Florida Department of Transportation Research

Scaling and Validation of Breakaway Connection for Multi-Post Ground Signs

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Current Situation

The U.S. Department of Transportation reports that about 15% of crashes are caused when a vehicle leaves the roadway and strikes a fixed object, such as a tree, a utility pole, or a roadway sign post. Fixed-object crashes are twice as likely as crashes in general to be fatal. The Florida Department of Transportation (FDOT) has been studying possible designs for a roadway sign post that can break away when struck by a vehicle, reducing risk to the occupants, while still meeting the requirement that the sign structure be able to resist hurricane-force winds.

Research Objectives

In this project, University of Florida researchers updated and refined a design for a breakaway device for use on sign posts along Florida highways. They rescaled their design for signs of different sizes and, therefore, different wind load requirements.

Roadside signs provide a range of useful information, but they can be a serious hazard in a crash.

Project Activities

To establish a suitable basis for their updated design, the researchers conducted an extensive review of the scientific literature and design specifications. AASHTO and FDOT design specifications were used to perform calculations of wind loads and steel post capacity for a range of sign sizes and configurations. AASHTO requirements for ultimate flexural strength and impact performance were also consulted. Comparing calculations and specifications with the FDOT sign inventory led to the definition of three size classes for which to design breakaway connections: high-, medium-, and low-capacity.

Using the breakaway connection developed in a previous project (BDK75-977-40), a "moment collar," the researchers analyzed multiple approaches to designing an updated breakaway connection system. They were mainly concerned with optimizing component weights and simplifying the processes of connection fabrication and assembly. Quasi-static finite element simulations were used to assess ultimate flexural strength, and dynamic simulations were used to assess impact performance.

Connectors in all three size categories were fabricated and tested to confirm that they met standard specifications. Impact tests included head-on impacts as well as oblique impacts. Connector components were also tested individually. All connector systems performed within design specifications, and the researchers made recommendations for further development of the breakaway connector system.

Project Benefits

This results of this project offer the possibility of significantly reducing fatalities and injuries when vehicles collide with roadway signs.

For more information, please see www.fdot.gov/research/.