

## **Chapter I – Introduction and Requirements**

This resource package/publication is a compilation of materials that are intended to assist rural Ohio townships, villages, and other local agencies with implementing their traffic sign retroreflectivity maintenance programs. By January 22, 2012, all agencies that maintain roadways open to public travel will have to establish and implement a sign maintenance program that can regularly address the new minimum sign retroreflectivity requirements.

### **What’s Included in this Publication?**

- A copy of the pages that set forth the traffic sign retroreflectivity requirements for Ohio.
- Examples of technical resources available from the Federal Highway Administration, along with links to additional publications/resources from FHWA and other agencies.
- Sample templates (program documents) that may be used, or adapted, for the purpose of implementing a sign retroreflectivity maintenance program.

### **Background**

“Retroreflectivity” refers to the property of a traffic sign to reflect light back to the driver. Retroreflective traffic signs are used to increase sign visibility at night. Maintaining sign retroreflectivity is important to promote nighttime traffic safety.

In January 2008, the Federal Highway Administration (FHWA) enacted new requirements for maintaining minimum levels of retroreflectivity for traffic signs. These requirements were established through the national Manual on Uniform Traffic Control Devices (MUTCD), and apply to all agencies that maintain roadways open to public travel. The MUTCD implementation resulted from a final rule published in the Federal Register on December 21, 2007. The FHWA *Sign Retroreflectivity Toolkit* website provides additional background information, which is available online at: [http://safety.fhwa.dot.gov/roadway\\_dept/night\\_visib/retrotoolkit/](http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/)

The Ohio Manual of Uniform Traffic Control Devices (OMUTCD) is required to “correlate with, and so far as possible conform to” the national MUTCD, and must incorporate new requirements within two years. Revision 1 of the OMUTCD 2005 Edition, effective January 2010, introduced a new section (2A.09) that sets forth the traffic sign retroreflectivity requirements for Ohio. *A reprint of OMUTCD Section 2A.09 is attached.*

The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices rests with the public agency or the official having jurisdiction. Per Section 4511.11 of the Ohio Revised Code, local authorities shall place and maintain traffic control devices in accordance with the OMUTCD.

## **Implementation Requirements**

The December 2007 final rule from FHWA established compliance dates as follows:

- By January 22, 2012, all agencies will have to establish and implement a sign maintenance program that can regularly address the new minimum sign retroreflectivity requirements.
- By January 22, 2015, all agencies must comply with the retroreflectivity requirements for most of their traffic signs, including: white on red and black on white regulatory signs (such as STOP signs and Speed Limit signs); black on yellow warning signs; and post-mounted white on green guide signs (except street name signs).
- By January 22, 2018, all agencies must comply with the retroreflectivity requirements for overhead guide signs and all street name signs.

## **Ohio MUTCD Requirements**

The OMUTCD establishes statewide standards for the design and use of traffic control devices on all public roads/highways in Ohio. It is important to use the most current version of the manual. Revision 2 of the OMUTCD 2005 Edition became effective in April 2011; and a new 2011 Edition is expected to be issued by December 2011. Local government agencies in Ohio can receive a free copy of the OMUTCD by calling 614-466-4700, or by filling out and submitting the OTE Publication Order Form for Local Jurisdictions (see Attachments to this chapter). The manual can be viewed in electronic format online at:

<http://www.dot.state.oh.us/Divisions/HighwayOps/Traffic/publications2/OhioMUTCD/Pages/>

Attached are copies of three OMUTCD sections that describe the traffic sign retroreflectivity and maintenance requirements for Ohio. Users of this resource package are encouraged to review these sections. Additional parts/sections of the OMUTCD should be referred to as needed with regard to traffic sign management and maintenance functions.

OMUTCD Section 2A.09 includes the following text, which establishes the traffic sign retroreflectivity maintenance requirements for Ohio.

### **Standard:**

**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:**

Compliance with the above standard 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 above Standard even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time.

The minimum maintained retroreflectivity levels shown in Table 2A-3 are in units of “candelas per lux per square meter” ( $\text{cd/lx/m}^2$ ), which correspond to measurements that can be made using an instrument called a retroreflectometer. Section 2A.09 lists several assessment and management methods that can be used to maintain sign retroreflectivity at or above the minimum levels established in the table. The 4-page FHWA publication “Maintaining Traffic Sign Retroreflectivity” states the following:

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.

When reviewed for the first time, Table 2A-3 may appear to be difficult to follow. The FHWA *Sign Retroreflectivity Toolkit* website contains an excellent instructional video called "Narrated Explanation of the Minimum Retroreflectivity Numbers". It discusses Table 2A-3 section by section, and includes 36 screens of graphics with examples. The web link to the video is:

[http://safety.fhwa.dot.gov/roadway\\_dept/night\\_visib/retrotoolkit/requirements/table2a-3.htm](http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/requirements/table2a-3.htm)

### **Contact Information**

This resource package was prepared by the Ohio Department of Transportation’s Local Technical Assistance Program (LTAP), in consultation with ODOT’s Office of Traffic Engineering. Ohio LTAP is jointly funded by ODOT and FHWA, and provides training and technical assistance to local agencies throughout the state.

Questions may be directed to the following persons:

#### **Ohio LTAP**

Mike Fitch, P.E., Program Manager – 614-387-7358 or 877-800-0031

Victoria Beale, JD, SPHR, LTAP Assistant Director – 614-466-3129

#### **ODOT Office of Traffic Engineering**

Jim Roth, P.E., Signing Engineer – 614-752-0438

Juanita Elliott, P.E., Traffic Standards Engineer – 614-644-8143

Due to the number of other sign retroreflectivity resource materials that are referenced, this publication is primarily being distributed by electronic means. Computer files for the chapters and program templates can be downloaded from the Ohio LTAP website. Ohio LTAP reserves the right to make future revisions, or to post additional resource materials. To download the files or check for updates, please visit the website at: <http://www.dot.state.oh.us/Divisions/Quality/LTAP/>

## *Chapter I – Attachments*

- OTE Publication Order Form for Local Jurisdictions and Public Agencies
- Reprint of Ohio MUTCD Sections:
  - Section 2A.08 - Retroreflectivity and Illumination
  - Section 2A.09 - Maintaining Minimum Retroreflectivity
  - Section 2A.22 - Maintenance

*The attached sections were reprinted from the version of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD) that was available in April 2011, namely the 2005 Edition with Revisions 1 and 2. A new **2011 Edition** of the manual is expected to be issued by December 2011. It is important to use the most current version of the OMUTCD. The user of this material is responsible for identifying any future updates to the applicable sections.*

<http://www.dot.state.oh.us/Divisions/HighwayOps/Traffic/publications2/OhioMUTCD/Pages/>

OTE Publication Order Form

Date \_\_\_\_\_

**OTE PUBLICATION ORDER FORM FOR  
LOCAL JURISDICTIONS AND PUBLIC AGENCIES**

<u>Publication</u>	<u>Unit Cost</u>	<u>Quantity</u>
<b>Ohio Manual of Uniform Traffic Control Devices (OMUTCD)</b> (2005 Edition with Revisions 1 & 2)	free	_____
<b>Temporary Traffic Control Manual (TTCM)</b> (Reprint of OMUTCD Parts 1, 5 and 7, orange cover; includes Revision 1 & 2 update sheet)	\$8.00	_____
<b>CD containing files for the OMUTCD and TTCM</b>	free	_____
<b>Guidelines for Traffic Control in Work Zones</b>	\$3.00	_____
<b>OMUTCD Revision 1 Revision Set</b> (To update existing 2005 OMUTCDs)	free	_____
<b>OMUTCD Revision 2 Revision Set</b> (To update existing 2005 OMUTCDs)	free	_____
<b>TTCM Revision Update Sheet</b> (To update existing 2005 TTCMs)	free	_____

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Name: \_\_\_\_\_

Title: \_\_\_\_\_

Organization: \_\_\_\_\_

\*Street Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip Code: \_\_\_\_\_

Telephone: \_\_\_\_\_

\* If available, please provide street address, not a P.O. Box. Whenever possible we use UPS to ship our publications.

For questions about traffic standards you may contact Juanita Elliott, P.E., Traffic Standards Engineer, at 614-644-8143; to order the free publications, you may contact Gerri Parker directly at 614-466-4700; and the TTCM may be ordered directly from the Office of Contracts at 1-800-459-3778.

Please return the completed form by fax to (614) 644-8199, or by mail to:

Ohio Department of Transportation  
Office of Traffic Engineering - Traffic Control Section  
Attention: Traffic Standards Engineer  
1980 W. Broad Street  
P.O. Box 899  
Columbus, OH 43216-0899

*Please note: a new 2011 Edition of the OMUTCD is expected to be issued by December 2011.*

Support:

Examples of safety messages include SEAT BELTS BUCKLED? and DON'T DRINK AND DRIVE. Examples of transportation-related messages include STADIUM EVENT SUNDAY, EXPECT DELAYS NOON TO 4 PM and OZONE ALERT CODE RED—USE TRANSIT.

Guidance:

When a changeable message sign is used to display a safety or transportation-related message, the requirements of Section 6F.55 should be followed. The message should be simple, brief, legible, and clear. A changeable message sign should not be used to display a safety or transportation-related message if doing so would adversely affect the respect for the sign. "CONGESTION AHEAD" or other overly simplistic or vague messages should not be displayed alone. These messages should be supplemented with a message on the location or distance to the congestion or incident, how much delay is expected, alternative route, or other similar messages.

**Standard:**

**When a changeable message sign is used to display a safety or transportation-related message, the display format shall not be of a type that could be considered similar to advertising displays. The display format shall not include animation, rapid flashing, or other dynamic elements that are characteristic of sports scoreboards or advertising displays.**

**Section 2A.08 Retroreflectivity and Illumination**

Support:

There are many materials currently available for retroreflection and various methods currently available for the illumination of signs. New materials and methods continue to emerge. New materials and methods can be used as long as the signs meet the standard requirements for color, both by day and by night.

**Standard:**

**Regulatory, warning, and guide signs shall be retroreflective or illuminated to show the same shape and similar color by both day and night, unless specifically stated otherwise in the text discussion in this Manual of a particular sign or group of signs.**

**The requirements for sign illumination shall not be considered to be satisfied by street or highway lighting.**

Guidance:

All overhead sign installations should be illuminated unless an engineering study shows that retroreflection will perform effectively without illumination.

Option:

Sign elements may be illuminated by the means shown in Table 2A-1.

Retroreflection of sign elements may be accomplished by the means shown in Table 2A-2.

Light Emitting Diode (LED) units may be used individually within the face of a sign and in the border of a sign, except for changeable message signs, to improve the conspicuity, increase the legibility of sign legends and borders, or provide a changeable message. Individual LED pixels may be used in the border of a sign.

**Standard:**

**If used, the LEDs shall be the same color as the sign legend, border, or background. If flashed, all LED units shall flash simultaneously at a rate of more than 50 and less than 60 times per minute. The uniformity of the sign design shall be maintained without any decrease in visibility, legibility, or driver comprehension during either daytime or nighttime conditions.**

OMUTCD – English units are preferred.

Please refer to the most current version of the OMUTCD, and review to identify any updates.

**Table 2A-1. Illumination of Sign Elements**

Means of Illumination	Sign Element To Be Illuminated
Light behind the sign face	<ul style="list-style-type: none"> <li>• Symbol or word message</li> <li>• Background</li> <li>• Symbol, word message, and background (through a translucent material)</li> </ul>
Attached or independently mounted light source designed to direct essentially uniform illumination onto the sign face	<ul style="list-style-type: none"> <li>• Entire sign face</li> </ul>
Light emitting diodes (LEDs)	<ul style="list-style-type: none"> <li>• Symbol or word message</li> <li>• Portions of the sign border</li> </ul>
Other devices, or treatments that highlight the sign shape, color, or message: Luminous tubing Fiber optics Incandescent light bulbs Luminescent panels	<ul style="list-style-type: none"> <li>• Symbol or word message</li> <li>• Entire sign face</li> </ul>

**Table 2A-2. Retroreflection of Sign Elements**

Means of Retroreflection	Sign Element
Reflector "buttons" or similar units	Symbol Word Message Border
A material that has a smooth, sealed outer surface over a microstructure that reflects light	Symbol Word Message Border Background

**A module of multiple LED units used as a closely-spaced, single light source shall only be used within the sign face for legends or symbols.**

Support:

Information regarding the use of retroreflective material on the sign support is contained in Section 2A.21.

**Section 2A.09 Maintaining Minimum Retroreflectivity**

Support:

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

Please refer to the most current version of the OMUTCD, and review to identify any updates.

OMUTCD – English units are preferred.

**Standard:**

**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:**

Compliance with the above standard 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 above Standard even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time.

**Guidance:**

Except for those signs specifically identified in the Option in this Section, 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:**

Additional information about these methods is contained in the 2007 Edition of FHWA’s “Maintaining Traffic Sign Retroreflectivity” (see Section 1A.11).

**Option:**

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. Adopt-A-Highway signs
- D. All signs with blue or brown backgrounds
- E. Bikeway signs that are intended for exclusive use by bicyclists or pedestrians

Please refer to the most current version of the OMUTCD, and review to identify any updates.

OMUTCD – English units are preferred.

**Table 2A-3. Minimum Maintained Retroreflectivity Levels ①**

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			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/m <sup>2</sup> 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.					
<b>Bold Symbol Signs</b>					
<ul style="list-style-type: none"> <li>• W1-1, -2 – Turn and Curve</li> <li>• W1-3, -4 – Reverse Turn and Curve</li> <li>• W1-5 – Winding Road</li> <li>• W1-6, -7 – Large Arrow</li> <li>• W1-8 – Chevron</li> <li>• W1-10 – Intersection in Curve</li> <li>• W1-11 – Hairpin Curve</li> <li>• W1-15 – 270 Degree Loop</li> <li>• W2-1 – Cross Road</li> <li>• W2-2, -3 – Side Road</li> <li>• W2-4, -5 – T and Y Intersection</li> <li>• W2-6 – Circular Intersection</li> <li>• W3-1 – Stop Ahead</li> </ul>		<ul style="list-style-type: none"> <li>• W3-2 – Yield Ahead</li> <li>• W3-3 – Signal Ahead</li> <li>• W4-1 – Merge</li> <li>• W4-2 – Lane Ends</li> <li>• W4-3 – Added Lane</li> <li>• W4-5 – Entering Roadway Merge</li> <li>• W4-6 – Entering Roadway Added Lane</li> <li>• W6-1, -2 – Divided Highway Begins and Ends</li> <li>• W6-3 – Two-Way Traffic</li> <li>• W10-1, -2, -3, -4, -11, -12 – Highway-Railroad Advance Warning</li> </ul>		<ul style="list-style-type: none"> <li>• W11-2 – Pedestrian Crossing</li> <li>• W11-3 – Deer Crossing</li> <li>• W11-4 – Cattle Crossing</li> <li>• W11-5 – Farm Equipment</li> <li>• W11-6 – Snowmobile Crossing</li> <li>• W11-7 – Equestrian Crossing</li> <li>• W11-8 – Fire Station</li> <li>• W11-10 – Truck Crossing</li> <li>• W12-1 – Double Arrow</li> <li>• W16-5p, -6p, -7p – Pointing Arrow Plaques</li> <li>• W20-7a – Flagger</li> <li>• W21-1a – Worker</li> </ul>	
<b>Fine Symbol Signs</b> – Symbol signs not listed as Bold Symbol Signs.					
<b>Special Cases</b>					
<ul style="list-style-type: none"> <li>• W3-1 – Stop Ahead: Red retroreflectivity ≥ 7</li> <li>• W3-2 – Yield Ahead: Red retroreflectivity ≥ 7; White retroreflectivity ≥ 35</li> <li>• W3-3 – Signal Ahead: Red retroreflectivity ≥ 7; Green retroreflectivity ≥ 7</li> <li>• W3-5 – Speed Reduction: White retroreflectivity ≥ 50</li> <li>• For non-diamond shaped signs such as W14-3 (No Passing Zone), W4-4p (Cross Traffic Does Not Stop), or W13-1, -2, -3, -5 (Speed Advisory Plaques), use largest sign dimension to determine proper minimum retroreflectivity level.</li> </ul>					

Please refer to the most current version of the OMUTCD, and review to identify any updates.

OMUTCD – English units are preferred.

Option:

Where engineering judgment indicates a need to draw attention to the sign during nighttime conditions, a strip of retroreflective material may be used on regulatory and warning sign supports.

**Standard:**

**If a strip of retroreflective material is used on the sign support, it shall be at least 50 mm (2 in) in width, it shall be placed for the full length of the support from the sign to within 0.6 m (2 ft) above the edge of the roadway, and its color shall match the background color of the sign, except that the color of the strip for the YIELD and DO NOT ENTER signs shall be red.**

**Section 2A.22 Maintenance**

Guidance:

Maintenance activities should consider proper position, cleanliness, legibility, and daytime and nighttime visibility (see Section 2A.09). Damaged or deteriorated signs should be replaced.

To assure adequate maintenance, a schedule for inspecting (both day and night), cleaning, and replacing signs should be established. Employees of highway, law enforcement, and other public agencies whose duties require that they travel on the roadways should be encouraged to report any damaged, deteriorated, or obscured signs at the first opportunity.

Steps should be taken to see that weeds, trees, shrubbery, and construction, maintenance, and utility materials and equipment do not obscure the face of any sign.

A regular schedule of replacement of lighting elements for illuminated signs should be maintained.

**Section 2A.23 Median Opening Treatments for Divided Highways with Wide Medians**

Support:

As noted in Section 1A.13, the definition of "intersection" in O.R.C. 4511.01(KK) (see Appendix B2) includes in part the following:

*"Where a highway includes two roadways thirty feet or more apart, then every crossing of each roadway of such divided highway by an intersecting highway shall be regarded as a separate intersection. If an intersecting highway also includes two roadways thirty feet or more apart, then every crossing of two roadways of such highways shall be regarded as a separate intersection;"*

**Standard:**

**Where divided highways are separated by median widths at the median opening itself of 9 m (30 ft) or more, median openings shall be signed as two separate intersections.**

Please refer to the most current version of the OMUTCD, and review to identify any updates.