

5.2 URBAN INTERSECTIONS

Urban intersections are typified by higher volumes, the convergence of many paths of travel, and multi-modal conflicting movements. Demands for operational efficiency are often in conflict with right-of-way constraints and surrounding development. These intersections must address the needs of pedestrians and cyclists in a way that invites safe and comfortable crossings, while clarifying right-of-way and priority for vulnerable users. The desire to accommodate high quality streetscaping and to create attractive places to be must also be considered at the project outset.

There are several strategies for minimizing exposure of pedestrians and cyclists at urban intersections where turning vehicles may have conflicting paths of travels with vulnerable users. In particular, the higher travel speeds of cyclists compared to pedestrians requires specific interventions to enhance safety.

In the context of Regional roads, two categories of treatments are generally applicable, as shown in Exhibit 5-2.



Exhibit 5-2. Strategies for Minimizing Conflicts between Cyclists and Turning Motorists

STRATEGY	APPLICATION	PROS	CONS
Separation in Time	Signals: separate conflicting movements in time (protected phases and leading intervals)	<ul style="list-style-type: none"> Eliminates almost all turn conflicts (some potential for conflicts remain due to signal violations) 	<ul style="list-style-type: none"> May increase cycle length or decrease length of other phases Associated increase in delay to some or all movements and/or modes Associated increase in queue lengths that may interfere with adjacent intersections or driveways
Separation in Space	Bend in (towards the parallel roadway): positions cyclists/ pedestrians closer to the parallel roadway, with the distance between the crossing and the parallel roadway measuring between 0.5-2m	<ul style="list-style-type: none"> On low speed roadways, provides optimal views and sightlines for motorists to see cyclists/pedestrians at the crossing when speeds are low Motorists must give way to traffic and pedestrians/cyclists in the crossing at the same location so right-of-way may be more clear Requires less space than bend-out 	<ul style="list-style-type: none"> Motorists on parallel roadway yield to cyclists/pedestrians in crossing before completing turn, increasing the potential for collisions Motorists on the side street may block the crossing when making a right-turn on a red signal Longer but narrower sight triangle required with associated no stopping zone Provides less space for cyclists/pedestrians to queue at the intersection crossings within the right-of-way
	Bend-out (away from the parallel roadway): positions cyclists/ pedestrians farther from the parallel roadway, with the distance between the crossing and the parallel roadway measuring between 4-7m	<ul style="list-style-type: none"> On higher speed roadways, provides space for slower turning motorists to give way at the crossing outside of the higher speed through traffic on the parallel roadway Motorists on the parallel roadway turn out of through traffic then yield to cyclists / pedestrians in the crossing, reducing the potential for collisions on the parallel roadway Motorists on the side street will not block the crossing when making a right-turn on a red signal Provides more space for cyclists/ pedestrians to queue at the intersection crossings within the right-of-way 	<ul style="list-style-type: none"> Requires more space than bend-in Wider but shorter sight triangle required affecting the placement of bus stops, shelters and other objects that may interrupt sightlines Motorists give way to traffic at a different location than to pedestrians / cyclists in the crossing so right-of-way may be less clear

Source: Adapted from FHWA's Separated Bike Lane Planning & Design Guide, MassDOT Separated Bike Lane Planning & Design Guide & CROW Record 25: Design manual for bicycle traffic

Exhibit 5-3. Bend-in Design

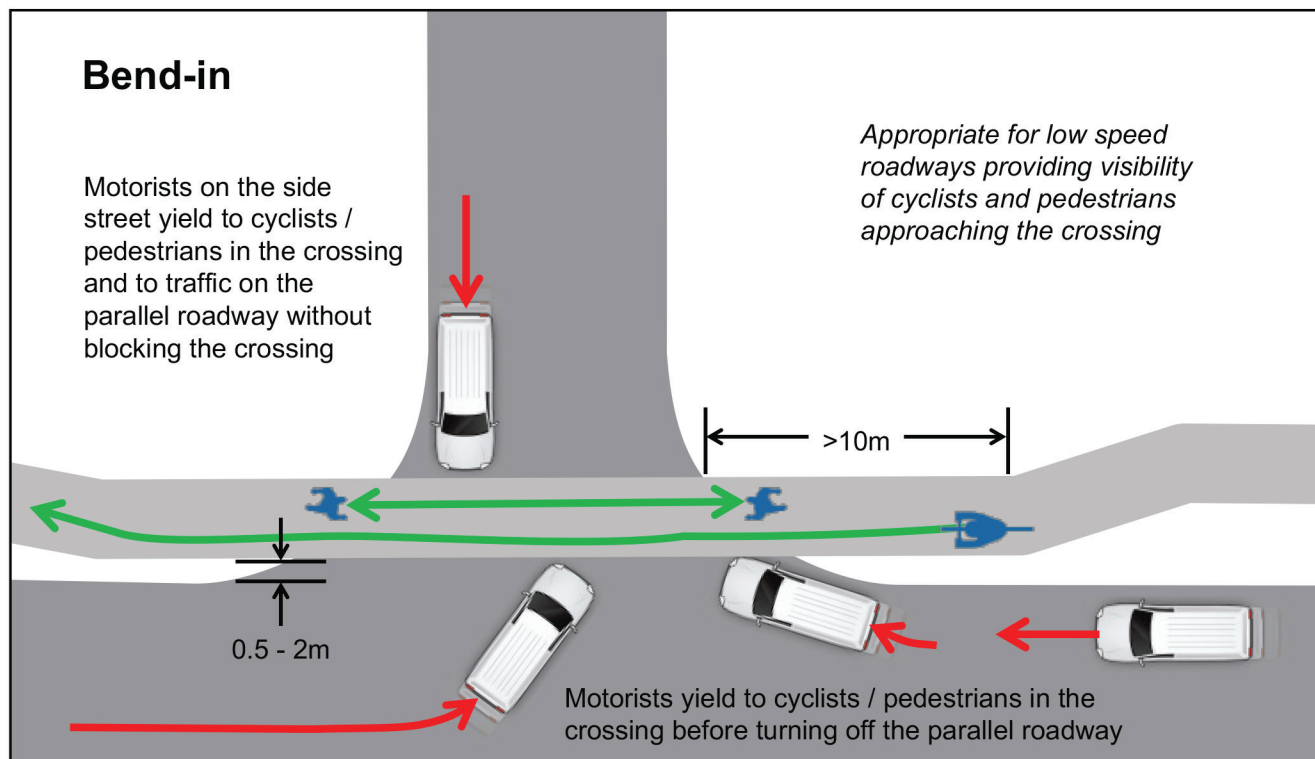
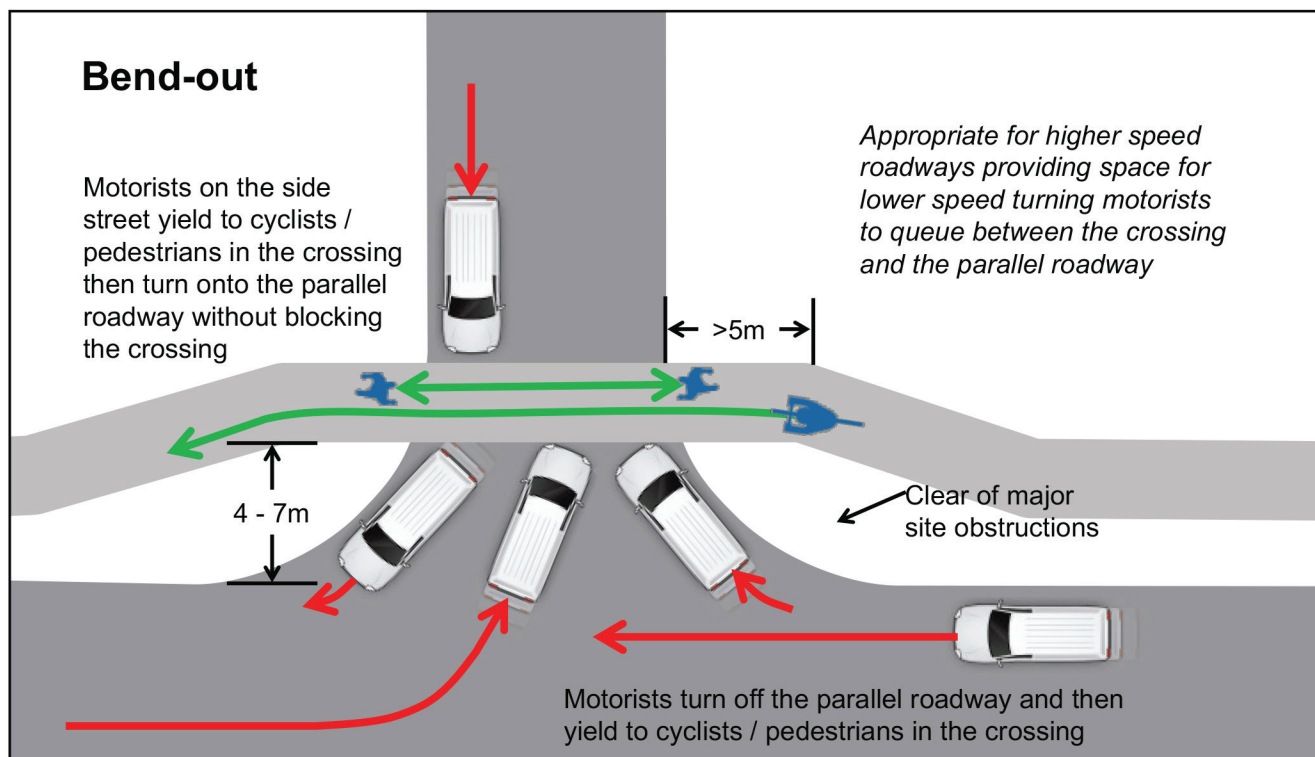


Exhibit 5-4. Bend-out Design



A third category of intervention – the application of mixing zones and lateral shifts - is generally not appropriate along Regional roads in urban settings due to the higher expected speeds and volumes of motorized vehicles.

Whenever possible within the constraints of signal timing, designers are encouraged to pursue signal phasing separation of pedestrian and cyclists from crossing motorists (refer to Chapter 8) in combination with bend-in or bend-out designs.

In instances where signal changes are not feasible (either due to operational challenges or at unsignalized intersections), facilities should be bent-in or bent-out at intersections as a minimum treatment. Generally, the decision to bend a facility in or out as presented in these intersection examples is based largely on the approaching facility type of the standardized cross-sections developed in Sections 4.9 & 4.10.

A summary of preferences for bend-in and bend-out designs is provided in Exhibit 5-5.

Exhibit 5-5. Preferred Bend-in & Bend-out Design Strategies for Intersections

	Raised Cycle track	In-Boulevard Cycle Track	Multi-use Path
City Centre Street	Bend-in	Bend-in or Bend-out	N/A
Avenue	Bend-out (preferred) or Bend-in	Bend-out	N/A
Connector	N/A	Bend-out	Bend-out
Main Street	Bend-in	N/A	N/A
Rural Hamlet Road	N/A	N/A	Bend-in
Rural Road	N/A	N/A	Bend-out

Note that where on-street parking is provided (as illustrated for some of the sample cross sections along City Centre Streets and Rural Hamlets in Section 4.10), parking must be setback sufficiently far from the intersection to ensure visibility of pedestrians and cyclists, approaching based on sight distance calculations, regardless of whether a bend-in or bend-out design is selected.

As urban intersections often represent the most challenging intersection in terms of competing right-of-way demands and land use contexts, trade-offs must often be made.

Some strategies which can be employed to make trade-offs at intersections include the following:

- Look for compromises on vehicular and median lane widths in order to provide additional space for pedestrian and cycling facilities. The difference between a lane width of 3.3 or 3.5 m is generally imperceptible to the average motor vehicle, while a sidewalk width of 1.5 compared to a width of 1.8 m can drastically improve accessibility and pedestrian comfort.
- Where sufficient boulevard space is not available for a bend-out design, consider a bend-in design. If there is insufficient space to bend the facility out, it is important to avoid an 'in-between' intersection offset (i.e. 2-4 m from edge of intersecting roadway to the crossing cycling facility) and instead provide a high quality bend-in design.
- Reduce the width of walking and cycling facilities to minimum widths approaching the intersection. This can be an acceptable treatment as pedestrians and cyclists are intended to slow down approaching controlled crossings. Where widths are reduced, they must still accommodate those waiting at an intersection and not compromise on accessibility.
- Where it is impossible to accommodate both high-quality walking and cycling facilities, **pedestrians** must take priority in intersection design. A transition to a shared space crossing can be employed in low volume areas, even where the approaching facilities are separated, although this is not a preferred design approach.

Photo Source: IBI Group

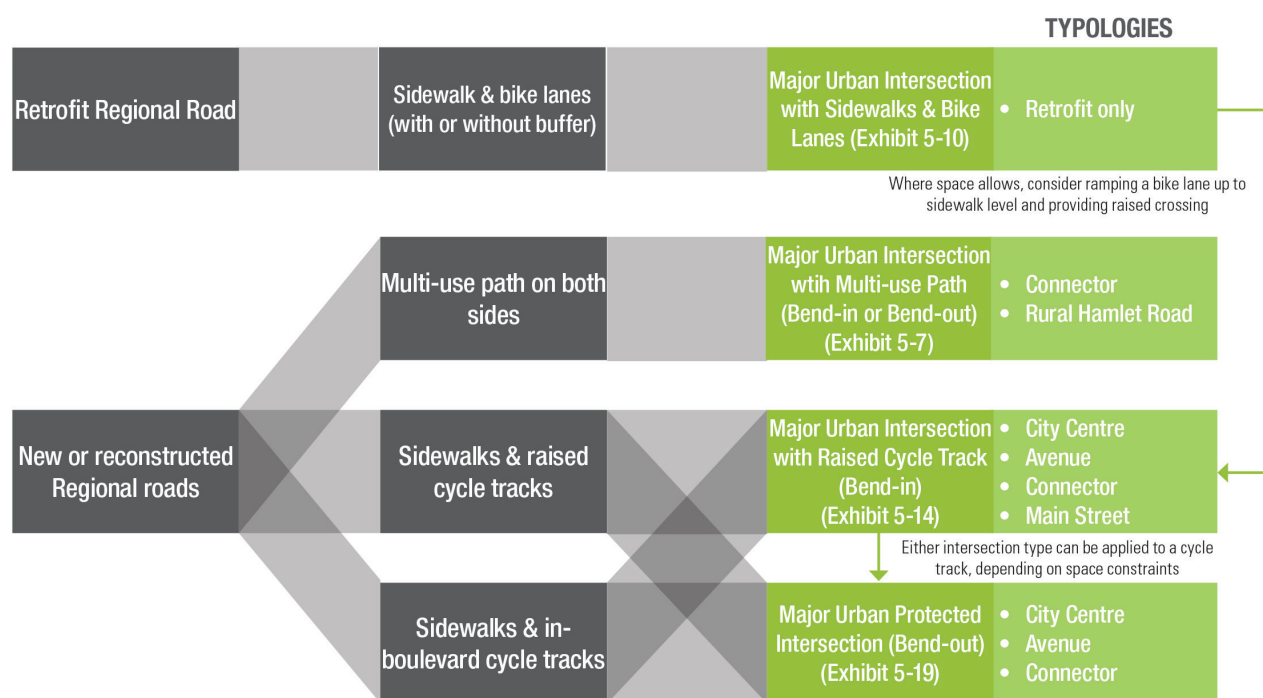


5.2.1 Signalized Intersections

As noted in Section 5.2, the general assumption behind the urban signalized intersection treatments presented in this chapter is that the approaching facility & associated road classification will, for the most part, govern the intersection treatment. The corresponding intersection treatments are summarized in Exhibit 5-6.

Rural intersection treatments are discussed in Chapter 5.3.

Exhibit 5-6. Intersection Treatment Selection Tool



As shown in Exhibit 5-6 above, there are a few instances where the facility can be upgraded at the intersection, if space allows.

In particular, consider opportunities to implement the following intersection upgrades:

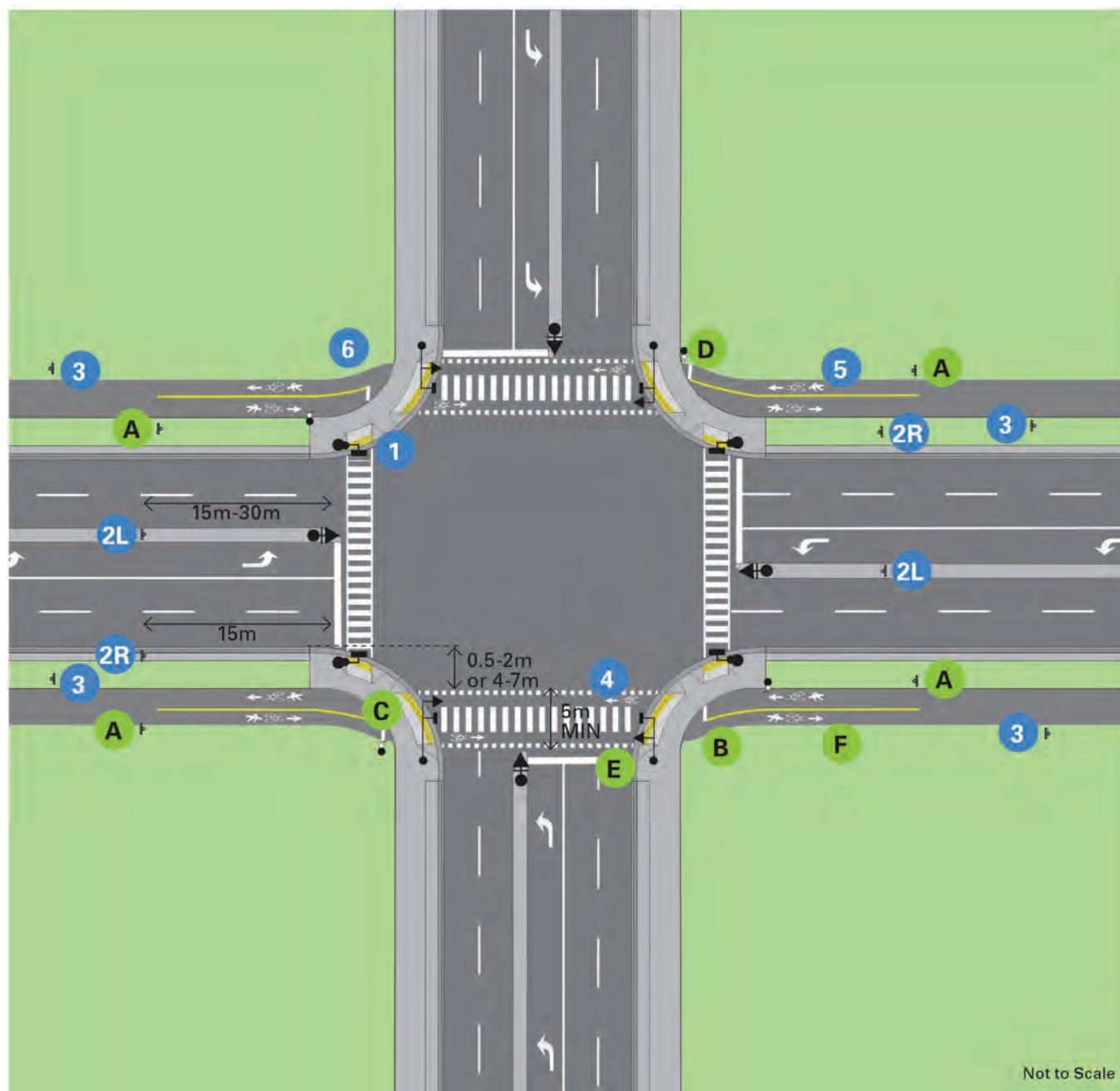
- Ramp a bike lane up into the boulevard to transition to a raised cycle track or in-boulevard cycle track through the intersection
- Bend a raised cycle track out in advance of an intersection in order to provide a protected intersection

Major Urban Intersection with Multi-use Path

Historically, the design of multi-use paths has largely neglected intersection treatments, impacting the overall quality and continuity of the facility. The intersection concept presented here integrates the concept of bend-in/bend-out and appropriate conflict zone markings to the design of multi-use paths.

Minimum	Preferred
<ol style="list-style-type: none"> 1 AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4) 2 ‘Bicycle Trail Crossing Side Street Sign’ signage and optional ‘Trail Crossing’ tab (WC-44 + WC-44T – TAC) alerting drivers to the potential presence of cyclists crossing the intersecting street. WC-44L should be placed in the median to alert left turners about a crossing to their left, and WC-44R should be placed on the right side of the roadway to alert right turning traffic 3 ‘Shared Pathway’ signage (RB-93 – TAC) should be applied 5-30 m downstream of the intersection. 4 Intersection crossing of the multi-use path should be designed as Combined Pedestrian and Cyclist Crossride (refer to Sections 7.0 for details of pavement markings). In some instances, cyclists may be likely to cross the road to use the multi-use path on the other side (for example, to reach a major destination). Where this is anticipated, a crossride may be added to the perpendicular legs of the intersection in addition to the parallel legs (refer to Section 5.2.3, Exhibit 5-29 for an illustration of an intersection with crossrides on all legs) 5 A yellow dividing line should be applied to the multi-use path approaching the intersection to reduce conflicts. 6 Multi-use paths should be bent-in (0.5-2 m) or bent-out (4-7 m) from parallel edge of roadway, depending on roadway context & right-of-way availability – refer to Exhibit 5-8 and Exhibit 5-9. 	<ol style="list-style-type: none"> A ‘Cyclists Yield to Pedestrians’ signage (Rb-73-OTM) can be applied where there are challenges with interactions between users. B Optional stop bar for cyclists located at the top of the curb ramp. C Multi-use path should be made of a different construction material than the sidewalk to mark the beginning of a shared space and to emphasize pedestrian priority. D Separate pedestrian pole with pushbutton for cyclists approaching on the right side of the multi-use path preferred to reduce conflicts with pedestrians and improve ease of crossing E Separate bicycle signals are preferred to provide consistency along the corridor and to allow for leading phases for path users. Where phasing is identical to parallel vehicle heads, only one head is needed. Otherwise, two bicycle heads should be provided. F Pedestrian and bicycle markings following/ approaching intersection

Exhibit 5-7. Major Urban Intersection with Multi-use Path



As the multi-use path approaches the intersection, it is important that the facility be positioned appropriately for safe crossings. In cases where the approaching multi-use path is located between 2-4 m offset from the face of curb, it should be bent-in or bent-out as illustrated in Exhibit 5-8 and Exhibit 5-9 below.

Exhibit 5-8. Multi-use Path Bend-in Approaching Intersection

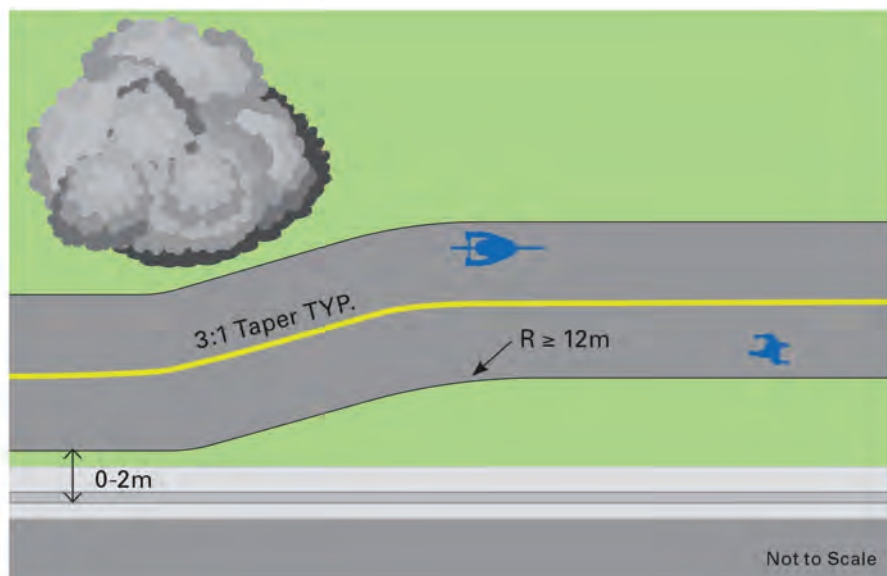


Exhibit 5-9. Multi-use Path Bend-out Approaching Intersection

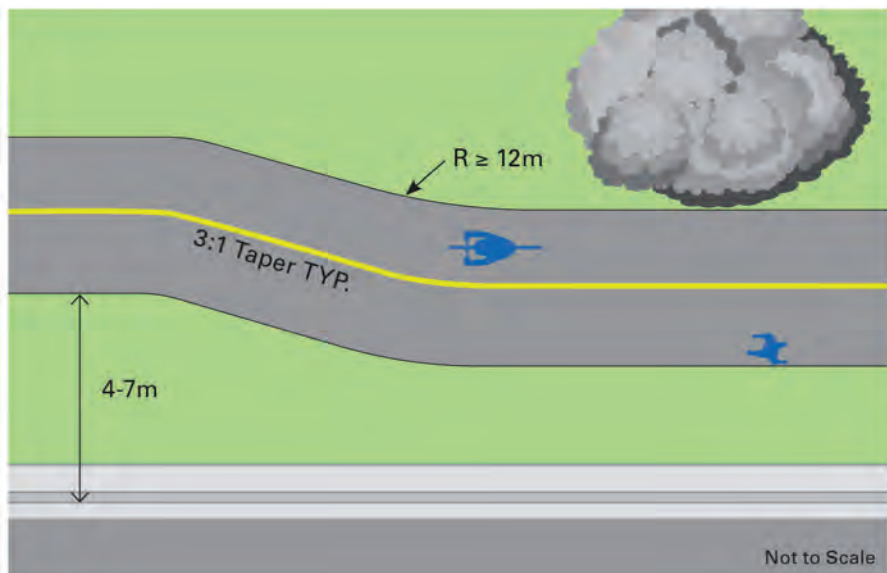




Photo Source: IBI Group

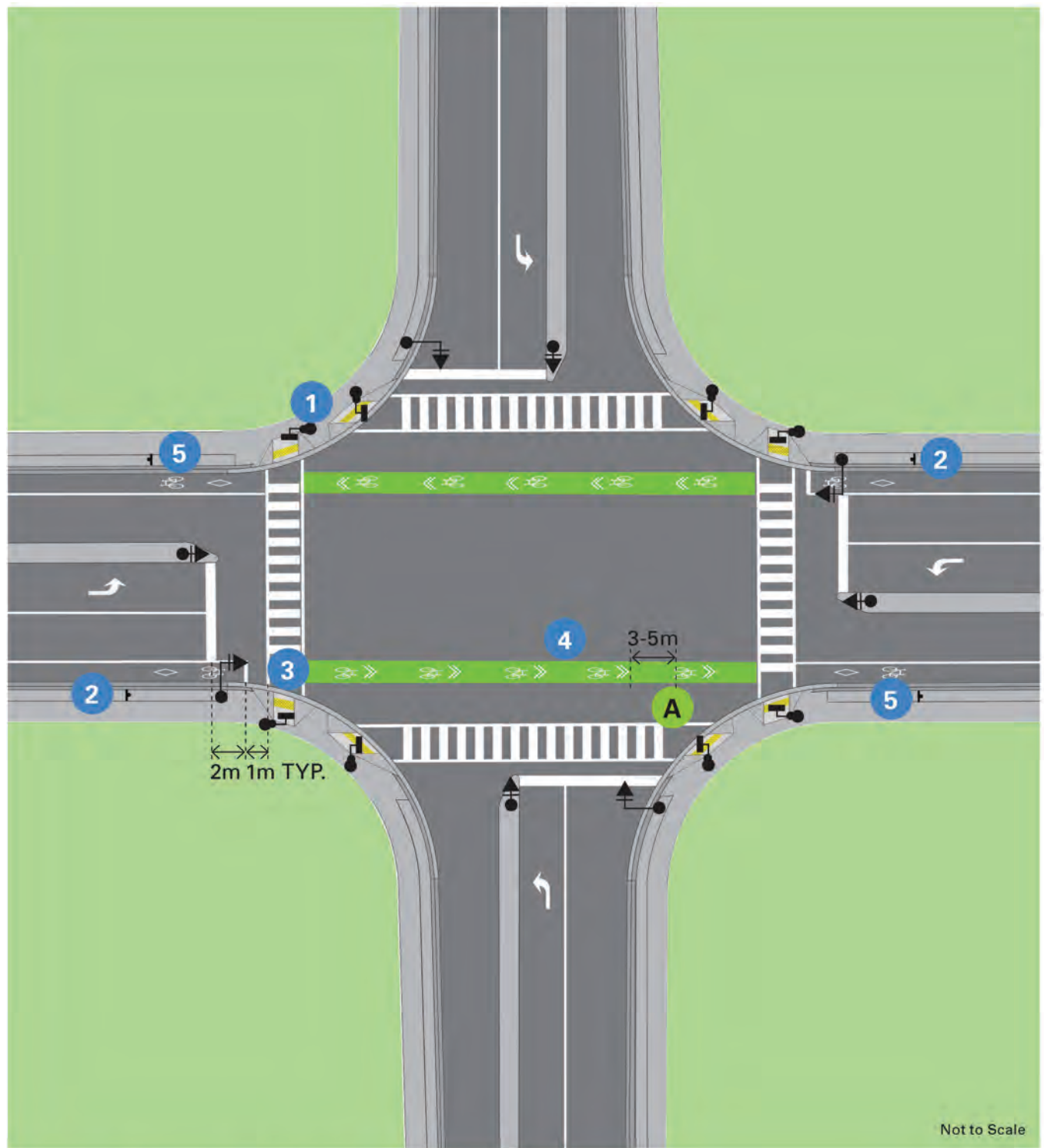
Urban Intersection with Sidewalks and Conventional Bike Lanes (Retrofit)

The application of conventional bike lanes will generally occur as a **retrofit of an existing roadway only along Regional roads**. For on-road cycling facilities, it is important to maximize the visibility of the cyclist to drivers and provide guidance on right of way at the intersection.

Where boulevard width and property allow, the bike lane should be ramped up into the boulevard to sidewalk level, and the bend in or bend out concepts applied (refer to Exhibit 5-14 or Exhibit 5-15).

Minimum	Preferred
<div>1</div> AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4)	<div>A</div> Sharrow markings to be applied with spacing of 3-5 m
<div>2</div> Customized ‘Turning Vehicles Yield To Bicycles’ (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists	
<div>3</div> Advance cyclist stop bar provided 2 m ahead of vehicular stop bar to improve visibility of cyclists	
<div>4</div> Green conflict zone marking through intersection	
<div>5</div> Bicycle lane marking and ‘Reserved Bicycle Lane’ signage (RB-91 - TAC) to re-confirm the designation of the cycling facility after the intersection	

Exhibit 5-10. Urban Intersection with Sidewalks & Conventional Bike Lane (retrofit)



Where a right turn lane is provided at an intersection, **a preferred approach to accommodating the turn lane is to ramp the cycling facility up into the boulevard (refer to Exhibit 5-11) and to transition to a raised or in-boulevard cycle track through the intersection. This can be coupled with separation in time (through signal phasing) or space (bend-out design). For additional details on the ramping, refer to Section 5.8.**

Exhibit 5-11. Bike Lane Ramping up into Boulevard

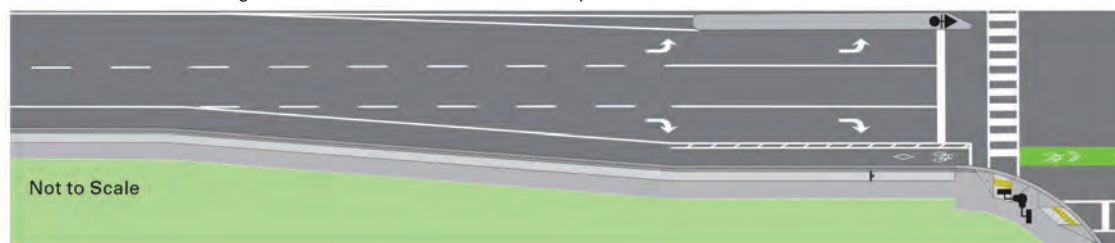


Where right-of-way or cost constraints do not allow for these alternatives, the following concepts may be considered.

Provide Advance Stop Bar & Buffered Bike Lane with Signal Separation (Retrofit)

This is a proposed treatment in which the bike lane is widened to accommodate a 0.5 m painted buffer with optional bollards. The vehicular stop bar is set back 2 m behind the cyclist stop bar to enhance visibility. This treatment should be implemented in concert with a separate bicycle signal which can be used to separate the vehicular right turn from the through cyclist movement (where a dedicated right turn lane is provided).

Exhibit 5-12. Bike Lane Right Turn Treatment with Advance Stop Bar



Conflict Zone Treatment (Retrofit)

This intersection treatment represents current practice. However, it is not preferred as many cyclists are likely to feel uncomfortable through conflict zones.

Exhibit 5-13. Dedicated Bikeway Right Turn Treatment with Conflict Zone





A conventional conflict zone with right turn lane can be intimidating for riders.

Major Urban Intersection with Sidewalks and Raised Cycle Tracks

This design illustrates an intersection treatment for cycle tracks which can be applied in constrained urban environments, to create a bend-in design.

Where additional boulevard width is available, the cycle track should be bent-out to provide a protected intersection (refer to Exhibit 5-144).

Minimum	Preferred
<div>1</div> AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4)	<div>A</div> Green conflict zone marking through intersection
<div>2</div> Customized ‘Turning Vehicles Yield To Bicycles’ (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists	<div>B</div> Two stage left turn queue boxes should be considered in accordance with the warrants presented in Exhibit 5-16.
<div>3</div> Cycle track and splash strip ramp down to road level (@ 5%) 3 m in advance of cyclist stop bar, and ramp back up following the intersection (refer to sample detail shown in Exhibit 5-15)	<div>C</div> Optional bollard can be added to mark the beginning of the full height cycle track and to deter vehicles
<div>4</div> Advance cyclist stop bar provided 2 m ahead of vehicular stop bar to improve visibility of cyclists	<div>D</div> Optional transition from in-boulevard cycle tracks (bend-in)
<div>5</div> Sharrow markings through intersection to be applied with spacing of 3-5 m	
<div>6</div> Green pavement markings illustrating the desired right turn path for vehicles should be added to assist motorists in avoiding the flush median	
<div>7</div> Bicycle symbol and arrow following intersection to confirm cycling facility	

Where a dedicated right turn lane for motor vehicles is provided adjacent a raised cycle track, consideration should be given to separating pedestrian and cyclists movements from the conflicting right turning vehicles through signal phasing. This would require the addition of separate bicycle signals. For further discussion, refer to Chapter 8.

Exhibit 5-14. Major Urban Intersection with Sidewalks & Raised Cycle Tracks (Bend-in)

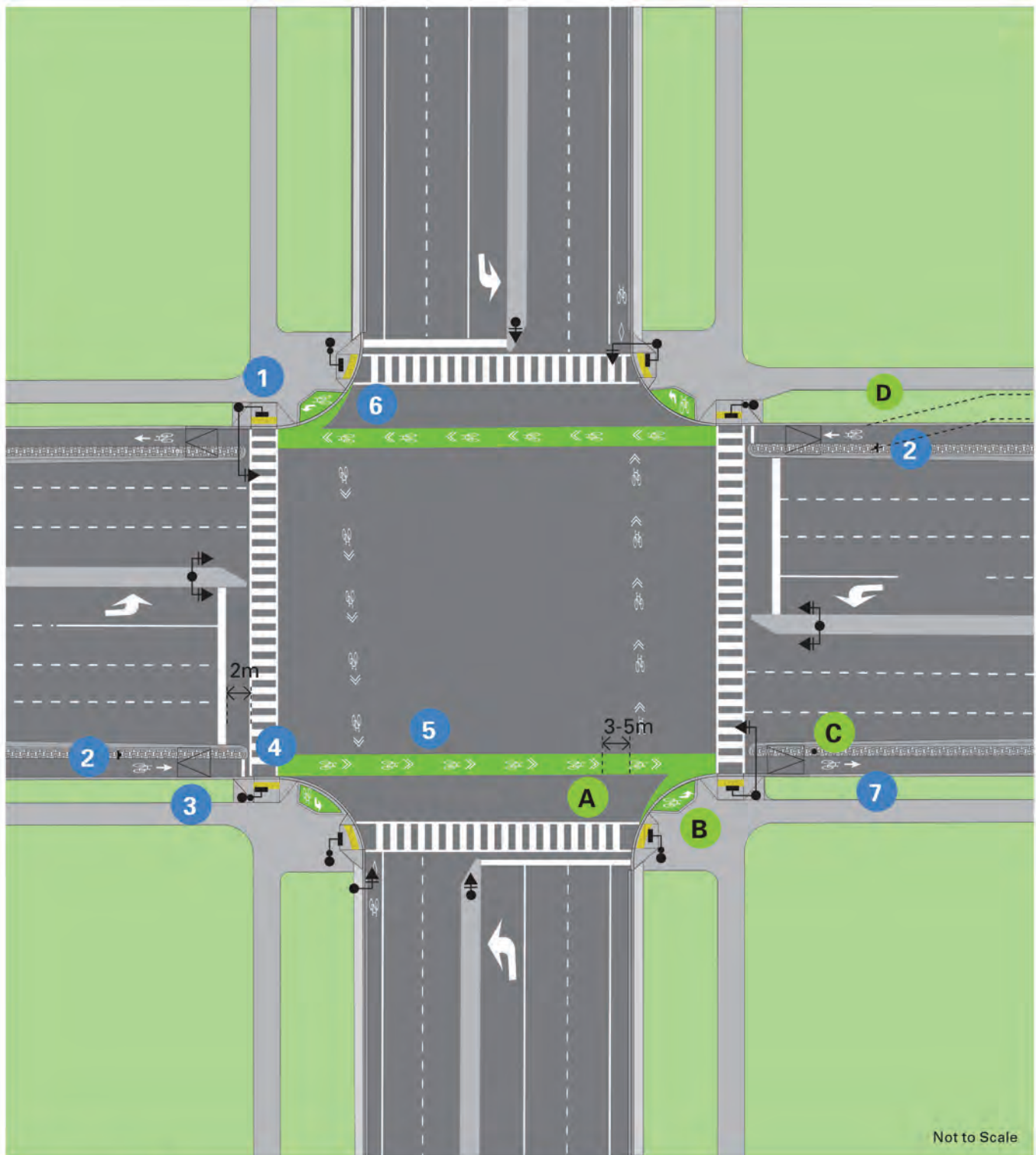
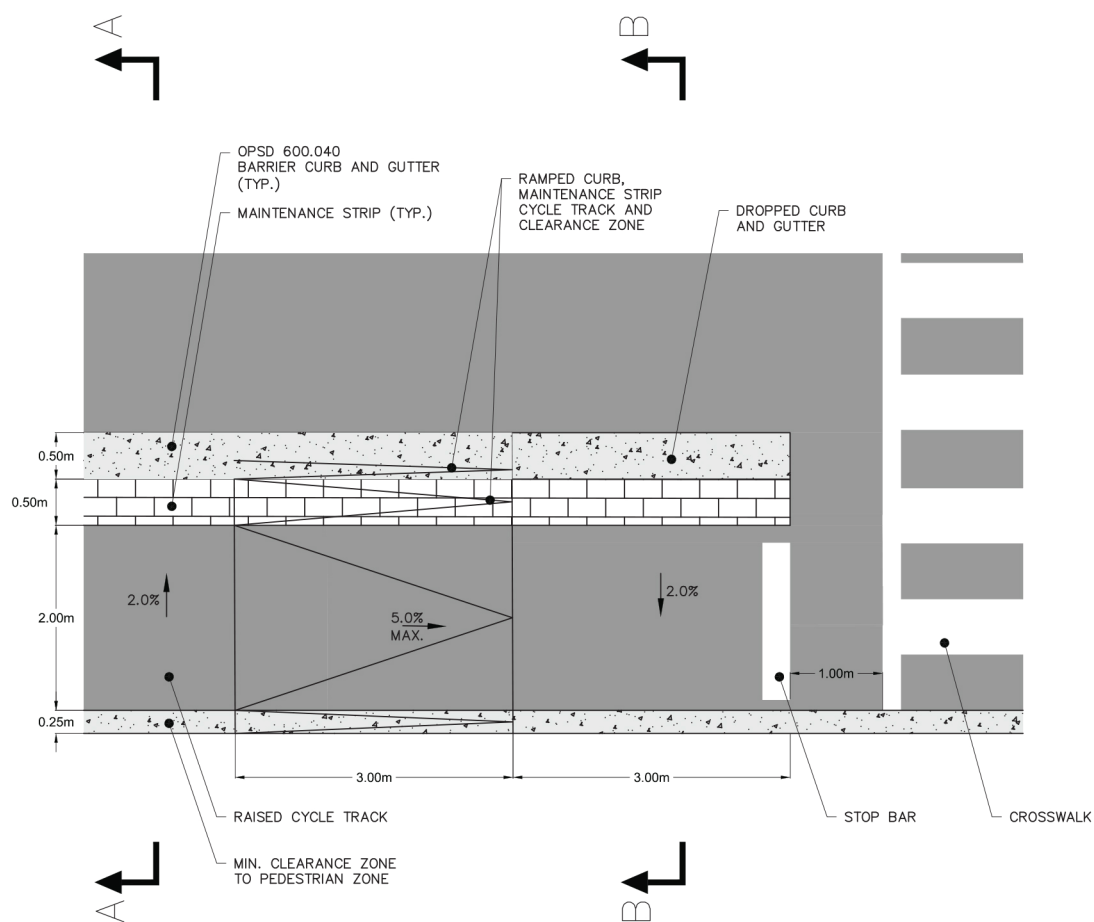
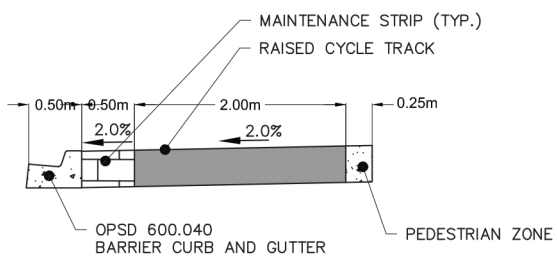


Exhibit 5-15. Sample Detail for Raised Cycle Track at Intersection

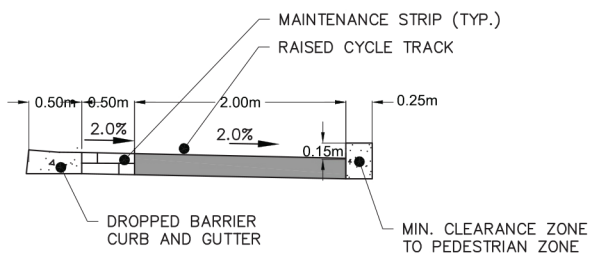


SECTION A



NOTE: DEPTH OF PAVEMENTS NOT TO SCALE

SECTION B



NOTE: DEPTH OF PAVEMENTS NOT TO SCALE

Two-stage Left Turn Queue Boxes

It is recommended that two-stage left turn queue boxes be applied along Regional roads where they will provide a benefit to cyclists, based on the approaching facility type, roadway and intersections context and the characteristics of the intersection roadway.

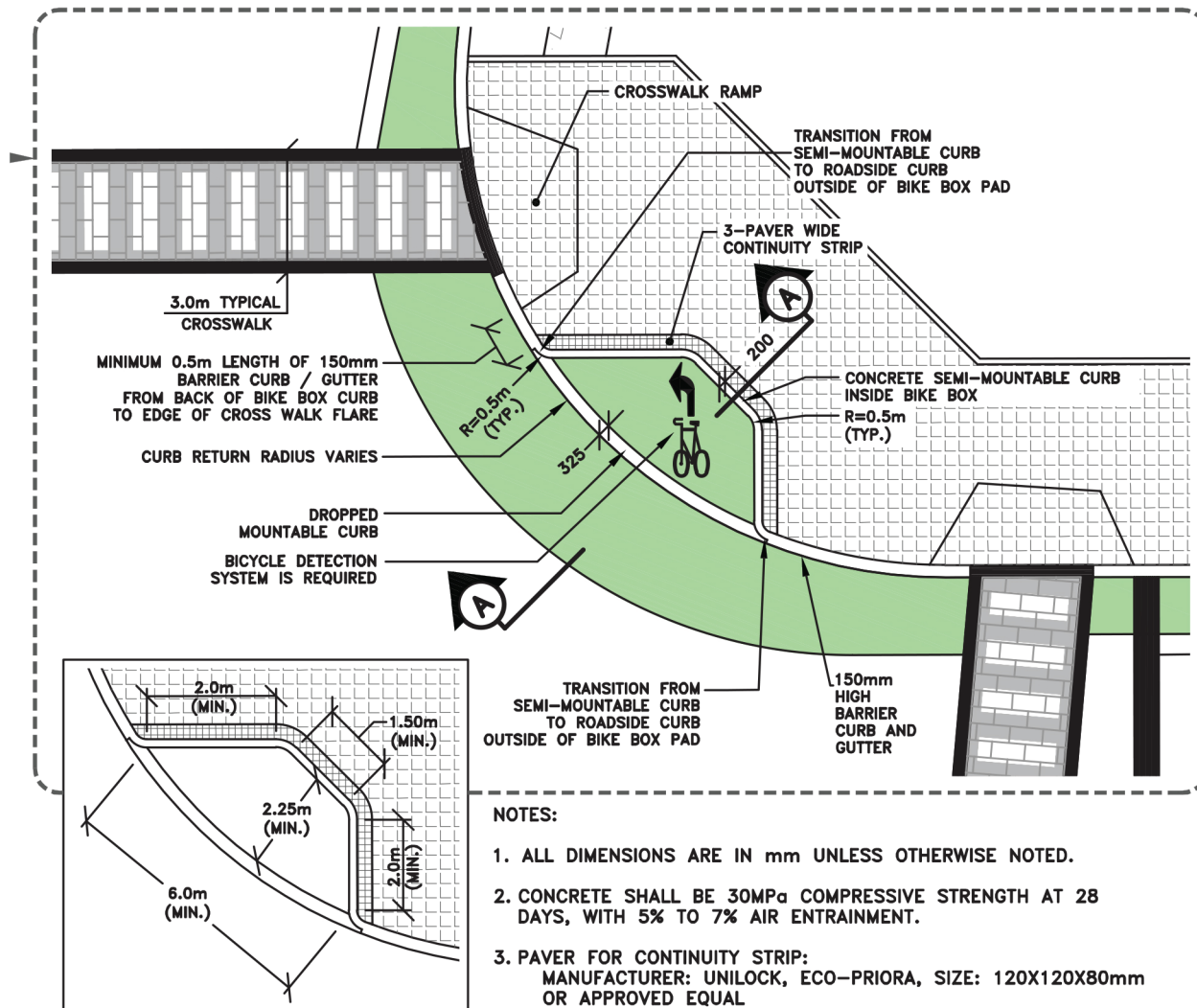
Exhibit 5-16. Two-Stage Left Turn Queue Box Warrant

In general, two stage left turn queue boxes should be considered where the following conditions are met:

- Should only be provided at signalized intersections along Regional corridors with cycling facilities appropriate for the street context
- Should be provided at signalized intersections in urban areas where any of the following conditions are met:
 - Where the intersecting street (municipal or regional) includes existing or planned cycling facilities appropriate for the street context
 - Where a two stage queue box could facilitate access to a major destination located within 500 m of an intersection regardless of whether cycling facilities are available on the intersecting roadway. A “major” destination may include a transit hub, school, community facility such as recreation centre or large commercial centre, or other destinations as determined by Regional staff. Note that where no receiving cycling facilities are provided, signage or other design interventions may be needed to ensure cyclists can safely merge into the intersecting roadway.
 - Where the Regional Road to be crossed is six lanes or wider, as a means of accommodating cyclists wishing to exit the Regional road. Note that where no receiving cycling facilities are provided, signage or other design interventions may be needed to ensure cyclists can safely merge into the intersecting roadway.

The Region has an existing standard two-stage left turn queue box design. Refer to York Region standard drawing D-10.04 in Exhibit 5-18.

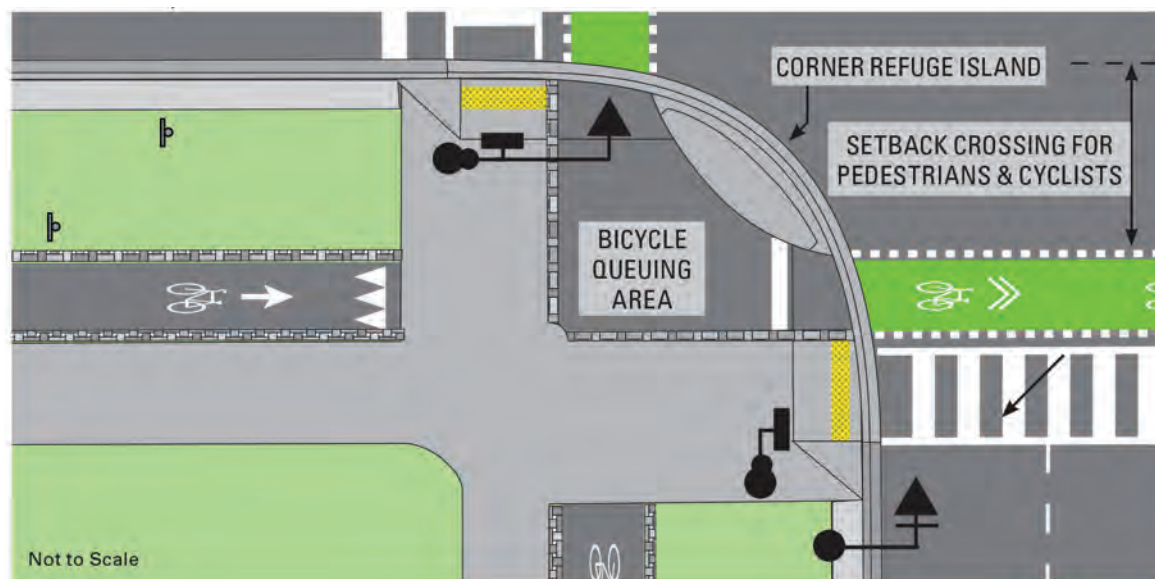
Exhibit 5-17. Typical Bike Box D-10.04



N.T.S.

Major Urban Protected Intersection

The protected intersection is emerging in North America as a preferred higher-order intersection treatment with the potential to provide high quality crossings for both pedestrians and cyclists. Key elements of the protected intersection include the following: a corner refuge island which can be design to accommodate truck with use of a semi-mountable aprons, use of the bend-out design and appropriate crossing set back (4-7 m), and a bicycle queuing area of sufficient depth.



Several examples of protected intersections that have been implemented in North America are shown below in Exhibit 5-18.

Exhibit 5-18. Protected Intersections in Chicago, Salt Lake City and Vancouver



Source: IBI Group

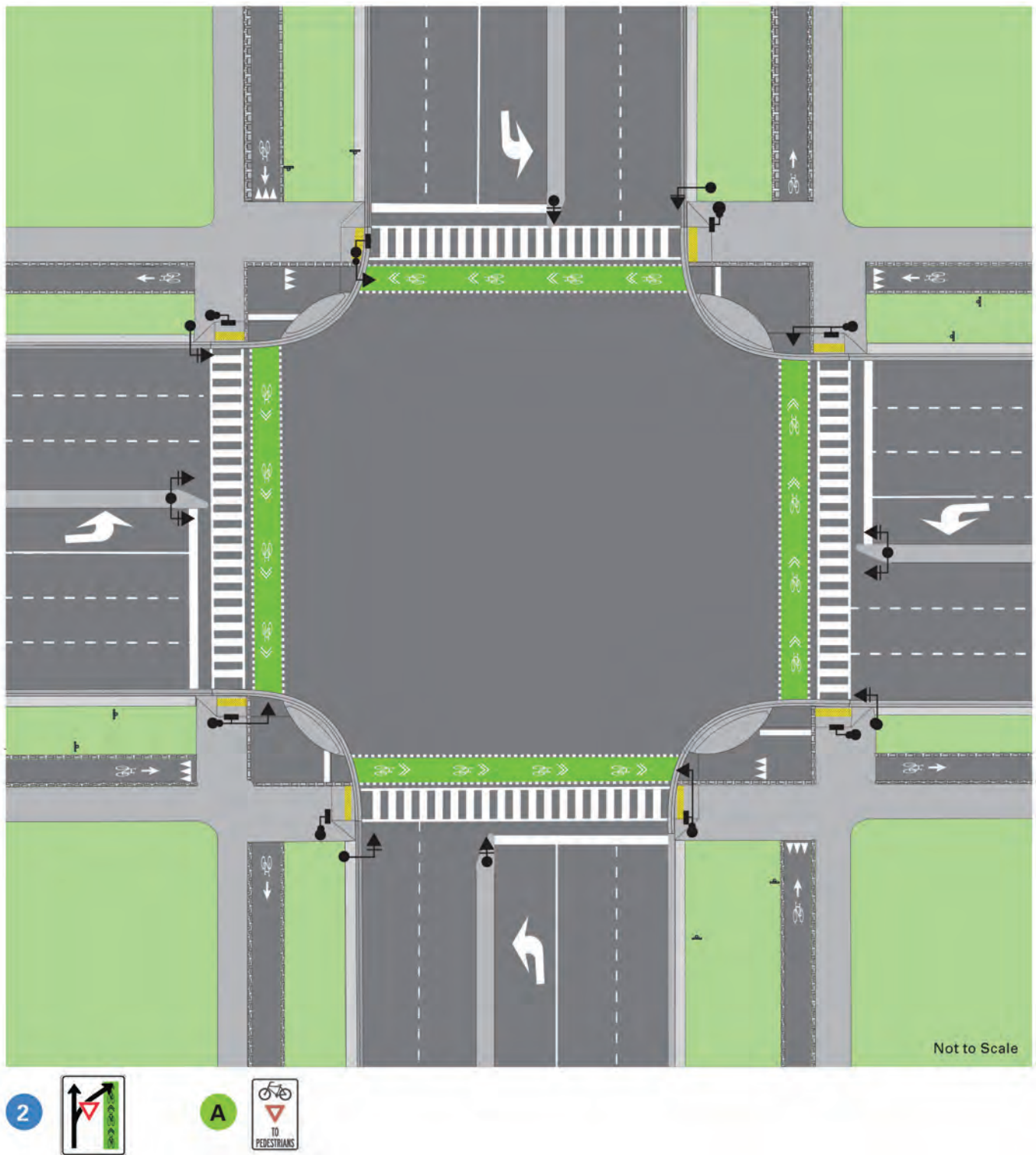


Source: Google Streetview

The following are the minimum and preferred elements of a protected intersection.

Minimum	Preferred
<p>1 AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4)</p>	<p>A ‘Cyclists Yield to Pedestrians’ signage (Rb-73-OTM) can be applied where there are challenges with interactions between users.</p>
<p>2 Customized ‘Turning Vehicles Yield To Bicycles’ (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists</p>	<p>B Optional stop bar for cyclists located at the top of the curb ramp.</p>
<p>3 Yield markings alerting approaching cyclists of pedestrian priority should be applied to separated cycling facilities</p>	<p>C Sidewalk should be carried across the cycle track crossing to emphasize pedestrian priority. Consideration may be given to additional higher-order treatments (i.e. tactile plates or crosswalk markings).</p>
<p>4 Corner refuge island to provide physical protection to waiting pedestrians and cyclists (refer to details in Exhibit 5-22 & Exhibit 5-23)</p>	<p>D Separate bicycle signals are preferred to provide consistency through the transition. Where phasing is identical to parallel vehicle heads, only one head is needed. Otherwise, two bicycle heads should be provided.</p>
<p>5 Bicycle queuing area must be provide sufficient storage so that a waiting bicycle does not block or impede through pedestrian traffic</p>	<p>E Optional transition from raised cycle tracks (bend-out)</p>
<p>6 Motorist yield zone (minimum 4 m) which allows turning drivers to yield to crossing pedestrians and cyclists without risk of being rear-ended by through cyclists</p>	
<p>7 Intersection crossing of the cycle track should be designed as a crossride for cyclists with elephant’s feet markings and sharrows to indicate direction of travel</p>	
<p>8 Bicycle marking should be applied following the intersection to re-confirm separated facilities</p>	

Exhibit 5-19. Major Urban Protected Intersection (Bend-out)



The design of the corner refuge for the protected intersection is particularly important to the overall operations of the intersection. Corner radii need to be reduced in order to slow turning vehicles and encourage yielding behaviour. The area must also be kept free of obstructions which may reduce the visibility of approaching pedestrians and cyclists (clear space - refer to Exhibit 5-18).

Sample approach clear space and corner radii for various typologies are suggested in Exhibit 5-20 below. In all cases, these design criteria should be determined for each intersection based on site specific conditions.

Exhibit 5-20. Suggested design criteria for protected intersections

Right-Turn Travel Speed	Approach Clear Space	Corner Radius
18km/h	13m	5m (Min.YR Urban Avenue)
20km/h	14m	7.5 (Desirable YR Urban Avenue)
24km/h	15m	13m (TAC Bus)

While tighter corner radii are critical to the implementation of protected intersections, Regional roads must also accommodate transit vehicles and heavy vehicles. For this reason, the corner refuge island can be implemented with a semi-mountable truck apron. The recommended maximum radius for the inner edge of the apron is about 9-12 m. When facilities are designed, the path of the control vehicle must be traced to ensure that the vehicle clears the refuge island with sufficient setback to waiting pedestrians and cyclists.

Details of a sample corner island are illustrated in Exhibit 5-22 & Exhibit 5-23.

Where a dedicated right turn lane for motor vehicles is provided adjacent a protected intersection, consideration should be given to separating pedestrian and cyclists movements from the right turning vehicles through signal phasing. This would require the use of separate bicycle signals. Refer to Chapter 8 for additional discussion on signal operations.

Exhibit 5-21. Approach Clear Space

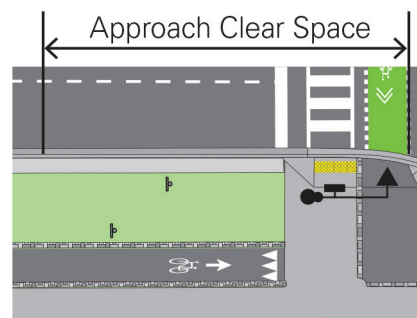
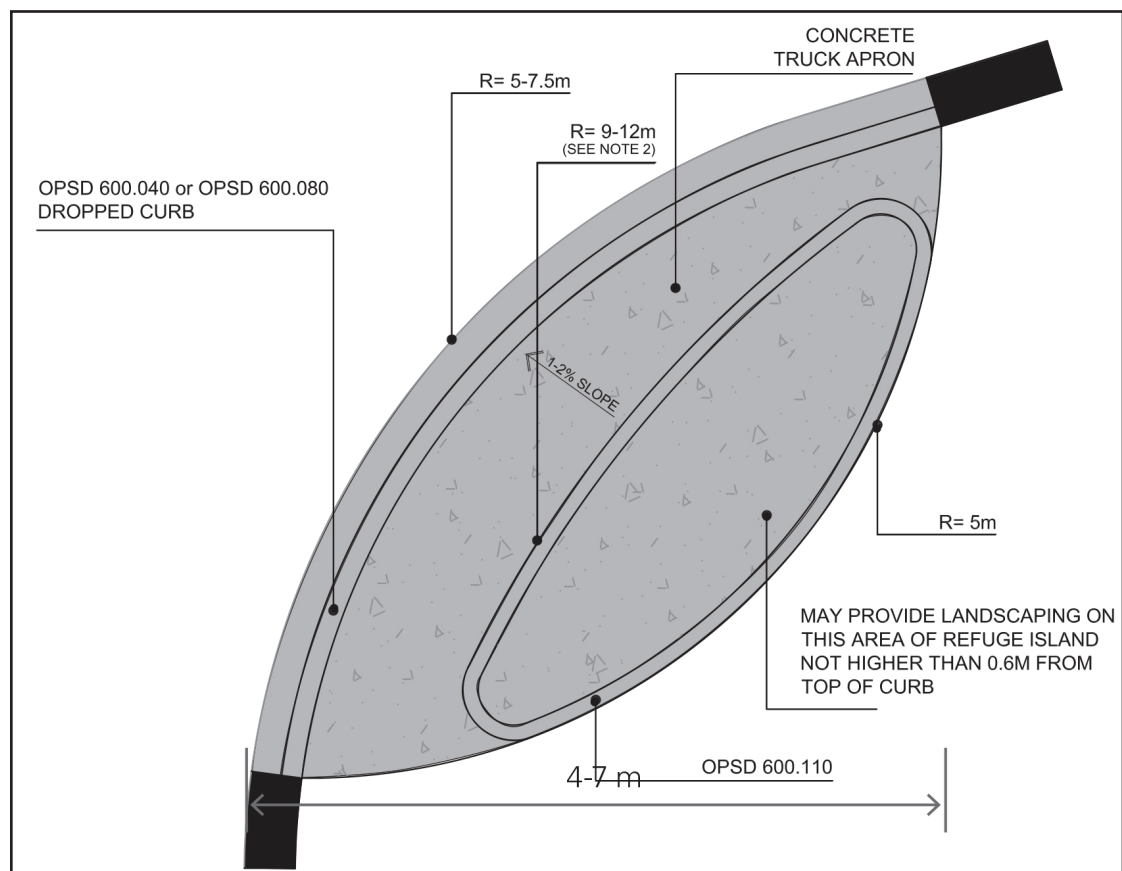
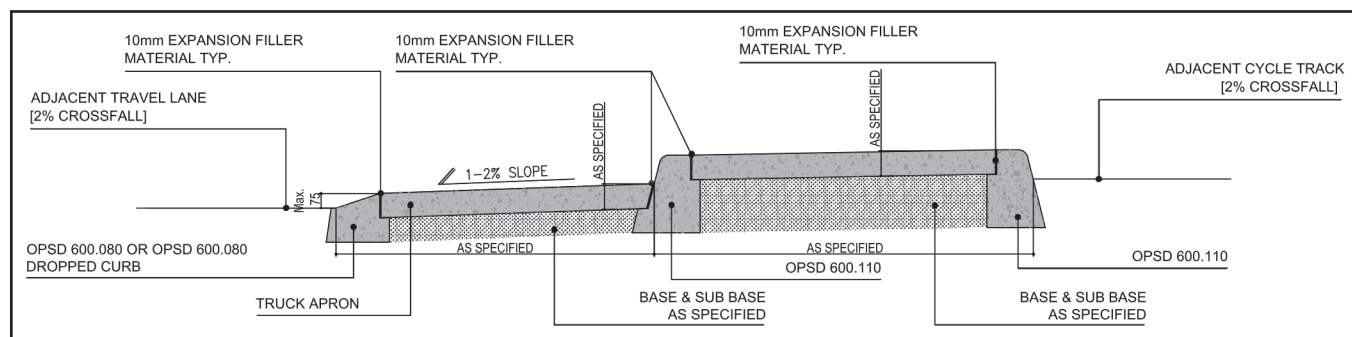


Exhibit 5-22. Corner Refuge Island Detail



Note: Determine truck apron corner radius (R9-12m or two-centred curve) to suit the frequent user, control (heavy) vehicle, ensure control vehicle at "crawl speed" does not track beyond the drop curb of the cycle track / sidewalk ramp on the departure leg of the intersection.

Exhibit 5-23. Concrete Truck Apron Detail



5.2.2 Unsignalized Intersections



Pavement markings highlight cyclist path across an unsignalized intersection



Crossings at unsignalized intersections must include curb ramps or depressions with tactile walking surface indicators

Along Regional roads, unsignalized intersections are most likely to occur where a local or collector road intersects a Regional Road. In these cases, drivers on the intersecting street must stop and identify a gap in traffic on the Regional road in order to complete their movement through the intersection. As a result, enhancing the visibility of conflicting movements from cyclists and pedestrians is critical to ensuring the safety of these users. This is perhaps most important where cyclists and pedestrians will be travelling in the opposite direction of opposing traffic, since drivers will focus on selecting a gap in cross-traffic.

The following types of active transportation facilities at unsignalized intersections are illustrated in these guidelines:

- Conventional bike lanes with sidewalk
- On-road separated bikeway (i.e. raised cycle track or protected bike lanes) with sidewalk
- In-boulevard separated bikeway (i.e. in-boulevard cycle track) with sidewalk
- Multi-use facility

Conventional Bike Lanes with Sidewalk

Unsignalized Intersection

Minimum	Preferred
<p>1 Accessible curb ramps per York Region Standard DS-100 series drawings</p>	<p>A Optional ladder crosswalk markings for improved visibility</p>
<p>2 Transverse crosswalk markings</p>	<p>B Sharrows spaced at 3 - 5 m (urban areas) or 8-10 m (rural areas) to alert drivers to cyclist's path of travel. In special instances, a green conflict zone marking may also be considered in addition to the sharrow markings.</p>
<p>3 Bike and diamond pavement marking following intersection in addition to bike lane signage (RB-91 - TAC)</p>	
<p>4 Corner radii will vary depending on control vehicles. Wherever possible, a reduced radii of 7.5 m can be used to slow turning vehicles.</p>	
<p>5 Customized RB-37 signage to alert turning drivers that they must yield to thru cyclists - refer to Section 7</p>	

Exhibit 5-24. Conventional Bike Lane with Sidewalk at Unsignalized Intersection



Separated Bikeway with Sidewalk

Unsignalized Intersection

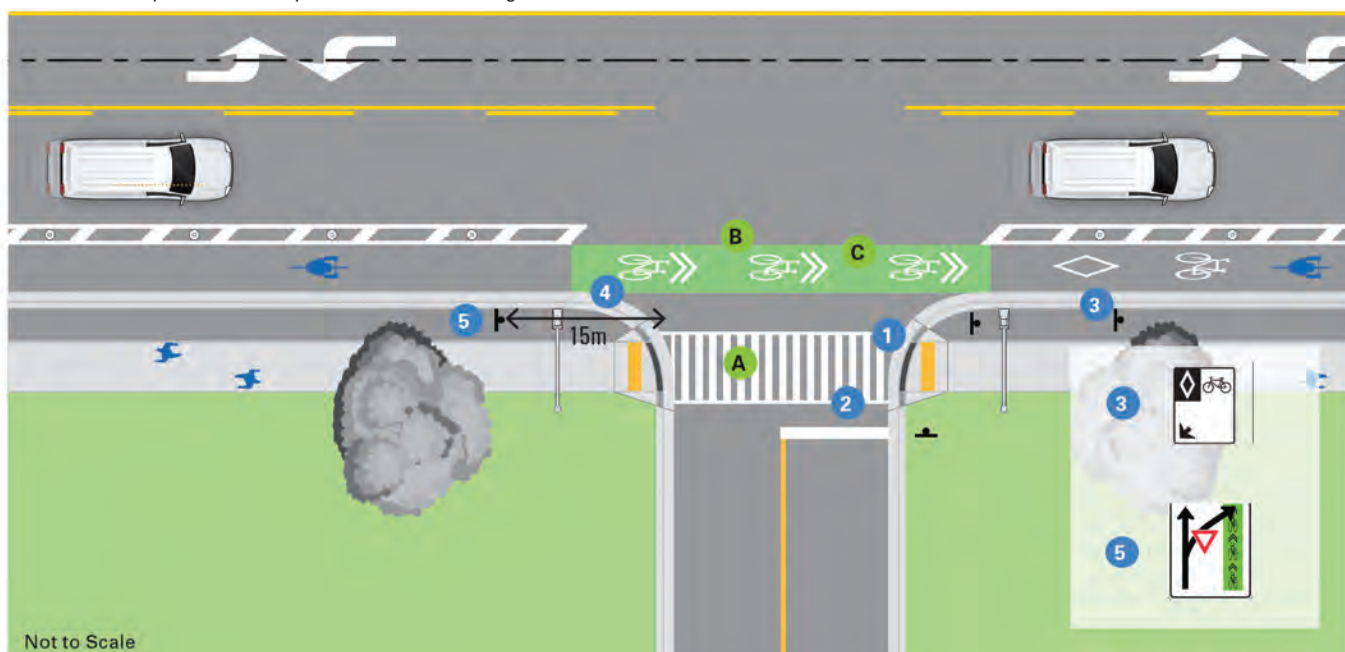
Minimum

- 1 Accessible curb ramps per York Region Standard DS-100 series drawings
- 2 Transverse crosswalk markings
- 3 Bike and diamond pavement marking following intersection in addition to bike lane signage (RB-91 - TAC)
- 4 Corner radii will vary depending on control vehicles. Wherever possible, a reduced radii of 7.5 m can be used to slow turning vehicles
- 5 Customized RB-37 signage to alert turning drivers that they must yield to thru cyclists - refer to Section 7

Preferred

- A Optional ladder crosswalk markings for improved visibility
- B Sharrows spaced at 3-5 m (urban areas) or 8-10 m (rural areas) to alert drivers to cyclist's path of travel
- C Green conflict zone marking through intersection

Exhibit 5-25. Separated Bikeway with Sidewalk at Unsignalized Intersection



In-Boulevard Separated Bikeway with Sidewalk

Unsignalized Intersection

The 'bend-out' design depicted in Exhibit 5-26 can be applied to cycling facilities located anywhere within the boulevard, including raised cycle tracks located adjacent the curb by beginning the 'bend-out' far enough in advance of the intersection. Where space constraints preclude the use of this treatment, the cycling facilities should be 'bent in' to between 0-2 m from the face of curb.

In-Boulevard Separated Bikeway with Sidewalk

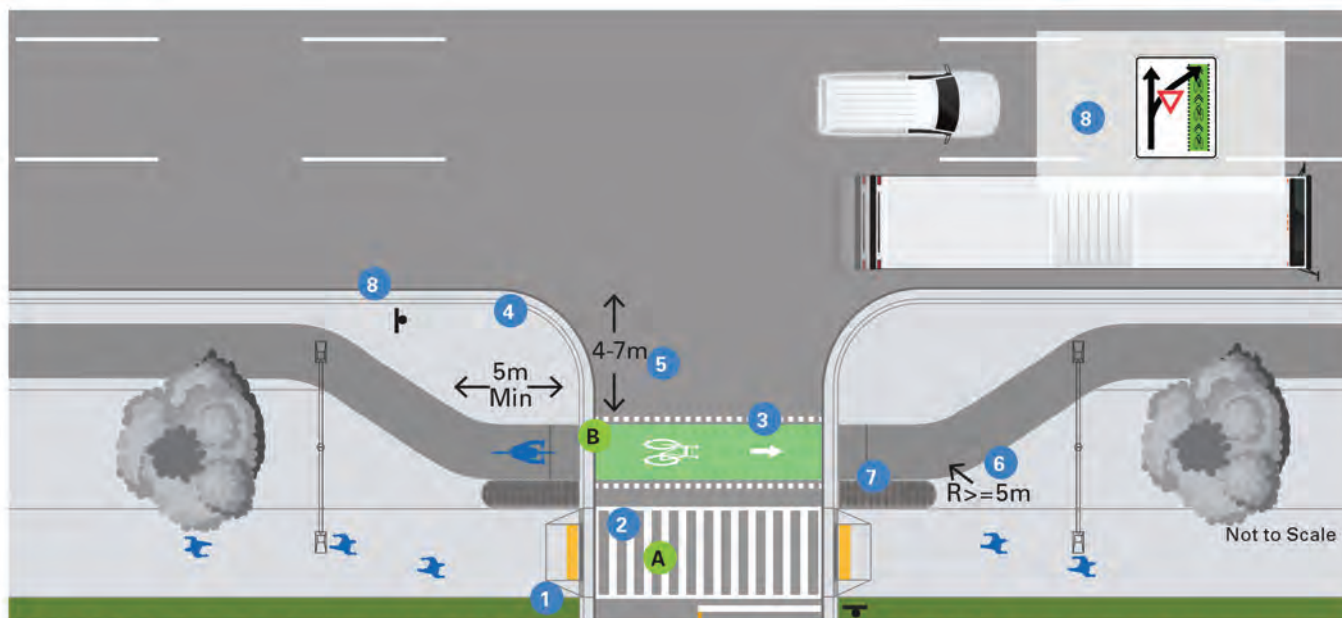
Minimum

- 1 Accessible curb ramps per York Region Standard DS-400 series drawings (See section 7.2.4)
- 2 Transverse crosswalk marking
- 3 Crossride marking for cyclists must incorporate elephant's feet markings and bike symbol with arrow to indicate direction of travel
- 4 Corner radii will vary depending on control vehicles, but 7.5 m is preferred to reduce the speed of right turning vehicles
- 5 Crossride must be set back from the Regional road 4-7 m to allow a turning vehicle space to yield to crossing cyclists without risk of being rear-ended
- 6 To improve cycling comfort, cycle track radii should be ≥ 5 m
- 7 Delineation of cycling and pedestrian space where the two facilities approach each other through the application of paving stones or other high contrast treatment
- 8 Customized RB-37 signage to alert turning drivers that they must yield to thru cyclists - refer to Section 7

Preferred

- A Optional ladder crosswalk markings for improved visibility
- B Green conflict zone marking through intersection

Exhibit 5-26. In-boulevard Separated Bikeway with Sidewalk at Unsignalized Intersection



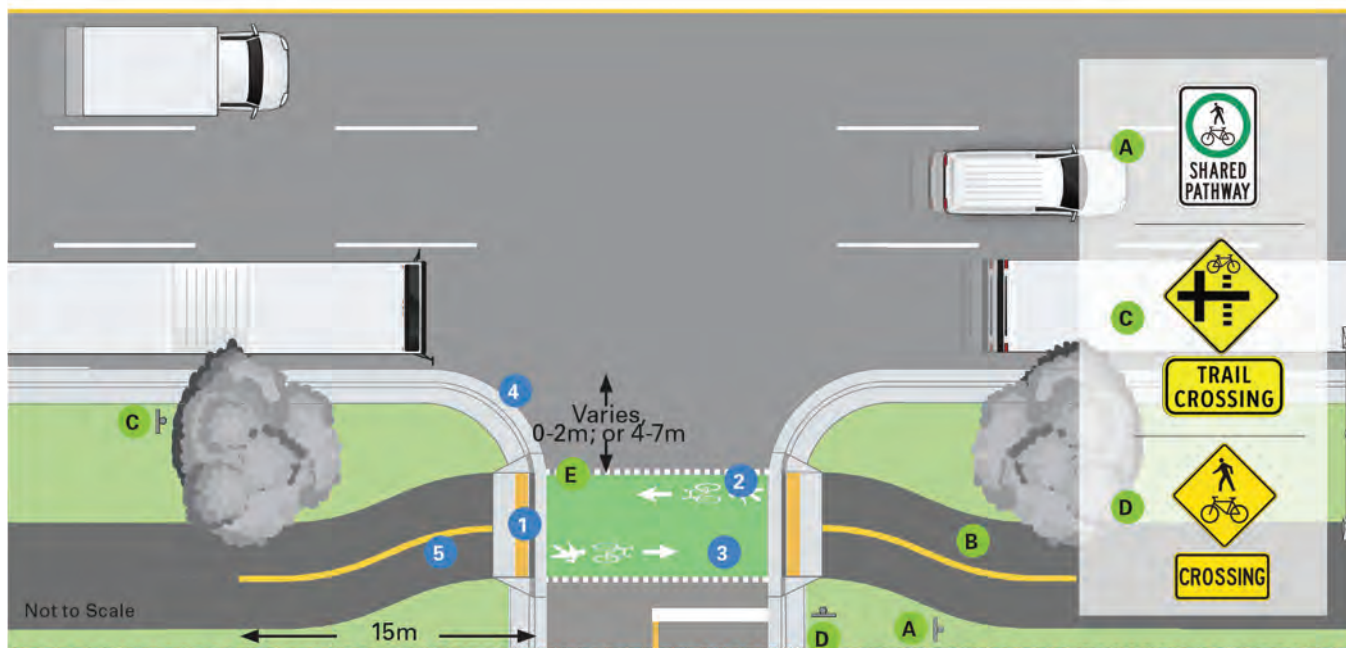
Multi-use Path

Unsignalized Intersection

This treatment should be applied where a boulevard multi-use path within Regional ROW crosses a minor stop-leg controlled street. For cases where a boulevard multi-use path crosses a driveway, please refer to Section 6.1.2.

Minimum	Preferred
<ol style="list-style-type: none"> 1 Accessible curb ramps per York Region Standard DS-400 series drawings (See section 7.2.4) 2 Crossride marking for cyclists must incorporate elephant's feet markings 3 Marking through crossride include pedestrian and cyclist with an arrow. Markings should be placed to align with the centre of the vehicular curb lane 4 Corner radii will vary depending on control vehicles, but 7.5 m is preferred to reduce the speed of right turning vehicles 5 A yellow dividing line should be used approaching the intersection to reduce conflicts. 	<ol style="list-style-type: none"> A 'Shared Pathway' signage (RB-93 - TAC) can be applied following the intersection for path users B Gentle curve in multi-use path may be used to slow cyclists approaching the intersection C 'Bicycle Trail Crossing Side Street' signage and tab (WC-44 - TAC & WC-44T - TAC) in advance of intersection along Regional road D Pedestrian – cyclist crossing ahead tab and signage (Wc-15 - OTM & Wc-32t - OTM) 15m in advance of path crossing along intersecting road E Green conflict zone marking through intersection

Exhibit 5-27. Multi-use Path at unsignalized intersection



5.2.3. Facility Transitions

Facility transitions occur where one facility meets or intersects another. These transitions are likely to occur where a roadway transitions from one classification to another, or where Regional roads intersect municipal roads. These transitions can present a challenge to users, particularly where uni-directional facilities meet bi-directional facilities. Designers should aim to reduce the inconvenience of these transitions wherever possible while ensuring that movements are controlled and predictable. Whenever possible, facility transitions should occur at signalized intersections in order to provide adequate opportunities for pedestrians and cyclists to safely cross roads, as needed.

Each facility transition will require detailed consideration of the context, however some generalized examples that are likely to have applications in York Region have been developed to assist designers in these instances.

The following types of facility transitions are illustrated in these guidelines:

- Separated bikeway on one side of an intersection transitioning to a multi-use path on the other side of the intersection
- Separated bikeway on major road intersecting a multi-use path on a cross road
- Multi-use facility on major road intersecting a multi-use path on cross road

Separated Bikeway on one side of an Intersection transitioning to a Multi-use Path on the other side of the Intersection

The scenario where a cycle track must transition to a multi-use path is likely to occur where a Regional road transitions from a highly urbanized area (i.e. Avenue or City Centre Street), to a or lower density area (i.e. Connector). The same treatment shown here can also be applied where an on-road (dedicated) facility meets a multi-use path by ramping the bike lane up into the boulevard and applying this treatment (refer to Exhibit 5-29).

For further details of the width of facilities, refer to Section 4.10, or for details of intersection geometry refer to Section 5.2.1.

Minimum	Preferred
<ol style="list-style-type: none"> 1 AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4) 2 Customized ‘Turning Vehicles Yield To Bicycles’ (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists 3 ‘Bicycle Route’ marker signage (IB-23 - TAC) combined with right turn signage (IS-5R) and custom street signage (C-1) indicating that cyclists wishing to continue to along the Regional Road must turn right 4 ‘Shared Pathway’ signage (RB-93 – TAC) should be applied 5-30 m downstream of the intersection where the multi-use pathway begins. 5 Intersection crossing of the cycle track should be designed as a crossride for cyclists with elephant’s feet markings and chevrons to indicate direction of travel 6 Yield markings alerting approaching cyclists of pedestrian priority should be applied to separated cycling facilities 7 A yellow dividing line should be applied to the multi-use path approaching the intersection to reduce conflicts. 	<ol style="list-style-type: none"> A ‘Cyclists Yield to Pedestrians’ signage (Rb-73-OTM) can be applied where there are challenges with interactions between users. B ‘Bicycle Route’ marker signage (IB-23 - TAC) combined with right turn signage (IS-8R-TAC) and custom street signage (C-1) indicating that cyclists wishing to continue to along the Regional Road must turn right to reinforce the previous signage where wrong way riding is expected or has been observed C Shared use path and cyclist right turn slip lane should be made of a different construction material than the sidewalk to mark the beginning of a shared space and to emphasize pedestrian priority. D Separate bicycle signals are preferred to provide consistency through the transition. Where phasing is identical to parallel vehicle heads, only one head is needed. Otherwise, two bicycle heads should be provided.

Exhibit 5-28. Separated Bikeway transitioning to a Multi-use Path

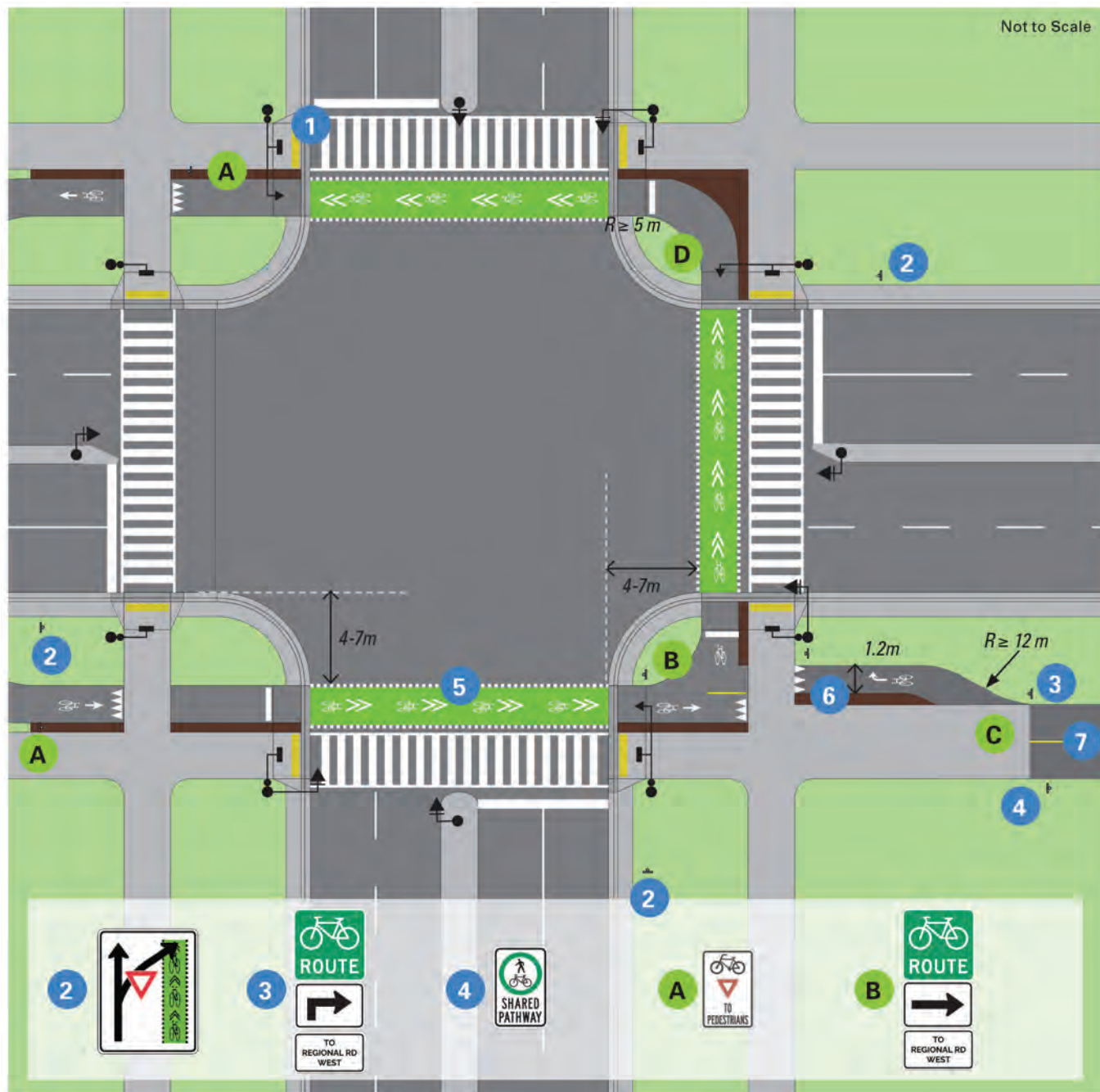
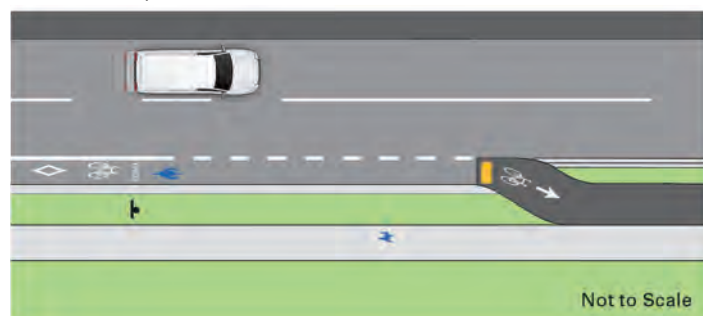


Exhibit 5-29. Optional transition from Bike Lanes into Boulevard



Separated Bikeway on Major Road intersecting a Multi-use Path on a Cross Road

For cases where a sidewalk and cycle track intersects a multi-use path, it is important to clarify pedestrian priority through a combination of material changes, signage and pavement markings. The same treatment shown here can also be applied where an on-road (dedicated) facility meets a multi-use path by ramping the bike lane up into the boulevard and applying this treatment. For further details of the width of facilities, refer to Section 4.10, or for details of intersection geometry refer to Section 5.2.1.

Minimum	Preferred
<ol style="list-style-type: none"> 1 AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4) 2 Customized ‘Turning Vehicles Yield To Bicycles’ (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists 3 ‘Bicycle Trail Crossing Side Street Sign’ signage and optional ‘Trail Crossing’ tab (WC-44 + WC-44T – TAC) alerting drivers to the potential presence of cyclists crossing the intersecting street. WC-44L should be placed in the median to alert left turners about a crossing to their left, and WC-44R should be placed on the right side of the roadway to alert right turning traffic 4 ‘Shared Pathway’ signage (RB-93 – TAC) should be applied 5-30 m downstream of the intersection. 5 Intersection crossing of the cycle track should be designed as a crossride for cyclists with elephant’s feet markings and chevrons to indicate direction of travel (refer to Section 5.2.1. for details) 6 Intersection crossing of the multi-use path should be designed as Combined Pedestrian and Cyclist Crossride (refer to Section 5.2.1. for details) 7 Yield markings alerting approaching cyclists of pedestrian priority should be applied to separated cycling facilities 8 A yellow dividing line should be applied to the multi-use path approaching the intersection to reduce conflicts. 	<ol style="list-style-type: none"> A ‘Cyclists Yield to Pedestrians’ signage (Rb-73-OTM) can be applied where there are challenges with interactions between users. B Optional stop bar for cyclists located at the top of the curb ramp. C Shared use path should be made of a different construction material than the sidewalk to mark the beginning of a shared space and to emphasize pedestrian priority. D Separate pedestrian pole with pushbutton for cyclists approaching on the right side of the multi-use path preferred to reduce conflicts with pedestrians and improve ease of crossing E Separate bicycle signals are preferred to provide consistency through the transition. Where phasing is identical to parallel vehicle heads, only one head is needed. Otherwise, two bicycle heads should be provided. F Pedestrian and bicycle markings following intersection to re-confirm separated facilities

Exhibit 5-30. Separated Bikeway Intersecting a Multi-use Path



Multi-use Path on Major Road intersecting a Multi-use Path on a Cross Road

In the cases where two multi-use paths intersect, it is important to reiterate pedestrian priority within the shared space at the intersection.

For further details of the width of facilities, refer to Section 4.10, or for details of intersection geometry refer to Section 5.2.1.

Minimum	Preferred
<ol style="list-style-type: none"> 1 AODA – compliant curb ramps and tactile plates per York Region Standard DS-400 series drawings (See section 7.2.4) 2 'Bicycle Trail Crossing Side Street Sign' signage and optional 'Trail Crossing' tab (WC-44 + WC-44T – TAC) alerting drivers to the potential presence of cyclists crossing the intersecting street. WC-44L should be placed in the median to alert left turners about a crossing to their left, and WC-44R should be placed on the right side of the roadway to alert right turning traffic 3 'Shared Pathway' signage (RB-93 – TAC) should be applied 5-30 m downstream of the intersection. 4 Intersection crossing of the multi-use path should be designed as Combined Pedestrian and Cyclist Crossride (refer to Sections 5.2.1. & 7 for details) 5) A yellow dividing line should be applied to the multi-use path approaching the intersection to reduce conflicts. 	<ol style="list-style-type: none"> A 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied where there are challenges with interactions between users. B Optional stop bar for cyclists located at the top of the curb ramp. C Shared use path should be made of a different construction material than the sidewalk to mark the beginning of a shared space and to emphasize pedestrian priority. D Separate pedestrian pole with push button for cyclists approaching on the right side of the multi-use path preferred to reduce conflicts with pedestrians and improve ease of crossing E Separate bicycle signals are preferred to provide consistency through the transition. Where phasing is identical to parallel vehicle heads, only one head is needed. Otherwise, two bicycle heads should be provided. F Optional pedestrian and cyclist markings following/approaching intersection.

Exhibit 5-31. Multi-use Path Intersecting a Multi-use Path

