



*Engineering Guide*

# The Basics of Right Turn Lanes

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Right turn lanes provide safety and capacity benefits for vehicles in some situations, but negatively impact the safety of pedestrians and bicyclists.

Right turn lanes are frequently developed without a thorough capacity analysis. This engineering guide provides background information, installation factors, installation criteria, design guidelines and a list of resources to help you determine when a right turn lane is appropriate.

## Right Turn Lane Background

Right turn lanes are exclusive vehicle lanes that allow a right turn movement to occur outside of the through lane. It is important to note the benefits of an exclusive right turn lane are less than that of a left turn lane, so when planning an intersection project preference should be given to the left turn lane.

Since right turn movements must only wait for a gap in one direction of traffic, they can often turn on red at a traffic signal and may have treatments (like wide corner radii) that quickly facilitate this movement. Through traffic can also flow better when right turn lanes are provided because through vehicles no longer have to wait behind those waiting to take right turns.

The Federal Highway Administration studied the safety impact of exclusive right turn lanes and

based on their review; crashes can be expected to decrease from 4% to 27% depending upon the circumstances<sup>1</sup>. Similar research shows left turn lanes provide approximately four times the safety benefit as providing right turn lanes.

While vehicle traffic flow can be improved with right turn lanes, other modes of travel can be negatively impacted. The additional lane creates a higher potential for vehicle conflicts with bicycle traffic riding in the street. Pedestrians crossing the road are exposed to traffic for more time because of the wider crossing distance on roads with right turn lanes. Pedestrians and bicyclists may also be impacted by traffic operations if the right turn lane allows free movement onto the cross street, particularly if separated with a channelizing island, which can make crossing less safe.



<sup>1</sup>Federal Highway Administration, Safety Effectiveness of Intersection Left- and Right-Turn Lanes

## RIGHT TURN LANE INSTALLATION FACTORS

- **Functional Classification:** high order roads, such as arterials, are often planned with right turn lanes to provide the desired mobility and access.
- **Vehicle Speeds:** right turn lanes help eliminate the conflict between high speed through traffic (45 mph or higher) and vehicles slowing to turn.
- **Capacity Needs:** right turn lanes increase the capacity of an intersection approach.
- **Percent of Right Turns:** when right turning vehicles account for a high percentage of the approach's traffic, a right 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 right turn lane.
- **Crash History:** a history of rear-end crashes attributable to right turning traffic slowing in the through lane can indicate a right turn lane will improve safety.

### Right Turn Lane Installation Warrants

Some agencies and regions have developed volume guidelines, called warrants, for when to install a right turn lane. The current *Highway Capacity Manual, 6th Edition* does not provide right turn installation guidelines. However, previous editions of the *Highway Capacity Manual* provided

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the simple volume threshold, suggesting more than 300 right turning vehicles in the peak hour warrants an exclusive right turn lane. The National Cooperative Highway Report Program (NCHRP) Report 780 has guidelines based on the peak hour volumes and the intersection configuration, as shown in Table 1.

**TABLE 1** Summary of NCHRP 780 Suggested Right Turn Lane Warrants with Cross

Adjacent Through Volume	2-Lane Major Street	4-Lane Major Street
<b>Three-Leg Intersection Right Turn Volume</b>		
200	n/a	n/a
400	300	n/a
600	175	n/a
800	125	n/a
1,000	100	n/a
1,200	75	n/a
1,400	50	n/a
1,600	n/a	370
1,800	n/a	320
2,000	n/a	250
2,200	n/a	220
<b>Four-Leg Intersection Right Turn Volume</b>		
200	230	n/a
400	100	220
600	60	150
800	50	100
1,000	30	80
1,200	20	60
1,400	10	45
1,600	n/a	35
1,800	n/a	30
2,000	n/a	25
2,200	n/a	20

### Right Turn Lane Design Guidelines

- Lane Width is 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 right 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). Smaller taper ratios, as low as 5:1, are used on lower speed roads in confined situations.
- Deceleration Length is 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 is 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.
- You should provide Signing and Striping 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 right turn lane, solid white right 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](#)
- Local Road Research Board, [Research 2008-14: Turn Lane Lengths for Various Speed Roads and Evaluation of Determining Criteria](#)
- National Cooperative Highway Research Program, [Report 780: Design Guidance for Intersection Auxiliary Lanes](#)