

Synopsis

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Degree: Master of Technology **Department:** Department of Civil Engineering
Thesis Title: Evaluation of black spot identification methods with directional traffic considerations on divided highway segments
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Identification of hazardous locations, commonly referred to as black spots, is an important component of roadway safety management. Conventional black spot identification approaches are commonly based on crash frequency or crash rate measures; however, such methods often fail to adequately account for uncertainties associated with crash occurrence, traffic exposure, and roadway characteristics. Nevertheless, traffic exposure representation in many roadway safety studies remains relatively simplified, particularly on divided highways where opposing carriageways may exhibit asymmetric operational, geometric, and roadside characteristics. Divided highways often experience directional heterogeneity arising from variations in traffic composition, roadside settlements, informal access points, minor road intersections, access density, and operational conditions between opposing carriageways. Despite these potential differences, most conventional black spot identification and crash frequency modeling studies continue to aggregate crash and traffic exposure data from both directions because asymmetric directional traffic volume data are typically unavailable or difficult to obtain. Such aggregation may mask direction-specific crash patterns and dilute hazardous locations that are prominent in only one direction of travel.

This thesis evaluates and compares black spot identification methods while explicitly examining directional traffic considerations on divided highways. Conventional and statistically based approaches, including Crash Frequency (CF), Crash Rate (CR), Empirical Bayes (EB), Potential for Safety Improvement (PSI), and IRC:131 methods, were analyzed and compared for black spot identification. Direction-specific black spot identification was further conducted separately for both carriageways to examine directional variations in crash occurrence patterns and black spot persistence. The analysis revealed substantial directional heterogeneity in black spot occurrence between opposing carriageways, with approximately 50% of identified black spot locations being common across both directions. The findings emphasize the importance of incorporating direction-specific safety analysis for improved black spot identification and roadway safety assessment on divided highways.