

An aerial photograph of a city intersection. The intersection features protected bike lanes with green pavement and white directional arrows. Crosswalks are marked with white stripes. Several cars are visible on the roads. In the background, there are trees and a house. A white rectangular box is overlaid on the upper portion of the image, containing the title and version information.

# Protected Intersection Review Checklist

Version 1.2



Montgomery  
Planning

Last revised: September 2023



Project Name: \_\_\_\_\_

Name of Applicant: \_\_\_\_\_

Project Number: \_\_\_\_\_

Name of Reviewer: \_\_\_\_\_

## LOCATION INFORMATION

Complete this section for each intersection.

### INTERSECTION INFORMATION

Complete this section for the entire intersection.

**Street Name:****Street Name:****Ownership:**

(select one)

Montgomery County

Maryland SHA

Other

**Ownership:**

(select one)

Montgomery County

Maryland SHA

Other

**Street Type:**

(select one)

Downtown

Town Center

Neighborhood

Industrial

Country

Other

**Street Type:**

(select one)

Downtown

Town Center

Neighborhood

Industrial

Country

Other

**Proposed Bikeway Type:**

(select one or two)

One-Way Separated Bike Lane

Two-Way Separated Bike Lane

Conventional Bike Lane

Buffered Bike Lane

Sidepath

No Bikeway

**Proposed Bikeway Type:**

(select one or two)

One-Way Separated Bike Lane

Two-Way Separated Bike Lane

Conventional Bike Lane

Buffered Bike Lane

Sidepath

No Bikeway

## DESIGN & CONTROL VEHICLES

Complete this section for the entire intersection.

See Complete Streets Design Guide, Section 6.4 Design Vehicle Versus Control Vehicle, for additional information.

**Design Vehicle:****Control Vehicle:**

## INTERSECTION CONTROL TYPE

Complete this section for the entire intersection.

**Control Type:**

(select one)

Signalized

All-Way Stop

Two-Way Stop

None

Please note: Turning movement counts are needed to complete checklist.

Date: \_\_\_\_\_

Project Name: \_\_\_\_\_

Name of Applicant: \_\_\_\_\_

Intersection Corner: \_\_\_\_\_

Project Number: \_\_\_\_\_

Intersection Name: \_\_\_\_\_

Intersection Crossing: \_\_\_\_\_

# DESIGN ELEMENTS CHECKLIST

Complete this section for each intersection corner and crossing. For any elements that do not meet the requirements, provide an explanation in the comments. Definitions and design guidance, reference graphics, tables, and figures are provided in the Appendix.

## GEOMETRIC DESIGN

|                              | <u>Met</u><br>(Y or N, or N/A)   | <u>Value</u> | <u>Requirements</u> | <u>Comments</u>   |
|------------------------------|--|--------------|---------------------|---|
| <b>Corner Island</b>         |  |              |                     |   |
| A                            | Corner Island*   |              | N/A                 | Corner Island is included in design plans.  |
| B                            | Corner Radius  |              |                     | Radius of corner island set to 15'. If not, provide explanation in the comments and complete Section C Mountable Truck Apron below.   |
| C                            | Mountable Truck Apron  |              |                     | Mountable truck apron is included, radius is set to 15'. If not included/appropriate, mark N/A.   |
| <b>Bicycle Queuing Space</b> |  |              |                     |   |
| D                            | Bicycle Queuing Space  |              |                     | Bicycle queuing space has been provided and is outside of the design vehicle envelope. Recommended minimum depth is 6.5'.   |
| E                            | Bikeway Type<br>One-Way Separated Bike Lane<br>Two-Way Separated Bike Lane<br>Conventional Bike Lane<br>Buffered Bike Lane<br>Sidepath |              | N/A                 | Select based on street type and available width and volumes. Recommendations for bikeway widths are provided in Table 2 in the appendix. Street types and facility selection are provided in Table 3 in the appendix.   |
| F                            | Bikeway Width  |              |                     | Bikeway meets minimum width requirements in Table 2 in the appendix. Sidepath minimum width is typically 10'. If width does not meet requirements, provide explanation in comments.   |
| G                            | Separated Bike Lane Curb Type  |              | N/A                 | Separated bike lane is beveled. For sidepaths, enter N/A.   |
| H                            | Stop Bar   |              | N/A                 | 12" bicycle stop line is present and outside of the vehicle travel path. Consider if a second stop bar is necessary across the bikeway at pedestrian crossings. This may be appropriate in areas with high volumes of pedestrian activity but may require additional bicyclist detection (see bikeway detection section). |
| <b>Clear Distance</b>        |  |              |                     |   |
| J                            | Clear Distance*  |              |                     | Confirm adequate clear distance for sight lines between parallel traveling motorists and bicyclists. Clear distance meets minimum requirements in Table 1 in the appendix. (Default is 20' clear distance where corner radius is 15'.)  |
| K                            | No Parking/Restricted Use Signs  |              | N/A                 | No Parking or No Stopping signs have been included to restrict vehicles from parking or stopping within the clear distance zone.  |

\*Items with an asterisk are considered an absolute requirement and must be achieved in order to proceed.

Date: \_\_\_\_\_

Project Name: \_\_\_\_\_

Name of Applicant: \_\_\_\_\_

Intersection Corner: \_\_\_\_\_

Project Number: \_\_\_\_\_

Intersection Name: \_\_\_\_\_

Intersection Crossing: \_\_\_\_\_

## GEOMETRIC DESIGN (Continued)

|                            |                             | <u>Met</u><br>(Y or N, or N/A) | <u>Value</u> | <u>Requirements</u>   | <u>Comments</u> |
|----------------------------|-----------------------------|--------------------------------|--------------|---|-----------------|
| <b>Motorist Yield Zone</b> |                             |                                |              |   |                 |
| L                          | Motorist Yield Zone         |                                |              | Motorist yield zone provides a 6' to 16.5' offset for vehicle yielding. If not, provide explanation of other treatments used to reduce motor vehicle turning speeds and reduce conflicts (i.e., through signalization) in comments (see signalization below.) |                 |
| <b>Pedestrian Refuge</b>   |                             |                                |              |   |                 |
| M                          | Pedestrian Refuge           |                                |              | A 6' or wider pedestrian refuge median is provided between the motor vehicle travel lane and the bikeway, and is located outside of the design vehicle turning envelope.  |                 |
| N                          | Detectable Warning Surfaces |                                | N/A          | Appropriate detectable warning surfaces (DWS) are provided in the curb ramp and pedestrian refuge median (as applicable).   |                 |
| <b>Other Elements</b>      |                             |                                |              |   |                 |
| O                          | Fire Hydrant                |                                | N/A          | If fire hydrant is present, it has been relocated outside of the corner.  |                 |

## SIGNING & MARKING

|                          |   | <u>Met</u><br>(Y or N, or N/A) | <u>Value</u> | <u>Requirements</u>   | <u>Comments</u> |
|--------------------------|---|--------------------------------|--------------|---|-----------------|
| <b>Crossing Markings</b> |   |                                |              |   |                 |
| P                        | Pedestrian Crossing of Travel Lanes Markings        |                                |              | High-visibility crosswalk markings are provided that cover the full width of the sidewalk or sidepath and are at least 10' wide. Crosswalk markings are aligned with the bikeway crossing markings (if applicable) to the maximum extent possible.  |                 |
| Q                        | Pedestrian Crossing of Separated Bike Lane Markings |                                | N/A          | A pedestrian crossing of the bikeway is provided. For sidepaths, enter N/A.   |                 |
| R                        | Bikeway Crossing Markings and Signing               |                                |              | Bikeway crossing markings are provided that comply with applicable state or county standards. Specify which standard is used. Bikeway crossing markings are aligned with the crosswalks (if applicable) to the maximum extent possible. If crossing of the bikeway is uncontrolled, a MD MUTCD R9-6 Bikes Yield To Peds sign is provided. |                 |
| S                        | Green-Colored Pavement                              |                                | N/A          | Where provided, green-colored pavement markings follow Montgomery County Standards.   |                 |

# PROTECTED INTERSECTION REVIEW CHECKLIST

Project Name: \_\_\_\_\_

Name of Applicant: \_\_\_\_\_

Intersection Corner: \_\_\_\_\_

Project Number: \_\_\_\_\_

Intersection Name: \_\_\_\_\_

Intersection Crossing: \_\_\_\_\_

## SIGNALIZATION

|   | <u>Met</u><br>(Y or N, or N/A) | <u>Value</u> | <u>Requirements</u>   | <u>Comments</u> |
|---|--------------------------------|--------------|---|-----------------|
| <b>Bikeway Signalization Strategy</b>   |                                |              |   |                 |
| Which of the following signalization strategies does the through-bicycle movement follow?<br>(Select one and complete the checklist under the selection.) |                                |              |   |                 |
| <b>Bicycle-Only Signal</b>  |                                |              |   |                 |
|   |                                | N/A          | Bicycle signal design follows all MD MUTCD guidance.  |                 |
|   |                                | N/A          | NO TURN ON RED (MD MUTCD R10-11) sign is present.   |                 |
| <b>Bikes Follow Pedestrian Signal</b>   |                                |              |   |                 |
|   |                                | N/A          | Pedestrian signal head is visible from the bikeway queuing area/stop bar location.  |                 |
|   |                                | N/A          | BIKES USE PED SIGNAL sign (MD MUTCD R9-5) is provided.  |                 |
|   |                                | N/A          | Leading pedestrian interval has been added (or considered and determined infeasible. If so, provide explanation in comments.)   |                 |
| <b>Bikes Follow Standard Traffic Signal</b>   |                                |              |   |                 |
|   |                                | N/A          | Bikeway operates one-way only. Two-way bikeway operations must use one of the other two signalization strategies, or standard signal head <u>must</u> be installed for the counterflow bicyclist. |                 |
|   |                                | N/A          | Standard signal head is visible from the bikeway queuing area/stop line location.   |                 |
| <b>Signal Phasing</b>   |                                |              |   |                 |
| Fill in the vehicle volume and lane data to determine if phase separation is recommended or required. Refer to Figure 1 in Appendix.                      |                                |              |   |                 |
| <b>Traffic Volumes &amp; Lane Data</b>  |                                |              |   |                 |
| Input the number of peak hour vehicles per hour for each turn.  |                                |              | Volume of peak hour right turning vehicles (across bikeway)   |                 |
|   |                                |              | Volume of peak hour left turning vehicles (across bikeway)  |                 |
| Input the number of lanes crossed by left-turning vehicles.   |                                |              | Number of travel lanes crossed by left-turning vehicles   |                 |
| <b>Bikeway Phase Separation</b>   |                                |              |   |                 |
| Is phase separation recommended based on Figure 1?  |                                | N/A          |   |                 |
| If phase separation is recommended, is phase separation provided?   |                                | N/A          |   |                 |

Date: \_\_\_\_\_

Project Name: \_\_\_\_\_

Name of Applicant: \_\_\_\_\_

Intersection Corner: \_\_\_\_\_

Project Number: \_\_\_\_\_

Intersection Name: \_\_\_\_\_

Intersection Crossing: \_\_\_\_\_

## SIGNALIZATION (Continued)

| <u>Met</u><br>(Y or N, or N/A)   | <u>Value</u> | <u>Requirements</u> | <u>Comments</u> |
|--|--------------|---------------------|-----------------|
| <b>Signal Phasing (Cont.)</b>  |              |                     |                 |
| <b>Signal Phasing Plans</b>  |              |                     |                 |
| Signal phasing plans have been included with this plan. If no, please explain in the comments.                 |              | N/A                 |                 |
| <b>Bikeway Detection</b>   |              |                     |                 |
| Which of the following (active and/or passive) bikeway detection strategies are used? (Select all that apply.) |              |                     |                 |
| Bicycle Movement Set to Recall   |              |                     |                 |
| Passive: Loop Induction  |              |                     |                 |
| Active: Push Button for Bicyclist  |              |                     |                 |
| Other, specify.  |              |                     |                 |

Project Name: \_\_\_\_\_

Name of Applicant: \_\_\_\_\_

Intersection Corner: \_\_\_\_\_

Project Number: \_\_\_\_\_

Intersection Name: \_\_\_\_\_

Intersection Crossing: \_\_\_\_\_

## BIKEWAY TRANSITIONS

| Met<br>(Y or N, or N/A)   | Value | Requirements   | Comments |
|---|-------|--|----------|
| <b>Bikeway Transition Strategy</b>  |       |  |          |
| At a project's limits, a separated bike lane must transition to another bikeway, the street, or a sidewalk to provide continuity and connectivity. Connections to intersecting on-road bikeways must also be addressed. Which of the following transition strategies is utilized? (Select all appropriate transition strategies.) |       |  |          |
| Separated Bike Lane connects to existing Separated Bike Lane  |       |  |          |
|   | N/A   | Design complies with all Geometric Design and Signing & Marking guidance for protected intersections discussed above.  |          |
| Separated Bike Lane Transitions to Sidewalk or Sidepath (near side)<br>See Transition Example #1 for a conceptual image of this transition.   |       |  |          |
|   | N/A   | Design provides either a bike ramp or a wide pedestrian curb ramp on the near side of intersection to access a sidewalk or sidepath.   |          |
| Separated Bike Lane Transitions to Sidewalk or Sidepath (far side)<br>See Transition Example #2 for a conceptual image of this transition.  |       |  |          |
|   | N/A   | Design maintains the separated bike lane up to the intersection and transitions to a wide pedestrian curb ramp on the far side of intersection to access a sidewalk or sidepath.         |          |
| Separated Bike Lane Transitions to Shared Lane<br>See Transition Example #3 for a conceptual image of this transition.  |       |  |          |
|   | N/A   | Design maintains the separated bike lane up to the intersection. Where possible, it continues beyond the intersection before merging with a shared lane on the far side of intersection. |          |
|   | N/A   | At signalized intersections, a bicycle box is provided to allow bicyclists arriving on red to enter the shared lane on the near side of the intersection.                                |          |
| Separated Bike Lane Transitions to Conventional Bike Lane<br>See Transition Example #4 for a conceptual image of this transition.   |       |  |          |
|   | N/A   | Design maintains the separated bike lane up to the intersection. Where possible, it continues beyond the intersection before merging into the existing conventional bike lane.           |          |
| Separated Bike Lane Transitions to On-Road Bikeway at Intersecting Streets  |       |  |          |
|   | N/A   | At signalized intersections, a two-stage bicycle turn box is provided for bicyclists to access an on-road bikeway on the intersecting street.  |          |

## APPENDIX

## DEFINITIONS &amp; RESOURCES

These definitions provide supplemental explanations of elements referenced in the checklist.

## GEOMETRIC DESIGN

## Definition &amp; Specifications

## Resources &amp; Additional Information

| Corner Island         |                       |  |   |
|-----------------------|-----------------------|--|---|
| A                     | Corner Island         | The corner island allows the bikeway to be physically separated up to the intersection crossing point where potential conflicts with turning motor vehicles can be controlled more easily. It serves an important purpose and must be present in order to be considered a protected intersection. Design, geometry, and materials may vary from project to project, constructed with a vertical curb or other materials, and may include a mountable truck apron.  | NACTO Don't Give Up at the Intersection                               |
| B                     | Corner Radius         | The default corner radius on most street types in Montgomery County is 15'. Exceptions include a default 25' corner radius when at least one street is industrial and a default 10' corner radius when all intersecting streets are Neighborhood Connectors, Neighborhood Streets, or Neighborhood Yield Streets. Designers should assume a maximum 10 mph turning speed for passenger cars and a 5 mph turning speed for all other vehicles.  | Complete Streets Design Guide, February 2021 (page 196)               |
| C                     | Mountable Truck Apron | Where a design or control vehicle requires a wider turning radius than the default corner radius requirement allows, a mountable truck apron is required. Mountable truck aprons are part of the traveled way and must be designed to discourage bicyclists and pedestrians from using them as a queuing area.   | Complete Streets Design Guide, February 2021 (pages 196, 203)         |
|                       |                       | The outer mountable truck radius should be set to 15' (or the recommended radius for the design vehicle). Radius closer to bikeway should be defined by the control vehicle. Mountable curb must be no taller than 3".   | Montgomery County Planning Department Bicycle Facility Design Toolkit |
| Bicycle Queuing Space |                       |  |   |
| D                     | Bicycle Queuing Space | The bicycle queuing space provides a waiting area for stopped bicyclists that is fully within the view of motorists waiting at the stop bar (if present). This enables bicyclists to enter the intersection prior to turning motorists at the beginning of the green signal if crossings are not separated. Minimum recommended depth of 6.5', but 10' or greater are desirable to accommodate trailers, cargo bicycles, and higher volumes of bicycles, measured from bicycle stop line to conflict zone. | NACTO Don't Give Up at the Intersection                               |
| E                     | Bikeway Type          | Is the bikeway a separated bike lane, sidepath, conventional bike lane, or buffered bike lane? Refer to Table 3 for guidance on bikeway selection.   | Complete Streets Design Guide, February 2021                          |
| F                     | Bikeway Width         | Bikeway widths vary based on bike lane operation (one-way vs. two-way) and anticipated bicyclist volumes. The opening at the entrance and exit of the crossing to the street should have the same operating width as the bike lane. The Complete Streets Design Guide provide additional context and guidance on bikeway width selection. Default and minimum widths for separated bikeways are provided in Table 2 with additional information in Table 3. Sidepath widths are typically 10' wide.        | Complete Streets Design Guide, February 2021 (pages 163, 165)         |



## GEOMETRIC DESIGN (Continued)

### Definition & Specifications

### Resources & Additional Information

| Bicycle Queuing Space (Cont.) |                                   |  |   |
|-------------------------------|-----------------------------------|--|---|
| G                             | Separated Bike Lane Curb Type     | Beveled curb is preferred where applicable, but mountable curb may be considered where applicable. Due to fire access requirements, the designer may reduce bikeway median curb height from 6" beveled or mountable to 3" height. On state roads, the applicable beveled curb standard is State Standard 620.02-01 Type C.   |   |
| H                             | Stop Line                         | Where bicyclist stops are required (signalized or stop-controlled intersection), a 12" thick stop line should be placed near the edge of the crossing roadway, located outside of the path of a turning vehicle and not in conflict with mountable truck apron (if present).   | MD MUTCD  |
| Clear Distance                |                                   |  |   |
| J                             | Clear Distance                    | Table 1 identifies the minimum approach clear space, measured from the point of curvature (PC) of the motorist's effective turning radius (i.e., fastest path) to the location of a nearest permitted sight obstruction (e.g., parked cars). This PC location may or may not be the curb line PC. Providing the appropriate approach clear space provides the necessary sight lines between motorists and bicyclists to stop (or yield) as appropriate. If the effective corner radius is less than 15' and on-street parking is provided, then the minimum restriction for parking is based on County Code, Sec 31-17: "Parking within thirty-five feet of intersections."  | Ohio Multimodal Design Guide, Table 3-6 Intersection Approach Clear Space by Vehicular Turning Design Speed |
| K                             | No Parking / Restricted Use Signs | Where on-street parking is present along the bikeway, parking restrictions should meet the clear distance requirements in Table 1, and any applicable Montgomery County Parking Restrictions or Standards.   |   |
| Motorist Yield Zone           |                                   |  |   |
| L                             | Motorist Yield Zone               | Bicycle and pedestrian crossings set back from the intersection create space for turning motorists to yield to bicyclists and pedestrians. Research indicates safety benefits at locations where bicycle crossings are offset from the motorist travel way at a preferable distance of between 6' and 16.5'. This offset improves motorist view of approaching bicyclists by reducing the need for motorists to scan behind them, creates space for a motorist to yield to bicyclists and pedestrians without blocking traffic approaching from the rear (for right turns) or the side (for left turns across two-way streets), and provides more time for all users to react to each other and negotiate the crossing. In constrained conditions, it may only be possible to maintain a minimum buffer width or vertical element to separate the travel lane and bicycle lane. If not possible to provide the recommended yielding distance, consider providing speed control (e.g., raised crossings, hardened center lines, etc.); improving the legibility of the crossings to achieve the desired motorist yielding behavior; or phase separating the bicycle and motor vehicle movements with signalization. |   |
| Pedestrian Refuge             |                                   |  |   |
| M                             | Pedestrian Refuge                 | The pedestrian refuge median is a space within the street buffer where pedestrians can wait between the bikeway and general purpose travel lanes. It should be a minimum width of 6'. In constrained conditions where there is insufficient width to provide a 6' pedestrian refuge, it is possible to provide a narrower median; however, it would not be considered to be a pedestrian refuge median. It is preferred to have the median pedestrian refuge and DWS match the width of the crosswalk.   |   |

## GEOMETRIC DESIGN (Continued)

### Definition & Specifications

### Resources & Additional Information

| Pedestrian Refuge (Cont.) |                             |  |  |
|---------------------------|-----------------------------|--|--|
| N                         | Detectable Warning Surfaces | Detectable warning surfaces (DWS) alert pedestrians to the interface between a pedestrian space and a vehicular space. Where medians are greater than 6' deep, DWS should be provided on the median to serve as a pedestrian refuge space. If curb-to-curb width is exactly 6' wide, then the DWS must be placed to align with the face of curb, ensuring that a 2' gap is provided between the two sets of DWS. DWS should not be used if the median width is less than 6'. |  |
| Other Elements            |                             |  |  |
| O                         | Fire Hydrant                | Where a fire hydrant is located on the corner, it must be relocated outside of the corner.   |  |

## SIGNING & MARKING

### Definition & Specifications

### Resources & Additional Information

| Crossing Markings |   |   |   |
|-------------------|---|---|---|
| P                 | Pedestrian Crossing of Travel Lanes Markings        | A high-visibility, continental crosswalk is the primary type of crosswalk marking used in Montgomery County. The "continental pattern" consists of a series of wide stripes parallel to the curb for the length of the crossing. The continental marking significantly increases the visibility of a crosswalk to oncoming traffic. Crosswalks should be at least as wide as the sidewalk or sidepath but no less than 10' in width.          | MD MUTCD Section 3B.18; Complete Streets Design Guide, February 2021 (page 218) |
| Q                 | Pedestrian Crossing of Separated Bike Lane Markings | Where pedestrians are expected to cross bikeways, pedestrian crossings should be provided to indicate a preferred crossing location and to communicate a clear message to bicyclists that pedestrians have the right of way. Pedestrian crosswalk markings across bikeways should be half the standard width.   |   |
| R                 | Bikeway Crossing Markings and Signing               | For separated bike lanes, bicyclists cross the motorist travel lane between the motorist yield zone and pedestrian crossing. County- and state-owned roadways use different bikeway crossing marking standards. On county owned roadways, use a 2' marking - 4' gap - 2' marking spacing; for state-owned roadways, use a 3' marking - 3' gap - 3' marking spacing. Bikeway crossing should only be used when a receiving bikeway is present. |   |
| S                 | Green-Colored Pavement                              | Use of green-colored pavement is optional, but it is recommended for separated bike lane intersections to improve visibility of bicyclists and alert all roadway users to the dedicated space. Where high volumes of bicyclists are expected to be present, green-colored pavement should be used.  |   |

# SIGNALIZATION

## Definition & Specifications

## Resources & Additional Information

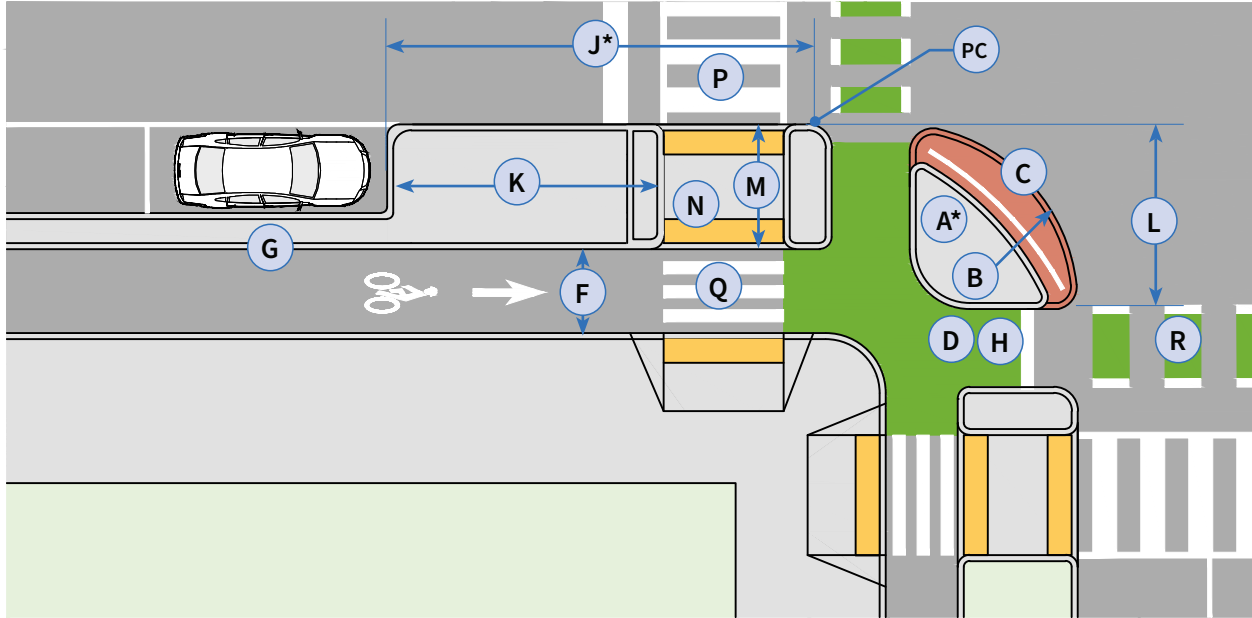
| Bikeway Signalization Strategy       |  |   |
|--------------------------------------|--|---|
| Bicycle-Only Signal                  | If bicycle signal lenses are planned, then no conflicting motor vehicle movements are permitted. As such, solid green or flashing turn arrow for motorists cannot be concurrent with bicyclist green. Use of bicycle signals must comply with FHWA Interim Approval IA-6.  |   |
| Bikes Follow Pedestrian Signal       | Standard: At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.   | MD MUTCD Section 9D Signals   |
|                                      | A BIKES USE PED SIGNAL sign (MD MUTCD R9-5) may be mounted adjacent to the pedestrian signal head to inform bicyclists they are not to follow the adjacent motor vehicle signs and crossing the street is controlled by the pedestrian signals.  | MD MUTCD Section 9B.11  |
|                                      | Where a pedestrian crosswalk is proposed parallel to the bikeway, a leading pedestrian interval (LPI) should be considered. LPIs give pedestrians the opportunity to enter the crosswalk at an intersection 3-7 seconds before vehicles are given a green indication. Pedestrians can better establish their presence in the crosswalk before vehicles have priority to turn right or left. In certain circumstances, installation of LPIs may require additional traffic signal timing evaluations. | Ohio Multimodal Design Guide: Section 8.3.4.1 Leading Pedestrian Intervals (LPIs)<br><br>FHWA Safety Countermeasures: <a href="https://safety.fhwa.dot.gov/provencountermeasures/lead_ped_int.cfm#:~:text=A%20leading%20pedestrian%20interval%20(LPI,to%20turn%20right%20or%20left">safety.fhwa.dot.gov/provencountermeasures/lead_ped_int.cfm#:~:text=A%20leading%20pedestrian%20interval%20(LPI,to%20turn%20right%20or%20left</a> |
| Bikes Follow Standard Traffic Signal | Standard: At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.   | MD MUTCD Section 9D Signals   |

# PROTECTED INTERSECTION EXAMPLES

Use these example graphics to identify elements in the checklist.

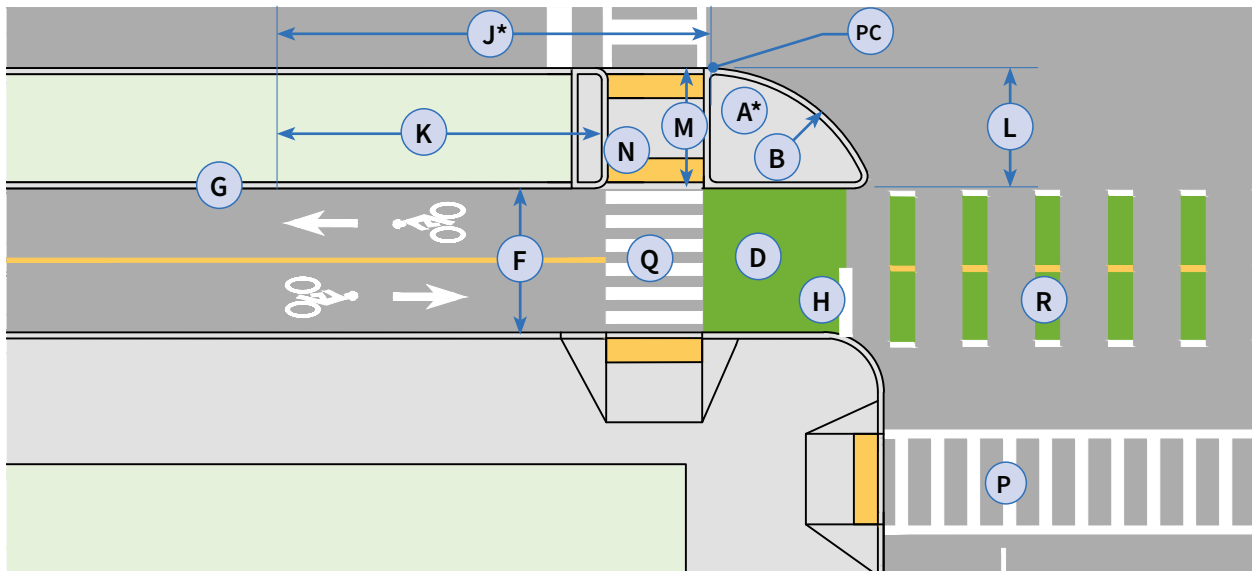
## EXAMPLE 1:

One-Way Separated Bike Lane Intersection with Mountable Truck Apron



## EXAMPLE 2:

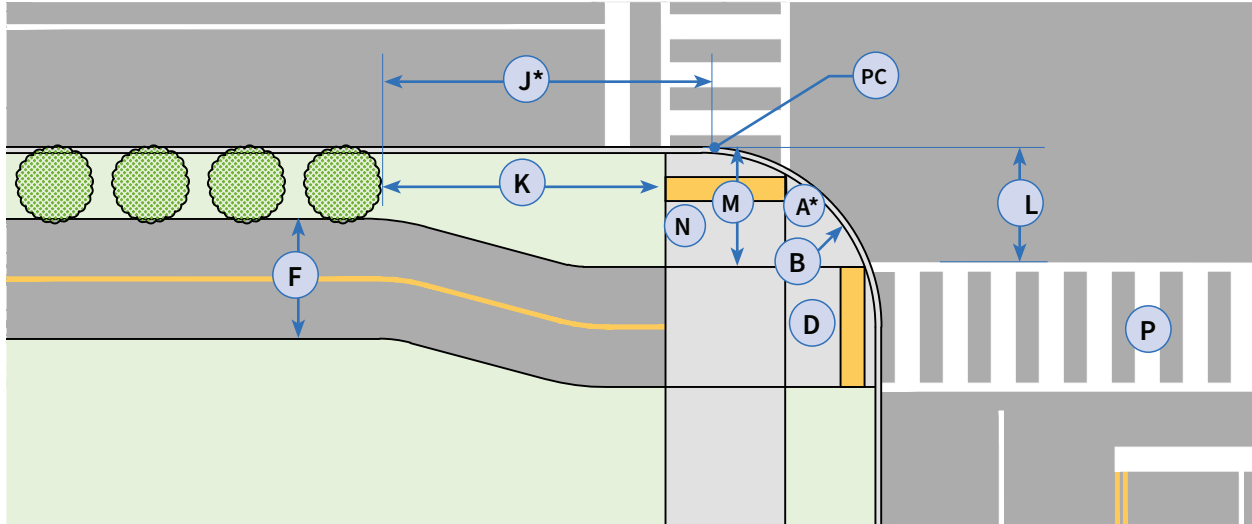
Two-Way Separated Bike Lane Intersection with No Intersecting Bikeway





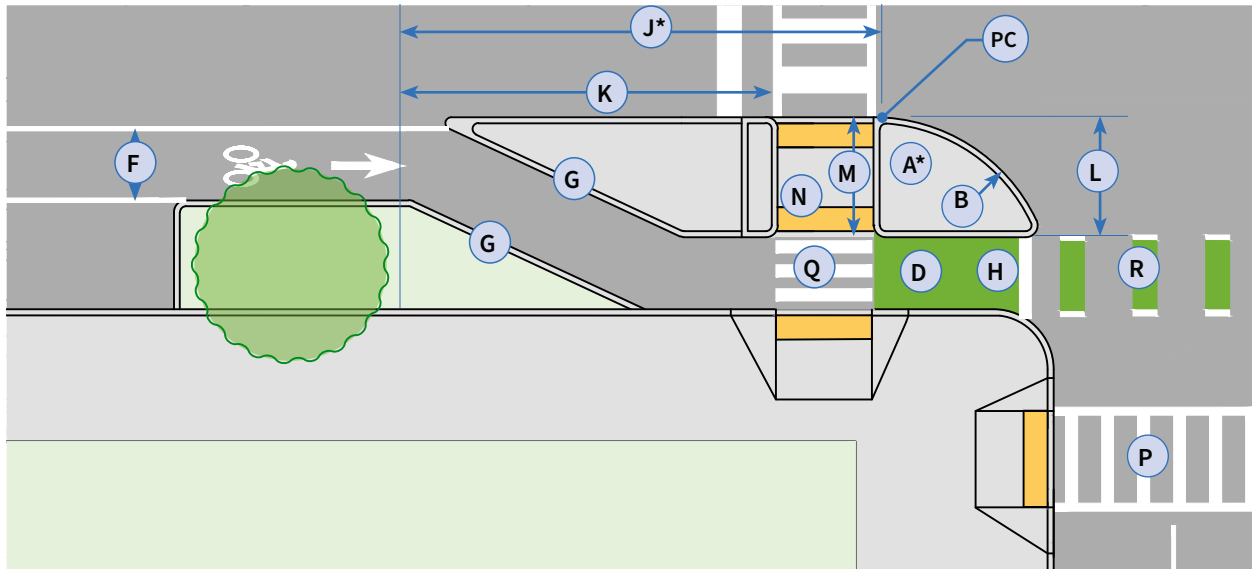
## EXAMPLE 3:

Sidepath Intersection with No Intersecting Bikeway



## EXAMPLE 4:

Conventional Bike Lane Intersection with No Intersecting Bikeway

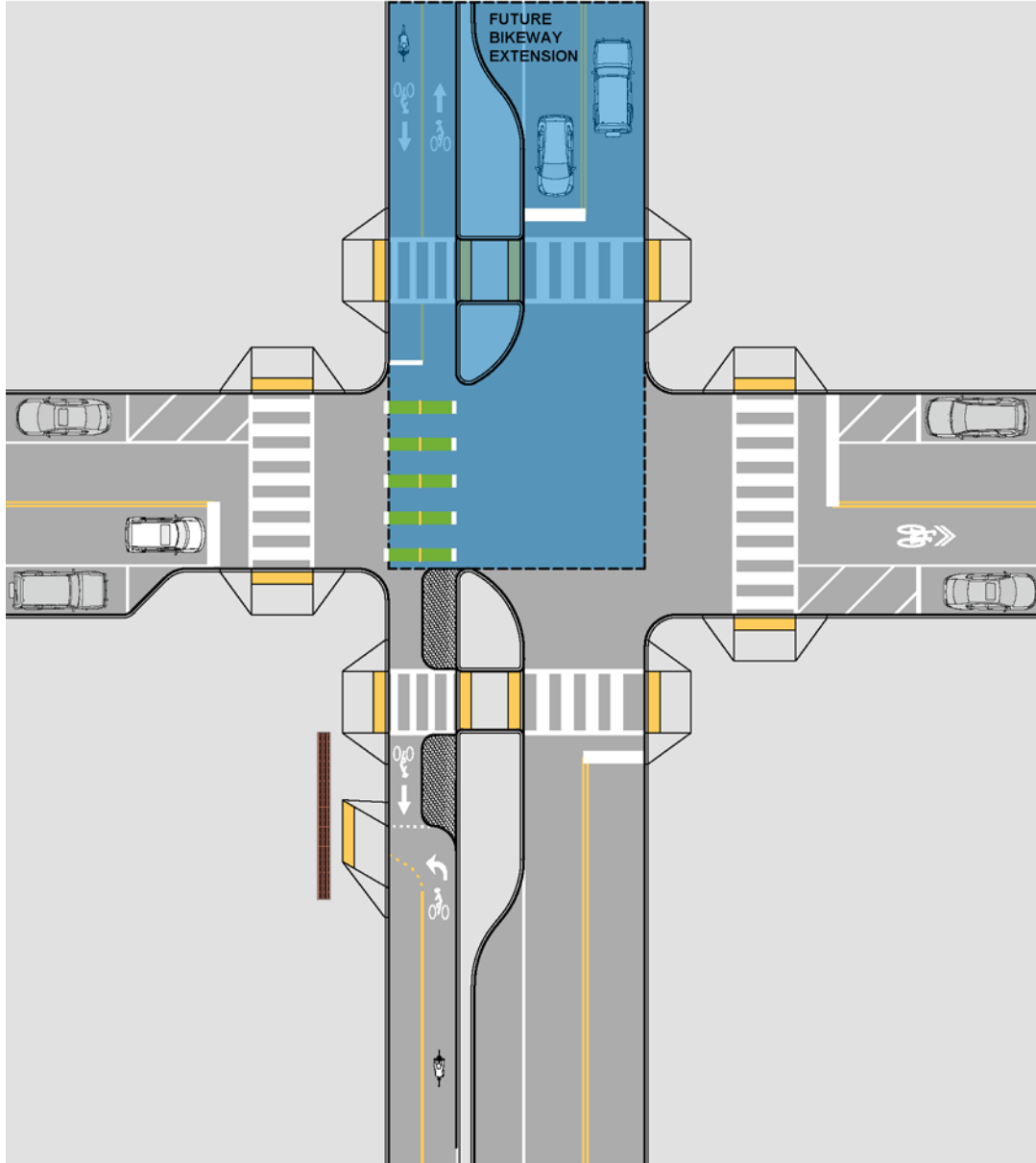


# TRANSITION EXAMPLES

Use these example graphics to identify elements in the checklist.

## EXAMPLE 1:

### Two-Way Separated Bike Lanes Transition to Sidewalk (Near side)



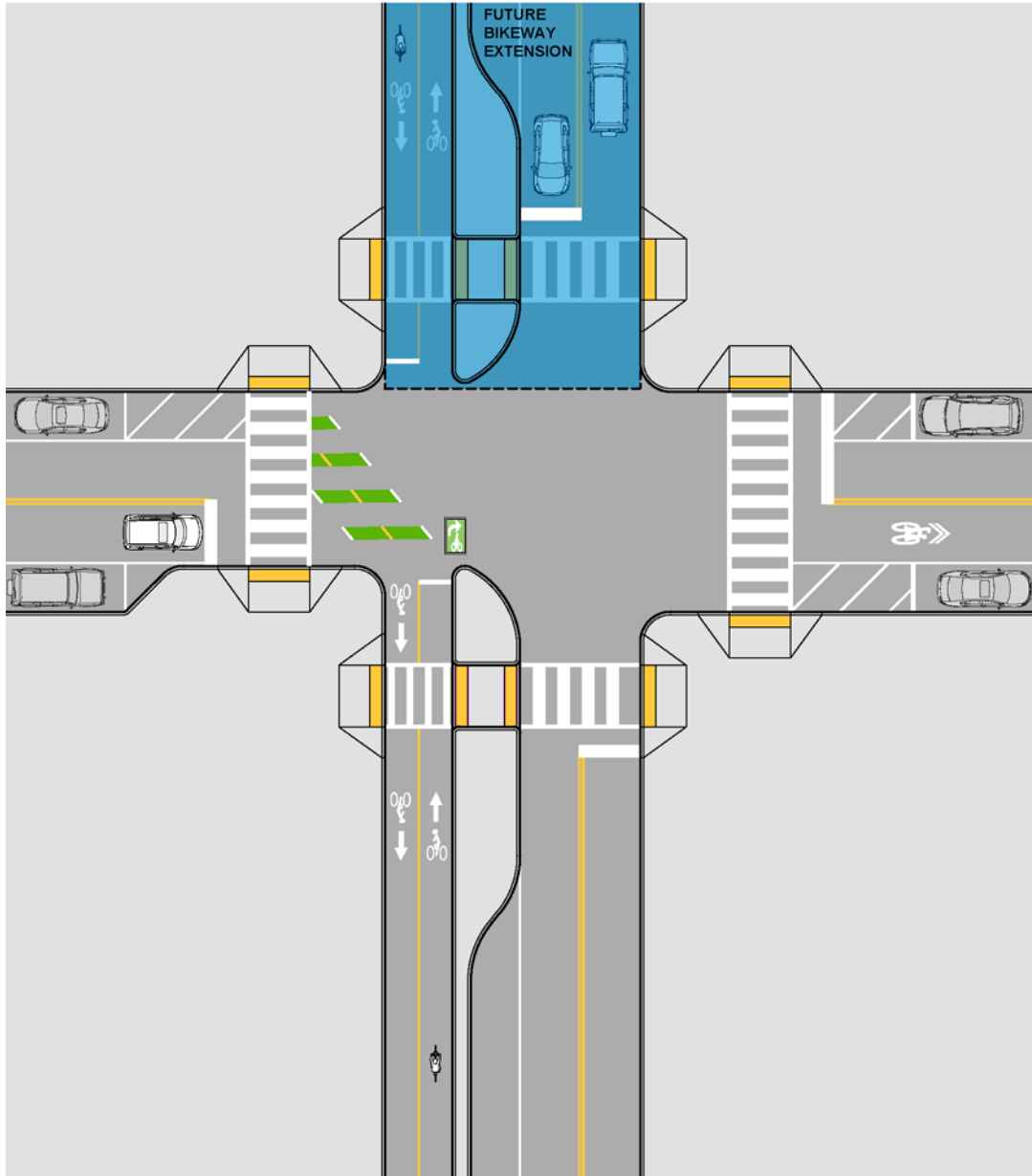
Median area for future removal. Medians may be cast-in-place, precast curb, or flexposts and markings at the discretion of the County based on expected timeline for the future bikeway extension. Placement of detectable warning surfaces and crosswalk may also vary based on the anticipated timeline for bikeway extension. In some cases the southbound separated bike lane nearest the intersection may also be blocked by the median and all bicyclists would use the bike ramp.



Tactile Detectable Indicator (Guidance Strip)

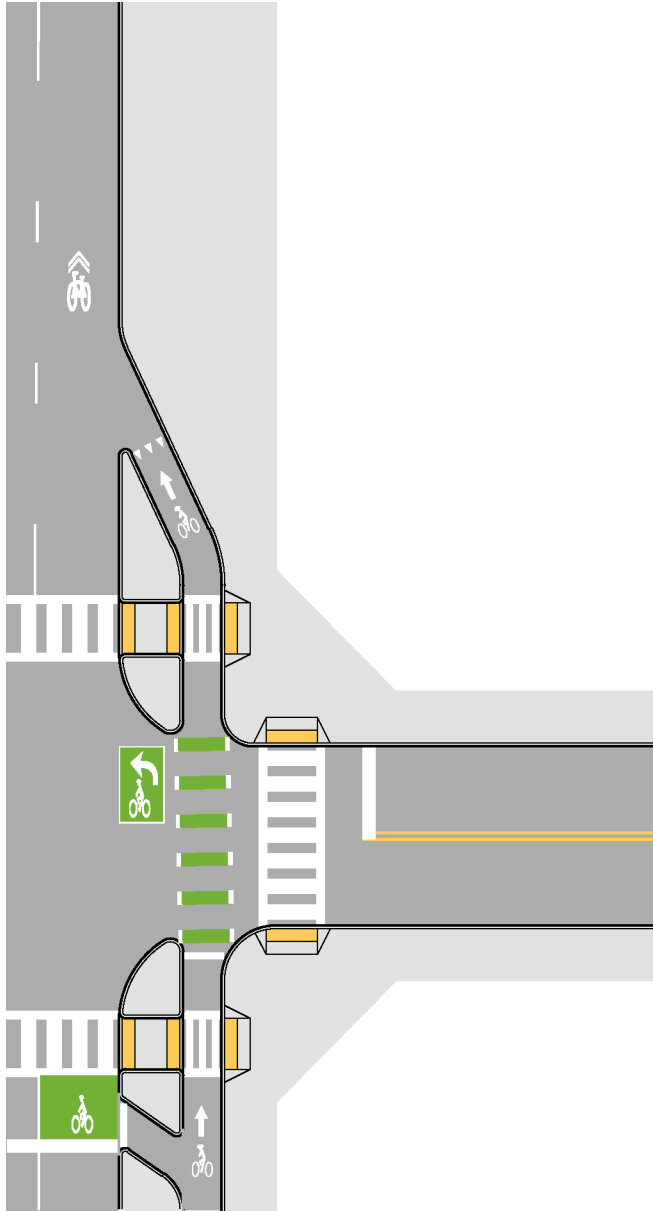
## EXAMPLE 2:

Two-Way Separated Bike Lanes Transition to Sidewalk (Far Side)

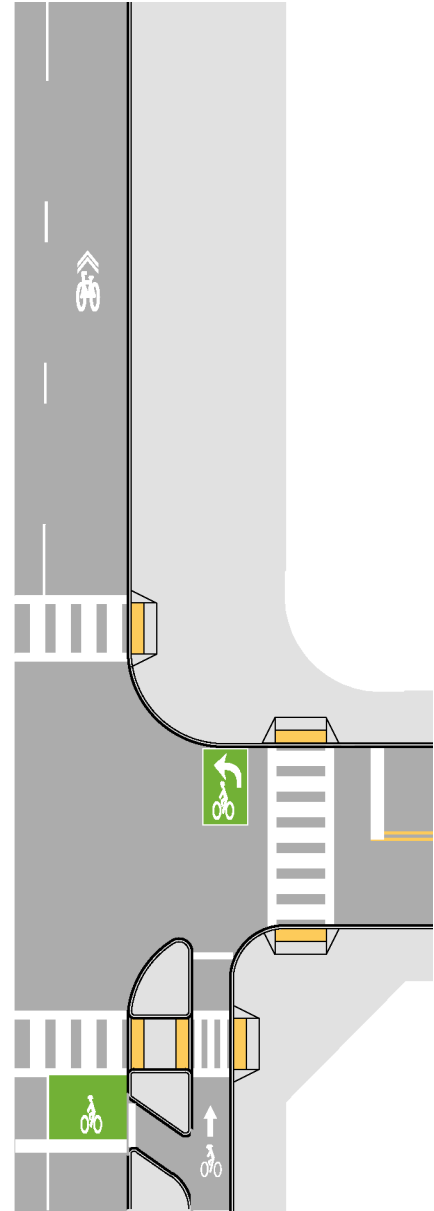


## EXAMPLE 3:

One-Way Separated Bike Lane Transition to Shared Lane



Preferred Option

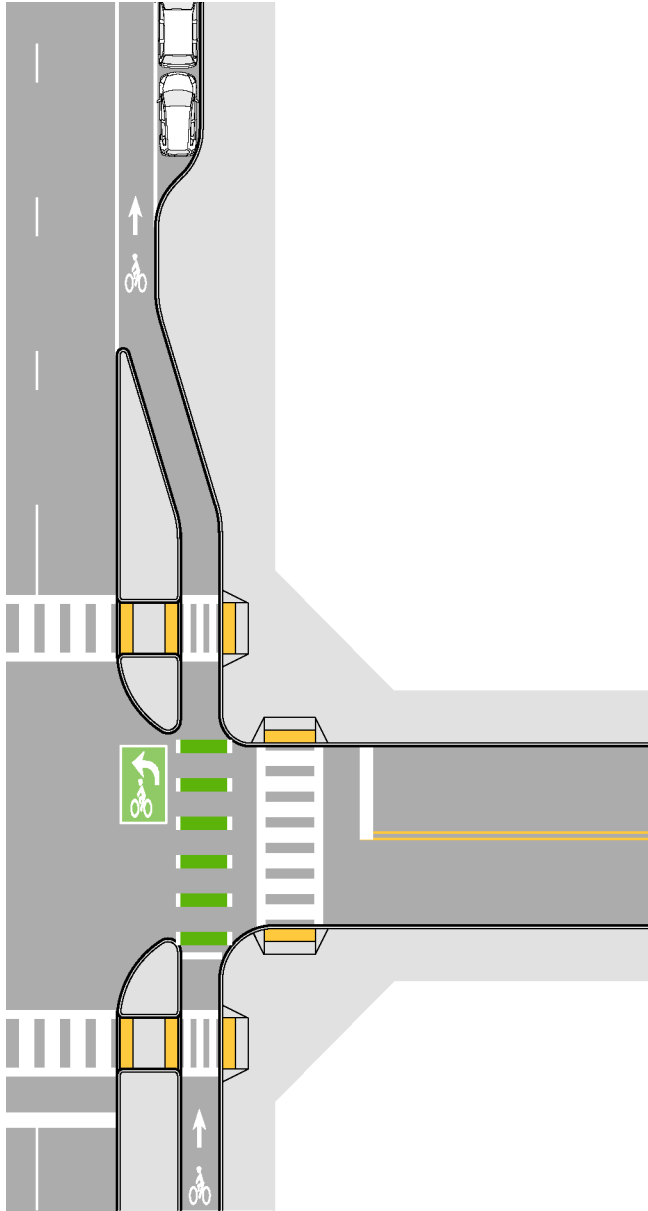


Constrained Option

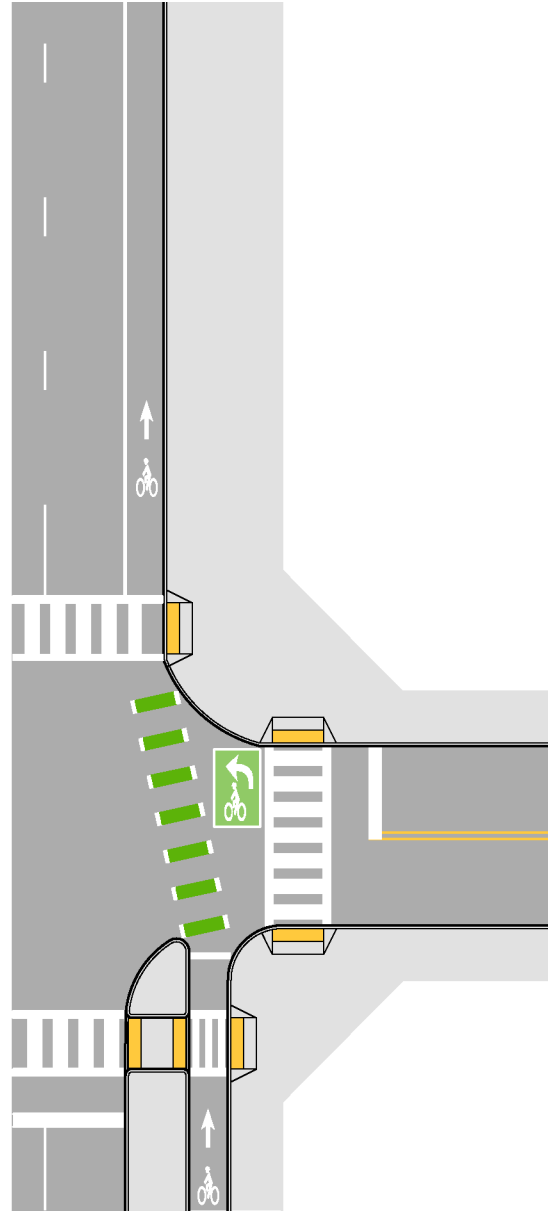


## EXAMPLE 4:

### One-Way Separated Bike Lanes Transition to Conventional Bike Lane



Preferred Option



Constrained Option

## TABLES & FIGURES

These tables & figures are referenced in the checklist.

**TABLE 1: INTERSECTION APPROACH CLEAR DISTANCE  
BASED ON EFFECTIVE VEHICLE TURNING RADIUS**

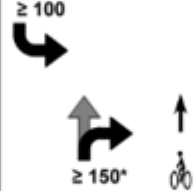
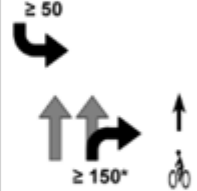
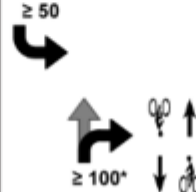
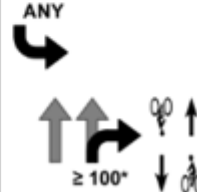
| Effective Vehicle Turning Radius | Vehicular Turning Speed | Approach Clear Space |
|----------------------------------|-------------------------|----------------------|
| <18 feet                         | <10mph*                 | 20 feet              |
| 18 feet                          | 10 mph                  | 40 feet              |
| 25 feet                          | 15 mph                  | 50 feet              |
| 30 feet                          | 20 mph                  | 60 feet              |
| >30 feet                         | 25 mph                  | 70 feet              |

**TABLE 2: SEPARATED BIKE LANE WIDTHS**

| Same Direction Bicyclists per Peak Hour | Bike Lane Width (feet) |         | Bidirectional Bicyclists per Peak Hour | Bike Lane Width (feet) |         |
|---|------------------------|---------|--|------------------------|---------|
|   | Default                | Minimum |  | Default                | Minimum |
| <150                                    | 6.5                    | 5.0     | <150                                   | 10.0                   | 8.0     |
| 150-750                                 | 8.0                    | 6.5     | 150-400                                | 11.0                   | 10.0    |
| >750                                    | 10.0                   | 8.0     | >400                                   | 14.0                   | 11.0    |

Source: Complete Streets Design Guide, February 2021

**FIGURE 1: RECOMMENDED HOURLY TURNING TRAFFIC THRESHOLDS FOR TIME-SEPARATED BICYCLE MOVEMENTS**

| Hourly Volume Thresholds for Separate Turn Phases |  |  |
|---|--|--|
|   | Left Turn Crossing One Oncoming Lane   | Left Turn Crossing Two Oncoming Lanes  |
| One-Way Separated Bike Lane                       | <p>≥ 100</p>  <p>≥ 150*</p> | <p>≥ 50</p>  <p>≥ 150*</p> |
| Two-Way Separated Bike Lane or Sidepath           | <p>≥ 50</p>  <p>≥ 100*</p>  | <p>ANY</p>  <p>≥ 100*</p>  |

\* The threshold also applies to left turns on one-way streets.

\*\* For each cell, the need for separate turn phases is triggered if at least one of the volume thresholds is exceeded.

\*\*\* If any portion of the bicycle movement operates at the same time as a permissive turn movement across the bikeway and a bicycle signal face is used, a Request to Experiment is required from FHWA.

**TABLE 3: BIKEWAY TYPES/WIDTHS BY STREET TYPE**

| Street Type               | Street Buffer (1)                                     | Ped / Bike Buffers | Default Bikeway Types and Widths (2)   |
|---------------------------|---|--------------------|--|
| Downtown Boulevard        | 8' default; 6' min                                    | 6' default; 2' min | Two-Way SBL on both sides of street (each SBL: 11' default; 8' min)  |
| Downtown Street           | 6; 11' if this space is shared with on-street parking | 6' default; 2' min | One-Way SBL; 6.5' default; 5' min  |
| Boulevard                 | 8' default; 6' min                                    | 6' default; 2' min | Sidepaths on both sides of the street (each sidepath: 11' default; 8' min)   |
| Town Center Boulevard     | 8' default; 6' min                                    | 6' default; 2' min | Two-Way SBL on both sides of street (each SBL: 11' default; 8' min)  |
| Town Center Street        | 6'  | 6' default; 2' min | One-Way SBL: 6.5' default; 5' min  |
| Neighborhood Connector    | 6'  | 6' default; 2' min | Sidepath on one side of the street: 10' default; 8' min, or Bike Lanes: 6' default, 5' min                             |
| Neighborhood Street       | 6'  | 6' default; 2' min | Neighborhood greenway, shared lanes, or advisory bike lanes (for design guidance, see Bicycle Facility Design Toolkit) |
| Neighborhood Yield Street | 6'  | N/A                | N/A (3)  |
| Industrial Street         | 6'  | 6' default; 2' min | One-way SBL: 6.5' default; 5' min or Sidepath on one side of the street: 10' default; 8' min                           |
| Country Connector         | 10' (if sidewalk or sidepath is provided)             | 6' default; 2' min | Bikeable Shoulders: 10' default; 5' min, or Sidepath on one side of the street: 10' default; 8' min                    |
| Country Road              | 8' default; 6' min                                    | N/A                | Bikeable Shoulders: 8' default; 5' min, or Sidepath on one side of the street: 10' default; 8' min                     |
| Major Highway             | As wide as feasible (10' minimum)                     | 6' default; 2' min | Sidepaths on both sides of the street (each sidepath: 11' default, 8' min)   |

(1) Where on-street parking is present, a minimum 3' door swing zone is required between the face of curb and any adjacent pedestrian or bicycle facility. Ped / Bike Buffers only required if a separated bike lane is provided. For open section roads, see the Complete Streets Design Guide.

(2) This is for non-master planned streets only. SBL = Separated Bike Lane. Street buffer widths are not included in these dimensions. If the bikeway is at street level and adjacent to the curb, the dimensions include the gutter pan. For corridors that are designated as Breezeways in the Bicycle Master Plan, see addition guidance in that document.

(3) Bikeways are not generally considered along this street type, unless otherwise specified in the Bicycle Master Plan.