ABSTRACT

Zou, Yaotian. Ph.D., Purdue University, December 2014. Performance Assessment of Road Barriers in Indiana. Major Professor: Andrew P. Tarko.

Road barriers have been used as an effective countermeasure to prevent errant vehicles being exposed to vehicles from the opposite direction or roadside hazards. The objective of this study is to assess the in-service safety performance of three types of road barriers (concrete barriers, W-beam guardrails and cable barriers) in Indiana with cross-sectional statistical analysis. In this study, barriers' in-service performance was composed of three components: 1) effects on the crash frequency (segment level), 2) effects on the distribution of hazardous events (crash level), and 3) effects on injury outcome distribution (occupant level). Each component was handled by a developed statistical model. Statistical simulation was conducted to connect the results from all the individual models. Eventually crash costs, as a measure of overall safety performance, were obtained for each studied barrier and non-barrier scenario.

This study found that both the median and roadside barriers were effective in reducing crash costs with median barriers being more effective. The benefits mainly came from the reduction of cross-median head-on events for median barriers and reduction of high risk events (rollover or hitting a sturdy roadside object) for roadside barriers. Crash costs were roughly cut in half with either the use of cable barriers in wide medians or the use of concrete barriers and guardrails in narrow medians. The use of a roadside guardrail resulted in roughly 20% to 30% crash cost reduction.

Median cable barriers were found to be most effective among all the studied barriers due to their smaller increase in crash frequency and less severe injury outcome associated with the cable

barrier collisions. Cable barriers' offset to the roadway was also investigated in this study. Nearside cable barriers (offset less than or equal to 30 feet) was shown to perform better than far-side cable barriers (offset larger than 30 feet) due to the former's higher reduction in high-risk events such as vehicle rollovers in the median. The findings of this study should help agencies develop: (1) criteria that justify consideration of road barriers, (2) guidelines for selecting the barrier type and related characteristics, and (3) crash cost modification factors to facilitate the cost-benefit analysis.