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Mr. Walker

FULL SCALE CRASH TESTS OF A TIRE-SAND INERTIA BARRIER

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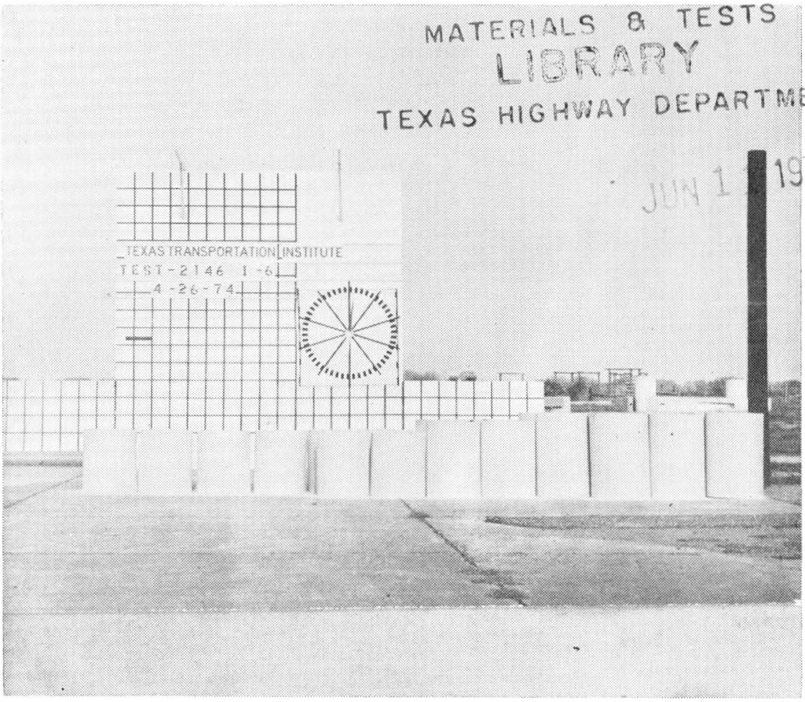

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Full Scale Crash Tests of a Tire-Sand Inertia Barrier

by

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This summary report describes one phase of Research Study 2-8-68-146 entitled "Adoption of Attenuation Systems."

Four full-scale crash tests were conducted on inertia barriers using scrap tires as containers for the sand mass. The first barrier utilized additional tires with empty beverage cans in the annular space and banded together for a support base. The bases of scrap tires collected under the front of the impacting vehicle and caused it to ramp upward. The second scrap tire-sand barrier was tested in which the modules were supported by a 14 gage welded wire cage. This inertia barrier performed satisfactorily. The ramping of the vehicle was eliminated and the vehicle was stopped smoothly. In the third and fourth tests the supports were fabricated from used 55 gal paint drums. When the chimes and bottoms were removed and a series of vertical cuts made in the drum, the barrier performed satisfactorily. There was a slight tendency toward vertical ramping, but the vehicle was stopped smoothly.

There are many rigid obstacles on our nation's highways which cannot be removed or made breakaway and consequently are hazardous to the motoring public. Vehicle impact attenuators have been developed to protect the motoring public from impacting these obstacles directly. In general, most of these attenuators are expensive and some obstacles remain unprotected since available funds are directed to protecting more "cost effective" locations. This study was undertaken to develop an inexpensive and effective barrier which could be employed to protect motorists from many hazards located near our highways.

Two previous studies had been made[1, 2] to show that a vehicle impact attenuator composed of scrap tires filled with sand was effective and feasible. The conclusions expressed in both reports were that the tire-sand inertia barrier was both effective and economical for selective locations. Also the bases should be constructed so that they will not "build-up" under the impacting vehicle and cause ramping.

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[1]Hirsch, T. J., Chapter 3.11, "Vehicle Impact Attenuation," from FINAL REPORT on the FEASIBILITY OF USING SOLID WASTE in HIGHWAY CONSTRUCTION and MAINTENANCE. Contract No. DOT-FH-11-7692, Texas Transportation Institute, Texas A&M Research Foundation, October 1971.

[2]Marquis, E. L., Hirsch, T. J. and Buth, G. E., "Development of Impact Attenuators Utilizing Waste Materials, Phase III—Tire-Sand Inertia Barrier and Tire-Can Crash Cushion." Research Report 846-3, NCHRP 20-7 Task Order 6, Phase I, Texas Transportation Institute, Texas A&M University, October 1973.

Bases composed of welded wire mesh and bases composed of portions of used 55 gallon paint drums were successfully investigated in this study. Typical design modules are shown in Figure 1 (Figure 2 of regular report). Curves in Figures 2 and 3

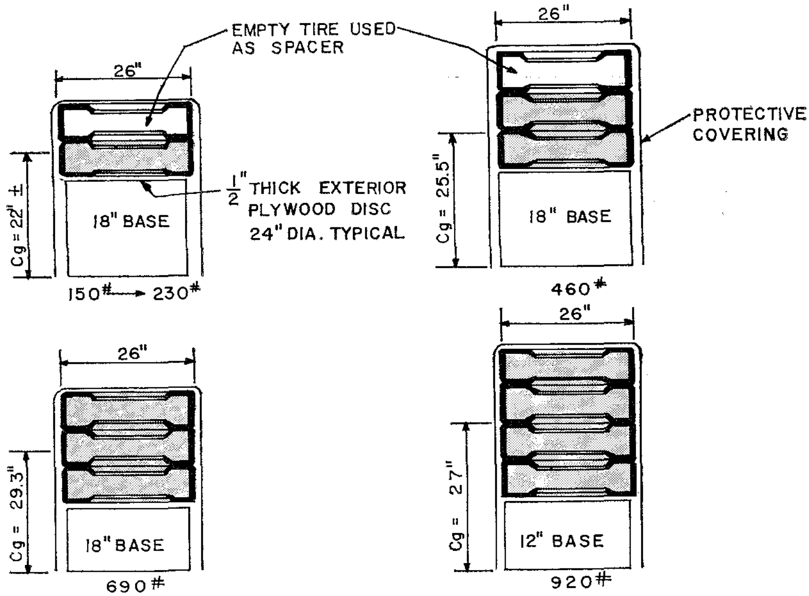

Figure 1. Typical design modules of the tire-sand inertia barrier.

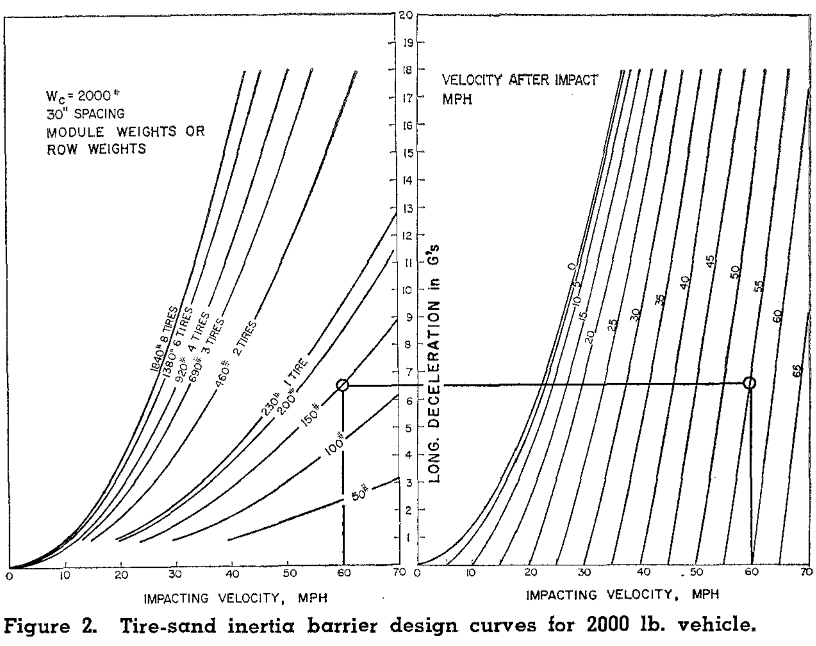

Figure 2. Tire-sand inertia barrier design curves for 2000 lb. vehicle.

were developed to aid the designer in selecting the proper module for a specific installation to use. The curve is entered on the bottom left at an impact velocity for a 2000 lb vehicle (Figure 3) proceed vertically to 150# for it's first module. Next draw a horizontal line to the right. Read deceleration of 6 G's average. Continue with this line to the right. Next draw a vertical line from the

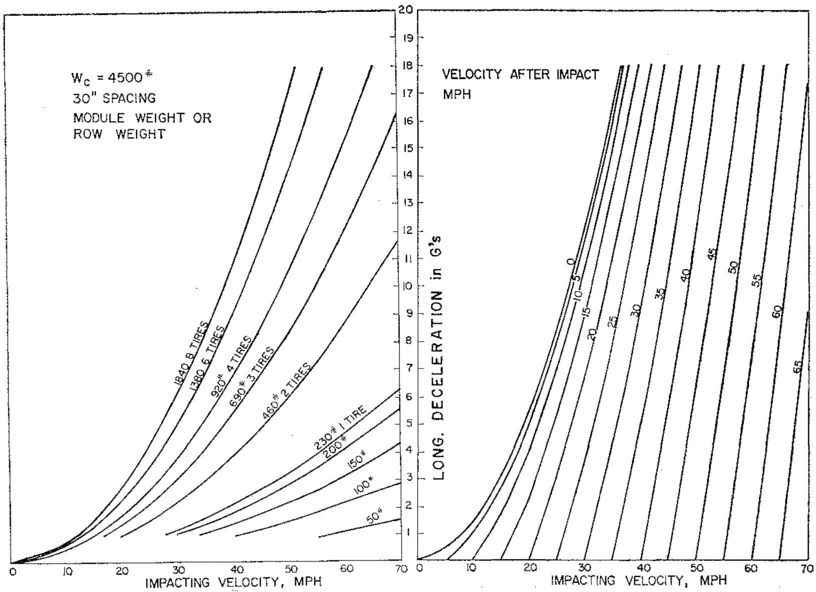

Figure 3. Tire-sand inertia barrier design curves for a 4500 lb. vehicle.

bottom to intersect this line at 55 mph. This is the velocity after impact and the impacting velocity for the second module. This procedure is continued selecting new modules until the 2000 lb vehicle is slowed to less than 10 mph. Next proceed to Figure 3. Check each module for the 4500 lb vehicle and add modules as necessary to slow this vehicle to less than 10 mph. The last 10 mph will be reduced by ploughing action.

Additional curves are developed for other module weights and spacings in the published version of this report.

The published version of this report and standard plans for a typical barrier may be obtained by addressing your request as follows:

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