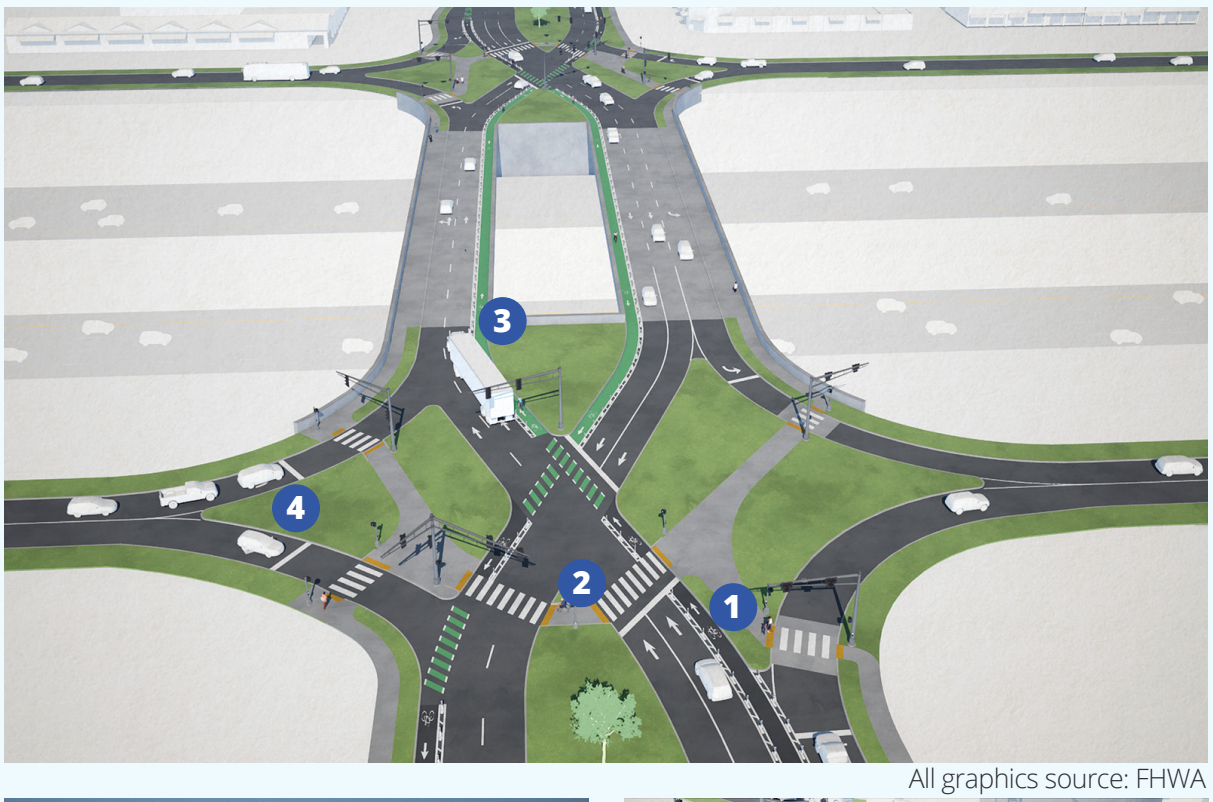
Diverging Diamond Interchange (DDI)

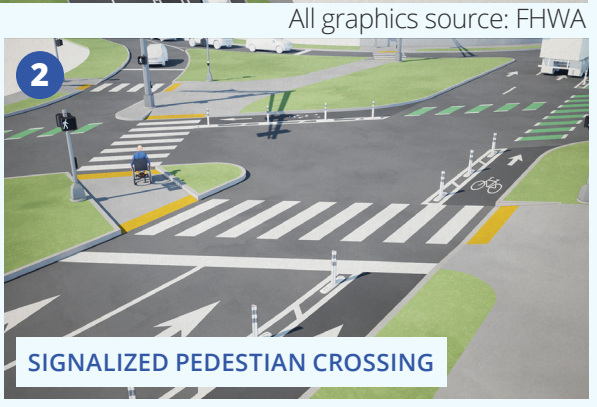
Diverging Diamond Interchanges (DDIs) are characterized by crossover intersections at the ramp termini where cross-street traffic crosses over to the left-hand side of the roadway between the ramps to allow unopposed left turns to and from the ramps. DDIs are used in situations with grade-separated interchanges.

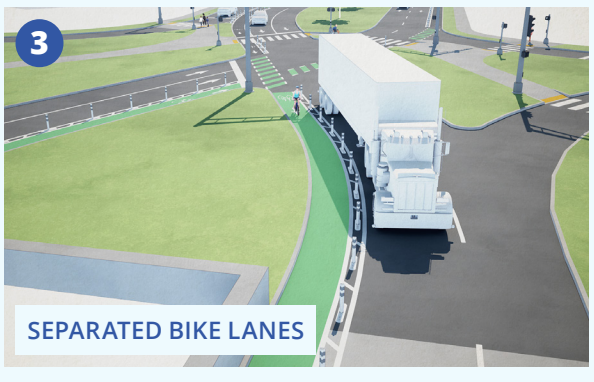


All graphics source: FHWA

Design Features

- Movements to and from the ramps should be controlled to improve crossings for pedestrians and bicyclists.
- Between the crossover intersections, pedestrian pathways and separated bikeways are integrated as either inside facilities (i.e., within the median) or outside facilities (i.e., beyond the outside edges of pavement).
- The DDI ramp terminal intersections typically operate as two-phase traffic signals.
- Install overhead lighting to illuminate bikeway and pathway networks and in advance of all intersection crossings.





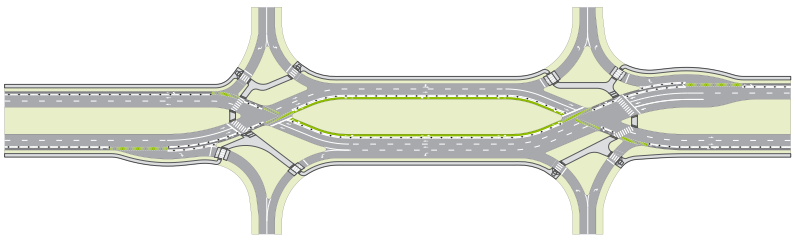
Benefits

- Two-phase signalization reduces traffic signal cycle length leading to reduced wait time and delay for pedestrians and bicyclists.
- The combination of lane arrangements and islands at DDIs facilitates crossing fewer conflicting movements and directions of traffic at a time.

Intersection Types

SEPARATED BIKE LANE (OUTER)

This DDI design shows separated bike lanes that follow the motor vehicle path, crossing over to the opposite side of the road on one edge of the interchange and crossing back at the other.

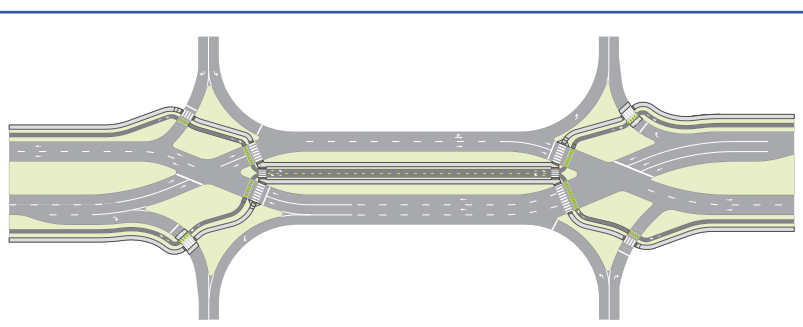


CONSIDERATIONS

- This arrangement may allow for bicyclists to take cues for wayfinding from motorists and can allow for signage to be consistent between motor vehicles and bicyclists.
- This also provides advantages for efficient use of available space.

SEPARATED BIKE LANE (INNER)

This design makes use of separated bike lanes and sidewalks that cross the roadway and travel down the center of the median.

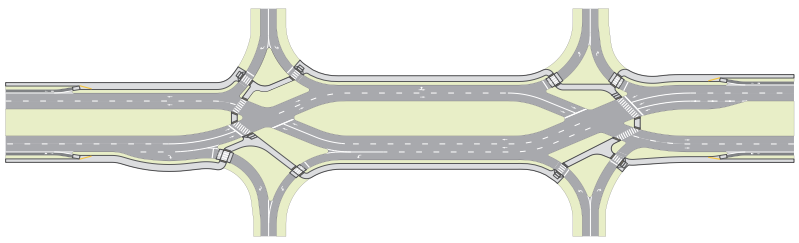


CONSIDERATIONS

- Housing the bicyclist and pedestrian facilities in the median of the interchange can minimize the needed right-of-way.
- Crossing to the middle of the road can make use of signal control to provide safe gaps for pedestrians and bicyclists.
- Barrier walls height should not produce an enclosed "tunnel effect" that reduces visibility at the crossings.

SIDEPATH

This design incorporates sidepaths that travel along the outer edge of the interchange footprint.



CONSIDERATIONS

- Pedestrians and bicyclists cross over several entrance and exit ramps to navigate through the intersection. If these ramps are not signal-controlled, they may lead to issues with driver yielding and pedestrians and bicyclists may have difficulty finding adequate gaps in traffic.
- It is important to design the width of shared paths, crosswalks, medians, and queuing areas to accommodate groups of people of all abilities.
- Shared facilities may be appropriate even where only low volumes of bicyclists and pedestrians are expected to use the intersection.

References

Cunningham, C., Chase, T., Deng, Y., Carnes, C., Pyo, K., Jenior, P., ..., Tanaka, A. (2021). Diverging Diamong Interchange Informational Guide: Second Edition [NCHRP Research Report 959]. Transportation Research Board, Washington DC. Retrieved from https://www.trb.org/Main/Blurbs/181562.aspx.

Mitman, M.F. & Ridgway, M.D. (2016). *Recommended Design Guidelines to Accommodate Pedestrians and Bicycles at Interchanges* [RP-039A]. Institute of Transportation Engineers, Washington, DC. Retrieved from https://ecommerce.ite.org/IMIS/ItemDetail?iProductCode=RP-039A.

U.S. Department of Transportation
Federal Highway Administration

ZERO IS OUR GOAL
A SAFE SYSTEM IS HOW WE GET THERE

For more information refer to *Improving Intersections for Pedestrians and Bicyclists Informational Guide* [FHWA-SA-22-017].