

November 2005

**RESEARCH PROJECT TITLE**

Intersection Traffic Control in Very Low  
Volume Rural Areas

**SPONSORS**

Iowa Highway Research Board (TR-527)

**PRINCIPAL INVESTIGATOR**

Reginald R. Souleyrette  
Prof., Civil, Construction, &  
Environmental Engineering  
Iowa State University  
515-294-5453  
reg@iastate.edu

**MORE INFORMATION**

[www.ctre.iastate.edu/research/detail.cfm?projectID=-1602955190](http://www.ctre.iastate.edu/research/detail.cfm?projectID=-1602955190)

**CTRE**

**Iowa State University  
2901 South Loop Drive, Suite 3100  
Ames, IA 50010-8634  
515-294-8103**

The mission of the Center for Transportation Research and Education (CTRE) at Iowa State University is to develop and implement innovative methods, materials, and technologies for improving transportation efficiency, safety, and reliability while improving the learning environment of students, faculty, and staff in transportation-related fields.

The sponsors of this research are not responsible for the accuracy of the information presented herein. The conclusions expressed in this publication are not necessarily those of the sponsors.

Stop control at very low volume intersections with adequate sight distance does not improve safety but could be a maintenance and liability issue.

## Objectives

- Assess the safety performance of stop-controlled versus uncontrolled intersections at ultra-low-volume unpaved roads for a large number of locations (> 6000)
- Develop criteria to assess the excessive use of stop control and analyze the effects of extensive versus lesser use of STOP signs
- Recommend procedures for removal/conversion of stop control

## Problem Statement

In Iowa, from 2001 to 2003, the major cause of about 20 percent of all fatal crashes on secondary roads was “ran STOP sign” and “FTYROW from STOP sign.” However, it is thought that unwarranted and excessive use of stop control is expensive, a potential liability, and may cause a reduction of respect for all signs. Maintenance and enforcement in rural areas is particularly expensive. As there may be 50,000 or more STOP signs on county roads in the state of Iowa, unnecessary signs may cost local governments thousands of dollars per year in maintenance and can represent a potential legal liability if inadequate maintenance or placement of signage is found to be a contributing factor in a crash.

Establishment of the proper level of traffic control on low-volume rural roads can be problematic for local agencies. Part 2 of the Manual on Uniform Traffic Control Devices (MUTCD) discourages the overuse of regulatory signs and lists general applications for installation of STOP and YIELD signs. However, no published guidelines for the removal of unneeded two-way stop control apparently exist, and local agencies are reluctant to undertake this action even at ultra-low-volume intersections.

## Research Description

A survey was sent to county engineers on practices and policies for the installation of traffic control at rural local road intersections. Information sought in the survey included type of control utilized, criteria employed for determining level of control, use of engineering studies, and adoption and use of formal policies for application of stop control. Twenty-nine of Iowa's ninety-nine counties responded to the survey. Nineteen counties provided data describing the locations of STOP and YIELD signs in their jurisdictions. Following the selection of unpaved study intersections, crash history was reviewed for a ten-year period.

*Continued from previous page*

An analysis of safety performance of stop-controlled versus uncontrolled intersections and a cost analysis were completed. A regression analysis was conducted to determine whether a crash was more likely to occur at a specific intersection based on type of control and daily entering vehicles (DEV). Additionally, three different analyses were completed to attempt to quantify the relationship between the widespread use of stop control and intersection safety performance: (1) the determination of “excess” control based only on a volume threshold, (2) the determination of “excess” control based on a volume threshold and the fraction of intersections that should be controlled due to sight distance limitations (approximated by a “terrain factor”), and (3) determination of a use factor based on the ratio of stop control used in a typical Iowa county. These analyses led to the identification of a potential volume threshold for the use of stop control.

## Key Findings

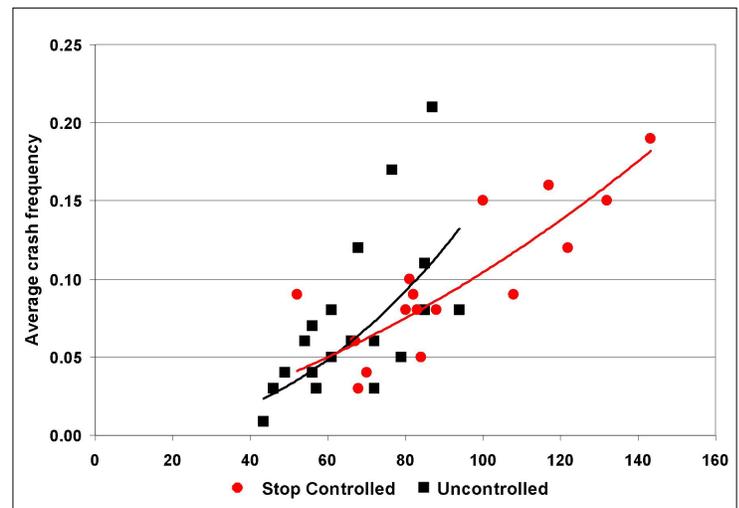
- Ultra-low-volume (< 150 DEV) unpaved rural intersections exhibit much lower crash rates than experienced on local rural roads in general. For these intersections, type of control has negligible effect on safety performance when sight distance is adequate. The most prominent crash type at these locations is failure to yield right-of-way, regardless of control type.
- Above approximately 150 DEV, uncontrolled rural intersections exhibit increasingly higher crash rates when compared to stop controlled.
- Compliance with stop control (as indicated by crash performance) does not appear to be affected by the use or excessive use of STOP signs, even when adjusted for volume and a sight distance proxy, and crash occurrence does not appear to be impacted by the liberal use of stop control.

## Implementation Benefits

- Knowledge of the effectiveness of rural stop control will be useful in the development of criteria that can be used to support engineering decisions made by county authorities to reduce or eliminate unnecessary control.



*Approaching a very low volume uncontrolled intersection*



*Ten-year crash performance, selected counties*

## Recommendations for Removal of Stop Control

- Have a written policy approved by your Board and reviewed by your Legal Counsel
- Perform a site visit
- Review crash records
- Check traffic volumes and planned development
- Provide effective public notice
- Plan interim steps
- Monitor the operation and modify if needed
- Consider YIELD application for seasonal control
- Document the entire process