

Intersection Proven Safety Countermeasure

Executive Summary:

Backplates with Retroreflective Borders

Easier to see, day or night

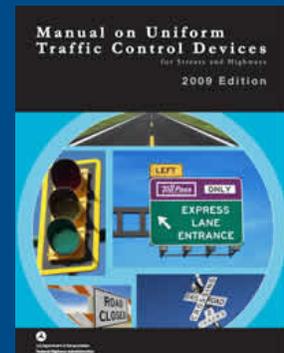
Traffic signal backplates—thin plates of material that surround traffic signal indication light arrays—are intended to improve the visibility of the signal by providing a consistent and controlled-contrast background.

Adding narrow strips of retroreflective tape or sheeting around the border of the backplates—called backplates with retroreflective borders—helps frame the signal indication. This treatment increases visibility and conspicuity of traffic signals, particularly during nighttime hours, and enhances visibility of traffic signals for aging and color vision impaired drivers. It may also alert drivers to signalized intersections during periods of power outages when the signals would otherwise be dark and the non-reflective signal heads would not be visible. FHWA cited the treatment as an “Aging Driver” Best Practice and one of its nine Proven Safety Countermeasures; the treatment was also added as an option in the 2009 Manual of Uniform Traffic Control Devices (MUTCD).

Included in the Manual of Uniform Traffic Control Devices (MUTCD)

MUTCD Section 4D.12 Visibility, Aiming, and Shielding of Signal Faces

A yellow retroreflective strip with a minimum width of 1 inch and a maximum width of 3 inches may be placed along the perimeter of the face of a signal backplate to project a rectangular appearance at night.



Easy, low-cost installation, big safety solution, many options

Installation. The most effective means of implementing retroreflective backplates is to adopt them as a standard treatment for signalized intersections across a jurisdiction, so that the treatment will be consistently incorporated into all new construction and modernization projects.



Depending on the implementation method chosen, costs range from \$35 for adding reflective tape to existing backplates to \$56-110 for replacing the backplates with reflective material already incorporated.

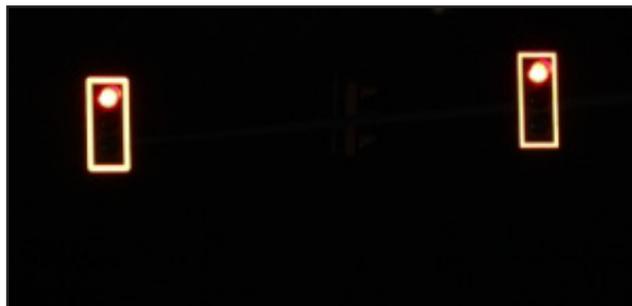


Exhibit 1: Retroreflective borders on backplates can provide a visual benefit during both daytime and nighttime conditions. (Source: VDOT)

Safety. Many formal studies, as well as case studies from State installations, show this treatment to be a proven safety measure.

- Studies of retroreflective backplates began in 1998 in British Columbia, Canada, with ten signalized intersections. What began as a small project turned into a sizable deployment and study, with robust statistical evaluations conducted after several years. One key report showed that the total modeled insurance claims were reduced by approximately 15 percent. That report is the basis for the Crash Modification Factor of 0.85.
- Before- and after-implementation comparisons at three high-crash locations in Columbia, South Carolina, showed crash reductions ranged between 29 percent (total crashes) and 50 percent (late-night/early-morning crashes) after the application of yellow reflective borders to existing backplates.
- A before-and-after study of 30 signalized intersections in Kentucky showed an aggregate crash reduction at those intersections of 19.6 percent, a 44.4 percent reduction in angle crashes, and a 10 percent reduction in rear end crashes.
- A Nashua, New Hampshire, project to upgrade 68 intersections—including installing retroreflective backplates—is projected to result in a 40 percent reduction in total crashes, better intersection levels of service, and improved air quality.

Installation options. Methods for placing retroreflective backplates include:

- Ordering backplates with retroreflective tape pre-applied.
- Ordering retroreflective tape (in desired width) and backplates at the same time, but without pre-application.
- Ordering retroreflective tape (in the desired width) and applying it to pre-existing backplates.



Exhibit 2: Signals at a displaced left turn (DLT) intersection in Fenton, Missouri, have backplates with and without retroreflective borders. (Source: FHWA)

Funding options. States address funding in various ways. For instance, the project in Nashua, New Hampshire, was funded through Federal participating Congestion Mitigation and Air Quality (CMAQ) funding for overall signal modernization (an 80/20 Federal/local ratio). Other States, such as Washington and Michigan, have largely funded installation refits through Highway Safety Improvement Program (HSIP) funding (90/10 Federal/local ratio). This treatment may even be considered for 100 percent Federal funding under 23 USC 120 provisions. The Virginia Department of Transportation's (VDOT's) retrofit program is using Open Container funds. The Washington State Department of Transportation (WSDOT) has also funded retroreflective backplate installations in more than 16 local jurisdictions, many of which have been completed under the Quick Response Safety Program.

Widely Implemented Safety Treatment

As of 2014, more than half of U.S. State highway agencies have a policy, specification, or standard for implementing backplates with retroreflective borders.

Case Study: Washington State's Success with Local Implementation of Retroreflective Borders on Traffic Signal Backplates

VISION: WSDOT has been working with local agencies to retrofit signals with retroreflective backplates, including adding retroreflective tape to existing backplates or adding backplates and tape in more than 16 jurisdictions; however, many installations are also made directly by local agencies.

CHARACTERISTICS: Many of the State's retroreflective backplate installations have been completed under the Quick Response Safety Program.

COST: The cost for implementing the countermeasure was approximately \$450 per intersection.

FUNDING: HSIP funding has been the primary source for local agencies; however, other funding sources have covered installations, including those on the State highway system.

IMPLEMENTATION: Yellow retroreflective borders were added to existing signal backplates, framing the signal head. In some locations without existing backplates, backplates with a retroreflective border were installed. The most common method of installation is to manually apply the tape to backplates.

CURRENT PRACTICE: Backplates should to have a 1-inch to 3-inch wide yellow stripe of retroreflective, Type IV, prismatic sheeting around the perimeter to project a rectangular image at night.



Exhibit 3: Mast-mounted signals with retroreflective borders. (Source: VHB)

For complete information, including references, please refer to the Backplates with Retroreflective Borders Technical Summary.

FOR MORE INFORMATION

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Visit FHWA's intersection safety Web site to download this and other technical outreach products highlighting proven intersection safety treatments from across the country:

<http://safety.fhwa.dot.gov/intersection>