TEST REPORT No. 2

ALUMINUM BRIDGE RAIL SYSTEMS

Prepared for

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by

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Test Railing Installation

The test railing installed was a variation of the Indiana Type 5A 2-bar aluminum bridge rail. The variable-thickness base plate used in the previous test was replaced with one of greater and constant thickness. In this test the aluminum nuts were replaced by steel ones. In all other respects, the test conditions were essentially identical to Test 4182-1. Figure 1 shows the details of the modification. As before, approximately 28 m (93 ft) of railing was installed on a massive foundation with no curb. An anchor was provided on the downstream end to simulate a continuous rail as shown in Figure 2. Hardware for the installation was fabricated by Magnode Products, Inc., Trenton, Ohio. The bridge rail hardware conforms dimensionally with ARBA Technical Bulletin No. 268-A, July 1973, with the exception of the modification as noted. The interior rail sections were in 8 m (26 ft) lengths.

Instrumentation

The vehicle was equipped with triaxial accelerometers mounted near the center of gravity. Roll, pitch, and yaw were sensed by on-board gyroscopic instruments. The analog signals were telemetered to a base station for recording on magnetic tape and display on real-time strip chart. Provision was made for transmission of calibration signals before and after the test, and an accurate time reference signal was simultaneously recorded with the data.

Tape switches near the impact area were actuated by the vehicle to indicate elapsed time over a known distance to provide a quick check of impact speed, and the initial contact also produces an "event" mark on the data recording to establish time zero.

High-speed motion pictures were obtained from various locations, including overhead, to document the events and provide a time-displacement history. Film and electronic data were synchronized through a visual event signal at initial contact that coincides with the electronic contact signal.

Test Description

A 1974 Plymouth Fury weighing 2043 kg (4500 lbs) was directed into the rail at an angle of 25 degrees and 100.8 km/h (62.6 mph). The impact point was .73 m (2.4 ft) past post 6. No anthropomorphic dummies were used in this test. The vehicle was free-wheeling and unrestrained at impact.

Figures 3 and 4 depict the vehicle and test area before and after the impact. Figure 5 includes overhead and oblique views of the impact area. It can be seen that posts 7, 8 and 9 were separated from their base-plate flanges. The overhead view shows a detached section of rail from posts 8 and 9. A section of the top rail from posts 7 and 8 was thrown about 46 m (150 ft) from the point of impact approximately in the direction of initial vehicle travel.

The posts separated from the base-plates through shearing of the rivets as shown in Figure 6. The vehicle was not significantly redirected or contained, and traveled approximately 6.1 m (20 ft) from the rail before plowing to a stop in the soft earth behind the rail installation.

Results

Sequential photographs and a summary of test data are shown in Figures 7 and 8. Figures 9, 10 and 11 are analog reproductions of the vehicle triaxial accelerations as a function of time.

Figure 12 represents the resultant absolute acceleration which had a maximum 50-millisecond-interval average of 11.91 g's. The triaxial acceleration traces indicate the individual maximum 50-millisecond-interval values.

Figures 13, 14 and 15 represent vehicle roll, pitch and yaw angles, respectively, as a function of time from impact.

The installation did not meet the relevant performance criteria promulgated in "Recommended Procedures for Vehicle Crash Testing of Highway Appurtenances", February, 1978.



Figure 1. Post and Rail Detail of Modified Indiana Guardrail.





Figure 2. Test Installation of Modified Indiana Guardrail.







Figure 5. Overhead and Oblique Views of Test Area After Test 4182-2.



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Figure 6. Sheared Rivets on Post Mountings After Test 4182-2.





0.000 sec







0.050 sec





0.122 sec



0.220 sec Figure 7. Sequential Photographs for Test 4182-2.



1.569 sec
Figure 7. Sequential Photographs for Test 4182-2 (continued).











Figure 11. Vehicle Vertical Accelerometer Trace for Test 4182-2.



Figure 12. Resultant Acceleration Trace for Test 4182-2.







