



National Committee on Uniform Traffic Control Devices

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

TECHNICAL COMMITTEE: Regulatory and Warning Signs Technical Committee and Signals Technical Committee

ITEM NUMBER: 18B-RW-02

TOPIC: R10-XX, LEFT (RIGHT) TURN YIELD ON FLASHING YELLOW ARROW signs for signals with permissive left turns

ORIGIN OF REQUEST: Pooled Fund Study (December 2017) and RW and SIG Technical Committees Joint Task force: Bob Seyfried RWSTC (chair), Erin Kissner (RWSTC), Lee Roadifer (RWSTC), Jeff Wolfe (RWSTC) and Gerry DeCamp (STC)

AFFECTED SECTIONS OF MUTCD: Sections 2B.53

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DEVELOPMENT HISTORY: Task force: 6-2-18, revised 6-21-18, revised 6-28-18

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READY FOR SPONSORS

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- Approved by RW Technical Committee: 06/21/2018
- Approved by SIGNAL Technical Committee: 06/21/2018
- Approved by RW Technical Committee following sponsor comments: XX/XX/XXXX
- Approved by SIGNAL Technical Committee following sponsor comments: XX/XX/XXXX
- Approved by NCUTCD Council: XX/XX/XXXX

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This is a proposal for recommended changes to the MUTCD that has been developed by a technical committee of the NCUTCD. The NCUTCD is distributing it to its sponsoring organizations for review and comment. Sponsor comments will be considered in revising the proposal prior to NCUTCD Council consideration. This proposal does not represent a revision of the MUTCD and does not constitute official MUTCD standards, guidance, or options. If approved by the NCUTCD Council, the recommended changes will be submitted to FHWA for consideration for inclusion in a future MUTCD revision. The MUTCD can be revised only through the federal rulemaking process.

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SUMMARY:

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The Traffic Control Devices Pooled Fund Study (TCD PFS) focused on a systematic evaluation of novel traffic control devices (TCDs), employing a process that addressed human factors and




32 operations issues for each TCD idea. As part of the TCD PFS effort, the Federal Highway
 33 Administration (FHWA) Human Factors Team evaluated both existing and proposed traffic
 34 signs. Sets of sign alternatives were evaluated for driver comprehension and legibility. For some
 35 sets, participants were also asked to rank the effectiveness of the alternatives.

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 37 The LEFT (RIGHT) TURN YIELD ON FLASHING YELLOW sign is intended to be used to
 38 inform drivers that they are expected to yield at a flashing yellow traffic signal. It is challenging
 39 to adequately convey dynamic “flashing” in a static symbol. The Pooled Fund Study investigated
 40 the most appropriate symbol to portray a flashing yellow arrow. Although the Pooled Fund Study
 41 limited its evaluation to only left turn applications for such a sign, the Joint Task Force
 42 considered it reasonable to make such a sign also applicable to right turns on flashing yellow
 43 arrows where it is desired to remind turning drivers to yield to pedestrians in the crosswalk or to
 44 U-turns on the cross street.

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 46 **DISCUSSION**

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 48 The following table presents all alternatives for the flashing yellow arrow sign that were
 49 evaluated by the Pooled Fund Study. In each case, the alternative sign was placed next to the
 50 appropriate signal face. A condition in which no sign was placed next to the signal face was also
 51 included. This was designed to provide insight as to whether or not the sign is necessary to
 52 properly interpret the signal.

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Table 11. Flashing Yellow Arrow Sign Alternatives Selected for Evaluation

Alt. 1	Alt. 2	Alt. 3	Alt. 4
			<p>(no sign)</p>

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 58 **Comprehension**
 59 Participants were only exposed to a single Flashing Yellow Arrow sign and were asked “Imagine
 60 you are driving and encounter this sign. You want to make a left turn and are positioned in the
 61 proper lane. How would you proceed?” The sign was placed in context next to the signal face on
 62 the mast arm. The yellow arrow was presented as flashing, in a solid state, and blank. Open
 63 ended responses were coded as a response including the acknowledgement that the driver did not
 64 have the right of way and needed to watch for oncoming traffic, as a need to use caution only, or
 65 some other response.

67 Participant responses as percentages are presented in Table 12. When exploring all data, no
 68 significant differences between sign alternatives were found, nor was there a significant
 69 interaction between the flashing state of the signal mast and the sign alternative ($p > .05$).
 70 However, the flashing state of the signal was found to significantly affect response. Significantly
 71 more people who saw the animated flashing yellow arrow verbally indicated that they did not
 72 have the right of way and needed to yield to oncoming traffic ($p < .05$). This result lends one to
 73 believe that the flashing of the light itself carries meaning to drivers.
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Table 12. The percentage of participant responses within each coded category for each alternative, by flashing state.

Flashing state	Sign Alternative	Yield to oncoming traffic %	Use Caution Only %	Other %
Off	Alt. 1	80	0	20
	Alt. 2	65	10	25
	Alt. 3	75	5	25
	Alt. 4	65	20	15
On (steady)	Alt. 1	65	20	15
	Alt. 2	75	5	20
	Alt. 3	60	20	20
	Alt. 4	45	30	25
Animated (flashing)	Alt. 1	70	30	0
	Alt. 2	100	0	0
	Alt. 3	85	5	10
	Alt. 4	70	30	0

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 77 Next, participants were told the intended meaning of the flashing yellow arrow sign. The three
 78 sign alternatives were presented (i.e., no blank sign was shown for ranking) and participants
 79 were asked to rank them in terms of perceived effectiveness. When considering only the top
 80 choice indicated by the participants (Ranking = 1), alternative 3 was selected as the top choice by
 81 47.5 percent (95/200) of the participants and alternative 2 was selected as the top choice by 34
 82 percent (68/200) of the participants. There was a significant difference in the rankings of each
 83 alternative $\chi^2(4) = 121.44, p < .001$. Alternative 1 (all text) was consistently rated the least
 84 effective sign ($p < .05$)
 85

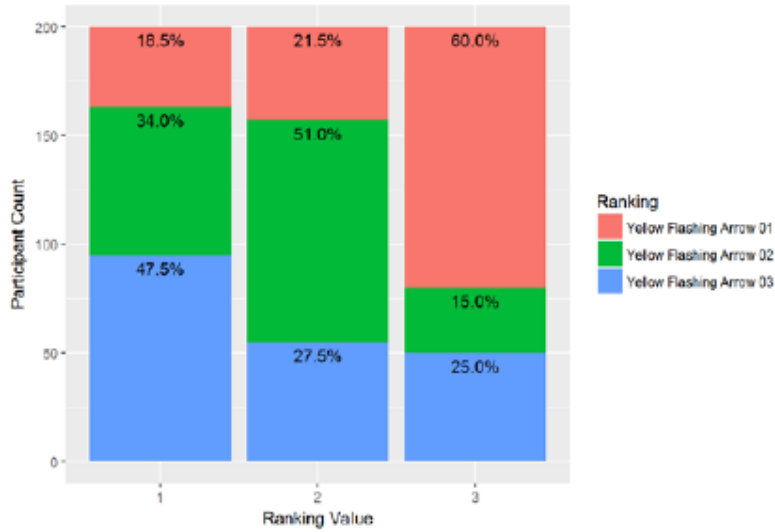


Figure 2. The percentage of participants selecting each sign alternative at each ranking value.

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Legibility

Mean legibility response distances are presented in Table 13. Mean response distance did not vary significantly by sign alternative $F(2) = .80$, $MSe = 3455.212$, $p > .05$. In other words, all signs were read at a similar distance.

Table 13. Mean response distance by sign alternative.

Alternative	Mean Distance (ft)
Alt. 1	376.07
Alt. 2	379.38
Alt. 3	389.97

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Summary Findings for Flashing Yellow Arrow

There were no significant differences between sign alternatives, nor was there a significant interaction between the flashing state of the signal face and sign alternative. Regardless of sign alternative or flashing state, between 75-100 percent of participants reported that the driver needed to yield to oncoming traffic or use caution; this was also true for participants who viewed alternative 4 (no sign), signifying that even with no sign at all, people would either choose to yield to oncoming traffic or use caution. The results also indicated that significantly more people who saw the animated flashing yellow arrow verbally indicated that they did not have the right of way and needed to yield to oncoming traffic. This is important because it suggests that the flashing light carries meaning to drivers.

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When considering the participant rankings of the signs, participants generally preferred alternative 3 and alternative 2 over alternative 1. All three signs had similar legibility distances. Although there were no statistically significant differences, more participants selected alternative

109 3 as their top choice than those who selected alternative 2, and alternative 3 also had a slightly
110 longer legibility distance (though, again, not significant).

111
112 With only 70 percent of participants reporting that they need to yield to oncoming traffic when
113 viewing the animated flashing yellow arrow with no sign, the Pooled Fund Study concluded that
114 it may be premature to not use a sign at all. However, there may be a point in the future where
115 the signs will not be needed, or can be removed after a certain period of time. Alternative 3 or
116 alternative 2 are both acceptable signs to use.

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118 As a result, it is recommended that a LEFT (RIGHT) TURN YIELD ON FLASHING YELLOW
119 sign be added to the MUTCD for optional use in conjunction with flashing left-turn YELLOW
120 ARROW and flashing right-turn YELLOW ARROW signal faces. Because alternatives 2 and 3
121 performed approximately equally, either could be used. However, because Alternative 2 had
122 100% correct responses when used in conjunction with a flashing yellow arrow, it is
123 recommended by the Task Force for addition to the MUTCD.

124 125 **DISUSSION OF ADDITIONAL POTENTIAL CHANGES**

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127 Although the RIGHT TURN YIELD ON FLASHING YELLOW sign was not considered in the
128 pooled fund study, the task force believes that the message is sufficiently similar to the LEFT
129 TURN YIELD ON FLASHING YELLOW sign to warrant its inclusion in the recommended
130 MUTCD changes. This sign could be useful at locations where a flashing yellow arrow is
131 desirable to indicate to right-turning motorists that they must yield to pedestrians or U-turning
132 vehicles.

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134 The task force was undecided whether there was a need to reference the optional use of the
135 LEFT (RIGHT) TURN YIELD ON FLASHING YELLOW sign in Sections 4D.18, 4D.20,
136 4D.22 and 4D.24. At the present time, the LEFT TURN YIELD ON GREEN (symbolic circular
137 green) sign (R10-12) is referenced in Section 4D.20. If this sign is retained in Section 4D.20,
138 then it is appropriate to add references to the LEFT (RIGHT) TURN YIELD ON FLASHING
139 YELLOW sign to Sections 4D.18, 4D.20, 4D.22 and 4D.24. If there is a consensus to delete the
140 reference to the LEFT TURN YIELD ON GREEN (symbolic circular green) sign (R10-12) in
141 Section 4D.20, then references to the LEFT (RIGHT) TURN YIELD ON FLASHING YELLOW
142 sign should not be added to these sections. Signals Technical Committee indicated that they plan
143 to delete reference in Section 4D.20 regarding the LEFT TURN YIELD ON GREEN sign (R10-
144 12); therefore, reference to the LEFT(RIGHT) TURN YIELD ON FLASHING YELLOW
145 ARROW sign is not needed in Sections 4D.18, 4D.20, 4D.22 and 4D.24. The use of signs at
146 signalized intersections, including the signs associated with this task force, is adequately
147 addressed in Section 4D.34.

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149 The task force did not reach a consensus on whether the LEFT TURN YIELD ON FLASHING
150 RED ARROW AFTER STOP (R10-27) should also be changed to LEFT (RIGHT) TURN
151 YIELD ON FLASHING RED ARROW AFTER STOP (R10-27) to include applications where
152 right turns operate on a flashing red arrow indication. Guidance from the RW and SIG Technical
153 Committees are recommended. SIG AND RW Technical committees agreed to include in
154 Section 2B.53. The Signal Technical Committee also expressed their desire to pursue the future

155 evaluation/consideration of a R10-27 sign that incorporates a red arrow (symbol). That will be a
156 separate task force item.

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158 **RECOMMENDED MUTCD CHANGES**

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

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168 **PART 2. SIGNS**
169 **Chapter 2B. REGULATORY SIGNS, BARRICADES, AND GATES**

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171 **Section 2B.53 Traffic Signal Signs (R10-5 through ~~R10-30~~ ~~R10-XX~~ R10-YY**

172 Option:

173 01 To supplement traffic signal control, Traffic Signal signs R10-5 through ~~R10-30~~ ~~R10-XX~~
174 R10-YY may be used to regulate road users.

175 02 Traffic Signal signs (see Figure 2B-27) may be installed at certain locations to supplement
176 ~~clarify~~ signal control. Among the legends ~~that may be used for this purpose~~ are:

- 177 • LEFT ON GREEN ARROW ONLY (R10-5),
- 178 • STOP HERE ON RED (R10-6 or R10-6a) ~~for observance of stop lines,~~
- 179 • DO NOT BLOCK INTERSECTION (R10-7) ~~for avoidance of traffic obstructions,~~
- 180 • USE LANE(S) WITH GREEN ARROW (R10-8) ~~for obedience to lane-use control~~
181 ~~signals~~-(see Chapter 4M), ~~and~~
- 182 • LEFT TURN YIELD ON GREEN (symbolic circular green) (R10-12),
- 183 • LEFT (RIGHT) TURN YIELD ON FLASHING yellow arrow (symbol) (R10-YY or
184 R10-YYa), and
- 185 • LEFT (RIGHT) TURN YIELD ON FLASHING RED ARROW AFTER STOP (R10-27
186 or R10-27a)

187 *Guidance:*

188 03 *If used, the LEFT ON GREEN ARROW ONLY (R10-5) sign, the LEFT TURN YIELD ON*
189 *GREEN (symbolic circular green) (R10-12) sign, LEFT TURN YIELD ON FLASHING yellow*
190 *arrow (symbol) (R10-YY) sign, or the LEFT TURN YIELD ON FLASHING RED ARROW*
191 *AFTER STOP (R10-27) sign should be located adjacent to the left-turn signal face. If used, the*
192 *RIGHT TURN YIELD ON FLASHING yellow arrow (symbol) (R10-YYa), or the RIGHT TURN*
193 *YIELD ON FLASHING RED ARROW AFTER STOP (R10-27a) sign should be located adjacent*
194 *to the right-turn signal face.*

195 Option:

196 04 If needed for additional emphasis, an additional LEFT TURN YIELD ON GREEN
197 (symbolic circular green) (R10-12) sign with an AT SIGNAL (R10-31P) supplemental plaque
198 (see Figure 2B-27) may be installed in advance of the intersection.

199 05 In situations where traffic control signals are coordinated for progressive timing, the Traffic
200 Signal Speed (I1-1) sign may be used (see Section 2H.03).

201 **Standard:**
 202 06 The CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Figure
 203 2B-27) shall only be used in conjunction with pedestrian hybrid beacons (see Section
 204 4F.02).
 205 07 The EMERGENCY SIGNAL (R10-13) sign (see Figure 2B-27) shall be used in
 206 conjunction with emergency-vehicle traffic control signals (see Section 4G.02).
 207 08 The EMERGENCY SIGNAL—STOP ON FLASHING RED (R10-14 or R10-14a) sign
 208 (see Figure 2B-27) shall be used in conjunction with emergency-vehicle hybrid beacons (see
 209 Section 4G.04).

210 **Option:**
 211 09 In order to remind drivers who are making turns at a signalized intersection to yield to or
 212 stop for pedestrians, a Turning Vehicles Yield to (Stop for) Pedestrians (R10-15, R10-15a) sign
 213 (see Figure 2B-27) may be used.

214 **Standard:**
 215 09a The Turning Vehicles Stop for Pedestrians (R10-15a) sign shall only be used in
 216 jurisdictions where laws, ordinances or resolutions specifically require that a driver must
 217 stop for a pedestrian. (approved by Council 1/06/2017)

218 **Option:**
 219 10 A U-TURN YIELD TO RIGHT TURN (R10-16) sign (see Figure 2B-27) may be installed
 220 near the left-turn signal face if U-turns are allowed on a protected left-turn movement on an
 221 approach from which a right-turn GREEN ARROW signal indication is simultaneously being
 222 displayed to drivers making a right turn from the conflicting approach to their left.

223 10a A U-TURN SIGNAL (R10-XX) sign (see Figure 2B-27) may be installed adjacent to the
 224 signal face that exclusively controls a u-turn movement. (approved by Council 6/20/2009)

226 **ADD sign R10-15a to Figure 2B.27. Add * fluorescent yellow-green background color may**
 227 **be used instead of yellow for this sign.** (approved by Council 1-6-2017)



228
 229
 230 R10-15a
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Figure 2B-27 Traffic Signal Signs and Plaques



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234 ((add U-TURN SIGNAL sign (R10-xx)) (approved by Council June 20, 2009)

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237 Add the following sign to Figure 2B-27:

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240 LEFT (RIGHT) TURN YIELD ON FLASHING yellow arrow (symbol) sign (R10-YY or R10-YYa)

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244 C:\NCUTCD\June 2018\18B.RW.02 Left Turn Yield on Flashing Yellow Arrow sign R10-XX

245 revised 7-3-18 READY FOR SPONSORS