FED.RD. DIV.NO.	FEDERAL PROJECT NO.		SHEET NO.
6	BR 2024 (791)		1
STATE	STATE DIST.	COUNTY	
TEXAS	ATL	UPSHUR	
CONT.	SECT.	JOB	HIGHWAY
1511	01	013	FM 993

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT
FEDERAL AID PROJECT

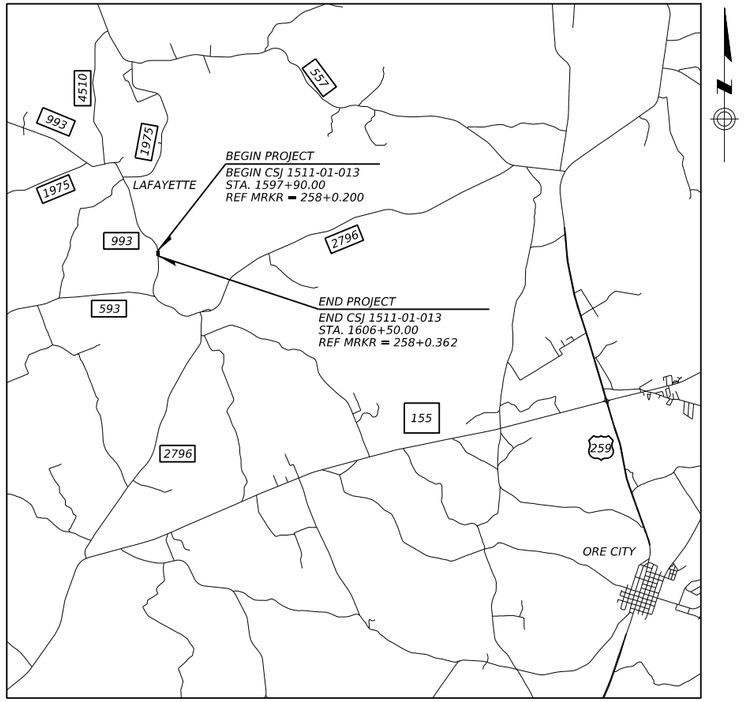
PROJECT NO. BR 2024 (791)

UPSHUR COUNTY
FM 993

LIMITS: AT WEST GREASY CREEK

NET LENGTH OF ROADWAY:	*755.00 FT.=*	*0.143 MI.*
NET LENGTH OF BRIDGE:	*105.00 FT.=*	*0.019 MI.*
TOTAL OF PROJECT:	*860.00 FT.=*	*0.162 MI.*

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



EXCEPTIONS: *NONE*
EQUATIONS: *NONE*
RAILROAD CROSSINGS: *NONE*

FUNCTIONAL CLASSIFICATION = RURAL MAJOR COLLECTOR
DESIGN SPEED = 40 MPH
A.D.T. (2022) = 290
A.D.T. (2042) = 528

CONTRACTOR NAME: _____
CONTRACTOR ADDRESS: _____

DATE WORK BEGAN: _____
DATE WORK COMPLETED: _____
DATE OF ACCEPTANCE: _____
LIST OF APPROVED FIELD CHANGES: _____

THE CONSTRUCTION WORK WAS PERFORMED
IN ACCORDANCE WITH THE PLANS.

_____ *P.E.* _____ *DATE*

STATE OF TEXAS
Blake W. Staton
121491
LICENSED PROFESSIONAL ENGINEER
12/8/2023

GARVER
3755 S. Capital of Texas Highway
Suite 325
Austin, TX 78704
(512) 485-0009
TBPELS Firm 5713

INDEX OF SHEETS

SHEET NO.	*DESCRIPTION*
SEE SHEET 2 FOR INDEX OF SHEETS	

THE CONTRACTOR SHALL PERFORM OWN INVESTIGATIONS AND ARRANGEMENTS FOR DELIVERY OF MATERIALS.

CONSTRUCTION SIGN AND BARRICADE PLACEMENT SHALL BE IN ACCORDANCE WITH THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, AS SHOWN ON THE BC STANDARDS, AS SPECIFIED HEREIN OR AS DIRECTED BY THE 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)

2023 **Texas Department of Transportation**

RECOMMENDED FOR LETTING: 1/8/2024

DocuSigned by: Katie Martin, P.E.
3B337C5031074A4...
DIRECTOR OF TRANSPORTATION PLANNING AND DEVELOPMENT

APPROVED FOR LETTING: 1/8/2024

DocuSigned by: Robert Hobbs, P.E.
23686C08B28F4A0...
DISTRICT ENGINEER

DATE: 12/7/2023 3:45:06 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/01_General/01_010_FM993_GEN_TTL_01.dgn

COUNTY UPSHUR *PROJ. NO. BR 2024 (791)*
HWY. NO. FM 993 *LETTING DATE MAR 2024*
DATE ACCEPTED _____

SHEET NO.		DESCRIPTION
		GENERAL
1		TITLE SHEET
2		INDEX OF SHEETS
3		PROJECT LAYOUT
4-6		TYPICAL SECTIONS
7,7A-7G		GENERAL NOTES
8, 8A-8B		ESTIMATE AND QUANTITY SHEET
9-10		SUMMARY OF QUANTITIES
11		SUMMARY OF SMALL SIGNS
		TRAFFIC CONTROL PLAN
12		DETOUR MAP
		TRAFFIC CONTROL STANDARDS
13-24	#	BC(1)-21 THRU BC(12)-21
25	#	TCP(1-1)-18
26	#	TCP(1-2)-18
27	#	TCP(2-1)-18
28	#	TCP(3-1)-13
29	#	TCP(3-3)-14
30	#	WZ(RCD)-13
31	#	WZ(STPM)-23
		ROADWAY DETAILS
32		CONTROL INDEX SHEET
33-35		CONTROL DETAIL SHEET
36		HORIZONTAL ALIGNMENT DATA
37		REMOVAL LAYOUT
38-39		PLAN & PROFILE
40		DRIVEWAY DETAILS
		ROADWAY STANDARDS
41	#	GF(31)-19
42-43	#	GF(31)TR TL3-20
44	#	GF(31)MS-19
45	#	BED-14
46	#	SGT(10S)31-16
47	#	SGT(11S)31-18
48	#	SGT(12S)31-18
49	#	SGT(15)31-20
50	#	WF(2)-10
51	#	SETP-PD
		DRAINAGE DETAILS
52-54		HYDRAULIC DATA
55		SCOUR DATA

SHEET NO.		DESCRIPTION
		BRIDGE DETAILS
56		BRIDGE LAYOUT
57		TYPICAL SECTION
58		ESTIMATED QUANTITIES AND CAP ELEVATIONS
59-62		TEST HOLE PROFILES
63		ABUTMENT #1 OR #4
64		INTERIOR BENTS #2 - #3
65		FRAMING PLAN (SPANS 1-3)
66		105.00' PRESTR CONC SLAB BEAM UNIT (SPANS 1-3)
67		PSBND
68		CSAB-REQUIRED SUPPLEMENTAL DETAILS
		BRIDGE STANDARDS
69-70	*	A-BAS-A (ATL DIST STD)
71	*	AJ
72-73	*	CSAB
74-75	*	FD
76	*	NBIS
77	*	PSB-4SB12
78	*	PSB-5SB12
79	*	PSBEB
80	*	PSBRA
81-82	*	SRR
83-84	*	TYPE SSTR
		TRAFFIC DETAILS
85-86		SIGNING & PAVEMENT MARKING LAYOUT
		TRAFFIC STANDARDS
87-91	#	D & OM(1)-20 THRU D & OM(5)-20
92	#	D & OM(VIA)-20
93	#	PM(1)-22
94	#	PM(2)-22
95	#	SMD(GEN)-08
96	#	SMD(SLIP-1)-08
97	#	SMD(SLIP-2)-08
98	#	SMD(SLIP-3)-08
99	#	SMD(TWT)-08
100	#	TSR(3)-13
101	#	TSR(4)-13
		ENVIRONMENTAL ISSUES
102-103		STORMWATER POLLUTION PREVENTION PLAN (SWP3)
104		ENVIRONMENTAL PERMITS, ISSUES, AND COMMITMENTS (EPIC)
105-106		ENVIRONMENTAL LAYOUT SHEETS
		ENVIRONMENTAL STANDARDS
107	#	EC(1)-16
108	#	EC(2)-16
109	#	EC(3)-16
110-112	#	EC(9)-16

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER

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

Alvaro J Lopez , P.E. 12/08/2023
ALVARO J. LOPEZ DATE

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED PROFESSIONAL ENGINEER

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

Adrian Rangel , P.E. 12/8/2023
ADRIAN RANGEL DATE

STATE OF TEXAS
Blake W. Staton
121491
LICENSED PROFESSIONAL ENGINEER
12/8/2023

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TBPELS Firm 5713

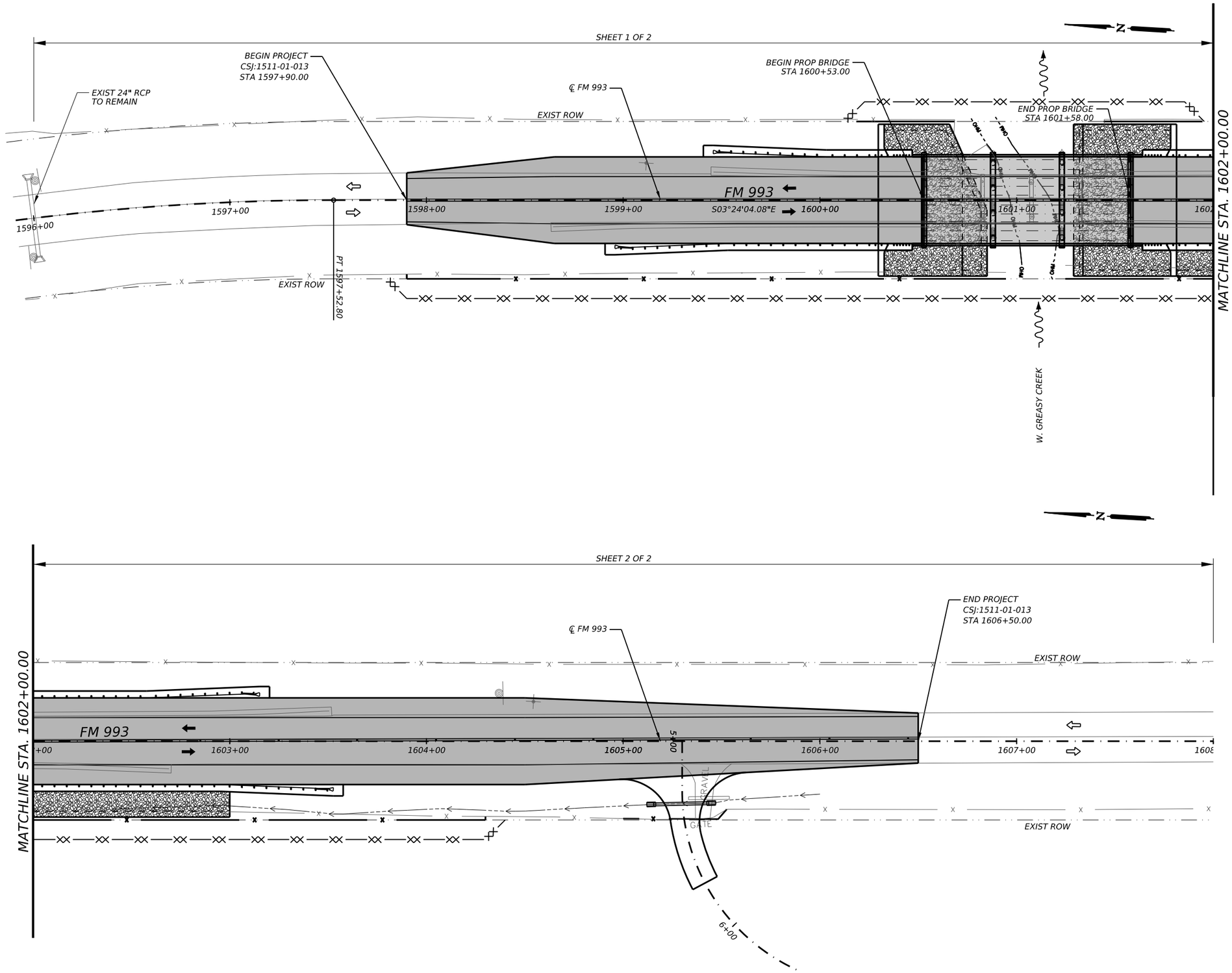
2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

INDEX OF SHEETS

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		2
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993



NOTE:
REFER TO HORIZONTAL ALIGNMENT DATA SHEET FOR ADDITIONAL INFORMATION.

0 25' 50'

SCALE: 1" = 50'

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED
PROFESSIONAL ENGINEER

Adrian Rangel
12/8/2023

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FM 993
AT WEST GREASY CREEK

PROJECT LAYOUT

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		3
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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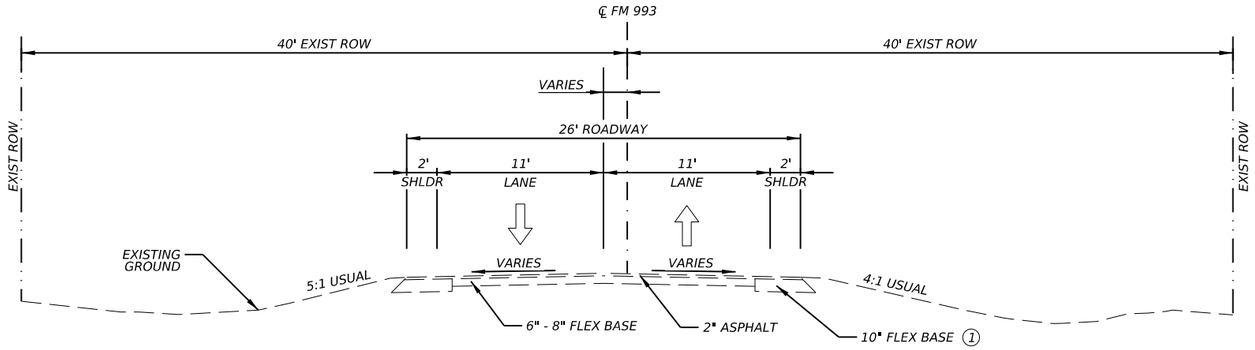
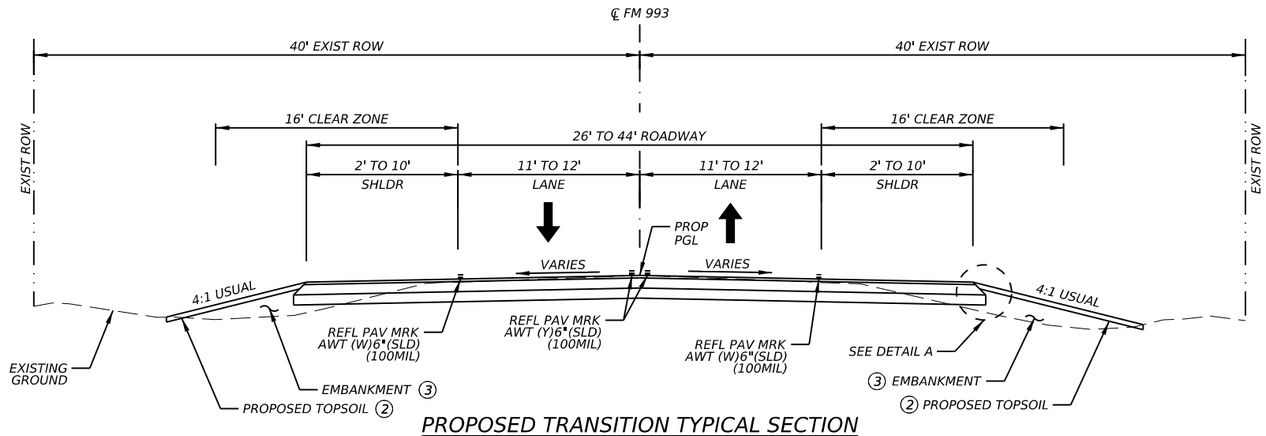


EXISTING TYPICAL SECTION

STA 1597+90.00 TO STA 1606+50.00
EXIST BRIDGE STA 1600+83.24 TO STA 1601+33.24



PROPOSED TRANSITION TYPICAL SECTION

STA 1597+90.00 TO STA 1598+65.00

LEGEND:

PROP DIRECTION OF TRAFFIC
EXIST DIRECTION OF TRAFFIC

(1) 10" FLEX BASE WIDENING NOT PRESENT IN AREAS WHERE MBGF IS PRESENT

(2) TOPSOIL TO CONTAIN NO BIO-SOLIDS, BE SEEDED AND HAVE SOIL RETENTION BLANKET WHEN STEEPER THAN 3:1.

(3) SEE GENERAL NOTES FOR EMBANKMENT MATERIAL REQUIREMENTS.

NOTE:
SEE TYPICAL SECTIONS SHEET 3 OF 3 FOR DETAIL A.

NOT TO SCALE

STATE OF TEXAS
ADRIAN RANGEL
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TYPICAL SECTIONS

SHEET 1 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		4
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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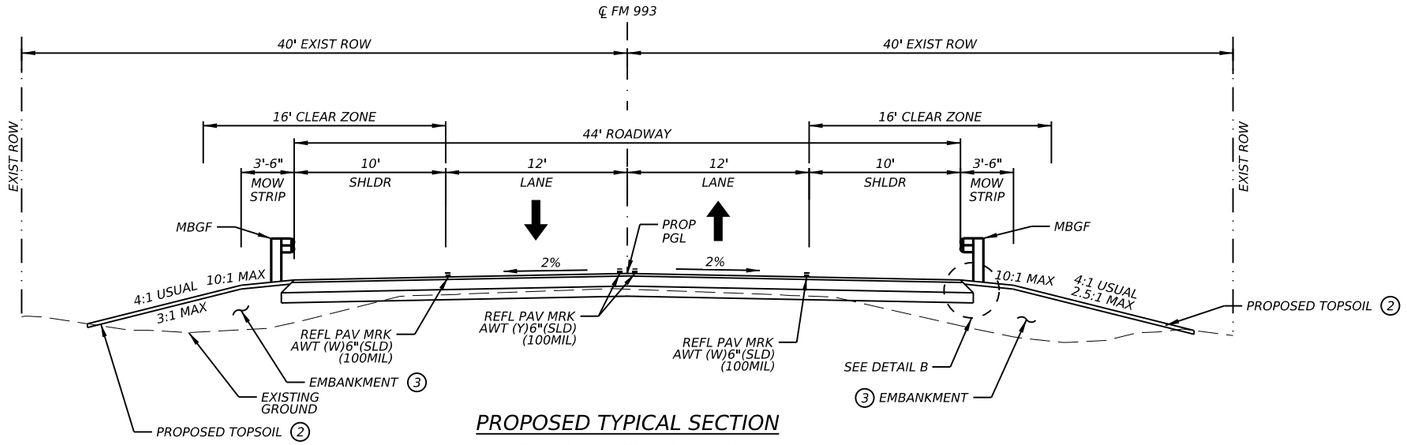
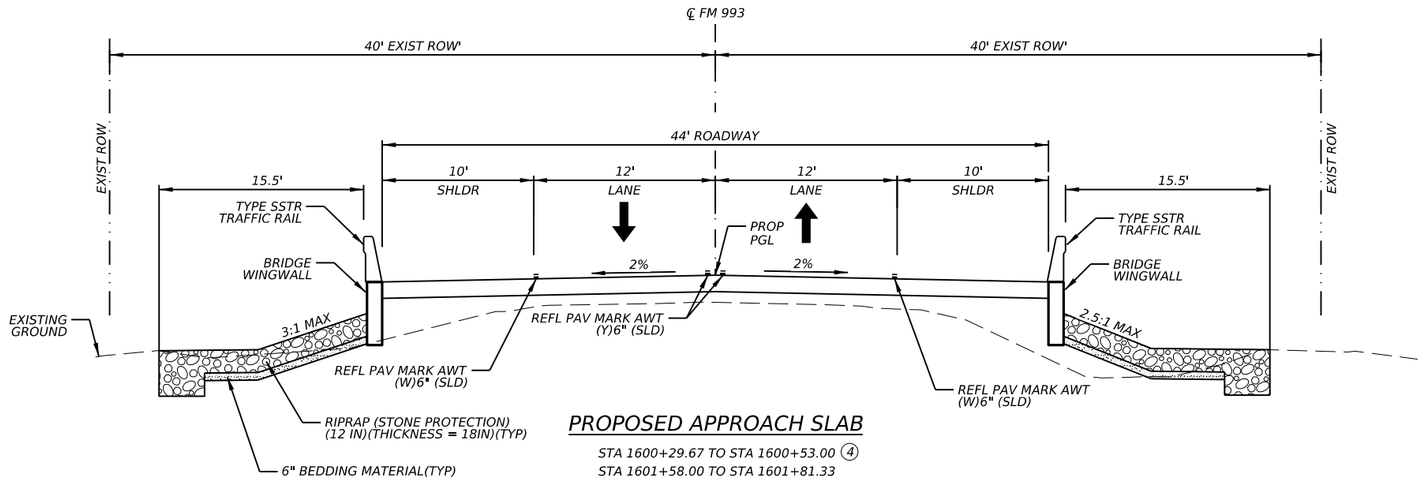


PROPOSED TYPICAL SECTION

STA 1598+65.00 TO STA 1600+29.67
STA 1601+81.33 TO STA 1604+50.00



PROPOSED APPROACH SLAB

STA 1600+29.67 TO STA 1600+53.00 (4)
STA 1601+81.33 TO STA 1604+50.00

LEGEND:

PROP DIRECTION OF TRAFFIC
EXIST DIRECTION OF TRAFFIC

(1) 10" FLEX BASE WIDENING NOT PRESENT IN AREAS WHERE MBGF IS PRESENT

(2) TOPSOIL TO CONTAIN NO BIO-SOLIDS, BE SEEDED AND HAVE SOIL RETENTION BLANKET WHEN STEEPER THAN 3:1.

(3) SEE GENERAL NOTES FOR EMBANKMENT MATERIAL REQUIREMENTS.

(4) SEE BRIDGE TYPICAL SECTION SHEET FOR TYPICAL SECTIONS FOR STA. 1600+53.00 - STA. 1601+58.00

NOTE:
SEE TYPICAL SECTIONS SHEET 3 OF 3 FOR DETAIL B.

NOT TO SCALE

STATE OF TEXAS
ADRIAN RANGEL
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LICENSED PROFESSIONAL ENGINEER
Adrian Rangel
12/8/2023

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FM 993
AT WEST GREASY CREEK

TYPICAL SECTIONS

SHEET 2 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		5
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/7/2023 3:47:03 PM
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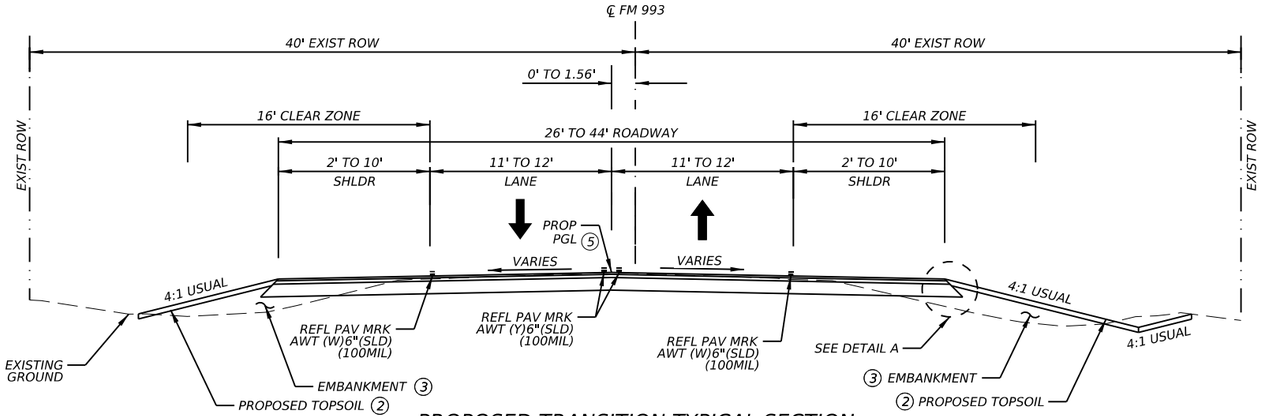


PROPOSED TRANSITION TYPICAL SECTION

STA 1604+50.00 TO STA 1606+50.00

LEGEND:

PROP DIRECTION OF TRAFFIC

EXIST DIRECTION OF TRAFFIC

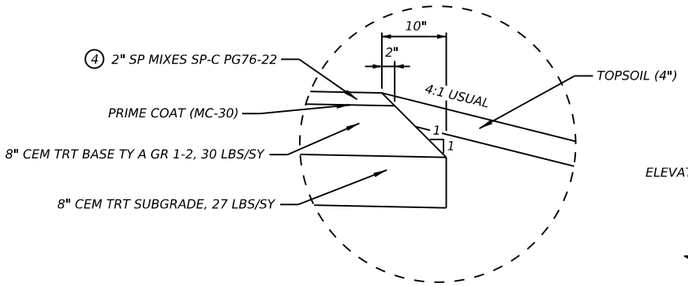
(1) 10" FLEX BASE WIDENING NOT PRESENT IN AREAS WHERE MBGF IS PRESENT

(2) TOPSOIL TO CONTAIN NO BIO-SOLIDS, BE SEEDED AND HAVE SOIL RETENTION BLANKET WHEN STEEPER THAN 3:1.

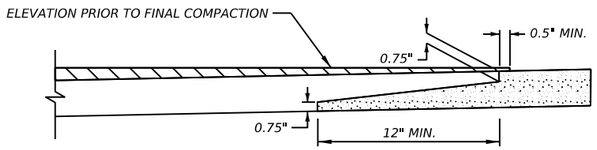
(3) SEE GENERAL NOTES FOR EMBANKMENT MATERIAL REQUIREMENTS.

(4) SUBSTITUTE PG BINDER IS NOT ALLOWED FOR SURFACE COURSE.

(5) PROPOSED PGL SHALL ALIGN WITH CENTERLINE FM 993 AT STA 1604+50 AND TRANSITION TO MATCH THE EXISTING CROWN AT STA 1606+50.00. PROPOSED PGL SHALL BE THE AXIS OF CROSS SLOPE ROTATION.

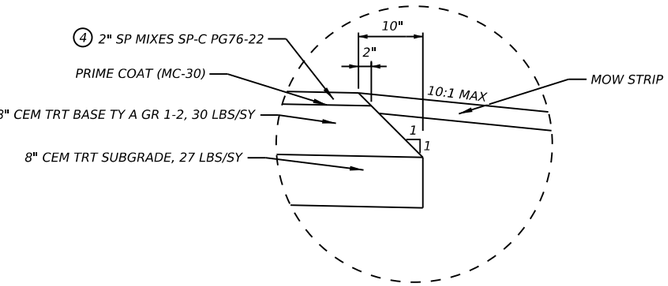


DETAIL A



LONGITUDINAL TAPERED JOINT DETAIL

SEE GENERAL NOTES FOR ADDITIONAL INFORMATION



DETAIL B

NOT TO SCALE

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED
PROFESSIONAL ENGINEER
Adrian Rangel
12/8/2023

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FM 993
AT WEST GREASY CREEK

TYPICAL SECTIONS

SHEET 3 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		6
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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GENERAL NOTES:

General Requirements and Covenants:

An inspection to determine the presence of asbestos was performed on the bridge structure(s) with the following results: No asbestos found.

Lead-based paint found. A copy of the inspection report can be obtained from the Engineer's office. Strip abatement has already been performed and the Contractor shall use this abated area if disturbance of the painted area is required to remove the existing structure.

Contractor questions on this project are to be addressed to the following individuals:

Wendy Starkes, P.E – Area Engineer
Wendy.Starkes@txdot.gov
Oscar Flores, P.E. – Assistant Area Engineer
Oscar.Flores@txdot.gov

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

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

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

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

All roadside signs, mailbox supports, delineators, and object markers located within the project limits shall be plumbed as part of the final cleanup. This work will not be paid for separately but will be considered subsidiary to the various bid items.

ITEM 2 – Instructions to Bidders:

This Project includes A+B bidding. Further information can be found under Item 8 in the General Notes.

ITEM 5 – Control of the Work:

Prior to contract letting, bidders may request a free electronic copy of the files that contain the earthwork information from the District Office in Atlanta. If printed copies of the actual cross-sections in addition to, or instead of, the electronic files are requested, prospective bidders may purchase prints of earthwork cross sections from the District Office in Atlanta.

Place construction points, stakes, and marks at intervals of no more than 100 ft., or as directed. Place stakes and marks so as not to interfere with normal maintenance operations.

It is the Contractor's responsibility to verify the accuracy of any department provided control points prior to use.

When a precast or cast-in-place concrete element is included in the plans, a precast concrete alternate may be submitted in accordance with "Standard Operating Procedure for Alternate Precast Proposal Submission" found online at
https://www.txdot.gov/business/resources/highway/bridge/bridge-publications.html#design

Acceptance or denial of an alternate is at the sole discretion of the Engineer. Impacts to the project schedule and any additional costs resulting from the use of alternates are the sole responsibility of the Contractor.

Contact all utility companies for the exact location of underground utilities before boring, trenching or any other work that might interfere with or damage existing utilities.

Repair any damage caused to utilities by Contractor operations at own expense and restore service in a timely manner.

ITEM 6 - Control of Material:

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

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

The Buy America Material Classification Sheet is located at the 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:

This project is covered by a U.S. Army Corps of Engineers Nationwide 3A permit with no coordination. Obtain a copy of permit and conditions at the Engineer's office.

The total area disturbed for this project is 1.25 acres. The disturbed area in this project, all project locations in the Contract, and the Contractor project specific locations (PSLs) within 1 mile of the project limits will be used to establish the authorization requirements for storm water discharges. The Department will obtain an authorization to discharge storm water from the Texas Commission on Environmental Quality (TCEQ) for the construction activities shown on the plans. The Contractor is to obtain required authorization from the TCEQ for Contractor PSLs for construction support activities on or off the ROW. When the total area disturbed in the Contract and PSLs within 1 mile of the project limits exceeds 5 acres, provide a copy of the Contractor NOI for PSLs on the ROW to the Engineer and to the local government that operates a separate storm sewer system.
The Contractor will not remove active nests from bridges and other structures during nesting season of the birds associated with the nests.

Temporary fills shall be removed in their entirety and the affected areas returned to pre-construction elevations. The affected or impaired areas must be re-vegetated, as appropriate.

RAP material generated may be used for ingress and egress to drives and intersections or construction exits. When removed, stockpile this material separately from other RAP material.

No significant traffic generator events.

If temporary stream crossing is utilized, use temporary barges, timber mats, or other structurally sound and non-eroding material for temporary stream crossing. A temporary crossing will consist of appropriately sized culverts/pipes and 4 to 8-inch nominal size rock. Temporary

stream crossings must not cause more than minimal changes to the hydraulic flow characteristics of the stream crossing in their entirety and return the affected area to their pre-existing elevation. All work and materials used for temporary construction stream or lake crossing will not be paid for directly but are subsidiary to pertinent items.

ITEM 8 – Prosecution and Progress:

Working days will be charged in accordance with Section 8.3.1.1, *"Five-**Day Workweek**"*

Road user cost will be $3,210 per day for substantial completion of the project. 102 Days will be the maximum number of days and 83 will be the minimum number of days that will be accepted as a responsive bid for substantial completion.

Substantial Completion – Bridge Replacement through placement of metal beam guard fence, mow strip, and final striping, and the roadway is opened to traffic.

20 days will be allowed for seeding and cleanup before final acceptance of the project after substantial completion.

Substantially completing the bridge replacement in 102 working days. The incentive for completion is $3,210 per day with a maximum of 19 working days for computing credit.

The total sum for incentive payment is $60,990 or 19 days for early substantial completion of the project.

ITEM 110 - Excavation:

Compact subgrade in earth cut sections, in accordance with section 132.3. 4.2 Density Control.

As cut slopes are constructed, round off the tops of back slopes to blend into the natural ground.

Excavation of existing stabilized materials will be measured and paid for as excavation (roadway).

Remove abandoned underground utility lines encountered. This work will be subsidiary to the pertinent bid items.

Flare ditches to prevent erosion of the toe of slope in areas of transition from cut to fill.

Excavated materials not meeting the requirements for Type C embankment will be considered waste. Dispose of as directed.

ITEM 132 – Embankment:

Embankment (Type C) fill material shall consist of lean clay meeting the material properties stipulated in the Specification Data included at the end of the general notes. New fill shall be benched into existing slope and compacted using density control per Item 132. The fill material placed below the original ground surface associated with benching will not be measured for separate payment.

Furnish material with an organic content less than 1.0%. The Engineer will test using UV-VIS equipment and procedure determined by TxDOT. Allow two weeks for testing.

Compact subgrade in earth cut sections, in accordance with section 132.3. 4.2 Density Control.

Test borrow sources and furnish results to the Engineer.

Where fill height is 5 feet or more above natural ground, the specified density will not be required on the first 2 feet of embankment, unless otherwise directed.

Remove deleterious material, organic matter, and sediment, etc., from all ponds, lakes, sloughs, channels, and existing roadway ditches prior to placement of embankment. This work will be subsidiary to this item.

Drill or dig one or more holes for thickness measurement, refill, and re-compact material at the location and frequency as directed. This work is considered subsidiary to this item.

Beginning with the final lift of embankment, measure the cross slope during pavement structure operations, at the completion of each land, and prior to covering with another course or lift to ensure that the cross slope is uniform and in compliance with the cross slope shown in the plans. Measure the cross slope at a minimum frequency of one measurement every 100 feet. The number of measurements may be reduced by demonstrating consistently acceptable results, with the approval of the Engineer. Furnish a digital measuring device approved by the Engineer for the measurement of cross slope. Make this measuring device available at the jobsite for the Engineer's use. Report the cross slope to the nearest 0.1%. Record all measurements on an approved form signed and dated certifying correct and submit to the Engineer the next working day for documentation. The Engineer will determine the number of verification measurements.

ITEM 160 – Topsoil:

Haul and spread topsoil before placement of the ACP surface course. Re-dress topsoil after placement of the ACP.

Finish slopes with a tracked vehicle running vertically up and down the slope.

Mow tall growing vegetation as directed, to provide optimum growing conditions for temporary or permanent seeded areas in accordance with Item 730 "Roadside Mowing" except for measurement and payment. This work will be subsidiary to pertinent bid items.

Repair topsoil, damaged by causes other than the Contractor's operations, as directed using topsoil, seeding, and fertilizer. This work will be measured and paid for in accordance with the applicable bid items of the contract.

ITEM 164 – Seeding for Erosion Control:

PERMANENT PLANTING MIXTURE
Species and Rates
(lb. PLS/ac.)

(Season: February 1 to May 15)

Green Sprangletop	0.4
Bermudagrass	2.4
Sand Lovegrass	1.0
Lance-Leaf Coreopsis	1.25

(Season: September 1 to November 30)

Bermuda (Unhulled)	12
Crimson Clover	10

TEMPORARY SEEDING FOR EROSION CONTROL
Warm Season
(Season: May 15 to August 31)

Bermudagrass	6
Foxtail Millet	34

Cool Season
(Season: September 1 to November 30)

Tall Fescue	4.5
Oats	24
Wheat	34

Adjust the seeding mixture and rates if directed.

Inoculate crimson clover seed with a legume inoculant. Sow inoculated seed dry, with either hand operated or mechanical equipment, after the fertilizer is placed.

Do not use Bahia grass.

Use crimper immediately after spreading mulch. Apply ballast to machine to achieve an anchoring depth of 2 to 3 inches to form soil-binding mulch and to prevent loss or bunching of the mulch by wind. Anchor the machine to prevent the formation of ridges and ruts. Use coulters at least ten inches in diameter. Traverse slopes horizontally. The number of passes needed, not to exceed three, will be as directed. In areas where an anchoring machine cannot be used, the Department will require a tacking agent be used in the mulch as directed.

Use broadcast seeding for temporary erosion control, when and as directed. This will not be paid for directly but is subsidiary to the various bid items.

Use additional temporary seeding if permanent seeding is placed outside the optimum growing season shown for this item, if directed.

Finish slopes with a tracked vehicle running vertically up and down the slope.

Mow tall growing vegetation as directed, to provide optimum growing conditions for temporary or permanent seeded areas in accordance with Item 730 “Roadside Mowing” except for measurement and payment. This work will be subsidiary to pertinent bid items.

Repair mulch sod, damaged by causes other than the Contractor’s operations, as directed using mulch sod, seeding, and fertilizer. This work will be measured and paid for in accordance with the applicable bid items of the contract.

ITEM 166 - Fertilizer:

When seeding between September 1 and January 1, place one-half of the amount of fertilizer specified for seeding with the seeds and place the remainder the following spring unless otherwise directed. When seeding is placed between January 1 and June 1, place one-half the amount of fertilizer specified for seeding with the seeds and place the remainder 30 days later unless otherwise directed.

Apply fertilizer (13-13-13) at a rate of 300 lbs. /5000 sq. yds.

ITEM 247 – Flexible Base:

Drill or dig one or more holes for thickness measurement, refill, and re-compact material at the location and frequency as directed. This work is considered subsidiary to this item.

Furnish material with an organic content less than 1.0%. The Engineer will test using UV-VIS equipment and procedure determined by TxDOT. Allow two weeks for testing.

The Engineer will test each stockpile. A minimum of 14 days will be required for testing after stockpile has been sampled.

Target grading required.

Do not use iron ore.

Stockpile 10,000 cu. yds. minimum or the estimated volume from the plan quantity.

Place a maximum of 10 layers. Maximum size of stockpile will be 15,000 cu. yds.

Beginning with the final lift of embankment, measure the cross slope during pavement structure operations, at the completion of each land, and prior to covering with another course or lift to ensure that the cross slope is uniform and in compliance with the cross slope shown in the plans. Measure the cross slope at a minimum frequency of one measurement every 100 feet. The number of measurements may be reduced by demonstrating consistently acceptable results, with the approval of the Engineer. Furnish a digital measuring device approved by the Engineer for the measurement of cross slope. Make this measuring device available at the jobsite for the Engineer’s use. Report the cross slope to the nearest 0.1%. Record all measurements on an approved form signed and dated certifying correct and submit to the Engineer the next working day for documentation. The Engineer will determine the number of verification measurements.

Moist cure the layer by sprinkling in accordance with ITEM 204, “Sprinkling” until primed or the next successive course is placed. The Engineer will measure the moisture content in the upper two inches of the layer using Tex-115E Part I, Nuclear Gauge Method. When the moisture content at any location within a land is more than 2 percent points below optimum the Contractor will prime or cover with the next successive course within three days unless approved otherwise.

Furnish clean 5-gallon plastic buckets with lids and wire handles for sampling, transporting, and shipping aggregate and base to the District Lab.

ITEM 275 – Cement Treatment (Road-Mixed):

Furnish material with an organic content less than 1.0%. The Engineer will test using UV-VIS equipment and procedure determined by TxDOT. Allow two weeks for testing.

Apply all cement in an essentially dust free manner as approved.

Rates of application of cement for subgrade shown in the plans are for estimating purposes only. Actual rate of application will be determined during construction for each land by the Engineer. The estimated rate of application is 27 lbs/sy. Pretreat with lime Item 260 when the soil Plasticity Index is greater than 18 %. The application rates will be determined by the Engineer.

When the addition of Item 260 is required, the additional Item will be considered "extra work" in accordance with Article 9.7.

Drill or dig one or more holes for thickness measurement, refill, and re-compact material at the location and frequency as directed. This work is considered subsidiary to this item.

Beginning with the final lift of embankment, measure the cross slope during pavement structure operations, at the completion of each land, and prior to covering with another course or lift to ensure that the cross slope is uniform and in compliance with the cross slope shown in the plans. Measure the cross slope at a minimum frequency of one measurement every 100 feet. The number of measurements may be reduced by demonstrating consistently acceptable results, with the approval of the Engineer. Furnish a digital measuring device approved by the Engineer for the measurement of cross slope. Make this measuring device available at the jobsite for the Engineer's use. Report the cross slope to the nearest 0.1%. Record all measurements on an approved form signed and dated certifying correct and submit to the Engineer the next working day for documentation. The Engineer will determine the number of verification measurements.

Moist cure the layer by sprinkling in accordance with ITEM 204, "Sprinkling" until primed or the next successive course is placed. The Engineer will measure the moisture content in the upper two inches of the layer using Tex-115E Part I, Nuclear Gauge Method. When the moisture content at any location within a land is more than 2 percent points below optimum the Contractor will prime or cover with the next successive course within three days unless approved otherwise.

ITEM 301 – Asphalt Antistripping Agents:

Add hydrated lime to the aggregate by the following method only: mix in an approved pug mill mixer with damp aggregate containing water at least 2% above saturated surface dry conditions.

ITEM 320 – Equipment for Asphalt Concrete Pavement:

Construct longitudinal joints so that the hot side overlaps the cold side by 0.5 inch minimum at the joint.

ITEM 420 – Concrete Substructures:

Chamfer or tool exposed edges or joints of concrete as directed.

Bent concrete will be a plans quantity item.

ITEM 421 – Hydraulic Cement Concrete:

The Department will furnish and maintain concrete compressive strength testing equipment.

ITEM 422 – Concrete Superstructures:

Reference section 440.3.5, "Placing" for the clear cover tolerance for bridge slabs.

Grading to zero tolerance may result in deficient clear cover and subsequent rejection of the work in accordance with section 5.3.2, "Correction of Defective or Unauthorized Work."

ITEM 427 – Surface Finishes for Concrete:

Provide a rub finish for surface area II.

ITEM 432 – Riprap:

Provide ½" expansion joint material with an area equal to the area of contact between the two concrete surfaces. The joint material will be visually inspected for approval.

ITEM 440 – Reinforcement for Concrete:

The following bridge elements require epoxy-coated reinforcement:

Approach Slabs (Both Mats)

Bridge Railing Bridge Slabs (Both Mats)

Reference section 440.3.5, “Placing” for the clear cover tolerance for bridge slabs.

Grading to zero tolerance may result in deficient clear cover and subsequent rejection of the work in accordance with section 5.3.2, “Correction of Defective or Unauthorized Work.”

ITEM 464 – Reinforced Concrete Pipe:

Backfill driveway culverts to obtain a minimum cover of 6 inches. Place backfill in accordance with section 132.3.4.1 “Ordinary Compaction” using approved equipment.

The Engineer will determine flow lines of pipes under private driveways.

ITEM 467 – Safety End Treatments:

Provide precast safety end treatments with a toewall measuring at least 12 inches. Construct toewalls for cast-in-place safety end treatments as shown in the plans.

Remove trees, bushes, and underbrush as directed. This work will be subsidiary to the pertinent bid items.

ITEM 502 – Barricades, Signs, and Traffic Handling:

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 responsible person (CRP) will be responsible for ensuring that the signs and traffic control devices are in place and functioning properly.

The CRP will inspect and ensure any deficiencies are corrected each and every day throughout the duration of this contract. Notify the Engineer in writing of the name, address, and telephone number of this employee or these employees.

Length of lane closures will be as directed based on the demonstrated ability to prosecute the work within the closed section.

Maintenance of driveways and intersections will not be paid for directly but is subsidiary to the pertinent bid items.

Restrict the movement of equipment across traffic lanes to an absolute minimum.

Use strobe lights or rotating beacons on all motorized equipment, operating on or adjacent to the road surface.

ITEM 506 – Temporary Erosion, Sedimentation, and Environmental Controls:

Sprinkle water for dust control. Meet the requirements of Item 204, “Sprinkling” except for measurement and payment. Sprinkling will be considered subsidiary to this Item.

Provide and install additional erosion or water pollution control measures deemed necessary by the Engineer as prescribed by this item and in accordance with the appropriate specification. Payment for erosion control measures for which applicable pay items are not included in the Contract shall be made in accordance with Article 9.7, “Payment for Extra Work and Force Account Method”.

ITEM 530 – Intersections, Driveways, and Turnouts:

Meet the requirements of Item 110, “Excavation” and Item 132, “Embankment, Type “C”, except for measurement and payment, for construction of driveways and turnouts.

Meet the requirements of Item 247, "Flexible Base” Type A, Grade 1-2 except for measurement and payment.

Place HMAC, Type SP-C Grade PG76-22 on driveways and turnouts.

ITEM 540 – Metal Beam Guard Fence:

Furnish round timber posts unless otherwise shown.

Place sufficient dry batch concrete mix in holes to ensure minimum of 2-inch embedment of tubes and posts.

ITEM 544 – Guardrail End Treatments:

Place sufficient dry batch concrete mix in holes to ensure minimum of 2-inch embedment of tubes and posts.

ITEM 552 – Wire Fence:

All wood posts and braces will be treated.

Construct the “Control of Access” fence 1 foot inside the right of way line or as directed.

Place fence wire on the field side of post unless otherwise directed.

ITEM 644 – Small Roadside Sign Assemblies:

Type A signs will be made of flat aluminum.

Existing sign assemblies will be removed after the proposed sign is installed. Contractor will leave existing sign in place while proposed sign goes up. The existing sign will be removed immediately after the proposed sign is installed.

Erect the proposed signs an appropriate distance from adjacent signs in accordance with the Texas MUTCD, as directed and as shown on the plans.

Verify the elevation difference between the edge of the travel lane and bottom of the sign.

Do not remove existing sign assemblies until signs are ready to be installed on new mounts.

Sign assemblies associated with warning signs or stop or yield signs will require Omni - Directional Post Wrap. Retroreflective sheeting wrapped around a warning sign is yellow. Stop or Yield signs will require red sheeting. Retroreflective sheeting wrapped around a sign has a height on the post of at least 12 inches. The bottom of the retroreflective sheeting will be placed two feet below the bottom of the sign. The Engineer will approve the retroreflective sheeting wrap prior to any installation. This work will not be paid for separately; but will be subsidiary to this Item.

Flat aluminum signs removed on the project will remain property of the State. The signs are to be delivered to the nearest Atlanta District Maintenance office yard, coordinate delivery with the Engineer. Mounting hardware and supports will remain property of the contractor to dispose of in accordance with federal, state and local regulations. This work will not be paid for separately but will be subsidiary to this Item.

ITEM 658 – Delineator and Object Marker Assemblies:

Install only round posts meeting the requirements of DMS-4400 or as directed.

ITEM 678 – Pavement Surface Preparation for Markings:

Furnish a high-pressure water blasting system for removing paint, thermoplastic, epoxy, and preformed tape materials from the following surfaces without causing any grooves or trenching of that surface, including asphalt, concrete, friction coarse asphalt, grooved asphalt, and grooved concrete.

Use a high-pressure water blasting system that consist of a vacuum recovery system that must provide for a nearly dry surface eliminating the possibility of uncontained run-off blasting water and debris.

All components required for the complete operation of the water blasting system – Ultra High Pressure (UHP) pump, vacuum system, clean water supply, vacuum recovery storage, blasting components will be mounted and transported on a single, fully self-contained and supporting truck chassis, thereby eliminating the need for any additional water, vacuum, or other transport vehicles.

ITEM 3077 - Superpave Mixtures:

Use field sand with a sand equivalent value of at least 35 when sampled and tested in accordance with Tex-203-F.

The plant is the designated aggregate sampling location, unless otherwise approved by the Engineer.

Construct longitudinal joints in the surface course as shown in the plans. Construct longitudinal joints in all other courses by tapering the bituminous mat as shown in the plans or providing a 6-inch minimum offset from lift to lift. Extend the tapered portion of the mat beyond the normal lane width. Construct the tapered portion of the mat using an approved strike-off device that will provide a uniform slope and will not restrict the main screed. Apply tack coat to the in-place taper before the adjacent mat is placed. Final density requirements for the entire pavement, including the taper area will not change. Compaction of the initial taper section will be required to be as near to final density as possible. Use a small static roller (approximately 200 lbs.) located immediately behind the paver for pre-compaction of the notched wedge joint.

Construct longitudinal joints so that the hot side overlaps the cold side by 0.5 inch minimum at the joint.

Furnish clean 5-gallon plastic buckets with lids and wire handles for sampling, transporting, and shipping aggregate and base to the District Lab.

Beginning with the final lift of embankment, measure the cross slope during pavement structure operations, at the completion of each land, and prior to covering with another course or lift to ensure that the cross slope is uniform and in compliance with the cross slope shown in the plans. Measure the cross slope at a minimum frequency of one measurement every 100 feet. The number of measurements may be reduced by demonstrating consistently acceptable results, with the approval of the Engineer. Furnish a digital measuring device approved by the Engineer for the measurement of cross slope. Make this measuring device available at the jobsite for the Engineer's use. Report the cross slope to the nearest 0.1%. Record all measurements on an approved form signed and dated certifying correct and submit to the Engineer the next working day for documentation. The Engineer will determine the number of verification measurements.

For hot-mix items, in place of typical tack material shown in Table 18 under Item 300, use a tracking resistant asphalt interlayer (TRAIL) material as a tack coat. Approved TRAIL products are found on TxDOT's Material Producer List under Asphalt Interlayer (Tracking Resistant) through http://www.txdot.gov/business/resources/materials.html.

There should be little to no evidence of tracking or pickup of the tack coat on the wheels of the equipment as determined by the Engineer. Use approved release agents or misters on equipment tires as necessary.

ITEM 6001 – Portable Changeable Message Sign:

Portable Changeable Message signs will be used on this contract. The Portable Changeable Message Signs will be used in advance of signal work where changing conditions may warrant the use of message boards. They may also be required at other locations as directed by the Engineer. The Engineer will provide the Contractor with the location and the messages to be displayed for each specific event. The Engineer or his representative will inspect each location once the Contractor has placed the message boards to verify that the placement and message is correct. The Contractor will change the message board location and modify the message being displayed as directed before leaving the location to the satisfaction of the Engineer or his representative. The Portable Changeable Message Signs will be paid for by the day after installed and fully operational. All locations that the Contractor will be called upon to use the Portable Changeable Message Signs will be for a minimum of 10 days. The Engineer will notify the Contractor when the Portable Changeable Message Signs are needed, and the Contractor will have the Portable Changeable Message Signs on location and fully operational in 5 working days. In cases of emergency the Contractor will have the Portable Changeable Message Signs on location and fully operational in 3 working days. Refer to traffic control plan sheets for typical temporary portable changeable message sign layout.

ITEM 6149 – All-Weather Thermoplastic Pavement Markings:

A mobile unit will be required to take reflectivity readings, readings will be taken on all lines in both directions. The mobile reflectivity readings will not be paid for separately but will be subsidiary to this bid item. Strict compliance with report output will be exercised in accordance to this general note. Information for each road must be together in the same file and submitted on a USB thumb drive. Submit a table of contents for each USB thumb drive. Each thumb drive will contain a customer interactive report that generates a color-coded map where the user can verify passing and failing sections of roadway. The color-coded map should match the color-coded graphs generated by the data in the computer. The graphs should have a color-coded portion or shaded area representing failing and passing. The map should be standard Google earth maps or equal. Reports need to be in numerical order by reference number, concurrent with direction, labeled and separated by color, and include the posting date. The format will require prior acceptance by the Engineer.

Use a mobile retroreflectometer that is prequalified at the Texas A&M Transportation Institute test facility. The prequalification is at the contractor's expense.

The required values of wet and dry readings will be strictly measured within this contract as per manufacturer's recommendations.

Adjustments to locations of no passing zones will be determined by the Department.

Install a seal coat RPM cover or any other method approved on any line having Raised Pavement Markers. Remove and dispose of the covers after the stripe is complete.

Placement of markings in proper alignment will be strictly enforced. Irregular lines placed on both sides of the existing markings or pilot line will not be accepted.

ITEM 6185–Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA):

The shadow vehicle with truck mounted attenuator (TMA) will not be optional but will be required as shown on the appropriate traffic control plan sheets.

A total of one (1) shadow vehicle with TMA will be required for work. The contractor will be responsible for determining if one or more of these operations will be ongoing at the same time to determine the total number of TMA's needed for the project.

A total of two (2) shadow vehicles with TMA will be required for Pavement Marking Operations.

SPECIFICATION DATA
TEST TO BE IN ACCORDANCE WITH DEPARTMENT OF TRANSPORTATION TEST METHODS

		GRADING REQUIREMENTS PERCENT RETAINED - SIEVES				SOIL CONSTANTS		
						L.L		P.I.
ITEM	DESCRIPTION	2-1/2"	1-3/4"	No. 4	No. 40	MAX.	MAX.	MIN.
132	Embankment (Type C)					50	25	4

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1511-01-013 **DISTRICT** Atlanta **COUNTY** Upshur
HIGHWAY FM 993

							TOTAL EST.	TOTAL FINAL
			CONTROL SECTION JOB		**1511-01-013**			
			PROJECT ID		**A00135655**			
			COUNTY		**Upshur**			
			HIGHWAY		**FM 993**			
ALT	**BID CODE**	**DESCRIPTION**		**UNIT**	EST.	FINAL		
	104-6009	REMOVING CONC (RIPRAP)		SY	122.000		122.000	
	104-6054	REMOVING CONCRETE(MOW STRIP)		LF	650.000		650.000	
	105-6076	REMOV STAB BASE AND ASPH PAV (2"-15")		SY	2,184.000		2,184.000	
	110-6001	EXCAVATION (ROADWAY)		CY	508.000		508.000	
	132-6006	EMBANKMENT (FINAL)(DENS CONT)(TY C)		CY	1,953.000		1,953.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")		SY	2,832.000		2,832.000	
	164-6054	BOND FBR MTRX SEED (PERM)(RURAL)(SAND)		SY	2,832.000		2,832.000	
	164-6055	BONDED FBR MTRX SEED (TEMP)(WARM)		SY	1,416.000		1,416.000	
	164-6056	BONDED FBR MTRX SEED (TEMP)(COOL)		SY	1,416.000		1,416.000	
	168-6001	VEGETATIVE WATERING		MG	91.000		91.000	
	169-6002	SOIL RETENTION BLANKETS (CL 1) (TY B)		SY	160.000		160.000	
	247-6236	FL BS (RDWY DEL)(TY A GR 1-2)(FNAL POS)		CY	727.000		727.000	
	275-6001	CEMENT		TON	95.000		95.000	
	275-6010	CEMENT TREAT (SUBGRADE) (8")		SY	3,319.000		3,319.000	
	275-6078	CEMENT TREAT (NEW BASE)(DC)(8")		SY	3,267.000		3,267.000	
	310-6009	PRIME COAT (MC-30)		GAL	818.000		818.000	
	400-6005	CEM STABIL BKFL		CY	137.000		137.000	
	416-6002	DRILL SHAFT (24 IN)		LF	275.000		275.000	
	416-6004	DRILL SHAFT (36 IN)		LF	240.000		240.000	
	420-6014	CL C CONC (ABUT)(HPC)		CY	27.800		27.800	
	420-6030	CL C CONC (CAP)(HPC)		CY	22.800		22.800	
	420-6038	CL C CONC (COLUMN)(HPC)		CY	8.500		8.500	
	422-6008	REINF CONC SLAB (SLAB BEAM)(HPC)		SF	4,848.000		4,848.000	
	422-6016	APPROACH SLAB (HPC)		CY	84.400		84.400	
	425-6009	PRESTR CONC SLAB BEAM (4SB12)		LF	414.000		414.000	
	425-6010	PRESTR CONC SLAB BEAM (5SB12)		LF	621.000		621.000	
	432-6006	RIPRAP (CONC)(CL B)		CY	2.400		2.400	
	432-6031	RIPRAP (STONE PROTECTION)(12 IN)		CY	566.000		566.000	
	432-6039	BEDDING MATERIAL (6 IN)		CY	108.000		108.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)		CY	30.000		30.000	
	450-6111	RAIL (TY SSTR) (W/DRAIN SLOT) (HPC)		LF	234.000		234.000	
	454-6003	ARMOR JOINT		LF	88.000		88.000	
	454-6004	ARMOR JOINT (SEALED)		LF	85.000		85.000	
	464-6003	RC PIPE (CL III)(18 IN)		LF	28.000		28.000	
	467-6363	SET (TY II) (18 IN) (RCP) (6: 1) (P)		EA	2.000		2.000	
	496-6009	REMOV STR (BRIDGE 0 - 99 FT LENGTH)		EA	1.000		1.000	
	496-6016	REMOV STR (PIPE)		EA	1.000		1.000	

Estimate & Quantity Sheet

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HIGHWAY FM 993

						TOTAL EST.	TOTAL FINAL
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		PROJECT ID		**A00135655**			
		COUNTY		**Upshur**			
		HIGHWAY		**FM 993**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	496-6043	REMOV STR (SMALL FENCE)	LF	858.000		858.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	6.000		6.000	
	506-6002	ROCK FILTER DAMS (INSTALL) (TY 2)	LF	100.000		100.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	15.000		15.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	115.000		115.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	160.000		160.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	160.000		160.000	
	506-6038	TEMP SEDMT CONT FENCE (INSTALL)	LF	1,608.000		1,608.000	
	506-6039	TEMP SEDMT CONT FENCE (REMOVE)	LF	1,608.000		1,608.000	
	506-6042	BIODEG EROSN CONT LOGS (INSTL) (18")	LF	355.000		355.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	355.000		355.000	
	530-6005	DRIVEWAYS (ACP)	SY	119.000		119.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	287.500		287.500	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	542-6001	REMOVE METAL BEAM GUARD FENCE	LF	400.000		400.000	
	542-6005	RM MTL BM GD FEN TRANS (T101)	EA	4.000		4.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	4.000		4.000	
	544-6003	GUARDRAIL END TREATMENT (REMOVE)	EA	4.000		4.000	
	552-6003	WIRE FENCE (TY C)	LF	760.000		760.000	
	552-6005	GATE (TY 1)	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	1.000		1.000	
	644-6060	IN SM RD SN SUP&AM TYTWT(1)WS(P)	EA	2.000		2.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	1.000		1.000	
	658-6014	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	EA	4.000		4.000	
	658-6016	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	EA	7.000		7.000	
	662-6109	WK ZN PAV MRK SHT TERM (TAB)TY W	EA	100.000		100.000	
	662-6111	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	EA	100.000		100.000	
	666-6225	PAVEMENT SEALER 6"	LF	608.000		608.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	22.000		22.000	
	678-6002	PAV SURF PREP FOR MRK (6")	LF	608.000		608.000	
	678-6033	PAV SURF PREP FOR MRK (RPM)	EA	4.000		4.000	
	3077-6032	SP MIXES SP-C PG76-22	TON	352.000		352.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	2.000		2.000	
	6149-6004	REFL PAV MRK AWT (W) 6" (SLD) (100MIL)	LF	1,720.000		1,720.000	
	6149-6010	REFL PAV MRK AWT (Y) 6" (SLD) (100MIL)	LF	1,720.000		1,720.000	
	6185-6002	TMA (STATIONARY)	DAY	5.000		5.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1511-01-013 **DISTRICT** Atlanta **COUNTY** Upshur
HIGHWAY FM 993

		CONTROL SECTION JOB		**1511-01-013**		TOTAL EST.	TOTAL FINAL
		PROJECT ID		**A00135655**			
		COUNTY		**Upshur**			
		HIGHWAY		**FM 993**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	6185-6003	TMA (MOBILE OPERATION)	HR	60.000		60.000	
	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 REMOVAL ITEMS

ITEM NO.		104	104	105	496	496	496	542	542	544	644
DESCRIPTION CODE		6009	6054	6076	6009	6016	6043	6001	6005	6003	6076
SHEET NO.	LOCATION	REMOVING CONC (RIPRAP)	REMOVING CONCRETE(MOW STRIP)	REMOVING STAB BASE & ASPH PAV (2"-15")	REMOV STR (BRIDGE 0 - 99 FT LENGTH)	REMOV STR (PIPE)	REMOV STR (SMALL FENCE)	REMOVE METAL BEAM GUARD FENCE	RM MTL BM GD FEN TRANS (T101)	GUARDRAIL END TREATMENT (REMOVE)	REMOVE SM RD SN SUP&AM
		SY	LF	SY	EA	EA	LF	LF	EA	EA	EA
SHEET 1 OF 1	BEGIN TO END	122	650	2184	1	1	858	400	4	4	1
PROJECT TOTALS		122	650	2184	1	1	858	400	4	4	1

SUMMARY OF ROADWAY ITEMS

ITEM NO.		110	132	247	275	275	275	275	310	432	464	467	530	540	540	544	552	552	3077
DESCRIPTION CODE		6001	6006	6236	6001	6001	6010	6078	6009	6045	6003	6363	6005	6001	6006	6001	6003	6005	6032
SHEET NO.	LOCATION	EXCAVATION (ROADWAY)	EMBANKMENT (FINAL)(DENS CONT)(TY C)	FL BS (RWDY DEL) (TY A GR 1-2) (FNAL POS)	CEMENT	CEMENT	CEMENT TREAT (SUBGRADE) (8")	CEMENT TREAT (NEW BASE) (DC)(8")	PRIME COAT (MC-30)	RIPRAP (MOW STRIP)(4 IN)	RC PIPE (CL III)(18 IN)	SET (TY II) (18 IN) (RCP) (6:1) (P)	DRIVEWAYS (ACP)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	GUARDRAIL END TREATMENT (INSTALL)	WIRE FENCE (TY C) ②	GATE (TY 1)	SP MIXES SP-C PG76-22
					SUBGRADE	NEW BASE													110 LBS/SY/IN
					27 LBS/SY	30 LBS/SY			0.25 GAL/SY										2"
		CY	CY	CY	TON	TON	SY	SY	GAL	CY	LF	EA	SY	LF	EA	EA	LF	EA	TON
SHEET 1 OF 2	BEGIN TO 1602+00.00	468	926	271	17	19	1236	1217	305	16				125	4	2	489		131
SHEET 2 OF 2	1602+00.00 TO END	40	1027	456	28	31	2083	2050	513	14	28	2	119	162.5		2	271	1	221
PROJECT TOTALS		508	1953	727	45	50	3319	3267	818	30	28	2	119	287.5	4	4	760	1	352

② TEMPORARY FENCE CONSTRUCTION SHALL BE SUBSIDIARY TO ITEM 552.

SUMMARY OF WORKZONE TRAFFIC CONTROL ITEMS

ITEM NO.		662	662	6001	6185	6185
DESCRIPTION CODE		6109	6111	6002	6002	6003
SHEET NO.	LOCATION	WK ZN PAV MRK SHT TERM (TAB)TY W	WK ZN PAV MRK SHT TERM (TAB)TY Y-2	PORTABLE CHANGEABLE MESSAGE SIGN	TMA (STATIONARY)	TMA (MOBILE OPERATION) ①
		EA	EA	EA	DAY	HR
SHEET 1 OF 1	BEGIN TO END	100	100	2	5	60
PROJECT TOTALS		100	100	2	5	60

① TWO (2) SHADOW VEHICLES WITH TMA WILL BE REQUIRED FOR PAVEMENT MARKING OPERATIONS PER STANDARD DRAWING TCP(3-1)-13 AND TCP (3-3)-14

SUMMARY OF SIGNING AND PAVEMENT MARKING ITEMS

ITEM NO.		644	644	658	658	666	672	678	678	6149	6149
DESCRIPTION CODE		6001	6060	6014	6016	6225	6009	6002	6033	6004	6010
SHEET NO.	LOCATION	IN SM RD SN SUP&AM TY10BWG (1) SA (P)	IN SM RD SN SUP&AM TYTWT (1)WS (P)	INSTL DEL ASSM (D-SW)SZ (BRF)CTB (BI)	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	PAVEMENT SEALER 6"	REFL PAV MRKR TY II-A-A	PAV SURF PREP FOR MRK (6")	PAV SURF PREP FOR MRK (RPM)	REFL PAV MRK AWT (W) 6" (SLD) (100MIL)	REFL PAV MRK AWT (Y) 6" (SLD) (100MIL)
		EA	EA	EA	EA	LF	EA	LF	EA	LF	LF
SHEET 1 OF 2	BEGIN TO 1602+00.00		1	4	3	608	10	608	4	820	820
SHEET 2 OF 2	1602+00.00 TO END	1	1		4		12			900	900
PROJECT TOTALS		1	2	4	7	608	22	608	4	1720	1720

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FM 993
AT WEST GREASY CREEK

SUMMARY OF QUANTITIES

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		9
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

SUMMARY OF EROSION CONTROL ITEMS																	
ITEM NO.		160	164	164	164	166	168	169	506	506	506	506	506	506	506	506	506
DESCRIPTION CODE		6003	6054	6055	6056		6001	6002	6002	6003	6011	6020	6024	6038	6039	6042	6043
SHEET NO.	LOCATION	FURNISHING AND PLACING TOPSOIL (4")	BOND FBR MTRX SEED (PERM)(RURAL) SAND)	BONDED FBR MTRX SEED (TEMP)(WARM)	BONDED FBR MTRX SEED (TEMP)(COOL)	FERTILIZER ③	VEGETATIVE WATERING	SOIL RETENTION BLANKETS (CL 1) (TY B)	ROCK FILTER DAMS (INSTALL) (TY 2)	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY1)	CONSTRUCTION EXITS (REMOVE)	TEMP SEDMT CONT FENCE (INSTALL)	TEMP SEDMT CONT FENCE (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (18")	BIODEG EROSN CONT LOGS (REMOVE)
						300 LBS/5000 SY	80 MG/5000 SY										
		SY	SY	SY	SY	TON	MG	SY	LF	LF	LF	SY	SY	LF	LF	LF	LF
SHEET 1 OF 2	BEGIN TO 1602+00.00	1260	1260	630	630	1	40	86	100	15	115	80	80	731	731	230	230
SHEET 2 OF 2	1602+00.00 TO END	1572	1572	786	786	1	51	74				80	80	877	877	125	125
PROJECT TOTALS		2832	2832	1416	1416	2	91	160	100	15	115	160	160	1608	1608	355	355

③ FOR CONTRACTOR INFORMATION ONLY, SUBSIDIARY TO ITEM 164

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FM 993
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SUMMARY OF QUANTITIES

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		10
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

SUMMARY OF SMALL SIGNS

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

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	MOUNTING DESIGNATION 1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
FM 993												
1 OF 2	1	W8-13aT		36"x36"	X		TWT	1	WS	P		
2 OF 2	2	W1-4L		36"x36"	X		10 BWG	1	SA	P		
		W13-1P		24"x24"								
2 OF 2	3	W8-13aT		36"x36"	X		TWT	1	WS	P		

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

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

http://www.txdot.gov/

NOTE:

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

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Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE: sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
4-16	DIST	COUNTY		SHEET NO.
8-16	ATL	UPSHUR		11

18

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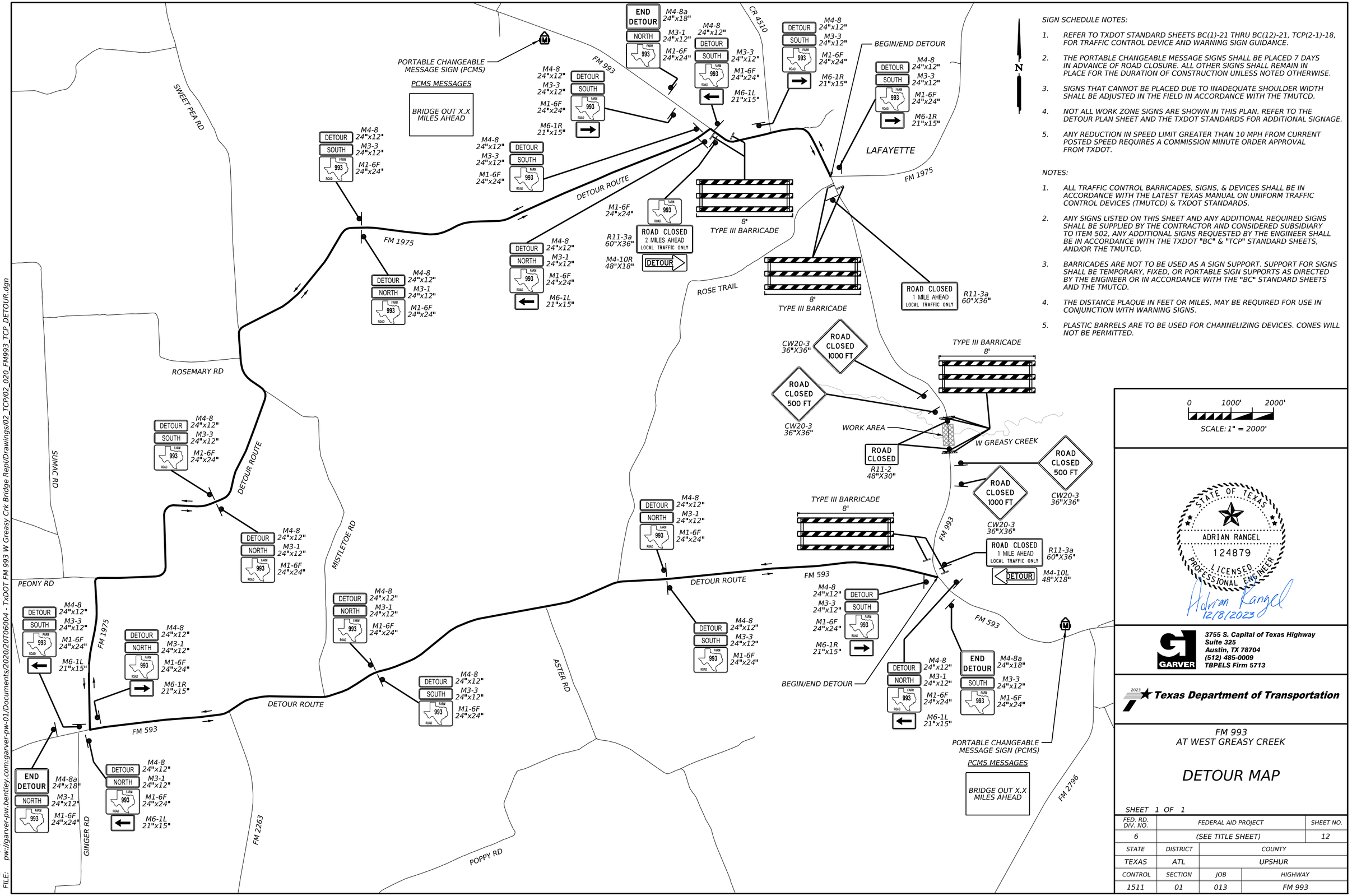

SIGN SCHEDULE NOTES:

1. *REFER TO TXDOT STANDARD SHEETS BC(1)-21 THRU BC(12)-21, TCP(2-1)-18, FOR TRAFFIC CONTROL DEVICE AND WARNING SIGN GUIDANCE.*
2. *THE PORTABLE CHANGEABLE MESSAGE SIGNS SHALL BE PLACED 7 DAYS IN ADVANCE OF ROAD CLOSURE. ALL OTHER SIGNS SHALL REMAIN IN PLACE FOR THE DURATION OF CONSTRUCTION UNLESS NOTED OTHERWISE.*
3. *SIGNS THAT CANNOT BE PLACED DUE TO INADEQUATE SHOULDER WIDTH SHALL BE ADJUSTED IN THE FIELD IN ACCORDANCE WITH THE TMUTCD.*
4. *NOT ALL WORK ZONE SIGNS ARE SHOWN IN THIS PLAN. REFER TO THE DETOUR PLAN SHEET AND THE TXDOT STANDARDS FOR ADDITIONAL SIGNAGE.*
5. *ANY REDUCTION IN SPEED LIMIT GREATER THAN 10 MPH FROM CURRENT POSTED SPEED REQUIRES A COMMISSION MINUTE ORDER APPROVAL FROM TXDOT.*

NOTES:

1. *ALL TRAFFIC CONTROL BARRICADES, SIGNS, & DEVICES SHALL BE IN ACCORDANCE WITH THE LATEST TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD) & TXDOT STANDARDS.*
2. *ANY SIGNS LISTED ON THIS SHEET AND ANY ADDITIONAL REQUIRED SIGNS SHALL BE SUPPLIED BY THE CONTRACTOR AND CONSIDERED SUBSIDIARY TO ITEM 502, ANY ADDITIONAL SIGNS REQUESTED BY THE ENGINEER SHALL BE IN ACCORDANCE WITH THE TXDOT "BC" & "TCP" STANDARD SHEETS, AND/OR THE TMUTCD.*
3. *BARRICADES ARE NOT TO BE USED AS A SIGN SUPPORT. SUPPORT FOR SIGNS SHALL BE TEMPORARY, FIXED, OR PORTABLE SIGN SUPPORTS AS DIRECTED BY THE ENGINEER OR IN ACCORDANCE WITH THE "BC" STANDARD SHEETS AND THE TMUTCD.*
4. *THE DISTANCE PLAQUE IN FEET OR MILES, MAY BE REQUIRED FOR USE IN CONJUNCTION WITH WARNING SIGNS.*
5. *PLASTIC BARRELS ARE TO BE USED FOR CHANNELIZING DEVICES. CONES WILL NOT BE PERMITTED.*

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FM 993
AT WEST GREASY CREEK

DETOUR MAP

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		12
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

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

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

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

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

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

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

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

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

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

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

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

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

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

WORKER SAFETY NOTES:

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

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

COMPLIANT WORKZONE TRAFFIC CONTROL DEVICES

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS

BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		13

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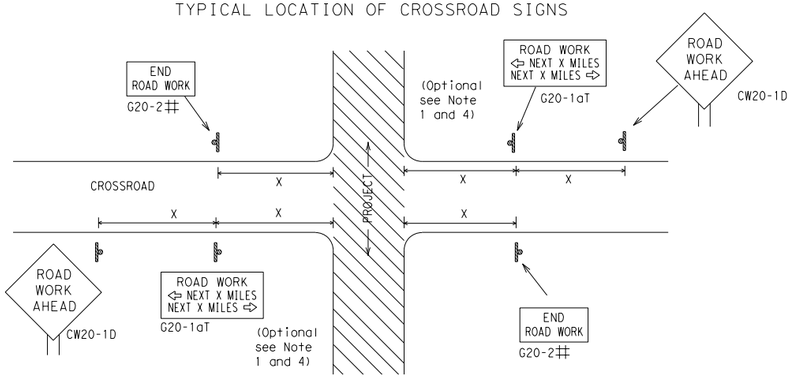
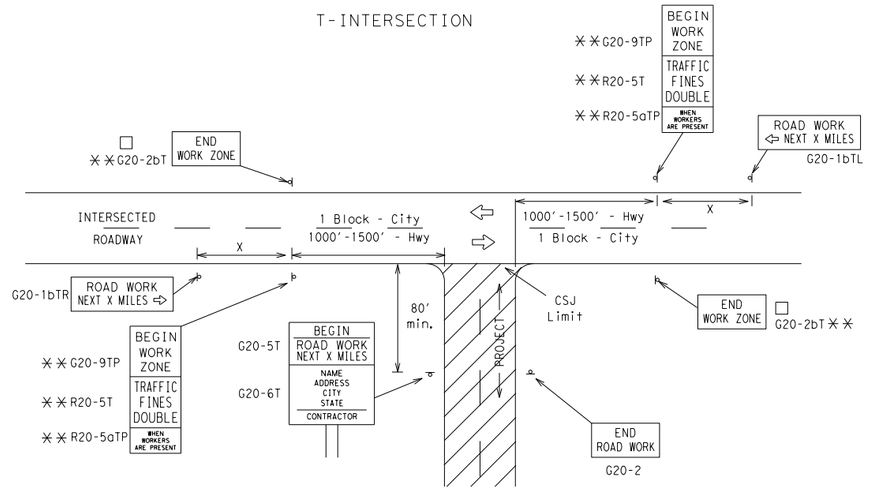
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

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

SIZE

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

SPACING

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

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

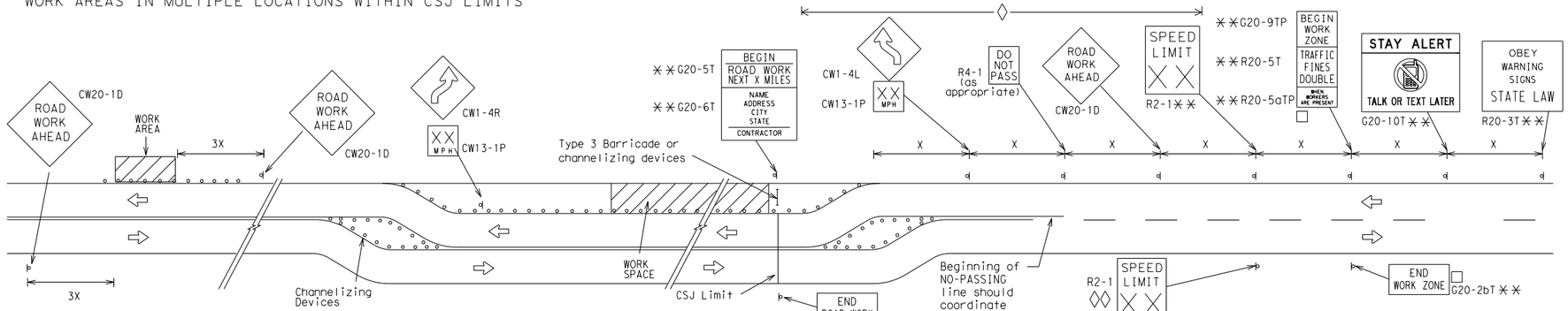
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

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

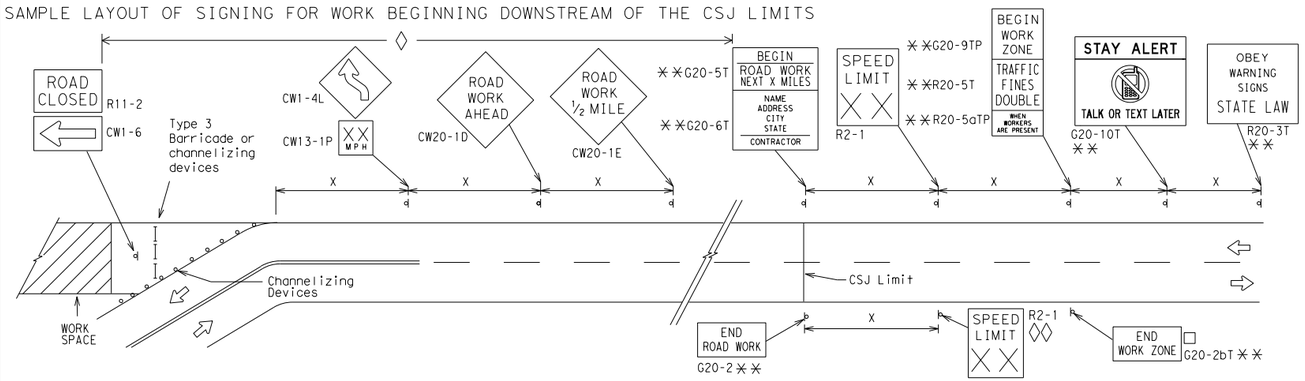
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



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

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



NOTES

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

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

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

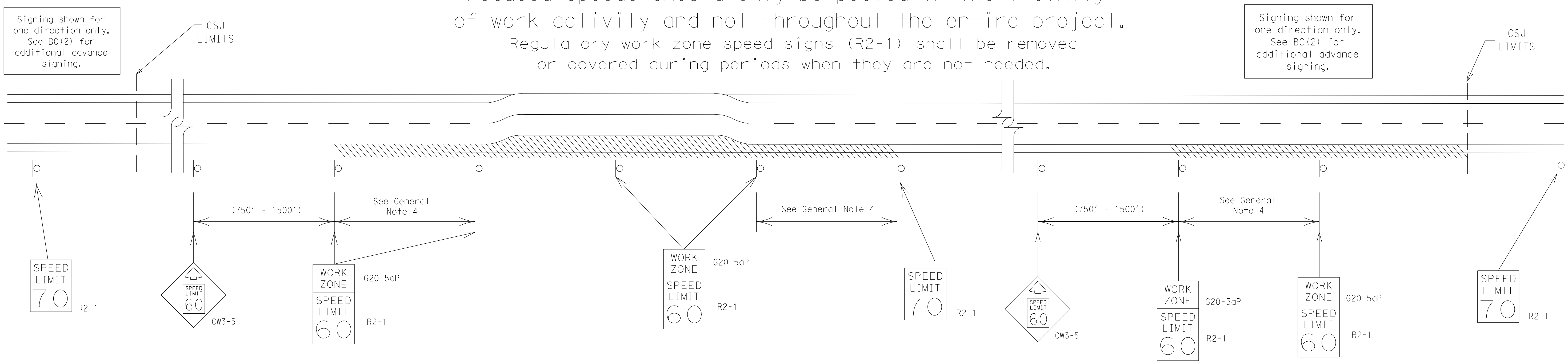
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	UPSHUR		14

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

FILE: bc-21.dgn		DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT		
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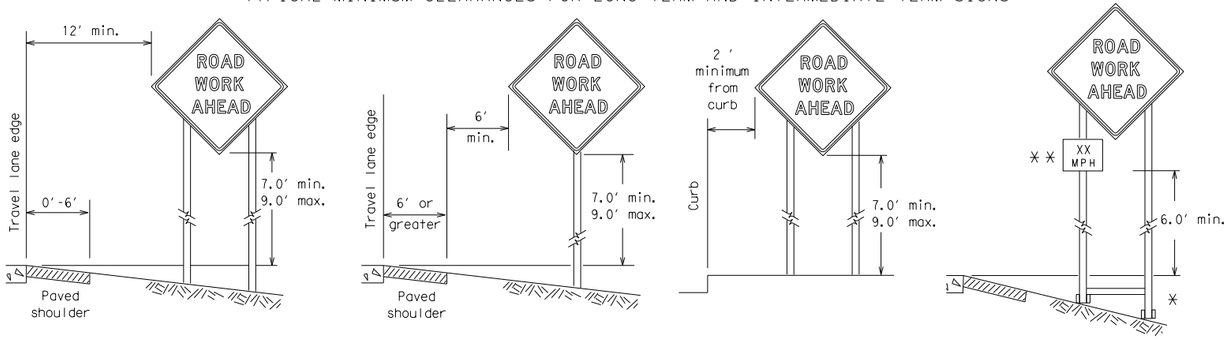
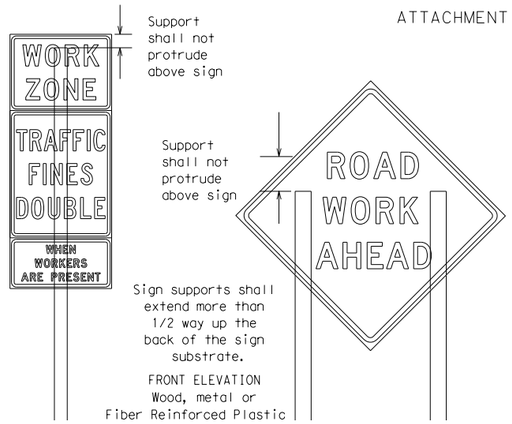
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

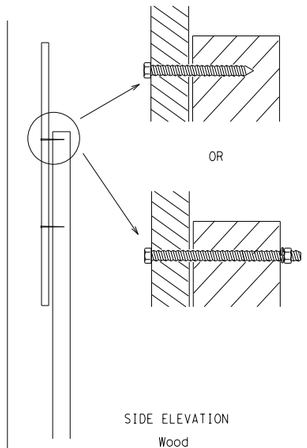


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





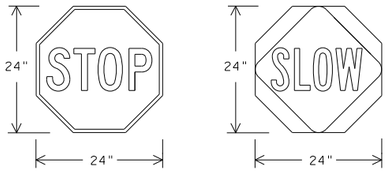
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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7-13 5-21	ATL	UPSHUR		16

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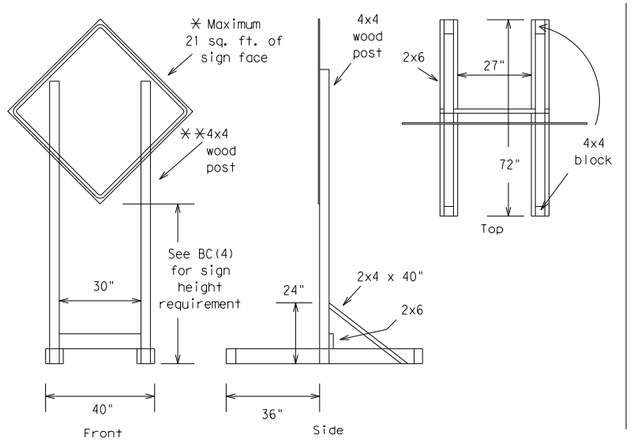
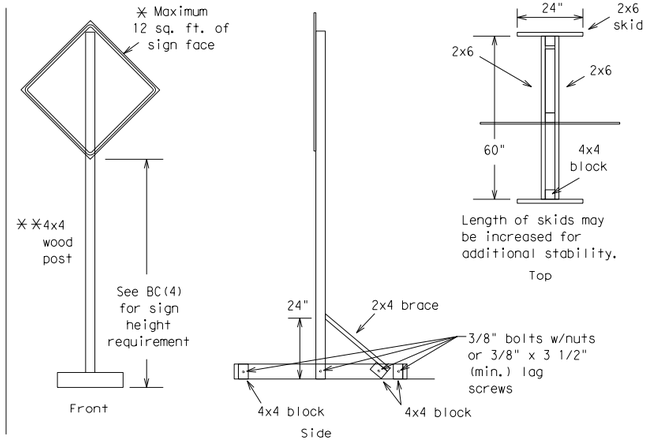
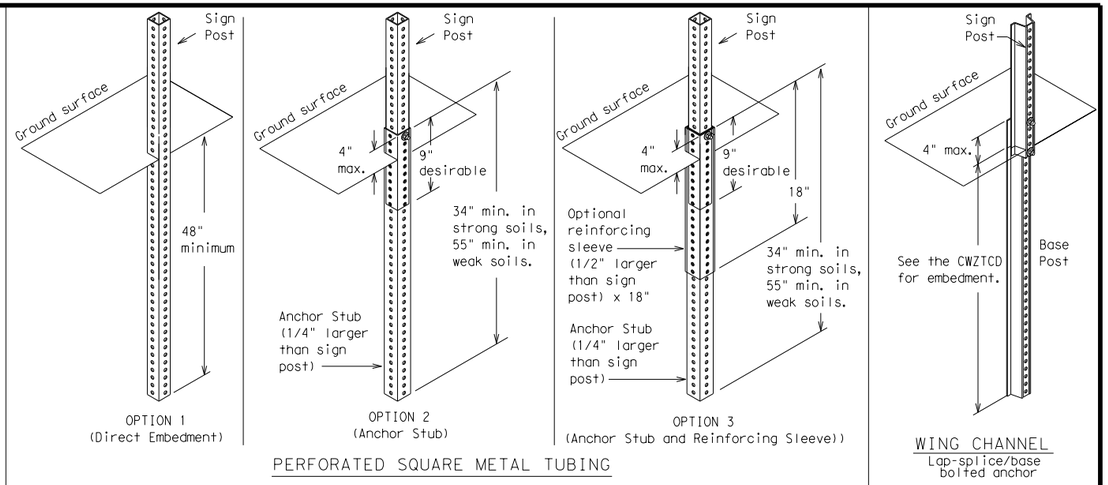




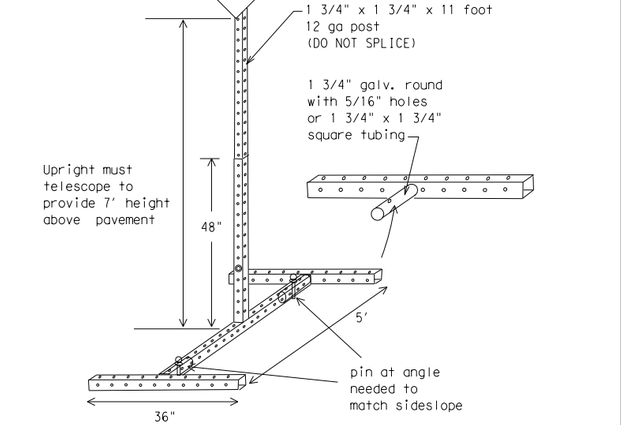
SKID MOUNTED WOOD SIGN SUPPORTS

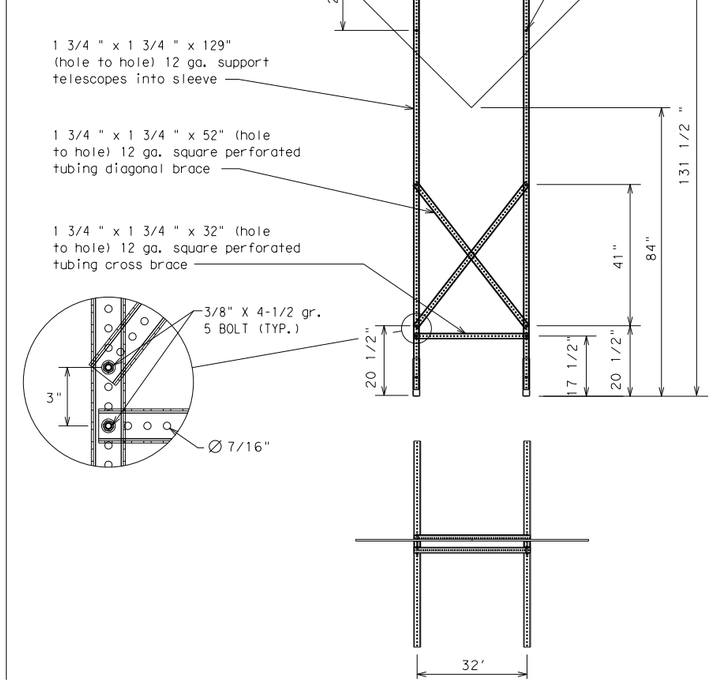
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

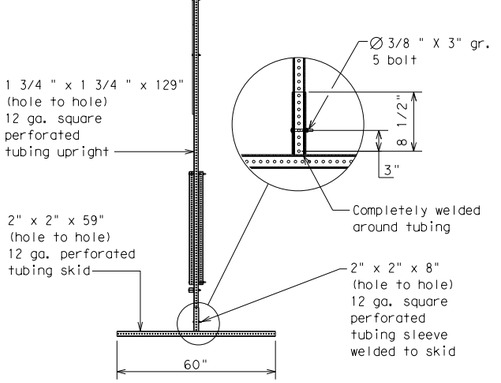


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	UPSHUR		17

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE	FRONTAGE ROAD CLOSED	ROADWORK XXX FT	ROAD REPAIRS XXXX FT
ROAD CLOSED AT SH XXX	SHOULDER CLOSED XXX FT	FLAGGER XXXX FT	LANE NARROWS XXXX FT
ROAD CLSD AT FM XXXX	RIGHT LN CLOSED XXX FT	RIGHT LN NARROWS XXXX FT	TWO-WAY TRAFFIC XX MILE
RIGHT X LANES CLOSED	RIGHT X LANES OPEN	MERGING TRAFFIC XXXX FT	CONST TRAFFIC XXX FT
CENTER LANE CLOSED	DAYTIME LANE CLOSURES	LOOSE GRAVEL XXXX FT	UNEVEN LANES XXXX FT
NIGHT LANE CLOSURES	I-XX SOUTH EXIT CLOSED	DETOUR X MILE	ROUGH ROAD XXXX FT
VARIOUS LANES CLOSED	EXIT XXX CLOSED X MILE	ROADWORK PAST SH XXXX	ROADWORK NEXT FRI-SUN
EXIT CLOSED	RIGHT LN TO BE CLOSED	BUMP XXXX FT	US XXX EXIT X MILES
MALL DRIVEWAY CLOSED	X LANES CLOSED TUE - FRI	TRAFFIC SIGNAL XXXX FT	LANES SHIFT *
XXXXXXXX BLVD CLOSED			

* 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		Location List	Warning List	** Advance Notice List
MERGE RIGHT	FORM X LINES RIGHT	AT FM XXXX	SPEED LIMIT XX MPH	TUE-FRI XX AM- X PM
DETOUR NEXT X EXITS	USE XXXXX RD EXIT	BEFORE RAILROAD CROSSING	MAXIMUM SPEED XX MPH	APR XX-XX X PM-X AM
USE EXIT XXX	USE EXIT I-XX NORTH	NEXT X MILES	MINIMUM SPEED XX MPH	BEGINS MONDAY
STAY ON US XXX SOUTH	USE I-XX E TO I-XX N	PAST US XXX EXIT	ADVISORY SPEED XX MPH	BEGINS MAY XX
TRUCKS USE US XXX N	WATCH FOR TRUCKS	XXXXXXX TO XXXXXXX	RIGHT LANE EXIT	MAY X-X XX PM - XX AM
WATCH FOR TRUCKS	EXPECT DELAYS	US XXX TO FM XXXX	USE CAUTION	NEXT FRI-SUN
EXPECT DELAYS	PREPARE TO STOP		DRIVE SAFELY	XX AM TO XX PM
REDUCE SPEED XXX FT	END SHOULDER USE		DRIVE WITH CARE	NEXT TUE AUG XX
USE OTHER ROUTES	WATCH FOR WORKERS			TONIGHT XX PM- XX AM
STAY IN LANE *				

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

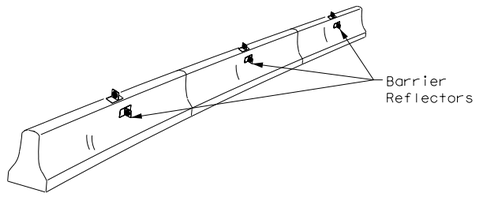
BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	UPSHUR		18

100

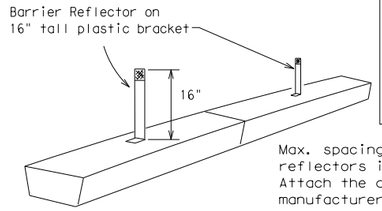
DATE: 12/7/2023 3:05:38 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/02_TCP/STANDARDS/02_01_bc-(7-12)-21.dgn

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



CONCRETE TRAFFIC BARRIER (CTB)

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

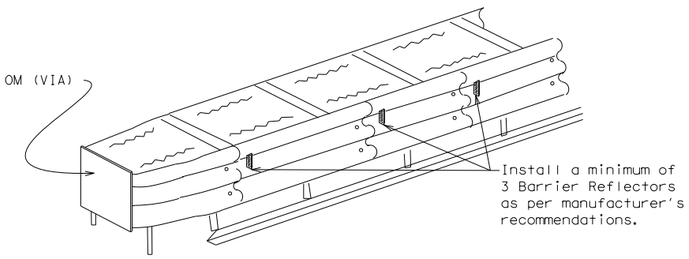


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

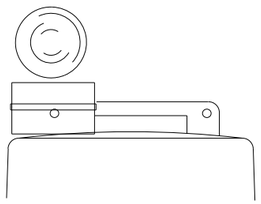


DELINEATION OF END TREATMENTS

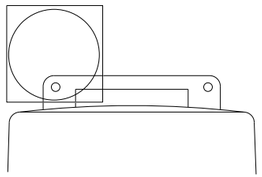
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

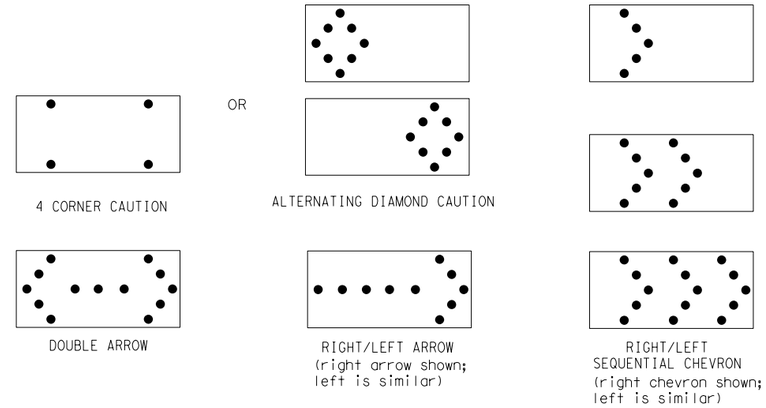
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



4 CORNER CAUTION

ALTERNATING DIAMOND CAUTION

DOUBLE ARROW

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

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

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

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

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation — Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	UPSHUR		19

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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:

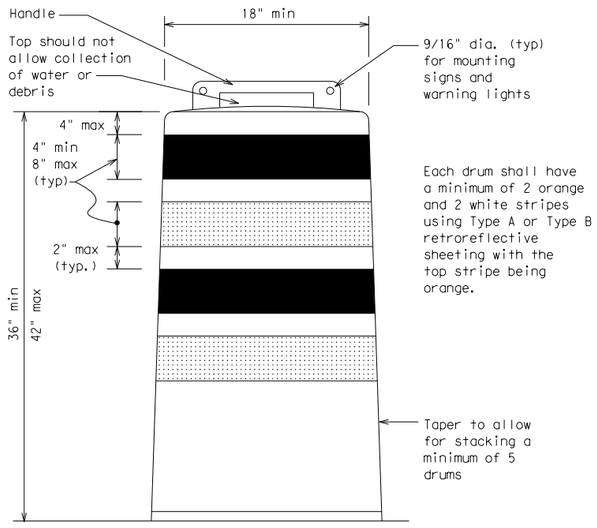
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

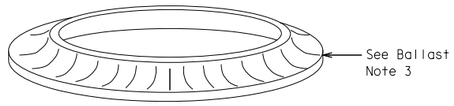
RETROREFLECTIVE SHEETING

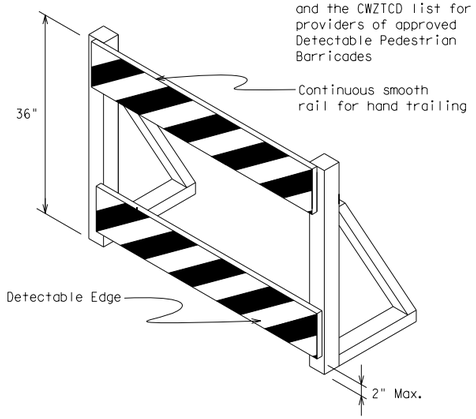
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

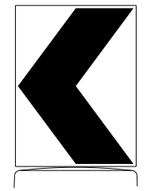




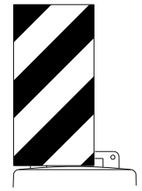


DETECTABLE PEDESTRIAN BARRICADES

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	ATL	UPSHUR		20
7-13				

102

DATE: 12/7/2023 3:05:39 PM
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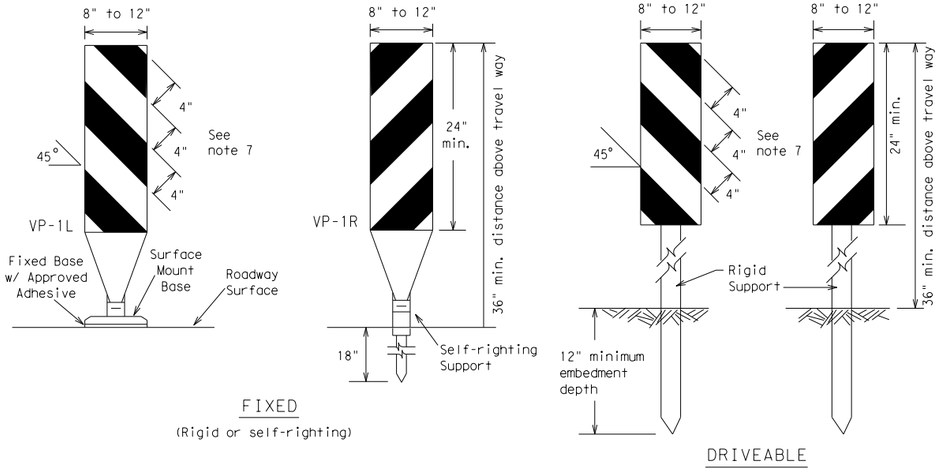
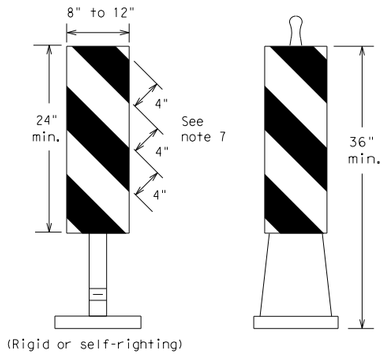


FIXED

(Rigid or self-righting)

DRIVEABLE

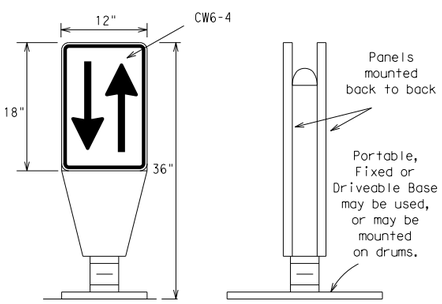


(Rigid or self-righting)

PORTABLE

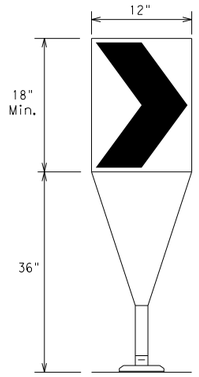
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



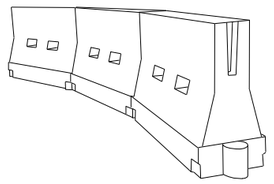
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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

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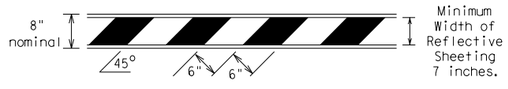
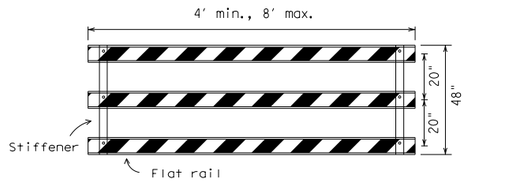
TYPE 3 BARRICADES

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

Barricades shall NOT be used as a sign support.



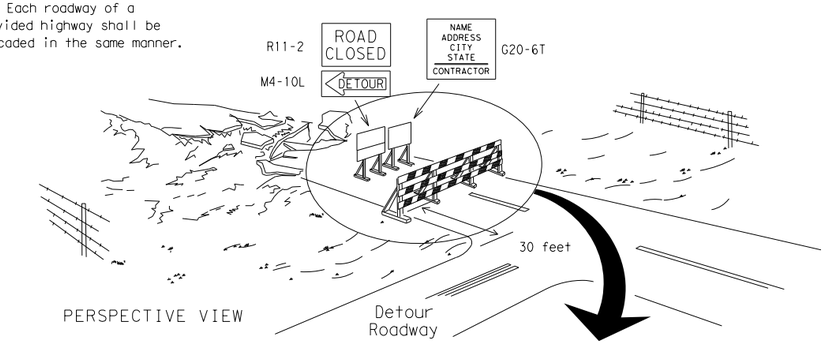
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

TYPICAL PANEL DETAIL
FOR SKID OR POST TYPE BARRICADES

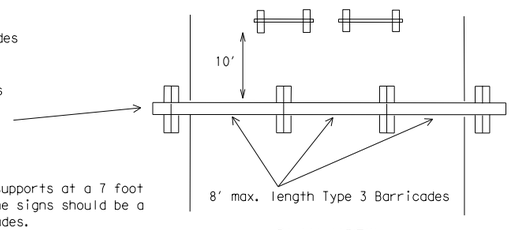
Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic.

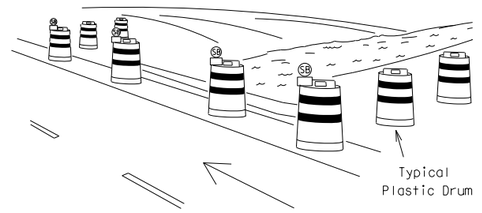
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

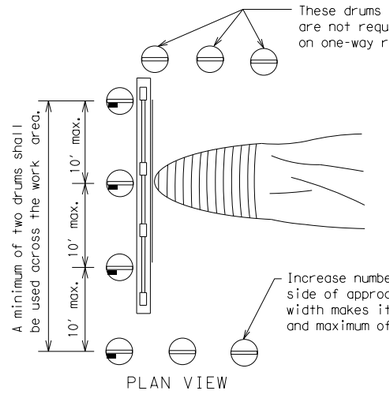
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

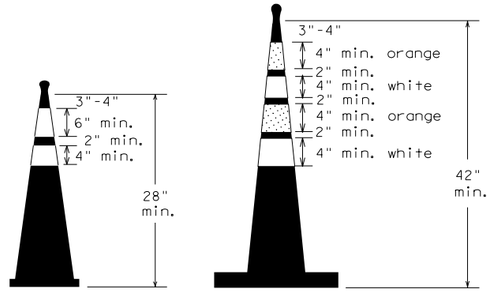
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



PLAN VIEW

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

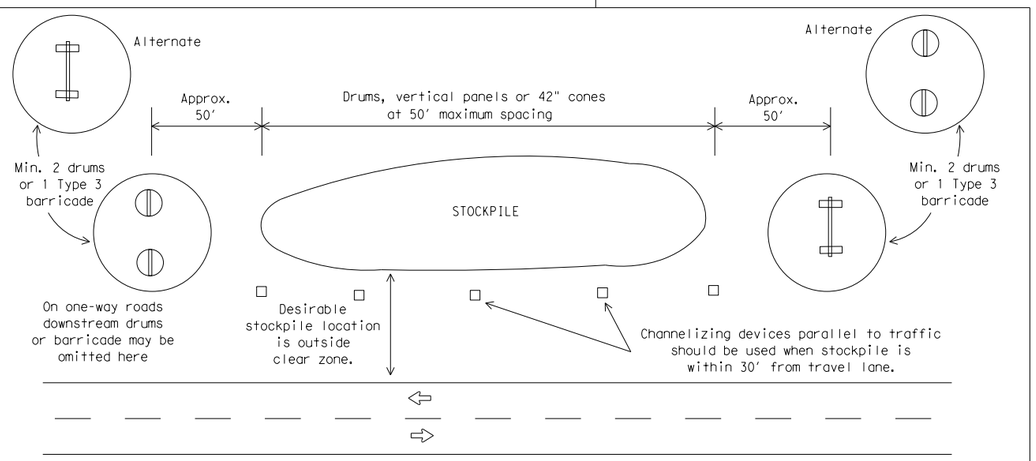
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	ATL	UPSHUR		22

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

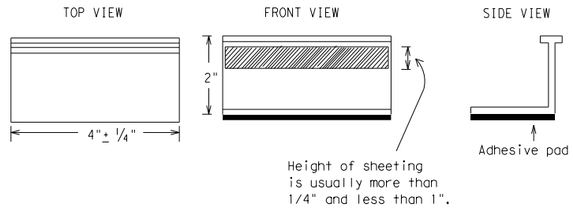
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		23

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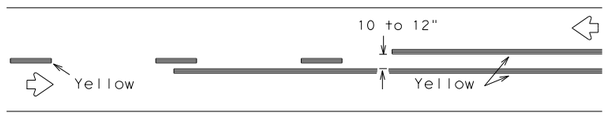
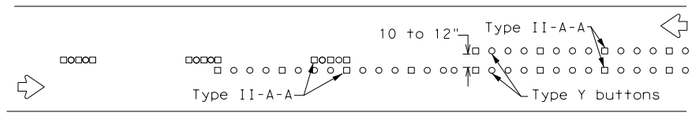
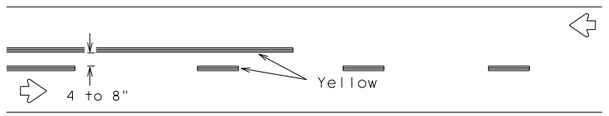
PAVEMENT MARKING PATTERNS



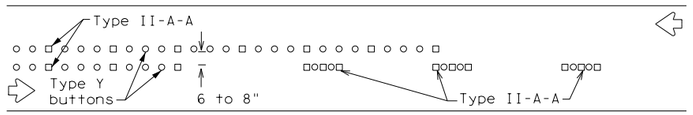
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



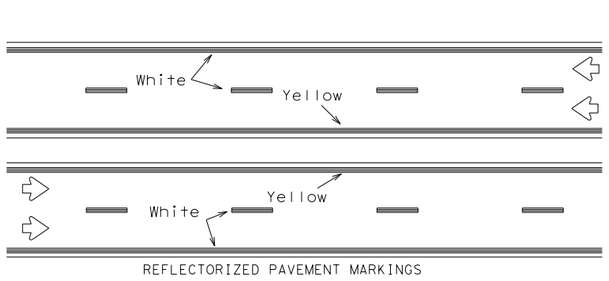
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



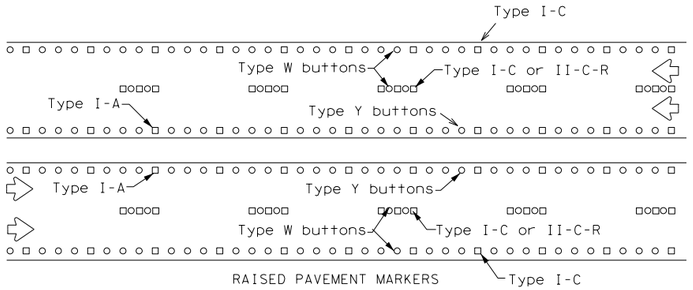
RAISED PAVEMENT MARKERS - PATTERN B

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

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



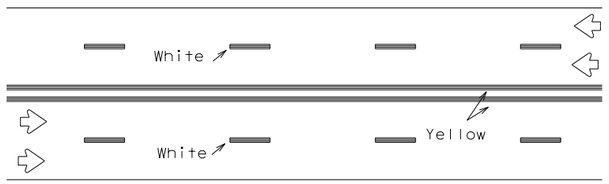
REFLECTORIZED PAVEMENT MARKINGS



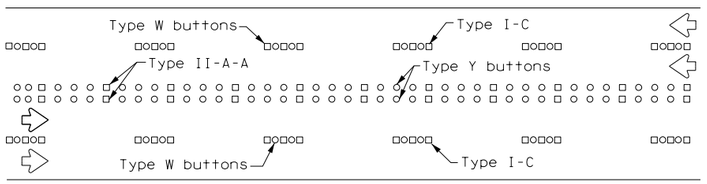
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



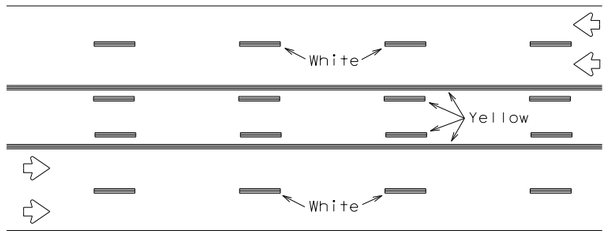
REFLECTORIZED PAVEMENT MARKINGS



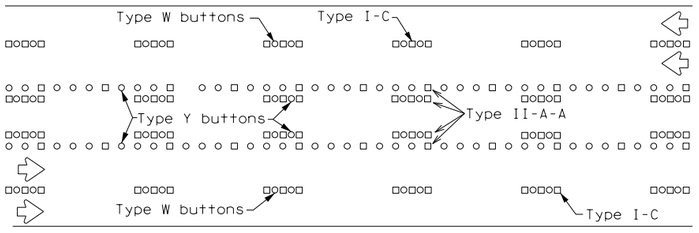
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

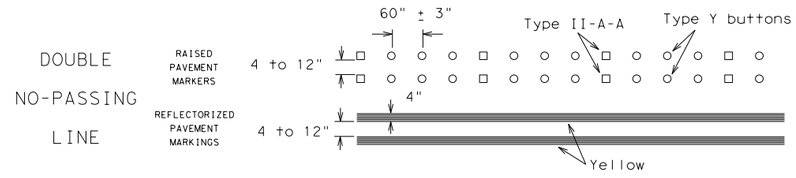
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

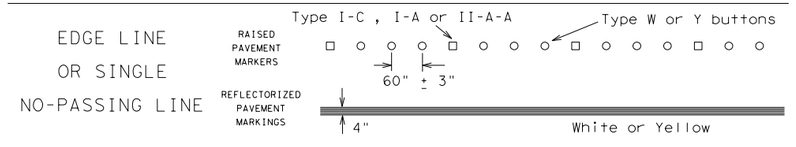
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

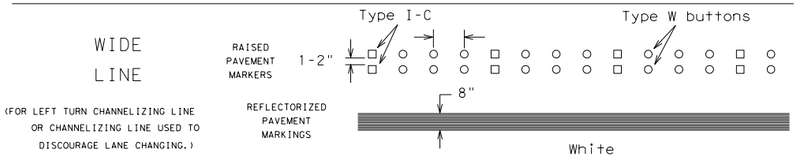


EDGE LINE OR SINGLE NO-PASSING LINE



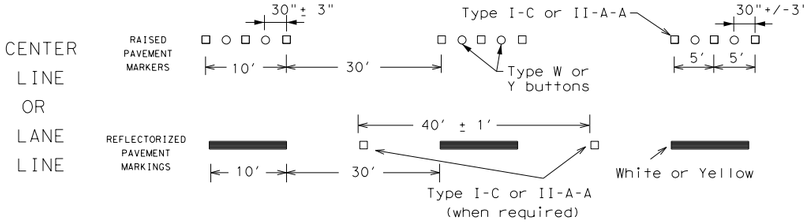
WIDE LINE

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

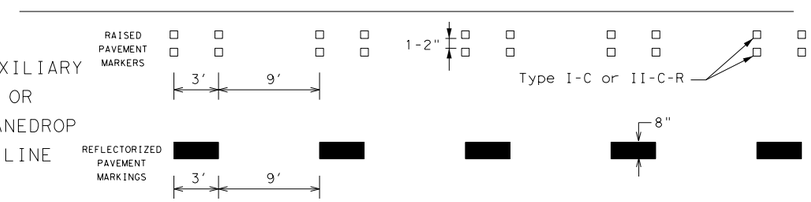


BROKEN LINES

CENTER LINE OR LANE LINE

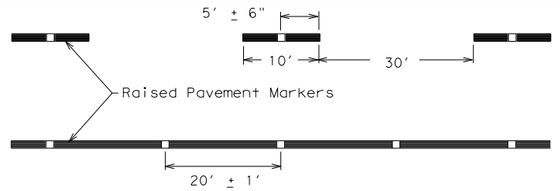


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

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



Centerline only - not to be used on edge lines

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		24

106

DATE: 12/7/2023 3:05:53 PM
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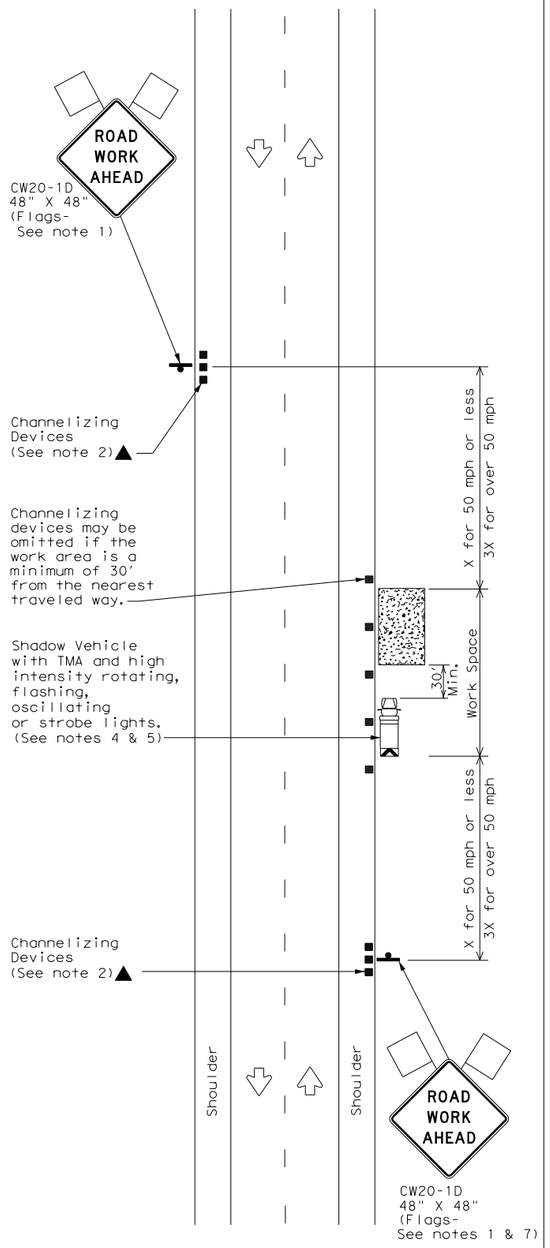
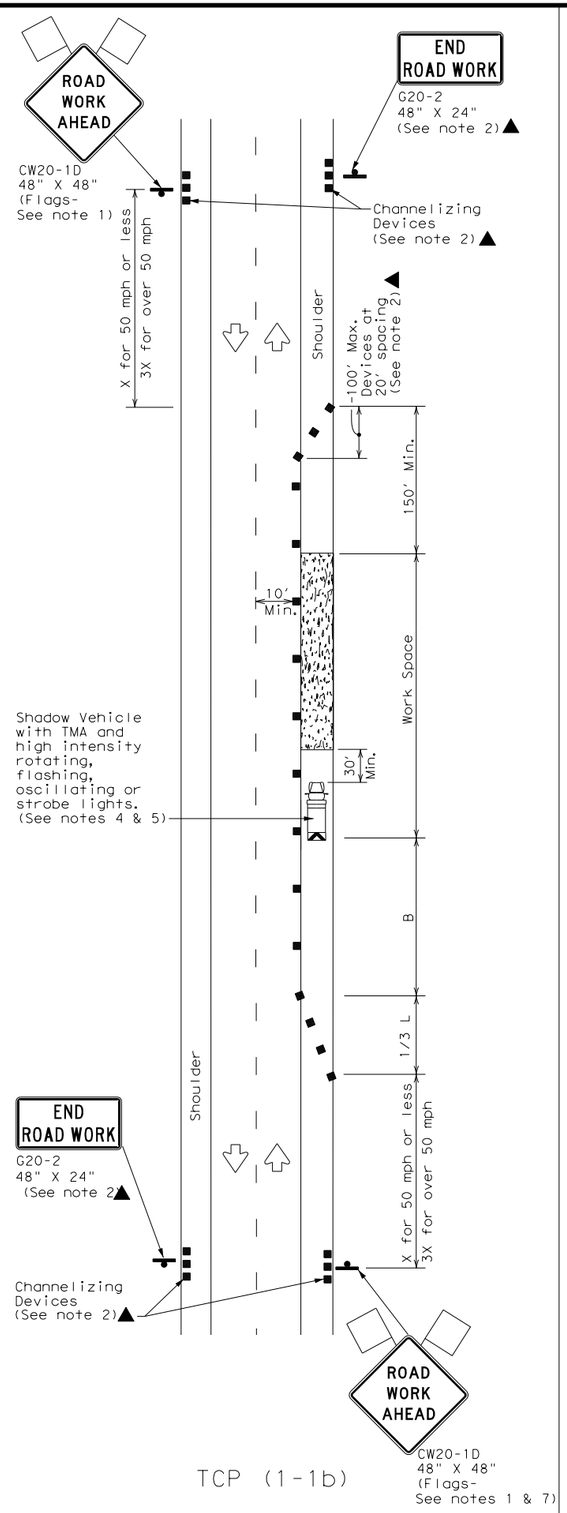


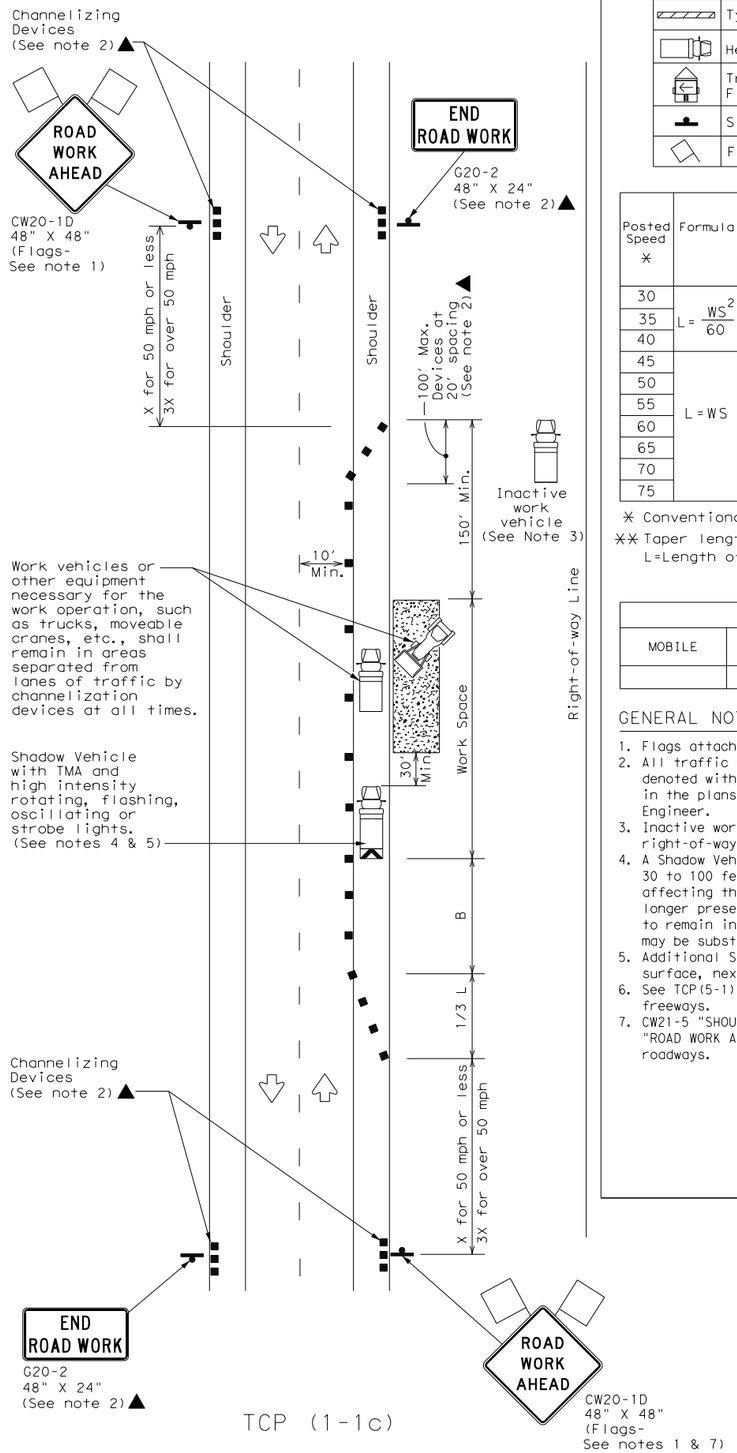
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation — Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98	1511	01	013	FM 993
8-95 2-12	DIST	COUNTY		SHEET NO.
1-97 2-18	ATL	UPSHUR		25

DATE: 12/7/2023 3:06:05 PM
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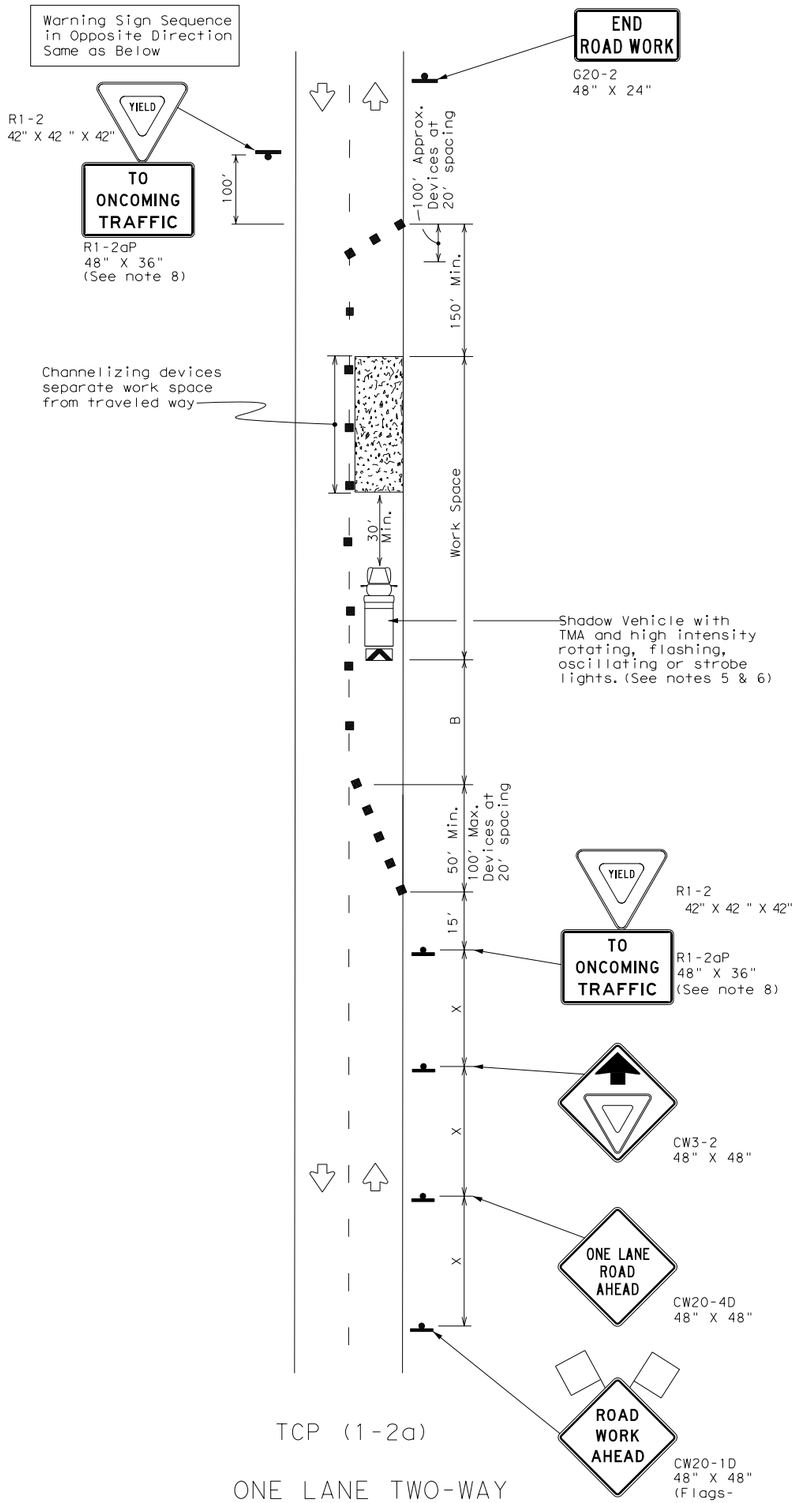
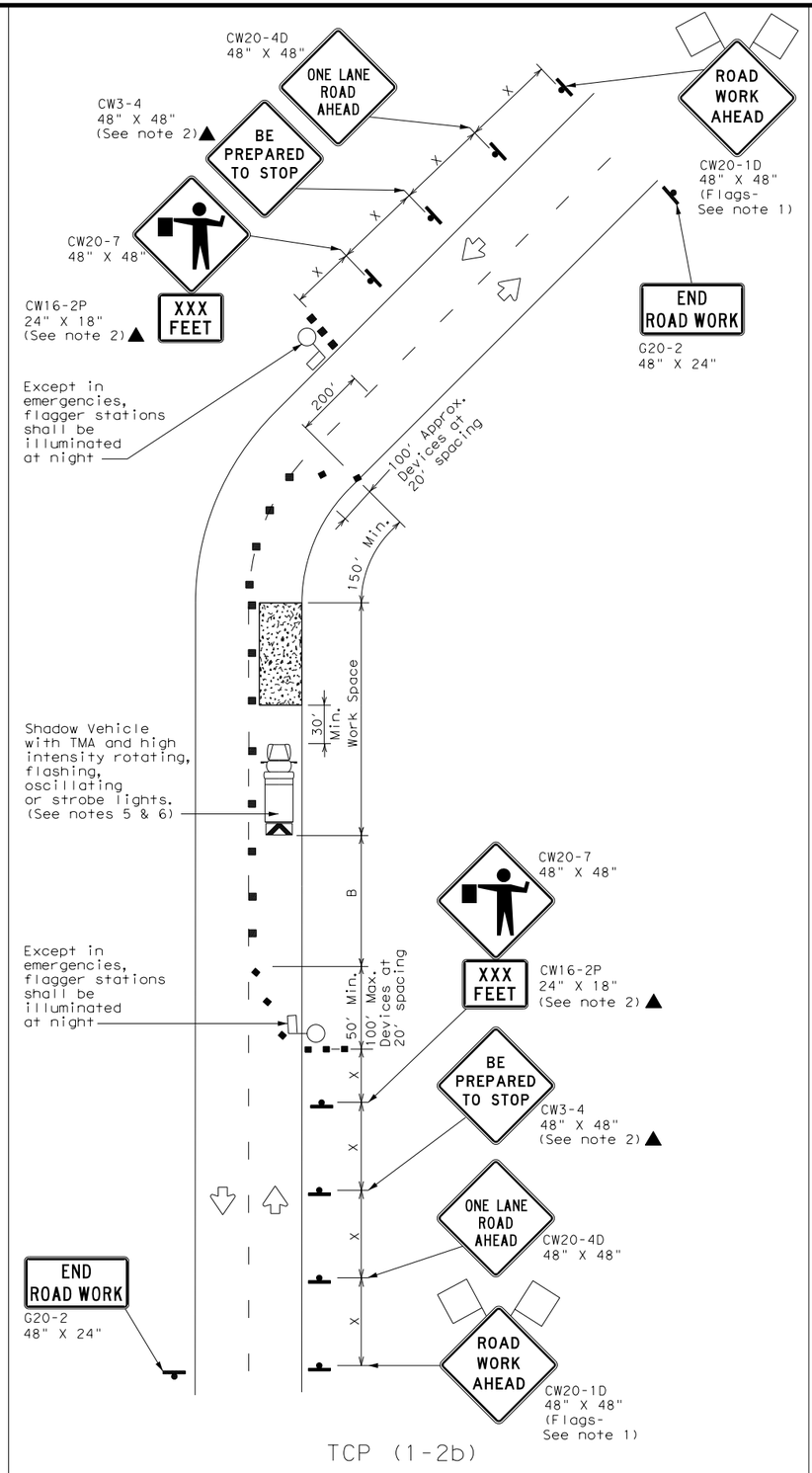


TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

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

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		26

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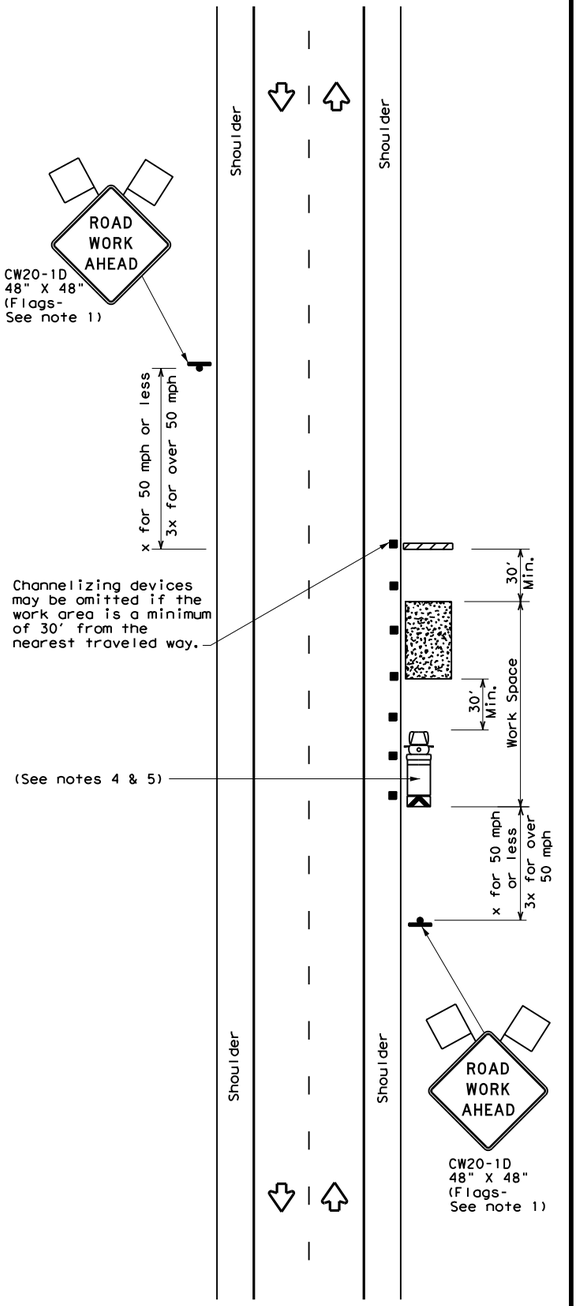
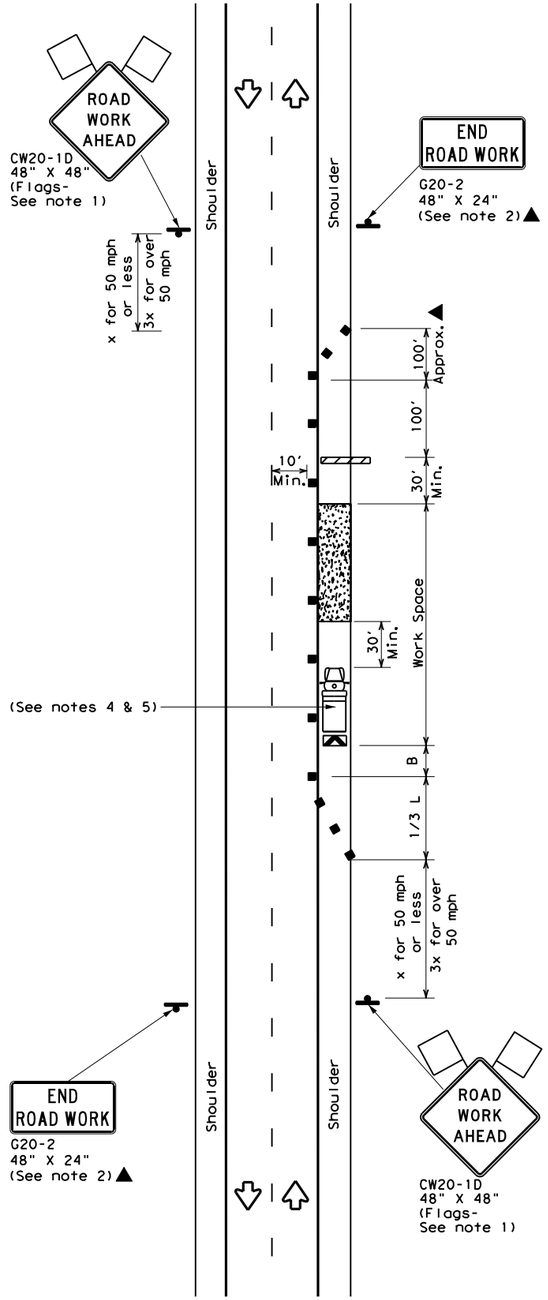


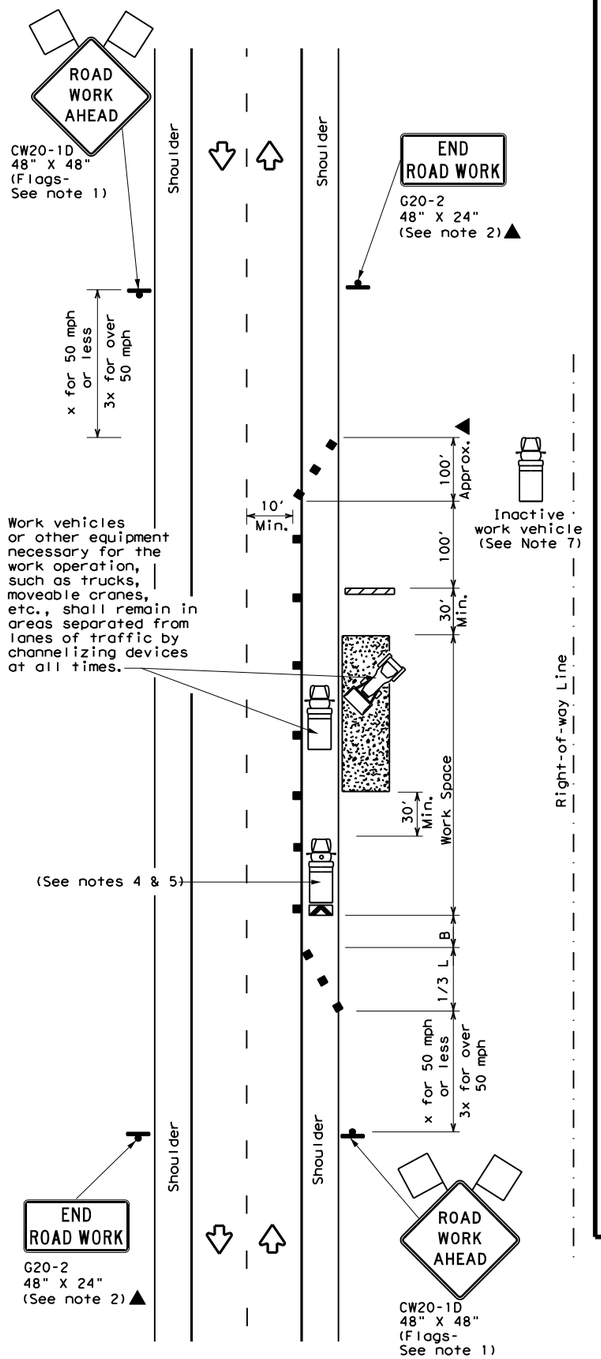
TCP (2-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (2-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (2-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(2-1)-18

FILE: tcp2-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	ATL	UPSHUR		27
1-97 2-18				

DATE: 12/7/2023 3:06:31 PM
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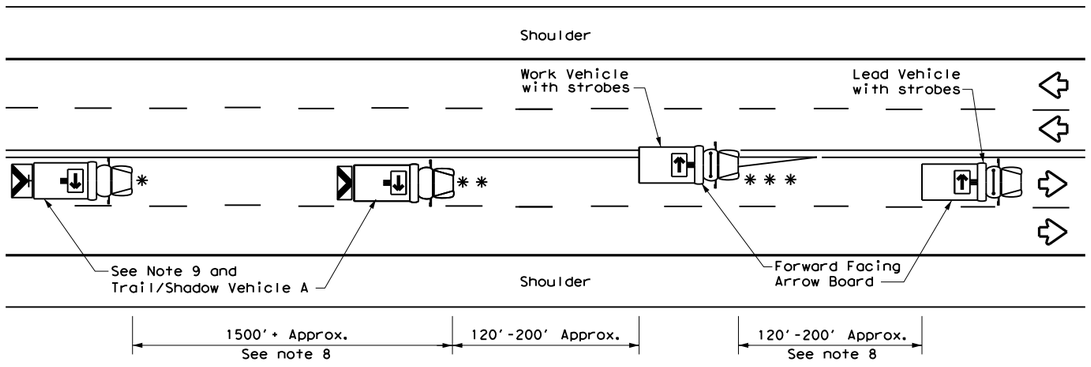
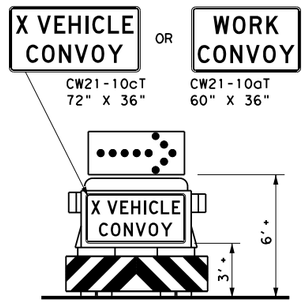


TCP (3-1a)

UNDIVIDED MULTILANE ROADWAY



TRAIL/SHADOW VEHICLE A

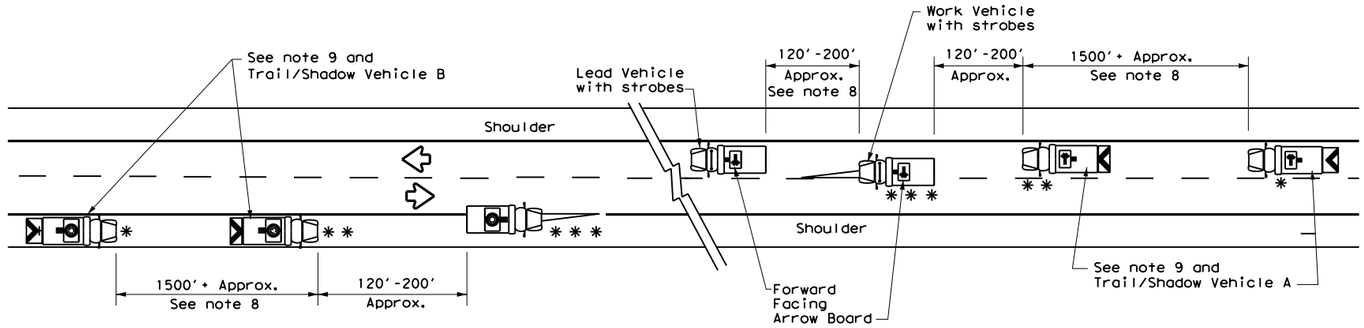
with RIGHT Directional display Flashing Arrow Board

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

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

GENERAL NOTES

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

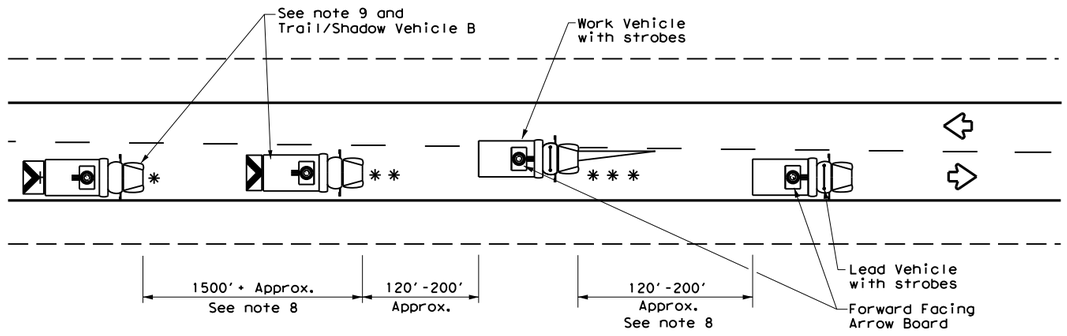


WORK ON SHOULDER

WORK ON TRAVEL LANE

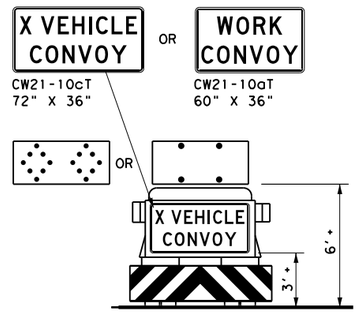
TCP (3-1b)

TWO-WAY ROADWAY WITH PAVED SHOULDERS



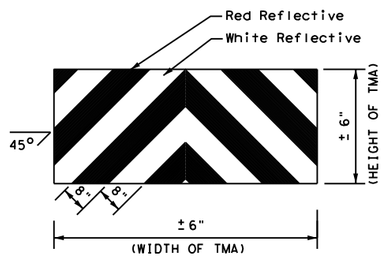
TCP (3-1c)

TWO-WAY ROADWAY WITHOUT PAVED SHOULDERS



TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board in CAUTION display



STRIPING FOR TMA

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS UNDIVIDED HIGHWAYS

TCP(3-1)-13

FILE: tcp3-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 7-13 1-97	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		28

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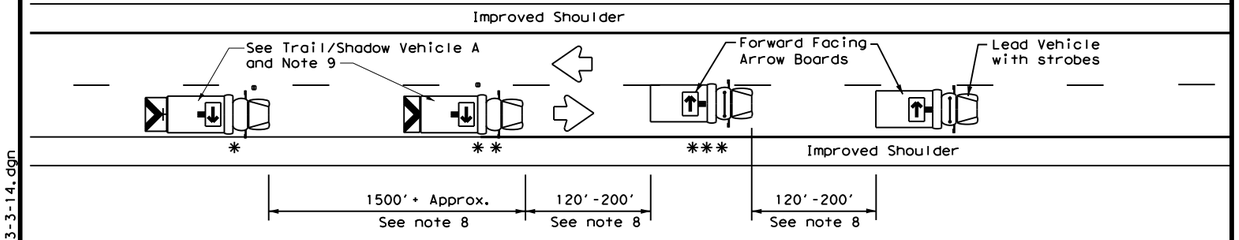
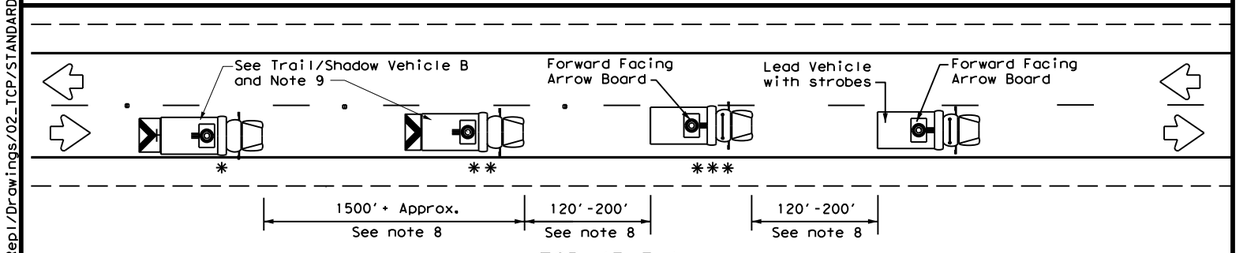


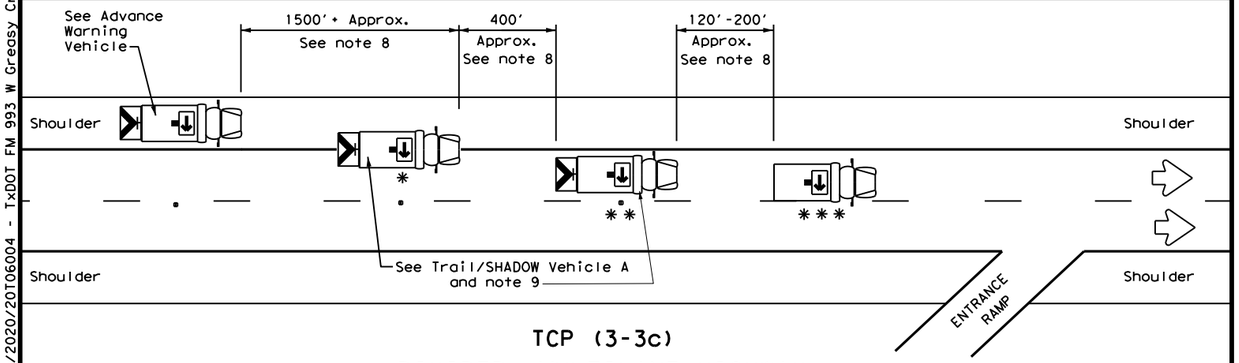
TCP (3-3a)

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



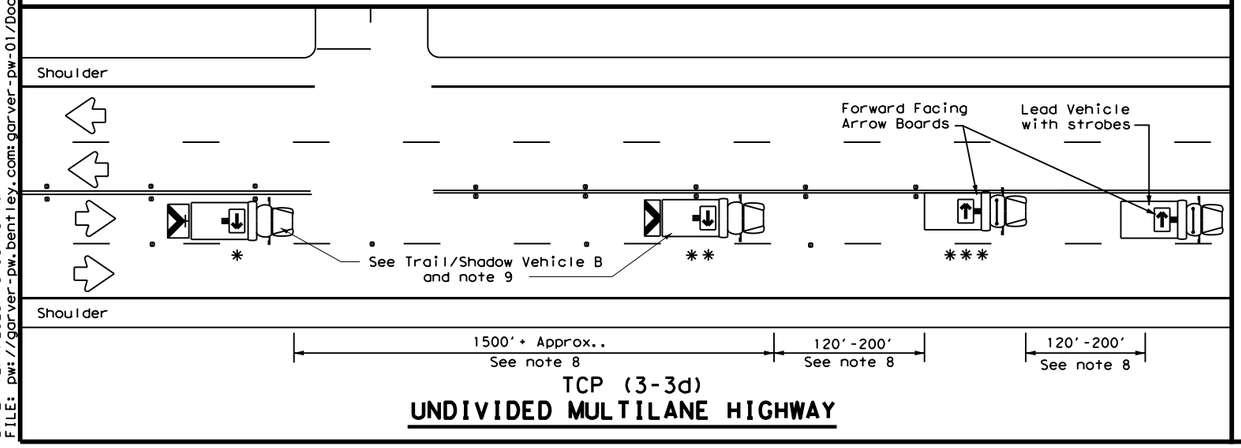
TCP (3-3b)

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



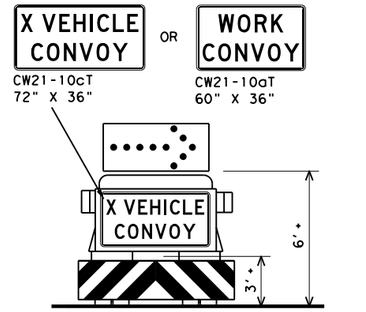
TCP (3-3c)

DIVIDED MULTILANE HIGHWAY



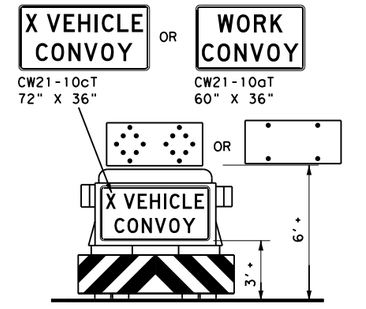
TCP (3-3d)

UNDIVIDED MULTILANE HIGHWAY



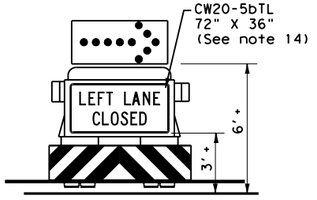
TRAIL/SHADOW VEHICLE A

with RIGHT Directional display
Flashing Arrow Board

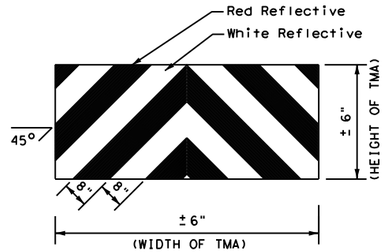


TRAIL/SHADOW VEHICLE B

with Flashing Arrow Board
in Caution Mode



ADVANCE WARNING VEHICLE



STRIPING FOR TMA

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

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

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN MOBILE OPERATIONS RAISED PAVEMENT MARKER INSTALLATION/ REMOVAL

TCP(3-3)-14

FILE: tcp3-3.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT September 1987	CONT	SECT	JOB	HIGHWAY
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2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 7-13	ATL	UPSHUR		29
1-97 7-14				

DATE: 12/7/2023 3:06:55 PM
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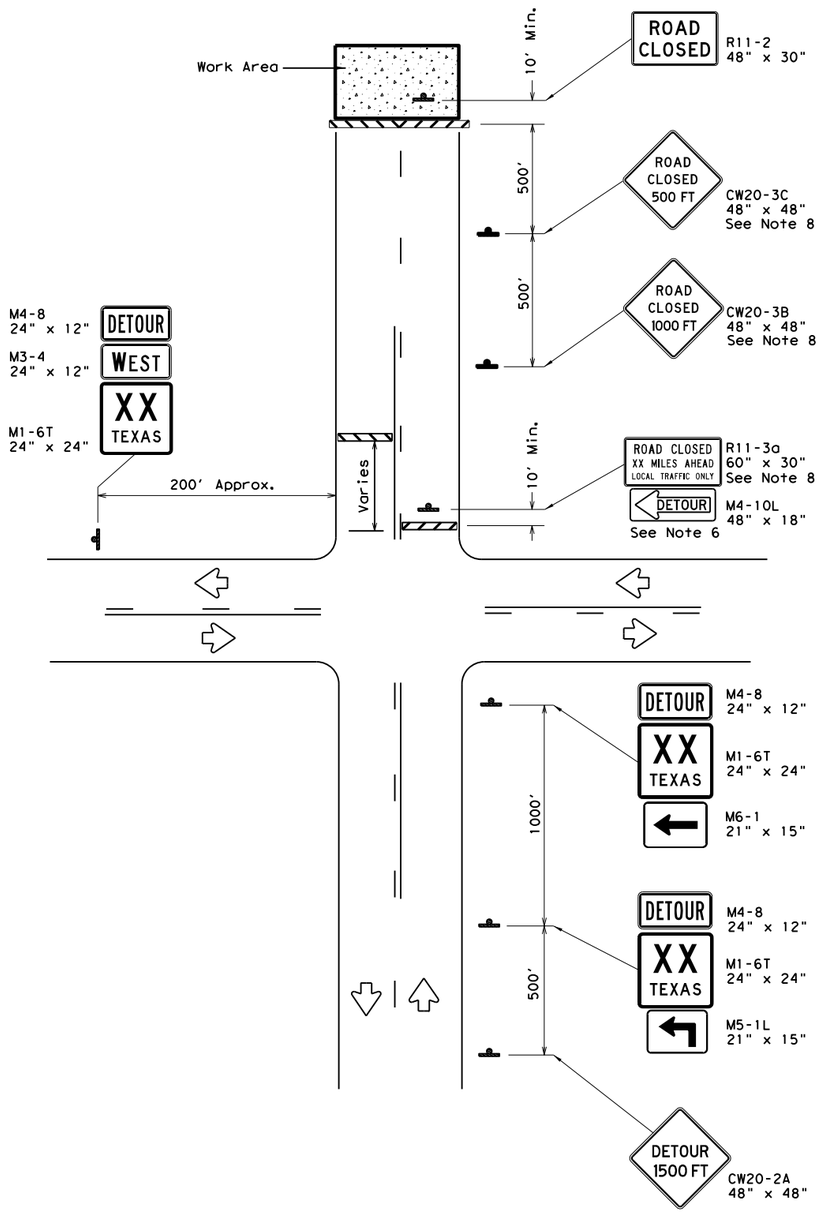
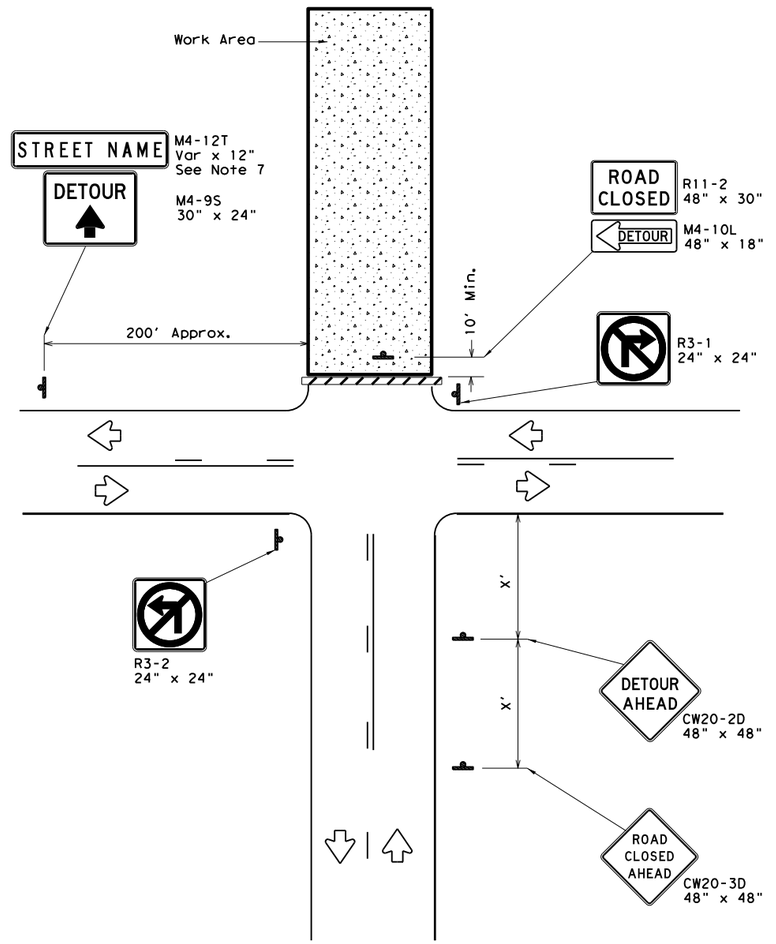


ROAD CLOSURE BEYOND THE INTERSECTION

Signing for a Numbered Route with an Off-Site Detour



ROAD CLOSURE AT THE INTERSECTION

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

LEGEND	
	Type 3 Barricade
	Sign

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

* Conventional Roads Only

GENERAL NOTES

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

Texas Department of Transportation

Traffic Operations Division Standard

WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	ATL	UPSHUR		30

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WORK ZONE SHORT TERM PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

TABS: 4" to 12" — 20' ± 6" — Type Y-2

TAPE: 4" to 12" — 20' ± 6" — 6" — Yellow — 4.5' ± 6"

SINGLE NO-PASSING LINE or CHANNELIZATION LINE

TABS: 20' ± 6" — Type Y-2 or W

TAPE: 20' ± 6" — 6" — 4.5' ± 6" — Yellow or White

BROKEN LINES

(FOR CENTER LINE OR LANE LINE)

TABS: 40' ± 1' — Type Y-2 or W — 1' ± 3"

TAPE: 40' ± 1' — 6" — 4.5' ± 6" — Yellow or White

WIDE DOTTED LINES

(FOR LANE DROP LINES)

TABS: 12' ± 6" — 4" ± 1" — 3' ± 3" — Type W

TAPE: 12' ± 6" — 12" — 3' ± 3" — White

WIDE GORE MARKINGS

TABS: 20' ± 6" — 4" ± 1" — Type W

TAPE: 20' ± 6" — 12" — 4.5' ± 6" — White

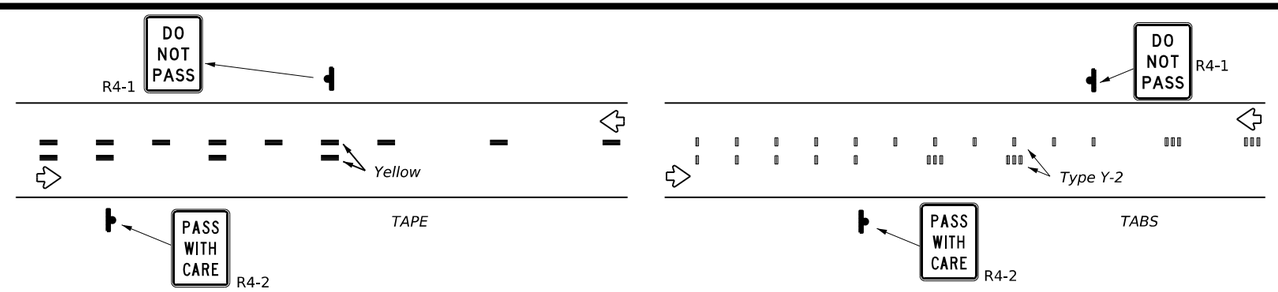
NOTES:

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

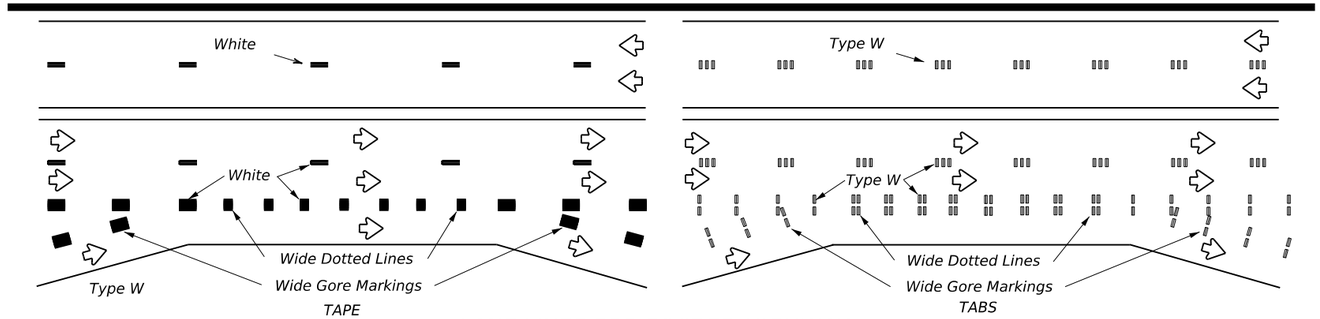
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS (TABS)

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

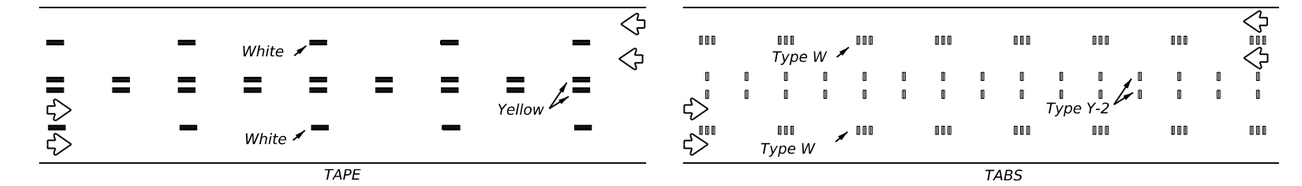
WORK ZONE SHORT TERM PAVEMENT MARKINGS PATTERNS



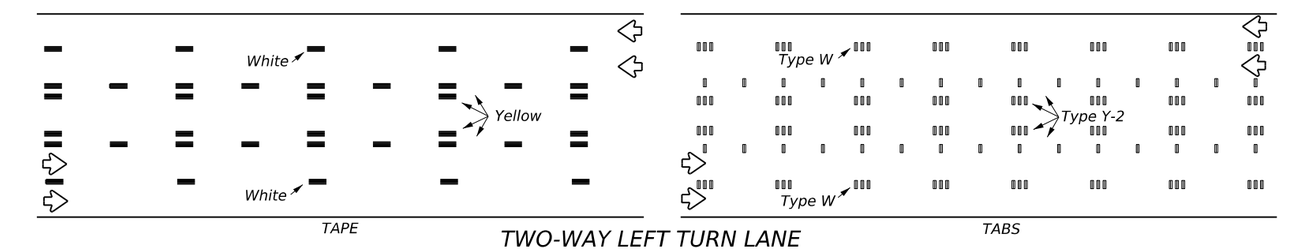
CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO LANE TWO-WAY HIGHWAYS



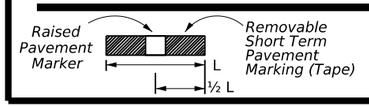
LANE LINES FOR DIVIDED HIGHWAY



LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



TWO-WAY LEFT TURN LANE



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

PREFABRICATED PAVEMENT MARKINGS

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

RAISED PAVEMENT MARKERS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

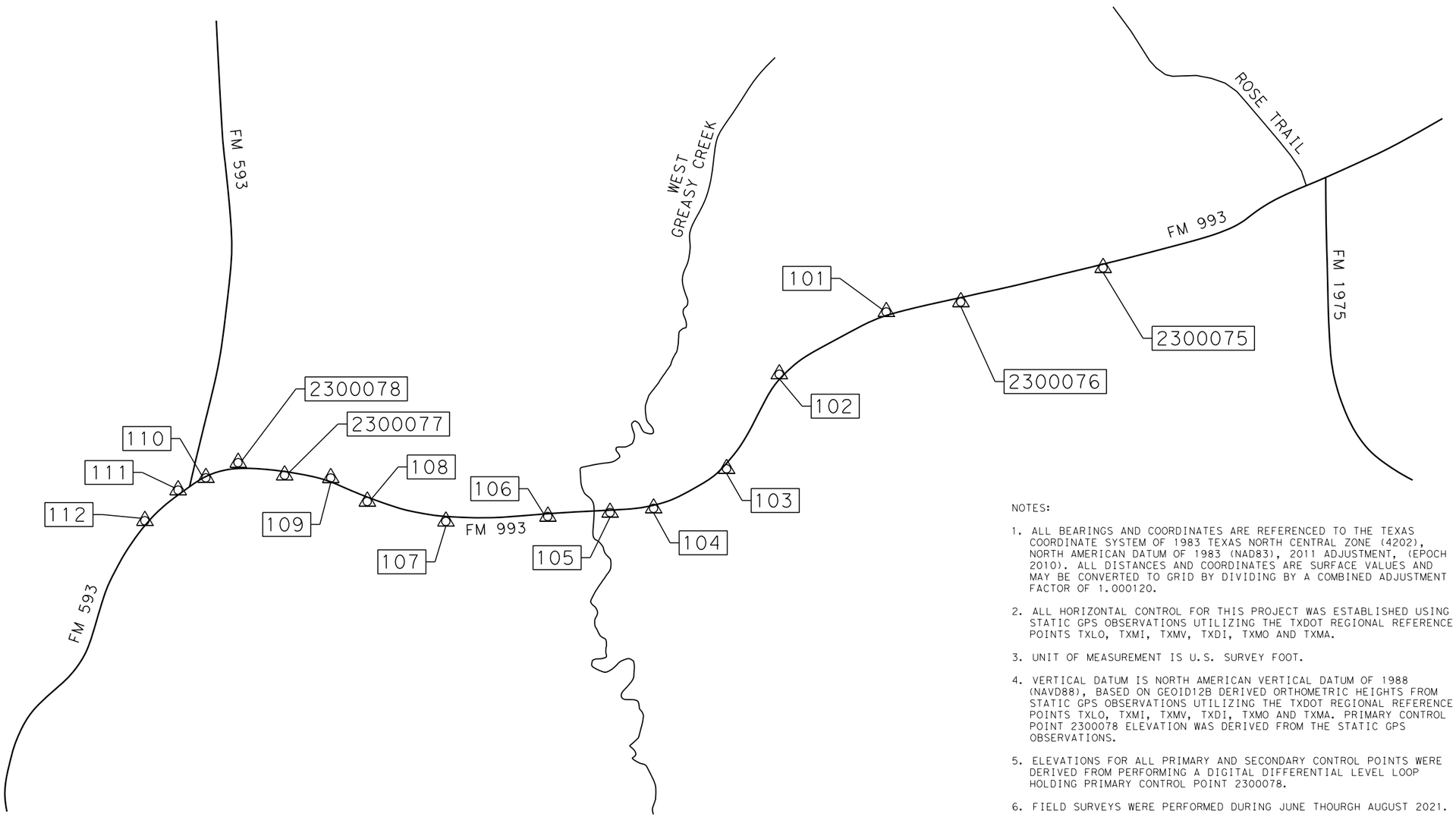
WORK ZONE SHORT TERM PAVEMENT MARKINGS

WZ(STPM)-23

FILE: wzstpm-23.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2023	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
4-92 7-13 1-97 2-23 3-03	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		31

111

CONTROL POINT	SURFACE COORDINATES		GRID COORDINATES		LATITUDE	LONGITUDE	ELEVATION	DESCRIPTION
	NORTHING	EASTING	NORTHING	EASTING				
2300075	7,028,046.986	3,087,806.538	7,027,203.722	3,087,436.046	N 32°53′34.44325"	W 94°51′13.57106"	358.345′	SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300075"
2300076	7,026,808.503	3,088,103.647	7,025,965.387	3,087,733.119	N 32°53′22.09487"	W 94°51′10.59297"	351.410′	SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300076"
2300077	7,020,925.776	3,089,610.643	7,020,083.366	3,089,239.934	N 32°52′23.40752"	W 94°50′55.32841"	341.768′	SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300077"
2300078	7,020,520.492	3,089,501.732	7,019,678.131	3,089,131.037	N 32°52′19.43744"	W 94°50′56.76970"	343.778′	SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300078"
101	7,026,160.255	3,088,190.252	7,025,317.217	3,087,819.714	N 32°53′15.65514"	W 94°51′09.84183"	339.785′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
102	7,025,229.400	3,088,732.000	7,024,386.474	3,088,361.397	N 32°53′06.26456"	W 94°51′03.87182"	308.029′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
103	7,024,771.152	3,089,554.925	7,023,928.281	3,089,184.223	N 32°53′01.45047"	W 94°50′54.41446"	299.183′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
104	7,024,136.147	3,089,898.971	7,023,293.352	3,089,528.228	N 32°52′55.05311"	W 94°50′50.64140"	291.264′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
105	7,023,757.123	3,089,935.722	7,022,914.373	3,089,564.974	N 32°52′51.29261"	W 94°50′50.36521"	291.825′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
106	7,023,215.507	3,089,969.176	7,022,372.822	3,089,598.424	N 32°52′45.92551"	W 94°50′50.19395"	293.485′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
107	7,022,328.603	3,090,012.806	7,021,486.025	3,089,642.049	N 32°52′37.14063"	W 94°50′50.04420"	331.624′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
108	7,021,644.777	3,089,838.575	7,020,802.281	3,089,467.839	N 32°52′30.43876"	W 94°50′52.36456"	336.079′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
109	7,021,326.998	3,089,634.374	7,020,484.540	3,089,263.662	N 32°52′27.36672"	W 94°50′54.88685"	335.764′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
110	7,020,240.835	3,089,633.553	7,019,398.507	3,089,262.841	N 32°52′16.62681"	W 94°50′55.33901"	335.058′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
111	7,019,998.925	3,089,740.112	7,019,156.626	3,089,369.388	N 32°52′14.19812"	W 94°50′54.18898"	326.739′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"
112	7,019,709.929	3,090,006.753	7,018,867.665	3,089,635.997	N 32°52′11.24878"	W 94°50′51.18243"	317.693′	SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT"



NOTES:

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983 TEXAS NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (NAD83), 2011 ADJUSTMENT, (EPOCH 2010). ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.000120.
2. ALL HORIZONTAL CONTROL FOR THIS PROJECT WAS ESTABLISHED USING STATIC GPS OBSERVATIONS UTILIZING THE TXDOT REGIONAL REFERENCE POINTS TXLO, TXMI, TXMV, TXDI, TXMO AND TXMA.
3. UNIT OF MEASUREMENT IS U.S. SURVEY FOOT.
4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON GEOID12B DERIVED ORTHOMETRIC HEIGHTS FROM STATIC GPS OBSERVATIONS UTILIZING THE TXDOT REGIONAL REFERENCE POINTS TXLO, TXMI, TXMV, TXDI, TXMO AND TXMA. PRIMARY CONTROL POINT 2300078 ELEVATION WAS DERIVED FROM THE STATIC GPS OBSERVATIONS.
5. ELEVATIONS FOR ALL PRIMARY AND SECONDARY CONTROL POINTS WERE DERIVED FROM PERFORMING A DIGITAL DIFFERENTIAL LEVEL LOOP HOLDING PRIMARY CONTROL POINT 2300078.
6. FIELD SURVEYS WERE PERFORMED DURING JUNE THOURGH AUGUST 2021.

NOT TO SCALE

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY MULTIPLE STATIC GPS OBSERVATIONS ACCESSING THE STATE REGIONAL REFERENCE SYSTEM IN JUNE AND JULY, 2021, AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS
REGISTERED
CHRIS T. ABBOTT
6407
PROFESSIONAL
LAND SURVEYOR

8/31/21

CHRIS T. ABBOTT
REGISTERED PROFESSIONAL LAND SURVEYOR TEXAS NO. 6407

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TX 76137
FIRM NO. 10106900 / PH. 817-496-1424

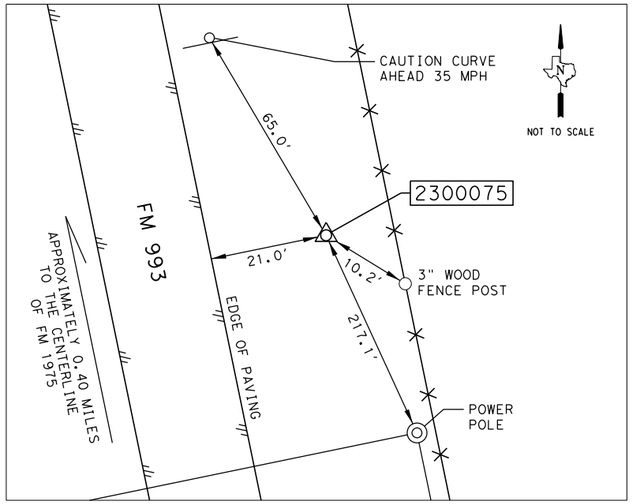
Texas Department of Transportation

FM 993
CONTROL INDEX SHEET

SHEET 1 OF 1

CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993
DIST	COUNTY		SHEET NO.
19	UPSHUR		32

8/31/2021



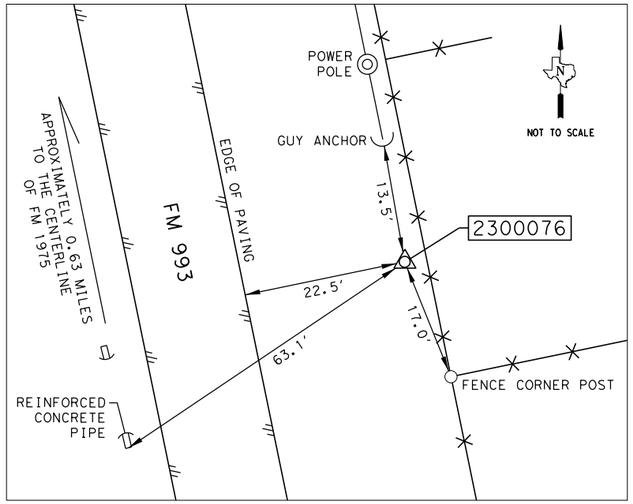
CONTROL POINT: 2300075

CP# 2300075 IS A SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300075", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.40 MILES SOUTH OF THE CENTERLINE OF FM 1975.

LATITUDE: N 32°53'34.44325"
LONGITUDE: W 94°51'13.57106"

SURFACE COORDINATES:
NORTHING: 7,028,046.986
EASTING: 3,087,806.538
ELEVATION: 358.345'

GRID COORDINATES:
NORTHING: 7,027,203.722
EASTING: 3,087,436.046
ELEVATION: 358.345'



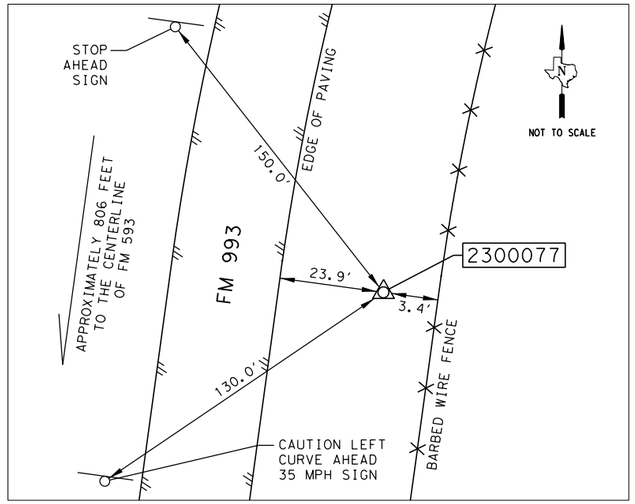
CONTROL POINT: 2300076

CP# 2300076 IS A SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300076", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.63 MILES SOUTH OF THE CENTERLINE OF FM 1975.

LATITUDE: N 32°53'22.09487"
LONGITUDE: W 94°51'10.59297"

SURFACE COORDINATES:
NORTHING: 7,026,808.503
EASTING: 3,088,103.647
ELEVATION: 351.410'

GRID COORDINATES:
NORTHING: 7,025,965.387
EASTING: 3,087,733.119
ELEVATION: 351.410'



CONTROL POINT: 2300077

CP# 2300077 IS A SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300077", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 806 FEET NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'23.40752"
LONGITUDE: W 94°50'55.32841"

SURFACE COORDINATES:
NORTHING: 7,020,925.776
EASTING: 3,089,610.643
ELEVATION: 341.768'

GRID COORDINATES:
NORTHING: 7,020,083.366
EASTING: 3,089,239.934
ELEVATION: 341.768'

NOTES:

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983 TEXAS NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (NAD83), 2011 ADJUSTMENT, (EPOCH 2010). ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.000120.
2. ALL HORIZONTAL CONTROL FOR THIS PROJECT WAS ESTABLISHED USING STATIC GPS OBSERVATIONS UTILIZING THE TXDOT REGIONAL REFERENCE POINTS TXLO, TXMI, TXMV, TXDI, TXMO AND TXMA.
3. UNIT OF MEASUREMENT IS U.S. SURVEY FOOT.
4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON GEOID12B DERIVED ORTHOMETRIC HEIGHTS FROM STATIC GPS OBSERVATIONS UTILIZING THE TXDOT REGIONAL REFERENCE POINTS TXLO, TXMI, TXMV, TXDI, TXMO AND TXMA. PRIMARY CONTROL POINT 2300078 ELEVATION WAS DERIVED FROM THE STATIC GPS OBSERVATIONS.
5. ELEVATIONS FOR ALL PRIMARY AND SECONDARY CONTROL POINTS WERE DERIVED FROM PERFORMING A DIGITAL DIFFERENTIAL LEVEL LOOP HOLDING PRIMARY CONTROL POINT 2300078.
6. FIELD SURVEYS WERE PERFORMED DURING JUNE THOURGH AUGUST 2021.

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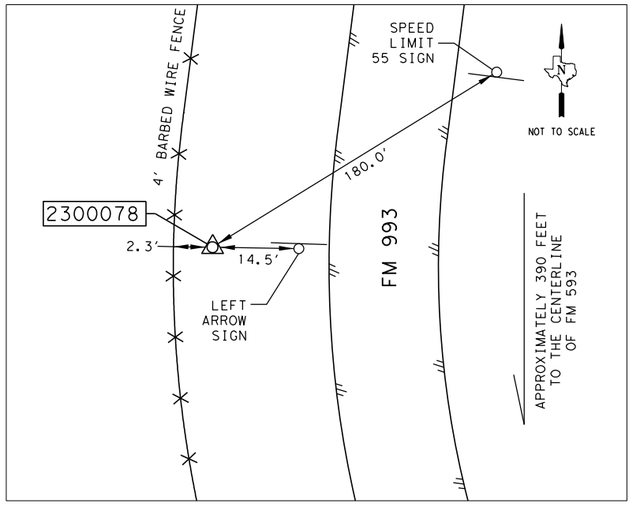
Texas Department of Transportation



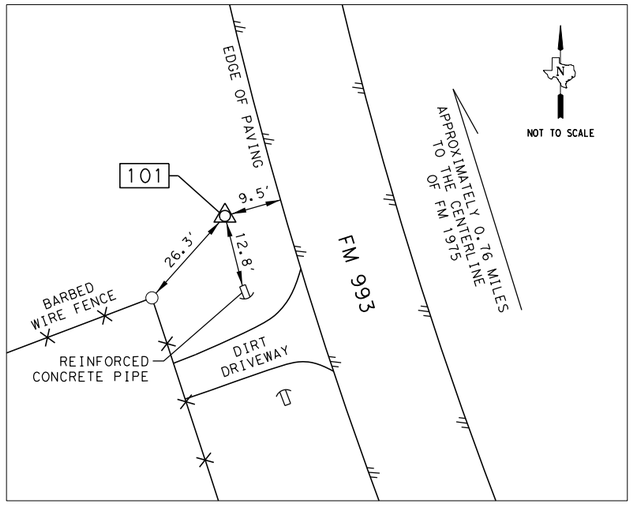
CONTROL POINT: 2300078

CP# 2300078 IS A SET TXDOT TYPE II CONCRETE MONUMENT WITH 3-1/2" ALUMINUM DISK STAMPED "TEXAS DEPARTMENT OF TRANSPORTATION CONTROL MARK 2300078", LOCATED ON THE WEST SIDE OF FM 993, APPROXIMATELY 390 FEET NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'19.43744"
LONGITUDE: W 94°50'56.76970"

SURFACE COORDINATES:
NORTHING: 7,020,520.493
EASTING: 3,089,501.732
ELEVATION: 343.778'

GRID COORDINATES:
NORTHING: 7,019,678.131
EASTING: 3,089,131.037
ELEVATION: 343.778'



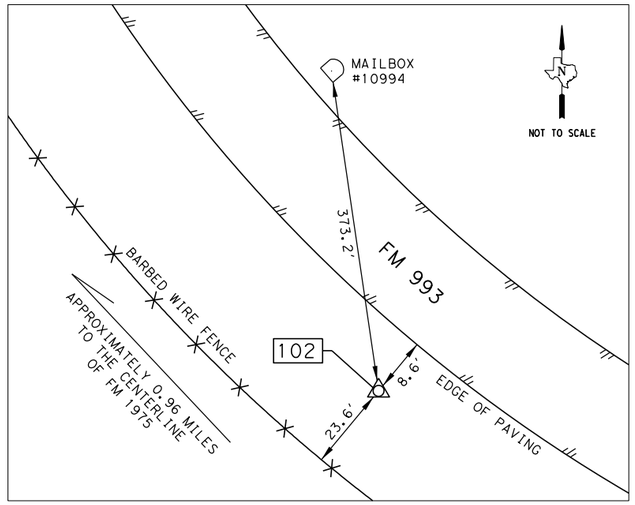
CONTROL POINT: 101

CP# 101 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE WEST SIDE OF FM 993, APPROXIMATELY 0.76 MILES SOUTH OF THE CENTERLINE OF FM 1975.

LATITUDE: N 32°53'15.65514"
LONGITUDE: W 94°51'09.84183"

SURFACE COORDINATES:
NORTHING: 7,026,160.255
EASTING: 3,088,190.252
ELEVATION: 339.785'

GRID COORDINATES:
NORTHING: 7,025,317.217
EASTING: 3,087,819.714
ELEVATION: 339.785'



CONTROL POINT: 102

CP# 102 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE WEST SIDE OF FM 993, APPROXIMATELY 0.96 MILES SOUTH OF THE CENTERLINE OF FM 1975.

LATITUDE: N 32°53'06.26456"
LONGITUDE: W 94°51'03.87182"

SURFACE COORDINATES:
NORTHING: 7,025,229.400
EASTING: 3,088,732.000
ELEVATION: 308.029'

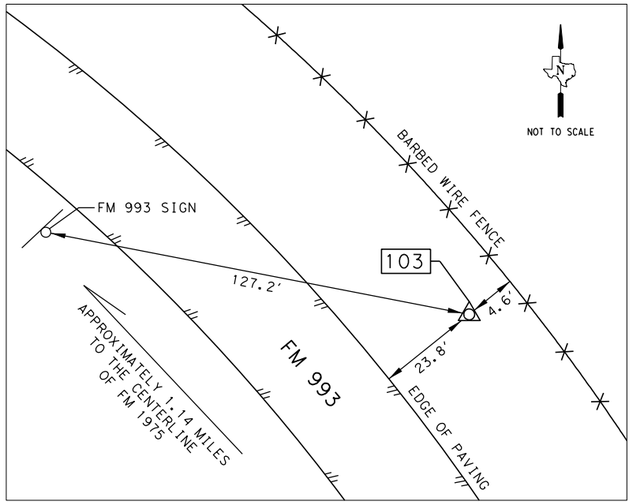
GRID COORDINATES:
NORTHING: 7,024,386.474
EASTING: 3,088,361.397
ELEVATION: 308.029'

FM 993
CONTROL DETAIL SHEET

SHEET 1 OF 3

CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993
DIST	COUNTY		SHEET NO.
19	UPSHUR		33

151101013_FM 993 CONTROL DETAIL SHEET_01.dgn
8/31/2021



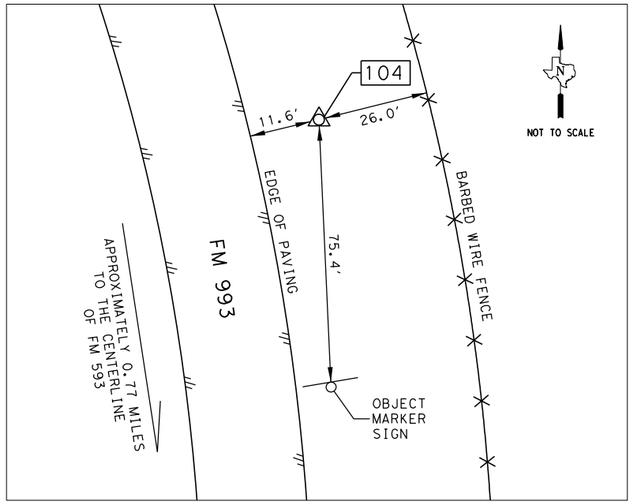
CONTROL POINT: 103

CP# 103 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE NORTHEAST SIDE OF FM 993, APPROXIMATELY 1.14 MILES SOUTH OF THE CENTERLINE OF FM 1975.

LATITUDE: N 32°53'01.45047"
LONGITUDE: W 94°50'54.41446"

SURFACE COORDINATES:
NORTHING: 7,024,771.152
EASTING: 3,089,554.925
ELEVATION: 299.183'

GRID COORDINATES:
NORTHING: 7,023,928.281
EASTING: 3,089,184.223
ELEVATION: 299.183'



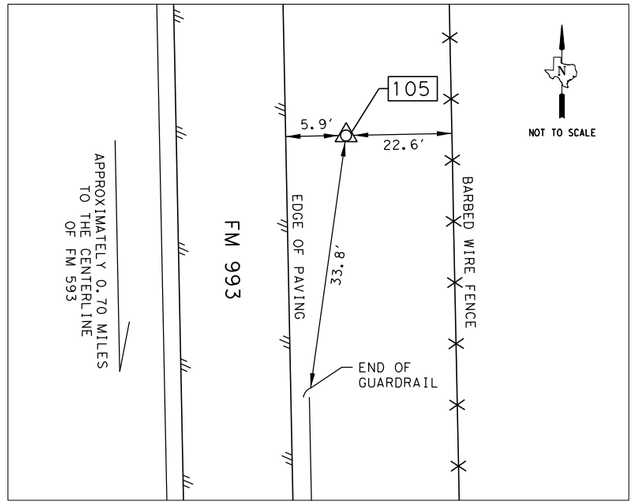
CONTROL POINT: 104

CP# 104 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.77 MILES NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'55.05311"
LONGITUDE: W 94°50'50.64140"

SURFACE COORDINATES:
NORTHING: 7,024,136.147
EASTING: 3,089,898.971
ELEVATION: 291.264'

GRID COORDINATES:
NORTHING: 7,023,293.352
EASTING: 3,089,528.228
ELEVATION: 291.264'



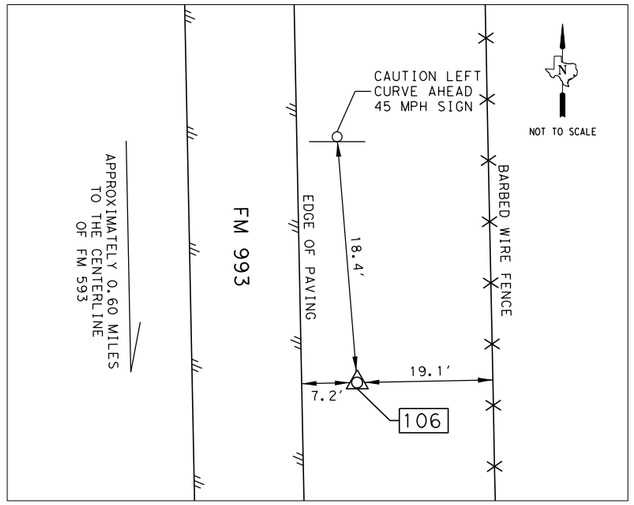
CONTROL POINT: 105

CP# 105 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.70 MILES NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'51.29261"
LONGITUDE: W 94°50'50.36521"

SURFACE COORDINATES:
NORTHING: 7,023,757.123
EASTING: 3,089,935.722
ELEVATION: 291.825'

GRID COORDINATES:
NORTHING: 7,022,914.373
EASTING: 3,089,564.974
ELEVATION: 291.825'



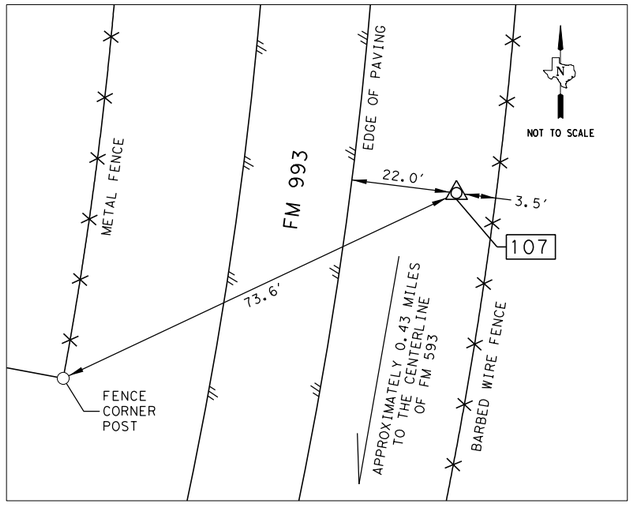
CONTROL POINT: 106

CP# 106 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.60 MILES NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'45.92551"
LONGITUDE: W 94°50'50.19395"

SURFACE COORDINATES:
NORTHING: 7,023,215.507
EASTING: 3,089,969.176
ELEVATION: 293.485'

GRID COORDINATES:
NORTHING: 7,022,372.822
EASTING: 3,089,598.424
ELEVATION: 293.485'



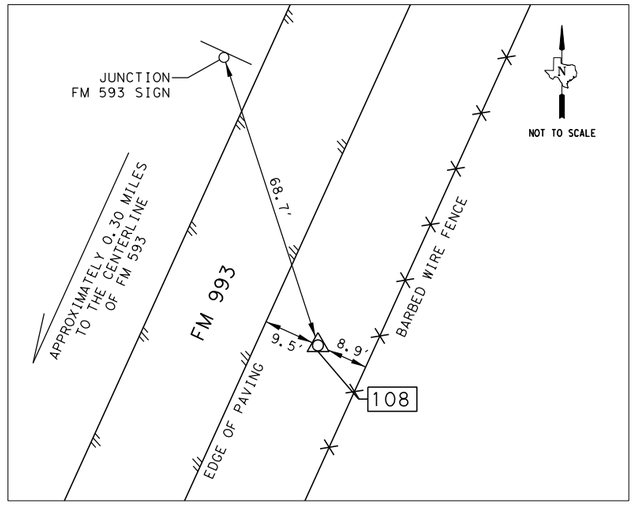
CONTROL POINT: 107

CP# 107 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.43 MILES NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'37.14063"
LONGITUDE: W 94°50'50.04420"

SURFACE COORDINATES:
NORTHING: 7,022,328.603
EASTING: 3,090,012.806
ELEVATION: 331.624'

GRID COORDINATES:
NORTHING: 7,021,486.025
EASTING: 3,089,642.049
ELEVATION: 331.624'



CONTROL POINT: 108

CP# 108 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 0.30 MILES NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'30.43876"
LONGITUDE: W 94°50'52.36456"

SURFACE COORDINATES:
NORTHING: 7,021,644.777
EASTING: 3,089,838.575
ELEVATION: 336.079'

GRID COORDINATES:
NORTHING: 7,020,802.281
EASTING: 3,089,467.839
ELEVATION: 336.079'

NOTES:

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3. UNIT OF MEASUREMENT IS U.S. SURVEY FOOT.
4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON GEOID12B DERIVED ORTHOMETRIC HEIGHTS FROM STATIC GPS OBSERVATIONS UTILIZING THE TXDOT REGIONAL REFERENCE POINTS TXLO, TXMI, TXMV, TXDI, TXMO AND TXMA. PRIMARY CONTROL POINT 2300078 ELEVATION WAS DERIVED FROM THE STATIC GPS OBSERVATIONS.
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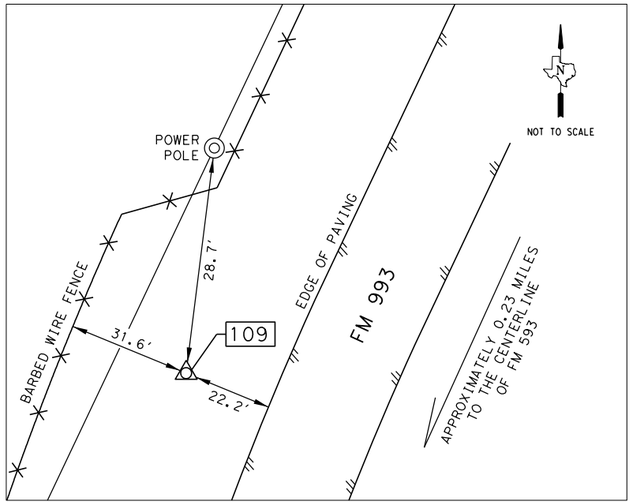
Texas Department of Transportation

FM 993
CONTROL DETAIL SHEET

SHEET 2 OF 3

CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993
DIST	COUNTY		SHEET NO.
19	UPSHUR		34



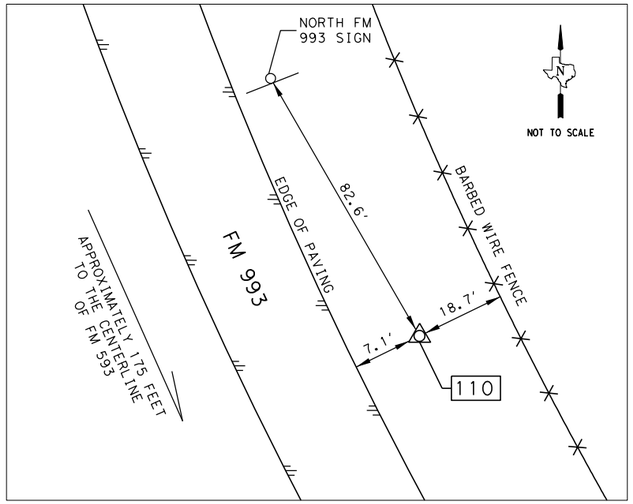
CONTROL POINT: 109

CP# 109 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE WEST SIDE OF FM 993, APPROXIMATELY 0.23 MILES NORTH OF THE CENTERLINE OF FM 593.

LATITUDE: N 32°52'27.36672"
LONGITUDE: W 94°50'54.88685"

SURFACE COORDINATES:
NORTHING: 7,021,326.998
EASTING: 3,089,634.374
ELEVATION: 335.764'

GRID COORDINATES:
NORTHING: 7,020,484.540
EASTING: 3,089,263.662
ELEVATION: 335.764'



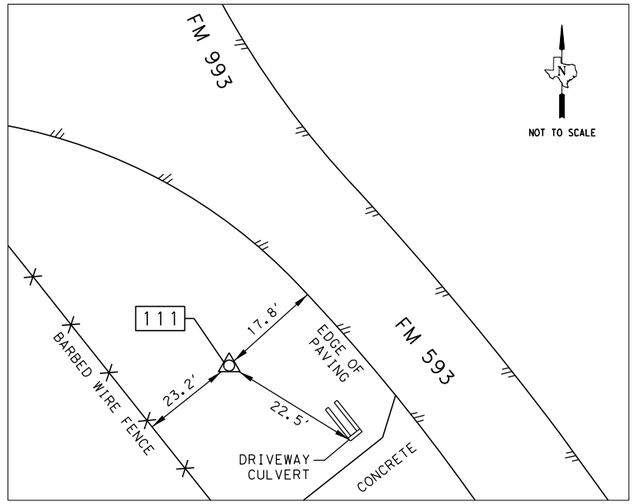
CONTROL POINT: 110

CP# 110 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE EAST SIDE OF FM 993, APPROXIMATELY 175 FEET NORTH OF THE INTERSECTION OF THE CENTERLINE OF FM 593 WITH THE CENTERLINE OF FM 993.

LATITUDE: N 32°52'16.62681"
LONGITUDE: W 94°50'55.33901"

SURFACE COORDINATES:
NORTHING: 7,020,240.835
EASTING: 3,089,633.553
ELEVATION: 335.058'

GRID COORDINATES:
NORTHING: 7,019,398.507
EASTING: 3,089,262.841
ELEVATION: 335.058'



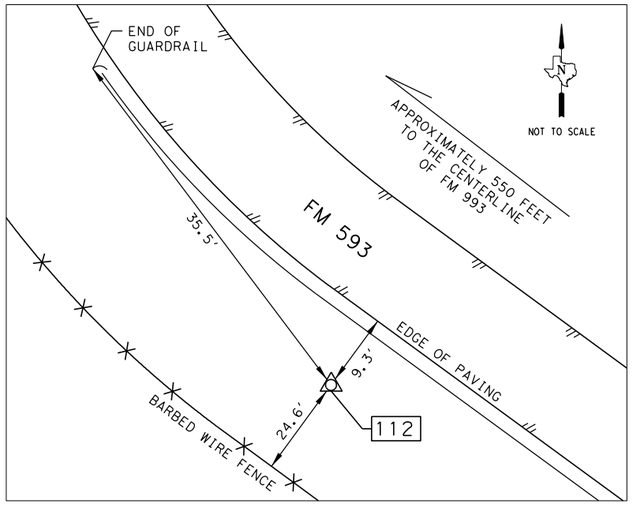
CONTROL POINT: 111

CP# 111 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE SOUTHWEST SIDE OF FM 593, APPROXIMATELY 80 FEET SOUTH OF THE INTERSECTION OF THE CENTERLINE OF FM 593 WITH THE CENTERLINE OF FM 993.

LATITUDE: N 32°52'14.19812"
LONGITUDE: W 94°50'54.18898"

SURFACE COORDINATES:
NORTHING: 7,019,998.925
EASTING: 3,089,740.112
ELEVATION: 326.739'

GRID COORDINATES:
NORTHING: 7,019,156.626
EASTING: 3,089,369.388
ELEVATION: 326.739'



CONTROL POINT: 112

CP# 112 IS A SET 5/8" IRON ROD WITH CAP STAMPED "REFERENCE POINT", LOCATED ON THE SOUTHWEST SIDE OF FM 593, APPROXIMATELY 550 FEET SOUTHEAST OF THE INTERSECTION OF THE CENTERLINE OF FM 593 WITH THE CENTERLINE OF FM 993.

LATITUDE: N 32°52'11.24878"
LONGITUDE: W 94°50'51.18243"

SURFACE COORDINATES:
NORTHING: 7,019,709.929
EASTING: 3,090,006.753
ELEVATION: 317.693

GRID COORDINATES:
NORTHING: 7,018,867.665
EASTING: 3,089,635.997
ELEVATION: 317.693

NOTES:

1. ALL BEARINGS AND COORDINATES ARE REFERENCED TO THE TEXAS COORDINATE SYSTEM OF 1983 TEXAS NORTH CENTRAL ZONE (4202), NORTH AMERICAN DATUM OF 1983 (NAD83), 2011 ADJUSTMENT, (EPOCH 2010). ALL DISTANCES AND COORDINATES ARE SURFACE VALUES AND MAY BE CONVERTED TO GRID BY DIVIDING BY A COMBINED ADJUSTMENT FACTOR OF 1.000120.
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4. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88), BASED ON GEOID12B DERIVED ORTHOMETRIC HEIGHTS FROM STATIC GPS OBSERVATIONS UTILIZING THE TXDOT REGIONAL REFERENCE POINTS TXLO, TXMI, TXMV, TXDI, TXMO AND TXMA. PRIMARY CONTROL POINT 2300078 ELEVATION WAS DERIVED FROM THE STATIC GPS OBSERVATIONS.
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CHRIS T. ABBOTT
REGISTERED PROFESSIONAL LAND SURVEYOR TEXAS NO. 6407

GORRONDONA & ASSOCIATES, INC.
2800 NE LOOP 820, SUITE 660
FORT WORTH, TX 76137
FIRM NO. 10106900 / PH. 817-496-1424

FM 993
CONTROL DETAIL SHEET

SHEET 3 OF 3

CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993
DIST	COUNTY		SHEET NO.
19	UPSHUR		35

CL FM 993

Alignment name: FM993CL
Alignment description:

	STATION	X	Y
POT	1538+00.0000 R1	3087482.8926	7029086.4581
PC	1538+31.5993 R1	3087495.1380	7029057.3279
Tangential Direction:	S22°48'00.9908"E		
Tangential Length:	31.5993		
PC	1538+31.5993 R1	3087495.1380	7029057.3279
PI	1540+15.9964 R1	3087566.5955	7028887.3394
CC		3085382.3886	7028169.1979
PT	1541+99.6007 R1	3087609.9558	7028708.1129
Radius:	2291.8300		
Delta:	09°12'00.1349" Right		
Degree of Curvature(Arc):	02°30'00.0046"		
Length:	368.0013		
Tangent:	184.3970		
Chord:	367.6061		
Middle Ordinate:	7.3823		
External:	7.4062		
Tangent Back Direction:	S22°48'00.9908"E		
Radial Direction:	S67°11'59.0092"W		
Chord Direction:	S18°12'00.9233"E		
Radial Direction:	S76°23'59.1441"W		
Tangent Ahead Direction:	S13°36'00.8559"E		
PT	1541+99.6007 R1	3087609.9558	7028708.1129
PI	1560+39.6000 R1	3088042.6245	7026919.7071
Tangential Direction:	S13°36'00.8559"E		
Tangential Length:	1839.9993		
PI	1560+39.6000 R1	3088042.6245	7026919.7071
PC	1566+50.1000 R1	3088168.8622	7026322.4012
Tangential Direction:	S11°56'00.8558"E		
Tangential Length:	610.5000		
PC	1566+50.1000 R1	3088168.8622	7026322.4012
PI	1568+62.8950 R1	3088212.8634	7026114.2051
CC		3089570.2953	7026618.5872
PT	1570+72.6000 R1	3088315.4876	7025927.7916
Radius:	1432.3900		
Delta:	16°54'00.1908" Left		
Degree of Curvature(Arc):	04°00'00.0451"		
Length:	422.5000		
Tangent:	212.7950		
Chord:	420.9701		
Middle Ordinate:	15.5494		
External:	15.7201		
Tangent Back Direction:	S11°56'00.8558"E		
Radial Direction:	S78°03'59.1442"W		
Chord Direction:	S20°23'00.9512"E		
Radial Direction:	S61°09'58.9534"W		
Tangent Ahead Direction:	S28°50'01.0466"E		
PT	1570+72.6000 R1	3088315.4876	7025927.7916
PC	1575+83.7000 R1	3088561.9747	7025480.0558
Tangential Direction:	S28°50'01.0466"E		
Tangential Length:	511.1000		
PC	1575+83.7000 R1	3088561.9747	7025480.0558
PI	1578+99.8456 R1	3088714.4416	7025203.1047
CC		3089398.5161	7025940.5878
PT	1581+94.3000 R1	3089002.0523	7025071.8487
Radius:	954.9300		
Delta:	36°38'09.5530" Left		
Degree of Curvature(Arc):	05°59'59.9923"		
Length:	610.6000		
Tangent:	316.1456		
Chord:	600.2511		
Middle Ordinate:	48.3893		
External:	50.9723		
Tangent Back Direction:	S28°50'01.0466"E		
Radial Direction:	S61°09'58.9534"W		
Chord Direction:	S47°09'05.8231"E		
Radial Direction:	S24°31'49.4004"W		
Tangent Ahead Direction:	S65°28'10.5996"E		
PT	1581+94.3000 R1	3089002.0523	7025071.8487
PC	1583+73.5000 R1	3089165.0779	7024997.4492
Tangential Direction:	S65°28'10.5996"E		
Tangential Length:	179.2000		
PC	1583+73.5000 R1	3089165.0779	7024997.4492
PI	1591+39.5757 R1	3089862.0085	7024679.3931
CC		3088636.4594	7023839.1303
PT	1597+52.8000 R1	3089907.4568	7023914.6667
Radius:	1273.2400		
Delta:	62°04'06.5203" Right		
Degree of Curvature(Arc):	04°29'59.9942"		
Length:	1379.3000		
Tangent:	766.0757		
Chord:	1312.8383		
Middle Ordinate:	182.2524		
External:	212.6981		
Tangent Back Direction:	S65°28'10.5996"E		
Radial Direction:	S24°31'49.4004"W		
Chord Direction:	S34°26'07.3394"E		
Radial Direction:	S86°35'55.9207"W		
Tangent Ahead Direction:	S03°24'04.0793"E		
PT	1597+52.8000 R1	3089907.4568	7023914.6667
PC	1610+03.0000 R1	3089981.6263	7022666.6687
Tangential Direction:	S03°24'04.0793"E		
Tangential Length:	1250.2000		

	STATION	X	Y
PC	1610+03.0000 R1	3089981.6263	7022666.6687
PI	1615+52.1625 R1	3090014.2060	7022118.4735
CC		3087693.8330	7022530.7033
PT	1620+81.0000 R1	3089794.7984	7021615.0455
Radius:	2291.8300		
Delta:	26°57'00.0505" Right		
Degree of Curvature(Arc):	02°30'00.0046"		
Length:	1078.0000		
Tangent:	549.1625		
Chord:	1068.0899		
Middle Ordinate:	63.0903		
External:	64.8762		
Tangent Back Direction:	S03°24'04.0793"E		
Radial Direction:	S86°35'55.9207"W		
Chord Direction:	S10°04'25.9460"W		
Radial Direction:	N66°27'04.0288"W		
Tangent Ahead Direction:	S23°32'55.9712"W		
PT	1620+81.0000 R1	3089794.7984	7021615.0455
PC	1623+52.6000 R1	3089686.2857	7021366.0645
Tangential Direction:	S23°32'55.9712"W		
Tangential Length:	271.6000		
PC	1623+52.6000 R1	3089686.2857	7021366.0645
PI	1625+79.8791 R1	3089595.4806	7021157.7133
CC		3090999.3856	7020793.7799
PT	1628+03.4000 R1	3089573.6305	7020931.4870
Radius:	1432.3900		
Delta:	18°01'55.4023" Left		
Degree of Curvature(Arc):	04°00'00.0451"		
Length:	450.8000		
Tangent:	227.2791		
Chord:	448.9418		
Middle Ordinate:	17.6978		
External:	17.9192		
Tangent Back Direction:	S23°32'55.9712"W		
Radial Direction:	N66°27'04.0288"W		
Chord Direction:	S14°31'58.2700"W		
Radial Direction:	N84°28'59.4312"W		
Tangent Ahead Direction:	S05°31'00.5688"W		
PT	1628+03.4000 R1	3089573.6305	7020931.4870
PC	1631+60.6000 R1	3089539.2899	7020575.9416
Tangential Direction:	S05°31'00.5688"W		
Tangential Length:	357.2000		
PC	1631+60.6000 R1	3089539.2899	7020575.9416
PI	1633+34.2410 R1	3089522.5964	7020403.1049
CC		3090109.5960	7020520.8583
PT	1634+97.8000 R1	3089604.6588	7020250.0788
Radius:	572.9600		
Delta:	33°43'11.5354" Left		
Degree of Curvature(Arc):	09°59'59.8615"		
Length:	337.2000		
Tangent:	173.6410		
Chord:	332.3547		
Middle Ordinate:	24.6278		
External:	25.7339		
Tangent Back Direction:	S05°31'00.5688"W		
Radial Direction:	N84°28'59.4312"W		
Chord Direction:	S11°20'35.1989"E		
Radial Direction:	S61°47'49.0334"W		
Tangent Ahead Direction:	S28°12'10.9666"E		
PT	1634+97.8000 R1	3089604.6588	7020250.0788
POT	1636+67.5000 R1	3089684.8586	7020100.5259
Tangential Direction:	S28°12'10.9666"E		
Tangential Length:	169.7000		

CL DR1

Alignment name: DR1
Alignment description:

	STATION	X	Y
POT	5+00.0000 R1	3089953.5651	7023138.8356
PC	5+25.3433 R1	3089928.2664	7023137.3321
Tangential Direction:	S86°35'55.9207"W		
Tangential Length:	25.3433		
PC	5+25.3433 R1	3089928.2664	7023137.3321
PI	5+90.8406 R1	3089862.8844	7023133.4464
CC		3089934.1991	7023037.5082
PT	6+41.3160 R1	3089840.3205	7023071.9584
Radius:	100.0000		
Delta:	66°26'50.9702" Left		
Degree of Curvature(Arc):	57°17'44.8062"		
Length:	115.9728		
Tangent:	65.4974		
Chord:	109.5820		
Middle Ordinate:	16.3463		
External:	19.5404		
Tangent Back Direction:	S86°35'55.9207"W		
Radial Direction:	N03°24'04.0793"W		
Chord Direction:	S53°22'30.4356"W		
Radial Direction:	N69°50'55.0495"W		
Tangent Ahead Direction:	S20°09'04.9505"W		

STATE OF TEXAS
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124879
LICENSED
PROFESSIONAL ENGINEER
Adrian Rangel
12/8/2023

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FM 993
AT WEST GREASY CREEK
HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		36
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/7/2023 3:50:26 PM
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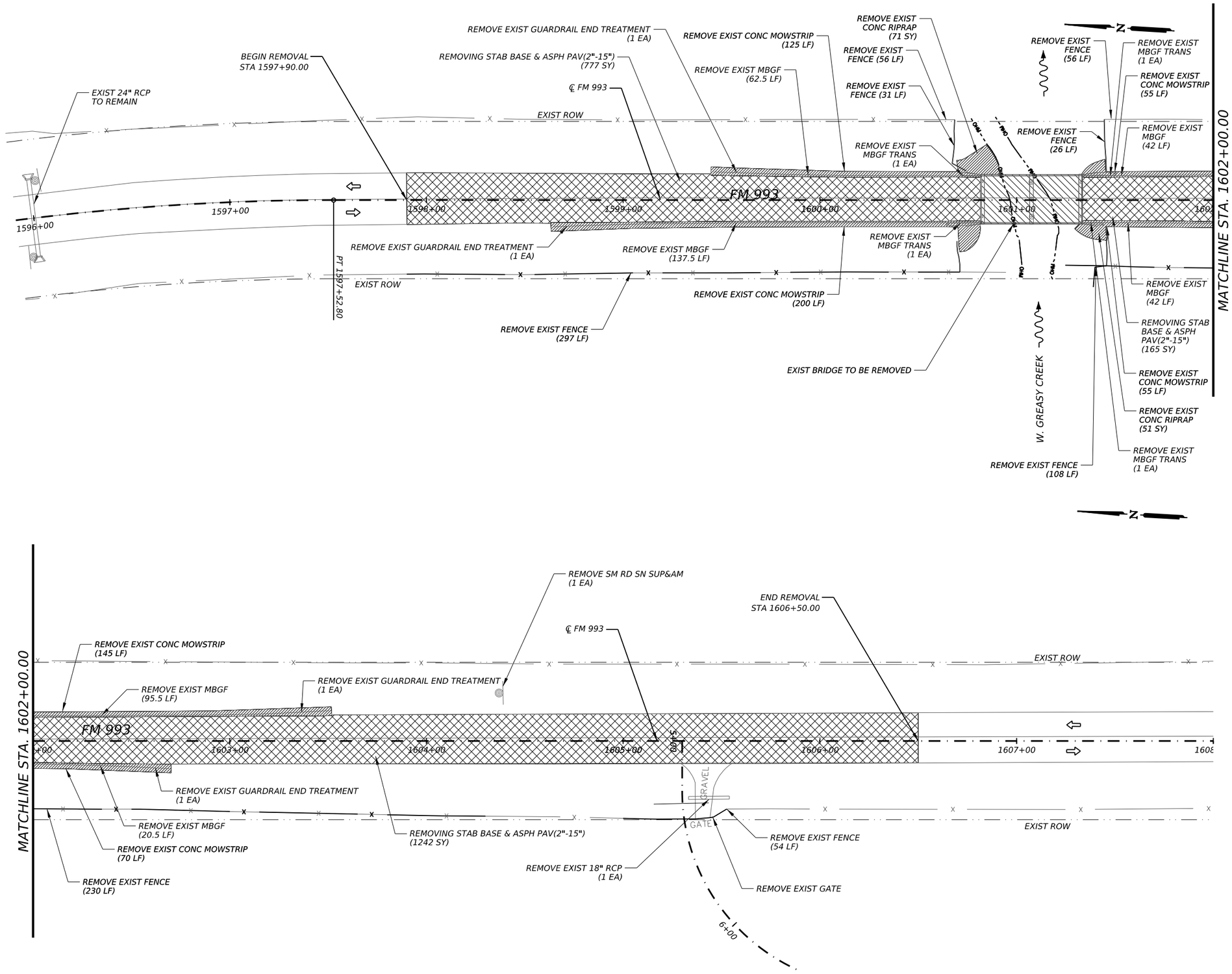

LEGEND:

- REMOV STR (BRIDGE 0 - 99 FT LENGTH)
- REMOVING STAB BASE & ASPH PAV (2"-15")
- REMOVE CONC (RIPRAP)
- REMOVE SMALL SIGN

NOTES:

1. ANY METAL BEAM GUARD FENCE, TERMINAL ANCHOR SECTIONS, OR GUARDRAIL END TREATMENTS REMOVED ARE TO BE RETAINED BY THE CONTRACTOR.
2. PAYMENT FOR SAW CUTS WILL NOT BE MADE DIRECTLY. SAW CUTS WILL BE SUBSIDIARY TO ITEM 105.

0 25' 50'
SCALE: 1" = 50'

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FM 993
AT WEST GREASY CREEK

REMOVAL LAYOUT

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		37
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE:
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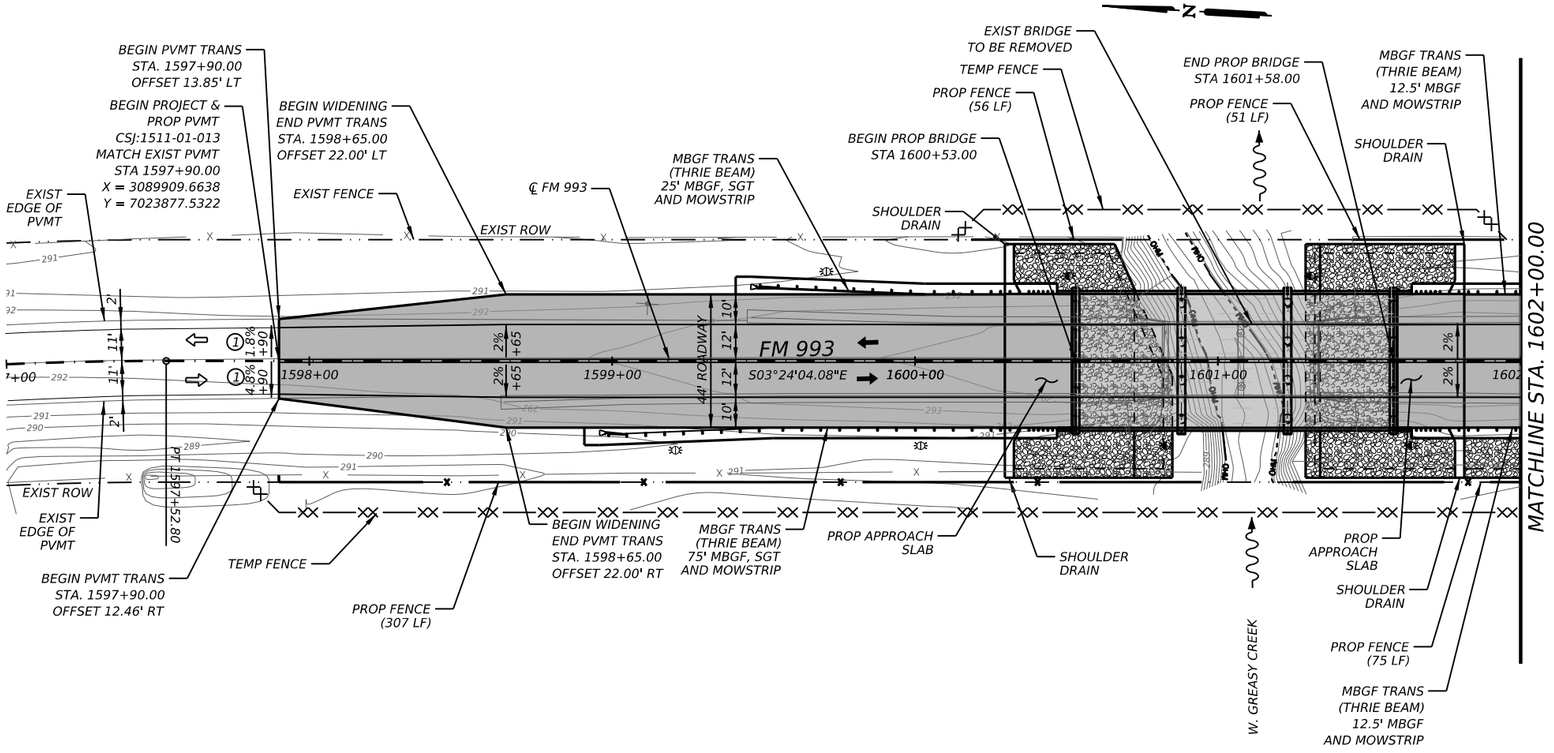


LEGEND:

- EXIST TOPOGRAPHY
- PROPOSED FEATURES
- CENTERLINES AND CONTROL LINES
- EXIST ROW
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- PROP FENCE
- EXIST FENCE
- FLOW ARROW
- OHM — ORDINARY HIGH WATER BOUNDARY
- PROP STONE PROTECTION
- (#) DRIVEWAY NUMBER

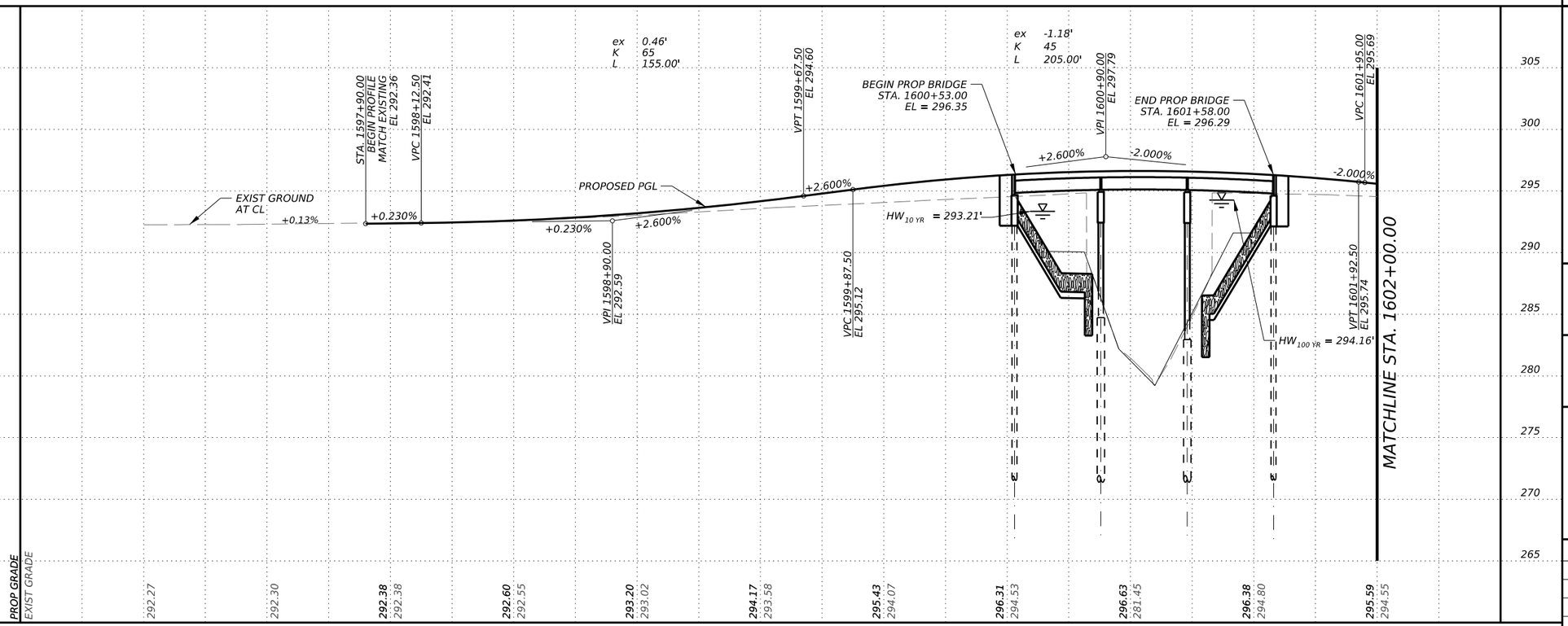
NOTES:

1. CONTRACTOR SHALL INSTALL TEMPORARY FENCE OR USE OTHER METHODS TO ENSURE LIVESTOCK REMAIN ON OWNERS PROPERTY DURING FENCE AND GATE CONSTRUCTION. COST WILL BE SUBSIDIARY TO ITEM 552.
2. REFER TO TYPICAL SECTIONS SHEETS FOR PROPOSED TRANSITION TYPICAL SECTION FROM STA. 1604+50 TO STA. 1606+50.

(1) MATCH EXIST CROSS SLOPE

0 25' 50'

SCALE: 1" = 50' HORZ
1" = 10' VERT



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FM 993
AT WEST GREASY CREEK

PLAN & PROFILE

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		38
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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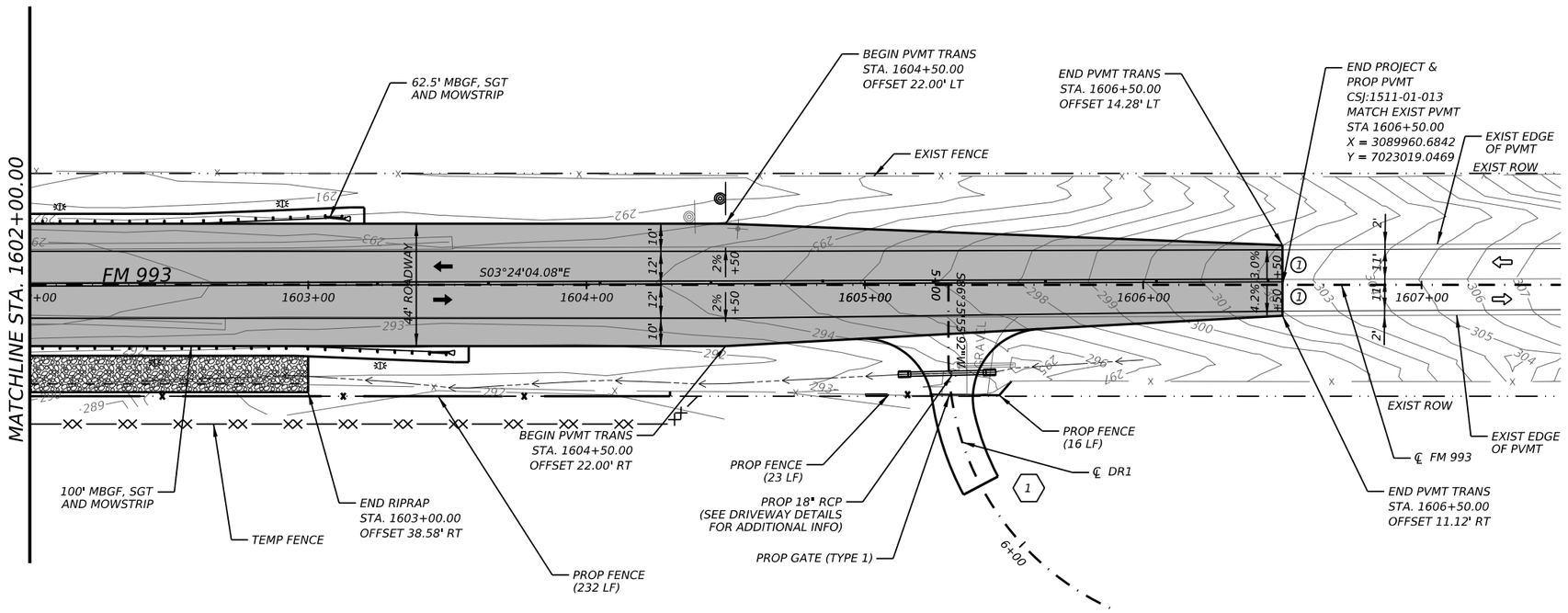


LEGEND:

- EXIST TOPOGRAPHY
- PROPOSED FEATURES
- CENTERLINES AND CONTROL LINES
- EXIST ROW
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- PROP FENCE
- EXIST FENCE
- FLOW ARROW
- OHM — ORDINARY HIGH WATER BOUNDARY
- PROP STONE PROTECTION
- # — DRIVEWAY NUMBER

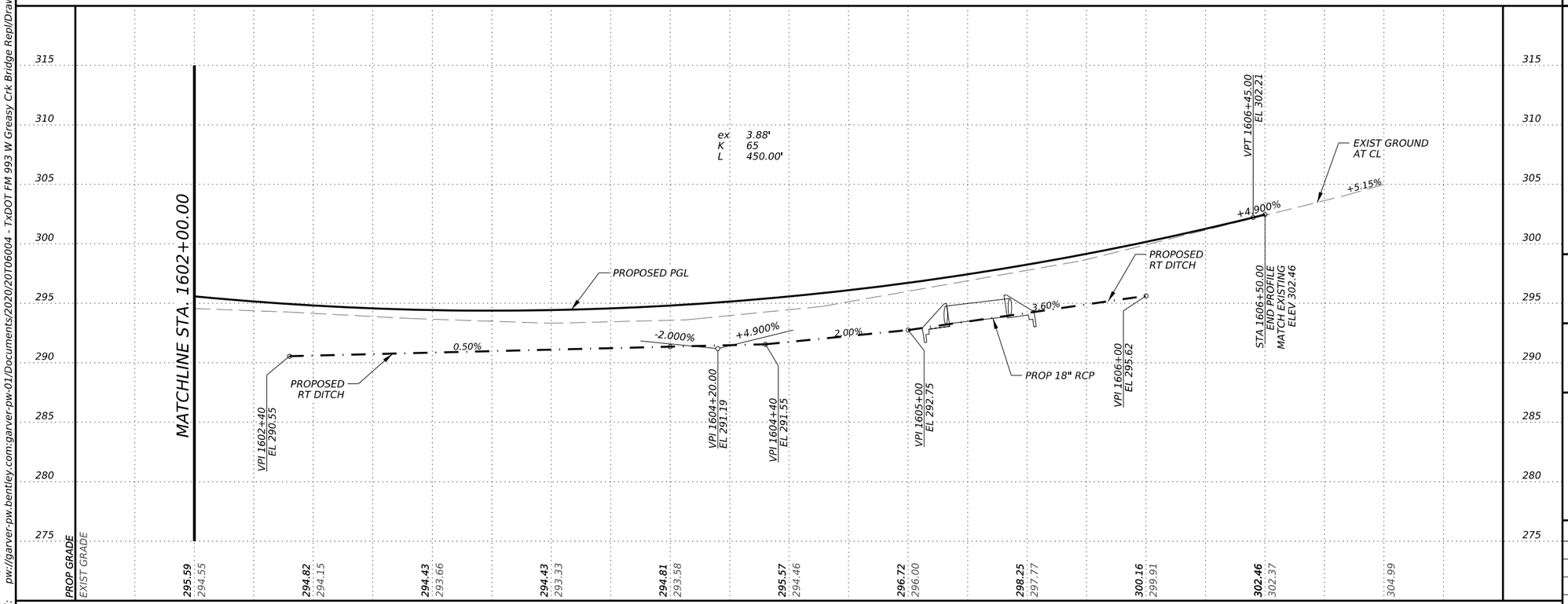
NOTES:

1. CONTRACTOR SHALL INSTALL TEMPORARY FENCE OR USE OTHER METHODS TO ENSURE LIVESTOCK REMAIN ON OWNERS PROPERTY DURING FENCE AND GATE CONSTRUCTION. COST WILL BE SUBSIDIARY TO ITEM 552.
2. REFER TO TYPICAL SECTIONS SHEETS FOR PROPOSED TRANSITION TYPICAL SECTION FROM STA. 1604+50 TO STA. 1606+50.

① MATCH EXIST CROSS SLOPE

0 25' 50'

SCALE: 1" = 50' HORZ
1" = 10' VERT



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FM 993
AT WEST GREASY CREEK

PLAN & PROFILE

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		39
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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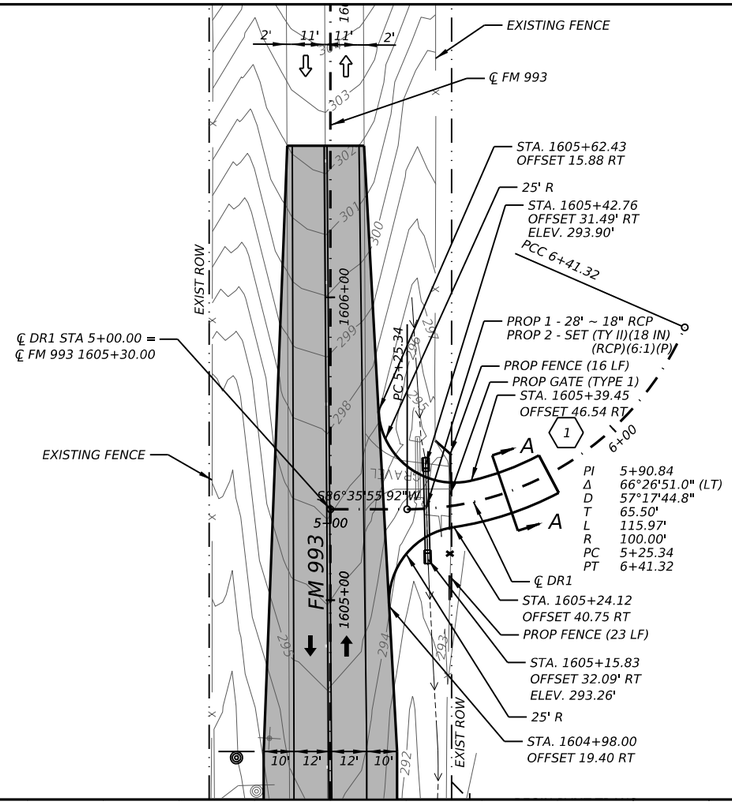
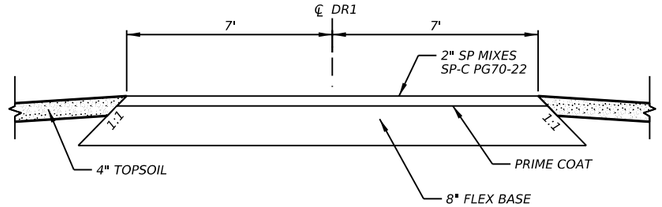




SECTION A-A

ASPHALT DRIVEWAY
N.T.S.

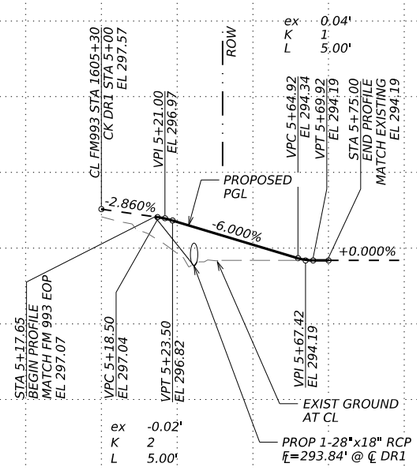
LEGEND:

- EXIST TOPOGRAPHY
- PROPOSED FEATURES
- CENTERLINES AND CONTROL LINES
- EXIST ROW
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC
- PROP FENCE
- EXIST FENCE
- FLOW ARROW
- OHM — ORDINARY HIGH WATER BOUNDARY
- PROP STONE PROTECTION
- # — DRIVEWAY NUMBER

0 25' 50'

SCALE: 1" = 50' HORZ
1" = 10' VERT

DRIVEWAY 1



315 310 305 300 295 290 285 280 275

PROP GRADE
EXIST GRADE

297.57 297.06 295.23 294.19 294.19

5+00

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FM 993
AT WEST GREASY CREEK

DRIVEWAY DETAILS

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		40
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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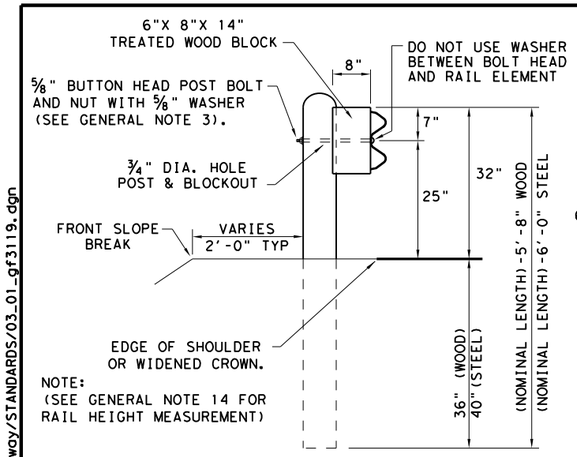
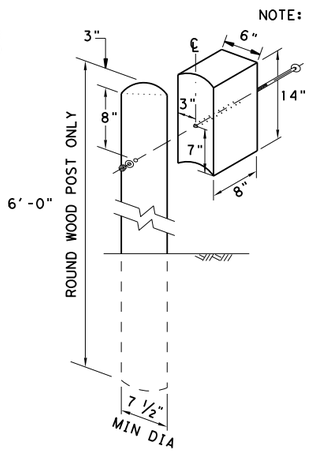


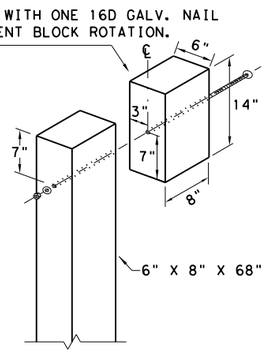
NOTE:
(SEE GENERAL NOTE 14 FOR
RAIL HEIGHT MEASUREMENT)

TYPICAL POST PLACEMENT

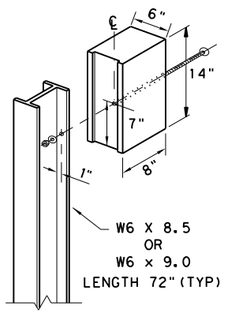


**WOOD BLOCK TO
ROUND WOOD POST**

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

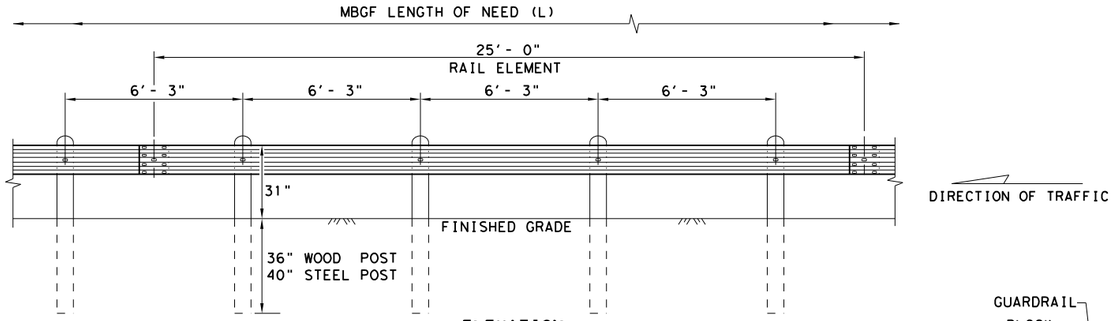


**WOOD BLOCK TO
RECTANGULAR WOOD POST**



**ROUTED WOOD BLOCK
TO I-BEAM STEEL POST**

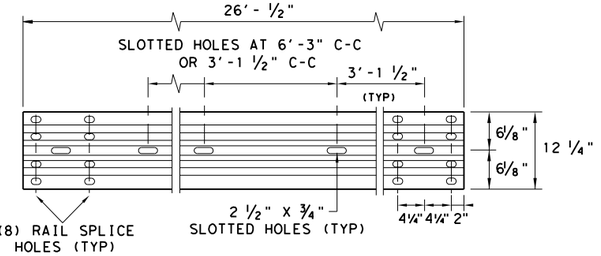
NOTE: ** "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



DIRECTION OF TRAFFIC

**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.

SPLICE BOLT LENGTH → VARIES

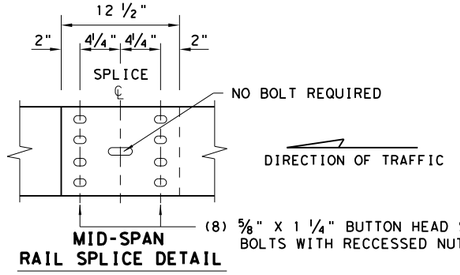
FBB01 = 1 ¼"
FBB02 = 2"

⅝"

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

BUTTON HEAD BOLT

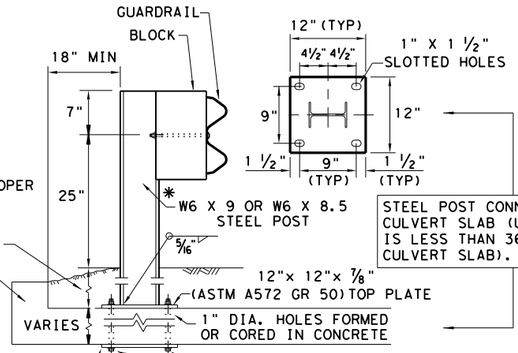
NOTE: SEE GENERAL NOTE 3 FOR SPLICE & POST BOLT DETAILS.



DIRECTION OF TRAFFIC

**MID-SPAN
RAIL SPLICE DETAIL**

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



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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		41

DATE: 12/7/2023
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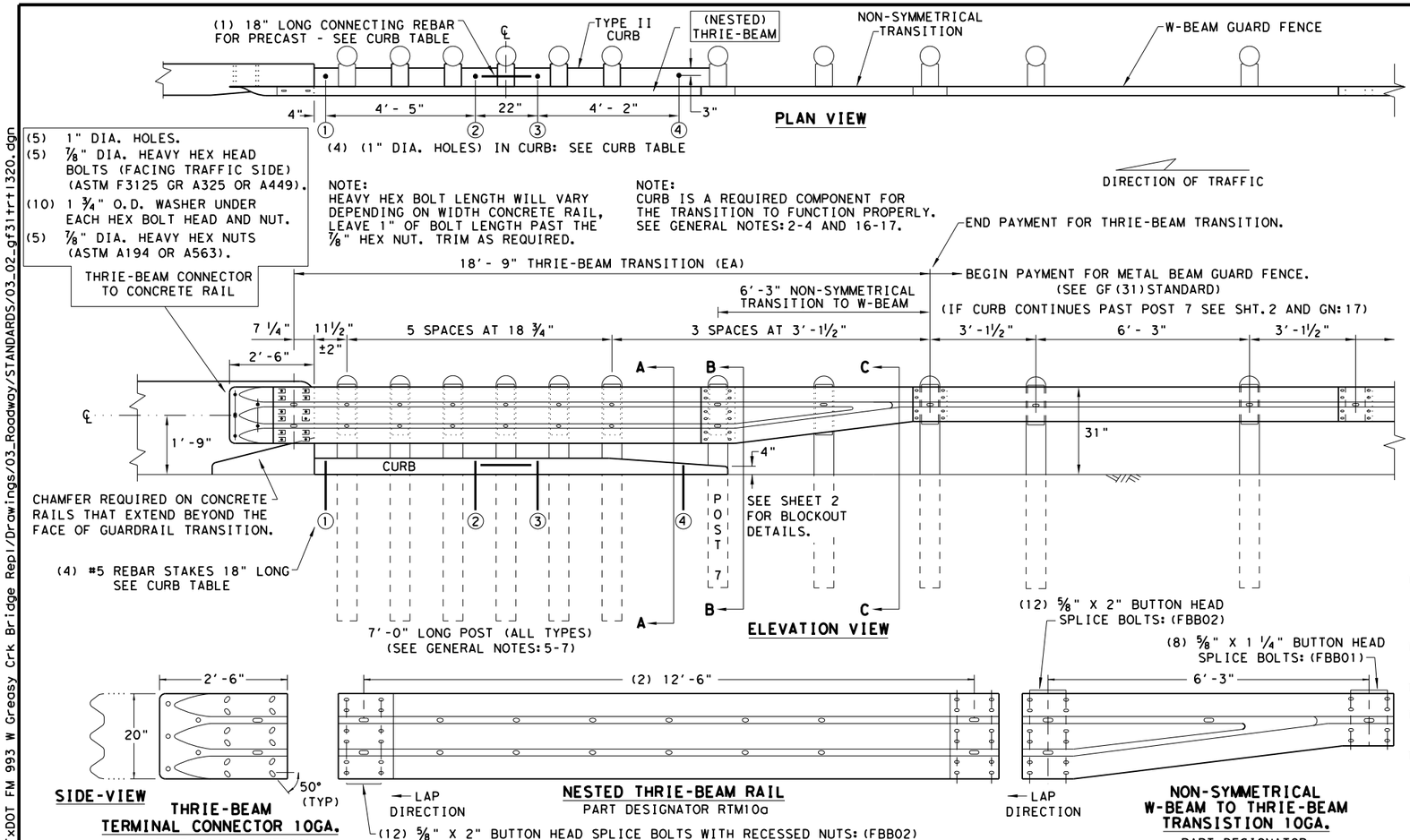
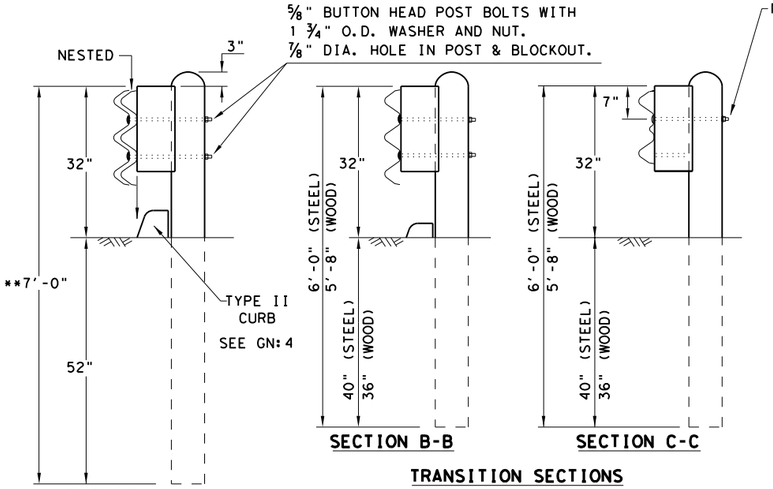
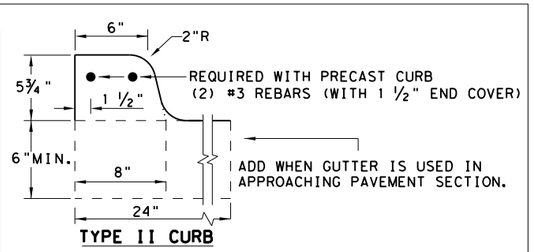




THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8" CURB (2) LENGTH 6'- 6" TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2): FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB END. USE (1) #5 GR.60 REBAR 18" LONG TO CONNECT BOTH CURBS.
SECURING PRECAST OR CAST-IN-PLACE TO FINISHED GRADE *: FORM OR CORE (4) 1" DIA. HOLES, SEE PLAN AND ELEVATION VIEWS FOR HOLE LOCATIONS. DRIVE (4) #5 GR.60 REBAR STAKES 18" LONG INTO THE GROUND AND ½" BELOW TOP OF CURB. FILL HOLES WITH APPROVED GROUT MIXTURE.



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

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

TYPE II CURB DETAILS

GENERAL NOTES

1. CONTACT THE DESIGN DIVISION FOR DRAINAGE CUT OUT OPTIONS NEEDED WITHIN THE CURB SECTION OF THE THRIE-BEAM TRANSITION. (512) 416-2678
2. CONCRETE CURB MAY BE CAST-IN-PLACE OR PRECAST AS SHOWN ON THIS SHEET. WHEN USED IN CONJUNCTION WITH THE THRIE-BEAM TRANSITIONS, CURB SHALL BE TYPE II (5- ¾" HEIGHT); SEE CURRENT CCCG STANDARD SHEET FOR FURTHER DETAILS. IF OTHER CURB HEIGHTS ARE SHOWN IN THE PLANS IN CONJUNCTION WITH THE TRANSITION, THE CURB HEIGHT MAY BE FROM 4" TO 8" WITH A RELATIVELY VERTICAL FACE. CONCRETE CURB SHALL BE CONTINUOUS TO THE SEVENTH POST UNLESS OTHERWISE SHOWN IN THE PLANS. SEE GENERAL NOTE: 17 FOR CIRCUMSTANCES WHERE CURB CONTINUES PAST POST 7.
3. CONCRETE CURB TYPE II SUBSIDIARY TO "METAL BEAM GUARD FENCE TRANSITION". IF NO ADDITIONAL CURB IS INDICATED BEYOND THE TRANSITION, THEN ANY CURB HEIGHT GREATER THAN 4" WILL BE TAPERED DOWN BEGINNING AT THE LAST 7 FT. POST TO A MAXIMUM HEIGHT OF 4" AT POST 7. IF SHOWN ELSEWHERE IN THE PLANS, ADDITIONAL CURB UNDERNEATH GUARDRAIL WILL BE PAID FOR BY THE LINEAR FOOT.
4. UNLESS OTHERWISE SHOWN IN THE PLANS, TRANSITIONS SHALL BE PLACED WITH THE BLOCKOUT FACE IN FRONT OF OR DIRECTLY ABOVE THE CURB FACE. SEE SECTION A-A.
5. FOR ROUND WOOD POST SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE THRIE-BEAM TRANSITION.
6. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. REFER TO GF(31) STANDARD SHEET.
7. THE POST LENGTH SHALL BE MARKED ON ALL 7'- 0" LONG POSTS BY THE MANUFACTURER. THE MARK SHALL BE LOCATED WITHIN THE TOP 1 FT. REGION OF THE POST, AT LEAST ⅝" IN HEIGHT, AND VISIBLE AFTER INSTALLATION. WOODEN POSTS SHALL BE MARKED WITH A BRAND, AND STEEL POSTS WITH A STENCIL BEFORE GALVANIZING.
8. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
9. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE THRIE-BEAM TERMINAL CONNECTOR AND THE THRIE-BEAM TRANSITION TO W-BEAM SHALL BE OF THE SAME MATERIAL, BUT SHALL NOT BE LESS THAN 10 GAUGE. CONTRACTOR SHALL VERIFY THAT THE LOCATIONS OF BOLT HOLES MATCH THOSE IN THE THRIE-BEAM TERMINAL CONNECTOR PRIOR TO ORDERING MATERIALS.
10. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
11. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
12. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
13. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
14. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. TXDOT'S MATERIALS AND TESTS DIVISION MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
15. REFER TO GF(31) STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
16. THE INSTALLATION OF THE TYPE II CURB IS CRITICAL FOR THE PERFORMANCE OF THE THRIE-BEAM TRANSITION SYSTEM. THE CURB PREVENTS (VEHICLE WHEEL SNAGGING) AT THE CONCRETE RAIL AND IS REQUIRED TO MEET MASH CRASH TEST CRITERIA.
17. IF CURB EXTENDS BEYOND POST 7, 25' OF NESTED W-BEAM GUARDRAIL SHALL BE INSTALLED BEYOND THE PAY LIMITS OF THRIE-BEAM TRANSITION SECTION, (SEE SHT.2). PAYMENT FOR THIS 25' SECTION WILL BE BY LINEAR FOOT, PAY ITEM "0540 6XXX MTL W-BEAM GD FEN (NESTED)(TIM POST)" OR "540 6XXX MTL W-BEAM GD FEN (NESTED)(STEEL POST)" AS APPLICABLE FOR POST TYPE. SEE SHT.2 FOR ADDITIONAL INFORMATION.

HIGH-SPEED TRANSITION

Texas Department of Transportation | Design Division Standard

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

GF(31)TR TL3-20

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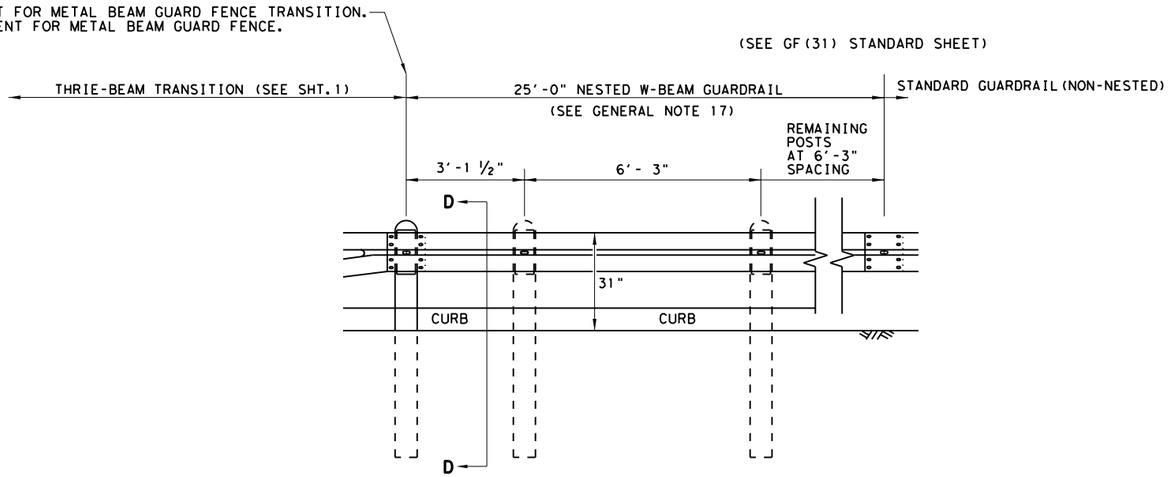
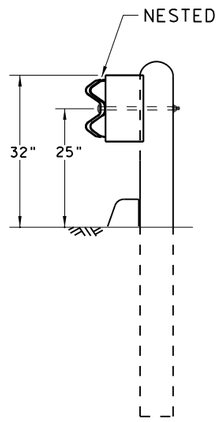
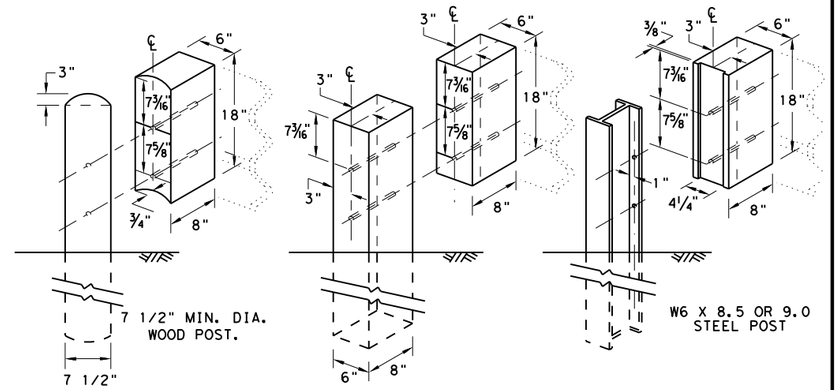
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation — Design Division Standard

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

GF(31)TR TL3-20

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©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
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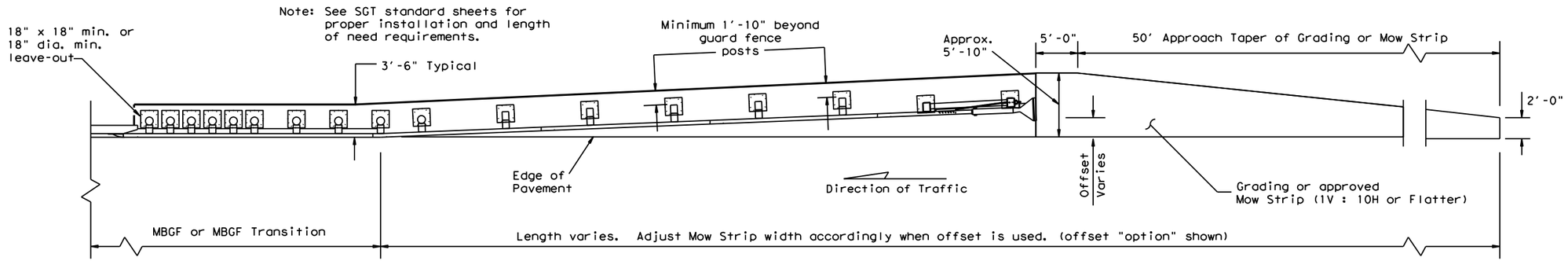
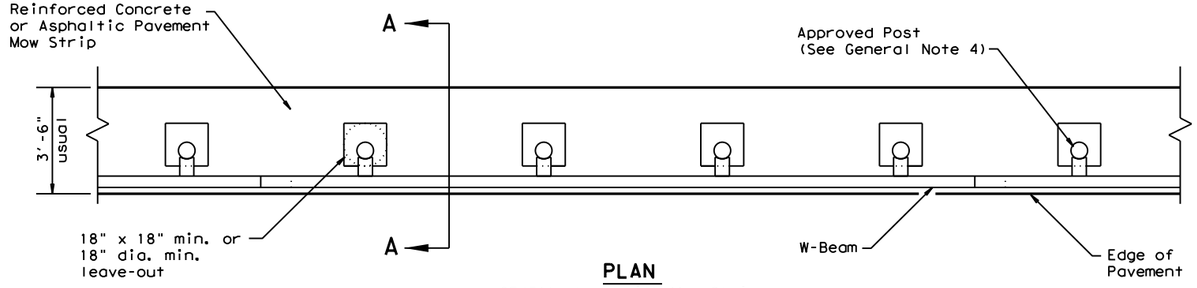
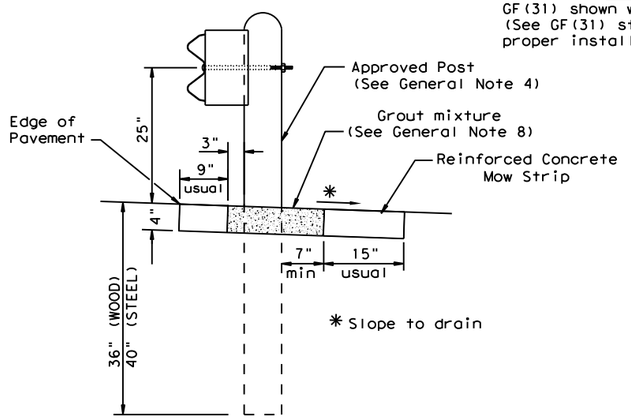


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



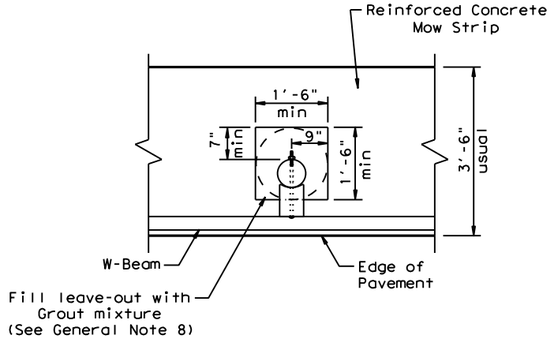
PLAN

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



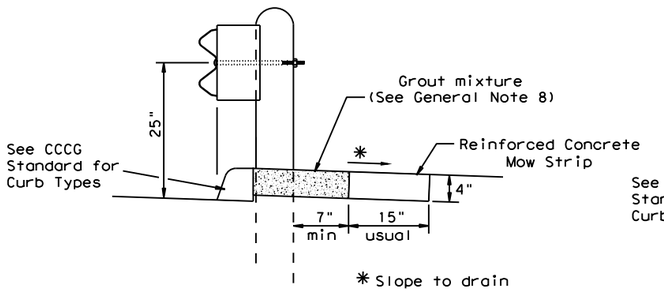
SECTION A-A

Typical



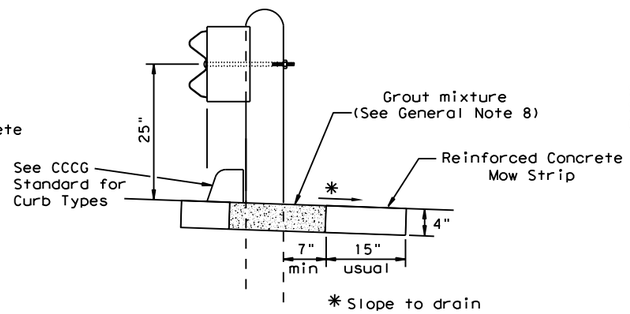
MOW STRIP DETAIL

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



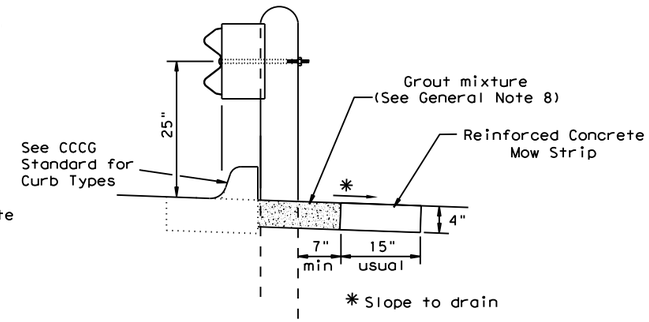
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.

Approach grading or mow strip may be decreased or eliminated, as directed by the Engineer.

GENERAL NOTES

1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments. See applicable GF(31) MBGF or GF(31) Transition Standard sheet for additional information.
2. Mow strips shall be reinforced concrete with (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item. Reinforced concrete shall be placed in accordance with Item 432, "Riprap." The use of the synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Material Producer List (MPL), maintained by TxDOT, Construction Division.
3. The leave-out behind the post shall be a minimum of 7".
4. Only steel (W6 x 8.5 or W6 x 9.0), or 7 ½" Dia. round wood posts are acceptable for use in the mow strip. See GF(31) Standard for additional details.
5. Other curb placement options may be used. Curbs are not considered part of the mow strip and will be paid for under other pertinent bid item.
6. Thickness of the mow strip will be 4".
7. The limits of payment for reinforced concrete will include leave-outs for the posts.
8. The leave-outs shall be filled with a Grout mixture consisting of: 2719 pounds sand, 188 pounds Type 1 or II cement, and 550 pounds of water per cubic yard, with a 28-day compressive strength of approximately 230 psi or less. Provide grout with a consistency that will flow into and completely fill all voids. Due to auger size, larger leave-out dimensions are acceptable from both an impact performance and maintenance repair standpoint (Suggested Maximum leave-out of 20"). Payment for furnishing and placing the grout mixture will be subsidiary to the pay item of riprap mow strip.

Texas Department of Transportation

Design Division Standard

METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG		
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB		HIGHWAY	
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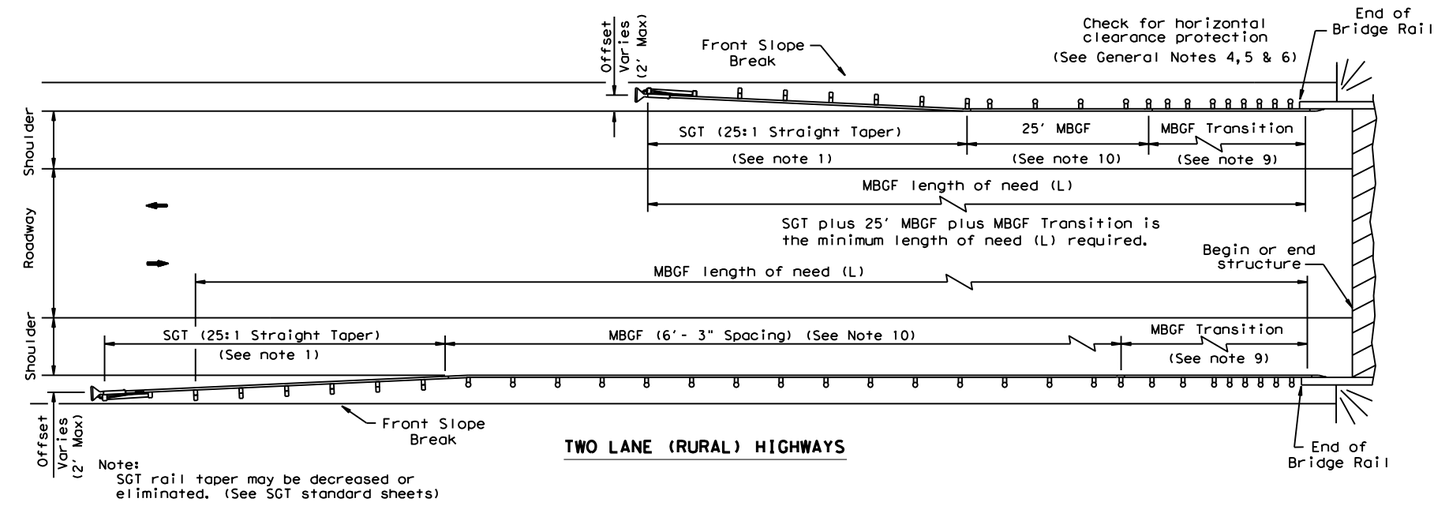
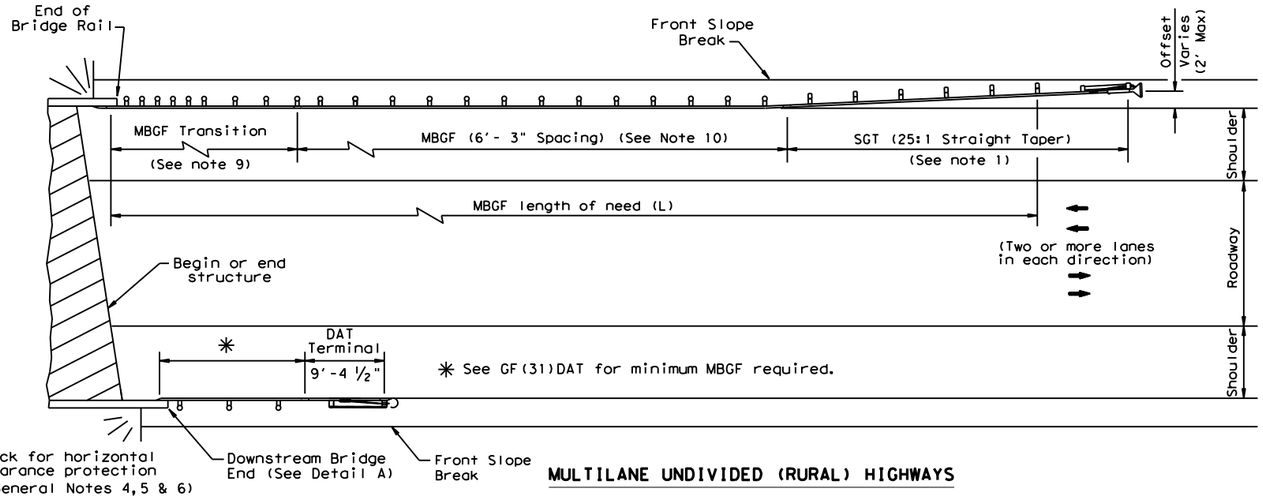
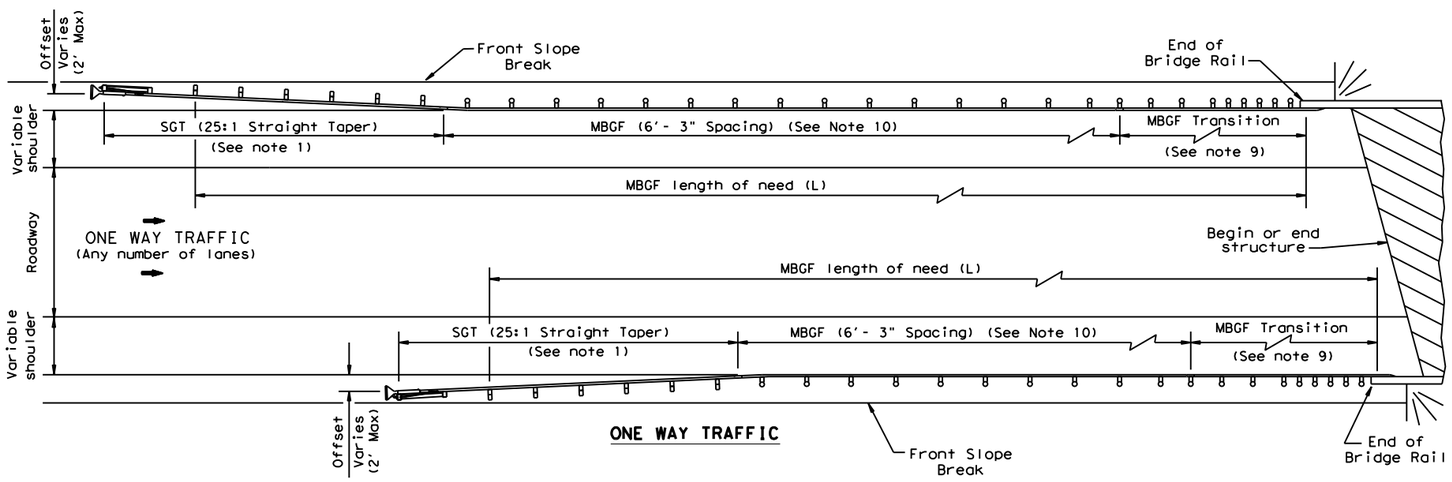


TWO LANE (RURAL) HIGHWAYS

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



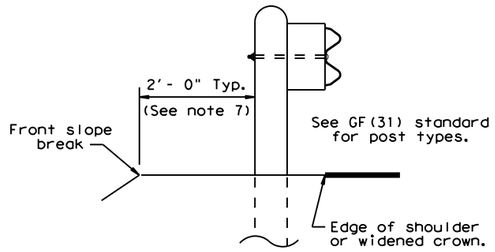
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



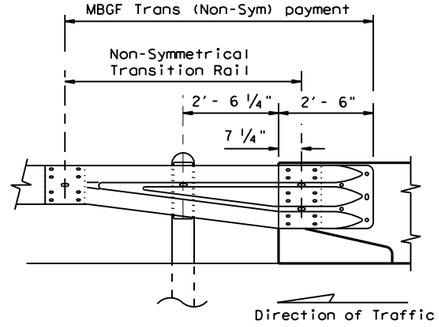
ONE WAY TRAFFIC

GENERAL NOTES

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



TYPICAL CROSS SECTION AT MBGF



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

DETAIL A

Showing Downstream Rail Attachment

Texas Department of Transportation

Design Division Standard

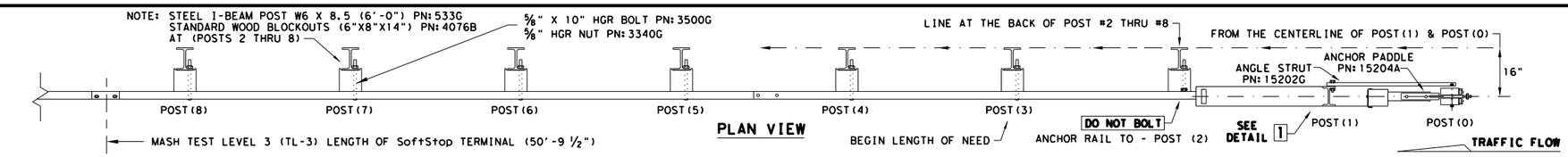
BRIDGE END DETAILS

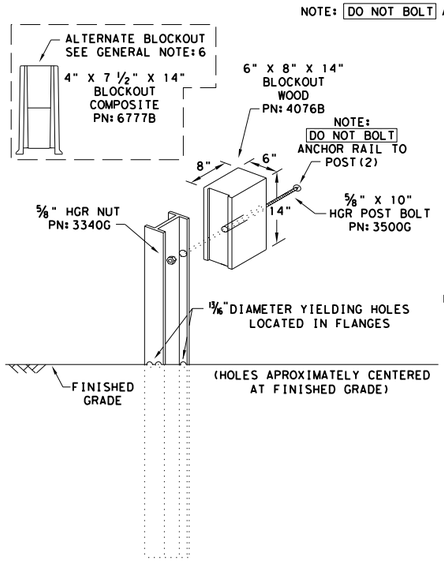
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL
© TxDOT: December 2011	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		45

DATE: 12/7/2023
FILE: dw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20106004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/03_Roadway/STANDARDS/03_05_sgt10s3116.dgn

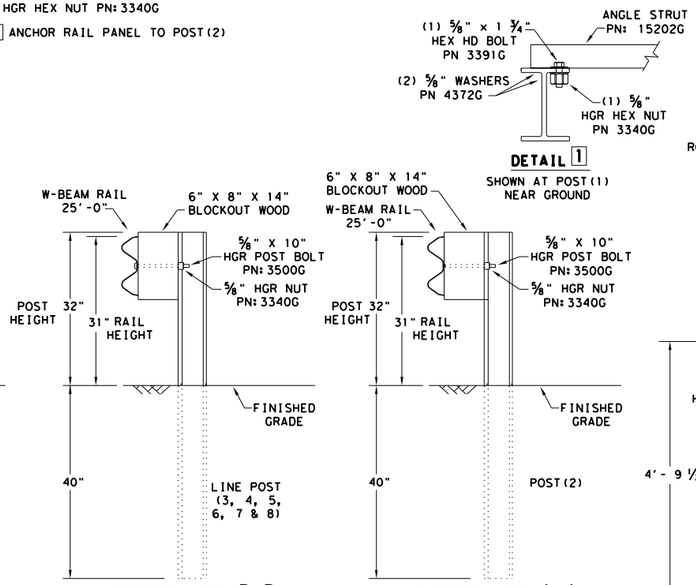




ISOMETRIC VIEW POST(1 & 2)

W6 X 8.5 I-BEAM POST SHOWING STANDARD WOOD BLOCKOUT

NOTE: NO BLOCKOUT INSTALLED AT POST(1)



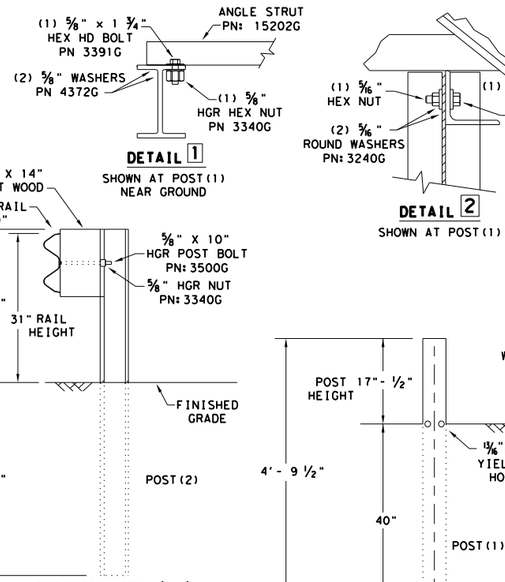
SECTION VIEW B-B

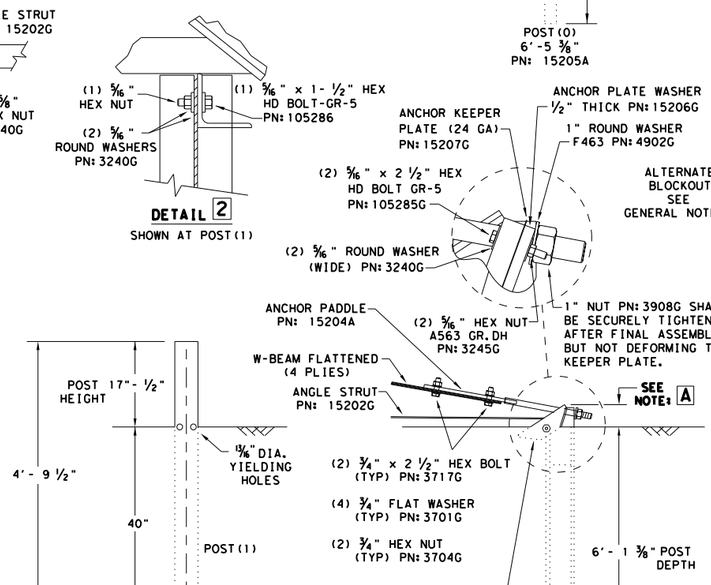
6'-0" (W6 X 8.5)
I-BEAM POST PN: 533G

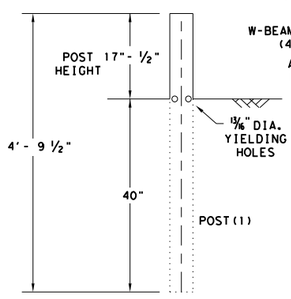
SECTION VIEW A-A

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

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







FRONT VIEW POST(1)

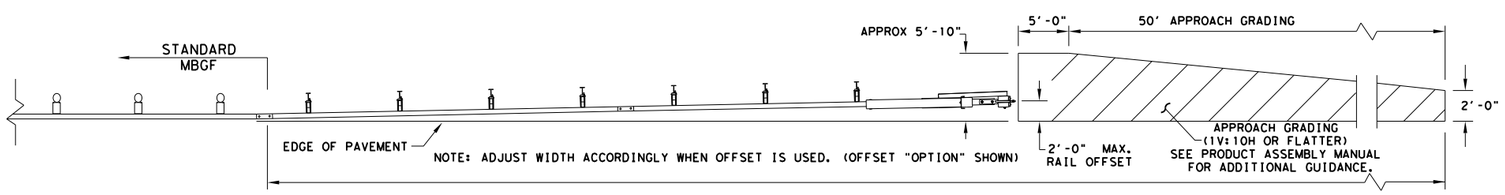
4'-9 1/2" (W6 X 8.5)
(SYTP) I-BEAM POST PN: 15203G

NOTE: NO BLOCKOUT INSTALLED AT POST(1)

DETAIL 3 AT POST(0)

6'-5 3/8" (W6 X 15)
I-BEAM POST PN: 15205A

TRAFFIC FLOW



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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 3-3/4" 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 7/8")
15203G	1	POST #1 - (SYTP) (4'- 9 1/2")
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 1/2" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" 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	3/4" x 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	5/8" x 1 1/4" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	5/8" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	5/8" x 10" HGR POST BOLT A307
3391G	1	5/8" x 1 3/4" HEX HD BOLT A325
4489G	1	5/8" x 9" HEX HD BOLT A325
4372G	4	5/8" WASHER F436
105285G	2	5/8" x 2 1/2" HEX HD BOLT GR-5
105286G	1	5/8" x 1 1/2" HEX HD BOLT GR-5
3240G	6	5/8" ROUND WASHER (WIDE)
3245G	3	5/8" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B

Texas Department of Transportation

Design Division Standard

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

FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1511	01	013	FM 993	
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	ATL	UPSHUR		46	

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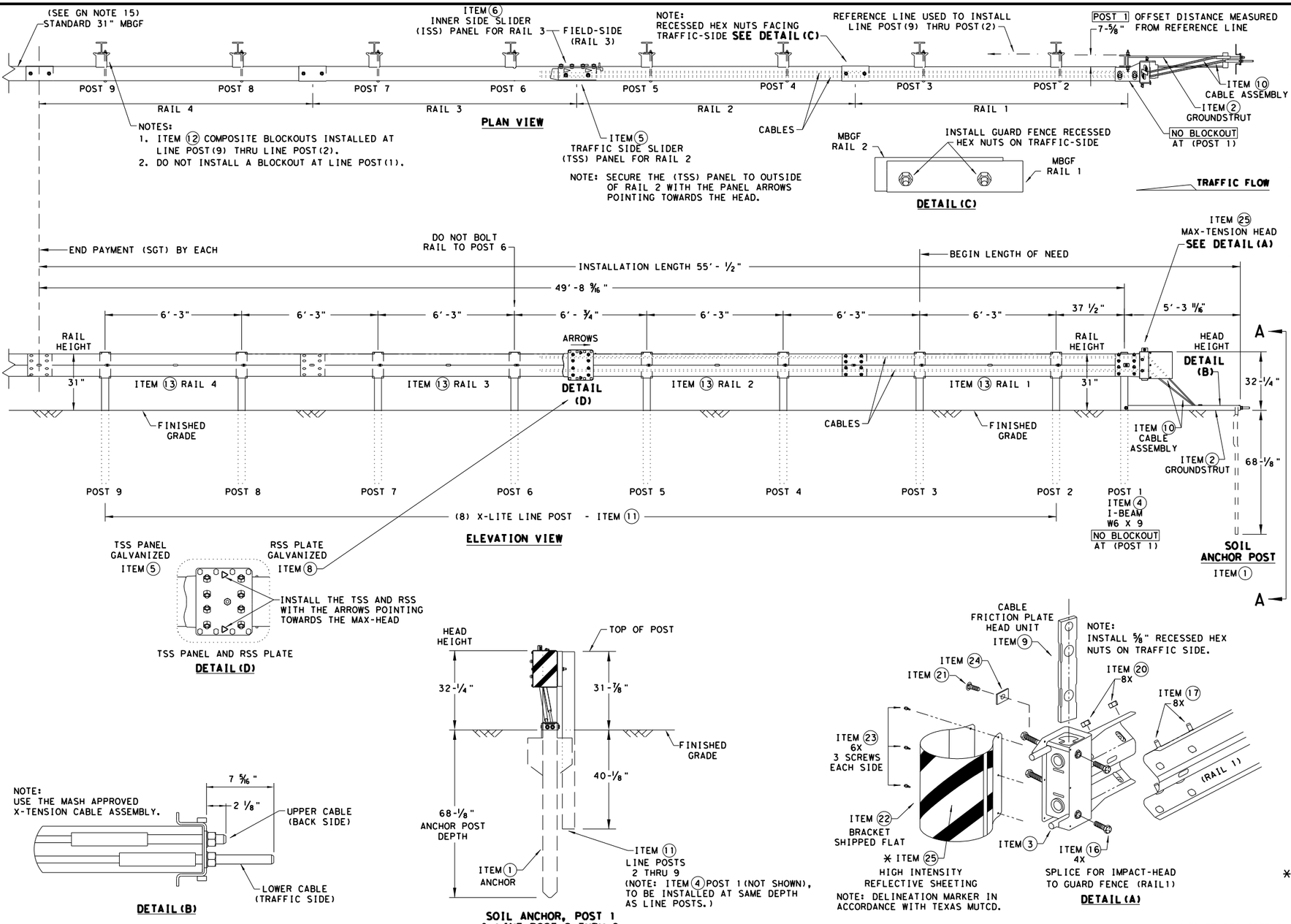

GENERAL NOTES

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

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT.-GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1012078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	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:
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
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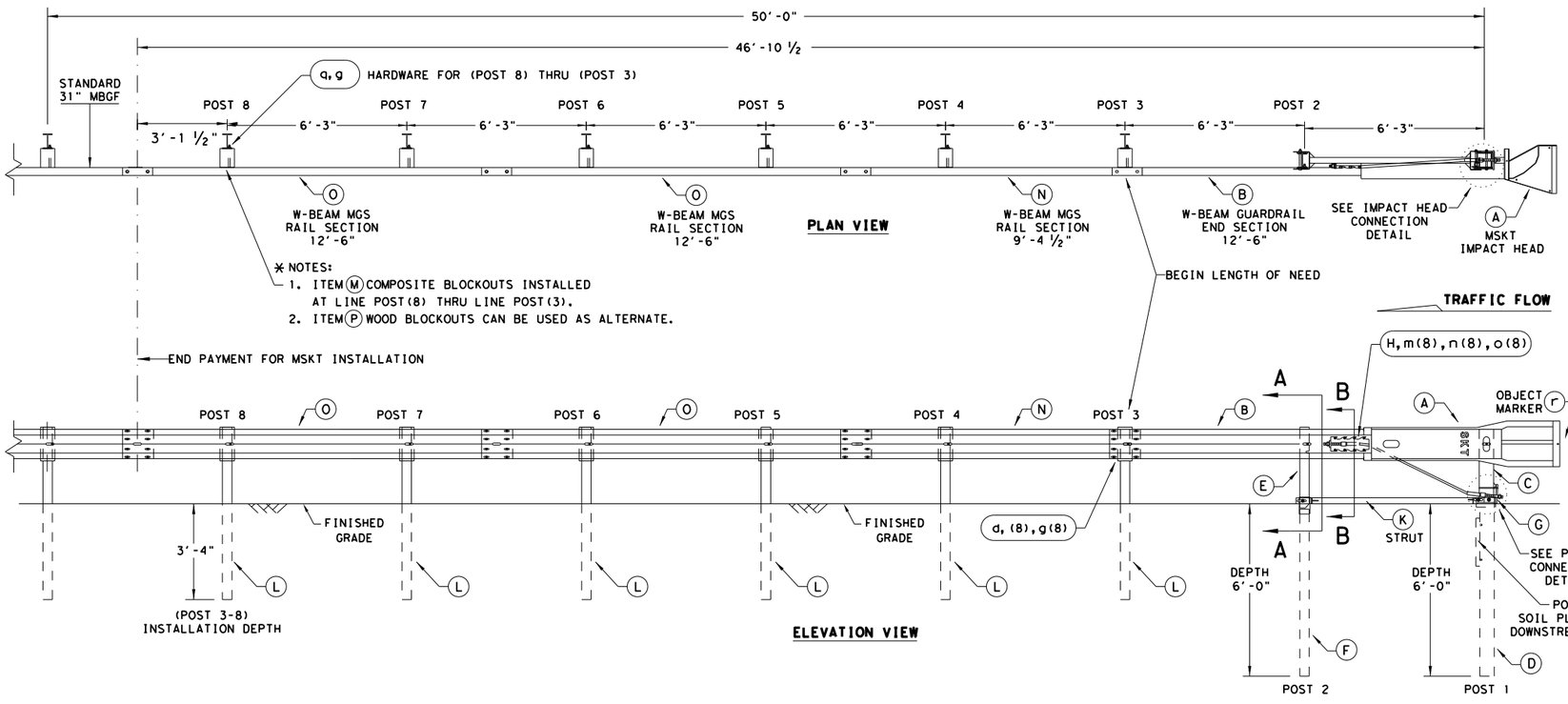
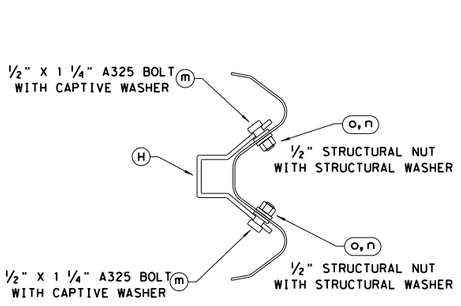
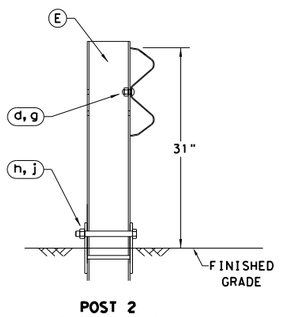
	ATL	UPSHUR		47

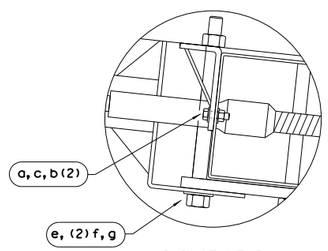
DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/03_Roadway/STANDARDS/03_07_sgt12s3118.dgn

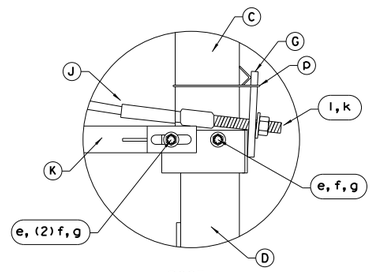


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.



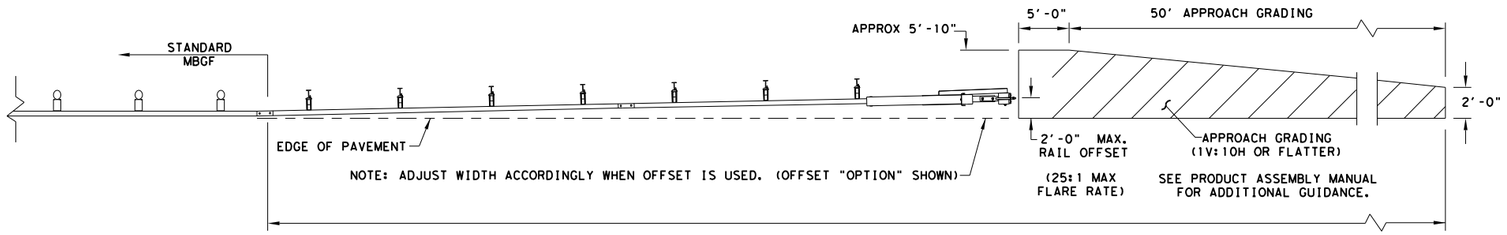






SEE NOTES: *

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



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

GENERAL NOTES

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

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

Texas Department of Transportation

Design Division Standard

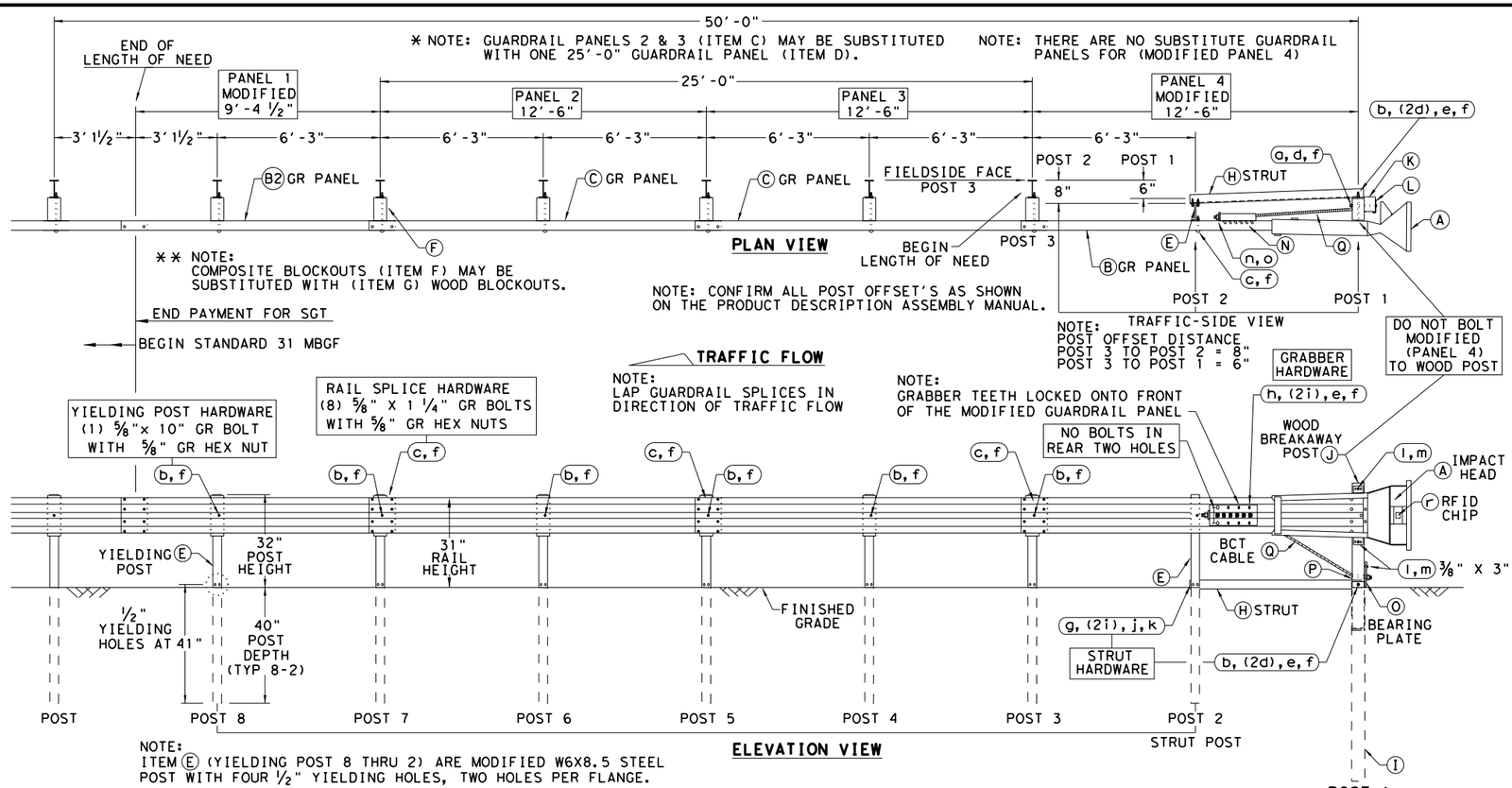
SINGLE GUARDRAIL TERMINAL

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	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		48

DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greosy Crk Bridge Repl/Drawings/03_Roadway/STANDARDS/03_08_sgt153120.dgn

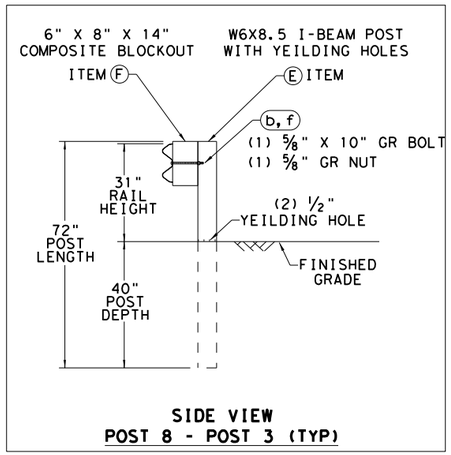


GENERAL NOTES

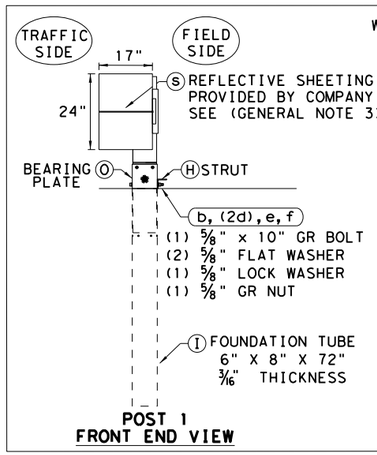
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S; SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

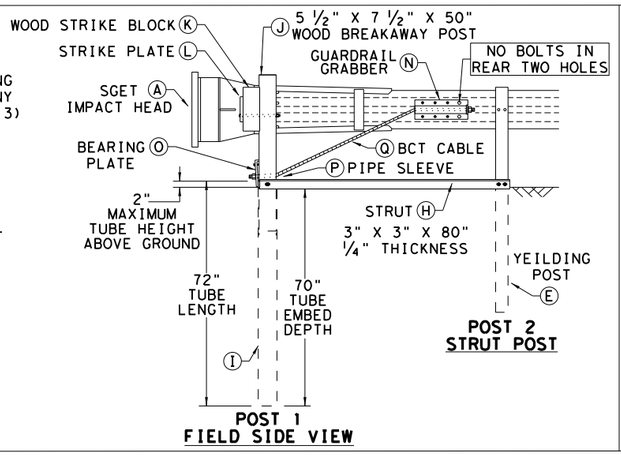
* ALTERNATIVE ITEMS
** NOTE: SEE PLAN VIEW



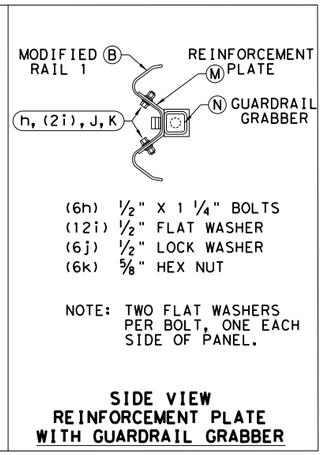
SIDE VIEW
POST 8 - POST 3 (TYP)



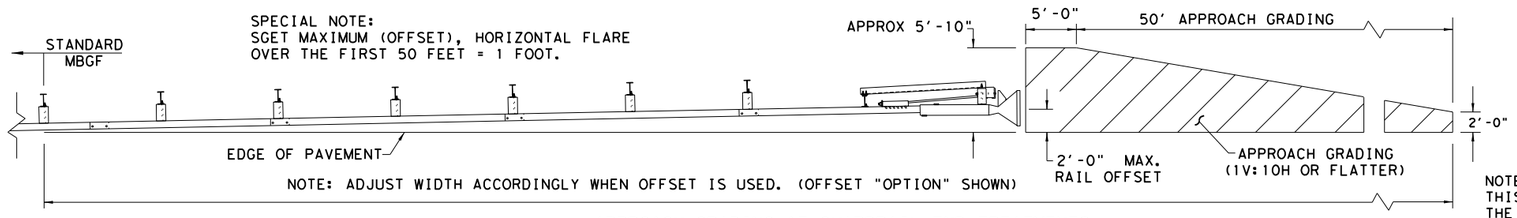
POST 1
FRONT END VIEW



POST 1
FIELD SIDE VIEW



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

Texas Department of Transportation
Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		49

DATE: 12/7/2023
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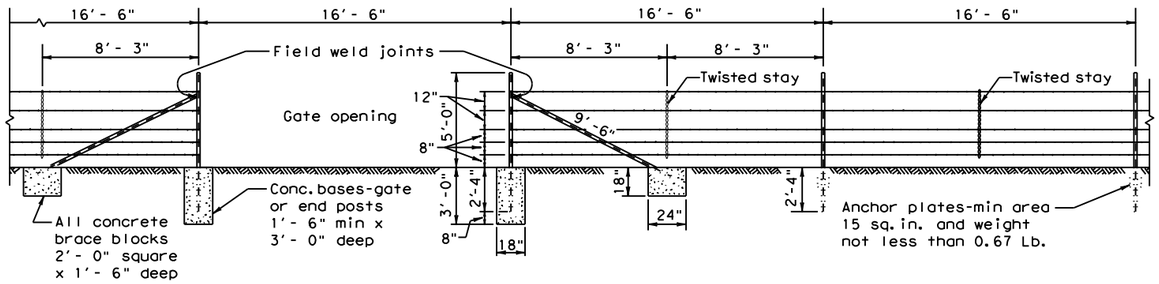


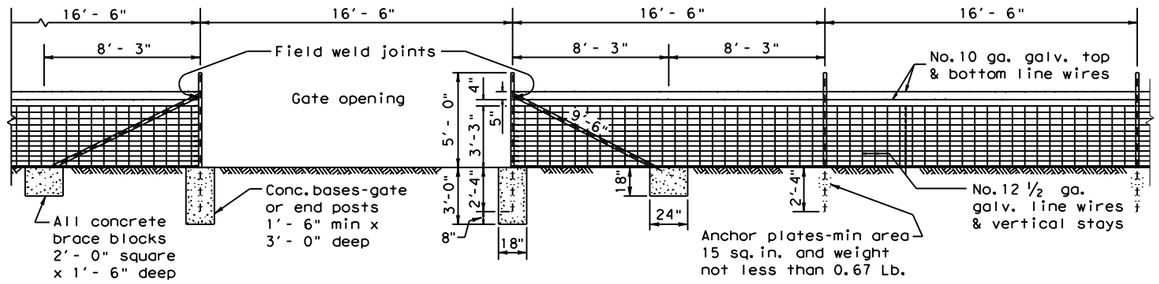
SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS

BRACING DETAIL USED AT ENDS AND GATES

TYPE "C" FENCE

(See General Note 8)

Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)

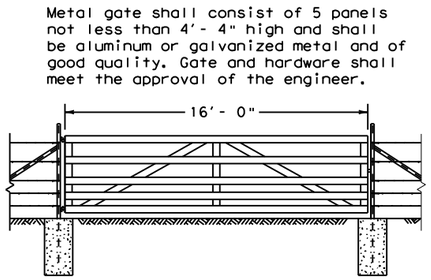


SECTION GALVANIZED WOVEN WIRE FENCE WITH METAL POSTS

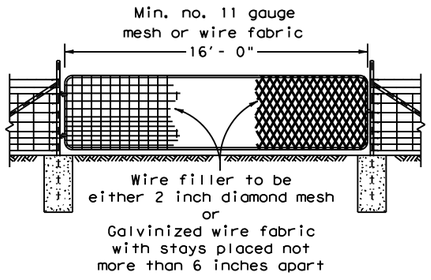
BRACING DETAIL USED AT ENDS AND GATES

TYPE "D" FENCE

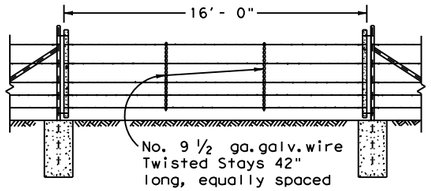
(See General Note 8)



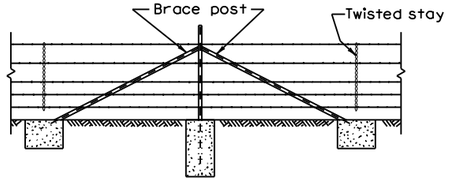
DETAIL TYPE 1 GATE



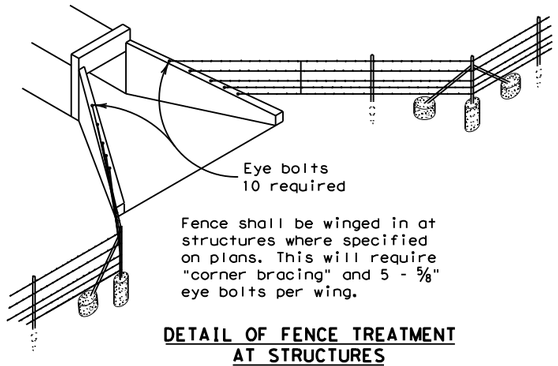
DETAIL TYPE 2 GATE



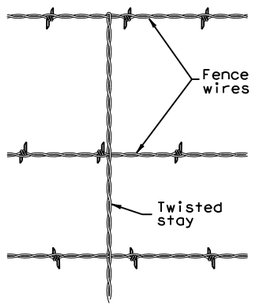
DETAIL TYPE 3 GATE



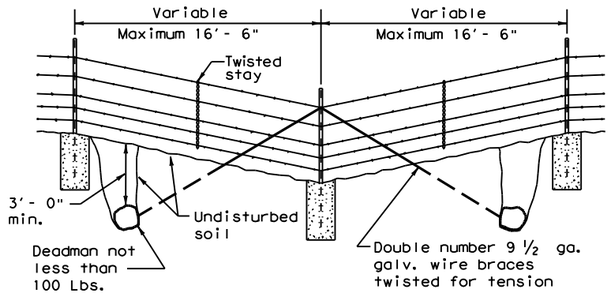
CORNER OR PULL POST ASSEMBLY



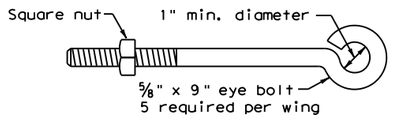
DETAIL OF FENCE TREATMENT AT STRUCTURES



DETAIL OF STAY
(Barbed Wire Fence)



DETAIL OF FENCE SAG



DETAIL OF EYE BOLT

GENERAL NOTES

1. Any high point which interferes with the placing of wire mesh shall be excavated to provide a 2 inch clearance.
2. Latches for Type 1 and Type 2 gates shall be good commercial quality and design latch of the spring, fork or chain type. All latches shall be suitable to the gate and shall be approved by the Engineer.
3. Hinges for Type 2 gates shall be a commercial design approved by the Engineer suitable for post and gate.
4. Concrete shall be of the design and consistency approved by the Engineer and shall contain not less than 4 sacks of cement per cubic yard. Concrete footings are to be crowned at the top to shed water.
5. Steel anchor plates shall be of a design and thickness sufficient to prevent turning of the post in firm soil.
6. Steel pipe end posts, corner and pull posts shall be a minimum of 2" Std. pipe (2.375" O.D., 0.154" wall thickness) with a 1¼" Std. pipe brace (1.660" O.D., 0.140" wall thickness), with a 2"x2"x1/4" angle, or other as approved by the Engineer. Fasteners for securing barbed wire or woven wire fence to metal posts shall be a minimum of 11 gauge galvanized steel wire. Tubular posts shall be fitted with water malleable iron caps.
7. If Steel pipe is used for posts and braces, use standard pipe in accordance with ASTM A 53, Class B or A 501. For T-Posts use steel that meets ASTM A 702. Metal line posts shall be not less than 6'-6" in length and shall weigh not less than (1.33 lbs./lin.ft.). These Items shall be in accordance with Item 552, "Wire Fence."
8. Barbed Wire shall be in accordance with ASTM A 121, Class 1 Design designation 12-2-4-1 4R or 12-2-5-1 4R, or as approved by the Engineer.

   Woven Wire Fence (Type D) shall be in accordance with ASTM A 116, Class 1 No. 12-1/2 Grade 60 (See Table 1 ASTM A 116) to the height and design shown on the plans, or as approved by the Engineer.
9. The location of gates and corner posts will be as indicated elsewhere in these plans.

Texas Department of Transportation

Design Division Standard

BARBED WIRE AND WOVEN WIRE FENCE (STEEL POSTS)

WF(2)-10

FILE: wf210.dgn	DN: TxDOT	CK: AM	DW: VP	CK:
© TxDOT 1996	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		50

DATE: 12/7/2023 3:09:30 PM
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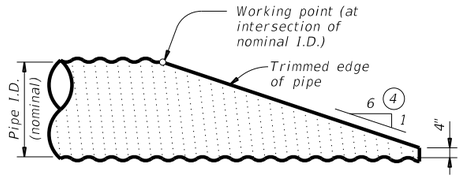
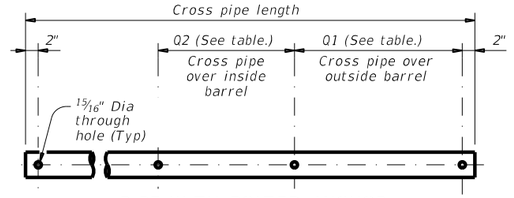


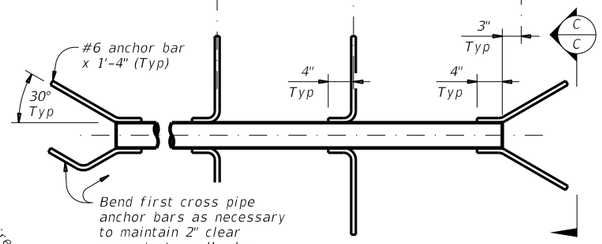
NOTE: All cross pipes, calculations, and dimensions are based on the pipe culverts mitered as shown in this detail. Alternate styles of mitered ends will require that appropriate adjustments be made to the values presented on this standard.

SIDE ELEVATION OF TYPICAL PIPE CULVERT MITER

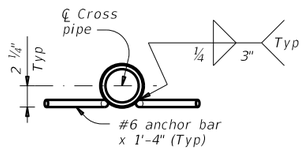
(Showing corrugated metal pipe (CMP) culvert Details at reinforced concrete pipe (RCP) culvert are similar.)



PIPE WITH BOLTED ANCHOR

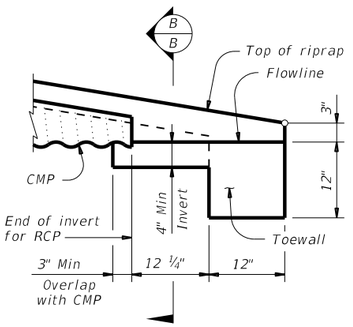


PIPE WITH ANCHOR BARS



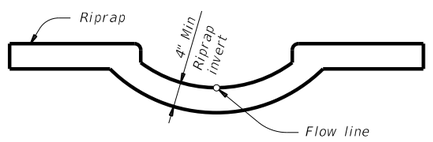
SECTION C-C

CROSS PIPE DETAILS



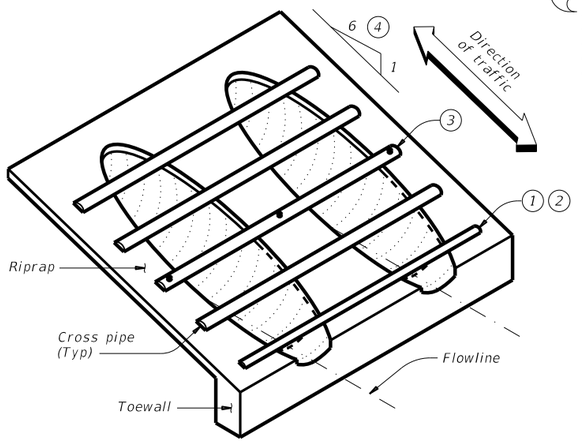
DETAIL "A"

(Showing invert with corrugated metal pipe (CMP) culvert. Reinforced concrete pipe (RCP) culvert details are similar. Cross pipes not shown for clarity.)



SECTION B-B

(Cross pipes not shown for clarity.)



ISOMETRIC VIEW OF TYPICAL INSTALLATION

CROSS PIPE LENGTHS, REQUIRED PIPE SIZES, AND RIPRAP QUANTITIES (2)

Nominal Culvert I.D.	Conc Riprap (CY) (6)	Pipe Culvert Spa ~ G	Single Barrel ~ Q1	Multi-Barrel ~ Q1	Q2	Conditions for Use of Cross Pipes	Cross Pipe Sizes
12"	0.6	0' - 9"	N/A	2' - 1"	1' - 9"	3 or more pipe culverts	3" Std (3.500" O.D.)
15"	0.7	0' - 11"	N/A	2' - 5"	2' - 2"		
18"	0.8	1' - 2"	N/A	2' - 10"	2' - 8"		
21"	0.9	1' - 4"	N/A	3' - 2"	3' - 1"		
24"	0.9	1' - 7"	N/A	3' - 6"	3' - 7"		
27"	1.0	1' - 8"	N/A	3' - 10"	3' - 11"	3 or more pipe culverts	3 ½" Std (4.000" O.D.)
30"	1.1	1' - 10"	N/A	4' - 2"	4' - 4"	2 or more pipe culverts	
33"	1.2	1' - 11"	4' - 2"	4' - 5"	4' - 8"	All pipe culverts	
36"	1.3	2' - 1"	4' - 5"	4' - 9"	5' - 1"	All pipe culverts	4" Std (4.500" O.D.)
42"	1.5	2' - 4"	4' - 11"	5' - 5"	5' - 10"		
48"	1.7	2' - 7"	5' - 5"	6' - 0"	6' - 7"	All pipe culverts	5" Std (5.563" O.D.)
54"	2.0	3' - 0"	5' - 11"	6' - 9"	7' - 6"		
60"	2.2	3' - 3"	6' - 5"	7' - 4"	8' - 3"		
66"	2.4	3' - 3"	6' - 11"	7' - 10"	8' - 9"		
72"	2.7	3' - 4"	7' - 5"	8' - 5"	9' - 4"		

(1) The proper installation of the first cross pipe is critical for vehicle safety. Place the top of the first cross pipe no more than 6" above the flow line.

(2) Provide cross pipes, except the first bottom pipe, of the size shown in the table. Provide a 3 1#2" standard pipe (4" O.D.) for the first bottom pipe.

(3) Install the third cross pipe from the bottom of the culvert using a bolted connection. Ensure that riprap concrete does not flow into the cross pipe so as to permit disassembly of the bolted connection to allow cleanout access. At the Contractor's option, install all other cross pipes using the bolted connection details.

(4) Match cross slope as shown elsewhere in the plans. Cross slope of 6:1 or flatter is required for vehicle safety.

(5) Riprap placed beyond the limits shown will be paid for as concrete riprap in accordance with Item 432, "Riprap."

(6) Quantities shown are for one end of one reinforced concrete pipe (RCP) culvert. For multiple pipe culverts or for corrugated metal pipe (CMP) culverts, quantities will need to be adjusted. Riprap quantities are for contractor's information only.

MATERIAL NOTES:

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

Provide cross pipes that meet the requirements of ASTM A53 (Type E or S, Gr B), ASTM A500 (Gr B), or API 5LX52.

Provide ASTM A307 bolts and nuts.

Galvanize all steel components, except concrete reinforcing, after fabrication. Repair galvanizing damaged during transport or construction in accordance with the specifications.

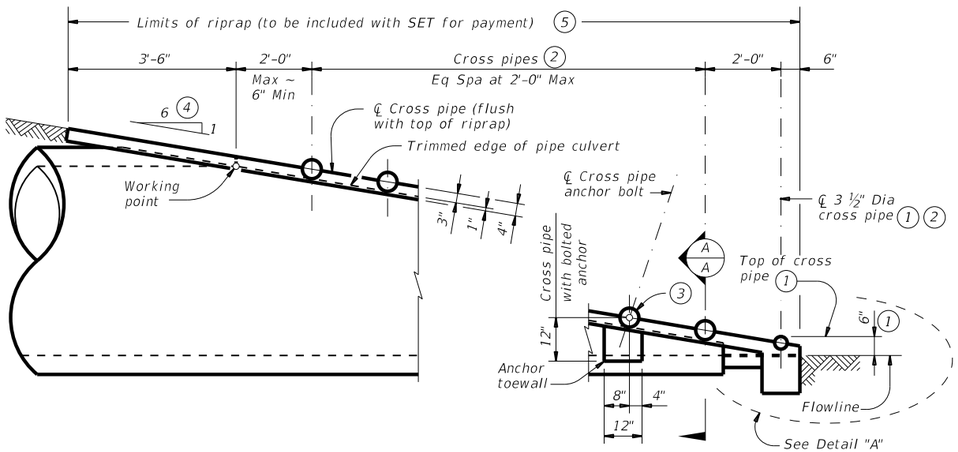
GENERAL NOTES:

Cross pipes are designed for a traversing load of 10,000 pounds at yield as recommended by Research Report 280-2F, "Safety Treatment of Roadside Parallel-Drainage Structures", Texas Transportation Institute, March 1981.

Safety end treatments (SET) shown herein are intended for use in those installations where out of control vehicles are likely to traverse the openings approximately perpendicular to the cross pipes.

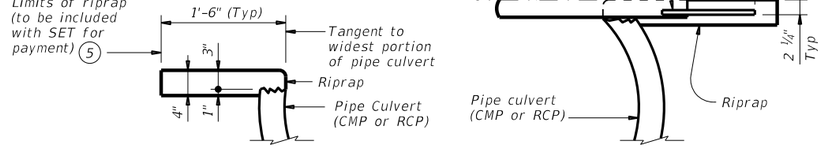
Construct concrete riprap and all necessary inverts in accordance with the requirements of Item 432, "Riprap."

Payment for riprap and toewall is included in the Price Bid for each Safety End Treatment.



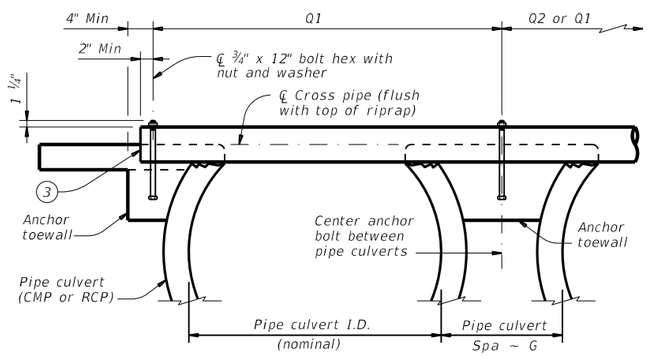
SIDE ELEVATION OF CAST-IN-PLACE CONCRETE

(Showing reinforced concrete pipe (RCP) culvert. Details at corrugated metal pipe (CMP) culvert are similar.)



SHOWING TYPICAL PIPE CULVERT AND RIPRAP

SHOWING CROSS PIPE WITH ANCHOR BAR



SHOWING CROSS PIPE WITH BOLTED ANCHOR

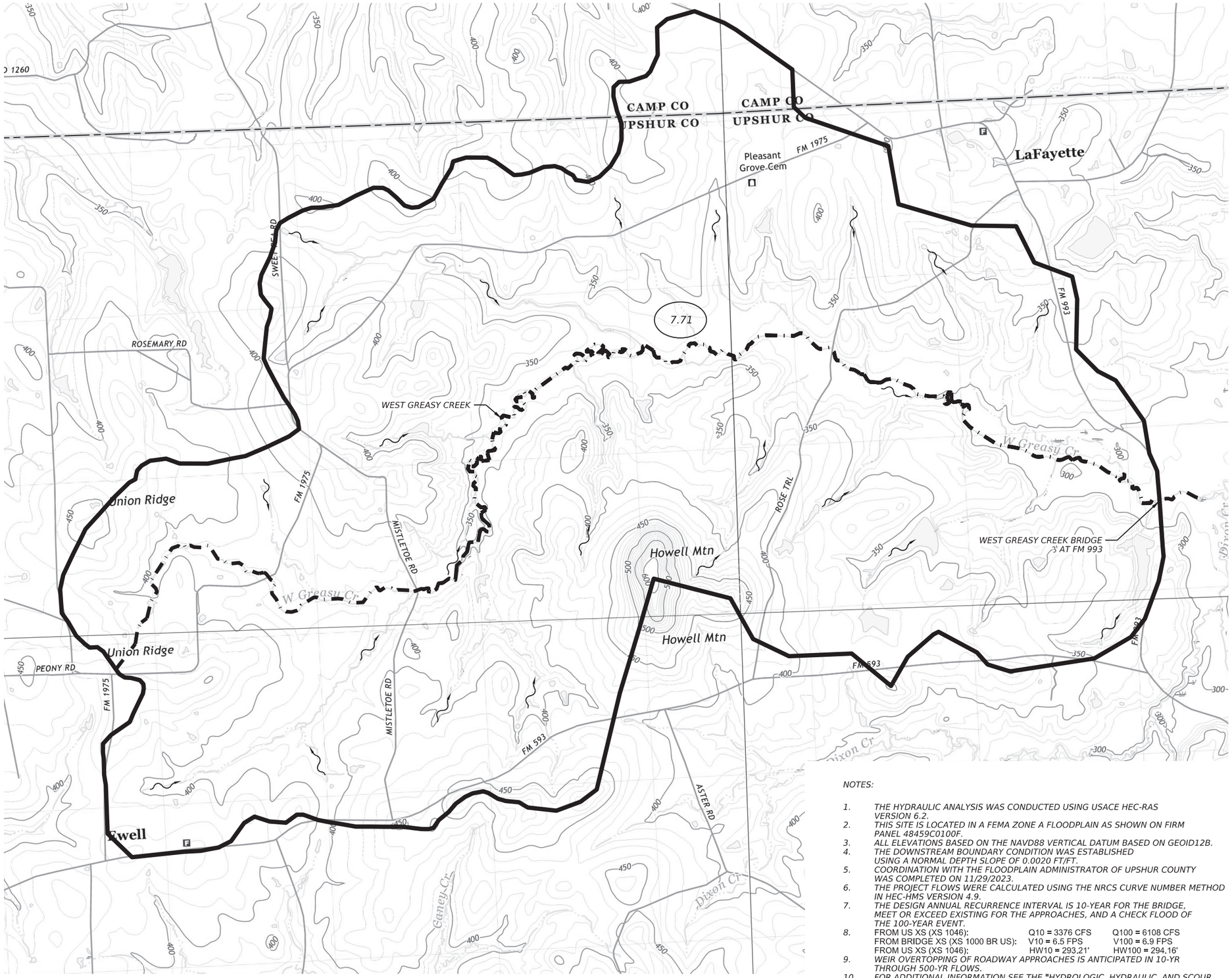
SECTION A-A

Texas Department of Transportation

Bridge Division Standard

SAFETY END TREATMENT
FOR 12" DIA TO 72" DIA PIPE CULVERTS
TYPE II ~ PARALLEL DRAINAGE
SETP-PD

FILE:	DN: GAF	CK: CAT	DW: JRP	CK: GAF
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		51



N

LEGEND

- DRAINAGE AREA BOUNDARY
- DIRECTION OF FLOW
- XXX.XX — DRAINAGE AREA SQ. MILES

HEC-HMS INPUTS	FM 993 AT WEST GREASY CREEK
AREA (SQ MI)	7.71
INITIAL ABSTRACTION (INCHES)	0.501
ADJUSTED CURVE NUMBER	80
IMPERVIOUS (%)	0.00
LAG TIME (MIN)	147.7

0 1000' 2000'

SCALE: 1" = 2000'

LOCATION	METHOD USED	DRAINAGE AREA (ACRES)	DRAINAGE AREA (SQ MI)	PEAK FLOW (CFS)						
				2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
FM 993 AT WEST GREASY CREEK	NRCSCN	4932	7.71	1681	2624	3376	4428	5247	6108	8322

NOTES:

1. THE HYDRAULIC ANALYSIS WAS CONDUCTED USING USACE HEC-RAS VERSION 6.2.
2. THIS SITE IS LOCATED IN A FEMA ZONE A FLOODPLAIN AS SHOWN ON FIRM PANEL 48459C0100F.
3. ALL ELEVATIONS BASED ON THE NAVD88 VERTICAL DATUM BASED ON GEOID12B.
4. THE DOWNSTREAM BOUNDARY CONDITION WAS ESTABLISHED USING A NORMAL DEPTH SLOPE OF 0.0020 FT/FT.
5. COORDINATION WITH THE FLOODPLAIN ADMINISTRATOR OF UPSHUR COUNTY WAS COMPLETED ON 11/29/2023.
6. THE PROJECT FLOWS WERE CALCULATED USING THE NRCS CURVE NUMBER METHOD IN HEC-HMS VERSION 4.9.
7. THE DESIGN ANNUAL RECURRENCE INTERVAL IS 10-YEAR FOR THE BRIDGE, MEET OR EXCEED EXISTING FOR THE APPROACHES, AND A CHECK FLOOD OF THE 100-YEAR EVENT.
8. FROM US XS (XS 1046): Q10 = 3376 CFS Q100 = 6108 CFS
   FROM BRIDGE XS (XS 1000 BR US): V10 = 6.5 FPS V100 = 6.9 FPS
   FROM US XS (XS 1046): HW10 = 293.21' HW100 = 294.16'
9. WEIR OVERTOPPING OF ROADWAY APPROACHES IS ANTICIPATED IN 10-YR THROUGH 500-YR FLOWS.
10. FOR ADDITIONAL INFORMATION SEE THE "HYDROLOGIC, HYDRAULIC, AND SCOUR REPORT - FM 993 AT WEST GREASY CREEK" DATED NOVEMBER 2023 BY TNP, INC.

REFERENCES
1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCE: RED RIVER LIDAR (2017) AND LOCAL SURVEY

STATE OF TEXAS
JOHN A. TERRY
51729
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PROFESSIONAL ENGINEER

11/30/2023

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TBPELS Firm 5713

FIRM REGISTRATION NO. F-230
tnp

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

HYDRAULIC DATA

DRAINAGE AREA MAP

SHEET 1 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		52
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 11/30/2023 2:00:30 PM
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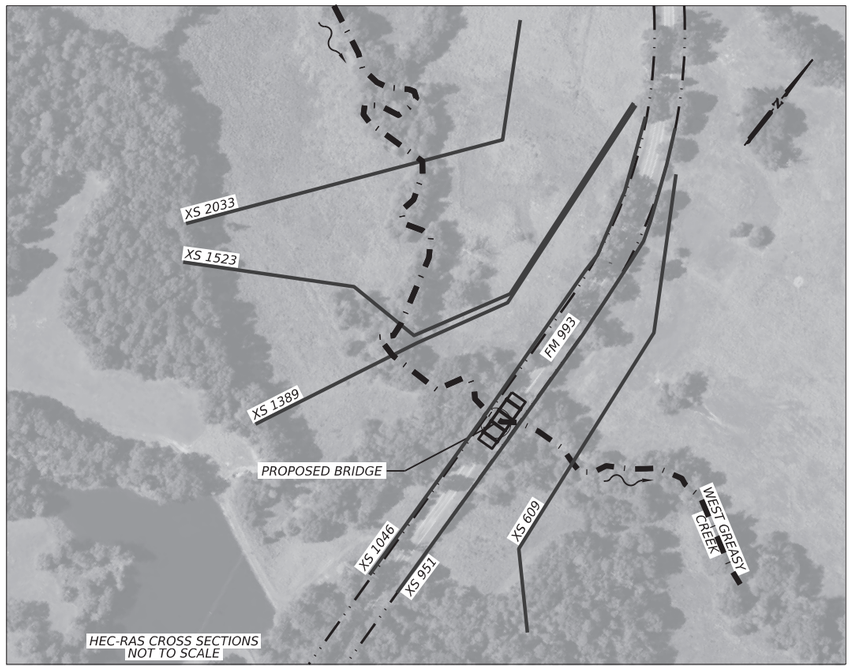


CROSS SECTION LOCATION MAP

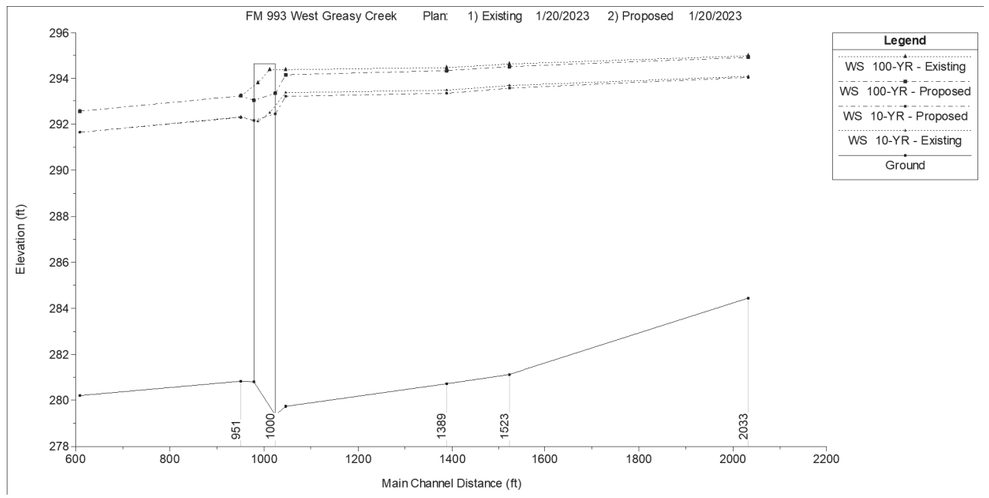
HYDRAULIC ANALYSIS												
	EXISTING CONDITIONS						PROPOSED CONDITIONS					
RIVER STATION	DESIGN 10-YEAR			CHECK 100-YEAR			DESIGN 10-YEAR			CHECK 100-YEAR		
	Q (CFS)	V (FT/S)	WSEL (ft)	Q (CFS)	V (FT/S)	WSEL (FT)	Q (CFS)	V (FT/S)	WSEL (ft)	Q (CFS)	V (FT/S)	WSEL (FT)
2033	3376	4.2	294.08	6108	3.8	294.98	3376	4.6	294.04	6108	4.0	294.91
1523	3376	3.1	293.67	6108	3.2	294.62	3376	3.3	293.57	6108	3.4	294.51
1389	3376	4.2	293.48	6108	4.0	294.47	3376	4.7	293.34	6108	4.4	294.33
1046	3376	2.1	293.36	6108	2.0	294.38	3376	2.3	293.21	6108	2.7	294.16
1000	FM 993 AT WEST GREASY CREEK						FM 993 AT WEST GREASY CREEK					
951	3376	5.1	292.31	6108	4.7	293.23	3376	5.0	292.31	6108	5.3	293.23
609	3376	4.87	291.65	6108	5.29	292.57	3376	4.87	291.65	6108	5.29	292.57

EXISTING BRIDGE OUTPUT

REACH	RIVER STATION	PROFILE	E.G. US. (FT)	BR OPEN AREA (SQ FT)	Q TOTAL (CFS)	MIN EL WEIR FLOW (FT)	Q WEIR (CFS)	DELTA EG (FT)
WEST GREASY CREEK	1000	10-YR	293.4	403.09	3376	292.41	895.59	0.85
		100-YR	294.42	403.09	6108	292.41	3398.26	1.03

PROPOSED BRIDGE OUTPUT

REACH	RIVER STATION	PROFILE	E.G. US. (FT)	BR OPEN AREA (SQ FT)	Q TOTAL (CFS)	MIN EL WEIR FLOW (FT)	Q WEIR (CFS)	DELTA EG (FT)
WEST GREASY CREEK	1000	10-YR	293.25	634.29	3376	292.41	681.81	0.71
		100-YR	294.21	634.29	6108	292.41	2727.17	0.76



STREAM PROFILE

BRIDGE CROSSING	EVENT	PROPOSED FREEBOARD (FT)
WEST GREASY CREEK	10-YR	1.12
	100-YR	0.17

NOTES:

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   FROM US XS (XS 1046): HW10 = 293.21' HW100 = 294.16'
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10. FOR ADDITIONAL INFORMATION SEE THE "HYDROLOGIC, HYDRAULIC, AND SCOUR REPORT - FM 993 AT WEST GREASY CREEK" DATED NOVEMBER 2023 BY TNP, INC.

REFERENCES
1. TXDOT'S HYDRAULIC DESIGN MANUAL (SEPTEMBER 2019)
2. TOPOGRAPHIC DATA SOURCE: RED RIVER LIDAR (2017) AND LOCAL SURVEY

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2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

HYDRAULIC DATA

SHEET 2 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		53
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 11/30/2023 2:02:33 PM
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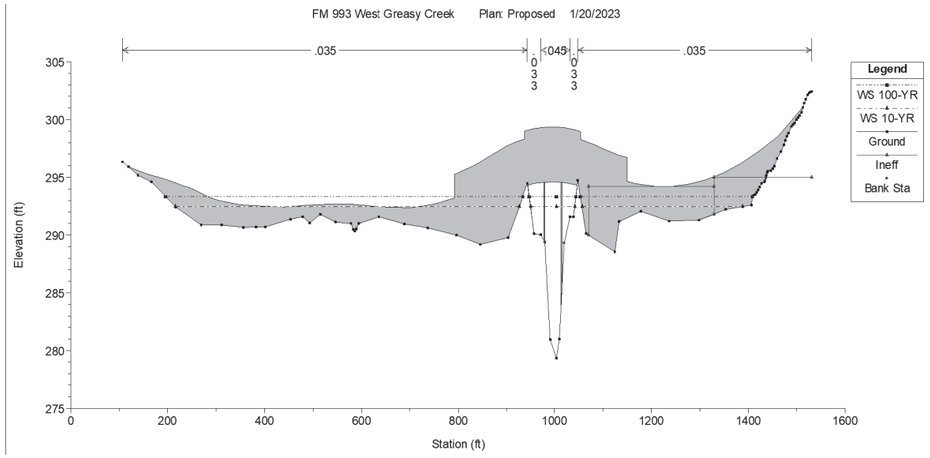
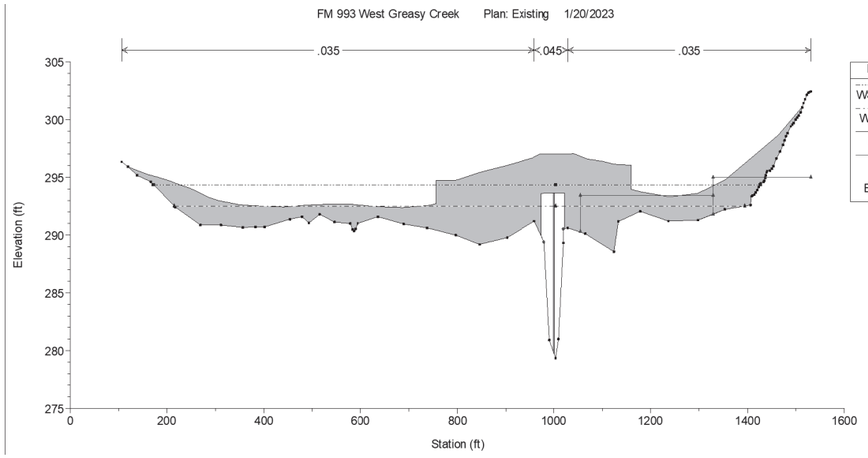
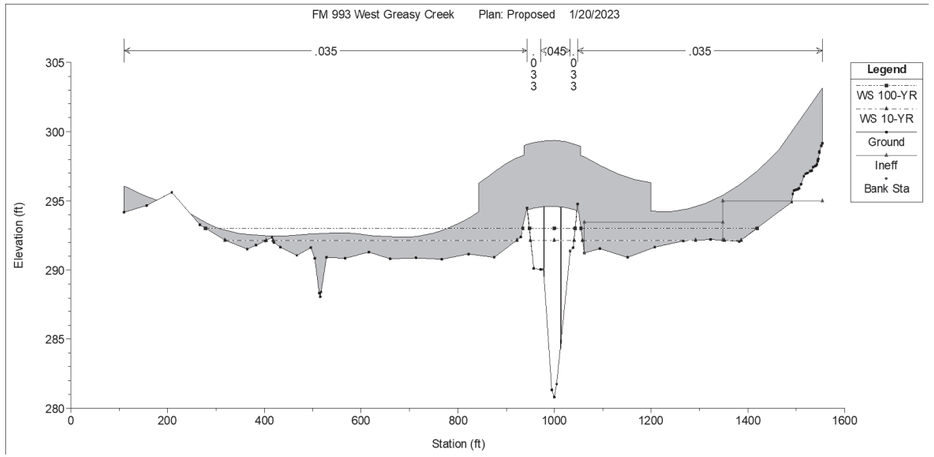


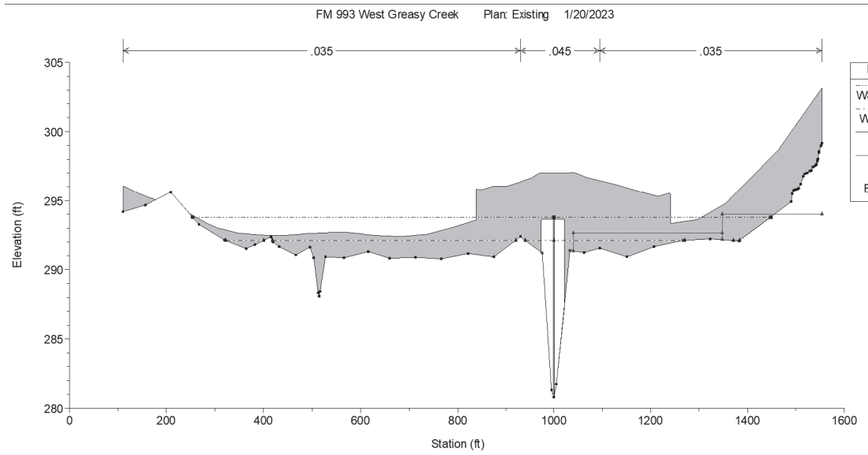
PROPOSED BRIDGE - UPSTREAM



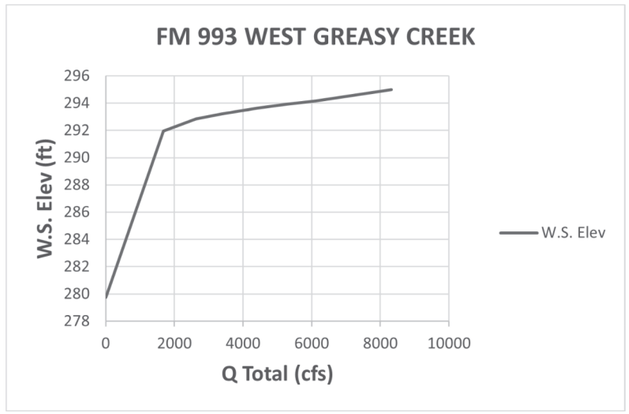
EXISTING BRIDGE - UPSTREAM



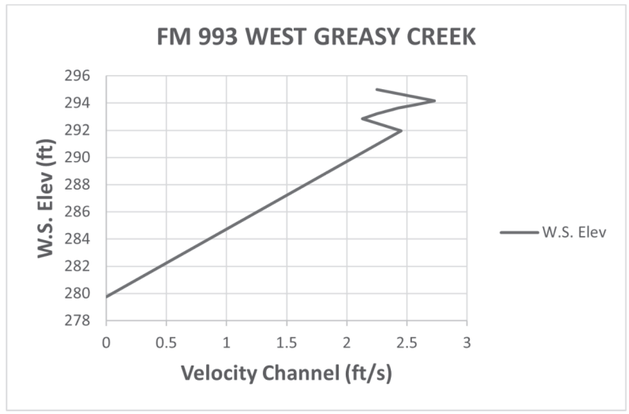
PROPOSED BRIDGE - DOWNSTREAM



EXISTING BRIDGE - DOWNSTREAM



PROPOSED XS UPSTREAM OF BRIDGE - CONVEYANCE CURVE



PROPOSED XS UPSTREAM OF BRIDGE - VELOCITY CURVE

NOTES:

1. *THE HYDRAULIC ANALYSIS WAS CONDUCTED USING USACE HEC-RAS VERSION 6.2.*
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10. *FOR ADDITIONAL INFORMATION SEE THE "HYDROLOGIC, HYDRAULIC, AND SCOUR REPORT - FM 993 AT WEST GREASY CREEK" DATED NOVEMBER 2023 BY TNP, INC.*

REFERENCES

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FM 993
AT WEST GREASY CREEK

HYDRAULIC DATA

SHEET 3 OF 3

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		54
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 11/30/2023 2:05:06 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/05_Drainage/FM993_DRN_HDS-03.dgn

CHANNEL MATERIAL	
CHANNEL BED MATERIAL DESCRIPTION	SAND
D50	0.000656 FEET (TXDOT GEOTECHNICAL MANUAL ASSUMED MINIMUM)
BASIS OF CHANNEL BED MATERIAL DESCRIPTION	BORING LOGS
NON-ERODIBLE STRATA	NON-ERODIBLE MATERIAL WAS FOUND IN THE TEST HOLES AT APPROXIMATE ELEVATION 212.00'

SUMMARY OF RETURN PERIODS	
DESIGN FLOOD	10-YEAR
SCOUR DESIGN FLOOD	25-YEAR
SCOUR CHECK FLOOD	50-YEAR
EXTREME EVENT CHECKS	100-YEAR, 500-YEAR

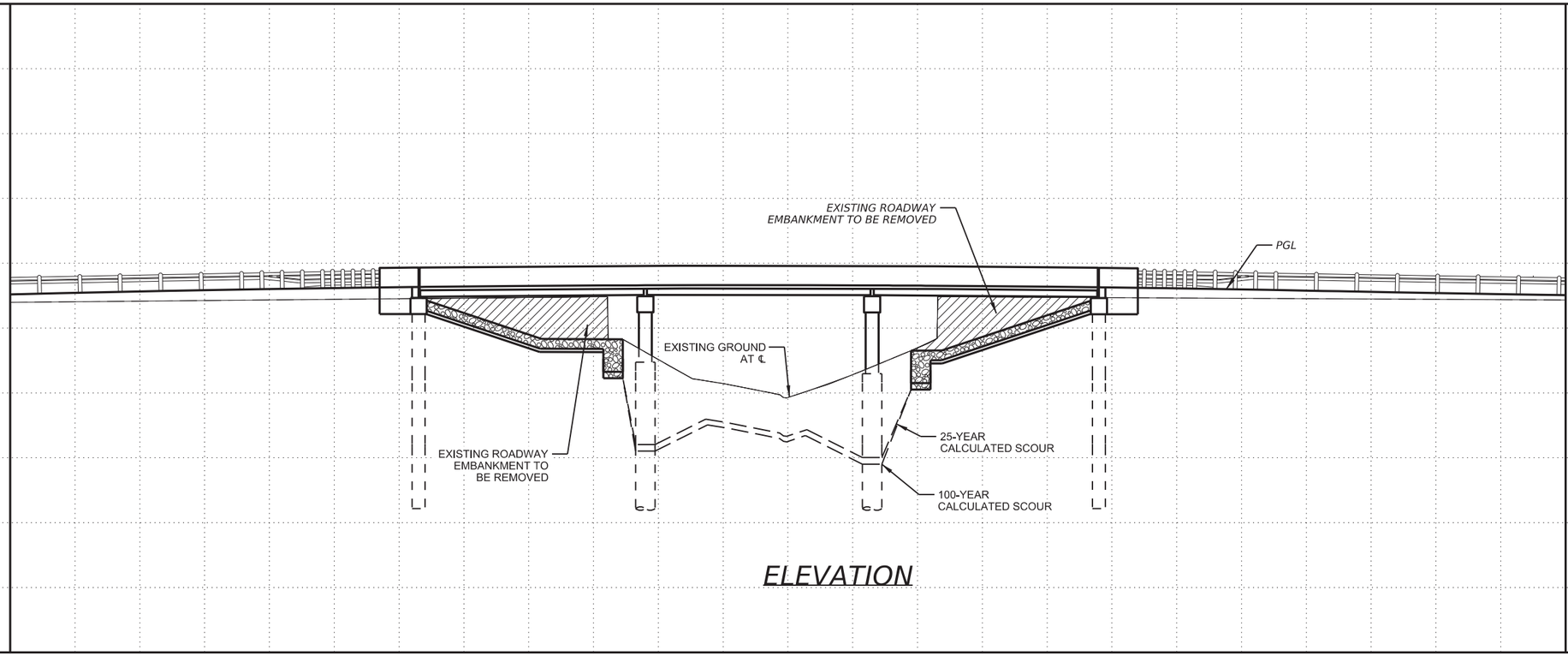
	SUMMARY OF CALCULATED SCOUR DEPTHS (FEET)											
	SCOUR DESIGN FLOOD (25-YEAR)				SCOUR CHECK FLOOD (50-YEAR)				MAXIMUM SCOUR CALCULATED (100-YEAR)			
	CONTRACTION SCOUR	PRESSURE SCOUR	PIER SCOUR	TOTAL SCOUR	CONTRACTION SCOUR	PRESSURE SCOUR	PIER SCOUR	TOTAL SCOUR	CONTRACTION SCOUR	PRESSURE SCOUR	PIER SCOUR	TOTAL SCOUR
ABUTMENT #1	5.92	0.00	N/A	5.92	6.41	0.00	N/A	6.41	6.76	0.00	N/A	6.76
BENT #2	5.92	0.00	7.49	13.41	6.41	0.00	7.59	14.00	6.76	0.00	7.67	14.43
BENT #3	5.92	0.00	7.49	13.41	6.41	0.00	7.59	14.00	6.76	0.00	7.67	14.43
ABUTMENT #4	5.92	0.00	N/A	5.92	6.41	0.00	N/A	6.41	6.76	0.00	N/A	6.76

NOTES:

1. THE HYDRAULIC ANALYSIS WAS CONDUCTED USING USACE HEC-RAS VERSION 6.2.
2. SCOUR COMPUTATIONS PERFORMED IN ACCORDANCE WITH TXDOT GEOTECHNICAL MANUAL, TXDOT SCOUR EVALUATION GUIDE, AND FHWA HEC-18 PROCEDURES.
3. FOR ADDITIONAL INFORMATION SEE THE "HYDROLOGIC, HYDRAULIC, AND SCOUR REPORT - FM 993 AT WEST GREASY CREEK" DATED NOVEMBER 2023 BY TNP, INC.

0 10' 20'

SCALE: 1"=20' HORZ & VERT



ELEVATION

STATE OF TEXAS
JOHN A. TERRY
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12/6/2023

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tnp

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

SCOUR DATA

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		55
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/6/2023 2:54:30 PM
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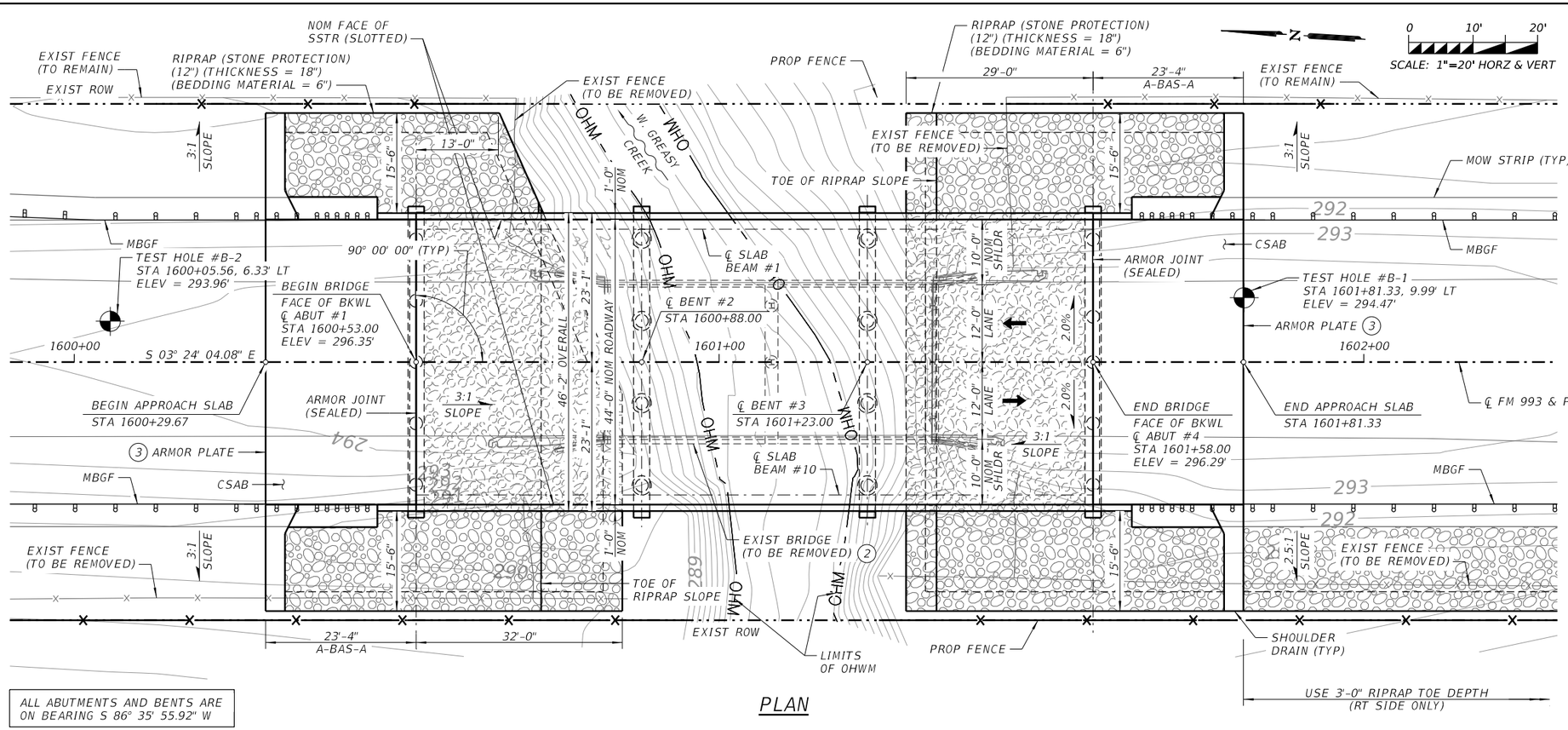
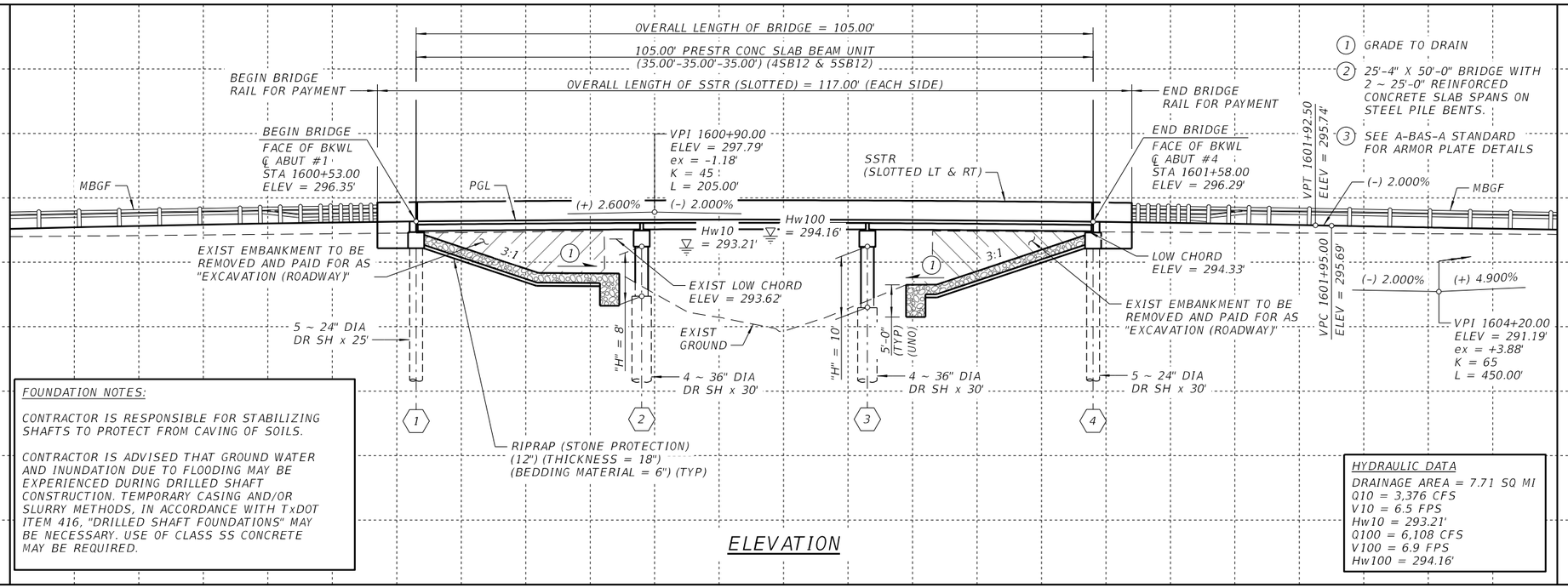


PLAN

ALL ABUTMENTS AND BENTS ARE ON BEARING S 86° 35' 55.92" W



ELEVATION

FOUNDATION NOTES:

CONTRACTOR IS RESPONSIBLE FOR STABILIZING SHAFTS TO PROTECT FROM CAVING OF SOILS.

CONTRACTOR IS ADVISED THAT GROUND WATER AND INUNDATION DUE TO FLOODING MAY BE EXPERIENCED DURING DRILLED SHAFT CONSTRUCTION. TEMPORARY CASING AND/OR SLURRY METHODS, IN ACCORDANCE WITH TxDOT ITEM 416, "DRILLED SHAFT FOUNDATIONS" MAY BE NECESSARY. USE OF CLASS SS CONCRETE MAY BE REQUIRED.

HYDRAULIC DATA

DRAINAGE AREA = 7.71 SQ MI
Q10 = 3,376 CFS
V10 = 6.5 FPS
Hw10 = 293.21'
Q100 = 6,108 CFS
V100 = 6.9 FPS
Hw100 = 294.16'

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).

BRIDGE NOT DESIGNED FOR OVERLAY.

ALL DIMENSIONS ARE HORIZONTAL OR VERTICAL AND MUST BE CORRECTED FOR VERTICAL GRADE AND CROSS-SLOPE WHERE APPROPRIATE.

SEE PSBEB STANDARD FOR BEAM END AND BEARING DETAILS.

THE "H" VALUE IS AN ESTIMATED COLUMN HEIGHT. THE CONTRACTOR IS RESPONSIBLE FOR CALCULATING THE ACTUAL COLUMN HEIGHT BASED ON FIELD CONDITIONS.

SAW-CUT GROOVING FINAL SURFACE TEXTURE ON THE BRIDGE DECK AND APPROACH SLAB IS REQUIRED.

SEE "TEST HOLE PROFILES" SHEETS FOR SUBSURFACE INFORMATION.

CONTRACTOR SHALL VERIFY THE LOCATIONS AND DEPTHS OF ALL UTILITIES PRIOR TO CONSTRUCTION AND FABRICATION. ENGINEER SHALL BE NOTIFIED IF ANY CONFLICTS IMMEDIATELY.

REFER TO CSAB STANDARD AND CSAB-REQUIRED SUPPLEMENTAL DETAILS FOR CEMENT STABILIZED BACKFILL DETAILS.

SEE "TYPICAL SECTION" SHEET FOR TYPICAL TRANSVERSE SECTION.

SEE ROADWAY PLANS FOR RIPRAP LIMITS NOT SHOWN.

FUNCTIONAL CLASS: RURAL MAJOR COLLECTOR
DESIGN SPEED: 40 MPH
ADT (2022): 290
ADT (2042): 528
EXIST NBI NO.: 19-230-0-1511-01-002
PROP NBI NO.: 19-230-0-1511-01-003

HL93 LOADING

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

SUPERSTRUCTURE INV/OPR RATINGS 1.25/1.80

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TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

BRIDGE LAYOUT

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		56
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/7/2023 3:15:06 PM
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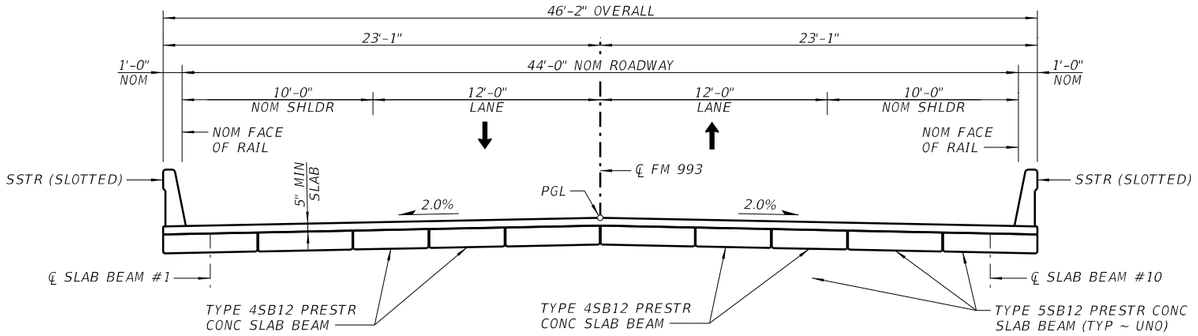

TYPICAL TRANSVERSE SECTION

STA 1600+53.00 TO 1601+58.00

HL93 LOADING

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

SUPERSTRUCTURE INV/OPR RATINGS 1.25/1.80

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FM 993
AT WEST GREASY CREEK

TYPICAL SECTION

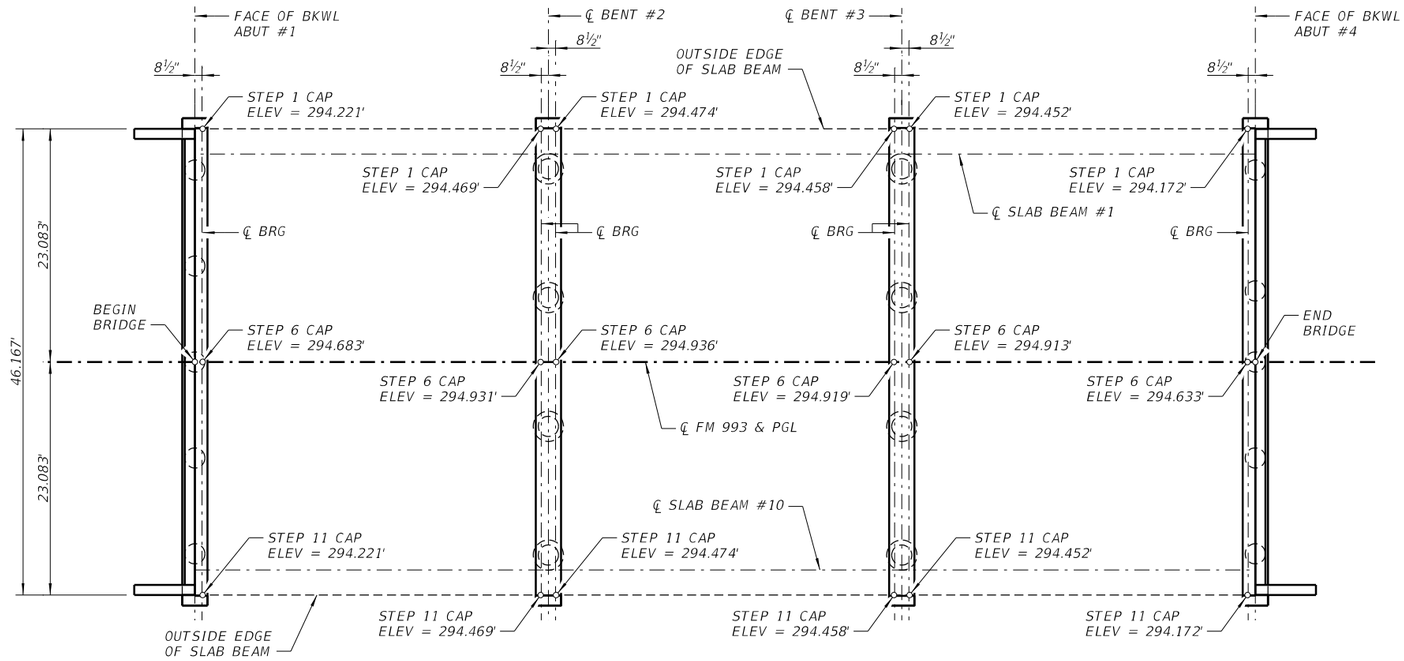
SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		57
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

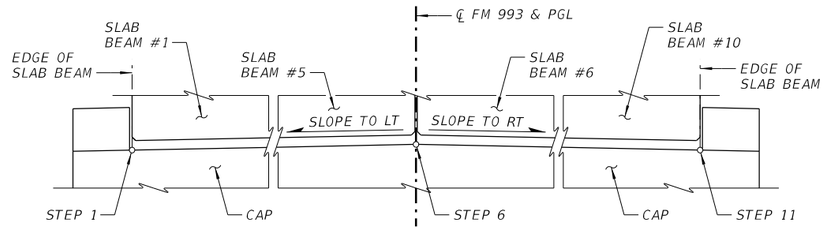
DATE: 12/7/2023 3:15:12 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/07_Bridge/FM993_S102_SX

SUMMARY OF ESTIMATED QUANTITIES

BID CODES	400-6005	416-6002	416-6004	420-6014	420-6030	420-6038	422-6008	422-6016	425-6009	425-6010	432-6006	432-6031	432-6039	450-6111	454-6003	454-6004
BID ITEM DESCRIPTION / BRIDGE ELEMENT	CEM STABIL BKFL	DRILL SHAFT (24 IN)	DRILL SHAFT (36 IN)	CL C CONC (ABUT)(HPC)	CL C CONC (CAP)(HPC)	CL C CONC (COLUMN)(HPC)	REINF CONC SLAB (SLAB BEAM)(HPC)	APPROACH SLAB (HPC) (2)	PRESTR CONC SLAB BEAM (4SB12)	PRESTR CONC SLAB BEAM (5SB12)	RIPRAP (CONC)(CL B)	RIPRAP (STONE PROTECTION)(12 IN)	BEDDING MATERIAL (6 IN)	RAIL (TY SSTR)(W/DRAIN SLOT)(HPC)	ARMOR JOINT (1)	ARMOR JOINT (SEALED)
	CY	LF	LF	CY	CY	CY	SF	CY	LF	LF	CY	CY	CY	LF	LF	LF
2 - ABUTMENTS	137	275		27.8				84.4			2.4	566	108	24.0	88	85
2 - INTERIOR BENTS			240		22.8	8.5										
1 - 105.00' PRESTR CONC SLAB BEAM UNIT							4,848		414.00	621.00				210.0		
TOTAL	137	275	240	27.8	22.8	8.5	4,848	84.4	414.00	621.00	2.4	566	108	234.0	88	85



PLAN OF CAP ELEVATIONS



COMMON TRANSVERSE SECTIONS AT STEP LOCATIONS

(LOOKING FORWARD STATION)

(1) ONE PLATE AT END OF EACH APPROACH SLAB. SEE A-BAS-A STANDARD FOR DETAILS.

(2) QUANTITY INCLUDES CONCRETE FOR SHOULDER DRAINS.

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

GARVER
3755 S. Capital of Texas Highway
Suite 325
Austin, TX 78704
(512) 485-0009
TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

ESTIMATED QUANTITIES AND CAP ELEVATIONS

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		58
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/7/2023 3:15:15 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/07_Bridge/FM993_S103_EQ.dgn

DRILLING LOG

WinCore
Version 3.3

County	Uphsur	Hole	B-1	District	Atlanta
Highway	FM 993	Structure	Bridge	Date	8/30/2022
CSJ	1511-01-013	Station	1601+81.33	Grnd. Elev.	294.47 ft
		Offset	9.99' LT	GW Elev.	280.47 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
293.5			12IN. ASPHALT							
			FILL, CLAYEY SAND, with asphalt fragments			2				#200(%)-2; SPT=6/12in.
291.5										
		4 (6) 4 (6)	SAND, dense to very dense, light gray, with trace clay (SP)			15				#200(%)-61; SPT=10/12in.
5										
288.5			SAND, slightly compact, light gray, clayey (SC)							SPT=12/12in.
		10 (6) 11 (6)				17				#200(%)-40; SPT=12/12in.
10										
279.5	15	4 (6) 3 (6)	CLAY, soft, light gray and tan, sandy (CL)			21	26	12		#200(%)-67
		7 (6) 7 (6)								
20						21				
269.5	25	50 (2) 50 (2)	LIGNITE, very hard, dark gray							
266.5			CLAY, very hard, reddish brown, with sand seams (CL)							
		50 (0.5) 50 (0.5)				16	38	18		#200(%)-97
30										
260.5										
		50 (2) 50 (1)	SAND, very dense, reddish brown, (SP)							
35										
		50 (0.25) 50 (0.25)								
40										

Remarks: Seepage observed at 14' during drilling.. Water at 11.5' after 15 minutes. GPS coordinates were obtained using the WGS-84 coordinate system. Latitude: 32.88066 Longitude: -94.847364

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

Driller: S. Campbell Logger: S. O'Conner Organization: Terracon Consultants, Inc.

\\P94WFS01\Data\Projects\2022\94225219A\Working Files\Diagrams-Drawings-Figures\CLG and PDF\94225219A FM993 bridge logs.clg

DRILLING LOG

WinCore
Version 3.3

County	Uphsur	Hole	B-1	District	Atlanta
Highway	FM 993	Structure	Bridge	Date	8/30/2022
CSJ	1511-01-013	Station	1601+81.33	Grnd. Elev.	294.47 ft
		Offset	9.99' LT	GW Elev.	280.47 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, very dense, reddish brown, (SP)							
45		50 (0.25) 50 (0.25)								
50		50 (0.5) 50 (0.5)								
55		50 (1) 50 (0.5)								
60		50 (1.5) 50 (0.5)								
65		50 (1) 50 (0.5)								
70		50 (0.5) 50 (0.5)								
219.5	75	50 (2) 50 (1.5)	MUDSTONE, hard to very hard, gray							
80		50 (1) 50 (0.5)								

Remarks: Seepage observed at 14' during drilling.. Water at 11.5' after 15 minutes. GPS coordinates were obtained using the WGS-84 coordinate system. Latitude: 32.88066 Longitude: -94.847364

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

Driller: S. Campbell Logger: S. O'Conner Organization: Terracon Consultants, Inc.

\\P94WFS01\Data\Projects\2022\94225219A\Working Files\Diagrams-Drawings-Figures\CLG and PDF\94225219A FM993 bridge logs.clg

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALI QAYS ABDULLAH
131059
LICENSED
PROFESSIONAL ENGINEER

07/27/2023

Terracon

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

TEST HOLE PROFILES

SHEET 1 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		59
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 7/26/2023 11:31:25 AM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/REF/Working Folder/Bridge/DOO/Geotech/FM993_S104_TH.dgn

DRILLING LOG

WinCore
Version 3.3

County	Uphsur	Hole	B-1	District	Atlanta
Highway	FM 993	Structure	Bridge	Date	8/30/2022
CSJ	1511-01-013	Station	1601+81.33	Grnd. Elev.	294.47 ft
		Offset	9.99' LT	GW Elev.	280.47 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
			MUDSTONE, hard to very hard, gray							
85		50 (0.5) 50 (0.5)								
90		50 (1) 50 (0.5)								
95		50 (0.5) 50 (0.5)								
194.5 100										
105										
110										
115										
120										

Remarks: Seepage observed at 14' during drilling.. Water at 11.5' after 15 minutes. GPS coordinates were obtained using the WGS-84 coordinate system. Latitude: 32.88066 Longitude: -94.847364

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

Driller: S. Campbell **Logger: S. O'Conner** **Organization: Terracon Consultants, Inc.**

\\P94WFS01\Data\Projects\2022\94225219A\Working Files\Diagrams-Drawings-Figures\CLG and PDF\94225219A FM993 bridge logs.clg

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALI QAYS ABDULLAH
131059
LICENSED PROFESSIONAL ENGINEER

07/27/2023

Terracon

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

TEST HOLE PROFILES

SHEET 2 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		60
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 7/26/2023 11:31:37 AM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/REF/Working Folder/Bridge/DOO/Geotech/FM993_S105_TH.dgn

DRILLING LOG

WinCore
Version 3.3

County	Uphsur	Hole	B-2	District	Atlanta
Highway	FM 993	Structure	Bridge	Date	8/30/2022
CSJ	1511-01-013	Station	1600+05.56	Grnd. Elev.	293.96 ft
		Offset	6.33' LT	GW Elev.	279.96 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
293.5			2IN. ASPHALT							
			SAND, compact, reddish tan, clayey (SC)			6				SPT=39/12in.
		13 (6) 11 (6)				8	27	14		#200(%)-49; SPT=20/12in.
5										
										SPT=10/12in.
		19 (6) 21 (6)				11	25	13		#200(%)-46; SPT=13/12in.
10										
										SPT=71/11.5in.
280.										SPT=77/11.5in.
		50 (2) 50 (2)	SAND, dense to very dense, tan, clayey (SC)							
15										
		50 (1) 50 (1)								
20						22				#200(%)-47
		50 (1) 50 (1)								
25										
268.			LIGNITE, very hard, dark gray			24				
265.										
		50 (0.5) 50 (0.5)	CLAY, hard, light gray and tan (CL)							
30										
						17	36	16		#200(%)-99
		50 (1) 50 (0.5)								
259.	35		SAND, very dense, reddish brown, (SP)							
		50 (0.25) 50 (0.25)								
40										

Remarks: Seepage observed at 14' during drilling.. Water at 14' after 15 minutes. GPS coordinates were obtained using the WGS-84 coordinate system. Latitude: 32.88066 Longitude: -94.847364

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

Driller: S. Campbell **Logger:** B. Weddell **Organization:** Terracon Consultants, Inc.

\\P94WFS01\Data\Projects\2022\94225219A\Working Files\Diagrams-Drawings-Figures\CLG and PDF\94225219A FM993 bridge logs.clg

DRILLING LOG

WinCore
Version 3.3

County	Uphsur	Hole	B-2	District	Atlanta
Highway	FM 993	Structure	Bridge	Date	8/30/2022
CSJ	1511-01-013	Station	1600+05.56	Grnd. Elev.	293.96 ft
		Offset	6.33' LT	GW Elev.	279.96 ft

Elev. (ft)	LOG	Texas Cone Penetrometer	Strata Description	Triaxial Test: Lateral Press. (psi)	Triaxial Test: Deviator Stress (psi)	Properties: MC	Properties: LL	Properties: PI	Properties: Wet Den. (pcf)	Additional Remarks
			SAND, very dense, reddish brown, (SP)							
45		50 (0.5) 50 (0.5)								
50		50 (1.5) 50 (1)								
55		50 (1.5) 50 (1.5)								
60		50 (0.5) 50 (0.5)								
65		50 (1.5) 50 (1.5)								
70		50 (0.5) 50 (0.5)								-interbedded mudstone seams below 70'
75		50 (1) 50 (1)								
214.	80	50 (1) 50 (0.5)								

Remarks: Seepage observed at 14' during drilling.. Water at 14' after 15 minutes. GPS coordinates were obtained using the WGS-84 coordinate system. Latitude: 32.88066 Longitude: -94.847364

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

Driller: S. Campbell **Logger:** B. Weddell **Organization:** Terracon Consultants, Inc.

\\P94WFS01\Data\Projects\2022\94225219A\Working Files\Diagrams-Drawings-Figures\CLG and PDF\94225219A FM993 bridge logs.clg

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALI QAYS ABDULLAH
131059
LICENSED
PROFESSIONAL ENGINEER

07/27/2023

Terracon

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

TEST HOLE PROFILES

SHEET 3 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		61
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 7/26/2023 11:31:44 AM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/REF/Working Folder/Bridge/DOO/Geotech/FM993_S106_TH.dgn

DRILLING LOG

WinCore
Version 3.3

County	Uphsur	Hole	B-2	District	Atlanta
Highway	FM 993	Structure	Bridge	Date	8/30/2022
CSJ	1511-01-013	Station	1600+05.56	Grnd. Elev.	293.96 ft
		Offset	6.33' LT	GW Elev.	279.96 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
85		50 (1) 50 (0.5)	MUDSTONE, soft, brown and gray, interbedded sand particles							SPT=50/2in.
90		50 (1.5) 50 (1)								
95		50 (1.5) 50 (1)								SPT=50/2.5in.
194. 100		50 (1) 50 (0.5)								
105										
110										
115										
120										

Remarks: Seepage observed at 14' during drilling.. Water at 14' after 15 minutes. GPS coordinates were obtained using the WGS-84 coordinate system. Latitude: 32.88066 Longitude: -94.847364

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

Driller: S. Campbell **Logger: B. Weddell** **Organization: Terracon Consultants, Inc.**

\\P94WFS01\Data\Projects\2022\94225219A\Working Files\Diagrams-Drawings-Figures\CLG and PDF\94225219A FM993 bridge logs.clg

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALI QAYS ABDULLAH
131059
LICENSED PROFESSIONAL ENGINEER

07/27/2023

Terracon

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

TEST HOLE PROFILES

SHEET 4 OF 4

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		62
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 7/26/2023 11:31:55 AM
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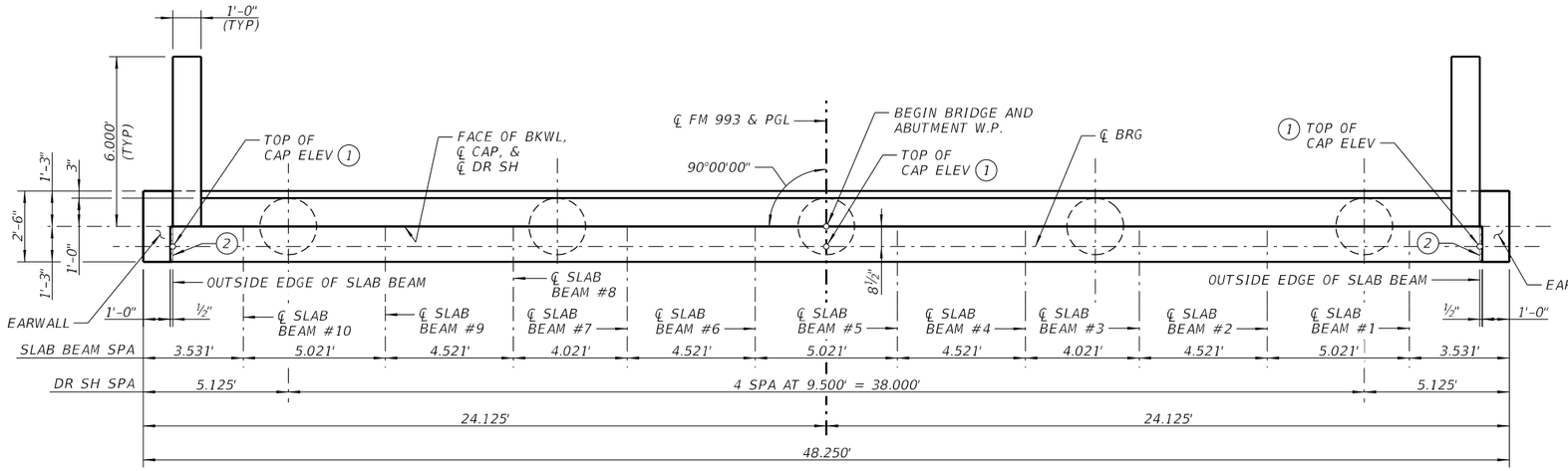
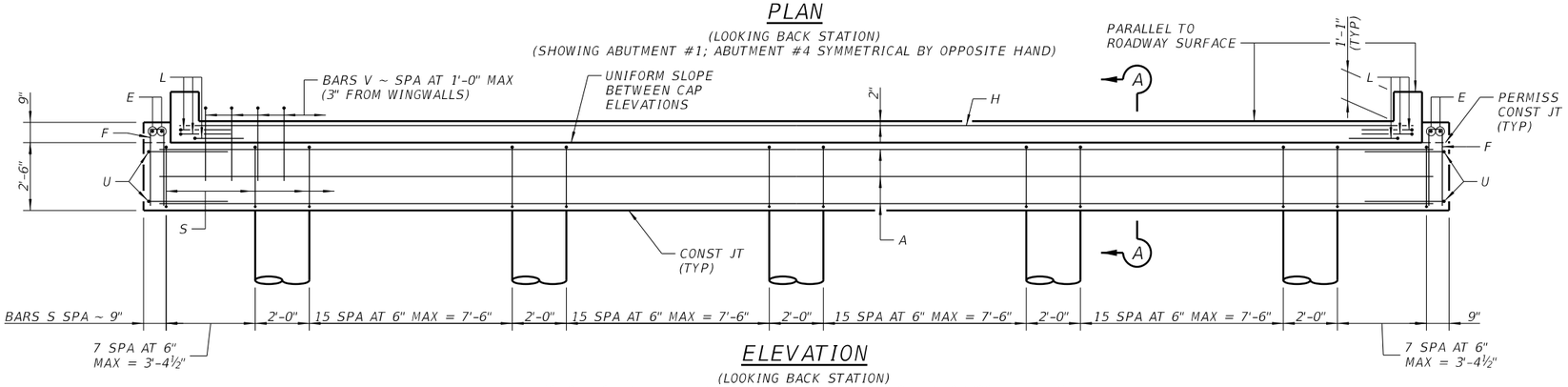
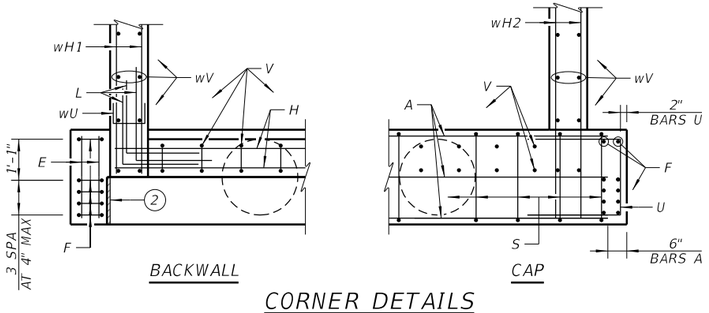


PLAN



ELEVATION

(LOOKING BACK STATION)
(SHOWING ABUTMENT #1; ABUTMENT #4 SYMMETRICAL BY OPPOSITE HAND)

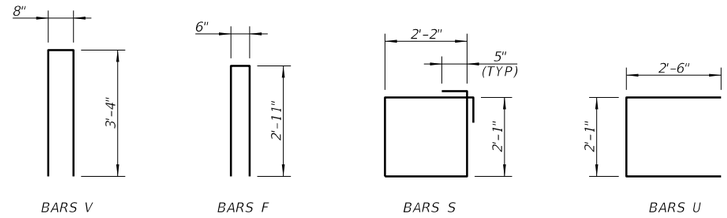


BACKWALL

CAP

CORNER DETAILS

(DRILLED SHAFT REBAR NOT SHOWN FOR CLARITY)

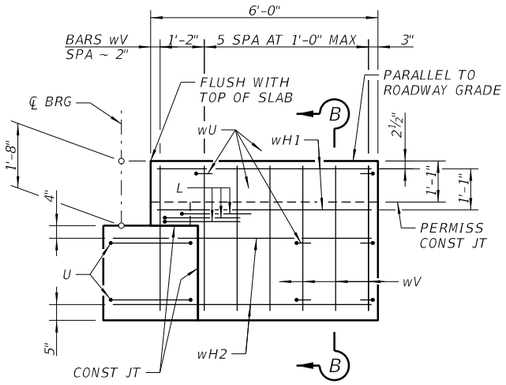


BARS V

BARS F

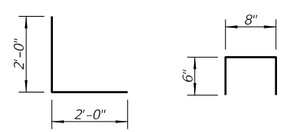
BARS S

BARS U



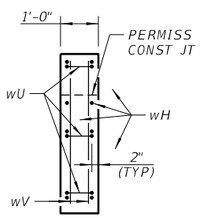
WINGWALL ELEVATION

(EARWALL NOT SHOWN FOR CLARITY)

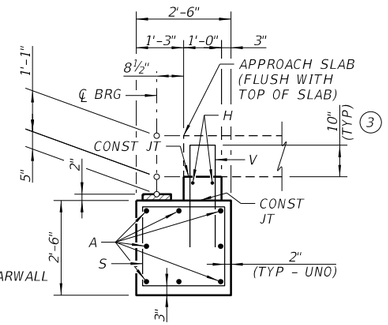


BARS L

BARS wU



SECTION B-B



SECTION A-A

TABLE OF ESTIMATED QUANTITIES - ONE ABUTMENT

BAR	NO.	SIZE	LENGTH	WEIGHT
A	8	#11	47'-3"	2,008
E	4	#4	2'-2"	6
F	10	#4	6'-4"	42
H	2	#6	45'-10"	138
L	6	#6	4'-0"	36
S	80	#5	9'-4"	779
U	4	#6	7'-1"	43
V	45	#5	7'-4"	344
wH1	8	#6	5'-8"	68
wH2	8	#6	6'-11"	83
wU	12	#4	1'-8"	13
wV	28	#5	3'-10"	112
REINFORCING STEEL			LB	3,672
CL C CONC (ABUT)(HPC)			CY	13.9

(1) SEE "ESTIMATED QUANTITIES AND CAP ELEVATIONS" SHEET FOR CAP ELEVATIONS.

(2) ½" PREFORMED BITUMINOUS FIBER MATERIAL BETWEEN SLAB BEAM AND EARWALL. BOND TO EARWALL WITH AN APPROVED ADHESIVE. CAST INSIDE FACE OF EARWALL PERPENDICULAR TO CAP.

(3) INCREASE AS REQUIRED TO MAINTAIN 3" FROM FINISHED GRADE.

HL93 LOADING

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

GARVER
3755 S. Capital of Texas Highway
Suite 325
Austin, TX 78704
(512) 485-0009
TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

ABUTMENT #1 OR #4

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		63
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).

SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.

SEE FD STANDARD FOR ALL FOUNDATION DETAILS AND NOTES.

SEE SRR STANDARD FOR RIPRAP ATTACHMENT DETAILS.

SEE TYPE SSTR STANDARD FOR RAIL ANCHORAGE IN WINGWALLS.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

CALCULATED DRILLED SHAFT FOUNDATION LOAD:
73 TONS/DR SH

MATERIAL NOTES:

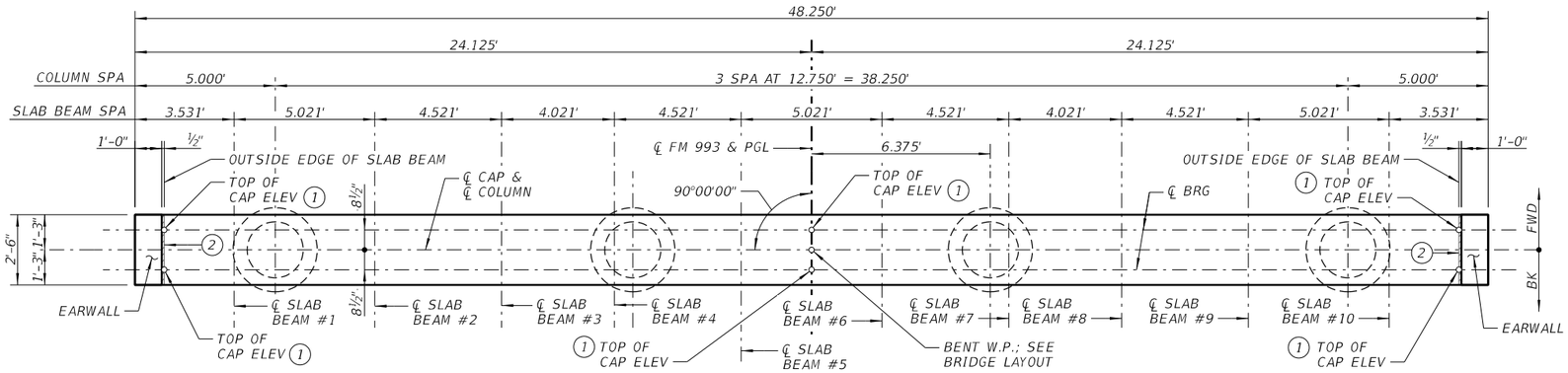
PROVIDE CLASS "C" (HPC) CONCRETE (f'c = 3,600 PSI).

PROVIDE GRADE 60 REINFORCING STEEL.

LEGEND:

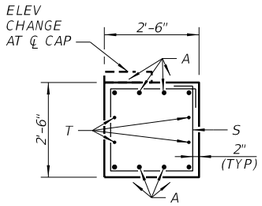
UNO - UNLESS NOTED OTHERWISE

DATE: 12/7/2023 3:15:57 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/07_Bridge/FM993_S201_AB.dgn

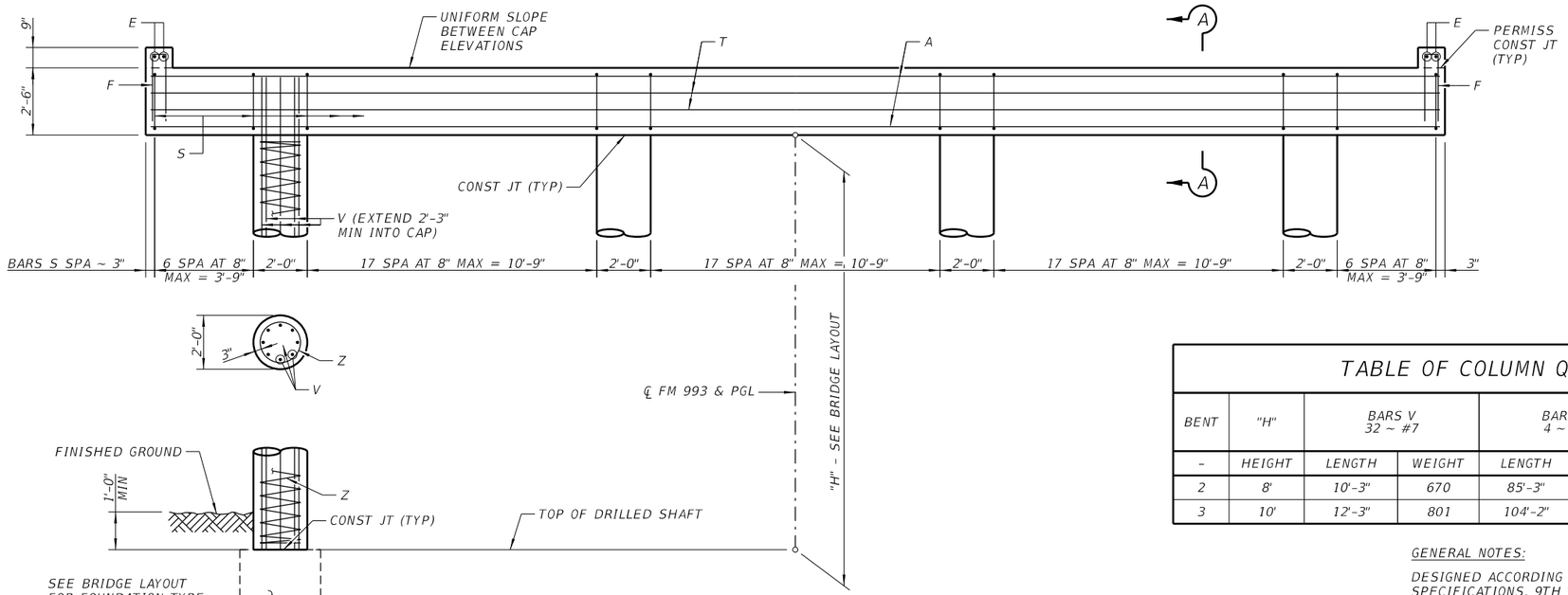


PLAN

(LOOKING FORWARD STATION)
(SHOWING BENT #2; BENT #3 SIMILAR)

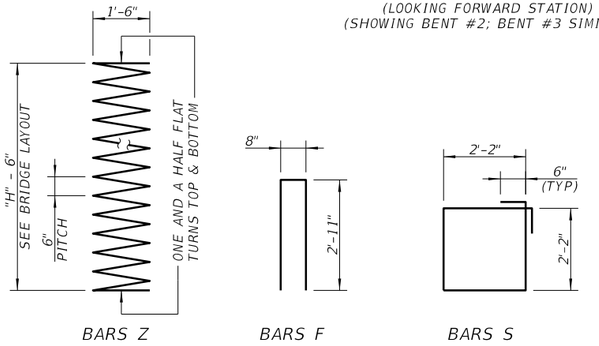


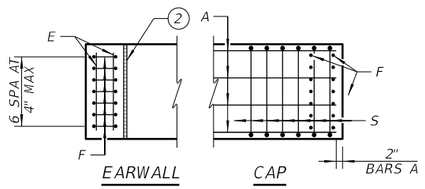
SECTION A-A



ELEVATION

(LOOKING FORWARD STATION)
(SHOWING BENT #2; BENT #3 SIMILAR)





CAP END DETAIL

TABLE OF ESTIMATED QUANTITIES – ONE CAP

BAR	NO.	SIZE	LENGTH	WEIGHT
A	8	#11	47'-11"	2,037
E	4	#4	2'-2"	6
F	14	#4	6'-6"	61
S	68	#5	9'-8"	686
T	4	#5	47'-11"	200
REINFORCING STEEL			LB	2,990
CL C CONC (CAP)(HPC)			CY	11.4

(1) SEE "ESTIMATED QUANTITIES AND CAP ELEVATIONS" SHEET FOR CAP ELEVATIONS.

(2) ½" PREFORMED BITUMINOUS FIBER MATERIAL BETWEEN SLAB BEAM AND EARWALL. BOND TO EARWALL WITH AN APPROVED ADHESIVE. CAST INSIDE FACE OF EARWALL PERPENDICULAR TO CAP.

(3) QUANTITIES SHOWN ARE FOR 4 ~ 36" DIA COLUMNS PER BENT. FOR EACH LINEAR FOOT VARIATION IN "H" VALUE, MAKE THE FOLLOWING ADJUSTMENTS:
BARS V LENGTH, 1'-0"
BARS Z LENGTH, 9'-6"
REINFORCING STEEL, 80 LB
CLASS C CONC (COLUMN) (HPC), 0.47 CY

TABLE OF COLUMN QUANTITIES (3)

BENT	"H"	BARS V 32 ~ #7		BARS Z 4 ~ #3		REINF STEEL	CL C CONC (COLUMN)(HPC)
-	HEIGHT	LENGTH	WEIGHT	LENGTH	WEIGHT	LB	CY
2	8'	10'-3"	670	85'-3"	128	798	3.8
3	10'	12'-3"	801	104'-2"	157	958	4.7

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).

SEE BRIDGE LAYOUT FOR FOUNDATION TYPE, SIZE, AND LENGTH.

SEE FD STANDARD FOR ALL FOUNDATION DETAILS AND NOTES.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE. REINFORCING BAR DIMENSIONS SHOWN ARE OUT-TO-OUT OF BAR.

CALCULATED DRILLED SHAFT FOUNDATION LOAD:
115 TONS/DR SH

MATERIAL NOTES:

PROVIDE CLASS "C" (HPC) CONCRETE (f'c = 3,600 PSI).

PROVIDE GRADE 60 REINFORCING STEEL.

HL93 LOADING

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

GARVER
3755 S. Capital of Texas Highway
Suite 325
Austin, TX 78704
(512) 485-0009
TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

INTERIOR BENTS #2 - #3

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT	SHEET NO.
6	(SEE TITLE SHEET)	64

STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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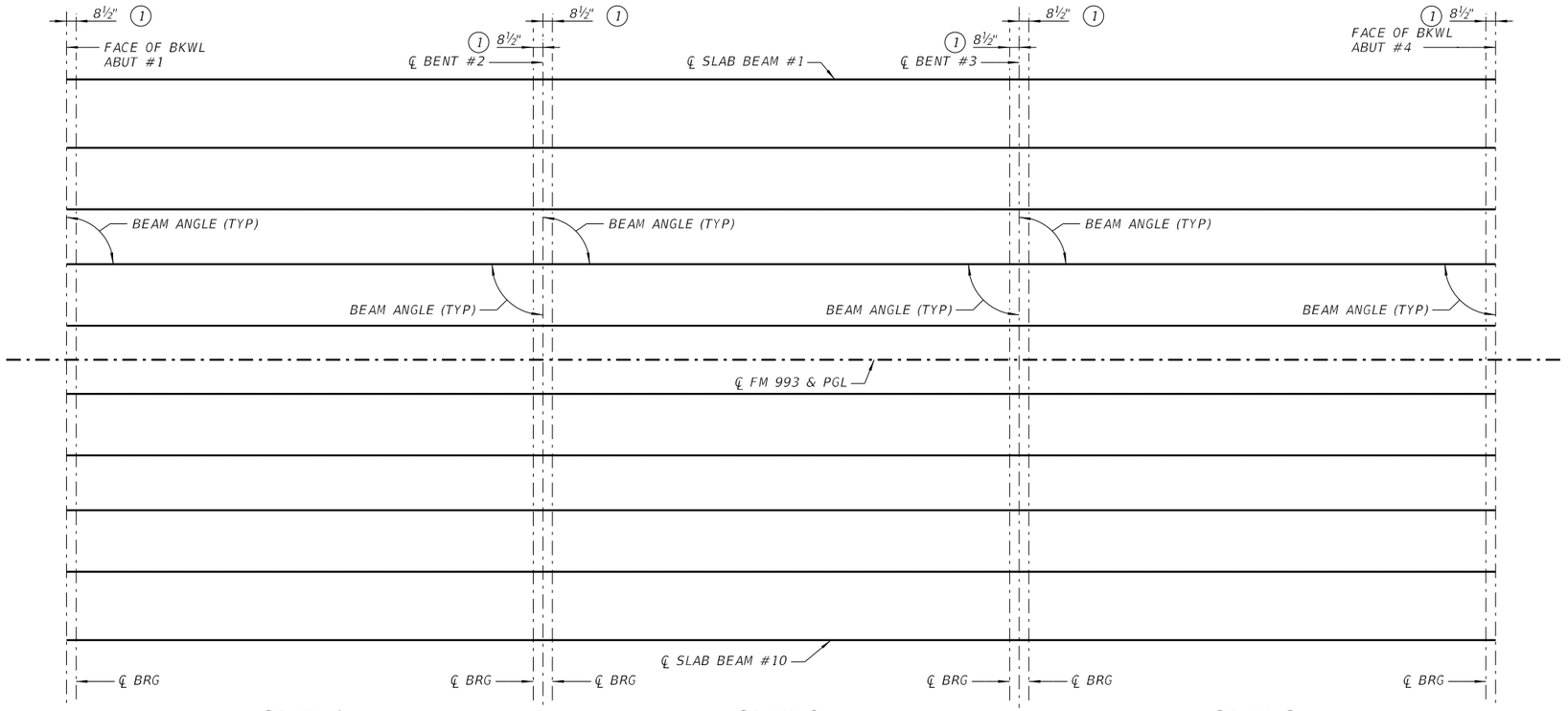

SPAN 1
(4SB12 AND 5SB12)

SPAN 2
(4SB12 AND 5SB12)

SPAN 3
(4SB12 AND 5SB12)

FRAMING PLAN

BENT REPORT

ABUT #1 (S 86 35 55.92 W)
DISTANCE BETWEEN STATION LINE AND BEAM 1 20.5940 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	BEAM	1	0.0000	90	00	00.00
	BEAM	2	5.0210	90	00	00.00
	BEAM	3	4.5210	90	00	00.00
	BEAM	4	4.0210	90	00	00.00
	BEAM	5	4.5210	90	00	00.00
	BEAM	6	5.0210	90	00	00.00
	BEAM	7	4.5210	90	00	00.00
	BEAM	8	4.0210	90	00	00.00
	BEAM	9	4.5210	90	00	00.00
	BEAM	10	5.0210	90	00	00.00
	TOTAL		41.1890			

BENT #2 (S 86 35 55.92 W)
DISTANCE BETWEEN STATION LINE AND BEAM 1 20.5940 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 1	BEAM	1	0.0000	90	00	00.00
	BEAM	2	5.0210	90	00	00.00
	BEAM	3	4.5210	90	00	00.00
	BEAM	4	4.0210	90	00	00.00
	BEAM	5	4.5210	90	00	00.00
	BEAM	6	5.0210	90	00	00.00
	BEAM	7	4.5210	90	00	00.00
	BEAM	8	4.0210	90	00	00.00
	BEAM	9	4.5210	90	00	00.00
	BEAM	10	5.0210	90	00	00.00
	TOTAL		41.1890			
SPAN 2	BEAM	1	0.0000	90	00	00.00
	BEAM	2	5.0210	90	00	00.00
	BEAM	3	4.5210	90	00	00.00
	BEAM	4	4.0210	90	00	00.00
	BEAM	5	4.5210	90	00	00.00
	BEAM	6	5.0210	90	00	00.00
	BEAM	7	4.5210	90	00	00.00
	BEAM	8	4.0210	90	00	00.00
	BEAM	9	4.5210	90	00	00.00
	BEAM	10	5.0210	90	00	00.00
	TOTAL		41.1890			

BENT #3 (S 86 35 55.92 W)
DISTANCE BETWEEN STATION LINE AND BEAM 1 20.5940 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 2	BEAM	1	0.0000	90	00	00.00
	BEAM	2	5.0210	90	00	00.00
	BEAM	3	4.5210	90	00	00.00
	BEAM	4	4.0210	90	00	00.00
	BEAM	5	4.5210	90	00	00.00
	BEAM	6	5.0210	90	00	00.00
	BEAM	7	4.5210	90	00	00.00
	BEAM	8	4.0210	90	00	00.00
	BEAM	9	4.5210	90	00	00.00
	BEAM	10	5.0210	90	00	00.00
	TOTAL		41.1890			
SPAN 3	BEAM	1	0.0000	90	00	00.00
	BEAM	2	5.0210	90	00	00.00
	BEAM	3	4.5210	90	00	00.00
	BEAM	4	4.0210	90	00	00.00
	BEAM	5	4.5210	90	00	00.00
	BEAM	6	5.0210	90	00	00.00
	BEAM	7	4.5210	90	00	00.00
	BEAM	8	4.0210	90	00	00.00
	BEAM	9	4.5210	90	00	00.00
	BEAM	10	5.0210	90	00	00.00
	TOTAL		41.1890			

ABUT #4 (S 86 35 55.92 W)
DISTANCE BETWEEN STATION LINE AND BEAM 1 20.5940 L

			BEAM SPA (C.L. BENT)	BEAM ANGLE D	M	S
SPAN 3	BEAM	1	0.0000	90	00	00.00
	BEAM	2	5.0210	90	00	00.00
	BEAM	3	4.5210	90	00	00.00
	BEAM	4	4.0210	90	00	00.00
	BEAM	5	4.5210	90	00	00.00
	BEAM	6	5.0210	90	00	00.00
	BEAM	7	4.5210	90	00	00.00
	BEAM	8	4.0210	90	00	00.00
	BEAM	9	4.5210	90	00	00.00
	BEAM	10	5.0210	90	00	00.00
	TOTAL		41.1890			

BEAM REPORT

BEAM REPORT, SPAN 1

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	BEAM SLOPE
BEAM 1	35.0000	33.5833	34.5009	0.00738
BEAM 2	35.0000	33.5833	34.5009	0.00738
BEAM 3	35.0000	33.5833	34.5009	0.00738
BEAM 4	35.0000	33.5833	34.5009	0.00738
BEAM 5	35.0000	33.5833	34.5009	0.00738
BEAM 6	35.0000	33.5833	34.5009	0.00738
BEAM 7	35.0000	33.5833	34.5009	0.00738
BEAM 8	35.0000	33.5833	34.5009	0.00738
BEAM 9	35.0000	33.5833	34.5009	0.00738
BEAM 10	35.0000	33.5833	34.5009	0.00738

BEAM REPORT, SPAN 2

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	BEAM SLOPE
BEAM 1	35.0000	33.5833	34.5000	-0.00048
BEAM 2	35.0000	33.5833	34.5000	-0.00048
BEAM 3	35.0000	33.5833	34.5000	-0.00048
BEAM 4	35.0000	33.5833	34.5000	-0.00048
BEAM 5	35.0000	33.5833	34.5000	-0.00048
BEAM 6	35.0000	33.5833	34.5000	-0.00048
BEAM 7	35.0000	33.5833	34.5000	-0.00048
BEAM 8	35.0000	33.5833	34.5000	-0.00048
BEAM 9	35.0000	33.5833	34.5000	-0.00048
BEAM 10	35.0000	33.5833	34.5000	-0.00048

BEAM REPORT, SPAN 3

	HORIZONTAL DISTANCE C-C BENT	C-C BRG.	TRUE DISTANCE BOT. BM. FLG. (2)	BEAM SLOPE
BEAM 1	35.0000	33.5833	34.5012	-0.00833
BEAM 2	35.0000	33.5833	34.5012	-0.00833
BEAM 3	35.0000	33.5833	34.5012	-0.00833
BEAM 4	35.0000	33.5833	34.5012	-0.00833
BEAM 5	35.0000	33.5833	34.5012	-0.00833
BEAM 6	35.0000	33.5833	34.5012	-0.00833
BEAM 7	35.0000	33.5833	34.5012	-0.00833
BEAM 8	35.0000	33.5833	34.5012	-0.00833
BEAM 9	35.0000	33.5833	34.5012	-0.00833
BEAM 10	35.0000	33.5833	34.5012	-0.00833

(1) SEE PSBEB STANDARD FOR ORIENTATION OF DIMENSIONS.

(2) BEAM LENGTHS SHOWN ARE BOTTOM BEAM LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE.

HL93 LOADING

NO.	DATE	REVISION	APPROVED

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

GARVER
3755 S. Capital of Texas Highway
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TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK
FRAMING PLAN
(SPANS 1-3)

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		65
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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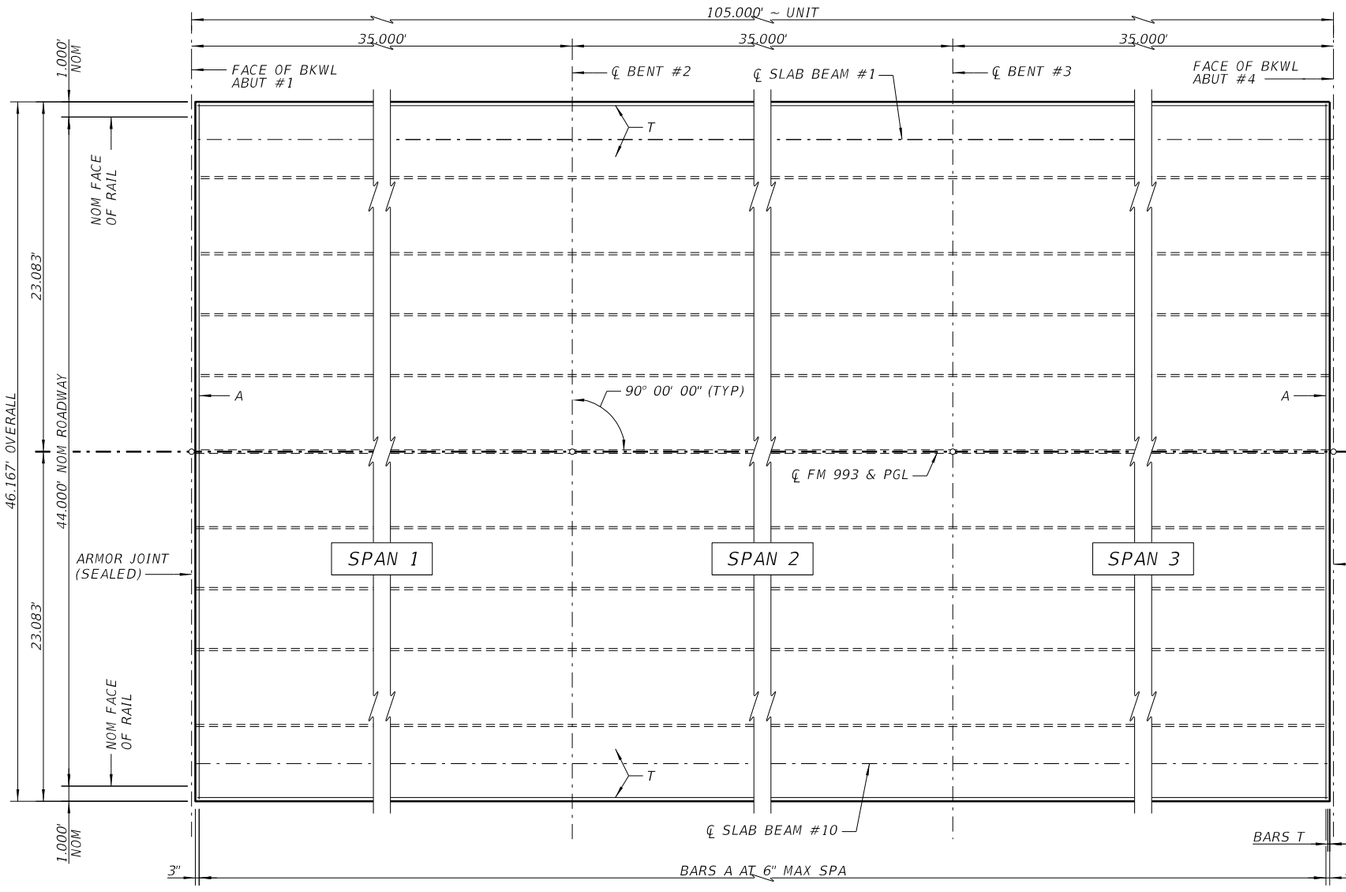
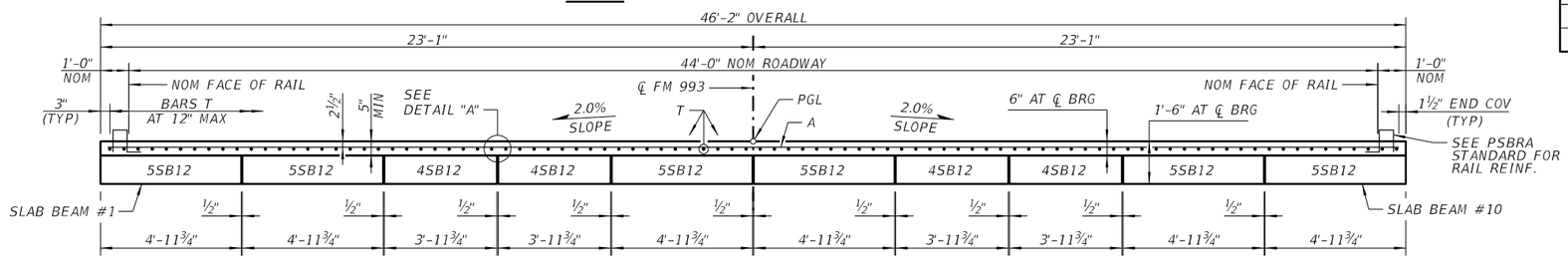
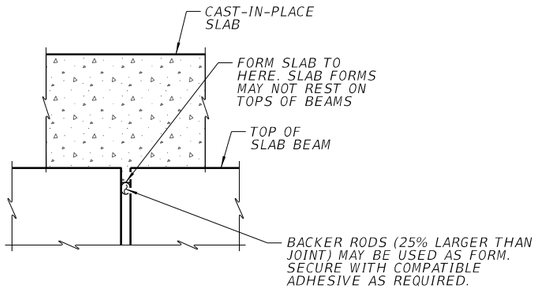


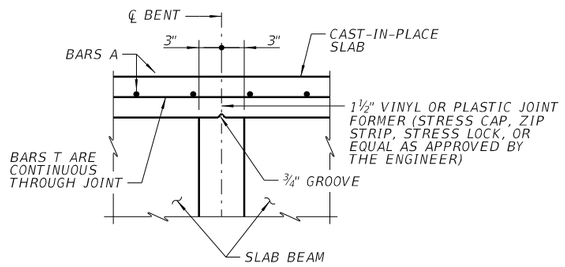
PLAN



TYPICAL TRANSVERSE SECTION



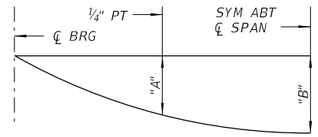
DETAIL "A"



CONTINUOUS SLAB DETAIL

TABLE OF DEAD LOAD DEFLECTIONS

SPAN	BEAM	"A"	"B"
		FT	FT
ALL	ALL	0.012	0.017



DEAD LOAD DEFLECTION DIAGRAM

NOTE: DEFLECTIONS SHOWN ARE DUE TO CONCRETE SLAB ONLY (EC = 5,000 KSI). CALCULATED DEFLECTIONS SHOWN ARE THEORETICAL AND ACTUAL DIMENSIONS MAY VARY. ADJUST BASED ON FIELD VERIFICATION.

TABLE OF ESTIMATED QUANTITIES

SPAN	REINF CONC SLAB (SLAB BEAM) (HPC)	PRESTRESSED CONCRETE SLAB BEAMS (2)		REINF STEEL (1)
		(TY 4SB12)	(TY 5SB12)	
–	SF	LF	LF	LB
1	1,616	138.00	207.00	4,525
2	1,616	138.00	207.00	4,525
3	1,616	138.00	207.00	4,525
TOTAL	4,848	414.00	621.00	13,575

GENERAL NOTES:

DESIGNED ACCORDING TO AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 9TH EDITION (2020) AND TxDOT BRIDGE DESIGN MANUAL (JAN 2023).

SEE PSBRA AND TYPE SSTR STANDARD FOR RAIL ANCHORAGE DETAILS.

SEE PSBEB STANDARD FOR GIRDER END DETAILS.

SEE AJ STANDARD FOR EXPANSION JOINT DETAILS.

SEE BRIDGE LAYOUT FOR SURFACE TEXTURE REQUIREMENTS.

COVER DIMENSIONS ARE CLEAR DIMENSIONS, UNLESS NOTED OTHERWISE.

(1) REINFORCING STEEL WEIGHT IS CALCULATED USING AN APPROXIMATE FACTOR OF 2.8 LBS/SF.

(2) LENGTHS SHOWN ARE BOTTOM BEAM LENGTHS WITH ADJUSTMENTS MADE FOR BEAM SLOPE.

HL93 LOADING

NO.	DATE	REVISION	APPROVED

BAR TABLE

BAR	SIZE
A	#5
T	#4

MATERIAL NOTES:

PROVIDE CLASS "S" (HPC) CONCRETE (f'c = 4,000 PSI).

PROVIDE GRADE 60 EPOXY COATED REINFORCING STEEL.

PROVIDE BAR LAPS, WHERE REQUIRED, AS FOLLOWS:
EPOXY COATED ~ #4 = 2'-5"
~ #5 = 3'-0"

DEFORMED WELDED WIRE REINFORCEMENT (WWR) (ASTM A1064) OF EQUAL SIZE AND SPACING MAY BE SUBSTITUTED FOR BARS A & T UNLESS OTHERWISE NOTED. PROVIDE THE SAME LAPS AS REQUIRED FOR REINFORCING BARS.

STATE OF TEXAS
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102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

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(512) 485-0009
TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

105.00' PRESTR CONC SLAB BEAM UNIT (SPANS 1-3)

SHEET 1 OF 1

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		66
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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DESIGNED BEAMS (STRAIGHT STRANDS)

STRUCTURE	SPAN NO.	BEAM NO.	BEAM TYPE	PRESTRESSING STRANDS: NON-STD STRAND PATTERN	PRESTRESSING STRANDS: TOTAL NO.	PRESTRESSING STRANDS: SIZE (in)	PRESTRESSING STRANDS: STRGTH fpu (ksi)	PRESTRESSING STRANDS: "e" ℄ (in)	PRESTRESSING STRANDS: "e" END (in)	PRESTRESSING STRANDS: TOT NO. DEB	DEBONDED STRANDS PER ROW: DIST FROM BOTTOM (in)	DEBONDED STRANDS PER ROW: NO. OF STRANDS: TOTAL	DEBONDED STRANDS PER ROW: NO. OF STRANDS: DE-BONDED	DEBONDED STRANDS PER ROW: NUMBER OF STRANDS DEBONDED TO (ft from end): 3	6	9	12	15	CONCRETE: RELEASE STRGTH ① f'ci (ksi)	CONCRETE: MINIMUM 28 DAY COMP STRGTH f'c (ksi)
WEST GREASY CREEK	ALL	ALL 5SB12	5SB12		14	0.6	270	3.50	3.50	0	0.00	0	0	0	0	0	0	0	4.000	5.000
BRIDGE	ALL	ALL 4SB12	4SB12		12	0.6	270	3.50	3.50	0	0.00	0	0	0	0	0	0	0	4.000	5.000

OPTIONAL DESIGN

DESIGN LOAD COMP STRESS (TOP ℄) (SERVICE I) fct (ksi)	DESIGN LOAD TENSILE STRESS (BOTT ℄) (SERVICE III) fcb (ksi)	REQUIRED MINIMUM ULTIMATE MOMENT CAPACITY (STRENGTH I) (kip-ft)	LIVE LOAD DISTRIBUTION FACTOR ② Moment	LIVE LOAD DISTRIBUTION FACTOR ② Shear
1.760	-2.206	652	0.427	0.427
1.796	-2.281	548	0.364	0.364

LOAD RATING FACTORS

STRENGTH I Inv	STRENGTH I Opr	SERVICE III Inv
1.39	1.80	1.25
1.39	1.81	1.29

NON-STANDARD STRAND PATTERNS

PATTERN	STRAND ARRANGEMENT AT ℄ OF 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.

DESIGN NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Load rated using Load and Resistance Factor Rating according to AASHTO Manual for Bridge Evaluation.

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

FABRICATION NOTES:

Provide Class H concrete.

Provide Grade 60 reinforcing steel.

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

Full-length debonded strands are not permitted in positions "A" and "B".

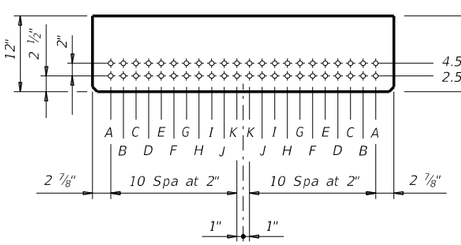
Strand debonding must comply with Item 424.4.2.2.2.4.

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.

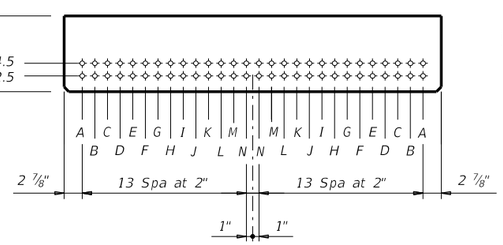
Locate strands for the designed beam as low as possible on the 2" grid system unless a non-standard strand pattern is indicated. Fill row "2.5", then row "4.5". Place strands within a row as follows:

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

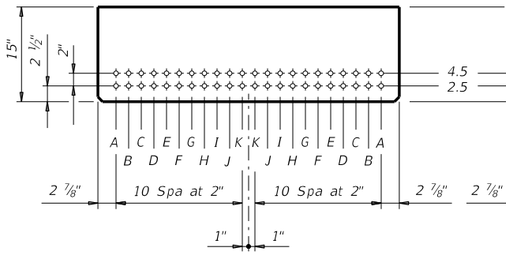
Do not debond strands in position "A". Distribute debonded strands symmetrically about the vertical centerline. Increase debonded lengths working outward, with debonding staggered in each row.



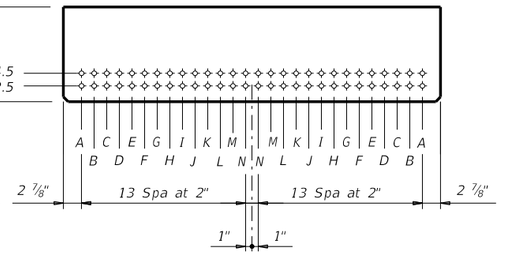
TxDOT 4SB12 SLAB BEAM



TxDOT 5SB12 SLAB BEAM



TxDOT 4SB15 SLAB BEAM



TxDOT 5SB15 SLAB BEAM

HL93 LOADING

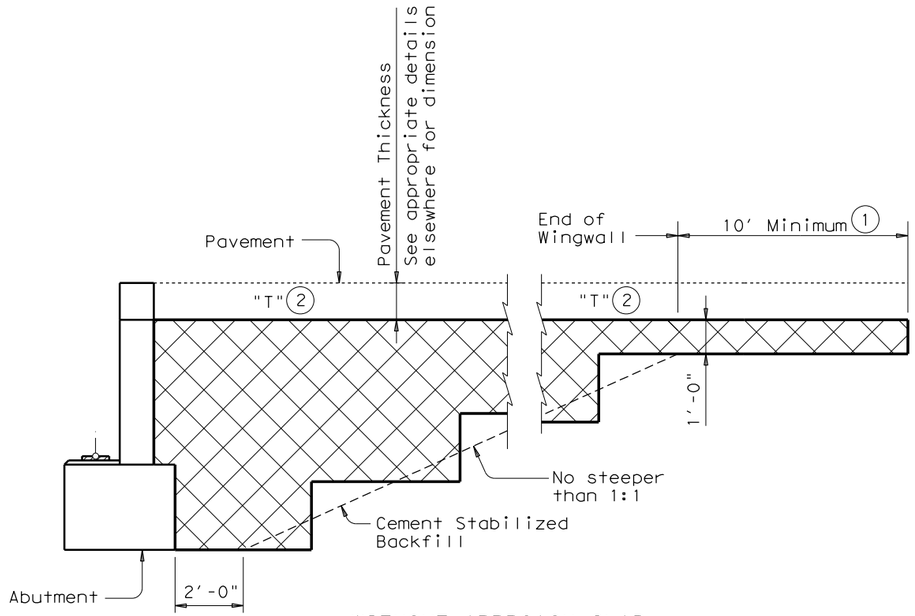
Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE SLAB BEAM DESIGNS (NON-STANDARD SPANS)

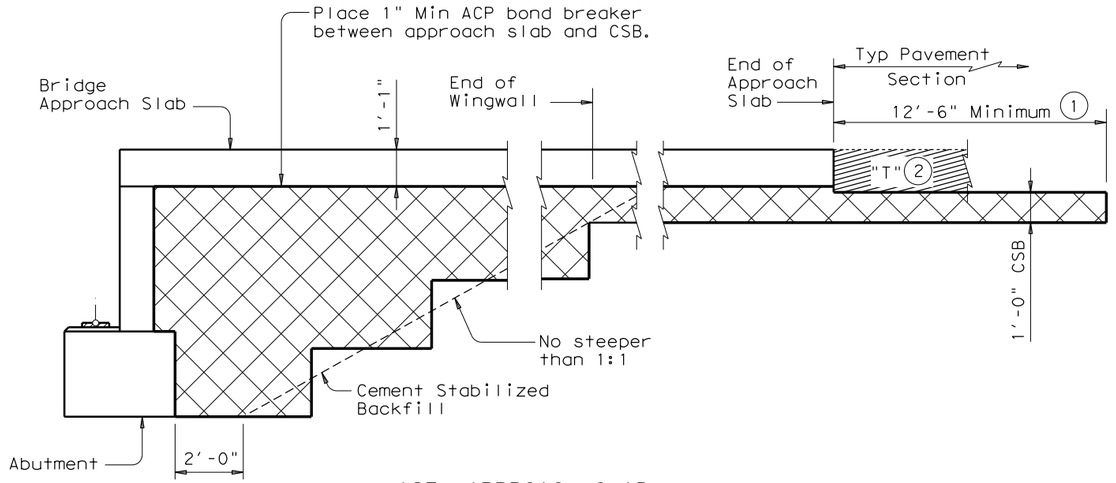
PSBND

FILE: psbsts05-22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
3-22: Added Load Rating.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		67



WITHOUT APPROACH SLAB

SEE SECTION A-A CSAB



WITH APPROACH SLAB

SEE SECTION A-A CSAB

(1) Limit of Cement Stabilized Backfill is at a minimum of 12.5' from the end of the bridge approach slab. However, extend limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
For locations without an approach slab, the minimum limit of Cement Stabilized Backfill is 10.0' from the end of the wingwall.

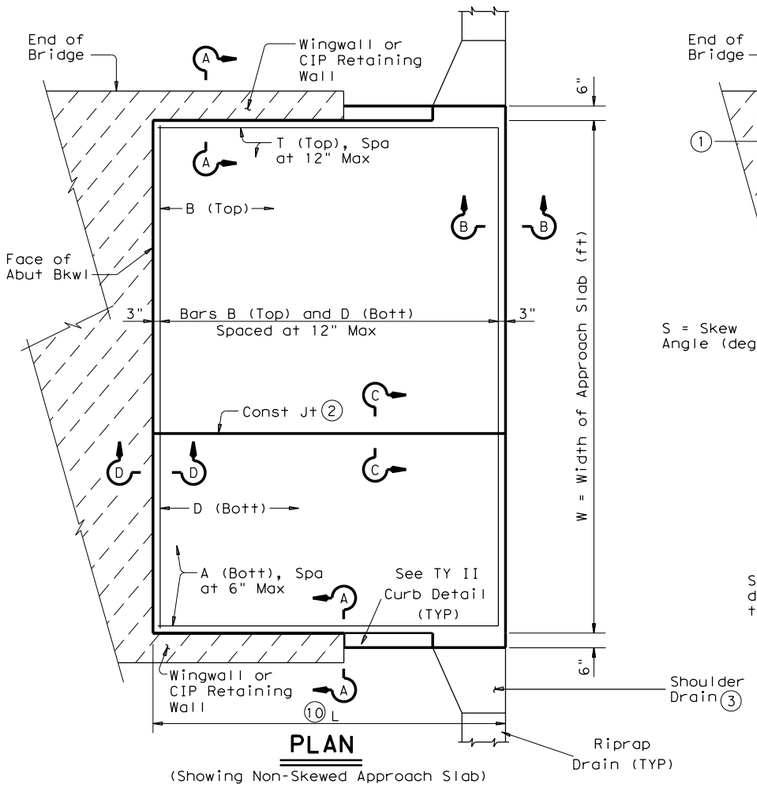
(2) Thickness "T" does not include the depth of the treated subgrade and bond breaker.

STATE OF TEXAS
ALVARO J. LOPEZ
102216
LICENSED PROFESSIONAL ENGINEER
12/08/2023

Atlanta District CSAB - REQUIRED SUPPLEMENTAL DETAILS

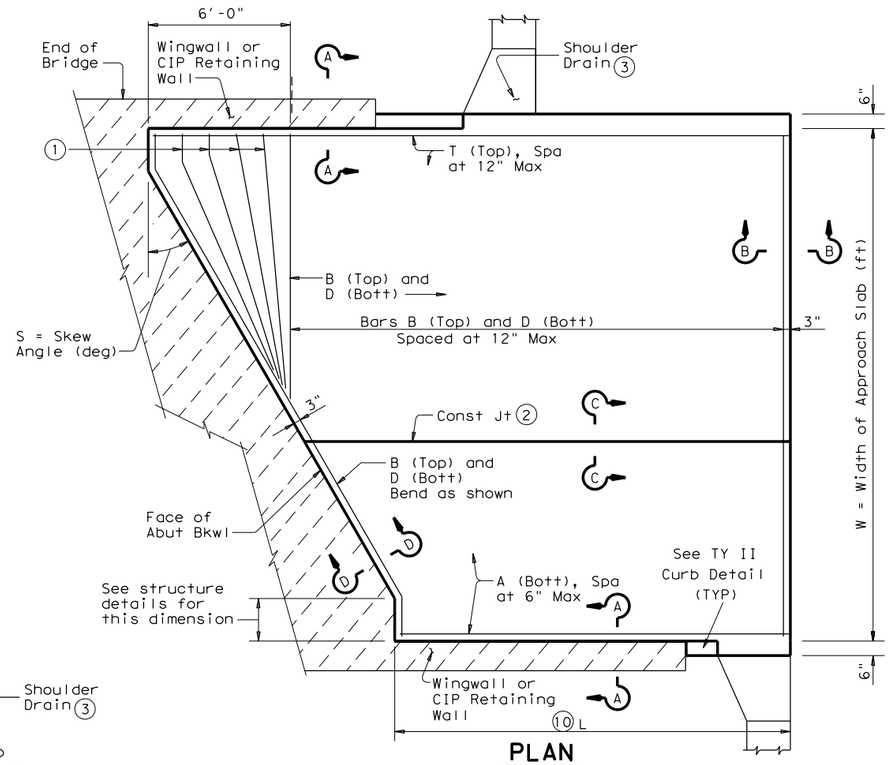
FHWA TEXAS DIVISION	FEDERAL AID PROJECT NO.		SHEET NO.
	(SEE TITLE SHEET)		68
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY NO.
1511	01	013	FM 993

FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/07*Bridge/Standards/CSAB-ATL.dgn
DATE: 12/7/2023 3:16:16 PM



PLAN

(Showing Non-Skewed Approach Slab)



PLAN

(Showing Skewed Approach Slab)

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

APPROXIMATE QUANTITIES (4)

Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Area of Appr Slab = $L \times W + 0.5W^2 \tan S$ (SF)

(Outside 6" From End of Wingwall to End of BAS not included)

W = Width of Approach Slab (ft)

S = Skew Angle (deg)

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

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

(3) See sheet 2 of 2 for shoulder drain location and details.

(4) For Contractor's information only.

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

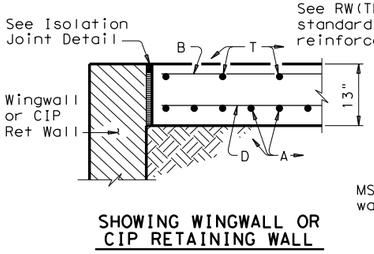
(6) See details elsewhere in plans for required cross-slope.

(7) Place in accordance with Item 438.

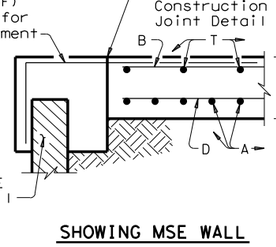
(8) Backer rod shall be 25% larger than joint opening and shall be compatible with the sealant.

(9) Place ½" Preformed Bituminous Fiber Material between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.

(10) Length "L" is equal to "Lw" (Length of Wingwall) + 17'4". when thrie-beam and curb are required. For "Lw", see bridge details. "L"=20' if thrie-beam and curb are not required.

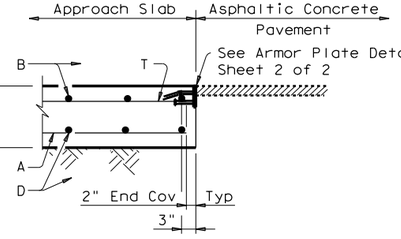


SHOWING WINGWALL OR CIP RETAINING WALL

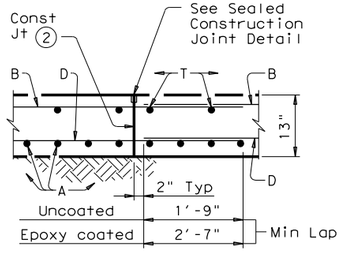


SHOWING MSE WALL

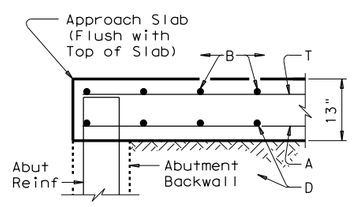
SECTION A-A



SECTION B-B



SECTION C-C (5)



SECTION D-D

GENERAL NOTES:

Construct approach slab in accordance with Item 420.

Concrete shall be Class "S" with a minimum compressive strength of 4,000 psi.

All reinforcing steel shall be Grade 60.

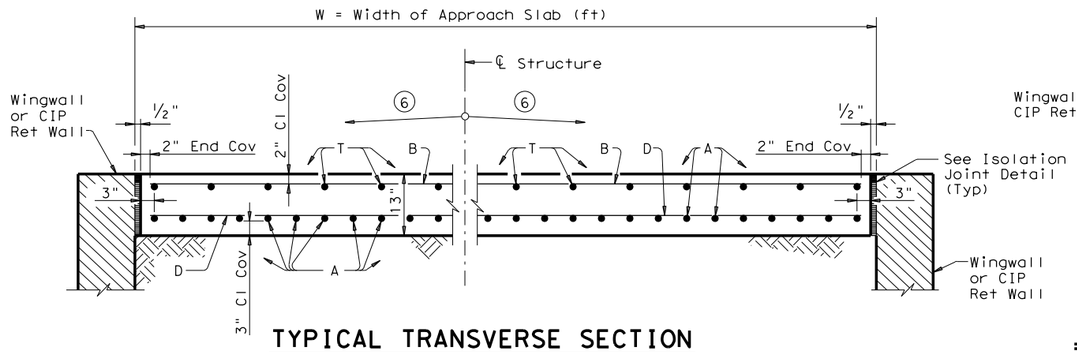
Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans.

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

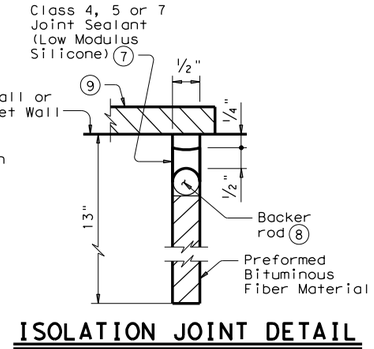
Cure for 4 days using water or membrane curing per Item 420.

Sealant, backer rod and preformed bituminous fiber material is subsidiary to approach slab concrete.

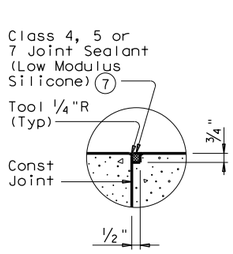
Provide a 1" bondbreaker (asphaltic concrete pavement or asphalt stabilized base) between the approach slab and cement stabilized backfill or cement treated base. Other bondbreakers may be used if approved by the Engineer.



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

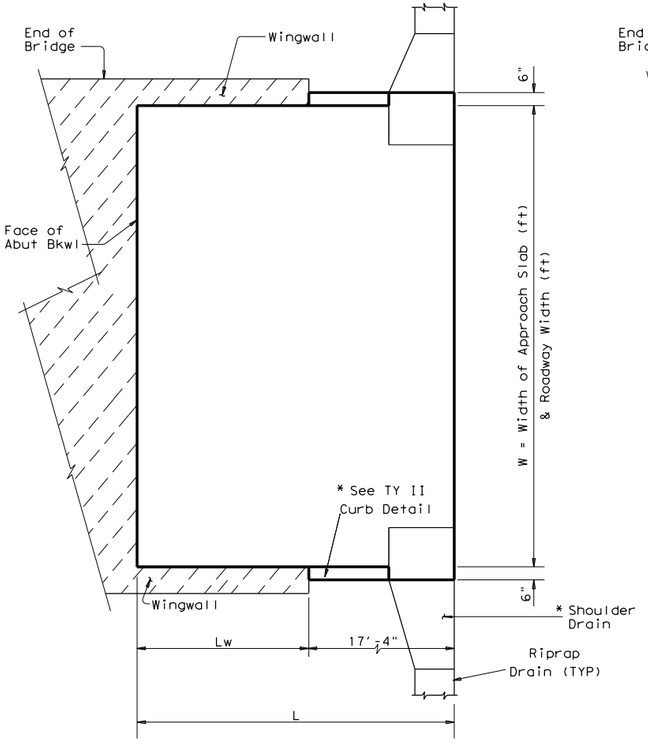
a-bas-A.std

Texas Department of Transportation
ATLANTA DISTRICT STANDARD

BRIDGE APPROACH SLAB
ASPHALTIC CONCRETE PAVEMENT
A-BAS-A
CONCRETE BRIDGE RAIL WITH THRIE BEAM

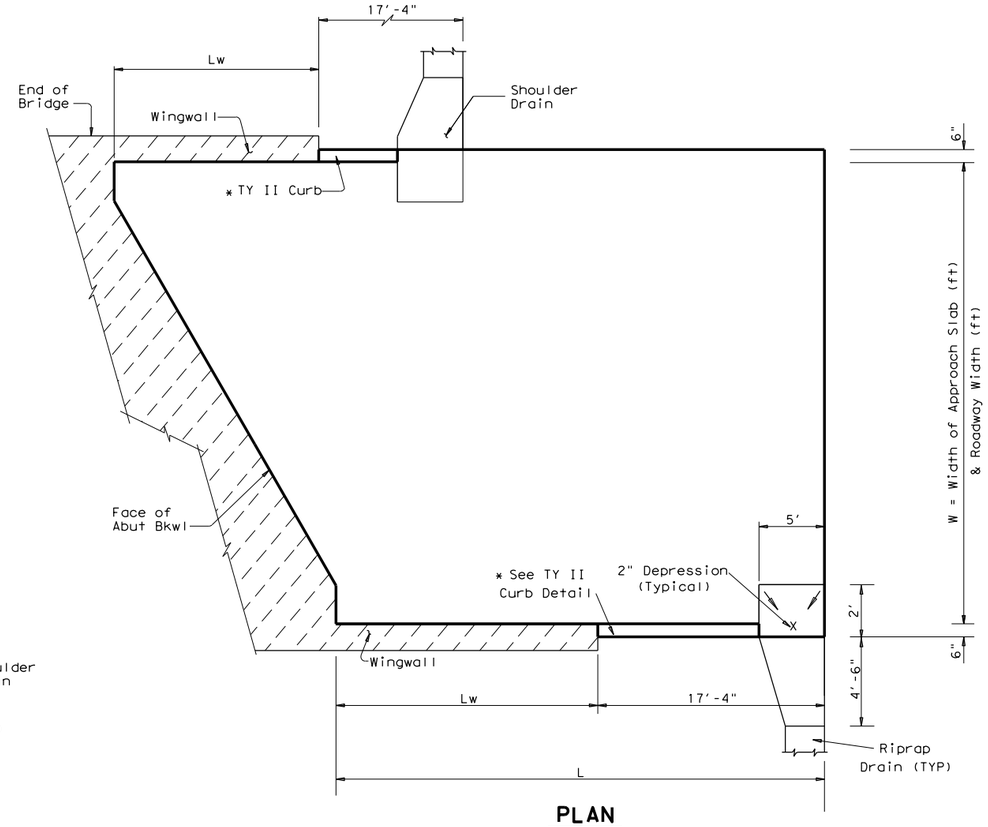
SHEET 1 OF 2

FILE: abas2005.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 2005	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS MARCH 2006 AUGUST 2006 MARCH 2008 APRIL 2011	ATL	(SEE TITLE SHEET)		69
	COUNTY	CONTROL	SECT	JOB	HIGHWAY
	UPSHUR	1511	01	013	FM 993



PLAN

(Showing Non-Skewed Approach Slab)



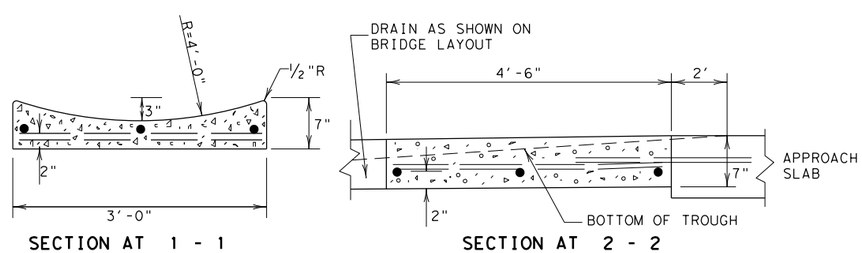
PLAN

(Showing Skewed Approach Slab)

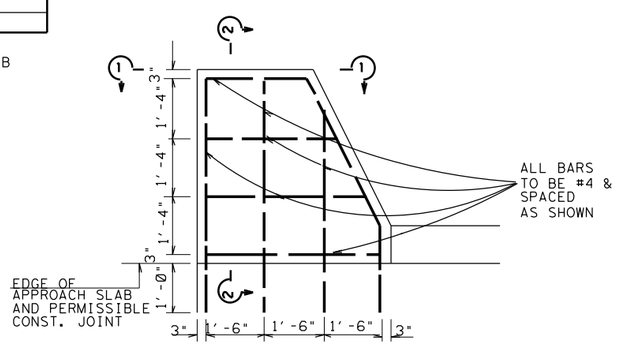
CONC. RIPRAP DRAIN DETAIL

ESTIMATED QUANTITIES FOR ONE SHOULDER DRAIN	
REINF. STEEL	CONCRETE
LBS	CY
25	0.34

QUANTITIES FOR SHOULDER DRAIN ARE INCLUDED IN QUANTITIES FOR APPROACH SLAB

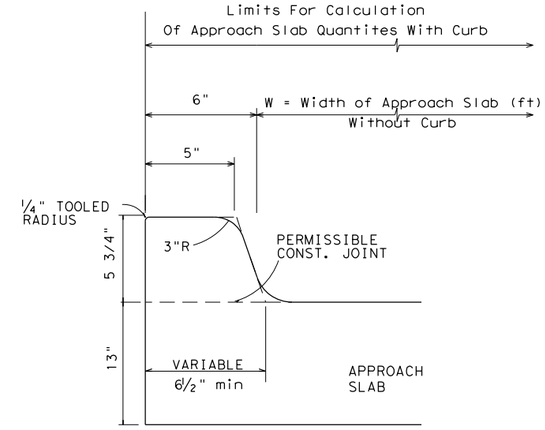


SHOULDER DRAIN



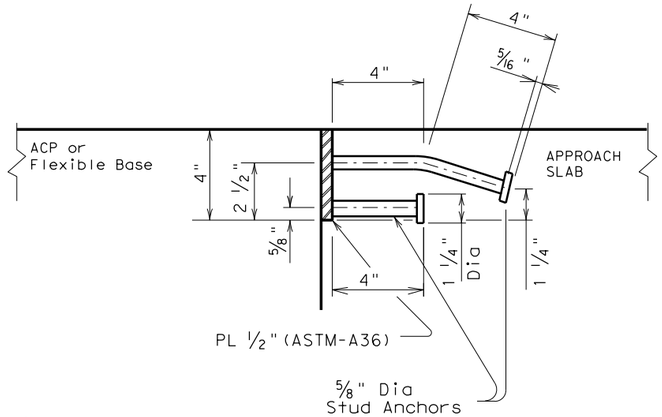
REINFORCING LAYOUT FOR SHOULDER DRAIN

* If Thrie-Beam is Not Required Eliminate Curb and Locate Shoulder Drain at End of Wingwall.



TYPE II CURB

TYPE II CURB WILL NOT BE PAID FOR DIRECTLY BUT IS CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.



ARMOR PLATE

WEIGHT OF ARMOR PLATE= 8.05 lbs./ft.

LENGTH OF ARMOR PLATE IS SAME AS ROADWAY WIDTH, UNLESS OTHERWISE NOTED.

Texas Department of Transportation
ATLANTA DISTRICT STANDARD

BRIDGE APPROACH SLAB
ASPHALTIC CONCRETE PAVEMENT
A-BAS-A
CONCRETE BRIDGE RAIL WITH THRIE BEAM

SHEET 2 OF 2

FILE: abas2005.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT May 2005	DISTRICT	FEDERAL AID PROJECT		SHEET
REVISIONS March 2006 August 2006 MARCH 2008 APRIL 2011	ATL	(SEE TITLE SHEET)		70
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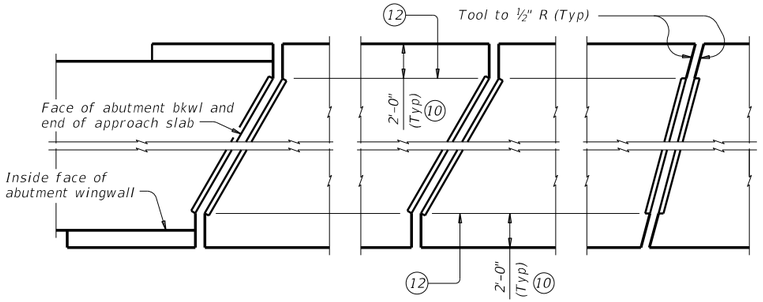
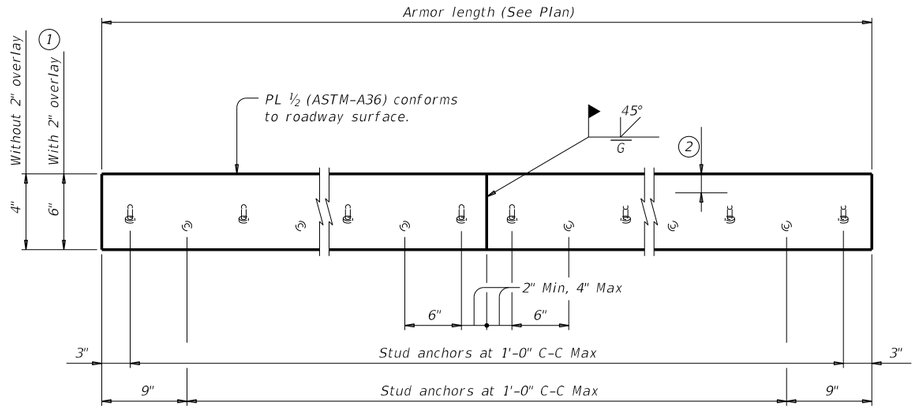


JOINTS AT ABUTMENTS | SKEWS OVER 15° | SKEWS THRU 15°

PLANS OF ARMOR PLATES



ELEVATION OF BASIC ARMOR PLATE

(1) Adjust 6" plate height for overlay thicknesses other than the 2" shown. Adjust weight by 1.70 plf for each ½" variation in thickness.

(2) Do not paint top 1 ½" of plate if using sealed armor joint.

(3) Set top of backer rod 1" below top of armor plate. Backer rod must be compatible with joint sealant. Use of multiple pieces to create a backer rod cross section is not permitted. Top of backer rod must be convex as shown.

(4) Blast clean entire contact area between sealant and plate (SSPC-SP10) before installing sealant. Light brush blast and thoroughly clean all dust and debris from concrete surfaces in contact with joint sealant before application of silicone seal.

(5) Use Class 7 joint sealant that conforms to DMS-6310.

(6) Place sealant while ambient temperature is between 55°F and 80°F and is rising.

(7) Armor joint does not include joint sealant or backer rod.

(8) Armor joint (sealed) includes Class 7 joint sealant and backer rod.

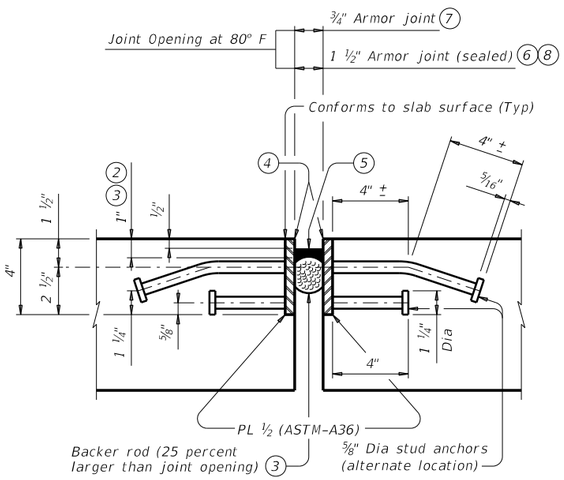
(9) Form vertical leg of seal as per the Manufacturer's recommendations. Use Class 4 joint sealant if Class 7 cannot be installed correctly. Install according to Manufacturer's recommendations.

(10) Unless shown otherwise, terminate armor plate at slab break point if break is more than 2'-0" from slab edge.

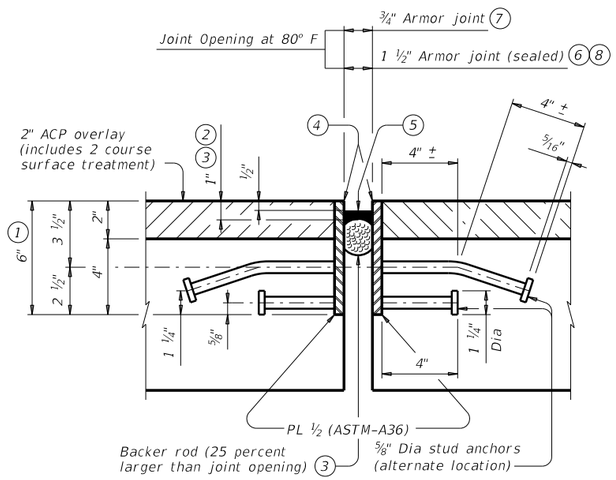
(11) See "Plans of Armor Plates".

(12) At Fabricator's option, armor plate may extend up to 6" beyond this point for skews through 15°.

(13) Align shipping angle perpendicular to joint.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION



SHOWN WITH 2" OVERLAY AT JOINT LOCATION (1)

ARMOR JOINT SECTIONS

Showing Armor Joint (Sealed)

FABRICATION NOTES:

Match mark corresponding plate sections and secure together for shipment with shipping angle. Do not use erection bolts.

Ship armor joints in convenient lengths of 10'-0" Min and 24'-0" Max unless necessary for stage 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.

Use groove welds for all shop and field butt splices. Grind smooth areas in contact with seal. Make all necessary field splice joint preparations in the shop.

Paint the entire steel section, except as stated in Note 2, with System II or IV primer in accordance with Item 446 "Field Cleaning and Painting Steel." Provide paints in accordance with Item 446.2. Prepare steel and apply paint in accordance with Items 446.4.7.3 and 446.4.7.4.

Shop drawings for the fabrication of armor joints will not require the Engineer's approval if fabrication is in accordance with the details shown on this standard.

CONSTRUCTION NOTES:

Secure armor joints in position and place to 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 Armor Joint.

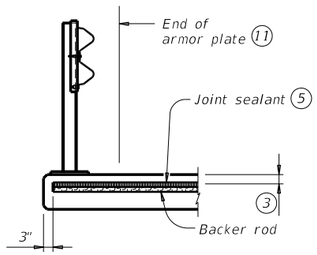
Remove shipping angle immediately after each joint half is secured in place. Grind smooth, and touch up with organic zinc-rich paint.

GENERAL NOTES:

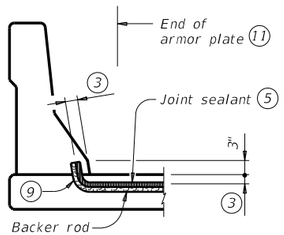
Provide armor joints at locations shown on the plans. Provide the seal when "Armor Joint (Sealed)" is noted on the plans.

These joint details accommodate a joint movement range of 1 ⅜" (¾" opening movement and ⅜" closure movement).

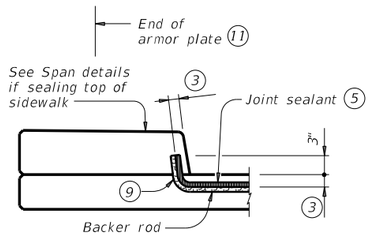
Payment for armor joint, with or without seal, is based on length of armor plate.



AT STEEL POST BRIDGE RAIL



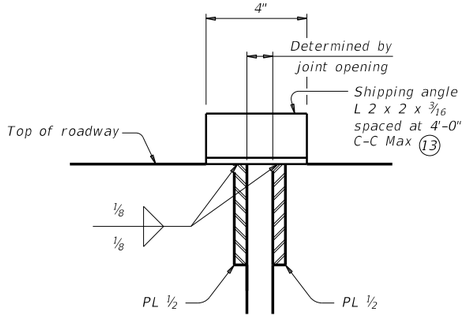
AT CONCRETE BRIDGE RAIL



AT SIDEWALK

JOINT SEALANT TERMINATION DETAILS

Armor joint (sealed) only. Armor plate is not shown for clarity.



SHOWN WITHOUT 2" OVERLAY AT JOINT LOCATION

With overlay similar

SHIPPING ANGLE

An alternate method of securing joint sections may be used if approved by the Bridge Division. Erection bolts are not allowed.

WEIGHTS FOR ONE ARMOR JOINT (2 PLATES)	
WITHOUT OVERLAY	16.10 plf
WITH 2" OVERLAY (1)	22.90 plf

Texas Department of Transportation

Bridge Division Standard

ARMOR JOINT DETAILS

AJ

FILE: ajstde01-19.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		71

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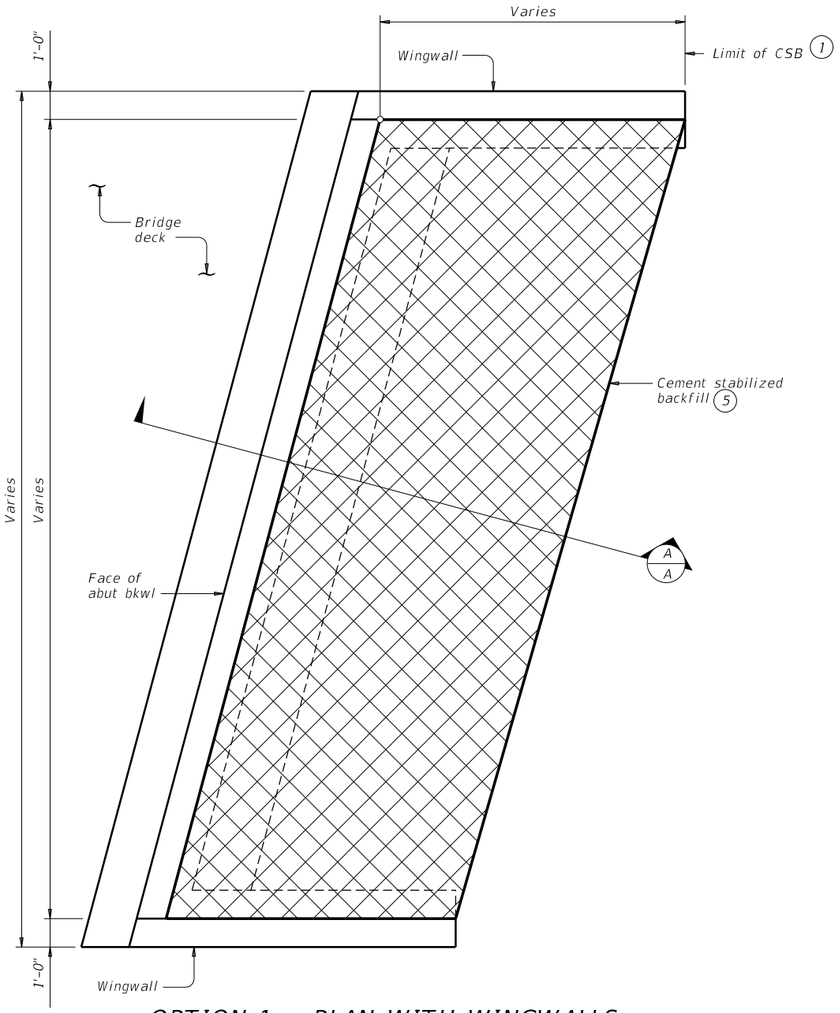
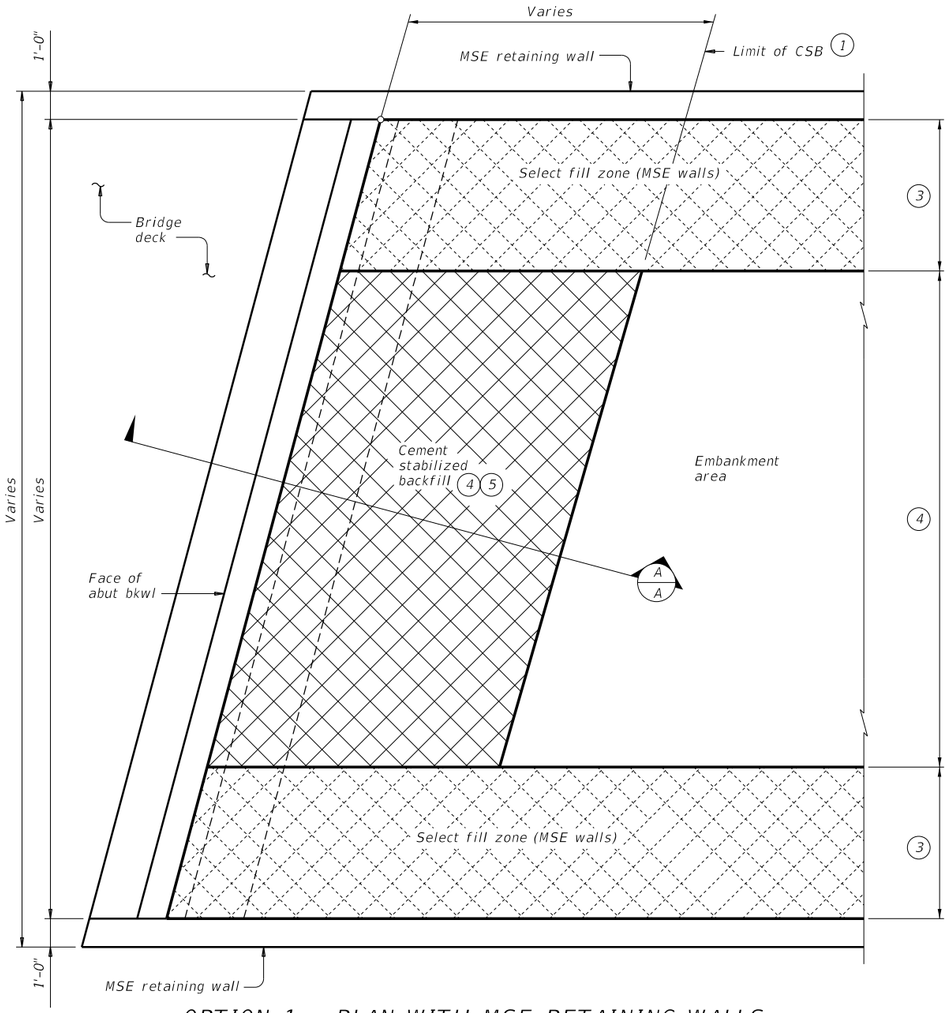
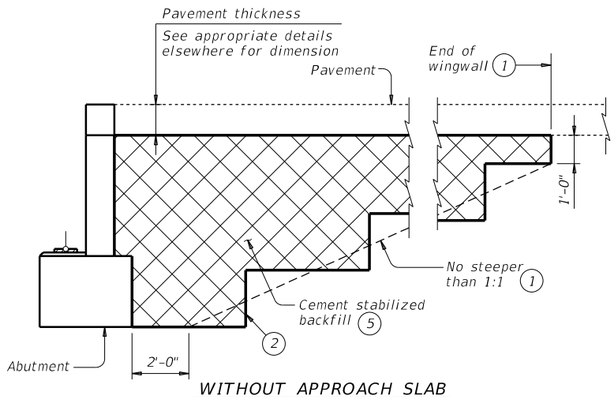


OPTION 1 ~ PLAN WITH WINGWALLS

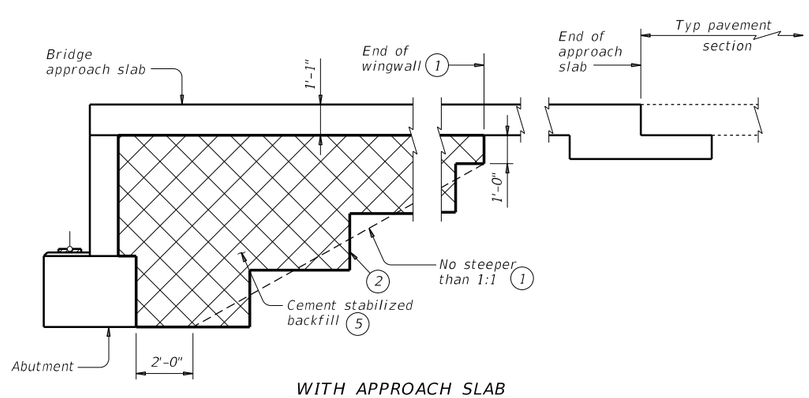
Cast-in-place retaining walls similar.



OPTION 1 ~ PLAN WITH MSE RETAINING WALLS



WITHOUT APPROACH SLAB



WITH APPROACH SLAB

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

SECTION A-A

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

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

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

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

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

GENERAL NOTES:

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

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

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

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

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

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

Texas Department of Transportation

Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		72

DATE: 12/7/2023 3:16:24 PM
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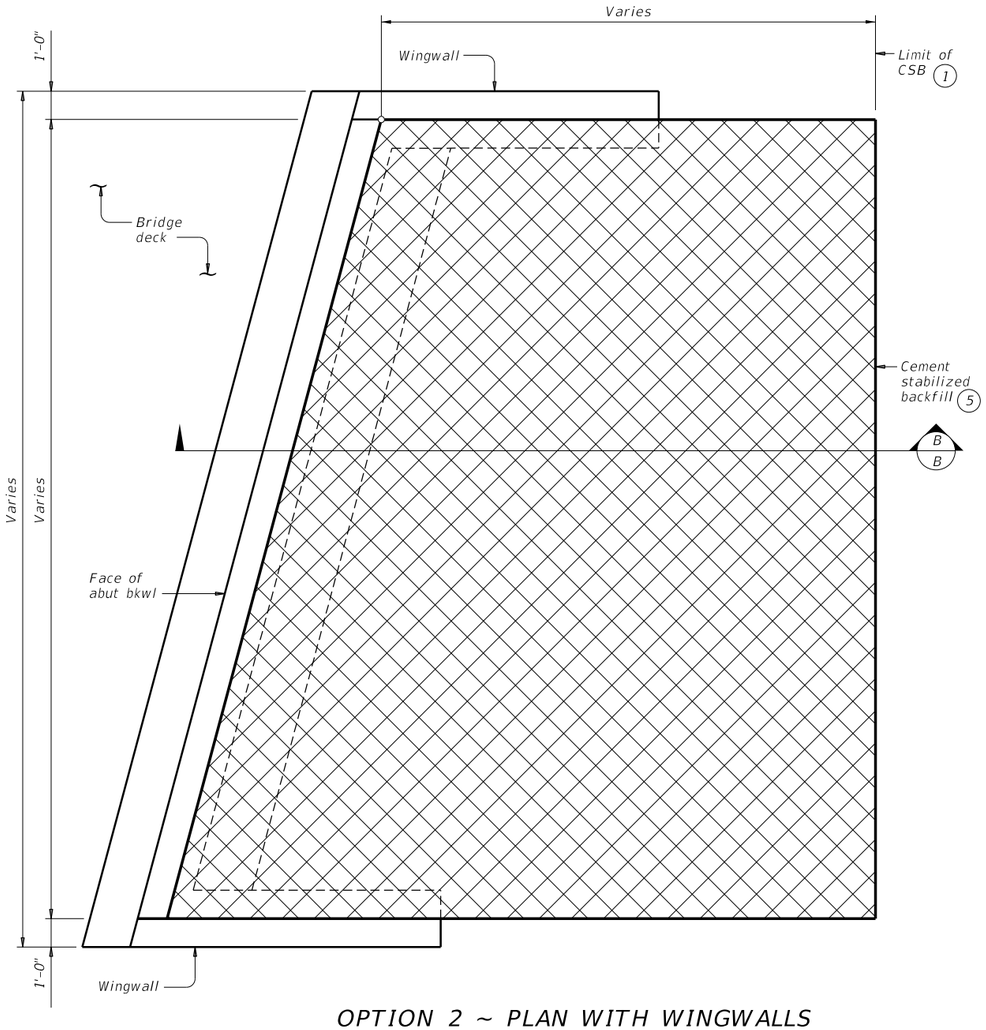
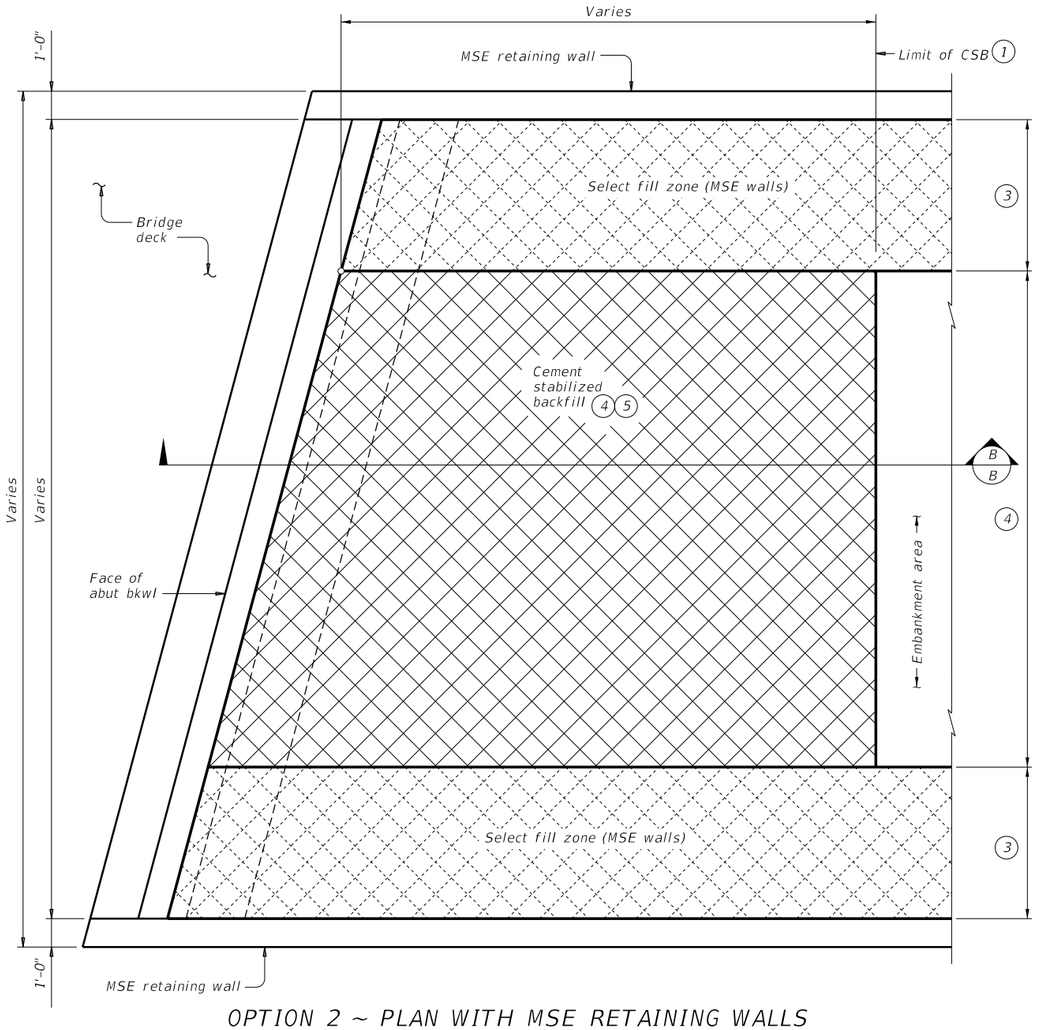


OPTION 2 ~ PLAN WITH WINGWALLS

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.

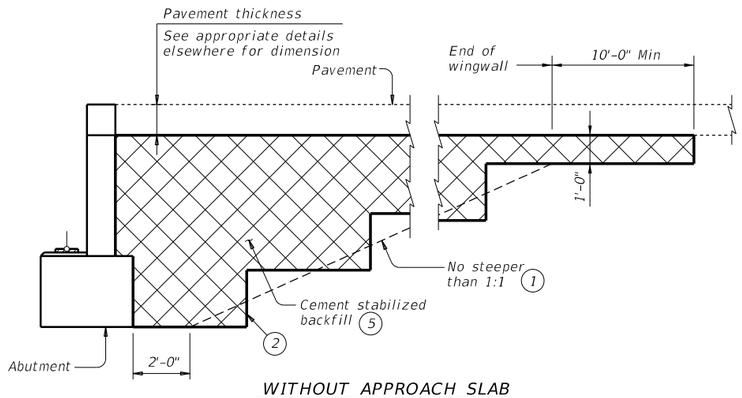
(2) Bench backfill as shown with 12" (approximate) bench depths.

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

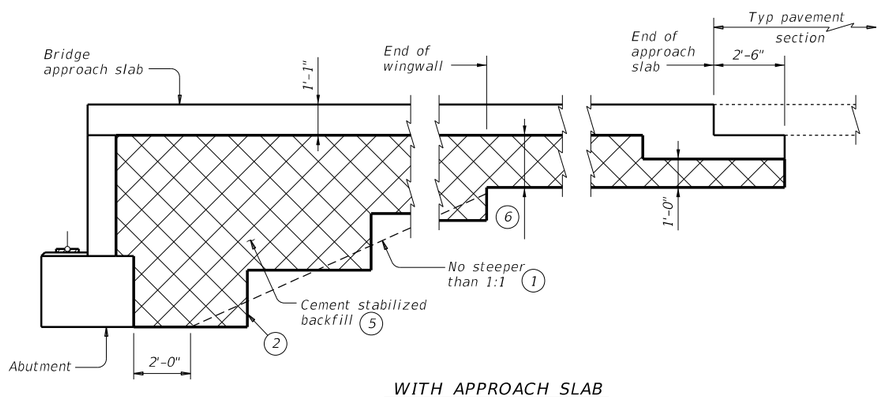
(4) When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

(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

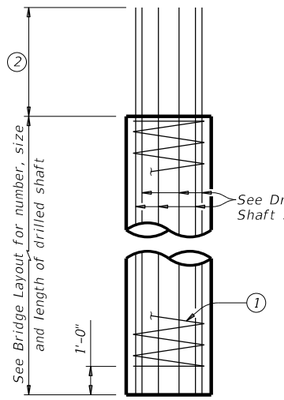
CEMENT STABILIZED ABUTMENT BACKFILL

BRIDGE ABUTMENT

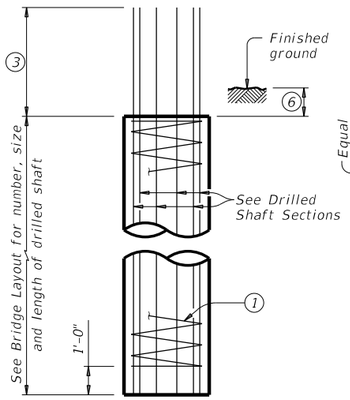
CSAB

FILE: MS-CSAB-23.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
02-20: Added Option 2. 03-23: Updated General Notes.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		73

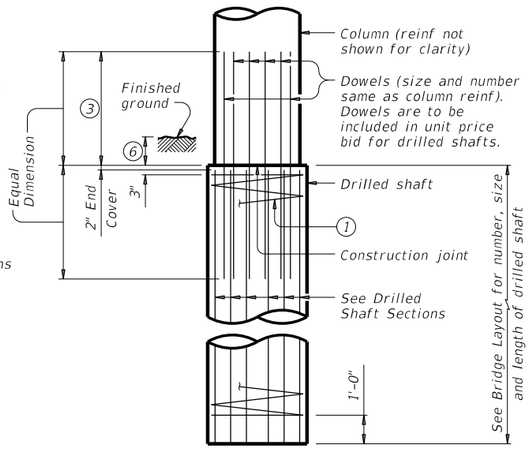
DATE: 12/7/2023 3:16:27 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/07_Bridge/Standards/fdstde01-20.dgn



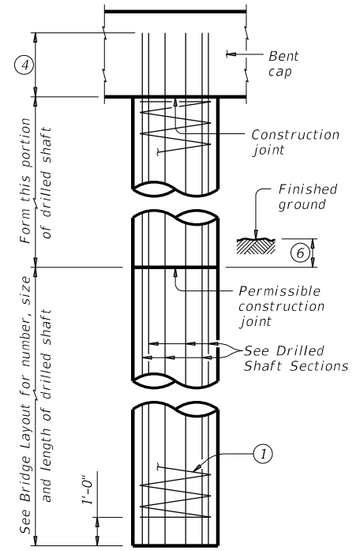
ABUTMENTS, WINGWALLS AND MULTI-DRILLED SHAFT FOOTINGS



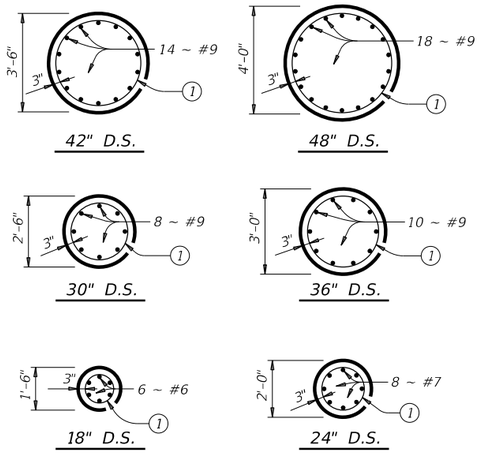
INTERIOR BENTS DRILLED SHAFT DIA EQUAL TO COLUMN DIA



INTERIOR BENTS DRILLED SHAFT DIA GREATER THAN COLUMN DIA



OPTIONAL INTERIOR BENT DRILLED SHAFT DETAIL (5)

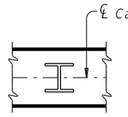


DRILLED SHAFT SECTIONS

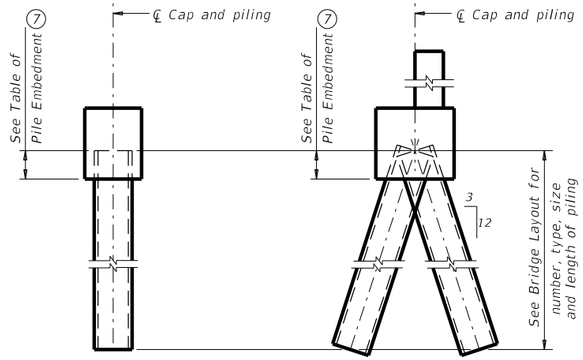
DRILLED SHAFT DETAILS

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

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

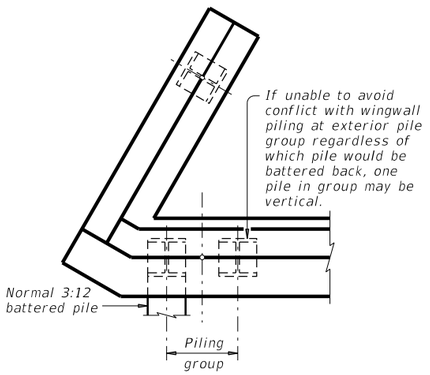


ORIENTATION OF STEEL H-PILING

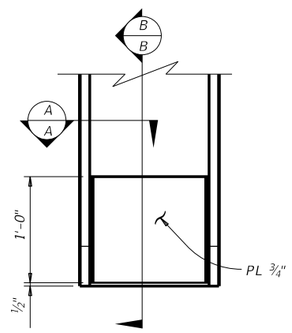


VERTICAL PILE BATTERED PILE

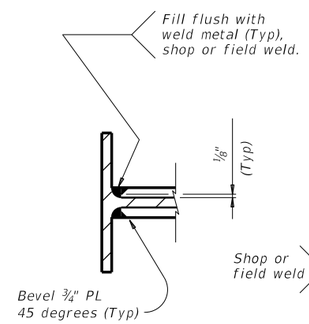
PILING DETAILS
(Concrete or steel H)



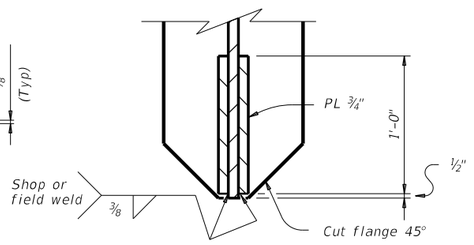
DETAIL "A"
(Showing plan view of a 30° skewed abutment)



ELEVATION

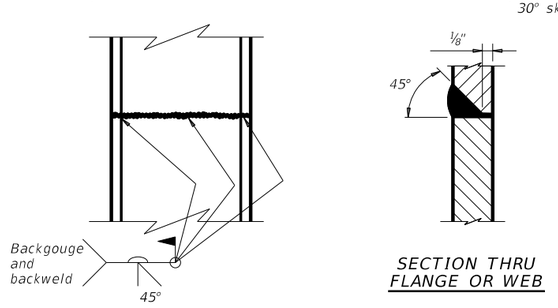


SECTION A-A



SECTION B-B

STEEL H-PILE TIP REINFORCEMENT
See Item 407 "Steel Piling" to determine when tip reinforcement is required and for options to the details shown.



SECTION THRU FLANGE OR WEB

STEEL H-PILE SPLICE DETAIL
Use when required.

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

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

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

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

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

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

(7) Or as shown on plans.

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	1511	01	013	FM 993
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		74

DATE: 12/7/2023 3:16:27 PM
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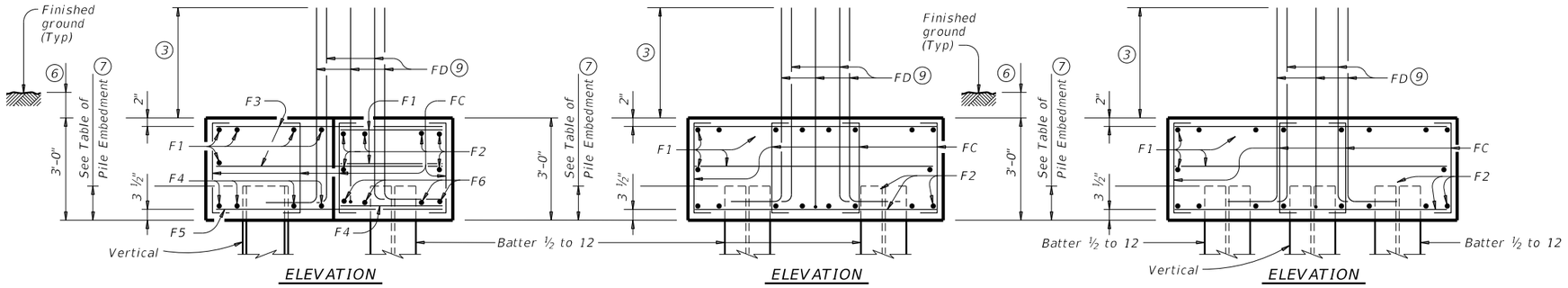
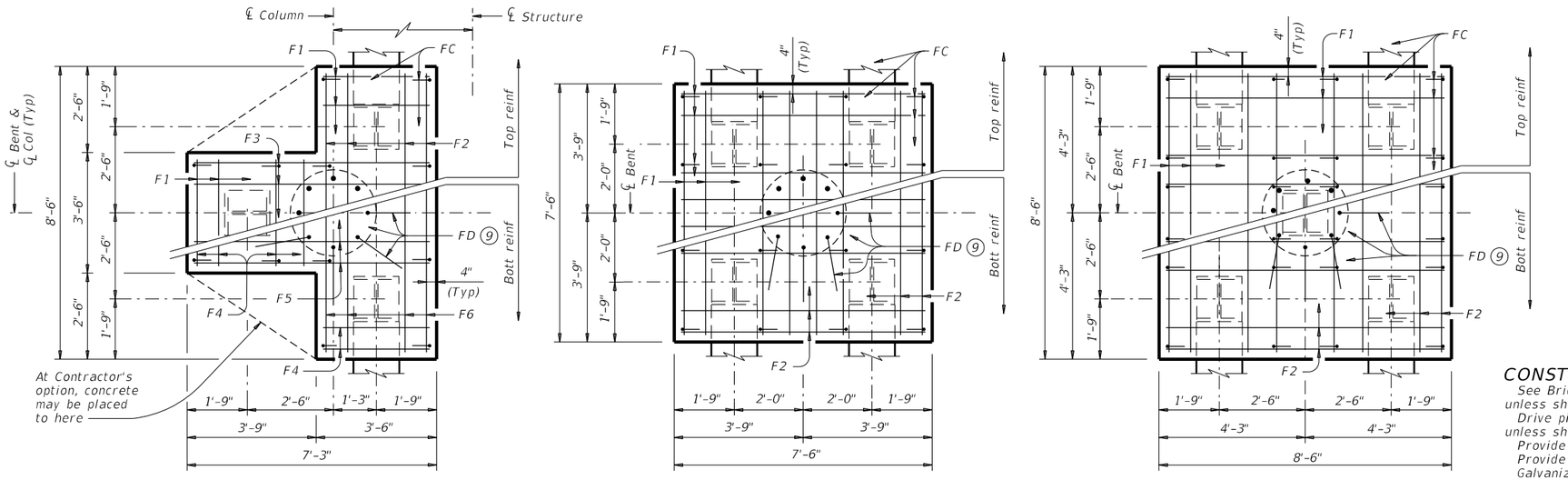




THREE PILE FOOTING (8)

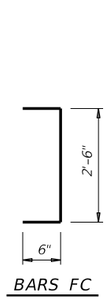
For 36" Dia and smaller columns.

FOUR PILE FOOTING (8)

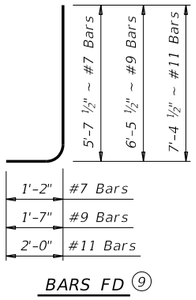
For 42" Dia and smaller columns.

FIVE PILE FOOTING (8)

For 42" Dia and smaller columns.



BARS FC



BARS FD (9)

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

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

(7) Or as shown on plans.

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

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

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

TABLE OF FOOTING QUANTITIES FOR 30" COLUMNS

ONE 3 PILE FOOTING

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

ONE 4 PILE FOOTING

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

ONE 5 PILE FOOTING

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

CONSTRUCTION NOTES:

See Bridge Layout for foundation type required. Use these foundation details unless shown otherwise.

Drive piling under abutment wingwalls to a minimum resistance of 10 Tons/Pile unless shown otherwise.

Provide Class C Concrete (f'c = 3,600 psi), unless shown otherwise.

Provide Grade 60 reinforcing steel.

Galvanize reinforcing if shown elsewhere in the plans.

Provide bar laps for drilled shaft reinforcing, where required, as follows:

Uncoated or galvanized (#6) ~ 2'-6"
Uncoated or galvanized (#7) ~ 2'-11"
Uncoated or galvanized (#9) ~ 3'-9"

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

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

DESIGNER NOTES:

Do not use the drilled shaft details shown on this standard for retaining wall, noise wall, barrier, or sign foundations without structural evaluation.

Do not use the footings shown on this standard in direct contact with salt water or exposed to salt water spray.

Maximum allowable pile loads for the footings shown are:

72 Tons/Pile with 24" Dia Columns
80 Tons/Pile with 30" Dia Columns
100 Tons/Pile with 36" Dia Columns
120 Tons/Pile with 42" Dia Columns

Texas Department of Transportation

Bridge Division Standard

COMMON FOUNDATION DETAILS

FD

FILE: fdstde01-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
01-20: Added #11 bars to the FD bars.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		75

DATE: 12/7/2023 3:16:30 PM
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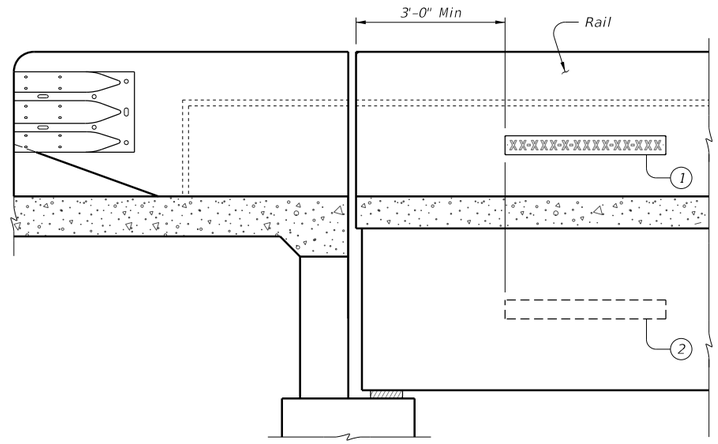

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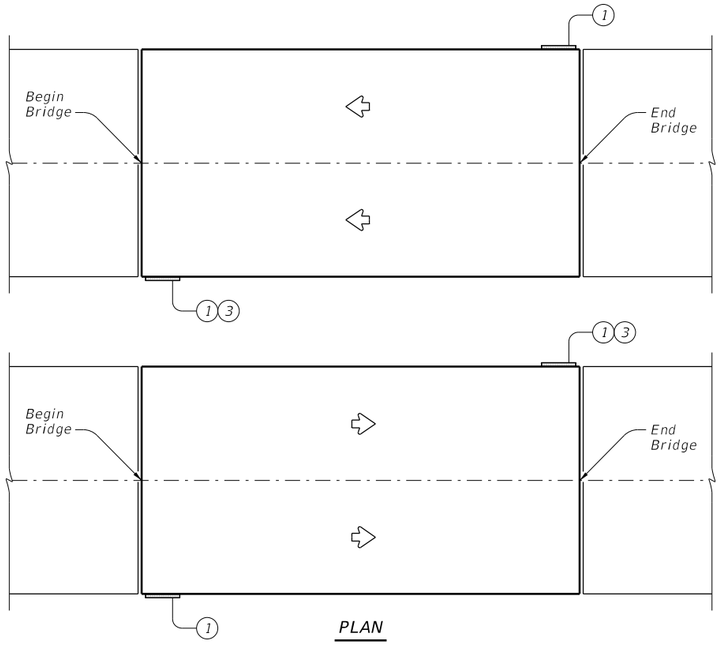
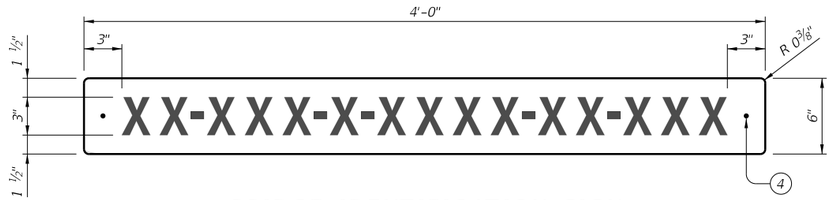
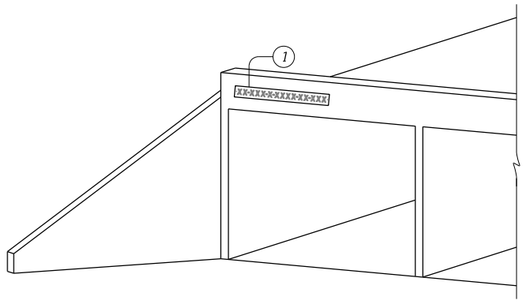


PLAN

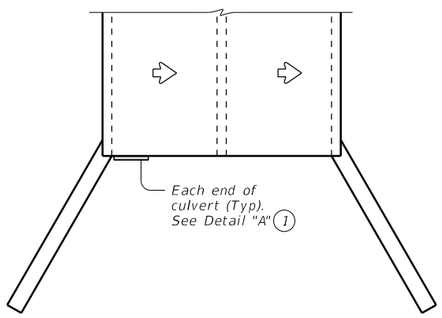
BRIDGE SIGN LOCATIONS



BRIDGE IDENTIFICATION SIGN

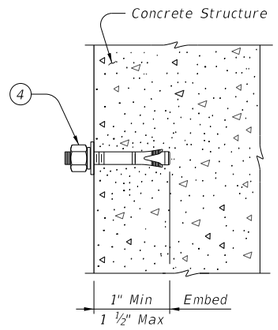


DETAIL "A"



PLAN

BRIDGE CLASS CULVERT SIGN PLACEMENT



ANCHOR DETAIL

SHEETING REQUIREMENTS		
Usage	Color	Sign Face Material
Background	White	Type B or C Sheeting
Letters and Symbols	Black	Type B or C Sheeting

(1) Bridge identification sign location

(2) Alternate sign placement location for exterior concrete beams.

(3) If adjacent bridges are less than 2 feet apart, these signs may be omitted.

(4) ¼" Diameter stainless steel expansion anchor with hex nut, washer, and spring-lock washer.

SIGN NOTES:

Standard sign designs can be found in the Standard Highway Sign Designs for Texas (SHSD).

Use the Clearview Alphabet CV-2W for the letters and symbols.

MATERIAL NOTES:

Provide lateral spacing between letters and numerals conforming with the SHSD, and any approved changes thereto. Provide a balanced appearance when spacing is not shown.

Provide aluminum sign blanks with a minimum thickness of 0.080" that meet the requirements of DMS-7110.

Provide sign face materials that meet the requirements of DMS-8300 and the sheeting requirements shown in the table.

Provide ¼" diameter stainless steel expansion anchors with one hex head nut, one flat washer, and one helical spring-lock washer each.

Use torque controlled mechanical expansion anchors that are approved for use in cracked concrete by the International Code Council, Evaluation Service (ICC-ES). Provide anchor products that have a designated ICC-ES Evaluation Report number. The approval status must be maintained on the ICC-ES website under Division 031600 for Concrete Anchors.

Unless otherwise approved by the Engineer: do not use adhesive anchors; do not use expansion anchors that are not included in the ICC-ES approval list; and do not use expansion anchors that are only approved for use in uncracked concrete.

Use anchors manufactured with stainless steel expansion wedges. Anchors manufactured with carbon steel expansion wedges are not allowed. Anchor bodies can be either zinc-plated carbon steel or stainless steel. For application in marine environments, provide both stainless steel anchor bodies and expansion wedges.

GENERAL NOTES:

Prior to hole drilling, locate rebar to ensure clearing of existing reinforcement and/or strands.

Prior to installation, obtain approval of sign locations from the Engineer. Avoid placement of sign over travel lanes and pedestrian walkways. Submit proposed installation method to Engineer prior to beginning work. Install anchors as shown on plans and in accordance with the anchor manufacturer's published installation instructions.

Do not install anchors sections of members under tension.

For new construction, the signs and anchors are subsidiary to the bridge. For installations on existing structures, the signs and anchors are paid under Item 442, "Metal for Structures." Each sign weighs 28 lbs.

Texas Department of Transportation

Bridge Division Standard

NBI BRIDGE IDENTIFICATION SIGN STANDARD

NBIS

FILE: MS-NBIS-23.dgn	DN: TAR	CK: TxDOT	DW: JER	CK: TAR
©TxDOT March 2023	CONT	SECT	JOB	HIGHWAY
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	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		76

DATE: 12/7/2023 3:16:32 PM
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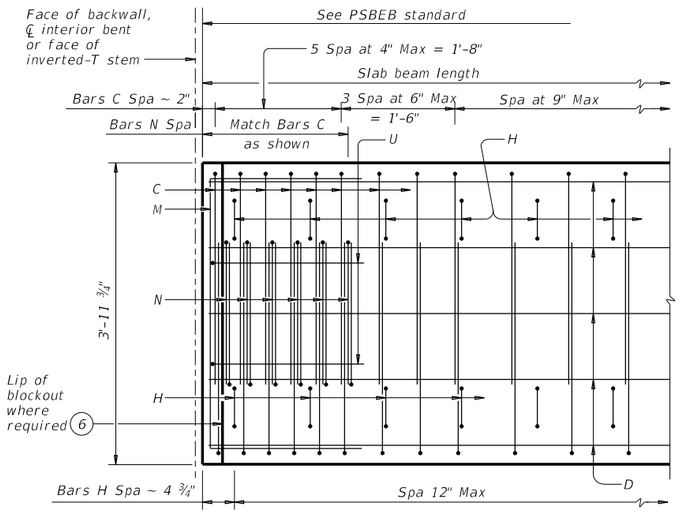
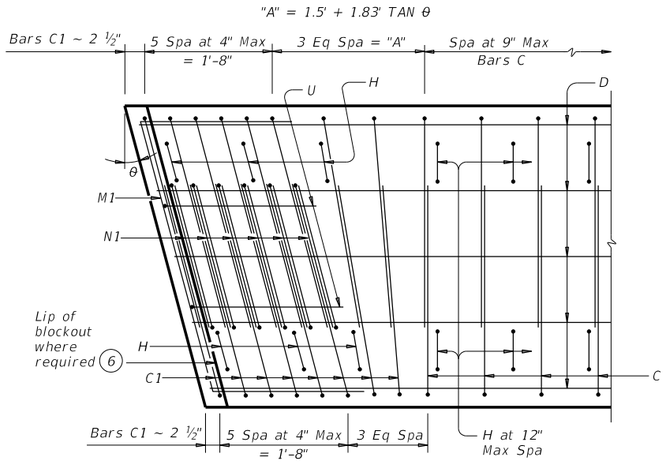
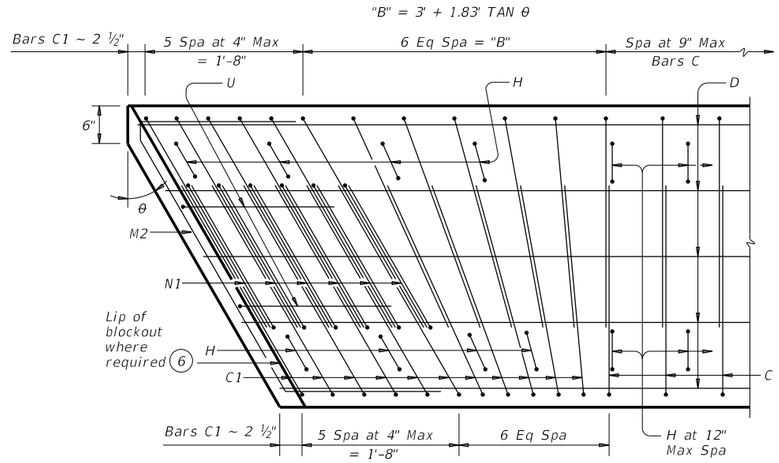


PART PLAN



PART SKEW PLAN

(Showing θ over 0° to 15° Skew)



PART SKEW PLAN

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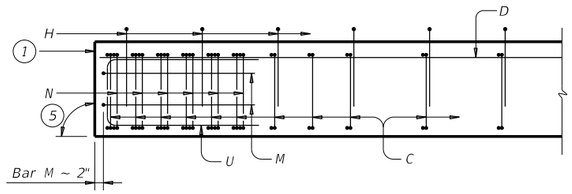
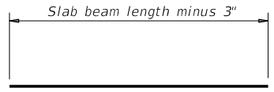
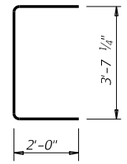


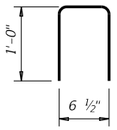
ELEVATION



BARS D(#6)



BARS M(#4)



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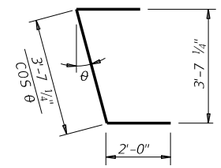
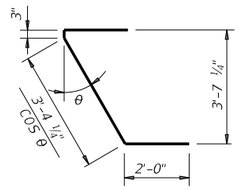
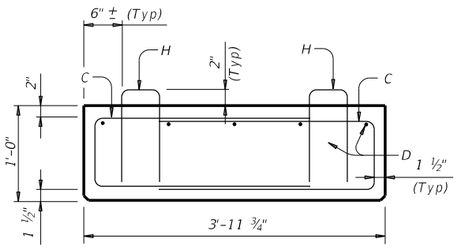


BARS M1(#4)



BARS M2(#4)



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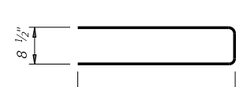

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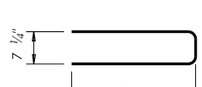

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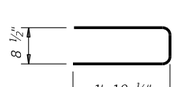

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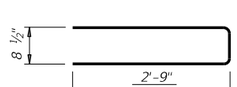

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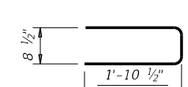

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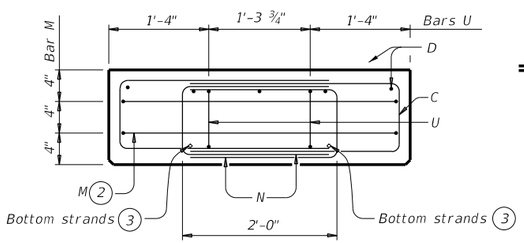
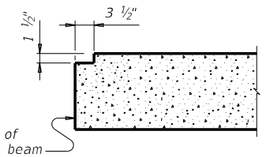


END MAT REINFORCING

Bars H not shown for clarity.



ELEVATION OF BLOCKOUT (6)

BEAM PROPERTIES		
Area	in^2	573.0
Y top	in	6.00
Y bott	in	6.00
I	in^4	6,876
Weight (4)	lb/ft	597

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Provide Class H concrete. Provide Class H (HPC) if shown elsewhere in the plans.

Provide Grade 60 reinforcing steel.

An equal area of welded wire reinforcement (WWR) (ASTM 1064) may be substituted for bars C and D if approved by the Engineer.

These details can be used for any skew angle up to a maximum of 30 degrees.

Chamfer all exposed corners 3/4" or round to a 3/4" radius.

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

Cover dimensions are clear dimensions, unless noted otherwise.

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

(1) See End Mat Reinforcing detail.

(2) Adjust bars M vertically to avoid strands.

(3) See sheet PSBND or PSBSD for strand locations.

(4) Assumes 150 pcf weight density of concrete.

(5) 90° at conventional interior bents. End of beam must be vertical at abutment backwall and inverted-T stem.

(6) Blockout required at armor joint (AJ) and sealed expansion joint (SEJ) locations to accommodate joint anchorage.

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE SLAB BEAM DETAILS

(TYPE 4SB12)

PSB-4SB12

FILE: psbsts01-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		77

DATE: 12/7/2023 3:16:36 PM
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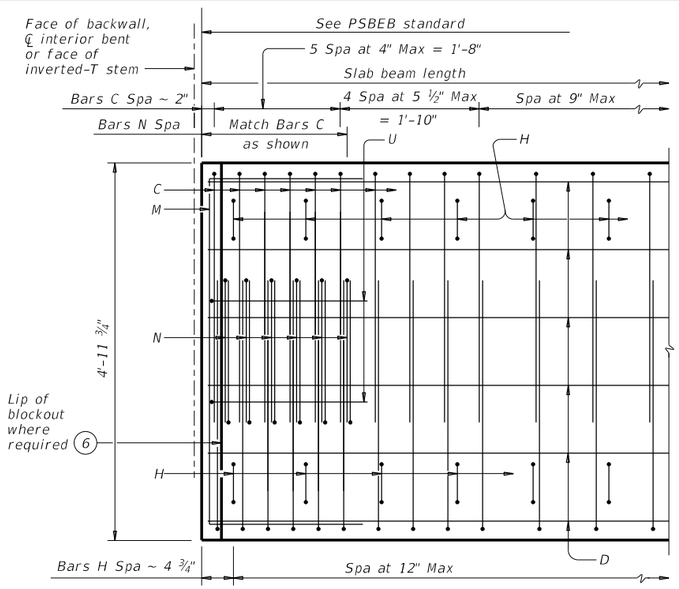
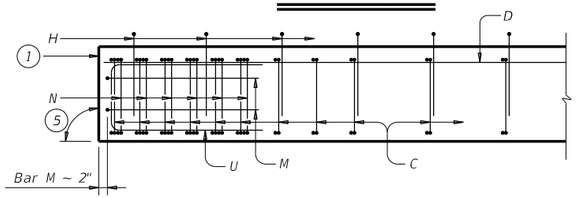
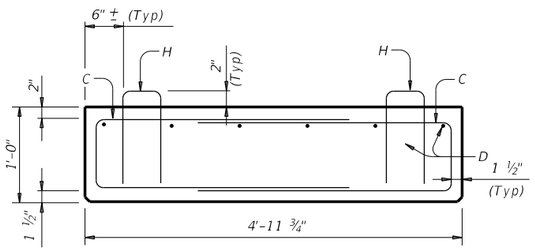


PART PLAN



ELEVATION



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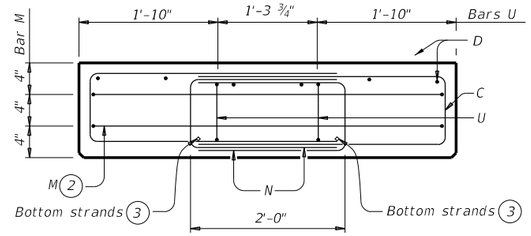
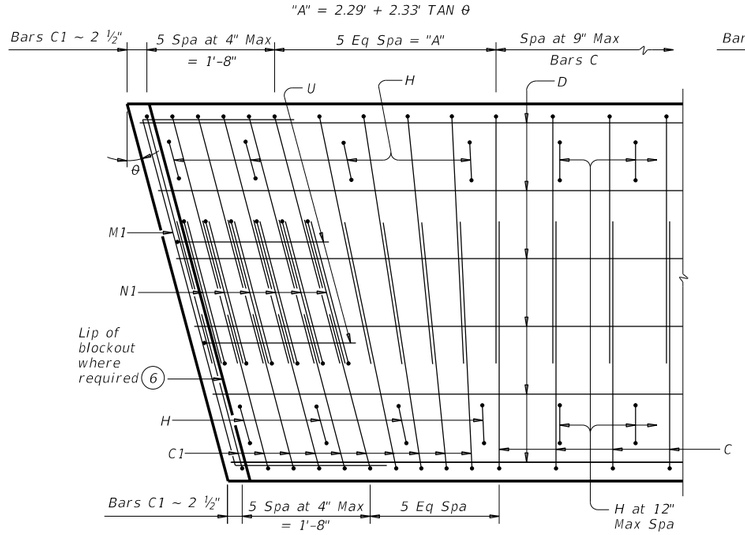


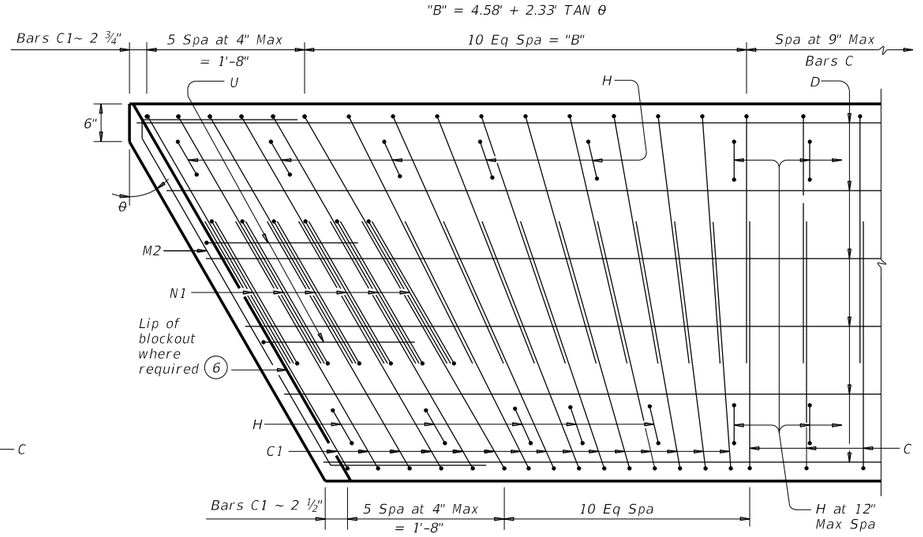
END MAT REINFORCING

Bars H not shown for clarity.



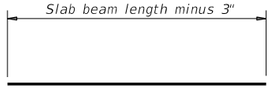
PART SKEW PLAN

(Showing θ over 0° to 15° Skew)

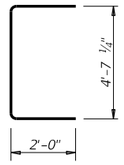


PART SKEW PLAN

(Showing θ over 15° to 30° Skew)



BARS D(#6)



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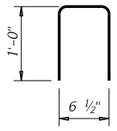

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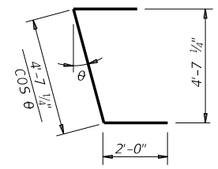
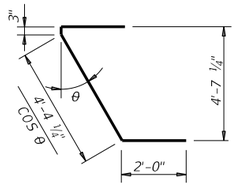


BARS M1(#4)



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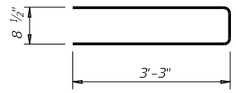

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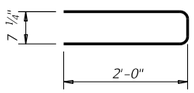

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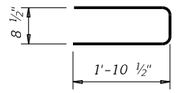

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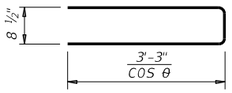

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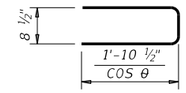

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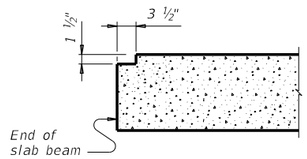

ELEVATION OF BLOCKOUT (6)

BEAM PROPERTIES		
Area	in^2	717.0
Y top	in	6.00
Y bott	in	6.00
I	in^4	8,604
Weight (4)	lb/ft	747

(1) See End Mat Reinforcing detail.

(2) Adjust bars M vertically to avoid strands.

(3) See sheet PSBND or PSBSD for strand locations.

(4) Assumes 150 pcf weight density of concrete.

(5) 90° at conventional interior bents. End of beam must be vertical at abutment backwall and inverted-T stem.

(6) Blockout required at armor joint (AJ) and sealed expansion joint (SEJ) locations to accommodate joint anchorage.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

Provide Class H concrete. Provide Class H (HPC) if shown elsewhere in the plans.

Provide Grade 60 reinforcing steel.

An equal area of welded wire reinforcement (WWR) (ASTM 1064) may be substituted for bars C and D if approved by the Engineer.

These details can be used for any skew angle up to a maximum of 30 degrees.

Chamfer all exposed corners ¾" or round to a ¾" radius.

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

Cover dimensions are clear dimensions, unless noted otherwise.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

PRESTRESSED CONCRETE SLAB BEAM DETAILS

(TYPE 5SB12)

PSB-5SB12

FILE: psbsts03-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		78

DATE: 12/7/2023 3:16:39 PM
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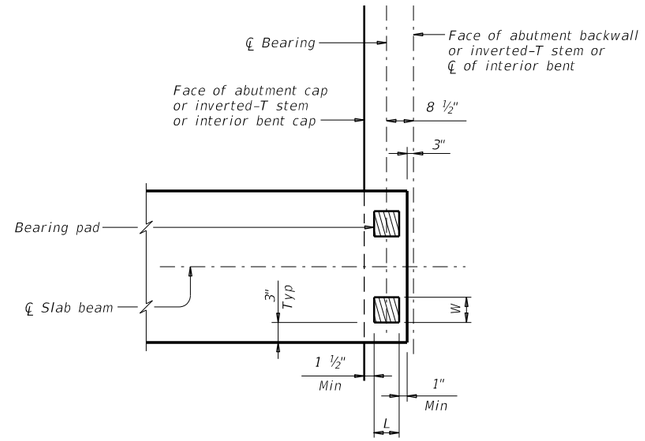
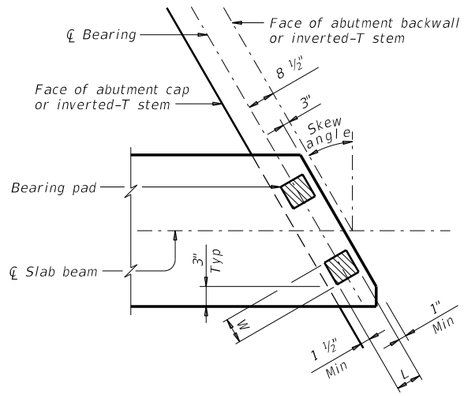
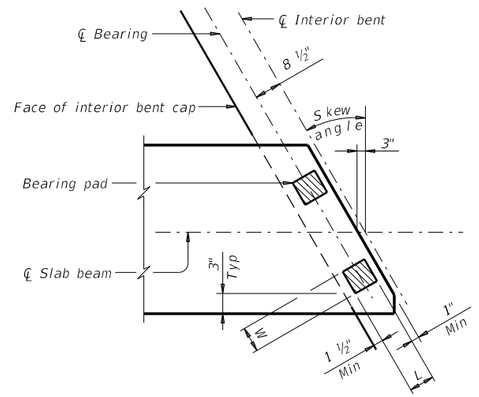


TWO-PAD DETAIL PLAN
(At abutment or inverted-T cap or at interior bent)



TWO-PAD DETAIL SKEW PLAN
(At abutment or inverted-T cap)



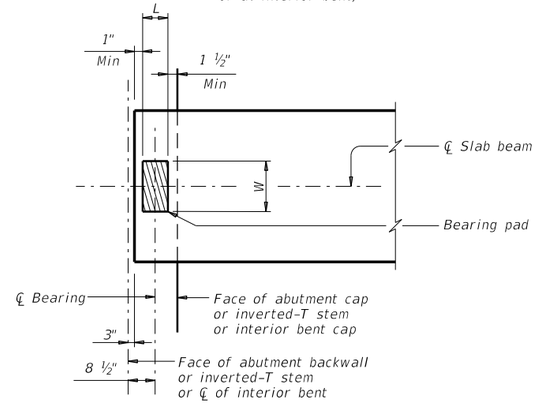
TWO-PAD DETAIL SKEW PLAN
(At interior bent)

TABLE OF BEARING PAD DIMENSIONS (ALL PRESTR CONC SLAB BM TYPES)

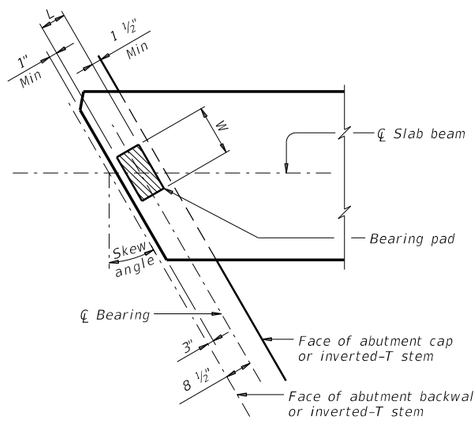
One-Pad (Ty SB1-"N") (2)			Two-Pad (Ty SB2-"N") (2)		
W	L	T	W	L	T
14"	7"	2"	7"	7"	2"

Pad sizes shown are applicable for the following conditions:

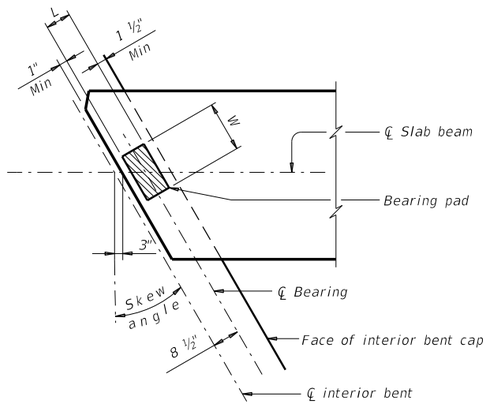
(1) All one, two and three span units where the minimum span length is not less than 25' and the maximum span is not more than 50'.
(2) Skews less than or equal to 30°.



ONE-PAD DETAIL PLAN
(At abutment or inverted-T cap or at interior bent)



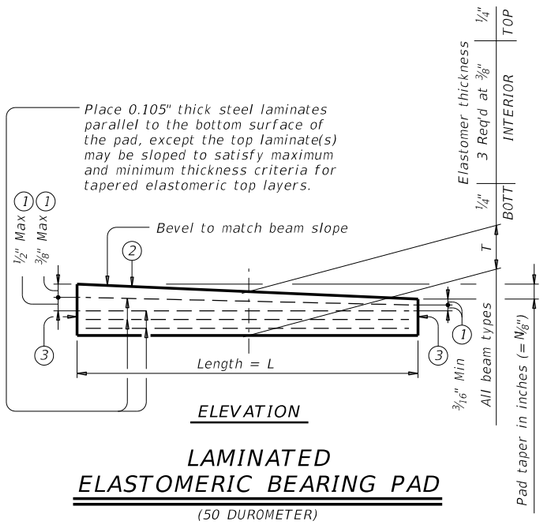
ONE-PAD DETAIL SKEW PLAN
(At abutment or inverted-T cap)



ONE-PAD DETAIL SKEW PLAN
(At interior bent)

ELASTOMERIC BEARING PAD PLACEMENT AND BEAM END DIAGRAMS

Place one bearing pad at forward station beam end.
Place two bearing pads at back station beam end.



ELEVATION

LAMINATED ELASTOMERIC BEARING PAD

(50 DUROMETER)

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

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

(3) Locate permanent mark here.

GENERAL NOTES:

These details accommodate skew angles up to 30°.

Shop drawings for approval are required.

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

Cost of furnishing and installing elastomeric bearings must be included in unit price bid for "Prestressed Concrete Slab Beams".

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

ELASTOMERIC BEARING AND BEAM END DETAILS

PRESTR CONCRETE SLAB BEAM

PSBEB

FILE: psbste06-17.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		79

DATE: 12/7/2023 3:16:42 PM
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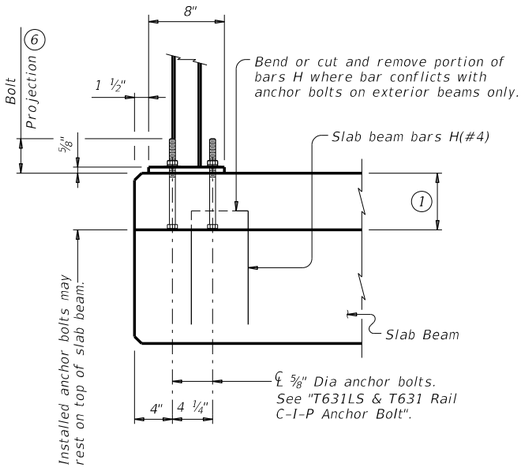
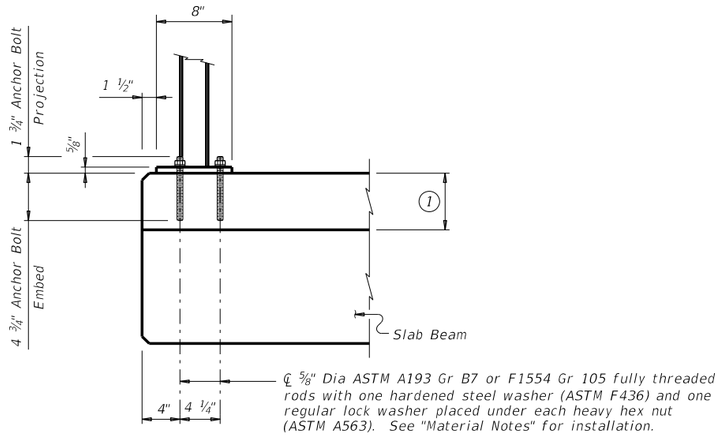


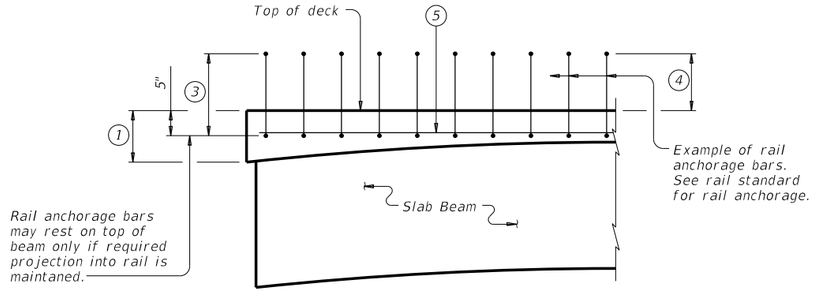
CAST-IN-PLACE ANCHORAGE OPTION



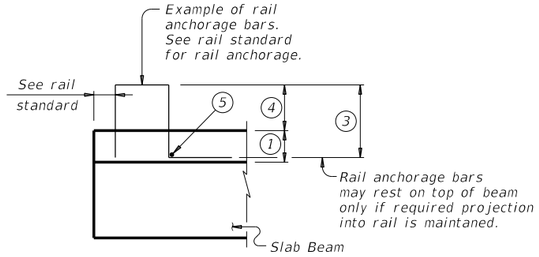
ADHESIVE ANCHORAGE OPTION

1. Cast-in-place slab thickness varies due to beam camber (5" minimum).
2. Replace cast-in-place anchor bolts shown on T631LS and 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 7", 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 bituminous fiber material under concrete rail, as shown.

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



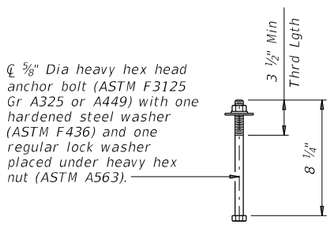
PART SPAN ELEVATION



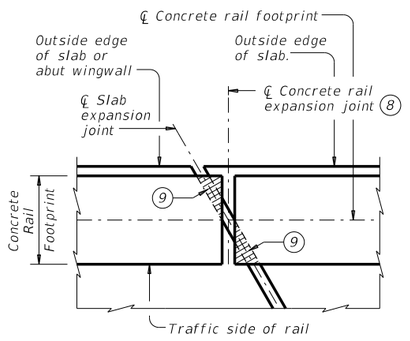
SECTION

TYPICAL CONCRETE RAIL ANCHORAGE

(Showing typical concrete rail anchorage)



T631LS & T631 RAIL C-I-P ANCHOR BOLT



PLAN OF CONCRETE RAILS AT EXPANSION JOINTS

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 5/8" 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 5/8" 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 slab 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 CONCRETE SLAB BEAMS

PSBRA

FILE: psbste07-18.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: JMH
©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
03-18: Updated adhesive anchor notes.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		80

DATE: 12/7/2023 3:16:45 PM
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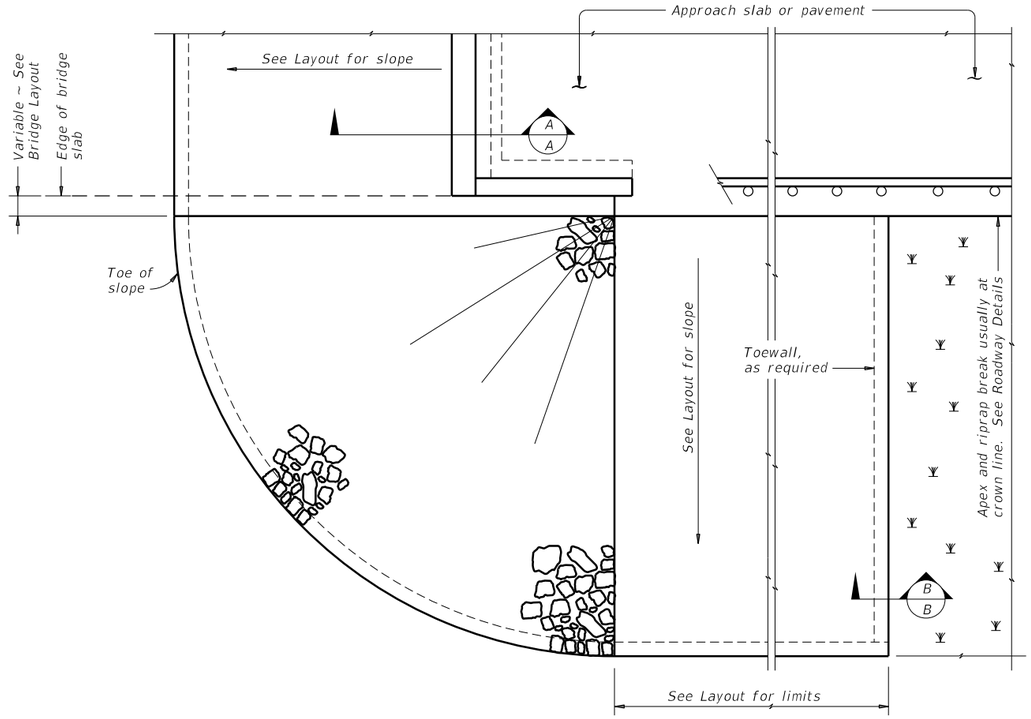
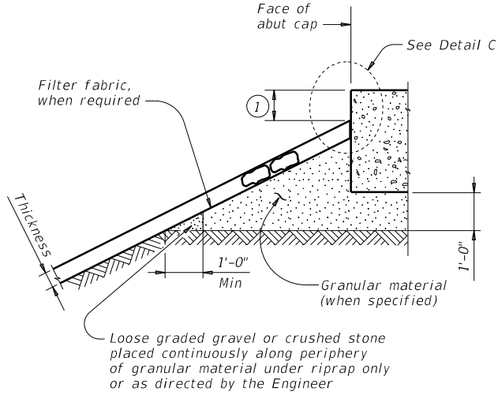
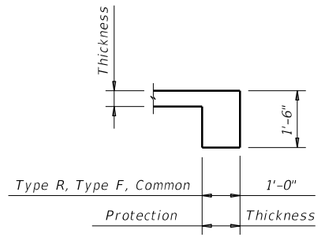


PLAN

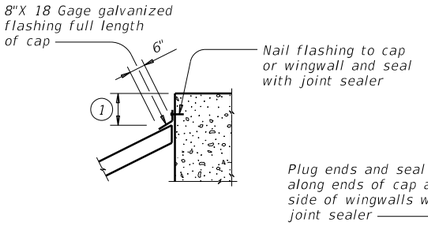


SECTION A-A AT CAP

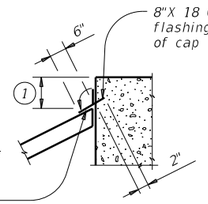


SECTION B-B

Provide toewall when shoulder drain is located adjacent to limits of stone riprap. Omit toewall when thickness of protection riprap is greater than 18".

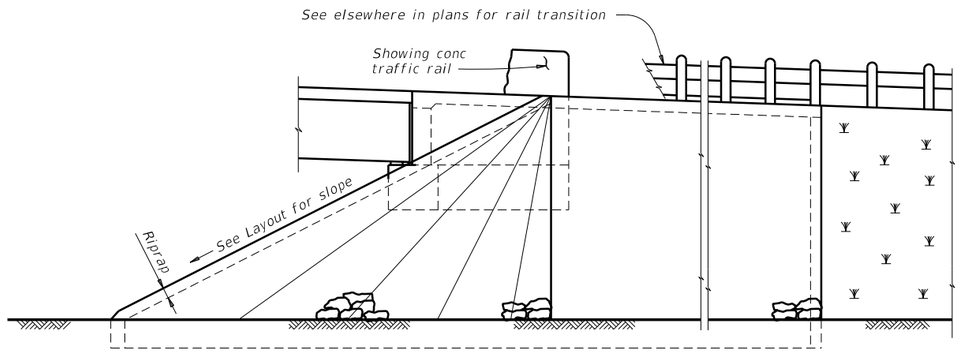


CAP OPTION A



CAP OPTION B

DETAIL C



ELEVATION

(1) Top of cap to top of riprap dimension varies as directed by the Engineer. Provide 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

GENERAL NOTES:
Refer to Item 432, "Riprap" for stone size and gradation, and construction details. See Layout for limits and thickness of riprap specified.
See elsewhere in plans for locations and details of shoulder drains.

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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©TxDOT April 2019	CONT	SECT	JOB		HIGHWAY		
REVISIONS	1511	01	013		FM 993		
	DIST	COUNTY			SHEET NO.		
	ATL	UPSHUR			81		

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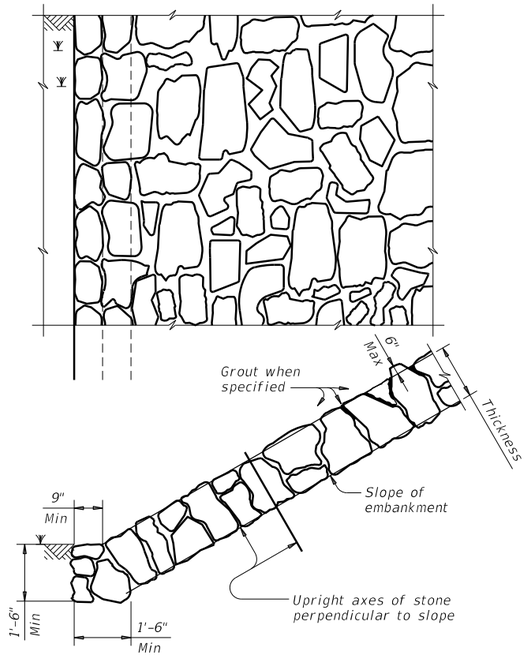


FIGURE 1 ~ TYPE R STONE RIPRAP

dry or grouted

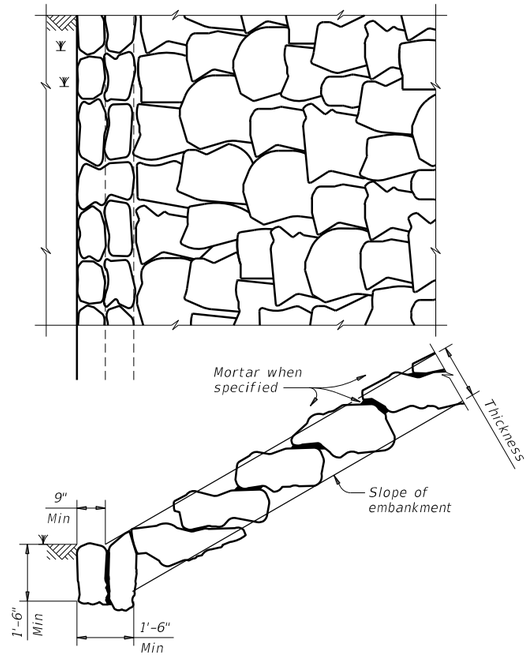


FIGURE 2 ~ TYPE F STONE RIPRAP

dry or mortared

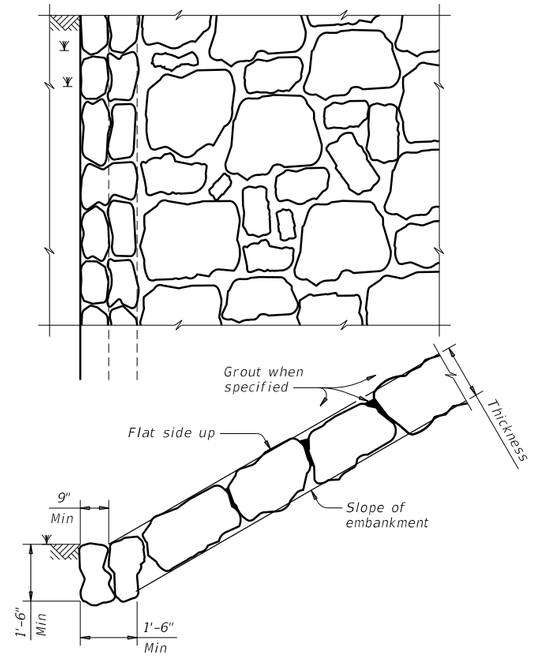


FIGURE 3 ~ TYPE F STONE RIPRAP

grouted

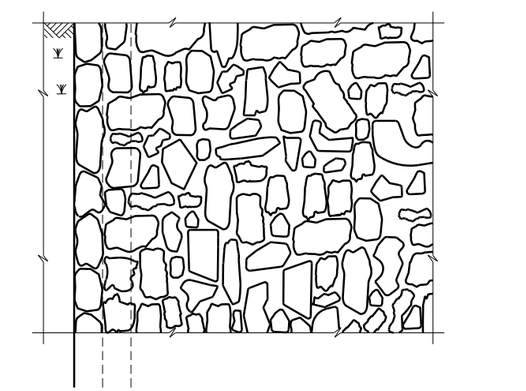


FIGURE 4 ~ COMMON STONE RIPRAP

dry or grouted

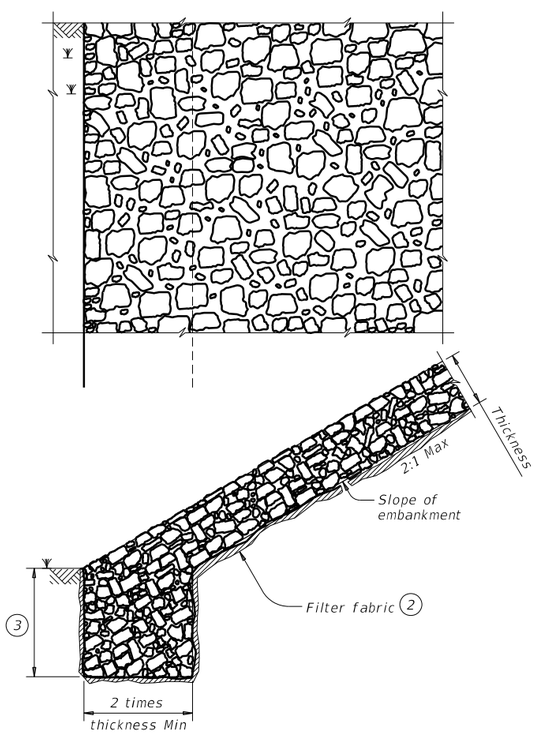


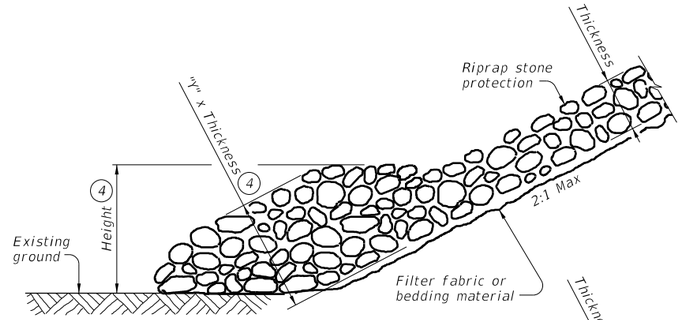
FIGURE 5 ~ PROTECTION STONE RIPRAP (5)

(2) Provide bedding material instead of filter fabric if shown elsewhere in plans. See Layout for thickness of bedding material.

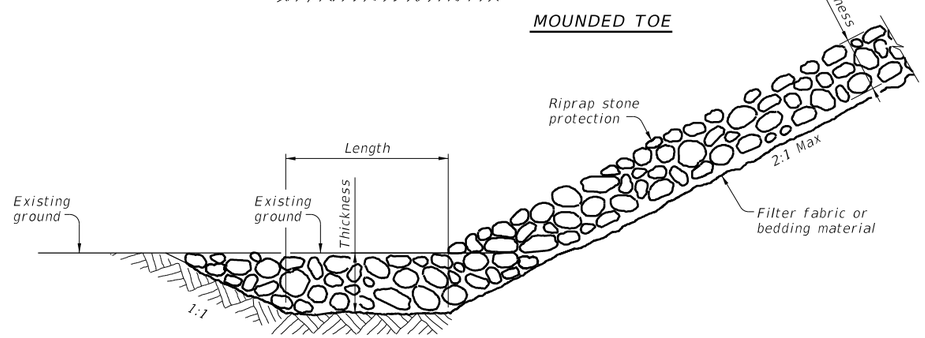
(3) Minimum toe depth is the larger of the maximum scour depth or 2 times the riprap thickness.

(4) "Y" and Height need to be defined. See layout or detail sheet for values if this option is used.

(5) List Stone Protection as size (XX inch) and thickness (YY inch) on the layout.
Example: Riprap (Stone Protection) XX inch, Thickness = YY inch.



MOUNDED TOE



EXTENDED ROCK FILLED TRENCH

PROTECTION STONE RIPRAP TOE OPTIONS (5)

Texas Department of Transportation

Bridge Division Standard

STONE RIPRAP

SRR

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	ATL	UPSHUR		82

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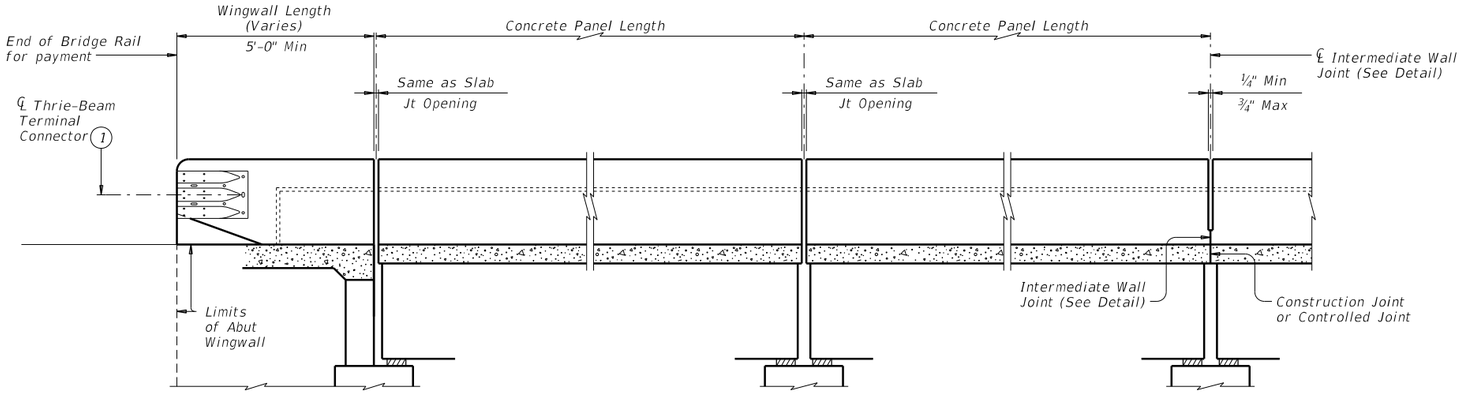
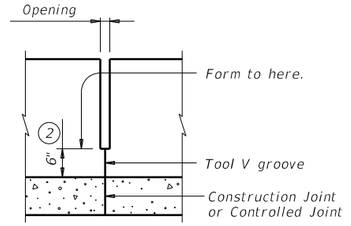


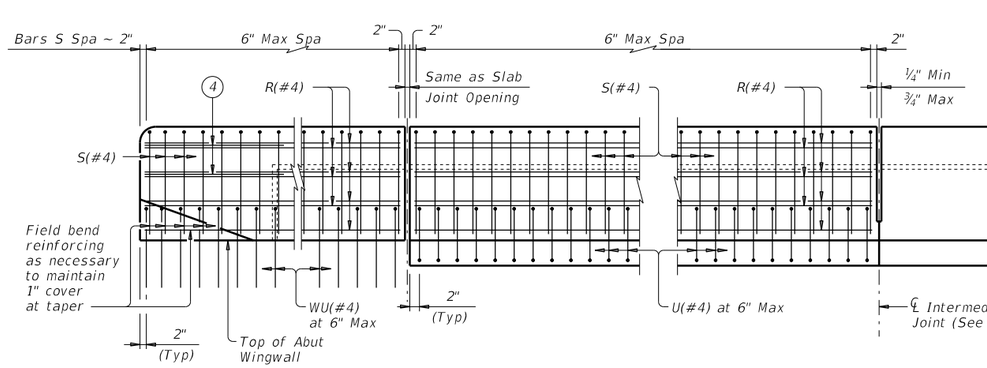
AT ABUTMENTS | AT BENTS WITH SLAB EXP JOINTS | AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL

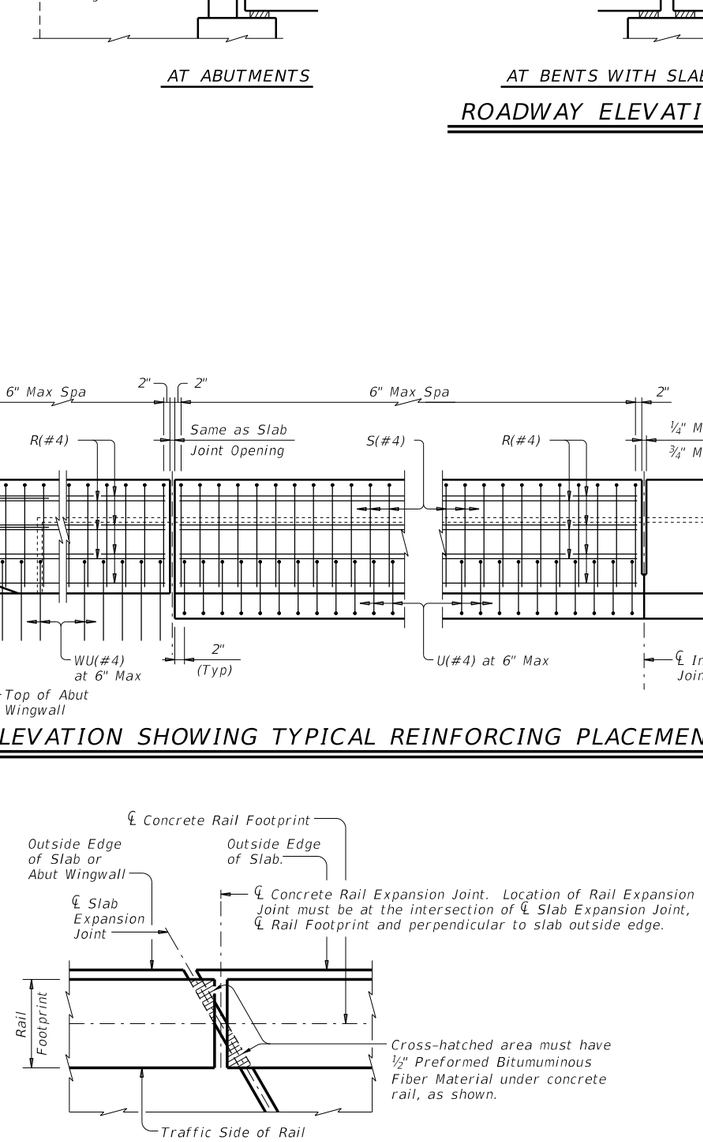


INTERMEDIATE WALL JOINT DETAIL

Provide at all interior bents without slab expansion joints.



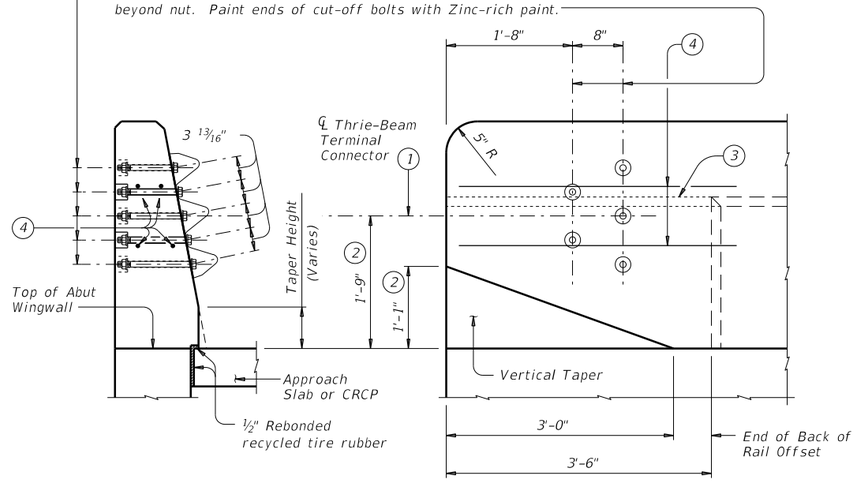
ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

℄ 5 ~ 1" Dia holes and 2 ½" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses. Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBGF Transition. Cut bolts off after installation so as to extend no more than ¾" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.



SECTION | ELEVATION

TERMINAL CONNECTION DETAILS

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. Increase 2" for structures with Overlay.
3. Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
4. Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.

Texas Department of Transportation | Bridge Division Standard

TRAFFIC RAIL
SINGLE SLOPE

TYPE SSTR

FILE: rlstd014-19.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
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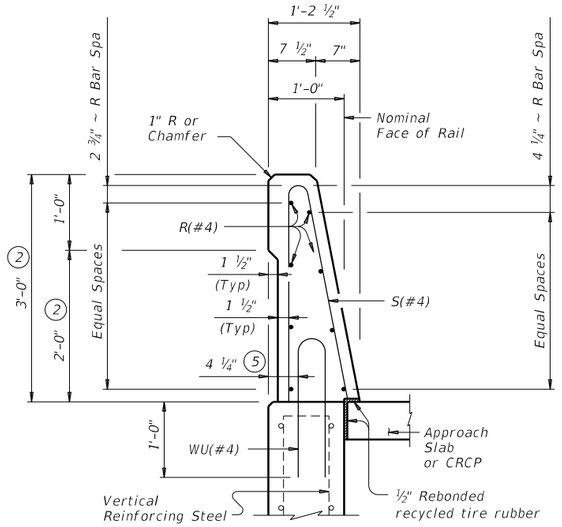
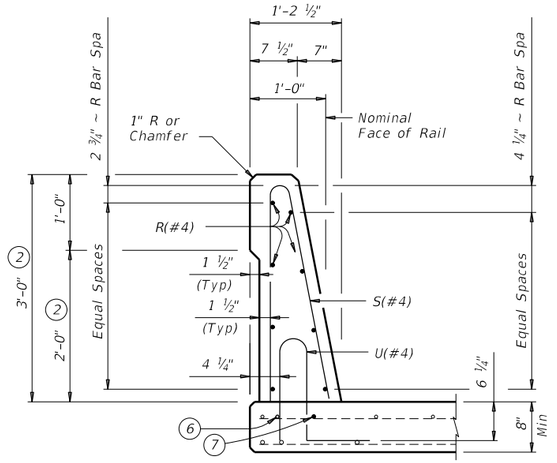


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS



ON BRIDGE SLAB

SECTIONS THRU RAIL

(2) Increase 2" for structures with Overlay.

(5) 5 ¼" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.

(6) As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.

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

(8) No longitudinal wires may be within upper bend.

(9) Bend or cut as required to clear drain slots.

(10) Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greator to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed by the slipform process when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slipform operations is acceptable. Welding may be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to bars U, WU and S at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. Paint welded areas on epoxy coated and/or galvanized reinforcing with an organic zinc rich paint in accordance with Item 445 "Galvanizing".

If rail is slipformed, apply an heavy epoxy bead 1" behind toe of traffic side of rail to concrete deck just prior to slip forming. Provide a ⅜" width x ¼" tall heavy epoxy bead with Type III, Class C or a Type V epoxy.

The back of railing must be vertical unless otherwise shown in 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 slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #4 = 1'-7"

Epoxy coated ~ #4 = 2'-5"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 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.

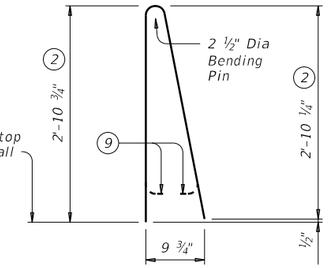
Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Shop drawings will not be required for this rail.

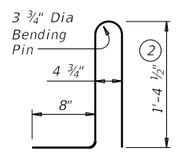
Average weight of railing with no overlay is 376 plf.

Cover dimensions are clear dimensions, unless noted otherwise.

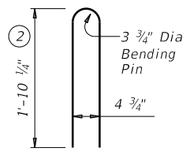
Reinforcing bar dimensions shown are out-to-out of bar.



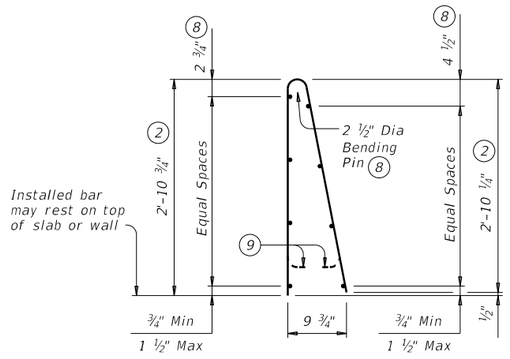
BARS S (#4)



BARS U (#4)

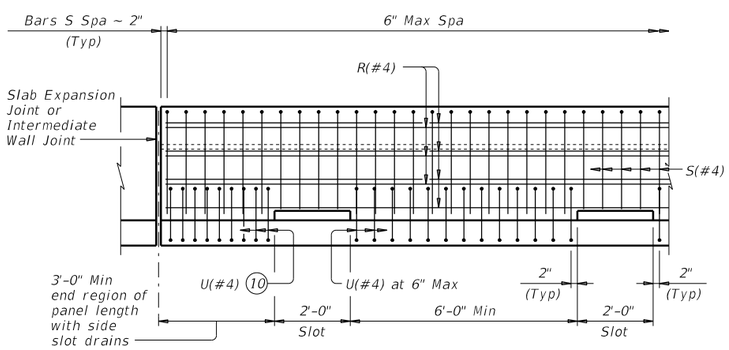


BARS WU (#4)



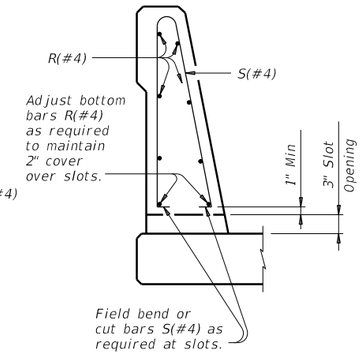
OPTIONAL WELDED WIRE REINFORCEMENT (WWR)

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
	No. of Wires	Spacing
Minimum	8	4"
Maximum	10	8"
Maximum Wire Size Differential	The smaller wire must have an area of 40% or more of the larger wire.	



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

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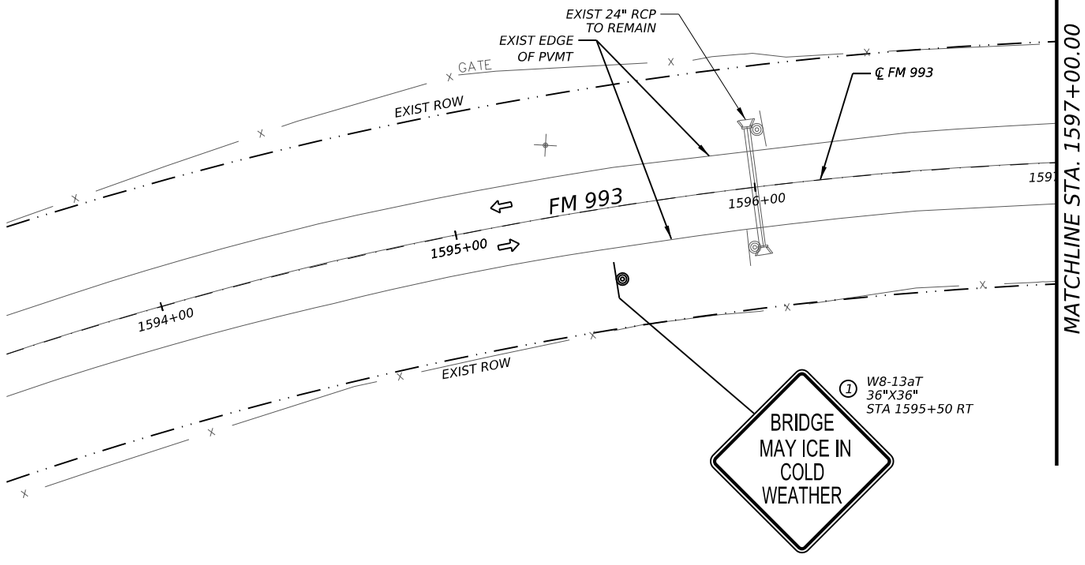
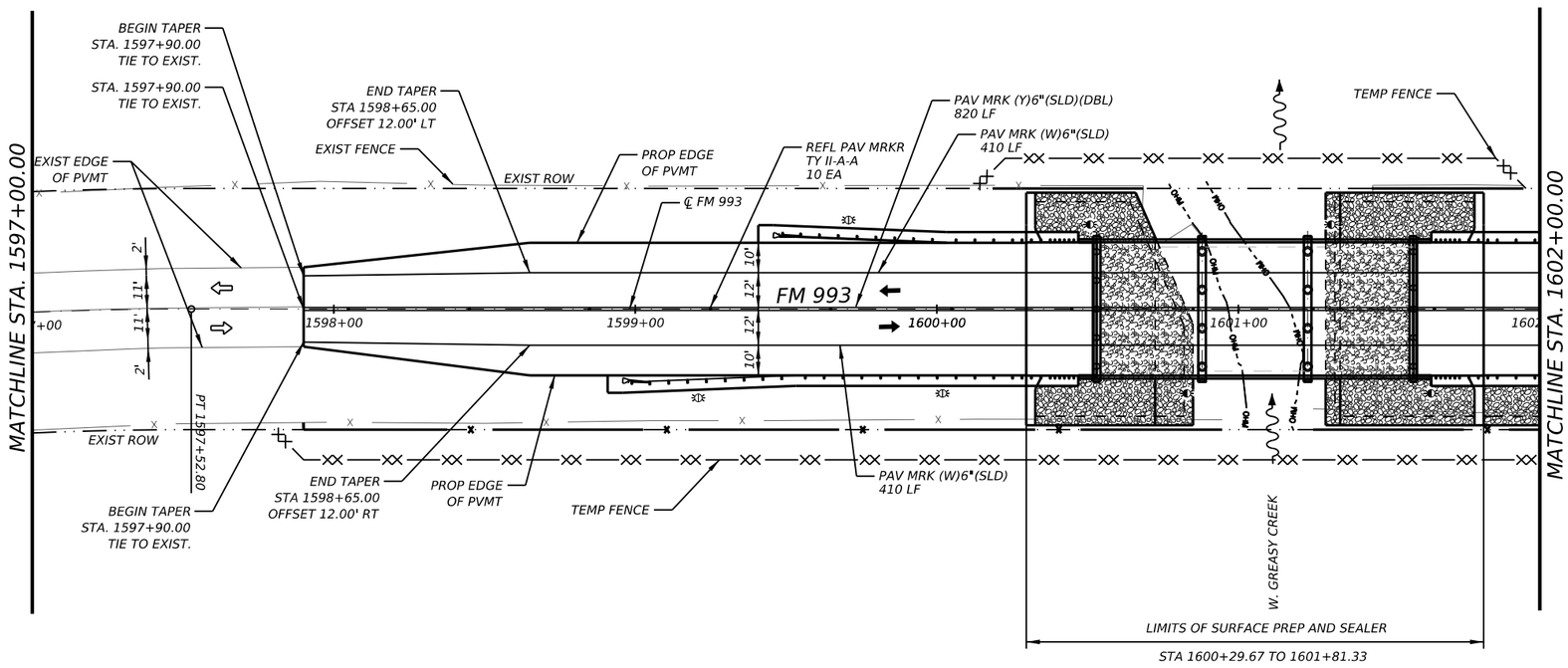
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		84





LEGEND:

- INSL DEL ASSM (D-SW)SZ(BRF)GF1(BI)
- INSL DEL ASSM (D-SW)SZ(BRF)CTB(BI)
- RAISED PAVEMENT MARKERS
- PROPOSED SIGN
- EXISTING SIGN TO BE REMOVED
- PROPOSED SIGN NUMBER
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC

NOTES:

1. SEE TXDOT STD D&OM FOR ADDITIONAL INFORMATION ON DELINEATOR PLACEMENT.
2. GF1 BARRIER REFLECTORS TO BE INSTALLED ALONG MBGF.
3. CTB REFLECTORS TO BE INSTALLED ALONG BRIDGE RAILS.

0 25' 50'

SCALE: 1" = 50'

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED
PROFESSIONAL ENGINEER
Adrian Rangel
12/8/2023

GARVER
3755 S. Capital of Texas Highway
Suite 325
Austin, TX 78704
(512) 485-0009
TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

SIGNING & PAVEMENT MARKING LAYOUT

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		85
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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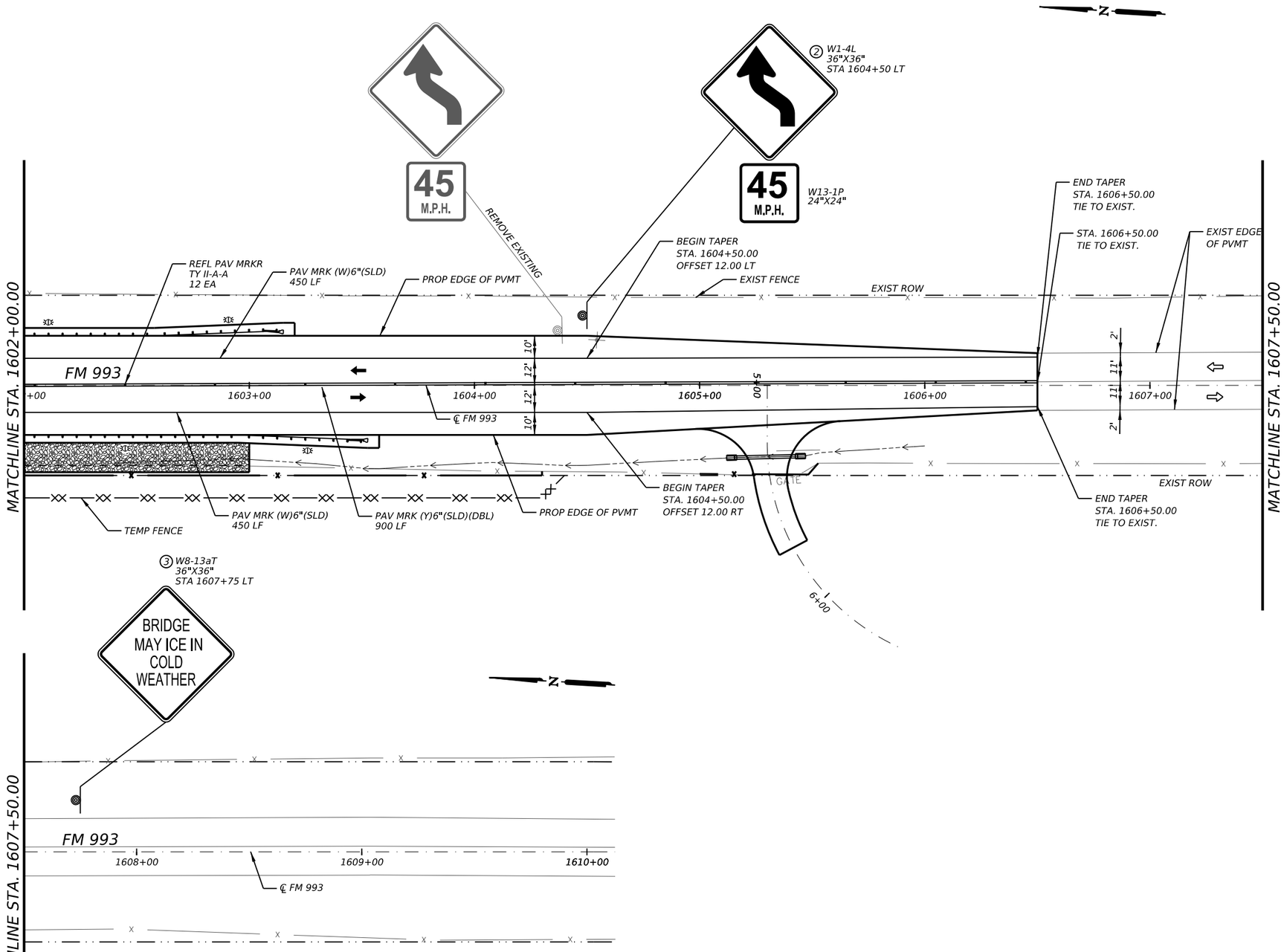

LEGEND:

- INSL DEL ASSM (D-SW)SZ(BRF)GF1(BI)
- INSL DEL ASSM (D-SW)SZ(BRF)CTB(BI)
- RAISED PAVEMENT MARKERS
- PROPOSED SIGN
- EXISTING SIGN TO BE REMOVED
- PROPOSED SIGN NUMBER
- PROP DIRECTION OF TRAFFIC
- EXIST DIRECTION OF TRAFFIC

NOTES:

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2. GF1 BARRIER REFLECTORS TO BE INSTALLED ALONG MBGF.
3. CTB REFLECTORS TO BE INSTALLED ALONG BRIDGE RAILS.

0 25' 50'

SCALE: 1" = 50'

STATE OF TEXAS
ADRIAN RANGEL
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12/8/2023

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2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

SIGNING & PAVEMENT MARKING LAYOUT

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
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TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/8/2023 10:47:50 AM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/08_Traffic/08_010_FM993_TRF_SPM_02.dgn

DATE: 12/7/2023 3:09:43 PM
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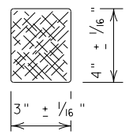
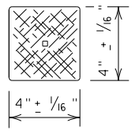
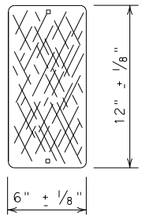
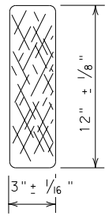
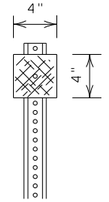
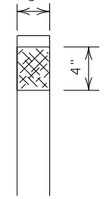
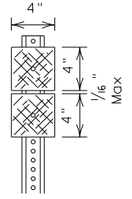
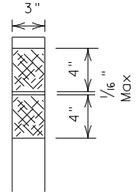
REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

	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

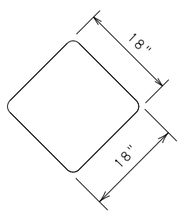
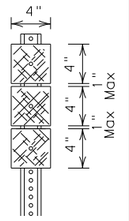
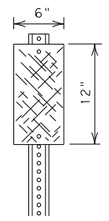
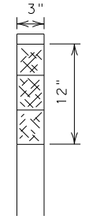
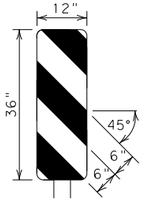
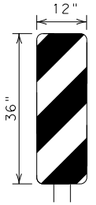
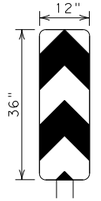
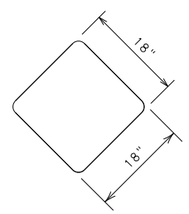
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker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

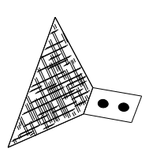
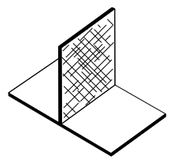
DIRECTION
- If Required
- BI = Bi-Directional

OBJECT MARKERS

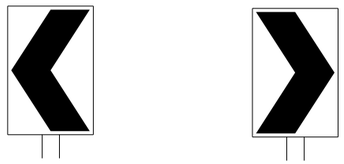
	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
DEVICE								
		3-Size 2 reflector units	1-Size 3 reflector unit	3-Size 1 reflector units or 1-Size 4 reflector unit				
SHEETING	Yellow-Type B_{FL} or C_{FL} Sheeting	Yellow - Type B or C Sheeting			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

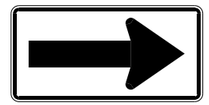
BARRIER REFLECTORS (BRF)

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

ONE DIRECTION LARGE ARROW

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

NOTE:

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

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

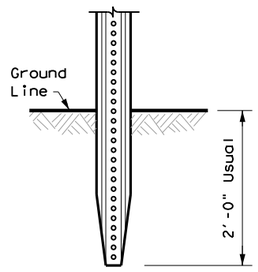
FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ATL	UPSHUR		87

20A

POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

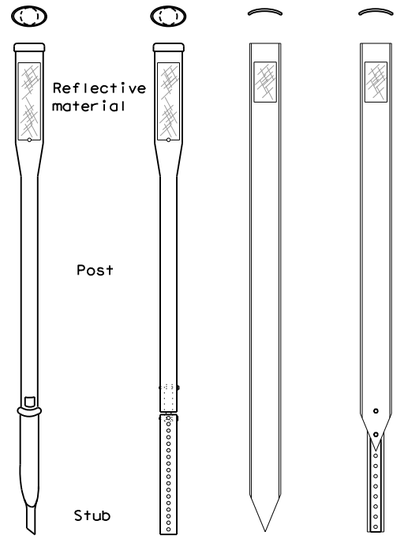


NOTES

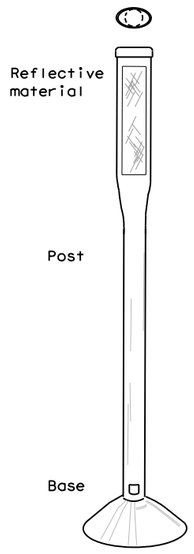
1. Embedded Wing Channel (WC) post option may be used for Type 2 Object Markers and Delineators only.
2. 1.12 lbs/ft steel per ASTM A 1011 SS Gr. 50, or ASTM A499.

FLEXIBLE POSTS (YFLX, WFLX)

GND



SRF



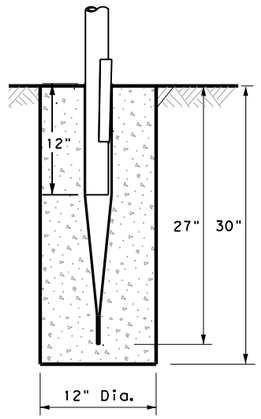
EMBEDDED | SURFACE MOUNT

NOTES

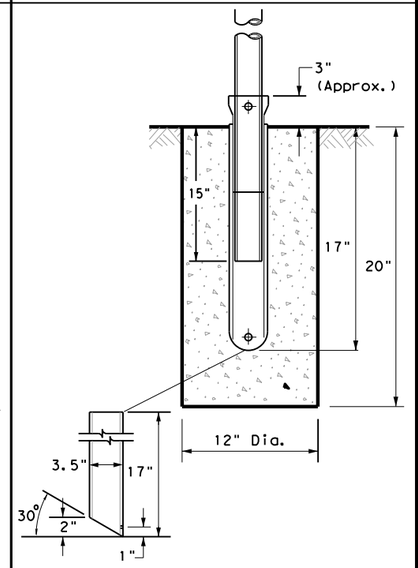
1. See "Flexible Delineator and Object Marker Posts" Material Producer List for approved devices.
2. Install per manufacturer's recommendations.
3. Post length may vary to meet field conditions.
4. When using yellow delineators with flexible posts to separate opposing direction of travel, such as centerline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

WEDGE ANCHOR SYSTEMS

WAS



WAP



STEEL | PLASTIC

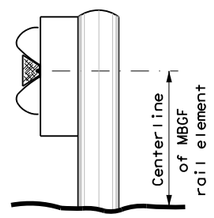
NOTE

1. Install per manufacturer's recommendations.

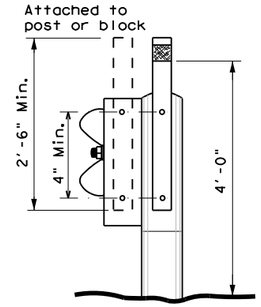
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

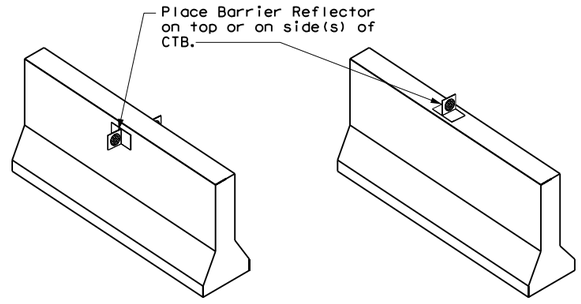
GF1



GF2



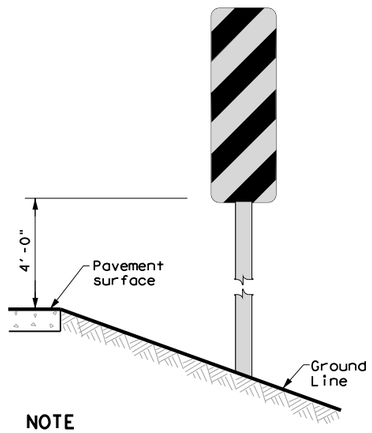
CONCRETE TRAFFIC BARRIER (CTB)



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.

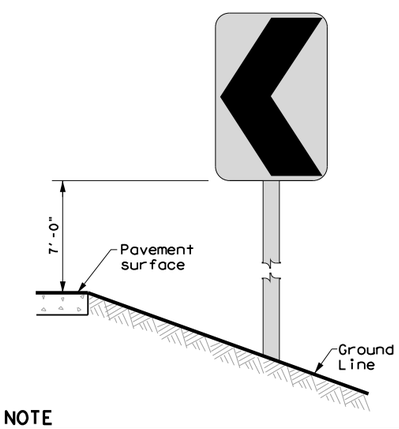
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



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)

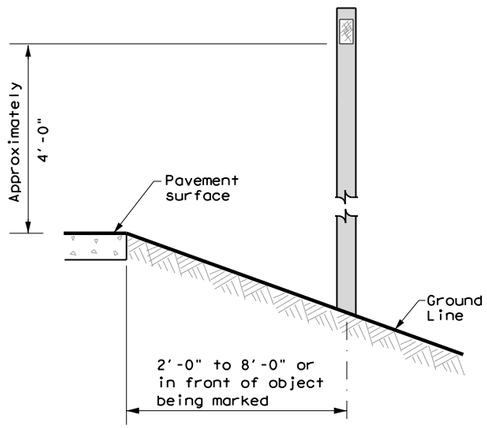
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



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	1511	01	013	FM 993
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	ATL	UPSHUR		88

20B

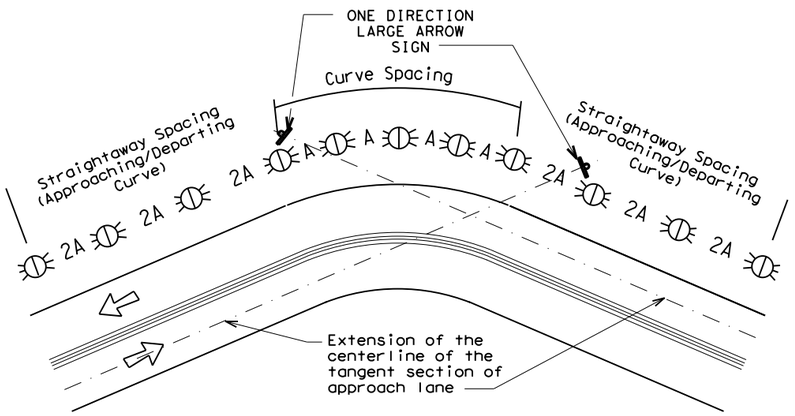
DATE: 12/7/2023 3:09:57 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/08_Traffic/STANDARDS/08_02_dom2-20.dgn

DATE: 12/7/2023 3:10:09 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/08_Traffic/STANDARDS/08_03_dom3-20.dgn

MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

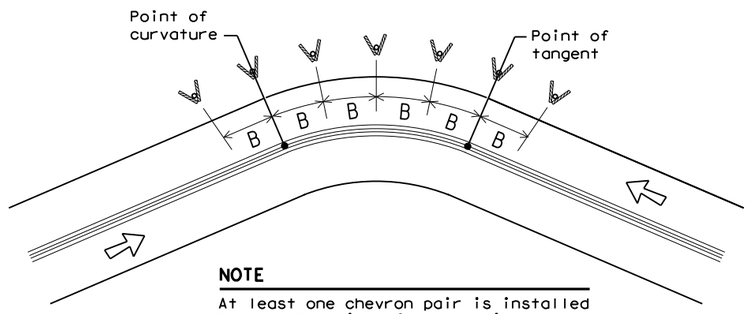
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND	
	Bi-directional Delineator
	Delineator
	Sign

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(3)-20

FILE: dom3-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
3-15 8-15	DIST	COUNTY		SHEET NO.
8-15 7-20	ATL	UPSHUR		89

20C

DATE: 12/7/2023 3:10:22 PM
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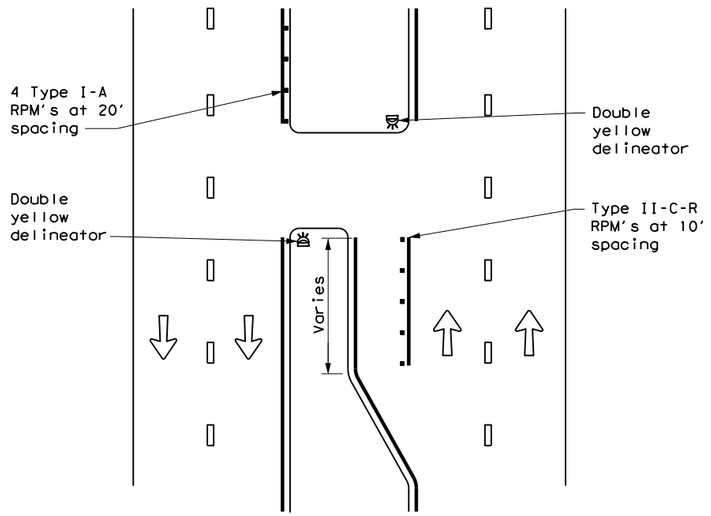
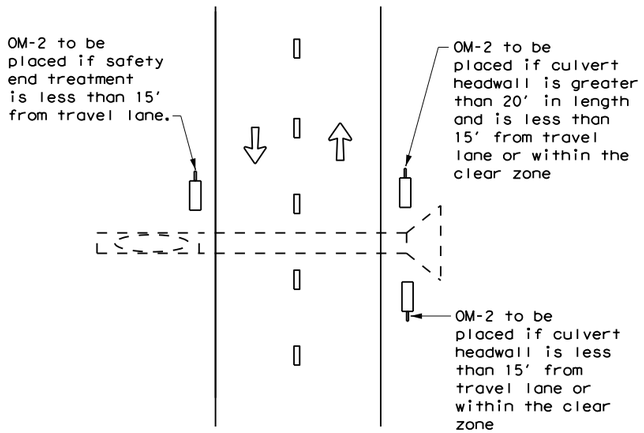
CROSSOVERS



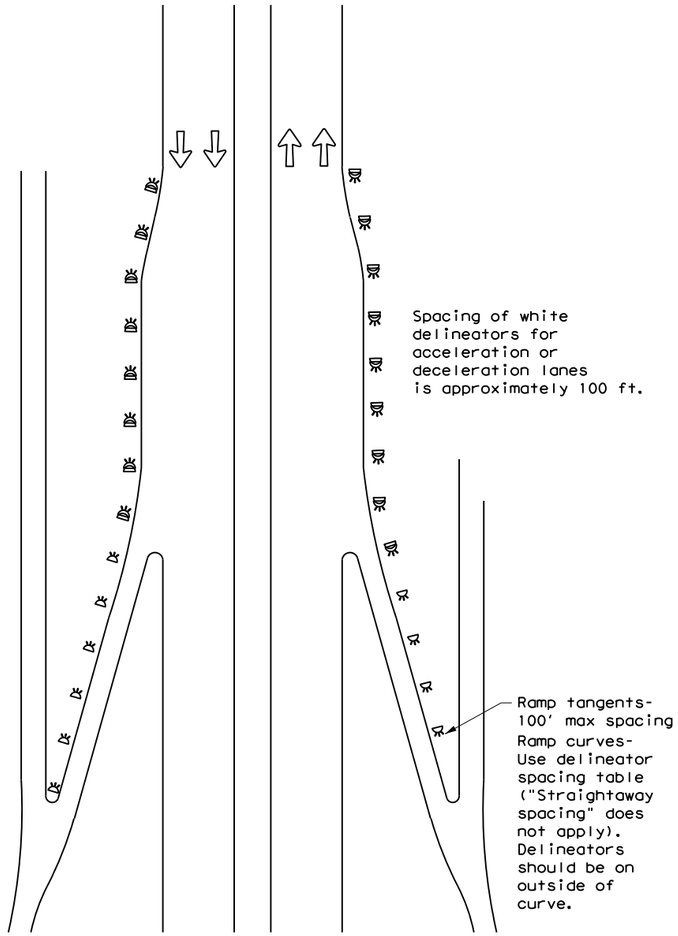
DETAIL 1

FOR CULVERTS WITHOUT MBGF



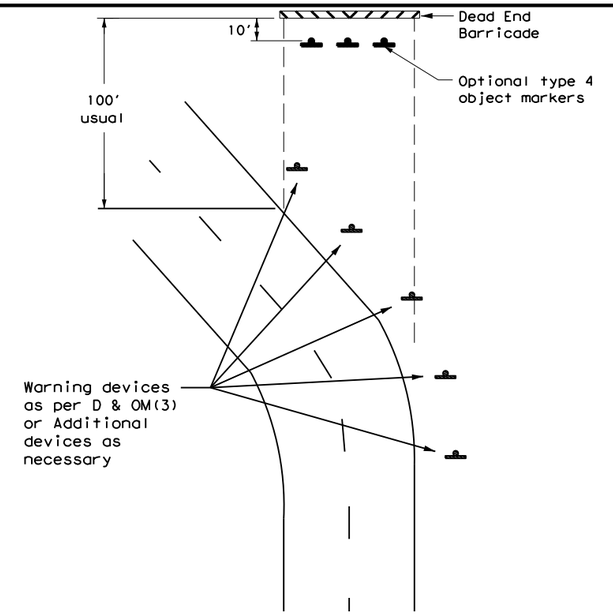
DETAIL 2

FREEWAY DELINEATION FOR RAMPS AND ACCELERATION/DECELERATION LANES



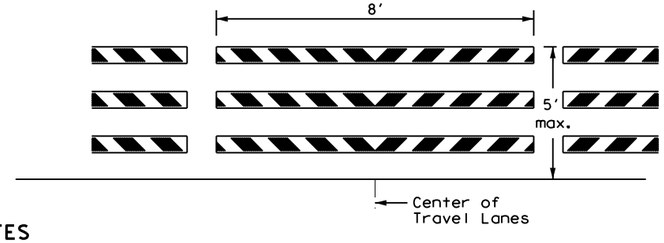
DETAIL 3

TYPICAL APPLICATION OF DEAD END BARRICADE



DETAIL 4

TYPICAL DEAD END BARRICADE INSTALLATION



NOTES

1. Barricade striping shall be red and white reflective sheeting for all permanent road closures.
2. Barricade striping is red and white sloping toward the center of the roadway.
3. Type 3 Barricade Supports should be anchored to soil or pavement as described in compliant Work Zone Traffic Control Devices List, section D.2.f and D.2.g.

DETAIL 5

LEGEND	
	Bidirectional Delineator
	Delineator
	OM-3
	Barricade
	Sign
	OM-2
	Double Delineator

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(4)-20

FILE: dom4-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
3-15 7-20	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		90

20D

DATE: 12/7/2023 3:10:35 PM
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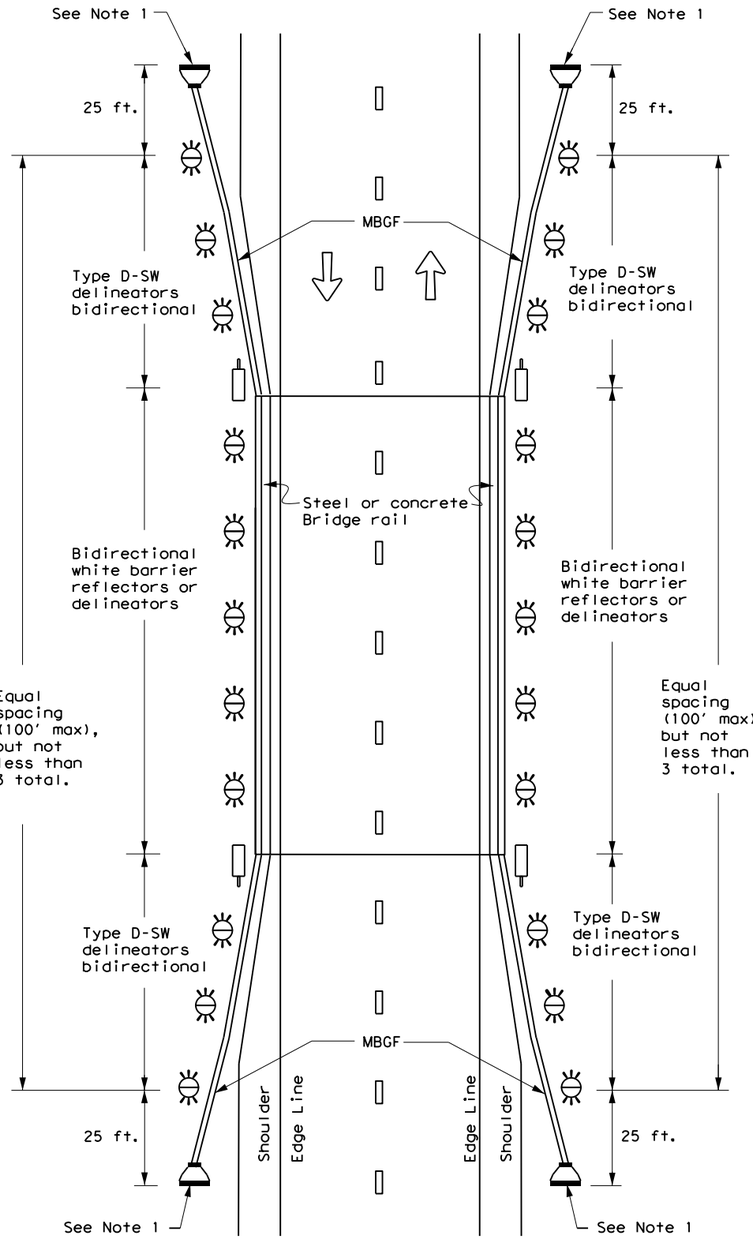
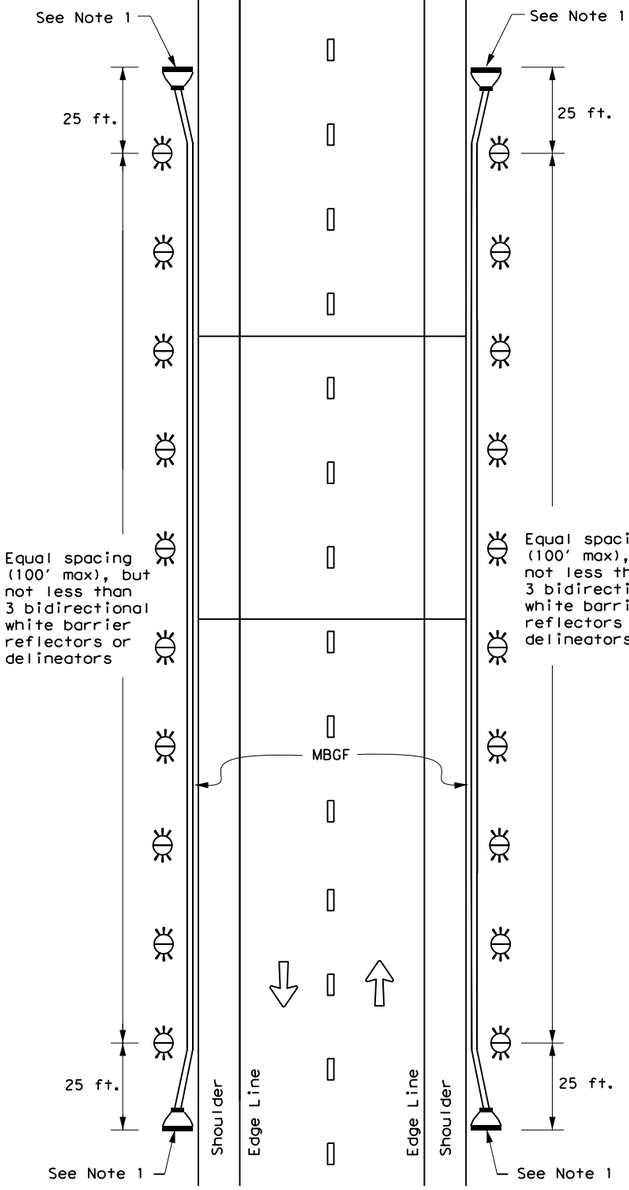
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

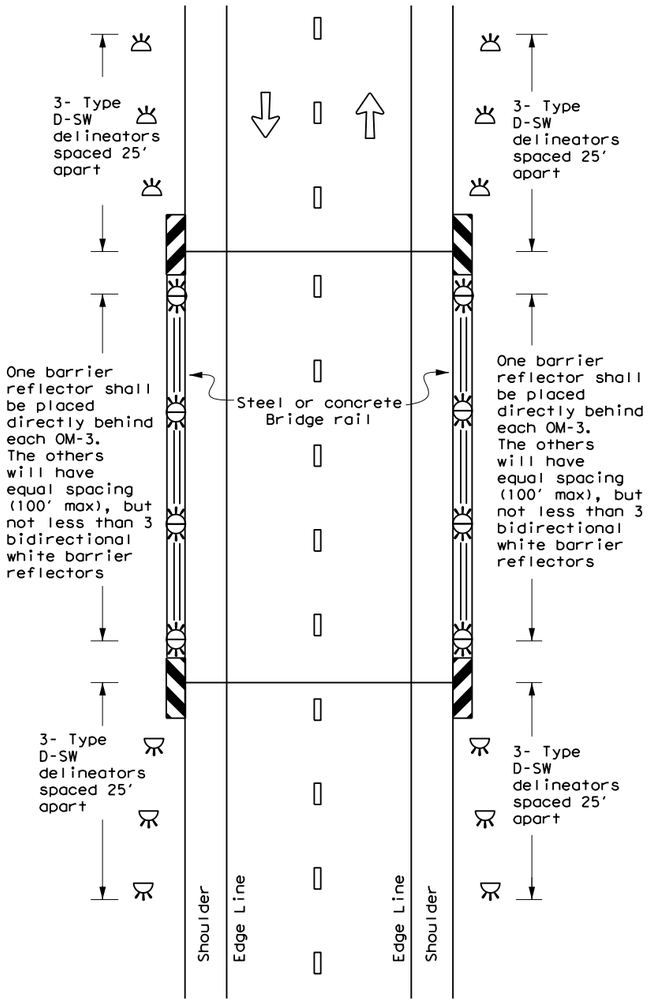
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

D & OM(5)-20

FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
7-20	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		91

20E

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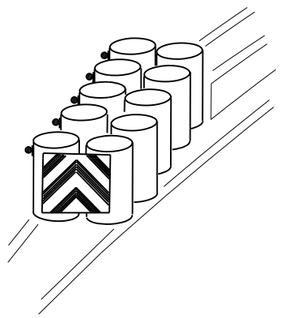
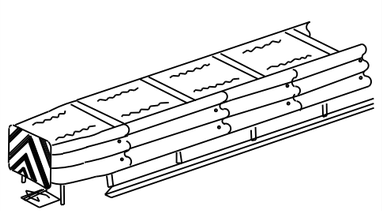
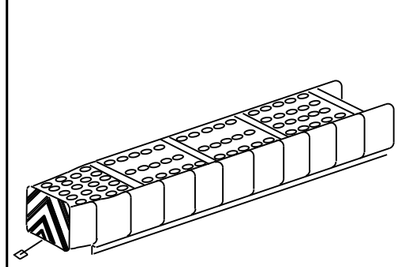
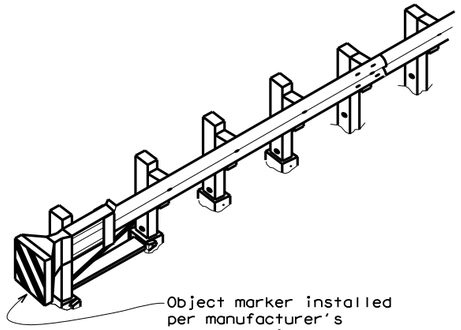
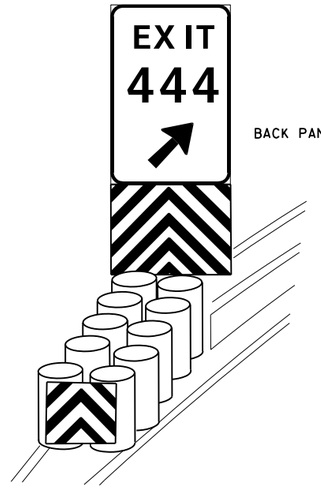
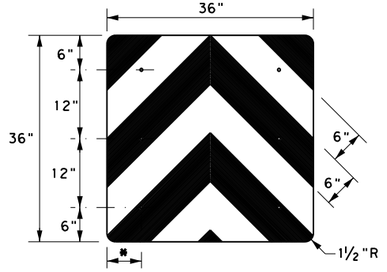


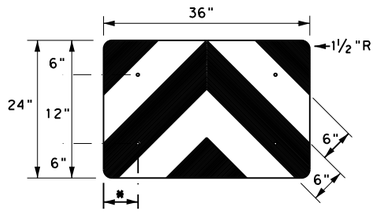




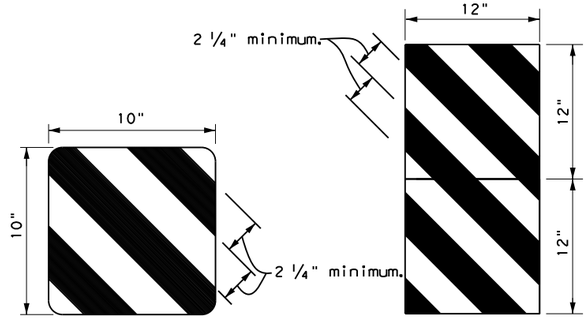




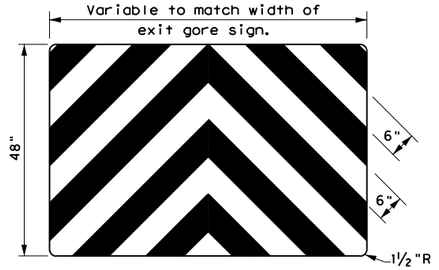


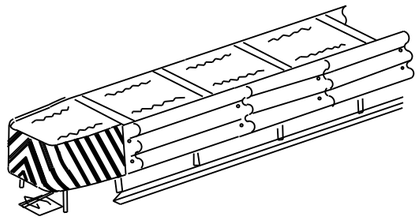


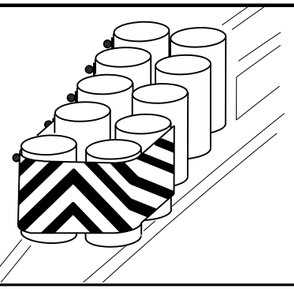
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

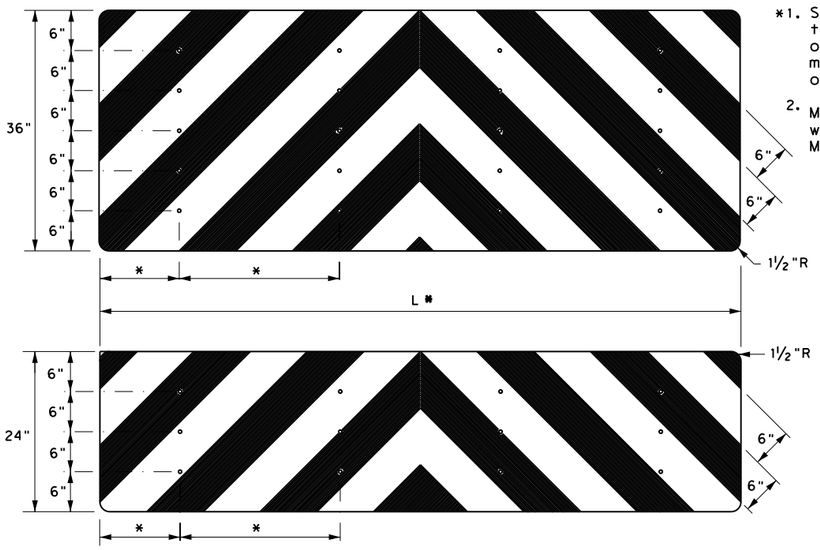


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

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

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

NOTES

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

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

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	ATL	UPSHUR		92
4-98 7-20				

20G

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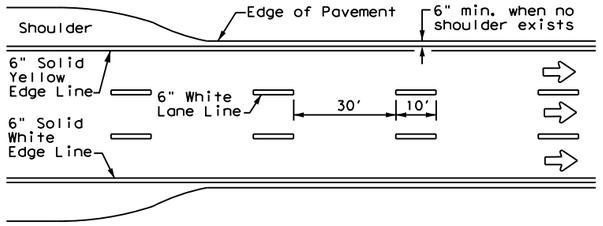
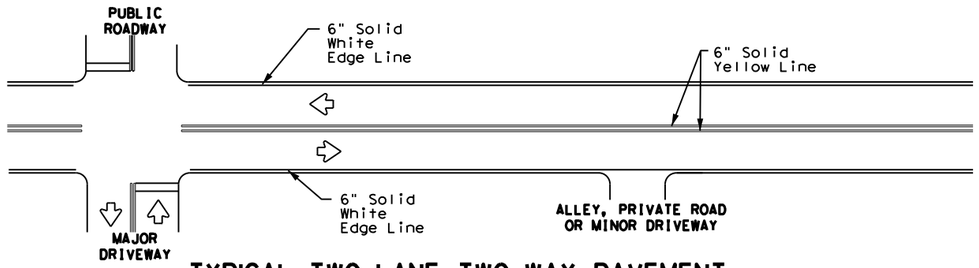
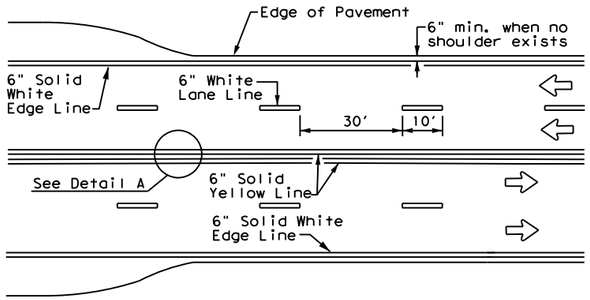
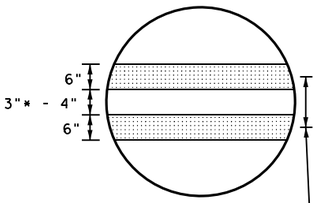


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS





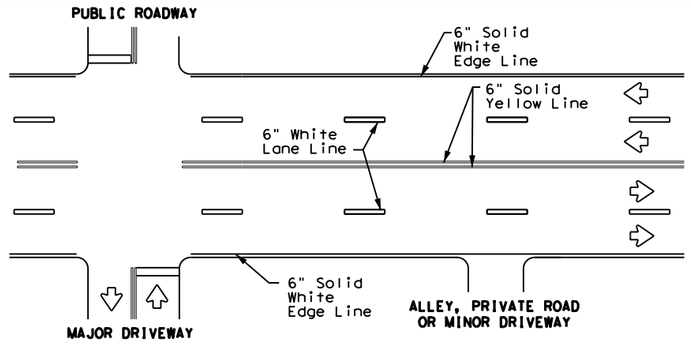
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

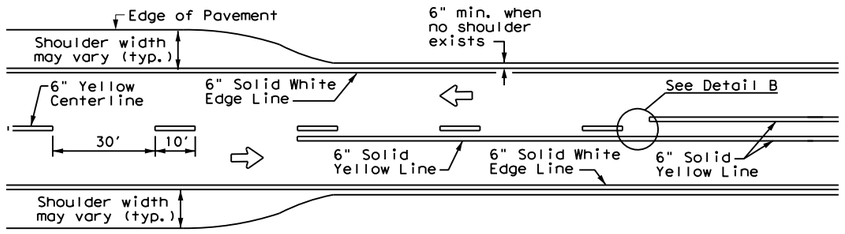
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

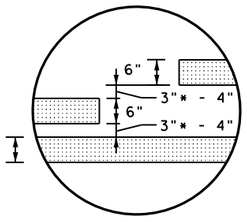
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



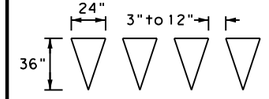
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



18" min. - 20" max.
(16" minimum for restripe projects when approved by the Engineer.)

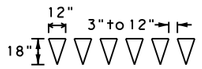
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

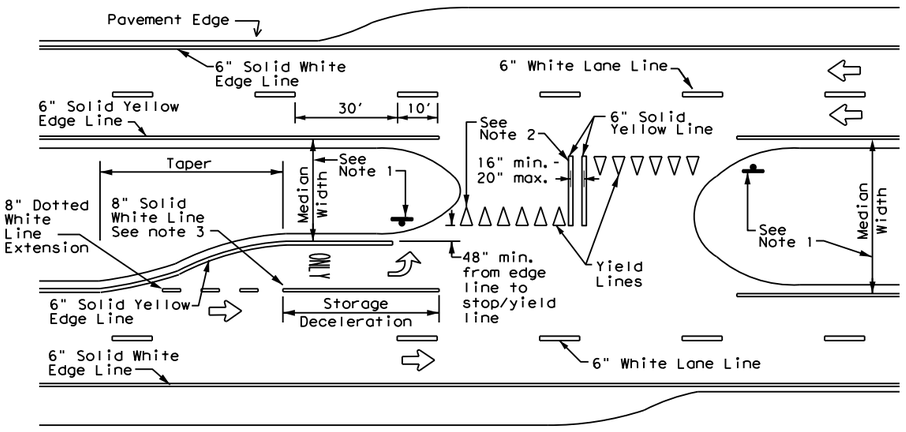


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



For posted speed on road being marked equal to or less than 40 MPH.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

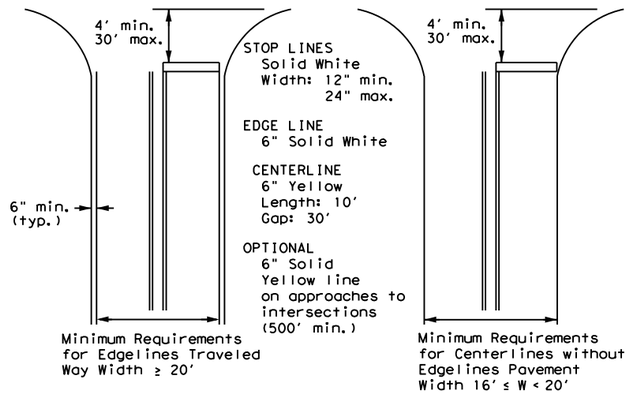
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling width to determine if signs are required. Yield signs are the typical intersection control. Stop signs and stop bars are optional as determined by the Engineer.
2. Install median striping (double yellow centerlines and stop lines/yield lines) when a 50' or greater median centerline can be placed. Stop lines shall only be used with stop signs. Yield lines shall only be used with yield signs.
3. Length of turn bays, including taper, deceleration, and storage lengths shall be as shown on the plans or as directed by the Engineer.

GENERAL NOTES

1. Edge line striping shall be as shown in the plans or as directed by the Engineer. The edge line should not be placed less than 6 inches from the edge of pavement. This distance may vary due to pavement raveling or other conditions. Edge lines are not required in curb and gutter sections of roadways.
2. The traveled way includes only that portion of the roadway used for vehicular travel. It does not include the parking lanes, sidewalks, berms and shoulders. The traveled ways shall be measured from the center of edge line to the center of edge line of a two lane roadway.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



NOTE: Traveled way is exclusive of shoulder widths. Refer to General Note 2 for additional details.

GUIDE FOR PLACEMENT OF STOP LINES, EDGE LINE & CENTERLINE

Based on Traveled Way and Pavement Widths for Undivided Roadways

Texas Department of Transportation

Traffic Safety Division Standard

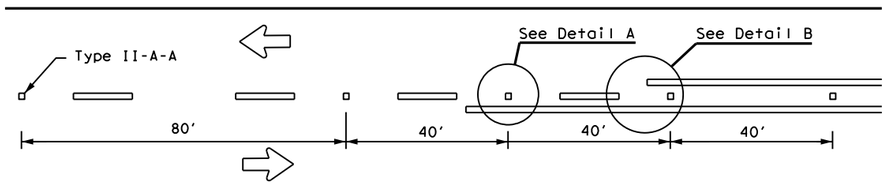
TYPICAL STANDARD PAVEMENT MARKINGS

PM(1)-22

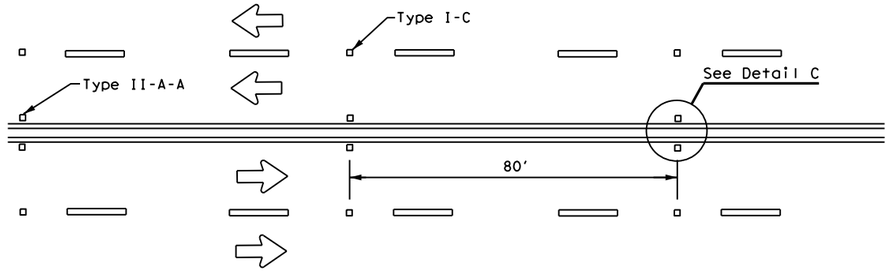
FILE: pm1-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 11-78 8-00 6-20 8-95 3-03 12-22 5-00 2-12	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		93

22A

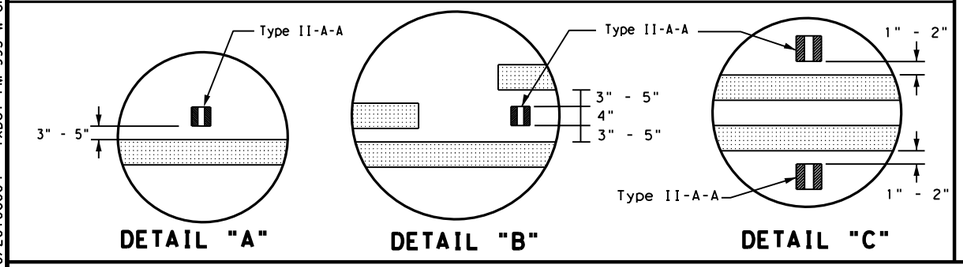
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE



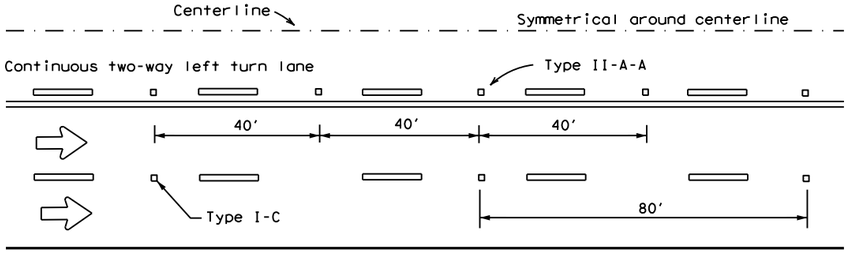
CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS



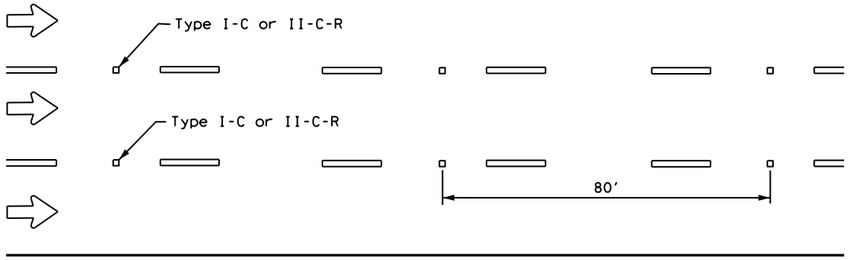
CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS



DETAIL "A" **DETAIL "B"** **DETAIL "C"**



CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



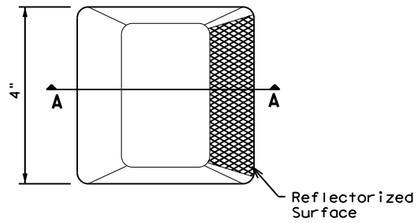
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

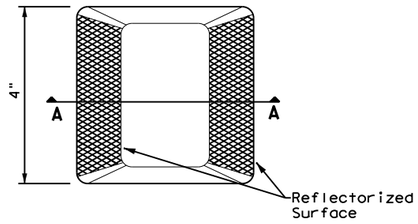
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

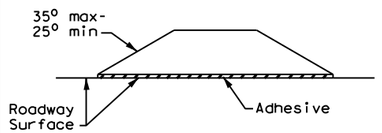
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

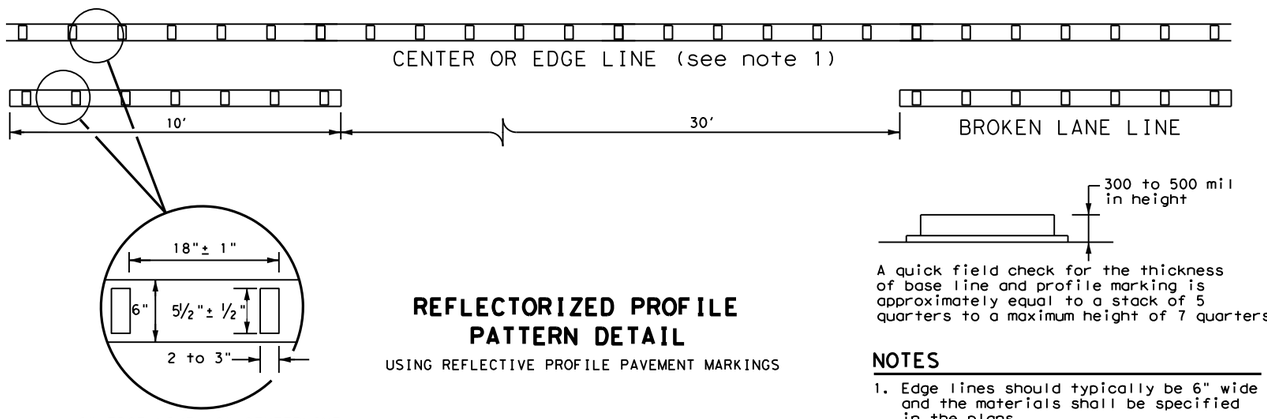


Type II (Top View)



SECTION A

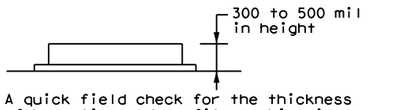
RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
©TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		94

22B

DATE: 12/7/2023 3:11:23 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/08_Traffic/STANDARDS/08_08_pm2-22.dgn

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

DATE: 12/7/2023 3:11:36 PM
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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

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

Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

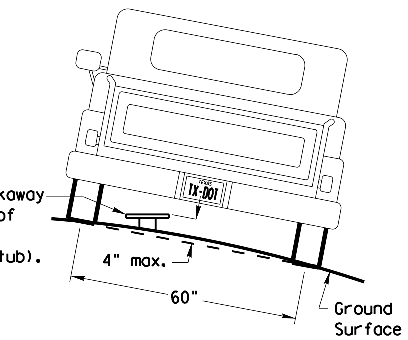
Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))

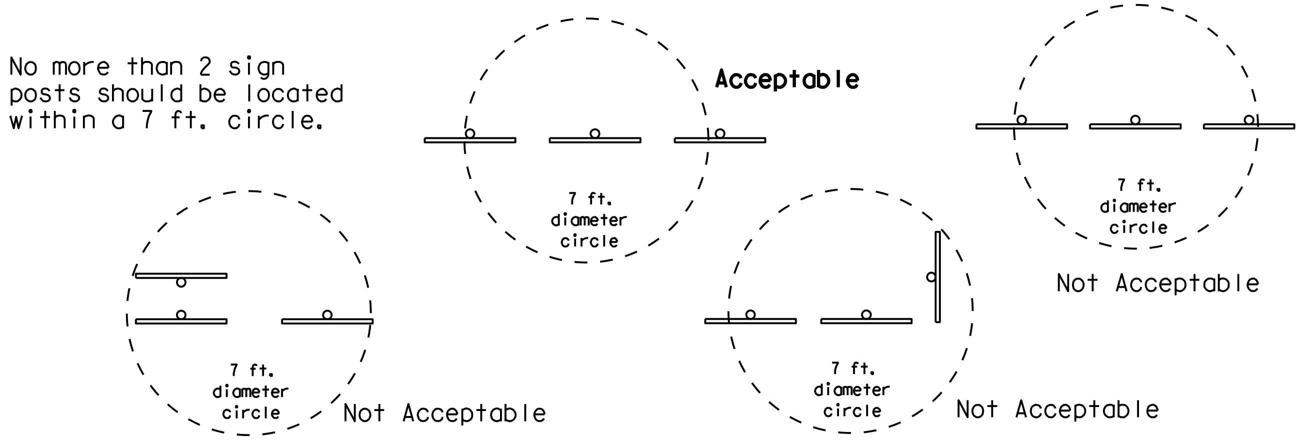
IF REQUIRED

- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT

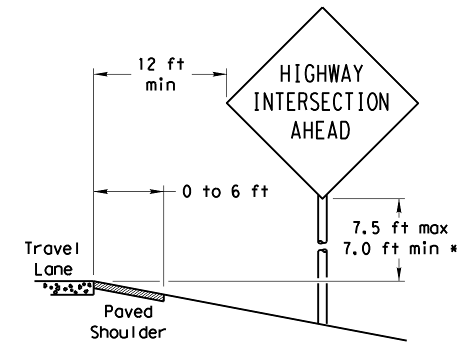


To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).



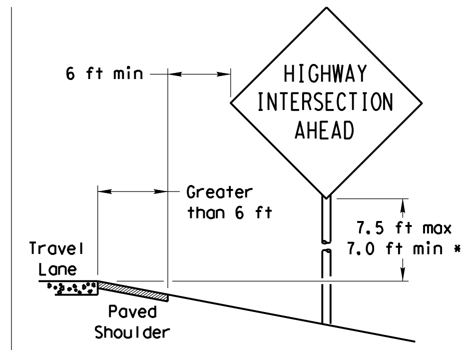
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

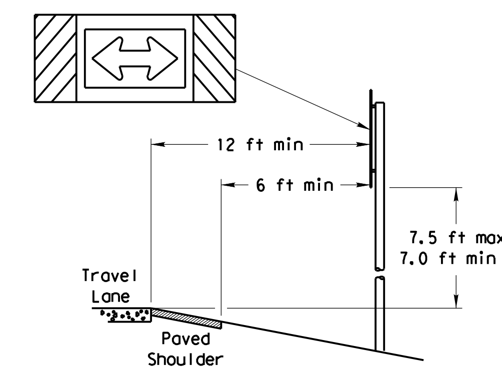
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



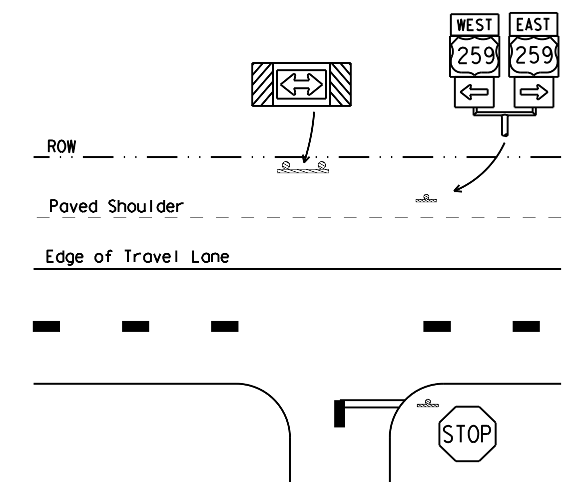
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

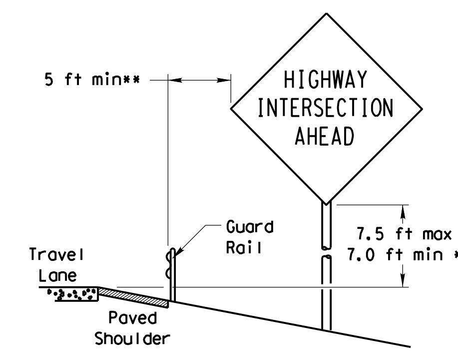
T-INTERSECTION



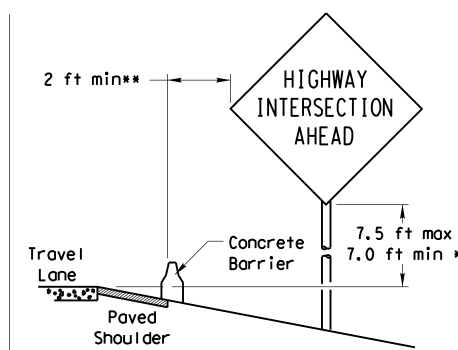
When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



BEHIND BARRIER



BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

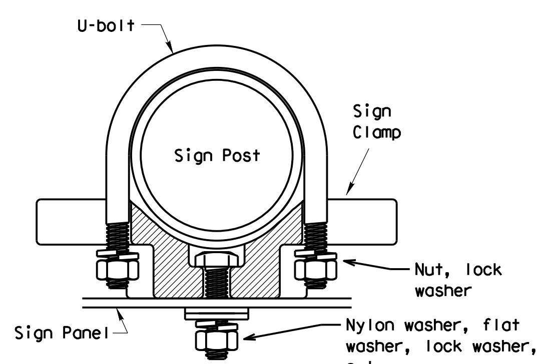
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

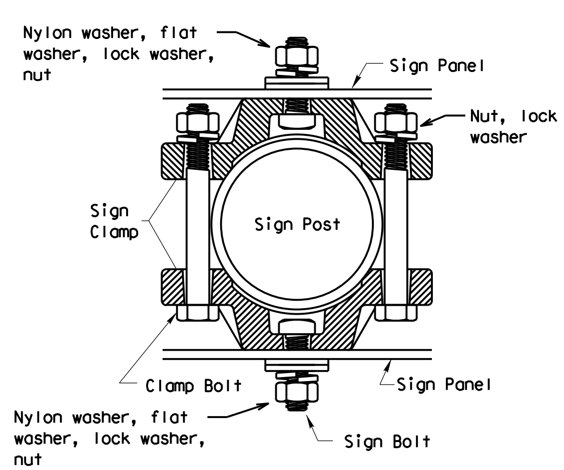
The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs



Back-to-Back Signs



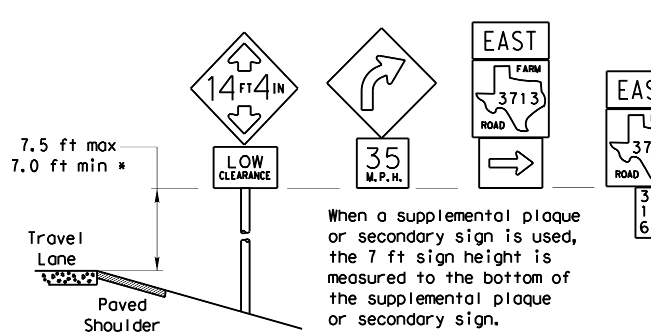
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

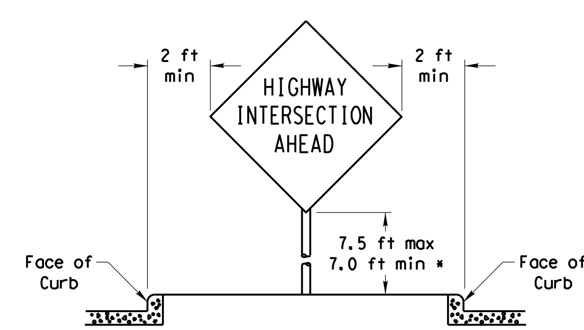
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



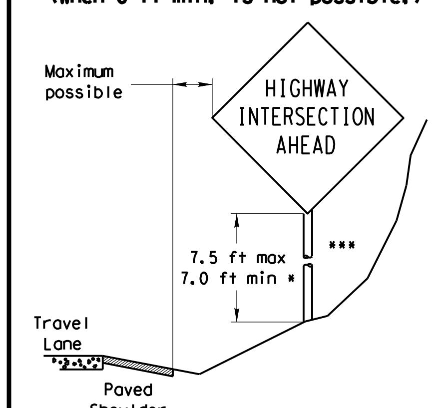
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

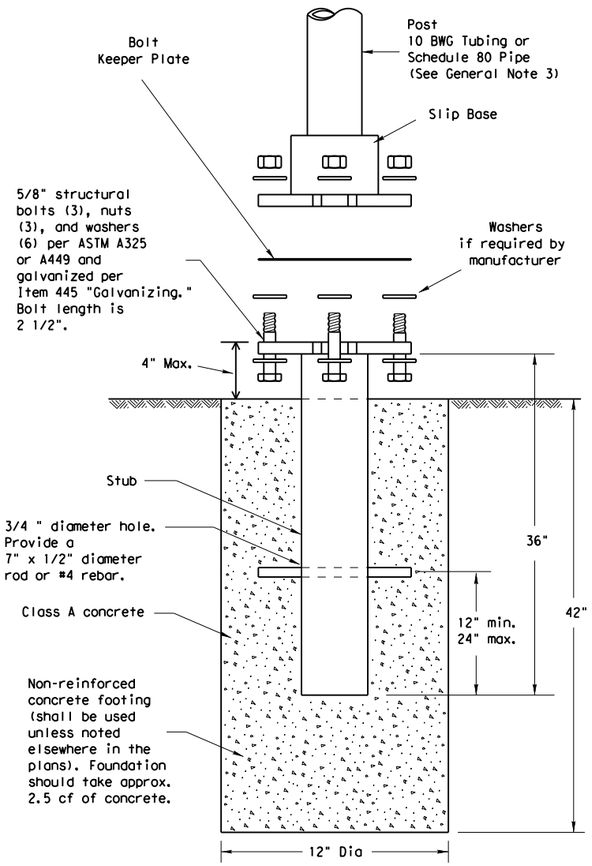
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

©TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT / SECT	JOB	HIGHWAY	
9-08	1511 / 01	013	FM 993	
	DIST	COUNTY	SHEET NO.	
	ATL	UPSHUR	95	

26A

TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

NOTE

There are various devices approved for the Triangular Slipbase System. Please reference the Material Producer List for approved slip base systems. http://www.txdot.gov/business/producer_list.htm The devices shall be installed per manufacturers' recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. Slip base shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to approval of the TxDOT Traffic Standards Engineer.
2. Material used as post with this system shall conform to the following specifications:
   10 BWG Tubing (2.875" outside diameter)
   - 0.134" nominal wall thickness
   - Seamless or electric-resistance welded steel tubing or pipe
   - Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   - Other steels may be used if they meet the following:
     - 55,000 PSI minimum yield strength
     - 70,000 PSI minimum tensile strength
     - 20% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.122" to 0.138"
   - Outside diameter (uncoated) shall be within the range of 2.867" to 2.883"
   - Galvanization per ASTM A123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.

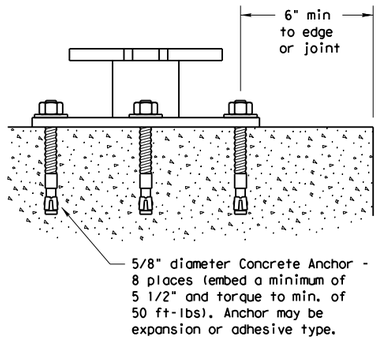
   Schedule 80 Pipe (2.875" outside diameter)
   - 0.276" nominal wall thickness
   - Steel tubing per ASTM A500 Gr C
   - Other seamless or electric-resistance welded steel tubing or pipe with equivalent outside diameter and wall thickness may be used if they meet the following:
     - 46,000 PSI minimum yield strength
     - 62,000 PSI minimum tensile strength
     - 21% minimum elongation in 2"
   - Wall thickness (uncoated) shall be within the range of 0.248" to 0.304"
   - Outside diameter (uncoated) shall be within the range of 2.855" to 2.895"
   - Galvanization per ASTM A123
3. See the Traffic Operations Division website for detailed drawings of sign clamps and Texas Universal Triangular Slipbase System components. The website address is: http://www.txdot.gov/publications/traffic.htm
4. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.

ASSEMBLY PROCEDURE

Foundation
1. Prepare 12-inch diameter by 42-inch deep hole. If solid rock is encountered, the depth of the foundation may be reduced such that it is embedded a minimum of 18 inches into the solid rock.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor-driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Concrete shall be Class A.
3. Push the pipe end of the slip base stub into the center of the concrete. Rotate the stub back and forth while pushing it down into the concrete to assure good contact between the concrete and stub. Continue to work the stub into the concrete until it is between 2 to 4 inches above the ground.
4. Plumb the stub. Allow a minimum of 4 days to set, unless otherwise directed by the Engineer.
5. The triangular slipbase system is multidirectional and is designed to release when struck from any direction.

Support
1. Cut support so that the bottom of the sign will be 7 to 7.5 feet above the edge of the travelway (i.e., edge of the closest lane) when slip plate is below the edge of pavement or 7 to 7.5 feet above slip plate when the slip plate is above the edge of the travelway. The cut shall be plumb and straight.
2. Attach sign to support using connections shown. When multiple signs are installed on the same support, ensure the minimum clearance between each sign is maintained. See SMD(SLIP-2) for clearances based on sign types.

CONCRETE ANCHOR



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

Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. Heavy hex nut per ASTM A563, and hardened washer per ASTM F436. The stud bolt shall have a minimum yield and ultimate tensile strength of 50 and 75 KSI, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations. Top of bolt shall extend at least flush with top of the nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 5 1/2" minimum embedment, shall have a minimum allowable tension and shear of 3900 and 3100 psi, respectively.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-1)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

REVISIONS
9-08

CONT	SECT	JOB	HIGHWAY
1511	01	013	FM 993

DIST	COUNTY	SHEET NO.
ATL	UPSHUR	96

DATE:12/7/2023 3:11:50 PM
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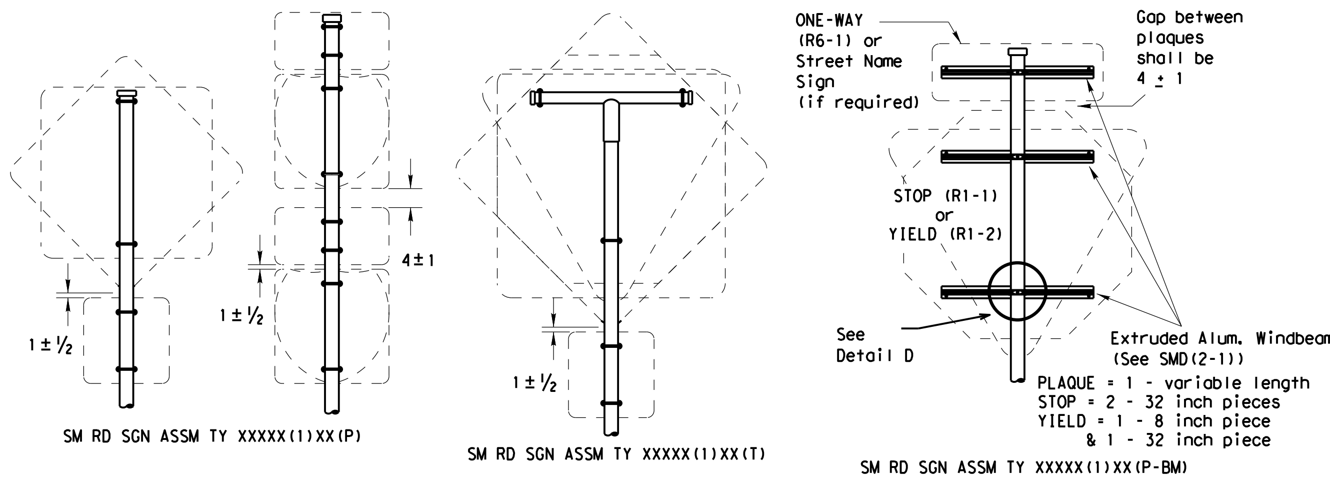
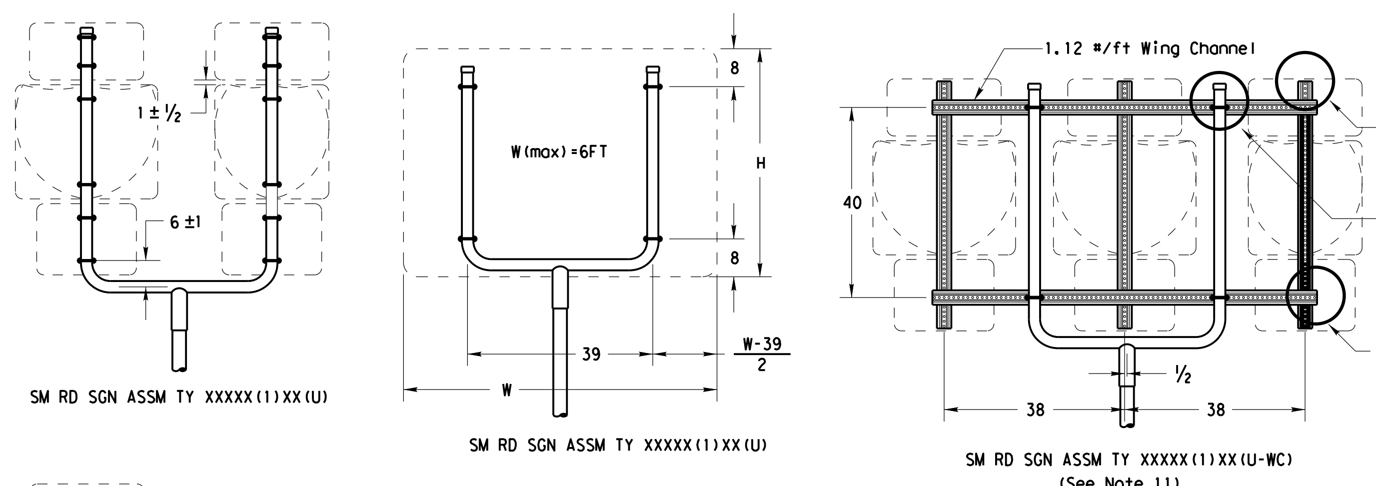
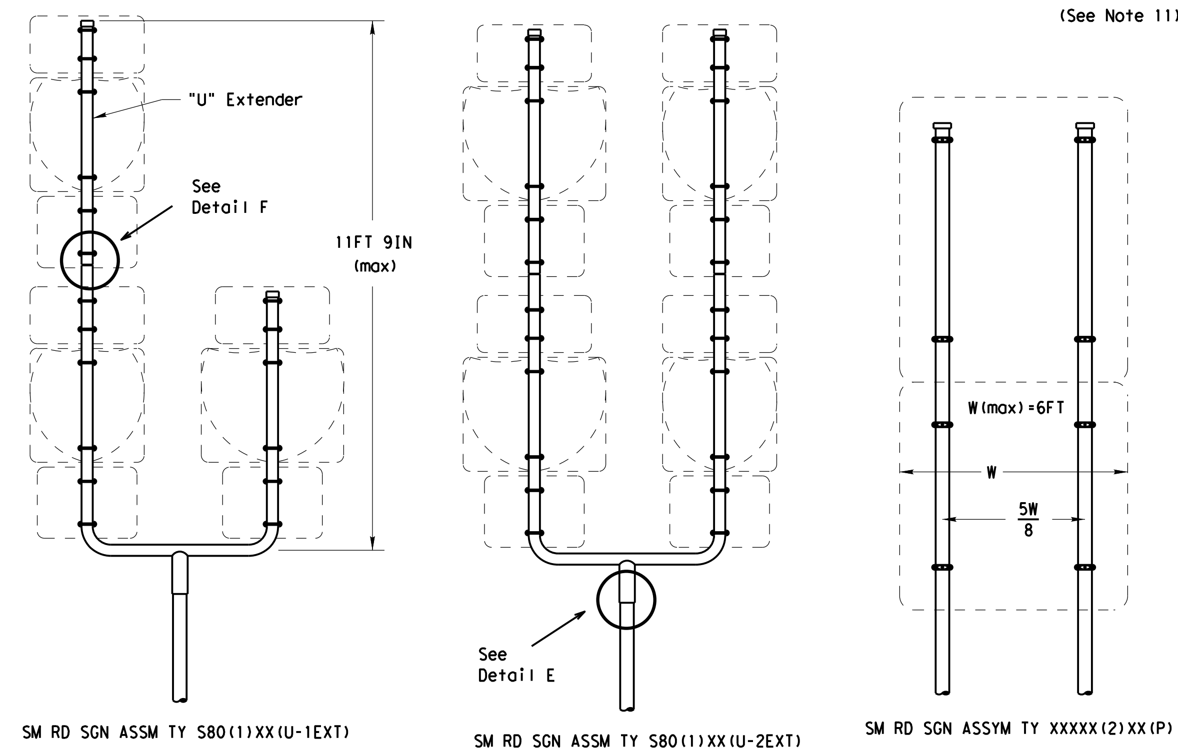
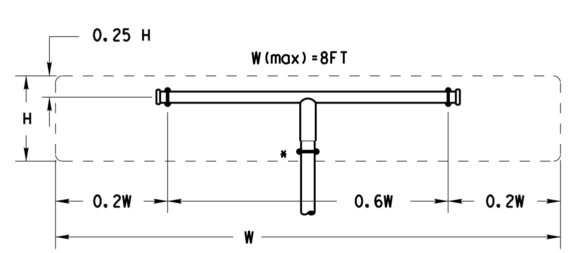


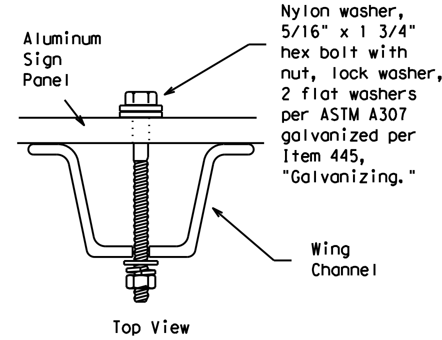




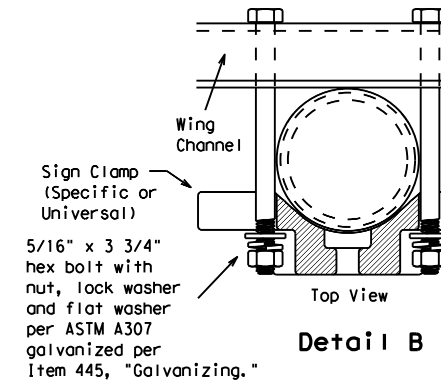


SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

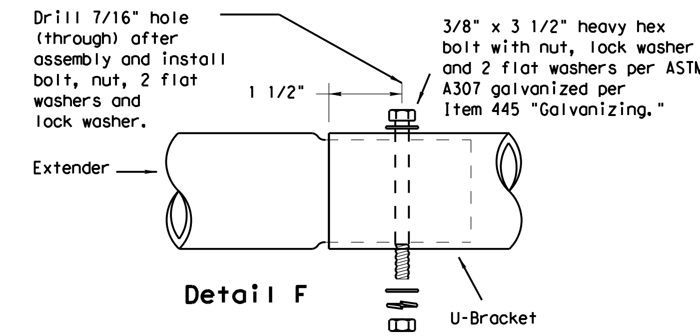
All dimensions are in english unless detailed otherwise.



Detail A

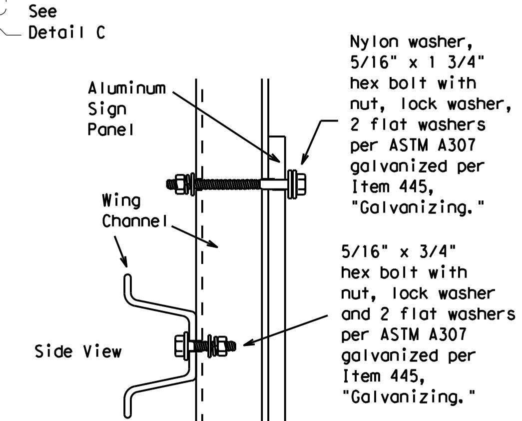


Detail B

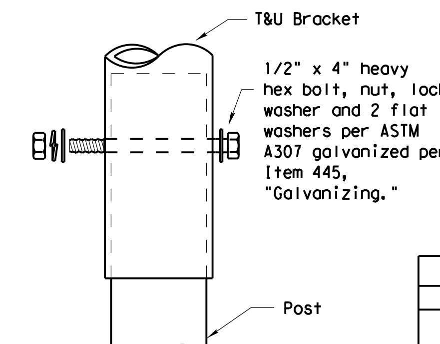


Detail F

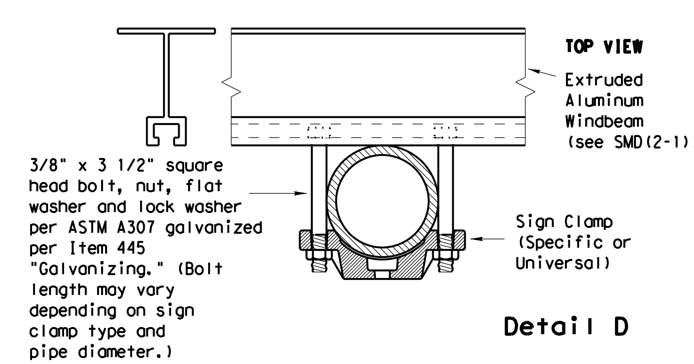
Splices shall only be allowed behind the sign substrate.



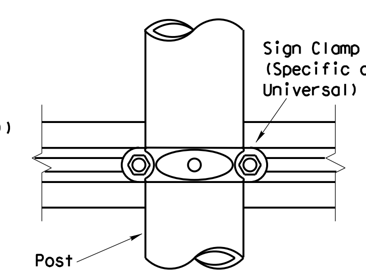
Detail C



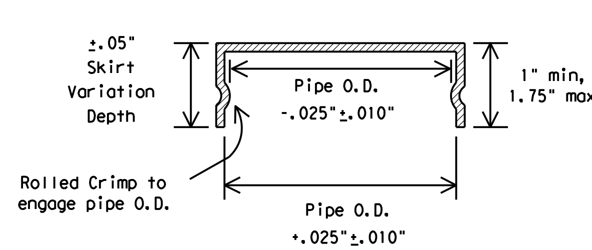
Detail E



Detail D



FRICTION CAP DETAIL



Friction caps may be manufactured from hot rolled or cold rolled steel sheets. The minimum sheet metal thickness shall be 24 gauge for all cap sizes.

The rim edges shall be reasonably straight and smooth. Caps shall be sized and formed in such a manner as to produce a drive-on friction fit and have no tendency to rock when seated on the pipe. The depth shall be sufficient to give positive protection against entrance of rainwater. They shall be free of sharp creases or indentations and show no evidence of metal fracture.

Caps shall have an electrodeposited coating of zinc in accordance with the requirements of ASTM B633 Class FE/ZN 8.

GENERAL NOTES:

1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
Regulatory	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
Regulatory	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
Regulatory	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
Regulatory	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
Warning	48x60-inch signs	TY S80(1)XX(T)
Warning	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
Warning	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
Warning	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

©TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
REVISIONS	CONT	SECT	JOB	HIGHWAY
9-08	1511	01	013	FM 993
	DIST		COUNTY	SHEET NO.
	ATL		UPSHUR	97

26C

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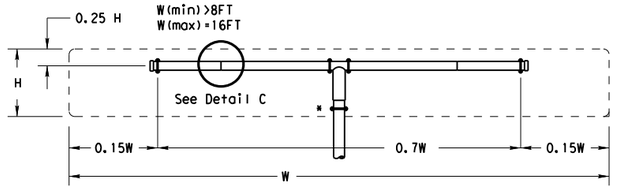
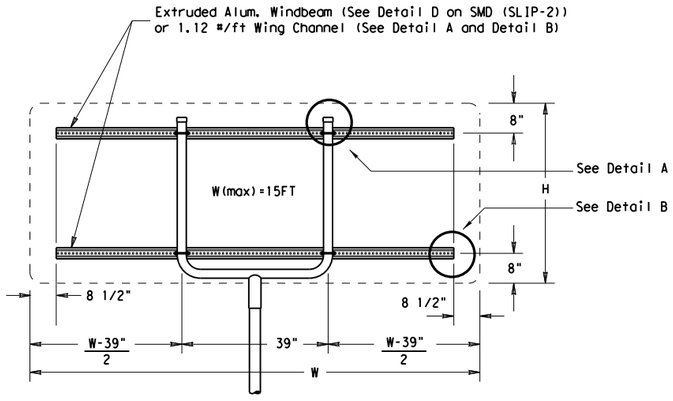


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

(* - See Note 12)



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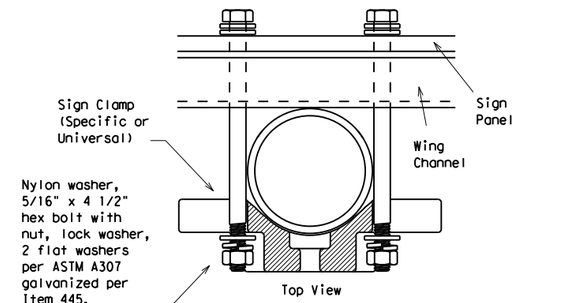
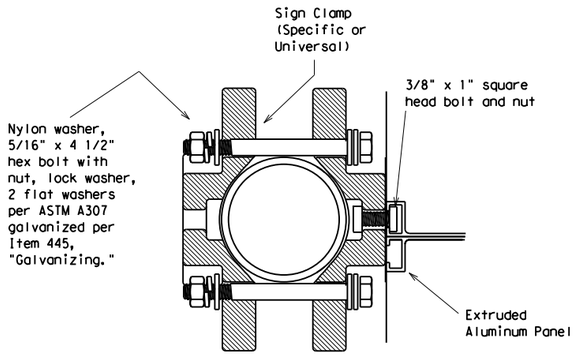
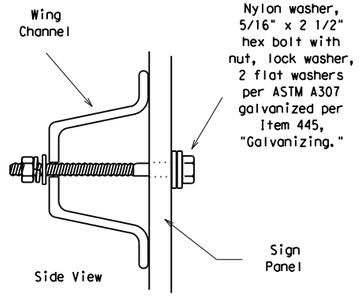


Detail A

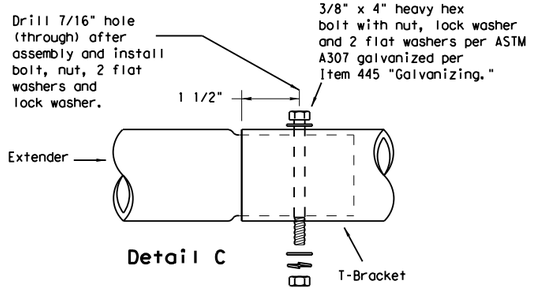


Detail D

EXTRUDED ALUMINUM SIGN WITH T BRACKET

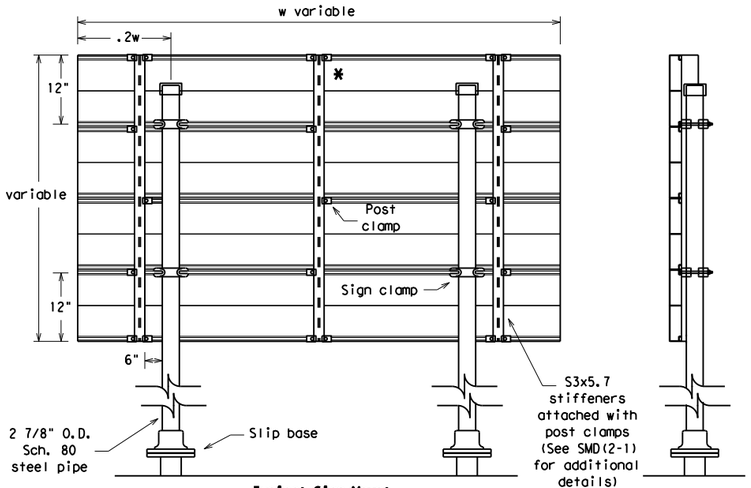


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

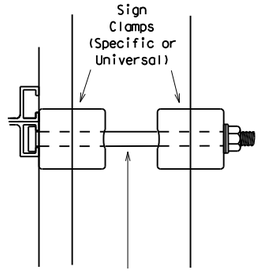


Typical Sign Mount

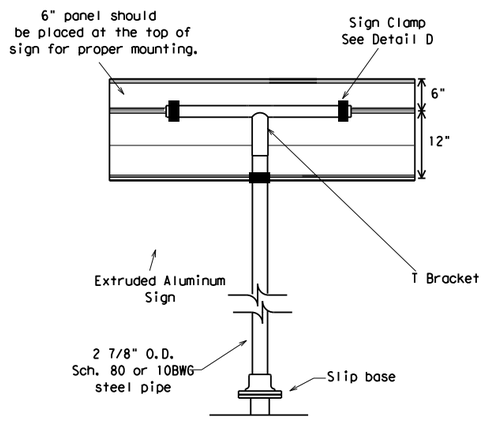
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

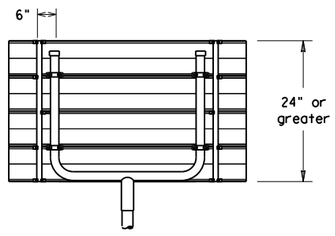
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

1. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
2. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
3. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
4. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
5. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
6. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
7. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
8. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
9. Sign blanks shall be the sizes and shapes shown on the plans.
10. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
11. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT

	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS

9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1511	01	013	FM 993

DIST	COUNTY	SHEET NO.
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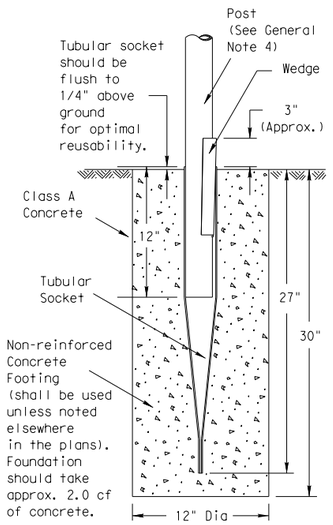
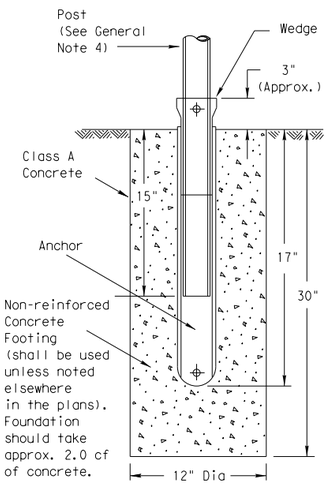
Wedge Anchor Steel System



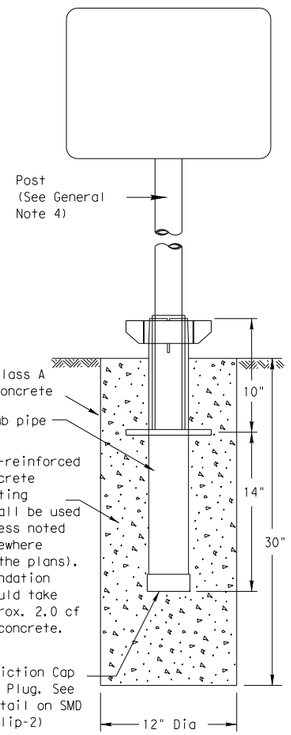
SM RD SGN ASSM TY TWT(X)WS(X)

Wedge Anchor High Density Polyethylene (HDPE) System

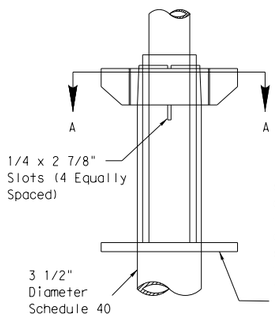


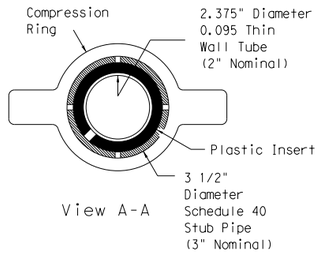
SMD RD SGN ASSM TY TWT(X)WP(X)

Universal Anchor System with Thin-Walled Tubing Post



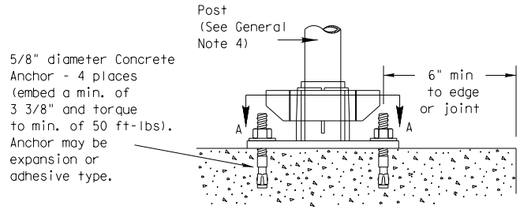
SM RD SGN ASSM TY TWT(X)UA(P)



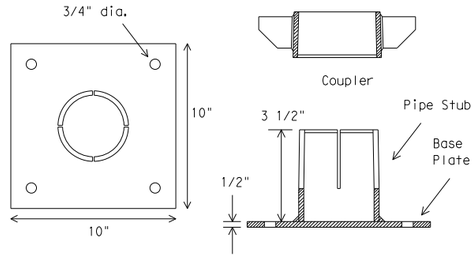


View A-A

Plastic insert must be used when using the TWT with either the Universal Anchor System or the Bolt Down Universal Anchor System. The insert should be approx. 10" long and cover the tubing from just above the top of the stub pipe to the bottom of the sign post when using the Universal Anchor System. The insert should be cut to approx. 4 1/2" when used with the Bolt Down Universal Anchor System.

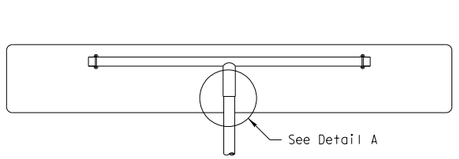


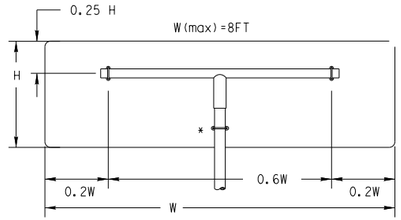
Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxies and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



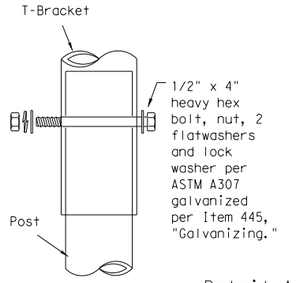
SM RD SGN ASSM TY TWT(X)UB(P)

Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post





SM RD SGN ASSM TY TWT(X)XX(T)
(* - See General Note 6)



Detail A

9/16" hole may need to be drilled through post to accommodate bolt.

NOTE

The devices shall be installed per manufacturer's recommendations.
Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

1. The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
2. The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
3. Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer list.htm
4. Material used as post with this system shall conform to the following specifications:
   13 BWG Tubing (2.375" outside diameter) (TWT)
   0.095" nominal wall thickness
   Seamless or electric-resistance welded steel tubing
   Steel shall be HSLAS Gr 55 per ASTM A1011 or ASTM A1008
   Other steels may be used if they meet the following:
   55,000 PSI minimum yield strength
   70,000 PSI minimum tensile strength
   18% minimum elongation in 2"
   Wall thickness (uncoated) shall be within the range of .083" to .099"
   Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
   Galvanization per ASTM 123 or ASTM A653 G210. For precoated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
5. Sign blanks shall be the sizes and shapes shown on the plans.
6. Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
7. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
8. See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: http://www.txdot.gov/publications/traffic.htm

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
3. Insert tubular socket into concrete until top of socket is approximaely 1/4 " above the concrete footing.
4. Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer..
5. Attach the sign to the sign post.
6. Insert the sign post into socket and align sign face with roadway.
7. Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

1. Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
2. Insert base post in hole to depths shown and backfill hole with concrete.
3. Level and plumb the base post using a torpedo level and allow concrete adequate time to set. The bottom of the slots provided in the stub pipe shall remain above the top of the concrete foundation.
4. Attach the sign to the sign post.
5. Install plastic insert around bottom of post.
6. Insert sign post into base post. Lower until the post comes to rest on steel rod.
7. Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
8. Check sign post by hand to ensure it is unable to turn. If loose, increase the tightening of the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST

SMD(TWT)-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

9-08 REVISIONS

CONT	SECT	JOB	HIGHWAY
1511	01	013	FM 993

DIST	COUNTY	SHEET NO.
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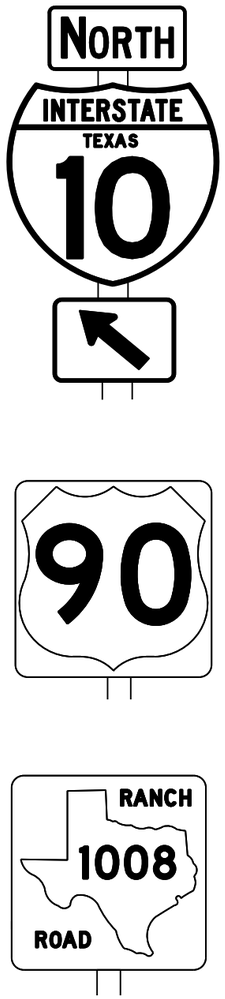
REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

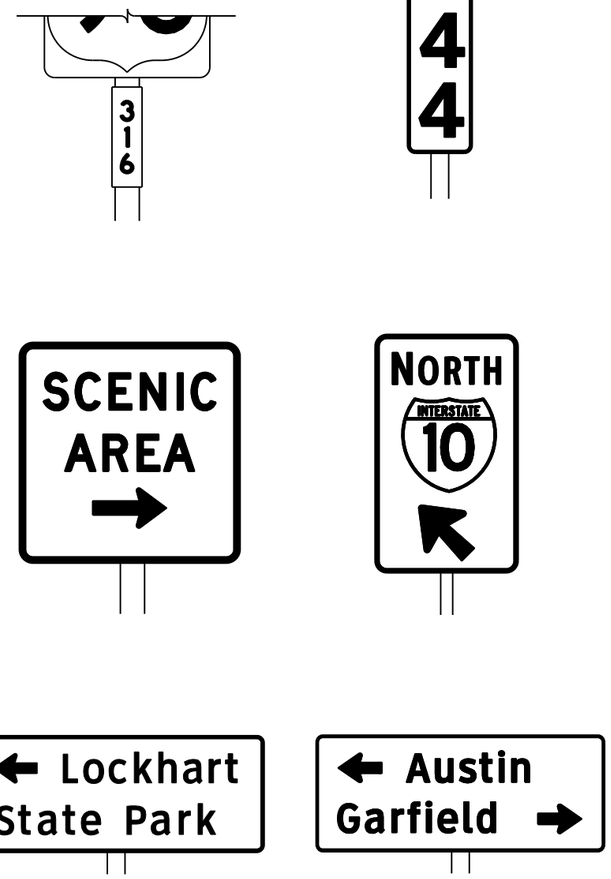
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
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9-08	ATL	UPSHUR		100

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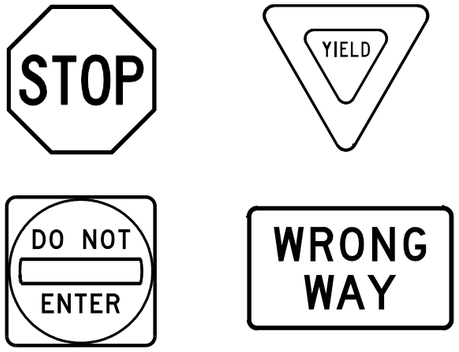
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

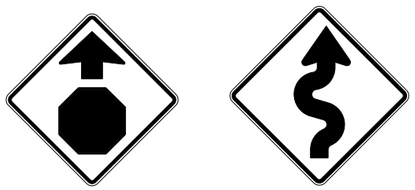
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
12-03 7-13 9-08	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		101

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

This SWP3 has been developed in accordance with the TPDES Construction General Permit TXR150000 (CGP). The Texas Department of Transportation (TxDOT) ensures that project specifications include adequate best management practices (BMPs) for this project.

For all projects with soil disturbing activity and for projects that have Environmental, Permits, Issues, and Commitments (EPICs) dependent on stormwater controls and water quality measures TxDOT will maintain a SWP3 with all pertinent records, correspondence, environmental documents, etc. at the project field office, Area Office, or electronically.

This SWP3 is consistent with requirements specified in applicable stormwater plans and the projects environmental permits, issues, and commitments (EPICs). A copy of the CGP is included in Attachment 2.12 of the SWP3 binder.

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

CSJ: 1511-01-013

1.2 PROJECT LIMITS:

From: 310' NORTH OF WEST GREASY CREEK

To: 550' SOUTH OF WEST GREASY CREEK

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 32°52'52.50" N ,(Long) 94°50'50.68" W

END: (Lat) 32°52'43.98" N ,(Long) 94°50'50.43" W

1.4 TOTAL PROJECT AREA (Acres): 1.60

1.5 TOTAL AREA TO BE DISTURBED (Acres): 1.25

1.6 NATURE OF CONSTRUCTION ACTIVITY:

CONSTRUCTION TO REPLACE EXISTING BRIDGE AND APPROACHES CONSISTING OF GRADING, DRAINAGE, PAVEMENT, SIGNING AND PAVEMENT MARKINGS.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
BOWIE FINE SANDY LOAM, 1 TO 5% SLOPES	90% BOWIE AND SIMILAR SOILS; 10% MINOR COMPONENTS, WELL DRAINED, CLASS 1 EROSION POTENTIAL
CUTHBERT FINE SANDY LOAM, 8 TO 25% SLOPES	85% CUTHBERT AND SIMILAR SOILS; 15% MINOR COMPONENTS, WELL DRAINED, CLASS 1 EROSION POTENTIAL
MATTEX LOAM, 0 TO 1% SLOPES FREQUENTLY FLOODED	90% MATTEX AND SIMILAR SOILS; 10% MINOR COMPONENTS, SOMEWHAT POORLY DRAINED, CLASS: NOTE-DEPOSITION

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	100, 101

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.5.)

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

☒ Sediment laden stormwater from stormwater conveyance over disturbed area
☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
☒ Solvents, paints, adhesives, etc. from various construction activities
☒ Transported soils from offsite vehicle tracking
☒ Construction debris and waste from various construction activities
☒ Contaminated water from excavation or dewatering pump-out water
☒ Sanitary waste from onsite restroom facilities
☒ Trash from various construction activities/receptacles
☒ Long-term stockpiles of material and waste
☒ Discharges from concrete washout activities, runoff from concrete cutting activities, and other concrete related activities.
☐ 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
West Greasy Creek, Lake O' the Pines	Greasy Creek (0404M); Big Cypress Creek Below Lake Bob Sandlin (0404): Impaired: Bacteria in water (Recreation Use)

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

☒ Development of plans and specifications
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Perform SWP3 inspections
☒ Maintain SWP3 records and update to reflect daily operations
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

☒ Day To Day Operational Control
☒ Submit Notice of Intent (NOI) to TCEQ (≥5 acres)
☒ Post Construction Site Notice
☐ Submit NOI/CSN to local MS4
☒ Maintain schedule of major construction activities
☒ Install, maintain and modify BMPs
☒ Complete and submit Notice of Termination to TCEQ
☒ Maintain SWP3 records for 3 years
☐ Other: _____
☐ Other: _____
☐ Other: _____

1.14 LOCAL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) OPERATOR COORDINATION:

MS4 Entity

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED PROFESSIONAL ENGINEER
Adrian Rangel 1/24/2024

Texas Department of Transportation

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		102
STATE	STATE DIST.	COUNTY	
TEXAS	ATL	UPSHUR	
CONT.	SECT.	JOB	HIGHWAY NO.
1511	01	013	FM 993

STORMWATER POLLUTION PREVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- [X] [ ] Protection of Existing Vegetation
- [ ] [ ] Vegetated Buffer Zones
- [X] [ ] Soil Retention Blankets
- [ ] [ ] Geotextiles
- [ ] [ ] Mulching/ Hydromulching
- [ ] [ ] Soil Surface Treatments
- [X] [ ] Temporary Seeding
- [ ] [X] Permanent Planting, Sodding or Seeding
- [X] [ ] Biodegradable Erosion Control Logs
- [X] [ ] Rock Filter Dams/ Rock Check Dams
- [X] [X] Vertical Tracking
- [ ] [ ] Interceptor Swale
- [ ] [X] Riprap
- [ ] [ ] Diversion Dike
- [ ] [ ] Temporary Pipe Slope Drain
- [ ] [X] Embankment for Erosion Control
- [ ] [ ] Paved Flumes
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____
- [ ] [ ] Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

Sediment control BMPs requiring design capacity calculations (See SWP3 Attachment 1.3.):

T / P

- [ ] [ ] Sediment Trap
  - [ ] Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
  - [ ] 3,600 cubic feet of storage per acre drained
- [ ] [ ] Sedimentation Basin
  - [X] Not required (<10 acres disturbed)
  - [ ] Required (>10 acres) and implemented.
    - [ ] Calculated volume runoff from 2-year, 24-hour storm for each acre of disturbed area
    - [ ] 3,600 cubic feet of storage per acre drained
  - [ ] Required (>10 acres), but not feasible due to:
    - [ ] Available area/Site geometry
    - [ ] Site slope/Drainage patterns
    - [ ] Site soils/Geotechnical factors
    - [ ] Public safety
    - [ ] Other: _____

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
RIPRAP	1599+50.00	1600+93.00
RIPRAP	1601+29.00	1603+15.00
PERMANENT PLANTING, SODDING OR SEEDING	1597+90.00	1605+50.00
EMBANKMENT FOR EROSION CONTROL	1597+90.00	1605+50.00
VERTICAL TRACKING	1597+90.00	1605+50.00

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

- [ ] Chemical Management
- [X] Concrete and Materials Waste Management
- [X] Debris and Trash Management
- [X] Dust Control
- [X] Sanitary Facilities
- [ ] Other: _____
- [ ] 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.

VEGETATED BUFFER ZONE IS NOT FEASIBLE DUE TO SITE RESTRICTIONS. EROSION CONTROL LOGS AND SEDIMENT CONTROL FENCE HAVE BEEN INCORPORATED INTO THE PROJECT SWP3.

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

Dewatering discharges of accumulated stormwater, groundwater, and surface water including discharges from dewatering of trenches, excavations, foundations, vaults, and other points of accumulation are prohibited unless managed by appropriate controls to prevent and minimize the offsite discharge of sediment and other pollutants.

2.9 INSPECTIONS:

All disturbed areas and erosion and sediment control devices shall be inspected at least once every seven (7) days. Inspections shall be performed by TxDOT as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

When dewatering activities are present, a daily inspection will be conducted once per day during those activities and documented in accordance with CGP and TxDOT requirements.

2.10 MAINTENANCE:

Control measures shall be properly installed according to specifications. If it is determined that a BMP or control measure is not operating effectively, maintenance must be accomplished as soon as possible and before the next anticipated rain event, but in no case later than 7 calendar days after being able to access the site. Maintenance shall be performed by the Contractor as indicated on the Field Inspection and Maintenance Report Form 2118 and retained in Attachment 2.5 of this SWP3.

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED PROFESSIONAL ENGINEER
Adrian Rangel
1/24/2024

STORMWATER POLLUTION PREVENTION PLAN (SWP3)

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
6	(SEE TITLE SHEET)		103
STATE	STATE DIST.	COUNTY	
TEXAS	ATL	UPSHUR	
CONT.	SECT.	JOB	HIGHWAY NO.
1511	01	013	FM 993

DATE: 12/7/2023 3:55:31 PM
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT ...

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

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

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

1. There are no MS4 Operators in the project area.

☐ No Action Required ☒ Required Action

Action No.

1. The project disturbs more than one acre but less than five acres 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, Item 7 Section 7.6, Page 43). The total disturbed acreage isthe combined acreage to be disturbed on the project and the contractors PSL.

   This EPIC must be updated if the disturbed area increases to one or more acres during the course of construction (refer to following sections). It may become necessary to post a site notice and/or NOI for the project and/or PSL.

Commitment No.

1. Comply with TPDES CGP. The project requires that a Small Site Notice be posted by TxDOT and the contractor. Implement and maintain the SW3P. Refer to SW3P Plan Sheet, BMPs and Detail.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

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

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

☐ No Permit Required

☐ Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)

☐ Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)

☐ Individual 404 Permit Required

☒ Other Nationwide Permit Required: NWP# 3A

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. West Greasy Creek
2.
3.
4.

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

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
☒ Temporary Vegetation	☒ Silt Fence	☐ Vegetative Filter Strips
☒ Blankets/Matting	☒ Rock Berm	☐ Retention/Irrigation Systems
☐ Mulch	☐ Triangular Filter Dike	☐ Extended Detention Basin
☐ Sodding	☐ Sand Bag Berm	☐ Constructed Wetlands
☐ Interceptor Swale	☐ Straw Bale Dike	☐ Wet Basin
☐ Diversion Dike	☐ Brush Berms	☐ Erosion Control Compost
☐ Erosion Control Compost	☐ Erosion Control Compost	☐ Mulch Filter Berm and Socks
☐ Mulch Filter Berm and Socks	☐ Mulch Filter Berm and Socks	☐ Compost Filter Berm and Socks
☐ Compost Filter Berm and Socks	☐ Compost Filter Berm and Socks	☒ Vegetation Lined Ditches
	☐ Stone Outlet Sediment Traps	☐ Sand Filter Systems
	☐ Sediment Basins	☐ Grassy Swales

III. CULTURAL RESOURCES

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

☒ No Action Required ☐ Required Action

Action 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.
2.
3.
4.

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

☐ No Action Required ☒ Required Action

Action No.

1. The project area contains suitable habitat for the following state listed threatened/endangered species: Monarch Butterfly & Northern Scarlet Snake. Alligator Snapping Turtle could potentially be found moving between water bodies but it is unlikely.

2. Silt fence placed will act as a barrier for terrestrial repitiles. The contractor will be advised of the potential occurence in the project area of the Alligator Snapping Turtle, and to avoid harming the species if encountered.

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

LIST OF ABBREVIATIONS

BMP:	Best Management Practice	SPCC:	Spill Prevention Control and Countermeasure
CGP:	Construction General Permit	SW3P:	Storm Water Pollution Prevention Plan
DSHS:	Texas Department of State Health Services	PCN:	Pre-Construction Notification
FHWA:	Federal Highway Administration	PSL:	Project Specific Location
MOA:	Memorandum of Agreement	TCEQ:	Texas Commission on Environmental Quality
MOU:	Memorandum of Understanding	TPDES:	Texas Pollutant Discharge Elimination System
MS4:	Municipal Separate Stormwater Sewer System	TPWD:	Texas Parks and Wildlife Department
MBTA:	Migratory Bird Treaty Act	TxDOT:	Texas Department of Transportation
NOT:	Notice of Termination	T&E:	Threatened and Endangered Species
NWP:	Nationwide Permit	USACE:	U.S. Army 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. **Lead containing paint was detected on the bridge columns, and has been strip abated.**

VII. OTHER ENVIRONMENTAL ISSUES

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

☒ No Action Required ☐ Required Action

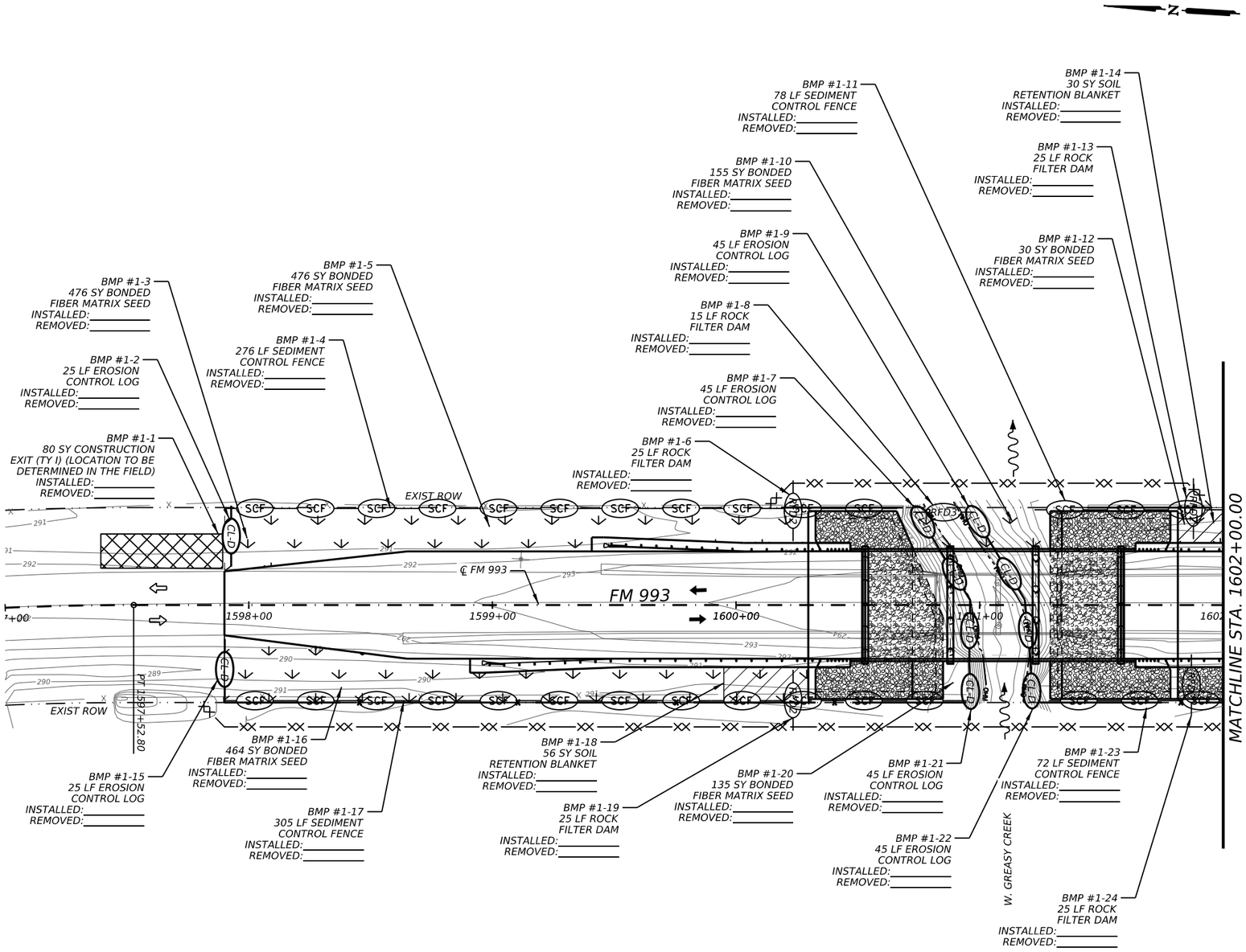
Action No.

1.
2.
3.

Texas Department of Transportation — Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS EPIC

FILE: epic.dgn	DN: TxDOT	CK: RG	DW: VP	CK: AR
© TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
12-12-2011 (DS) 05-07-14 ADDED NOTE SECTION IV. 01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		104



LEGEND:

- TEMPORARY & PERMANENT SEEDING
- STABILIZED CONSTRUCTION EXIT
- SOIL RETENTION BLANKET (TY B)(CL I)
- SCF — TEMPORARY SEDIMENT CONTROL FENCE
- CL-D — EROSION CONTROL LOG
- RFD2 — TYPE 2 ROCK FILTER DAM
- RFD3 — TYPE 3 ROCK FILTER DAM
- PROPOSED DITCH

0 25' 50'

SCALE: 1" = 50'

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED PROFESSIONAL ENGINEER

Adrian Rangel
12/8/2023

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Austin, TX 78704
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TBPELS Firm 5713

2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

ENVIRONMENTAL LAYOUT SHEETS

SHEET 1 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		105
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

DATE: 12/8/2023 11:11:42 AM
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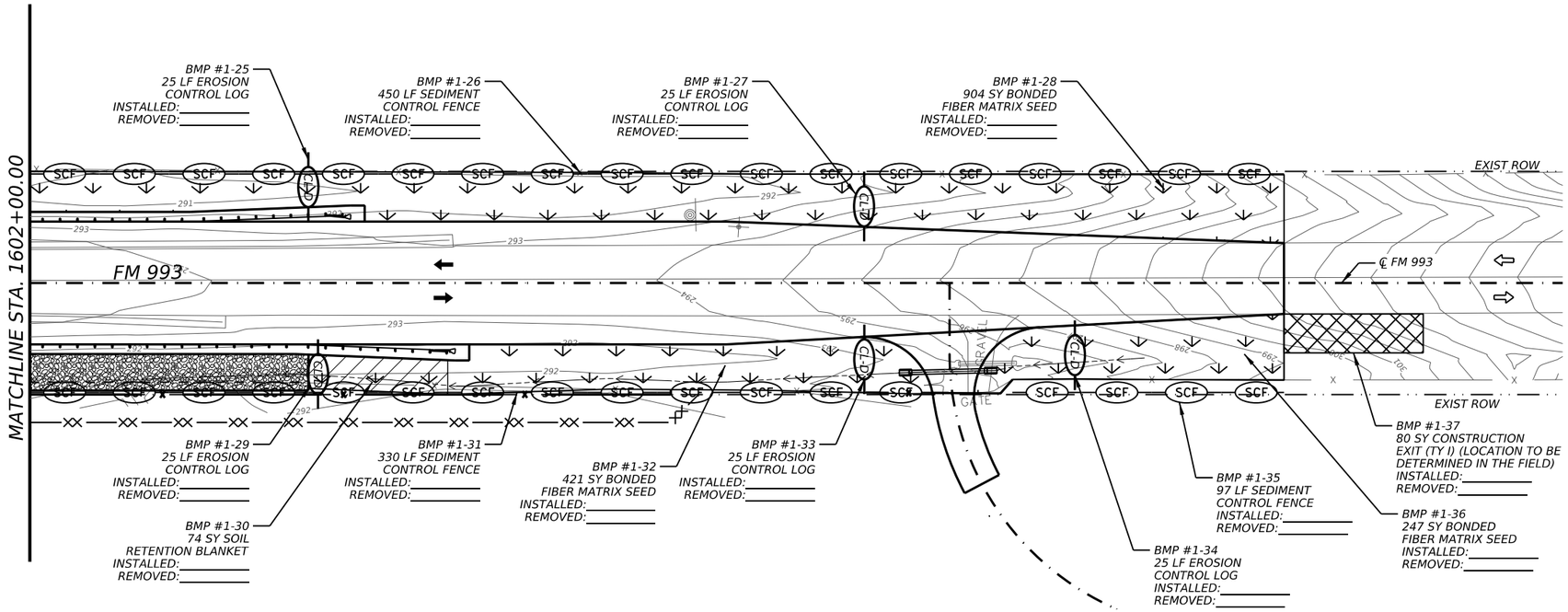
N

LEGEND:

- TEMPORARY & PERMANENT SEEDING
- STABILIZED CONSTRUCTION EXIT
- SOIL RETENTION BLANKET (TY B)(CL I)
- SCF — TEMPORARY SEDIMENT CONTROL FENCE
- CL-D — EROSION CONTROL LOG
- RFD2 — TYPE 2 ROCK FILTER DAM
- RFD3 — TYPE 3 ROCK FILTER DAM
- PROPOSED DITCH



0 25' 50'

SCALE: 1" = 50'

STATE OF TEXAS
ADRIAN RANGEL
124879
LICENSED
PROFESSIONAL ENGINEER

Adrian Rangel
12/8/2023

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2023 Texas Department of Transportation

FM 993
AT WEST GREASY CREEK

ENVIRONMENTAL LAYOUT SHEETS

SHEET 2 OF 2

FED. RD. DIV. NO.	FEDERAL AID PROJECT		SHEET NO.
6	(SEE TITLE SHEET)		106
STATE	DISTRICT	COUNTY	
TEXAS	ATL	UPSHUR	
CONTROL	SECTION	JOB	HIGHWAY
1511	01	013	FM 993

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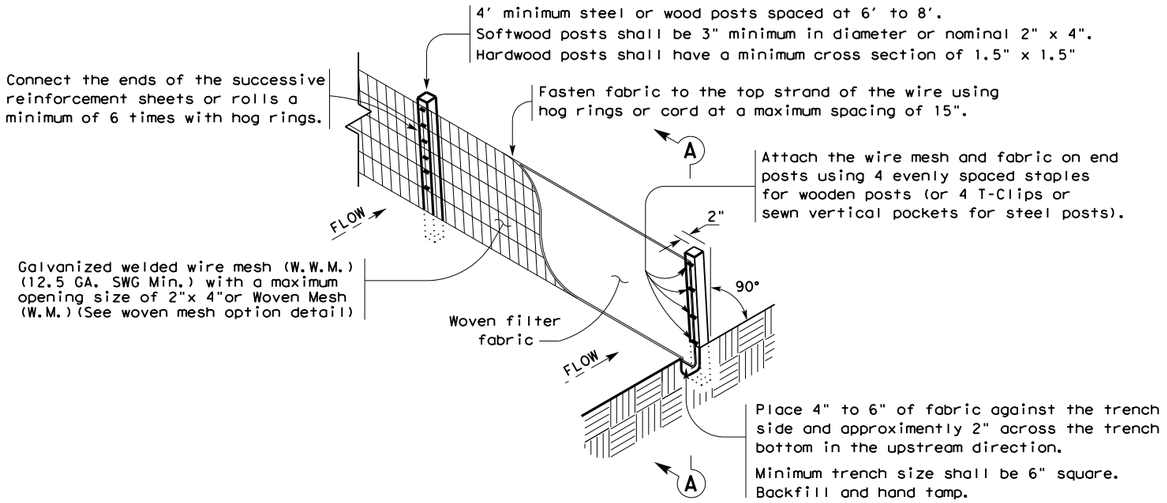
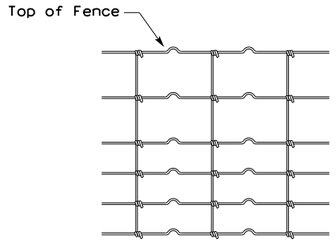
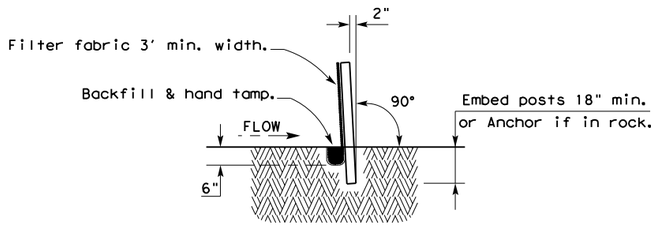
12/7/2023
pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/10_Environmental/STANDARDS/10_01_ec116.dgn



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.

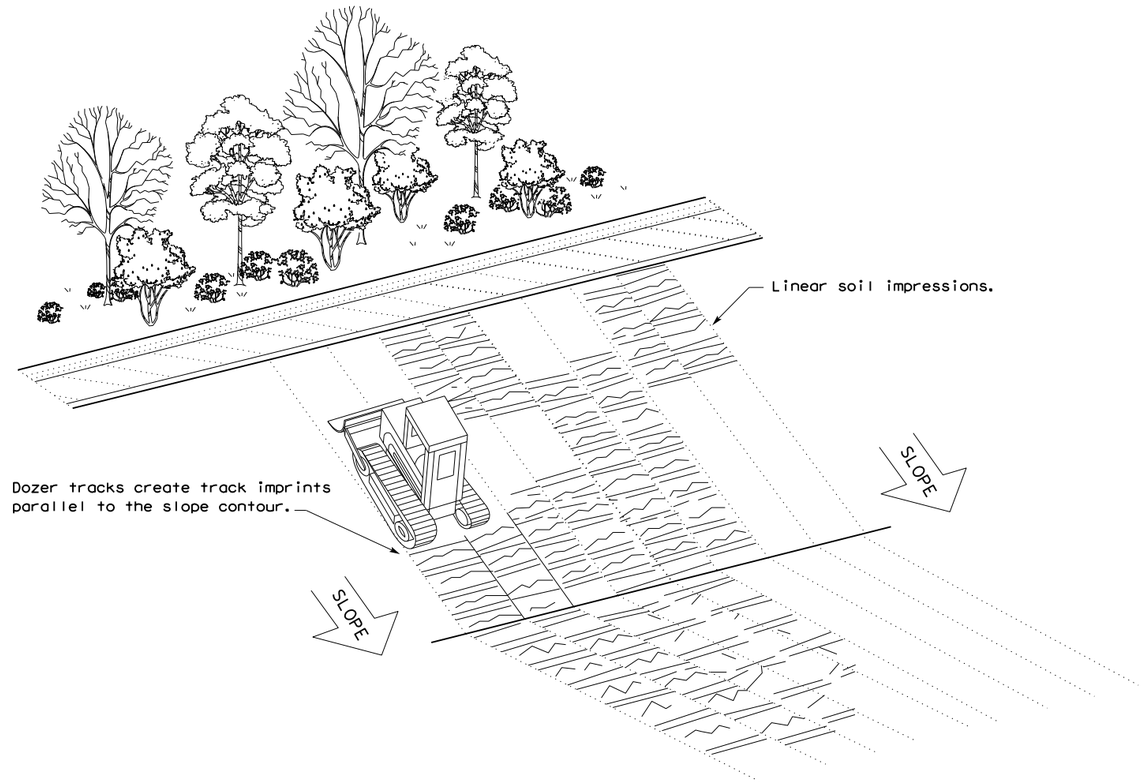
LEGEND

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

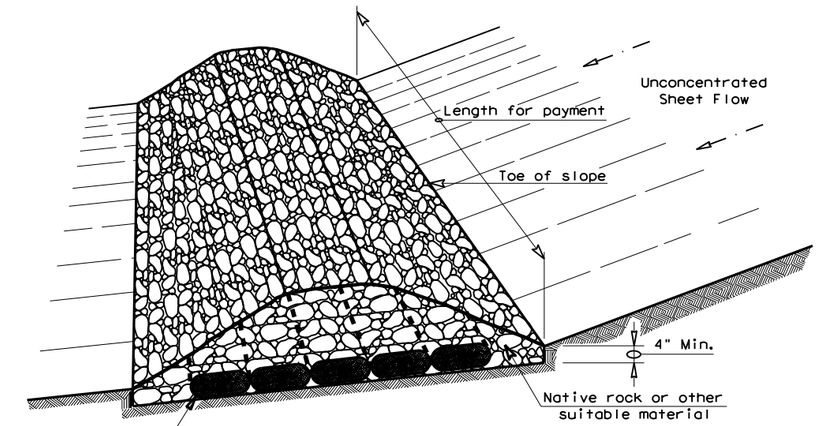
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

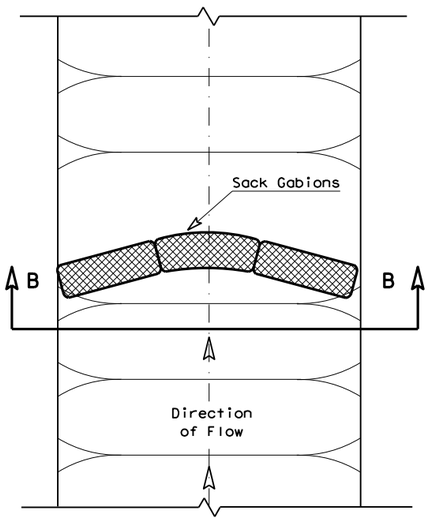
FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		107

DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/10_Environmental/STANDARDS/10_02_ec216.dgn

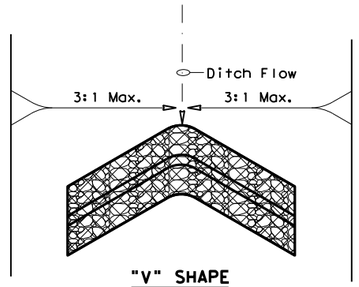


FILTER DAM AT TOE OF SLOPE

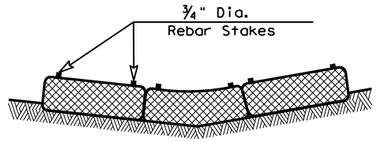
RFD1



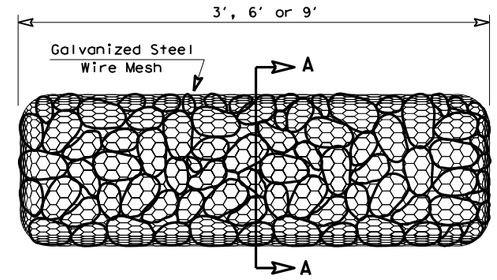
PLAN VIEW



"V" SHAPE PLAN VIEW

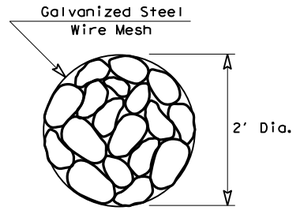


SECTION B-B

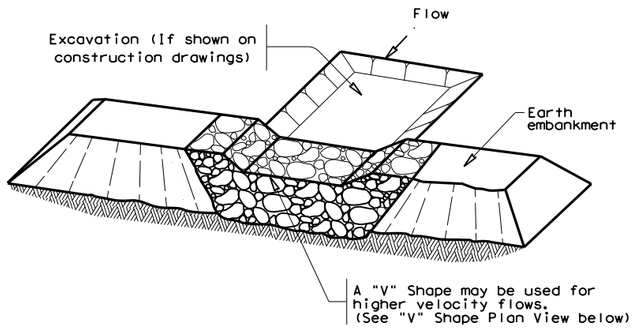


TYPE 4 (SACK GABIONS)

RFD4

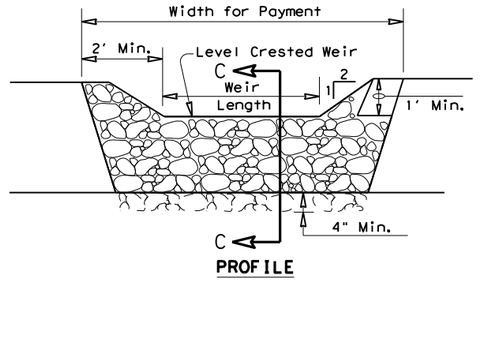


SECTION A-A

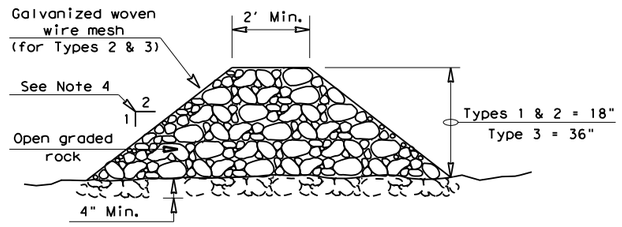


FILTER DAM AT SEDIMENT TRAP

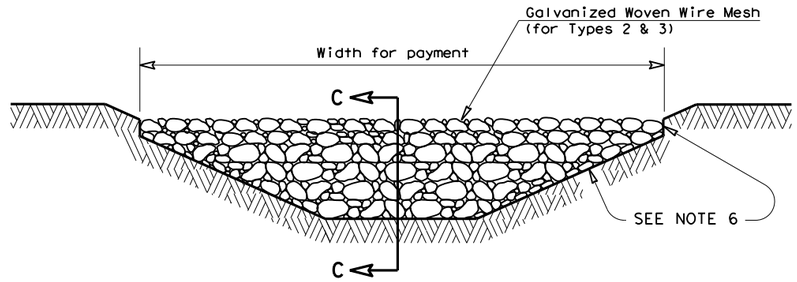
RFD1 — OR — RFD2



PROFILE



SECTION C-C



FILTER DAM AT CHANNEL SECTIONS

RFD1 — OR — RFD2 — OR — RFD3

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

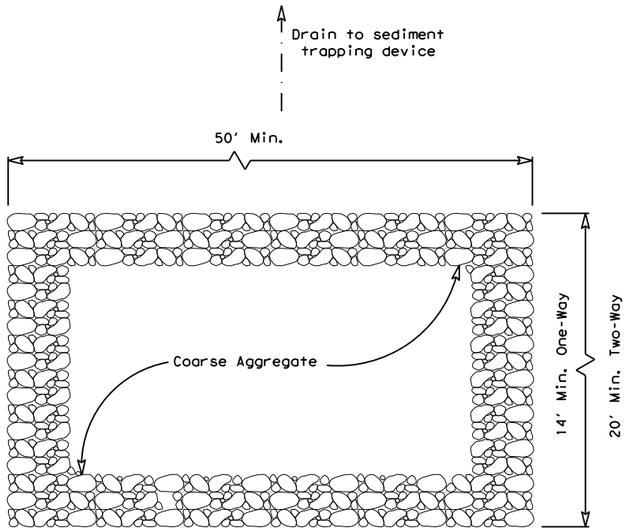
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

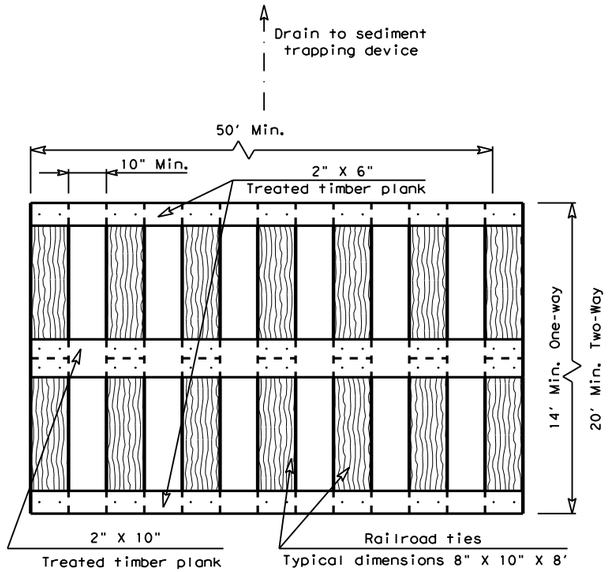
EC(2)-16

FILE: ec216	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		108

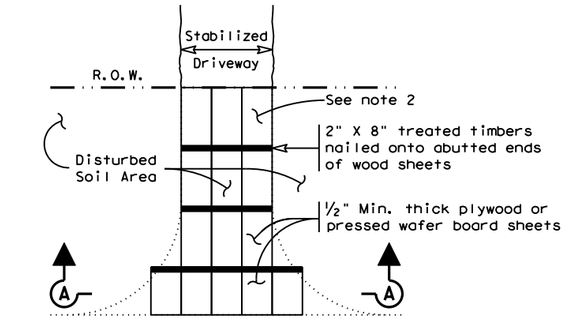
DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/10_Environmental/STANDARDS/10_03_ec316.dgn



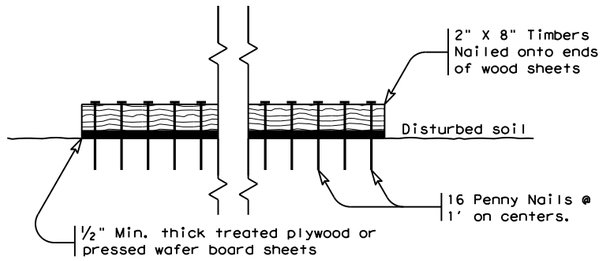
PLAN VIEW



PLAN VIEW



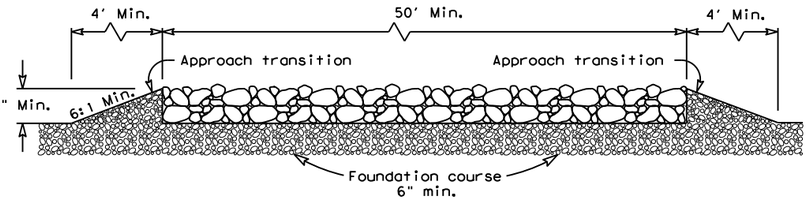
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

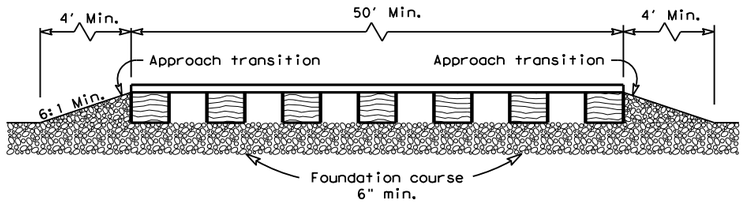
SHORT TERM



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 1)

ROCK CONSTRUCTION (LONG TERM)



ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)

TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

1. The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
2. The coarse aggregate should be open graded with a size of 4" to 8".
3. The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
4. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materialas approved by the Engineer.
5. The construction exit shall be graded to allow drainage to a sediment trapping device.
6. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
7. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 2)

1. The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
2. The treated timber planks shall be attached to the railroad ties with ½"x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
5. The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
6. The construction exit should be graded to allow drainage to a sediment trapping device.
7. The guidelines shown hereon are suggestions only and may be modified by the Engineer.
8. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.

GENERAL NOTES (TYPE 3)

1. The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
2. The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
3. The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
4. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

Texas Department of Transportation

Design Division Standard

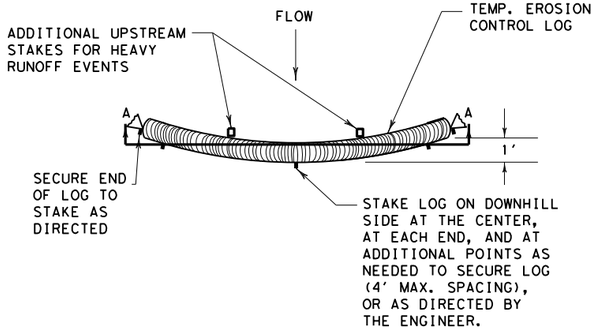
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

CONSTRUCTION EXITS

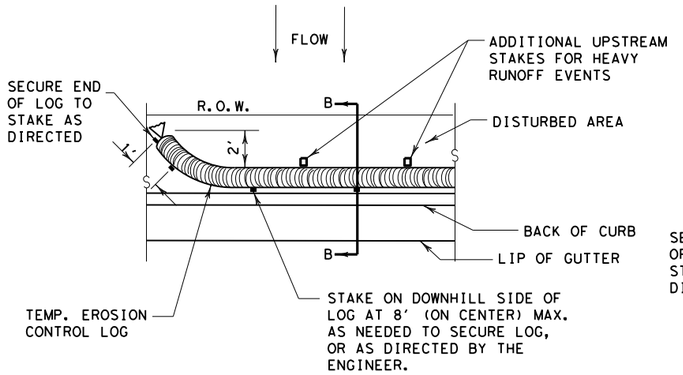
EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		109

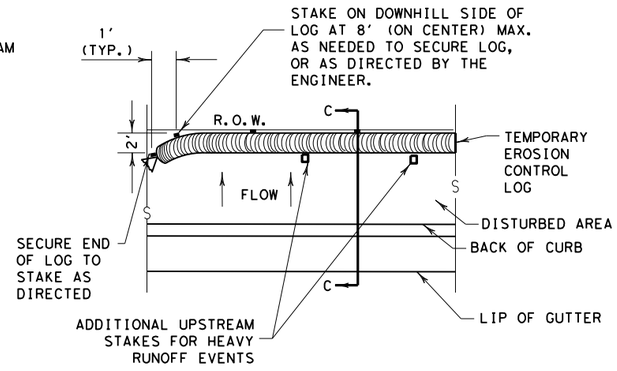
DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/10_Environmental/STANDARDS/10_04_ec916.dgn



PLAN VIEW



PLAN VIEW



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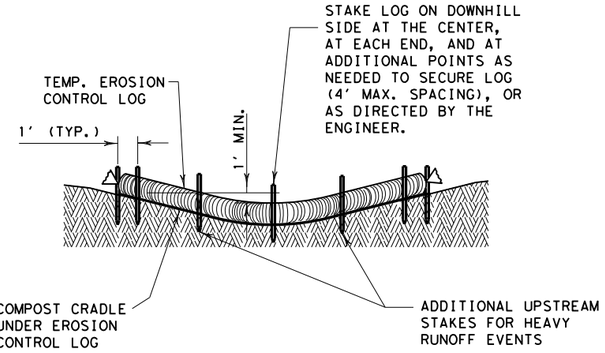
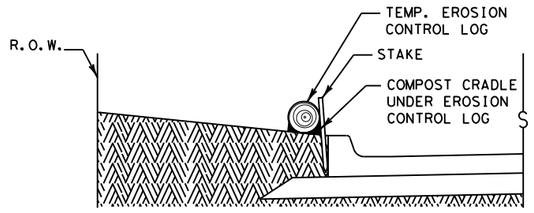


SECTION A-A

EROSION CONTROL LOG DAM

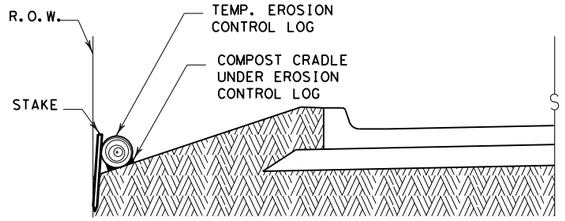
CL-D



SECTION B-B

EROSION CONTROL LOG AT BACK OF CURB

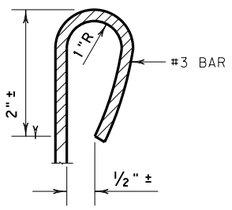
CL-BOC



SECTION C-C

EROSION CONTROL LOG AT EDGE OF RIGHT-OF-WAY

CL-ROW



REBAR STAKE DETAIL

LEGEND

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

GENERAL NOTES:

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

SEDIMENT BASIN & TRAP USAGE GUIDELINES

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

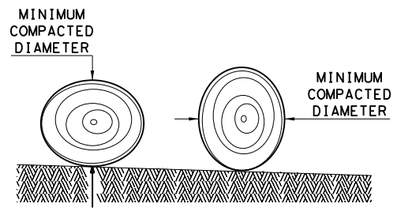
Log Traps: The drainage area for a sediment trap should not exceed 5 acres. The trap capacity should be 1800 CF/Acre (0.5" over the drainage area).

Control logs should be placed in the following locations:

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

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

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



DIAMETER MEASUREMENTS OF EROSION CONTROL LOGS SPECIFIED IN PLANS

Texas Department of Transportation

Design Division Standard

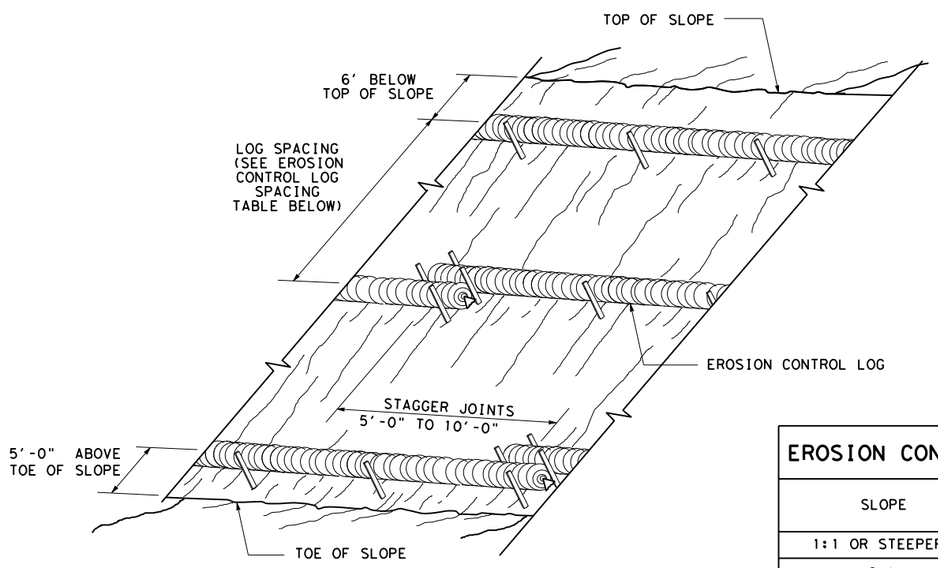
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

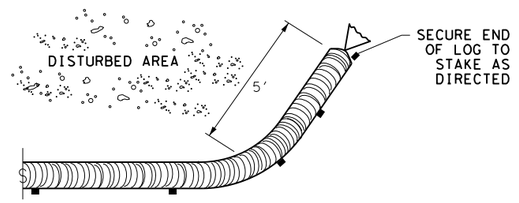
FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1511	01	013		FM 993	
	DIST	COUNTY			SHEET NO.	
	ATL	UPSHUR			110	

DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/10_Environmental/STANDARDS/10_04_ec916.dgn



EROSION CONTROL LOGS ON SLOPES
STAKE AND TRENCHING ANCHORING

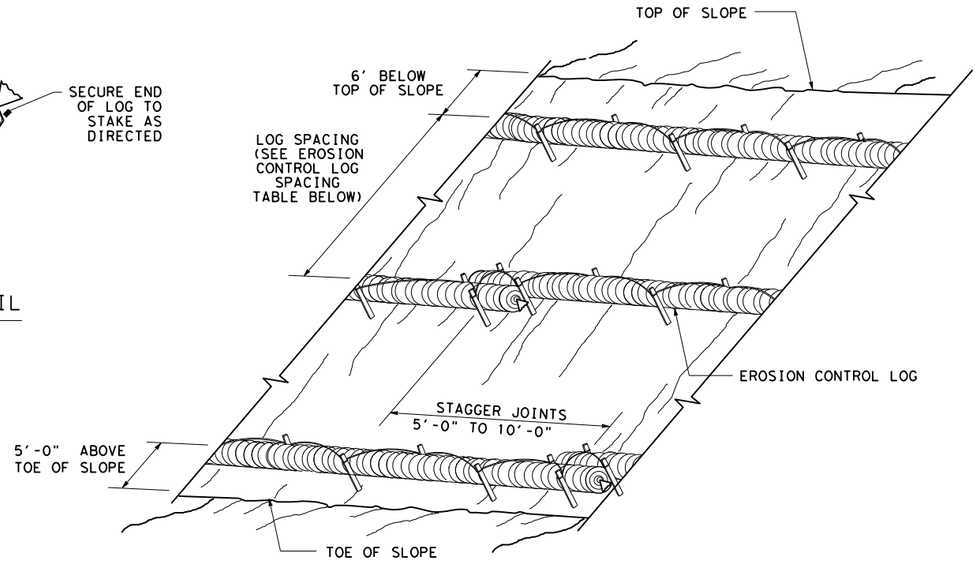
CL-SST



END SECTION RAP DETAIL

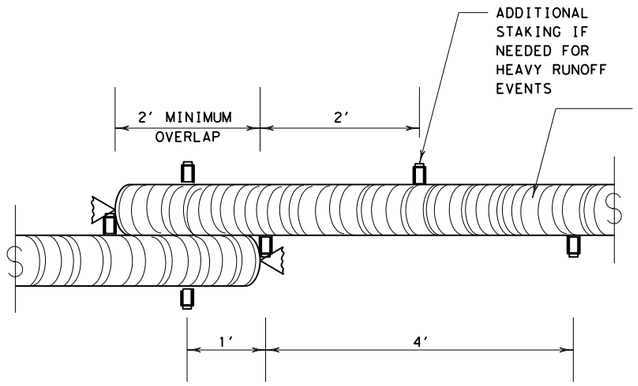
EROSION CONTROL LOG SPACING TABLE				
SLOPE	LOG DIAMETER			
	6"	8"	12"	18"
1:1 OR STEEPER	5'	10'	15'	20'
2:1	10'	20'	30'	40'
3:1	15'	30'	45'	60'
4:1 OR FLATTER	20'	40'	60'	80'

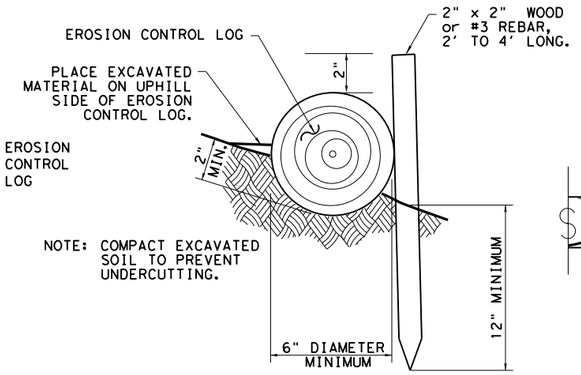
* ADJUSTMENTS CAN BE MADE FOR SOIL TYPE:
SOFT, LOAMY SOILS-ADJUST ROWS CLOSER TOGETHER;
HARD, ROCKY SOILS- ADJUST ROWS FARTHER APART



EROSION CONTROL LOGS ON SLOPES
STAKE AND LASHING ANCHORING

CL-SSL

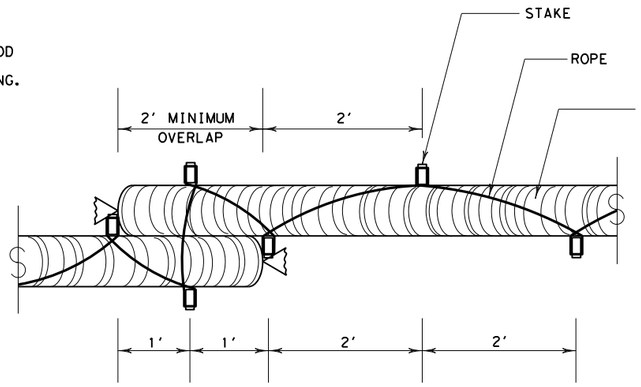


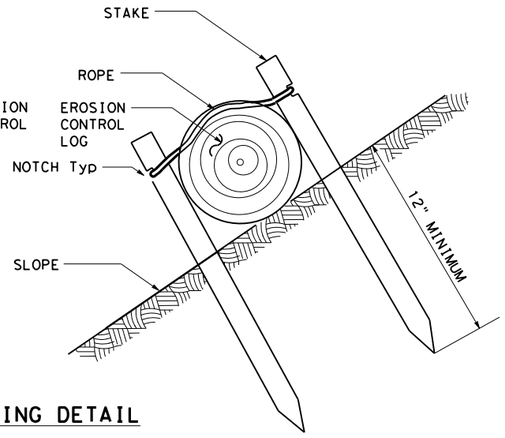


STAKE AND TRENCHING ANCHORING DETAIL

CL-SST

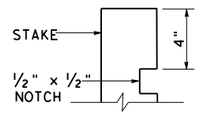
TRENCH DEPTH TABLE	
LOG DIAMETER	DEPTH
6"	2"
8"	3"
12"	4"
18"	5"





STAKE AND LASHING ANCHORING DETAIL

CL-SSL



STAKE NOTCH DETAIL

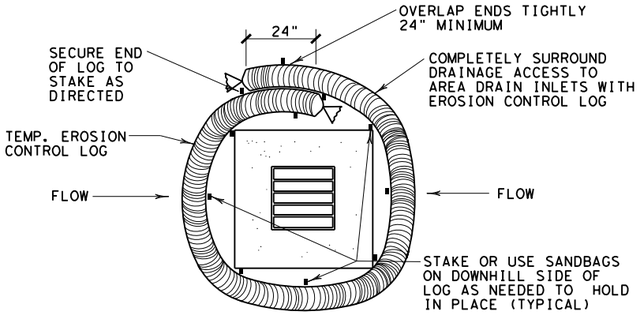
Texas Department of Transportation

Design Division Standard

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

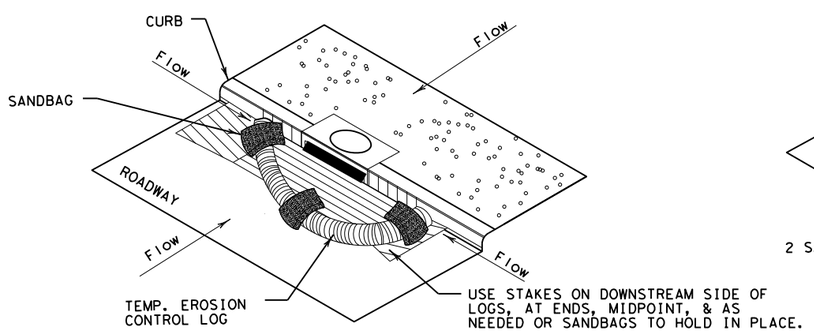
FILE: ec116	DN: TxDOT	CK: KM	DW: LS/PT	CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	1511	01	013	FM 993
	DIST	COUNTY		SHEET NO.
	ATL	UPSHUR		111

DATE: 12/7/2023
FILE: pw://garver-pw.bentley.com:garver-pw-01/Documents/2020/20T06004 - TxDOT FM 993 W Greasy Crk Bridge Repl/Drawings/10_Environmental/STANDARDS/10_04_ec916.dgn



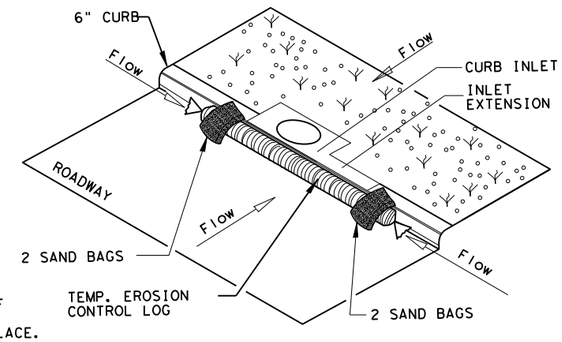
EROSION CONTROL LOG AT DROP INLET

CL-DI



EROSION CONTROL LOG AT CURB INLET

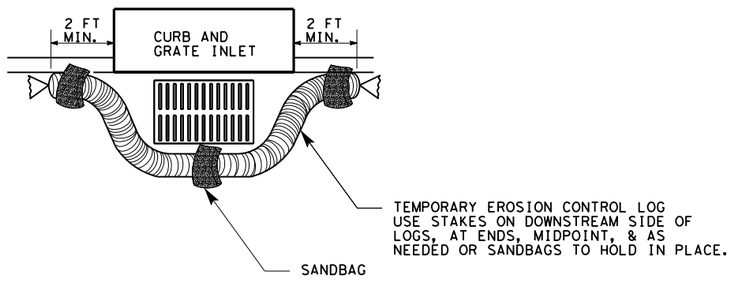
CL-CI



EROSION CONTROL LOG AT CURB INLET

CL-CI

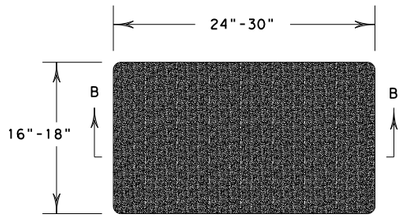
NOTE:
EROSION CONTROL LOGS USED AT CURB INLETS SHOULD ONLY BE USED IF THEY WILL NOT IMPEDE TRAFFIC OR FLOOD THE ROADWAY OR WHEN THE STORM SEWER SYSTEM IS NOT FULLY FUNCTIONAL.



EROSION CONTROL LOG AT CURB & GRADE INLET

CL-GI

SECTION B-B



SANDBAG DETAIL

SHEET 3 OF 3

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

EROSION CONTROL LOG

EC(9)-16

FILE: ec916	DN: TxDOT		CK: KM	DW: LS/PT		CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1511	01	013		FM 993	
	DIST	COUNTY			SHEET NO.	
	ATL	UPSHUR			112	