



U.S. Department  
of Transportation

**Federal Highway  
Administration**

June 2, 2006

400 Seventh St., S.W.  
Washington, D.C. 20590

In Reply Refer To: HSA-10/B-148

Mr. Steve L. Brown  
President  
Trinity Highway Safety Products Division  
P.O. Box 568887  
Dallas, Texas 75356-8887

Dear Mr. Brown:

In his April 28, 2006 letter to Mr. Richard Powers, Mr. Brian Smith requested the Federal Highway Administration (FHWA) acceptance of a new strong post Thrie-beam guardrail design called the T-39. With the letter, he also sent copies of a Texas Transportation Institute (TTI) report dated April 2006, entitled "Testing and Evaluation of the T-39 Thrie-Beam Longitudinal Barrier", and digital videos of the three tests that were run.

The T-39 Thrie-beam guardrail uses standard 12-gauge Thrie-beam panels mounted on modified W6 x 8.5 steel posts with a top-of-rail height of 39 inches. The modified posts, called Steel Yielding Line Posts (SYLP) posts are 6-feet long and set in the ground to a depth of 40 inches on standard 6-ft, 3-inch centers. Each post has four 13/16-inch diameter holes in the flanges at the ground line. The rail is attached to each post without an offset block using a 5/8-inch diameter x 1-3/4-inch long special bolt with a slotted countersunk head. A 6-inch long section of W-beam called a flange protector (backup plate) is used at each post. All splices in the Thrie-beam rail elements fall midspan, between adjacent posts. Design details for the SYLP post and its unique connection bolt are shown on Enclosure 1. Note that the top of the post is 32 inches above the ground and that the top of the Thrie-beam is 7 inches higher. The T-39 railing can be installed as a roadside barrier with rail only on the traffic side of the posts (as shown in Enclosure 1) or as a symmetrical median barrier with Thrie-beam mounted on both sides of the support posts.

Test 3-10 was conducted using the current National Cooperative Highway Research Program Report 350 small car (820C) impacting the T-39 **median barrier** at a 20-degree angle. The median design was used for this test because the stiffer of the two designs was deemed more likely to cause the small car to impact and interact with the posts. Test 3-11 was conducted with a quad-cab pickup truck having a nominal weight of 2270 kg (currently proposed as the



new test vehicle under the Report 350 update) into the **roadside version** of the T-39, and test 4-11 was run using the standard single-unit truck, also into the roadside design. For the latter two tests, it was believed that the roadside design would be most likely to fail with the larger vehicles due to increased dynamic deflection. My staff agreed with these assumptions. Summary sheets for each of these tests are shown in Enclosure 2.

Based on these test results, both the median and roadside versions of the T-39 guardrail, as described above, may be considered crashworthy under the existing Report 350 guidelines as test level 4 (TL-4) barriers and may be used on the National Highway System when such use is acceptable to the contracting authority. When new testing guidelines are formally adopted, you may choose to rerun the small car test at the 25-degree impact angle proposed by the researchers for test 3-10 since your small car test was deemed marginal (due to passenger compartment deformation) under the current 20-degree impact angle. Because the rail height exceeds that of existing metal beam guardrails, you will need to develop transition designs if the T-39 rail is connected to a bridge parapet or to a crashworthy W-beam terminal. Potential users also need to be aware that under TL-4 impact conditions, the truck box exhibited an estimated roll angle of over 30 degrees (the cab roll angle was reported as 12 degrees), and extended more than 3 feet beyond the deflected rail. This area must be kept free of rigid vertical objects such as overhead/cantilever sign supports and bridge piers.

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

- Any changes that may adversely influence the crashworthiness of this barrier will require a new acceptance letter.
- Should the FHWA discover that the qualification testing was flawed, that in-service performance reveals unacceptable safety problems, or that the device being marketed is significantly different from the version that was crash tested, it reserves the right to modify or revoke its acceptance.
- You will be expected to supply potential users with sufficient information on design and installation requirements to ensure proper performance.
- You will be expected to certify to potential users that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as that submitted for acceptance.
- To prevent misunderstanding by others, this correspondence, designated as acceptance letter B-148, shall not be reproduced except in full. This letter, and the test documentation upon which this letter is based, is public information. All such letters and documentation may be reviewed at our office upon request.
- Since the T-39 guardrail is a steel product, the provisions of Title 23, Code of Federal Regulations, Section 635.410 apply to its use on federally funded projects.
- The T-39 guardrail includes patented components and is considered a proprietary product. When proprietary devices are *specified by a highway agency* for use on federally-funded projects they: (a) must be supplied through competitive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with 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.

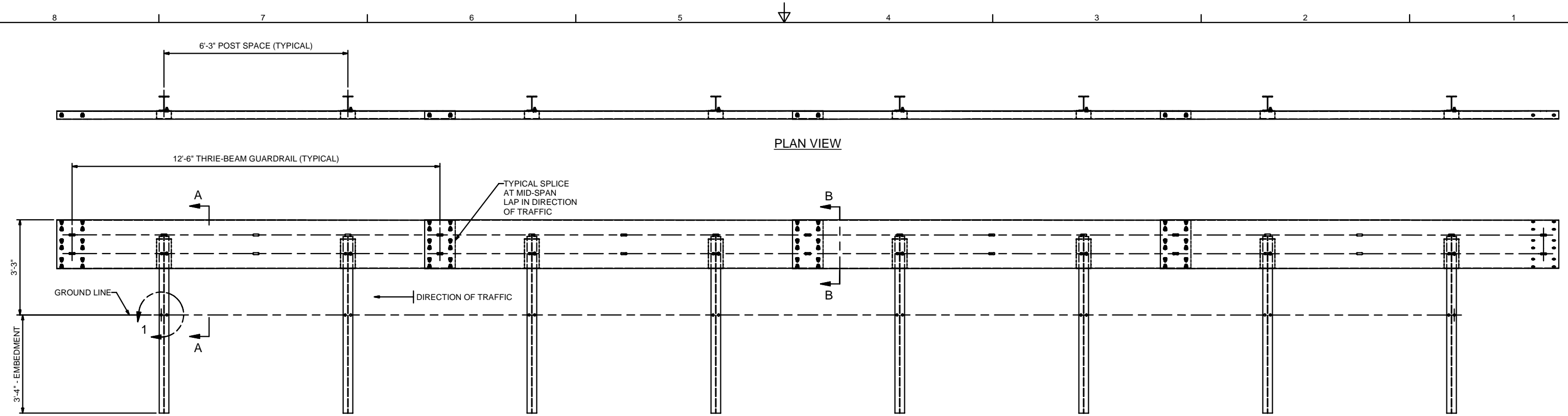
- This acceptance letter shall not be construed as authorization or consent by the FHWA to use, manufacture, or sell any patented device for which the applicant is not the patent holder. Patent issues, if any, are to be resolved by the applicant.

Sincerely yours,

*/original signed by/*

John R. Baxter, P.E.  
Director, Office of Safety Design  
Office of Safety

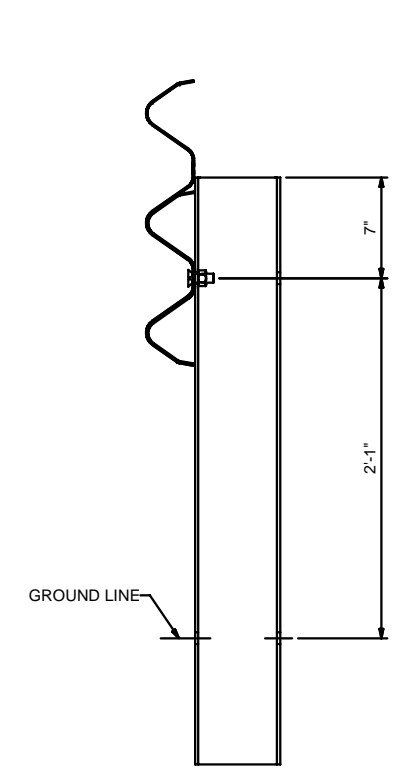
2 Enclosures



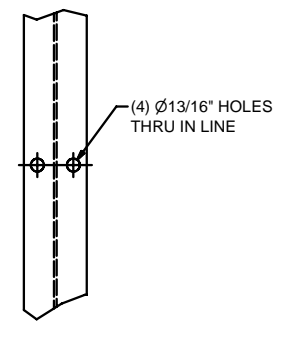
PLAN VIEW

ELEVATION VIEW

MATERIAL FOR 12'-6" T-39 SECTION						
QTY	PART No	ITEM	DESCRIPTION	LENGTH	Lbs / Each	MATERIAL
2	15000G	1	POST - W 6 x 8.5	6'-0"	53.74	A36
2	7G	2	12 Ga W-BEAM SECTION	6"	3.33	M180
1	211G	3	12 Ga THRIEBEAM	12'-6"	142.31	M180
2	4419G	4	5/8 SLOTTED CSNK BOLT	1 3/4"	0.18	A307
14	3340G	5	5/8" HGR RECESSED NUT		0.08	A563
12	3360G	6	5/8 HGR BOLT	1 1/4"	0.22	A307



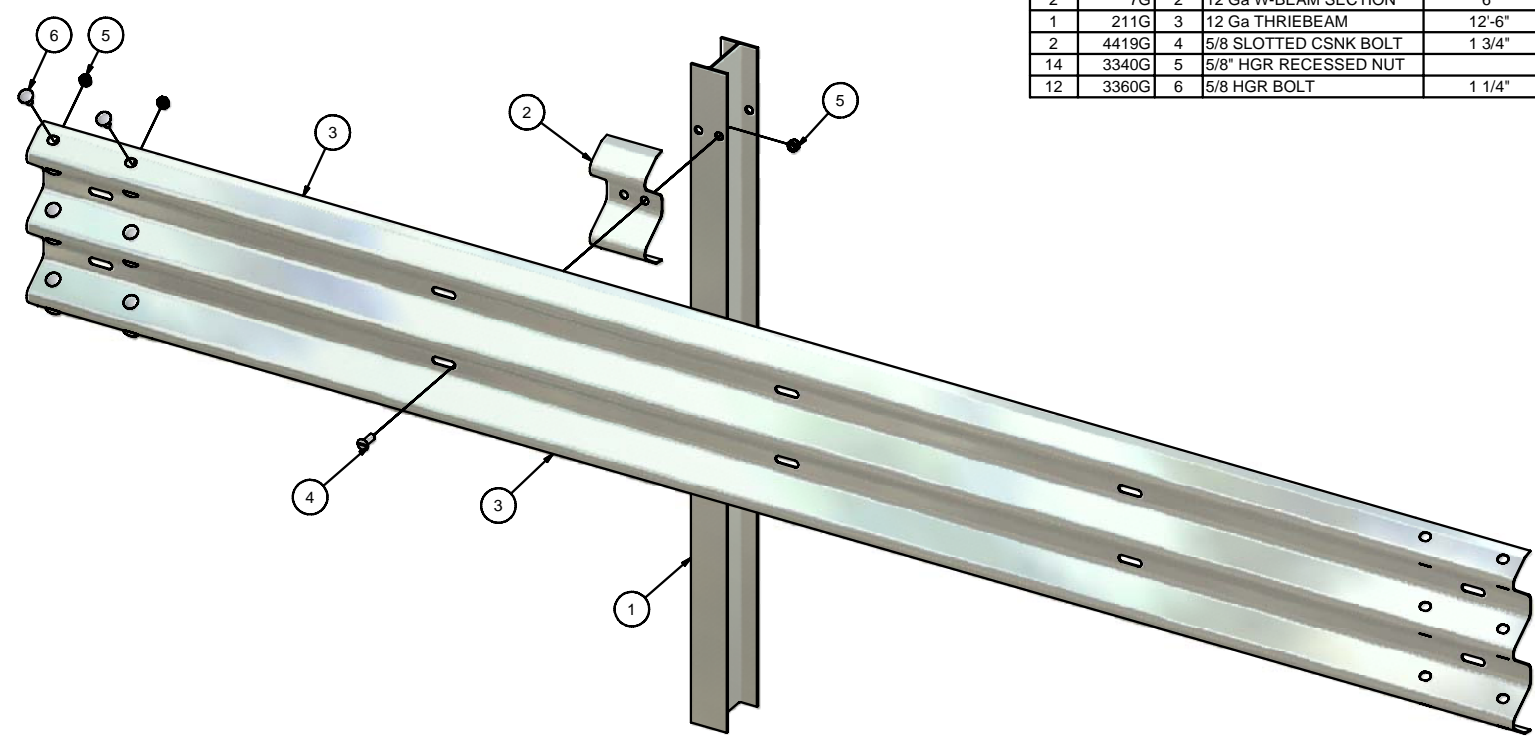
SECTION A-A



DETAIL 1



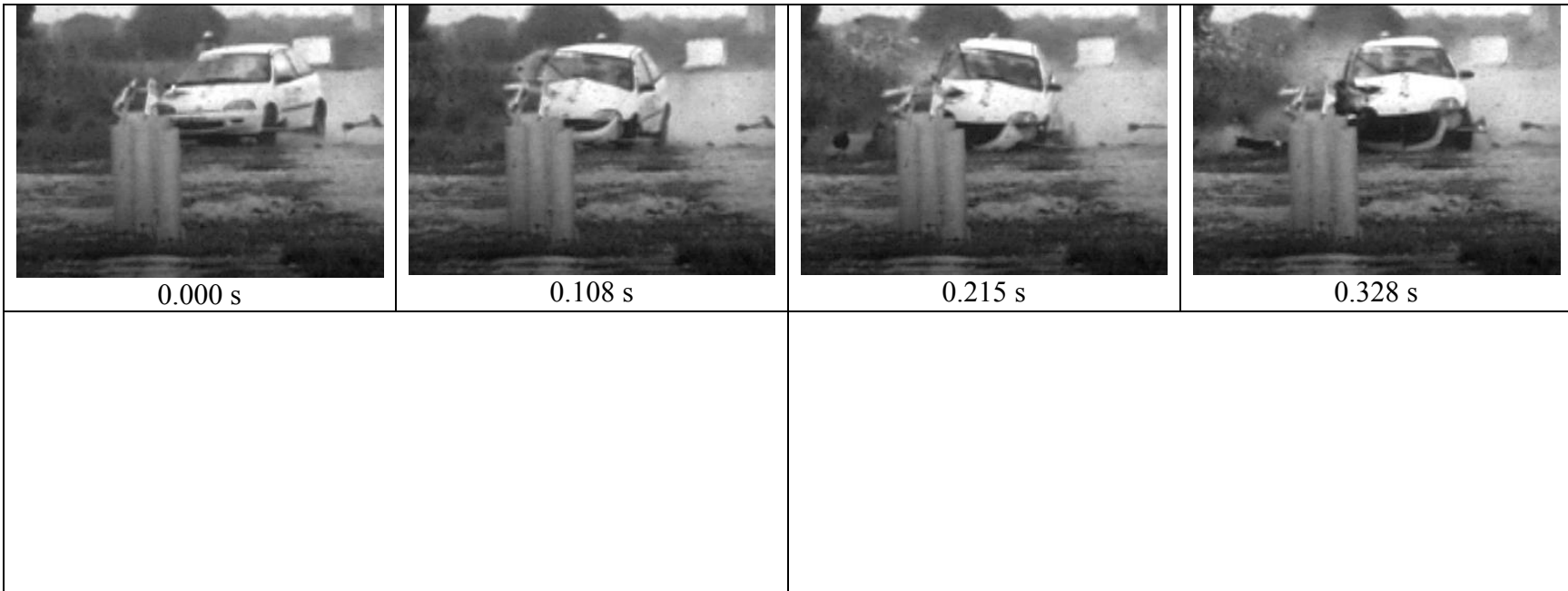
SECTION B-B  
(TYPICAL SPLICE)



T-39 RAIL TO POST ASSEMBLY

T-39 GUARD RAIL SYSTEM WITH STEEL YIELDING LINE POST (SYLP)		GALV SPEC:
		SHIPPING WT:
DRW: E.A.S.	5/22/2006	
CHK: B.S.	5/23/2006	
SHT: 1 OF 1	SIZE: D	
<b>TRINITY HIGHWAY SAFETY PRODUCTS, INC.</b>		DWG NO: SS-739
		REV: 0

PROJ: T-39 SYSTEM



**General Information**

Test Agency..... Texas Transportation Institute  
 Test No. .... 220570-5  
 Date ..... 11-11-2005

**Test Article**

Type..... Median Barrier Guardrail  
 Name ..... T-39 Thrie Beam Guardrail  
 Installation Length (m)..... 68.6  
 Material or Key Elements ..... Thrie Beam Guardrail on Steel Yielding  
 Line Posts w/top of rail height of 991 mm  
 Soil Type and Condition..... Standard Soil, Dry

**Test Vehicle**

Type..... Production  
 Designation..... 820C  
 Model..... 1996 Chevrolet Metro  
 Mass (kg)  
 Curb..... 851  
 Test Inertial..... 877  
 Dummy ..... 79  
 Gross Static..... 956

**Impact Conditions**

Speed (km/h) ..... 102.6  
 Angle (deg) ..... 19.8

**Exit Conditions**

Speed (km/h) ..... 64.3  
 Angle (deg) ..... 0.3

**Occupant Risk Values**

Impact Velocity (m/s)  
 Longitudinal ..... 6.2  
 Lateral ..... 6.5  
 THIV (km/h) ..... 32.2  
 Ridedown Accelerations (g's)  
 Longitudinal ..... -10.3  
 Lateral ..... -10.9  
 PHD (g's) ..... 12.5  
 ASI ..... 1.26  
 Max. 0.050-s Average (g's)  
 Longitudinal ..... -9.3  
 Lateral ..... -9.1  
 Vertical ..... -2.3

**Test Article Deflections (m)**

Dynamic ..... 0.34  
 Permanent..... 0.11  
 Working Width ..... 0.88

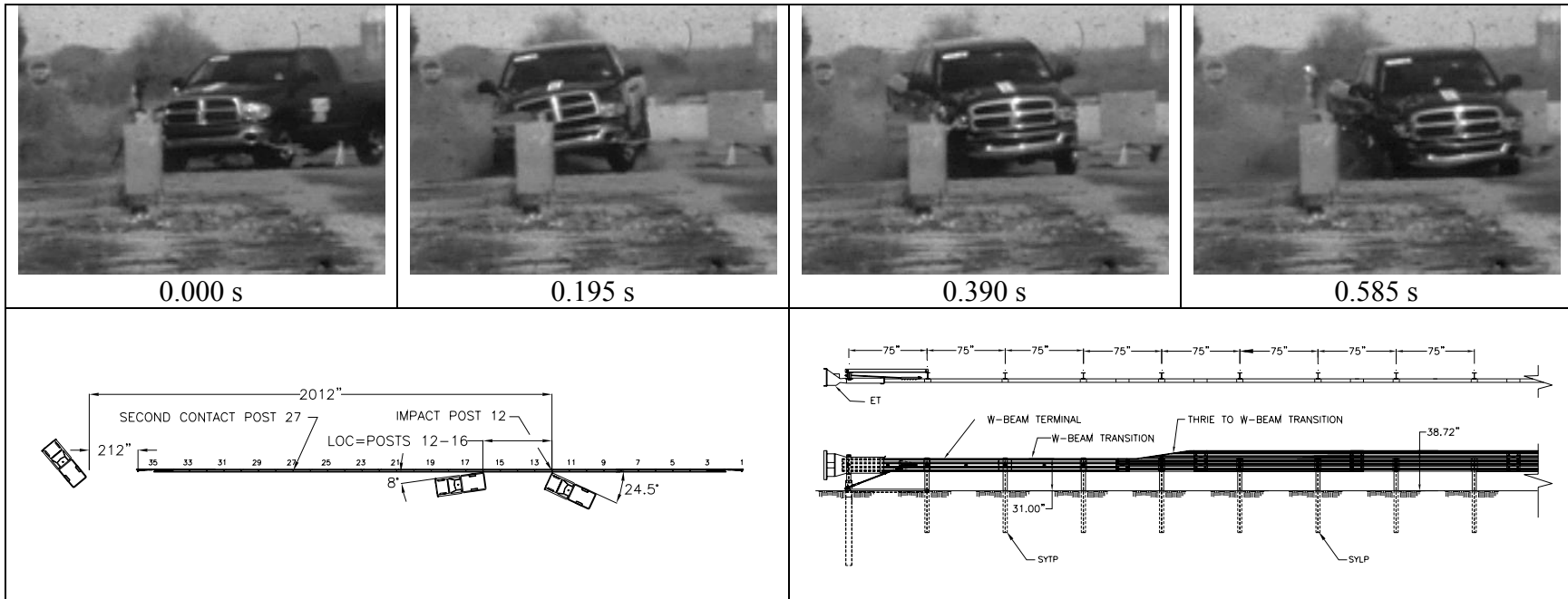
**Vehicle Damage**

Exterior  
 VDS..... 01RFQ5  
 CDC ..... 01RFEW3  
 Max. Exterior  
 Vehicle Crush (mm) ..... 390  
 Interior  
 OCDI ..... RF1022000  
 Max. Occupant Compartment  
 Deformation (mm) ..... 185

**Post-Impact Behavior**

(during 1.0 sec after impact)  
 Max. Yaw Angle (deg)..... Wire Cut  
 Max. Pitch Angle (deg)..... -4  
 Max. Roll Angle (deg) ..... 8

Summary of results for *NCHRP Report 350* test 3-10 on T-39 Thrie Beam Median Barrier Guardrail.



**General Information**

Test Agency..... Texas Transportation Institute  
 Test No. .... 220570-7  
 Date ..... 02-09-2006

**Test Article**

Type..... Guardrail  
 Name ..... T-39 Thrie Beam Guardrail  
 Installation Length (m) ..... 68.6  
 Material or Key Elements ..... Thrie Beam Guardrail on Steel Yielding Line Posts w/top of rail height of 991 mm

**Soil Type and Condition**..... Standard Soil, Dry

**Test Vehicle**

Type..... Production  
 Designation..... 2270P  
 Model..... 2002 Dodge 1500 pickup truck  
 Mass (kg)  
 Curb..... 2220  
 Test Inertial..... 2290  
 Gross Static..... 2290

**Impact Conditions**

Speed (km/h) ..... 99.0  
 Angle (deg) ..... 24.5

**Exit Conditions**

Speed (km/h) ..... 62.0  
 Angle (deg) ..... 8.0

**Occupant Risk Values**

Impact Velocity (m/s)  
 Longitudinal ..... 6.9  
 Lateral ..... 2.3  
 THIV (km/h) ..... 25.8  
 Ridedown Accelerations (g's)  
 Longitudinal ..... -9.9  
 Lateral ..... -17.6  
 PHD (g's) ..... 16.6  
 ASI ..... 1.43  
 Max. 0.050-s Average (g's)  
 Longitudinal ..... -5.1  
 Lateral ..... -12.6  
 Vertical ..... 2.9

**Test Article Deflections (m)**

Dynamic ..... 0.63  
 Permanent ..... 0.60  
 Working Width ..... 0.63

**Vehicle Damage**

Exterior  
 VDS ..... 01RFQ4  
 CDC ..... 01FREW3  
 Max. Exterior  
 Vehicle Crush (mm) ..... 350

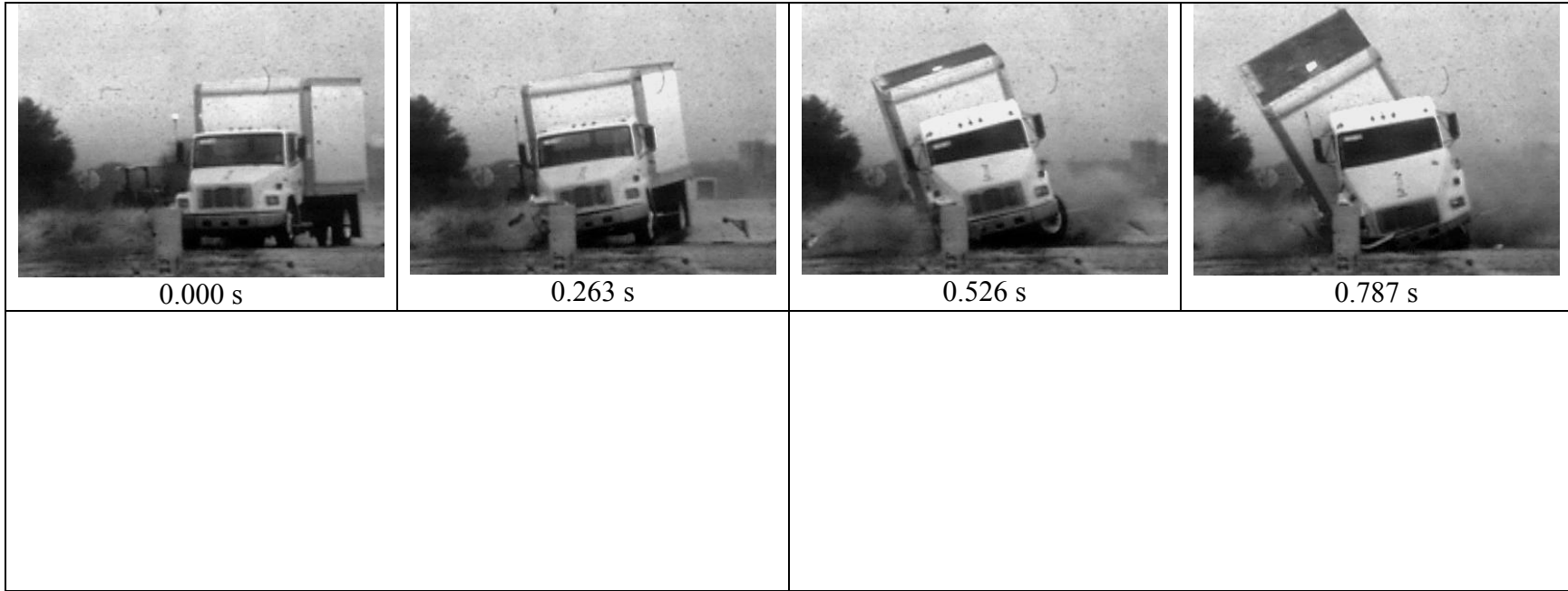
Interior

OCDI ..... RF0000000  
 Max. Occupant Compartment  
 Deformation (mm) ..... 0

**Post-Impact Behavior**

(during 1.0 sec after impact)  
 Max. Yaw Angle (deg) ..... -29  
 Max. Pitch Angle (deg) ..... -7  
 Max. Roll Angle (deg) ..... -12

Figure 36. Summary of results for NCHRP Report 350 test 3-11 (updated) on T-39 Thrie Beam Guardrail.



**General Information**

Test Agency..... Texas Transportation Institute  
 Test No. .... 220570-6  
 Date ..... 01-20-2006

**Test Article**

Type..... Guardrail  
 Name ..... T-39 Thrie Beam Guardrail  
 Installation Length (m)..... 68.6  
 Material or Key Elements ..... Thrie Beam Guardrail on Steel Yielding  
 Line Posts w/top of rail height of 991 mm  
**Soil Type and Condition**..... Standard Soil, Dry

**Test Vehicle**

Type..... Production  
 Designation..... 8000S  
 Model..... 1996 Freightliner FL60 Truck  
 Mass (kg)  
 Curb..... 5425  
 Test Inertial..... 8192  
 Gross Static..... 8192

**Impact Conditions**

Speed (km/h) ..... 78.8  
 Angle (deg) ..... 15.3

**Exit Conditions**

Speed (km/h) ..... N/A  
 Angle (deg) ..... ~-6.6

**Occupant Risk Values**

Impact Velocity (m/s)  
 Longitudinal ..... 3.2  
 Lateral ..... 2.6  
 THIV (km/h) ..... 13.7  
 Ridedown Accelerations (g's)  
 Longitudinal ..... -2.0  
 Lateral ..... -3.7  
 PHD (g's) ..... 3.9  
 ASI ..... 0.26  
 Max. 0.050-s Average (g's)  
 Longitudinal ..... -1.9  
 Lateral ..... -2.1  
 Vertical ..... 1.0

**Test Article Deflections (m)**

Dynamic ..... 0.81  
 Permanent..... 0.30  
 Working Width ..... 1.86

**Vehicle Damage**

Exterior  
 CDC ..... N/A  
 Max. Exterior  
 Vehicle Crush (mm) ..... N/A

**Post-Impact Behavior**

(during 1.0 sec after impact)  
 Max. Yaw Angle (deg)..... -19  
 Max. Pitch Angle (deg)..... -24  
 Max. Roll Angle (deg) ..... 17

Summary of results for *NCHRP Report 350* test 4-12 on T-39 Thrie Beam Guardrail.