FED. RD. DIV. NO.	PROJECT NO.			SHEET NO.
6	BR 2024 (939)			1
STATE	STATE DIST.	COUNTY		
TEXAS	SAT	KERR		
CONT.	SECT.	JOB	HIGHWAY NO.	
1135	03	030	FM 1341	

FINAL PLANS SUBMITTA

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
STATE HIGHWAY IMPROVEMENT

FEDERAL AID PROJECT
PROJECT NO. BR 2024 (939)
CSJ: 1135-03-030

KERR
FM 1341

LIMITS AT: CYPRESS CREEK

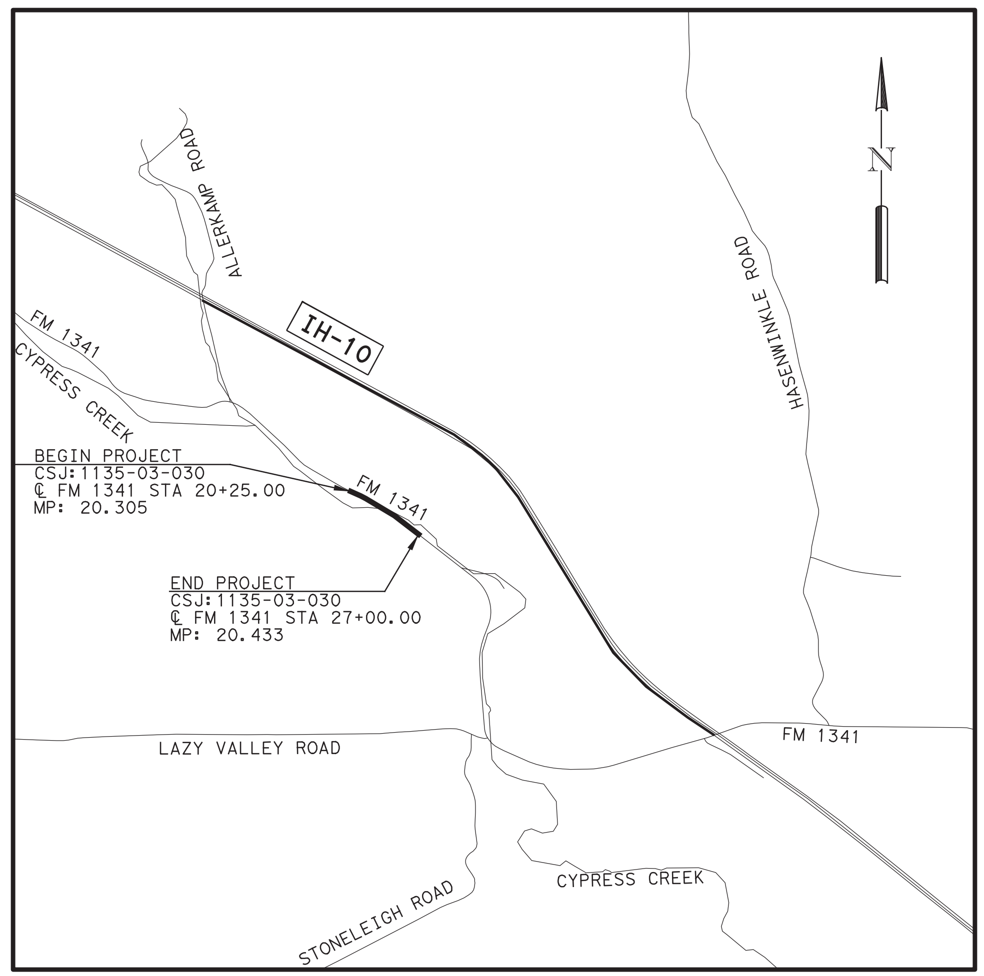
NET LENGTH OF ROADWAY: 593.69 FT. = 0.113 MI.
NET LENGTH OF BRIDGE: 81.31 FT. = 0.015 MI.
NET LENGTH OF PROJECT: 675.00 FT. = 0.128 MI.

FOR WORK CONSISTING OF REPLACE BRIDGE AND APPROACHES

INDEX OF SHEETS

SEE SHEET 2 FOR INDEX OF SHEETS

FUNCTIONAL CLASS: MINOR COLLECTOR
DESIGN SPEED: 50 MPH
AREA OF DISTURBED SOIL = < 1 ACRE
A.D.T.(2024): 350
A.D.T.(2044): 450
ACCESSIBILITY STANDARDS = PROWAG



N.T.S.

FINAL PLANS

LETTING DATE: ____________________

DATE CONTRACTOR BEGAN WORK: ____________________

DATE WORK WAS ACCEPTED: ____________________

FINAL CONTRACT COST: $ ____________________

CONTRACTOR: ____________________

FINAL PLANS STATEMENT:

THE CONSTRUCTION WORK WAS PERFORMED
IN ACCORDANCE WITH THE PLANS.

______________________ P.E. ______________
AREA ENGINEER DATE

TEXAS DEPARTMENT OF TRANSPORTATION

EXCEPTIONS: NONE
EQUATIONS: NONE
R.R. CROSSINGS: NONE
NBI NO.: EXIST: 15-133-0-1135-03-116
PROPOSED: 15-133-0-1135-03-119

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)

SUBMITTED FOR LETTING: DocuSigned by: Lizette J. Colbert, P.E. 2/1/2024
DF7D9915513A45A...
TRANSPORTATION ENGINEER SUPERVISOR

RECOMMENDED FOR LETTING: DocuSigned by: [signature] P.E. 2/1/2024
74F59AC8868D4EB...
DEPUTY DISTRICT ENGINEER

REVIEWED FOR LETTING: DocuSigned by: DCRogers, P.E. 2/1/2024
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TRANSPORTATION ENGINEER SUPERVISOR

APPROVED FOR LETTING: DocuSigned by: Charles C. Benavidez, P.E. 2/2/2024
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DISTRICT ENGINEER

FILE LOCATION AND NAME
T:\Engdata\Standards\Design\TITLESHEET-2014Specs.DGN

LEVELS DISPLAYED
1

COUNTY KERR PROJ. NO.
HWY. NO. FM1341 LETTING DATE 04/01/24
DATE ACCEPTED

FINAL PLANS SUBMITTAL

PLOTDRIVER:TXDOT*PDF*BW.pltcfg
PENTABLE:113030330.tbl

DATE:1/11/2024
PLOTTING TIME:2:23:58 PM

File Name:FM1341*INDEX.dgn
User Name:EWANG

	SHEET NUMBERS	DESCRIPTION
		I. GENERAL
	1	TITLE SHEET
	2	INDEX OF SHEETS
	3	PROJECT LAYOUT
	4	EXISTING TYPICAL SECTIONS
	5 - 6	PROPOSED TYPICAL SECTIONS
	7,7A - 7E	GENERAL NOTES
	8 & 8A	ESTIMATES AND QUANTITY
	9	QUANTITY SUMMARIES
		II. TRAFFIC CONTROL
	10	TRAFFIC CONTROL PLAN PHASE 1 PHASING LAYOUT
	11	TCP NARRATIVE
	12	TRAFFIC CONTROL PLAN PHASE 1 EASTBOUND DETOUR
	13	TRAFFIC CONTROL PLAN PHASE 1 WESTBOUND DETOUR
	14	ADVANCED WARNING FM 1341 BRIDGE CLOSURE LAYOUT
	15	TRAFFIC CONTROL PLAN - TCP DETAIL
		TRAFFIC CONTROL STANDARDS
#	16 - 27	BC (1)-21 THRU BC (12)-21
#	28	WZ(RCD)-13
		III. ROADWAY
	29	CONTROL DATA INDEX SHEET
	30	HORIZONTAL & VERTICAL CONTROL
	31	HORIZONTAL ALIGNMENT DATA
	32	REMOVAL LAYOUT
	33 - 34	PLAN AND PROFILE
	35	OVERALL GRADING LAYOUT
		ROADWAY STANDARDS
#	36	GF (31)-19
#	37	GF (31) DAT-19
#	38	GF(31)MS-19
#	39 - 40	GF(31)TR TL3-20
#	41	BED-14
#	42	SGT(11S)31-18
#	43	SGT(12S)31-18
#	44	TE(HMAC)-11
#	45	WF(2)-10
		IV. DRAINAGE
	46	EXISTING DRAINAGE AREA MAP
	47	HYDROLOGIC DATA SHEET
	48	HYDRAULIC CALCULATION DATA SHEET
	49	PROPOSED INTERIOR DRAINAGE AREA MAP
	50	HYDROLOGY & HYDRAULIC CALCULATIONS
	51	BRIDGE CLASS CULVERT LAYOUT
	52	HILL COUNTRY REGION COLOR PLACEMENT
	53	HILL COUNTRY REGION FINISHES AND TEXTURES
		DRAINAGE STANDARDS
#	54	CRR
#	55 - 57	TYPE T223
#	58	SCP-MD
#	59	SCP-12
	60	BCS
#	61	PW
#	62 - 63	RAC
	64	BRIDGE NBI NUMBER STENCIL
		V. TRAFFIC ITEMS - SIGNING AND PAVEMENT MARKING
	65	SIGNING & PAVEMENT MARKING
	66	SUMMARY OF SMALL SIGNS
		SIGNING & PAVEMENT MARKING STANDARDS
#	67	FGA-15
#	68	TSR(3)-13
#	69	TSR(4)-13
#	70 - 72	D&OM(1) THRU D&OM(3)-20
#	73	D&OM(5)-20
#	74	D&OM (VIA)-20
#	75	SMD(GEN)-08
#	76 - 78	SMD(SLIP-1)-08 THRU SMD(SLIP-3)-08
#	79	PM(1)-22
#	80	PM(2)-22
		VI. ENVIRONMENTAL ITEMS
	81 - 82	ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS
	83 - 84	STORMWATER POLLUTION PREVENTION PLAN (SW3P)
	85	EROSION CONTROL LAYOUT
		EROSION CONTROL STANDARDS
#	86	EC(1)-16
#	87	EC(2)-16
#	88	EC(3)-16
		VII. UTILITIES
	89	EXISTING UTILITY LAYOUT

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

SIGNATURE OF REGISTRANT ,P.E. 1/11/24 DATE

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK

INDEX OF SHEETS

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	2

FINAL PLANS SUBMITTAL

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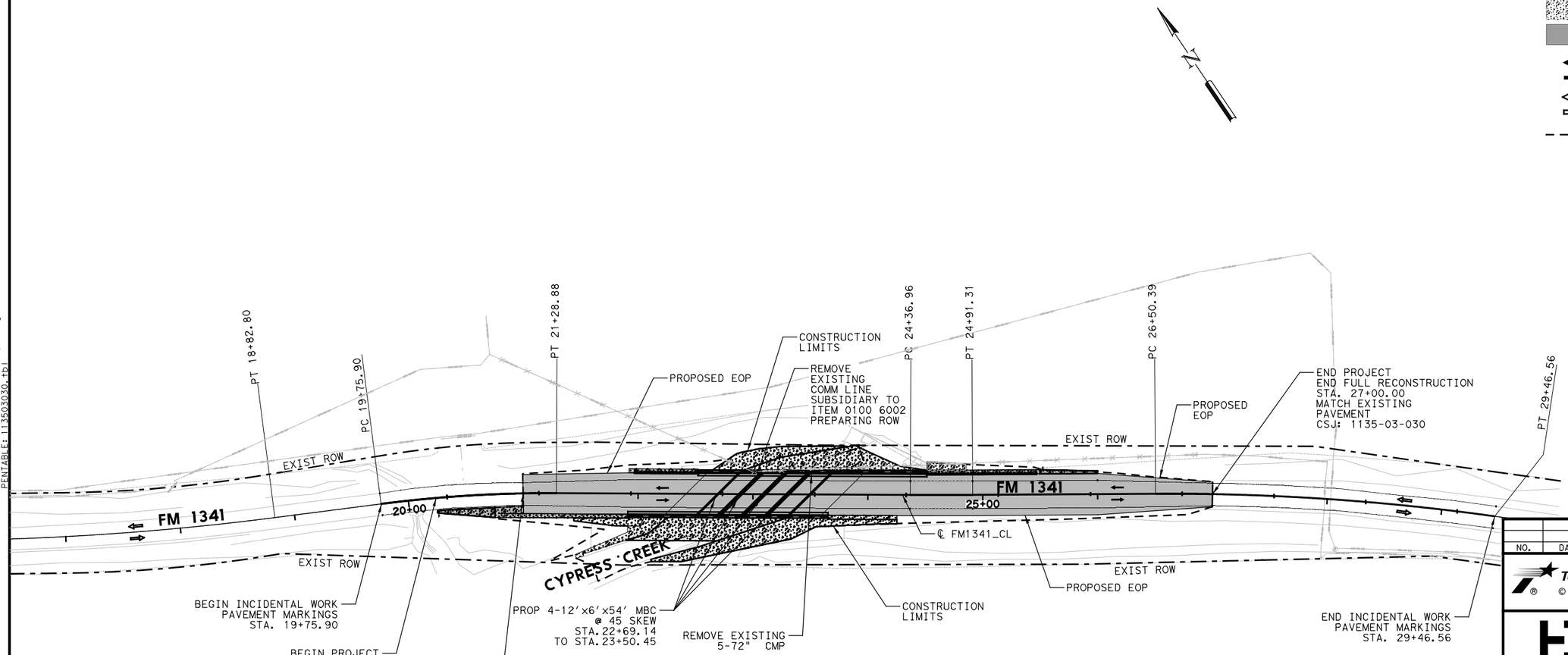
PENTABLE: 1135030.tbl

DATE: 1/11/2024
PLOTTING TIME: 2:24:00 PM

File Name: FM1341-PROJECT-LAYOUT.dgn
User Name: EWANG

LEGEND

- CHANNEL GRADING
- PROPOSED RECONSTRUCTION
- PROPOSED TRAFFIC ARROWS
- EXISTING TRAFFIC ARROWS
- CONSTRUCTION LIMITS



NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

0 50 100 150 200
SCALE IN FEET

FM 1341 AT CYPRESS CREEK

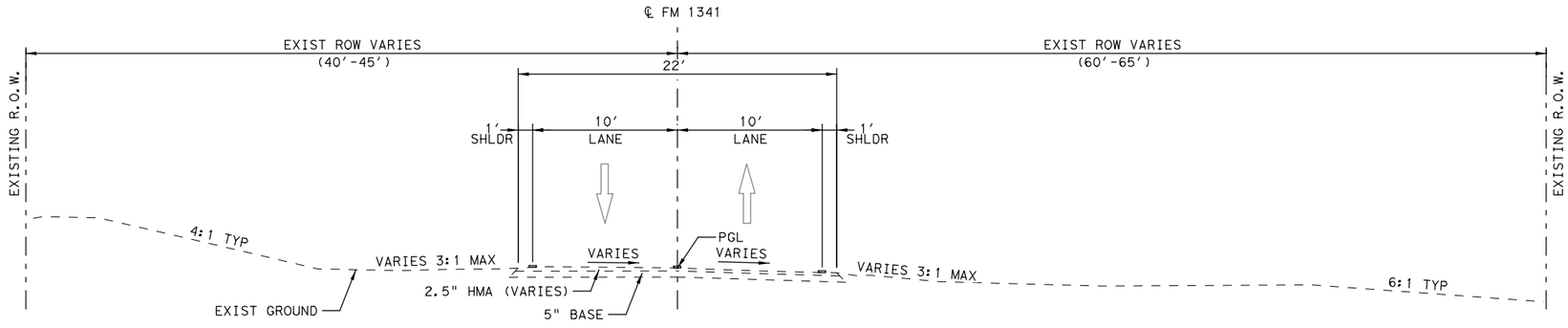
PROJECT LAYOUT

SCALE: 1"=100'

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	3

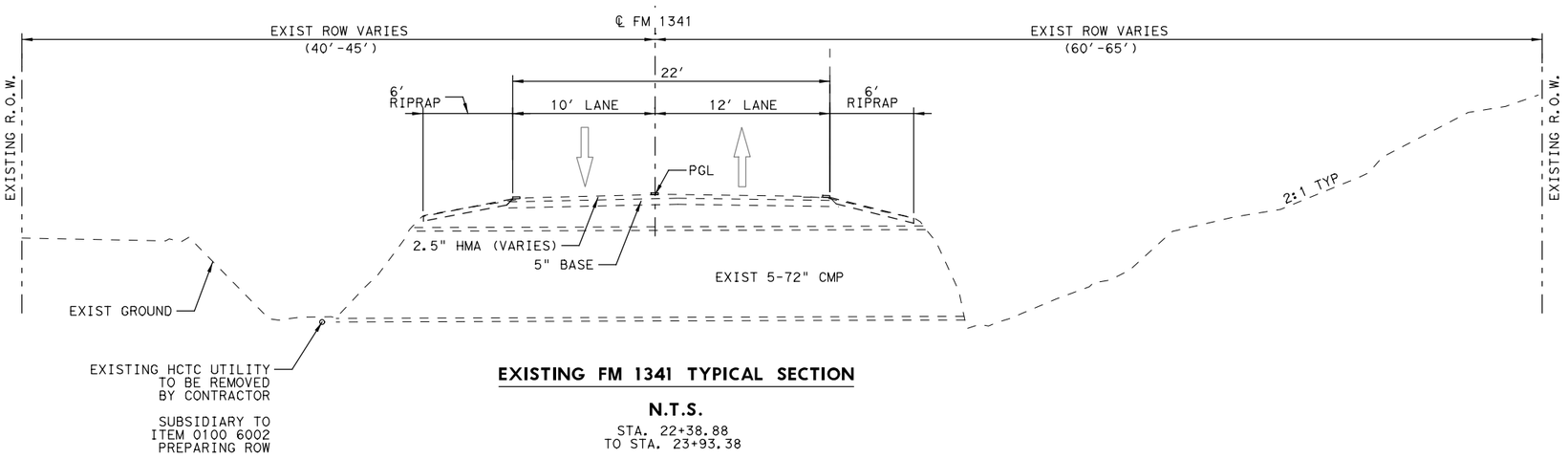
FINAL PLANS SUBMITTAL



EXISTING FM 1341 TYPICAL SECTION

N.T.S.

STA. 20+25.00
TO STA. 22+38.88



EXISTING FM 1341 TYPICAL SECTION

N.T.S.

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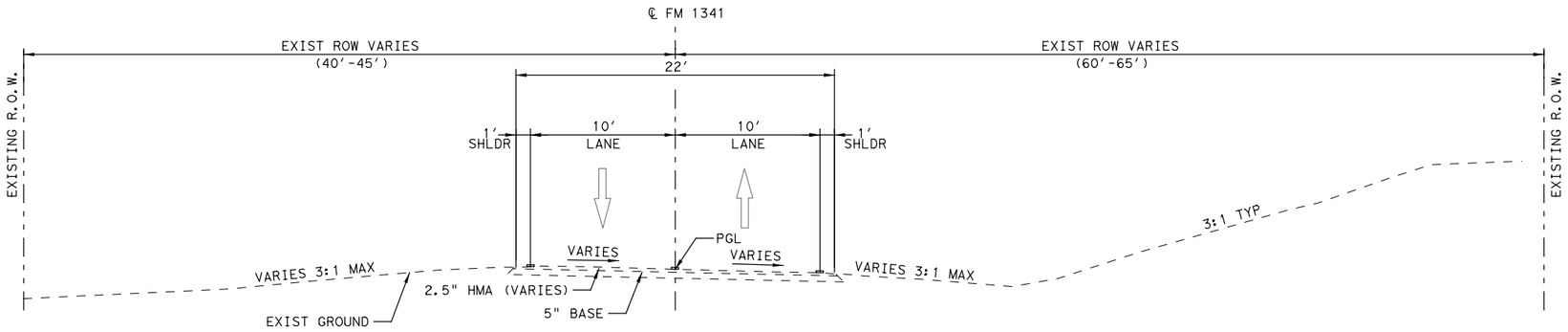
TO STA. 23+93.38



EXISTING FM 1341 TYPICAL SECTION

N.T.S.

STA. 23+93.38
TO STA. 27+00.00

LEGEND

➡ PROP TRAFFIC LANE

⇨ EXIST TRAFFIC LANE

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK

EXISTING TYPICAL SECTIONS

N. T. S. SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	4

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User Name: EWANG

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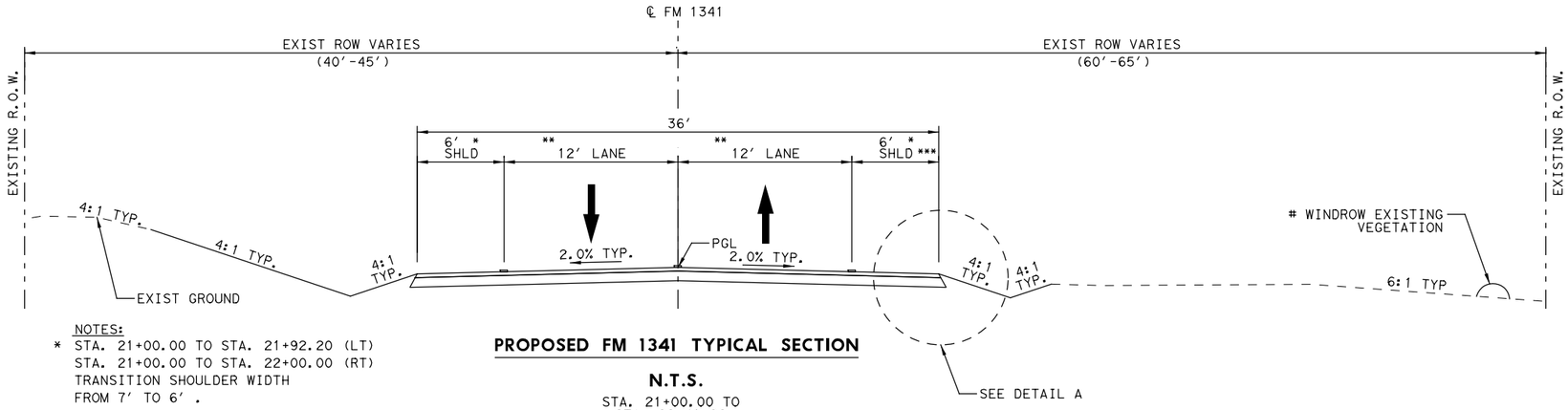


PROPOSED FM 1341 TYPICAL SECTION

N.T.S.

STA. 21+00.00 TO
STA. 22+41.92

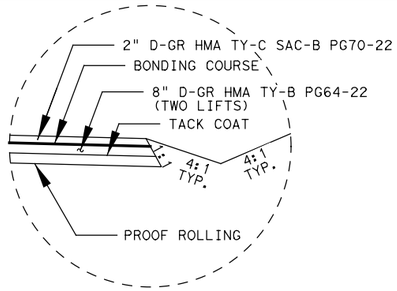
NOTES:

* STA. 21+00.00 TO STA. 21+92.20 (LT)
STA. 21+00.00 TO STA. 22+00.00 (RT)
TRANSITION SHOULDER WIDTH
FROM 7′ TO 6′ .

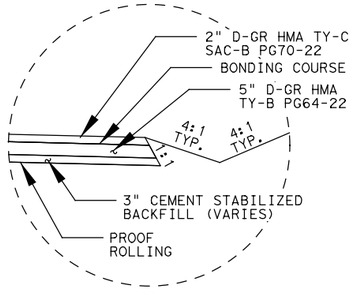
** STA. 21+00.00 TO STA. 22+00.00
TRANSITION LANE WIDTH (LT AND RT)
FROM 10′ TO 12′.

*** REFER TO ROADWAY PLAN SHEETS
FOR MOW STRIP LIMITS AT THE
EXISTING EDGE OF PAVEMENT FROM
STA. 20+25.00 TO STA. 21+00.00

1. BLADE EXIST. VEGETATION INTO WINDROW AS SHOWN.
2. SPREAD WINDROW UP TO EDGE OF PAVEMENT.
(ALL WORK SUBSIDIARY TO ITEMS 110 AND 132)



DETAIL A - N.T.S.

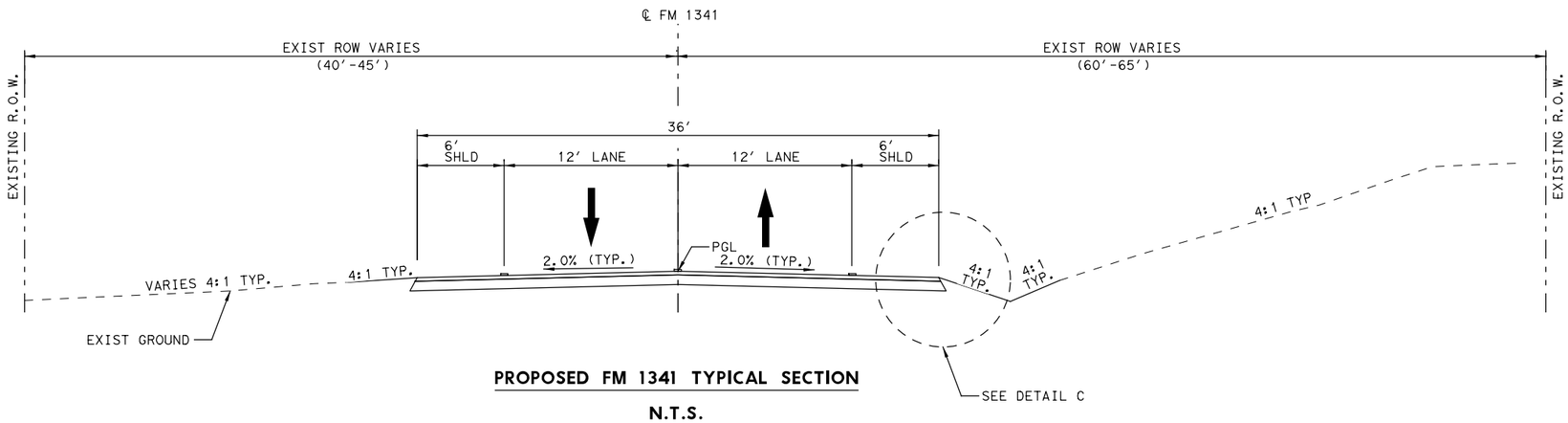


DETAIL C - N.T.S.

LEGEND

➡ PROP TRAFFIC LANE

⇨ EXIST TRAFFIC LANE



PROPOSED FM 1341 TYPICAL SECTION

N.T.S.

STA. 22+41.92 TO STA. 22+69.14
STA. 23+50.45 TO STA. 23+77.68

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK

PROPOSED TYPICAL SECTIONS

N. T. S. SHEET 1 OF 2

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	5

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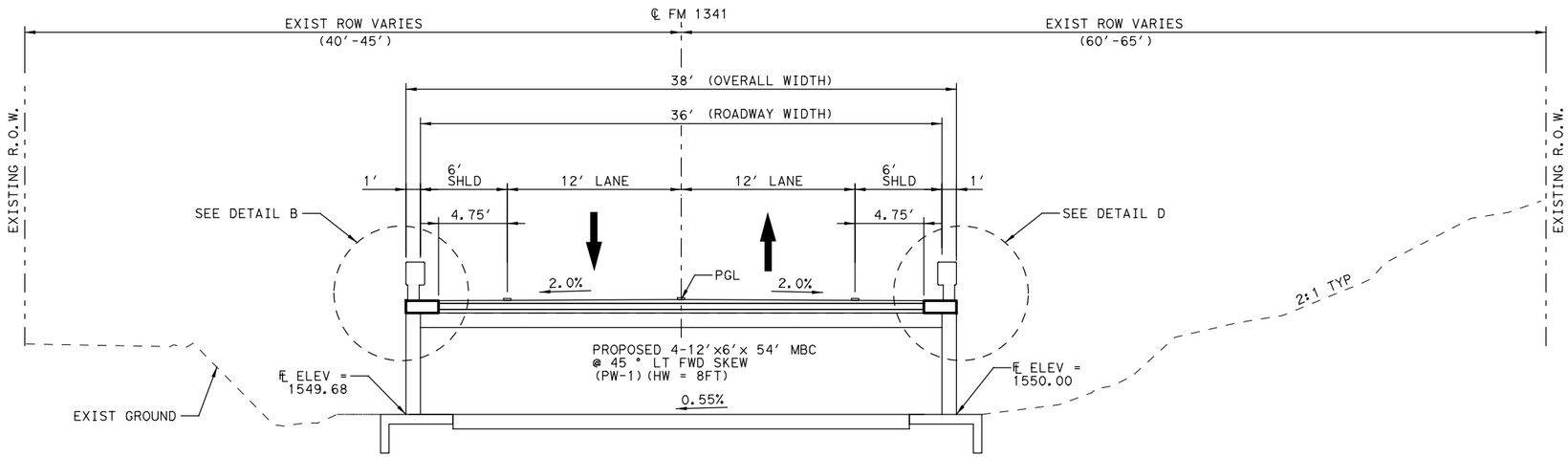
DATE: 1/11/2024
PLOTTING TIME: 2:24:12 PM
File Name: FM1341-TYP-02.dgn
User Name: EWANG

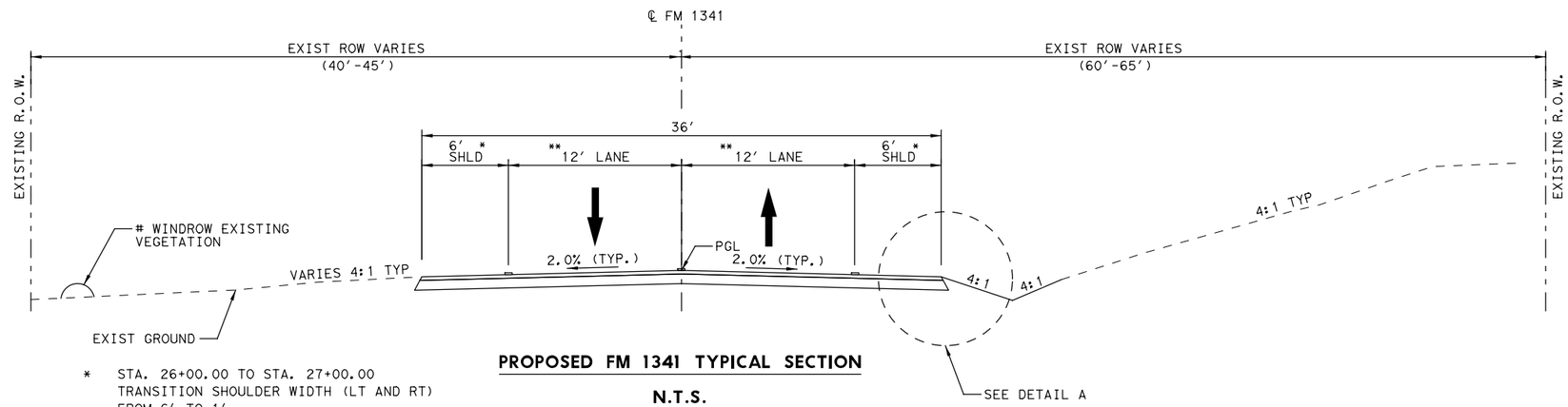
FINAL PLANS SUBMITTAL



PROPOSED FM 1341 TYPICAL SECTION

N.T.S.

BEGIN CULVERT STA. 22+69.14
TO END CULVERT STA. 23+50.45



PROPOSED FM 1341 TYPICAL SECTION

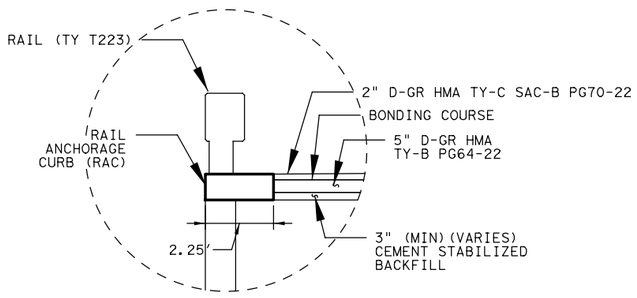
N.T.S.

STA. 23+77.68
TO STA. 27+00.00

* STA. 26+00.00 TO STA. 27+00.00
TRANSITION SHOULDER WIDTH (LT AND RT)
FROM 6′ TO 1′.

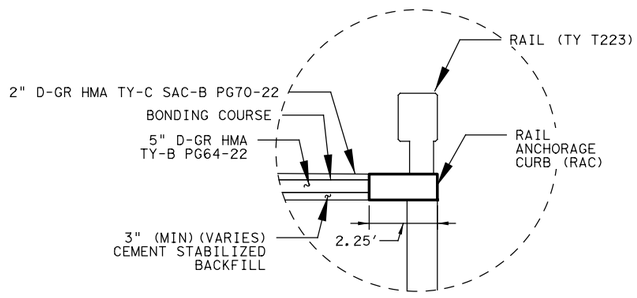
** STA. 26+00.00 TO STA. 27+00.00
TRANSITION LANE WIDTH (LT AND RT)
FROM 12′ TO 10′.

\# 1. BLADE EXIST. VEGETATION INTO WINDROW AS SHOWN.
2. SPREAD WINDROW UP TO EDGE OF PAVEMENT.
(ALL WORK SUBSIDIARY TO ITEMS 110 AND 132)



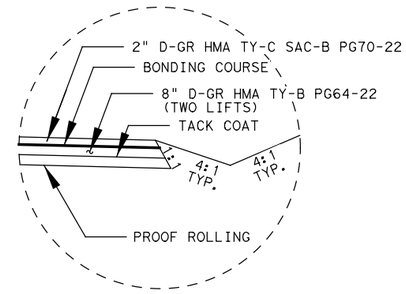
DETAIL B - N.T.S.

STA. 22+87.14 TO STA. 23+68.54



DETAIL D - N.T.S.

STA. 22+51.15 TO STA. 23+32.46



DETAIL A - N.T.S.

LEGEND

PROP TRAFFIC LANE

EXIST TRAFFIC LANE

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK

PROPOSED TYPICAL SECTIONS

N. T. S.

SHEET 2 OF 2

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	6

PLOTDRIVER: TXDOT-PDF-BW.pltcfg
PENTABLE: 113030330.tbl
DATE: 1/11/2024
PLOTTING TIME: 2:24:14 PM
File Name: FM1341-TYP-03.dgn
User Name: EWANG

**********GENERAL NOTES**********
2014 Specification Book

========== Basis of Estimate ==========

Item	Description	Rate/Area	Quant-Unit
168	Vegetative Watering	15.6 GAL/SY	8 MG
216	Proof Rolling	0.025 HR/SY	61 HR
3076	Tack Coat	0.20 GAL/SY	462 GAL
3084	Bonding Course	0.20 GAL/SY	457 GAL

========== Asphalt Concrete Pavement ==========

Type	Location	Depth	Rate/Area	Quant-Tons
D-GR HMA TY B	Main Rdwy	8 in	115 LBS/ SY/IN	1062 TONS
D-GR TY C SAC B	Main Rdwy	2 in	115 LBS/ SY/IN	262 TONS

--General--
Any materials removed and not reused and determined to be salvageable shall be stored within the project limits at an approved location or delivered undamaged to the storage yard as directed. Deface traffic signs so that they will not reappear in public as signs.

Any sign panels that are adjusted or removed and replaced, shall be done the same workday unless otherwise approved. This work shall be considered subsidiary to Item 502.

Hurricane Evacuation

Hurricane Season is from June 1 thru November 30. As the closest metropolitan city inland from the Texas Coast, the City of San Antonio is a major shelter destination during mandatory hurricane evacuations. As such, planned work zone lane or road closures may be restricted and/or suspended during mandatory hurricane evacuation operations. The District will coordinate these restrictions at a minimum H-120 from any projected impact to the Texas Coast.

No time charges will be made if the Engineer determines that work on the project was impacted by the hurricane.

The Engineer may order changes in the Traffic Control Plan to accommodate evacuation traffic, and may suspend the work, all or in part, to ensure timely completion of this work. All work to

Implement changes in the Traffic Control Plan will be paid through existing bid prices or through Item 9.5, Force Account. However, the Department will not entertain any request for delay damages, loss of efficiency that may be attributed to the restriction or suspension of road or lane closures, or to changes in the Traffic Control Plan.

In accordance with the Underground Facility Damage Prevention Act (One Call Bill) the phone number for a utility locator is 811. It is the Contractor's responsibility to plan for utility locators as needed.

Underground utilities owned by the Texas Department of Transportation may be present within the Right-Of-Way. Call or email the TxDOT offices listed below for locates a minimum of 48 hours in advance of excavation. If city or town owned irrigation facilities are present, call the appropriate department of the local city or town a minimum of 48 hours in advance of excavation. The Contractor is liable for all damages incurred to the above-mentioned utilities when working without having the utilities located prior to excavation.

Contractor questions on this project are to be addressed to the following individual(s):
Area Engineer Andres Gonzalez, andres.gonzalez@txdot.gov
Assistant Area Engineer Roberto Madrigal, roberto.madrigal@txdot.gov

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

--Item 5--

Prevention of Migratory Bird Nesting

It is anticipated that migratory birds, a protected group of species, may try to nest on bridges, culverts, vegetation, or gravel substrate, at any time of the year. The preferred nesting season for migratory birds is from February 15 through October 1. When practicable, schedule construction operations outside of the preferred nesting season. Otherwise, nests containing migratory birds

must be avoided and no work will be performed in the nesting areas until the young birds have fledged.

Structures

Bridge and culvert construction operations cannot begin until swallow nesting prevention is implemented, until after October 1 if it's determined that swallow nesting is actively occurring, or until it's determined swallow nests have been abandoned. If the State installed nesting deterrent on the bridges and culverts, maintain the existing nesting deterrent to prevent swallow nesting until October 1 or completion of the bridge and culvert work, whichever occurs earlier. If new nests are built and occupied after the beginning of the work, do not perform work that can interfere with or discourage swallows from returning to their nests. Prevention of swallow nesting can be performed by one of the following methods:

1. By February 15 begin the removal of any existing mud nests and all other mud placed by swallows for the construction of nests on any portion of the bridge and culverts. The Engineer will inspect the bridges and culverts for nest building activity. If swallows begin nest building, scrape, or wash down all nest sites. Perform these activities daily unless the Engineer determines the need to do this work more frequently. Remove nests and mud through October 1 or until bridge and culvert construction operations are completed.

2. By February 15 place a nesting deterrent (which prevents access to the bridge and culvert by swallows) on the entire bridge (except deck and railing) and culverts. This work is subsidiary to the various bid items.

No extension of time or compensation payment will be granted for a delay or suspension of work caused by nesting swallows.

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

--Item 6--
Show the stockpile lot and/or sub lot numbers on all tickets for all materials.

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

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--
The total disturbed area within the project is anticipated at less than one (1) acre. Due to this type of construction, the project qualifies for exclusion under the Construction General Permit (CGP) issued by the Texas Commission on Environmental Quality (TCEQ). However, should the sum of the Engineer's anticipated disturbances and the Contractor's (On ROW and off ROW) PSL's equal or exceed the one (1) acre threshold; both TxDOT and the Contractor have project responsibilities under the CGP that reverts to non-exclusion status. Obtain approval for all non-depicted areas of disturbance that increases the initial soil and vegetation disturbed area estimates before work starts at these locations.

Notify the Engineer of the disturbed acreage within one (1) mile of the project limits. Obtain authorization from the TCEQ for Contractor PSL's for construction support activities on or off ROW.

Roadway closures during the following key dates and/or special event are prohibited.
See the general notes under Item 502 for these dates.

TxDOT will coordinate the closure of FM 1341 at Cypress Creek with public officials from municipalities affected by the closure.

--Item 8--
Working days will be computed and charged in accordance with Article 8.3.1.4 - Standard Work Week.

A Special Provision to Item 8 for a delayed authorized date to begin work has been included in the contract. The reason for including the Special Provision is for material processing or contractor mobilization.

Create and maintain a Critical Path Method schedule.

The CPM schedule shall be created and maintained using software fully compatible with Primavera Project Planner version P6 Professional R15.2 .

Incentive using road-user cost or contract administration liquidated damage values and disincentive using road-user cost will be paid in accordance with special provision 008---006.

The road-user cost liquidated damages shall be $6500.00 per day.

Notes for Milestones

Substantial Completion of Work is defined in Special Provision to Item 8.

Milestone 1
See the traffic control plans (TCP) for a detailed description of Milestone 1.

The daily road-user cost for incentive and disincentive for Milestone 1 will be $6,500 per day.

The contractor will have 47 working days for Milestone 1.

Working day time charges for Milestone 1 will be computed and charged in accordance with Article 8.3.1.4 Standard work week.

The time charges for the purpose of computing incentive and disincentive will begin with Milestone 1.

The time charges for the purpose of computing incentive and disincentive will end with Milestone 1.

The maximum number of working days for computing the incentive credit for Milestone 1 will be 11 days. The maximum credit allowable for early completion of Milestone 1 is $71,500.

Failure to complete Milestone 1 within the established number of working days shown above will result in the assessment of disincentives using the daily road-user costs shown above for each working day more than those allowed for Milestone 1.

--Item 100—
Trim and remove brush and trees within the stations noted in the plans and as needed for construction operations. Unless shown otherwise in the plans or a designated non-mow area, perform trimming or removal for areas to the ROW limits. Trim or remove to provide minimum of 5 ft. of horizontal clearance and 7 ft. of vertical clearance for the following: sidewalks, paths, guard fence, rails, signs, object markers, and structures. Trim to provide a minimum of 12 ft. vertical clearance under all trees.

Obtain approval for proposed method of tree and brush trimming and removal. Vertical flailing equipment is not allowed. Treat damaged or cut branches, roots and/or stumps of all oak trees with a commercial tree wound dressing. Disinfect all pruning tools with a solution of 70% alcohol before moving from one tree to another. Unless otherwise approved remove all resulting vegetative debris from the ROW within 24 hours. The Engineer can stop all construction operations if the dressing, cut and removal requirements are not followed.

There is an abandoned communication copper cable owned by Hill Country Telephone Cooperative, Inc which is to be removed by the contractor. This work shall be subsidiary to this item.
Removal and disposal of existing abandoned utilities that were unable to be identified before letting required to support this project's construction shall be performed under the overall Preparing Right of Way. If you are uncertain whether the utility is active, contact the District Utility Section.

--Item 132—
Use Embankment Ordinary Compaction Type B for this project.

--Item 164—
Drill seeding of permanent grasses requires the use of approved grass seeding equipment capable of properly storing and metering the release of small seeds (such as Bermuda grass) separately from fluffy type seeds (such as bluestems). Equipment manufactured for planting grain crops is acceptable for planting temporary cool season seeds, but not for planting the permanent seed mix.

If performing a permanent seeding in an area with established temporary grass cover and mowing is performed instead of tilling, seed and fertilizer may be distributed simultaneously during "Broadcast Seeding" operations, provided each component is applied at the specified rate.

--Item 168—
Apply vegetative watering as needed to supplement natural rainfall during the vegetation establishment period. Plan quantity of irrigation water is based on the application of a total of 1.3 gal of water each week for each sq. yd. of area that is sodded or seeded. Establishment time is estimated to be 12 weeks for both sod and permanent seed mixes. Temporary seeding will require less time for establishment. Provide a schedule and coordinate watering cycles and rates per cycle with the Engineer. Obtain approval if the quantity of water to be applied is expected to exceed the plan quantity. Adjust the amount of water applied with each cycle and the number of cycles each wk. according to actual site conditions. Drought or other conditions, as determined by the Engineer, may require the application of supplemental irrigation during hours other than normal working hours.

--Item 450—
Color placements, materials, labor, equipment, etc related to the bridge rail shall be subsidiary to to item 450.

--Item 462—
The following structures shall be pre-cast:
4-12'x6' x 54' MBC.

--Item 496—
The Contractor will submit a demolition plan for all structures to be replaced and/or removed in accordance with Item 496.

The placement of temporary Barbed Wire fence during construction shall be subsidiary to the Remove Str (Small Fence) pay item.

--Item 502—
General

In addition to providing a Contractor's Responsible Person and a phone number for emergency contact, have an employee available to respond on the project for emergencies and for taking corrective measures within 2 hours or within a reasonable time frame as specified by the Engineer.

Avoid placing stockpiles, equipment, and other construction materials within the roadway's horizontal clear zone or at any location that will constitute a hazard and will endanger traffic. If a stockpile is placed within the clear zone, address in accordance with the TMUTCD.

If Nighttime work is required and work is not behind positive barrier then full Class 3 reflective gear is required to be worn by all workers, hard hat halos are required to be worn by the flaggers at flagging stations, TY III barricades are required to be spaced at 500 ft, and a mandatory night work meeting is required.

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.

Mounting and moving the mailbox as needed for the various construction phases is subsidiary to Item 502.

Access to adjoining property must be maintained at all times.

Barricades, Signs, and Traffic Control Devices

When advanced warning flashing arrow panels and/or changeable message sign is specified, have one standby unit in good condition at the job site. Standby time shall be considered subsidiary to the bid item.

After written notification, the time frame is provided on the Form 599 to provide properly maintained signs and barricades before considered in non-compliance with this item.

Moving an existing sign to a temporary location is subsidiary to Item 502. Installations with permanent supports at permanent locations will be paid for under the applicable bid item(s).

Cover permanent signs if not used. This is subsidiary to Item 502.

Notify the Engineer in writing 10 business days in advance of any temporary or permanent lane closures Any other modifications to the roadway that may adversely affect the mobility of oversized/overweight trucks also require 10 business days advance written notice to the Engineer. At least one lane must always remain open.

For closures not listed in the TCP; the lane closures are limited to between the hours of 8 PM to 5 AM, and at least one lane must remain open at all times.

Unless otherwise noted in the plans and/or as directed by the Engineer, daily lane closures shall be limited according to the following restrictions:

No lane closures will be permitted for the following dates and/or special events:
Between December 15 and January 1
Wednesday before Thanksgiving thru the Sunday after Thanksgiving
Saturday and Sunday before Memorial Day and Labor Day
Saturday or Sunday when July 4 falls on a Friday or Monday
Easter Weekend

Hauling

The use of rubber-tired equipment will be required for moving dirt or other materials along or across pavement surfaces. Where the contractor desires to move any equipment not licensed for operation on public highways, on or across pavement, they shall protect the pavement from damage as directed/approved by the Engineer.

Throughout construction operations, the Contractor will be required to conduct their hauling operations in a manner such that vehicles will not haul over previously recompacted subgrade or compacted base material, except in short sections for dumping manipulations.

The Contractor shall keep the roadway clean and free of dirt or other materials during hauling operations. If the Contractor does not maintain a clean roadway, they shall cease all construction operations, when directed by the Engineer, to clean the roadway to the satisfaction of the Engineer.

--Item 506--
An Inspector will perform a regularly scheduled SWP3 inspection every 7 calendar days.

Failure to address items noted on the SW3P inspection report within two report cycles may result in the Department stopping all construction operations, exclusive of time charges, or withholding that month's estimate until the SW3P deficiencies are corrected unless the Engineer determines that the area is too wet to correct SW3P deficiencies.

Failure to correctly maintain daily monitoring reports and submitting to TxDOT on a daily/weekly basis may result in the monthly estimate being withheld.

--Item 540--
Guard fence posts placed in proposed and/or existing areas of riprap, sidewalks or other concrete shall have an 18 inch +/- (square or round) leave-out in the concrete as shown in the state standard for MBGF Mow Strip. After the posts are installed, fill the leave-outs with a Grout mixture as shown in the state standard for MBGF Mow Strip.

When connecting a Thrie-Beam to a concrete wingwall, bridge rail, CTB, etc., drill the holes for bolt placement using rotary or core type equipment. Use a core type drill when reinforcing steel is encountered. Do not use percussion or impact drilling. Repair damage to the concrete and spalls exceeding ½" from the edge of the hole.

--Item 585--
Use Surface Test Type A for travel lanes.

--Item 644--
The wedge anchor system shown on State Standard Sheet SMD (TWT) is not allowed.

Triangular Slipbase Systems with set screws are not allowed.

--Item 666--
Use TY II markings (vs. an acrylic or epoxy) on asphalt surfaces as the sealer for the TY I markings, unless otherwise approved by the Engineer.

--Item 672--
Place all adhesive material directly from the heated dispenser to the pavement. Do not use portable or non-heated containers. Use adhesive of sufficient thickness so that when the marker is pressed into the adhesive, 1/8" or more adhesive will remain under 100% of the marker. The adhesive should extend not less than 1/2" but not more than 1 1/2" beyond the perimeter of the marker.

--Item 677--
Obtain approval before using the mechanical method for the elimination of existing thermoplastic pavement markings.

--Item 3076, 3077, 3079, 3080, 3081, & 3082 --

1. Table 10 in Item 3076 and Table 11in Item 3077, Hamburg Wheel Test Requirements tested in accordance with Tex-242-F are changed for PG 64-22 or lower and PG 70-22. Minimum number of passes at 12.55 mm Rut Depth, Tested at 50 degrees C will be 5,000 and 10,000 respectively.

2. Submit a copy of the Tex 233-F production charts on a weekly basis. At the end of the ACP work, provide all originals.

3. Crushing of aggregate for hot mix and immediate use for production of the mix is not allowed. Stockpile the aggregate until enough material is available for five days of production unless prior approval is provided.

4. Hold a pre-paving meeting one month prior to the placement of the hot mix. The date and time of pre-paving meeting should be coordinated with the Engineer prior to scheduling.

5. Do not use diesel or solvents as asphalt release agents in production, transportation, or construction. A list of approved asphalt release agents is available from the District Laboratory.

6. No more than one hot mix lot will be open for any specific type of hot mix, unless authorized. After a lot is open and the Contractor gets approval to change plants, the previous lot will be closed, and a new lot will be opened. The numbering for the lots produced at the new plant will start with No. 1. If allowed to switch back to the original or previous plant, the next lot from that plant will resume numbering sequentially from the last lot produced by that plant.

--Item 3084 & 3085 --
The minimum application rates are listed in Table UC/BC. The Engineer may adjust the application rates taking into consideration the existing pavement surface conditions.

Table UC/BC

Material	Minimum Application Rate (gal. per square yard)
TRAIL – Hot Asphalt	0.15
Spray Applied Underseal Membrane	0.20
Seal Coat – Emulsion (CHFRS-2P, CRS-2P)	0.25
Seal Coat – Asphalt (AC-15P, AC-20-5TR, AC-20XP, AC10-2TR)	0.23
Aggregate for Seal Coat Options TY PB GR 4(AC) or TY B GR 4(Emulsion)	1 CY:120 SY

--Item 4171--
Install bridge identification numbers shown below for each of the following listed bridges in accordance with the special specification and San Antonio District Standard. Install the bridge identification number on two locations as shown on the plans, or as directed. For bridges in a two-way condition, install the bridge identification number on each outside beam on the upstream side of traffic. For bridges in a one-way condition, install the bridge identification number on each side, opposite corners on each outside beam. For culverts less than 5 ft. in height, install the bridge identification number on the headwall on upstream and downstream location. For culverts greater than 5 ft. in height, install the bridge identification number inside the first barrel on the upstream side of traffic and inside the last barrel on the opposite corner in the direction of traffic.

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1135-03-030 **DISTRICT** San Antonio **COUNTY** Kerr
HIGHWAY FM 1341

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1135-03-030**			
		PROJECT ID		**A00136967**			
		COUNTY		**Kerr**			
		HIGHWAY		**FM 1341**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	100-6002	PREPARING ROW	STA	7.000		7.000	
	104-6009	REMOVING CONC (RIPRAP)	SY	915.000		915.000	
	105-6061	REMOV STAB BASE & ASPH PAV (8"-20")	SY	1,526.000		1,526.000	
	110-6001	EXCAVATION (ROADWAY)	CY	352.000		352.000	
	110-6002	EXCAVATION (CHANNEL)	CY	768.000		768.000	
	132-6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	122.000		122.000	
	160-6003	FURNISHING AND PLACING TOPSOIL (4")	SY	469.000		469.000	
	164-6001	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY	469.000		469.000	
	168-6001	VEGETATIVE WATERING	MG	8.000		8.000	
	216-6001	PROOF ROLLING	HR	61.000		61.000	
	400-6005	CEM STABIL BKFL	CY	88.000		88.000	
	402-6001	TRENCH EXCAVATION PROTECTION	LF	59.000		59.000	
	420-6136	CL C CONC (RAC-R)	CY	23.000		23.000	
	432-6002	RIPRAP (CONC)(5 IN)	CY	212.000		212.000	
	432-6045	RIPRAP (MOW STRIP)(4 IN)	CY	24.000		24.000	
	450-6006	RAIL (TY T223)	LF	375.000		375.000	
	462-6041	CONC BOX CULV (12 FT X 6 FT)	LF	216.000		216.000	
	466-6183	WINGWALL (PW - 1) (HW=8 FT)	EA	2.000		2.000	
	496-6007	REMOV STR (PIPE)	LF	420.000		420.000	
	496-6043	REMOV STR (SMALL FENCE)	LF	100.000		100.000	
	500-6001	MOBILIZATION	LS	1.000		1.000	
	502-6001	BARRICADES, SIGNS AND TRAFFIC HANDLING	MO	4.000		4.000	
	506-6003	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	50.000		50.000	
	506-6011	ROCK FILTER DAMS (REMOVE)	LF	50.000		50.000	
	506-6020	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	112.000		112.000	
	506-6024	CONSTRUCTION EXITS (REMOVE)	SY	112.000		112.000	
	506-6041	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	1,291.000		1,291.000	
	506-6043	BIODEG EROSN CONT LOGS (REMOVE)	LF	1,291.000		1,291.000	
	540-6001	MTL W-BEAM GD FEN (TIM POST)	LF	112.500		112.500	
	540-6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4.000		4.000	
	540-6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	2.000		2.000	
	544-6001	GUARDRAIL END TREATMENT (INSTALL)	EA	2.000		2.000	
	552-6002	WIRE FENCE (TY B)	LF	100.000		100.000	
	560-6025	RELOCATE EXISTING MAILBOX	EA	1.000		1.000	
	644-6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2.000		2.000	
	644-6023	IN SM RD SN SUP&AM TYFRP(1)UA(P)	EA	1.000		1.000	
	644-6076	REMOVE SM RD SN SUP&AM	EA	1.000		1.000	

Estimate & Quantity Sheet

CONTROLLING PROJECT ID 1135-03-030 **DISTRICT** San Antonio **COUNTY** Kerr
HIGHWAY FM 1341

						TOTAL EST.	TOTAL FINAL
		CONTROL SECTION JOB		**1135-03-030**			
		PROJECT ID		**A00136967**			
		COUNTY		**Kerr**			
		HIGHWAY		**FM 1341**			
ALT	**BID CODE**	**DESCRIPTION**	**UNIT**	EST.	FINAL		
	658-6016	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	EA	15.000		15.000	
	666-6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	1,942.000		1,942.000	
	666-6210	REFL PAV MRK TY II (Y) 6" (SLD)	LF	1,942.000		1,942.000	
	666-6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	1,942.000		1,942.000	
	666-6347	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)	LF	1,942.000		1,942.000	
	672-6009	REFL PAV MRKR TY II-A-A	EA	26.000		26.000	
	3076-6003	D-GR HMA TY-B PG64-22 (EXEMPT)	TON	1,062.000		1,062.000	
	3076-6066	TACK COAT	GAL	462.000		462.000	
	3076-6074	D-GR HMA TY-C SAC-B PG70-22 (EXEMPT)	TON	262.000		262.000	
	3084-6001	BONDING COURSE	GAL	457.000		457.000	
	4171-6001	INSTALL BRIDGE IDENTIFICATION NUMBERS	EA	2.000		2.000	
	6001-6002	PORTABLE CHANGEABLE MESSAGE SIGN	EA	8.000		8.000	
	18	SAFETY CONTINGENCY: CONTRACTOR FORCE ACCOUNT WORK (PARTICIPATING)	LS	1.000		1.000	
		EROSION CONTROL MAINTENANCE: CONTRACTOR FORCE ACCOUNT WORK (PART)	LS	1.000		1.000	

FINAL PLANS SUBMITTAL

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SUMMARY OF TCP QUANTITIES

PLAN SHEET NO.	STATION TO STATION	0502 6001	6001 6002
		BARRICADES, SIGNS AND TRAFFIC HANDLING	PORTABLE CHANGEABLE MESSAGE SIGN
		MO	EA
ROADWAY SHEETS			
FM 1341 TCP	20+25 TO 27+00	4	8
ROADWAY TOTALS		4	8

SUMMARY OF DRAINAGE QUANTITIES

PLAN SHEET NO.	STATION TO STATION	0402 6001	0420 6136	0450 6006	0462 6041	0466 6183	4171 6001
		TRENCH EXCAVATION PROTECTION	CL C CONC (RAC-R)	RAIL (TY T223)	CONC BOX CULV (12 FT X 6 FT)	WINGWALL (PW - 1) (HW=8 FT)	INSTALL BRIDGE IDENTIFICATION NUMBERS
		LF	CY	LF	LF	EA	EA
DRAINAGE SHEETS							
51	22+69.14 TO 23+50.45	59	23	375	216	2	2
DRAINAGE TOTALS		59	23	375	216	2	2

SUMMARY OF ROADWAY QUANTITIES

PLAN SHEET NO.	STATION TO STATION	0100 6002	0110 6001	0110 6002	0132 6003	0216 6001	0400 6005	0432 6002	0432 6045	0540 6001	0540 6006	0540 6016	0544 6001	0552 6002	0560 6025
		PREPARING ROW	EXCAVATION (ROADWAY)	EXCAVATION (CHANNEL)	EMBANKMENT (FINAL) (ORD COMP) (TY B)	PROOF ROLLING	CEM STABIL BKFL	RIPRAP (CONC) (5 IN)	RIPRAP (MOW STRIP) (4 IN)	MTL W-BEAM GD FEN (TIM POST)	MTL BEAM GD FEN TRANS (THRIE-BEAM)	DOWNSTREAM ANCHOR TERMINAL SECTION	GUARDRAIL END TREATMENT (INSTALL)	WIRE FENCE (TY B)	RELOCATE EXISTING MAILBOX
		STA	CY	CY	CY	HR	CY	CY	CY	LF	EA	EA	EA	LF	EA
ROADWAY SHEETS															
33	20+25 TO 25+00	5	352	768	122	42	88	212	17	88	4	2	1	100	1
34	25+00 TO 27+00	2				19			7	25			1		
ROADWAY TOTALS		7	352	768	122	61	88	212	24	113	4	2	2	100	1

PLAN SHEET NO.	STATION TO STATION	3076 6003	3076 6074	3076 6066	3084 6001
		D-GR HMA TY-B PG64-22 (EXEMPT)	D-GR HMA TY-C SAC-B PG70-22 (EXEMPT)	TACK COAT	BONDING COURSE
		TON	TON	GAL	GAL
ROADWAY SHEETS					
33	20+25 TO 25+00	720	178	313	309
34	25+00 TO 27+00	342	84	149	148
ROADWAY TOTALS		1062	262	462	457

SUMMARY OF EROSION CONTROL QUANTITIES

PLAN SHEET NO.	STATION TO STATION	0160 6003	0164 6001	0168 6001	0506 6003	0506 6011	0506 6020	0506 6024	0506 6041	0506 6043
		FURNISHING AND PLACING TOPSOIL (4")	BROADCAST SEED (PERM) (RURAL) (SANDY)	VEGETATIVE WATERING	ROCK FILTER DAMS (INSTALL) (TY 3)	ROCK FILTER DAMS (REMOVE)	CONSTRUCTION EXITS (INSTALL) (TY 1)	CONSTRUCTION EXITS (REMOVE)	BIODEG EROSN CONT LOGS (INSTL) (12")	BIODEG EROSN CONT LOGS (REMOVE)
		SY	SY	MG	LF	LF	SY	SY	LF	LF
ROADWAY SHEETS										
85	20+25 TO 27+00	469	469	8	50	50	112	112	1291	1291
ROADWAY TOTALS		469	469	8	50	50	112	112	1291	1291

SUMMARY OF REMOVAL QUANTITIES

PLAN SHEET NO.	STATION TO STATION	0104 6009	0105 6061	0496 6007	0496 6043	0644 6076
		REMOVING CONC (RIPRAP)	REMOV STAB BASE & ASPH PAV (8"-20")	REMOV STR (PIPE)	REMOV STR (SMALL FENCE)	REMOVE SM RD SN SUP&AM
		SY	SY	LF	LF	EA
REMOVAL SHEETS						
32	20+25 TO 27+00	915	1526	420	100	1
REMOVAL TOTALS		915	1526	420	100	1

SUMMARY OF PAVEMENT MARKING/SIGNING QUANTITIES

PLAN SHEET NO.	STATION TO STATION	0644 6001	0644 6023	0658 6016	0666 6174	0666 6210	0666 6343	0666 6347	0672 6009
		IN SM RD SN SUP&AM TY10BWG(1)SA(P)	IN SM RD SN SUP&AM TYFRP(1)UA(P)	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	REFL PAV MRK TY II (W) 6" (SLD)	REFL PAV MRK TY II (Y) 6" (SLD)	REF PROF PAV MRK TY I(W)6"(SLD)(10 0MIL)	REF PROF PAV MRK TY I(Y)6"(SLD)(10 0MIL)	REFL PAV MRKR TY II-A-A
		EA	EA	EA	LF	LF	LF	LF	EA
ROADWAY SHEETS									
65	19+75.90 TO 29+46.56	2	1	15	1942	1942	1942	1942	26
ROADWAY TOTALS		2	1	15	1942	1942	1942	1942	26

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

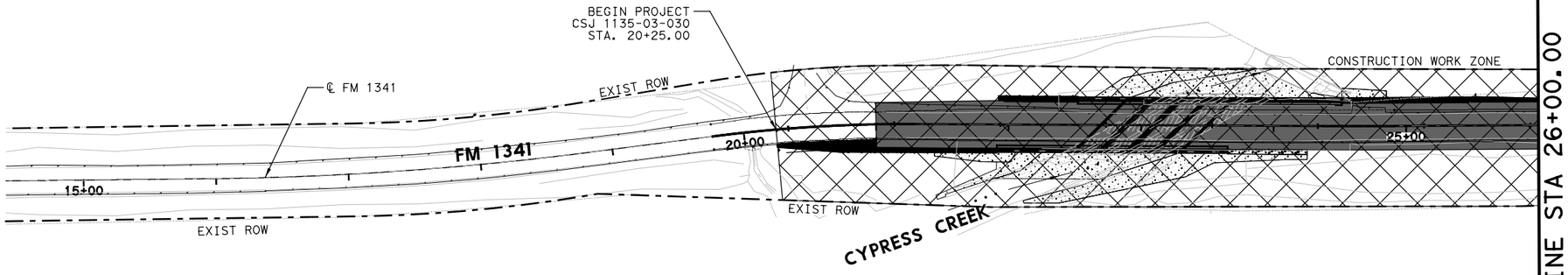
FM 1341 AT CYPRESS CREEK

QUANTITY SUMMARIES

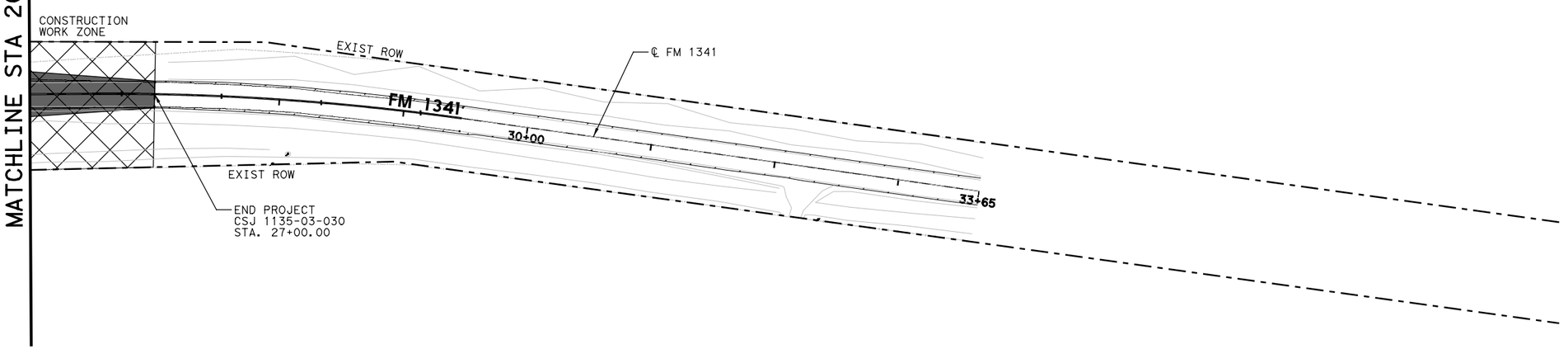
SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	9

FINAL PLANS SUBMITTAL



MATCHLINE STA 26+00.00



LEGEND

CONSTRUCTION PHASE 1

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

0 50 100 150 200
SCALE IN FEET

FM 1341 AT CYPRESS CREEK

TRAFFIC CONTROL PLAN
PHASE 1 PHASING LAYOUT

SCALE: 1"=100' SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	10

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DATE: 1/30/2024
PLOTTING TIME: 12:06:21 PM

File Name: FM1341-TCP-NARRATIVE
User Name: EWANG

TRAFFIC CONTROL PLAN SEQUENCE OF WORK

(1) THIS PROJECT WILL BE CONSTRUCTED IN ONE (1) PHASE. BEFORE THE COMMENCEMENT OF PHASE 1, INSTALL ADVANCE WARNING SIGNS, TEMPORARY SIGNS AND BARRICADES AS SHOWN ON THE PLANS AND/OR AS DIRECTED/APPROVED BY THE ENGINEER. DAILY LANE CLOSURES WILL BE USED IN ACCORDANCE WITH STATE TCP STANDARDS. DROP OFF CONDITIONS OF GREATER THAN 2" MUST HAVE A 3:1 SLOPE AT THE END OF THE EACH DAY, AS WELL AS THROUGHOUT THE PROJECT WHERE ACCESS TO ADJACENT PROPERTIES IS ALLOWED TO DRIVEWAYS AND SIDE STREETS.

(2) PREPARING ROW/ REMOVAL OF EXISTING ITEMS TO BE DONE ONLY IN AREAS WHERE WORK IS OCCURRING, AS PER THE PHASES NOTED BELOW.

(3) PLANING, SURFACE TREATMENTS AND OVERLAYS SHALL BE PERFORMED IN THE DIRECTION OF TRAFFIC. BEGIN SURFACE CONSTRUCTION ON THE HIGH SIDE OF THE ROAD TO AVOID WATER PONDING ISSUES.

(4) THE CONTRACTOR'S ATTENTION IS DIRECTED TO THE REQUIREMENTS OF ITEM 7, "LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC" AND ITEM 502, "BARRICADES, SIGNS, AND TRAFFIC HANDLING", OF THE STANADARD SPECIFICATIONS, AND TO THE GENERAL NOTES

(5) A BRIEF DESCRIPTION OF THESE PHASES ARE AS FOLLOWS:

PHASE 1

THE INTENT OF PHASE 1 IS TO REMOVE THE EXISTING CULVERT AND ROADWAY AND CONSTRUCT THE NEW CULVERT STRUCTURE AND ROADWAY AT CYPRESS CREEK.

1. MOBILIZATION.
2. PLACE DETOUR SIGNS, ADVANCE WARNING SIGNS, TEMPORARY SIGNS AND BARRICADES AS SHOWN ON THE TRAFFIC CONTROL LAYOUTS AND DETOUR SHEETS AND/OR DIRECTED/APPROVED BY THE ENGINEER.
3. CLOSE DOWN FM 1341 AT CYPRESS CREEK FOR BOTH EB AND WB TRAFFIC. DETOUR ALL TRAFFIC AS DIRECTED IN THE DETOUR SHEETS. **BEGIN MILESTONE #1 – DETOUR TRAFFIC**
4. PLACE STORM WATER POLLUTION PREVENTION MEASURES ALONG CONSTRUCTION ZONE AS SHOWN ON SW3P LAYOUT SHEETS.
5. PREPARE ROW.
6. REMOVE EXISTING CULVERT, RIPRAP AND ROADWAY WITHIN CONSTRUCTION LIMITS AS SHOWN ON THE REMOVAL SHEETS.
7. INSTALL PROPOSED CULVERTS, WINGWALLS, BRIDGE RAIL PER PLANS.
8. GRADE CHANNEL AND INSTALL RIPRAP PER PLANS.
9. CONSTRUCT FM 1341 ROADWAY AS SHOWN PER THE TYPICAL SECTIONS AND PLANS.
10. INSTALL MBGF AND MOW STRIP AS SHOWN IN THE PLANS.
11. PLACE PROPOSED SIGNAGE AND PAVEMENT MARKING PER PLANS.
12. OPEN FM 1341 TRAFFIC TO FINAL CONFIGURATION. **END MILESTONE #1 – OPEN TRAFFIC TO ORIGINAL FM 1341 CONFIGURATION**
13. PERFORM FINAL CLEANUP.
14. REMOVE ALL PHASE 1 TRAFFIC CONTROL AS DIRECTED BY THE ENGINEER.

NO.	DATE	REVISION	APPR BY

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San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER

01/30/24

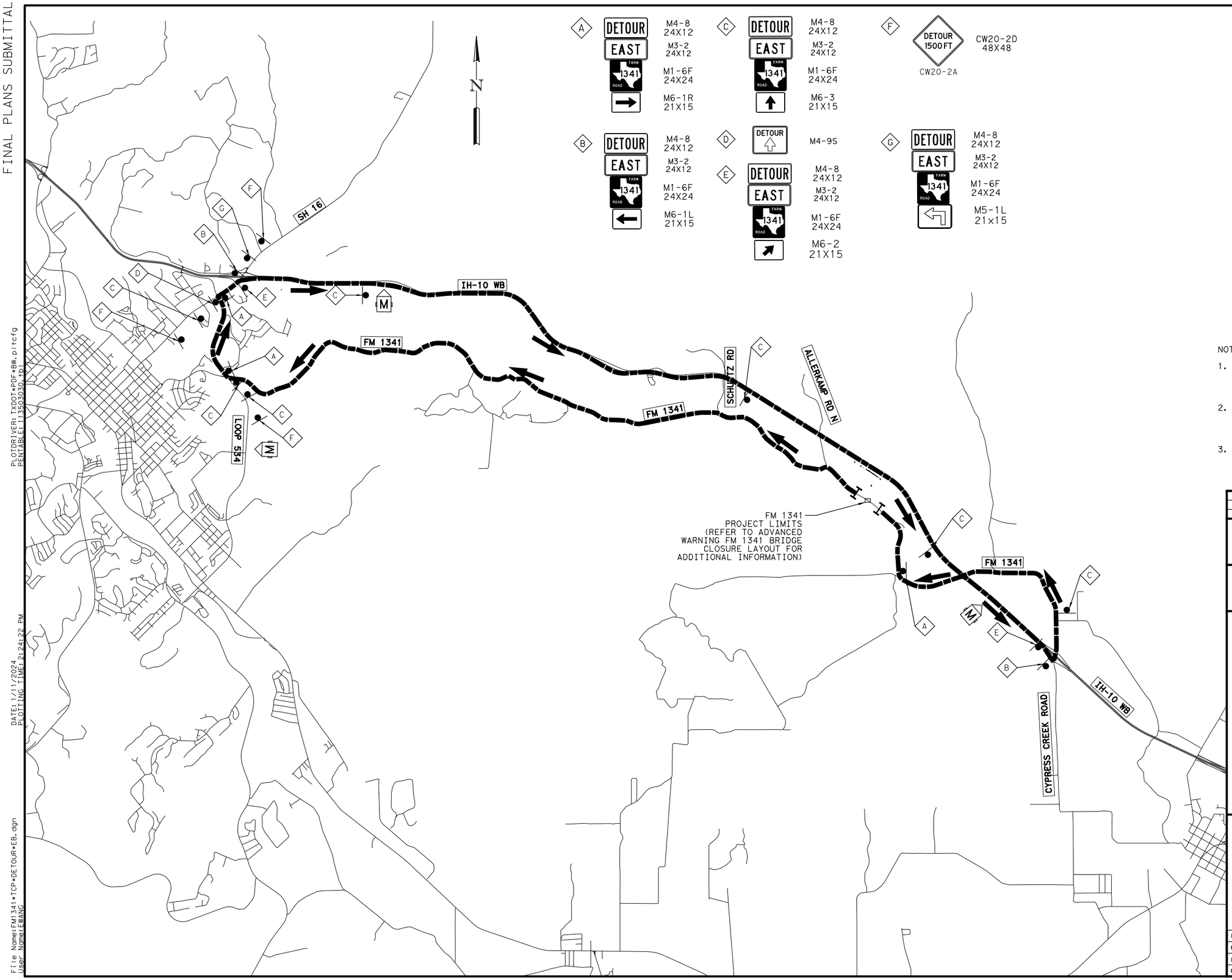
FM 1341 AT CYPRESS CREEK

TCP NARRATIVE

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	11

FINAL PLANS SUBMITTAL



A
DETOUR
EAST
FARM 1341 ROAD
M4-8 24X12
M3-2 24X12
M1-6F 24X24
M6-1R 21X15

B
DETOUR
EAST
FARM 1341 ROAD
M4-8 24X12
M3-2 24X12
M1-6F 24X24
M6-1L 21X15

C
DETOUR
EAST
FARM 1341 ROAD
M4-8 24X12
M3-2 24X12
M1-6F 24X24
M6-3 21X15

D
DETOUR
M4-9S

E
DETOUR
EAST
FARM 1341 ROAD
M4-8 24X12
M3-2 24X12
M1-6F 24X24
M6-2 21X15

F
DETOUR 1500 FT
CW20-2A
CW20-2D 48X48

G
DETOUR
EAST
FARM 1341 ROAD
M4-8 24X12
M3-2 24X12
M1-6F 24X24
M5-1L 21x15

LEGEND

- SIGN
- TYPE 3 BARRICADE
- PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- PROP TRAFFIC DETOUR
- EXIST TRAFFIC LANE
- PROPOSED DETOUR ROUTE

NOTES:

1. REFER TO THE FM 1341 TRAFFIC CONTROL NARRATIVE, ADVANCED WARNING LAYOUT AND TCP DETAIL SHEET FOR ADDITIONAL TRAFFIC CONTROL INFORMATION.
2. PCMS TO BE PLACED AT MAJOR INTERSECTION APPROACHES. REFER TO THE GENERAL NOTES FOR PCMS MESSAGES. PCMS CAN BE RELOCATED WITH ENGINEER'S APPROVAL.
3. FM 1341 BRIDGE OVER CYPRESS CREEK WILL BE CLOSED FOR DURATION OF PROJECT. REFER TO TCP NARRATIVE FOR ADDITIONAL INFORMATION.

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STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

0 3000 6000 9000 12000
SCALE IN FEET

FM 1341 AT CYPRESS CREEK
TRAFFIC CONTROL PLAN
PHASE 1
EASTBOUND DETOUR

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	12

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DATE: 1/11/2024
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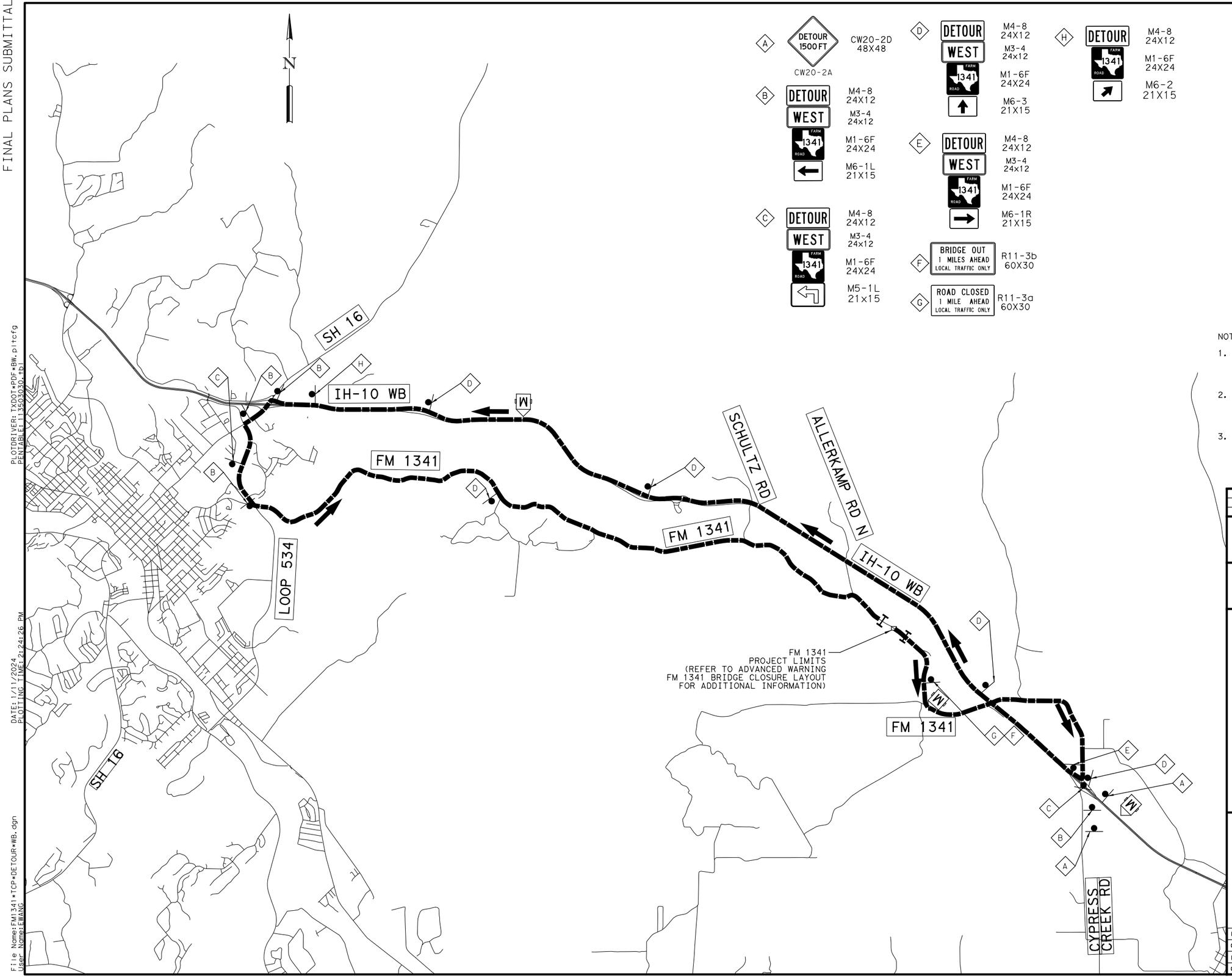
User Name: EWANG

FINAL PLANS SUBMITTAL



A — DETOUR 1500 FT — CW20-2D 48X48; CW20-2A

B — DETOUR — M4-8 24X12; WEST — M3-4 24x12; FM 1341 ROAD — M1-6F 24X24; M6-1L 21X15

C — DETOUR — M4-8 24X12; WEST — M3-4 24x12; FM 1341 ROAD — M1-6F 24X24; M5-1L 21x15

D — DETOUR — M4-8 24X12; WEST — M3-4 24x12; FM 1341 ROAD — M1-6F 24X24; M6-3 21X15

E — DETOUR — M4-8 24X12; WEST — M3-4 24x12; FM 1341 ROAD — M1-6F 24X24; M6-1R 21X15

F — BRIDGE OUT 1 MILES AHEAD LOCAL TRAFFIC ONLY — R11-3b 60X30

G — ROAD CLOSED 1 MILE AHEAD LOCAL TRAFFIC ONLY — R11-3a 60X30

H — DETOUR — M4-8 24X12; FM 1341 ROAD — M1-6F 24X24; M6-2 21X15

LEGEND

- SIGN
- TYPE 3 BARRICADE
- M — PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)
- PROP TRAFFIC DETOUR
- EXIST TRAFFIC LANE
- PROPOSED DETOUR ROUTE

NOTES:

1. REFER TO THE FM 1341 TRAFFIC CONTROL NARRATIVE, ADVANCED WARNING LAYOUT AND TCP DETAIL SHEET FOR ADDITIONAL TRAFFIC CONTROL INFORMATION.
2. PCMS TO BE PLACED AT MAJOR INTERSECTION APPROACHES. REFER TO THE GENERAL NOTES FOR PCMS MESSAGES. PCMS CAN BE RELOCATED WITH ENGINEER'S APPROVAL.
3. FM 1341 BRIDGE OVER CYPRESS CREEK WILL BE CLOSED FOR DURATION OF PROJECT. REFER TO TCP NARRATIVE FOR ADDITIONAL INFORMATION.

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01/11/24

0 3000 6000 9000 12000
SCALE IN FEET

FM 1341 AT CYPRESS CREEK
TRAFFIC CONTROL PLAN
PHASE 1
WESTBOUND DETOUR

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	13

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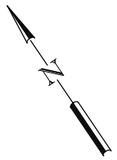
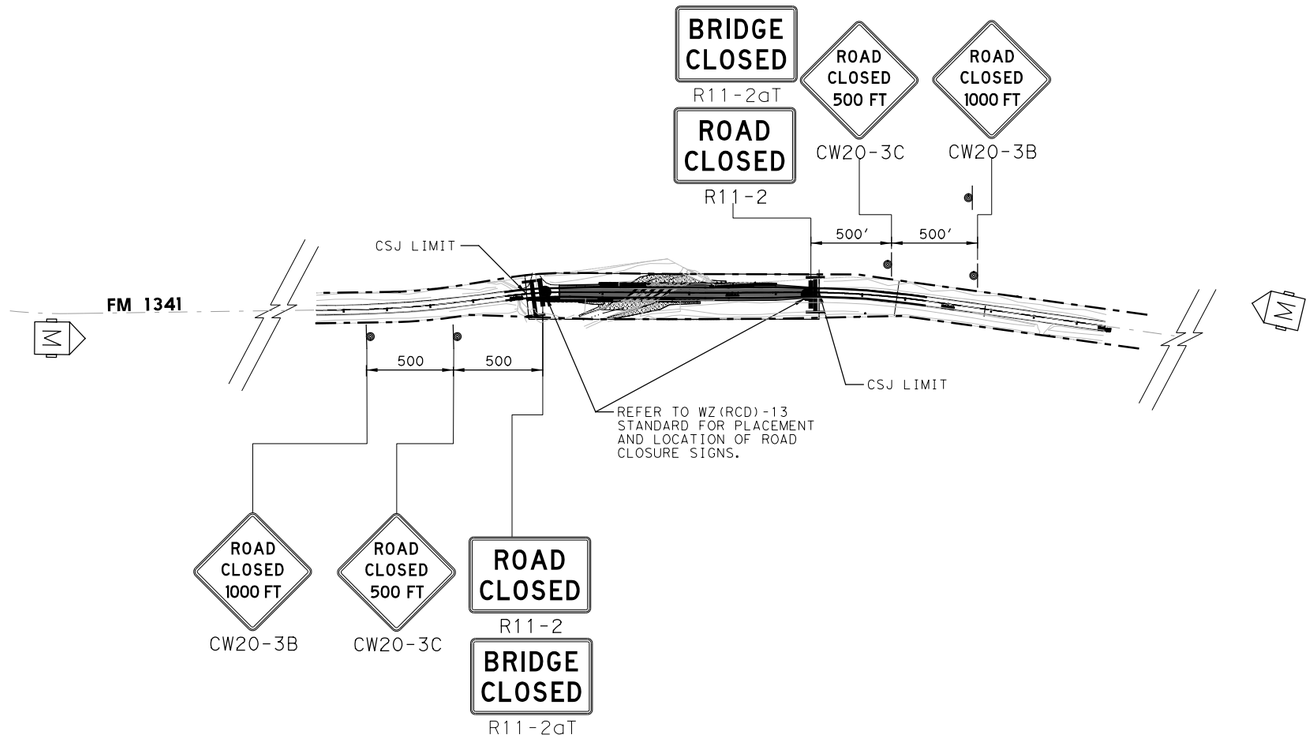
User Name:EWANG

FINAL PLANS SUBMITTAL





LEGEND

- TRAFFIC SIGN
- PORTABLE CHANGEABLE MESSAGE SIGN
- TYPE 3 BARRICADE
- C.S.J. LIMITS

SIGN SCHEDULE NOTES:

1. REFER TO TXDOT STANDARD SHEETS BC(1)-21 THRU BC(12)-21 AND WZ(RCD)-13, FOR TRAFFIC CONTROL DEVICES AND WARNING SIGN GUIDANCE.
2. ALL SIGNS SHALL REMAIN IN PLACE FOR THE DURATION OF CONSTRUCTION UNLESS NOTED OTHERWISE.
3. SIGNS CANNOT BE PLACED DUE TO INADEQUATE SHOULDER WIDTH SHALL BE ADJUSTED IN THE FIELD IN ACCORDANCE TO TMUTCD.
4. NOT ALL WORK ZONE SIGNS ARE SHOWN ON THE PLAN. REFER TO TXDOT STANDARDS FOR ADDITIONAL SIGNAGE.

NOTES:

1. ALL TRAFFIC CONTROL BARRICADES, SIGNS, & DEVICES SHALL BE IN ACCORDANCE WITH THE 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. A DISTANCE PLAQUE IN FEET OR MILES MAY BE REQUIRED FOR USE IN CONJUNCTION WITH WARNING SIGNS.
5. PLASTIC BARRELS OR VERTICAL PANELS ARE TO BE USED AS CHANNELIZING DEVICES. CONES WILL NOT BE PERMITTED.
6. ALL CONSTRUCTION TRAFFIC IS TO BE REGULATED TO INCONVENIENCE THE TRAVELING PUBLIC AS LITTLE AS POSSIBLE. WHEN IT IS NECESSARY FOR CONSTRUCTION EQUIPMENT OR TRUCKS TO STOP, UNLOAD, OR CROSS ROADWAYS UNDER TRAFFIC, WARNING SIGNS AND A FLAGGER SHALL BE PROVIDED AS NECESSARY TO PROTECT THE TRAVELING PUBLIC.
7. REFER TO TCP STANDARDS FOR SIGN SPACING.

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123262
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PROFESSIONAL ENGINEER
01/11/24

0 3000 6000 9000 12000
SCALE IN FEET

FM 1341 AT CYPRESS CREEK
ADVANCED WARNING
FM 1341 BRIDGE CLOSURE LAYOUT

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	14

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DATE: 1/11/2024
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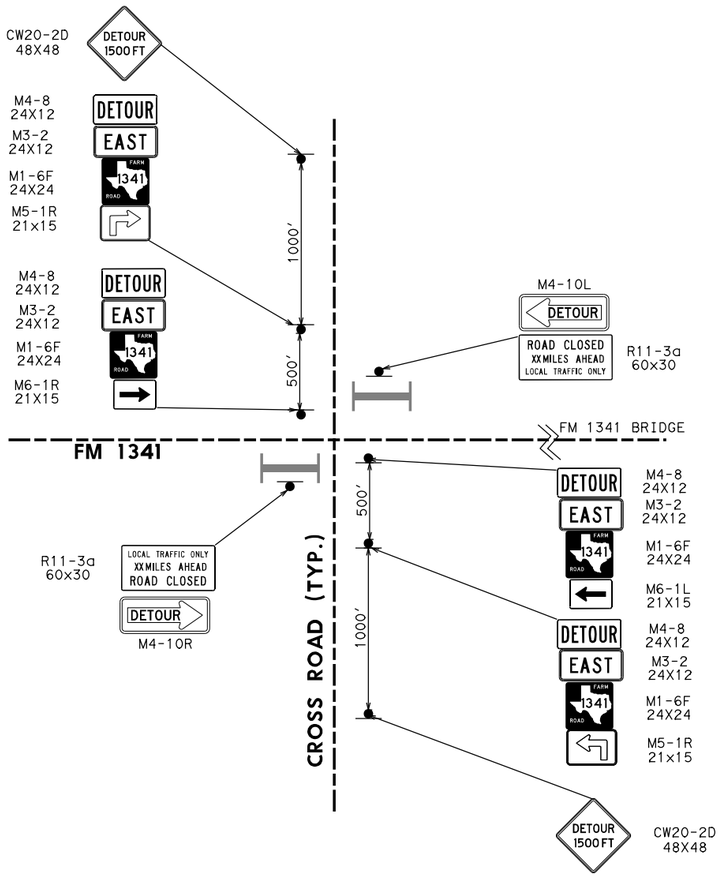
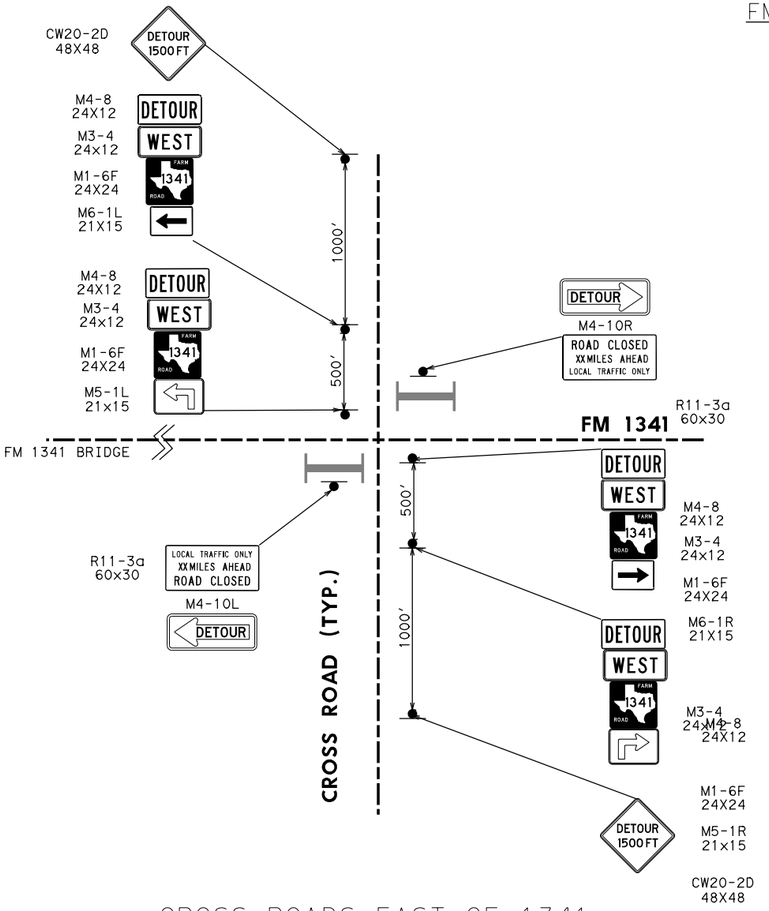
User Name: EWANG

FINAL PLANS SUBMITTAL



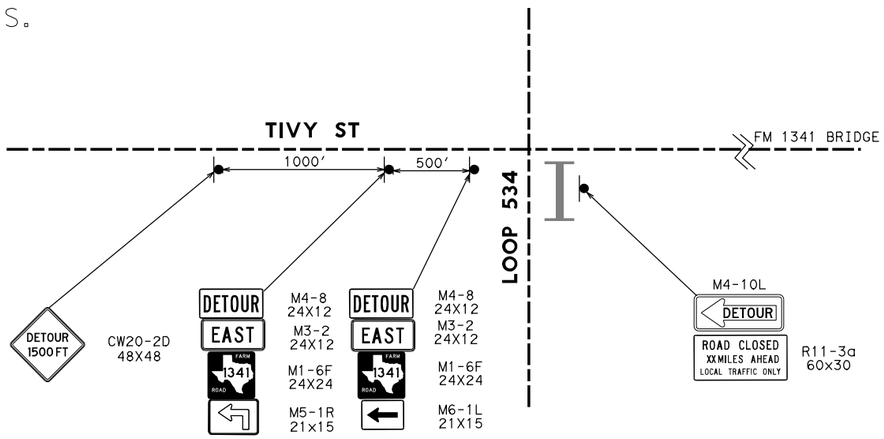
CROSS ROADS WEST OF 1341
BRIDGE REPLACEMENT

N.T.S.



CROSS ROADS EAST OF 1341
BRIDGE REPLACEMENT

N.T.S.



FM 1341/ TIVY ROAD
& LOOP 534 INTERSECTION

N.T.S.

FM 1341 INTERSECTION SIGN SPACING

FM 1341 Intersecting Roads	Posted Speed	Minimum Sign Spacing "x" Distance
Tivy Street	35	160
Loop 534	55	500
Green Oak Drive	30	120
Schultz Road	30	120
Allerkamp Rd	30	120
Lazy Valley Road	30	120
Holekamp Road	30	120
Hasenwinkel Road	30	120
Old Cypress Creek Road	30	120
Cypress Creek Road	45	320

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STATE OF TEXAS
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123262
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PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK
TRAFFIC CONTROL PLAN
TCP DETAIL

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	15

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PENTABLE: 113030.tbl
DATE: 1/11/2024
PLOTTING TIME: 2:24:40 PM
File Name: FM1341-TCP-DETAIL
User Name: EWANG

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	1135	03	030	FM 1341
4-03 7-13	DIST	COUNTY		SHEET NO.
9-07 8-14	SAT	KERR		16
5-10 5-21				

DATE: 1/11/2024 2:24:42 PM
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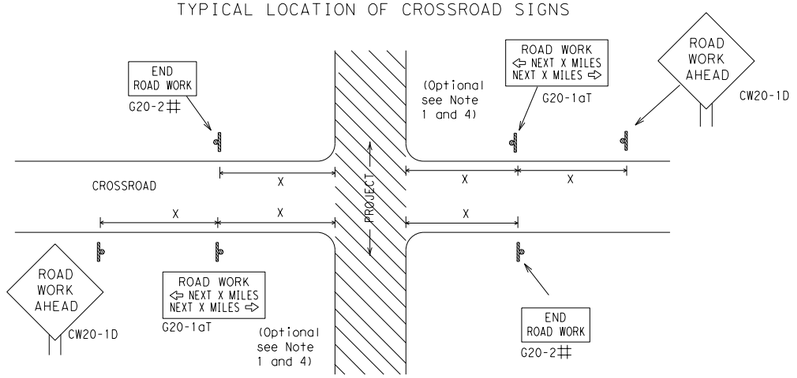
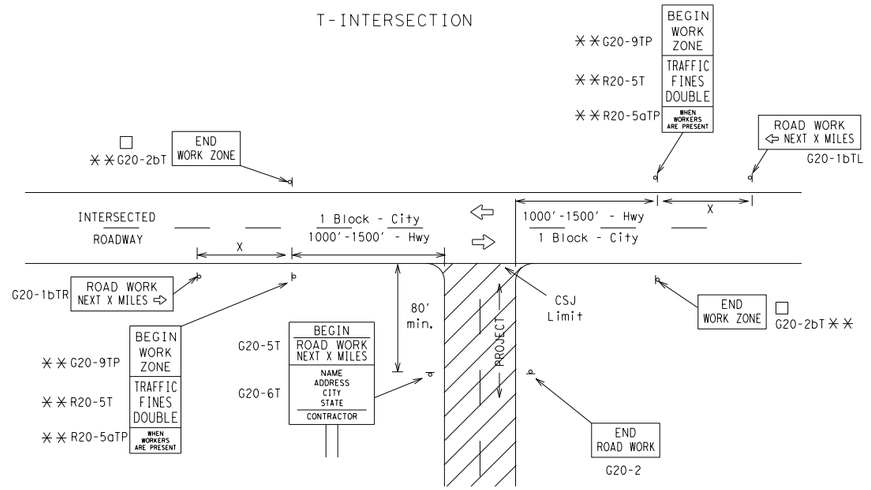
TYPICAL LOCATION OF CROSSROAD SIGNS



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.

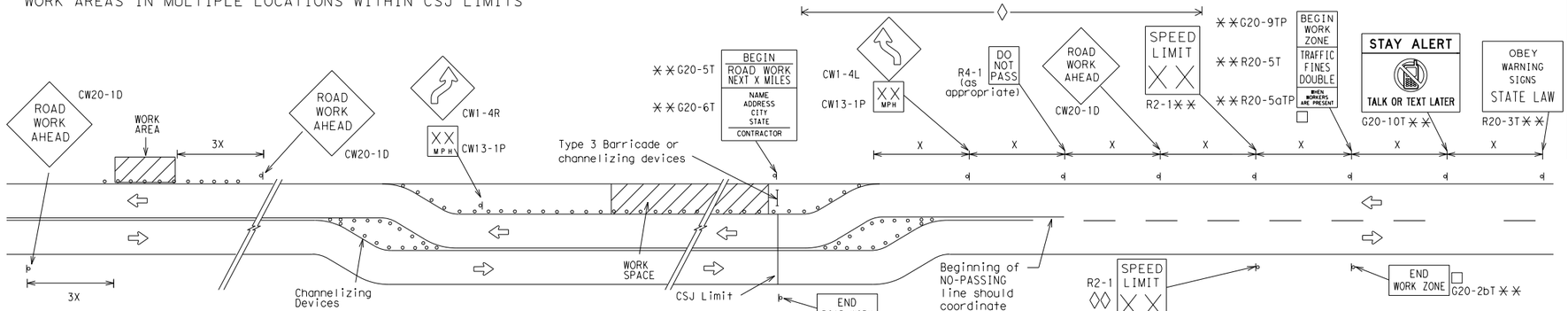
△ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

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.

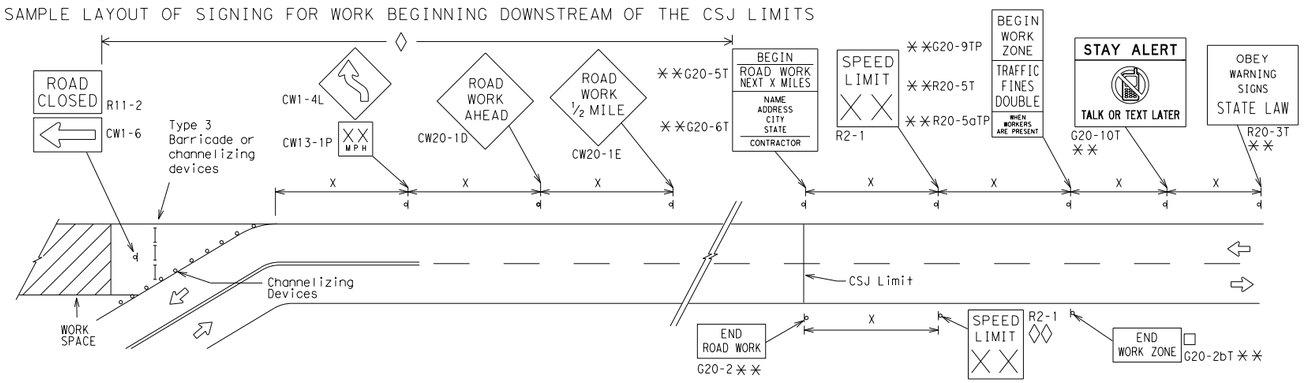
WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

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

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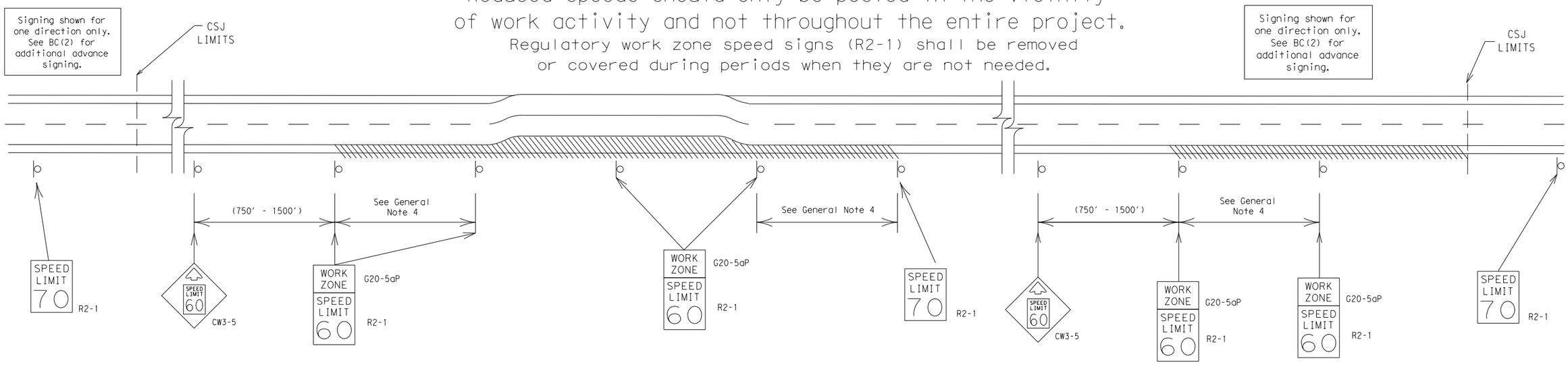
TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

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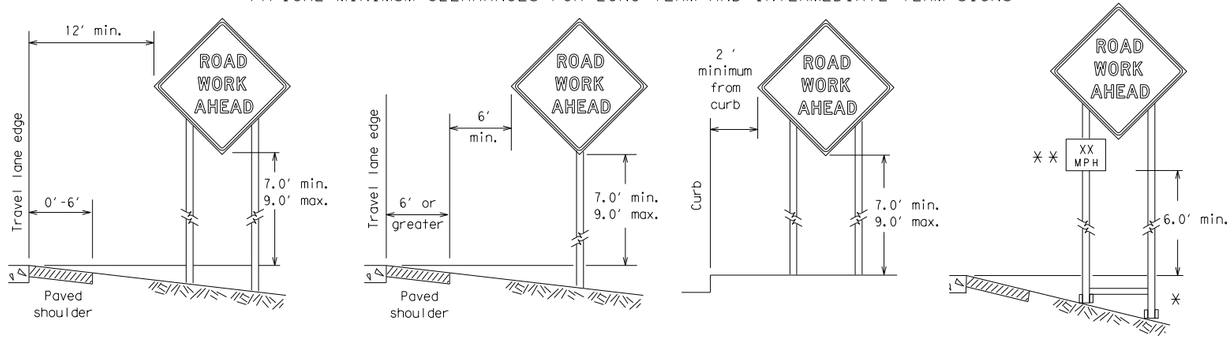
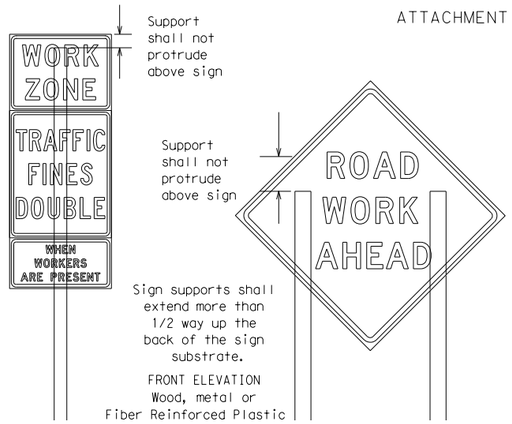
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

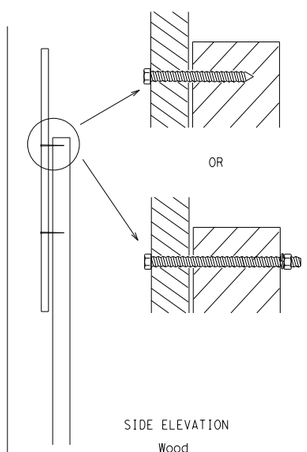


⁎ When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





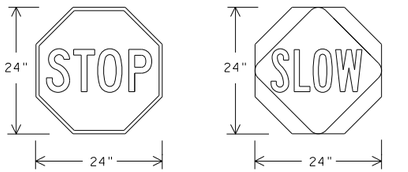
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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

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

STOP/SLOW PADDLES

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



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

CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

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

GENERAL NOTES FOR WORK ZONE SIGNS

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

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

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

SIGN MOUNTING HEIGHT

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

SIZE OF SIGNS

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

SIGN SUBSTRATES

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

REFLECTIVE SHEETING

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

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

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BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

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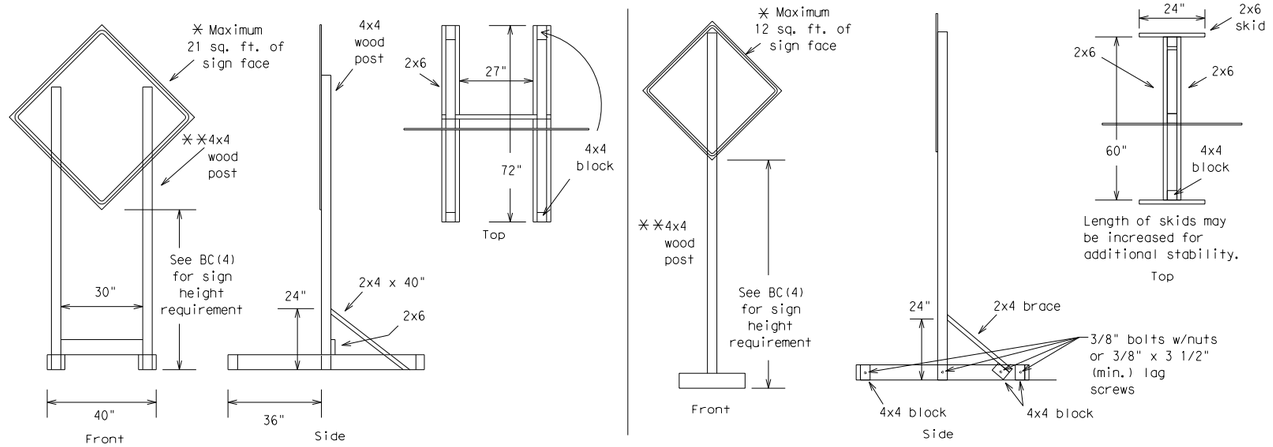
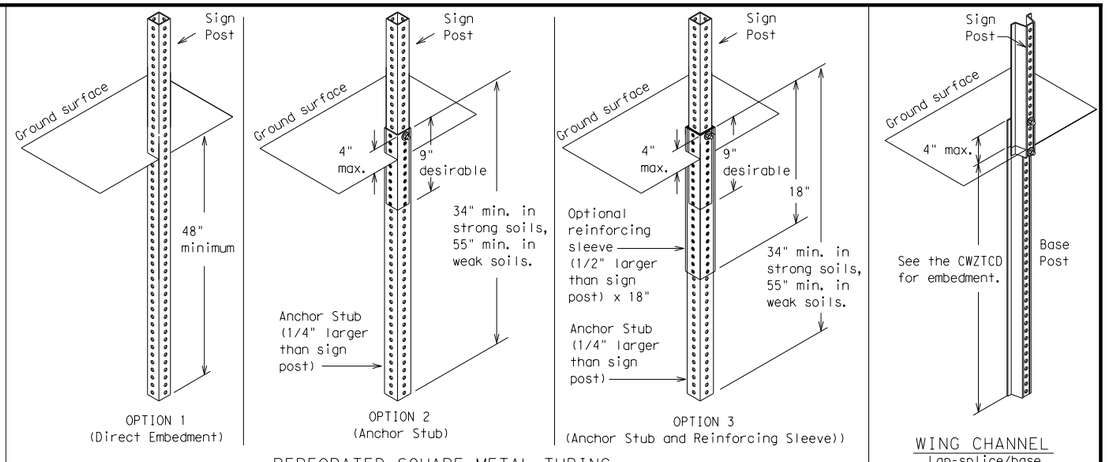


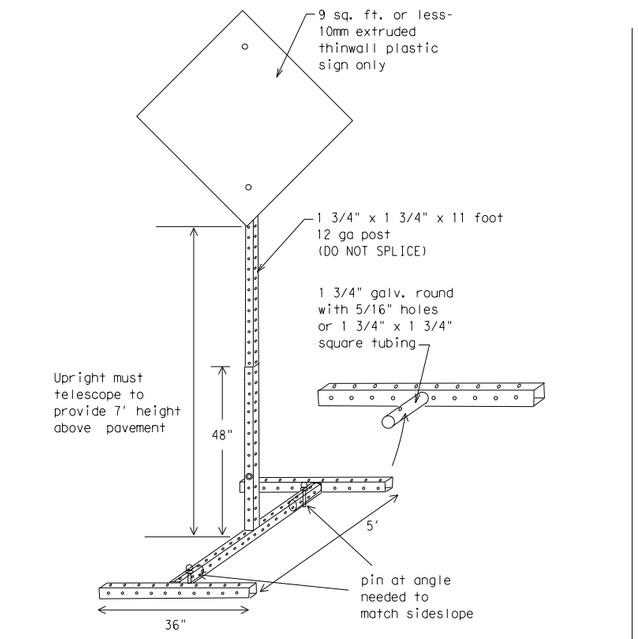
SKID MOUNTED WOOD SIGN SUPPORTS

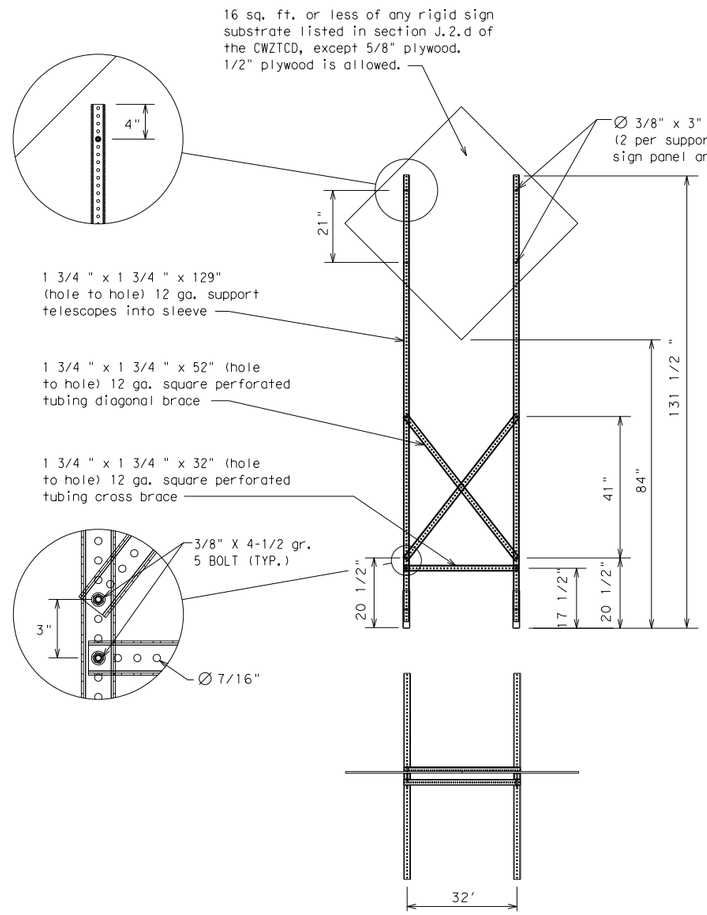
* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS

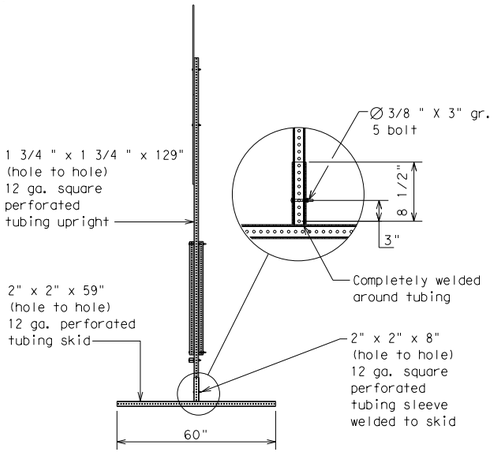


GROUND MOUNTED SIGN SUPPORTS

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







SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

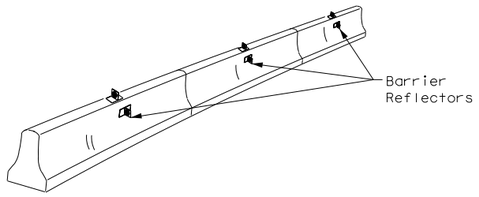
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE:	bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS		1135	03	030	FM 1341
9-07 8-14		DIST	COUNTY		SHEET NO.
7-13 5-21		SAT	KERR		21

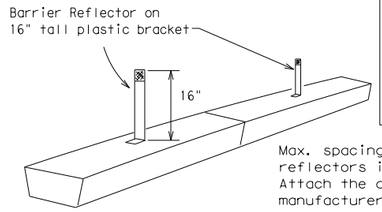
100

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



CONCRETE TRAFFIC BARRIER (CTB)

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

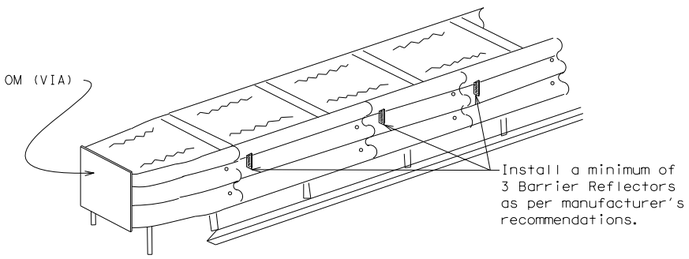


Max. spacing of barrier reflectors is 20 feet. Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB)

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

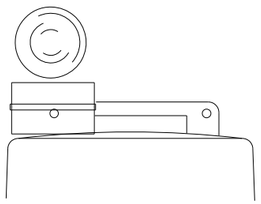


DELINEATION OF END TREATMENTS

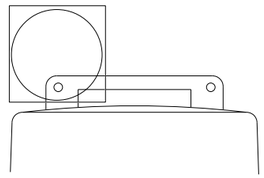
END TREATMENTS FOR CTB'S USED IN WORK ZONES

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

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS



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



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

WARNING LIGHTS

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

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

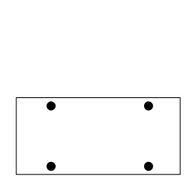
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

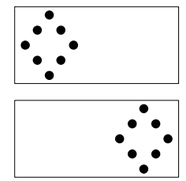
Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

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

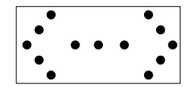


4 CORNER CAUTION

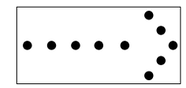
OR



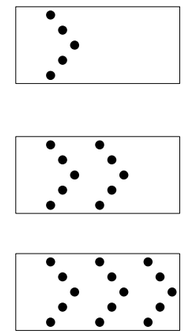
ALTERNATING DIAMOND CAUTION



DOUBLE ARROW



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



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

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

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

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

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

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

Texas Department of Transportation

Traffic Safety Division Standard

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

BC(7)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	SAT	KERR		22

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GENERAL NOTES

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

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

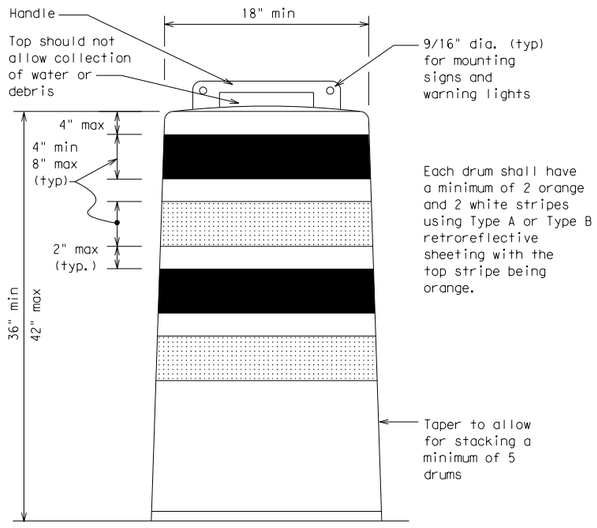
1. Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

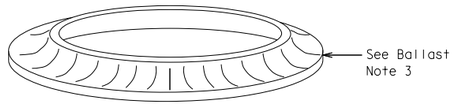
RETROREFLECTIVE SHEETING

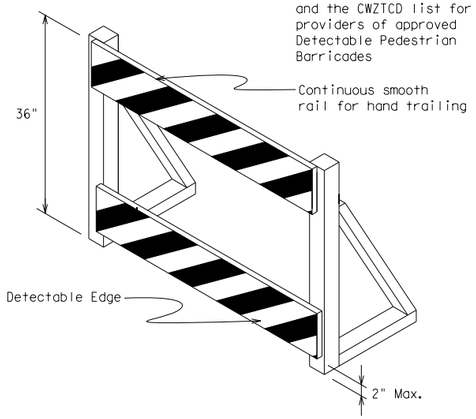
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

BALLAST

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

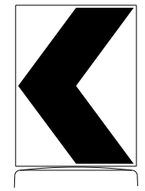




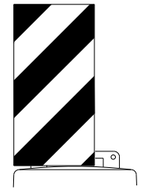


DETECTABLE PEDESTRIAN BARRICADES

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



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



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

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

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

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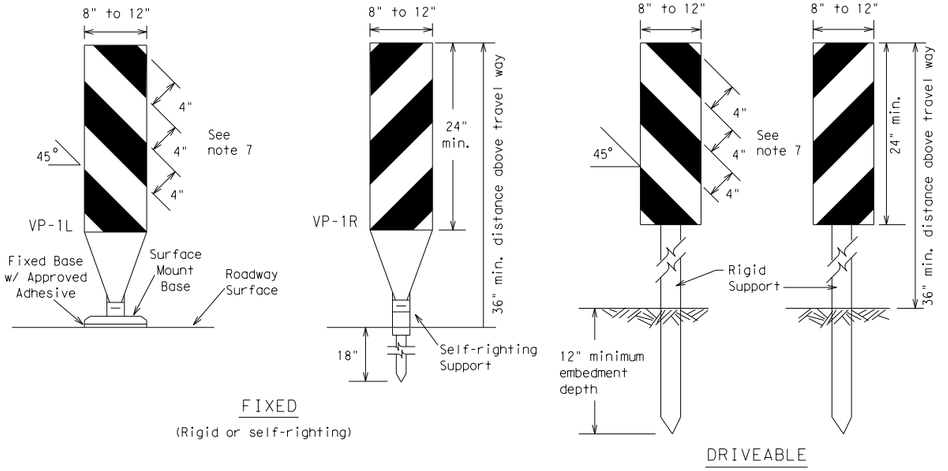
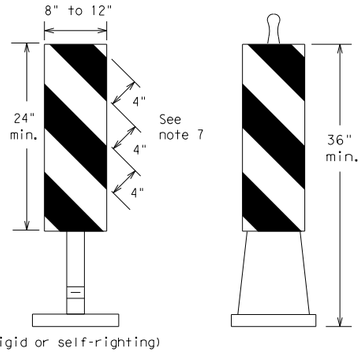


FIXED
(Rigid or self-righting)

DRIVEABLE

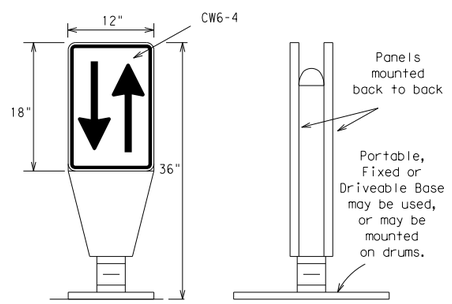


(Rigid or self-righting)

PORTABLE

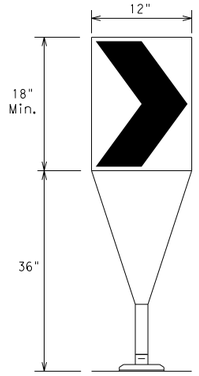
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is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

VERTICAL PANELS (VPs)



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

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



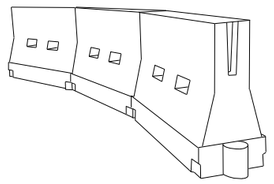
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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

CHEVRONS

GENERAL NOTES

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



LONGITUDINAL CHANNELIZING DEVICES (LCD)

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

WATER BALLASTED SYSTEMS USED AS BARRIERS

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

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

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

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

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

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES AND MINIMUM DESIRABLE TAPER LENGTHS

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Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(9)-21

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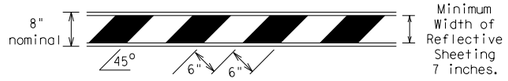
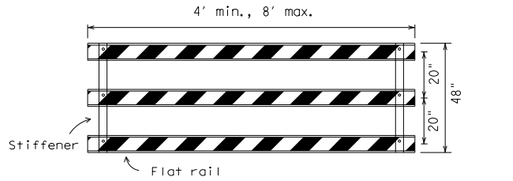
TYPE 3 BARRICADES

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.



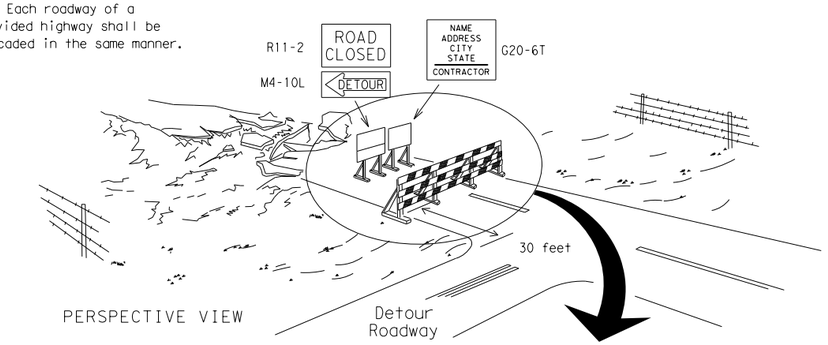
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

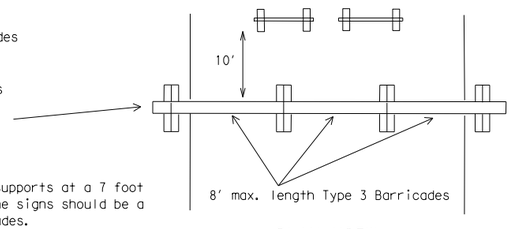
Each roadway of a divided highway shall be barricaded in the same manner.



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.

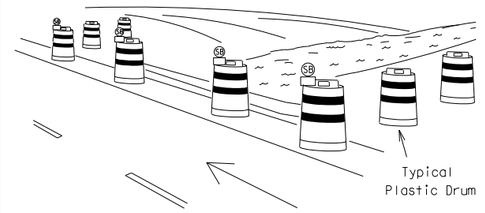
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

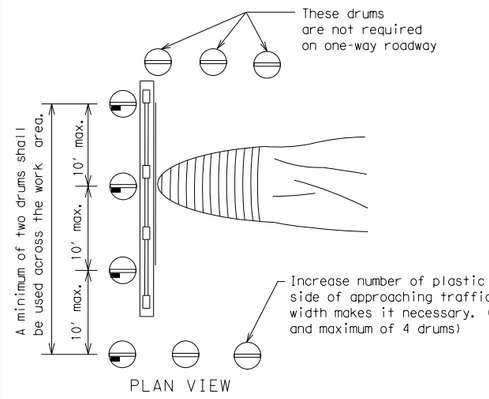
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

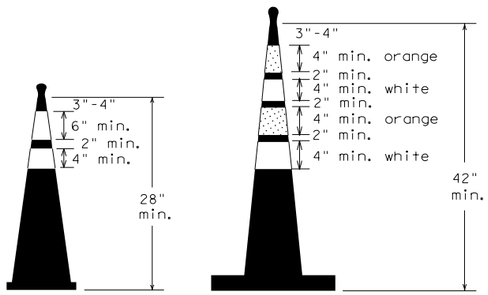
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



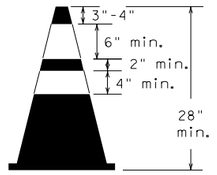
PLAN VIEW

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

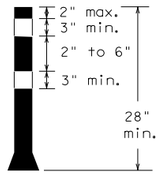
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

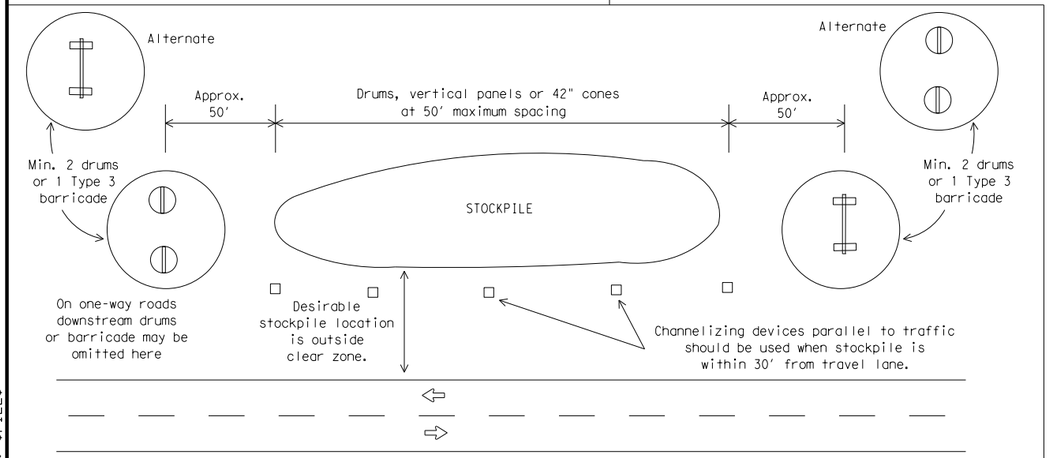


Tubular Marker

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

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

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



TRAFFIC CONTROL FOR MATERIAL STOCKPILES

SHEET 10 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

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WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

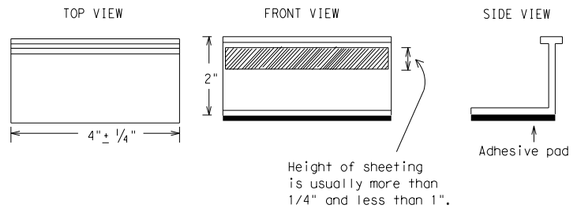
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

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BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

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FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT February 1998	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	SAT	KERR		26
11-02 8-14				

105

DATE: 1/11/2024 2:24:53 PM
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DATE: 1/11/2024 2:24:54 PM
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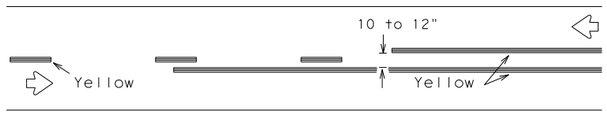
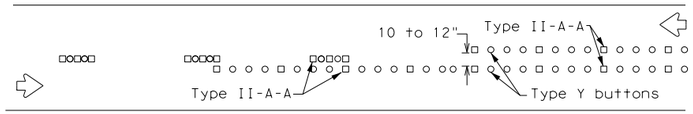
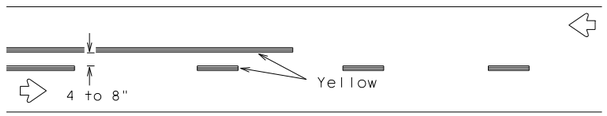
PAVEMENT MARKING PATTERNS



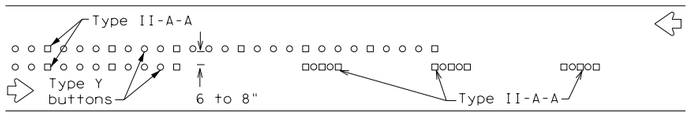
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



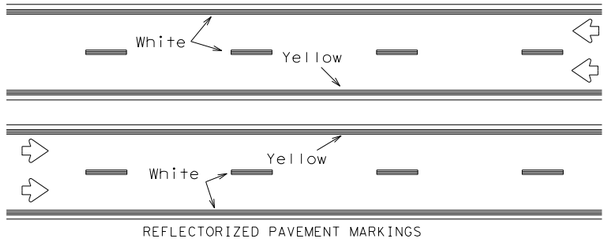
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



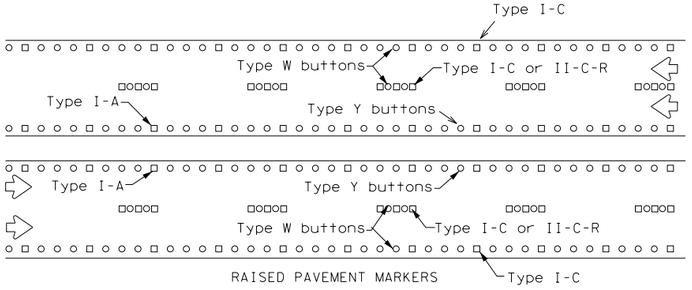
RAISED PAVEMENT MARKERS - PATTERN B

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

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



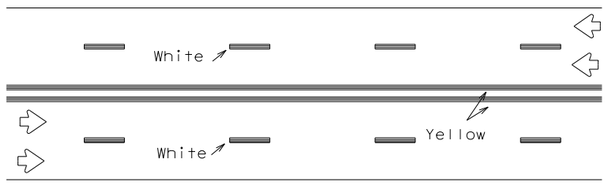
REFLECTORIZED PAVEMENT MARKINGS



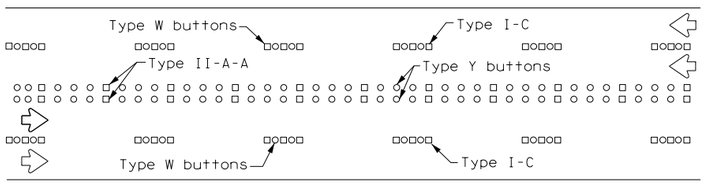
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



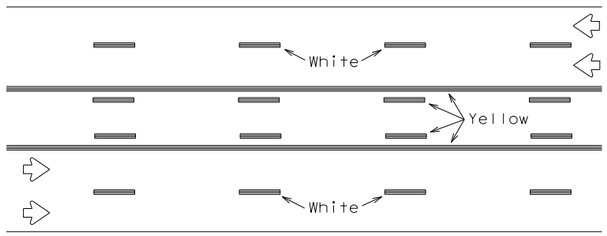
REFLECTORIZED PAVEMENT MARKINGS



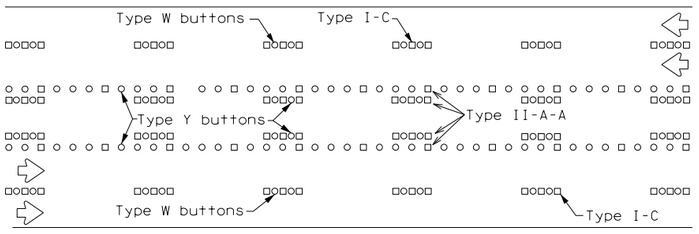
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

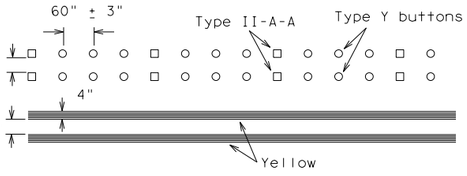
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

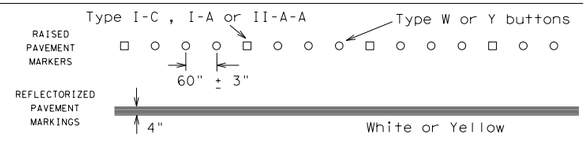
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

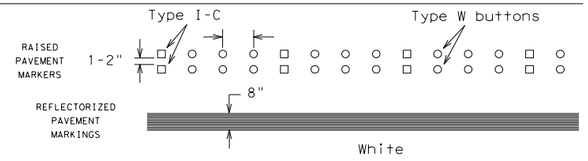


EDGE LINE OR SINGLE NO-PASSING LINE



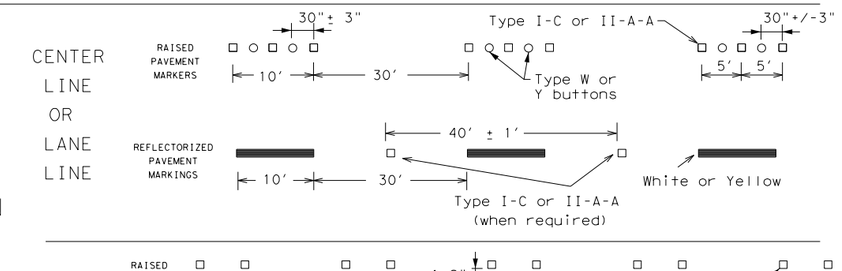
WIDE LINE

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

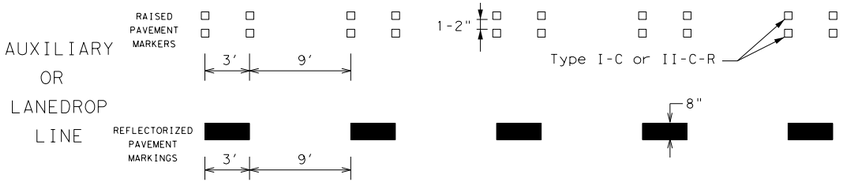


BROKEN LINES

CENTER LINE OR LANE LINE

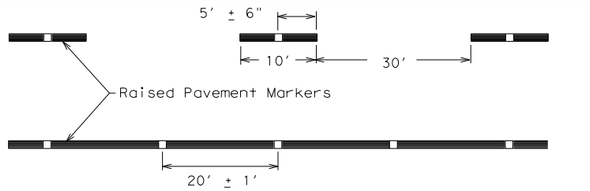


AUXILIARY OR LANEDROP LINE



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	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		27

DATE: 1/11/2024 2:24:55 PM
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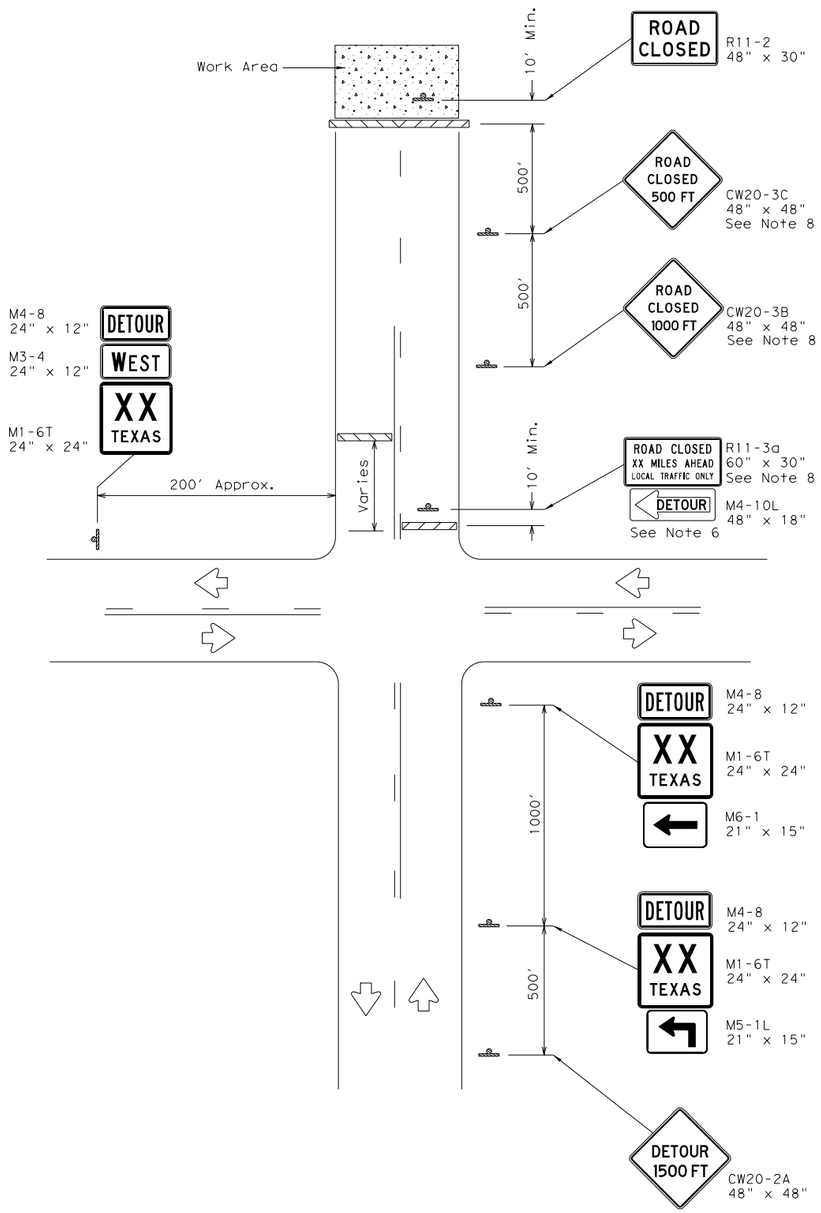
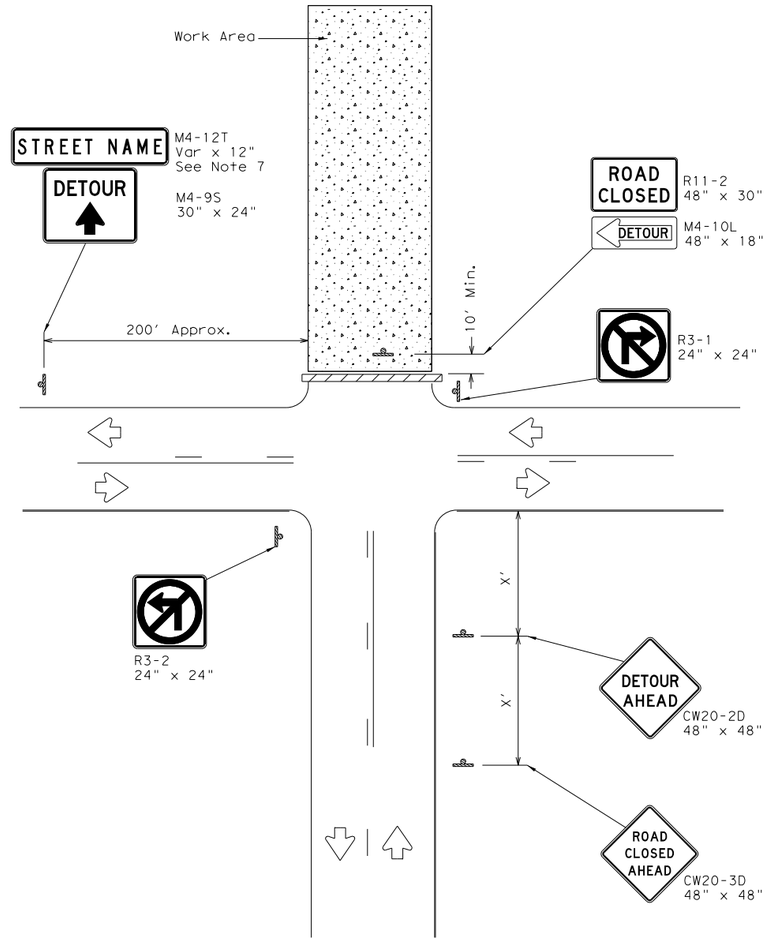


ROAD CLOSURE BEYOND THE INTERSECTION

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

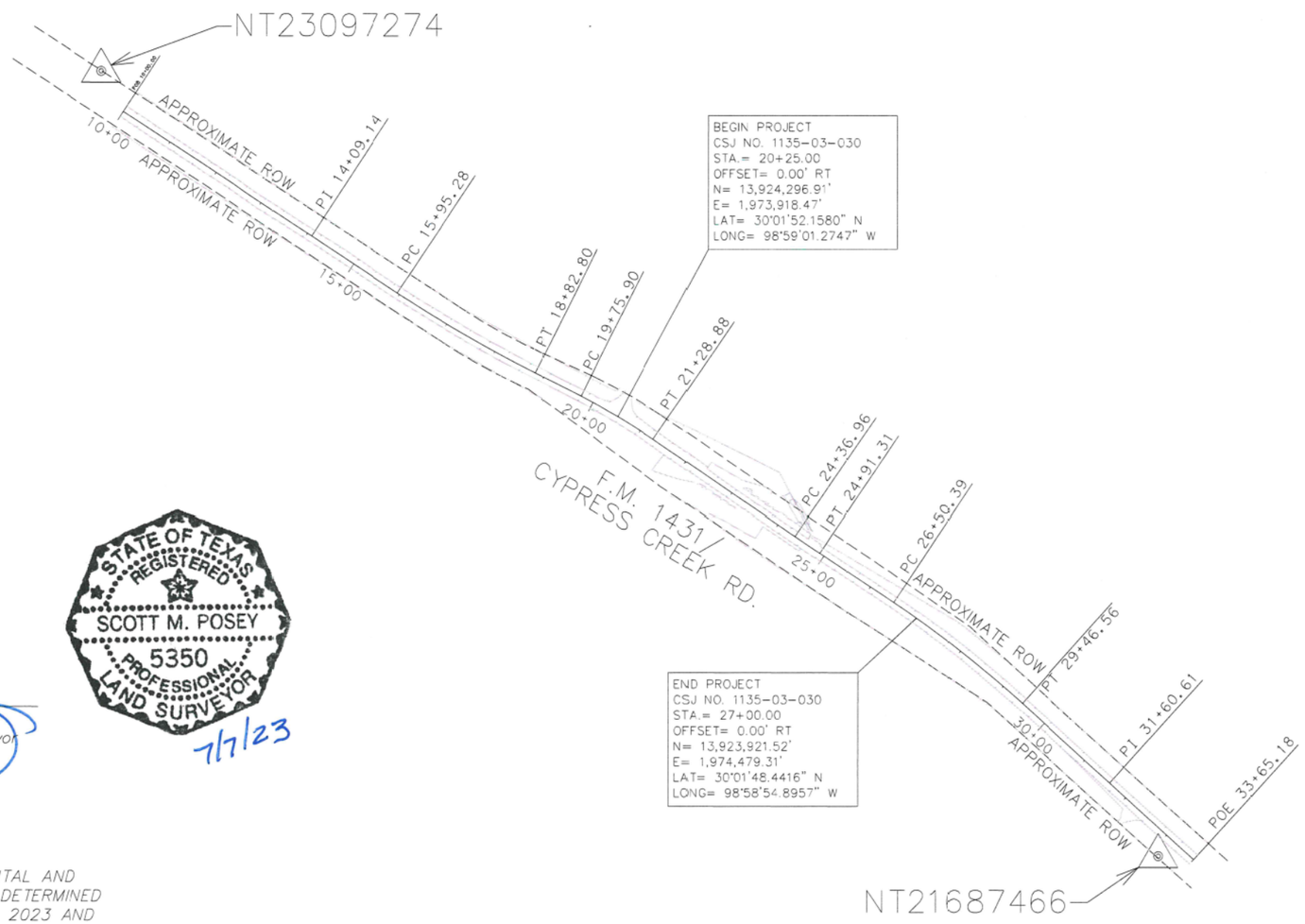
WORK ZONE ROAD CLOSURE DETAILS

WZ(RCD)-13

FILE: wzrcd-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT August 1995	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
1-97 4-98 7-13	DIST	COUNTY		SHEET NO.
2-98 3-03	SAT	KERR		28

113

CONTROL	SURFACE COORDINATES				
POINT	NORTHING	EASTING	ELEVATION	STATION	OFFSET
NT21687466	13,923,493.30	1,974,918.98	1,562.91'	33+13.96	38.30' RT
NT23097274	13,924,905.62	1,973,006.05	1,573.33'	OFF CHAIN	OFF CHAIN



N

250 0 125 250

GRAPHIC SCALE IN FEET

PLEASE REFER TO BAR SCALE. DRAWING MAY HAVE BEEN REDUCED OR ENLARGED.

1" = 500' (22" X 34" SHEETS)
1" = 250' (11" X 17" SHEETS)

CONTROL POINT LEGEND

△ DENOTES PRIMARY CONTROL POINT (5/8" IRON ROD SET IN CONCRETE WITH A 3 1/4" ALUMINUM CAP STAMPED "TEXAS DEPT OF TRANSPORTATION CONTROL MARK"), UNLESS OTHERWISE NOTED

NO.	DATE	REVISION	APPR BY

STATE OF TEXAS REGISTERED SCOTT M. POSEY 5350 PROFESSIONAL LAND SURVEYOR

7/7/23

Scott M. Posey
Registered Professional Land Surveyor
No. 5350

TBEPLS # 10048300

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON JANUARY 20, 2023 AND IS CORRECTLY SHOWN HEREON.

NOTE:

THE SURVEY CONTROL INFORMATION HAS BEEN ACCEPTED AND INCORPORATED INTO THIS "PS&E" WHICH IS SIGNED, SEALED AND DATED BY A TEXAS PROFESSIONAL ENGINEER.

HORIZONTAL DATUM: NAD-83 (2011)
VERTICAL DATUM: NAVD88
ZONE: TEXAS SOUTH CENTRAL (4204)
UNITS: U.S. SURVEY FEET

SURFACE ADJUSTMENT SCALE FACTOR: 1.00013

LAMB-STAR ENGINEERING, L.L.C.
3801 PARKWOOD BLVD, SUITE 550
FRISCO, TEXAS 75034
(214) 440-3600
TEXAS REGISTERED ENGINEERING
FIRM F-9073

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

FM 1341 AT CYPRESS CREEK

CONTROL DATA INDEX SHEET

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	29

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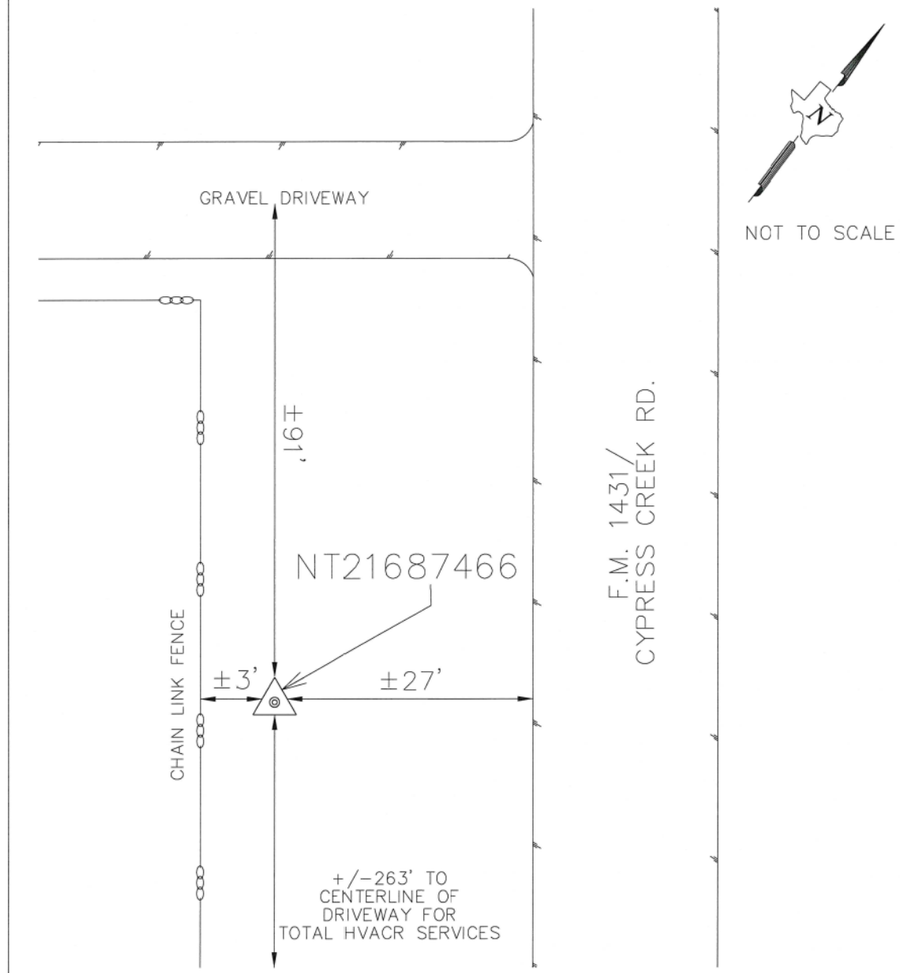
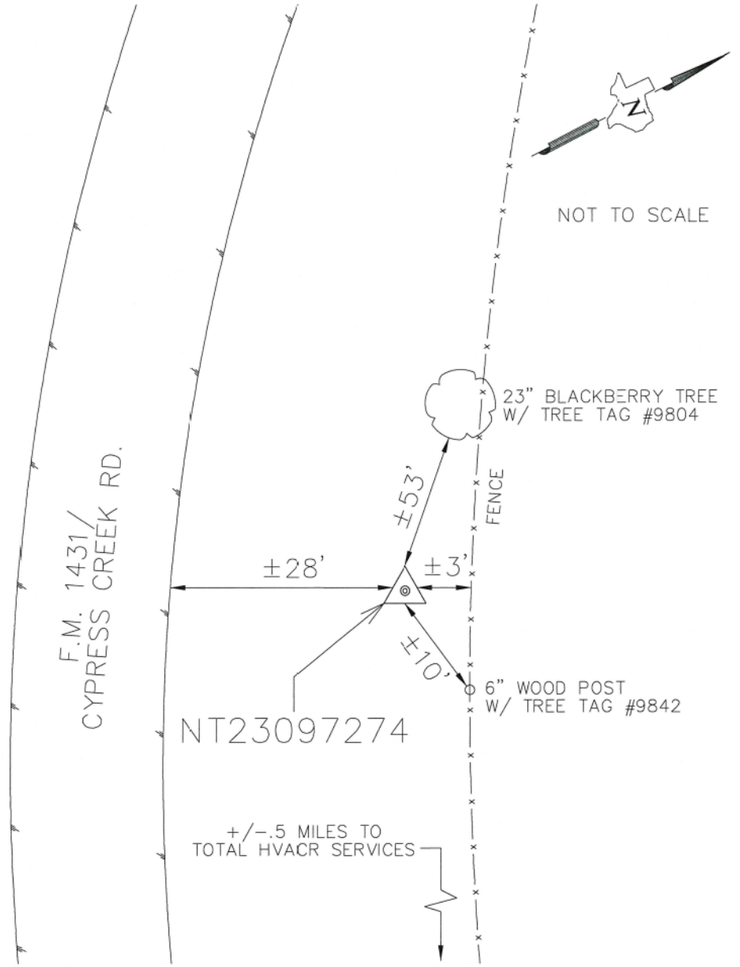


APPROXIMATE LOCATION NT21687466:

5/8" IRON ROD SET IN CONCRETE WITH A 3 1/4" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT", ±3' NORTH OF A CHAIN LINK FENCE, ±27' SOUTHWEST OF EDGE OF FM 1341/CYPRESS CREEK ASPHALT ROAD, ±91' SOUTHEAST OF CENTERLINE OF GRAVEL DRIVE WAY, AND 263' NORTHWEST OF THE CENTERLINE OF THE DRIVEWAY FOR TOTAL HVACR SERVICES.

US SURVEY FEET
NAVD 88 ELEVATION= 1,562.91'
DATE SET: JANUARY 20, 2023
MONUMENT: 3 1/4" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT"
KERR COUNTY SCALE FACTOR: 1.00013
SURFACE ENGLISH CO-ORDS
NORTHING: 13,923,493.3024
EASTING: 1,974,918.9784
STATE PLANE ENGLISH CO-ORDS
NORTHING: 13,921,683.4835
EASTING: 1,974,662.2723
ELEVATIONS ARE NAVD 88 BASED UPON TxDOT VRS RTK NETWORK



APPROXIMATE LOCATION NT23097274:

5/8" IRON ROD SET IN CONCRETE WITH A 3 1/4" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT", ±28' NORTHWEST OF EDGE OF FM1341/CYPRESS CREEK ASPHALT ROAD, ±53' SOUTHEAST OF A 23" BLACKWALNUT WITH TAG NUMBER 9804, ±3' SOUTHWEST OF A FENCE, ±10' SOUTHWEST OF A 6" WOOD POST WITH TREE TAG NUMBER 9842, AND ±0.5 MILE NORTHWEST OF TOTAL HVACR SERVICES.

US SURVEY FEET
NAVD 88 ELEVATION= 1,573.33'
DATE SET: JANUARY 20, 2023
MONUMENT: 3 1/4" ALUMINUM CAP STAMPED "TEXAS DEPT. OF TRANSPORTATION CONTROL POINT"
KERR COUNTY SCALE FACTOR: 1.00013
SURFACE ENGLISH CO-ORDS
NORTHING: 13,924,905.6225
EASTING: 1,973,006.0457
STATE PLANE ENGLISH CO-ORDS
NORTHING: 13,923,095.6200
EASTING: 1,972,749.5883
ELEVATIONS ARE NAVD 88 BASED UPON TxDOT VRS RTK NETWORK

I HEREBY CERTIFY THAT THE HORIZONTAL AND VERTICAL DATA SHOWN HEREON WAS DETERMINED BY A FIELD SURVEY ON JANUARY 20, 2023 UTILIZING THE TxDOT VIRTUAL REFERENCE SYSTEM RTK NETWORK AND IS CORRECTLY SHOWN HEREON.

STATE OF TEXAS
REGISTERED
SCOTT M. POSEY
5350
PROFESSIONAL
LAND SURVEYOR

6/28/23

Scott M. Posey
Registered Professional Land Surveyor
No. 5350

TBPELS # 10048300

NO.	DATE	REVISION	APPR BY

LAMB-STAR ENGINEERING, L.L.C.
3801 PARKWOOD BLVD, SUITE 550
FRISCO, TEXAS 75034
(214) 440-3600
TEXAS REGISTERED ENGINEERING
FIRM F-9073

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

FM 1341 AT CYPRESS CREEK

HORIZONTAL AND VERTICAL CONTROL

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	30

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User Name: Roy.Hendershot

℄ FM1341

Project Name: FM1341
Description:
Horizontal Alignment Name: FM1341_CL
Description: Created By Civil Geometry
Style: Default

		STATION	NORTHING	EASTING
Element: Linear				
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Eqn	( )	0+00.00	13924832.690	1973045.776
Eqn	( )	R1 10+00.00	13924832.690	1973045.776
PI	( )	R1 14+09.14	13924608.577	1973388.075
Tangent Direction:		326.8°		
Tangent Length:		409.1392		
Element: Linear				
PI	( )	R1 14+09.14	13924608.577	1973388.075
PC	( )	R1 15+95.28	13924505.936	1973543.365
Tangent Direction:		326.5°		
Tangent Length:		186.1453		
Element: Circular				
PC	( )	R1 15+95.28	13924505.936	1973543.365
PI	( )	R1 17+39.21	13924426.576	1973663.431
CC	( )		13926549.821	1974894.302
PT	( )	R1 18+82.80	13924361.820	1973791.964
Radius:		2450.0000		
Delta:		6.7° Left		
Degree of Curvature(Arc):		2.3°		
Length:		287.5171		
Tangent:		143.9238		
Chord:		287.3521		
Middle Ordinate:		4.2164		
External:		4.2237		
Tangent Direction:		326.5°		
Radial Direction:		236.5°		
Chord Direction:		329.9°		
Radial Direction:		243.3°		
Tangent Direction:		333.3°		
Element: Linear				
PT	( )	R1 18+82.80	13924361.820	1973791.964
PC	( )	R1 19+75.90	13924319.930	1973875.110
Tangent Direction:		333.3°		
Tangent Length:		93.1023		
Element: Circular (CURVE #1)				
PC	( )	R1 19+75.90	13924319.930	1973875.110
PI	( )	R1 20+52.50	13924285.465	1973943.518
CC	( )		13923292.909	1973357.686
PT	( )	R1 21+28.88	13924242.232	1974006.751
Radius:		1150.0000		
Delta:		7.6° Right		
Degree of Curvature(Arc):		5.0°		
Length:		152.9730		
Tangent:		76.5995		
Chord:		152.8603		
Middle Ordinate:		2.5426		
External:		2.5483		
Tangent Direction:		333.3°		
Radial Direction:		243.3°		
Chord Direction:		329.4°		
Radial Direction:		235.6°		
Tangent Direction:		325.6°		
Element: Linear				
PT	( )	R1 21+28.88	13924242.232	1974006.751
PC	( )	R1 24+36.96	13924068.349	1974261.073
Tangent Direction:		325.6°		
Tangent Length:		308.0827		
Element: Circular (CURVE #2)				
PC	( )	R1 24+36.96	13924068.349	1974261.073
PI	( )	R1 24+64.13	13924053.012	1974283.505
CC	( )		13928195.842	1977083.094
PT	( )	R1 24+91.31	13924037.919	1974306.102
Radius:		5000.0000		
Delta:		0.6° Left		
Degree of Curvature(Arc):		1.1°		
Length:		54.3472		
Tangent:		27.1739		
Chord:		54.3470		
Middle Ordinate:		0.0738		
External:		0.0738		
Tangent Direction:		325.6°		
Radial Direction:		235.6°		
Chord Direction:		326.0°		
Radial Direction:		236.3°		
Tangent Direction:		326.3°		
Element: Linear				
PT	( )	R1 24+91.31	13924037.919	1974306.102
PC	( )	R1 26+50.39	13923949.566	1974438.392
Tangent Direction:		326.3°		
Tangent Length:		159.0819		
Element: Circular (CURVE #3)				
PC	( )	R1 26+50.39	13923949.566	1974438.392
PI	( )	R1 27+98.73	13923867.175	1974561.754
CC	( )		13922244.817	1973299.826
PT	( )	R1 29+46.56	13923767.881	1974671.969
Radius:		2050.0000		
Delta:		8.3° Right		
Degree of Curvature(Arc):		2.8°		
Length:		296.1750		
Tangent:		148.3456		
Chord:		295.9175		
Middle Ordinate:		5.3464		
External:		5.3604		
Tangent Direction:		326.3°		
Radial Direction:		236.3°		
Chord Direction:		322.1°		
Radial Direction:		228.0°		
Tangent Direction:		318.0°		
Element: Linear				
PT	( )	R1 29+46.56	13923767.881	1974671.969
PI	( )	R1 31+60.61	13923624.609	1974830.999
Tangent Direction:		318.0°		
Tangent Length:		214.0500		
Element: Linear				
PI	( )	R1 31+60.61	13923624.609	1974830.999
POE	( )	R1 33+65.18	13923487.317	1974982.650
Tangent Direction:		317.8°		
Tangent Length:		204.5656		

℄ FM1341 FL

Project Name: FM1341
Description:
Horizontal Alignment Name: FM1341_FL
Description: Created By Civil Geometry
Style: Geom_Centerline

		STATION	NORTHING	EASTING
Element: Linear				
POB	( )	0+00.00	13924172.438	1973997.919
PI	( )	0+43.06	13924161.124	1974039.469
Tangent Direction:		344.8°		
Tangent Length:		43.0629		
Element: Linear				
PI	( )	0+43.06	13924161.124	1974039.469
PI	( )	1+03.47	13924141.285	1974096.520
Tangent Direction:		340.8°		
Tangent Length:		60.4026		
Element: Linear				
PI	( )	1+03.47	13924141.285	1974096.520
PI	( )	1+34.55	13924134.633	1974126.881
Tangent Direction:		347.6°		
Tangent Length:		31.0811		
Element: Linear				
PI	( )	1+34.55	13924134.633	1974126.881
PI	( )	1+98.46	13924146.432	1974189.695
Tangent Direction:		10.6°		
Tangent Length:		63.9130		
Element: Linear				
PI	( )	1+98.46	13924146.432	1974189.695
POE	( )	2+59.48	13924127.133	1974247.586
Tangent Direction:		341.6°		
Tangent Length:		61.0230		

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

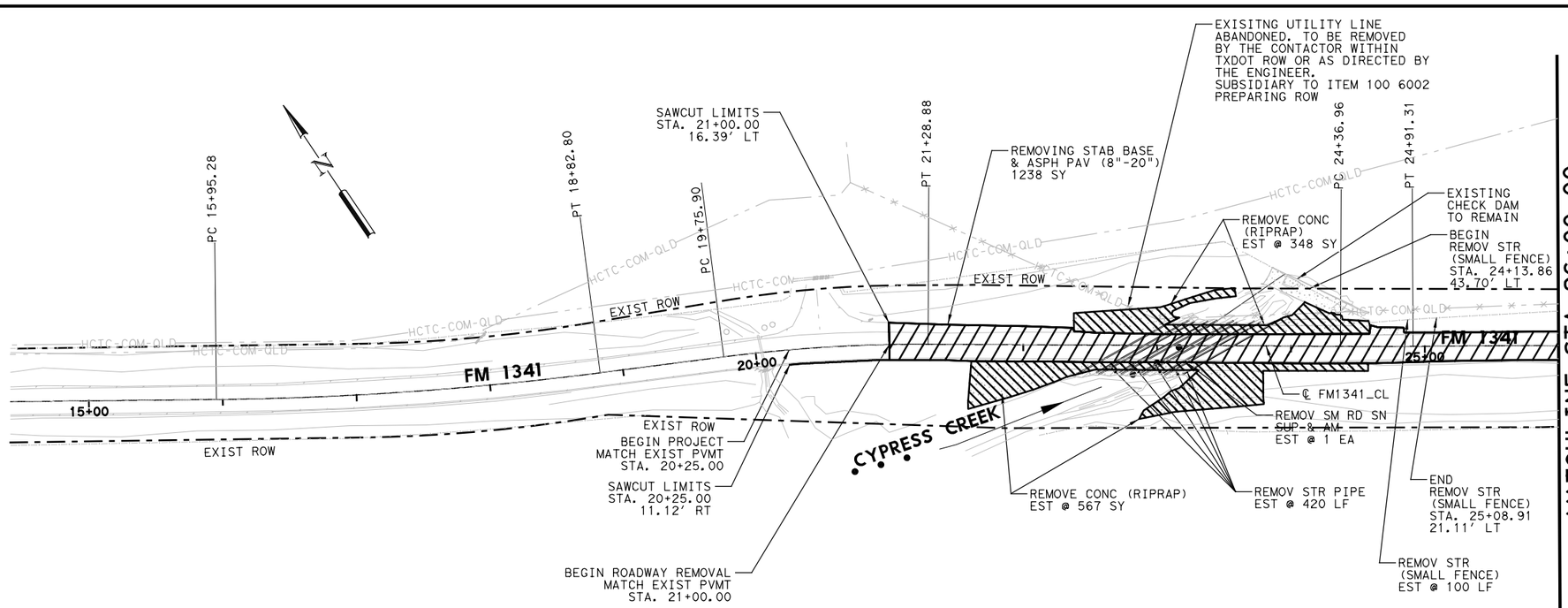
FM 1341 AT CYPRESS CREEK

HORIZONTAL ALIGNMENT DATA

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	31

FINAL PLANS SUBMITTAL



SHEET SUMMARY OF ESTIMATED QUANTITIES			
ITEM#	DESCRIPTION	UNIT	QTY
0104 6009	REMOVING CONC (RIPRAP)	SY	915
0105 6061	REMOV STAB BASE & ASPH PAV (8"-20")	SY	1526
0496 6007	REMOV STR (PIPE)	LF	420
0496 6043	REMOV STR (SMALL FENCE)	LF	100
0644 6076	REMOVE SM RD SN SUP&AM	EA	1

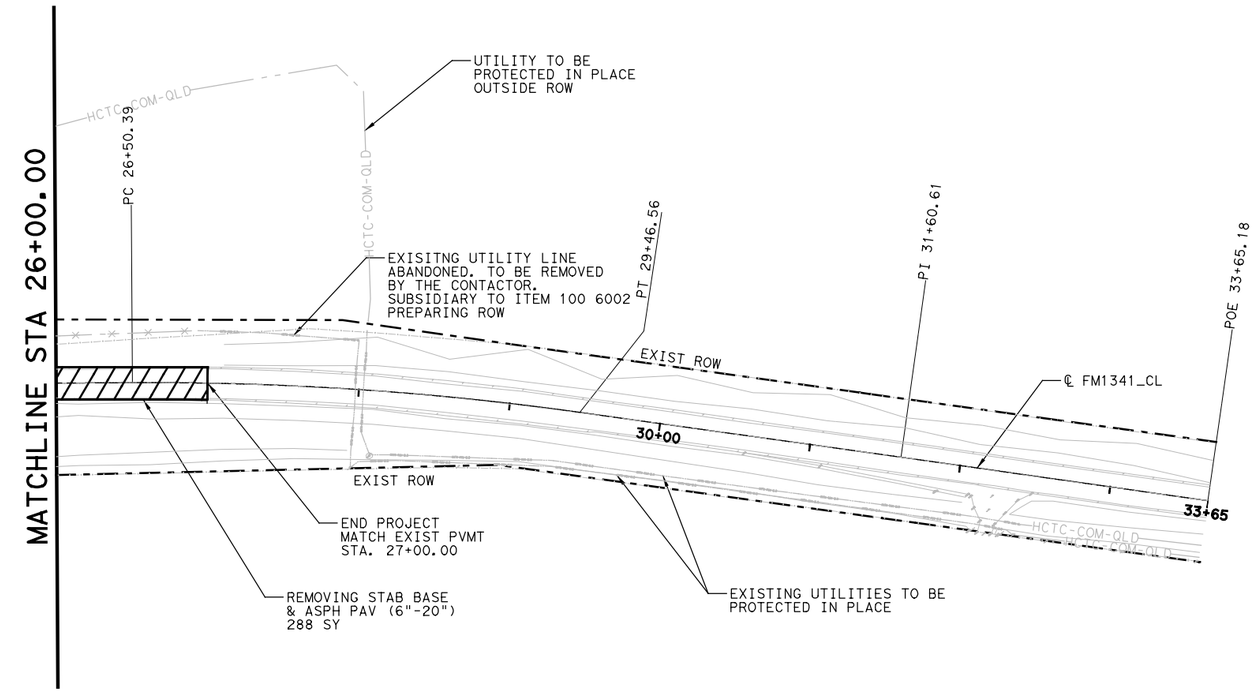
LEGEND

REMOVING STAB BASE & ASPH PAV (6"-20")

REMOVE CONC (RIPRAP)

NOTE:

1. THE CONTRACTOR SHALL NOT PROCEED WITH THE REMOVAL OF EXISTING FENCE (ITEM 0496) WITHOUT THE WRITTEN APPROVAL BY THE ENGINEER.
2. SAWCUT SUBSIDIARY TO ITEM 0105 REMOV STAB BASE AND ASPH PAV.



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0 50 100 150 200
SCALE IN FEET

FM 1341 AT CYPRESS CREEK

REMOVAL LAYOUT

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	32

PLOTDRIVER: TXDOT-PDF-BW.pltcfg
PENTABLE: 113503030.tbl
DATE: 1/11/2024
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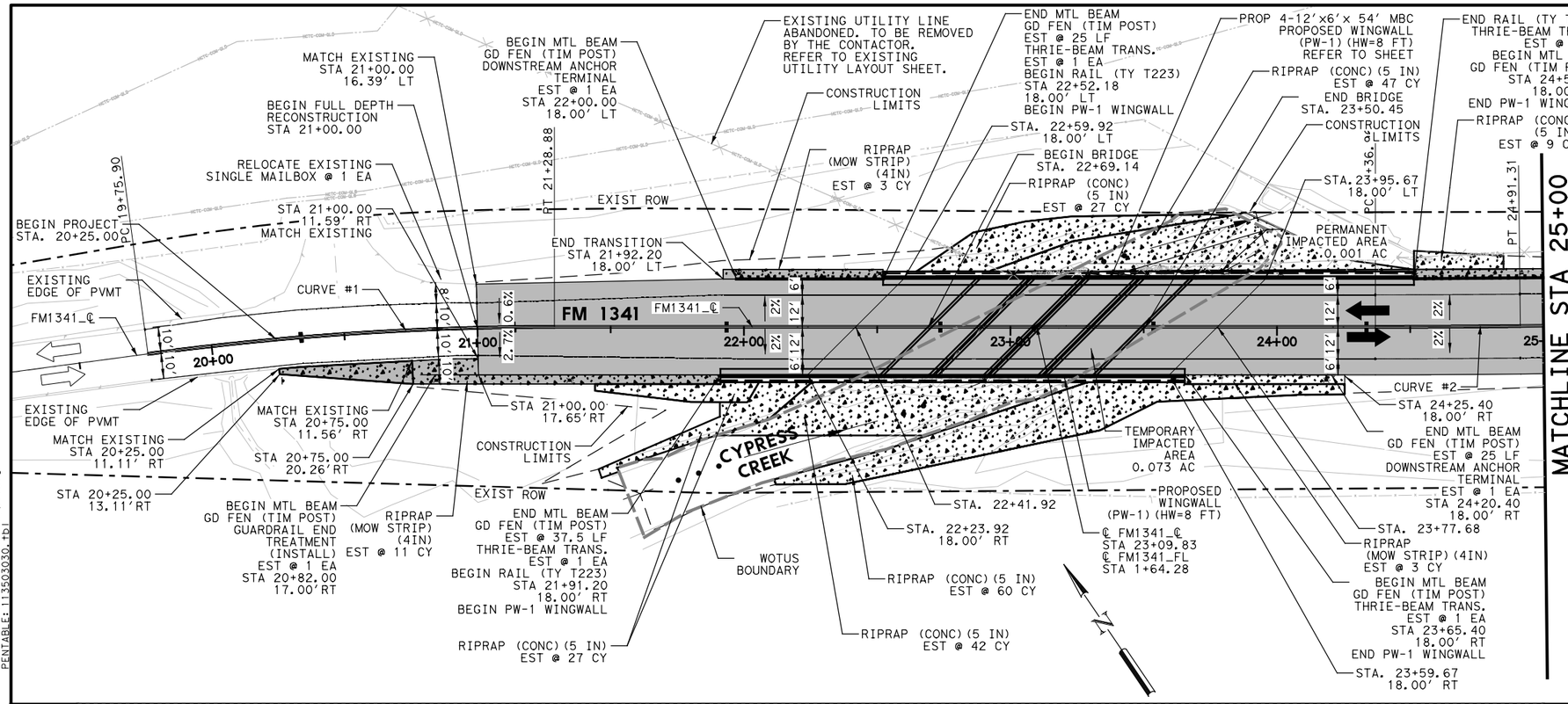
File Name: FM1341-REMOVAL-PP01.dgn
User Name: EWANG

FINAL PLANS SUBMITTAL

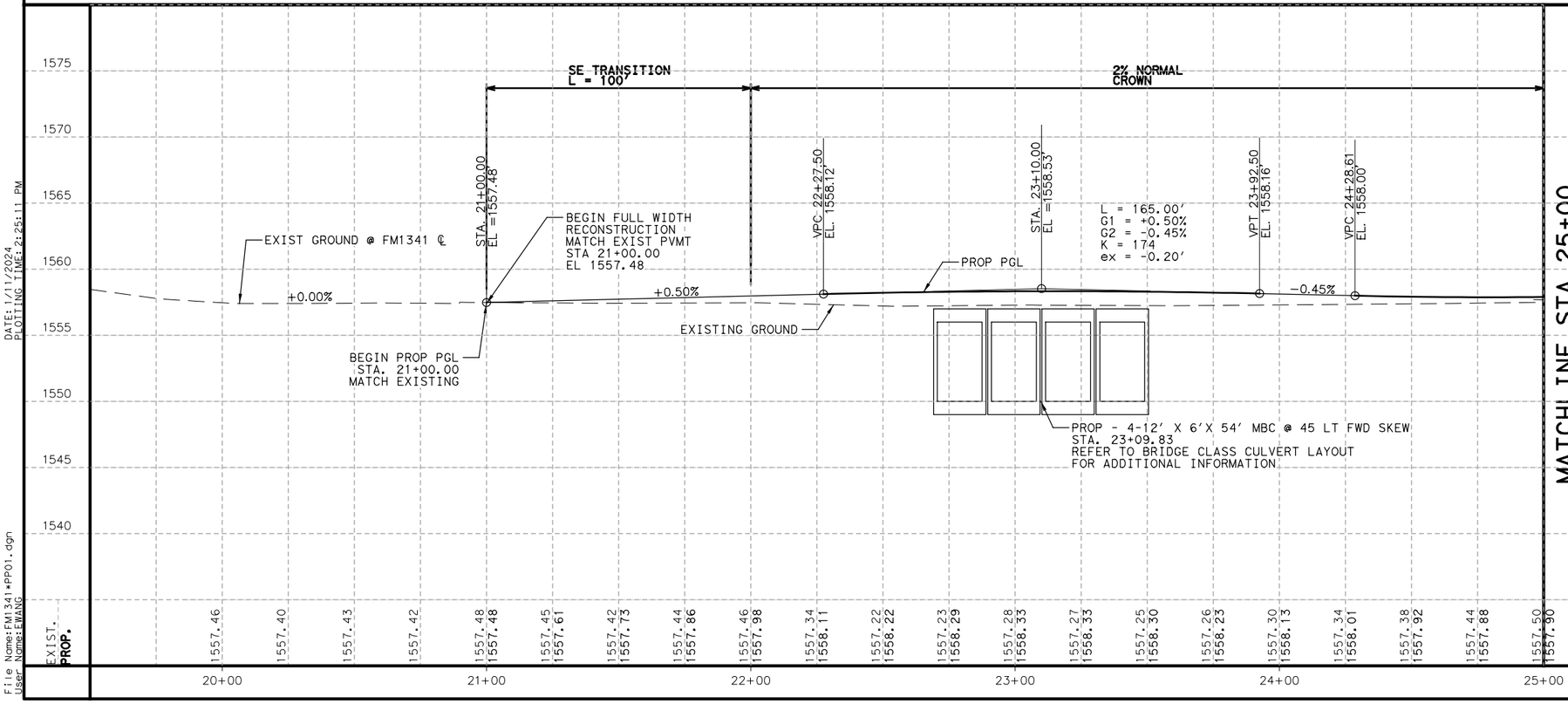


SHEET SUMMARY OF ESTIMATED QUANTITIES			
ITEM#	DESCRIPTION	UNIT	QTY
0100 6002	PREPARING ROW	STA	5
0110 6001	EXCAVATION (ROADWAY)	CY	352
0110 6002	EXCAVATION (CHANNEL)	CY	768
0132 6003	EMBANKMENT (FINAL)(ORD COMP)(TY B)	CY	122
0216 6001	PROOF ROLLING	HR	42
0400 6005	CEM STABIL BKFL	CY	88
0432 6002	RIPRAP (CONC)(5 IN)	CY	212
0432 6045	RIPRAP (MOW STRIP)(4 IN)	CY	17
0540 6001	MTL W-BEAM GD FEN (TIM POST)	LF	87.5
0540 6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	4
0540 6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	2
0544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
0552 6002	WIRE FENCE (TY B)	LF	100
0560 6025	RELOCATE EXISTING MAILBOX	EA	1
3076 6003	D-GR HMA TY-B PG64-22 (EXEMPT)	TON	720
3076 6074	D-GR HMA TY-C SAC-B PG70-22 (EXEMPT)	TON	178
3076 6066	TACK COAT	GAL	313
3084 6001	BONDING COURSE	GAL	309

LEGEND

- EXIST FENCE
- METAL BEAM GUARD FENCE
- PROP TRAFFIC LANE
- EXIST TRAFFIC LANE
- FLOW ARROW
- BORING
- PROPOSED RECONSTRUCTION
- CONCRETE RIPRAP

PROPOSED NBI # 15-133-0-1135-03-119
HL 93 LOADING
INV/OPR RATINGS: 1.00/1.30* ~*assumed rating



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01/11/24

0 25 50 75 100
HORIZ. SCALE IN FEET

0 5 10 15 20
VERT. SCALE IN FEET

FM 1341 AT CYPRESS CREEK

PLAN AND PROFILE STA 20+00 TO STA 25+00

SCALE: 1"=50'-H
1"=10'-V

SHEET 1 OF 2

DSN: EW	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	33

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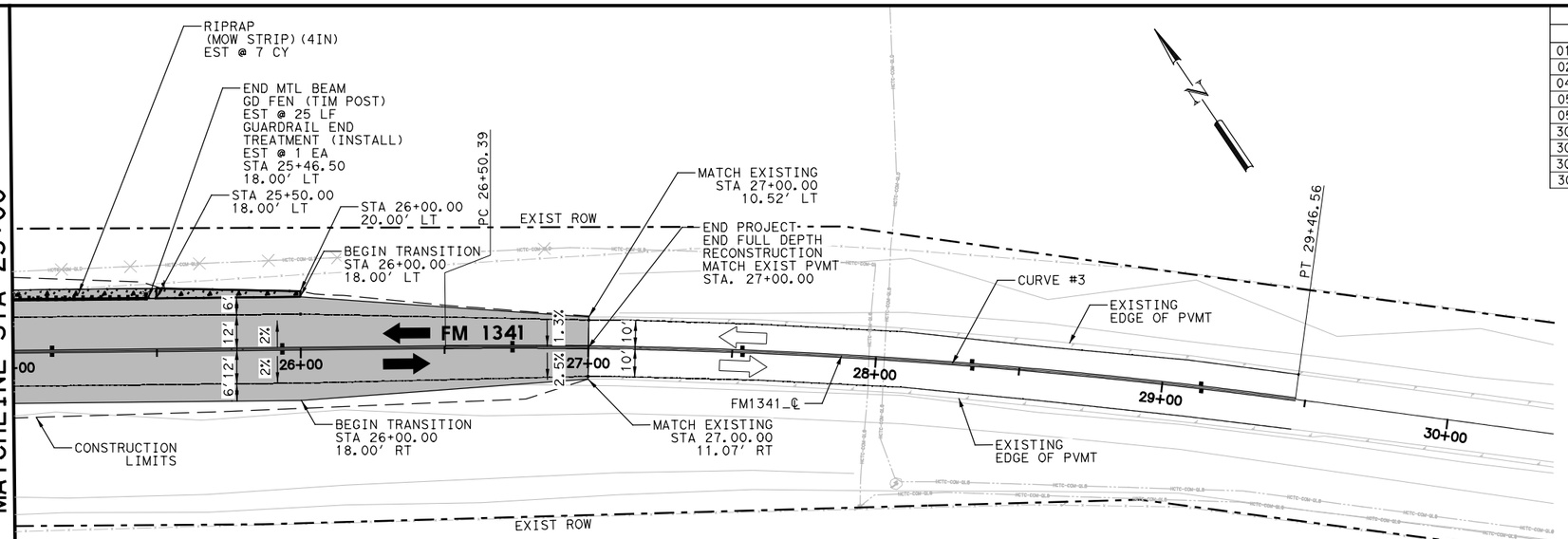
PENTABLE: 113503030.tbl
DATE: 1/11/2024
PLOTTING TIME: 2:25:11 PM
File Name: FM1341-PP01.dgn
User Name: EWANG

FINAL PLANS SUBMITTAL

PLOTDRIVER: TXDOT-PDF-BW.pltcfg
PENTABLE: 113030.tbl

MATCHLINE STA 25+00



SHEET SUMMARY OF ESTIMATED QUANTITIES			
ITEM#	DESCRIPTION	UNIT	QTY
0100 6002	PREPARING ROW	STA	2
0216 6001	PROOF ROLLING	HR	19
0432 6045	RIPRAP (MOW STRIP)(4 IN)	CY	7
0540 6001	MTL W-BEAM GD FEN (TIM POST)	LF	25
0544 6001	GUARDRAIL END TREATMENT (INSTALL)	EA	1
3076 6003	D-GR HMA TY-B PG64-22 (EXEMPT)	TON	342
3076 6074	D-GR HMA TY-C SAC-B PG70-22 (EXEMPT)	TON	84
3076 6066	TACK COAT	GAL	149
3084 6001	BONDING COURSE	GAL	148

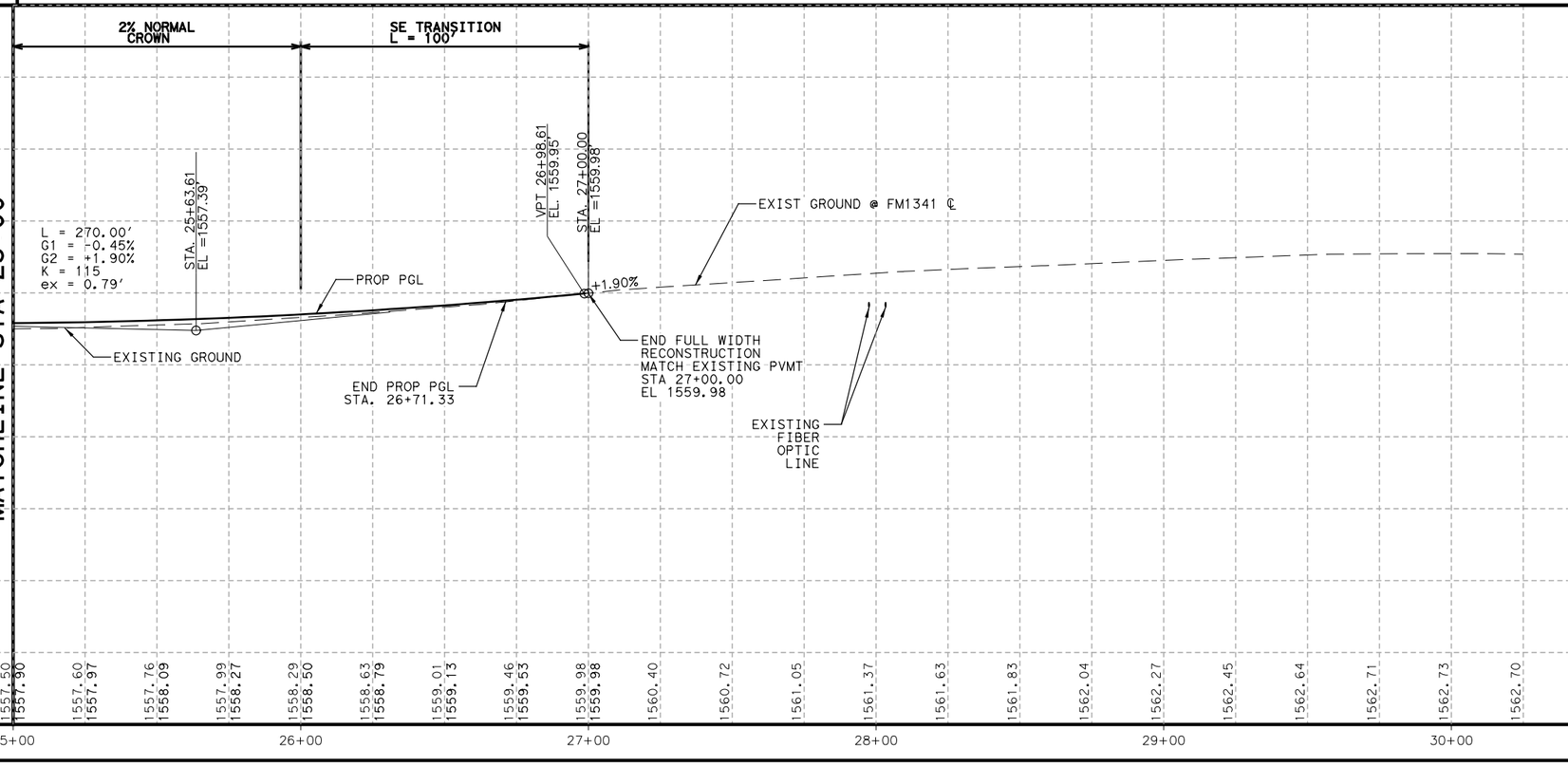
LEGEND

- EXIST FENCE
- METAL BEAM GUARD FENCE
- PROP TRAFFIC LANE
- EXIST TRAFFIC LANE
- FLOW ARROW
- BORING
- PROPOSED RECONSTRUCTION
- CONCRETE RIPRAP

DATE: 1/11/2024
PLOTTING TIME: 2:25:14 PM

File Name:FM1341*PP02.dgn
User Name:EWANG

MATCHLINE STA 25+00



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STATE OF TEXAS
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123262
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01/11/24

HORIZ. SCALE IN FEET: 0 25 50 75 100
VERT. SCALE IN FEET: 0 5 10 15 20

FM 1341 AT CYPRESS CREEK

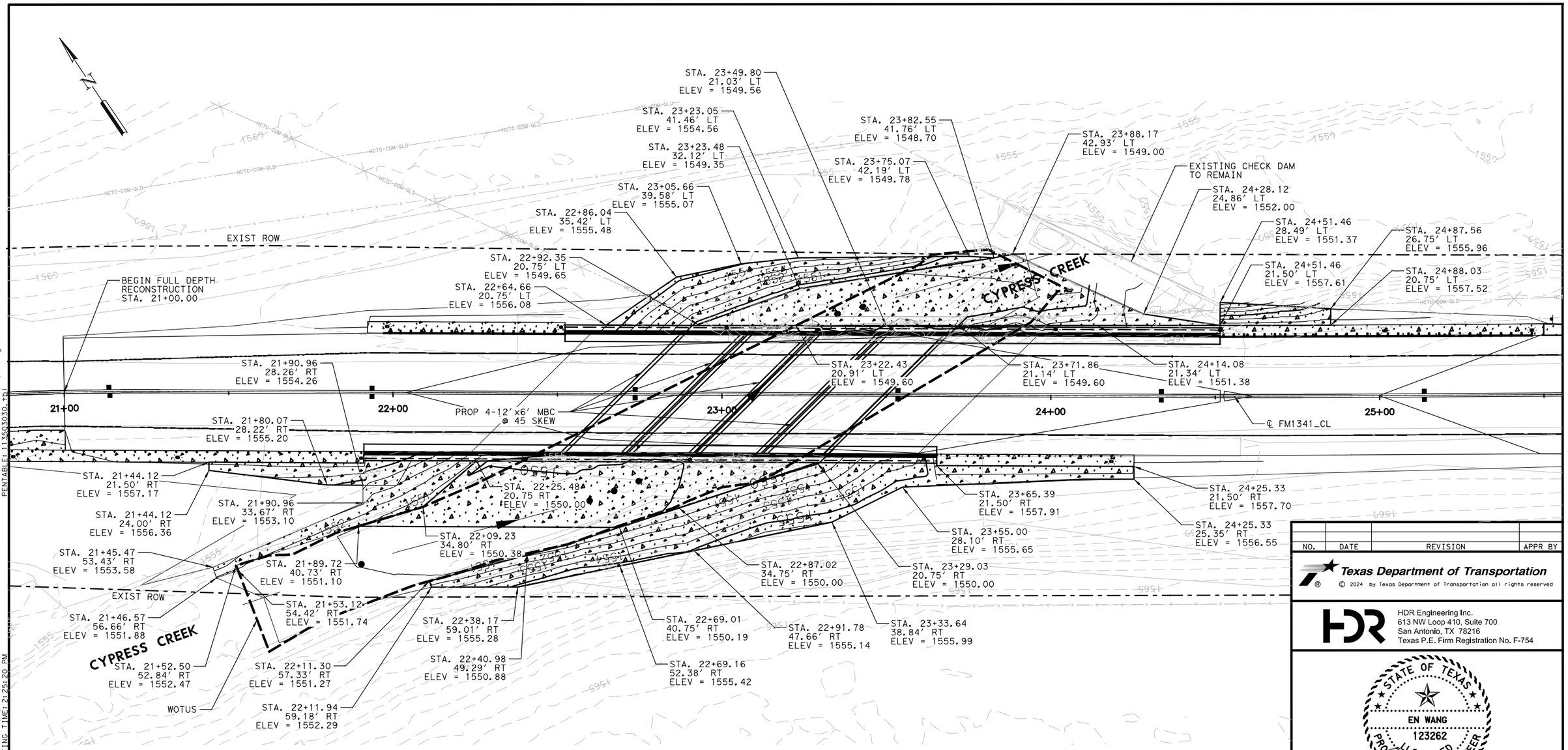
PLAN AND PROFILE STA 25+00 TO END

SCALE: 1"=50'-H
1"=10'-V

SHEET 2 OF 2

DSN: EW	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	34

FINAL PLANS SUBMITTAL



LEGEND

- PROPOSED MAJOR CONTOUR (5')
- PROPOSED MINOR CONTOUR (1')
- EXISTING MAJOR CONTOUR (5')
- EXISTING MINOR CONTOUR (1')
- CONCRETE RIPRAP

NOTE

1. REFER TO CRR-19 STANDARD FOR RIPRAP DETAILS.
2. STATIONS, OFFSETS, AND ELEVATIONS DEPICT THE TOP OR BOTTOM OF CONCRETE CHANNEL. ALL STATIONS ARE MEASURED FROM THE CENTERLINE OF FM 1341.
3. CONTRACTOR SHALL TAKE CAUTION WHILE EXCAVATING AND CONSTRUCTING NEAR THE EXISTING CHECK DAM STRUCTURE.

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01/11/24

0 15 30 45 60
SCALE IN FEET

FM 1341 AT CYPRESS CREEK
OVERALL
GRADING LAYOUT

SCALE: 1"=30'

SHEET 1 OF 1

DSN: EW	STATE	FED RD. DIV. NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	35

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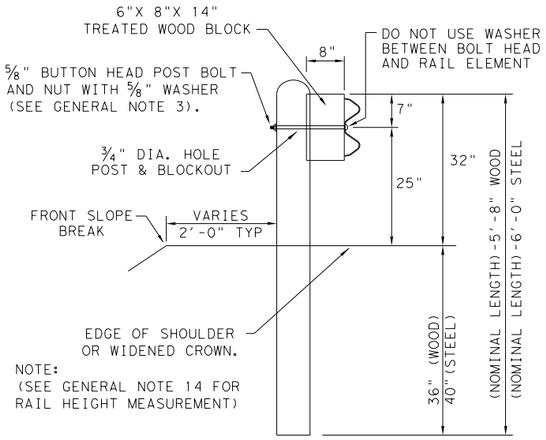
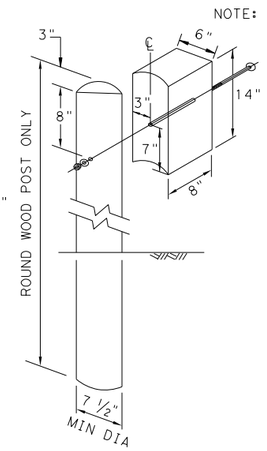
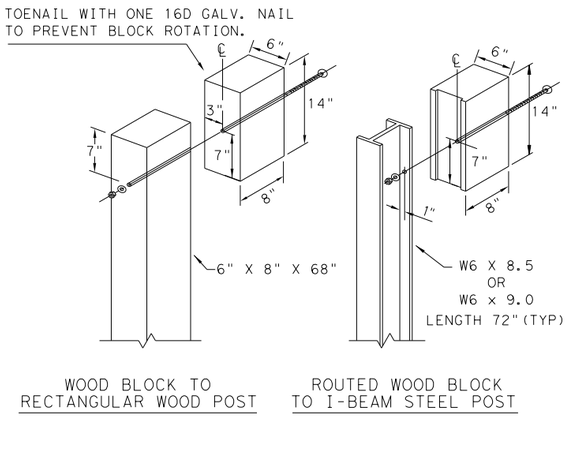


TYPICAL POST PLACEMENT



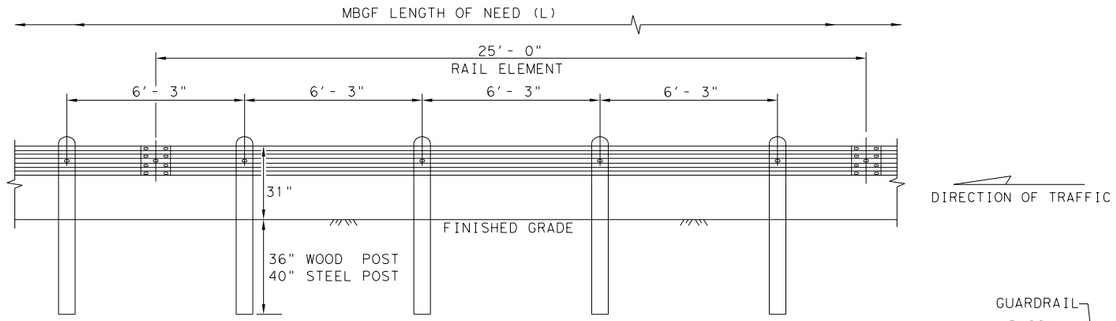
WOOD BLOCK TO
ROUND WOOD POST



WOOD BLOCK TO
RECTANGULAR WOOD POST

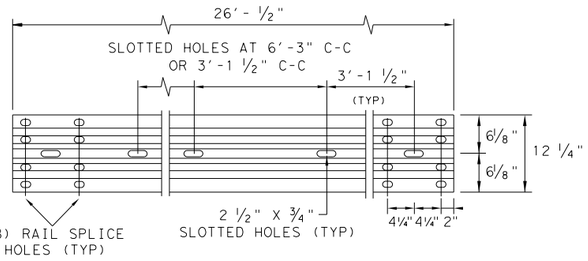
ROUTED WOOD BLOCK
TO I-BEAM STEEL POST

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



ELEVATION
MID-SPAN RAIL SPLICE

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



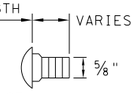
ELEVATION 25'- 0"(NOM.) W-BEAM SECTION

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

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

SPLICE BOLT LENGTH

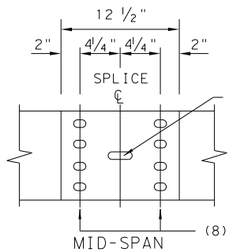
FBB01 = 1 ¼"
FBB02 = 2"



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

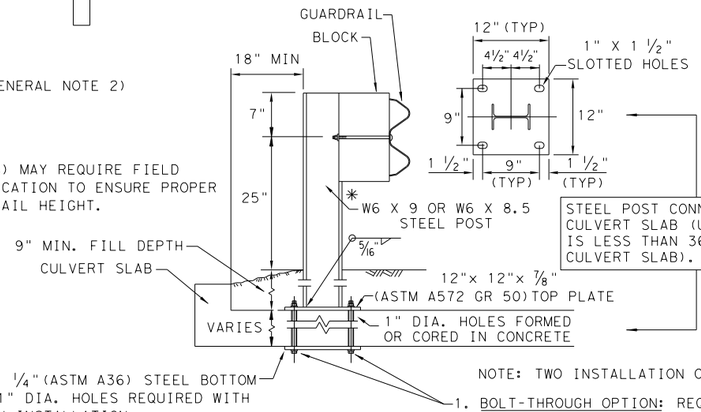
BUTTON HEAD BOLT

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



MID-SPAN
RAIL SPLICE DETAIL

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



LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

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

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

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

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.

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.

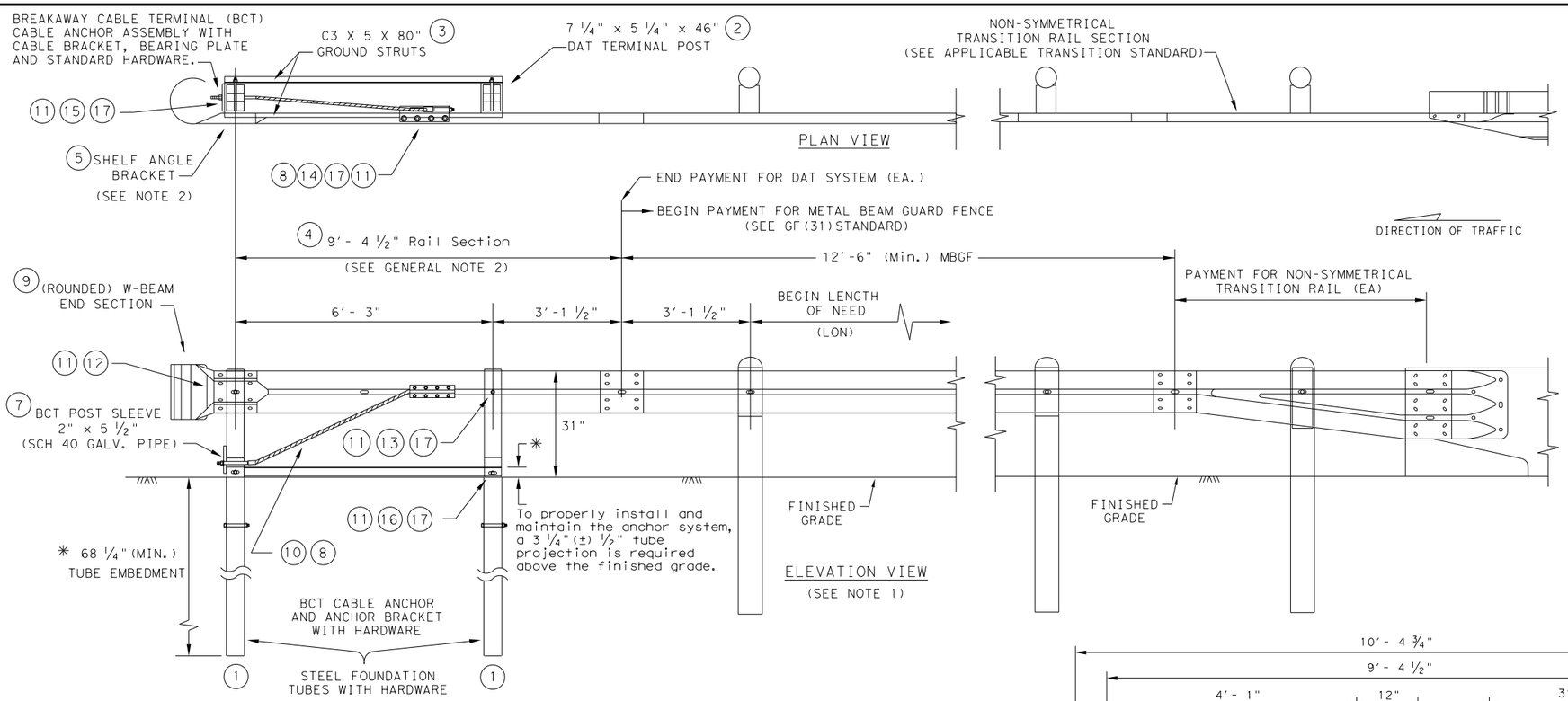
Texas Department of Transportation — Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1135	03	030	FM 1341	
	DIST	COUNTY		SHEET NO.	
	SAT	KERR		36	

DATE: 1/11/2024
FILE: $FILE$

DATE: 1/11/2024
FILE: $FILE$



DOWNSTREAM ANCHOR TERMINAL (DAT)

NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

GENERAL NOTES

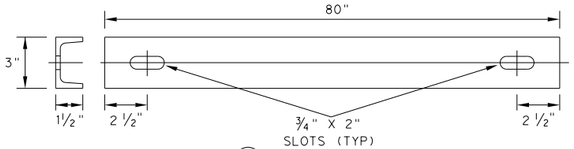
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 3 3/4" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(31) SHEET FOR TERMINAL CONNECTION DETAILS.

MOW STRIP INSTALLATION

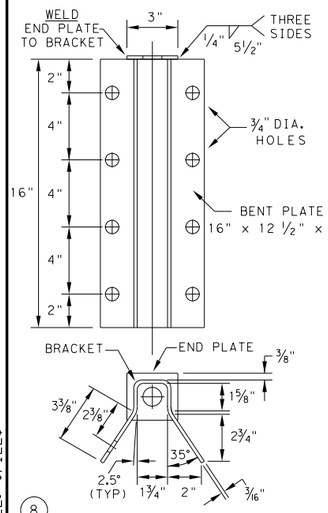
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

#	(DAT) PARTS LIST	QTY
(1)	STEEL FOUNDATION TUBE	2
(2)	DAT TERMINAL POST	2
(3)	CHANNEL STRUT	2
(4)	TERMINAL RAIL ELEMENT	1
(5)	SHELF ANGLE BRACKET	1
(6)	BCT BEARING PLATE	1
(7)	BCT POST SLEEVE	1
(8)	GUARDRAIL ANCHOR BRACKET	1
(9)	(ROUNDED) W-BEAM END SECTION	1
(10)	BCT CABLE ANCHOR	1
(11)	RECESSED NUT, GUARDRAIL	20
(12)	1 1/4" BUTTON HEAD BOLT	4
(13)	10" BUTTON HEAD BOLT	2
(14)	5/8" X 2" HEX HEAD BOLT	8
(15)	5/8" X 8" HEX HEAD BOLT	4
(16)	5/8" X 10" HEX HEAD BOLT	2
(17)	5/8" FLAT WASHER	18

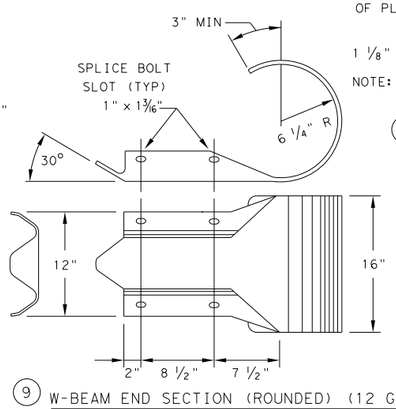
(4) TERMINAL RAIL ELEMENT FOR DAT



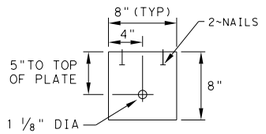
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

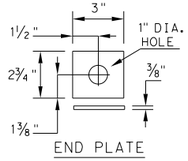


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

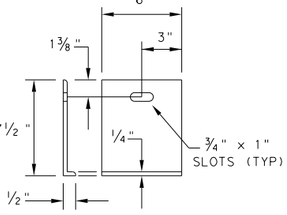


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

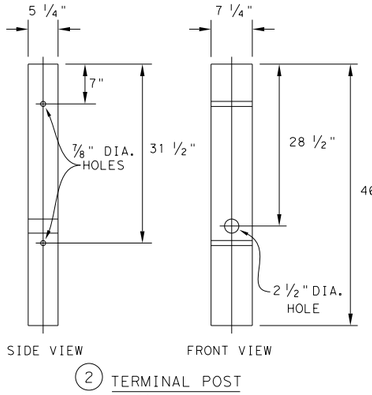
(6) BEARING PLATE
8"x 8"x 5/8" R



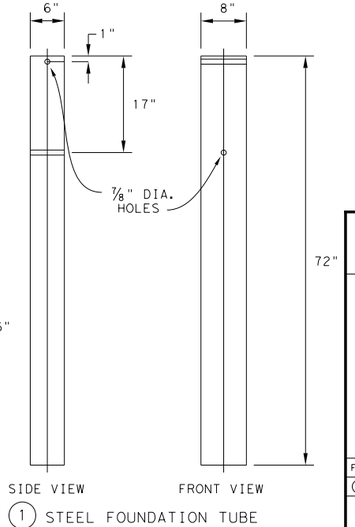
END PLATE



(5) SHELF ANGLE BRACKET



(2) TERMINAL POST
7 1/4"x 5 1/4"x 46" WOOD POST



(1) STEEL FOUNDATION TUBE
6"x 8"x 1/8" x 72" STEEL TUBE

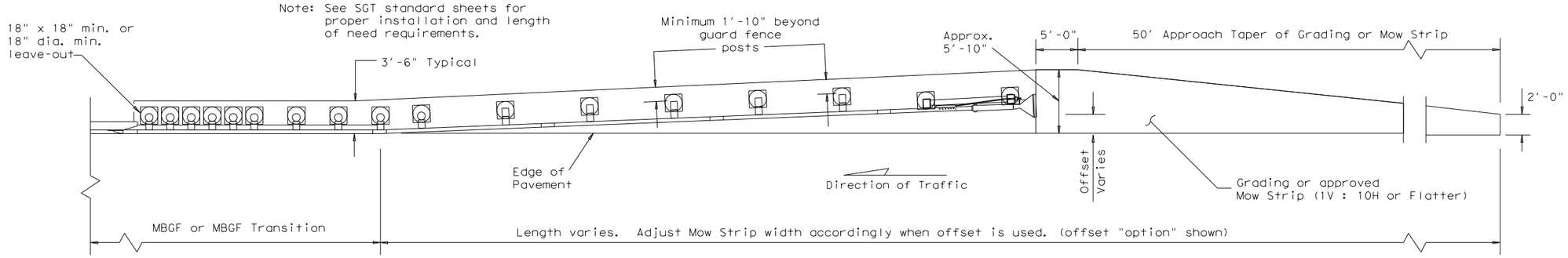
Texas Department of Transportation

Design Division Standard

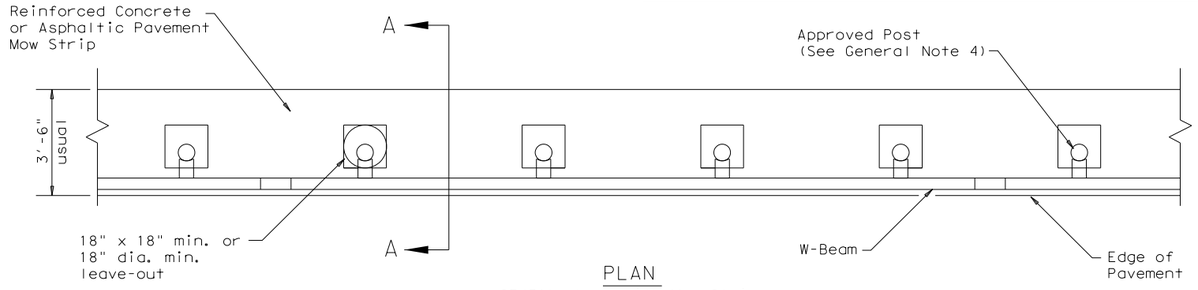
METAL BEAM GUARD FENCE
(DOWNSTREAM ANCHOR TERMINAL)
TL-3 MASH COMPLIANT

GF(31)DAT-19

FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		37

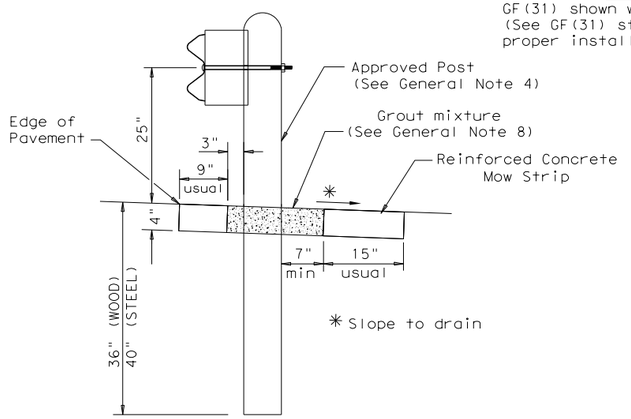


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



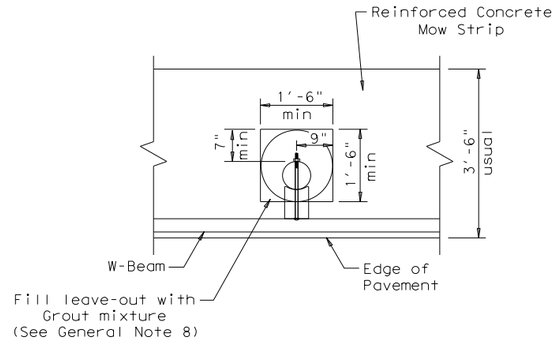
PLAN

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



SECTION A-A

Typical



MOW STRIP DETAIL

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

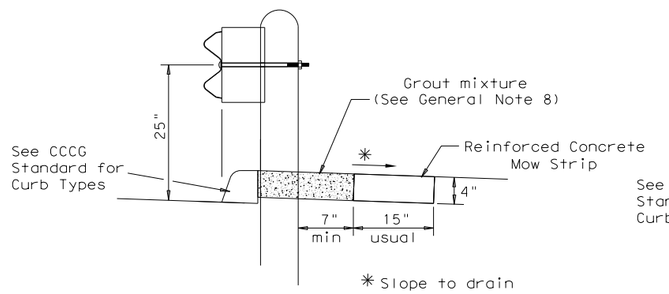
Note: Site Condition(s)

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

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

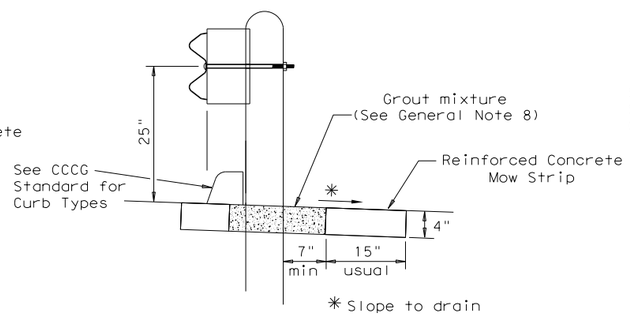
GENERAL NOTES

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



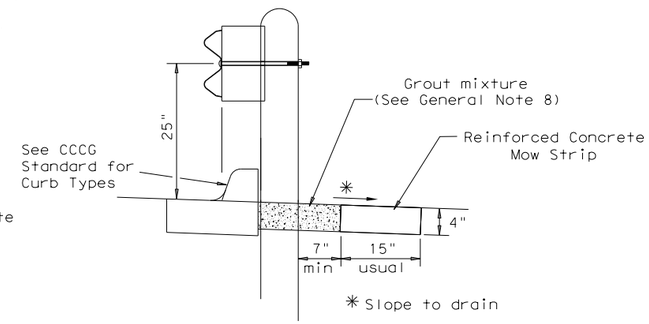
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Texas Department of Transportation

Design Division Standard

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

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1135	03	030	FM 1341	
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DATE: 1/11/2024
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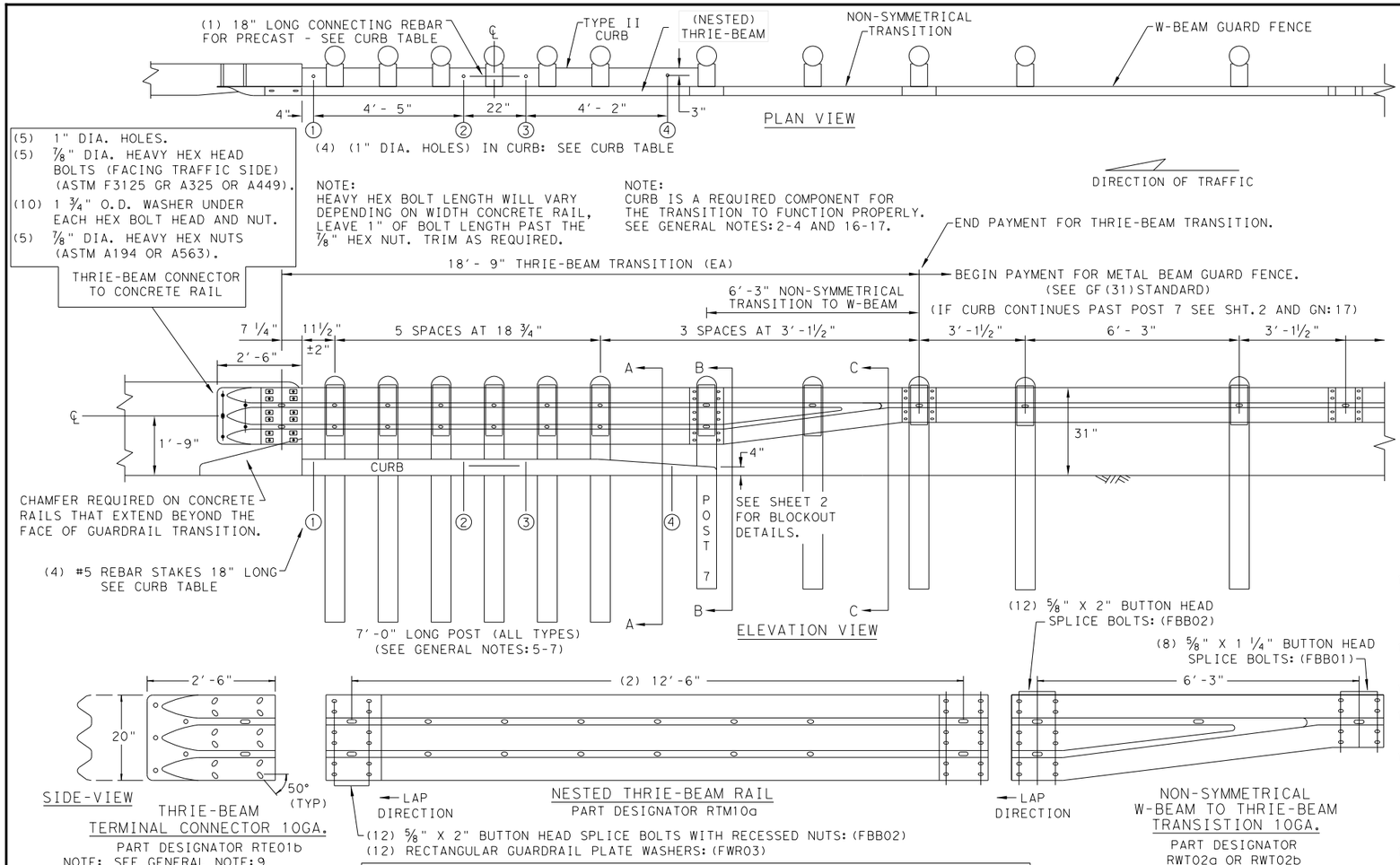
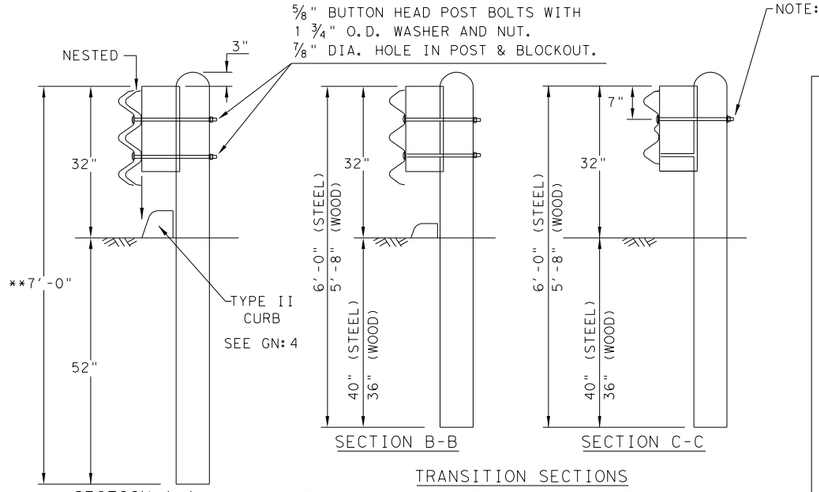


GENERAL NOTES

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



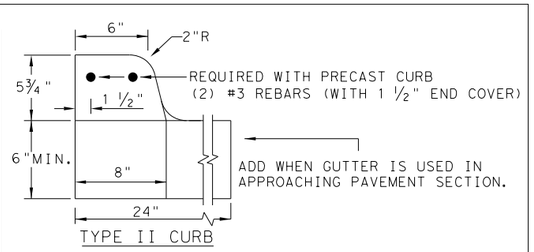
THRIE-BEAM TERMINAL - CURB TABLE

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

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

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

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



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

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

TYPE II CURB DETAILS

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

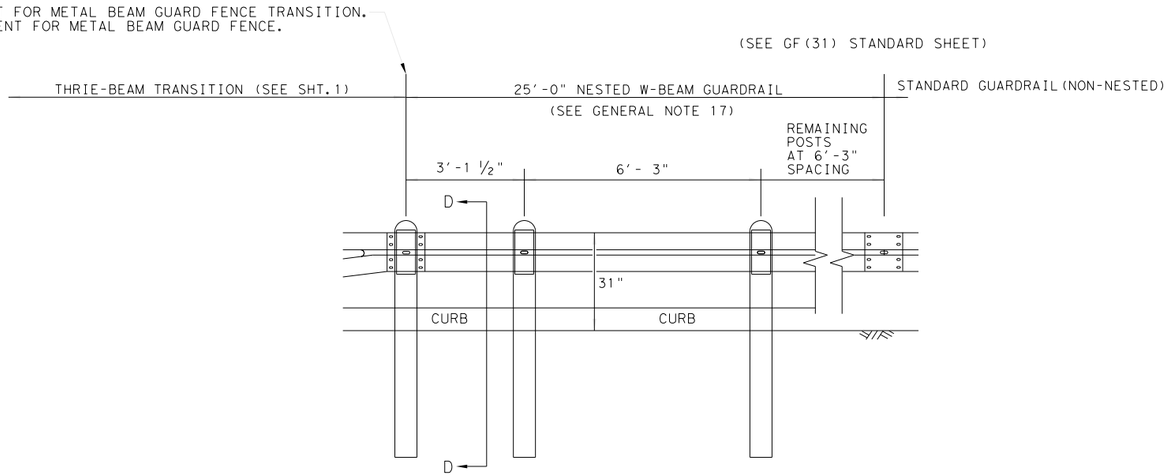
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

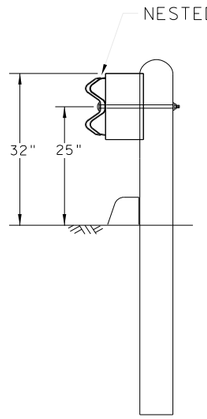
FILE: gf31tr1320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		39

DATE: 1/11/2024
FILE: $FILE$

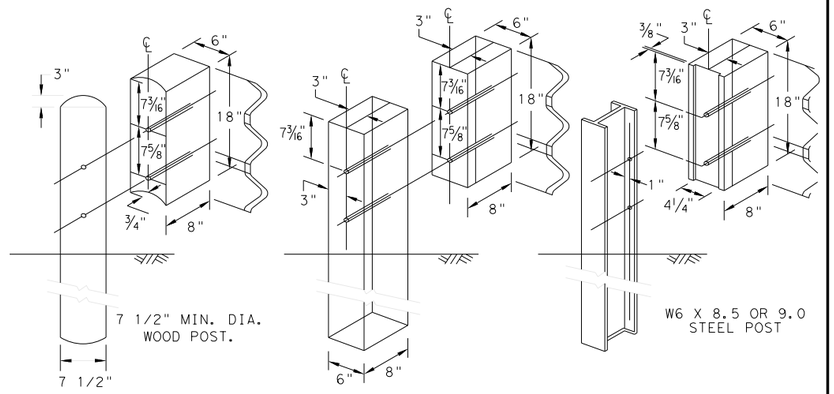
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

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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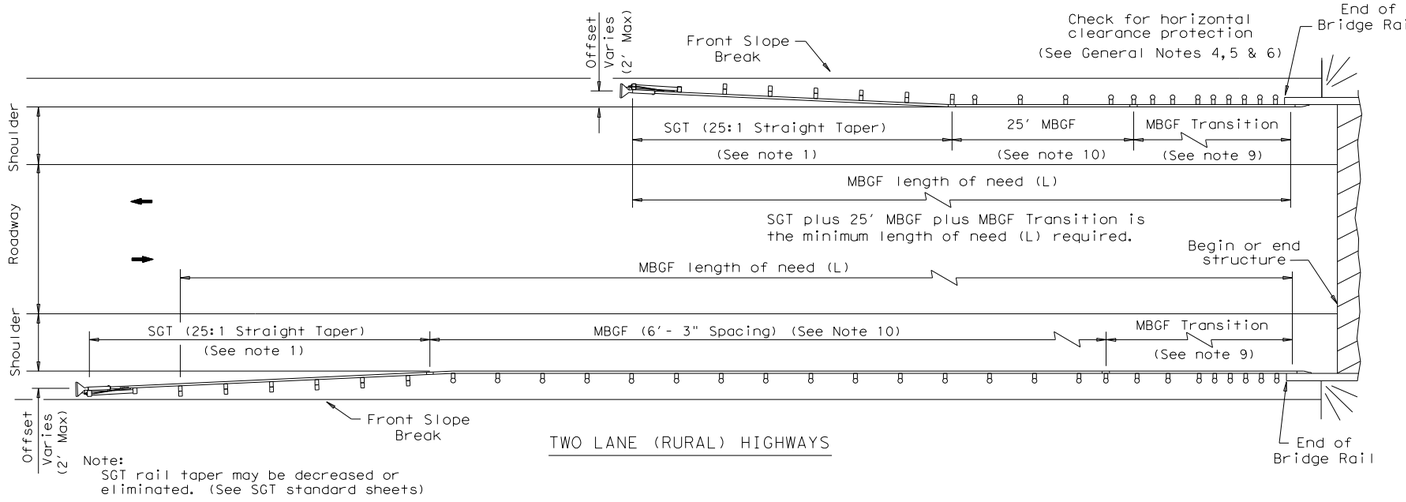
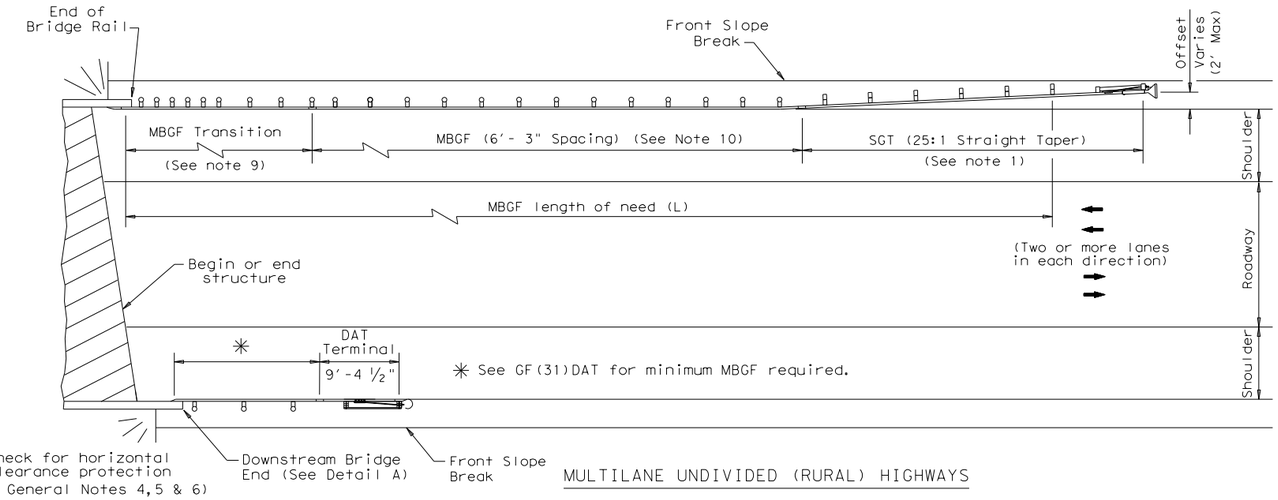
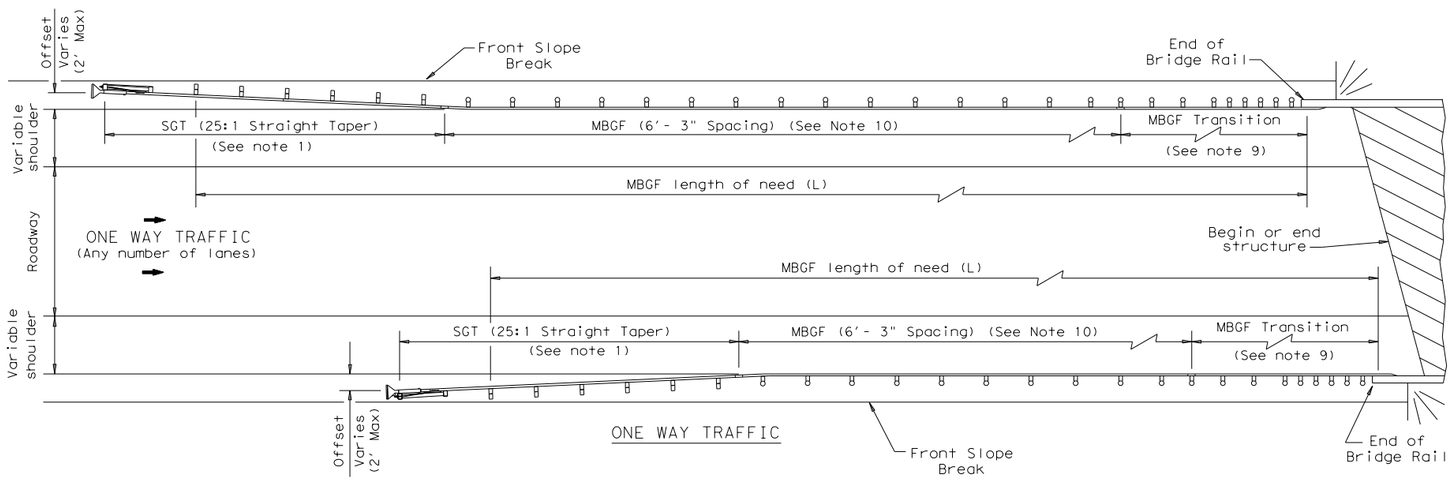


TWO LANE (RURAL) HIGHWAYS

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



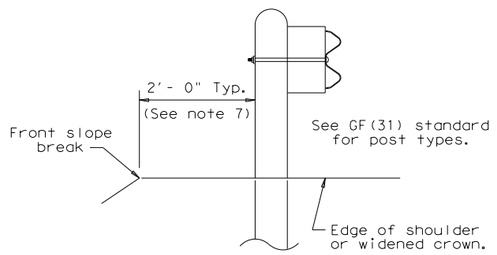
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



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
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REVISED APRIL 2014 SEE (MEMO 0414)	DIST	COUNTY		SHEET NO.
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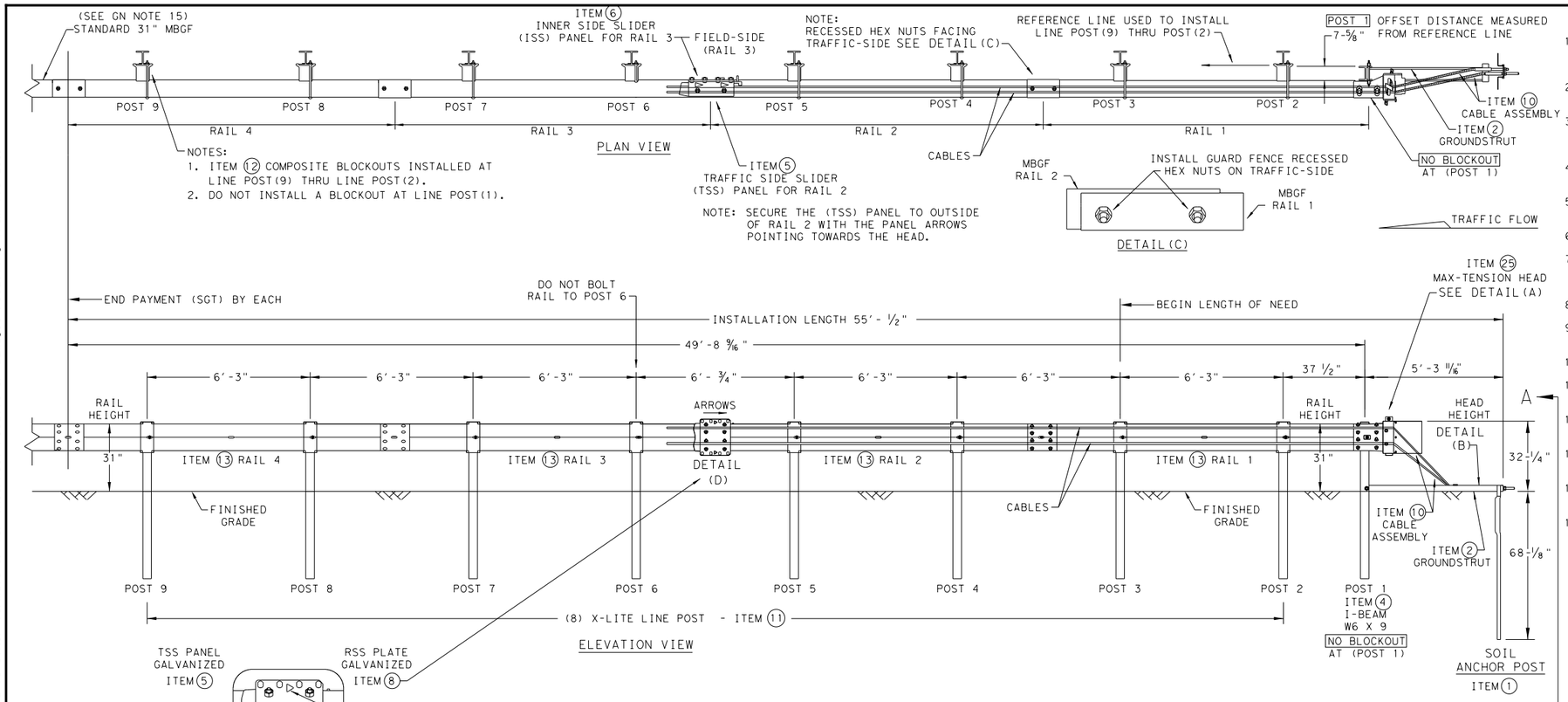

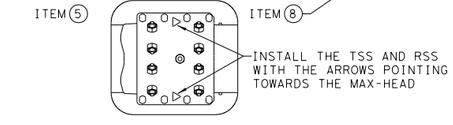

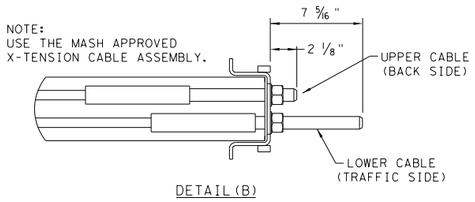

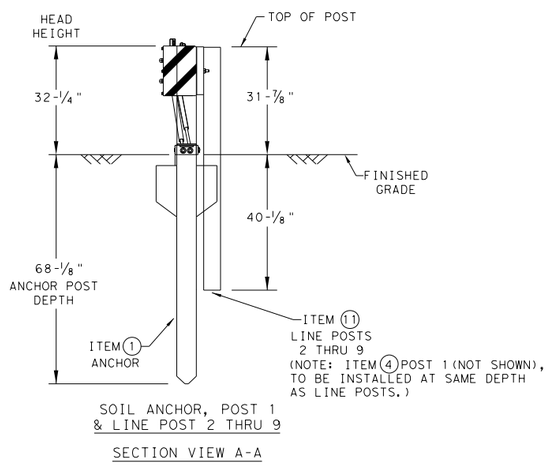

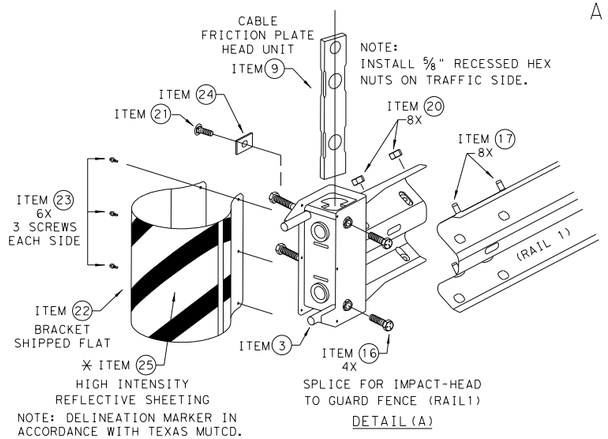

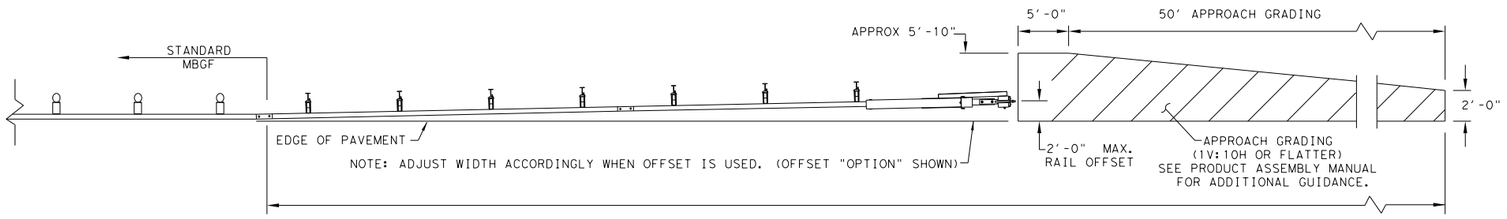

GENERAL NOTES

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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	SAT	KERR		42

DATE: 1/11/2024
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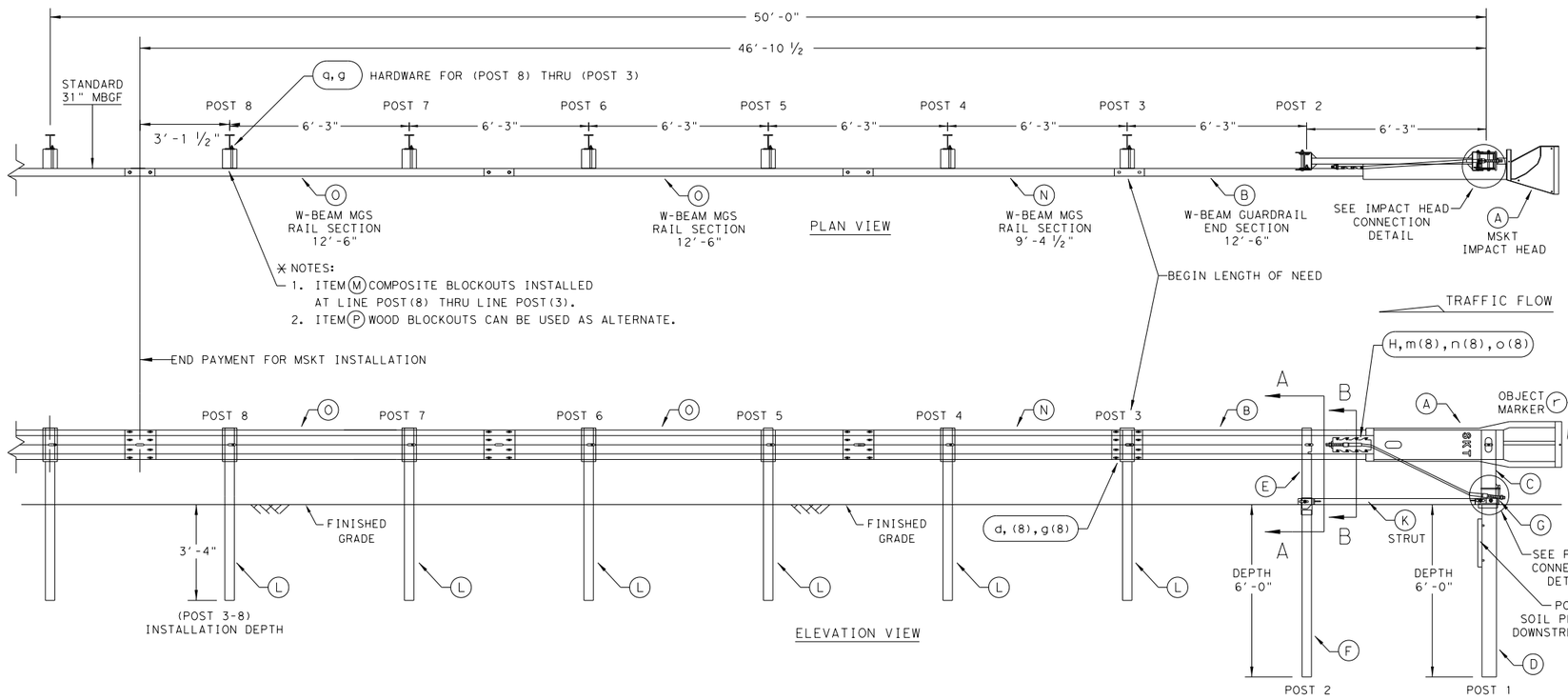


NOTE: SEE (GENERAL NOTE 14) FOR DRIVING CAP INFORMATION.

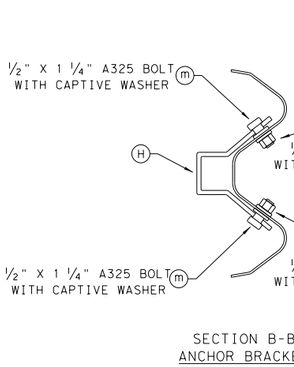
GENERAL NOTES

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

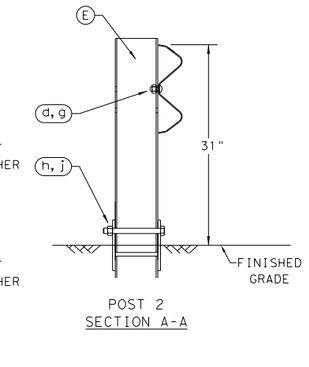
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	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	5/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	5/8" WASHER	W0516
c	2	5/8" HEX NUT	N0516
d	25	5/8" Dia. x 1 1/4" SPLICE BOLT (POST 2)	B580122
e	2	5/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	5/8" WASHER	W050
g	33	5/8" Dia. H.G.R NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
j	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/16" O.D. x 9/16" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	5/8" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: ✳

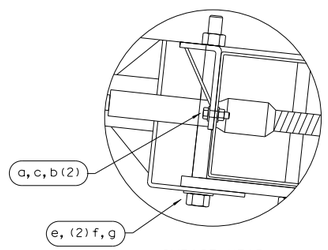
ALTERNATIVE ITEMS NOT SHOWN. ✳✳
✳ ITEM(P) 8" WOOD-BLOCKOUT
✳✳ ITEM(Q) 25'GUARD FENCE PANEL



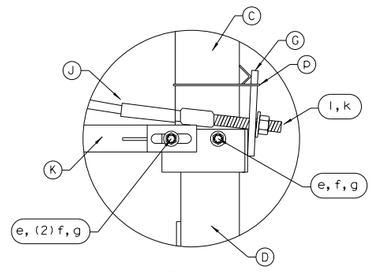
SECTION B-B
ANCHOR BRACKET



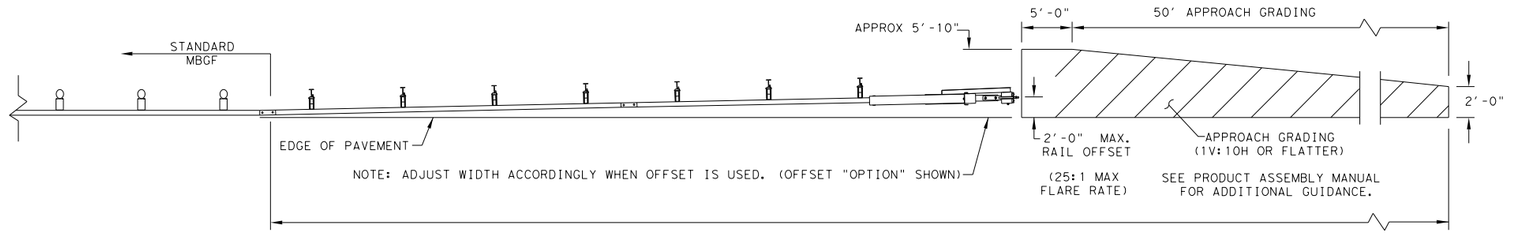
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



TRAFFIC FLOW

APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

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© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
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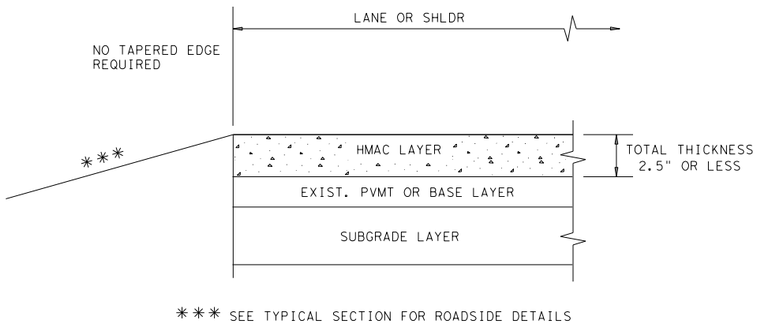
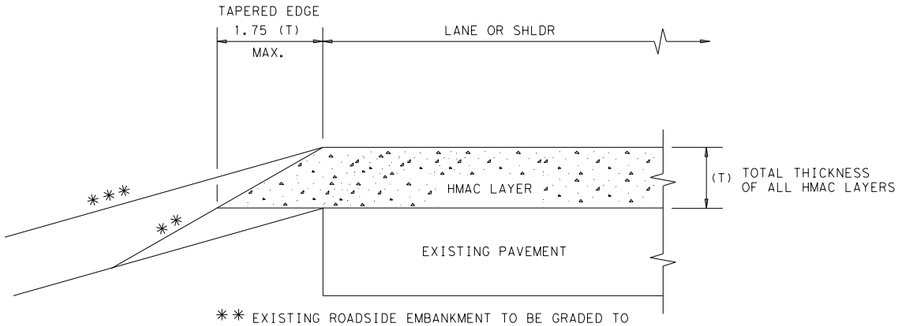


*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

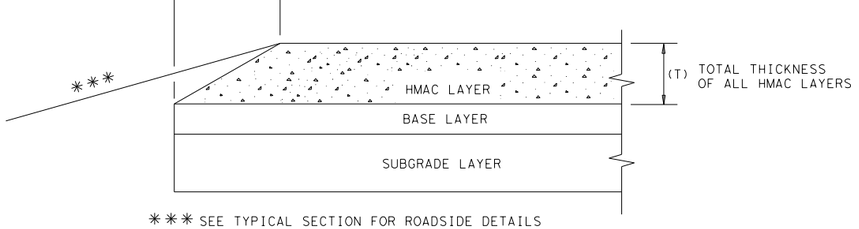
CONDITION - 1
THIN HMAC SURFACES OR HMAC OVERLAY
WITH THICKNESS OF 2.5" OR LESS



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

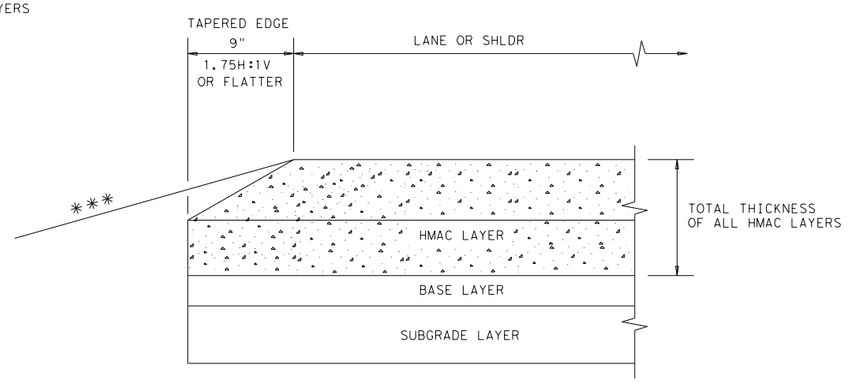
*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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



*** SEE TYPICAL SECTION FOR ROADSIDE DETAILS

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

(NOT TO SCALE)

GENERAL NOTES

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

Texas Department of Transportation

Design Division Standard

TAPERED EDGE DETAILS
HMAC PAVEMENT

TE(HMAC)-11

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©TxDOT January 2011	CONT	SECT	JOB		HIGHWAY	
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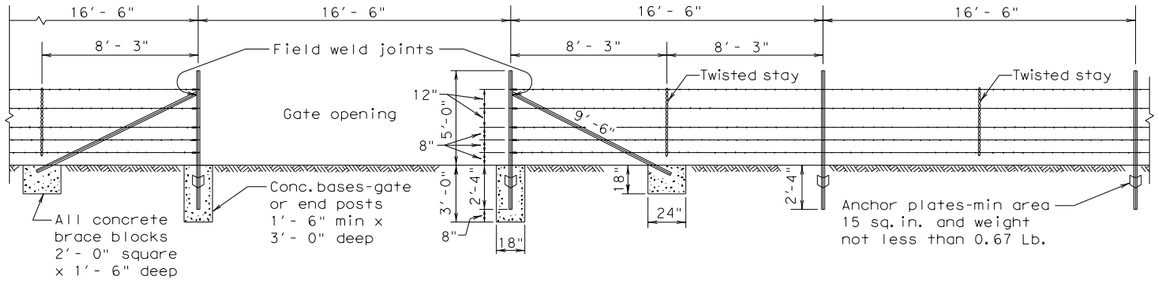
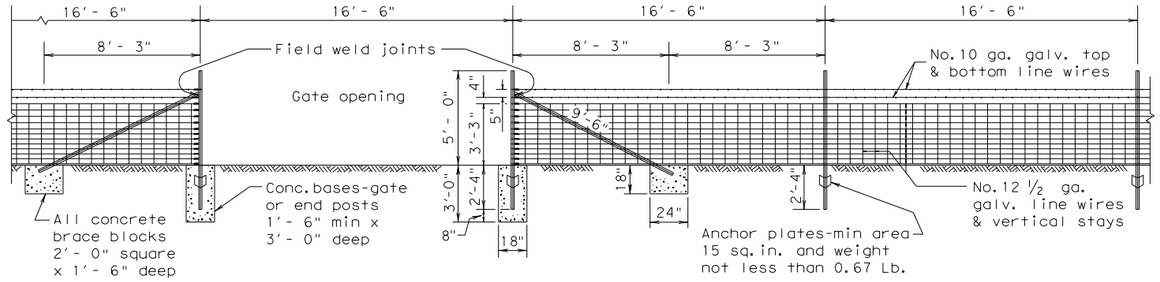
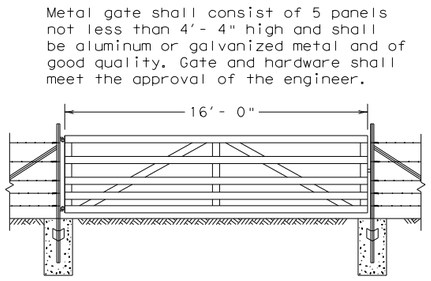


SECTION GALVANIZED BARBED WIRE FENCE WITH METAL POSTS
BRACING DETAIL USED AT ENDS AND GATES
TYPE "C" FENCE
(See General Note 8)

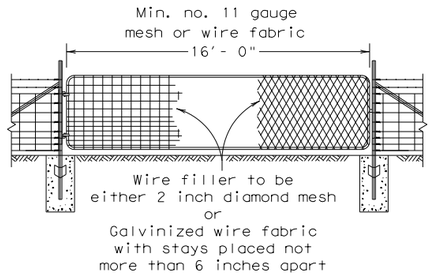
Note:
For Steel pipe and T-Post requirements. (See General Notes 6 & 7)



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



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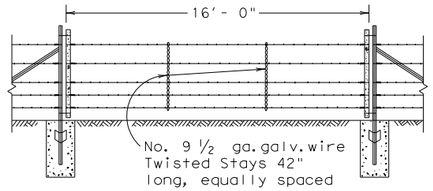
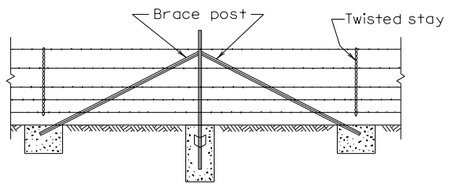
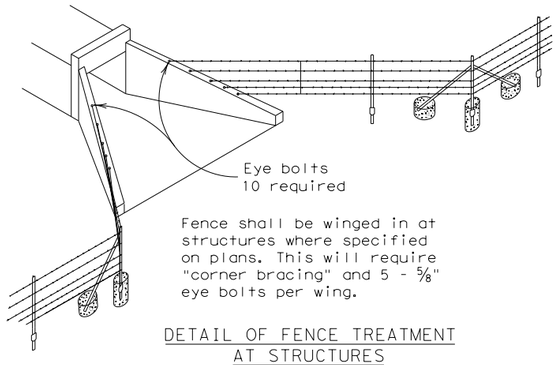


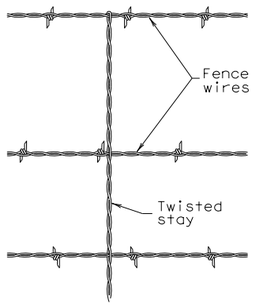
DETAIL TYPE 3 GATE



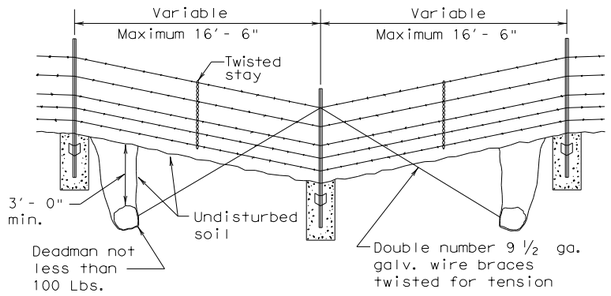
CORNER OR PULL POST ASSEMBLY



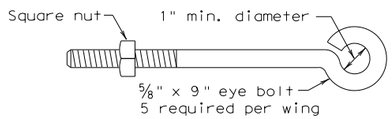
DETAIL OF FENCE TREATMENT AT STRUCTURES



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

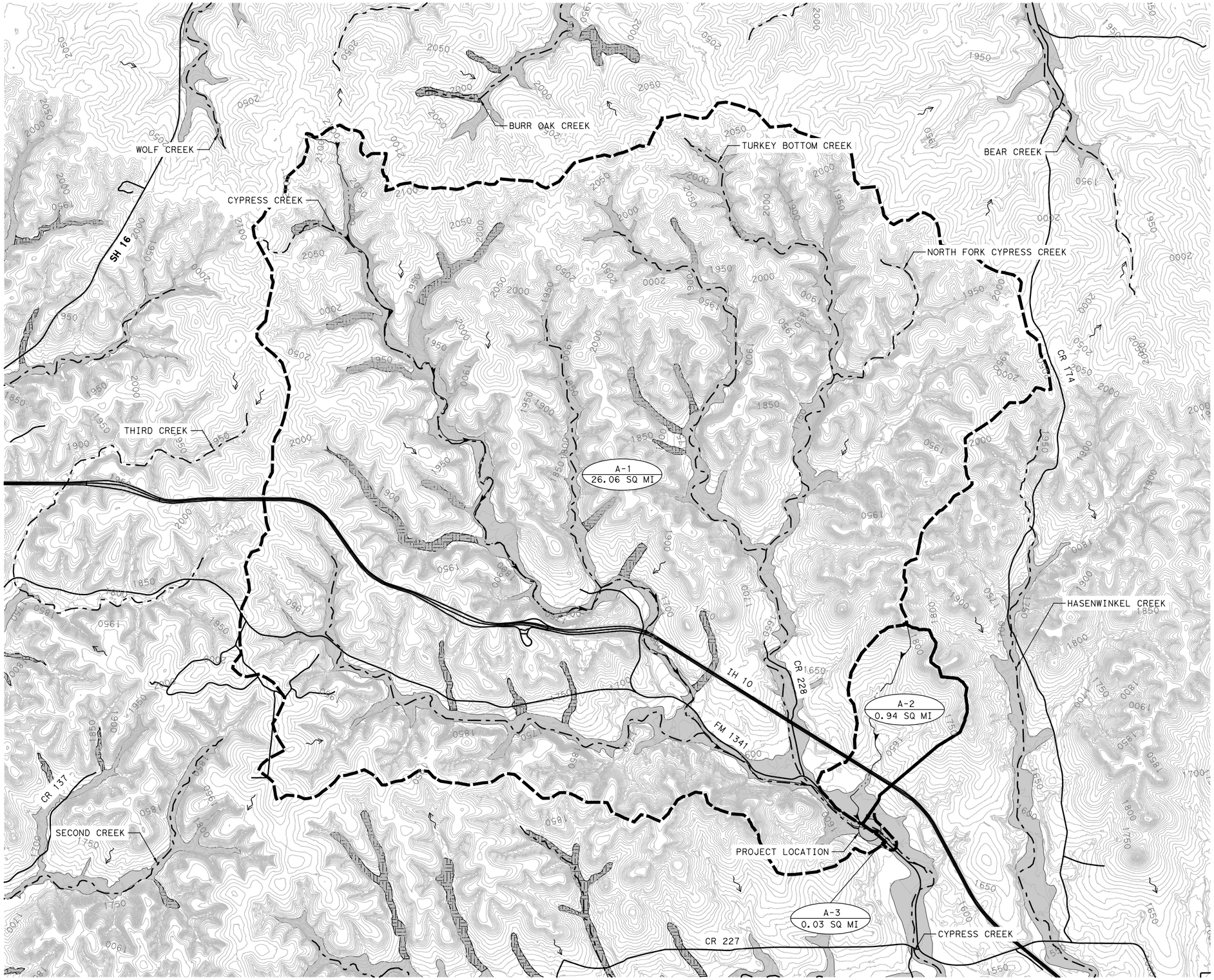
Design Division Standard

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	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		45

FINAL PLANS SUBMITTAL



DRAINAGE LEGEND

- EXIST DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- STREAM CENTERLINE
- FLOWPATH
- DA-ID / X.XX SQ MI — DRAINAGE AREA ID
- 500 — EXISTING 10' CONTOURS (2019)
- ROADS
- EFFECTIVE FLOODWAY
- EFFECTIVE ZONE A SFHA
- EFFECTIVE ZONE AE SFHA
- EFFECTIVE ZONE X 0.2% AC

NOTES:

1. FOR DRAINAGE AREA CALCULATIONS REFER TO HYDROLOGIC DATA SHEETS.
2. EFFECTIVE ZONE A FLOODPLAIN SOURCE KERR COUNTY FEMA FIRM PANEL 48265C0525F, EFFECTIVE MARCH 3RD, 2011.
3. INITIAL COORDINATION TO INFORM THE KERR COUNTY FLOODPLAIN ADMINISTRATOR OF THE PROJECT COMPLETED ON NOVEMBER 10TH, 2022.
4. FLOODPLAIN LETTER SUBMITTED TO TXDOT FOR THE PROJECTED COMPLETED ON OCTOBER 31ST, 2023.
5. CONTOUR DATA FROM USGS 2019 - 70 CM HURRICANE LIDAR.

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

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San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
DAVID J. COBURN
145423
LICENSED
PROFESSIONAL ENGINEER
1/12/24

0 2000 4000 6000 8000
SCALE IN FEET

FM 1341 AT CYPRESS CREEK
EXISTING
DRAINAGE AREA MAP

SCALE: 1"=4000' SHEET 1 OF 1

DSN: DC	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK: DC	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK: DC	KERR	SAT	1135	03	030	46

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FINAL PLANS SUBMITTAL

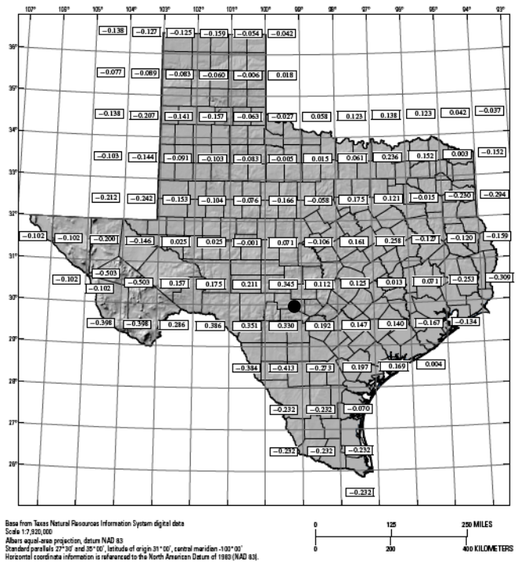
EXISTING CONDITIONS CN LOSS METHOD HYDROLOGIC COMPUTATIONS												
Structure ID	Contributing Subbasin(s)	Area	Area	Composite CN	Tc	Tlag	Q2	Q5	Q10	Q25*	Q50	Q100
		(ACRES)	(SQ MI)		(MIN)	(MIN)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)
A1	A1	16678	26.06	77	183.46	110	7,131	11,217	15,136	21,075	26,052	31,541
A2	A2	599	0.94	75	35.81	21	765	1,203	1,608	2,201	2,682	3,196
A3	A3	17	0.03	58	85.50	51	5	10	16	26	35	46

COMPOSITE CN: COMPOSITE CURVE NUMBER VALUES DEVELOPED USING SSURGO HYDROLOGIC SOIL GROUPS AND LANDUSE INCLUDING BRUSH, CROPS, IMPERVIOUS, INDUSTRIAL, OPEN SPACE, RESIDENTIAL, AND WOODED AREAS REFERENCING TO TABLES 4-18, 4-19, AND 4-20 IN THE TXDOT HDM.

EXISTING CONDITIONS CUMULATIVE TR-55 CN METHOD HYDROLOGIC COMPUTATIONS									
Structure ID	Contributing Subbasin(s)	Area	Area	Q2	Q5	Q10	Q25*	Q50	Q100
		(ACRE)	(SQ. MI)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)	(CFS)
FM 1341	A1 & A2	17280	27.00	7,214	11,346	15,319	21,331	26,374	31,936
Downstream	A1, A2, & A3	17299	27.03	7,217	11,351	15,327	21,343	26,391	31,958

* DESIGN STORM - REFER TO JUSTIFICATION LETTER FOR DOCUMENTATION ON NOT MEETING THE HDM DESIGN STORM

DRAINAGE AREA ID	DRAINAGE AREA (ACRE)	DRAINAGE AREA (SQ. MI)	MEAN ANNUAL PRECIPITATION (IN)	MAIN CHANNEL SLOPE (FT/FT)	OmegaEm PARAMETER	DESIGN YEAR	a	b	c	d	e	f	Q (CFS)
FM 1341	17280	27.00	31	0.0111	0.345	2-YR	50.98	-50.3	1.398	0.27	0.776	-0.0058	2,868
						5-YR	16.62	-15.32	1.308	0.372	0.885	-0.0215	7,538
						10-YR	13.62	-11.97	1.203	0.403	0.918	-0.0289	11,509
						25-YR	11.79	-9.819	1.14	0.446	0.945	-0.0374	18,389
						50-YR	11.17	-8.997	1.105	0.476	0.961	-0.0424	24,885
						100-YR	10.82	-8.448	1.071	0.507	0.969	-0.0467	32,977
						500-YR	10.4	-7.605	0.988	0.569	0.976	-0.0554	57,912



HILL-SHADE RELIEF IN TEXAS WITH SUPERIMPOSED VALUES OF OmegaEM PARAMETER THAT REPRESENTS GENERALZED TERRAIN PEAK-STREAMFLOW FREQUENCY.

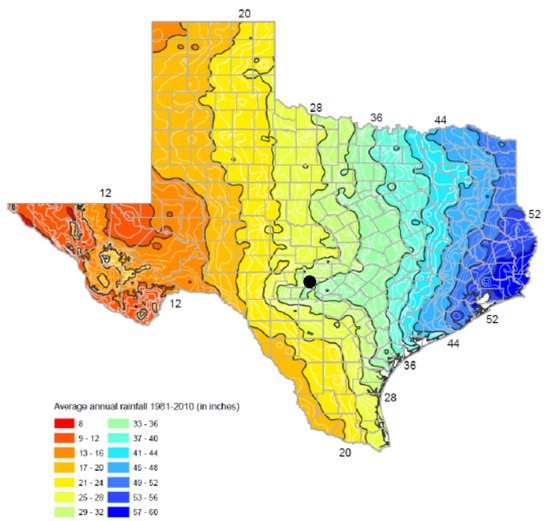


Figure 4-6. Mean annual precipitation, in inches (Source: Texas Water Development Board 2017)

MEAN ANNUAL PRECIPITATION (P) MAP OF TEXAS

DESIGN REQUIREMENTS:

1. 25-YEAR DESIGN STORM EVENT REDUCED TO MINIMUM DESIGN STORM BASED ON EXISTING LEVEL (<2-YR) OF SERVICE PER DESIGN FREQUENCY EVALUATION. REFER TO H&H ANALYSIS TECHNICAL MEMORANDUM FOR ADDITIONAL.
2. LESS THAN 1-FOOT RISE IN 100-YEAR WSE OUTSIDE TXDOT ROW FEMA GUIDELINES.
3. NO SIGNIFICANT ADVERSE IMPACTS TO EXISTING INSURABLE STRUCTURES.

HYDROLOGIC ANALYSIS DESIGN METHOD:

1. CN LOSS METHOD AND NRCS UNIT HYDROGRAPH METHOD USED TO DEVELOP PEAK FLOWS.
2. REGRESSION EQUATION CALCULATIONS FOR COMPARISON PURPOSES ONLY. UNIT HYDROGRAPH METHOD PEAK FLOWS USED FOR ANALYSIS PURPOSES.

NOTES:

1. TXDOT HYDRAULIC DESIGN MANUAL (HDM), SEPTEMBER 2019, WAS USED TO DETERMINE HYDROLOGIC DATA.
2. BASE CN DEVELOPED USING SSURGO HYDROLOGIC SOIL GROUPS AND LANDUSE CURVE NUMBERS WITH ANTECEDENT MOISTURE CONDITION (AMC) II.
3. PEAK FLOWS (HEC-HMS V4.10) DEVELOPED USING ATLAS 14 DDF INFORMATION LOCATED IN KERR COUNTY ZONE 3 PER THE TXDOT EBDLKUP-2019-V6.2.10 SPREADSHEET.
4. OMEGA EM REGIONAL REGRESSION EQUATIONS COMPARED TO TR-55 METHOD BECAUSE DRAINAGE AREA > 10 SQ MI.

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1/12/24

FM 1341 AT CYPRESS CREEK

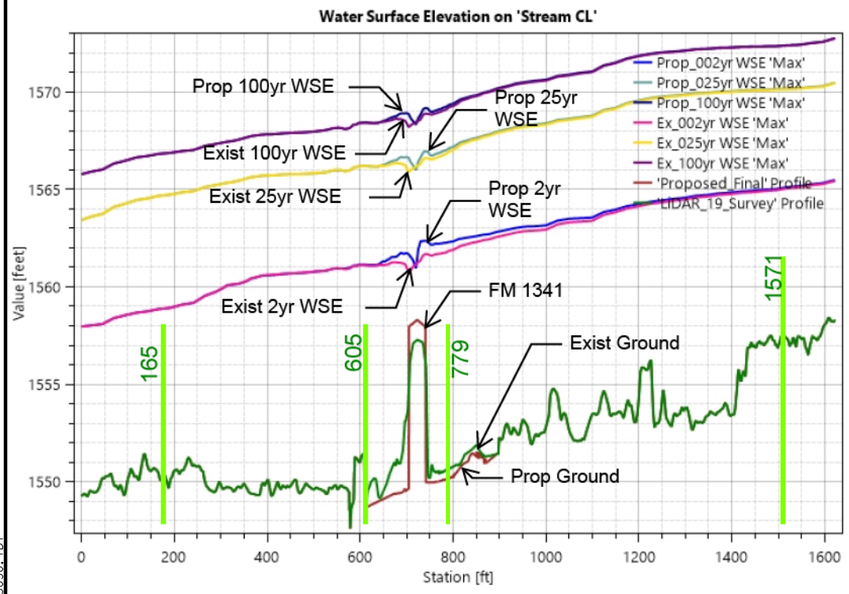
HYDROLOGIC DATA SHEET

SHEET 1 OF 1

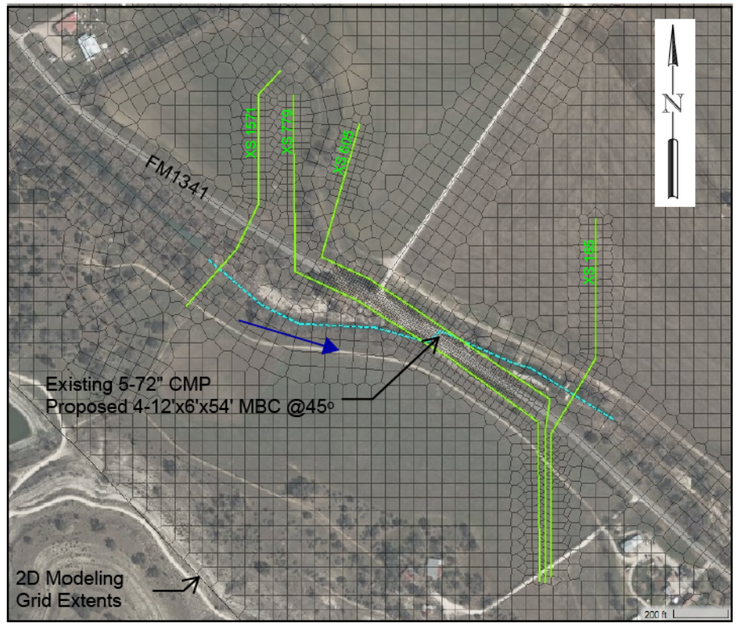
DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	47

FINAL PLANS SUBMITTAL

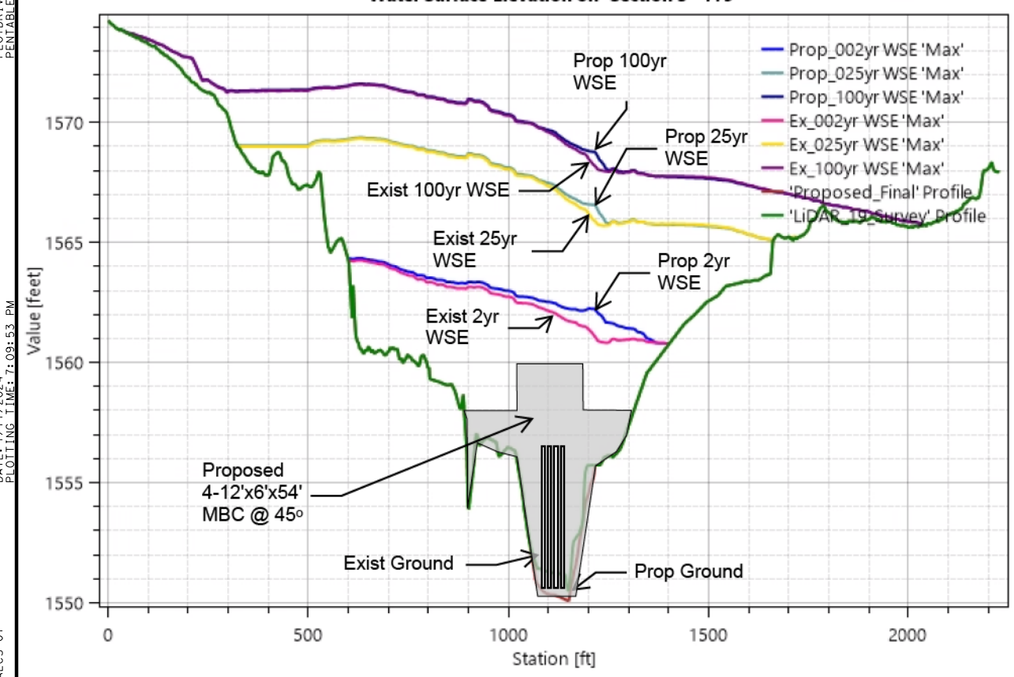
HEC-RAS PROFILE (XS 779)



HEC-RAS CROSS SECTION LAYOUT



HEC-RAS STRUCTURE UPSTREAM SECTION (XS 779)



NOTES:

1. HEC-RAS 6.3.1 USED FOR 2D HYDRAULIC ANALYSIS.
2. A NORMAL DEPTH COMPUTATION USED FOR DOWNSTREAM BOUNDARY CONDITION WITH A SLOPE OF 0.005 FT/FT TO DETERMINE THE STARTING WATER SURFACE ELEVATION (WSE). SLOPE DERIVED FROM USGS LIDAR (2019).
3. HYDRAULIC GEOMETRIES CROSS SECTION DATA BASED ON LIDAR (2019) AND TOPOGRAPHIC SURVEY WITHIN TXDOT ROW.
4. VERTICAL DATUM IS NAVD 88.
5. FOR PEAK FLOWS USED IN HYDRAULIC HEC-RAS MODELS, REFER TO THE HYDROLOGIC DATA SHEETS.
6. MANNING'S N-VALUES BASED ON AERIAL IMAGERY AND SITE PHOTOS REFERENCING TXDOT HDM.
7. SUMMARY OF RESULTS TAKEN FROM AVERAGE 2D OUTPUT DATA WITHIN THE CHANNEL AREA FOR SPECIFIED STORM EVENTS.
8. EFFECTIVE ZONE A FLOODPLAIN SOURCE KERR COUNTY FEMA FIRM PANEL 48265C0525F, EFFECTIVE MARCH 3RD, 2011.
9. INITIAL COORDINATION TO INFORM THE KERR COUNTY FLOODPLAIN ADMINISTRATOR OF THE PROJECT COMPLETED ON NOVEMBER 10TH, 2022. HISTORICAL DATA WAS RECEIVED NOVEMBER 16TH, 2022. FINAL COORDINATION TO TAKE PLACE PRIOR TO CONSTRUCTION.
10. FLOODPLAIN LETTER SUBMITTED TO TXDOT FOR THE PROJECT COMPLETED ON OCTOBER 31ST, 2023.
11. THE PROPOSED IMPROVEMENTS INCREASED THE CAPACITY FROM 850 CFS TO 1,100 CFS.

HEC-RAS Cross Section Output

River Sta	Profile	Plan	Q Total (cfs)	Min Ch El. (ft)	W.S. Elev (ft)	Vel. (fps)
1571	2-YR	Existing	7214	1575.35	1565.28	8.35
1571	25-Yr	Existing	21331	1575.35	1570.30	10.89
1571	100-Yr	Existing	31936	1575.35	1572.58	11.58
1571	2-YR	Proposed	7214	1575.35	1565.32	8.29
1571	25-Yr	Proposed	21331	1575.35	1570.33	10.85
1571	100-Yr	Proposed	31936	1575.35	1572.60	11.56
779	2-YR	Existing	7214	1574.25	1563.03	8.57
779	25-Yr	Existing	21331	1574.25	1569.34	11.34
779	100-Yr	Existing	31936	1574.25	1571.60	12.19
779	2-YR	Proposed	7214	1574.25	1563.09	8.04
779	25-Yr	Proposed	21331	1574.25	1569.38	11.08
779	100-Yr	Proposed	31936	1574.25	1571.62	11.98
726	FM1341					
605	2-YR	Existing	7214	1572.47	1562.33	9.21
605	25-Yr	Existing	21331	1572.47	1569.02	11.99
605	100-Yr	Existing	31936	1572.47	1571.32	13.23
605	2-YR	Proposed	7214	1572.47	1562.53	9.45
605	25-Yr	Proposed	21331	1572.47	1569.07	12.02
605	100-Yr	Proposed	31936	1572.47	1571.35	13.23
165	2-YR	Existing	7214	1567.63	1558.92	9.64
165	25-Yr	Existing	21331	1567.63	1564.82	11.15
165	100-Yr	Existing	31936	1567.63	1566.94	12.22
165	2-YR	Proposed	7214	1567.63	1558.92	9.64
165	25-Yr	Proposed	21331	1567.63	1566.92	11.13
165	100-Yr	Proposed	31936	1567.63	1566.93	12.20

HEC-RAS Culvert Output

Profile	Plan	W.S. US (ft)	W.S. DS (ft)	Q Culv. Group (cfs)	Min. El. Weir Flow (ft)	Q Weir (cfs)	Culv. Vel. US (fps)	Cul. Vel. DS (fps)
2-Yr	Existing	1561.58	1560.87	850	1557.00	6364	8.57	9.21
25-Yr	Existing	1566.97	1565.92	850	1557.00	20481	11.34	11.99
100-Yr	Existing	1569.24	1568.21	850	1557.00	31086	12.19	13.23
2-Yr	Proposed	1561.77	1561.35	1100	1557.00	6114	8.04	9.45
25-Yr	Proposed	1566.85	1566.14	1100	1557.00	20231	11.08	12.02
100-Yr	Proposed	1569.11	1568.41	1100	1557.00	30836	11.98	13.23

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STATE OF TEXAS
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145423
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PROFESSIONAL ENGINEER
1/12/24

FM 1341 AT CYPRESS CREEK

HYDRAULIC CALCULATION DATA SHEET

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	48

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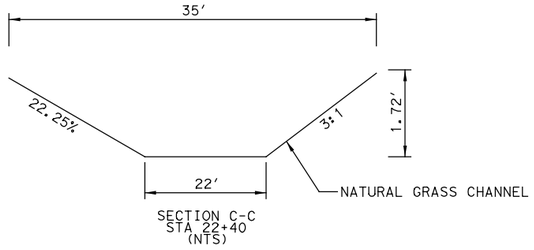
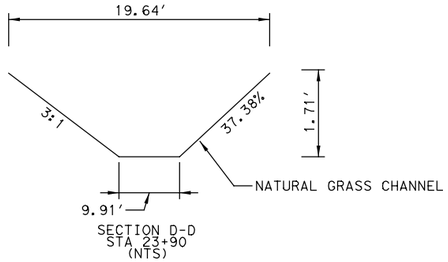


SECTION C-C
STA 22+40
(NTS)



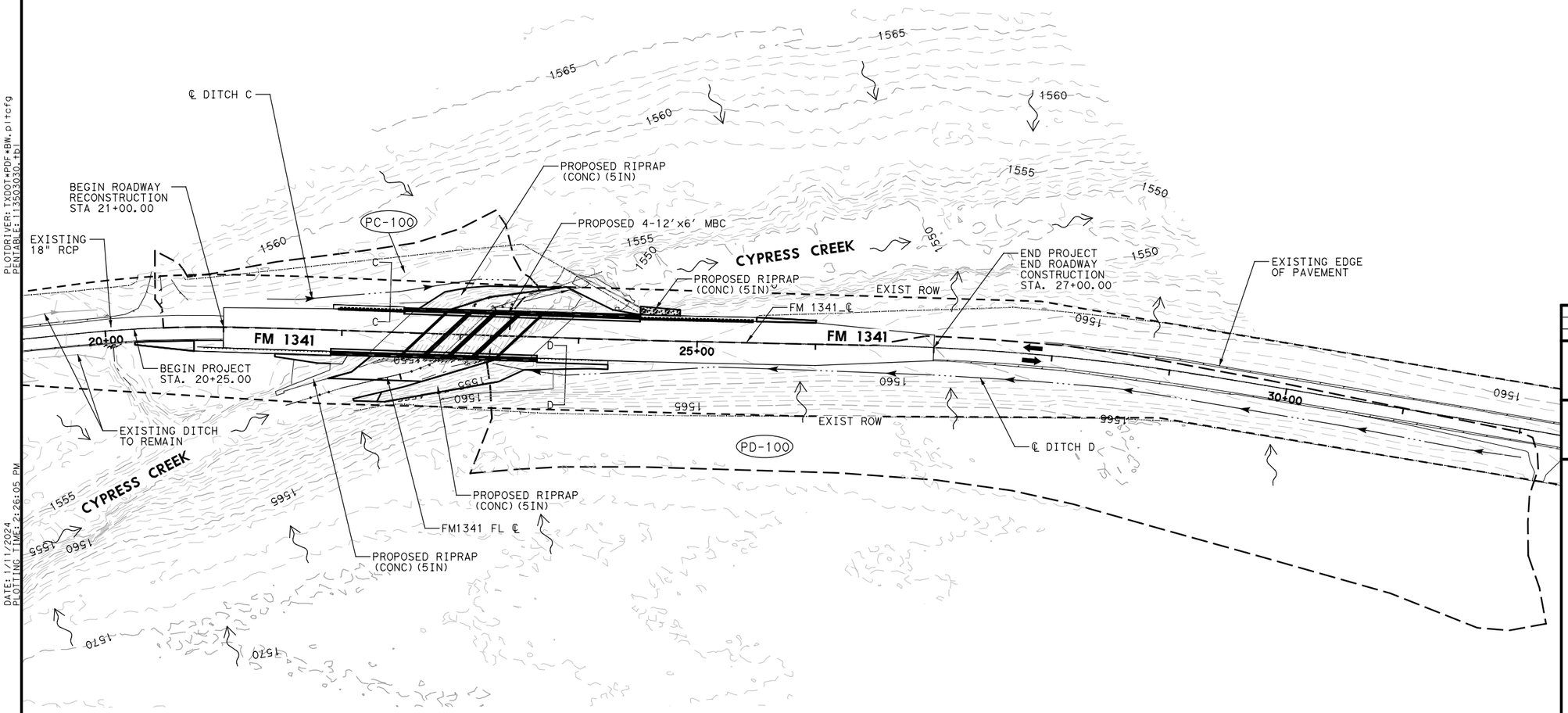
SECTION D-D
STA 23+90
(NTS)

DRAINAGE LEGEND

- PROP DRAINAGE AREA BOUNDARY
- FLOW DIRECTION
- PROP DITCH
- EXIST DITCH
- ROW
- (DA-ID) DRAINAGE AREA ID
- EXISTING 1' CONTOURS (2019)

NOTES:

1. FOR DRAINAGE AREA CALCULATIONS REFER TO EXTERNAL DRAINAGE AREA HYDROLOGIC DATA SHEETS.
2. CONTOUR DATA FROM TINRIS 2019 LIDAR BASED ON 1M RESOLUTION.
3. BASIN DELINEATION BASED ON BEST AVAILABLE EXISTING CONDITIONS TOPOGRAPHIC DATA.
4. REFER TO GRADING LAYOUT, ROADWAY PLANS, AND PROPOSED TYPICAL SECTIONS FOR DITCH CONSTRUCTION.



0 50 100 150 200

SCALE IN FEET

NO.	DATE	REVISION	APPR BY

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P.E.
1/11/24

FM 1341 AT CYPRESS CREEK
PROPOSED INTERIOR DRAINAGE AREA MAP

SCALE: 1"=100'

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	49

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FINAL PLANS SUBMITTAL

EXISTING DITCH CALCULATIONS

EXISTING DITCH CALCULATIONS																									
Ditch No.	UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	SLOPE LT	SLOPE RT	CHANNEL DEPTH	MANNING'S "n"	DITCH MATERIAL	CAPACITY	DESIGN FLOW 5-YR	CHECK FLOW 100-YR	SLOPE	NORMAL DEPTH 5-YR	NORMAL DEPTH 100-YR	VELOCITY 5-YR	VELOCITY 100-YR	MAX SHEAR 5-YR	MAX SHEAR 100-YR	TOP OF DITCH ELEVATION 5-YR	WATER SURFACE ELEVATION 5-YR	FREE 5-YR BOARD
	STATION	OFFSET	FLOWLINE ELEVATION	STATION	OFFSET	FLOWLINE ELEVATION																			
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)	(%)	(ft)			(cfs)	(cfs)	(cfs)	(ft/ft)	(ft)	(ft)	(ft/s)	(ft/s)	(lb/sf)	(lb/sf)	(ft)	(ft)	(ft)
Ditch-C	21+36.28	24.37' LT	1557.22	23+59.69	43.44' LT	1554.27	24.0	17.58%	8.10%	1.12	0.035	Grass w/ TY A	174.7	1.43	2.56	0.0141	0.07	0.10	0.8	1.0	0.06	0.09	1555.39	1554.34	1.1
Ditch-D	32+04.67	23.89' RT	1562.15	23+55.00	28.10' RT	1554.63	13.0	11.35%	28.08%	1.21	0.035	Grass w/ TY A	89.7	6.41	11.48	0.0086	0.28	0.39	1.6	1.9	0.15	0.21	1555.84	1554.91	0.9

* DESIGN STORM - 5 YEAR EVENT

PROPOSED DITCH CALCULATIONS

PROPOSED DITCH CALCULATIONS																									
Ditch No.	UPSTREAM			DOWNSTREAM			BOTTOM WIDTH	SLOPE LT	SLOPE RT	CHANNEL DEPTH	MANNING'S "n"	DITCH MATERIAL	CAPACITY	DESIGN FLOW 5-YR	CHECK FLOW 100-YR	SLOPE	NORMAL DEPTH 5-YR	NORMAL DEPTH 100-YR	VELOCITY 5-YR	VELOCITY 100-YR	MAX SHEAR 5-YR	MAX SHEAR 100-YR	TOP OF DITCH ELEVATION 5-YR	WATER SURFACE ELEVATION 5-YR	FREE 5-YR BOARD
	STATION	OFFSET	FLOWLINE ELEVATION	STATION	OFFSET	FLOWLINE ELEVATION																			
	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)	(%)	(ft)			(cfs)	(cfs)	(cfs)	(ft/ft)	(ft)	(ft)	(ft/s)	(ft/s)	(lb/sf)	(lb/sf)	(ft)	(ft)	(ft)
Ditch-C	21+.36.28	24.37' LT	1557.22	23+59.69	43.44' LT	1554.27	22.0	22.25%	33.33%	1.72	0.035	Grass w/ TY A	307.0	1.58	2.84	0.0141	0.08	0.11	0.9	1.1	0.07	0.10	1555.99	1554.35	1.6
Ditch-D	32.04.67	23.89' RT	1562.15	23+55.00	28.10' RT	1554.95	9.9	33.33%	37.38%	1.71	0.035	Grass w/ TY A	113.8	6.49	11.62	0.0083	0.34	0.47	1.8	2.2	0.18	0.25	1556.66	1555.29	1.4

* DESIGN STORM - 5 YEAR EVENT

EXISTING DRAINAGE AREA

DRAINAGE AREA								
Area - ID	Drainage Area	Composite C Value	Composite Area	To Used	Intensity (5YR)	Intensity (100-YR)	Area - Discharge (5-YR)	Area - Discharge (100-YR)
	(AC)		(AC)	(MIN)	(IN/HR)	(IN/HR)	(CFS)	(CFS)
EC-100	0.47	0.49	0.23	10.00	6.24	11.16	1.43	2.56
ED-100	2.65	0.39	1.03	10.00	6.24	11.16	6.41	11.48

PROPOSED DRAINAGE AREA

DRAINAGE AREA								
Area - ID	Drainage Area	Composite C Value	Composite Area	To Used	Intensity (5YR)	Intensity (100-YR)	Area - Discharge (5-YR)	Area - Discharge (100-YR)
	(AC)		(AC)	(MIN)	(IN/HR)	(IN/HR)	(CFS)	(CFS)
PC-100	0.47	0.54	0.25	10.00	6.24	11.16	1.58	2.84
PD-100	2.65	0.39	1.03	10.00	6.24	11.16	6.49	11.62

NOTE:

1. THE CALCULATIONS ASSUMES STEADY AND UNIFORM FLOW. SEE TXDOT'S HYDRAULIC MANUAL, CHAPTER 6. OPEN CHANNEL FLOW FOR ADDITIONAL DETAILS.
2. DESIGNED PER LATEST TXDOT HYDRAULIC MANUAL (SEPTEMBER 2019), A MINIMUM TIME OF CONCENTRATION OF 10 MIN. WAS USED FOR THE PDS RATIONAL METHOD.
3. DITCH HYDRAULICS WAS CALCULATED USINGS MANNING'S EQUATION.
4. ALL GRASS CHANNEL LINING MATERIAL TO BE RETARDANCE CLASS B. MAXIMUM PERMISSIBLE SHEAR STRESS = 2.10 LBS/CFT
5. REFER TO ROADWAY CROSS SECTIONS FOR ADDITIONAL INFORMATION RELATED TO DITCH GRADING.
6. THE FLOWS FOR INTERNAL DRAINAGE AREAS WERE COMPUTED USING TXDOT RATIONAL EQUATION FOR AREAS LESS THAN 200 ACRES: Q=CIA; WHERE Q IS FLOW (CFS);C IS THE RATIONAL COEFFICIENT; I IS THE RAINFALL INTENSITY (IN/HR) OBTAINED FROM NOAA ATLAS 14; A IS THE DRAINAGE AREA (ACRES).
7. THE DETAILED INTERNAL DRAINAGE AREAS WERE DELINEATED BASED ON AVAILABLE CONTOURS.
8. THE RUNOFF COEFFICIENT C WAS DETERMINED USING TXDOT HYDRAULIC DESIGN MANUAL, SEPTEMBER 2019 AND VERIFIED WITH CURRENT AERIAL IMAGE.
9. TIME OF CONCENTRATION (Tc): 10 MINUTES WAS USED FOR ANY Tc LESS THAN 10 MINUTES.
10. PARTIAL DURATION SERIES (PDS) METHODOLOGY WAS USED FOR INTENSITY VALUES.

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
GABRIEL J. VILLARREAL
102456
LICENSED
PROFESSIONAL ENGINEER
P.E.
1/11/24

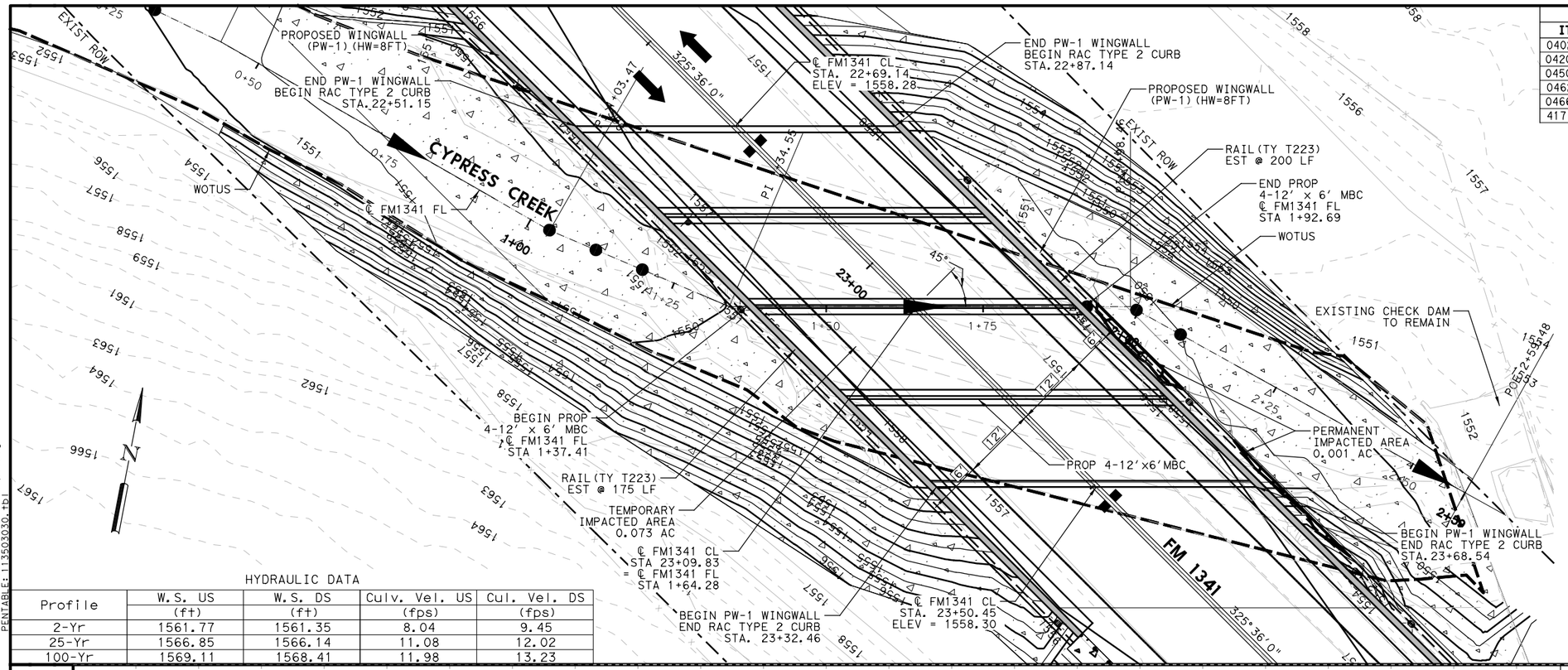
FM 1341 AT CYPRESS CREEK

HYDROLOGY & HYDRAULIC CALCULATIONS

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	50

FINAL PLANS SUBMITTAL



HYDRAULIC DATA

Profile	W.S. US (ft)	W.S. DS (ft)	Culv. Vel. US (fps)	Cul. Vel. DS (fps)
2-Yr	1561.77	1561.35	8.04	9.45
25-Yr	1566.85	1566.14	11.08	12.02
100-Yr	1569.11	1568.41	11.98	13.23

SHEET SUMMARY OF ESTIMATED QUANTITIES

ITEM#	DESCRIPTION	UNIT	QTY
0402 6001	TRENCH EXCAVATION PROTECTION	LF	59
0420 6136	CL C CONC (RAC-R)	CY	23
0450 6006	RAIL (TY T223)	LF	375
0462 6041	CONC BOX CULV (12 FT X 6 FT)	LF	216
0466 6183	WINGWALL (PW - 1) (HW=8 FT)	EA	2
4171 6001	INSTALL BRIDGE IDENTIFICATION NUMBERS	EA	2

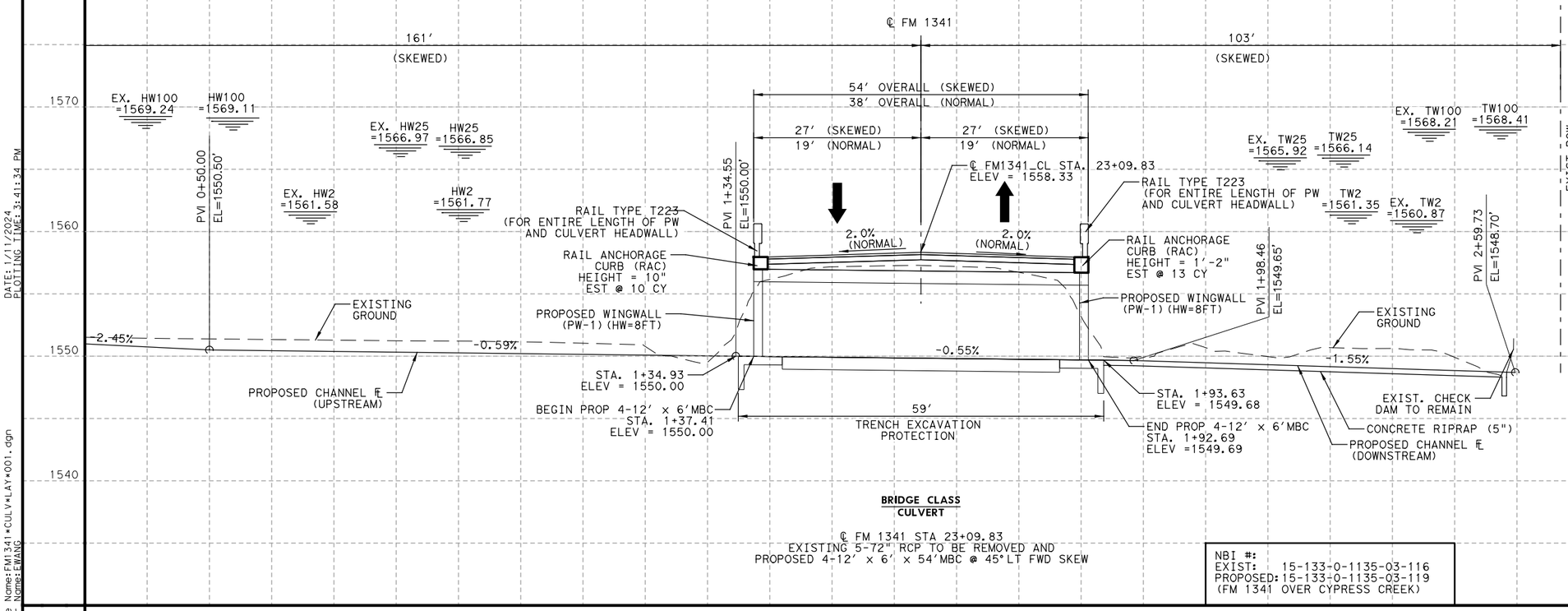
LEGEND

- ORDINARY HIGH WATER MARK (OHWM)
- ROW
- PROPOSED RIPRAP
- XX EXISTING CONTOURS (2019)

NOTES:

1. CONTRACTOR SHALL MAINTAIN POSITIVE DRAINAGE THROUGHOUT THE PROJECT.
2. CONTRACTOR TO VERIFY ALL LOCATIONS OF EXISTING UTILITIES WITHIN THE LIMITS OF CONSTRUCTION PRIOR TO EXCAVATION.
3. CONTRACTOR SHALL FIELD VERIFY ALL ELEVATIONS PRIOR TO THE CONSTRUCTION OF THE CULVERT AND DITCHES.
4. REFER TO THE HORIZONTAL ALIGNMENT DATA SHEET FOR CHANNEL ALIGNMENT DATA.
5. CONTOUR DATA FROM SURVEY TOPO AND TNRIS 2019 LIDAR BASED ON 1M RESOLUTION.

FUNCTIONAL CLASS: MINOR COLLECTOR
DESIGN SPEED: 50 MPH
A.D.T. (2024): 350
A.D.T. (2044): 450



BRIDGE CLASS CULVERT

℄ FM 1341 STA 23+09.83
EXISTING 5-72" RCP TO BE REMOVED AND
PROPOSED 4-12′ x 6′ x 54′MBC @ 45°LT FWD SKEW

NBI #:
EXIST: 15-133-0-1135-03-116
PROPOSED: 15-133-0-1135-03-119
(FM 1341 OVER CYPRESS CREEK)

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HDR Engineering Inc.
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San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

HORIZ. SCALE IN FEET: 0 10 20 30 40
VERT. SCALE IN FEET: 0 5 10 15 20

FM 1341 AT CYPRESS CREEK

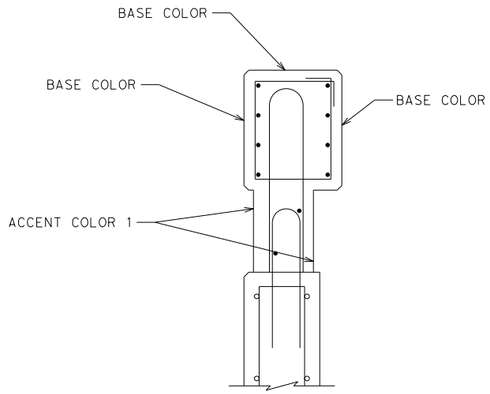
BRIDGE CLASS CULVERT LAYOUT

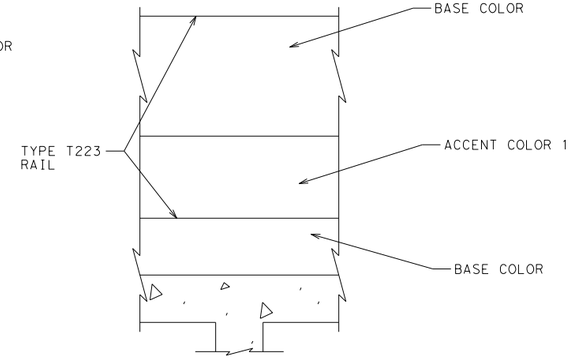
SCALE: 1"=20′-H
1"=10′-V

SHEET 1 OF 1

DSN: EW	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	51

FINAL PLANS SUBMITTAL





TYPE T223 RAIL COLOR PLACEMENT

SHOWING COLOR PLACEMENT

NOTE:

1. USE BASE COLOR FOR ALL SURFACES UNLESS OTHERWISE SHOWN. SEE SHEET "HILL COUNTRY REGION FINISHES AND TEXTURES" FOR COLOR SELECTION.
2. COLOR PLACEMENT SELECTION - REFER TO THE HILL COUNTRY REGION FINISHES AND TEXTURE FOR BASE COLOR AND ACCENT COLOR #1
3. COLOR PLACEMENT, MATERIALS, LABOR, EQUIPMENT, ETC SHALL BE SUBSIDIARY TO ITEM 0450 6006 RAIL (TY T223).

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK
HILL COUNTRY REGION COLOR PLACEMENT

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	52

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PENTABLE: 113503030.tbl
DATE: 1/11/2024
PLOTTING TIME: 2:26:13 PM
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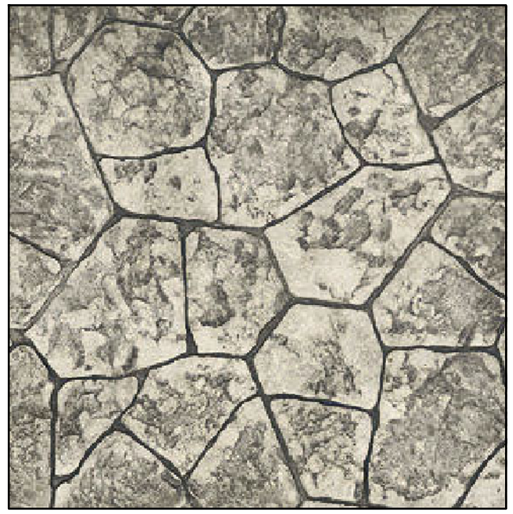
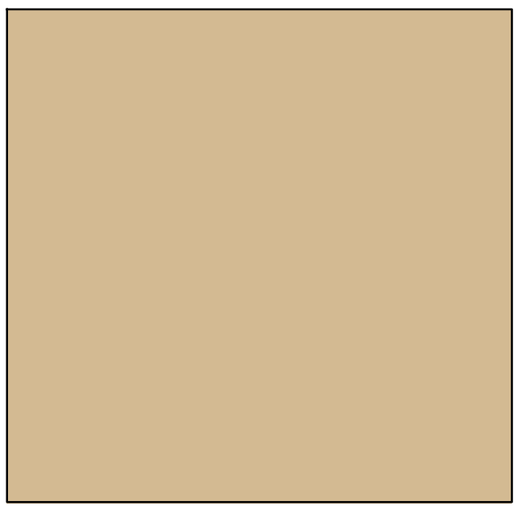
User Name: EWANG

CHISELED STONE FINISH
See Sheet HC39 for Form Liner Details

ROUGH STONE FINISH

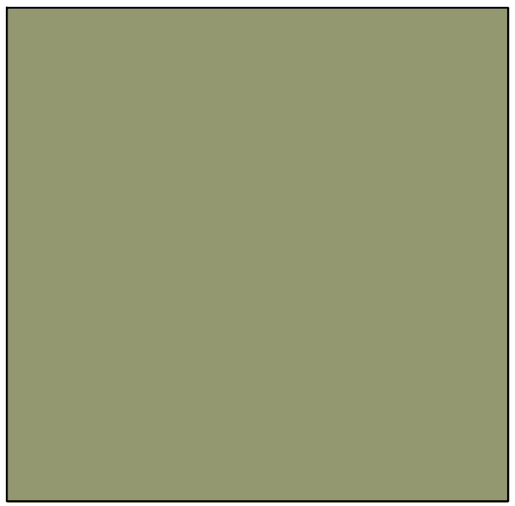


COLORED TEXTURED CONCRETE
RANDOM SLATE PATTERN
(REGULAR SLATE TEXTURE) (TOOLS A - D)
By Bomanite (559 -673-2411 or Approved Equal)

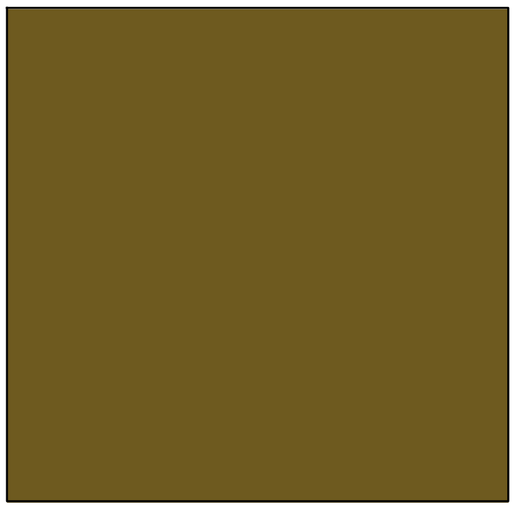


BASE COLOR
SHERWIN WILLIAMS
SW 6142 'MACADAMIA' OR APPROVED EQUAL

Base color to be applied to all surfaces unless otherwise noted.



ACCENT COLOR #1
SHERWIN WILLIAMS
SW 6179 'ARTICHOKE' OR APPROVED EQUAL



ACCENT COLOR #2
SHERWIN WILLIAMS
SW 6152 'SUPERIOR BRONZE' OR APPROVED EQUAL

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Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
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LICENSED
PROFESSIONAL ENGINEER
01/11/24

FM 1341 AT CYPRESS CREEK
HILL COUNTRY REGION
FINISHES AND TEXTURES

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	53

DATE: 1/11/2024 2:26:16 PM
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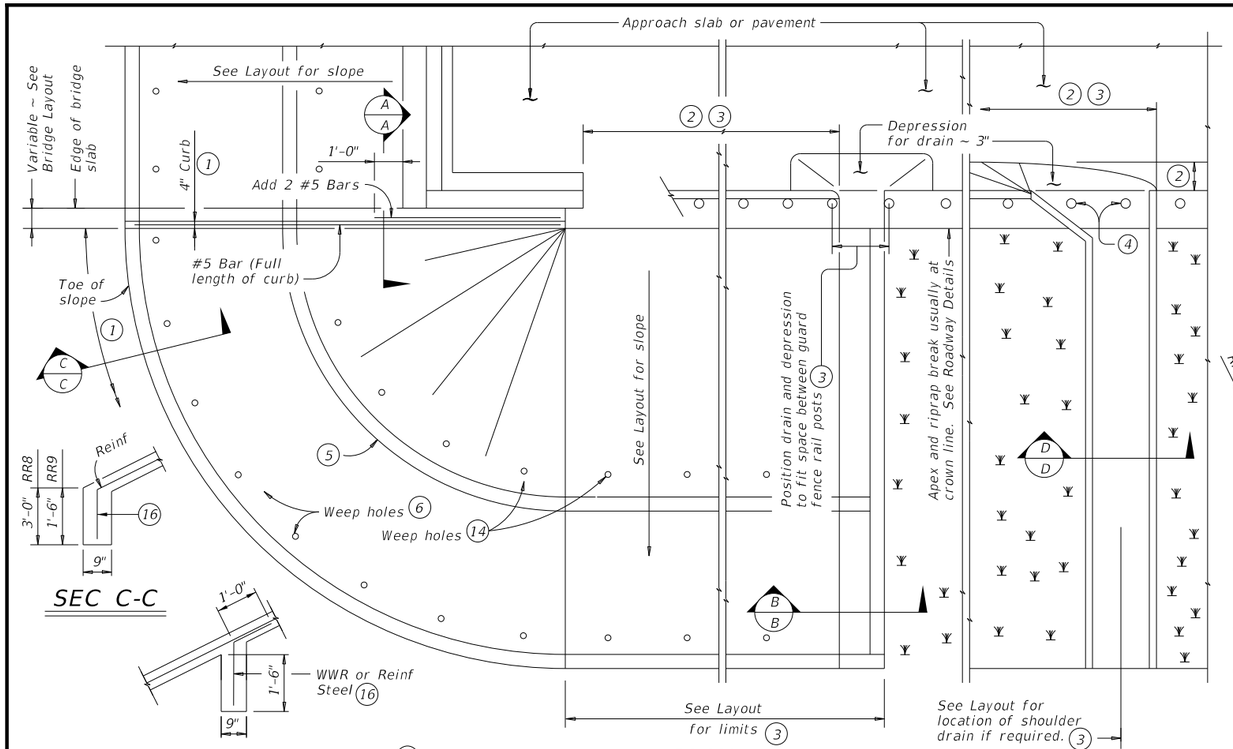
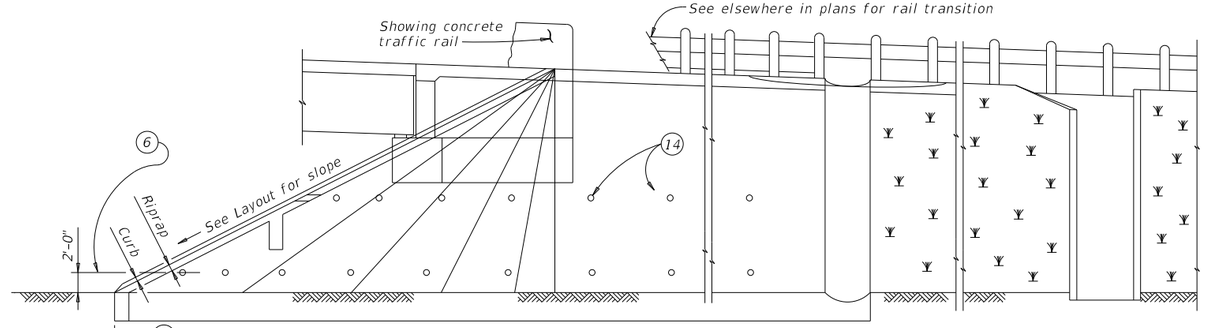


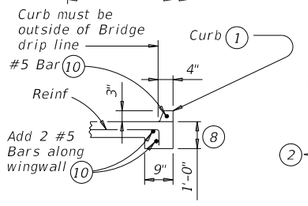
PLAN

SEC C-C

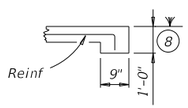
INTERMEDIATE TOEWALL (5)



ELEVATION

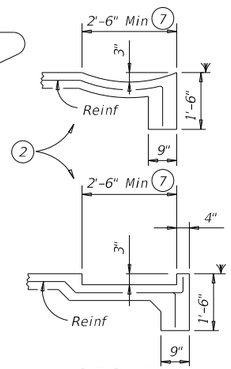


SEC A-A



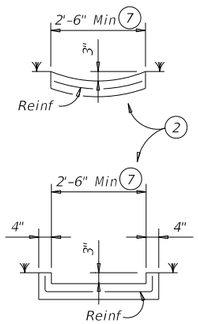
SEC B-B

(No drain)



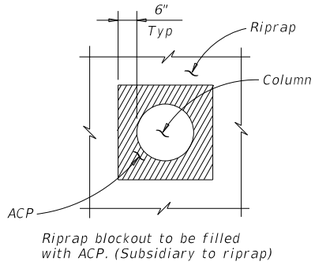
SEC B-B

(Shoulder drain integral with riprap)



SEC D-D

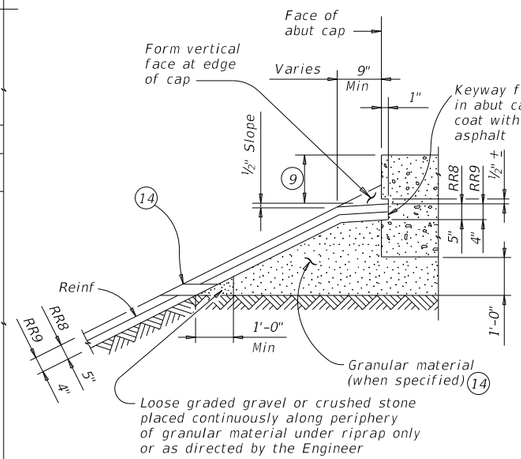
(Shoulder drain)



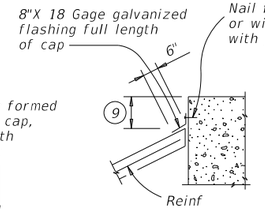
Riprap blockout to be filled with ACP. (Subsidiary to riprap)

RIPRAP DETAIL AT COLUMNS

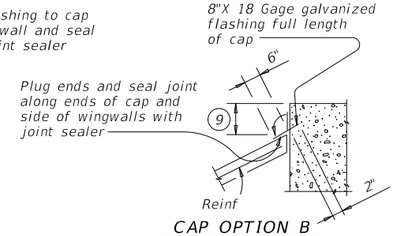
(As directed by the Engineer)



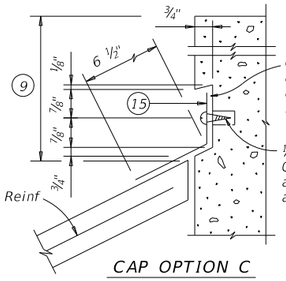
SHOWING KEYWAY OPTION



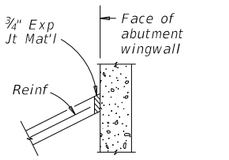
CAP OPTION A



CAP OPTION B

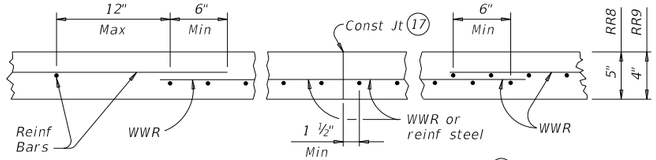


CAP OPTION C



SECT THRU RIPRAP AT WINGWALL (12)

SECTIONS THRU RIPRAP AT CAP (11)



REINFORCEMENT DETAILS (13)

See General Notes for optional synthetic fiber reinforcement.

(1) When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.

(2) Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.

(3) Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.

(4) See details elsewhere in plans for installation of guard fence posts through concrete riprap.

(5) Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.

(6) Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.

(7) Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.

(8) Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.

(9) Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.

(10) #5 bars shown are required even when synthetic fiber reinforcing option is selected.

(11) Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.

(12) Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.

(13) Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D2.9xD2.9 or D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.

(14) If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.

(15) 8" x 18 Gage Galv Sheet Metal

(16) Provide WWR or #3 bars, with 1'-0" extension into slope.

(17) WWR or reinforcing steel is continuous through riprap construction joints. Provide WWR or reinforcing steel that extends 1'-1" minimum into adjacent riprap on each side of construction joint even if synthetic reinforcing fiber is utilized.

FOR CONTRACTOR'S INFORMATION ONLY:
5" of RR8 = 0.015 CY/SF
4" of RR9 = 0.012 CY/SF
#3 Reinf at 18" c-c = 0.501 Lbs/SF
6x6-D3xD3 = 0.408 Lbs/SF

GENERAL NOTES:

Provide Class "B" concrete (f'c = 2,000 psi) unless noted elsewhere in plans.

Provide Grade 60 reinforcing steel.

Provide deformed welded wire reinforcement (WWR) meeting ASTM A1064, unless otherwise shown.

Provide reinforcing bars, deformed WWR, or any suitable combination of both types for riprap reinforcing, unless specified elsewhere in the plans.

Optionally synthetic fibers may be used if approved by the Engineer. Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete.

Install construction joints or grooved joints extending the full slant slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.

Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".

See Layout for limits of riprap.

RR8 is to be used on stream crossings.

RR9 is to be used on other embankments.

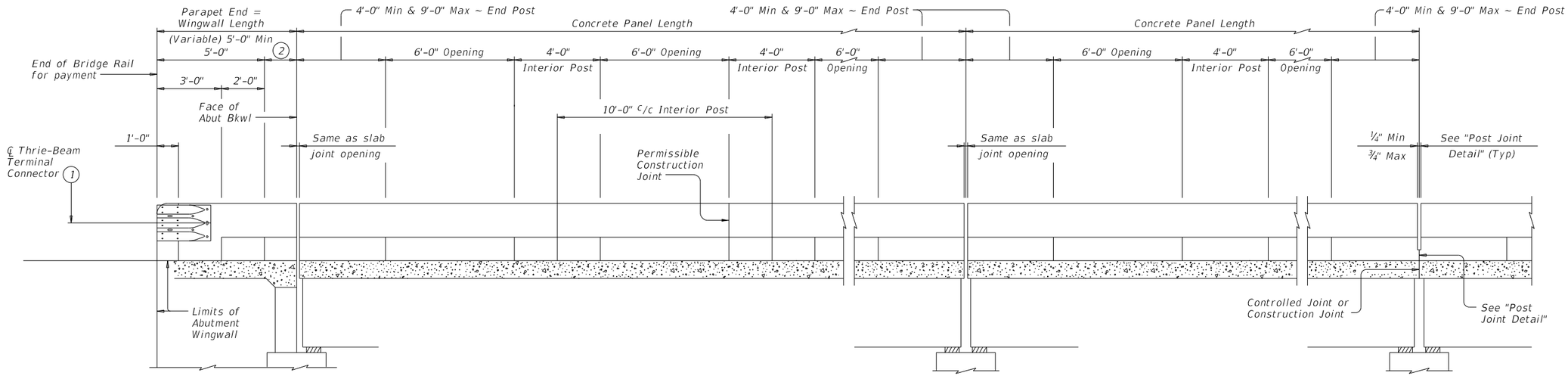
Texas Department of Transportation

Bridge Division Standard

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

CRR

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT April 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		54

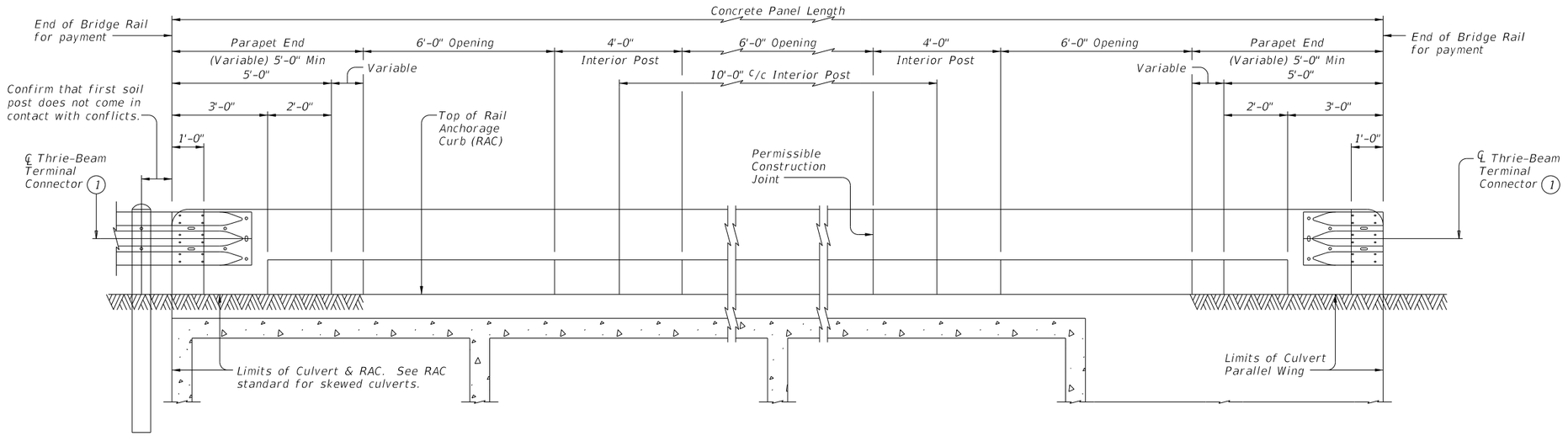


AT ABUTMENTS

AT BENTS WITH SLAB EXP JOINTS

AT BENTS WITHOUT SLAB EXP JOINTS

ROADWAY ELEVATION OF RAIL ON BRIDGE



AT STRAIGHT OR FLARED WINGS

AT PARALLEL WINGS

ROADWAY ELEVATION OF RAIL ON BOX CULVERTS

Showing 0° skew culvert. Skewed culverts similar. See RAC standard for details not shown. Vertical joints in concrete rail are not required, unless shown elsewhere.

(1) *Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.*

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

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		55

DATE: 1/11/2024 2:26:18 PM
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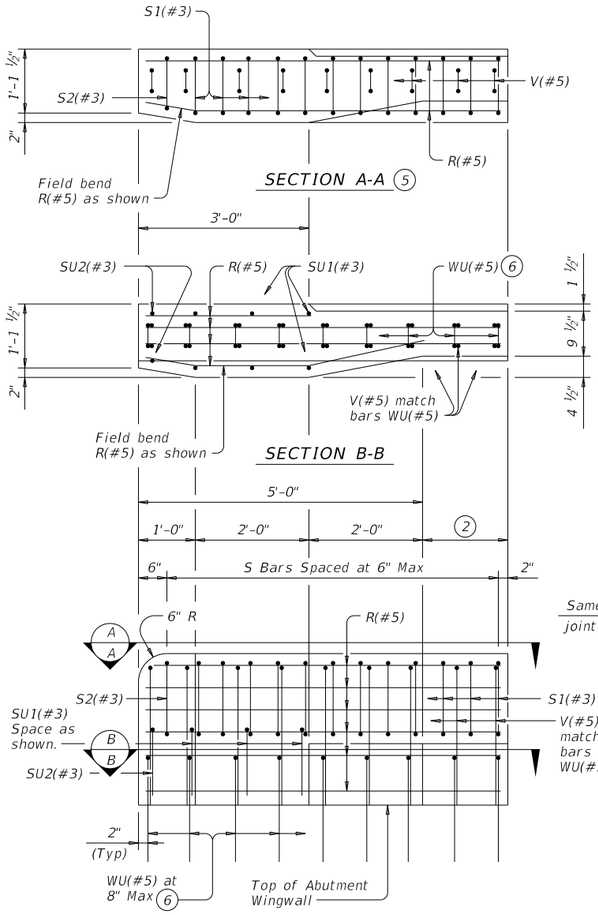
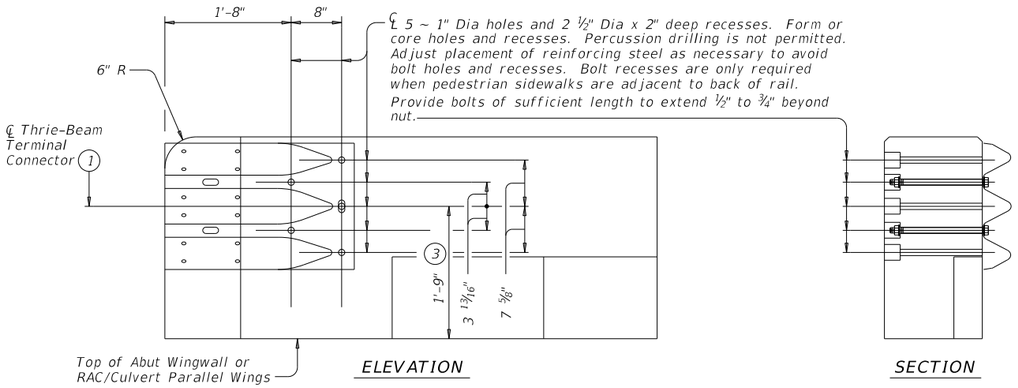
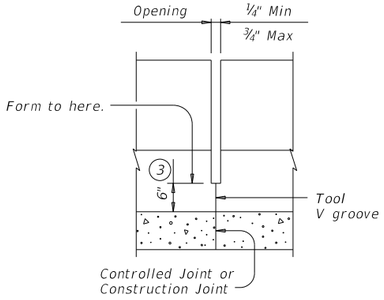


PARAPET END AT ABUT WINGWALL (6)

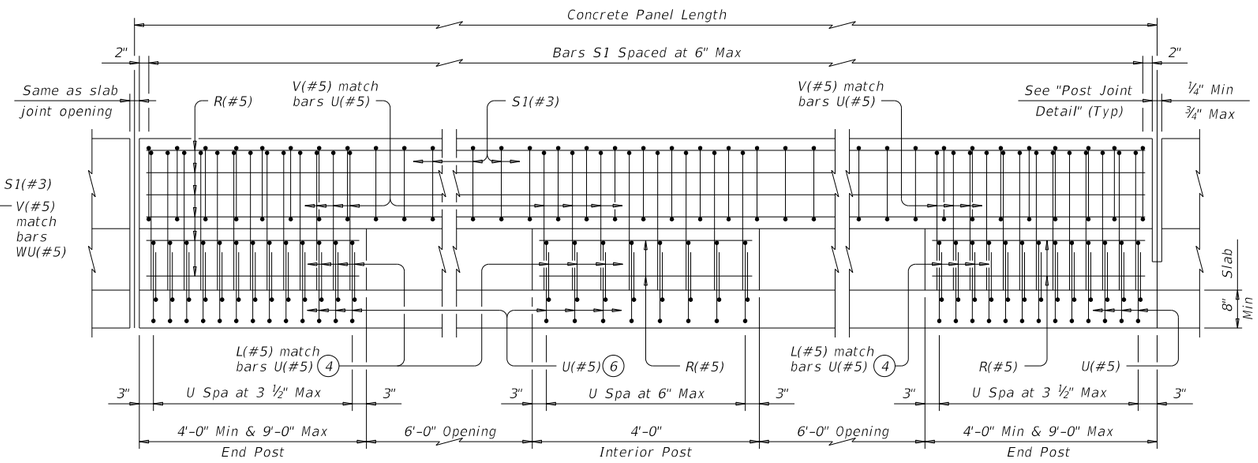


TERMINAL CONNECTION DETAILS



POST JOINT DETAIL

Provide at all interior bents without slab expansion joints.



AT SLAB EXPANSION JOINTS

AT 4' INTERIOR POST

AT BENTS WITHOUT SLAB EXPANSION JOINTS

ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT

Showing rail on slab. Rail on box culvert similar.

(1) Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.

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

(3) Increase 2" for structures with overlay.

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

(5) Bars SU1(#3), SU2(#3) and WU(#5) not shown for clarity.

(6) Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE:	DN: TxDOT	CK: TxDOT	DW: JTR	CK: AES
©TxDOT September 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		56

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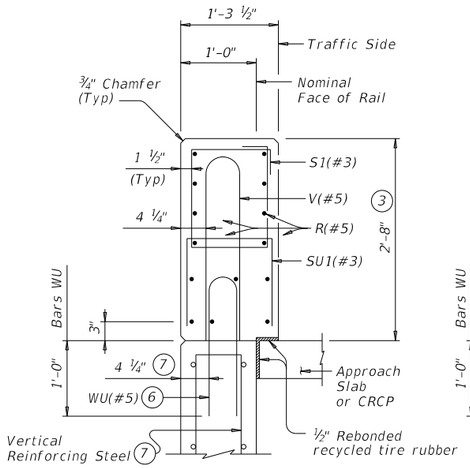
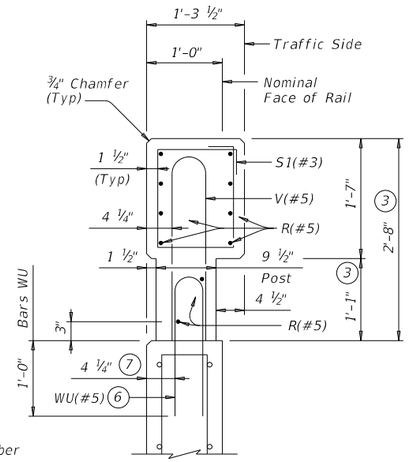
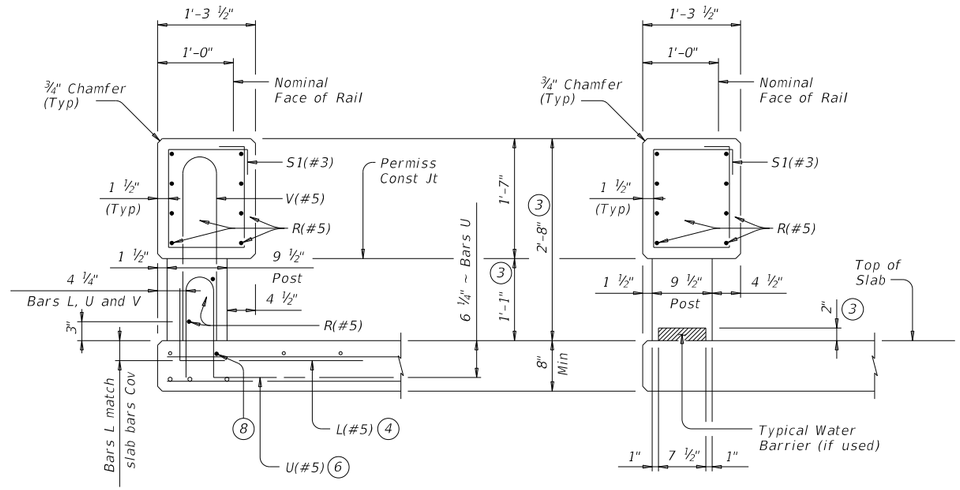


SECTION C-C
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS



SECTION D-D
ON ABUTMENT WINGWALLS
OR CIP RETAINING WALLS

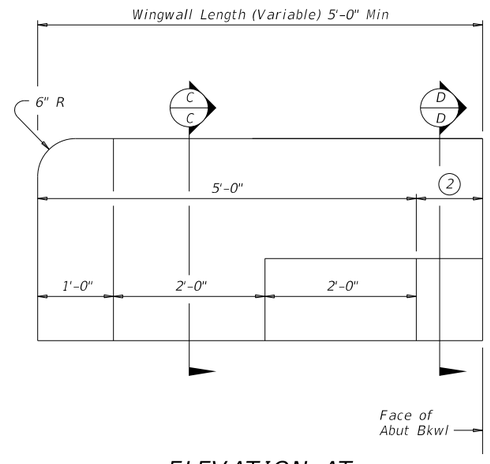


AT POST
ON BRIDGE SLAB

AT OPENING
ON BRIDGE SLAB

SECTIONS THRU RAIL

Sections on box culverts similar.



ELEVATION AT ABUTMENT WINGWALL

Box culvert parallel wings or rail anchorage curb similar.

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

(3) *Increase 2" for structures with overlay.*

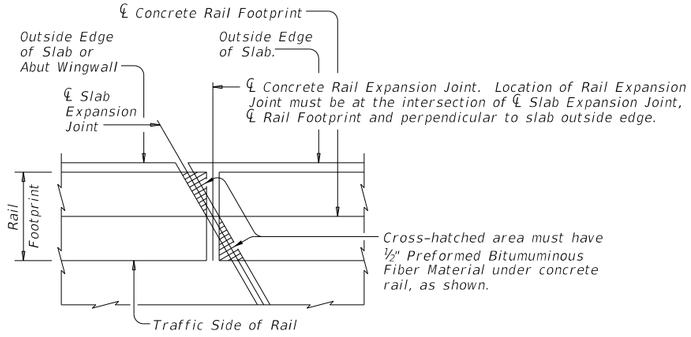
(4) *Bars L(#5) are part of rail reinforcing and are included in unit price bid for railing. Space with Bars U. Bars L match slab bar cover. Bars L may be bundled with top slab reinforcing if spacing is equivalent.*

(6) *Substitute Bars U(#5) for Bars WU(#5) when parapet end is located on anchorage curb over culvert top slab. Use Bars WU(#5) in culvert parallel wings.*

(7) *When vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls on traffic side of wall, move the horizontal wingwall/retaining wall reinforcing to the inside of Bars WU where bars conflict.*

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

(9) *At the Contractor's option, Bars V may be replaced by extending Bars U to 2'-5 ¼" above the roadway surface without overlay.*



PLAN OF RAIL AT EXPANSION JOINTS

Example showing Slab Expansion Joints without breakbacks.

CONSTRUCTION NOTES:

Face of rail and parapet must be vertical transversely unless otherwise shown in the plans or approved by the Engineer.

Provide water barriers at openings draining onto undercrossing roadways and sidewalks. They may be cast-in-place or precast in convenient lengths and bonded to the bridge deck with an approved epoxy cement.

Chamfer all exposed corners.

MATERIAL NOTES:

Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere.

Provide Grade 60 reinforcing steel.

Epoxy coat or galvanize all reinforcing steel if slab bars are epoxy coated or galvanized.

Deformed Welded Wire Reinforcing (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U, V, and WU unless noted otherwise. Provide the same laps as required for reinforcing bars.

Provide bar laps, where required, as follows:

Uncoated or galvanized ~ #5 = 2'-0"
Epoxy coated ~ #5 = 3'-0"

GENERAL NOTES:

This rail has been evaluated by full-scale crash test to meet MASH TL-3 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less.

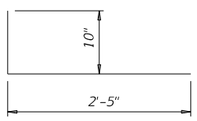
Do not use this railing on bridges with expansion joints providing more than 5" movement.

Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

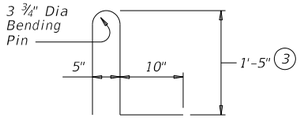
Shop drawings are not required for this rail.

Average weight of railing with no overlay is 358 plf.

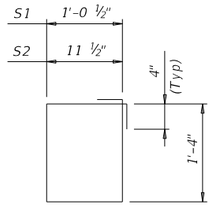
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing bar dimensions shown are out-to-out of bar.



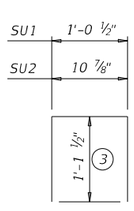
BARS L (#5)



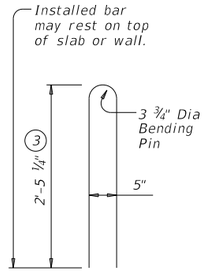
BARS U (#5) (9)



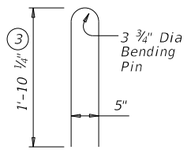
BARS S (#3)



BARS SU (#3)



BARS V (#5) (9)



BARS WU (#5)

SHEET 3 OF 3

Texas Department of Transportation

Bridge Division Standard

TRAFFIC RAIL

TYPE T223

FILE:	DN: TxDOT	CK: TxDOT	DN: JTR	CK: AES
©TxDOT September 2019 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		57

DATE: 1/11/2024 2:26:20 PM
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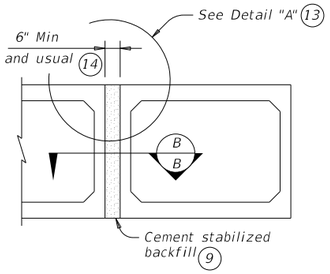
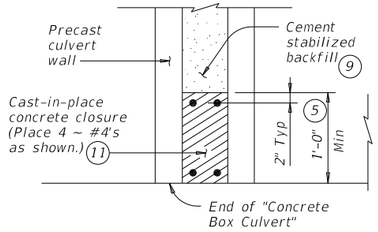
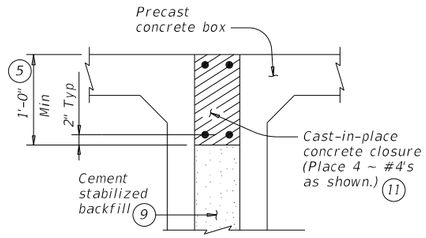


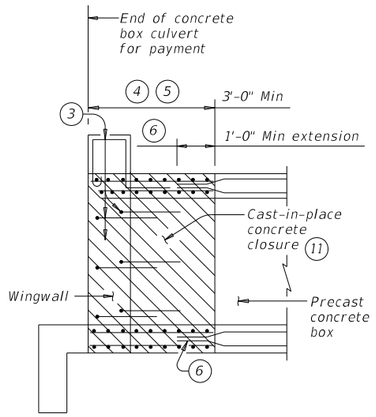
MULTIPLE UNIT PLACEMENT



SECTION B-B

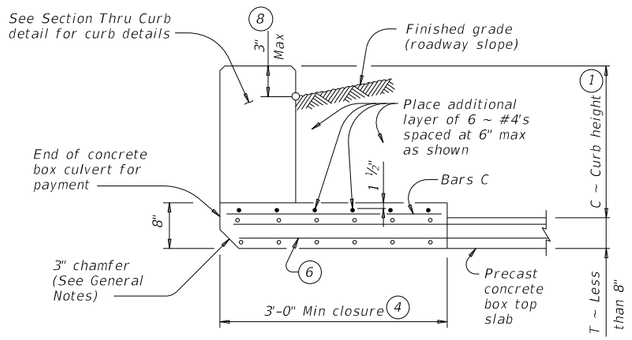


DETAIL "A" (13)

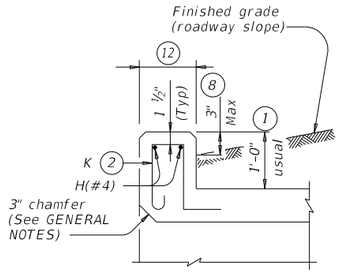


WINGWALL CONNECTION

(Also applies to safety end treatment.)

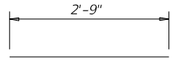


SECTION THRU TOP SLABS LESS THAN 8"

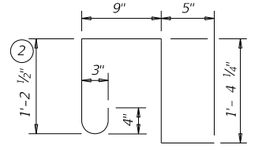


SECTION THRU CURB

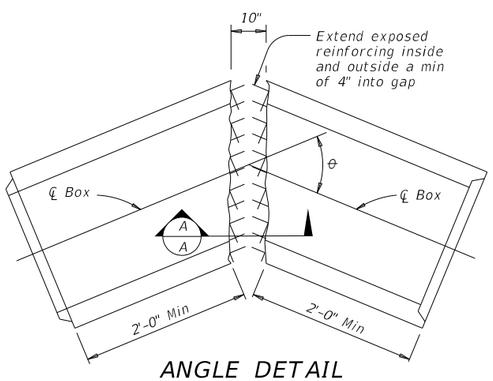
QUANTITIES PER FOOT OF CURB (10)	
Reinforcing Steel	4.12 Lb
Concrete	0.037 CY



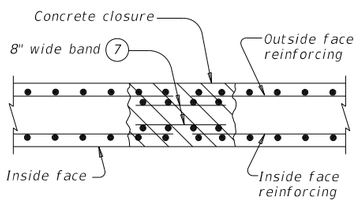
BARS C (#4)
(Spa = 1'-0" Max)



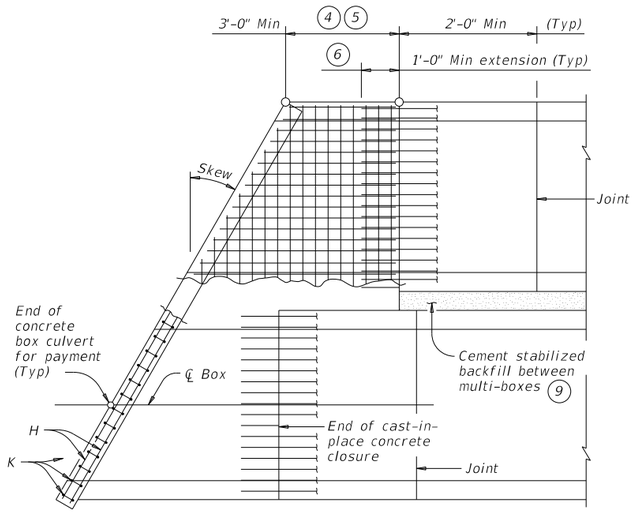
BARS K (#4)
(Spa = 1'-0" Max)
(Length = 4'-2")



ANGLE DETAIL



SECTION A-A



PLAN OF SKEWED ENDS

(Showing multi-box placement.)

1. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail, or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
2. For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
3. Extend curb, wingwall, or safety end treatment reinforcing into concrete closure. Bend or trim, as necessary, any reinforcing that does not fit into closure area.
4. Provide a 3'-0" Min cast-in-place concrete closure. Break back boxes in the field or cast boxes short. Provide bands of reinforcing in the closure that are the same size and spacing as in the precast box section. Provide #4 longitudinal reinforcement spaced at 12 inches Max within the closure. Except where shown otherwise, construct the cast-in-place closure flush with the inside and outside faces of the precast box section.
5. For multiple unit placements, adjust the length of the closure for the interior walls as necessary. Provide a 3'-0" Min cast-in-place closure in the top slab, bottom slab, and exterior wall. See Section B-B detail when interior walls are cast full length.
6. Extend precast box reinforcing a minimum of 1'-0" into concrete closure (Typ).
7. Place bands of reinforcing matching the inside and outside face reinforcing in the gaps of the top and bottom slabs. Place a band matching the outside face reinforcing of the wall in the gaps of the walls (placed in the outside face only). Tack weld the bands to the exposed reinforcing at each point of contact.
8. For vehicle safety, the following requirements must be met:
   - For structures without bridge rail, construct curbs no more than 3" above finished grade.
   - For structures with bridge rail, construct curbs flush with finished grade.

   Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
9. Cement stabilized backfill between boxes is considered part of the box culvert for payment.
10. All curb concrete and reinforcing is considered part of the box culvert for payment.
11. Any additional concrete and reinforcing required for the closures will be considered subsidiary to the box culvert for payment.
12. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
13. For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in Detail "A".
14. This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box." No payment will be made for any additional material in the gap between adjacent boxes.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.
Provide ASTM A1064 welded wire reinforcement.
Provide Class C concrete (f'c = 3,600 psi) for the closures.
Provide cement stabilized backfill meeting the requirements of Item 400, "Excavation and Backfill for Structures."
Any additional concrete required for the closures will be considered subsidiary to the box culvert.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.
Refer to the Single Box Culverts Precast (SCP) standard sheets for details and notes not shown.
Chamfer the bottom edge of the top slab closure 3 inches at culvert closure ends.

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

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

SCP-MD

FILE:	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		58

DATE: 1/11/2024 2:26:22 PM
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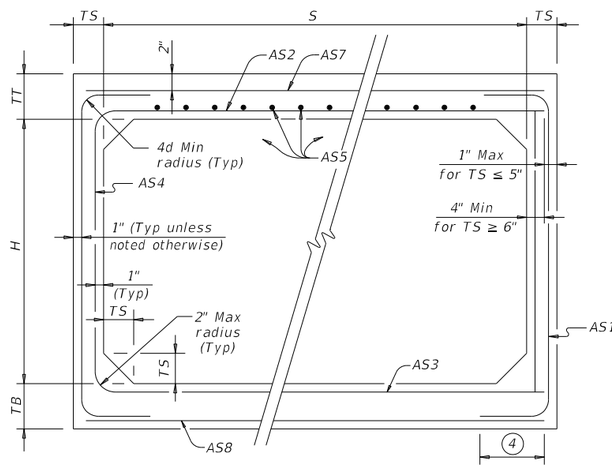
BOX DATA

SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
12	4	12	12	12	< 2	–	0.38	0.31	0.29	0.29	0.29	0.29	0.29	22.8
12	4	12	12	12	2 < 3	73	0.44	0.37	0.30	0.29	–	–	–	22.8
12	4	12	12	12	3 - 5	66	0.37	0.30	0.29	0.29	–	–	–	22.8
12	4	12	12	12	10	66	0.44	0.34	0.35	0.29	–	–	–	22.8
12	4	12	12	12	15	59	0.60	0.46	0.48	0.29	–	–	–	22.8
12	4	12	12	12	20	59	0.78	0.60	0.61	0.29	–	–	–	22.8
12	4	12	12	12	25	59	0.97	0.74	0.75	0.29	–	–	–	22.8
12	5	12	12	12	< 2	–	0.34	0.33	0.29	0.29	0.29	0.29	0.29	24.0
12	5	12	12	12	2 < 3	66	0.41	0.40	0.33	0.29	–	–	–	24.0
12	5	12	12	12	3 - 5	61	0.34	0.33	0.30	0.29	–	–	–	24.0
12	5	12	12	12	10	59	0.41	0.38	0.39	0.29	–	–	–	24.0
12	5	12	12	12	15	59	0.55	0.51	0.52	0.29	–	–	–	24.0
12	5	12	12	12	20	59	0.71	0.66	0.67	0.29	–	–	–	24.0
12	5	12	12	12	25	59	0.88	0.81	0.82	0.29	–	–	–	24.0
12	6	12	12	12	< 2	–	0.32	0.36	0.32	0.29	0.29	0.29	0.29	25.2
12	6	12	12	12	2 < 3	66	0.38	0.43	0.36	0.29	–	–	–	25.2
12	6	12	12	12	3 - 5	59	0.32	0.36	0.33	0.29	–	–	–	25.2
12	6	12	12	12	10	59	0.38	0.41	0.42	0.29	–	–	–	25.2
12	6	12	12	12	15	53	0.51	0.55	0.57	0.29	–	–	–	25.2
12	6	12	12	12	20	53	0.65	0.71	0.72	0.29	–	–	–	25.2
12	6	12	12	12	25	53	0.81	0.87	0.89	0.29	–	–	–	25.2
12	7	12	12	12	< 2	–	0.30	0.39	0.35	0.29	0.29	0.29	0.29	26.4
12	7	12	12	12	2 < 3	66	0.35	0.46	0.39	0.29	–	–	–	26.4
12	7	12	12	12	3 - 5	59	0.29	0.38	0.36	0.29	–	–	–	26.4
12	7	12	12	12	10	59	0.36	0.43	0.45	0.29	–	–	–	26.4
12	7	12	12	12	15	53	0.47	0.58	0.61	0.29	–	–	–	26.4
12	7	12	12	12	20	53	0.61	0.75	0.77	0.29	–	–	–	26.4
12	8	12	12	12	< 2	–	0.29	0.41	0.38	0.29	0.29	0.29	0.29	27.6
12	8	12	12	12	2 < 3	66	0.33	0.49	0.42	0.29	–	–	–	27.6
12	8	12	12	12	3 - 5	59	0.29	0.41	0.38	0.29	–	–	–	27.6
12	8	12	12	12	10	59	0.34	0.46	0.48	0.29	–	–	–	27.6
12	8	12	12	12	15	53	0.44	0.61	0.64	0.29	–	–	–	27.6
12	8	12	12	12	20	53	0.57	0.78	0.81	0.29	–	–	–	27.6
12	8	12	12	12	25	53	0.69	0.96	0.99	0.29	–	–	–	27.6

BOX DATA

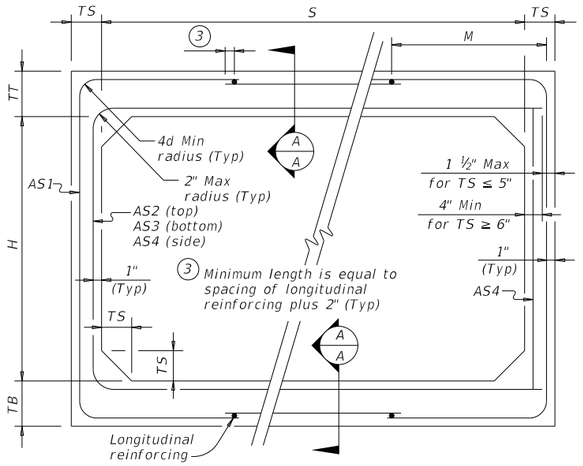
SECTION DIMENSIONS					Fill Height	M (Min)	REINFORCING (sq. in. / ft.) (2)							(1) Lift Weight
S (ft.)	H (ft.)	TT (in.)	TB (in.)	TS (in.)	(ft.)	(in.)	AS1	AS2	AS3	AS4	AS5	AS7	AS8	(tons)
12	9	12	12	12	< 2	–	0.29	0.43	0.40	0.29	0.29	0.29	0.29	28.8
12	9	12	12	12	2 < 3	66	0.30	0.51	0.45	0.29	–	–	–	28.8
12	9	12	12	12	3 - 5	66	0.29	0.43	0.41	0.29	–	–	–	28.8
12	9	12	12	12	10	59	0.32	0.47	0.51	0.29	–	–	–	28.8
12	9	12	12	12	15	53	0.42	0.63	0.67	0.29	–	–	–	28.8
12	9	12	12	12	20	53	0.53	0.81	0.85	0.29	–	–	–	28.8
12	9	12	12	12	25	53	0.69	0.96	0.99	0.29	–	–	–	28.8
12	10	12	12	12	< 2	–	0.29	0.45	0.43	0.29	0.29	0.29	0.29	30.0
12	10	12	12	12	2 < 3	73	0.29	0.54	0.48	0.29	–	–	–	30.0
12	10	12	12	12	3 - 5	66	0.29	0.45	0.43	0.29	–	–	–	30.0
12	10	12	12	12	10	59	0.31	0.49	0.53	0.29	–	–	–	30.0
12	10	12	12	12	15	53	0.40	0.65	0.70	0.29	–	–	–	30.0
12	10	12	12	12	20	53	0.51	0.84	0.88	0.29	–	–	–	30.0
12	10	12	12	12	25	53	0.62	1.03	1.07	0.29	–	–	–	30.0
12	11	12	12	12	< 2	–	0.29	0.47	0.45	0.29	0.29	0.29	0.29	31.2
12	11	12	12	12	2 < 3	80	0.29	0.56	0.51	0.29	–	–	–	31.2
12	11	12	12	12	3 - 5	73	0.29	0.47	0.46	0.29	–	–	–	31.2
12	11	12	12	12	10	66	0.29	0.51	0.55	0.29	–	–	–	31.2
12	11	12	12	12	15	59	0.38	0.67	0.72	0.29	–	–	–	31.2
12	11	12	12	12	20	53	0.48	0.85	0.91	0.29	–	–	–	31.2
12	11	12	12	12	25	53	0.59	1.05	1.10	0.29	–	–	–	31.2
12	12	12	12	12	< 2	–	0.29	0.49	0.48	0.33	0.29	0.29	0.29	32.4
12	12	12	12	12	2 < 3	93	0.29	0.59	0.53	0.29	–	–	–	32.4
12	12	12	12	12	3 - 5	80	0.29	0.49	0.48	0.29	–	–	–	32.4
12	12	12	12	12	10	73	0.29	0.52	0.58	0.29	–	–	–	32.4
12	12	12	12	12	15	59	0.37	0.69	0.74	0.29	–	–	–	32.4
12	12	12	12	12	20	59	0.46	0.87	0.93	0.29	–	–	–	32.4



CORNER OPTION "A" CORNER OPTION "B"

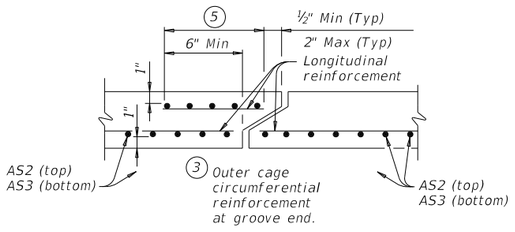
FILL HEIGHT LESS THAN 2 FT

(4) Length is equal to spacing of longitudinal reinforcing plus 2". (10" Min) (Typ)



CORNER OPTION "A" CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER



SECTION A-A

(Showing top and bottom slab joint reinforcement.)

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

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

MATERIAL NOTES:

Provide 0.03 sq. in./ft. minimum longitudinal reinforcement at each face in slabs and walls. This minimum requirement may be met by the transverse wires when wire mesh reinforcement is used.

Provide Class H concrete (f`c = 5,000 psi).

GENERAL NOTES:

Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.

See Box Culverts Precast Miscellaneous Details (SCP-MD) standard sheet for details and notes not shown.

In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Submit shop plans for alternate designs in accordance with Item "Precast Concrete Structural Members (Fabrication)."

HL93 LOADING

Texas Department of Transportation

Bridge Division Standard

SINGLE BOX CULVERTS PRECAST

12'-0" SPAN

SCP-12

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		59

Culvert Station and/or Creek Name followed by applicable end (Lt, Rt or Both)	Description of Box Culvert No. Spans ~ Span X Height	Max Fill Height (Ft)	Applicable Box Culvert Standard (4)	Applicable Wingwall or End Treatment Standard	Skew Angle (0°,15°, 30° or 45°)	Side Slope or Channel Slope Ratio (SL:1)	T Culvert Top Slab Thickness (In)	U Culvert Wall Thickness (In)	C Estimated Curb Height (Ft)	Hw Height of Wingwall (1) (Ft)	A Curb to End of Wingwall (Ft)	B Offset of End of Wingwall (Ft)	Lw Length of Longest Wingwall (Ft)	Ltw Culvert Toewall Length (Ft)	Atw Anchor Toewall Length (Ft)	Riprap Apron (CY)	Class "C" Conc (Curb) (2) (CY)	Class "C" Conc (Wingwall) (3) (CY)	Total Wingwall Area (SF)
23+09.83 CULV. OVER CYPRESS CREEK (LT)	4-12'x6'	2'	SCP-12	PW-1	45	6:1	12	12	1	8	N/A	N/A	82	118	N/A	0	10	70	944
23+09.83 CULV. OVER CYPRESS CREEK (RT)	4-12'x6'	2'	SCP-12	PW-1	45	4:1	12	12	1	8	N/A	N/A	60	93	N/A	0	13	54	744

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

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

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

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

C = Curb height

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

Hw = Height of wingwall

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

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

Lw = Length of longest wingwall.

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

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

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

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

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

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

SPECIAL NOTE:

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

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

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

Texas Department of Transportation

Bridge Division Standard

BOX CULVERT SUPPLEMENT
WINGS AND END TREATMENTS

BCS

FILE:	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		60

DATE: 1/11/2024 2:26:26 PM
FILE: $FILE$

DATE: 1/11/2024 2:26:28 PM
FILE: $FILE$

TABLE OF DIMENSIONS AND REINFORCING STEEL
(Wings for one structure end)

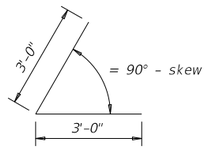
Dimensions					Variable Reinforcing				Estimated Quantities per ft of wing (2~wings) (4)		Estimated Quantities per ft of Toewall (1~toewall)	
					Bars J1		Bars J2					
Maximum Wingwall Height Hw	W	X	Y	Z	Size	Spa	Size	Spa	Reinf Lb/Ft)	Conc (CY/Ft)	Reinf (Lb/Ft)	Conc (CY/Ft)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING
(2~wings)

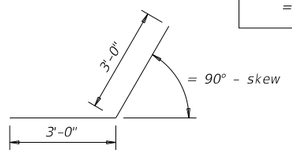
Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



BARS D1



BARS D2

WING DIMENSION FORMULAS:
(All values are in feet.)

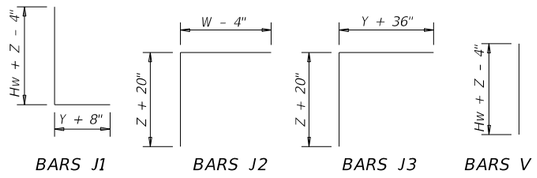
Hw = H + T + C
Lw = (Hw) (SL) ÷ cosine (θ) for Type PW-1
= (Hw - 1') (SL) ÷ cosine (θ) for Type PW-2 and Hw ≥ 4'
= (Hw - 0.5') (SL) ÷ cosine (θ) for Type PW-2 and Hw < 4'

For cast-in-place culverts:
Ltw = [(N) (S) + (N + 1) (U)] ÷ cosine (θ)

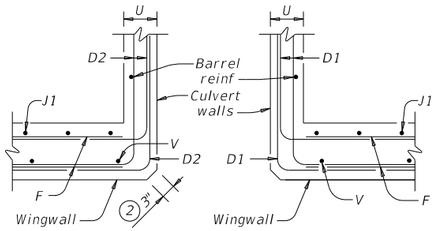
For precast culverts:
Ltw = [(N) (2 U + S) + (N - 1) (0.5')] ÷ cosine (θ)
Total Wingwall Area (two wings ~ SF)
= (2)(Hw)(Lw) for Type PW-1
= (2)(Hw)(Lw) - 6 SF for Type PW-2 and Hw ≥ 4'
= (2)(Hw)(Lw) - 1.5 SF for Type PW-2 and Hw < 4'

Hw = Height of wingwall
Lw = Length of wingwall
Ltw = Culvert toewall length
N = Number of culvert spans
SL:1 = Channel slope ratio. (horizontal: 1 vertical, usual value is 2:1)
θ = Culvert skew

See applicable box culvert standard sheet for S, H, T, and U values.



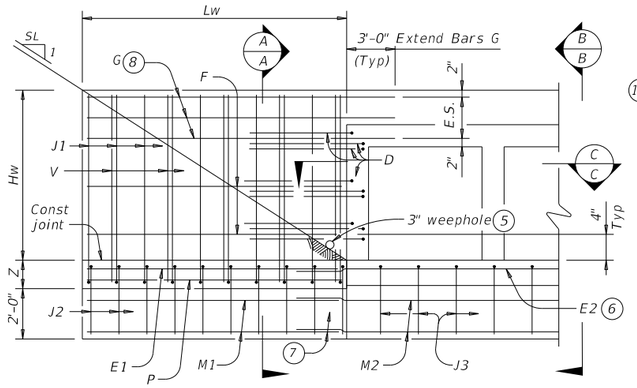
BARS J1 BARS J2 BARS J3 BARS V



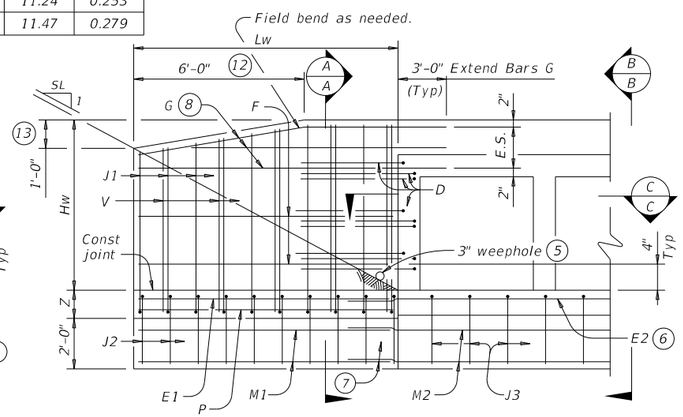
SECTION C-C - PW-1

1. Skew = 0°
2. At discharge end, chamfer may be ¾" minimum.
3. For 15° skew ~ 1"
   For 30° skew ~ 2"
   For 45° skew ~ 3"
4. Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
5. Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
6. Extend Bars E2 1'-6" minimum into the wingwall footing.
7. Lap Bars M1 1'-6" minimum with Bars M2.
8. Place Bars G as shown, equally spaced at 8" maximum. Provide at least two pairs of Bars G per wing.
9. 0" Min to 5'-0" Max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail or curbs taller than 1'-0, refer to the Extended Curb Details (ECD) standard sheet. For structures with T631 or T631LS bridge rail, refer to the Mounting Details for T631 & T631LS Rails (T631-CM) standard sheet. Refer to the Box Culvert Rail Mounting Details (RAC) standard sheet for structures with bridge rail other than T631 or T631LS.
10. For vehicle safety, the following requirements must be met:
    - For structures without bridge rail, construct curbs no more than 3" above finished grade.
    - For structures with bridge rail, construct curbs flush with finished grade.

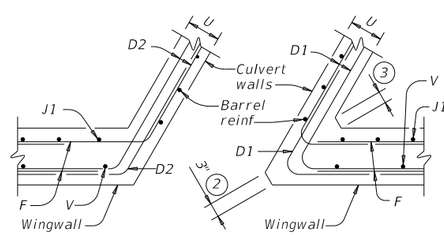
    Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
11. 1'-0" typical. 2'-3" when the Box Culvert Rail Mounting Details (RAC) standard sheet is referred to elsewhere in the plans.
12. 3'-0" for Hw < 4'.
13. 6" for Hw < 4'.



PARTIAL ELEVATION - PW-1



PARTIAL ELEVATION - PW-2



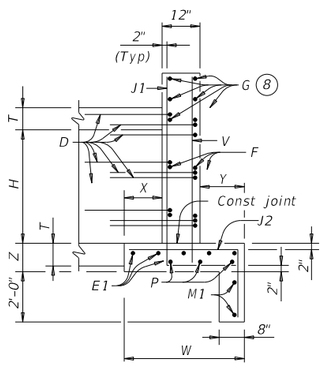
SECTION C-C - PW-2

DESIGNER NOTES:
Type PW-1 can be used for all applications and must be used if railing is to be mounted to the wingwall.
Type PW-2 can only be used for applications without a railing mounted to the wingwall.

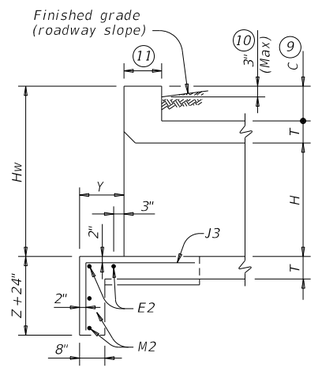
MATERIAL NOTES:
Provide Class C concrete (f'c=3,600 psi).
Provide Grade 60 reinforcing steel.
Provide galvanized reinforcing steel if required elsewhere in the plans.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications.
Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
See Box Culvert Supplement (BCS) standard sheet for wingwall type and additional dimensions and information.
Quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

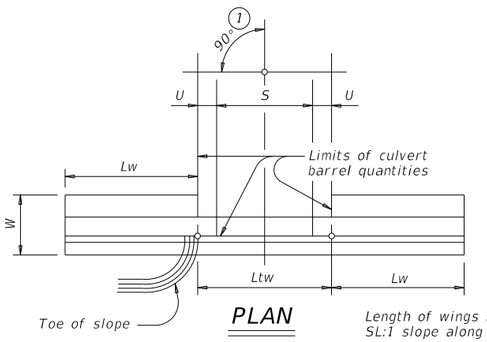
Cover dimensions are clear dimensions, unless noted otherwise. Reinforcing dimensions are out-to-out of bars.



SECTION A-A
(Showing wing reinforcement.)

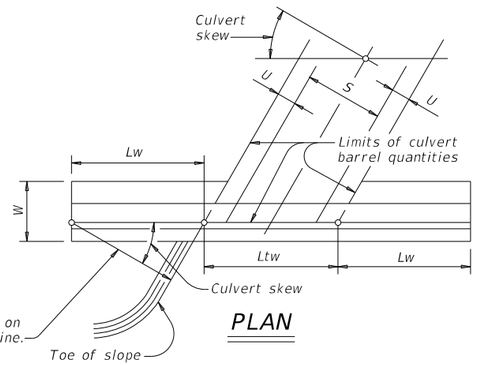


SECTION B-B
(Showing wing reinforcement.)



PLAN

DETAILS FOR NON-SKEWED BOX CULVERTS



PLAN

DETAILS FOR SKEWED BOX CULVERTS
(Showing 30° skew.)

Texas Department of Transportation
Bridge Division Standard

CONCRETE WINGWALLS
WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE:	DN: GAF	CK: CAT	DW: TxDOT	CK: TxDOT
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		61

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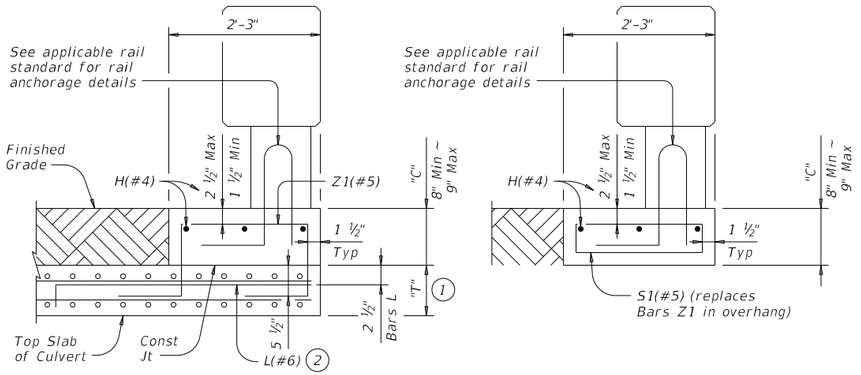
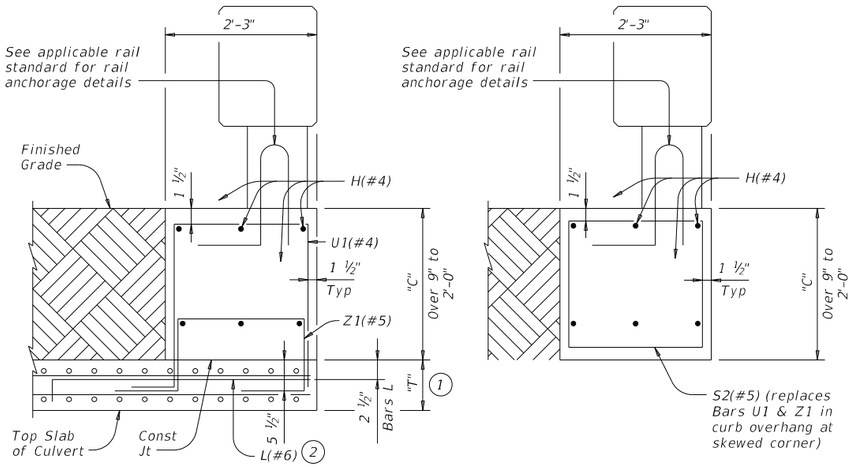


SECTION A-A SECTION B-B

TYPE 1 CURB

Used for curbs from 8" to 9" (Showing "C" = 9"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



SECTION A-A SECTION B-B

TYPE 2 CURB

Used for curbs over 9" to 2'-0" (Showing "C" = 2'-0"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.

TABLE OF REINFORCING SPACING		
Curb Height "C"	Section Type	Bars S, U, & Z Spa
8" to 9"	1	12"
Over 9" to 2'-0"	2	9"
Over 2'-0" to 3'-0"	3	7"
Over 3'-0" to 5'-0"	3	5"

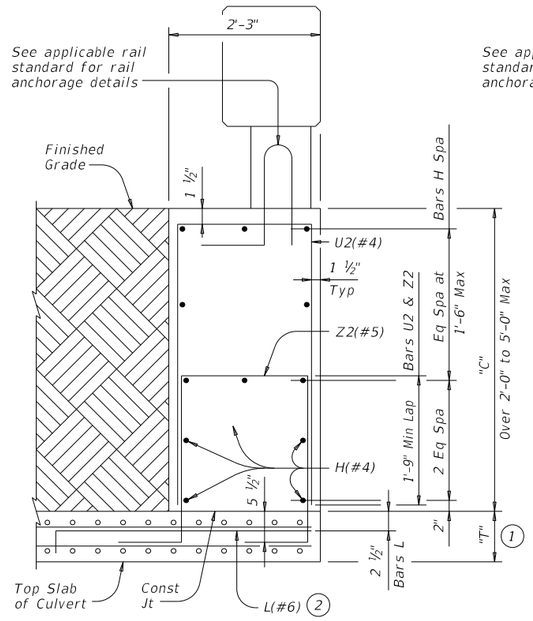
TABLE OF ESTIMATED QUANTITIES (4)			
Curb Height "C"	Section Type	Reinf Steel (Lb/LF)	Class "C" Concrete (CY/LF)
8"	1	21.5	0.056
9"	1	21.5	0.063
1'-0"	2	29.7	0.083
1'-6"	2	30.6	0.125
2'-0"	2	31.5	0.167
3'-0"	3	44.6	0.250
4'-0"	3	56.8	0.333
5'-0"	3	60.0	0.417

(1) *"T" is equal to the culvert top slab thickness. For Precast Boxes with slabs less than 8" thick, see SCP-MD Standard for additional details.*

(2) *Tilt Bars L hook as necessary to maintain cover.*

(3) *Optional Bars L are to be used only for Precast Box Culverts with 3'-0" closure pours.*

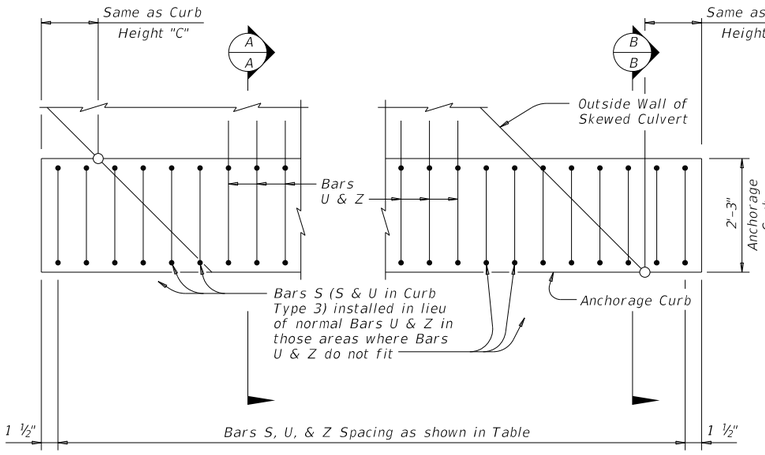
(4) *Quantities shown are for Contractor's information only. Quantities are per Linear Foot of curb length. The values for each section type in table can be interpolated for intermediate values of Curb Height, "C".*



SECTION A-A SECTION B-B

TYPE 3 CURB

Used for curbs over 2'-0" to 5'-0" (Showing "C" = 4'-0"). Showing T223 Rail, other rails similar. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.



TYPICAL CURB PLAN

Showing typical installation on skewed culvert. (Bars L(#5) on T223 and C223 Rails are not used for this structure). Bars RH(#5) required on standards T80HT, T80SS and T224 are not required when used with the RAC standard.

CONSTRUCTION NOTES:

When using this anchorage curb, omit normal culvert curb reinforcing bars K and H shown on the culvert standard sheets.

For vehicle safety, the top of the curb must be flush with the finished grade.

MATERIAL NOTES:

Provide Grade 60 reinforcing steel.

Galvanize all reinforcing steel if required elsewhere.

Provide bar laps, where required, as follows:
Uncoated or galvanized ~ #4 = 1'-11"

Provide Class "C" concrete (f'c=3,600 psi). Provide Class "C" (HPC) concrete if shown elsewhere in the plans.

GENERAL NOTES:

Designed according to AASHTO LRFD Bridge Design Specifications.

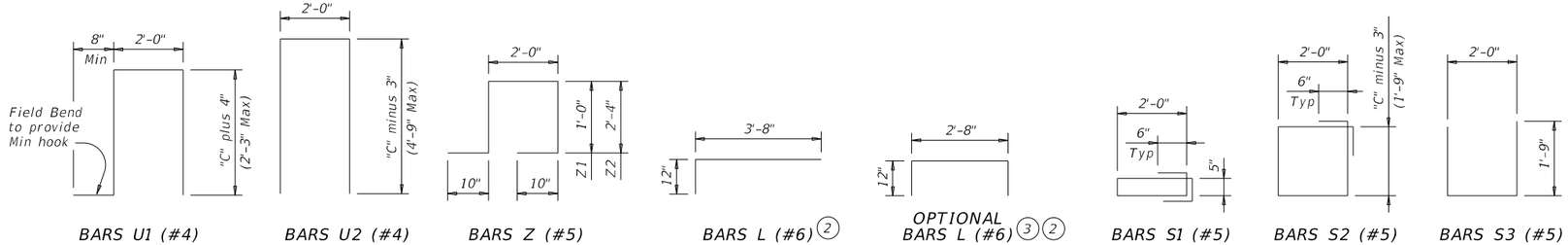
The rail anchorage curb details have sufficient strength for use with all standard rail types.

See appropriate rail standard for approved design speed restrictions, notes and details not shown.

This anchorage curb is considered part of the Box Culvert for payment.

These details are for use with curbs that are 8" to 5'-0" tall only. Curb heights that are less than or greater than those shown will require special design.

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



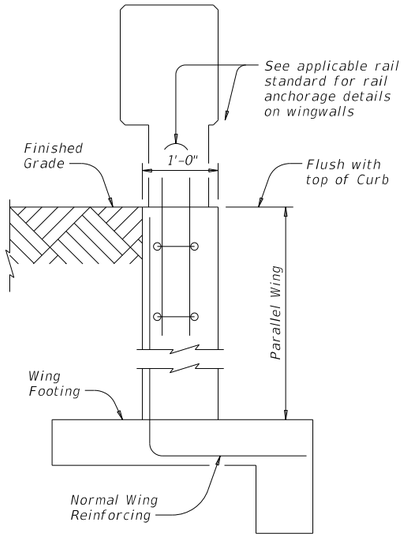
BARS U1 (#4) BARS U2 (#4) BARS Z (#5) BARS L (#6) (2) Spaced at 6" Max OPTIONAL BARS L (#6) (3) (2) Spaced at 6" Max BARS S1 (#5) BARS S2 (#5) BARS S3 (#5)

SHEET 1 OF 2

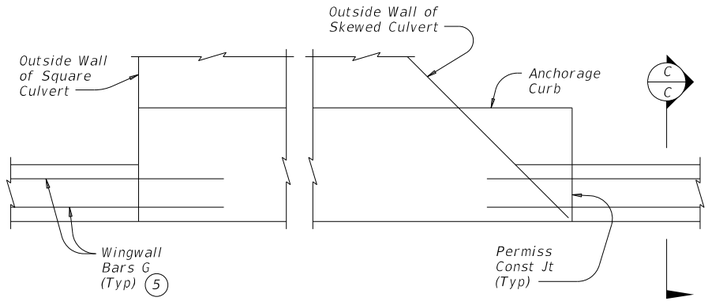
Texas Department of Transportation — Bridge Division Standard

RAIL ANCHORAGE CURB
BOX CULVERT
RAIL MOUNTING DETAILS
(CURBS 8" TO 5'-0" TALL ONLY)
RAC

FILE:	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		62



SECTION C-C



TYPICAL CURB PLAN

Curb reinforcing and footings not shown for clarity

INSTALLATION AT PARALLEL CULVERT WINGWALLS

See culvert wingwall standard for bars and details not shown.

(5) Bars G (#5), as identified on the PARALLEL WINGS PW standard sheet, must extend 1'-6" into the Anchorage Curb similar to that shown for a normal culvert curb.

DATE: 1/11/2024 2:26:31 PM
FILE: $FILE$

SHEET 2 OF 2

Texas Department of Transportation

Bridge Division Standard

RAIL ANCHORAGE CURB
BOX CULVERT
RAIL MOUNTING DETAILS
(CURBS 8" TO 5'-0" TALL ONLY)

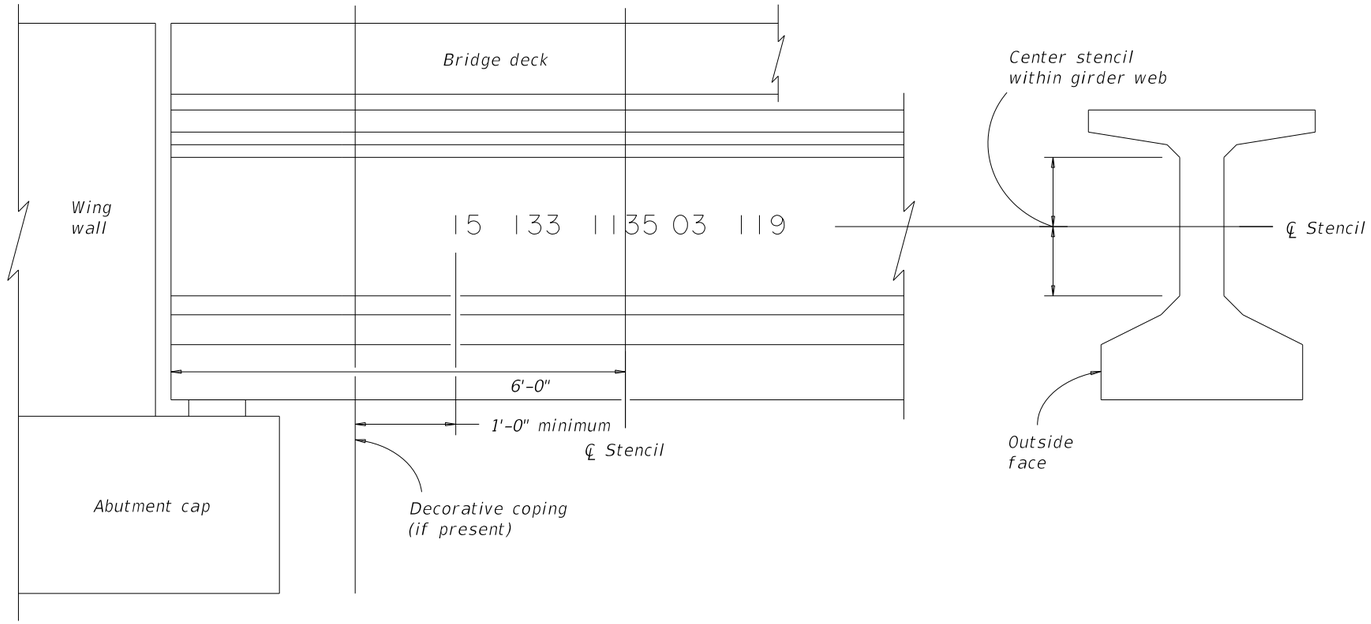
RAC

FILE:	DN: GAF	CK: TxDOT	DW: TxDOT	CK: GAF
©TxDOT February 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		63

15 133 1135 03 119

San Antonio District designation | County designation | Control number | Section nunber | Structure number

PAINTED STRUCTURE NUMBER DETAIL



TYPICAL BRIDGE CORNER (ELEVATION)

SAN ANTONIO DISTRICT COUNTY DESIGNATIONS

Atascosa 007
Bandera 010
Bexar 015
Comal 046
Frio 083
Guadalupe 095
Kendall 131
Kerr 133
McMullen 162
Medina 163
Uvalde 232
Wilson 247

GENERAL NOTES:
Apply stucture number in accordance with Special Specification for Stenciling Permanent Structure Numbers.

SAN ANTONIO DISTRICT STANDARD

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

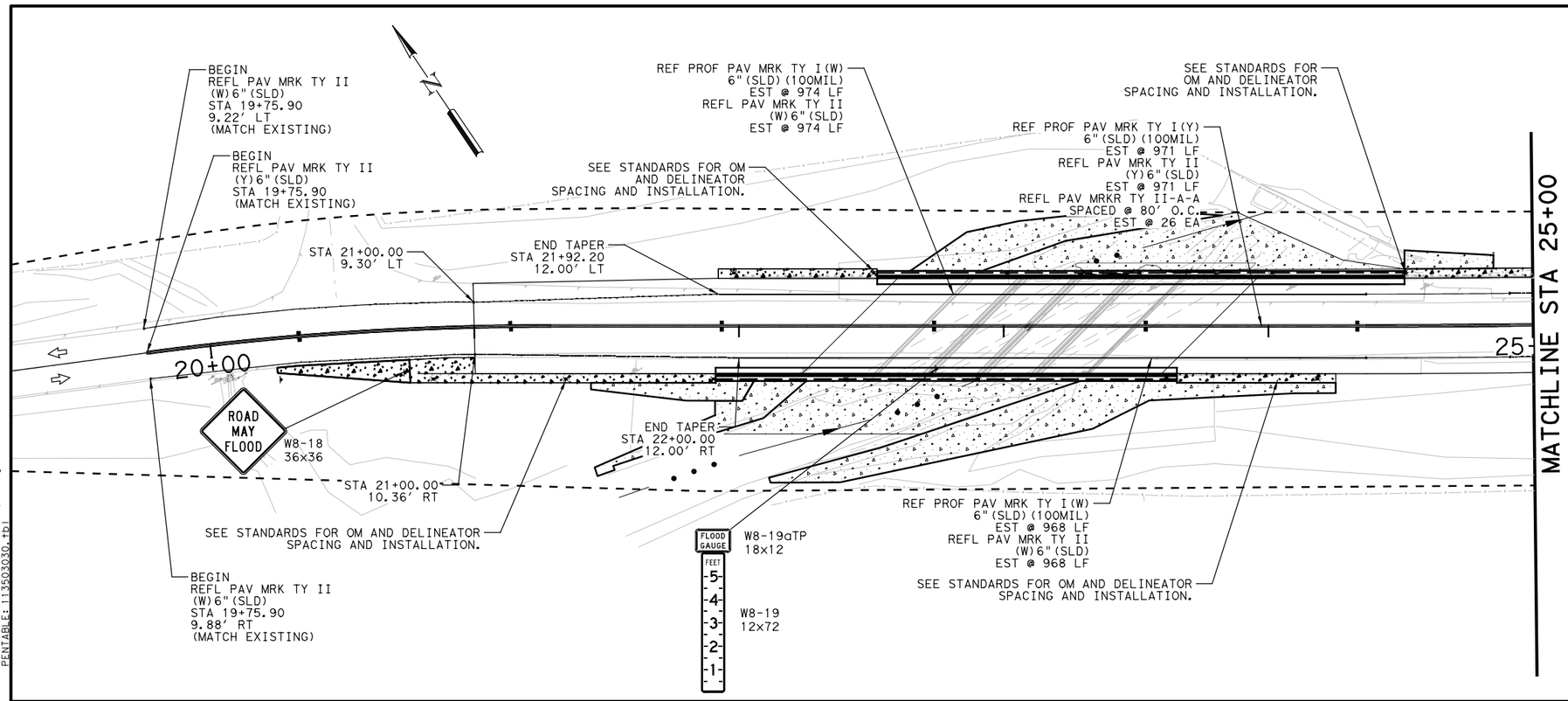
Texas Department of Transportation
San Antonio District (Structural Design)
Prepared by and for the use of TxDOT

BRIDGE NBI NUMBER STENCIL

DN: EW	CK: WB	FILENAME: 000000000 SA District Stencil.dgn	
DW: EW	CK: WB	ORIGINAL DRAWING DATE: August 2019	
DIST	FED.RD. DIV.NO.	FEDERAL AID PROJECT NO.	COUNTY
SAT	6	SEE TITLE	KERR
CONTROL	SECTION	JOB / SHEET NO.	ROUTE
1135	03	030 / 64	FM 1341

REVISIONS:

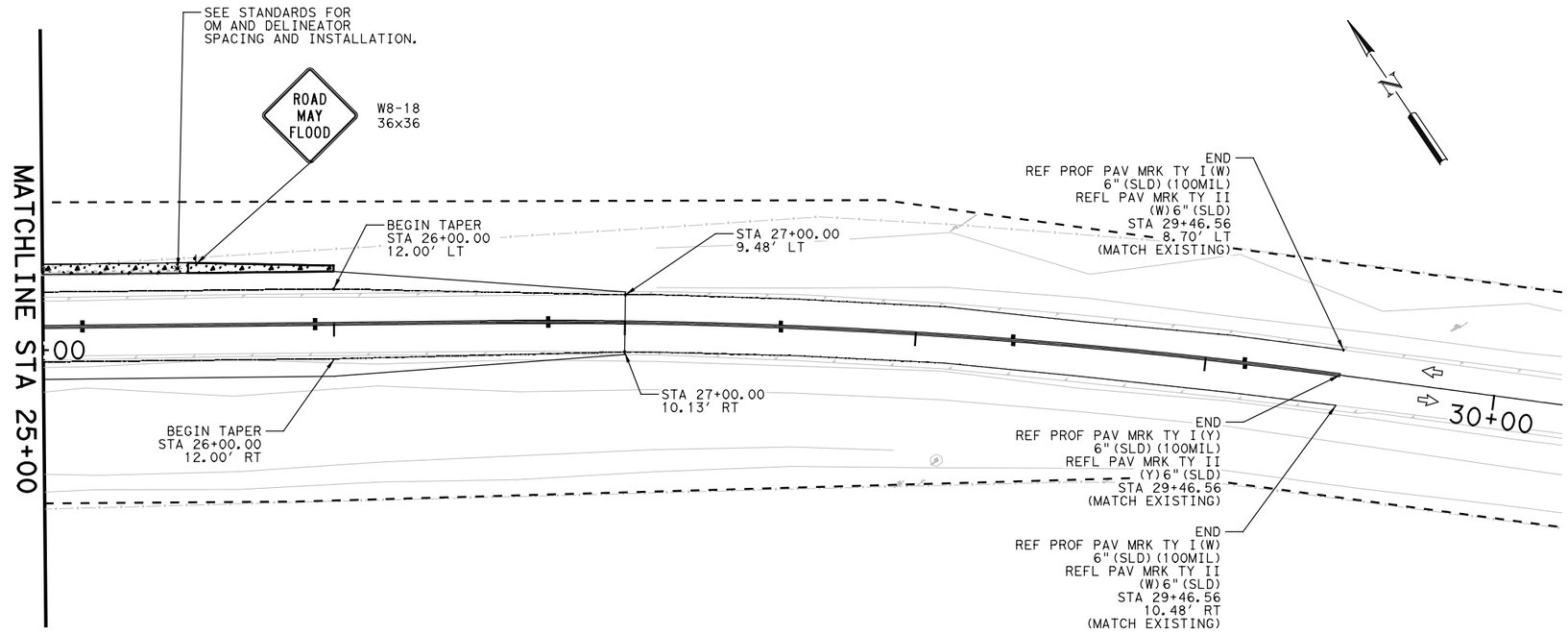
FINAL PLANS SUBMITTAL



SHEET SUMMARY OF ESTIMATED QUANTITIES			
ITEM#	DESCRIPTION	UNIT	QTY
0644 6001	IN SM RD SN SUP&AM TY10BWG(1)SA(P)	EA	2
0644 6023	IN SM RD SN SUP&AM TYFRP(1)UA(P)	EA	1
0658 6016	INSTL DEL ASSM (D-SW)SZ (BRF)GF1 (BI)	EA	15
0666 6174	REFL PAV MRK TY II (W) 6" (SLD)	LF	1942
0666 6210	REFL PAV MRK TY II (Y) 6" (SLD)	LF	1942
0666 6343	REF PROF PAV MRK TY I(W)6"(SLD)(100MIL)	LF	1942
0666 6347	REF PROF PAV MRK TY I(Y)6"(SLD)(100MIL)	LF	1942
0672 6009	REFL PAV MRKR TY II-A-A	EA	26

LEGEND

- EXIST FENCE
- METAL BEAM GUARD FENCE
- PROP TRAFFIC LANE
- EXIST TRAFFIC LANE
- CONCRETE RIPRAP



NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

0 25 50 75 100
HORIZ. SCALE IN FEET

FM 1341 AT CYPRESS CREEK
SIGNING & PAVEMENT MARKINGS
STA 19+75 TO STA 29+46

SCALE: 1"=50'-H

SHEET 1 OF 1

DSN: EW	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	65

PLOTDRIVER: TXDOT*PDF*BW.pltcfg
PENTABLE: 113030330.tbl
DATE: 1/11/2024
PLOTTING TIME: 2:26:38 PM
File Name=FM1341*PAVMRK*01.dgn
User Name=EWANG

SUMMARY OF SMALL SIGNS

PLAN SHEET NO.	SIGN NO.	SIGN NOMENCLATURE	SIGN	DIMENSIONS	FLAT ALUMINUM (TYPE A)	EXAL ALUMINUM (TYPE G)	SM RD SGN ASSM TY XXXXX (X) XX (X-XXXX) POST TYPE FRP = Fiberglass TWT = Thin-Wall 10BWG = 10 BWG S80 = Sch 80	POSTS 1 or 2	ANCHOR TYPE UA=Universal Conc UB=Universal Bolt SA=Slipbase-Conc SB=Slipbase-Bolt WS=Wedge Steel WP=Wedge Plastic	MOUNTING DESIGNATION PREFABRICATED P = "Plain" T = "T" U = "U"	1EXT or 2EXT = # of Ext BM = Extruded Wind Beam WC = 1.12 #/ft Wing Channel EXAL= Extruded Alum Sign Panels	BRIDGE MOUNT CLEARANCE SIGNS (See Note 2) TY = TYPE TY N TY S
65												
	1	W8-18	ROAD MAY FLOOD	36X36	X		10BWG	1	SA	P		
	2	W8-19aTP	FLOOD GAUGE FEET 5 4 3 2 1	18X12	X		FRP	1	UA	P		
		W8-19		12X72								
	3	W8-18	ROAD MAY FLOOD	36X36	X		10BWG	1	SA	P		

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

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

http://www.txdot.gov/

NOTE:

1. Sign supports shall be located as shown on the plans, except that the Engineer may shift the sign supports, within design guidelines, where necessary to secure a more desirable location or to avoid conflict with utilities. Unless otherwise shown on the plans, the Contractor shall stake and the Engineer will verify all sign support locations.

2. For installation of bridge mount clearance signs, see Bridge Mounted Clearance Sign Assembly (BMCS)Standard Sheet.

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

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FILE: $FILE$

Texas Department of Transportation

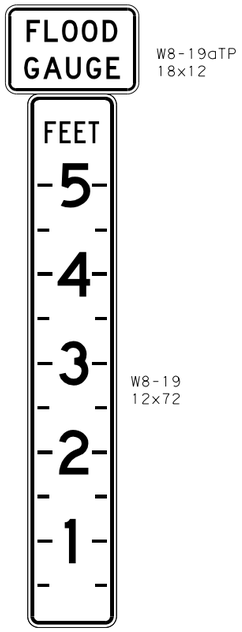
Traffic Operations Division Standard

SUMMARY OF SMALL SIGNS

SOSS

FILE:	sums16.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT	May 1987	CONT	SECT	JOB	HIGHWAY
REVISIONS		1135	03	030	FM 1341
4-16		DIST	COUNTY		SHEET NO.
8-16		SAT	KERR		66

TB



W8-19aTP
18x12

W8-19
12x72

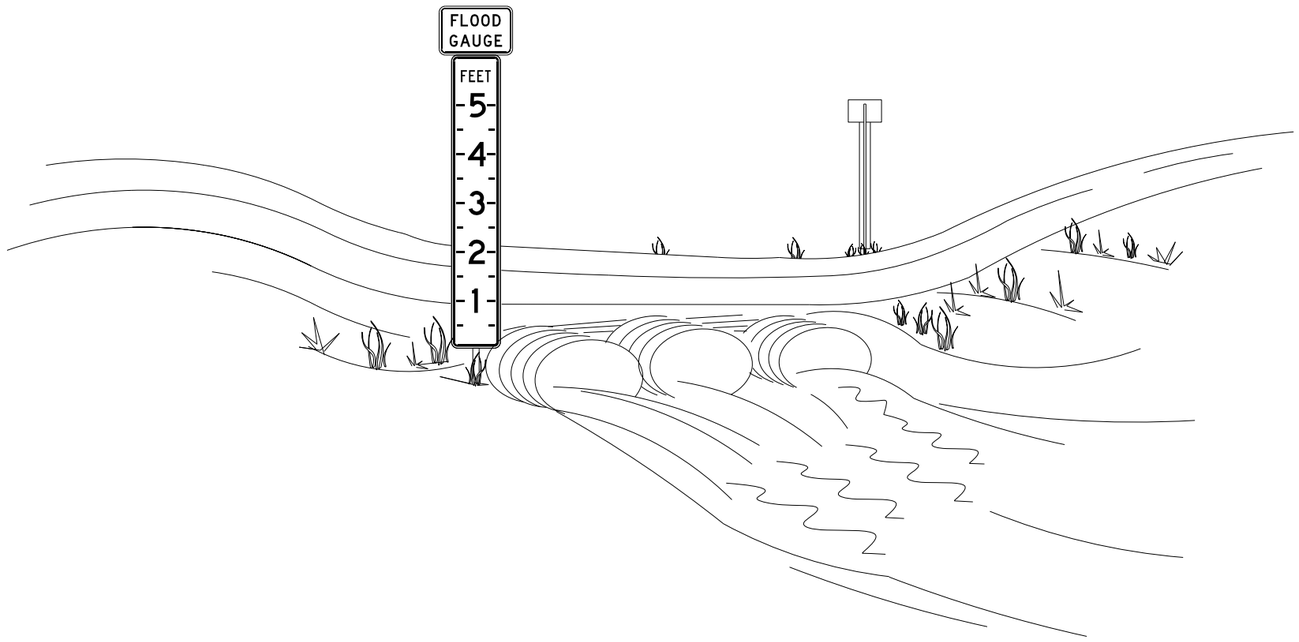
W8-18
36x36

W16-4P
18x12

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

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLUORESCENT YELLOW	TYPE B_{FL} & C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM



GENERAL NOTES

1. Each flood gauge assembly shall consist of the FLOOD GAUGE sign (W8-19aTP) and DEPTH MARKER (W8-19). Two assemblies should be erected, one along each approach, at the low water crossing location on the right side of the roadway.

2. The flood gauge assembly should be of sufficient height to register depth of water to a minimum of five (5) Feet above the lowest travel lane pavement surface. Actual height of depth marker required for each location is shown elsewhere in the plans, but should not be in excess of ten (10) feet.

3. The flood gauge assembly should be located not more than ten (10) feet from the pavement edge. Consideration should be given to placement with regard to the following factors:

   a) Accurate register of depth of water over roadway.

   b) Daytime and nighttime visibility of the flood gauge assembly along roadway approaches.

   c) Outside the main flow of water during both normal and flood conditions.

4. In areas where flood conditions would likely obscure the flood gauge assembly, a second pair of gauges, one on each approach, registering depths greater than shown on the first flood gauge assembly, is recommended.

5. The Engineer will approve all flood gauge assembly locations before installation.

6. The alphabets and lateral spacing between letters and numerals shall conform with the Texas "Manual on Uniform Traffic Control Devices for Streets and Highways", latest edition, and any approved changes thereto. Lateral Spacing of text shall provide a balanced appearance. All materials shall conform to Department Specifications.

7. FLOOD GAUGE signs and depth marker shall be mounted in accordance with Standard SMD (series). The recommended mounting is three (3) inch fiberglass reinforced pipe (FRP) pipe as shown on Standard SMD(GEN) and SMD(FRP). ROAD MAY FLOOD sign (W8-18) along the approach roadway may be required in areas where rainfall causes frequent roadway flooding.

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

FLOOD GAUGE ASSEMBLY

FGA-15

FILE: fga-15.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT January 1997	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
3-15	DIST	COUNTY		SHEET NO.
	SAT	KERR		67

10F

DATE: 1/11/2024 2:26:41 PM
FILE: $FILE$

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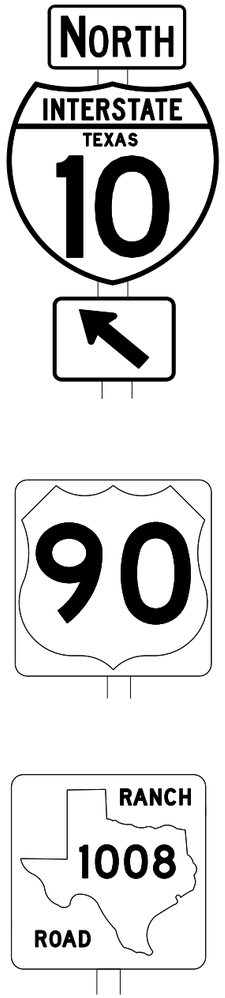
FILE: $FILE$

REQUIREMENTS FOR INDEPENDENT MOUNTED ROUTE SIGNS

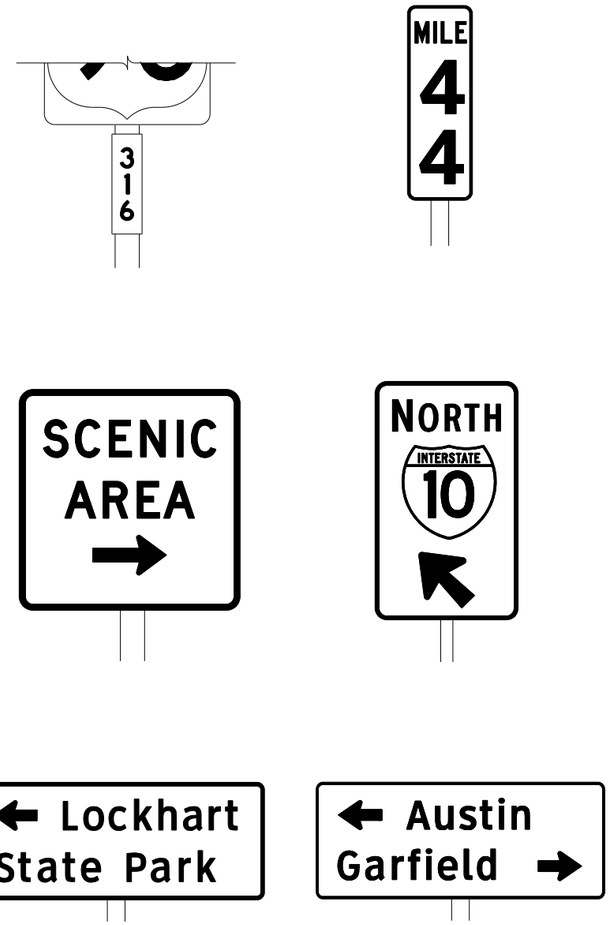
SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE A SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & BORDERS	ALL OTHERS	TYPE B or C SHEETING



TYPICAL EXAMPLES

REQUIREMENTS FOR BLUE, BROWN & GREEN D AND I SERIES GUIDE SIGNS

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	ALL	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE D SHEETING
LEGEND, SYMBOLS & BORDERS	ALL OTHERS	TYPE B OR C SHEETING



TYPICAL EXAMPLES

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).

2. White legend shall use the Clearview Alphabet. The following Clearview fonts shall be used to replace the existing white Federal Highway Administration (FHWA) Standard Highway Alphabets, when not specified in the SHSD, or in the plans.

B	CV-1W
C	CV-2W
D	CV-3W
E	CV-4W
Emod	CV-5WR
F	CV-6W

3. Route sign legend (ie. IH, US, SH and FM shields) shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets B, C, D, E, Emod or F).

4. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.

5. Independent mounted route sign with white or colored legend and borders shall be applied by screening process with transparent color ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof. White legend, symbols and borders on all other signs shall be cut-out white sheeting applied to colored background sheeting.

6. Information regarding borders and radii for signs is found in the "Standard Highway Sign Designs for Texas". Dimensions shown and described for borders and corner radii on parent sign are nominal. Borders may vary in width as much as 1/2 inch. Corner radii above 3 inches may vary in width as much as 1 inch. Borders and corner radii within a parent sign must be of matching widths. The sign area outside the corner radius should be trimmed or rounded.

7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.

8. Mounting details of roadside signs are shown in the "SMD series" Standard Plan Sheets.

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(3)-13

FILE: tsr3-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	SAT	KERR		68

DATE: 1/11/2024 2:26:44 PM
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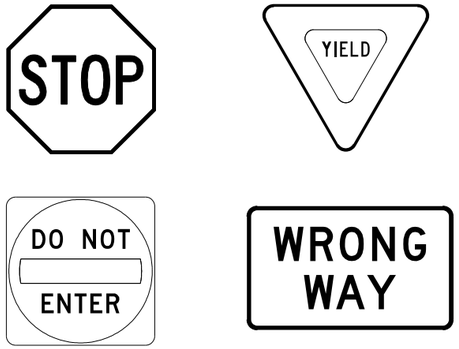
REQUIREMENTS FOR RED BACKGROUND REGULATORY SIGNS

(STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)



REQUIREMENTS FOR FOUR SPECIFIC SIGNS ONLY

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	RED	TYPE B OR C SHEETING
BACKGROUND	WHITE	TYPE B OR C SHEETING
LEGEND & BORDERS	WHITE	TYPE B OR C SHEETING
LEGEND	RED	TYPE B OR C SHEETING

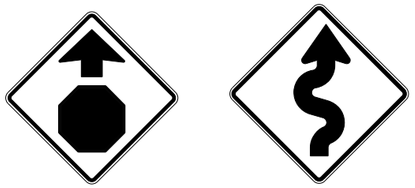
REQUIREMENTS FOR WHITE BACKGROUND REGULATORY SIGNS

(EXCLUDING STOP, YIELD, DO NOT ENTER AND WRONG WAY SIGNS)

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	ALL OTHERS	TYPE B OR C SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND, BORDERS AND SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR WARNING SIGNS



TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	FLOURESCENT YELLOW	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND & BORDERS	BLACK	ACRYLIC NON-REFLECTIVE FILM
LEGEND & SYMBOLS	ALL OTHER	TYPE B OR C SHEETING

REQUIREMENTS FOR SCHOOL SIGNS

TYPICAL EXAMPLES

SHEETING REQUIREMENTS		
USAGE	COLOR	SIGN FACE MATERIAL
BACKGROUND	WHITE	TYPE A SHEETING
BACKGROUND	FLOURESCENT YELLOW GREEN	TYPE B_{FL} OR C_{FL} SHEETING
LEGEND, BORDERS AND SYMBOLS	BLACK	ACRYLIC NON-REFLECTIVE FILM
SYMBOLS	RED	TYPE B OR C SHEETING

GENERAL NOTES

1. Signs to be furnished shall be as detailed elsewhere in the plans and/or as shown on sign tabulation sheet. Standard sign designs and arrow dimensions can be found in the "Standard Highway Sign Designs for Texas" (SHSD).
2. Sign legend shall use the Federal Highway Administration (FHWA) Standard Highway Alphabets (B, C, D, E, Emod or F).
3. Lateral spacing between letters and numerals shall conform with the SHSD, and any approved changes thereto. Lateral spacing of legend shall provide a balanced appearance when spacing is not shown.
4. Black legend and borders shall be applied by screening process or cut-out acrylic non-reflective black film to background sheeting, or combination thereof.
5. White legend and borders shall be applied by screening process with transparent colored ink, transparent colored overlay film to white background sheeting or cut-out white sheeting to colored background sheeting, or combination thereof.
6. Colored legend shall be applied by screening process with transparent colored ink, transparent colored overlay film or colored sheeting to background sheeting, or combination thereof.
7. Sign substrate shall be any material that meets the Departmental Material Specification requirements of DMS-7110 or approved alternative.
8. Mounting details for roadside mounted signs are shown in the "SMD series" Standard Plan Sheets.

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

DEPARTMENTAL MATERIAL SPECIFICATIONS	
ALUMINUM SIGN BLANKS	DMS-7110
SIGN FACE MATERIALS	DMS-8300

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

http://www.txdot.gov/

Texas Department of Transportation

Traffic Operations Division Standard

TYPICAL SIGN REQUIREMENTS

TSR(4)-13

FILE: tsr4-13.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT October 2003	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
12-03 7-13	DIST	COUNTY		SHEET NO.
9-08	SAT	KERR		69

REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS

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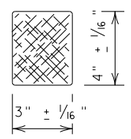
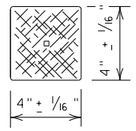
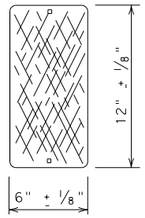
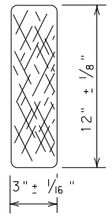
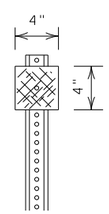
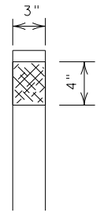
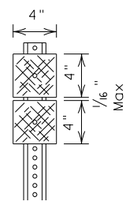
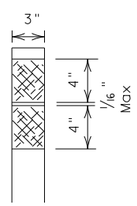
DEVICE				
SHEETING	Yellow, White or Red Type B or C reflective sheeting			
NOTE	1. Size 1 and 4 - Direct applied reflective sheeting for use on flexible post (flx). 2. Size 2 and 3 - For use on wing channel (wc) post only. Use approved metal, plastic or fiberglass backplate with 17/64" mounting holes.			

DELINEATORS

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

D & OM DESCRIPTIVE CODES

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

NUMBER OF REFLECTORS
- S = Single
- D = Double

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

REFLECTOR UNIT SIZE
- 1 or 2

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

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

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

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

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

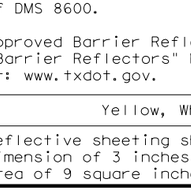
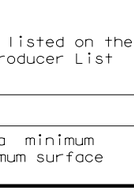
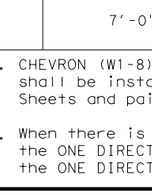
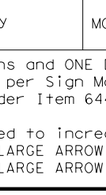
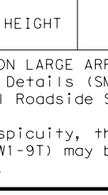
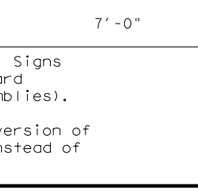
NUMBER OF REFLECTORS OR DIRECTION
- X = 3-Size 2 reflector units (Type 2 only)
- Y = 1-Size 3 reflector unit (Type 2 only)
- Z = 3-Size 1 or 1-Size 4 reflector unit(s)(Type 2 only)
- L = Left Side (Type 3 Object Marker only)
- R = Right Side (Type 3 Object Marker only)
- C = Center (Type 3 Object Marker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

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

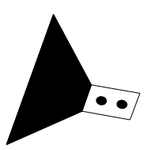
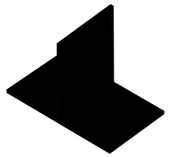
TYPE OF MOUNT
- GND = Embedded (drivable)
- SRF = Surface Mount
- WAS = Wedge Anchor Steel
- WAP = Wedge Anchor Plastic

DIRECTION
If Required
- BI = Bi-Directional

OBJECT MARKERS

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

BARRIER REFLECTORS (BRF)

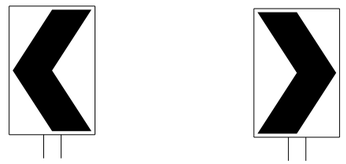
	GF1	GF2	CTB
DEVICE			

1. Barrier reflectors shall meet the requirements of DMS 8600.
2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.

SHEETING: Yellow, White, Red

NOTE: 1. Reflective sheeting shall have a minimum dimension of 3 inches and minimum surface area of 9 square inches.

CHEVRONS

DEVICE:  W1-8

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

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

ONE DIRECTION LARGE ARROW

DEVICE:  W1-6

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

DEPARTMENTAL MATERIAL SPECIFICATIONS

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

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

Texas Department of Transportation — Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION

D & OM(1)-20

FILE: dom1-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	SAT	KERR		70

20A

DATE: 1/11/2024 2:26:46 PM
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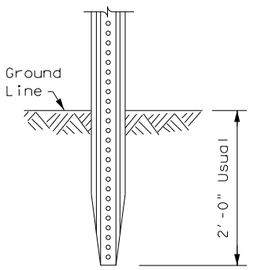
POST TYPE AND SUPPORT FOUNDATION DETAILS

WING CHANNEL (WC)

GND

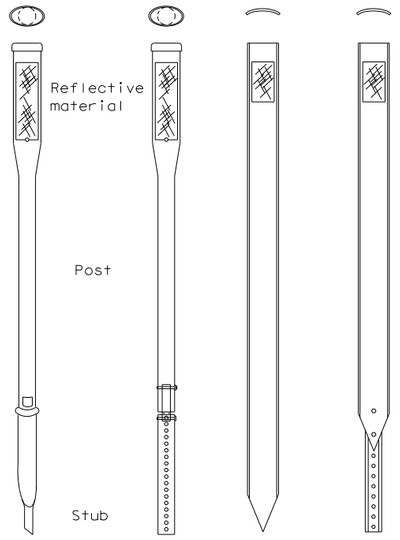


NOTES

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

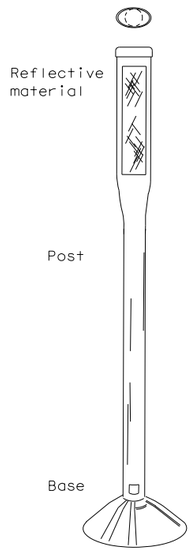
FLEXIBLE POSTS (YFLX, WFLX)

GND



EMBEDDED

SRF



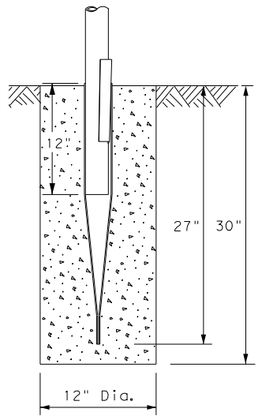
SURFACE MOUNT

NOTES

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

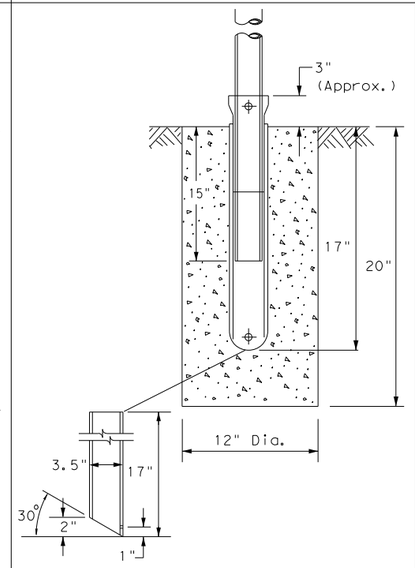
WEDGE ANCHOR SYSTEMS

WAS



STEEL

WAP



PLASTIC

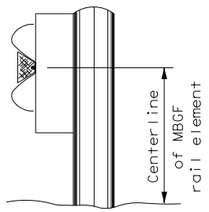
NOTE

1. Install per manufacturer's recommendations.

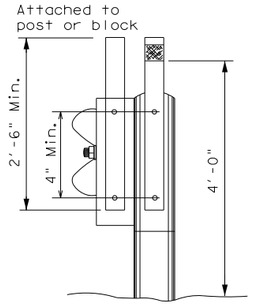
TYPE OF BARRIER MOUNTS

GUARD FENCE ATTACHMENT

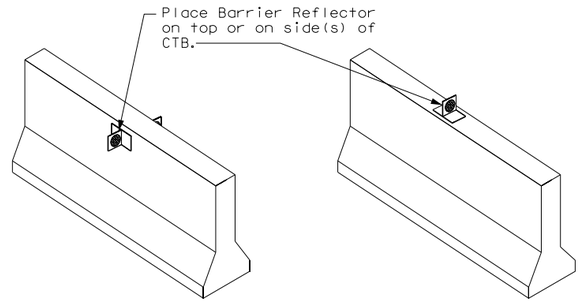
GF1



GF2



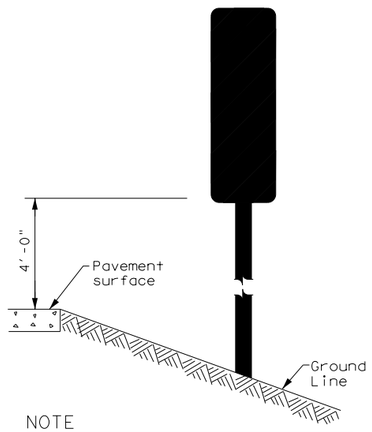
CONCRETE TRAFFIC BARRIER (CTB)



GENERAL NOTES

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

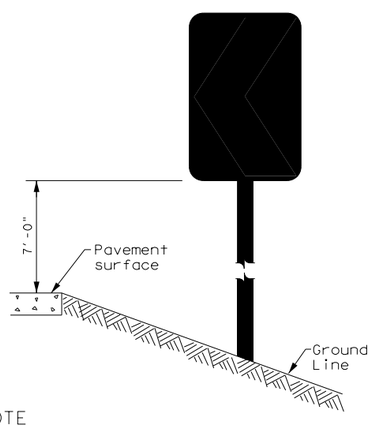
TYPES 1, 3, AND 4 OBJECT MARKERS AND CHEVRONS



NOTE

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

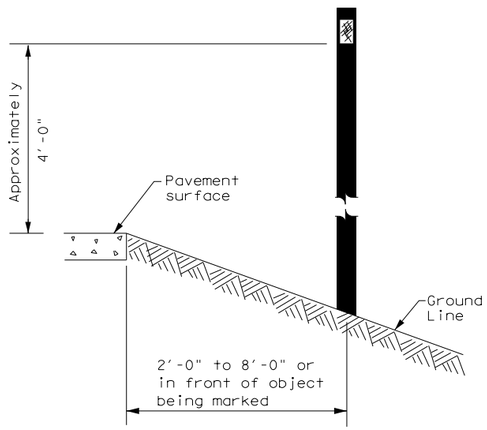
CHEVRONS AND ONE DIRECTION LARGE ARROW SIGN



NOTE

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

DELINEATORS AND TYPE 2 OBJECT MARKERS



See general notes 1, 2 and 3.

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER INSTALLATION

D & OM(2)-20

FILE: dom2-20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
© TxDOT August 2004	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
10-09 3-15	DIST	COUNTY		SHEET NO.
4-10 7-20	SAT	KERR		71

20B

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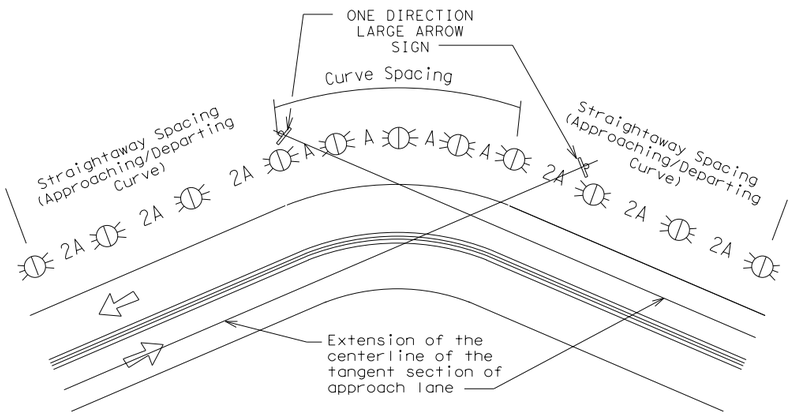
MINIMUM WARNING DEVICES AT CURVES WITH ADVISORY SPEEDS

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

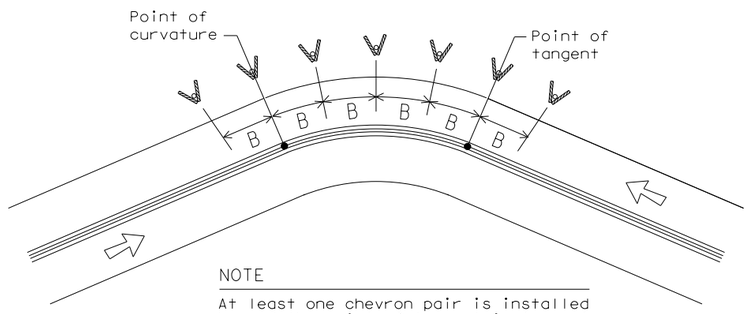
SUGGESTED SPACING FOR DELINEATORS ON HORIZONTAL CURVES



NOTE

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

SUGGESTED SPACING FOR CHEVRONS ON HORIZONTAL CURVES



NOTE

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS KNOWN

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

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

DELINEATOR AND CHEVRON SPACING

WHEN DEGREE OF CURVE OR RADIUS IS NOT KNOWN

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

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

DELINEATOR AND OBJECT MARKER APPLICATION AND SPACING

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

NOTES

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

LEGEND	
	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	1135	03	030	FM 1341
3-15 8-15 8-15 7-20	DIST	COUNTY		SHEET NO.
	SAT	KERR		72

20C

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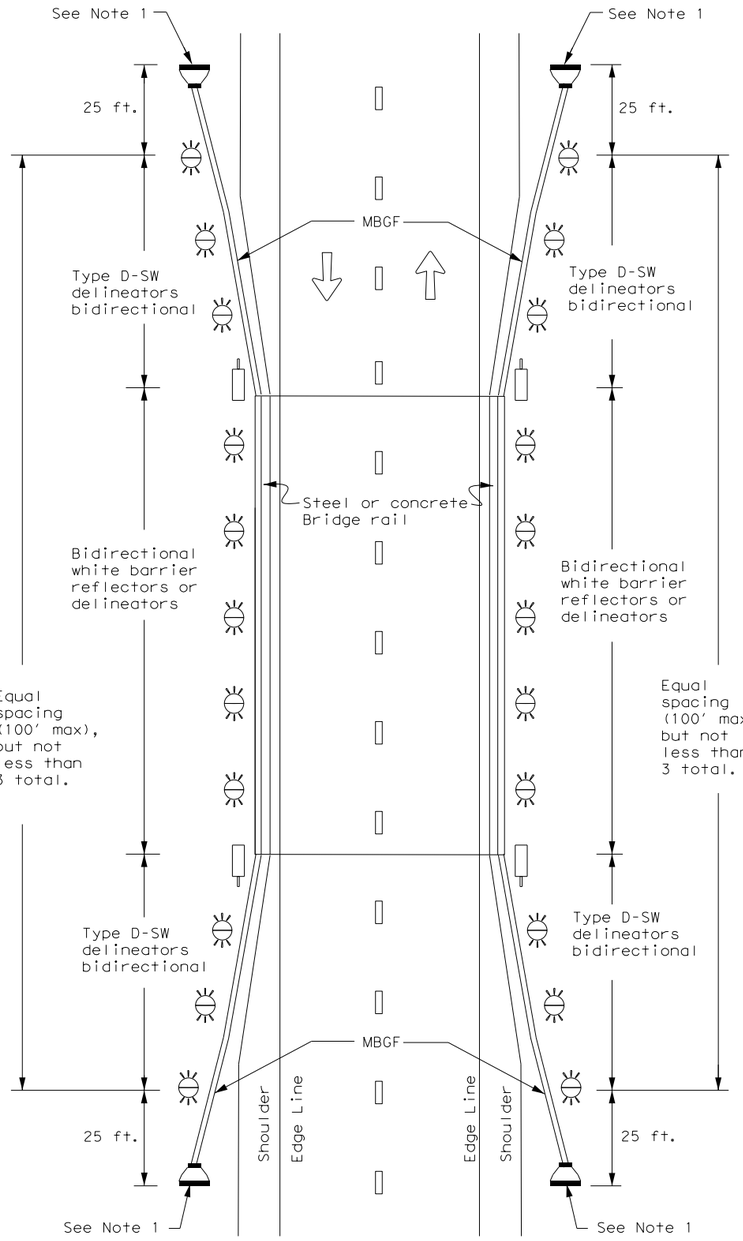
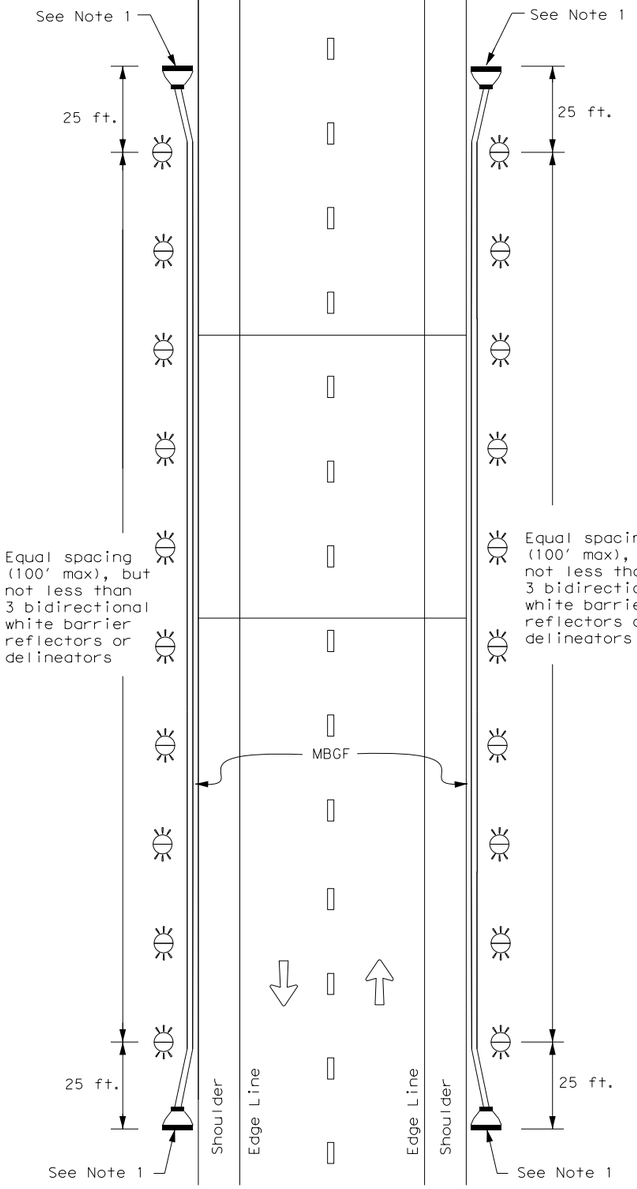
TWO-WAY, TWO LANE ROADWAY WITH REDUCED WIDTH APPROACH RAIL



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

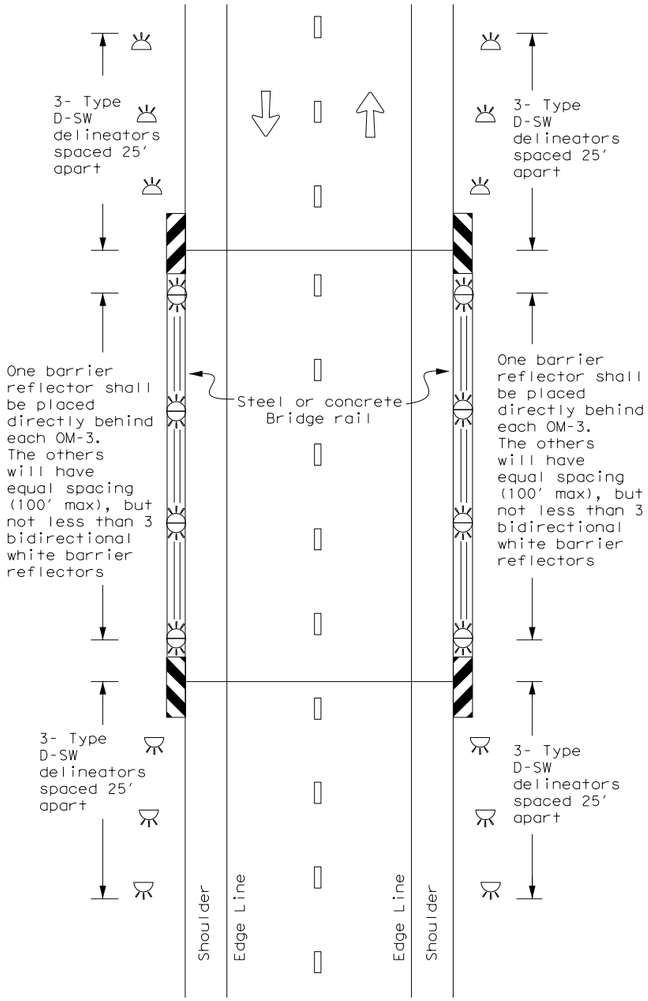
TWO-WAY, TWO LANE ROADWAY WITH METAL BEAM GUARD FENCE (MBGF)



NOTE:

1. Terminal ends require reflective sheeting provided by manufacturer per D & OM (VIA) or a Type 3 Object Marker (OM-3) in front of the terminal end.

TWO-WAY, TWO LANE ROADWAY BRIDGE WITH NO APPROACH RAIL



LEGEND

	Bidirectional Delineator
	Delineator
	OM-3
	OM-2
	Terminal End
	Traffic Flow

Texas Department of Transportation

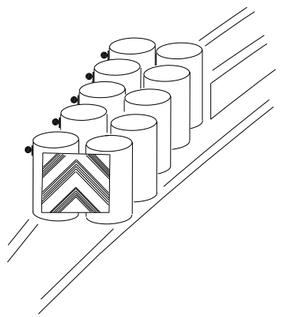
Traffic Safety Division Standard

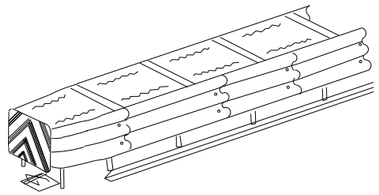
DELINEATOR & OBJECT MARKER PLACEMENT DETAILS

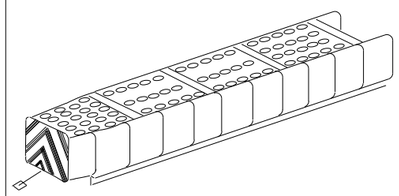
D & OM(5)-20

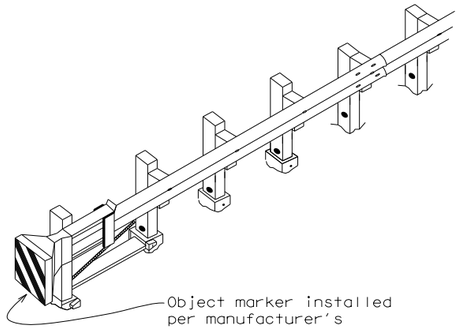
FILE: dom5-20.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT August 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
7-20	DIST	COUNTY		SHEET NO.
	SAT	KERR		73

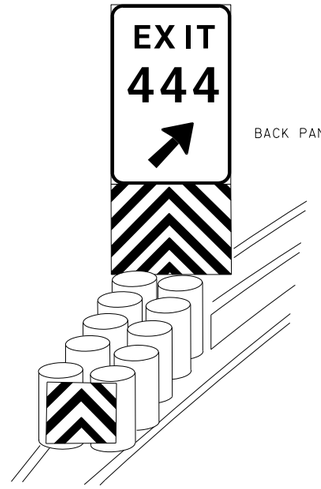
20E

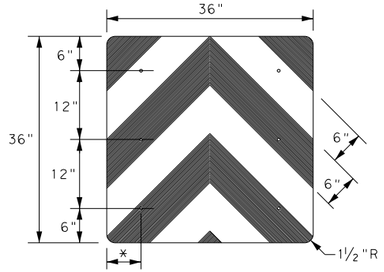


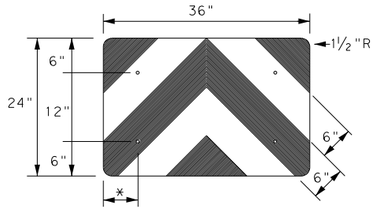




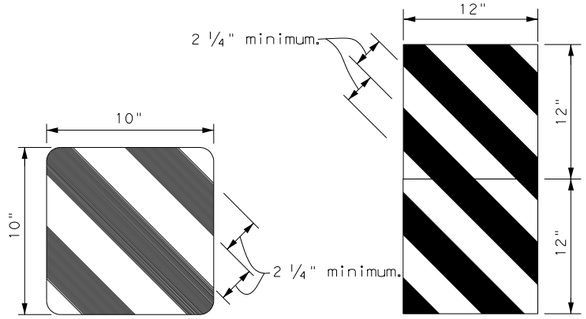




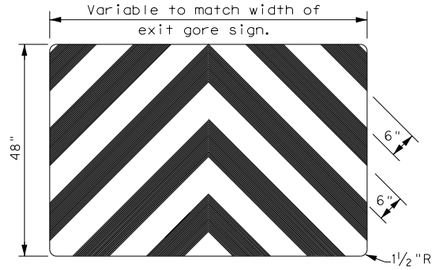


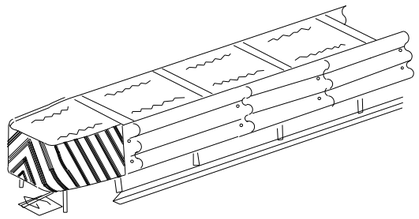


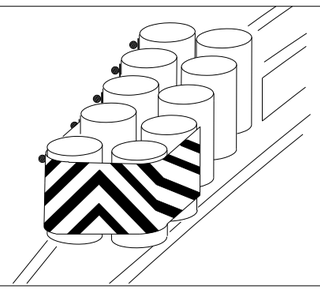
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

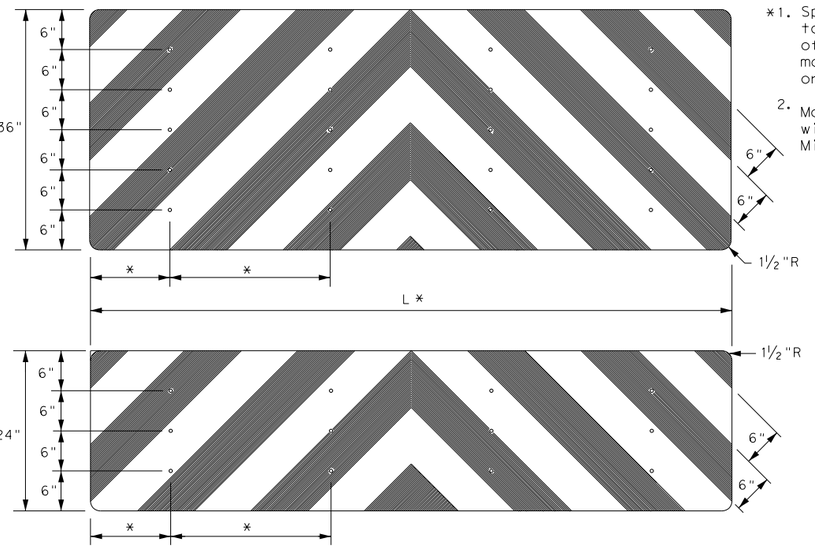


OBJECT MARKERS SMALLER THAN 3 FT^2









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.

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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	1135	03	030	FM 1341
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	SAT	KERR		74
4-98 7-20				
20G				

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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)

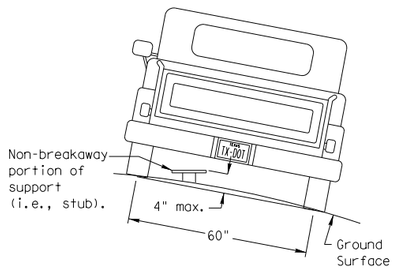
Anchor Type

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

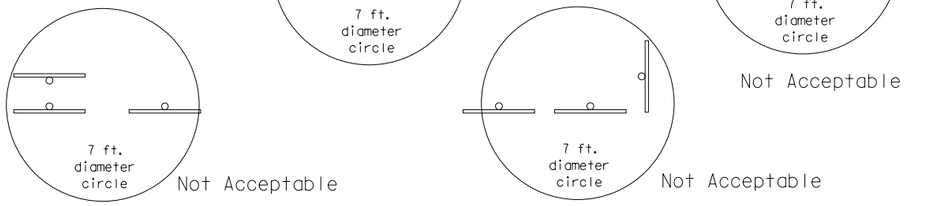
P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
IF REQUIRED
1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-1))

REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



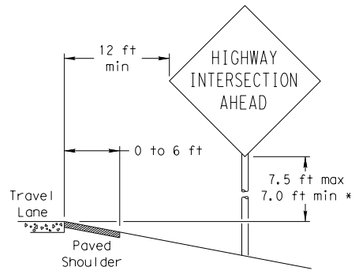
To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

No more than 2 sign posts should be located within a 7 ft. circle.



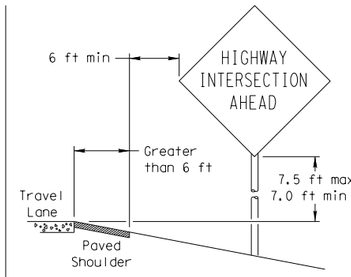
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

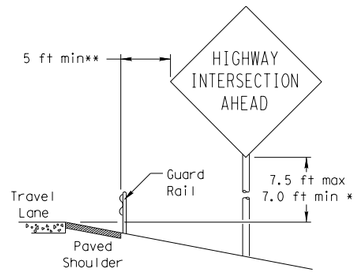
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



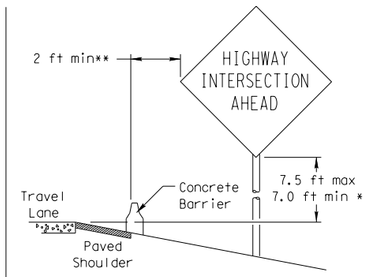
GREATER THAN 6 FT. WIDE

When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

BEHIND BARRIER



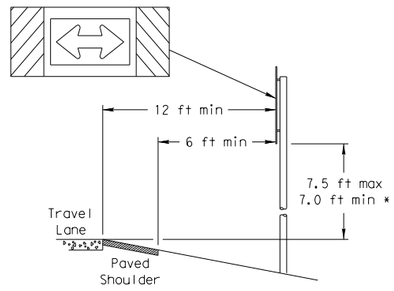
BEHIND GUARDRAIL



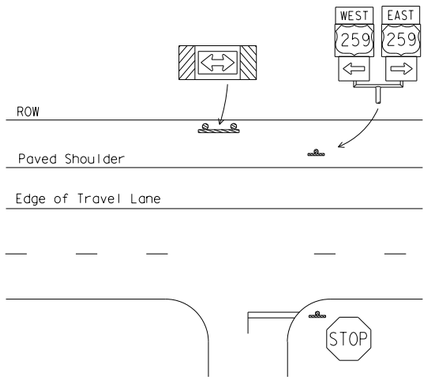
BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

T-INTERSECTION



When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

(1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or

(2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

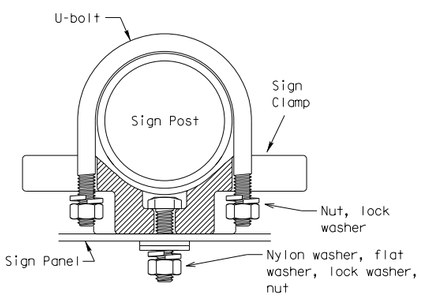
The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for detailed drawings of sign clamps, Triangular Slipbase System components and Wedge Anchor System components.

The website address is:
http://www.txdot.gov/publications/traffic.htm

TYPICAL SIGN ATTACHMENT DETAIL

Single Signs

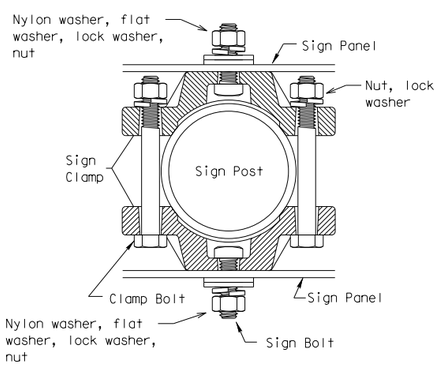


Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

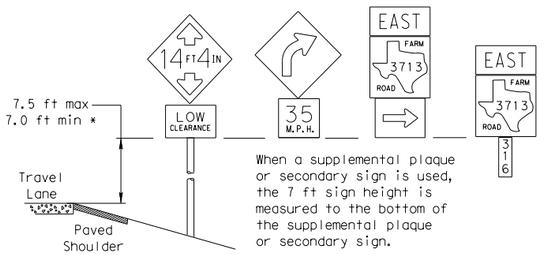
Sign clamps may be either the specific size clamp or the universal clamp.

Back-to-Back Signs



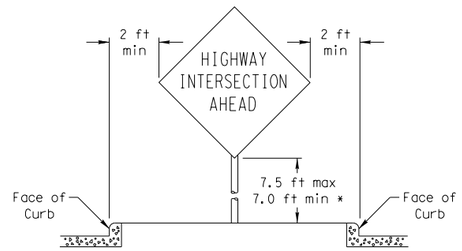
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES



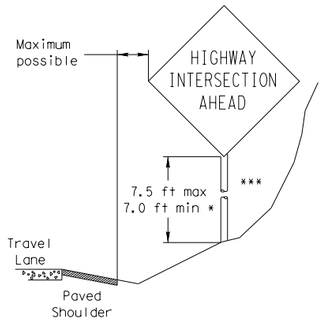
When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



RESTRICTED RIGHT-OF-WAY

(When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

© TxDOT July 2002	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08 REVISIONS	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		75

26A

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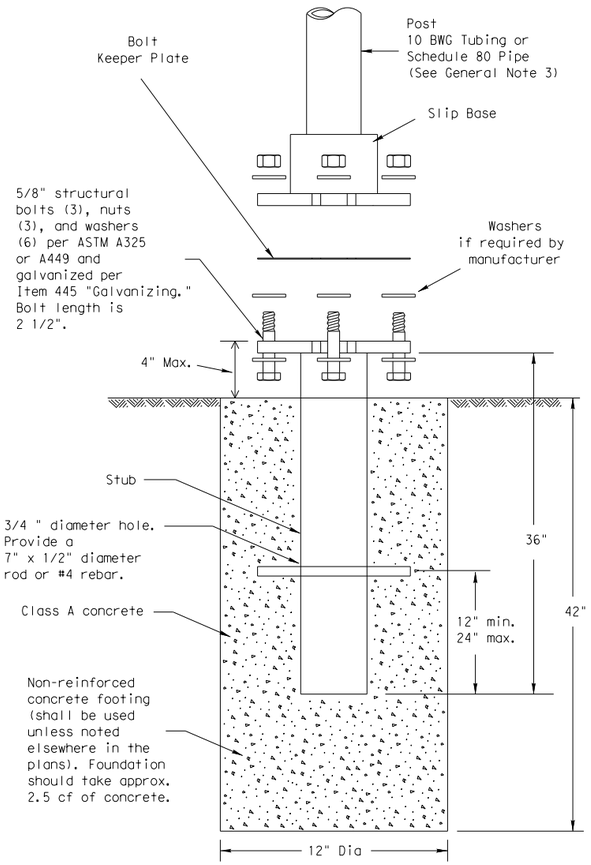
TRIANGULAR SLIPBASE INSTALLATION GENERAL REQUIREMENTS



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

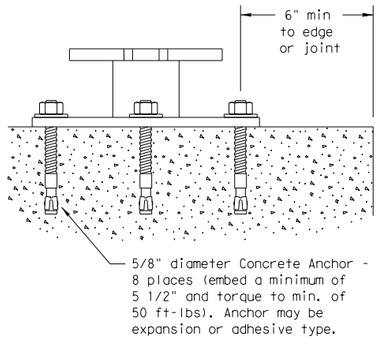
Foundation

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
1135	03	030	FM 1341

DIST	COUNTY	SHEET NO.
SAT	KERR	76

26B

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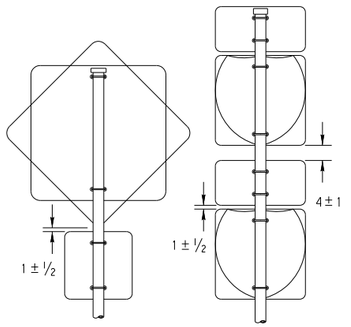
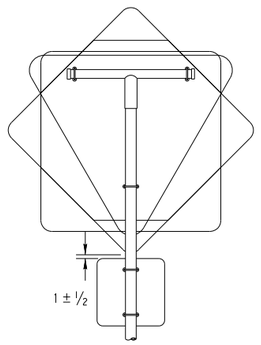


SM RD SGN ASSM TY XXXXX(1)XX(P)



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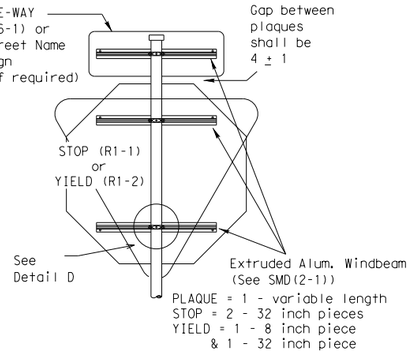

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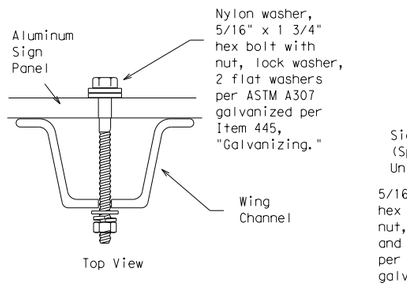
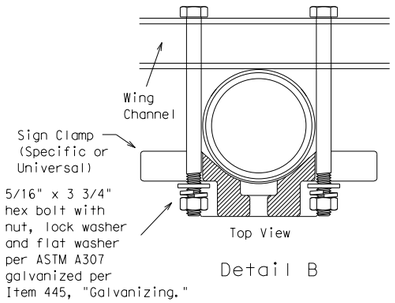


Detail A



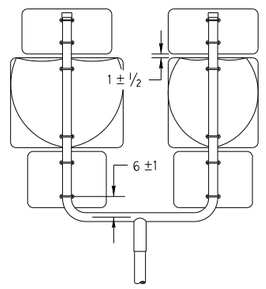
Detail B

GENERAL NOTES:

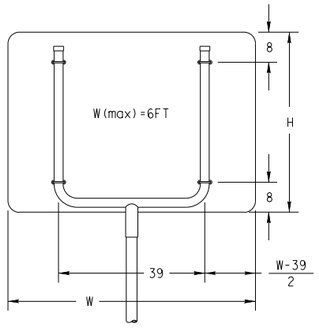
1.

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

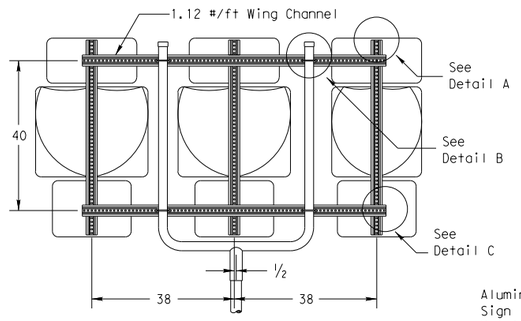
2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Additional route markers may be added vertically, provided the total sign area does not exceed the maximum allowable amount per Note 1.
11. Additional sign clamp required on the "T-bracket" post for 24 inch height signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.
13. Sign blanks shall be the sizes and shapes shown on the plans.



SM RD SGN ASSM TY XXXXX(1)XX(U)

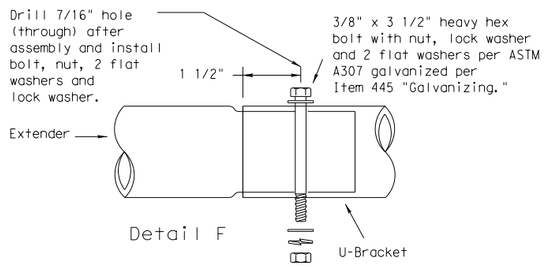


SM RD SGN ASSM TY XXXXX(1)XX(U)



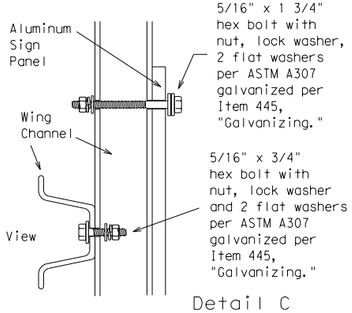
SM RD SGN ASSM TY XXXXX(1)XX(U-WC)
(See Note 11)

Drill 7/16" hole (through) after assembly and install bolt, nut, 2 flat washers and lock washer.

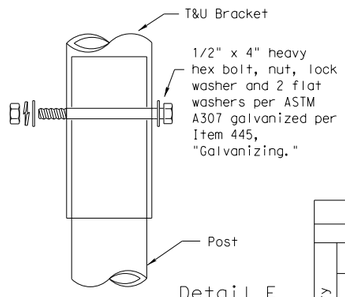


Detail F

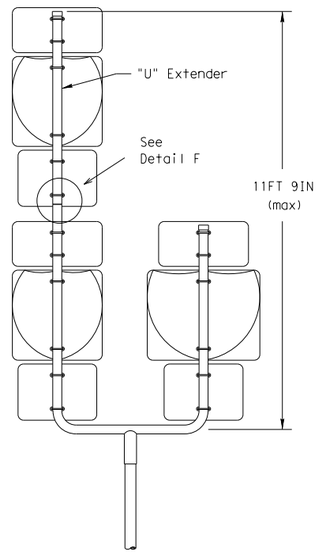
Splices shall only be allowed behind the sign substrate.



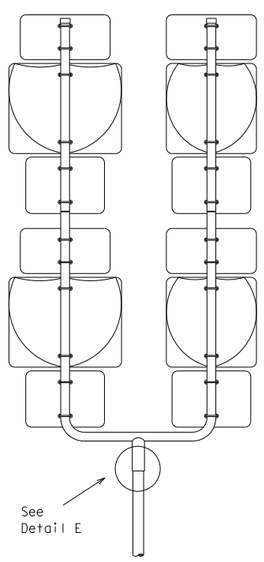
Detail C



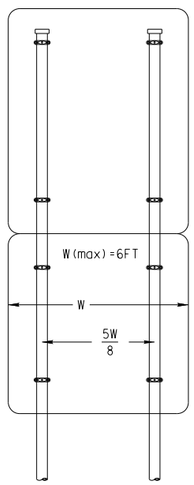
Detail E



SM RD SGN ASSM TY S80(1)XX(U-1EXT)

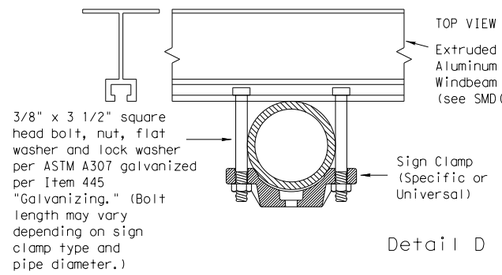


SM RD SGN ASSM TY S80(1)XX(U-2EXT)

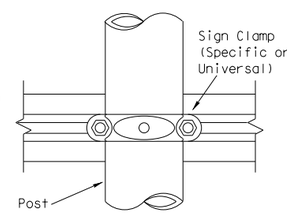


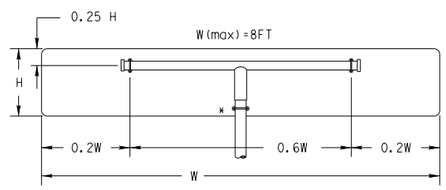
SM RD SGN ASSYM TY XXXXX(2)XX(P)

SIDE VIEW



Detail D

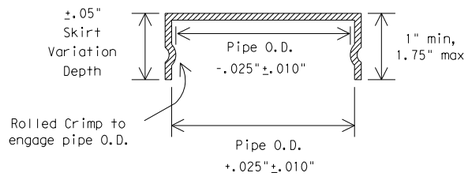




All dimensions are in english unless detailed otherwise.

SM RD SGN ASSM TY XXXXX(1)XX(T)
(* - See Note 12)

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.

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

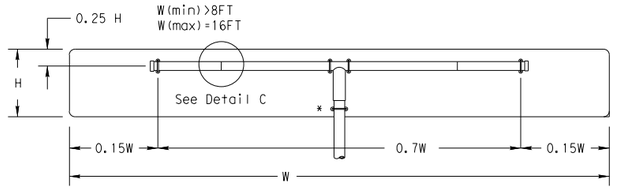
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-2)-08

REVISIONS	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
9-08	CONT	SECT	JOB	HIGHWAY
	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		77

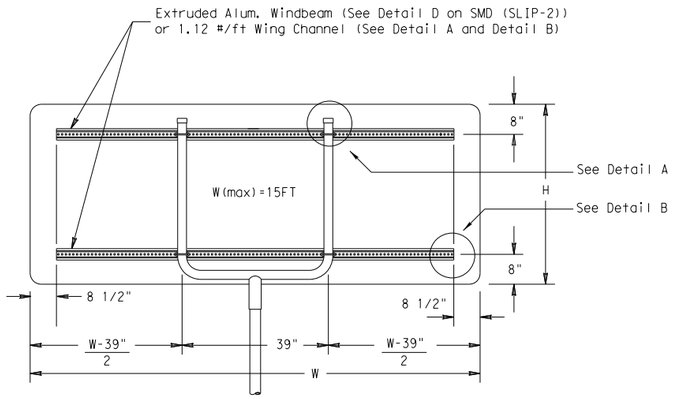
26C

DATE: 1/11/2024 2:26:58 PM
FILE: $FILE$

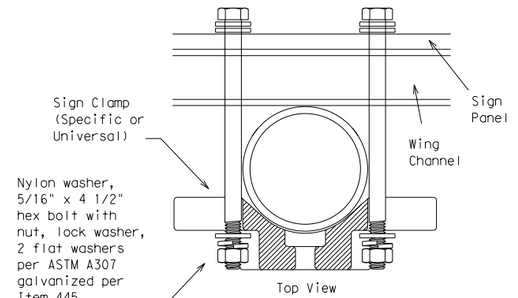


SM RD SGN ASSM TY XXXXX(1)XX(T-2EXT)

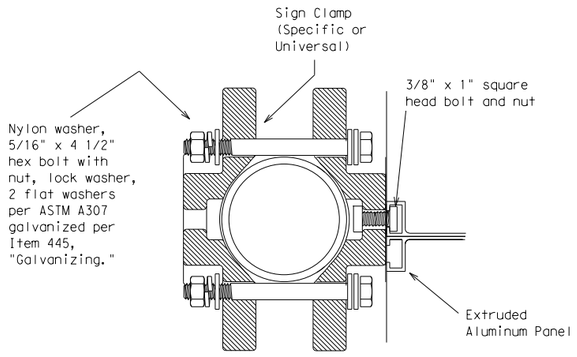
(* - See Note 12)



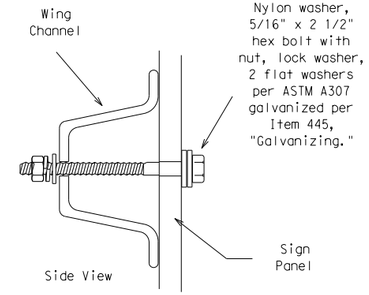
SM RD SGN ASSM TY XXXXX(1)XX(U-XX)



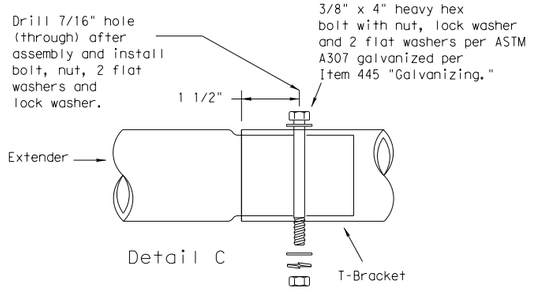
Detail A



Detail D
EXTRUDED ALUMINUM SIGN WITH T BRACKET

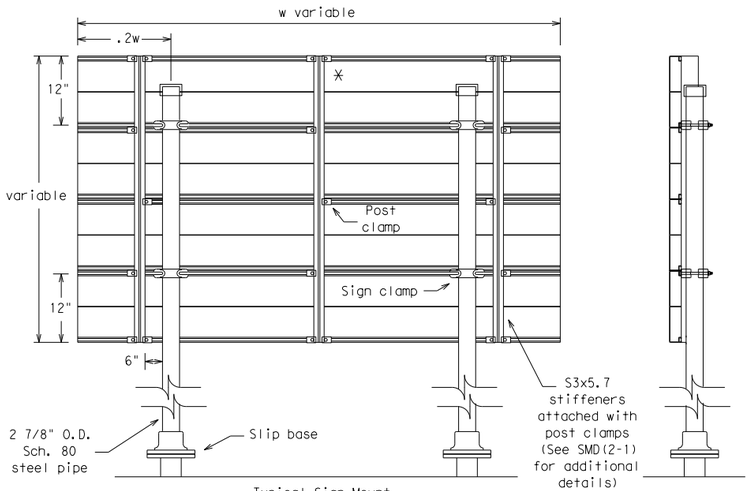


Detail B



Detail C

Splices shall only be allowed behind the sign substrate.

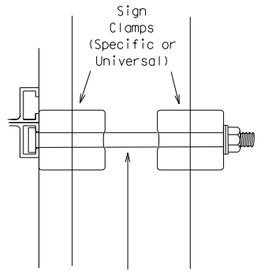


Typical Sign Mount

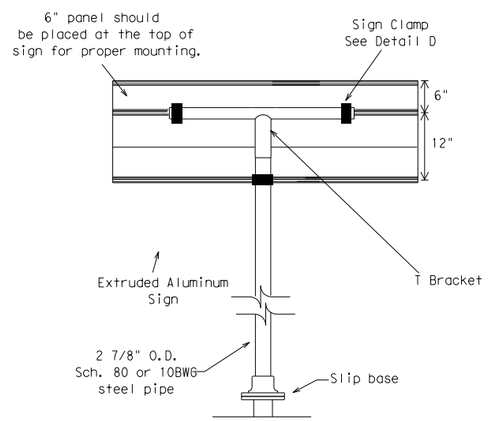
SM RD SGN ASSM TY S80(2)XX(P-EXAL)

* Additional stiffener placed at approximate center of signs when sign width is greater than 10'.

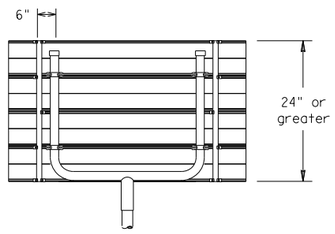
See Detail E
for clamp installation



Detail E



Extruded Aluminum Sign
With T Bracket



Use Extruded Alum. Windbeam as stiffeners
See SMD (2-1) for additional details

See Detail E
for clamp installation

GENERAL NOTES:

SIGN SUPPORT	# OF POSTS	MAX. SIGN AREA
10 BWG	1	16 SF
10 BWG	2	32 SF
Sch 80	1	32 SF
Sch 80	2	64 SF

2. The Engineer may require that a Schedule 80 post be used in place of a 10 BWG where a sign height is abnormally high due to a fill slope.
3. Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
4. Aluminum sign blanks shall conform to Departmental Material Specifications DMS-7110 and shall have the following minimum thicknesses: 0.080 for signs less than 7.5 sq. ft., 0.100 for signs 7.5 to 15 sq. ft., and 0.125 for signs greater than 15 sq. ft.
5. Signs that require specific supports due to reasons in addition to windloading are indicated on the "REQUIRED SUPPORT" table on this sheet.
6. For horizontal rectangular signs fabricated from flat aluminum, T-brackets are used for signs 24 inches or less in height. U-brackets are used for signs of greater height.
7. When two triangular slipbase supports are used to support a single sign, they shall not be "rigidly" connected to each other except through the sign panel. This will allow each support to act independently when impacted by an errant vehicle.
8. Wing channel shall meet ASTM A 1011 SS Gr 50 and be galvanized per ASTM A 123.
9. Excess pipe, wing channel, or windbeam shall be cut off so that it does not extend beyond the sign panel (i.e., excess support shall not be visible when the sign is viewed from the front.) Repair galvanized coating at cut support ends per Item 445, "Galvanizing."
10. Sign blanks shall be the sizes and shapes shown on the plans.
11. Additional sign clamp required on the "T-bracket" post for 24 inch high signs. Place the clamp 3 inches above bottom of sign when possible.
12. Post open ends shall be fitted with Friction Caps.

REQUIRED SUPPORT		
	SIGN DESCRIPTION	SUPPORT
Regulatory	48-inch STOP sign (R1-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	60-inch YIELD sign (R1-2)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	48x16-inch ONE-WAY sign (R6-1)	TY 10BWG(1)XX(T) TY 10BWG(1)XX(P-BM)
	36x48, 48x36, and 48x48-inch signs	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
Warning	48x48-inch signs (diamond or square)	TY 10BWG(1)XX(T)
	48x60-inch signs	TY S80(1)XX(T)
	48-inch Advance School X-ing sign (S1-1)	TY 10BWG(1)XX(T)
	48-inch School X-ing sign (S2-1)	TY 10BWG(1)XX(T)
	Large Arrow sign (W1-6 & W1-7)	TY 10BWG(1)XX(T)

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS TRIANGULAR SLIPBASE SYSTEM

SMD(SLIP-3)-08

REVISIONS
9-08

DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT

CONT	SECT	JOB	HIGHWAY
1135	03	030	FM 1341

DIST	COUNTY	SHEET NO.
SAT	KERR	78

26D

DATE: 1/11/2024 2:27:00 PM
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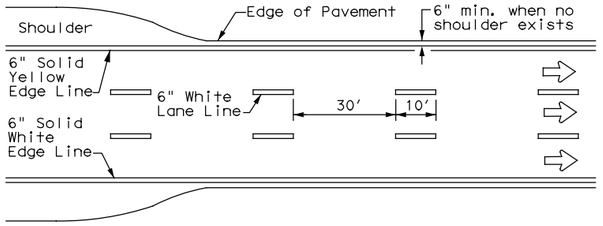
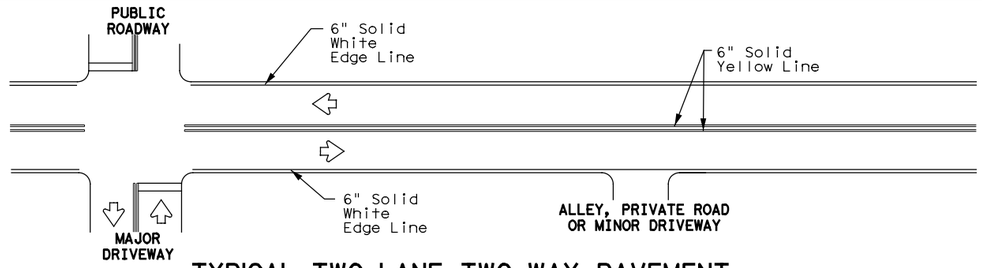
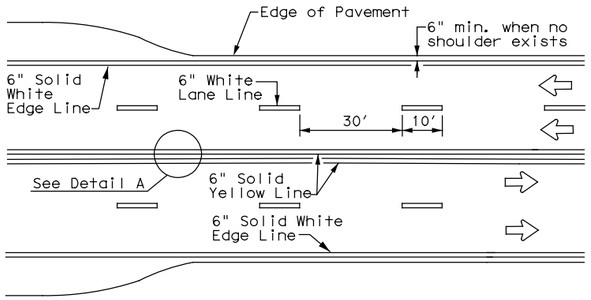
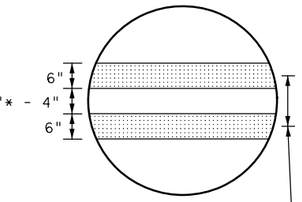


EDGE LINE AND LANE LINES ONE-WAY ROADWAY WITH OR WITHOUT SHOULDERS



TYPICAL TWO-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS





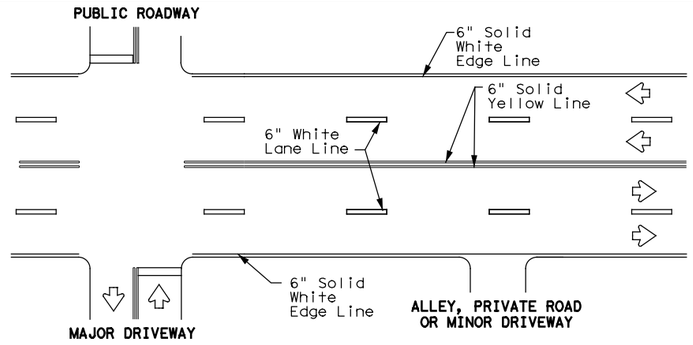
DETAIL "A"

9"** min. - 10" typ.
(18" max. for traveled way greater than 48' only)

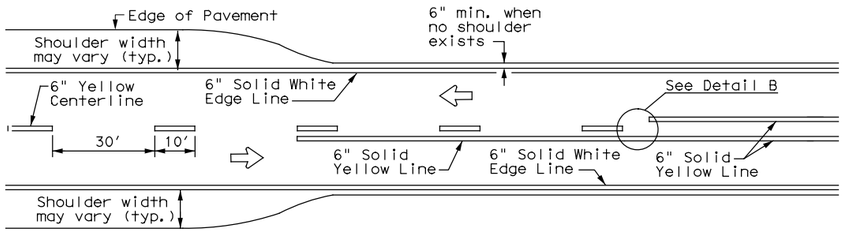
CENTERLINE AND LANE LINES FOUR LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS

* 2" minimum for restripe projects when approved by the Engineer.

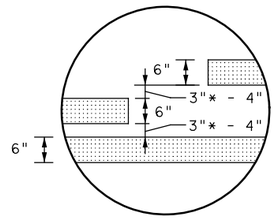
** 8" minimum for restripe projects when approved by the Engineer.



TYPICAL MULTI-LANE, TWO-WAY PAVEMENT MARKINGS THROUGH INTERSECTIONS



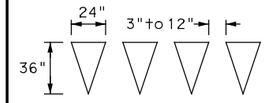
TWO LANE TWO-WAY ROADWAY WITH OR WITHOUT SHOULDERS



18" min. - 20" max.
(16" minimum for restripe projects when approved by the Engineer.)

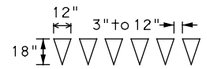
DETAIL "B"

* 2" minimum for restripe projects when approved by the Engineer.

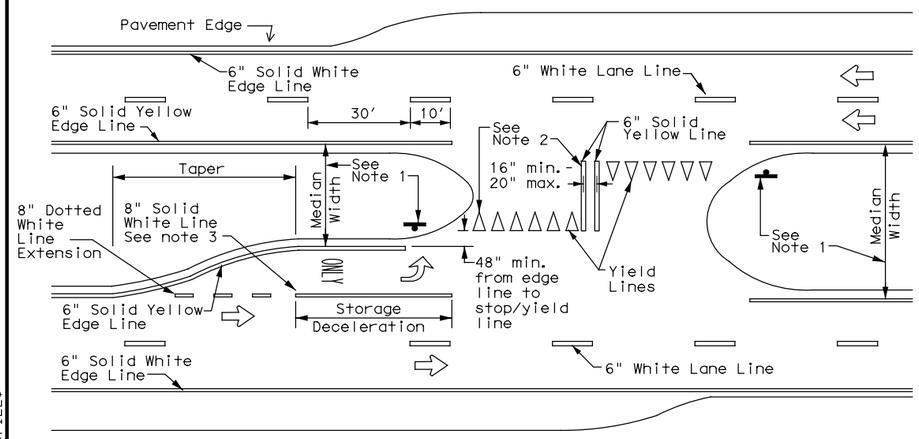


For posted speed on road being marked equal to or greater than 45 MPH.

YIELD LINES



For posted speed on road being marked equal to or less than 40 MPH.



FOUR LANE DIVIDED ROADWAY CROSSOVERS

NOTES

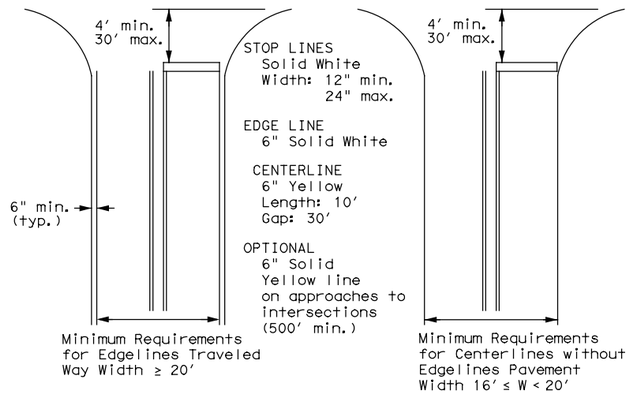
1. Where divided highways are separated by median widths at the median opening itself of 30 feet or more, median openings shall be signed as two separate intersections. Each median opening has two width measurements, with one measurement for each approach. The narrow median width will be the controlling 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	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		79

22A

DATE: 1/11/2024 2:27:02 PM
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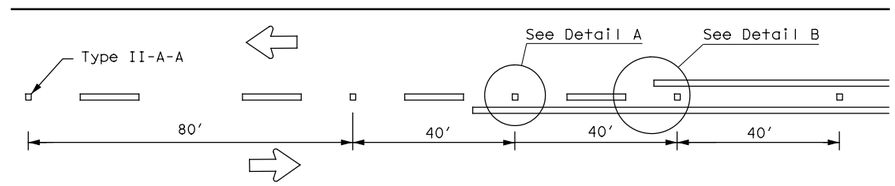
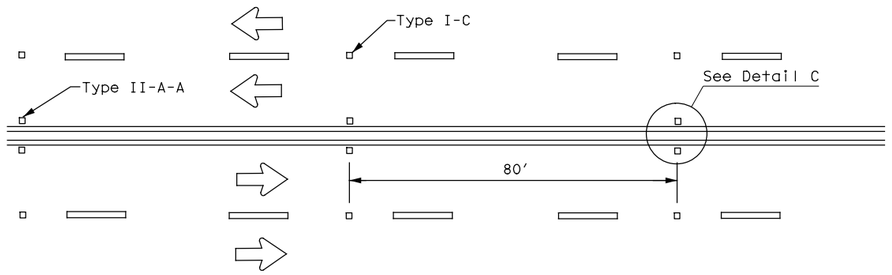
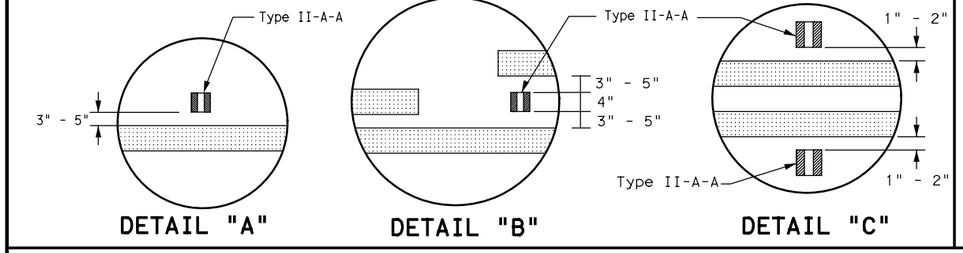
REFLECTIVE RAISED PAVEMENT MARKERS FOR VEHICLE POSITIONING GUIDANCE

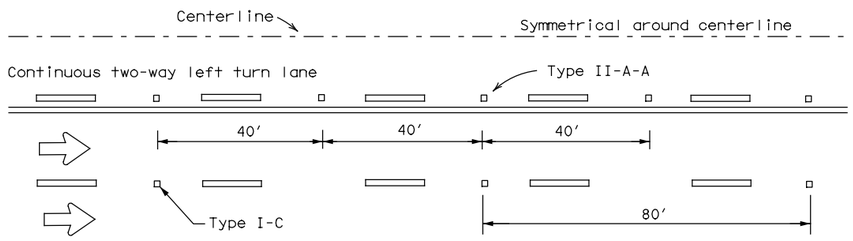


CENTERLINE FOR ALL TWO LANE TWO-WAY ROADWAYS

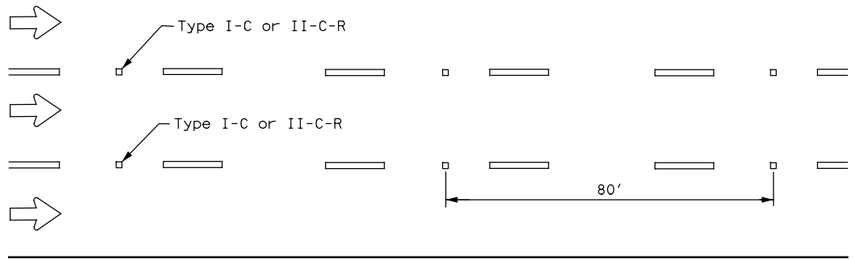


CENTERLINE & LANE LINES FOR FOUR LANE TWO-WAY ROADWAYS





CENTERLINE AND LANE LINES FOR TWO-WAY LEFT TURN LANE



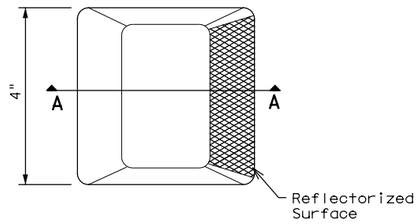
LANE LINES FOR ONE-WAY ROADWAY (NON-FREEWAY FACILITIES)

Raised pavement markers Type II-C-R shall have clear face toward normal traffic and red face toward wrong-way traffic.

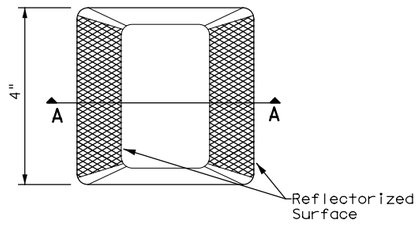
See Note 3.

MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
TRAFFIC PAINT	DMS-8200
HOT APPLIED THERMOPLASTIC	DMS-8220
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240

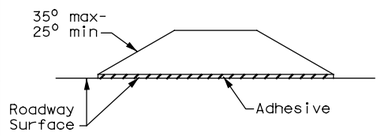
All pavement marking materials shall meet the required Departmental Material Specifications as specified by the plans.



Type I (Top View)

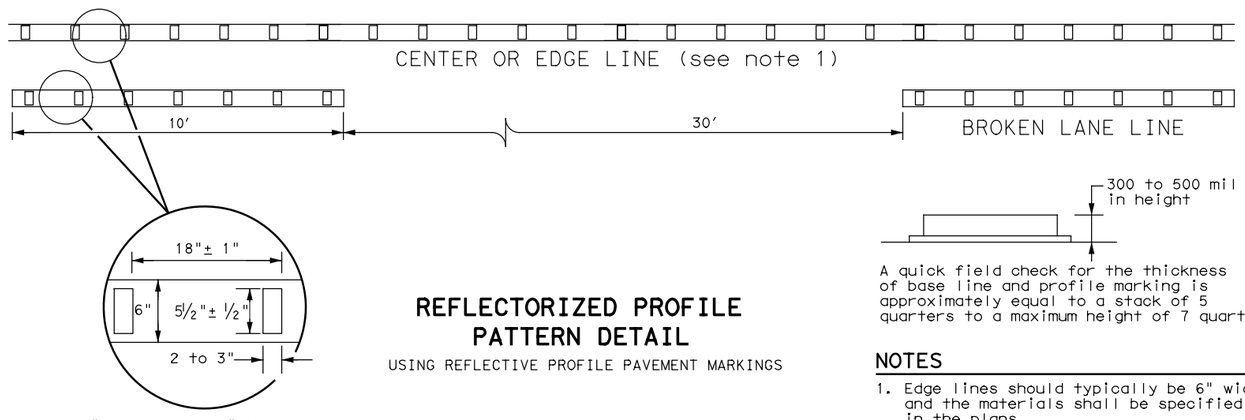


Type II (Top View)



SECTION A

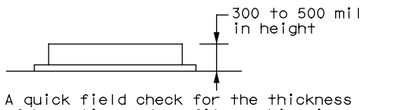
RAISED PAVEMENT MARKERS



6" EDGE LINE, 6" CENTERLINE OR 6" LANE LINE

REFLECTORIZED PROFILE PATTERN DETAIL

USING REFLECTIVE PROFILE PAVEMENT MARKINGS



A quick field check for the thickness of base line and profile marking is approximately equal to a stack of 5 quarters to a maximum height of 7 quarters.

NOTES

1. Edge lines should typically be 6" wide and the materials shall be specified in the plans.
2. Profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

GENERAL NOTES

1. All raised pavement markers placed along broken lines shall be placed in line with and midway between the stripes.
2. On concrete pavements the raised pavement markers should be placed to one side of the longitudinal joints.
3. Use raised pavement marker Type I-C with undivided roadways, flush medians and two way left turn lanes. Use raised pavement marker Type II-C-R with divided highways and raised medians.

Texas Department of Transportation

Traffic Safety Division Standard

POSITION GUIDANCE USING RAISED MARKERS RELECTORIZED PROFILE MARKINGS PM(2)-22

FILE: pm2-22.dgn	DN:	CK:	DW:	CK:
© TxDOT December 2022	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-77 8-00 6-20 4-92 2-10 12-22 5-00 2-12	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		80

22B

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FILE: $FILE$

I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

Texas Pollutant Discharge Elimination System (TPDES) TXR 150000: Stormwater Discharge Permit or Construction General Permit (CGP) required for projects with 1 or more acres distrubed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

☒ No Action Required ☐ Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000.
2. Comply with the Storm Water Pollution Prevention Plan (SW3P) and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and Texas Commission on Environmental Quality (TCEQ), Environmental Protection Agency (EPA) or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, Contractor shall submit Notice of Intent (NOI) to TCEQ and the Engineer.
5. NOI required: ☐Yes ☒No

Note: If amount of soil disturbance changes, permit requirements may change.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

US Army Corps of Engineers (USACE) Permit required for filling, dredging, excavating or other work in any potential USACE jurisdictional water, such as, rivers, creeks, streams, or wetlands.

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

☐ No Permit Required
☐ Nationwide Permit (NWP) 14 - Pre-construction Notice (PCN) not Required
☐ Nationwide Permit 14 - PCN Required
☐ 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 (BMPs) planned to control erosion, sedimentation and post-project total suspended solids (TSS).

1. CYPRESS CREEK (STA.1+64.28)
2.
3.
4.

401 Best Management Practices: (Not applicable if no USACE permit)

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	☐ Sedimentation Chambers
		☐ 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

REFER TO THE FOLLOWING EPIC SHEET FOR ALL BMP NOTES.

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. MIGRATORY BIRD NESTS: Schedule construction activities as needed to meet the following requirements:

   A. Do not remove or destroy any active migratory bird nests (nests containing eggs and/or flightless birds) at any time of year. If there are any active nests, they shall not be removed until the nests become inactive.

   B. On/in structures, if there are any active nests, they shall not be removed until all nests become inactive. After inactive nests are removed and/or before nest activity begins, deterrent materials may be applied to the structures to prevent future nest building.

2. See Item 5 in General Notes.

REFER TO THE FOLLOWING EPIC SHEET FOR ALL BMP NOTES.

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

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 follwing 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

Hazardous Materials or Contamination Issues Specific to this Project:

☒ No Action Required ☐ Required Action

Action No.

1.
2.
3.

Does the project involve the demolition of a span bridge?

☐ Yes ☒ No (No further action required)

If "Yes", a pre- demolition notification must be submitted to the Texas Department of State Health Services. The contractor shall contact TxDOT's Project Engineer 25 calendar days prior to the demolition of the bridges(s) on the project to assist with the notification.

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
San Antonio District Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

SHEET 1 OF 2

FILE: epic_2015-10-09_SAT.dgn	DN: TxDOT	CK: TxDOT	DW: BW	CK: GAG
©TxDOT OCTOBER 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		81

IV. Vegetation Resources (Continued from SHEET 1 of 2)

1. Western box turtle BMPs: The following Vegetation BMPs will be implemented for the Western box turtle.
- Minimize the amount of vegetation cleared. Removal of native vegetation, particularly mature native trees and shrubs should be avoided. Impacted vegetation should be replaced with in-kind on-site replacement/restoration of native vegetation.
- To minimize adverse effects, activities should be planned to preserve mature trees, particularly acorn, nut or berry producing varieties. These types of vegetation have high value to wildlife as food and cover.
- It is strongly recommended that trees greater than 12 inches in diameter at breast height (DBH) that are removed be replaced. TPWD's experience indicates that for ecologically effective replacement, a ratio of three trees for every one (3:1) lost should be provided to either on-site or off-site. Trees less than 12 inches DBH should be replaced at a 1:1 ratio.
- Replacement trees should be of equal or better wildlife quality than those removed and be regionally adapted native species.
- When trees are planted, a maintenance plan that ensures at least an 85 percent survival rate after three years should be developed for the replacement trees.
- The use of any non-native vegetation in landscaping and revegetation is discouraged. Locally adapted native species should be used.
- The use of seed mix that contains seeds from only regional ecotype native species is recommended.

V. Federal Listed. Proposed T/E Species, Critical Habitat, State Species, Candidates Species, & Migratory Birds (Continued from SHEET 1 of 2)

3. Skunk BMP: The following BMPs will be implemented for the Eastern Spotted Skunk:
- These species have the potential to occur in the project area. Avoid harming the species if encountered and avoid unnecessary impacts to dens.

4. Water Quality BMP - The following BMPs will be implemented for the Cagle's map turtle
- Minimize the use of equipment in streams and riparian areas during construction. When possible, equipment access should be from banks, bridge decks, or barges.
- When temporary stream crossings are unavoidable, remove stream crossings once they are no longer needed and stabilize banks and soils around the crossing.
- Wet-Bottomed detention ponds are recommended to benefit wildlife and downstream water quality. Consider potential wildlife-vehicle interactions when siting detention ponds.
- Rubbish found near bridges on TxDOT ROW should be removed and disposed of properly to minimize the risk of pollution. Rubbish does not include brush piles or snags.
- Minimize impacts to riverine habitats in the Guadalupe and San Antonio River drainages.
- Minimize impacts to gently sloping sand banks within 30 feet of shoreline.

5. Aquatic Amphibian and Reptile BMP: The following BMPs will be implemented for the Cagle's map turtle
- Minimize impacts to wetlands, temporary and permanent open water features, including depressions, and riverine habitats.
- Maintain the existing hydrologic regime and any connections between wetlands and other aquatic features.
- Use barrier fencing to direct animal movements away from construction activities and areas of potential wildlife-vehicle collisions in construction areas directly adjacent, or that may directly impact, potential habitat for the target species.
- Apply hydromulching and/or hydroseeding in areas for soil stabilization and/or revegetation of disturbed areas around wetlands and in riparian areas. If erosion control blankets or mats will be used, the product should not contain netting, but should only contain loosely woven natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic netting should be avoided.
- Project specific locations (PSLs) proposed within state-owned ROW should be located in uplands away from aquatic features.
- When work is directly adjacent to the water, minimize impacts to shoreline basking sites (e.g., downed trees, sand bars, exposed bedrock) and refugia/overwinter sites (e.g., brush and debris piles, crayfish burrows, aquatic logjams, and leaf packs).
- If gutters and curbs are part of the roadway design, install gutters that do not include the side box inlet and include sloped (i.e., mountable) curbs to allow small animals to leave roadway. If this modification to the entire curb system is not possible, install sections of sloped curb on either side of the storm water drain for several feet to allow small animals to leave the roadway. Priority areas for these design recommendations are those with nearby wetlands or other aquatic features.

6. Terrestrial Amphibian and Reptile BMPs: The following BMPs will be implemented for the Western box turtle.
- For open trenches and excavated pits, install escape ramps at an angle of less than 45 degrees (1:1) in areas left uncovered. Visually inspect excavation areas for trapped wildlife prior to backfilling.
- Avoid or minimize disturbing or removing cover objects, such as downed trees, rotting stumps, brush piles, and leaf litter. If avoidance or minimization is not practicable, consider removing cover objects prior to the start of the project and replace them at project completion.
- Examine heavy equipment stored on site before use, particularly after rain events when reptile and amphibian movements occur more often, to ensure use will not harm individuals that might be seeking temporary refuge.
- Due to increased activity (mating) of reptiles and amphibian during the spring, construction activities like clearing or grading should attempt to be scheduled outside of the spring (March-May) season. Also, timing ground disturbing activities before October when reptiles and amphibians become less active and may be using burrows in the project area is also encouraged.
- When designing roads with curbs, consider using Type I or Type III curbs to provide a gentle slope to enable turtles and small animals to get out of roadways.
- If Texas tortoises (*Gopherus berlandieri*) or box turtles (*Terrepene* spp.) are present in a project area, the Contractor should remove them from the area and relocated between 100 and 200 meters from the project area. After removal of the individuals, the area that will be disturbed during active construction and project specific locations should be fenced off to exclude reentry by turtles, tortoises, and other reptiles. The exclusion fence should be constructed and maintained as follows:
  - The exclusion fence should be constructed with metal flashing or drift fence material.
  - Rolled erosion control mesh material should not be used.
  - The exclusion fence should be buried at least 6 inches deep and be at least 24 inches high.
  - The exclusion fence should be maintained for the life of the project and only removed after the construction is completed and the disturbed site has been revegetated.

• After project is complete, revegetate disturbed areas with an appropriate locally sourced native seed mix. If erosion control blankets or mats will be used, the product should not contain netting, but should only contain loosely woven natural fiber netting in which the mesh design allows the threads to move, therefore allowing expansion of the mesh openings. Plastic netting should be avoided.

Texas Department of Transportation
San Antonio District Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

SHEET 2 OF 2

FILE: epic_2015-10-09_SAT.dgn	DN: TxDOT	CK: TxDOT	DW: BW	CK: GAC
	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		82

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

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

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

1.0 SITE/PROJECT DESCRIPTION

1.1 PROJECT CONTROL SECTION JOB (CSJ):

1135-03-030

1.2 PROJECT LIMITS:

From: 0.05 MI WEST OF FM 1341 AT CYPRESS CREEK

To: 0.10 MI EAST OF FM 1341 AT CYPRESS CREEK

1.3 PROJECT COORDINATES:

BEGIN: (Lat) 30°1′51.91"N, (Long) 98°59′0.83"W

END: (Lat) 30°1′48.43"N, (Long) 98°58′54.91"W

1.4 TOTAL PROJECT AREA (Acres): 0.75

1.5 TOTAL AREA TO BE DISTURBED (Acres): 0.75

1.6 NATURE OF CONSTRUCTION ACTIVITY:

REMOVAL OF EXISTING 5-72" CMPS. GRADE CYPRESS CREEK FOR THE INSTALLATION 4-12′x6′ MBC. RECONSTRUCT FM 1341 ROADWAY, INSTALL BRIDGE RAIL AND MBGF.

1.7 MAJOR SOIL TYPES:

Soil Type	Description
BOERNE FINE SANDY LOAM	BOERNE FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, OCCASIONALLY FLOODED

1.8 PROJECT SPECIFIC LOCATIONS (PSLs):

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

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

Type	Sheet #s

All off-ROW PSLs required by the Contractor are the Contractor's responsibility. The Contractor shall secure all permits required by local, state, federal laws for off-ROW PSLs. The contractor shall provide diagrams, areas of disturbance, acreage, and BMPs for all off-ROW PSLs within one mile of the project.

1.9 CONSTRUCTION ACTIVITIES:

(Use the following list as a starting point when developing the Construction Activity Schedule and Ceasing Record in Attachment 2.3.)

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

1.10 POTENTIAL POLLUTANTS AND SOURCES:

- ☒ Sediment laden stormwater from stormwater conveyance over disturbed area
- ☒ Fuels, oils, and lubricants from construction vehicles, equipment, and storage
- ☒ Solvents, paints, adhesives, etc. from various construction activities
- ☒ Transported soils from offsite vehicle tracking
- ☒ Construction debris and waste from various construction activities
- ☐ Contaminated water from excavation or dewatering pump-out water
- ☒ Sanitary waste from onsite restroom facilities
- ☒ Trash from various construction activities/receptacles
- ☐ Long-term stockpiles of material and waste
- ☒
- ☐ Other: _____
- ☐ Other: _____
- ☐ Other: _____

1.11 RECEIVING WATERS:

Receiving waters must be depicted on the Environmental Layout Sheets in Attachment 1.2 of this SWP3. Include Segment # for receiving waters.

Tributaries	Classified Waterbody
CYPRESS CREEK	GUADALUPE RIVER (1806); IMPAIRED FOR BACTERIA

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

1.12 ROLES AND RESPONSIBILITIES: TxDOT

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

1.13 ROLES AND RESPONSIBILITIES: CONTRACTOR

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

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

July 2023 Sheet 1 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
	SEE TITLE SHEET		83
STATE	STATE DIST.	COUNTY	
TEXAS	SAT	KERR	
CONT.	SECT.	JOB	HIGHWAY NO.
1135	03	030	FM 1341

STORMWATER POLLUTION PRVENTION PLAN (SWP3):

2.0 BEST MANAGEMENT PRACTICES (BMPs) AND CONTROLS, INSPECTION, AND MAINTENANCE

The Contractor shall be the responsible party for implementing the BMPs described herein and for complying with the SWP3 for control of erosion and sedimentation during day-to-day operations. The Contractor shall implement changes to this SWP3 approved by TxDOT within the times specified in this SWP3 or the CGP.

2.1 EROSION CONTROL AND SOIL STABILIZATION BMPs:

T / P

- ☒ ☐ Protection of Existing Vegetation
- ☐ ☐ Vegetated Buffer Zones
- ☐ ☐ Soil Retention Blankets
- ☐ ☐ Geotextiles
- ☐ ☐ Mulching/ Hydromulching
- ☐ ☐ Soil Surface Treatments
- ☐ ☐ Temporary Seeding
- ☐ ☐ Permanent Planting, Sodding or Seeding
- ☐ ☐ Biodegradable Erosion Control Logs
- ☒ ☐ Rock Filter Dams/ Rock Check Dams
- ☐ ☐ Vertical Tracking
- ☐ ☐ Interceptor Swale
- ☐ ☒ Riprap
- ☐ ☐ Diversion Dike
- ☐ ☐ Temporary Pipe Slope Drain
- ☐ ☐ Embankment for Erosion Control
- ☐ ☐ Paved Flumes
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____
- ☐ ☐ Other: _____

2.2 SEDIMENT CONTROL BMPs:

T / P

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

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

2.3 PERMANENT CONTROLS:

(Coordinate post-construction BMPs with appropriate TxDOT maintenance sections.)

BMPs To Be Left In Place Post Construction:

Type	Stationing	
	From	To
RIPRAP	20+25	27+00

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

2.4 OFFSITE VEHICLE TRACKING CONTROLS:

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

2.5 POLLUTION PREVENTION MEASURES:

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

2.6 VEGETATED BUFFER ZONES:

Natural vegetated buffers shall be maintained as feasible to protect adjacent surface waters. If vegetated natural buffer zones are not feasible due to site geometry, the appropriate additional sediment control measures have been incorporated into this SWP3.

Type	Stationing	
	From	To

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

2.7 ALLOWABLE NON-STORMWATER DISCHARGES:

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

2.8 DEWATERING:

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 2.3 of this SWP3 .

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 2.3 of this SWP3.

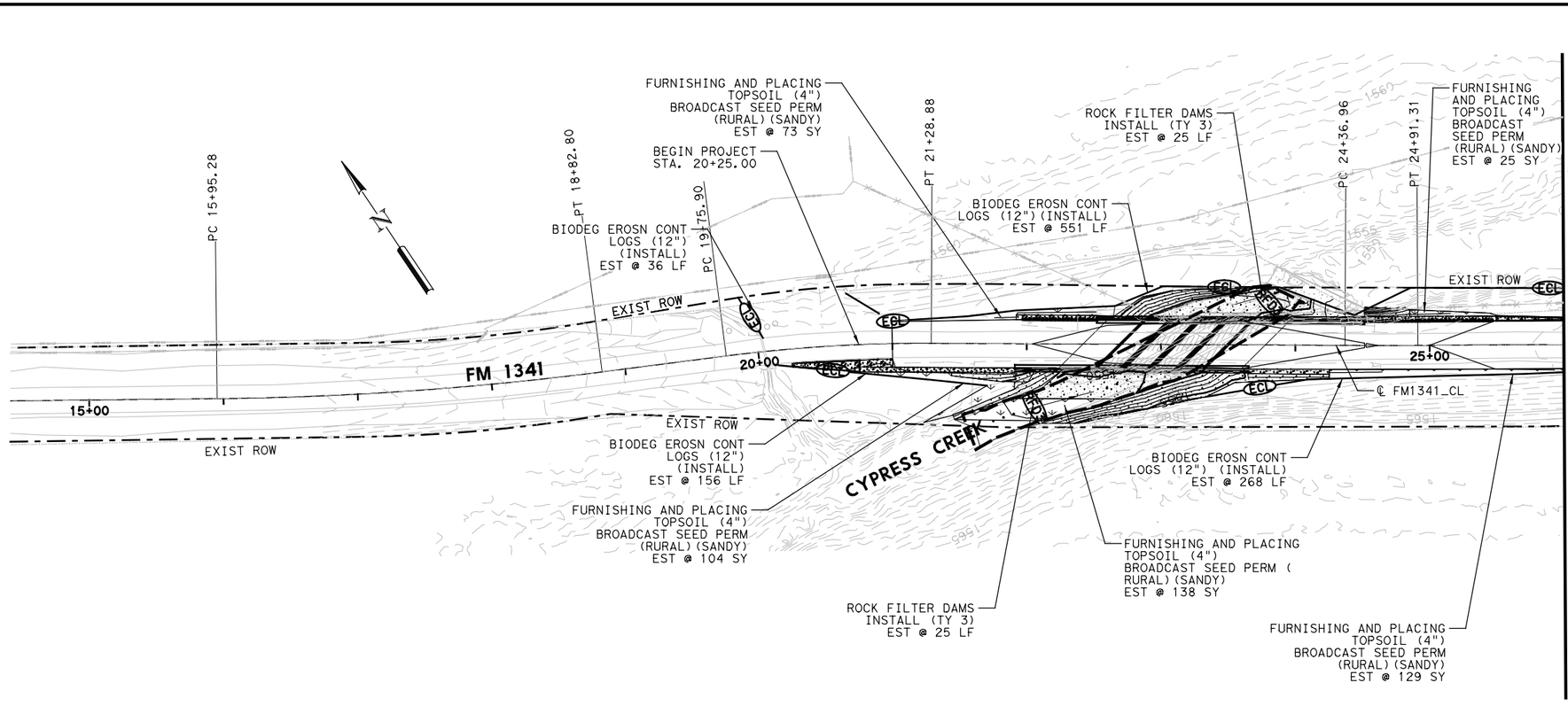
STORMWATER POLLUTION PREVENTION PLAN (SWP3) (Less Than 1 Acre)

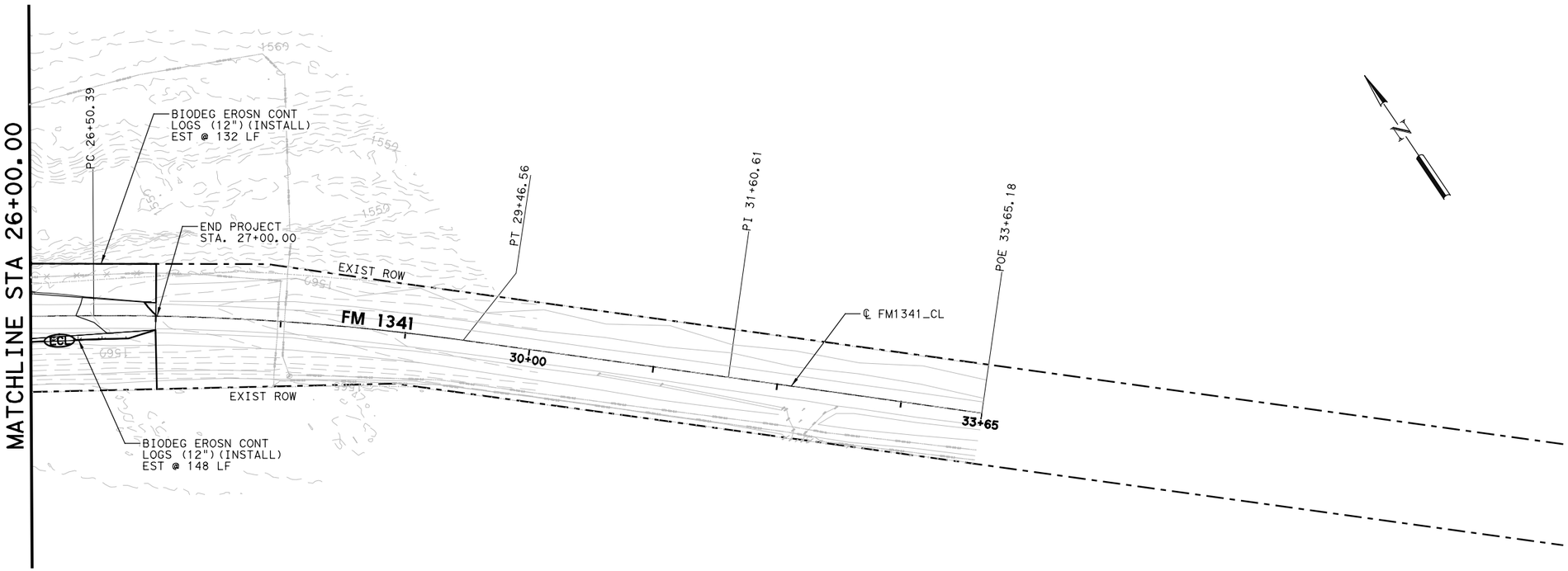
July 2023 Sheet 2 of 2

Texas Department of Transportation

FED. RD. DIV. NO.	PROJECT NO.		SHEET NO.
	SEE TITLE SHEET		84
STATE	STATE DIST.	COUNTY	
TEXAS	SAT	KERR	
CONT.	SECT.	JOB	HIGHWAY NO.
1135	03	030	FM 1341

FINAL PLANS SUBMITTAL





SHEET SUMMARY OF ESTIMATED QUANTITIES			
ITEM#	DESCRIPTION	UNIT	QTY
0160	FURNISHING AND PLACING TOPSOIL (4")	SY	469
0164	BROADCAST SEED (PERM) (RURAL) (SANDY)	SY	469
0168	VEGETATIVE WATERING	MG	8
0506	ROCK FILTER DAMS (INSTALL) (TY 3)	LF	50
0506	ROCK FILTER DAMS (REMOVE)	LF	50
0506	CONSTRUCTION EXITS (INSTALL) (TY 1)	SY	112
0506	CONSTRUCTION EXITS (REMOVE)	SY	112
0506	BIODEG EROSN CONT LOGS (INSTL) (12")	LF	1291
0506	BIODEG EROSN CONT LOGS (REMOVE)	LF	1291

NOTES:

1. REFER TO SW3P STANDARDS FOR DETAILS.
2. INSTALLED SW3P MEASURES SHALL REMAIN IN PLACE AND SHALL BE MAINTAINED THROUGHOUT DURATION OF PROJECT OR AS DIRECTED BY THE ENGINEER
3. SW3P MEASURES SHOWN ARE MINIMUM REQUIREMENTS BASED UPON PROJECT DESIGN. INSTALLATION OF SW3P MEASURES WILL BE AS SHOWN AND MODIFIED TO ACCOMMODATE ACTUAL FIELD CONDITIONS.
4. CONSTRUCTION EXITS TO BE LOCATED IN THE FIELD AND APPROVED BY THE ENGINEER. REFER TO STANDARD EC(3)-16 FOR DETAILS.

LEGEND

ECL — EROSION CONTROL LOG

RFD3 — ROCK FILTER DAM TY 3

NO.	DATE	REVISION	APPR BY

Texas Department of Transportation

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
EN WANG
123262
LICENSED
PROFESSIONAL ENGINEER
01/11/24

0 50 100 150 200
SCALE IN FEET

FM 1341 AT CYPRESS CREEK
EROSION CONTROL LAYOUT

SCALE: 1"=100' SHEET 1 OF 1

DSN: EW	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN: IA	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	85

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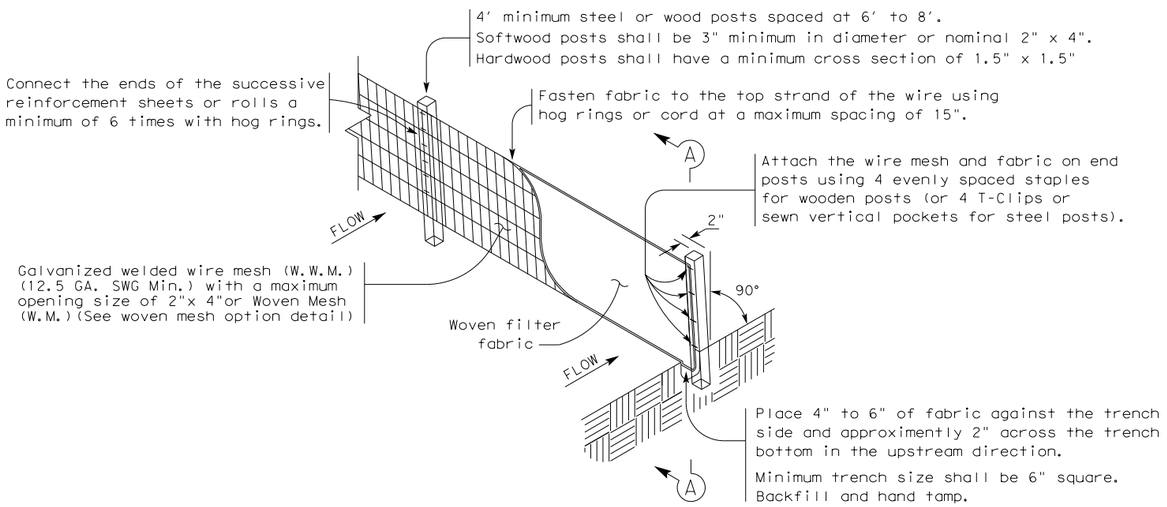
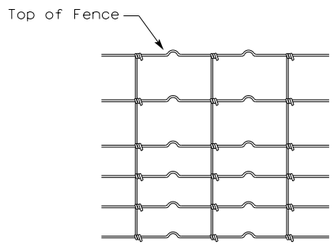
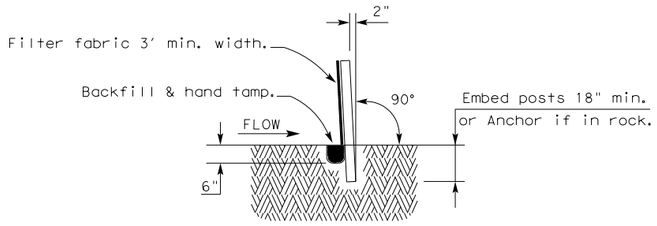


TEMPORARY SEDIMENT CONTROL FENCE

SCF





SECTION A-A

HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA.SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT^2. Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

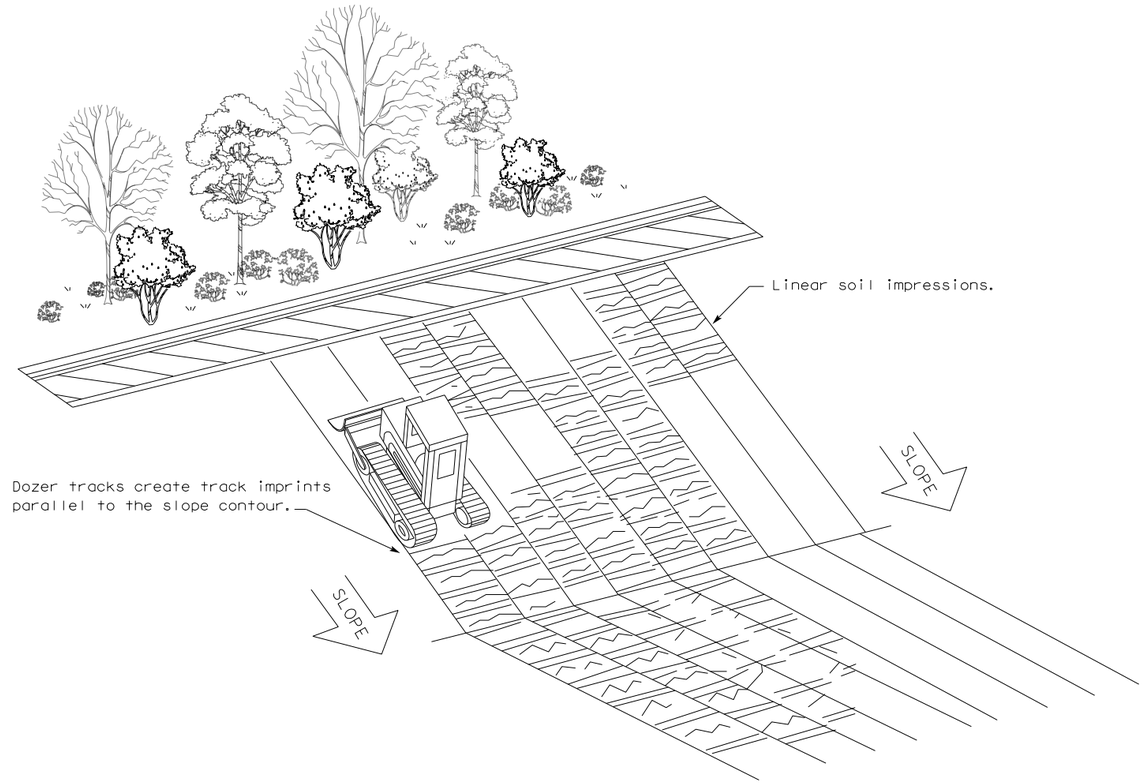
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

Texas Department of Transportation

Design Division Standard

TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

FENCE & VERTICAL TRACKING

EC(1)-16

FILE: ec116	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS	
© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY	
REVISIONS	1135	03	030	FM 1341	
	DIST	COUNTY		SHEET NO.	
	SAT	KERR		86	

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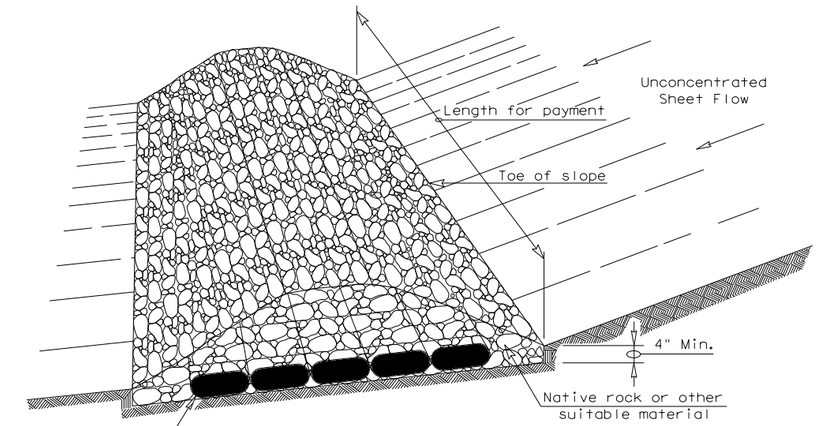
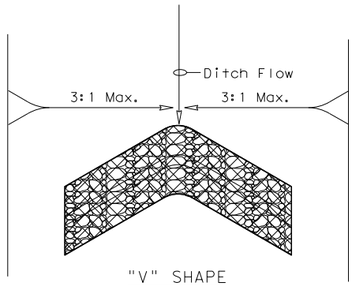
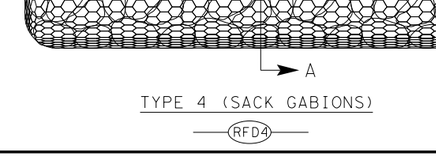


FILTER DAM AT TOE OF SLOPE

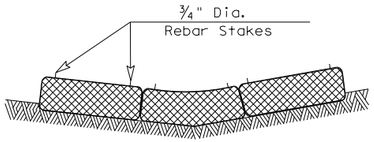
RFD1



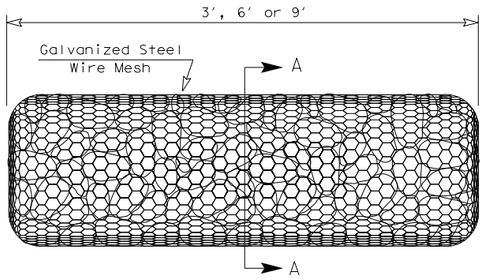
"V" SHAPE
PLAN VIEW



PLAN VIEW

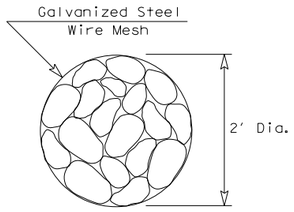


SECTION B-B

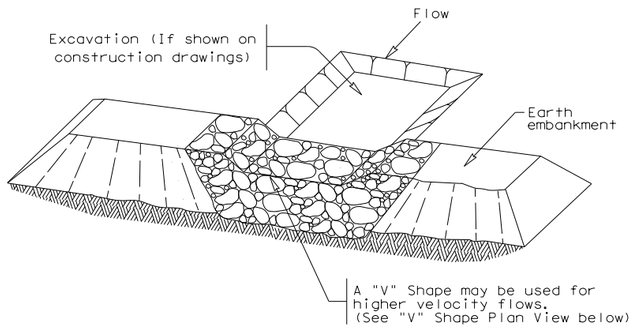


TYPE 4 (SACK GABIONS)

RFD4

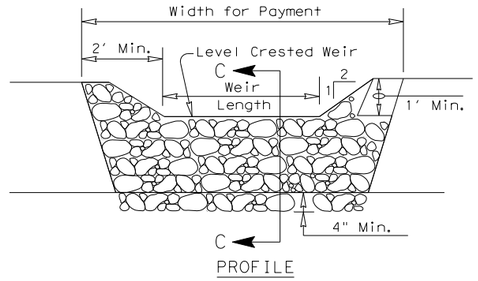


SECTION A-A

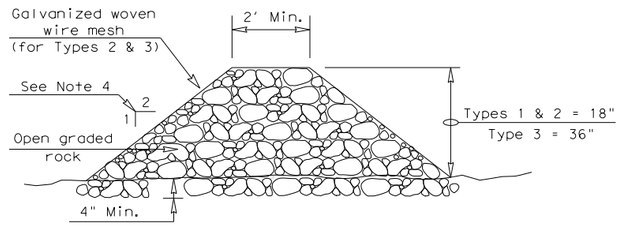


FILTER DAM AT SEDIMENT TRAP

RFD1 OR RFD2



PROFILE



SECTION C-C

ROCK FILTER DAM USAGE GUIDELINES

Rock Filter Dams should be constructed downstream from disturbed areas to intercept sediment from overland runoff and/or concentrated flow. The dams should be sized to filter a maximum flow through rate of 60 GPM/FT^2 of cross sectional area. A 2 year storm frequency may be used to calculate the flow rate.

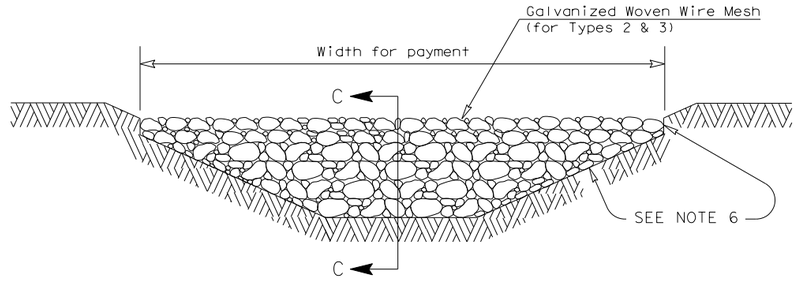
Type 1 (18" high with no wire mesh) (3" to 6" aggregate): Type 1 may be used at the toe of slopes, around inlets, in small ditches, and at dike or swale outlets. This type of dam is recommended to control erosion from a drainage area of 5 acres or less. Type 1 may not be used in concentrated high velocity flows (approximently 8 Ft/Sec or more) in which aggregate wash out may occur. Sandbags may be used at the embedded foundation (4" deep min.) for better filtering efficiency of low flows if called for on the plans or directed by the Engineer.

Type 2 (18" high with wire mesh) (3" to 6" aggregate): Type 2 may be used in ditches and at dike or swale outlets.

Type 3 (36" high with wire mesh) (4" to 8" aggregate): Type 3 may be used in stream flow and should be secured to the stream bed.

Type 4 (Sack gabions) (3" to 6" aggregate): Type 4 May be used in ditches and smaller channels to form an erosion control dam.

Type 5: Provide rock filter dams as shown on plans.



FILTER DAM AT CHANNEL SECTIONS

RFD1 OR RFD2 OR RFD3

GENERAL NOTES

1. If shown on the plans or directed by the Engineer, filter dams should be placed near the toe of slopes where erosion is anticipated, upstream and/or downstream at drainage structures, and in roadway ditches and channels to collect sediment.
2. Materials (aggregate, wire mesh, sandbags, etc.) shall be as indicated by the specification for "Rock Filter Dams for Erosion and Sedimentation Control".
3. The rock filter dam dimensions shall be as indicated on the SW3P plans.
4. Side slopes should be 2:1 or flatter. Dams within the safety zone shall have sideslopes of 6:1 or flatter.
5. Maintain a minimum of 1' between top of rock filter dam weir and top of embankment for filter dams at sediment traps.
6. Filter dams should be embedded a minimum of 4" into existing ground.
7. The sediment trap for ponding of sediment laden runoff shall be of the dimensions shown on the plans.
8. Rock filter dam types 2 & 3 shall be secured with 20 gauge galvanized woven wire mesh with 1" diameter hexagonal openings. The aggregate shall be placed on the mesh to the height & slopes specified. The mesh shall be folded at the upstream side over the aggregate and tightly secured to itself on the downstream side using wire ties or hog rings. For in stream use, the mesh should be secured or staked to the stream bed prior to aggregate placement.
9. Sack Gabions should be staked down with ¾" dia. rebar stakes, and have a double-twisted hexagonal weave with a nominal mesh opening of 2 ½" x 3 ¼"
10. Flow outlet should be onto a stabilized area (vegetation, rock, etc.).
11. The guidelines shown hereon are suggestions only and may be modified by the Engineer.

PLAN SHEET LEGEND

Type 1 Rock Filter Dam	RFD1
Type 2 Rock Filter Dam	RFD2
Type 3 Rock Filter Dam	RFD3
Type 4 Rock Filter Dam	RFD4

Texas Department of Transportation — Design Division Standard

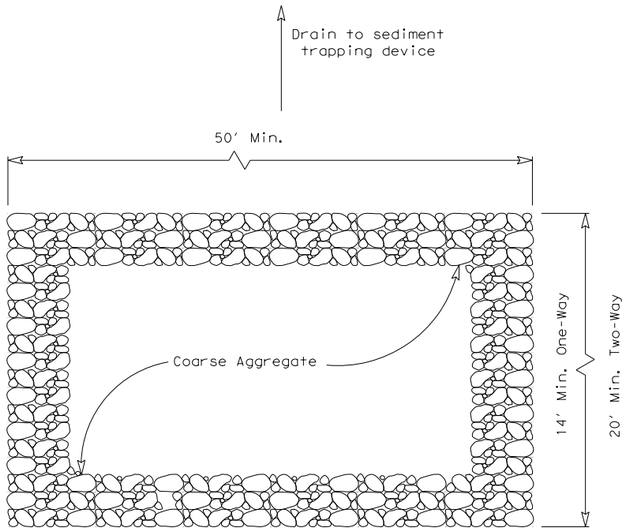
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES

ROCK FILTER DAMS

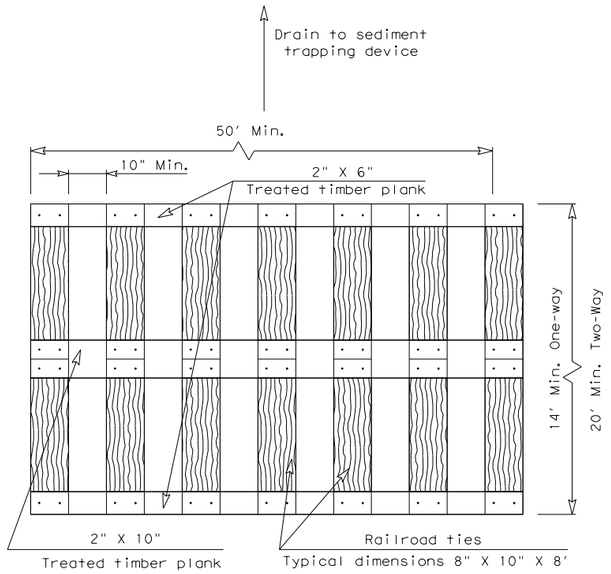
EC(2)-16

FILE: ec216	DN: TxDOT		CK: KM		DW: VP	DN/CK: LS
© TxDOT: JULY 2016	CONT	SECT	JOB		HIGHWAY	
REVISIONS	1135	03	030		FM 1341	
	DIST	COUNTY			SHEET NO.	
	SAT	KERR			87	

DATE: 1/11/2024
FILE: $FILE$



PLAN VIEW



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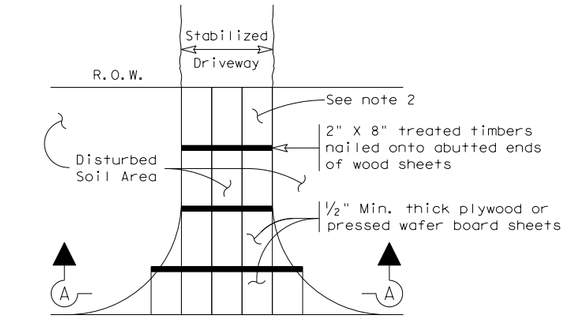
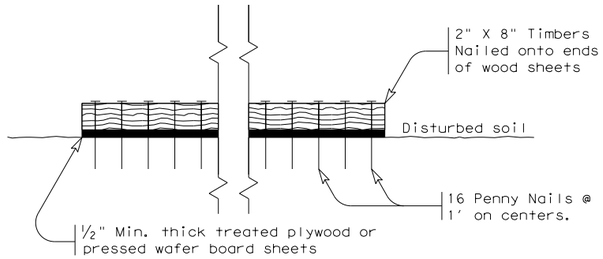


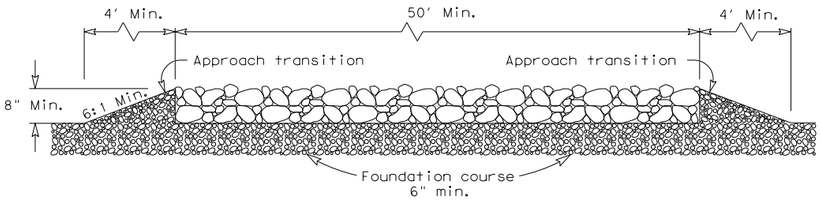
PLAN VIEW



SECTION A-A

CONSTRUCTION EXIT (TYPE 3)

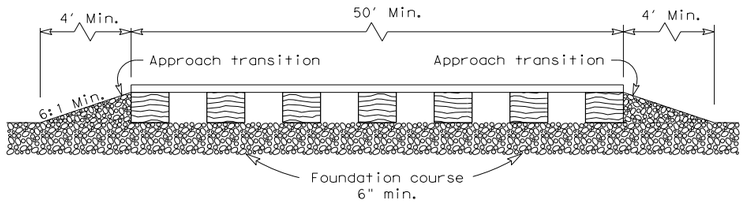
SHORT TERM



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

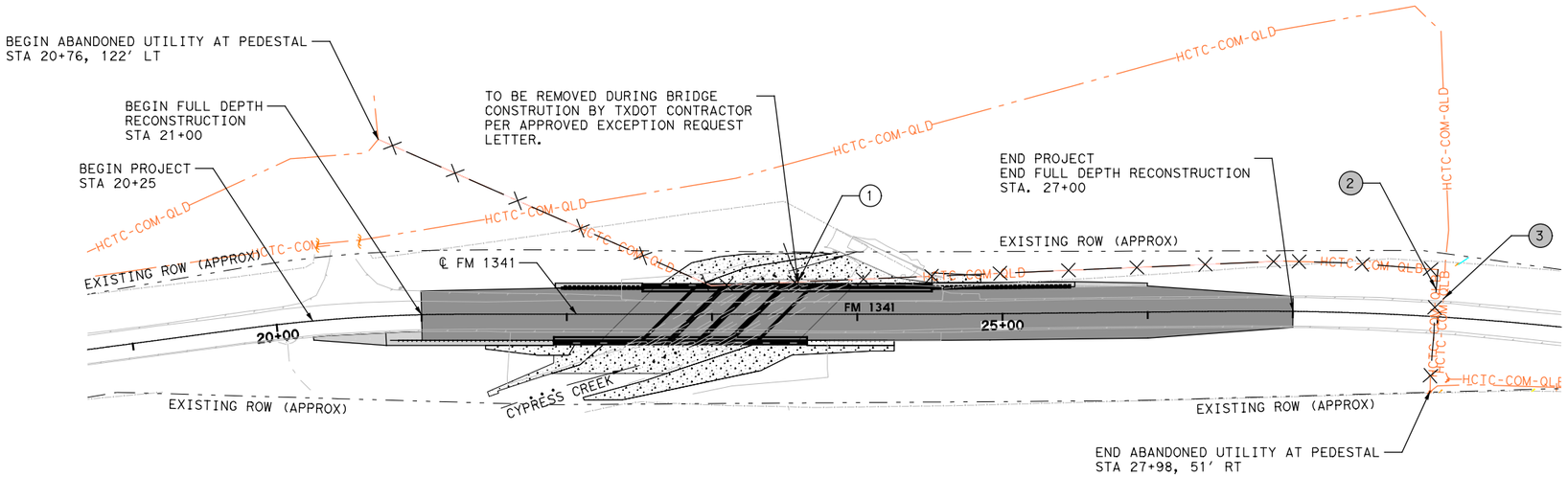
CONSTRUCTION EXITS

EC(3)-16

FILE: ec316	DN: TxDOT	CK: KM	DW: VP	DN/CK: LS
	CONT	SECT	JOB	HIGHWAY
REVISIONS	1135	03	030	FM 1341
	DIST	COUNTY		SHEET NO.
	SAT	KERR		88

DATE: 1/11/2024
FILE: $FILE$

FINAL PLANS SUBMITTAL



EXISTING UTILITY LEGEND

HILL CNTRY. TEL. COOP. QLB	HCTC-COM-QLB
HILL CNTRY. TEL. COOP. QLD	HCTC-COM-QLD
ABANDONED UTILITY	
CONFLICT NUMBER (SEE CONFLICT MATRIX)	1

NO.	DATE	REVISION	APPR BY

HDR Engineering Inc.
613 NW Loop 410, Suite 700
San Antonio, TX 78216
Texas P.E. Firm Registration No. F-754

STATE OF TEXAS
CHARLES M. LAYNE
128198
LICENSED
PROFESSIONAL ENGINEER
Max Layne
1/12/24

FM 1341 AT CYPRESS CREEK

EXISTING UTILITY LAYOUT

SCALE: 1"=100'

SHEET 1 OF 1

DSN:	STATE	FED RD. DIV NO.	FEDERAL PROJECT NO.			HIGHWAY NO.
CK:	TEXAS	6	SEE TITLE SHEET			FM 1341
DRN:	COUNTY	DIST.	CONT.	SECT.	JOB	SHEET NO.
CK:	KERR	SAT	1135	03	030	89

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