CHAPTER 4E. TRAFFIC CONTROL SIGNAL INDICATIONS

Section 4E.01 Signal Indications – Design, Illumination, Color, and Shape

Standard:

01 **The illuminated part of each signal indication shall be circular or arrow, except those used for bicycle symbol signal indications, pedestrian signal heads, light rail transit signal indications, and lane-use control signals.**

02 **Letters or numbers (including those associated with countdown displays) shall not be displayed as part of a vehicular signal indication.**

03 **Strobes shall not be used within or adjacent to any signal indication.**

04 **Except for the flashing vehicular and pedestrian signal indications and the distinctive indications for emergency-vehicle preemption (see Section 4F.19) that are expressly allowed by the provisions of this Part, flashing displays shall not be used within or adjacent to any signal indications.**

05 **Each circular signal indication shall emit a single color: red, yellow, or green.**

06 **Except as provided in Paragraph 7 of this Section, each arrow signal indication shall emit a single color: red, yellow, or green.**

Option:

07 A bimodal signal section that is capable of alternating between the display of a GREEN ARROW signal indication and the display of a YELLOW ARROW signal indication, both pointing in the same direction, may be used provided that both colors are never displayed simultaneously.

Standard:

08 **The arrow, which shall show only one direction, shall be the only illuminated part of an arrow signal indication.**

09 **Arrows shall be pointed:**

- **A. Vertically upward to indicate a straight-through movement,**
- **B. Horizontally in the direction of the turn to indicate a turn at approximately or greater than a right angle,**
- **C. Upward with a slope at an angle approximately equal to that of the turn if the angle of the turn is substantially less than a right angle, or**
- **D. In a manner that directs the driver through the turn if a U-turn arrow is used (see Figure 4E-1).**

10 **Except as provided in Paragraph 11 of this Section, the requirements of Chapters 1 and 2 of the publication entitled "Equipment and Materials Standards of the Institute of Transportation Engineers" that pertain to the aspects of the signal head design that affect the display of the signal indications shall be met for signal optical units that use incandescent lamps within optical assemblies that include lenses. Except as provided in Paragraph 11 of this Section, the requirements of the Institute of Transportation Engineers' publications entitled "Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Circular Signal Supplement," 2005, ITE, and "Vehicle Traffic Control Signal Heads: Light Emitting Diode (LED) Vehicle Arrow Traffic Signal Supplement," 2008, ITE, that pertain to the aspects of the signal head design that affect the display of the signal indications shall be met for light-emitting diode (LED) traffic signal modules.**

Guidance:

11 *The intensity and distribution of light from each illuminated signal lens or LED signal module should comply with the publications specified in Paragraph 10 of this Section, as appropriate.*

Support:

12 References to signal lenses in this section are not intended to limit signal optical units to incandescent lamps within optical assemblies that include lenses. Research has resulted in signal optical units that are not lenses, such as, but not limited to, light-emitting diode (LED) traffic signal modules. Some units are practical for all signal indications, and some are practical for specific types such as visibility-limited signal indications.

Guidance:

13 *If a signal indication is so bright that it causes excessive glare during nighttime conditions, some form of automatic dimming should be used to reduce the brilliance of the signal indication.*

Section 4E.02 Size of Vehicular Signal Indications

Standard:

01 **There shall be three nominal diameter sizes for vehicular signal indications: 4 inches, 8 inches, and 12 inches.**

02 **Four-inch signal indications shall only be used for bicycle signal faces per Section 4H.07. 03**

03 **Twelve-inch signal indications shall be used for all arrow signal indications.**

04 **Except as provided in Paragraph 5 of this Section, 12-inch signal indications shall be used for all circular signal indications in all new signal faces.**

Option:

05 Eight-inch circular signal indications may be used in new signal faces only for:

A. The green or flashing yellow signal indications in an emergency-vehicle traffic control signal (see Section 4M.02);
B. The circular indications in signal faces controlling the approach to the downstream location where two adjacent signalized locations are close to each other and it is impractical because of factors such as high approach speeds, horizontal or vertical curves, or other geometric factors to install visibility- limited signal faces for the downstream approach;
C. The circular indications in a signal face that is located less than 120 feet from the stop line on a roadway with a posted or statutory speed limit or operating speed of 30 mph or less;
D. The circular indications in a supplemental near-side signal face;
E. The circular indications in a supplemental signal face installed for the sole purpose of controlling pedestrian movements rather than vehicular movements; and
F. The circular indications in a flashing beacon (see Chapter 4S).

06 Different sizes of signal indications may be used in the same signal face or signal head, provided that the signal face or signal head complies with the requirements contained in Paragraphs 3 through 5 of this Section.

Section 4E.03 Positions of Signal Indications Within a Signal Face – General

Support:

01 Standardization of the number and arrangements of signal sections in vehicular traffic control signal faces enables road users who are color vision deficient to identify the illuminated color by its position relative to other signal sections.

Standard:

02 **Unless otherwise provided in this Manual for a particular application, each signal face at a signalized location shall have three, four, or five signal sections. Unless otherwise provided in this Manual for a particular application, if a vertical signal face includes a cluster (see Section 4E.04), the signal face shall have at least three vertical positions.**

03 **A single-section signal face shall be permitted at a traffic control signal if it consists of a continuously-displayed GREEN ARROW signal indication that is being used to indicate a continuous movement.**

04 **The signal sections in a signal face shall be arranged in a vertical or horizontal straight line, except as otherwise provided in Section 4E.04.**

05 **The arrangement of adjacent signal sections in a signal face shall follow the relative positions listed in Sections 4E.04 or 4E.05, as applicable.**

06 **If a signal section that displays a CIRCULAR YELLOW signal indication is used, it shall be located between the signal section that displays the red signal indication and all other signal sections.**

07 **If a U-turn arrow signal section is used in a signal face for a U-turn to the left, its position in the signal face shall be the same as stated in Sections 4E.04 and 4E.05 for a left-turn arrow signal section of the same color. If a U-turn arrow signal section is used in a signal face for a U-turn to the right, its position in the signal face shall be the same as stated in Sections 4E.04 and 4E.05 for a right-turn arrow signal section of the same color.**

08 **A U-turn arrow signal indication pointing to the left shall not be used in a signal face that also contains a left-turn arrow signal indication. A U-turn arrow signal indication pointing to the right shall not be used in a signal face that also contains a right-turn arrow signal indication.**

Option:

09 Within a signal face, two identical CIRCULAR RED or RED ARROW signal indications may be displayed immediately horizontally adjacent or immediately vertically adjacent to each other in a vertical signal face (see Drawing A in Figure 4E-2) or immediately horizontally adjacent to each other in a horizontal signal face (see Drawing B in Figure 4E-2) for emphasis.

10 Horizontally-arranged and vertically-arranged signal faces may be used on the same approach provided they are separated to meet the lateral separation spacing required in Section 4D.07.

Support:

11 Figure 4E-2 illustrates some of the typical arrangements of signal sections in signal faces that do not control separate turning movements. Figures 4F-1 through 4F-7 illustrate the typical arrangements of signal sections in left-turn signal faces. Figures 4F-8 through 4F-14 illustrate the typical arrangements of signal sections in right-turn signal faces.

Standard:

12 **There shall be at least two signal faces for each movement on each signal-controlled approach.**

Guidance:

13 *Supplemental signal faces should be considered if any of the following conditions exist:*

A. *The area is rural.*
B. *The area is urban and the signal is the first one on a particular highway.*
C. *The roadway is striped for two or more approach lanes.*
D. *Where visibility of the signal is affected by alignment* or obstructions.

Support:

14 On an undivided roadway, the signal faces for each through approach of an intersection are usually placed at the far right and far left corners.

Option:

15 The signal faces for two or more approaches may be combined on a single standard.

Support:

16 It is generally desirable to locate the signal faces on separate standards at curb returns. This practice will tend to maximize the visibility of the signal faces for the controlled approach while minimizing the visibility of the signal faces intended for the cross-street approach.

Guidance:

17 *Separate standards should be considered whenever the curb return radius is greater than 10 feet.*

18 *The preferred locations for new installations of signal faces for fully-protected left turn movements at a typical intersection are on a mast arm of sufficient length to place one signal face as nearly as practical in line with the left turn lane and to place the second face on a standard at the far left corner.*

Option:

19 Unusual roadway geometrics, wide medians, wide roadways, more than one left turn lane in the same direction or other factors may require the left turn signal face(s) to be mounted on standard(s) located in a median to satisfy visibility requirements.

20 A signal face, containing a circular green indication, may be located in a far median only when:

A. The signal phasing provides a protected left turn movement; or
B. The signal face is provided with some type of visibility control so that the indications are not visible to traffic in the left turn storage lane; or
C. It is not facing a left turn storage lane; or
D. LEFT TURN YIELD ON GREEN (symbolic circular green) (R10-12) sign is installed below the said signal face.

21 A signal face containing a circular green indication may be located in the near median where there is a left turn storage lane and there is no associated left turn phase.

22 Supplemental signal faces may be placed at a near side location or suspended from a mast arm.

Section 4E.04 Positions of Signal Indications Within a Vertical Signal Face

Standard:

01 **In each vertically-arranged signal face, all signal sections that display red signal indications shall be located above all signal sections that display yellow and green signal indications.**

02 **In vertically-arranged signal faces, each signal section that displays a YELLOW ARROW signal indication shall be located above the signal section that displays the GREEN ARROW signal indication to which it applies.**

03 **The relative positions of signal sections in a vertically-arranged signal face, from top to bottom, shall be as follows:**

CIRCULAR RED
Steady and/or flashing left-turn RED ARROW
Steady and/or flashing right-turn RED ARROW
CIRCULAR YELLOW
CIRCULAR GREEN

Straight-through GREEN ARROW
Steady left-turn YELLOW ARROW
Flashing left-turn YELLOW ARROW
Left-turn GREEN ARROW
Steady right-turn YELLOW ARROW
Flashing right-turn YELLOW ARROW
Right-turn GREEN ARROW

04 **If a bimodal signal section (see Section 4E.01) is used in a vertically-arranged signal face, the bimodal signal section shall occupy the same position relative to the other sections as the signal section that displays the GREEN ARROW signal indication in a vertically-arranged signal face would occupy.**

Option:

05 In a vertically-arranged signal face, signal sections that display signal indications of the same color may be arranged horizontally adjacent to each other at right angles to the basic straight line arrangement to form a clustered signal face (see Figures 4E-2, 4F-4, 4F-6, 4F-10, 4F-11, 4F-13, and 4F-15).

Support:

05a Refer to FHWA's List of Known Errors for error in Paragraph 5 text. Refer to Section 1A.04 for more details.

Standard:

06 **Such clusters shall be limited to the following:**

- **A. Two identical signal sections,**
- **B. Two or three different signal sections that display signal indications of the same color, or**
- **C. For only the specific case described in Section 4F.16 (see Drawing B in Figure 4F-15), two signal sections, one of which displays a GREEN ARROW signal indication and the other of which displays a flashing YELLOW ARROW signal indication.**

07 **Except as otherwise provided in Sections 4F.04, 4F.08, 4F.11, and 4F.15 for a three-section separate turn signal face with a bimodal signal section that displays a flashing YELLOW ARROW signal indication, the signal section that displays a flashing yellow signal indication during steady mode operation:**

- **A. Shall not be placed in the same vertical position as the signal section that displays a steady yellow signal indication, and**
- **B. Shall be placed below the signal section that displays a steady yellow signal indication.**

Support:

08 Sections 4J.02 and 4N.02 contain exceptions to the provisions of this Section that are applicable to hybrid beacons.

Section 4E.05 Positions of Signal Indications Within a Horizontal Signal Face

Standard:

01 **In each horizontally-arranged signal face, all signal sections that display red signal indications shall be located to the left of all signal sections that display yellow and green signal indications.**

02 **In horizontally-arranged signal faces, each signal section that displays a YELLOW ARROW signal indication shall be located to the left of the signal section that displays the GREEN ARROW signal indication to which it applies.**

03 **The relative positions of signal sections in a horizontally-arranged signal face, from left to right, shall be as follows:**

CIRCULAR RED
Steady and/or flashing left-turn RED ARROW
Steady and/or flashing right-turn RED ARROW
CIRCULAR YELLOW
Steady left-turn YELLOW ARROW
Flashing left-turn YELLOW ARROW
Left-turn GREEN ARROW CIRCULAR GREEN
Straight-through GREEN ARROW
Steady right-turn YELLOW ARROW
Flashing right-turn YELLOW ARROW
Right-turn GREEN ARROW

04 **If a bimodal signal section (see Section 4E.01) is used in a horizontally-arranged signal face, the signal section that displays the dual left-turn arrow signal indication shall be located immediately to the right of the signal section that displays the CIRCULAR YELLOW signal indication, the signal section that displays the straight-through GREEN ARROW signal indication shall be located immediately to the right of the signal section that displays the CIRCULAR GREEN signal indication, and the signal section that displays the dual right-turn arrow signal indication shall be located to the right of all other signal sections.**

05 **Except as otherwise provided in Sections 4F.04, 4F.08, 4F.11, and 4F.15 for a three-section separate turn signal face with a flashing YELLOW ARROW signal indication, the signal section that displays a flashing yellow signal indication during steady mode operation:**

- **A. Shall not be placed in the same horizontal position as the signal section that displays a steady yellow signal indication, and**
- **B. Shall be placed to the right of the signal section that displays a steady yellow signal indication.**

Figure 4E-1. Typical Arrangements of U-Turn Signal Faces

Figure 4E-2. Typical Arrangements of Signal Sections in Signal Faces That Do Not Control Turning Movements