

SEE SHEET 2 FOR INDEX OF SHEETS

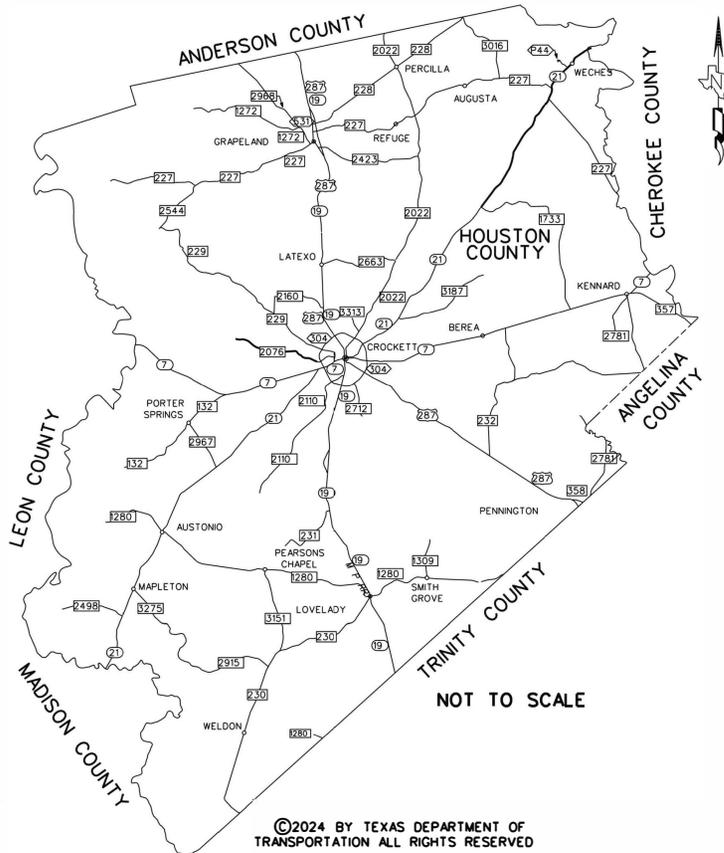
STATE OF TEXAS  
DEPARTMENT OF TRANSPORTATION

FHWA TEXAS DIVISION	MAINTENANCE PROJECT NO.		SHEET NO.
	RMC 6471-51-001		1
STATE	DISTRICT	COUNTY	
TEXAS	LFK	HOUSTON	
CONTROL SECTION	JOB	HIGHWAY NO.	
6471	51	001 US 287, ETC	

PLANS OF PROPOSED  
STATE HIGHWAY ROUTINE MAINTENANCE CONTRACT  
TYPE OF WORK:  
REPAIR AND MAINTENANCE OF  
METAL BEAM GUARD FENCE

RMC 6471-51-001  
US 287, ETC  
HOUSTON COUNTY

LIMITS: VARIOUS LOCATIONS IN THE HOUSTON COUNTY MAINTENANCE SECTION



**BARRICADES AND WARNING SIGNS**  
PROJECT LIMIT BARRICADES WILL NOT BE REQUIRED. THE CONTRACTOR SHALL PROVIDE AND ERECT WARNING SIGNS IN ACCORDANCE WITH THE BARRICADE & CONSTRUCTION STANDARDS, TCP STANDARDS, THE "TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" AND AS DIRECTED.



RECOMMENDED FOR LETTING:

DocuSigned by:  
*L. Preslie Herlady, P.E.*  
8/14/2024  
DISTRICT MAINTENANCE ENGINEER DATE  
APPROVED FOR LETTING:

DocuSigned by:  
*L. Preslie Herlady, P.E.*  
8/14/2024  
DIRECTOR OF MAINTENANCE DATE

T:\LFRD\Main\Contract\0..RMC - Routine Maintenance Contracts\FY25 Plans\6471-51-001 Houston MBGF.VGN\TitleSheet\_Houston MBGF.dgn\_6453-70-001.dgn  
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SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF TRANSPORTATION SEPTEMBER 1, 2024 AND SPECIAL SPECIFICATION ITEMS INCLUDED IN THE CONTRACT SHALL GOVERN ON THIS PROJECT. REQUIRED CONTRACT PROVISIONS FOR ALL FEDERAL-AID CONSTRUCTION CONTRACTS (FORM FHWA, OCTOBER 2023)

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7/12/2024 10:13:11 AM T:\L\FDDM\Maint Contracts\0\_RMC - Routine Maintenance Contracts\FY25 Plans\6471-51-001 Houston MBGF\RMC 6471-51-001 Houston MBGF\DDN\INDEX\_She by MBGF\_6443-20-001

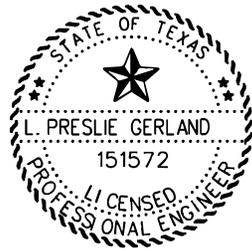
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THE STANDARD SHEETS SPECIFICALLY IDENTIFIED BY \* HAVE BEEN SELECTED BY ME OR UNDER MY RESPONSIBLE SUPERVISION AS BEING APPLICABLE TO THIS PROJECT.

DocuSigned by:  
*L. Preslie Gerland, P.E.* 8/14/2024  
 ENGINEER NAME, DATE

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6471	51	001	US 287, ETC
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		2

**Project Number:** RMC 6471-51-001

**Control:** 6471-51-001

**County:** HOUSTON

**Highway:** US 287, ETC.

**GENERAL NOTES:**

**PROJECT DESCRIPTION:** This project consists of Repair/Upgrade Metal Beam Guard Fence, Crash Attenuator Systems and Bridge Rail, on a call-out basis in Houston County.

**TXDOT PROJECT SUPERVISORS:** All work on this contract will be scheduled and directed by the Maintenance Section Supervisor(s) listed below. Payment will be made monthly for work completed and accepted according to specifications. All payment requests should be directed to the following Maintenance Section Supervisor listed below.

<u>COUNTY</u>	<u>SUPERVISOR</u>	<u>ADDRESS</u>	<u>CONTACT #</u>
HOUSTON	Danny Luna	1123 E Loop 304 Crockett, TX 75835	(936) 544-2264

**CONTRACT PROSECUTION:** Each contract awarded by the Department stands on its own and, as such, is separate from other contracts. A Contractor awarded multiple contracts must be capable and sufficiently staffed to concurrently process any or all contracts at the same time.

Existing regulatory, warning and guide signs within project limits are to always remain visible to the traveling public. If a sign must be repositioned during construction operations, move, and install the sign to an approved location. Use care when working near existing signs and repair or replace signs damaged by work operations. All work involved repositioning existing signs will be subsidiary to various bid items.

Furnish materials and make repairs to the existing roadway and right-of-way at any location damaged by construction operations. This work shall be done in an approved manner and will be subsidiary to various bid items.

Minimize vehicles and equipment in construction areas to lessen the impact on existing vegetation. The intent of the plans is to prepare only that portion of the right-of-way necessary for construction.

Always provide suitable access to adjacent businesses, private property, and side roads.

Remove dirt, silt, rocks, debris, and other foreign matter that accumulates in structures due to the Contractor's operations as directed. Keep stream channels always open. This work will not be paid for directly but will be subsidiary to pertinent items.

All workers on TxDOT right-of-way shall wear reflective clothing meeting ANSI Class II requirements during the day and ANSI Class III requirements during the night. Non-compliance with any of these requirements shall be grounds for suspension of work.

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

Preslie Gerland [Lauren.Perry@TxDOT.gov](mailto:Lauren.Perry@TxDOT.gov)  
 Tamara Gibson [Tamara.Gibson@TxDOT.gov](mailto:Tamara.Gibson@TxDOT.gov)

**Project Number:** RMC 6471-51-001

**Control:** 6471-51-001

**County:** HOUSTON

**Highway:** US 287, ETC.

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.

In case of emergency, the contractor shall begin work within 48 hours after verbal notification.

All workers on TxDOT right-of-way shall wear reflective clothing meeting ANSI Class II requirements during the day and ANSI Class III requirements during the night. Non-compliance with any of these requirements shall be grounds for suspension of work.

The following standard detail sheets have been modified; T202TR & T2/T201TR.

**LIMITS AND LOCATIONS:**

The portions of the highways listed below are located on property owned by the U.S. Forest Service (USFS).

- SH 21 from FM 227 west to FM 1733
- FM 227 from SH 21 south to SH 7
- FM 1733
- SH 7 from Angelina County line west to FM 232
- FM 357 from SH 7 in Kennard south to Trinity County line
- FM 2781 from SH 7 in Kennard south to Trinity County line
- FM 232 from Democrat Road to County Road 4545

The Houston County Maintenance Supervisor shall notify the Davy Crockett National Forest District Ranger before work begins within any of the above-listed locations.

**Item 2: Instructions to Bidders**

View plans on-line or download from the web at:  
<https://www.txdot.gov/business/letting-bids/plans-online.html>

Order plans from any of the plan reproduction companies shown on the web at:  
[https://www.dot.state.tx.us/business/contractors\\_consultants/repro\\_companies.htm](https://www.dot.state.tx.us/business/contractors_consultants/repro_companies.htm)

**Project Number:** RMC 6471-51-001**Control:** 6471-51-001**County:** HOUSTON**Highway:** US 287, ETC.**Item 4: Scope of Work**

The contract may be extended if in the judgment of the Engineer, the contractor has satisfactorily fulfilled the terms and conditions of the contract. The extension must be agreed upon in writing by both parties to the contract and may be extended for an additional period not to exceed the original contract period. The extended contract may be for additional quantities up to the original bid quantities plus any quantities added by an approved change order. The extensions shall meet the terms and conditions of the original contract or any mutually agreed modifications to the said terms and conditions by one or more cumulative change orders. The Engineer will set a deadline for completing the agreements. This deadline will be based in the time needed to re-let and award a new contract if no extension is agreed upon.

**ITEM 5: CONTROL OF THE WORK**

There are several existing sewer manholes within the right of way. Work around them with care to prevent damage to the sewer system.

In the event utility lines needing unforeseen adjustments are encountered during construction operations, alter operations and continue to prosecute the contract in such a manner that will allow utility adjustments to be made by others. An extension of working time may be granted for any delays caused by the utility adjustments if deemed necessary.

Texas Department of Licensing and Regulation (TDLR) will perform an inspection of sidewalks, pedestrian ramps, and other pedestrian facilities upon completion of the project to verify conformance with Texas Accessibility Standards. Deficiencies found by TDLR shall be corrected as directed.

**ITEM 7: LEGAL RELATIONS AND RESPONSIBILITIES**

The proposed work of this project is to repair/upgrade and maintenance of metal beam guard fence, attenuator systems, and bridge rail within the Houston County Maintenance Section. This activity maintains the original line and grade, hydraulic capacity, and original purpose of the site. Therefore, this project meets the definition of a routine maintenance activity as defined in the TPDES General Permit No. TXR150000 effective March 5, 2023, and TCEQ's TPDES CGP does not apply.

Contractor to repair or replace in kind, at their own expense, any historic materials damaged (buildings, historical markers, etc.) while executing the work. Contractor is responsible for locating replacement source for historical materials damaged in the course of the work. TxDOT-Environmental Affairs Division is to be informed of proposed repairs to facilitate consultation with Texas Historical Commission prior to the execution of repairs.

1. Portions of State Highway (SH) 21, SH 7, Farm-to-Market (FM) 227, FM 1733, FM 357, FM 2781, and FM 232 traverse through compartments of the Davy Crockett National Forest (USFS) and require the following actions:

**General Notes****Sheet 3A****Project Number:** RMC 6471-51-001**Control:** 6471-51-001**County:** HOUSTON**Highway:** US 287, ETC.

- A) Maintenance Supervisor shall notify Davy Crockett National Forest (USFS) prior to commencing work on the above listed roadways within USFS boundaries.
- B) NO stockpiling or storage of materials and equipment within USFS boundaries.

2. Red-cockaded Woodpecker (federally listed endangered species) habitat is present adjacent to the ROW along SH 7, FM 227, and FM 1733. The conservation measures below must be followed to comply with the Endangered Species Act.

- A) NO WORK shall be performed at the below roadway limits from April 1 to July 31.
- B) WORK SHALL begin one hour after sunrise and cease one hour before sunset for the following roadway limits below.
- C) NO STOCKPILES or EQUIPMENT STORAGE shall be allowed along or within the ROW along the following roadway limits below.

- SH 7: From 1.20 miles East of CR 1160 to 0.90 miles East of CR 1160 AND from 1.33 miles West of CR 1160 to 2.25 miles West of CR 1160.
- FM 227: From 3.50 miles South of SH 21 to 4.72 miles South of SH 21
- FM 1733: From SH 7 to County Road 1070.

3. Neches River rose-mallow (federally listed endangered species) Critical Habitat is present within the ROW along FM 230. The conservation measure below must be followed to comply with the Endangered Species Act:

- A) NO STOCKPILES or EQUIPMENT STORAGE shall be allowed within the ROW along the following roadway limits below.
- B) NO EQUIPMENT or VEHICLES shall leave the pavement of the following roadways limits below.

- FM 230 from 2.25 mi. West of SH 19 to 2.90 mi. West of SH 19

**Item 8: Prosecution and Progress**

Contract Time: This project shall be 365 days or 1 year after the execution of this contract. For this project, working days will be computed and charged in accordance with Item 8, Section 3.1.5, "Calendar Day".

This contract includes callout work; the number of working days will be established in each work order.

The Engineer will specify the number of working days granted for each work order based on a percentage of the dollar amount of the work order versus the total dollar amount of the contract or based on typical production rates for the work ordered.

The Contractor shall be on site within 48 hours for emergency work orders or within five business days for regular work orders.

**General Notes****Sheet 3A**

**Project Number:** RMC 6471-51-001

**Control:** 6471-51-001

**County:** HOUSTON

**Highway:** US 287, ETC.

Verbal notification may be given for the work orders above; however, written notification will be delivered electronically following the verbal notification. Written notification will state the date of verbal approval to begin work.

Notify the Engineer at least 24 hours before proceeding with planned work activities to the requesting Maintenance Section or appropriate contact person. Any work performed without proper notification will not be eligible for payment.

Perform work only as directed by a work order. Any work performed at locations not covered by a work order will not be paid for, unless directly authorized.

In accordance with Article 8.6 "Failure to Complete the Work on Time", liquidated damages will be charged for failure to complete each work order in the specified number of days. The

Liquidated Damage amount to be assessed per day, until the work is completed will be 1% of the estimated cost of the Work Order, but not less than \$50 per day and not to exceed \$200 per day.

**ITEM 9: MEASUREMENT AND PAYMENT**

This Contract includes callout work. In accordance with Article 9.2., "Plans Quantity Measurement", plans quantity measurement requirements are not applicable. The quantities shown are for estimates only and payment will be based on the actual quantities placed.

**NONCOMPLIANCE PENALTY** – A penalty will be assessed for each instance the contractor is in noncompliance. A noncompliance instance is defined by the following:

1. The contractor fails to begin work at the specified time and/or location(s).
2. The contractor does not have all the personnel and pieces of equipment necessary to fulfill of the item(s) called out at the specified time and/or location(s).
3. The contractor does not complete the work continuously, unless approved by the Engineer.
4. The contractor fails to complete any requirements as stated in the general notes.

The Noncompliance Penalty will be deducted from any money due or to become due for any completed item(s) of work. The Noncompliance Penalty will be assessed as follows: \$250 per instance, per location, until the contractor returns to a state of compliance or otherwise approved by the engineer.

**Item 502: Barricades, Signs and Traffic Handling**

Traffic Control Plan (TCP):

**General Notes**

**Sheet 3B**

**Project Number:** RMC 6471-51-001

**Control:** 6471-51-001

**County:** HOUSTON

**Highway:** US 287, ETC.

Furnish and maintain all warning signs, flaggers, channelizing devices, etc. required for traffic control on this contract in accordance with Item 502.1 & 502.2. This work will not be paid for directly but will be considered subsidiary to the various bid items.

For protection of the traveling public, direct traffic through the work area using signs, flaggers, and other devices. Required signs are shown in the plans on the Barricade and Construction Standards and Traffic Control Plan Sheets. The latest edition of the "Texas Manual on Uniform Traffic Control Devices" shall also be used as a guide for handling traffic on this project.

Texas Transportation Code 547.105 authorizes the use of warning lights to promote safety and provides an effective means of gaining the travelling public's attention as they drive in areas where construction crews are present. To influence the public to move over when high risk construction activities are taking place, minimize the utilization of blue warning lights. These lights must be used only while performing work on or near the travel lanes or shoulder where the travelling public encounters construction crews that are not protected by a standard work zone set up such as a lane closure, shoulder closure, or one-way traffic control. Refrain from leaving the warning lights engaged while travelling from one work location to another or while parked on the right-of-way away from the pavement or a work zone.

No lane closures on US 59 and SL 287 will be allowed after noon on Fridays or on days preceding major holidays unless otherwise approved. Extra time has been added to the total number of working days allocated for this. Work shall be planned such that this is not a limiting factor in the schedule.

Restrict construction work to single lane widths with only minor disruptions in traffic flow. Lane closures shall conform to the traffic control plan for lane closures as shown in the plans. No overnight closures will be permitted.

Provide temporary rumble strips as shown on work zone rumble strip standards. Temporary rumble strips shall be a product listed on the Compliant Work Zone Traffic Control Devices and shall be a two-piece rumble strip that hinges in the middle.

Provide a flashing arrow panel and a truck-mounted attenuator to supplement required signs and devices for each lane closure.

Provide adequate flaggers to protect the traveling public when working on or near a roadway carrying traffic. All flaggers shall wear hardhats and ANSI approved reflective safety vests. Vests shall be clean and worn fully fastened.

Install "Be Prepared to Stop" (CW20-7B) and "Flagger Ahead" (CW22-7D) signs when flaggers are present. Position the signs where good visibility and traffic control can be maintained.

Provide one high-intensity yellow, rotating dome-light on all equipment such as distributors, spreader boxes, lay-down machines, rollers, backhoes, road graders, loaders, etc. Mount lights high enough to be visible from all directions and operating when the equipment is within 30 feet of the travel way. On all other equipment, such as trucks, trailers, automobiles, etc., use emergency flashers while within the work zone.

**General Notes**

**Sheet 3B**

**Project Number:** RMC 6471-51-001

**Control:** 6471-51-001

**County:** HOUSTON

**Highway:** US 287, ETC.

**Item 505: Truck Mounted Attenuator (TMA) and Trailer Attenuator (TA)**

The contractor will be responsible for determining if multiple stationary operations will be ongoing at the same time to determine the total number of TMAs needed for the project.

Quantities were estimated based on one mobile working operation, as per the number of working days. If multiple crews are utilized, additional TMAs will be required.

The TMA/TA used for installation/removal of traffic control for a work area will be subsidiary to the TMA/TA used to perform the work.

**Item 540: Metal Beam Guard Fence**

Use round timber posts. In lieu of MTL W-BEAM GD FEN (TIM POST), MTL W-BEAM GD FEN (STEEL POST) may be used with written approval by the engineer. A mix will not be allowed.

Determine length of steel posts for low fill culvert post mounting in the field to ensure proper metal beam guard fence height.

At the close of work each day, protect the ends of metal beam guard fence in an approved manner, so that no blunt ends are exposed to approaching traffic. Plastic drums will be required at these locations.

For existing non-mow strip to remain in place, backfill top 4" in an existing abandoned post hole with HMA and backfill below 4" with suitable earth material. This work will be subsidiary to Item 540.

Form or core holes and recesses. Percussion drilling is not permitted.

Repair abandoned holes with approved patching material. This work will be subsidiary to Item 540.

**ITEM 658: DELINEATOR AND OBJECT MARKER ASSEMBLIES**

Install delineators on the departure side of the posts when mounting to metal beam guard fence and guardrail end treatments.

Install CTB barrier reflectors on top of concrete bridge rail and concrete barriers.

Install D-SW delineators on the departure side of steel bridge rail posts.

Surface mount object markers shall be bolted to the concrete surface with galvanized lag bolts, 2 lag bolts minimum. Drilling may be necessary. Plastic shims shall be used as necessary to ensure posts are plumb. This work will be subsidiary to Item 658, Object Markers.

**Project Number:** RMC 6471-51-001

**Control:** 6471-51-001

**County:** HOUSTON

**Highway:** US 287, ETC.

For surface mount flexible delineator and object marker posts, the following manufacturers for the post type as indicated in the TxDOT Material Producer List are approved for district use:

1. Safe-Hit, a division of Energy Absorption Systems
2. Impact Recovery Systems, Inc.
3. FlexStake, Inc.
4. Shur-Tite Products

**Item 770: Guard Fence Repair**

Do not mix parts on SGT's. Use only manufacture parts for each.

**Item 774: Attenuator Repair**

The contractor shall furnish details on the method proposed to "Retrofit" the new systems at the existing crash cushion locations, prior to beginning this work.



# Estimate & Quantity Sheet

CONTROLLING PROJECT ID 6471-51-001

DISTRICT Lufkin  
HIGHWAY US0287

COUNTY Houston

CONTROL SECTION JOB				6471-51-001		TOTAL EST.	TOTAL FINAL
PROJECT ID				A00211578			
COUNTY				Houston			
HIGHWAY				US0287			
ALT	BID CODE	DESCRIPTION	UNIT	EST.	FINAL		
	429-7009	CONC STR REPAIR (STANDARD)	SF	5.000		5.000	
	500-7002	MOBILIZATION (CALLOUT)	EA	5.000		5.000	
	505-7001	TMA (STATIONARY)	DAY	20.000		20.000	
	540-7001	MTL W-BEAM GD FEN (TIM POST)	LF	200.000		200.000	
	540-7005	MTL BEAM GD FEN TRANS (THRIE-BEAM)	EA	5.000		5.000	
	540-7007	MTL BEAM GD FEN TRANS (T101)	EA	5.000		5.000	
	542-7001	REMOVE METAL BEAM GUARD FENCE	LF	200.000		200.000	
	770-7001	REPLACE RAIL ELEMENT (W-BEAM)	LF	300.000		300.000	
	770-7006	REPLACE TIMBER POST W/O CONC FND	EA	100.000		100.000	
	770-7007	REPLACE STEEL POST W/O CONC FND	EA	100.000		100.000	
	770-7008	REPLACE TIMBER POST W/ CONC FND	EA	10.000		10.000	
	770-7009	REPLACE STEEL POST W/ CONC FND	EA	10.000		10.000	
	770-7010	REALIGN POSTS	EA	10.000		10.000	
	770-7013	REM OBSOLETE GET & REPL W/ SGT	EA	5.000		5.000	
	770-7015	REPL SINGLE GDRAIL TERM IMPACT HEAD	EA	5.000		5.000	
	770-7016	REPLACE SINGLE GDRAIL TERMINAL RAIL	LF	200.000		200.000	
	770-7017	REPLACE SINGLE GDRAIL TERMINAL POST	EA	5.000		5.000	
	770-7018	REPLACE BLOCKOUT	EA	5.000		5.000	
	770-7019	REPAIR STEEL POST WITH BASE PLATE	EA	10.000		10.000	
	770-7020	RESET SGT IMPACT HEAD	EA	5.000		5.000	
	776-7008	REPAIR (T101RC)	LF	50.000		50.000	
	776-7015	REPAIR STEEL POST W/ BASE PLATE (T6)	EA	5.000		5.000	
	778-7001	CONCRETE RAIL REPAIR (IN-KIND)	LF	50.000		50.000	

DISTRICT	COUNTY	CCSJ	SHEET
Lufkin	Houston	6471-51-001	4

SUMMARY OF GUARD FENCE, ATTENUATOR & RAIL REPAIR ITEMS			
ITEN NO.	DESCRIPTION	UNIT	QUANTITY
0429 7009	CONC STR REPAIR (STANDARD)	SF	5
0500 7002	MOBILIZATION (CALLOUT)	EA	5
0505 7001	TMA (STATIONARY)	DAY	20
0540 7001	MTL W-BEAM GD FEN (TIM POST)	LF	200
0540 7005	MTL BEAM GD FEN TRANS (THRIE-BEAM) ①	EA	5
0540 7007	MTL BEAM GD FEN TRANS (T101)	EA	5
0542 7001	REMOVE METAL BEAM GUARD FENCE	LF	200
0770 7001	REPAIR RAIL ELEMENT(W - BEAM FURNISHED)	LF	300
0770 7006	REM / REPL TIMBER POST W/O CONC FND	EA	100
0770 7007	REM / REPL STL POST W/O CONC FND	EA	100
0770 7008	REM / REPL TIMBER POST W/CONC FND	EA	10
0770 7009	REM / REPL STL POST W/CONC FND	EA	10
0770 7010	REALIGN POSTS	EA	10
0770 7013	REMOVE GDRAIL END TRT / REPL WITH SGT	EA	5
0770 7015	REPL SINGLE GDRAIL TERM IMPACT HEAD	EA	5
0770 7016	REPLACE SINGLE GDRAIL TERMINAL RAIL	LF	200
0770 7017	REPLACE SINGLE GDRAIL TERMINAL POST	EA	5
0770 7018	REMOVE & REPLACE BLOCKOUT	EA	5
0770 7019	REPAIR STEEL POST WITH BASE PLATE	EA	10
0770 7020	REM & RESET SGT IMPACT HEAD	EA	5
0776 7008	REPAIR (TY T101RC)	LF	50
0776 7015	REPAIR (STL POST W/DOUBLED W-BEAMS-T6)	EA	5
0778 7001	CONCRETE RAIL REPAIR (IN-KIND)	LF	50

① WHEN ATTACHING THRIE BEAM TO T202, T2 OR T201 RAILS, ANCHOR PLATES AS SHOWN ON DETAILS T202 TR & T2/T201 TR WILL BE CONSIDERED SUBSIDIARY TO THE THRIE BEAM SYSTEM

NOTE: ALL QUANTITIES ARE AN ESTIMATE AND SHALL BE VERIFIED IN THE FIELD PRIOR TO BEGINNING OF WORK. NO GUARANTEES ARE MADE AS TO THE AMOUNT OF WORK WHICH WILL BE PERFORMED AT EACH LOCATION.

<b>QUANTITY SUMMARY</b>			
2024 			
CONT	SECT	JOB	HIGHWAY
6471	51	001	US 287, ETC
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		5

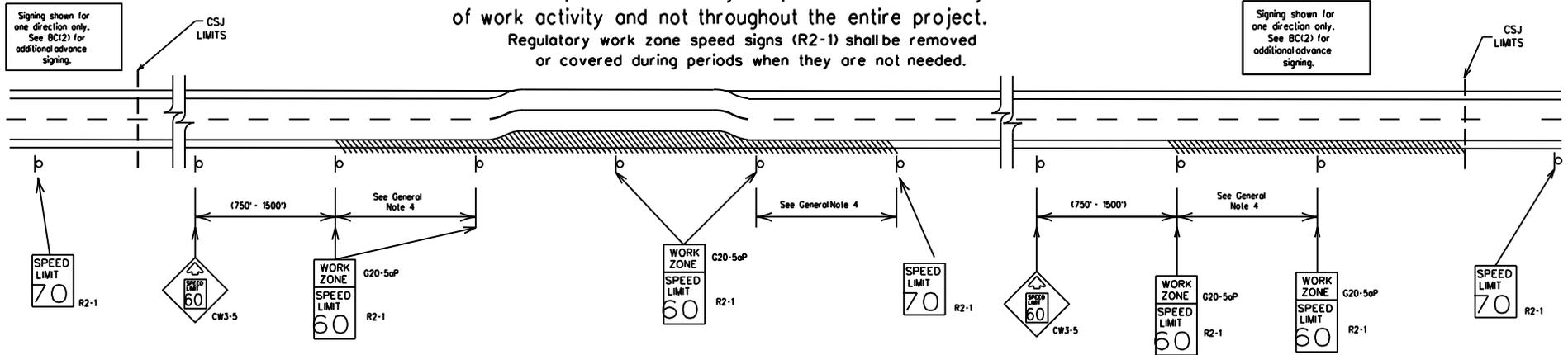




## TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

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:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- 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

- Regulatory work zone speed limits should be used only for sections of construction projects where speed controls of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- 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
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- 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.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
  - A. Low enforcement.
  - B. Flogger stationed next to sign.
  - C. Portable changeable message sign (PCMS).
  - D. Low-power (drone) radar transmitter.
  - E. Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- 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.

SHEET 3 OF 12



Traffic Safety Division Standard

## BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

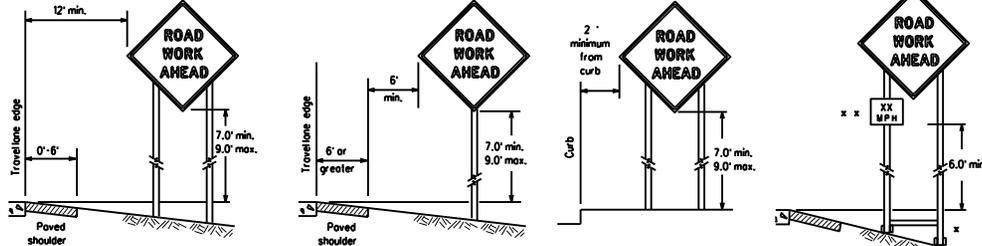
BC(3)-21

FILE:	bc-21.dgn	DN: TxDOT	CR: TxDOT	DN: TxDOT	CR: TxDOT
REVISED:	9-07	8-14	7-13	5-21	
CONT:	6471	51	001	US 287, ETC	
SECT:					
DIST:	LFK		HOUSTON		
SHEET NO.:					8

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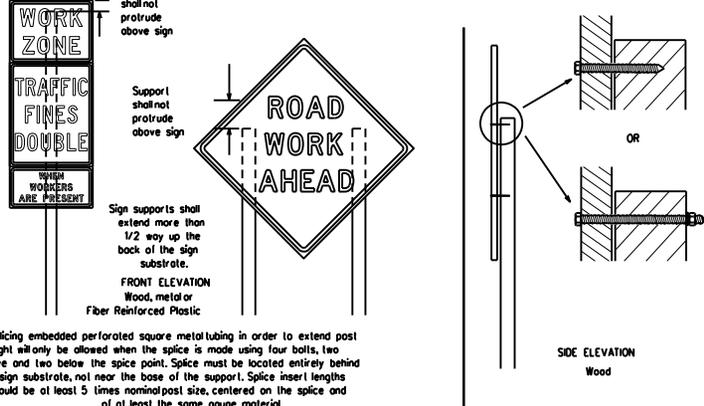
**TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS**



x When placing skid supports on uneven 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 travelway. 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.**

**GENERAL NOTES FOR WORK ZONE SIGNS**

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
- Wooden sign posts shall be painted white.
- Barricades shall NOT be used as sign supports.
- 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.
- 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 change 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.
- 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.
- 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.
- 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.
- 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 Uniform Traffic Control Devices" Part 6)**

- 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.
  - Long-term stationary - work that occupies a location more than 3 days.
  - 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.
  - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
  - Short, duration - work that occupies a location up to 1 hour.
  - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes).

**SIGN MOUNTING HEIGHT**

- 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.
- 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.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- 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.
- 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**

- 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**

- 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.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the lightness of the weave.
- 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**

- All signs shall be retro-reflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 (or rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B or Type B<sub>1</sub>, shall be used for rigid signs with orange backgrounds.

**SIGN LETTERS**

- All sign letters and numbers shall be clear, and open rounded type uppercase alphanumerical 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**

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- 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.
- 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.
- When signs are covered, the material used shall be opaque, such as heavy 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.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor studs shall be removed and holes backfilled upon completion of work.

**SIGN SUPPORT WEIGHTS**

- Where sign supports require the use of weights to keep from turning over, the use of sandbags with 6" x 6" catchbasins sand shall be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- Sandbags shall 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 fire inner tubes) shall NOT be used.
- Rubber ballists designed for churning devices shall not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber hoses may be used when shown on the CWZTCD list.
- 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.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

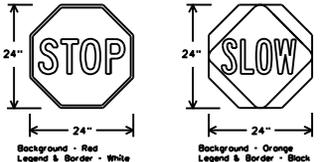
**FLAGS ON SIGNS**

- 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.

DISCLAIMER: This Standard is governed by the "Texas Engineering Practice Act". No warranty, of any kind, is made by TxDOT for use of this Standard or for incorrect results or damages resulting from its use. TxDOT is not responsible for any claims or damages resulting from its use. TxDOT is not responsible for any claims or damages resulting from its use. TxDOT is not responsible for any claims or damages resulting from its use.

**STOP/SLOW PADDLES**

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24".
- STOP/SLOW paddles shall be retro-reflectORIZED when used at night.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6C.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 <sub>1</sub> OR C <sub>1</sub> 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**

- 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.
- 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.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- 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.
- 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.
- 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.



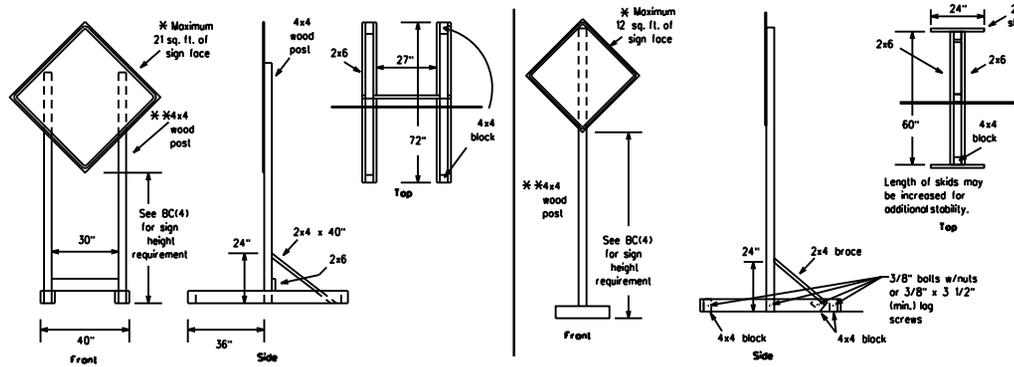
**BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES**

**BC(4)-21**

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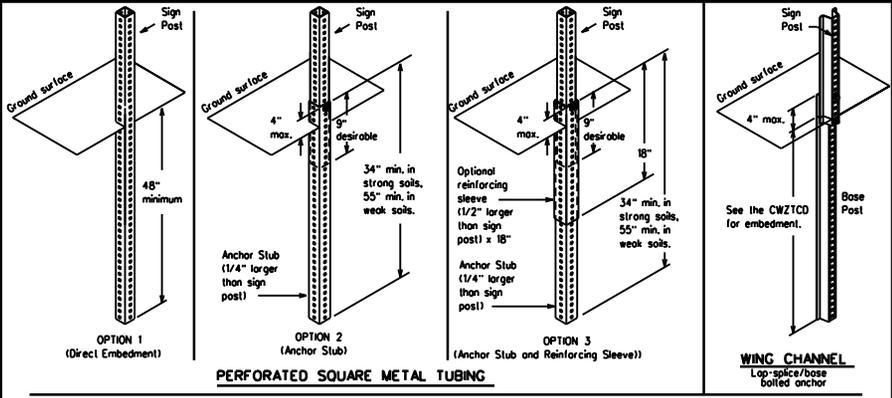
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**SKID MOUNTED WOOD SIGN SUPPORTS**

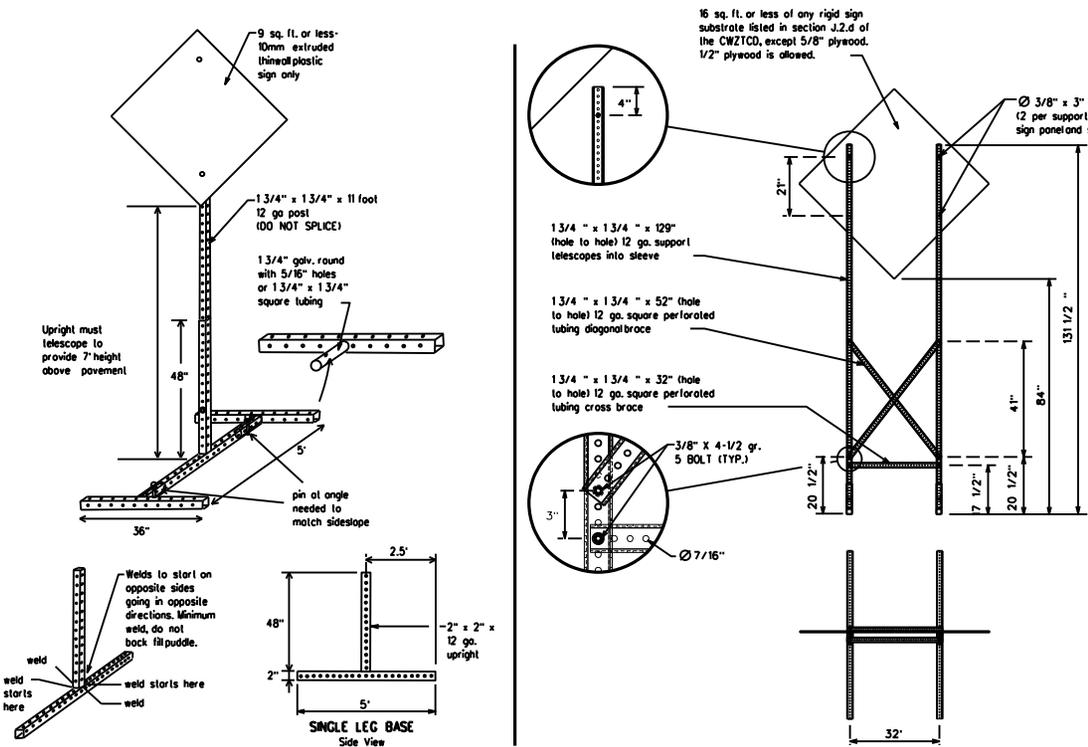
\* LONG/INTERMEDIATE TERM STATIONARY - PORTABLE SKID MOUNTED SIGN SUPPORTS



**PERFORATED SQUARE METAL TUBING**

**GROUND MOUNTED SIGN SUPPORTS**

Refer to the CWZTCO 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 CWZTCO LIST. SEE BC(1) FOR WEBSITE LOCATION.

**GENERAL NOTES**

- 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.
  - No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCO List.
  - 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 pointed white.  
 See the CWZTCO for the type of sign substrate that can be used for each approved sign support.

SHEET 5 OF 12



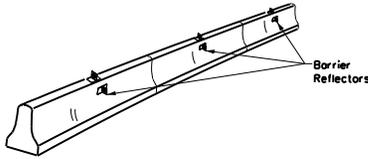
**BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT**

BC(5)-21

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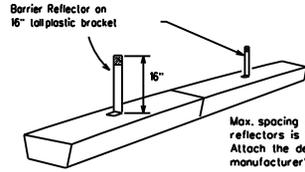


- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMTUCD. The cost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



CONCRETE TRAFFIC BARRIER (CTB)

- 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.
- 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 (B-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edge line being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.

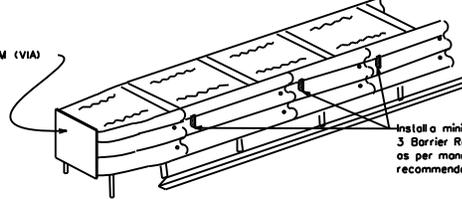


LOW PROFILE CONCRETE BARRIER (LPCB)

**LOW PROFILE CONCRETE BARRIER (LPCB) USED IN WORK ZONES**

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

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



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 CWZTCU List for approved end treatments and manufacturers.

**BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS**

**WARNING LIGHTS**

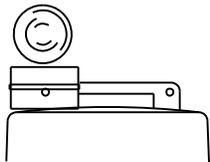
- Warning lights shall meet the requirements of the TMTUCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet 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.
- 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".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- 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.
- 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.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

**WARNING LIGHTS MOUNTED ON PLASTIC DRUMS**

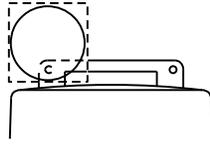
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing 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.
- 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.
- Type A, Type C, and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- 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**

- 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.
- 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 CWZTCU.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- 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.
- 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.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



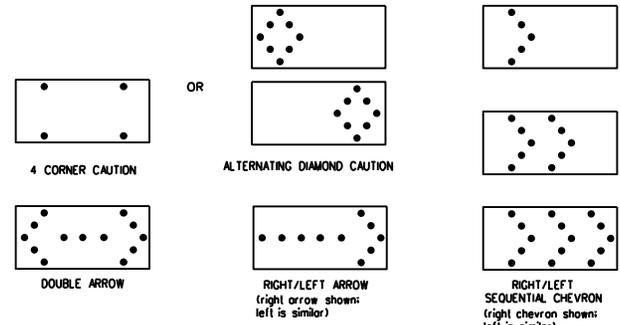
Type C Warning Light or approved substitute mounted on a drum adjacent to the travelway.



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

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.

- 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.
- 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.
- 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.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- 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.
- 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.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- 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.
- 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**

SHEET 7 OF 12

**TRUCK-MOUNTED ATTENUATORS**

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCU for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCU for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- 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.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



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

BC(7)-21

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REVISED: November 2002	CONT: 6471	SECT: 51	JOB: 001	US 287, ETC
REVISIONS: 9-07 8-14 7-13 5-21	DIST: LFK	COUNTY: HOUSTON	SHEET NO: 12	

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**GENERAL NOTES**

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums shall 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.
- 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.
- Drums and 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).
- 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.
- 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:

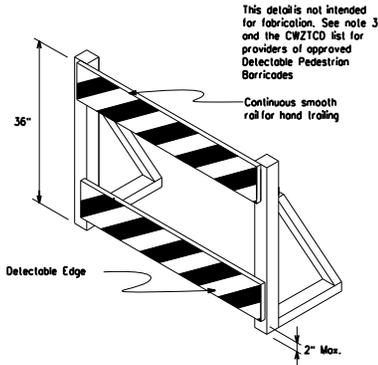
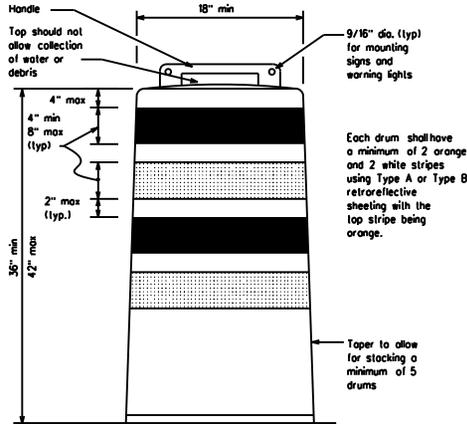
- Plastic drums shall be a two-piece design: the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelizing devices or sign supports.
- 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.
- 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.
- 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-retroreflective space between any two adjacent stripes shall not exceed 2 inches in width.
- 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.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unboltsed weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

**RETROREFLECTIVE SHEETING**

- 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.
- 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.

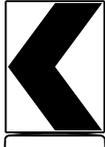
**BALLAST**

- Unboltsed bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, shall 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. Slacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- 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.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- 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.
- 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.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



**DETECTABLE PEDESTRIAN BARRICADES**

- 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 Contrarequirements for Sidewalk Diversions, Sidewalk Detours and Crosswalk Closures.
- 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.
- 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.
- 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.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades should use 8" nominal barricade rolls as shown on BC(10) provided that the top roll provides a smooth continuous roll 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, Driveaway sign D700, Keep Right R4 series or other signs as approved by Engineer



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

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

**SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS**

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B or Type C Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- 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 travel lane.
- 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.
- Signs shall be installed using a 1/2 inch ball (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- 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 every third drum. A minimum of three (3) should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-1a SideWalk Closed signs which are 24 inches wide may be mounted on plastic drums, with approval of the Engineer.

SHEET 8 OF 12



Texas Department of Transportation  
Traffic Safety Division Standard

BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC(8)-21

FILE: bc-21.dgn	DR: TxDOT	CR: TxDOT	DR: TxDOT	CR: TxDOT
REV: November 2002	CONT: 6471	SECT: 51	JOB: 001	HIGHWAY: US 287, ETC
4-03 8-14	DIST: LFK	COUNTY: HOUSTON	SHEET NO. 13	
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7-13				





**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 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(S17PM).
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 BC112.
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 (fall back) shall meet the requirements of DMS-8240.

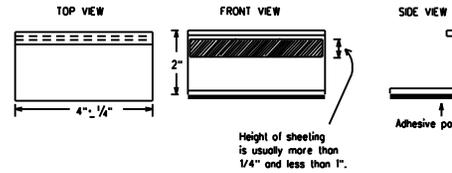
**MAINTAINING WORK ZONE PAVEMENT MARKINGS**

1. The Contractor shall 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 material 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. Block-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 lab manufacturers.
4. See Standard Sheet WZ(S17PM) for tab placement on new pavements. See Standard Sheet TC(P17-1) 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 BC11.

SHEET 11 OF 12



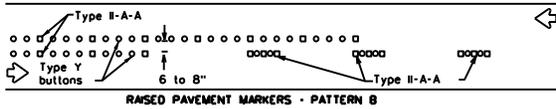
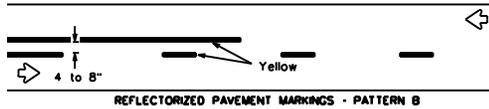
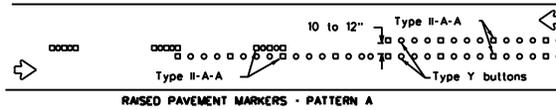
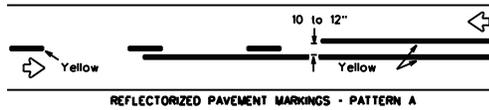
**BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS**

**BC(11)-21**

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2	1-02	7-13							
3	11-02	8-14	LFK			HOUSTON			16

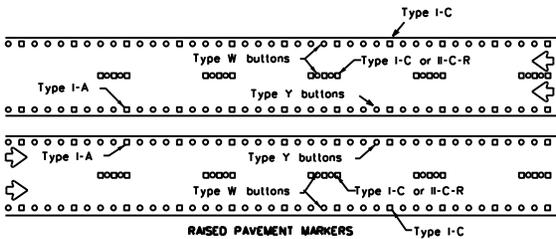
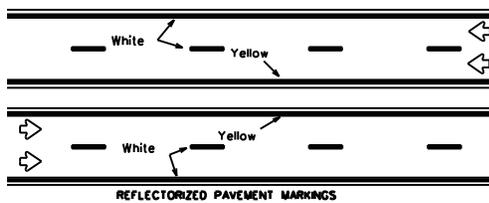
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### PAVEMENT MARKING PATTERNS



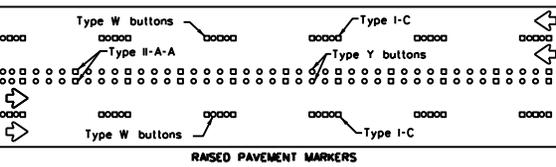
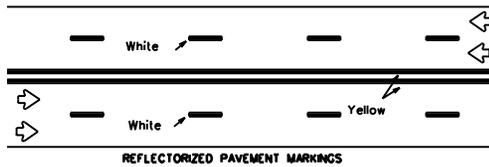
Pattern A is the TxDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectORIZED pavement markings.

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



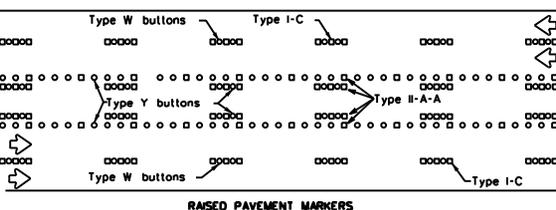
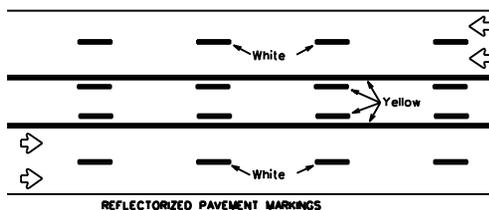
Prefabricated markings may be substituted for reflectORIZED pavement markings.

### EDGE & LANE LINES FOR DIVIDED HIGHWAY



Prefabricated markings may be substituted for reflectORIZED pavement markings.

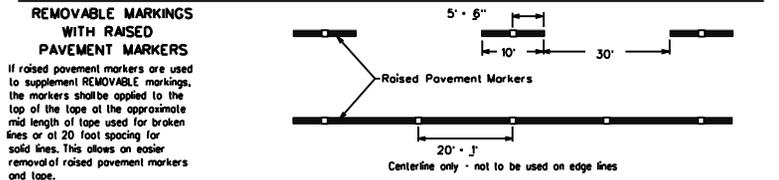
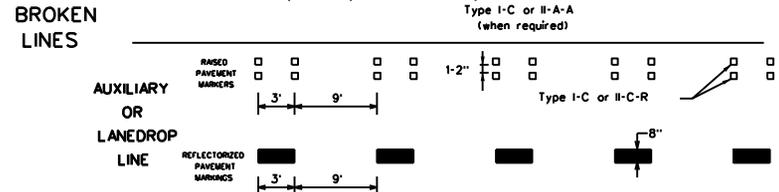
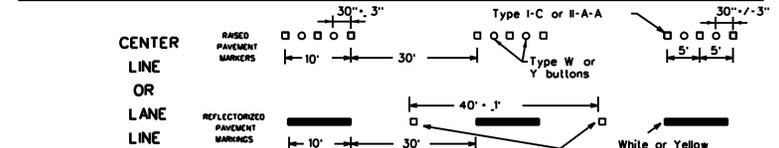
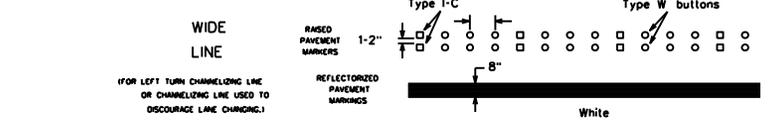
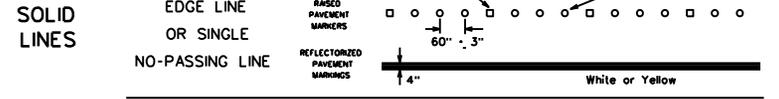
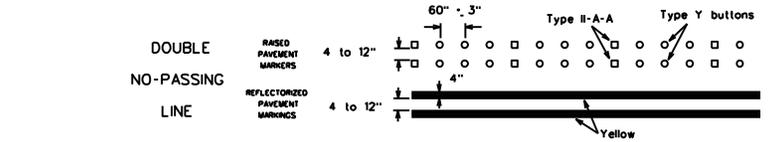
### LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



Prefabricated markings may be substituted for reflectORIZED pavement markings.

### TWO-WAY LEFT TURN LANE

### STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



SHEET 12 OF 12



### BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC(12)-21

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

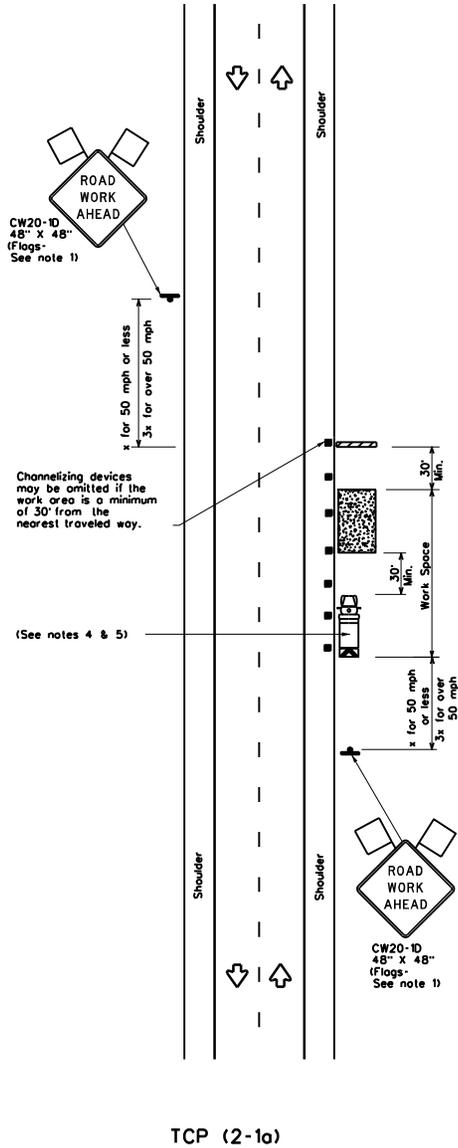
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REVISIONS: 1-97 9-07 5-21	DIST: LFK	COUNTY: HOUSTON	SHEET NO. 17	
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11-02 8-14				

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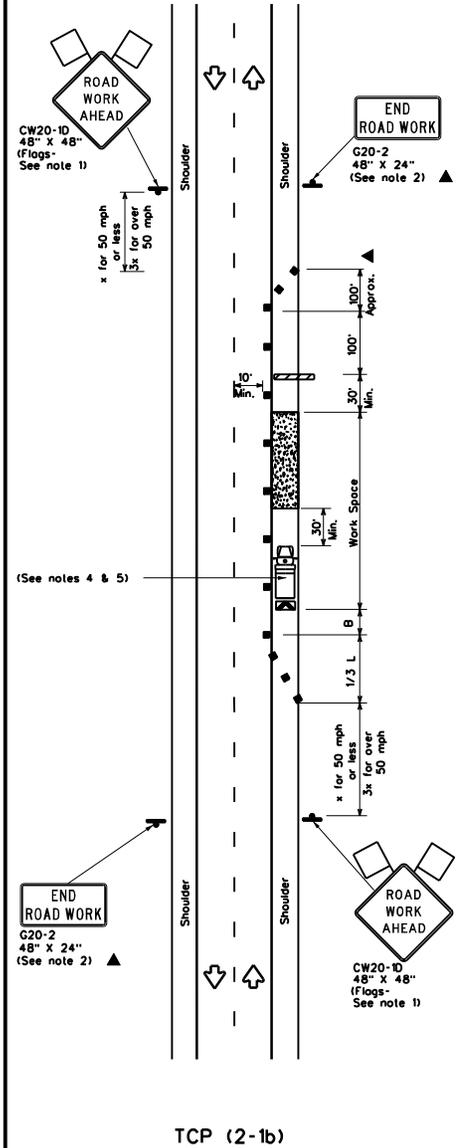
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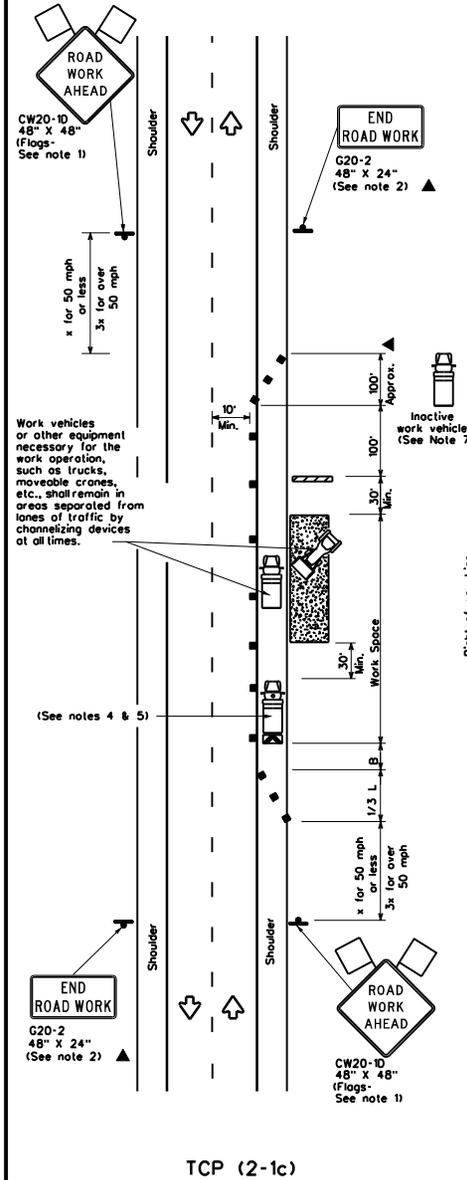
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**WORK SPACE NEAR SHOULDER**  
Conventional Roads



**WORK SPACE ON SHOULDER**  
Conventional Roads



**WORK VEHICLES ON SHOULDER**  
Conventional Roads

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

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

x Conventional Roads Only  
 x x 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
	✓	✓	✓	✓

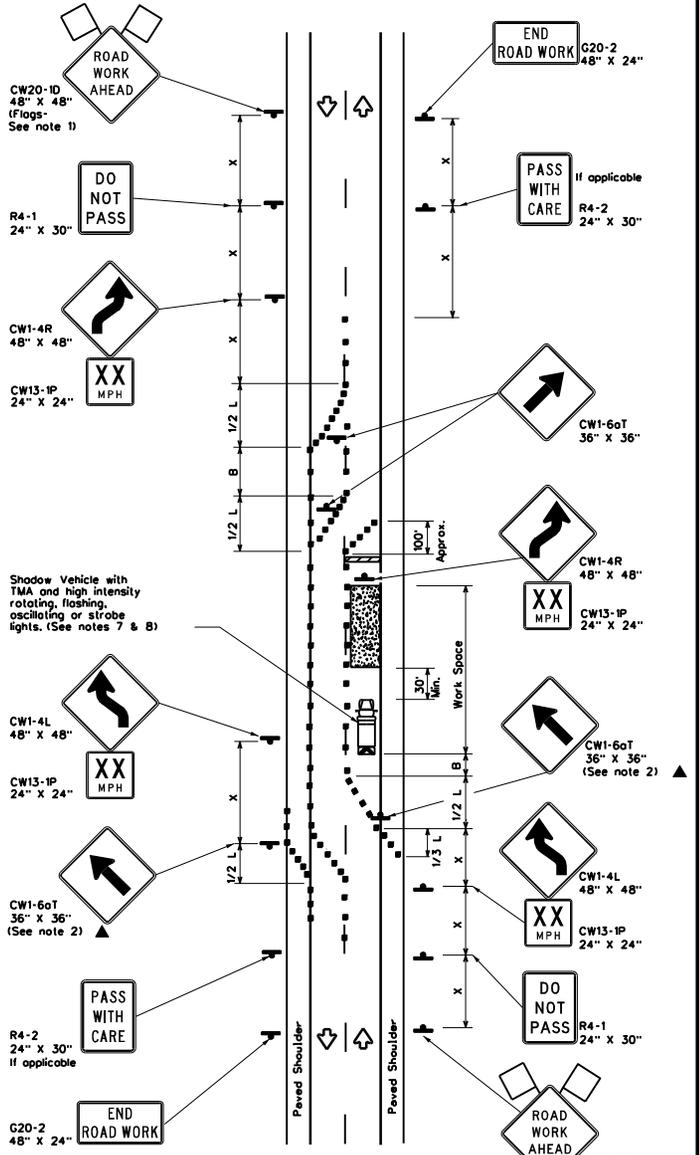
- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated in the plans, or for routine maintenance work, when approved by the Engineer.
  - Stockpiled material should be placed a minimum of 30 feet from nearest traveled way.
  - 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.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
  - See TCP15-11 for shoulder work on divided highways, expressways and freeways.
  - Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
  - CW21-5 "SHOULDER WORK" signs may be used in place of CW20-1D "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

**TRAFFIC CONTROL PLAN**  
**CONVENTIONAL ROAD**  
**SHOULDER WORK**  
**TCP(2-1)-18**

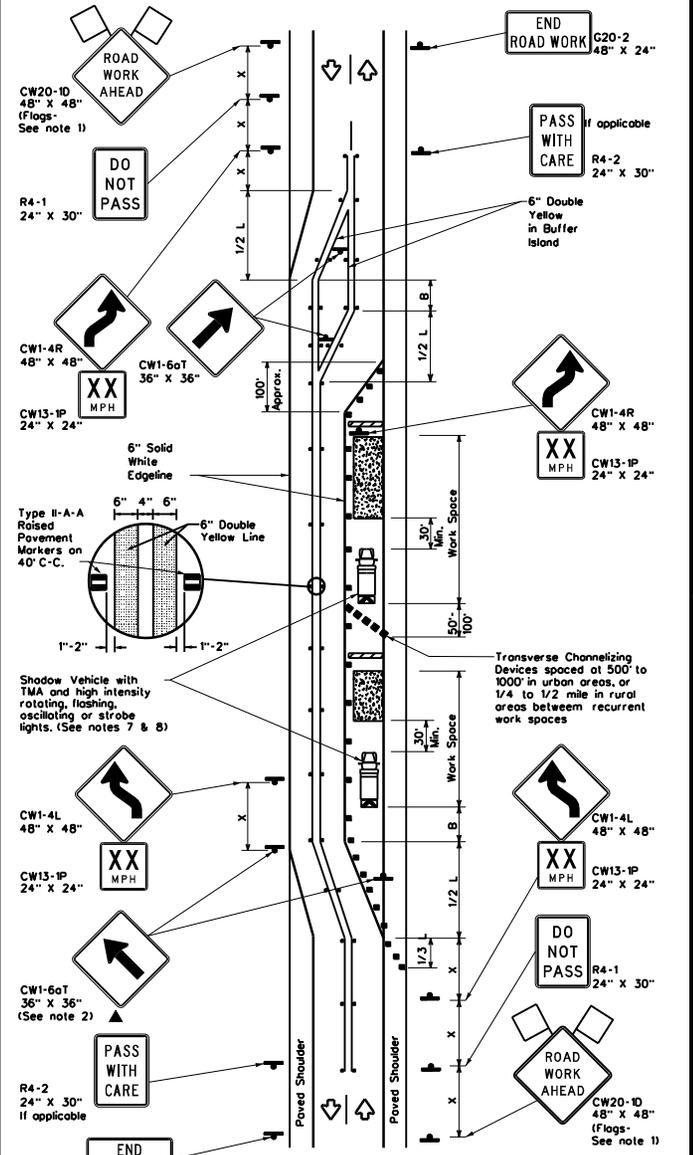
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1-97	2-18				



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**TCP (2-3a)**  
**2-LANE ROADWAY WITH PAVED SHOULDERS**  
**ONE LANE CLOSED**  
**ADEQUATE FIELD OF VIEW**



**TCP (2-3b)**  
**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		Raised Pavement Markers Ty II-AA
	Sign		Traffic Flow
	Flag		Flagger

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

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

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

- GENERAL NOTES**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when staked elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - When work space will be in place less than three days existing pavement markings may remain in place. Channelizing devices shall be used to separate traffic.
  - Flagger control should NOT be used unless roadway conditions or heavy traffic volume require additional emphasis to safety control traffic. Flagger should be positioned at end of traffic queue.
  - The R4-1 "DO NOT PASS", R4-2 "PASS WITH CARE" and construction regulatory speed zone signs may be installed within CW20-1D "ROAD WORK AHEAD" signs. Proper spacing of signs shall be maintained.
  - Conflicting pavement marking shall be removed for long term projects.
  - 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.
  - Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect a wider work space.
- TCP (2-3a)**
- Conflicting pavement markings shall be removed for long-term projects. For shorter durations 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 1/2(1S) where S is the speed in mph. This tighter device spacing is intended for the area of the conflicting markings, not the entire work zone.

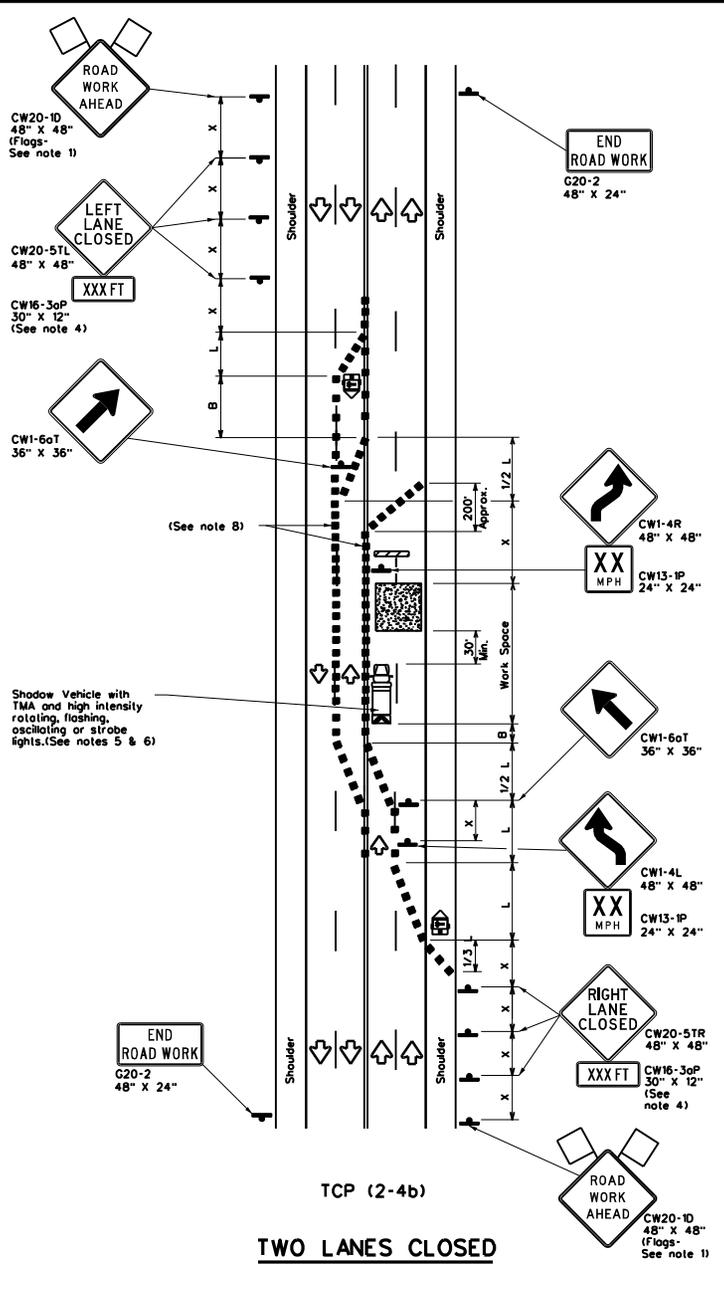
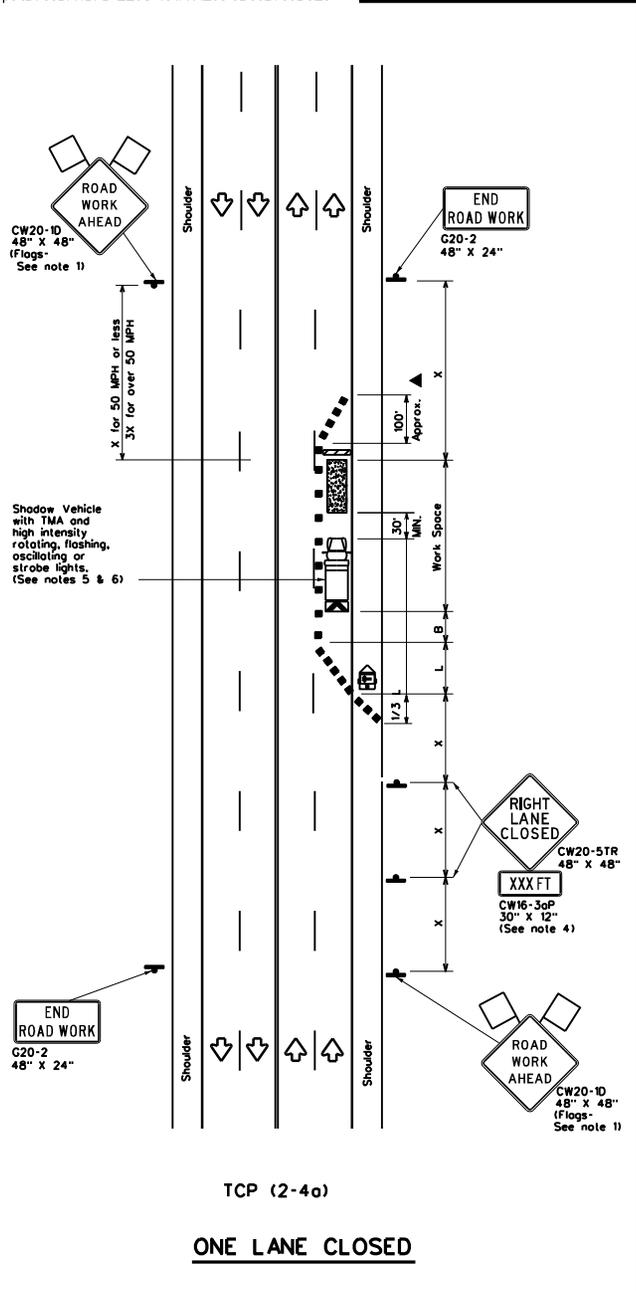
Traffic Safety Division Standard

TRAFFIC CONTROL PLAN  
 TRAFFIC SHIFTS ON  
 TWO-LANE ROADS  
 TCP(2-3)-23

FILE: tcp2-3i-23.dgn	DATE: April 2023	COM: 6471	SECT: 51	JOB: 001	US 287, ETC
REV: 8-95 4-96 2-98	REV: 8-95 3-03 4-23	DIST: LFK	COUNTY: HOUSTON	SHEET NO.: 20	

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DATE: 7/12/2024 10:05:48 AM  
 FILE: TXLFD00A\Main\Contract\Y25 Plans\Routine Maintenance\Contract\Y25 Plans\RM\CP2-4-1B.dgn



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

Posted Speed x	Formula	Minimum Desirable Taper Lengths x x			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x"	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L · WS <sup>2</sup> 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	L · WS	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**
- Flags attached to signs where shown, are REQUIRED.
  - All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when staked elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
  - The downstream taper is optional. When used, it should be 100 feet minimum length per lane.
  - For short term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a CW16-3oP supplemental plaque.
  - 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.
  - 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.
- TCP (2-4a)**
- 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 to protect the work space from opposing traffic with the arrow board placed in the closed lane near the end of the merging taper.
- TCP (2-4b)**
- For shorter durations 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 1/2(S) where S is the speed in mph. This tighter devices spacing is intended for the area of conflicting markings, not the entire work zone.

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN  
 LANE CLOSURES ON MULTILANE  
 CONVENTIONAL ROADS

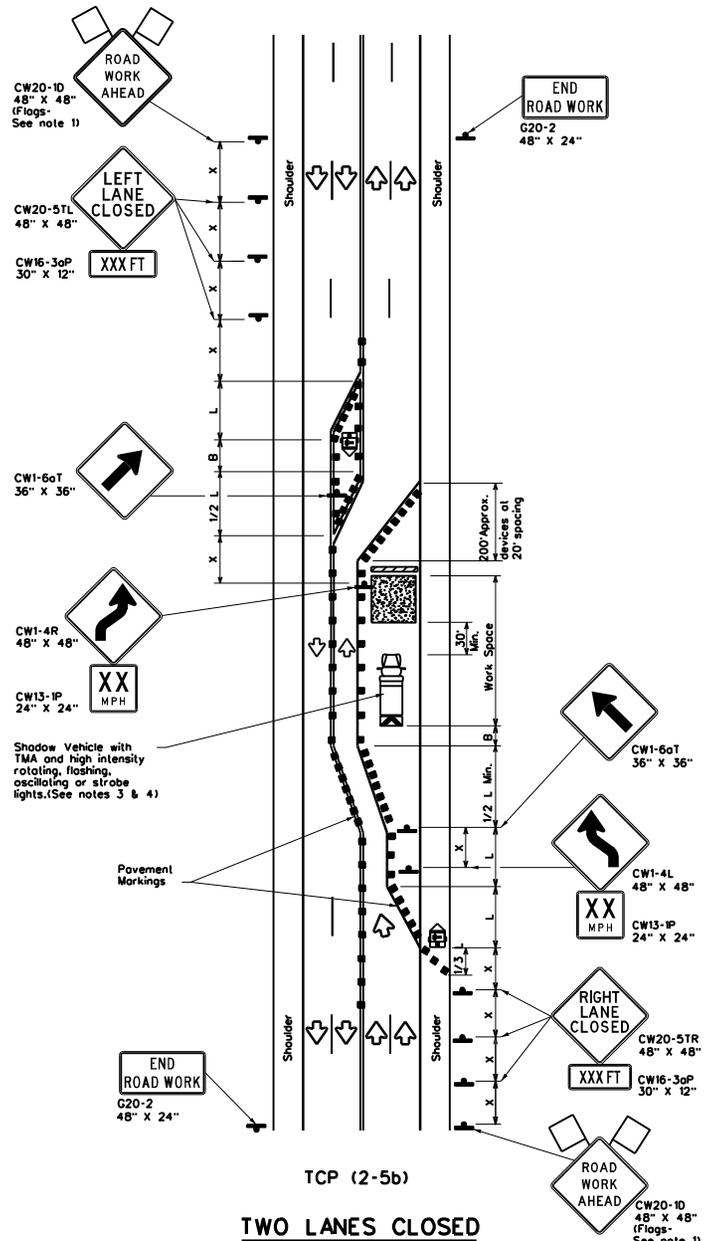
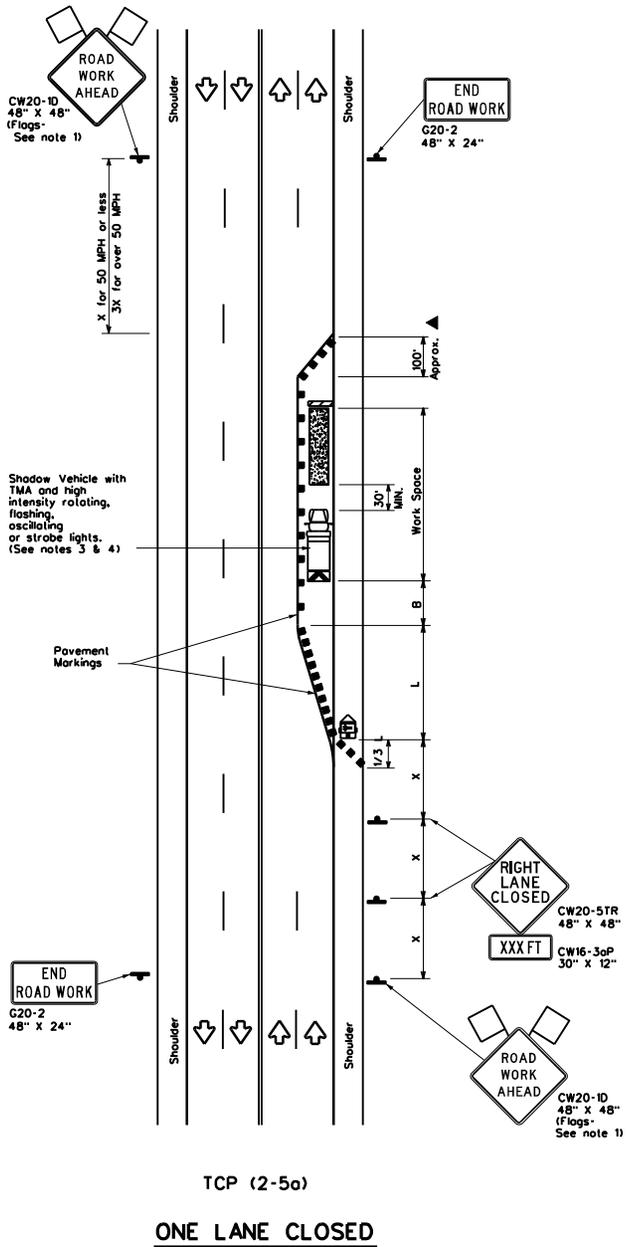
TCP(2-4)-18

FILE: tcp2-4-18.dgn	DATE: December 1985	COM: 6471	SECT: 51	JOB: 001	HIGHWAY: US 287, ETC
REVISIONS		DIST		COUNTY	SHEET NO.
8-95	3-03	LFK		HOUSTON	21

162

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DATE: 7/12/2024 10:05:49 AM  
 FILE: \\NFDDM\mnt\contracts\B\_RMC - Routine Maintenance Contracts\FY25 Plans\Work\Signage\Signage\CP2-5-18.dgn



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

Posted Speed x	Formula	Minimum Desirable Taper Lengths x ±			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40	L = WS	265'	295'	320'	40'	80'	240'	155'
45		450'	495'	540'	45'	90'	320'	195'
50	L = WS	550'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60	L = WS	600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70	L = WS	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(F) W=Width of Offset(F) S=Posted Speed(MPH)

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

**GENERAL NOTES**

- Flags attached to signs where shown, are REQUIRED.
- 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.
- 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.
- 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.
- The downstream taper is optional. When used, it should be 100 feet approximately per lane, with channelizing devices spaced at 20 feet.

**TCP (2-5a)**

- 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 to protect the work space from opposing traffic, with the arrow board placed in the closed lane near the end of the merging taper.

**TCP (2-5b)**

- Conflicting pavement markings shall be removed for long-term projects.

Traffic Operations Division Standard

TRAFFIC CONTROL PLAN  
 LONG TERM LANE CLOSURES  
 MULTILANE CONVENTIONAL RDS.

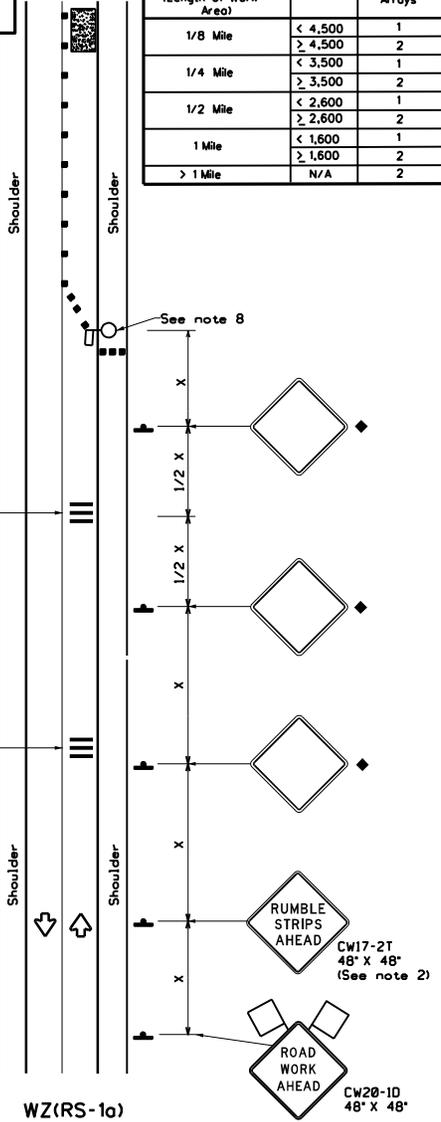
TCP(2-5)-18

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REVISIONS:		1-97	3-03	DIST: COUNTY	SHEET NO.
4-98		2-18		LFK	HOUSTON

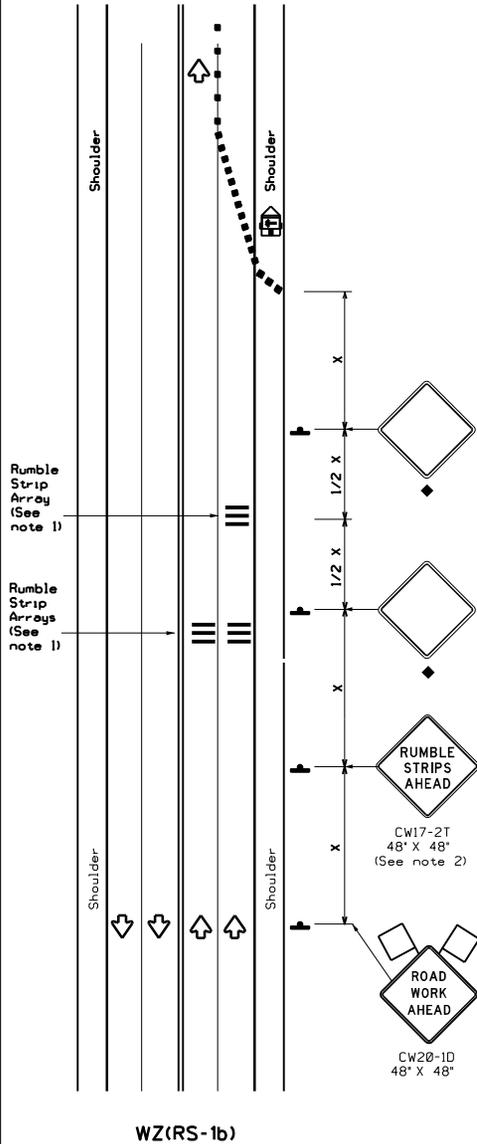


Warning sign and rumble strip sequence in opposite direction is same as below.

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



**RUMBLE STRIPS ON ONE-LANE TWO-WAY APPLICATION**



**RUMBLE STRIPS FOR LANE CLOSURE ON CONVENTIONAL ROADWAY**

**GENERAL NOTES**

- Each Rumble Strip Array should consist of three rumble strips spaced center to center of the spacing shown in Table 2, placed transverse across the lane at locations shown.
- 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.
- Temporary Rumble Strips will be considered subsidiary to Item 502, and shall be a product listed on the Compliant Work Zone Traffic Control Devices.
- Remove Temporary Rumble Strips before removing the advanced warning signs.
- Temporary Rumble Strips should not be used on horizontal curves, loose gravel, soft or bleeding asphalt, heavily rutted pavements or unpaved surfaces.
- Temporary Rumble Strips shall be installed and maintained as per manufacturer's recommendations.
- This standard sheet shall be used in conjunction with other appropriate TCP standard, TMUTCD typical application or project specific detail for the project.
- The one-lane two-way application may utilize a flagger, an Automated Flagger Assistance Device (AFAD) or a Portable Traffic Signal (PTS).
- Replace defective Temporary Rumble Strips as directed by the Engineer.
- Temporary Rumble Strips may be used on freeways or expressways based on engineering judgment and written direction from the Engineer.

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

Posted Speed x	Formula	Minimum Desirable Taper Lengths s = x		Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "x"	Suggested Longitudinal Buffer Space "s"
		10' Offset	15' Offset	On a Taper	On a Tangent		
30	L = WS <sup>2</sup> / 60	150'	165'	180'	30'	60'	120'
35		205'	225'	245'	35'	70'	160'
40	L = WS	265'	295'	320'	40'	80'	240'
45		450'	495'	540'	45'	90'	320'
50	L = WS	500'	550'	600'	50'	100'	400'
55		550'	605'	660'	55'	110'	500'
60	L = WS	600'	660'	720'	60'	120'	600'
65		650'	715'	780'	65'	130'	700'
70	L = WS	700'	770'	840'	70'	140'	800'
75		750'	825'	900'	75'	150'	900'

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

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.

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**

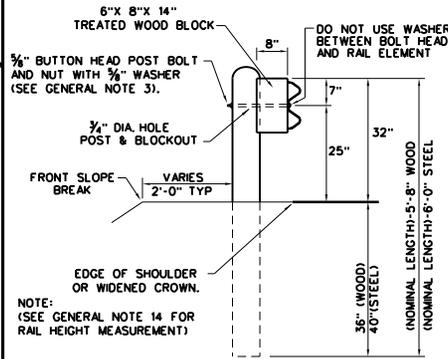
**WZ(RS)-22**

FILE: wzs22.dgn	DATE: TxDOT November 2012	DATE: TxDOT November 2012	DATE: TxDOT November 2012
© TxDOT November 2012	COM: 6471	SECT: 51	JOB: 001
REVISIONS: 2-14 4-16	REV: 1-22	DIST: LFK	COUNTY: HOUSTON
			US 287, ETC
			SHEET NO. 24

DATE: 7/12/2024 10:05:49 AM  
 FILE: T:\LFD\DM\Plant Contracts\B\_RMC - Routine Maintenance Contracts\FY25 Plans\WZ(RS)22.dgn  
 DSC: MAFS  
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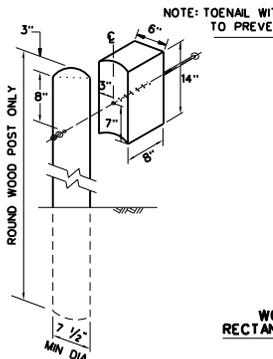
DECLARE: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT"; NO WARRANTY OF ANY KIND IS MADE BY TxDOT FOR ANY PURPOSE WHATSOEVER. TxDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.

DATE: 7/12/2024  
 FILE: TMLPFD004\Main Contracts\B.RMC - Routine Maintenance Contracts\1225 Plans\6471-51-001 Houston MBGF\UGA\STD-1\STANDARDS\GUARD FENCE\GF(31)-19.dgn

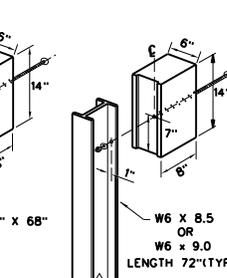


**TYPICAL POST PLACEMENT**

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



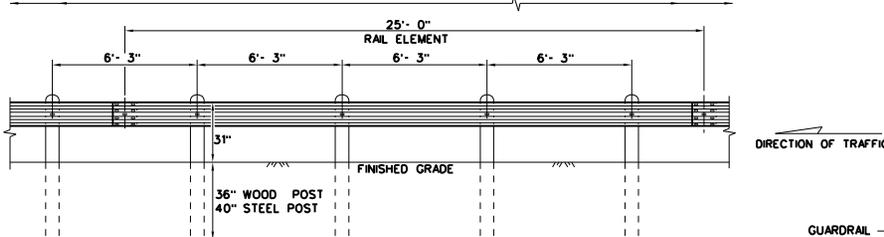
**WOOD BLOCK TO RECTANGULAR WOOD POST**



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

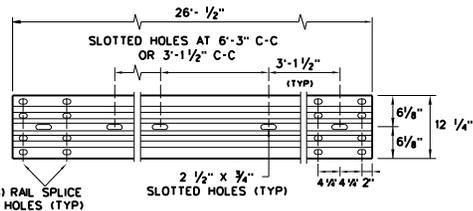
**WOOD BLOCK TO ROUND WOOD POST**

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



**ELEVATION MID-SPAN RAIL SPLICE**

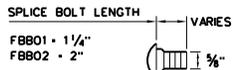
SHOWING A 25'-0" SECTION OF W-BEAM RAIL. (SEE GENERAL NOTE 2)



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

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

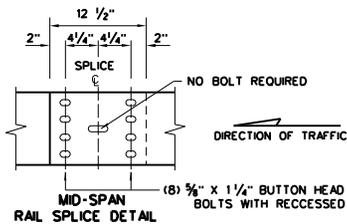
NOTE: FOUR TYPES OF BUTTON-HEAD GUARD RAIL BOLTS COME WITH A RECESSED NUT.



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

**BUTTON HEAD BOLT**

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

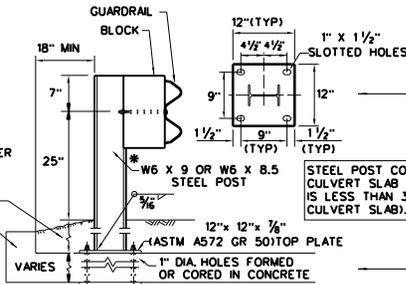


**MID-SPAN RAIL SPLICE DETAIL**

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

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

9" MIN. FILL DEPTH CULVERT SLAB



**LOW FILL CULVERT POST**

NOTE: TWO INSTALLATION OPTIONS.

1. **BOLT-THROUGH OPTION:** REQUIRES A 6" MIN. SLAB THICKNESS. 3/4" 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 3/8" 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.

**GENERAL NOTES**

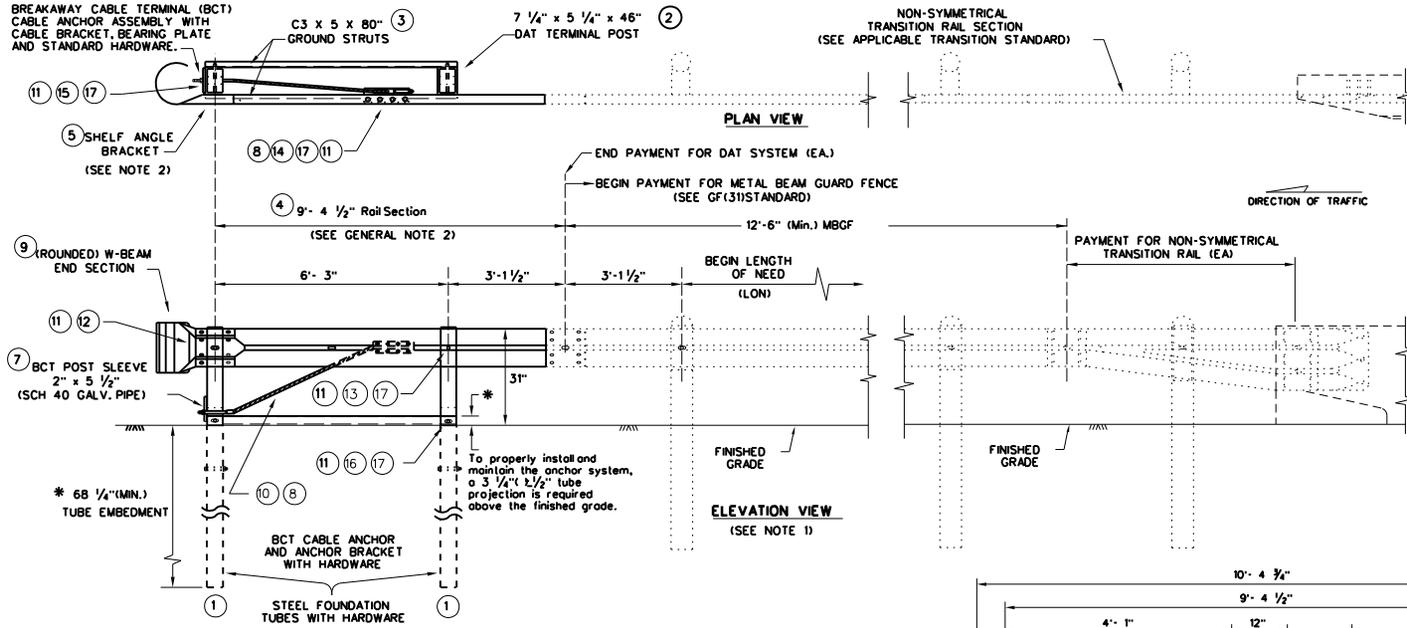
1. THE TYPE OF POST (ROUND WOOD POST, RECTANGULAR WOOD POST, OR STEEL POST) WILL BE AS SHOWN IN THE PLANS. THE EXACT POSITION OF MBGF SHALL BE SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER. STEEL POSTS TO BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING."
2. RAIL ELEMENTS SHALL MEET THE REQUIREMENTS 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 3/4" WASHER (FWC160) 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 2 1/4" DIA. HOLE, 24" INTO THE ROCK. IF SOLID ROCK IS ENCOUNTERED BELOW 18", DRILL A 12" DIA. HOLE, 12" INTO THE ROCK OR TO THE STANDARD EMBEDMENT DEPTH, WHICHEVER MAYBE LESS. ANY EXCESS POST LENGTH, AFTER MEETING THESE DEPTHS, MAY BE FIELD CUT TO ENSURE PROPER GUARDRAIL MOUNTING HEIGHT. BACKFILL WITH COARSE AGGREGATE MATERIAL.
10. POSTS SHALL NOT BE SET IN CONCRETE, OF ANY DEPTH.
11. SPECIAL FABRICATION WILL BE REQUIRED AT INSTALLATION LOCATIONS HAVING A CURVATURE OF LESS THAN 150 FT. RADIUS.
12. UNLESS OTHERWISE SHOWN IN THE PLANS, A COMPOSITE MATERIAL BLOCK THAT MEETS THE REQUIREMENTS OF DMS-7210, "COMPOSITE MATERIAL POSTS AND BLOCKS FOR METAL BEAM GUARD FENCE" MAY BE SUBSTITUTED FOR BLOCKS OF SIMILAR DIMENSIONS. THE CONSTRUCTION DIVISION, TxDOT MAINTAINS A MATERIAL PRODUCER LIST (MPL) FOR PRODUCERS OF MATERIALS CONFORMING TO DMS-7210 ONLY PRODUCERS ON THE MPL MAY FURNISH COMPOSITE MATERIAL BLOCKS.
13. FOR THE LOW FILL CULVERT OPTION, POSTS LOCATED PARTIALLY OR WHOLLY BETWEEN PRECAST BOX CULVERT UNITS, THE USE OF A CAST-IN-PLACE CONCRETE CLOSURE BETWEEN BOXES IS REQUIRED. THE LENGTH OF THE CAST-IN-PLACE CONCRETE CLOSURE SHALL ACCOMMODATE THE PLACEMENT OF THE LOW FILL CULVERT OPTION. SEE CONCRETE CLOSURE DETAILS ON BRIDGE STANDARD SCP-MD.
14. GUARDRAIL HEIGHT MEASUREMENT: WHEN THE GUARDRAIL IS LOCATED ABOVE PAVEMENT, MEASURE THE HEIGHT FROM THE PAVEMENT TO THE TOP OF THE W-BEAM RAIL. WHEN THE GUARDRAIL IS LOCATED UP TO 2 FT. OFF OF THE EDGE OF PAVEMENT OR FOR A PAVEMENT OVERLAY, USE A 10-FOOT STRAIGHTEDGE TO EXTEND THE PAVEMENT/SHOULDER SLOPE TO THE BACK OF RAIL. MEASURE FROM THE BOTTOM OF STRAIGHTEDGE TO THE TOP OF RAIL. FOR GUARDRAIL LOCATED DOWN A 10:1 SLOPE, MEASURE FROM THE NOMINAL TERRAIN.

NOTE: TRANSITIONS 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.

		Design Division Standard	
<b>METAL BEAM GUARD FENCE</b> <b>TL-3 MASH COMPLIANT</b> <b>GF(31)-19</b>			
FILE: g3119.dgn	DN:TxDOT	CK:KM	DN:VP
© TxDOT: NOVEMBER 2019	CONF SECT	JOB	HIGHWAY
REVISIONS	6471 51	001	US 287, ETC
DIST	COUNTY		SHEET NO.
LFK	HOUSTON		25

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DATE: 7/12/2024  
 FILE: TLFKDDM\Main Contracts\B.RMC - Routine Maintenance Contracts\FY25 Plans\6471-51-001 Houston MBGF.UGN.STD-1\STANDARDS\GUARD FENCE GF(3)DAT-19.dgn



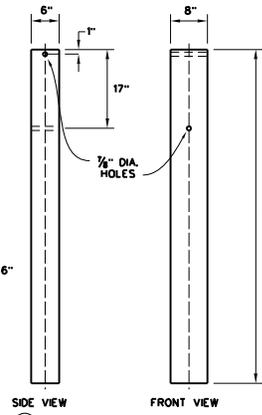
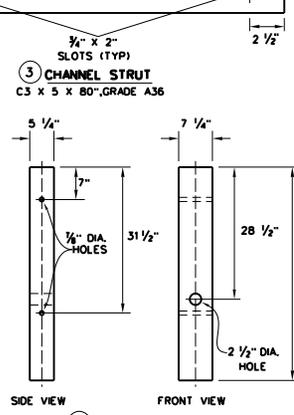
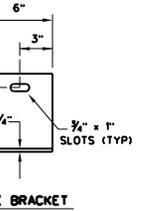
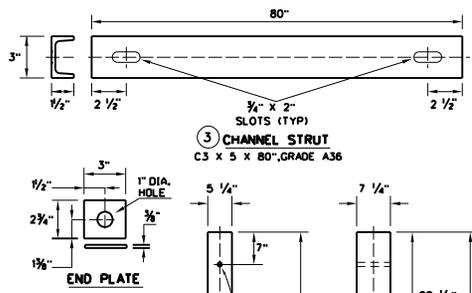
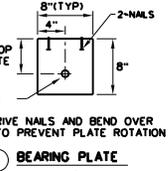
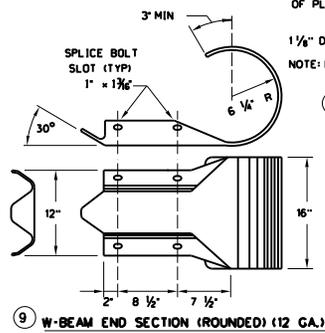
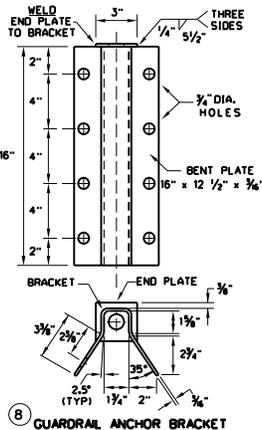
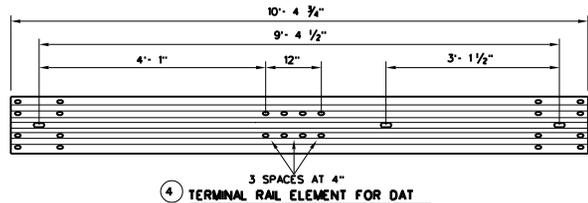
**DOWNSTREAM ANCHOR TERMINAL (DAT)**  
 NOTE: ONLY FOR DOWNSTREAM USE, WHEN LOCATED OUTSIDE THE HORIZONTAL CLEARANCE AREA OF OPPOSING TRAFFIC.

**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 1/2" ABOVE THE FINISHED GRADE.
4. ALL HARDWARE FOR DAT SHALL BE ASTM A307 UNLESS OTHERWISE SHOWN.
5. REFER TO GF(3) 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		
NO.	DESCRIPTION	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	3/8" X 2" HEX HEAD BOLT	8
15	3/8" X 8" HEX HEAD BOLT	4
16	3/8" X 10" HEX HEAD BOLT	2
17	3/8" FLAT WASHER	18

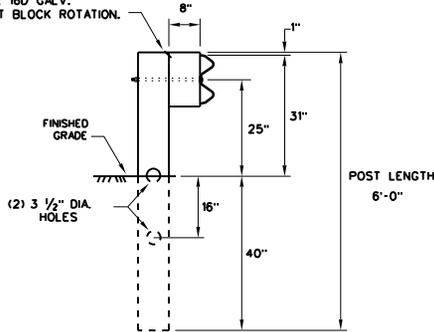


Design Division Standard  
**METAL BEAM GUARD FENCE (DOWNSTREAM ANCHOR TERMINAL)**  
**TL-3 MASH COMPLIANT**  
**GF(3)DAT-19**

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REVISIONS	CONF SECT	JOB	HIGHWAY	
NOVEMBER 2019	6471 51	001	US 287, ETC	
DIST	COUNTY	SHEET NO.		
LFK	HOUSTON	26		

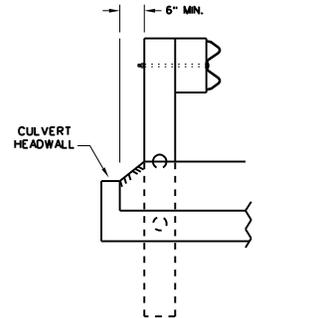
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NOTE: TOENAIL WITH ONE 16D GALV. NAIL TO PREVENT BLOCK ROTATION.



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

(6) CRT REQUIRED  
SEE ELEVATION DETAIL FOR LOCATIONS

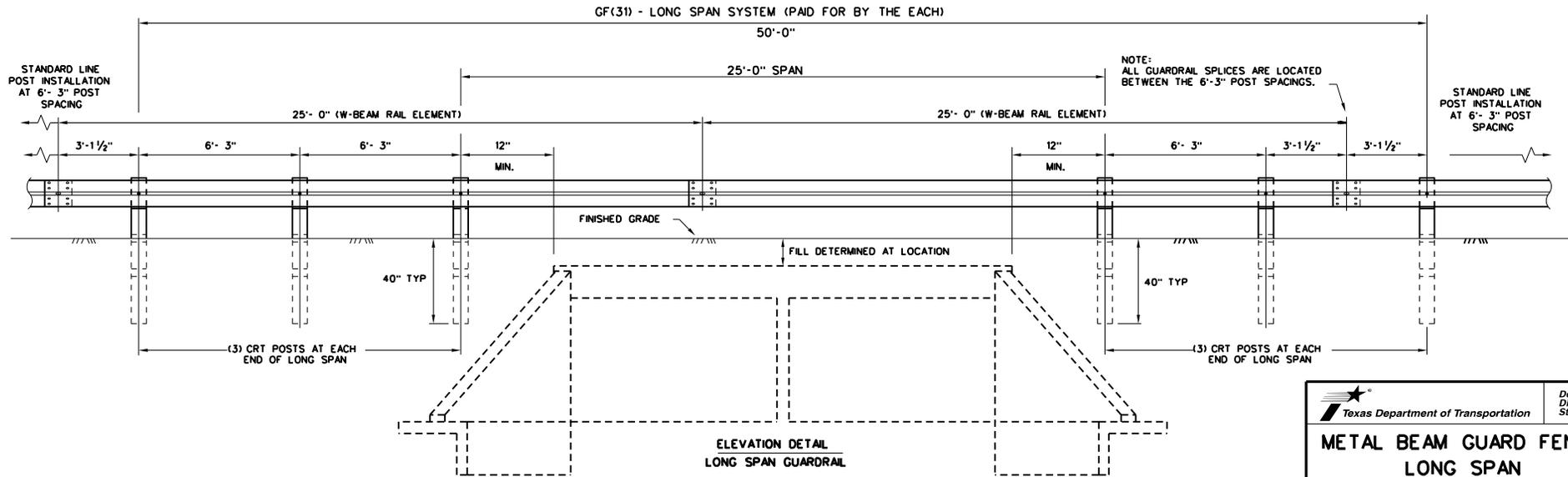


**LATERAL OFFSET BETWEEN THE  
GUARDRAIL AND THE CULVERT HEADWALL**

**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 1/2" 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 5/8" 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.

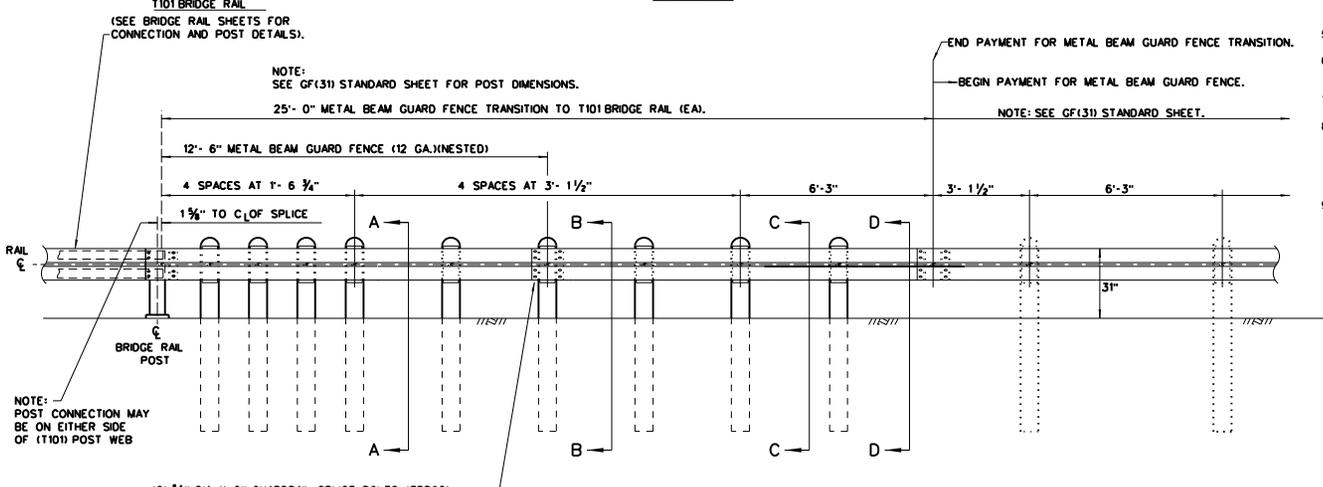
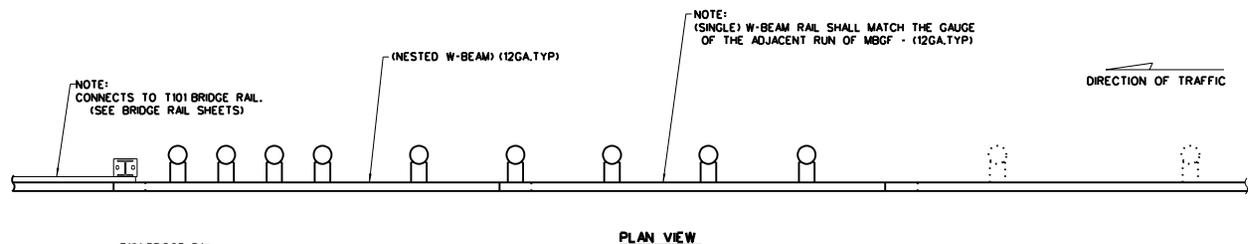
NOTE: SEE GF(31) STANDARD FOR STANDARD LINE POSTS.



**ELEVATION DETAIL  
LONG SPAN GUARDRAIL**

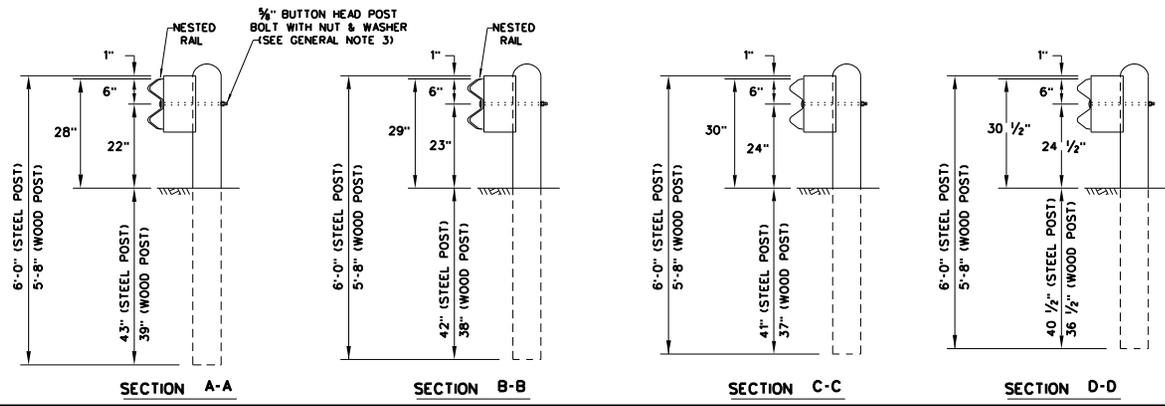
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<b>METAL BEAM GUARD FENCE LONG SPAN TL-3 MASH COMPLIANT GF(31)LS-19</b>			
FILE: gf31s19.dgn	DN: TxDOT	CK: KM	DR: VP
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 FILE: T:\LFD\DDA\Main\ Contracts\B.RMC - Routine Maintenance Contracts\FY25 Plans\6471-51-001 Houston MBGF.VMC 6471-51-001 Houston MBGF.VGN.STD.\STANDARDS\GUARD FENCE\GF(31)T101-19.dgn



(8) 3/8" DIA. X 2" GUARDRAIL SPLICE BOLTS (FBB02) WITH 3/8" GUARDRAIL NUTS (ASTM A563) (SEE GENERAL NOTE 3)

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

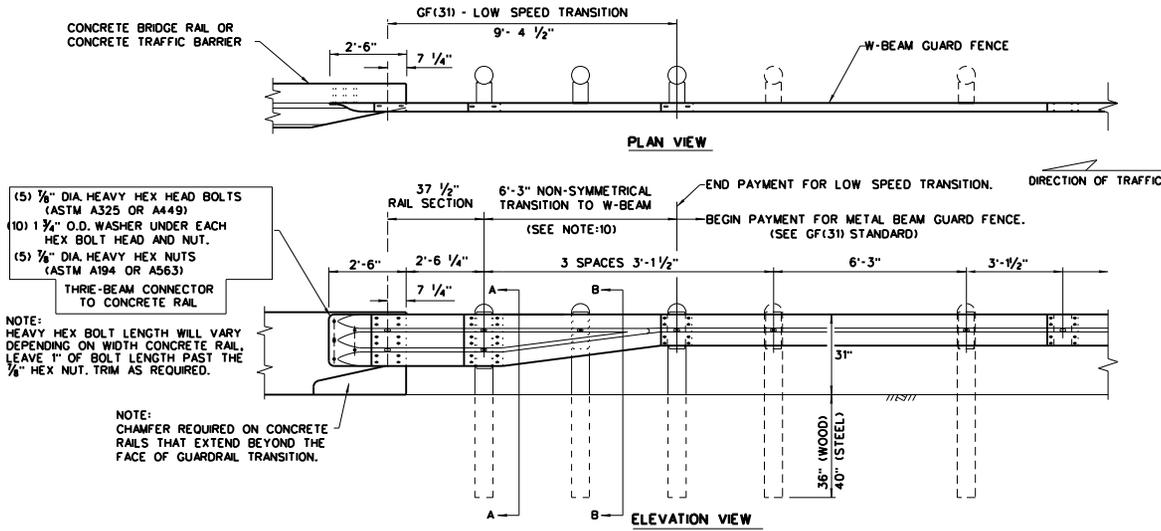


**GENERAL NOTES**

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 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 GR.A) SHALL BE OF SUFFICIENT LENGTH TO EXTEND THROUGH THE FULL THICKNESS OF THE NUT (ASTM A563) AND 3/8" ROUND WASHER (ASTM F436) AND NOT MORE THAN 1" BEYOND IT. BUTTON HEAD "SPLICE" BOLTS (ASTM A307) ARE 3/8" X 1- 1/2" WITH 3/8" 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.

		Design Division Standard	
<b>METAL BEAM GUARD FENCE TRANSITION (T101)</b> <b>GF(31)T101-19</b>			
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LFK	HOUSTON		28

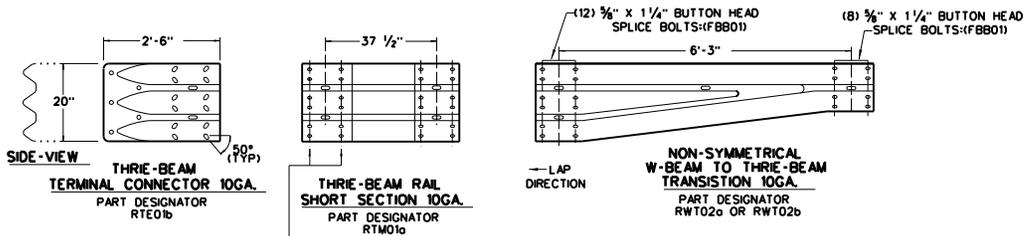
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- (5) 3/8" DIA. HEAVY HEX HEAD BOLTS (ASTM A325 OR A449)
  - (10) 1 1/4" O.D. WASHER UNDER EACH HEX BOLT HEAD AND NUT.
  - (5) 3/8" DIA. HEAVY HEX NUTS (ASTM A194 OR A563)
- THREE-BEAM CONNECTOR TO CONCRETE RAIL
- NOTE: HEAVY HEX BOLT LENGTH WILL VARY DEPENDING ON WIDTH CONCRETE RAIL. LEAVE 1" OF BOLT LENGTH PAST THE 3/8" HEX NUT. TRIM AS REQUIRED.
- NOTE: CHAMFER REQUIRED ON CONCRETE RAILS THAT EXTEND BEYOND THE FACE OF GUARDRAIL TRANSITION.

**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 3/8" 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 1/2" DIA. MINIMUM THROUGHOUT THE TRANSITION.



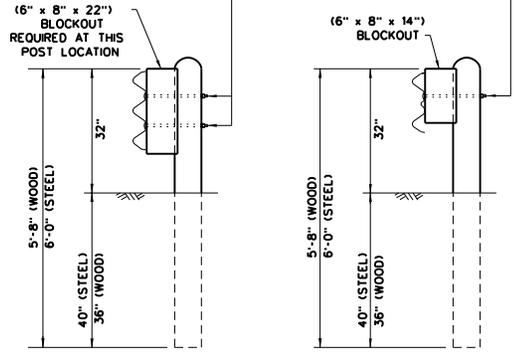
- (2) 3/8" BUTTON HEAD POST BOLTS & NUTS (FBB04)
- (1) 3/8" FLAT WASHER (FWC14a) UNDER EACH NUT

- (12) 3/8" X 1 1/4" BUTTON HEAD SPLICE BOLTS WITH RECESSED NUTS (FBB01)
- (12) RECTANGULAR GUARDRAIL PLATE WASHERS (FWR03)

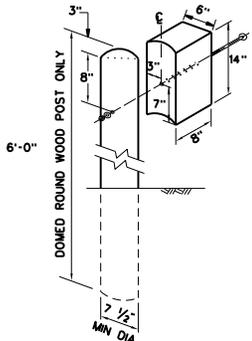
PLATE WASHER INSTRUCTIONS

BRIDGE APPROACH - UPSTREAM: THE SHORT RAIL LAPS OVER THE TERMINAL CONNECTOR. PLATE WASHERS ARE INSTALLED UNDER THE SPLICE NUTS AGAINST INSIDE OF CONNECTOR.

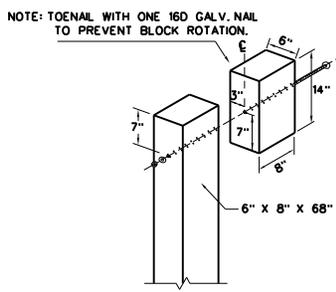
BRIDGE EXIT - DOWNSTREAM: THE TERMINAL CONNECTOR LAPS OVER THE NESTED RAIL. PLATE WASHERS ARE INSTALLED UNDER THE BOLT HEAD AGAINST OUTSIDE OF CONNECTOR.



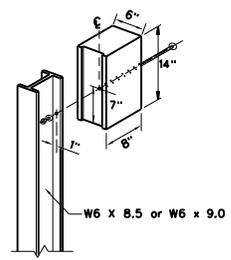
NOTE: \*WOOD\* INDICATES DIMENSIONS FOR BOTH ROUND AND RECTANGULAR WOOD POST SYSTEMS.



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



ROUTED WOOD BLOCK TO I-BEAM STEEL POST

**LOW-SPEED TRANSITION**

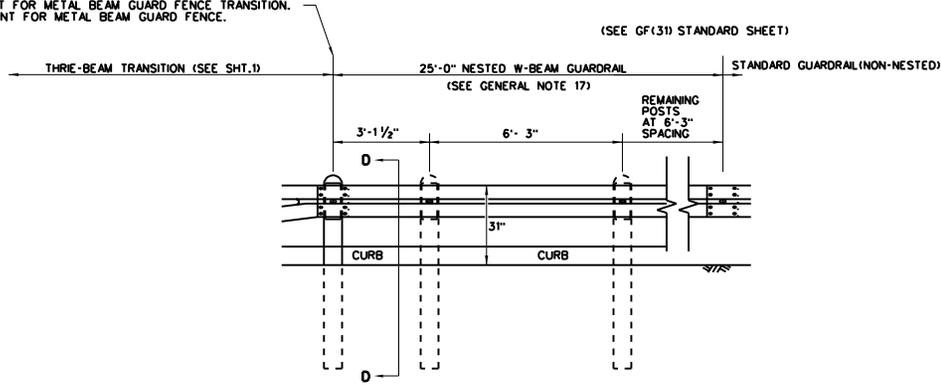
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	LFK	HOUSTON	29



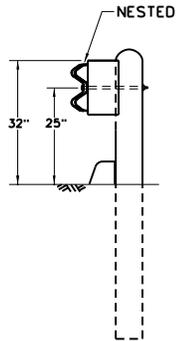
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REQUIRED ALTERNATIVE FOR CONTINUOUS CURB EXTENDING PAST POST 7 (SEE SHT. 1 GENERAL NOTE 17)

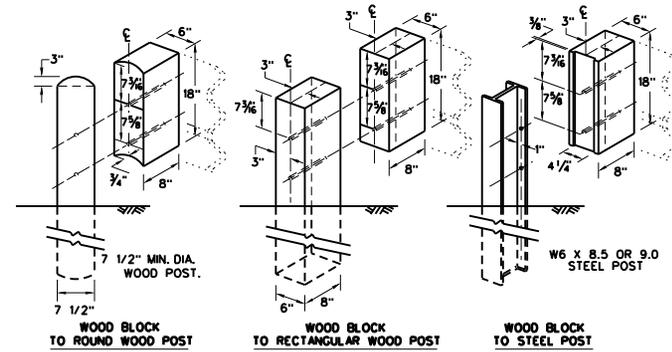
END PAYMENT FOR METAL BEAM GUARD FENCE TRANSITION.  
 BEGIN PAYMENT FOR METAL BEAM GUARD FENCE.



ELEVATION VIEW



SECTION D-D



THREE BEAM TRANSITION BLOCKOUT DETAILS

HIGH-SPEED TRANSITION

SHEET 2 OF 2

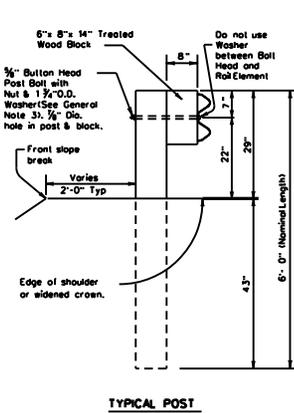


METAL BEAM GUARD FENCE  
 THREE-BEAM TRANSITION  
 TL-3 MASH COMPLIANT  
 GF(31)TR TL3-20

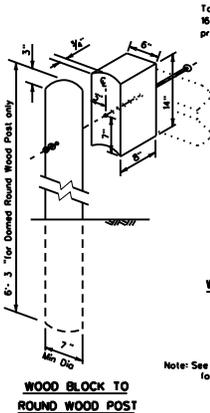
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REVISIONS	6471	51	001	US 287, ETC
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LFK	HOUSTON		31	

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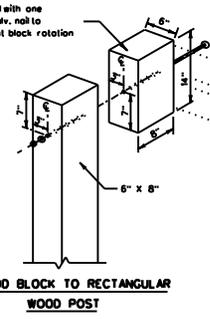
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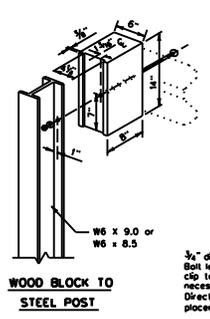
TYPICAL POST



WOOD BLOCK TO RECTANGULAR WOOD POST

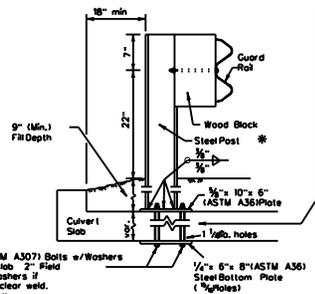


WOOD BLOCK TO STEEL POST

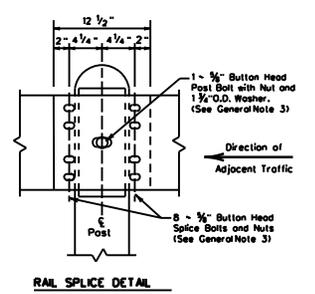


3/4" dia. (ASTM A307) Bolts w/Washers  
 Bolt length - slab 2" field clip lapside washers if necessary to clear weld.  
 Direction of bolt placement is upward.

**LOW FILL CULVERT POST**  
 FOR USE ON NON-BRIDGE CLASS CULVERTS ONLY



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



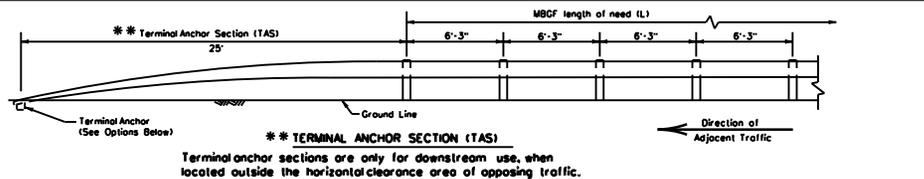
RAIL SPLICE DETAIL

**GENERAL NOTES**

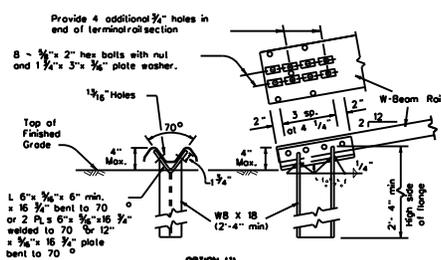
- The type of post (round wood post, rectangular wood post, or steelpost) will be shown elsewhere in the plans. The exact position of MBGF shall be shown elsewhere in the plans or as directed by the Engineer. Steelposts to be galvanized in accordance with Item 445, "Galvanizing."
- Rail element shall 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.
- 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 1/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 7/8" x 1 1/4" for 2" long at triple rail splices) with a 3/8" double recessed nut (ASTM A563).
- Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
- Crown shall be widened to accommodate the Metal Beam Guard Fence.
- The lateral approach to the guard fence, shall have a slope rate of not more than 1V:10H.
- 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.
- 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.
- Posts shall not be set in concrete, of any depth.
- Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
- 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."
- 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.

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

		Design Division Standard	
<h2>METAL BEAM GUARD FENCE</h2> <h3>MBGF - 19</h3>			
FILE: mbgf19.dgn	DN: TxDOT	CK: KM	DN: BD
REVISIONS 6471 51 001 US 287, ETC DIST COUNTY SHEET NO. LFK HOUSTON 32	CONT SECT JOB 6471 51 001 US 287, ETC DIST COUNTY SHEET NO. LFK HOUSTON 32	DN: TxDOT 6471 51 001 US 287, ETC DIST COUNTY SHEET NO. LFK HOUSTON 32	DN: TxDOT 6471 51 001 US 287, ETC DIST COUNTY SHEET NO. LFK HOUSTON 32



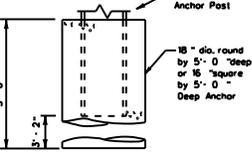
**Terminal Anchor Section (TAS)**  
 Terminal anchor sections are only for downstream use, when located outside the horizontal clearance area of opposing traffic.



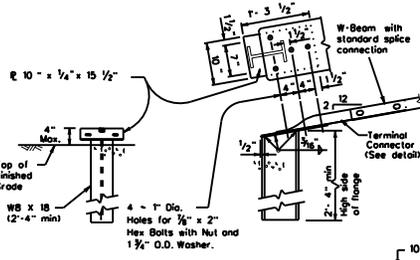
**OPTION 1 (1)**  
 Note: This anchor post requires four additional 3/4 inch holes (shop or field) in the roll member with eight 3/4 inch hex bolts with nut and plate washer.

**Terminal Anchor Post Options**  
 (See General Note 11)

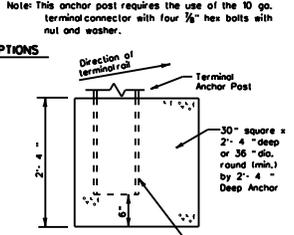
Notes:  
 Either concrete anchor may be used with either post option above.  
 No construction joint is allowed in the concrete anchor.  
 Terminal rail may be bolted to post and in twist position prior to placing concrete anchor.  
 If concrete anchor is precast, the area should be completed as directed by the Engineer, when placed in the field.



**Terminal Concrete Anchor Options**  
 (See General Note 11)

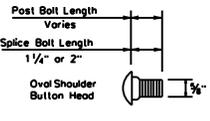


Note: Terminal Connector to be used with terminal anchor post options 2.

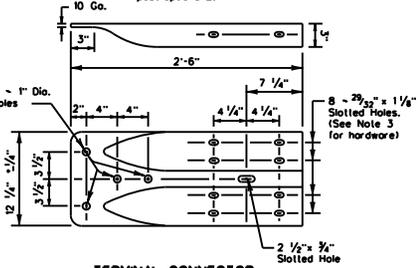


**Terminal Connector**

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



**Button Head Bolt**  
 Post and Splice Bolts  
 (See General Note 3)

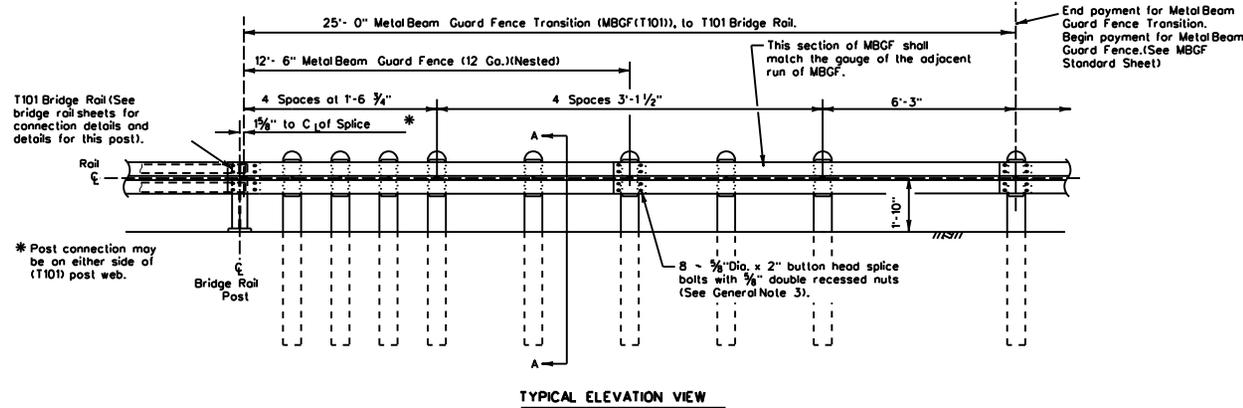
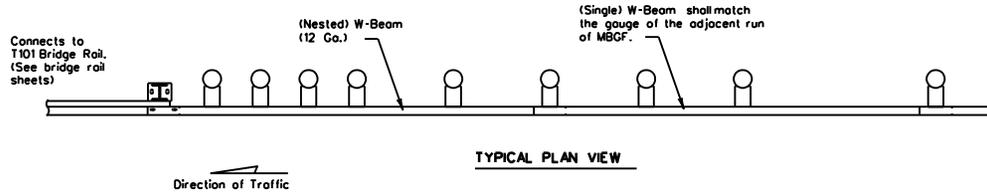


**Terminal Connector**

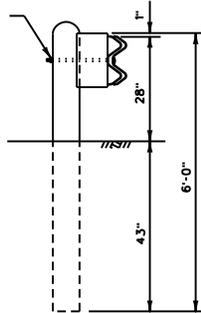
For connection hardware to concrete rails, see the MBGF transition standards.



DECLARE: 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: 7/12/2024  
 FILE: T:\LFR000A\Meint Contracts\FY25 Plans\6471-51-001 Houston MBGF.VMC 6471-51-001 Houston MBGF.VGN\STD.\1\STANDARDS\MBGF\MBGF(T101)-19.dgn

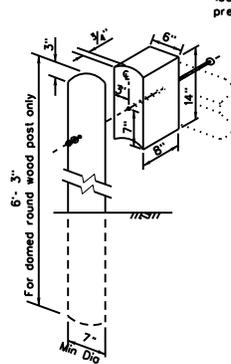


3/8" Button head post bolt with nut & washer (See General Note 3)

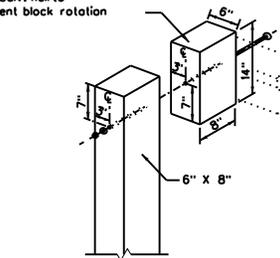


SECTION A-A

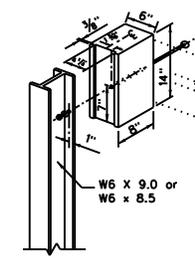
Toenail with one 16d Galv. nail to prevent block rotation



WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



WOOD BLOCK TO STEEL POST

**GENERAL NOTES**

- 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.
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
- 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 3/8" x 2" (at triple rail splices) with a 3/8" double recessed nuts (ASTM A563).
- 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.
- Crown will be widened to accommodate transitions.
- If solid rock is encountered, see the MBGF standard sheet for proper installation guidance.
- Posts shall not be set in concrete.
- 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.
- Refer to MBGF Standard Sheet for additional details.

ONLY FOR USE IN MAINTENANCE REPAIRS.



Design Division Standard

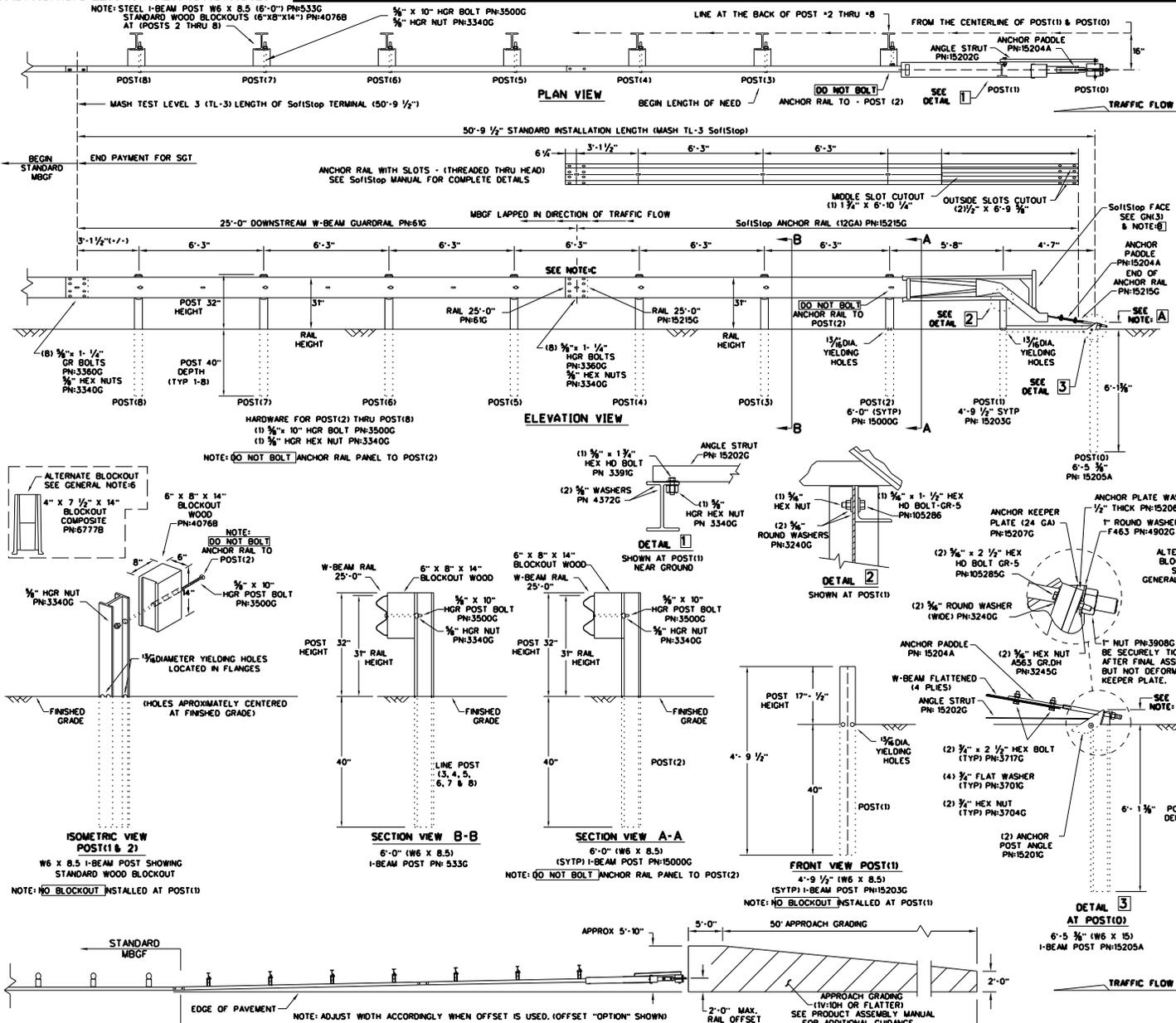
**METAL BEAM GUARD FENCE TRANSITION (T101) (T101 BRIDGE RAIL) MBGF (T101)-19**

FILE: mbgf10109.dgn	DN: TxDOT	CR: KM	DR: BD	CR: VP
© TxDOT NOVEMBER 2019	CONT SECT	JOB	HIGHWAY	
REVISIONS	6471 51	001	US 287, ETC	
DIST	COUNTY		SHEET NO.	
LFK	HOUSTON		34	



DISCLAIMER: 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: 7/12/2024  
 FILE: T:\LEF\KDD\Main\Contract\51-981-Houston MBGF\UGN\STD.\1\STANDARDS\SGT\10S\11B\31-16.dgn



- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY AT 188B1323-6374, 2525 N. STEMMONS FREEWAY, DALLAS, TX 75207
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE SoftStop END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL, PN#520378
  - 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.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - 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.
  - IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL AND REFER TO THE LATEST ROADWAY MBGF STANDARD FOR INSTALLATION GUIDANCE.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - IT IS ACCEPTABLE TO INSTALL THE SoftStop IMPACT HEAD PARALLEL TO THE GRADE LINE OR WITH AN UPWARD TILT.
  - DO NOT ATTACH THE SoftStop SYSTEM DIRECTLY TO A RIGID BARRIER.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE SoftStop SYSTEM BE CURVED.
  - A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRUSHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.

**NOTE-A** THE INSTALLATION HEIGHT OF FULLY ASSEMBLED ANCHOR POST WILL VARY FROM 3'-3/4" MIN. TO 4" MAX. ABOVE FINISHED GRADE.

**NOTE-B** PART PN#5852B RIGHT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING) PART PN#5851B LEFT-SIDE (HIGH INTENSITY REFLECTIVE SHEETING)

**NOTE-C** W-BEAM SPlice LOCATED BETWEEN LINE POST(4) AND LINE POST(5) GUARDRAIL PANEL 25'-0" PN#61G ANCHOR RAIL 25'-0" PN#15215G LAP GUARDRAIL IN DIRECTION OF TRAFFIC FLOW.

PART	QTY	MAIN SYSTEM COMPONENTS
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 CUTOUP SLOTS
61G	1	SoftStop DOWNSTREAM W-BEAM RAIL (12GA) (25'-0")
15205A	1	POST -0 - ANCHOR POST (6'-5 3/4")
15203G	1	POST -1 - (SYTP) (4'-9 1/2")
15000G	1	POST -2 - (SYTP) (6'-0")
533G	6	POST -3 THRU -8 - I-BEAM (W6 x 8.5) (6'-0")
4076B	7	BLOCKOUT - WOOD (ROUTED) (6" x 8" x 14")
6777B	7	BLOCKOUT - COMPOSITE (14" x 7 1/2" x 14")
15204A	1	ANCHOR PADDLER
15207G	1	ANCHOR KEEPER PLATE (24 GA)
15206G	1	ANCHOR PLATE WASHER (1/2" THICK)
15201G	2	ANCHOR POST ANGLE (10" LONG)
15202C	1	ANGLE STRUT
HARDWARE		
4902G	1	1" ROUND WASHER F436
3908G	1	1" HEAVY HEX NUT A563 GR.DH
3717G	2	3/4" x 2 1/2" HEX BOLT A325
3701G	4	3/4" ROUND WASHER F436
3704G	2	3/4" HEAVY HEX NUT A563 GR.DH
3360G	16	3/4" x 1/2" W-BEAM RAIL SPlice BOLTS HGR
3340G	25	3/4" W-BEAM RAIL SPlice NUTS HGR
3500G	7	3/4" x 10" HGR POST BOLT A307
3391G	1	3/4" x 1 1/2" HEX HD BOLT A325
4499G	1	3/4" x 9" HEX HD BOLT A325
4372G	4	3/4" WASHER F436
105285G	2	3/4" x 2 1/2" HEX HD BOLT GR-5
105286G	1	3/4" x 1 1/2" HEX HD BOLT GR-5
3240G	6	3/4" ROUND WASHER (WIDE)
3245G	3	3/4" HEX NUT A563 GR.DH
5852B	1	HIGH INTENSITY REFLECTIVE SHEETING - SEE NOTE-B

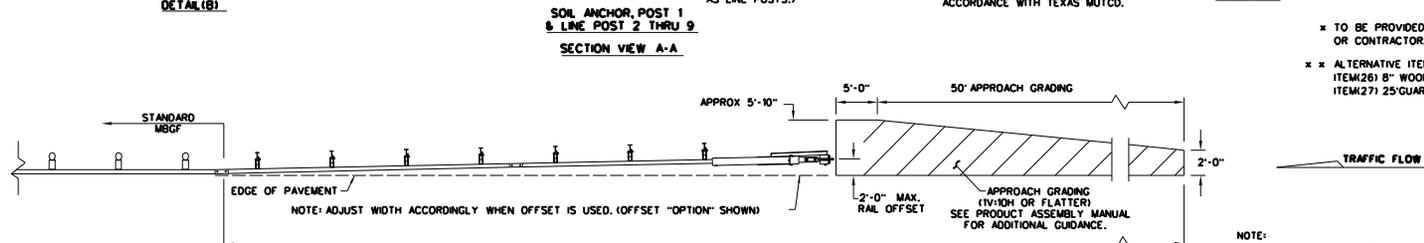
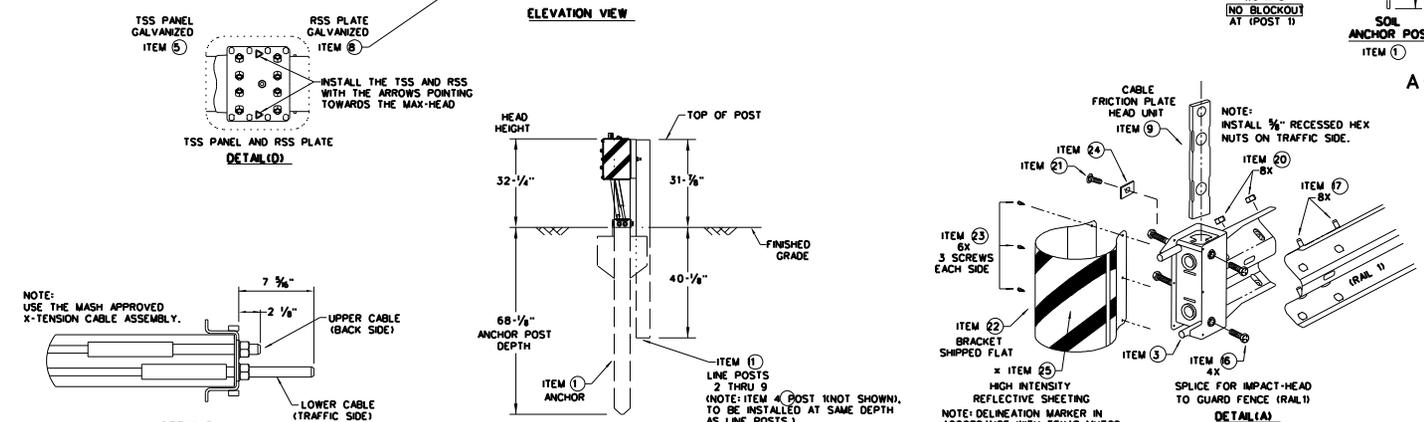
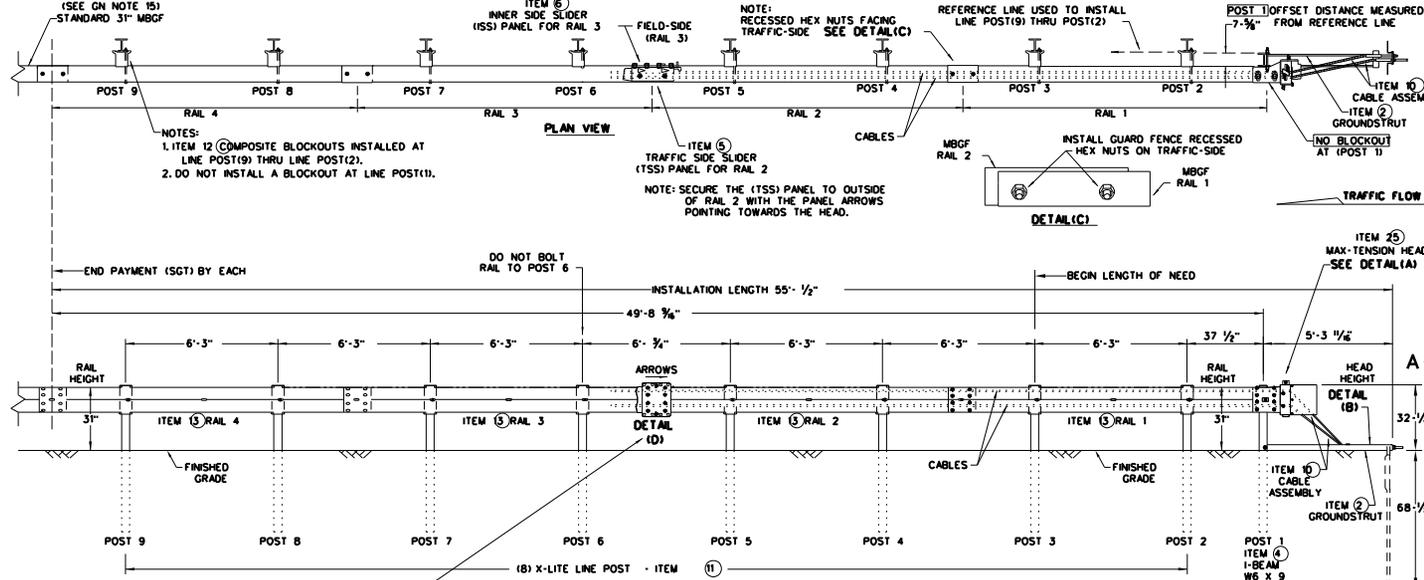
**TRINITY HIGHWAY**  
**SOFTSTOP END TERMINAL**  
**MASH - TL-3**  
**SGT(10S)31-16**

FILE: sg10s3116	DN: TxDOT	CR: KM	DN: VP	CR: MB/VP
CONT: 10DOT: JULY 2016	SECT: 1001	JOB: 001	US 287, ETC	
REVISIONS:	6471	51	001	US 287, ETC
DIST: LFK	COUNTY: HOUSTON	SHEET NO: 36		

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

DSC# 4469: 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 units.

DATE: 7/12/2024  
 FILE: T:\FORD\Main\Contract\B\_RMC - Routine Maintenance Contracts\FY25 Plans\B\_RMC\B\_RMC\_SGT(11S)31-18.dgn



**GENERAL NOTES**

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800
- FOR INSTALLATION, REPAIR, & MAINTENANCE REFER TO THE MAX-TENSION INSTALLATION INSTRUCTION MANUAL, P/N MANUAX REV D (ECN 356).
- 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.
- FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
- ALL STEEL COMPONENTS ARE GALVANIZED PER ASTM A123 OR EQUIVALENT UNLESS OTHERWISE STATED.
- SYSTEM SHOWN USING STEEL WIDE FLANGE POST WITH COMPOSITE BLOCKOUTS.
- 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.
- REFER TO INSTALLATION MANUAL FOR SPECIFIC PANEL LAPPING GUIDANCE.
- IF SOLID ROCK IS ENCOUNTERED SEE THE MANUFACTURER'S INSTALLATION MANUAL FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- 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.
- MAX-TENSION SYSTEM SHALL NEVER BE INSTALLED WITHIN A CURVED SECTION OF GUARDRAIL.
- IF A DELINEATION MARKER IS REQUIRED, MARKER SHALL BE IN ACCORDANCE WITH TEXAS MUTCD.
- THE SYSTEM IS SHOWN WITH 12'-6" MBGF PANELS, 25'-0" MBGF PANELS ARE ALSO ALLOWED.
- A MINIMUM OF 12'-6" OF 12GA MBGF IS REQUIRED IMMEDIATELY DOWNSTREAM OF THE MAX-TENSION SYSTEM.

ITEM #	PART NUMBER	DESCRIPTION	QTY
1	BSI-1610060-00	SOIL ANCHOR - GALVANIZED	1
2	BSI-1610061-00	GROUND STRUT - GALVANIZED	1
3	BSI-1610062-00	MAX-TENSION IMPACT HEAD	1
4	BSI-1610063-00	W6x9 I-BEAM POST 6FT. GALVANIZED	1
5	BSI-1610064-00	TSS PANEL - TRAFFIC SIDE SLIDER	1
6	BSI-1610065-00	ISS PANEL - INNER SIDE SLIDER	1
7	BSI-1610066-00	TOOTH - GEOMET	1
8	BSI-1610067-00	RSS PLATE - REAR SIDE SLIDER	1
9	B061058	CABLE FRICTION PLATE - HEAD UNIT	1
10	BSI-1610069-00	CABLE ASSEMBLY - MASH X-TENSION	2
11	BSI-1021078-00	X-LITE LINE POST-GALVANIZED	8
12	B090534	8" W-BEAM COMPOSITE-BLOCKOUT XT110	4
13	BSI-4004386	12'-6" W-BEAM GUARD FENCE PANELS 12GA.	8
14	BSI-1102027-00	X-LITE SQUARE WASHER	1
15	BSI-2001886	3/8" x 7" THREAD BOLT HH (GR.5)GEOMET	1
16	BSI-2001885	3/8" x 3" ALL-THREAD BOLT HH (GR.5)GEOMET	4
17	400115	3/8" x 1 1/2" GUARD FENCE BOLTS (GR.2)MGAL	48
18	2001840	3/8" x 10" GUARD FENCE BOLTS MGAL	8
19	2001836	3/8" WASHER F436 STRUCTURAL MGAL	2
20	400116	3/8" RECESSED GUARD FENCE NUT (GR.2)MGAL	59
21	BSI-2001888	3/8" x 2" ALL THREAD BOLT (GR.5)GEOMET	1
22	BSI-1701063-00	DELINEATION MOUNTING (BRACKET)	1
23	BSI-2001887	1/2" x 3/8" SCREW SD HH 40SS	7
24	4002051	GUARDRAIL WASHER RECT AASHTO FWR03	1
25	SEE NOTE BELOW	HIGH INTENSITY REFLECTIVE SHEETING	1
26	4002337	8" W-BEAM TIMBER-BLOCKOUT, P08018	8
27	BSI-4004431	25' W-BEAM GUARDRAIL PANEL, B-SPACE, 12GA.	2
28	MANUAX Rev-D	MAX-TENSION INSTALLATION INSTRUCTIONS	1

\* TO BE PROVIDED BY DISTRIBUTOR OR CONTRACTOR.  
 \* \* ALTERNATIVE ITEMS NOT SHOWN. ITEM 26) 8" WOOD-BLOCKOUTS ITEM 27) 25' GUARD FENCE PANELS

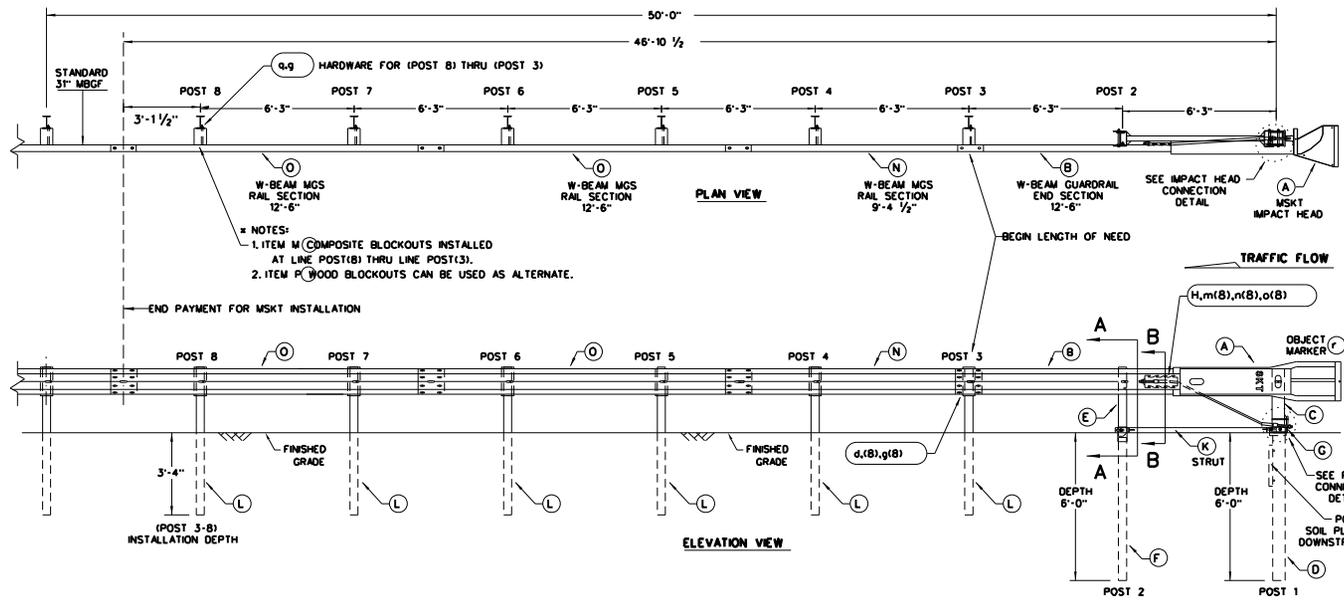
Design Division Standard

MAX-TENSION END TERMINAL  
 MASH - TL-3  
 SGT(11S)31-18

FILE: sgt11s3118.dgn	DN: TxDOT	CK: KM	DW: TxDOT	OK: CL
© TxDOT: FEBRUARY 2018	CONT SECT	JOB	HIGHWAY	
REVISIONS	6471 51	001	US 287, ETC	
	DIST	COUNTY	SHEET NO.	
	LFK	HOUSTON	37	

DISCLAIMER: THIS STANDARD IS COVERED 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 ACCIDENTS OR DAMAGES RESULTING FROM ITS USE.

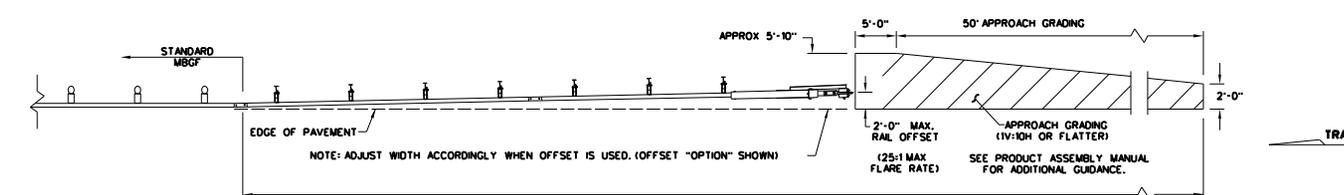
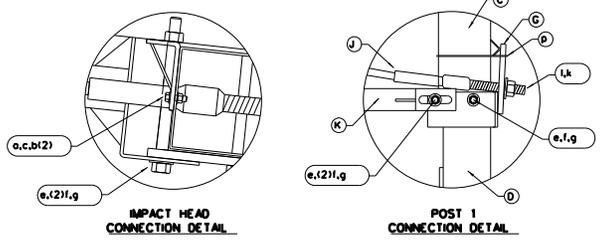
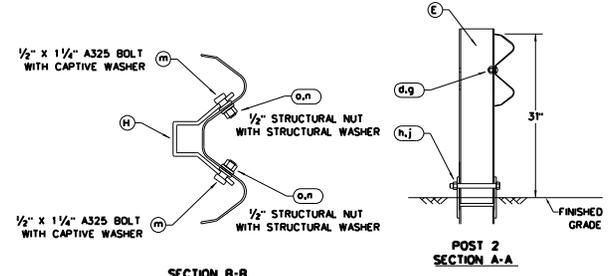
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- GENERAL NOTES**
- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: ROAD SYSTEMS, INC. (432)263-2435, 3616 OLD HOWARD COUNTY AIRPORT, BIG SPRING, TX 79720
  - FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO THE MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
  - 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.
  - FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TXDOT'S LATEST ROADWAY MOW STRIP STANDARD.
  - HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 445, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
  - SYSTEM SHOWN USING STEEL WIDE FLANGE POSTS WITH COMPOSITE BLOCKOUTS.
  - 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.
  - 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.
  - POSTS SHALL NOT BE SET IN CONCRETE.
  - SYSTEM MUST BE ATTACHED TO STANDARD 31" MBGF.
  - UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
  - 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.
  - THE SYSTEM IS SHOWN WITH TWO 12'-6" MBGF PANELS, ONE 25'-0" MBGF PANEL IS ALSO ALLOWED IN THEIR PLACE.
  - A DRIVING CAP WITH A TAMBER 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 Go.	SF1303
C	1	POST 1 - TOP (6" X 6" X 1/2" TUBE)	MTPHP1A
D	1	POST 1 - BOTTOM (6" W6X15)	WTPHP1B
E	1	POST 2 - ASSEMBLY TOP	UHP2A
F	1	POST 2 - ASSEMBLY BOTTOM (6" W6X9)	HP2B
G	1	BEARING PLATE	E750
H	1	CABLE ANCHOR BOX	S760
J	1	BCT CABLE ANCHOR ASSEMBLY	E770
K	1	GROUND STRUT	MS785
L	6	W6x9 OR W6x8.5 STEEL POST	P621
M	6	COMPOSITE BLOCKOUTS	CBSP-14
N	1	W-BEAM MGS RAIL SECTION (9'-4 1/2")	G12025
O	2	W-BEAM MGS RAIL SECTION (12'-6")	G1203A
P	6	WOOD BLOCKOUT 6" X 8" X 14"	P675
Q	1	W-BEAM MGS RAIL SECTION (25'-0")	G1209

SMALL HARDWARE			
o	2	3/8" x 1" HEX BOLT (GRD 5)	B5160104A
b	4	3/8" WASHER	W0516
c	2	3/8" HEX NUT	N0516
d	25	3/8" Dia. x 1 1/2" SPLICE BOLT (POST 2)	B580122
e	2	3/8" Dia. x 9" HEX BOLT (GRD A449)	B580904A
f	3	3/8" WASHER	W050
g	33	3/8" Dia. H.G.R. NUT	N050
h	1	3/4" Dia. x 8 1/2" HEX BOLT (GRD A449)	B340854A
i	1	3/4" Dia. HEX NUT	N030
k	2	1 ANCHOR CABLE HEX NUT	N100
l	2	1 ANCHOR CABLE WASHER	W100
m	8	1/2" x 1 1/4" A325 BOLT WITH CAPTIVE WASHER	SB12A
n	8	1/2" STRUCTURAL NUTS	N012A
o	8	1 1/4" O.D. x 3/8" I.D. STRUCTURAL WASHERS	W012A
p	1	BEARING PLATE RETAINER TIE	CT-100ST
q	6	3/4" x 10" H.G.R. BOLT	B581002
r	1	OBJECT MARKER 18" X 18"	E3151



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.

Design Division Standard

## SINGLE GUARDRAIL TERMINAL

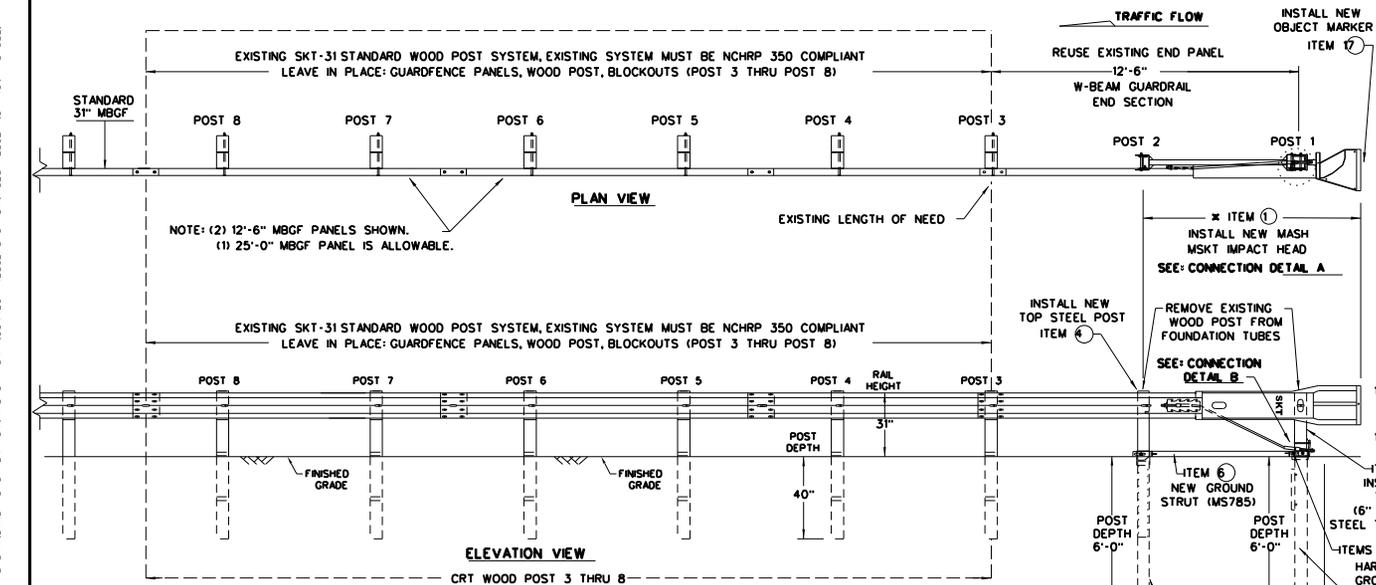
### MSKT-MASH-TL-3

### SGT(12S)31-18

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REVISIONS:	6471	51	001	
DIST: LFK	COUNTY: HOUSTON	SHEET NO.: 38		



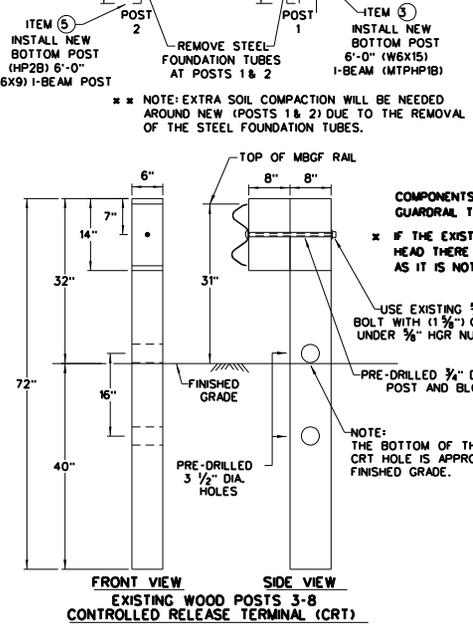
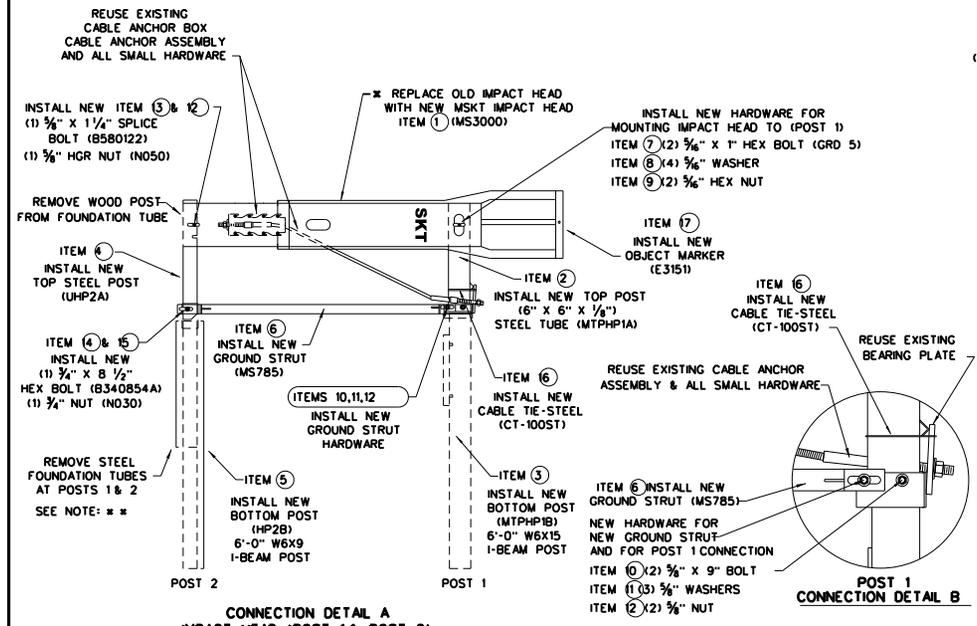
DECLARATION: THIS STANDARD IS GOVERNED BY THE "TEXAS ENGINEERING PRACTICE ACT"; NO WARRANTY OF ANY KIND IS MADE BY TxDOT FOR ANY PURPOSE WHATSOEVER. TxDOT ASSUMES NO RESPONSIBILITY FOR THE CONVERSION OF THIS STANDARD TO OTHER FORMATS OR FOR INCORRECT RESULTS OR DAMAGES RESULTING FROM ITS USE.



**GENERAL NOTES**

- 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
- FOR INSTALLATION, REPAIR AND MAINTENANCE REFER TO: MSKT END TERMINAL, PRODUCT DESCRIPTION ASSEMBLY MANUAL (PUBLICATION-062717).
- 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.
- FOR POST (LEAVE-OUT) INSTALLATION AND GUIDANCE SEE TxDOT'S LATEST ROADWAY MOW STRIP STANDARD.
- HARDWARE (BOLTS, NUTS, & WASHERS) SHALL BE GALVANIZED IN ACCORDANCE WITH ITEM 4.45, "GALVANIZING". FITTINGS SHALL BE SUBSIDIARY TO THE BID ITEM.
- IF SOLID ROCK IS ENCOUNTERED IN THE AREA OF (POST 1) AND / OR (POST 2) CONTACT THE MANUFACTURER, AND REFER TO THE LATEST ROADWAY MBSG STANDARD FOR INSTALLATION GUIDANCE.
- POSTS SHALL NOT BE SET IN CONCRETE.
- 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.
- UNDER NO CIRCUMSTANCES SHALL THE GUARDRAIL WITHIN THE MSKT SYSTEM BE CURVED.
- A FLARE RATE OF UP TO 25:1 MAY BE USED TO PREVENT THE TERMINAL HEAD FROM ENCRUCHING ON THE SHOULDER. THE FLARE MAY BE DECREASED OR ELIMINATED FOR SPECIFIC INSTALLATIONS, IF DIRECTED BY THE ENGINEER.
- 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 1/4" 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	3/8" X 1" HEX BOLT (GRD 5)	B516014A
8	4	3/8" WASHERS	W0516
9	2	3/8" HEX NUT	N0516
10	2	3/4" X 9" HEX BOLT (GRD A449)	B580904A
11	3	3/8" WASHERS	W050
12	3	3/8" H.G.R NUT	N050
13	1	3/8" 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.

USE EXISTING 3/4" X 18" BOLT WITH (1 3/4") O.D. WASHER UNDER 3/8" HGR NUT FIELD-SIDE

PRE-DRILLED 3/4" DIA. HOLE POST AND BLOCKOUT

NOTE: THE BOTTOM OF THE UPPER 3 1/2" CRT HOLE IS APPROXIMATELY AT FINISHED GRADE.

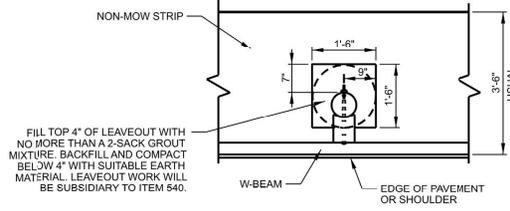
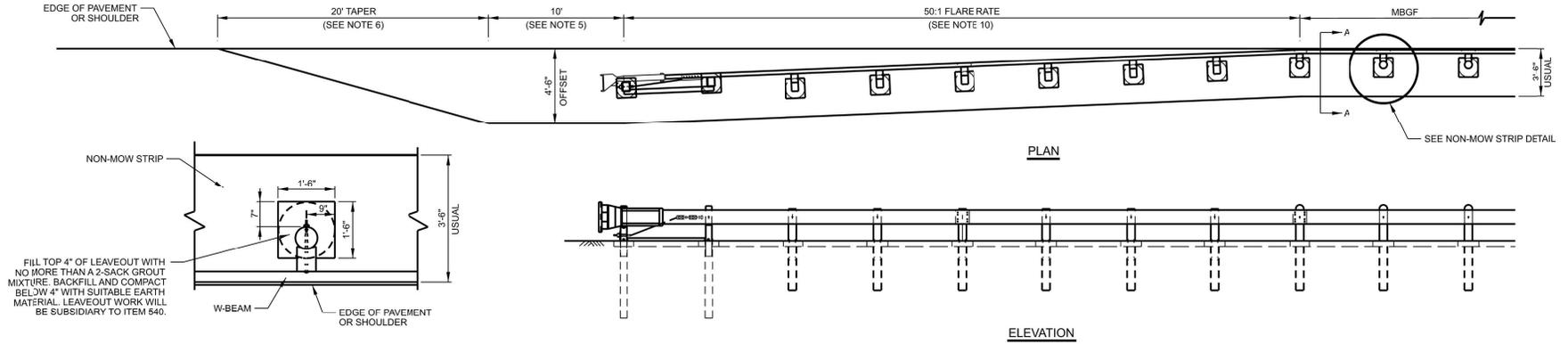
**RETROFIT STANDARD  
SKT 31' WOOD POST SYSTEM  
TO MASH MSKT  
SGT(14W)31-18**

FILE: sgt14w3118.dgn	DN: TxDOT	CK: KM	DW: VP	CK: CL
REVISIONS	CONT SECT	JOB	HIGHWAY	
① TxDOT: APRIL 2018	6471	51	001	US 287, ETC
	DIST	COUNTY	SHEET NO.	
	LFK	HOUSTON		40

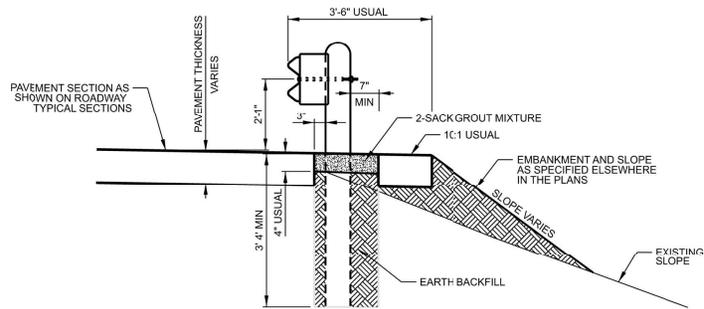
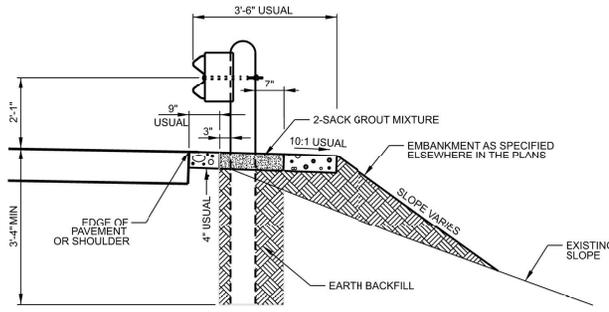
NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE EXISTING SKT END TERMINAL RETROFITTED TO THE MSKT MASH COMPLIANT TERMINAL. IT IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

DATE: FILE:





**NON-MOW STRIP DETAIL**  
HOT MIX ASPHALTIC PAVEMENT NON-MOW STRIP WITH 18"X18" OR 18" DIA. MINIMUM LEAVEOUT



**GENERAL NOTES**

- NON-MOW STRIPS SHALL BE HOT MIX ASPHALTIC PAVEMENT UNLESS OTHERWISE SHOWN ON THE PLANS. HOT MIX ASPHALTIC PAVEMENT SHALL MEET THE REQUIREMENTS OF AND BE PLACED IN ACCORDANCE WITH THE PERTINENT BID ITEM AS SHOWN ON THE PLANS. OTHER MATERIALS MAY BE USED AS INDICATED ELSEWHERE IN THE PLANS. MATERIALS FOR THE OPTIONAL WIDENED PAVEMENT SECTION SHALL BE AS SHOWN IN THE ROADWAY TYPICAL SECTIONS.
- THE TYPE OF APPROVED POST WILL BE SHOWN ELSEWHERE IN THE PLANS. SEE THE APPLICABLE STANDARD SHEETS FOR ADDITIONAL DETAILS AND INFORMATION.
- THE LIMITS OF PAYMENT FOR HOT MIX ASPHALTIC PAVEMENT WILL INCLUDE LEAVEOUTS FOR POST.
- THE LEAVEOUTS SHALL BE FILLED WITH NO MORE THAN A 2-SACK GROUT MIXTURE AND PLACED IN ACCORDANCE WITH SECTION 42-2.7, "MORTAR AND GROUT". PAYMENT FOR FURNISHING AND PLACING THE GROUT MIXTURE WILL BE CONSIDERED SUBSIDIARY TO THE VARIOUS BID ITEMS.
- THE NON-MOW STRIP SHALL BE EXTENDED FULL WIDTH FOR 10' IN ADVANCE OF THE GUARDRAIL END TREATMENT UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
- A 20' TAPER WILL BE USED IN ADVANCE OF GUARDRAIL UNLESS OTHERWISE SHOWN IN THE PLANS, OR DIRECTED BY THE ENGINEER.
- EXACT LOCATION OF MBGF PLACEMENT WILL BE SHOWN ELSEWHERE IN THE PLANS TO MEET APPROPRIATE CLEAR ROADWAY WIDTH AND CLEAR ZONE REQUIREMENTS.
- EXCAVATION REQUIRED TO CONSTRUCT NON-MOW STRIP WILL NOT BE MEASURED OR PAID FOR DIRECTLY BUT WILL BE SUBSIDIARY TO PERTINENT ITEMS.
- THE FLARE RATE MAY BE DECREASED OR ELIMINATED IF DIRECTED BY THE ENGINEER.
- WHEN THE EXISTING NON-MOW STRIP IS TO REMAIN IN PLACE, FILLING THE EXISTING POST HOLES WITH GROUT AND DIGGING NEW POST HOLES WILL BE SUBSIDIARY. THE TOP 4 INCHES OF A POST HOLE WITHIN AN EXISTING NON-MOW STRIP SHALL BE BACKFILLED WITH HMA. THIS WORK WILL NOT BE PAID FOR BUT WILL BE SUBSIDIARY TO ITEM 542.

N.T.S.

NOTE:  
THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF CHARLES M. BRAZIL, P.E. 12704 ON 8/8/2024. IT IS NOT TO BE USED FOR CONSTRUCTION OR BIDDING PURPOSES.



**NON-MOW STRIP DETAILS**

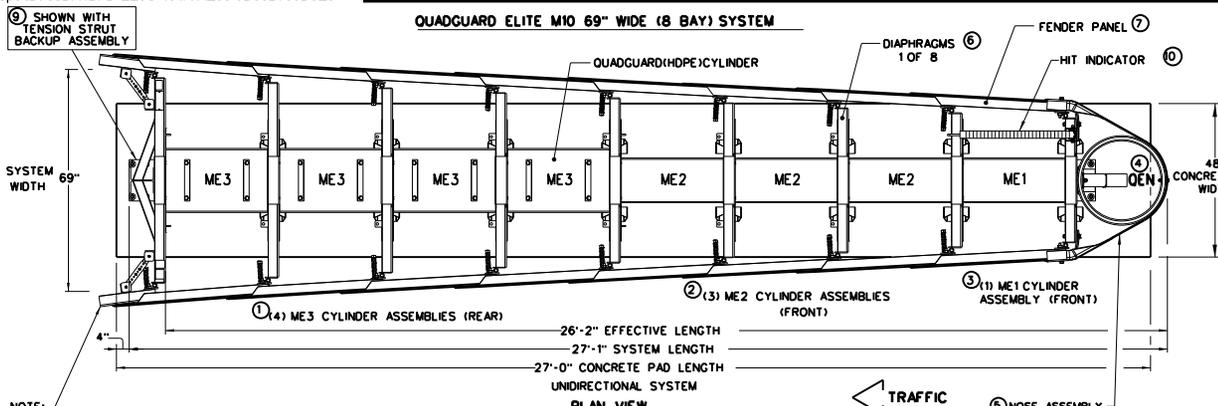
LATEST REVISION: 4/12/2023

CONT	SECT	JOB	HIGHWAY
6471	51	001	US 287, ETC
DIST	COUNTY	SHEET NO.	
LFK	HOUSTON	42	

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

DATE: 7/12/2024  
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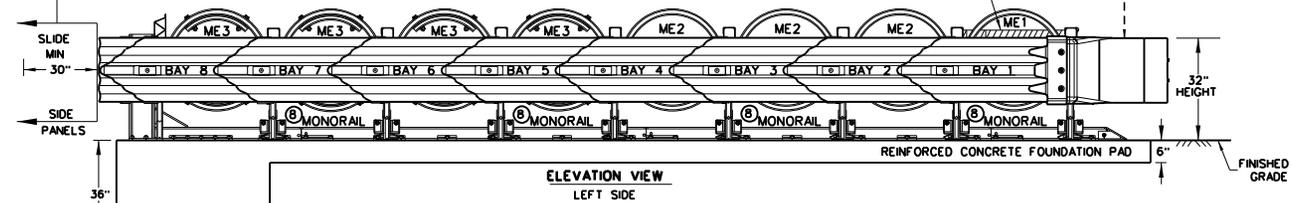


NOTE:  
A TRANSITION MAY BE REQUIRED TO INSTALL THE QUADGUARD ELITE M10 TO THE OBJECT BEING SHIELDED.

KEY	KEY
① ME3 CYLINDER ASSEMBLIES	⑥ DIAPHRAGMS
② ME2 CYLINDER ASSEMBLIES	⑦ FENDER PANELS
③ ME1 CYLINDER ASSEMBLY	⑧ MONORAILS
④ OEN CYLINDER	⑨ TYPE OF BACKUP
⑤ NOSE BELT ASSEMBLY	⑩ HIT INDICATOR

NOTE:  
HIT INDICATOR WILL RAISE UPON IMPACT.

NOTE:  
PROVISION SHALL BE MADE FOR REAR FENDER SIDE PANELS TO SLIDE REARWARD UPON IMPACT, 30" MIN.



NOTES:  
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.

A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD ELITE WIDE M10 FIELD INSTALLATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.

6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.

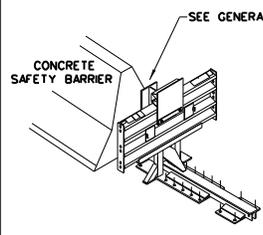
8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.

CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE:  
THE QUADGUARD ELITE M10 WIDE 8-BAY SYSTEM TESTED TO MASH TEST LEVEL 3.

TL-3 MODEL #	QM10069E	CYLINDER TYPES IN BAYS				
BAYS	8	TYPE-ME3	TYPE-ME2	TYPE-ME1	TYPE-OEN	1
DIAPHRAGMS	8	4	3	1		
WIDTH	69"	REAR	FRONT			NOSE

**BACKUP ASSEMBLY TYPES FOR SYSTEM TRANSITIONS**



⑨ TENSION STRUT BACKUP

NOTES:  
CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR THE CORRECT BACKUP ASSEMBLY AND TRANSITION PANELS OR SIDE PANELS USED FOR STANDARD AND BI-DIRECTIONAL INSTALLATIONS. AT DIVIDED-HIGHWAY MEDIANS OR UNDIVIDED ROADWAYS WHERE THE SYSTEM IS EXPOSED TO IMPACTS FROM ONE OR TWO DIFFERENT DIRECTIONS OF TRAFFIC FLOW.

SYSTEM TRANSITIONS TYPES	
1	QUAD-BEAM TO CONCRETE SAFETY BARRIER
2	QUAD-BEAM TO CONCRETE BRIDGE RAIL
3	QUAD-BEAM TO SINGLE SLOPE OFFSET
4	QUAD-BEAM TO CONCRETE END SHOE
5	QUAD-BEAM TO THREE-BEAM RAIL
6	QUAD-BEAM TO W-BEAM RAIL

NOTE:  
TRANSITION ASSEMBLIES FOR THE QUADGUARD ELITE M10 TO THREE-BEAM OR W-BEAM FENCE REQUIRES I-BEAM POSTS:  
ALL POSTS W6X8.5/9 I-BEAMS (78" LONG).

**GENERAL NOTES**

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT 18881323-6374.
- SEE THE RECENT QUADGUARD ELITE M10 WIDE PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE WIDE 69" SYSTEM BEFORE INSTALLING THE QUADGUARD ELITE M10 AT ANY GIVEN LOCATION.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD ELITE M10 WIDE 69" IS RESTRICTED. AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD ELITE M10 WIDE 69", THE QUADGUARD ELITE M10 SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD ELITE M10 AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD ELITE M10 SYSTEM IS SHIELDING. SEE THE QUADGUARD ELITE M10 WIDE (69") PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- COMPONENTS FOR THE QUADGUARD ELITE (M10) BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD ELITE M10 WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa (4,000 PSI) (P.C.) OR 8" MIN. NON-REINFORCED 28MPa (4,000 PSI) CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- THE QUADGUARD ELITE M10 SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP, THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- THE WIDE QUADGUARD ELITE M10 SYSTEM IS ONLY AVAILABLE IN A 69" WIDTH.

FOUNDATION & ANCHORING REQUIREMENTS	
FOUNDATION TYPES: A, B, C, & D	
FOUNDATION TYPE-A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE-B	ASPHALT OVER P.C.C.
FOUNDATION:	3" MIN. (A.C.) OVER 3" MIN. (P.C.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE-C	ASPHALT OVER SUBBASE
FOUNDATION:	6" MIN. (A.C.) OVER 6" MIN. (C.S.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE-D	ASPHALT ONLY
FOUNDATION:	8" MIN. (A.C.)
ANCHORAGE:	18" THREADED ROD EMBEDDED 16 1/2" - APPROVED ADHESIVE

KEY:  
ASPHALT CONCRETE (A.C.)  
COMPACTED SUBBASE (C.S.)  
PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.

IF THE UNIT IS ANCHORED TO ASPHALTIC CONCRETE, IT SHOULD BE RELOCATED TO FRESH, UNDISTURBED ASPHALT AND RE-ANCHORED AFTER EACH IMPACT TO ENSURE ADEQUATE FUTURE PERFORMANCE.

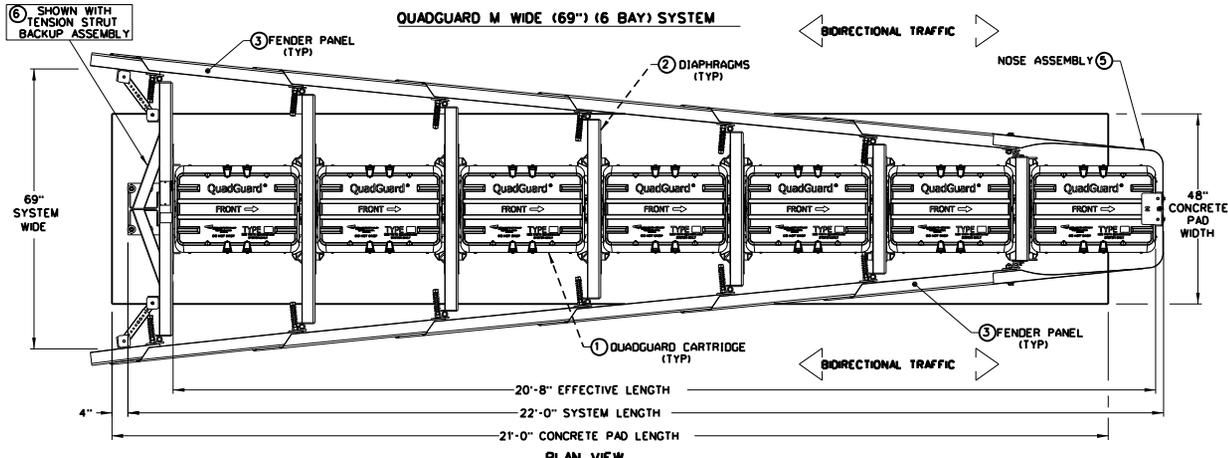
TENSION STRUT BACKUP MAY BE USED IN CONSTRUCTION ZONES ON ASPHALT CONCRETE (A.C.) FOR TEMPORARY USE ONLY.

		Design Division Standard	
<b>TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD ELITE M10 WIDE (MASH TL-3) OGELITE(M10)(W)-20</b>			
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REVISIONS		US 287, ETC	
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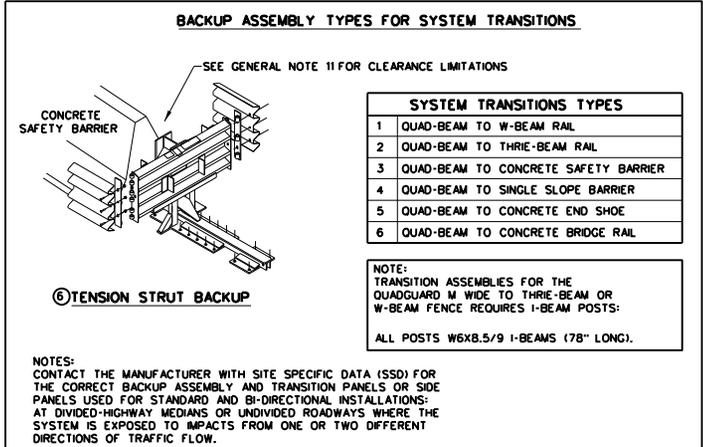
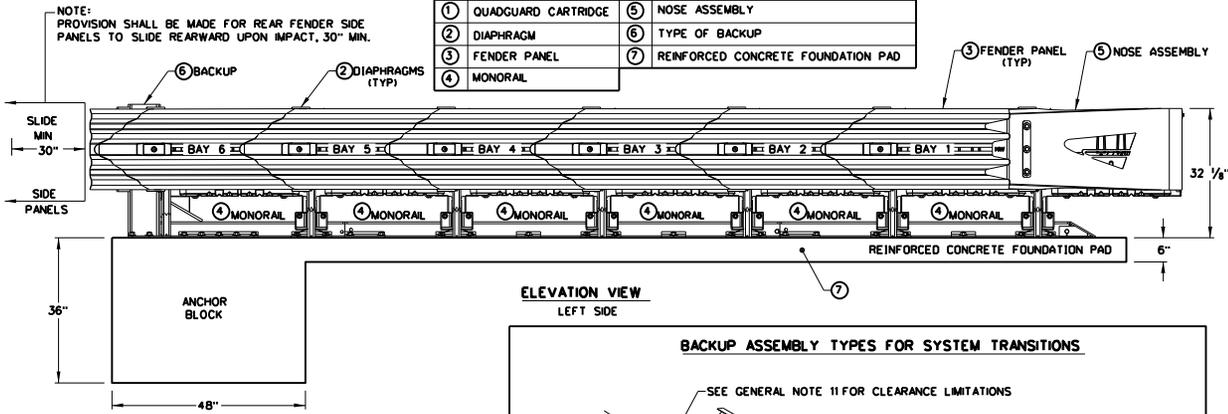
**LOW MAINTENANCE**

NOTE:  
THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD ELITE M10 WIDE SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

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.



KEY	DESCRIPTION	KEY	DESCRIPTION
1	QUADGUARD CARTRIDGE	5	NOSE ASSEMBLY
2	DIAPHRAGM	6	TYPE OF BACKUP
3	FENDER PANEL	7	REINFORCED CONCRETE FOUNDATION PAD
4	MONORAIL		



NOTES:  
 CONTACT THE MANUFACTURER WITH SITE SPECIFIC DATA (SSD) FOR CONCRETE PAD AND ANCHOR BLOCK INSTALLATION REQUIREMENTS.  
 A MANUFACTURER'S DRAWING PACKAGE UNIQUE AND SPECIFIC FOR THE QUADGUARD M WIDE FIELD INSTALLATION AND INFORMATION REGARDING THE TYPE OF BACKUP ASSEMBLY REQUIRED FOR THE TRANSITION WILL BE PROVIDED BY THE MANUFACTURER TO THE ENGINEER AND INSTALLER.  
 6" REINFORCED CONCRETE PAD REQUIRES THE INSTALLATION OF AN ANCHOR BLOCK AS SHOWN ON THE MANUFACTURER'S DRAWING PACKAGE.  
 8" NON-REINFORCED CONCRETE PAD MAY NOT REQUIRE AN ANCHOR BLOCK, IF THE PAD IS INSTALLED AGAINST AN IMMOVABLE CONCRETE BACKUP.  
 CONCRETE PAD AND ANCHOR BLOCK COMBINATIONS SHALL BE CONFIRMED WITH THE MANUFACTURER BASED UPON SITE SPECIFIC DATA (SSD).

NOTE: THE QUADGUARD M WIDE 6-BAY SYSTEM TESTED TO MASH TL-3.

TL-3 MODEL*	QM10069 (627515)	CARTRIDGE TYPES IN BAYS	
BAYS		TYPE I	TYPE II
DIAPHRAGMS	6	4	3
WIDTH	69"	REAR	FRONT

**GENERAL NOTES**

- FOR SPECIFIC INFORMATION REGARDING INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: TRINITY HIGHWAY - ENERGY ABSORPTION INC. AT (888)323-6374 OR WEBSITE www.trinityhighway.com.
- SEE THE RECENT QUADGUARD M WIDE PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS AND THE DRAWING PACKAGE FOR THE SIX (6) BAY WIDE (69") SYSTEM BEFORE INSTALLING THE QUADGUARD M WIDE AT ANY GIVEN LOCATION.
- COMPONENTS FOR THE QUADGUARD M WIDE BACKUP AND REINFORCING DETAILS ARE SHOWN ON THE QUADGUARD M WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL.
- THE INSTALLATION AREA SHOULD BE FREE OF CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
- FOR PERMANENT APPLICATIONS, QUADGUARD M WIDE SHOULD BE ASSEMBLED ON AN EXISTING OR FRESHLY PLACED AND CURED CONCRETE BASE 28MPa (4,000 PSI) MINIMUM. QUADGUARD M WIDE SYSTEM MAY ALSO BE ASSEMBLED ON REINFORCED OR NON-REINFORCED CONCRETE ROADWAY (MINIMUM 8" THICK).
- CONCRETE PAD SHALL BE 6" MIN. REINFORCED 28MPa (4,000 PSI) (P.C.) OR 8" MIN. NON-REINFORCED 28MPa (4,000 PSI) CONCRETE ROADWAY MEASURING AT LEAST 12'-0" WIDE BY 50'-0" LONG. ANCHOR BLOCK IS NOT REQUIRED WHEN USING 8" CONCRETE PAD INSTALLED AGAINST AN IMMOVABLE STRUCTURE, E.G. CONCRETE WALL.
- IF THE CROSS-SLOPE VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
- FOR BI-DIRECTIONAL TRAFFIC: THE LOCATION AND OR WIDTH OF THE QUADGUARD M WIDE IS RESTRICTED, AS BI-DIRECTIONAL TRAFFIC APPROACHES THE REAR OF THE QUADGUARD M WIDE. THE QUADGUARD M WIDE SHOULD NOT EXTEND FURTHER INTO THE TRAFFIC-SIDE OF THE BARRIER THAN THE OBSTACLE. ANY TRANSITION INSTALLED MUST EITHER BE TANGENT TO BOTH QUADGUARD M WIDE AND OBSTACLE OR MUST ANGLE TOWARD FIELD SIDE OF THE BARRIER.
- SYSTEM TRANSITION: APPROPRIATE TRANSITION PANELS OR SIDE PANELS WILL BE REQUIRED FOR PROPER IMPACT PERFORMANCE. THE CORRECT PANEL(S) TO USE WILL DEPEND ON THE DIRECTION OF TRAFFIC FLOW AND WHAT TYPE OF BARRIER OR ROAD FEATURE THE QUADGUARD M WIDE SYSTEM IS SHELDED. SEE THE QUADGUARD M WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- THE QUADGUARD M WIDE SYSTEM SHOULD BE INSTALLED APPROXIMATELY PARALLEL WITH THE BARRIER.
- FOR THE TENSION STRUT BACKUP, THE DISTANCE BETWEEN THE BACK OF BACKUP AND THE BARRIER WALL SHOULD NOT EXCEED 7" IN ANY CASE.
- THE WIDE QUADGUARD M WIDE SYSTEM IS ONLY AVAILABLE IN A 69" WIDTH AND HAS A 6-BAY SYSTEM THAT HAS BEEN TESTED TO MASH TEST LEVEL 3.
- IF THE OUTSIDE WIDTH OF OBSTACLE(S) BEING SHELDED IS 53" OR GREATER, THE OUTSIDE OF OBSTACLE(S) MUST BE CHAMFERED. SEE THE QUADGUARD M WIDE PRODUCT DESCRIPTION & ASSEMBLY MANUAL FOR FURTHER DETAILS.
- SEE THE "QUADGUARD M WIDE SYSTEM PRODUCT MANUAL" FOR A DESCRIPTION OF ITS IMPACT PERFORMANCE CHARACTERISTICS AND DESIGN LIMITATIONS BEFORE PLACING A SYSTEM AT A GIVEN SITE. INFORMATION AND COPIES OF ABOVE MANUAL ARE AVAILABLE BY CALLING CUSTOMER SERVICE DEPARTMENT AT (888) 323-6374.

FOUNDATION & ANCHORING REQUIREMENTS	
FOUNDATION TYPES: A & B	
FOUNDATION TYPE-A	REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	6" MINIMUM DEPTH WITH ANCHOR BLOCK (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
FOUNDATION TYPE-B	REINFORCED OR NON-REINFORCED CONCRETE PAD OR ROADWAY
FOUNDATION:	8" MINIMUM DEPTH (P.C.C.)
ANCHORAGE:	7" STUDS EMBEDDED 5 1/2" - APPROVED ADHESIVE
KEY:	COMPACTED SUBBASE (C.S.)
	PORTLAND CEMENT CONCRETE (P.C.C.)

NOTE: SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR THE APPROVED ADHESIVE.  
 TENSION STRUT BACKUP MAY NOT BE USED IN ASPHALT CONCRETE (A.C.). SEE TRINITY'S PRODUCT DESCRIPTION ASSEMBLY MANUAL FOR MORE INFORMATION.

		Design Division Standard	
<b>TRINITY HIGHWAY ENERGY ABSORPTION QUADGUARD M WIDE (MASH TL-3) OG(M)(W)-21</b>			
FILE:	qgrm21.dgn	DN: TxDOT	CR: KM
DESIGNER:	JULY 2021	CONT: 6471	SECT: 51
REVISIONS:		JOB: 001	COUNTY: HOUSTON
		US: 287	SHEET NO.: 44

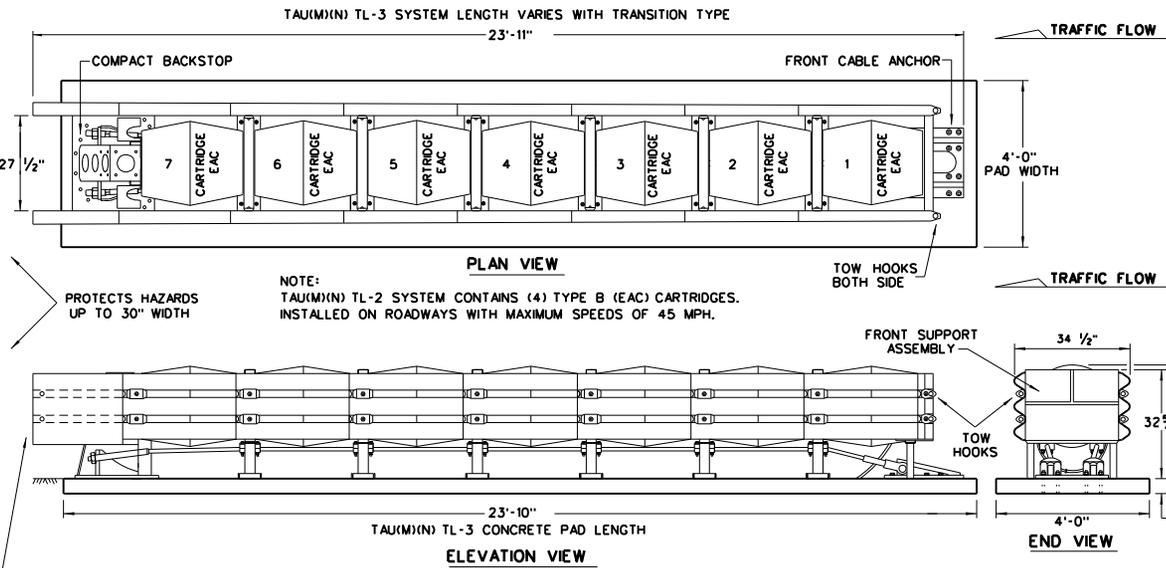
**REUSABLE**

NOTE: THIS STANDARD IS A BASIC REPRESENTATION OF THE QUADGUARD OG M WIDE SYSTEM AND IS NOT INTENDED TO REPLACE THE PRODUCT DESCRIPTION ASSEMBLY MANUAL.

DATE: 7/12/2024  
 FILE: #FILE#

DISCLAIMER: THIS STANDARD IS COVERED 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: 7/12/2024  
 FILE: TAU(M)(N)Mash Contracts V.P25 Plans (6/7/15-19) Houston MBGF.RMC 6471-51-001 Houston MBGF.UGN.STD.TAU(M)(N)-19.dgn



**GENERAL NOTES**

1. FOR SPECIFIC INFORMATION REGARDING THE INSTALLATION AND TECHNICAL GUIDANCE OF THE SYSTEM, CONTACT: LINDSAY TRANSPORTATION SOLUTIONS (LTS) - BARRIER SYSTEMS, INC. AT (707) 374-6800, 180 RIVER ROAD, RIO VISTA, CA 94571
2. REFER TO THE LATEST (LTS) INSTALLATION INSTRUCTION MANUAL FOR IMPORTANT SAFETY MESSAGES, COMPLETE SYSTEM ASSEMBLY, AND ANCHOR INSTALLATION REQUIREMENTS FOR THE NINE (9) DIFFERENT SITE TRANSITIONS.
3. INSTALLATION DETAILS FOR THE COMPACT BACKSTOP, FRONT CABLE ANCHOR AND FOUNDATION OPTIONS ARE SHOWN ON THE INSTALLATION INSTRUCTION MANUAL FURNISHED TO THE ENGINEER.
4. CONCRETE SHALL BE CLASS "S" WITH A MINIMUM COMPRESSIVE STRENGTH OF 4,000 P.S.I.
5. IF THE CROSS-SLOPES VARIES MORE THAN 2% OVER THE LENGTH OF THE SYSTEM, THE CONCRETE PAD WILL REQUIRE LEVELING. MAXIMUM PERMISSIBLE CROSS-SLOPE IS 8%.
6. THE INSTALLATION AREA SHOULD BE FREE FROM CURBS, ELEVATED OBJECTS, OR DEPRESSIONS.
7. THE TAU(M)(N) SYSTEM SHOULD BE APPROXIMATELY PARALLEL WITH THE BARRIER OR CENTER LINE OF MERGING BARRIERS.
8. THIS DRAWING REPRESENTS THE UNIVERSAL TAU(M)(N) TL-3 SYSTEM, A RE-DIRECTIVE NON-GATING CRASH CUSHION THAT CAN PROTECT HAZARDS UP TO 30-INCHES IN WIDTH. ALSO AVAILABLE IN TL-2 CONFIGURATION.

NOTES:  
 TRANSITIONS AND ATTACHMENTS TO VARIOUS BARRIER SHAPES, RAILINGS AND BI-DIRECTIONAL TRAFFIC FLOWS ARE AVAILABLE. SEE MANUFACTURER'S INSTALLATION INSTRUCTIONS MANUAL FOR ADDITIONAL TRANSITION DETAILS.

NOTE:  
 CONCRETE FOUNDATION PAD LENGTH VARIES WITH TL-3 AND TL-2 SYSTEMS, SEE SYSTEM & FOUNDATION LENGTH TABLE.

BILL OF MATERIALS FOR TAU(M)(N) TL-3 & TL-2 SYSTEMS		QUANTITIES	
PART NUMBER	PART DESCRIPTION	TL-3 SYSTEM	TL-2 SYSTEM
BSI-1708019-00	SLIDING PANEL GALVANIZED TAU(M)(N)	14	8
BSI-1708030-00	END PANEL, THRIE BEAM, GALV, TAU(M)(N)	2	2
BSI-1706001-00	CABLE ASSEMBLY, 7 BAY, TAU(M)(N)	2	-
BSI-1805036-00	CABLE ASSEMBLY, 4 BAY, TAU(M)(N)	-	2
BSI-1708018-00	FRONT CABLE ANCHOR	1	1
BSI-1707034-00	COMPACT BACKSTOP	1	1
B030703	MIDDLE SUPPORT ASSEMBLY	6	3
B030704	FRONT SUPPORT	1	1
B010722	ENERGY ABSORBING CARTRIDGE, TYPE B	7	4
K001005	TAU-II FRONT SUPPORT LEG KIT	1	1
BSI-1709083-KT	TETHER KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1809041-KT	SLIDER KIT (INCLUDES ALL HARDWARE)	7	4
BSI-1808033-KT	CABLE GUIDE KIT (INCLUDES ALL HARDWARE)	6	3
BSI-1809040-KT	TOW HOOK KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808034-KT	DELINEATION BRACKET KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808035-KT	END PANEL MOUNT KIT (INCLUDES ALL HARDWARE)	1	1
BSI-1808036-KT	CONCRETE ANCHORING KIT	1	1
SEE NOTE	HIGH REFLECTIVE DECAL	1	1
ECN 3883	INSTALLATION AND INSTRUCTIONS MANUAL	1	1

FOUNDATION OPTIONS
6" REINFORCED CONCRETE
8" UNREINFORCED CONCRETE
ASPHALT OVER CONCRETE WITH MINIMUM 6" EMBEDMENT IN CONCRETE
6" ASPHALT OVER 6" COMPACT SUBBASE
8" MINIMUM ASPHALT

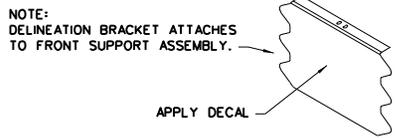
SYSTEM & FOUNDATION LENGTH TABLE	
SYSTEM LENGTH	FOUNDATION LENGTH
TL-2 • 15'-5"	TL-2 • 15'-4"
TL-3 • 23'-11"	TL-3 • 23'-10"

x NOTE:  
 REQUIRES AN ASPHALT ANCHORAGE PACKAGE: INCLUDES ADDITIONAL BRACES FOR THE FRONT CABLE ANCHOR AND THE COMPACT BACKSTOP, AND ASPHALT HARDWARE KIT. THE TL-3 ASPHALT CONFIGURATION ALSO REQUIRES NESTED SLIDER PANELS AND SHIMS AT THE LAST TWO BAYS. SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR DETAILS.

NOTE:  
 SEE MANUFACTURER'S INSTALLATION INSTRUCTION MANUAL FOR FOUNDATION SPECIFICATIONS THAT INCLUDE, STONE AGGREGATE MIX, COMPRESSION STRENGTH, STEEL SIZE, ANCHOR SIZE, AND EMBEDMENT DEPTH.

x x NOTE:  
 ENGINEER OR CONTRACTOR SHALL COORDINATE WITH THE MANUFACTURER FOR THE CORRECT DECAL PER TRAFFIC FLOW, LEFT, RIGHT OR BOTH-SIDES.

TRANSITION OPTIONS	
USE THE COMPACT BACKSTOP	VERTICAL WALL
	CONCRETE TRAFFIC BARRIERS
	W-BEAM GUARDRAIL
	THRIE BEAM GUARDRAIL



NOTE:  
 APPLY A HIGH REFLECTIVE DECAL TO THE DELINEATION BRACKET. DELINEATION DECAL ORIENTATION IS SHOWN ON THE CONSTRUCTION PLAN SET AND SHALL BE IN ACCORDANCE WITH THE TEXAS MUTCD FOR (TRAFFIC CONTROL DEVICES). DECALS ARE AVAILABLE FOR TRAFFIC FLOW ON THE LEFT-SIDE, BOTH -SIDES AND RIGHT-SIDE.

NOTES:  
 UPGRADE KITS ARE AVAILABLE TO RETROFIT EXISTING NCHRP 350 TAU-II SYSTEMS TO MASH COMPLIANT SYSTEMS. SEE MANUFACTURER'S PRODUCT INFORMATION.

THE TAU(M)(N) UNIDIRECTIONAL SYSTEM IS FREE STANDING AND IS NOT REQUIRED TO BE CONNECTED TO THE HAZARD.

TRANSITIONS TO GUARD FENCE, BRIDGE RAILS AND ROADSIDE BARRIERS SHALL BE IN ACCORDANCE WITH TxDOT'S POLICY.

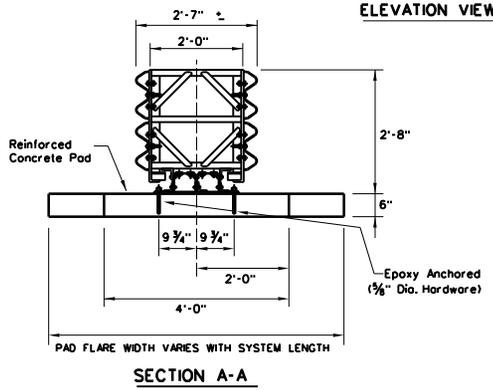
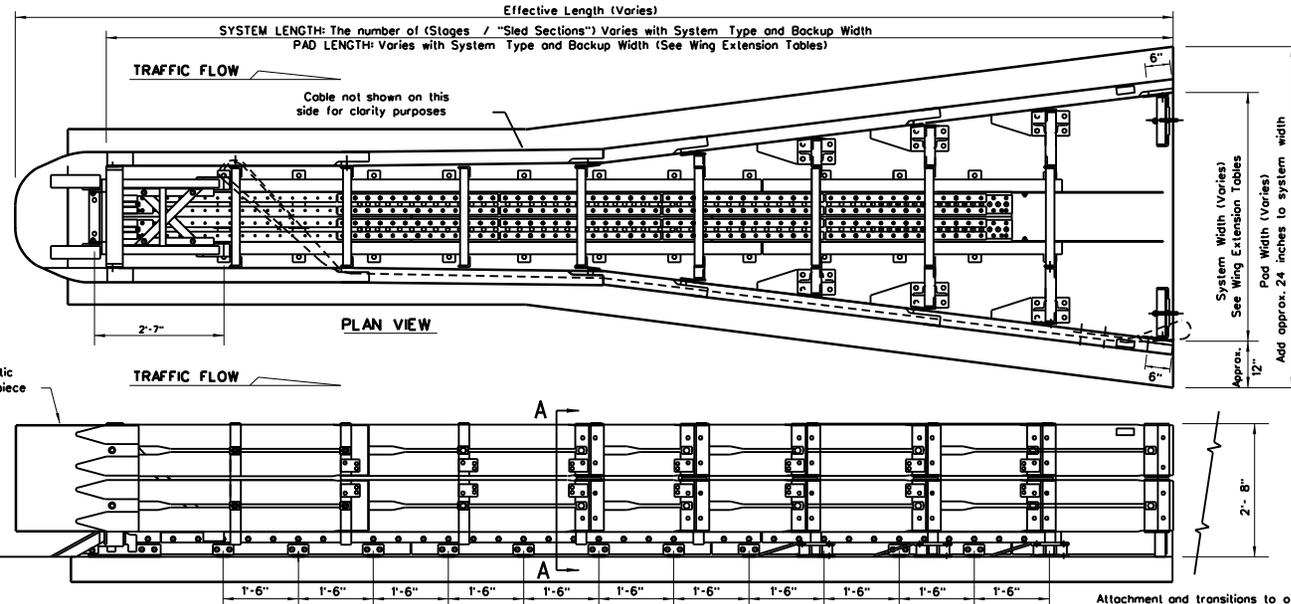
NOTE:  
 THIS STANDARD IS A BASIC REPRESENTATION OF THE UNIVERSAL TAU(M)(N) SYSTEM, IT IS NOT INTENDED TO REPLACE THE INSTALLATION INSTRUCTION MANUAL.

NOTE:  
 FOR BI-DIRECTIONAL TRANSITION PANELS AND BRIDGE RAIL END SHOE DETAILS. SEE MANUFACTURER'S INSTALLATION INSTRUCTIONS MANUAL.

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		Design Division Standard	
<b>LINDSAY TRANSPORTATION SOLUTIONS</b> <b>UNIVERSAL CRASH CUSHION</b> <b>(MASH TL-3 &amp; TL-2)</b> <b>TAU(M)(N)-19</b>			
FILE: tau19.dgn	DN: TxDOT	CK: KM	DN: VP
© TxDOT: APRIL 2019	CONT SECT	JOB	HIGHWAY
REVISIONS	6471 51	001	US 287, ETC
DIST	COUNTY	SHEET NO.	
LFK	HOUSTON	45	

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 DATE: 7/12/2024  
 FILE: T:\FPO\DDM\Main\Contracts\FY25 Plans\6471-51-001 Houston MBGF.VMC 6471-51-001 Houston MBGF.VMC\STD-11-TRACCS16.dgn



TYPE (WIDE)	TEST LEVEL
FASTRACC (4 Stage System)	70
TRACC (3 Stage System)	TL-3
SHORTTRACC (2 Stage System)	TL-2

NOTE: The Stage System refers to number of replaceable "sled sections" that could be replaced independently.

NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-FASTRACC EXTENSION PART NUMBER (LEFT* / RIGHT*)
0 (BASE UNIT)	71"	25'-11"	27'-11"	33940
1	78"	28'-3"	30'-3"	33941 / 33942
2	85"	30'-7"	32'-7"	33943 / 33944
3	92"	32'-11"	34'-11"	33945 / 33946
4	99"	35'-2"	37'-2"	33947 / 33948
5	106"	37'-6"	39'-6"	33949 / 33950
6	113"	39'-10"	41'-10"	33951 / 33952
7	120"	42'-2"	44'-2"	33953 / 33954
8	127"	44'-5"	46'-5"	33955 / 33956
9	134"	46'-9"	48'-9"	33957 / 33958
10	141"	49'-1"	51'-1"	CONSULT TRINITY SALES PERSON

NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-TRACC EXTENSION PART NUMBER (LEFT* / RIGHT*)
0 (BASE UNIT)	58"	21'	23'	33940
1	65"	23'-4"	25'-4"	33941 / 33942
2	72"	25'-8"	27'-8"	33943 / 33944
3	79"	28'-2"	30'-2"	33945 / 33946
4	86"	30'-4"	32'-4"	33947 / 33948
5	92"	32'-8"	34'-8"	33949 / 33950
6	99"	35'	37'	33951 / 33952
7	106"	37'-4"	39'-4"	33953 / 33954
8	113"	39'-8"	41'-8"	33955 / 33956
9	120"	42'	44'	33957 / 33958
10	127"	44'-4"	46'-4"	CONSULT TRINITY SALES PERSON

NUMBER OF WING EXTENSIONS	WIDTH	SYSTEM LENGTH	EFFECTIVE LENGTH	Wide-SHORTTRACC EXTENSION PART NUMBER (LEFT* / RIGHT*)
0 (BASE UNIT)	39"	15'	17'	33940
1	46"	17'-4"	19'-4"	33941 / 33942
2	53"	18'-9"	20'-9"	33943 / 33944
3	60"	21'-1"	23'-1"	33945 / 33946
4	66"	23'-5"	25'-5"	33947 / 33948
5	73"	25'-9"	27'-9"	33949 / 33950
6	80"	28'-1"	30'-1"	33951 / 33952
7	87"	30'-4"	32'-4"	33953 / 33954
8	94"	32'-7"	34'-7"	33955 / 33956
9	101"	34'-11"	36'-11"	33957 / 33958
10	108"	37'-3"	39'-3"	CONSULT TRINITY SALES PERSON

Attachment and transitions to other shapes, barriers railings and bi-directional traffic flows are available. (See manufacturer's product manual).

SQUARE CONCRETE BACKUP
CONCRETE BARRIER (CTB) BACKUP
SINGLE SLOPE CONCRETE BARRIER(SSCB)
GUARDRAIL BACKUP (BASE-PLATED POST)
GUARDRAIL BACKUP (DRIVEN POST)

FOR BI-DIRECTIONAL TRANSITION PANEL DETAILS (SEE MANUFACTURER'S PRODUCT MANUAL).  
 BACKUP AND TRANSITION TYPES ARE SHOWN ELSEWHERE ON THE PLANS, (I.E. ATTENUATOR LOCATION DETAILS OR IN THE GENERAL NOTES).

6" REINFORCED CONCRETE
8" UNREINFORCED CONCRETE
3" MIN. ASPHALT OVER 3" MIN. CONCRETE
6" ASPHALT OVER 6" COMPACT SUBBASE
8" MINIMUM ASPHALT

FOR STEEL PLACEMENT IN CONCRETE FOUNDATIONS, (SEE MANUFACTURER'S PRODUCT MANUAL).

**GENERAL NOTES**

- For specific information regarding installation and technical guidance of the system, contact: Trinity Highway at (888)323-6374, 2525 N. Stemmons Freeway - Dallas, TX 75207
- Contact the company for Custom widths from 31" up to 57" wide, and transition panels for bi-directional traffic applications.
- Details of components for the WideTRACC, Backups and re-inforcing details will be shown on the manufacturer's shop drawings furnished to the Engineer.
- Concrete shall be class "S" with a min. compressive strength 4,000 p.s.i.
- If the cross-slope varies more than 2% over the length of the system, the concrete pad will require leveling. Maximum permissible cross-slope 8%.
- The installation area should be free from curbs, elevated objects, or depressions.
- The WideTRACC should be approximately parallel with the barrier or C of merging barriers.
- The Unit shown is flored on both sides, but can be flored on a single side either left or right. The flores will effect the length and width of the system. (See Wing Extension Tables)

PART #	FAST TRACC QTY	TRACC QTY	SHORT TRACC QTY	DESCRIPTION
25937A	1			WIDEFASTRACC UNIT ASSEMBLY
25939A		1		WIDETRACC UNIT ASSEMBLY
25997A			1	WIDESHORTTRACC UNIT ASSEMBLY
3310G	4	4	4	5/8" LOCKWASHER
4372G	4	4	4	3/4" FLATWASHER
4451G	4	4	4	3/8" DIA X 6" EXP. WEDGE ANCHOR
6531B	1	1	1	PLASTIC NOSEPIECE
6668B	4	4	4	REFLECTIVE SHEETING

PART #	QTY	DESCRIPTION
5204B	72	50 18 3/8" DIA X 7-1/8" THD ANCHOR STUD
4372G	72	50 18 3/4" FLATWASHER
3310G	72	50 18 5/8" LOCKWASHER
3361G	72	50 18 3/8" HEX NUT
5206B	6	4 2 Adhesive, HiHiHit HY-150

PART #	QTY	DESCRIPTION
6380G	72	50 18 3/4" Dia x 18" Thd Anchor Stud
4372G	72	50 18 3/4" Flatwasher
3310G	72	50 18 5/8" Lockwasher
3361G	72	50 18 3/8" Hex Nut
5206B	15	11 4 ADHESIVE, HILTIHIT HY-150

PART #	QTY	DESCRIPTION
5207B	A/R	A/R A/R NOZZLE, MIXER, HILTIHIT HY-150
5208B	A/R	A/R A/R EXT. TUBE, MIXER, HILTIHIT HY-150
5205B	A/R	A/R A/R DISPENSER GUN, HILTIHIT HY-150
5209B	A/R	A/R A/R DRILL BIT, 1/2", HILTI SDS

Design Division Standard

**TRINITY HIGHWAY**

**CRASH CUSHION**

**(WIDE UNIT)**

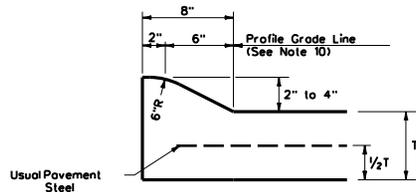
**TRACC(W)-16**

FILE: traccw16.dgn	DN: TxDOT	CR: KM	DN: VP	CR: VP
© TxDOT February 2006	CONT	SECT	JOB	HIGHWAY
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REVISED 06, 2016 (VP)	DIST	COUNTY		SHEET NO.
REVISED 03, 2016 (VP)	LFK	HOUSTON		46

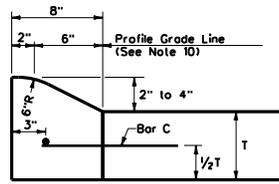
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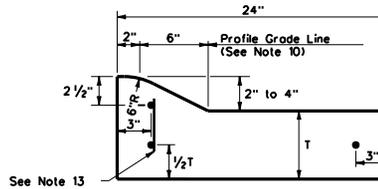
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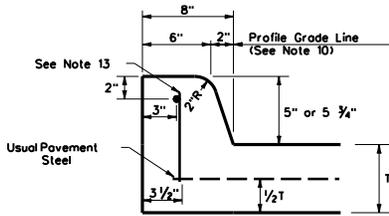
**TYPE I CURB (MONOLITHIC)**  
2'' - 4'' HEIGHT



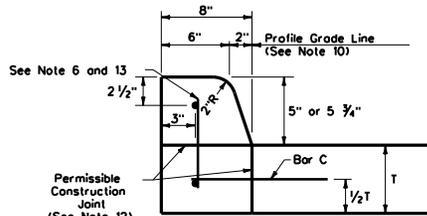
**TYPE I CURB**  
2'' - 4'' HEIGHT



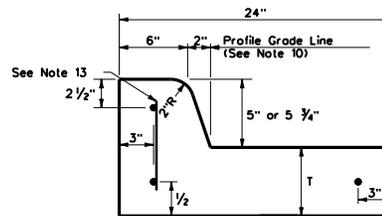
**TYPE I CURB AND GUTTER**  
2'' - 4'' HEIGHT



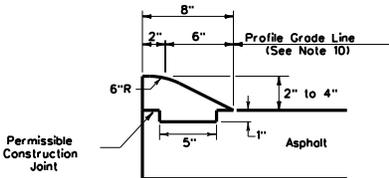
**TYPE II CURB (MONOLITHIC)**  
5'' - 5 3/4'' HEIGHT



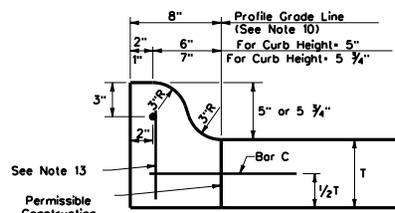
**TYPE II CURB**  
5'' - 5 3/4'' HEIGHT



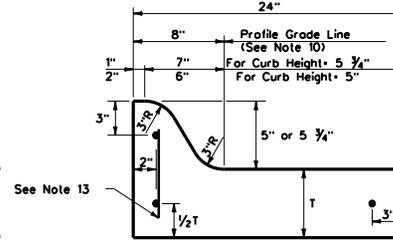
**TYPE II CURB AND GUTTER**  
5'' - 5 3/4'' HEIGHT



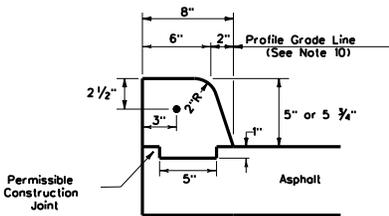
**TYPE III CURB (KEYED)**  
2'' - 4'' HEIGHT



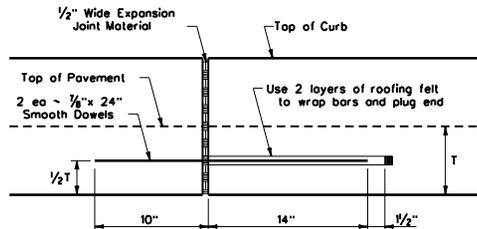
**TYPE IIIa CURB**  
5'' - 5 3/4'' HEIGHT



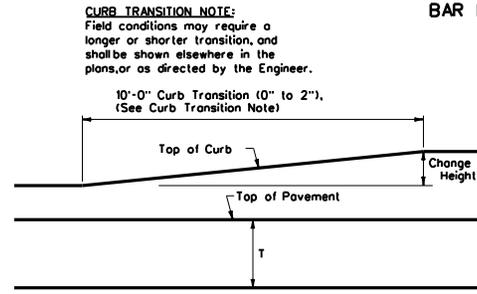
**TYPE IIIa CURB AND GUTTER**  
5'' - 5 3/4'' HEIGHT



**TYPE IV CURB (KEYED)**  
5'' - 5 3/4'' HEIGHT



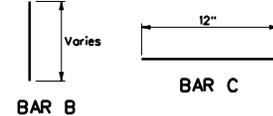
**EXPANSION JOINT DETAIL**



**CURB TRANSITION**  
Note: To be paid for as Highest Curb

**GENERAL NOTES**

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of fiber reinforced concrete in lieu of reinforcing steel is acceptable. Use fibers meeting the requirements of DMS 4550, "Fibers for Concrete," and dose fibers in accordance with Material Producers List (MPL) "Fibers for Class A and B Concrete Applications."
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is to be placed on existing concrete pavement, Bar B may be drilled and grouted in place, or may be inserted into fresh concrete.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When horizontal permissible construction joints are used, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans. Reinforcing steel for curb section shall then conform to that required for concrete curb.
- Bar B placement as needed (typically at four ft. C-C) to support curb reinforcing steel during concrete placement.



		Design Division Standard	
<b>CONCRETE CURB AND GUTTER</b>			
<b>CCCC-22</b>			
FILE: cccg21.dgn	DN: TxDOT	CR: AN	DR: CS
© TxDOT: JUNE 2022	CONT SECT	JOB	HIGHWAY
REVISIONS	6471 51	001	US 287, ETC
DIST	COUNTY	SHEET NO.	
LFK	HOUSTON	47	

DSC# 4469: 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 units.   
 DATE: 7/12/2024 10:44:27 AM   
 FILE: T:\LFD004\Material Contracts\B\_RMC - Routine Maintenance Contracts\725 Plans\B\_RMC\Sign\Sign Standards\GUARD FENCE.dgn

**REFLECTOR UNIT SIZES FOR DELINEATORS AND OBJECT MARKERS**

**DELINEATORS**

**D & OM DESCRIPTIVE CODES**

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

**INSTL DEL ASSM (D-XX)SZ X (XXX)XXX(XX)**  
 NUMBER OF REFLECTORS  
 S - Single  
 D - Double  
 COLOR OF REFLECTORS  
 W - White  
 Y - Yellow  
 R - Red  
 REFLECTOR UNIT SIZE  
 1 or 2  
 TYPE OF POST OR DELINEATOR  
 WC - Wing Channel Post  
 YFLX - Yellow Flexible Post  
 WFLX - White Flexible Post  
 BR - Barrier Reflector  
 TYPE OF MOUNT  
 GND - Embedded (drivable or set in concrete)  
 CTB - Concrete Barrier Mount  
 GF1 or GF2 - Guard Fence Attachment  
 SRF - Surface Mount  
 DIRECTION  
 If Required  
 Bi - Bi-Directional  
 BR - Bi-Directional with red on back

**OBJECT MARKERS**

DEVICE	Type 1 (OM-1)	Type 2 (OM-2)			Type 3 (OM-3)			Type 4 (OM-4)
	OM-1	OM-2X	OM-2Y	OM-2Z	OM-3L	OM-3R	OM-3C	OM-4
SHEETING	Yellow-Type B or C Sheeting	Yellow - Type B or C Sheeting			Alternating acrylic black and retroreflective yellow - Type B or C Sheeting			Red -Type B or C Sheeting
POST TYPE	TWT	WC	WC	WFLX	TWT			TWT
MOUNT TYPE	WAS, WAP	GND	GND	GND, SRF	WAS, WAP			WAS, WAP

**INSTL OM ASSM (OM-XX) (XXX)XXX(XX)**  
 TYPE OF OBJECT MARKER  
 1, 2, 3, or 4  
 NUMBER OF REFLECTORS OR DIRECTION  
 X - 3-Size 2 reflector units (Type 2 only)  
 Y - 1-Size 3 reflector unit (Type 2 only)  
 Z - 3-Size 1 or 1-Size 4 reflector units (Type 2 only)  
 L - Left Side (Type 3 Object Marker only)  
 R - Right Side (Type 3 Object Marker only)  
 C - Center (Type 3 Object Marker only)  
 TYPE OF POST  
 WC - Wing Channel Post  
 WFLX - White Flexible Post  
 TWT - Thin Walled Tubing  
 TYPE OF MOUNT  
 GND - Embedded (drivable)  
 SRF - Surface Mount  
 WAS - Wedge Anchor Steel  
 WAP - Wedge Anchor Plastic  
 DIRECTION  
 If Required  
 Bi - Bi-Directional

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

**BARRIER REFLECTORS (BRF)**

**CHEVRONS**

**ONE DIRECTION LARGE ARROW**

DEVICE	GF1	GF2	CTB	DEVICE	W1-8		DEVICE	W1-6			
SHEETING	Yellow, White, Red			SIZE (W x L)	18" x 24" (Conventional)	24" x 30" (Conventional Oversize)	30" x 36" (Expressway)	36" x 48" (Freeway)	SIZE (W x L)	48" x 24" (Conventional)	60" x 30" (Expressway & Freeway)
NOTE	1. Barrier reflectors shall meet the requirements of DMS 8600. 2. Approved Barrier Reflectors are listed on the "Barrier Reflectors" Material Producer List at: www.txdot.gov.			MOUNTING HEIGHT	4'-0" or 7'-0"		7'-0" Only	MOUNTING HEIGHT	7'-0"		

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



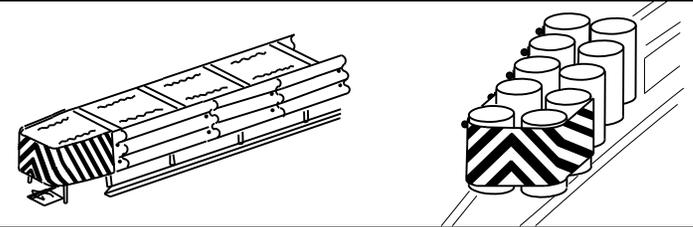
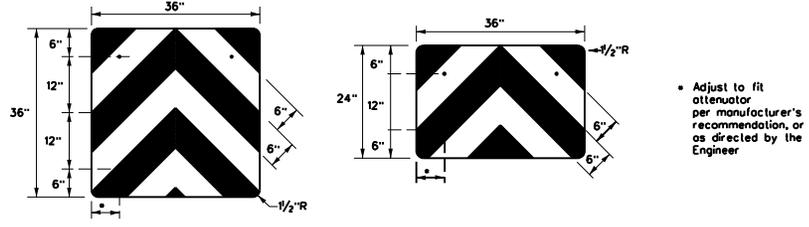
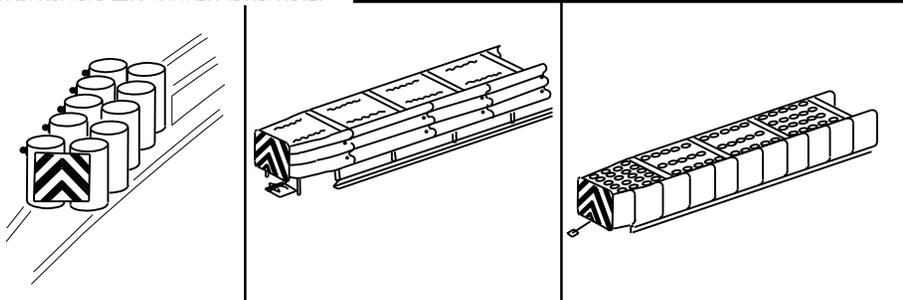
**DELINEATOR & OBJECT MARKER MATERIAL DESCRIPTION D & OM(1)-20**

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© TXDOT August 2004	CONT SECT	JOB	HIGHWAY	
REVISIONS	6471	51	001	US 287, ETC
10-09 3-15	DIST	COUNTY	SHEET NO.	
4-10 7-20	LFK	HOUSTON	48	

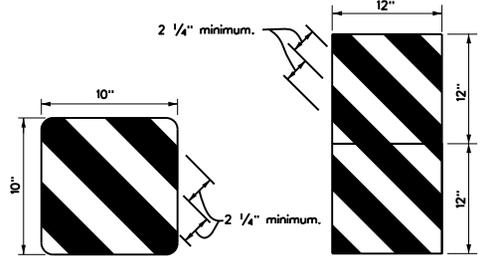
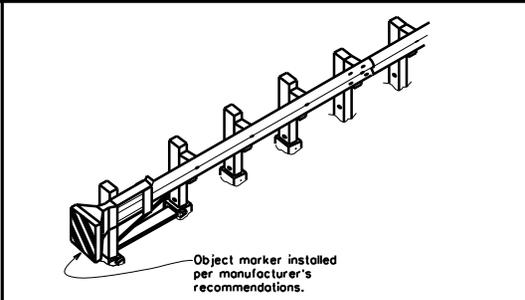
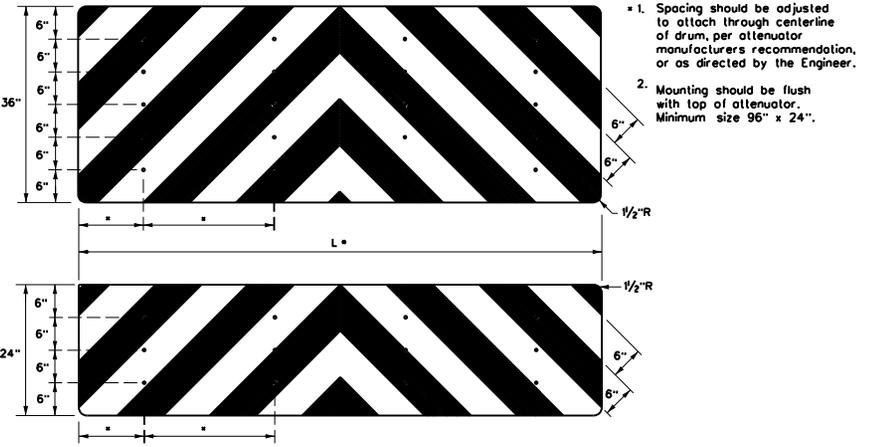


DSC: MAFS: The use of this standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any purpose whatsoever. TxDOT assumes no responsibility for the conversion of units.

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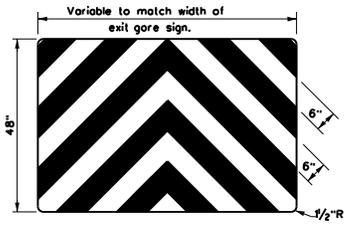
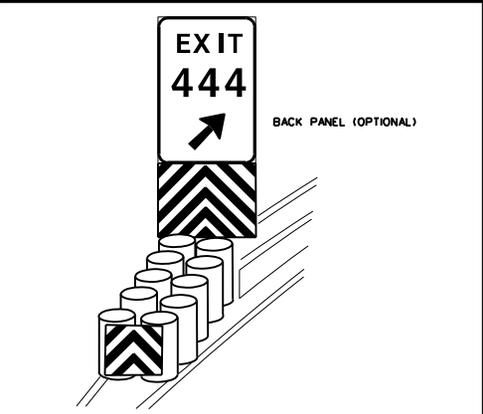
**NOTES**



**OBJECT MARKERS SMALLER THAN 3 FT<sup>2</sup>**

**NOTES**

- 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.
- 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.
- Object Marker size may be reduced to fit smaller devices. Width of alternating black and yellow stripes are typically 6". Object Markers smaller than 3ft may have reduced width stripes of a minimum of 2 1/4".
- 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.
- Object Marker at nose of attenuator is subsidiary to the attenuator.
- See D & OM (1-4) for required barrier reflectors.

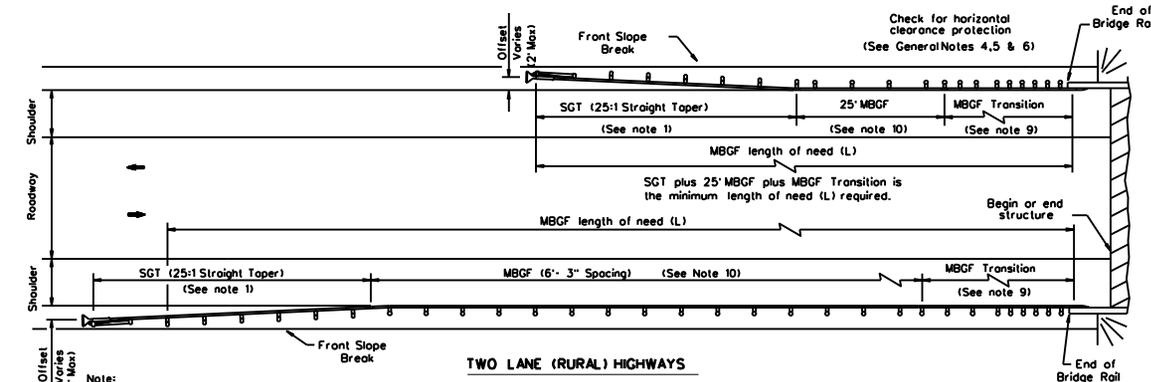


		Traffic Safety Division Standard	
<b>DELINEATOR &amp; OBJECT MARKER FOR VEHICLE IMPACT ATTENUATORS</b> <b>D &amp; OM(VIA)-20</b>			
FILE: domvia20.dgn	DN: TXDOT	CR: TXDOT	OK: TXDOT
© TXDOT December 1989	CONT SECT	JOB	HIGHWAY
REVISIONS	6471 51	001	US 287, ETC
4-92 8-04	DIST	COUNTY	SHEET NO.
8-95 3-15	LFK	HOUSTON	50
4-98 7-20			
206			

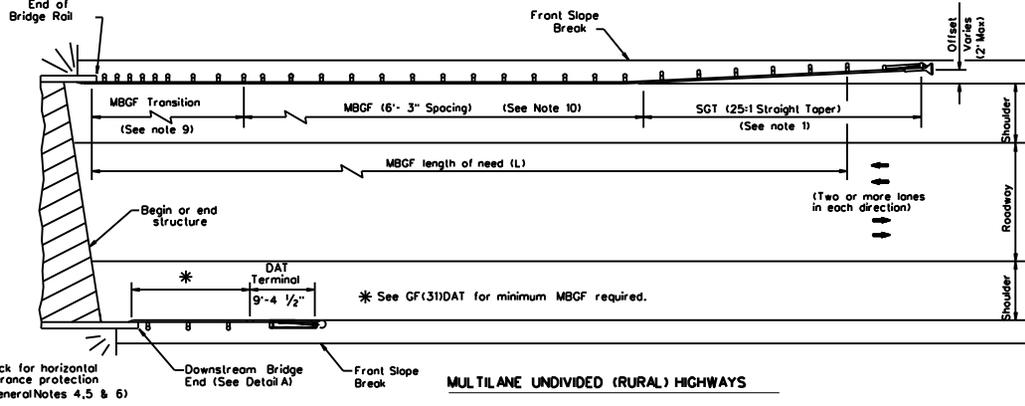


DISCLAIMER: This standard is governed by the "Texas Engineering Practice Act". No warranty of any kind is made by TxDOT for any persons whatsoever. TxDOT assumes no responsibility for the conversion of this standard to other formats or for incorrect results or damages resulting from its use.

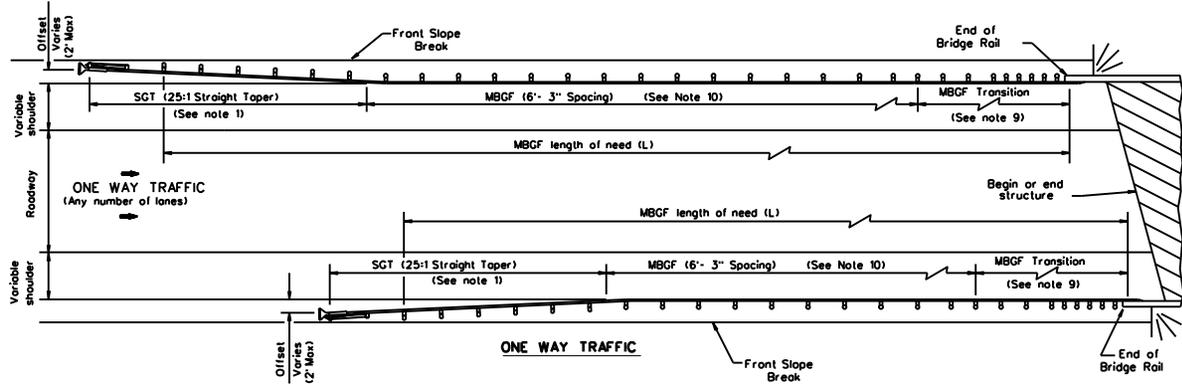
DATE: 7/12/2024 10:52:01 AM  
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Note: SGT rail taper may be decreased or eliminated. (See SGT standard sheets)

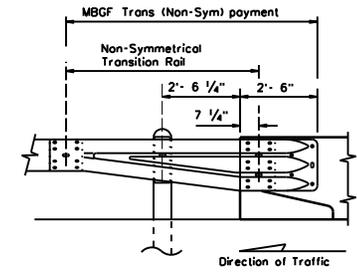
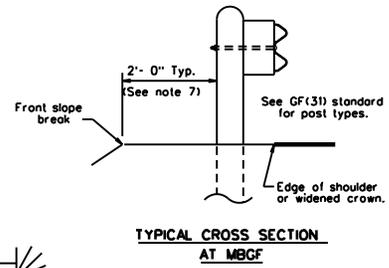


\* See GF(31)DAT for minimum MBGF required.



**GENERAL NOTES**

- For more detail: See GF(31), SGT(131), GF(31)TR, and GF(31)TL2 standard sheets.
- Quantities of metal beam guard fence (MBGF) at individual bridge ends are as shown in the plans.
- 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.
- 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.
- Downstream anchor terminals (DAT) are only for downstream end anchorage use, outside the horizontal clearance area of opposing traffic.
- 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)
- 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 of MBGF).
- 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 of the 2 ft. "maximum" offset from the shoulder edge in the approach direction.
- Transition length and post spacing will vary depending on the transition type. Transition type will be shown elsewhere in the plans.
- A minimum 25' length of MBGF will be required.

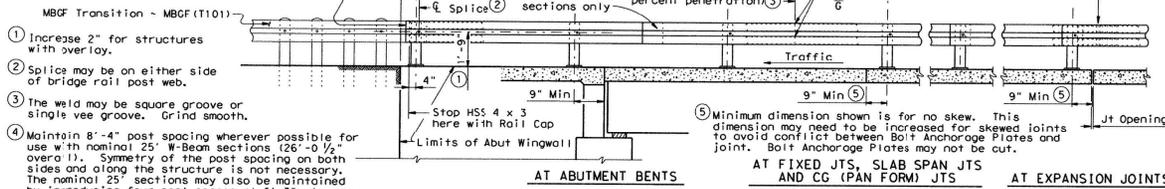


Note: All rail elements shall be lapped in the direction of adjacent traffic.

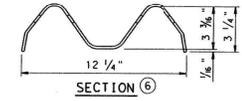
		Design Division Standard		
<h2 style="margin: 0;">BRIDGE END DETAILS</h2> <p style="margin: 0;">(METAL BEAM GUARD FENCE APPLICATIONS TO RIGID RAILS)</p> <h3 style="margin: 0;">BED-14</h3>				
FILE: bed14.dgn	DN: TxDOT	CR: AM	DN: BD/VP	CR: CGL
© TxDOT: December 2011	CONT SECT	JOB	HIGHWAY	
REVISED APRIL 2001	6471 51	001	US 287, ETC	
REVISIONS	DIST	COUNTY	SHEET NO.	
	LFK	HOUSTON	52	

Note: Bridge rail must be attached to a metal beam guard fence transition section (nested W-beam) which then attaches to a metal beam guard fence and extends along the embankment unless shown otherwise on the plans. See plan sheet for details and length for payment. A regular splice is used to join the approach guard fence transition to the bridge rail.

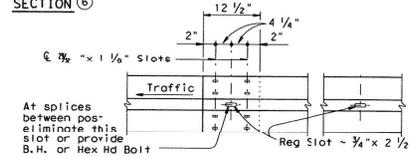
Note: Do not provide a tube splice in first section unless it crosses an expansion joint.



- Increase 2" for structures with overlay.
- Splices may be on either side of bridge rail post web.
- The weld may be square groove or single vee groove. Grind smooth.
- Maintain 8'-4" post spacing wherever possible for use with nominal 25" W-Beam sections (26"-0 1/2" over I). Symmetry of the post spacing on both sides and along the structure is not necessary. The nominal 25" sections may also be maintained by introducing four post spaces at 6'-3" at areas of conflict. Two adjacent spaces of 8'-8" and 8'-0" each are also permissible.



Members are 12 Gage Steel Nom thickness = 0.1045" exclusive of protective coating. Actual section may vary slightly with the manufacturer and conforms to AASHTO M-180.

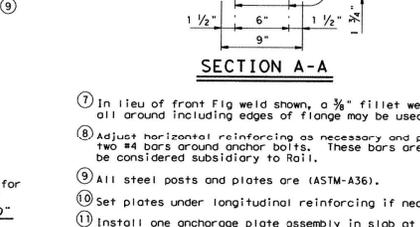
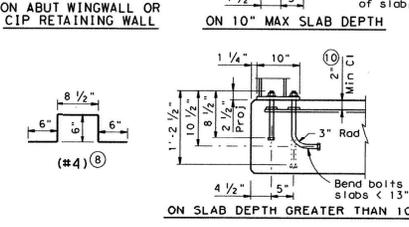
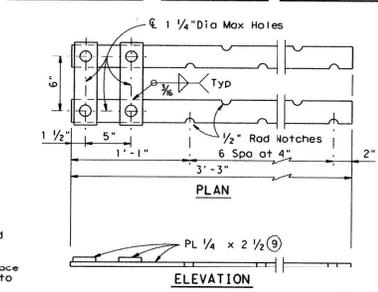
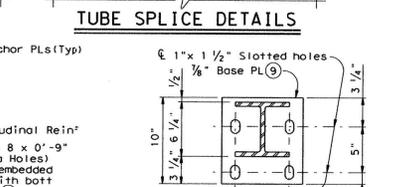
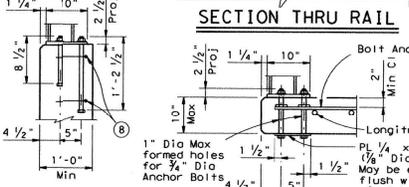
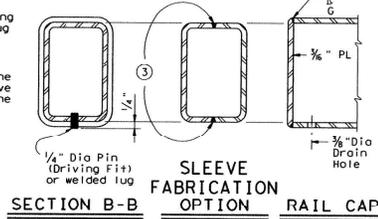
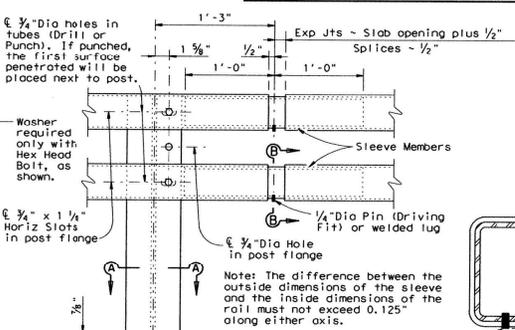
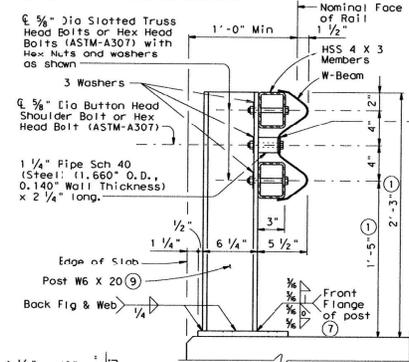


Note: Provide 3/8" Dia Button Head Shoulder Bolts or Hex Head Bolts (ASTM-A307) with Hex Nuts at all splice slots to AASHTO M-180.

**ROADWAY ELEVATION OF RAIL**

TUBE & SLEEVE MEMBERS	
Rail Member	Sleeve Thickness
Material	Material - A36
A 500 Grade C	0.188"
A 500 Grade B	0.250"
A 500 Grade A or A 501	0.313"

Note: Other sections of equal or greater strength are acceptable for sleeves.



- In lieu of front Fig weld shown, a 3/8" fillet weld all around including edges of flange may be used.
- Adjust horizontal reinforcing as necessary and place two #4 bars around anchor bolts. These bars are to be considered subsidiary to Rail.
- All steel posts and plates are (ASTM-A36).
- Set plates under longitudinal reinforcing if necessary.
- Install one anchorage plate assembly in slab at each rail post. Do not galvanize or oil this assembly. Bolt Anchorage Plates may not be cut.

**CONSTRUCTION NOTES:**  
 Attach section lengths of HSS 4 x 3 members continuously to a minimum of three posts (except at abutments with expansion joints).  
 Face of rail and posts must be vertical transversely unless otherwise approved by the Engineer. Posts must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/8" exist.  
 At expansion slots in W-beam rail transition bolts snugly. For curved railing applications, fabricate the tubes and pipes when the radius is 600' or less and fabricate the W-beam to the radius when the radius is less than 150'. Submit shop drawings for approval when tubes are required to be fabricated to a radius.

**MATERIAL NOTES:**  
 Galvanize all steel components unless otherwise shown on plans. Anchor bolts are 3/4" Dia ASTM-A325 bolts or A449 heavy hex bolts or A449 threaded rods with one tack welded heavy hex nut each) with one heavy hex nut and one 2" O.D. washer (0.153" Min thickness plus one 1 1/2" O.D. hardened washer (0.122" Min thick) at each bolt. Optionally use rectangular 3/8" x 2 x 0-3" ASTM-A36 plate with 3/8" Dia hole.

**GENERAL NOTES:**  
 This rail was evaluated based on the results of previous crash tests and approved for a NCHRP Report 350 TL-3 rating. The Metal Beam Guard Fence (T101) transition standard must be used regardless of the design speed. This railing cannot be used on bridges with expansion joints providing more than 4" movement. This rail requires a Min slab thickness of 8" and is not recommended for use with Box Beam or Double-T Structures with asphalt overlay. Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications. This rail is not recommended for use with more than 3 posts mounted on any of the following structures: cast-in-place retaining walls, Traffic Railing Foundations (TRF), or bridge abutment wingwalls. This standard, used in conjunction with the Rail Anchorage Curb (RAC) standard or the Rail Anchorage Curb Retrofit (RAC-R) standard, allows this rail to be mounted on box culverts. For all rails, erection drawings showing section lengths, splice locations, rail post spacing and anchor bolt setting must be submitted to the Engineer for approval. Average weight of railing with no overlay and with 0.25" tubes is 39 pft.

Texas Department of Transportation  
 Bridge Division

## TRAFFIC RAIL

### TYPE T101

FILED: F1510003.dgn    DATE: TXDOT    DESIGNED: TXDOT    DRAWN: JTR    CHECKED: JMH  
 © TXDOT April 2009    DISTRICT:    PROJECT NO.    SHEET NO.  
 REVISIONS:    LFK    RMC 6253-82-001    4E  
 COUNTY:    CONTRACT:    SECTION:    JOB:    HIGHWAY NO.  
 MACCODOCHES    6253    82    001    51, ETC.

'AS BUILT'  
 TYPE T101

Texas Department of Transportation  
 CR024

PROJECT NO.    SHEET NO.  
 6    RMC 6A71-51-001    53

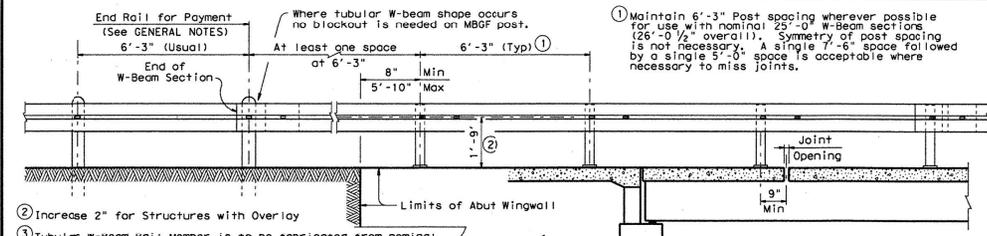
STATE    DIST.    COUNTY  
 TEXAS    LFK    HOUSTON

CONT.    SECT.    JOB    HIGHWAY NO.  
 6471    51    001    US 287, ETC

FOR INFORMATIONAL PURPOSES ONLY

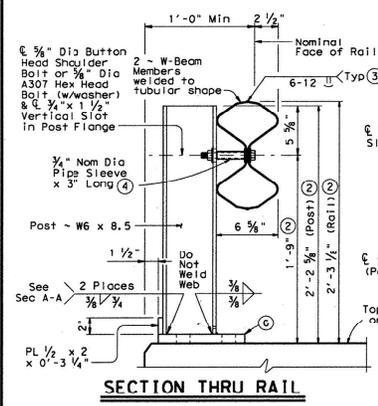
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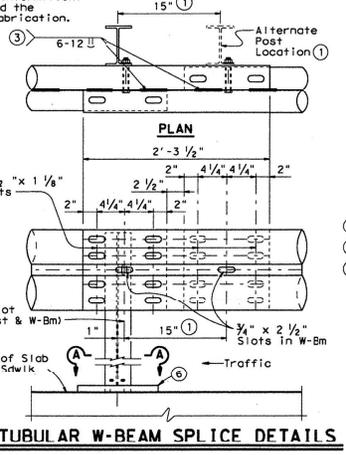


**ROADWAY ELEVATION OF RAIL**

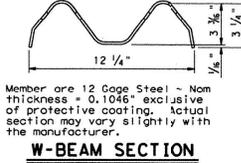
- ② Increase 2" for Structures with Overlay
- ③ Tubular W-beam Rail Member is to be fabricated from nominal 25'-0" W-Beam sections (26'-0 1/2" overall). Additional post mounting slots are to be made in each member 15" from the standard slots at 6'-3" centers. Top and bottom seams may be continuously welded with 80% penetration in lieu of intermittent welding shown. Welds must be chipped and cleaned and the complete 27'-3 1/2" tubular member galvanized after fabrication.
- ④ See Section Thru Splice for Washers



**SECTION THRU RAIL**

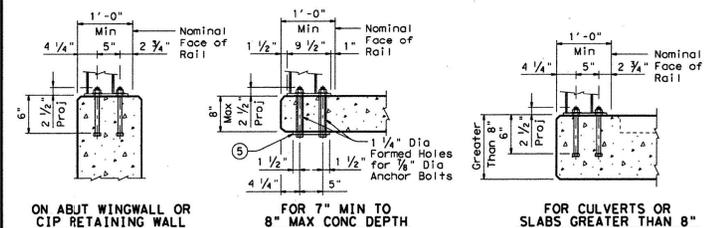


**TUBULAR W-BEAM SPLICE DETAILS**

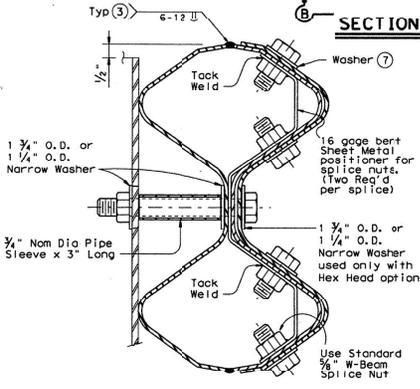


**W-BEAM SECTION**

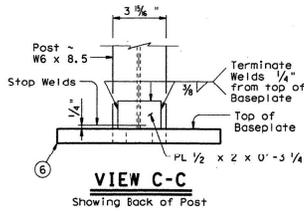
- ⑤ 1/4" x 6 x 0'-8" (3/8" Dia Holes)
- ⑥ 1/4" x 9 1/2" x 1'-0"
- ⑦ 8 - 3/8" Splice nuts. Tack weld to bent sheet metal positioners as shown. Other suitable positioning methods or devices may be substituted. The complete splice must have 16 bolts. Each bolt will include a 1 3/4" x 3" x 3/8" plate washer or a 1 3/4" O.D. washer.



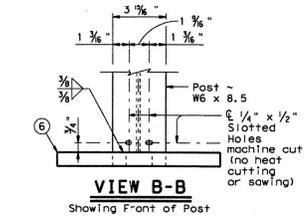
**POST MOUNTING DETAILS**



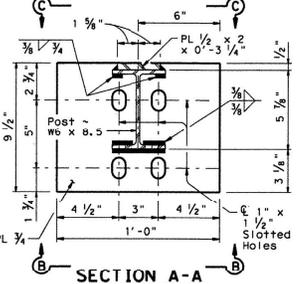
**SECTION THRU SPLICE**



**VIEW C-C**



**VIEW B-B**



**SECTION A-A**

**CONSTRUCTION NOTES:**  
 Tubular Rail Member must be extended and connected to at least the first soil embedded post at each end of the structure. More such posts must be used to utilize 25' standard sections. Approach guard fence posts must be spaced at 6'-3" adjacent to the Tubular Rail since its flexibility is similar to standard metal beam guard fence. Do not install additional posts at 3'-1 1/2" centers.  
 Rail must be extended across all fixed armor joints, slip span joints, or pan form joints with no change in post spacing or continuity. At expansion armor joints of 1/4" or less, the splice bolts nearest the joint and post mounting bolts at intervening post must be snugly tightened to allow for rail expansion. At expansion armor joints over 1/4", suitably longer splice bolts must be provided.  
 Face of rail and posts must be vertical transversely unless otherwise approved by the Engineer. Posts must be perpendicular to adjacent roadway grade. Use epoxy mortar under post base plates if gaps larger than 1/8" exist.

**MATERIAL NOTES:**  
 All steel components except reinforcing must be galvanized unless otherwise shown in plans.  
 Anchor bolts must be 3/4" Dia ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt (1 3/4" O.D. or 2" O.D. as directed by the Engineer). Slotted washers may be used as necessary. Threaded rods may be 0.781" minimum diameter with rolled threads. Nuts must conform to A563 requirements.

**GENERAL NOTES:**  
 This rail was evaluated based on the results of previous crash tests and approved for a MCHRP Report 350 TL-2 rating. The rail is only approved for low speed use, design speeds of 45 mph and less.  
 This railing cannot be used on bridges with expansion joints providing more than 4" movement.  
 Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.  
 Payment for this rail must be in increments of 25'. Shop drawings to be submitted to the Engineer for approval are required only for the proposed rail splices at expansion joints greater than 1/4". For rails not requiring shop drawings, erection drawings showing splice locations must be submitted to the Engineer for approval.  
 Average weight of railing (6'-3" Post spacing and no Overlay) = 23 plf.

**DESIGN/REPAIR CRITERIA**  
 The posts of this rail are designed to break away on impact from an errant vehicle. The rail is designed to deflect approx. two to three feet as it contains and redirects the errant vehicle. This rail may not be installed on top of or behind curbs that project above finished grade.  
 Fully anchored guardfence must be attached to each end of rail.  
 Repair to impact-damaged post/baseplate units are not permitted. All impact-damaged posts must be replaced with a new post/baseplate unit.  
 This railing is especially suitable for use on bridge width box culverts. The detail sheet titled "Box Culvert Mounting Details For Type T6 Rail, T6-CM" is then required, showing culvert curbs and wingwall modifications and additional reinforcing steel to be included as part of the railing for payment.

The use of this railing is restricted to design speeds of 45 mph or less and to horizontal curves with radius greater than 1000 feet.

**Texas Department of Transportation**  
 Bridge Division

**TRAFFIC RAIL**

**TYPE T6**

FILE	REV	DATE	BY	CHK	TITLE
1010011.000		APR 11 2009			
DISTRICT		FEDERAL AID PROJECT		SHEET	
LFK		RMC 6233-29-001		33	
COUNTY		CONTROL SECT		JOB HIGHWAY	
POL K		6233		29 US 59	

**'AS BUILT'**  
**TYPE T6**

**TEXAS DEPARTMENT OF TRANSPORTATION**  
 BRIDGE DIVISION

PROJECT NO.	6471-51-001	SHEET NO.	54
STATE	TEXAS	DIST.	LFK
COUNTY	HOUSTON	JOB	001
HIGHWAY NO.	287	US	59

FOR INFORMATIONAL PURPOSES ONLY

