Public Abstract
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As the nation's population continues to grow, the users of highway network face increased safety risks, delays and congestion. Budget constraints at many public agencies frequently make infeasible the construction of new facilities to improve the safety and capacity of the highway network. This thesis addresses two issues pertaining to roadway safety and capacity: maintenance of traffic for innovative geometric design work zones and calibrating highway safety manual for Missouri interchanges.
In an effort to improve the safety and capacity of existing roads, many transportation practitioners are implementing innovative designs at intersections and interchanges. The development of construction phasing plans for these projects is a critical component to maintaining safety and mobility on the facility during construction. The goal of this research is to present the state of the practice and providing guidance for transportation practitioners in developing construction phasing and maintenance of traffic (MOT) plans for projects with innovative geometric designs. Several types of innovative geometric designs were studied including the roundabout, single point urban interchange (SPUI), diverging diamond interchange (DDI), restricted-crossing left turn (RCUT), median U-turn (MUT), and displaced left turn (DLT). Example MOT phasing diagrams showing phasing sequencing and construction work areas were developed based on a review of literature, survey of practitioners, interviews with industry experts, and review of actual project plans. The example MOT phasing diagrams are intended to serve as a starting point for transportation practitioners, but project-specific factors such as driver experience, availability of detours, traffic counts, adjacent land use, elevation differences, barrier offsets, number of lanes, and anticipated impacts of a possible closure should be considered when deciding on the best MOT methods for a given project.
The second issue relates to the safety analysis of Missouri interchanges using AASHTO's Highway Safety Manual (HSM), a nationally accepted manual. In a 2014 supplement, freeway facilities were added to the original manual to allow for the modeling of highway interchanges. This research documents the calibration of the most vital freeway interchange facility types in Missouri. These facility types include nine freeway interchange terminals, including diamond, partial cloverleaf, and full cloverleaf interchanges. The non-terminal facilities included entrance and exit speed-change lanes, and entrance and exit ramps. The calibrated facilities applied to both rural and urban locations. For each facility type, sample sites were randomly selected from an exhaustive master list. Four types of data were collected for each site: geometric, AADT, traffic control, and crash. Crash data was especially noteworthy because of a crash geo-referencing problem, i.e. crashes were not located on the proper interchange facility. A significant crash correction project was undertaken involving the review of 11,768 crash reports, and the detailed review of 9,168 crash reports. Using the corrected data, 44 calibration values were derived for freeway terminal and non-terminal facilities. These values are the first reported freeway interchange calibration values since the release of the 2014 HSM supplement.