

**National Committee on Uniform Traffic Control Devices
TECHNICAL COMMITTEE RECOMMENDATION**

Approved by NCUTCD Council – June 30, 2006

TECHNICAL COMMITTEE: **Regulatory/Warning Signs TC**

DATE OF ACTION: **Revised 06/02/05, Revised by RWSTC 06/22/05, Revised 4/6/06, Revised 4/29/06, Revised 4/21/06, Revised by RWSTC 06/29/06 Approved by NCUTCD Council 06/30/06**

REQUEST NUMBER:

TOPIC: Sign Sizes for Multi-lane Arterials, Sections 2A.06, 2A.12, 2A.16, 2A.17, 2B.03 and 2C.04.

DISCUSSION:

The basic principles of traffic control devices require them to command attention: convey a clear and simple meaning; and give adequate time for proper response (MUTCD Section 1A.02). These principles are met through adequate design and proper placement of a traffic control sign. A sign should be within the “Cone of Vision” to command attention, positioned to address the situation so the meaning is clear and provide the size and placement to provide legibility for adequate and proper response (Traffic Control Devices Handbook, Table 1-4, page 8). Concern has been expressed that some smaller sign sizes may not meet the road user needs on multi-lane arterials.

The provisions of the MUTCD address signing for Conventional Roads, Expressways, Freeways and Low Volume Roads. Generally, the sign sizes for Expressways and Freeways are larger recognizing the higher traffic volumes and higher operating speeds on these multi-lane, controlled access, facilities. A Conventional Road becomes any road, street or highway other than a low volume road, expressway or freeway. Accordingly, it can be urban/rural, high/low speed and two or more lanes. The sign size that may be adequate for a residential street, two-lane highway, or county road does not necessarily satisfy the road-user needs on a multi-lane, high volume, arterial. Considering that road-users have multiple driving tasks because of congestion, traffic signals and auxiliary lanes, does the smaller sign size meet their needs?.

The minimum letter size for most signs other than very low speed facilities has been established at 5 to 6 inches. With a legibility index of 40 ft/in as presently established by the MUTCD, that legend size provides 200 to 240 feet of legibility distance for a sign. The perception-response time (PRT) for this legibility distance at various speeds would be as follows, (ie. $200/50=4.0$ and $240/50=4.8$):

$$\text{Speed} = \text{Ft/Sec} \quad \text{PRT}$$

35	50	4.0 to 4.8 sec.
45	66	3.0 to 3.6 sec
55	80	2.5 to 3.0 sec.
65	95	2.1 to 2.5 sec.

These PRT's are adequate considering that most warning signs are installed in advance of a roadway condition based on Table 2C-4, MUTCD. Table 2C-4 provides under Condition A, Speed Reduction and Lane Changing in Heavy Traffic, sign placement for a driver decision sight distance of 14.0 to 14.5 seconds minus a sign legibility distance of 175 feet. The driver reaction and decision times after reading a sign appear to be accommodated.

A problem does begin to develop because of a driver's "Cone of Vision" (Traffic Control Devices Handbook, page 31). A sign may be identifiable but not necessarily legible within the driver's cone of vision at greater distances from the sign. As noted, the visual acuity of a driver drops off rapidly outside a 10 to 12 degree cone of vision. Based on the assumptions for Figure 2-3, Traffic Control Devices Handbook, page 31, the sign would be within a driver's cone of vision while driving in the right lane and as noted above also have satisfactory legibility. Signs installed outside the cone of vision require a driver to move their eyes or head and focus on the sign to be read. A sign installed outside the cone of vision also may not command sufficient attention to be detected by the driver and requires additional time for head/eye movement and repeated glances to read the sign. The time that a driver can assign to sign detection and comprehension is reduced in higher speed, heavy traffic, situations where a driver's cone of vision is narrowed down to 5 degrees to track other vehicles ahead and in adjacent traffic lanes. Therefore, while a sign may be readily legible within a satisfactory cone of vision from the right lane of a roadway, that cone of vision does not exist from the left lane and is even narrowed down as volumes and speed increase. Additionally, considering that higher traffic volumes generate a need for a multi-lane facility, it is safe to assume the traffic volumes will be higher on this type of facility. A sign would not be within the driver's cone of vision from the left lane until they are close to the sign and it would require head/eye movement and glance legibility. Furthermore, with the heavier traffic volumes on a multi-lane facility, there is a greater chance that other vehicles especially trucks will block the visibility of a ground mounted sign. Therefore, probability of sign detection is reduced, sign recognition may not occur, and legibility is compromised because of other vehicles, the number of traffic lanes and primary driving tasks.

There would appear to be several alternatives for enhancement of the sign detection and legibility on a multi-lane roadway facilities.

1. The one frequently used is duplicate signing in the median of the roadway placing a sign in the cone of vision on the driver's left. Redundant signing has been an effective method to improve driver traffic control compliance. It should be noted that a multi-lane facility with a non-traversable median is geometrically and operationally approaching the characteristics of an expressway that presently requires a larger sign size than conventional roads. However, a roadway with a painted median does not provide a location for redundant, left side, signing.
2. The other option would be to increase the sign letter size from 6 inches to 8 inches for signs installed on the right for multi-lane facilities.. This increases the sign

- legibility distance to 320 feet placing the sign within an 8 degree cone of vision at the sign legibility distance potentially enhancing the sign detection and comprehension. A review of the sign details in the Standard Highway Signs publication indicates that a 48x48 inch sign size is typically needed to provide an 8 inch sign legend. The sign sizes for Expressway warning signs are specified at 36x36 and 48x48 inches. Therefore, Expressway sign sizing would marginally satisfy the drivers requirements but not be quite as effective as redundant signing.
3. A third option would be to use overhead signing to improve sign detection and visibility. The cost of overhead signing precludes the wide spread use of overhead signs but could be a consideration for critical sign installations.

The best alternative would be the use of redundant signing on multi-lane facilities if a median exists for installation of redundant left hand signing. The secondary alternative would be to specify the installation of expressway size signs on multi-lane arterials although the 36"x36" warning sign size may fall a little short of the legend requirements. It would also be appropriate to review the sign sizes indicated for expressway signing to ensure that all signs that may be used on a multi-lane arterial are addressed in the sign size tables of the MUTCD. The overhead sign option should be considered for those critical sign installations where detection and legibility are of primary importance.

Accordingly, it is recommended that the following MUTCD revisions be approved to provide guidance and information addressing the multi-lane arterial requirements. Various sections have been modified to call attention to the multi-lane signing considerations.

This proposal was sent out to Sponsors after June 2005 and discussed by RWSTC 1/18/06 and then Tabled till June 2006.

The Sponsors had little comment on Section 2A.12, 2A.16, 2A.17 revisions. The major concerns were 2B.03 and 2C.04. The argument is that the larger sign sizes can not be used in all cases on multi-lane arterials because of the lack of lateral space back of curb to accommodate the larger sizes. Many urban, multi-lane arterials have sidewalks and limited rights-of-way so the border area is limited. Diamond sign widths are 42 inches for 30 x 30, 51 inches for 36 X 36, and 68 inches for 48 X 48 signs. Signs require a 2 foot minimum clearance behind curbs, a 3 foot minimum clearance with shared ped/bike paths, and 1.5 foot minimum clearance to sidewalks requiring 8 to 10 foot between the curb and sidewalk for the larger signs.

The proposal has been circulated to the RWSTC for comments in preparation for discussion at the June 2006 meeting. It was the consensus of the responders that we should revert back to the MUTCD text in Section 2A.06, 2A.12, 2A.16, and 2A.17. The only changes occur in Sections 2B.03 and 2C.04 relative to sizes of signs. We have made the use of Expressway sign sizes a "should" for multi-lane streets over 40 mph. It is recognized that some of these streets may not have adequate lateral rights-of-way to permit the larger sign sizes. However, because that right-of-way does not exist, it provides a sound basis for not using the larger sign sizes. Accordingly, the following proposal is recommended.

Section 2A.06 Design of Signs

Support:

The basic requirements of a highway sign that it be legible to those for whom it is intended and that it be understandable in time to permit a proper response. Desirable attributes include:

- A. High visibility by day and night, and
- B. High legibility (adequately sized letters or symbols, and a short legend for quick comprehension by a road user approaching the sign).

~~C. Left side signing, median installed signs or overhead signs on multi-lane facilities.~~

Note: Item “C” was originally included as a revision and then deleted by RWSTC since it is covered by Items “A” and “B”. Everyone agreed with this so we a reverting to the original MUTCD text.

Section 2A.12 Dimensions

Support:

.....Larger sizes are designed for use on freeways and expressways, and ~~can also be used to~~ enhance road user safety and convenience on other facilities, especially on multi-lane divided highways and ~~streets. on undivided highways having five or more lanes of traffic and/or high speeds.~~.....

Note: This revision was considered appropriate since this was the only location in the MUTCD where we used the wording, “undivided highways having five or more lanes”. **It has been suggested we go back to 2003 MUTCD text which captures the essence of what we are trying to do. Accordingly, we will revert to original MUTCD text that omits the items in “RED” and retains the items lined through.**

Section 2A.16 Standardization of Location

Option:

Under some circumstances, such as curves to the right, signs may be placed on median islands or on the left side of the roadway. A supplementary sign located on the left of the roadway ~~or in the median~~ may be used on a multi-lane road where traffic in the right lane might obstruct the view to the right.

The “or on the median” can be deleted reverting to the 2003 text since a highway is technically two roadways so on the left would cover the roadway. Accordingly, the revision “or in the median” will not be incorporated in the text.

Section 2A.17 Overhead Sign Installations

Option:

The following conditions (not in priority order) may be considered in an engineering study to determine if overhead signs would be beneficial:

- A. Traffic volume at or near capacity;
- B. Complex interchange design;
- C. ~~Three or more lanes in each direction: Multi-lane arterials;~~

(It has been suggested that we revert to the 2003 text as being more appropriate for consideration of overhead sign usage. Accordingly, Item C. becomes “Three or more lanes in each direction” which is the existing MUTCD text.)

2B.03 Size of Regulatory Signs

Guidance:

The Freeway and Expressway sizes should be used for higher-speed applications and on multi-lane arterials to provide larger signs for increased visibility and recognition.

The Expressway sizes should be used on multi-lane streets posted at 60 km/h (4540 mph) or higher to provide larger sizes for increased visibility and recognition.

2C.04 Size of Warning Signs

Guidance:

The Conventional Road size should be used on conventional roads.

The Freeway and Expressway sizes should be used for higher speed applications and on multi-lane arterials to provide larger signs for increased visibility and recognition.

The Expressway sizes should be used on multi-lane streets posted at 60 km/h (4540 mph) or higher to provide larger sizes for increased visibility and recognition.

VOTE:

For: 16

Opposed: 4

Abstained: 0