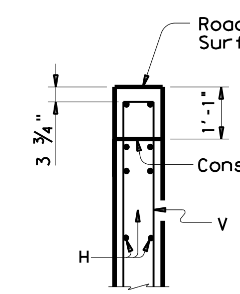
SECTION A-A

(Showing Approach Slab) 2



EARWALL ELEVATION DETAIL 10

(Slope top of earwall away from beams)



BACKWALL DETAIL

(Without Approach Slab) 2

TABLE OF WINGWALL LENGTHS "WL"

Beam Type	"WL"
B20	8.000'
B28	10.000'
B34	11.000'

TABLE OF FOUNDATION LOADS 8

Span Length	Drilled Shaft Load	Battered Pile Load
Ft	Tons/DS	Tons/Pile
30	50	38
35	55	41
40	60	43
45	64	45
50	68	47
55	73	50
60	77	52
65	81	54
70	85	56
75	89	58
80	93	60
85	97	62
90	101	64
95	105	66

1. Top of Cap Elevations are based on section depths shown on Span Details.
2. See Bridge Layout for Joint type and to determine if Approach Slab is present.
3. See Span details for "Y" value.
4. Increase as required to maintain 3 ¾" from Finished Grade.
5. With pile foundations, replace Bar A, located at bottom centerline of cap with 2 ~ #11 x 5'-0" bars placed between pile groups. Deduct 93 Lbs from reinforcing steel total.
6. ½" Preformed Bituminous Fiber material between beam and earwall. Bond to beam with an approved adhesive. Inside face of earwall to be cast with vertical side of beam.
7. Surface finish for the top of Cap will be a textured wood float finish. The surface must be level in the direction of the centerline of Beams.
8. Foundation loads are based on B34 beams.
9. Use 2 Eq Spa for B28 and B34 beams. Use 1 space for B20 beams.
10. Do not cast earwalls until beams are erected in their final position.
11. This set of Bars L only required for B28 and B34 beams.

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.
Concrete strength f'c = 3,600 psi.
All reinforcing must be Grade 60.
Designed for normal embankment header slope of 3:1 or 2:1.
See Bridge Layout for beam type and foundation type, size and length.
See standard FD for all foundation details and notes.
See applicable rail details for rail anchorage cast in wingwalls.
See standard CRR for riprap attachment details, if applicable.
These abutment details may be used only with the following standards:
SBBS-B20-24 or SBBO-B20-24
SBBS-B28-24 or SBBO-B28-24
SBBS-B34-24 or SBBO-B34-24

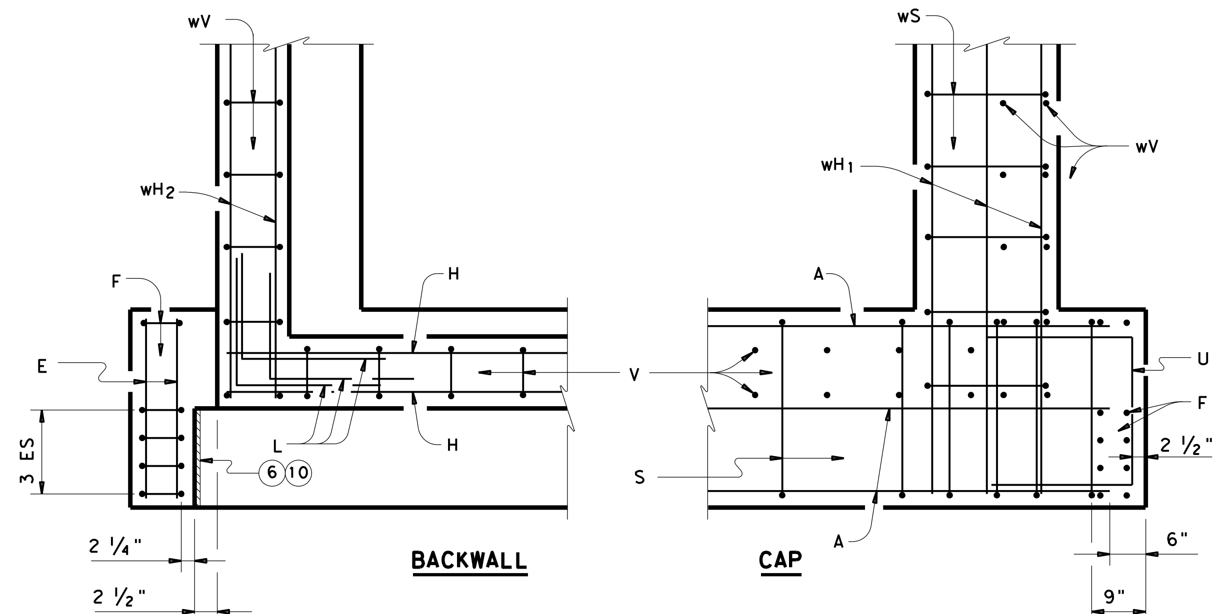
HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS
PRESTR CONC BOX BEAMS 24' RDWY

ABB-24

FILE: bbstde17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December, 2006	CONT 0908	SECT 27	JOB 006	HIGHWAY CR 316
REVISIONS: 04-11: Span length.	DIST ABL	COUNTY KENT		SHEET NO. 50



CORNER DETAILS

TABLE OF ESTIMATED QUANTITIES (TYPE B20 BEAMS) (12)

BAR	NO.	SIZE	LENGTH	WEIGHT
A (5)	8	#11	27' - 7"	1,172
E	4	# 5	2' - 5"	10
F	10	# 5	6' - 1"	63
H	4	# 6	25'-10"	155
L	12	# 6	4' - 0"	72
S	32	# 4	9' - 8"	207
U	4	# 6	7' - 3"	44
V	25	# 5	7' - 6"	191
wH1	14	# 6	9' - 0"	189
wH2	12	# 6	7' - 8"	138
wS	18	# 4	7' - 9"	93
wV	18	# 5	7' - 9"	145
Reinforcing Steel			Lb	2,479
Class "C" Concrete (w/Slab)			CY	12.6
Class "C" Concrete (w/ACP)			CY	12.3

TABLE OF ESTIMATED QUANTITIES (TYPE B28 BEAMS) (12)

BAR	NO.	SIZE	LENGTH	WEIGHT
A (5)	8	#11	27' - 7"	1,172
E	4	# 5	2' - 5"	10
F	10	# 5	6' - 1"	63
H	6	# 6	25'-10"	233
L	18	# 6	4' - 0"	108
S	32	# 4	9' - 8"	207
U	4	# 6	7' - 3"	44
V	25	# 5	8' - 9"	226
wH1	14	# 6	11' - 0"	231
wH2	16	# 6	9' - 8"	232
wS	22	# 4	7' - 9"	114
wV	22	# 5	9' - 0"	207
Reinforcing Steel			Lb	2,847
Class "C" Concrete (w/Slab)			CY	14.7
Class "C" Concrete (w/ACP)			CY	14.4

TABLE OF ESTIMATED QUANTITIES (TYPE B34 BEAMS) (12)

BAR	NO.	SIZE	LENGTH	WEIGHT
A (5)	8	#11	27' - 7"	1,172
E	4	# 5	2' - 5"	10
F	10	# 5	6' - 1"	63
H	6	# 6	25'-10"	233
L	18	# 6	4' - 0"	108
S	32	# 4	9' - 8"	207
U	4	# 6	7' - 3"	44
V	25	# 5	9'-10"	254
wH1	14	# 6	12' - 0"	252
wH2	16	# 6	10' - 8"	256
wS	24	# 4	7' - 9"	124
wV	24	# 5	10' - 1"	252
Reinforcing Steel			Lb	2,975
Class "C" Concrete (w/Slab)			CY	16.2
Class "C" Concrete (w/ACP)			CY	15.9

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

(5) With pile foundations, replace Bar A, located at bottom centerline of cap, with 2 ~ #11 x 5'-0" bars placed between pile groups. Deduct 93 Lbs from reinforcing steel total.

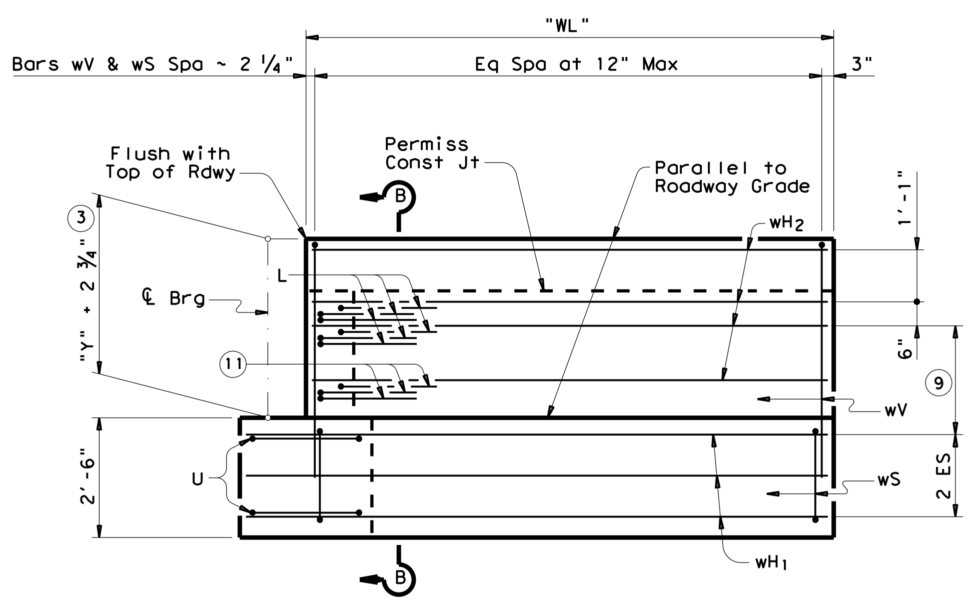
(6) 1/2" Preformed Bituminous Fiber material between beam and earwall. Bond to beam with an approved adhesive. Inside face of earwall to be cast with vertical side of beam.

(9) Use 2 Eq Spa for B28 and B34 beams and 1 space for B20 beams.

(10) Do not cast earwalls until beams are erected in their final position.

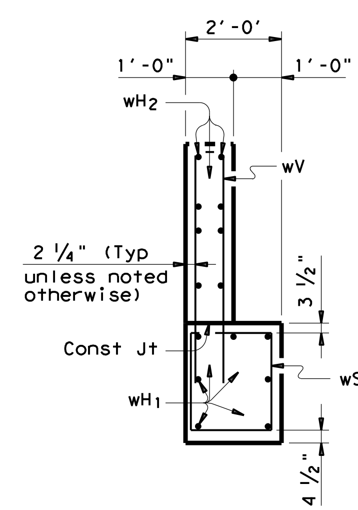
(11) This set of Bars L only required for B28 and B34 beams.

(12) Quantities shown are for one Abutment only (with Approach Slab). With no Approach Slab, add 1.0 CY Class "C" concrete and 78 Lb reinforcing steel for 2 additional Bars H.

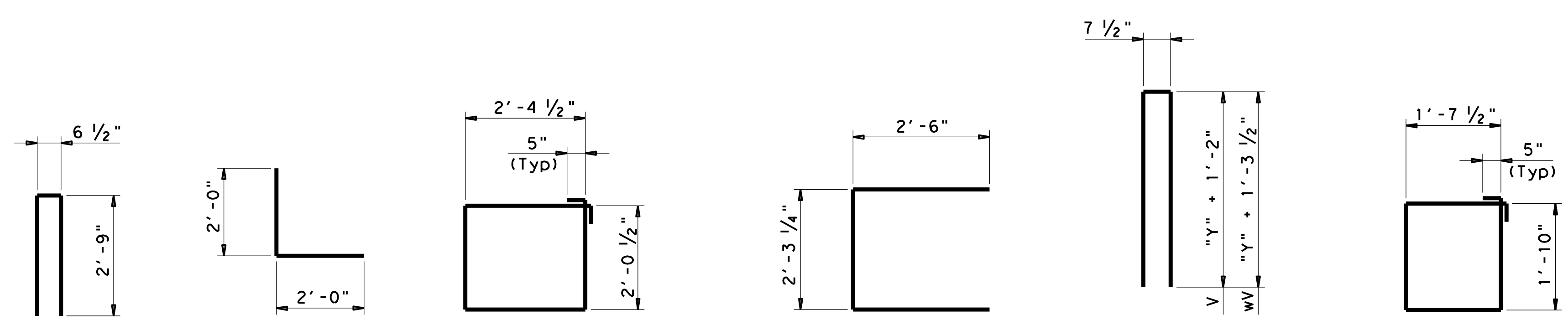


WINGWALL ELEVATION

(Earwall omitted for clarity)



SECTION B-B



HL93 LOADING

SHEET 2 OF 2

Texas Department of Transportation — Bridge Division Standard

ABUTMENTS

PRESTR CONC BOX BEAMS 24' RDWY

ABB-24

FILE: bbstde17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
04-11: Span length.	DIST		COUNTY	SHEET NO.
	ABL		KENT	51

DATE: 9/14/2023 6:15:07 PM
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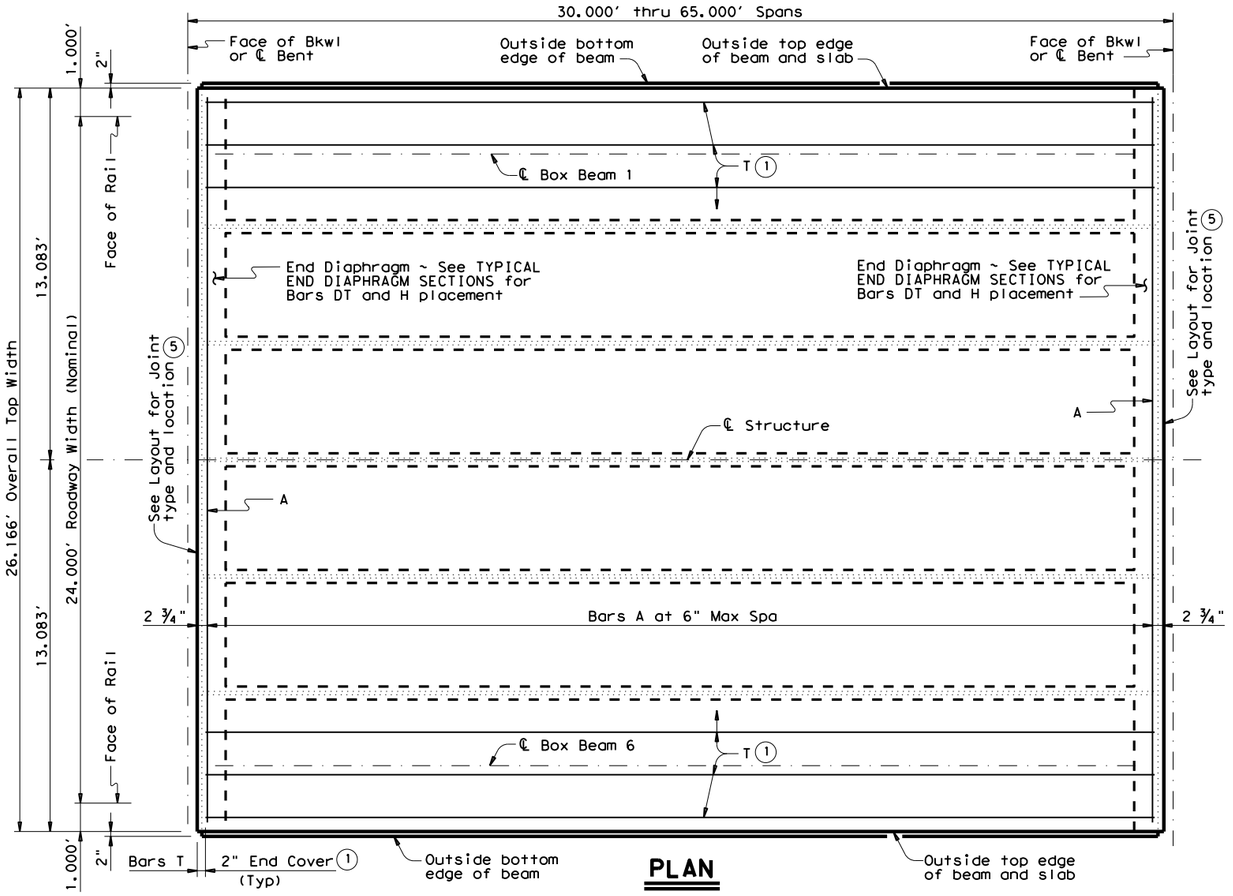
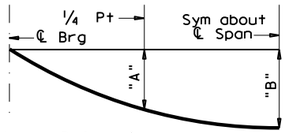


PLAN



Note: Deflections shown are due to shear key and concrete slab only, ($E_c = 5 \times 10^3$ ksi). Calculated deflections shown are theoretical and actual dimension may be less. Deflections may be adjusted based on field observation.

DEAD LOAD DEFLECTION DIAGRAM

TABLE OF DEFLECTIONS AND SECTION DEPTHS

SPAN LENGTH (FT)	BEAM NO.	POINT	DEAD LOAD DEFLECTIONS (FT) SHEAR KEY	SLAB	TOTAL	SECTION DEPTHS "X" AT ℄ BRG (2)	"Y" AT ℄ BRG (2)
30	ALL	"A"	0.000	0.002	0.002	5 ¼"	2'-1 ¼"
		"B"	0.001	0.002	0.003		
35	ALL	"A"	0.001	0.003	0.004	5 ¼"	2'-1 ¼"
		"B"	0.001	0.004	0.005		
40	ALL	"A"	0.002	0.005	0.007	5 ¼"	2'-1 ¼"
		"B"	0.003	0.007	0.010		
45	ALL	"A"	0.003	0.009	0.012	5 ½"	2'-1 ½"
		"B"	0.004	0.012	0.016		
50	ALL	"A"	0.005	0.013	0.018	5 ¾"	2'-1 ¾"
		"B"	0.006	0.019	0.025		
55	ALL	"A"	0.007	0.019	0.026	6 ¼"	2'-2 ¼"
		"B"	0.010	0.027	0.037		
60	ALL	"A"	0.010	0.028	0.038	6 ¾"	2'-2 ¾"
		"B"	0.014	0.039	0.053		
65	ALL	"A"	0.013	0.039	0.052	7"	2'-3"
		"B"	0.019	0.054	0.073		

(1) If multi-span units (with slab continuous over Interior Bents) are indicated on the Bridge Layout, Bars T must be continuous through joint. See Continuous Slab Detail.

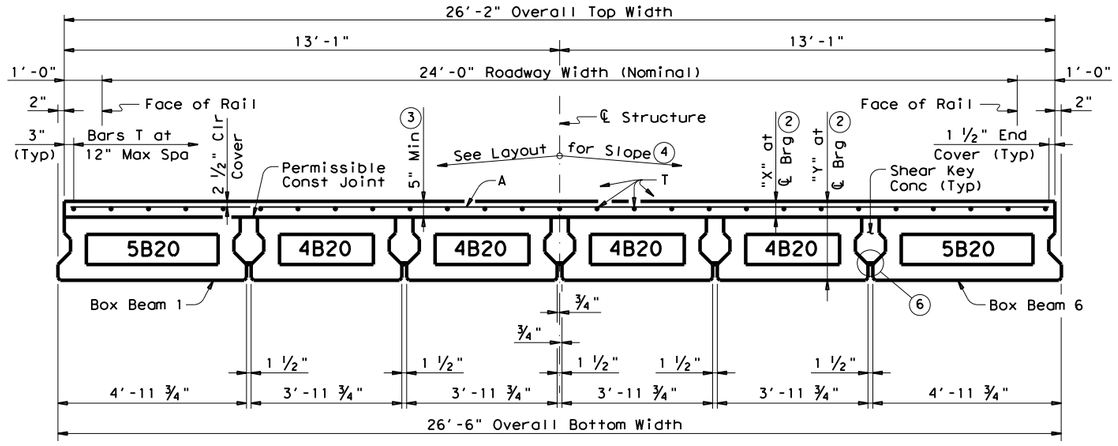
(2) Based on theoretical beam camber, dead load deflections of 5" Cast-in-place slab, shear key dead load and a constant grade. The contractor must adjust these values for any vertical curve.

(3) Slab thickness at midspan of Beams may not exceed 7 inches.

(4) This standard does not provide for changes in roadway cross slopes within the structure.

(5) If using Type A expansion joints, the maximum distance between joints is 100 feet.

(6) Form bottom of shear keys with foam backer rod or other material acceptable to the Engineer.



TYPICAL TRANSVERSE SECTION

BAR TABLE	
BAR	SIZE
A	#4
DT	#4
H	#5
T	#4

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Provide Class S concrete (f'c = 4,000 psi) for slab and shear key. Provide Class S (HPC) concrete if shown elsewhere in the plans.

All reinforcing must be Grade 60.

Two-span or three-span units, with the slab continuous over Interior Bents, may be formed with the details on this standard. Unit Length cannot exceed 3.5 times length of the shortest end span.

Bar laps, where required, will be as follows:

Uncoated ~ #4 = 1'-5"

Epoxy coated ~ #4 = 2'-1"

It is recommended, with crown cross-slope, to erect beams adjacent to crown point first. For structures without a crown point, it is recommended to erect beams on the high side of cross-slope first and progress to the low side.

This sheet does not support the use of Transition Bents.

See railing details and standard BBRAS for rail anchorage.

HL93 LOADING

SHEET 1 OF 2

Texas Department of Transportation

Bridge Division Standard

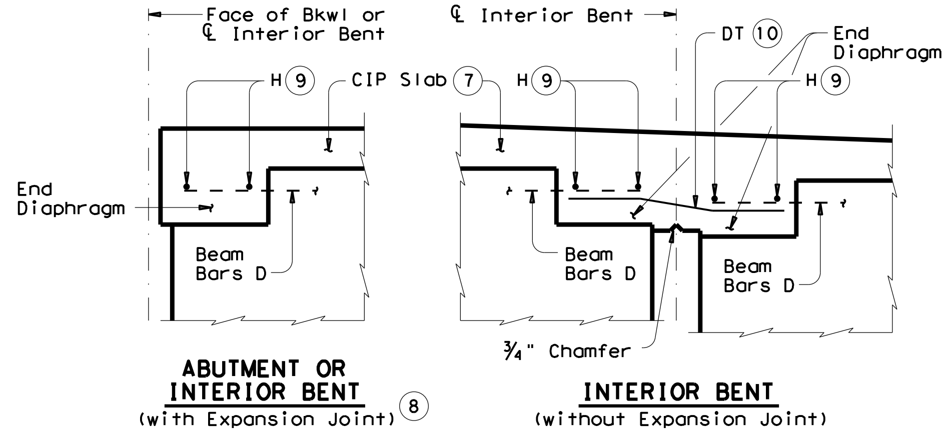
PRESTRESSED CONCRETE BOX BEAM SPANS

TYPE B20 24' RDWY (WITH SLAB)

SBBS-B20-24

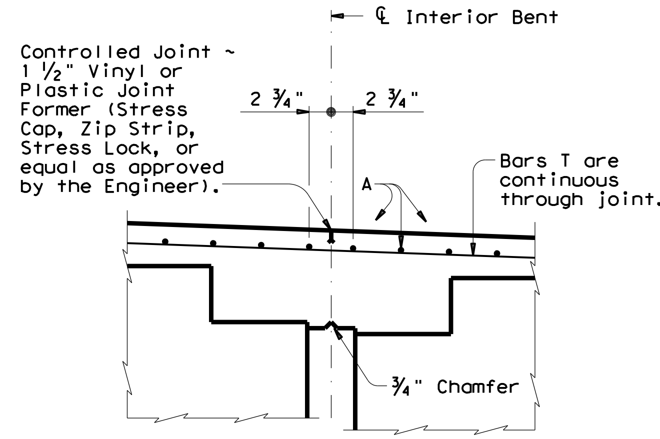
FILE: bbstds19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS 01-12: Cover. 10-15: Table of Est Quantities, Notes.	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		52

DATE: 9/14/2023 6:15:22 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 for Design/PLIGHTSET/Bridge/052-093-SBBS-B20-24.dgn



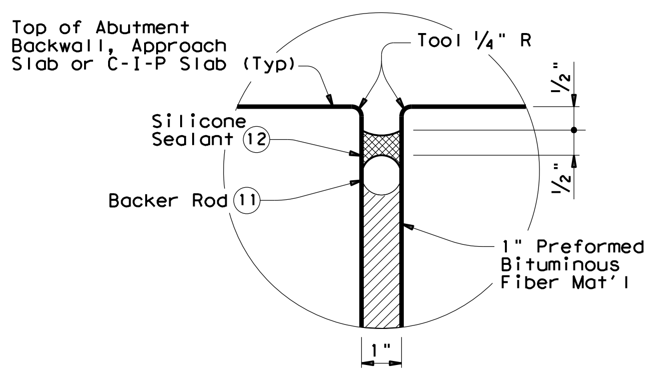
TYPICAL END DIAPHRAGM SECTIONS

(along centerline of Box Beam)



CONTINUOUS SLAB DETAIL

(Diaphragm reinforcing not shown for clarity)



TYPE A JOINT DETAIL (5)

TABLE OF ESTIMATED QUANTITIES

SPAN LENGTH	SHEAR KEY	REINF CONC SLAB (BOX BEAM)	PRESTR CONCRETE BOX BEAMS (TY 4B20) (13)	PRESTR CONCRETE BOX BEAMS (TY 5B20) (13)	TOTAL REINF STEEL (14)
FT	CY	SF	LF	LF	Lb
30	4.0	785	118.00	59.00	1,570
35	4.6	916	138.00	69.00	1,832
40	5.3	1,047	158.00	79.00	2,094
45	6.0	1,177	178.00	89.00	2,354
50	6.6	1,308	198.00	99.00	2,616
55	7.3	1,439	218.00	109.00	2,878
60	8.0	1,570	238.00	119.00	3,140
65	8.6	1,701	258.00	129.00	3,402

(5) If using Type A expansion joints, the maximum distance between joints is 100 ft.

(7) Slab reinforcing omitted for clarity.

(8) See Bridge Layout for Joint type.

(9) Provide 1 ½" end cover to Bars H. After all beams have been placed, weld one Bar H to two Bars D at each end of all beams.

(10) Lap Bars DT 9" Min with each Beam Bar D at Interior Bents without Expansion Joints. Bars DT shown bent for clarity only.

(11) Backer rod must be 25% larger than joint opening and must be compatible with the sealant.

(12) Use Class 7 silicone sealant. Prepare joint and seal in accordance with Item 438 "Cleaning and Sealing Joints".

(13) Fabricator must adjust beam lengths for beam slopes as required.

(14) Reinforcing steel weight is based on an approximate factor of 2.0 lbs per square foot of slab.

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HL93 LOADING

Texas Department of Transportation
Bridge Division Standard

PRESTRESSED CONCRETE BOX BEAM SPANS

TYPE B20 24' RDWY
(WITH SLAB)

SBBS-B20-24

FILE: bbstds19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
01-12: Cover. 10-15: Table of Est Quantities, Notes.	DIST		COUNTY	SHEET NO.
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DATE: 9/14/2023 6:15:37 PM
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STANDARD SBBS-B20-24	DESIGNED BEAMS (STRAIGHT STRANDS)																		OPTIONAL DESIGN				
	PRESTRESSING STRANDS									DEBONDED STRAND PATTERN PER ROW								CONCRETE				
	SPAN LENGTH (ft)	BEAM NO.	BEAM TYPE	NON-STD STRAND PATTERN	TOTAL NO.	SIZE (in)	STRGTH fpu (ksi)	"e" ℄ (in)	"e" END (in)	TOT NO. DEB	DIST FROM BOTTOM (in)	NO.OF STRANDS TOTAL	NO.OF STRANDS DE-BONDED	NUMBER OF STRANDS DEBONDED TO (ft from end) 3	6	9	12	15	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) (ft-kips)	LIVE LOAD DISTRIBUTION FACTOR ② Moment	LIVE LOAD DISTRIBUTION FACTOR ② Shear
	30	1&6	5B20		8	0.6	270	7.38	7.38	0	2.50	8	0	0	0	0	0	0	4.000	5.000	0.640	-0.808	704	0.454	0.691
	30	2-5	4B20		6	0.6	270	7.31	7.31	0	2.50	6	0	0	0	0	0	0	4.000	5.000	0.693	-0.860	601	0.379	0.511
	35	1&6	5B20		8	0.6	270	7.38	7.38	0	2.50	8	0	0	0	0	0	0	4.000	5.000	0.838	-1.041	795	0.440	0.680
	35	2-5	4B20		6	0.6	270	7.31	7.31	0	2.50	6	0	0	0	0	0	0	4.000	5.000	0.911	-1.111	615	0.367	0.498
	40	1&6	5B20		10	0.6	270	7.38	7.38	0	2.50	10	0	0	0	0	0	0	4.000	5.000	1.061	-1.297	889	0.427	0.671
24' Roadway	40	2-5	4B20		8	0.6	270	7.31	7.31	0	2.50	8	0	0	0	0	0	0	4.000	5.000	1.156	-1.388	712	0.356	0.488
5" Slab	45	1&6	5B20		10	0.6	270	7.38	7.38	0	2.50	10	0	0	0	0	0	0	4.000	5.000	1.316	-1.590	960	0.417	0.663
	45	2-5	4B20		10	0.6	270	7.31	7.31	0	2.50	10	0	0	0	0	0	0	4.000	5.000	1.437	-1.706	824	0.348	0.481
	50	1&6	5B20		12	0.6	270	7.38	7.38	0	2.50	12	0	0	0	0	0	0	4.000	5.000	1.606	-1.927	1147	0.408	0.655
	50	2-5	4B20		12	0.6	270	7.31	7.31	0	2.50	12	0	0	0	0	0	0	4.000	5.000	1.755	-2.070	985	0.340	0.476
	55	1&6	5B20		16	0.6	270	7.38	7.38	0	2.50	16	0	0	0	0	0	0	4.000	5.000	1.921	-2.289	1344	0.400	0.649
	55	2-5	4B20		14	0.6	270	7.31	7.31	0	2.50	14	0	0	0	0	0	0	4.000	5.000	2.104	-2.464	1157	0.334	0.471
	60	1&6	5B20		18	0.6	270	7.38	7.38	0	2.50	18	0	0	0	0	0	0	4.000	5.000	2.262	-2.677	1551	0.393	0.643
	60	2-5	4B20		18	0.6	270	7.31	7.31	2	2.50	18	2	0	2	0	0	0	4.000	5.000	2.487	-2.899	1347	0.333	0.467
	65	1&6	5B20		24	0.6	270	7.38	7.38	6	2.50	24	6	2	2	0	2	0	4.000	5.000	2.627	-3.091	1769	0.387	0.638
	65	2-5	4B20		20	0.6	270	7.31	7.31	4	2.50	20	4	0	2	0	2	0	4.000	5.800	2.903	-3.368	1551	0.333	0.463

DESIGN NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

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

Beam designs are applicable for 5" concrete slabs without overlay and 0 degree skew.

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel bars.

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

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

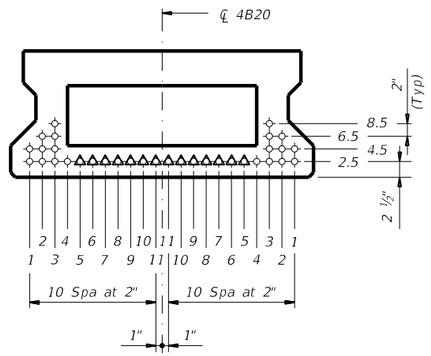
Locate strands for the designed beam as low as possible on the 2" grid system unless a non-standard stand pattern is indicated. Fill row "2.5", then row "4.5", then row "6.5", etc. Place strands within a row as follows:

1) Locate a strand in each "1" position.
2) Place strand symmetrically about vertical centerline of box.
3) Space strands as equally as possible across the entire width.

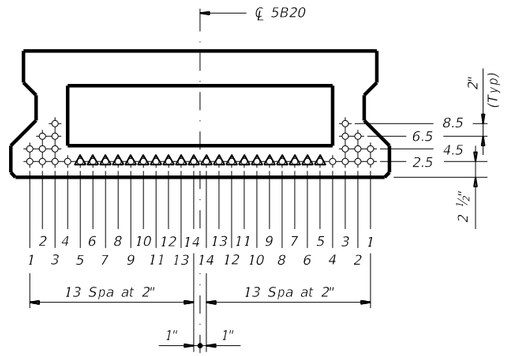
Strand debonding must comply with Item 424.4.2.2.2.4.

Do not debond strands in position "1". Distribute debonded strands equally about the vertical centerline. Decrease debonded lengths working inward, with debonding staggered in each row.

Full-length debonded strands are only permitted in positions marked △.



TxDOT 4B20 BOX BEAM



TxDOT 5B20 BOX BEAM

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.

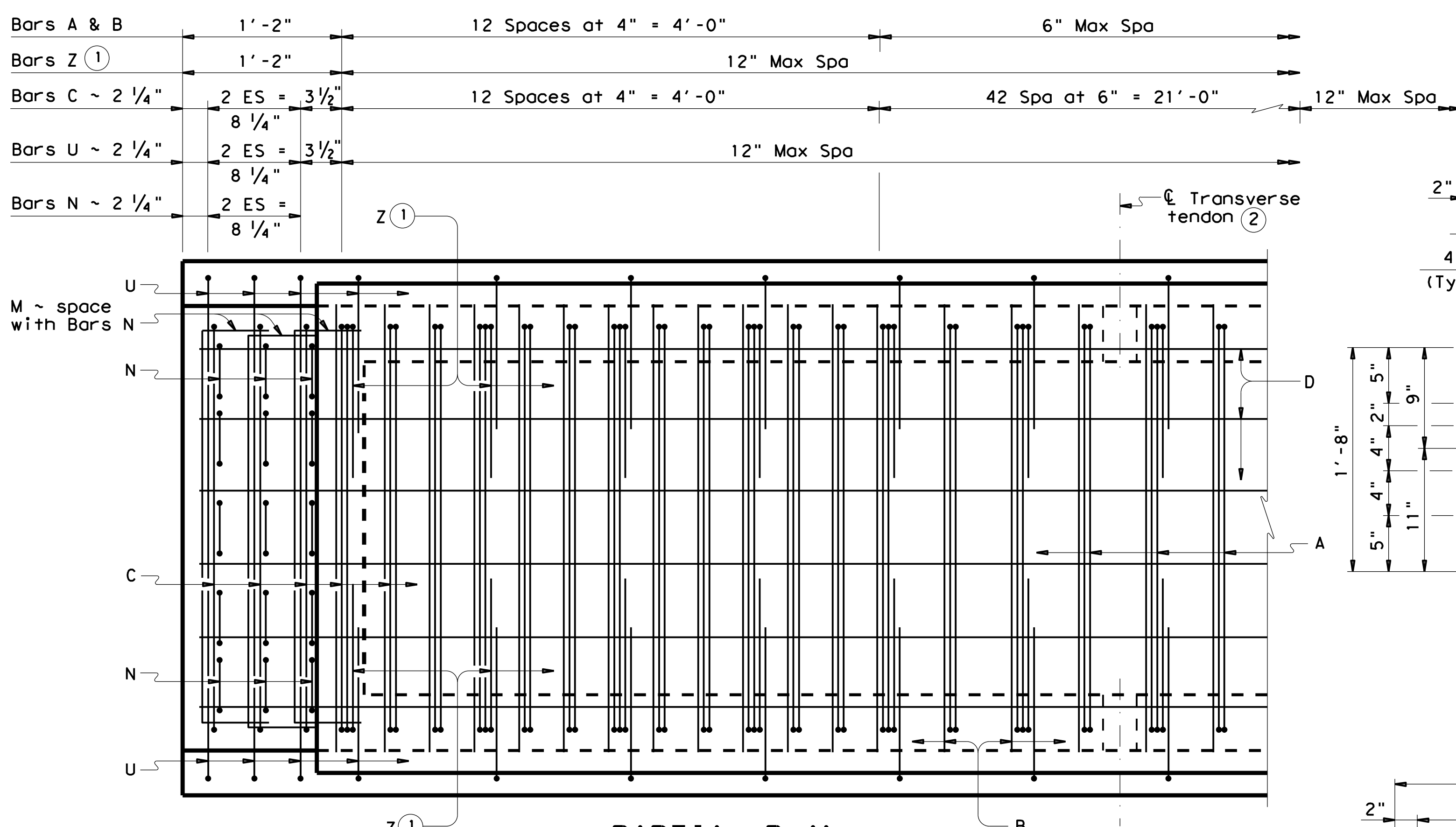
HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRESTR CONC BOX BEAM STANDARD DESIGNS
TYPE B20 24' RDWY (WITH SLAB)

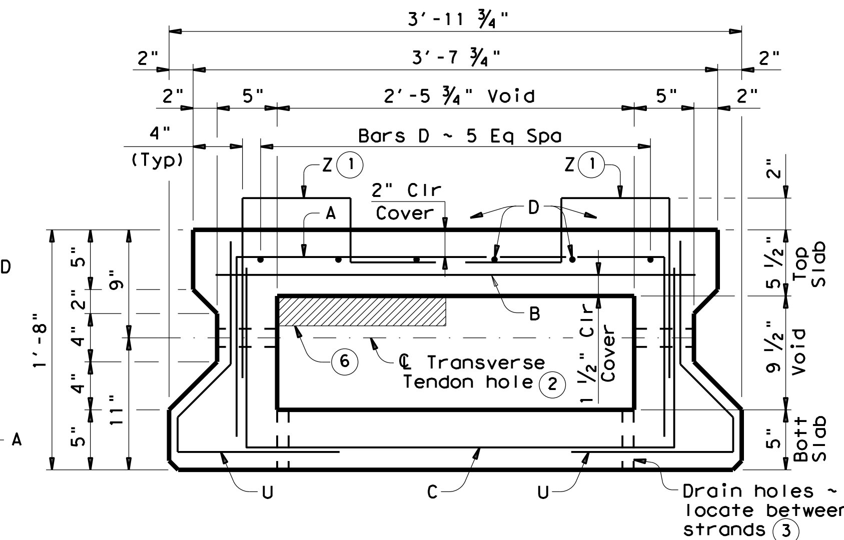
BBSDS-B20-24

FILE: bbstds11.dgn	DN: SRW	CK: BMP	DW: SFS	CK: SDB
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
04-11: f'ci and LLDF. 01-16: Notes, 0.6" strand designs.	DIST	COUNTY		SHEET NO.
	ABL	KENT		54

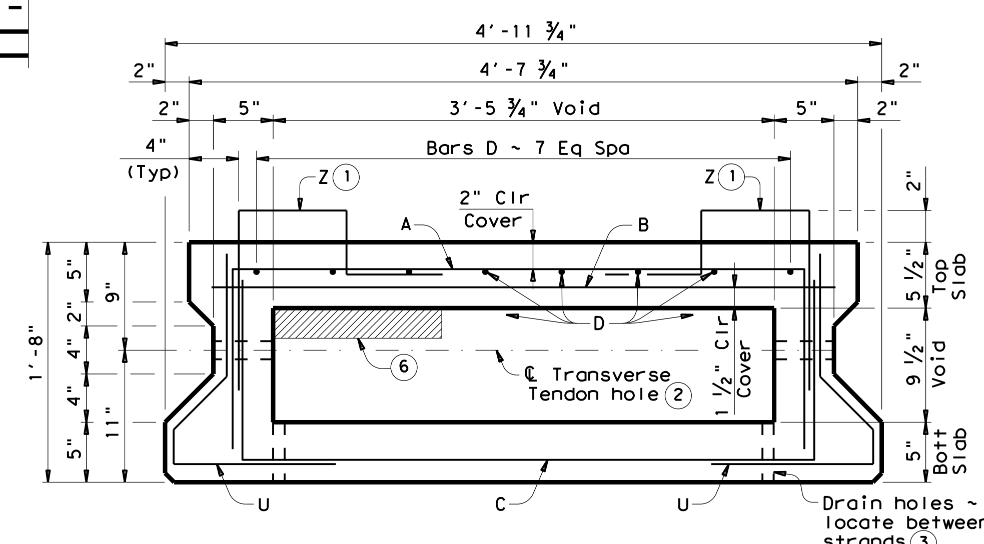


PARTIAL PLAN

(Showing Type 4B20)



TYPICAL SECTION ~ TYPE 4B20



TYPICAL SECTION ~ TYPE 5B20

(1) Bars Z are required for beams topped with a cast-in-place concrete slab only.

(2) Post-tensioning tendons are required for beams not topped with a Min 5" cast-in-place concrete slab. See span details for number and spacing of transverse tendons. Cast interior diaphragms in exterior beams and beams that serve temporarily as exterior beams in staged constructed bridges. See "Blockout, Interior Diaphragm, and Drain Details". Form 3" Dia holes in interior beams. See standard BBPT for details.

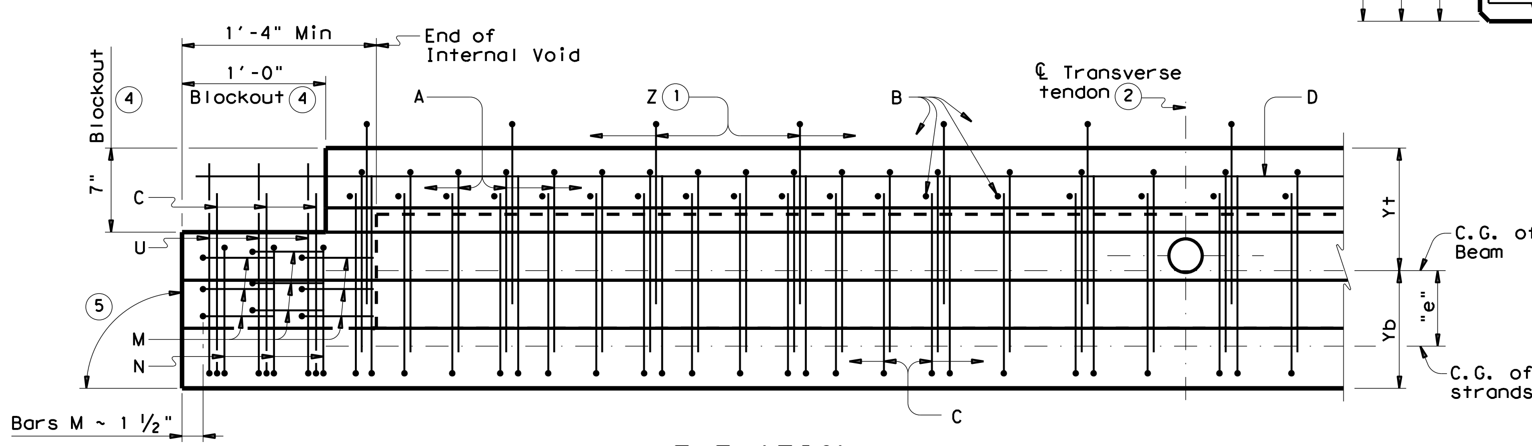
(3) Place drain holes (1" Dia PVC Sch 40 Pipe) as shown in all beam void corners including each side of interior diaphragms. See "Blockout, Interior Diaphragm, and Drain Details".

(4) Blockouts required at ends of all beams. Extend beam reinforcement into blockouts.

(5) 90° at conventional Interior Bents. Ends of beams shall be vertical at Abutment backwall and Inverted Tee Bent Stems.

(6) Showing void modification required in exterior beams not topped with a Min 5" cast-in-place concrete slab. See standard BBRAO for void modification dimensions.

(7) Based on 150 pcf weight density of concrete. Weight of end blocks and interior diaphragms is not included.



ELEVATION

BEAM PROPERTIES			
		Type 4B20	Type 5B20
Area	in^2	591.8	717.8
Y top	in	10.19	10.12
Y bott	in	9.81	9.88
I	in^4	28,086	35,234
Weight (7)	lb/ft	616	748

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.

Use Class H concrete. Use Class H (HPC) if required elsewhere in plans. All reinforcing steel must be Grade 60.

Two-stage monolithic casting is required. The concrete in the first stage cast (bottom beam flange) must remain plastic until the second stage cast (webs and top beam flange) is placed. Vibrate as required to ensure consolidation between the two casts.

1 1/4" clear cover to reinforcement is required unless noted otherwise.

See standard BBRAS or BBRAO for railing anchorage at bridge edges to be cast in beams.

An equal area of welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be substituted for Bars A, B, C, and D.

These details are applicable for skews up to 30 degrees only.

Chamfer bottom beam corners 3/4" or round to a 3/4" radius.

HL93 LOADING

SHEET 1 OF 3

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE BOX BEAM DETAILS (TYPE B20)

BB-B20

FILE: bbstds01.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
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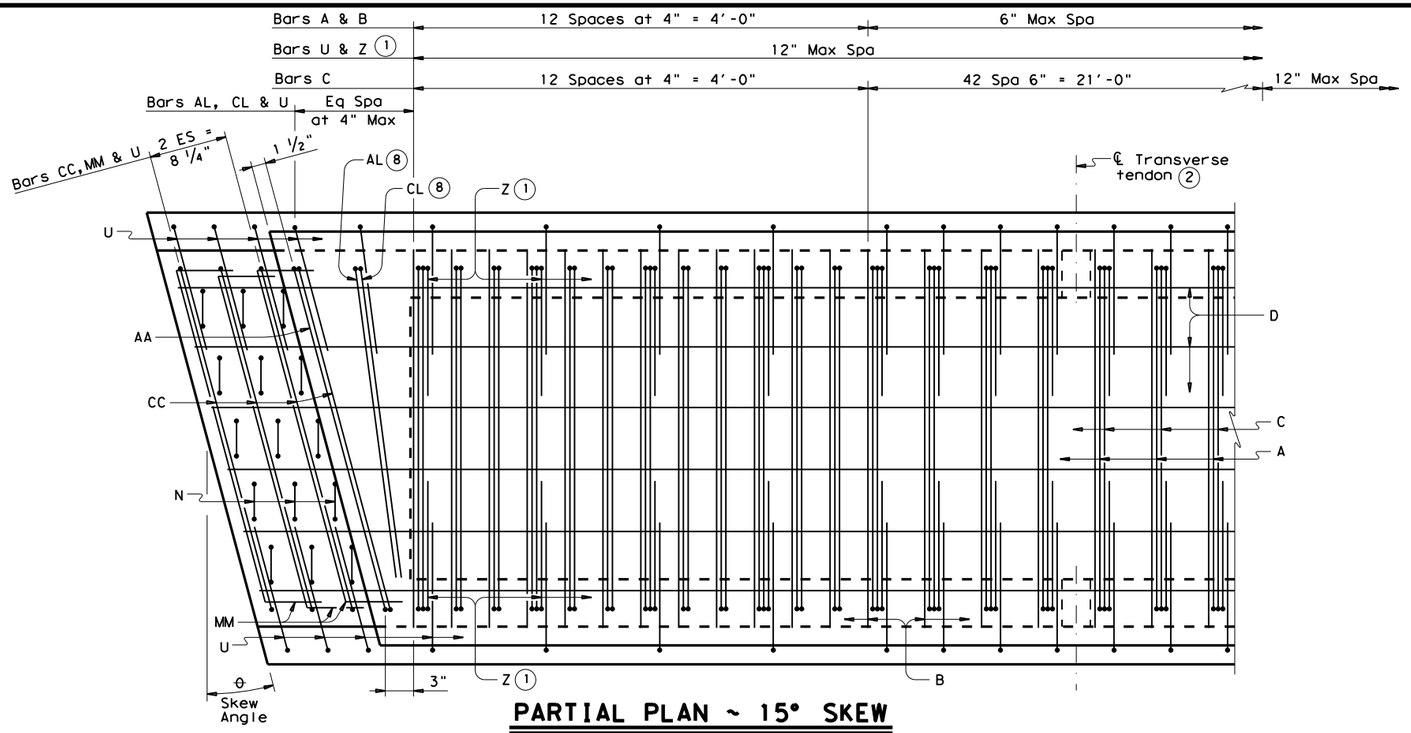
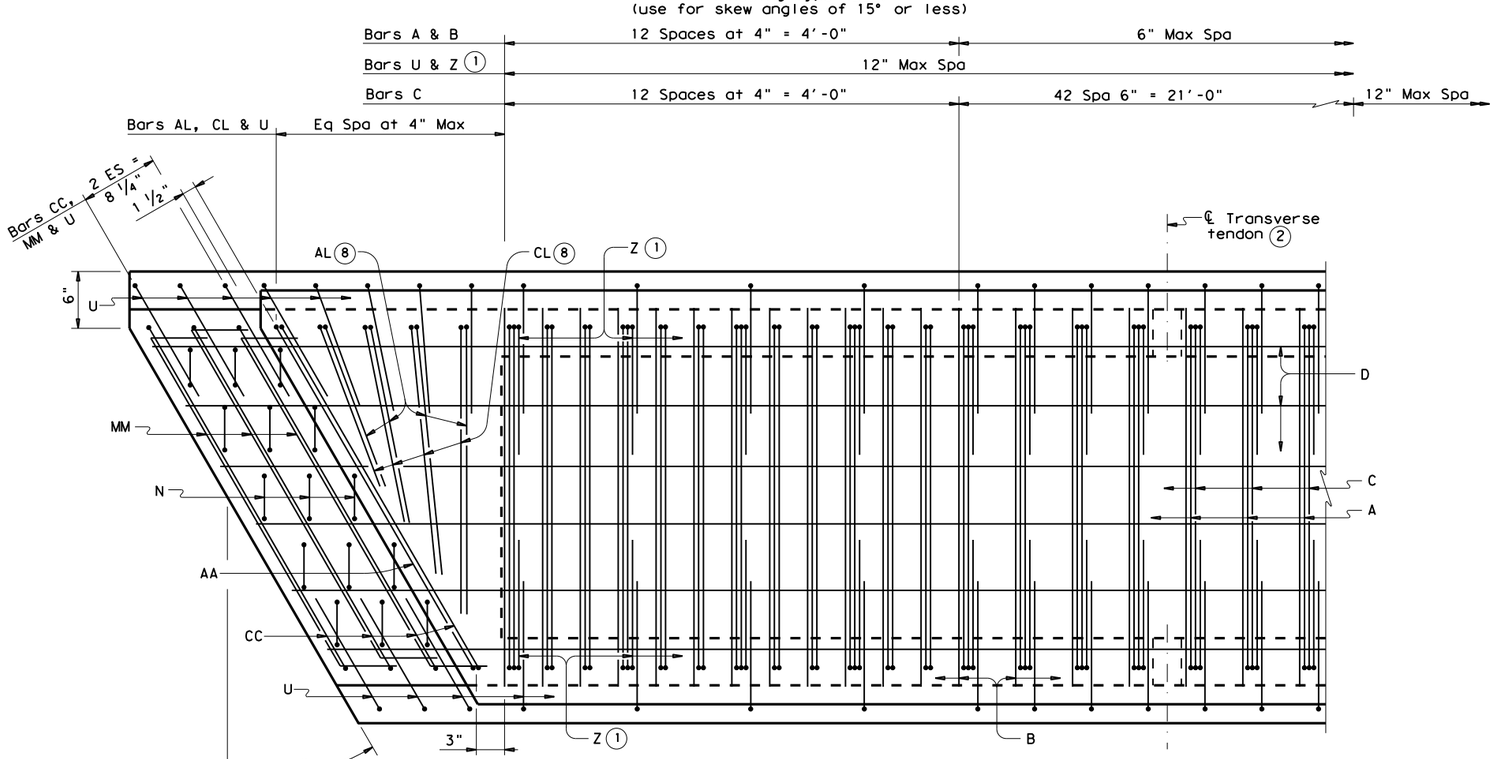


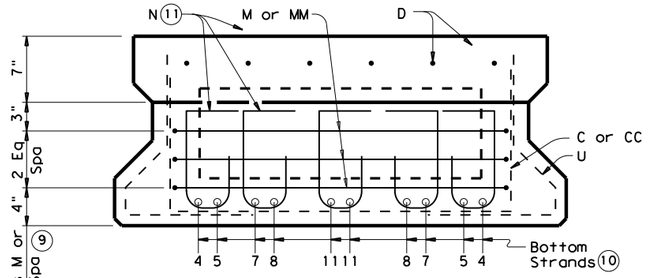
PARTIAL PLAN ~ 15° SKEW

(Showing Type 4B20)
(use for skew angles of 15° or less)



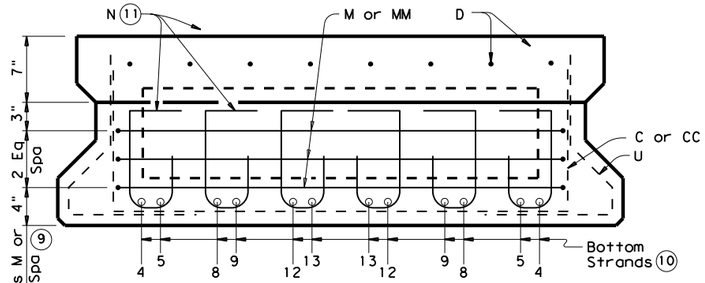
PARTIAL PLAN ~ 30° SKEW

(Showing Type 4B20)
(use for skew angles greater than 15° and less than or equal to 30°)



SECTION THRU BLOCKOUT ~ TYPE 4B20

(Showing End Mat Reinforcing)



SECTION THRU BLOCKOUT ~ TYPE 5B20

(Showing End Mat Reinforcing)

(1) Bars Z are required for beams topped with a cast-in-place concrete slab only.

(2) Post-tensioning tendons are required for beams not topped with a Min 5" cast-in-place concrete slab. See span details for number and spacing of transverse tendons. Cast interior diaphragms in exterior beams and beams that serve temporarily as exterior beams in staged constructed bridges. See "Blockout, Interior Diaphragm, and Drain Details". Form 3" Dia hole in interior beams. See standard BBPT for details.

(8) Cut as required to maintain one inch clear between bars.

(9) Bars M may be adjusted vertically as required to avoid pretensioning strands in web.

(10) See standard BBND or appropriate Prestressed Concrete Box Beam Standard Designs sheet for locations of pretensioning strands.

(11) For Type 4B20 Box Beams: Bars N may be reduced to 4 bars per row when beam design contains fewer than 22 strands. In this case, place Bars N at the 5-6 and 8-9 strand locations.

For Type 5B20 Box Beams: Bars N may be reduced to 5 bars per row when beam design contains fewer than 28 strands. In this case, place Bars N at the 4-5, 9-10 and 14-14 strand locations.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE BOX BEAM DETAILS (TYPE B20)

BB-B20

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©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
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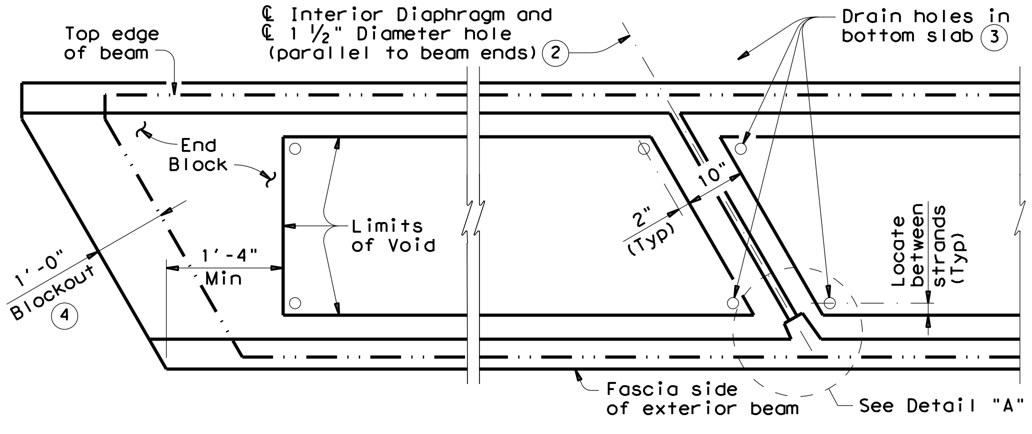
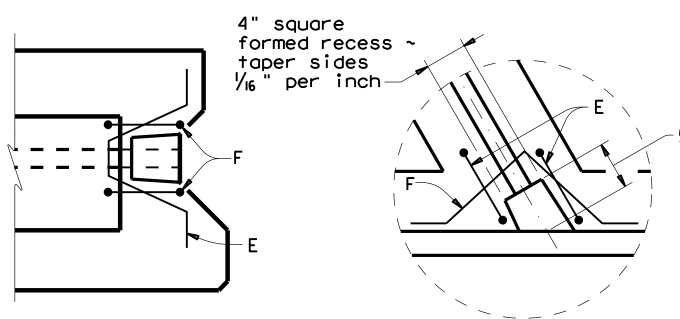


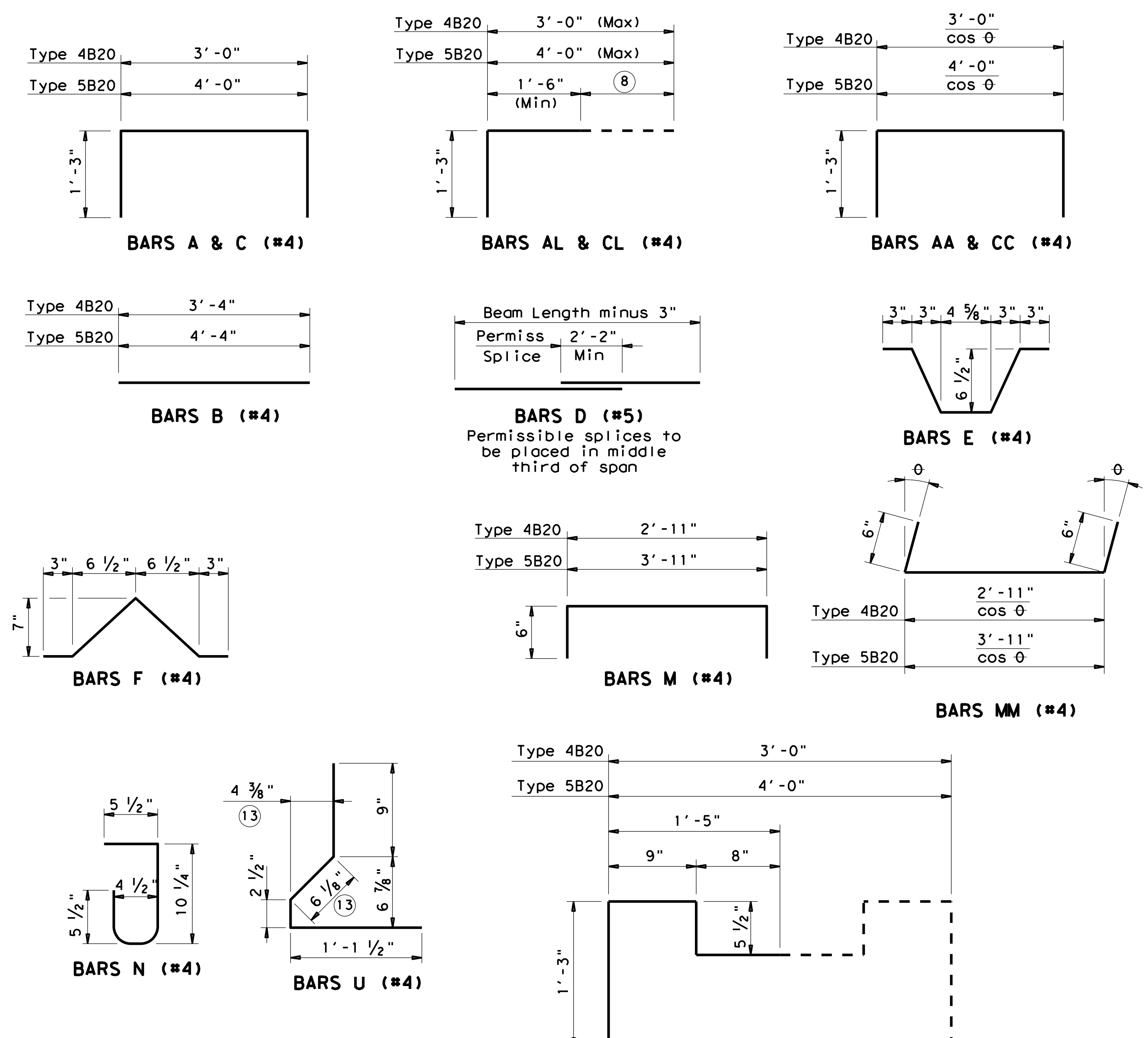
BLOCKOUT, INTERIOR DIAPHRAGM AND DRAIN DETAILS

(Showing 30° skew)



POST-TENSION ANCHORAGE DETAIL

DETAIL A



At fabricator's option, Bars Z pairs may be fabricated using one continuous bar. If this option is used, Bars B at Bar Z locations (only) may be omitted.

(1) Bars Z are required for beams topped with a cast-in-place concrete slab only.

(2) Post-tensioning tendons are required for beams not topped with a Min 5" cast-in-place concrete slab. See span details for number and spacing of transverse tendons. Cast interior diaphragms in exterior beams and beams that serve temporarily as exterior beams in staged constructed bridges. Form 3" Dia holes in interior beams. See "Blockout, Interior Diaphragm, and Drain Details". See standard BBPT for details.

(3) Place drain holes (1" Dia PVC Sch 40 Pipe) as shown in all beam void corners including each side of interior diaphragms. See "Blockout, Interior Diaphragm, and Drain Details".

(4) Blockouts required at ends of all beams. Extend beam reinforcement into blockouts.

(8) Cut as required to maintain one inch clear between bars.

(12) 5" (Typ) or sufficient depth to provide 1" Cover on cut-off tendon. See BBPT for details.

(13) Dimension will vary slightly with skew. Adjust as necessary.

HL93 LOADING

Texas Department of Transportation — Bridge Division Standard

PRESTRESSED CONCRETE BOX BEAM DETAILS (TYPE B20)

BB-B20

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©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
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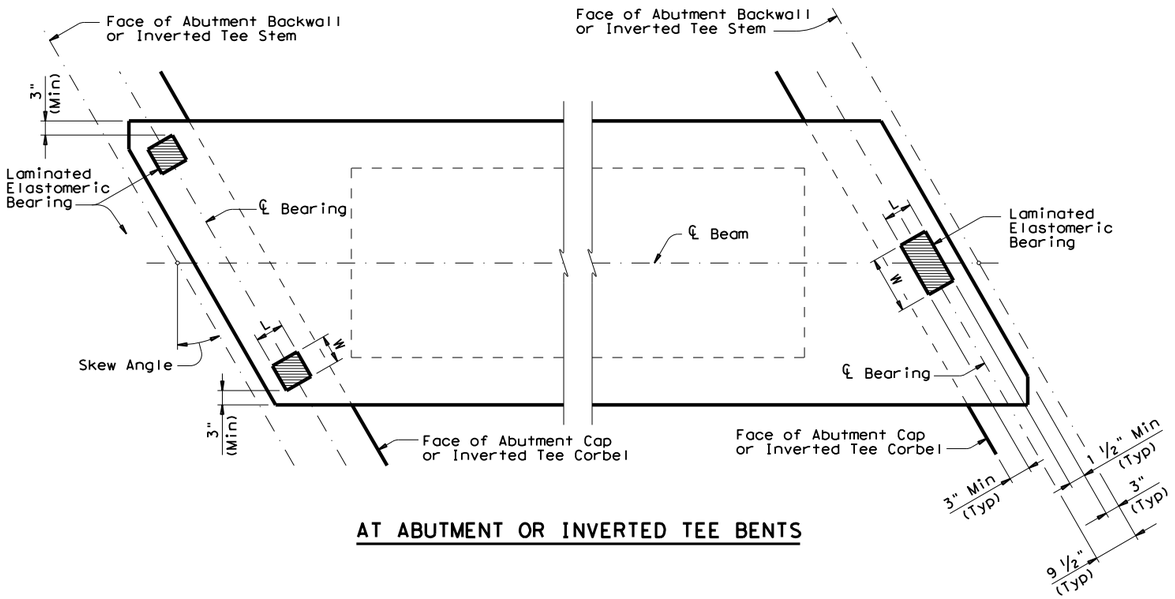
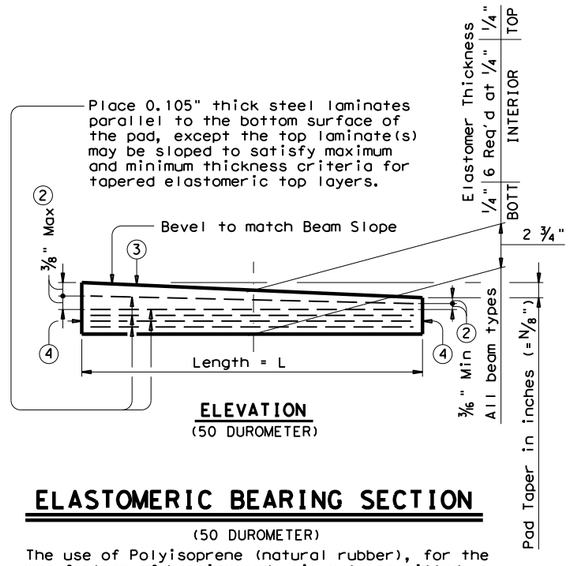


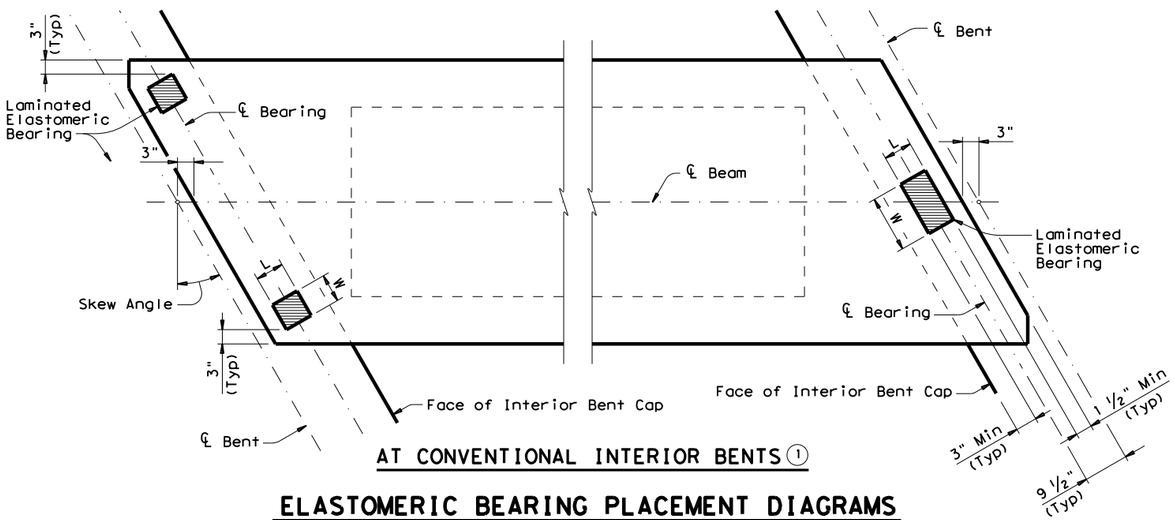
AT ABUTMENT OR INVERTED TEE BENTS



ELEVATION
(50 DUROMETER)

ELASTOMERIC BEARING SECTION

(50 DUROMETER)
The use of Polyisoprene (natural rubber), for the manufacture of bearing pads, is not permitted.



AT CONVENTIONAL INTERIOR BENTS ①

ELASTOMERIC BEARING PLACEMENT DIAGRAMS

The Forward Station Beam End will have one bearing and the Back Station Beam End will have two bearings.

① For Transition Bents with backwall, beams and elastomeric bearings will receive the same treatment as shown for Abutment Bents.

② Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.

③ Indicate BEARING TYPE on all pads. For tapered pads, BEARING TYPE will be located on the high side. The Fabricator will 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 beam slope by more than $\left(\frac{0.0625"}{\text{Length}}\right)$ IN/IN.

④ Locate Permanent Mark here.

ELASTOMETRIC BEARING DIMENSIONS

BEARING TYPE	BEAM TYPE	ONE BEARING L	ONE BEARING W	TWO BEARINGS L	TWO BEARINGS W
B20-"N"	4B20	6"	12"	6"	6"
	5B20	6"	12"	6"	6"
B28-"N"	4B28	6"	14"	6"	7"
	5B28	6"	14"	6"	7"
B34-"N"	4B34	6"	16"	6"	8"
	5B34	6"	16"	6"	8"
B40-"N"	4B40	6"	20"	6"	10"
	5B40	6"	20"	6"	10"

GENERAL NOTES:
Set beams on elastomeric bearings of the dimensions shown. Center bearings as near nominal ℄ bearing as possible within limits shown.
Constant thickness bearings may be used for moderate beam slopes up to 0.0113 ft/ft.
For skewed supports, Bearings beveled for beam slope may not provide uniform contact. However, predicted contact is considered within allowable tolerances.
Shop drawings for approval are required.
A bearing layout which identifies location and orientation of all bearings will 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 is to be included in unit price bid for "Prestressed Concrete Box Beams".
Details are drawn showing right forward skew. See Bridge Layout for actual direction.
These details are applicable for skews up to 30 degrees only.

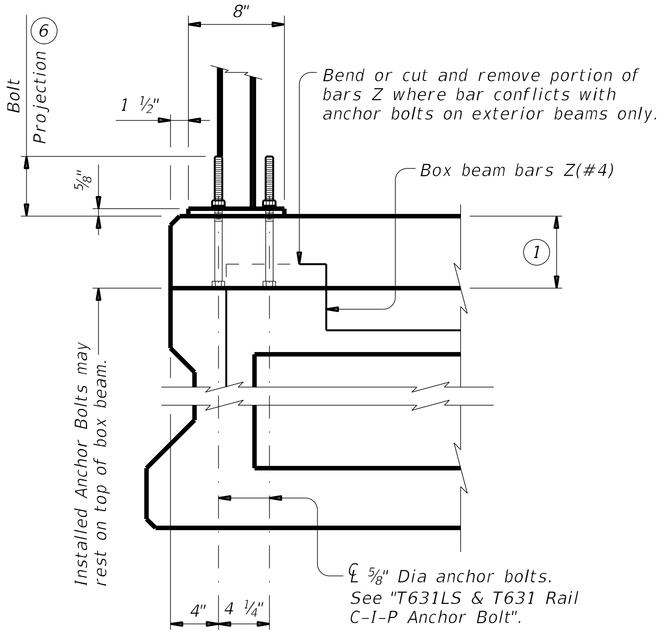
HL93 LOADING

Texas Department of Transportation | Bridge Division Standard

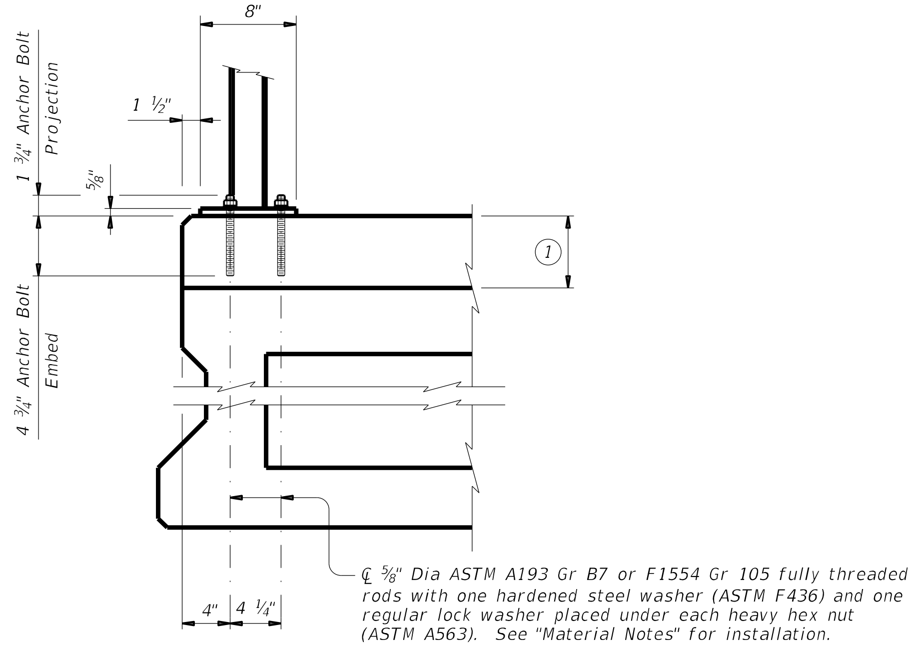
ELASTOMERIC BEARING DETAILS
PRESTR CONC BOX BEAMS

BBEB

FILE: bbstde08.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT December, 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		58

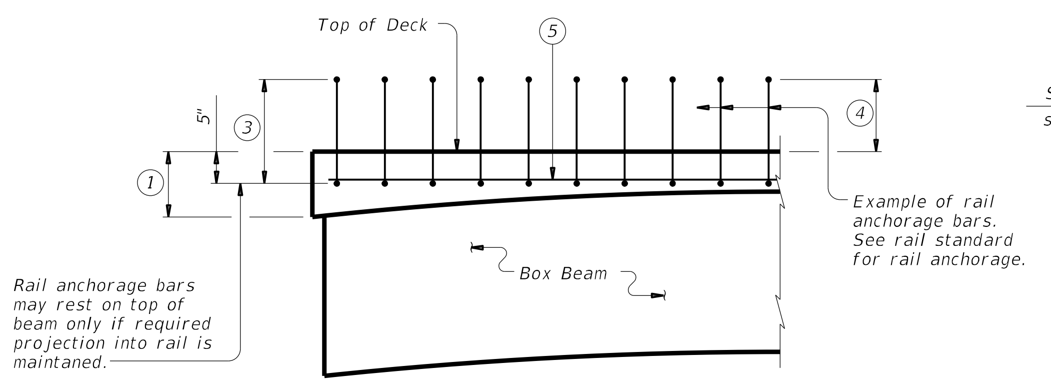


CAST-IN-PLACE ANCHORAGE OPTION

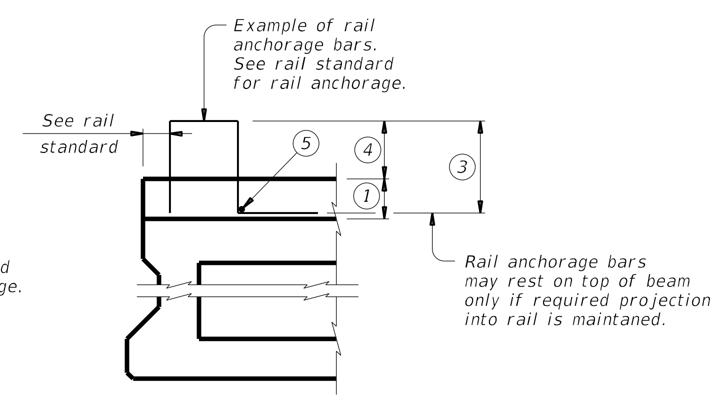


ADHESIVE ANCHORAGE OPTION

T631LS & T631 RAIL ANCHORAGE PLACEMENT (2)(7)



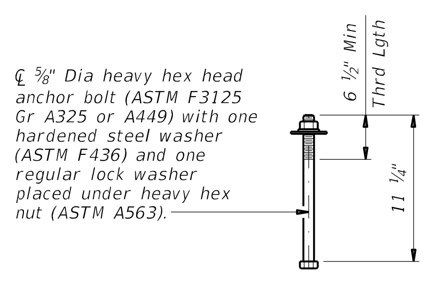
PART SPAN ELEVATION



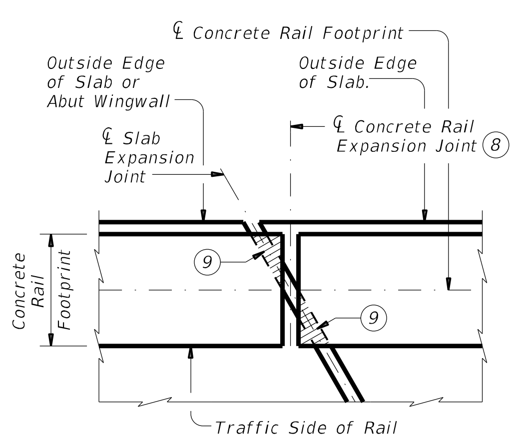
SECTION

TYPICAL CONCRETE RAIL ANCHORAGE

(Showing typical concrete rail anchorage)



T631LS & T631 RAIL C-I-P ANCHOR BOLT



PLAN OF CONCRETE RAILS AT EXPANSION JOINTS

(1) Cast-in-place slab thickness varies due to beam camber (5" minimum).

(2) Replace cast-in-place anchor bolts shown on T631LS or T631 Rail standard with an adhesive anchor system or cast-in-place anchor bolts shown on this sheet.

(3) Bar length shown on rail standard, minus 1 ¼". Adjust bar length for a raised sidewalk.

(4) See Rail standard for projection from finished grade or top of sidewalk.

(5) Place additional (#5) longitudinal bar.

(6) Excess bolt length has been provided to accommodate a variable slab thickness due to beam camber. If slab thickness on span details exceed 10", bolt length must be increased accordingly. After posts have been set and bolts tightened, bolt projection above nuts of more than ½" must be cut off and painted with two coats of zinc-rich paint conforming to the Item 445 "Galvanizing".

(7) Distance from end of top outside edge of slab to center of first bolt group can not be less than 9", except: 15° Skew: 1'-0" (acute corner only)
30° Skew: 1'-3" (acute corner only)

(8) Location of Rail Expansion Joint must be at the intersection of ℄ Slab Expansion Joint, ℄ Rail Footprint and perpendicular to slab outside edge.

(9) Cross-hatched area must have ½" Preformed Bitumuminous Fiber Material under concrete rail, as shown.

CONSTRUCTION NOTES:

Rail anchorage bars may be field bent as required to clear rail reinforcing or provide minimum cover shown on standard rail detail sheets.

Test adhesive anchors in accordance with Item 450.3.3, "Tests". Test 3 anchors per 100 anchors installed. Perform corrective measures to provide adequate capacity if any of the tests do not meet the required test load. Repair damage from testing as directed.

MATERIAL NOTES:

Galvanize all steel components of steel rail system.

Provide Grade 60 reinforcing steel.

Cast-in-place anchorage system for T631LS and T631 Rail must be ⅝" Dia heavy hex head anchor bolts (ASTM F3125 Gr 325 or A449) with one hardened steel washer (ASTM F436) and one regular lock washer placed under heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed anchor bolts 4 ½" minimum.

Adhesive anchors for T631LS and T631 Rail must be ⅝" Dia ASTM A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened steel washer (ASTM F436) and one regular lock washer placed under each heavy hex nut. Nuts must conform to ASTM A563 requirements. Embed fully threaded rod into slab and/or abutment wingwall using a Type III, Class C, D, E, or F anchor adhesive. Minimum adhesive anchor embedment depth is 4 ¾". Anchor adhesive chosen must be able to achieve a nominal bond strength in tension of a single anchor, Na, of 8 kips (edge distance must be accounted for). Submit signed and sealed calculations or the manufacturer's published literature showing the proposed anchor adhesive's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean out, must be in accordance with Item 450, "Railing."

Epoxy coat or galvanize reinforcing steel shown on this standard if rail reinforcement is epoxy coated or galvanized.

GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.

This standard is for use with structures with a 5" minimum cast-in-place concrete slab.

This standard may require modification for interior rails. This standard does not apply to median barriers.

This standard does not provide details for Type T221P, T224, T80HT, T80SS, C412, PR11, PR22 and PR3 rails on box beam bridges.

See rail standards for approved speed restrictions, notes and details not shown.

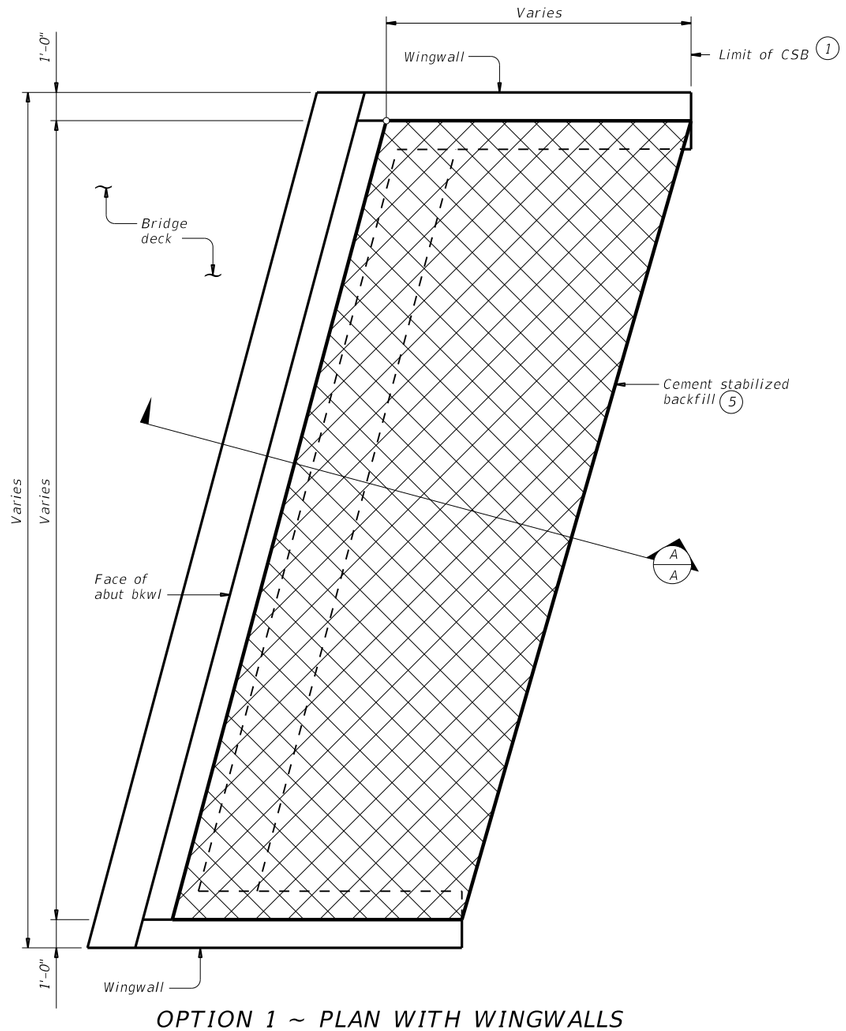
Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation — Bridge Division Standard

RAIL ANCHORAGE DETAILS
PRESTR CONC BOX BEAMS (WITH SLAB)
BBRAS

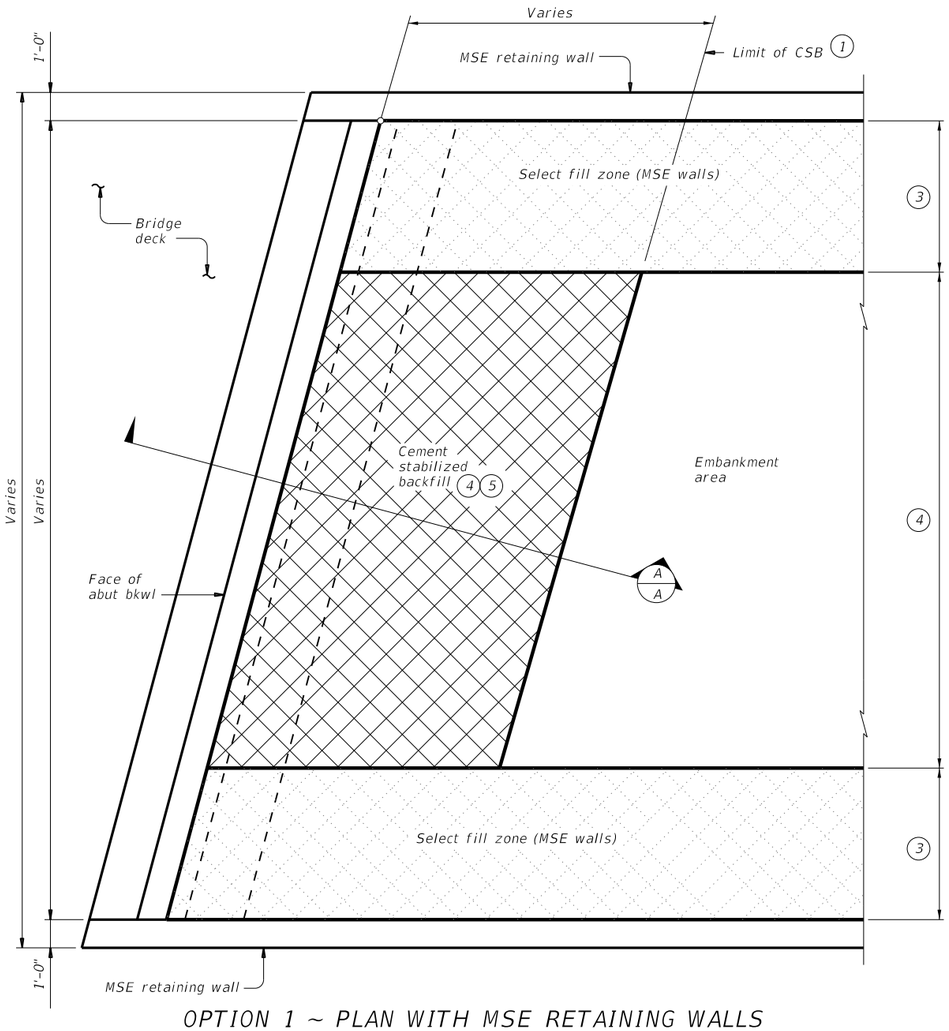
FILE: bbstde09-18.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH	
©TxDOT December 2006	CONT	SECT	JOB	HIGHWAY	
REVISIONS 04-90: Updated for new rails. 01-12: rails anchor bars. 07-14: Removed T101 & T6. Added T631. 03-16: Class D, E, or F epoxy in material notes. T221P & T224 in general notes. 03-18: Updated adhesive anchor notes.	0908	27	006	CR 316	
	DIST	COUNTY		SHEET NO.	
	ABL	KENT		59	

DATE: 9/14/2023 6:16:36 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/7. Bridge/060-061 CSAB



OPTION 1 ~ PLAN WITH WINGWALLS

Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS

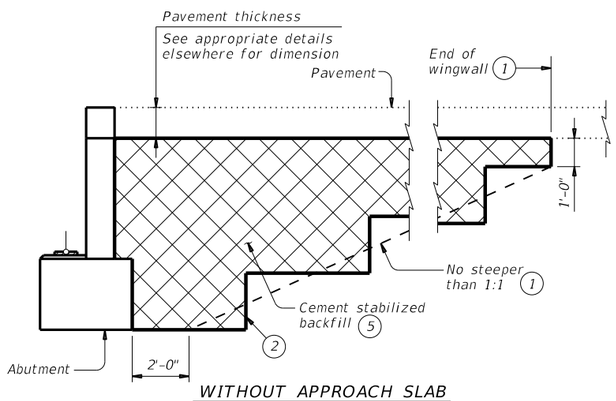
(1) Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.

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

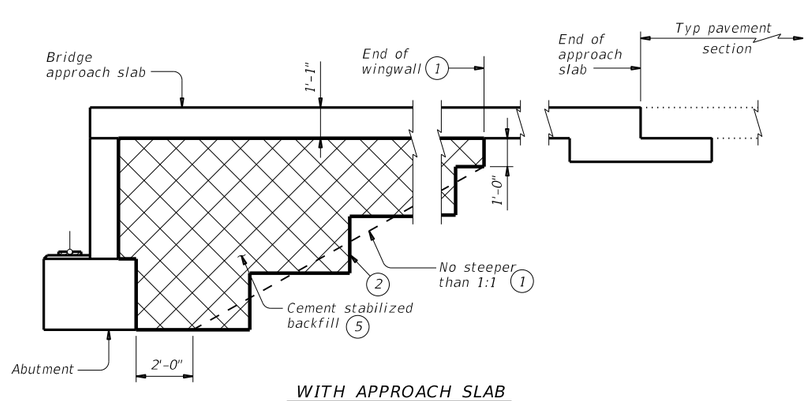
(3) Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.

(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).



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

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

SECTION A-A

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	0908	27	006	CR 316
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	ABL	KENT		60

DATE: 9/14/2023 6:16:37 PM
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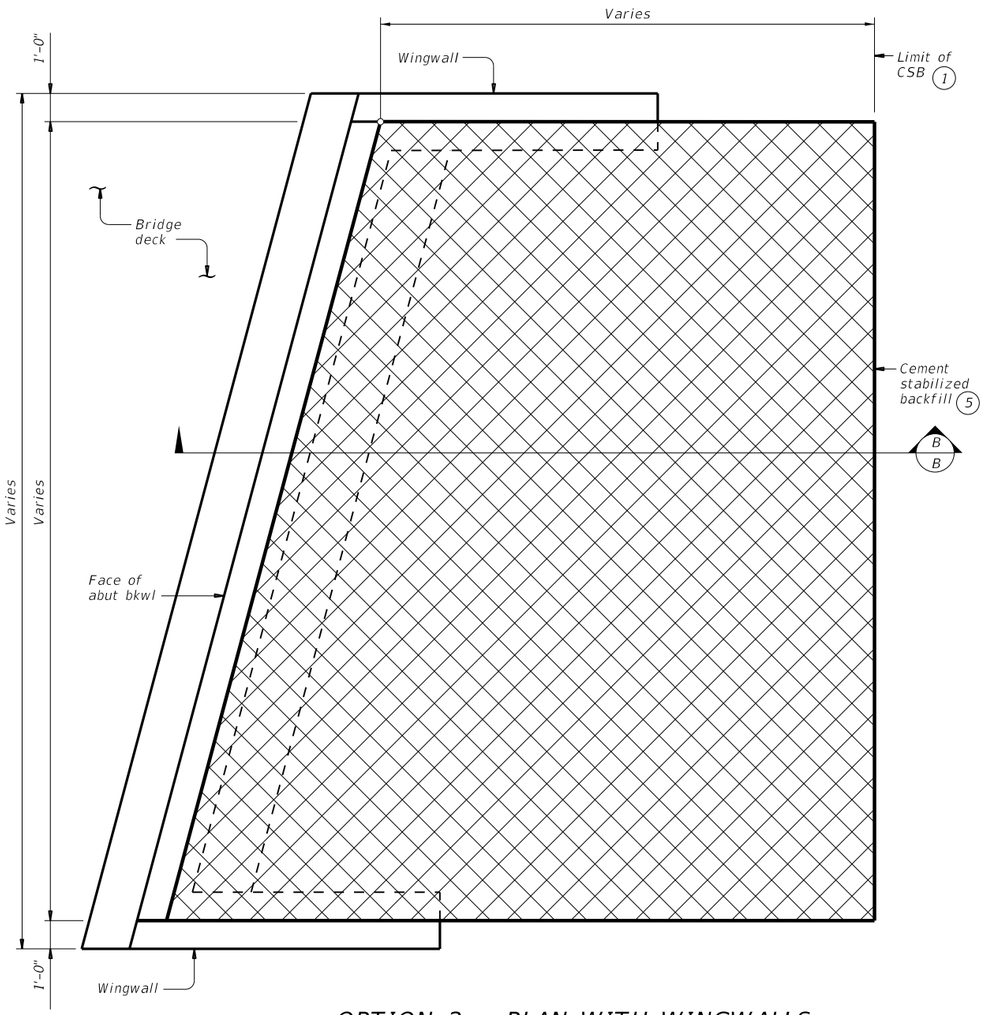
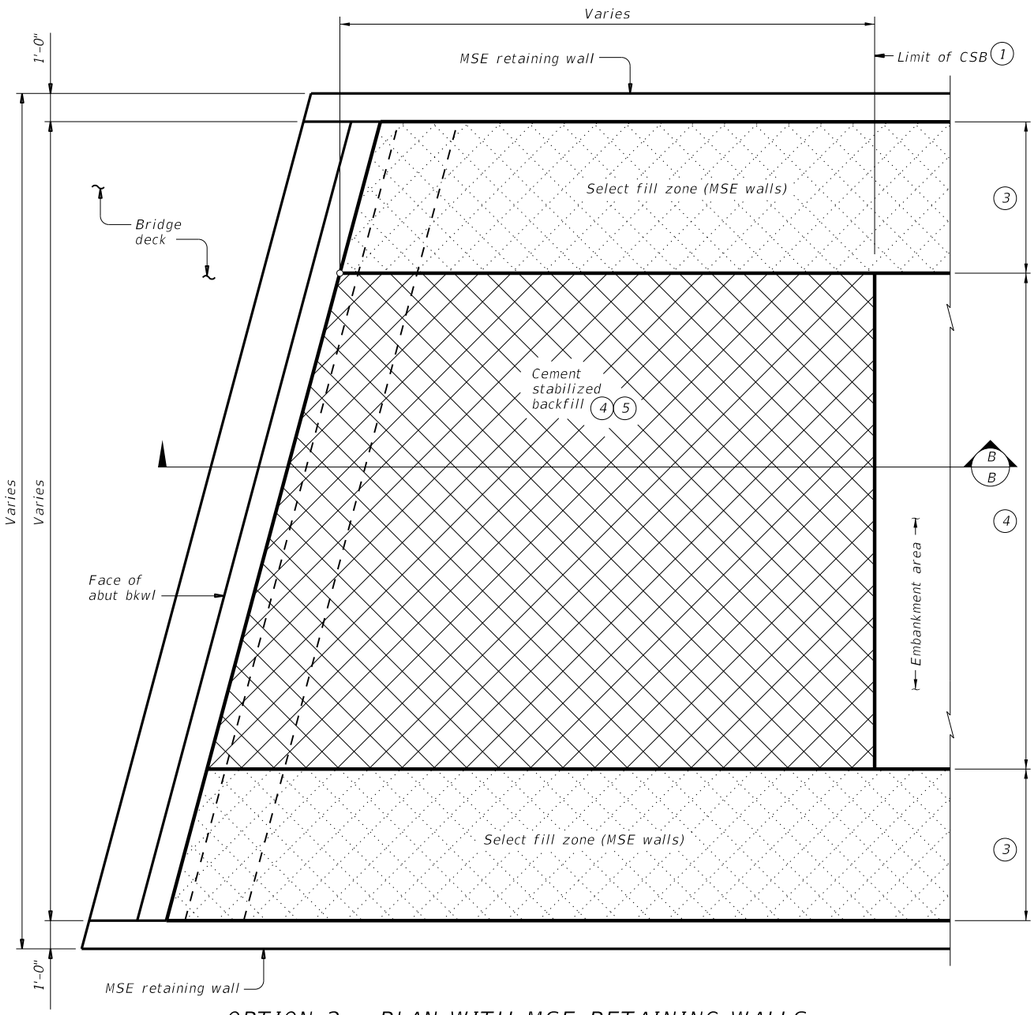


OPTION 2 ~ PLAN WITH WINGWALLS

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.

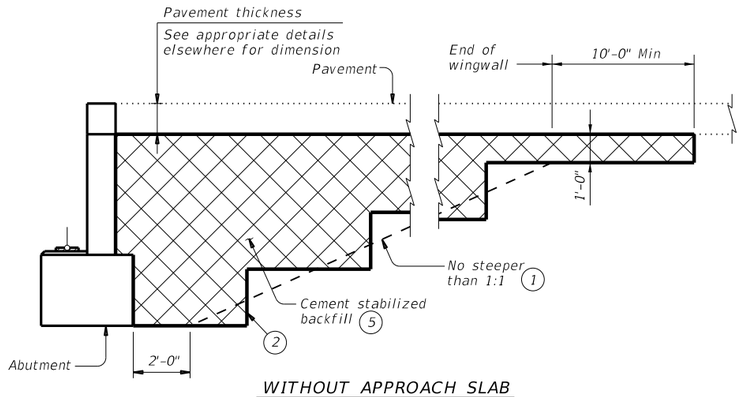
(2) Bench backfill as shown with 12" (approximate) bench depths.

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

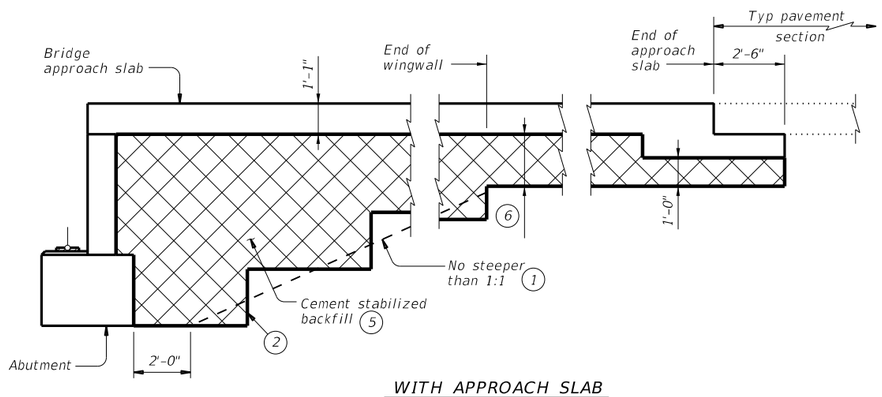
(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(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



WITHOUT APPROACH SLAB



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	0908	27	006	CR 316
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	ABL	KENT		61

DATE: 9/14/2023 6:16:52 PM
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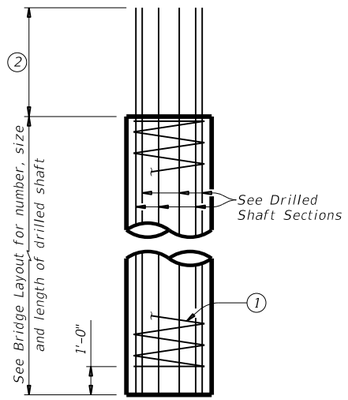
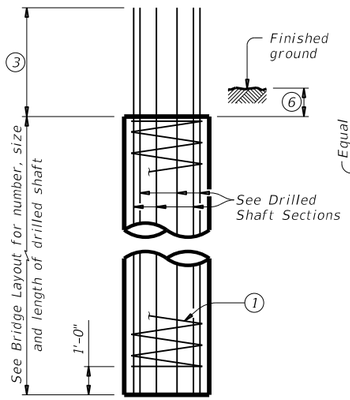
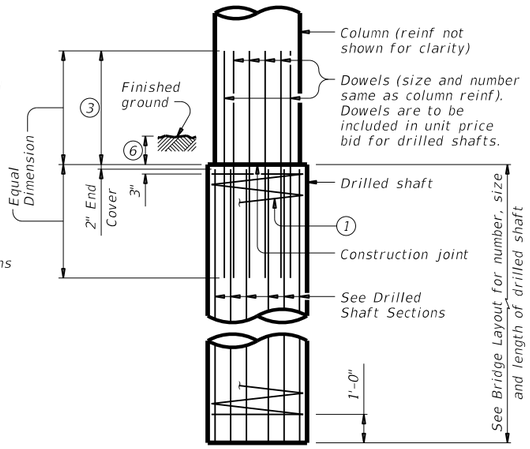


ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS

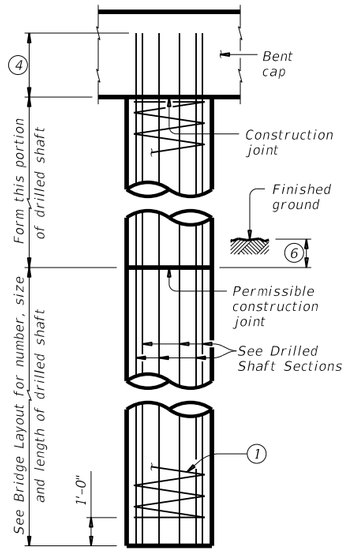


INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA

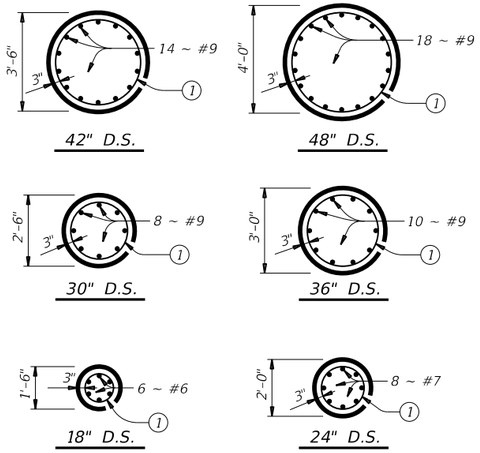


INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA

DRILLED SHAFT DETAILS



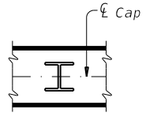
OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)



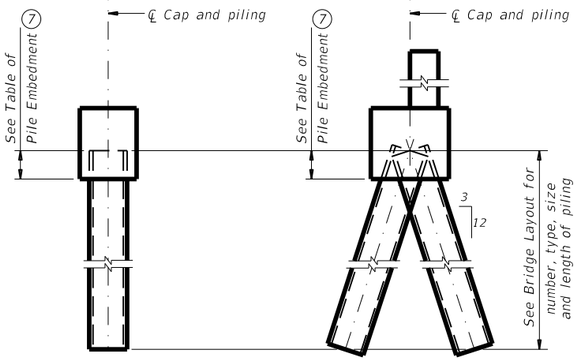
DRILLED SHAFT SECTIONS

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"

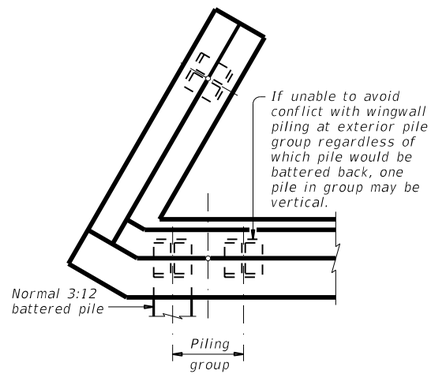
See Prestressed Concrete Piling (CP) standard for additional details on concrete pile embedment.



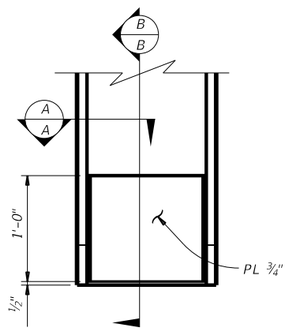
ORIENTATION OF STEEL H-PILING



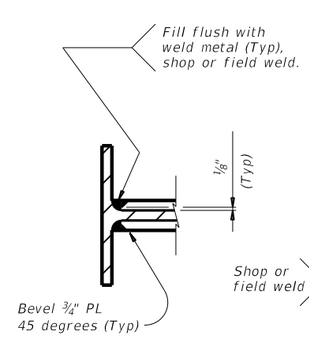
PILING DETAILS
(Concrete or steel H)



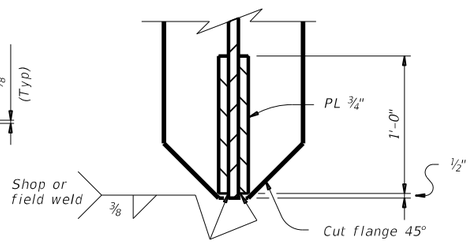
DETAIL "A"
(Showing plan view of a 30° skewed abutment)



ELEVATION



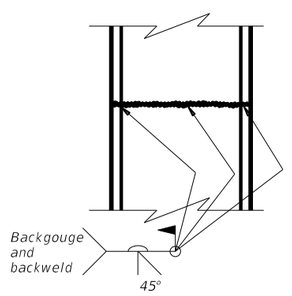
SECTION A-A

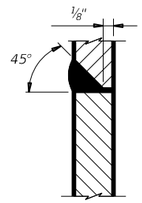


SECTION B-B

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.

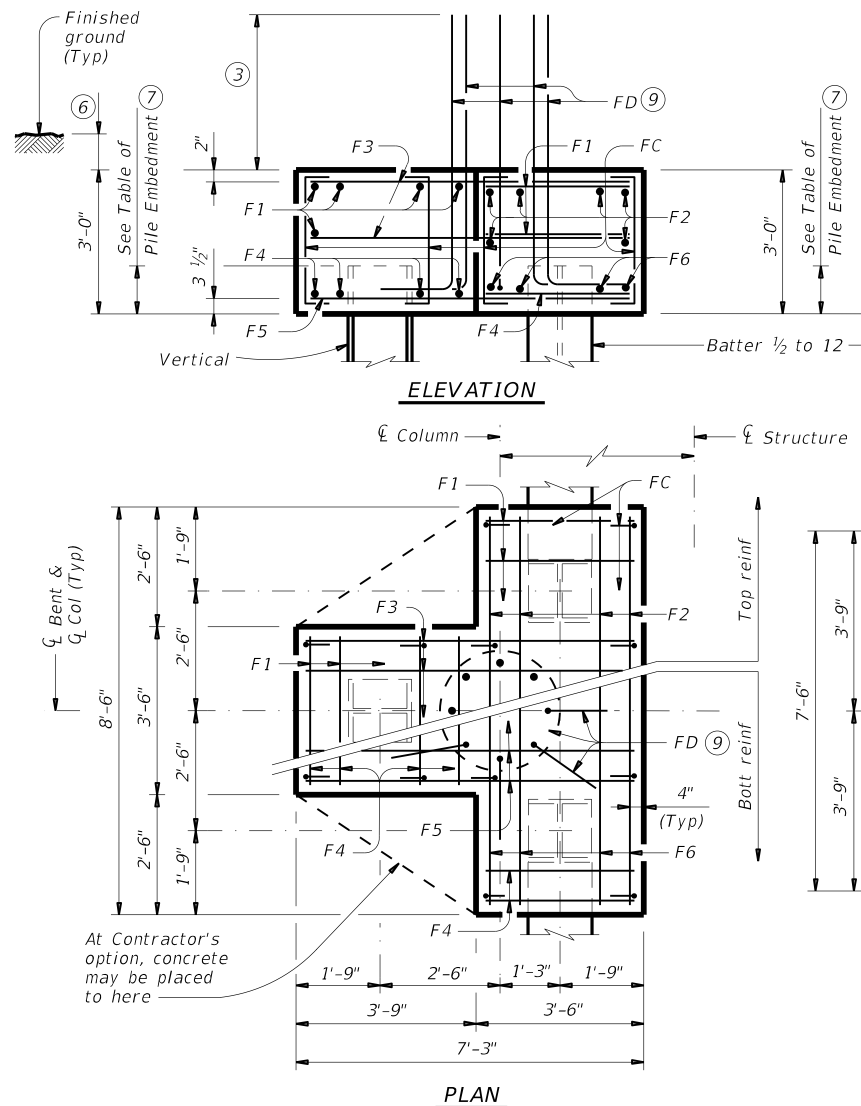
Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

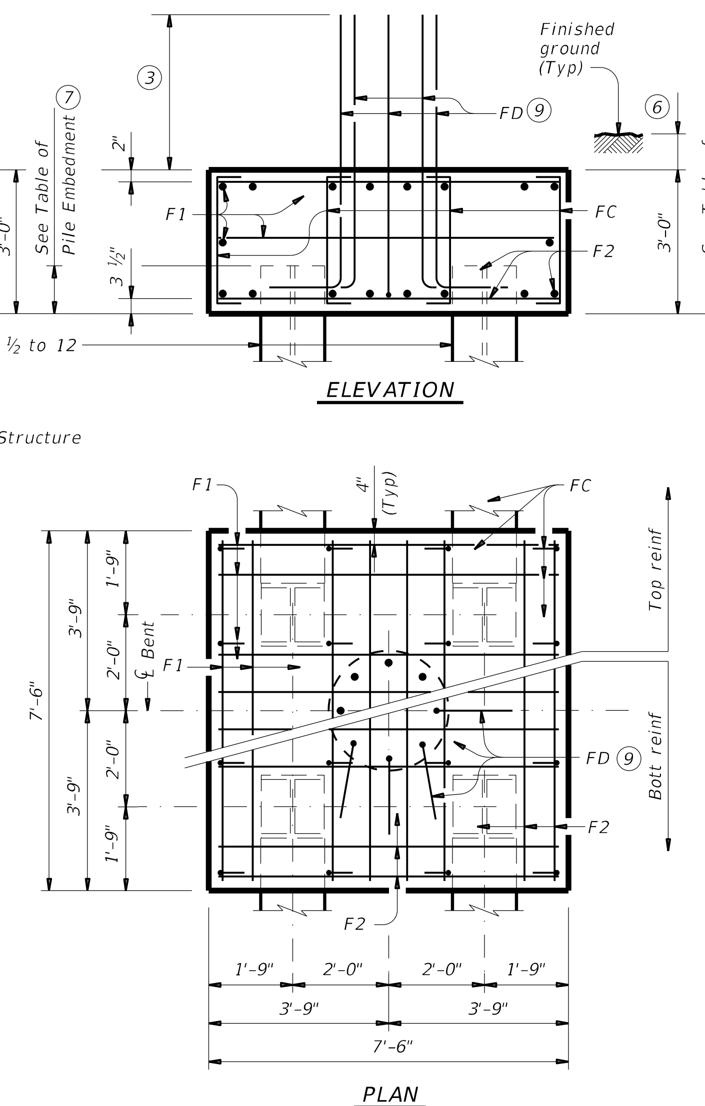
FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	ABL	KENT		62



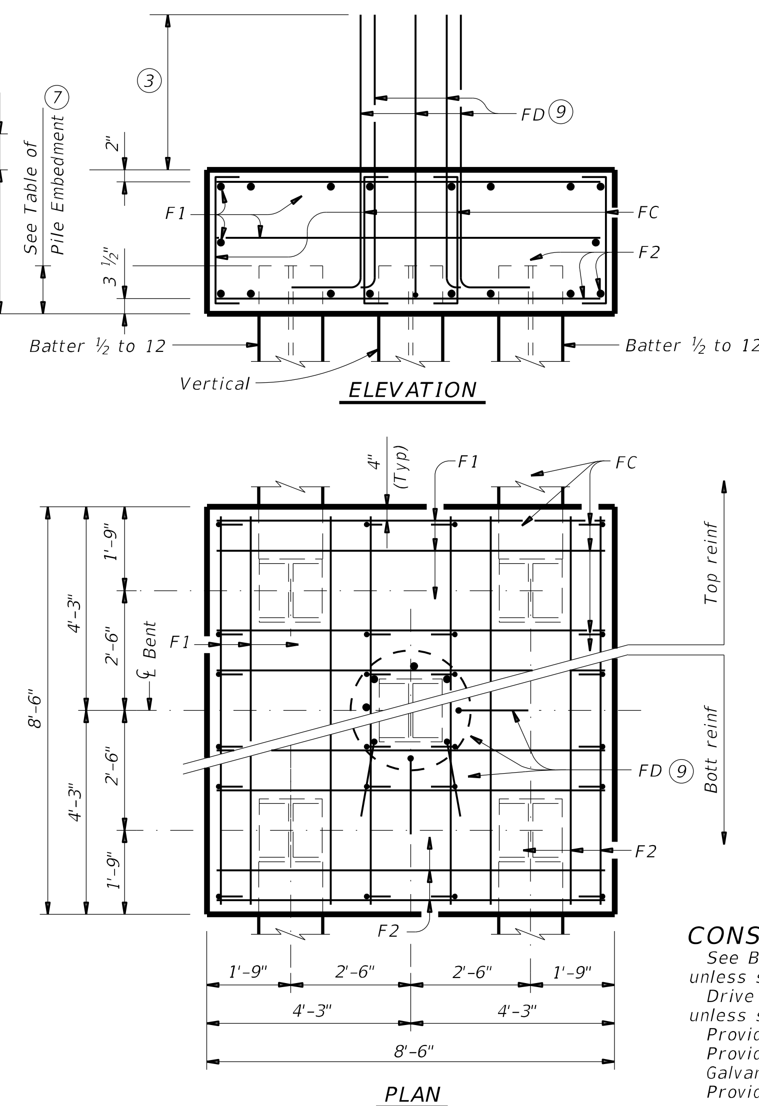
THREE PILE FOOTING ⑧

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.

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

Bar	No.	Size	Length	Weight
ONE 3 PILE FOOTING				
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				
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				
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"

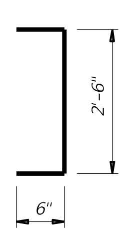
GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

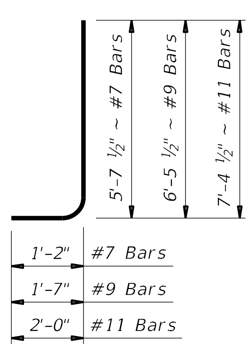
Cover dimensions are clear dimensions, unless noted otherwise.
Reinforcing bar dimensions shown are out-to-out of bar.

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



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.

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SHEET 2 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
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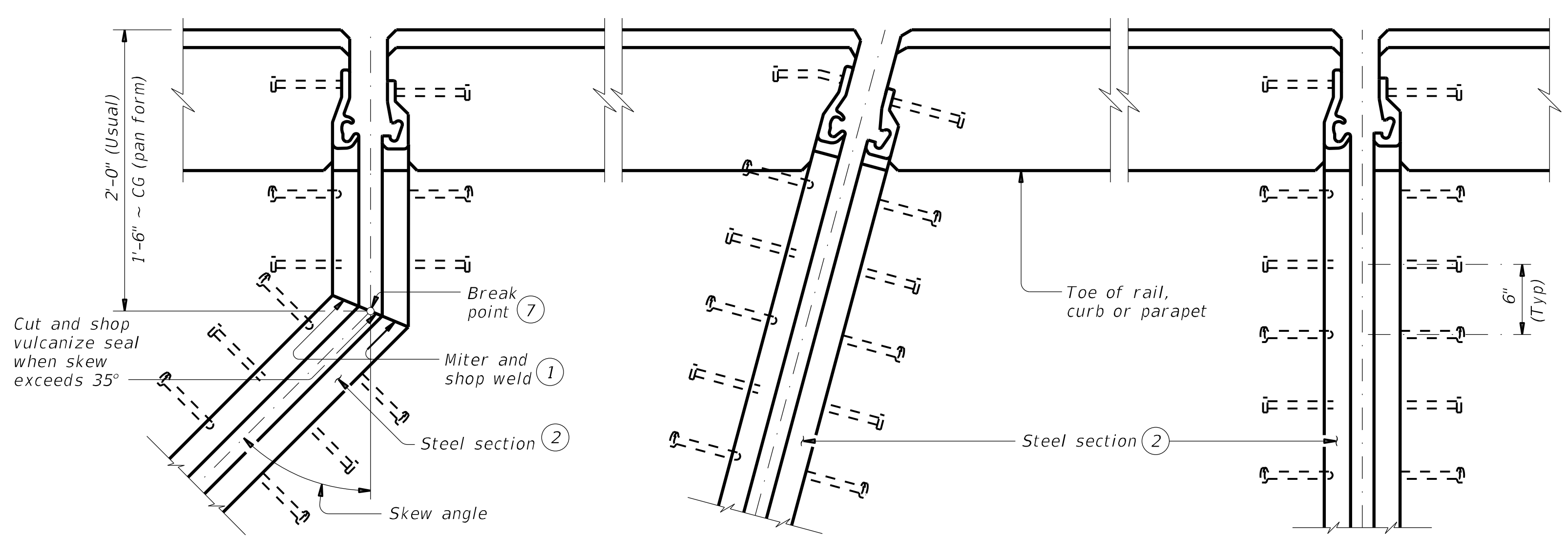
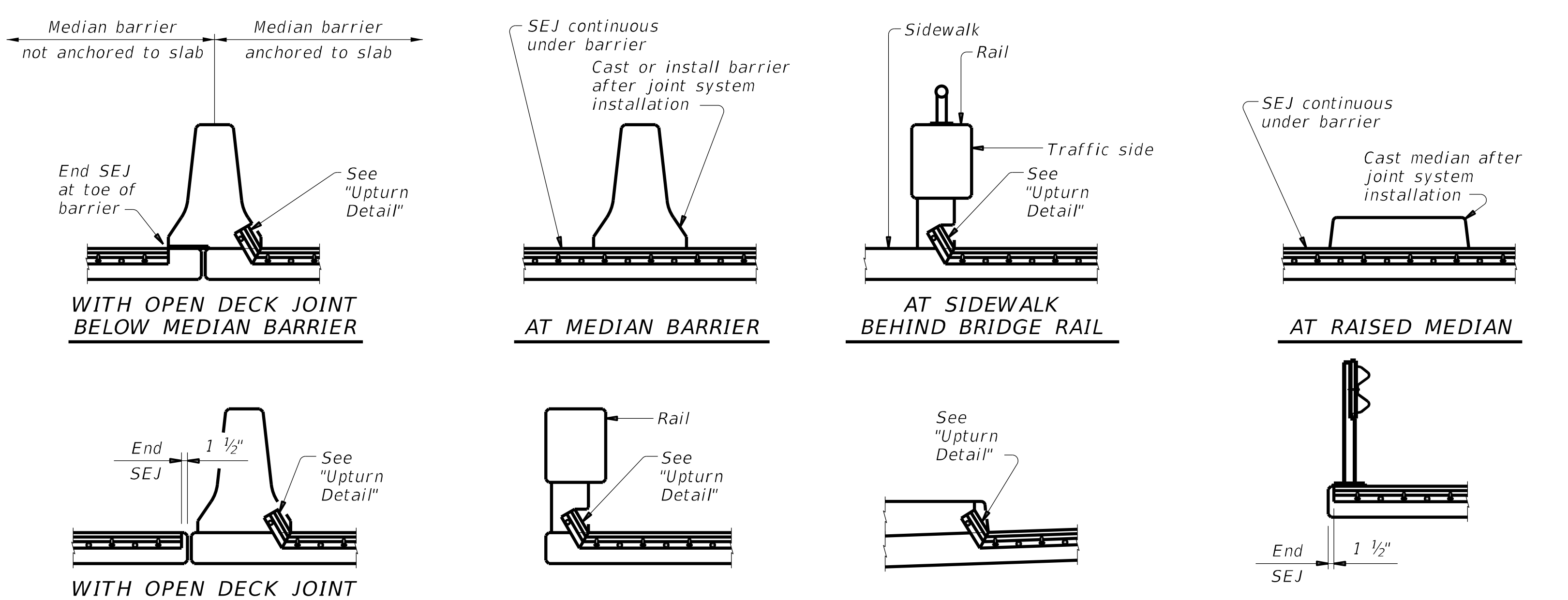
REVISIONS 01-20: Added #11 bars to the FD bars.	DIST ABL		COUNTY KENT	SHEET NO. 63

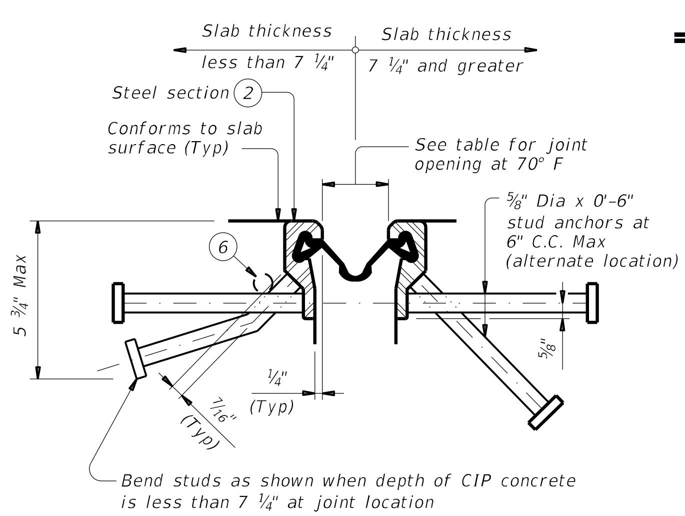
DATE: 9/14/2023 6:17:08 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/0908270064/4 Design/Plan Set/7. Bridge/064 SEJ-M



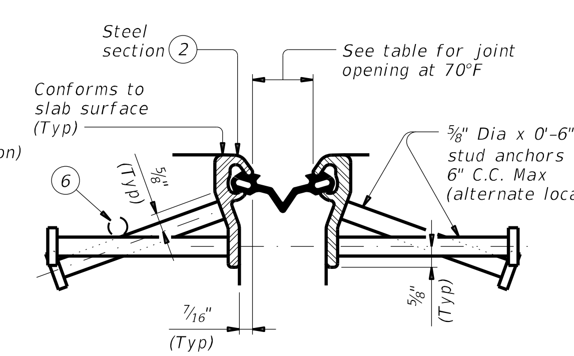
PLANS OF END CONDITIONS



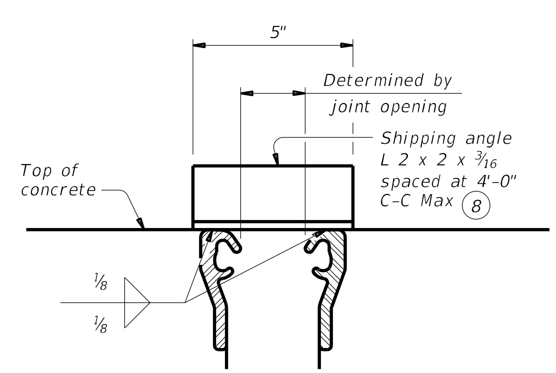
TYPICAL SECTIONS (5)



SECTION THRU WATSON BOWMAN ACME (SE-400 OR SE-500) JOINTS



SECTION THRU D.S. BROWN (A2R-400 OR A2R-XTRA) JOINTS



SHOWING D.S. BROWN (Ty SSCM2)
(All joints are similar.) (Studs are 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.

TABLE OF SEALED EXPANSION JOINT INFORMATION

MANUFACTURER	STEEL SECTION (2)	STRIP SEAL			
		4" JOINT		5" JOINT	
		Seal Type	Joint Opening (3)	Seal Type	Joint Opening (3)
D.S. Brown	Type SSCM2	A2R-400	1 ¾"	A2R-XTRA	2"
Watson Bowman Acme	Type R	SE-400	1 ¾"	SE-500	2"

REDUCED LONGITUDINAL MOVEMENT RANGE

SKEW (deg)	JOINT SIZE 4"	JOINT SIZE 5"
0	4.0"	5.0"
15	4.0"	5.0"
30	3.5"	4.3"
45	2.8"	3.5"

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) Remove all burrs which will be in contact with seal prior to making splice.

(2) Shape of steel section shown is typical. Variations in sections must be approved by the Engineer.

(3) These openings are also the recommended minimum installation openings.

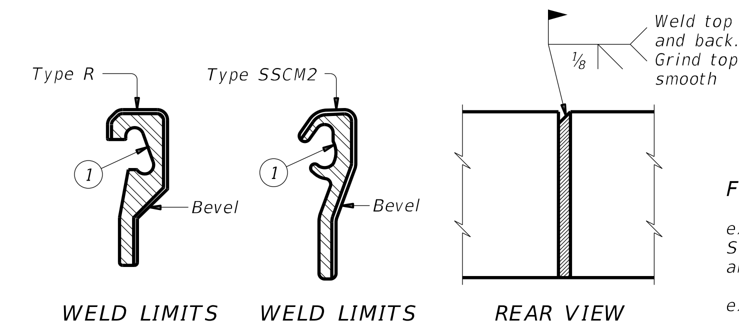
(4) Reduce for sidewalk or parapet heights less than 6".

(5) Other conditions affecting the joint profile should be noted elsewhere.

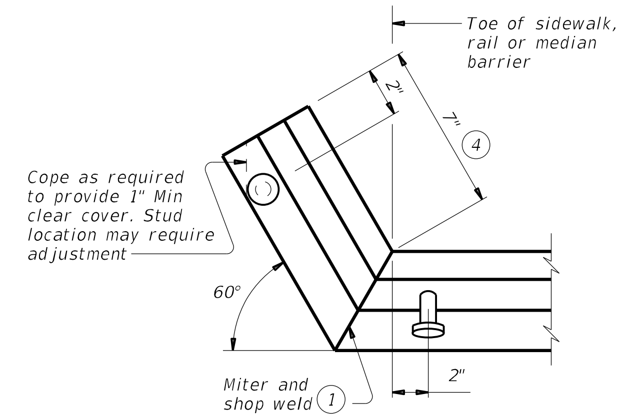
(6) Move transverse bars that are in conflict with SEJ studs, in either the bridge slab or approach slab, to rest at the junction of the studs.

(7) See Span details for location of break point.

(8) Align shipping angle perpendicular to joint.



FIELD SPLICE DETAIL



UPTURN DETAIL

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", unless required to galvanize when shown in the plans. Provide galvanizing in accordance with Item 445, "Galvanizing". 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.

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-M is 6 ½".

Texas Department of Transportation — Bridge Division Standard

SEALED EXPANSION JOINT TYPE M WITHOUT OVERLAY

SEJ-M

FILE: sejmste1-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
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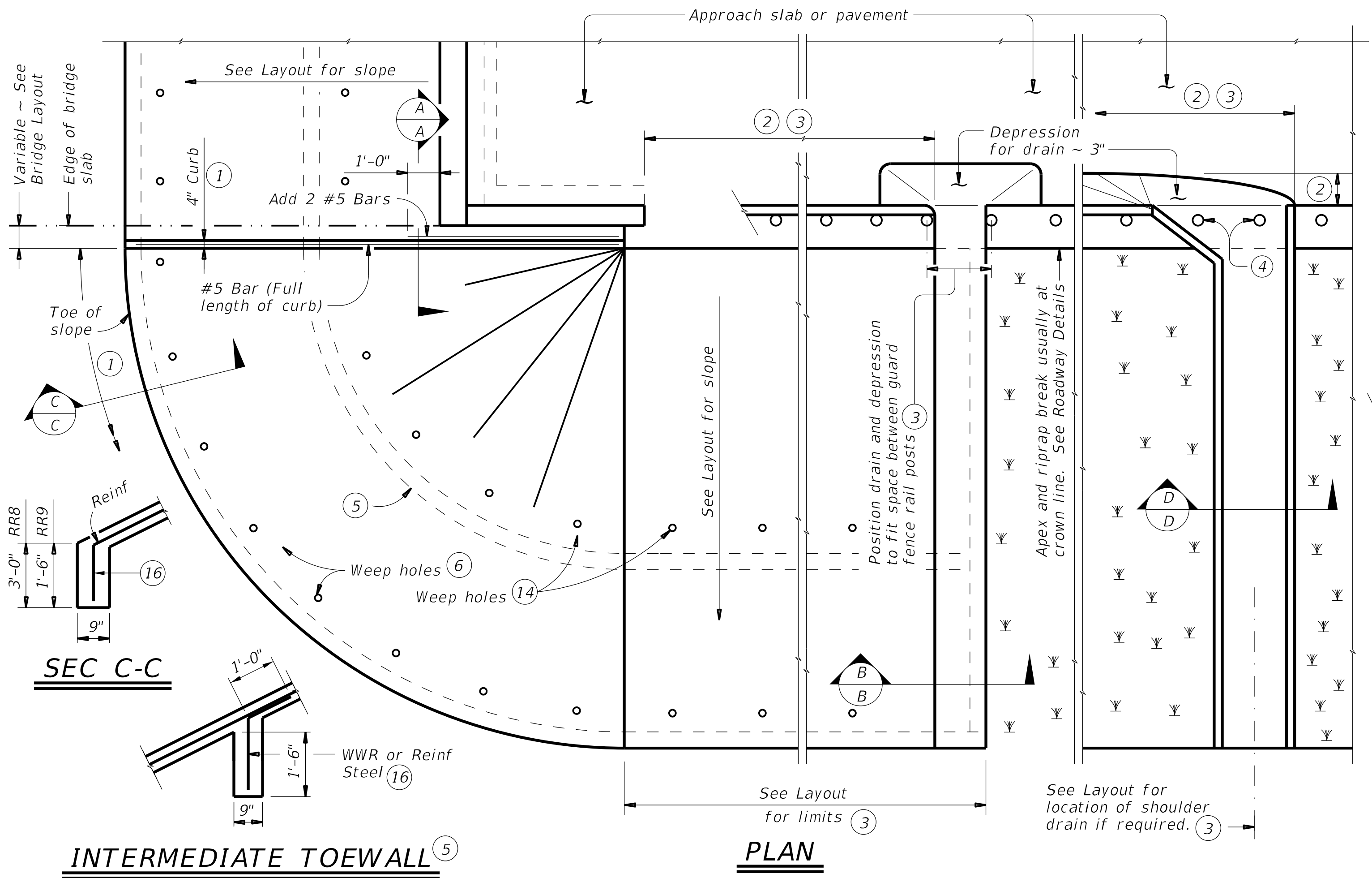
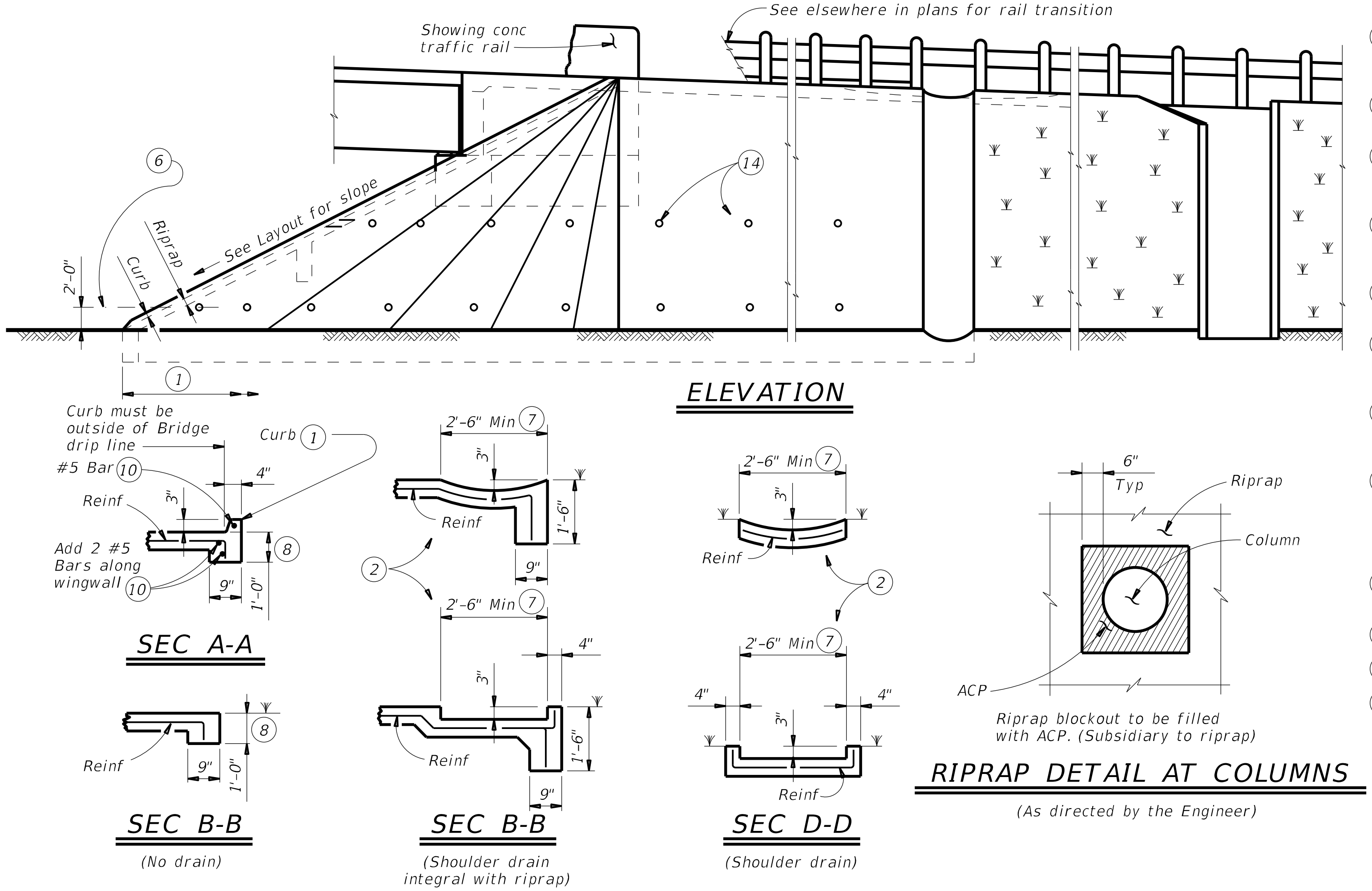
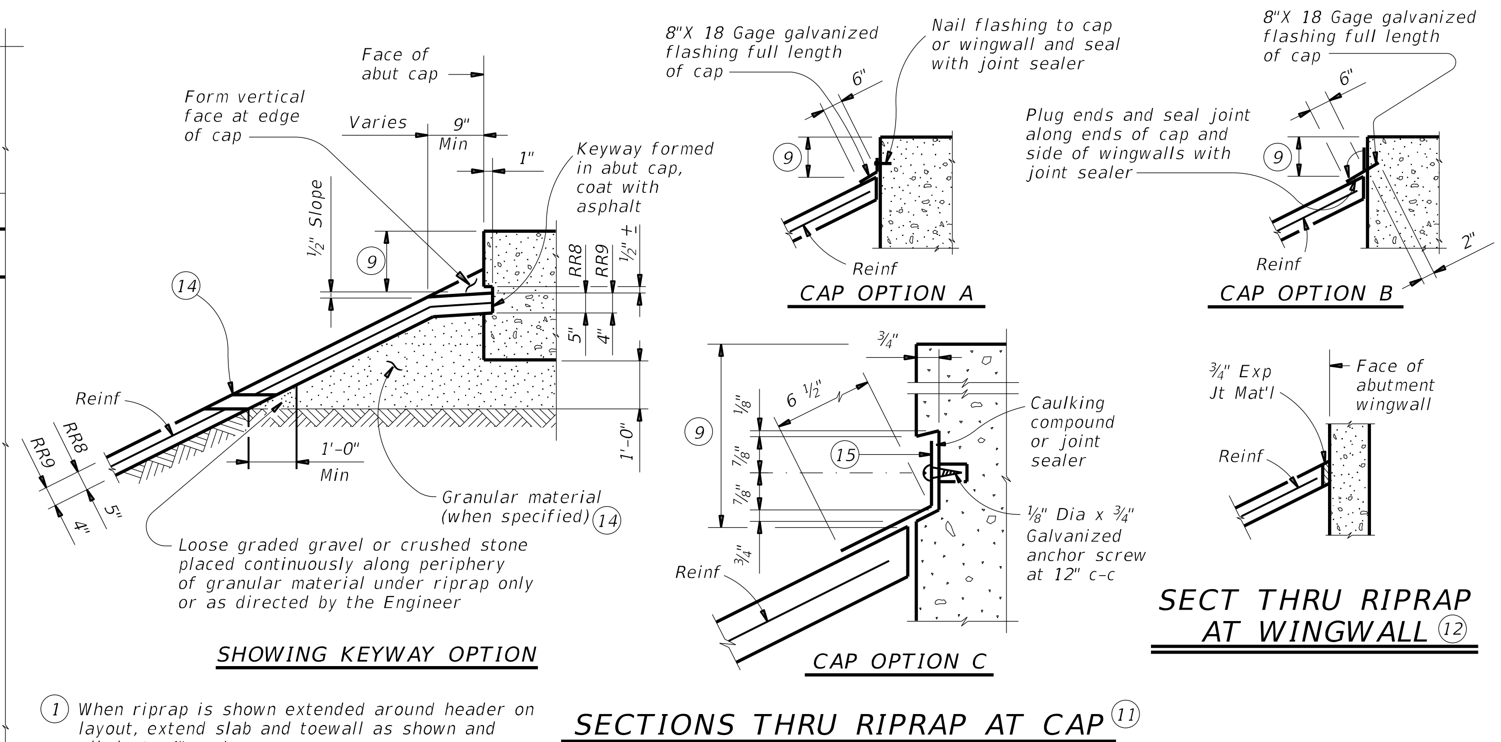
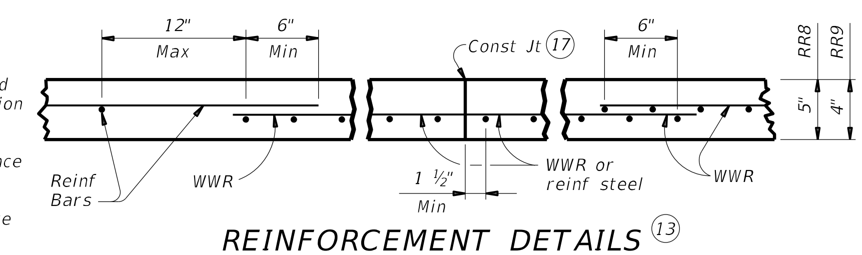
REVISIONS	DIST ABL	COUNTY KENT		SHEET NO. 64









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

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
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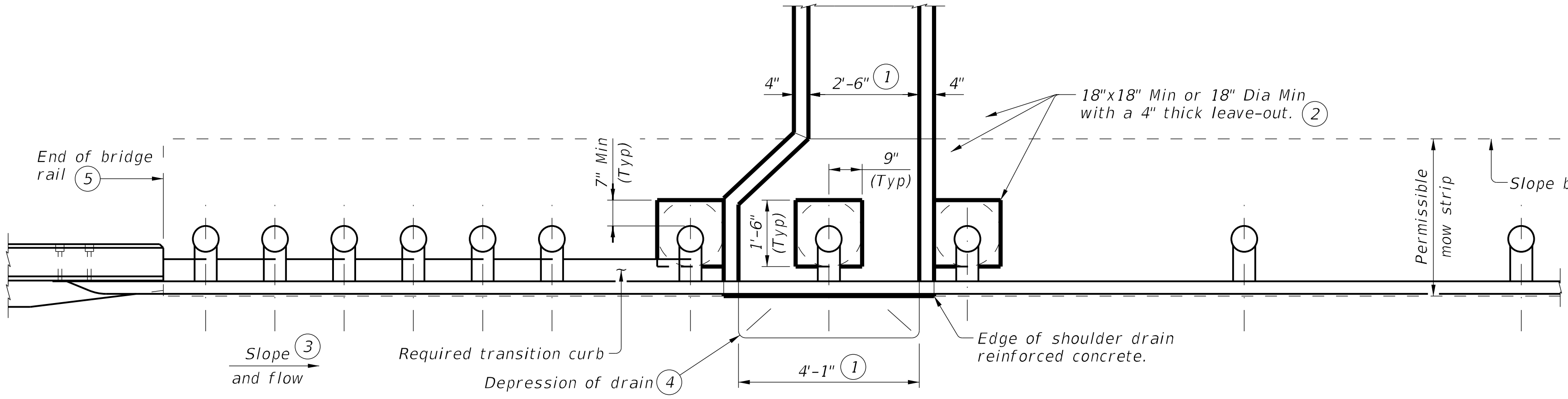
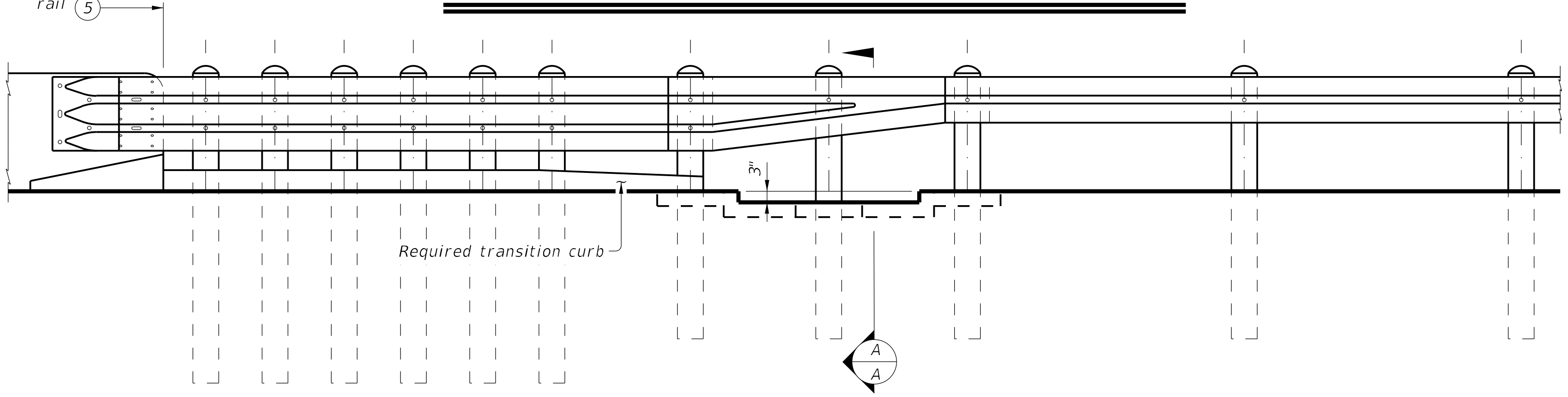
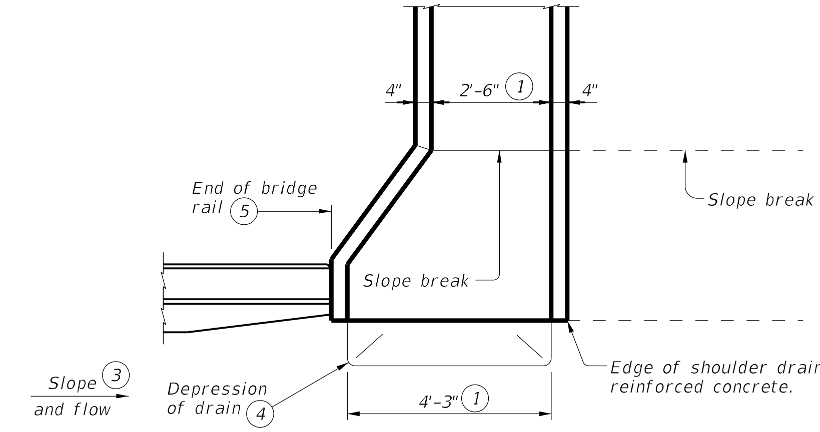


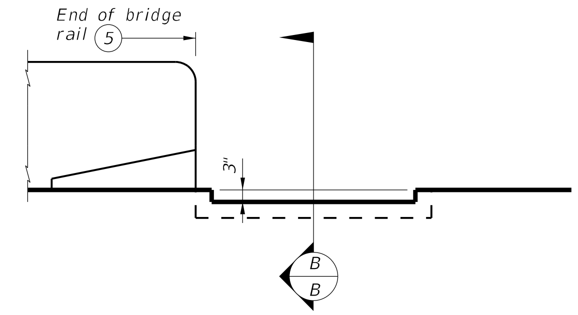
PLAN OF DRAIN WITH THRIE BEAM TRANSITION



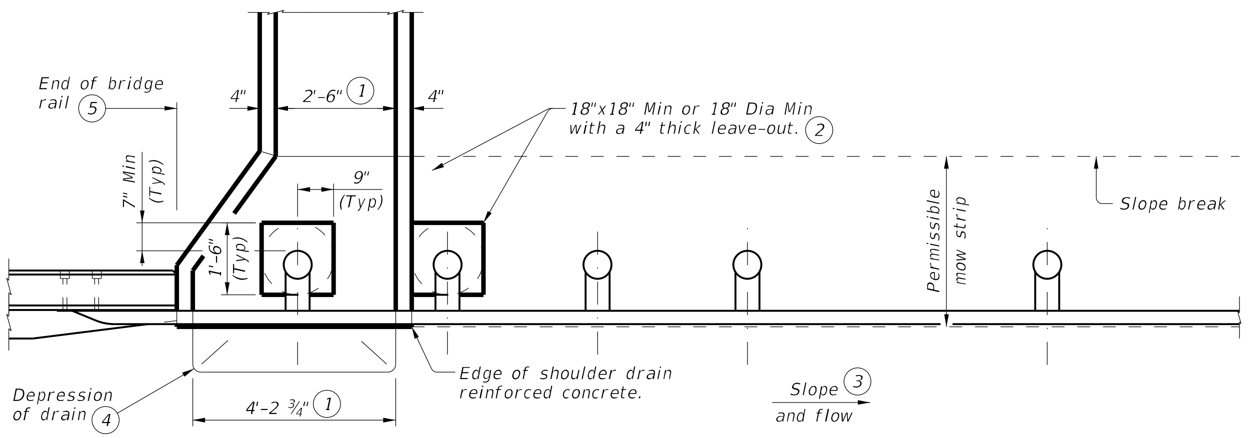
ROADWAY ELEVATION OF DRAIN WITH THRIE BEAM TRANSITION



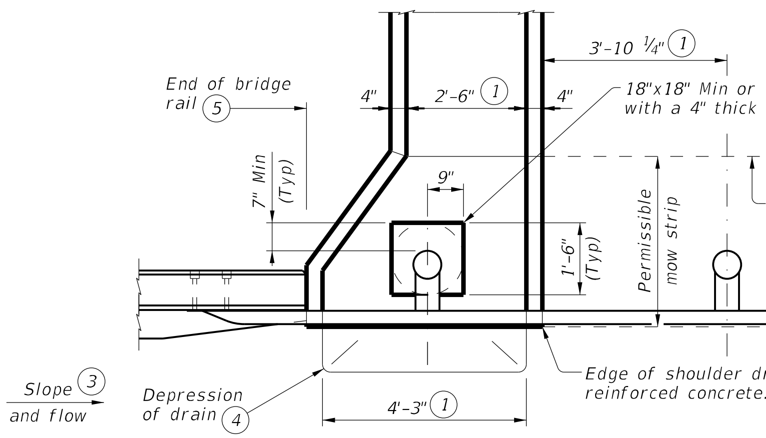
PLAN OF DRAIN WITHOUT MBGF TRANSITION



ROADWAY ELEVATION OF DRAIN WITHOUT MBGF TRANSITION

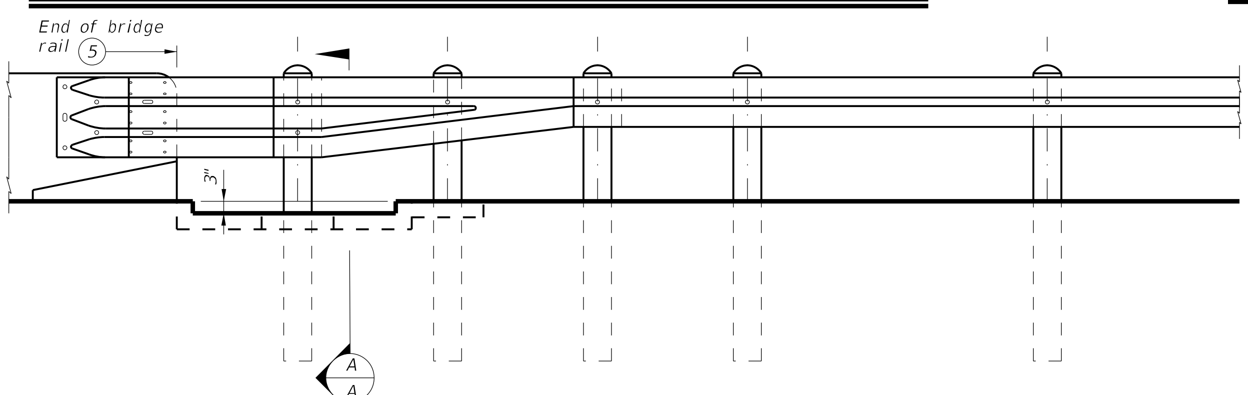


PLAN OF DRAIN WITH TL-2 (LOW SPEED) TRANSITION

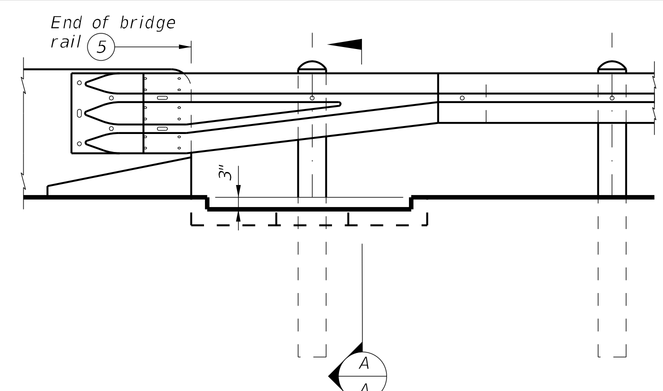


PLAN OF DRAIN WITH DOWNSTREAM ANCHOR TERMINAL

1. Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer. Location of shoulder drain must consider limitation imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
2. Fill leave-outs with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of 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 (20" Max leave-out).
3. For other slope and flow directions drain configuration may be mirrored wider or tapered wider if shown elsewhere in the plans or directed by the Engineer.
4. Form depression into concrete, asphalt pavement, or approach slab.
5. See Bridge Layout for rail type.



ROADWAY ELEVATION OF DRAIN WITH TL-2 (LOW SPEED) TRANSITION



ROADWAY ELEVATION OF DRAIN WITH DOWNSTREAM ANCHOR TERMINAL

Texas Department of Transportation

Bridge Division Standard

SHOULDER DRAIN AT END OF BRIDGE RAIL

SD-EBR

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©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
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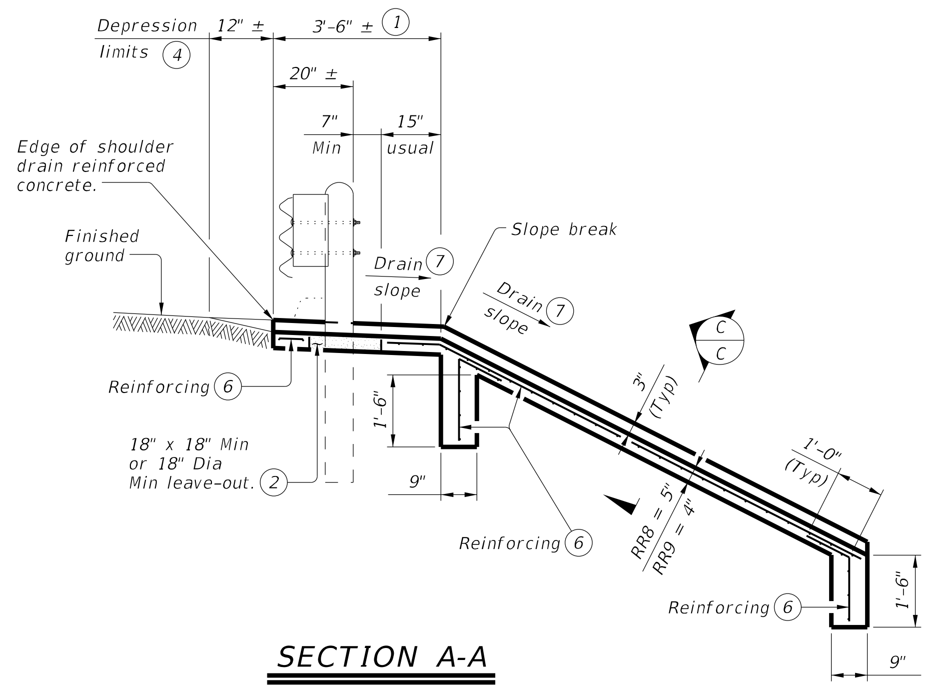
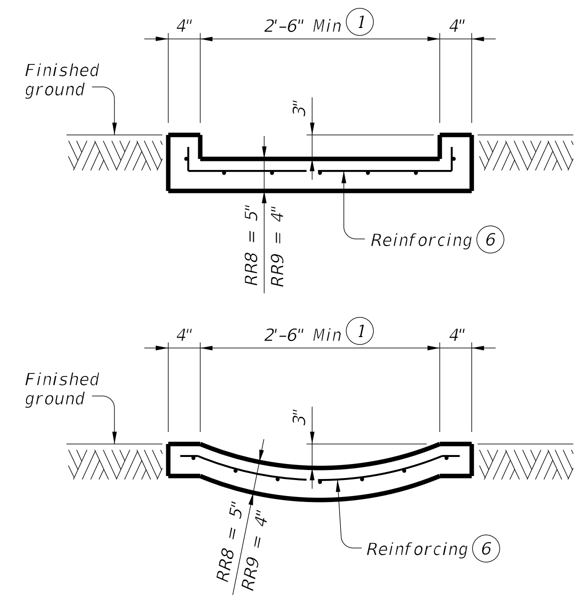
	DIST	COUNTY		SHEET NO.
	ABL	KENT		66

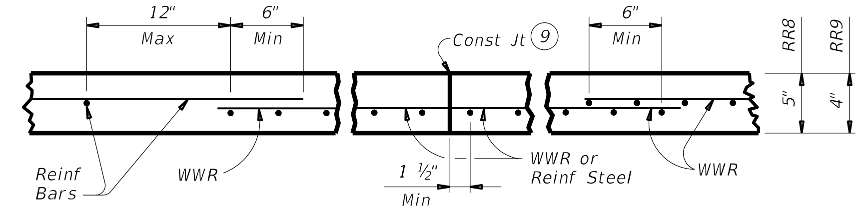


SECTION A-A



SECTION C-C

Sections shown without integrated riprap.



REINFORCEMENT DETAILS (6)

See General Notes for optional synthetic fiber reinforcement.

(1) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer. Location of shoulder drain must consider limitation imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(2) Fill leave-outs with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of 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 (20" Max leave-out).

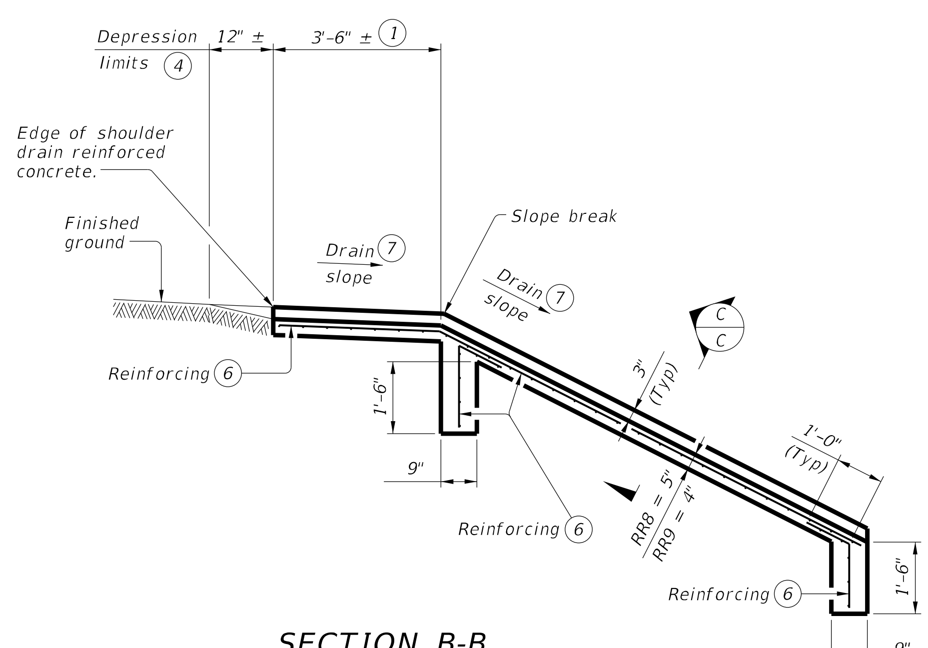
(4) Form depression into concrete, asphalt pavement, or approach slab.

(6) Provide (#3) reinforcing bar at 18" spacing c-c or 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, unless shown otherwise.

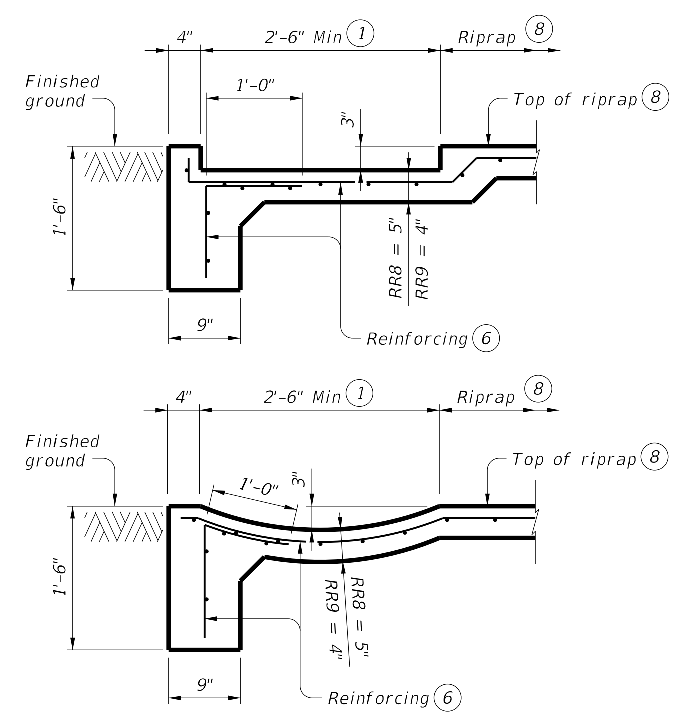
(7) See elsewhere in plans or as directed by the Engineer.

(8) See CRR standard for details and notes not shown.

(9) 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 fiber is utilized.



SECTION B-B



SECTION C-C

Sections shown with integrated riprap.

GENERAL NOTES:

Provide Class "B" concrete with a minimum compressive strength of 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.

See Metal Beam Guard Fence (Mow Strip) standard for details and notes not shown.

Payment for furnishing and placing 2-sack grout mixture will be subsidiary to shoulder drain.

Payment for shoulder drain will be as per Item 420, "Cl B Conc (Flume)". All details shown herein are subsidiary to shoulder drain.

See Layout for limits of shoulder drain.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

SHEET 2 OF 2

Texas Department of Transportation | Bridge Division Standard

SHOULDER DRAIN AT END OF BRIDGE RAIL

SD-EBR

FILE: sdebr001-19.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
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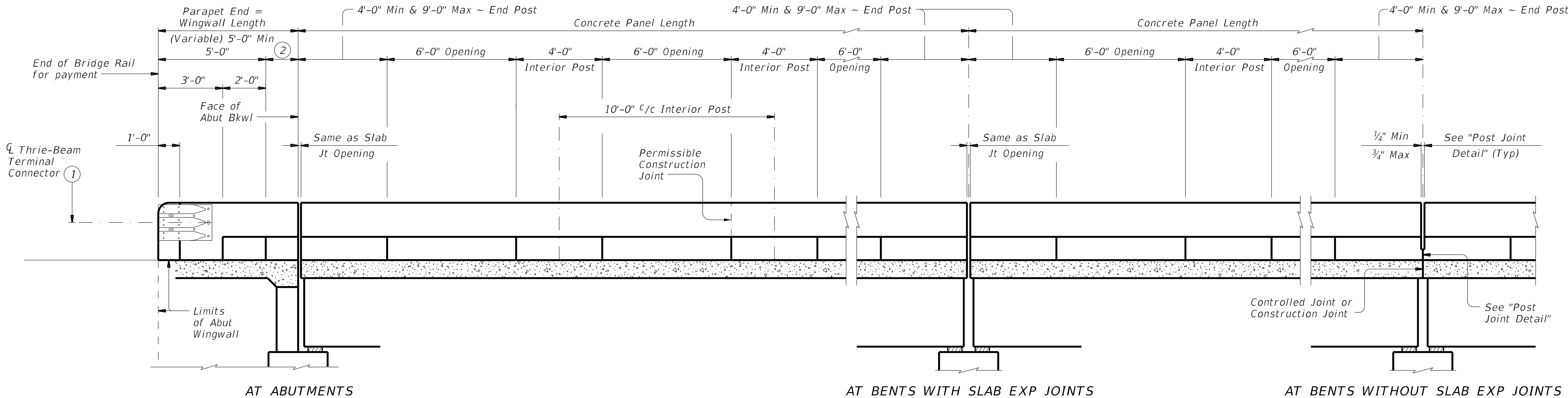
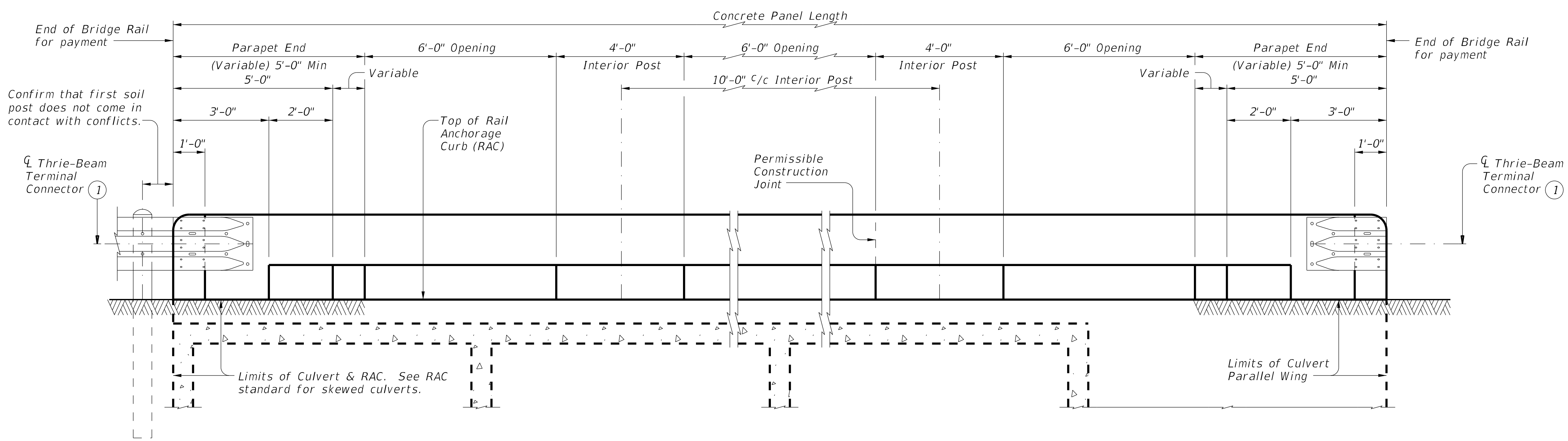


ROADWAY ELEVATION OF RAIL ON BRIDGE



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)

SHEET 1 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
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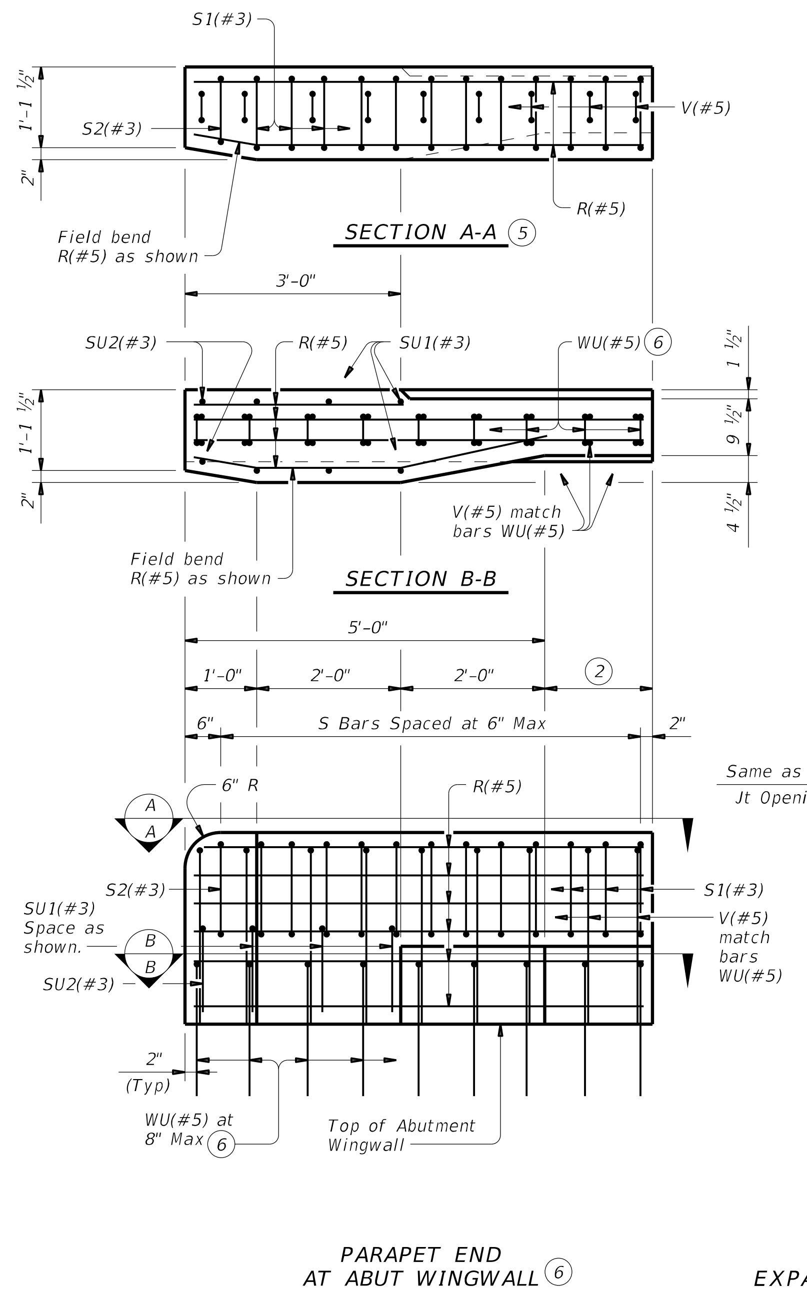
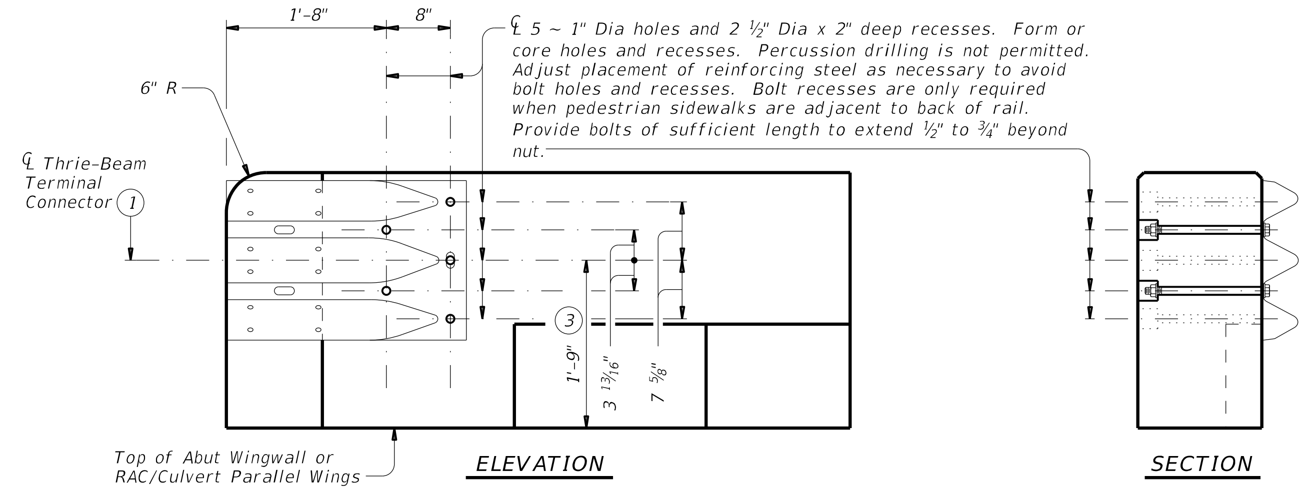
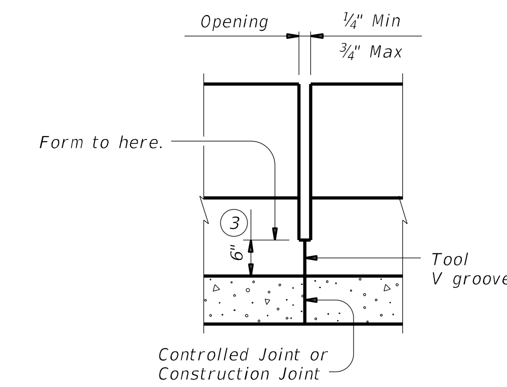


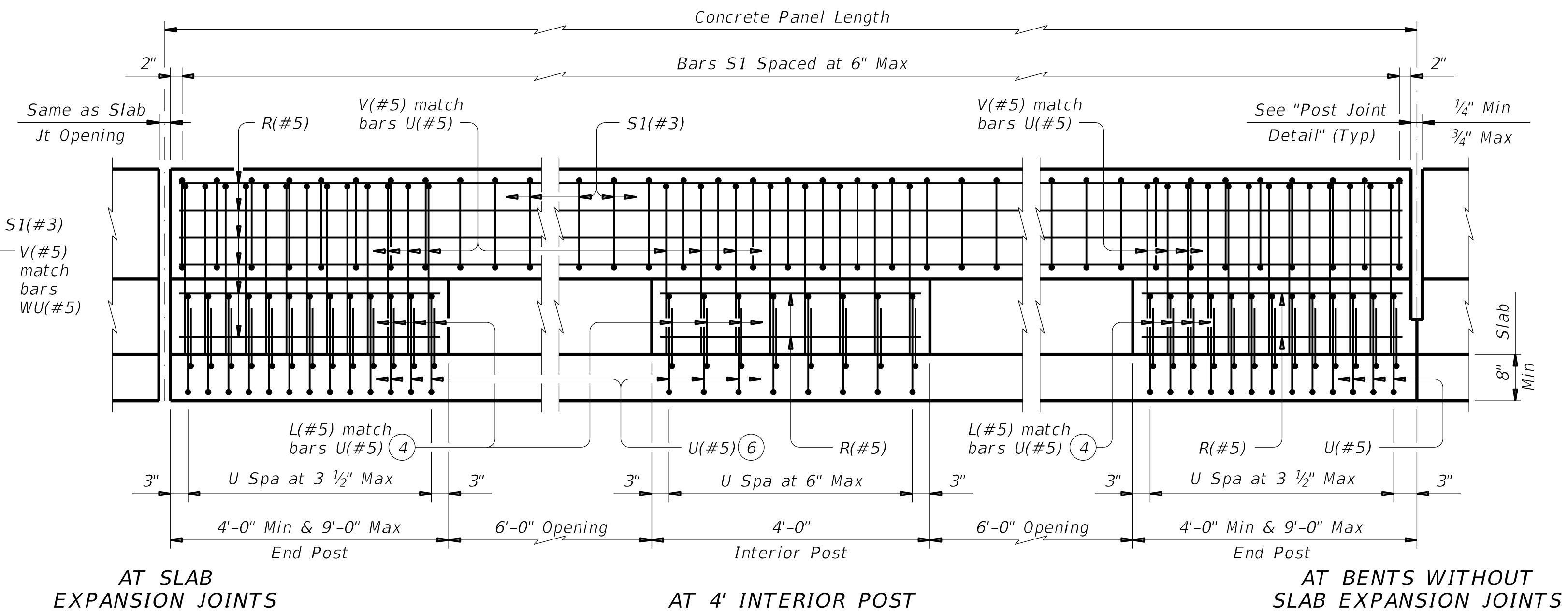


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior 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: 9/14/2023 6:17:53 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 Design/Plan Set/7 Bridge/068-070 T223

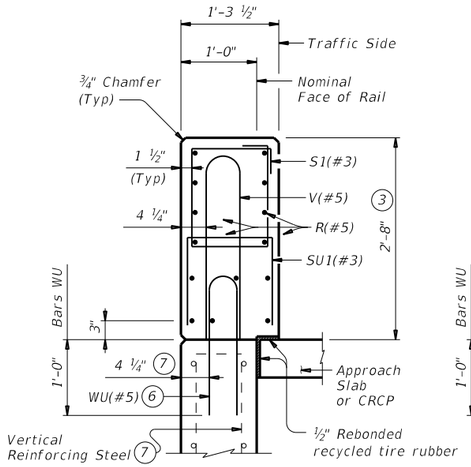
Texas Department of Transportation — Bridge Division Standard

TRAFFIC RAIL

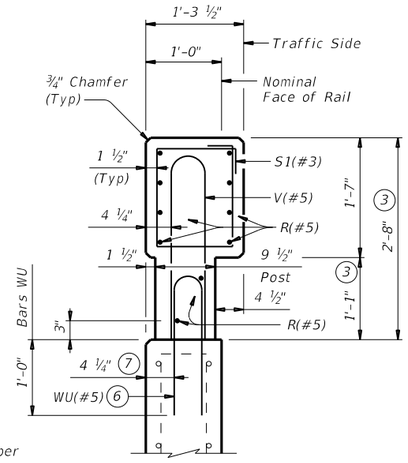
TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
	DIST		COUNTY	SHEET NO.
	ABL		KENT	69

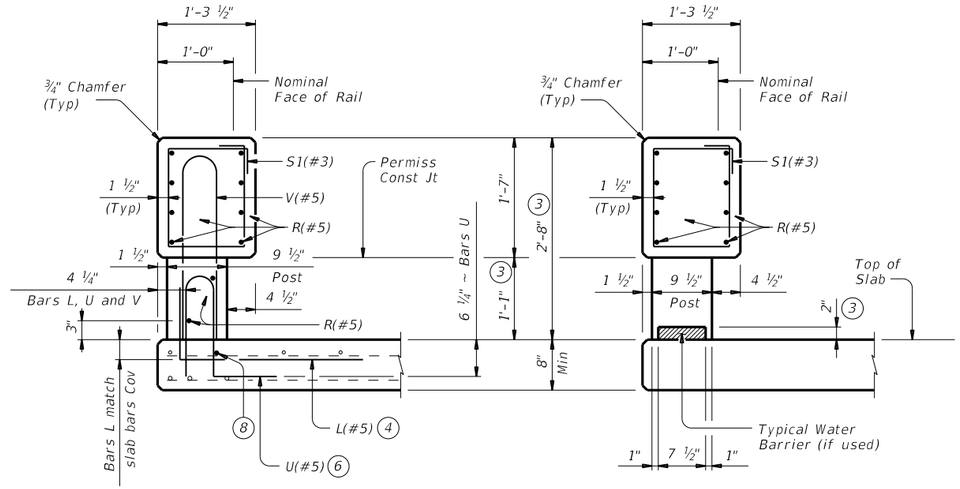
DATE: 9/14/2023 6:17:53 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 for Design/rlstd005-19.dgn



SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

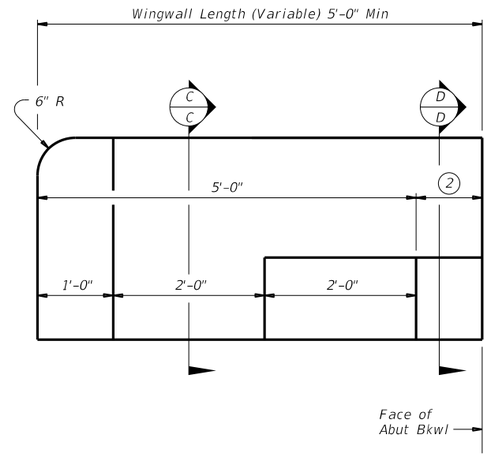


AT POST
ON BRIDGE SLAB

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.

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.

(2) Wingwall Length minus 5'-0" (Varies)

(3) Increase 2" for structures with overlay.

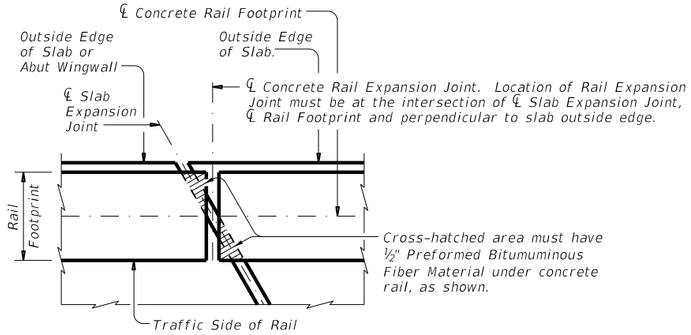
(4) Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.

(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.

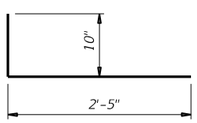
(8) Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.

(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.

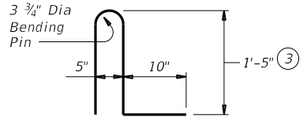


PLAN OF RAIL AT EXPANSION JOINTS

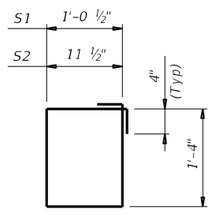
Example showing Slab Expansion Joints without breakbacks.



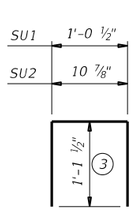
BARS L (#5)



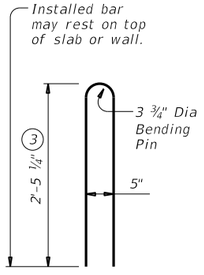
BARS U (#5) (9)



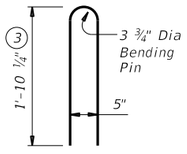
BARS S (#3)



BARS SU (#3)



BARS V (#5) (9)



BARS WU (#5)

SHEET 3 OF 3

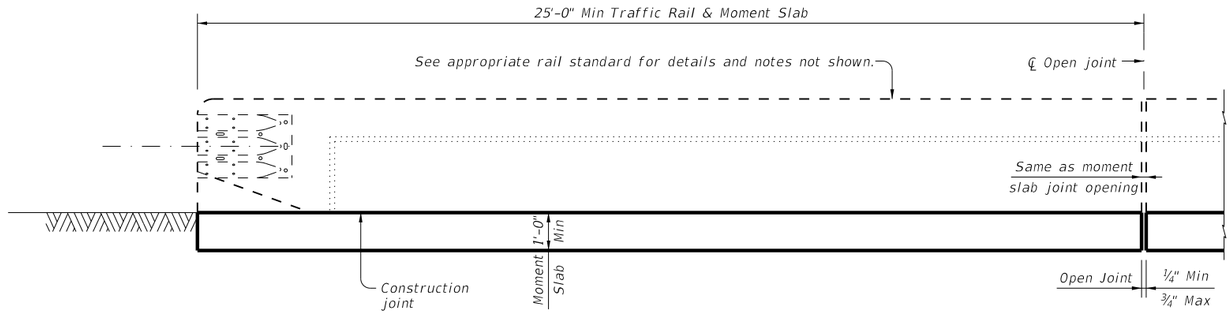
Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

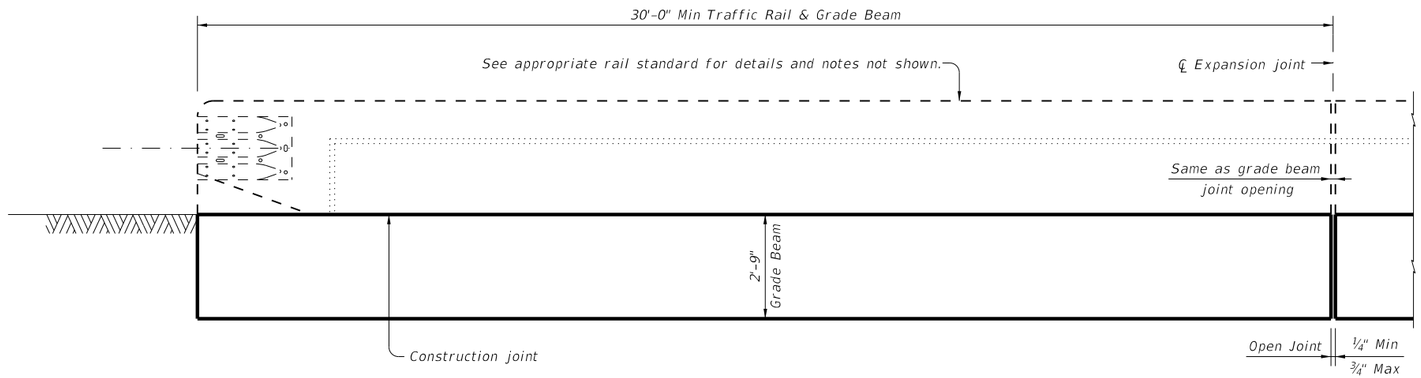
TYPE T223

FILE: rlstd005-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		70



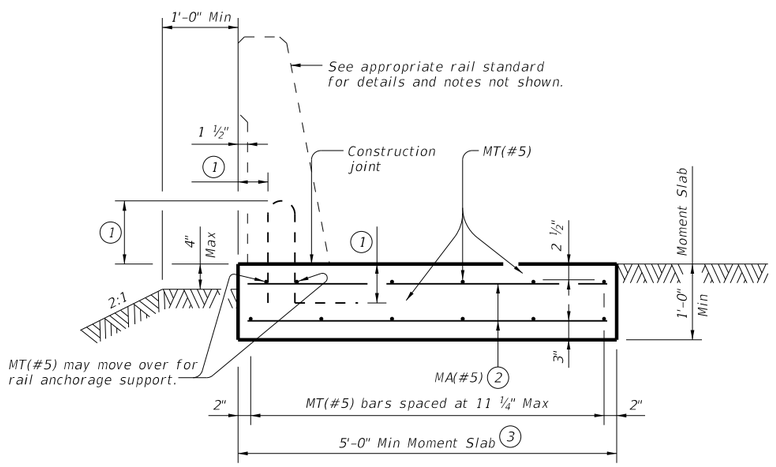
ROADWAY ELEVATION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



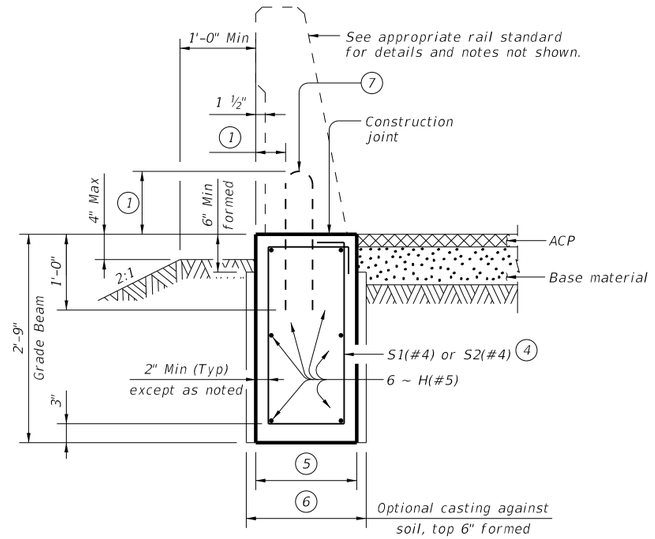
ROADWAY ELEVATION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar. Reinforcing not shown for clarity.)



SECTION OF TRAFFIC RAIL ON MOMENT SLAB (TRF-MS)

(Showing SSTR rail other rails are similar.)



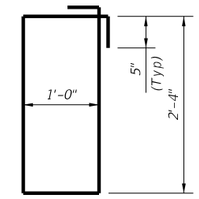
SECTION OF TRAFFIC RAIL ON GRADE BEAM (TRF-GB)

(Showing SSTR rail other rails are similar.)

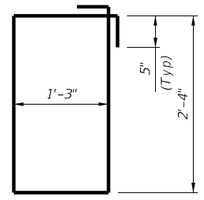
1. See applicable bridge rail standard.
2. MA(#5) space longitudinally along moment slab at 12" Max. (Spaced 2 ½" longitudinally from outside edge of moment slab).
3. Approximate moment slab concrete = 0.19 CY/LF and reinforcement = 22.4 LB/LF.
4. S1(#4) or S2(#4) spaced longitudinally along grade beam at 8" Max. (Spaced 2 ½" longitudinally from outside edge of grade beam).
5. Use bar S1(#4) with 1'-4" grade beam width and bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.
   Approximate grade beam concrete = 0.14 CY/LF and reinforcement = 13.8 LB/LF.

   Use bar S2(#4) with 1'-7" grade beam width and bridge rail types: T66 and C66.
   Approximate grade beam concrete = 0.16 CY/LF and reinforcement = 14.2 LB/LF.
6. 1'-6" for bridge rail types: All rails except for T224, C412, T66, C66, T80HT and T80SS.

   1'-9" bridge rail types: T66 and C66.
7. Modify reinforcing on standard bridge rail anchorage if necessary by extending rail anchorage 12" Min, vertically into traffic rail



BARS S1(#4)



BARS S2(#4)

CONSTRUCTION NOTES:

Align moment slab (TRF-MS) or grade beam (TRF-GB) open joints with rail open joints maintaining no less than minimum rail length. Provide moment slab (TRF-MS) or grade beam (TRF-GB) with open joints at no greater than 100' spacing unless otherwise shown on the plans or approved by the Engineer.

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 required elsewhere.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for bars S1(#4), S2(#4) and H(#5) unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-4"
Epoxy coated ~ #5 = 3'-6"

GENERAL NOTES:

Use of these details will result in a moment slab (TRF-MS) or grade beam (TRF-GB) foundation that is acceptable for traffic rails which are MASH TL-2, TL-3, or TL-4 compliant.

See elsewhere in the plans for selected options between moment slab (TRF-MS) and/or grade beam (TRF-GB).

The foundation design resistance is based on the current AASHTO bridge railing requirements with the assumption of fair to good soil support conditions. Poor soil conditions will require suitably deeper and/or wider foundations.

See appropriate rail standard for details and notes not shown.

This detail is intended for use as a guide to unusual railing anchorage situations but may be included in the plans, modified as necessary to apply to specific installations required on the project.

Payment for moment slab (TRF-MS) and/or grade beam (TRF-GB) will be by Class "C" concrete or Class "C" (HPC) concrete for rail foundations.

The associated bridge railing will be paid for by the linear foot which includes the concrete and reinforcement.

Excavation will be subsidiary to other Items.

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

TRAFFIC RAIL FOUNDATIONS

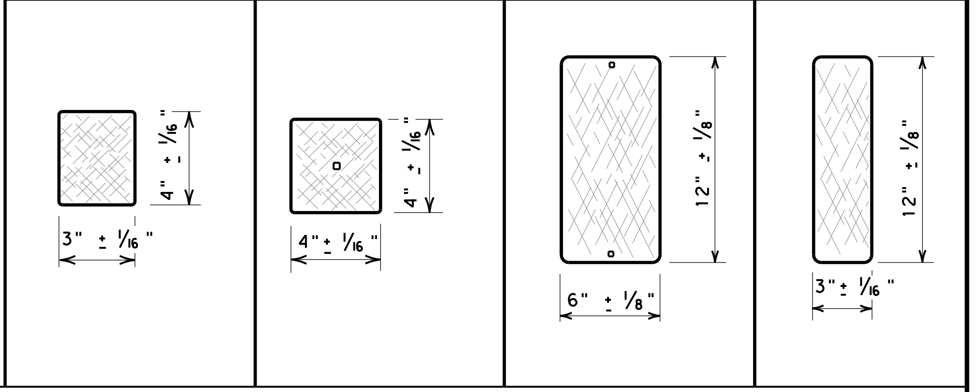
FOR MASH TL-2, TL-3 & TL-4 BRIDGE RAILS

TRF

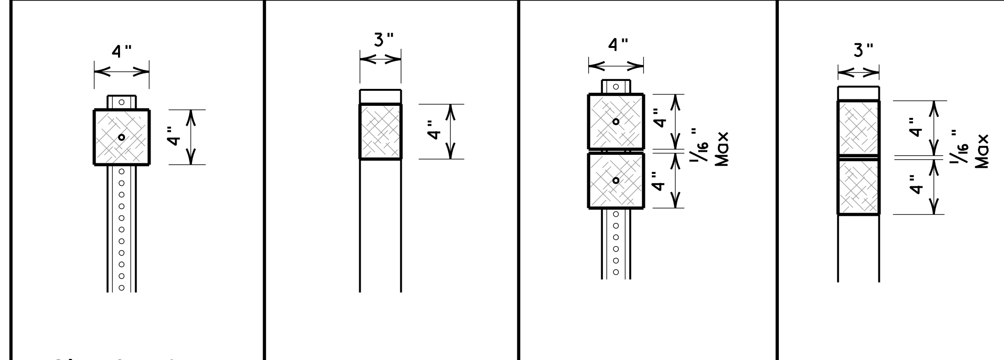
FILE:	rlstd027-20.dgn	DN: TxDOT	CK: TAR	DW: JTR	CK: TAR
©TxDOT	September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS		0908	27	006	CR 316
07-20: Added moment slab with rail foundation lengths.		DIST	COUNTY		SHEET NO.
		ABL	KENT		71

DATE: 9/14/2023 6:18:10 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/09082T0064/Design/rlstd027-20.dgn

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	SIZE 1	SIZE 2	SIZE 3	SIZE 4
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

	SINGLE		DOUBLE	
DEVICE	 1-Size 2 reflector unit	1-Size 1 reflector unit	2-Size 2 reflector units	2-Size 1 reflector units
SHEETING	Yellow, White or Red Type B or C Reflective Sheeting			
POST TYPE	WC	YFLX, WFLX	WC	YFLX, WFLX
MOUNT TYPE	GND	GND, SRF	GND	GND, SRF

D & OM DESCRIPTIVE CODES

INSTL DEL ASSM (D-XX)SZ X (XXXX)XXX(XX)

NUMBER OF REFLECTORS
- S = Single
- D = Double

COLOR OF REFLECTORS
- W = White
- Y = Yellow
- R = Red

REFLECTOR UNIT SIZE
- 1 or 2

TYPE OF POST OR DELINEATOR
- WC = Wing Channel Post
- YFLX = Yellow Flexible Post
- WFLX = White Flexible Post
- BRF = Barrier Reflector

TYPE OF MOUNT
- GND = Embedded (drivable or set in concrete)
- CTB = Concrete Barrier Mount
- GF1 or GF2 = Guard Fence Attachment
- SRF = Surface Mount

DIRECTION
- If Required
- BI = Bi-Directional
- BR = Bi-Directional with red on back

INSTL OM ASSM (OM-XX) (XXXX)XXX(XX)

TYPE OF OBJECT MARKER
- 1, 2, 3, or 4

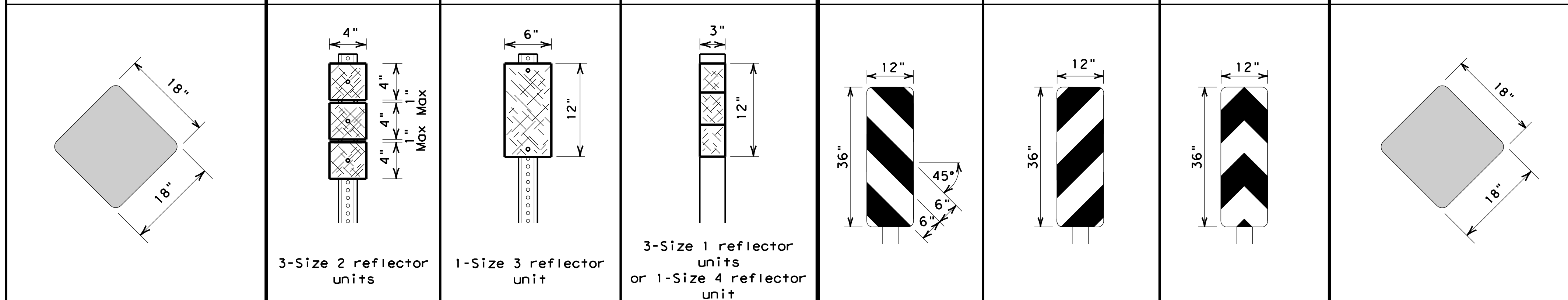
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker only)

TYPE OF POST
- WC = Wing Channel Post
- WFLX = White Flexible Post
- TWT = Thin Walled Tubing

TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
- If Required
- BI = Bi-Directional

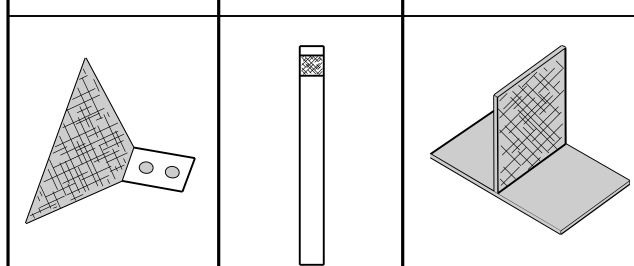
OBJECT MARKERS

	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroflective yellow - Type B_{FL} or C_{FL} Sheeting			Red -Type B_{FL} or C_{FL} Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

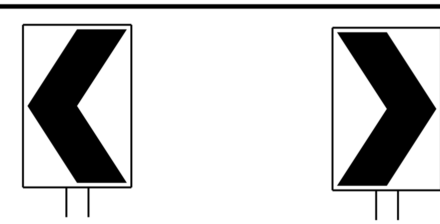
DEPARTMENTAL MATERIAL SPECIFICATIONS

FLEXIBLE DELINEATOR & OBJECT MARKER POSTS (EMBEDDED & SURFACE MOUNT TYPES)	DMS-4400
SIGN FACE MATERIALS	DMS-8300
DELINEATORS, OBJECT MARKERS AND BARRIER REFLECTORS	DMS-8600

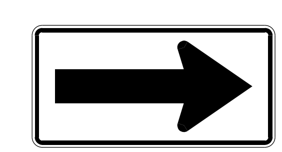
BARRIER REFLECTORS (BRF)

	GF1	GF2	CTB
DEVICE			
	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.		
SHEETING	Yellow, White, Red		
NOTE	1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.		

CHEVRONS

DEVICE	 W1-8			
SIZE (W x L)	18"x 24" (Conventional)	24"x 30" (Conventional Oversize)	30"x 36" (Expressway)	36" x 48" (Freeway)
MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	

ONE DIRECTION LARGE ARROW

DEVICE	 W1-6	
SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
MOUNTING HEIGHT	7'-0"	

NOTE

1. CHEVRON (W1-8) signs and ONE DIRECTION LARGE ARROW (W1-6) Signs shall be installed per Sign Mounting Details (SMD) Standard Sheets and paid under Item 644 (Small Roadside Sign Assemblies).
2. When there is a need to increase conspicuity, the Texas version of the ONE DIRECTION LARGE ARROW sign (W1-9T) may be used instead of the ONE DIRECTION LARGE ARROW (W1-6).

NOTE:

Delineator and object marker substrates and sign substrates shall be 0.080" Aluminum sign blank to conform to ASTM B-209 Alloy 6061-T6 or approved alternative.

DATE: 9/14/2023 6:18:26 PM
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/...

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

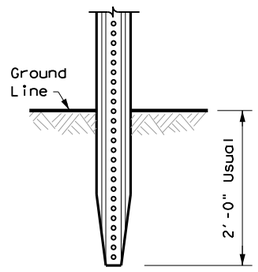
FILE:	dom1-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS		0908	27	006	CR 316
10-09 3-15		DIST		COUNTY	SHEET NO.
4-10 7-20		ABL		KENT	72

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

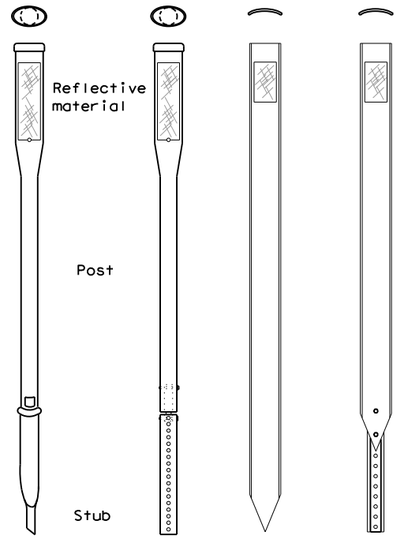


NOTES

1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

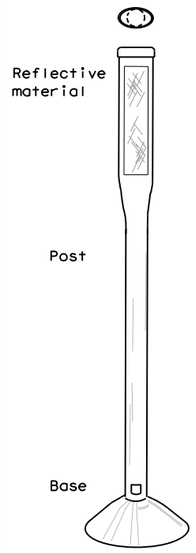
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



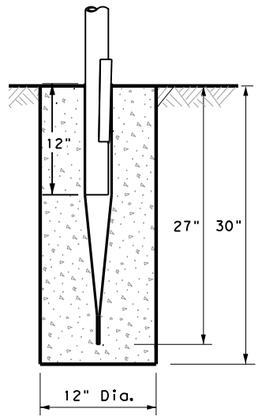
SURFACE MOUNT

NOTES

1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline or median use, the flexible posts shall be yellow.

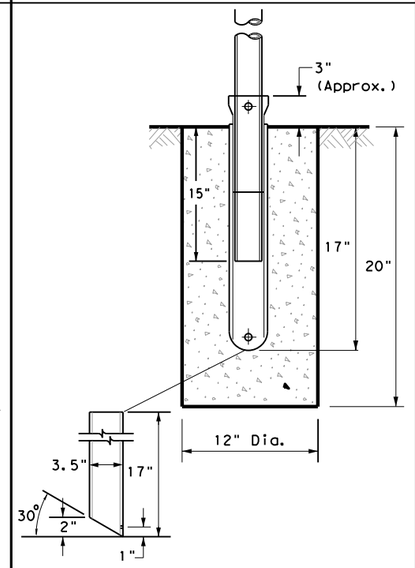
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

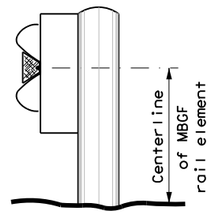
NOTE

1. Install per manufacturer's recommendations.

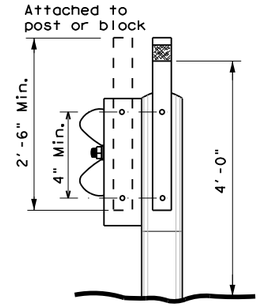
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

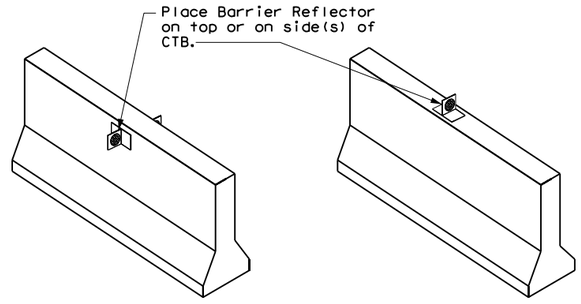
GF1



GF2



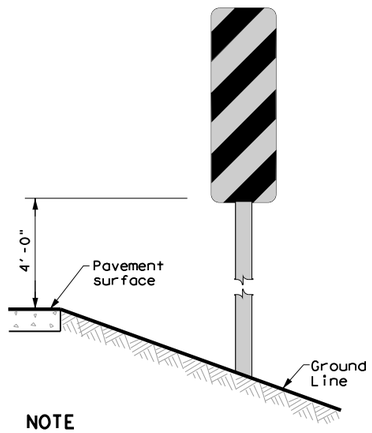
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

1. Place delineators on a section of roadway at a consistent distance from the edge of pavement.
2. Where a restriction prevents consistent placement from the pavement edge, place the affected object markers in line with the innermost edge of the obstruction.
3. When Type 2 object markers and delineators are more than 8'-0" from the edge of the pavement, it may not be possible to maintain a height of approximately 4'-0". If this is the case, place the object marker or delineator as close to the desired height as possible.
4. Install all delineators, object markers and barrier reflectors in accordance with the manufacturer's recommendation.
5. Barrier reflectors should be installed a minimum of 18 inches above the edge of the pavement surface.
6. Diagonal stripes on Type 3 object markers shall slope down toward the intended travel lane.

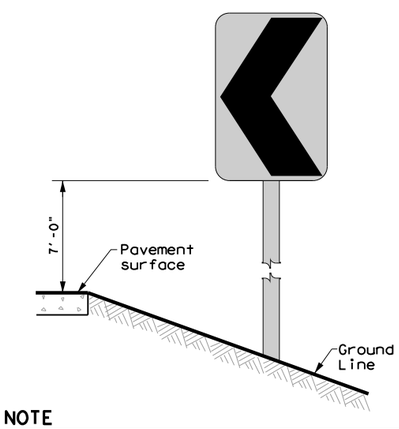
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

Mounting at 4 feet to the bottom of the chevron is permitted for chevrons that will not exceed a height of 6'-6" to the top of the chevron (sizes 24" x 30" and smaller)

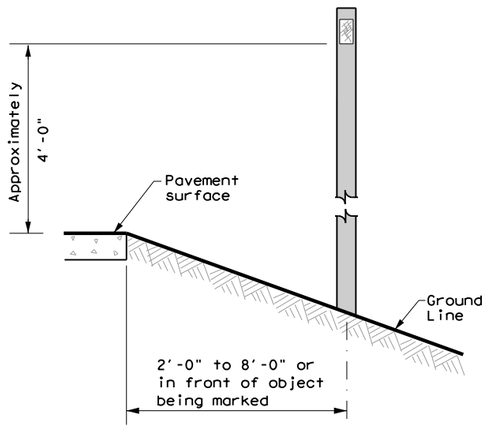
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

Chevrons 30" x 36" and larger shall be mounted at a height of 7' to the bottom of the chevron. Chevron sign and ONE DIRECTION LARGE ARROW sign (W1-9T) shall be installed per SMD standard sheets and paid under item 644.

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ABL	KENT		73

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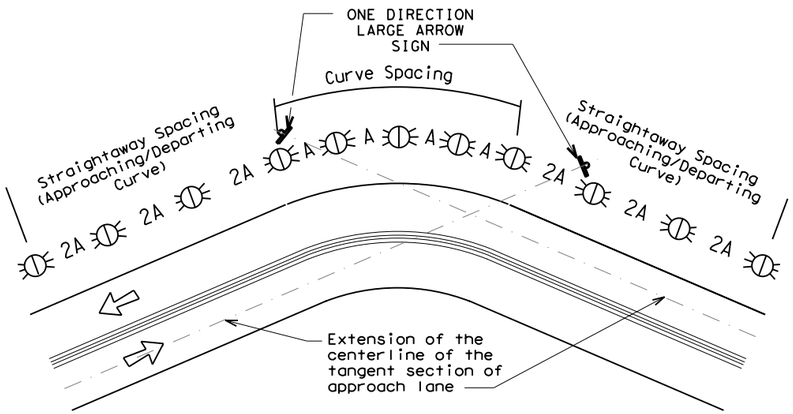
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

Amount by which Advisory Speed is less than Posted Speed	Curve Advisory Speed	
	Turn (30 MPH or less)	Curve (35 MPH or more)
5 MPH & 10 MPH	• RPMs	• RPMs
15 MPH & 20 MPH	• RPMs and One Direction Large Arrow sign	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons.
25 MPH & more	• RPMs and Chevrons; or • RPMs and One Direction Large Arrow sign where geometric conditions or roadside obstacles prevent the installation of chevrons	• RPMs and Chevrons

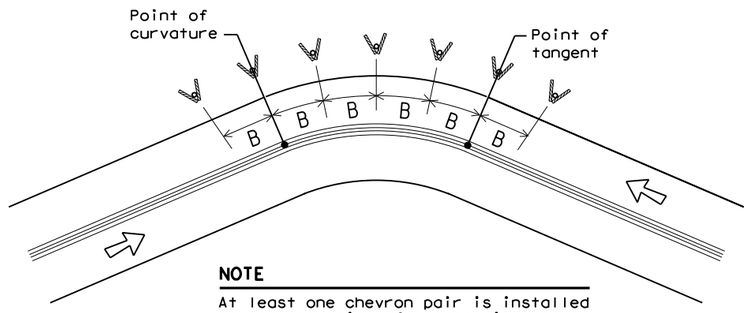
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

ONE DIRECTION LARGE ARROW (W1-6) sign should be located at approximately and perpendicular to the extension of the centerline of the tangent section of approach lane.

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

At least one chevron pair is installed beyond the point of tangent in tangent section.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

Degree of Curve	FEET			
	Radius of Curve	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
		A	2A	B
1	5730	225	450	—
2	2865	160	320	—
3	1910	130	260	200
4	1433	110	220	160
5	1146	100	200	160
6	955	90	180	160
7	819	85	170	160
8	716	75	150	160
9	637	75	150	120
10	573	70	140	120
11	521	65	130	120
12	478	60	120	120
13	441	60	120	120
14	409	55	110	80
15	382	55	110	80
16	358	55	110	80
19	302	50	100	80
23	249	40	80	80
29	198	35	70	40
38	151	30	60	40
57	101	20	40	40

Curve delineator approach and departure spacing should include 3 delineators spaced at 2A. This spacing should be used during design preparation or when the degree of curve is known.

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

Advisory Speed (MPH)	Spacing in Curve	Spacing in Straightaway	Chevron Spacing in Curve
	A	2xA	B
65	130	260	200
60	110	220	160
55	100	200	160
50	85	170	160
45	75	150	120
40	70	140	120
35	60	120	120
30	55	110	80
25	50	100	80
20	40	80	80
15	35	70	40

If the degree of curve is not known, delineator spacing may be determined based on the Advisory Speed of the curve. Use the delineator curve spacing for each Advisory Speed (MPH).

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

CONDITION	REQUIRED TREATMENT	MINIMUM SPACING
Frwy./Exp. Tangent	RPMs	See PM-series and FPM-series standard sheets
Frwy./Exp. Curve	Single delineators on right side	See delineator spacing table
Frwy/Exp.Ramp	Single delineators on at least one side of ramp (should be on outside of curves) (see Detail 3 on D&OM(4))	100 feet on ramp tangents Use delineator spacing table for ramp curves ("straightway spacing" does not apply to ramp curves)
Acceleration/Deceleration Lane	Double delineators (see Detail 3 on D&OM(4))	100 feet (See Detail 3 on D & OM (4))
Truck Escape Ramp	Single red delineators on both sides	50 feet
Bridge Rail (steel or concrete)and Metal Beam Guard Fence	Bi-Directional Delineators when undivided with one lane each direction Single Delineators when multiple lanes each direction	Equal spacing (100'max) but not less than 3 delineators
Concrete Traffic Barrier (CTB) or Steel Traffic Barrier	Barrier reflectors matching the color of the edge line	Equal spacing 100' max
Cable Barrier	Reflectors matching the color of the edge line	Every 5th cable barrier post (up to 100'max)
Guard Rail Terminus/Impact Head	Divided highway - Object marker on approach end Undivided 2-lane highways - Object marker on approach and departure end	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5) and D & OM (6)
Bridges with no Approach Rail	Type 3 Object Marker (OM-3) at end of rail and 3 single delineators approaching rail	See D & OM(5)
Reduced Width Approaches to Bridge Rail	Type 2 and Type 3 Object Markers (OM-3) and 3 single delineators approaching bridge	Requires reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end See D & OM (5)
Culverts without MBGF	Type 2 Object Markers	See Detail 2 on D & OM(4)
Crossovers	Double yellow delineators and RPMs	See Detail 1 on D & OM (4)
Pavement Narrowing (lane merge) on Freeways/Expressway	Single delineators adjacent to affected lane for full length of transition	100 feet

NOTES

1. Unless indicated otherwise, the delineator or barrier reflector color shall conform to the color of the pavement edge line on the side of the road where the delineators or barrier reflectors are placed.
2. Barrier reflectors may be used to replace required delineators.
3. Single red delineators may be mounted on the back side of delineator posts for wrong way driver applications

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
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REVISIONS	0908	27	006	CR 316
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	ABL	KENT		74

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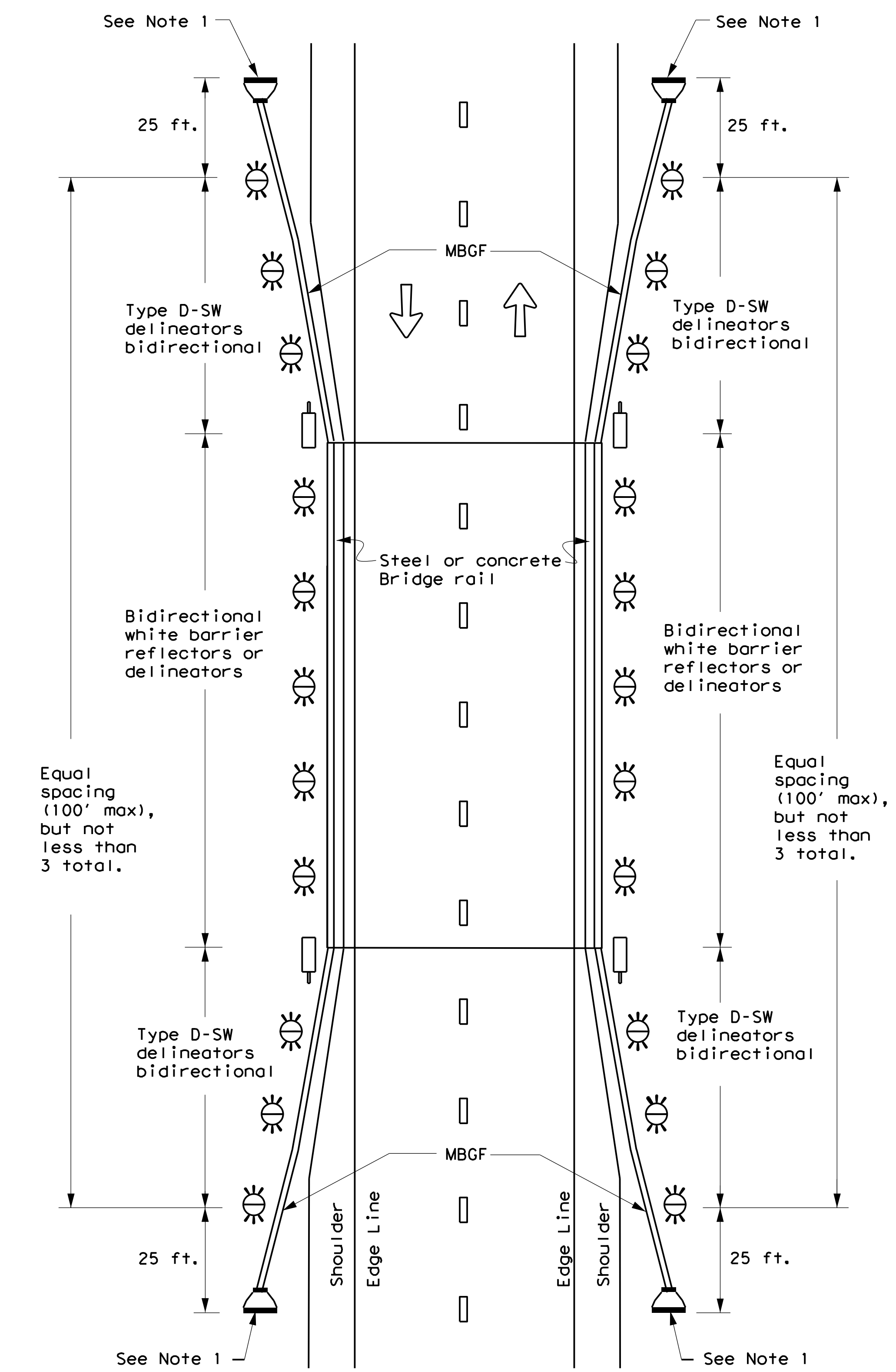
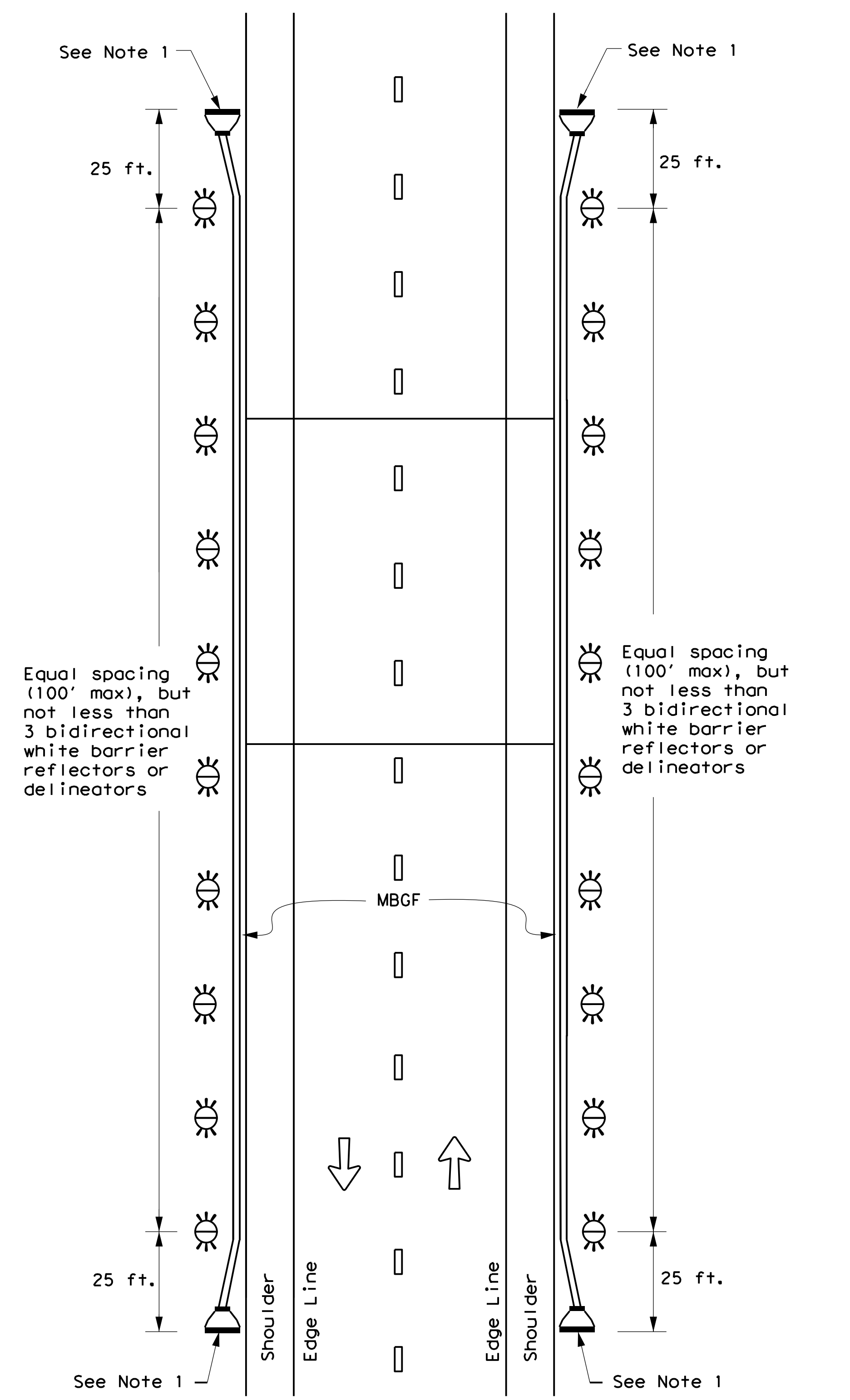
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



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.

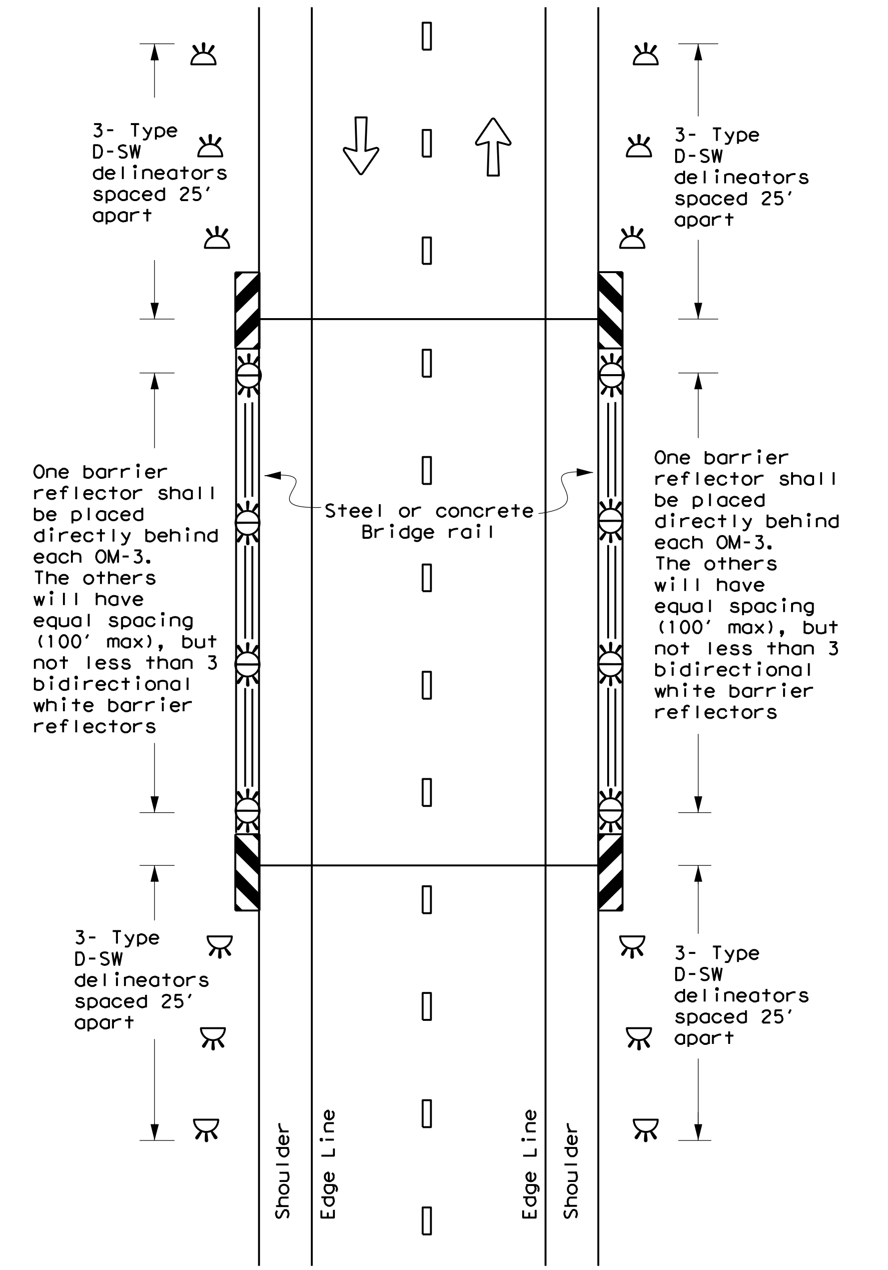
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



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

Symbol	Description
(symbol)	Bidirectional Delineator
(symbol)	Delineator
(symbol)	OM-3
(symbol)	OM-2
(symbol)	Terminal End
(symbol)	Traffic Flow

Texas Department of Transportation

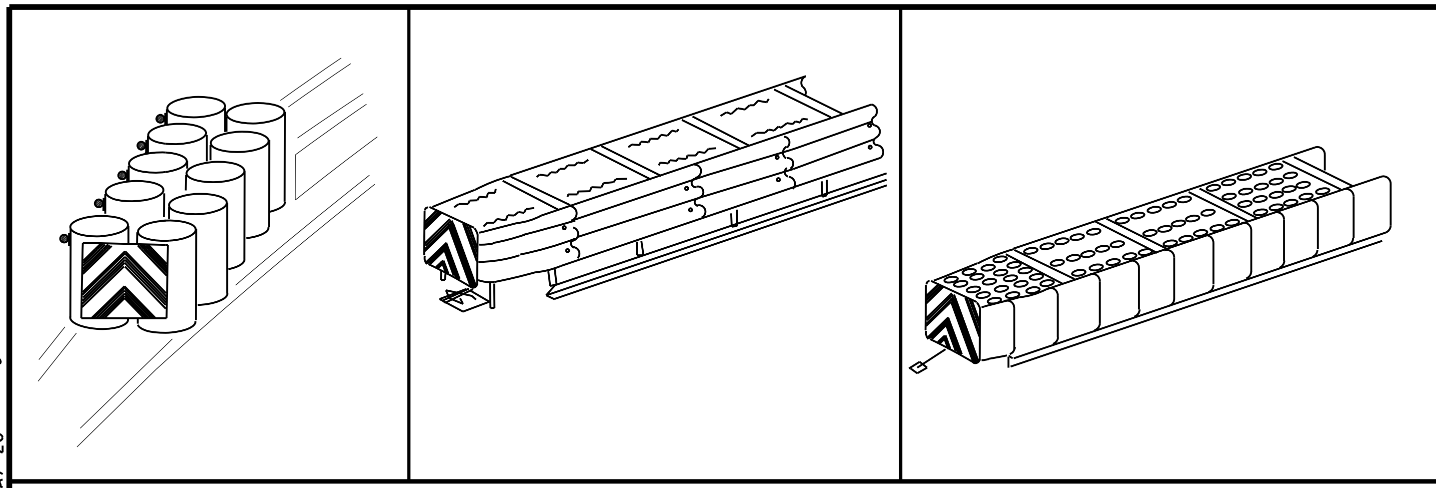
Traffic Safety Division Standard

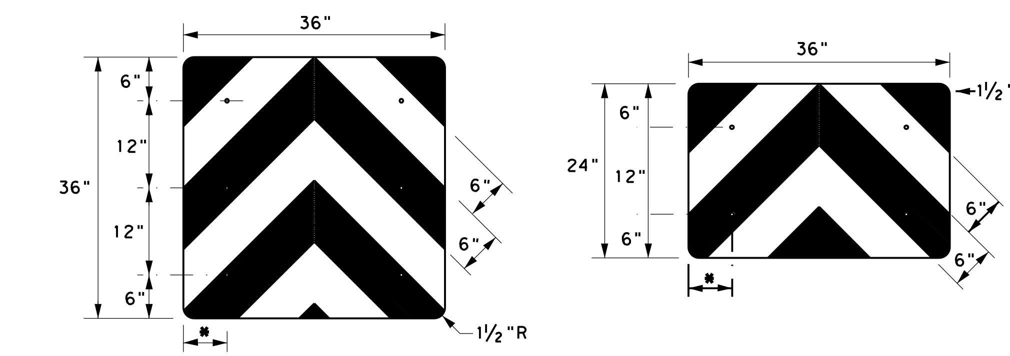
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

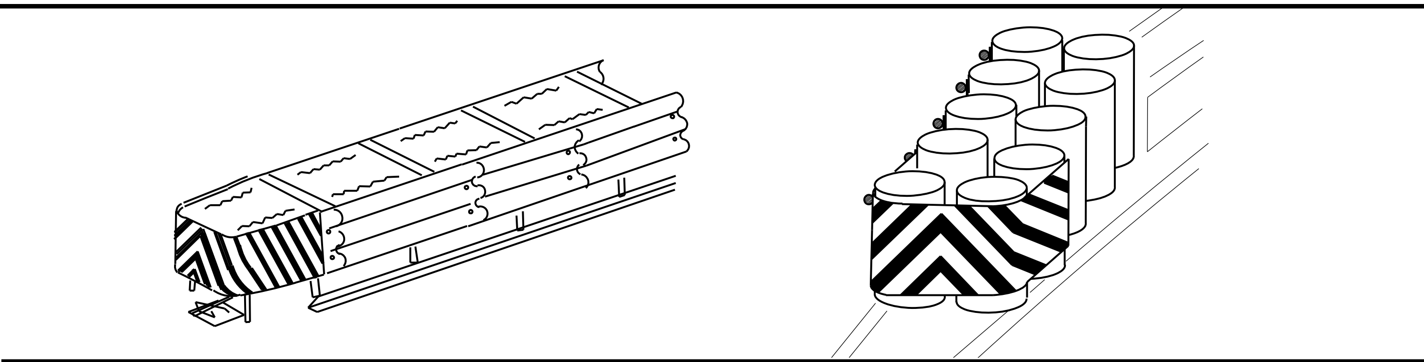
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
7-20	DIST		COUNTY	SHEET NO.
	ABL		KENT	75

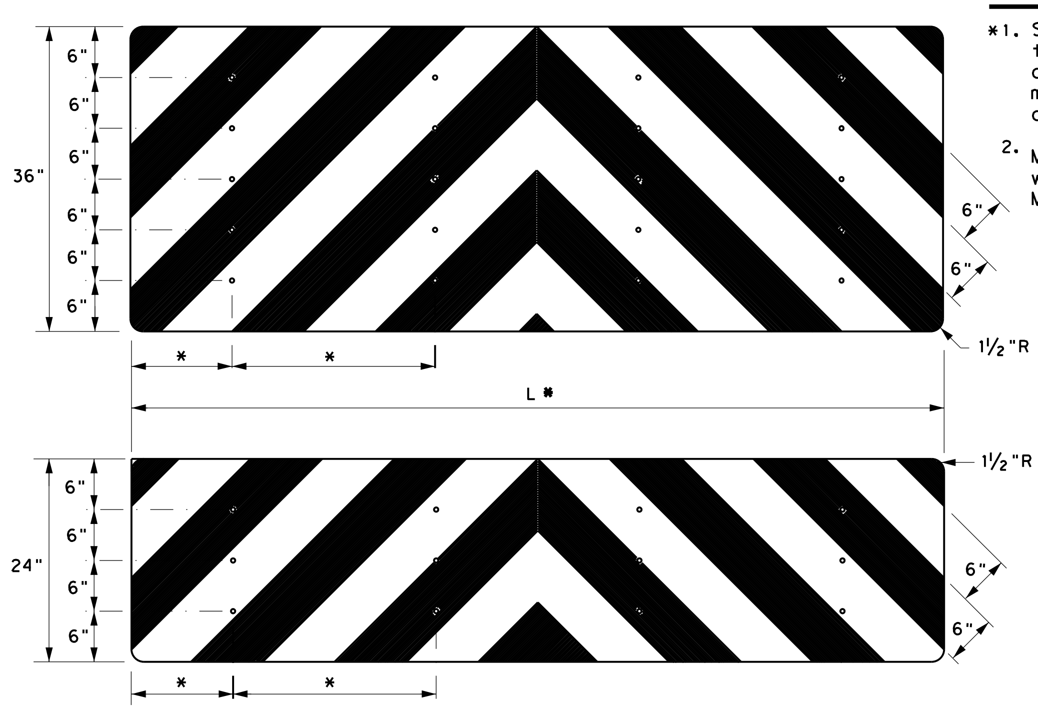
20E





* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

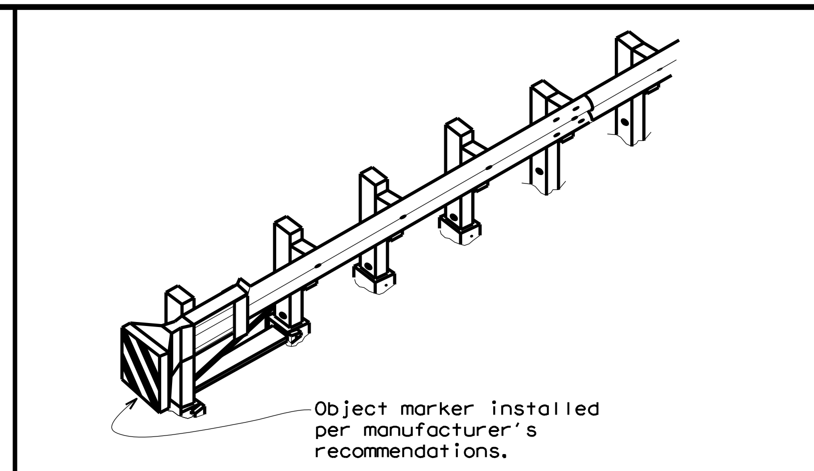


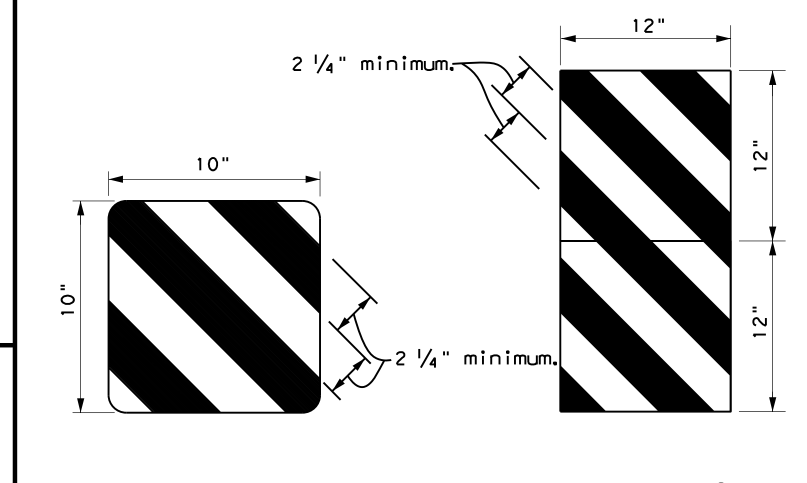


NOTES

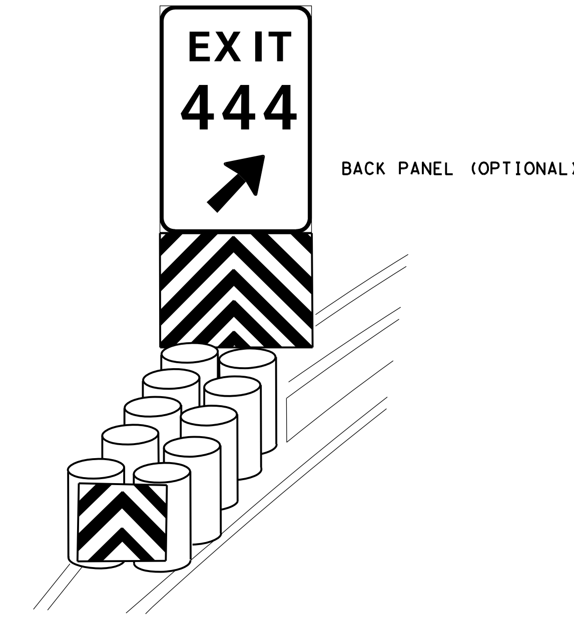
*1. Spacing should be adjusted to attach through centerline of drum, per attenuator manufacturers recommendation, or as directed by the Engineer.

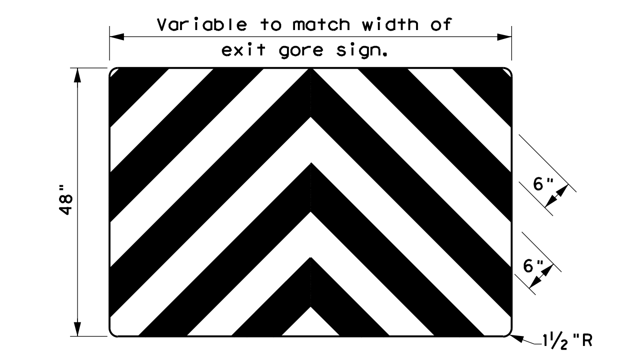
2. Mounting should be flush with top of attenuator. Minimum size 96" x 24".





OBJECT MARKERS SMALLER THAN 3 FT^2





NOTES

1. Object Markers shall conform to the Texas MUTCD and meet the color and reflectivity requirement of Department Material Specification DMS 8300. Background shall be yellow reflective sheeting (Type B or C) and Chevron shall be black.

2. Object Markers may be fabricated from adhesive backed reflective sheeting applied directly to guardrail end treatment, or applied directly to an "end cap" as per the manufacturer's recommendation. Direct applied sheeting shall provide a smooth surface and have no wrinkles, air bubbles, cuts or tears. A radius at the corners is not required for direct applied sheeting.

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".

4. Pop rivets, screws, or nuts and bolts may be used to attach object markers and reflectors. Holes, slots or other openings may be cut or drilled through object markers to allow cable or other attachments.

5. Object Marker at nose of attenuator is subsidiary to the attenuator.

6. See D & OM (1-4) for required barrier reflectors.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT		CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB		HIGHWAY
REVISIONS	0908	27	006		CR 316
4-92 8-04	DIST		COUNTY		SHEET NO.
8-95 3-15 4-98 7-20	ABL		KENT		76

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STORMWATER POLLUTION PRVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with TxDOT policy for projects disturbing less than 1 acre of soil, and not part of a larger common plan of development.

For all projects with any soil disturbing activities, TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office. If no field office is available, then this SWP3 shall be kept at the appropriate TxDOT Area Office.

This SWP3 is consistent with requirements specified in applicable stormwater plans, and the project's environmental permits, issues, and commitments (EPICs).

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):
0908-27-006

1.2 PROJECT LIMITS:
From: CR 316 AT COOPER CREEK

To: CR 316 AT COOPER CREEK

1.3 PROJECT COORDINATES:
BEGIN: (Lat) 33° 5'32.38"N ,(Long) 100°51'26.52"W

END: (Lat) 33° 5'29.47"N ,(Long) 100°51'24.06"W

1.4 TOTAL PROJECT AREA (Acres): 0.50

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.32

1.6 NATURE OF CONSTRUCTION ACTIVITY:
REPLACE BRIDGE AND WIDEN APPROACHES

1.7 MAJOR SOIL TYPES:

Soil Type	Description
Clairemont Slit Loam 0 - 1% Slopes	11% Sand, 68% Silt, 21% Clay, Well Drained, Negligible Runoff None - Deposition Erosion

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):
PSLs must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. PSLs may be identified during preconstruction meetings or during the construction process. Please choose from the options below:

☐ PSLs determined during preconstruction meeting
☒ PSLs determined during construction
☐ No PSLs planned for construction

Type	Sheet #s
Concrete Washout	80, Enviromental Layout

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 2.3.)

☒ Mobilization
☒ Install sediment and erosion controls
☒ Blade existing topsoil into windrows, prep ROW, clear and grub
☒ Remove existing pavement
☒ Grading operations, excavation, and embankment
☒ Excavate and prepare subgrade for proposed pavement widening
☐ Remove existing culverts, safety end treatments (SETs)
☒ Remove existing metal beam guard fence (MBGF), bridge rail
☐ Install proposed pavement per plans
☐ Install culverts, culvert extensions, SETs
☒ Install mow strip, MBGF, bridge rail
☒ Place flex base
☒ Rework slopes, grade ditches
☒ Blade windrowed material back across slopes
☐ Revegetation of unpaved areas
☒ Achieve site stabilization and remove sediment and erosion control measures
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☐ Solvents, paints, adhesives, etc. from various construction activities
☐ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☐ Contaminated water from excavation or dewatering pump-out water
☒ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☐ Long-term stockpiles of material and waste
☐ Other: _____
☐ 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
Cooper Creek	Double Mountain Fork Brazos River (1241); Bacteria in Water (Recreation Use)
No TMDLS Or I-PLANS Were Identified	

* Add (*) for impaired waterbodies with pollutant in ().

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☐ Other: _____
☐ Other: _____

☐ Other: _____

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		77
STATE	STATE DIST.	COUNTY	
TEXAS	ABL	KENT	
CONT.	SECT.	JOB	HIGHWAY NO.
0908	27	006	CR 316

STORMWATER POLLUTION PRVENTION 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
- ☐ ☐ Temporary Seeding
- ☐ ☐ Permanent Planting, Sodding or Seeding
- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☒ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

- ☒ ☐ Biodegradable Erosion Control Logs
- ☐ ☐ Dewatering Controls
- ☐ ☐ Inlet Protection
- ☐ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Sandbag Berms
- ☒ ☐ Sediment Control Fence
- ☐ ☐ Stabilized Construction Exit
- ☐ ☐ Floating Turbidity Barrier
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Vegetated Filter Strips
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

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

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

- ☐ Excess dirt/mud on road removed daily
- ☐ Haul roads dampened for dust control
- ☐ Loaded haul trucks to be covered with tarpaulin
- ☐ Stabilized construction exit
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

2.5 POLLUTION PREVENTION MEASURES:

- ☐ Chemical Management
- ☒ Concrete and Materials Waste Management
- ☒ Debris and Trash Management
- ☐ Dust Control
- ☒ Sanitary Facilities
- ☐ Other: _____
- ☐ 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

Refer to the Environmental Layout Sheets/ SWP3 Layout Sheets located in Attachment 1.2 of this SWP3

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

- ☒ Fire hydrant flushings
- ☒ Irrigation drainage
- ☒ Pavement washwater (where spills or leaks have not occurred, and detergents are not used)
- ☒ Potable water sources
- ☒ Springs
- ☒ Uncontaminated groundwater
- ☒ Water used to wash vehicles or control dust
- ☒ Other allowable non-stormwater discharges as allowed by TPDES GP TXR150000.

2.8 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3 .

2.9 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.3 of this SWP3.

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.

9/14/2023

STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	SEE TITLE SHEET		78
STATE	STATE DIST.	COUNTY	
TEXAS	ABL	KENT	
CONT.	SECT.	JOB	HIGHWAY NO.
0908	27	006	CR 316

PREPARED BY (NAME OF DESIGNER)
DATE: 9/14/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/... ENVIRONMENTAL PERMITS,

I. STORM WATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Storm water Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

1.

☐ No Action Required ☒ Required Action

Action No.

1. The project disturbs less than one acre of surface area. The contractor is responsible for the PSL as defined in the Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2014 Edition, Section 7.6., Page 44). The total disturbed acreage is the combined acreage to be disturbed on the project and the contractors PSL.
2. Prevent storm water pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
3. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
4. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
5. 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, WATER BODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

☐ No Permit Required
☒ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
☐ Individual 404 Permit Required
☐ Other Nationwide Permit Required: NWP# ______

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

1.

2.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☐ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☐ Blankets/Matting	☐ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Sedimentation Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw & Hay Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost Mulch
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☐ Sand Filter Systems
☒ Temporary Erosion Control Logs (BIOLOGS)	☒ Temporary Erosion Control Logs (BIOLOGS)	☐ Temporary Erosion Control Logs (BIOLOGS)
☒ Preservation of Natural Resources	☐ Sediment Traps	☐ Permanent Vegetation (Planting, Sodding, or Seeding)
☐ Construction Exits	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical.
Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

☐ No Action Required ☒ Required Action

Action No.

1. USE NATIVE VEGETATION - E.O. 13112

2.

3.

4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

☐ No Action Required ☒ Required Action

Action No.

1. MIGRATORY BIRD TREATY ACT

2. PLEASE REFER TO GENERAL NOTES

3.

4.

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 Storm water Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army Corps of Engineers
NOI:	Notice of Intent	USFWS:	U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:
* Dead or distressed vegetation (not identified as normal)
* Trash piles, drums, canister, barrels, etc.
* Undesirable smells or odors
* Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

☒ Yes ☐ No

If "No", then no further action is required.
If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

☐ Yes ☒ No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.

2.

3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

☒ No Action Required ☐ Required Action

Action No.

1.

2.

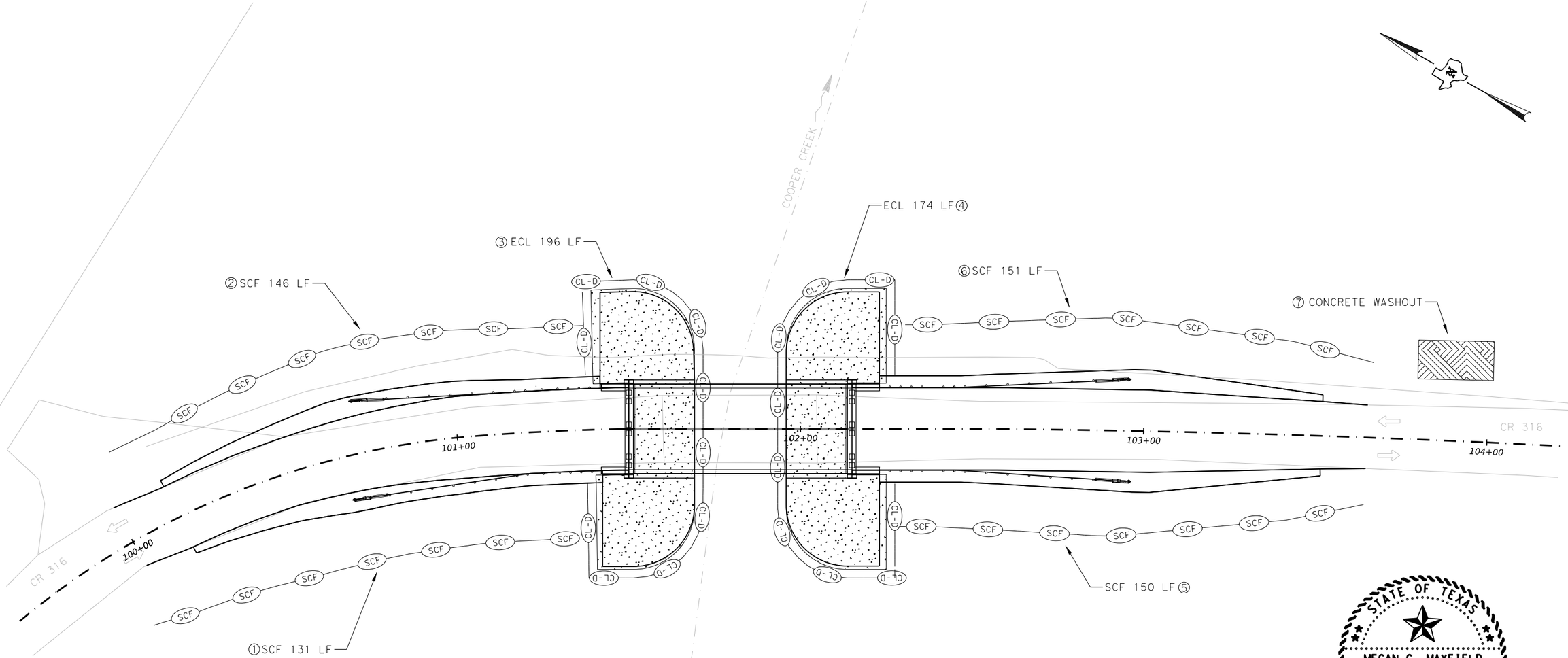
3.

CR 316 ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC

NO SCALE SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.			HIGHWAY NO.
6	SEE TITLE SHEET			CR 316
STATE	COUNTY			SHEET NO.
TEXAS	KENT			79
DISTRICT	CONTROL	SECTION	JOB	
ABL	0908	27	006	

REV. DATE: 02/2015



	BMP			DATE	
NO.	TYPE	UNIT	QTY	PLACED	REMOVED
1	SCF	LF	131		
2	SCF	LF	146		
3	ECL	LF	196		
4	ECL	LF	174		
5	SCF	LF	150		
6	SCF	LF	151		
7	CONC. WASHOUT	EA	1		

LEGEND

- SCF — TEMP SEDIMENT CONTROL FENCE (SCF)
- CL-D — EROSION CONTROL LOGS
- DIRECTION OF WATER FLOW
- CONCRETE WASHOUT
- WIRE FENCE
- CONCRETE RIPRAP

STATE OF TEXAS
MEGAN C. MAYFIELD
146002
LICENSED PROFESSIONAL ENGINEER

Megan C. Mayfield, P.E.
9/14/2023

ENVIRONMENTAL LAYOUT

 Texas Department of Transportation

SCALE: 1" = 30' SHEET 1 OF 1

FHWA DIVISION	PROJECT NO.		HIGHWAY NO.
6	SEE TITLE SHEET		CR 316
STATE	COUNTY		SHEET NO.
TEXAS	KENT		80
DISTRICT	CONTROL	SECTION	JOB
ABL	0908	27	006

FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/9. Environmental/080 ENVIRONMENTAL LAYOUT
DATE: 9/14/2023 6:20:20 PM

DN: TxDOT CK: KM DW: VP DN/CK: LS
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DW: TxDOT2/Documents/08 - ABL/Design Projects/0908270074 - Design/Plan Set/9. Environmental/081 EC(1)-16.dgn
9/1/2023
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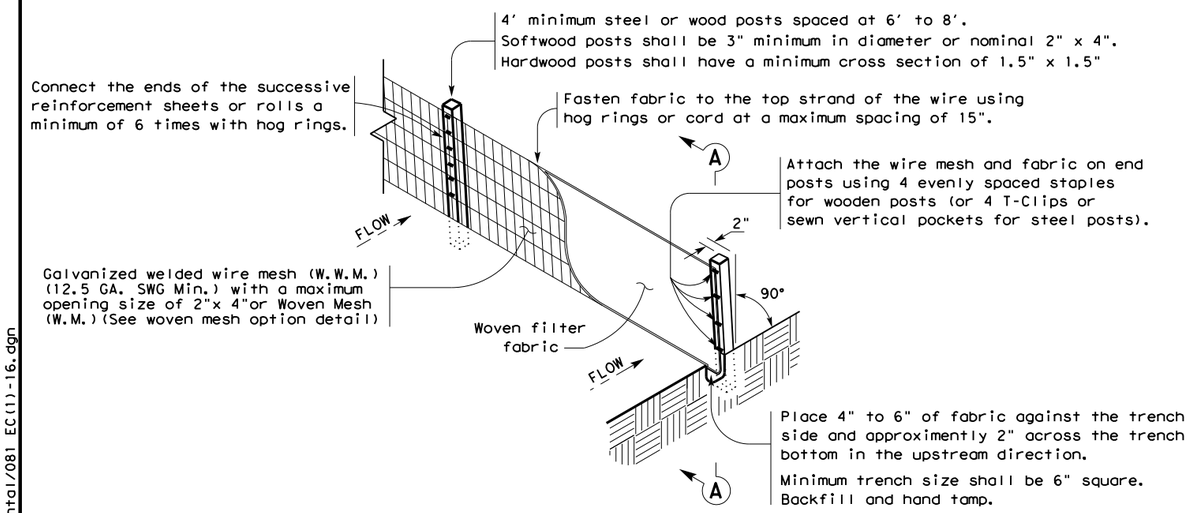
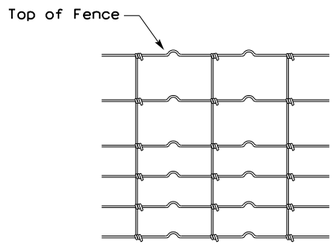
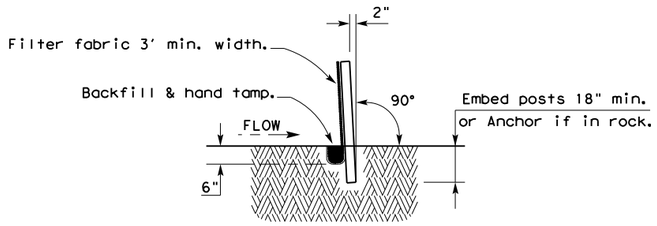


TEMPORARY SEDIMENT CONTROL FENCE

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.

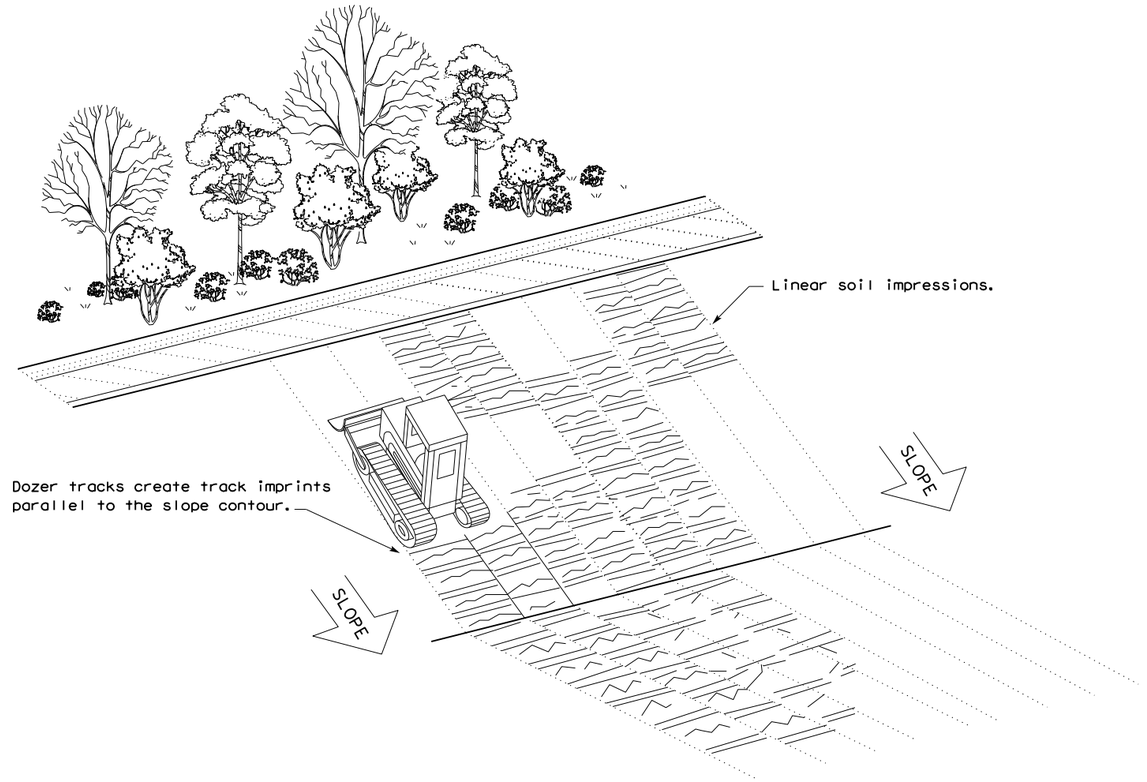
LEGEND

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	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		81

DATE: 9/14/2023
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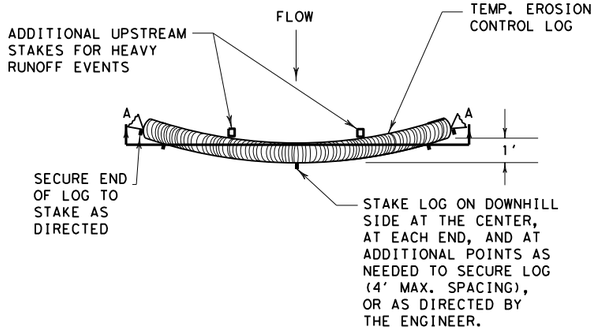
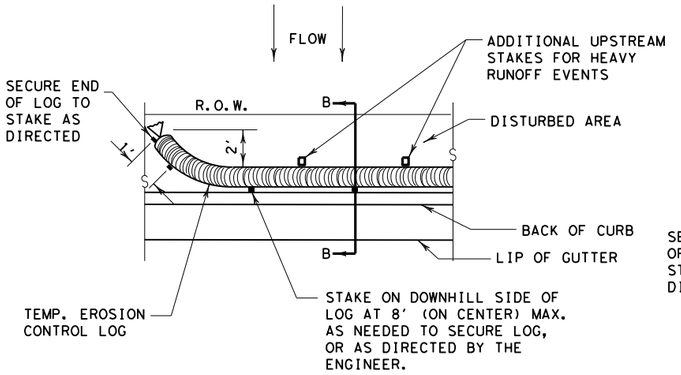
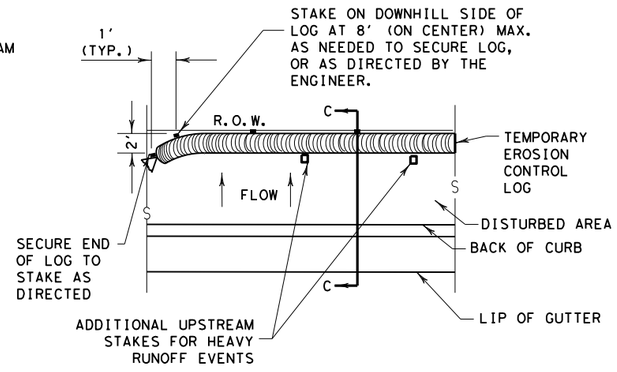


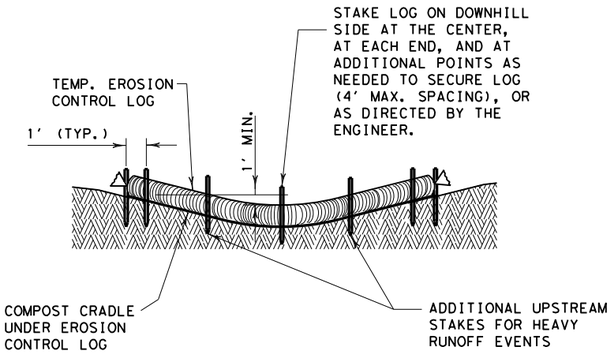
PLAN VIEW



PLAN VIEW



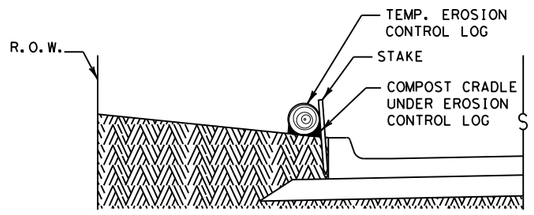
PLAN VIEW



SECTION A-A

EROSION CONTROL LOG DAM

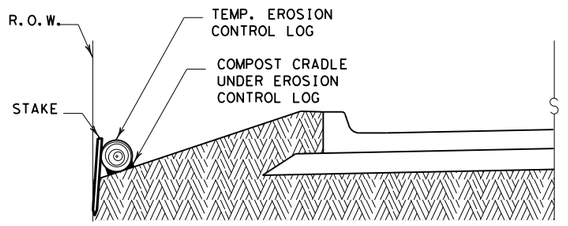
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

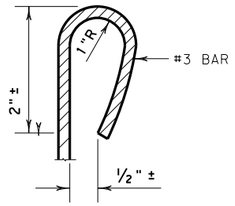
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

- CL-D — EROSION CONTROL LOG DAM
- CL-BOC — EROSION CONTROL LOG AT BACK OF CURB
- CL-ROW — EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY
- CL-SST — EROSION CONTROL LOGS ON SLOPES STAKE AND TRENCHING ANCHORING
- CL-SSL — EROSION CONTROL LOGS ON SLOPES STAKE AND LASHING ANCHORING
- CL-DI — EROSION CONTROL LOG AT DROP INLET
- CL-CI — EROSION CONTROL LOG AT CURB INLET
- CL-GI — EROSION CONTROL LOG AT CURB & GRATE INLET

GENERAL NOTES:

1. EROSION CONTROL LOGS SHALL BE INSTALLED IN ACCORDANCE WITH MANFACTURER'S RECOMMENDATIONS, OR AS DIRECTED BY THE ENGINEER.
2. LENGTHS OF EROSION CONTROL LOGS SHALL BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AND AS REQUIRED FOR THE PURPOSE INTENDED.
3. UNLESS OTHERWISE DIRECTED, USE BIODEGRADABLE OR PHOTODEGRADABLE CONTAINMENT MESH ONLY WHERE LOG WILL REMAIN IN PLACE AS PART OF A VEGETATIVE SYSTEM. FOR TEMPORARY INSTALLATIONS, USE RECYCLABLE CONTAINMENT MESH.
4. FILL LOGS WITH SUFFICIENT FILTER MATERIAL TO ACHIEVE THE MINIMUM COMPACTED DIAMETER SPECIFIED IN THE PLANS WITHOUT EXCESSIVE DEFORMATION.
5. STAKES SHALL BE 2" X 2" WOOD OR #3 REBAR, 2'-4' LONG, EMBEDDED SUCH THAT 2" PROTRUDES ABOVE LOG, OR AS DIRECTED BY THE ENGINEER.
6. DO NOT PLACE STAKES THROUGH CONTAINMENT MESH.
7. COMPOST CRADLE MATERIAL IS INCIDENTAL & WILL NOT BE PAID FOR SEPARATELY.
8. SANDBAGS USED AS ANCHORS SHALL BE PLACED ON TOP OF LOGS & SHALL BE OF SUFFICIENT SIZE TO HOLD LOGS IN PLACE.
9. TURN THE ENDS OF EACH ROW OF LOGS UPSLOPE TO PREVENT RUNOFF FROM FLOWING AROUND THE LOG.
10. FOR HEAVY RUNOFF EVENTS, ADDITIONAL UPSTREAM STAKES MAY BE NECESSARY TO KEEP LOG FROM FOLDING IN ON ITSELF.

SEDIMENT BASIN & TRAP USAGE GUIDELINES

An erosion control log sediment trap may be used to filter sediment out of runoff draining from an unstabilized area.

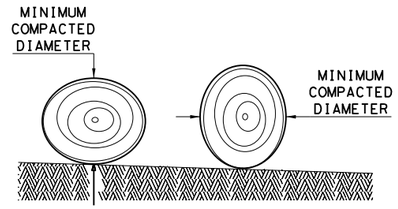
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

1. Within drainage ditches spaced as needed or min. 500' on center
2. Immediately preceding ditch inlets or drain inlets
3. Just before the drainage enters a water course
4. Just before the drainage leaves the right of way
5. Just before the drainage leaves the construction limits where drainage flows away from the project.

The logs should be cleaned when the sediment has accumulated to a depth of 1/2 the log diameter.

Cleaning and removal of accumulated sediment deposits is incidental and will not be paid for separately.



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916		DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016		CONT	SECT	JOB		HIGHWAY	
REVISIONS		0908	27	006		CR 316	
		DIST		COUNTY			SHEET NO.
		ABL		KENT			82

DATE: 9/14/2023
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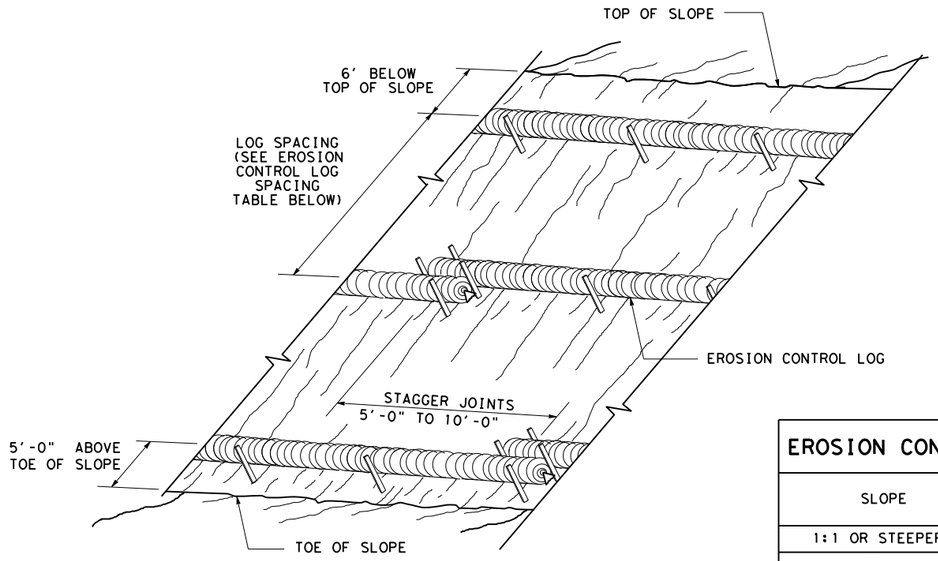
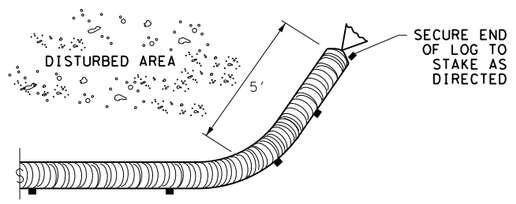


EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

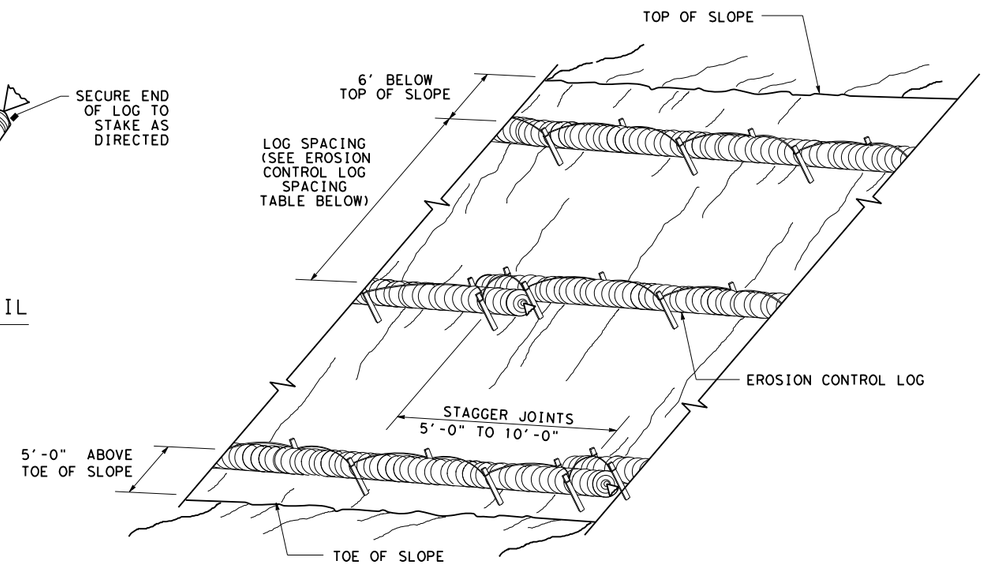
CL-SST



END SECTION RAP DETAIL

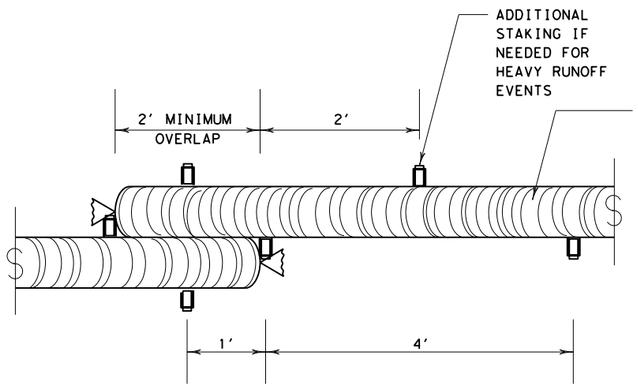
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

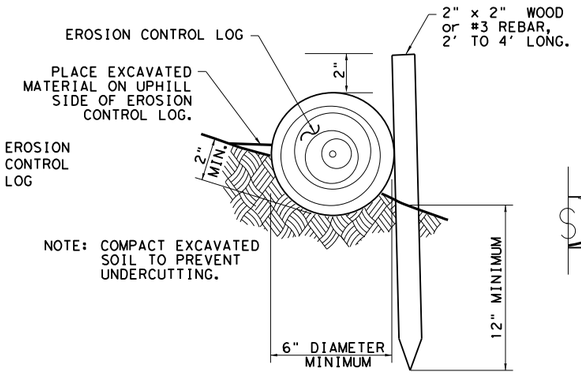
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

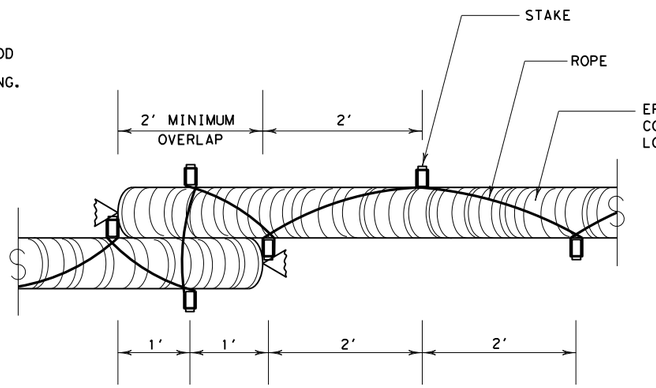


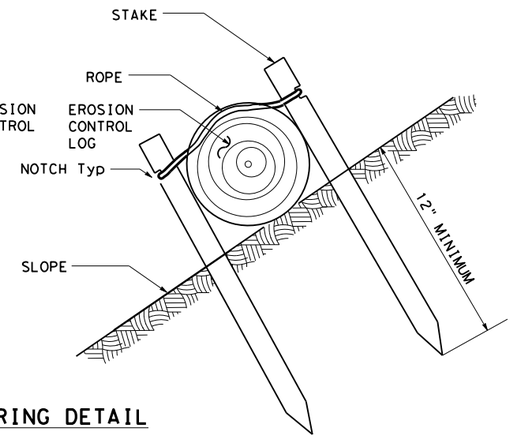


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

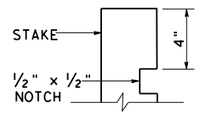
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



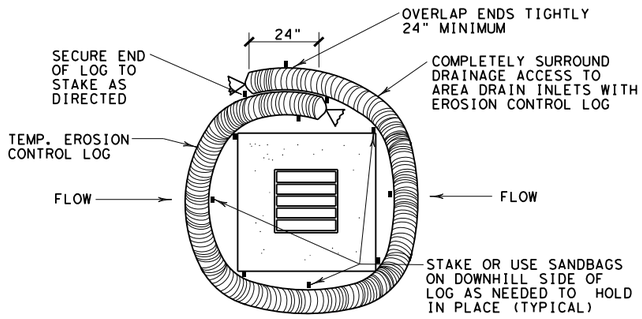
STAKE NOTCH DETAIL

Texas Department of Transportation — Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES
EROSION CONTROL LOG
EC(9)-16

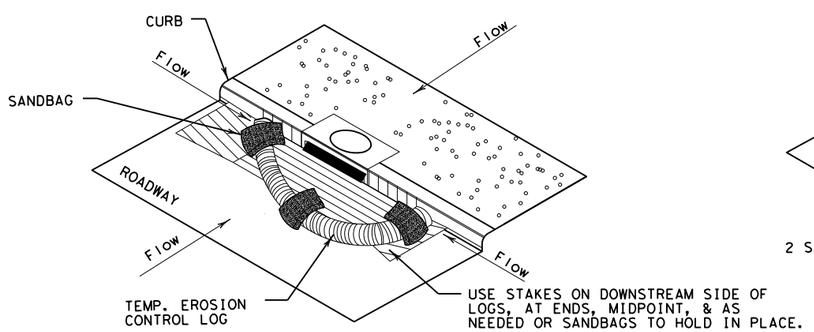
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		83

DATE: 9/14/2023
FILE: pw://txdot.projectwiseonline.com:TxDOT2/Documents/08 - ABL/Design Projects/090827006/4 - Design/Plan Set/9. Environmental/082-084 EC(9)-16.dgn



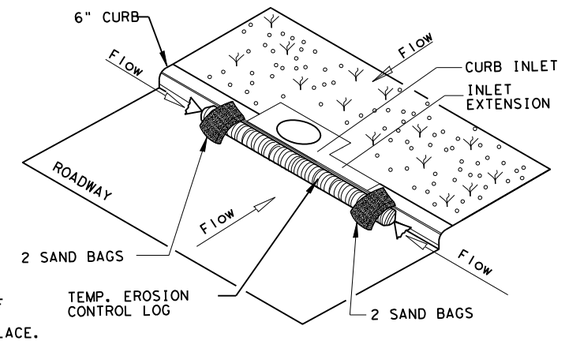
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

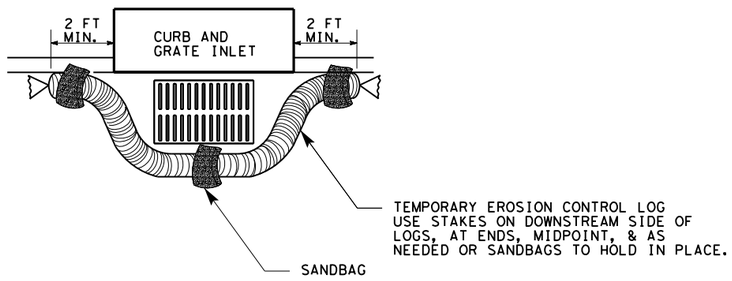
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

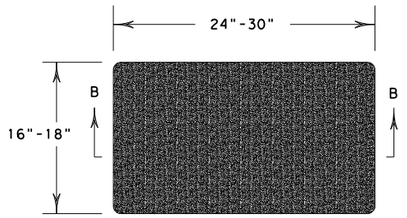
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



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
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REVISIONS	0908	27	006	CR 316
	DIST	COUNTY		SHEET NO.
	ABL	KENT		84