

OFFICE MEMORANDUM



MICHIGAN
STATE HIGHWAY DEPARTMENT

September 14, 1966

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To: R. L. Greenman
Assistant Testing and Research Engineer

From: E. A. Finney

Subject: "Fiberglas" Reinforced Plastic Rods. Research Project 66 NM-155.
Research Report No. R-606.

At its August 10, 1966 meeting, the Committee for Investigation of New Materials reviewed and discussed Research Report No. R-595, covering an evaluation of the subject material for highway delineator posts. During the discussion it was pointed out that the rod's cost is approximately four times greater than the steel post currently being used. Therefore, in order to justify use of the rods as delineator posts, the Committee felt it would be necessary to demonstrate their superiority to current posts with respect to damage inflicted by vehicles hitting them, and to deterioration caused by weathering. The Research Laboratory was asked: 1) to conduct a very limited study to determine the rod's ability to withstand simulated vehicle impact forces, and 2) to review the possibilities of making an experimental field study to compare performance of the rods to the posts currently being used.

In accordance with the request, the Research Laboratory performed impact tests on six samples of the 3/4-in. diam rods, reported here by J. E. Simonsen. The tests were conducted at the weigh station on westbound I 96 west of Portland. Each rod was installed at the edge of the bituminous shoulder to a height approximately 4 ft above the pavement edge. An impact bar, consisting of a 4-in. channel, was mounted on a truck so that it extended 4 ft out from the left side of the truck. Tests were made with the bottom of the channel at 6, 12, and 18 in. above ground. Test speed was 30 mph in all cases. The results were as follows:

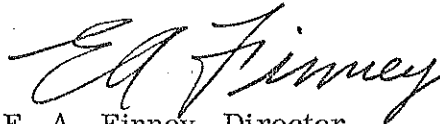
Sample No.	Height of Impact Bar, ft	Description of Failure
1	6	Fibers fractured and separated over full cross-section of rod.
2	6	Fibers fractured and separated over full cross-section of rod.
3	6	Fibers fractured and separated over full cross-section of rod.
4	12	Outside fibers fractured.
5	12	Outside fibers fractured.
6	18	Top of rod split, with some fiber damage 6 in. from top of rod and at point of initial impact.

Figure 1 shows the damage caused by hitting a rod 6 in. above ground and 12 in. above ground. Although the rods hit at the 12-in. height returned to their original position after impact, their rigidity was greatly reduced, because of fractures in the outside fiber layers. As illustrated, major damage to the rod hit 18 in. above ground was confined to its top. The rod split longitudinally, and the fibers on the side from which the rod was hit were fractured near the top of the rod, as well as at the point of initial impact. Based on the results of these tests none of the rods could be re-used after impact.

Ground clearance for modern cars is usually between 6 and 9 in., depending on make and model, tire size, lateral profile beneath the car, etc. Although no impact bar can exactly duplicate the effect of a blow from an auto, the relatively low speed of 30 mph and the impact heights of 6 and 12 in. are believed to be reasonable approximations of the actual event, and the results obtained are believed representative.

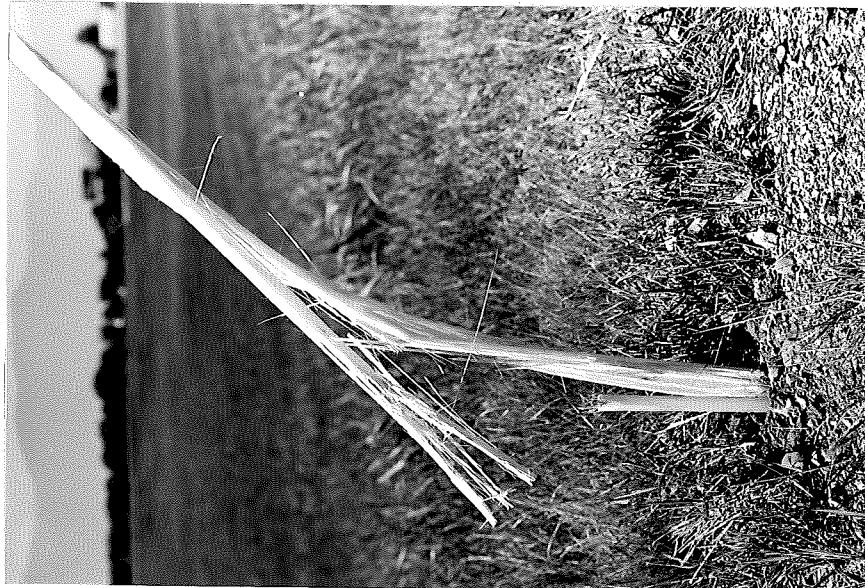
Movies of the tests were taken using both the regular and slow-motion speeds of the T&R Graphic Section's movie camera. Camera speed was insufficient to capture the entire impact sequence; however, the film is interesting and is available should Committee members wish to see it.

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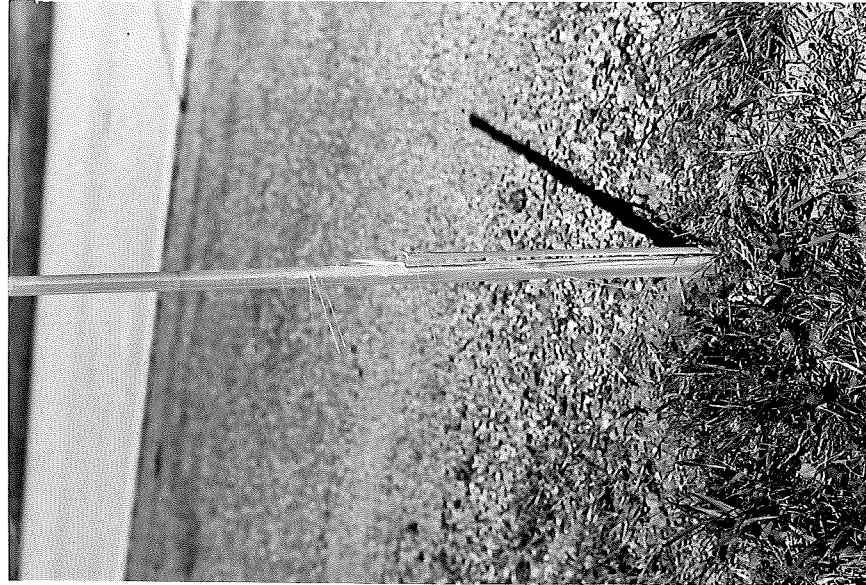


E. A. Finney, Director
Research Laboratory Division

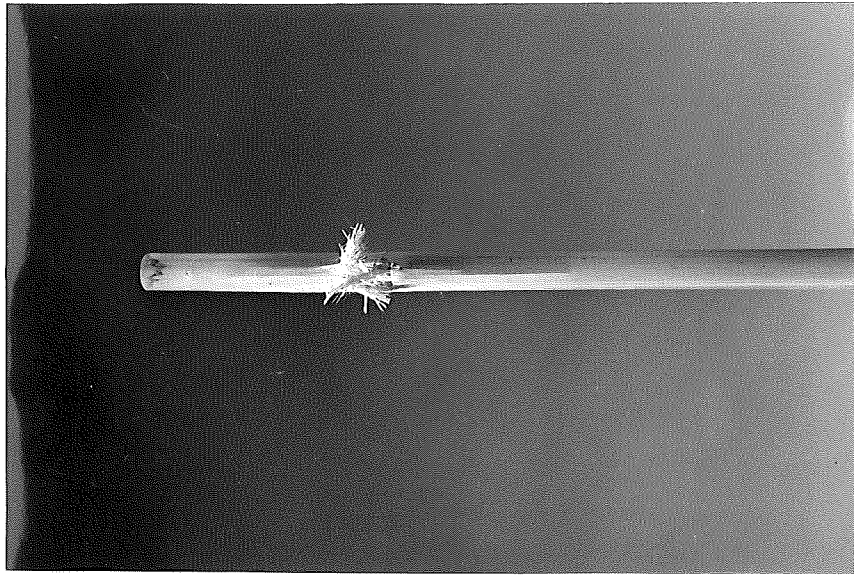
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Impact 6 in. above ground.



Impact 12 in. above ground.



Impact 18 in. above ground.

Figure 1. Impact conditions at various heights above ground.