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DYNAMIC BEHAVIOR OF AN AUTOMOBILE TRAVERSING SELECTED CURBS AND MEDIANS

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Dynamic Behavior of an Automobile Traversing Selected Curbs and Medians

by

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At the request of several districts within the Texas Highway Department (THD), studies were conducted to determine the behavior of an automobile traversing selected curbs and sloped median configurations. The purpose of these studies was to determine if a potential existed for the automobile to vault a barrier placed near the curb or on the sloped medians.

The Highway-Vehicle-Object-Simulation-Model (HVOSM)[1] was used to determine the dynamic behavior of the automobile. A full-size automobile (weight of 4000 pounds) with a standard suspension system was simulated in each case. An extensive validation study has shown that the HVOSM can accurately predict behavior after traversing curbs.[2] The study was divided into two parts, as follows.

Study A

Two median-barrier configurations were investigated in Study A. These consisted of a Metal Beam Guard Fence (MBGF) placed in the middle of (1) an 8-foot wide raised median with a 6-inch type C curb, and (2) a 12-foot wide median with a 1 1/3 inch per foot slope up to the barrier.

In the 8-foot median, accidents have occurred which resulted in vehicles going over the barrier. It was not known if the curb had been a factor in the vehicles vaulting the rail. Previous studies[2] had shown that the 6-inch type C curb introduced lift to an automobile that could potentially cause vaulting.

As a possible means of attenuating this lift, it was suggested that an asphalt "plug" be placed in the curb. HVOSM simulations were then made to determine an automobile's behavior for various encroachment angles into the plugged curb.

The investigation involved a determination of the automobile's behavior up to the time of impact with the barrier in each of the above medians. Limitations of the Texas Transportation Institute's version of HVOSM precluded a simulation of the automobile's behavior after impact with the barrier.

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[1] A computer program developed at the CALSPAN Corporation, Buffalo, New York, for the FHWA.

[2] "Effects of Curb Geometry and Location on Vehicle Behavior," Olson, R. M., Weaver, G. D., Ross, H. E., and Post, E. R., **NCHRP,** Report No. 150, 1974.

Study B

Three median-barrier configurations and one roadside-barrier configuration were investigated in Study B. Details of the three median-barrier configurations were as follows.

Median	Width (FT)	TYPE MEDIAN	TYPE BARRIER
1A	16	Raised, 8-inch curb	MBGF
1B	16	Raised, 1.1 inch per foot slope	MBGF
2A	5	Raised, 8-inch curb	MBGF
2B	5	Raised, 4.6 inch per foot slope	MBGF
3A	4	Raised, 8-inch curb	MBGF
3B	4	Raised, 8-inch curb	CMB*

*CMB—Concrete Median Barrier

The roadside-barrier configuration consisted of a standard guard-rail placed 3½ feet behind an 8-inch curb.

Conclusions

From a safety standpoint, it is concluded that traffic barriers should not be placed near curbs. Curbs can potentially cause the vehicle to vault the barrier or to impact it at a lower than normal position which can cause snagging of the vehicle. A flat approach area to the barrier appears to be the most desirable configuration.

Problems with barriers on raised curb-median or curb-roadside configurations can be reduced in certain cases by sloping the median or roadside up to the barrier.

Concrete median barriers placed on narrow raised median should be avoided where possible.

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