IMPROVING SAFETY BY PROVIDING ALL-RED CLEARANCE INTERVALS AND LARGER SIGNAL LENSES

INTRODUCTION

Red-light running is estimated to cause more 170,000 injuries and approximately 900 deaths per year[1]. Some of these crashes occur because of driver speeding, distracted driving, or inability or failure to see the traffic control device in time to comply. Research demonstrates that the number and severity of crashes can be reduced by using simple, low-cost enhancements such as providing clearance intervals—both lengthening the yellow-change intervals in accordance with the recommended Institute for Transportation Engineers (ITE) formula[2] as well as providing an all-red clearance interval—together with increasing the size of the signal lens for the red, yellow and green indications. The experience of Detroit and Highland Park, Michigan, demonstrates how transportation agencies can improve safety with low-cost enhancements.

The cities of Detroit and Highland Park were concerned about the high number of crashes, particularly angle crashes, at some of their signalized urban intersections. Recognizing that poor signal visibility and inadequate clearance time can cause crashes, these cities implemented all-red clearance intervals and larger signal lenses at 33 intersections experiencing a high incidence of crashes (particularly angle crashes), many with injuries. The safety improvements were implemented in 1997. 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 13 months at each intersection, between 1997 - 2002. The “before” and “after” observation periods ranged between 13-34 months depending on the intersection.

This article summarizes the application of two successful combinations of intersection treatment enhancements that reduced crashes at signalized intersections.

LOW-COST IMPROVEMENTS

The cities upgraded existing 8-inch red, yellow, and green signal lenses to 12-inch lenses and added an all-red clearance interval ranging from 1-2 seconds at 33 intersections, along a 7.5 mile length of Woodward Avenue corridor. Adding or extending an all-red clearance interval (a brief period when the lights in all directions are red) provides a “cushion” between signal phases, reducing the risk of a crash. Larger signal lenses make signals more visible providing drivers with more time to recognize and respond to a signal. Figure 1 illustrates the relative size difference between the larger and smaller signal.

The Cost of Improved Safety

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[1] Federal Highway Administration Red-Light Running Web Site (2008), http://safety.fhwa.dot.gov/intersection/redlight/.

[2] Calculated using Institute of Transportation Engineers (ITE) recommended guidelines ARI = (W+L)/V, where ARI is the length of the all-red interval in seconds, W is the intersection width (in feet), L is the length of the clearing vehicle (typically 20 feet), and V is the approach speed (in feet/second).

The cities had no implementation issues with these countermeasures and the costs for implementing the enhancements at all 33 intersections totaled $2.3 million (approximately $70,000 per intersection). The treatments were implemented within 6 months.

The combinations of enhanced countermeasures installed at these Michigan signalized intersections cumulatively reduced total crashes by approximately 33.3 percent and injury crashes by an average of 45.5 percent per year. Angle crashes were reduced by a significant 75.7 percent per year at the treated intersections.

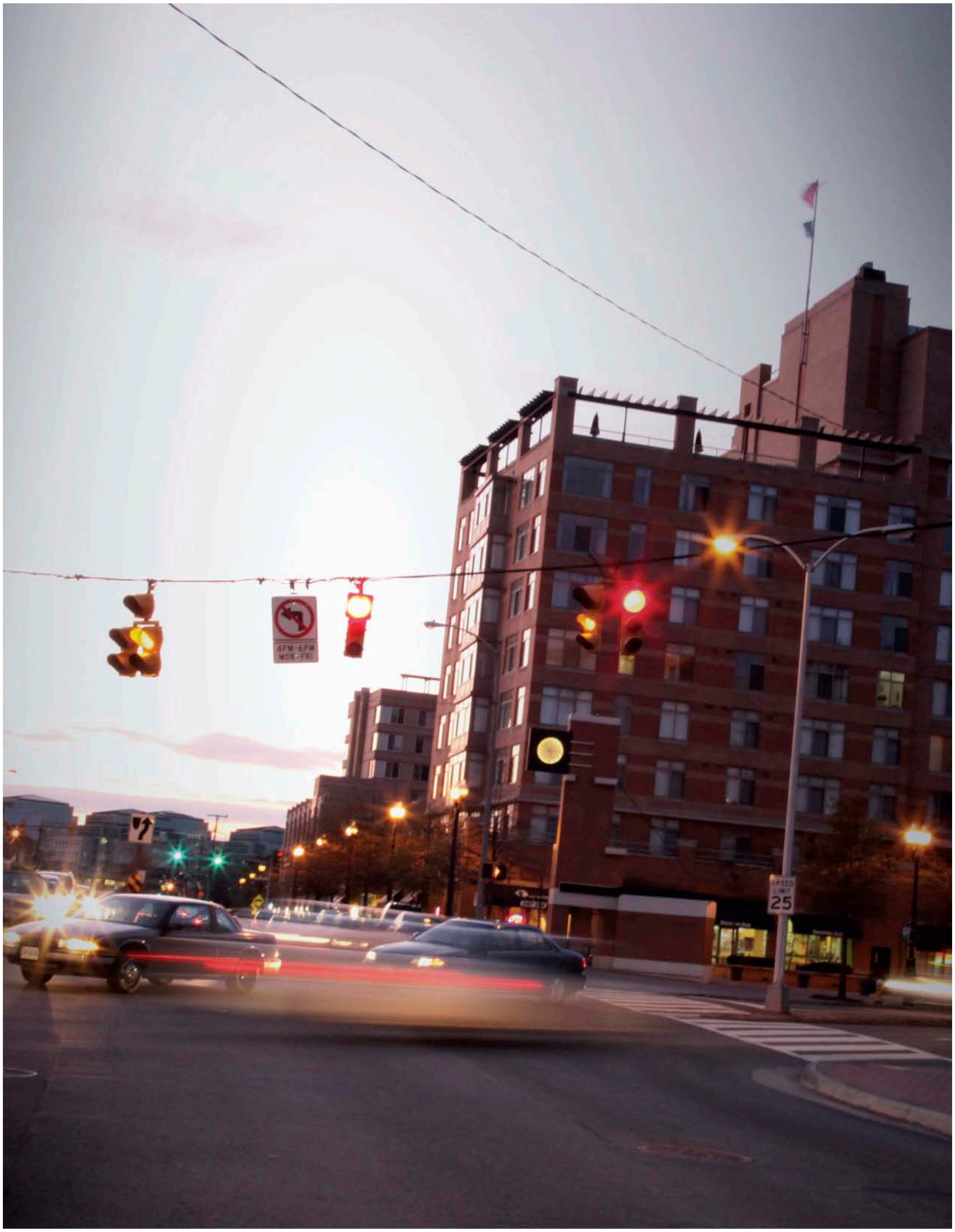
As the Michigan experience demonstrates, low-cost improvements can effectively improve safety and reduce traffic crashes and their resulting injuries. For more detailed data and results on this success story and other proven intersection safety treatments from across the country, please see the following 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), or Tapan Datta, WSU-Transportation Research Group, MI (tdatta@eng.wayne.edu).

Figure 1: Relative size difference between 12-inch (top lens) and 8-inch signal lens (bottom lenses)

(Photo courtesy of istock [used with permission]).

OPTIONAL PHOTOS:

(Photo by April Armstrong [used with permission]).



(Photo by April Armstrong [used with permission]).