

minimize any impact on State or local governments.

79. In Section 2C.33 Lane Ends Signs (W4-2, W9-1, W9-2) (numbered Section 2C.30 in the NPA), the FHWA changes the title of the section to reflect the addition of the Lane Ends (W4-2) sign (referred to as the Lane Reduction sign in the NPA.) This symbol sign was included in the 1988 edition of the MUTCD but in the 2000 Edition of the MUTCD it was deleted from Part 2 due to poor comprehension of the 1988 symbol by road users. However, in Part 6 of the 2000 MUTCD this symbol sign continued to be shown in many of the figures, particularly for the Typical Applications in Chapter 6H, and therefore this symbol sign has continued to be widely used by State and local highway agencies.

The FHWA believes that a symbolic sign for the Lane Ends message continues to be needed and in the NPA the FHWA proposed changes the design of the Lane Ends (W4-2) symbol sign to improve comprehension by road users. The FHWA received nine comments from the NCUTCD, the Minnesota DOT, and private citizens opposed to the new sign design and five comments from the Oregon, Virginia and Wisconsin DOTs as well as private citizens in support of the new sign design.

The opposing commenters suggested that the new design would not be understood and also stated that there was not sufficient research to support the new design. An FHWA human factors research project<sup>18</sup> has found that road users very poorly comprehend the meaning of the previous design of the W4-2 sign. The research found that the old design is commonly misinterpreted to mean "merge ahead" or "road narrows" and does not adequately convey the intended message of a lane ending (reduction in the number of lanes.) This research also evaluated an alternative design similar to the design used in Canada but with more graphic elements (bent arrows.) This study found that comprehension of the tested alternative symbol was much better than the old W4-2 design, but because of the complexity of the added graphical elements (arrows) the legibility distance was less than that of the old W4-2 design. The FHWA adopts a revised design for the W4-2 sign that is identical to the design used in Canada

for several decades. A study in Canada<sup>19</sup> found the Canadian symbol sign to be legible in the range of 70 to 200 meters, which is better legibility than most symbols. The FHWA adopts this design in this final rule because the long-standing Canadian use of this sign indicates it is successful and because having a uniform design between the U.S. and Canada will benefit cross-border travelers. Several State DOTs suggested that the OPTION allowing jurisdictions to modify the Lane Ends sign to represent the actual road lane configuration be removed. The FHWA agrees and eliminates the OPTION allowing the sign to be modified. The adopted sign design conveys that the number of lanes is being reduced by one, regardless of how many total lanes are on the roadway. The FHWA establishes a phase-in target compliance date of 10 years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

Additionally, the FHWA adds the Lane Ends (W4-2) symbol sign to the first and second GUIDANCE statements and to the OPTION statement, indicating that the W4-2 symbol sign is an alternative to the LANE ENDS MERGE LEFT (RIGHT) (W9-2) word sign. This will provide additional flexibility to jurisdictions. The FHWA received one comment from Caltrans opposed to this change, stating that allowing the option to use word or symbol signs will lead to motorist confusion. The FHWA disagrees because there are many examples in the MUTCD where jurisdictions may choose between symbol signs and word message signs and there is no data indicating this causes confusion. Also, this provides jurisdictions with more flexibility. The FHWA adopts this change, as proposed in the NPA, in this final rule.

80. In Section 2C.34 Two-Way Traffic Sign (W6-3) (numbered Section 2C.31 in the NPA), the FHWA adds to the GUIDANCE statement that a Two-Way Traffic sign with an AHEAD (W16-9P) plaque should be used to warn road users of a transition from a one-way street to a two-lane, two-way section of roadway. The FHWA makes this addition in response to three comments received from private citizens regarding this section and a figure in Section 2B.37 ONE WAY Signs (R6-1, R6-2) (numbered 2B.32 in the NPA), where

use of the sign is also illustrated, indicating that this revision should be made to clarify the text. The most common use of the W6-3 sign is along sections of two-lane, two-way roadways. In the specific case that is illustrated in Section 2B.37, the W6-3 sign is posted on the one-way street, in advance of where it changes to a two-way road. Therefore, the use of an AHEAD plaque with the W6-3 sign is recommended to enhance safety by minimizing possible misinterpretation of the meaning of the sign in that particular application. The FHWA establishes a phase-in target compliance date of five years from the effective date of this final rule for existing signs in good condition to minimize any impact on State or local governments.

81. In Section 2C.36 Advisory Exit, Ramp, and Curve Speed Signs (W13-2, W13-3, W13-5) (numbered Section 2C.33 in the NPA), the FHWA changes the design of the metric exit speed, ramp speed, and curve speed signs, and advisory speed signs/plaques so that the metric speed value is within a black circle with "km/h" below. This new design better differentiates between warning signs and plaques with metric units for speed from those using English units for speed. The FHWA received two comments from ATSSA and the City of Tucson, Arizona, in overall support of changes in this section. Three commenters representing the Minnesota and Ohio DOTs and a private citizen opposed the design of the metric exit speed sign, stating that this non-standard sign may not be recognized and understood by motorists. The FHWA disagrees and, consistent with decisions regarding the R2-1 sign in Chapter 2B, the FHWA adopts the metric exit speed sign as proposed in the NPA.

The FHWA received one comment from the Oregon DOT opposed to the first STANDARD statement regarding the use of the RAMP SPEED sign in addition to the EXIT SPEED sign, stating that the added signs clutter the sign environment and that the warning can more easily be handled with proper curvature signs with advisory speed plaques. The commenter suggested that the RAMP SPEED signs be an OPTION rather than a STANDARD. While the FHWA does not agree with removing the RAMP SPEED sign from the STANDARD, the FHWA adds a new OPTION paragraph stating that a Curve or Turn sign with Advisory Speed plaque may be used in place of a Ramp Speed sign if it is located such that it clearly does not apply to drivers on the main roadway. The NCUTCD suggested that all of the references to curves and

<sup>18</sup> "Evaluation of Selected Potential MUTCD Signs," by Alicandri and Wochinger, 2000, Federal Highway Administration (FHWA) report number FHWA-RD-00-053, is available from FHWA Turner-Fairbank Highway Research Center, 6300 Georgetown Pike, McLean, Virginia 22101, or through their web site at the following URL: <http://www.tfhrc.gov>.

<sup>19</sup> "Age Differences in the Legibility of Symbol Highway signs," by Frank Schieber and Donald Kline, 1994, is available for downloading at the University of South Dakota's Web site at the following URL: <http://www.usd.edu/~schieber/pdf/signs.pdf>.