Florida Department of Transportation Research

Evaluation of Innovative Alternative Intersection Designs in the Development of Safety Performance Functions and Crash Modification Factors

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Current Situation

Most crashes happen at intersections, including half of all severe crashes. Most severe crashes occur when a driver makes a left turn without adequately checking opposing traffic or when the gap in opposing traffic is too small to complete the turn. Therefore, reducing conflict points in intersections has been of major interest to traffic engineers, and alternative intersection designs have been proposed that improve both safety and efficiency by reducing conflict points.

Research Objectives

University of Central Florida researchers reviewed alternative intersections that have been implemented in other states and examined their possible effects if implemented in Florida.

An RCUT intersection has no left turns. A "J-turn" lane (yellow) provides access to the opposing lane and a safer right turn.

Project Activities

The researchers collected data on alternative intersections from 27 states and selected 10 intersection types for further investigation: continuous green T-intersection (CGT), median U-turn intersections (MUT: 3 types), continuous flow intersection, jughandle intersections (3 types), restricted crossing U-turn (RCUT) intersection, and diverging diamond interchange (DDI). Each has its advantage. For example, jughandle type 1 is the most effective at minimizing left-turn crashes, and the continuous flow intersection is the most effective for minimizing nonmotorized crashes.

A survey of traffic engineers across the country provided information about their experiences with alternative intersections. Engineers matched specific intersection types to primary concerns, for example, the jughandle for mobility, DDI for mobility and safety, and RCUT for safety. DDI was reportedly most expensive to construct, but there was little information about annual maintenance costs for any of the alternative intersection types.

The researchers further characterized safety effects by calculating safety performance factors and crash modification factors for several alternative intersections. The researchers then identified the 50 Florida four-leg intersections with the highest crash risk. Crash data showed that rear-end crashes were most common, followed by left-turn crashes. For each intersection, two alternative intersection types were proposed to minimize (1) the crash type prevalent at that intersection and (2) equivalent property damage only (EPDO) for all crash types.

The prevalence of rear-end crashes at the 50 intersections led to further examination, showing that signalization reduced severe crash types (e.g., angle, left-turn) but increased rear-end crashes, in particular for elderly drivers, and increased the severity of these crashes. Effects differed at urban and rural intersections, indicating that signalization should be considered and implemented carefully.

Project Benefits

The results of this project indicate that implementation of alternative intersection types can make Florida's heavily traveled roads safer and more efficient.

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