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TEMPORARY LOW PROFILE BARRIER: WIDTH REDUCTION

PROBLEM STATEMENT

In an earlier study (BC976), a low-profile portable concrete roadside safety barrier was developed using computer simulation techniques and full-scale validation crash testing. Individual segments in that system were 28 inches in width and were connected together using a connection scheme that permitted segments to be laid out on horizontally and vertically curved alignments. The ability to reduce the width of the barrier would have the positive effect of increasing lane space.

OBJECTIVES

The goal of this study was to use impact finite element simulation techniques to evaluate the feasibility of reducing the width of the previously developed barrier system, while preserving its re-directional and protective features.

FINDINGS AND CONCLUSIONS

Impact finite element simulation techniques have been used to evaluate the performance of reduced-width barrier sections under a variety of different conditions. In all cases, the ability of the barrier to redirect errant vehicles was determined. The *effective width* of the barrier (the sum of the physical barrier width plus the required lateral deflection space) has been computed for each case. Simulations of vehicles impacting barriers with widths ranging from 13 inches to 28 inches were conducted to predict vehicle roll angles and lateral barrier deflections. The feasibility of using high-unit-weight concrete as a means of offsetting the effect of reduced barrier width was evaluated for selected cases. Furthermore, simulations corresponding to placement of barrier segments immediately adjacent to drop-off zones were conducted.

Based on the results of the simulations conducted, it appears that the physical width of the low-profile barrier system previously developed could be reduced, but that only marginal reductions in *effective width* can be achieved. Of the systems considered, barrier widths in the range of 18 inches to 22 inches appear to be the most viable from the standpoint of ensuring adequate segment interlock during impact loading. For such cases, a modified barrier system can likely be developed that has an effective width approximately 4 to 6 inches less than that of the previously developed system. Width reductions beyond this range are unlikely to be achieved for the performance criteria that have been specified. Furthermore, utilization of high-unit-weight concrete to reduce lateral barrier deflections during impact was found to be only moderately effective. Finally, simulations of barrier installations immediately adjacent to drop-off zones indicated that inadequate barrier performance will result if insufficient lateral deflection space is provided.

BENEFITS

This research determined that reducing the width of the subject barrier would not result in a significant increase in lane space, since the space gained through barrier width reduction would largely be consumed by a concomitant increase in space required for deflection. Consequently, further spending (i.e., for crash testing reduced-width barriers) was avoided. Another benefit of the study was that the effectiveness of using high-unit-weight materials to improve the performance of crash barriers has been given an initial evaluation.

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