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National Committee on Uniform Traffic Control Devices

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Agenda Item III.3, June 2014

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TECHNICAL COMMITTEE:

RWSTC RECOMMENDATION

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TOPIC:

LED Sign Applications

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Task Force

**Pline, Bartlett, Carlson, Cohen, Heydel, Kennedy, Lipps,
McCourt, Ranck, Ramisch, Forbes (Canada)**

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STATUS/DATE OF ACTION:

09/20/10, 03/30/11, 05/06/11, 06/29/11,
08/25/11,/09/07/11, 11/07/11, 12/22/11,
03/06/1203/16/12, revised 1-9-14

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TC Drafts:

**05/05/12, 02/19/13, 02/2/13, 02/26/13, 03/23/13,
06/04/13, 07/22/13, 08/13/13, 08/22/13, 09/16/13**

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TC Approval:

1-9-14

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Transmitted to Sponsors:

April 2014

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TC Approval following sponsor comments:

June 26, 2014

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Council Approval:

June 28, 2014

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ORIGIN OF REQUEST:

Regulatory & Warning Signs Technical Committee

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AFFECTED SECTIONS OF MUTCD:

Parts 2A, 2B, 2C, 2G, 2H, 2L, 6E, 6F, 7B and 8B

23

DISCUSSION/QUESTION:

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Industry has developed LED lights beyond the existing coverage in the MUTCD and are applying LEDs to various sign applications. State and local agencies are being contacted promoting various LED applications for sign enhancements, specific sign legends, and special applications. The existing MUTCD provisions for LEDs does not provide the requirements to evaluate

29 the LED proposals while maintaining the basic principles of the MUTCD. The
30 RWSTC considered these issues and appointed a Task Force in June 2009 to
31 accomplish the following;

32 **OBJECTIVE: Review traffic control products being marketed relative to MUTCD provisions for LED**
33 **Regulatory and Warning signs and messages on all sign displays. Recommend MUTCD revisions to**
34 **maintain basic traffic control concepts, recognize the adaptability of LED technology for**
35 **communicating regulatory and warning sign messages and provide guidance to industry for LED**
36 **signing developments.**

37 The Task Force has reviewed the products in the market place, FHWA letters and responses relative to
38 LED signs, Canadian LED-Embedded Traffic Signs report, and various other research projects relating to
39 LED applications.

40 After this review and extensive discussion, the Task Force developed the following General Provisions
41 and guidelines to address the MUTCD provisions:

42 **LED Signs – General Provisions 01/28/11, 02/19/13,**
43 **06/03/13,07/22/13, 08/22/13, 09/16/13, 1-9-14**

- 44 1. LED signs shall comply with the MUTCD relative to shape, color, dimensions, symbols,
45 legends and border provisions for the comparable standard sign.
- 46 2. Dynamic (road user activated) signs should be supplemental to other standard signing.
- 47 3. No multiple concentration of LEDs or LED clusters or large LEDs that resemble a flasher
48 shall be permitted within the face of the sign.
- 49 4. The appropriate viewing angles for signs incorporating LEDs will not change from the
50 standard signing.
- 51 5. Viewing distance – 100 feet to ¼ mile
- 52 6. LED Color- ITE specifications for Vehicle Traffic Control Signal Heads: Light Emitting
53 Diode (LED) Circular Signal Supplement and Pedestrian Traffic Control Signal Indications-
54 Part 2, Light Emitting Diode Pedestrian Traffic Signal Modules.
- 55 7. Minimum Intensity – The minimum maintained luminous intensity of the LEDs should be
56 in accordance with industry practice to ensure adequate external luminance contrast.
57 Maximum Intensity – The maximum luminous intensity shall be no more than 10 times
58 the minimum maintained luminous intensity, shall not create disability glare, reduce
59 sign legibility, or create undue road user distraction.
60 Uniformity – The ratio of the maximum and minimum luminance intensities in a single
61 installation shall be a maximum of 10:1.

- 62 **8.** Due to the substantial difference in LED visibility between sunlight and nighttime
63 conditions, the LEDs shall have dimming capabilities that adjust to ambient light
64 conditions.
- 65 **9.** Not more than one message should flash at the same time. Only one flashing LED sign is
66 permitted within XX feet of another flashing LED sign.

67 **LED SIGN MATRIX**

68 Description	Border Only	Legend	Full Matrix
69 Purpose	Enhance sign 70 conspicuity and 71 attract drivers 72 attention	Increase sign legibility or provide part time or dynamic legend	Individual sign display on changeable message sign
73 LED Application	Individual pixels border only	Legend only	Sign border, legend and background
75 LED Color	Same as sign background	As specified for each sign	Same as standard sign
78 LED Flash	Simultaneously	Simultaneously	No
81 Flash Rate	50 to 120 times per minute	50 to 120 times per minute	
84 LED Diameter	¼-inch maximum	¼ inch maximum	¼ -inch maximum
85 LED Spacing	At least 25 % of sign perimeter dimension	Legend & Symbol layout shall match standard sign. The pitch shall provide a legend that is comparable to a static sign when the LED's are illuminated	Not Applicable
92 Sign Examples	Stop/Yield Stop/Slow Paddles Do Not Enter Wrong Way	Variable Speed Limit Turn Prohibitions Variable Lane Control Reversible Lane Control	Route Markers Guide Sign Legends Regulatory signs on CMS Warning signs on CMS

96	Warning Signs	Preferential Lane Control
97	Exit Speed	Chevrons
98	Ramp Speed	One Direction Large Arrow
99	School Crosswalk	School Speed Limit
100	Assembly	Your Speed XX MPH

101 There was some confusion generated when addressing the regulatory and warning signs and
102 Changeable Message signs. To resolve that problem, it was the decision of the Task Force to
103 retain the Changeable Message terminology for the full matrix LED signs and other wording
104 such as “Part Time”, electronic, driver feedback, and blank-out to differentiate the regulatory
105 and warning sign applications. The MUTCD provisions for Changeable Message signs have been
106 included without modifications in the following proposed text revisions to facilitate a
107 comparison of the LED provisions.

108 **RECOMMENDED WORDING:**

109
110 **MUTCD 2009 Text pertaining to LEDs and Changeable Message Signs**

111 **Existing 2009 Text = Black**

112 **Deletions = ~~strikethrough-Red~~ Additions = RED underlined**

113 **Previous Council Action = Blue**

114 **Comments and Explanation = Green**

115 **Latest Revisions = 11/07/2011, 12/22/2011**

116 **03/06/2012, 06/03/13, 08/22/13, 09/16/13,**
117 **1-9-14, 6/02/14**

118
119 **REVISE THE FOLLOWING DEFINITIONS**

120 **Section 1A.13 Definitions of Headings, Words, and Phrases in this**
121 **Manual**

122 **5. Actuation – initiation of a change in or extension of a traffic signal phase or sign**
123 **legend through the operation of any type of detector.**

124 **28. Changeable Message Sign—a sign that is capable of displaying more than one**
125 **message ~~7~~ changeable manually, by remote control, or by automatic control. Electronic-**
126 **display changeable message signs are referred to as Dynamic Message Signs in the**
127 **National Intelligent Transportation Systems (ITS) Architecture and are referred to as**
128 **Variable Message Signs in the National Electrical Manufacturers Association (NEMA)**
129 **standards publication.**

130 **74. Flashing – an operation in which a light source, such as a traffic signal indication or**
131 **LED, is turned on and off repetitively.**

132 **RECOMMEND THE FOLLOWING CHANGES**

133 **Section 2A.06 Design of Signs**

134 **Standard:**
135 06 **The term legend shall include all word messages and symbol and arrow designs that**
136 **are intended to convey specific meanings.**

137 07 **Uniformity in design shall include shape, color, dimensions, legends, borders, and**
138 **illumination or retroreflectivity.**

139 09 **All symbols shall be unmistakably similar to, or mirror images of, the adopted**
140 **symbol signs, all of which are shown in the "Standard Highway Signs and Markings"**
141 **book (see Section 1A.11). Symbols and colors shall not be modified unless otherwise**
142 **provided in this Manual. All symbols and colors for signs not shown in the "Standard**
143 **Highway Signs and Markings" book shall follow the procedures for experimentation**
144 **and change described in Section 1A.10.**

145 **Standard:**
146 11 **Where a standard word message is applicable, the wording shall be as provided in**
147 **this Manual.**

148 12 **In situations where word messages are required other than those provided in this**
149 **Manual, the signs shall be of the same shape and color as standard signs of the same**
150 **functional type.**

151 **Section 2A.07 Retroreflectivity and Illumination**

152 Support:
153 01 There are many materials currently available for retroreflection and various methods currently
154 available for the illumination of signs and object markers. New materials and methods continue
155 to emerge. New materials and methods can be used as long as the signs and object markers
156 meet the standard requirements for color, both by day and by night.

157 **Standard:**
158 02 **Regulatory, warning, and guide signs and object markers shall be retroreflective**
159 **(see Section 2A.08) or illuminated to show the same shape and similar color by both**
160 **day and night, unless otherwise provided in the text discussion in this Manual for a**
161 **particular sign or group of signs.**

162 03 **The requirements for sign illumination shall not be considered to be satisfied by**
163 **street or highway lighting.**

164 Option:
165 04 Sign elements may be illuminated by the means shown in Table 2A-1.

166 **Table 2A-1. Illumination of Sign Elements**

167 Means of Illumination	168 Sign Element to be Illuminated
169 Light behind the sign face	170 • Symbol or word message 171 • Background 172 • Symbol, word message, and background 173 (through a translucent material)
174 Attached or independently 175 mounted light source designed 176 to direct essentially uniform	177 Entire sign face

178	illumination onto the sign face	
179		
180	Light emitting diodes (LED's)	• Symbol or word message
181		• Portions of the Sign border
182		• <u>Entire Background</u>
183		
184	Other devices, or treatments that	
185	highlight the sign shape, color, or	
186	message:	
187	Luminous tubing	Symbol or word message
188	Fiber optics	Entire sign face
189	Incandescent light bulbs	
190	Luminescent panel	• Symbol or word message
191		

192 06 Light Emitting Diode (LED) units may be used individually within the border, legend or symbol
193 of a sign, in a one-legend "blank-out" sign, part-time sign or driver feedback sign to enhance the
194 sign conspicuity and increase the sign legibility. These application of LED units are not
195 considered as changeable message signs, or provide a changeable message.

196 Support:

197 LED units that are used to illuminate the full sign matrix, background and legend, are changeable
198 message signs (CMS) covered in Part 2L Regulatory and warning LED signs are covered in Parts
199 2B, 2C and 7.

200 **Standard:**

201 07 Except as provided in Paragraphs 11 and 12 , and changeable message signs neither
202 individual LEDs nor groups of LEDs shall be placed within the background area of a sign.

203 The application of LEDs to display sign legends or symbols shall use a maximum pitch of 20
204 mm to cover the stroke width of the letter or symbol.

205 08 ~~if used~~, The LEDs shall not protrude outside the sign border or legend when used in
206 such applications, shall have a maximum diameter of 1/4 inch, and shall be the following
207 colors based on the type of sign:

- 208 A. White or Red, ~~if used with STOP or YIELD~~ with red background regulatory signs.
- 209 B. White, ~~if used with other~~ regulatory signs ~~other than STOP or YIELD signs.~~
- 210 C. White or Yellow, ~~if used~~ with warning signs.
- 211 D. White or Green ~~if used~~ with guide signs.
- 212 E. White, Yellow, or orange, ~~if used~~ with temporary traffic control signs.
- 213 F. White ~~or~~, Yellow or yellow green, ~~if used~~ with school area or pedestrian or bicycle
214 warning signs.

215 09 If flashed, all LED units shall flash simultaneously at any steady rate between 50 and
216 120 times per minute. All the LED units in a sign legend or border shall be illuminated
217 simultaneously with no sequential (chasing) or variable flash (dancing) rates. A cluster of
218 LEDs shall not be used within the border of a sign.

219 10 The uniformity of the sign design shall be maintained without any decrease in visibility,
220 legibility, or driver comprehension during either daytime or nighttime conditions. The LEDs
221 shall not produce disability glare that obscures the sign legend. The LED units shall have
222 the capability to be dimmed automatically by a timing mechanism or a device sensitive to
223 ambient light (photo-electric cell).

- 224 Option:
 225 11 For STOP and YIELD signs and other regulatory signs with a red background, LEDs may be
 226 placed within the border or within one border width within the background of the sign.
- 227 12 For STOP/SLOW paddles used by flaggers see Section 6E.03 and the STOP paddles used by
 228 adult crossing guards see Section 7D.05.

229
 230 **Table 2A-5. Common Uses of Sign Colors**

Type of Sign	Legend						Background									
	Black	Green	Red	White	Yellow	Org FYG FPK	Black	Blue	Brown	Green	Orange*	Red*	White	Yellow	FYG	FPK
Changeable Message Signs																
Regulatory			X***	X												X
Warning					X											X
Temporary Traffic Control					X	X										X
Guide				X									X**			X
Motorist Services				X												X
Incident Management					X										X	X
School, Pedestrian,					X										X	X
Bicycle																X

243 * Fluorescent versions of these background colors may also be used.
 244 ** These alternative background colors would be provided by blue or green lighted pixels such that the entire CMS would be lighted, not just
 245 the legend.
 246 *** Red is used only for the circle and slash or other red elements of a similar static regulatory sign.
 247 **** The use of the color purple on signs is restricted per the provisions of Paragraph 1 of Section 2F.03.

249 **Section 2A.12 Symbols**

250 **Standard:**
 251 01 **Symbol designs shall in all cases be unmistakably similar to those shown in this**
 252 **Manual and in the "Standard Highway Signs and Markings" book (see Section 1A.11).**

253 **Standard:**
 254 08 **A symbol used for a given category of signs (regulatory, warning, or guide) shall not**
 255 **be used for a different category of signs, except as specifically authorized in this**
 256 **Manual.**

257 **Section 2A.13 Word Messages**

258 **Standard:**
 259 01 **Except as provided in Section 2A.06, all word messages shall use standard wording**
 260 **and letters as shown in this Manual and in the "Standard Highway Signs and Markings"**
 261 **book (see Section 1A.11).**

262 **Section 2A.14 Sign Borders**

263 **Standard:**
 264 01 **Unless otherwise provided, each sign illustrated in this Manual shall have a border**
 265 **of the same color as the legend, at or just inside the edge.**

266 02 **The corners of all sign borders shall be rounded, except for STOP signs.**

267 *Guidance:*
268 03 *A dark border on a light background should be set in from the edge, while a light border on a*
269 *dark background should extend to the edge of the sign. A border for 30-inch signs with a light*
270 *background should be from 1/2 to 3/4 inch in width, 1/2 inch from the edge. For similar signs*
271 *with a light border, a width of 1 inch should be used. For other sizes, the border width should be*
272 *of similar proportions, but should not exceed the stroke-width of the major lettering of the sign.*
273 *On signs exceeding 72 x 120 inches in size, the border should be 2 inches wide, or on larger*
274 *signs, 3 inches wide. Except for STOP signs and as otherwise provided in Section 2E.16, the*
275 *corners of the sign should be rounded to a radius that is concentric with that of the border.*

276 04 LEDs used in the border of a sign should be the same color as the background of the sign
277 with some variations permitted as noted in Section 2A.07. The number of LEDs should be
278 sufficient to outline the shape of the sign.

279 **Section 2A.15 Enhanced Conspicuity for Standard Signs**

280 *Option:*
281 01 *Based upon engineering judgment, where the improvement of the conspicuity of a standard*
282 *regulatory, warning, or guide sign is desired, any of the following methods may be used, as*
283 *appropriate, to enhance the sign's conspicuity (see Figure 2A-1):*

284 J. *Adding light emitting diode (LED) units within the symbol , legend or border of a*
285 *standard regulatory, warning, or guide sign, as provided in Section 2A.07.*
286

287 **Section 2B.01 Application of Regulatory Signs**

288 **Standard:**
289 01 **Regulatory signs shall be used to inform road users of selected traffic laws or**
290 **regulations and indicate the applicability of the legal requirements.**

291 02 *Regulatory signs shall be installed at or near where the regulations apply. The signs shall*
292 *clearly indicate the requirements imposed by the regulations and shall be designed and installed*
293 *to provide adequate visibility and legibility in order to obtain compliance.*

294 03 *Regulatory signs shall be retroreflective or illuminated (see Section 2A.07) to show the same*
295 *shape and similar color by both day and night, unless specifically stated otherwise in the text*
296 *discussion in this Manual for a particular sign or group of signs.*

297 **Section 2B.02 Design of Regulatory Signs**

298 **Standard:**
299 01 **Regulatory signs shall be rectangular unless specifically designated otherwise.**
300 **Regulatory signs shall be designed in accordance with the sizes, shapes, colors, and**
301 **legends contained in the "Standard Highway Signs and Markings" book (see Section**
302 **1A.11).**

303 *Guidance:*
304 05 Changeable-message LED signs displaying a part-time regulatory message incorporating a
305 prohibitory message that includes a red circle and slash on a static sign should display a red
306 symbol that approximates the same red circle and slash as closely as possible. The prohibited

307 movement symbol should be a white LED symbol on a black background or a black symbol on a
308 full matrix white LED background.

309 Option

310 06 The LEDs in the border of regulatory signs may be static, or flash at rates per Section 2A.07
311 (09).

312 **Standard:**

313 **07 A regulatory sign displayed entirely with LEDs and incorporated within the border**
314 **of a larger full matrix changeable message sign shall display the regulatory sign**
315 **legend in the size, shape, color and legend of the standard regulatory sign.**

316 **A full matrix LED display shall not be used for a STOP (R1-1) sign or a YIELD (R1-2)**
317 **sign.**

318 **Section 2B.13 Speed Limit Sign (R2-1)**

319 Option:

320 18 A ~~n changeable message LED part time regulatory variable speed limit~~ sign that changes the
321 speed limit for traffic and ambient conditions may be installed provided that the appropriate
322 speed limit is displayed at the proper times and locations in accordance with paragraph (04) and
323 (05) (Council 1/19/13).

324 **Standard:**

325 **19 The variable speed limit sign legend "SPEED LIMIT" shall be a black legend on a**
326 **white retroreflective background.**

327 Option:

328 20 The variable speed limit legend may be indicated by white LEDs on a opaque black
329 background

330 Option:

331 ~~19~~ 21 A changeable message The driver feedback sign (WX-XX) that displays to approaching
332 drivers the speed at which they are traveling may be installed ~~in conjunction with a Speed Limit~~
333 ~~sign.~~ to supplement the Speed Limit sign (See Section 2C.XX)

334 Guidance:

335 20 If a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED
336 XX MPH or such similar legend should be displayed. The color of the changeable message legend
337 should be a yellow legend on a black background or the reverse of these colors.

338 **Section 2B.18 Movement Prohibition Signs (R3-1 through R3-4, R3-** 339 **18, and R3-27)**

340 12 When the movement restriction applies during certain time periods only, the following
341 Movement Prohibition signing alternatives may be used and are listed in order of preference:

- 342 A. ~~Changeable message~~ A part-time regulatory sign that displays prohibitive movement
343 showing for the hours during which the prohibition is applicable, especially at signalized
344 intersections.
- 345 B. Permanently mounted signs incorporating a supplementary legend showing the hours and
346 days during which the prohibition is applicable
- 347 C. Portable signs, installed by proper authority, located off the roadway at each corner of
348 the intersection. The portable signs are only to be used during the time that the
349 movement prohibition is applicable.

350

351 **Standard:**

352 The blank-out LED part-time prohibitive movement sign shall consist of a red LED
353 circle and slash with white LED prohibited movement on an opaque black background.

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

355 Option:

356 01 A reversible lane may be used for through traffic (with left turns either permitted or
357 prohibited) in alternating directions during different periods of the day, and the lane may be used
358 for exclusive left turns in one or both directions during other periods of the day as well.
359 Reversible Lane Control (R3-9e through R3-9i) signs (see Figure 2B-6) may be either static type
360 or changeable message type. These signs may be either post-mounted or overhead.

361 **Standard:**

362 02 **Post-mounted Reversible Lane Control signs shall be used only as a**
363 **supplement to overhead signs or signals. Post-mounted signs shall be identical in**
364 **design to the overhead signs and an additional legend such as CENTER LANE shall be**
365 **added to the sign (R3-9f) to indicate which lane is controlled. For both word messages**
366 **and symbols, this legend shall be at the top of the sign.**

367 03 **Where it is determined by an engineering study that lane-use control**
368 **signals or physical barriers are not necessary, the lane shall be controlled by**
369 **overhead Reversible Lane Control signs (see Figure 2B-7).**

370 Option:

371 04 Reversing traffic flow may be controlled with pavement markings and Reversible Lane Control
372 signs (without the use of lane control signals), when all of the following conditions are met:

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

377 **Standard:**

378 05 **Reversible Lane Control signs shall contain the legend or symbols designating the**
379 **allowable uses of the lane and the time periods such uses are allowed. Where symbols**
380 **and legends are used, their meanings shall be as shown in Table 2B-2.**

381 06 Reversible Lane Control signs shall consist of a white background with a black
382 legend and border, except for the R3-~~9d~~ (9e) sign, where the color red is used.

383 07 Symbol signs, such as the R3-~~9d~~(9e) sign, shall consist of the appropriate symbol in
384 the upper portion of the sign with the appropriate times of the day and days of the
385 week below it. All times of the day and days of the week shall be accounted for on the
386 sign to eliminate confusion to the road user.

387 08 In situations where more than one message is conveyed to the road user, such as
388 on the R3-~~9d~~ (9e) sign, the sign legend shall be arranged as follows:

- 389 A. The prohibition or restriction message is the primary legend and shall be on the
390 top for word message signs and to the far left for symbol signs,
- 391 B. The permissive use message shall be displayed as the second legend, and
- 392 C. The OTHER TIMES message shall be displayed at the bottom for word message
393 signs and to the far right for symbol signs.

394 Option:

395 09 The symbol signs may also include a downward pointing arrow with the legend THIS LANE.
396 The term OTHER TIMES may be used for either the symbol or word message sign.

397 **Standard:**

398 14 Flashing beacons, if used to **accentuate supplement** the overhead Reversible Lane
399 Control signs, shall comply with the applicable requirements for flashing beacons in
400 **Chapter 4L**.

401 **Section 2B.37 DO NOT ENTER Sign (R5-1)**

402 **Standard:**

403 01 The DO NOT ENTER (R5-1) sign (see **Figure 2B-11**) shall be used where traffic is
404 prohibited from entering a restricted roadway.

405 *Guidance:*

406 02 The DO NOT ENTER sign, if used, should be placed directly in view of a road user at the point
407 where a road user could wrongly enter a divided highway, one-way roadway, or ramp (see
408 **Figure 2B-12**). The sign should be mounted on the right-hand side of the roadway, facing traffic
409 that might enter the roadway or ramp in the wrong direction.

410 03 If the DO NOT ENTER sign would be visible to traffic to which it does not apply, the sign
411 should be turned away from, or shielded from, the view of that traffic.

412 Option:

413 04 The DO NOT ENTER sign may be installed where it is necessary to emphasize the one-way
414 traffic movement on a ramp or turning lane.

415 05 A second DO NOT ENTER sign on the left-hand side of the roadway may be used, particularly
416 where traffic approaches from an intersecting roadway (see **Figure 2B-12**).

417 **Red LEDs may be installed within the border of the DO NOT ENTER sign to enhance the**
418 **conspicuity of the sign. The LEDs may be vehicle actuated to flash at the rates as shown in**
419 **Section 2A.07(09).**

420 Support:
421 06 [Section 2B.41](#) contains information regarding an optional lower mounting height for DO NOT
422 ENTER signs that are located along an exit ramp facing a road user who is traveling in the wrong
423 direction.

424 **Section 2B.38 WRONG WAY Sign (R5-1a)**

425 Option:
426 01 The WRONG WAY (R5-1a) sign (see [Figure 2B-11](#)) may be used as a supplement to the DO
427 NOT ENTER sign where an exit ramp intersects a crossroad or a crossroad intersects a one-way
428 roadway in a manner that does not physically discourage or prevent wrong-way entry (see
429 [Figure 2B-12](#)).

430 *Guidance:*
431 02 *If used, the WRONG WAY sign should be placed at a location along the exit ramp or the one-*
432 *way roadway farther from the crossroad than the DO NOT ENTER sign (see [Section 2B.41](#)).*

433 Support:
434 03 [Section 2B.41](#) contains information regarding an optional lower mounting height for WRONG
435 WAY signs that are located along an exit ramp facing a road user who is traveling in the wrong
436 direction.

437 Option:

438 Red LEDs may be installed within the border of the WRONG WAY sign to enhance the conspicuity
439 of the sign. The LEDs may be vehicle actuated to flash at the rates as shown in [Section](#)
440 [2A.07\(09\)](#).

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

442
443 **Standard:**
444 01 **Where a right turn on red (or a left turn on red from a one-way street to a one-way**
445 **street) is to be**
446 **prohibited, a symbolic NO TURN ON RED (symbolic circular red) (R10-11) sign (see**
447 **Figure 2B-27) or a NO TURN ON RED (R10-11a, R10-11b) word message sign (see Figure**
448 **2B-27) shall be used.**

449
450 *Guidance:*
451 02 *If used, the No Turn on Red sign should be installed near the appropriate signal head.*
452 03 *A No Turn on Red sign should be considered when an engineering study finds that one or more of the*
453 *following conditions exists:*
454 *A. Inadequate sight distance to vehicles approaching from the left (or right, if applicable);*
455 *B. Geometrics or operational characteristics of the intersection that might result in unexpected*
456 *conflicts;*
457 *C. An exclusive pedestrian phase;*
458 *D. An unacceptable number of pedestrian conflicts with right-turn-on-red maneuvers, especially*
459 *involving children, older pedestrians, or persons with disabilities;*
460 *E. More than three right-turn-on-red accidents reported in a 12-month period for the particular*
461 *approach; or*

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

464
465 Option:

466 ~~04 A supplemental R10-20aP plaque (see Figure 2B-27) showing times of day (similar to the S4-1P plaque~~
467 ~~shown in Figure 7B-1) with a black legend and border on a white background may be mounted below a~~
468 ~~No Turn on Red sign to indicate that the restriction is in place only during certain times.~~

469 ⁰⁵ ~~04~~ Alternatively, A blank-out part-time restriction prohibited movement (R3-1, R3-2, R3-4, R3-18, and
470 R3-27) LED sign (See Section 2B.18) may be used instead of a static NO TURN ON RED sign, to
471 display either the NO TURN ON RED legend or the No Right Turn symbol or word message, as
472 appropriate, only at certain times during the day or during one or more portion(s) of a particular cycle of
473 the traffic signal.

474
475 05 Alternatively, a supplemental R10-20aP plaque (see Figure 2B-27) showing times of day (similar to
476 the S4-1P plaque shown in Figure 7B-1) with a black legend and border on a white background may be
477 mounted below a No Turn on Red sign to indicate that the restriction is in place only during certain times.
478 White LEDs may be used in the border and activated during periods of turn prohibition to enhance the
479 sign conspicuity.

480
481 ⁰⁶ On signalized approaches with more than one right-turn lane, a NO TURN ON RED EXCEPT FROM
482 RIGHT LANE (R10-11c) sign (see Figure 2B-27) may be post-mounted at the intersection or a NO
483 TURN ON RED FROM THIS LANE (with down arrow) (R10-11d) sign (see Figure 2B-27) may be
484 mounted ~~directly~~ over the approximate (Council 1/11/13) center of the lane from which turns on red are
485 prohibited.

486
487 *Guidance:*

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

491
492 Option:

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

496 **Section 2C.03 Design of Warning Signs**

497 **Standard:**

498 **01 Except as provided in Paragraph 2 or unless specifically designated otherwise, all**
499 **warning signs shall be diamond-shaped (square with one diagonal vertical) with a**
500 **black legend and border on a yellow background. Warning signs shall be designed in**
501 **accordance with the sizes, shapes, colors, and legends contained in the "Standard**
502 **Highway Signs and Markings" book (see Section 1A.11).**

503 Option:

504 ⁰² A warning sign that is larger than the size shown in the Oversized column in Table 2C-2 for
505 that particular sign may be diamond-shaped or may be rectangular or square in shape.

506 ⁰⁴ Word message warning signs other than those provided in this Manual may be developed and
507 installed by State and local highway agencies.

508 05 Warning signs regarding conditions associated with pedestrians, bicyclists, and playgrounds
509 may have a black legend and border on a yellow or fluorescent yellow-green background.

510 Warning signs may be enhanced with static or flashing LEDs at acceptable rates (See Section
511 2A.07) in the sign border matching the background color of the sign.

512 **Standard:**

513 06 **Warning signs regarding conditions associated with school buses and schools and**
514 **their related supplemental plaques shall have a black legend and border on a**
515 **fluorescent yellow-green background (see Section 7B.07).**

516 **Section 2C.08 Advisory Speed Plaque (W13-1P)**

517 Option:

518 01 The Advisory Speed (W13-1P) plaque (see Figure 2C-1) may be used to supplement any
519 warning sign to indicate the advisory speed for a condition.

520 **Standard:**

521 02 **The use of the Advisory Speed plaque for horizontal curves shall be in accordance**
522 **with the information shown in Table 2C-5. The Advisory Speed plaque shall also be**
523 **used where an engineering study indicates a need to advise road users of the advisory**
524 **speed for other roadway conditions.**

525 03 **If used, the Advisory Speed plaque shall carry the message XX MPH. The speed**
526 **displayed shall be a multiple of 5 mph.**

527 04 **Except in emergencies or when the condition is temporary, an Advisory Speed plaque**
528 **shall not be installed until the advisory speed has been determined by an engineering**
529 **study.**

530 05 **The Advisory Speed plaque shall only be used to supplement a warning sign and**
531 **shall not be installed as a separate sign installation.**

532 06 **The advisory speed shall be determined by an engineering study that follows established**
533 **engineering practices.**

534 Section 2C.xx Driver Feedback Sign (WX-XX):

535 Option:

536 11 A supplemental driver feedback LED sign indicating YOUR SPEED XX MPH (WX-XX) sign may
537 be used near the point of curvature of a horizontal curve to supplement the standard alignment
538 warning sign or used downstream of a posted speed limit sign. The vehicle speed display may be
539 static or flash at acceptable rates (See Section 2A.07)

540 **Standard:**

541 12 **The legend, YOUR SPEED, on a YOUR SPEED XX MPH (WX-XX) sign shall be a black**
542 **legend with a font size in conformance with the appropriate facility type on a yellow**
543 **retroreflective background. The LED legend displaying the speed value shall be a**

544 yellow illuminated legend with not less than 20 mm pitch LEDs covering the stroke
545 width of a 10 inch series numeral on an opaque black background.

546 Option:

547 13 A driver feedback LED sign that displays the legend "SLOW TO XX MPH" may be used to
548 activate the sign speed legend when the approaching vehicle speed exceeds the posted speed

549 **Section 2C.09 Chevron Alignment Sign (W1-8)**

550 **Standard:**

551 01 **The use of the Chevron Alignment (W1-8) sign (see Figures 2C-1 and 2C-2) to**
552 **provide additional emphasis and guidance for a change in horizontal alignment shall be**
553 **in accordance with the information shown in Table 2C-5.**

554 **Option:**

555 02 ~~When used,~~ (Council 1/19/12) Chevron Alignment signs may be used instead of or in addition
556 to standard delineators.

557 **Standard:**

558 03 **The Chevron Alignment sign shall be a vertical rectangle. No border shall be used on**
559 **the Chevron Alignment sign.**

560 06 ~~If used,~~ The Chevron Alignment signs should be visible for a sufficient distance to provide the
561 road user with adequate time to react to the change in alignment.

562

563 Option:

564 07 LEDs may be used to enhance chevron signs and if vehicle activated the LEDs may be flashed
565 concurrently but not sequentially within the sign panel.

566 **Standard:**

567 08 The LEDs used in the chevron alignment sign shall consist of yellow LEDs outlining
568 the chevron symbol.

569 **Section 2C.13 Truck Rollover Warning Sign (W1-13)**

570 **Option:**

571 01 A Truck Rollover Warning (W1-13) sign (see Figure 2C-1) may be used to warn drivers of
572 vehicles with a high center of gravity, such as trucks, tankers, and recreational vehicles, of a
573 curve or turn where geometric conditions might contribute to a loss of control and a rollover as
574 determined by an engineering study.

575 **Standard:**

576 03 **If a Truck Rollover Warning (W1-13) sign is used, it shall be accompanied by an**
577 **Advisory Speed (W13-1P) plaque indicating the recommended speed for vehicles with**
578 **a higher center of gravity.**

579 Option:
580 04 The Truck Rollover Warning sign may be displayed as a static sign, as a static sign
581 supplemented by a flashing-warning beacon, or as a driver feedback changeable message LED
582 sign activated by the detection of an approaching vehicle with a high center of gravity that is
583 traveling in excess of the recommended speed for the condition. The driver feedback -LED sign
584 may be yellow LEDs in the warning sign border or a flashing advisory speed legend in the
585 advisory speed plaque.

586 Guidance:

587 The driver feedback LED sign should be a yellow LED legend on a black opaque background
588 displaying the vehicle speed approaching the change in horizontal alignment. The detected speed
589 should have a steady or flashing message displaying the vehicle speed approaching the change
590 in horizontal alignment.

591 **Section 2C.36 Advance Traffic Control Signs (W3-1, W3-2, W3-3,** 592 **W3-4)**

593 **Standard:**

594 01 **The Advance Traffic Control symbol signs (see Figure 2C-6) include the Stop Ahead**
595 **(W3-1), Yield Ahead (W3-2), and Signal Ahead (W3-3) signs. These signs shall be**
596 **installed on an approach to a primary traffic control device that is not visible for a**
597 **sufficient distance to permit the road user to respond to the device (see Table 2C-4).**
598 **The visibility criteria for a traffic control signal shall be based on having a continuous**
599 **view of at least two signal faces for the distance specified in Table 4D-2.**

600 Option:

601 05 An Advance Traffic Control sign may be used for additional emphasis of the primary traffic
602 control device, even when the visibility distance to the device is satisfactory.

603 06 An advance street name plaque (see Section 2C.58) may be installed above or below an
604 Advance Traffic Control sign.

605 07 A warning beacon or yellow LEDs within the border of the sign may be used with an Advance
606 Traffic Control sign.

607 08 A BE PREPARED TO STOP (W3-4) sign (see Figure 2C-6) may be used to warn of stopped
608 traffic caused by a traffic control signal or in advance of a section of roadway that regularly
609 experiences traffic congestion.

610 **Standard:**

611 09 **When a BE PREPARED TO STOP sign is used in advance of a traffic control signal, it**
612 **shall be used in addition to a Signal Ahead sign and shall be placed downstream from**
613 **the Signal Ahead (W3-3) sign.**

614 Option:

615 10 The BE PREPARED TO STOP sign may be supplemented with a warning beacon (see Section
616 4L.03) or yellow LEDs within the border of the sign.

617 *Guidance:*

618 11 *When the warning beacon or sign border LEDs are interconnected with a traffic control signal*

619 *or queue detection system, the BE PREPARED TO STOP sign should be supplemented with a*
620 *WHEN FLASHING (W16-13P) plaque (see [Figure 2C-12](#)).*

621 **Section 2G.03 Regulatory Signs for Preferential Lanes – General**

622 **Standard:**

623 **01 When a preferential lane is established, the Preferential Lane regulatory signs (see**
624 **[Figure 2G-1](#)) and pavement markings (see Chapter 3D) for these lanes shall be used to**
625 **advise road users**

626 **Option:**

627 05 Changeable message signs may supplement, substitute for, or be incorporated into static
628 Preferential Lane regulatory signs where travel conditions change or where multiple types of
629 operational strategies (such as variable occupancy requirements or vehicle types) are used and
630 varied throughout the day or week, or on a real-time basis, to manage the use of, control of, or
631 access to preferential lanes.

632 **Support:**

633 06 [Figure 2G-1](#) illustrates examples of changeable messages incorporated into static Preferential
634 Lane regulatory signs. [The LED sign legends are normally the variable text such as the open and](#)
635 [closed lane legends.](#)

636 **Standard:**

637 **07 When changeable message signs (see Chapter 2L) are used as regulatory signs for**
638 **preferential lanes, they shall be the required sign size and shall display the required**
639 **letter height and legend format that corresponds to the type of roadway facility and**
640 **design speed.**

641 **Standard:**

642 23 The provisions of [Sections 2G.03](#) through [2G.07](#) regarding regulatory signs for
643 Preferential lanes shall apply to managed lanes operated at all times or at certain
644 times by varying vehicle occupancy requirements (HOV) or by using vehicle type
645 restrictions as a congestion management strategy. Such managed lanes shall use
646 changeable message signs or changeable message elements within static signs to
647 display the appropriate regulatory sign messages only when they are in effect.

648 **Section 2G.10 Preferential Lane Guide Signs – General**

649 22 Changeable message signs may supplement, substitute for, or be incorporated into static
650 guide signs ([See Figure 2G-6](#)) where travel conditions change or where multiple types of
651 operational strategies (such as variable occupancy requirements, vehicle types, or pricing
652 policies) are used and varied throughout the day or week to manage the use of, control of, or
653 access to preferential lanes.

654 **Standard:**

655 23 **When changeable message signs (see [Chapter 2L](#)) are used as guide signs for**
656 **preferential lanes, they shall be the required sign size and shall display the required**
657 **letter height and legend format that corresponds to the type of roadway facility and**
658 **design speed.**

659 **Section 2G.17 Regulatory Signs for Priced Managed Lanes**

660 **Standard:**
661 01 **Except as otherwise provided in this Section, the provisions of Sections 2G.03**
662 **through 2G.07 regarding regulatory signs for Preferential lanes shall apply to priced**
663 **managed lanes operated at all times or at certain times with a toll payment**
664 **requirement of some or all vehicles to use the lane(s). Such managed lanes shall use**
665 **changeable message signs or changeable message elements within static signs to**
666 **display the appropriate regulatory sign messages only when they are in effect.**

667 02 Regulatory signs for preferential lanes shall be appropriately modified for adaptation to a
668 priced managed lane, where applicable, as shown in Figure 2G-17.

669 03 Regulatory signs shall be used to indicate the toll charged. If the toll varies, regulatory signs
670 that include changeable message elements, such as the R3-48 and R3-48a signs that are shown
671 in Figure 2G-17, shall be used to display the actual toll amount in effect at any given time.

672 **Section 2G.18 Guide Signs for Priced Managed Lanes**

673 Option:
674 06 Changeable message signs may also be used on non-managed highways to display
675 comparative travel times or congestion levels for a nearby managed highway.

676 **Section 2H.03 Traffic Signal Speed Sign (I1-1)**

677 Option:
678 01 The Traffic Signal Speed (I1-1) sign (see Figure 2H-1), reading SIGNALS SET FOR XX MPH,
679 may be used to indicate a section of street or highway on which the traffic control signals are
680 coordinated into a progressive system timed for a specified speed at all hours during which they
681 are operated in a coordinated mode.

682 02 If different system progression speeds are set for different times of the day, a changeable
683 message element may be used for the numerals of the Traffic Signal Speed (I1-1) sign. If the
684 system is operated in coordinated mode only during certain times, a blank-out version of the
685 Traffic Signal Speed (I1-1) sign may be used to display the message only during those times.

686 **Standard:**
687 04 **The Traffic Signal Speed sign shall be a minimum of 24 x 36 inches with the longer**
688 **dimension vertical. It shall have a white message and border on a green background.**

689 *Guidance:*

690 *The LED message panel on a green Traffic Signal Speed sign shall be a white LED legend on a*
691 *black opaque background*

692 **Section 2L.01 Description of Changeable Message Signs**

693 Support:
694 01 A changeable message sign (CMS) is a traffic control device that is capable of displaying one
695 or more alternative messages. Some changeable message signs have a blank mode when no
696 message is displayed, while others display multiple messages with only one of the messages
697 displayed at a time (such as OPEN/CLOSED signs at weigh stations).

698 02 The provisions in this Chapter apply to both permanent and portable changeable message
699 signs with electronic displays. Additional provisions that only apply to portable changeable
700 message signs can be found in Section 6F.60. The provisions in this Chapter do not apply to
701 changeable message signs with non-electronic displays that are changed either manually or
702 electromechanically, such as a hinged-panel, rotating-drum, or back-lit curtain or scroll CMS.

703 **Standard:**

704 03 **Except as provided in Paragraph 2 of Section 2L.02, changeable message signs shall**
705 **display only traffic operational, regulatory, warning, and guidance information.**
706 **Advertising messages shall not be displayed on changeable message signs or its**
707 **supports or other equipment.**

708 04 **The design of legends for non-electronic display changeable message signs shall**
709 **comply with the provisions of Chapters 2A through 2K, 2M, and 2N of this Manual. All**
710 **other changeable message signs shall comply with the design and application**
711 **principles established in this Chapter, and in, Chapter 2A and other provisions noted**
712 **for specific signs.**

713 *Guidance:*

714 05 *Blank-out signs that display only single-phase, predetermined electronic-display legends that*
715 *are limited by their composition and arrangement of pixels or other illuminated forms in a fixed*
716 *arrangement (such as a blank-out sign indicating a part-time turn prohibition, a blank-out or*
717 *changeable lane-use sign, or a changeable OPEN/CLOSED sign for a weigh station) should*
718 *comply with the provisions of the applicable Section for the specific type of sign, provided that*
719 *the letter forms, symbols, and other legend elements are duplicates of the static messages as*
720 *detailed in the "Standard Highway Signs and Markings" book (see Section 1A.11). Because such*
721 *a sign is effectively an illuminated version of a static sign, the size of its legend elements, the*
722 *overall size of the sign, and placement of the sign should comply with the applicable provisions*
723 *for the static version of the sign.*

724

725 **Section 2L.02 Applications of Changeable Message Signs**

726 Support:

727 01 Changeable message signs have a large number of applications including, but not limited to,
728 the following:

- 729 A. Incident management and route diversion
- 730 B. Warning of adverse weather conditions
- 731 C. Special event applications associated with traffic control or conditions
- 732 D. Control at crossing situations
- 733 E. Lane, ramp, and roadway control
- 734 F. Priced or other types of managed lanes
- 735 G. Travel times
- 736 H. Warning situations
- 737 I. Traffic regulations
- 738 J. Speed control
- 739 K. Destination guidance

740 Support:
741 07 Section 2B.13 contains information regarding the design of changeable message signs that
742 are used to display variable speed limits that change based on ambient or operational conditions,
743 or that display the speed at which approaching drivers are traveling.

744 **Section 2L.03 Legibility and Visibility of Changeable Message Signs**

745 Support:

746 01 The maximum distance at which a driver can first correctly identify letters and words on a sign is called
747 the legibility distance of the sign. Legibility distance is affected by the characteristics of the sign design
748 and the visual capabilities of drivers. Visual capabilities, and thus legibility distances, vary among drivers.
749

750 02 For the more common types of changeable message signs, the longest measured legibility distances on
751 sunny days occur during mid-day when the sun is overhead. Legibility distances are much shorter when
752 the sun is behind the sign face, when the sun is on the horizon and shining on the sign face, or at night.
753

754 03 Visibility is the characteristic that enables a CMS to be seen. Visibility is associated with the point
755 where the CMS is first detected, whereas legibility is the point where the message on the CMS can be
756 read. Environmental conditions such as rain, fog, and snow impact the visibility of changeable message
757 signs and can reduce the available legibility distances. During these conditions, there might not be enough
758 viewing time for drivers to read the message.

759

760 *Guidance:*

761 04 *Changeable message signs used on roadways with speed limits of 55 mph or higher should be visible*
762 *from 1/2 mile under both day and night conditions. The message should be designed to be legible from a*
763 *minimum distance of 600 feet for nighttime conditions and 800 feet for normal daylight conditions. When*
764 *environmental conditions that reduce visibility and legibility are present, or when the legibility distances*
765 *stated in the previous sentences in this paragraph cannot be practically achieved, messages composed of*
766 *fewer units of information should be used and consideration should be given to limiting the message to a*
767 *single phase (see Section 2L.05 for information regarding the lengths of messages displayed on*
768 *changeable message signs).*

769

770

771 *Guidance:*

772 *The changeable message regulatory and warning signs used individually or as part of the legend for a*
773 *larger Changeable Message sign should meet the standard size and legend requirements for those*
774 *specific signs in Parts 2B and 2C.*

775 **Section 2L.04 Design Characteristics of Changeable Message Signs**

776 **Standard:**

777 01 **Changeable message signs shall not include advertising, animation, ~~rapid flashing,~~**
778 **dissolving, exploding, scrolling, or other dynamic elements.**

779 Support:

780 02 Section 6F.61 contains information regarding the use of arrow boards that use flashing or
781 sequential displays for lane closures.

782 *Guidance:*

783 03 *Except in the case of a limited-legend sign (such as a blank-out or a part-time regulatory*
784 *sign) that is used in place of a static regulatory sign or an activated blank-out warning sign that*
785 *supplements a static warning sign at a separate location, the signs should be used as a*

786 supplement to and not as a substitute for conventional signs and markings except as noted
787 herein.

788 Support:

789 09 The width-to-height ratio is commonly accomplished using a minimum font matrix density of
790 five pixels wide by seven pixels high.

791 **Standard:**

792 10 **Changeable message signs shall automatically adjust their brightness under varying**
793 **light conditions to maintain legibility.**

794 **Standard:**

795 14 **The colors used for the legends and backgrounds on changeable message signs shall**
796 **be as provided in Table 2A-5.**

797 *Guidance:*

798 15 *If a black background is used, the color used for the legend on a changeable message sign*
799 *should match the background color that would be used on a standard sign for that type of*
800 *legend, such as white or red for regulatory, yellow for warning, orange for temporary traffic*
801 *control, ~~red for stop or yield~~, fluorescent pink for incident management, and fluorescent yellow-*
802 *green or yellow for bicycle, pedestrian, and school warning.*

803 **Standard:**

804 16 **If a green background is used for a guide message on a CMS or if a blue background**
805 **is used for a motorist services message on a CMS, the background color shall be**
806 **provided by green or blue lighted pixels such that the entire CMS would be lighted, not**
807 **just the white legend.**

808 Support:

809 17 Some CMS that employ newer technologies have the capability to display an exact duplicate of
810 a standard sign or other sign legend using standard symbols, the Standard Alphabets and letter
811 forms, route shields, and other typical sign legend elements with no apparent loss of resolution
812 or recognition to the road user when compared with a static version of the same sign legend.
813 Such signs are of the full-matrix type and can typically display full-color legends. Use of such
814 technologies for new CMS is encouraged for greater legibility of their displays and enhanced
815 recognition of the message as it pertains to regulatory, warning, or guidance information.

816 *Guidance:*

817 18 *If used, the CMS described in the preceding paragraph should not display symbols or route*
818 *shields unless they can do so in the appropriate color combinations. For a single-phase message*
819 *where the Standard Alphabets and other legend elements of standard designs are used, the*
820 *lettering style, size, and line spacing should comply with the applicable provisions for the type of*
821 *message displayed as provided elsewhere in this Manual. For two-phase messages, larger legend*
822 *heights should be used as described previously in this Section because of the need for such*
823 *messages to be legible at a greater distance. Regardless of the number of phases, the CMS*
824 *should comply with the legibility and visibility provisions of Section 2L.03.*

825 **Section 7B.15 School Speed Limit Assembly (S4-1P, S4-2P, S4-3P,**
826 **S4-4P, S4-6P, S5-1) and END SCHOOL SPEED LIMIT Sign (S5-3)**

827 **Standard:**
828 08 **The School Speed Limit assembly shall be either a fixed-message sign assembly or a**
829 **~~changeable-message part-time regulatory LED~~ sign.**

830 09 **The fixed-message School Speed Limit assembly shall consist of a top plaque (S4-**
831 **3P) with the legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1P,**
832 **S4-2P, S4-4P, or S4-6P) indicating the specific periods of the day and/or days of the**
833 **week that the special school speed limit is in effect (see Figure 7B-1).**

834 Option:
835 10 ~~The part-time regulatory Changeable-message LED signs (see Chapter 2L and Section 6F.60)~~
836 ~~may be used to inform drivers of the school speed limit. The sign is~~ **may be** internally
837 illuminated **or an LED speed legend with** a white legend on a black ~~opaque~~ background. ~~The part-~~
838 ~~time regulatory speed Changeable-message LED signs with flashing beacons may be used for~~
839 ~~situations to enhance where greater emphasis of the special school speed limit is needed.~~

840 *Guidance:*
841 11 *Even though it might not always be practical because of special features to make part-time*
842 *regulatory changeable-message LED signs conform in all respects to the standards in this*
843 *Manual for fixed-message signs, during the periods that the school speed limit is in effect, their*
844 *basic shape, message, legend layout, and colors should comply with the standards for fixed-*
845 *message signs.*

846 12 *A confirmation light, flasher or device to indicate that the speed limit message is in operation*
847 *should be considered for inclusion on the back of the part-time regulatory changeable-message*
848 *LED sign.*

849 **Standard:**
850 13 **Fluorescent yellow-green or yellow LEDs shall be used when the "SCHOOL"**
851 **message is displayed on a part-time regulatory changeable-message LED sign for a**
852 **school speed limit.**
853

854 Option:
855 ~~The part-time regulatory Changeable-message LED signs may rest in the dark mode use blank-~~
856 ~~out messages or other methods in order to display the school speed limit only during the periods~~
857 ~~of time where the school speed limit does not apply. it applies.~~

858 15 ~~Driver feedback Changeable-message LED~~ signs that display the speed of approaching drivers
859 (see ~~Section 2B.132C.08~~) may be used **to supplement** ~~in~~ a school speed limit zone

860 16 A Speed Limit Sign Beacon (see Section 4L.04) also may be used, with a WHEN FLASHING
861 legend, to identify the periods that the school speed limit is in effect.

862 **Section 8B.08 Turn Restrictions During Preemption**

863 *Guidance:*
864 01 *At a signalized intersection that is located within 200 feet of a highway-rail grade crossing,*
865 *measured from the edge of the track to the edge of the roadway, where the intersection traffic*
866 *control signals are preempted by the approach of a train, all existing turning movements toward*
867 *the highway-rail grade crossing should be prohibited during the signal preemption sequences.*

868 Option:
869 02 A ~~blank-out turn prohibition or changeable message~~ LED sign and/or appropriate highway
870 traffic signal indication or other similar type sign may be used to prohibit turning movements
871 toward the highway-rail grade crossing during preemption. The R3-1a and R3-2a signs shown in
872 Figure 8B-1 may be used for this purpose.

873 Support:
874 03 LRT operations can include the use of activated blank-out sign technology for turn prohibition
875 signs. The signs are typically used on roads paralleling a semi-exclusive or mixed-use LRT
876 alignment where road users might turn across the LRT tracks. A blank-out sign displays its
877 message only when activated. When not activated, the sign face is blank.

878 *Guidance:*
879 04 *An LRT-activated blank-out turn prohibition (R3-1a or R3-2a) sign should be used where an*
880 *intersection adjacent to a highway-LRT crossing is controlled by STOP signs, or is controlled by*
881 *traffic control signals with permissive turn movements for road users crossing the tracks.*

882 Option:
883 05 An LRT-activated blank-out turn prohibition (R3-1a or R3-2a) sign may be used for turning
884 movements that cross the tracks.

885 06 As an alternative to LRT-activated blank-out turn prohibition signs at intersections with traffic
886 control signals, exclusive traffic control signal phases such that all movements that cross the
887 tracks have a steady red indication may be used in combination with No Turn on Red (R10-11,
888 R10-11a, or R10-11b) signs (see Section 2B.53).

889 **Standard:**
890 07 **Turn prohibition signs that are associated with preemption shall be visible or**
891 **activated only when the grade crossing restriction is in effect.**

892 VOTE: 1-9-14 RWSTC For: 29 Opposed 0 Abstentions 1

893 RWSTC Vote following sponsor comments 6-26-14 For: 22 Opposed: 3
894 Abstentions: 1

895 COUNCIL VOTE : 6-28-14 For: 36 Opposed: 0 Abstentions: 1 **motion passed**

896

897 C:\ncutcd\June 2014 meeting\RW # 3 LED SIGN APPLICATIONS-CMS RWSTC revised 6/5/14, approved by
898 RWSTC 6-26-14, approved by COUNCIL 6-28-14