September 5, 2002

HSA-10/CC54D

Mr. Rodney A. Boyd
Trinity Highway Safety Products Division
Box 568887
Dallas, Texas 75356-9619

Dear Mr. Boyd:

In his August 15 letter to Mr. Richard Powers of my staff, your consultant, James Albritton, requested the Federal highway Administration's (FHWA) review and acceptance of modifications to your TRACC and FASTRACC crash cushions. These modifications consisted of flared extensions to the original designs, thus making them suitable to shield wider hazards. To support this request, he also sent a Texas Transportation Institute report, dated August 2002, entitled "NCHRP Report 350 Testing and Evaluation of the WideTRACC" and videotapes of the tests that were conducted.

The WideTRACC is essentially a modification of the original 6.4-m long TRACC crash cushion. Approximately 2.9 m from the nose, the side panels, connected to four progressively wider support frames, begin to flare outward at a seven-degree angle. Depending on the width and location of the shielded object, either one or both sides of the TRACC can be flared. The wider frames are anchored to the asphalt or concrete foundation with special low-profile anchors, and the side panels are bolted to the widened frames with special joint plates that establish the seven-degree flare angle between the frames and the panels. At this point, the WideTRACC is 1.47-m wide at the rear. If the shielded object is wider than 1.47 m, the seven-degree flare can be continued in 0.71 m increments. Each added increment of length adds 0.17 m to the width of the system. As an example (assuming both sides are flared), a 3.56 m extension would result in a rear width of 2.34 m and the WideTRACC unit would be 9.94-m long. The extended sections are comprised of two 10-gauge W-beam panels bolted to W150 x 13 steel posts that have C75 x 6 channel braces behind each post. The posts and braces are welded to a common base plate that is bolted to the foundation. When the extension transitions to a rigid concrete wall, a C200 x 17 steel channel must be used between the lower W-beam and the braced support posts. These and other design details are shown in Enclosure 1.

Because the original TRACC was subjected to a full array of tests, only those tests likely to be affected by the flared sides of the WideTRACC were conducted. These included NCHRP Report 350 test 3-31 and test 3-38. The latter test was run twice. The first impact point was approximately at the point where the side panels began to flare and the second was at the transition point to a concrete safety shape barrier. Summary reports for these three tests are shown in Enclosure 2.

Based on the information you provided, I agree that the WideTRACC, as described above and as shown in Enclosure 2, may be considered a test level 3 crash cushion and used on the National Highway System (NHS) when its use is acceptable to the contracting agency. Since it is a proprietary device, the conditions listed in Title 23, Code of Federal Regulations, Section 635.411 apply to its use on Federal-aid projects, except exempt, non-NHS projects.

I also agree that the wider design can be applied to your FASTRACC attenuator, which met NCHRP Report 350 evaluation criteria for test 3-31 (head-on impact with the 2000-kg pickup truck) at an impact speed of 112.3 km/h. When applied to the FASTRACC, the flared panels begin at the same location relative to the nose of the attenuator, but five progressively wider support frames must be used in advance of any transition section. Since only test 3-31 was run at the higher impact speed, there is no assurance that either version of the FASTRACC will meet NCHRP Report 350 evaluation criteria for a test level 3 (TL-3) attenuator at impact speeds greater than 100 km/h for any of the other impact conditions included in the Report 350 test matrix for crash cushions.

Sincerely yours,

(original signed by Carol H. Jacoby)

Carol H. Jacoby, P.E.
Director, Office of Safety Design

2 Enclosures

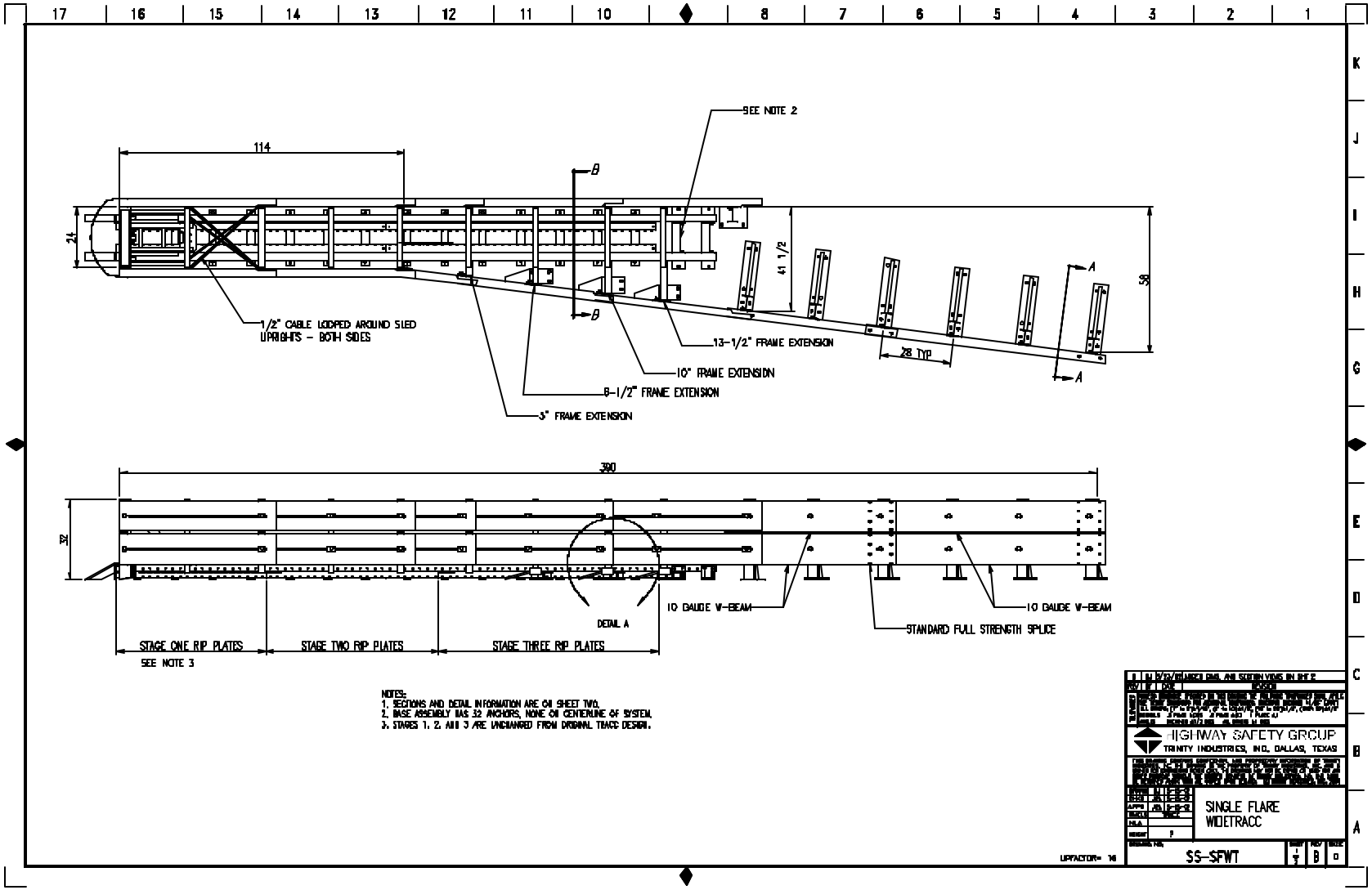


Figure 1. Details of the WIDETRACC used for tests 400001-WTR6 and WTR9 (redirection test, *NCHRP Report 350* test 3-38).

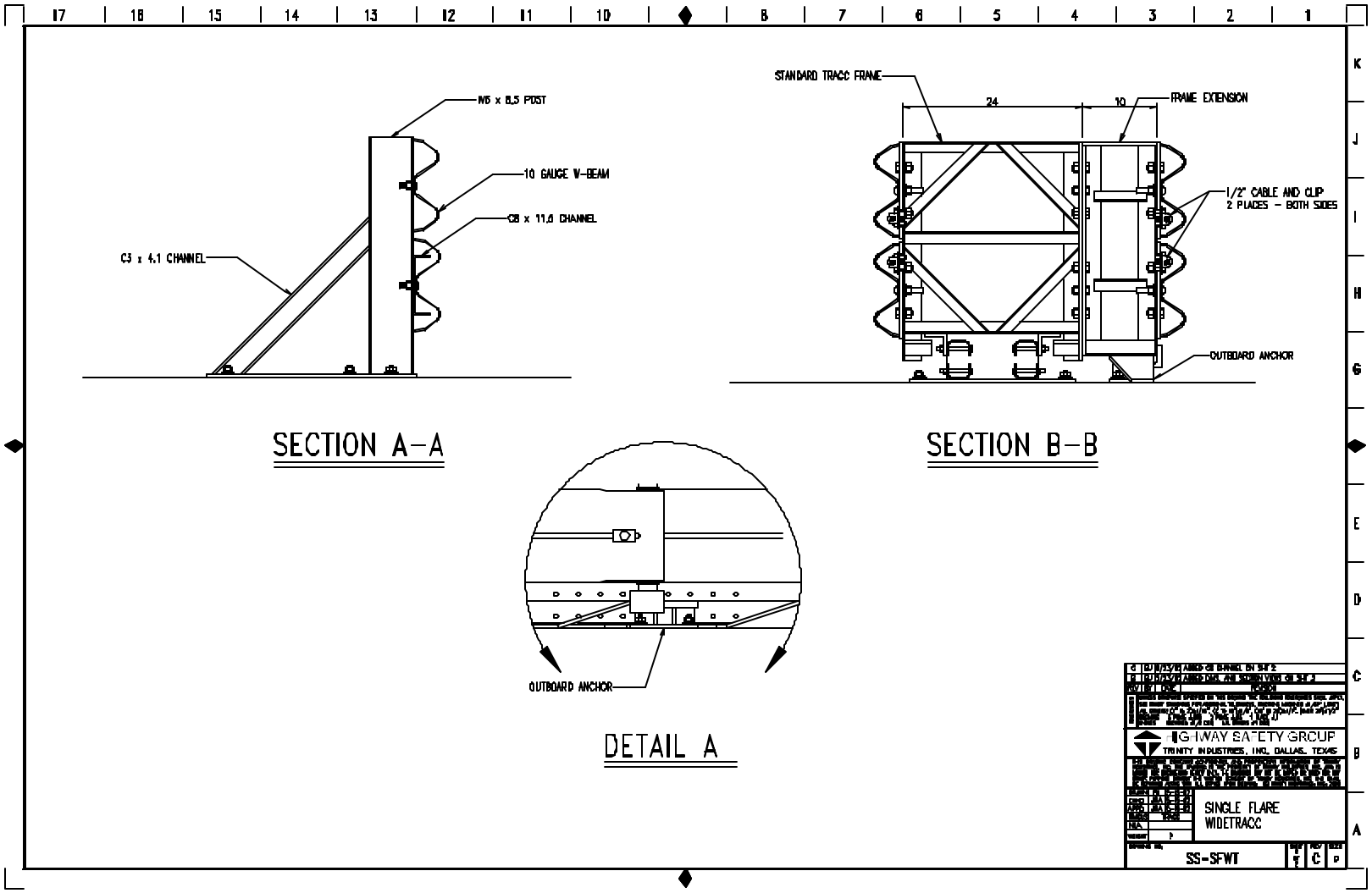


Figure 1. Details of the WIDETRACC used for tests 400001-WTR6 and WTR9 (redirection test, *NCHRP Report 350* test 3-38) (continued).

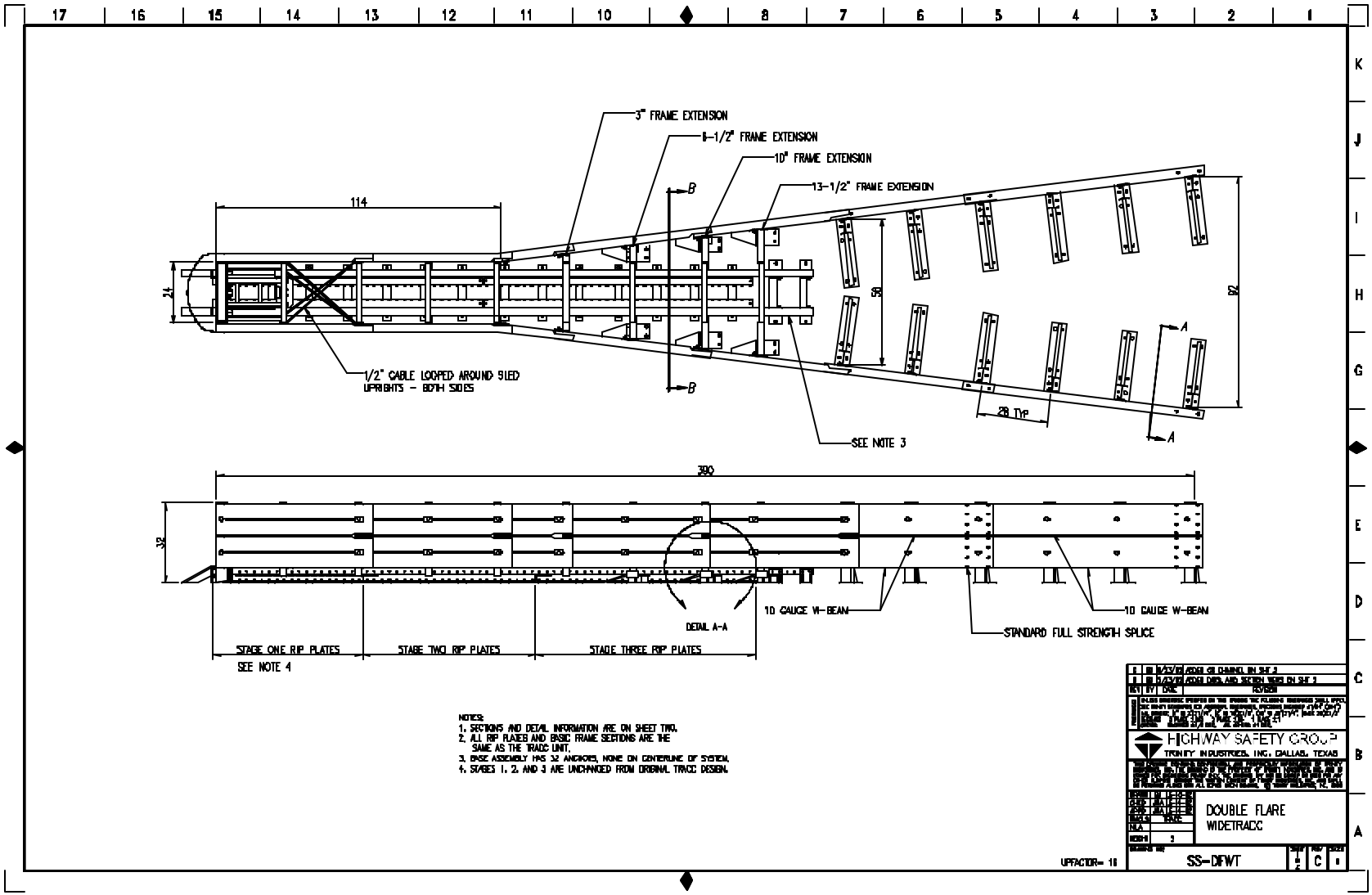


Figure 2. Details of the WIDETRACC for test 400001-WTR7 (end-on test, *NCHRP Report 350* test 3-31).

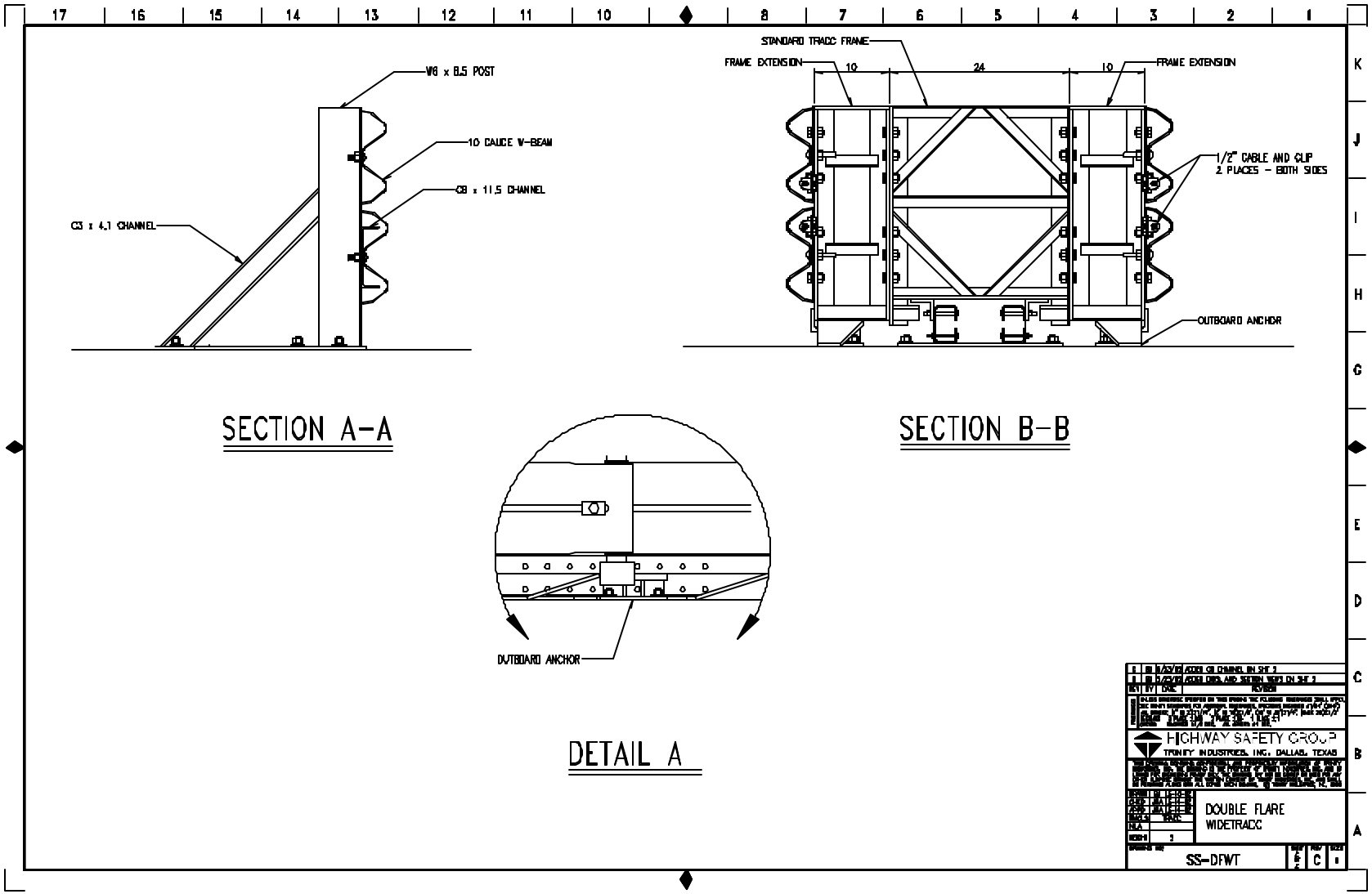


Figure 2. Details of the WIDETRACC for test 400001-WTR7 (end-on test, *NCHRP Report 350* test 3-31) (continued).

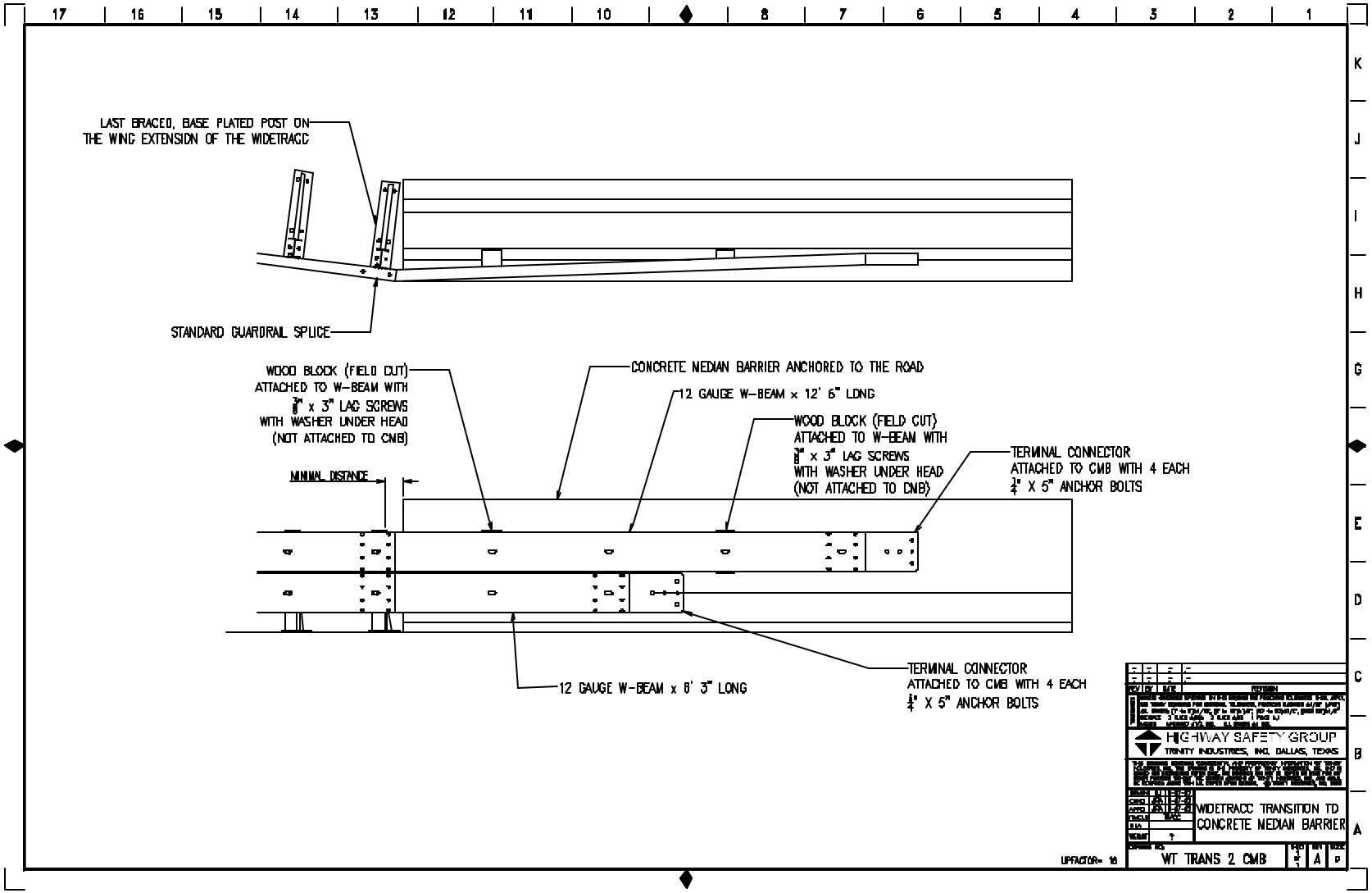
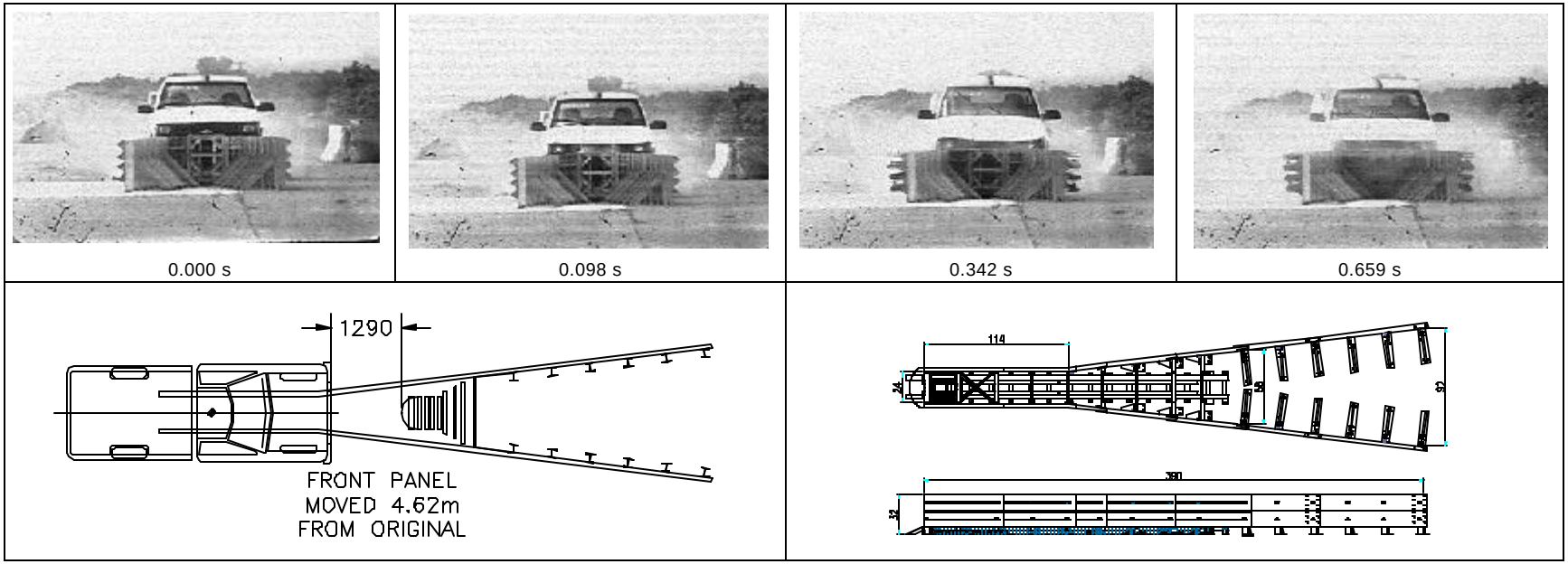


Figure 3. Details of the WIDETRACC transition to safety-shaped CMB used for test 400001-WTR9.



General Information

Test Agency	Texas Transportation Institute
Test No.	400001-WTR7
Date	05/08/02

Test Article

Type	Crash Cushion
Name	WIDETRACC
Installation Length (m)	9.9
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	1998 Chevrolet 2500 Pickup
Mass (kg)	
Curb	2110
Test Inertial	2044
Dummy	N/A
Gross Static	2044

Impact Conditions

Speed (km/h)	100.0
Angle (deg)	0.0

Exit Conditions

Speed (km/h)	8.2
Angle (deg)	3.6

Occupant Risk Values

Impact Velocity (m/s)	
x-direction	8.9
y-direction	0.2
THIV (km/h)	32.0
Ridedown Accelerations (g's)	
x-direction	-14.7
y-direction	4.2
PHD (g's)	14.7
ASI	0.95
Max. 0.050-s Average (g's)	
x-direction	-11.2
y-direction	1.4
z-direction	-4.1

Test Article Deflections (m)

Dynamic	4.71
Permanent	4.62
Max. Extension of Fenders	0.65 (right side) 0.59 (left side)

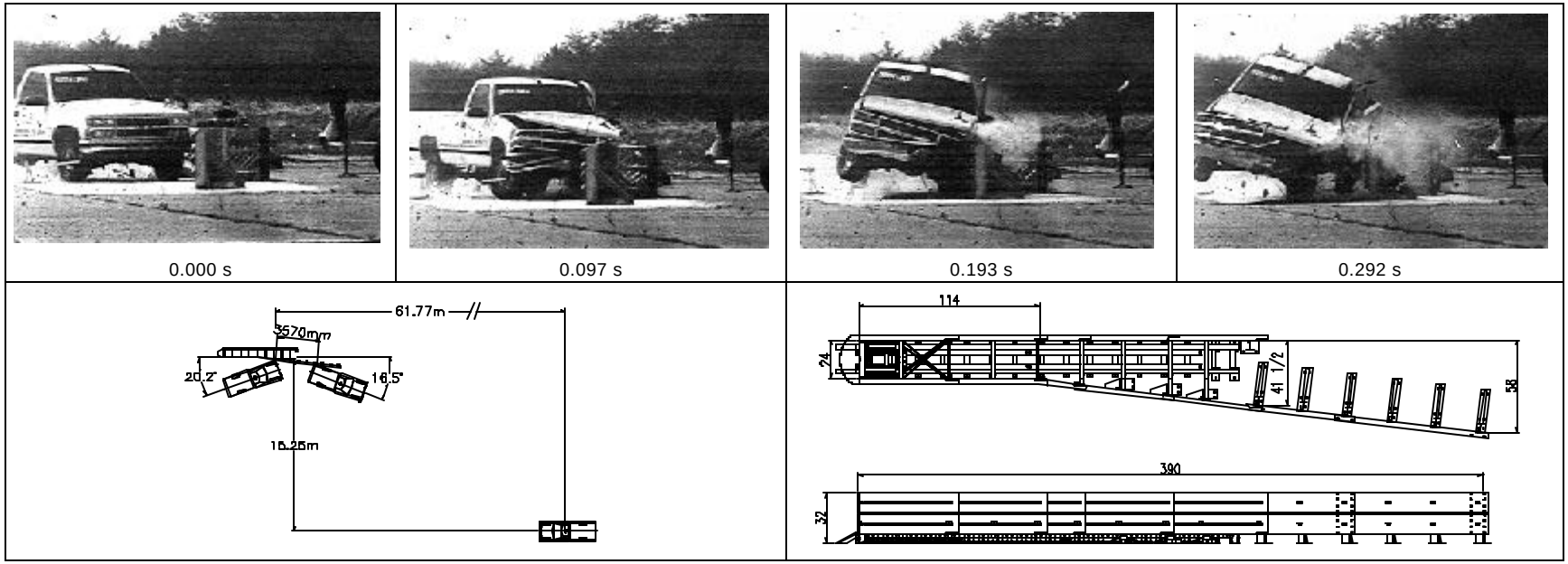
Vehicle Damage

Exterior	
VDS	12FC1
CDC	12FCEW1
Maximum Exterior	
Vehicle Crush (mm)	375
Interior	
OCDI	FS0000000
Max. Occ. Compart.	
Deformation (mm)	None

Post-Impact Behavior

(during 1.0 s after impact)	
Max. Yaw Angle (deg)	-4.8
Max. Pitch Angle (deg)	-6.7
Max. Roll Angle (deg)	-2.7

Figure 21. Summary of results for test 400001-WTR7, *NCHRP Report 350* test 3-31.



General Information
- Test Agency . . . . . Texas Transportation Institute
- Test No. 400001-WTR6
- Date 03/22/02

Test Article
- Type . . . . . Crash Cushion
- Name . . . . . WIDETRACC
- Installation Length (m) 9.9
- 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 . . . . . 1998 Chevrolet 2500 Pickup
- Mass (kg)
  - Curb 2154
  - Test Inertial 2042
  - Dummy . . . . . N/A
  - Gross Static 2042

Impact Conditions
- Speed (km/h) 100.6
- Angle (deg) 20.2

Exit Conditions
- Speed (km/h) 75.5
- Angle (deg) 16.5

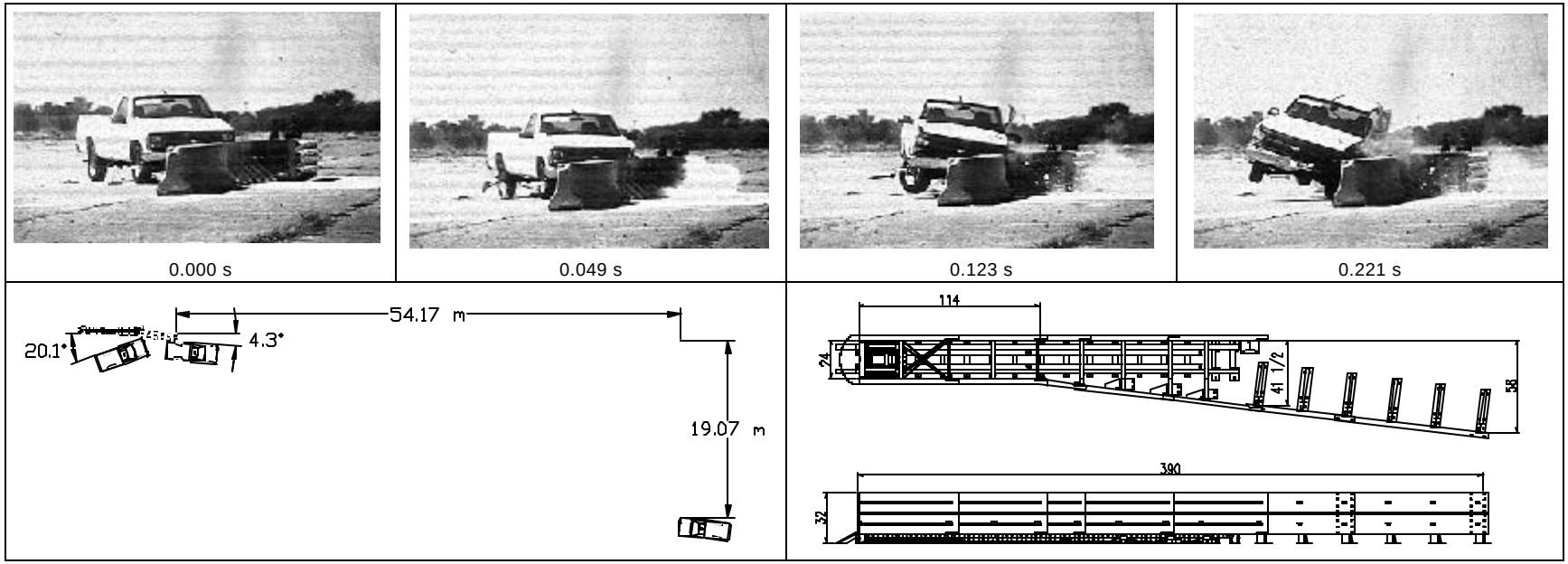
Occupant Risk Values
- Impact Velocity (m/s)
  - x-direction 7.1
  - y-direction 8.7
- THIV (km/h) 39.3
- Ridedown Accelerations (g's)
  - x-direction . . . . . -10.2
  - y-direction 11.9
- PHD (g's) 15.3
- ASI 1.86
- Max. 0.050-s Average (g's)
  - x-direction . . . . . -10.9
  - y-direction 14.3
  - z-direction . . . . . -8.4

Test Article Deflections (m)
- Dynamic 0.11
- Permanent 0.11
- Vehicle Overhang 0.59

Vehicle Damage
- Exterior
  - VDS 11FL3
  - CDC 11FLEW3
- Maximum Exterior
  - Vehicle Crush (mm) 480
- Interior
  - OCDI LF1113000
- Max. Occ. Compart.
  - Deformation (mm) 102

Post-Impact Behavior
(during 1.0 s after impact)
- Max. Yaw Angle (deg) 57.3
- Max. Pitch Angle (deg) . . . . -14.0
- Max. Roll Angle (deg) . . . . . -35.1

Figure 14. Summary of results for test 400001-WTR6, *NCHRP Report 350* test 3-38 (with critical impact point as specified by Exodyne and FHWA).



General Information
- Test Agency . . . . . Texas Transportation Institute
- Test No. 400001-WTR9
- Date 07/11/02

Test Article
- Type . . . . . Crash Cushion
- Name . . . . . WIDETRACC
- Installation Length (m) 9.9
- 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 . . . . . 1997 Chevrolet 2500 Pickup
- Mass (kg)
  - Curb 2071
  - Test Inertial 2043
  - Dummy . . . . . N/A
  - Gross Static 2043

Impact Conditions
- Speed (km/h) 100.5
- Angle (deg) 20.1

Exit Conditions
- Speed (km/h) 79.5
- Angle (deg) 4.3

Occupant Risk Values
- Impact Velocity (m/s)
  - x-direction 6.6
  - y-direction 9.0
- THIV (km/h) 38.2
- Ridedown Accelerations (g's)
  - x-direction . . . . . -6.1
  - y-direction 8.8
- PHD (g's) 9.3
- ASI 1.86
- Max. 0.050-s Average (g's)
  - x-direction . . . . . -10.2
  - y-direction 14.8
  - z-direction . . . . . -9.6

Test Article Deflections (m)
- Dynamic 0.04
- Permanent 0.04
- Vehicle Overhang 0.53

Vehicle Damage
- Exterior
  - VDS 11FL2
  - CDC 11FLEW2
- Maximum Exterior
  - Vehicle Crush (mm) 740
- Interior
  - OCDI LF1110000
- Max. Occ. Compart.
  - Deformation (mm) 155

Post-Impact Behavior
(during 1.0 s after impact)
- Max. Yaw Angle (deg) 62.6
- Max. Pitch Angle (deg) . . . . -9.1
- Max. Roll Angle (deg) . . . . . -33.6

Figure 28. Summary of results for test 400001-WTR9, *NCHRP Report 350* test 3-38 (with critical impact point as specified by *NCHRP Report 350* and FHWA).