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National Committee on Uniform Traffic Control Devices

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RWSTC agenda item V.3 January 2012
RWSTC agenda item IV.A June 2012
RWSTC agenda item III. 1, January 2013

National Committee on Uniform Traffic Control Devices JOINT TASK FORCE GM & I/RWSTC/SIGNALS RECOMMENDATION FOLLOWING SPONSOR COMMENTS

TECHNICAL COMMITTEE: NCUTCD 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

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44 “approximate center of the lane” or “approximate center of each lane” as applicable for
45 the specific case.

46
47 Part 2B.26 (paragraph 12) – remove the words “be carefully reviewed” since that requires
48 judgment in a standard statement.

49
50 Part 2B.26 (paragraph 13) there needs to be an allowance that the R3-9g or R3-9h signs
51 are not required when there is a longitudinal barrier separating the reversible lanes since
52 drivers do not need to be advised of the end or beginning of a reversible lane in that
53 situation.

54
55 Part 2B.26 (paragraph 19) – provide for consistency in parking signs and reversible lane
56 signs to avoid confusion.

57
58 **RECOMMENDATION: Revise Parts 2B, 2E, 2D, 2F, 4D, 4I, 4K, 4L, 4M and 4N**
59 **for consistency regarding “centering a sign over a lane”.**

60
61 **Note: Proposed changes to the MUTCD are shown in underline red and removed**
62 **text are shown in ~~strikethrough red~~.**

63
64 **RECOMMENDED WORDING:**

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

66 Option:

67 01 A reversible lane may be used for through traffic (with left turns either permitted or
68 prohibited) in alternating directions during different periods of the day, and the lane may be used
69 for exclusive left turns in one or both directions during other periods of the day as well.

70 Reversible Lane Control (R3-9e through R3-9i) signs (see Figure 2B-6) may be either static type
71 or changeable message type. These signs may be either post-mounted or overhead.

72

73 **Standard:**

74 02 **Post-mounted Reversible Lane Control signs shall be used only as a supplement to**
75 **overhead signs or signals. post-mounted signs shall be identical in design to the overhead**
76 **signs and an additional legend such as CENTER LANE shall be added to the sign (R3-9f) to**
77 **indicate which lane is controlled. For both word messages and symbols, this legend shall be**
78 **at the top of the sign.**

79

80 03 **Where it is determined by an engineering study that lane-use control signals or**
81 **physical barriers are not necessary, the lane shall be controlled by overhead Reversible**
82 **Lane Control signs (see Figure 2B-7).**

83

84 Option:

85 04 Reversing traffic flow may be controlled with pavement markings and Reversible Lane
86 Control signs (without the use of lane control signals), when all of the following conditions are
87 met:

88 A. Only one lane is being reversed,

89 B. An engineering study indicates that the use of Reversible Lane Control signs alone would
90 result in an acceptable level of safety and efficiency, and

91 C. There are no unusual or complex operations in the reversible lane pattern.

92
93 **Standard:**

94 05 **Reversible Lane Control signs shall contain the legend or symbols designating the**
95 **allowable uses of the lane and the time periods such uses are allowed. Where symbols and**
96 **legends are used, their meanings shall be as shown in Table 2B-2.**

97
98 06 **Reversible Lane Control signs shall consist of a white background with a black**
99 **legend and border, except for the R3-9d sign, where the color red is used.**

100
101 07 **Symbol signs, such as the R3-9d sign, shall consist of the appropriate symbol in the**
102 **upper portion of the sign with the appropriate times of the day and days of the week below**
103 **it. All times of the day and days of the week shall be accounted for on the sign to eliminate**
104 **confusion to the road user.**

105
106 08 **In situations where more than one message is conveyed to the road user, such as on**
107 **the R3-9d sign, the sign legend shall be arranged as follows:**

108 **A. The prohibition or restriction message is the primary legend and shall be on the top for**
109 **word message signs and to the far left for symbol signs,**

110 **B. The permissive use message shall be displayed as the second legend, and**

111 **C. The OTHER TIMES message shall be displayed at the bottom for word message signs**
112 **and to the far right for symbol signs.**

113
114 Option:

115 09 The symbol signs may also include a downward pointing arrow with the legend THIS
116 LANE. The term OTHER TIMES may be used for either the symbol or word message sign.

117 **Standard:**

118 10 **A Reversible Lane Control sign shall be mounted over the approximate**
119 **center of the lane that is being reversed ~~and shall be perpendicular to the~~**
120 **roadway alignment.**

121 11 **If the vertical or horizontal alignment is curved to the degree that a driver would be**
122 **unable to see at least one sign, and preferably two signs, then additional overhead signs**
123 **shall be installed. The placement of the signs shall be such that the driver will have a**
124 **definite indication of the lanes specifically reserved for use**
125 **at any given time. Special consideration shall be given to major generators introducing**
126 **traffic between the normal sign placement.**

127 12 **Transitions at the entry to and exit from a section of roadway with reversible**
128 **lanes shall ~~be carefully reviewed, and~~ include advance signs ~~shall be~~**
129 **installed to notify or warn drivers of the boundaries of the reversible lane**
130 **controls. The R3-9g or R3-9h signs shall be used for this purpose.**

131 Option:

132 13 More than one sign may be used at the termination of the reversible lane to emphasize the
133 importance of the message (R3-9i).

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

136
137 **Standard:**

138 14 **Flashing beacons, if used to accentuate the overhead Reversible Lane Control signs,**
139 **shall comply with the applicable requirements for flashing beacons in Chapter 4L.**

140
141 15 **When used in conjunction with Reversible Lane Control signs, the Turn Prohibition**
142 **signs (R3-1 to R3-4, R3-18) shall be mounted overhead and separate from the Reversible**
143 **Lane Control signs. The Turn Prohibition signs shall be designed and installed in**
144 **accordance with Section 2B.18.**

145
146 *Guidance:*

147 16 *For additional emphasis, a supplemental plaque stating the distance of the prohibition,*
148 *such as NEXT 1 MILE, should be added to the Turn Prohibition signs that are used in*
149 *conjunction with Reversible Lane Control signs.*

150
151 17 *If used, overhead signs should be located at intervals not greater than 1/4 mile. The*
152 *bottom of the overhead Reversible Lane Control signs should not be more than 19 feet above the*
153 *pavement grade.*

154
155 18 *Where more than one sign is used at the termination of a reversible lane, they should be*
156 *at least 250 feet apart. Longer distances between signs are appropriate for streets with speeds*
157 *over 35 mph, but the separation should not exceed 1,000 feet.*

158
159 19 *Because left-turning vehicles have a significant impact on the safety and efficiency of a*
160 *reversible lane operation, if an exclusive left-turn lane or two-way left-turn lane cannot be*
161 *incorporated into the lane-use pattern for a particular peak or off-peak period, consideration*
162 *should be given to prohibiting left turns and U-turns during that time period.*

163
164 *Guidance:*

165 20 *Where curb parking is prohibited during only certain times of day, the use of reversible*
166 *lane variable signs should be consistent in message with parking signs during the same*
167 *operational periods.*

168

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

170 **Standard:**

171 01 **Where a right turn on red (or a left turn on red from a one-way street to a**
172 **one-way street) is to be prohibited, a symbolic NO TURN ON RED (symbolic**
173 **circular red) (R10-11) sign (see Figure 2B-27) or a NO TURN ON RED (R10-11a,**
174 **R10-11b) word message sign (see Figure 2B-27) shall be used.**

175 *Guidance:*

176 02 *If used, the No Turn on Red sign should be installed near the appropriate signal head.*

177 03 *A No Turn on Red sign should be considered when an engineering study finds that one*
178 *or more of the following conditions exists:*

- 179 A. *Inadequate sight distance to vehicles approaching from the left (or right, if*
180 *applicable);*
181 B. *Geometrics or operational characteristics of the intersection that might result in*
182 *unexpected conflicts;*
183 C. *An exclusive pedestrian phase;*

- 184 D. An unacceptable number of pedestrian conflicts with right-turn-on-red
185 maneuvers, especially involving children, older pedestrians, or persons with
186 disabilities;
- 187 E. More than three right-turn-on-red accidents reported in a 12-month period for the
188 particular approach; or
- 189 F. The skew angle of the intersecting roadways creates difficulty for drivers to see
190 traffic approaching from their left.

191 Option:

192 04 A supplemental R10-20aP plaque (see [Figure 2B-27](#)) showing times of day (similar to
193 the S4-1P plaque shown in [Figure 7B-1](#)) with a black legend and border on a white
194 background may be mounted below a No Turn on Red sign to indicate that the restriction
195 is in place only during certain times.

196 05 Alternatively, a blank-out sign may be used instead of a static NO TURN ON RED sign,
197 to display either the NO TURN ON RED legend or the No Right Turn symbol or word
198 message, as appropriate, only at certain times during the day or during one or more
199 portion(s) of a particular cycle of the traffic signal.

200 06 On signalized approaches with more than one right-turn lane, a NO TURN ON RED
201 EXCEPT FROM RIGHT LANE (R10-11c) sign (see [Figure 2B-27](#)) may be post-mounted at
202 the intersection or a NO TURN ON RED FROM THIS LANE (with down arrow) (R10-11d)
203 sign (see [Figure 2B-27](#)) may be mounted **directly** over the **approximate** center of the lane
204 from which turns on red are prohibited.

205 *Guidance:*

206 07 Where turns on red are permitted and the signal indication is a steady RED ARROW,
207 the RIGHT (LEFT) ON RED ARROW AFTER STOP (R10-17a) sign (see [Figure 2B-27](#)) should
208 be installed adjacent to the RED ARROW signal indication.

209 Option:

210 08 A RIGHT TURN ON RED MUST YIELD TO U-TURN (R10-30) sign (see [Figure 2B-27](#))
211 may be installed to remind road users that they must yield to conflicting u-turn traffic on
212 the street or highway onto which they are turning right on a red signal after stopping.

213

214 **Section 2D.08 Arrows**

215

216 **Standard:**

217

218 02 On overhead signs where it is desirable to indicate a lane to be followed, a down arrow
219 shall be positioned **approximately** over the **approximate** center of the lane and shall point
220 vertically downward toward the approximate center of that lane. Down arrows shall be
221 used only on overhead guide signs that restrict the use of specific lanes to traffic bound for
222 the destination(s) and/or route(s) indicated by these arrows. Down arrows shall not be used
223 unless an arrow can be located over and pointed to the approximate center of each
224 lane that can be used to reach the destination displayed on the sign.

225

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

227 **Standard:**

228 04 The Combination Lane-Use/Destination (D15-1) overhead guide sign shall be
229 used only where the designated lane is a mandatory movement lane. The D15-1
230 sign shall not be used for lanes with optional movements.

231 05 The D15-1 sign shall have a green background with a white border. As shown
232 in Figure 2D-7, the lane-use sign (see Chapter 2B) shall be placed near the
233 bottom of the sign and the destination information shall be placed near the top
234 of the sign. The D15-1 sign shall be located **approximately** over the approximate
235 center of the lane to which it applies.

236

237

238 Section 2E.19 Arrows for Interchange Guide Signs

239 Standard:

240 04 Directional arrows on guide signs for multi-lane exits shall be positioned
241 below the legend **approximately** over the approximate center of each lane to
242 which the arrow applies (see Figures 2E-4 and 2E-8).

243 05 On overhead signs where down arrows are used to indicate a lane to be
244 followed, a down arrow shall be positioned **approximately** over the approximate
245 center of each lane and shall point vertically downward toward the approximate
246 center of that lane. Down arrows shall be used only on overhead guide signs
247 that restrict the use of specific lanes to traffic bound for the destination(s)
248 and/or route(s) indicated by these arrows. Down arrows shall not be used
249 unless an arrow can be located over and pointed to the approximate center of
250 each lane that can be used to reach the destination displayed on the sign.

251 06 If down arrows are used, having more than one down arrow pointing to the
252 same lane on a single overhead sign (or on multiple signs on the same overhead
253 sign structure) shall not be permitted.

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

255 Standard:

256 07 Overhead Arrow-per-Lane guide signs used on freeways and expressways
257 shall include one arrow above each lane and shall be designed in accordance
258 with the following criteria:

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

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

268 C. The arrow for a lane that must exit shall be curved in the direction of the
269 exit and shall be accompanied by black-on-yellow EXIT (E11-1a) and
270 ONLY (E11-1b) sign panels adjacent to the lower end of the arrow shaft.

- 271 The E11-1a and E11-1b sign panels shall not be used for a split of two
 272 overlapping routes where neither of the diverging routes is designated as
 273 an exit. Where the through lanes curve and the exit continues on a
 274 straight alignment, upward-pointing vertical arrows shall be used for the
 275 exiting movement and curved arrows for the through movement.
- 276 D. The arrow for an optional exit lane that also carries the through route
 277 shall have a single shaft that bifurcates into a vertically upward-pointing
 278 arrow and a curving arrow corresponding to the configuration of the
 279 through and exit lanes.
 - 280 E. For splits with an option lane, the arrow for the lane from which either
 281 direction of the split can be accessed shall have a single shaft that
 282 bifurcates into two upward-pointing curving arrows showing the
 283 approximate degrees of curvature of the two roadways beyond the
 284 theoretical gore (see [Figure 2E-6](#)).
 - 285 F. A vertical white line shall be used to separate the route shields and
 286 destinations for the two diverging movements from each other.
 - 287 G. The distance to the exit or split shall be displayed below the off-
 288 movement destination on the advance signs at the 1-mile and 2-mile
 289 locations.
 - 290 H. The number of lanes displayed on a sign shall correspond to the number
 291 of lanes at the location of that sign. An advance sign shall not depict
 292 lanes that are added downstream of a sign location.
 - 293 I. For numbered exits, the Exit Number (E1-5P) or Left Exit Number (E1-
 294 5bP) plaque shall be used at the top of the sign in accordance with
 295 [Section 2E.31](#). For unnumbered left exits, the LEFT (E1-5aP) plaque shall
 296 be used at the top left edge of the sign.

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Section 2E.24 Signing for Interchange Lane Drops

300 **Standard**

301 04 For lane drops, the Exit Direction sign (see [Section 2E.36](#) and [Figure 2E-26](#))
 302 shall be of the format shown in [Figures 2E-15](#) and [2E-16](#). The bottom portion of
 303 the Exit Direction sign shall be yellow with a black border and shall include a
 304 diagonally upward-pointing black directional arrow (left or right) for each lane
 305 dropped at the exit, with the sign designed and placed so that each arrow is
 306 located over the approximate center of each lane being dropped. **Except as**
 307 **[noted in paragraph 5](#)**, the words EXIT and ONLY shall be positioned to the left
 308 and right, respectively, of the arrow on the E11-1d sign panel for a single-lane
 309 drop. For a two-lane drop, the words EXIT ONLY shall be located between the
 310 two arrows on the E11-1e sign panel. The number of arrows on the sign shall
 311 correspond to the number of dropped lanes at the location of the sign.

312 [Option:](#)

313 [05 Where there are sign structure length constraints or where adjacent signs constrain](#)
 314 [the width of a sign, the arrow may be positioned right or left of the words EXIT ONLY in](#)
 315 [lieu of between the words.](#)

316 **Proposed Section 2E.XX Freeway Split with Dedicated Lanes (approved by Council on June**
 317 **24, 2011)**

318 **Standard:**
319 **The signs for this application shall be mounted overhead. When arrows are used, each**
320 **arrow shall be located ~~approximately~~ over the approximate center of the lane to which it**
321 **applies.**

322
323 **Section 2F.14 Advance Signs for Conventional Toll Plazas**

324 *Guidance:*

325 01 *For conventional toll plazas (those without a divergence onto a separate alignment*
326 *from mainline-aligned open-road tolling or ETC-Only lanes), one or more sets of overhead*
327 *advance guide signs complying with the provisions of this Section should be provided.*
328 *The advance guide signs for multi-lane toll plazas should provide information regarding*
329 *which lanes to use for all of the toll payment methods accepted at the toll plaza. These*
330 *signs should include toll plaza lane numbers (if used), or action messages or lane-use*
331 *information such as LEFT LANE(S), CENTER LANE(S), RIGHT LANE(S), or down arrows*
332 *over the approximate center of each applicable lane. These signs should also incorporate*
333 *regulatory messages indicating any restrictions or prohibitions on the use of the lanes*
334 *associated with the various types of payment methods by certain types of vehicles. For*
335 *mainline toll plazas, these signs should be at least 1/2 mile in advance of the toll plaza,*
336 *and farther if practical.*

337 *No change recommended to Section 2F.14. It reads "approximate center of the lane" or*
338 *in this case "approximate center of each applicable lane" so is consistent with other*
339 *sections on the manual.*

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

342 *Guidance:*

343 02 *For toll plazas located on a separate alignment that diverges from mainline-aligned*
344 *Open-Road ETC lanes where vehicles are required to have a registered ETC account to*
345 *use the Open-Road Tolling lanes, overhead advance signs should be provided at*
346 *approximately 1 mile and 1/2 mile in advance of the divergence point. Both the 1-mile*
347 *and 1/2-mile advance signs should include:*

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

357 03 *At or near the theoretical gore of the divergence point, an additional set of overhead*
358 *guide signs should be provided and should include:*

- 359 A. *The ETC (pictograph) Account-Only guide sign (see Figures 2F-8 and 2F-11) with*
360 *a down arrow over the approximate center of each Open-Road ETC lane;*

- 361 B. *Guide signs conforming to the provisions of Section 2F.13, with diagonally*
- 362 *upward-pointing directional arrow(s) over the approximate center of each lane*
- 363 *indicating the direction of the divergence, and providing lane information for all*
- 364 *types of payment methods accepted at the toll plaza; and*
- 365 C. *Regulatory signs, plaques, or panels within the guide signs, indicating any*
- 366 *restrictions or prohibitions on the use of the toll plaza lanes associated with the*
- 367 *various types of payment methods by certain types of vehicles.*

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Section 2F.16 Toll Plaza Canopy Signs

370 **Standard:**

371 01 **A sign complying with the provisions of Section 2F.13 shall be provided above**

372 **the approximate center of each lane that is not an Open-Road ETC lane,**

373 **mounted on or suspended from the toll plaza canopy, or on a separate structure**

374 **immediately in advance of the plaza located such that each sign is clearly**

375 **related to an individual toll lane, indicating the payment type(s) accepted in the**

376 **lane and any restrictions or prohibitions of certain types of vehicles that apply**

377 **to the lane. Except for toll-ticket systems, the toll for passenger or 2-axle**

378 **vehicles shall be included on the canopy sign or on a separate sign mounted on**

379 **the upstream side of the tollbooth.**

380 06 **For multi-lane toll plazas, lane-use control signals (see Section 4K.02) shall**

381 **be provided above the approximate center of each toll plaza lane that is not an**

382 **Open-Road ETC lane to indicate the open or closed status of each lane. Lane-use**

383 **control signals shall not be used to call attention to a lane for a specific toll**

384 **payment type such as ETC Account-Only lanes.**

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

386 **Standard:**

387 01 **The signal faces for each approach to an intersection or a midblock location**

388 **shall be provided as follows:**

- 389 A. **If a signalized through movement exists on an approach, a minimum of**
- 390 **two primary signal faces shall be provided for the through movement. If**
- 391 **a signalized through movement does not exist on an approach, a**
- 392 **minimum of two primary signal faces shall be provided for the signalized**
- 393 **turning movement that is considered to be the major movement from the**
- 394 **approach (also see Section 4D.25).**
- 395 B. **See Sections 4D.17 through 4D.20 for left-turn (and U-turn to the left)**
- 396 **signal faces.**
- 397 C. **See Sections 4D.21 through 4D.24 for right-turn (and U-turn to the right)**
- 398 **signal faces.**

399 **Option:**

400 02 **Where a movement (or a certain lane or lanes) at the intersection never conflicts with**

401 **any other signalized vehicular or pedestrian movement, a continuously-displayed single-**

402 **section GREEN ARROW signal indication may be used to inform road users that the**

403 **movement is free-flow and does not need to stop.**

404 **Support:**

405 03 **In some circumstances where the through movement never conflicts with any other**

406 signalized vehicular or pedestrian movement at the intersection, such as at T-
 407 intersections with appropriate geometrics and/or pavement markings and signing, an
 408 engineering study might determine that the through movement (or certain lanes of the
 409 through movement) can be free-flow and not signalized.

410 *Guidance:*

411 04 *If two or more left-turn lanes are provided for a separately controlled protected only*
 412 *mode left-turn movement, or if a left-turn movement represents the major movement*
 413 *from an approach, two or more primary left-turn signal faces should be provided.*

414 05 *If two or more right-turn lanes are provided for a separately controlled right-turn*
 415 *movement, or if a right-turn movement represents the major movement from an*
 416 *approach, two or more primary right-turn signal faces should be provided.*

417 *Support:*

418 06 Locating primary signal faces overhead on the far side of the intersection has been
 419 shown to provide safer operation by reducing intersection entries late in the yellow
 420 interval and by reducing red signal violations, as compared to post-mounting signal faces
 421 at the roadside or locating signal faces overhead within the intersection on a diagonally-
 422 oriented mast arm or span wire. On approaches with two or more lanes for the through
 423 movement, one signal face per through lane, over the approximate center of centered
 424 ~~over~~ each through lane, has also been shown to provide safer operation.

425 *Guidance:*

426 07 *If the posted or statutory speed limit or the 85th-percentile speed on an approach to a*
 427 *signalized location is 45 mph or higher, signal faces should be provided as follows for all*
 428 *new or reconstructed signal installations (see Figure 4D-3):*

- 429 A. *The minimum number and location of primary (non-supplemental) signal faces for*
 430 *through traffic should be provided in accordance with Table 4D-1.*
- 431 B. *If the number of overhead primary signal faces for through traffic is equal to the*
 432 *number of through lanes on an approach, one overhead signal face should be*
 433 *located ~~approximately~~ over the approximate center of each through lane.*
- 434 C. *Except for shared left-turn and right-turn signal faces, any primary signal face*
 435 *required by Sections 4D.17 through 4D.25 for an exclusive turn lane should be*
 436 *located ~~overhead approximately~~ over the approximate center of each exclusive*
 437 *turn lane.*
- 438 D. *All primary signal faces should be located on the far side of the intersection.*
- 439 E. *In addition to the primary signal faces, one or more supplemental pole-mounted*
 440 *or overhead signal faces should be considered to provide added visibility for*
 441 *approaching traffic that is traveling behind large vehicles.*
- 442 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

Number of Through Lanes on Approach	Total Number of Primary Through Signal Faces for Approach*	Minimum Number of Overhead-Mounted Primary Through Signal Faces for Approach
1	2	1
2	2	1

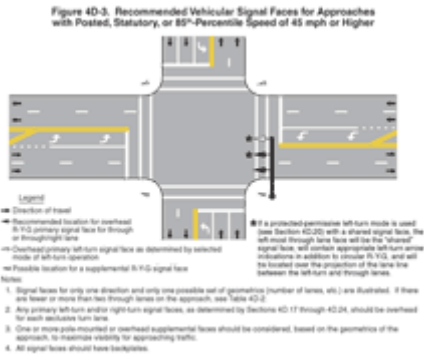
3	3	2**
4 or more	4 or more	3**

443 Notes:

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

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

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



451

452 08 This layout of signal faces should also be considered for any major urban or suburban
 453 arterial street with four or more lanes and for other approaches with speeds of less than
 454 45 mph.

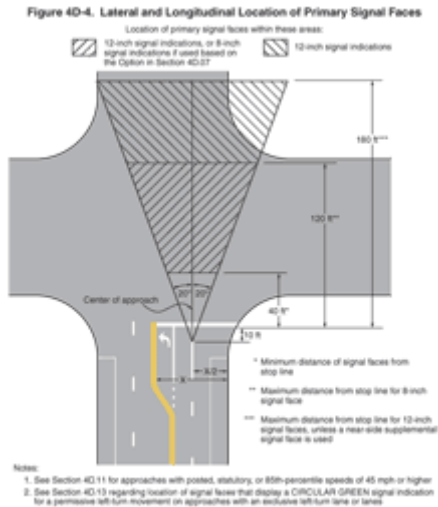
455 **Section 4D.13 Lateral Positioning of Signal Faces**

456 **Standard:**

457 01 At least one and preferably both of the minimum of two primary signal faces
 458 required for the through movement (or the major turning movement if there is
 459 no through movement) on the approach shall be located between two lines
 460 intersecting with the center of the approach at a point 10 feet behind the stop
 461 line, one making an angle of approximately 20 degrees to the right of the center
 462 of the approach extended, and the other making an angle of approximately 20
 463 degrees to the left of the center of the approach extended. The signal face that
 464 satisfies this requirement shall simultaneously satisfy the longitudinal
 465 placement requirement described in [Section 4D.14](#) (see [Figure 4D-4](#)).

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

468 **[Figure 4D-4](#) Lateral and Longitudinal Location of Primary Signal Faces**



469

470 **02 If both of the minimum of two primary signal faces required for the through**
 471 **movement (or the major turning movement if there is no through movement) on**
 472 **the approach are post-mounted, they shall both be on the far side of the**
 473 **intersection, one on the right and one on the left of the approach lane(s).**

474 **03 The required signal faces for through traffic on an approach shall be located**
 475 **not less than 8 feet apart measured horizontally perpendicular to the approach**
 476 **between the centers of the signal faces.**

477 **04 If more than one separate turn signal face is provided for a turning**
 478 **movement and if one or both of the separate turn signal faces are located over**
 479 **the roadway, the signal faces shall be located not less than 8 feet apart**
 480 **measured horizontally perpendicular to the approach between the centers of the**
 481 **signal faces.**

482 *Guidance:*

483 **05 If a signal face controls a specific lane or lanes of an approach, its position should**
 484 **make it readily visible to road users making that movement.**

485 *Support:*

486 **06 Section 4D.11 contains additional provisions regarding lateral positioning of signal**
 487 **faces for approaches having a posted or statutory speed limit or an 85th-percentile speed**
 488 **of 45 mph or higher.**

489 **Standard:**

490 **07 If an exclusive left-turn, right-turn, or U-turn lane is present on an approach**
 491 **and if a primary separate turn signal face controlling that lane is mounted over**
 492 **the roadway, the primary separate turn signal face shall not be positioned any**
 493 **further to the right than the extension of the right-hand edge of the exclusive**
 494 **turn lane or any further to the left than the extension of the left-hand edge of**
 495 **the exclusive turn lane.**

496 **08 Supplemental turn signal faces mounted over the roadway shall not be**
 497 **subject to the positioning requirements in the previous paragraph.**

498 *Guidance:*
499 09 For new or reconstructed signal installations, on an approach with an exclusive turn
500 lane(s) for a left-turn (or U-turn to the left) movement and with opposing vehicular
501 traffic, signal faces that display a CIRCULAR GREEN signal indication should not be post-
502 mounted on the far-side median or mounted overhead above the exclusive turn lane(s)
503 or the extension of the lane(s).

504 **Standard:**
505 10 If supplemental post-mounted signal faces are used, the following limitations
506 shall apply:

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

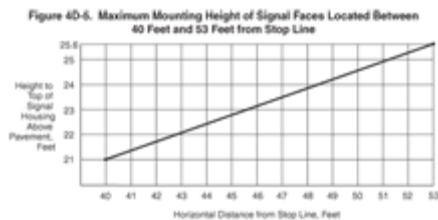
512 **No changes recommended to 4D.13.**

513 Section 4D.15 Mounting Height of Signal Faces

514 **Standard:**
515 01 The top of the signal housing of a vehicular signal face located over any
516 portion of a highway that can be used by motor vehicles shall not be more than
517 25.6 feet above the pavement.

518 02 For viewing distances between 40 and 53 feet from the stop line, the
519 maximum mounting height to the top of the signal housing shall be as shown in
520 Figure 4D-5.

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



523

524 03 The bottom of the signal housing and any related attachments to a vehicular
525 signal face located over any portion of a highway that can be used by motor
526 vehicles shall be at least 15 feet above the pavement.

527 04 The bottom of the signal housing (including brackets) of a vehicular signal
528 face that is vertically arranged and not located over a roadway:

- 529 A. Shall be a minimum of 8 feet and a maximum of 19 feet above the
530 sidewalk or, if there is no sidewalk, above the pavement grade at the
531 center of the roadway.

532 B. Shall be a minimum of 4.5 feet and a maximum of 19 feet above the
533 median island grade of a center median island if located on the near side
534 of the intersection.

535 05 The bottom of the signal housing (including brackets) of a vehicular signal
536 face that is horizontally arranged and not located over a roadway:

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

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

543 No change recommended to Section 4D.15

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

545 Standard:

546 01 Ramp control signals shall meet all of the standard design specifications for
547 traffic control signals, except as otherwise provided in this Section.

548 02 The signal face for freeway entrance ramp control signals shall be either a
549 two-section signal face containing red and green signal indications or a three-
550 section signal face containing red, yellow, and green signal indications.

551 03 If only one lane is present on an entrance ramp or if more than one lane is
552 present on an entrance ramp and the ramp control signals are operated such
553 that green signal indications are always displayed simultaneously to all of the
554 lanes on the ramp, then a minimum of two signal faces per ramp shall face
555 entering traffic.

556 04 If more than one lane is present on an entrance ramp and the ramp control
557 signals are operated such that green signal indications are not always displayed
558 simultaneously to all of the lanes on the ramp, then one signal face shall be
559 provided over the approximate center of each separately-controlled lane.

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

561 Guidance:

562 05 Additional side-mounted signal faces should be considered for ramps with two or more
563 separately-controlled lanes.

564 Standard:

565 06 Ramp control signals shall be located and designed to minimize their viewing
566 by mainline freeway traffic.

567 Option:

568 07 Ramp control signals may be placed in the dark mode (no indications displayed) when
569 not in use.

570 08 Ramp control signals may be used to control some, but not all, lanes on a ramp, such
571 as when non-metered HOV bypass lanes are provided on a ramp.

572 09 The required signal faces, if located at the side of the ramp roadway, may be mounted
573 such that the height above the pavement grade at the **approximate** center of the ramp
574 roadway to the bottom of the signal housing of the lowest signal face is between 4.5 and
575 6 feet.

576 10 For entrance ramps with only one controlled lane, the two required signal faces may
577 both be mounted at the side of the roadway on a single pole, with one face at the normal
578 mounting height and one face mounted lower as provided in Paragraph 9, as a specific
579 exception to the normal 8-foot minimum lateral separation of signal faces required by
580 Section 4D.13.

581 *Guidance:*

582 11 *Regulatory signs with legends appropriate to the control, such as XX Vehicle(S) Per*
583 *Green or XX VEHICLE(S) PER GREEN Each Lane (see Section 2B.56), should be installed*
584 *adjacent to the ramp control signal faces. When ramp control signals are installed on a*
585 *freeway-to-freeway ramp, special consideration should be given to assuring adequate*
586 *visibility of the ramp control signals, and multiple advance warning signs with flashing*
587 *warning beacons should be installed to warn road users of the metered operation.*

588

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

590 **Standard:**

591 01 **Lane-use control signals used at toll plazas shall comply with the provisions**
592 **of Chapter 4M except as otherwise provided in this Section.**

593 02 **At toll plazas with multiple lanes where one or more lanes is sometimes**
594 **closed to traffic, a lane-use control signal shall be installed above the**
595 **approximate center of each toll plaza lane to indicate the open or closed status**
596 **of the controlled lane.**

597 *Option:*

598 03 The bottom of the signal housing of a lane-use control signal above a toll plaza lane
599 having a canopy may be mounted lower than 15 feet above the pavement, but not lower
600 than the vertical clearance of the canopy structure.

601 04 Lane-use control signals may also be used to indicate the open or closed status of an
602 Open-Road ETC lane as a supplement to other devices used for the temporary closure of
603 a lane (see Part 6).

604 **Section 4L.02 Intersection Control Beacon**

605 **Standard:**

606 01 **An Intersection Control Beacon shall consist of one or more signal faces**
607 **directed toward each approach to an intersection. Each signal face shall consist**
608 **of one or more signal sections of a standard traffic signal face, with flashing**
609 **CIRCULAR YELLOW or CIRCULAR RED signal indications in each signal face. They**
610 **shall be installed and used only at an intersection to control two or more**
611 **directions of travel.**

612 02 **Application of Intersection Control Beacon signal indications shall be limited**
613 **to the following:**

- 614 **A. Yellow on one route (normally the major street) and red for the**
615 **remaining approaches, and**
616 **B. Red for all approaches (if the warrant described in Section 2B.07 for a**
617 **multi-way stop is satisfied).**

618 **03 Flashing yellow signal indications shall not face conflicting vehicular**
619 **approaches.**

620 **04 A STOP sign shall be used on approaches to which a flashing red signal**
621 **indication is displayed on an Intersection Control Beacon (see Section 2B.04).**

622 **05 If two horizontally aligned red signal indications are used on an approach for**
623 **an Intersection Control Beacon, they shall be flashed simultaneously to avoid**
624 **being confused with grade crossing flashing-light signals. If two vertically**
625 **aligned red signal indications are used on an approach for an Intersection**
626 **Control Beacon, they shall be flashed alternately.**

627 *Guidance:*

628 *06 An Intersection Control Beacon should not be mounted on a pedestal in the roadway*
629 *unless the pedestal is within the confines of a traffic or pedestrian island.*

630 *Option:*

631 *07 Supplemental signal indications may be used on one or more approaches in order to*
632 *provide adequate visibility to approaching road users.*

633 *08 Intersection Control Beacons may be used at intersections where traffic or physical*
634 *conditions do not justify conventional traffic control signals but crash rates indicate the*
635 *possibility of a special need.*

636 *09 An Intersection Control Beacon is generally located over the approximate center of an*
637 *intersection; however, it may be used at other suitable locations.*

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

639 **Standard:**

640 **01 All lane-use control signal indications shall be in units with rectangular signal**
641 **faces and shall have opaque backgrounds. Nominal minimum height and width**
642 **of each DOWNWARD GREEN ARROW, YELLOW X, and RED X signal face shall be**
643 **18 inches for typical applications. The WHITE TWO-WAY LEFT-TURN ARROW and**
644 **WHITE ONE WAY LEFT-TURN ARROW signal faces shall have a nominal minimum**
645 **height and width of 30 inches.**

646 **02 Each lane to be reversed or closed shall have signal faces with a DOWNWARD**
647 **GREEN ARROW and a RED X symbol.**

648 **03 Each reversible lane that also operates as a two-way or one-way left-turn**
649 **lane during certain periods shall have signal faces that also include the**
650 **applicable WHITE TWO-WAY LEFT-TURN ARROW or WHITE ONE WAY LEFT-TURN**
651 **ARROW symbol.**

652 **04 Each non-reversible lane immediately adjacent to a reversible lane shall have**
653 **signal indications that display a DOWNWARD GREEN ARROW to traffic traveling**

654 in the permitted direction and a RED X to traffic traveling in the opposite
655 direction.

656 05 If in separate signal sections, the relative positions, from left to right, of the
657 signal indications shall be RED X, YELLOW X, DOWNWARD GREEN ARROW,
658 WHITE TWO-WAY LEFT-TURN ARROW, WHITE ONE WAY LEFT-TURN ARROW.

659 06 The color of lane-use control signal indications shall be clearly visible for
660 2,300 feet at all times under normal atmospheric conditions, unless otherwise
661 physically obstructed.

662 07 Lane-use control signal faces shall be located **approximately** over the
663 **approximate** center of the lane controlled.

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

665 Option:

666 01 In-roadway lights may be installed at certain marked crosswalks, based on an
667 engineering study or engineering judgment, to provide additional warning to road users.

668 **Standard:**

669 02 **If used, In-Roadway Warning Lights at crosswalks shall be installed only at**
670 **marked crosswalks with applicable warning signs. They shall not be used at**
671 **crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.**

672 03 **If In-Roadway Warning Lights are used at a crosswalk, the following**
673 **requirements shall apply:**

- 674 A. **Except as provided in Paragraphs 7 and 8, they shall be installed along**
675 **both sides of the crosswalk and shall span its entire length.**
- 676 B. **They shall initiate operation based on pedestrian actuation and shall**
677 **cease operation at a predetermined time after the pedestrian actuation**
678 **or, with passive detection, after the pedestrian clears the crosswalk.**
- 679 C. **They shall display a flashing yellow light when actuated. The flash rate**
680 **shall be at least 50, but no more than 60, flash periods per minute. If**
681 **they are flashed in a manner that includes a continuous flash of varying**
682 **intensity and time duration that is repeated to provide a flickering effect,**
683 **the flickers or pulses shall not repeat at a rate that is between 5 and 30**
684 **per second to avoid frequencies that might cause seizures.**
- 685 D. **They shall be installed in the area between the outside edge of the**
686 **crosswalk line and 10 feet from the outside edge of the crosswalk.**
- 687 E. **They shall face away from the crosswalk if unidirectional, or shall face**
688 **away from and across the crosswalk if bidirectional.**

689 04 **If used on one-lane, one-way roadways, a minimum of two In-Roadway**
690 **Warning Lights shall be installed on the approach side of the crosswalk. If used**
691 **on two-lane roadways, a minimum of three In-Roadway Warning Lights shall be**
692 **installed along both sides of the crosswalk. If used on roadways with more than**
693 **two lanes, a minimum of one In-Roadway Warning Light per lane shall be**
694 **installed along both sides of the crosswalk.**

695 *Guidance:*
696 05 *If used, In-Roadway Warning Lights should be installed in the **approximate** center of*
697 *each travel lane, at the center line of the roadway, at each edge of the roadway or*
698 *parking lanes, or at other suitable locations away from the normal tire track paths.*

699

700

701 RWSTC Vote: 1-19-12 For: Unanimous

702 GM & I Vote: Unanimous 1-19-12

703 Signals Vote: approved 6-21-12

704 RWSTC Vote following sponsor comments 1-9-13: For: Unanimous

705 GM & I Vote: 1-10-13 Unanimous

706 Signals Vote: 1-9-13 For: Unanimous

707

708 Council Vote: For: Unanimous 1-11-13

709

710

711 c: NCUTCD/Jan 2012 meetings/RW # 1 – center over lane 11-27-11, revised 12-

712 4-11, revised 1-19-12, approved by signals 6-21-12, revised following sponsor comments

713 12-9-12, approved by RWSTC 1-9-13, Signals 1-9-13, GM & I 1-10-13, approved by

714 council 1-13-13

715