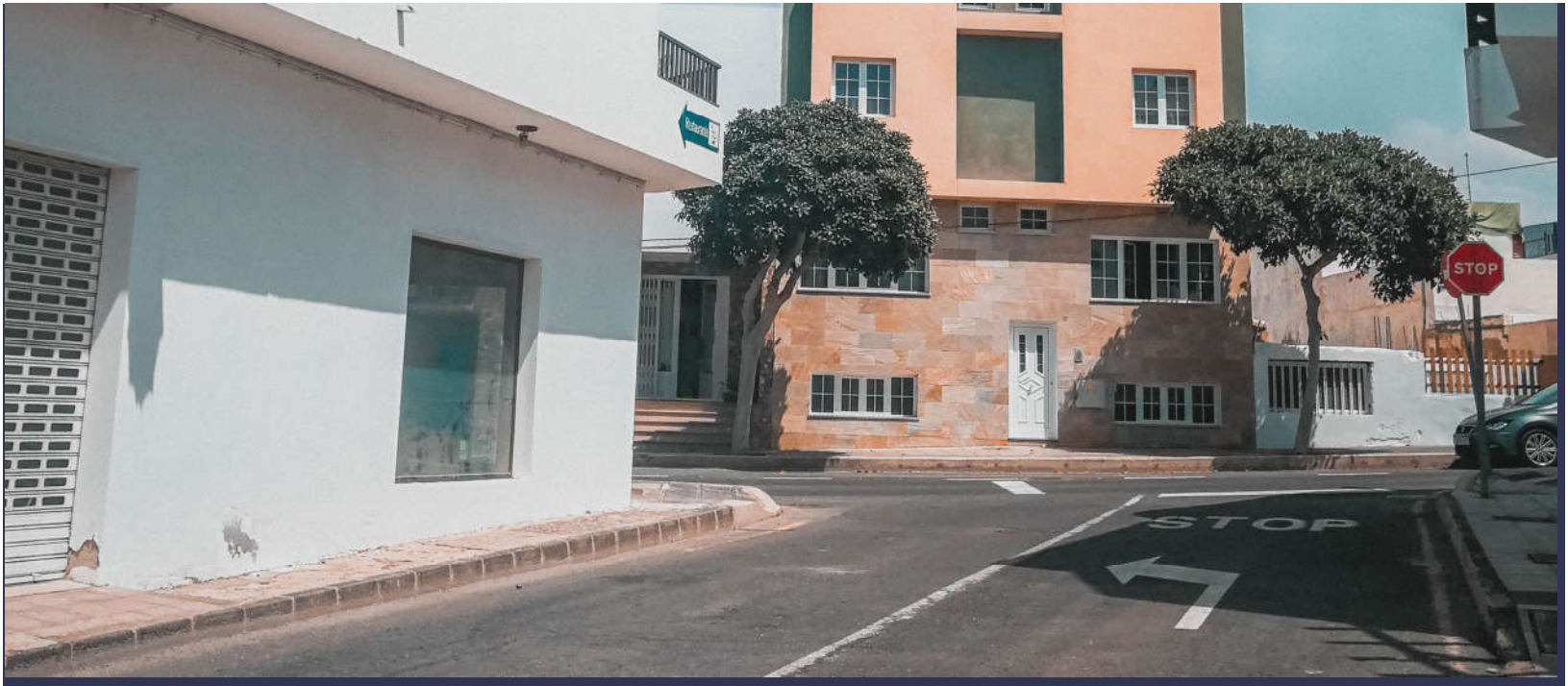

Spack
SOLUTIONS

Engineering Guide

Left Turn Lanes

Left Turn Lanes

The best tool in the traffic engineer's toolbox

Left turn lanes are arguably the best strategy a traffic engineer can employ because of the large safety and capacity benefits they provide versus the relatively low cost to build them. This guide will provide background information, installation factors, installation criteria, design guidelines and a list of resources for you to dig deeper.

Left turn lane background

Left turn lanes are exclusive turning lanes that allow for a left turn movement to occur outside of the through lane. One report suggests that adding a left turn lane increases approach capacity by approximately 25%[1]. The Federal Highway Administration has found crashes can be expected to decrease 10% to 44% after installing a left turn lane, depending on the circumstances[2].

However, left turn lanes may negatively impact pedestrians and bicyclists. Pedestrians crossing the road are exposed to traffic for more time because of the wider crossing distance on roads with left turn lanes. Pedestrians and bicyclists are also delayed by left turn lanes when traffic signals have exclusive left-turn phasing. Exclusive left turn phasing for a signal increases the overall timing and will add delay to those looking to cross the road.

[1] S/K Transportation Consultants, Inc., 2000, National Highway Institute Course Number 133078: Access Management, Location, and Design.

[2] Federal Highway Administration, Effectiveness of Intersection Left- and Right-Turn Lanes

Left turn lane installation factors

- **Functional Classification:** high order roads, such as arterials, are often planned with left turn lanes to provide the desired mobility and access.
- **Vehicle Speeds**: left turn lanes help eliminate the conflict between high speed through traffic (45 mph or higher) and vehicles slowing to turn.
- **Capacity Needs:** left turn lanes increase the capacity of an intersection approach.
- **Percent of Left Turns:** when left turning vehicles account for a high percentage of the approach's traffic, a left turn lane recognizes that movement as the primary travel route.
- **Site Conditions:** sight distance limitations, corridor design consistency, potential roadway obstructions, or other characteristics of an intersection can drive the need for a left turn lane.
- **Crash History:** a history of right-angle crashes can indicate a left turn lane will improve safety.

Left turn lane installation criteria

Some agencies and regions have developed volume guidelines, called warrants, for when to install a left turn lane. The current Highway Capacity Manual, 6th Edition does not provide left turn installation guidelines. However, previous editions of the Highway Capacity Manual provided the simple volume threshold suggesting more than 100 left turning vehicles in the peak hour warrants an exclusive left turn lane and 300 left turning vehicles in the peak hour warrants an exclusive dual left turn lane. The National Cooperative Highway Report Program (NCHRP) Report 745 has guidelines based on the peak hour volumes and the intersection configuration, as shown in Table 1.

TABLE 1 Summary of NCHRP 745 Recommended Left Turn Lane Warrants

Left Turn Lane Peak Hour Volume (vehicles/ hour)	Rural 2-Lane Highway	Rural 4-Lane Highway	Urban / Suburban
Three-Leg Intersection Right Turn Volume			
5	200	75	450
10	100	75	300
15	100	50	250
20	50	50	200
25	50	50	200
30	50	50	150
35	50	50	150
40	50	50	150
45	50	50	150
50 or More	50	50	100
Four-Leg Intersection Major Road Volume (vehicles/ hour/lane) that Warrants a Left-Turn Lane			
5	150	50	50
10	50	25	50
15	50	25	50
20	< 50	25	50
25	< 50	< 25	50
30	< 50	< 25	50
35	< 50	< 25	50
40	< 50	< 25	50
45	< 50	< 25	< 50
50 or More	< 50	< 25	< 50

LEFT TURN LANE DESIGN GUIDELINES

Lane Width

typically 11 to 12 feet but can be as wide as 14 to 16 feet wide if there is a large volume of heavy vehicles using the turn lane.

Taper Length

provides the shift from the through lane to the left turn lane. The taper rate is typically a 15:1 ratio between taper length and turn lane width on higher speed roads (45 mph or greater).

Deceleration Length

the space needed for a turning vehicle to enter the turn lane and slow to a stop before the intersection. Most agencies assume the deceleration starts at the beginning of the taper. Deceleration lengths of 170 feet (30 mph) to 485 feet (55 mph) are needed for a deceleration rate of 6 feet per second per second.

Storage Length

the space needed for cars to stack while waiting to complete their turn. The calculated 95th percentile queue length, the distance at which 95% of the queues will be at or below, can be used for the necessary storage length. You can also estimate the storage length based on the average number of vehicles expected during a two-minute period within the peak hour. Without any volume information, at least 50 feet of storage length, about two cars, should be provided.

Signing and Striping

provide as per your jurisdiction's engineering standards (i.e., Manual on Uniform Traffic Control Devices). In general, the guidelines call for a solid white line dividing the through lane from the left turn lane; solid white left turn arrows at each end of the turn lane, and a mandatory movement lane control sign.

Resources

- Federal Highway Administration, Manual on Uniform Traffic Control Devices
- Federal Highway Administration, Safety Effectiveness of Intersection Left- and Right-Turn Lanes
- Federal Highway Administration, Signalized Intersections: Informational Guide
- National Cooperative Highway Research Program, NCHRP 745: Left Turn Accommodations at Unsignalized Intersections
- Local Road Research Board, Research 2008-14: Turn Lane Lengths for Various Speed Roads and Evaluation of Determining Criteria