3 ISSUE BRIEFS

Traffic Control Devices: Uses and Misuses

Overview

Traffic control devices are signs, signals, pavement markings, and other devices placed along highways and streets to provide for the safe and efficient movement of all road users. Theses devices are placed in key locations to guide and regulate traffic movement, control vehicle speeds, and warn of potentially hazardous conditions. Traffic control devices also provide important information to users about detours and traffic delays. Traffic control devices at and in advance of intersections are of particular importance. Enough signing and marking must be provided to give the user important information—but not so much as to distract the user, thereby negatively affecting safety (See Figure 1). *Drivers are limited in their ability to read and comprehend information on traffic signs as a function of their speed and the amount of time to view and process the information on signs; information on signs beyond that limit are simply not read.*

Figure 1: A good example of clear and simple intersection signage

Functions of Traffic Control Devices

The main purpose of a traffic control device is to provide information to road users so they can safely move along a highway, street, pedestrian facility, or bikeway. The five basic criteria of a traffic control device, as defined by the *Manual on Uniform Traffic Control Devices* (MUTCD), are to do the following:

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

Signs, signals, pavement markings, object markers, and barricades are designed with dedicated colors, shapes, and sizes based on the different functions they perform. They regulate, guide, and warn users about road conditions. Uniformity of design (e.g., color, shape, size, and location) helps drivers to understand quickly the messages of traffic control devices. Consistency is important for driver attention, respect, and recognition and for proper reaction to the devices.

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Characteristics of Uniform Traffic Control Devices

Color. Certain colors are used to trigger instant recognition and reaction; for example, STOP signs are always red with white letters, and warning signs are always black lettering and symbols on a yellow background. Similarly, signals at intersections must have the same sequence of "green/yellow/red" to communicate "go/prepare to stop/stop" to drivers, bicyclists, and pedestrians. This color sequence is established to provide uniformity for all signals.

Figure 2: Illuminated street sign

Nighttime visibility. Traffic control devices are made visible under nighttime operating conditions through the use of lighting or retroreflective materials that bounce light from vehicle headlamps back to drivers' eyes. New retroreflectivity requirements have been developed by FHWA to help jurisdictions in this respect. For more information on sign retroreflectivity, see sections 2A.08 and 2A.09 of the 2003 MUTCD.

Daytime visibility. Traffic control devices are designed with highly visible colors or a sharp contrast of messages against a background.

Shape and size. Signs have standard shapes and sizes to help trigger instant recognition and reaction. For example, warning signs have a diamond shape that no other sign is permitted to have. There are similar specifications for the shapes and sizes of many other traffic control devices for both permanent and temporary conditions. Sign sizes are based upon highway class, with larger signs used on freeways and smaller sized signs used on bikeways. Larger signs are sometimes used to enhance road user safety.

Location and visibility. Traffic control devices must be placed in locations that provide enough time for drivers to read and understand the message the sign or signal is conveying and to subsequently react by safely making the appropriate maneuver, such as entering or departing a road, changing lanes, or stopping and turning to avoid conflicts with other vehicles and pedestrians. Visibility is just as important as the proper location. Signs and signals that are obscured by trees or poles will be less effective.

Messages. Traffic control devices are designed with carefully chosen symbols or word messages of specific sizes and content. Word messages should be as brief as possible with text that is large enough to provide adequate legibility from a distance. The use of symbols and abbreviations should conform to those outlined in the MUTCD.

Humans are not perfect when making decisions and some errors in judgment are inevitable. However, steps can be taken to help reduce the likelihood that driver errors will take place. Therefore, intersection design and features are important and should take the limitations of human performance into account.

How to Select the Correct Traffic Control Device

Traffic control devices work in concert with the basic "rules of the road" contained in traffic laws and ordinances, including each states' uniform code that regulates vehicle and pedestrian movements. One example is the "right-of-way" principle that determines which driver has priority when approaching or entering an intersection.

Traffic control devices have undergone a long evolution of design and installation criteria. Current designs and the standards for using them are the result of several decades of scientific investigation and the combined experience of many professional engineers, human behavior and vision researchers, and safety policymakers.

One of the major resources for determining the design and use of traffic control devices is the MUTCD. The 2003 edition of the MUTCD is the national standard applicable to all roads open to public travel. The MUTCD provides standards, guidance, and application information for signs, markings, traffic signals, and other traffic control devices. This document can be found on the FHWA Web site (http://mutcd.fhwa.dot.gov). As of November 2009, the MUTCD is undergoing a revision that could have an impact on the information presented in this brief.

The Traffic Control Devices Handbook produced by the Institute of Transportation Engineers (ITE) also is a good resource for information on traffic control devices. The handbook can be ordered through the ITE Bookstore at http://www.ite.org/bookstore.

Common Problems with Traffic Control Device Placement and Installation

Due to resource constraints, many jurisdictions do not have traffic engineers or traffic engineering technicians on staff. These jurisdictions may rely on personnel that may have an engineering background—but who are not specifically trained in traffic engineering—or on individuals without any engineering education. Knowledge of the standards, guidance, and applications included in the MUTCD is an essential element in the design, construction, operation, and maintenance of roadway segments and intersections. A few of the common problems with traffic control device placement and installation are provided below.

1. Use of an improper device. Placing an unwarranted traffic signal where a less restrictive control would be more appropriate may result in unnecessary delays, excessive violations, increased crashes, and diversion to less desirable routes, such as residential streets.

2. Improper placement. A traffic control device at the wrong location may result in the device being seen too late by drivers to react safely (e.g., placing a STOP AHEAD or SIGNAL AHEAD sign too close to an intersection to allow a driver adequate time to stop).

3. Wrong color, shape, or size. Using a color, shape, or size for a sign or

Figure 3: Green STOP Sign on a private residential driveway connecting with a major arterial roadway

other traffic control device that is in conflict with the MUTCD can result in the inability of drivers to detect and comprehend the need to make safe maneuvers and can cause inattention or visibility problems (e.g., "I didn't see the STOP sign.") Similarly, signs with text that is too small cannot be seen by road users, especially older drivers.

4. Land use, traffic, and other changes can cause existing traffic control devices to become obsolete. As an example, traffic signs that may have controlled the movement of vehicles and pedestrians for years may no longer be effective if surrounding land uses have changed.

5. Lack of signs or other devices to warn drivers, bicyclists, and pedestrians of unexpected, potentially hazardous conditions. For example, neglecting to provide advance warning of an upcoming signal or STOP sign over the top of a steep hill can result in inappropriate braking and steering maneuvers that may result in crashes.

6. Poor maintenance. Signs and pavement markings need to be maintained on a regular basis. Faded signs and pavement markings make traffic control devices harder for road users to detect and may lead to potentially dangerous situations. For example, faded STOP signs may lead to drivers entering an intersection without stopping. Nighttime visibility also must be maintained to comply with new retroreflectivity standards.

7. Overuse. If road users are overloaded with too many warning signs in an area, they may tend to ignore the signs and be surprised when they encounter a road hazard. Similarly, too many guide signs may confuse drivers or cause them to take their eyes off the road for too long.

8. Competing information. Placing devices too close to each other, especially when one of the devices has a message that is more important to the particular location, may distract or overwhelm a user. For example, placing a speed limit or warning sign near a complex guide sign may prevent a driver from making a critical decision in a timely manner.

Figure 4: Common Problems 3, 6, 8. The black on orange speed limit is an improper design of a regulatory sign as orange is for temporary traffic control warning sign color. Each message on the sign needs to be placed on separate posts spaced sufficiently apart so that drivers can recognize, read, and process the information and take appropriate action. There is also graffiti on the SPEED LIMIT sign, which is indicative of poor maintenance.

Resources

Manual on Uniform Traffic Control Devices. Washington, DC, USA: Federal Highway Administration, 2003. Accessible via http://mutcd.fhwa.dot gov.

Traffic Engineering Handbook, 6th Edition. Washington, DC, USA: Institute of Transportation Engineers, 2009. Available through the ITE bookstore via http://www.ite.org/bookstore.

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FHWA-SA-10-005