

# LOW-COST SAFETY IMPROVEMENTS CAN IMPROVE SAFETY AT STOP SIGN-CONTROLLED INTERSECTIONS

## INTRODUCTION

Stop signs are the primary form of traffic control at intersections across the United States. However, intersections controlled by stop signs also account for one-third of all intersection crashes and more than 40 percent of fatal crashes<sup>1</sup>. Research has shown that a primary reason for the high number of crashes is driver inability or failure to see the stop sign and/or to understand where to stop. Research also demonstrates that the number and severity of crashes can be reduced by using simple, low-cost enhancements such as improving stop sign visibility, adding "Stop Ahead" advance traffic control signs, and adding pavement markings to increase the level of driver compliance with the stop sign. The experience of Winston-Salem, NC, demonstrates how transportation agencies can improve safety with low-cost enhancements.

The city of Winston-Salem was concerned about the high number of crashes at some of its intersections controlled by stop signs. Recognizing that poor sign visibility and inadequate markings can cause crashes, the city of Winston-Salem installed larger additional stop signs, "Stop Ahead" advance traffic control signs and clearly visible markings in various combinations at 16 intersections experiencing a high incidence of crashes, many with injuries<sup>2</sup>. The crash reduction averages in this report reflect the average percent reduction per year based on the difference between the total number of "before" and "after" crashes, observed over a minimum duration of 3 years at each intersection, between 1988 - 2002. The "before" and "after" observation periods ranged between 39-55 months depending on the intersection.

This article summarizes the application of four successful combinations of intersection treatment enhancements that reduced crashes at stop sign-controlled intersections. These four combinations are described below.

## LOW-COST IMPROVEMENTS

### 1) Install Larger (30-inch) Stop Signs, "Stop Ahead" Advance Traffic Control Signs, and Pavement Markings

Winston-Salem replaced existing 24-inch stop signs with 30-inch signs (Figure 1) and placed 12-inch stop bars and a short segment of double-yellow centerlines at four intersections. Officials also installed "Stop Ahead" advance traffic control signs at two intersections. Data showed that 45 crashes occurred before the improvements were made; 20 crashes occurred after the changes. **These relatively inexpensive treatments have proven effective in reducing crashes, and Winston-Salem experienced an average crash reduction of 56.9 percent per year at these intersections.**

### 2) Add Pavement Markings (Double-Yellow Centerline and Stop Bars) to Existing (24-inch) Stop Signs

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<sup>1</sup> Insurance Institute for Highway Safety, Volume 37, No 9, October 26, 2000.

<sup>2</sup> Existing intersections met minimum Manual on Uniform Traffic Control Devices (MUTCD) standards.

Winston-Salem added pavement markings at four two-way, two-lane, stop-controlled intersections to increase visibility of both the intersection and the proper stop position as well as to alert drivers to the intersection control (Figure 2). Data showed that 45 crashes occurred before the improvements were made; 21 crashes occurred after the changes. **Installing these simple, low-cost countermeasures reduced crashes by 52.7 percent and reduced injuries by approximately 70 percent per year.**

### 3) Install Additional and Larger (30-inch) Stop Signs

To visually emphasize the required stop at four intersections, Winston-Salem placed additional stop signs on the left side of the stop approach and used larger (30-inch) stop signs for the intersections (Figure 3). These enhancements were intended to better alert drivers to the upcoming stop sign, and enhance their ability to safely navigate the intersection. Data showed that 68 crashes occurred before the improvements were made; 35 crashes occurred after the changes. **Winston-Salem realized an average crash reduction of 48.3 percent per year at these locations.**

### 4) Install Additional and Larger (30-inch) Stop Signs with Added Pavement Markings

Drivers were not always able to see approaching traffic from the cross streets at four intersections with existing 24-inch stop signs. The city implemented a set of low-cost sign and marking enhancements to heighten the awareness of the intersection control and encourage drivers to stop in a position that provided an effective view of approaching traffic. Countermeasures included placing an additional stop sign on the left side of the stop approach, installing larger (30-inch) stop signs for the intersection at all stop-controlled approaches, and placing 12-inch stop bars at all stop-controlled approaches. Short segments of double-yellow centerlines (up to 50 feet) were also installed at two approaches. Data showed that 41 crashes occurred before the improvements were made; 14 crashes occurred after the changes. **These simple, low-cost countermeasures reduced crashes by 65.9 percent and reduced injuries by 65 percent per year.**

### The Cost of Improved Safety

Winston-Salem had no implementation issues with these countermeasures and the costs for implementing the enhancements were low: approximately \$350 for a 30-inch stop sign or a "Stop Ahead" advance traffic control sign, and approximately \$1,250 for the enhanced pavement markings (centerlines and stop bars). The signing and pavement marking treatments were implemented within 3 months.

The combinations of enhanced countermeasures installed in these Winston-Salem stop-controlled intersections reduced total crashes by approximately 55 percent and total injuries by an average of 70 percent per year.

As the Winston-Salem experience demonstrates, low-cost improvements can effectively improve safety and reduce traffic crashes and their resulting injuries and/or fatalities. For more detailed data and results on this success story and other proven intersection safety treatments from across the country, please see the following website: <http://safety.fhwa.dot.gov/intersection>. For more information, contact Ed Rice, Intersection Safety Team Leader, FHWA Office of Safety ([ed.rice@dot.gov](mailto:ed.rice@dot.gov)), or Stanley Polanis, Director of Transportation, City of Winston-Salem, NC ([stanp@cityofws.org](mailto:stanp@cityofws.org)).

Figure 1: Larger (30-inch) Stop Sign



Figure 2: Enhanced Pavement markings (double-yellow centerlines and stop bar)



Figure 3: Additional, larger (30-inch) stop signs with stop bars

