



U.S. Department
of Transportation
**Federal Highway
Administration**

1200 New Jersey Ave., SE
Washington, D.C. 20590

May 1, 2013

In Reply Refer To:
HSST/CC-115D

Mr. Brian Smith
Trinity Highway Products, LLC
2525 North Stemmons Freeway
Dallas, Texas 75207

Dear Mr. Smith:

This correspondence supersedes existing eligibility letter HSST/CC-115A dated September 7, 2012 and is in response to your request for additional system details for furthered consideration for Federal Highway Administration (FHWA) review of the as-described roadside safety system for eligibility for reimbursement under the Federal-aid highway program.

Name of system: Trinity TL3 SOFT-STOP Terminal
Type of system: W-Beam Guardrail Terminal
Test Level: MASH Test Level 3 (TL-3)
Testing conducted by: Original testing by Texas Transportation Institute
Task Force 13 Designator: SEW22
Date of request: January 23, 2013
Date of final package: April 12, 2013

Decision:

The following device is eligible, with details provided in the form which is attached as an integral part of this letter.

- Trinity TL3 SOFT-STOP Terminal

Based on a review of previous crash tests submitted by the manufacturer certifying the device described herein meets the crash test and evaluation criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH), the device is eligible for reimbursement under the Federal-aid highway program. Eligibility for reimbursement under the Federal-aid highway program does not establish approval or endorsement by the FHWA for any particular purpose or use.

The FHWA, the Department of Transportation, and the United States Government do not endorse products or services and the issuance of a reimbursement eligibility letter is not an endorsement of any product or service.

FHWA: HSST: WLongstreet: sf.x60087: WLongstreet: 4/24/13
File: h://directory folder/HSST/ CC-115D_TL3 SOFT-STOP Terminal.docx
cc: HSST Will Longstreet

Requirements

To be found eligible for Federal-aid funding, roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH).

Description

The device and supporting documentation are described in the attached form.

Summary and Standard Provisions

Therefore, the system described and detailed in the attached form is eligible for reimbursement and may be installed under the range of conditions tested.

Please note the following standard provisions that apply to FHWA eligibility letters:

- This letter provides a AASHTO/ARTBA/AGC Task Force 13 designator that should be used for the purpose of the creation of a new and/or the update of existing Task Force 13 drawing for posting on the on-line 'Guide to Standardized Highway Barrier Hardware' currently referenced in AASHTO Roadside Design Guide.
- This finding of eligibility does not cover other structural features of the systems, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may influence system conformance with MASH will require a new reimbursement eligibility letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals safety problems, or that the system is significantly different from the version that was crash tested, we reserve the right to modify or revoke this letter.
- You are expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of the MASH.
- To prevent misunderstanding by others, this letter of eligibility is designated as number CC-115D and shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed at our office upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder. The FHWA does not become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.
- The Trinity SOFT-STOP Terminal is a patented product and considered proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures



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of Transportation
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Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

A handwritten signature in blue ink that reads "Michael S. Griffith". The signature is written in a cursive style with a large initial "M" and "G".

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility Of Highway Safety Hardware

Submitter	Date of Request:	April 11, 2013
	Name:	Don Gripne
	Company:	TRINITY HIGHWAY PRODUCTS, LLC
	Address:	2525 STEMMONS FREEWAY, DALLAS, TX 75207
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

System Type	Device Name / Variant	Testing Criterion	Test Level
CC: Crash Cushions, Attenuators, <input checked="" type="checkbox"/>	TRINITY TL-3 SOFT-STOP TERMINAL	AASHTO MASH <input checked="" type="checkbox"/>	TL3 <input checked="" type="checkbox"/>

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the test / evaluation results meet the appropriate evaluation criteria in the MASH.

Identification of the individual or organization responsible for the product:

Don Jay Gripne

Contact Name:	BRIAN SMITH
Company Name:	TRINITY HIGHWAY PRODUCTS, LLC
Address 1:	2525 STEMMONS FREEWAY
Address 2:	
City/State/Zip:	DALLAS, TX 75207
Country:	USA

PRODUCT DESCRIPTION

<input type="radio"/> New Hardware	<input checked="" type="radio"/> Modification to Existing Hardware	<input type="radio"/> Non-Significant - Effect is positive or inconsequential
<p>The original crash test of the Trinity SoftStop (TTI Crash Report 2009) as per Eligibility Letter CC-115 dated December 19, 2011 specified steel post and w-beam guardrail using 12-Inch wood block out. The crash test was conducted by Texas Transportation Institute (TTI) entitled NCHRP 350 Crash Testing and Evaluation of the Vertical Squisher dated February 2009 (TTI Crash Report 2009).</p> <p>This request is to accept the as-tested article as per CC-115 for the following:</p> <ol style="list-style-type: none"> 1. A MASH TL-3 Soft Stop Terminal with a length of 50'-9 1/2'. 2. 12 Inch or 8 Inch wood/composite block outs. 3. An offset 2-foot from tangent, flare rate of 25:1. 4. For attachment to 8-inch/12-inch block out systems or no blockout W-beam guardrail systems. <p>This modification is considered Non-significant, Effect is Positive or Inconsequential.</p>		

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Identification of the individual or organization responsible for the product:

Contact Name:	BRIAN SMITH
Company Name:	TRINITY HIGHWAY PRODUCTS, LLC
Address 1:	2525 STEMMONS FREEWAY
Address 2:	
City/State/Zip:	DALLAS, TX 75207
Country:	USA

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CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-30 (1100C)	As per TTI Crash Report 2009, an 1100C (24251b) passenger car impacting the terminal end-on at a nominal impact speed and angle of 62 mi/h and 0 degree, respectively, with the quarter point of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT -STOP slowed and redirected the 1100C vehicle. No occupant compartment deformation occurred. The 1100C vehicle remained upright during and after the collision event. Maximum roll was 25 degrees, and maximum pitch was 7 degrees. Occupant risk factors were within the limits specified for MASH test 3-30. The vehicle subsequently came to rest 27 feet downstream of impact and 34 feet toward traffic lanes. The SOFT-STOP performed acceptably according to the evaluation criteria of MASH test 3-30.	WAIVER REQUES
3-31 (2270P)	As per TTI Crash Report 2009, A 2270P (5000 lb) pickup truck impacting the terminal end-on at a nominal impact speed and angle of 62 mi/h and 0 degree, respectively, with the center line of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT-STOP brought the 2270P vehicle to a controlled stop. No occupant compartment deformation occurred. The 2270P vehicle remained upright during and after the collision event. Maximum roll was 4 degrees, and maximum pitch was -3 degrees. Occupant risk factors were within the limits specified for MASH test 3-31. The 2270P vehicle came to rest within the installation. The SOFT-STOP performed acceptably according to the evaluation criteria of MASH test 3-31.	WAIVER REQUES
3-32 (1100C)	As per TTI Crash Report 2009, an 1100C (24251b) passenger car impacting the terminal end-on at a nominal impact speed and angle of 62 mph and 5/15 degrees, respectively, with the center line of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT -STOP slowed and stopped the 1100C vehicle. No occupant compartment deformation occurred. The 1100C vehicle remained upright during and after the collision event. Maximum roll was 28 degrees, and maximum pitch was -26 degrees. Occupant risk factors were within the limits specified for MASH test 3-32. The vehicle subsequently came to rest with the front of the vehicle adjacent to post 4 of the terminal, with most of the vehicle toward the field side. The SOFT -STOP performed acceptably according to the evaluation criteria of MASH test 3-32.	WAIVER REQUES
3-33 (2270P)	As per TTI Crash Report 2009, the 2000P vehicle, traveling at an impact speed of 62.7 mi/h, impacted the nose of the Vertical Squisher end-on at an impact angle of 16.3 degrees. At 0.044 s after impact, the head of the terminal began to move along the rail, and at 0.093 s, the 2000P vehicle began to redirect toward the field side. The front right tire contacted the terminal at 0.207 s. The vehicle began to travel parallel with the guardrail at 0.285 s, at a speed of 48.2 mi/h (77.6 km/h). At 0.372 s, the 2000P vehicle overrode the terminal and lost contact with the guardrail and was traveling at an exit speed and angle of 51.7 mi/h (83.2 km/h) and 1.8 degrees, respectively. After completely exiting the installation, the 2000P vehicle partially traversed a steep mound of soil and came to rest on its right side 242 ft downstream and 30 ft toward the field side.	WAIVER REQUES

Required Test Number	Narrative Description	Evaluation Results
3-34 (1100C)	<p>As per TTI Crash Report 2009, an 1100C (24251b) passenger car impacting the terminal at a nominal impact speed and angle of 62 mi/h and 15 degrees, respectively, with the corner of the vehicle bumper aligned with the critical impact point (CIP) of the length of need (LON) of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT-STOP contained and redirected the 1100C vehicle. The vehicle did not penetrate or override the installation. Maximum dynamic deflection was 1.96 feet and the head fed through 6.2 feet of w-beam rail element. Maximum occupant compartment deformation was 1.0 inch inward in the area of the instrument panel on the left side. The 1100C vehicle remained upright during and after the collision event. Maximum roll was 10 degrees, and maximum pitch was -4 degrees. Occupant risk factors were within the limits specified for MASH test 3-34. The vehicle subsequently came to rest 15 feet toward traffic lanes in front of post 8. The SOFT -STOP performed acceptably according to the evaluation criteria of MASH test 3-34.</p>	WAIVER REQUES
3-35 (2270P)	<p>As per TTI Crash Report 2009, a 2270P (5000 lb) pickup truck impacting the terminal at a nominal impact speed and angle of 62 mi/h and 25 degrees, respectively, with the corner of the vehicle bumper aligned with the beginning of the LON of the terminal. This test is primarily intended to evaluate structural adequacy and vehicle trajectory criteria. The SOFT-STOP contained and redirected the 2270P. The vehicle did not under ride or override the installation. Although the w-beam rail anchorage released late in the impact event, the vehicle did not penetrate the installation. While the vehicle was in contact with the w-beam, the maximum dynamic deflection was 10.4 feet. However, the upstream anchor released and as the vehicle lost contact with the w-beam, the w-beam continued to deflect, reaching a maximum displacement of 11.6 feet. The kickpanel of the left side was deformed inward 0.4 inch. The 2270P vehicle remained upright during and after the collision event. Maximum roll was -30 degrees, and maximum pitch was -12 degrees. Occupant risk factors were within the preferred limits specified for MASH test 3-31. The 2270P vehicle exited within the exit box. The SOFT -STOP performed acceptably according to the evaluation criteria of MASH test 3-35.</p>	WAIVER REQUES
3-36 (2270P)	<p>As per TTI Crash Report 2009, a 2270P (5000 lb) pickup truck impacting the terminal at a nominal impact speed and angle of 62 mi/h and 25 degrees, respectively, with the corner of the vehicle bumper aligned with the CIP with respect to the transition to the stiff barrier or backup structure. As a w-beam guardrail terminal, the SOFT-STOP will never be attached directly to a backup structure, and the transition to a stiff barrier is basically at Post 3. Therefore, Trinity feels that Test 3-36 is irrelevant and was therefore not conducted.</p> <p>Eligibility Letter CC-115 indicated that MASH test 3-36 may be waived because the SOFT-STOP will not be connected to any stiffer device than W-beam guardrail.</p>	WAIVER REQUES
3-37 (2270P)	<p>As per TTI Crash Report 2009, a 2270P (5000 lb) pickup truck impacting the terminal at a nominal impact speed and angle of 62 mi/h and 25 degrees, respectively, mid-point between the nose and the end of the terminal in the reverse direction. This test is intended to evaluate the performance of a terminal for a "reverse" hit. However, researchers at TTI believe that the reverse direction impact would be more critical for the 1100C (2425 lb) passenger car than for the 2270P pickup. Therefore, an 1100C (2425 lb) passenger car was used in Test 3-37.</p> <p>Eligibility Letter CC-115 indicated that the substitution of the 1100C vehicle to evaluate the reverse direction impact was appropriate.</p>	WAIVER REQUES

3-38 (1500A)	As per TTI Crash Report 2009, a 1500A (33071b) passenger car impacting the terminal end-on at a nominal impact speed and angle of 62 mi/h and 0 degree, respectively, with the center line of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate the performance of the staged attenuator/terminal when impacted by a mid-size vehicle. The SOFT-STOP is not a staged device. Therefore Test3-38 was not conducted. However, as per Appendix G of MASH, calculations based on Test 3-31 have been performed to predict the occupant risk values for the 1500A (33071b) vehicle. The results of these calculations (shown on the enclosed document) predict that in crash testing with the 1500A (33071b) vehicle, the SOFT-STOP Terminal, would perform acceptably according to the Test Level 3 (TL-3) evaluation criteria set out in the MASH guidelines for terminals. Eligibility Letter CC-115 indicates that test 3-38 is not necessary because the SOFT-STOP is not a staged device and that manufacturers calculations predict crash worthy performance with the 1500A vehicle.	WAIVER REQUES
3-40 (1100C)	Does not apply to non-gating/energy absorbing devices.	
3-41 (2270P)	Does not apply to non-gating/energy absorbing devices.	
3-42 (1100C)	Does not apply to non-gating/energy absorbing devices.	
3-43 (2270P)	Does not apply to non-gating/energy absorbing devices.	
3-44 (2270P)	Does not apply to non-gating/energy absorbing devices.	
3-45 (1500A)	Does not apply to non-gating/energy absorbing devices.	

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Texas Transportation Institute
Laboratory Contact:	Dean Alberson
Address:	3135 TAMU, College Station, TX. 77843-3135
Country:	USA
Accreditation Certificate Number and Date:	Mechanical 2821.01, Current date April 30, 2013

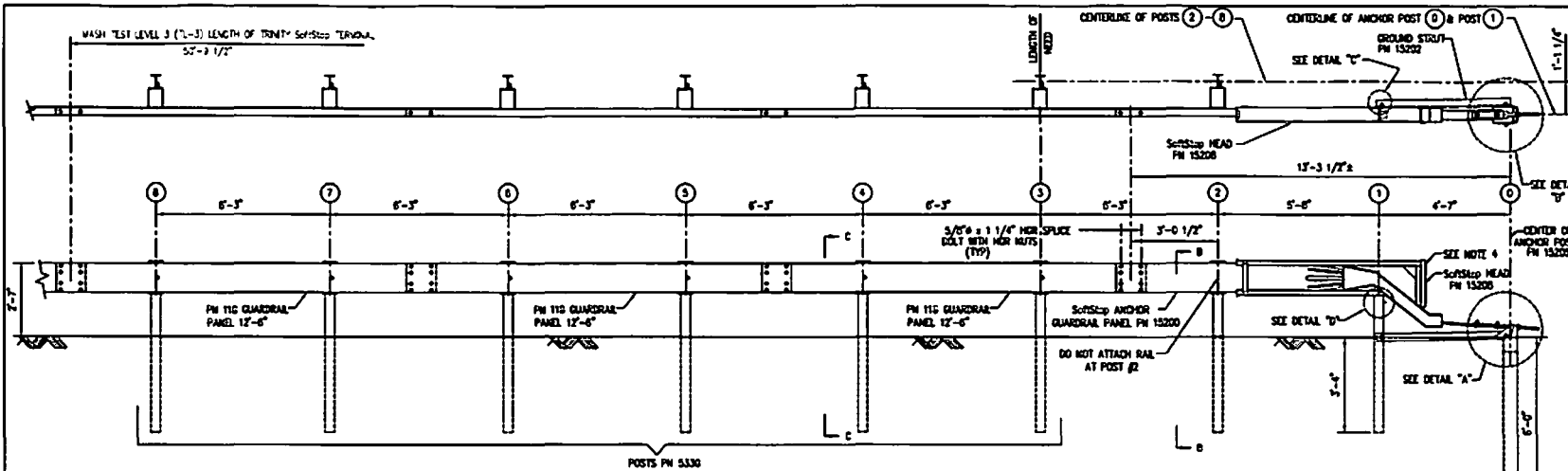
ATTACHMENTS

Attach to this form:

- 1) A copy of the Test Data Summary Sheet for each test conducted in support of this request.
- 2) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are key to understanding the performance of the device should also be submitted to facilitate our review.

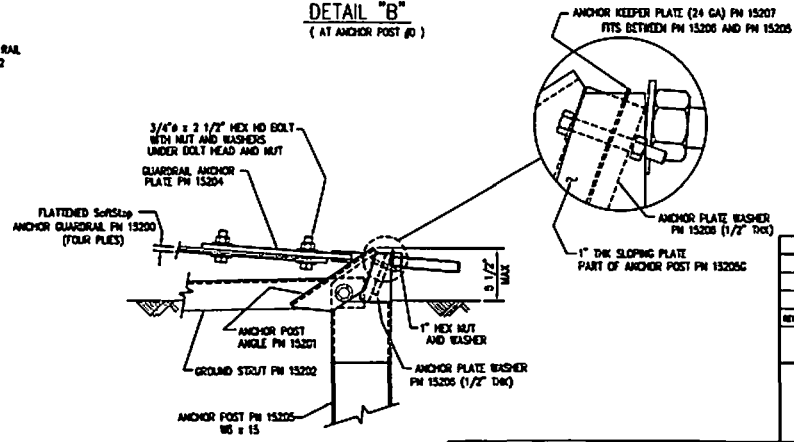
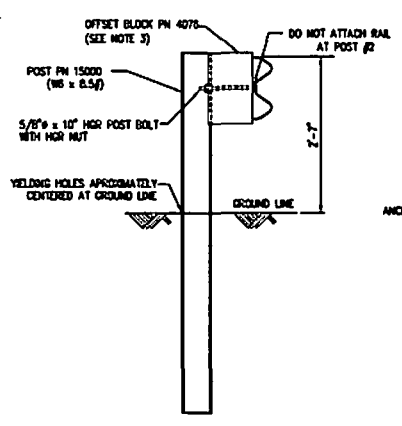
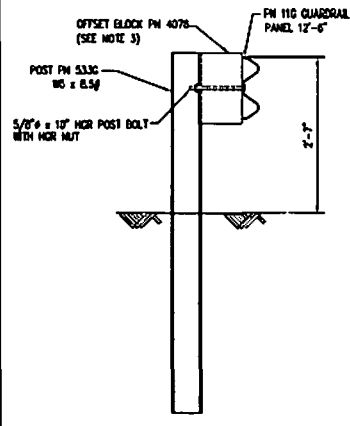
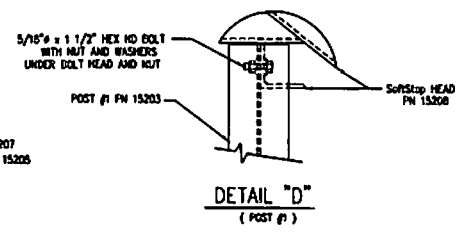
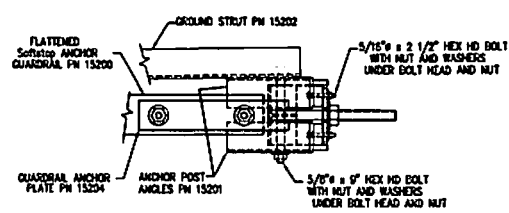
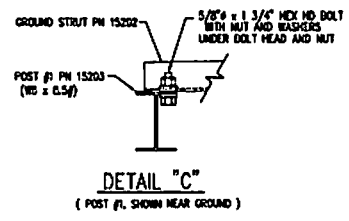
FHWA Official Business Only:

Eligibility Letter		AASHTO TF13	
Number	Date	Designator	Key Words
CC-115D	April 22, 2013	SEW22	TL3, non-gating/energy absorbing terminal, tensioned wbeam guardrail terminal, steel yielding terminal posts, deflector terminal head.



BILL OF MATERIAL			
PART NUMBER	QTY	DESCRIPTION	
11G	3	12/12/5/71.5/5 GUARDRAIL (FORD)	
153000	1	SoftStop ANCHOR QUADRANT (12CA)	
15300A	1	SoftStop HEAD	
15300C	1	POST #1 4'-9 1/2" (STD)	
15300D	1	POST #2 4'-2" (STD)	
4075B	7	OFFSET BLOCK 6" x 6" x 14"	
15300A	1	QUADRANT ANCHOR PLATE	
15300A	1	ANCHOR POST #0	
15300C	2	ANCHOR POST ANGLE 10" LG	
15300E	1	ANCHOR KEEPER PLATE (24 GA)	
15300G	1	ANCHOR PLATE WASHER (1/2" DIA)	
15300H	1	GROUND STRUT = 4'-6 1/2"	
533C	8	POST #3-#8 6'-0" HARDWARE	
60020	1	1" WASHER	F-436
32000	1	1" FUEL NUT	A563 DN
37170	2	3/4" x 2 1/2" HEX HD BOLT	A-325
53025	4	3/4" WASHER	F-430
33040	2	3/4" HEX NUT	A563 DN
33040	2	5/8" x 1 1/4" HEX SPLICE BOLT	A-307
33040	7	5/8" x 10" HGR POST BOLT	A-307
33040	1	5/8" x 1 3/4" HEX HD BOLT	A-325
44000	1	5/8" x 6" HEX HD BOLT	F-436
43720	4	5/8" WASHER	F-436
33040	2	5/8" HEX NUT	A563 DN
33040	2	5/8" HEX NUT	A563 A
103000G	2	5/16" x 2 1/2" HEX HD BOLT	68-5
103000G	1	5/16" x 1 1/2" HEX HD BOLT	68-5
32400	8	5/16" WASHER	A-307
32440	3	5/16" HEX NUT	N104 BK
ANCHOR QUADRANT PANEL PREP HARDWARE			
33000	4	5/8" WASHER	F-644
33400	4	5/8" HGR HEX NUT	A563 A
45520	2	5/8" x 15" ALL THREAD ROD	A-307

- NOTES:
- 1) REFER TO SoftStop ASSEMBLY MANUAL.
 - 2) SoftStop IS A MASH TEST LEVEL 3 (TL-3) END TREATMENT.
 - 3) 8" DEEP PLASTIC OFFSET BLOCKS (ROUNDED) ARE ACCEPTABLE ALTERNATIVES.
 - 4) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE RELECTORIZATION OF THE TERMINAL.

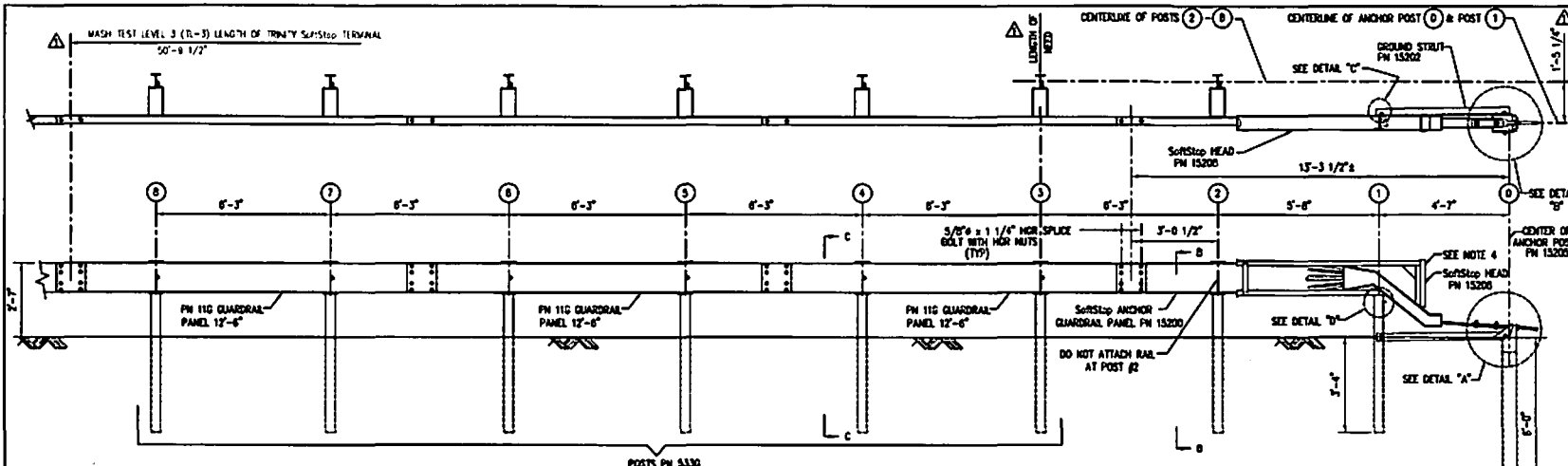


REV		CHG	BY	DATE	REASON
TRINITY SoftStop TERMINAL (6" BLOCKS) PLAN, ELEVATION & SECTION MASH TEST LEVEL 3 (TL-3)					
DESIGN	BY				
CHECKED	ES				
SCALE	N.T.S.				
DATE	11/14/93				
DRW FILE #	SS 645-02				
DRAWN	ES				
DESIGN	ES				
DRAWING NO.	SS 646	REV	0		

The drawings and the information shown herein are copyrighted by Trinity Highway Products (2003) and the sole property of Trinity Highway Products. Neither the drawings nor such information is to be used for any purpose other than that which it was specifically furnished from Trinity Highway Products LLC, nor in any reproduction without written permission.

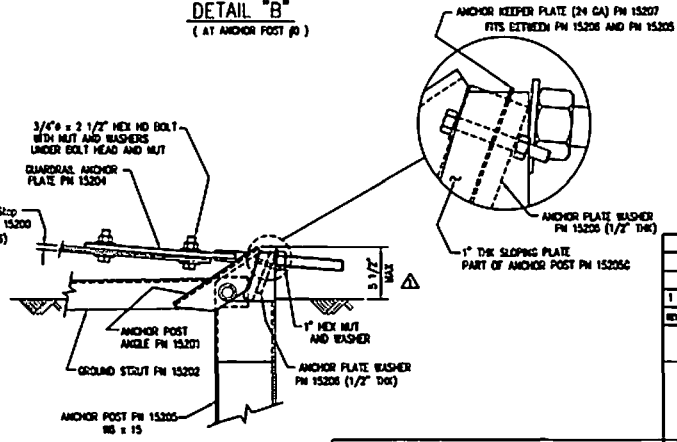
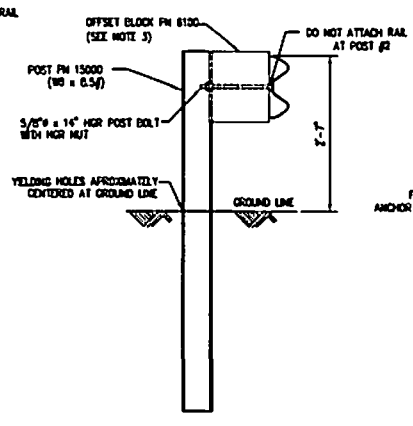
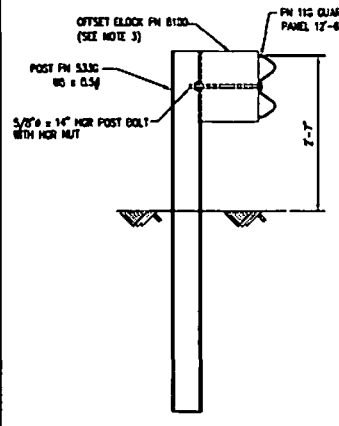
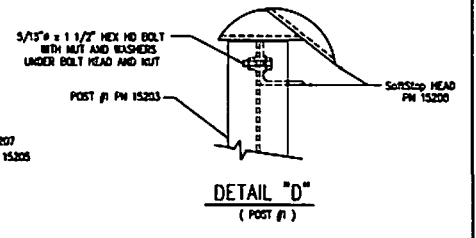
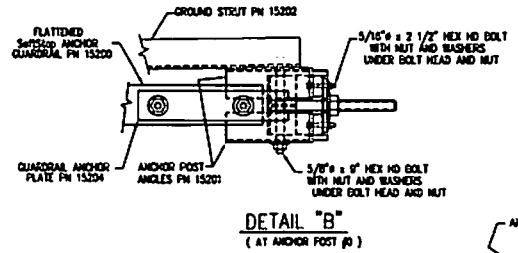
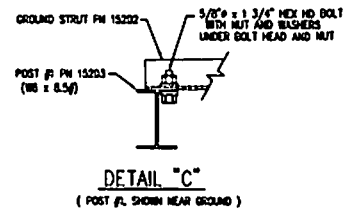


TRINITY HIGHWAY PRODUCTS, L.L.C.
2525 STEWARTS FREDWAY
DALLAS, TX 75207



BILL OF MATERIAL			
PART NUMBER	QTY	DESCRIPTION	
11C	3	12 1/2" x 5 1/2" x 5" QUADRANGULAR (TRGA)	
152000	1	SoftStop ANCHOR QUADRANGULAR (12GA)	
152004	1	SoftStop HEAD	
152006	1	POST #1 4'-9 1/2" (STYP)	
152008	1	POST #2 6'-0" (STYP)	
61000	7	OFFSET BLOCK 6 x 12 x 14	
152044	1	QUADRANGULAR ANCHOR PLATE	
152054	1	ANCHOR POST #0	
152010	2	ANCHOR POST ANGLE 10" LG	
152076	1	ANCHOR KEEPER PLATE (24 GA)	
152086	1	ANCHOR PLATE WASHER (1/2" DIA)	
152026	1	GROUND STOUT 4'-8 1/4"	
5330	8	POST #3-#8 6'-0"	
HARDWARE			
49020	1	1" WASHER	F-430
39080	1	1" HEX NUT	A-363 CH
37170	2	3/4" x 2 1/2" HEX HD BOLT	A-325
37010	4	3/4" WASHER	F-430
37040	2	3/4" HEX NUT	A-363 CH
33800	32	5/8" x 1 1/4" HEX SPLICE BOLT	A-307
33400	7	5/8" x 14" HEX POST BOLT	A-325
33710	1	5/8" x 1 3/4" HEX HD BOLT	A-325
44800	1	5/8" x 9" HEX HD BOLT	A-325
43720	4	5/8" WASHER	F-430
33810	2	5/8" HEX NUT	A-363 CH
33400	2	5/8" HEX HD BOLT	A-363 CH
1028206	2	5/16" x 2 1/2" HEX HD BOLT	GR-5
1028205	1	5/16" x 1 1/2" HEX HD BOLT	GR-5
32400	6	5/16" WASHER	GR-5
32440	3	5/16" HEX NUT	A194 2H
ANCHOR QUADRANGULAR PANEL PREP HARDWARE			
33000	4	5/8" WASHER	F-444
33400	4	5/8" HEX HD BOLT	A-363 CH
49020	2	5/8" x 15" ALL THREAD ROD	A-307

- NOTES:
- 1) REFER TO SoftStop ASSEMBLY MANUAL.
 - 2) SoftStop IS A MASH TEST LEVEL 3 (TL-3) END TREATMENT.
 - 3) 12" DEEP PLASTIC OFFSET BLOCKS (ROUTED) ARE ACCEPTABLE ALTERNATES.
 - 4) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZATION OF THE TERMINAL.

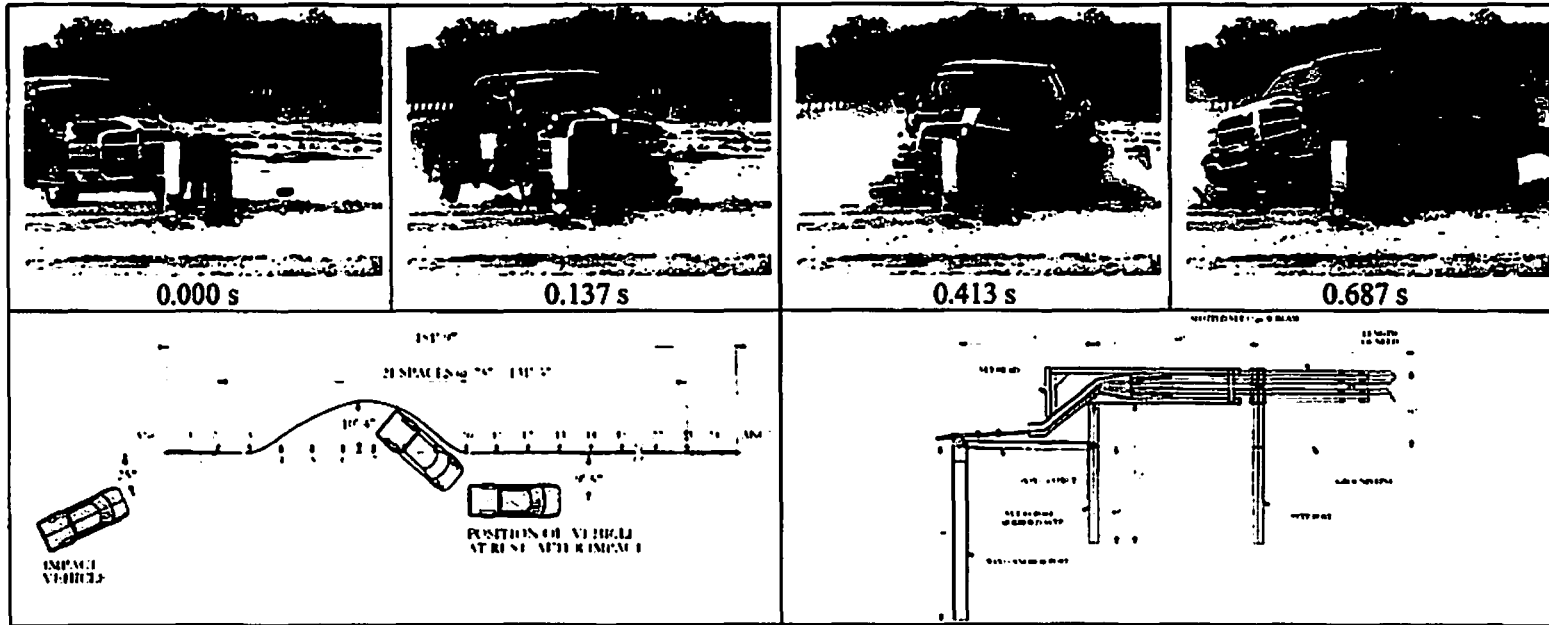


1	SC	BT	5/14/12	ADDED DIMENSIONS AT ANCHOR POST, L&L, NOTES & SYSTEM LENGTH
REV	DATE	BY	REASON	
TRINITY SoftStop TERMINAL (12" BLOCKS) PLAN, ELEVATION & SECTION MASH TEST LEVEL 3 (TL-3)				
DESIGN	BT			
DRAWN	ES			
CHECK	M.L.S.			
DATE	07/10/12			
CON. FILE #	SS 645-012			
DRAWN	ET OF 1			
REVISED NO.	SS 645	REV		

The drawings and the information shown herein are copyrighted by Trinity Highway Products (2002) and the sole property of Trinity Highway Products. Without the drawings and such information to be used for any purpose other than that which it was specifically furnished from Trinity Highway Products, LLC, nor in any reproduction, without the written permission.



TRINITY HIGHWAY PRODUCTS, LLC.
 2525 STEVENS FREETWAY
 DALLAS, TX 75207



General Information

Test Agency..... Texas Transportation Institute
 Test No. 400001-TSQ1
 Date 2009-10-01
Test Article
 Type..... Terminal
 Name Vertically Loading Terminal (VLT)
 Installation Length 151.75 ft
 Material or Key Elements 31 in tall 12 ga w-beam, steel posts

Soil Type and Condition..... Standard Soil, Damp

Test Vehicle

Type/Designation..... 2270P
 Make and Model 2003 Dodge Ram 1500 quad-cab pickup
 Curb 4708 lb
 Test Inertial..... 5028 lb
 Dummy No dummy
 Gross Static..... 5028 lb

Impact Conditions

Speed 63.5 mi/h
 Angle 26.4 degrees
 Location/Orientation At Post 3

Exit Conditions

Speed Out of view
 Angle Out of view

Occupant Risk Values

Impact Velocity
 Longitudinal 15.8 ft/s
 Lateral 14.4 ft/s

Ridedown Accelerations

Longitudinal -11.0 G
 Lateral 7.9 G
 THIV 21.0 km/h
 PHD 11.6 G

Max. 0.050-s Average

Longitudinal -4.7 G
 Lateral 5.0 G
 Vertical 2.5 G

Post-Impact Trajectory

Stopping Distance 62.5 ft downstrm
 9.4 ft twd traffic

Vehicle Stability

Maximum Yaw Angle 74 degrees
 Maximum Pitch Angle -12 degrees
 Maximum Roll Angle -30 degrees
 Vehicle Snagging No
 Vehicle Pocketing No

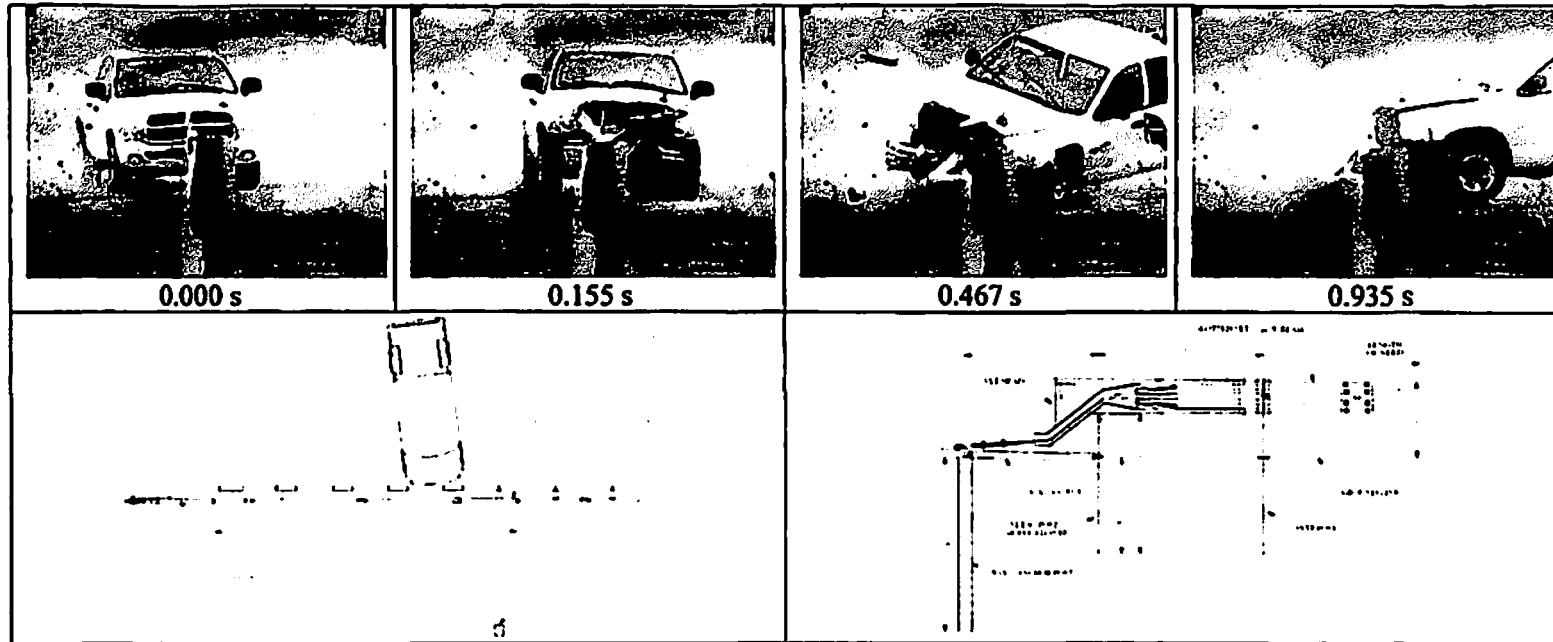
Test Article Deflections

Dynamic 11.6 ft
 Permanent 11.2 ft
 Working Width 10.4 ft

Vehicle Damage

VDS 11LFQ4
 CDC 11FDEW3
 Max. Exterior Deformation 16.0 inches
 Max. Occupant Compartment
 Deformation 0.4 inch

Summary of results for *MASH* test 3-35 on the VLT.



General Information

Test Agency..... Texas Transportation Institute
 Test No. 400001-TSQ6
 Date 2010-01-06

Test Article

Type..... Terminal
 Name Vertically Loading Terminal (VLT)
 Installation Length 151.75 ft
 Material or Key Elements 31 in tall 12 ga w-beam, steel posts

Soil Type and Condition..... Standard Soil, Damp

Test Vehicle

Type/Designation..... 2270P
 Make and Model..... 2003 Dodge Ram 1500 quad-cab pickup
 Curb..... 4695 lb
 Test Inertial..... 4958 lb
 Dummy No dummy
 Gross Static..... 4958 lb

Impact Conditions

Speed60.9 mi/h
 Angle 7.3 degrees
 Location/OrientationEnd-on

Exit Conditions

SpeedOut of view
 AngleOut of view

Occupant Risk Values

Impact Velocity
 Longitudinal21.0 ft/s
 Lateral 3.0 ft/s
 Ridedown Accelerations
 Longitudinal-9.5 G
 Lateral 3.8 G
 THIV23.3 km/h
 PHD 9.7 G
 Max. 0.050-s Average
 Longitudinal-7.3 G
 Lateral 2.8 G
 Vertical-3.1 G

Post-Impact Trajectory

Stopping Distance28 ft downstm
 Adjct to field side

Vehicle Stability

Maximum Yaw Angle..... 85 degrees
 Maximum Pitch Angle..... 5 degrees
 Maximum Roll Angle.....-21 degrees
 Vehicle Snagging.....No
 Vehicle Pocketing.....No

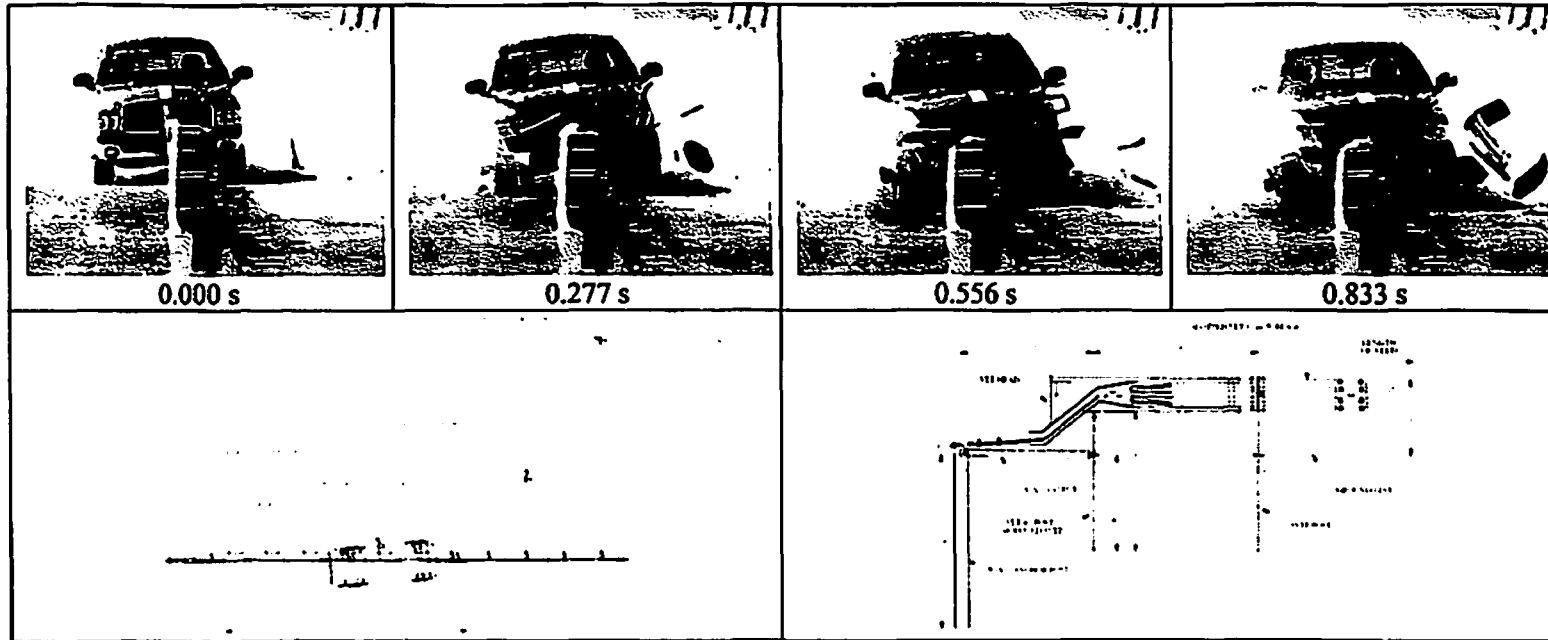
Test Article Deflections

Dynamic..... 2.0 ft
 Permanent 2.0 ft
 Working Width.....14.7 ft

Vehicle Damage

VDS12FC5
 CDC.....12FCEN4
 Max. Exterior Deformation..... 17.75 inches
 Max. Occupant Compartment
 Deformation.....0

Summary of results for *MASH* test 3-33 on the VLT.



General Information

Test Agency..... Texas Transportation Institute
 Test No. 400001-TSQ7
 Date 2010-01-12

Test Article

Type..... Terminal
 Name Vertically Loading Terminal (VLT)
 Installation Length 151.75 ft
 Material or Key Elements 31 in tall 12 ga w-beam, steel posts

Soil Type and Condition..... Standard Soil, Damp

Test Vehicle

Type/Designation..... 2270P
 Make and Model 2002 Dodge Ram 1500 quad-cab pickup
 Curb 5024 lb
 Test Inertial..... 5084 lb
 Dummy No dummy
 Gross Static..... 5084 lb

Impact Conditions

Speed 61.1 mi/h
 Angle 1.4 degrees
 Location/Orientation End-on

Exit Conditions

Speed Out of view
 Angle 5.0 degrees

Occupant Risk Values

Impact Velocity
 Longitudinal 20.0 ft/s
 Lateral 0.0 ft/s
 Ridedown Accelerations
 Longitudinal -8.6 G
 Lateral -2.3 G
 THIV 21.8 km/h
 PHD 8.6 G
 Max. 0.050-s Average
 Longitudinal -5.0 G
 Lateral -0.8 G
 Vertical 2.3 G

Post-Impact Trajectory

Stopping Distance 37.5 ft downstrm
 Over posts 6-7

Vehicle Stability

Maximum Yaw Angle 3 degrees
 Maximum Pitch Angle -3 degrees
 Maximum Roll Angle 4 degrees
 Vehicle Snagging No
 Vehicle Pocketing No

Test Article Deflections

Dynamic 45.7 ft
 Permanent 45.7 ft
 Working Width 4.4 ft

Vehicle Damage

VDS 12FC5
 CDC 12FCEN4
 Max. Exterior Deformation 17.0 inches
 Max. Occupant Compartment
 Deformation 0

Summary of results for *MASH* test 3-31 on the VLT.



U.S. Department
of Transportation
**Federal Highway
Administration**

1200 New Jersey Ave., SE
Washington, D.C. 20590

May 1, 2013

In Reply Refer To:
HSST/CC-115D

Mr. Brian Smith
Trinity Highway Products, LLC
2525 North Stemmons Freeway
Dallas, Texas 75207

Dear Mr. Smith:

This correspondence supersedes existing eligibility letter HSST/CC-115A dated September 7, 2012 and is in response to your request for additional system details for furthered consideration for Federal Highway Administration (FHWA) review of the as-described roadside safety system for eligibility for reimbursement under the Federal-aid highway program.

Name of system: Trinity TL3 SOFT-STOP Terminal
Type of system: W-Beam Guardrail Terminal
Test Level: MASH Test Level 3 (TL-3)
Testing conducted by: Original testing by Texas Transportation Institute
Task Force 13 Designator: SEW22
Date of request: January 23, 2013
Date of final package: April 12, 2013

Decision:

The following device is eligible, with details provided in the form which is attached as an integral part of this letter.

- Trinity TL3 SOFT-STOP Terminal

Based on a review of previous crash tests submitted by the manufacturer certifying the device described herein meets the crash test and evaluation criteria of the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH), the device is eligible for reimbursement under the Federal-aid highway program. Eligibility for reimbursement under the Federal-aid highway program does not establish approval or endorsement by the FHWA for any particular purpose or use.

The FHWA, the Department of Transportation, and the United States Government do not endorse products or services and the issuance of a reimbursement eligibility letter is not an endorsement of any product or service.

Requirements

To be found eligible for Federal-aid funding, roadside safety devices should meet the crash test and evaluation criteria contained in the American Association of State Highway and Transportation Officials' Manual for Assessing Safety Hardware (MASH).

Description

The device and supporting documentation are described in the attached form.

Summary and Standard Provisions

Therefore, the system described and detailed in the attached form is eligible for reimbursement and may be installed under the range of conditions tested.

Please note the following standard provisions that apply to FHWA eligibility letters:

- This letter provides a AASHTO/ARTBA/AGC Task Force 13 designator that should be used for the purpose of the creation of a new and/or the update of existing Task Force 13 drawing for posting on the on-line 'Guide to Standardized Highway Barrier Hardware' currently referenced in AASHTO Roadside Design Guide.
- This finding of eligibility does not cover other structural features of the systems, nor conformity with the Manual on Uniform Traffic Control Devices.
- Any changes that may influence system conformance with MASH will require a new reimbursement eligibility letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals safety problems, or that the system is significantly different from the version that was crash tested, we reserve the right to modify or revoke this letter.
- You are expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You are expected to certify to potential users that the hardware furnished has the same chemistry, mechanical properties, and geometry as that submitted for review, and that it will meet the test and evaluation criteria of the MASH.
- To prevent misunderstanding by others, this letter of eligibility is designated as number CC-115D and shall not be reproduced except in full. This letter and the test documentation upon which it is based are public information. All such letters and documentation may be reviewed at our office upon request.
- This letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented system for which the applicant is not the patent holder. The FHWA does not become involved in issues concerning patent law. Patent issues, if any, are to be resolved by the applicant.
- The Trinity SOFT-STOP Terminal is a patented product and considered proprietary. If proprietary systems are specified by a highway agency for use on Federal-aid projects: (a) they must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with the existing highway facilities or that no equally suitable alternative exists; or (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes.

Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411.

Sincerely yours,

A handwritten signature in blue ink that reads "Michael S. Griffith". The signature is written in a cursive style with a large, stylized initial "M".

Michael S. Griffith
Director, Office of Safety Technologies
Office of Safety

Enclosures

Request for Federal Aid Reimbursement Eligibility Of Highway Safety Hardware

Submitter	Date of Request:	April 11, 2013
	Name:	Don Gripne
	Company:	TRINITY HIGHWAY PRODUCTS, LLC
	Address:	2525 STEMMONS FREEWAY, DALLAS, TX 75207
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

System Type	Device Name / Variant	Testing Criterion	Test Level
CC: Crash Cushions, Attenuators, <input checked="" type="checkbox"/>	TRINITY TL-3 SOFT-STOP TERMINAL	AASHTO MASH <input checked="" type="checkbox"/>	TL-3 <input checked="" type="checkbox"/>

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the test / evaluation results meet the appropriate evaluation criteria in the MASH.

Identification of the individual or organization responsible for the product:

Don Jay Gripne

Contact Name:	BRIAN SMITH
Company Name:	TRINITY HIGHWAY PRODUCTS, LLC
Address 1:	2525 STEMMONS FREEWAY
Address 2:	
City/State/Zip:	DALLAS, TX 75207
Country:	USA

PRODUCT DESCRIPTION

<input type="radio"/> New Hardware	<input checked="" type="radio"/> Modification to Existing Hardware	<input type="radio"/> Non-Significant - Effect is positive or inconsequential
<p>The original crash test of the Trinity SoftStop (TTI Crash Report 2009) as per Eligibility Letter CC-115 dated December 19, 2011 specified steel post and w-beam guardrail using 12-Inch wood block out. The crash test was conducted by Texas Transportation Institute (TTI) entitled NCHRP 350 Crash Testing and Evaluation of the Vertical Squisher dated February 2009 (TTI Crash Report 2009).</p> <p>This request is to accept the as-tested article as per CC-115 for the following:</p> <ol style="list-style-type: none"> 1. A MASH TL-3 Soft Stop Terminal with a length of 50'-9 1/2'. 2. 12 Inch or 8 Inch wood/composite block outs. 3. An offset 2-foot from tangent, flare rate of 25:1. 4. For attachment to 8-inch/12-inch block out systems or no blockout W-beam guardrail systems. <p>This modification is considered Non-significant, Effect is Positive or Inconsequential.</p>		

Request for Federal Aid Reimbursement Eligibility Of Highway Safety Hardware

Submitter	Date of Request:	April 11, 2013
	Name:	Don Gripne
	Company:	TRINITY HIGHWAY PRODUCTS, LLC
	Address:	2525 STEMMONS FREEWAY, DALLAS, TX 75207
	To:	Michael S. Griffith, Director FHWA, Office of Safety Technologies

I request the following devices be considered eligible for reimbursement under the Federal-aid highway program.

System Type	Device Name / Variant	Testing Criterion	Test Level
'CC': Crash Cushions, Attenuators, & T	TRINITY TL-3 SOFT-STOP TERMINAL	AASHTO MASH	TL3

By submitting this request for review and evaluation by the Federal Highway Administration, I certify that the product(s) was (were) tested in conformity with the AASHTO Manual for Assessing Safety Hardware and that the test / evaluation results meet the appropriate evaluation criteria in the MASH.

Identification of the individual or organization responsible for the product:

Contact Name:	BRIAN SMITH
Company Name:	TRINITY HIGHWAY PRODUCTS, LLC
Address 1:	2525 STEMMONS FREEWAY
Address 2:	
City/State/Zip:	DALLAS, TX 75207
Country:	USA

PRODUCT DESCRIPTION

Modification to Existing Hardware Non-Significant - Effect is positive or Inconsequential
<p>The original crash test of the Trinity Soft Stop (TTI Crash Report 2009) as per Eligibility Letter CC-115 dated December 19, 2011 specified steel post and w-beam guardrail using 12-inch wood block out. The crash test was conducted by Texas Transportation Institute (TTI) entitled NCHRP 350 Crash Testing and Evaluation of the Vertical Squisher' dated February 2009 (TTI Crash Report 2009).</p> <p>This request is to accept the as-tested article as per CC-115 for the following:</p> <ol style="list-style-type: none"> 1. A MASH TL-3 Soft Stop Terminal with a length of 50'-9 1/2". 2. 12 inch or 8 inch wood/composite block outs. 3. An offset 2-foot from tangent, flare rate of 25:1. 4. For attachment to 8-inch/12-inch block out systems or no blockout W-beam guardrail systems. <p>This modification is considered Non-significant, Effect is Positive or Inconsequential.</p>

CRASH TESTING

A brief description of each crash test and its result:

Required Test Number	Narrative Description	Evaluation Results
3-30 (1100C)	As per TTI Crash Report 2009, an 1100C (24251b) passenger car impacting the terminal end-on at a nominal impact speed and angle of 62 mi/h and 0 degree, respectively, with the quarter point of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT -STOP slowed and redirected the 1100C vehicle. No occupant compartment deformation occurred. The 1100C vehicle remained upright during and after the collision event. Maximum roll was 25 degrees, and maximum pitch was 7 degrees. Occupant risk factors were within the limits specified for MASH test 3-30. The vehicle subsequently came to rest 27 feet downstream of impact and 34 feet toward traffic lanes. The SOFT-STOP performed acceptably according to the evaluation criteria of MASH test 3-30.	WAIVER REQUES
3-31 (2270P)	As per TTI Crash Report 2009, A 2270P (5000 lb) pickup truck impacting the terminal end-on at a nominal impact speed and angle of 62 mi/h and 0 degree, respectively, with the center line of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT-STOP brought the 2270P vehicle to a controlled stop. No occupant compartment deformation occurred. The 2270P vehicle remained upright during and after the collision event. Maximum roll was 4 degrees, and maximum pitch was -3 degrees. Occupant risk factors were within the limits specified for MASH test 3-31. The 2270P vehicle came to rest within the installation. The SOFT-STOP performed acceptably according to the evaluation criteria of MASH test 3-31.	WAIVER REQUES
3-32 (1100C)	As per TTI Crash Report 2009, an 1100C (24251b) passenger car impacting the terminal end-on at a nominal impact speed and angle of 62 mph and 5/15 degrees, respectively, with the center line of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT -STOP slowed and stopped the 1100C vehicle. No occupant compartment deformation occurred. The 1100C vehicle remained upright during and after the collision event. Maximum roll was 28 degrees, and maximum pitch was -26 degrees. Occupant risk factors were within the limits specified for MASH test 3-32. The vehicle subsequently came to rest with the front of the vehicle adjacent to post 4 of the terminal, with most of the vehicle toward the field side. The SOFT -STOP performed acceptably according to the evaluation criteria of MASH test 3-32.	WAIVER REQUES
3-33 (2270P)	As per TTI Crash Report 2009, the 2000P vehicle, traveling at an impact speed of 62.7 mi/h, impacted the nose of the Vertical Squisher end-on at an impact angle of 16.3 degrees. At 0.044 s after impact, the head of the terminal began to move along the rail, and at 0.093 s, the 2000P vehicle began to redirect toward the field side. The front right tire contacted the terminal at 0.207 s. The vehicle began to travel parallel with the guardrail at 0.285 s, at a speed of 48.2 mi/h (77.6 km/h). At 0.372 s, the 2000P vehicle overrode the terminal and lost contact with the guardrail and was traveling at an exit speed and angle of 51.7 mi/h (83.2 km/h) and 1.8 degrees, respectively. After completely exiting the installation, the 2000P vehicle partially traversed a steep mound of soil and came to rest on its right side 242 ft downstream and 30 ft toward the field side.	WAIVER REQUES

Required Test Number	Narrative Description	Evaluation Results
3-34 (1100C)	<p>As per TTI Crash Report 2009, an 1100C (24251b) passenger car impacting the terminal at a nominal impact speed and angle of 62 mi/h and 15 degrees, respectively, with the corner of the vehicle bumper aligned with the critical impact point (CIP) of the length of need (LON) of the terminal. This test is primarily intended to evaluate occupant risk and vehicle trajectory criteria. The SOFT-STOP contained and redirected the 1100C vehicle. The vehicle did not penetrate or override the installation. Maximum dynamic deflection was 1.96 feet and the head fed through 6.2 feet of w-beam rail element. Maximum occupant compartment deformation was 1.0 inch inward in the area of the instrument panel on the left side. The 1100C vehicle remained upright during and after the collision event. Maximum roll was 10 degrees, and maximum pitch was -4 degrees. Occupant risk factors were within the limits specified for MASH test 3-34. The vehicle subsequently came to rest 15 feet toward traffic lanes in front of post 8. The SOFT -STOP performed acceptably according to the evaluation criteria of MASH test 3-34.</p>	WAIVER REQUES
3-35 (2270P)	<p>As per TTI Crash Report 2009, a 2270P (5000 lb) pickup truck impacting the terminal at a nominal impact speed and angle of 62 mi/h and 25 degrees, respectively, with the corner of the vehicle bumper aligned with the beginning of the LON of the terminal. This test is primarily intended to evaluate structural adequacy and vehicle trajectory criteria. The SOFT-STOP contained and redirected the 2270P. The vehicle did not under ride or override the installation. Although the w-beam rail anchorage released late in the impact event, the vehicle did not penetrate the installation. While the vehicle was in contact with the w-beam, the maximum dynamic deflection was 10.4 feet. However, the upstream anchor released and as the vehicle lost contact with the w-beam, the w-beam continued to deflect, reaching a maximum displacement of 11.6 feet. The kickpanel of the left side was deformed inward 0.4 inch. The 2270P vehicle remained upright during and after the collision event. Maximum roll was -30 degrees, and maximum pitch was -12 degrees. Occupant risk factors were within the preferred limits specified for MASH test 3-31. The 2270P vehicle exited within the exit box. The SOFT -STOP performed acceptably according to the evaluation criteria of MASH test 3-35.</p>	WAIVER REQUES
3-36 (2270P)	<p>As per TTI Crash Report 2009, a 2270P (5000 lb) pickup truck impacting the terminal at a nominal impact speed and angle of 62 mi/h and 25 degrees, respectively, with the corner of the vehicle bumper aligned with the CIP with respect to the transition to the stiff barrier or backup structure. As a w-beam guardrail terminal, the SOFT-STOP will never be attached directly to a backup structure, and the transition to a stiff barrier is basically at Post 3. Therefore, Trinity feels that Test 3-36 is irrelevant and was therefore not conducted.</p> <p>Eligibility Letter CC-115 indicated that MASH test 3-36 may be waived because the SOFT-STOP will not be connected to any stiffer device than W-beam guardrail.</p>	WAIVER REQUES
3-37 (2270P)	<p>As per TTI Crash Report 2009, a 2270P (5000 lb) pickup truck impacting the terminal at a nominal impact speed and angle of 62 mi/h and 25 degrees, respectively, mid-point between the nose and the end of the terminal in the reverse direction. This test is intended to evaluate the performance of a terminal for a "reverse" hit. However, researchers at TTI believe that the reverse direction impact would be more critical for the 1100C (2425 lb) passenger car than for the 2270P pickup. Therefore, an 1100C (2425 lb) passenger car was used in Test 3-37.</p> <p>Eligibility Letter CC-115 indicated that the substitution of the 1100C vehicle to evaluate the reverse direction impact was appropriate.</p>	WAIVER REQUES

3-38 (1500A)	As per TTI Crash Report 2009, a 1500A (33071b) passenger car impacting the terminal end-on at a nominal impact speed and angle of 62 mi/h and 0 degree, respectively, with the center line of the vehicle aligned with the center line of the nose of the terminal. This test is primarily intended to evaluate the performance of the staged attenuator/terminal when impacted by a mid-size vehicle. The SOFT-STOP is not a staged device. Therefore Test3-38 was not conducted. However, as per Appendix G of MASH, calculations based on Test 3-31 have been performed to predict the occupant risk values for the 1500A (33071b) vehicle. The results of these calculations (shown on the enclosed document) predict that in crash testing with the 1500A (33071b) vehicle, the SOFT-STOP Terminal, would perform acceptably according to the Test Level 3 (TL-3) evaluation criteria set out in the MASH guidelines for terminals. Eligibility Letter CC-115 indicates that test 3-38 is not necessary because the SOFT-STOP is not a staged device and that manufacturers calculations predict crash worthy performance with the 1500A vehicle.	WAIVER REQUES
3-40 (1100C)	Does not apply to non-gating/energy absorbing devices.	
3-41 (2270P)	Does not apply to non-gating/energy absorbing devices.	
3-42 (1100C)	Does not apply to non-gating/energy absorbing devices.	
3-43 (2270P)	Does not apply to non-gating/energy absorbing devices.	
3-44 (2270P)	Does not apply to non-gating/energy absorbing devices.	
3-45 (1500A)	Does not apply to non-gating/energy absorbing devices.	

Full Scale Crash Testing was done in compliance with MASH by the following accredited crash test laboratory (cite the laboratory's accreditation status as noted in the crash test reports.):

Laboratory Name:	Texas Transportation Institute
Laboratory Contact:	Dean Alberson
Address:	3135 TAMU, College Station, TX. 77843-3135
Country:	USA
Accreditation Certificate Number and Date:	Mechanical 2821.01, Current date April 30, 2013

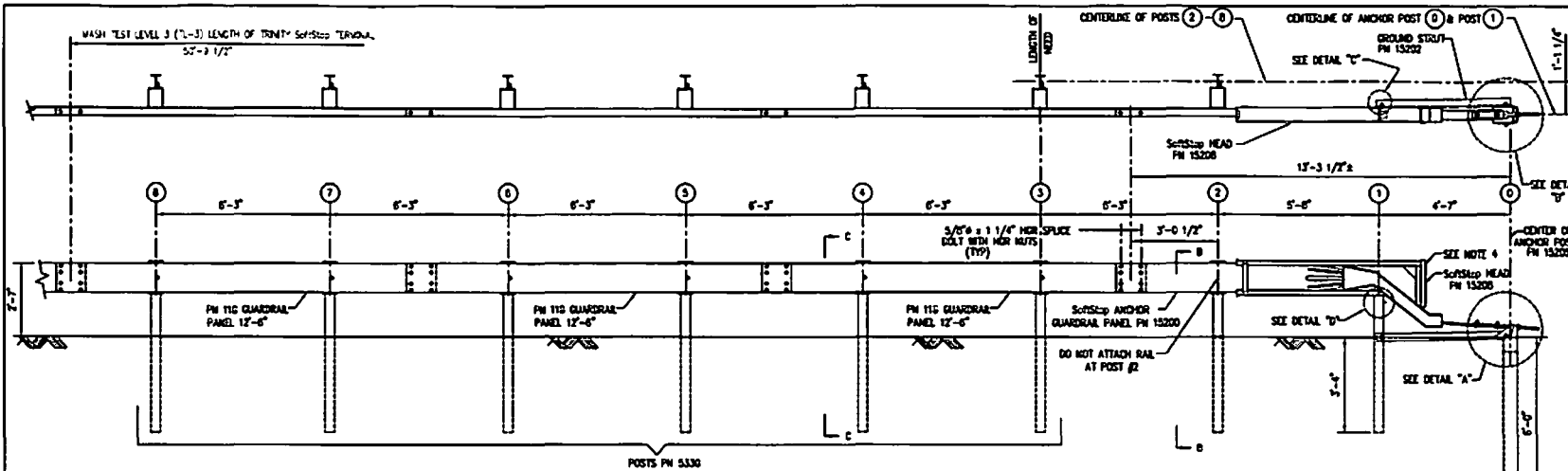
ATTACHMENTS

Attach to this form:

- 1) A copy of the Test Data Summary Sheet for each test conducted in support of this request.
- 2) A drawing or drawings of the device(s) that conform to the Task Force-13 Drawing Specifications [[Hardware Guide Drawing Standards](#)]. For proprietary products, a single isometric line drawing is usually acceptable to illustrate the product, with detailed specifications, intended use, and contact information provided on the reverse. Additional drawings (not in TF-13 format) showing details that are key to understanding the performance of the device should also be submitted to facilitate our review.

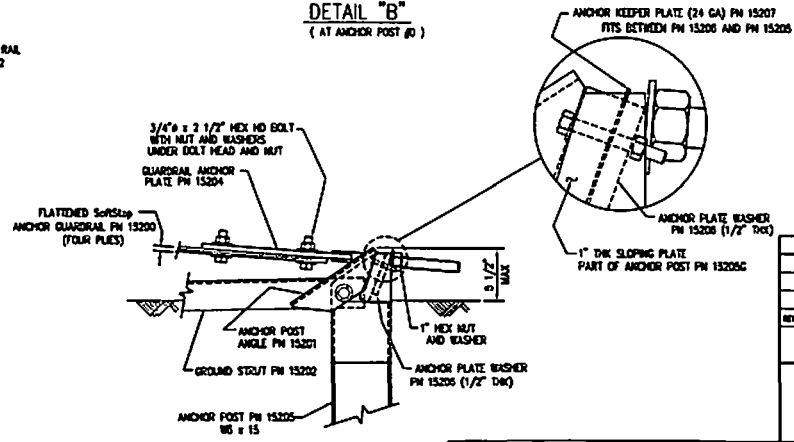
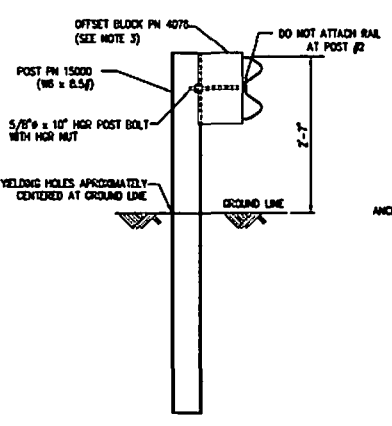
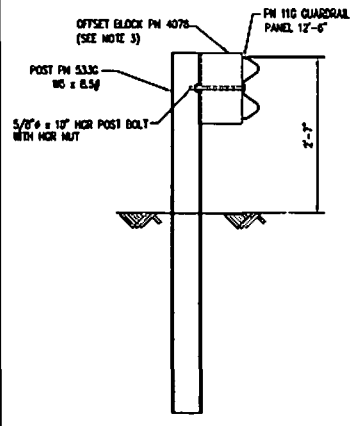
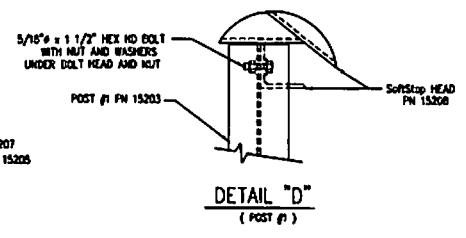
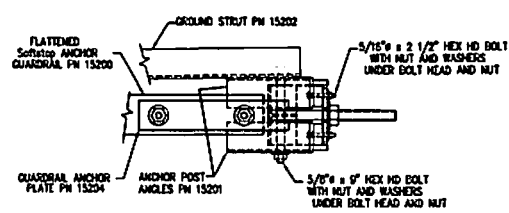
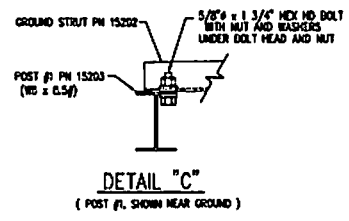
FHWA Official Business Only:

Eligibility Letter		AASHTO TF13	
Number	Date	Designator	Key Words
CC-115D	April 22, 2013	SEW22	TL3, non-gating/energy absorbing terminal, tensioned wbeam guardrail terminal, steel yielding terminal posts, deflector terminal head.



BILL OF MATERIAL			
PART NUMBER	QTY	DESCRIPTION	
11G	3	12/12/5/71.5/5 GUARDRAIL (FORD)	
153000	1	SoftStop ANCHOR GUARDRAIL (12CA)	
15300A	1	SoftStop HEAD	
15300C	1	POST #1 4'-9 1/2" (STD)	
15300D	1	POST #2 6'-2" (STD)	
4075B	7	OFFSET BLOCK 6" x 6" x 14"	
15300A	1	GUARDRAIL ANCHOR PLATE	
15300A	1	ANCHOR POST #0	
15300C	2	ANCHOR POST ANGLE 10" LG	
15300E	1	ANCHOR KEEPER PLATE (24 GA)	
15300G	1	ANCHOR PLATE WASHER (1/2" DIA)	
15300S	1	GROUND STRUT = 4'-6 1/2"	
533C	8	POST #3-#8 6'-0" HARDWARE	
60020	1	1" WASHER	F-436
32000	1	1" HEX NUT	A563 DN
37170	2	3/4" x 2 1/2" HEX HD BOLT	A-325
53025	4	3/4" WASHER	F-430
33040	2	3/4" HEX NUT	A563 DN
33040	2	5/8" x 1 1/2" HEX SPLICE BOLT	A-307
33040	2	5/8" x 1 1/2" HEX HD BOLT	A-307
33040	1	5/8" x 1 3/4" HEX HD BOLT	A-325
44000	1	5/8" x 6" HEX HD BOLT	F-436
43720	4	5/8" WASHER	F-436
33040	2	5/8" HEX NUT	A563 DN
33040	2	5/8" HEX NUT	A563 A
103000G	2	5/16" x 2 1/2" HEX HD BOLT	68-5
103000S	1	5/16" x 1 1/2" HEX HD BOLT	68-5
32400	8	5/16" WASHER	F-430
32440	3	5/16" HEX NUT	N104 BK
ANCHOR GUARDRAIL PANEL PREP HARDWARE			
33000	4	5/8" WASHER	F-644
33400	4	5/8" HEX NUT	A563 A
45520	2	5/8" x 15" ALL THREAD ROD	A-307

- NOTES:
 1) REFER TO SoftStop ASSEMBLY MANUAL.
 2) SoftStop IS A MASH TEST LEVEL 3 (TL-3) END TREATMENT.
 3) 8" DEEP PLASTIC OFFSET BLOCKS (ROUNDED) ARE ACCEPTABLE ALTERNATIVES.
 4) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE RECTIFICATION OF THE TERMINAL.



SECTION "C-C"
(POSTS #1 -#8)

SECTION "B-B"
(POST #2)

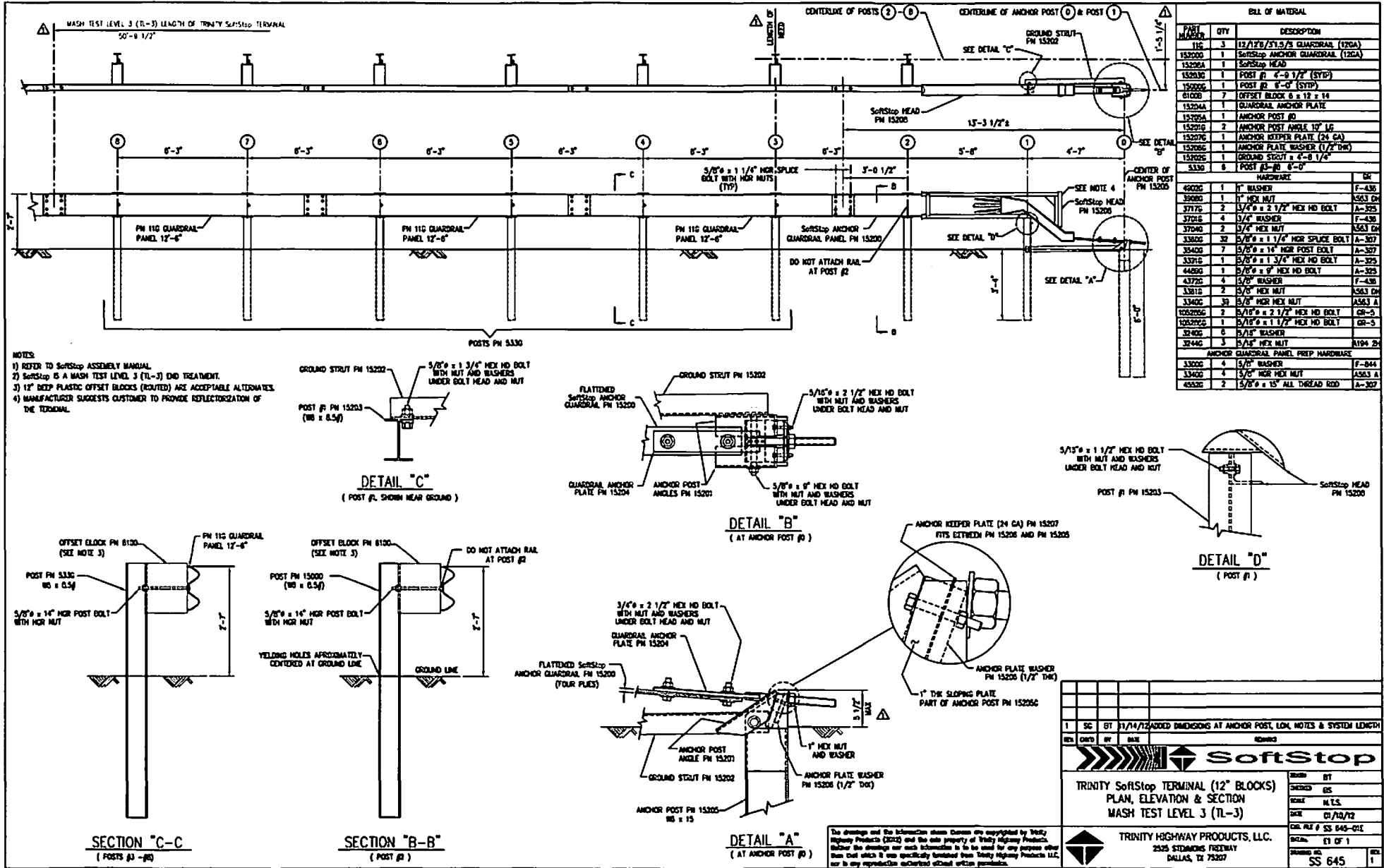
DETAIL "A"
(AT ANCHOR POST #0)

REV	CHG	BY	DATE	REASON
TRINITY SoftStop TERMINAL (6" BLOCKS) PLAN, ELEVATION & SECTION MASH TEST LEVEL 3 (TL-3)				
DESIGN	BY			
CHECKED	BY			
SCALE	AS SHOWN			
DATE	11/14/93			
DRW FILE #	SS 645-02			
DRAWN	BY			
CHECKED	BY			
DESIGNED	BY			
DATE	11/14/93			
SCALE	AS SHOWN			
DRW FILE #	SS 645-02			
DESIGNED	BY			
CHECKED	BY			
DATE	11/14/93			
SCALE	AS SHOWN			
DRW FILE #	SS 645-02			
DESIGNED	BY			
CHECKED	BY			
DATE	11/14/93			
SCALE	AS SHOWN			
DRW FILE #	SS 645-02			

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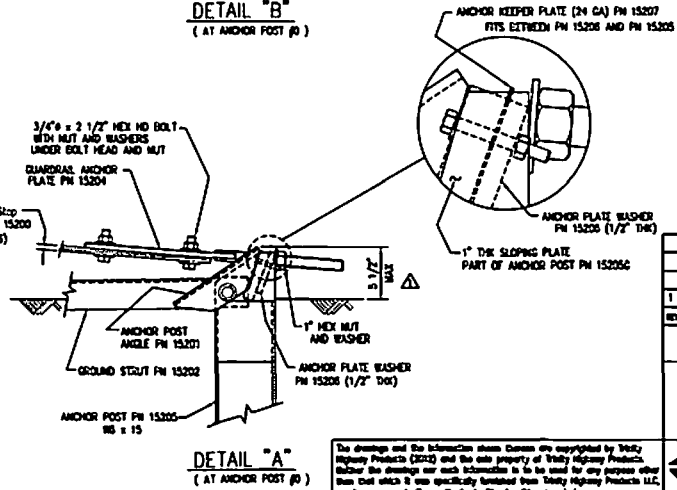
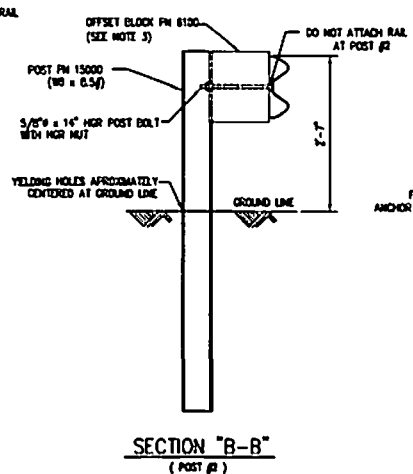
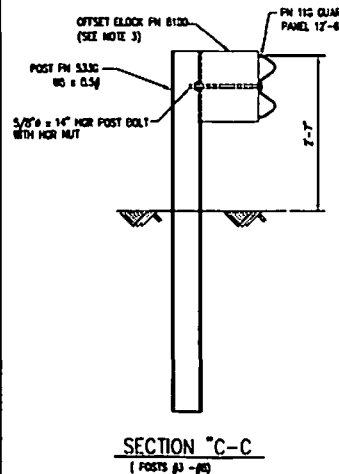
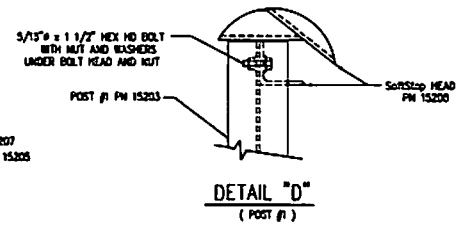
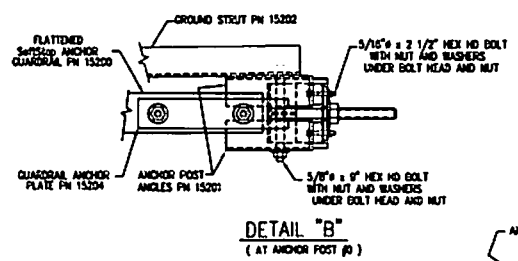
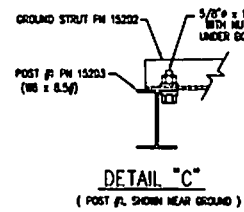


TRINITY HIGHWAY PRODUCTS, L.L.C.
 2525 STEWARTS FREDWAY
 DALLAS, TX 75267



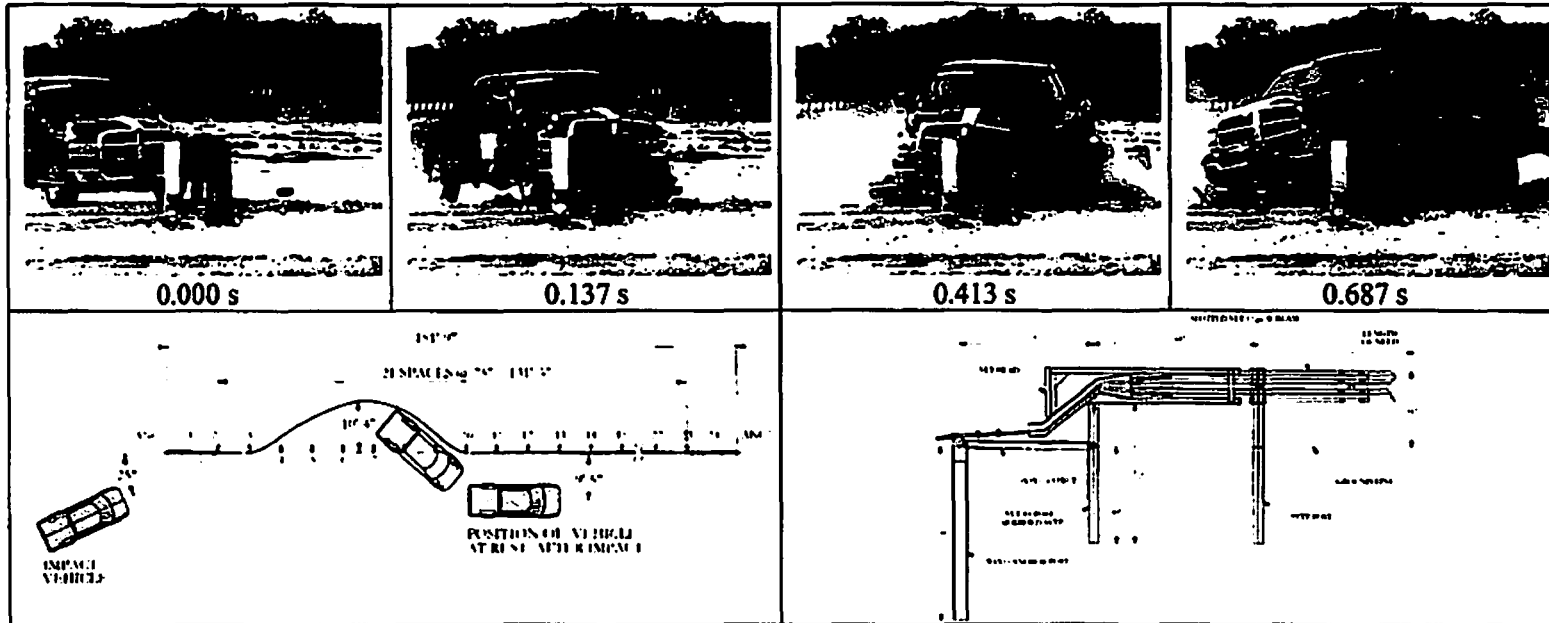
BILL OF MATERIAL			
PART NUMBER	QTY	DESCRIPTION	
11C	3	12 1/2" x 5 1/2" x 5/8" QUADRANGULAR (TRGA)	
152000	1	SoftStop ANCHOR QUADRANGULAR (12GA)	
152004	1	SoftStop HEAD	
152006	1	POST #1 4'-9 1/2" (STD)	
152006	1	POST #2 8'-0" (STD)	
61000	7	OFFSET BLOCK 6 x 12 x 14	
152044	1	QUADRANGULAR ANCHOR PLATE	
152054	1	ANCHOR POST #0	
152010	2	ANCHOR POST ANGLE 10" LG	
152076	1	ANCHOR KEEPER PLATE (24 GA)	
152086	1	ANCHOR PLATE WASHER (1/2" DIA)	
152026	1	GROUND STRUT 4'-8 1/4"	
5330	8	POST #3-#8 6'-0"	
HARDWARE			
48020	1	1" WASHER	F-430
39080	1	1" HEX NUT	A-363 CH
37170	2	3/4" x 2 1/2" HEX HD BOLT	A-325
37010	4	3/4" WASHER	F-430
37040	2	3/4" HEX NUT	A-363 CH
33800	32	5/8" x 1 1/4" HEX SPLICE BOLT	A-307
33400	7	5/8" x 14" HEX POST BOLT	A-325
33710	1	5/8" x 1 3/4" HEX HD BOLT	A-325
44800	1	5/8" x 9" HEX HD BOLT	A-325
43720	4	5/8" WASHER	F-430
33810	2	5/8" HEX NUT	A-363 CH
33400	32	5/8" x 14" HEX POST BOLT	A-325
1028206	2	5/16" x 2 1/2" HEX HD BOLT	GR-5
1028206	1	5/16" x 1 1/2" HEX HD BOLT	GR-5
32400	6	5/16" WASHER	F-430
32440	3	5/16" HEX NUT	A194 2H
ANCHOR QUADRANGULAR PANEL PREP HARDWARE			
33000	4	5/8" WASHER	F-444
33400	4	5/8" HEX HD BOLT	A-363 CH
48020	2	5/8" x 15" ALL THREAD ROD	A-307

- NOTES:**
- 1) REFER TO SoftStop ASSEMBLY MANUAL.
 - 2) SoftStop IS A MASH TEST LEVEL 3 (TL-3) END TREATMENT.
 - 3) 12" DEEP PLASTIC OFFSET BLOCKS (ROUTED) ARE ACCEPTABLE ALTERNATES.
 - 4) MANUFACTURER SUGGESTS CUSTOMER TO PROVIDE REFLECTORIZER OF THE TERMINAL.



1	SE	BT	11/14/13	ADDED DIMENSIONS AT ANCHOR POST, L&L, NOTES & SYSTEM LENGTH
REV	DATE	BY	REASON	
TRINITY SoftStop TERMINAL (12" BLOCKS) PLAN, ELEVATION & SECTION MASH TEST LEVEL 3 (TL-3)				SHEET BT CHECKED ES DRAWN M.L.S. DATE 07/10/12 CDR. FILE # SS 645-01E
TRINITY HIGHWAY PRODUCTS, LLC. 2525 STEVENS FREETWAY DALLAS, TX 75207				SHEET 11 OF 1 DRAWING NO. SS 645 REV 1

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General Information

Test Agency..... Texas Transportation Institute
 Test No. 400001-TSQ1
 Date 2009-10-01
Test Article
 Type..... Terminal
 Name Vertically Loading Terminal (VLT)
 Installation Length 151.75 ft
 Material or Key Elements 31 in tall 12 ga w-beam, steel posts

Soil Type and Condition..... Standard Soil, Damp

Test Vehicle

Type/Designation..... 2270P
 Make and Model 2003 Dodge Ram 1500 quad-cab pickup
 Curb 4708 lb
 Test Inertial..... 5028 lb
 Dummy No dummy
 Gross Static..... 5028 lb

Impact Conditions

Speed 63.5 mi/h
 Angle 26.4 degrees
 Location/Orientation At Post 3

Exit Conditions

Speed Out of view
 Angle Out of view

Occupant Risk Values

Impact Velocity
 Longitudinal 15.8 ft/s
 Lateral 14.4 ft/s

Ridedown Accelerations

Longitudinal -11.0 G
 Lateral 7.9 G
 THIV 21.0 km/h
 PHD 11.6 G

Max. 0.050-s Average

Longitudinal -4.7 G
 Lateral 5.0 G
 Vertical 2.5 G

Post-Impact Trajectory

Stopping Distance 62.5 ft downstrm
 9.4 ft twd traffic

Vehicle Stability

Maximum Yaw Angle 74 degrees
 Maximum Pitch Angle -12 degrees
 Maximum Roll Angle -30 degrees
 Vehicle Snagging No
 Vehicle Pocketing No

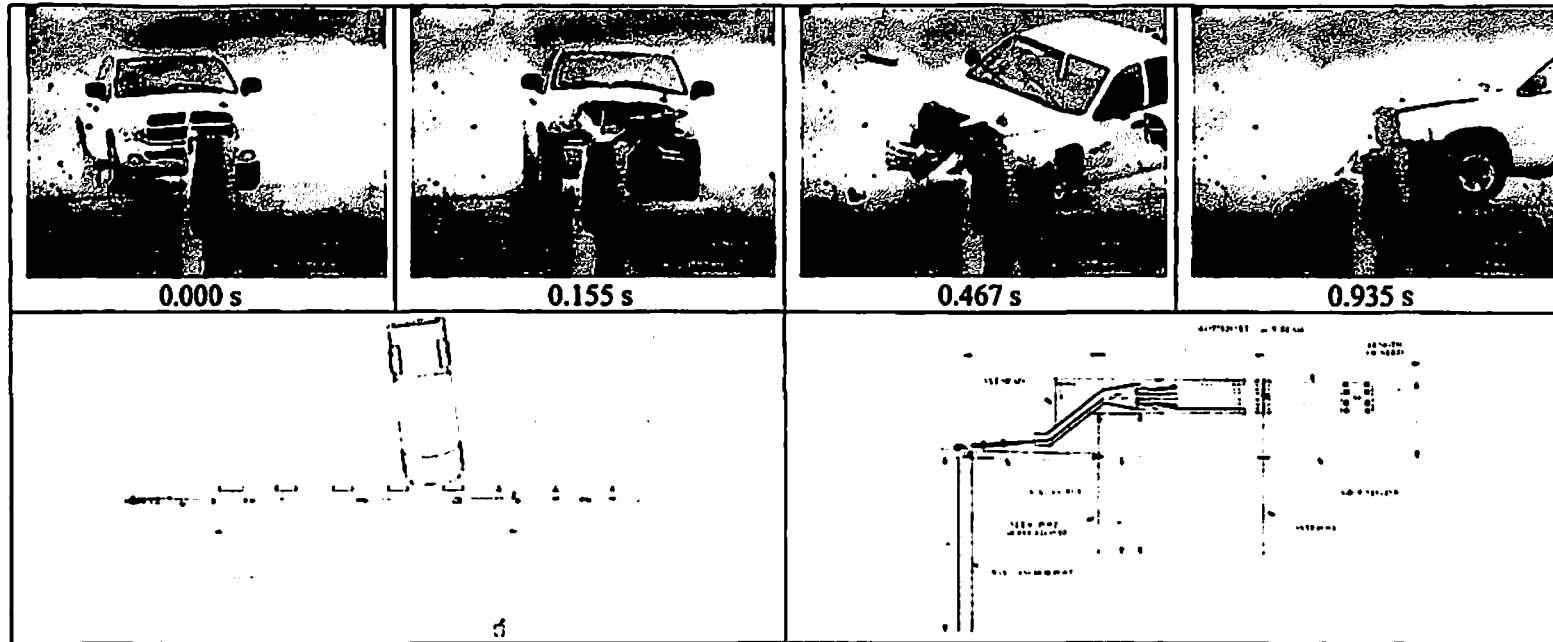
Test Article Deflections

Dynamic 11.6 ft
 Permanent 11.2 ft
 Working Width 10.4 ft

Vehicle Damage

VDS 11LFQ4
 CDC 11FDEW3
 Max. Exterior Deformation 16.0 inches
 Max. Occupant Compartment
 Deformation 0.4 inch

Summary of results for *MASH* test 3-35 on the VLT.



General Information

Test Agency..... Texas Transportation Institute
 Test No. 400001-TSQ6
 Date 2010-01-06

Test Article

Type..... Terminal
 Name Vertically Loading Terminal (VLT)
 Installation Length 151.75 ft
 Material or Key Elements 31 in tall 12 ga w-beam, steel posts

Soil Type and Condition..... Standard Soil, Damp

Test Vehicle

Type/Designation..... 2270P
 Make and Model..... 2003 Dodge Ram 1500 quad-cab pickup
 Curb..... 4695 lb
 Test Inertial..... 4958 lb
 Dummy No dummy
 Gross Static..... 4958 lb

Impact Conditions

Speed60.9 mi/h
 Angle 7.3 degrees
 Location/OrientationEnd-on

Exit Conditions

SpeedOut of view
 AngleOut of view

Occupant Risk Values

Impact Velocity
 Longitudinal21.0 ft/s
 Lateral 3.0 ft/s
 Ridedown Accelerations
 Longitudinal-9.5 G
 Lateral 3.8 G
 THIV23.3 km/h
 PHD 9.7 G
 Max. 0.050-s Average
 Longitudinal-7.3 G
 Lateral 2.8 G
 Vertical-3.1 G

Post-Impact Trajectory

Stopping Distance28 ft downstm
 Adjct to field side

Vehicle Stability

Maximum Yaw Angle..... 85 degrees
 Maximum Pitch Angle..... 5 degrees
 Maximum Roll Angle.....-21 degrees
 Vehicle Snagging.....No
 Vehicle Pocketing.....No

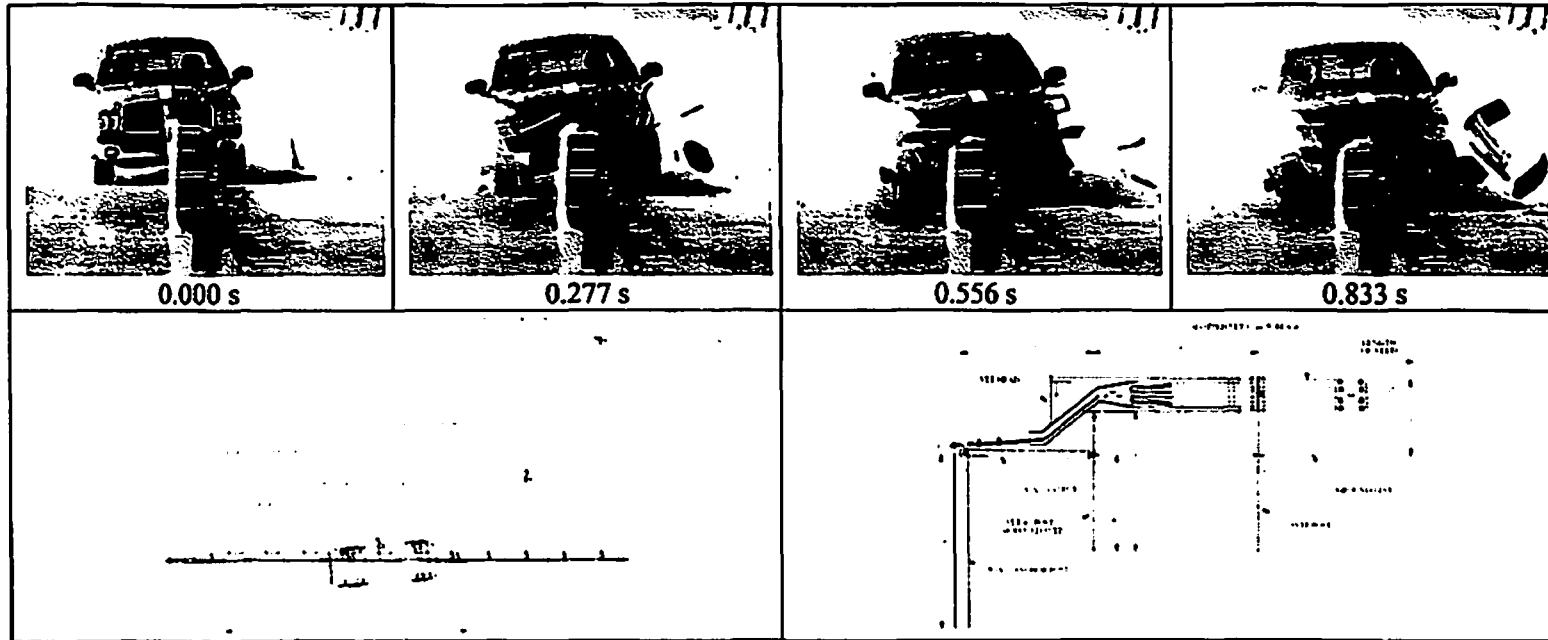
Test Article Deflections

Dynamic..... 2.0 ft
 Permanent 2.0 ft
 Working Width.....14.7 ft

Vehicle Damage

VDS12FC5
 CDC.....12FCEN4
 Max. Exterior Deformation..... 17.75 inches
 Max. Occupant Compartment
 Deformation.....0

Summary of results for *MASH* test 3-33 on the VLT.



General Information

Test Agency..... Texas Transportation Institute
 Test No. 400001-TSQ7
 Date 2010-01-12

Test Article

Type..... Terminal
 Name Vertically Loading Terminal (VLT)
 Installation Length 151.75 ft
 Material or Key Elements 31 in tall 12 ga w-beam, steel posts

Soil Type and Condition..... Standard Soil, Damp

Test Vehicle

Type/Designation..... 2270P
 Make and Model 2002 Dodge Ram 1500 quad-cab pickup
 Curb 5024 lb
 Test Inertial..... 5084 lb
 Dummy No dummy
 Gross Static..... 5084 lb

Impact Conditions

Speed 61.1 mi/h
 Angle 1.4 degrees
 Location/Orientation End-on

Exit Conditions

Speed Out of view
 Angle 5.0 degrees

Occupant Risk Values

Impact Velocity
 Longitudinal..... 20.0 ft/s
 Lateral 0.0 ft/s
 Ridedown Accelerations
 Longitudinal..... -8.6 G
 Lateral -2.3 G
 THIV 21.8 km/h
 PHD 8.6 G
 Max. 0.050-s Average
 Longitudinal..... -5.0 G
 Lateral -0.8 G
 Vertical 2.3 G

Post-Impact Trajectory

Stopping Distance 37.5 ft downstrm
 Over posts 6-7

Vehicle Stability

Maximum Yaw Angle..... 3 degrees
 Maximum Pitch Angle..... -3 degrees
 Maximum Roll Angle..... 4 degrees
 Vehicle Snagging..... No
 Vehicle Pocketing..... No

Test Article Deflections

Dynamic..... 45.7 ft
 Permanent..... 45.7 ft
 Working Width 4.4 ft

Vehicle Damage

VDS 12FC5
 CDC 12FCEN4
 Max. Exterior Deformation..... 17.0 inches
 Max. Occupant Compartment
 Deformation..... 0

Summary of results for *MASH* test 3-31 on the VLT.