



U.S. Department
of Transportation

Federal Highway
Administration

Memorandum

via Electronic Mail

Subject: **INFORMATION:** MUTCD – Interim Approval for
Optional Use of Flashing Yellow Arrow for
Permissive Left Turns (IA-10)

Date: March 20, 2006

From: Jeffrey F. Paniati
Associate Administrator for Operations

Reply to
Attn. of: HOTO-1

To: Division Administrators
Resource Center Director and Operations Managers
Federal Lands Highway Division Engineers

Purpose: The purpose of this memorandum is to issue an Interim Approval for the optional use of a flashing yellow arrow (FYA) signal indication as the signal display for left-turn movements during permissive turn intervals at signalized locations. Interim Approval allows interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in the MUTCD.

Background: For many years, some engineers have had concerns that drivers turning left on a permissive circular green signal indication might inadvertently mistake that indication as implying the left turn has the right of way over opposing traffic, especially under some geometric conditions. A variety of different indications and signal face arrangements for permissive left turns have been tried over the years by road authorities, but no comprehensive research had been conducted to evaluate all the potential displays.

Research on the Flashing Yellow Arrow: National Cooperative Highway Research Program (NCHRP) Project 3-54, Evaluation of Traffic Signal Displays for Protected/Permissive Left-Turn Control, was initiated in the mid-1990s for the purpose of conducting the necessary definitive research to evaluate the wide variety of potential displays for permissive left-turn movements. Over a 7-year period, a very comprehensive research process was conducted, including engineering analyses, static and video-based driver comprehension studies, field implementation, video conflict studies, and crash analyses. In 2003, the completed research was published as NCHRP Report 493. The full report may be accessed via the Interim Approvals page of the MUTCD website at <http://mutcd.fhwa.dot.gov>. Key findings of the research include:

- The FYA was found to be the best overall alternative to the circular green as the permissive signal display for a left-turn movement.
- FYA was found to have a high level of understanding and correct response by left-turn drivers, and a lower fail-critical rate than the circular green.



- The FYA display in a separate signal face for the left-turn movement offers more versatility in field application. It is capable of being operated in any of the various modes of left-turn operation by time of day, and is easily programmed to avoid the “yellow trap” associated with some permissive turns at the end of the circular green display.

The NCHRP Report 493 recommends that the FYA be allowed as an alternative to the circular green for permissive left-turn intervals. It also recommends certain specific signal face arrangements and locations, based on driver understanding and performance.

Subsequent to the publication of the NCHRP research, FHWA has approved additional experimentation with the FYA by numerous jurisdictions. Although these experimentations are still in progress, initial results have been positive and supportive of the NCHRP research findings.

FHWA Evaluation of Results: The Office of Transportation Operations has reviewed the research and subsequent additional experimentation and considers the FYA to be successful. Motorists responded strongly and favorably to the concept with little or no public information; these highway users intuitively knew what the flashing yellow arrow meant. The FHWA believes that the FYA has a low risk of safety or operational concerns. Further, the optional use of the FYA provides safety and operational benefits that merit earlier implementation by agencies that wish to use it, pending official MUTCD rulemaking. FYA provides the ability to easily implement lead-lag left-turn phasing and/or variable phasing by time of day, without revising signal hardware and without creating the “left-turn yellow trap” that can occur with the traditional circular green display. Discussions at recent meetings of the National Committee on Uniform Traffic Control Devices (NCUTCD) indicate a consensus in the practitioner community in support of optional use of the FYA. There is a low risk of negative reactions by industry or specific manufacturers or suppliers, and FHWA does not perceive any adverse financial impacts. All existing signal manufacturers make standard signal faces capable of displaying the FYA for left-turn sequences. This Interim Approval does not create a new mandate compelling installation of the FYA for left turns, but for those agencies that do wish to use FYA, it is a low-cost measure to implement.

Conditions of Interim Approval: Interim Approval for the optional use of the FYA for a permissive left-turn indication will be granted to any jurisdiction that submits a written request to the Office of Transportation Operations. A State may request Interim Approval for all jurisdictions in that State. Jurisdictions using FYA under this Interim Approval must agree to maintain an inventory list of all locations where the devices are placed and to comply with Item F at the bottom of Page 1A-6 of the 2003 MUTCD, Section 1A.10 which requires: "An agreement to restore the site(s) of the Interim Approval to a condition that complies with the provisions in this Manual within 3 months following the issuance of a Final Rule on this traffic control device. This agreement must also provide that the agency sponsoring the Interim Approval will terminate use of the device or application installed under the Interim Approval at any time that it determines significant safety concerns are directly or indirectly attributable to the device or application. The FHWA's Office of Transportation Operations has the right to terminate the interim approval at any time if there is an indication of safety concerns."

If an agency opts to use FYA under this Interim Approval, the following design and operational requirements shall apply, and shall take precedence over any conflicting provisions of existing Section 4D.06 of the 2003 MUTCD for the approach on which FYA is displayed:

1. Mode(s) of Left-Turn Operation:

- a. The flashing YELLOW ARROW signal indication may be displayed to indicate a permissive left-turn movement in either a protected/permissive mode or a permissive only mode of operation.
- b. It is not necessary that the left-turn mode for an approach always be the same throughout the day. Varying the left-turn mode on an approach among the permissive only and/or the protected/permissive and/or the protected only left-turn modes during different periods of the day is acceptable.

2. Signal Face Arrangement:

- a. At least one separate four-section signal face, in addition to the minimum of two signal faces for other traffic on the approach, shall be provided for the left-turn movement. The separate left-turn signal face shall be capable of displaying, from top to bottom (or left to right in a horizontally-aligned face), the following set of signal indications: Steady left-turn RED ARROW, steady left-turn YELLOW ARROW, flashing left-turn YELLOW ARROW, and steady left-turn GREEN ARROW. If the left-turn movement is always operated in the permissive only mode, a separate three-section face shall be used instead, with the GREEN ARROW signal section omitted.
- b. A CIRCULAR RED may be substituted for the RED ARROW in States where RED ARROWS are not in current use. If CIRCULAR RED is used instead of RED ARROW in the left-turn signal face, and the left-turn signal face sometimes displays a steady CIRCULAR RED signal indication at a time when the signal faces for the adjacent through movement are not displaying steady CIRCULAR RED signal indications, the CIRCULAR RED signal indication in the left-turn signal face shall be shielded, hooded, louvered, positioned, or designed such that it is not readily visible to drivers in the through lane(s) or a LEFT TURN SIGNAL sign (R10-10) shall be installed adjacent to the left-turn signal face.
- c. A dual-arrow signal section (capable of alternating between the display of a steady GREEN ARROW and a flashing YELLOW ARROW signal indication during steady mode operation) may be used to reduce the total number of signal sections to three if physical conditions make it impractical to use a four-section signal face.

3. Signal Face Location: If an exclusive left-turn lane is present on the approach and if a left-turn signal face is mounted over the roadway, that left-turn signal face should be centered over the left-turn lane or the extension thereof. If centering of the overhead left-turn signal face is not practical, it shall not be positioned any further to the right than the lane line (or the extension of the lane line) between the left-turn lane and the adjacent through lane, nor shall it be positioned any further to the left than the left edge of the left-turn lane (or extension thereof.)
4. Signal Displays:
 - a. During a protected left-turn movement, the left-turn signal face shall display only a steady left-turn GREEN ARROW signal indication.
 - b. During a permissive left-turn movement, the left-turn signal face shall display only a flashing left-turn YELLOW ARROW signal indication.
 - c. During a prohibited left-turn movement, the left-turn signal face shall display only a steady left-turn RED ARROW or a steady CIRCULAR RED.
 - d. A steady left-turn YELLOW ARROW signal indication shall be displayed following every steady left-turn GREEN ARROW signal indication.
 - e. A steady left-turn YELLOW ARROW signal indication shall be displayed following the flashing left-turn YELLOW ARROW signal indication if the permissive left-turn movement is being terminated and the left-turn signal face will subsequently display a steady red signal indication. The signal section that displays the steady left-turn YELLOW ARROW signal indication during change intervals shall not be used to display the flashing left-turn YELLOW ARROW signal indication for permissive left turns.
 - f. When a permissive left-turn movement is changing to a protected left-turn movement, a steady left-turn GREEN ARROW signal indication shall be displayed immediately upon termination of the flashing left-turn YELLOW ARROW signal indication. A steady left-turn YELLOW ARROW signal indication shall not be displayed between the display of the flashing left-turn YELLOW ARROW signal indication and the display of the steady left-turn GREEN ARROW signal indication.
 - g. During flashing mode operation (see Section 4D.12), the display of a flashing left-turn YELLOW ARROW signal indication shall be only from the signal section that displays a steady left-turn YELLOW ARROW signal indication during steady mode (stop-and-go) operation.

Any questions concerning this Interim Approval should be directed to Mr. Scott Wainwright at scott.wainwright@fhwa.dot.gov or by telephone at 202-366-0857.