

CAPACITY-RELATED DRIVER BEHAVIOR ON MODERN ROUNDABOUTS BUILT ON HIGH-SPEED ROADS

The objective of this thesis was to investigate the factors that affect capacity-related driver behavior on modern roundabouts built on high-speed roads. The capacity of roundabouts is strongly affected by the behavior of drivers as represented by critical headway (critical gap) and follow-up headway (follow-up time). The effects of heavy vehicles (single-unit truck, bus, and semi-trailer) and area type (rural or urban) on roundabout capacity were investigated by comparing the critical headways for roundabouts located on high-speed and low-speed roads. The effects of nighttime conditions (in the presence of street lighting) were also considered. Data were collected using the Purdue Mobile Traffic Lab at four roundabouts built on state roads located in Indiana. The data were used to estimate a Probit model of the critical headways and their factors, as well as the average follow-up headways, which revealed that drivers of heavy vehicles accepted critical headways that were 1.1 sec longer than other drivers; on roundabouts built on high-speed roads in rural areas, they accepted critical headways that were 0.6 sec longer than on roundabouts on low-speed roads in urban areas; and in nighttime conditions, drivers accepted headways that were 0.6 sec longer than in daylight conditions. In addition, it was found that the gap-acceptance parameters for a single-lane roundabout in an urban area were smaller than those of the HCM 2010 default values, while the estimated critical headway was larger for dual-lane roundabouts on state roads in rural areas. The findings of this thesis are intended to improve capacity analysis of roundabouts designed on Indiana state roads and to contribute to an increased understanding of capacity factors in general.