

## I. RESEARCH PROJECT TITLE

Evaluation of Bypass Lane Safety, Operations, and Design in Kansas

## II. RESEARCH PROBLEM STATEMENT

Shoulder bypass lanes at rural intersections have typically been identified as a relatively low cost safety improvement that particularly reduces the number of rear-end crashes (Toolbox of Countermeasures, Institute of Transportation Engineers 2004). Nebraska has reported a marked decrease in rear-end collisions at shoulder bypass lanes, and other states have reported relatively few accidents occurring at shoulder bypass lane installations (Sebastian and Pusey, 1982). However, a more recent study conducted by Minnesota Department of Transportation evaluated the operational and safety effects of using bypass lanes at rural intersections by comparing the operational and safety characteristics of rural intersections without turning lanes, with bypass lanes, and with left-turn lanes (Preston and Schoenecker, 1999). Based upon a comparative crash analysis and a before-after evaluation, Minnesota was unable to conclude that the use of a bypass lane provides a greater degree of safety when compared with intersections without a bypass lane or a left-turn lane. Based on these mixed findings, NCHRP 17-18: Implementing the AASHTO Strategic Highway Safety Plan, has recommended additional evaluations as necessary to sufficiently quantify the safety effectiveness of bypass lanes on shoulders ([http://safety.transportation.org/htmlguides/UnsigInter/description\\_of\\_strat.htm#S17.1\\_B4](http://safety.transportation.org/htmlguides/UnsigInter/description_of_strat.htm#S17.1_B4)).

Bypass lanes are fairly prevalent in Kansas roadways and there is a need to conduct a study similar to MN and decide whether it is necessary for KDOT to address bypass lanes. This study is expected to serve that purpose.

## III. RESEARCH OBJECTIVES

The main objectives of this study are to evaluate bypass lane safety, operations, and design in Kansas and provide appropriate recommendations for the future use of bypass lanes in Kansas.

Following major tasks will be completed in accomplishing the above objectives.

### ***Task 1: Literature Review***

Conduct a detailed literature review on studies conducted throughout the country about use of bypass lanes as an intersection safety improvement measure.

### ***Task 2: Understanding the Current Practice***

Conduct a survey among relevant KDOT, city, and county engineers throughout the state of Kansas to determine characteristics of in-place bypass lanes at unsignalized three and four-legged intersections. The survey will include questions about design and warrant characteristics, pavement markings, and comments about the operations of the bypass lanes. Survey responses will be analyzed to identify issues and concerns related to bypasses in Kansas.

### ***Task 3: Comparable Safety Analysis and Evaluation***

Crash data for similar intersections will be collected with the help from KDOT under different geometric characteristics such as a) No turn lanes, b). Bypass lanes and c). Left turn lanes based on number of approaches (Three-legged vs Four-legged). A comparative crash data analysis will be conducted using crash rates based on intersection design category and approach volume to evaluate the comparative merits of bypass lanes, if there are any. Severity of crashes and types of crashes will be the other parameters considered in addition to crash rates.

### ***Task 4: Before-and-After Crash Data Analysis***

Locations where bypass lanes have been introduced in the past will be identified with the KDOT assistance and before and after data will be collected by considering a suitable time period. Safety parameters such as crash frequency and crash rate will be statistically compared between the two time periods while accounting for severity.

**Task 5: Operational Evaluation**

Based on the results of Tasks 1-4 identify 2-3 critical intersections with bypass lanes and record the traffic operations. This is intended to be carried out using video camera technique without being visible to the road users. Data will be extracted and analyzed to identify important parameters such as speed reductions, problem maneuvers, traffic conflicts or near misses of crashes and such.

**Task 6: Develop Recommendations**

Based on the findings of the previous steps develop the recommendations on the use of bypass lanes at three and four legged rural intersections in Kansas.

**Task 6: Report Preparation**

Document all the tasks of the project in a final report.

**IV. ESTIMATE OF FUNDING AND RESEARCH PERIOD**

Research Period: 24 months from the beginning of the project.

Funding: Estimated project cost is \$ 79,000.

**V. URGENCY AND PAYOFF POTENTIAL**

This study will provide definite answers on how bypass lanes are performing at intersections in Kansas. Leader of the Geometric Design, Drainage and Environmental Area Panel, Jim Brewer has identified this topic as much needed and timely. If there are no guaranteed safety benefits there is no need to waste limited resources on adding more bypasses; whereas if there are benefits it may be necessary to continue the practice. Either way, the project is expected to have a high pay off potential.

**VI. IMPLEMENTATION STRATEGY**

Recommendations developed in this study could be utilized by the Bureau of Design at KDOT when deciding on future applications of bypass lanes in Kansas.

**VII. PROJECT PERSONNEL**

The principal investigator of this project will be Dr. Sunanda Dissanayake (Associate Professor of Civil Engineering) who has many years of experience in the areas of traffic engineering, safety, crash data analysis, and access management related issues. One Graduate Research Assistant will work on this project whose master thesis would be focused on this study. Every effort will be made to recruit a qualified female and/or minority student to work on this project.

**VIII. SUBMISSION INFORMATION**

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