Traffic Engineering and Highway Safety Bulletin 21-01
August 2021

Sign Management: Best Practices

In This Issue…

TRANSPORTATION ENGINEERING AGENCY (TEA)

1 Soldier Way
Scott Air Force Base, Illinois
62225-5006
http://www.sddc.army.mil/sites/TEA

Scan Here to Quickly Visit Us Online!

Overview

The purpose of this bulletin is to provide recommendations for signing-related deficiencies that are commonly observed on military bases, and to discuss sign maintenance practices.

Signing is an important type of traffic control device that provides key information to a driver. A common problem on military installations is too many signs. There is a misconception that extra signs won't do any harm. In reality, these extra signs create unnecessary clutter and detract from the necessary traffic signs that provide critical information to drivers. Other common problems associated with signing include:

- ☑ Using non-standard, homemade-type signs
- ☑ Installing signs at a substandard height.
- ☑ Spacing signs too close to other signs; or locating too close to a curve, turn, or intersection.
- ☑ Installing guide signs with too many destinations.
- ☑ Using improper colors (e.g., brown and white for regulatory and warning signs).
- ☑ Allowing obsolete (i.e., non-retroreflective or non-legible) signs to remain in place.

The "how-to" book for traffic signs is Part 2 of the *Manual on Uniform Traffic Control Devices* (*MUTCD*), published by the Federal Highway Administration (FHWA). The primary purpose of the *MUTCD* is to improve safety and reduce driver frustration by promoting uniformity in the design and application of traffic control devices.

Traffic signs are the most common and recognizable type of traffic control device. In fact, more than half of the *MUTCD* is devoted to the discussion and application of signs. However, despite the explicit guidance in the *MUTCD*, the use of non-standard, homemade-type signs is a continual problem. To make matters worse, sometimes these signs are made with incorrect colors and/or shapes; and frequently with substandard size legends and without retroreflective sheeting material.

Examples of Homemade Signs

Basic Sign Requirements

According to the *MUTCD*, a traffic control device should meet the following five requirements:

- ☑ Fulfill a need
- ☑ Command attention
- ☑ Convey a clear, simple meaning
- ☑ Command respect from road users
- ☑ Give adequate time for proper response

Fulfilling a need and commanding respect are often closely related since signs that are not needed are not likely to be respected. For example, motorists may violate unrealistic posted speed limits, ignore pedestrian signage posted in areas with very low pedestrian activity, or roll through stop-controlled approaches where STOP signs are used to control speeds rather than establishing right-of-way.

The remaining three requirements are also inter-related by the design and placement of a sign and are more aptly described under three categories: legibility, visibility, and location. The following table shows specific requirements related to these categories.

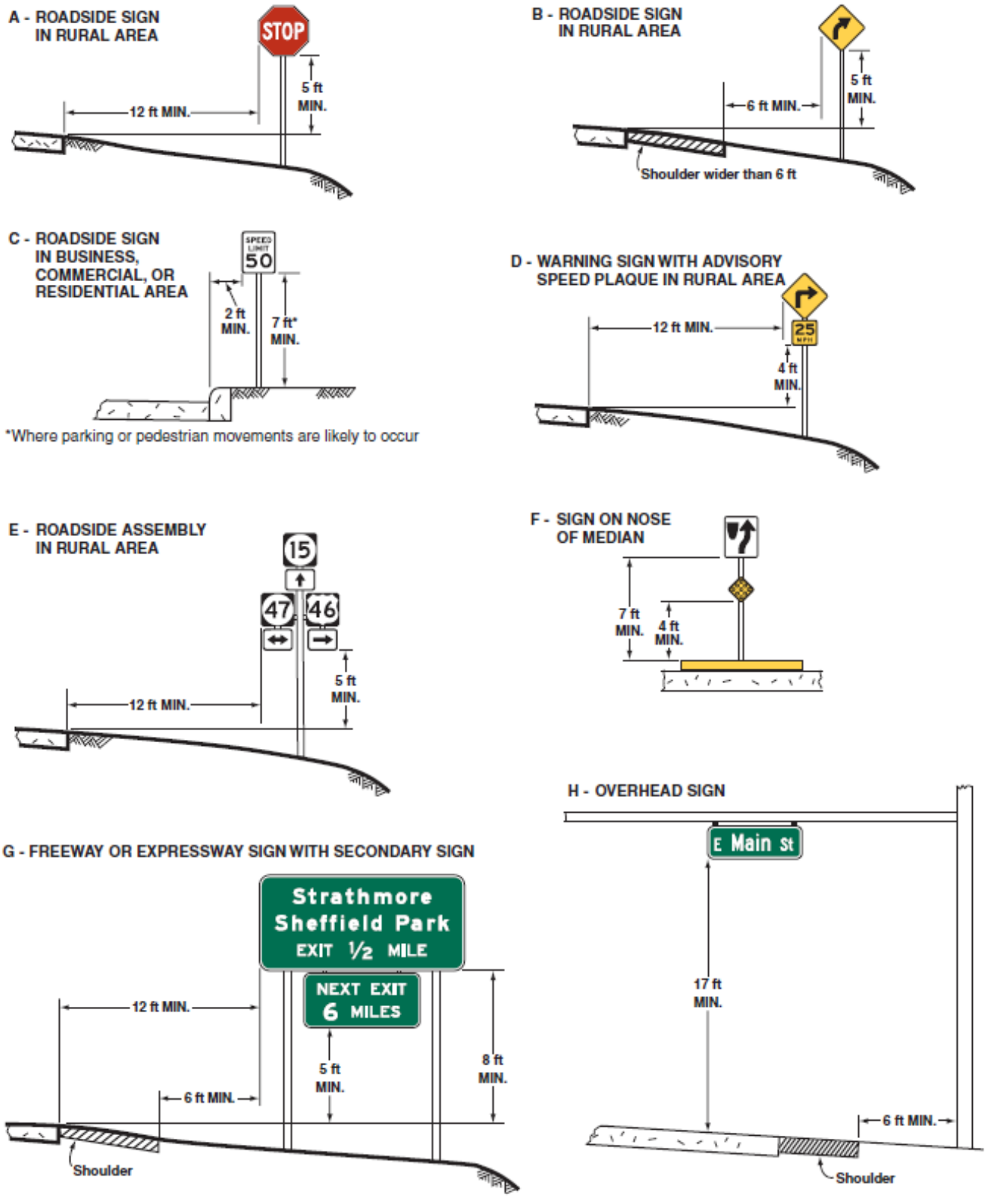
Legibility
☑ Use symbols as opposed to text when available
☑ Use minimum 6-inch high lettering (with certain exceptions such as No Parking signs).
☑ Ensure that sign sizes follow the recommended dimensions in the *MUTCD* or at least the minimum dimensions
☑ Use standard designs from the FHWA's *Standard Highway Signs* book
☑ In rare situations where other messages are needed, minor modifications may be made to the design provided that the essential appearance characteristics are met
☑ Modifications cannot be made to the standard symbols, with some limited exceptions for horizontal alignment and intersection warning signs

Visibility
☑ Require Type III or better retroreflective sheeting on new signs
☑ Replace or repair damaged or misaligned signs
☑ Replace signs as needed to maintain required minimum retroreflectivity levels
☑ Clear obstructions and roadside features such as vegetation and utility poles
☑ Orient signs to face approaching traffic
☑ Space signs at intervals of at least 200 feet (preferably) from other signs, with an allowance to use 100 feet minimum for speeds 35 mph and lower

Location
☑ Use proper lateral offset distance from the edge of the road. Figures 1 and 2 on the next pages show MUTCD figures 2A-2 and 2A-3 for proper heights and lateral offsets.
☑ Install sign panels at the proper height above the roadway surface. Figures 1 and 2 on the next pages show MUTCD figures 2A-2 and 2A-3 for proper heights and lateral offsets.
☑ Use approved breakaway (yielding) sign posts and install in accordance with the manufacturer's recommendations
☑ Use overhead lane use signs for three or more lanes in one direction, or when a single lane can serve multiple movements

Figure 1: *MUTCD* Figure 2A-2

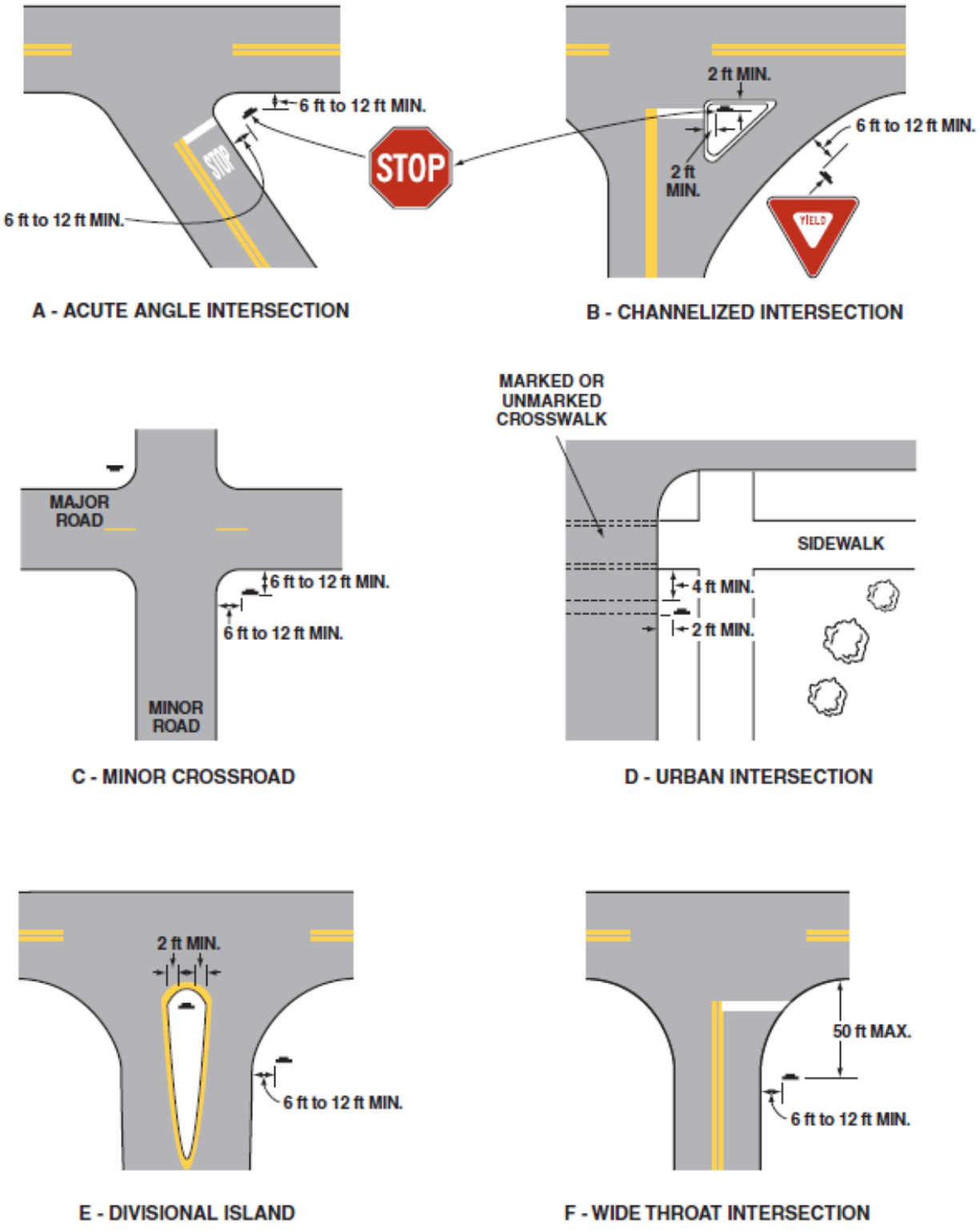
Figure 2A-2. Examples of Heights and Lateral Locations of Sign Installations



Note:
See Section 2A.19 for reduced lateral offset distances that may be used in areas where lateral offsets are limited, and in business, commercial, or residential areas where sidewalk width is limited or where existing poles are close to the curb.

Figure 2: *MUTCD* Figure 2A-3

Figure 2A-3. Examples of Locations for Some Typical Signs at Intersections



Note: Lateral offset is a minimum of 6 feet measured from the edge of the shoulder, or 12 feet measured from the edge of the traveled way. See Section 2A.19 for lower minimums that may be used in urban areas, or where lateral offset space is limited.

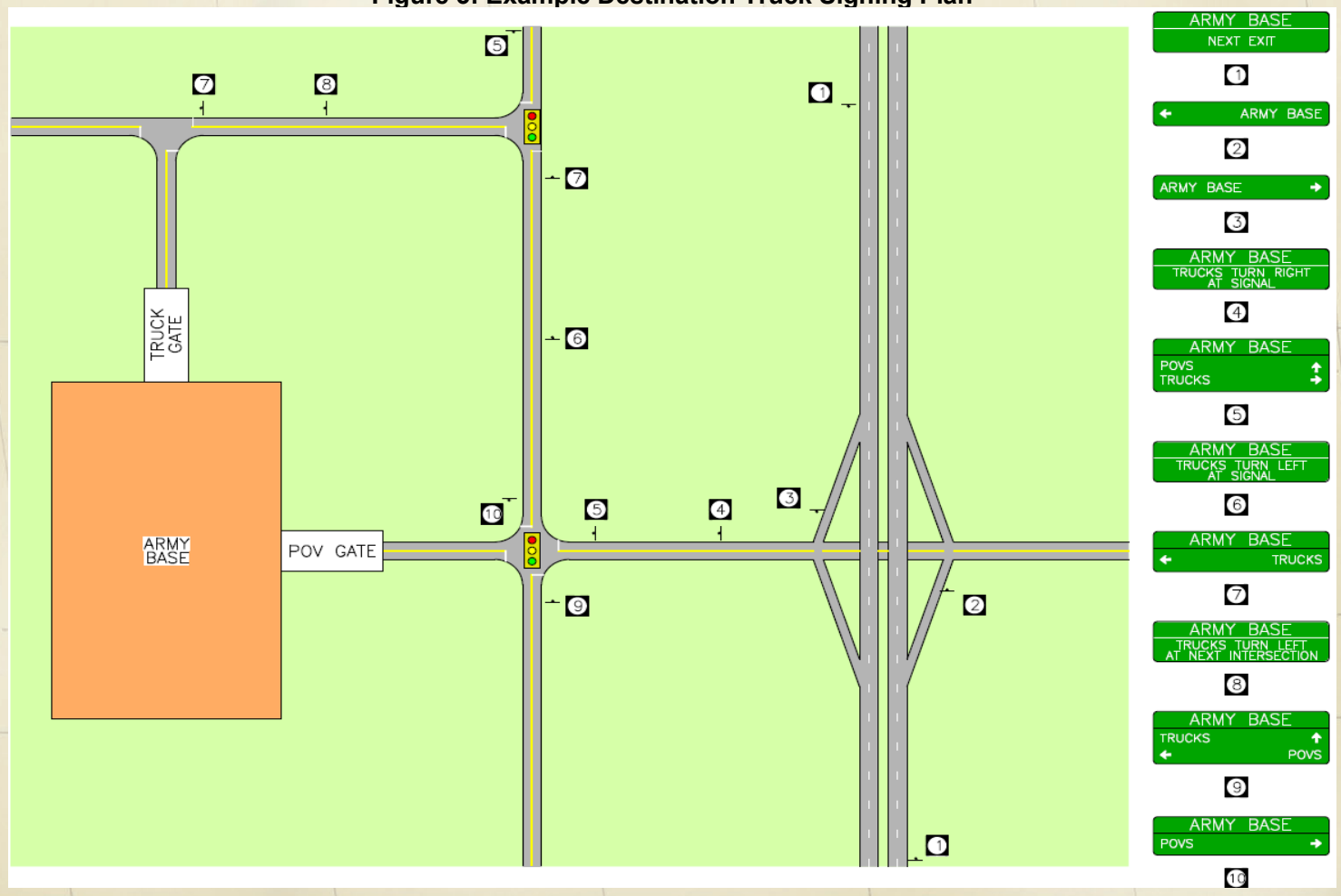
Commercial Vehicle Signing

At many military installations, commercial vehicles enter the installation at a gate separate from privately owned vehicle (POV) traffic. Just as passenger vehicles rely on signage to be routed to a gate, trucks also must be routed. In addition, trucks that utilize GPS routing devices are often directed to a gate used only by POV traffic. If a commercial vehicle (truck) gate is present, it is crucial to convey clear directions to truck drivers to avoid them inadvertently attempting to enter via a POV gate. A consequence of improper routing is the need to reject a truck at the POV gate. It is ideal to have truck rejection capabilities at a POV gate, but it is better to prevent the confusion that leads trucks to the main gate by giving the driver the proper information before the gate. Trucks attempting to enter at the incorrect gate is a frequent problem when improper signing is present. Signs must be located in advance of the location where a driver must make a decision. Signs must provide adequate time for drivers to perceive and react to the message. Signage would be appropriate at an external (off-installation) intersection where a truck driver must turn to access the truck gate. Another example would be on an interstate highway where traffic to the truck gate would use a different exit. The installation would need to work with the local government or department of transportation (DOT) to install the required sign(s).

Signs must be large enough for proper visibility based on travel speeds. If approaching an intersection, two signs (i.e., one advance sign and one at the intersection) provide the benefit of redundancy in the event the truck driver fails to see the first sign. The sign shall portray a clear, unambiguous message that tells the driver precisely what to do. A message such as "Trucks Use Truck Gate on Main Street" is unclear and will result in motorist confusion as unfamiliar drivers will not know where the Truck Gate is located nor the names of the local roadways. A message such as "Trucks Turn Right at Signal" (especially if it is supplemented with directional arrows) clearly tells drivers precisely what to do. Figure 3 below shows example sign messages.

In addition to external signing, truck signing can also be necessary within the ECF. Since trucks typically need to be directed toward an inspection area (rather than from

Figure 3: Example Destination Truck Signing Plan



the POV ID check area), it is helpful to provide signing to show where trucks are to travel through the ECF.

Additionally, the ECF that trucks must use to exit an installation should also be conveyed to the drivers via internal signing. Often ECFs are designed to allow trucks to exit at any gate on an installation, but some installations require trucks to exit at the truck gate only. If this is the case, this could be signed as the truck enters the gate, or at key locations throughout the installation.

Speed Limit Signs

An issue frequently observed on military installations is the overabundance or inconsistent placement of speed limit signs. Particularly, an overabundance in housing areas is often observed. Additionally, there often is a multitude of speed limit postings to establish frequently changing speed zones, confusing motorists. In other cases, there are too few speed limit signs, which leaves motorists to assume an appropriate speed limit.

Speed Limit signs must be correctly posted to ensure a speed limit is enforceable and to encourage compliance. The standard Speed Limit (*MUTCD sign designation R2-1*) sign is 24 inches by 30 inches on roads with one travel lane in the same direction and 30 inches by 36 inches for multi-lane roadways. Larger sizes can be used for additional emphasis if needed.

Place Speed Limit signs at every location where the speed limit changes, beyond major intersections, and at other locations where it is necessary to remind the road users of the applicable speed limit. However, avoid placing a speed limit posting immediately in advance of a horizontal curve or turn in the event that the curve / turn requires an advisory speed posting. The *MUTCD* does not contain any maximum spacing requirements for Speed Limit signs, but many states have unique requirements that must be followed in order to enforce speed limits. Therefore, Speed Limit signs should also be placed at intermediate locations as necessary to comply with state requirements. In the absence of specific state spacing requirements, installations are encouraged to use maximum 1-mile spacing for speed limits of 35 mph or lower, and maximum 3-mile spacing for higher speeds.

To minimize the number of speed limit signs required, a blanket speed limit posting can be utilized as permitted by the 2009 (revised 2012) *MUTCD*. However, as some states do not allow blanket postings, it is important to consult your state's *MUTCD* (or state supplement) to determine if they are allowed. A blanket speed limit posting could be posted at the entrance of the installation after the ECF area, or at more localized areas such as at the entrance to a housing area. If this type of speed limit posting is used, it should be signed with an INSTALLATION (R2-5iP-TEA) or RESIDENTIAL (R2-5cP) plaque, a SPEED LIMIT (R2-1) sign, and an UNLESS OTHERWISE POSTED (R2-5P) plaque as shown.

R2-5iP-TEA, R2-1, R2-5P

Image Source: *MUTCD*

Pedestrian Crossing Signs

A pedestrian crosswalk may require signing, depending on the location and conditions at the roadway being crossed. The two types of crosswalk locations are:

- ☑ Controlled locations (i.e., where traffic is required by traffic control to stop). This includes crossings at signalized intersections, the stopped approaches of a two-way stop-controlled intersection, and all approaches of an all-way stop-controlled intersection.
- ☑ Uncontrolled locations (i.e., where traffic is not required by traffic control to stop). This includes midblock locations, the free approaches to a two-way stop-controlled intersection, and approaches to roundabouts prior to the Yield point.

Controlled crosswalk locations should not have pedestrian signing. With traffic stopping, there is no need for added emphasis with the use of signing. Actually, it can have an adverse effect by distracting the driver from the need to stop. In the case of signalized intersections, pedestrian accommodations should be used, including pedestrian signals and pushbuttons.

Crosswalk signing at uncontrolled crosswalk locations should follow guidance in the addendum to SDDCTEA Pamphlet 55-17: *Crosswalk Warrant and Guidelines*, dated 1 July 2021. For marked uncontrolled crosswalks, this includes signing at, and in advance of, the crosswalk. There are several different scenarios for the specific signing required, dependent on the number of travel lanes, speed of the roadway, and the actual presence of an intersection. In the most simple form, the Pedestrian Crossing (W11-2) sign is used along with the diagonal downward pointing arrow (W16-7P) plaque.

W11-2

W16-7PL

Image Source: *MUTCD*

Non-Standard Signs

The use of non-standard signs, as well as inappropriate use of standard signs, is prevalent on military installations. All signing should be consistent with federal, state, and/or TEA standards. TEA recommends these non-standard or inappropriate signs be replaced with correct signing, or simply be removed.

Children at Play Signing

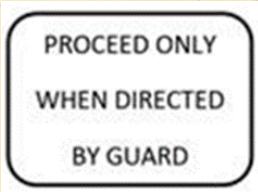
Children at Play signs are often used in housing areas, near schools, or other areas where children are likely to play. This sign is not standard and commands no reaction by the driver. It could be inferred that with children playing nearby, a driver should drive slower and more cautiously. This is not clearly stated, and as such, should not be expected from drivers. Use standard signs for the actual condition: If a playground is nearby, post the Playground (W15-1) sign. If a crosswalk is nearby, sign as required for crosswalks. If excessive speeds are a problem, consider evaluating the speed limit in place, or installing speed humps or other forms of traffic calming.

W15-1

Image Source: *MUTCD*

Stop Signs at Gates

Installations commonly install STOP signs at the ID check position of an ECF to inform motorists of the need to stop. A STOP sign is not appropriate at this location because it conflicts with the guard control. The requirement at a STOP sign is for traffic to stop, then proceed when there is no conflicting traffic. In this case, the guard serves as the traffic control device; the motorist may only proceed when allowed by the guard. However, the STOP sign can be beneficial during low volume periods, when guards go inside the guard house and come out as a vehicle stops. Though not recommended by TEA, if used, add a supplemental placard developed by TEA with the message: Proceed Only When Directed by Guard.



Alterations to Standard Signing

There may be unique conditions where it is necessary to convey a message for an uncommon condition. For example, access to parking lots or other areas may be difficult to sign using standard signing since the desired message may not exist. While it is important to remember that standard signs may not be altered, it is possible that a better sign is available. Preferably, consider the condition that drives the need for the sign. If the condition is extremely uncommon and confusing to motorists, design changes should be considered.

This photo illustrates an alteration of the standard DO NOT ENTER (R5-1) sign panel. At a glance, this sign is easily misinterpreted.

TEA is always available to assist with evaluating traffic control, signing, and unconventional conditions.

Sign Retroreflectivity

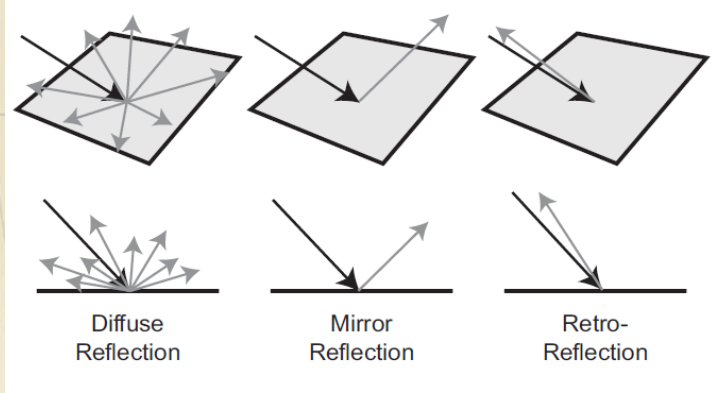
Nighttime driving is inherently more dangerous than daytime driving, making it extremely important that signs are visible. Therefore, the *MUTCD* requires traffic signs to be either retroreflective or illuminated to show the same shape and color both day and night. It is more cost effective to make signs retroreflective than it is to illuminate them. Furthermore, since it is possible for the light bulbs at an illuminated sign to burn out, all signs should be made with retroreflective sheeting even if the sign is illuminated.

What is Retroreflection?

Most objects reflect light. The most common type of reflection is "diffuse reflection" where light scatters after striking rough surfaces such as trees, clothing, and carpet. Only a very small amount of the diffused light reflects back toward the light source.

Another type of reflection is "mirror reflection" that occurs when light strikes smooth or glossy surfaces, and the light reflects off the surface at an equal but opposite angle. Mirror reflection frequently occurs at night on wet roads when the headlights of approaching vehicles create extensive glare. In contrast, "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 source; and "retroreflectivity" is the measure of this unique property.

These three types of reflection are illustrated below.



Retroreflective Sheeting Materials

To make signs retroreflective, sign shops apply retroreflective sheeting to the face of each sign panel, which incorporates either microscopic glass beads or microscopic cube-corner reflectors (frequently called "microprismatic material") behind a smooth translucent pigmented surface layer. If the manufacturers could make perfectly shaped glass beads or cube-corner reflectors, all light from a vehicle's headlights would return directly back to the headlights. Although we do not have perfectly shaped glass beads or reflectors, drivers do see more reflected light when their eyes are closer to the headlights. As illustrated below, the angle formed between the headlights, the sign, and the driver's eyes is the observation angle, and the smaller the angle the higher the retroreflection.

Retroreflective materials are also more efficient when the light source is approximately perpendicular to the sign face; therefore, it is important to have signs oriented toward approaching traffic.

Some traffic signs may look almost new during the day but are completely ineffective at night. This nighttime visibility problem is usually a function of the type and age of the retroreflective material. This underscores the importance of:

- ☑ Obtaining all signs from a reputable sign shop
- ☑ Specifying a minimum Type III sheeting type, and
- ☑ Performing nighttime inspections of the signs.

Sheeting types range from Type I through XI. Sheeting Types I and II barely meet current minimum retroreflectivity requirements when new, and quickly become deficient with age. TEA requires a minimum of Type III sheeting be used for all signs. The higher sheeting types are appropriate in urban areas where there are more visual distractions from light sources at night which compete for the driver's attention. These include commercial business signs, and street and business lighting. State departments of transportation are increasingly utilizing Type XI sheeting for signs to maximize brightness; however, TEA believes a minimum of Type III is adequate since it provides a sufficient amount of retroreflectivity. Also in some cases, depending on the application, a higher type may be too bright at night with familiar drivers.

Figures 3 and 4 show the sign sheeting guide as published by FHWA.

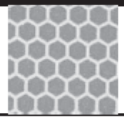
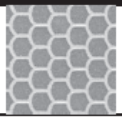
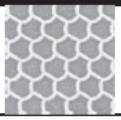
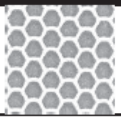
Figure 3: FHWA's Retroreflective Sheeting Guide

2014 Traffic Sign Retroreflective Sheeting Identification Guide

U.S. Department of Transportation
Federal Highway Administration

This document is intended to help identify sign sheeting materials for rigid signs and their common specification designations. It is not a qualified product list. FHWA does not endorse or approve sign sheeting materials. Many other sheeting materials not listed here are available for delineation and construction/work zone uses.
Many sign sheeting materials have watermarks and/or patterns that are used to identify the material type and manufacturer. The watermarks shown in this guide have been enhanced. The watermarks will be less visible in practice and may not be present on smaller pieces of sheeting due to the spacing.

Retroreflective Sheeting Materials Made with Glass Beads

Example of Sheeting (Shown to scale)								
ASTM D4956-04	I	II	II	III	III	III	III	III
ASTM D4956-13	I		II	III	III	III	III	III
AASHTO M268-13	(1)		(1)	A	A	A	A	A
Manufacturer	Several companies	Avery Dennison®	Nippon Carbide	3M™	ATSM, Inc.	Avery Dennison®	Nippon Carbide	ORAFOL Americas Inc
Brand Name	Engineer Grade	Super Engr Grade	Super Engr Grade**	High Intensity	High Intensity	High Intensity	High Intensity	ORALITE® High Intensity
Series	Several	T-2000	15000	2800 3800	ATSM HI	T-5500	N500	5800
NOTES:	(2) (8)	(3) (4) (9)	(4)	(3) (4) (9)	(4)	(4)	(4)	(4)

DO NOT USE

1) Sheeting material does not meet minimum AASHTO classification criteria.
2) Glass Bead Engineer Grade sheeting is uniform without any patterns or identifying marks.
3) Material no longer sold in the United States as of the date of this publication.
4) Section 2A.08 of the 2009 MUTCD (http://mutcd.fhwa.dot.gov) does not allow this sheeting type to be used for new legends on green signs.

- ASTM D4956-04 is referenced in Table 2A-3 of the 2009 MUTCD.
- ASTM D4956-13 is the most current ASTM sign sheeting specification (the 2013 version is designated by "-13").
- AASHTO M268-13 is the most current AASHTO specification (the 2013 version is designated by "-13").

Manufacturer Contact Information

3M - http://www.3M.com/roadwaysafety
ATSM, Inc. - http://www.atsminc.com
Avery Dennison - http://www.reflectives.averydennison.com
Nippon Carbide - http://www.nikkalite.com
ORAFOL Americas Inc. – http://www.orafolamericas.com

FHWA Publication Number: FHWA-SA-14-022. You may download and print the electronic version of this document, available at www.fhwa.dot.gov/retro

Image Source: FHWA

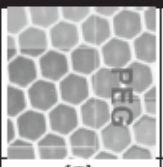
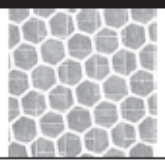
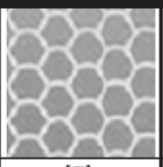
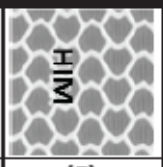
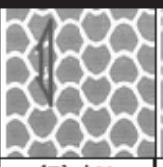
Figure 4: FHWA's Retroreflective Sheeting Guide (Continued)

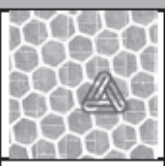
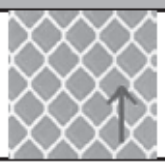
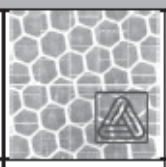
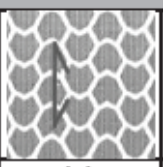
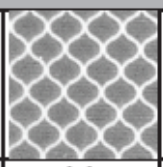
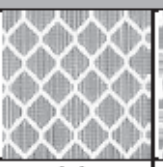
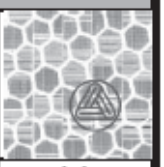
2014 Traffic Sign Retroreflective Sheeting Identification Guide

U.S. Department of Transportation
Federal Highway Administration

This document is intended to help identify sign sheeting materials for rigid signs and their common specification designations. It is not a qualified product list. FHWA does not endorse or approve sign sheeting materials. Many other sheeting materials not listed here are available for delineation and construction/work zone uses.
Many sign sheeting materials have watermarks and/or patterns that are used to identify the material type and manufacturer. The watermarks shown in this guide have been enhanced. The watermarks will be less visible in practice and may not be present on smaller pieces of sheeting due to the spacing.

Retroreflective Sheeting Materials Made with Micro-Prisms

Example of Sheeting (Shown to scale)								
D4956-04	(5)	(5)	III, IV	III, IV, X	(5)	(5)	(5) / X	(5)
D4956-13	I	I	III, IV	III, IV	III, IV	III, IV	VIII	VIII
M268-13	(6)	(6)	B	B	B	B	B	B
Manufacturer	3M™	Avery Dennison®	Avery Dennison®	3M™	ORAFOL Americas Inc	Nippon Carbide	Nippon Carbide	3M™
Brand Name	EGP	PEG	HIP	HIP	ORALITE® HIP	HIM	Crystal Grade	Reflective Sheeting
Series	3430	T-2500	T-6500	3930	5900/5930	CRG 94000	CRG 92000	3940
NOTES:	(8)	(8)						

Example of Sheeting (Shown to scale)								
D4956-04	VIII	VII, VIII, X	IX	IX	(5)	(5)	(5)	(5)
D4956-13	VIII	VIII	IX	IX	IX	IX	XI	XI
M268-13	B	(7)	B	B	B	B	D	D
Manufacturer	Avery Dennison®	3M™	3M™	Avery Dennison®	Nippon Carbide	ORAFOL Americas Inc	3M™	Avery Dennison®
Brand Name	MVP Prismatic	Diamond Grade™ LDP	Diamond Grade™ VIP	OmniView™	Crystal Grade	ORALITE®	Diamond Grade™ DG3	OmniCube™
Series	T-7500	3970	3990	T-9500	95000	7900	4000	T-11500
NOTES:		(9)			(9)			

5) Material was either unavailable in 2005 (previous version of this Guide) or unassigned in the 2004 version of ASTM D4956.
6) Sheeting material does not meet minimum AASHTO classification criteria.
7) Material has been discontinued prior to AASHTO M268-10.
8) Section 2A.08 of the 2009 MUTCD (http://mutcd.fhwa.dot.gov) does not allow this sheeting type to be used for new yellow or orange signs, or new legends on green signs.
9) Material no longer sold in the United States as of the date of this publication.

Resources

Federal Highway Administration – http://www.fhwa.dot.gov/retro
Manual on Uniform Traffic Control Devices (MUTCD) – http://mutcd.fhwa.dot.gov
Texas A&M Transportation Institute – http://tti.tamu.edu/visibility
ASTM – http://www.astm.org AASHTO – http://www.transportation.org

Image Source: FHWA

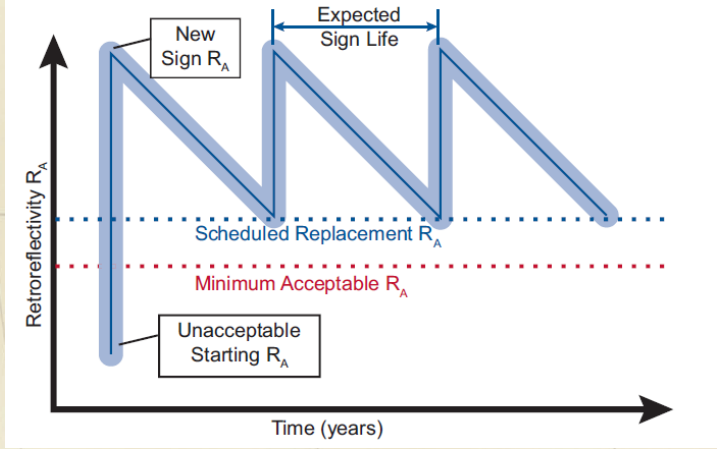
Sign Management Studies

Per the *MUTCD*, all agencies must have a sign management method in place to maintain signs to proper retroreflectivity levels. This requirement has been in place for several years. While many military installations do have a management method in place, there are still many that do not.

Provided below is a brief overview of the *MUTCD* requirements:

- ☑ Conform to new requirements relating to sign size, sign type, and placement.
- ☑ Develop an installation-wide sign management system for the purpose of conforming to FHWA's requirement that agencies implement a program for the maintenance of minimum levels of retroreflectivity.
- ☑ Ensure compliance with minimum retroreflectivity requirements, dependent on sign type.

When a sign reaches the end of its life, it must be replaced. A sign management system helps track the expected life and helps schedule replacement. The figure below shows the decline of retroreflectivity with time.



Note that this chart assumes replacement of the sign when it reaches the scheduled replacement time.

What is a Sign Management Study?

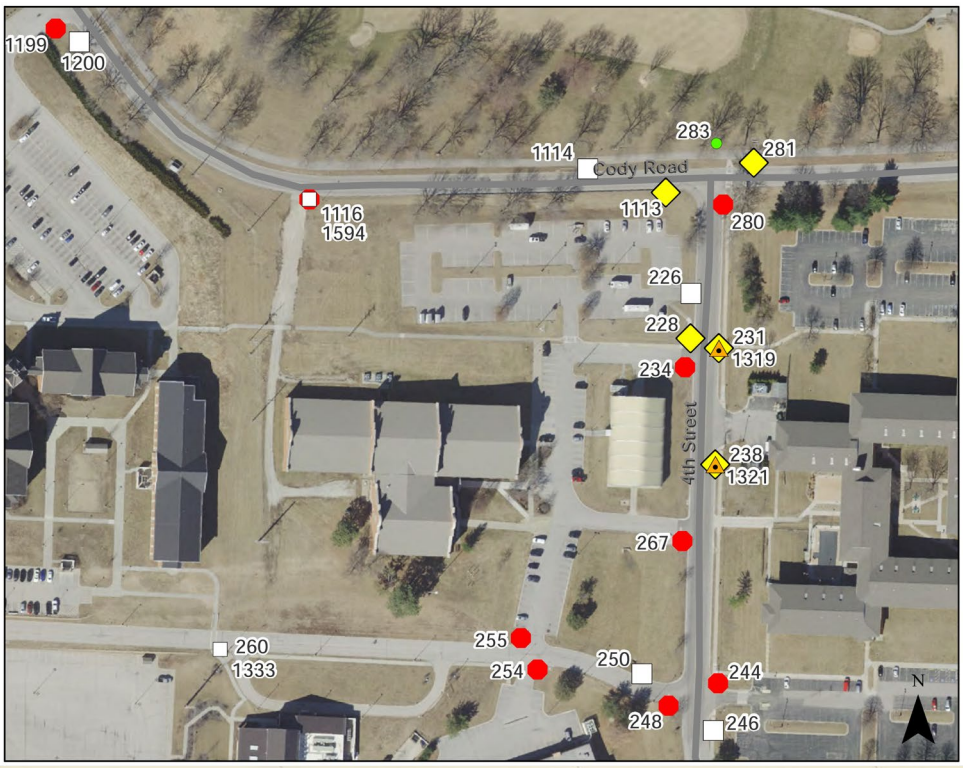
TEA is available to conduct sign management studies. A sign management study (SMS) includes a complete inventory of all installation traffic signs subject to the retroreflectivity requirements. The retroreflectivity must be assessed to verify that it is greater than the minimum and to estimate the remainder of its service life. Often a retroreflectometer is used to measure the actual retroreflectivity; but in reality, it is not necessary for the majority of signs. TEA has found that signs with good legends and microprismatic sheeting that is Type III or higher usually have significantly more than adequate retroreflectivity, and signs with Sheeting Types I and II must be replaced since they do not meet the minimum standards. In these cases, retroreflectivity readings are not necessary. The readings are necessary when a sign appears to be marginal; mainly when the sign still looks like it has service life remaining, but it is clearly several years old.

A SMS conducted by TEA goes beyond the minimum requirements and assesses the adequacy of the sign and its placement. This includes details on location, mounting height, presence of barrier or curb, and position with respect to traffic. It assesses the sign post, specifically if it lacks breakaway properties. It also assesses the actual sign, including the sign message, shape and size, background and legend colors, versus the standards. The study makes recommendations on and changes necessary to the sign message and its placement. It also recommends if a sign should simply be removed, or if a location requires that a sign be added.

The end product is a GIS database of all signs inventoried, containing a GPS point and all features collected, plus a photo of the sign. The intent is for the installation to keep the database current. If a sign is replaced, the database should be updated. If a project adds or removes signing, the database should be updated to remain current. Often included with the SMS are plan sheets showing each sign and if it has a priority level for replacement. This could be given to maintenance staff or a contractor for ease of sign replacement. An example plan sheet is shown as figure 5 on the following page.

Figure 5: SMS Plan Sheet Example

Signs												
SignID	Primary Sign	Proposed Sign	Proposed Post	MUTCD Sign Type	MUTCD Series Number	Existing/ Proposed Sign Size	Sign Replacement Size	Post Breakaway	Replace Sign	Remove Sign	Standard Regulatory/ Warning/ Sign Comments	Reflectivity Condition
226	Yes	No	No	Regulatory	R2-1 Speed Limit	24X30		Yes	No	No		Good
228	Yes	No	No	Warning	W11-2 Pedestrian	30X30		Yes	No	No		Good
231	Yes	No	No	Warning	W11-2 Pedestrian	30X30		Yes	No	No		Good
234	Yes	No	No	Regulatory	R1-1 Stop	30X30		Yes	No	No		Good
238	Yes	No	No	Warning	W11-2 Pedestrian	30X30		Yes	No	No		Good
244	Yes	No	No	Regulatory	R1-1 Stop	30X30		Yes	No	No		Good
246	Yes	No	No	Regulatory	R2-1 Speed Limit	24X30		No	No	No		Good
248	Yes	No	No	Regulatory	R1-1 Stop	30X30		Yes	No	No		Good
250	Yes	No	No	Regulatory	R2-1 Speed Limit	12X18		No	No	No	Not a formal road but appears to function as one	Poor
254	Yes	No	No	Regulatory	R1-1 Stop	24X24		Yes	No	No		Poor



Replacing Signs

When TEA performs a SMS, three methods are typically given by which to replace signs throughout the installation. These include:

- ☑ Blanket by Sign Type
- ☑ Blanket by Area
- ☑ Priority Method.

Blanket by Sign Type. With this method, all signs of the same type are replaced at the same time throughout the installation, starting with the most critical. In decreasing priority order, this would include all STOP signs, followed by speed limit signs and other regulatory signs, and lastly by warning and guide signs of different types. The advantage of this method is that the installation can purchase multiple of the same type of signs, then replace all of them. It may be simpler to order one thousand STOP signs versus one thousand signs of multiple different types. The disadvantage is that some signs may be replaced prematurely

Blanket by Area. With this method, the installation is divided into multiple sections containing about the same number of signs. The intent is to replace all signs at the same time in an area, then replace subsequent areas in defined time intervals - perhaps one area per year until all areas are complete and the cycle starts again. The advantage of this method is ease of replacement since all signs within an area are replaced, and it is easy to track sign replacement since they are all on the same replacement cycle. The disadvantage is that some signs may be replaced prematurely

Priority Method. With this method, all signs are assessed for changes by certain priorities, based on importance and criticality. With this, all signs within the priority are replaced at the same time, and different priorities can be addressed as funding is available. Some example priorities are shown on the following page. Priorities can vary based on the actual needs of the installation.

Example Sign Replacement Priorities

-	Clear vegetation obstructing signing (does not replace sign)
1	All Signs needing removal
2	Replace Yield with Stop where inappropriate type of intersection control
3	Speed Limit or Keep Right Sign smaller than 18x24 any location
4	Speed Limit or Keep Right Sign smaller than 24x30 (except housing) that is Single Lane (or multi-lane <= 35 mph)
5	Do Not Enter smaller than 30x30
6	YIELD Sign < 36x36 on Single Lane
7	Diamond Warning signs smaller than 36x36 (on multi-lane roads only)
8	Diamond Warning signs smaller than 24x24 (all other roads, i.e. local, housing)
9	W1-8 if smaller than 18x24
10	STOP Sign < 30x30 (non multi-lane)

The advantage of this method is that signs are replaced as needed and no earlier. This method also addresses deficiencies with signing, allowing for signing to be in compliance sooner than with other replacement methods. The disadvantage is that the signs could be located throughout the installation, so a crew replacing signs may require significantly more time to replace them due to travel. This is lessened; however, by using the GIS database developed as part of the study. The database uses GPS for exact sign location, so the crew should know exactly where to go to replace each sign.

The use of GPS technology is essential for the priority method. There are several different options for using GPS. Modern smart phones have built-in GPS capability with good accuracy. Devices are available with more precision, but as precision increases, so does cost. Using GPS from a smart phone is sufficient for locating signs for replacement.

Why is Sign Management Important?

In addition to providing a method to replace signs to maintain the retroreflectivity requirements, a sign management system provides a record of the signing that is in place in the event that a sign or multiple signs go missing. Without such a record, it can be difficult to know what sign(s) must be installed within a particular area. If a sign is missing, the sign management system can be referenced to identify the correct sign to install.

There are cases in point for military installations with and without a sign management system in place.

Hurricane Maria caused catastrophic damage to Puerto Rico in 2017. Damage was widespread, and much of the island had to be completely rebuilt, including the military bases. Fort Allen/Camp Santiago did not have a sign management system in place. As a result, the installation did not have any record of signing that needed to be replaced. It can be argued that the base and the island had more critical needs to respond to at the time, but the sign management system could have made this part easier when the appropriate time came to replace signing. While many signs, especially at intersections are straightforward, signs installed at non-intersection locations are not as obvious. In this example a signing plan had to be completely developed.

Fort Carson, Colorado was hit with extreme winds in January 2017 when the jet stream essentially down sloped off the mountains and into the installation and nearby communities. The day long storm produced straight line winds gusting to approximately 100 MPH. Among the damage to the installation, hundreds of traffic signs were ripped from their posts or from signal mast arms and scattered for miles. Fortunately, the installation had a sign management system in place, and as a result, they were able to easily replace the signs by giving the information directly to their contractor.

Mr. Bruce A. Busler, SES
Director, Transportation Engineering Agency

Contact Us

TRANSPORTATION ENGINEERING AGENCY (TEA)

1 Soldier Way
Scott Air Force Base, Illinois
62225-5006

DSN: 770-5218

FAX: 618-220-5125

EMAIL: army.sddc.safb.traffic@mail.mil

WEBSITE: http://www.sddc.army.mil/sites/tea
for pamphlets, bulletins and studies

Reference List

- ☑ TEA Home: http://www.sddc.army.mil/sites/tea
- ☑ *Better Military Traffic Engineering*, SDDCTEA Pamphlet 55-17. 2016. https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/TrafficEngineeringBranch/Pamphlets/SDDCTEA_Pamphlet_55-17.pdf
- ☑ Addendum to SDDCTEA Pamphlet 55-17, *Crosswalk Warrant and Guidelines*, 1 July 2021. https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/TrafficEngineeringBranch/Pamphlets/SDDCTEA_Pamphlet_55-17%20Addendum.pdf
- ☑ Federal Highway Administration: *Manual on Uniform Traffic Control Devices*, 2009 Edition with Revision Numbers 1 and 2 incorporated, dated May 2012. https://mutcd.fhwa.dot.gov/?vm=r
- ☑ Federal Highway Administration: *Standard Highway Signs*, 2004 Edition. https://mutcd.fhwa.dot.gov/ser-shs_millennium.htm