CRASH TEST OF MILE POST MARKER

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Research Report Number 146-8

Studies of Field Adaption of Impact
Attenuation Systems

Research Study Number 2-8-68-146

Sponsored by

The Texas Highway Department
in cooperation with
The U. S. Department of Transportation
Federal Highway Administration

January, 1972

Texas Transportation Institute
Texas A&M University
College Station, Texas

ACKNOWLEDGEMENTS

The information contained in this report was developed on a cooperative research study sponsored jointly by the Texas Highway Department and the Federal Highway Administration. Liaison was maintained through Mr. John Nixon and Mr. Leon Hawkins of the Texas Highway Department in Austin.

ABSTRACT

This report describes a vehicle crash test on a mile post marker. The vehicle was a sedan weighing 3400 lbs. and was towed into the mile post marker at 43.9 mph. The mile post marker, proposed for use on interstate highways, consisted of a 1 ft. by 4 ft. sign panel mounted on a 2 in. standard pipe 8 ft. high with a threaded coupling as a breakaway feature.

The standard threaded coupling breakaway feature resulted in only 1.6 mph change in vehicle velocity during impact. However, the behavior of the sign panel and post, which struck the windshield, is considered undesirable. Penetration through the windshield was estimated to have been about 3 in. and was reduced by the sign's contact with the vehicle's cowling, windshield, wiper assembly and top of dash.

Modifications to the proposed mile post marker are indicated in order to minimize the probability of a secondary impact into the windshield and interior of the passenger compartment.

Key Words: Highway safety, Full-scale crash testing, Sign post, Breakaway sign support, Mile post marker.

SUMMARY

A single full-scale vehicle crash test was conducted on a mile post marker mounted on a 2 in. standard pipe support. The foundation was a 2 in. standard pipe with a standard threaded coupling embedded in an 8 in. diameter concrete filled hole with the top of the coupling flush with the top of the concrete.

A 1963 Dodge weighing 3400 lbs. was towed into the mile post marker at 43.9 mph.

The standard threaded coupling breakaway feature resulted in only 1.6 mph change in vehicle velocity during impact. However, the behavior of the sign panel and post, which struck the windshield, is considered undesirable. The post buckled at the bumper height, the threaded end pulled out of the coupling, and the post and sign penetrated the windshield into the passenger compartment of the vehicle. Penetration through the windshield was estimated to have been about 3 in. and was reduced by the sign's contact with the vehicle's cowling, windshield, wiper assembly, and top of dash.

Modifications to the proposed mile post marker are indicated in order to minimize the probability of a secondary impact into the windshield and interior of the passenger compartment.

IMPLEMENTATION STATEMENT

Modifications to the proposed mile post marker are indicated in order to minimize the probability of a secondary impact into the windshield and interior of the passenger compartment of the vehicle. While this conclusion is based on only one test, it is apparent that such signs could penetrate the windshield and result in serious injury to the vehicle occupants.

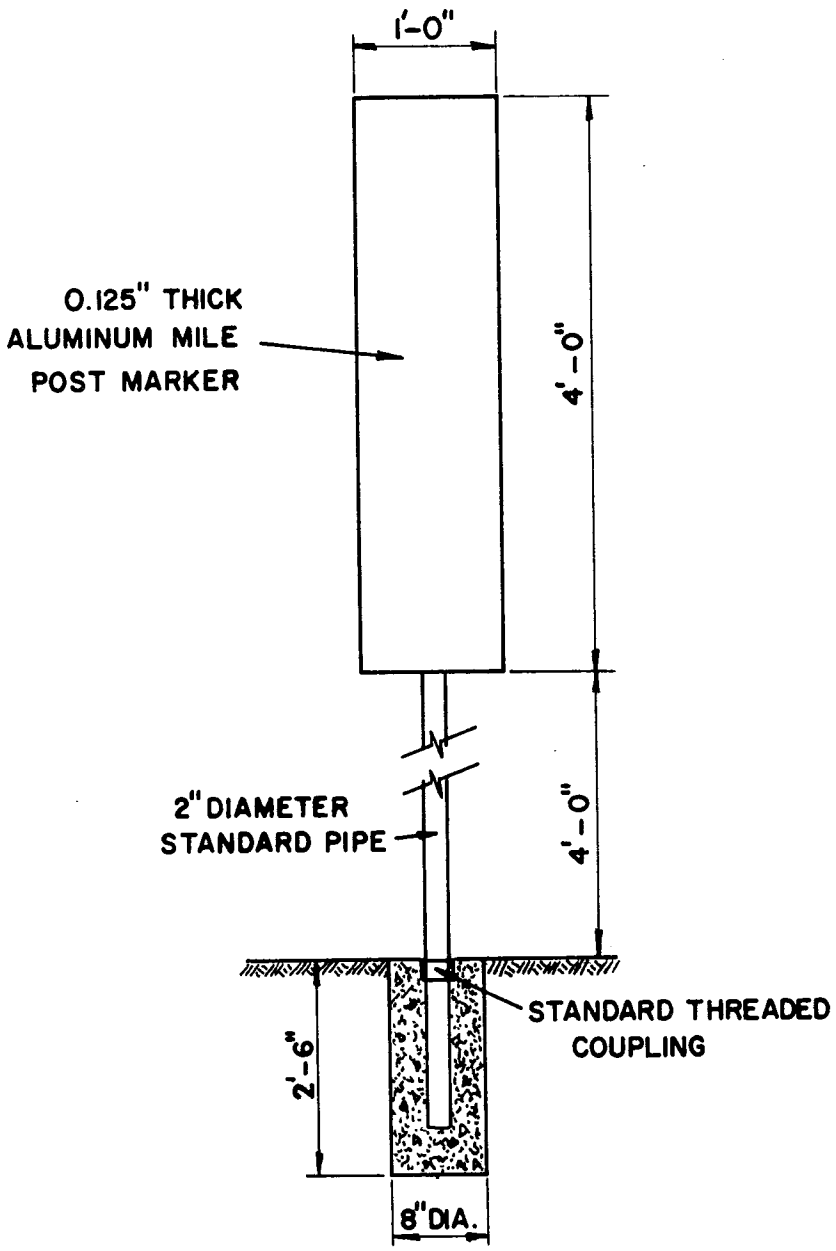
CRASH TEST OF MILE POST MARKER

Background information concerning the events that led to the decision to conduct a full-scale vehicle crash test on a mile post marker is contained in an interoffice memorandum by Mr. D. L. Hawkins, Texas Highway Department dated October 30, 1972.

> "The increased size for mile post markers to conform with MUTCD standards will result in increased size for the supporting post. Heretofore it has been customary to mount the mile post marker on a hat-section delineator post. This has been very satisfactory since a delineator post presents little or no threat to traffic and can be easily ridden down by any vehicle. To meet AASHO design requirements for wind loads the equivalent of a 2" pipe for a support will be required for the larger marker. . . .
>
> District 15 (San Antonio) of the Texas Highway Department has, for a number of years, used a threaded pipe coupling at the ground line on the support for highway signing other than Interstate for the purpose of minimizing replacement costs on signs damaged by collision. By incorporating a "weak point" in the system damage is confined to the sign face and pipe above the coupling, thus simplifying replacement. District 15's experience with this configuration has been favorable. Most contracts appear to have occurred at points of turning movements and at lower speeds so the objective of limited sign damage seems to have had, as a by product, limited damage to colliding vehicles."

A single full-scale vehicle crash test was conducted on a mile post marker mounted on a 2 in. standard pipe support. The foundation was a 2 in. standard pipe with a standard threaded coupling embedded in an 8 in. diameter concrete filled hole with the top of the coupling flush with the top of the concrete. A line drawing, before test photographs, and after test photographs of the mile post marker are given in Figures 1 through 3.

The test vehicle was a 1963 Dodge weighing 3400 lbs. and was towed into the mile post marker at 43.9 mph. A speed of between 40 and 45 mph



MILE POST MARKER

Figure 1. Geometry of mile post marker.

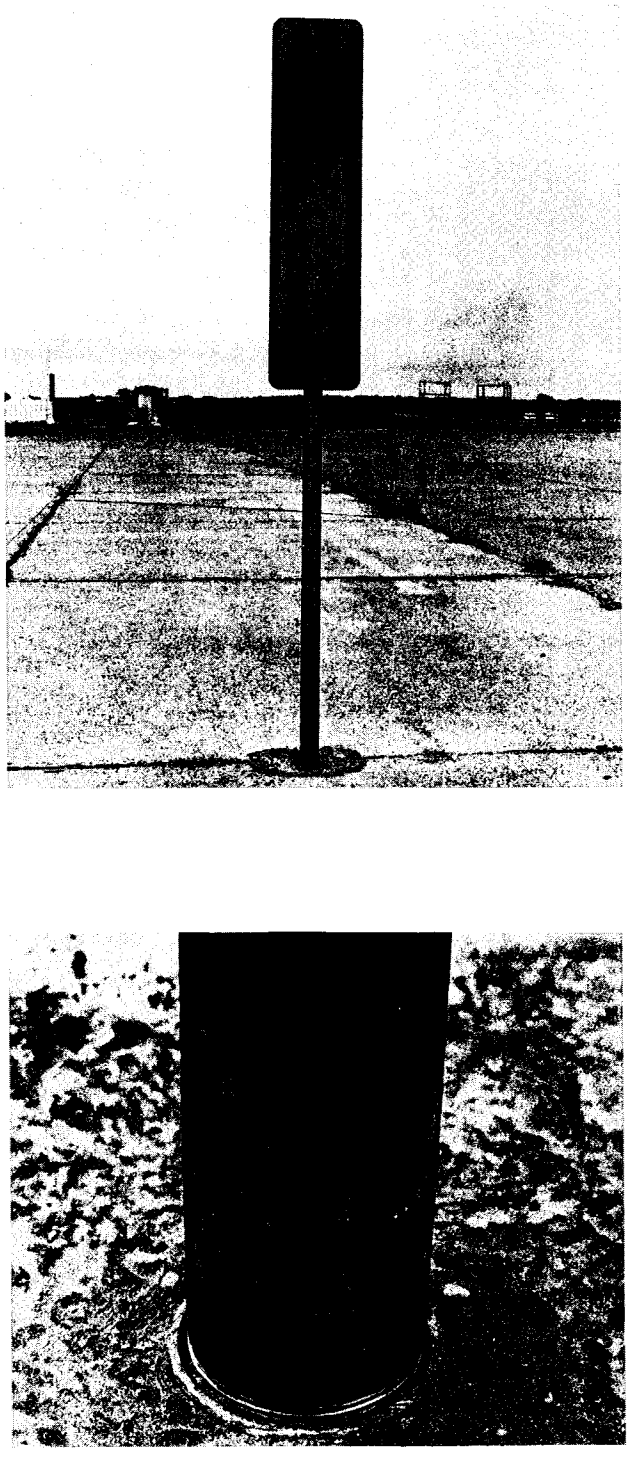
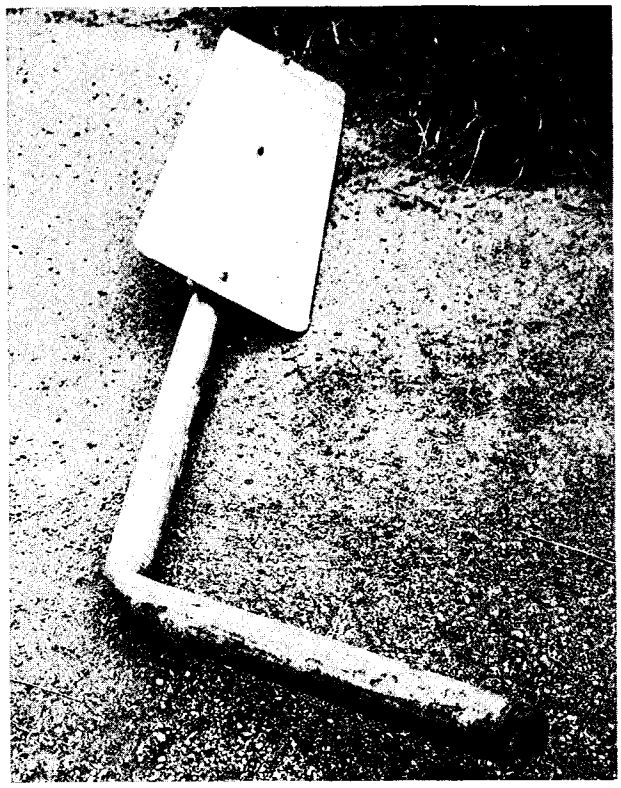


Figure 2. "Before" photographs of mile post marker.



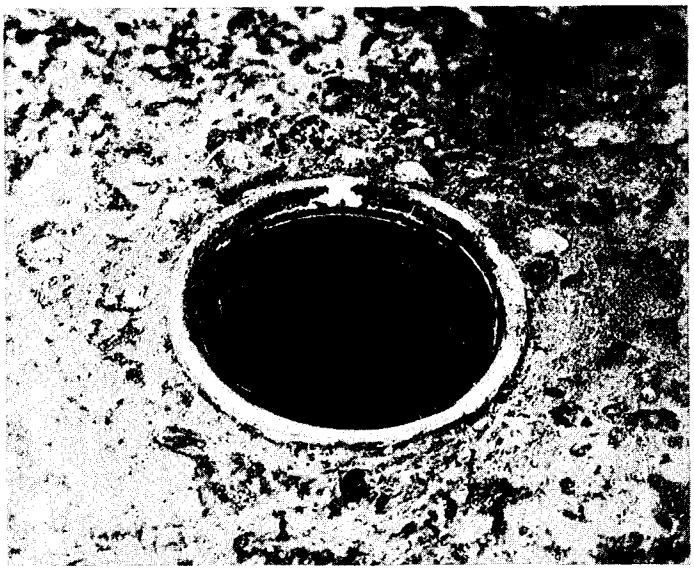


Figure 3. "After" photographs of mile post marker.

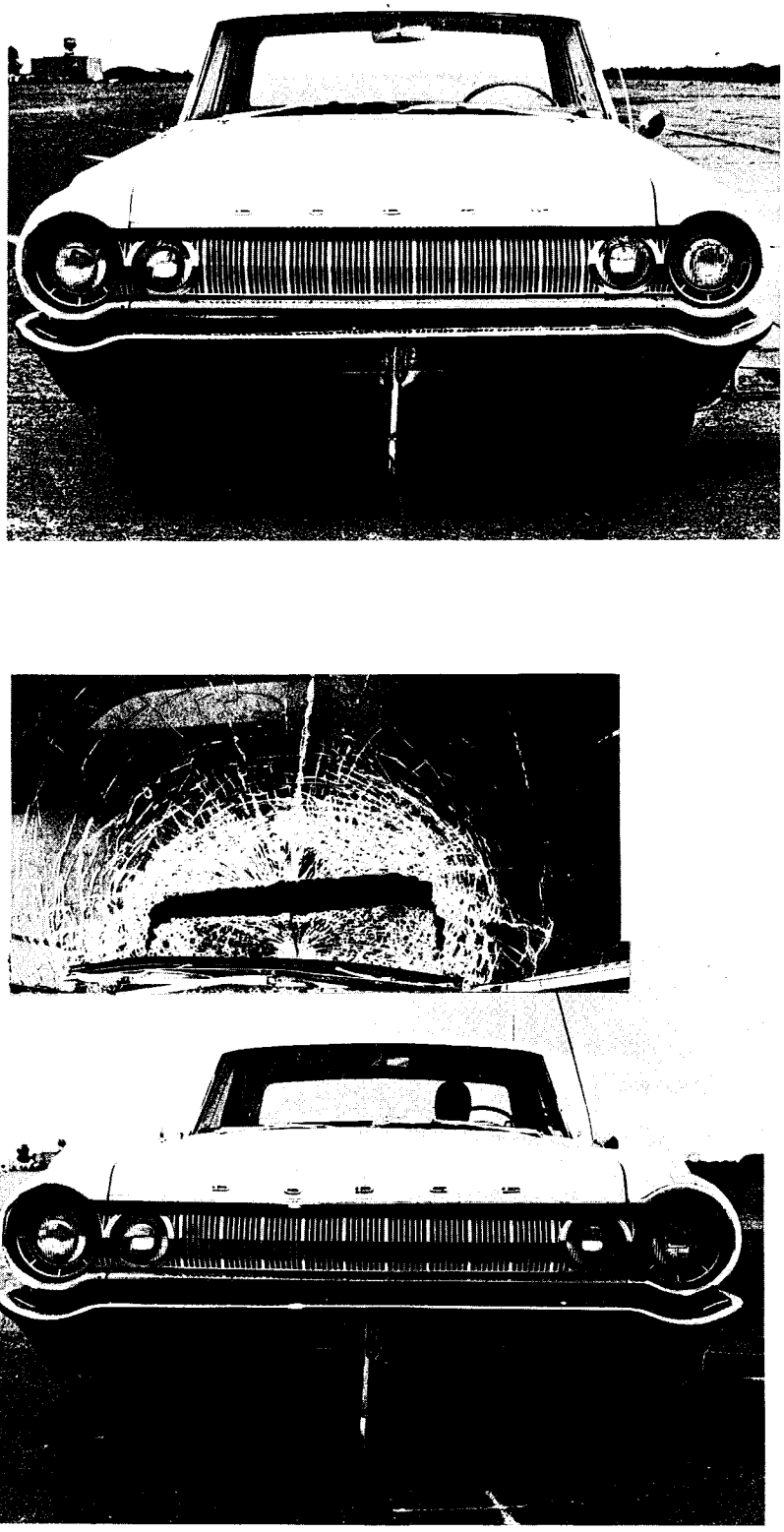


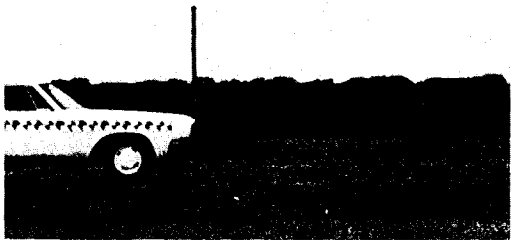
Figure 4. "Before" and "after" photographs of test vehicle.

was used because previous tests at this speed (Research Study 2-5-63-68, Research Report 68-2) on single post signs resulted in secondary collisions near the windshield area. Before and after photographs of the vehicle are given in Figure 4.

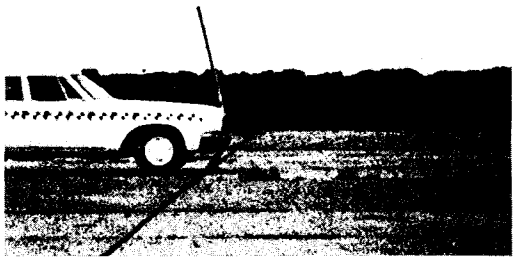
A high-speed camera was used to photograph the test and to obtain vehicle time-displacement data. A sequence of photographs from this high-speed film is shown in Figure 5 and time-displacement data for the vehicle are given in Table 1.

The standard threaded coupling breakaway feature resulted in only 1.6 mph change in vehicle velocity during impact. However, the behavior of the sign panel and post, which struck the windshield, is considered undesirable. As can be observed from the sequence photographs in Figure 5, after the post buckled at the bumper height and the threaded end pulled out of the coupling, the post and sign penetrated the windshield into the passenger compartment of the vehicle. Penetration through the windshield was estimated to have been about 3 in. and was reduced by the sign's contact with the vehicle's cowling, windshield, wiper assembly and top of dash.

Modifications to the proposed mile post marker are certainly indicated in order to minimize the probability of a secondary impact into the windshield and passenger compartment.



t = 0.0



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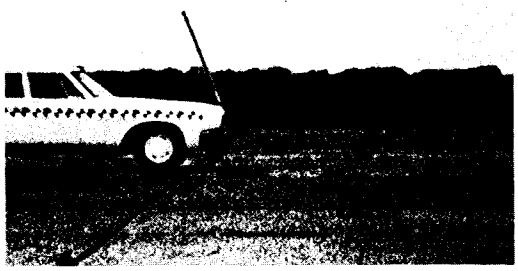
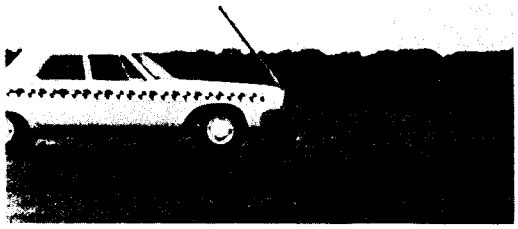
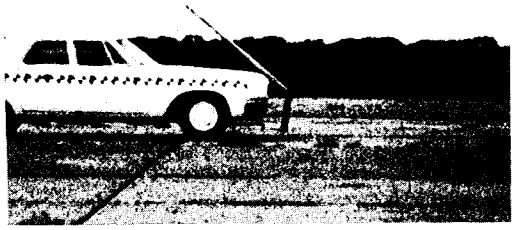


t = 0.025

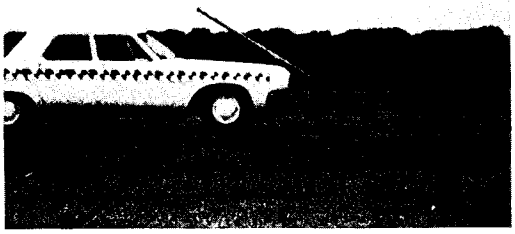


t = 0.045

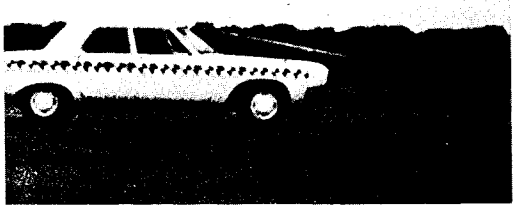
Figure 5. Sequence photographs from high-speed film.



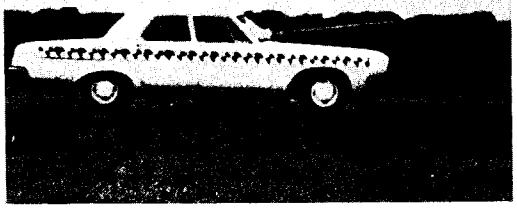
t = 0.060



t = 0.070



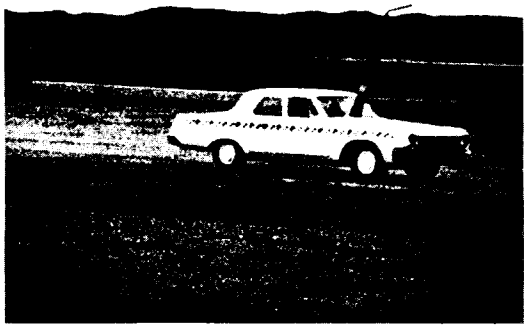
t = 0.110



t = 0.145

Figure 5. (continued).

t ≃ 0.17 sec.



t ≃ 0.67 sec

t ≃ 1.12 sec

Figure 5. (continued).

TABLE 1

TIME-DISPLACEMENT DATA FOR VEHICLE

	Time (sec)	Displacement (ft)	Comments
V_1 = 64.4 fps 43.9 mph	-0.045	-2.9	
	-0.030	-2.0	
	-0.015	-1.0	
	0	0	Impact
	0.015	0.95	
	0.030	1.9	
	0.045	2.9	
	0.055	3.9	Pole has left ground
	0.075	4.9	
	0.090	5.9	
V_2 = 62.1 fps 42.3 mph	0.105	6.9	
	0.120	7.8	
	0.135	8.8	
	0.150	9.8	