FED. RD. DIV. NO.	PROJECT NUMBER		HIGHWAY NUMBER
6	RMC 6469-98-001		SH 36, ETC.
STATE	DISTRICT	COUNTY	
TEXAS	BRY	WASHINGTON, ETC.	
CONTROL	SECTION	JOB	SHEET NO.
			1

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

PLANS OF PROPOSED
HIGHWAY ROUTINE MAINTENANCE CONTRACT

PROJECT NUMBER: RMC 6469-98-001

SH 36, ETC.

WASHINGTON COUNTY, ETC.

TYPE OF WORK: METAL BEAM GUARD FENCE REPAIR AND UPGRADE

LIMITS: FROM VARIOUS
TO VARIOUS

INDEX OF SHEETS

1		TITLE SHEET
2-4		LOCATION MAPS
5-7A		GENERAL NOTES
8		ESTIMATE AND QUANTITY SHEET
9-20	*	BC(1)-21 - BC(12)-21
21-25	*	TCP (1-1)-18 - TCP (1-5)-18
26	*	TCP (2-6)-18
27	*	TCP (5-1)-18
28	*	TCP (6-1)-12
29	*	TCP (6-2)-12
30	*	WZ(RS)-22
31	*	MBGF-19
32	*	MBGF (SR)-19
33	*	MBGF (TR)-19
34	*	MBGF (TL2)-19
35	*	MBGF (T101)-19
36	*	MBGF (MS)-19
37	*	BED(28)-19
38	*	GF(31)-19
39	*	GF(31)DAT-19
40	*	GF(31)LS-19
41-42	*	GF(31)TR TL3-20
43	*	GF(31)TR TL2-19
44	*	GF(31)T101-19
45	*	GF(31)T6-19
46	*	GF(31)MS-19
47-49	*	SRG(TL-2)-21
50-52	*	SRG(TL-3)-21
53	*	RAIL-ADJ(A)-19
54	*	RAIL-ADJ(B)-19
55	*	BED-14
56	*	SGT(10S)31-16
57	*	SGT(11S)31-18
58	*	SGT(12S)31-18
59	*	SGT(13S)31-18
60	*	SGT(14W)31-18
61	*	SGT(15)31-20
62-64	*	BRIFEN(TL4)-14
65	*	CASS(TL4)-14
66	*	GBRLTR(TL4)-14
67-68	*	NU-CABLE(TL4)-14
69	*	MOW STRIP
70	*	PCF-05
71	*	D&OM(VIA)-20

STATE OF TEXAS
PAUL M. RAY
115982
LICENSED
PROFESSIONAL ENGINEER

TEXAS DEPARTMENT OF TRANSPORTATION

NO EXCEPTIONS
NO EQUATIONS
NO RAILROAD CROSSINGS

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

DocuSigned by:
Paul M. Ray P.E.
D5649C5D0971432

PAUL M. RAY, P.E. (No. 115982)

6/4/2024
DATE

RECOMMENDED FOR LETTING

DocuSigned by:
P.E.
275CD3AF332445F

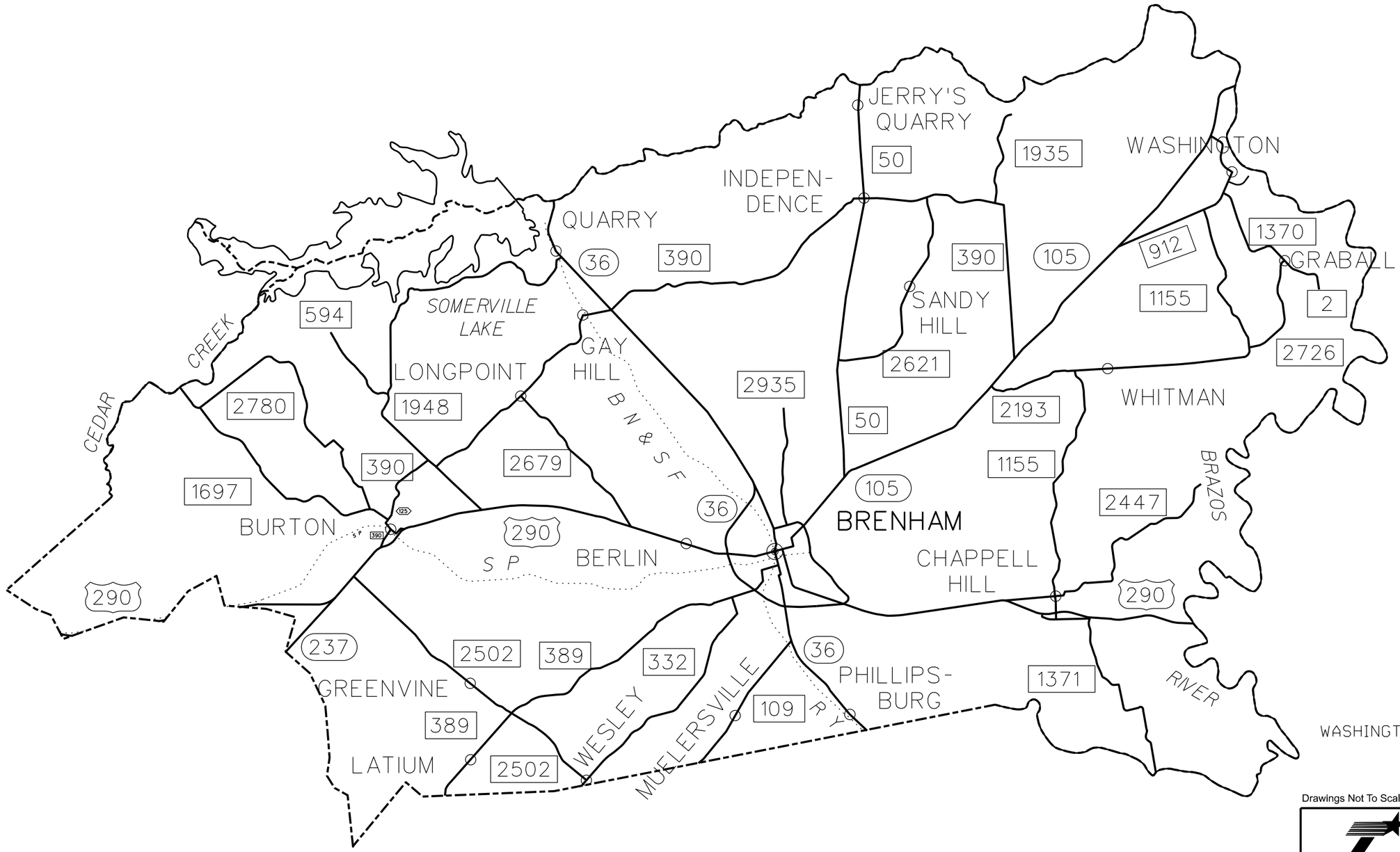
JACE LEE, P.E. DIRECTOR OF MAINTENANCE

6/5/2024
DATE:

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION, NOVEMBER 1, 2014 SHALL GOVERN ON THIS PROJECT.

FILENAME: $FILE$

CSJ: 6469-98-001



Drawings Not To Scale

PRINT DATE	REVISION DATE

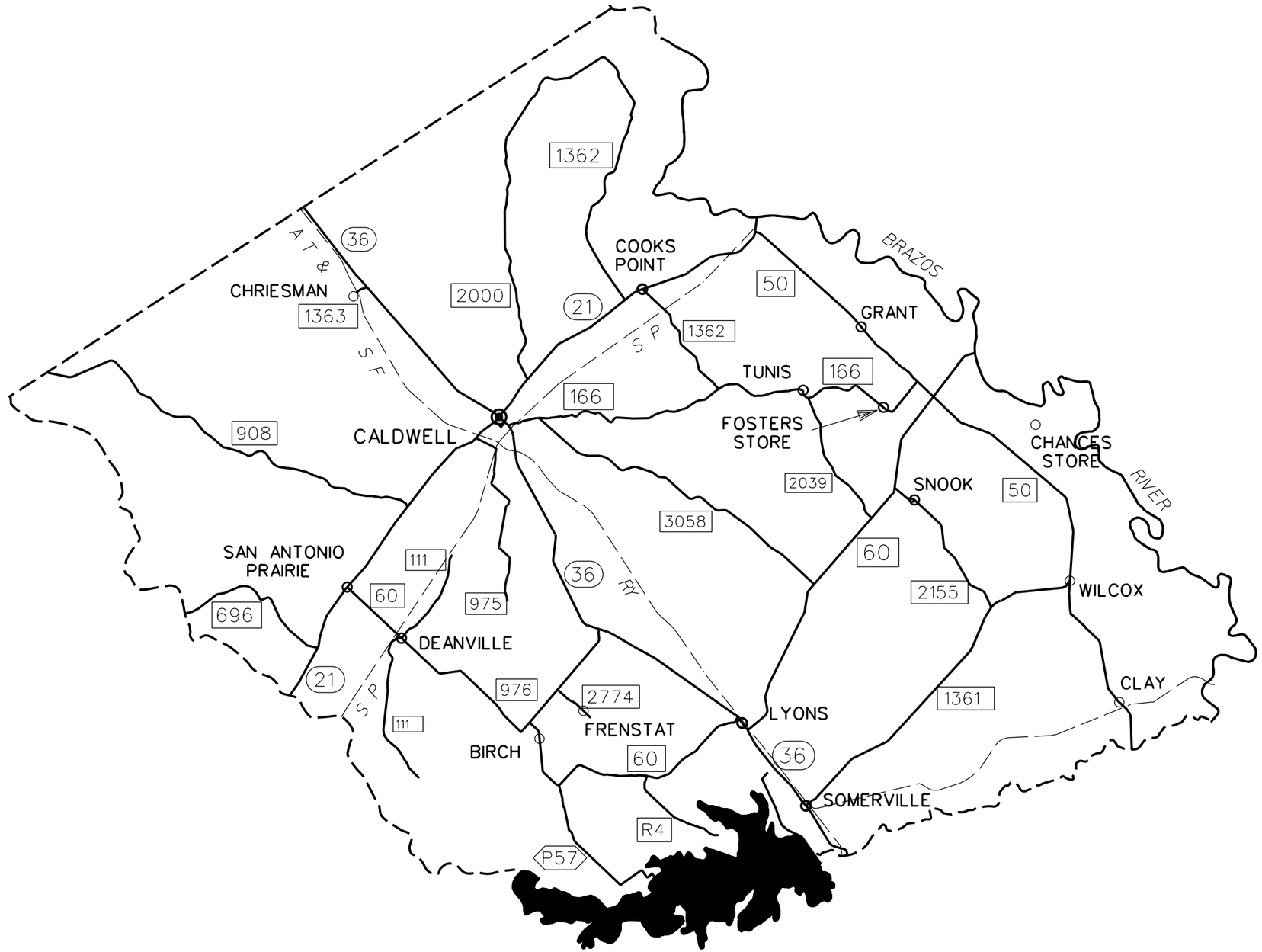
Texas Department of Transportation
Bryan District Maintenance Office

LOCATION MAPS

SHEET 1 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		2

CSJ: 6469-98-001 FILENAME: $FILE$



BURLESON COUNTY

Drawings Not To Scale

PRINT DATE	REVISION DATE

Texas Department of Transportation © 2024

Bryan District Maintenance Office

LOCATION MAPS

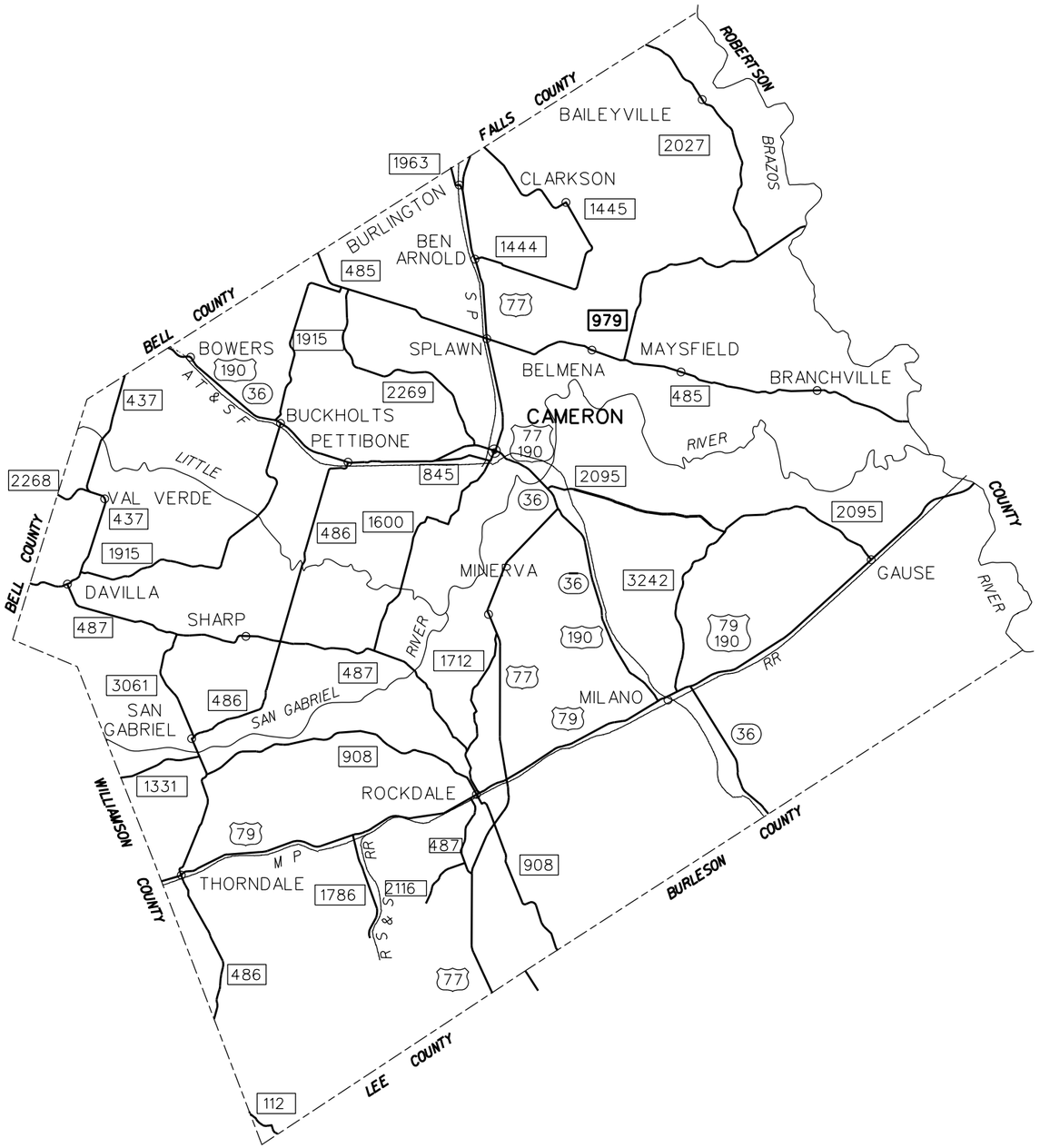
SHEET 2 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.

STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.

CONTROL	SECTION	JOB	SHEET NO.
			3

CSJ: 6469-98-001 FILENAME: $FILES



MILAM COUNTY

Drawings Not To Scale

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

LOCATION MAPS

SHEET 3 OF 3 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		4

CSJ: 6469-98-001 FILENAME: $FILES

GENERAL NOTES:

DEBT TO THE STATE:

If the Comptroller is currently prohibited from issuing a warrant to the Contractor because of a debt owed to the State, then the Contractor agrees that any payment owing under the contract will be applied toward the debt or delinquent taxes until the debt or delinquent taxes are paid.

GENERAL:

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

Paul M. Ray, P.E. – District Maintenance – Paul.Ray@txdot.gov
Michael Estillette – District Maintenance – Michael.Estillette@txdot.gov

Questions may be submitted via the Letting Pre-Bid Q&A web page. This webpage can be accessed from the Notice to Contractors dashboard located at the following Address: https://tableau.txdot.gov/views/ProjectInformationDashboard/NoticetoContractors

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

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

The following Maintenance Section Supervisor oversees the county in this Contract:

Brett Sander 1821 SH 105	Washington County Maintenance Supervisor Brenham, Texas 77833	979-836-9350
Joel Withem 2157 SH 36 S	Burleson County Maintenance Supervisor Caldwell, Texas 77836	979-567-7862
Robert Talafuse 3303 N Travis	Milam County Maintenance Supervisor Cameron, Texas 76520	254-697-6629

ITEM 2 – INSTRUCTIONS TO BIDDERS:

View (Chrome, Edge, or Firefox) plan sheets on-line or download from the web at:
http://www.txdot.gov/business/letting-bids/plans-online.html

Order plans from any of the plan reproduction companies shown on the web at:
http://www.dot.state.tx.us/business/contractors_consultants/repro_companies.htm

By signing this proposal, the Contract bidder acknowledges they have a copy of the "Standard Specifications for Construction of Highways, Streets and Bridges", adopted by the Texas Department of Transportation, November 1, 2014.

ITEM 3 – AWARD AND EXECUTION OF CONTRACT:

This is a non-site specific (callout) Contract. Multiple Work Orders will be used to procure work of the type identified in the Contract. Contractor will be provided the list of locations in the first work order prior to the pre-construction meeting. The first formal Work Order (WO) will be provided at the pre-construction meeting (pre-con).

Contractor may expect a Work Order to have multiple locations including multiple roadways within the various counties listed under this Contract.

This Contract is independent of other active callout Contracts. If the Contractor is awarded multiple Contracts, they should expect Work Orders between the awarded Contracts to overlap and plan for equipment, materials and crews to be available to prosecute all Contracts for which they have been awarded.

The Contractor is responsible to distribute resources in order to complete all assigned Work Orders without incurring liquidated damages. Use of multiple crews to complete Work Orders will not be paid for directly but will be subsidiary to pertinent Items.

If a Work Order is not completed in the allotted days provided, liquidated damages will be charged in accordance with SP 000-1243 for each day the work is not finished.

Working days will not transfer from one Work Order to another.

Work orders may be issued until one (1) calendar year after authorization for work is given. No work orders will be issued after this date unless there is mutual agreement between the contractor and the department. The contract will be in effect until the work on the last work order is completed.

This contract allows for a 1-year extension with mutual agreement between Contractor and Engineer as allowed by SP 004—001.

The Contractor will be notified a minimum of 24 hours prior to the issuance of a work order.

If the Engineer determines that the repair location is a concern for public safety, the Contractor will be required to complete repairs at the location within forty-eight (48)

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

GENERAL NOTES

SHEET 1 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		5

CSJ: 6469-98-001 FILENAME: $FILES

hours of notification.

Bridge column protection and SGT repairs will be considered safety concerns with no minimum work amounts.

Daily production rate used to calculate the duration of a work order is 200 LF of Metal Beam Guard Fence (MBGF) per day. This work will include all components necessary to bring the damaged MBGF into compliance. The Contractor will be given one (1) working day to remove and replace each damaged single guardrail terminal or crash attenuator system. Production rates for cable median barrier will be 25 posts per working day, and/or 200 LF of cable per working day. Cable median barrier terminal sections will be one (1) per working day.

When multiple locations are specified in a Work Order, each location will be continuously worked to completion before moving to the next unless approved by the Engineer. Time charges will begin at the new location on the following working day to allow the Contractor to relocate. Working days for items other than what has been listed will be determined by the Engineer.

Provide an anticipated work schedule every Wednesday for the work to be performed the following week. Notify the responsible Maintenance Office of any changes to the schedule no less than the day before the scheduled changes.

ITEM 6 – CONTROL OF MATERIALS:

Contractor shall furnish all material in accordance with applicable specifications, test methods and general notes in this Contract or as directed by the Engineer.

Use materials from pre-qualified producers. A list of material producers pre-qualified by the Construction Division (CST) of the Texas Department of Transportation (TxDOT) can be found at the following website: https://www.txdot.gov/business/resources/producer-list.html

Deliver salvageable items to the respective TxDOT county maintenance yard with respect to the county the work was performed in, between the hours of 8:30 a.m. and 4:00 p.m. Monday through Thursday. The Engineer will determine which elements are salvageable. All unsalvageable material will become the property of the Contractor.

ITEM 7 – LEGAL RELATIONS AND RESPONSIBILITIES:

State contract mowers will mow the right of way during the growing season. The Contractor will be notified by the Engineer one week in advance of the anticipated time when mowers will be in the limits of the project. Clean the right of way to such a condition that allows the mowing contractors to safely mow.

This project is on a hurricane evacuation route. Furnish at the pre-construction meeting a written plan outlining procedures to suspend work, secure the job site and safely handle traffic through and across the project in the event of a hurricane evacuation.

During the hurricane season (June 1 through November 30), do not close any travel lanes except when the Contractor can demonstrate that he can provide labor, equipment, material, work plan, and quality of work to satisfactorily return all lanes to an open, all-weather travel surface within three days of receiving written or verbal notice but no later than 3 days prior to hurricane landfall. Construction of temporary lanes to an all-weather surface will be paid in accordance with Article 9.7, "Payment for Extra Work and Force Account Method."

In addition to lane closures, cease work 3 days prior to hurricane landfall on or near the roadway that adversely impacts the flow of traffic and reduces the capacity of the highway during an evacuation. Prohibit the Contractor's, sub-contractors' or material suppliers' vehicles from entering or exiting the stream of traffic including material hauling and delivery, and mobilization or demobilization of equipment. When directed, this prohibition will include a reasonable time period for the evacuees to return to their point of origin.

In the event of the declaration of a hurricane watch, warning, other severe weather warning or national or state emergency that requires the roadways in the vicinity be used as evacuation routes, cease all work that requires the Contractor's, sub-contractors' or material suppliers' vehicles to enter the stream of traffic on these primary or secondary evacuation routes. This work includes material hauling and delivery, and mobilization or demobilization of equipment.

The following roadways are recognized evacuation routes in the Bryan District:

Primary Evacuation Routes: IH 45, US 290, SH 6, SH 36

Secondary Evacuation Routes: US 79, US 84, SH 7, SH 30, SH 21, SH 105.

Other routes may be designated.

ITEM 8 – PROSECUTION AND PROGRESS:

Contract length will be computed and charged in accordance with Article 8.3.1.5 Calendar Day.

Work Orders will be issued in accordance with Section 8.3.1.4. "Standard Workweek. Report each day, or as directed, prior to the beginning of work to the maintenance supervisor of the county as to the time(s), location(s), and work expected for inspection and acceptance as it develops and/or is completed.

Do not commence work prior to sunrise and arrange the work such that all equipment and/or personnel will be off on any traveled roadway or picnic area after sunset.

Do not work from narrow side of median unless approved by the Engineer. Obtain approval from Engineer prior to placement of lane closures.

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

GENERAL NOTES

SHEET 2 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		6

FILENAME: $FILES

CSJ: 6469-98-001

A minimum of $1000 of work will be scheduled for repair and/or upgrade for each Work Order. If the final Work Order at the project close-out is less than the minimum call-out amount, the Contractor will be required to complete this work, if requested.

Damage to any roadway or other highway appurtenance, resulting from any metal beam guard fence repair operations, will be repaired by the Contractor at his/her sole expense. It is the Contractor's responsibility to remove, maintain and replace delineators, signs and appurtenances that are damaged during construction. This will be considered subsidiary to other bid items.

In those instances where fixed features require earthwork, the governing slopes indicated herein may be varied between the limits decided in the field and the extent determined by the Engineer.

Notify the Engineer by 7:45 a.m. if work will not be performed that day.

ITEM 9 – MEASUREMENT AND PAYMENT:

In accordance with Article 9.2 "Plans Quantity Measurement," plans quantity measurement requirements are not applicable for this contract. Quantities shown in the plans are for bidding purposes only.

TXDOT does not guarantee that all or only the quantities shown in plans will be requested for delivery may be requested (under-run / over-run). Contractor should expect to provide materials in the quantity and type requested in the Work Order(s). Material quantities less or more than those listed in the contract estimate (under-run / over-run) may be requested based upon TXDOT needs and requirements and shall be provided at the same cost per unit of measure as per the original bid price.

The acceptance of this contract also does not guarantee that any materials may be purchased (zero-run) by TXDOT during the time period for which the contract is active.

Contractor is responsible for obtaining annual overweight tolerance permit if hauling material which exceeds the legal road weight.

ITEM 432 – RIPRAP:

The fifty-foot (50') approach taper to the MBGF end treatment will be 4" concrete Mow Strip unless otherwise directed by the Engineer.

Commercially bagged concrete mix may be used if approved by the Engineer and it meets strength requirements of Class B concrete. Mix concrete according to manufacturer's instructions.

ITEM 502 – BARRICADES, SIGNS, AND TRAFFIC HANDLING:

Provide all traffic control for this project. In accordance with Section 502.4.1.6, traffic control and barricades will not be paid directly, but will be subsidiary to the various bid items of the contract.

Truck Mounted Attenuators (TMAs) will be required for this project if the Contractor has a lane closure. The traffic control plan will be governed by PART VI of the TMUTCD, the BC standards sheets, and the traffic control standard sheets or as directed by the Engineer. Additional signing and/or barricades shown in the TMUTCD, BC, and TCP standards may be required by the Engineer to ensure the safety of the traveling public.

TMAs will be paid under Item 6185.

Close entrance ramp in the vicinity of the lane closure as directed by the Engineer in accordance with TCP (1-5)-18 and/or TCP (6-2)-12.

Seven-day advance notice of lane closure will not be required as shown on TCP (6-1)-12.

Duplicate construction warning signs will be erected on the median side of freeways where median width will permit.

Work within 30 feet of the outside travel lane of freeways / expressways will require application of TCP (5-1)-18 for cable barrier or MBGF repair.

All work performed on cable barrier or MBGF on the inside shoulder of freeways / expressways will be completed under an inside lane and shoulder closure as shown on TCP (6-1)-12.

Where shown on applicable TCP standards, channelizing devices on the centerline are required at all times; including when a pilot vehicle is used to lead traffic. Mount a G20-4 sign at a conspicuous location on the rear of the vehicle. Traffic delays caused by one-lane, two-way traffic control, will not be allowed to exceed 5 minutes unless approved by the Engineer.

Use WZ(RS)-22 "Temporary Rumble Strips" when using one-lane two-way operations and lane closures on conventional roadways. Use of rumble strips is subsidiary to various bid items.

Portable changeable message signs will be paid for under Item 6001.

ITEM 506 – TEMPORARY EROSION, SEDIMENTATION AND ENVIRONMENTAL CONTROLS:

It is not anticipated that any erosion control devices will be needed on this project. However, in the event that any devices are needed, payment for the work will be determined in accordance with Article 9.7, "Payment for Extra Work and Force Account Method".

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

GENERAL NOTES

SHEET 3 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		7

CSJ: 6469-98-001 FILENAME: $FILES

ITEM 540 – METAL BEAM GUARD FENCE:

Item 540 is to be used when furnishing, installing, or adjusting metal beam guard fence consisting of the full system of rail elements, hardware, blocks, and support posts.

Unless otherwise specified by the Engineer, all installation, repair and upgrade of MBGF shall be done to the 31 inch standard height.

ITEM 544 – GUARDRAIL END TREATMENTS:

Furnish and install only MASH compliant guardrail end treatments. Use TYPE III post and tube option when using wood post guardrail end treatments.

ITEM 770 – GUARD FENCE REPAIR:

Item 770 is to be used when repairing or replacing individual damaged guard fence elements, posts, terminal anchor sections, single guard fence terminals, and other appurtenances.

Paint all field fabricated cut edges and/or drill holes with an approved galvanized repair compound. Drill through concrete with core barrel drill bit, or as directed by the Engineer.

Backfill of posts set in hot mix/surface treatment will be four (4) inches of cold-mix, or similar material approved by the Engineer. Material and work are subsidiary to various bid items.

Any rail removed and replaced to remove/replace posts will not be paid for directly but considered subsidiary to various bid items.

ITEM 771 – REPAIR CABLE BARRIER SYSTEM:

Payment for Item 771-6002 REPLACE POSTS (TL-4) includes replacing damaged post and all post hardware.

Remove and replace concrete foundations in accordance with the details on the plans under Item 771-6006 REPAIR CONCRETE FOUNDATION (TL-4)

Item 771-6008 REPR OR RPLC CABLE BARR TERM SEC(TL-4) does not cover replacement of concrete foundation. Item pays for damage to the terminal section above ground and cable anchor.

Payment for Item 771-6012, REPLACE POST HARDWARE (TL-4) includes replacing all hardware (missing or damaged) at undamaged post.

ITEM 774 – ATTENUATOR REPAIR:

Hardware required for repair of an attenuator is subsidiary to various bid items.

If concrete is needed, furnish class specified in plan sheets. If concrete class is not specified furnish class "A" concrete in accordance with Item 421.

ITEM 6001 – PORTABLE CHANGEABLE MESSAGE SIGN:

Furnish, install, and operate up to two (2) Portable Changeable Message Signs (PCMS) for this project. The signs can be used both on the project and within a ten (10) mile radius of the project. Locations, messages, and durations of use will be specified by the Engineer. The primary uses will be to inform the public of special events, lane and road closures, and changes in traffic control. PCMS as described here will be paid for only when used as directed by the Engineer.

ITEM 6185 TRUCK MOUNTED ATTENUATOR (TMA) AND TRAILER ATTENUATOR (TA)

The truck mounted attenuators (TMA) as shown in the Traffic Control Plan Standard Sheets are not optional and are required to be mounted on each shadow vehicle.

TMA's shall meet the requirements of the Compliant Work Zone Traffic Control Device List. http://ftp.txdot.gov/pub/txdot-info/cmd/mpl/cwztcd.pdf

TMA's will be paid under Item 6185-6002 TMA (STATIONARY)

The TMA used for set-up and removal of the Traffic Control Plan is deemed to be the one and the same TMA used during maintenance of the Traffic Control Plan.

Submit to the Engineer on or before the pre-construction meeting a letter certifying all TMA devices used on the project meet NCHRP 350 or AASHTO Manual for assessing Safety Hardware (MASH) requirements.

Signs and arrow boards required on truck-mounted attenuators and pilot vehicles are subsidiary to Item 6185.

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

GENERAL NOTES

SHEET 4 OF 4 SHEETS

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		7A

CSJ: 6469-98-001 FILENAME: $FILE$

ESTIMATE SUMMARY

ITEM CODE		DESCRIPTION	UNIT	PROJECT: 6469-98-001	
				HIGHWAY: SH 36, ETC.	
ITEM NO.	DESC CODE			ALL BID ITEMS	
				EST	Revised
432	6045	RIPRAP (MOW STRIP)(4 IN)	CY	5.00	
500	6033	MOBILIZATION (CALLOUT)	EA	30.00	
540	6001	MTL W-BEAM GD FEN (TIM POST)	LF	2250.00	
540	6002	MTL W-BEAM GD FEN (STEEL POST)	LF	50.00	
540	6006	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	5.00	
540	6010	MTL W - BEAM GD FEN ADJUSTMENT	LF	50.00	
540	6016	DOWNSTREAM ANCHOR TERMINAL SECTION	EA	5.00	
542	6001	REMOVE METAL BEAM GUARD FENCE	LF	1900.00	
542	6002	REMOVE TERMINAL ANCHOR SECTION	EA	5.00	
542	6003	REMOVE DOWNSTREAM ANCHOR TERMINAL	EA	5.00	
544	6001	GUARDRAIL END TREATMENT (INSTALL)	EA	20.00	
544	6003	GUARDRAIL END TREATMENT (REMOVE)	EA	15.00	
770	6001	REPAIR RAIL ELEMENT (W-BEAM)	LF	4000.00	
770	6002	REPAIR RAIL ELEMENT (THRIE-BEAM)	LF	15.00	
770	6003	REP RAIL ELMNT (THRIE-BM TRANS TO W-BM)	LF	20.00	
770	6004	REPAIR RAIL ELEMENT (CURVED RAIL)	LF	50.00	
770	6006	RAISE RAIL ELEMENT	LF	450.00	
770	6012	REM / REPL TIMBER POST W / O CONC FND	EA	150.00	
770	6013	REM / REPL STEEL POST W / O CONC FND	EA	25.00	
770	6014	REM / REPL TIMBER POST W / CONC FND	EA	30.00	
770	6015	REM / REPL STEEL POST W / CONC FND	EA	5.00	
770	6016	REPAIR STEEL POST WITH BASE PLATE	EA	5.00	
770	6017	REALIGN POSTS	EA	300.00	
770	6019	REMOVE AND REPLACE BLOCKOUT	EA	70.00	
770	6020	REPLACE STL BLOCKOUTS W/WOOD	EA	25.00	
770	6021	REPLACE SINGLE GDRAIL TERMINAL RAIL	LF	125.00	
770	6022	REPLACE SINGLE GDRAIL TERMINAL POST	EA	40.00	
770	6027	REMOVE GDRAIL END TRT/ REPL WITH SGT	EA	25.00	
770	6028	REPL SINGLE GDRAIL TERM IMPACT HEAD	EA	10.00	
770	6029	REM & RESET SGT IMPACT HEAD	EA	10.00	
770	6030	REPLACE SGT CABLE ASSEMBLY	EA	10.00	
770	6031	REPLACE SGT CABLE ANCHOR	EA	10.00	
770	6032	REPLACE SGT STRUT	EA	10.00	
770	6033	REPLACE SGT OBJECT MARKER	EA	10.00	
770	6060	REMOVE AND REPLACE DAT	EA	10.00	
771	6002	REPLACE POSTS (TL-4)	EA	250.00	
771	6004	CABLE SPLICE / TURNBUCKLE (TL-4)	EA	10.00	
771	6006	REPAIR CONCRETE FOUNDATION (TL-4)	EA	10.00	
771	6008	REPR OR REPLC CABLE BARR TERM SEC(TL-4)	EA	10.00	
771	6010	REPLACE CABLE (TL-4)	LF	200.00	
771	6011	CHECK/RE-TENSION CABLE	EA	25.00	
771	6012	REPLACE POST HARDWARE (TL-4)	EA	100.00	
774	6013	REPAIR (NARROW REACT 350)	LF	50.00	
774	6017	REPAIR (WIDE QUAD)	EA	2.00	
774	6118	REPAIR (QUADGUARD)(MASH)(N)	EA	2.00	
774	6122	REPAIR (TAU)(MASH)(N)	EA	2.00	
776	6004	REPAIR (STL POST W/DOUBLED W-BEAMS-T-6	LF	50.00	
6001	6001	PORTABLE CHANGEABLE MESSAGE SIGN	DAY	10.00	
6185	6002	TMA (STATIONARY)	DAY	70.00	

CSJ: 6469-98-001 FILENAME: $FILES

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

ESTIMATE AND QUANTITY SHEET

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		8

DATE:
FILE:

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

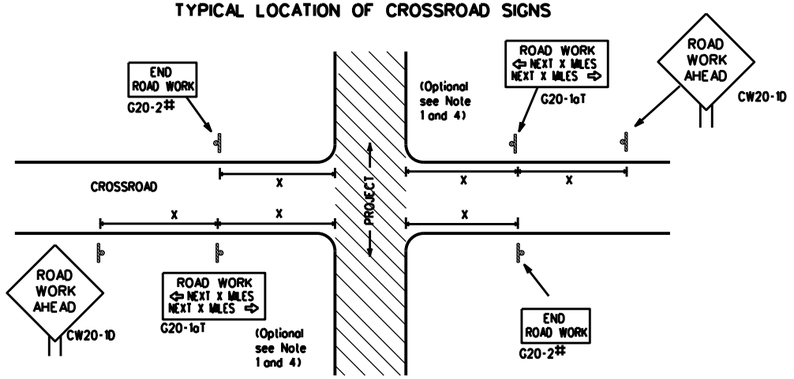
BC(1)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC *	HIGHWAY	
REVISIONS 4-03 7-13 9-07 8-14 5-10 5-21		6469-98-001	SH 36, ETC.	
	DIST	COUNTY	SHEET NO.	
	BRY	WASHINGTON, ETC	09	

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

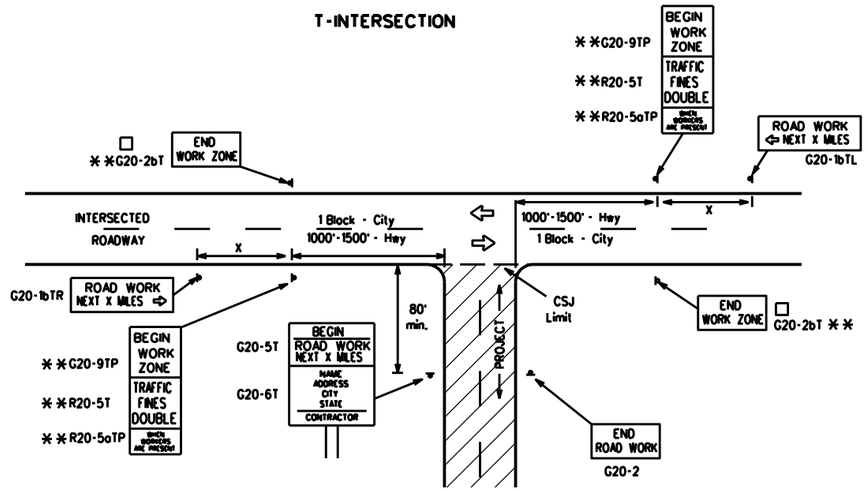
TYPICAL LOCATION OF CROSSROAD SIGNS



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

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

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

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

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING

1.5.6

SIZE

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

SPACING

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

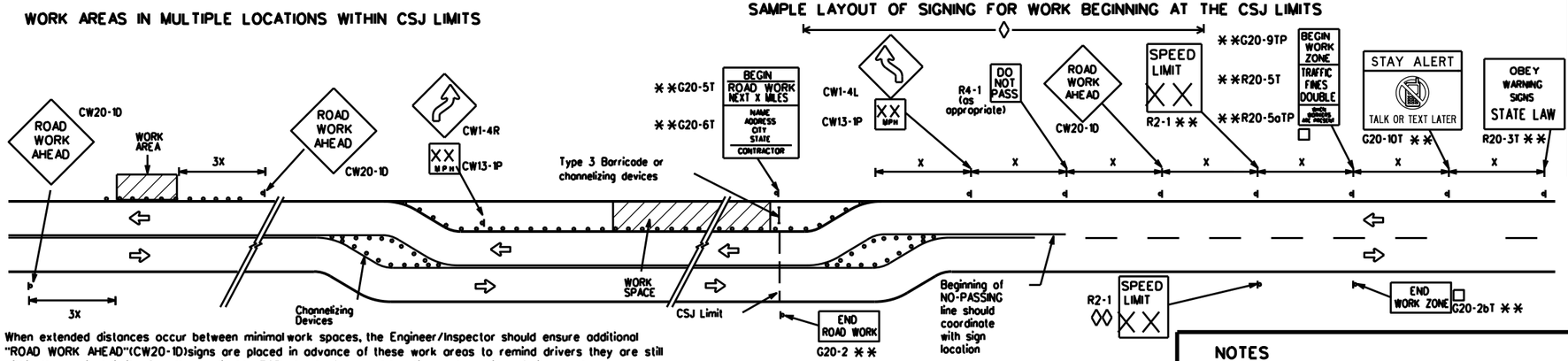
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

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

GENERAL NOTES

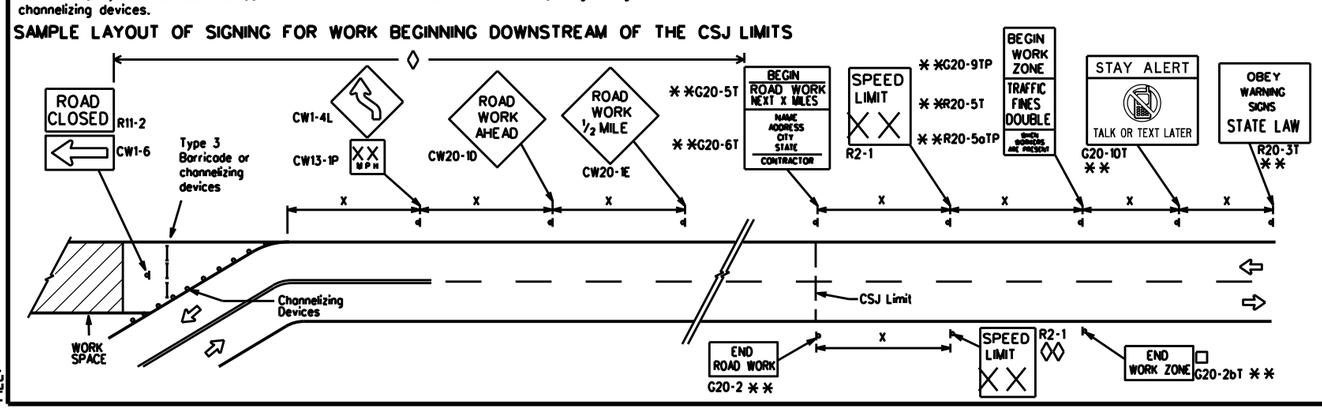
1. Special or larger size signs may be used as necessary.
2. Distance between signs should be increased as required to have 1500 feet advance warning.
3. Distance between signs should be increased as required to have 1/2 mile or more advance warning.
4. 36" x 36" "ROAD WORK AHEAD" (CW20-1D)signs may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

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS



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

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



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS

NOTES

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

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

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

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

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

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

SHEET 2 OF 12

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PROJECT LIMIT

BC(2)-21

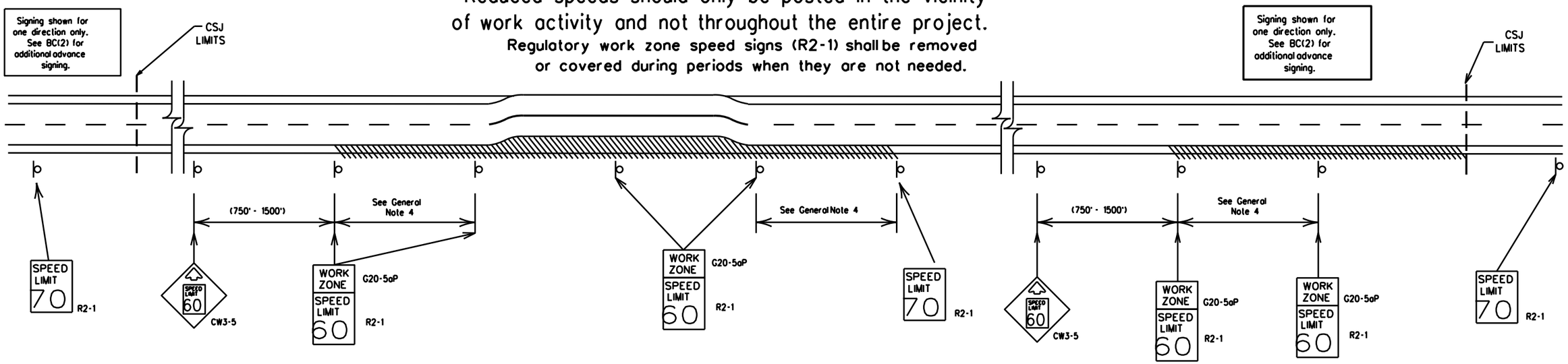
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC *	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRY	WASHINGTON, ETC		10

TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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

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

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



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

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

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

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

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

SHORT TERM WORK ZONE SPEED LIMITS

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

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

GENERAL NOTES

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

Texas Department of Transportation | Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC(3)-21

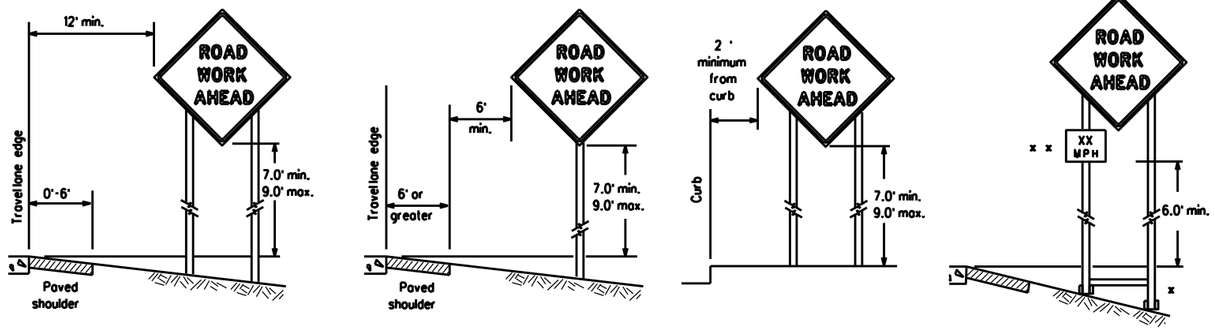
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT	
©TxDOT November 2002		RMC *		HIGHWAY	
REVISIONS 9-07 8-14 7-13 5-21		6469-98-001		SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC		11	

DATE:
FILE:

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

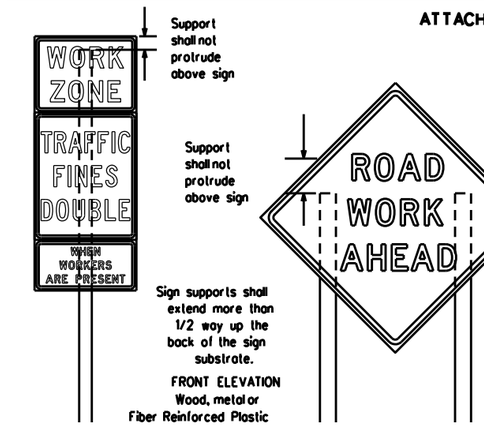
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS

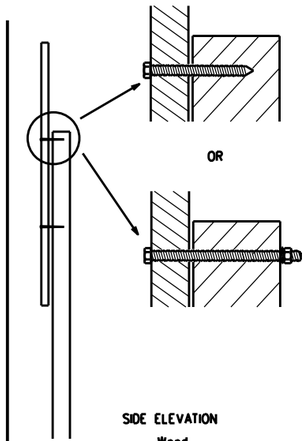


x When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

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

ATTACHMENT FOR SIGN SUPPORTS





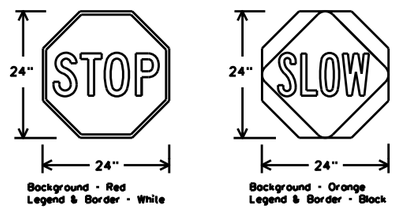
Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

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 lightness 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 or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

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

REMOVING OR COVERING

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

SIGN SUPPORT WEIGHTS

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

FLAGS ON SIGNS

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

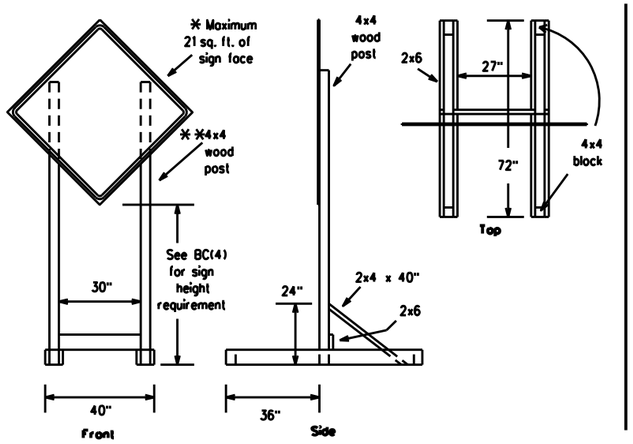
Texas Department of Transportation | Traffic Safety Division Standard

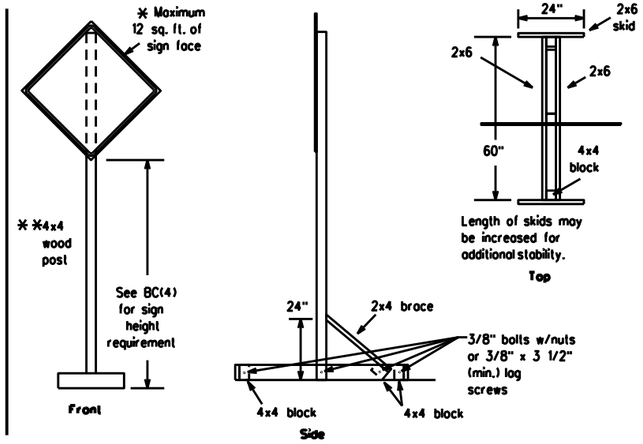
BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES

BC(4)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC *		HIGHWAY
REVISIONS		6469-98-001		SH 36, ETC.
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRY	WASHINGTON, ETC		12

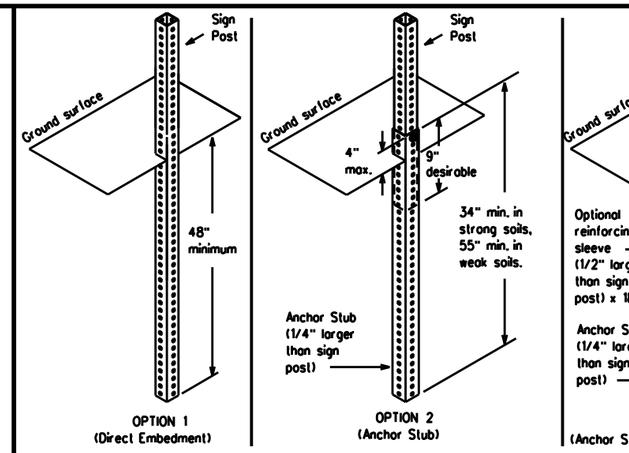
DATE:
FILE:



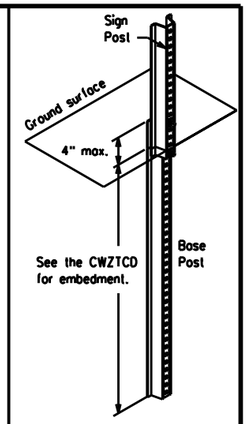


SKID MOUNTED WOOD SIGN SUPPORTS

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



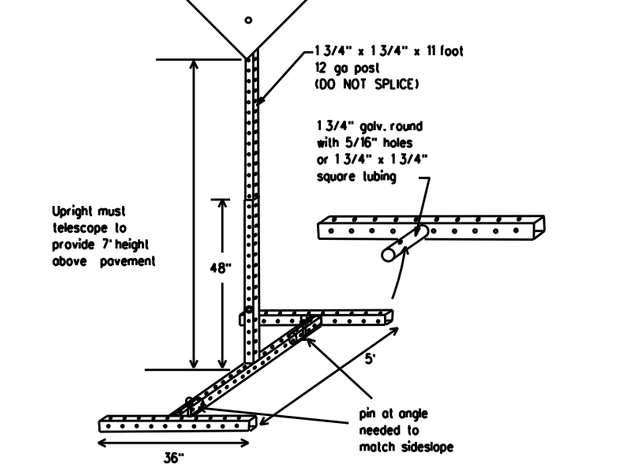
PERFORATED SQUARE METAL TUBING

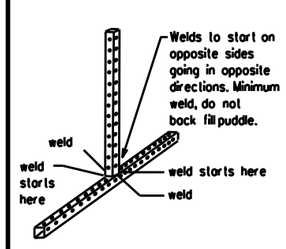


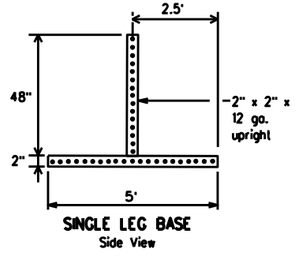
WING CHANNEL
Lap-splice/base bolted anchor

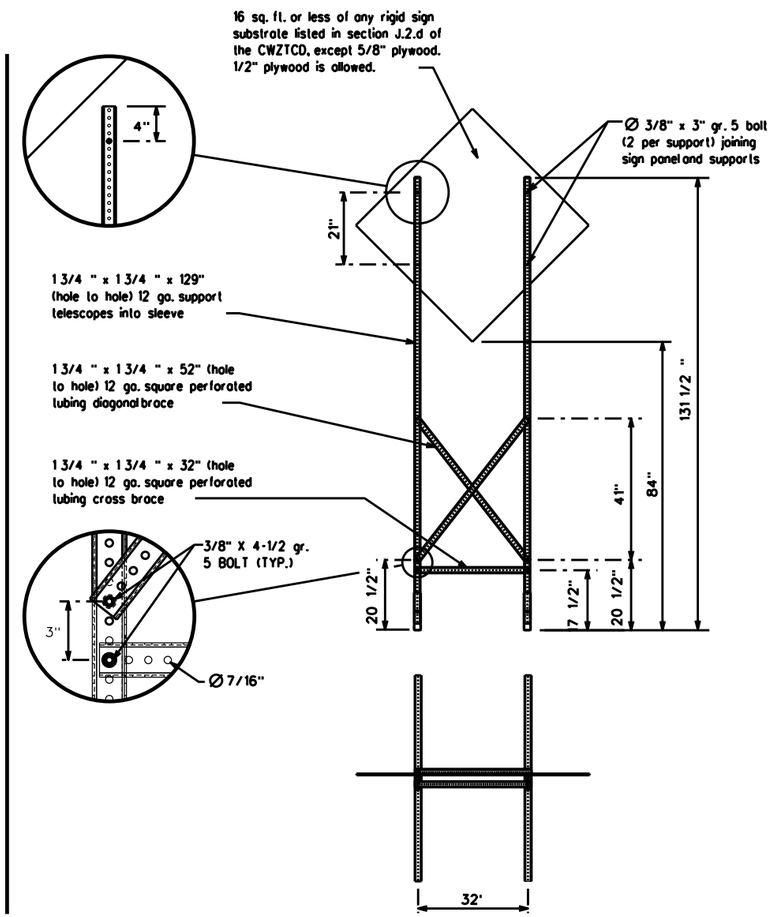
GROUND MOUNTED SIGN SUPPORTS

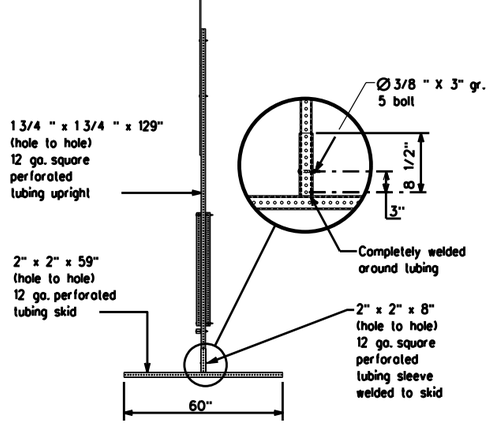
Refer to the CWZTCD and the manufacturer's installation procedure for each type sign support.
The maximum sign square footage shall adhere to the manufacturer's recommendation.
Two post installations can be used for larger signs.











SKID MOUNTED PERFORATED SQUARE STEEL TUBING SIGN SUPPORTS

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

WEDGE ANCHORS

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

OTHER DESIGNS

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

GENERAL NOTES

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC(5)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC *	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRY	WASHINGTON, ETC		13

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

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

PORTABLE CHANGEABLE MESSAGE SIGNS

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

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

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

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

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

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

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

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

Other Condition List

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

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

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

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

Location List

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

Warning List

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

** Advance Notice List

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

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

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

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

WORDING ALTERNATIVES

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

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

FULL MATRIX PCMS SIGNS

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

Texas Department of Transportation

Traffic Safety Division Standard

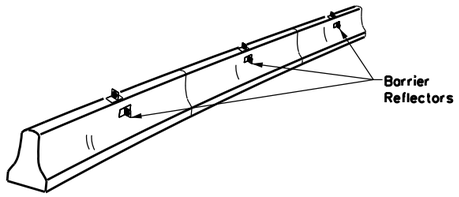
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC(6)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC =	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	WASHINGTON, ETC	14	

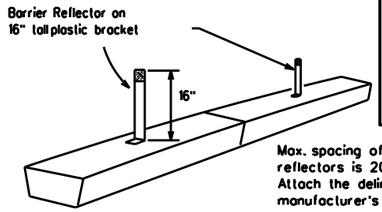
DATE:
FILE:

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



CONCRETE TRAFFIC BARRIER (CTB)

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

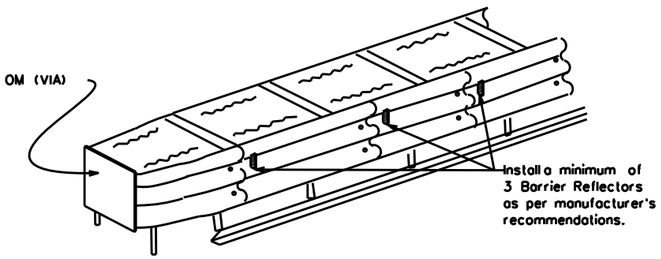


Max. spacing of barrier reflectors is 20 feet.
Attach the delineators as per manufacturer's recommendations.

LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES

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

LOW PROFILE CONCRETE BARRIER (LPCB)

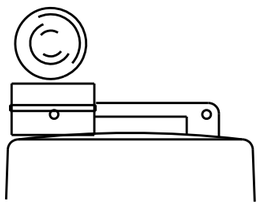


DELINEATION OF END TREATMENTS

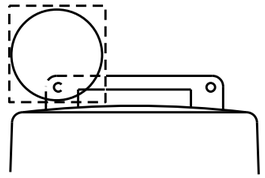
END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet the appropriate 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 or C Sheeting, meeting the requirements of Departmental Material Specification DMS-8300.
4. Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
5. The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
6. When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
7. When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
8. The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

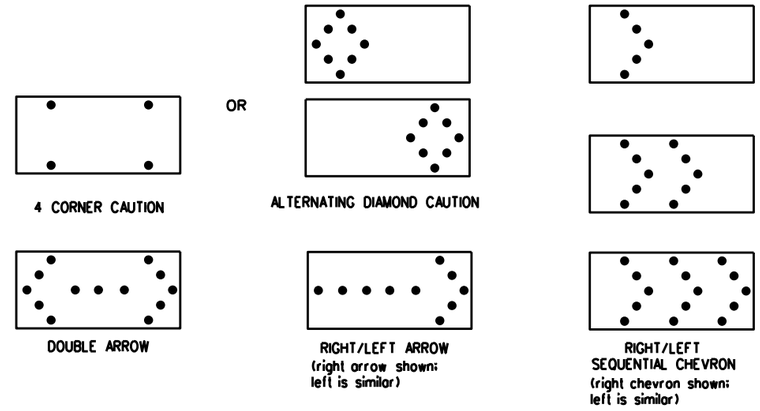
1. Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
2. Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
3. A series of sequential flashing warning lights placed on channelizing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

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

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

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

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



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

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

ATTENTION

Flashing Arrow Boards shall be equipped with automatic dimming devices.

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

FLASHING ARROW BOARDS

TRUCK-MOUNTED ATTENUATORS

1. Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
2. Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
3. Refer to the CWZTCD for a list of approved TMAs.
4. TMAs are required on freeways unless otherwise noted in the plans.
5. A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
6. The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is on 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		RMC *	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	WASHINGTON, ETC	15	

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

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:

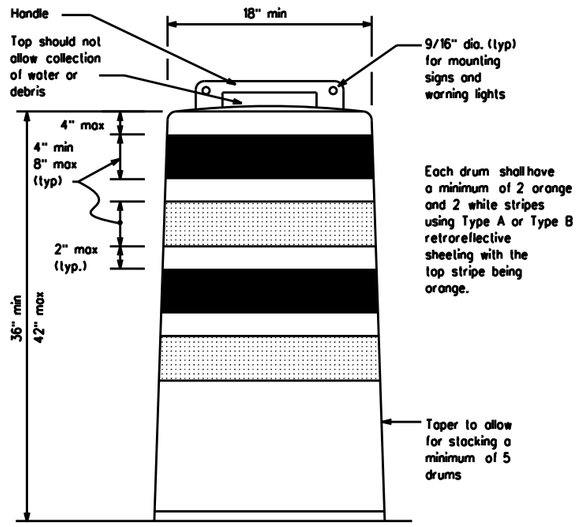
1. Plastic drums shall be a two-piece design: the "body" of the drum shall be the top portion and the "base" shall be the bottom.
2. The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents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

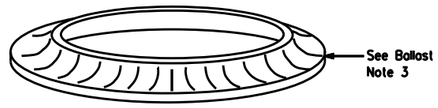
RETROREFLECTIVE SHEETING

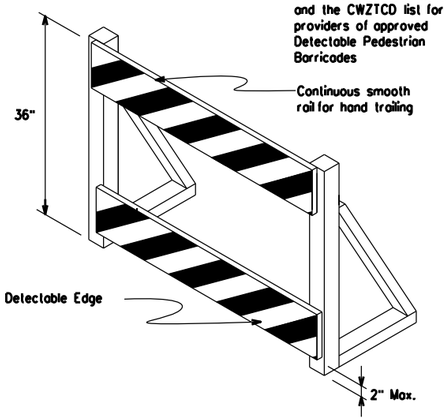
1. The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A or Type B reflective sheeting shall be supplied unless otherwise specified in the plans.
2. The sheeting shall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

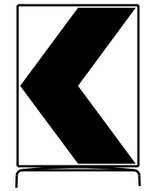




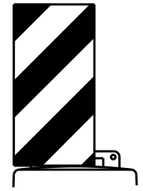


DETECTABLE PEDESTRIAN BARRICADES

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

Texas Department of Transportation

Traffic Safety Division Standard

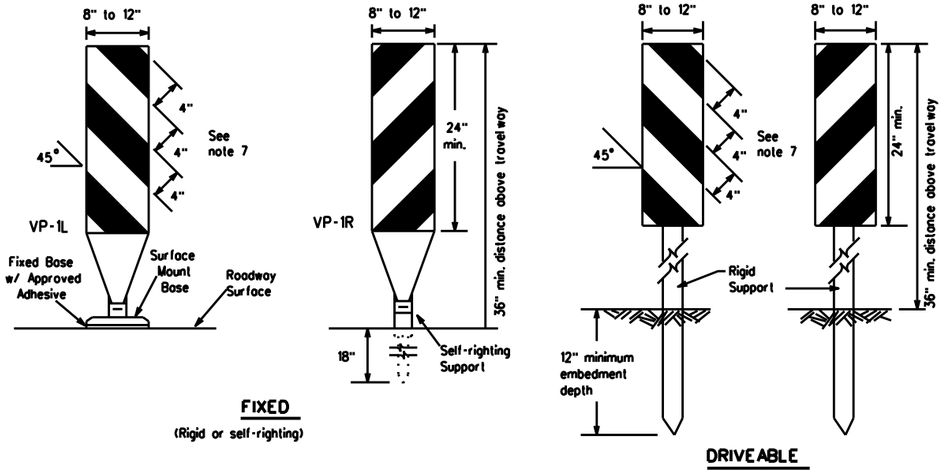
BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC *	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
4-03 8-14	DIST	COUNTY		SHEET NO.
9-07 5-21	BRY	WASHINGTON, ETC		16
7-13				

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

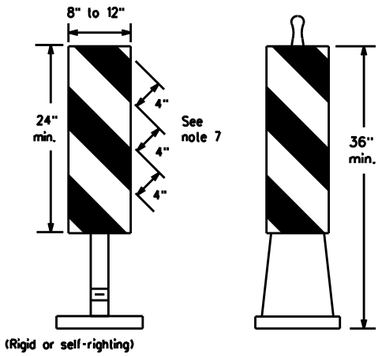
DATE:
FILE:



FIXED

(Rigid or self-righting)

DRIVEABLE

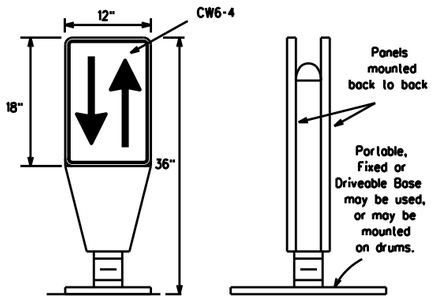


(Rigid or self-righting)

PORTABLE

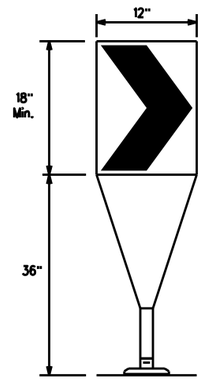
1. Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
2. VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is 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 or Type C conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.

OPPOSING TRAFFIC LANE DIVIDERS (OTLD)



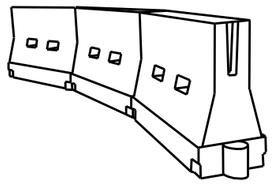
Fixed Base w/ Approved Adhesive (Driveable Base, or Flexible Support can be used)

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 or Type C 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

Texas Department of Transportation

Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

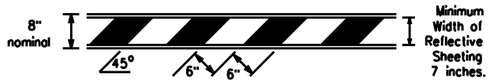
BC(9)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002		RMC =	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13 5-21	BRY	WASHINGTON, ETC	17	

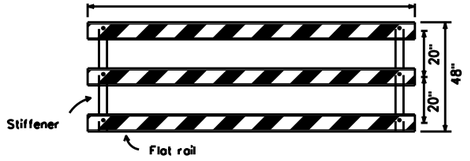
TYPE 3 BARRICADES

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.



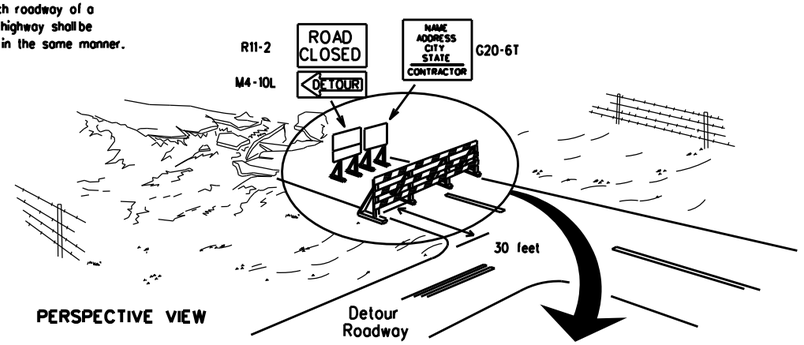
TYPICAL STRIPING DETAIL FOR BARRICADE RAIL



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

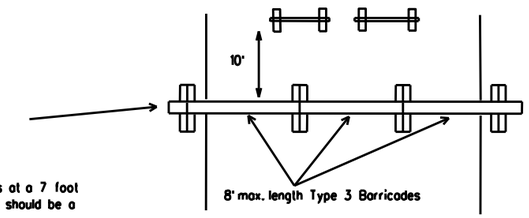
Each roadway of a divided highway shall be barricaded in the same manner.



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.

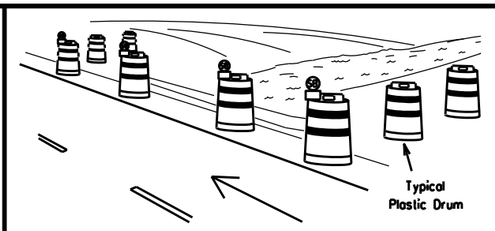
Barricade striping should slant downward in the direction of detour.



PLAN VIEW

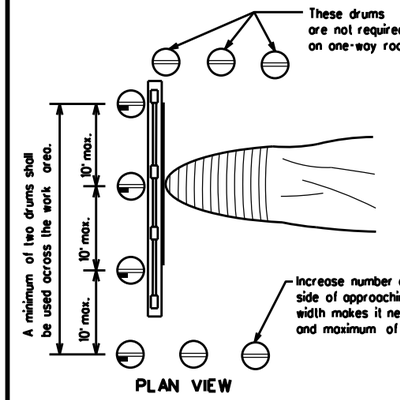
1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

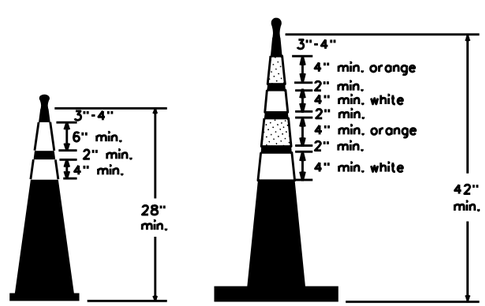
1. Where positive redirectional capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder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



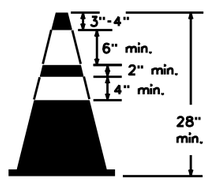
PLAN VIEW

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

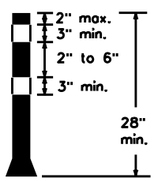
CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones



One-Piece cones

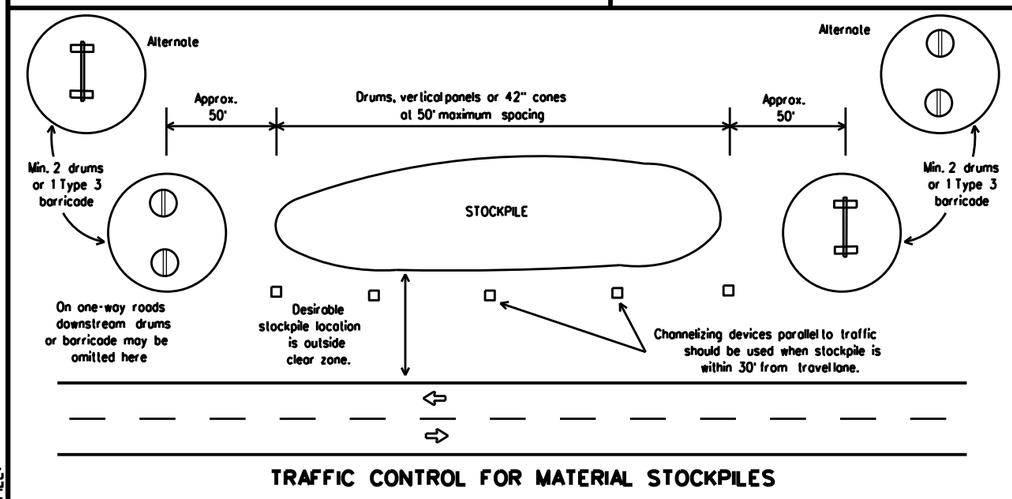


Tubular Marker

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

DATE:
FILE:

Texas Department of Transportation — Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(10)-21

FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2002		RMC *	HIGHWAY	
REVISIONS		6469-98-001	SH 36, ETC.	
9-07 8-14	DIST	COUNTY		SHEET NO.
7-13 5-21	BRY	WASHINGTON, ETC		18

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

WORK ZONE PAVEMENT MARKINGS

GENERAL

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

RAISED PAVEMENT MARKERS

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

PREFABRICATED PAVEMENT MARKINGS

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

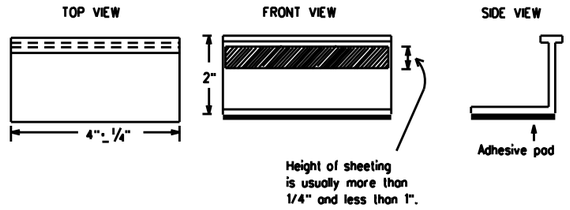
MAINTAINING WORK ZONE PAVEMENT MARKINGS

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

REMOVAL OF PAVEMENT MARKINGS

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

Temporary Flexible-Reflective Roadway Marker Tabs



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

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

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

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

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

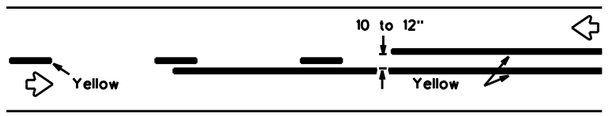
BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11)-21

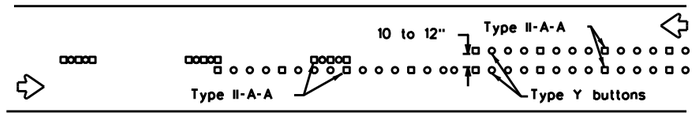
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998		RMC *		HIGHWAY
REVISIONS		6469-98-001		SH 36, ETC.
2-98 9-07 5-21	DIST	COUNTY		SHEET NO.
1-02 7-13	BRY	WASHINGTON, ETC		19
11-02 8-14				

DATE:
FILE:

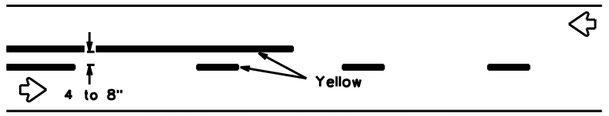
PAVEMENT MARKING PATTERNS



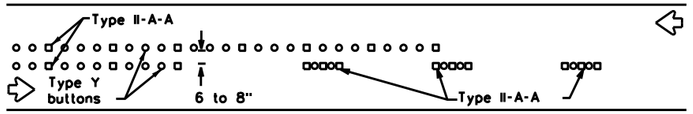
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



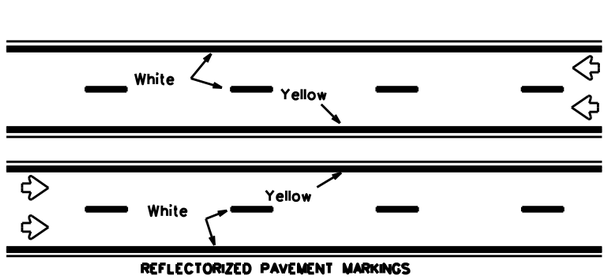
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



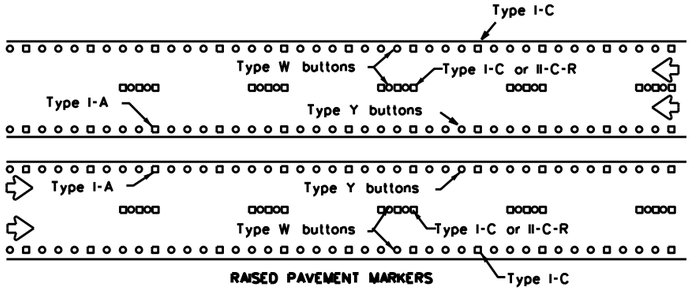
RAISED PAVEMENT MARKERS - PATTERN B

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



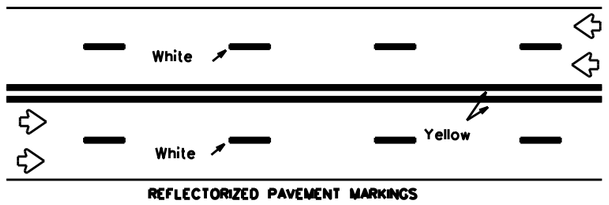
REFLECTORIZED PAVEMENT MARKINGS



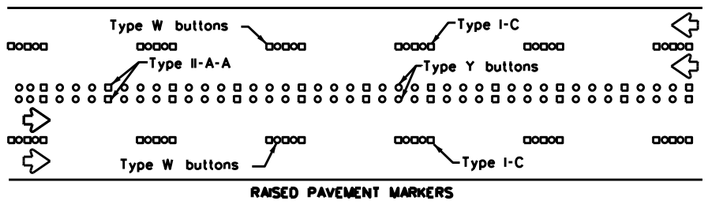
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

EDGE & LANE LINES FOR DIVIDED HIGHWAY



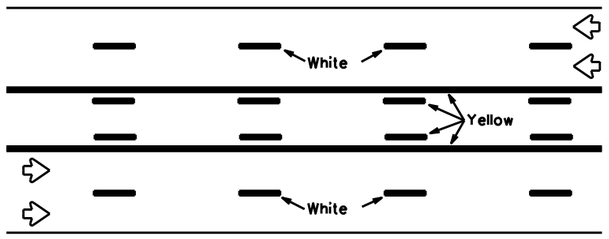
REFLECTORIZED PAVEMENT MARKINGS



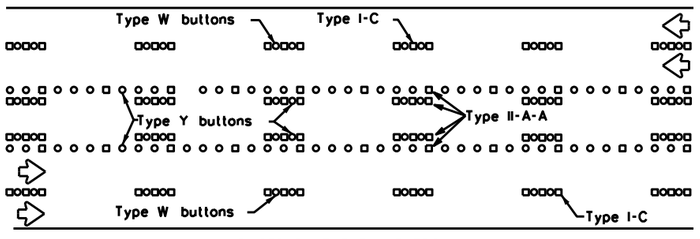
RAISED PAVEMENT MARKERS

Prefabricated markings may be substituted for reflectorized pavement markings.

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS



RAISED PAVEMENT MARKERS

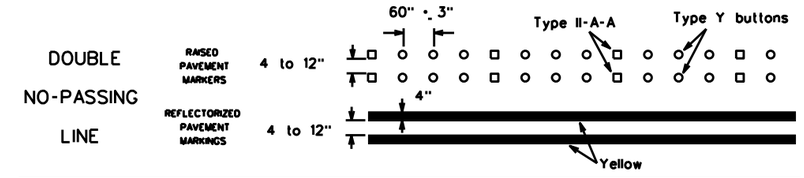
Prefabricated markings may be substituted for reflectorized pavement markings.

TWO-WAY LEFT TURN LANE

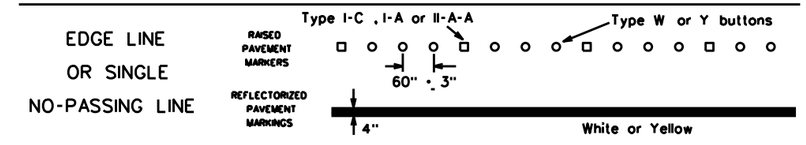
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS

SOLID LINES

DOUBLE NO-PASSING LINE

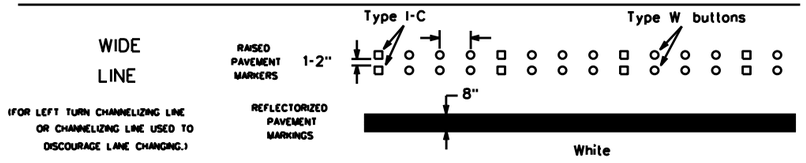


EDGE LINE OR SINGLE NO-PASSING LINE



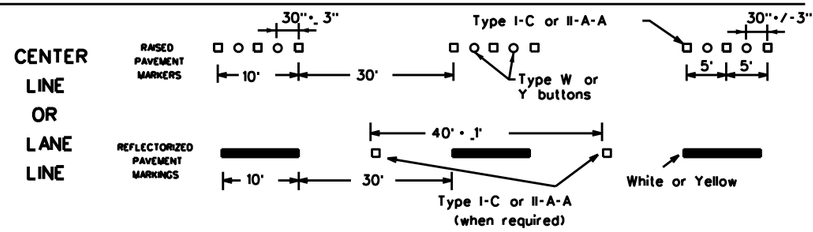
WIDE LINE

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

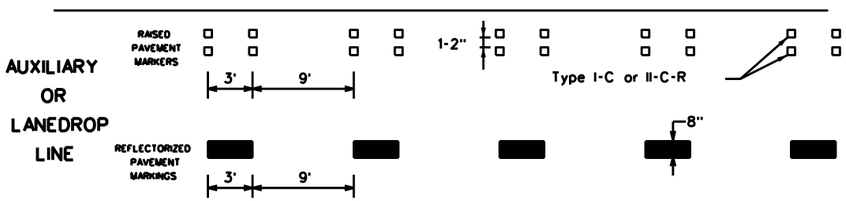


BROKEN LINES

CENTER LINE OR LANE LINE

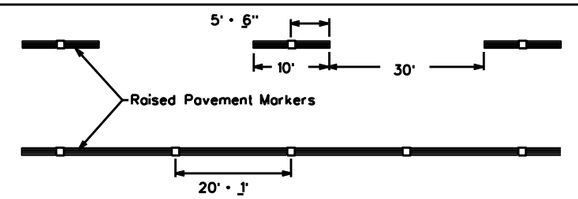


AUXILIARY OR LANEDROP LINE



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."

SHEET 12 OF 12

Texas Department of Transportation

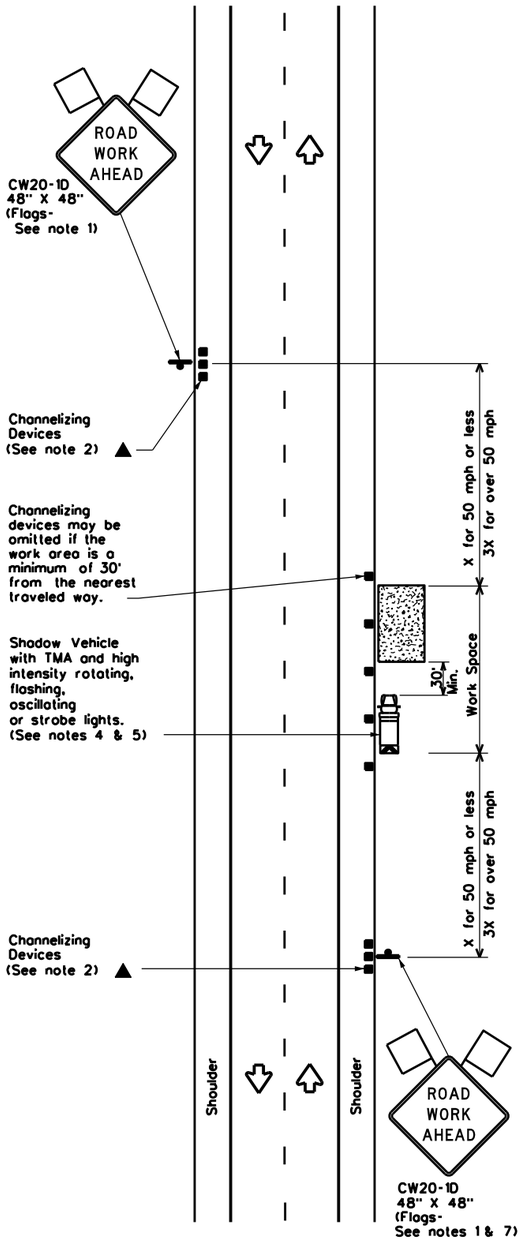
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

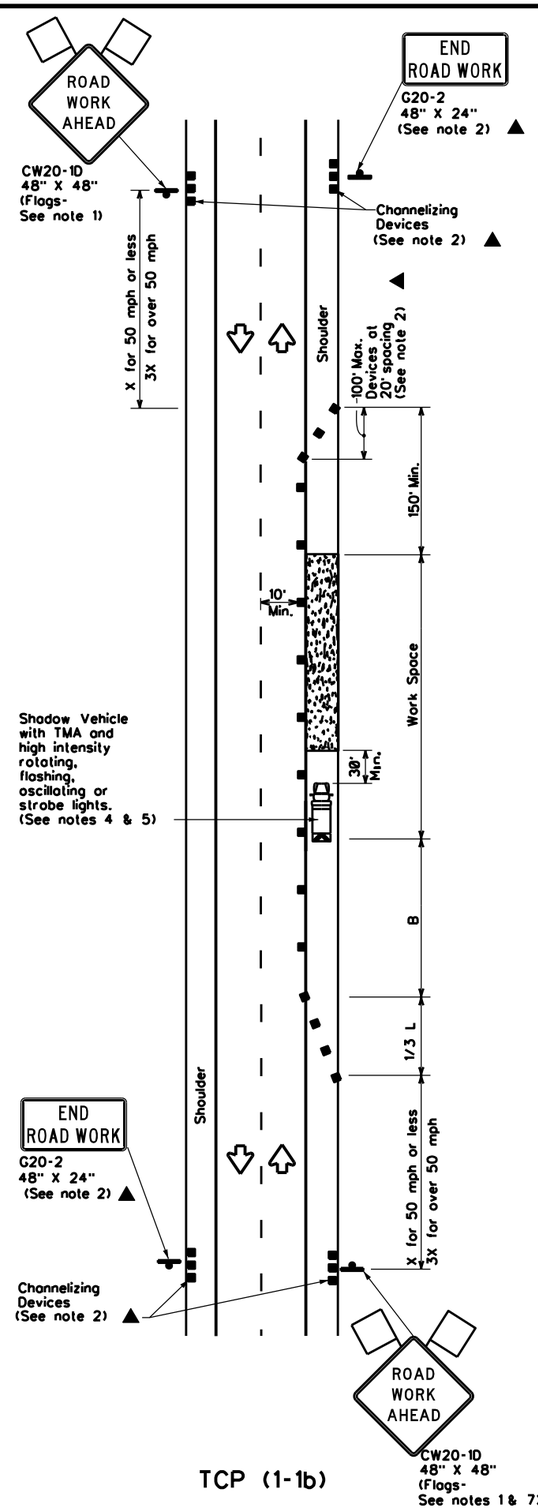
FILE: bc-21.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998		RMC •	HIGHWAY	
REVISIONS 1-97 9-07 5-21 2-98 7-13 11-02 8-14		6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		20

DATE:
FILE:



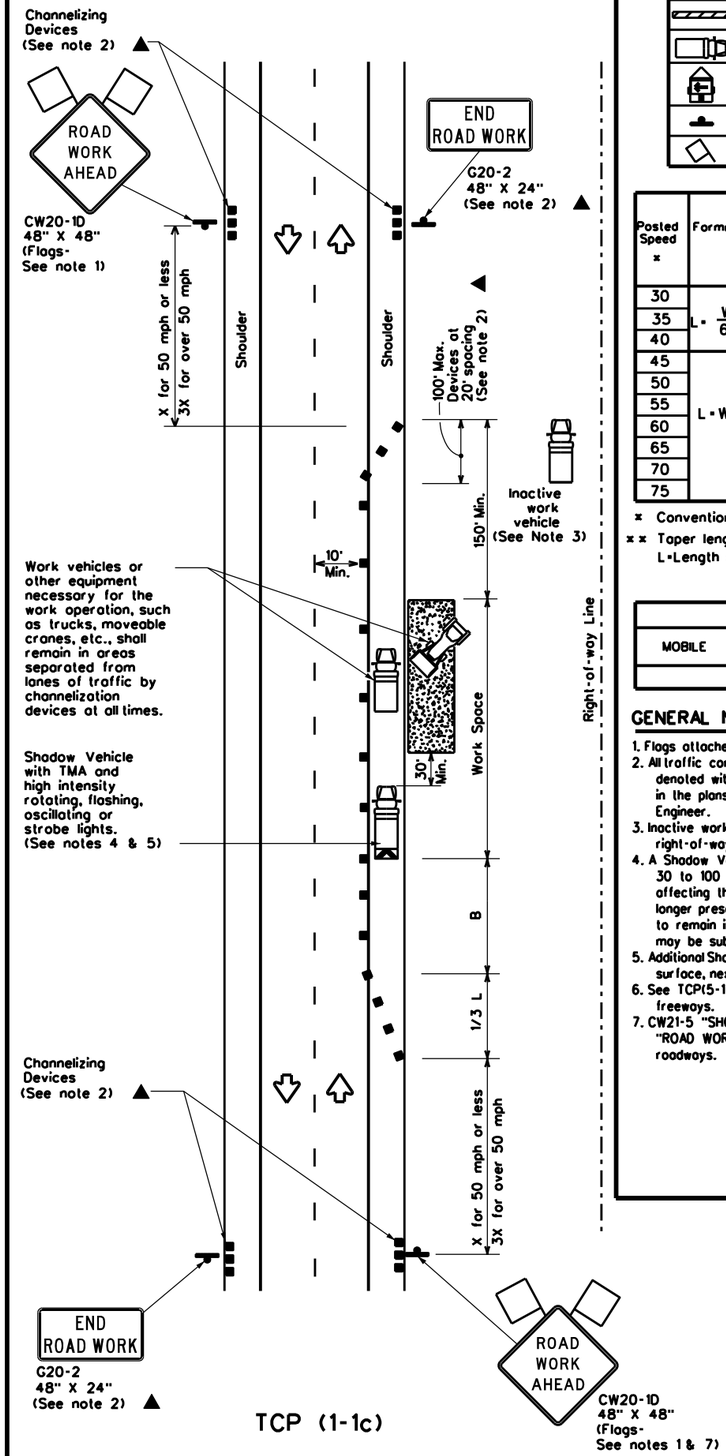
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

Texas Department of Transportation

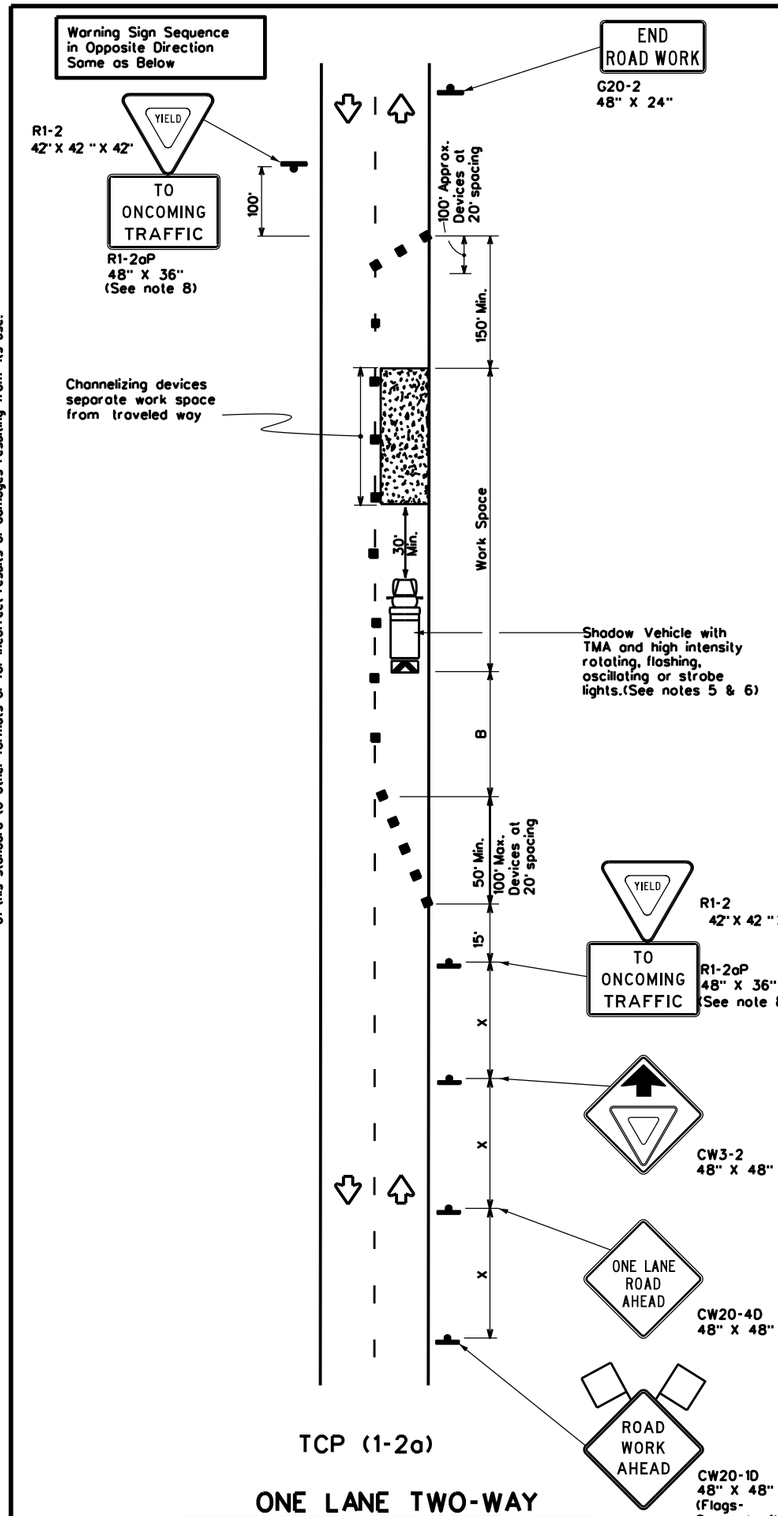
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN CONVENTIONAL ROAD SHOULDER WORK

TCP(1-1)-18

FILE: tcp1-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-94 4-98 8-95 2-12 1-97 2-18			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		21

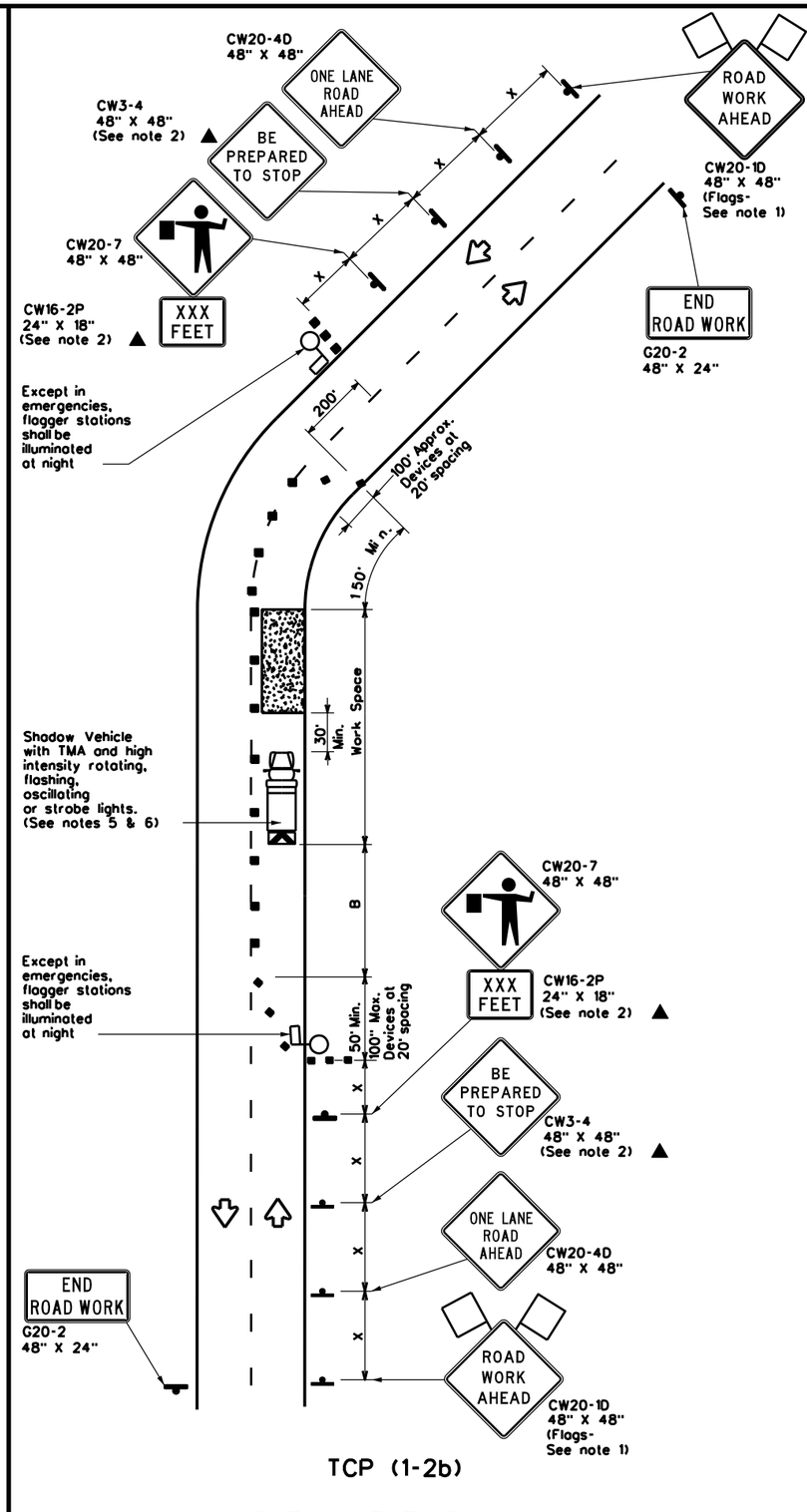
DATE:
FILE:



TCP (1-2a)

ONE LANE TWO-WAY CONTROL WITH YIELD SIGNS

(Less than 2000 ADT - See note 7)



TCP (1-2b)

ONE LANE TWO-WAY CONTROL WITH FLAGGERS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

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

TCP (1-2a)

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

TCP (1-2b)

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

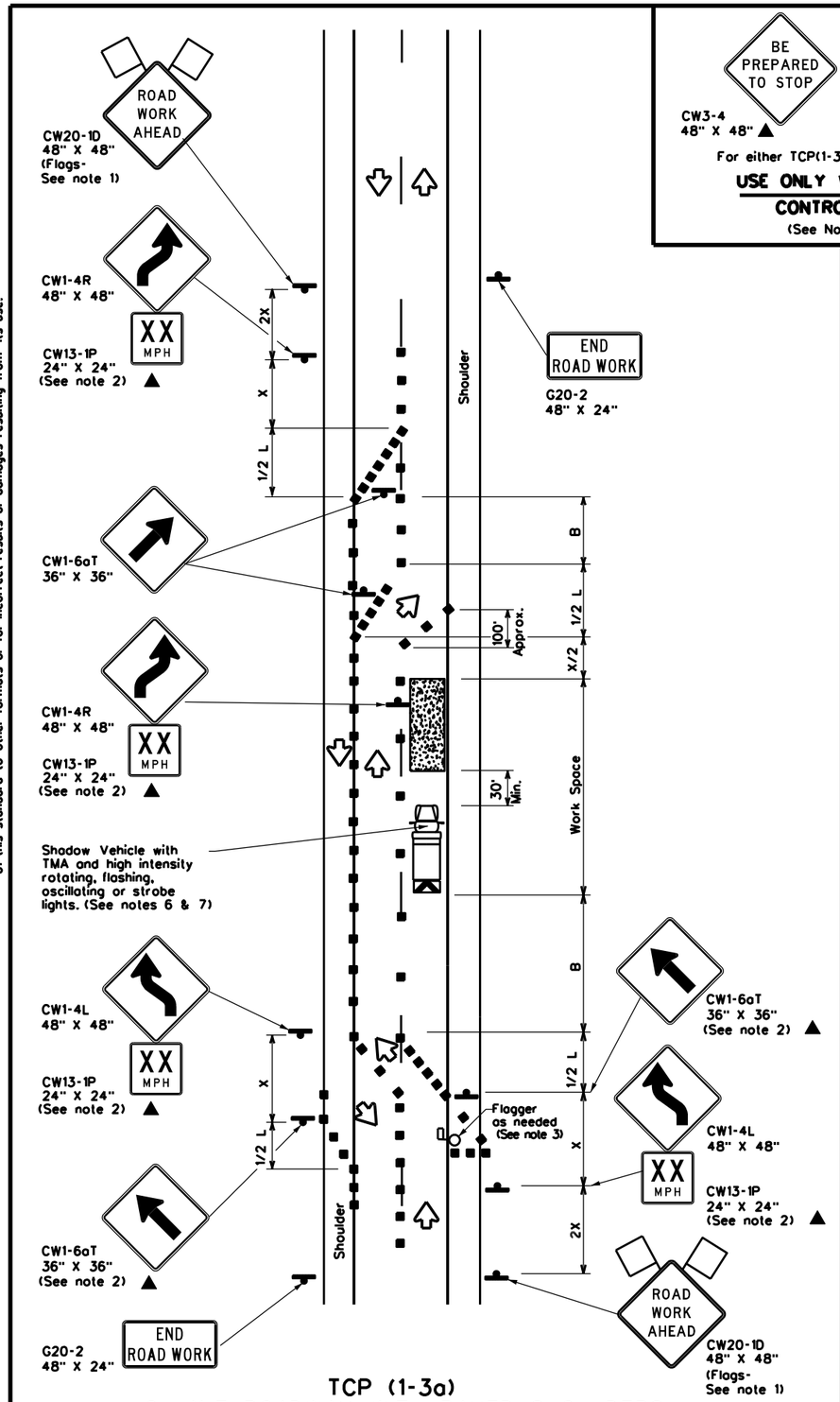
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN ONE-LANE TWO-WAY TRAFFIC CONTROL

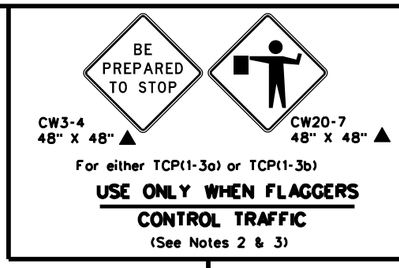
TCP(1-2)-18

FILE: tcp1-2-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS 4-90 4-98 2-94 2-12 1-97 2-18			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		22



TCP (1-3a)
2-LANE ROADWAY WITH PAVED SHOULDERS

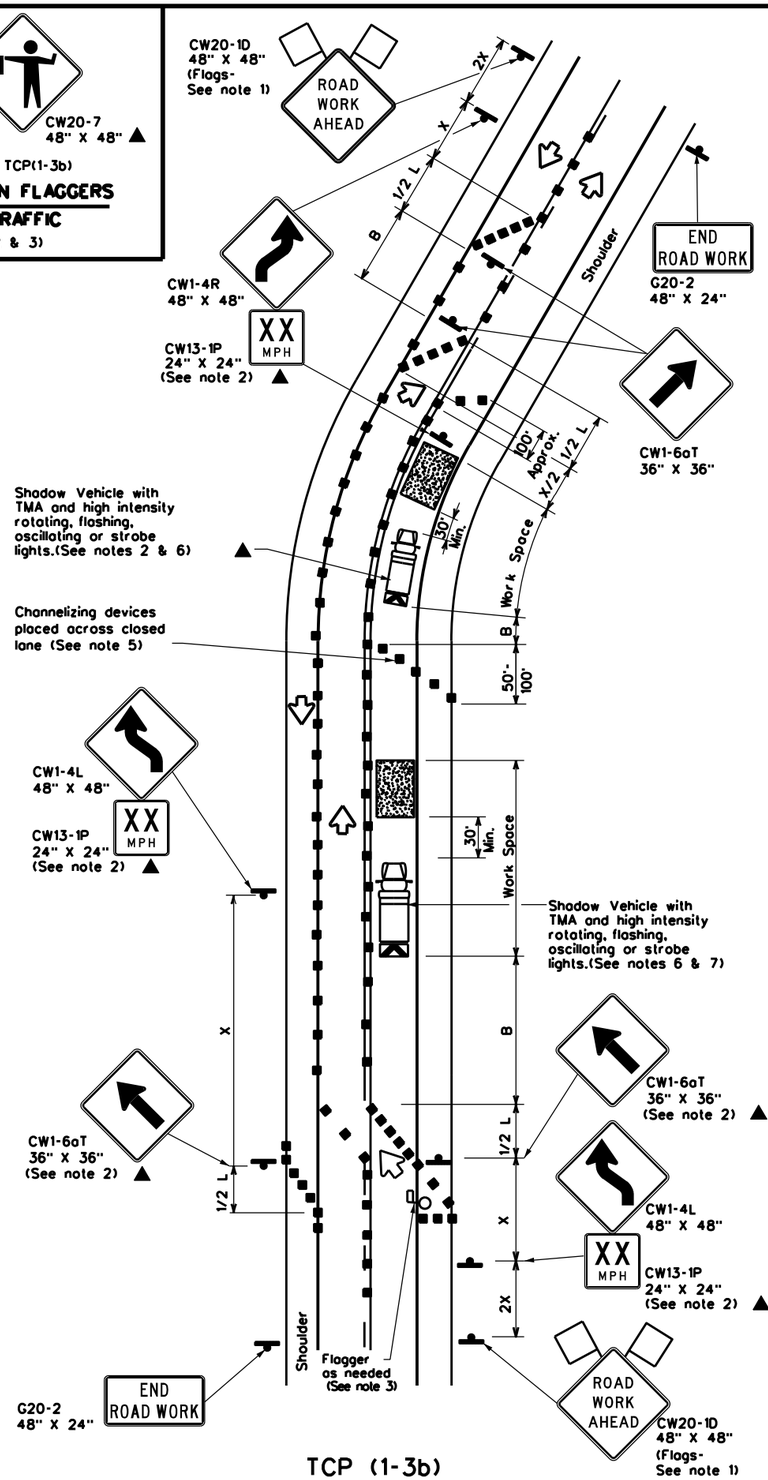
ONE LANE CLOSED
ADEQUATE FIELD OF VIEW



For either TCP(1-3a) or TCP(1-3b)

USE ONLY WHEN FLAGGERS CONTROL TRAFFIC

(See Notes 2 & 3)



TCP (1-3b)
2-LANE ROADWAY WITH PAVED SHOULDERS

ONE LANE CLOSED
INADEQUATE FIELD OF VIEW

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safely control traffic. Additional flaggers may be positioned in advance of traffic queues to alert traffic to reduce speed.
4. DO NOT PASS, PASS WITH CARE and construction regulatory speed zone signs may be installed downstream of the ROAD WORK AHEAD signs.
5. When the work zone is made up of several work spaces, channelizing devices should be placed laterally across the closed lane to re-emphasize closure. Laterally placed channelizing devices should be repeated every 500 to 1000 feet in urban areas and every 1/4 to 1/2 mile in rural areas.
6. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
8. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20', or 15' if posted speed are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This lighter device spacing is intended for the area of conflicting markings not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

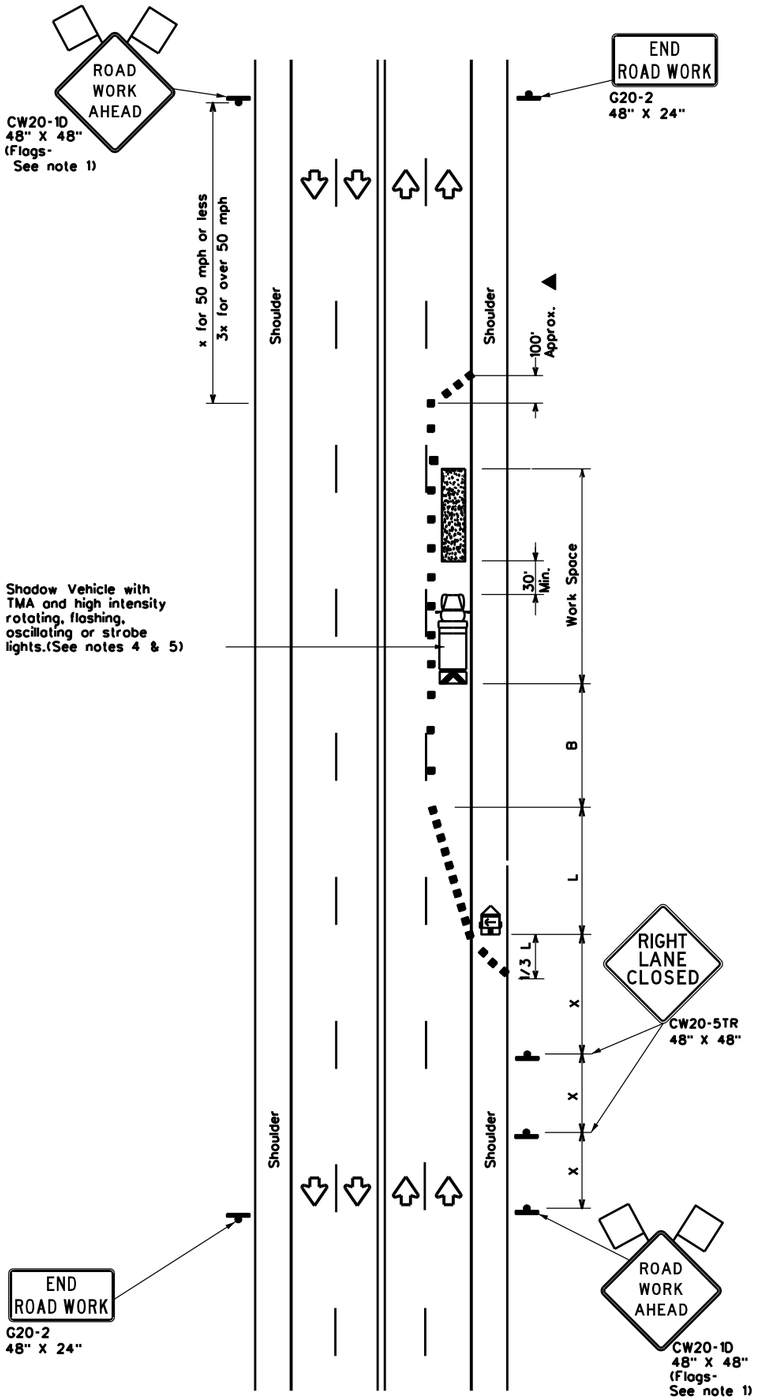
TRAFFIC CONTROL PLAN TRAFFIC SHIFTS ON TWO LANE ROADS

TCP(1-3)-18

FILE: tcp1-3-18.dgn	DN:	CK:	DW:	CK:
©TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
2-94 4-98 / 8-95 2-12 / 1-97 2-18	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		23

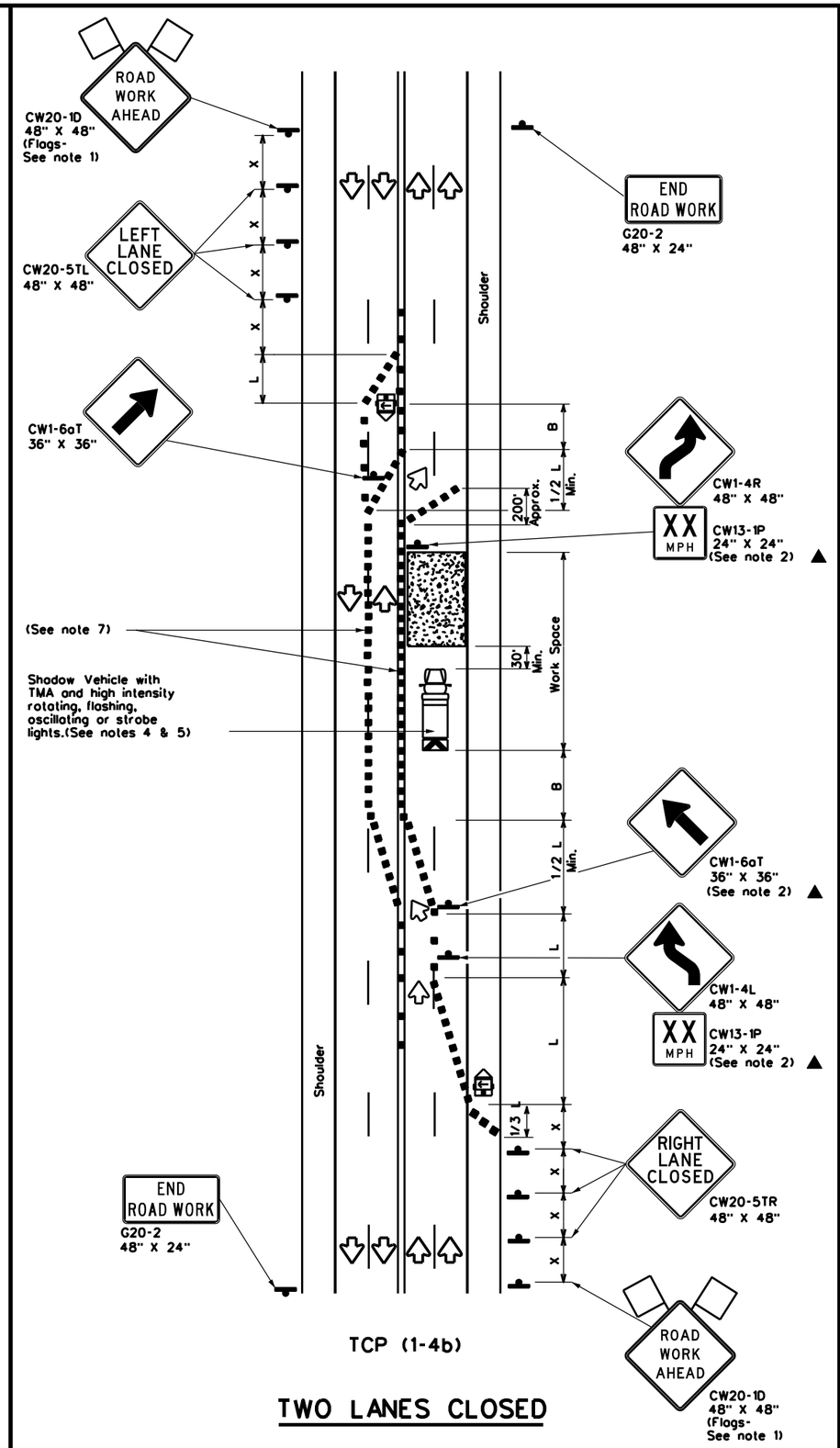
DATE:
FILE:

DATE:
FILE:



TCP (1-4a)

ONE LANE CLOSED



TCP (1-4b)

TWO LANES CLOSED

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

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

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

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

GENERAL NOTES

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

TCP (1-4a)

6. If this TCP is used for a left lane closure , CW20-5TL "LEFT LANE CLOSED" signs shall be used and channelizing devices shall be placed on the centerline where needed to protect the work space from opposing traffic with the arrow panel placed in the closed lane near the end of the merging taper.

TCP (1-4b)

7. Where traffic is directed over a yellow centerline, channelizing devices which separate two-way traffic should be spaced on tapers at 20' or 15' if posted speeds are 35 mph or slower, and for tangent sections, at 1/2S where S is the speed in mph. This lighter device spacing is intended for the areas of conflicting markings, not the entire work zone.

Texas Department of Transportation

Traffic Operations Division Standard

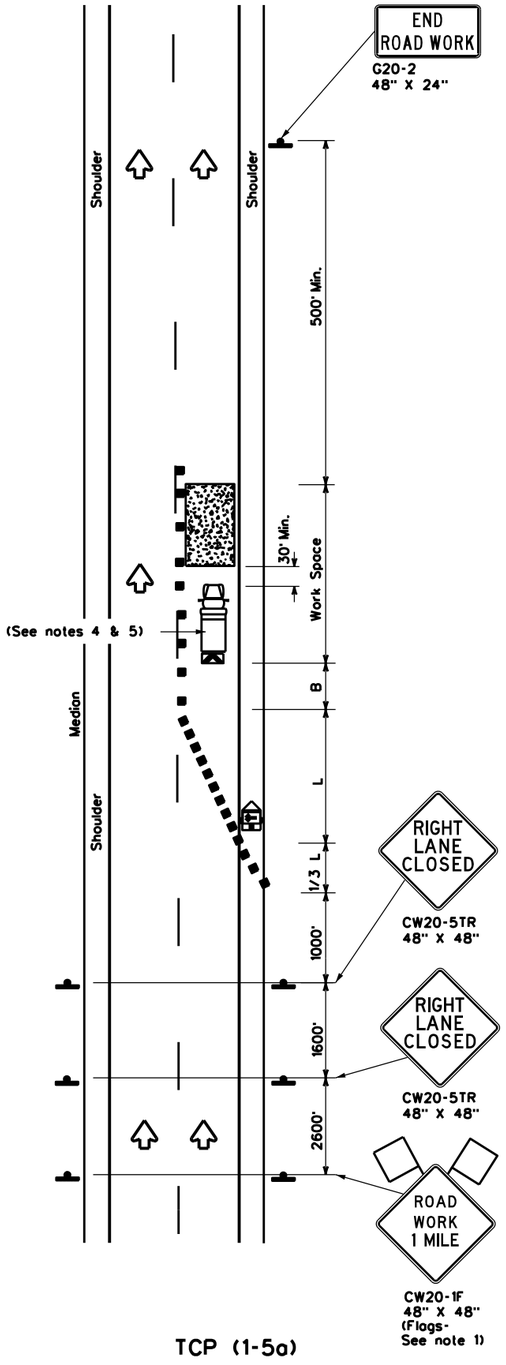
TRAFFIC CONTROL PLAN LANE CLOSURES ON MULTILANE CONVENTIONAL ROADS

TCP(1-4)-18

FILE: tcp1-4-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BRY	WASHINGTON, ETC.		24
1-97 2-18				

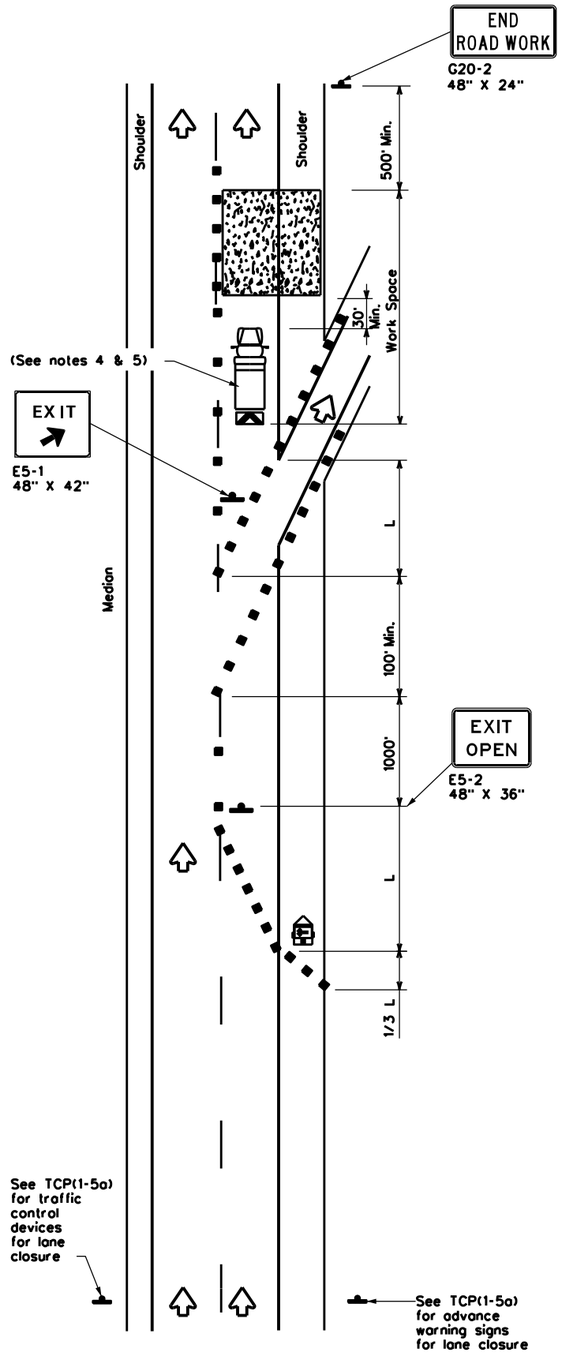
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



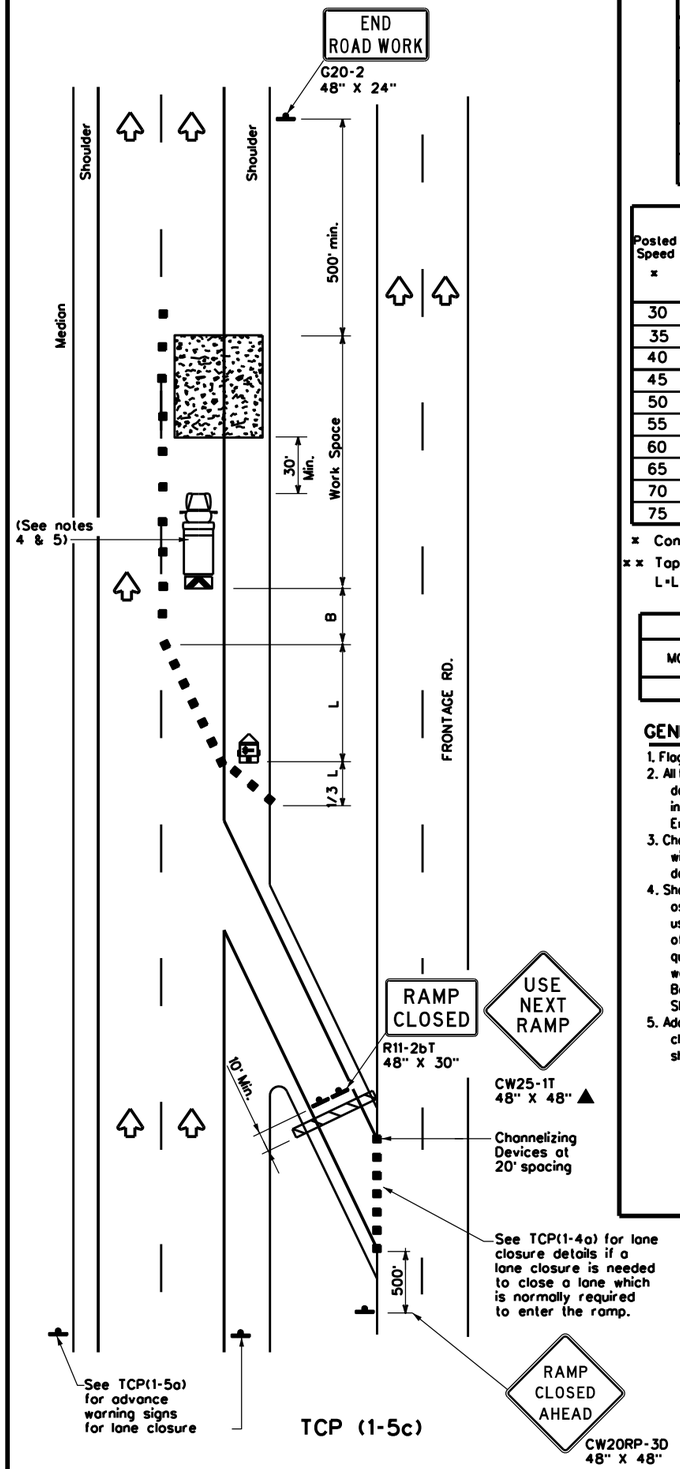
TCP (1-5a)

ONE LANE CLOSURE



TCP (1-5b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (1-5c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
5. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

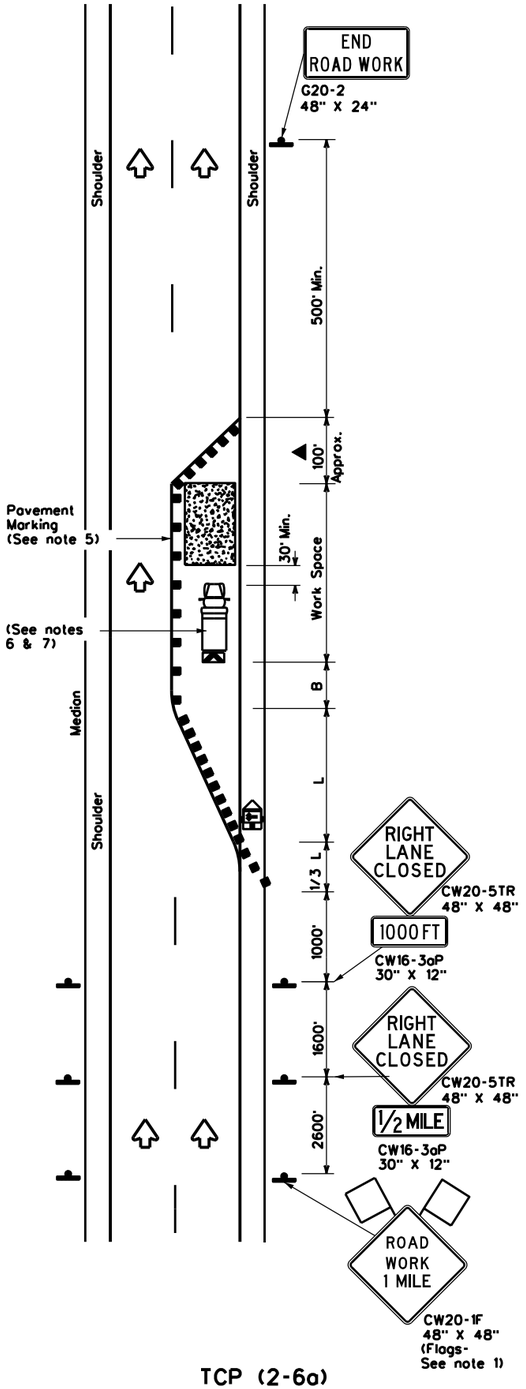
TRAFFIC CONTROL PLAN LANE CLOSURES FOR DIVIDED HIGHWAYS

TCP(1-5)-18

FILE: tcp1-5-18.dgn	DN:	CK:	DW:	CK:
©TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS 2-18			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		25

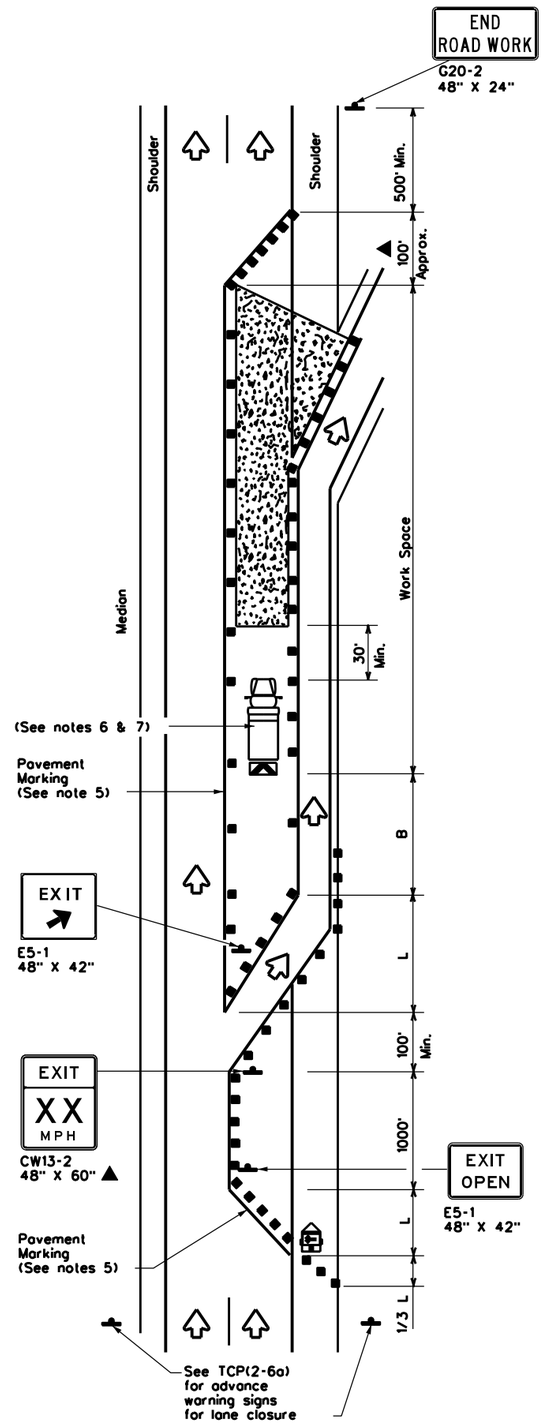
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



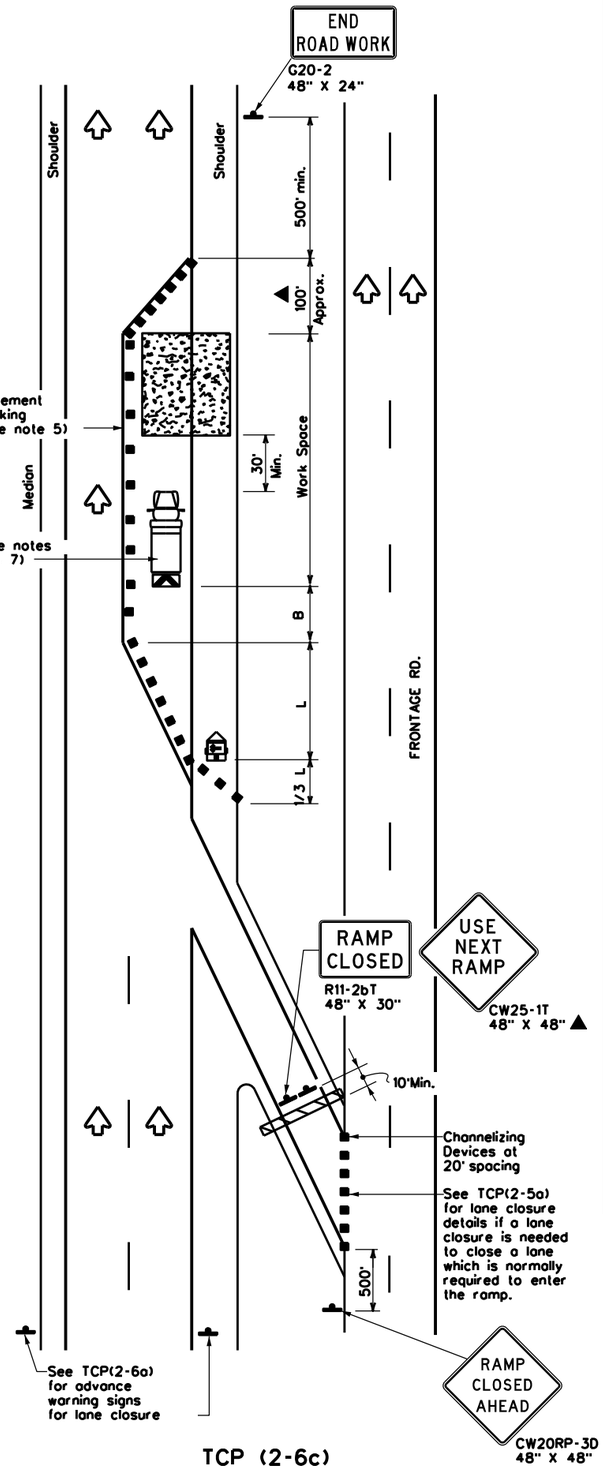
TCP (2-6a)

ONE LANE CLOSURE



TCP (2-6b)

LANE CLOSURE NEAR EXIT RAMPS



TCP (2-6c)

LANE CLOSURE NEAR ENTRANCE RAMPS

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

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

* Conventional Roads Only

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

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

GENERAL NOTES

1. Flags attached to signs where shown, are REQUIRED.
2. All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
3. Channelizing devices used to close lanes may be supplemented with the Chevron Alignment Sign placed on every other channelizing device. Chevrons may be attached to plastic drums as per BC Standards.
4. Channelizing devices used along the work space or along tangent sections may be supplemented with vertical panels (VP) placed on everyother channelizing device. If night time conditions make it difficult to see at least two VPs, the VPs may be placed on each channelizing device.
5. The placement of pavement markings may be omitted on intermediate-term stationary work zones with the approval of the Engineer.
6. Shadow Vehicle with TMA and high intensity rotating, flashing,oscillating or strobe lights. Shadow Vehicle with TMA and high intensity rotating, flashing, oscillating or strobe lights. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
7. Additional Shadow Vehicles with TMAs may be positioned in each closed lane, on the shoulder or off the paved surface, next to those shown in order to protect a wider work space.

Texas Department of Transportation

Traffic Operations Division Standard

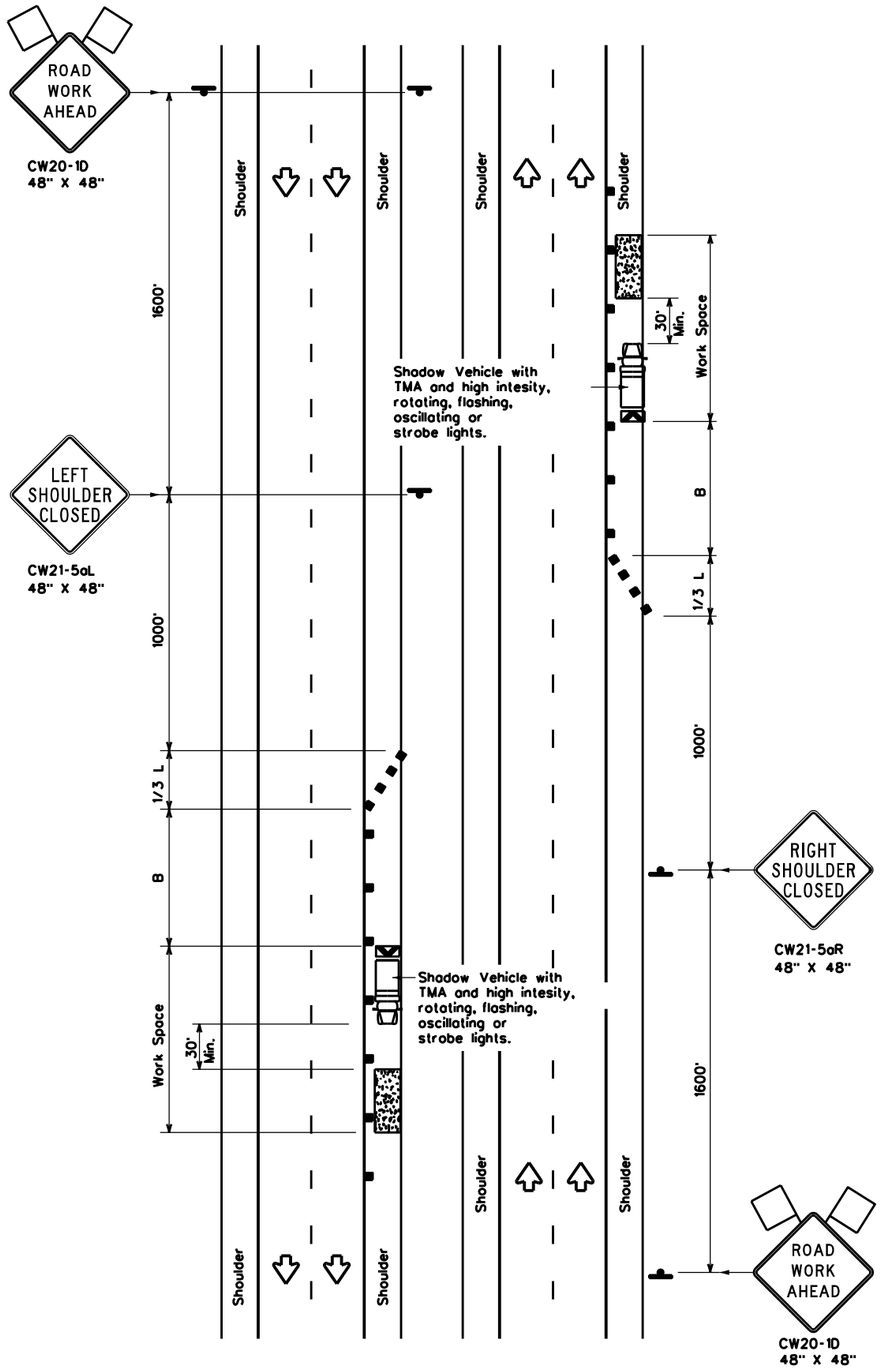
TRAFFIC CONTROL PLAN LANE CLOSURES ON DIVIDED HIGHWAYS

TCP(2-6)-18

FILE: tcp2-6-18.dgn	DN:	CK:	DW:	CK:
© TxDOT December 1985	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
2-94 4-98	DIST	COUNTY		SHEET NO.
8-95 2-12	BRY	WASHINGTON, ETC.		26
1-97 2-18				

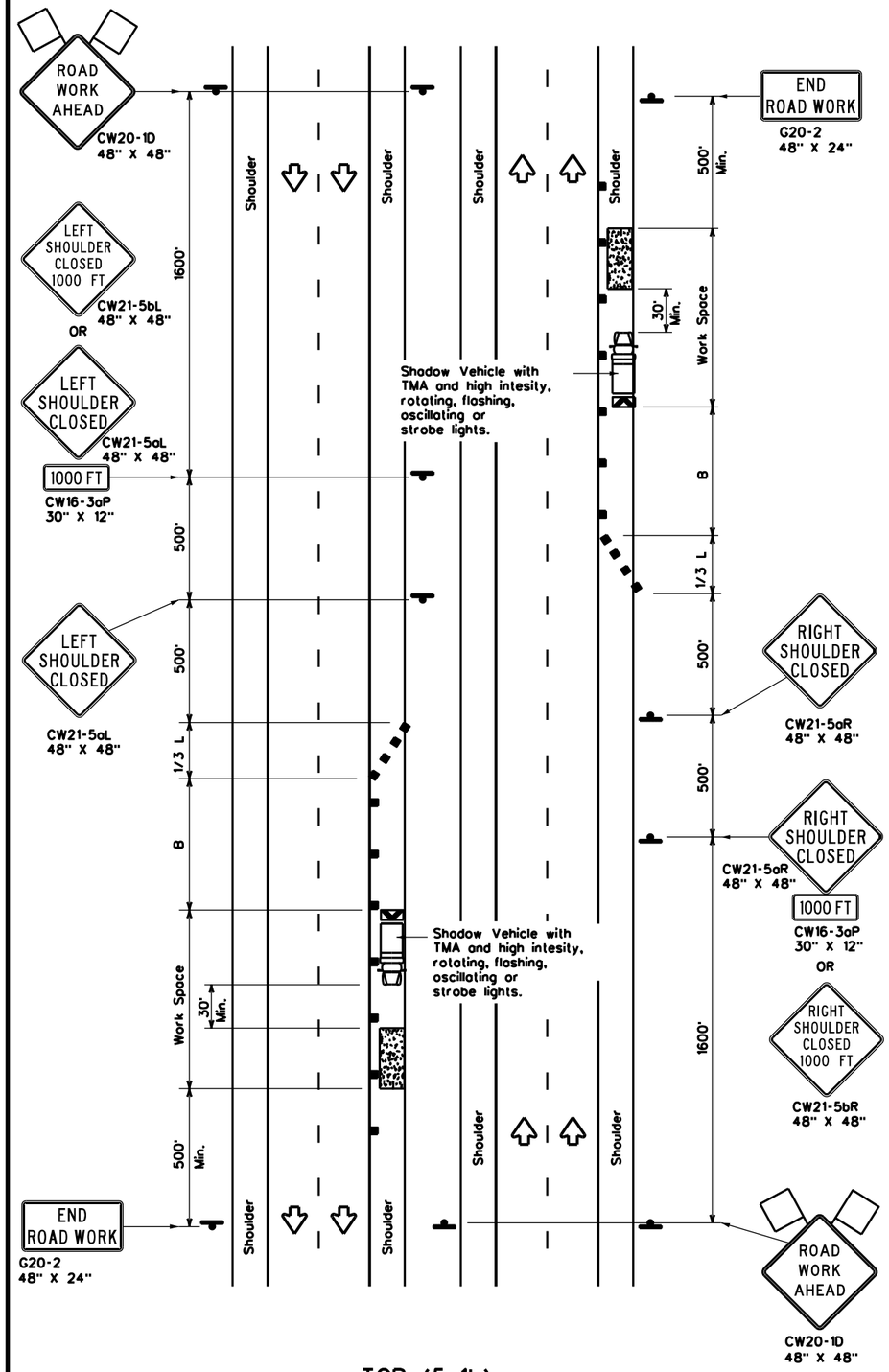
DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:



TCP (5-1a)

WORK AREA ON SHOULDER



TCP (5-1b)

WORK AREA ON SHOULDER

LEGEND

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

Posted Speed *	Formula	Minimum Desirable Taper Lengths ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
30	$L=\frac{WS^2}{60}$	150'	165'	180'	30'	60'	90'
35		205'	225'	245'	35'	70'	120'
40		265'	295'	320'	40'	80'	155'
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper(FT) W=Width of Offset(FT) S=Posted Speed(MPH)

TYPICAL USAGE

MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	TCP(5-1a)	TCP(5-1b)	TCP(5-1b)	

GENERAL NOTES

1. A Shadow Vehicle with a TMA should be used anytime it can be positioned 30' to 100' in advance of the area of crew exposure without adversely effecting the performance or quality of the work. Type 3 barricades or drums may be substituted when workers on foot are no longer present when approved by the Engineer.
2. 28" tall or taller one-piece cones will be allowed only for Short Duration or Short Term stationary operations when workers are present to maintain the devices upright and in proper location. Intermediate Term stationary work areas should use Drums, Vertical Panels or 42" tall two-piece cones.

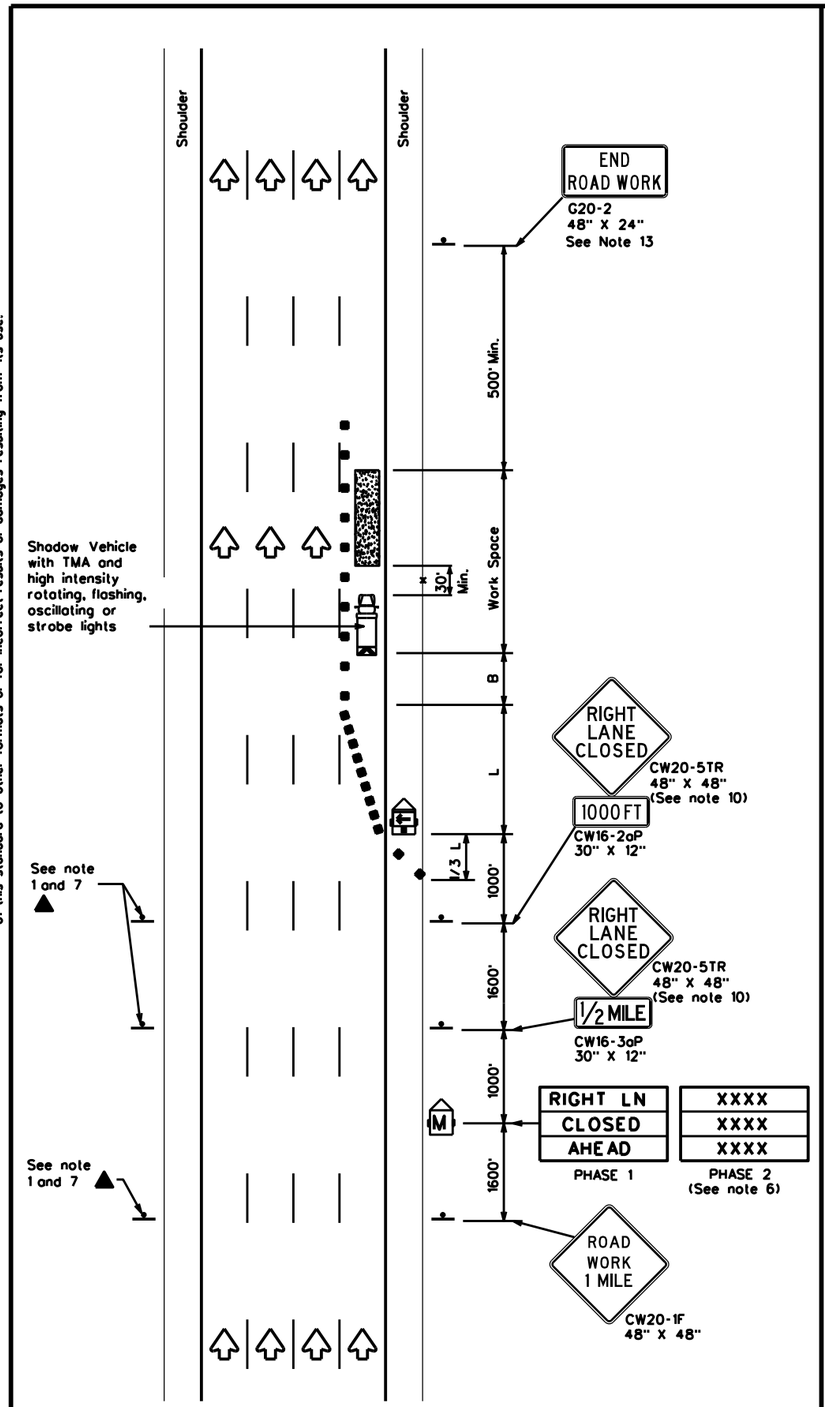
Texas Department of Transportation

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN SHOULDER WORK FOR FREEWAYS / EXPRESSWAYS

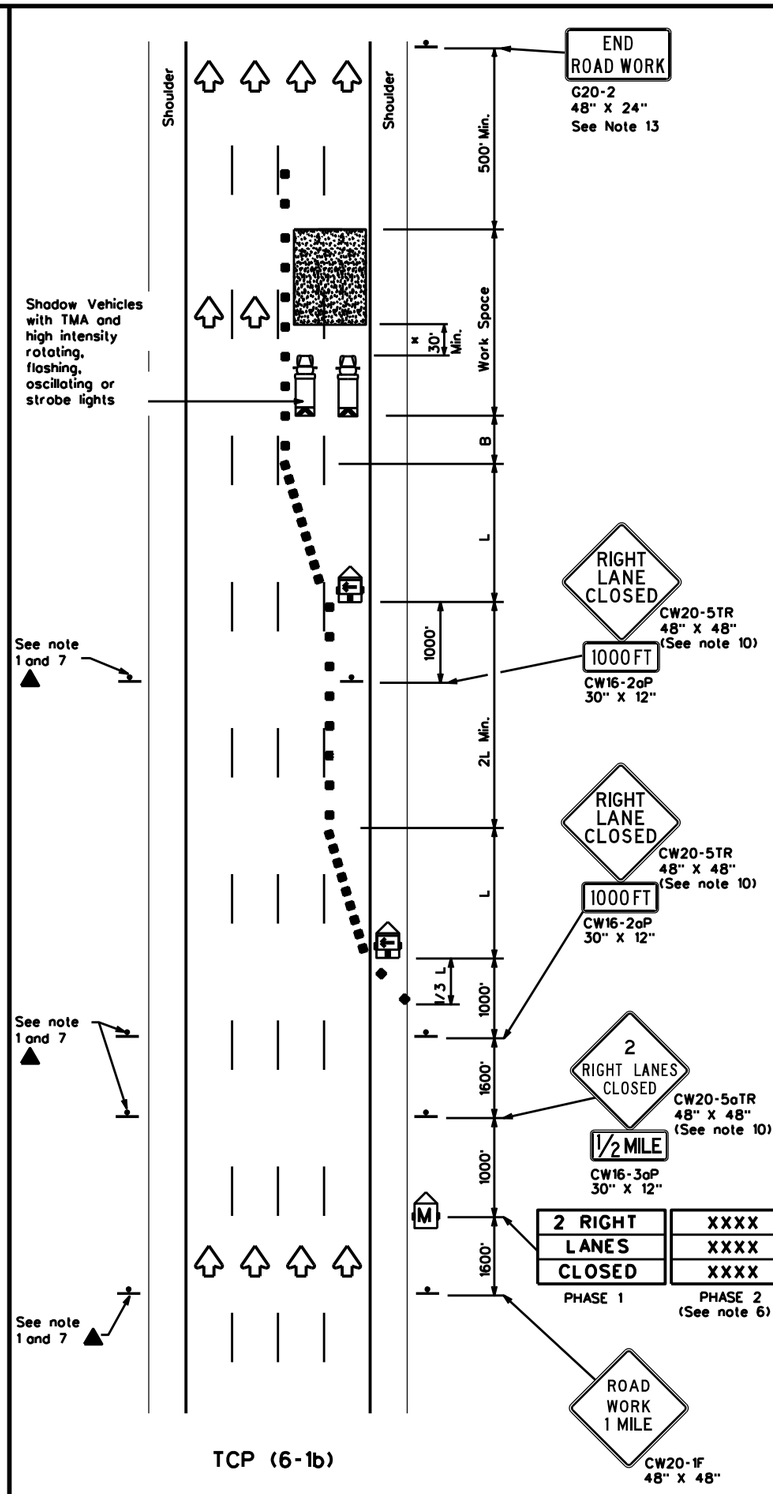
TCP(5-1)-18

FILE: tcp5-1-18.dgn	DN:	CK:	DW:	CK:
© TxDOT February 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
2-18	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		27



TCP (6-1a)

TYPICAL FREEWAY
ONE LANE CLOSURE



TCP (6-1b)

TYPICAL FREEWAY
TWO LANE CLOSURE

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

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

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

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. Drums or 42"cones are the typical channelizing devices. For Intermediate Term Stationary work, drums shall be used on tapers with drums or 42" cones used on tangent sections. Other channelizing devices may be used as directed by the Engineer.
3. All construction signs and barricades placed during any phase of work shall remain in place until removal is approved by the Engineer.
4. The Engineer may direct the Contractor to furnish additional signs and barricades as required to maintain traffic flow, detours and motorist safety during construction.
5. Static message boards or changeable message signs stating the date and duration of ramp or freeway lane closures shall be placed a minimum of seven (7) calendar days in advance of the actual closure.
6. Phase 2 of the PCMS message should include appropriate information formatted as shown on BC(6), such as "MERGE LEFT," recommended advisory speed, delay information, or other specific warnings.
7. Duplicate construction warning signs should be erected on the medians side of freeways where median width will permit and traffic volume justifies the signing.
8. The number of closed lanes may be increased provided the spacing of traffic control devices, taper lengths and tangent lengths meet the requirements of the TMUTCD.
9. Warning signs for intermediate term stationary work should be mounted at 7' to the bottom of the sign.
10. Warning signs shown shall be appropriately altered for left lane closures. When signs are mounted at 1' height for short term stationary or short duration work, sign versions shown in the SHSD for Texas with distances on the sign face rather than mounted on a ploque below the sign may be used.
11. When possible, PCMS units should be located in advance of the last available exit ramp prior to the lane closure to allow motorists an alternate route. They may also be relocated to improve advance warning in case of unanticipated queuing or congestion.
12. For Intermediate Term Stationary work at night, floodlights should be used to illuminate the work area and equipment crossings. Floodlights shall not produce a disabling glare condition for road users or workers.
13. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

* A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

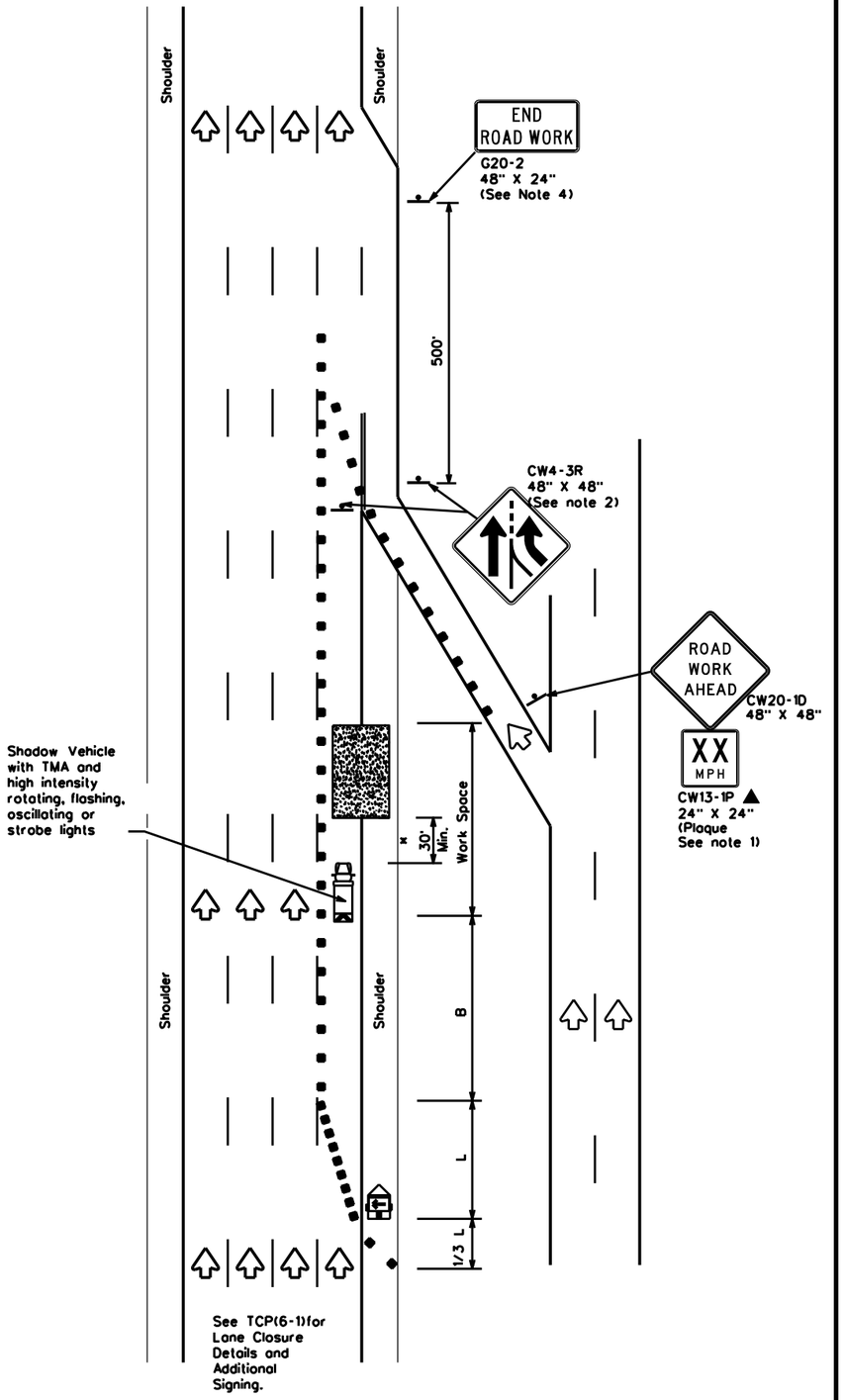
Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
FREEWAY LANE CLOSURES

TCP(6-1)-12

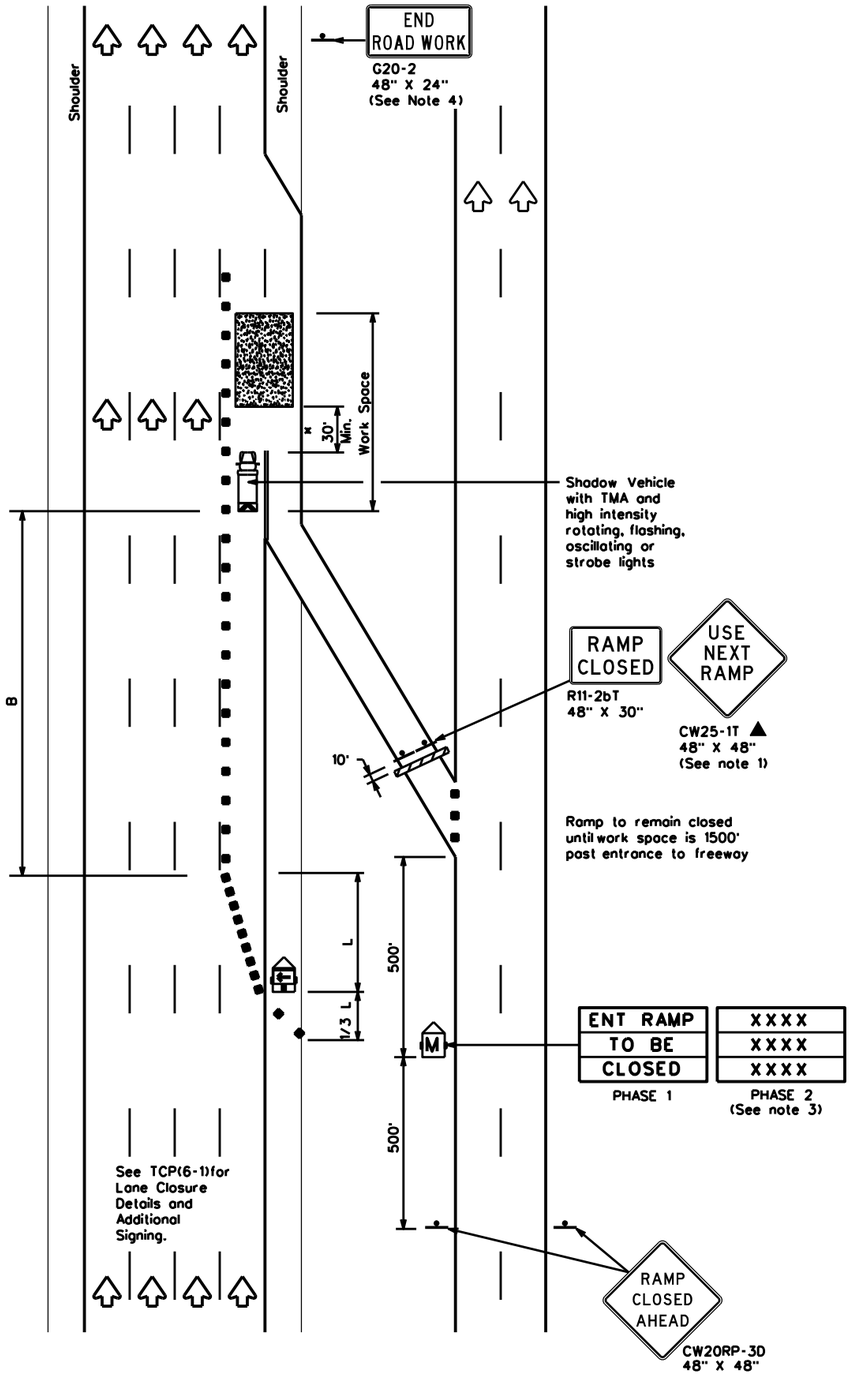
FILE: tcp6-1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1998	CONT	SECT	RMC PROJECT NO.	HIGHWAY
REVISIONS 8-12			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		28

DATE:
FILE:



TCP (6-2a)

ENTRANCE RAMP OPEN
WORK WITHIN 500' OF RAMP



TCP (6-2b)

ENTRANCE RAMP CLOSED

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

Posted Speed	Formula	Minimum Desirable Taper Lengths "L" ** 10' Offset	11' Offset	12' Offset	Suggested Maximum Spacing of Channelizing Devices: On a Taper	On a Tangent	Suggested Longitudinal Buffer Space "B"
45	L=WS	450'	495'	540'	45'	90'	195'
50		500'	550'	600'	50'	100'	240'
55		550'	605'	660'	55'	110'	295'
60		600'	660'	720'	60'	120'	350'
65		650'	715'	780'	65'	130'	410'
70		700'	770'	840'	70'	140'	475'
75		750'	825'	900'	75'	150'	540'
80		800'	880'	960'	80'	160'	615'

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

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

GENERAL NOTES

1. All traffic control devices illustrated are REQUIRED. Devices denoted with the triangle symbol may be omitted when stated elsewhere in the plans.
2. ADDED LANE Symbol (CW4-3) sign may be omitted when sign between ramp and mainlane can be seen from both roadways.
3. See "Advance Notice List" on BC(6) for recommended date and time formatting options for PCMS Phase 2 message.
4. The END ROAD WORK (G20-2) sign may be omitted when it conflicts with G20-2 signs already in place on the project.

x A shadow vehicle equipped with a Truck Mounted Attenuator is typically required. A shadow vehicle equipped with a TMA shall be used if it can be positioned 30' to 100' in advance of the area of crew exposure without adversely affecting the work performance.

Additional requirements for lane closures and advance signing shall be as shown on TCP (6-1) or as directed by the Engineer.

Texas Department of Transportation
Traffic Operations Division Standard

TRAFFIC CONTROL PLAN
WORK AREA NEAR RAMP

TCP(6-2)-12

FILE: tcp6-2.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT February 1994	CONT	SECT	RMC PROJECT NO.	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
1-97 8-98	DIST	COUNTY		SHEET NO.
4-98 8-12	BRY	WASHINGTON, ETC.		29

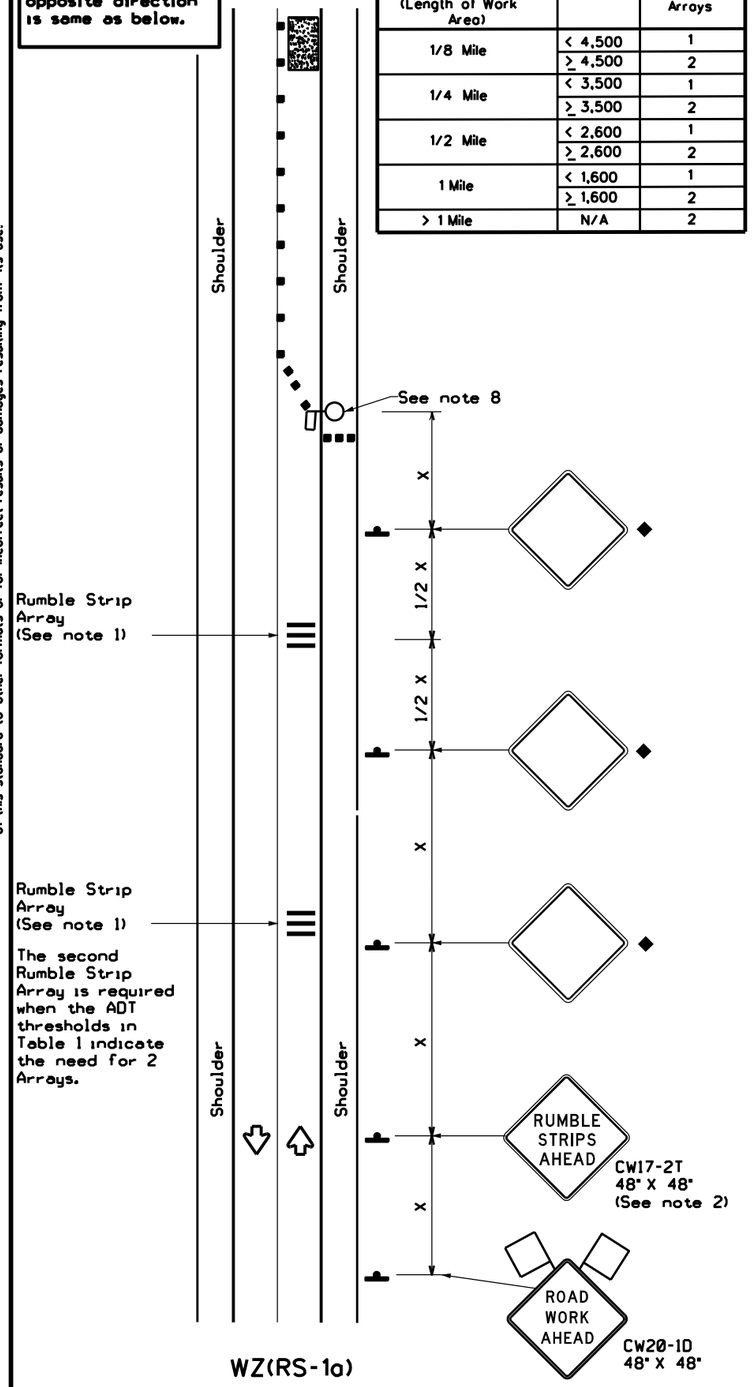
DATE:
FILE:

DISCLAIMER:
The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

DATE:
FILE:

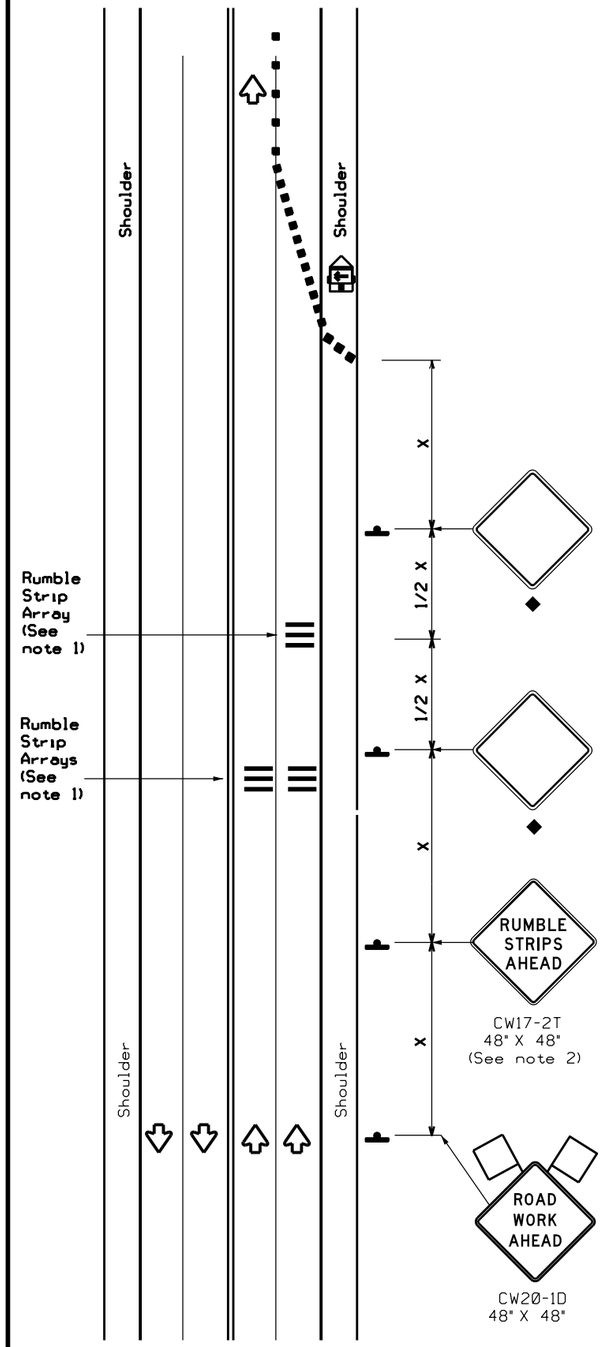
Warning sign and rumble strip sequence in opposite direction is same as below.

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



WZ(RS-1a)

RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION



WZ(RS-1b)

RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY

GENERAL NOTES

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

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

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

* Conventional Roads Only

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

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

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

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

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

Texas Department of Transportation

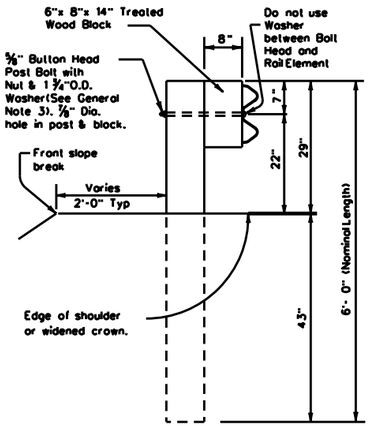
Traffic Safety Division Standard

TEMPORARY RUMBLE STRIPS

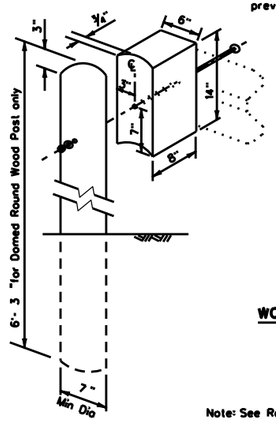
WZ(RS)-22

FILE: wzrs22.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
©TxDOT November 2012	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
2-14 1-22	DIST	COUNTY		SHEET NO.
4-16	BRY	WASHINGTON, ETC		30

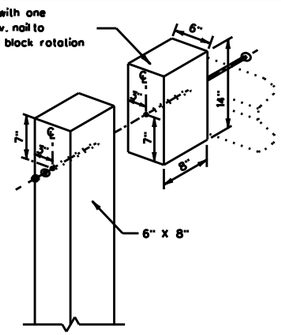
DATE:
FILE:



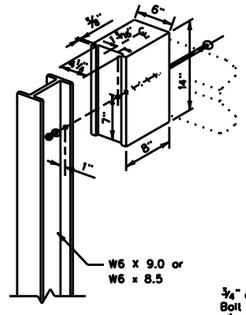
TYPICAL POST



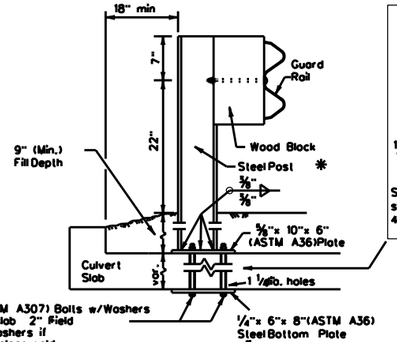
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST

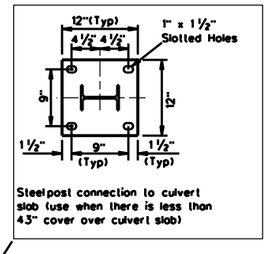


WOOD BLOCK TO STEEL POST

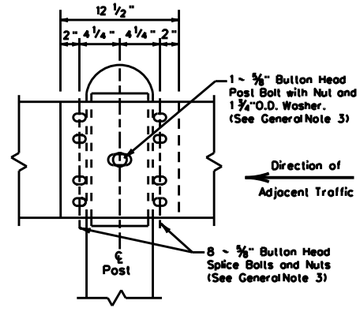


*LOW FILL CULVERT POST

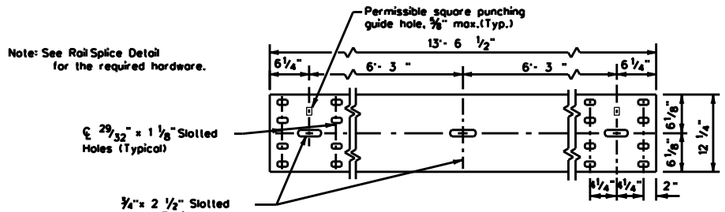
FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY



* Post(s) may require field modifications to ensure proper guardrail height.



RAIL SPLICE DETAIL



ELEVATION 12 1/2"(NOM.) W-BEAM SECTION

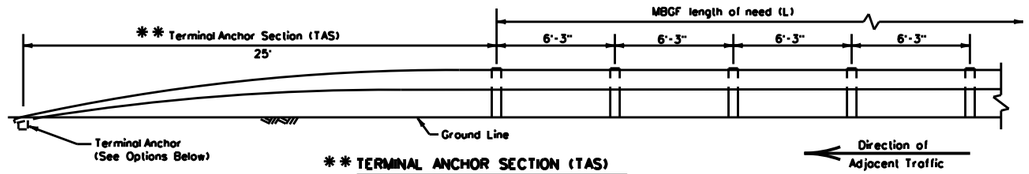
25 foot sections may also be supplied (See General Note 2)

GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
2. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 1/2 or 25 foot nominal lengths.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 1 1/4" (or 2" long at triple rail splices) with a 5/8" double recessed nut (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
5. Crown shall be widened to accommodate the Metal Beam Guard Fence.
6. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
7. 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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
8. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
9. Posts shall not be set in concrete, of any depth.
10. Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
11. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
12. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.

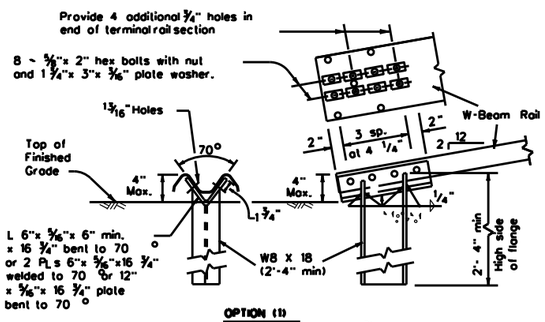
BUTTON HEAD BOLT

Post and Splice Bolts (See General Note 3)



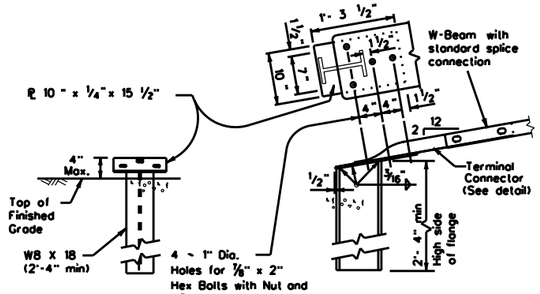
** TERMINAL ANCHOR SECTION (TAS)

Terminal anchor sections are only for downstream use, when located outside the horizontal clearance area of opposing traffic.



OPTION (1)

Note: This anchor post requires four additional 3/4" holes (shop or field) in the rail member with eight 5/8" hex bolts with nut and plate washer.

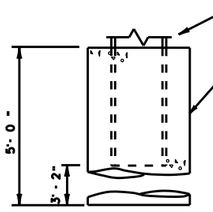


OPTION (2)

Note: This anchor post requires the use of the 10 ga. terminal connector with four 7/8" hex bolts with nut and washer.

TERMINAL ANCHOR POST OPTIONS

(See General Note 11)



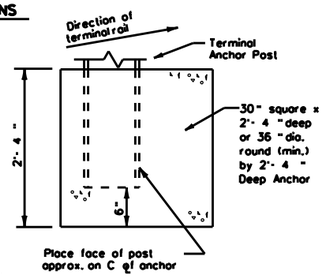
Notes :

Either concrete anchor may be used with either post option above.

No construction joint is allowed in the concrete anchor.

Terminal rail may be bolted to post and in twist position prior to placing concrete anchor.

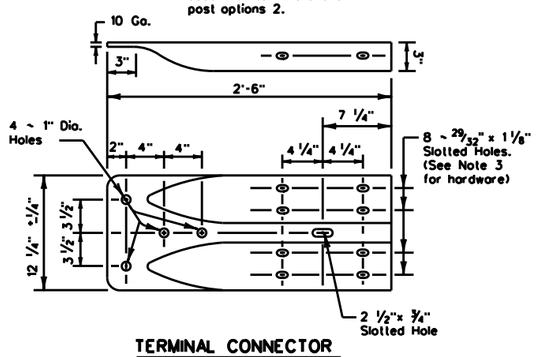
If concrete anchor is precast, the area should be compacted as directed by the Engineer, when placed in the field.



TERMINAL CONCRETE ANCHOR OPTIONS

(See General Note 11)

Note: Terminal Connector to be used with terminal anchor post options 2.



TERMINAL CONNECTOR

For connection hardware to concrete rails, see the MBGF transition standards.

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

Texas Department of Transportation

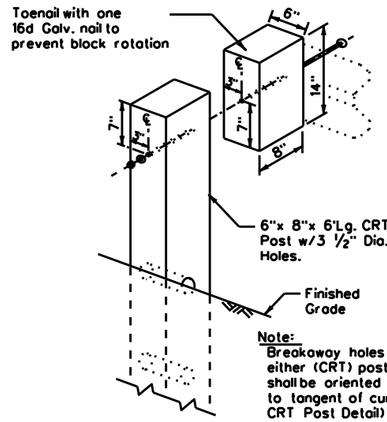
Design Division Standard

METAL BEAM GUARD FENCE

MBGF-19

FILE: mbgf19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		31

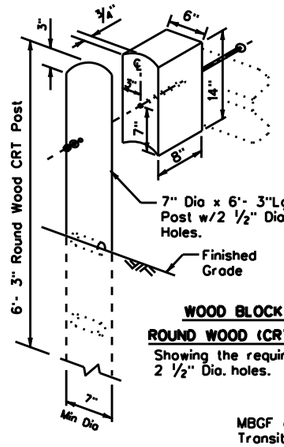
DATE:
FILE:



Note:
Breakaway holes in either (CRT) post type, shall be oriented parallel to tangent of curve (See CRT Post Detail)

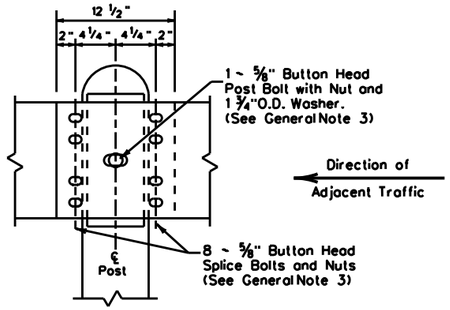
WOOD BLOCK TO RECTANGULAR WOOD (CRT) POST

Showing the required 3 ½" Dia. holes.

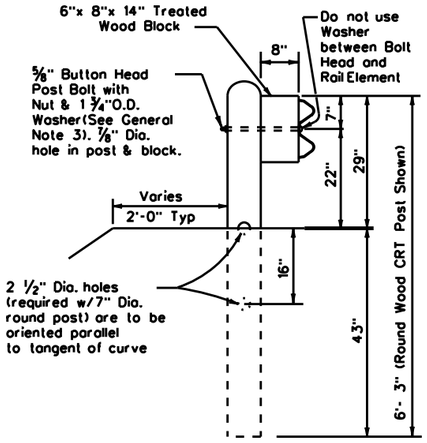


WOOD BLOCK TO ROUND WOOD (CRT) POST

Showing the required 2 ½" Dia. holes.

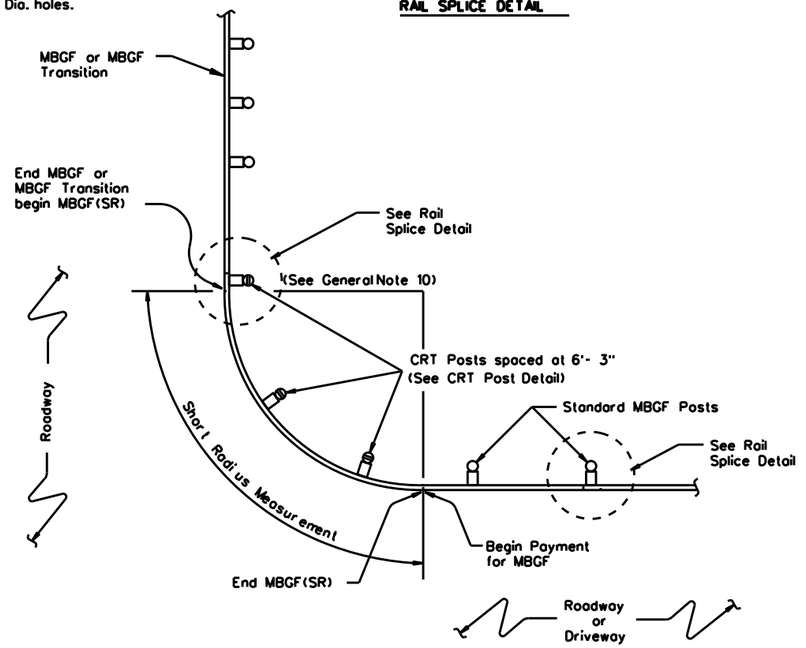


RAIL SPLICE DETAIL



(CRT) POST DETAIL
CONTROLLED RELEASE TERMINAL POST

Two or more wood CRT post(s) are required at any radius installation located at intersecting roadways or driveways.



PLAN VIEW
SHOWING TYPICAL RADIUS

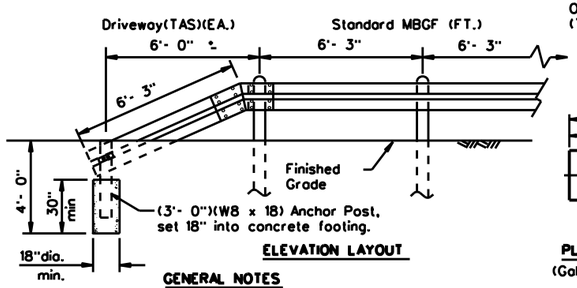
The required radius is shown elsewhere on the plans.

GENERAL NOTES

1. The type of (CRT) post (round wood post, or rectangular wood post) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer.
2. Steel posts are not permitted at CRT post positions.
3. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans. The Contractor may furnish rail elements of 12 ½ or 25 foot nominal lengths.
4. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 ¾" O.D.)washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 1 ¼" (or 2" long at triple rail splices) with a ⅝" double recessed nut (ASTM A563).
5. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
6. Crown shall be widened to accommodate the Metal Beam Guard Fence.
7. The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
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 block. Rail placed over curbs shall be installed so that the post bolt is located approximately 21 inches above the gutter pan or roadway surface.
9. If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, 24" into the rock, or drill two 12" dia. front to back overlapping holes, 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 is less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
10. Guardrail posts shall not be set in concrete, of any depth.
11. Special rail fabrication will be required at installations having a curvature of less than 150 ft. radius. The required radius shall be shown on the plans.
12. The terminal anchor section (TAS) post shall be set in Class A concrete (unless otherwise shown in the plans) in accordance with Item 421,"Hydraulic Cement Concrete." Concrete shall be subsidiary to the bid item requiring construction of the terminal anchor section (TAS). Terminal anchor post to be galvanized in accordance with Item 445, "Galvanizing."
13. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.

"DRIVEWAY" TERMINAL ANCHOR SECTION

Only for use within driveway locations, where a standard (TAS) Terminal Anchor Section can not be installed.



ELEVATION LAYOUT

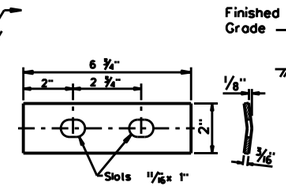
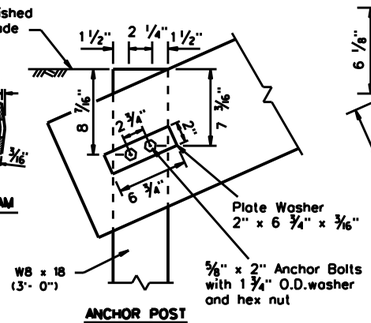
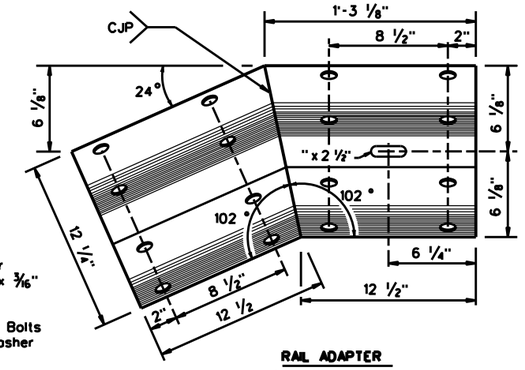


PLATE WASHER FOR METAL BEAM
(Galvanized after fabrication)



ANCHOR POST



RAIL ADAPTER
Rail - 10 gauge
(Galvanized after fabrication)

GENERAL NOTES

1. The "Driveway" Terminal Anchor Section is ONLY to be used within driveway locations, where the ROW is limited and a standard 25 ft.(TAS)Terminal Anchor Section,is too long.
2. Terminal anchor post shall be set in Class A concrete.
3. All steel shall be galvanized after fabrication in accordance with Item 445, "Galvanizing."

ONLY FOR USE IN MAINTENANCE REPAIRS OR HIGHLY CONSTRAINED SITE CONDITIONS.

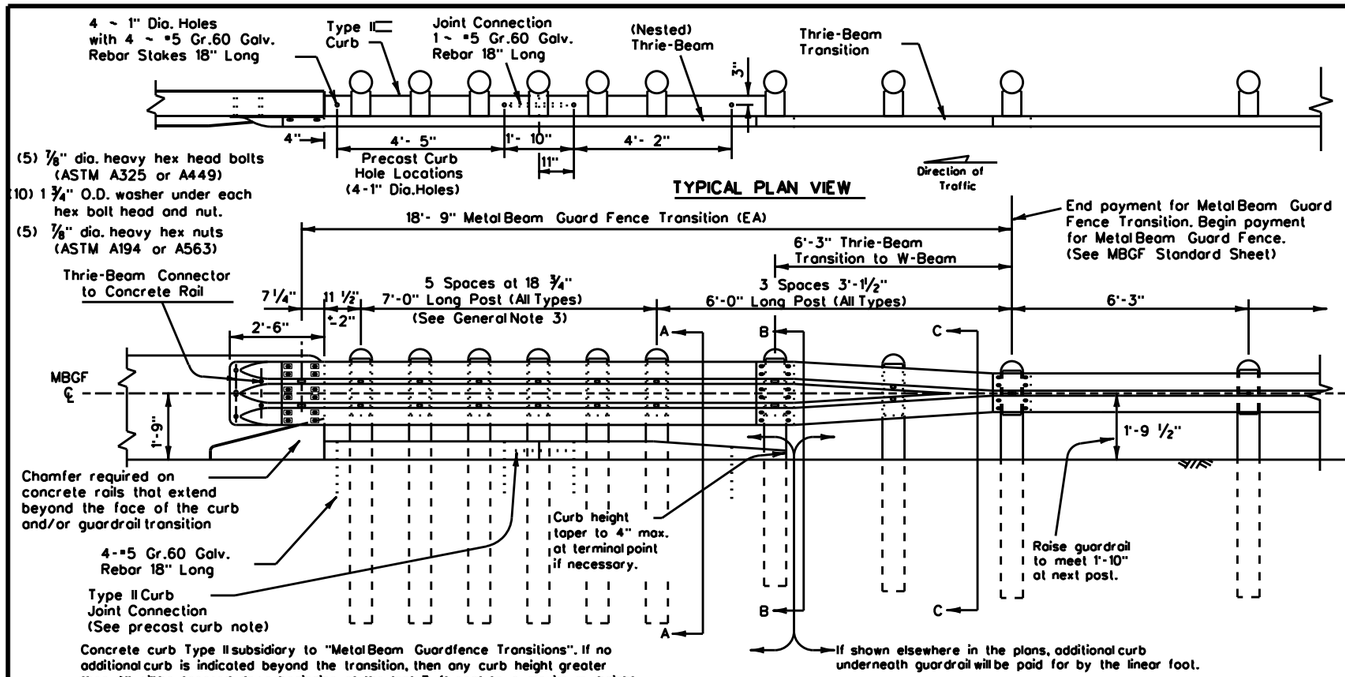
Texas Department of Transportation

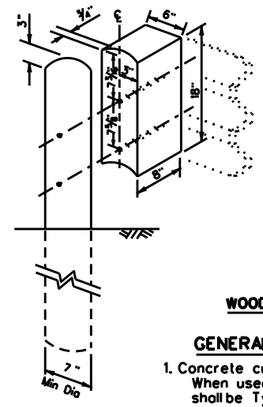
Design Division Standard

METAL BEAM GUARD FENCE
(SHORT RADIUS)
MBGF(SR)-19

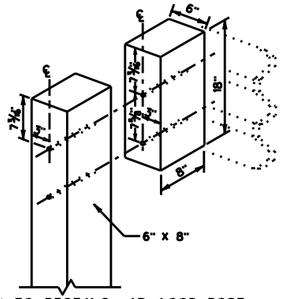
FILE: mbgfsr19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		32

DATE:
FILE:

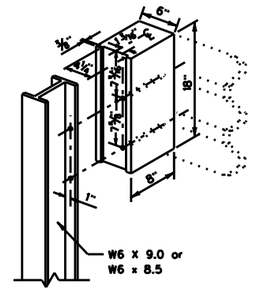




WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK TO STEEL POST

GENERAL NOTES

1. Concrete curb may be cast-in-place or precast as shown on this sheet. When used in conjunction with thrie-beam guard fence transitions, curb shall be Type II (Typically 5 3/4" height above surface: See CCCG standard sheet) unless otherwise shown in the plans. 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.

   Contact the Design Division for drainage cut options needed within the curb section of the transition.

2. The type of post (round wood, rectangular wood or steel) will be shown elsewhere in the plans.

3. 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.

4. Rail element 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.

5. Unless otherwise shown in the plans, transitions shall be placed with the block face in front of or directly above the curb face.

6. Install terminal connector with (12) rectangular guardrail plate washers: (FWR03) and (12) 5/8" X 2" button head splice bolts with recessed nuts.

7. 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.

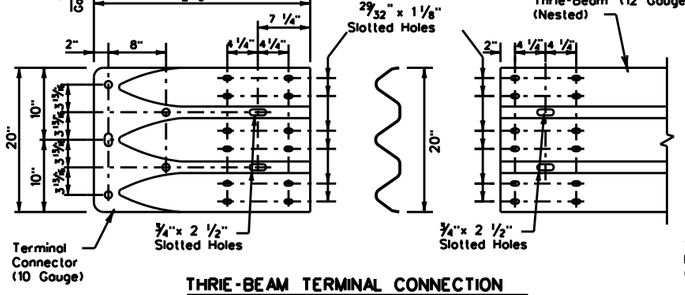
8. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445,"Galvanizing". Fittings shall be subsidiary to the bid item.

9. Crown shall be widened to accommodate transitions.

10. If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.

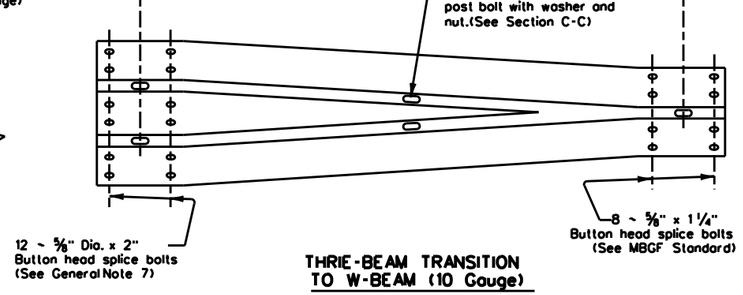
11. Posts shall not be set in concrete.

12. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT, maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.

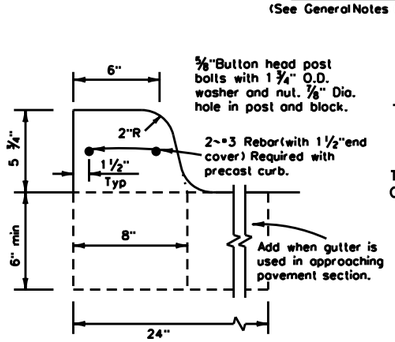


THRIE-BEAM TERMINAL CONNECTION
(See General Notes 6 & 7 for required hardware)

TYPICAL ELEVATION VIEW

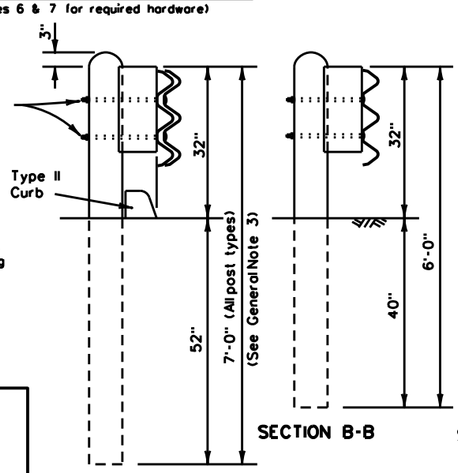


THRIE-BEAM TRANSITION TO W-BEAM (10 Gauge)



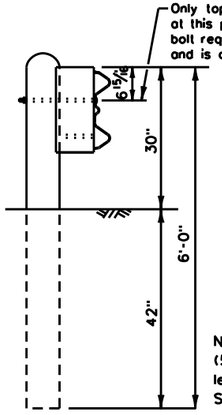
TYPE II CURB
Cast-in-Place or Precast

PRECAST CURB: Type II Precast Curb secured with 4~#5 Gr.60 Galv. Rebar stakes 18" long. The 12'- 2" section of curb may be cast in two sections.
Section 1 (5)- 8" long
Section 2 (6)- 6" long with the last 3'- 6" of curb tapered to a 4" height.
The Joint Connection is two 9" long 1" dia female ends connected with 1~#5 Gr.60 Galv.Rebar 18" long.



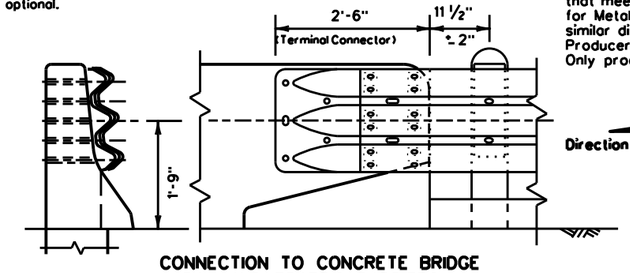
SECTION A-A

SECTION B-B



SECTION C-C

TRANSITION SECTIONS



CONNECTION TO CONCRETE BRIDGE RAIL AND TRAFFIC BARRIERS

NOTES:
(5) 7/8" dia. heavy hex bolts, length will vary depending on width of concrete rail, leave 1" of bolt length past the 5/8" hex nut. Trim as required.
See General Notes: 6 & 7 for additional connection details.

PLATE WASHER INSTRUCTIONS

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

ONLY FOR USE IN MAINTENANCE REPAIRS.

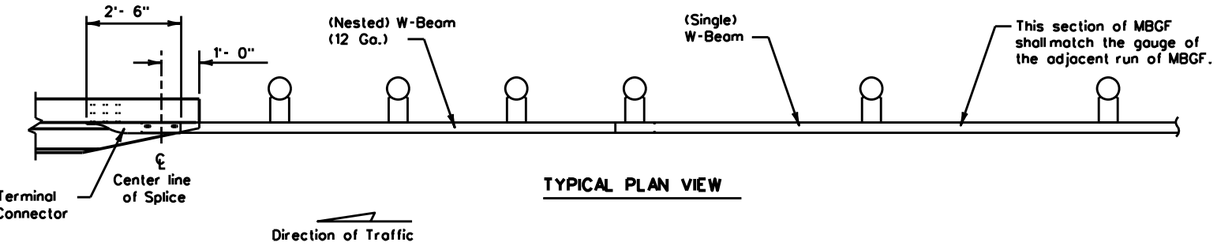
Texas Department of Transportation

Design Division Standard

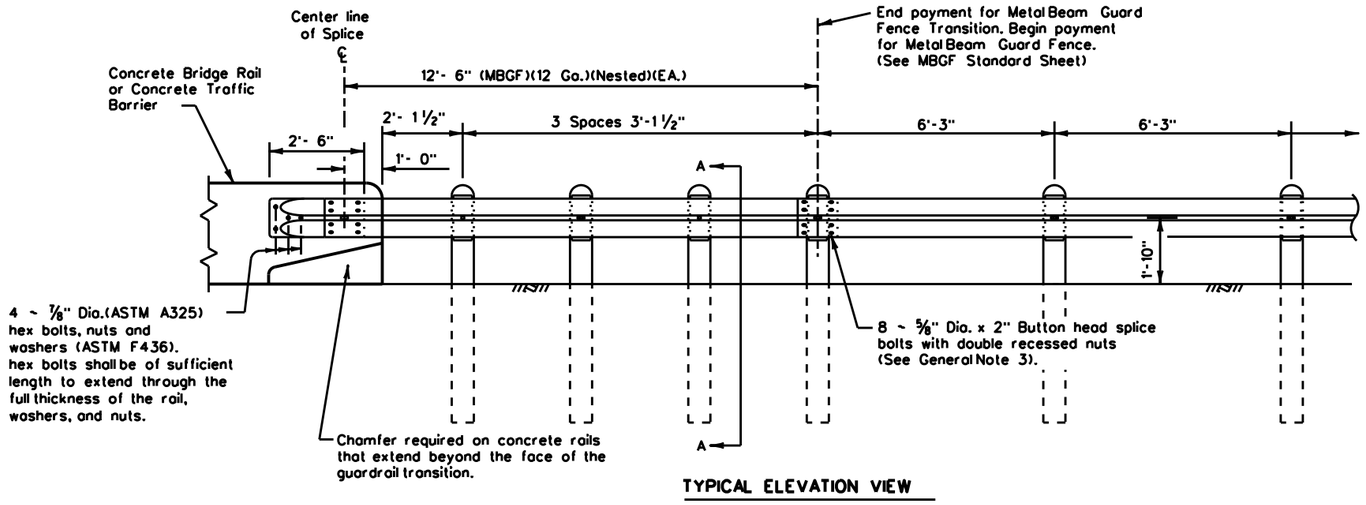
METAL BEAM GUARD FENCE TRANSITION (THRIE-BEAM TRANSITION) MBGF(TR)-19

FILE: mbgftr19.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		33

DATE:
FILE:



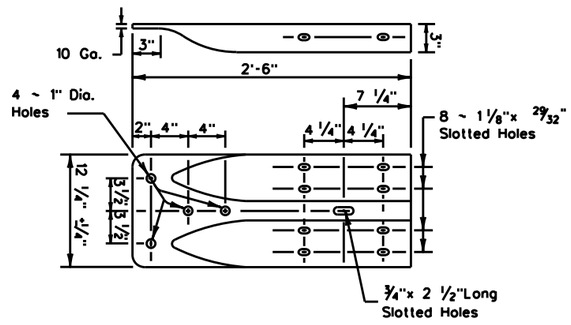
TYPICAL PLAN VIEW



TYPICAL ELEVATION VIEW

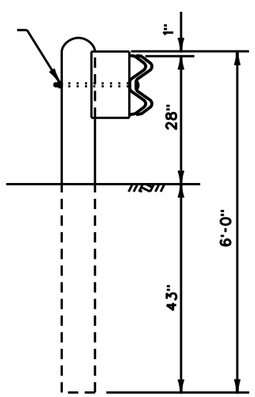
GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut and Type A 1¾" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are ⅝" x 2"(at triple rail splices) with ⅝" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445,"Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for the proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT, maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.
9. Refer to MBGF standard sheet for additional details.

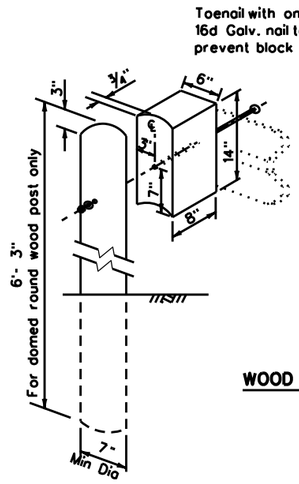


TERMINAL CONNECTOR

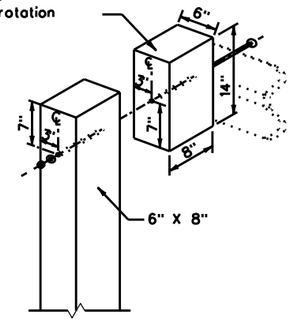
FOR USE WITH MBGF CONNECTIONS TO CONCRETE BRIDGE RAILS AND TRAFFIC BARRIERS



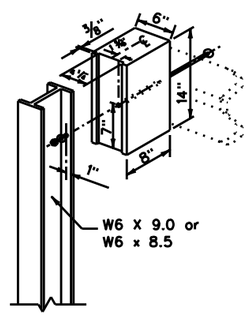
SECTION A-A



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK TO STEEL POST

ONLY FOR USE IN MAINTENANCE REPAIRS.

Texas Department of Transportation | Design Division Standard

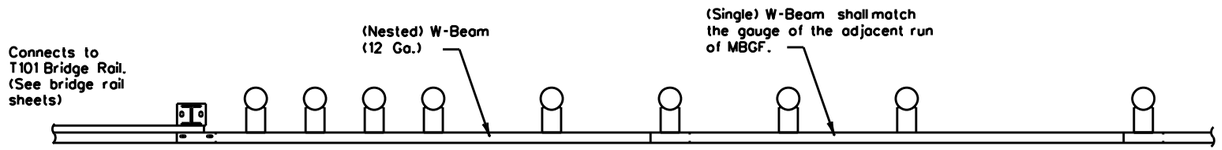
METAL BEAM GUARD FENCE TRANSITION (TL2)

(Low Speed Transition)

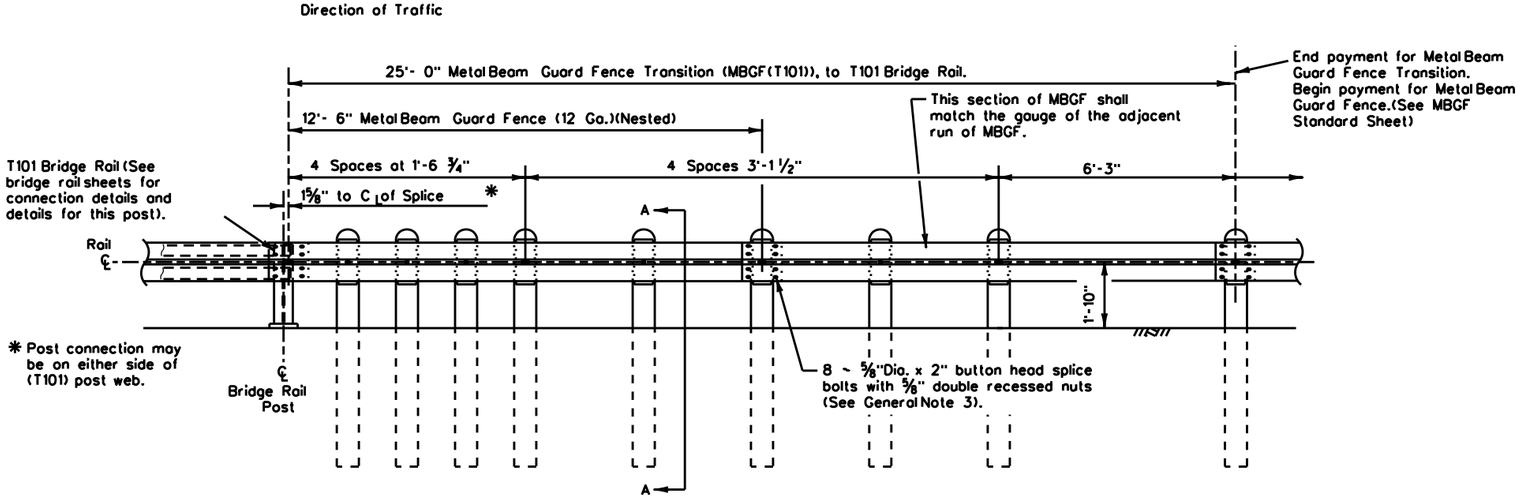
MBGF(TL2)-19

FILE: mbgftl219.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP	
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		34	

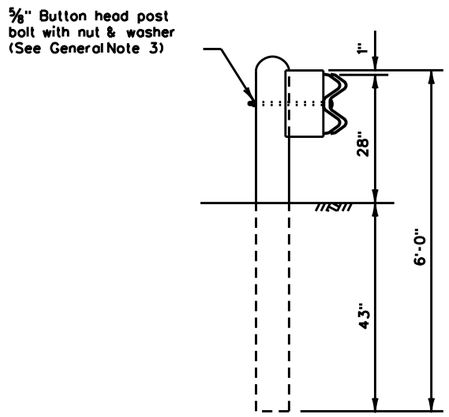
DATE:
FILE:



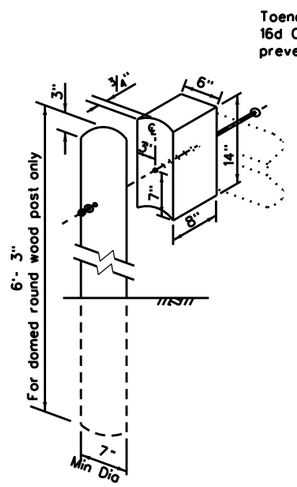
TYPICAL PLAN VIEW



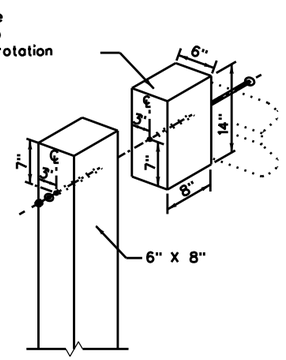
TYPICAL ELEVATION VIEW



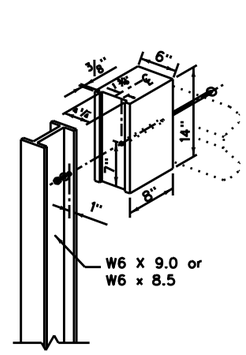
SECTION A-A



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK TO STEEL POST

GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steel post) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540,"Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 2" (at triple rail splices) with a 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445,"Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the MBGF standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210,"Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT, maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.
8. Refer to MBGF Standard Sheet for additional details.

ONLY FOR USE IN MAINTENANCE REPAIRS.

Texas Department of Transportation

Design Division Standard

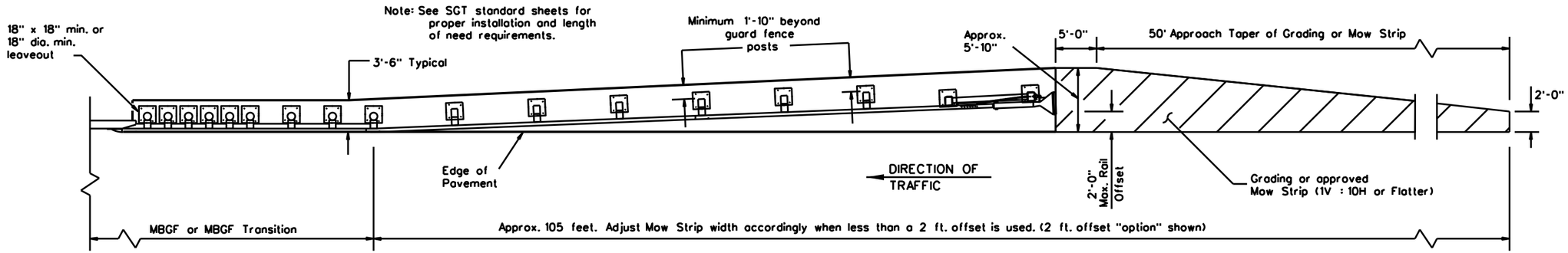
METAL BEAM GUARD FENCE TRANSITION (T101)

(T101 BRIDGE RAIL)

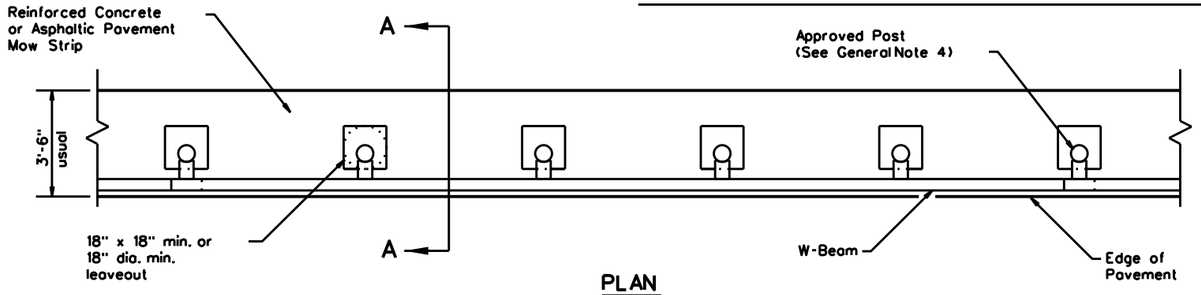
MBGF(T101)-19

FILE: mbgft10119.dgn	DN: TxDOT	CK: KM	DW: BD		CK: VP
© TxDOT NOVEMBER 2019	CONT	SECT	JOB		HIGHWAY
REVISIONS			6469-98-001		SH 36, ETC.
	DIST	COUNTY			SHEET NO.
	BRY	WASHINGTON, ETC.			35

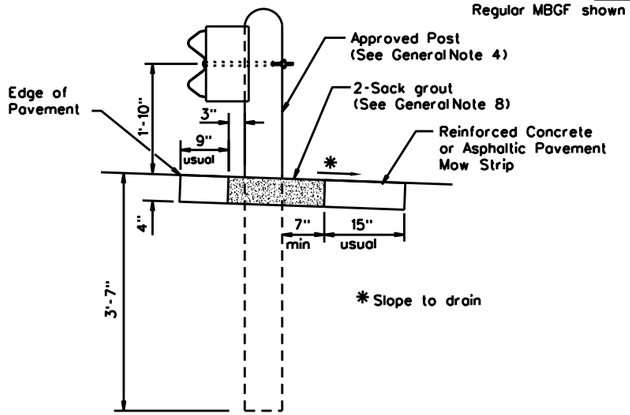
DATE:
FILE:



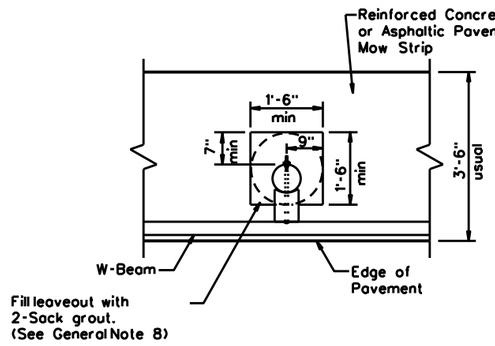
GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



PLAN
Regular MBGF shown with Mow Strip



SECTION A-A
Typical

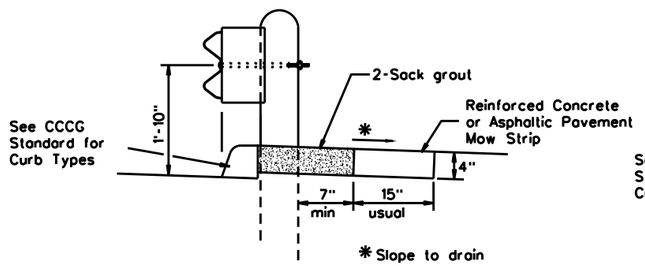


MOW STRIP DETAIL
Reinforced Concrete or Asphaltic Pavement Mow Strip with 18" x 18" or 18" dia. minimum leaveout.

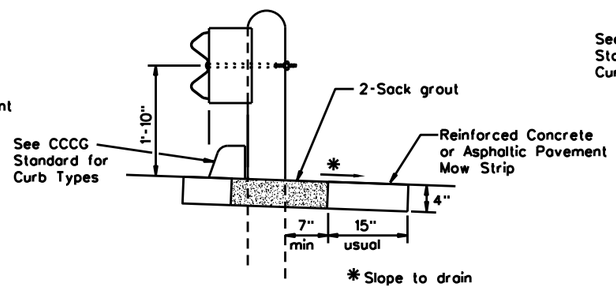
Note: Site Condition(s)
Site conditions may exist where grading is required for the proper installation of metal guard fence and end treatments.
Approach grading or mow strip may be decreased or eliminated. As directed by the Engineer.

GENERAL NOTES

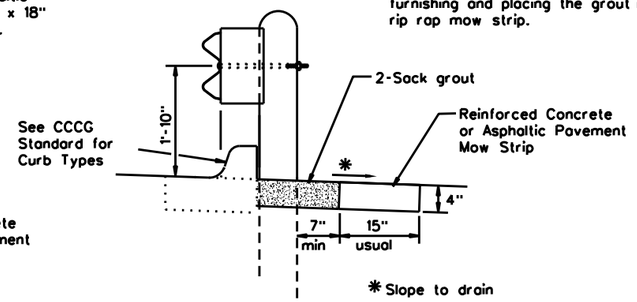
1. This mow strip design is for use with metal beam guard fence, guard fence transitions, and guard fence end treatments (See SGT standards for proper SGT installation).
2. Mow strips shall be asphaltic pavement or reinforced concrete (wire mesh or synthetic fiber), as shown on the plans and will be paid for under the pertinent bid item of work. Asphaltic pavement shall meet the requirements of the item, and be placed in accordance with the pertinent bid item as shown on the plans. 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 leaveout behind the post shall be a minimum of 7".
4. The type of approved post will be shown elsewhere in the plans. See the applicable standard sheets for additional details and information.
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. Depth of mow strip will be 4".
7. The limits of payment for asphaltic pavement or reinforced concrete will include leaveouts for posts.
8. The leave-outs shall be filled with no more than a 2-sack grout mixture (1 part cement, 5 parts water, and 14 parts sand by volume) with a 28-day compressive strength of approximately 120 psi or less. Provide grout of a consistency that will flow into and completly 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 rip rap mow strip.



CURB OPTION (1)
This option will increase the post embedment through out the system.



CURB OPTION (2)
Curb shown on top of mow strip



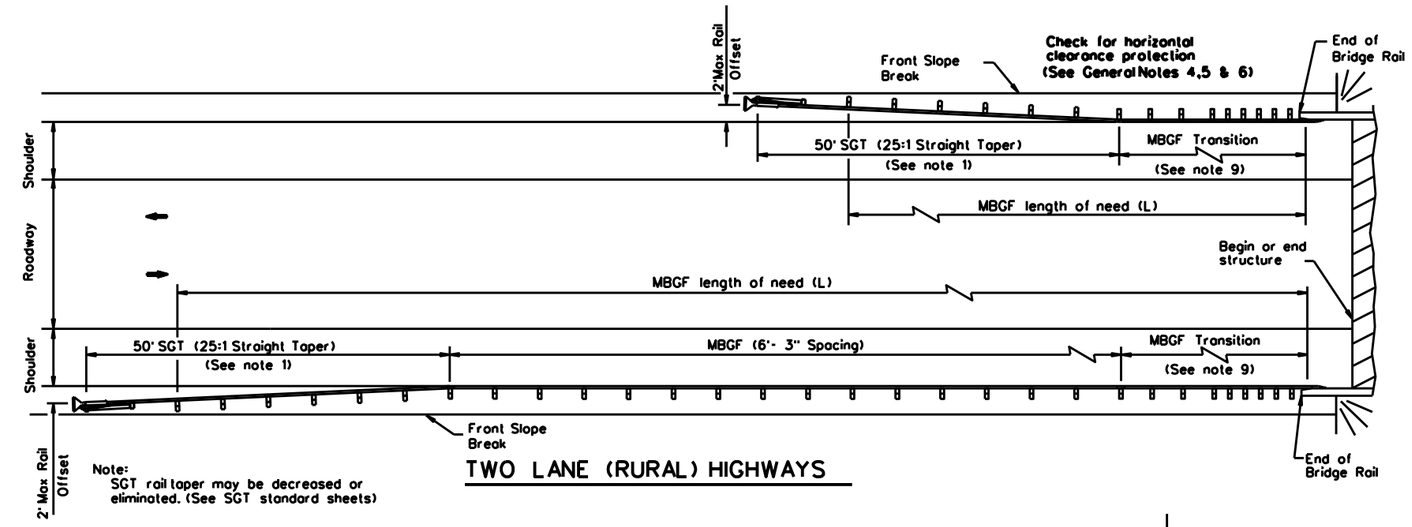
CURB OPTION (3)

ONLY FOR USE IN MAINTENANCE REPAIRS.

Texas Department of Transportation | Design Division Standard

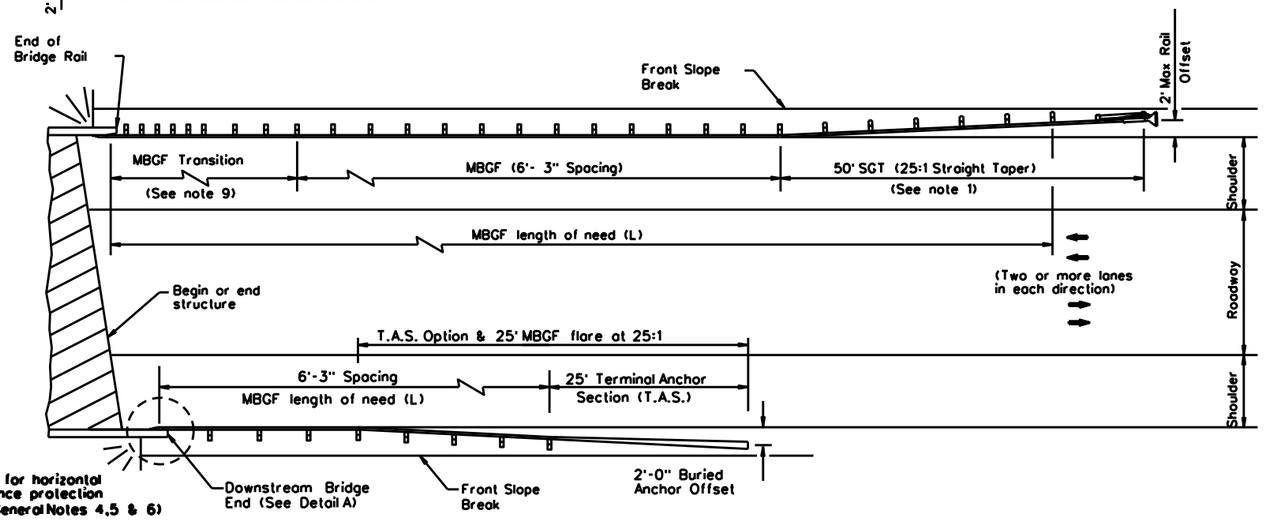
METAL BEAM GUARD FENCE
(MOW STRIP)
MBGF(MS)-19

FILE: mbgfms19.dgn	DN: TxDOT	CK: KM	DW: TXDOT	CK: CL
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		36

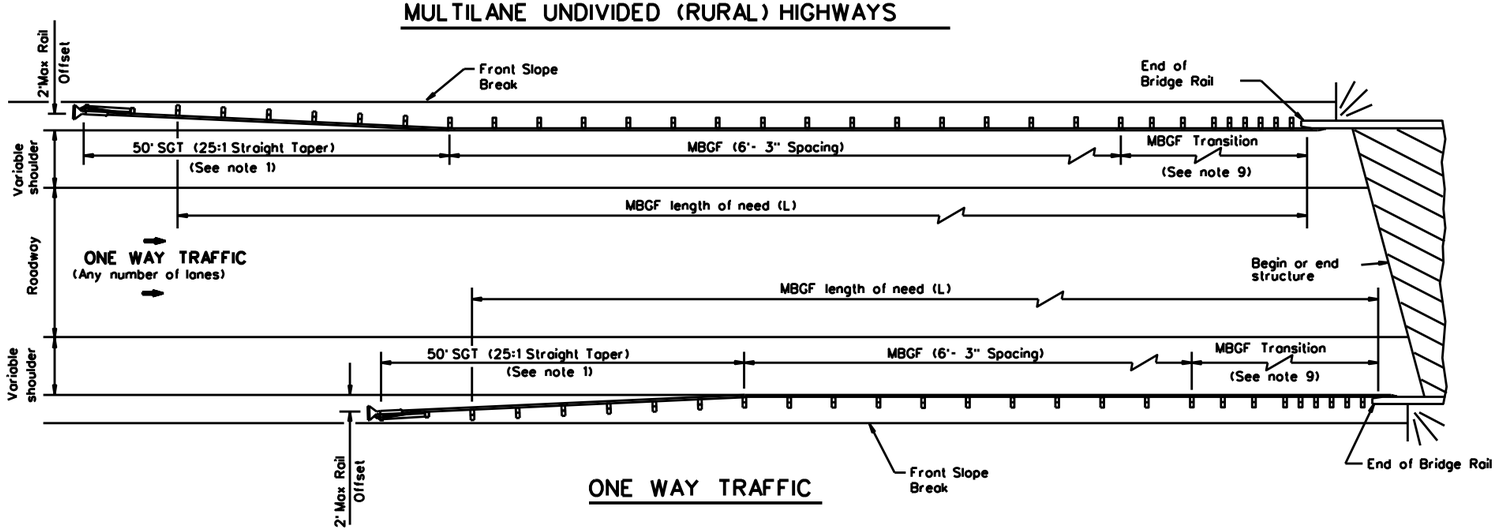


Note:
SGT rail taper may be decreased or eliminated. (See SGT standard sheets)

TWO LANE (RURAL) HIGHWAYS



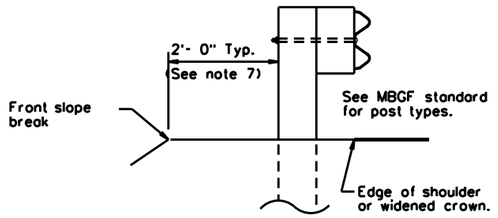
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



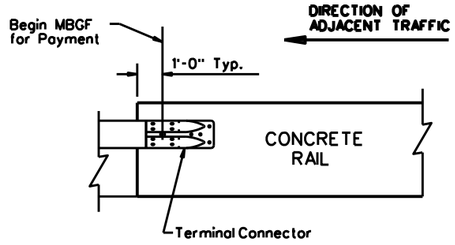
ONE WAY TRAFFIC

GENERAL NOTES

1. For more detail: See MBGF, SGT, and MBGF Transition standard sheets.
2. Quantities of metal beam guard fence (MBGF) at individual bridge ends are shown elsewhere in 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. Terminal anchor sections (TAS) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
6. Direct connection of MBGF (at 6'-3" post spacing without transition) to concrete rail are only for downstream rail connections outside the horizontal clearance area of opposing traffic. (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.
9. Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.



TYPICAL CROSS SECTION AT MBGF



DETAIL A

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

ONLY FOR USE IN MAINTENANCE REPAIRS.

Texas Department of Transportation

Design Division Standard

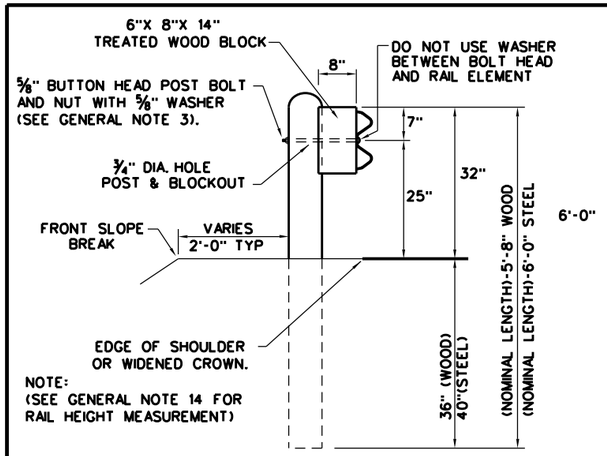
BRIDGE END DETAILS (28" METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED(28)-19

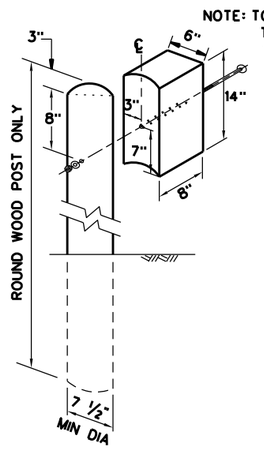
FILE: bed2819.dgn	DN: TxDOT	CK: KM	DW: BD	CK: VP
©TxDOT NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		37

DATE:
FILE:

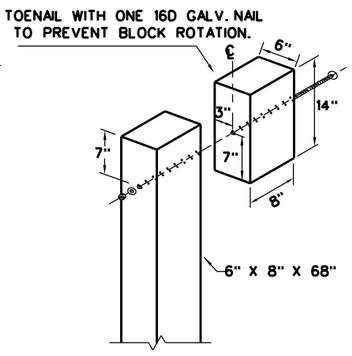
DATE:
FILE:



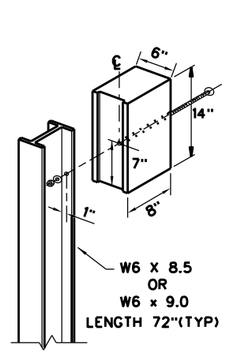
TYPICAL POST PLACEMENT



WOOD BLOCK TO ROUND WOOD POST

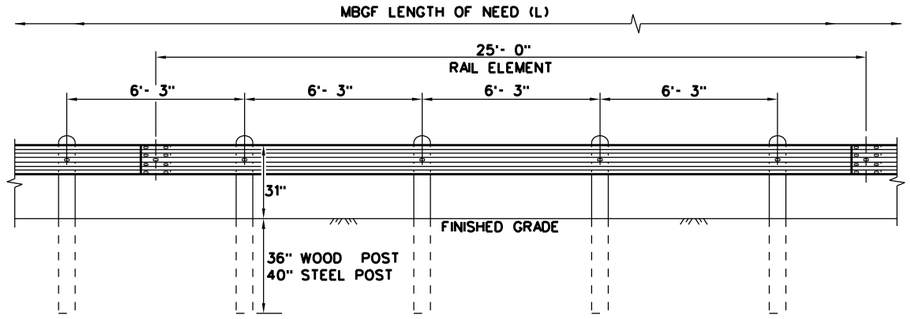


WOOD BLOCK TO RECTANGULAR WOOD POST



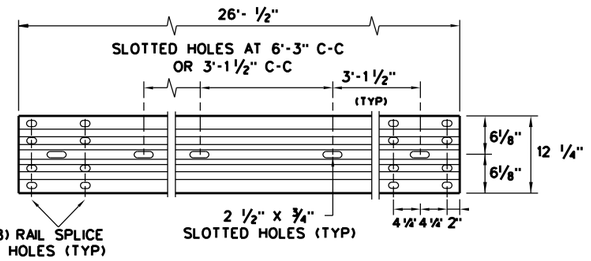
ROUTED WOOD BLOCK TO I-BEAM STEEL POST

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



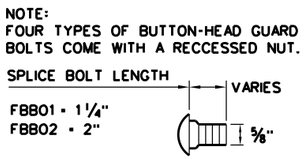
ELEVATION MID-SPAN RAIL SPLICE

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



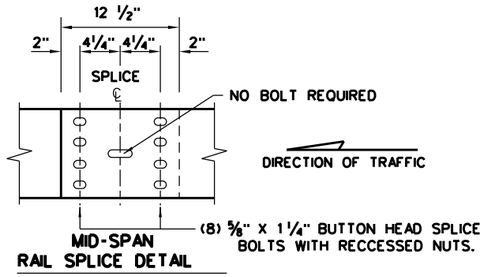
ELEVATION 25'- 0"(NOM.) W-BEAM SECTION

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



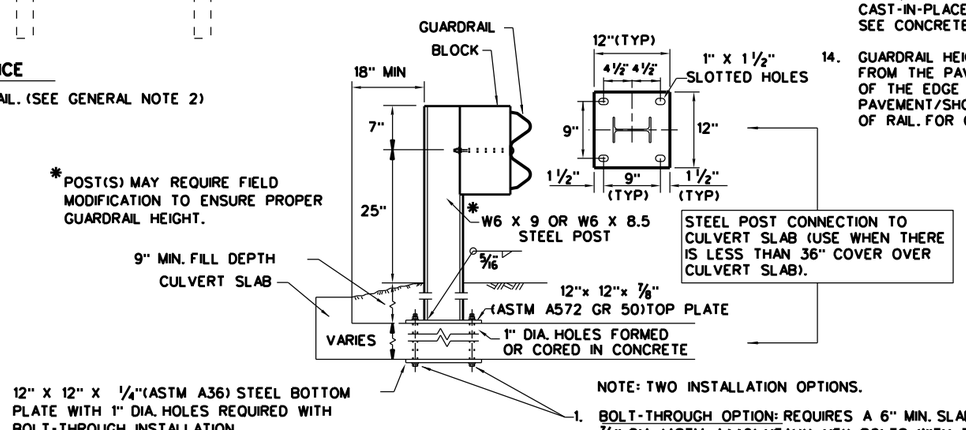
BUTTON HEAD BOLT

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



MID-SPAN RAIL SPLICE DETAIL

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



* POST(S) MAY REQUIRE FIELD MODIFICATION TO ENSURE PROPER GUARDRAIL HEIGHT.

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

LOW FILL CULVERT POST

NOTE: TWO INSTALLATION OPTIONS.

1. BOLT-THROUGH OPTION: REQUIRES A 6" MIN. SLAB THICKNESS. 7/8" DIA (ASTM A449) HEAVY HEX BOLTS WITH TWO HARDENED WASHER EACH AND HEAVY HEX NUTS.
   NOTE: BOLT LENGTH = SLAB PLUS 2 1/4" MIN.

2. EPOXY ANCHOR OPTION: THIS OPTION MAY ONLY BE USED IF THE CULVERT SLAB IS 9" MIN. THICK. THREADED ANCHOR RODS MUST BE 7/8" DIA. ASTM A449 OR A193 GRADE B7 WITH HEAVY HEX NUT, AND ONE HARDENED WASHER EACH. EMBED ANCHOR RODS 6" WITH HILTI HIT RE 500 EPOXY ADHESIVE. OTHER TYPE III CLASS C EPOXY ADHESIVES MEETING THE REQUIREMENTS OF DMS-6100, "EPOXIES AND ADHESIVES", MAY BE USED IF IT CAN BE DEMONSTRATED THAT THEY MEET OR EXCEED THE STRENGTH OF HILTI HIT RE 500 WITH THE SAME EMBEDMENT DEPTH AND THREADED ROD DIA. FOLLOW THE MANUFACTURER'S REQUIREMENTS FOR INSTALLING EPOXIED THREADED RODS. EXTEND RODS 1/4" MIN. BEYOND NUT.

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

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

GENERAL NOTES

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

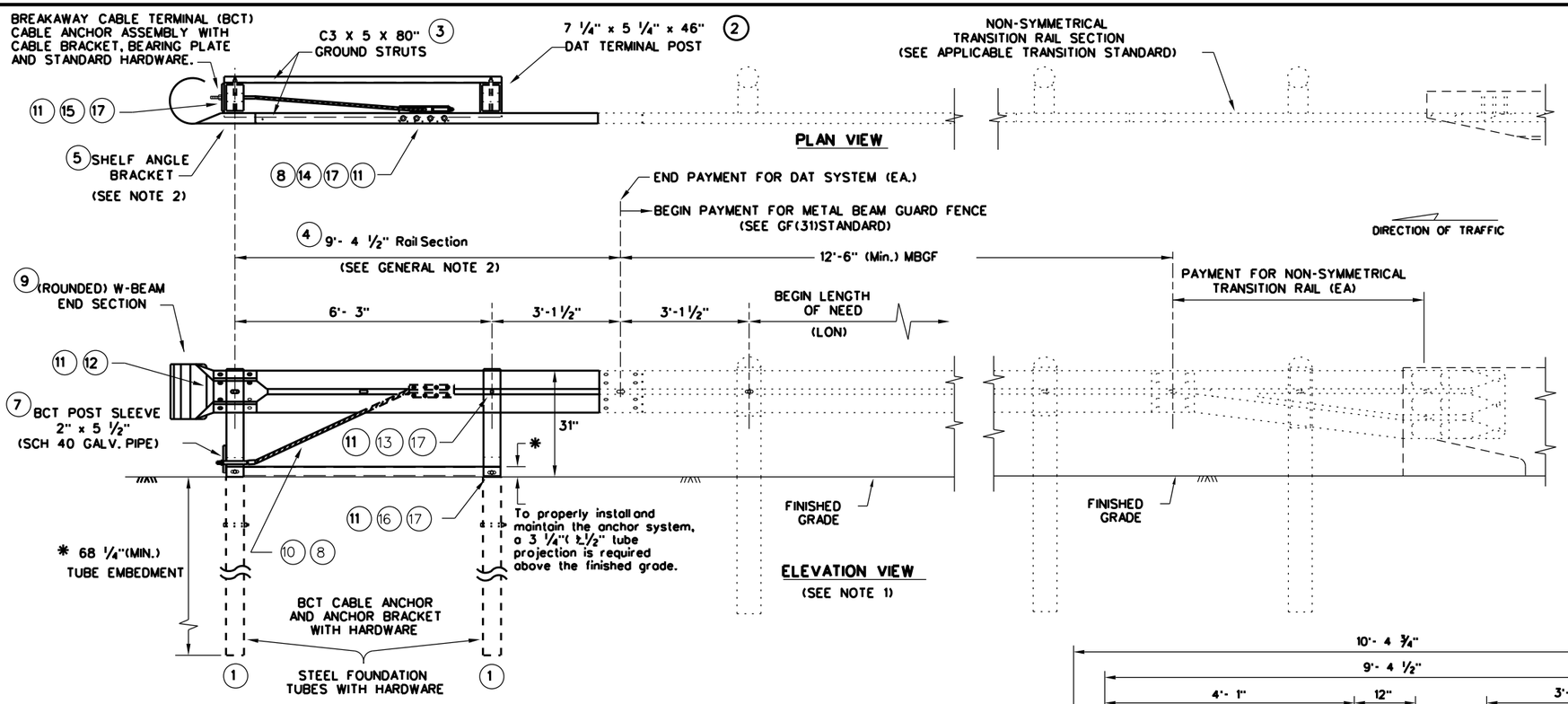
Texas Department of Transportation

Design Division Standard

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

FILE: gf3119.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		38	

DATE:
FILE:



DOWNSTREAM ANCHOR TERMINAL (DAT)

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

GENERAL NOTES

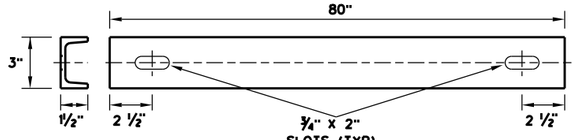
1. THE DETAIL SHOWN IS THE MINIMUM LENGTH OF NEED (LON) FOR A DOWNSTREAM ANCHOR TERMINAL (DAT) CONNECTED TO A CONCRETE RAIL.
2. THE RAIL SECTION AT THE END POST IS SUPPORTED BY THE SHELF ANGLE BRACKET. THE RAIL ELEMENT IS NOT ATTACHED TO THE END POST.
3. THE FOUNDATION TUBES SHALL NOT PROJECT MORE THAN 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

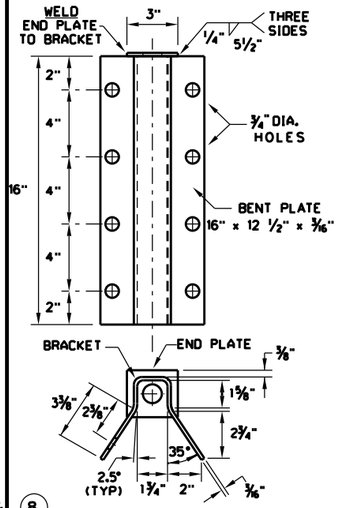
IF A MOW STRIP IS REQUIRED WITH THE DAT INSTALLATION THE LEAVE-OUT AREA AROUND THE STEEL FOUNDATION TUBES AND THE TWO CHANNEL STRUTS MAY BE OMITTED. THIS WILL REQUIRE A FULL POUR AT THE FOUNDATION TUBES.

•	(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

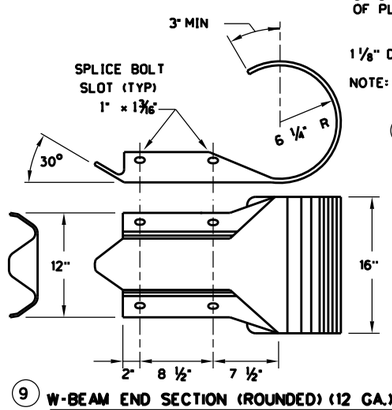
(4) TERMINAL RAIL ELEMENT FOR DAT



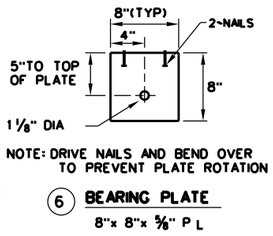
(3) CHANNEL STRUT
C3 X 5 X 80", GRADE A36



(8) GUARDRAIL ANCHOR BRACKET

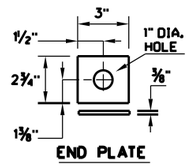


(9) W-BEAM END SECTION (ROUNDED) (12 GA.)

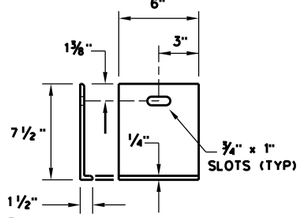


NOTE: DRIVE NAILS AND BEND OVER TO PREVENT PLATE ROTATION

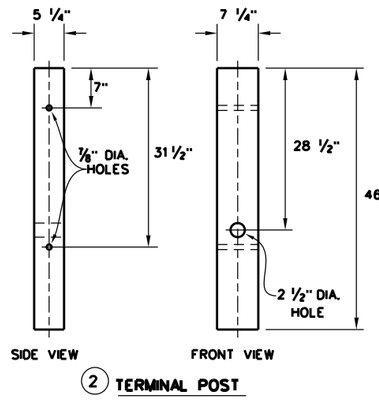
(6) BEARING PLATE
8"x 8"x 5/8" PL



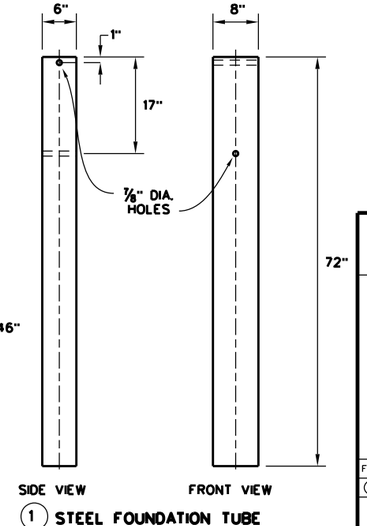
END PLATE



(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

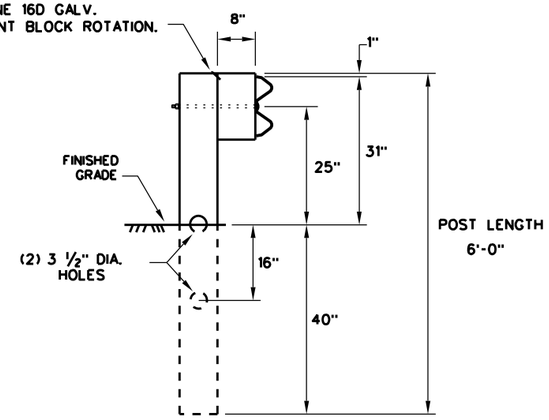
Design Division Standard

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

GF(31)DAT-19

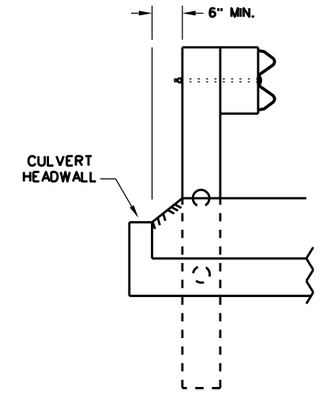
FILE: gf31dat19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		39

DATE:
FILE:



RECTANGULAR CRT POST (6"X 8" X 6' LONG)

(6) CRT REQUIRED
SEE ELEVATION DETAIL FOR LOCATIONS



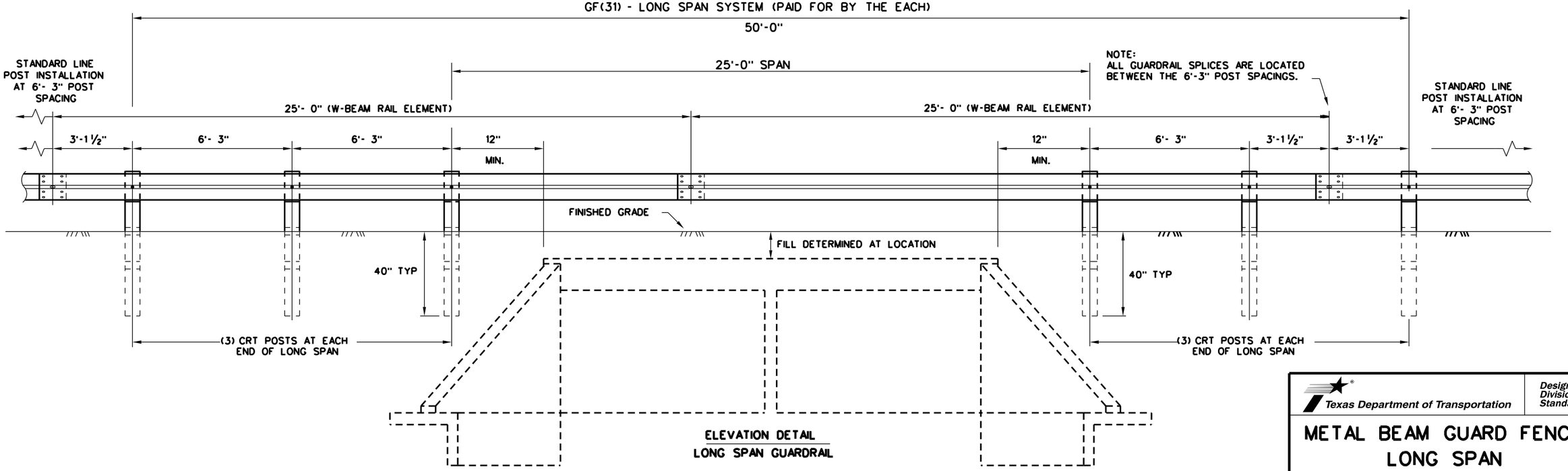
LATERAL OFFSET BETWEEN THE GUARDRAIL AND THE CULVERT HEADWALL

GENERAL NOTES

1. THE TYPE OF LINE POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF THE TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET ALL REQUIREMENTS OF ITEM 540, "METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12'- 6" OR 25'- 0" NOMINAL LENGTHS.
3. RAIL POST HOLES ARE OFFSET 3'- 1 ½" FROM STANDARD GUARDRAIL TO ACCOMMODATE THE MIDSPAN SPLICING.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NO MORE THAN 1" BEYOND IT.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
8. REFER TO GF(31) STANDARD SHEET FOR ADDITIONAL DETAILS.
9. FLAME CUTTING OF HOLES IN GUARDRAIL SHALL NOT BE PERMITTED. IF YOU ENCOUNTER MIS-ALIGNED BOLT HOLES IN GUARDRAIL CONTACT THE DESIGN DIVISION FOR ADDITIONAL INFORMATION & OPTIONS.

DIRECTION OF TRAFFIC

NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.



ELEVATION DETAIL
LONG SPAN GUARDRAIL

Texas Department of Transportation

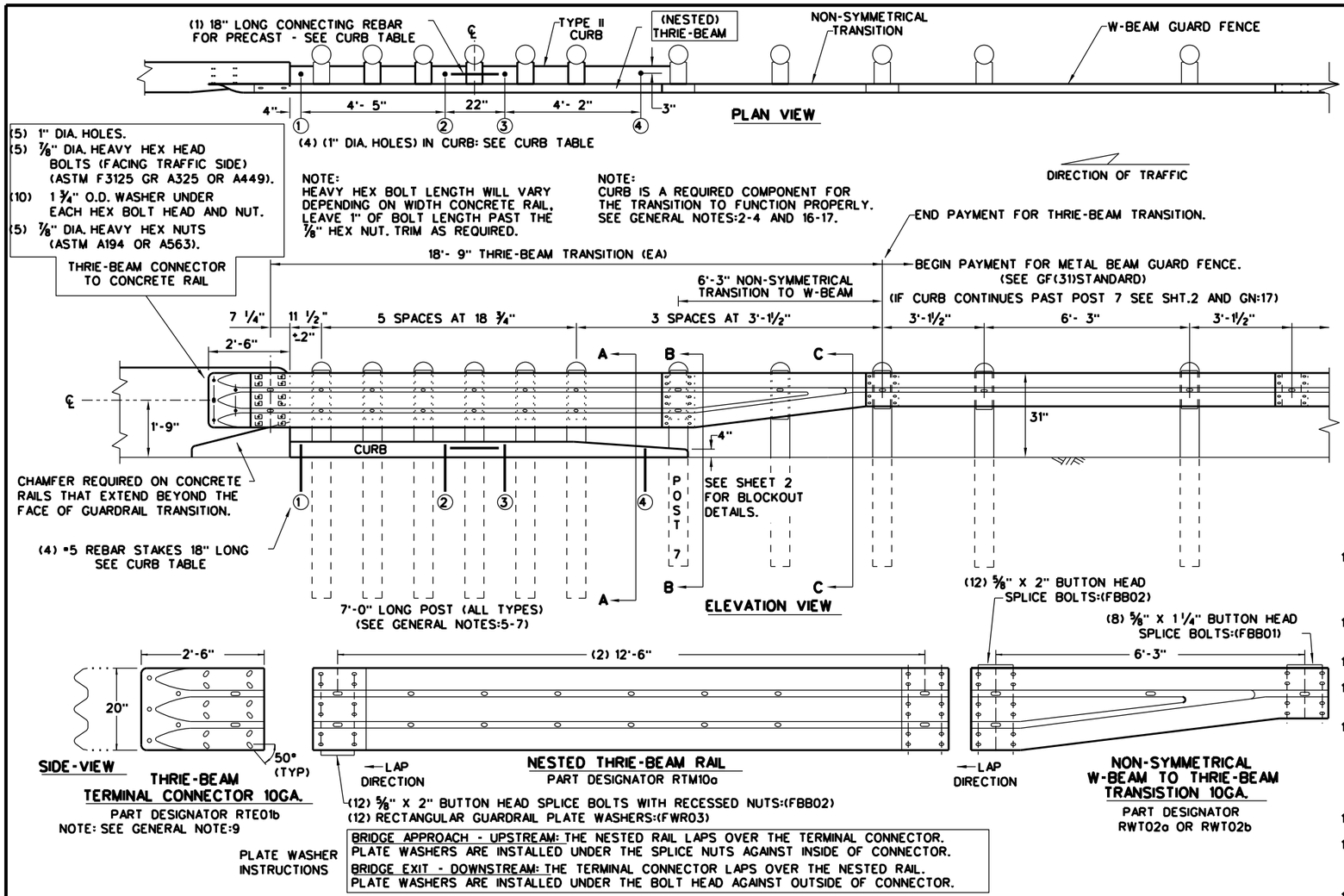
Design Division Standard

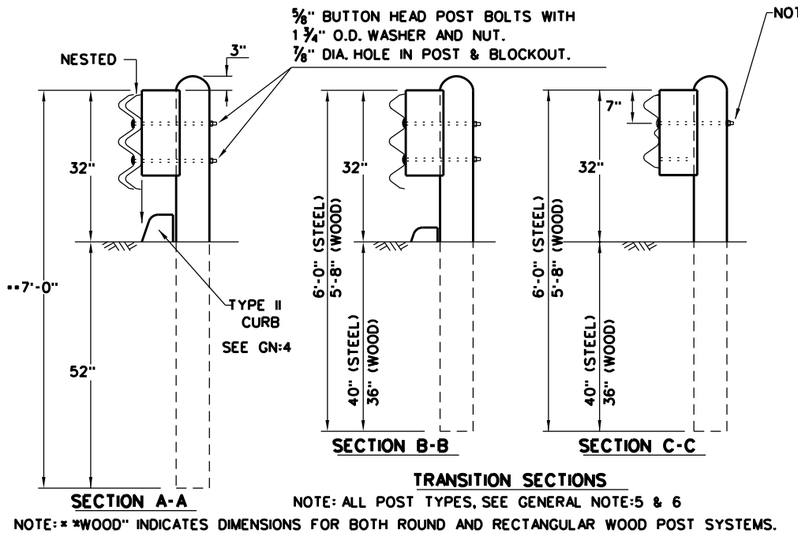
METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT

GF(31)LS-19

FILE: gf31ls19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		40	

DATE:
FILE:

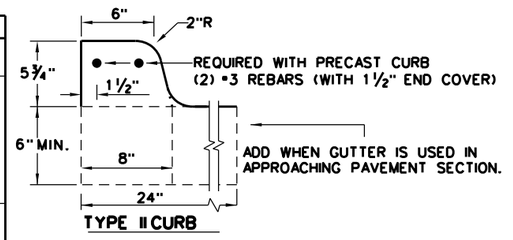




THRIE-BEAM TERMINAL - CURB TABLE
PRECAST CURB FULL LENGTH EQUALS 12'- 2" THE PRECAST CURB MAY BE FORMED INTO TWO SECTIONS.
CURB (1) LENGTH 5'- 8"
CURB (2) LENGTH 6'- 6"
TAPER CURB (2) TO A HEIGHT OF 4" AT POST 7
CONNECTING PRECAST CURB SECTIONS (1) & (2):
FORM OR CORE 1" DIA. HOLE 9" LONG INTO EACH CURB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

* 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



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

GENERAL NOTES

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

HIGH-SPEED TRANSITION

SHEET 1 OF 2

Texas Department of Transportation — Design Division Standard

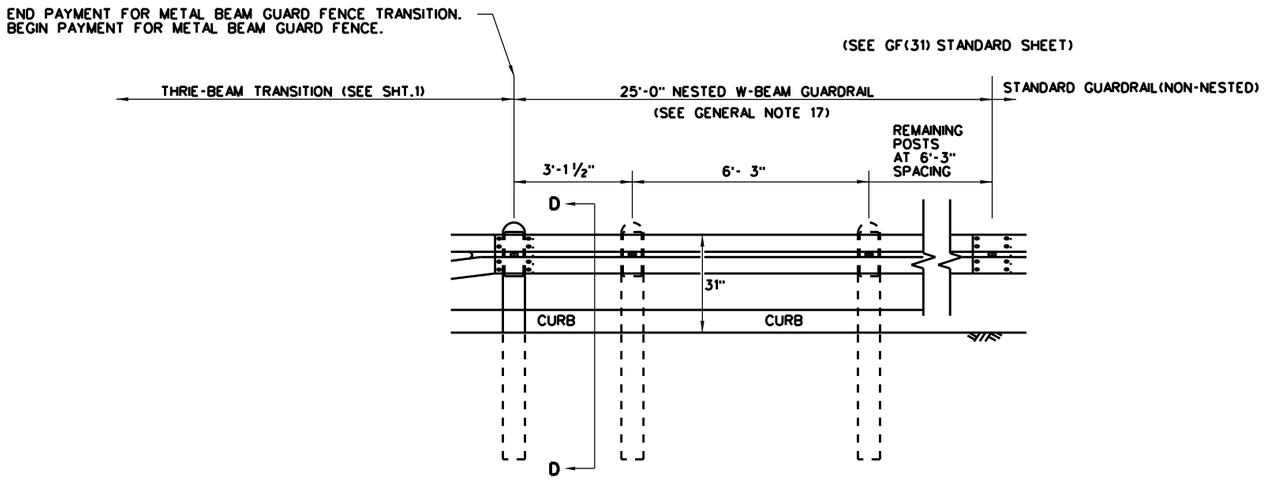
METAL BEAM GUARD FENCE THRIE-BEAM TRANSITION TL-3 MASH COMPLIANT

GF(31)TR TL3-20

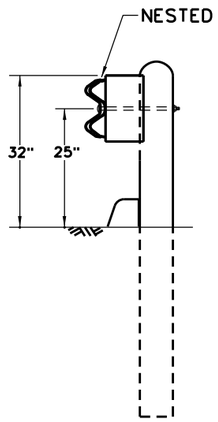
FILE: gf31trtl320.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		41

DATE:
FILE:

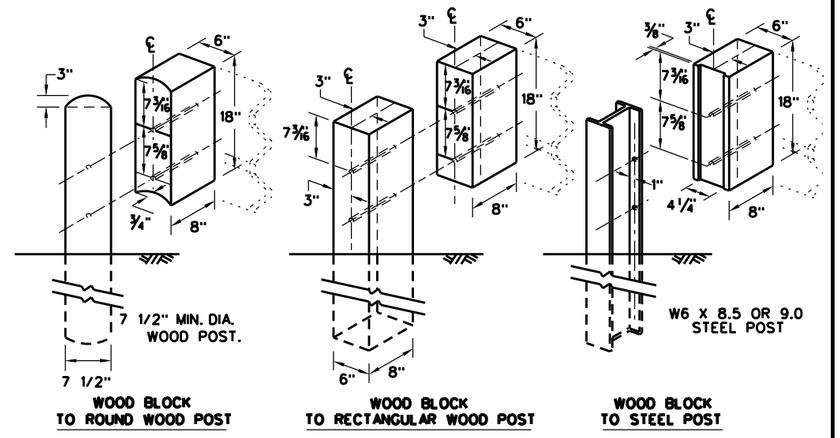
REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)



ELEVATION VIEW



SECTION D-D



THRIE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

Texas Department of Transportation

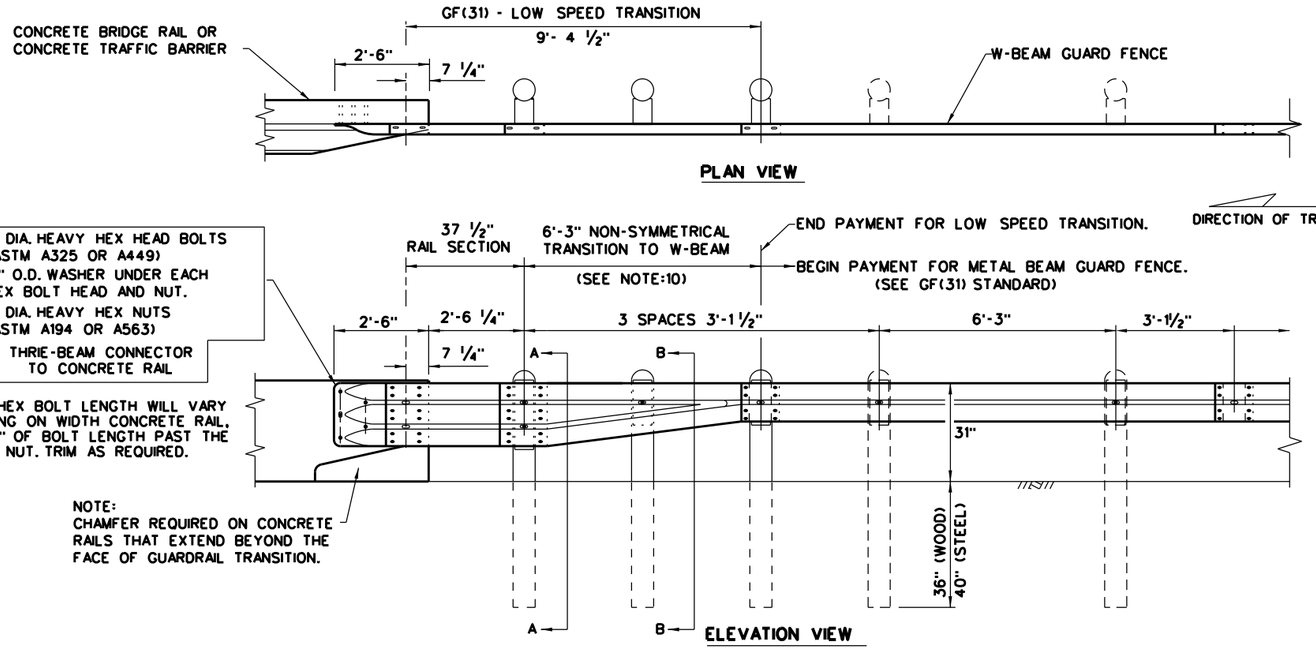
Design Division Standard

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

GF(31)TR TL3-20

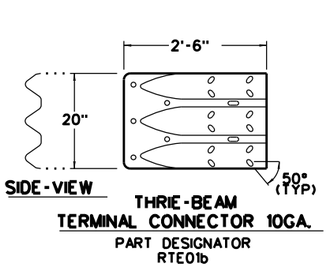
FILE: gf31trtl320.dgn	DN: TxDOT	CK: KM	DW: KM	CK: CGL/AG	
©TxDOT: NOVEMBER 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC		42	

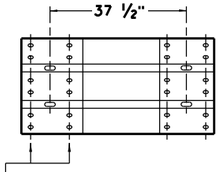
DATE:
FILE:

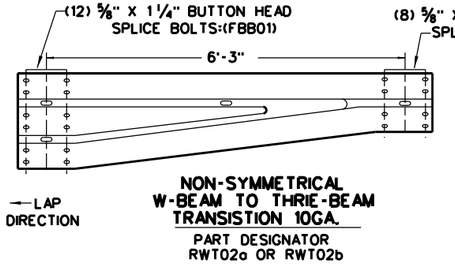


GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF TRANSITIONS SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. REFER TO GF(31)STANDARD SHEET.
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS.
3. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a)AND NOT MORE THAN 1" BEYOND IT. TRIM BOLT LENGTH TO MEET REQUIRED LENGTH.
5. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE TRANSITIONS.
7. WHERE SOLID ROCK IS ENCOUNTERED, CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
8. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT, MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL CAN FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO GF(31)STANDARD SHEET & BRIDGE RAILING DETAILS FOR ADDITIONAL DETAILS.
10. FOR ROUND WOOD POSTS SYSTEMS, ALL ROUND WOOD POSTS SHALL BE 7 ½" DIA. MINIMUM THROUGHOUT THE TRANSITION.



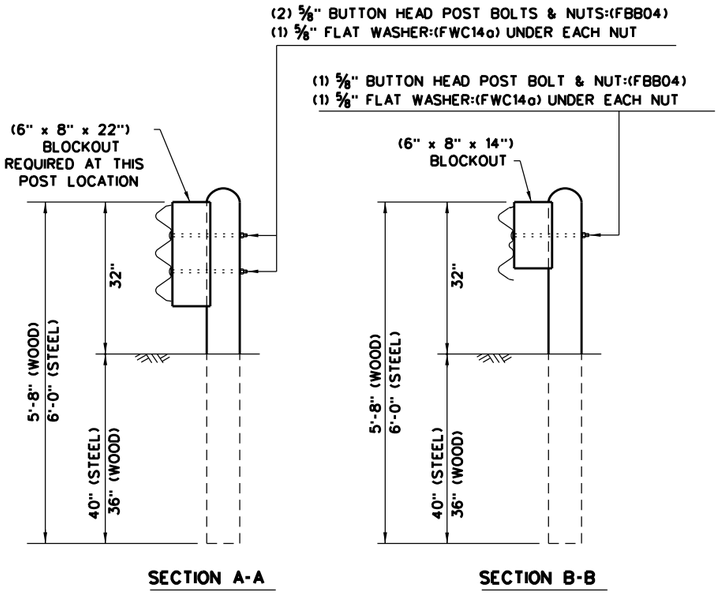




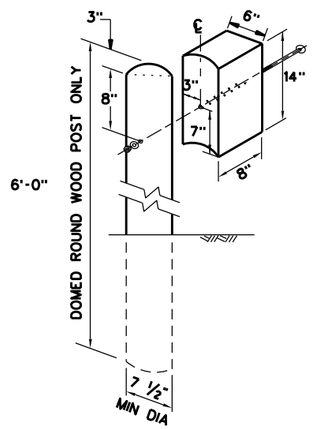
(12) ⅝" X 1 ¼" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS:(FBB01)
(12) RECTANGULAR GUARDRAIL PLATE WASHERS:(FWR03)

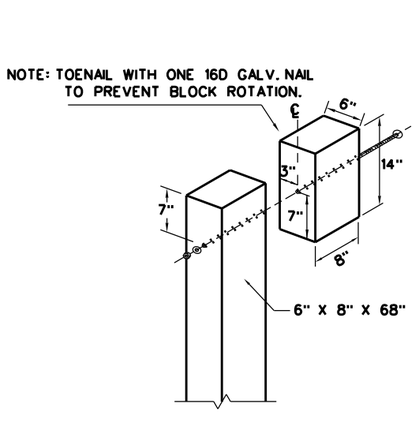
PLATE WASHER INSTRUCTIONS

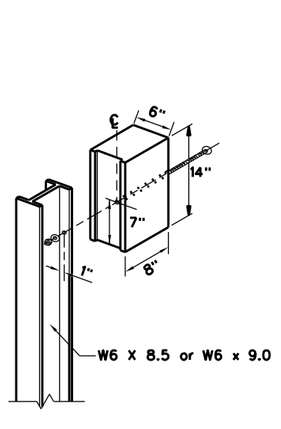
BRIDGE APPROACH - UPSTREAM: THE SHORT RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



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







LOW-SPEED TRANSITION

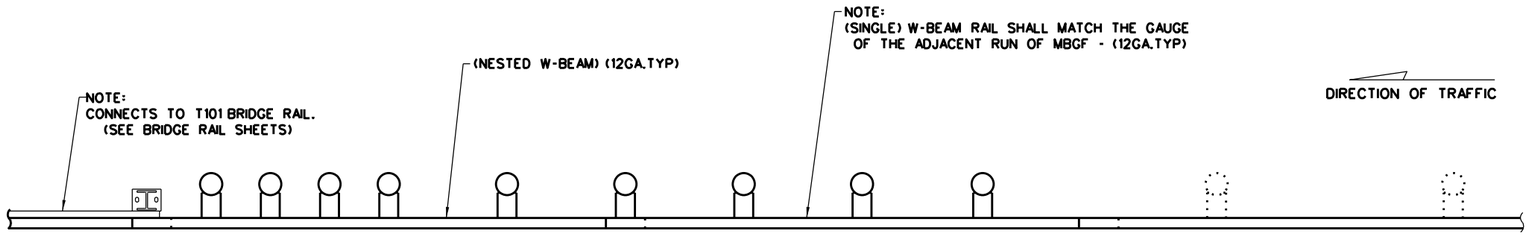
Texas Department of Transportation — Design Division Standard

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

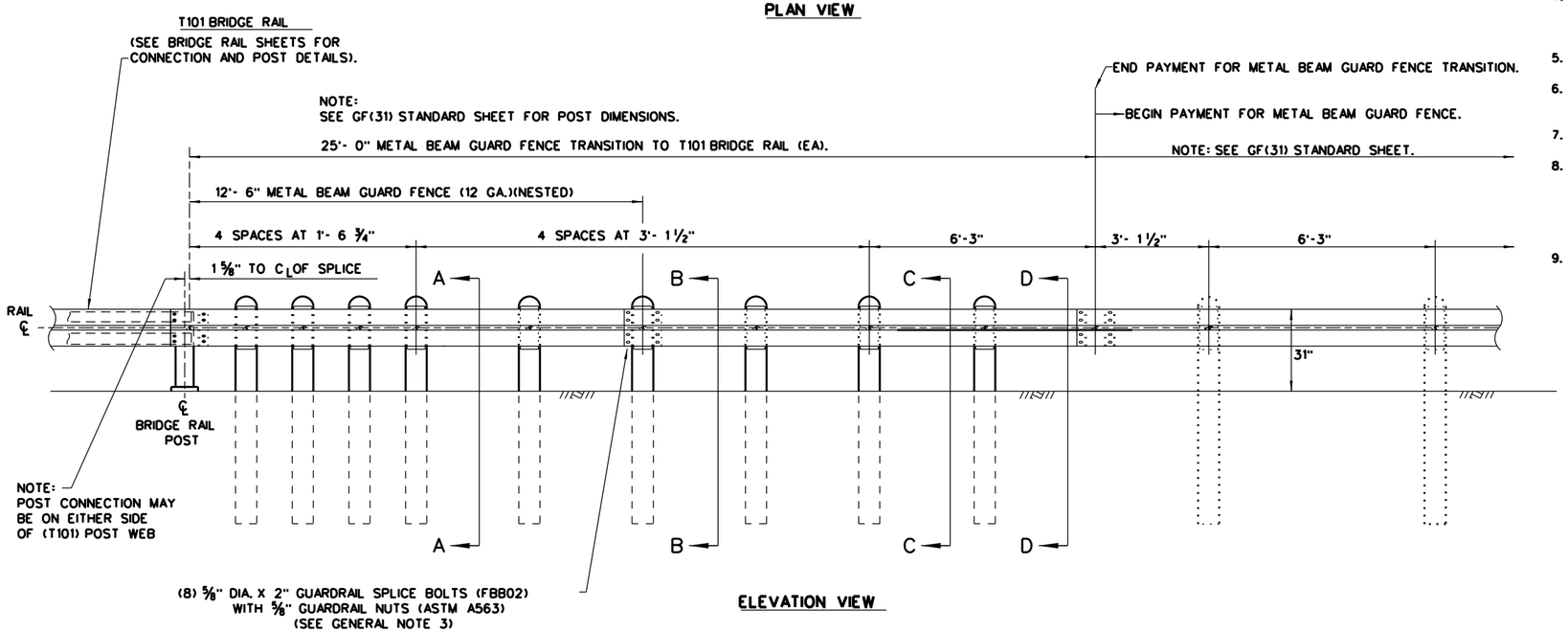
GF(31)TR TL2-19

FILE: gf31trtl219.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC		43	

DATE:
FILE:



PLAN VIEW

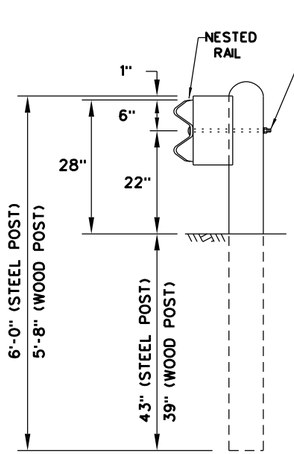


ELEVATION VIEW

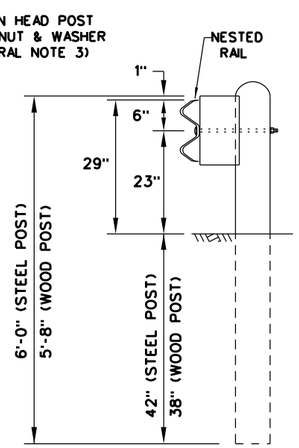
GENERAL NOTES

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 ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'- 1½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307 GR.A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1- 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. WHERE SOLID ROCK IS ENCOUNTERED. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO STANDARD GF(31) AND APPLICABLE BRIDGE RAILING STANDARD FOR ADDITIONAL DETAILS.

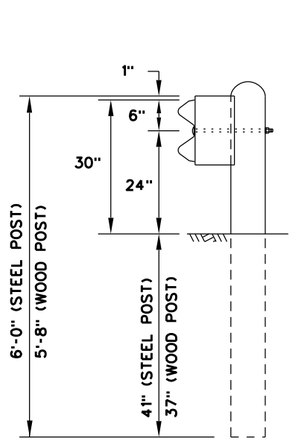
* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



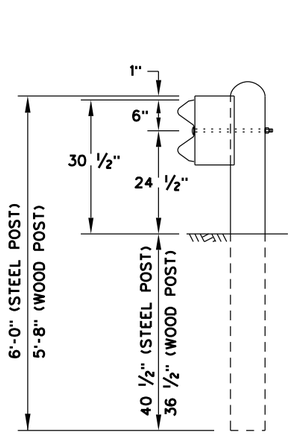
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

Texas Department of Transportation

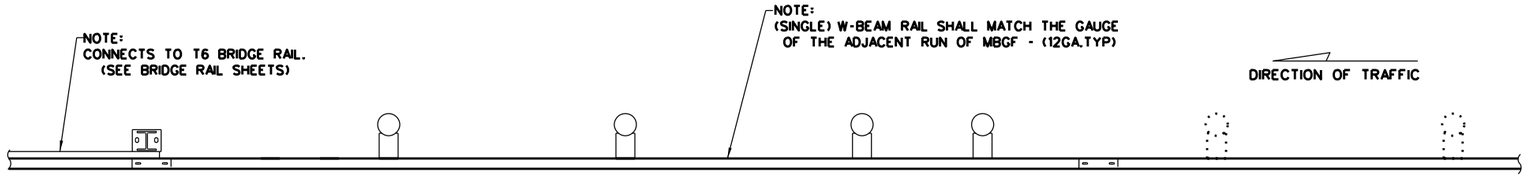
Design Division Standard

METAL BEAM GUARD FENCE TRANSITION (T101)

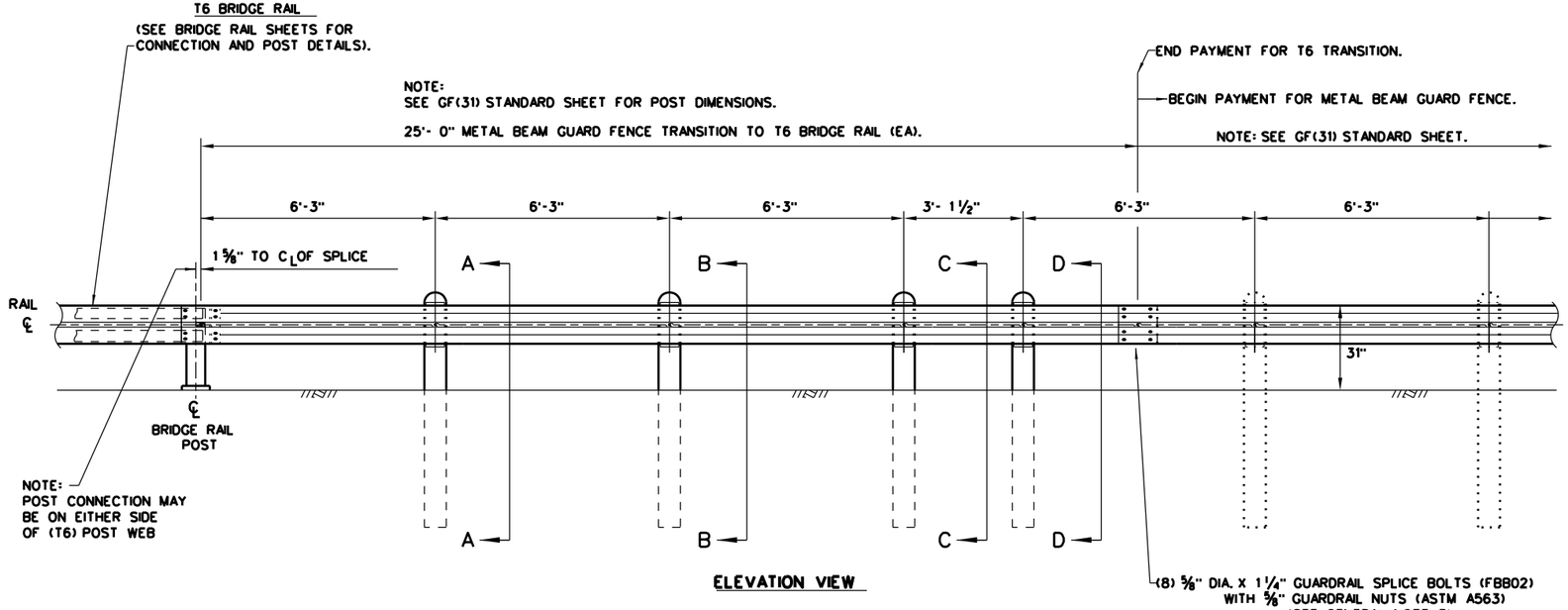
GF(31)T101-19

FILE: gf31t10119	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		44

DATE:
FILE:



PLAN VIEW

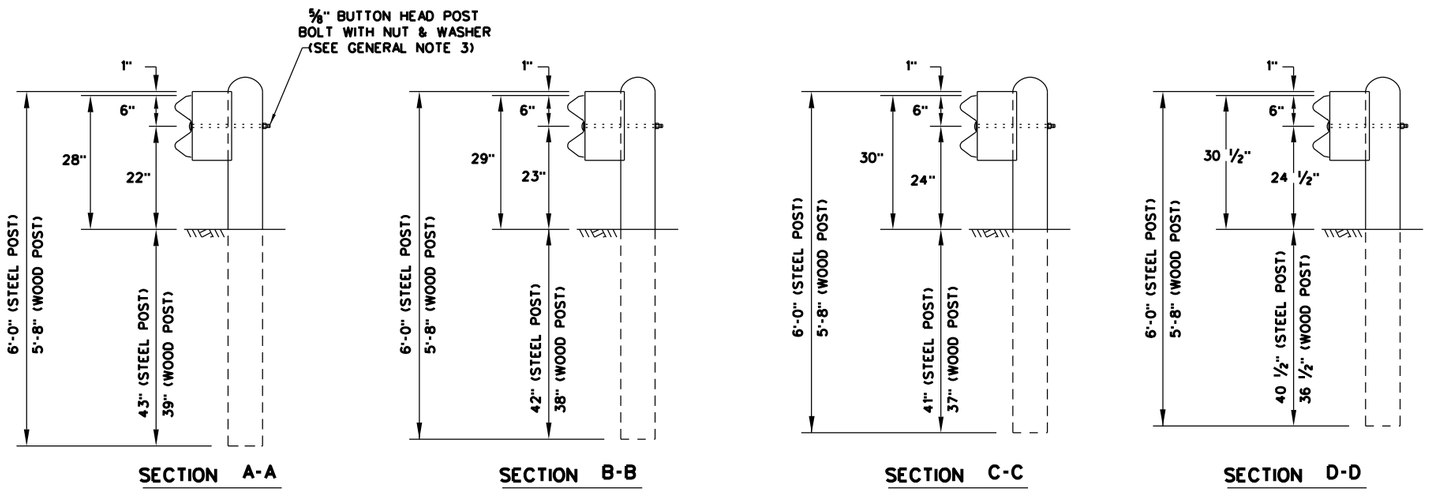


ELEVATION VIEW

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 ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'- 1½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307 GR.A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND ⅝" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE ⅝" X 1- ¼" WITH ⅝" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. WHERE SOLID ROCK IS ENCOUNTERED. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE. (512) 416-2678
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
9. REFER TO STANDARD GF(31) & APPLICABLE BRIDGE RAILING STANDARD FOR ADDITIONAL DETAILS.

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



Texas Department of Transportation

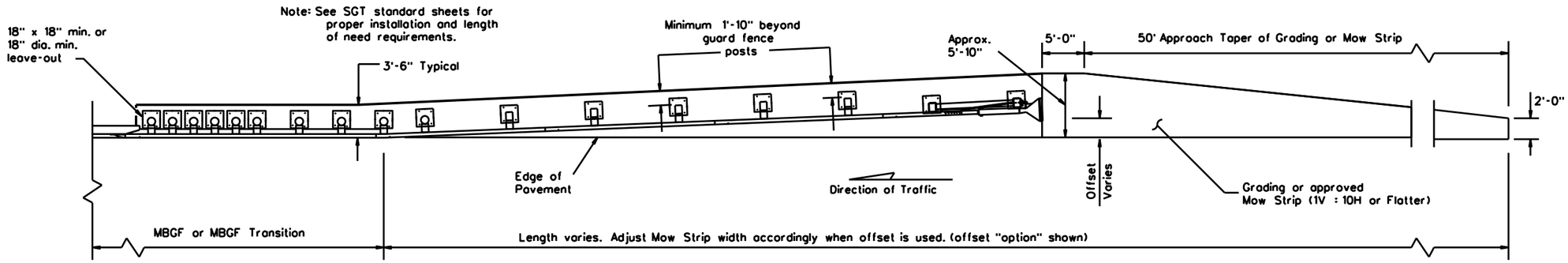
Design Division Standard

METAL BEAM GUARD FENCE TRANSITION (T6)

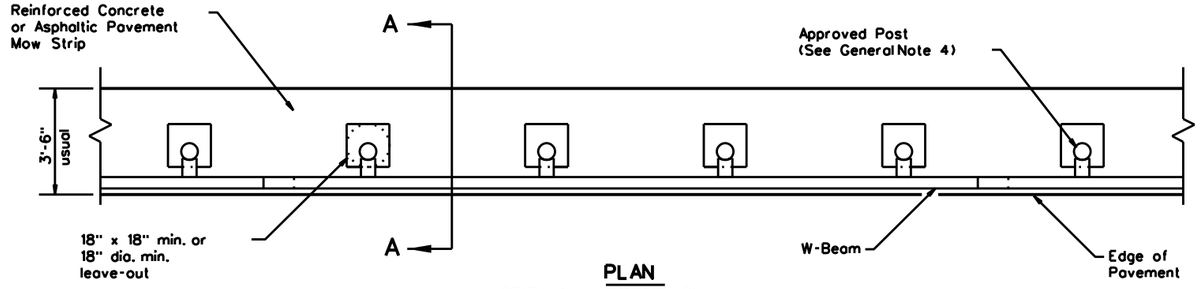
GF(31)T6-19

FILE: gf31t619.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		45	

DATE:
FILE:

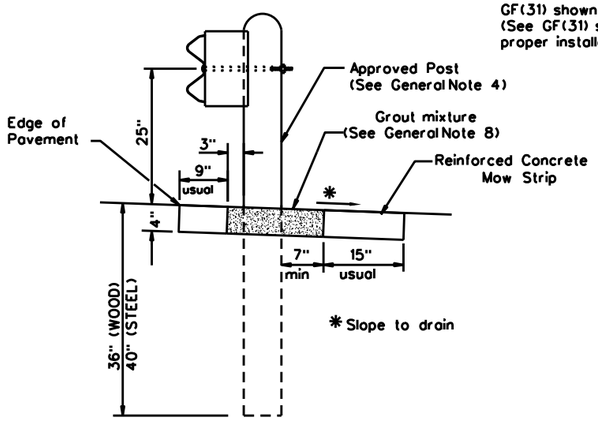


GRADING AND MOW STRIP AT GUARDRAIL END TREATMENTS



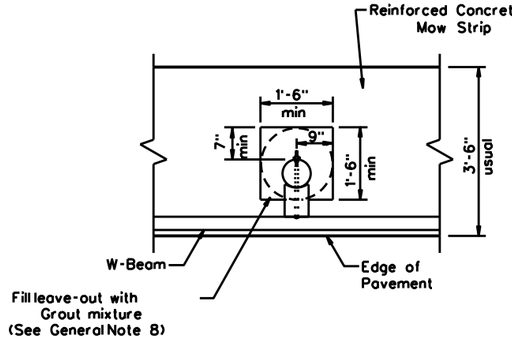
PLAN

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



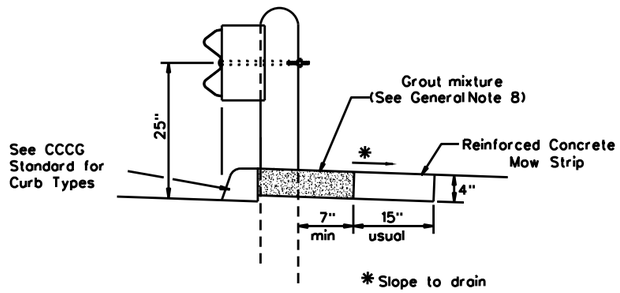
SECTION A-A

Typical



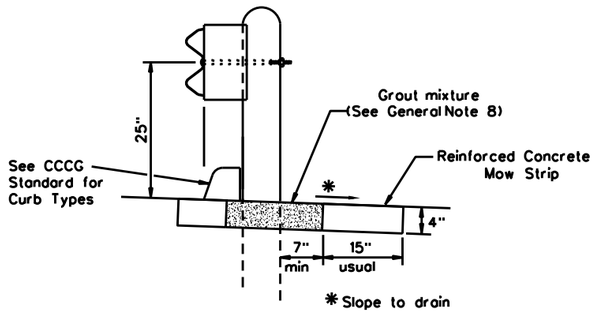
MOW STRIP DETAIL

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



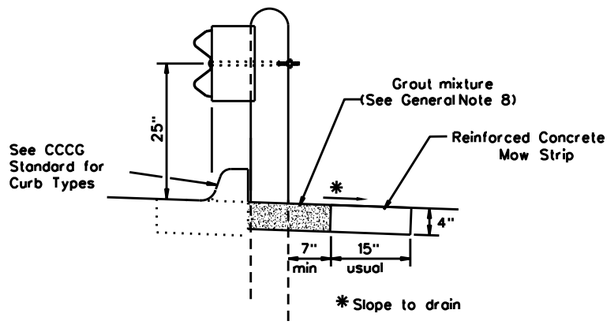
CURB OPTION (1)

This option will increase the post embedment throughout the system.



CURB OPTION (2)

Curb shown on top of mow strip



CURB OPTION (3)

Note: Site Condition(s)

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

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

GENERAL NOTES

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

Texas Department of Transportation

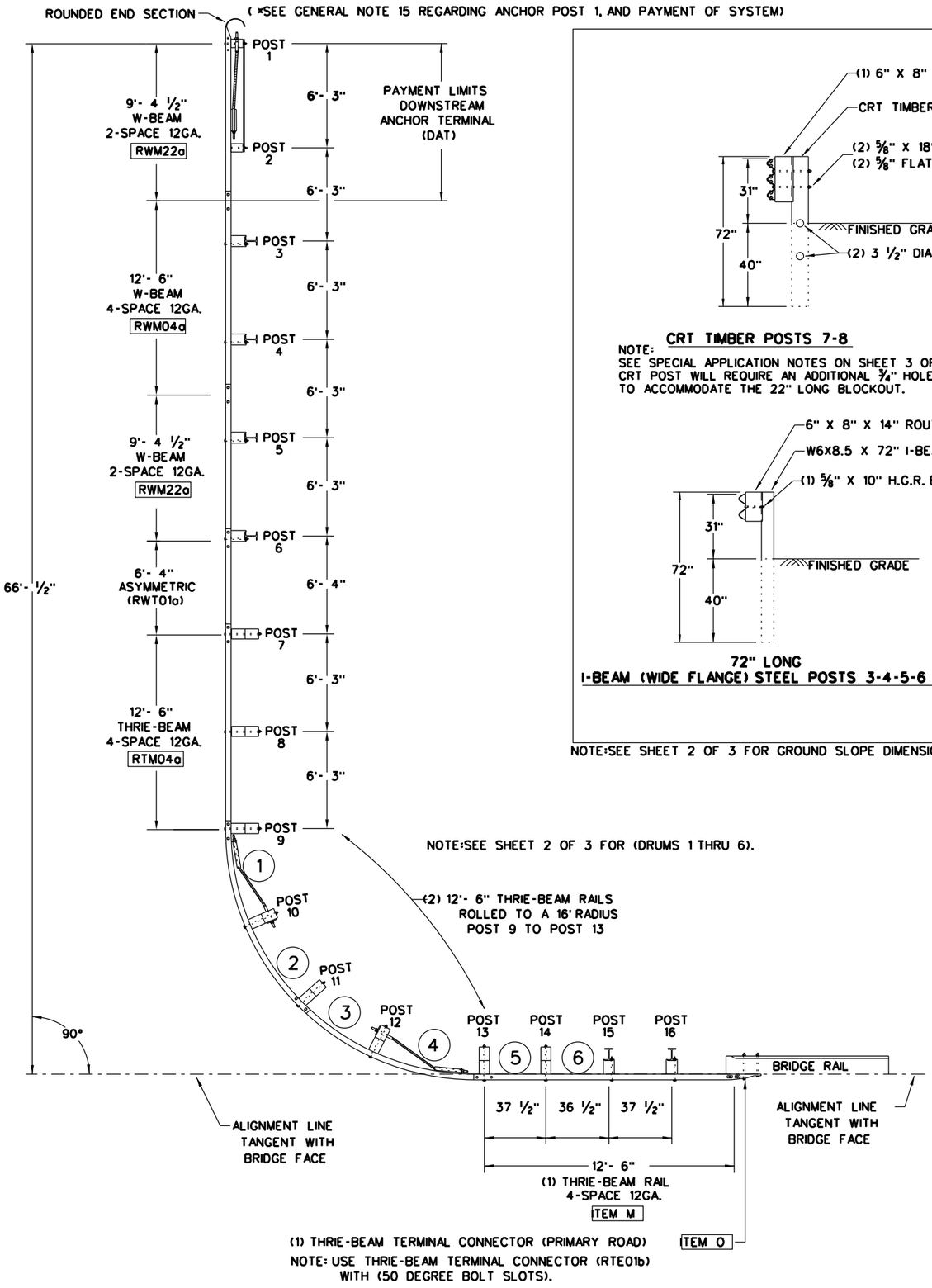
Design Division Standard

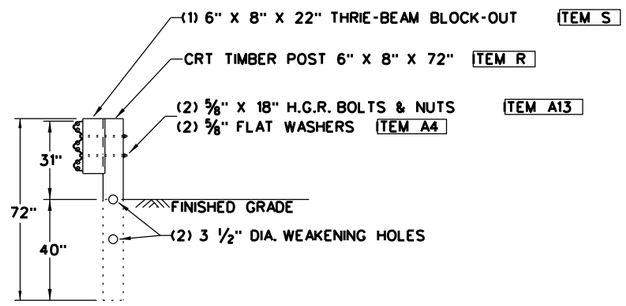
METAL BEAM GUARD FENCE (MOW STRIP) TL-3 MASH COMPLIANT

GF(31)MS-19

FILE: gf31ms19.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		46

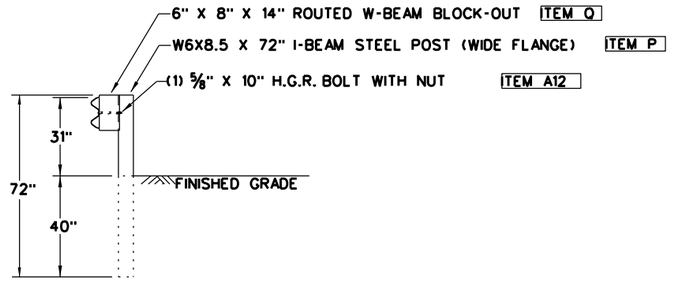
DATE:
FILE:



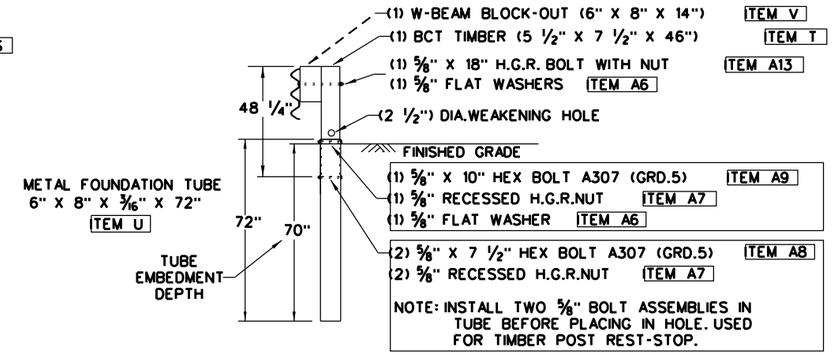


CRT TIMBER POSTS 7-8

NOTE:
SEE SPECIAL APPLICATION NOTES ON SHEET 3 OF 3.
CRT POST WILL REQUIRE AN ADDITIONAL 3/4" HOLE TO ACCOMMODATE THE 22" LONG BLOCKOUT.



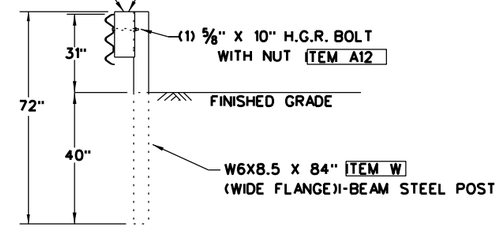
72" LONG
I-BEAM (WIDE FLANGE) STEEL POSTS 3-4-5-6



BCT TIMBER POSTS WITH METAL FOUNDATION TUBES
9-10-11-12-13-14

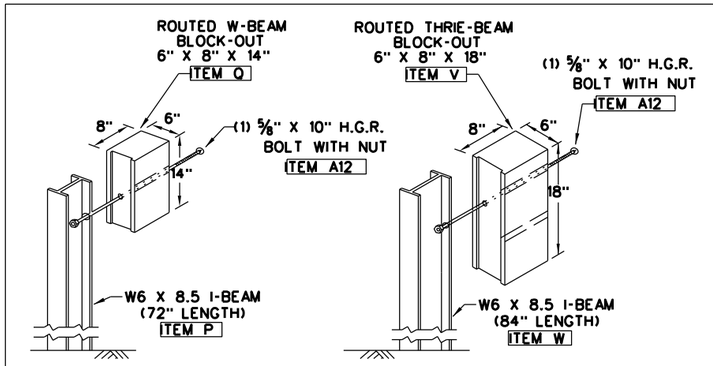
NOTE:
FOR I-BEAM (POST 15) ITEM V
USE (1) 6" X 8" X 14"
ROUTED WOOD BLOCK-OUT ITEM A9
(1) H.G.R. BOLT & NUT

NOTE:
FOR I-BEAM (POST 16) ITEM X
USE (1) 6" X 8" X 18"
ROUTED WOOD BLOCK-OUT ITEM A9
(1) H.G.R. BOLT & NUT



84" LONG
I-BEAM WIDE FLANGE STEEL POSTS 15-16

NOTE:SEE SHEET 2 OF 3 FOR GROUND SLOPE DIMENSIONS.



POST 3-4-5-6-15 **POST 16**

INSTALLATION DETAIL
ROUTED WOOD BLOCK-OUT WITH WIDE FLANGE STEEL POST

NOTE:
POST SYSTEM USES TWO TYPES OF 14" WOOD BLOCK-OUTS.
FOR CRT & BCT WOOD POSTS USE: (PDB01a)
FOR I-BEAM STEEL POSTS USE: (PDB01b)

POST (3-4-5-6) USE: 14" BLOCK-OUT (PDB01b)
POST (7-8) USE: 22" BLOCK-OUT (PDB02)
POST (9 THRU 14) USE: 14" BLOCK-OUT (PDB01a)
POST (15) USE: 14" BLOCK-OUT (PDB01b)
POST (16) USE: 18" BLOCK-OUT (PDB01)

(MASH TL-2 COMPLIANT)
TESTED TO MASH TL-2 WITH A 3:1 SLOPE

SHEET 1 OF 3

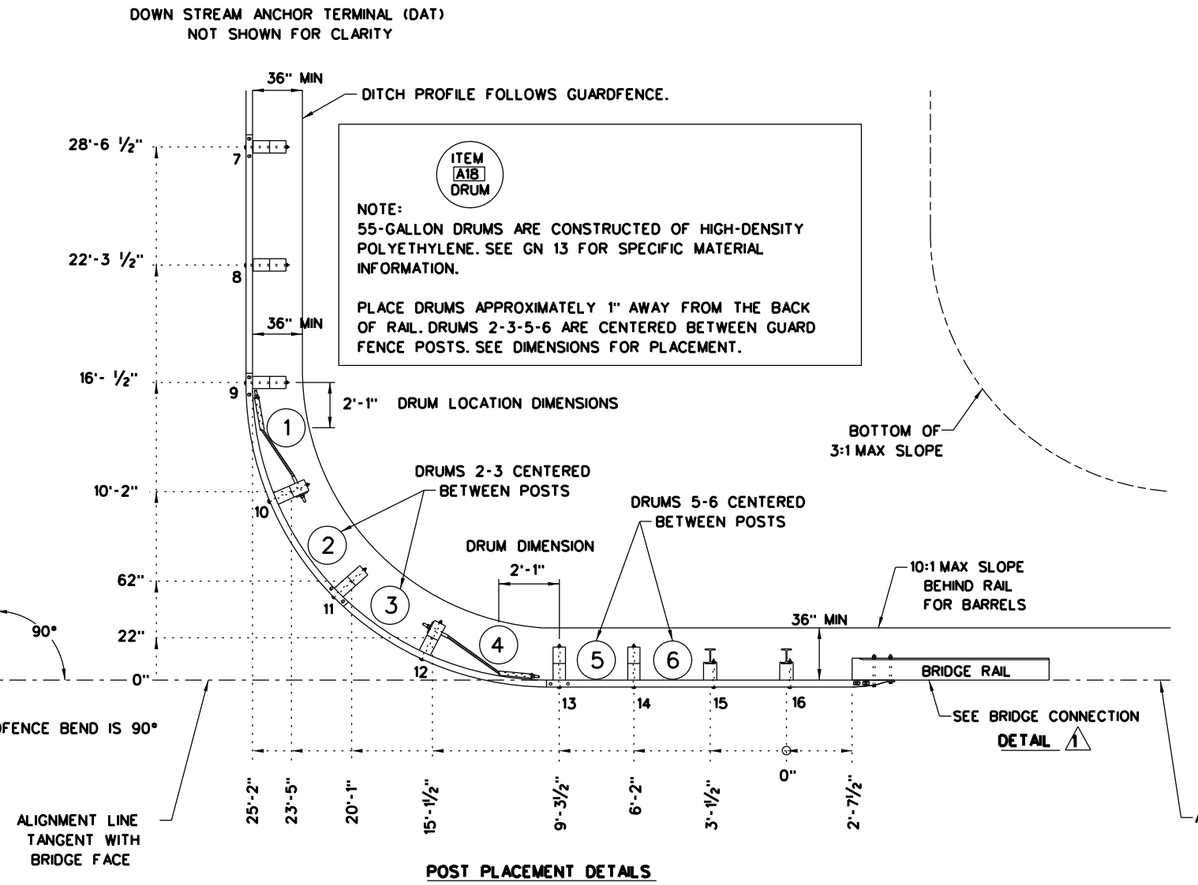
Texas Department of Transportation | Design Division Standard

TL-2
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

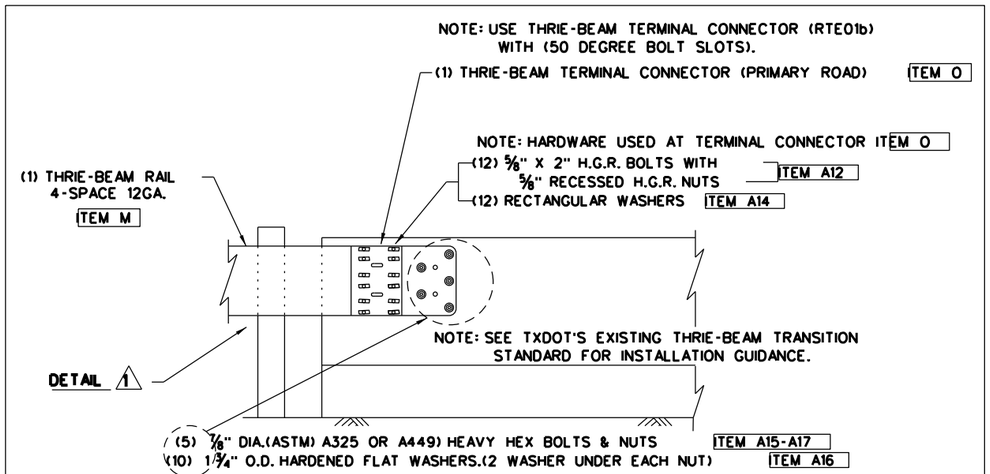
SRG(TL-2)-21

FILE: srgtl221	TxDOT	CK:KM	DN:VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		47

DATE:
FILE:



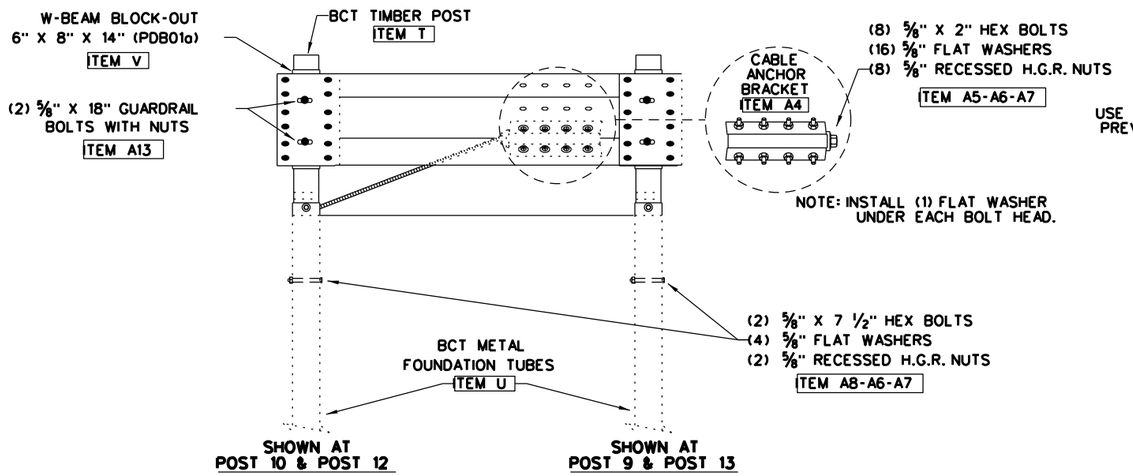
POST PLACEMENT DETAILS

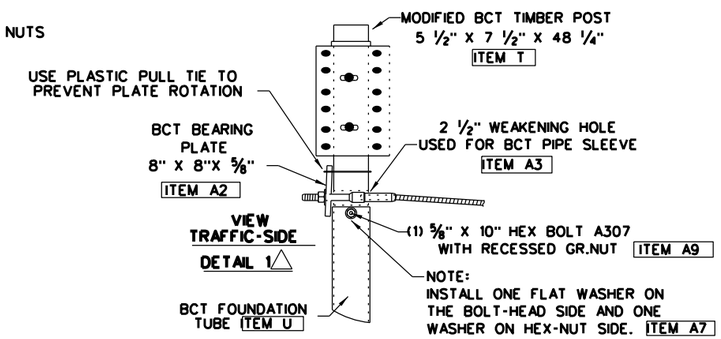


NOTE: TO ACCOMMODATE THE THRIE-BEAM TERMINAL CONNECTOR AT THE ROADWAY BRIDGE RAIL. DRILL (5) 1" DIA. HOLES. USE CONNECTOR PLATE FOR HOLE LOCATION TEMPLATE.

NOTE: BOLTS SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE BRIDGE-RAIL, WASHER & HEX NUT. INSTALL WITH BOLT HEADS ON TRAFFIC-SIDE. (LENGTH OF THE BOLTS SHALL BE VERIFIED BY CONTRACTOR PRIOR TO ORDERING.)

PRIMARY ROADWAY BRIDGE-RAIL DETAIL





SHOWN AT POST 10 & POST 12

BCT TIMBER POST WITH METAL FOUNDATION TUBE

(MASH TL-2 COMPLIANT)
TESTED TO MASH TL-2 WITH A 3:1 SLOPE

Texas Department of Transportation | Design Division Standard

TL-2
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

SRG(TL-2)-21

FILE: srgtl221	TxDOT	CK:KM	DN:VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		48

ITEM	ALL LARGE & SMALL COMPONENT DESCRIPTIONS	TL-2 DOWNSTREAM ANCHOR TERMINAL (DAT) ☐ (PAYABLE BY EA.) ITEM	QTY	TL-2 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM (INCL DAT) △ (ALL PAY ITEMS) ITEM	TOTAL QTY
A	POST 1& 2 BCT TIMBER (5 ½" X 7 ½" X 48 ¼") (PDF01)	A	2	A	2
B	POST 1& 2 BCT TUBE (6" X 8" X 3/16" X 72" LENGTH) (PTE05)	B	2	B	2
C	POST 1& 2 CHANNEL STRUTS (C3 X 5 X 80") A36	C	2	C	2
D	POST 1 SHELF ANGLE BRACKET (6" X 7 ½" X ¼") SEE DAT DETAIL	D	1	D	1
E	POST 1 BCT POST SLEEVE (FMM02a)	E	1	E	1
F	POST 1 BCT CABLE BEARING PLATE (⅝" X 8" X 8") (FPB01)	F	1	F	1
G	BCT CABLE ANCHOR ASSEMBLIES (¾" X 6'-6 ¾" LENGTH) (FCA01)	G	1	G	1
H	W-BEAM RAIL (ROUNDED END ANCHOR-TYPE) 12GA. (RWE03a)	H	1	H	1
I	W-BEAM RAIL (LENGTH 9'-4 ½") 12GA. (RWM22a)	I	2	I	2
J	W-BEAM RAIL (LENGTH 12'-6") 12GA.(4 SPACE) (RWM04a)			J	1
K	W-BEAM RAIL (LENGTH 9'-4 ½") 12GA. (RWM22a)			K	1
L	W-BEAM TO THRIE-BEAM ASYMMETRIC RAIL (RWT01a). (LENGTH 6'-4")			L	1
M	THRIE-BEAM RAIL (LENGTH 12'-6") 12GA. (4 SPACE) (RTM04a)			M	1
N	THRIE-BEAM RAIL (LENGTH 12'-6") 12GA. (16' RADIUS) (RTM02a)			N	2
O	THRIE BEAM RAIL (TERMINAL CONNECTOR) (BRIDGE-RAIL) (RTE01b)			O	1
P	POSTS 3,4,5,6 I-BEAM POSTS (LENGTH W6X8.5 X 72") (PWE01)			P	4
Q	POSTS 3,4,5,6,15 ROUTED W-BEAM BLOCK-OUTS (6" X 8" X 14") (PDB01b)			Q	5
R	POSTS 7,8 CRT TIMBER POSTS (LENGTH 6" X 8" X 72") (PDE09)			R	2
S	POSTS 7,8 THRIE-BEAM BLOCK-OUTS (6" X 8" X 22") (PDB02a)			S	2
T	POSTS 9,10,11,12,13,14 BCT TIMBER (5 ½" X 7 ½" X 46") (PDF04)			T	6
U	POSTS 9,10,11,12,13,14 BCT TUBE (6" X 8" X 3/16" X 72") (PTE05)			U	6
V	POSTS 9,10,11,12,13,14, W-BEAM BLOCK-OUTS (6" X 8" X 14") (PDB01a)			V	6
W	POSTS 15,16 I-BEAM POSTS (LENGTH W6X8.5 X 84") (PWE07)			W	2
X	POSTS 16 ROUTED THRIE-BEAM BLOCK-OUT (6" X 8" X 18") (PDB01)			X	1
A1	MODIFIED BCT CABLE ANCHOR ASSEMBLIES (¾" X LENGTH 5'-5")			A1	2
A2	BCT CABLE BEARING PLATE (⅝" X 8" X 8") (POST 10 & POST 12) (FPB01)			A2	2
A3	BCT CABLE POST SLEEVE (POST 10 & POST 12) (FMM02)			A3	2
A4	BCT CABLE ANCHOR BRACKET (AT POST 9 & POST 13) (FPA01)			A4	2
A5	⅝" X 2" HEX BOLTS A307 GRD.5 (FOR CABLE ANCHOR BRACKETS)	A5	8	A5	24
A6	⅝" FLAT WASHER A307 GRD.5 (1 WASHER UNDER BOLT & 1 WASHER UNDER NUT)	A6	18	A6	48
A7	⅝" RECESSED H.G.R. NUTS (FOR ALL ⅝" BOLTS)	A7	20	A7	152
A8	⅝" X 7 ½" HEX BOLTS A307 GRD.5 BCT POSTS (9-10-11-12-13-14)	A8	4	A8	12
A9	⅝" X 10" HEX BOLTS A307 GRD.5 BCT POSTS (9-10-11-12-13-14)	A9	2	A9	6
A10	⅝" X 1 ¼" H.G.R. BOLTS SPLICES AT POST (2-3-4-5-6-7-9-11-13)(FBB01)	A10	4	A10	72
A11	⅝" X 2" H.G.R. BOLTS (ROUND TERM-POST 10-END SPLICE)(FBB02)			A11	18
A12	⅝" X 10" H.G.R. BOLTS (I-BEAM POSTS RAIL & BLOCKOUT)(FBB03)	A12	2	A12	10
A13	⅝" X 18" H.G.R. BOLTS (POSTS 9,10,11,12,13,14)(FBB04)			A13	10
A14	RECTANGULAR WASHERS (FWR03) (FOR TERMINAL CONNECTOR RTE01b)			A14	12
A15	⅞" X (LENGTH VARIES) HEX BOLTS A325 OR A449 GR.5			A15	5
A16	1 ¾" O.D. HARDENED FLAT WASHER A325			A16	10
A17	⅞" HEX NUT GR.5 A325			A17	5
A18	55 GALLON DRUM - FILLED WITH SAND 700-715lbs.			A18	6

GENERAL NOTES

1. FOR ADDITIONAL INSTALLATION INFORMATION AND GUIDANCE CONTACT: TEXAS DEPARTMENT OF TRANSPORTATION, (TXDOT'S DESIGN DIVISION).(512) 416-2678. THE EXACT POSITION OF MBGF SHALL BE SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SIGHT DISTANCE OF THE INSTALLATION WILL NEED TO BE VERIFIED WITH RESPECT TO THE SPECIFIC SITE PLACEMENT.

2. STEEL POSTS ARE NOT PERMITTED AT CRT OR BCT POST POSITIONS.

3. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12 ½" OR 25 FOOT NOMINAL LENGTHS.

4. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND TYPE A (1 ¾" O.D.) WASHER AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE ⅝" X 1 ¼" OR 2" LONG AT TRIPLE RAIL SPLICES WITH A DOUBLE RECESSED NUT (ASTM A563).

5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.

6. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.

7. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A SLOPE RATE OF NOT MORE THAN 1V:10H.

8. IT IS NOT RECOMMENDED THAT GUARD FENCE BE PLACED IN THE VICINITY OF CURBS.

9. GUARDRAIL POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.

10. SPECIAL RAIL FABRICATION WILL BE REQUIRED FOR THRIE BEAM RAIL RADIUS (ITEM J).

11. ALL MATERIAL AND WORK INVOLVED IS SUBSIDIARY TO SHORT RADIUS BID ITEM, INCLUDING, BUT NOT LIMITED TO FOUNDATIONS, GRADING, THRIE BEAM RAIL, SAND DRUMS, AND OTHER PARTS.

12. ALL CABLE ASSEMBLIES SHOULD BE TAUT AFTER INSTALLATION. WHEN CABLES ARE MANIPULATED BY HAND THE CABLES SHOULD NOT MOVE MORE THAN 1" IN ANY DIRECTION PERPENDICULAR TO THE CABLE.

13. THE DRUMS ARE EAGLE MODEL 1656 FILLED WITH 715 LB (+/-15) SAND WITH THE PLASTIC LEVER-LOCK; OR AN APPROVED EQUIVALENT. THE APPROXIMATE HEIGHT OF THE DRUM IS 37" (+/-).

14. WHEN THE SHORT RADIUS SYSTEM IS TERMINATED BY A DAT, REFER TO THE LATEST DAT STANDARD FOR INSTALLATION OF THE DAT SYSTEM. IF THE SYSTEM IS TERMINATED BY ANOTHER END TERMINAL SYSTEM, REFER TO THE CORRESPONDING END TERMINAL STANDARD.

× 15. WHEN THE PLANNED LOCATION OF POST (1) IS WITHIN THE RIGHT-OF-WAY AND WITHIN THE CLEAR ZONE OF THE DIRECTION OF THE OPPOSING TRAFFIC, AN APPROPRIATE CRASHWORTHY END TERMINAL SHALL BE INSTALLED IN PLACE OF THE DOWNSTREAM ANCHOR TERMINAL (DAT). THE PAYMENT OF THE COMPLETE SHORT RADIUS SYSTEM WITH A DAT AT THE TERMINUS WILL BE WITH BID ITEMS: 540 6016 DOWNSTREAM ANCHOR TERMINAL SECTION, AND 540 6046 TL-2 31" SHORT RADIUS (W/O DAT). THE PAYMENT OF THE SYSTEM TERMINATED BY A CRASHWORTHY END TERMINAL (IN LIEU OF THE DAT) WILL BE WITH BID ITEMS: 540 6046 TL-2 31" SHORT RADIUS (W/O DAT), AND 544 6001 GUARDRAIL END TREATMENT (INSTALL).

16. TESTED TO MASH WITH A 3:1 SLOPE OR SHALLOWER IS PREFERABLE IN THE LIMITS OF THE TOP AND BOTTOM OF THE SLOPE AS SHOWN IN THE PLAN VIEW. IF FIELD CONDITIONS REQUIRE A STEEPER SLOPE,THIS MAY BE ALLOWABLE UP TO A 2:1 SLOPE. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE.

NOTE: SEE SHEET 1 OF 3.

SPECIAL APPLICATION NOTES.

1. THIS IS A MASH COMPLIANT TL-2 SHORT RADIUS GUARDRAIL SYSTEM 31 INCHES TALL. THE SYSTEM REQUIRES A MINIMUM PLACEMENT FOOTPRINT OF 35' ALONG THE PRIMARY ROAD AND 30' ALONG THE SECONDARY DRIVEWAY.

2. THE SYSTEM ALSO REQUIRES A MINIMUM 3' WIDE (WORK ZONE) DIRECTLY BEHIND THE GUARDRAIL SYSTEM, WITH A SLOPE AT 1V:10H, FROM THERE A 3:1 SLOPE IS RECOMMENDED. SEE SHEET 2 OF 3 FOR SLOPE DETAILS.

3. NOTE FOR INSTALLER: THE TWO (2) CRT POSTS ITEM (R), AT POST LOCATIONS 7 & 8.), WILL REQUIRE THE FOLLOWING FIELD ADJUSTMENT. USING A ¾" X 10" LONG SPADE BIT DRILL ONE (1) ADDITIONAL HOLE 7-⅞" DIRECTLY BELOW THE EXISTING TOP HOLE TO ACCOMMODATE THE HARDWARE FOR THE 22" LONG BLOCKOUT.

   OPTION FOR ADDITIONAL ¾" HOLE. THE 22" LONG BLOCKOUT (PDB01a) IS MANUFACTURED WITH TWO ¾" DRILLED HOLES FOR THE POST HARDWARE, THEREFORE THE BLOCKOUT CAN BE USED AS A TEMPLATE GUIDE FOR THE BOTTOM ¾" HOLE. AFTER INSTALLING THE CRT POST USE THE TOP HOLE TO MOUNT THE 22" LONG BLOCKOUT TO POST, USE THE BLOCKOUT'S PRE-DRILLED HOLE AS A GUIDE FOR THE BOTTOM ¾" HOLE.

(MASH TL-2 COMPLIANT)
TESTED TO MASH TL-2 WITH A 3:1 SLOPE

Texas Department of Transportation — Design Division Standard

TL-2
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

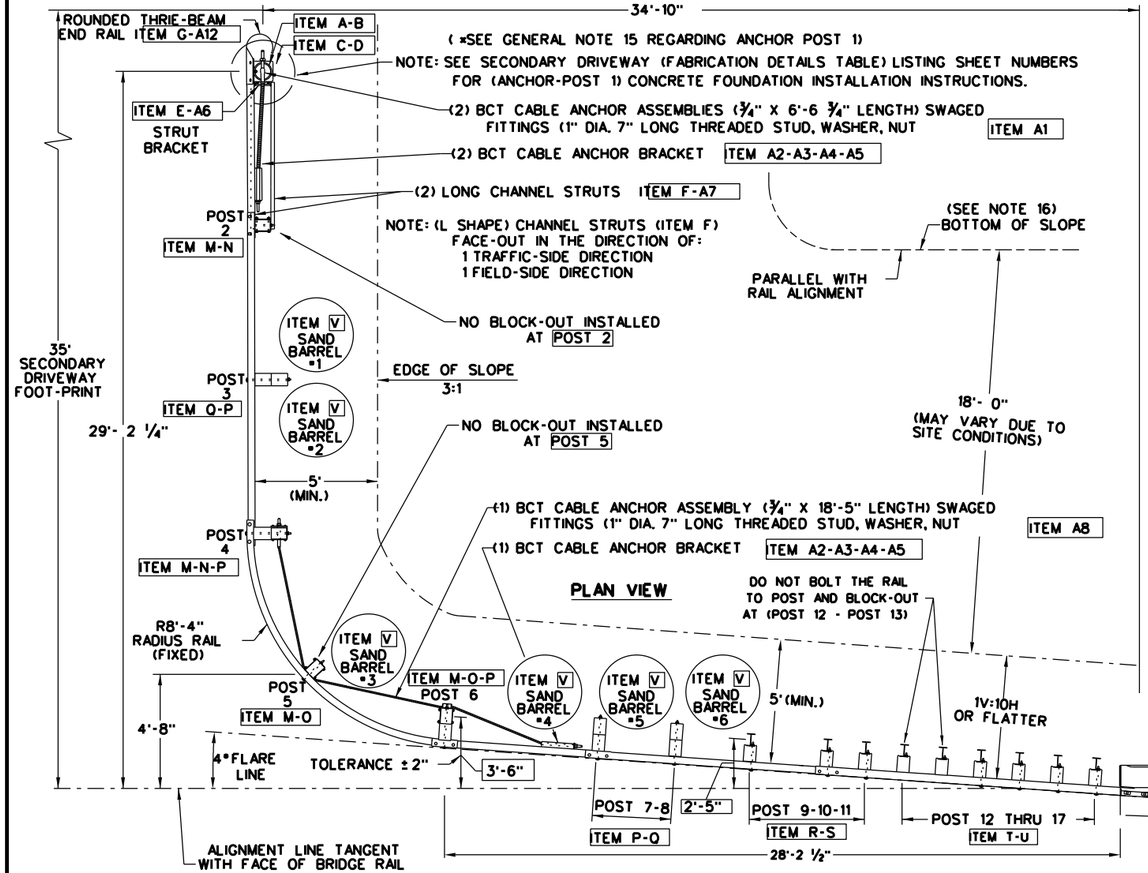
SRG(TL-2)-21

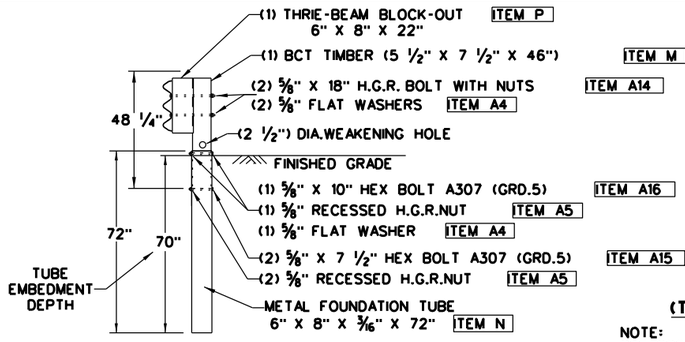
FILE: srgtl221	TxDOT	CK:KM	DN:VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		49

DATE:
FILE:

DISCLAIMER:
THE USE OF THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT". NO WARRANTY OF ANY KIND IS MADE BY TXDOT FOR ANY PURPOSE WHATSOEVER. TXDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

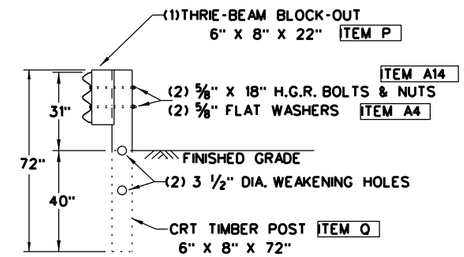
DATE:
FILE:





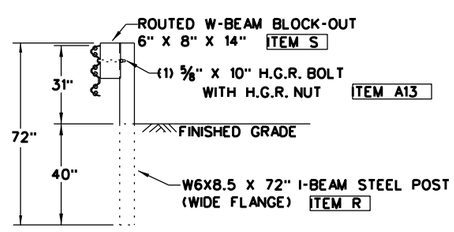
SECTION VIEW (A-A)
TIMBER POST WITH METAL FOUNDATION TUBE
(TYP) BCT POSTS 2-4-5-6

NOTE:
NO BLOCK-OUTS INSTALLED AT BCT POST 2 - POST 5

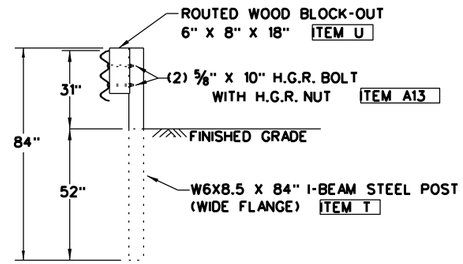


SECTION VIEW (B-B)
(TYP) CRT TIMBER POSTS 3-7-8

NOTE:
SEE SPECIAL APPLICATION NOTES ON SHEET 3 OF 3.
CRT POST WILL REQUIRE AN ADDITIONAL ¾" HOLE TO ACCOMMODATE THE 22" LONG BLOCKOUT.



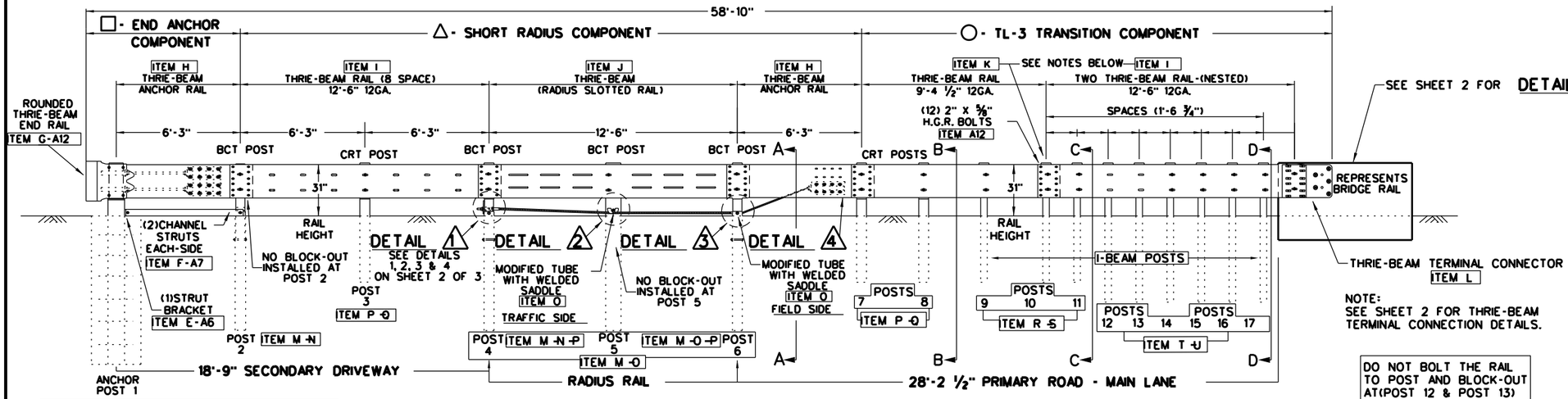
SECTION VIEW C-C
(TYP) AT POSTS 9-10-11



* SECTION VIEW D-D
(TYP) AT POSTS 12-13-14-15-16-17

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT(POST 12 & POST 13)

NOTE: FOR POST 12 & 13



NOTE:
SEE SHEET 2 FOR THRIE-BEAM TERMINAL CONNECTION DETAILS.

DO NOT BOLT THE RAIL TO POST AND BLOCK-OUT AT(POST 12 & POST 13)

NOTE: FOR POST 12 & 13

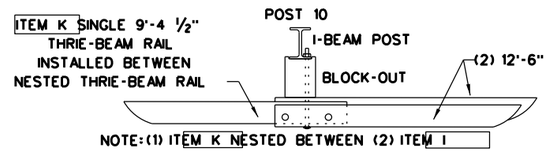
(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

ANCHOR POST 1 FABRICATION DETAILS	
SHEET DESCRIPTION	SHEET NUMBER
ANCHOR POST	SHEET 1 OF 8
ANCHOR SLEAVE	SHEET 2 OF 8
RADIUS RAIL	SHEET 3 OF 8
THRIE-BEAM RAILS	SHEET 4 OF 8
BCT TIMBER POST	SHEET 5 OF 8
STRUT RADIUS ANCHOR	SHEET 6 OF 8
FOUNDATION TUBE	SHEET 7 OF 8
ANCHOR CABLE	SHEET 8 OF 8

FULL-LENGTH ELEVATION VIEW

NOTE: ALL CABLE BRACKET ASSEMBLIES ARE LOCATED ON THE FIELD-SIDE. SHOWN HERE FOR CLARITY.

NOTE: FOR BCT POSTS 2-4-5-6 INSTALL (1) OR (2) ITEM A15-A4-A5 BOLT ASSEMBLIES TO PREVENT TIMBER POST SLIDING DOWN FOUNDATION TUBE.



NOTE: (1) ITEM K NESTED BETWEEN (2) ITEM I

NESTED-GUARDRAIL SPLICE AT POST 10

SHEET 1 OF 3

Texas Department of Transportation

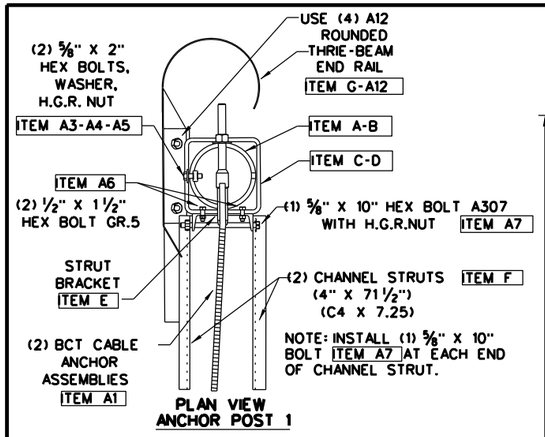
Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

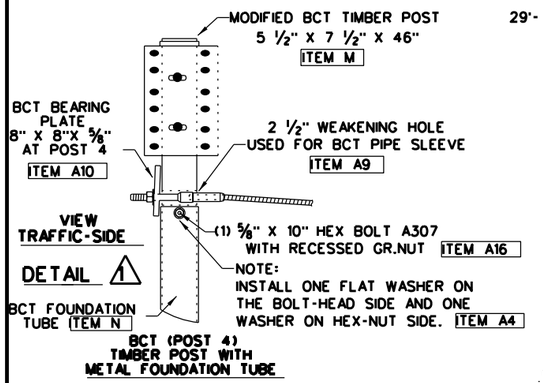
SRG(TL-3)-21

FILE: srgtl321	TxDOT	CK:KM	DN: VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		50

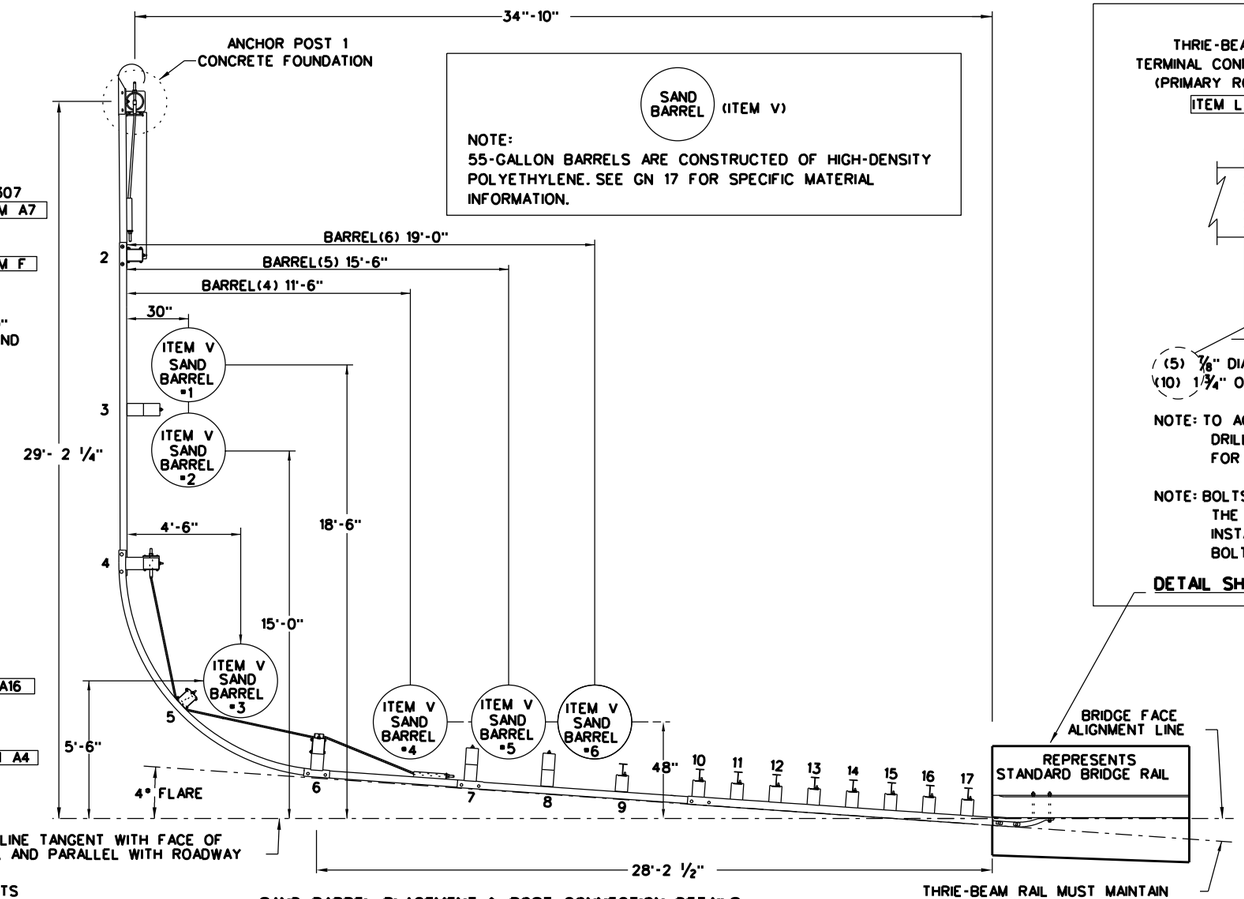
DATE:
FILE:



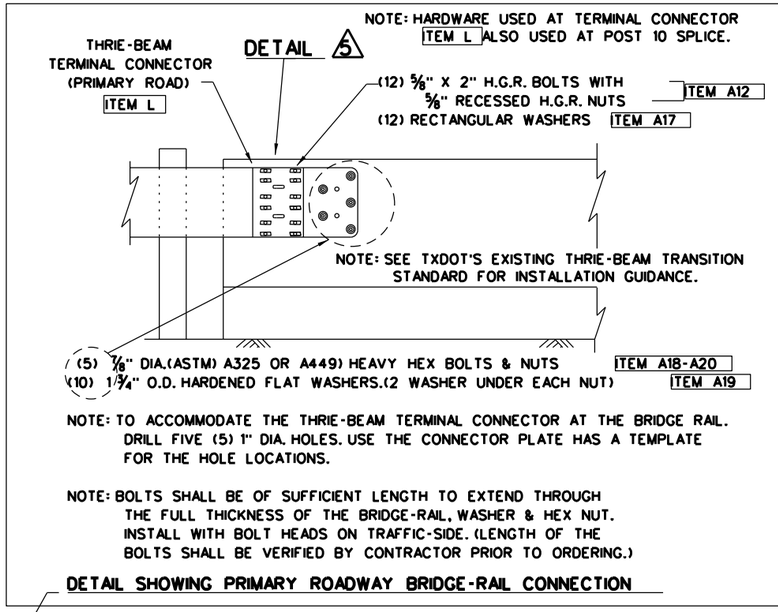
PLAN VIEW
ANCHOR POST 1



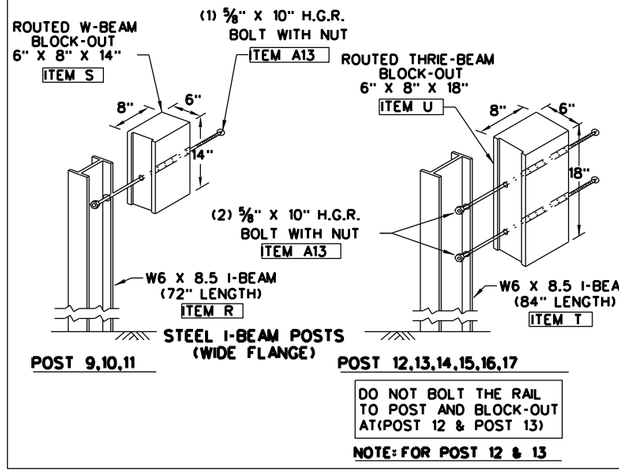
BCT (POST 4)
TIMBER POST WITH
METAL FOUNDATION TUBE

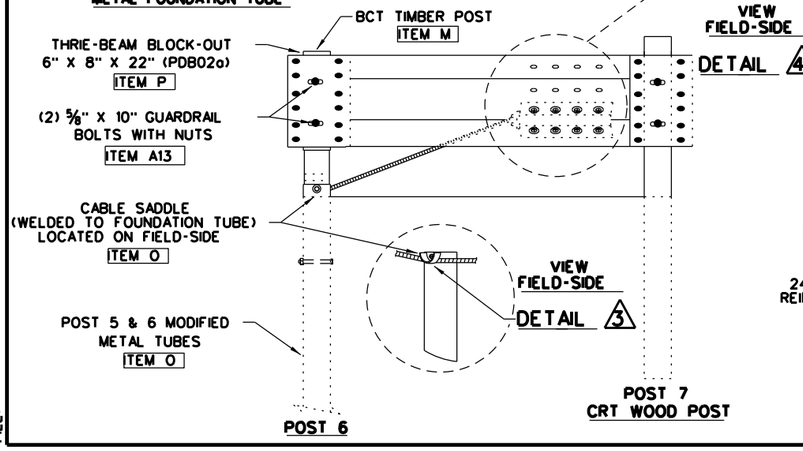


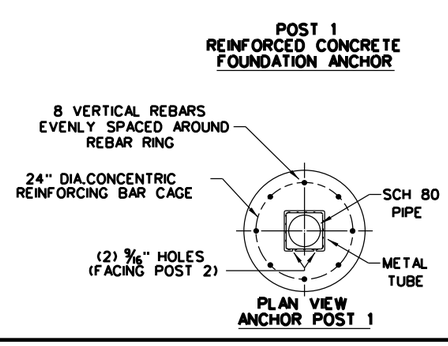
SAND BARREL PLACEMENT & POST CONNECTION DETAILS



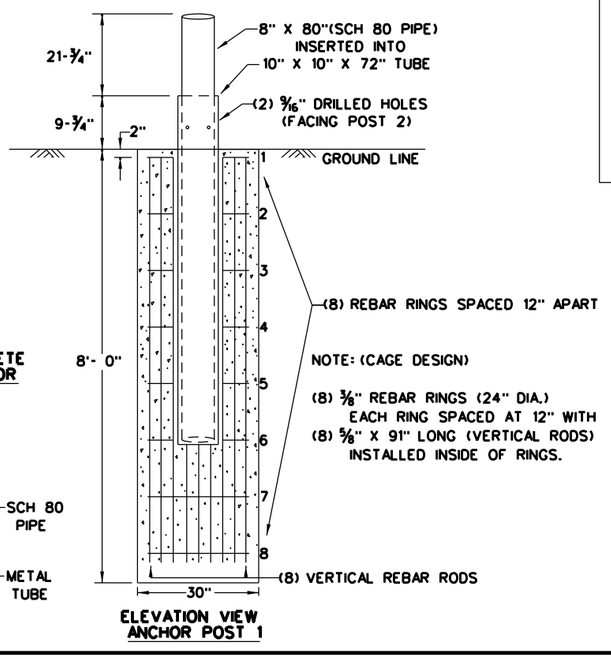
DETAIL SHOWING PRIMARY ROADWAY BRIDGE-RAIL CONNECTION







PLAN VIEW
ANCHOR POST 1



ELEVATION VIEW
ANCHOR POST 1

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

Texas Department of Transportation

Design Division Standard

TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

SRG(TL-3)-21

FILE: srgtl321	TxDOT	CK:KM	DN: VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		51

DATE:
FILE:

ITEM	ALL LARGE & SMALL COMPONENT DESCRIPTIONS	END ANCHOR (POST 1 & POST 2) □ ITEM	END ANCHOR (POST 1 & POST 2) □ QTY	TL-3 SHORT RADIUS (POST 2 TO POST 7) △ ITEM	TL-3 SHORT RADIUS (POST 2 TO POST 7) △ QTY	TL-3 TRANSITION (POST 7 TO POST 17) ○ ITEM	TL-3 TRANSITION (POST 7 TO POST 17) ○ QTY	TL-3 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM ITEM	TL-3 SHORT RADIUS GUARDRAIL COMPLETE SYSTEM TOTAL QTY
A	POST 1 TOP (SCH.80 PIPE) (8" X 80" LENGTH)	A	1					A	1
B	POST 1 TOP (WELDED SUPPORT COLLAR 10" X 10" X ½" ASTM A36)	B	1					B	1
C	POST 1 TUBE (HSS 10" X 10" X ½" X 72" LENGTH) A500 GR.B	C	1					C	1
D	POST 1 (WELDED PLATE 9 ¼" X 9 ¼" X ⅛") A36	D	1					D	1
E	POST 1 STRUT BRACKET (C8 X 11.50 A36)	E	1					E	1
F	(POST 1 & 2) CHANNEL STRUTS (4" X 71 ½")(C4 X 7.25)A36	F	2					F	2
G	THRIE-BEAM RAIL (END ANCHOR - ROUNDED TYPE) 12GA. (RTE02a)	G	1					G	1
H	THRIE-BEAM RAIL (ANCHOR) (6'-3" LENGTH) 12GA. (RWM14a)	H	1	H	1			H	2
I	THRIE-BEAM RAIL (8 SPACE) (12'-6" LENGTH) 12GA. (RTM08)			I	1	I	2	I	3
J	THRIE-BEAM RAIL (RADIUS 8'-4 ½") (SLOTTED) 12GA.			J	1			J	1
K	THRIE-BEAM RAIL (3 SPACE) (9'-4 ½" LENGTH) 12GA.					K	1	K	1
L	THRIE BEAM RAIL (TERMINAL CONNECTOR) (BRIDGE-RAIL) (RTE01b)					L	1	L	1
M	POST 2,4,5,6 BCT TIMBER (5 ½" X 7 ½" X 46") (PDF04)			M	4			M	4
N	POST 2,4, BCT TUBE (6" X 8" X 3/16" X 72" LENGTH) (PTE05)			N	2			N	2
O	POST 5,6 MODIFIED BCT TUBES (FOR WELDED CABLE SADDLES)			O	2			O	2
P	POST 3,4,6,7,8 THRIE-BEAM BLOCK-OUT (6" X 8" X 22")(PDB02a)			P	4	P	1	P	5
Q	POST 3,7,8 CRT TIMBER POSTS (6" X 8" X 72" LENGTH)(PDE09)			Q	2	Q	1	Q	3
R	POST 9,10,11 I-BEAM POSTS (W6X8.5 X 72" LENGTH) (PWE01)					R	3	R	3
S	POST 9,10,11 ROUTED W-BEAM BLOCK-OUT(6" X 8" X 14")(PDB01b)					S	3	S	3
T	POST 12 THRU 17 I-BEAM POSTS (W6X8.5 X 84" LENGTH) (PWE07)					T	6	T	6
U	POST 12 THRU 17 ROUTED BLOCK-OUT (6" X 8" X 18") (PDB??)					U	6	U	6
V	SAND BARRELS 700-715 LBS							V	6
A1	BCT CABLE ANCHOR ASSEMBLIES (¾" X 6'-6 ¾" LENGTH) (FCA01)	A1	2					A1	2
A2	BCT CABLE ANCHOR BRACKET (FPA01)	A2	2	A2	1			A2	3
A3	⅝" X 2" HEX BOLT A307 GRD.5 (FOR CABLE BRACKETS)	A3	18	A3	8			A3	26
A4	⅝" FLAT WASHER A307 GRD.5 (1 WASHER UNDER BOLT HEAD & 1 NUT)	A4	36	A4	40			A4	76
A5	⅝" RECESSED H.G.R NUT (NUTS FOR HEX BOLTS)	A5	22	A5	20			A5	42
A6	STRUT BRACKET HARDWARE (½" X 1 ½") HEX BOLT A307 GRD.5	A6	2					A6	2
A7	CHANNEL STRUT HARDWARE (⅝" X 10") HEX BOLT A307 GRD.5	A7	2					A7	2
A8	BCT CABLE ANCHOR ASSEMBLY (FCA02) (¾" X 18'-5" LENGTH)			A8	1			A8	1
A9	BCT POST SLEEVE (FMM02a) (POST 4 ONLY)			A9	1			A9	1
A10	BCT CABLE BEARING PLATE (⅝" X 8" X 8" (FPB01) (POST 4 ONLY)			A10	1			A10	1
A11	⅝" X 1 ¼" H.G.R. BOLTS (FBB01) (SPLICES AT POST 2,4,6,7)			A11	48			A11	48
A12	⅝" X 2" H.G.R. BOLTS (FBB02)(ROUND TERM-POST 10-END SPLICE)	A12	4			A12	24	A12	28
A13	⅝" X 10" H.G.R. BOLTS (FBB03) (I-BEAM POSTS RAIL & BLOCKOUT)					A13	18	A13	18
A14	⅝" X 18" H.G.R. BOLTS (FBB04) (POSTS 3,4,6,7,8)			A14	8	A14	2	A14	10
A15	⅝" X 7 ½" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)			A15	8			A15	8
A16	⅝" X 10" HEX BOLTS A307 GRD.5 (BCT POSTS 2,4,5,6)			A16	4			A16	4
A17	RECTANGULAR WASHERS (FWR03) (FOR TERMINAL CONNECTOR RTE01b)					A17	12	A17	12
A18	⅞" X (LENGTH VARIES) HEX BOLTS A325 OR A449 GR.5					A18	5	A18	5
A19	1 ¾" O.D. HARDENED FLAT WASHER A325					A19	10	A19	10
A20	⅞" HEX NUT GR.5 A325					A20	5	A20	5

GENERAL NOTES

1. FOR ADDITIONAL INSTALLATION INFORMATION AND GUIDANCE CONTACT: TEXAS DEPARTMENT OF TRANSPORTATION,(TXDOT'S DESIGN DIVISION).(512) 416-2678. THE EXACT POSITION OF MBGF SHALL BE SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER. THE SIGHT DISTANCE OF THE INSTALLATION WILL NEED TO BE VERIFIED WITH RESPECT TO THE SPECIFIC SITE PLACEMENT.
2. STEEL POSTS ARE NOT PERMITTED AT CRT OR BCT POST POSITIONS.
3. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED ON THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 12 ½" OR 25 FOOT NOMINAL LENGTHS.
4. BUTTON HEAD "POST BOLTS & NUTS" SHALL MEET THE REQUIREMENTS OF (ASTM A307), AND SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT AND ⅝" WASHER (FWC16a) AND NOT MORE THAN 1" BEYOND IT. TRIM REMAINING BOLT LENGTH TO MEET REQUIRED LENGTH.
5. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
7. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A SLOPE RATE OF NOT MORE THAN 1V:10H.
8. IT IS NOT RECOMMENDED THAT GUARD FENCE BE PLACED IN THE VICINITY OF CURBS.
9. GUARDRAIL POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
10. SPECIAL FABRICATION WILL BE REQUIRED FOR THRIE BEAM RAIL RADIUS (ITEM J).
11. ALL MATERIAL AND WORK INVOLVED IS SUBSIDIARY TO SHORT RADIUS BID ITEM, INCLUDING, BUT NOT LIMITED TO FOUNDATIONS, GRADING, THRIE BEAM RAIL, SAND BARRELS, AND OTHER PARTS.
12. ALL CABLE ASSEMBLIES SHOULD BE TAUT AFTER INSTALLATION. WHEN CABLES ARE MANIPULATED BY HAND THE CABLES SHOULD NOT MOVE MORE THAN 1" IN ANY DIRECTION PERPENDICULAR TO THE CABLE.
13. THE BCT BEARING PLATE INSTALLED AT POST 4 SHOULD BE ORIENTED SUCH THAT THE 3" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE BOTTOM AND 5" DIMENSION FROM PLATE EDGE TO CENTER OF BOLT HOLE IS ON THE TOP.
14. FOUNDATION AT POST 1 SHALL BE CLASS C CONCRETE.
15. * POST (1) IS NOT A CRASHWORTHY TERMINAL. THE DESIGN AND PLACEMENT OF POST (1) MUST BE OUTSIDE OF THE CLEAR ZONE OF THE SECONDARY ROADWAY USING THE RESPECTIVE CLEAR ZONE CRITERIA. PLEASE CONTACT THE DESIGN DIVISION (512) 416-2678 FOR ASSISTANCE IN DETERMINING THE APPROPRIATE USE AND/OR PLACEMENT OF THE SYSTEM IN CONSTRAINED LOCATIONS. THE PAYMENT OF THE COMPLETE SYSTEM WILL BE WITH BID ITEMS: 540 XXXX TL-3 31" SHORT RADIUS (COMPLETE).
16. TESTED TO MASH WITH A 3:1 SLOPE OR SHALLOWER IS PREFERABLE IN THE LIMITS OF THE TOP AND BOTTOM OF THE SLOPE AS SHOWN IN THE PLAN VIEW. IF FIELD CONDITIONS REQUIRE A STEEPER SLOPE,THIS MAY BE ALLOWABLE UP TO A 2:1 SLOPE. CONTACT THE DESIGN DIVISION FOR ADDITIONAL GUIDANCE.
17. THE BARRELS ARE ENERGY ABSORPTION ENERGITE III, MODEL 640 FILLED WITH 715 LB (+/-15) SAND; OR AN APPROVED EQUIVALENT. THE APPROXIMATE HEIGHT OF THE BARREL IS 41" (+/-).
18. ALTERNATE METHODS TO TERMINATE THE SRG ALONG THE PRIMARY ROADWAY ARE AVAILABLE WHEN SITE CONDITIONS DICTATE. CONTACT DESIGN DIVISION FOR DETAILS: 512 416-2678

* NOTE: SEE SHEET 1 OF 3.

(MASH TL-3 COMPLIANT)
TESTED TO MASH TL-3 WITH A 3:1 SLOPE

SPECIAL APPLICATION NOTES.

1. THIS IS A MASH COMPLIANT TL-3 SHORT RADIUS GUARDRAIL SYSTEM WITH A TOP RAIL HEIGHT OF 31". AVAILABLE FOR USE ON ANY SPEED ROADWAY. THE SYSTEM REQUIRES A MINIMUM PLACEMENT FOOTPRINT OF 34'-10" ALONG THE PRIMARY ROAD AND A 35'-0" ALONG SECONDARY DRIVEWAY.
2. IT IS CRITICAL THAT THE PRIMARY GUARDRAIL MAINTAIN A (4 DEGREE FLARE) WITH THE SECONDARY DRIVEWAY.
3. THE SYSTEM REQUIRES A MINIMUM 5' WIDE (WORK ZONE) DIRECTLY BEHIND THE GUARDRAIL SYSTEM WITH A SLOPE AT 1V:10H OR FLATTER FROM THERE A MAXIMUM 3:1 SLOPE IS RECOMMENDED. SEE SHEET 1 OF 3 FOR FLARE AND SLOPE DETAILS.
4. NOTE FOR INSTALLER: THE THREE (3) CRT POSTS ITEM (Q), AT POST LOCATIONS, 3, 7, & 8.), REQUIRE THE FOLLOWING FIELD ADJUSTMENT. USING A ¾" X 10" LONG SPADE BIT DRILL ONE (1) ADDITIONAL HOLE 7-⅞" DIRECTLY BELOW THE EXISTING TOP HOLE TO ACCOMMODATE THE HARDWARE FOR THE 22" LONG BLOCKOUT.

   OPTION FOR ADDITIONAL ¾" HOLE. THE 22" LONG BLOCKOUT (PDB01a) IS MANUFACTURED WITH TWO ¾" DRILLED HOLES FOR THE POST HARDWARE, THEREFORE THE BLOCKOUT CAN BE USED AS A TEMPLATE GUIDE FOR THE BOTTOM ¾" HOLE. AFTER INSTALLING THE CRT POST USE THE TOP HOLE TO MOUNT THE 22" LONG BLOCKOUT TO POST, USE THE BLOCKOUT'S PRE-DRILLED HOLE AS A GUIDE FOR THE BOTTOM ¾" HOLE.

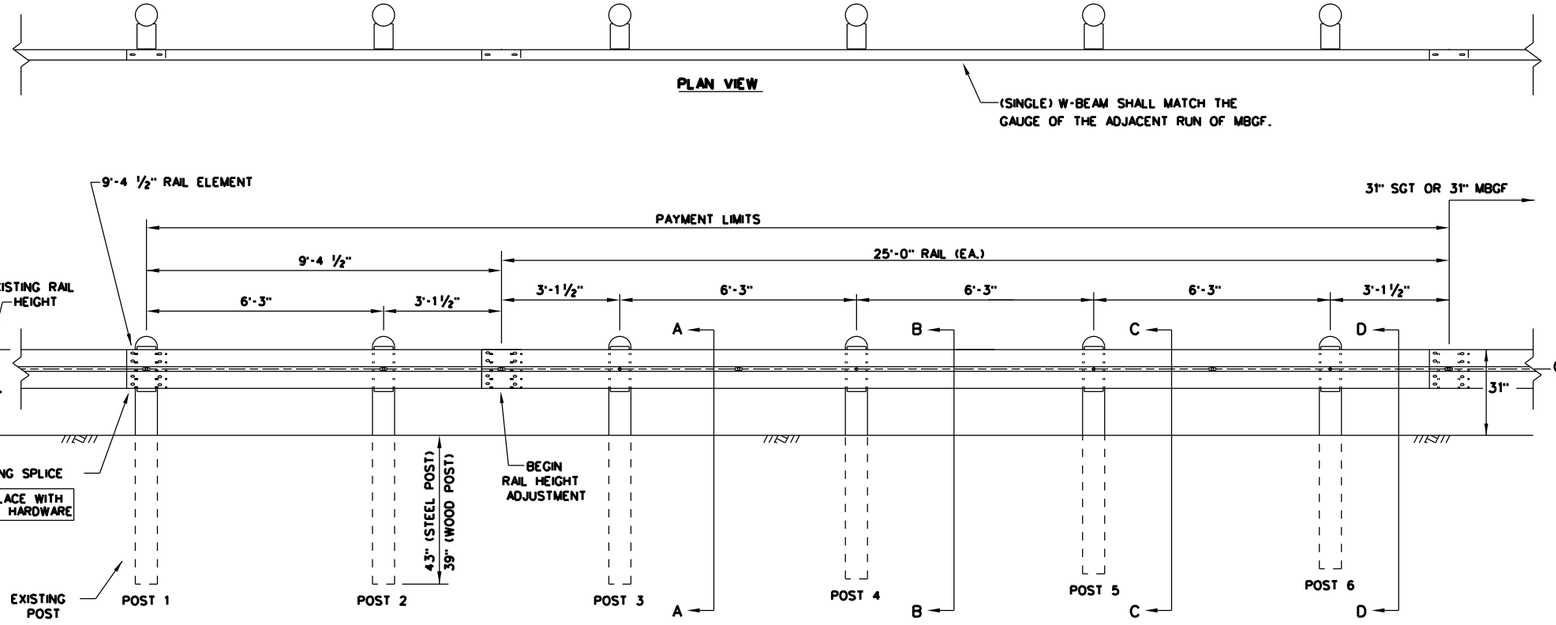
Texas Department of Transportation

Design Division Standard

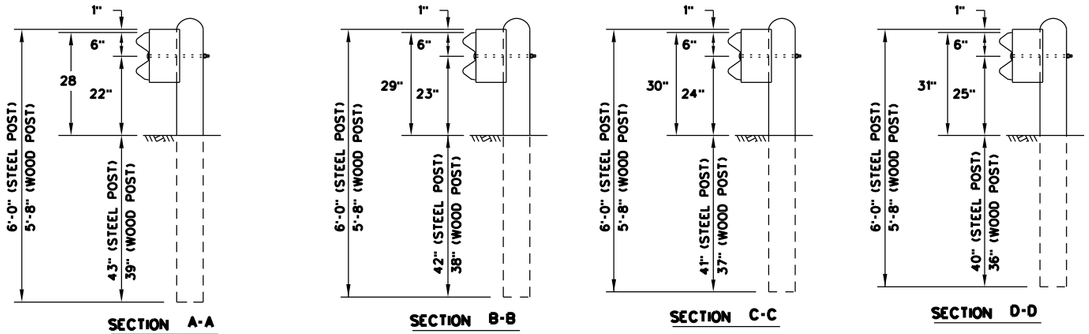
TL-3
SHORT RADIUS GUARDRAIL
MASH COMPLIANT

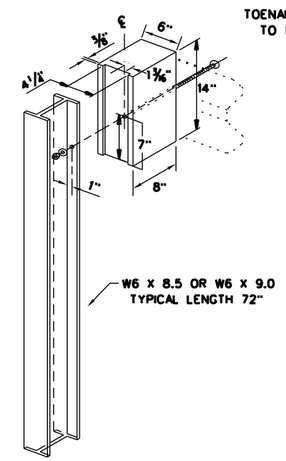
SRG(TL-3)-21

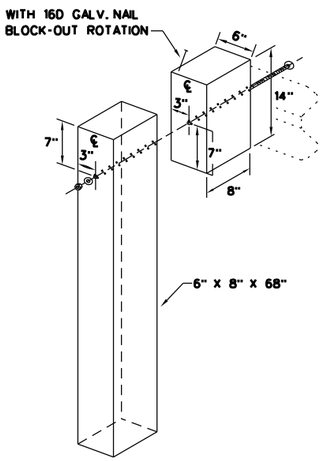
FILE: srgtl321	TxDOT	CK:KM	DN: VP	CK:CGL
© TxDOT: FEBRUARY 2021	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		52

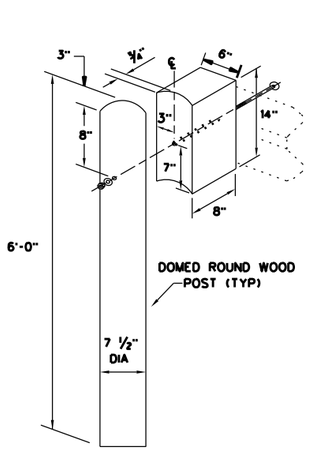


* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



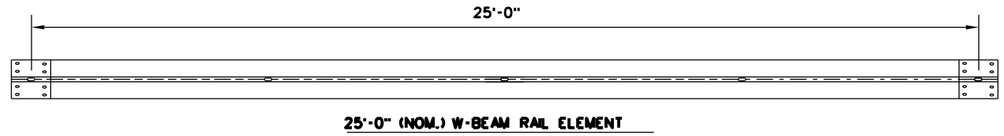


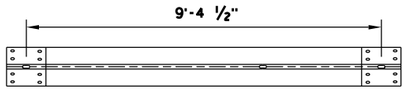




GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'- 1½" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND ⅝" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE ⅝" X 1- ¼" WITH ⅝" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.





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

POST AND BLOCK-OUT TYPES AVAILABLE

FOR WOOD POST

FOR STEEL POST

NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.

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

Texas Department of Transportation

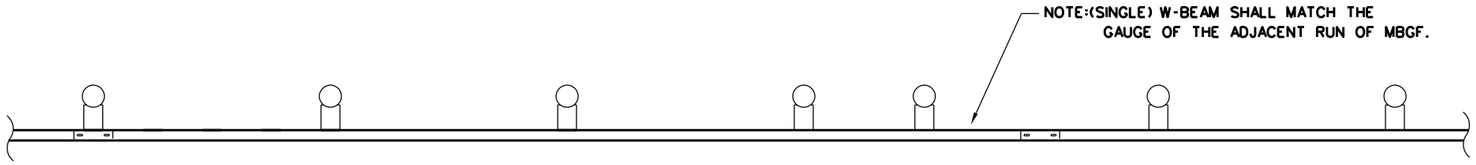
Design Division Standard

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

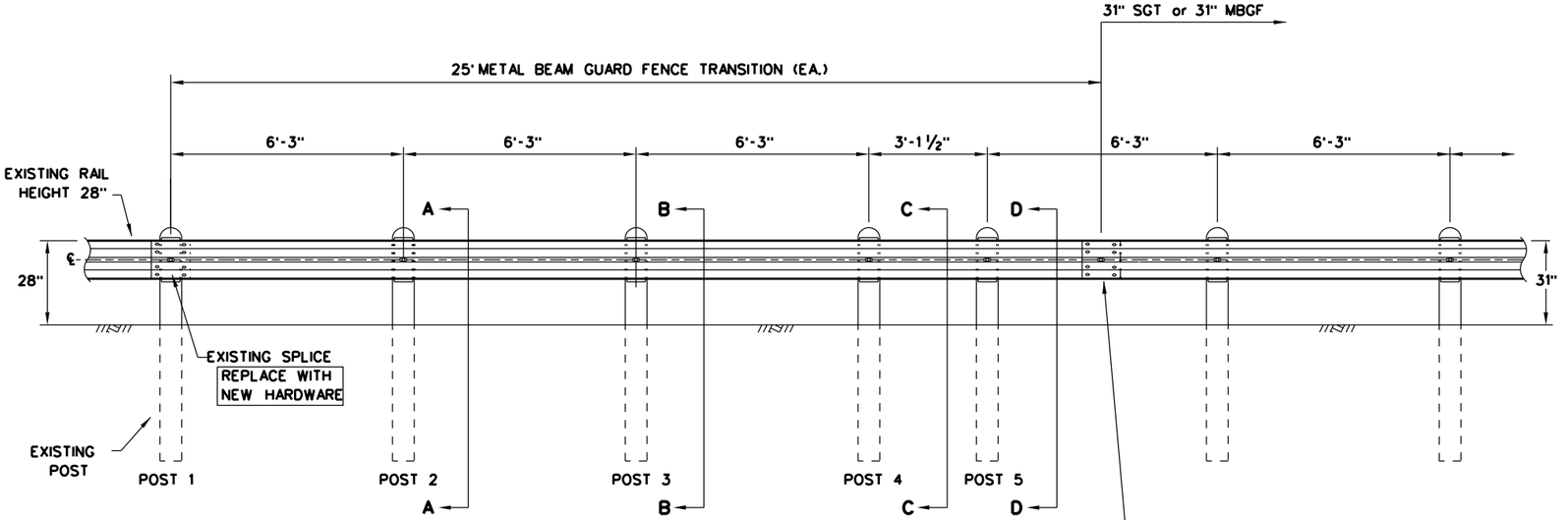
RAIL-ADJ(A)-19

FILE: railadja19	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		53

DATE:
FILE:

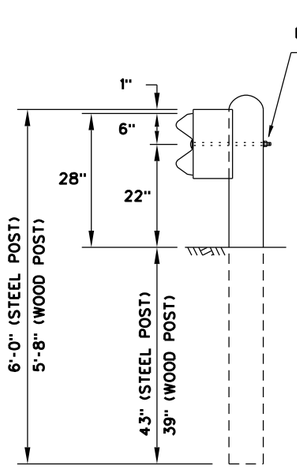


PLAN VIEW

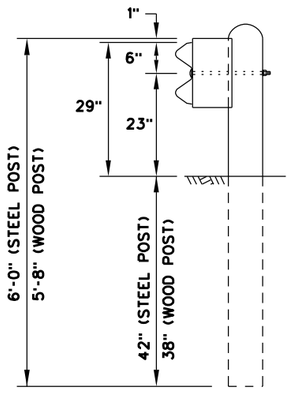


ELEVATION VIEW

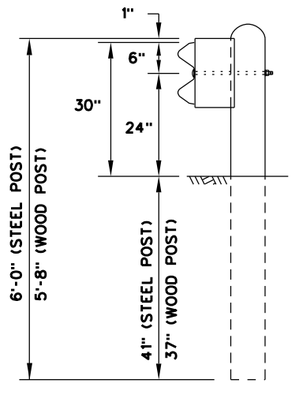
* "WOOD" INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



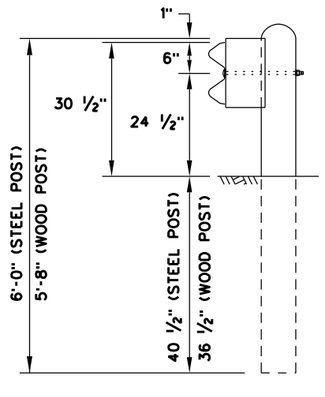
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

GENERAL NOTES

1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENT SHALL MEET THE REQUIREMENTS OF ITEM 540,"METAL BEAM GUARD FENCE" EXCEPT AS MODIFIED IN THE PLANS. THE CONTRACTOR MAY FURNISH RAIL ELEMENTS OF 25'- 0", OR 12'- 6" (NOM.) LENGTHS. RAIL ELEMENTS MAY HAVE SLOTTED HOLES AT 3'- 1 1/2" C-C OR 6'-3" C-C. A SPECIAL LENGTH OF RAIL MAY BE MANUFACTURED TO ACCOMMODATE THE TRANSITION SECTIONS OF GUARDRAIL.
3. BUTTON HEAD "POST" BOLTS (ASTM A307) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 5/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 5/8" X 1- 1/4" WITH 5/8" NUTS (ASTM A563).
4. FITTINGS (BOLTS, NUTS, AND WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING." FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM REQUIRING CONSTRUCTION OF THE TRANSITION.
5. CROWN SHALL BE WIDENED TO ACCOMMODATE THE METAL BEAM GUARD FENCE.
6. THE LATERAL APPROACH TO THE GUARD FENCE, SHALL HAVE A MAXIMUM SLOPE OF 1V:10H.
7. IF SHOWN ELSEWHERE IN THE PLANS OR AS DIRECTED BY THE ENGINEER, THE GUARD FENCE MAY BE FLARED AT A RATE OF 25:1 OR FLATTER.
8. APPLICATIONS IN SOLID ROCK ARE ONLY ALLOWED WITH STEEL POSTS. SEE GF(31) STANDARD FOR INSTALLATION GUIDANCE.
9. POSTS SHALL NOT BE SET IN CONCRETE.
10. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210,"COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TXDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210. ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
11. REFER TO STANDARD GF(31) FOR ADDITIONAL DETAILS.
12. RAIL HEIGHT ADJUSTMENT IS ASSESSED AT TL-3 MASH COMPLIANT FOR STEEL POST HEIGHT TRANSITION TO 28" STEEL POST GUARDRAIL.

HARDWARE LIST

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

POST AND BLOCK-OUT TYPES AVAILABLE

FOR WOOD POST

FOR STEEL POST

NOTE: HARDWARE SHALL MEET THE FOLLOWING REQUIREMENTS.

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

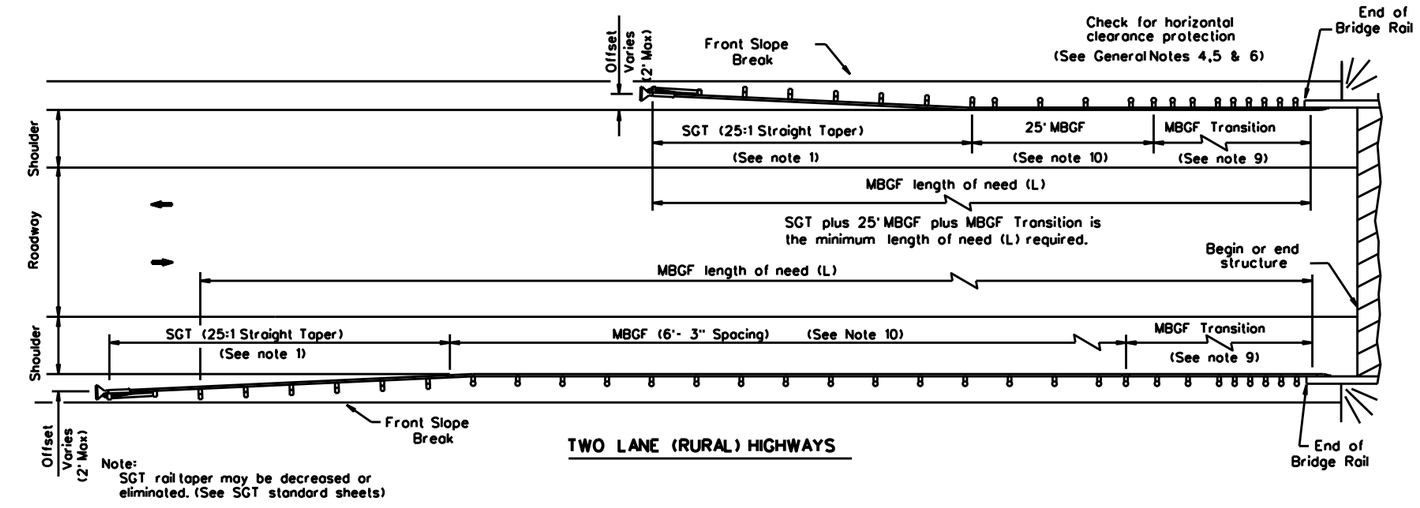
Texas Department of Transportation

Design Division Standard

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

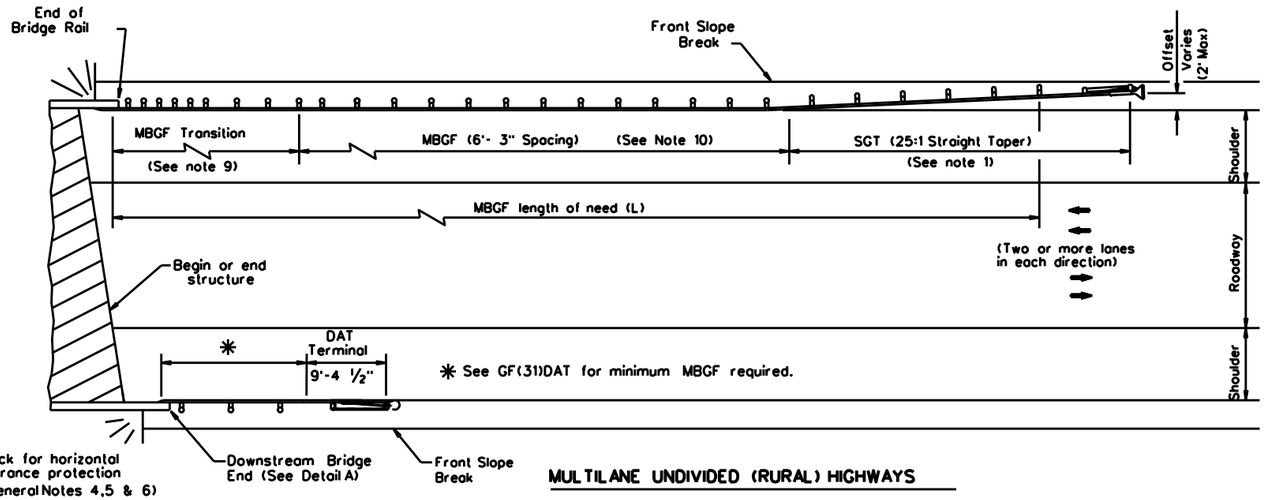
RAIL-ADJ(B)-19

FILE: railadjb19	DN: TxDOT	CK: KM	DW: VP	CK: CGL/AG	
©TxDOT: NOVEMBER 2019	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		54	

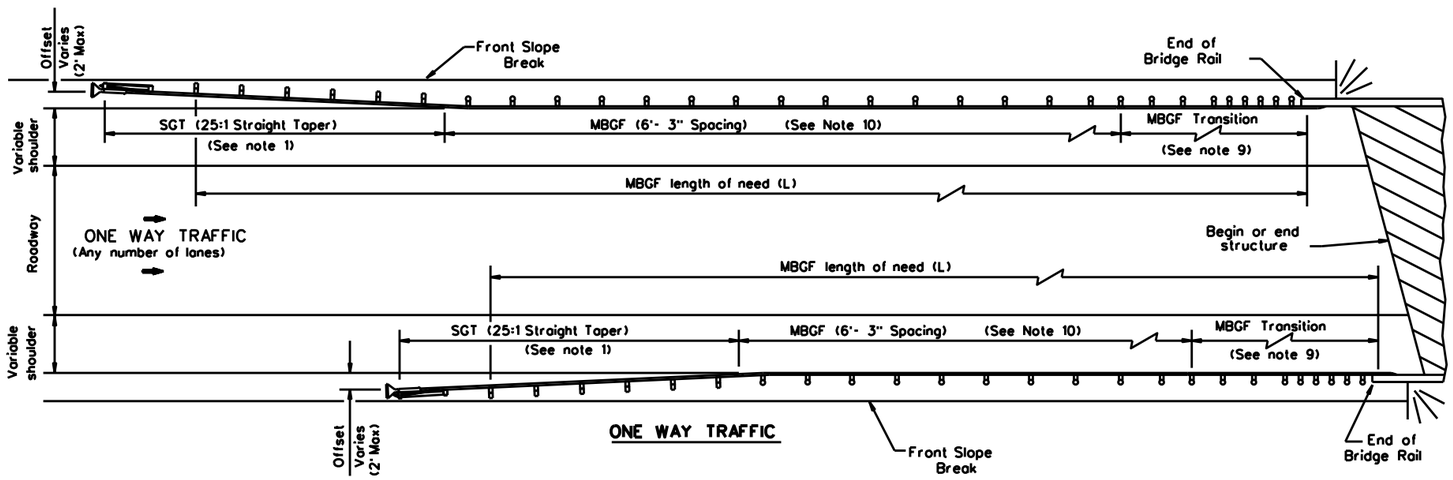


TWO LANE (RURAL) HIGHWAYS

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



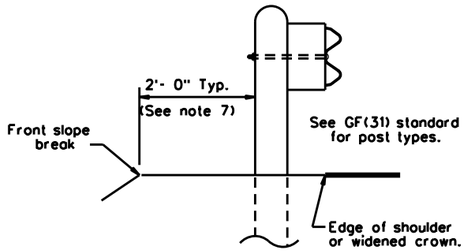
MULTILANE UNDIVIDED (RURAL) HIGHWAYS



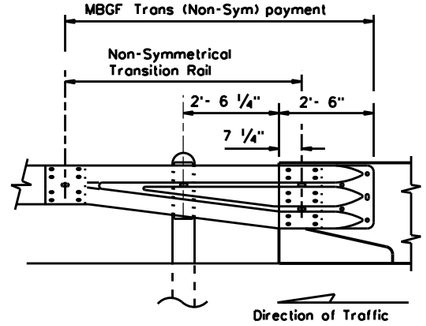
ONE WAY TRAFFIC

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

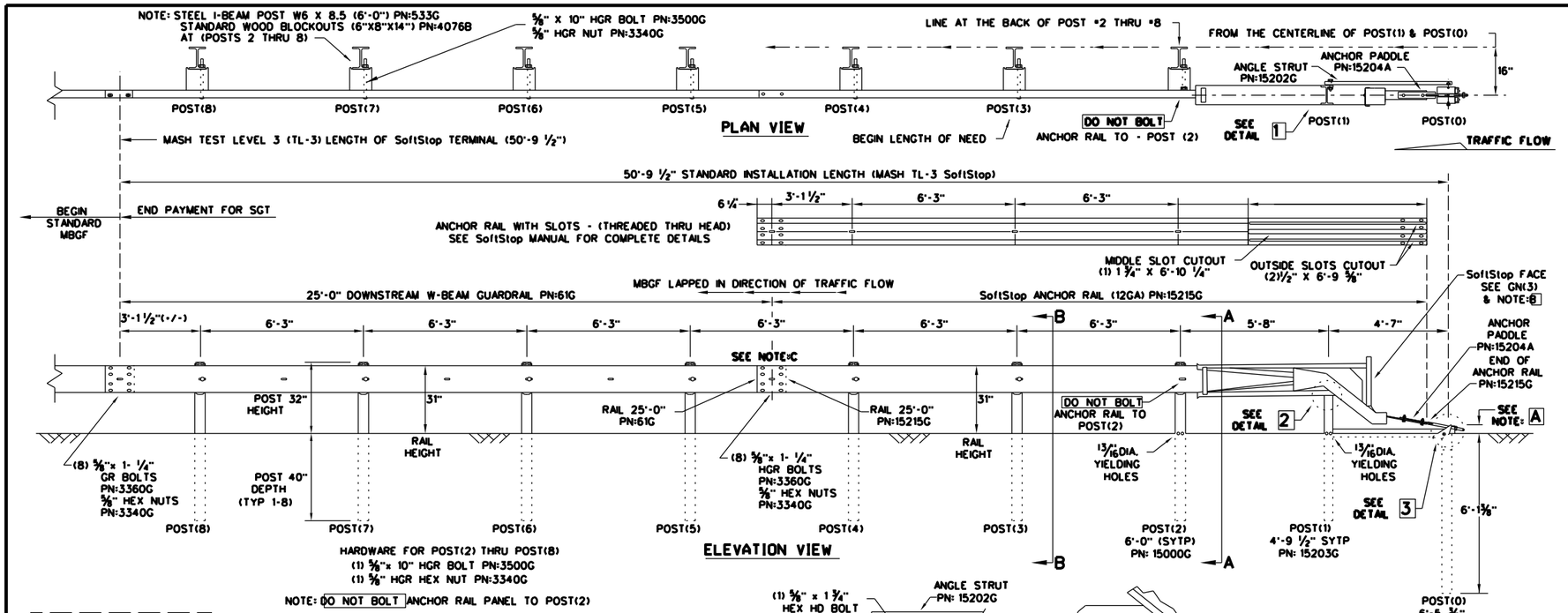
(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)

BED-14

FILE: bed14.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: CGL		
© TxDOT: December 2011	CONT	SECT	RMC PROJECT NO.	HIGHWAY		
REVISIONS			6469-98-001	SH 36, ETC.		
04-2014	DIST	COUNTY		SHEET NO.		
	BRY	WASHINGTON, ETC.		55		

DATE:
FILE:

DATE:
FILE:



GENERAL NOTES

1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 1(888)323-6374. 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE: SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL. PN:6202378
3. APPLY HIGH INTENSITY REFLECTIVE SHEETING, "OBJECT MARKER" ON THE FRONT FACE OF THE DEVICE PER MANUFACTURER'S RECOMMENDATIONS. OBJECT MARKER SHALL CONFORM TO THE STANDARDS REQUIRED IN TEXAS MUTCD.
4. FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
5. HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445,"GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
6. A COMPOSITE MATERIAL BLOCKOUT THAT MEETS THE REQUIREMENTS OF DMS-7210, MAY BE SUBSTITUTED FOR BLOCKOUTS OF SIMILAR DIMENSIONS. SEE CONSTRUCTION DIVISION MATERIAL PRODUCER LIST (MPL) FOR CERTIFIED PRODUCERS.
7. IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
8. POSTS SHALL NOT BE SET IN CONCRETE.
9. IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
10. DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
11. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
12. A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCROACHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

NOTE:A	THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3-¾" MIN. TO 4" MAX. ABOVE FINISHED GRADE.
NOTE:B	PART PN:58528 RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN:58518 LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)
NOTE:C	W-BEAM SPLICE LOCATED BETWEEN LINE POST(4)AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN:61G ANCHOR RAIL 25'-0" PN:15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
6202378	1	PRODUCT DESCRIPTION ASSEMBLY MANUAL (LATEST REV.)
15208A	1	SoftStop HEAD (SEE MANUAL FOR RIGHT-LEFT APPROACH)
15215G	1	SoftStop ANCHOR RAIL (12GA) WITH CUTOUT SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'- 0")
15205A	1	POST #0 - ANCHOR POST (6'- 5 ⅜")
15203G	1	POST #1 - (SYTP) (4'- 9 ½")
15000G	1	POST #2 - (SYTP) (6'- 0")
533G	6	POST #3 THRU #8 - I-BEAM (W6 x 8.5) (6'- 0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (4" x 7 ½" x 14")
15204A	1	ANCHOR PADDLE
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (½" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202G	1	ANGLE STRUT
		HARDWARE
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	¾" x 2 ½" HEX BOLT A325
3701G	4	¾" ROUND WASHER F436
3704G	2	¾" HEAVY HEX NUT A563 GR.DH
3360G	16	⅝" x 1 ¼" W-BEAM RAIL SPLICE BOLTS HGR
3340G	25	⅝" W-BEAM RAIL SPLICE NUTS HGR
3500G	7	⅝" x 10" HGR POST BOLT A307
3391G	1	⅝" x 1 ¾" HEX HD BOLT A325
4489G	1	⅝" x 9" HEX HD BOLT A325
4372G	4	⅝" WASHER F436
105285G	2	⅝" x 2 ½" HEX HD BOLT GR-5
105286G	1	⅝" x 1 ½" HEX HD BOLT GR-5
3240G	6	⅝" ROUND WASHER (WIDE)
3245G	3	⅝" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE:B

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

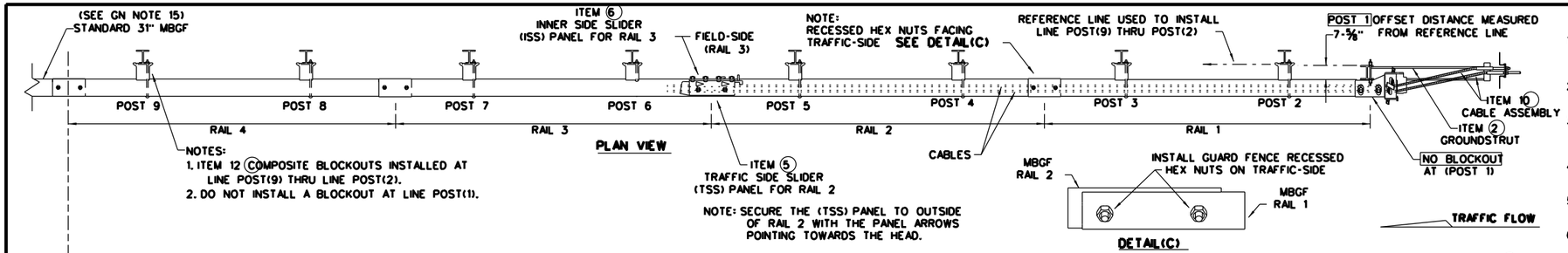
Texas Department of Transportation

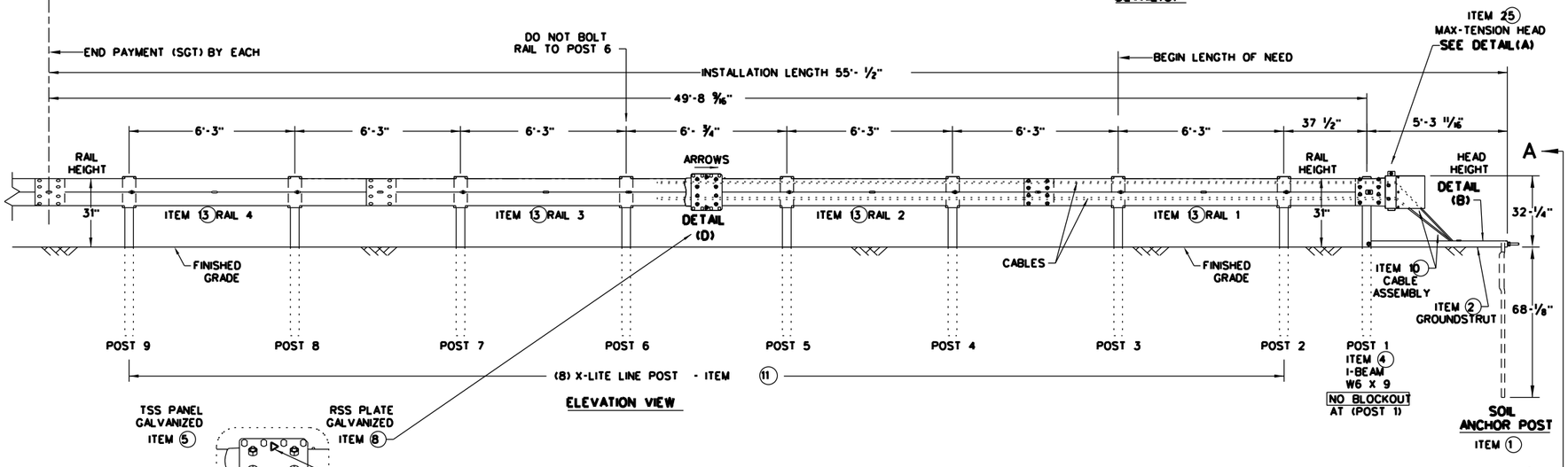
Design Division Standard

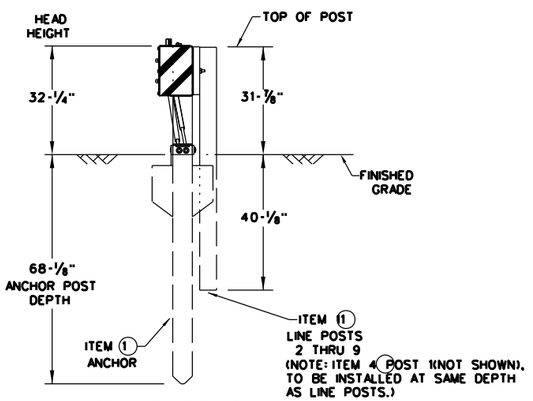
TRINITY HIGHWAY
SOFTSTOP END TERMINAL
MASH - TL-3
SGT(10S)31-16

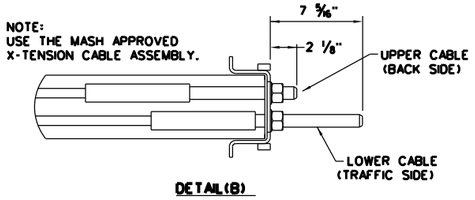
FILE: sgt10s3116	DN: TxDOT	CK: KM	DW: VP	CK: MB/VP
©TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		56

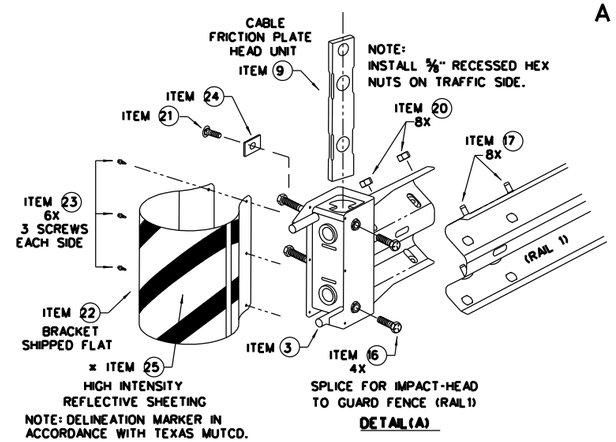
DATE:
FILE:

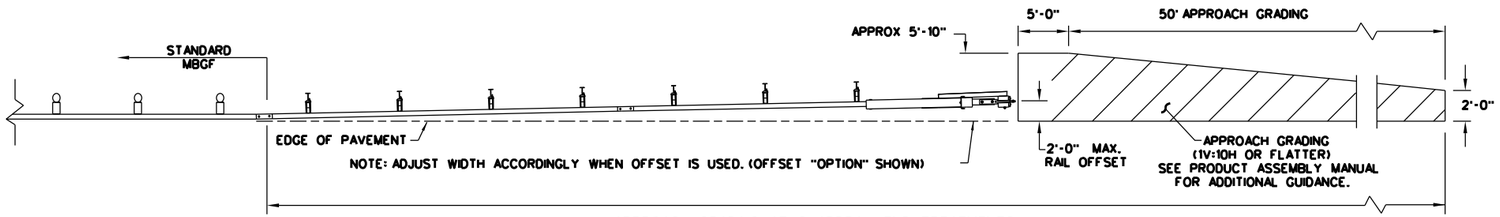












GENERAL NOTES

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	8061058	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	8090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	8
	13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	4
	14	BSI-1102027-00	X-LITE SQUARE WASHER	1
	15	BSI-2001886	⅝" X 7" THREAD BOLT HH (GR.5)GEOMET	1
	16	BSI-2001885	¾" X 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
	17	4001115	⅝" X 1¼" GUARD FENCE BOLTS (GR.2)MGAL	48
	18	2001840	⅝" X 10" GUARD FENCE BOLTS MGAL	8
	19	2001636	⅝" WASHER F436 STRUCTURAL MGAL	2
	20	4001116	⅝" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
	21	BSI-2001888	⅝" X 2" ALL THREAD BOLT (GR.5)GEOMET	1
	22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
	23	BSI-2001887	¼" X ¾" SCREW SD HH 410SS	7
	24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
x	25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
x x	26	4002337	8" W-BEAM TIMBER-BLOCKOUT, PDB01B	8
x x	27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL,8-SPACE,12GA.	2
	28	MANMAX Rev-(D)	MAX-TENSION INSTALLATION INSTRUCTIONS	1

x TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.

x x 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.

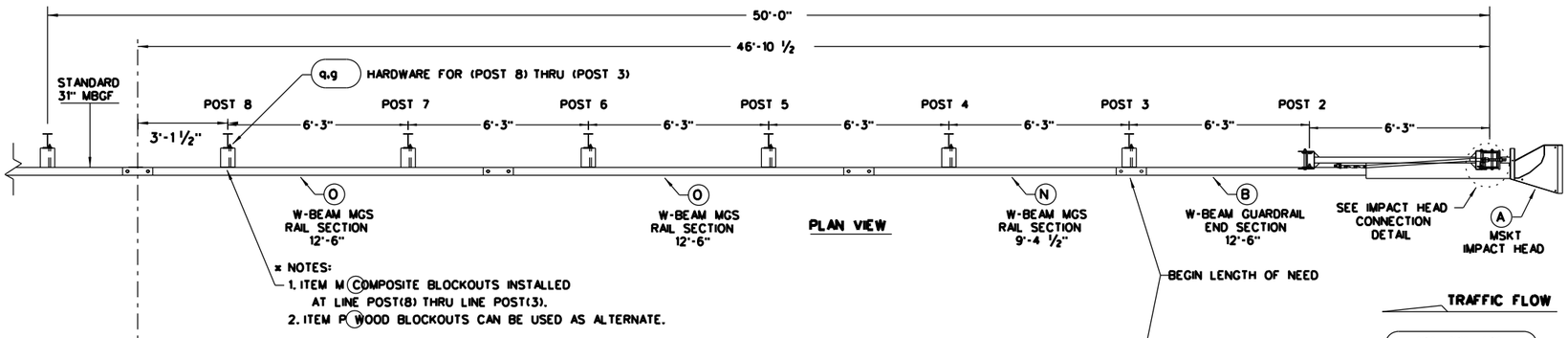
Texas Department of Transportation

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	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		57	

DATE:
FILE:



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

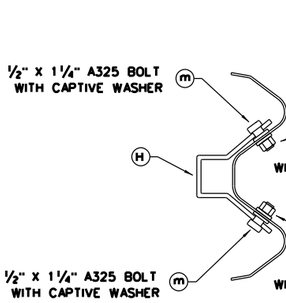
GENERAL NOTES

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.

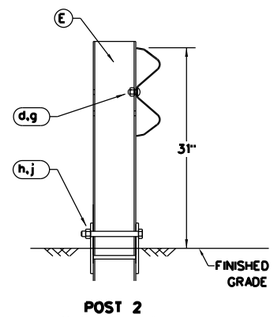
ITEM	QTY	MAIN SYSTEM COMPONENTS	ITEM NUMBERS
A	1	MSKT IMPACT HEAD	MS3000
B	1	W-BEAM GUARDRAIL END SECTION, 12 Ga.	SF1303
C	1	POST 1 - TOP (6" X 6" X ⅛" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
G	1	BEARING PLATE	E750
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 ½")	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	⅝" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	⅝" WASHER	W0516
c	2	⅝" HEX NUT	N0516
d	25	⅝" Dia. x 1¼" SPLICE BOLT (POST 2)	B580122
e	2	⅝" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	⅝" WASHER	W050
g	33	⅝" Dia. H.G.R NUT	N050
h	1	¾" Dia. x 8 ½" HEX BOLT (GRD A449)	B340854A
j	1	¾" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	½" x 1¼" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	½" STRUCTURAL NUTS	N012A
o	8	1 ⅛" O.D. x ⅝" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	⅝" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151

SEE NOTES: *

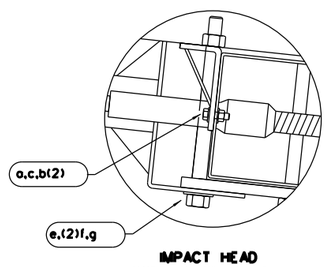
ALTERNATIVE ITEMS NOT SHOWN. * *
* ITEM(P) 8" WOOD-BLOCKOUT
* * ITEM(Q) 25'GUARD FENCE PANEL



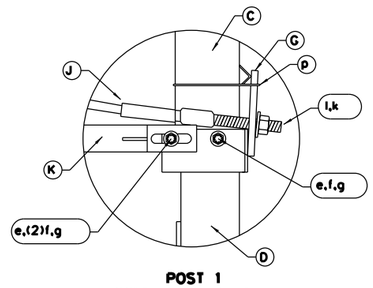
SECTION B-B
ANCHOR BRACKET



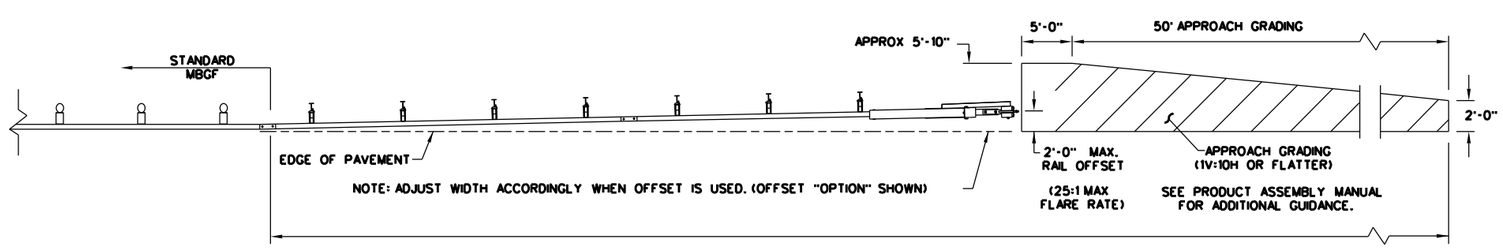
POST 2
SECTION A-A



IMPACT HEAD
CONNECTION DETAIL



POST 1
CONNECTION DETAIL



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

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

Texas Department of Transportation

Design Division Standard

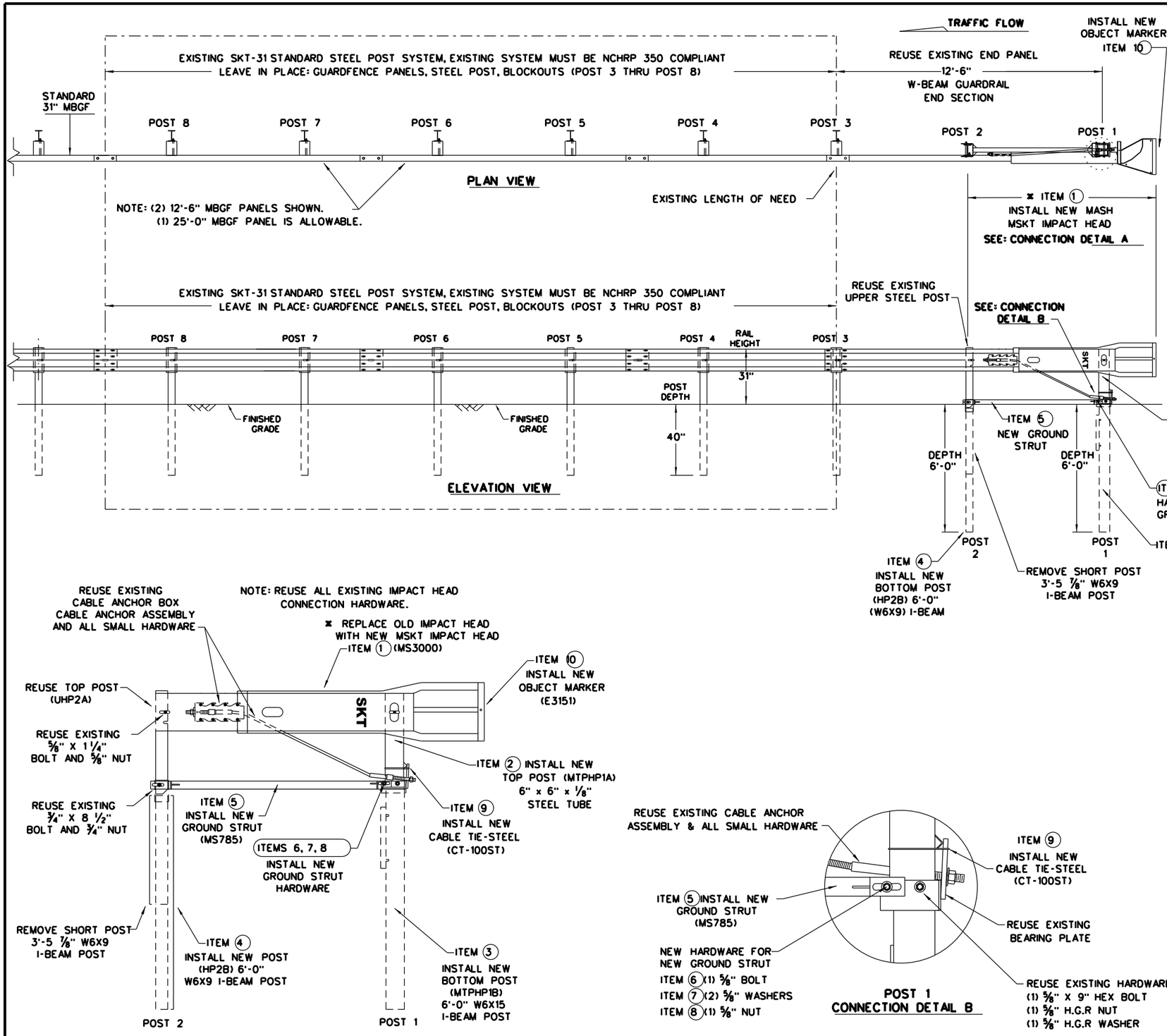
SINGLE GUARDRAIL TERMINAL

MSKT-MASH-TL-3

SGT(12S)31-18

FILE: sgt12s3118.dgn	DN: TxDOT	CK: KM	DW: VP		CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		58	

DATE:
FILE:



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: 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. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. THE EXISTING SKT 31" STANDARD STEEL POST SYSTEM MUST BE THOROUGHLY INSPECTED, AND DETERMINED TO BE INTACT, AND FREE OF ANY DAMAGE OR DEFECTS BEFORE RETROFITTING. THIS INSPECTION INCLUDES COMPLETING THE MSKT RETROFIT INSPECTION CHECKLIST FOR THE EXISTING SKT 31" STEEL POST NCHRP 350 SYSTEM. ALL EXISTING, AND REUSABLE PARTS MUST BE FREE OF ANY DAMAGE FOR A MASH COMPLIANT RETROFIT.
9. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
10. 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.
11. SPECIAL DRIVING CAP TO BE USED WHEN DRIVING (LOWER POSTS 1 & 2) TO PREVENT DAMAGE TO THE WELDED PLATES.

CONNECTION DETAIL A
IMPACT HEAD (POST 1 & POST 2)

POST 1
CONNECTION DETAIL B

ITEMS	QTY	MAIN SYSTEM COMPONENTS	PART NUMBERS
* 1	1	MSKT IMPACT HEAD	MS3000
2	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
3	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
4	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
5	1	GROUND STRUT	MS785
6	1	5/8" X 9" HEX BOLT (GRD A449)	B580904A
7	2	5/8" WASHERS	W050
8	1	5/8" H.G.R NUT	N050
9	1	CABLE TIE-STEEL	CT-100ST
* 10	1	OBJECT MARKER 18" X 18"	E3151

COMPONENTS REQUIRED TO RETROFIT: EXISTING 31" STEEL POST (NCHRP 350 SKT) GUARDRAIL TERMINAL WITH THE NEW 31" (MASH COMPLIANT MSKT IMPACT HEAD).

* IF THE EXISTING NCHRP 350 (31" STEEL POST SKT) ALREADY HAS THE MSKT IMPACT HEAD THERE IS NO NEED TO REPLACE THE IMPACT HEAD OR OBJECT MARKER AS LONG AS IT IS NOT DAMAGED.

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

Texas Department of Transportation

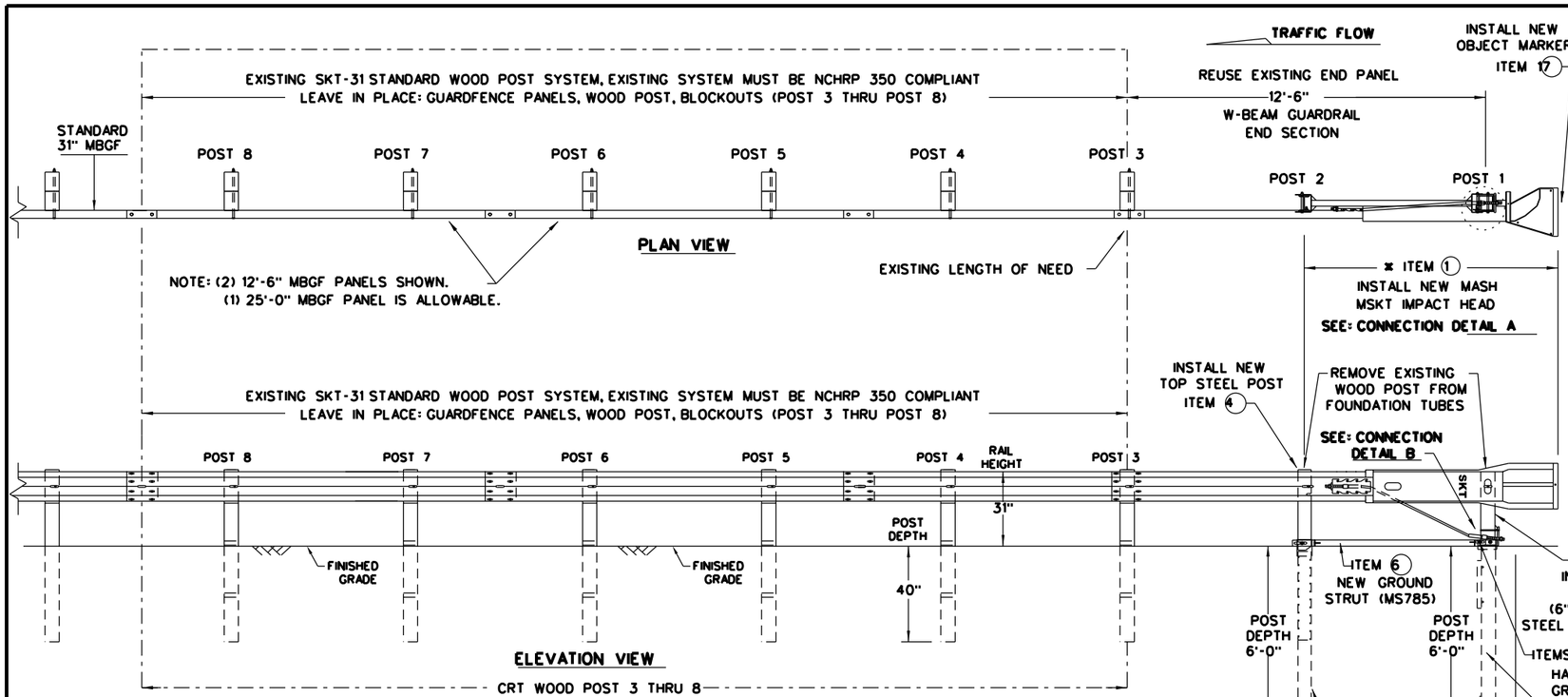
Design Division Standard

RETROFIT STANDARD SKT 31" STEEL POST SYSTEM TO MASH MSKT

SGT(13S)31-18

FILE: sgt13s3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS		6469-98-001		SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		59

DATE:
FILE:



* * NOTE: EXTRA SOIL COMPACTION WILL BE NEEDED AROUND NEW (POSTS 1 & 2) DUE TO THE REMOVAL OF THE STEEL FOUNDATION TUBES.

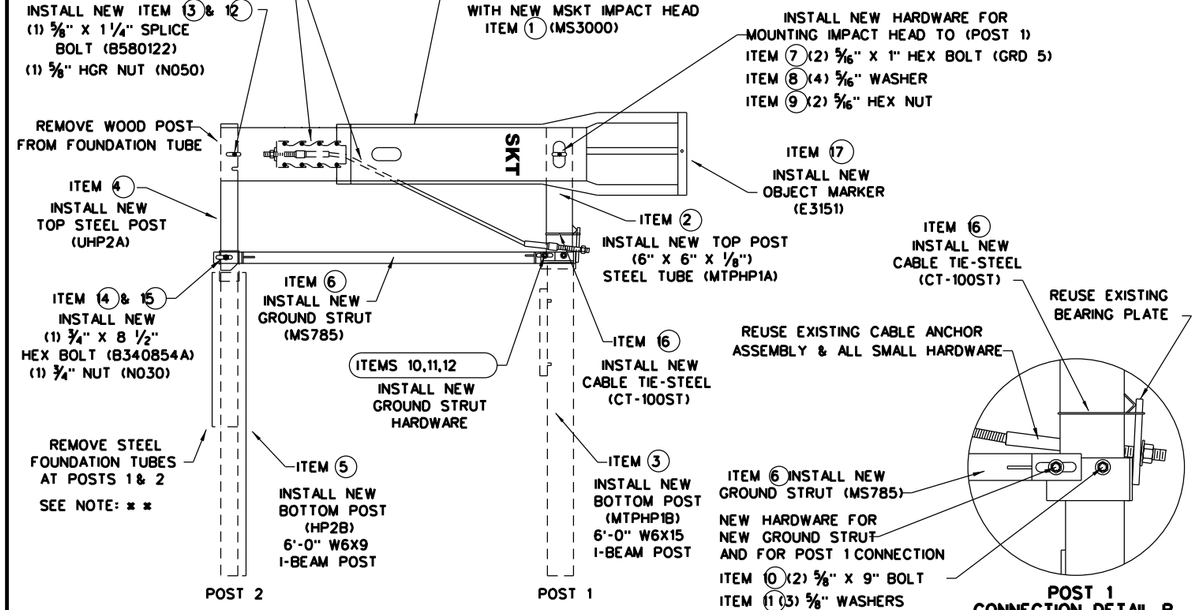
GENERAL NOTES

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: 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. IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
7. POSTS SHALL NOT BE SET IN CONCRETE.
8. THE EXISTING SKT 31" STANDARD WOOD POST SYSTEM MUST BE THOROUGHLY INSPECTED, AND DETERMINED TO BE INTACT, AND FREE OF ANY DAMAGE OR DEFECTS BEFORE RETROFITTING. THIS INSPECTION INCLUDES COMPLETING THE MSKT RETROFIT INSPECTION CHECKLIST FOR THE EXISTING SKT 31" WOOD POST NCHRP 350 SYSTEM. ALL EXISTING, AND REUSABLE PARTS MUST BE FREE OF ANY DAMAGE FOR A MASH COMPLIANT RETROFIT.
9. UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
10. 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.
11. SPECIAL DRIVING CAP TO BE USED WHEN DRIVING (LOWER POSTS 1 & 2) TO PREVENT DAMAGE TO THE WELDED PLATES.

ITEMS	QTY	MAIN SYSTEM COMPONENTS	PART NUMBERS
1	1	MSKT IMPACT HEAD	MS3000
2	1	POST 1 - TOP (6" X 6" X 1/8" TUBE)	MTPHP1A
3	1	POST 1 - BOTTOM (6' W6X15)	MTPHP1B
4	1	POST 2 - ASSEMBLY TOP	UHP2A
5	1	POST 2 - ASSEMBLY BOTTOM (6' W6X9)	HP2B
6	1	GROUND STRUT	MS785
7	2	5/16" X 1" HEX BOLT (GRD 5)	B516014A
8	4	5/16" WASHERS	W0516
9	2	5/16" HEX NUT	N0516
10	2	5/8" X 9" HEX BOLT (GRD A449)	B580904A
11	3	5/8" WASHERS	W050
12	3	5/8" H.G.R NUT	N050
13	1	5/8" X 1 1/4" SPLICE BOLT	B580122
14	1	3/4" X 8 1/2" HEX BOLT (GRD 5)	B340854A
15	1	3/4" HEX NUT	N030
16	1	CABLE TIE-STEEL	CT-100ST
17	1	OBJECT MARKER 18" X 18"	E3151

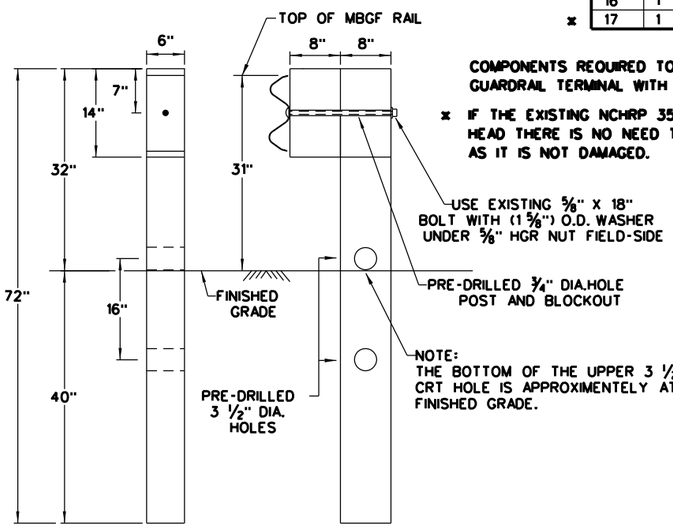
* COMPONENTS REQUIRED TO RETROFIT: EXISTING 31" WOOD POST (NCHRP 350 SKT) GUARDRAIL TERMINAL WITH THE NEW 31" (MASH COMPLIANT MSKT IMPACT HEAD).

* IF THE EXISTING NCHRP 350 (31" WOOD POST SKT) ALREADY HAS THE MSKT IMPACT HEAD THERE IS NO NEED TO REPLACE THE IMPACT HEAD OR OBJECT MARKER AS LONG AS IT IS NOT DAMAGED.



CONNECTION DETAIL A
IMPACT HEAD (POST 1 & POST 2)

POST 1
CONNECTION DETAIL B



FRONT VIEW SIDE VIEW
EXISTING WOOD POSTS 3-8
CONTROLLED RELEASE TERMINAL (CRT)

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

Texas Department of Transportation

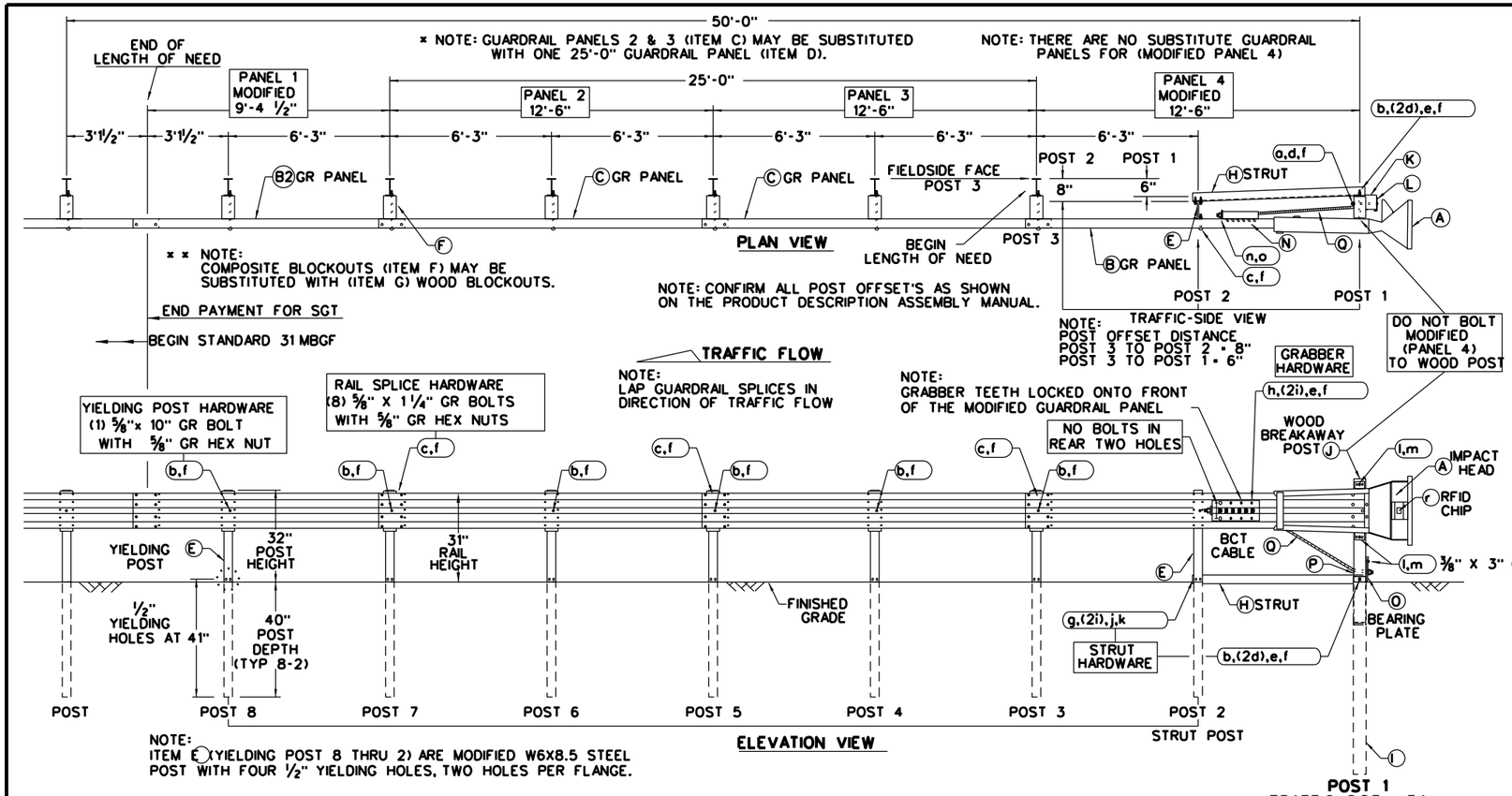
Design Division Standard

RETROFIT STANDARD SKT 31" WOOD POST SYSTEM TO MASH MSKT

SGT(14W)31-18

FILE: sgt14w3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
© TxDOT: APRIL 2018	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC		60

DATE:
FILE:

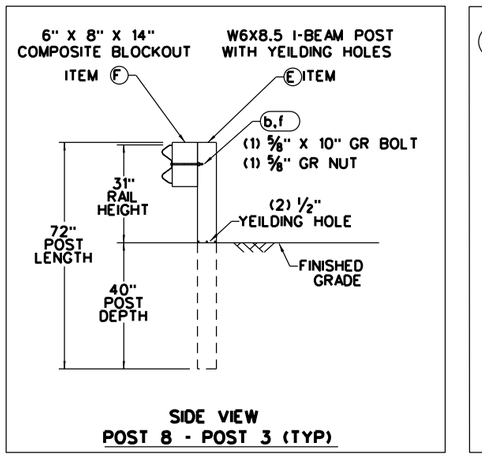


GENERAL NOTES

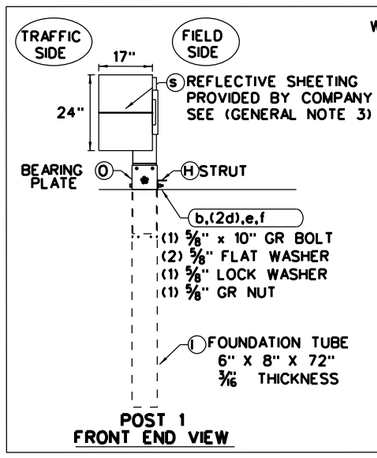
1. FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: SPIG INDUSTRY, INC. AT 1(267) 644-9510. 14675 INDUSTRIAL PARK RD; BRISTOL, VA 24202
2. FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MANUFACTURER'S: SGET END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY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

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

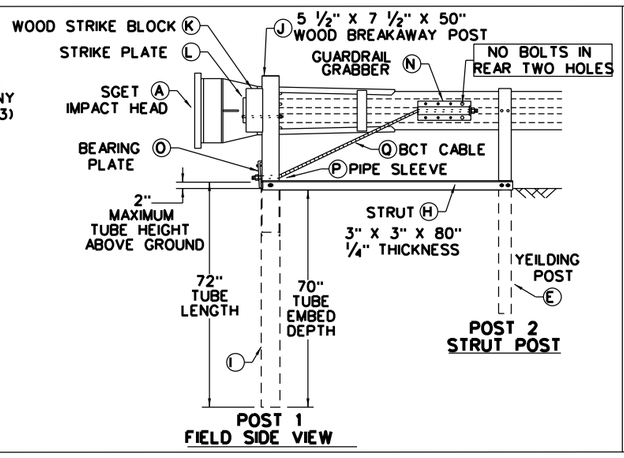
ALTERNATIVE ITEMS * **
NOTE: SEE PLAN VIEW



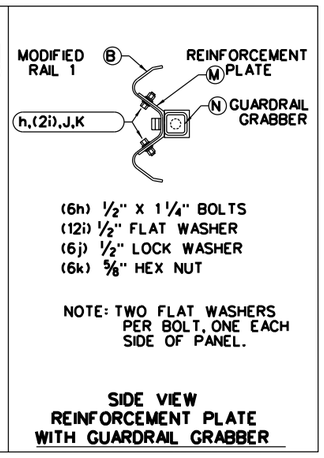
SIDE VIEW
POST 8 - POST 3 (TYP)



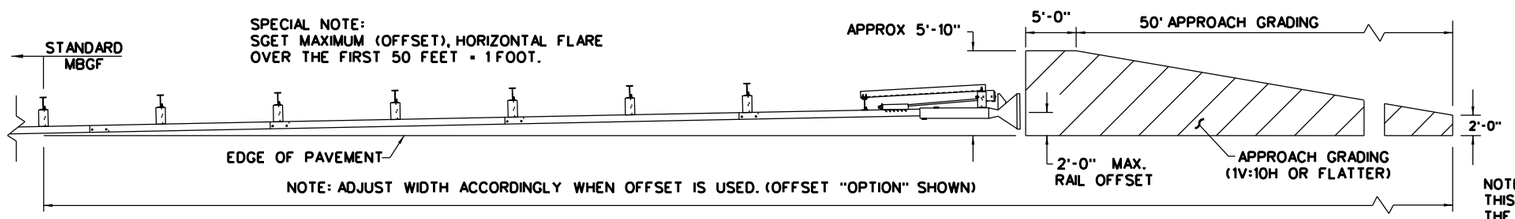
POST 1
FRONT END VIEW



POST 2
STRUT POST



SIDE VIEW
REINFORCEMENT PLATE
WITH GUARDRAIL GRABBER



APPROACH GRADING AT GUARDRAIL END TREATMENTS

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

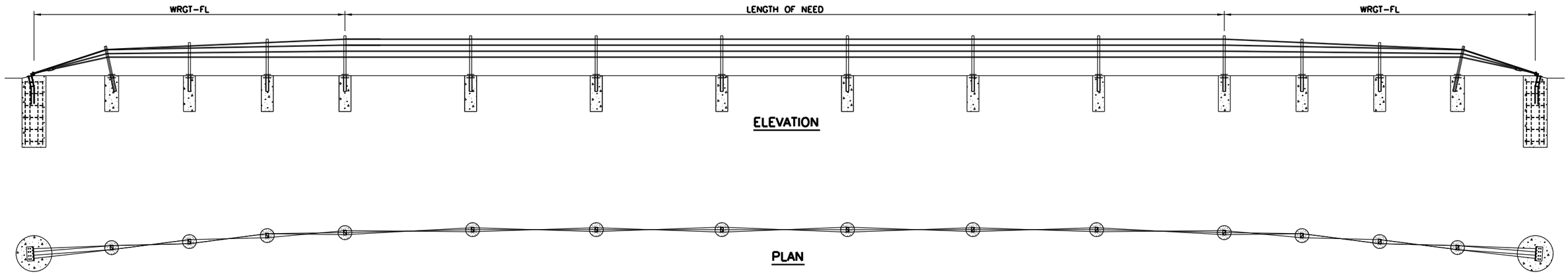
Texas Department of Transportation

Design Division Standard

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

FILE: sgt153120.dgn	DN: TxDOT	CK: KM	DW: VP	CK: VP	
©TxDOT: APRIL 2020	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC		61	

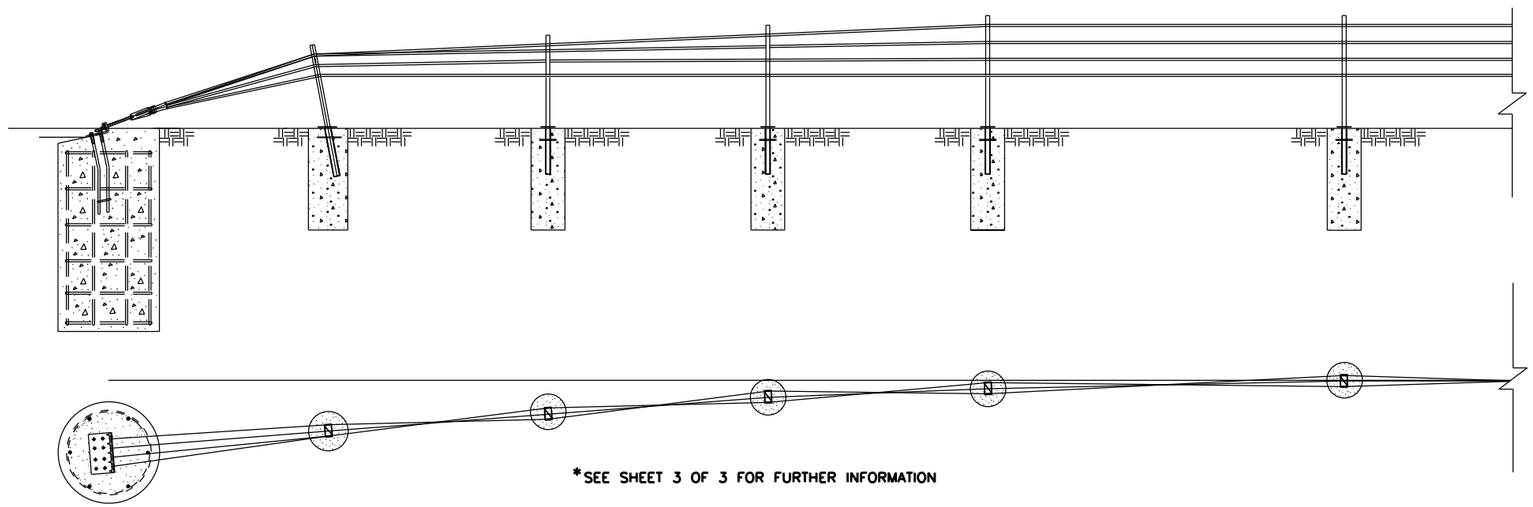
DATE:
FILE:



ELEVATION

PLAN

WRGT-FL END ANCHOR



*SEE SHEET 3 OF 3 FOR FURTHER INFORMATION

ROPE TENSION TABLE		
ROPE TEMP (°F)	TENSION (LBS)	TENSION (kN)
0	5700	25.4
5	5550	24.7
10	5400	24.0
15	5250	23.4
20	5100	22.7
25	4950	22.0
30	4800	21.4
35	4650	20.74
40	4500	20.0
45	4350	19.3
50	4200	18.7
55	4050	18.0
60	3900	17.3
65	3750	16.7
70	3600	16.0
75	3450	15.3
80	3300	14.7
85	3150	14.0
90	3000	13.3
95	2850	12.7
100	2700	12.0
105	2550	11.3
110	2400	10.7
115	2250	10.0
120	2100	9.3
125	1950	8.7
130	1800	8.0
135	1650	7.3
140	1500	6.7

*ROPE TENSION: ± 20% AFTER 2-WEEK INTERVAL

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.
2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACT MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.
5. THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.
6. ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.
7. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
8. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
9. FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.
10. TAPER RATES FOR THE BRIFEN WRSF ARE AS FOLLOWS:
    HORIZONTAL: 25:1 MAXIMUM, 50:1 PREFERABLE
    VERTICAL: 25:1 MAXIMUM, 50:1 PREFERABLE

Texas Department of Transportation

Design Division Standard

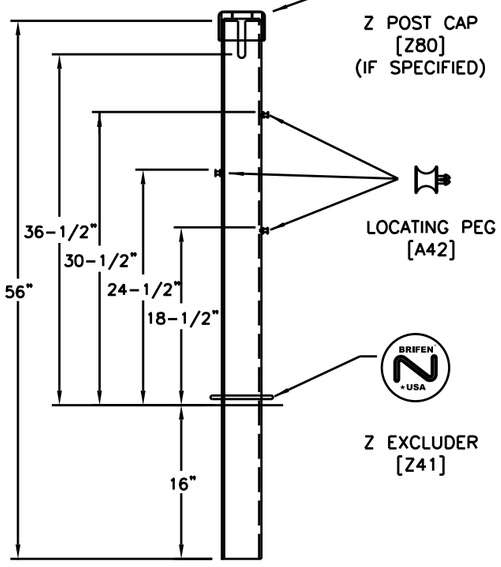
BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

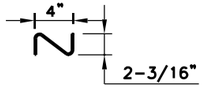
FILE: brifentl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
©TxDOT: MARCH 2014	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		62

DATE:
FILE:

LINE POST ASSEMBLY
[Z11]



ELEVATION

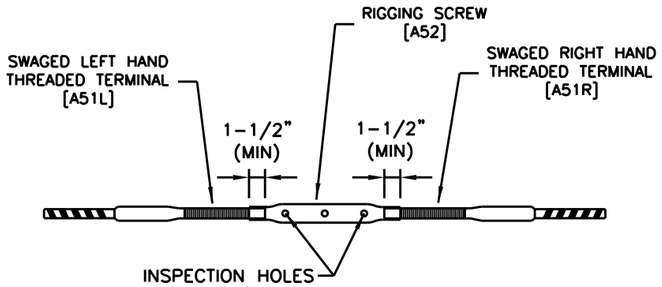


PLAN

NOTES SPECIFIC TO LINE POST ASSEMBLY

1. ROPE HEIGHTS SHALL BE ±1" TO GROUND LINE.
2. POST SHALL BE ±4" FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.

ROPE CONNECTION DETAIL

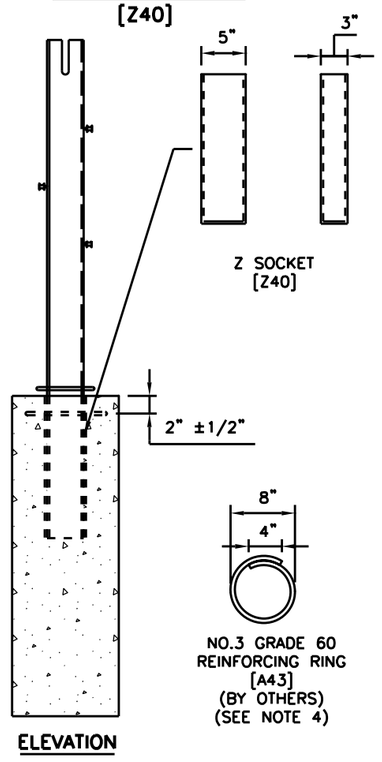


NOTES SPECIFIC TO ROPE CONNECTION DETAIL

1. THE WIRE ROPE TERMINALS SHALL BE THREADED A MINIMUM OF 1-1/2" INTO RIGGING SCREW.
2. AFTER FINAL TENSIONING, THE TERMINALS SHALL BE VISIBLE IN THE INSPECTION HOLES.

SOCKET ASSEMBLY

CONCRETE FOOTING
[Z40]



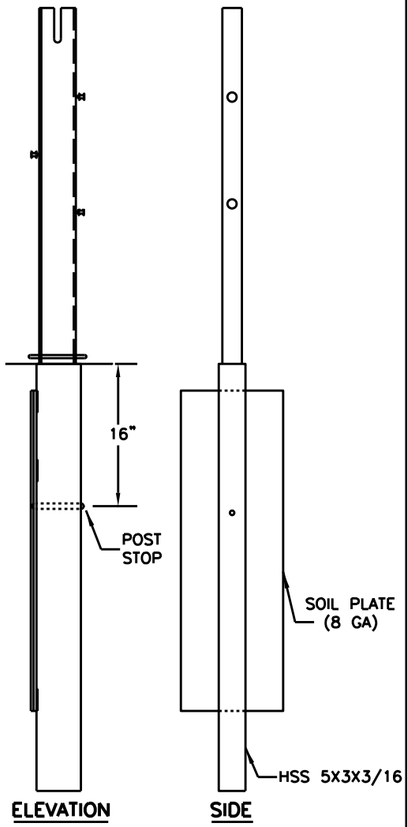
ELEVATION

PLAN

NOTES SPECIFIC TO CONCRETE FOOTING

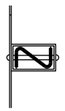
1. SIZE OF FOOTING WILL BE DETERMINED BY SOIL CONDITIONS, FOUNDATION TYPE AND PROJECT CONDITIONS.
2. CONCRETE BASED ON AGENCY SPECIFICATIONS.
3. CONCRETE BY OTHERS.
4. REINFORCING RING (BY OTHERS) WILL BE USED ACCORDING TO FOUNDATION SIZE AND TYPE. THE REINFORCEING RING MAY BE OMITTED IF THE FOOTING IS PLACED IN A CONTINOUS CONCRETE MOW STRIP.
5. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
6. SOCKET SHALL BE ±2° OF VERTICAL PLUMB.

DRIVE SOCKET
[Z44]



ELEVATION

SIDE



PLAN

NOTES SPECIFIC TO DRIVE SOCKETS

1. SIZE OF SOIL PLATE WILL BE DETERMINED BY SOIL CONDITIONS AND PROJECT CONDITIONS.
2. THE SOIL PLATE SHALL BE PARALLEL TO ROADWAY AND CAN FACE TOWARD OR AWAY FROM THE TRAVEL LANE.
3. FOOTING SHALL BE FLUSH WITH THE GROUND LINE, TO A MAXIMUM OF 1 INCH BELOW OR ABOVE GROUND LINE.
4. SOCKET SHALL BE ±2° OF VERTICAL PLUM.
5. SOCKETS SHALL BE DRIVEN IN A MANNER TO NOT DISTORT OR DESTROY THE TOP OF SOCKET TO A DEGREE THAT PLACES THE SOCKET OR LINE POST OUT OF CONSTRUCTION TOLERANCES.

GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. 1-866-427-4336.
2. THE BRIFEN WRSF HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-4 CONDITIONS ON SLOPES 6:1 OR FLATTER AND NCHRP 350 TL-3 CONDITIONS ON SLOPES 4:1 TO 6:1.
3. THE POST SPACING SHALL BE DETERMINED BY THE SPECIFYING AGENCY. POST SPACING MAY BE DECREASED TO AVOID OBSTRUCTIONS OR UTILITIES. IN NO EVENT SHALL THE POST SPACING EXCEED 21'-0".
4. BRIFEN WRSF SHALL BE PLACED ON A SMOOTH SURFACE, WITHOUT HUMPS, DROP-OFFS, HOLES, ETC THAT WOULD INTERFERE WITH THE STABILITY OF THE ERRANT VEHICLE. GRADING, FILL AND COMPACTION MAY BE REQUIRED TO ASSURE THAT ROPES ARE INSTALLED AT THE DESIGN HEIGHT.

Texas Department of Transportation

Design Division Standard

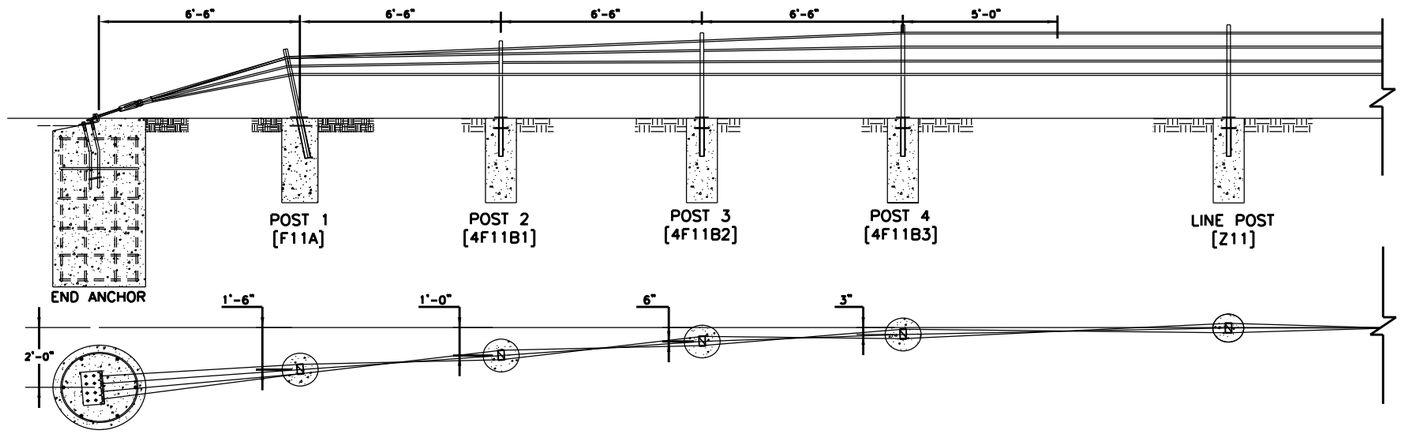
BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

FILE: brifentl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:	
©TxDOT: MARCH 2014	CONT	SECT	JOB	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		63	

DATE:
FILE:

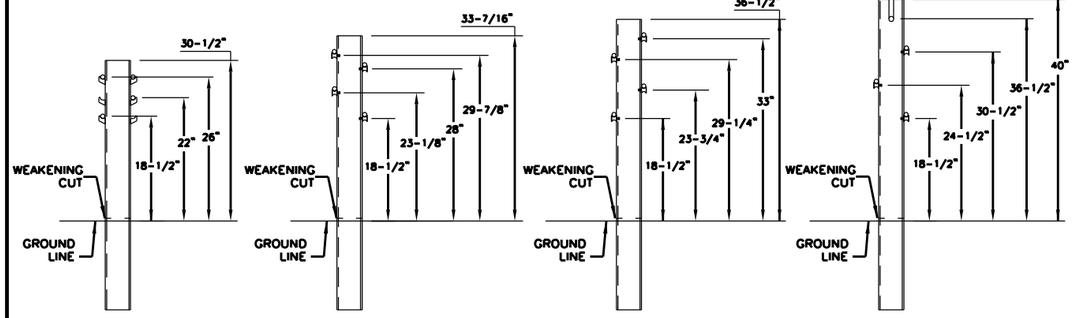
WRGT-FL END ANCHOR LAYOUT



GENERAL NOTES:

1. BRIFEN DRAWINGS, SPECIFICATIONS, AND PRODUCT MANUAL SHOULD BE REVIEWED PRIOR TO STARTING AN INSTALLATION. FOR ADDITIONAL INFORMATION OR QUESTIONS, CONTACT BRIFEN USA, INC. AT 1-866-427-4336.
2. THE WRGT-FL END ANCHOR HAS BEEN SUCCESSFULLY TESTED TO NCHRP 350 TL-3 CONDITIONS. THE LENGTH OF NEED BEGINS 31'-0" FROM THE END ANCHOR. POSTS A THROUGH POST B3, SPACED 6'-6" APART, HAVE WEAKENED CUTS AT THE GROUND THAT SHALL FACE THE ANCHOR.
3. ANCHOR AND LINE POST DIMENSIONS AND STEEL REINFORCEMENT WILL BE DETERMINED ON PROJECT SPECIFIC SOIL CLASSIFICATION, PROPERTIES AND TEMPERATURE EXTREMES. CONTACT BRIFEN USA, INC. FOR ADDITIONAL INFORMATION.
4. ALL REINFORCEMENT AND CONCRETE FOR THE ANCHORS AND LINE POSTS PROVIDED BY OTHERS.
5. REINFORCEMENT AND CONCRETE PROPERTIES SHALL MEET AGENCY SPECIFICATIONS.
6. FOR PLACEMENT NEAR GUARDRAIL OR OTHER OBSTACLES CONTACT BRIFEN USA, INC. FOR ADDITIONAL DRAWINGS AND SUPPORT.

WRGT-FL POST DETAILS

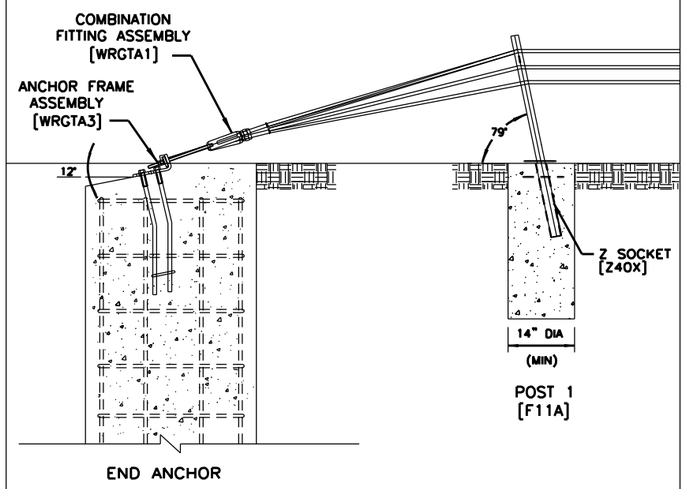


POST 1 [F11AL] | POST 2 [4F11B1L] | POST 3 [4F11B2L] | POST 4 [4F11B3L]

NOTES SPECIFIC TO WRGT-FL POST DETAIL

1. ROPE HEIGHTS SHALL BE ±1" TO GROUND LINE.
2. POST SHALL BE ±4" FROM VERTICAL PLUMB.
3. POST CAPS SHALL BE USED IF SPECIFIED.
4. REFLECTORS SHALL BE SPACED ACCORDING TO AGENCY SPECIFICATIONS.
5. REFLECTORS CAN BE PLACED ON THE POST CAP OR POST.
6. Z EXCLUDER (Z41) SHALL BE USED.
7. POST A & SOCKET SHALL BE PLACED 79° (±4°) TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
8. POST A SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.
9. FOUNDATIONS FOR POST 2 THRU 4 SHALL BE THE SAME AS THE LINE POST ASSEMBLY'S FOR THE PROJECT.
10. WEAKENED CUTS SHALL FACE END ANCHOR.

END ANCHOR DETAILS

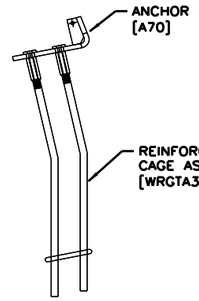


NOTES SPECIFIC TO END ANCHOR DETAIL

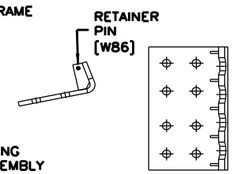
1. THE END ANCHOR ASSEMBLY SHALL BE PLACED 12" (+3", -1") BELOW HORIZONTAL PLANE.
2. POST 1 & SOCKET SHALL BE PLACED 79° (±4°) TOWARD END ANCHOR FROM THE HORIZONTAL PLANE.
3. POST 1 SOCKET SHALL BE PLACED IN 14" (MIN) CONCRETE FOUNDATION. DEPTH TO BE DETERMINED FROM SOIL CONDITIONS AND PROJECT CONDITIONS.

END ANCHOR COMPONENTS

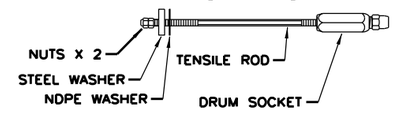
ANCHOR FRAME ASSEMBLY



ANCHOR FRAME [A70]



COMBINATION FITTING [WRGTA1]



SHEET 3 OF 3

Texas Department of Transportation | Design Division Standard

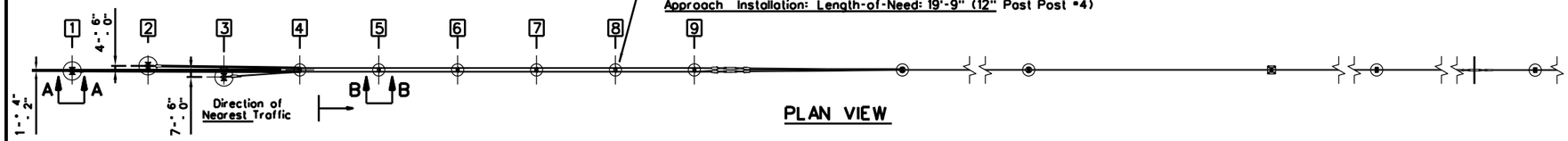
BRIFEN
WIRE ROPE SAFETY FENCE
(TL-4)

BRIFEN(TL4)-14

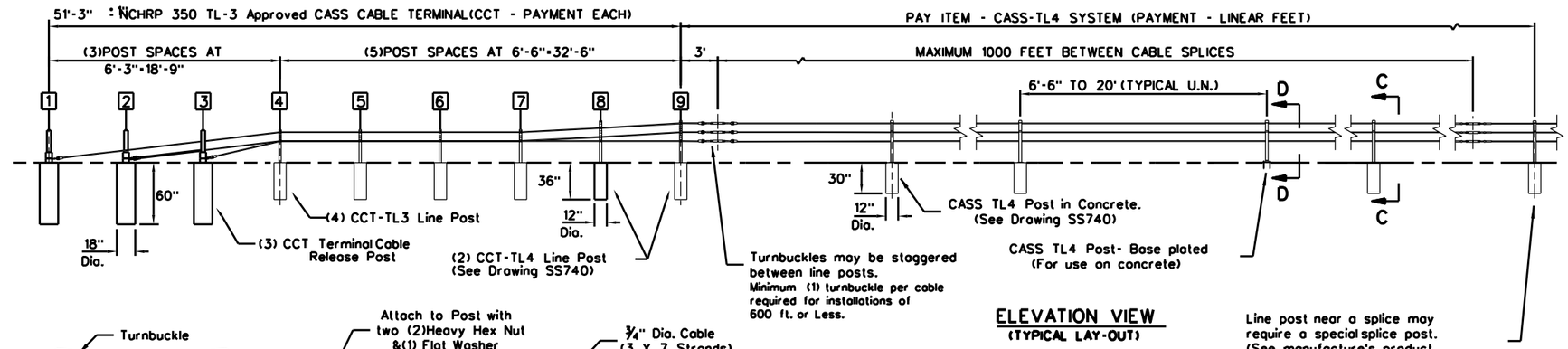
FILE: brifentl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:		
© TxDOT: MARCH 2014	CONT	SECT	JOB	HIGHWAY		
REVISIONS			6469-98-001	SH 36, ETC.		
	DIST	COUNTY		SHEET NO.		
	BRY	WASHINGTON, ETC.		64		

Preferred Installation: Locate post #2 away from nearest traffic.
System has been succesfully tested with opposite installation.

Length-of-Need Cass Cable Terminal (CCT):
Departure Installation: Length-of-Need: 44'-9" (At Post #8)
Approach Installation: Length-of-Need: 19'-9" (12" Post Post #4)

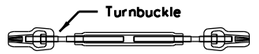


PLAN VIEW



ELEVATION VIEW
(TYPICAL LAY-OUT)

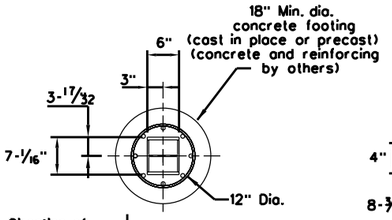
Line post near a splice may require a special splice post. (See manufacture's product manual for details)



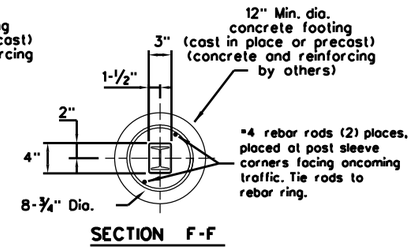
CABLE SPLICE WITH TURNBUCKLE
(OPEN BODY STYLE)

CABLE STUD ASSEMBLY

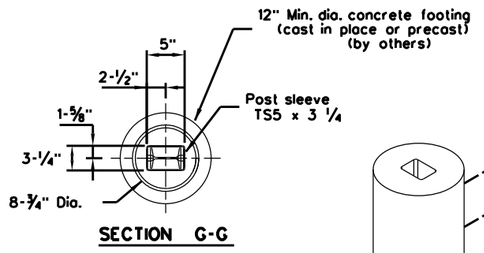
TORPEDO CABLE SPLICE



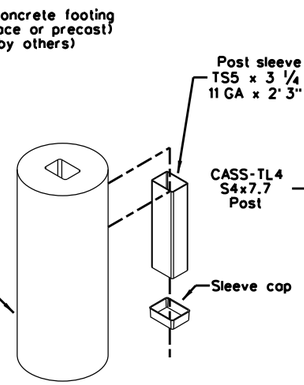
SECTION E-E



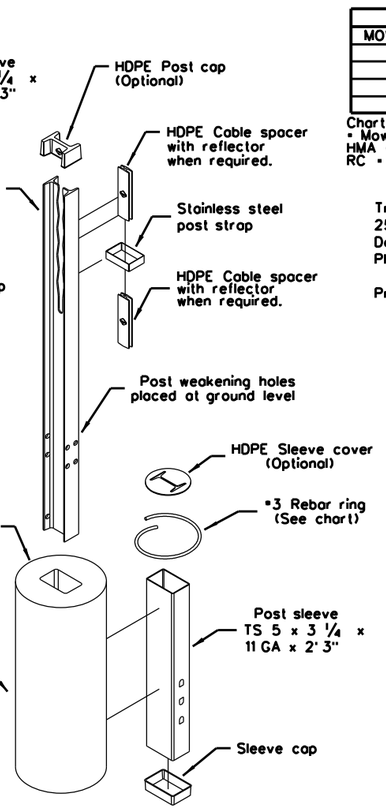
SECTION F-F



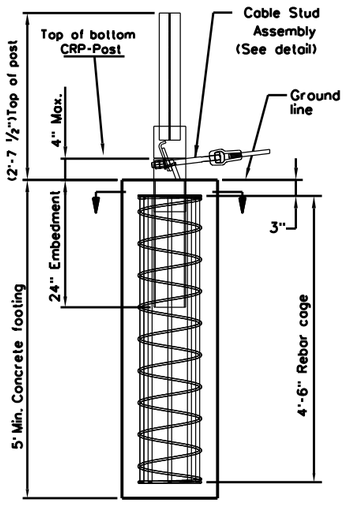
SECTION G-G



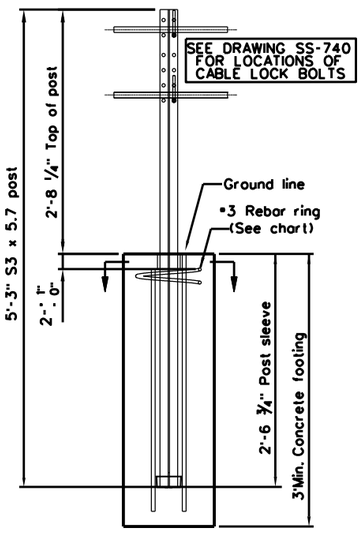
CONCRETE FOOTING
(IN QUALIFYING MOW STRIP SEE CHART)



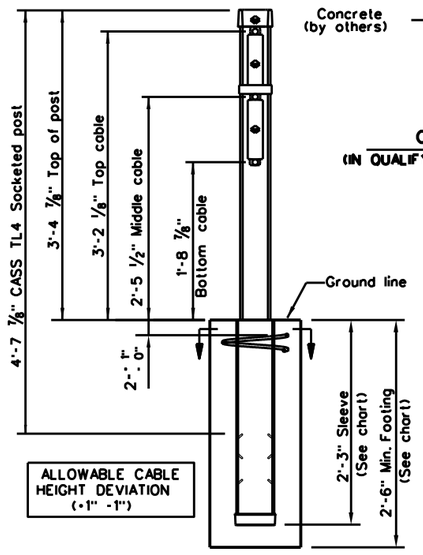
STANDARD POST & CONCRETE FOOTING
(SOCKETED POST)



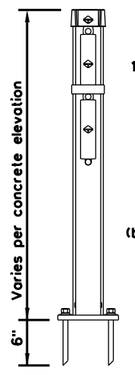
VIEW A-A
(CABLE RELEASE POST 1-3)



VIEW B-B
(TERMINAL LINE POST 4-7)



SECTION C-C
(SOCKETED POST)



SECTION D-D
(BASE PLATED POST)

GENERAL NOTES

1. This drawing is a general overview of CASS TL-4 Barrier System. See SS-740 (latest version) for specific details of CASS cable terminal (CCT) and cable safety system (CASS) requirements, proper installation, options and specification.
2. CASS is designed for bi-directional traffic flows and can be installed on either side of the median. Contact Trinity (800-527-6050) or consult the design, installation, or repair manual(s) for additional information.
3. All concrete for CASS footings shall be TxDOT class A. If class A or stronger concrete is utilized for the mowstrip, please see chart below for allowable footing depth and sleeve deviations.
4. All posts shall be socketed unless otherwise specified. All cables shall be pre-stretched unless otherwise specified.
5. For payment see Special Specification "Cable Barrier System".
6. CASS-TL4 shall be installed on shoulders or medians with slopes of 6:1 or flatter without obstructions, depressions, etc. That may significantly affect the stability of an errant vehicle. Grading of site and/or appropriate fill materials may be required. The designer/installer shall "Flatten" or "Round" various topographical inconsistencies that could interfere with the ability of the installer to consistently maintain the design height (in relation to the terrain) of the cables. Please consult manual(s) and / or TxDOT Memo(s) for installations in "Ditch Sections".
7. CASS TL-4 post spacing may be modified to avoid obstacles that conflict with the installation of cass-tl4 line posts or to reduce deflection on radiuses. No post space can exceed the maximum post TxDOT space limit of 20'. Reducing or increasing post spacing affects deflection. CASS TL-4 may be laterally transferred at a rate not to exceed 30:1.
8. Post foundations may be drilled through existing pavement. Please see line post foundation chart for minimum footing requirements in various applications.
9. For aesthetic purposes Trinity recommends all sleeves, driven posts, and lower cable release posts to be installed reasonably plumb (approximately 1/8" per foot).
10. CASS TL-4 shall be installed in well-drained, compacted, NCHRP Report 350 Standard soil. If soil does not meet this classification, if solid rock/concrete is encountered below grade or if soil is susceptable to severe freeze/thaw cycles, please contact Trinity about alternate footing design(s). Trinity suggests the use of "Mow strips" for erosion prevention and ease of maintenance / installation.
11. See the Texas MUTCD for proper "Barrier" Delineation.

MOW STRIP DETAIL*			CONCRETE FOOTING CHART		
MOW STRIP	DEPTH	WIDTH	FOOTING	TUBE SLEEVE	REBAR RING
NONE			30" Min.	27" Min.	YES
HMA	6" Min.	3' Min.	27" Min.	15" Min.	NO
HMA	8" Min.	3' Min.	24" Min.	15" Min.	NO
RC	3" Min.	3' Min.	24" Min.	15" Min.	NO

Chart does not apply to Terminal Posts 1 thru 9.
* Mow strip or pavement.
HMA = Hot Mix Asphalt (Not Recycled Asphalt Pavement).
RC = Reinforced Concrete (TxDOT Class A Minimum).

CABLE TENSION CHART	
FAHRENHEIT	PRE-STRETCHED
DEGREES	LB / FORCE
-10	7300
0	7000
10	6600
20	6300
30	6000
40	5600
50	5300
60	5000
70	4600
80	4300
90	4000
100	3600
110	3300
120	3000
130	2700
140	2500
150	2300

Allowable deviation from chart in tangent sections:
+800, -200 pounds/force. Cable tension readings are typically higher in curved cable sections.

Trinity Highway Products, LLC.
2525 Stemmons Freeway
Dallas, TX 75207
Phone: (800) 644-7976

Product.INFO@TRIN.NET

Texas Department of Transportation

Design Division Standard

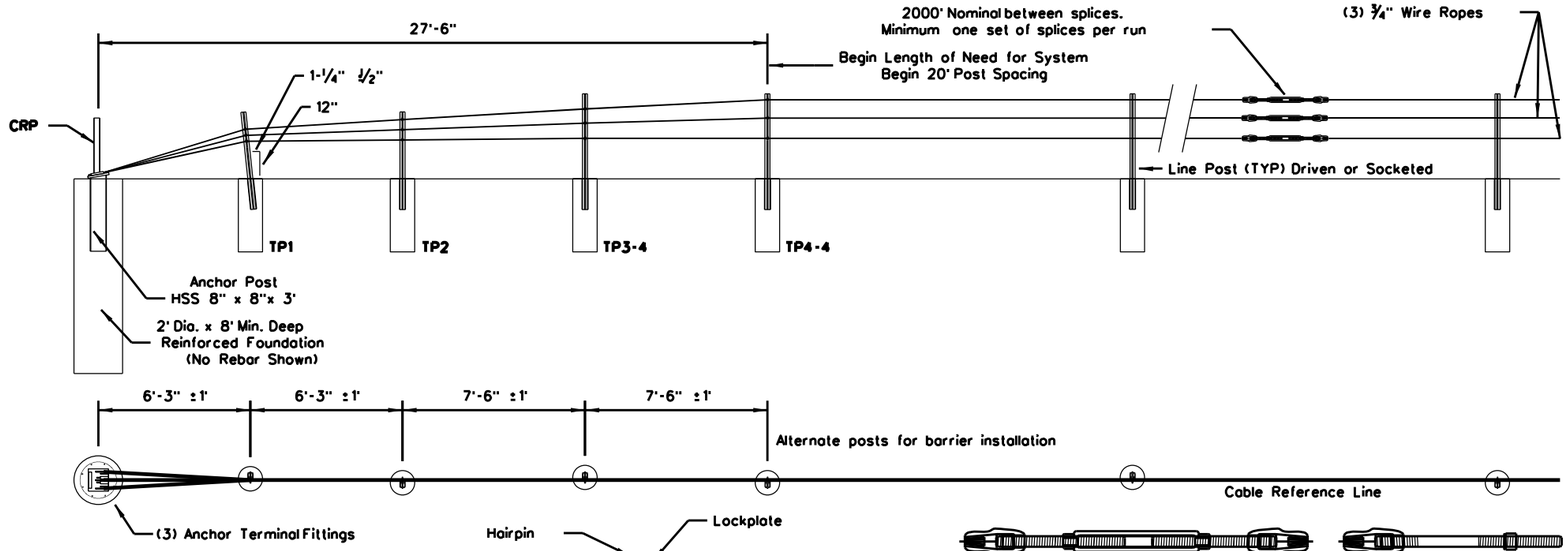
TRINITY CABLE SAFETY SYSTEM (TL-4)

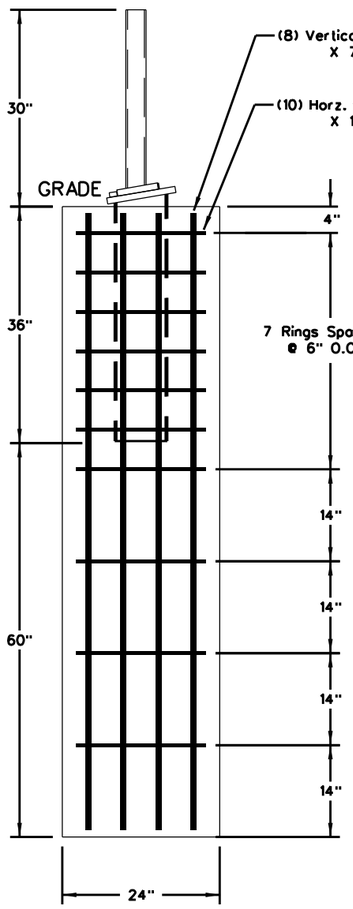
CASS(TL4)-14

FILE: casstl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:	
©TxDOT: March 2014	CONT	SECT	RMC PROJECT NO.	HIGHWAY	
REVISIONS			6469-98-001	SH 36, ETC.	
03-2014	DIST	COUNTY		SHEET NO.	
	BRY	WASHINGTON, ETC.		65	

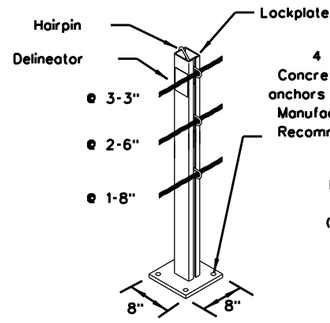
DATE:
FILE:

DATE:
FILE:

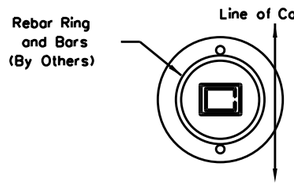




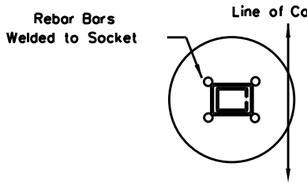
CABLE RELEASE AND ANCHOR POST



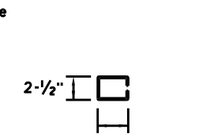
LINE POST
(BASE-PLATED OPTION)
Low-Fill Box Culvert Less than 15" Fill



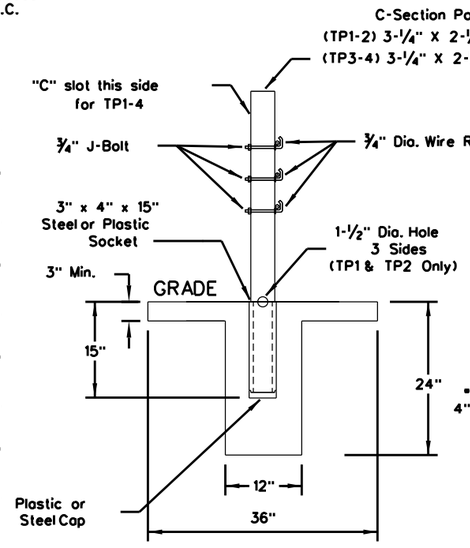
SECTION A



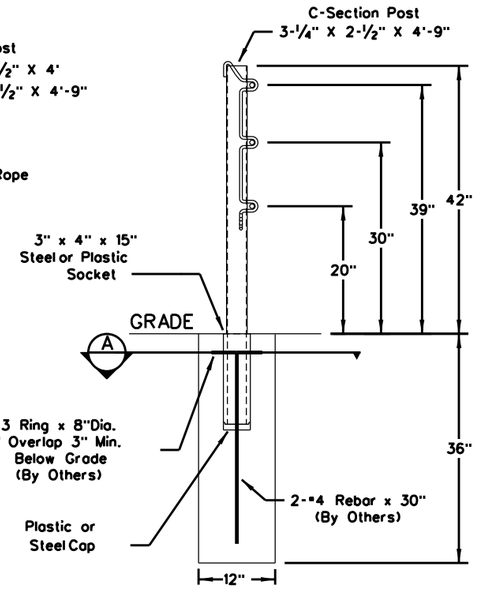
SECTION B



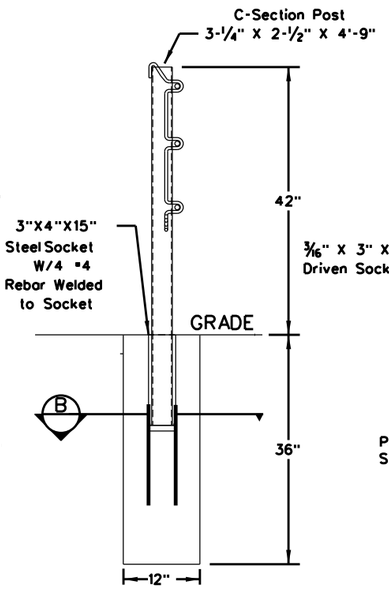
C-SECTION POST



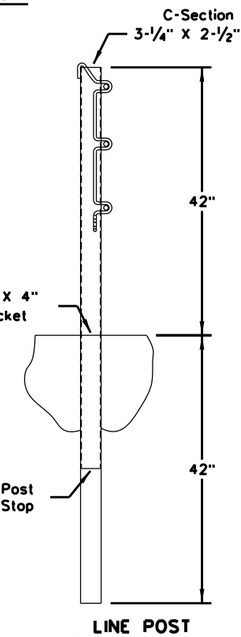
TERMINAL POST
(SHOWN WITH CONCRETE MOWSTRIP)
(Shown with Tube Plate Option)
(See Note 10)



LINE POST SOCKETED
(Shown with Rebar Ring/Bars Socket Option)
(See Note 9)



LINE POST SOCKETED
(Shown with Welded Rebar Socket Option)
(See Note 9)



LINE POST
(DRIVEN OPTION)
(Shown with Driven
Socket Option)
(See Note 9)

GENERAL NOTES

1. For additional information contact Gibraltar, Inc. at 1-800-495-8957, 830-798-5444, or see the manufacturer's product manual.
2. All concrete shall be CLASS A.
3. The Cable Barrier System shall be installed on shoulders or on medians with slopes of 6:1 or flatter. If installed on slopes steeper than 6:1 up to 4:1 the TL-4 system performs as a TL-3 and Gibraltar must be contacted for various guidelines related to placement.
4. The Cable Barrier System is accepted by the FHWA Test Level - 4.
5. See the Texas MUTCD for proper "Barrier" delineation.
6. Rock Clause: Where solid rock is encountered:
   A. For socketed post, continue digging 12" diameter, 15" deep into rock or the required plan depth, whichever comes first.
   B. For driven post, core drill a 4" diameter hole 18" deep into rock or the required plan depth, whichever comes first.
   C. For Anchor post, continue digging 24" diameter, 30" deep into rock or the required plan depth, whichever comes first.
7. Tolerances:
   - LP - 3" out of plumb, at top
   - Cable height - 1"
   - Anchor Post - 5" off of Cable Reference Line
8. The Gibraltar cable barrier system shall be installed in NCHRP Report 350 standard compacted soil. Soil must be well drained.
9. All non-welded rebar by others.
10. Minimum recommended line post foundation.
    A. Without mowstrip, 36" Deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long
    B. With 4" minimum depth hot mix asphalt, 30" deep x 12" diameter foundations with #3 rebar ring x 8" diameter with two #4 rebar vertical bars 30" long.
    C. With 3" minimum depth concrete mowstrip, 24" deep x 12" diameter foundations. (No rebar required)
    D. Direct drive post 42" deep.

DEFLECTION	
Deflection	Post Spacing
8'-0"	20 FT
7'-0"	12 FT
6'-8"	10 FT

- Allowable Deviation from Chart +/- 10%

CABLE TENSION CHART*	
-10 °F	8000
0 °F	7600
10 °F	7200
20 °F	6800
30 °F	6400
40 °F	6000
50 °F	5600
60 °F	5200
70 °F	4800
80 °F	4400
90 °F	4000
100 °F	3600
110 °F	3200

Texas Department of Transportation

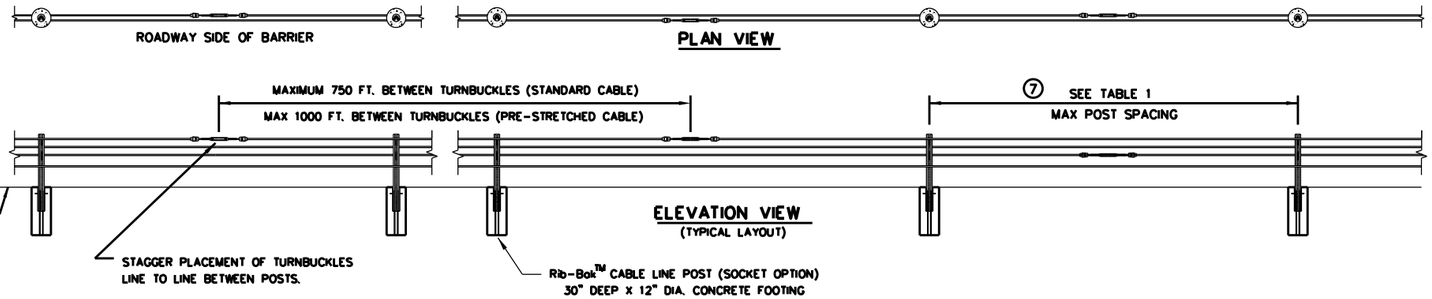
Design Division Standard

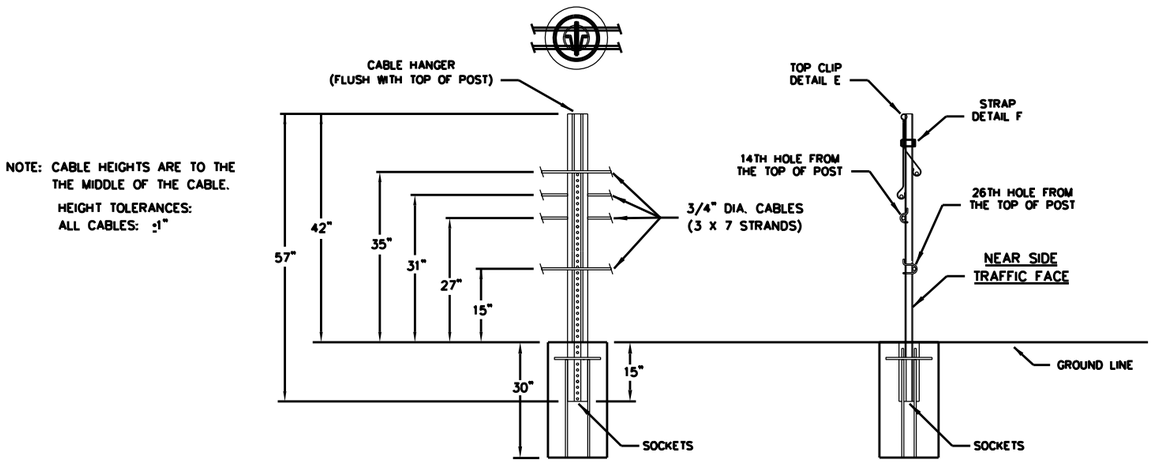
GIBRALTAR CABLE BARRIER SYSTEM (TL-4)

GBRLTR(TL4)-14

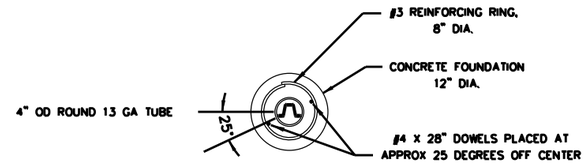
FILE: gbrltrtl414.dgn	DN: TxDOT	CK: RM	DW: VP	CK:
©TxDOT: March 2014	CONT	SECT	RMC PROJECT NO.	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
03-2014	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		66

DATE:
FILE:

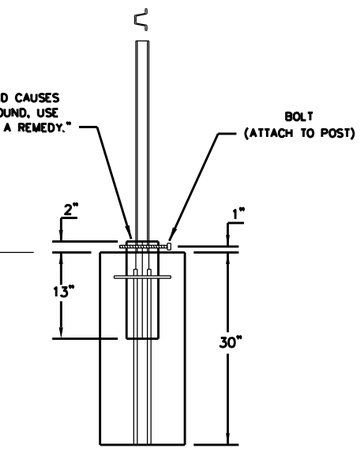




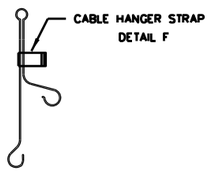
INSTALLATION DETAIL
4 CABLE 6:1



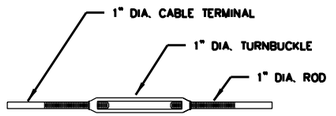
⑪ **SOCKETED POST OPTION**
(TYPE S POST)



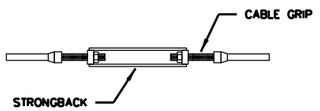
ALTERNATE SOCKET PLACEMENT
(TYPE S POST)



CABLE HANGER BRACKET
DETAIL E
(SUBJECT TO MANUFACTURER'S TOLERANCES)



WEDGED FITTING
TURNBUCKLE DETAIL
(TYPICAL)



STRONGBACK (SELF-SWAGING)
TURNBUCKLE DETAIL
(OPTIONAL)

GENERAL NOTES

1. FOR ADDITIONAL INFORMATION CONTACT YOUR DISTRIBUTOR OR NUCOR STEEL MARION, INC. AT (740) 383-4011.
2. FOR PAYMENT SEE SPECIAL SPECIFICATION "CABLE BARRIER SYSTEM".
3. FOR ADDITIONAL INFORMATION SEE THE MANUFACTURER'S PRODUCT MANUAL.
4. THE NU-CABLE SYSTEM IS DESIGNED FOR BI-DIRECTIONAL TRAFFIC FLOWS. SEE THE MANUFACTURER'S PRODUCT MANUAL FOR PLACEMENT ADJACENT TO GUARDRAIL END TREATMENTS.
5. THE NU-CABLE SYSTEM SHALL BE INSTALLED ON MEDIANS WITH SLOPES OF 6:1 OR FLATTER WITHOUT OBSTRUCTIONS, DEPRESSIONS, ETC; THAT MAY SIGNIFICANTLY AFFECT THE STABILITY OF AN ERRANT VEHICLE.
6. THE NU-CABLE SYSTEM MAY BE INSTALLED ON EITHER SIDE OF THE ROADWAY. Rib-Bak™ CABLE LINE POSTS MAY BE SOCKETED OR DRIVEN DESIGN.
7. THE TL-4 FOR 6:1 SLOPES CAN USE 4# / LF POST. SEE TABLE #1 FOR POST SIZE PER SPACING.
8. SEE (TABLE 2) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR INITIAL INSTALLATION.
9. SEE (TABLE 3) FOR TENSION AMOUNT AT SPECIFIC CABLE TEMPERATURE FOR MAINTENANCE.
10. FOURTH (LOWEST) CABLE IS NOT OPTIONAL ON THE TL-4 SYSTEM.
11. CONSULT YOUR PROJECT PLAN SHEETS AND CABLE BARRIER SPECIFICATIONS FOR DESIRED SOCKET MATERIAL.
12. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGN IF SOIL TYPES DIFFER.

⑦ **TABLE 1**

POST SIZE TABLE	
POST SPACING	POST SIZE
0' - 17'-6"	4# / LF x 4' OR 6' POST
17'-6" - 20'	5# / LF x 4' POST

POST SPACING IS PER 8 FOOT DEFLECTION REQUIRMENTS.
CONSULT PRODUCT MANUAL IF GREATER DEFLECTION IS PERMISSIBLE.

⑧ **TABLE 2**

CABLE TENSION CHART	
INITIAL INSTALL	
F	LBF
120	4624
110	4986
100	5350
90	5713
80	6077
70	6440
60	7167
50	7894
40	8619
30	9346
20	10073
10	10800
0	11525
-10	12252
-20	12979
-30	13706

⑨ **TABLE 3**

CABLE TENSION CHART	
MAINTENANCE	
F	LBF
120	4021
110	4336
100	4652
90	4968
80	5284
70	5600
60	6232
50	6864
40	7495
30	8127
20	8759
10	9391
0	10022
-10	10654
-20	11286
-30	11918

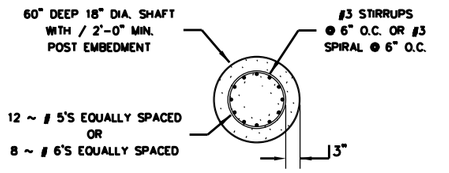
Texas Department of Transportation
Design Division Standard

NU-CABLE BARRIER SYSTEM
(TL-4)
(4 CABLE)

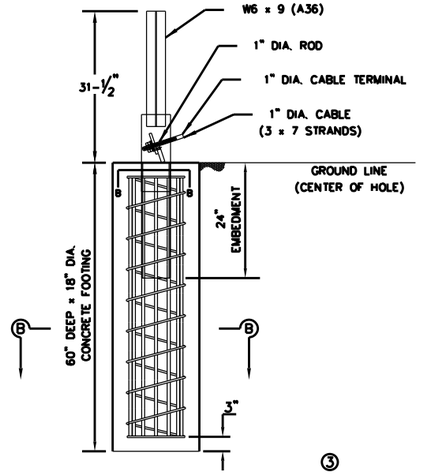
NU-CABLE(TL4)-14

FILE:	DN:	CK:	DW:	CK:
©TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		67

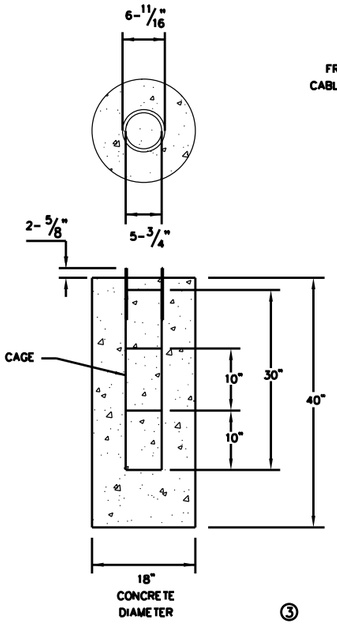
DATE:
FILE:

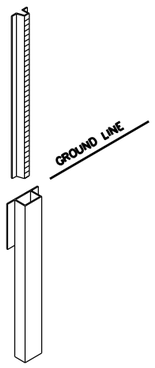


SECTION B-B
(CABLE RELEASE POST)



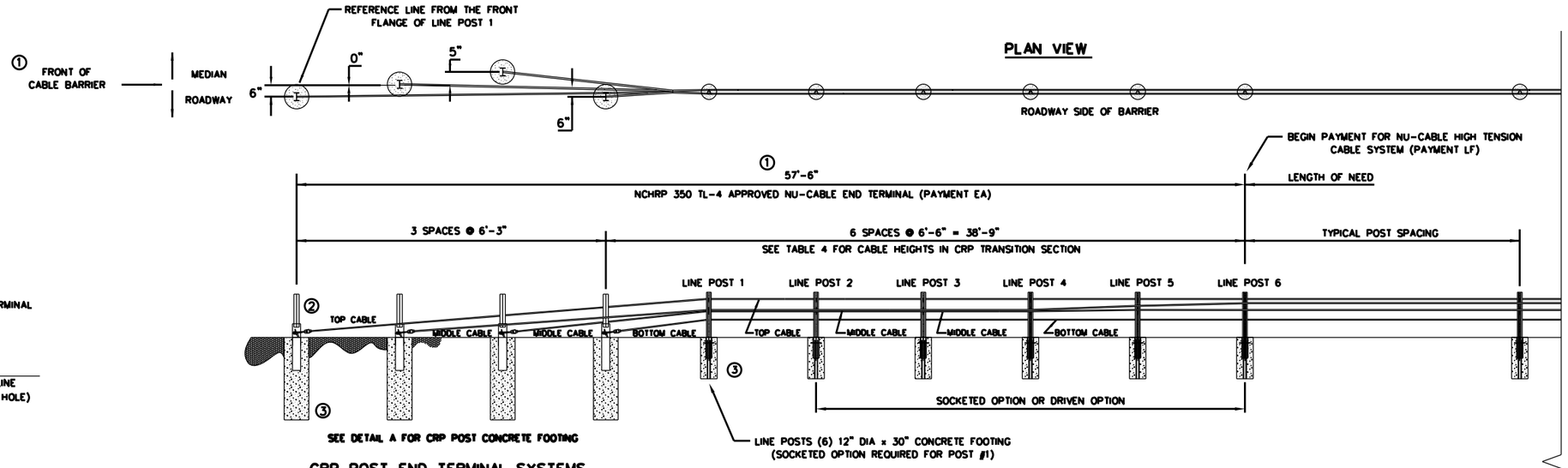
DETAIL A – CRP IN CONCRETE FOOTING ③
(3000 PSI MIN CONCRETE)





DRIVEN SOCKET OPTION

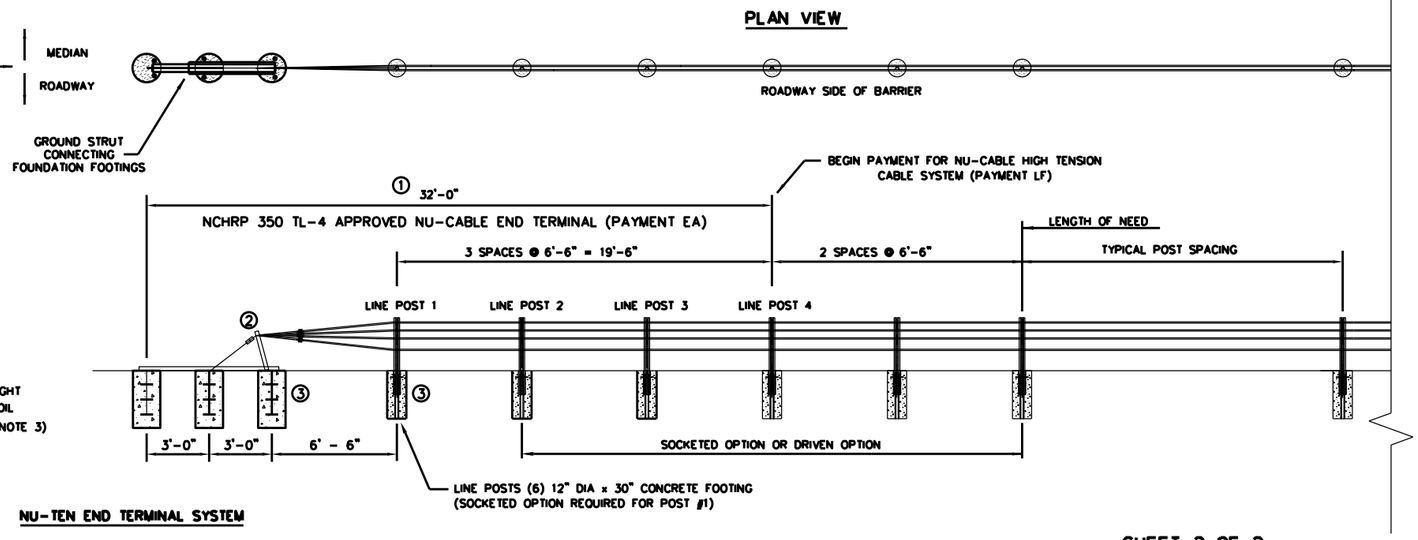
NU-TEN CONCRETE FOOTING DETAIL ③



CRP POST END TERMINAL SYSTEMS

ELEVATION VIEW

① THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT.



NU-TEN END TERMINAL SYSTEM

ELEVATION VIEW

④ **TABLE 4**

CRP END TERMINAL CABLE HEIGHTS - TL-4						
	LP 1	LP 2	LP 3	LP 4	LP 5	LP 6
TOP CABLE	34"	34"	34"	34"	34"	34"
UPPER-MIDDLE CABLE	27"	27"	27"	27"	28"	31"
BOTTOM-MIDDLE CABLE	24"	24"	24"	24"	24"	24"
BOTTOM CABLE	15"	15"	15"	15"	15"	15"

NOTES

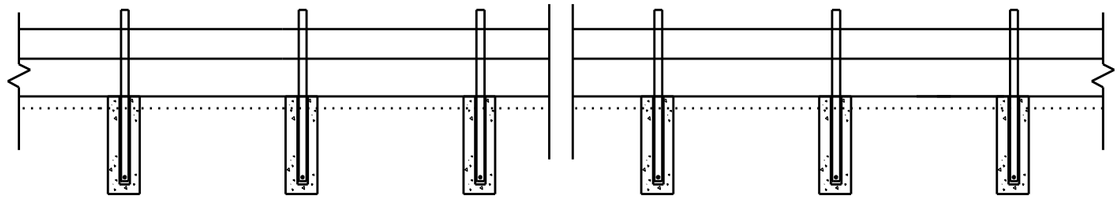
1. THE OPPOSING END TREATMENTS ON A PARTICULAR RUN ARE MIRRORED IN THEIR LAYOUT. SYSTEM PAYMENT IS PER EACH (EA). REFER TO PROJECT SPECIFICATIONS FOR ADDITIONAL PAYMENT INFORMATION
2. REFER TO INSTALLATION MANUAL FOR CABLE END ASSEMBLY DETAIL.
3. ALL FOUNDATION DESIGNS ARE BASED ON NCHRP 350 STRONG (S1) SOIL. CONSULT THE MANUFACTURER FOR SPECIFIC FOUNDATION DESIGNS IF SOIL TYPES DIFFER.
4. SEE TABLE 4 CABLE HEIGHTS IN CRP TRANSITION SECTION.

Texas Department of Transportation
Design Division Standard

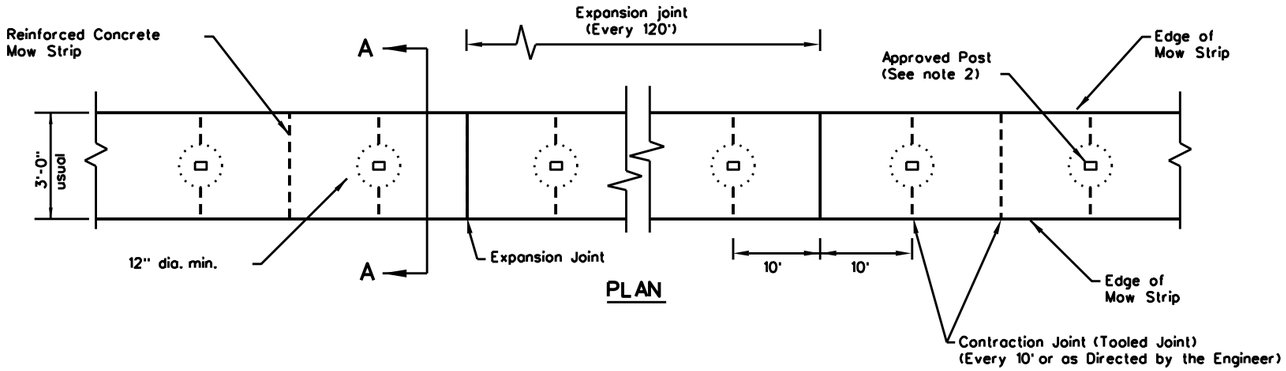
NU-CABLE BARRIER SYSTEM
(TL-4)
(4 CABLE)

NU-CABLE(TL4)-14

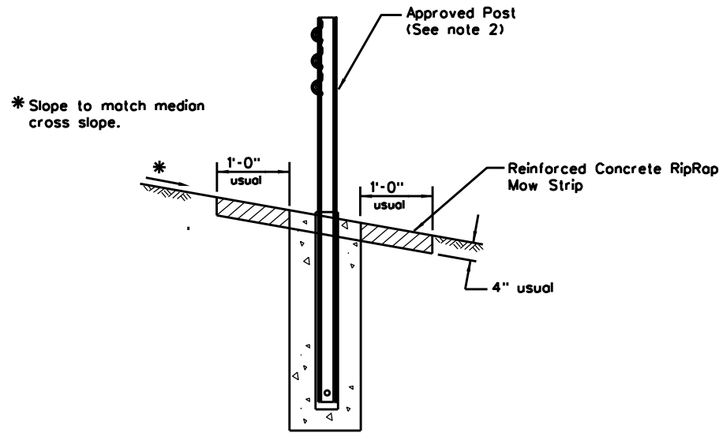
FILE:	DN:	CK:	DW:	CK:
©TxDOT:	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	SH 36, ETC.
	DIST	COUNTY		SHEET NO.
	BRY	WASHINGTON, ETC.		68



ELEVATION

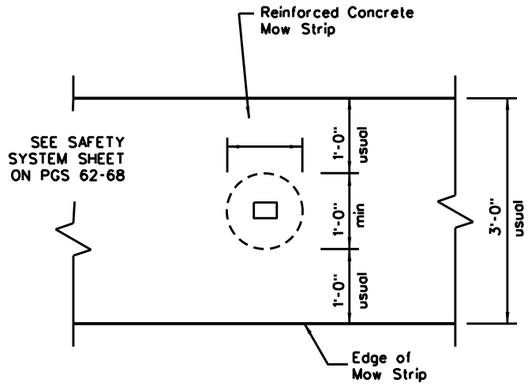


PLAN



SECTION A-A

Typical



MOW STRIP DETAIL

Reinforced Concrete Mow Strip
with 12" dia. minimum leaveout.

GENERAL NOTES

1. Concrete Mow strips shall be CL A concrete and will be placed and paid for in accordance with Item 432, "Riprap".
2. The type of approved post will be shown elsewhere in the plans. See the applicable Cable System sheets for additional details and information.
3. Depth of mow strip may vary, (4" usual, 8" maximum), but payment will not include depths greater than 4".
4. The limits of payment for concrete riprap will include leaveouts for post.
5. Expansion material will be Redwood or Asphalt Board or other approved material as directed by the Engineer. The work and material for the expansion joints will be subsidiary to the Mowstrip.

STATE OF TEXAS
PAUL M. RAY
115982
LICENSED
PROFESSIONAL ENGINEER

DocuSigned by:
Paul M. Ray P.E. 6/4/2024
D5649C5D0971432...

PRINT DATE	REVISION DATE

Texas Department of Transportation
Bryan District Maintenance Office

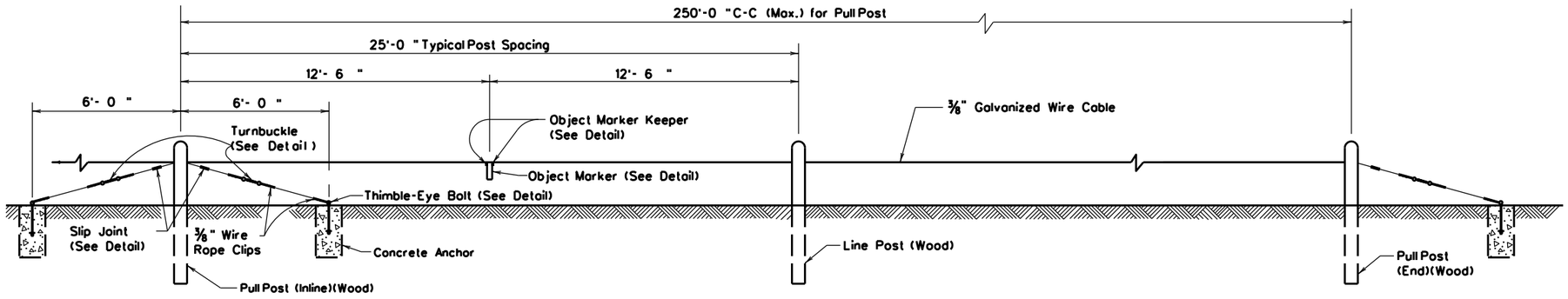
MOW STRIP DETAIL SHEET

FED. RD. DIV. NO.	PROJECT NUMBER	HIGHWAY NUMBER
6	RMC 6469-98-001	SH 36, ETC.
STATE	DISTRICT	COUNTY
TEXAS	BRY	WASHINGTON, ETC.
CONTROL	SECTION	JOB / SHEET NO.
		69

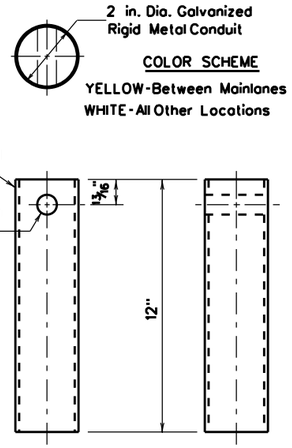
CSJ: 6469-98-001 FILENAME: $FILES

LEVELS DISPLAYED

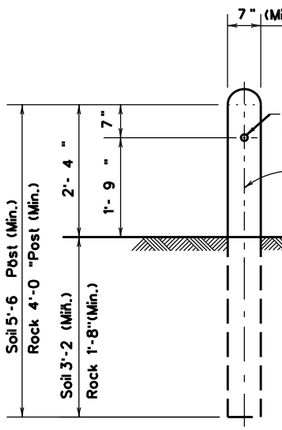
1	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43
44	45	46	47	48	49	50	51	52	53	54	55	65	75	85	90
61	62	63													



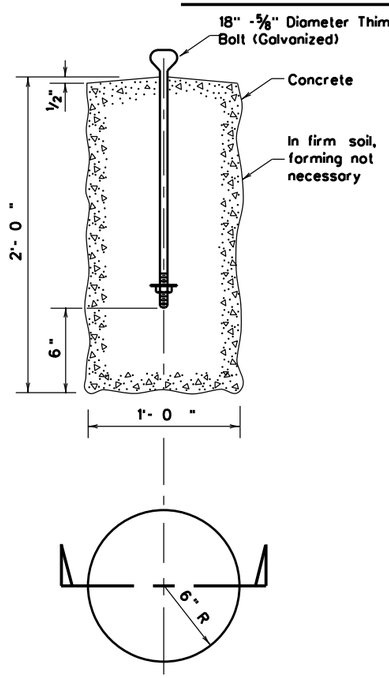
WOOD POST & CABLE UNIT



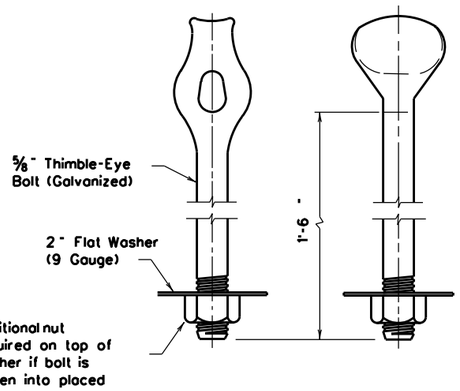
OBJECT MARKER (Reflector Detail)



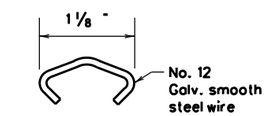
WOOD POST DETAIL



CONCRETE ANCHOR DETAILS



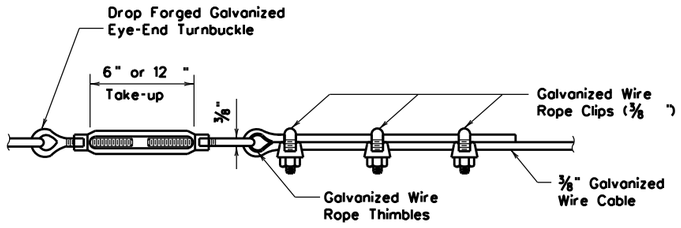
THIMBLE-EYE BOLT DETAILS



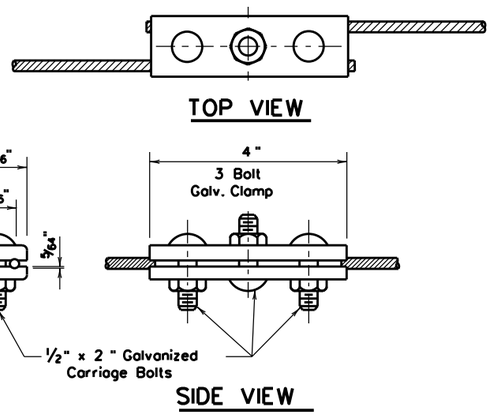
OBJECT MARKER KEEPER DETAIL

GENERAL NOTES

1. Furnish Class "B" or better concrete in accordance with Item 421, "Hydraulic Cement Concrete". Cure concrete anchors at least five (5) days before attaching the cable.
2. Furnish galvanized cable fittings in accordance with the Item 445, Galvanizing.
3. Furnish posts meeting the requirements of DMS 7200, "Timer Posts and Blocks for Metal Beam Guard Fence." Do not use painted timber posts.
4. Cover the entire surface of object marker (reflector) with a reflectorized sheeting material conforming to Departmental Material Specification DMS 8300, "Sign Face Materials", Type C.
5. Furnish cable conforming to ASTM designation A475.



WIRE CABLE CONNECTION (at turnbuckles & eyebolts) DETAIL



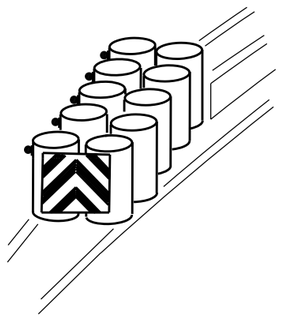
SLIP JOINT DETAIL

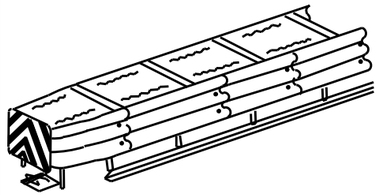
Texas Department of Transportation
Maintenance Division

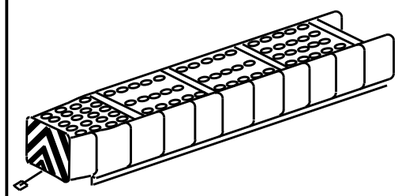
POST & CABLE FENCE

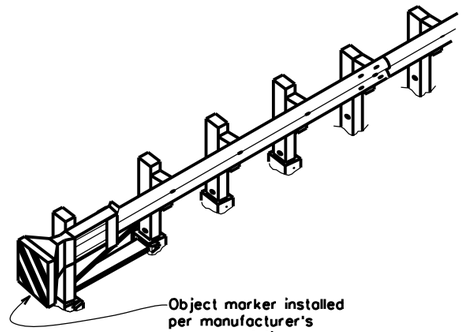
PCF-05

FILE: pcf05.dgn	DN:	CK:	DW: LJB	CK: JG	NEG:	
©TxDOT FEB. 2005	DIST	FED REG	FEDERAL AID PROJECT	•		SHEET
REVISIONS 2/02 Rev.Design Div. PCF-99	BRY	6	6469-98-001			70
	COUNTY		CONTROL	SECT	JOB	HIGHWAY
	WASHINGTON, ETC.					SH 36, ETC

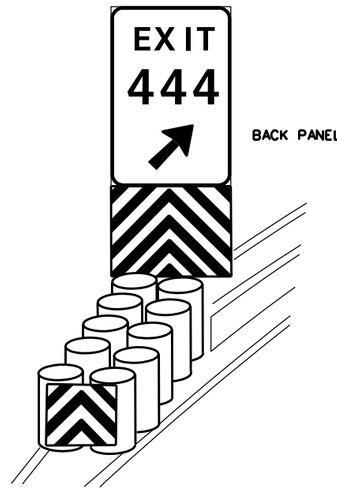




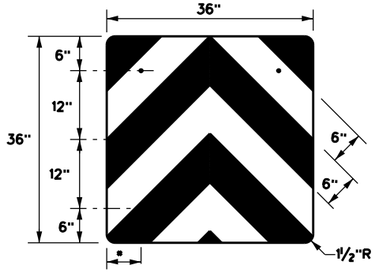


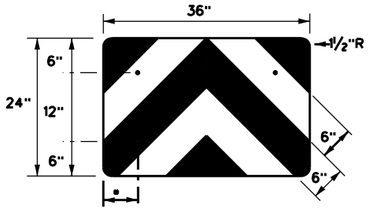


Object marker installed per manufacturer's recommendations.

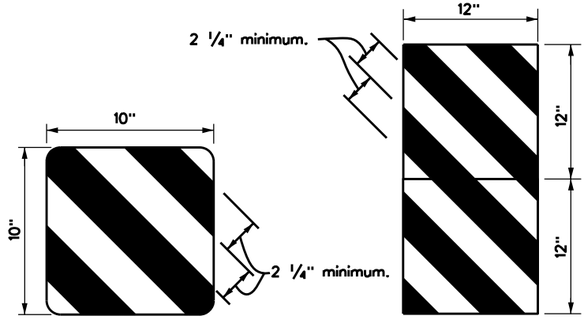


BACK PANEL (OPTIONAL)

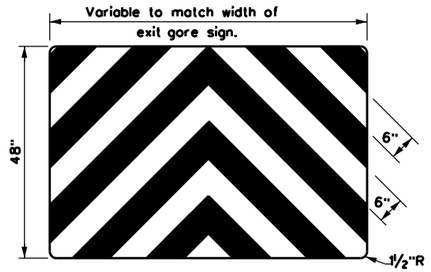


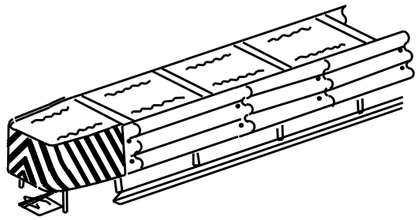


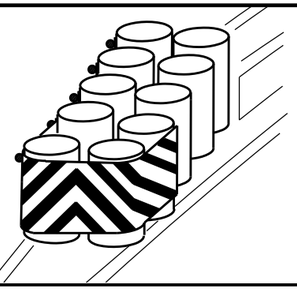
* Adjust to fit attenuator per manufacturer's recommendation, or as directed by the Engineer

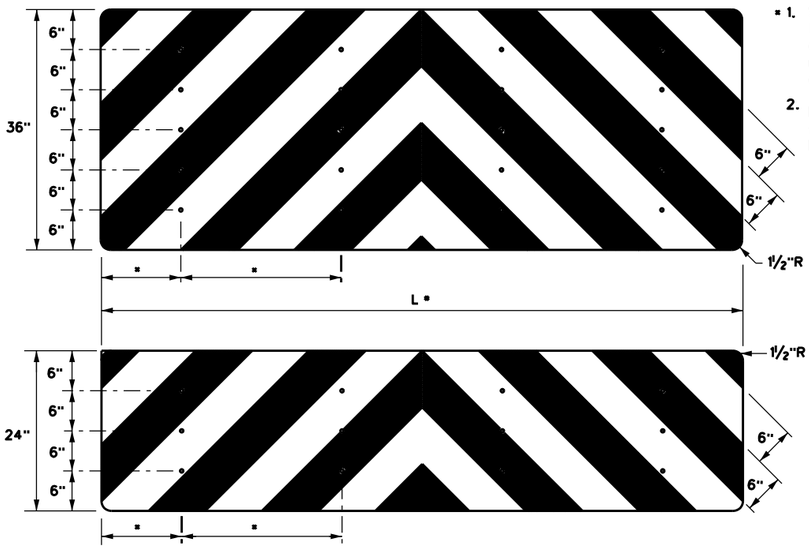


OBJECT MARKERS SMALLER THAN 3 FT^2









NOTES

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

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

NOTES

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

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

3. Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 ¼".

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

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

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

Texas Department of Transportation

Traffic Safety Division Standard

DELINEATOR & OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS

D & OM(VIA)-20

FILE: domvia20.dgn	DN: TXDOT	CK: TXDOT	DW: TXDOT	CK: TXDOT
©TxDOT December 1989	CONT	SECT	JOB	HIGHWAY
REVISIONS			6469-98-001	IH 35, ETC
4-92 8-04	DIST	COUNTY		SHEET NO.
8-95 3-15	BRY	WASHINGTON, ETC		72
4-98 7-20				

20G

DATE:
FILE: