

Retroreflectivity

Background

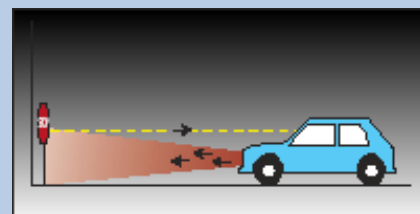
According to the Federal Highway Administration (FHWA), while only 25 percent of travel occurs at night, more than half of traffic fatalities occur during nighttime hours. In Massachusetts, nearly half of all fatal crashes occur during the nighttime. Poor visibility may be a contributing factor in nighttime crashes. Headlights and roadway lighting help to illuminate the roadway, but are often not enough to meet the needs of nighttime drivers. For this reason, FHWA recommends the use of retroreflective traffic control devices so that at night a driver can see a sign or pavement marking sooner and can then take appropriate actions.

Retroreflective Signs and Pavement Markings

Retroreflective materials used on signs, pavement markings, and other traffic control devices can provide additional visual cues on wet pavements and in the nighttime driving environment helping to meet the needs of nighttime drivers. Retroreflective materials, which use small glass beads and microprismatic reflectors mixed into the paint, have the ability to reflect light and enable a vehicle operator to see traffic control devices more easily at night. The [Manual on Uniform Traffic Control Devices \(MUTCD\)](#) states that all signs and pavement markings shall be retroreflective or have adequate ambient lighting. Fortunately, most traffic signs and pavement markings use retroreflective technology.

Retroreflective paint can be useful and effective and can be used in nearly all instances to reflect a vehicle's headlights thus adding conspicuity. According to the MUTCD, pavement markings shall be installed with the proper retroreflective color as per [Section 3A.04](#). Similarly, all regulatory, warning, and guide signs must use retroreflective or other illuminating materials displaying the same color during both night and day, unless specifically stated otherwise in the [MUTCD Section 2A.11](#). Additionally, it is important to note that the installation procedure is critical in order to obtain the full benefit of retroreflective materials. For example, the height and lateral placement of a sign are critical components of the installation. Please see the MUTCD for additional information regarding the installation procedures of retroreflective signs.

As shown in the adjacent picture, the headlight from a vehicle shines on a retroreflective sign and the message on the sign bounces back to the driver.



Source: FHWA

Did You Know?

The FHWA estimates that up to half of the 58 million traffic signs in the U.S. are beyond their useful lifespan (estimated at 10 years) from a retroreflectivity standpoint.

EOT

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Retroreflective STOP Sign (Source: minimumreflectivity.org)

Measuring Retroreflectivity

As of January 2008, the FHWA has established guidelines for maintaining minimum retroreflectivity levels on traffic signs, which are available in the online version of the MUTCD in [Section 2A.09](#). Signage that does not provide adequate retroreflectivity should be upgraded. In the field, retroreflectivity can be measured in two ways:

1. A precise measurement can be attained with a retroreflectometer. This device is pointed at a sign or pavement marking and measures the light from the object that has been scattered and reflected back to the meter. The actual units for this measure are candela per square meter per incident lux (cd/lx/m^2).
2. A more subjective, yet commonly used method, is to gauge retroreflectivity through a simple visual inspection at night.

Costs for Retroreflective Devices

When considering retroreflective devices, considerations in the overall cost include the type of traffic control device (e.g., paint, signs, etc.), the associated installation costs, as well as the level of retroreflective properties. It is also worth noting that costs may vary across manufacturers and with the quantity of an order. Based upon these variations in cost, it is recommended that several alternatives be considered when ordering retroreflective materials, including paint and signage. The following are some devices and the associated prices*:

- Retroreflective delineator—\$22.75 per device
- Retroreflective warning signs—\$18 per square foot
- Retroreflective location and guide signs—\$20 per square foot
- Retroreflective street name signs —\$100 per sign
- Retroreflective paint—\$1.70 per square foot

*prices included are from the [MassHighway Weighted Average Bid Prices](#) as of January 2008. These prices reflect the relative costs for retroreflective materials, and will generally be lower than what a municipality may expect to pay.

Resources

Massachusetts Traffic Safety Toolbox Series

This series of fact sheets provides information on safety improvements that can be implemented at the local level. Information on problem areas, possible countermeasures, and implementation considerations is included in each fact sheet which can be found at www.mass.gov/mhd/safetytoolbox/

The Manual on Uniform Traffic Control Devices (MUTCD)

Published by the FHWA, the MUTCD defines the standards used by transportation professionals nationwide to install and maintain traffic control devices on all streets and highways. The most recent version (2003) can be found at <http://mutcd.fhwa.dot.gov/>



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