

# DESIGN MEMO 9.06

To: Designers, Contractors, and City Departments  
Date: January 10, 2023  
Subject: Opposing Left Turns  
Category: Traffic

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## Table of Contents

1	Purpose .....	1
2	Applicability .....	2
3	Definitions.....	2
4	Design Guidance.....	2
4.1	General.....	2
4.2	Positive Offset Design .....	3
4.3	Negative Offset and Design Exception .....	3
4.4	Sight Distance Requirements.....	4
4.5	Deceleration / Storage Length .....	5
4.6	Signing and Pavement Markings .....	5
4.7	Median / Buffered Left-Turn Design.....	6
4.8	U-Turns .....	6

## 1 Purpose

At both signalized and unsignalized intersections with permissive left turns, vehicles in an opposing left-turn lane could potentially restrict the left-turning motorist’s view of oncoming through traffic depending on the offset dimension between the two lanes. This can result in an increased risk of collision and/or increased delay from hesitation due to gap uncertainty.

This memo focuses on guidance for design of opposing left-turn lanes to maximize sight distance and reduce collision frequency and delay.



## 2 Applicability

Until further notice, this direction will be used for scoping, design, and construction of plans within the City of Columbus right-of-way. The guidance provided in this memo is applicable to any uncontrolled, stop-controlled, or signalized intersection with opposing left-turn lanes within the City of Columbus.

## 3 Definitions

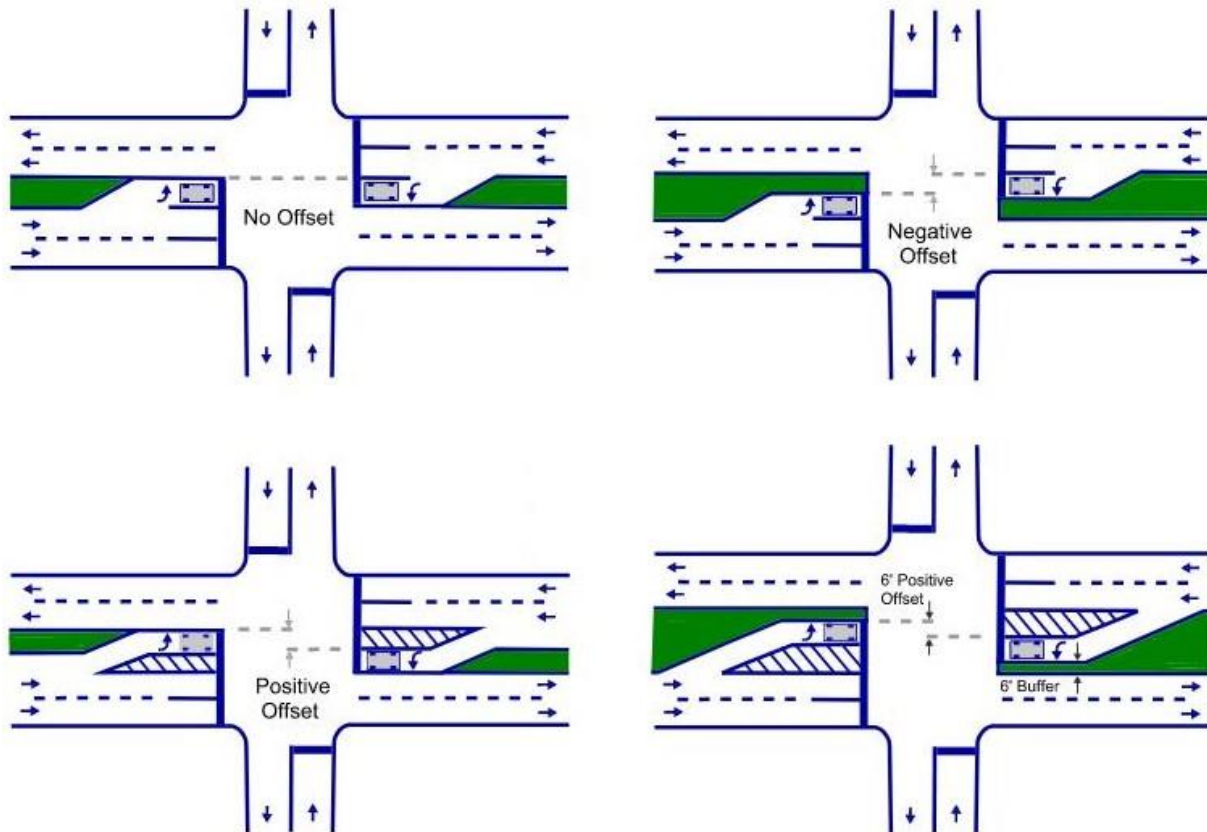
Definitions of key terms in this memo are provided in City of Columbus Design Memo 1.00: Introduction.

## 4 Design Guidance

### 4.1 General

A major factor affecting sight distance and safe gap acceptance at intersections with opposing left turns is the offset (see **Figure 1**). Offset is defined as the distance between the left edge of the turn lane and the right edge of the opposing turn lane. Direct alignment is referred to as zero offset. If the opposing lane is to the left, allowing the opposing vehicle to block all or a portion of the motorist's view of oncoming traffic, the offset is negative. If the opposing lane is to the right, enhancing visibility, the offset is positive. For new construction projects the design goal is to provide a zero or positive offset to ensure that opposing left-turn vehicles have adequate sight distance to safely judge gaps in oncoming through traffic in accordance with the guidelines of this memo. For projects at existing intersections with zero or positive offsets, the design will utilize available space to provide a positive offset equal to or greater than existing. At intersections with existing negative offsets, the design shall provide a positive offset if space is available. If adequate space is not available and acquisition is non-feasible, then a negative offset will be permitted, but not to exceed 2 feet.





**Figure 1: Offset Types**

Other important factors affecting the design of opposing left turns include vehicle type and horizontal and vertical geometry of the intersection and approaches. As with any dedicated turn lane, adequate storage length must be provided to prevent blocking of through lanes.

#### 4.2 Positive Offset Design

A positive offset of 6 feet is recommended for opposing left-turn lanes at intersections on relatively flat terrain with near 90-degree geometry. Deviation from the recommended offset may be acceptable where justified by variations in lane width, striping, intersection angle, sight distance, and intersection control type. See Section 4.4 below for guidance on sight distance requirements.

Generally, conflicts do not occur between opposing left-turning vehicles where lanes with the recommended positive offset of 6 feet are provided. However, intersections are unique, and the designer should check turning templates for the design and check vehicle.

Where dual left turns are warranted in one or both directions, offset is determined by the alignment of the opposing right-hand left-turn lanes. See Figure 401-12 of the ODOT L&D Manual, Volume 1.

#### 4.3 Negative Offset and Design Exception

If a design providing the recommended offsets is not feasible due to insufficient right-of-way or other limiting factors, an engineering evaluation will be required for consideration of offsets that are less than



the recommended widths. The evaluation shall consider speed, through and turning volumes, truck volume and type, geometry, vertical alignment, and resulting sight distance. The evaluation shall describe the factors causing the restriction and why an intersection meeting the recommended parameters is not feasible.

Minimizing negative offset or increasing limited positive offset can be achieved in a number of ways when the recommended offsets are determined impractical. Shifting left and right edge lines of all turn lanes closer to the median can encourage motorists to move as far left as possible in the turn lane. Reducing lane width between edge lines and placing the extra width between the right edge line and channelizing line or buffer can also encourage movement to the left (MN DOT 2019).

#### 4.4 Sight Distance Requirements

The required minimum sight distance for left-turn movements by passenger vehicles from the major road shall equal the intersection sight distance listed in the table in **Figure 2** for the various design speeds. These ISDs shall be used when evaluating opposing left-turn lanes that do not meet the 6' positive offset requirement.

Design Speed (mph)	Stopping Sight Distance (ft)*	Intersection Sight Distance (ft)**
15	80	115
20	115	155
25	155	200
30	200	250
35	250	375
40	305	445
45	360	500
50	425	555
55	495	610
60	570	665

\* SSD from AASHTO (2018), Table 9-17

\*\* ISD for left turning vehicles - Columbus Design Memo 4.11, Table 1

**Figure 2: Intersection Sight Distance for Left Turn from Major Road**



### 4.5 Deceleration / Storage Length

Section 401.6 of the ODOT L&D Manual, Volume 1, provides guidance on the design of left-turn lanes. Figures 401-9 and 401-10 specifically cover turn lane length for deceleration and storage length and include a design example.

### 4.6 Signing and Pavement Markings

Signing and pavement markings for opposing left-turn lanes should follow the standards of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD) (2012).

For raised medians less than 30 feet wide, the regulatory sign KEEP RIGHT (R4-7) is preferred near the median ends. One-way signs can be omitted when the KEEP RIGHT sign is placed at an angle so that it can be viewed by motorists making a left turn onto the mainline from the cross street (MN DOT 2019). See **Figure 3** below. If the end of the median is too narrow for the KEEP RIGHT sign, it can be moved back to a wider portion of the median if within a range where the sign remains effective. Otherwise, one-way signs should be used.

At the approach end of the buffer island where the left-turn lane separates from the through lane, a BEGIN LEFT-TURN LANE (R3-20L) regulatory sign should be used. OMUTCD Sections 2B.32 and 2B.40 provide additional guidance for signing at intersections with median left-turn lanes.

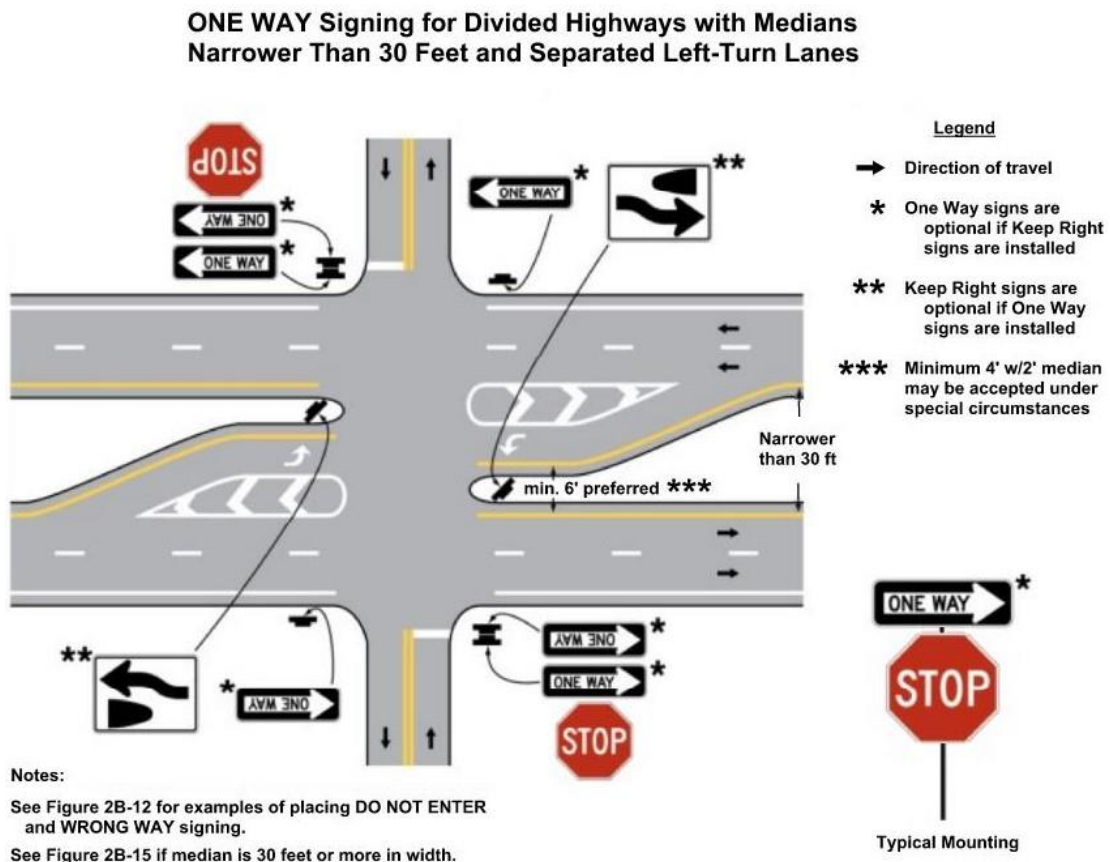


Figure 3: OMUTCD 2012 (Fig. 2B-17 Modified)



### 4.7 Median / Buffered Left-Turn Design

For streets with medians, the desired minimum median width approaching the intersection is 17 feet. This allows an 11' wide offset turn lane with a 6' wide buffer (4' wide median) between the left turn and through lane (see **Figure 1**). Offset turn lanes should be parallel to the through lanes prior to reaching the left-turn lane stop line. If the minimum island width adjacent to the left-turn lane cannot be maintained to achieve a zero or positive offset, then it should be eliminated, and a double yellow centerline used.

Crosswalk length should also be a consideration when determining median widths. Single stage pedestrian actuated crossings are preferred and take precedence over the use of medians as buffers. Where pedestrian volumes are heavy, longer single stage timings are preferred over two stage crossings. In rare cases where a two-stage pedestrian crossing is necessary, medians used for refuge shall have a minimum width of 6 feet, back-to-back of curb. Refer to City of Columbus Design Memo 6.05 Pedestrian and Median Islands.

### 4.8 U-Turns

U-turns are prohibited within the City of Columbus (Codified Ordinance No. 2131.12). For multi-lane roadways with continuous medians, U-turns may be allowed from designated left-turn lanes at signalized and unsignalized intersections on a case-by-case basis as approved by the Director. U-turns will not be approved from through lanes. To accommodate U-turns, adequate pavement width must be available on the receiving side for the design vehicle to make an un-interrupted, continuous turn. The following design criteria focuses on permitted U-turns at unsignalized, properly signed intersections.

The AASHTO "Green Book" provides the following table (see **Figure 4**) as guidance for median widths for various vehicular types and maneuvers. The minimum median width for U-turning passenger vehicles is typically 18 feet if no shoulder is present. For trucks, an additional receiving lane and/or shoulder, or widening of the radius return on the cross street may be considered to accommodate wide turns.

Type of Maneuver		U.S. Customary						
		M - Minimum Width of Median for Design Vehicle (ft)						
		P	WB-40	SU-30	BUS	SU-40	WB-62	WB-67
		Length of Design Vehicle (ft)						
		19	50	30	40	40	63	68
Inner Lane to Inner Lane		30	61	63	63	76	69	69
Inner Lane to Outer Lane		18	49	51	51	64	57	57
Inner Lane to Shoulder		8	39	41	41	54	47	47

**Figure 4: Minimum Design for U-turns**  
(AASHTO 2018, Table 9-28)



Adequate sight distance is critical for the completion of safe U-turns for both the turning vehicle and the approaching through vehicles. The following sight distance chart (**Figure 5**) is from the 2014 Florida Median Handbook, Section 3.0.3 and assumes:

- 2 seconds perception-reaction time,
- additional time needed to perform the U-turn movement,
- begin acceleration from 0 mph at the end of the U-turn movement,
- use of speed/distance/ and acceleration figures from AASHTO “Green Book” (2018), and
- 50 feet added safety clearance between vehicles.

<i>Speed (mph)</i>	<i>Sight Distance (ft)</i>
<b>25</b>	<b>520</b>
<b>40</b>	<b>640</b>
<b>45</b>	<b>830</b>
<b>50</b>	<b>1040</b>
<b>55</b>	<b>1250</b>
<b>60</b>	<b>1540</b>

**Figure 5: Optimum sight distance for U-turn at unsignalized median opening**  
(Florida Median Handbook, 2014)

Another option for providing U-turns is the Restricted Crossing U-Turn or RCUT intersection. The RCUT removes some or all of the left-turn movements from the main intersection by moving them to a one-way median opening downstream. Refer to Section 404 of the ODOT L&D Manual, Volume 1 for details on the application and design of this intersection option.

