Selecting a Method to Comply with the Requirements for Traffic Sign Retroreflectivity

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Federal Way, WA
The Complexity of Sign Retroreflectivity

- Driver
- Vehicle
- Road
- Environment
- Sign
- Sign location
- Ra measurement
Sign Retroreflectivity Assessment & Management Methods

• Visual Nighttime Inspection
• Measured Sign Retro
• Expected Sign Life
• Blanket Replacement
• Control Signs
Maintaining Traffic Signs

Sign Retroreflectivity

Visual Assessment

Sign Inspection

Sign Maintenance
Sign Inspection is Sign Maintenance
The Value (and Need) for Sign Inspection

• Benefits of Inspecting Signs
  – Is the sign still there?
  – Is it lying on the ground?
  – Has it been defaced?
  – Can you see it?
  – How well can you answer inquiries from the attorneys or the insurance company or the newspaper?
  – Proactively fixing sign concerns (versus reacting on someone else’s notification) costs less
The Value (and Need) for Sign Inspection

Is the sign adequately delivering the intended message to the road user?

Does it command respect?
Sign Inspection is Sign Maintenance
Can we decide to replace signs based on daytime inspections?
Older Signs Pulled From Field and Set Up in Sign Shop Yard
Visual Assessment of Signs at Night

• Issues to consider
  – Overtime? Shift differential? One person or two?
  – On-board tools and equipment?
  – Do you fix sign problems you encounter? Or call another crew? Or defer the work?
  – Agency policy recommended
Measured Retroreflectivity
What do the numbers look like?

Pictures do not represent retroreflectivity well
Use of a Sign Retroreflectometer

• Borrow for a day or two and take some sample measurements to get a feel for what the numbers look like (and how some of your signs compare)

• LTAPs: Consider purchasing one that can be made available to your constituency

• Or Purchase
  – In-field control sample readings
  – Test new sheeting
  – Quality control & inspection for contractor-installed signs
Retroreflectivity measurements
Blanket Replacement Example

Decide on Sheeting Types

• Engineering grade (EG) (ASTM Type I)

Phase Out Type I for:
– Yellow (Warning) Signs
– Orange (Temp Traffic Control)
– Green (Guide & Street Name Signs)
Decide on Sheeting Types
Yellow, Orange, Green
(Red series, White also)

Consider:

– Sheeting cost as part of overall cost of installed sign
– Anticipated sign life
– Current budget

Type III & IV? (ground)
Type IX? (overhead)
Blanket Replacement (by area or by roadway)?
Expected Sign Life

The Value of Serial Number Tagging
Signs left by vandals... where do they belong?
### Date stamping within serial number

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- **95052938**
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- **95040154**
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- **9501231X**
- **95011469**
- **95011465**
- **95011463**
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- **95011421**
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- **95011409**
- **95010390**
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- **95010880**
- **95010878**
- **95010874**
- **95010873**
- **95010869**
- **95010866**
- **95010865**
Agency Signs by Age
(Possible Use for Expected Sign Life & Control Signs methods)
Control Signs Method

• Select in-field control sample representative of signs existing on agency’s roadways

• Measure & track retroreflectivity of control signs

• When retroreflectivity of control signs approaches minimum levels, begin replacing the signs represented by that particular control sign sample

• The value of a traffic sign inventory
The Value of a Sign Inventory

• For maintenance purposes FIRST

• Maintenance personnel buy-in

• Foundation for programming sign replacement & preparing budgets & setting priorities

• Asset management
## Retroreflectivity data and calculations

### Sign Testing Results for Retroreflectivity

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<th>Route</th>
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<th>DR</th>
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<th>BN</th>
<th>Offset</th>
<th>Size</th>
<th>Sign Code</th>
<th>VAR</th>
<th>Serial #</th>
<th>#</th>
<th>Sequence</th>
<th>Result / Date</th>
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### Serial 

**Serial #**: 95020557

- **White Average**: 310
- **Red Average**: 41

**Ratio**: 7.6

- **White Average**: 310
- **Red Average**: 41

**Result / Date**: March 6, 2007

### Additional Data

- **BR001**: 95020557
- **Sequence**: 1
- **Result / Date**: March 6, 2007

---

**Note**: The image contains a table with various columns including Route, POS, On Street, DIST, DR, Reference St, BN, Offset, Size, Sign Code, VAR, Serial #, Sequence, Result / Date, and additional data for each entry.
Which Method?
You Choose

• Flexibility in the MUTCD – different methods available

• Tie-in to Table 2A.3 values

• Gauge by most effective use of in-agency resources & expertise

• Training a key
MUTCD Compliance
Sign Retroreflectivity

“Compliance...is achieved by having a method in place and using the method to maintain the minimum levels established in Table 2A-3.... even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time.”
Sign Retroreflectivity Compliance Dates

• January 2012:
  ➢ Have your method in place

• January 2015:
  ➢ Replace ground-mounted regulatory, warning, guide signs

• January 2018:
  ➢ Replace overhead signs and ground-mounted street name signs
Sign Retroreflectivity Toolkit

- Primarily for agencies with no traffic engineer on staff
- Provides step-by-step instruction to select the best method for you
- Includes CD with additional help
  - Helps develop sign replacement budget
  - Provides sample forms

FHWA-CFL / TD-09-005
report.center@dot.gov or your LTAP center
Comments on Proposed Requirements for Maintained Minimum Retroreflectivity Levels of Pavement Markings

James W. Ellison, P.E.
Consulting Traffic Engineer
Federal Way, WA
Proposal applies to these longitudinal markings

- Required or recommended center lines
- Required or recommended lane lines
- Required or recommended edge lines
- Any optional edge line markings used to qualify for lower minimum retro levels in Table
Proposed methods for maintaining pavement marking retroreflectivity

• Calibrated Visual Nighttime Inspection
• Consistent Parameters Visual Nighttime Inspection
• Service Life Based on Monitored Markings
• Measured Retroreflectivity
• Blanket Replacement
• Other methods
Compliance Support Statement

Agencies would be in compliance if they:

• Have a method in place & are using it
• Maintain minimum levels in Table
• “Even if there are markings that do not meet the minimum retroreflectivity levels at a particular location or at a particular point in time”
Pavement Marking Management Systems

Key Elements

• Inventory
• Documentation of work
• Regular, periodic inspections
Pavement Marking Management Systems

Prioritization approach

• Maintain highest needs first/earlier
• Set frequency of striping (annually or ?)
• Durable material vs. paint?
Resources

• Your local LTAP Center
  – Some might have retroreflectometers for loan

• Methods for Maintaining Traffic Sign Retroreflectivity, 2007
  – FHWA-HRT-08-026

• FHWA  fhwa.dot.gov/retro

• ATSSA  www.retroreflectivity.net

• James W. Ellison, P.E.  Jim@jameswellison.com
MUTCD Sign Retroreflectivity:

Requirements and Methods for Maintenance

National Association of Counties (NACo) Annual Meeting
Portland, Oregon

July 19th, 2011

George W. Merritt
Motor Vehicle Crashes: The Magnitude of the Problem

Distribution of global injury mortality by cause:

- Road traffic injuries, 22.8%
- Suicide, 16.9%
- Violence, 10.8%
- Drowning, 7.3%
- Fires, 6.2%
- Other intentional injuries, 0.2%
- Other unintentional injuries, 18.1%
- Falls, 7.5%
- Poisoning, 6.7%
- War, 3.4%

Motor Vehicle Crashes: Implications of Darkness

Vehicle occupant deaths, FARS, 1987-2003
Key Issue: Older Drivers

- As of 2006, 20.6 million drivers age 70+
- Drivers need more light to see as they age
  - At age 72 you need 16X the amount of light you needed at age 20
Origin of the New MUTCD Requirements

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.”
THE GOAL:
Improve Safety by Maintaining Night-time Visibility
2009 MUTCD Requirements:

Sign Retroreflectivity & Maintenance Methods
Final Rule

• Published on Dec 21, 2007
  – Vol 72, No. 245

• Revision #2 of the 2003 Edition of the MUTCD

• Effective Jan 22, 2008
MUTCD Changes

• Portions of the MUTCD revised:
  – Introduction
    • Compliance dates
  – Part 1
    • 1A.11 - relation to other publications
  – Chapter 2A
    • 2A.08 - minimum sign retroreflectivity
    • 2A.22 - sign maintenance
  – Minor editorial changes to cross-references
    • 2A, 2B, and 6F
New MUTCD Language
Section 2A.08 Maintaining Minimum Retroreflectivity

• “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”
New MUTCD Language
Section 2A.08 Maintaining Minimum Retroreflectivity

• “Support:
  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.”
Sign Maintenance Methods

1. Visual Nighttime Inspection
2. Measured Sign Retro
3. Expected Sign Life
4. Blanket Replacement
5. Control Signs
6. Future Method Based On Engr. Study
Exempt Signs

- Parking/Standing/Stopping
- Walking/Hitchhiking
- Adopt-A-Highway
- Blue or Brown Backgrounds
- Exclusive Use of Bikes or Peds

Note: These must still meet other requirements in the MUTCD (inspections, retroreflective, etc.)
Compliance Periods

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)
Resources

• FHWA Nighttime Visibility Website: http://safety.fhwa.dot.gov/roadway_dept/night_visib/

• Retroreflectivity “Toolkit” for Local Agencies: http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/
Proposed MUTCD Requirements:

Notice of Proposed Amendment:
Maintaining Minimum Pavement Marking Retroreflectivity
Notice of Proposed Amendment

• Federal Register – April 22, 2010
• 2009 MUTCD Proposed Revision 1
• Maintaining Minimum Retroreflectivity of Longitudinal Pavement Markings
• Request for public comment within 120 days
  – Deadline: August 20, 2010
Safety of Pavement Markings

• Adding center lines and/or edge lines has been consistently shown to reduce fatal and injury crashes
  – Adding center lines ➔ 12% decrease in nighttime fatal and serious injury crashes
  – Adding edge lines ➔ 16% decrease in nighttime fatal and serious injury crashes
Proposed Amendment

- Section 1A.11
  - Relation to Other Documents

- Section 3A.03
  - Maintaining Minimum Retroreflectivity of Longitudinal Pavement Markings
Proposed Amendment to MUTCD Section 3A.03

• (STANDARD)
  – Establish and use a method designed to maintain retroreflectivity of:
    • white and yellow longitudinal pavement markings
    • at or above the minimum levels in Table 3A-1
Proposed Amendment to MUTCD Section 3A.03

• Centerlines:
  – Where required or recommended by Section 3B.01, such as
    • no-passing zone markings,
    • longitudinal two-way left-turn lane (TWLTL) markings
    • yellow markings used to form flush medians
Proposed Amendment to MUTCD Section 3A.03

• Lane line markings
  – Where required or recommended by Section 3B.04, including
    • solid lines
    • broken lines
    • dotted lane lines
    • lane drop markings, and
    • longitudinal preferential lane markings
Proposed Amendment to MUTCD Section 3A.03

- Edge line markings
  - Where required or recommended by Section 3B.07, including
    - left and right edge lines
    - channelizing lines delineating
      - gores,
      - divergences,
      - obstructions on such roads
Proposed Amendment to MUTCD Section 3A.03

• 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 3A-1. Provided that a method is being used, an agency or official having jurisdiction would be in compliance with the above Standard even if there are pavement markings that do not meet the minimum retroreflectivity levels at a particular location or at a particular point in time.
Proposed Amendment to MUTCD Section 3A.03

• Support:
  – There are many factors for agencies to consider in developing a method of maintaining minimum pavement marking retroreflectivity including, but not limited to, winter weather, environmental conditions and pavement resurfacing.
Rule Making Process

• Notice of Proposed Amendment published in Federal Register April 22, 2010
  – 75 Fed. Reg. 20935

• Review: www.regulations.gov
  – Search: “FHWA-2009-0139-0002”
Resources

• Your State Department of Transportation

• Local Technical Assistance Program Office:
  – http://www.ltapt2.org/centers/

• FHWA Nighttime Visibility Website:
  – http://safety.fhwa.dot.gov/roadway_dept/night_visib/