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## Drivers Correctly Interpret Flashing Yellow Arrows for Left Turns

Permissive left turns, where a driver does not have a green arrow and must wait for a gap in oncoming traffic before turning, can be indicated by different traffic signal configurations. Flashing yellow arrows are becoming a preferred signal type in Minnesota and across the nation. New research provides traffic engineers with confidence that drivers understand the meaning of the signal, even without an accompanying Left Turn Yield sign.

### What Was the Need?

Providing for safe left turns and efficient traffic flows is a priority for Minnesota transportation agencies. Traditionally, traffic signal configurations included a green arrow to indicate a protected left turn and a solid green circle to indicate a permissive left turn after the driver yielded to oncoming traffic.

For over a decade, flashing yellow arrow (FYA) signals have been replacing the solid green circles to indicate

a permissive left turn when traffic conditions include sufficient gaps in the oncoming traffic stream to allow left turns. Introduced in the Manual on Uniform Traffic Control Devices by the Federal Highway Administration (FHWA) in 2009, FYA signals are thought to be a more intuitive indication to drivers that they can proceed with a left turn as traffic allows. FYA signals also enable switching signals between protected and permissive left turns, depending on traffic volume.

*“These results give local transportation agencies confidence that flashing yellow arrows are well understood by drivers without having to install and maintain an accompanying Left Turn Yield sign.”*

—VICTOR LUND, TRAFFIC ENGINEER, ST. LOUIS COUNTY  
PUBLIC WORKS

FYA signals appear in different configurations, including a cluster of five signal heads—or doghouse configuration—and four signal heads arranged horizontally or vertically. Additionally, some FYA signals in Minnesota are accompanied by a Left Turn Yield sign. Local agencies wanted to assess driver understanding of the FYA in different signal arrangements and whether having an accompanying sign helped comprehension.

## What Did We Do?

A literature review, survey and field study demonstrated how drivers understood various traffic signal configurations involving FYA signals. Several studies since FHWA’s adoption of FYA signals explored various aspects of driver comprehension and behavior, and were used to inform the development of this project’s survey.

Working with a Technical Advisory Panel (TAP) and a group of volunteers, researchers created an online survey containing six pairs of traffic signal images. Variations included both four signal head and doghouse configurations; in each pair, one signal had an attached Left Turn Yield on Flashing Yellow Arrow sign. In response to a question about driver response given the pictured signal, volunteers from a variety of organizations selected from choices such as:

- Wait until the signal changes to a green arrow or flashing yellow arrow and then make your turn.
- Wait until there is a sufficient gap in oncoming traffic and then make your turn.
- Wait because the signal is about to turn red.
- Make your turn because oncoming traffic should stop.

The TAP then identified nine intersections in the Twin Cities region with either FYA signals or solid green circles, and locations for each type with either a Left Turn Yield sign or no sign. Each intersection had posted speeds between 30 mph and 40 mph, and could accommodate Minnesota Traffic Observatory’s portable, pole-mounted video equipment. One to two weeks of video data were gathered to compare driver behavior at each signal-sign combination and measure temporal gaps between the driver turning left and an oncoming vehicle.

## What Did We Learn?

Survey results from approximately 480 partial and complete responses overwhelmingly (over 90%) indicated drivers understood that an FYA signal indicates a permitted, not protected, left turn. There was little difference if a Left Turn Yield sign was present. The

field study produced similar results and provided further data on the gaps drivers allowed between oncoming vehicles and a left turn.

The temporal gaps at intersections were, on average, longer with solid green circles indicating permissive left turns than with FYA signals, suggesting improved traffic flow with FYA signals. Gaps also tended to be longer when a Left Turn Yield sign was present for both signal types.

## What’s Next?

Local Minnesota traffic engineers will continue to use FYA signals for permissive left turns at intersections, either all the time or at certain times of day. While this study did not specifically analyze safety implications of FYA signals, agencies have not observed an increase in crashes or other safety concerns with the signals’ use. Absent indications that FYA signals are negatively impacting crash rates or traffic flow, no further research is planned.

## About This Project

### REPORT 2023-42

“Driver Comprehension of Flashing Yellow Arrows.”

Find it at [mdl.mndot.gov](http://mdl.mndot.gov).

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\$213,656

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