

# TECHNICAL MEMORANDUM

**To:** Christina Huber, P.E.  
DOT&PF Project Manager

**From:** Jeremiah Gingrich, P.E.  
Lounsbury Project Engineer

**Through:** David Gamez, P.E., PTOE  
Lounsbury Project Manager

**Date:** January 23, 2025

**Subject:** Old Seward Highway & Huffman Road Pavement Preservation  
Guardrail Analysis Report - Draft  
Project No. 0537010/CFHWY00886

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## 1.0 Project Description

The Old Seward Highway & Huffman Road Project Pavement Preservation (the project) includes an inventory of the guardrail systems along the Old Seward Highway and Huffman Road corridors. A field assessment was conducted to evaluate the existing condition of the guardrail, terminals, and associated hardware.

The Central Region DOT&PF Guardrail End Treatment (GET) Replacement Requirements (Appendix A) details the conditions that require an NCHRP-350 compliant terminal or a MASH compliant terminal. Per this guidance, as Seward Highway is part of the National Highway System (NHS), terminals that receive an F rating are to be upgraded to MASH standards. NCHRP-350 compliant terminals can remain if they receive A-D ratings. This Guardrail Analysis Report (GAR) provides recommendations for repair and/or replacement of the segments that are damaged or do not meet current safety standards. The recommendations in this report have the goal of limiting design efforts to only what is necessary to bring the existing guardrail up to current safety standards.

## 2.0 Existing Facilities

Old Seward Highway begins at Rabbit Creek Road as a two-lane facility, one lane in either direction, fanning out to a four-lane facility, two lanes in either direction, over the Seward Highway. It then drops back to a three-lane facility, one lane in either direction with a two-way left turn lane, north of the bridge. The three-lane facility continues to the roundabout at Huffman Road, becoming a five-lane roadway north of the roundabout with two lanes in either direction and a two-way left turn lane to O'Malley Centre Drive. From O'Malley Centre Drive to O'Malley Road the northbound and southbound lanes are separated by a raised median. Auxiliary lanes and raised medians are added at intersections as needed. Intermittent shoulders and multi-use pathways are present along the roadway. There are nine guardrail segments along the roadway. Three of the segments transition to bridge rail over Seward Highway. Two segments of guardrail curve at private driveway approaches and extend down the driveways, therefore the inspection ended at the driveway approaches and the three affected

terminals were not included. The speed limit is 45 miles per hour (mph) and the Annual Average Daily Traffic (AADT) ranges from 4,890 to 22,100.

Huffman Road extends from the Old Seward Highway to the Seward Highway as a four-lane facility with a series of four successive roundabout intersections. The four-lane section consists of two lanes westbound, and one lane eastbound, with a two-way left turn lane from Old Seward Highway to Brandon Street and two lanes in either direction separated by a median from Brandon Street to Gregory Road. From there Huffman Road has one lane in either direction to Birch Road with a two-way left turn lanes in between Gregory Road and Wagner Street. Auxiliary lanes are added as needed at intersections for turn lanes. The posted speed limit varies from 35 miles per hour to 45 miles per hour. The Annual Average Daily Traffic (AADT) is between 1,960 and 11,900 vehicles along the length of the project. The only segment of guardrail is located at the Trinity Presbyterian Church, ending at Lorraine Street.

### **3.0 Design Standards**

Design standards and guidelines that apply are contained in the following publications.

#### **Standard**

- Roadside Design Guide (RDG), 4th Edition, AASHTO, 2011.
- Alaska Highway Preconstruction Manual (HPCM), DOT&PF, 2020.

#### **Guidelines:**

- Field Inspection Rating Guide for Existing Guardrail, DOT&PF, 2020
- Recommended Procedures for the Safety Performance Evaluation of Highway Features, Report 350, NCHRP 350, Transportation Research Board, 1993.
- Criteria for Restoration of Longitudinal Barriers, Report 656, NCHRP 656, Transportation Research Board, 2010.
- Manual for Assessing Safety Hardware (MASH), 2nd Edition, AASHTO, 2016
- Central Region Memorandum: Guardrail Replacement Regional Practice for Projects, 4-16-2019.

### **4.0 Field Inventory and Data Collection**

The Central Region of DOT&PF have developed detailed guidance for identification and inspection of guardrail segments. This guidance includes a Guardrail Deficiency Procedure flow chart, a Guardrail End Terminal (GET) Replacement Requirements chart and a detailed Guardrail Field Inspection Rating Guide. They describe the process for assessing guardrail systems and end terminals for damage and include a description of various damage codes used in grading guardrails systems and making repair or replacement determinations.

Any damage to guardrail systems can affect the performance of the barrier, however there are some types of damage that can lead to a complete failure of the barrier, putting motorists at greater risk. The Guardrail Field Inspection Rating Guide includes examples, criteria, and steps for assigning codes of A-F for runs of guardrail and individual end terminals. Codes of A, B, or C represent acceptable conditions requiring no immediate or near-term maintenance or replacement actions. D

codes represent damaged but functional conditions and are considered to be a priority for future repairs and maintenance. Codes of F indicate that the guardrail or terminal would have an unacceptable safety performance should it be hit and require replacement. The Rating Guide with a description of all the codes, as well as a photo log, can be found in Appendix B.

Adequate Length of Need (LON) is an important aspect of guardrail safety performance. The LON is the length of guardrail required in advance of an obstacle or hazard to prevent a vehicle from penetrating the rail into the obstacle or hazard for a given speed and AADT of a roadway. LON calculations were performed for the terminals recommended for replacement in accordance with the AASHTO Roadside Design Guide and the Alaska Highway Preconstruction Manual *based on inputs from photos and aerial imagery and will be updated with surveyed dimensions*. Preliminary calculations indicate that the LON for one of the terminals on Old Seward Highway and one terminal on Huffman Road are inadequate.

## 5.0 Results and Initial Recommendations

### *Terminals*

The terminals along Old Seward Hwy and Huffman Road were assessed and assigned codes during the field assessment. There are one SRT-350, one CRT, two ET-PLUS, and 10 SKT models. Of the 14 terminals, eight received failing, or F, codes.

The codes include:

- FT-HGT: This code is applied when the height of the terminal did not fall in the range of 26.5 to 32 inches, which is the acceptable height of guardrail to meet NCHRP 350 or MASH testing standards.
- FT-HIT-TERM: This code is applied to an activated or “kinked” energy absorbing terminal or crash cushion when more than one post is sheared or cracked or there is damage to foundations that disallows repair.



Photo 1 – FT-HIT-TERM

- FT-LAG: This code is used when lag screws in a wood post are missing or have failed, or there are extruding terminals. It is also used when non galvanized bolting is rusting, has a poor fit, is missing or there is an improper use of nails.



Photo 2 – FT-LAG

- FT-MISS-CBL: This code is used when the anchor cable is missing.

### *Guardrails*

Of the ten W-beam segments included in this project, four on Old Seward Highway received F codes.

The codes from the field assessment include:

- F-HGT: This code is applied when the height from the asphalt to the top of the W-beam does not fall in the range of 26.5 to 32 inches, which is the acceptable height of guardrail to meet NCHRP-350 or MASH testing standards.
- F-HOLES: This code is used when there are crash-induced holes, lug nut damage, or holes rusted through the guardrail. Included are any holes over 1-inch in height, more than two holes less than 1-inch high over a 12.5-foot stretch of rail, and any hole which intersects the top or bottom edge of rail.



Photo 3 – F-HOLES

The two guardrail segments that include curved W-beam at private driveways received failure codes of F-HGT at the curved portion of rail, with the remainder of the rail receiving passing or D codes. Making the necessary upgrades at the curves to meet MASH standards would necessitate going outside of existing right of way (ROW). Other alternatives that stay within ROW would not meet length of need. Therefore, it has been determined that leaving the two segments of guardrail in place is currently the best course of action.

D codes were also assigned to several segments of guardrail on Old Seward Highway as well as the segment on Huffman Road, as shown in the tables below to further illustrate the condition of the rail. The definition of the D codes can be found in Appendix B. The results from the field assessment are shown in the table below.

Table 1: Old Seward Highway Field Assessment Results

OLD SEWARD HIGHWAY GUARDRAIL FIELD INSPECTION RATING FORM										
DATE: OCTOBER 25, 2023							INSPECTOR: ALEXANDER LITVINCHUK, JEREMIAH GINGRICH, JAKE LIVINGSTON			
GUARDRAIL/ TERMINAL	TYPE	STATION OR MILEPOST, LANDMARK	DIRECTION OF TRAVEL	OFFSET (INCREASING MP)	LATITUDE	LONGITUDE	OBSTACLE	HEIGHT (INCHES)	GRADE CONDITION	RECOMMENDATION
					DETERMINED BY GOOGLE EARTH EARTH PIN DROP					
TERMINAL	SKT	RABBIT CREEK RD			61.083409	149.823935	SLOPE	0	FT-REFL, FT-HIT-TERM, DT-FLARE	UPGRADE TO MASH STANDARDS
GUARDRAIL	W-BEAM		NW	RT				44	F-HGT, D-TWST-BLKT	UPGRADE TO MASH STANDARDS
TERMINAL	SKT	CHENOWETH ST			61.083782	149.826901		30	DT-FLARE	LEAVE IN PLACE
TERMINAL	SKT	RABBIT CREEK RD			61.083284	149.824651	SLOPE	25	FT-HGT, FT-REFL, FT-DEND-POST	UPGRADE TO MASH STANDARDS
GUARDRAIL	W-BEAM		SE	LT				27-30	D-TWST-BLKT	LEAVE IN PLACE
TERMINAL	CRT	CHENOWETH ST			61.083662	149.827382		28.5	FT-MISS-CBL	UPGRADE TO MASH STANDARDS
TERMINAL	SKT				61.086006	149.832549	SLOPE, BRIDGE	30-33.5	FT-HGT, FT-REFL, DT-CBL-ANCR, DT-FLARE	UPGRADE TO MASH STANDARDS
GUARDRAIL	W-BEAM	Q3 SEWARD HWY BRIDGE	SE	LT				28	D-HORIZ-TEAR	LEAVE IN PLACE
TERMINAL	SKT				61.086817	149.833187	SLOPE, BRIDGE	31	DT-FLARE, DT-STRUT	LEAVE IN PLACE
GUARDRAIL	W-BEAM	Q2 SEWARD HWY BRIDGE	NW	RT				31	A/B/C	LEAVE IN PLACE
GUARDRAIL	W-BEAM	Q1 SEWARD HWY BRIDGE	NW	RT				31	A/B/C	LEAVE IN PLACE
TERMINAL	SKT				61.088326	149.835858		29	DT-FLARE	LEAVE IN PLACE
TERMINAL	SRT-350	NEAR Q4 SEWARD HWY BRIDGE			61.088747	149.837255	SLOPE, RETAINING WALL	31	FT-HIT-TERM	UPGRADE TO MASH STANDARDS
GUARDRAIL	W-BEAM		SE	LT				29	F-HOLES, D-DEFL, D-FLAT-RAIL, D-TWST-BLKT	UPGRADE TO MASH STANDARDS
TERMINAL	SKT	TURNAGAIN BLUFF WAY			61.089471	149.83833		29	FT-HIT-TERM	UPGRADE TO MASH STANDARDS
GUARDRAIL	W-BEAM	14460/14440 OLD SEWARD HWY	SE	LT	61.090026	149.839064	SLOPE	28	FT-HGT	LEAVE IN PLACE
GUARDRAIL	W-BEAM	14440 OLD SEWARD HWY	SE	LT			SLOPE	29	FT-HGT, D-TWST-BLKT	LEAVE IN PLACE
TERMINAL	SKT	N OF DENNIS WAY			61.091315	149.840747		30	FT-LAG, FT-HIT-TERM, DT-STRUT	UPGRADE TO MASH STANDARDS
TERMINAL	SKT	DE ARMOUN RD			61.09413	149.844558	SLOPE	28.5	FT-HIT-TERM	UPGRADE TO MASH STANDARDS
GUARDRAIL	W-BEAM		SE	LT				29-30.5	D-DEFL	LEAVE IN PLACE
TERMINAL	SKT	N OF KAREN ST			61.0955247	149.846065		28	DT-CBL-ANCHR	LEAVE IN PLACE

Table 2: Huffman Road Field Assessment Results

HUFFMAN ROAD GUARDRAIL FIELD INSPECTION RATING FORM										
DATE: NOVEMBER 2, 2023							INSPECTOR: KATHERINE BENZMILLER, JACOB LIVINGSTON			
GUARDRAIL/ TERMINAL	TYPE	STATION OR MILEPOST, LANDMARK	DIRECTION OF TRAVEL	OFFSET FROM CENTERLINE (TRAVELING EAST)	LATITUDE	LONGITUDE	OBSTRUCTION	HEIGHT (INCHES)	GRADE CONDITION	RECOMMENDATION
					DETERMINED BY GOOGLE EARTH PIN DROP					
TERMINAL	ET-PLUS	WEST OF LORRAINE ST			61.108686	149.202053	NON-RECOVERABLE SLOPE	29.5	DT-BRG-PLT	LEAVE IN PLACE
GUARDRAIL	STEEL POST W-BEAM		W	LT				29	A/B/C	LEAVE IN PLACE
TERMINAL	ET-PLUS	CORNER OF LORRAINE ST			61.108694	149.807131		27	DT-STRUT, DT-FLARE	LEAVE IN PLACE

## APPENDIX A

### Central Region DOT&PF Guardrail End Treatment (GET) Replacement Requirements

**EXHIBIT B-9**  
**CENTRAL REGION DOTPF**  
**Guardrail End Treatment (GET)**  
**Replacement Requirements**

Alaska DOT&PF Guardrail End Terminal Replacement Requirements (Rev 05-31-18)												
Existing Guardrail End Terminal (GET)	Type of Project or Maintenance	Non-NHS			National Highway System (NHS)							
					Non-High Spd / High Volume < 45 MPH / < 6000 ADT			High Speed and High Volume >= 50 MPH / >= 6000 ADT				
		GET Condition			GET Condition			GET Condition				
		OK	Damage		OK	Deficiency		OK	Damage			
F-Priority	D-Damaged		F-Priority	D-Damaged		F-Priority	D-Damaged					
No existing guardrail	New Construction Projects	MASH	MASH	MASH	MASH	MASH	MASH	MASH	MASH	MASH		
Non-MASH Compliant Or BCT's	4R Projects	MASH		MASH	MASH		MASH	MASH				
	3R Projects (Including Gravel to Pavement)	RNR		RNR	R350 BCT		R350 BCT	MASH		MASH	MASH	
	1R Preventive Maintenance Projects							R350 BCT			R350 BCT	
	State-funded maintenance (non-project)							RNR			RNR	R350 BCT
Turned Down n or Blunt Ends	All projects (4R, 3R, 1R )	MASH		MASH	MASH		MASH	MASH		MASH		
	State-funded maintenance (non-project)	RNR		RNR							MASH	

**Notes:**

- **F - PRIORITY and D – DAMAGED** terminal ratings are per Central Region Guardrail Inspection Guide.
- Terminal replacement requirements may be waived for a current project, if a separate guardrail project is funded in the STIP to receive construction funding less than one year after construction begins on the current project, and will correct terminal deficiencies within the limits of the current project.
- *Make nothing worse.* If the Design creates the deficiency or makes it worse after project completion, then the deficiency should be remedied to MASH compliance by the Design.
- Terminal replacement is not required for terminals outside the clear zone. Those may be removed.

**MASH:** (Manual for Assessing Safety Hardware AASHTO 2009) MASH compliant terminal replacements are required. For MASH replacements, install embankment widening conforming to standard drawing G-20. Review Length-of-Need (LON) and widening location for all replacements. If embankment widening is not feasible due to slope steepness, height and constraints on the road footprint, document the reasons for nonconformance in the Design Study Report (DSR).

**R350 BCT:** NCHRP-350 compliant terminals can remain. Replace BCT's with a MASH compliant device.

**RNR:** Replacement Not Required. BCT's can remain. However, if terminals are not replaced, damaged parts still must be repaired through routine maintenance. When terminals are replaced, replacements must be MASH compliant.

**1R Preventive Maintenance Projects:** Federal Preventive Maintenance projects which resurface the roadway include asphalt surface treatments, rut filling, profiling, and similar work and may be done either by DOT&PF maintenance or contractors. This table does not apply to other preventive maintenance that does not change the surface pavement profile, such as crack sealing or striping.



## APPENDIX B

### Central Region DOT&PF Field Inspection Rating Guide for Existing Guardrail, 2020

# HSIP Guardrail Inventory

## Guardrail End Terminal (GET) Types

### 1. MKST



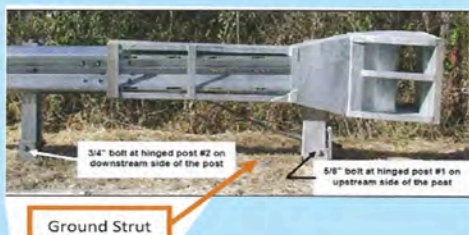
### 2. SOFT-STOP



### 3. MAX-TENSION



### 4. SKT



### 5. X-TENSION



### 6. ET-PLUS

Extruding Head  
Cable Anchor  
Ground Strut  
Behind Posts  
1 and 2. Object  
marker panel  
taller with  
extruding head.  
"1 square" front of head.  
Triangular handle backside.



Angle Strut

### 7. X-LITE



### 8. SRT-350

Cable Anchor  
Slotted Rail  
Ground Strut  
Looks like  
BCT, but with  
slots,ground  
strut



### 8. SRT-350 (continued)



### 9. WY-BET



### 10. CRT (existing)

Features: Cable Anchor, No Strut,  
Round Pipe Can on End Post,  
Wood breakaway posts in radius



### 11. TAU II-R



### 12. REACT



NCHRP-350

### 13. FT-BCT

(Breakaway End Terminals)  
BCTs are not acceptable on 45 MPH or  
greater roadways or National Highway  
System (NHS) Routes. BCTs have no  
extruding head, no horizontal rail,  
and no ground strut slotted



### 14. FT-SLPD-END

(Sloped Concrete Ends at 35+ MPH)  
Do not use for speeds of 35 MPH  
or more within the clear zone.  
Only for temporary or low speed  
use of 30 MPH or less.



### 15. FT-TEXAS TWIST

"Texas Twist" is  
a turned-down  
rail end bolted  
to ground level.



### 16. BIB

Buried-In- Backslope



**NON-COMPLIANT /  
NO FURTHER  
ASSESSMENT  
NEEDED**

*\*If these are encountered,  
log it, document the  
obstruction, and move to rail analysis.*



# HSIP Guardrail Inventory GET Damage Assessment

## 1. FT-HIT-TERM

Activated or "kinked" energy absorbing terminal or crash cushion. More than one post sheared or cracked. Damage to foundations that disallows repair.



## 2. FT-DEND POST

End post is not functional (sheared, rotted, cracked against the grain)



## 3. FT-HGT

Terminal height is too low or too high. Top of NCHRP 350 or BCT terminal is less than 26.5 in, or top of MASH terminal is higher than 32 in.



## 4. FT-REFL

No web reflectors within 50' of end terminal. Post top reflectors are ok.



## 5. FT-MISS-CBL

Missing Anchor Cable (Usually found on a proprietary Slotted Rail Terminal with horizontal slots shown). Anchor cable also needed on a BCT.



## 6. FT-NO-BRGPL

Missing Bearing Plate

No added bearing plate at cable bolt on end post



## 7. FT-TERM-OFFST

End Terminal Offset Too Far: 2' offset maximum for a 50' terminal. Use a  $\leq 25:1$  offset rate.



## 8. FT-MFR-INSTR

Incorrect Terminal Installation:

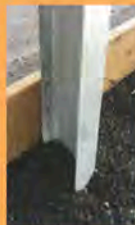
Posts or rail slots facing wrong way to give way on impact. Long bolts where short bolt required. Review manufacturer's installation instructions for alignment and their checklist.



## 9. FT-MOD

Modified Terminals

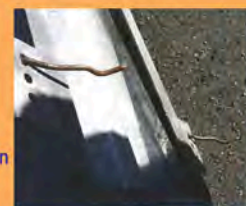
No timber drainage barrier curb or open rock down drains within end terminal area 50'. No web effectors on 50' terminals. Use end delineators only.



## 10. FT-LAG

Lag Screws

Missing or failed lag screws in wood post, extruding terminals. Non galvanized bolting = rusting, poor fit. Improper use of nails.



## 11. FT-NO-BRDG

No bridge connection:

Guardrail transition not attached to bridge rail with a transition piece - there may be a gap between w-beam rail and bridge rail. with no connection. May be older bridges. New standards may require opposing direction treatment.



## 12. FT-NO-TRANS

No stiffened transition:

Guardrail transition not stiffened with increasing post density prior to rigid rail barrier/wall/ bridge connection.



## 13. OTHER

Other F-damage not listed: log/document damage details in comments

**F-DAMAGE**  
\*If these are encountered,

log it, document obstruction, and move to rail analysis

## 14. DT-STRUT

Stub height or "floating strut"

Undercarriage snagging concern - Bottom of strut should be flush with ground or pavement. Problem when steel soil sleeve tubes, post base stubs have steel height which extends 4 inches up from ground level. "Floating strut" crossbar between 1st and 2nd posts should be  $\leq 4"$  from top of strut to adjacent gravel or paved road surface (not used on BCTs).



## 15. DT-CBL-SLK

Anchor Cable Slack:

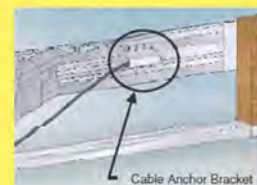
More than 1" of movement when pushed down by hand



## 16. DT-CBL-ANCHR

Anchor Cable Bracket:

Loose or not firmly seated in rail



## 17. DT-BRG-PLT

Loose or misaligned bearing plate



## 18. DT-FLARE

Parallel terminal widening Improper flare pad or approach cross slope. (Proper flare shown)



## 19. DT-BRDGEGAP

Poor Bridge Connection 3'-9" max. between last bridge rail post and 3 beam post.



**D-DAMAGE**  
\* Log all applicable

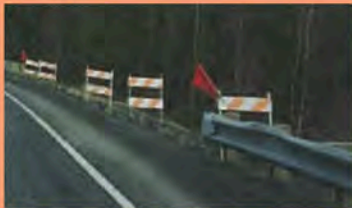
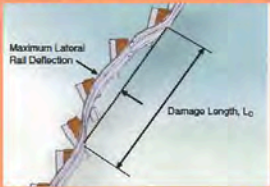

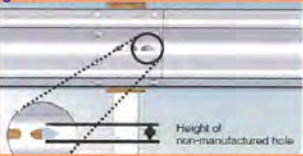





# HSIP Guardrail Inventory

## Types of Guardrail

<b>1. WOOD POST W-BEAM</b> 	<b>2. WOOD POST W-31</b> <p>The W-31 looks just like the W beam with the following differences:</p> <ol style="list-style-type: none"> <li>1. The top of the W-31 beam is mounted at 31" instead of 27.5" for regular W-beam.</li> <li>2. The splice is located mid-span for the W-31 instead of over the post for regular W-beam.</li> </ol>	<b>3. STEEL POST W-BEAM</b> 	<b>4. STEEL POST W-31</b> <p>The W-31 looks just like the W beam with the following differences:</p> <ol style="list-style-type: none"> <li>1. The top of the W-31 beam is mounted at 31" instead of 27.5" for regular W-beam.</li> <li>2. The splice is located mid-span for the W-31 instead of over the post for regular W-beam.</li> </ol>
<b>5. WOOD POST THRIE BEAM</b> 	<b>6. STEEL POST THRIE BEAM</b> 	<b>7. G3S BOX BEAM</b> 	<b>8. G1S CABLE GUARDRAIL</b> 

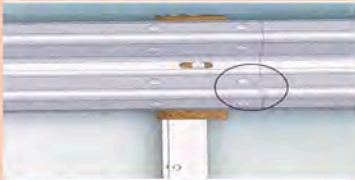
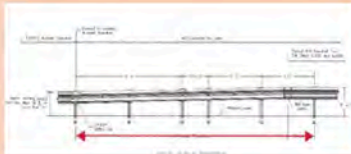
## Guardrail Damage Assessment

<b>1. F-HGT</b> (Rail Height too Low or Too High) Over a 25-ft length of rail (between any 4 standard posts), top pvmt to top rail: Top of W Beam or W-31 rail is higher than 32 inches; Top of W-beam rail is less than 26.5 inches when spliced at post only (2017 and earlier installations); or Top of W rail less than 30 inches when spliced between posts		<b>2. F-MISS-RAIL</b> Missing Rail 	
<b>3. F-DEFL</b> Post and Rail Deflection over 9" in a 25' length of rail (between 4 standard posts) <b>*CAPTURE ALL AREAS OF DEFLECTION*</b> 	<b>4. F-MISS-POST</b> (Missing/Broken Posts) 1 or more posts missing, cracked against the grain, rotted or with metal tears, disconnected from ground level. Includes end posts on guardrail terminals. 		<b>5. F-VERT-TEAR</b> Vertical Tear 
<b>6. F-HOLES</b> Non-Manufactured Holes Crash-induced holes, lug nut damage, or holes rusted through the guardrail: Any holes over 1" high; More than 2 holes less than 1" high over a 12.5' stretch of rail; and Any hole which intersects the top or bottom edge of rail 	<b>7. F-EMBD</b> Loss of post embedment More than one post completely exposed due to erosion. 		<b>8. F-IMPR-SPLC</b> Improper Splice Splice not consistently bolted at posts for older 29" rail, allowed at midspan only for 31" rail, not < 3' off adjacent post  <p>Not a std splice</p> <b>9. F-SPLC-BOLTS</b> Damage at Rail Splice More than 2 splice bolts damaged, missing, visibly missing any underlying guardrail, or torn through rail.  <p><b>F-DAMAGE</b>  <i>* If encountered, log it and move to next segment</i></p>



# HSIP Guardrail Inventory

## Guardrail Damage Assessment (Continued)

<div><b>10. D-POST-SEP</b></div> <div>Posts Separated: 2 or more posts with a block out attached with a post/rail separation less than 3 in. 1 or more posts with a post/rail separation which exceeds 3 in. If the blockout is not firmly attached to the post, use the missing blockout attribute.</div> <div></div>	<div><b>11. D-MISS-BLKT</b></div> <div>Any blockouts missing, cracked against the grain, cracked from top or bottom of blockout through post bolt hole, or rotted.</div> <div></div>	<div><b>12. TWST-BLKT</b></div> <div>Twisted blockouts</div> <div></div>	
<div><b>13. D-DEFL</b></div> <div>Post and Rail Separation <math>\leq 9"</math>  6-9 in lateral deflection anywhere over a 25' length of rail or between 2 adjacent posts.</div> <div></div>	<div><b>14. D-HORIZ-TEAR</b></div> <div>Any horizontal tear greater than 12" long or 0.5" wide. (If there are any horizontal tears smaller than that, use the non manufactured holes attribute.)</div> <div></div>	<div><b>15. D-FLAT-RAIL</b></div> <div>Rail cross-section height is <math>&gt; 17"</math> (such as may occur if the rail is flattened), or rail cross-section height is <math>&lt; 9"</math> (such as a dent to the top edge).</div> <div></div>	<div><b>16. D-SPLC-BOLT</b></div> <div>Bolt missing, torn or damaged at rail splice (only one bolt damaged)</div> <div></div>
<div><b>17. D-REFL</b></div> <div>Web Reflectors Location Poor Should not be installed on splice or on post bolts, should only be between posts. Post top reflectors are ok.</div> <div></div>	<div><b>18. D-SHORT-TRANS</b></div> <div>W-Beam (29") to W-31 (31") transition too short. 25' transition length required.</div> <div></div>	<div><b>19. D-LOOSE HARDWARE</b></div> <div><b>D-DAMAGE</b> * Log all applicable</div>	

## Process Overview

### Terminal Assessment

1. Obtain GET height in inches
2. Determine GET type
3. Take 3 Photos - one detailing the GET, one looking up the rail, and one looking backwards along an imaginary rail extension

**\*If the GET type failed, document the obstruction and move to rail assessment**

### 4. Perform GET Damage Assessment

**\*If any F damage is noted, document the obstruction and move to rail assessment.**

**If no F damage is noted, select all D-damage that applies (use comment field if needed) and move to the rail assessment.**

### Rail Assessment

1. Obtain rail height in inches
2. Determine rail type
3. Perform Rail Damage Assessment

**\*If any F damage is noted, the assessment can stop**

**If no F damage is noted, select all D-damage that applies (use comment field if needed).**

**The 'DAM' code and additional photos can be used to document instances of additional damage.**