



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

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

In Reply Refer To:  
HSA-10/CC-90A

September 18, 2006

Dean L. Sicking, P.E., Ph. D.  
CEO, Safety By Design Co.  
5931 The Knolls  
Lincoln, NE 68512

Dear Dr. Sicking:

In my April 15, 2005, acceptance letter to you, designated as HSA-10/CC90, I accepted your Burster Energy Absorbing Technology trailer TMA as a National Cooperative Highway Research Program (NCHRP) Report 350 truck-mounted attenuator at test level 3 (TL-3) based on successful completion of the mandatory TMA tests prescribed by Report 350. On June 21, 2006, I received a request that this device also be noted as having met the two optional tests identified in Report 350. With your letter, you sent copies of test reports and videotapes documenting the results of the two optional tests.

Staff review of the optional tests you conducted on modified versions of the original design raised questions concerning the use of these tests to certify the original design as meeting the evaluation criteria for the optional tests. Furthermore, although the support vehicle was blocked to prevent forward movement in both optional tests, the rear axle was lifted off the ground and the truck shifted several feet sideways in test 3-53, casting some doubt on the validity of the test to show that there was no upper weight limit to the support vehicle. After much discussion with my staff, it was mutually agreed that you would re-run test 3-53 using the original TMA design (with the relatively minor design changes as noted below) and with the support truck fully blocked to prevent motion in any direction. We agreed to accept the results of test 3-52 if the second test 3-53 was successful.

Your August 25, 2006, letter to Mr. Richard Powers of my staff transmitted the results of your second test. Enclosure 1 shows a drawing of your final design. You reported that this design differs from the originally accepted version in that the 1) the bolted splice in the middle of the first stage energy absorbing tube has been moved to the junction between the second and third stages and 2) the third stage energy absorbing tubes were scored over the first 305 mm (12 inches). Enclosures 2A-2C are the test summary sheets for test 3-52, the first 3-53 test, and the final 3-53 test on the modified original design, respectively.



I agree that the final design may be considered to meet all four Report 350 TMA tests and may be used with a support vehicle with no upper weight limit. Since the lowest acceptable weight limit has not been established through testing, it remains the manufacturer's responsibility to advise potential users of the TMA as to what lower limit is appropriate to ensure the safety of occupants of an impacting vehicle, the driver of the support truck, and other motorists and workers in the immediate area. Primary concerns with the use of a relatively light (and untested) support vehicle are the unknown post-crash stabilities and trajectories of both the impacting vehicle and the support truck.

Please note that the standard provisions to the Federal Highway Administration acceptance letters included in our original letter remain applicable to this modification as well.

Sincerely yours,

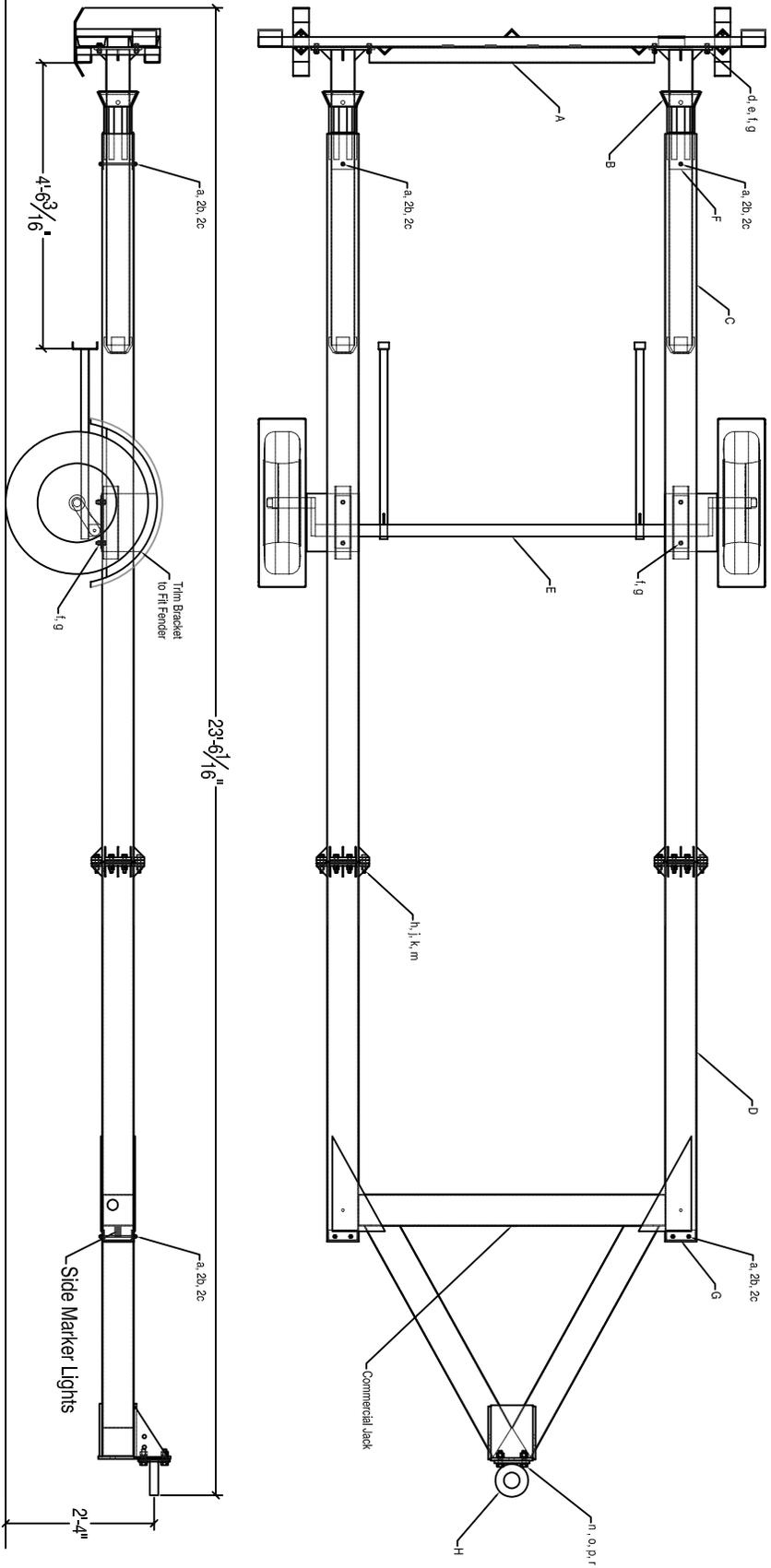
**/original signed by/**

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

2 Enclosures

| ITEM | QTY | DESCRIPTION                  | ITEM | QTY | DESCRIPTION                   |
|------|-----|------------------------------|------|-----|-------------------------------|
| a    | 6   | 5/16" x 7" Grd 5 Thrd Rod    | h    | 16  | 9/16" x 3" Grd 5 Hex Bolt     |
| b    | 12  | 5/16" Heavy Lock Washer      | j    | 16  | 9/16" SAE Washer              |
| c    | 12  | 5/16" Grd 5 Hex Nut          | k    | 16  | 9/16" Heavy Lock Washer       |
| d    | 8   | 1/2" x 1 1/2" Grd 5 Hex Bolt | m    | 16  | 9/16" Grd 5 Hex Nut           |
| e    | 8   | 1/2" Washer                  | n    | 4   | 5/8" x 2 1/2" Grd 5 Hex Bolt* |
| f    | 12  | 1/2" Heavy Lock Washer       | o    | 4   | 5/8" Washer                   |
| g    | 12  | 1/2" Grd 5 Hex Nut           | p    | 4   | 5/8" Heavy Lock Washer        |
|      |     |                              | r    | 4   | 5/8" Grd 5 Hex Nut            |

| ITEM | QTY | DESCRIPTION          |
|------|-----|----------------------|
| A    | 1   | Impact Head          |
| B    | 2   | Bursting Mandrel     |
| C    | 2   | First Tube           |
| D    | 1   | Trailer Frame        |
| E    | 1   | Axle Assembly        |
| F    | 4   | Plastic Guide Plates |
| G    | 2   | End Caps             |
| H    | 1   | Hitch Assembly       |



**Safety Trailers, Inc.**  
San Antonio, TX  
Phone: 970 819 1741

**Safety Trailers, Inc.**  
**Trailer TMA**  
**Assembly**

Sheet: **100**

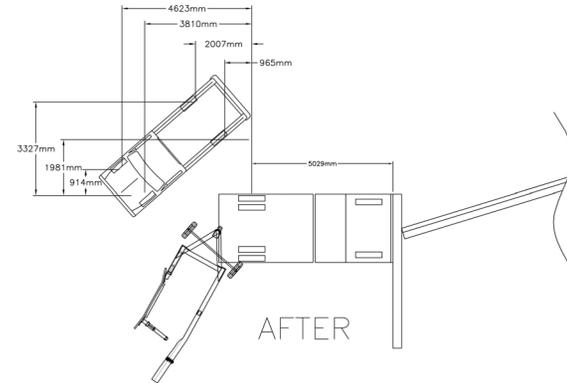
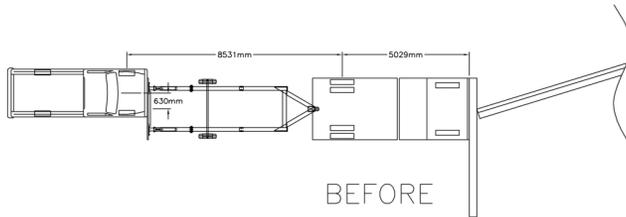
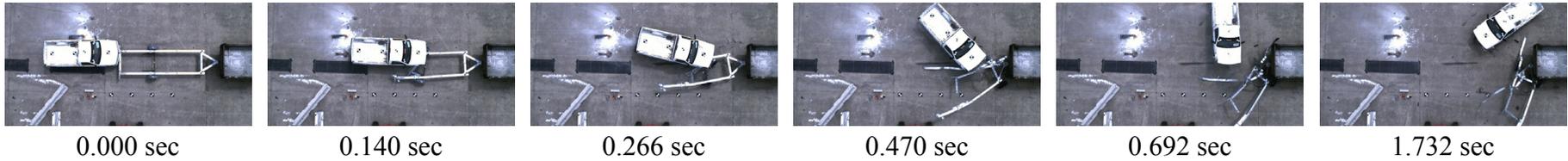
Date: 6/15/06

By: JRR

Drawing Name: TTMA - 100

Scale: NONE

Rev:



- Test Number . . . . . TTMA-5
- NCHRP 350 Test Designation . . . 3-52
- Date . . . . . 7/29/05
- Test Article
  - Type . . . . . Trailer TMA
  - Key Elements . . . . . Trailer TMA impact head
  - . . . . . Tubular steel frame
  - . . . . . Trailer wheel and axle assembly
  - Orientation . . . . . Centerline offset by one-third of width
- Soil Type . . . . . NA
- Vehicle Model . . . . . 2000 Chevrolet C2500
  - Curb . . . . . 2,021 kg
  - Test Inertial . . . . . 2,024 kg
  - Gross Static . . . . . 2,024 kg
- Vehicle Speed
  - Impact . . . . . 102.1 km/h
  - Exit (not required) . . . . . NA
- Vehicle Angle
  - Impact (trajectory) . . . . . 1.3 deg
  - Exit (not required) . . . . . NA

- Vehicle Stability . . . . . Satisfactory
- Occupant Ridedown Deceleration (10 msec avg.)
  - Longitudinal . . . . . 14.30 g's < 20 g's
  - Lateral . . . . . 6.68 g's < 20 g's
- Occupant Impact Velocity
  - Longitudinal . . . . . 10.66 m/s < 12 m/s
  - Lateral . . . . . 1.04 m/s < 12 m/s
- Post-Impact Head Deceleration and Theoretical Head Impact Velocity
  - THIV . . . . . 10.75 m/s < 12 m/s (not req.)
  - PHD . . . . . 18.07 g's < 20 g's (not req.)
- Vehicle Damage . . . . . Moderate
  - TAD<sup>8</sup> . . . . . 12-FR-4
  - SAE<sup>9</sup> . . . . . 12FYEW3
  - OCDI . . . . . F000000000
- Vehicle Stopping Distance . . . . . 5.03 m downstream
- Test Article Damage . . . . . Moderate
- Maximum Deflection
  - Permanent Set . . . . . NA
  - Dynamic . . . . . NA
- Working Width . . . . . 7.86-m long by 12.78-m wide

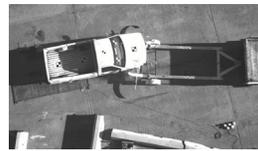
Figure 19. Summary of Test Results and Sequential Photographs, Test TTMA-5



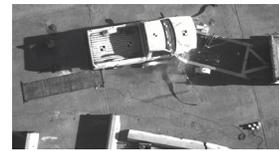
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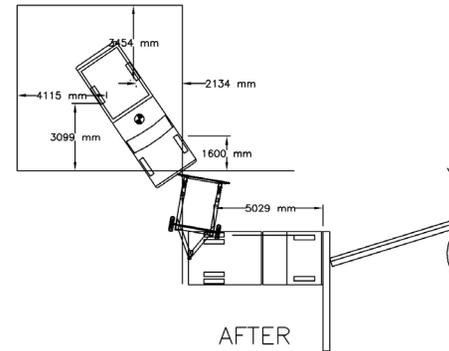
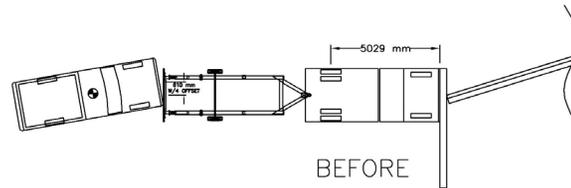
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36

- Test Number . . . . . TTMA-7 (3-53)
- Date . . . . . 12/20/05
- Test Article
  - Type . . . . . Trailer TMA
  - Key Elements . . . . . Trailer TMA impact head
  - Tubular steel frame
  - Trailer wheel and axle assembly
  - Orientation . . . . . Centerline offset by one-fourth of width
- Soil Type . . . . . NA
- Vehicle Model . . . . . 1999 Chevrolet C2500
  - Curb . . . . . 1,956 kg
  - Test Inertial . . . . . 2,013 kg
  - Gross Static . . . . . 2,013 kg
- Vehicle Speed
  - Impact . . . . . 99.9 km/h
  - Exit . . . . . NA
- Vehicle Angle
  - Impact (trajectory) . . . . . 11.0 deg
  - Exit (trajectory) . . . . . NA
- Vehicle Stability . . . . . Satisfactory

- Occupant Ridedown Deceleration (10 msec avg.)
  - Longitudinal . . . . . 12.83 g's < 20 g's
  - Lateral . . . . . 9.15 g's < 20 g's
- Occupant Impact Velocity
  - Longitudinal . . . . . 10.80 m/s < 12 m/s
  - Lateral . . . . . 1.50 m/s < 12 m/s
- Post-Impact Head Deceleration and Theoretical Head Impact Velocity
  - THIV . . . . . 11.10 m/s < 12 m/s (not req.)
  - PHD . . . . . 14.31 g's < 20 g's (not req.)
- Vehicle Damage . . . . . Moderate
  - TAD<sup>9</sup> . . . . . 12-FR-4
  - SAE<sup>10</sup> . . . . . 12FZEW4
  - OCDI . . . . . F000000000
- Vehicle Stopping Distance . . . . . 7.38 m downstream
- Test Article Damage . . . . . Moderate
- Maximum Deflection
  - Permanent Set . . . . . NA
  - Dynamic . . . . . NA
- Working Width . . . . . 9.04 m long by 13.00 m wide

Figure 18. Summary of Test Results and Sequential Photographs, Test TTMA-7



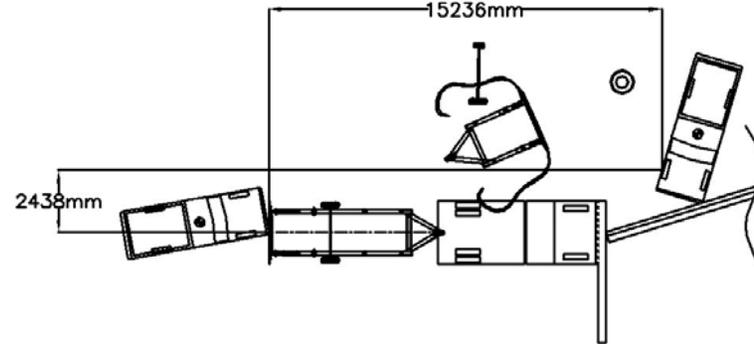
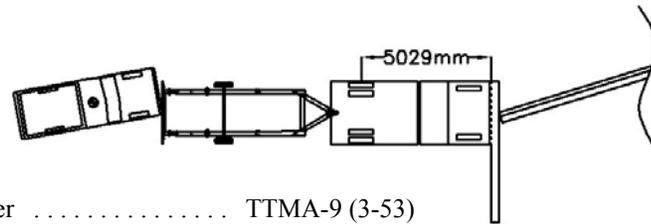
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- Test Number ..... TTMA-9 (3-53)
- Date ..... 8/18/06
- Test Article
  - Type ..... Trailer TMA
  - Key Elements ..... Trailer TMA impact head  
Tubular steel frame  
Trailer wheel and axle assembly
  - Orientation ..... Centerline offset by one-fourth of width
  - Shadow Vehicle ..... Right-rear tire blocked against lateral movement  
Ballasted to total weight of 10,433 kg
- Soil Type ..... NA
- Vehicle Model ..... 1999 Chevrolet C2500
  - Curb ..... 2,105 kg
  - Test Inertial ..... 2,023 kg
  - Gross Static ..... 2,023 kg
- Vehicle Speed
  - Impact ..... 100.4 km/h
  - Exit ..... NA
- Vehicle Angle
  - Impact (trajectory) ..... 9.3 deg
  - Exit (trajectory) ..... NA

- Vehicle Stability ..... Satisfactory
- Occupant Ridedown Deceleration (10 msec avg.)
  - Longitudinal ..... -11.27 g's < 20 g's
  - Lateral ..... -6.43 g's < 20 g's
- Occupant Impact Velocity
  - Longitudinal ..... -9.21 m/s < 12 m/s
  - Lateral ..... -0.65 m/s < 12 m/s
- Vehicle Damage ..... Moderate
  - TAD<sup>9</sup> ..... 12-FD-4
  - SAE<sup>10</sup> ..... 12FDEW4
  - OCDI ..... F000000000
- Vehicle Stopping Distance ..... 15.24 m downstream  
2.44 m toward the left
- Test Article Damage ..... Moderate
- Maximum Deflection
  - Permanent Set ..... NA
  - Dynamic ..... NA
- Working Width ..... 18.33 m long by 14.93 m wide

Summary of Test Results and Sequential Photographs, Test TTMA-9