



## Dual Left Flashing Yellow Arrow ("Dual Left FYA")

Communities and transportation professionals strive to provide sufficient peak period travel capacity without creating oversized streets and intersections that operate inefficiently or create off-peak delay.

High numbers of left turns have the potential to upset this balance. While adding a second left turn lane may provide additional peak capacity, the "protected-only" operation typically associated with dual lefts may increase intersection delay for the majority of the day.

A Dual Left Flashing Yellow Arrow ("Dual Left FYA") has the potential to avoid some of the downsides associated with typical dual left turn operation while still providing sufficient peak period capacity.

### Dual Left Flashing Yellow Arrow ("Dual Left FYA")

With sufficient "intersection sight distance" for left-turning vehicles to scan opposing traffic and execute a safe turn, Dual Left FYA may be a viable option. However, several factors will be evaluated, including corridor operating speeds; opposing through volumes and lanes; left-turning crossing distance; crash history at the intersection; typical corridor left turn phasing; controller flexibility; and site-specific factors.

#### Typical challenges associated with a second left turn lane

- While a single left turn lane often allows "left turn after yield," typical North Carolina practice with two left turn lanes has been to restrict left turns to only when the green arrow is shown
- Restricting left turns to a green arrow increases delays for left turns – and for everyone else – because the green arrow must be displayed even for one left-turning vehicle

#### Benefits of Dual (or single) Left Flashing Yellow Arrow

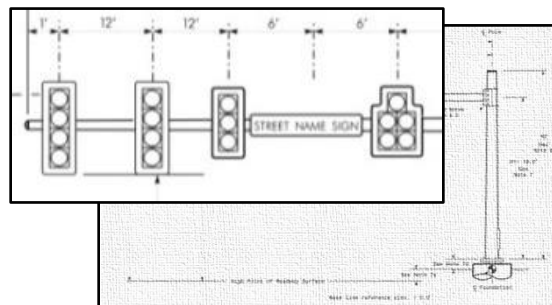
- **Improved coordination** – the green arrow can be displayed anytime in the signal cycle
- **Reduced delay** – the flashing arrow allows "left turn after yield" (i.e., "permitted") operation
- **Flexible operation** – the flashing arrow can be omitted/suppressed during certain times of day as needed to improve safety performance

As an example, a case study highlighted at the June 2014 I-40 Regional Partnership meeting found that Dual Left FYA would lower delay by almost 50%, reduce queue lengths by 20-30%, and save 10,000+ hours of delay per year at an existing signalized Cary intersection (Evans Rd./Weston Pkwy.)

#### Examples of Dual Left Flashing Yellow Arrow applications

- Five North Carolina intersections use Dual Left FYA, with several more planned
- Dual FYA has been used for many years in other cities in the United States, including Richardson and McKinney, Texas; Boulder, Colorado; and Chandler, Arizona
- Diamond interchanges may be particularly promising for Dual Left FYA since there are no opposing left turns

See reverse for some additional variations and considerations for the Dual Left FYA treatment.

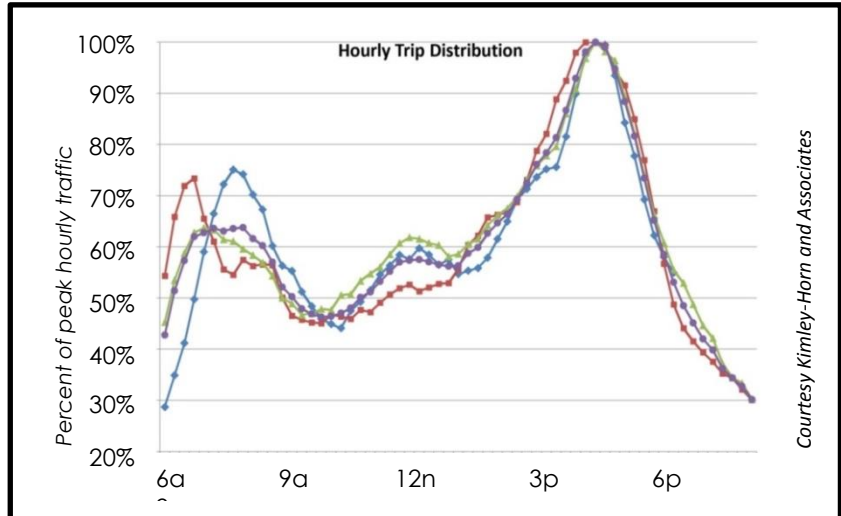


# Dual Left Flashing Yellow Arrow (“Dual Left FYA”), continued

Example variations and considerations for the Dual Left FYA treatment:

**Alternative 1 – If either high peak volumes or high off-peak speeds are a concern at a particular intersection location, consider varying Dual Left FYA by time of day**

- Monitor and consider suppressing the Dual Left FYA during times with high “cross products” (hourly left turn volume multiplied by the opposing through and right turn volume for the same hour)
- Also monitor and consider suppressing Dual Left FYA during some off-peak times (if speeds complicate permitted left turn gap selection)
- See the chart **at right** for examples of variation of a few Triangle signalized intersection traffic volumes by time of day
- Here volumes were below 75% of peak for 21 hours/day
- Note that the chart only shows **relative** variations by time of day rather than absolute differences



**Alternative 2 – If Dual Left FYA is not possible, consider “doing nothing” / reversion to single left FYA**

- If the expected sight distance with a second left lane would preclude the ability to use Dual FYA, one option is to consider retaining or reverting to a single left turn lane and flashing yellow arrow
- The signal timing could be adjusted during peak periods under this “do nothing” / reversion option by providing more time for left turns and/or a longer cycle length
- The intersection will operate more efficiently during off-peak times than with typical “protected” dual turn lanes, and a smaller intersection footprint would reduce pedestrian crossing time

**Alternative 3 – Consider improving vertical or horizontal sight distance to enable Dual (or single) Left FYA**

- If existing sight distance precludes the ability to display either a dual or single Flashing Yellow Arrow for all or a portion of the day, consider whether the sight distance could be improved
- In the case of an existing single left turn lane, it may be that dual left turn lanes would no longer be needed during peak periods if sight distance were improved and FYA became feasible

**Alternative 4 – If FYA is infeasible, consider innovative designs or implement typical dual left turn lanes**

- If adequate sight distance cannot be provided, consider redirecting certain movements, for example, one possibility would be the Synchronized Street (Superstreet)
- If no alternative option is acceptable or feasible, dual protected left turn lanes may be installed

*The key is to acknowledge that a tradeoff exists between peak capacity, off-peak delay, operational flexibility and community context, and to mitigate the tradeoff as safely and efficiently as possible.*

*As with any new treatment, a Dual Left FYA installation should be closely monitored from a safety and operational standpoint. If significant crash patterns associated with the left turn movements under permissive operations develop, additional countermeasures should be evaluated and considered.*

**For more information about the Dual Left FYA treatment:**

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