Warning Signs

Background

Warning signs provide important information that could lead to increased safety on roadways. Warning signs are used to call attention to conditions on or adjacent to a highway or street that may not be expected by or readily apparent to road users. Warning signs alert motorists to conditions that may call for some action on their part, such as a reduction in speed, and inform drivers of conditions that they are likely to encounter. Warning signs for which there is not an obvious, consistent need may cause motorists to ignore that type of sign even in locations where there is a consistent need for it. For this reason, overuse or misuse of warning signs is a significant concern.

Warning Sign Impact

A Minnesota Department of Transportation study reported that Traffic signing was found to reduce fatalities by 39% and non-fatal injuries by 15% with a benefit to cost ratio of 22.4.

Application and Design of Warning Signs

Typical Warning Sign (W4-2)

An effective warning sign must be visible, easily understood, and properly positioned. Signs should be highly visible both during the day and at night. All warning signs should be diamond shaped with a black legend and border on a yellow background unless specifically designated in the Manual on Uniform Traffic Control Devices (MUTCD). A fluorescent yellow-green background color with black legend and border may be used for conditions associated with pedestrians, bicyclists, playgrounds, and schools. Warning signs must be designed in accordance with the size, shapes, colors, and legends contained in the "Standard Highway Signs" book. See the Manual on Uniform Traffic Control Devices for more information on design specifications for warning signs. (MUTCD Chapter 2C)

Categories of Warning Signs

Category	Examples
Roadway Related: Alerts motorists to conditions involving changes in horizontal alignment, vertical alignment, cross section, and roadway surface condition.	Turn Curve Lane Drop
Traffic Related: Alerts motorists to conditions involving advance traffic control, traffic flow, change in speed, intersections, vehicular traffic, and non-vehicular traffic.	Stop Ahead Pedestrian Crossing
Supplemental Plaques: Includes distance, advisory speed, arrow, hill related, street name plaque, intersection, share the road, HOV, and traffic circle.	Advisory Speed Share the Road Traffic Circle

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Placement of Warning Signs

Because warning signs are used for drivers who may be unfamiliar with a roadway and its conditions, placement of these signs is critical to achieving the intended effect. Specifically, warning signs intending to elicit a response from a driver must be located far enough in advance for the driver to have sufficient time to react. The total time needed to perceive and respond to a warning sign is called the PIEV time, or the sum of the times necessary for:

- **Perception** (seeing the problem);
- **Identification** (understanding);
- **Emotion** (decision making); and
- **Volition** (execution of decision).

Typical Warning Sign (W1-10) *(Source: MUTCD)*

Specific equations for calculating this time can be found in the AASHTO *A Policy on Geometric Design of Highways and Streets*. Warning signs must be placed in a location which provides adequate PIEV time, but should not be placed too far in advance of the condition, as this will cause many motorists to forget the warning due to other distractions. The minimum spacing between warning signs with different messages should be based on both the PIEV time and the time required to complete the intended maneuver. A key factor to consider when placing a warning sign is the posted speed (see MUTCD Table 2C-4). This is important to ensure that the signs will be spaced far enough apart for the required decisions to be made safely by the road user. Warning signs should be located on the right side of the roadway, such that they:

1. Are outside the clear zone unless placed on a breakaway or yielding support;
2. Optimize nighttime visibility;
3. Minimize the effects of mud splatter and debris;
4. Do not obscure each other; and
5. Are not hidden from view.

In certain circumstances, such as a curve to the right, signs may be placed on median islands or on the left side of the road. Signs in locations other than the right side of the road should be considered as supplementary to signs in the normal locations, except as indicated in MUTCD Section 2A-16.

Application of Warning Signs

Warning signs should only be used when justified by engineering judgment or studies. The use of warning signs should be coordinated with the design of the roadway in order to ensure that signs are located such that they give the road user adequate warning. Each sign should be used only for the specific purpose outlined in the MUTCD. Signs that are required by certain road conditions must be removed when those conditions cease to exist. See the MUTCD for more information. (MUTCD Chapter 2A)

Important Reminder

Use of warning signs should be kept to a minimum, as overuse tends to breed disrespect for all signs.

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Excessive Use of Signs

The use of warning signs is determined by the physical conditions on or around the roadway and by field studies. All warning signs should fill a previously determined need, and should draw attention, as their purpose is defeated if they go unnoticed by road users. Signs should be located where hazards are not immediately evident to road users. Their use should be limited, as too many signs on a roadway can create visual clutter, which in turn can cause signs to get lost and lose effectiveness. An overabundance of signs is expensive and can cause confusion among motorists.

Consider an Example

Playground or children at play signs are meant to inform road users that they are entering a zone in which they are likely to consistently encounter children playing. If a playground sign is installed at a location in which children only occasionally play, road users will constantly see this sign with no apparent hazard, and eventually will begin to ignore the sign. This would defeat the purpose of installing the sign at locations in which it is actually necessary.

Typical Playground Sign (W15-1)

Sample Changeable Message Sign (CMS)

Changeable Message Signs

The use of changeable message signs is becoming more widespread. They are used to inform road users of variable situations, especially in areas with high volumes of traffic. When used to display a warning message, changeable message signs should use a black background with a white, yellow, orange, red, or fluorescent yellow-green legend as appropriate. Except for safety or transportation-related messages, changeable message signs should not be used to display information other than regulatory, warning, and guidance information related to traffic control.

Resources

Massachusetts Traffic Safety Toolbox Series

This series of fact sheets provides information on safety improvements that can be implemented at the local level. Information on problem areas, possible countermeasures, and implementation considerations is included in each fact sheet which can be found at www.mass.gov/mhd/safetytoolbox/

The Manual on Uniform Traffic Control Devices (MUTCD)

Published by the FHWA, the MUTCD defines the standards used by transportation professionals nationwide to install and maintain traffic control devices on all streets and highways. The most recent version (2003) can be found at http://mutcd.fhwa.dot.gov/

A Policy on Geometric Design of Highways and Streets

The AASHTO Policy, also known as the AASHTO "Green Book", is based upon established design practices, and is intended to provide guidance in roadway design. This document is available for purchase through AASHTO at https://bookstore.transportation.org/

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