

Turn Lanes (1 of 2)

INTERSECTIONS

DESCRIPTION AND DEFINITION

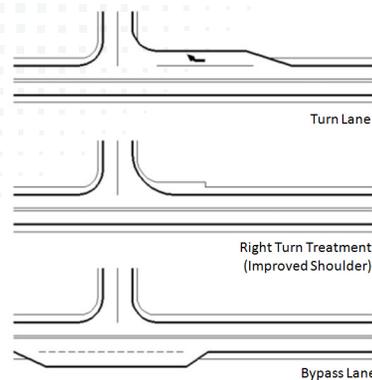
A turn lane is an auxiliary lane designed to separate turning vehicles from through vehicles. Turn lanes serve two purposes: provide for deceleration of vehicles making turning movements, and provide storage for turning vehicles.

Bypass lanes on the right side are provided at unsignalized intersections on two-lane roadways to allow through moving vehicles to go around a stopped or turning vehicle. They are often considered for implementation instead of a left turn lane because of the reduced cost.

Turn Lane Types



Example of Right Turn Lane



As discussed in the Intersection Treatments Practice Summary, the most severe type of crash is the right-angle crash at intersections. Because the turn lane does not address the most severe type of crashes, it should be considered a minor safety improvement or as only a mitigation for rear end crashes.

Bypass Lanes

A 1999 study of bypass lanes in Minnesota could not conclude that the use of the turn lane provided any greater degree of safety when compared to intersections without a bypass lane or left turn lane. However, studies completed in other states have found a decrease in rear end and left turn injury crashes with the implementation of bypass lanes.

PROVEN, TRIED, INEFFECTIVE, OR EXPERIMENTAL

- All studies in the FHWA Crash Reduction Clearinghouse documented crash reductions of 10 to 50 percent after installation of left and right turn lanes.
- NCHRP considers providing left and right turn lanes **PROVEN** safety strategies for reducing the frequency and severity of conflicts at unsignalized intersections.
- Bypass lanes are considered a **TRIED** strategy.

TYPICAL CHARACTERISTICS OF CANDIDATE LOCATIONS

Turn Lanes

Turn lanes are usually not appropriate on rural roadways with low volumes unless at an access to a high traffic generator site such as a commercial development. Turn lanes are mostly appropriate on urban or suburban city/county roadways.

Bypass Lanes

The difference in cost between the implementation of a left turn lane and a bypass lane makes the bypass lane more likely to be implemented on rural roadways with lower volumes. The 1999 study of bypass lanes in Minnesota cautioned the use of bypass lanes at four-legged intersections, citing the following findings:

- No overall crash frequency reduction (did not address rear end crashes)
- Use of the bypass lane impairs the visibility of left-turning vehicles to opposing through traffic

TYPICAL COSTS

Implementation Costs:

- Left turn lane = \$100,000 to \$300,000
- Right turn lane = \$50,000 to \$70,000
- Bypass lane = \$65,000 to \$75,000

SAFETY CHARACTERISTICS

Turn Lanes

Turn lanes are mitigation for rear end crashes. Left turn lanes, which provide shelter for turning vehicles, may encourage drivers to be more selective and wait for a gap in opposing traffic at unsignalized intersections.

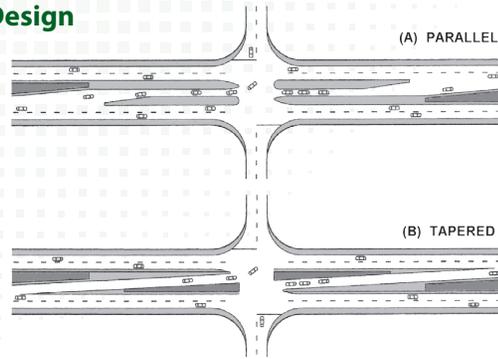


Turn Lanes (2 of 2)

INTERSECTIONS

Vehicles approaching on the cross street may be confused by use of the bypass lane for someone using it as a turn lane. MnDOT's *Access Management Manual* now recommends that bypass lanes be used only on T-intersections. For bypass lane implementation purposes, intersections that have a private access as one approach are considered four-legged intersections.

Example of an Off-Set Left Turn Design



Example of Off-Set Left Turn Lane

DESIGN FEATURES

The basic objective of a turn lane is to reasonably accommodate decelerating vehicles while providing storage. The design process involves first computing the expected demand, which is based on vehicle speeds and volume, and then determining the design side of the equation—how to distribute the available space in the corridor between the tapered and full-width parts of the turn lane.

SOURCES

Bypass Lane Safety, Operations and Design Study. 2000. Preston, H. LRRB Research 2000-22.
 MnDOT *Access Management Manual*.
 MnDOT *Road Design Manual*.
Design of Turn Lane Guidelines, Minnesota Local Road Research Board, Report 2010-25, 2010.
Traffic Volume Thresholds for Requiring Right Turn Lanes and Treatments on Two-Lane Roads, Minnesota Local Road Research Board, Report 2008-25ts, 2008.
Turn Lane Lengths for Various Speed Roads and Evaluation of Determining Criteria, Minnesota Local Road Research Board, Report 2008-14, 2008.
Warrants for Right-Turn Lanes/Treatments on Two-Lane Roads, Minnesota Local Road Research Board, Report 2008-25, 2008.



A new type of turn lane design on divided roadways is the Off-Set Left and Right Turn Lane. Advantages of this innovative design include the following:

- Improves left turn leaving gap acceptance
- Improves opposing traffic's ability to observe left turn traffic
- Buffers left-turning traffic from through traffic, thus reducing conflicts

Left-Turning Volume	Storage Length (feet)		
	0 – 5% Heavy Commercial	>5 – 10% Heavy Commercial	>10 – 15% Heavy Commercial
50	50	50	60
60	55	60	70
70	65	70	80
80	75	80	90
90	85	90	100
100	95	100	115
110	105	110	125
120	110	120	
130	120	130	
140	130	140	
150	145	150	
160	150	160	
170	160	170	
180	165	180	
190	175	190	215
200	185	200	225

Facility Type	Taper	Length
Unconstrained Conventional/Expressway	1:15	180 feet
Constrained Expressway Roadway	1:8	100 feet
Constrained Conventional Roadway	1:5	60 feet

Example of Design Tools found in Mn/DOT's *Design of Turn Lane Guidelines*

BEST PRACTICE
 Turn lanes should be provided at all major intersections. Bypass lanes, if used, should be limited to T-intersections.

Turn Lanes Policy (1 of 2)

INTERSECTIONS

POLICY PURPOSE/INTRODUCTION

The purpose of this policy is to establish uniformity and consistency in the application, installation, and maintenance of turn lanes on *<Insert Agency>*'s roadway system.

DEFINITIONS

Turn Lane: A lane designated for slowing down and making a turn on a roadway so as to reduce disruption to through traffic.

POLICY

It is the policy of *<Insert Agency>* to provide turn lanes at all major traffic generators on two-lane, two-way roadways and divided highways when warranted under the terms in this policy. Turn lanes will be implemented as part of reconstruction projects and as part of traffic impact mitigation for commercial developments. Bypass lanes will only be considered at T-intersections when cost or right-of-way constraints limit the ability to implement turn lanes.

POLICY CRITERIA

Turn lane implementation will be determined based on two approaches: functional classification and operations analysis.

Functional Classification—One way to determine the need for turn lanes is based on the functional classification of the major street and the cross street or access. Higher functional classification connections (such as principal arterial to minor arterial) should have turn lanes with lower functional classification connections (for instance, local streets with private driveways) and would use a paved shoulder.

The table below provides guidance for turn lane needs based on the functional classification of the intersecting roadways.

Major Street Functional Classification	Cross Street Functional Classification				
	Principal Arterial	Minor Arterial	Collector	Local Street	Private Driveway
Principal Arterial	LTL	LTL	LTL	LTL (N.R)	N.A.
Minor Arterial	LTL	LTL	Min LTL	Min LTL	Paved Shoulder
Collector	LTL	Min LTL	Min LTL	Paved Shoulder	Paved Shoulder
Local Street	LLT	Min LLT	Paved Shoulder	Paved Shoulder	Paved Shoulder

Definitions:

LTL = Left Turn Lane

N.A. = Not Allowed

Min LTL = Minimum Length Left Turn Lane (480 feet = 180 feet of taper + 300 feet of storage)

(N.R.) = Intersections of local streets with Principal Arterials are not recommended

Turn Lanes Policy (2 of 2)

INTERSECTIONS

Operations Analysis—Another way to determine the need for turn lanes is based on a traffic impact operational analysis. New development or redevelopment projects would complete an impact analysis to determine traffic operations on all adjacent roadways and assess the need for turn lanes based on operational impacts.

Some considerations when analyzing the need for turn lanes based on new development or redevelopment adjacent to **<Insert Agency>**'s roadway include:

- A developer should install right turn lanes on the **<Insert Agency>**'s roadways at its expense at all subdivisions and public roads, or at any entrance serving commercial or industrial property that is estimated to generate over 100 right turns per day.
- A left turn bypass lane may be required if warranted in MnDOT's *Road Design Manual*.
- Turn lanes and/or bypass lanes may be required if other similar accesses along the same segment of the roadway already have turn lanes and/or bypass lanes.
- Turn lane lengths should be consistent with guidance provided in MnDOT's *Design of Turn Lanes Guidelines* (July 2010), which includes length for both deceleration and necessary storage of queued vehicles.
- Turn lanes and bypass lanes shall be designed and constructed to **<Insert Agency>** standards.
- If turn lanes or bypass lanes cannot be constructed due to limitations in right-of-way, the developer will be required to pay an amount determined by the **<Insert Agency>** engineer, pursuant to state standards, to be adequate to cover the cost of such items.