H-178

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

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Forwarded to:
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Deputy Administrator
Federal Highway Administration
400 Seventh Street, S.W.
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SAFETY RECOMMENDATION(S)

H-80-25 and -26

On October 17, 1978, a passenger car vaulted a guardrail near Clarkston, Georgia. The driver was driving in excess of 55 mph when he lost control, struck the transition section of a guardrail at a bridge overpass, and vaulted the guardrail and bridge parapet. The vehicle slid along the bridge rail and became airborne before it impacted the earth adjacent to the roadway below. All three occupants were killed.

On June 8, 1979, a passenger car with eight occupants was westbound on the Grand Central Parkway in New York City. During a high-speed passing maneuver, the vehicle veered out of control, vaulted the median guardrail, and collided with three eastbound passenger cars. Four persons were killed, and 10 persons were injured. 1/

The Safety Board concluded that these two accidents involved ineffective transition sections and "metal post-type" roadside/median barriers due, respectively, to design deficiencies and the cumulative effect of variations from standard design and construction details. Although the barriers are intended to minimize personal injury and property damage by redirecting errant vehicles to the traveled way, inadequate design and variations from standard barrier, design and installation are adversely affecting performance of the barriers. In some cases, the result is increased damage through impact with the barrier, while in the most severe examples, vehicles have vaulted the barriers. In 1978, 2,890 fatalities resulted from 2,573 accidents in which a vehicle struck a guardrail. Only fixed object accidents involving collision with trees and utility poles resulted in more fatalities than collisions involving guardrails.

1/ For more information see "Highway Accident Report—Multiple-Vehicle Median Barrier Crossover and Collision, Grand Central Parkway, New York, June 8, 1979" (NTSB-HAR-79-8).

The American Association of State Highway and Transportation Officials (AASHTO) "Guide for Selecting, Locating, and Designing Traffic Barriers" states, "It has been shown that small variations in design details should correspond to the as-tested details unless adequate justification exists for changing the design." Unfortunately, there has been only limited research in crash testing of barrier designs which correlates or attempts to quantify the effect of deviations from the guidelines. The Safety Board believes that the research should either quantify, or at least establish by subjective evaluation (extreme, severe, major, marginal, minimal, or satisfactory), the effects of variations in the strength, shape, offset, and anchorage of the posts and guardrail. Similarly, the effect of reduced guardrail height above grade because of the accumulation of debris and vegetation should be evaluated. The research should identify the cumulative and offsetting effects of variations in these factors individually and collectively. Finally, the research should incorporate tests of vehicles braked at impact, as well as free-rolling vehicles, to take into account the changed crash dynamics resulting from the application of brakes which lowers the front end and stiffens the suspension of the vehicle.

Although it is a clear source of variations from design or construction details, the AASHTO Guide allows the use of a curb in conjunction with a roadside barrier. The Guide then states, "If the top of the rail is approximately 27 inches above the top of the curb a rub rail should be added." Thus, although encouraged, additional height and rub rails are not required. A Highway Safety Review, compiled in 1978 by the FHWA and Safety Board staff, expressed concern that curbs reduce barrier effectiveness. A recent Safety Board review of the design specifications for highways in several States also found deviations from the AASHTO Guide design specifications that could reduce the effectiveness of barriers when used in conjunction with curbs.

In the Clarkston, Georgia, accident, the need for a safe transition section from W-beam guardrail to bridge structure was highlighted. A staff review which examined the only transition section fully acceptable to AASHTO revealed that the severity of impacts with this design would approach the tolerances of occupants even if they were restrained with seatbelts and shoulder harnesses. Researchers concluded that "this transition detail is recommended for the interim;" however, a "research effort to develop improved transitions is indicated." 2/ The concern was restated in an FHWA research report 3/ which was later incorporated in the AASHTO Guide. The Safety Board believes additional research and development should be undertaken to develop a compatible transition for joining the widely used "W-beam" to a rigid structure.

Therefore, the National Transportation Safety Board recommends that the Federal Highway Administration:

> Assure that current and future research examines the variations in designs or construction details which can affect adversely impact performance of roadside barriers. (Class III, Longer Term Action) (H-80-25)

2/ NCHRP Report #115, HRB, 1971.
3/ Report No. FHWA-RD-76-503, 1976.

Develop and prescribe design criteria for transition sections between W-beam guardrail sections and rigid structures that will safely retain and redirect vehicles. (Class II, Priority Action) (H-80-26)

KING, Chairman, DRIVER, Vice Chairman, McADAMS and BURSLEY, Members, concurred in these recommendations. GOLDMAN, Member, did not participate.

By: James B. King
Chairman