

2016



TxDOT

Design Division

# **METAL BEAM GUARDFENCE TRANSITION AND END TREATMENT IDENTIFICATION GUIDE**

A guide to help TxDOT employees identify metal beam guardfence transitions and end treatments for the purpose of bridge rail inspection.

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# Chapter 1

## About This Guide

### Organization

The information in this guide is organized as follows:

- Chapter 1, “About This Guide,” contains introductory information on the purpose and organization of this guide.
- Chapter 2, “MBGF Systems,” describes MBGF systems, differences, and how to measure the height of the MBGF.
- Chapter 3, “Identifying MBGF Transitions,” contains figures and descriptions of MBGF transitions.
- Chapter 4, “Identifying MBGF end treatments,” contains descriptions and figures of end treatments to aid in identification.

### Purpose

This guide is an aid for Texas Department of Transportation (TxDOT) personnel and consultants who must identify existing Metal beam guardfence (MBGF) transitions and end treatment types in the field.

The information provided here is for guidance only, and does not constitute policy. For policy on use of metal beam guardfence transitions and end treatments on roadways TxDOT is responsible for, refer to the *Roadway Design Manual*. Should conflicts in information exist, the *Roadway Design Manual* governs.

### Updates

Updates to this guide are summarized in the following table.

#### Revision History

Version	Publication Date	Summary of Changes
2016-1	July 2016	New guide published.

## Glossary of terms

Guardfence=Guardrail=Guiderail

W-Beam - any references to w-beam in this document are specifically referring to the w-beam metal rail associated with a metal beam guardrail system. See Figure 1 for W-Beam Rail and Figure 2 for Thrie Beam Rail.

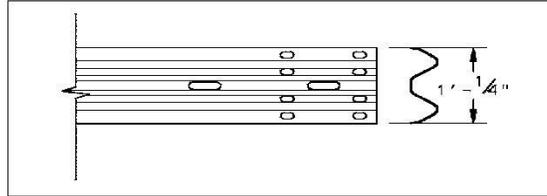


Figure 1: W-Beam Rail

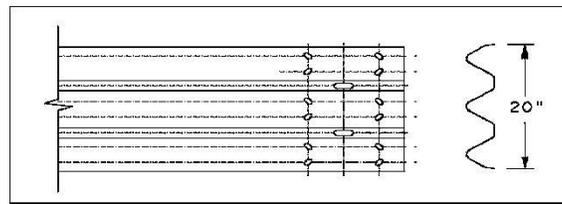


Figure 2: Thrie Beam Rail

End Shoe – The end shoe splices the appropriate transition to the concrete rail.

Nested - Two pieces of w-beam or thrie beam rail layered or coupled together to provide additional resistance to lateral impacts to the rail system. See Figure 3 below.

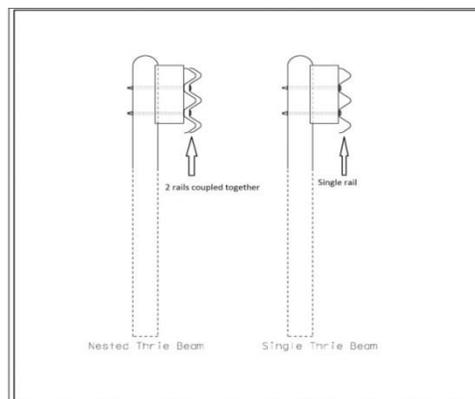


Figure 3: Nested rail versus Single rail

Metal Beam Guardfence End Treatment - The devices at the ends of a metal beam guardrail run which are used to anchor the system in order to maintain tension throughout the entire system and/or absorb the energy of an impacting vehicle when struck.

TL-2 – An abbreviation for Test Level 2. For the purposes of this guide the test level is defined by AASHTO published Manual for Assessing Safety Hardware (MASH) or NCHRP report 350 (350). Both MASH and NCHRP 350 define TL-2 as devices crash tested at approximately 45 mph. Devices that pass this test level are acceptable for use on all roadways with a speed limit of 45 mph or less.

TL-3 – An abbreviation for Test Level 3. For the purposes of this guide the test level is defined by AASHTO published Manual for Assessing Safety Hardware (MASH) or NCHRP report 350 (350). Both MASH and NCHRP 350 define TL-3 as devices crash tested at approximately 62 mph. Devices that pass this test level are acceptable for use on all roadways regardless of speed limit.

### **Quick Links**

Quick links to the MBGF, MBGF transitions, and MBGF end treatment standards:

<http://www.dot.state.tx.us/insdtdot/orgchart/cmd/cserve/standard/rdwylse.htm>

### **Feedback**

You may direct any questions or comments on the content of this guide to the Director of the Design Division, Texas Department of Transportation.

## Chapter 2 Metal Beam Guardfence Systems

### Identification Procedure

The following provides recommended steps for identifying existing metal beam guardfence in the field.

1. Determine speed limit of the roadway.
2. Determine type of guardrail system. See section “guardfence types” below.
3. Compare the transitions and end treatments to figures and pictures provided in Chapters 3 - 4.
  - a. Take note of distinguishing features.
  - b. If a corresponding figure cannot be found, the transition or end treatment may be obsolete (contact Design Division for guidance).
4. Measure the height of the existing transition and end treatment.
  - a. If the guardfence approach has no overlay, measure height as shown in Figure 4a or Figure 4b.
  - b. If the guardfence approach is topped with an overlay or seal coat, measure height as shown in Figure 4c.

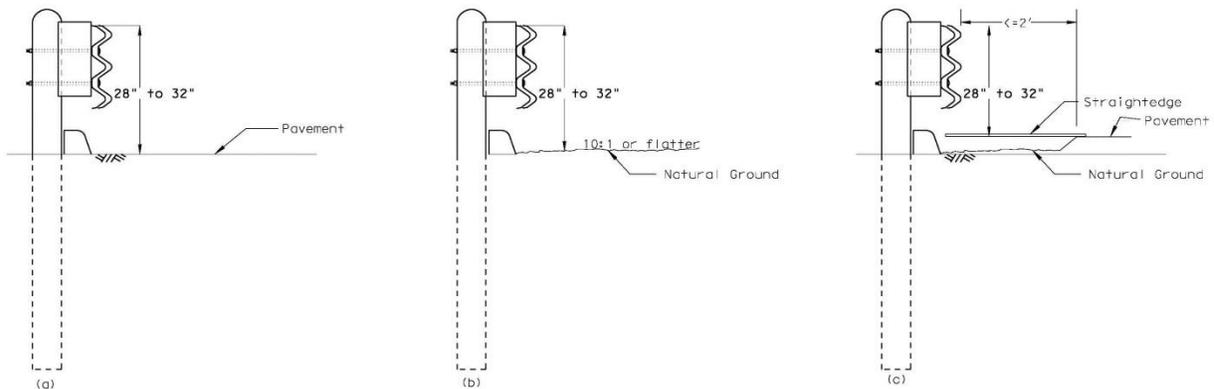


Figure 4: Measuring height of rail

### Guardfence types

TxDOT currently allows two types of guardfence on our roadways. The current guardfence referred to as a modified Midwest Guardrail System (MGS), and the interim guardfence referred to as a modified G4(1S) system. The modified MGS system is considered our current standard and the system that will be newly installed barring

special circumstances; this system is considered acceptable when the nominal height of the rail is within the range of 28" to 32" (TxDOT Roadway Design Standard: *GF(31) - latest on-line version*). The existing modified G4(1S) system is considered acceptable when the nominal height of the rail is within the acceptable range (28" to 30") (TxDOT Roadway Design Standard: *MBGF – latest on-line version*). The modified G4(1S) system is allowed to be newly installed when site conditions dictate its use. Consult with Design Division Roadway Design Section for guidance on when installation of modified G4(1S) is appropriate. The splice location is one easily noticeable feature that distinguishes between the two systems. The modified MGS system splices the W-beam rail in-between the posts, mid-span, while the modified G4(1S) system splices the W-Beam rail at the posts. The splice locations are depicted in Figure 5 below.

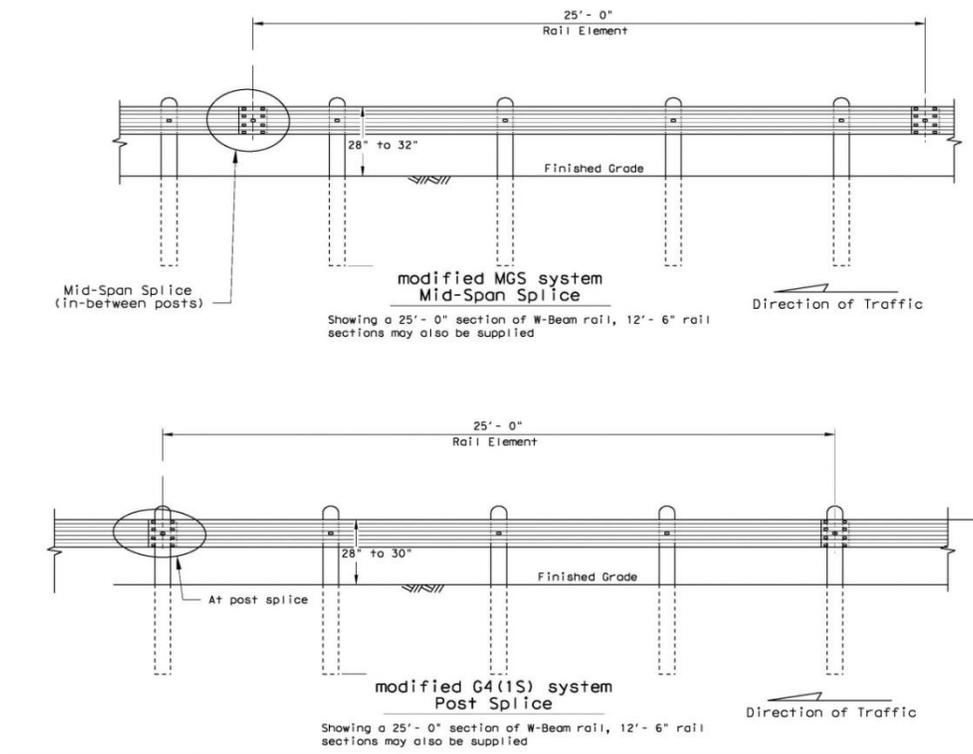


Figure 5: Guardfence Types

# Chapter 3

## Identifying Metal Beam Guardfence transitions

### TL-3 MGS Transition

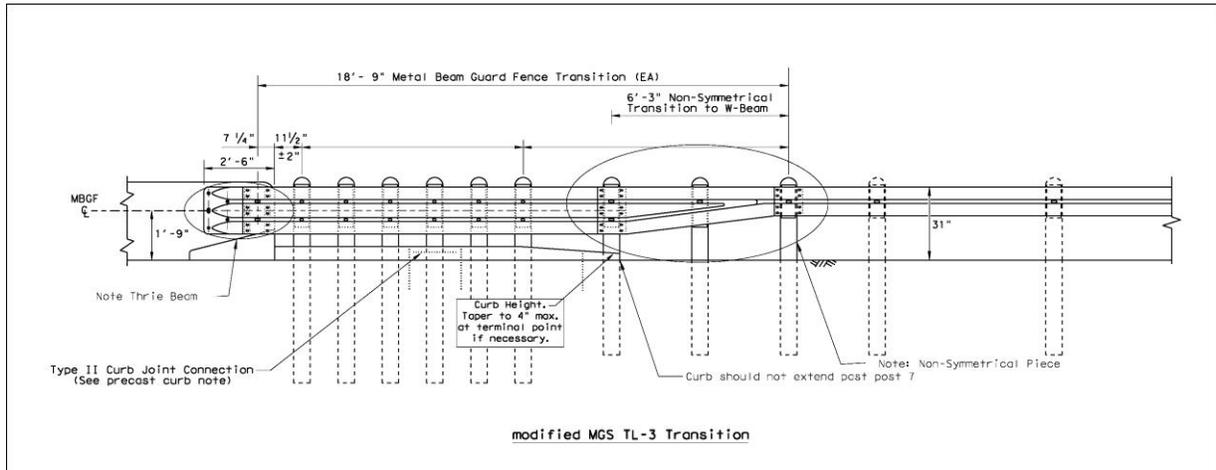


Figure 6: TL-3 MGS Transition

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable Height at first post adjacent to bridge rail (Height to top of rail)	28" to 32"
Distinguishing features	<ul style="list-style-type: none"> <li>-Thrie Beam transition</li> <li>- Non-symmetrical transition piece from thrie beam to w-beam</li> <li>- Transition length = 18'-9"</li> <li>- curb as shown in Fig. 6</li> </ul>
Roadway Design Standard	GF(31)TR – (latest on-line version)

## TL-3 G4(1S) Transition

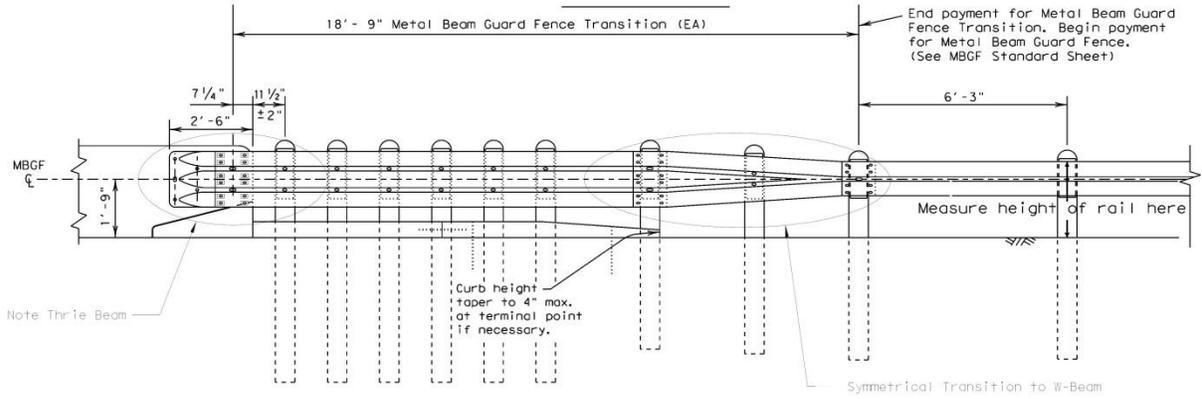


Figure 7: TL-3 G4(1S) Transition

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable Height (measure at location indicated in Fig. 7)	28" to 30"
Distinguishing features	<ul style="list-style-type: none"> <li>-Thrie Beam instead of W-Beam</li> <li>- Length of transition =18'-9"</li> <li>- Symmetrical transition from thrie beam to W-Beam</li> <li>- curb as shown in Fig. 7</li> </ul>
Roadway Design Standard	MBGF(TR) – (latest on-line version)

## TL-2 MGS Transition

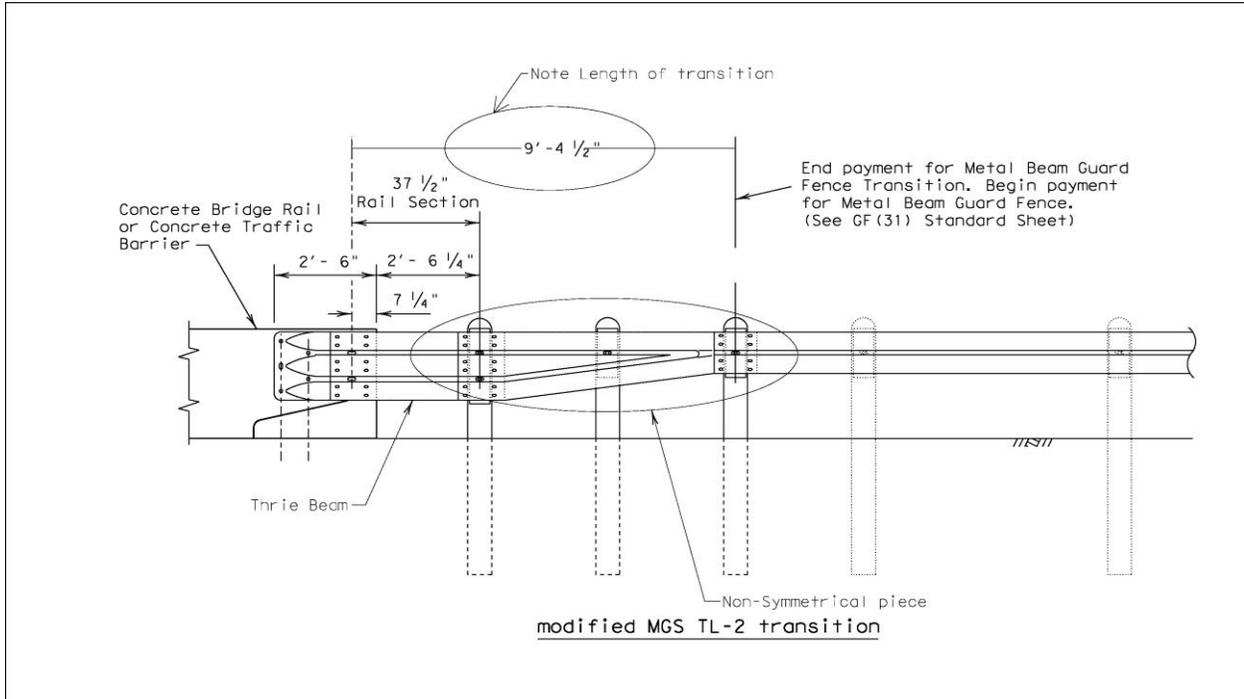


Figure 8: TL-2 MGS Transition

Speed Limit	Acceptable for use on roadways with speed limits of 45 mph or less
Acceptable Height at first post adjacent to bridge rail (Height to top of rail)	28" to 32"
Distinguishing features	<ul style="list-style-type: none"> <li>-Thrie Beam instead of W-Beam</li> <li>- Length of transition = <math>9' - 4 \frac{1}{2}"</math></li> <li>- Non-Symmetrical transition from end shoe to W-Beam</li> </ul>
Roadway Design Standard	GF(31)TL2 – (latest on-line version)

## TL-2 G4(1S)

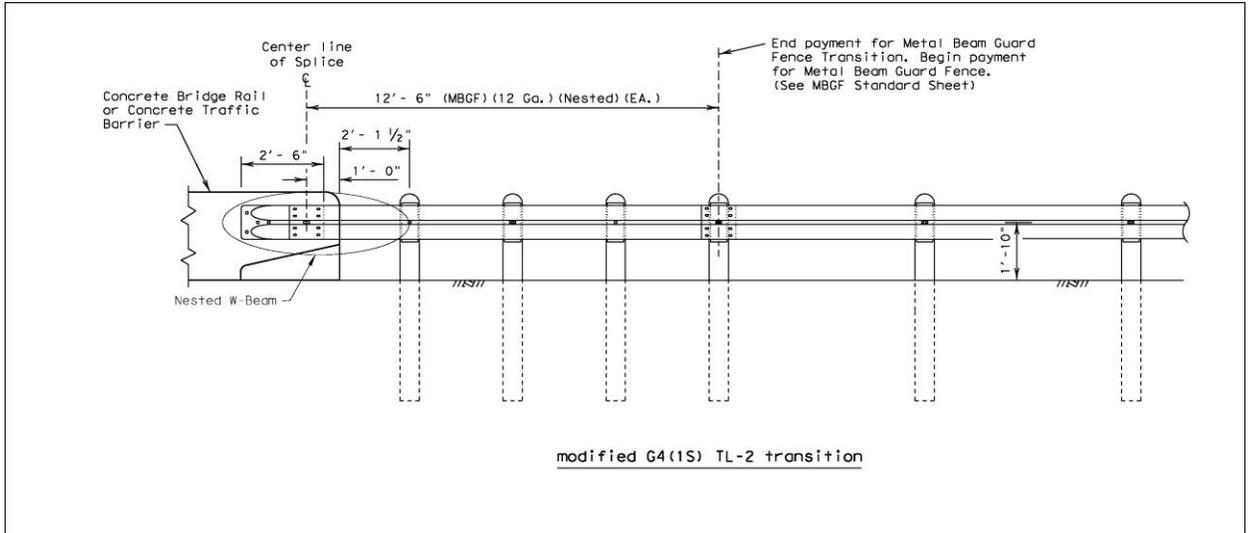


Figure 9: TL-2 G4(1S) Transition

Speed Limit	Acceptable speed limits of 45 mph and less
Acceptable Height at first post adjacent to bridge rail (Height to top of rail)	28" to 30"
Distinguishing features	<ul style="list-style-type: none"> <li>- Nested W-Beam instead of thrie beam (1 rail attached to bridge must be nested for this to be a viable transition)</li> <li>- Length of transition = 12'-6"</li> </ul>
Roadway Design Standard	MBGF(TL2) – (latest on-line version)

## Chapter 4 Identifying Metal Beam Guardfence End Treatments

### SKT End Terminal

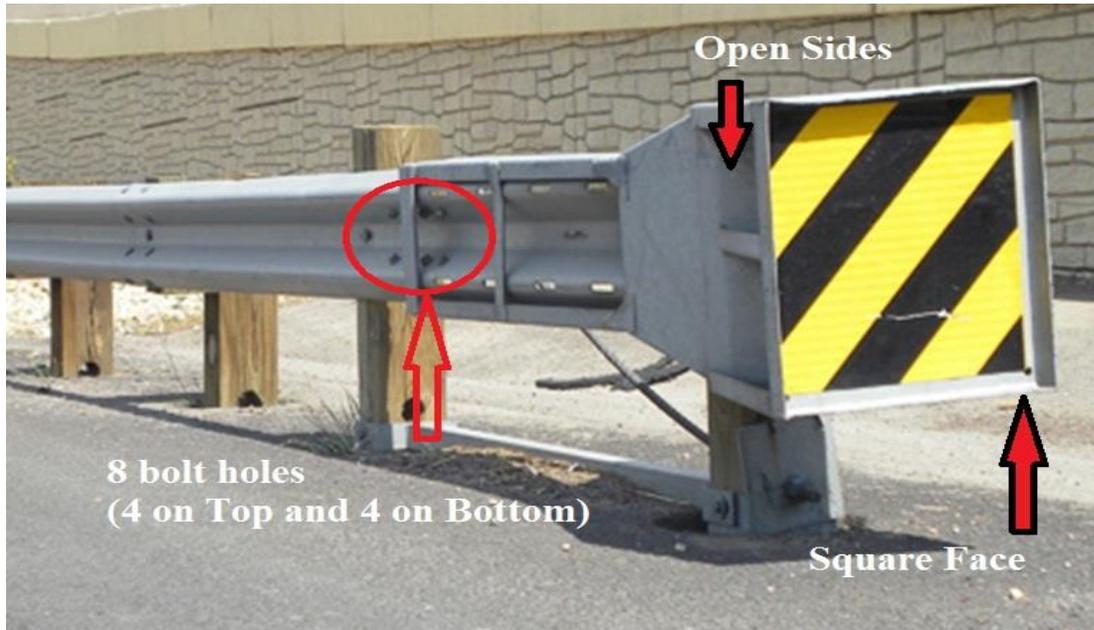


Figure 10: SKT end terminal

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	28" to 32" for MGS system 28" to 30" for G4(1S) system
Distinguishing features	- Square head (face) - Open sides of head - 8 bolt holes (4 top and 4 bottom) on 1 <sup>st</sup> rail of w-beam
Acceptable Post types	Wood Posts or Steel posts
Roadway Design Standards	SGT(8)31, SGT(8S)31,SGT(8),SGT(8)H – (latest on-line versions)

ET-Plus End Terminal

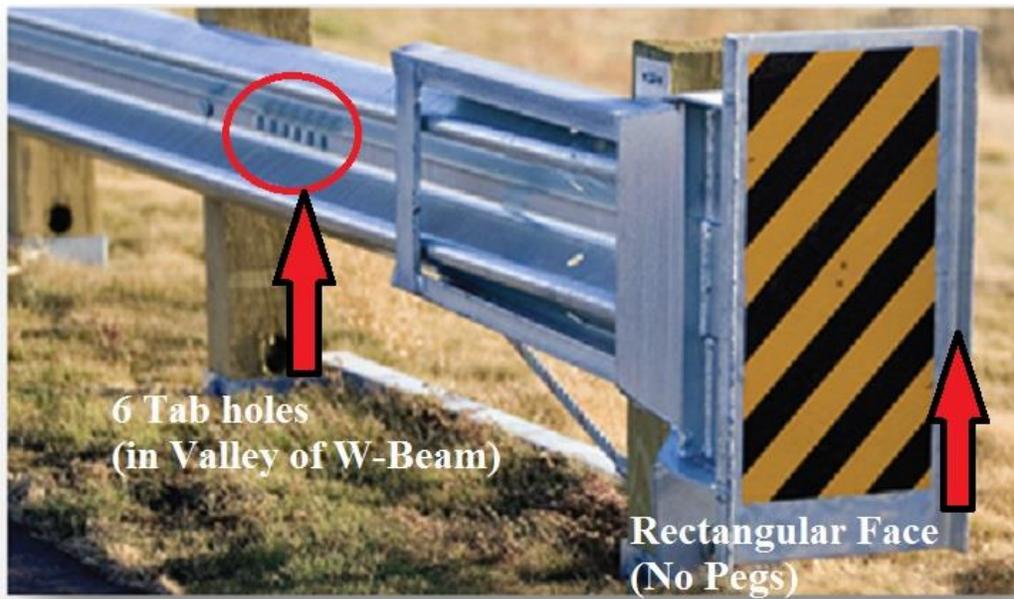


Figure 11: ET-Plus end treatment

Speed Limit	** All speeds on Texas Roadways
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	28" to 32" for MGS system 28" to 30" for G4(1S) system
Distinguishing features	- Rectangular head with no pegs - 6 tab holes in the valley of 1 <sup>st</sup> rail of w-beam
Acceptable Post types	Wood Posts or Steel posts

\*\* Effective October 28, 2014, the ET-Plus system is suspended as an alternative in contracts and is discontinued for use in new installations.

ET-2000 End Terminal

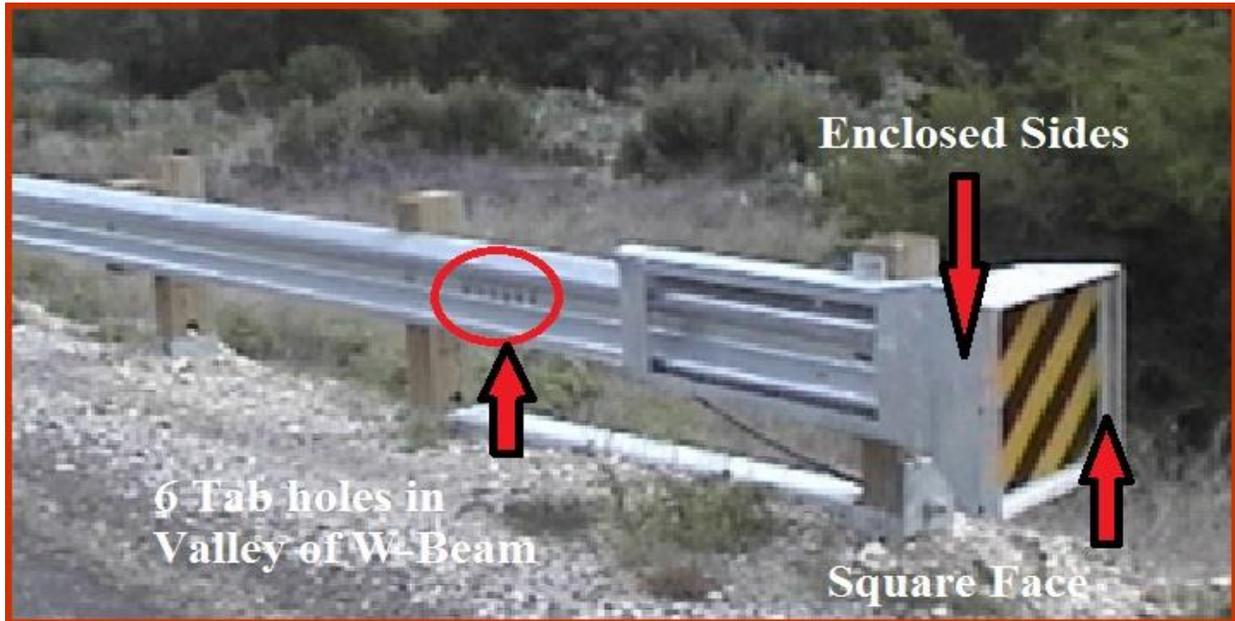


Figure 12: ET-2000 end treatment

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	28" to 32" for MGS system 28" to 30" for G4(1S) system
Distinguishing features	- Square head - Enclosed sides on head - 6 tab holes in the valley of 1 <sup>st</sup> rail of w-beam
Acceptable Post types	Wood Posts or Steel posts

X-Lite End Terminal



Figure 13: X-Lite end terminal

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	28" to 32" for MGS system 28" to 30" for G4(1S) system
Distinguishing features	- Rectangular head - note: pegs on face - Cable anchor bracket between posts 2 and post 3
Acceptable Post types	Steel posts only
Roadway Design Standard	SGT(9S)31, SGT(9S) – (latest on-line versions)

SoftStop End Terminal



Figure 14: SoftStop end terminal

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	30" to 32" for MGS system
Distinguishing features	- Rectangular head - Anchor in front of system (unique to SoftStop)
Acceptable Post types	Steel posts only
Roadway Design Standard	SGT(10S)31 – (latest on-line version)

## Driveway Terminal Anchor Section

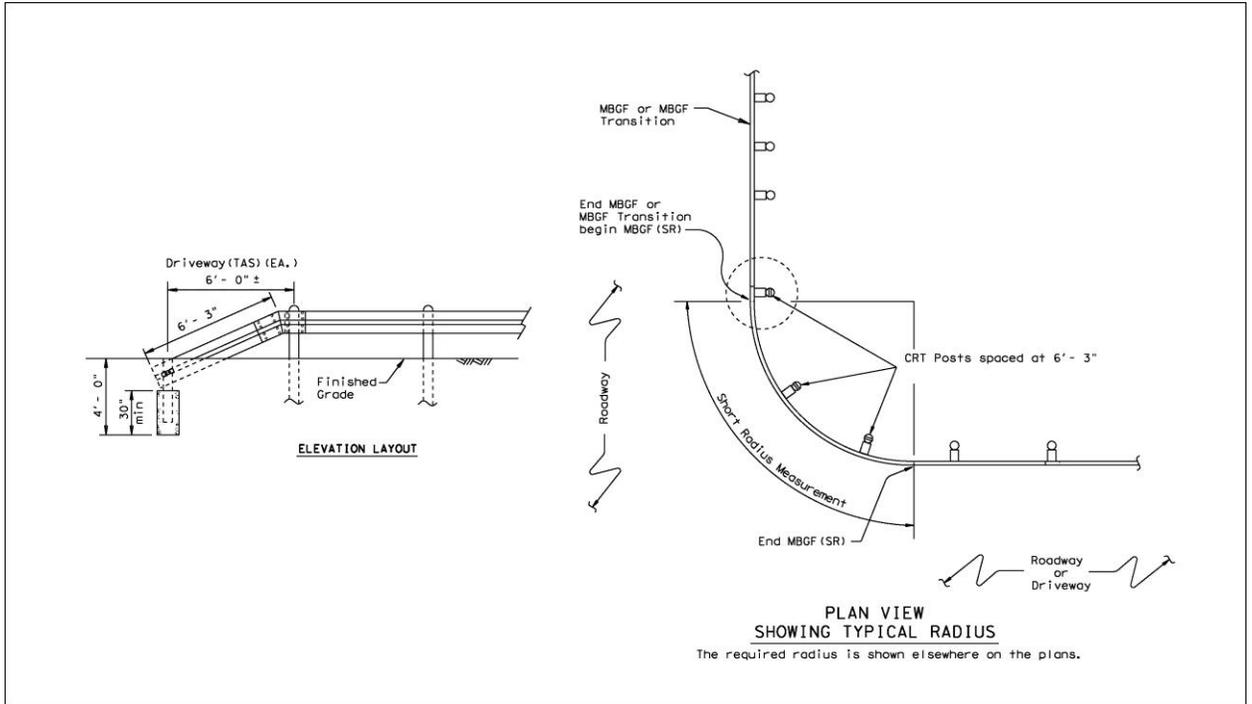


Figure 15: Driveway anchor terminal section

Speed Limit	Acceptable for low speed roadways (45 mph or less) or with approval from Design Division
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	28" to 30"
Distinguishing features	- Driveway anchor terminal section only allowed to be installed parallel to driveways. - Only allowed when attached to short radius guardfence
Acceptable Post types	Wood posts only
Roadway Design Standard	MBGF(SR) – (latest on-line version)

## Downstream Anchor Terminal



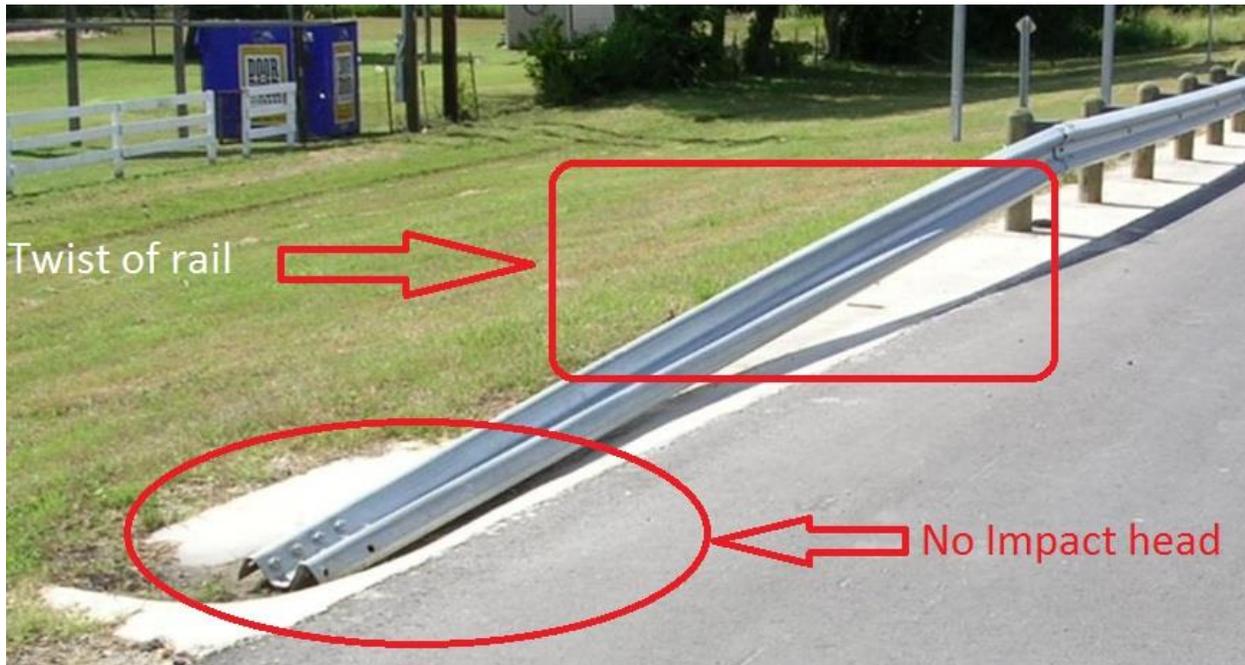
Figure. 16: Downstream Anchor Terminal Traffic side



Figure 17: Downstream Anchor Terminal Field Side

Speed Limit	Acceptable for all speeds on Texas Roadways
Acceptable height at second post (adjacent to head of end terminal) (Height to top of rail)	28" to 32"
Distinguishing features	- Only allowed on downstream end of guardrail - No impact head
Acceptable Post types	Wood posts only
Roadway Design Standard	GF(31)DAT – (latest on-line version)

## Terminal Anchor Section



Speed Limit	Upstream: Never acceptable on any speed roadway. Downstream: Only acceptable when located outside clearzone of opposing traffic; contact Design Division for guidance as needed.
Acceptable height at 1 <sup>st</sup> post (adjacent to tail of end terminal) (Height to top of rail)	28" to 30"
Distinguishing features	- Twist of rail - No impact head
Acceptable Post types	No posts
Roadway Design Standard	MBGF- (latest on-line version)