Traffic Engineering and Highway Safety Bulletin

How to Meet Minimum Sign Retroreflectivity Requirements

January 2010

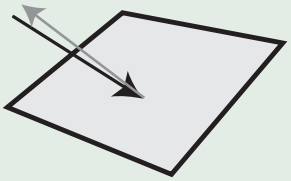
Did You Know?

Only about one-quarter of highway travel is at night, but approximately one-half of all highway fatalities occur during the hours of darkness. This means that the nighttime fatality rate per vehicle-mile of travel is about three times greater than the daytime fatality rate.

The inability to see and "read" some signs at night is a contributing factor to the high nighttime fatality rate. In light of this, in 1993 congress mandated that the *Manual on Uniform Traffic Control Devices (MUTCD)* include minimum retroreflectivity levels for traffic signs. To the Federal Highway Administration's (FHWA) credit, they funded extensive research projects and numerous outreach meetings with focus groups to help establish minimum retroreflectivity values and meaningful methodologies to satisfy the minimum values.

What is Retroreflectivity?

"Retroreflection" is the unique ability of a surface to reflect light back toward the light source even when the surface is not perpendicular to the light; and "retroreflectivity" is the measure of this unique property.



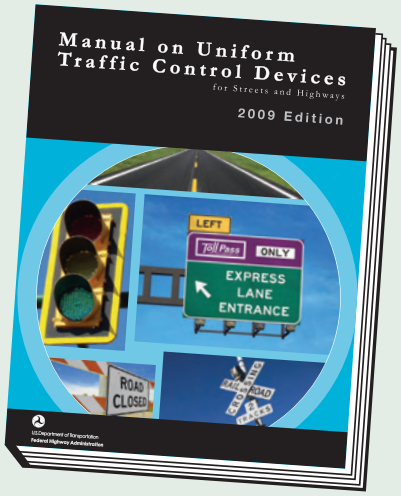
In December 2007, FHWA adopted minimum values for most types of signs and incorporated them into the *MUTCD*.

The *MUTCD* requires agencies to implement a program to maintain minimum levels of retroreflectivity by January 2012. Further, the compliance date for most regulatory, warning, and guide signs is January 2015, except the compliance date for street name signs and overhead guide signs is January 2018.

2009 *MUTCD* is Available

The 2009 MUTCD *is now available online at* http://mutcd.fhwa.dot.gov/kno_2009.htm. *Military installations are encouraged to become familiar with this new edition because it is filled with new signs and markings, and many changes throughout.*

Section 2A.08 in the MUTCD *defines the minimum retroreflectivity standards. Since all military installations must comply with the* MUTCD *per Joint Regulation (AR 55-80, OPNAVINST 11210.2, AFMAN 32-1017, MCO 11210.2D and DLAR 4500.19) of the Department of Defense (DoD) Transportation Engineering Program, installations must meet the federally-mandated minimum sign retroreflectivity values.*



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What are the Minimum Retroreflectivity Values?

FHWA's minimum retroreflectivity values are contained in Table 2A-3 of the *MUTCD*. However, this table is complex since the adopted values vary by the type and color of sheeting, sign size, type of sign message, and the sign location. For example, the table contains four different minimum values for white materials, three values for green materials, and two values for both orange and yellow materials.

The values in this table are stated as "minimum maintained retroreflectivity values." New signs need to possess higher initial values since retroreflectivity deteriorates over time, and all signs should be replaced before their retroreflectivity reaches the minimum values.

Because additional research is needed, FHWA technically allows the following signs to be excluded from the current minimum retroreflectivity value, but we suggest that you include them in your review:

- ✔ Parking, Standing, and Stopping (R7 and R8 series) signs.
- ✔ Walking/Hitchhiking/Crossing (R9 series, R10-1 through R10-4b) signs.
- ✔ Adopt-A-Highway signs.
- ✔ All signs with blue or brown backgrounds.
- ✔ Bikeway signs that are intended for the exclusive use by bicyclists or pedestrians.

Retroreflectivity and its importance are discussed in the April 2006 Traffic Engineering and Highway Safety Bulletin entitled *"Sign Retroreflectivity"* (available at http://www.tea.army.mil/pubs/nr/dod/bulletins/Retroreflective(Apr06).pdf). One of the recommendations of the 2006 bulletin was to immediately discontinue using any Type I and Type II retroreflective materials, and in the future to specify a minimum Type III material. This change makes perfect sense because these higher retroreflective materials:

1. Provide superior nighttime performance.
2. Reduce annual signing costs because the materials last longer than the less expensive materials, resulting in lower material and labor costs on a life-cycle basis.

Making Retroreflective Signs

Signs are made retroreflective by applying white or colored retroreflective sheeting on the sign blank. Sign messages for mass-produced signs are typically silk-screened directly on the sheeting using a black or colored ink. All non-black inks applied to white sheeting during silk-screening need to be a transparent ink so that the screened color is also retroreflective.

One-of-a-kind signs are typically made with cut-out, pressure-sensitive legend (i.e., letters, numbers, arrows, and borders). Non-black cut-out legends need to be made from retroreflective sheeting material.

The complexity of Table 2A-3 in the *MUTCD* can be greatly reduced to the values in Exhibit 1 if we:

- ✔ Eliminate Type I and Type II materials.
- ✔ Use the higher set of values for all colors, e.g., use the values required for the smaller warning signs that have either legend or "fine symbol" messages.

Inferior Type I and Type II Materials

Type I and Type II retroreflective materials should not be used. These inferior materials are easy to recognize because they have a uniform appearance similar to metallic automotive paints, whereas the better materials all have a pattern of hexagons, diamonds, or other similar shapes that are about one-eighth inch wide.

To help identify the various manufacturers and types of sheeting, FHWA published a guide at http://www.trafficsign.us/reflidguide.pdf.

Type III and Type IV retroreflective sheeting materials should be able to satisfy all of the minimum retroreflectivity values in Exhibit 1 except for white legend on overhead signs. Therefore, installations are encouraged to use a Type VII retroreflective sheeting for white legends on all overhead signs.

Exhibit 1: Simplified Minimum Maintained Retroreflectivity Levels

Color	Minimum Maintained Retroreflectivity, R_A (cd/lx/m²)
Green (& Blue*)	25
Orange & Yellow	75
Red**	7
White***	120, except 250 for legend on overhead signs
(Brown*)	20

* The values for blue and brown materials are not in the current *MUTCD*, but these are the values recommended by recent research.

** Agencies must also maintain a minimum contrast ratio of 3:1, i.e., the ratio of white retroreflectivity divided by the red retroreflectivity.

*** The minimum value for overhead guide signs will require the use of a higher type of retroreflective sheeting.

Measuring Retroreflectivity

Retroreflectivity is measured with a retroreflectometer. Hand-held instruments that can be used in the field cost about $12,000 and measure the retroreflectivity value at preset angles to simulate what drivers see. Many units also capture GPS coordinates which can be downloaded into an asset management database.

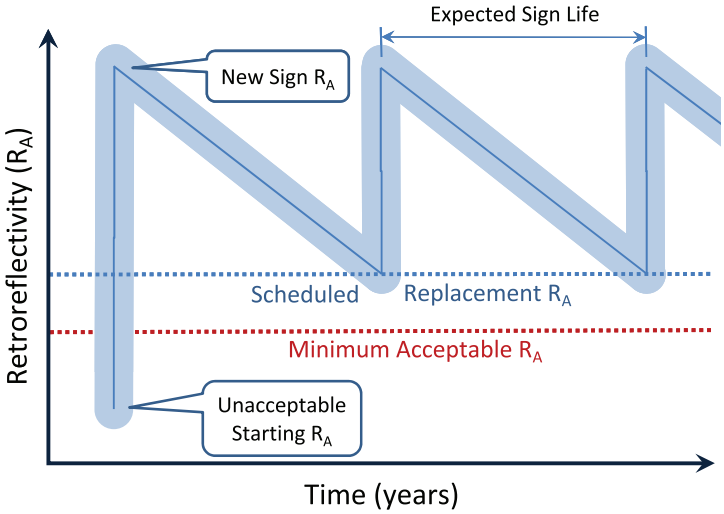
However, using a portable retroreflectometer is not child's play because signs are normally on posts and either the retroreflectometer needs to be supported by an extension pole and accurately held against the sign face, or the user must climb on a ladder.

In addition, researchers typically suggest taking about three readings on signs nearing the end of their useful life since retroreflectivity frequently varies at different locations. And to make matters worse, the unit must also be precisely centered on white legends, such as on STOP signs, guide signs, etc., in order to take accurate readings. Therefore, up to six readings are sometimes recommended, making the process challenging and time-consuming. Taking retroreflectivity readings on signs installed over the road on mast arms or sign structures is another story!

Retroreflectivity readings are normally defined as the value R_A measured in candelas per lux per square meter (cd/lx/m²). The R_A value deteriorates over time, but materials of even the same type and color do not always deteriorate uniformly.

Therefore, it is desirable to provide a safety factor when scheduling replacement signs as illustrated to the right.

Courtesy of Gene Hawkins, Texas Transportation Institute



Methods to Maintain Adequate Sign Retroreflectivity

Historically, the most common method used by highway agencies to evaluate sign retroreflectivity was to have a trained sign inspector drive the road at night and identify the unacceptable signs and then schedule those signs for replacement. However, this method is very subjective, and now the stakes are higher because minimum retroreflectivity values have been established.

Exhibit 2 shows five methods to maintain adequate sign retroreflectivity, and the advantages and disadvantages of each. The first two methods are assessment methods where signs are evaluated individually, and the last three methods are management methods where signs are evaluated on a macroscopic basis. These methods are not fool-proof, but FHWA requires that every agency implement a program to maintain sign retroreflectivity.

A brief discussion of the five methods is as follows, but installations can develop other methods or can change methods in the future.

ASSESSMENT METHODS

Method A; Visual Nighttime Inspection.

As noted before, Method A is the method historically used by most highway agencies, but in order to be acceptable, it must be fine-tuned. Therefore, if Method A is used, inspectors need to be trained, and additional guidelines must be followed.

Although the visual assessment method is subjective, it does help to identify some other issues such as: signs hidden by foliage, signs that are not properly aligned, nighttime visual clutter, blinding lights and other distractions. If used as the sign assessment method, it should generally be repeated annually, or at least every other year.

Method A could be performed several ways, some of which require the use of marginally-acceptable signs for "calibrating" the inspector's eyes. However, for small agencies, FHWA suggests using the "Consistent Parameter Procedure" as defined in their *Sign Retroreflectivity Guidebook: How to Meet the New National Standard for Small Agencies, Federal Land Management Agencies, and Tribal Governments*.

Daytime Visual Inspections Do Not Work

If a sign looks bad in the day it will look bad at night, but if the sign looks good in the day it could still be non-retroreflective, like this sign.

Section 2A.09 of the *MUTCD* States:

"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 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."

If using the consistent parameter procedure:

- ✔ Inspections must be conducted at night.
- ✔ Inspectors must be 60 years or older.
- ✔ Inspectors must conduct inspections from a sports utility vehicle (SUV) or pickup truck, model year 2000 or later.
- ✔ Inspectors must go through training. Training courses are available at many Local Technical Assistance Program (LTAP) centers, http://www.ltapt2.org.

Will the "Consistent Parameter Procedure" Work?

Any visual inspection is subjective, but the important thing to remember is that this procedure attempts to duplicate a person with poorer vision in a vehicle that returns less retroreflected light to the driver. The goal is to reduce as many variables as possible, which is essentially the methodology used to develop the minimum retroreflectivity values, except in this case only one inspector is being used instead of a series of inspectors. Therefore, this procedure should work.

If used, each military installation should develop additional guidelines for conducting nighttime inspections that, as a minimum, include the following:

1. **Consistency of testing** – Conduct inspections during consistent nighttime conditions. For example, always conduct inspections when there is no rain or fog, and when signs do not have snow or dew on their faces. Keep the interior vehicle lights off, and use a pen light for recording the results of the inspection. Use at least three ratings: adequate, marginal, and fail. Do not start the inspection until it is completely dark.
2. **Speed of vehicle** – Conduct inspections at normal roadway operating speeds. If you have to slow or stop the vehicle to read the sign, this usually means the sign should be replaced.
3. **Vehicle position** – Signs should be inspected from the travel lane, and at the typical viewing distance, that is, at a distance that provides the driver adequate time for an appropriate response.
4. **Headlights** – Use properly aimed low-beam headlights. Take the vehicle to your local mechanic to verify that the head lamps are properly aimed.
5. **Safety issues** – If possible, designate a driver for the vehicle. This serves the dual purpose of allowing the inspector to focus on the sign evaluation, which promotes consistency and accuracy of results, as well as improving safety for all on the roadway. If the inspector has to drive use a tape recorder to record evaluations.
6. **Recordkeeping** – Use a standardized form for tracking inspection results and maintain results in a file cabinet or a computer database for ease of reference and future use. Have the form partially filled out prior to the nighttime review, including the sign location and type listed in the driving order so that the inspector can concentrate on the visual evaluation and only needs to enter the score. The form may be a printout from a computerized inventory or a hand-written form similar to the example.

Nighttime Sign Inspection Form

Road: _____ Military Installation: _____

Direction: _____

Route Start Point: _____ Inspector: _____

Route End Point: _____ Date: _____

Trip Odometer	Sign Description	Retroreflectivity			Replacement Date
		Good	Marginal	Defective	
0.1	Speed Limit 35	✔			
0.5	Crossroad			✔	
0.6	STOP		✔		

7. **Replacement** – Any sign that is not legible to the inspector at the typical viewing distance and speed should be replaced as soon as possible. Also, schedule any signs rated as marginal for replacement since it may be at least a year before the signs are reviewed again.
8. **Frequency** – Installations should generally perform inspections on an annual basis, but at least every other year.
9. **Documentation** – Maintain all evaluations for future reference to prove that the inspections were conducted and that defective and margin signs were replaced.

If using this method, installations are strongly encouraged to retain the list of signs and sign locations in a computerized inventory (e.g., a simple database or spreadsheet) that can be used to generate new inspection forms for the next nighttime inspection. This type of inventory also helps to identify any signs that were lost during the year. However, the ultimate goal should be to eventually transfer the data to a more complex inventory as discussed later.

Method B; Measured Sign Retroreflectivity.

Technically, a military installation could take retroreflectivity readings on every sign to determine which signs need replaced. However, as previously mentioned, using a retroreflectometer is definitely not a quick or an easy task. Therefore, taking readings on every sign is not a viable method.

MANAGEMENT METHODS

Method C; Expected Sign Life.

Manufacturers of Type III and higher types of sheeting typically provide a minimum 10-year warranty for their materials during which they guarantee a minimum level of retroreflectivity. Since the guaranteed retroreflectivity values at the end of the warranty period (typically 80 percent of new minimum values) are significantly greater than the minimum retroreflectivity values in Exhibit 1, these materials should exceed the manufacturer's warranty even if installed under the harshest conditions, e.g., facing south (in the northern hemisphere) and installed at locations with high temperatures, high humidity, and high elevation.

Therefore, it should be safe to assume that as a minimum, signs will last at least as long as the warranty. In fact, many highway agencies have determined that signs made from Type III or Type IV material have a life expectancy of 12 to 15 years. Anyone can monitor their signs and adopt either a longer or a shorter "expected sign life," as appropriate. However, military installations are encouraged to query their state Department of Transportation (DOT) to learn about its experience with specific manufacturers, types, and colors of sheeting.

Ideally, military installations should have a sign inventory database for asset management. However, in the absence of an inventory, the sign installation date can be identified by:

- ✔ Applying a durable preprinted label on the back of the sign that displays the year that the sign was installed, or may include years, months and days where the person installing the sign punches out the appropriate numbers to show the installation date prior to affixing it to the sign. Stickers are typically about 3 to 4 inches wide, and are available from companies like 3M, Custom Products Corporation, and others. Military installations are encouraged to use different colors for each year to expedite field reviews.
- ✔ Physically writing the installation date on the back of the sign with a durable paint marker.

Do You Need a Retroreflectometer?

A retroreflectometer is not required if your installation is using the visual nighttime inspection method discussed in Method A, or a management method using the expected sign life based on the sheeting manufacturer's warranty or information provided by others.

You can also modify the expected sign life based on observed sign life for the same manufacturer, type and color of material as determined by the local DOT. Most transportation agencies can get more years from their sheeting than the warranted number of years. However, if reliable observed data is not available, consider purchasing a retroreflectometer to maximize your investment. Available types of retroreflectometers currently include the RoadVista Model 922 and the RetroSign GR3. Be sure to document the information sources and the rationale for your decisions.

Military installations must keep in mind, that without a sign inventory, the inspector will need to get close enough to each sign to "read" the date on the back of the sign in order to determine the year that the sign was installed. And, to put things in perspective, if the expected sign life is 12 years, on the average 12 signs will need to be reviewed before identifying one sign that should be replaced.

Exhibit 2: Sign Replacement Programs

Methods	Advantages	Disadvantages
A. Visual Nighttime Inspection. At least every 2 years, inspect all signs at night by a trained sign inspector, driving at normal speeds and using low-beams. The inspector should be 60 or older and should evaluate the signs from the normal viewing distance, and the vehicle should be a 2000 model year or newer SUV or pick-up truck. Replace defective and marginally-acceptable signs.	✓ Helps evaluate sign orientation issues and other distractions	✓ Requires a trained, nighttime sign inspector ✓ Subjective and inaccurate ✓ Requires a frequent review ✓ Requires some type of inventory to document the signs that are acceptable, marginal, or defective
B. Measured Sign Retroreflectivity. Periodically measure the retroreflectivity of sign backgrounds and retroreflective legends. Replace the individual signs with substandard retroreflectivity values.	✓ Minimizes the number of prematurely replaced signs	✓ Requires a retroreflectometer ✓ Extremely labor intensive ✓ Potential hazards if climbing ladders ✓ Requires a good inventory system to document the retroreflectivity readings and to identify the signs that need replaced
C. Expected Sign Life. Replace individual signs based on the age of the sign and the expected sign life.* To track the installation date, maintain a sign inventory or identify the year of installation on the back of the signs.	✓ Simple	✓ Requires a good inventory or a sign-dating system ✓ If using a sign-dating system, inspectors need to search for the target year signs
D. Blanket Sign Replacement. Replace all signs on the installation or area within the installation at the same time using the previous replacement date and the expected sign life.* (A variation could be, replace all STOP signs in Year #1, Speed Limit signs in Year #2, other regulatory signs in Year #3, etc., but this will modify the advantages and disadvantages.)	✓ Reduces the mixing of old and new signs ✓ Lowest labor costs	✓ May prematurely replace some signs installed between blanket replacement cycles, e.g., signs that replaced signs damaged in crashes ✓ Special funding may be needed if the effort is base wide
E. Control Signs. Replace signs based on measured retroreflectivity of signs that represent the general population of signs purchased in the same basic timeframe. The control signs can either be installed in the field or in another location such as in a maintenance yard.	✓ Provides for year-to-year differences in materials	✓ Requires a retroreflectometer, and some type of inventory ✓ The number of batches of control signs could be extensive since multiple signs should be installed to represent all color combinations from different groups of sign purchases ✓ Routinely evaluating the retroreflectivity of all control signs could be very labor intensive

* The expected sign life could be based on the retroreflectivity of control signs, the manufacturer's warranty, or based on information from an outside source such as a state DOT in the same geographic area. If control signs are used, they should face south (in the northern hemisphere) to simulate the harshest environment, and should include signs of every color combination.

Method D; Blanket Replacement.

The blanket replacement method also uses the expected sign life but with this method all signs in a specified area or all signs of a given type are replaced at the same time. This approach simplifies the date of installation by allowing external records to be kept instead of requiring a sign inventory or adding the date to the back of every sign. For example, if all colors of sheeting provide a minimum 13-year life as determined by sampling or via the local DOT, then if your installation replaces all signs in 2010, the next scheduled replacement program would be in 2023.

By replacing all of the signs at the same time, the need to monitor individual sign replacement dates is eliminated. However, it is always a good idea to inspect signs on a regular basis to ensure that signs are present and properly oriented, and that drivers have a clean line-of-sight to them. It is also good to perform some of the reviews at night, because night reviews help identify problems caused by lights and other visual distractions.

To provide a more uniform budgetary impact, it may be desirable to:

1. Divide the military installation into several smaller areas, each having a different replacement cycle, or
2. Spread the type of signs over a series of years, e.g., replace STOP and YIELD signs in one year, speed limit signs a second year, other regulatory signs a third year, etc.

It is important to remember, however, that some signs will be replaced mid-cycle due to crashes, construction, etc., and these signs will need to be replaced prematurely to maintain the same cycle.

Method E; Control Signs.

This method requires the designation of control signs to represent every manufacturer, type, and color combination from ongoing sign purchases. Because it is labor intensive to take retroreflective readings, this method has broader application for DOTs where these costs can be spread over a larger signing program.

What Method is Best for Your Installation?

In the long-term, it is safe to say that the simplest and most economical way to ensure that signs satisfy the minimum sign retroreflectivity standards is by using one of the management methods. Moreover, the choice depends on the availability of a sign inventory.

For example, for installations with a sign inventory, the "Expected Sign Life" approach, i.e., Method C is probably the best choice because new signs can be ordered based on the sign inventory. However, if a sign inventory does not exist, the recommended method would be the "Blanket Replacement" approach, i.e., Method D.

In either case, the installation needs to temporarily supplement the program with a visual nighttime inspection (Method A) in order to ease into the selected program. For example, if Method C is selected and some sign installation dates are not available, start to track the new installation dates but also replace obvious problem signs based on visual nighttime inspections. Similarly, if Method D is selected, there is no need to replace all signs prior to January 2015, but signs that are scheduled for future blanket replacement should be routinely reviewed.

However, installations may elect to use Method A as their starting point and build an inventory. In this case, the inventory should be complete with replacement dates, sign sizes, type material, etc.

Sign Inventory

The importance of having a good sign inventory cannot be overemphasized. For example, without an inventory, missing signs may go unnoticed for years, perhaps until someone complains or a crash occurs and someone restudies the location.

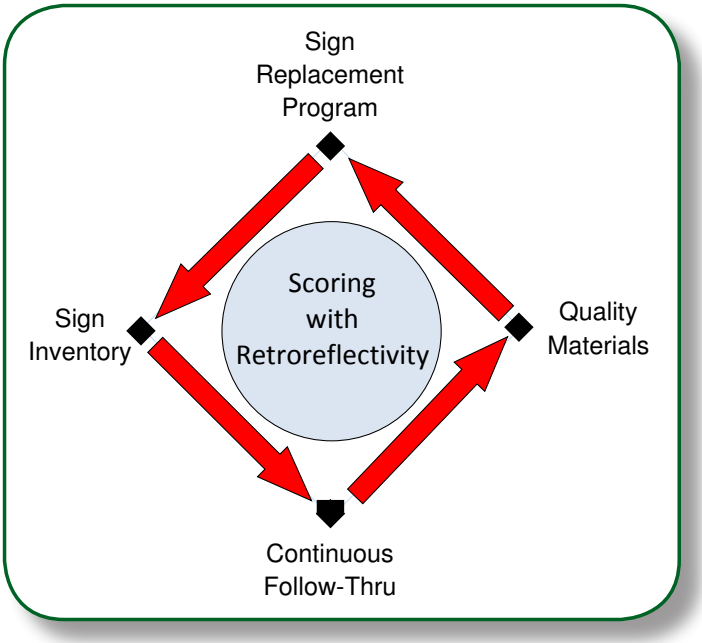
A good sign inventory system improves the quality of a signing program and should reduce the number of nighttime crashes. An electronic inventory can also assist in determining the anticipated number of any given type of sign that should be replaced next year or during some other time period based on the data in the file.

The process of capturing, analyzing, and presenting sign inventory information has evolved significantly in the last decade. The reduced cost and increased accuracy of Global Positioning System (GPS) has made the process of inventorying assets along highways much easier and more viable. In addition, the sophistication of Geographic Information Systems (GIS) has provided better data models for displaying and integrating asset inventories using Linear Referencing Systems (LRS). Today, it is possible to capture road assets using video log and GPS technologies, and then integrate the GPS locations using the LRS and generate milepost/offset values for the sign locations.

Items to capture in a sign inventory:

- ✔ Roadway name or designation
- ✔ Direction of travel
- ✔ Linear location along the road (or GPS coordinates)
- ✔ Side of road (left, median, overhead, or right side)
- ✔ Sign code and size
- ✔ Sign message if unique (e.g., destination and distance signs are generally one-of-a-kind signs)
- ✔ Position of the sign on an assembly with other signs
- ✔ Type and manufacturer of sheeting
- ✔ Type and number of sign supports
- ✔ Date installed
- ✔ Date last inspected
- ✔ Inspection comments (physical condition, retroreflectivity readings, required maintenance, etc.)
- ✔ Maintenance history (replacement date for sign posts, etc)

The beauty of any electronic sign inventory is that it can help manage a sign maintenance program while keeping costs to a minimum. Military installations can develop their own electronic inventory but there are definite advantages of using off-the-shelf software with a built-in sign library of the *MUTCD* signs and automatic upgrades.



What Can SDDCTEA Do for You?

- ✔ Study military installations to determine if the signs are correct.
- ✔ Provide more information or assistance on anything discussed in this bulletin.

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One of the most popular software packages used for sign inventories is CartêGraph's suite of modules that facilitates asset management not only for signs, but also for water, sewer, storm water, bridge, lights, pavements, etc. For an initial investment of about $10,000 to $15,000, installations can purchase a personal digital assistant (PDA) with GPS and the necessary licenses and training, and then lease the software suite for about $2,500 per year. Software is also available from GBA Sign Master.

Which is Worse, a Sign with Substandard Retroreflectivity, or a Missing Sign?

If a sign has substandard retroreflectivity, it probably is still effective during the day and perhaps somewhat effective at night. Moreover, there is also an excellent chance that the sign will eventually be replaced.

However, if the sign was knocked down and there is no sign inventory, it may in fact never be replaced. Perhaps it will take a crash before the location is restudied and a new sign is installed.

Therefore, the value of a good sign inventory cannot be over emphasized.

Action Items

In order to comply with FHWA's minimum sign retroreflectivity mandate, every military installation should take the following action:

1. If your installation is still installing signs with Type I or Type II retroreflective sheeting material, discontinue this practice ASAP and start using a minimum Type III or Type IV material, except use Type VII material for white letters on overhead signs.
2. Select a sign management method. Your installation may elect to start with Method A, but eventually you should seriously consider either Method C or D to maintain the mandated minimum sign retroreflectivity levels. Document your decision in writing.
3. If your installation currently does not have a sign inventory, consider making this a goal in order to make future sign replacements more efficient and to help assure that all approved traffic signs continue to be maintained.
4. If your installation selects Method C (i.e., "Expected Sign Life") and a sign inventory does not exist and is not being proposed, then immediately establish a sign-dating program where all new signs have the date (or as a minimum, the year) of installation durably affixed to the back of every sign as they are replaced.
5. Initiate a program to replace all defective regulatory, warning, and ground-mounted guide (except street name) signs before January 2015. Until all signs are initially replaced under the selected sign management program, supplement your sign management program with a nighttime visual inspection, and replace all signs that are defective or marginally acceptable. In addition, prior to January 2015, replace all signs fabricated from a Type I or Type II retroreflective sheeting material.
6. Be cognizant of the fact that all defective street name signs and overhead guide signs need replaced before January 2018.

First Things First

Prior to implementing a major sign replacement program, it is important to review existing signs to make sure that they are appropriate instead of merely replacing them with the same type of sign. For example:

- ✔ *Are the speed limits and advisory speeds appropriate?*
- ✔ *Did traffic volumes change so much that the STOP signs are now on the major roads instead of on the minor roads?*
- ✔ *Are the advance warning signs located at an appropriate distance from the hazard in accordance with the current MUTCD?*
- ✔ *Are all of the signs necessary? For example, why would you need railroad crossing signs if the tracks were removed or paved over?*
- ✔ *Can some signs be relocated to spread them out to improve the driver's ability to "read" the signs?*
- ✔ *Are the signs located in advance of the entry control facility (ECF) in accordance with the standards?*

2010
SDDCTEA Workshops
Attend One or Attend Both

Military Surface Deployment and Distribution Command
Transportation Engineering Agency

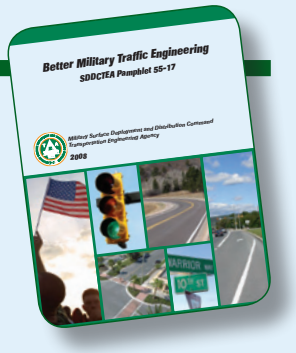
Maintaining Control Workshop

The purpose of this workshop is to provide guidance regarding the planning, design, and operation of entry control facilities (i.e. access control point or gate) while addressing security, safety and traffic requirements.

The two-day workshop will cover:

- ✔ Entry Control Facility (ECF) Background and Functional Requirements
- ✔ Facilities Overview
- ✔ Speed Management
- ✔ Geometric Design - ECF Overview
- ✔ Lighting Considerations
- ✔ Technology Overview including Automation
- ✔ Force Protection Considerations
- ✔ Active Vehicle Barriers (AVBs)
- ✔ Traffic Control for AVBs

Traffic Engineering & Safety Workshop



The purpose of this workshop is to provide guidance regarding traffic engineering and safety considerations along roadways, intersections, and at entry control facilities so that these facilities provide for safe and efficient operation.

The two-day workshop will cover:

- ✔ Traffic Engineering Studies
- ✔ Geometric Design
- ✔ Intersection Traffic Control
- ✔ Signs and Markings
- ✔ Roadway and Pedestrian Safety
- ✔ Speed Limits
- ✔ Traffic Calming and Roundabouts
- ✔ Access Management and Parking
- ✔ Traffic Signals

The Buzz!
"Well paced workshop. A good use and timing of exercises. One of the best I've attended."
-Tampa Workshop Attendee

2010 Locations and Dates

Location	Maintaining Control Workshop 2 days	Traffic Engineering & Safety Workshop 2 days	Both Workshops 4 days	Registration Deadline
Maxwell AFB Montgomery, AL	April 12, 13	April 14, 15	April 12-15	March 12
Andersen AFB Guam	April 26, 27	April 28, 29	April 26-29	March 26
Naval Support Facility Annapolis, MD	June 7, 8	June 9, 10	June 7-10	May 7
US Air Force Academy Colorado Springs, CO	July 12, 13	July 14, 15	July 12-15	June 11

Sign retroreflectivity will be discussed at both workshops listed above. If you would like to receive more information including registration details, please contact Amy Firestine at 717-763-7211, ext. 2170, or by e-mail at afirestine@gfnet.com.

Mr. Curt Zargani
Acting Director, SDDCTEA

DEPARTMENT OF THE ARMY
Military Surface Deployment and
Distribution Command Transportation
Engineering Agency
709 Ward Drive
Building 1990
Scott Air Force Base, Illinois 62225

OFFICIAL BUSINESS

Reference List

- ✔ Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), *Sign Retroreflectivity* Bulletin, Scott Air Force Base, April 2006. (http://www.tea.army.mil/pubs/nr/dod/bulletins/Retroreflective(Apr06).pdf).
- ✔ U.S. Department of Transportation, Federal Highway Administration. *New MUTCD Sign Retroreflectivity Requirements, FHWA-SA-07-020*. Washington, D.C., 2007. (http://safety.fhwa.dot.gov/roadway_dept/night_visib/policy_guide/fhwasa07020/fhwasa07020.pdf).
- ✔ U.S. Department of Transportation, Federal Highway Administration. *Manual on Uniform Traffic Control Devices*. Washington, D.C. 2009 Edition. (http://mutcd.fhwa.dot.gov/kno_2009.htm)
- ✔ U.S. Department of Transportation, Federal Highway Administration, *Sign Retroreflectivity Guidebook: How to Meet the New National Standard for Small Agencies, Federal Land Management Agencies, and Tribal Governments, FHWA-CFL/TD-09-005*, Washington, D.C., September 2009 (http://safety.fhwa.dot.gov/roadway_dept/night_visib/retrotoolkit/index.htm).
- ✔ Institute of Transportation Engineers. *Traffic Engineering Handbook*. Washington D.C. 2009.
- ✔ www.fhwa.dot.gov
- ✔ www.tea.army.mil
- ✔ www.ite.org

Training

Continuing Education	Phone	Web Site
Pennsylvania State University;		
The Pennsylvania Transportation Institute	(814) 865-4700	www.pti.psu.edu
University of Maryland;		
Md. Transportation Technology Transfer Center	(301) 403-4623	www.ence.umd.edu/tttc
Georgia Institute of Technology	(404) 385-3501	www.gatech.edu
Northwestern University Center for Public Safety	(800) 323-4011	www.northwestern.edu/nucps/index.htm
Texas A&M University	(979) 845-3211	www.tamu.edu
University of Washington; College of Engineering	(206) 543-2100	www.engr.washington.edu/epp

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