RESEARCH
PROJECT CAPSULE [18-4SA]

January 2019

Intersection on Horizontal Curves: Problems and Potential Solutions

PROBLEM

Horizontal curves and intersections are recognized as target areas for safety improvement among many highway safety strategies. The average crash rate for horizontal curves is about three times higher than that of other highway segments. In 2016, approximately 25% of roadway fatalities occurred along horizontal curves.

Although intersections constitute only a small part of the overall highway system, about one-fourth of traffic fatalities and roughly half of all traffic injuries over the last several years are attributed to intersections in the United States.

Having an intersection on a horizontal curve is a combined challenge. There are many intersections on horizontal curves located on state- or locally-owned roads in Louisiana. The Louisiana Strategic Highway Safety Plan (SHSP) aims to halve roadway departure, intersection, and non-motorized user fatalities and severe injuries by 2030.

In order to achieve this target and prevent further crashes, it is important to better understand the magnitude of the problem and identify the roadway characteristics and risk factors that contribute to fatalities and serious injuries at intersections on horizontal curves.

OBJECTIVES

The objectives of this project are to quantify safety performance of intersections on curves for Louisiana's state- and locally-owned roads, determine the magnitude of the problem, identify risk factors or roadway characteristics associated with related crashes, and develop a list of possible countermeasures that target the identified risk factors.

METHODOLOGY

An initial literature review will be performed to learn as much as possible from previous studies and past design practices. The focus of this review will be on design guidelines and practice, safety performance of intersections on horizontal curves, major contributing factors to crashes at those locations, and proven countermeasures.

Identifying intersections on horizontal curves is critical for the success of this project. Considering the size of the roadway network (state- or locally-owned), an automatic identification method will be utilized. Several database files are available for location identification.

Lack of locally-owned roadway information presents a major challenge. The use of a crash database may be one way to overcome this obstacle. Longitude/latitude information is not yet 100% available currently, but this percentage has been increasing for the past several years. It is expected that some location identification work will need to be done manually (e.g., Google Maps).

The position of an intersection on a curve (end, middle) and the intersection skew angle are two important attributes affecting safety of intersections on horizontal curves, primarily due to concerns regarding visibility and ease of vehicle maneuvering. These attributes will be determined for the identified locations.

Three to five years of most recent crash data will be used for crash analysis. General crash characteristics of intersections on curves will be compared with those of intersections on tangent. After completing this crash characteristics analysis, the intersections can be ranked by crash frequency and severity.

A comprehensive location-by-location analysis will be conducted for the top ranking intersections to identify potential risk factors, specifically what combination of factors in design, traffic control, and land use development lead to higher crash risk. A new database will be developed, including all identified locations with their attributes.

The *Highway Safety Manual* lists parametric models for determining the safety performance function of intersections, but it does not currently consider intersections on horizontal curves. Quantification of safety performance for intersections on horizontal curves will be provided, and is dependent on the quality and completeness of the new database.

Project recommendations, including a list of possible countermeasures that target the identified risk factors, will be provided. Cost and effectiveness of recommended countermeasures will also be described.

IMPLEMENTATION POTENTIAL
Recommendations from this project can be implemented by DOTD as part of its efforts to accomplish the goals of the Louisiana SHSP. It is critical to continually target problem locations so that Louisiana roadway safety is enhanced.