National Committee on
Uniform Traffic Control Devices

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NCUTCD Proposal for Changes to the Manual on Uniform Traffic Control Devices

TECHNICAL COMMITTEE:	Regulatory and Warning Signs Committee
ITEM NUMBER:	19A-RW-02
TOPIC:	HILL BLOCKS VIEW Sign
ORIGIN OF REQUEST:	RWSTC Discussions Task Force: Dan Paddick (Chair) Randy McCourt, Herman Hill, Dan Waddle, James Sullivan, Jeff Wolfe, Jim Pline
AFFECTED SECTIONS OF MUTCD:	Section 2C.18

DEVELOPMENT HISTORY: Task Force: 11/20/18, revised 1/10/19, updated 1/14/19

- Approved by RW Technical Committee: 01/10/2019
- Approved by RW Technical Committee Following Sponsor Comments: 06/19/2019
- Approved by NCUTCD Council: 06/20/2019

This is a proposal for recommended changes to the MUTCD that has been approved by the NCUTCD Council. This proposal does not represent a revision of the MUTCD and does not constitute official MUTCD standards, guidance, or options. It will be submitted to FHWA for consideration for inclusion in a future MUTCD revision. The MUTCD can be revised only by the FHWA through the federal rulemaking process.

SUMMARY:
In the late 1970's, Federal funding was made available for the first time to the States to perform, R&P, 3R or maintenance type paving projects. The LIMITED SIGHT DISTANCE (LSD) sign was developed to address the retention of non-standard vertical curves on these projects The HILL BLOCKS VIEW sign first appeared in the 2003 MUTCD. Both of these signs have been the subject of controversy since they first appeared in the MUTCD. The existing research on these signs and various limited visibility symbol signs have had inconsistent results. This proposal will consider the possibility of replacing the HILL BLOCKS VIEW sign with a symbol sign.

DISCUSSION:
The LSD sign first appeared in the 1978 MUTCD. The LSD sign (W14-4) was omitted from the 1988 MUTCD and it has not been included in any of the subsequent MUTCD's. The HILL BLOCKS VIEW sign (W7-6) first appeared in the 2003 MUTCD and is in 2009 MUTCD.

In the late 1970's, Federal funding was made available for the first time to the States to perform, R&P, 3R or maintenance type paving projects. These projects frequently involved the repaving of older highways that were not built to modern standards. There were numerous locations on these projects where the stopping sight distance was less than the modern design standard. Generally, it was uneconomical or impractical to improve the alignment of these roadways to attain the required sight distance standard. At these locations, the Federal Highway Administration insisted that either the speed limit be lowered to a value consistent with the available sight distance or that warning signs be installed to notify motorists of the substandard sight distance. The LSD sign was developed to address this situation.

An unintended consequence of this policy was the use of a relatively large number of LSD signs on isolated sections of highway that had recently been repaved. Adjacent to these repaved segments were long sections of highway with similar geometric limitations where the LSD sign was not being used. In New York State, the sign and its inconsistent use generated significant public comment. There was also concern within the NYSDOT's Traffic and Safety Division that the sign was not understood and that it was not performing its intended function. In February 1981, the NYSDOT released a study entitled *"Evaluation of Limited Sight Distance Warning Signs"*. The study concluded that:

1. At the LSD sign locations, the vehicle operating speeds were more closely related to the speed limit than the advisory speed on the LSD sign.
2. At the LSD sign locations vehicle operating speeds were found to be either essentially the same as, or significantly higher than when the LSD sign was not used. It was hypothesized that at some locations the advisory speed actually emboldened some drivers to go faster. Before, they were not able to see over the hill. Now they had some idea how bad the sight distance was and being better than they thought, they went faster than previously. The traditionally conservative method for setting the curve warning sign advisory speed may have also been a factor.
3. The before and after accident analysis was inconclusive due to a short after period. It was noted that only 3.3% of the accidents at the LSD sites had limited sight distance listed as a contributing factor.
4. The policy resulted in a proliferation of LSD signs relative to other warning signs on the R&P projects studied.
5. The LSD sign was the least understood sign on a motorist study conducted by the NYSDOT

The NYSDOT study recommended that the FHWA pursue a further evaluation of the sign. The FHWA did conduct a study. It was entitled "*Limited Sight Distance Warning for Vertical Curves"* Report No. FHWA/RD-85/046. This was a fairly comprehensive study of the issue. In the preliminary stages, thirteen word message signs and ten symbol signs were considered. After a review by 41 respondents, these signs were whittled down to three word message signs and three symbol signs. The word signs were the LSD sign, a CAUTION HILL BLOCKS VIEW sign and a SLOW HILL BLOCKS VIEW sign. The symbol signs were side views. The first depicted one vehicle approaching a hill crest. The second, a vehicle on both approaches of the hill crest. The third a single vehicle approaching the hill crest with an obstruction in the road on the opposite side of the hill crest. These signs were tested in the lab and the best symbol, the best word sign and the LSD sign were tested in the field. In the lab, the SLOW HILL BLOCKS

VIEW sign was the best word sign and the LSD the worst. The two-vehicle sign was judged the best symbol sign. The symbol signs were correctly identified 50% more often than the word signs in the simulation test. In the field test, both the word sign and the symbol sign outperformed the LSD sign but neither sign was very effective in influencing test subjects to reduce speed. It was the recommendation of the study that none of the signs be used and that the LSD sign be eliminated from the MUCTD. This study was completed a couple of years before FHWA eliminated the LSD sign from the 1988 MUTCD.

In April 2010 Canada's Traffic Operations and Management Standing Committee (TOMSC) published a paper entitled Final Report for Project No. 254 "*Vertical Visibility Constraint Signs."*

They found that many Jurisdictions were encountering situations where there was inadequate sight distance provided on vertical crest curves. At that time, unlike the situation for horizontal curves, there was no sign for such situations in the MUTCDC. Road designers were becoming reluctant to stamp design drawings at locations where the road did not meet the minimum standards.

In December 2003, a questionnaire was sent to all TOMSC members. Twenty-five (25) responses were received. The results of the questionnaire showed that there was no clear choice for the Vertical Visibility Constraint Sign. There was however, a clear recommendation for the tab sign that should be used (i.e. "Limited Visibility"). Results indicated that a pictorial sign was preferred over a text only sign as used in the MUTCD (US). (Figure 1) It was also clear that the respondents wished to utilize a "Limited Visibility" tab in conjunction with whatever sign was adopted.

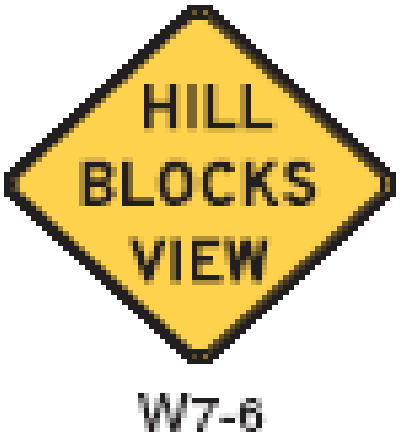

Figure 1

Figure 2

Figure 3

Based on the questionnaire results, a comprehensive testing was undertaken by Professor Alison Smiley of the University of Toronto. Participants were asked what they thought the sign meant and what a driver should do in response to the sign. Their exact responses were recorded and an explanation of the sign was provided if subjects did not answer correctly. The participants were then shown both (Figure 2) and (Figure 3), with and without a supplementary tab, and were asked to choose the alternative that best conveys the meaning of the sign.

The study concluded that the Limited Visibility Sign with supplementary tab (Figure 2) was easy to understand. It was recommended that a Limited Visibility Sign (Figure 2) with supplementary tab be added to the MUTCDC.

The fourth and final research study was the Pooled Fund Study. The results were presented in the
December 2017, Final Report of the Traffic Control Devices Pooled Fund Study entitled "*Comprehension and Legibility of Selected Symbol Signs, Phase IV*."

The study states "Though vertical curves can obscure key roadway features or activity that might lie ahead of an unaware driver and therefore represent a critical safety event, there is no well-accepted traffic control device for warning drivers of vertical curvature. The HILL BLOCKS VIEW sign and LIMITED SIGHT DISTANCE sign have demonstrated limited success in conveying messages related to limited sight distance."

The following alternative blind hill warning signs were evaluated.

Alt. 1	Alt. 2	Alt. 3	Alt. 4
			

Participants were posed an open-ended question to assess comprehension of these blind hill warning signs. The sign was placed in-context near the crest of a hill. They were asked "Imagine you are driving and encounter this sign. What does this sign mean?" Participant responses were coded based on the following:

A. Mention of a sight obstruction and a hill/mountain/similar
B. Mention of a hill (but no sight obstruction)
C. Mention of a sight obstruction (but no hill)
D. Use caution (but no specifics as to why)
E. Other

A summary of the responses are presented in the following table. The percentage of participant responses within each coded category for each alternative**.**

Sign Alternative	A Sight Obstruction + Hill %	B. Hill%	C. Sight Distance Obstruction %	D. Use Caution %	E. Other %
Alt. 1	58.0	2.0	28.0	8.0	4.0
Alt. 2	14.0	84.0	0.0	0.0	2.0
Alt. 3	50.0	16.0	12.0	18.0	4.0
Alt. 4	34.0	38.0	6.0	10.0	12.0

Next, participants were told the intended meaning of the blind hill warning sign. The four sign alternatives were presented and the participants were asked to rank them in terms of perceived effectiveness. When considering only the top choice indicated by the participants (Ranking = 1), Alternative 1 was selected as the top choice by the majority of participants (65.5 percent). The data helps support that the blind hill warning signs were usually preferred by the participants in the following order: Alternative 1, Alternative 3, Alternative 2, Alternative 4.

Legibility was also studied. The results are shown in the following table:

Alternative	Mean Distance (ft)
Alt. 1	439.14
Alt. 2	424.89
Alt. 3	371.71
Alt. 4	367.29

Alternate 1, the HILL BLOCKS VIEW sign had the best legibility distance. Alternate 3 had the had the third best legibility distance.

Answers A and C in the first table identified a sight distance obstruction as being the problem. In eighty-six percent of the responses to Alternate 1 either A or C was chosen. This indicates that the responders got the message that there was a sight distance restriction. Alternate 3 was the next best with 62%. Alternate 4 had 40%. Alternate 1 was the best for comprehension and for legibility distance. Alternate 3 was second for understanding and had the third best legibility distance.

The Pooled Fund Study did not consider the use of a supplemental plaque. In the Canadian study the symbol signs with a supplement plaque were favored over the symbol signs without the supplemental plaque.

In summary, the four studies concluded:

1. The NYSDOT concluded that the LSD sign was not understood and its use did not result in lower vehicles speeds.
2. In the FHWA study, the symbol signs were correctly identified 50% more often than the word signs in the simulation test. In the field test, both the word sign and the symbol sign outperformed the LSD sign but none of the signs were very effective in influencing test subjects to reduce speed.
3. Canadian study concluded that the Limited Visibility sign (symbol) with supplementary tab (Figure 2) was easy to understand and should be used.
4. The Pooled Fund Study concluded that the HILL BLOCK VIEW sign had the best comprehension and legibility distance. The comprehension of the most effective symbol sign was 24% worse than the legend sign and its legibility distance was 14 % shorter. Symbol signs with a supplemental plaque were not considered.

Based on these studies it is not conclusive that the HILL BLOCKS VIEW sign should be replaced with a symbol sign. Three of the studies (NYSDOT, FHWA and Canadian) concluded that the legend signs were ineffective. One study (Canadian) concluded that the symbol sign should be used. One study (FHWA) concluded that none of the signs should be used. One study (Pooled Fund) concluded that the legend sign was the best understood and had the best legibility distance. But, symbol signs with a supplemental plaque were not considered in this study.

These results were discussed at the RWSTC meeting on June 20, 2018. It was the general consensus that the Task Force prepare a proposal for a symbol sign similar to Figure 2 of the

Canadian study. The consensus was that the LIMITED VISIBILITY plaque should be replaced with a HILL BLOCKS VIEW plaque or an OBSTRUCTED VIEW plaque. However, Sponsor comments indicated that there was considerable opposition to the RWSTC consensus. Upon review of the Sponsor comments it was decided to retain the HILL BLOCKS VIEW sign.

It was also the consensus of the RWSTC that a paragraph be added stating that it was preferable to sign for the specific potential hazard beyond the crest (i.e. Curve Warning, Intersection, STOP AHEAD, etc.) rather than using the general blind hill sign.

RECOMMENDATIONS

1. Retain the existing HILL BLOCKS VIEW (W7-6) sign.
2. Downgrade the use of the Advisory Speed plaque to an Option from a Guidance. Section 2C.08 already allows this option so no new text is needed. The original NYSDOT study found that the use of the Advisory Speed plaque was counterproductive. Approach speeds actually increased when the plaque was used. Since Section 2C.08 already allows the optional use of an Advisory Speed plaque with any warning sign delete any mention of the Advisory Speed plaque in this Section.
3. Add a Guidance paragraph stating that the sign for specific potential hazard beyond the crest (i.e. Curve Warning, Intersection, STOP AHEAD, etc.) should be used rather than the general OBSTRUCTED VIEW sign.

RECOMMENDED MUTCD CHANGES

The following present the proposed changes to the current MUTCD within the context of the current MUTCD language. Proposed additions to the MUTCD are shown in blue underline and proposed deletions from the MUTCD are shown in ~~red strikethrough~~. Changes previously approved by NCUTCD Council (but not yet adopted by FHWA) are shown in green double underline for additions and ~~green double strikethrough~~ for deletions. In some cases, background comments may be provided with the MUTCD text. These comments are indicated by [highlighted light blue in brackets].

Section 2C.18 HILL BLOCKS VIEW Sign (W7-6)

Option:

~~01 A HILL BLOCKS VIEW (W7-6) sign (see Figure 2C-4) may be used in advance of a crest vertical curve to advise road users to reduce speed as they approach and traverse the hill as only limited stopping sight distance is available.~~

~~*Guidance:*~~

~~*02 When a HILL BLOCKS VIEW sign is used, it should be supplemented by an Advisory Speed (W13-1P) plaque indicating the recommended speed for traveling over the hillcrest based on available stopping sight distance.*~~

01a A HILL BLOCKS VIEW (W7-6) sign (see Figure 2C-4) may be used on the approach to a crest vertical curve where the vertical curvature provides inadequate stopping sight distance at the posted speed limit.

Guidance:

01b When a vertical curve results in a sight distance obstruction to a specific beyond the crest of the vertical curve, the sign for the specific condition beyond the vertical crest should be used

rather than the HILL BLOCKS VIEW (W7-6) sign. Some examples are the Curve Warning W1 series, Intersection W2 series, STOP AHEAD W3 series, RR Crossing W10 series, Crosswalk/Crossings W11 series, etc.