January 13, 2004

Refer to: HSA-10/CC-54F

Mr. Rodney A. Boyd
Trinity Industries
2525 Stemmons Freeway
Dallas, Texas 75207

Dear Mr. Boyd:

In his December 11 letter to Mr. Richard Powers of my staff, your consultant Mr. James Albritton, requested Federal Highway Administration acceptance of specific design changes made to the original TRACC crash cushion. These changes were:

- The impact sled was changed from a single weldment to a six-piece bolt-up assembly. As seen in enclosure 1, the weight of the sled was reduced by eliminating the original four horizontal angle stiffeners and bolting the w-beam side panels directly to the impact sled frame using high-strength 5/8-inch bolts, with a 1/4-inch rectangular washer (2-1/4 x 3) under the head of each bolt on the outside of the panels and two rectangular washers between each panel and the frame acting as spacers. This connection will be part of the TRACC assembly done by Trinity prior to shipment.
- The original single-piece, heat-treated cutter plate in the impact sled was replaced with a pair of hardened steel bolts, backed by a steel plate welded to the sled assembly (enclosure 2). The leading edge of these bolts shear the rip plates when the front end of the TRACC is impacted and the sled is forced backwards.
- The 5-mm (3/16-inch) thick Stage 2 and Stage 3 rip plates were modified by adding 25.4-mm (one inch) diameter holes on 73-mm (2-7/8 inch) centers. The same size holes were added to the 10-gauge rip plates used in Stage 3, but on 68-mm (2-11/16 inch) centers. The 16-gauge rip plates used in Stage 1 were not modified and retained the same 2-1/2-inch long slots on 3-inch centers that were used in the original design.

To confirm that these design changes did not adversely affect crash performance, crash tests were conducted at the Texas Transportation Institute (TTI) and described in that agency's January 2004 reports entitled "NCHRP Report 350 Test 3-31 of the Modified TRACC" and "NCHRP Report 350 Test 3-32 of the Modified TRACC." Since changes to the impact sled should have no measurable effect on side-impact performance, tests 3-31 and 3-32 were selected as being the most critical and were conducted. The summary results of these two certification tests are shown as enclosures 3 and 4.

Based on staff review of the design changes and certification test results, I consider the modified TRACC design as described above and shown in the enclosures acceptable for

use on the NHS as a substitute for all previously-accepted TRACC designs, including the ShorTRACC, FasTRACC (test 3-31 only), and WideTRACC, at the same test levels at which they were previously accepted.

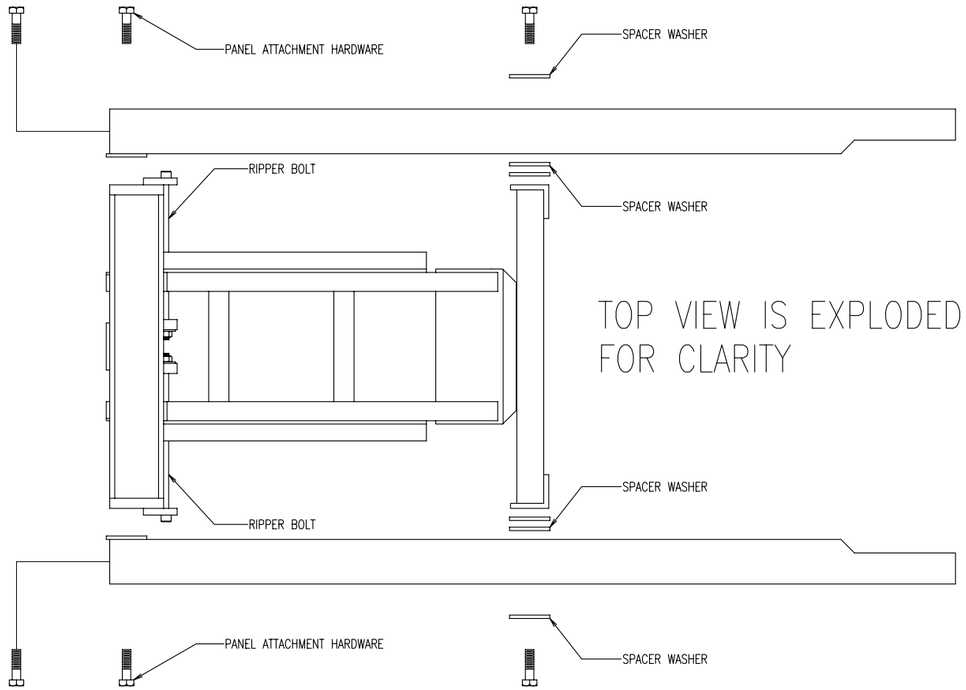
Sincerely yours,

/ Original signed by /

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

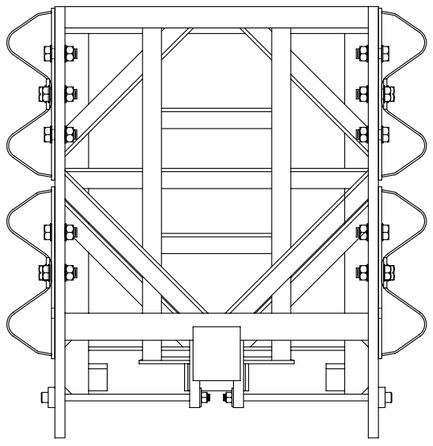
4 Enclosures

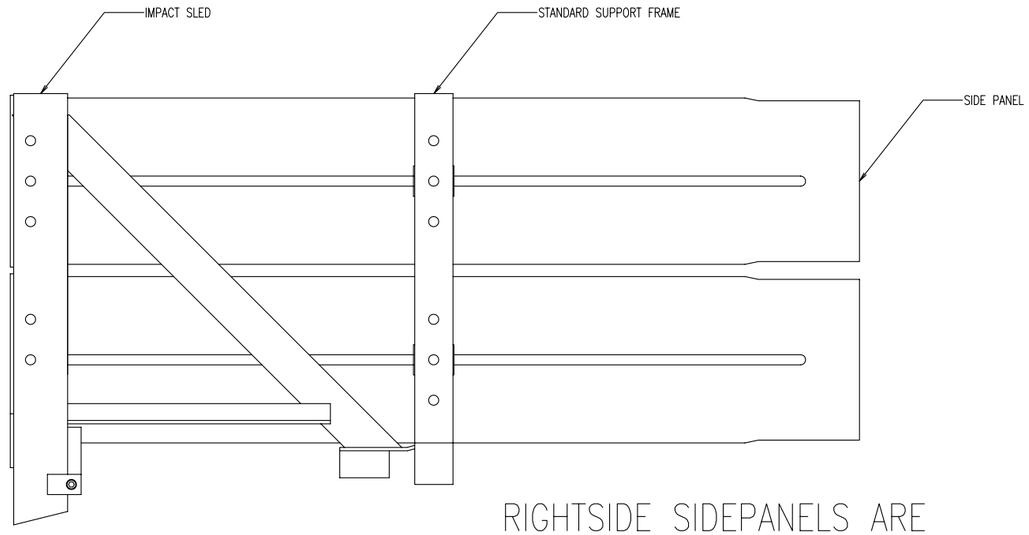
PARTS LIST			
ITEM	PART NO.	QTY	DESCRIPTION
1	NPN	1	IMPACT SLED ASSEMBLY
2	33339G	1	STANDARD SUPPORT FRAME
3	33338G	4	STANDARD SIDE PANEL
4	NPN	12	SPACER WASHER
5	5306G	14	BOLT, HEXHEAD, 5/8" x 2-1/4" LONG



TOP VIEW IS EXPLODED FOR CLARITY

NOTES:
1. RIGHTSIDE SIDE PANELS ARE REMOVED IN SIDE VIEW FOR CLARITY.
2. FRAME IS LOCATED DIRECTLY BEHIND SLED ASSEMBLY.
3. FRAME IS BOLTED TIGHT IN POSITION WITH ITEMS 4 AND 5.
4.





RIGHTSIDE SIDEPANELS ARE REMOVED FOR CLARITY

UPFACTOR= 5.333

REV	BY	DATE	REVISION
B	BJ	12.22.03	ADDED PANELS IN TWO VIEWS

TOLERANCES: UNLESS OTHERWISE SPECIFIED ON THIS DRAWING THE FOLLOWING TOLERANCES SHALL APPLY. SEE TRINITY STANDARDS FOR ADDITIONAL TOLERANCES. FRACTIONS MACHINED ±1/64" (.016") ALL OTHERS: (1" to 2')±1/16", (2' to 10')±1/8", (10' to 20')±1/4", (OVER 20')±1/2" DECIMALS 3 PLACE ±.005 2 PLACE ±.03 1 PLACE ±.1 ANGLES MACHINED ±1/2 DEG. ALL OTHERS ±1 DEG.

HIGHWAY SAFETY GROUP
TRINITY INDUSTRIES, INC. DALLAS, TEXAS

DRAWN	BJ	12-18-03
CHKD	BJ	12-18-03
APPD	JRA	12-18-03
ITMCLS	TRACC	
NLA	~	
WEIGHT	~	

SLED ASSEMBLY WITH SIDE PANELS

DRAWING NO:	SHEET	REV	SIZE
DP UGA	1 OF 1	B	D

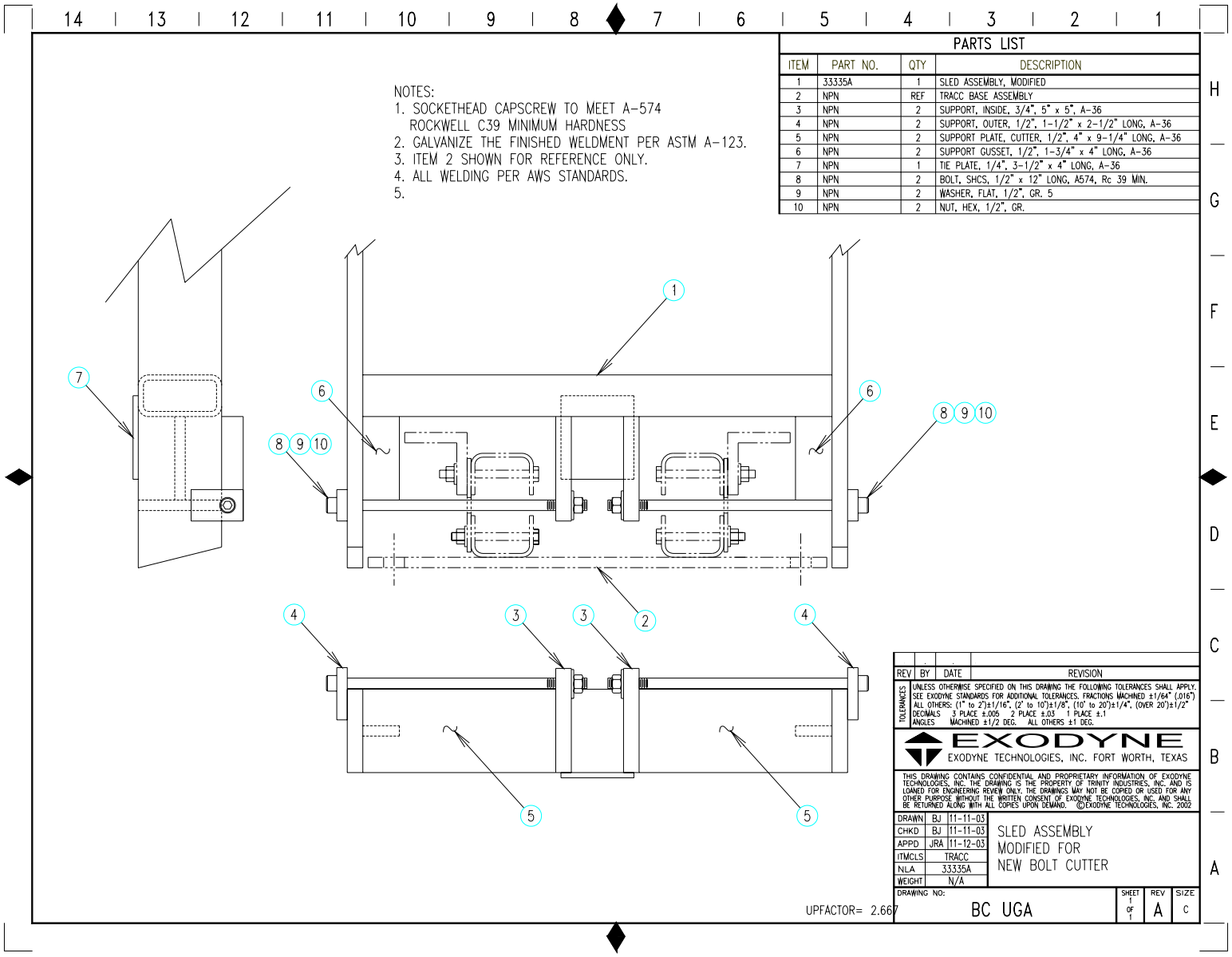
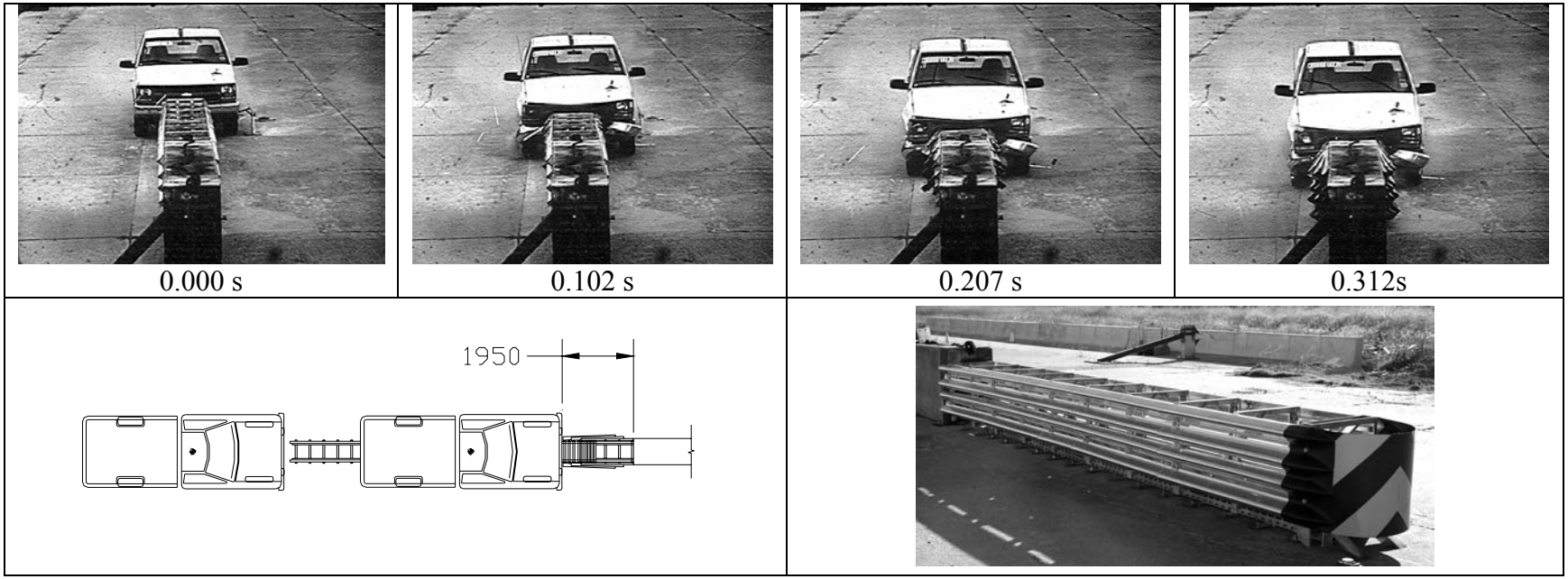


Figure 1. Details of sled assembly.



General Information

Test Agency	Texas Transportation Institute
Test No.	400001-TTR2
Date	10-30-2003

Test Article

Type	Crash Cushion
Name	TRACC
Installation Length (m)	6.5
Material or Key Elements	Guidance Tracks, Impact "Sled", Steel Frames And W-Beam Fender Panels
Soil Type and Condition	Concrete Footing with Chemical Anchors

Test Vehicle

Type	Production
Designation	2000P
Model	1999 Chevrolet Cheyenne 2500
Mass (kg)	
Curb	2154
Test Inertial	2062
Dummy	No dummy
Gross Static	2062

Impact Conditions

Speed	97.3
Angle	0.0

Exit Conditions

Speed	Stopped
Angle	N/A

Occupant Risk Values

Impact Velocity (m/s)	
Longitudinal	8.4
Lateral	0.1
THIV (km/h)	30.4
Ridedown Accelerations (g's)	
Longitudinal	-17.9
Lateral	-2.9
PHD (g's)	17.9
ASI	1.09
Max. 0.050-s Average (g's)	
Longitudinal	-13.0
Lateral	1.1
Vertical	5.0

Test Article Deflections (m)

Dynamic	4.82
Permanent	4.82
Working Width	1.88

Vehicle Damage

Exterior	
VDS	12FR3
CDC	12FCEW2
Maximum Exterior Vehicle Crush (mm)	510
Interior	
OCDI	FS0000000
Maximum Occupant Cmpt. Deformation (mm)	0.0

Post-Impact Behavior

(during 1.0 sec after impact)

Max. Yaw Angel (deg)	-4.3
Max. Pitch Angle (deg)	-5.2
Max. Roll Angle (deg)	-3.2

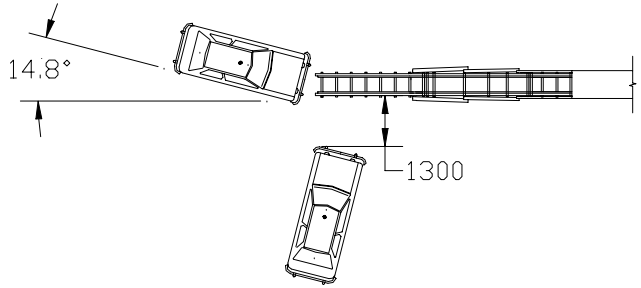
Figure 13. Summary of results for *NCHRP Report 350* test 3-31 on modified TRACC.

0.000 s

0.076 s

0.152 s

0.234 s



General Information	
Test Agency	Texas Transportation Institute
Test No.	400001-TTR4
Date	12/16/2004
Test Article	
Type	Crash Cushion
Name	TRACC
Installation Length (m)	6.5
Material or Key Elements	Guidance Tracks, Impact "Sled," Steel Frames and W-Beam Fender Panels
Soil Type and Condition	Concrete Footing with Chemical Anchors
Test Vehicle	
Type	Production
Designation	820C
Model	2000 Geo Metro
Mass (kg)	
Curb	837
Test Inertial	845
Dummy	77
Gross Static	922

Impact Conditions	
Speed	99.6
Angle	14.8
Exit Conditions	
Speed	Stopped
Angle	N/A
Occupant Risk Values	
Impact Velocity (m/s)	
Longitudinal	11.8
Lateral	2.9
THIV (km/h)	43.7
Ridedown Accelerations (g's)	
Longitudinal	-13.8
Lateral	-4.5
PHD (g's)	13.8
ASI	1.59
Max. 0.050-s Average (g's)	
Longitudinal	-17.7
Lateral	-6.1
Vertical	4.5

Test Article Deflections (m)	
Dynamic	2.62
Permanent	2.51
Working Width	
Vehicle Damage	
Exterior	
VDS	12FD5
CDC	12FDEW3
Maximum Exterior Vehicle Crush (mm)	430
Interior	
OCDI	FS0010000
Maximum Occupant Cmpt. Deformation (mm)	46
Post-Impact Behavior	
(during 1.0 sec after impact)	
Max. Yaw Angel (deg)	-65.0
Max. Pitch Angle (deg)	-20.6
Max. Roll Angle (deg)	5.0

Summary of results for *NCHRP Report 350* test 3-32 on the TRACC.