



Maintaining Traffic Sign Retroreflectivity

**updated in 2013 to reflect current MUTCD compliance dates*

FHWA-SA-07-020 (Revised 2013)

This document is referenced in **Section 2A.08** of the *Manual on Uniform Traffic Control Devices* (MUTCD). Please be sure to review the methods discussed on pages two and three, along with the related procedures that make each method reliable and meaningful in its use to maintain signs above the minimum retroreflectivity levels. A full report on these methods can be found at www.fhwa.dot.gov/retro.

SCHEDULE

Method:

Agencies have until **June 14, 2014** to implement and continue to use an assessment or management method that is designed to maintain regulatory and warning sign retroreflectivity at or above the minimum levels in Table 2A-3 of the 2009 MUTCD.

Although guide signs are included in the minimum retroreflectivity levels table, there is not a specified compliance date for guide signs (including street name signs) to be addressed by an agency's method. Guide signs are to be added to an agency's management or assessment method as resources allow.

Sign Replacement:

Agencies need to replace any sign they identify as not meeting the established minimum retroreflectivity levels. Agencies' schedules for replacing signs are based on resources and relative priorities rather than specific compliance dates.

Traffic signs provide important information to road users. To be effective, traffic sign visibility must be maintained during daytime and nighttime conditions. In addition to Section 2A.08, the MUTCD addresses sign visibility in several other places, including Sections 1A.03, 1A.04, 1A.05, 2A.06, 2A.07, and 2A.22. These sections address factors such as uniformity, design, placement, operation, and maintenance.

The Standard in Section 2A.08 requires agencies to use a maintenance method that is designed to maintain traffic signs at or above minimum levels of retroreflectivity in Table 2A-3. Including Table 2A-3 in the MUTCD does not imply that an agency must measure the retroreflectivity of every sign. Rather, the MUTCD summarizes five methods that agencies can use to maintain traffic sign retroreflectivity at or above the minimum levels. These methods are listed in Section 2A.08 and are discussed on pages two and three of this document. The Standard promotes safety while providing sufficient flexibility for agencies to choose one or more maintenance methods that best match their specific conditions.

This Standard does NOT imply all signs need to be replaced. The intent is to identify and replace signs that no longer meet the needs of nighttime drivers.

The MUTCD language recognizes that there may be some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time. Reasons for this include vandalism, weather, or damage due to a crash. As long as the agency is using one of the methods (with appropriate procedures) to maintain their signs, they are considered to be in compliance with this Standard.

The methods recommended in the MUTCD are broken into two categories: management methods and assessment methods. Assessment methods involve sending personnel out to examine and assess the retroreflective performance of signs. Some agencies may find this approach to be more labor intensive and turn to management methods as an alternative. Management methods may require less field work (or none at all in some cases) but may also result in replacing some signs that still have useful life left in terms of retroreflectivity. These recommended methods are discussed on pages two and three of this document and are described in detail in a full report entitled "Methods for Maintaining Traffic Sign Retroreflectivity," available at www.fhwa.dot.gov/retro.

ASSESSMENT METHODS

Assessment methods involve evaluating individual signs within an agency's jurisdiction. There are two basic assessment methods identified in the 2009 MUTCD: visual nighttime inspection and measured sign retroreflectivity.

1. VISUAL NIGHTTIME INSPECTION METHOD

In the visual nighttime inspection method, on-the-fly assessments of retroreflectivity are made by an inspector during nighttime conditions. The following are keys to successfully implementing the visual nighttime inspection method:

- A. Develop guidelines and procedures for inspectors to use in conducting the nighttime inspections and train inspectors in the use of these procedures.
- B. Conduct inspections at normal speed from the travel lane(s).
- C. Conduct inspections using low-beam headlights while minimizing interior vehicle lighting.
- D. Evaluate signs at typical viewing distances so that adequate time is available for an appropriate driving response.

One or more of the following procedures should be used to properly implement this method:

Calibration Signs Procedure (for Visual Nighttime Inspection Method)

Calibration signs have known retroreflectivity levels at or above minimum levels. These calibration signs are set up so the inspector views the calibration signs in a manner similar to nighttime field inspections. A trained inspector views calibration signs prior to conducting the nighttime inspection described in 1 A-D above. The inspector uses the visual appearance of the calibration signs to establish the evaluation threshold for that night's inspection.

During the nighttime drive-through inspection of in-service signs, if the inspector believes a sign appears to be less bright than the calibration signs viewed earlier, the in-service sign should be replaced. The following factors provide additional information on the use of this procedure:

- Calibration signs are needed for each color of sign in Table 2A-3 of the 2009 MUTCD.
- Calibration signs are viewed at typical viewing distances using the inspection vehicle.
- Calibration signs need to be properly stored between inspections so that their retroreflectivity does not deteriorate over time.

Comparison Panels Procedure (for Visual Nighttime Inspection Method)

Comparison panels are fabricated with retroreflectivity levels at or above the minimum levels. The trained inspector makes an initial nighttime visual inspection described in 1 A-D above to identify signs that are obviously above or below the minimum retroreflectivity values as well as those the inspector considers to be marginal.

Those signs designated as obviously below the minimum retroreflectivity values are scheduled for replacement.

For signs considered marginal, a supplementary nighttime inspection is conducted by attaching a comparison panel to the in-service sign. With a flashlight, the inspector views the in-service sign along with the comparison panel to determine whether the in-service sign appears brighter or less bright than the comparison panel. If the in-service sign appears less bright than the comparison panel, the in-service sign should be replaced.

Consistent Parameters Procedure (for Visual Nighttime Inspection Method)

For this procedure, nighttime inspections described in 1 A-D above are conducted by a trained inspector under similar factors that were used in the research to develop the minimum retroreflectivity levels. These traits include:

- Using an inspector who is at least 60 years old.
- Using a sport utility vehicle or pick-up truck from which to make the observations.
- Using a model year 2000 or newer vehicle.

The trained inspector makes a judgment call as to whether an in-service sign meets their nighttime driving needs. Those signs judged not to meet the visual driving needs should be replaced. Note, the three factors listed here are specific to this procedure and are not required for visual nighttime inspections using the calibration signs procedure or the comparison panels procedure.

2. MEASURED SIGN RETROREFLECTIVITY METHOD

In this method the retroreflectivity of a sign is measured with a handheld or mobile retroreflectometer and directly compared to the minimum level appropriate for that sign. ASTM E1709, Standard Test Method for Measurement of Retroreflective Signs Using a Portable Retroreflectometer, provides the standard method for measuring sign retroreflectivity with handheld instruments. If the measured sign retroreflectivity value is less than the appropriate level in Table 2A-3, the sign should be replaced.

MANAGEMENT METHODS

Management methods provide an agency with the ability to maintain sign retroreflectivity without having to physically inspect each individual sign. While it is not required by the MUTCD, some agencies have chosen to determine the sheeting type and age or retroreflectivity levels of existing signs before using a management method. This is done by those agencies to prevent signs currently near or below minimum levels from being left in place several additional years. The 2009 MUTCD identifies three management methods:

1. EXPECTED SIGN LIFE METHOD

In this method, the agency monitors the age of individual signs and replaces them before they are expected to degrade below the minimum levels in Table 2A-3 of the 2009 MUTCD. The retroreflectivity life of a sign may vary by such factors as type of sheeting, geographic location, color, and direction the sign faces. This method depends on knowing the age and type of sheeting used for the signs. Agencies may choose to consider weathering deck results, measurements of field signs, sign sheeting warranties, or other criteria as the basis for the expected sign life. A common approach for identifying the age of individual signs uses a label on the sign to mark the year of fabrication or installation. Agencies can also use sign management systems to track the age of individual signs.

2. BLANKET REPLACEMENT METHOD

In this method, an agency manages signs in groups rather than as individual signs. An agency may choose to group signs by geographic area, roadway corridor, type of sheeting, or sign category (e.g., warning signs). The sign replacement interval is based on the expected sign life for the sign sheeting in the group with the shortest expected life. This method typically obligates an agency to replace all of the designated signs within a group, even if a sign was recently replaced due to issues such as vandalism or damage.

3. CONTROL SIGNS METHOD

In this method, agencies monitor the performance of a control sample of signs that represent a larger group of signs. Agencies track the retroreflectivity of the control signs to determine when replacement of the larger group is necessary based on the performance of the control signs.

- Agencies should develop a sampling plan to determine the appropriate number and type of control signs needed to represent the larger group of signs. Samples should represent the entire group, including such factors as sign sheeting type and color.
- Control signs may be actual signs in the field or signs in a maintenance yard (for convenience).
- Agencies should monitor the retroreflectivity of the control signs using an assessment method.

OTHER METHODS

Other assessment or management methods that are developed based on engineering studies can be used as long as they are designed to maintain minimum levels in Table 2A-3 of the 2009 MUTCD, as stated in the MUTCD Standard statement in Section 2A.08.

Excerpt from Part 2 of the 2009 MUTCD

Section 2A.08 Maintaining Minimum Retroreflectivity

Support:

- 01 Retroreflectivity is one of several factors associated with maintaining nighttime sign visibility (see Section 2A.22).

Standard:

- 02 **Public agencies or officials having jurisdiction shall use an assessment or management method that is designed to maintain sign retroreflectivity at or above the minimum levels in Table 2A-3.**

Support:

- 03 Compliance with the Standard in Paragraph 2 is achieved by having a method in place and using the method to maintain the minimum levels established in Table 2A-3. Provided that an assessment or management method is being used, an agency or official having jurisdiction would be in compliance with the Standard in Paragraph 2 even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time.

Guidance:

- 04 *Except for those signs specifically identified in Paragraph 6, one or more of the following assessment or management methods should be used to maintain sign retroreflectivity:*
- A. *Visual Nighttime Inspection—The retroreflectivity of an existing sign is assessed by a trained sign inspector conducting a visual inspection from a moving vehicle during nighttime conditions. Signs that are visually identified by the inspector to have retroreflectivity below the minimum levels should be replaced.*
 - B. *Measured Sign Retroreflectivity—Sign retroreflectivity is measured using a retroreflectometer. Signs with retroreflectivity below the minimum levels should be replaced.*
 - C. *Expected Sign Life—When signs are installed, the installation date is labeled or recorded so that the age of a sign is known. The age of the sign is compared to the expected sign life. The expected sign life is based on the experience of sign retroreflectivity degradation in a geographic area compared to the minimum levels. Signs older than the expected life should be replaced.*

- D. *Blanket Replacement—All signs in an area/corridor, or of a given type, should be replaced at specified intervals. This eliminates the need to assess retroreflectivity or track the life of individual signs. The replacement interval is based on the expected sign life, compared to the minimum levels, for the shortest-life material used on the affected signs.*
- E. *Control Signs—Replacement of signs in the field is based on the performance of a sample of control signs. The control signs might be a small sample located in a maintenance yard or a sample of signs in the field. The control signs are monitored to determine the end of retroreflective life for the associated signs. All field signs represented by the control sample should be replaced before the retroreflectivity levels of the control sample reach the minimum levels.*
- F. *Other Methods—Other methods developed based on engineering studies can be used.*

Support:

- 05 Additional information about these methods is contained in the 2007 Edition of FHWA's "Maintaining Traffic Sign Retroreflectivity" (see Section 1A.11).

Option:

- 06 Highway agencies may exclude the following signs from the retroreflectivity maintenance guidelines described in this Section:
- A. Parking, Standing, and Stopping signs (R7 and R8 series)
 - B. Walking/Hitchhiking/Crossing signs (R9 series, R10-1 through R10-4b)
 - C. Acknowledgment signs
 - D. All signs with blue or brown backgrounds
 - E. Bikeway signs that are intended for exclusive use by bicyclists or pedestrians

Note: The referenced document is actually this four-page brochure you are reading.

Table 2A-3.
Minimum Maintained
Retroreflectivity
Levels¹

| Sign Color | Sheeting Type (ASTM D4956-04) | | | | Additional Criteria |
|---------------------------------------|-------------------------------|-----------------|------------|-------------------------------|---------------------|
| | Beaded Sheeting | | | Prismatic Sheeting | |
| | I | II | III | III, IV, VI, VII, VIII, IX, X | |
| White on Green | W*; G ≥ 7 | W*; G ≥ 15 | W*; G ≥ 25 | W ≥ 250; G ≥ 25 | Overhead |
| | W*; G ≥ 7 | W ≥ 120; G ≥ 15 | | | Post-mounted |
| Black on Yellow or Black on Orange | Y*; O* | Y ≥ 50; O ≥ 50 | | | 2 |
| | Y*; O* | Y ≥ 75; O ≥ 75 | | | 3 |
| White on Red | W ≥ 35; R ≥ 7 | | | | 4 |
| Black on White | W ≥ 50 | | | | — |

¹ The minimum maintained retroreflectivity levels shown in this table are in units of cd/lx/m² measured at an observation angle of 0.2° and an entrance angle of -4.0°.

² For text and fine symbol signs measuring at least 48 inches and for all sizes of bold symbol signs

³ For text and fine symbol signs measuring less than 48 inches

⁴ Minimum sign contrast ratio ≥ 3:1 (white retroreflectivity ÷ red retroreflectivity)

* This sheeting type shall not be used for this color for this application.

| 2009 MUTCD Section Number(s) | 2009 MUTCD Section Title | Specific Provision | Compliance Date |
|------------------------------|---------------------------------------|--|---|
| 2A.08 | Maintaining Minimum Retroreflectivity | Implementation and continued use of an assessment or management method that is designed to maintain regulatory and warning sign retroreflectivity at or above the established minimum levels (see Paragraph 2) | June 14, 2014 (date established in Revision 2 to 2009 MUTCD)* |

* Types of signs other than regulatory or warning are to be added to an agency's management or assessment method as resources allow.