

Traffic Sign Retroreflectivity

Current Status?

Traffic Sign Retroreflectivity

1993 DOT Appropriations Act

“The Secretary of Transportation shall revise the MUTCD to include a standard for a minimum level of retroreflectivity that must be maintained for traffic signs and pavement markings which apply to all roads open to public travel.”

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Portions of the MUTCD revised:

- Introduction
 - **Compliance dates**
- Part 1
 - 1A.11 - relation to other publications
- Chapter 2A
 - **2A.09 - minimum sign retroreflectivity**
 - 2A.22 - sign maintenance
- Minor editorial changes to cross-references
 - 2A, 2B, and 6F

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New MUTCD Sign Retroreflectivity Maintenance Requirements:

- Published on Dec 21, 2007
 - Vol 72, No. 245
- Revision #2 of the 2003 Edition of the MUTCD
- Effective Jan 22, 2008

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New MUTCD Table 2A.3

Minimum Maintained Retroreflectivity Levels

Sign Color	Sheeting Type (ASTM D4956-04) ①				Additional Criteria
	Beaded Sheeting			Prismatic Sheeting	
	I	II	III		
White on Green	W* G ≥ 7	W* G ≥ 15	W* G ≥ 25	III, IV, VI, VII, VIII, IX, X W ≥ 250; G ≥ 25	Overhead
	W* G ≥ 7	W ≥ 120; G ≥ 15			Ground-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 1200 mm (48 in) and for all sizes of bold symbol signs

③ For text and fine symbol signs measuring less than 1200 mm (48 in)

④ Minimum Sign Contrast Ratio ≥ 3:1 (white retroreflectivity ÷ red retroreflectivity)

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

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What Are “Compliance Dates”?

- Dates established by FHWA for compliance with new requirements, revised device designs
- Established by rulemaking in Final Rules for revisions to the MUTCD
- Listed in Table I-2 of 2009 MUTCD: Dates for 58 specific items that were set by Final Rules in 2000, 2003, 2007, and 2009.

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What Do Compliance Dates Apply To?

- **Not for TCDs being newly installed or rebuilt**
 - **These must comply immediately on Fed.-aid projects, and**
 - **All other new/rebuilt devices must comply once State adopts new MUTCD (within 2 yrs)**
- **For replacement of existing TCDs in field**
 - **Generally based on estimated service lives**

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What If There Is No Compliance Date?

- Jurisdictions expected to upgrade devices over time to meet new requirements
 - “Systematic upgrading program”
- Agencies can prioritize and schedule based on relative safety needs, resources, etc.
 - Can decide to wait until noncompliant device wears out – replace w/ compliant device

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From “Effective” Date of Final Rule (January 22, 2008):

- **Establish and implement method(s)**
 - 4 yrs (January, 2012)
- **Replace identified regulatory, warning, ground-mounted guide signs (except street-name)**
 - 7 yrs (January, 2015)
- **Replace identified street name & overhead guide signs**
 - 10 yrs (January, 2018)

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

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Nov. 30, 2010 Request for Comments

- Published in Federal Register
- 592 letters submitted to docket
- Many highway agencies expressed concerns about:
 - Impacts of Min. Retroreflectivity Standards for Signs
 - Large number of compliance dates
 - Confusion over what is specifically required
 - Burden to comply by the established dates

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What Happened Next?

- Comments reviewed and analyzed by FHWA
MUTCD Team
- Decision to proceed with NPA at end of August
2011
- 60-day comment period, ended October 31, 2011
- Waiting to final rules to be published

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Proposed Changes

- Eliminate compliance dates (but NOT the requirements in the MUTCD) for 46 items:
 - 8 that have already expired
 - 38 that have future compliance dates
- Extend and/or revise the dates for 4 items
- No change in dates for the other 8 items

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Sign Retroreflectivity Compliance Dates

- Existing: Compliance Date of Jan. 22, 2012 for the Section 2A.08 provision requiring agencies to implement an assessment or management method designed to maintain sign retroreflectivity at or above the established minimum levels.
- Proposed: Extend date to 2 years after effective date of final rule of this revision of MUTCD – and limit date to regulatory & warning signs only

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Sign Retroreflectivity Compliance Dates

- What this means:
 - MUTCD language requiring agencies to have and use a method is not changing, but:
 - Additional 2+ years to implement and start using management/assessment method for regulatory & warning signs
 - No specific date to implement method for guide & other signs. Agencies could decide when their resources and priorities will allow them to add to their sign retroreflectivity management/assessment systems.

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Sign Retroreflectivity Compliance Dates

- Existing Compliance Dates for replacing any signs found to not meet min. sign retroreflectivity levels – Jan. 22, 2015 for regulatory, warning, & post-mounted guide signs (except street name signs), and Jan. 22, 2018 for street name signs & overhead guide signs.
- Proposed: Eliminate both dates.

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Sign Retroreflectivity Compliance Dates

- What this means:
 - Any sign a jurisdiction identifies as not meeting the established minimum retroreflectivity levels would still need to be replaced, but:
 - No specific date to replace
 - Flexibility to determine when the replacement would be scheduled.
 - The jurisdiction would need to be prepared to defend its replacement scheduling decisions if liability issues arise.

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What Should An Agency Do Now?



Act casual,
say nothing,
and hope no one
notifies; or start
getting a program
going?

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“...One or more of the following assessment or management methods should be used...”

- Visual Nighttime Inspection
- Measured Sign Retroreflectivity
- Expected Sign Life
- Blanket Replacement
- Control Signs
- Future Method Based On Engineering Study
- Combination Of Any

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Method 1 - Visual assessment

- Trained inspector
- Visual inspection at night
- One of the following should be used:
 - Calibration signs procedure, or
 - Comparison panels procedure, or
 - Consistent parameters

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Common elements of all visual assessment techniques:

- Aim inspection vehicle headlamps
- Two-person crew works best
- Having an inventory is ideal
- Use low-beam headlamps
- Have evaluation form and criteria
- Conduct evaluations at roadway speed

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- “Calibrate” eyes with calibration signs
- Calibration signs are near minimum retro
- Evaluate signs compared to calibration signs



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- Tie to minimum values with comparison panels
 - Panels are near desired retro
 - Clipped to sign - viewed from distance
 - Evaluate signs compared to panels



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- Tie to minimum values by using consistent parameters as used to develop the minimum levels
 - SUV type vehicle
 - Model year 2000 or newer vehicle
 - Inspector – older driver (60+)



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Calibration Signs and Comparison Panels

- Kit consists of a full set of **8 Calibration Sign Standards** and **12 Comparison Panel Standards**
- NOT actual traffic signs – but designed to engineering standards, precisely manufactured to MUTCD minimum levels of retroreflectivity (guaranteed for 2 years)
- Reliably measured per ASTM E 810 and certified accurate
- Will conduct formal engineering study evaluating this as a *daytime technique* and submit to FHWA for review

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- Advantages:

- Low administrative and fiscal burden
- Signs are viewed in their natural surroundings
- Low level of sign replacement and sign waste.

- Disadvantages:

- Subjective but research has shown that trained observers can reasonably and repeatedly detect signs with marginal retroreflectivity.
- Exposure of conducting nighttime inspections
- Paying overtime

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Method 2 - Measured retroreflectivity

- Use a portable instrument
- Receive proper training
- Have a protocol for consistency
- Compare readings to minimum values



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Contact
Devices:



*Model 922
(Gamma Scientific)*



*Model GR3
(Delta)*

Non-
Contact
Devices:



SMARTS Van

Experimental concept, but NOT
yet available.

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Handheld Devices as of May 2008

- Delta Retrosign GR3
 - <http://www.flintrtrading.com>
- RoadVista 922
 - <http://www.roadvista.com>
- Zehntner ZRS (Available in Europe)
 - http://www.zehntner.com/html/download/prospekt_zrs5060_d_e.pdf
- Mechatronic RC200 (Available in Europe)
 - <http://www.mechatronic.de/04traffic/en/01/rc2000.html>

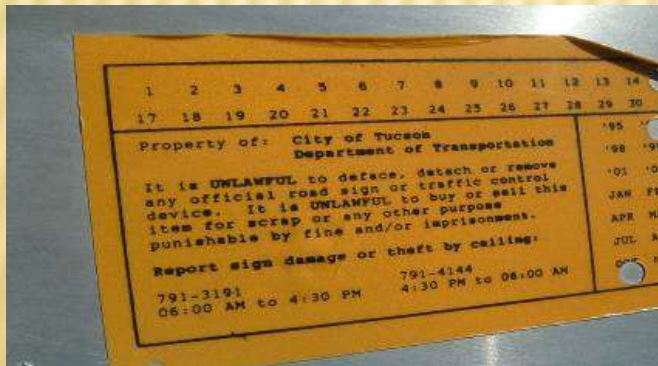
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- Advantages:
 - Provides the most direct means of monitoring the maintained retroreflectivity levels
 - Removes subjectivity
- Disadvantages:
 - Cost of instruments (approx \$10,000 to \$12,000)
 - Measuring all signs in a jurisdiction can be time consuming
 - Using retroreflectivity as the only indicator of whether or not a sign should be replaced may end up neglecting other attributes of the sign's overall appearance.

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Method 3 - Expected sign life

- Find the life of the sheeting type in your area
- Replacement based on expected life for individual signs
 - Stickers on front or back of sign to show when fabricated or installed



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Determining Sign Life

- ***Build and use a weathering rack like the one shown***



- ***Use AASHTO-NTPEP data***
- ***Use warranty information from sheeting company***
- ***Specify sign life***
- ***Measure existing signs with known install date and compare to min level***



- ***Use weathering data or nearby jurisdiction's weathering data***

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- Predicted sign age could be provided in a warranty by sheeting manufacturers.
- Typical warranties not typically based on minimum retroreflectivity levels
- Agencies could develop specifications with warranties based on minimum retroreflectivity levels
 - Example: Warranty Type III sheeting for 15 years in accordance to Table 2A-3 of the MUTCD

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Advantages:

- This method requires that agencies track the installation date of their signs.
- Can use a date sticker, bar code, or computerized sign management system
- Agencies can develop or copy local service life levels

Disadvantages:

- It may be time consuming to inspect date stickers if the stickers are not easily viewable or identifiable on the sign.
- Another possible difficulty relates to marking signs that need to be replaced.

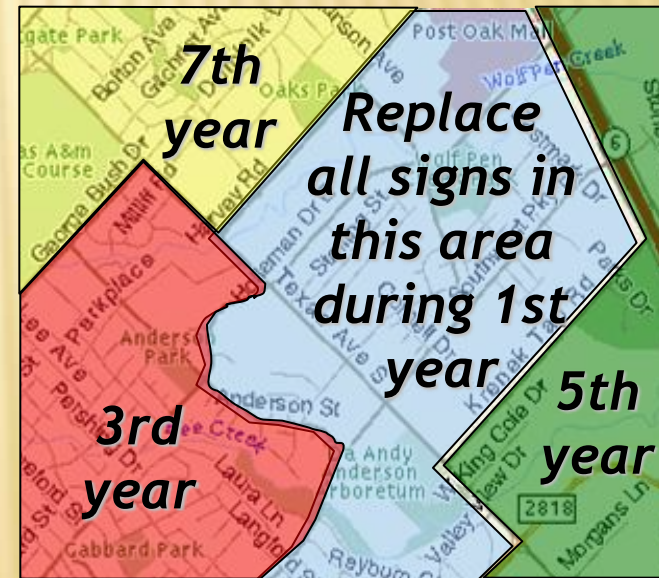
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Method 4 - Blanket replacement

- All signs in an area/corridor are replaced at the same time at specified intervals
- Specified intervals could be set based on expected sign life
- Some existing blanket sign replacement policies exist using 10-12 years for Beaded High-Intensity sheeting signs

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- Divide agency into areas/corridors or zones
- Relate number of areas to replacement cycle
- Replace all signs in an area/ corridor each replacement cycle
 - 10 yr life, → 10 areas
 - Annual replacement in each area



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- Advantages:
 - The major benefit of using this method is that all signs are replaced; there is a low likelihood of a given sign being skipped over or not being replaced. This ensures that all replaced signs are visible and meet minimum retroreflectivity levels.
- Disadvantages:
 - The major drawback to this method is the potential amount of waste than can be generated if signs that are relatively new are removed during a normal replacement cycle.

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Method 5 - Control signs

- Sign life is estimated using a subset of signs representing an agency's inventory.
 - Subset of signs is the "control signs"
- Control signs can be in-service signs or signs in a maintenance yard.
- Agency monitors control signs to estimate condition of all their signs.
- Periodically measure retroreflectivity of control signs.



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- Advantages:
 - Not very labor intensive
 - Low cost option
- Disadvantages:
 - Need to have an adequate sampling of signs
 - Need to have signs selected from in-service signs or have a place in the designated area like a maintenance yard

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Method 6 - Future methods

- Flexibility is provided for future advancements in technology and methods that have not been fully developed
- Must be based on an engineering study



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Combination of Methods

- Use one or more of the methods together
 - Support and reinforce each other
 - Use one as quality control of another
- Possibilities
 - Visual inspection to identify signs to be measured
 - Measured retro of control signs

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Traffic signs provide important information to drivers at all times, both day and night. To be effective, their visibility must be maintained. The 2003 *Manual on Uniform Traffic Control Devices (MUTCD)* addresses sign visibility in several places, including Sections 1A.01, 1A.04, 1A.04, 1A.05, 2A.06, 2A.08, and 2A.22. These sections address factors such as uniformity, design, placement, operation, and maintenance. Previously, the MUTCD did not specify minimum retroreflectivity levels.

The second revision of the 2003 MUTCD introduces new language establishing minimum retroreflectivity levels that must be maintained for traffic signs.

Agencies have until January 2012, to establish and implement a sign assessment or management method to maintain minimum levels of sign retroreflectivity.

The compliance date for regulatory, warning, and ground-mounted guide signs is January 2015.

For overhead guide signs and street name signs, the compliance date is January 2018. The new MUTCD language is shown on page 2 and 3 of this document.

The new standard in Section 2A.09 requires that agencies maintain traffic signs to a minimum level of retroreflectivity outlined in Table 2A-3 of the MUTCD. The Federal Highway Administration (FHWA) believes that this proposed change will promote safety while providing sufficient flexibility for agencies to choose a maintenance method that best matches their specific conditions.

Including Table 2A-3 in the MUTCD does not imply that an agency must measure the retroreflectivity of every sign. Rather, the new MUTCD language describes five methods that agencies can use to maintain traffic sign retroreflectivity at or above the minimum levels. Agencies can choose from these methods or combine them. Agencies are allowed to develop other appropriate methods based on engineering studies. However, agencies should adopt a consistent method that produces results that correspond to the values in Table 2A-3.

The new MUTCD language recognizes that there may be some

individual signs that do not meet the minimum retroreflectivity levels at a particular point in time. As long as the agency with jurisdiction is maintaining signs in accordance with Section 2A.09 of the MUTCD, the agency will be considered to be in compliance. This document describes methods that can be used to maintain sign retroreflectivity at or above the MUTCD's minimum maintained retroreflectivity levels.

RETROREFLECTIVITY MAINTENANCE

The MUTCD describes two basic types of methods that agencies can use to maintain sign retroreflectivity at or above the MUTCD minimum maintained retroreflectivity levels — assessment methods and management methods. The FHWA has identified and listed assessment and management methods for maintaining sign retroreflectivity in accordance with Section 2A.09. These methods are described on page four. A full report on these methods can be found at www.fhwa.dot.gov/retro.

- FHWA Retro Web Site
www.fhwa.dot.gov/retro

- 4-page summary

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The End

Questions?