

# **SAFETY EFFECTIVENESS OF SHOULDER WIDTH ON INDIANA RURAL ROADS**

## **ABSTRACT**

Roadway design plays a crucial role in traffic safety, particularly on rural roads. This research investigates the safety effectiveness of shoulder width on Indiana's rural two-lane highways, addressing a critical gap in understanding the relationship between geometric design and crash frequency. Although previous studies have established the benefits of shoulder widening, limited research has quantified these effects under Indiana-specific conditions. This research aims to evaluate the safety effectiveness of shoulders on rural roads in Indiana and to propose a practical and systemic approach to identifying road segments that require more attention and possible shoulder improvements.

A negative binomial model with random effects was employed to evaluate crash frequency using nine years of crash data (2015-2023) from across over 5,000 miles of rural highways. The model incorporates geometric factors, traffic exposure, and the presence of rumble strips to quantify the impact of shoulder width on crash occurrence. Crash Modification Factors (CMFs) were developed based on the existing combination of shoulder and lane width and the proposed design alternatives, allowing for a comparison among different configurations. Findings indicated that increasing shoulder width generally reduces crash frequency, with the most significant improvements observed for shoulders of 5-6 feet. However, shoulders equal or exceeding 7 feet showed diminishing safety benefits, potentially due to increased risk taking by drivers. The presence of roadside rumble strips was found to reduce run-off-road (ROR) crashes by 21%.

The results provide a systematic approach to identifying high-risk road segments and to improving safety countermeasures. The developed CMFs can aid the Indiana Department of Transportation (INDOT) in prioritizing shoulder improvements based on the provided evidence.