

REMOVAL OF SIGNAL FLASHING MODE DURING LATE-NIGHT / EARLY-MORNING OPERATION

INTRODUCTION

For years, it has been standard practice to operate traffic signals in the flashing mode when traffic volumes are low, typically during late-night/early-morning hours. For most intersections with adequate sight distance, transportation agencies usually use a flashing yellow signal indication on the major street approaches and a flashing red signal indication on the minor street approaches. However, results of field studies have indicated that crashes may increase when traffic signals are operating in flashing mode during the late-night/early-morning hours¹.

The city of Winston-Salem, North Carolina was concerned about the high number of crashes at urban signalized intersections operating in the flashing mode during late-night/early-morning hours. Field studies have indicated that crash rates may increase around traffic signals using flashing operations during late-night/early-morning conditions. The city of Winston-Salem changed signal operations from flashing mode to steady (stop-and-go) mode during late-night/early-morning hours at 8 intersections experiencing a high incidence of injury crashes, particularly right-angle crashes². The crash reductions in this report reflect the percent reduction per year based on the difference between the total number of "before" and "after" crashes, observed over a minimum duration of approximately 6 years at each intersection, between 1997 - 2007. The "before" and "after" observation periods ranged between 35-51 months, depending on the intersection.

This article summarizes the safety benefits associated with removing the flashing operation from traffic signals during late-night/early-morning hours that reduced crashes. The results are described below.

TREATMENT SUMMARY

The eight intersections ranged in size from one-to-three lanes in each direction, with most being two-lane intersections. All of the intersections had a speed limit of 35 mph (with one 30 mph cross street). They experienced Annual Daily Traffic ranging from 3,500 to 13,000 in the "before" condition and 2,700 to 12,000 in the "after" condition. Late-night/early morning flashing operations were removed from the traffic signals and replaced with steady (stop-and-go) mode at all eight of these intersections.

The eight intersections are described below:

1) Indiana Avenue and Patterson Avenue

The flashing operation during late-night/early-morning hours was removed from the traffic signals on May 31, 2001. The "before" and "after" observation period was 45 months. Data showed that 31 crashes occurred before the improvement was made; 22 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash**

¹ Source: S.F. Polanis, "Right-Angle Crashes and Late-Night/Early- Morning Flashing Operation: 19 Case Studies," ITE Journal, April 2002

² Existing intersection treatments met minimum Manual on Uniform Traffic Control Devices (MUTCD) requirements.

reduction of 29 percent, reduced injury crashes by 63.6 percent per year and reduced the targeted right-angle crashes by 75 percent per year.

2) Sprague Street and Vargrave Street

The flashing operation during late-night/early-morning hours was removed from the traffic signals on October 29, 2001. The "before" and "after" observation period was 46 months. Data showed that 32 crashes occurred before the improvement was made; 26 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash reduction of 18.8 percent, reduced injury crashes by 50 percent per year and reduced the targeted right-angle crashes by 75 percent per year.**

3) Hawthorne Road and Miller Street

The flashing operation during late-night/early-morning hours was removed from the traffic signals on October 30, 2001. The "before" and "after" observation period was 35 months. Data showed that 31 crashes occurred before the improvement was made; 15 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash reduction of 51.6 percent. Injury crashes and the targeted right-angle crashes were eliminated (from eleven and three, respectively, in the "before" period).**

4) Martin Luther King Jr. Drive and Waughtown Street

The flashing operation during late-night/early-morning hours was removed from the traffic signals on March 14, 2002. The "before" and "after" observation period was 40 months. Data showed that 57 crashes occurred before the improvement was made; 38 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash reduction of 33.3 percent and reduced injury crashes by 36.4 percent per year. The targeted right-angle crashes were eliminated (from eight in the "before" period).**

5) Country Club Road and Westview Drive

The flashing operation during late-night/early-morning hours was removed from the traffic signals on April 10, 2002. The "before" and "after" observation period was 51 months. Total crashes remained unchanged at 16 crashes before and after the improvement was made. **After the return to steady operations during late-night/early-morning hours, injury crashes decreased by 42.9 percent per year and the targeted right-angle crashes decreased by 75 percent per year.**

6) Marshall Street and Salem Avenue

The flashing operation during late-night/early-morning hours was removed from the traffic signals on April 10, 2002. The "before" observation period was 39 months and the "after" observation period was 37 months. Data showed that 8 crashes occurred before the improvement was made; 6 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash reduction of 20.9 percent, reduced injury crashes by 73.6 percent per year. The targeted right-angle crashes were eliminated (from three in the "before" period).**

7) Sixth Street and Trade Street

The flashing operation during late-night/early-morning hours was removed from the traffic signals on July 2, 2002. The "before" and "after" observation period was 37 months. Data showed that 7 crashes occurred before the improvement was made; 4 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash reduction of**

42.9 percent and injury and the targeted right-angle crashes were eliminated (from four and three, respectively, in the “before” period).

8) Third Street and Metropolitan Drive

The flashing operation during late-night/early-morning hours was removed from the traffic signals on May 26, 2004. The “before” and “after” observation period was 36 months. Data showed that 16 crashes occurred before the improvement was made; 9 crashes occurred after the change. **After the return to steady operations during late-night/early-morning hours, this intersection experienced a crash reduction of 43.8 percent, reduced injury crashes by 40 percent per year and reduced the targeted right-angle crashes by 85.7 percent per year.**

The Cost of Improved Safety

Winston-Salem had no implementation issues with these countermeasures. The cost for changing the traffic signals from flashing mode to steady mode was estimated at \$500 per intersection. The removal of the signal from flashing mode operation took less than four hours per intersection.

The removal of the late-night/early-morning flashing mode from eight urban intersections in Winston-Salem cumulatively reduced total crashes by 30.9 percent, injury crashes by 60.1 percent, and right-angle crashes by 88.8 percent per year.

As the Winston-Salem experience demonstrates, removing signals from late-night/early-morning flashing mode operation effectively improves safety and reduces traffic crashes and their resulting injuries. For more detailed data and results on this success story and other proven intersection safety treatments from across the country, please visit: <http://safety.fhwa.dot.gov/intersections/>. For more information, contact Ed Rice, Intersection Safety Team Leader, FHWA Office of Safety (ed.rice@dot.gov), or Stanley Polanis, Director of Transportation, City of Winston-Salem, NC (stanp@cityofws.org).

OPTIONAL IMAGES:

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