

ABSTRACT

Hubbard, Sarah Marie Lillo. PhD, Purdue University, December, 2007. A New Perspective on Pedestrian Level of Service at Signalized Intersections. Major Professor: Darcy M. Bullock.

Balancing the needs of all surface transportation modes safely and efficiently is an important objective, and especially critical at signalized intersections where turning vehicles and pedestrians share the crosswalk. This thesis identifies a significant gap in the literature for evaluating the impact of right turning vehicles on pedestrian level of service (LOS). A new measure for pedestrian LOS that is sensitive to alternative pedestrian phasing options is proposed and a methodology for field application is developed. This methodology, called the percentage compromised method, defines a compromised crossing as a crossing in which the pedestrian is delayed or changes travel path or speed in response to turning vehicles. This method can be applied to either individual pedestrians, pedestrian platoons, or it may be used to identify the percentage of cycles in which there are compromises due to turning vehicles.

The percentage compromised procedure is then applied to a case study intersection near Disneyland in Anaheim, California to evaluate the impact of a leading pedestrian interval and provide quantitative assessment. This study provided quantitative evidence that the leading pedestrian interval did not perform as well as traditional concurrent pedestrian phasing due to right turns on red.

Subsequent chapters describe the application of the percent compromised procedure to thirteen crosswalks at ten intersections in West Lafayette, Indiana, Indianapolis, Indiana, Portland, Oregon, and Cincinnati, Ohio. Approximately seventy-six hours of videotape were analyzed, resulting in a data set of 1,385 pedestrian crossings. Discrete outcome analysis demonstrated the methodology was sensitive to the right turn flow rate, direction of travel, number of pedestrians during the cycle, signal compliance, and crosswalk location. The raw data from the pedestrian crossings is provided in an electronic form in the dissertation appendices.

The dissertation concludes by demonstrating how pedestrian phase data can be integrated with vehicle sensing equipment to provide real-time pedestrian LOS performance measures for pedestrian crossings at signalized intersections.

Recommendations are made to extend the methodology to incorporate left turning vehicles and revise Chapter 18 of the Highway Capacity Manual to include a pedestrian LOS measure that more effectively quantifies the negative impact of turning vehicles on pedestrians.