



PERFORMANCE OF RETROFIT HIGHWAY BARRIERS WITH MECHANICAL ANCHOR

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Abstract

The Texas Department of Transportation uses vehicular barriers at the edges of highway bridge decks. A recent TxDOT research study, conducted at the University of Texas at Austin, was intended to develop designs for retrofit barriers, connected to bridge decks using post-installed mechanical anchors, which could be used to replace highway barriers damaged by vehicular collisions. In the research study described here, two retrofit barrier designs were developed: one an intermittent barrier with through anchors, and the other a continuous barrier with undercut anchors. The undercut-anchor design involved groups of inclined anchors, whose capacity was governed by concrete breakout, and for which current design provisions were not directly applicable. The barriers were tested under quasi-static and impact loading. The current US anchor design provisions of ACI 318-05 Appendix D can safely be used to predict the capacity of such barriers.

Keywords: anchors, barriers, finite elements, post-installed, retrofit

1. INTRODUCTION

Bridge rails (also referred to as “barriers”) are very important structural components for ensuring highway safety. They should redirect impacting vehicles back onto the roadway while deforming so as to limit the forces on the occupants of the vehicle, and they should resist impact from a collision. To meet these demands, the US Federal Highway Administration (FHWA) requires that barriers meet the testing and performance requirements established in the National Highway Cooperative Research Program (NCHRP) *Report 350* (1993).

If an original cast-in-place barrier is slightly damaged by vehicular impact, it can be repaired. More severe damage, however, may require that the original barrier be replaced with a retrofit barrier. Existing barriers that are substandard by modern requirements may also be replaced by retrofit barriers. Post-installed mechanical anchors are widely used to connect structural components to hardened concrete. The use of these anchors can be extended to retrofit barriers. As shown in Figure 1, the basic approach of this investigation involved the design, construction and verification of a full-scale impact-test pendulum; the comparison of results from that pendulum with previously obtained crash test results; and the comparison of experimental results with nonlinear finite-element analyses using LS-DYNA (2006).

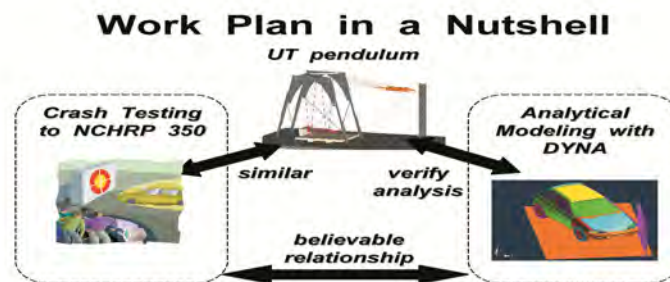


Figure 1 basic approach of this study