National Committee on Uniform Traffic Control Devices

JOINT TASK FORCE GM & I/RWSC/ SIGNALS RECOMMENDATION
FOLLOWING SPONSOR COMMENTS

TECHNICAL COMMITTEE: NCUUTC Regulatory/Warning Signs Technical Committee, Signals Technical Committee, GM & I Technical Committee

DATE OF ACTION: 11-27-11, revised 12-4-11, revised 1-19-12, revised 12-9-12 following sponsor comments, revised 1-10-13 following sponsor comments

Reviewer: Tom Heydel
Task force: Tom Heydel (RWSTC task force chair), Kathy Falk (GM & I), John Hibbard (Signals)

RWSTC APPROVAL DATE: 1-9-13
SIGNAL TECHNICAL COMMITTEE APPROVAL DATE: 1-9-13
GM & I TECHNICAL COMMITTEE APPROVAL DATE: 1-10-13
TRANSMITTAL TO SPONSORS DATE: Fall 2012
COUNCIL APPROVAL DATE: 1-11-13

TOPIC: Overhead signing - Center over lane, Sections 2B.26, 2B.54, 2D.08, 2D.33, 2E.19, 2E.21, 2E.24, 2F.14, 2F.15, 2F.16, 4D.11, 4I.02, 4K.02, 4L.02, 4M.03, 4N.02 and proposed section 2E.XX

Standard statements modifications in Section 2B.26.

AFFECTED PORTIONS OF MUTCD: Parts 2B, 2D, 2E, 2F, 4D, 4I, 4K, 4L, 4M and 4N

DISCUSSION/QUESTION: The 2009 MUTCD uses the term “approximate center of the lane” and “center of the lane” in different sections of the MUTCD. A consistent term is needed throughout the manual to avoid confusion. It was found that there are various texts in Part 2B, 2D, 2E, 2F, 4D, 4I, 4K, 4L, 4M and 4N that use one of these two terminologies. Accordingly, the proposal below makes them all consistent by using...
“approximate center of the lane” or “approximate center of each lane” as applicable for the specific case.

Part 2B.26 (paragraph 12) – remove the words “be carefully reviewed” since that requires judgment in a standard statement.

Part 2B.26 (paragraph 13) there needs to be an allowance that the R3-9g or R3-9h signs are not required when there is a longitudinal barrier separating the reversible lanes since drivers do not need to be advised of the end or beginning of a reversible lane in that situation.

Part 2B.26 (paragraph 19) – provide for consistency in parking signs and reversible lane signs to avoid confusion.

RECOMMENDATION: Revise Parts 2B, 2E, 2D, 2F, 4D, 4I, 4K, 4L, 4M and 4N for consistency regarding “centering a sign over a lane”.

Note: Proposed changes to the MUTCD are shown in underline red and removed text are shown in strikethrough red.

RECOMMENDED WORDING:

Section 2B.26 Reversible Lane Control Signs (R3-9e through R3-9i)

Option:

A reversible lane may be used for through traffic (with left turns either permitted or prohibited) in alternating directions during different periods of the day, and the lane may be used for exclusive left turns in one or both directions during other periods of the day as well. Reversible Lane Control (R3-9e through R3-9i) signs (see Figure 2B-6) may be either static type or changeable message type. These signs may be either post-mounted or overhead.

Standard:

Post-mounted Reversible Lane Control signs shall be used only as a supplement to overhead signs or signals. Post-mounted signs shall be identical in design to the overhead signs and an additional legend such as CENTER LANE shall be added to the sign (R3-9f) to indicate which lane is controlled. For both word messages and symbols, this legend shall be at the top of the sign.

Where it is determined by an engineering study that lane-use control signals or physical barriers are not necessary, the lane shall be controlled by overhead Reversible Lane Control signs (see Figure 2B-7).

Option:

Reversing traffic flow may be controlled with pavement markings and Reversible Lane Control signs (without the use of lane control signals), when all of the following conditions are met:

A. Only one lane is being reversed,
B. An engineering study indicates that the use of Reversible Lane Control signs alone would result in an acceptable level of safety and efficiency, and
C. There are no unusual or complex operations in the reversible lane pattern.

Standard:

05 Reversible Lane Control signs shall contain the legend or symbols designating the allowable uses of the lane and the time periods such uses are allowed. Where symbols and legends are used, their meanings shall be as shown in Table 2B-2.

06 Reversible Lane Control signs shall consist of a white background with a black legend and border, except for the R3-9d sign, where the color red is used.

07 Symbol signs, such as the R3-9d sign, shall consist of the appropriate symbol in the upper portion of the sign with the appropriate times of the day and days of the week below it. All times of the day and days of the week shall be accounted for on the sign to eliminate confusion to the road user.

08 In situations where more than one message is conveyed to the road user, such as on the R3-9d sign, the sign legend shall be arranged as follows:
A. The prohibition or restriction message is the primary legend and shall be on the top for word message signs and to the far left for symbol signs,
B. The permissive use message shall be displayed as the second legend, and
C. The OTHER TIMES message shall be displayed at the bottom for word message signs and to the far right for symbol signs.

Option:

09 The symbol signs may also include a downward pointing arrow with the legend THIS LANE. The term OTHER TIMES may be used for either the symbol or word message sign.

Standard:

10 A Reversible Lane Control sign shall be mounted over the approximate center of the lane that is being reversed and shall be perpendicular to the roadway alignment.

11 If the vertical or horizontal alignment is curved to the degree that a driver would be unable to see at least one sign, and preferably two signs, then additional overhead signs shall be installed. The placement of the signs shall be such that the driver will have a definite indication of the lanes specifically reserved for use at any given time. Special consideration shall be given to major generators introducing traffic between the normal sign placement.

12 Transitions at the entry to and exit from a section of roadway with reversible lanes shall be carefully reviewed, and include advance signs shall be installed to notify or warn drivers of the boundaries of the reversible lane controls. The R3-9g or R3-9h signs shall be used for this purpose.

Option:

13 More than one sign may be used at the termination of the reversible lane to emphasize the importance of the message (R3-9i).

Where longitudinal barriers separate opposing directions of traffic, the R3-9g or R3-9h signs are not required.

Standard:
Flashing beacons, if used to accentuate the overhead Reversible Lane Control signs, shall comply with the applicable requirements for flashing beacons in Chapter 4L.

When used in conjunction with Reversible Lane Control signs, the Turn Prohibition signs (R3-1 to R3-4, R3-18) shall be mounted overhead and separate from the Reversible Lane Control signs. The Turn Prohibition signs shall be designed and installed in accordance with Section 2B.18.

Guidance:
For additional emphasis, a supplemental plaque stating the distance of the prohibition, such as NEXT 1 MILE, should be added to the Turn Prohibition signs that are used in conjunction with Reversible Lane Control signs.

If used, overhead signs should be located at intervals not greater than 1/4 mile. The bottom of the overhead Reversible Lane Control signs should not be more than 19 feet above the pavement grade.

Where more than one sign is used at the termination of a reversible lane, they should be at least 250 feet apart. Longer distances between signs are appropriate for streets with speeds over 35 mph, but the separation should not exceed 1,000 feet.

Because left-turning vehicles have a significant impact on the safety and efficiency of a reversible lane operation, if an exclusive left-turn lane or two-way left-turn lane cannot be incorporated into the lane-use pattern for a particular peak or off-peak period, consideration should be given to prohibiting left turns and U-turns during that time period.

Guidance:
Where curb parking is prohibited during only certain times of day, the use of reversible lane variable signs should be consistent in message with parking signs during the same operational periods.

Section 2B.54 No Turn on Red Signs (R10-11 Series, R10-17a, and R10-30)

Standard:
Where a right turn on red (or a left turn on red from a one-way street to a one-way street) is to be prohibited, a symbolic NO TURN ON RED (symbolic circular red) (R10-11) sign (see Figure 2B-27) or a NO TURN ON RED (R10-11a, R10-11b) word message sign (see Figure 2B-27) shall be used.

Guidance:
If used, the No Turn on Red sign should be installed near the appropriate signal head.

A No Turn on Red sign should be considered when an engineering study finds that one or more of the following conditions exists:

A. Inadequate sight distance to vehicles approaching from the left (or right, if applicable);
B. Geometrics or operational characteristics of the intersection that might result in unexpected conflicts;
C. An exclusive pedestrian phase;
D. An unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially involving children, older pedestrians, or persons with disabilities;

E. More than three right-turn-on-red accidents reported in a 12-month period for the particular approach; or

F. The skew angle of the intersecting roadways creates difficulty for drivers to see traffic approaching from their left.

Option:

04 A supplemental R10-20aP plaque (see Figure 2B-27) showing times of day (similar to the S4-1P plaque shown in Figure 7B-1) with a black legend and border on a white background may be mounted below a No Turn on Red sign to indicate that the restriction is in place only during certain times.

05 Alternatively, a blank-out sign may be used instead of a static NO TURN ON RED sign, to display either the NO TURN ON RED legend or the No Right Turn symbol or word message, as appropriate, only at certain times during the day or during one or more portion(s) of a particular cycle of the traffic signal.

06 On signalized approaches with more than one right-turn lane, a NO TURN ON RED EXCEPT FROM RIGHT LANE (R10-11c) sign (see Figure 2B-27) may be post-mounted at the intersection or a NO TURN ON RED FROM THIS LANE (with down arrow) (R10-11d) sign (see Figure 2B-27) may be mounted directly over the approximate center of the lane from which turns on red are prohibited.

Guidance:

07 Where turns on red are permitted and the signal indication is a steady RED ARROW, the RIGHT (LEFT) ON RED ARROW AFTER STOP (R10-17a) sign (see Figure 2B-27) should be installed adjacent to the RED ARROW signal indication.

Option:

08 A RIGHT TURN ON RED MUST YIELD TO U-TURN (R10-30) sign (see Figure 2B-27) may be installed to remind road users that they must yield to conflicting u-turn traffic on the street or highway onto which they are turning right on a red signal after stopping.

Section 2D.08 Arrows

Standard:

02 On overhead signs where it is desirable to indicate a lane to be followed, a down arrow shall be positioned approximately over the approximate center of the lane and shall point vertically downward toward the approximate center of that lane. Down arrows shall be used only on overhead guide signs that restrict the use of specific lanes to traffic bound for the destination(s) and/or route(s) indicated by these arrows. Down arrows shall not be used unless an arrow can be located over and pointed to the approximate center of each lane that can be used to reach the destination displayed on the sign.

Section 2D.33 Combination Lane-Use/Destination Overhead Guide Sign (D15-1)

Standard:
The Combination Lane-Use/Destination (D15-1) overhead guide sign shall be used only where the designated lane is a mandatory movement lane. The D15-1 sign shall not be used for lanes with optional movements.

The D15-1 sign shall have a green background with a white border. As shown in Figure 2D-7, the lane-use sign (see Chapter 2B) shall be placed near the bottom of the sign and the destination information shall be placed near the top of the sign. The D15-1 sign shall be located approximately over the approximate center of the lane to which it applies.

Section 2E.19 Arrows for Interchange Guide Signs

Standard:

Directional arrows on guide signs for multi-lane exits shall be positioned approximately over the approximate center of each lane to which the arrow applies (see Figures 2E-4 and 2E-8).

On overhead signs where down arrows are used to indicate a lane to be followed, a down arrow shall be positioned approximately over the approximate center of each lane and shall point vertically downward toward the approximate center of that lane. Down arrows shall be used only on overhead guide signs that restrict the use of specific lanes to traffic bound for the destination(s) and/or route(s) indicated by these arrows. Down arrows shall not be used unless an arrow can be located over and pointed to the approximate center of each lane that can be used to reach the destination displayed on the sign.

If down arrows are used, having more than one down arrow pointing to the same lane on a single overhead sign (or on multiple signs on the same overhead sign structure) shall not be permitted.

Section 2E.21 Design of Overhead Arrow-per-Lane Guide Signs for Option Lanes

Standard:

Overhead Arrow-per-Lane guide signs used on freeways and expressways shall include one arrow above each lane and shall be designed in accordance with the following criteria:

A. The sign shall include an upward-pointing arrow for each lane of the approach to the split or exit, and the shaft of each arrow shall be located approximately over the approximate center of the lane to which it applies.

B. Arrows for continuing through lanes shall be vertically upward pointing (see Figure 2E-4) unless those lanes are on a significantly curved alignment beyond the theoretical gore, in which case the arrows for the continuing through lanes shall indicate the approximate degree of curvature (see Figure 2E-5).

C. The arrow for a lane that must exit shall be curved in the direction of the exit and shall be accompanied by black-on-yellow EXIT (E11-1a) and ONLY (E11-1b) sign panels adjacent to the lower end of the arrow shaft.
The E11-1a and E11-1b sign panels shall not be used for a split of two overlapping routes where neither of the diverging routes is designated as an exit. Where the through lanes curve and the exit continues on a straight alignment, upward-pointing vertical arrows shall be used for the exiting movement and curved arrows for the through movement.

D. The arrow for an optional exit lane that also carries the through route shall have a single shaft that bifurcates into a vertically upward-pointing arrow and a curving arrow corresponding to the configuration of the through and exit lanes.

E. For splits with an option lane, the arrow for the lane from which either direction of the split can be accessed shall have a single shaft that bifurcates into two upward-pointing curving arrows showing the approximate degrees of curvature of the two roadways beyond the theoretical gore (see Figure 2E-6).

F. A vertical white line shall be used to separate the route shields and destinations for the two diverging movements from each other.

G. The distance to the exit or split shall be displayed below the off-movement destination on the advance signs at the 1-mile and 2-mile locations.

H. The number of lanes displayed on a sign shall correspond to the number of lanes at the location of that sign. An advance sign shall not depict lanes that are added downstream of a sign location.

I. For numbered exits, the Exit Number (E1-5P) or Left Exit Number (E1-5bP) plaque shall be used at the top of the sign in accordance with Section 2E.31. For unnumbered left exits, the LEFT (E1-5aP) plaque shall be used at the top left edge of the sign.

Section 2E.24 Signing for Interchange Lane Drops

Standard

For lane drops, the Exit Direction sign (see Section 2E.36 and Figure 2E-26) shall be of the format shown in Figures 2E-15 and 2E-16. The bottom portion of the Exit Direction sign shall be yellow with a black border and shall include a diagonally upward-pointing black directional arrow (left or right) for each lane dropped at the exit, with the sign designed and placed so that each arrow is located over the approximate center of each lane being dropped. Except as noted in paragraph 5, the words EXIT and ONLY shall be positioned to the left and right, respectively, of the arrow on the E11-1d sign panel for a single-lane drop. For a two-lane drop, the words EXIT ONLY shall be located between the two arrows on the E11-1e sign panel. The number of arrows on the sign shall correspond to the number of dropped lanes at the location of the sign.

Option:

Where there are sign structure length constraints or where adjacent signs constrain the width of a sign, the arrow may be positioned right or left of the words EXIT ONLY in lieu of between the words.

Proposed Section 2E.XX Freeway Split with Dedicated Lanes (approved by Council on June 24, 2011)
Standard:
The signs for this application shall be mounted overhead. When arrows are used, each arrow shall be located approximately over the approximate center of the lane to which it applies.

Section 2F.14 Advance Signs for Conventional Toll Plazas

Guidance:
01 For conventional toll plazas (those without a divergence onto a separate alignment from mainline-aligned open-road tolling or ETC-Only lanes), one or more sets of overhead advance guide signs complying with the provisions of this Section should be provided. The advance guide signs for multi-lane toll plazas should provide information regarding which lanes to use for all of the toll payment methods accepted at the toll plaza. These signs should include toll plaza lane numbers (if used), or action messages or lane-use information such as LEFT LANE(S), CENTER LANE(S), RIGHT LANE(S), or down arrows over the approximate center of each applicable lane. These signs should also incorporate regulatory messages indicating any restrictions or prohibitions on the use of the lanes associated with the various types of payment methods by certain types of vehicles. For mainline toll plazas, these signs should be at least 1/2 mile in advance of the toll plaza, and farther if practical.

02 For conventional toll plazas (those without a divergence onto a separate alignment from mainline-aligned open-road tolling or ETC-Only lanes), one or more sets of overhead advance guide signs complying with the provisions of this Section should be provided. The advance guide signs for multi-lane toll plazas should provide information regarding which lanes to use for all of the toll payment methods accepted at the toll plaza. These signs should include toll plaza lane numbers (if used), or action messages or lane-use information such as LEFT LANE(S), CENTER LANE(S), RIGHT LANE(S), or down arrows over the approximate center of each applicable lane. These signs should also incorporate regulatory messages indicating any restrictions or prohibitions on the use of the lanes associated with the various types of payment methods by certain types of vehicles. For mainline toll plazas, these signs should be at least 1/2 mile in advance of the toll plaza, and farther if practical.

Section 2F.15 Advance Signs for Toll Plazas on Diverging Alignments from Open-Road ETC Account-Only Lanes

Guidance:
02 For toll plazas located on a separate alignment that diverges from mainline-aligned Open-Road ETC lanes where vehicles are required to have a registered ETC account to use the Open-Road Tolling lanes, overhead advance signs should be provided at approximately 1 mile and 1/2 mile in advance of the divergence point. Both the 1-mile and 1/2-mile advance signs should include:

A. The ETC (pictograph) Account-Only guide sign (see Figures 2F-8 and 2F-11) with a down arrow over the approximate center of each lane that will become an Open-Road ETC lane;
B. For the lane or lanes which will diverge to a toll plaza, guide signs conforming to the provisions of Section 2F.13, indicating which lane or lanes will diverge to the toll plaza for the various cash toll payment methods; and
C. Regulatory signs, plaques, or panels within the guide signs, indicating any restrictions or prohibitions of certain types of vehicles from toll plaza lanes associated with the various types of payment methods.

03 At or near the theoretical gore of the divergence point, an additional set of overhead guide signs should be provided and should include:

A. The ETC (pictograph) Account-Only guide sign (see Figures 2F-8 and 2F-11) with a down arrow over the approximate center of each Open-Road ETC lane;
B. Guide signs conforming to the provisions of Section 2F.13, with diagonally upward-pointing directional arrow(s) over the approximate center of each lane indicating the direction of the divergence, and providing lane information for all types of payment methods accepted at the toll plaza; and

C. Regulatory signs, plaques, or panels within the guide signs, indicating any restrictions or prohibitions on the use of the toll plaza lanes associated with the various types of payment methods by certain types of vehicles.

Section 2F.16 Toll Plaza Canopy Signs

Standard:

A sign complying with the provisions of Section 2F.13 shall be provided above the approximate center of each lane that is not an Open-Road ETC lane, mounted on or suspended from the toll plaza canopy, or on a separate structure immediately in advance of the plaza located such that each sign is clearly related to an individual toll lane, indicating the payment type(s) accepted in the lane and any restrictions or prohibitions of certain types of vehicles that apply to the lane. Except for toll-ticket systems, the toll for passenger or 2-axle vehicles shall be included on the canopy sign or on a separate sign mounted on the upstream side of the tollbooth.

For multi-lane toll plazas, lane-use control signals (see Section 4K.02) shall be provided above the approximate center of each toll plaza lane that is not an Open-Road ETC lane to indicate the open or closed status of each lane. Lane-use control signals shall not be used to call attention to a lane for a specific toll payment type such as ETC Account-Only lanes.

Section 4D.11 Number of Signal Faces on an Approach

Standard:

The signal faces for each approach to an intersection or a midblock location shall be provided as follows:

A. If a signalized through movement exists on an approach, a minimum of two primary signal faces shall be provided for the through movement. If a signalized through movement does not exist on an approach, a minimum of two primary signal faces shall be provided for the signalized turning movement that is considered to be the major movement from the approach (also see Section 4D.25).

B. See Sections 4D.17 through 4D.20 for left-turn (and U-turn to the left) signal faces.

C. See Sections 4D.21 through 4D.24 for right-turn (and U-turn to the right) signal faces.

Option:

Where a movement (or a certain lane or lanes) at the intersection never conflicts with any other signalized vehicular or pedestrian movement, a continuously-displayed single-section GREEN ARROW signal indication may be used to inform road users that the movement is free-flow and does not need to stop.

Support:

In some circumstances where the through movement never conflicts with any other
signalized vehicular or pedestrian movement at the intersection, such as at T-
intersections with appropriate geometrics and/or pavement markings and signing, an
ing engineering study might determine that the through movement (or certain lanes of the
through movement) can be free-flow and not signalized.

Guidance:
04 If two or more left-turn lanes are provided for a separately controlled protected only
mode left-turn movement, or if a left-turn movement represents the major movement
from an approach, two or more primary left-turn signal faces should be provided.
05 If two or more right-turn lanes are provided for a separately controlled right-turn
movement, or if a right-turn movement represents the major movement from an
approach, two or more primary right-turn signal faces should be provided.

Support:
06 Locating primary signal faces overhead on the far side of the intersection has been
shown to provide safer operation by reducing intersection entries late in the yellow
interval and by reducing red signal violations, as compared to post-mounting signal faces
at the roadside or locating signal faces overhead within the intersection on a diagonally-
oriented mast arm or span wire. On approaches with two or more lanes for the through
movement, one signal face per through lane, over the approximate center of centered
each through lane, has also been shown to provide safer operation.

Guidance:
07 If the posted or statutory speed limit or the 85th-percentile speed on an approach to a
signalized location is 45 mph or higher, signal faces should be provided as follows for all
new or reconstructed signal installations (see Figure 4D-3):

A. The minimum number and location of primary (non-supplemental) signal faces for
through traffic should be provided in accordance with Table 4D-1.
B. If the number of overhead primary signal faces for through traffic is equal to the
number of through lanes on an approach, one overhead signal face should be
located approximately over the approximate center of each through lane.
C. Except for shared left-turn and right-turn signal faces, any primary signal face
required by Sections 4D.17 through 4D.25 for an exclusive turn lane should be
located overhead approximately over the approximate center of each exclusive
turn lane.
D. All primary signal faces should be located on the far side of the intersection.
E. In addition to the primary signal faces, one or more supplemental pole-mounted
or overhead signal faces should be considered to provide added visibility for
approaching traffic that is traveling behind large vehicles.
F. All signal faces should have backplates.

Table 4D-1. Recommended Minimum Number of Primary Signal Faces
for Through Traffic on Approaches with Posted, Statutory, or 85th-
Percentile Speed of 45 mph or Higher

<table>
<thead>
<tr>
<th>Number of Through Lanes on Approach</th>
<th>Total Number of Primary Through Signal Faces for Approach*</th>
<th>Minimum Number of Overhead-Mounted Primary Through Signal Faces for Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
**Table 4D-1**

<table>
<thead>
<tr>
<th>3</th>
<th>3</th>
<th>2**</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 or more</td>
<td>4 or more</td>
<td>3**</td>
</tr>
</tbody>
</table>

Notes:

* A minimum of 2 through signal faces is always required (see Section 4D.11). These recommended numbers of through signal faces may be exceeded. Also, see cone of vision requirements otherwise indicated in Section 4D.13.

** If practical, all of the recommended number of primary through signal faces should be located overhead.

**Figure 4D-3** Recommended Vehicular Signal Faces for Approaches with Posted, Statutory, or 85th Percentile Speed of 45 mph or Higher

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Section 4D.13 Lateral Positioning of Signal Faces

Standard:

1. At least one and preferably both of the minimum of two primary signal faces required for the through movement (or the major turning movement if there is no through movement) on the approach shall be located between two lines intersecting with the center of the approach at a point 10 feet behind the stop line, one making an angle of approximately 20 degrees to the right of the center of the approach extended, and the other making an angle of approximately 20 degrees to the left of the center of the approach extended. The signal face that satisfies this requirement shall simultaneously satisfy the longitudinal placement requirement described in Section 4D.14 (see Figure 4D-4).

NO change recommended to 4D.13 (01). Does not apply to centering over the lane.

**Figure 4D-4** Lateral and Longitudinal Location of Primary Signal Faces

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08 This layout of signal faces should also be considered for any major urban or suburban arterial street with four or more lanes and for other approaches with speeds of less than 45 mph.
02 If both of the minimum of two primary signal faces required for the through movement (or the major turning movement if there is no through movement) on the approach are post-mounted, they shall both be on the far side of the intersection, one on the right and one on the left of the approach lane(s).

03 The required signal faces for through traffic on an approach shall be located not less than 8 feet apart measured horizontally perpendicular to the approach between the centers of the signal faces.

04 If more than one separate turn signal face is provided for a turning movement and if one or both of the separate turn signal faces are located over the roadway, the signal faces shall be located not less than 8 feet apart measured horizontally perpendicular to the approach between the centers of the signal faces.

Guidance:
05 If a signal face controls a specific lane or lanes of an approach, its position should make it readily visible to road users making that movement.

Support:
06 Section 4D.11 contains additional provisions regarding lateral positioning of signal faces for approaches having a posted or statutory speed limit or an 85th-percentile speed of 45 mph or higher.

Standard:
07 If an exclusive left-turn, right-turn, or U-turn lane is present on an approach and if a primary separate turn signal face controlling that lane is mounted over the roadway, the primary separate turn signal face shall not be positioned any further to the right than the extension of the right-hand edge of the exclusive turn lane or any further to the left than the extension of the left-hand edge of the exclusive turn lane.

08 Supplemental turn signal faces mounted over the roadway shall not be subject to the positioning requirements in the previous paragraph.
Guidance:

For new or reconstructed signal installations, on an approach with an exclusive turn lane(s) for a left-turn (or U-turn to the left) movement and with opposing vehicular traffic, signal faces that display a CIRCULAR GREEN signal indication should not be post-mounted on the far-side median or mounted overhead above the exclusive turn lane(s) or the extension of the lane(s).

Standard:

If supplemental post-mounted signal faces are used, the following limitations shall apply:

A. Left-turn arrows and U-turn arrows to the left shall not be used in near-right signal faces.

B. Right-turn arrows and U-turn arrows to the right shall not be used in far-left signal faces. A far-side median-mounted signal face shall be considered a far-left signal for this application.

No changes recommended to 4D.13.

Section 4D.15 Mounting Height of Signal Faces

Standard:

The top of the signal housing of a vehicular signal face located over any portion of a highway that can be used by motor vehicles shall not be more than 25.6 feet above the pavement.

For viewing distances between 40 and 53 feet from the stop line, the maximum mounting height to the top of the signal housing shall be as shown in Figure 4D-5.

Figure 4D-5 Maximum Mounting Height of Signal Faces Located Between 40 Feet and 53 Feet from Stop Line

The bottom of the signal housing and any related attachments to a vehicular signal face located over any portion of a highway that can be used by motor vehicles shall be at least 15 feet above the pavement.

The bottom of the signal housing (including brackets) of a vehicular signal face that is vertically arranged and not located over a roadway:

A. Shall be a minimum of 8 feet and a maximum of 19 feet above the sidewalk or, if there is no sidewalk, above the pavement grade at the center of the roadway.
B. Shall be a minimum of 4.5 feet and a maximum of 19 feet above the median island grade of a center median island if located on the near side of the intersection.

05 The bottom of the signal housing (including brackets) of a vehicular signal face that is horizontally arranged and not located over a roadway:

A. Shall be a minimum of 8 feet and a maximum of 22 feet above the sidewalk or, if there is no sidewalk, above the pavement grade at the center of the roadway.

B. Shall be a minimum of 4.5 feet and a maximum of 22 feet above the median island grade of a center median island if located on the near side of the intersection.

No change recommended to Section 4D.15

Section 4I.02 Design of Freeway Entrance Ramp Control Signals

Standard:

01 Ramp control signals shall meet all of the standard design specifications for traffic control signals, except as otherwise provided in this Section.

02 The signal face for freeway entrance ramp control signals shall be either a two-section signal face containing red and green signal indications or a three-section signal face containing red, yellow, and green signal indications.

03 If only one lane is present on an entrance ramp or if more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are always displayed simultaneously to all of the lanes on the ramp, then a minimum of two signal faces per ramp shall face entering traffic.

04 If more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are not always displayed simultaneously to all of the lanes on the ramp, then one signal face shall be provided over the approximate center of each separately-controlled lane.

No change in language recommended. It is consistent with proposal.

Guidance:

05 Additional side-mounted signal faces should be considered for ramps with two or more separately-controlled lanes.

Standard:

06 Ramp control signals shall be located and designed to minimize their viewing by mainline freeway traffic.

Option:

07 Ramp control signals may be placed in the dark mode (no indications displayed) when not in use.

08 Ramp control signals may be used to control some, but not all, lanes on a ramp, such as when non-metered HOV bypass lanes are provided on a ramp.
The required signal faces, if located at the side of the ramp roadway, may be mounted such that the height above the pavement grade at the approximate center of the ramp roadway to the bottom of the signal housing of the lowest signal face is between 4.5 and 6 feet.

For entrance ramps with only one controlled lane, the two required signal faces may both be mounted at the side of the roadway on a single pole, with one face at the normal mounting height and one face mounted lower as provided in Paragraph 9, as a specific exception to the normal 8-foot minimum lateral separation of signal faces required by Section 4D.13.

Guidance:

Regulatory signs with legends appropriate to the control, such as XX Vehicle(S) Per Green or XX VEHICLE(S) PER GREEN Each Lane (see Section 2B.56), should be installed adjacent to the ramp control signal faces. When ramp control signals are installed on a freeway-to-freeway ramp, special consideration should be given to assuring adequate visibility of the ramp control signals, and multiple advance warning signs with flashing warning beacons should be installed to warn road users of the metered operation.

Section 4K.02 Lane-Use Control Signals at or Near Toll Plazas

Standard:

01 Lane-use control signals used at toll plazas shall comply with the provisions of Chapter 4M except as otherwise provided in this Section.

02 At toll plazas with multiple lanes where one or more lanes is sometimes closed to traffic, a lane-use control signal shall be installed above the approximate center of each toll plaza lane to indicate the open or closed status of the controlled lane.

Option:

03 The bottom of the signal housing of a lane-use control signal above a toll plaza lane having a canopy may be mounted lower than 15 feet above the pavement, but not lower than the vertical clearance of the canopy structure.

04 Lane-use control signals may also be used to indicate the open or closed status of an Open-Road ETC lane as a supplement to other devices used for the temporary closure of a lane (see Part 6).

Section 4L.02 Intersection Control Beacon

Standard:

01 An Intersection Control Beacon shall consist of one or more signal faces directed toward each approach to an intersection. Each signal face shall consist of one or more signal sections of a standard traffic signal face, with flashing CIRCULAR YELLOW or CIRCULAR RED signal indications in each signal face. They shall be installed and used only at an intersection to control two or more directions of travel.

02 Application of Intersection Control Beacon signal indications shall be limited to the following:
A. Yellow on one route (normally the major street) and red for the remaining approaches, and
B. Red for all approaches (if the warrant described in Section 2B.07 for a multi-way stop is satisfied).

03 Flashing yellow signal indications shall not face conflicting vehicular approaches.

04 A STOP sign shall be used on approaches to which a flashing red signal indication is displayed on an Intersection Control Beacon (see Section 2B.04).

05 If two horizontally aligned red signal indications are used on an approach for an Intersection Control Beacon, they shall be flashed simultaneously to avoid being confused with grade crossing flashing-light signals. If two vertically aligned red signal indications are used on an approach for an Intersection Control Beacon, they shall be flashed alternately.

Guidance:
06 An Intersection Control Beacon should not be mounted on a pedestal in the roadway unless the pedestal is within the confines of a traffic or pedestrian island.

Option:
07 Supplemental signal indications may be used on one or more approaches in order to provide adequate visibility to approaching road users.

08 Intersection Control Beacons may be used at intersections where traffic or physical conditions do not justify conventional traffic control signals but crash rates indicate the possibility of a special need.

09 An Intersection Control Beacon is generally located over the approximate center of an intersection; however, it may be used at other suitable locations.

Section 4M.03 Design of Lane-Use Control Signals

Standard:
01 All lane-use control signal indications shall be in units with rectangular signal faces and shall have opaque backgrounds. Nominal minimum height and width of each DOWNWARD GREEN ARROW, YELLOW X, and RED X signal face shall be 18 inches for typical applications. The WHITE TWO-WAY LEFT-TURN ARROW and WHITE ONE WAY LEFT-TURN ARROW signal faces shall have a nominal minimum height and width of 30 inches.

02 Each lane to be reversed or closed shall have signal faces with a DOWNWARD GREEN ARROW and a RED X symbol.

03 Each reversible lane that also operates as a two-way or one-way left-turn lane during certain periods shall have signal faces that also include the applicable WHITE TWO-WAY LEFT-TURN ARROW or WHITE ONE WAY LEFT-TURN ARROW symbol.

04 Each non-reversible lane immediately adjacent to a reversible lane shall have signal indications that display a DOWNWARD GREEN ARROW to traffic traveling
in the permitted direction and a RED X to traffic traveling in the opposite
direction.

If in separate signal sections, the relative positions, from left to right, of the
signal indications shall be RED X, YELLOW X, DOWNWARD GREEN ARROW,
WHITE TWO-WAY LEFT-TURN ARROW, WHITE ONE WAY LEFT-TURN ARROW.

The color of lane-use control signal indications shall be clearly visible for
2,300 feet at all times under normal atmospheric conditions, unless otherwise
physically obstructed.

Lane-use control signal faces shall be located approximately over the
approximate center of the lane controlled.

Section 4N.02 In-Roadway Warning Lights at Crosswalks

Option:
01 In-roadway lights may be installed at certain marked crosswalks, based on an
engineering study or engineering judgment, to provide additional warning to road users.

Standard:
02 If used, In-Roadway Warning Lights at crosswalks shall be installed only at
marked crosswalks with applicable warning signs. They shall not be used at
crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.

If In-Roadway Warning Lights are used at a crosswalk, the following
requirements shall apply:

A. Except as provided in Paragraphs 7 and 8, they shall be installed along
both sides of the crosswalk and shall span its entire length.

B. They shall initiate operation based on pedestrian actuation and shall
cease operation at a predetermined time after the pedestrian actuation
or, with passive detection, after the pedestrian clears the crosswalk.

C. They shall display a flashing yellow light when actuated. The flash rate
shall be at least 50, but no more than 60, flash periods per minute. If
they are flashed in a manner that includes a continuous flash of varying
intensity and time duration that is repeated to provide a flickering effect,
the flickers or pulses shall not repeat at a rate that is between 5 and 30
per second to avoid frequencies that might cause seizures.

D. They shall be installed in the area between the outside edge of the
crosswalk line and 10 feet from the outside edge of the crosswalk.

E. They shall face away from the crosswalk if unidirectional, or shall face
away from and across the crosswalk if bidirectional.

If used on one-lane, one-way roadways, a minimum of two In-Roadway
Warning Lights shall be installed on the approach side of the crosswalk. If used
on two-lane roadways, a minimum of three In-Roadway Warning Lights shall be
installed along both sides of the crosswalk. If used on roadways with more than
two lanes, a minimum of one In-Roadway Warning Light per lane shall be
installed along both sides of the crosswalk.
Guidance:

If used, In-Roadway Warning Lights should be installed in the \textit{approximate} center of each travel lane, at the center line of the roadway, at each edge of the roadway or parking lanes, or at other suitable locations away from the normal tire track paths.

\begin{tabular}{l}
RWSTC Vote: 1-19-12 \hspace{1em} For: Unanimous \\
GM & I Vote: Unanimous 1-19-12 \\
Signals Vote: approved 6-21-12 \\
RWSTC Vote following sponsor comments 1-9-13: \hspace{1em} For: Unanimous \\
GM & I Vote: 1-10-13 \hspace{1em} Unanimous \\
Signals Vote: 1-9-13 \hspace{1em} For: Unanimous \\
Council Vote: \hspace{1em} For: Unanimous 1-11-13
\end{tabular}

c: NCUTCD/Jan 2012 meetings/RW # 1 – center over lane 11-27-11, revised 12-4-11, revised 1-19-12, approved by signals 6-21-12, revised following sponsor comments 12-9-12, approved by RWSTC 1-9-13, Signals 1-9-13, GM & I 1-10-13, approved by council 1-13-13