
Markham Stouffville Ho

6.0 Curbside Activity

6.1 TRANSIT STOPS

York Region Transit (YRT) operates a variety of transit routes including Viva Bus Rapid Transit (BRT) Routes, standard YRT routes, and community bus routes. Depending on the characteristics of these routes, headways can vary from five to sixty minutes, and a wide range of transit vehicles are used to service the various routes.

This chapter presents some generalized design concepts for addressing the interactions between transit stops and pedestrian and cycling facilities. In the vicinity of all transit stops, the safety of passengers boarding and disembarking from transit facilities should be emphasized through clear pedestrian priority. From the perspective of transit vehicle operators, treatments that enhance the visibility of pedestrians and cyclists will help to reduce potential conflicts with transit vehicles.

The following principles should be applied when designing active transportation facilities around transit stops and stations:

- Whenever possible, the preferred approach is to separate through cyclists and pedestrians from transit passengers. Depending on the active transportation facilities, treatments may involve:
  - Bending the multi-use path behind the transit facility and providing a paved connection to the passenger area
  - Bending the separated cycling facility behind the transit facility to avoid interactions with passengers
  - Ramping an on-road cycling facility up into the boulevard in advance of the transit stop in order to bend it behind the transit facility
- Where it is not possible to bend facilities away from transit facilities due to property or ROW constraints, mitigation strategies must be employed to reduce or limit conflicts. Depending on the type of facilities, strategies may include:
  - Application of enhanced pavement markings for on-road cycling facilities to alert bus drivers of potential conflicts with cyclists
  - Providing signage and pavement markings that alert cyclists to pedestrian priority where the cycling facility must cross through shared space
  - Providing other clues that emphasize a changing condition such as through the use of different surface materials for shared facilities or plantings
- Requiring cyclist to dismount at transit stops is generally not a viable solution and should be avoided

The following types of active transportation facilities at both near-side/far-side and midblock transit stops with bus bays are illustrated in these guidelines:

- Dedicated bikeway (i.e. bike lanes) with sidewalk
- Separated bikeway (i.e. raised cycle track or in-boulevard cycle track) with sidewalk for both constrained and unconstrained conditions
- Multi-use path

Dedicated Bikeway & Sidewalk with Transit Stop

Minimum

1. Bike lane to ramp up to sidewalk elevation through the bus bay in advance of the transit boarding zone (1.8 m MIN to 3.0 m PREF) in advance to accommodate the length of a bicycle. A sample cross-section for the ramp is shown in Exhibit 6-3.
2. Conflict zone pavement marking through the pedestrian conflict zone and along the full length of the tactile plate.
3. Tactile plate to be provided along the length of the transit boarding zone. Length of the tactile plate should be determined based on the number and length of anticipated transit vehicles using the stop at a given time (to allow for all-door boarding).

   For reference, typical lengths include 12.5 m (conventional fleet) and up to 19 m (articulated bus).

Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied where there are challenges with interactions between users, and to aert cyclist of transit passengers.

B. Application of crosswalk markings lengthwise along conflict zone. As an alternative to crosswalks, bike symbols and arrows may be applied along YRT/Viva corridors.

Alternative Marking:

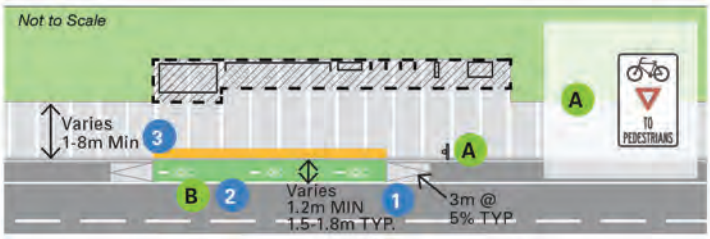
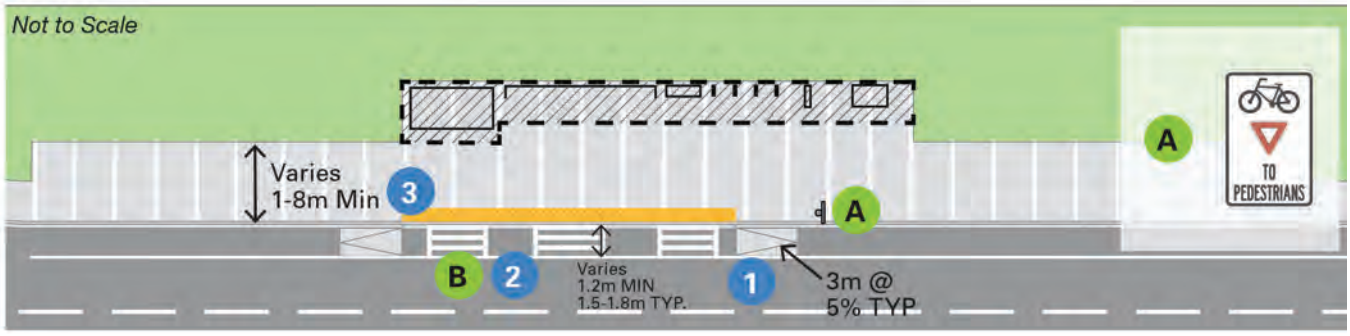
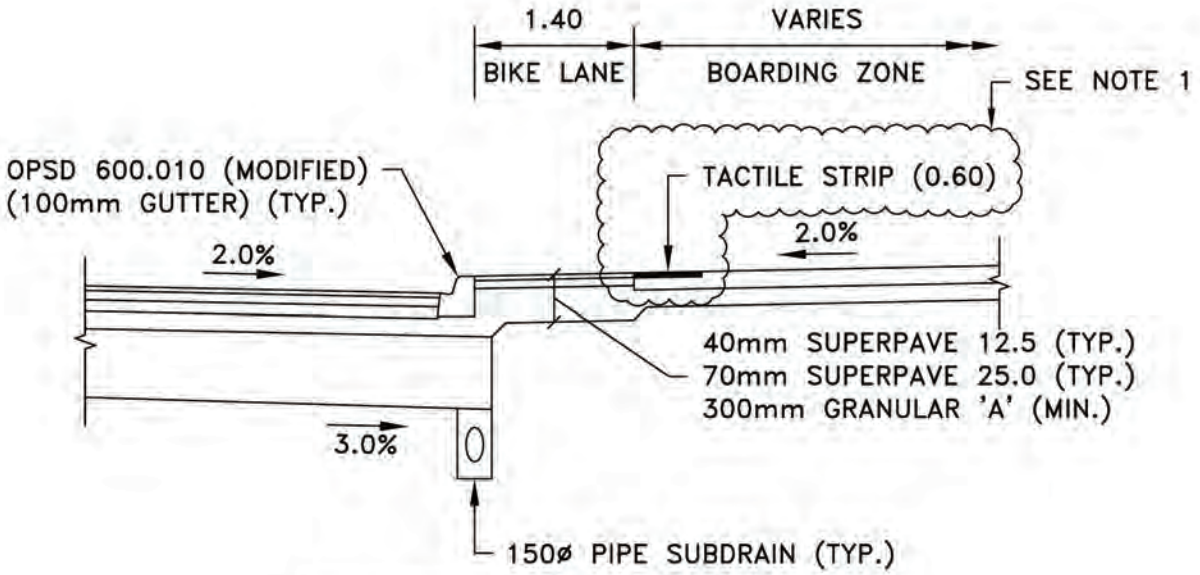


Exhibit 6-1. Dedicated Bikeway and Sidewalk Transit Concept





Source: VivaNext Typical Detail (Draft)

Exhibit 6-3. Dedicated Facility Ramping Up at a Transit Stop (Source: IBI Group)

Dedicated Bikeway & Sidewalk with Bus Bay – Preferred

Minimum

1. Bike lane to ramp up to sidewalk elevation through the bus bay. It is preferred that the ramp begin in advance of the bus bay to limit potential encroachment by transit vehicles.
2. Conflict zone pavement marking through the pedestrian conflict zone and along the full length of the tactile plate.
3. Reserved bike lane and diamond pavement marking following bus bay in addition to bike lane signage (RB-91 - TAC)
4. Tactile plate to be provided along the length of the transit boarding zone. Length of the tactile plate should be determined based on the number and length of anticipated transit vehicles using the stop at a given time (to allow for all-door boarding).

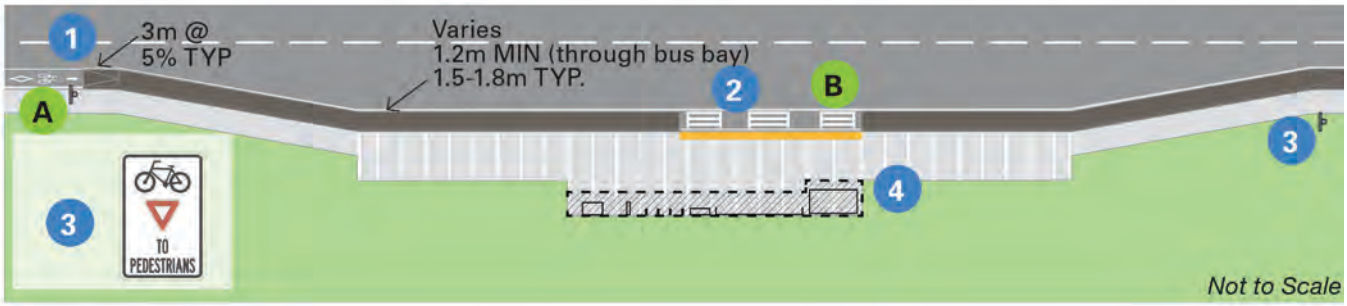
Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied to alert cyclist of transit passengers

B. Application of bike symbols and arrows through the pedestrian conflict zone

Alternative Marking:

Exhibit 6-4. Dedicated Bikeway and Sidewalk with Bus Bay Concept – Preferred



Dedicated Bikeway & Sidewalk with Bus Bay – Retrofit

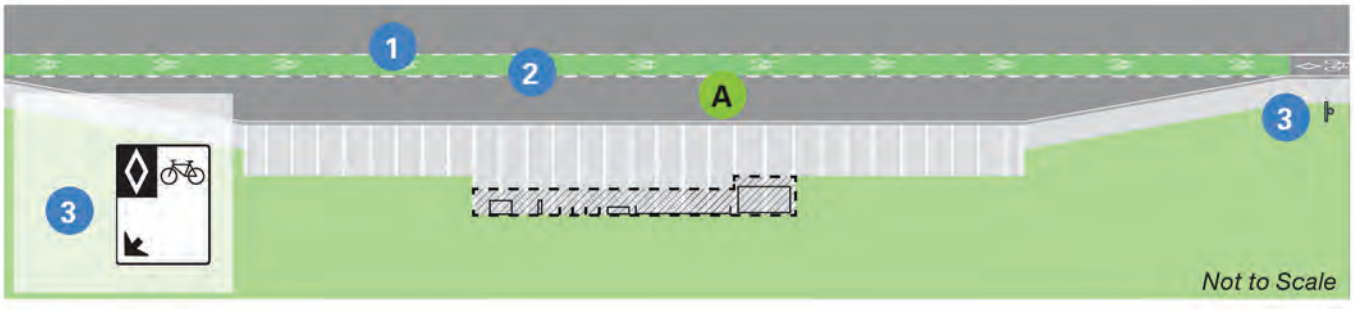
Minimum

1. Bike lane to be dashed through the bus bay to alert cyclists of the potential conflict with transit vehicles
2. Conflict zone pavement marking through the conflict zone
3. Reserved bike lane and diamond pavement marking following bus bay in addition to bike lane signage (RB-91 - TAC)

Preferred

A. Application of bike symbols through the conflict zone (spaced 3-5 m)

Exhibit 6-5. Dedicated Bikeway with Bus Bay Transit Concept



Separated Bikeway & Sidewalk with Transit Stop - Constrained

Minimum

1. Conflict zone pavement marking through the pedestrian conflict zone and along the full length of the tactile plate
2. Tactile plate to be provided along the length of the transit boarding zone. Length of the tactile plate should be determined based on the number and length of anticipated transit vehicles using the stop at a given time (to allow for all-door boarding)
3. Bike symbol and arrow following bus bay

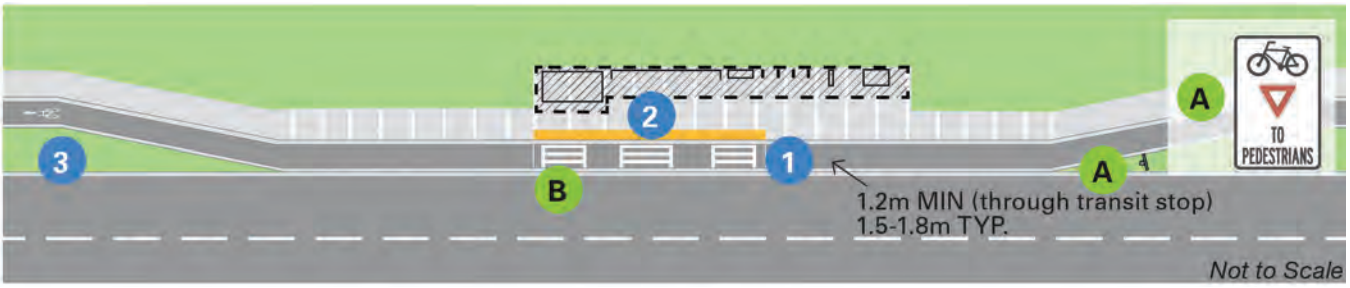
Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied to alert cyclist of transit passengers

B. Application of bike symbols and arrows through the pedestrian conflict zone

Alternative Marking:

Exhibit 6-6. Separated Bikeway and Sidewalk with Transit Concept - Constrained



Separated Bikeway & Sidewalk with Transit Stop - Preferred

Minimum

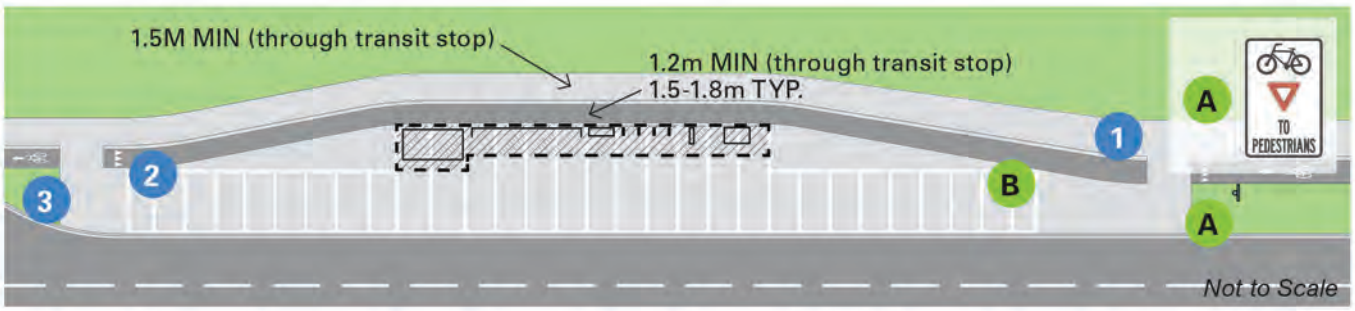
1. Sidewalk carried through the cycle track to emphasize pedestrian priority
2. Yield markings alerting approaching cyclists of pedestrian priority
3. Bike symbol and arrow following bus bay

Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) to alert cyclist of transit passengers

B. Where space is constrained pedestrians can pass through the transit bay in lieu of a separate sidewalk

Exhibit 6-7. Separated Bikeway and Sidewalk with Transit Concept - Preferred



Separated Bikeway & Sidewalk with Bus Bay - Constrained

Minimum

1. Conflict zone pavement marking through the pedestrian conflict zone
2. Tactile plate to be provided along the length of the transit boarding zone. Length of the tactile plate should be determined based on the number and length of anticipated transit vehicles using the stop at a given time (to allow for all-door boarding)
3. Bike symbol and arrow following bus bay

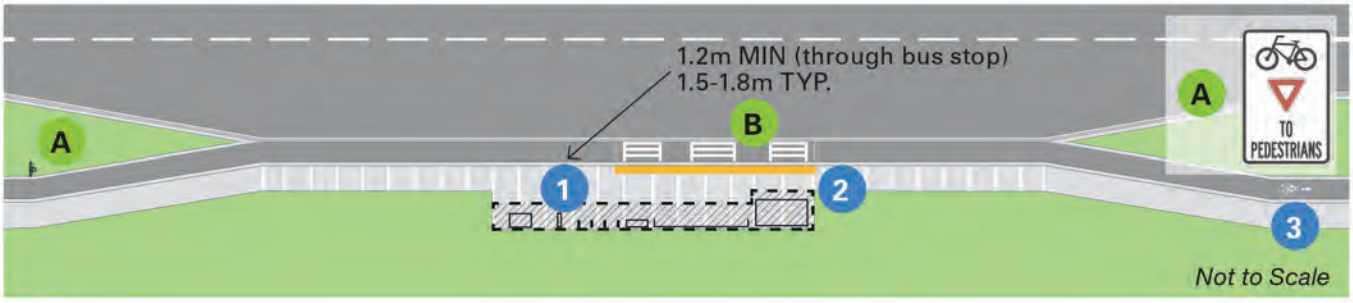
Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied to alert cyclist of transit passengers

B. Application of bike symbols and arrows through the pedestrian conflict zone

Alternative Marking:

Exhibit 6-8. Separated Bikeway & Sidewalk with Bus Bay - Constrained



Separated Bikeway & Sidewalk with Bus Bay - Preferred

Minimum

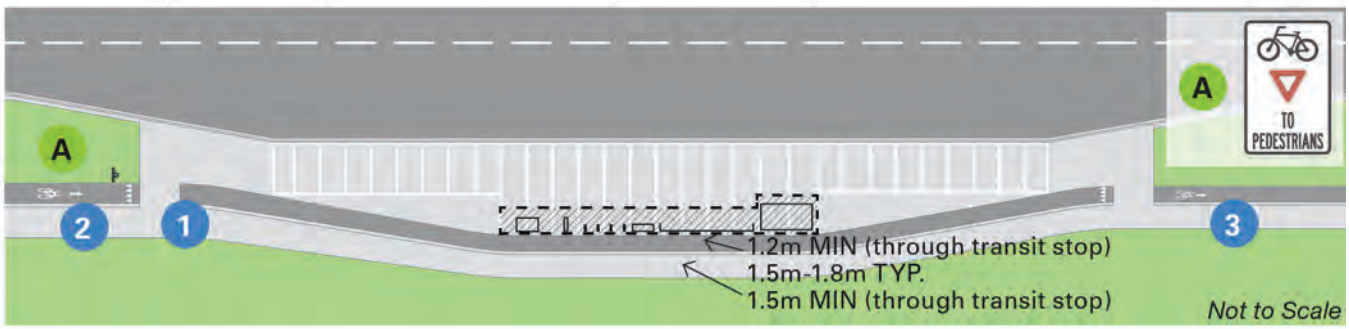
1. Sidewalk carried through the cycle track to emphasize pedestrian priority
2. Yield markings alerting approaching cyclists of pedestrian priority
3. Bike symbol and arrow following bus bay

Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) to alert cyclist of transit passengers

B. Where space is constrained pedestrians can pass through the transit bay in lieu of a separate sidewalk

Exhibit 6-9. Separated Bikeway and Sidewalk with Bus Bay – Preferred Concept



Multi-use Path with Transit Stop

Preferred

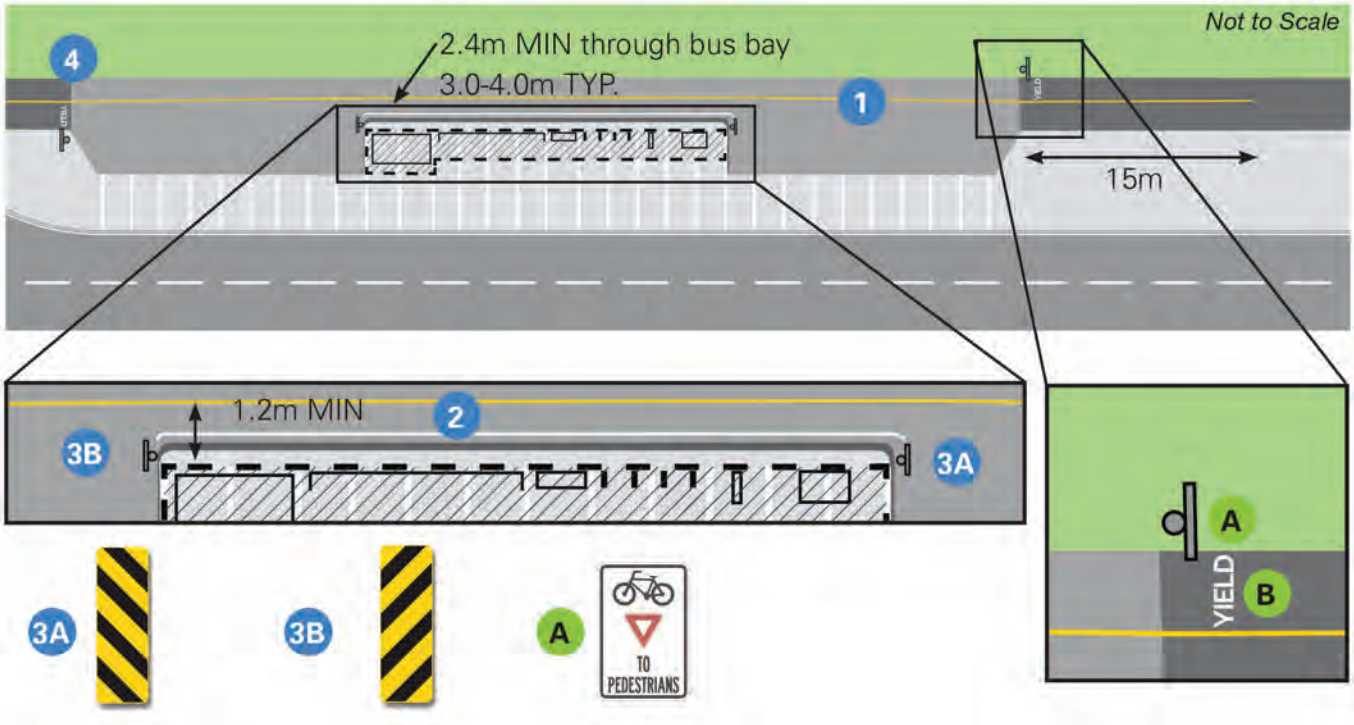
Minimum

1. A 100 mm solid yellow dividing line can be applied to the multi-use path approaching the driveway to reduce conflicts
2. A 100 mm white solid line should mark the back of the transit stop, where shelters or other street furniture is provided, to warn cyclists of potential hazards
3. 'Object Marker' signage where there potential hazards associated with the transit stop i.e. transit shelters or bike parking (Wa-33L – OTM & Wa-33R – OTM)
4. Change in surface material to emphasize pedestrian priority in the vicinity of the transit stop

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied to alert cyclists of transit passengers

B. 'YIELD' can be applied to provide additional guidance on pedestrian priority where there are challenges with interactions between user

Exhibit 6-10. Multi-use Path with Bus Bay Concept



Multi-use Path with Bus Bay

Minimum

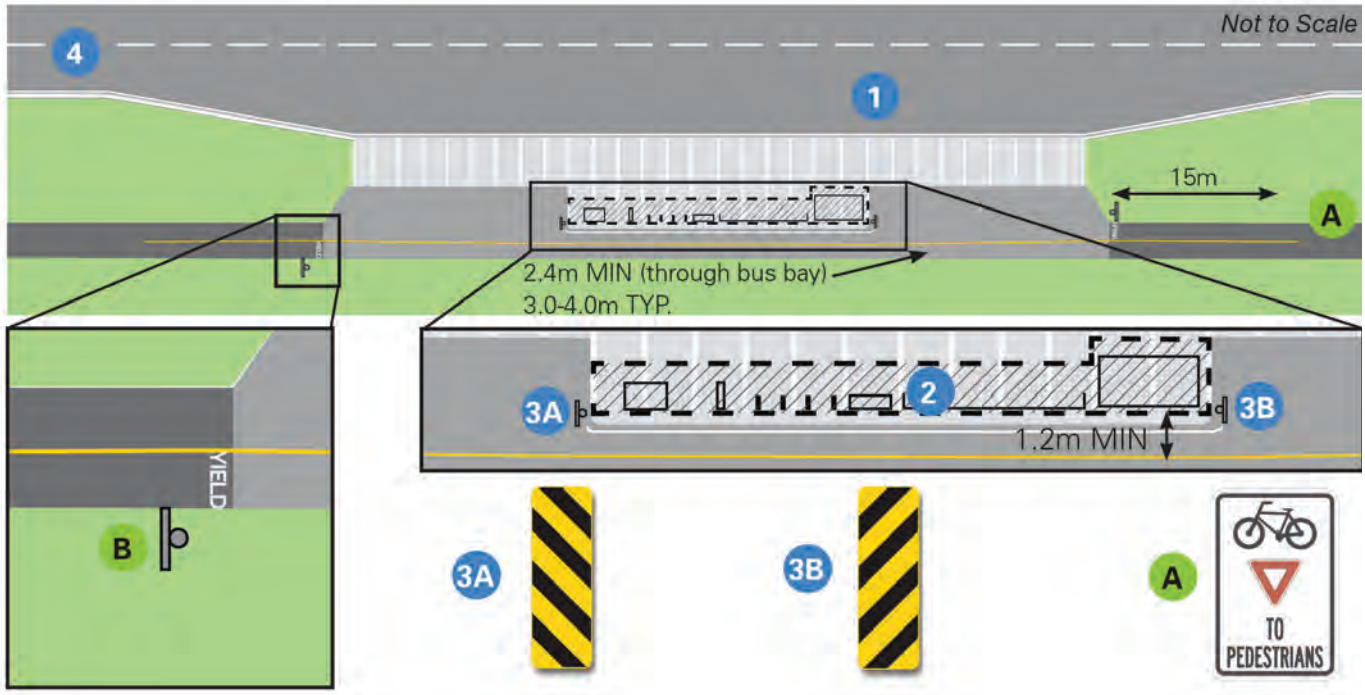
1. A 100 mm solid yellow dividing line can be applied to the multi-use path approaching the driveway to reduce conflicts
2. A 100 mm white solid line should mark the back of the transit stop
3. 'Object Marker' signage where there potential hazards associated with the transit stop i.e. transit shelters or bike parking (Wa-33L – OTM & Wa-33R – OTM)
4. Change in surface material to emphasize pedestrian priority in the vicinity of the transit stop

Preferred

A. 'Cyclists Yield to Pedestrians' signage (Rb-73-OTM) can be applied to alert cyclists of transit passengers

B. 'YIELD' can be applied to provide additional guidance on pedestrian priority where there are challenges with interactions between user

Exhibit 6-11. Multi-use Path with Bus Bay Concept



6.2 DRIVEWAYS

Conflicts between vulnerable users and vehicles at driveways can be a major issue in urbanized areas where driveways often carry heavy volumes of traffic. Whenever possible, driveways should be limited, consolidated and/or formalized through an access management review along corridors with expected high volumes of pedestrian and cycling use. Where driveways are unavoidable, it is important that the design of driveways clarifies the right of way and enhances visibility of facilities to minimize risk to pedestrians and cyclists..

The Highway Traffic Act (HTA) requires that drivers entering a public roadway from a private road or driveway that is not controlled by a traffic control signal yield the right-of-way to all traffic approaching on the highway so closely that to enter would constitute an immediate hazard. Since pedestrians and cyclists qualify as traffic operating on a multi-use path or cycle tracks within the right-of-way of a road, drivers entering the road are required to yield the right-of-way where the facility crosses the driveway.

Although an uncontrolled driveway crossing is not a crosswalk as defined in the HTA, the intention is that drivers yield to conflicting users in the crossing similarly to a crosswalk. Thus, the recommended pavement markings draw on the OTM Book 18 recommendations for crossrides, as well as intersection concepts presented in Section 5.2.

Conflicts between vulnerable users and vehicles at driveways can be a major issue in urbanized areas

In addition to the signage and pavement marking applications discussed in these guidelines, it is critical that appropriate sightlines be provided so that vehicles entering and exiting the driveways can see both vulnerable users and motor vehicles on the main roadway. In instances where on-street parking is provided, parking set-backs should consider the need for visibility of pedestrians and cyclists for drivers entering driveways. Parking restrictions should be considered at least 6 m in advance of, and departing each driveway, but this distance may be higher depending on the speed of the Regional road.

For the purposes of these guidelines, three broad categories of driveway types are considered:

- Single Family Residential
- Multi-Family Residential
- Driveways serving higher density residential uses (i.e. townhouses, condos and/or high rises)
- Commercial/Industrial or any driveways with >100 vehicles per hour (entering/exiting) during the peak hour of traffic

In all cases, the pedestrian or cycling facilities should be carried through unsignalized driveways (refer to Exhibit 6-12). Where a driveway is signalized, this can be treated as an intersection, and appropriate treatments applied (refer to Section 5.2).

Exhibit 6-12. Sidewalk continued through driveway at Aurora Heights Public School

Facilities crossing driveways with heavier conflicting volumes should incorporate appropriate pavement markings to improve conspicuity of crossing pedestrians and cyclists. Exhibit 6-13 summarizes the recommended driveway treatments across various driveway types, including references to illustrations of the concepts.

In addition to the pavement marking and signage of driveways, consideration should be given to bending facilities in or out at driveways, in accordance with the recommendations in Exhibit 5-1.

Exhibit 6-13. Summary of Driveway Treatments across Various Driveway Types

Facility type	Single Family	Multi-Family Residential	Commercial/Industrial Or Volume>100 VPH
Multi-use Path	No pavement markings. Facilities should be carried through the driveway i.e. sidewalk continuous across driveway etc.	Elephant's feet Refer to **Exhibit 6-14**	Multi-use path carried through the driveway and marked as a Mixed Crossride Refer to **Exhibit 6-15**
Sidewalk + Dedicated Cycling Facility		No pavement markings on sidewalk + On-road cycling facility: Buffer carried through the intersection (solid) + optional bike symbol (typical one per lane or every 3m) Refer to **Exhibit 6-16**	No pavement markings on sidewalk + On-road cycling facility: Buffer dash through the driveway(with internal hatching dropped) + bike symbol (typical one per lane or every 3m) + optional green pavement marking Refer to **Exhibit 6-17**
Sidewalk + In-Boulevard Separated Cycling Facility (Raised Cycle Track or In-Boulevard Cycle Track)		Sidewalk: No pavement markings + In-boulevard cycling facility: Elephant's feet + optional bike symbol & arrow Refer to **Exhibit 6-19**	Sidewalk: No pavement markings + In-boulevard cycling facility: Elephant's feet + bike symbol & arrow + optional green pavement marking Refer to **Exhibit 6-20**

Multi-use Path crossing a Multi- Family Residential Driveway

This treatment will help to improve the conspicuity of the path in low visibility conditions and is recommended for multi-family residential driveways.

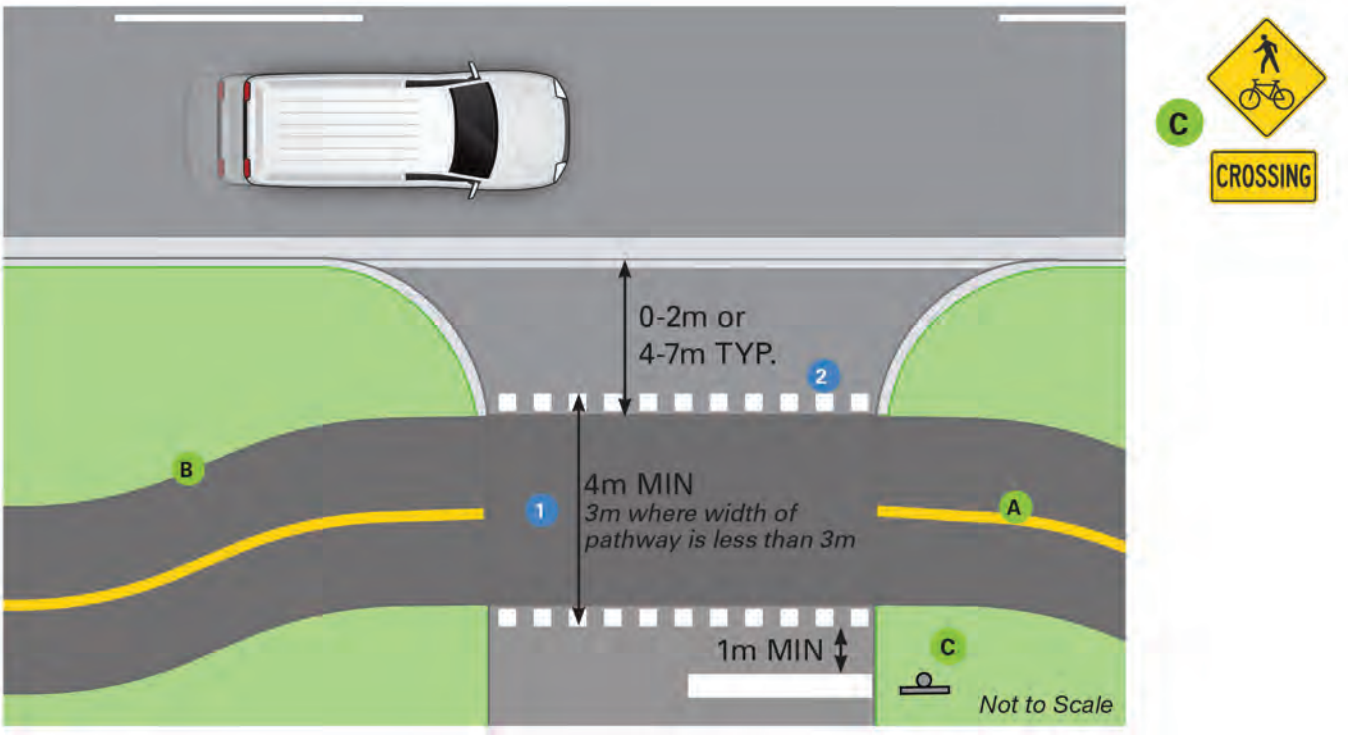
Minimum

1. Facility carried through the driveway
2. Elephant's feet markings (refer to Section 7 for details)

Preferred

- **A** A yellow dividing line can be applied to the multi-use path approaching the driveway to reduce conflicts
- **B** Gentle curve in multi-use path may be used to slow cyclists approaching the driveway
- **C** Optional 'Stop' sign (Ra-1 – OTM) and corresponding stop bar, or 'Yield' sign (Ra-2 – OTM) without stop bar. Where neither stop or yield conditions are warranted, consider applying a 'Pedestrian and Bicycle Crossing Ahead Sign' and tab (Wc-15 - OTM & Wc-32t - OTM)

Exhibit 6-14. Multi-use Path crossing a Multi-Family Residential Driveway



Multi-use Path crossing a Commercial/Industrial/High-Volume Driveway

This treatment to be applied at higher volume driveways or where blocking of the driveway by drivers entering the street or visibility of the path to drivers entering the driveway is of concern.

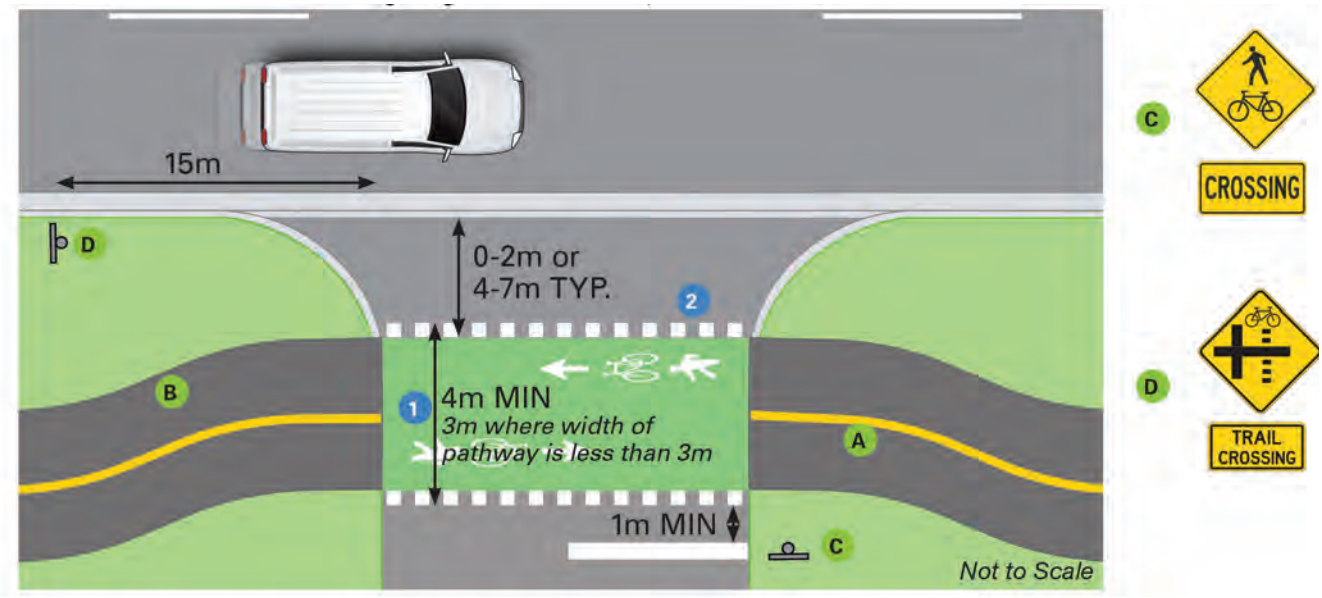
Minimum

1. Facility carried through the driveway
2. Combined crossride markings (refer to Section 7 for details)

Preferred

- **A** A 100 mm solid yellow dividing line can be applied to the multi-use path approaching the driveway to reduce conflicts
- **B** Gentle curve in multi-use path may be used to slow cyclists approaching the driveway
- **C** Optional 'Stop' sign (Ra-1 – OTM) and corresponding stop bar, or 'Yield' sign (Ra-2 – OTM) without stop bar. Where neither stop or yield conditions are warranted, consider applying a 'Pedestrian and Bicycle Crossing Ahead Sign' and tab (Wc-15 - OTM & Wc-32t - OTM)
- **D** Bicycle Trail Crossing Side Street Sign' signage and optional 'Trail Crossing' tab (WC-44 + WC-44T – TAC) can be applied to alert drivers to the potential presence of cyclists crossing the driveway. 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
- **E** Green conflict zone pavement marking

Exhibit 6-15. Multi-use Path crossing a High Volume Driveway



Separated On-Road Bikeway crossing a Multi-Family Residential Driveway

This treatment will help to improve the conspicuity of the on-road facility and is recommended for multi-family residential driveways.

Minimum

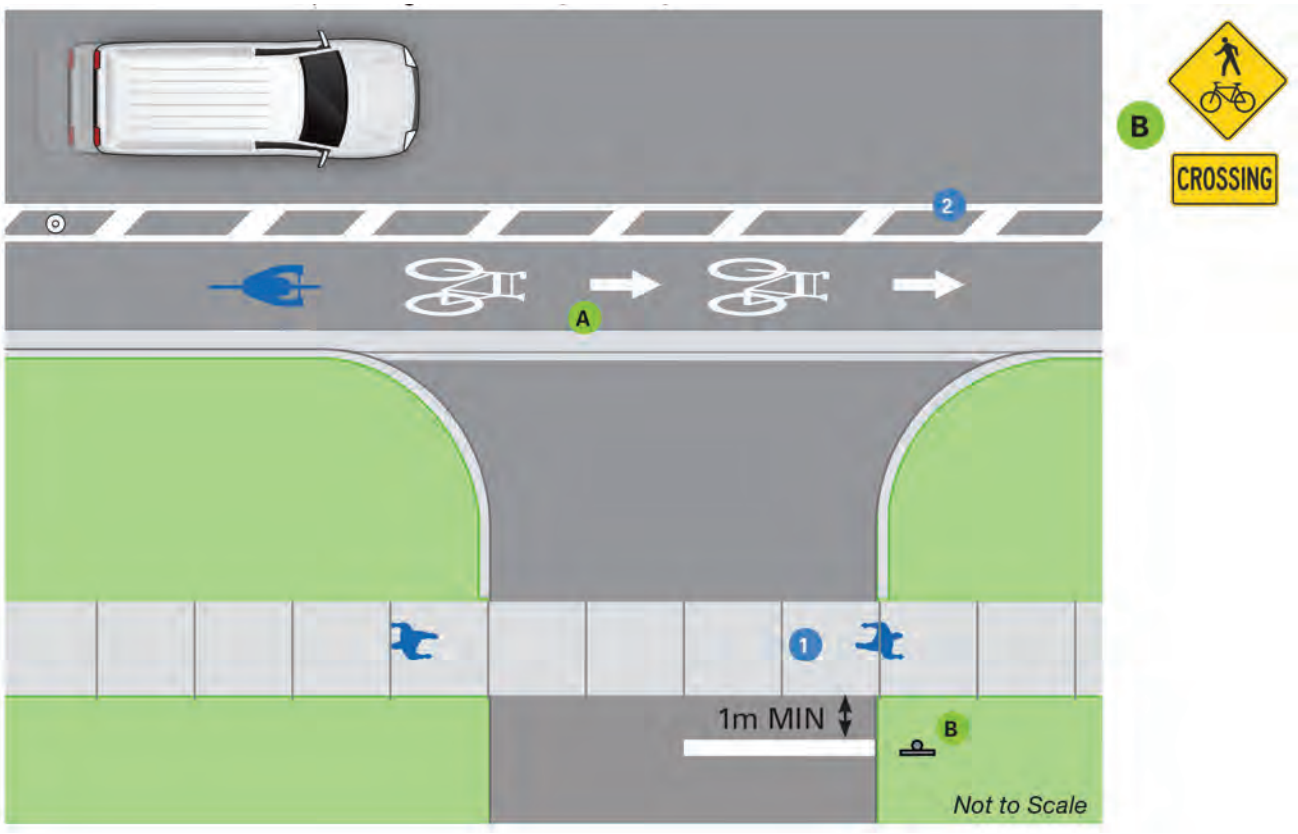
1. Sidewalk carried through the driveway
2. Buffer of cycling facility carried through the driveway to emphasize that through cyclists have right of way over vehicles entering the roadway from the driveway

Preferred

A. Application of bike symbols across lanes of the driveway

B. Optional 'Stop' sign (Ra-1 – OTM) and corresponding stop bar, or 'Yield' sign (Ra-2 – OTM) without stop bar. Where neither stop or yield conditions are warranted, consider applying a 'Pedestrian and Bicycle Crossing Ahead Sign' and tab (Wc-15 - OTM & Wc-32t - OTM)

Exhibit 6-16. On-Road Bikeway crossing a Multi-Family Driveway



Separated On-Road Bikeway crossing a Commercial/Industrial/High-Volume Driveway

This treatment to be applied at higher volume driveways or where blocking of the driveway by drivers entering the street or visibility of the path to drivers entering the driveway is of concern.

Minimum

1. Sidewalk carried through the driveway
2. Buffer of cycling facility to be dashed through the driveway to alert cyclists of the potential for vehicles to enter the roadway from the driveway and include application of bike symbols across lanes of the driveway
3. Where delineators are used in the buffer of the cycling facility, they should be set back from the point of tangent of the driveway radius by a minimum of 2 m

Preferred

A. Green conflict zone pavement markings

B. Customized 'Turning Vehicles Yield To Bicycles' (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists

C. Optional 'Stop' sign (Ra-1 – OTM) and corresponding stop bar, or 'Yield' sign (Ra-2 – OTM) without stop bar. Where neither stop or yield conditions are warranted, consider applying a 'Pedestrian and Bicycle Crossing Ahead Sign' and tab (Wc-15 - OTM & Wc-32t - OTM)

Exhibit 6-17. On-Road Bikeway crossing a High Volume Driveway

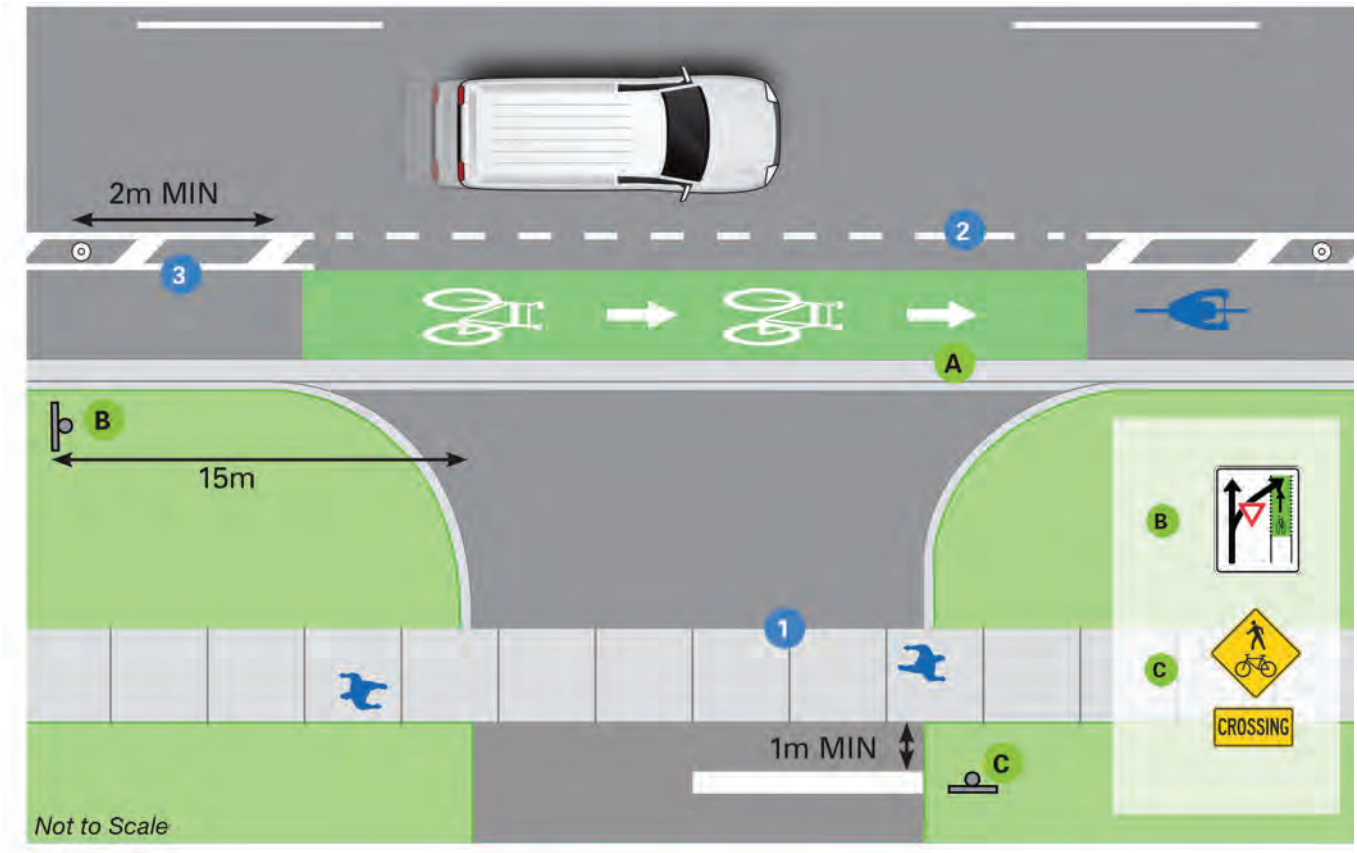


Exhibit 6-18. Solid buffer of separated bikeway carried across a multi-family residential driveway

Source: IBI Group

In-Boulevard Cycle Track crossing a Multi-Family Residential Driveway

This treatment will help to improve the conspicuity of the cycle track and is recommended for multi-family residential driveways.

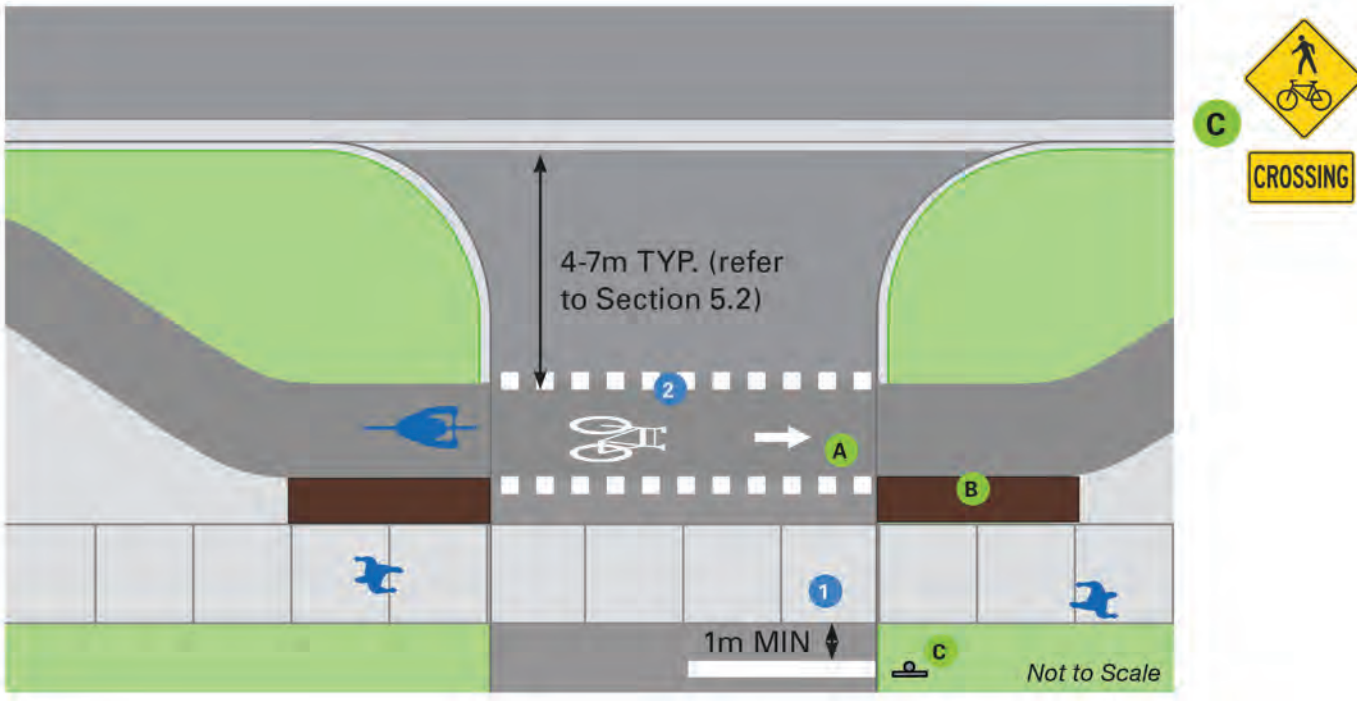
Minimum

1. Sidewalk carried through the driveway
2. Elephant's feet markings (refer to Section 7 for details)

Preferred

- **A** Application of bike symbol and arrow across lanes of the driveway
- **B** Delineation of cycling and pedestrian space where the two facilities approach each other through the application of paving stones or other high contrast treatment
- **C** Optional 'Stop' sign (Ra-1 – OTM) and corresponding stop bar, or 'Yield' sign (Ra-2 – OTM) without stop bar. Where neither stop or yield conditions are warranted, consider applying a 'Pedestrian and Bicycle Crossing Ahead Sign' and tab (Wc-15 - OTM & Wc-32t - OTM)

Exhibit 6-19. In-Boulevard Cycle Track crossing a Multi-Family Driveway



In-Boulevard Cycle Track crossing a Commercial/Industrial/High-Volume Driveway

This treatment to be applied at higher volume driveways or where blocking of the driveway by drivers entering the street or visibility of the path to drivers entering the driveway is of concern.

Minimum

1. Sidewalk carried through the driveway
2. Elephant's feet markings (refer to Section 7 for details) with application of bike symbol and arrow across lanes of the driveway

Preferred

- **A** Green conflict zone pavement marking
- **B** Customized 'Turning Vehicles Yield To Bicycles' (RB-37 – TAC) signage to alert turning drivers that they must yield to through cyclists
- **C** Optional 'Stop' sign (Ra-1 – OTM) and corresponding stop bar, or 'Yield' sign (Ra-2 – OTM) without stop bar. Where neither stop or yield conditions are warranted, consider applying a 'Pedestrian and Bicycle Crossing Ahead Sign' and tab (Wc-15 - OTM & Wc-32t - OTM)
- **D** Delineation of cycling and pedestrian space where the two facilities approach each other through the application of paving stones or other high contrast treatment

Exhibit 6-20. In-Boulevard Cycle Track crossing a High-Volume Driveway

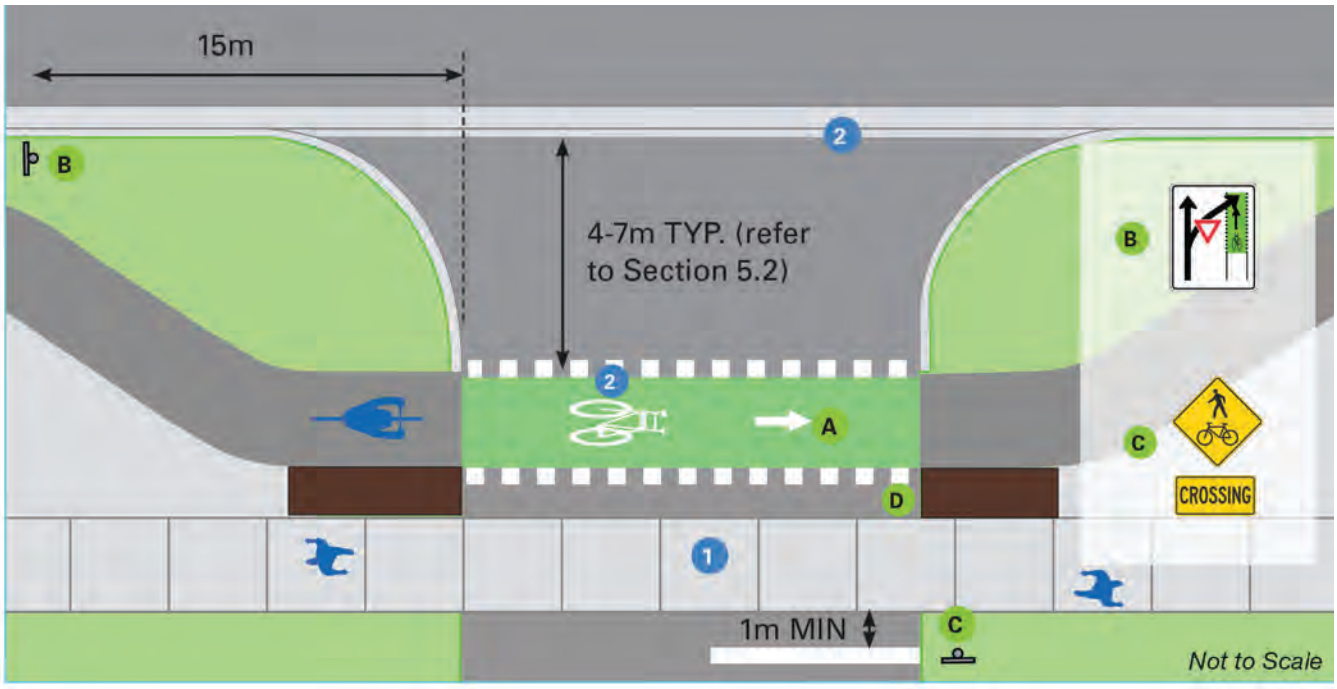
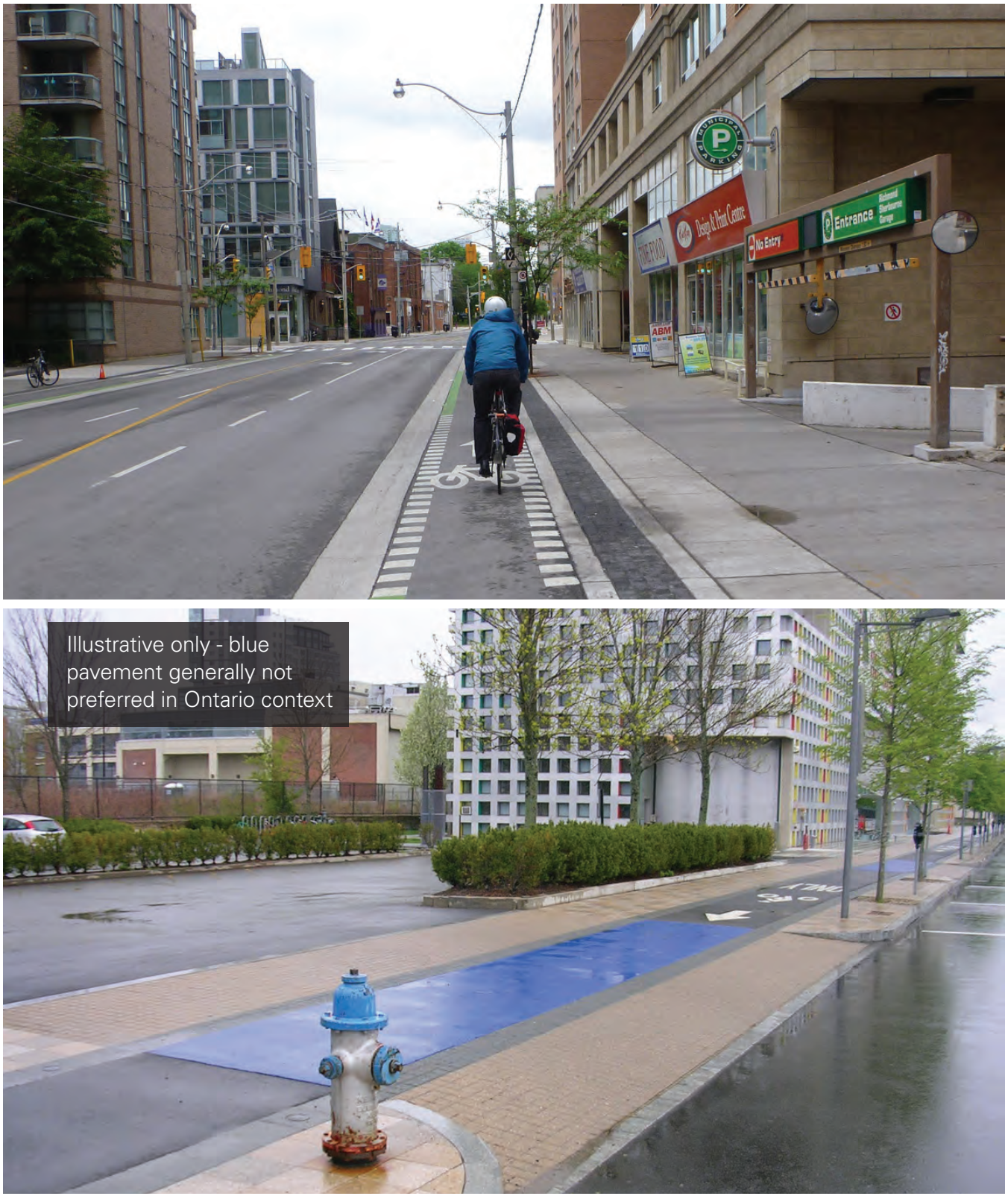


Exhibit 6-21. Example of high visibility treatments for cycle tracks at driveways



Source: IBI Group

Exhibit 6-22. Example of a Multi-use Path bent behind a Transit Shelter in York Region

Source: York Region


Cochrane
2012
Cycle Safe
LUAS

7.0 Pavement Markings and Signage

This chapter summarizes the details of the pavement marking and signage identified in the preceding chapters, focusing primarily on the applications associated with the pedestrian and cycling facilities.

7.1 SIGNAGE

This chapter focuses on regulatory and warning signage for pedestrian and cycling facilities. This chapter is not intended to cover all applicable signage for every scenario, but refers to the most commonly referenced signs in these guidelines.

Please refer to the corresponding Regional standards, OTM books and TAC guidelines for detailed guidance on the use of these signs.

7.1.1 Regulatory Signage

Right-of-Way Control Signage

STOP SIGN

OTM Ra-1 – 600 mm X 600 mm

OTM Ra-101 – 750 mm x 750 mm

OTM Ra-1101 – 1200 mm x 1200 mm

Source: OTM Book 5

APPLICATIONS	Unsignalized Intersections (Chapter 5.2.2) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• To direct motorists exiting a driveway or minor roadway and crossing a cycling or pedestrian facility to stop before crossing the facility • Place minimum 1m in advance of the cycling or pedestrian facility crossing (but ideally no farther than 15m from the edge of the intersecting street) • Where a stop sign is applied to a pedestrian or cycling facility and is not intended for vehicles, the size of the sign may be reduced to a minimum horizontal and vertical dimension of 300 mm
FURTHER GUIDANCE	OTM Book 5

YIELD SIGN

OTM Ra-2 – 750 mm

OTM Ra-102 – 900 mm

Source: OTM Book 5

APPLICATIONS	Unsignalized Intersections (Chapter 5.2.2) Freeway Crossings (Chapter 5.4)
USAGE & LOCATION CRITERIA	• In these guidelines, used to direct motorists exiting a driveway or minor roadway and crossing a cycling or pedestrian facility to yield to pedestrians and cyclists before crossing the facility • Another application is to warn cyclists and pedestrians crossing freeway merge / diverge ramps to yield to motor vehicles using the ramps • Place minimum 1m in advance of the cycling or pedestrian facility crossing (but ideally no farther than 15m from the edge of the intersecting street) • May be combined with the educational 'YIELD' tab (OTM Ra-2t, Ra-102t) as needed where motorists/cyclists may be unfamiliar with the signage • Where a yield sign is applied to a pedestrian or cycling facility and is not intended for vehicles, the size of the sign may be reduced to a minimum dimension of 450 mm
FURTHER GUIDANCE	OTM Book 5

TURNING VEHICLES YIELD TO BICYCLES SIGN

TAC RB-37 - 600 mm x 750 mm (CUSTOMIZED)

Source: Adapted from TAC Bikeway Traffic Control Guidelines for Canada, p. 15

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Facility Transitions (Chapter 5.2.3) Rural Intersections (Chapter 5.3) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Used to alert drivers that they must yield to through cyclists • Conflict zone marking on the sign must be customized to reflect the specific markings applied at the crossing • Generally placed 15m in advance of the crossing / conflict zone
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

YIELD TO PEDESTRIANS SIGN

OTM Rb-73 / TAC RB-39 - 300 mm x 450 mm

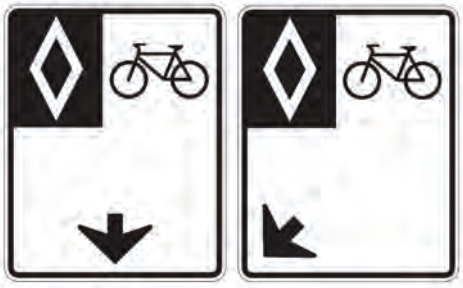
Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 15

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Facility Transitions (Chapter 5.2.3) Rural Intersections (Chapter 5.3) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Used to alert cyclists that they must yield to through cyclists
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

RESERVED BICYCLE LANE SIGN

TAC RB – 90 (Overhead) – 600 mm x 750 mm

TAC RB-91 (Adjacent) – 600 mm x 750 mm



Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 24

APPLICATIONS	Signalized Intersections (Chapter 5.2.1)
USAGE & LOCATION CRITERIA	• For on-road facilities and separated cycle tracks, installed downstream from each intersection, at a maximum of 15m from the end of the curb radius, with subsequent signs installed at 200m intervals
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

RESERVED BICYCLE LANE ENDS SIGN

TAC RB – 92 – 600 mm x 750 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 24

APPLICATIONS	Signalized Intersections (Chapter 5.2.1)
USAGE & LOCATION CRITERIA	• For on-road facilities and separated cycle tracks, installed downstream from each intersection, at a maximum of 15m from the end of the curb radius, with subsequent signs installed at 200m intervals
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

AUTOMOBILES AND MOTORCYCLES PROHIBITED SIGN

TAC RB-89 - 600 mm x 600 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 23

APPLICATIONS	Signalized Intersections (Chapter 5.2.1)
USAGE & LOCATION CRITERIA	• For on-road facilities and separated cycle tracks, installed downstream from each intersection, at a maximum of 15m from the end of the curb radius, with subsequent signs installed at 200m intervals
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

SHARED PATHWAY SIGN

TAC RB-93 - 300 mm x 450 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 23

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Facility Transitions (Chapter 5.2.3) Midblock Crossings (Chapter 5.6) Roundabouts (Chapter 5.8)
USAGE & LOCATION CRITERIA	• Used to indicate to pedestrians and cyclists that they are using a shared facility • Typically installed following intersections, or at the start / end of shared path segments
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

7.1.2 Warning Signage

Specific Road and Bikeway Features

HILL SIGN FOR BICYCLES

TAC WA-41 – 450 mm x 450 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 33

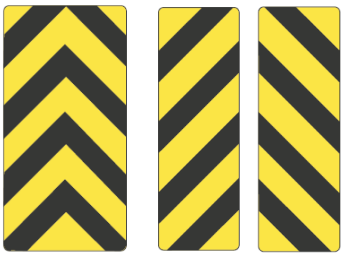
APPLICATIONS	As needed, depending on the grade of the cycling facility
USAGE & LOCATION CRITERIA	• Applied to warn cyclists of a downgrade of 10 percent or more for lengths of 50m or more and where the length of the downgrade is 50m or more • Can also be considered where the grade is on a horizontal curve which makes higher speeds dangerous • Can be supplemented by Distance Advisory supplementary tab sign (WA-28S) to indicate the length of bikeway over which the cyclist can expect to encounter the grade
FURTHER GUIDANCE	TAC Bikeway Traffic Control Guidelines

OBJECT MARKER

TAC WA-36– 300 mm x 600 mm

TAC WA-36L – 225 mm x 600 mm

TAC WA-36R – 225 mm x 600 mm



Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 35

APPLICATIONS	As needed, depending on obstructions / hazards within the bikeway
USAGE & LOCATION CRITERIA	• Applied to warn cyclists of obstructions adjacent to or within the bikeway, particularly where such obstructions encroach on the lateral clearance of the bikeway • Typically mounted directly on the hazard itself or just in front of the hazard
FURTHER GUIDANCE	TAC Bikeway Traffic Control Guidelines

Intermittent or Moving Hazards

PEDESTRIAN AND BICYCLE CROSSING AHEAD SIGN

TAC WC-46L – 600 mm x 600 mm

TAC WC-46R – 600 mm x 600 mm (pictured)

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 37

APPLICATIONS	Freeway Crossings (Chapter 5.4) Midblock Crossings (Chapter 5.6)
USAGE & LOCATION CRITERIA	• Use in advance of crossing on driveways facing drivers exiting the driveway of high-volume driveways serving medium to high-density residential, retail/ commercial and employment developments, or where blocking of the driveway by drivers entering the street is of concern • The pedestrian and bicycle symbols are oriented towards the centre of the road • The Crossing supplementary tab sign (WC-7S) must be used to convey the meaning of the Pedestrian and Bicycle Crossing Ahead sign • Typically placed 1 to 15m in advance of the path crossing on the driveway but within the roadway right-of-way
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

RAILWAY CROSSING AHEAD SIGN

TAC WA-18 – 450 mm x 450 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 32

APPLICATIONS	Railway Crossings (Chapter 5.7)
USAGE & LOCATION CRITERIA	• Used to alert pedestrians and cyclists of upcoming at grade railway crossings
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

CROSSING TAB

TAC WC-7s / OTM Wc-32t –
300 mm x 600 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 38

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Midblock Crossings (Chapter 5.6)
USAGE & LOCATION CRITERIA	• Supplementary tab to crossing warning signs
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

BICYCLE TRAIL CROSSING SIDE STREET SIGN

TAC WC-44 - 600 mm x 600 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 38

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Midblock Crossings (Chapter 5.6)
USAGE & LOCATION CRITERIA	• In the context of pedestrian and cycling facilities, placed on the roadway at the approach to an intersection with a side street where a parallel in-boulevard facility crosses the side street close to the through road • Use in advance of crossing on driveways facing drivers exiting the driveway of high-volume driveways serving medium to high-density residential, retail/ commercial and employment developments, or where blocking of the driveway by drivers entering the street is of concern • Place TAC WC-44R on roadway 15m in advance of a path crossing of a driveway to the right • Place TAC WC-44L on roadway 30m in advance of a path crossing of the driveway to the left. If the major street has a left-turn lane adjacent the median, place the sign on the median, 15 to 30m in advance of the stop bar
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

SLOW WATCH FOR TURNING VEHICLES

OTM Custom Sign
Suggested Size: 450 mm x 450 mm

Source: Adapted from OTM Book 18

APPLICATIONS	As needed, depending on project-specific considerations
USAGE & LOCATION CRITERIA	• Optional sign which may be applied along cycling or trail facilities to alert cyclists of turning motorists • Generally located 15m in advance of crossing
FURTHER GUIDANCE	OTM Book 18

7.1.3 Guide & Information Signs & Tabs

BICYCLE SIGNAL LOOP DETECTOR STENCIL SIGN

TAC ID-24 - 130 mm x 200 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, p. 44

APPLICATIONS	Signalized Intersections (Chapter 5.2.1)
USAGE & LOCATION CRITERIA	• Where a traffic control signal is loop-activated, used to indicate where a cyclist should be positioned to activate a green signal phase
FURTHER GUIDANCE	TAC Bikeway Traffic Control Guidelines for Canada

BICYCLE ROUTE MARKER SIGN

OTM M511 /TAC IB-23 - 450 x 450 mm

Source: TAC Bikeway Traffic Control Guidelines for Canada, 2012 p. 44

APPLICATIONS	Facility Transitions (Chapter 5.2.3)
USAGE & LOCATION CRITERIA	• The Bicycle Route Marker sign provides route guidance for cyclists and indicates those streets, highways and separate facilities which form part of a bicycle route system (refer to York Region's Wayfinding Guidelines) • The sign can also be applied where facilities transition to clarify the cyclist path of travel through an intersections • This sign is typically unnecessary when the Reserved Bicycle Lane signs (RB-90, RB-91) are used
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

CYCLIST USE PEDESTRIAN SIGNAL SIGN

Source: MUTCD

APPLICATIONS	As needed, depending on project-specific considerations
USAGE & LOCATION CRITERIA	• Install adjacent the pedestrian signal head facing the path users to indicate to cyclists to follow the pedestrian signal head indications • Install adjacent pedestrian signal head, min. 3.7 m vertical clearance over sidewalk surface
FURTHER GUIDANCE	Not currently included in Ontario guidance

USE BIKE BOX FOR LEFT TURN SIGN

York Region Custom Sign - 600 x 750 mm

Source: York Region

APPLICATIONS	As needed, where two-stage left turn queue boxes are applied
USAGE & LOCATION CRITERIA	• Alerts cyclists to the presence of a two-stage left turn queue box to facilitate left turns
FURTHER GUIDANCE	Not currently included in Ontario guidance

7.1.4 Signage Placement

Placement of all signs should conform to OTM Book 1B. According to OTM Book 1B, the basic guidelines for horizontal mounting offsets are as follows:

- **Rural areas without raised curbs:**
  2 m to 4 m from the outside edge of the outer traffic lane.
- **Urban or residential areas with raised curbs:**
  30 cm to 2 m from the curb line.

Where the signs will be placed adjacent pedestrian and/or cycling facilities rather than vehicular lanes, similar horizontal clearances are acceptable, except that a minimum lateral clearance of 50 cm to the pedestrian or cycling facility is preferred.

The basic guidelines for vertical mounting offsets of ground-mounted signs are:

- **Areas with no pedestrians and without raised curbs:** 1.5 m to 2.5 m from curb line to bottom of principal sign, regardless of whether there is a tab sign mounted beneath principal sign
- **Areas with no pedestrians and with raised curbs:** 1.5 m to 2.5 m from curb line to bottom of principal sign, regardless of whether there is a tab sign mounted beneath principal sign
- **Areas with pedestrians:** 2 m to 3 m from ground elevation at the base of the sign post to the bottom of the overall sign, including tab if present

Per OTM Book 1B, "typical sign placement is upstream of the condition to which the sign applies. Signs should normally be placed individually on separate posts, except where one sign supplements the other, or where route

7.1.5 Wayfinding Signage

Wayfinding provides direction to help pedestrians and cyclists navigate through space and among places. When wayfinding is successful, it goes beyond providing information, and supports placemaking, enriching the public realm. Wayfinding that highlights options for walking and cycling are important investments that help to build a multimodal transportation system.

York Region has developed a *York Region Active Transportation Wayfinding Guidelines* document that covers the following topics related to wayfinding:

- Purpose and goals of wayfinding signage
- Existing wayfinding signage in York Region
- General principles of wayfinding signage
- Proposed family of wayfinding signage
- Sign design considerations
- Sign placement criteria
- Considerations for implementation

For detailed guidance, please refer to the *York Region Active Transportation Wayfinding Guidelines.*

7.2 PAVEMENT MARKINGS

This chapter provides a concise summary of the various pavement markings presented in these guidelines.

Please refer to the corresponding Regional standards, OTM books and TAC guidelines for detailed guidance on the use of these signs.

7.2.1 Longitudinal & Transverse Pavement Markings

SOLID WHITE LINE

100 mm solid white line

200 mm solid white lane

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Transit Integration (Chapter 6.1) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• In the context of pedestrian and cycling facilities, generally used as an edge line for a uni-directional facility (i.e. bike lanes or buffered bike lanes) or • May also be used to indicate a hazard on one side of a facility (i.e. multi-use path) • Use of the wider 200mm line should be considered for the outer edge of any on-road cycling facilities (i.e. bike lanes, buffered bike lanes, paved shoulders)
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

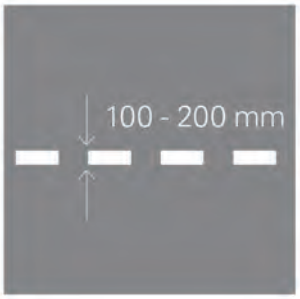
SOLID YELLOW DIVIDING LINE

100 mm solid yellow line

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Transit Integration (Chapter 6.1) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Applied to multi-use paths to indicate no passing zones
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

DASHED WHITE DIVIDING LINE/GUIDING LINE

100 mm 1 m x 1 m dashed white line

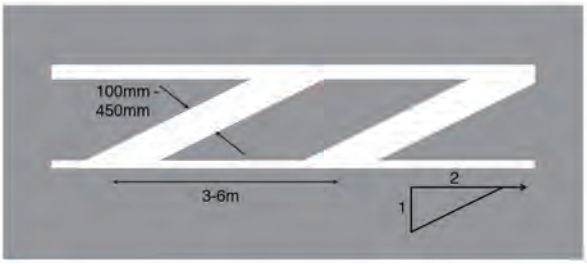


APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Transit Integration (Chapter 6.1) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Applied to multi-use paths to indicate no passing zones
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

BUFFER HATCHING

100 mm solid white line on either side or 200 mm solid white line on outer edge

100 mm – 450 mm diagonal lines at 30 degrees



APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Transit Integration (Chapter 6.1) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• In the context of pedestrian and cycling facilities, a dashed white line is generally used to indicate an on-road cycling facility that can be crossed (for example, where a driver is expected to pull into the bike lane to make a right turn at a driveway or intersection approach) • Spacing of hatching can be 3m MIN, 6m MAX; Consider 3m in urban areas, 6m in rural areas
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

ELEPHANT'S FEET FOR CROSSRIDES

Two sets of 200-400 mm broken white 200-400 mm line, 200-400 mm skip

Source: OTM Book 18, p. 120

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Typically used where an in-boulevard facility crosses a roadway or driveway • 400mm width is typical for Regional roads • Place crossride through the entire width of the driveway or intersection
FURTHER GUIDANCE	OTM Book 18

LADDER CROSSWALK MARKING

0.6 m x 2.5 m (MIN) bars, spaced at 0.6 m, with 0.2 m transverse lines

Source: OTM Book 15, p. 50

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Facility Transitions (Chapter 5.2.3) Rural Intersections (Chapter 5.3) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Used to delineate the pedestrian path through an intersection/crossing • Offset crosswalk marking (except for transverse lines) 0.6m from curb ramp to reduce slip hazards • Crosswalk typically placed 1.0m in advance of the vehicular stop bar
FURTHER GUIDANCE	OTM Book 15, York Region Standard Drawing DS-119 for signalized intersections

7.2.2 Symbol Pavement Markings

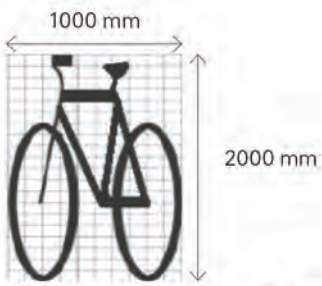
PEDESTRIAN SYMBOL

Pedestrian Symbol

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Applied to indicate or clarify the pedestrian path of travel (typically along a multi-use path, or where pedestrian and cyclists paths diverge/merge • Optional treatment (depending on context)
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

BIKE SYMBOL

Bike symbol

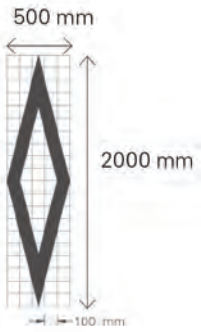


Source: OTM Book 18, p. 65

APPLICATIONS	Bike lanes, Buffered Bike Lanes, Separated Bike Lanes, Multi-use Paths, Cycle Tracks Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Midblock Crossings (Chapter 5.6) Roundabouts (Chapter 5.8) Transit Integration (Chapter 6.1) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Used to designate space for cyclist or shared use (when combined with pedestrian symbol) • When combined with Diamond Symbol and signage, indicates space that is formally designated for use by cyclists only
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

DIAMOND SYMBOL

Diamond symbol with stroke width of 75 mm

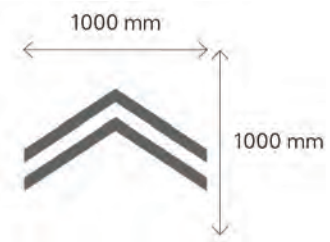


Source: TAC Bikeway Traffic Control Guidelines For Canada, 2nd Edition, p, 58

APPLICATIONS	Bike lanes, Buffered Bike Lanes, Separated Bike Lanes Signalized Intersections (Chapter 5.2.1)
USAGE & LOCATION CRITERIA	• Used to indicate a lane is reserved (for cyclists) • Combined with bicycle symbol • Combined with signage indicating the lane is reserved for use by bicycles (TAC RB-90, RB-91, RB-92)
FURTHER GUIDANCE	OTM Book 18, OTM Book 11

CHEVRON

Double arrow marking with stroke width of 100 mm, spaced at 100 mm

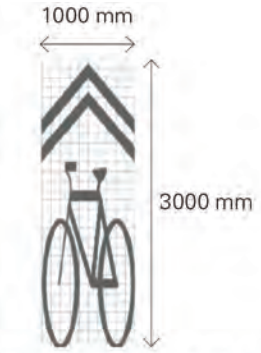


Source: OTM Book 18, p. 47

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Retrofit Dedicated Bikeway through Bus Bay (Chapter 6.1)
USAGE & LOCATION CRITERIA	• Chevron spacing to confirm to specific recommendations in guideline (typically 3.5m in urban areas; 8-10m in rural areas) • Placement should try to avoid vehicular turning paths in order to reduce maintenance costs
FURTHER GUIDANCE	OTM Book 18

SHARROW

Consists of bicycle symbol and chevrons



Source: OTM Book 18, p. 47

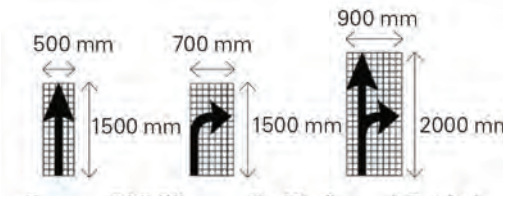
APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Rural Intersections (Chapter 5.3) Unsignalized Intersections (Chapter 5.2.2) Retrofit Dedicated Bikeway through Bus Bay (Chapter 6.1)
USAGE & LOCATION CRITERIA	• Sharrow spacing to confirm to specific recommendations in guideline (typically 3.5m in urban areas; 8-10m in rural areas) • Placement should try to avoid vehicular turning paths in order to reduce maintenance costs • Sharrows should not be applied in combination with dashed guide lines through conflict zones (per OTM Book 18, p. 140)
FURTHER GUIDANCE	OTM Book 18

REDUCED SIZE PEDESTRIAN & CYCLIST DIRECTIONAL ARROWS

Through arrow

Right turn arrow

Through – right arrow

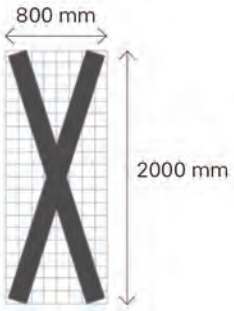


Source: TAC Bikeway Traffic Control Guidelines For Canada, 2nd Edition, p, 60

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Facility Transitions (Chapter 5.2.3) Unsignalized Intersections (Chapter 5.2.2) Midblock Crossings (Chapter 5.6) Roundabouts (Chapter 5.8) Transit Integration (Chapter 6.1) Driveways (Chapter 6.2)
USAGE & LOCATION CRITERIA	• In the context of pedestrian and cycling facilities, generally used to indicate directions of travel specific to multi-use path or cycle tracks users; Where motorists are required to see and interpret the arrow, a full-sized elongated motorist directional arrow should be used instead • Often combined with the bicycle or pedestrian symbol
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines For Canada

RAILWAY CROSSING SYMBOL

150 mm wide elongated 'X' symbol



Source: TAC Bikeway Traffic Control Guidelines for Canada, 2nd Edition, p, 59

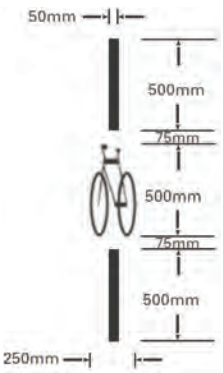
APPLICATIONS	Railway Crossings (Chapter 5.5)
USAGE & LOCATION CRITERIA	• Used to alert cyclists of an approaching at-grade rail crossing • Offset from rail crossing to correspond with placement of 'X' symbol for vehicles
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines for Canada

BICYCLE DETECTION MARKING SYMBOL

Through arrow

Right turn arrow

Through – right arrow

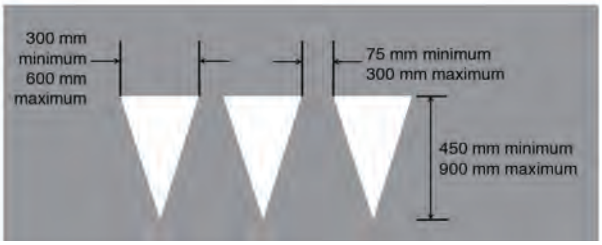


Source: Adapted from TAC Bikeway Traffic Control Guidelines For Canada, 2nd Edition, p, 61

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Signal Operations (Chapter 8.0)
USAGE & LOCATION CRITERIA	• Used to identify where a cyclist should wait at a signalized intersection to ensure actuation of the signal • Can be supplemented with the TAC ID-24 'Bicycle Signal Loop Detector Stencil' Sign (refer to Section 7.1)
FURTHER GUIDANCE	OTM Book 18, TAC Bikeway Traffic Control Guidelines For Canada

YIELD MARKING

300 X 450 mm triangle markings



Source: OTM Book 15 (June 2016), p. 48

APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Facility Transitions (Chapter 5.2.3) Midblock Crossings (Chapter 5.6) Roundabouts (Chapter 5.8) Transit Integration (Chapter 6.1)
USAGE & LOCATION CRITERIA	• Marking used to indicate the point at which a vehicle/cyclist must yield to pedestrians • In many of the boulevard applications shown in the guidelines, combined with TAC RB-73 signage to indicate that cyclists must yield to pedestrians • Required at all PXO applications (refer to Book 15)
FURTHER GUIDANCE	OTM Book 15

GREEN CONFLICT ZONE MARKING

Green pavement marking applied for cycling applications to alert drivers/cyclists of potential conflicts or

May also be applied to increase awareness of cyclist turning movements

Source: York Region

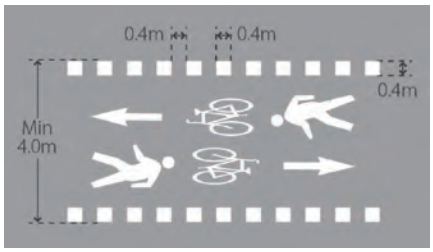
APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Unsignalized Intersections (Chapter 5.2.2) Transit Integration (Chapter 6.1) Driveway crossings (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Conflict zone marking generally applied through the conflict zone area • Width of conflict zone marking should correspond with the width of the approaching cycling facility (generally minimum 2.0m) • The use of preformed thermoplastic for green applications is preferred in York Region, and has been applied on Highway 7, Ninth Line and across interchange conflict zones. MMA is also used in some applications, and is found to be less expensive to install, however there are concerns with skid resistance over the longer term.
FURTHER GUIDANCE	OTM Book 18, Green Skid/Slip Resistant Preformed Thermoplastic Pavement Markings OPSS 710

7.2.3 Intersection & Crossing Markings (Combination of Longitudinal & Symbols)

MIXED PEDESTRIAN AND CYCLIST CROSSRIDE

Two sets of elephant's feet
(400 mm broken white 0.4 m line, 0.4 m skip)

White pedestrian, bicycle and arrow symbols



Source: OTM Book 18, p. 160

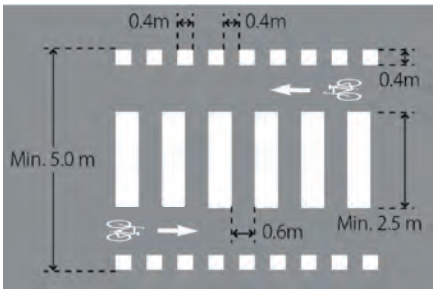
APPLICATIONS	Unsignalized Intersections (Chapter 5.2.2) Driveway crossings (Chapter 6.2)
USAGE & LOCATION CRITERIA	• Applied to unsignalized crossings only • Place crossride through the entire width of the driveway or intersection at a minimum of 4m spacing between the broken lines or matching the path width (whichever is greater) • Width of crossride can be reduced to 3.0m in constrained areas (where width of path is less than 3.0 m) • Place the pedestrian, bicycle and arrow symbols within the crossing so that at least one symbol is aligned with each lane of the driveway or intersection
FURTHER GUIDANCE	OTM Book 18

COMBINED PEDESTRIAN AND CYCLIST CROSSRIDE

Two sets of elephant's feet
(400 mm broken white 0.4 m line, 0.4 m skip)

Crosswalk ladder markings

Optional bicycle symbols and arrows applied between the crosswalk and the crossride markings (recommended for Regional roads)



Source: OTM Book 18, p. 123

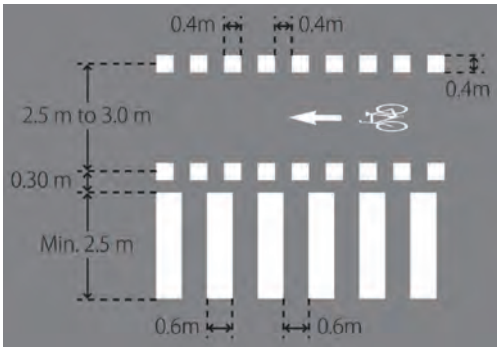
APPLICATIONS	Signalized Intersections (Chapter 5.2.1) Facility Transitions (Chapter Midblock Crossings (Chapter 5.6) Roundabouts (Chapter 5.8)
USAGE & LOCATION CRITERIA	• Place crossride through the entire width of the intersection/crossing at a minimum of 5m spacing between the broken lines or matching the path width (whichever is greater) • Where used, place the bicycle and arrow symbols within the crossing so that at least one symbol is aligned with each lane of the crossing
FURTHER GUIDANCE	OTM Book 18

SEPARATED CROSSRIDE

Two sets of elephant's feet
(400 mm broken white 0.4 m line, 0.4 m skip)

Crosswalk ladder markings spaced at 0.3 m from cyclist crossing

Optional bicycle symbols and arrows applied within the elephant's feet



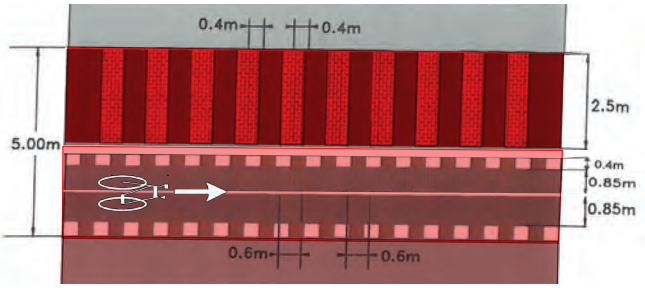
APPLICATIONS	Signalized Intersections (Chapter 5.2.1)
USAGE & LOCATION CRITERIA	• Preferred to a Combined Crossride where separated pedestrian and cycling facilities are provided • Where used, place the bicycle and arrow symbols within the crossing so that at least one symbol is aligned with each lane of the crossing
FURTHER GUIDANCE	OTM Book 18

MODIFIED CROSSRIDE

Two sets of elephant's feet
(400 mm broken white 0.4 m line, 0.4 m skip)

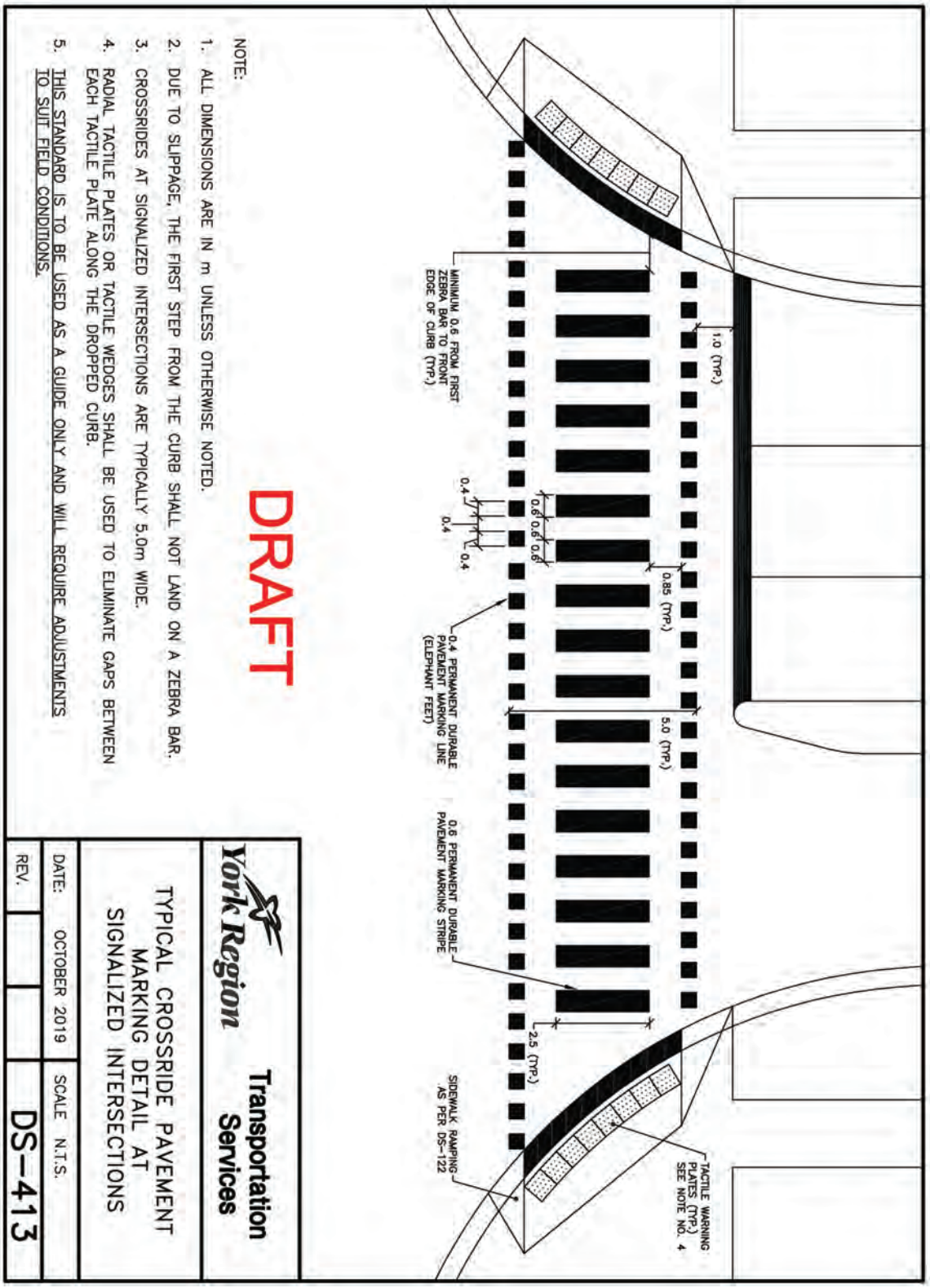
Crosswalk ladder markings

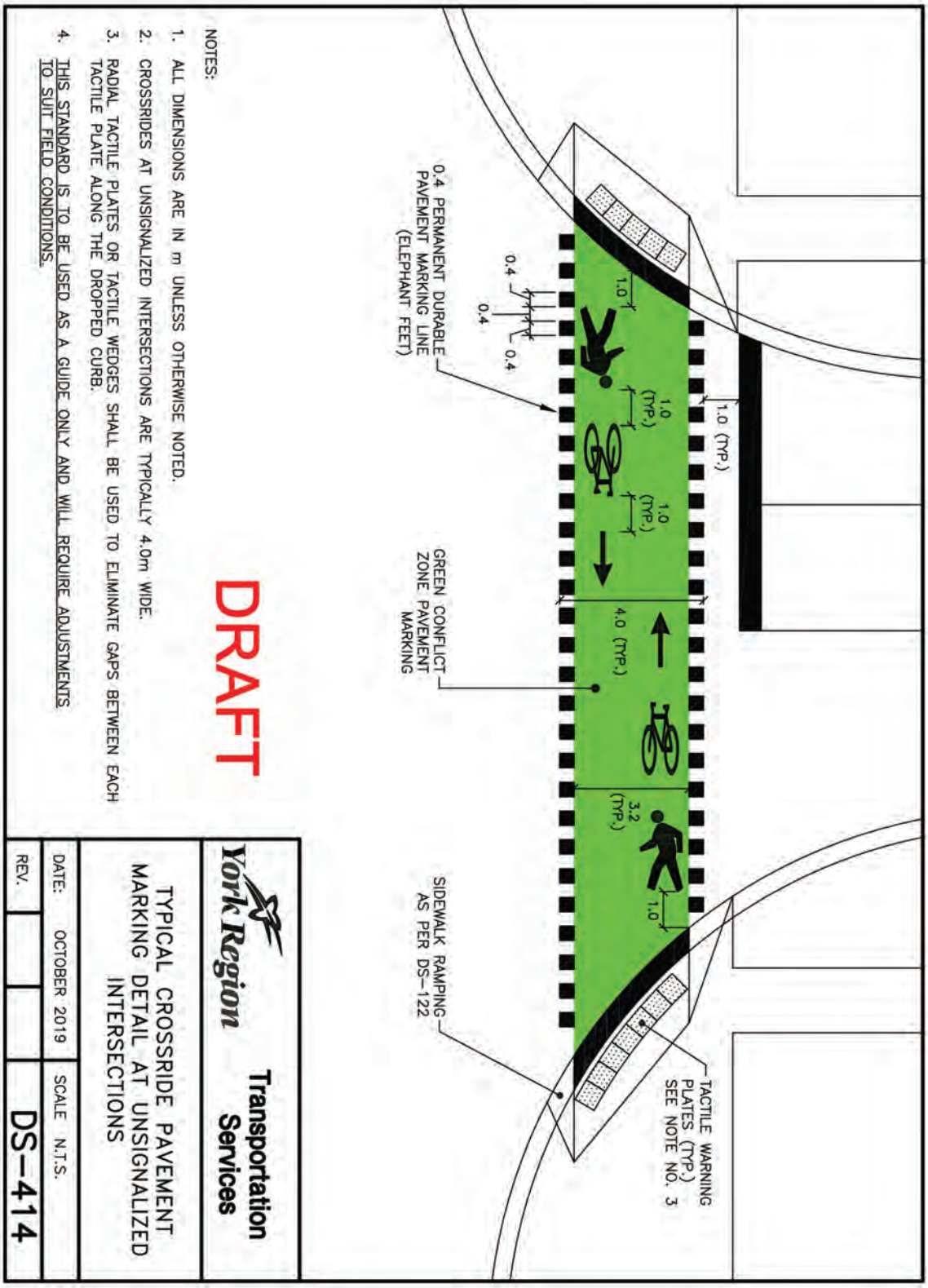
Bicycle symbol and arrows applied within the elephant's feet



APPLICATIONS	YRT Viva Corridors
USAGE & LOCATION CRITERIA	• Applied along YRT Viva Corridors
FURTHER GUIDANCE	YRT VIVA Standards & Specifications

7.2.4 York Region Design Standards Crossride DS-400 Series for Intersections & Driveways





DRAFT

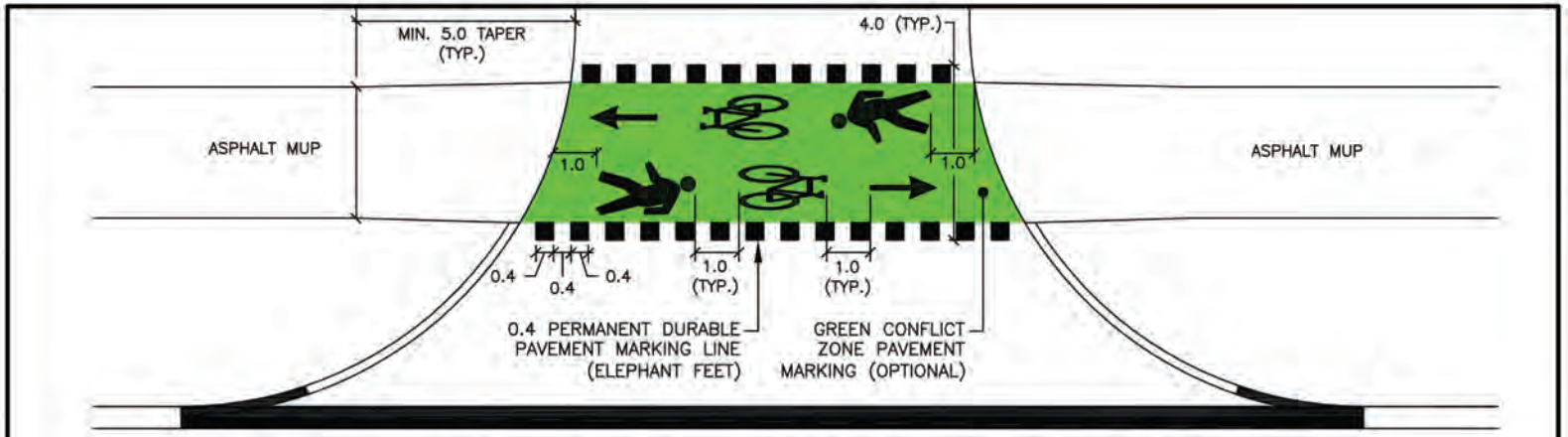
NOTES:

1. ALL DIMENSIONS ARE IN m UNLESS OTHERWISE NOTED.
2. CROSSRIDES AT UNSIGNALIZED INTERSECTIONS ARE TYPICALLY 4.0m WIDE.
3. RADIAL TACTILE PLATES OR TACTILE WEDGES SHALL BE USED TO ELIMINATE GAPS BETWEEN EACH TACTILE PLATE ALONG THE DROPPED CURB.
4. THIS STANDARD IS TO BE USED AS A GUIDE ONLY AND WILL REQUIRE ADJUSTMENTS TO SUIT FIELD CONDITIONS.

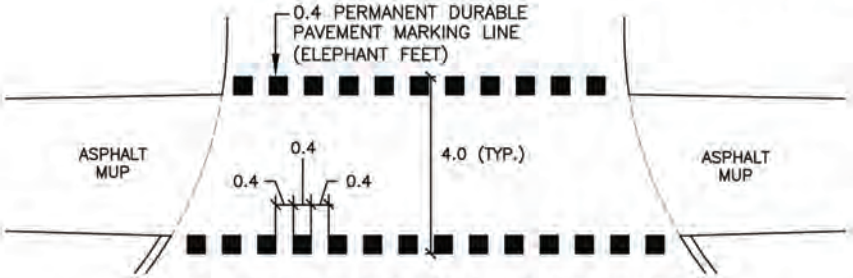
York Region Transportation Services

TYPICAL CROSSRIDE PAVEMENT MARKING DETAIL AT UNSIGNALIZED INTERSECTIONS

REV.			DATE: OCTOBER 2019	SCALE N.T.S.
				DS-414



COMMERCIAL/INDUSTRIAL DRIVEWAY (HIGH VOLUME)



MULTI–FAMILY RESIDENTIAL OR
COMMERCIAL/INDUSTRIAL DRIVEWAY (LOW VOLUME)

DRAFT

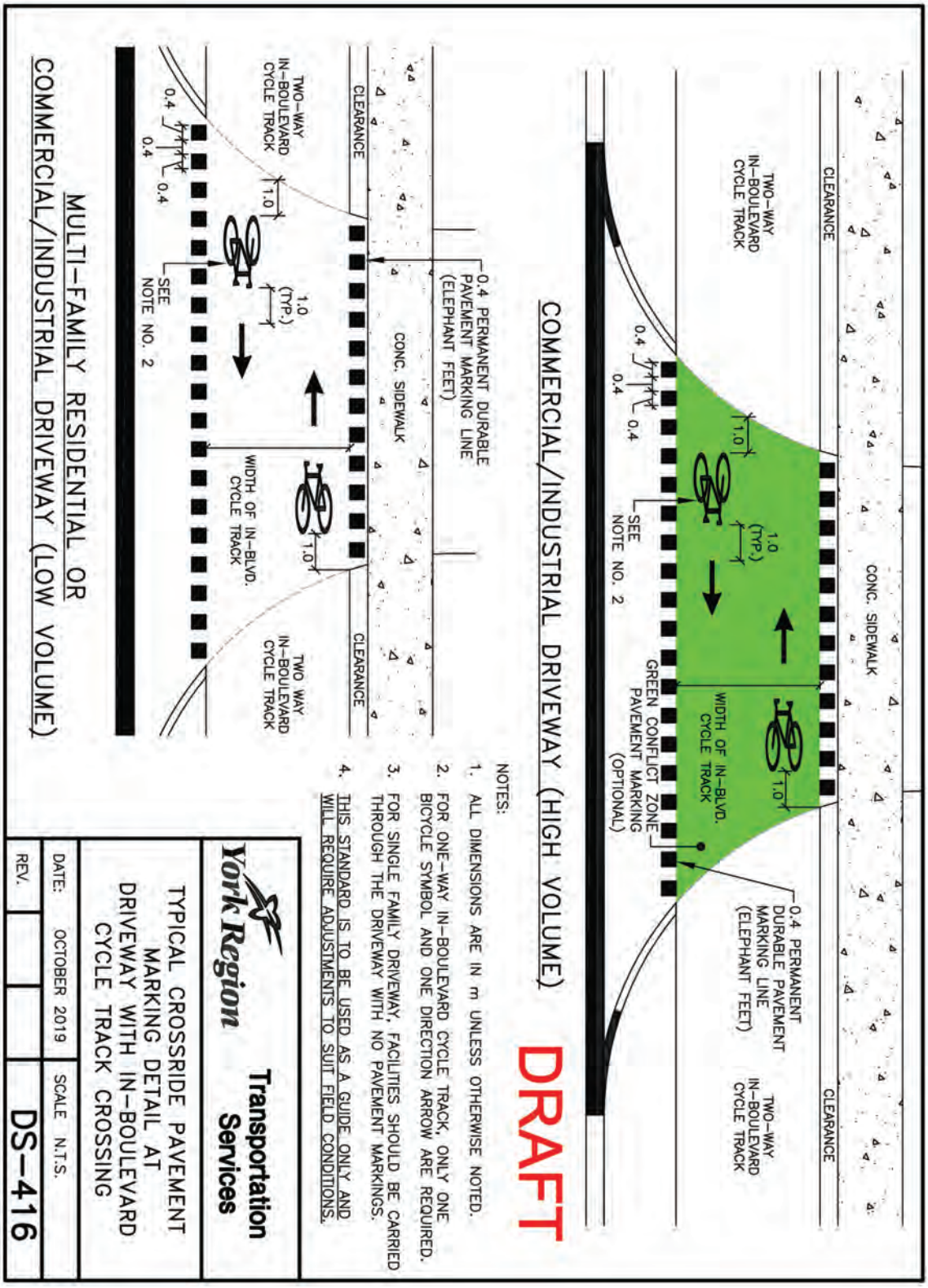
NOTES:

1. ALL DIMENSIONS ARE IN m UNLESS OTHERWISE NOTED.
2. CROSSRIDES AT DRIVEWAY ENTRANCE WITH MULTI–USE PATH CROSSING ARE TYPICALLY 4.0m WIDE.
3. FOR SINGLE FAMILY DRIVEWAY, FACILITIES SHOULD BE CARRIED THROUGH THE DRIVEWAY WITH NO PAVEMENT MARKINGS.
4. THIS STANDARD IS TO BE USED AS A GUIDE ONLY AND WILL REQUIRE ADJUSTMENTS TO SUIT FIELD CONDITIONS.

York Region **Transportation Services**

TYPICAL CROSSRIDE PAVEMENT MARKING DETAIL AT DRIVEWAY WITH MULTI–USE PATH CROSSING

DATE: OCTOBER 2019	SCALE N.T.S.
REV.	DS–415


CLEARANCE
TWO-WAY IN-BOULEVARD CYCLE TRACK
CONC. SIDEWALK
1.0
1.0 (TYP.)
WIDTH OF IN-BLVD. CYCLE TRACK
0.4
0.4
SEE NOTE NO. 2
GREEN CONFLICT ZONE PAVEMENT MARKING (OPTIONAL)
0.4 PERMANENT DURABLE PAVEMENT MARKING LINE (ELEPHANT FEET)
TWO-WAY IN-BOULEVARD CYCLE TRACK
CLEARANCE
COMMERCIAL/INDUSTRIAL DRIVEWAY (HIGH VOLUME)
DRAFT
NOTES:
1. ALL DIMENSIONS ARE IN m UNLESS OTHERWISE NOTED.
2. FOR ONE-WAY IN-BOULEVARD CYCLE TRACK, ONLY ONE BICYCLE SYMBOL AND ONE DIRECTION ARROW ARE REQUIRED.
3. FOR SINGLE FAMILY DRIVEWAY, FACILITIES SHOULD BE CARRIED THROUGH THE DRIVEWAY WITH NO PAVEMENT MARKINGS.
4. THIS STANDARD IS TO BE USED AS A GUIDE ONLY AND WILL REQUIRE ADJUSTMENTS TO SUIT FIELD CONDITIONS.
0.4 PERMANENT DURABLE PAVEMENT MARKING LINE (ELEPHANT FEET)
CONC. SIDEWALK
CLEARANCE
TWO-WAY IN-BOULEVARD CYCLE TRACK
1.0
1.0 (TYP.)
WIDTH OF IN-BLVD. CYCLE TRACK
1.0
TWO WAY IN-BOULEVARD CYCLE TRACK
CLEARANCE
0.4
0.4
0.4
SEE NOTE NO. 2
MULTI-FAMILY RESIDENTIAL OR
COMMERCIAL/INDUSTRIAL DRIVEWAY (LOW VOLUME)
York Region
Transportation Services
TYPICAL CROSSRIDE PAVEMENT MARKING DETAIL AT DRIVEWAY WITH IN-BOULEVARD CYCLE TRACK CROSSING
DATE: OCTOBER 2019
SCALE N.T.S.
REV.
DS-416

8.0 Signal Operations

Photo Source: IBI Group

8.1 OVERVIEW

Signal operations can have a significant impact on the comfort and safety of pedestrians and cyclists. The Region presently utilizes a number of best practices in signal phasing for pedestrians and cyclists.

For information on signal operations related to pedestrians, please refer to the Region's current practices & guidelines.

Since the application of separated bikeways is growing across the Region, **the following sections focus on phasing, timing and detection considerations for separated cycling facilities.**

8.2 SIGNAL PHASING FOR SEPARATED CYCLING FACILITIES

The following section summarizes some best practices for signal phasing for separated cycling facilities. In some cases, signal phasing modifications will be considered to enhance separated cycling facilities. Considerations for the applications of protected and leading bicycle phases are summarized below.

Protected Bicycle Phase – A fully protected cycling phase allows cyclists dedicated time in a cycle while vehicular movements are held.

A fully protected phase may be considered in the following cases:

- **At locations with two-way or contraflow bicycle movements** – In instances with bi-directional separated cycling facilities, intersection movements are complex. Drivers turning left on two-way streets may be less likely to look for cyclists approaching from behind while they are focused on selecting a gap in traffic. In these cases, protected phases help to eliminate potential conflicts.
- **Locations with high volumes of cyclists, or with unique movements** – In some instances, the geometry of cycling facilities means that unusual or atypical movements are required through intersections. In these cases, or in cases with heavy cycling volumes, a protected phase can help to reduce cognitive demands of cyclists and drivers, as well as reducing frustration for drivers in trying to select a gap between cyclists

- **Locations with high volumes of conflicting vehicular turning movements** – In some cases, heavy turning volumes may make it nearly impossible for a cyclist to clear an intersection. A protected phase (even a minimum length phase) can provide the opportunity a cyclists needs to clear an intersection. The threshold for high turning volumes may vary, depending on street context. A sample warrant from MassDot's Separated Bike Lane Planning & Design Guide is shown in Exhibit 8-1. While these thresholds may require refinement over time to better suit the Regional context, they provide basic guidance for practitioners.

Exhibit 8-1. Sample thresholds for consideration of protected bicycle signal phasing

Separated Bike Lane Operation	Motor vehicles per hour turning across separated bike lane		
	Right Turn	Left Turn across One Lane	Left Turn across Two Lanes
One-way	150	100	50
Two-way	100	50	0

Source: Adapted from MassDOT's Separated Bike Lane Planning & Design Guide

The biggest downside to a protected bicycle phase is the potential for increased delays for motorists. The competing demands at an intersection may also result in a short interval for cyclists. It is important to note that protected bicycle phase can often be implemented in concert with an exclusive pedestrian phase, extending the benefits to other intersection users.

Leading Bicycle Phase – A leading interval which provides waiting cyclists a head start through the intersection before allowing conflicting vehicular movements may be considered where the facility and volumes are not supportive of protected phases, or where protected phases are not feasible, but there is a desire to provide a higher quality cycling crossing. Where implemented, a leading bicycle phase would likely be coordinated with a leading pedestrian phase, to ensure benefits for all vulnerable users.

As with any signal phasing, both leading and protected bicycle phases must be considered in the context of other competing demands. For example, the City of Toronto's practice is to consider bicycle phases only in circumstances where they would provide increased safety, throughput or convenience to cyclists with minimal or no impact to other movements (refer to the City of Toronto's Traffic Signals Operations Policies & Strategies). In York Region, additional studies and/or business cases may be needed to assess the full impacts of adding a protected or leading cycling phase to the existing intersection traffic operations. In addition, the Region's Traffic Signal Operations group needs to be consulted for any potential sites where a protected bicycle phase is planned to confirm the controller

has the capability to add extra bicycle phases. As noted in OTM Book 12A, "since bicycle phasing is not commonplace, it is incumbent on the practitioner to use engineering judgement as to the appropriateness of installing bicycle phasing and the best way to implement it".

The OTC's Bicycle Traffic Signal Guide provides a 'long-list' of potential considerations in pursuing separated signal phasing, which is summarized in Exhibit 8-2 for reference. Note these criteria are provided for reference only, and may require refinement to better reflect the York Region context.

Exhibit 8-2. – Summary of Potential Criteria for Considering Separated Bicycle Phases

Collision/Conflict Criteria • a bicycle signal phase should only be considered for use when an engineering study finds that a significant number of bicycle/motor vehicle conflicts occur or may be expected to occur at the intersection and that other less restrictive measures would not be effective • collisions (when two or more bicycle/vehicle collisions of types susceptible to correction by a bicycle signal have occurred over a 12 month period and a responsible public-works official determines that a bicycle signal will reduce the number of collisions) • when there is a need to provide a leading interval for cyclists in order to increase their visibility and safety	**Geometric Criteria** • geometric (a path connection or to allow movement not allowed by vehicles) • geometric factors: an intersection that impedes cyclist crossings that could be mitigated with the bicycle phase • an approach to a signalized intersection is intended for bicycles only and it is desirable to signalize that approach • examples of geometric configurations that might benefit from the use of a bicycle signal phase include: • a bike lane to the right of a high volume right turn; and, • a multi-use path that comes into the intersection in such a way that motorists may not see or yield to cyclists approaching the intersection	**Volume/Delay Criteria** • volume, based on the number of bicycles per peak hour (at least 50) and the number of vehicles at the peak hour entering the intersection • to reduce overall delay to cyclists where delay is significant
Planning Criteria • where the addition of a special phase would complete the continuity of a bicycle system and where the movement protected or encouraged would otherwise be challenging	**Timing/Phasing Criteria** • where paths cross roadways – to provide a shorter green time for cyclists when no pedestrians are present • if there is a bicycle movement that is not accommodated by typical traffic signals	**Demographic/ Geographic Criteria** • proximity to schools, parks, and popular bike routes should be considered

Source: Adapted from OTC's Bicycle Traffic Signals Guide

8.3 SIGNAL TIMING

Some adjustments to signal timing may be required where cyclists will be a primary user of the corridor. These changes are necessary because of different operating characteristics compared to motor vehicles. Bikes typically operate at lower speeds than motor vehicles, and have a shorter stopping distance and time.

Potential timing changes include:

- **Adjustments to all-red/yellow times** – Because of lower operating speeds, if a bicycle enters the intersection just before or during the yellow display, the all-red clearance interval may be insufficient. Because alterations to the yellow time are generally discouraged, the additional time for cycling clearance may be incorporated through adjustments to the all-red time, based on the formula in Exhibit 8-3

  The decision to adjust the all red phase is based on professional judgement. Even if no adjustment is made to the all-red time, the OTC Bicycle Traffic Signal Guide notes that "the Ontario Highway Traffic Act makes more than one provision for a situation in which a vehicle or pedestrian which has legally entered the intersection but has not completed their movement retains the right of way over conflicting traffic even if that conflicting traffic is presented with a green indication". (p. 10)

Exhibit 8-3. Clearance Interval Calculations

Amber + All-red = PRT + V/(2d) + (W + L)/V

Where:

Amber = PRT + V/(2d) and
All-red = (W + L)/V

Specifically, the following values are suggested:

d = bicycle deceleration rate (3.0 m/sec^2)

V = typical cyclist speed, generally 14-20km/hr

W = intersection width, measured from stop bar to far crosswalk line or equivalent if not present

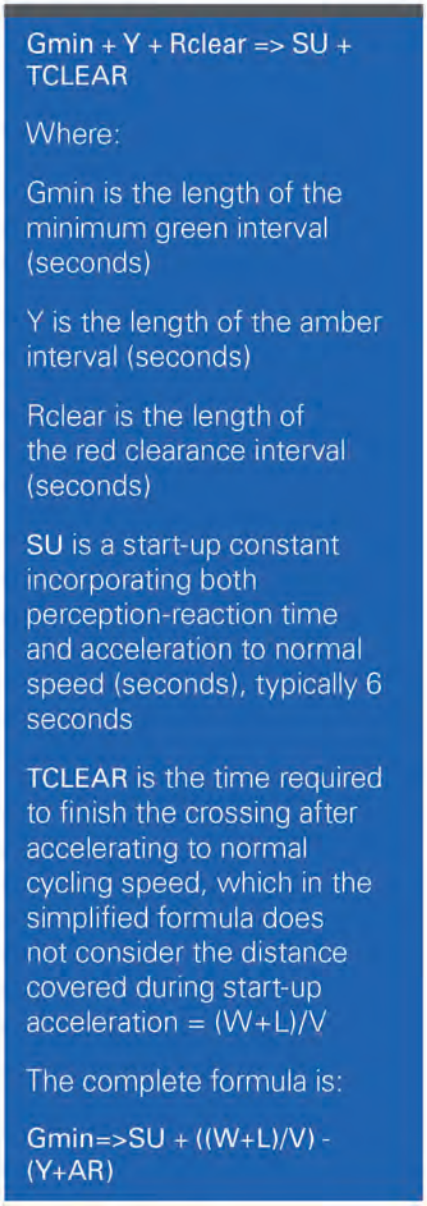
L = bicycle length, assumed to be 1.8 m

PRT = Perception Reaction Time. 1 second minimum

Source: OTM Book 12A

- **Minimum green time** – Cyclists are slower to accelerate than motor vehicles, which can impact the time they need to cross through an intersection. In almost all cases operating in mixed traffic, the minimum green time will accommodate a cyclist because the walk time + flashing don't walk time will govern the signal timing, and will be longer than a cycling clearance time. One exception to this may be side streets on major roadways where the pedestrian phase is not activated. In these cases, the minimum green time may need to be adjusted to allow cyclists sufficient time to cross the intersection, based on the formula in Exhibit 8-4.
- In all cases where the signal is for cyclists and pedestrians only, timing should be calculated specifically for bicycles.

Exhibit 8-4. Minimum green time



Source: OTM Book 12A

8.4 DETECTION OF CYCLISTS

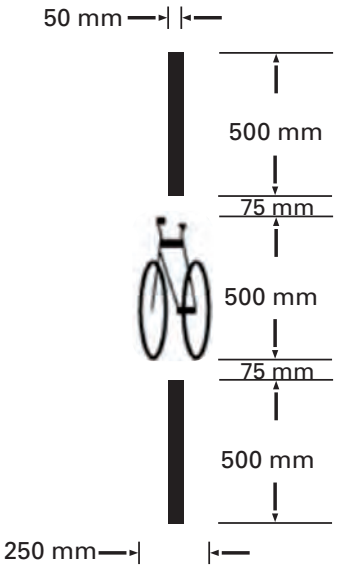
Just like other motor vehicles, it is important for bicycles to be able to proceed through intersections safely and efficiently. One method to aid cyclists in crossing at traffic signals is the application of bicycle detection methods at signalized intersections. Many traffic signals in York Region are activated by detector loops embedded in the roadway, which respond to the magnetic field induced by the metal in a motor vehicle. Bicycles are also being considered in the timing of traffic signals and in the selection, sensitivity and placement of vehicle detection devices. For example, along Highway 7, exclusive cycling loops are provided beneath the in-boulevard two-stage left turn queue boxes. When cyclists are detected, the side street phasing is adjusted to allow the cyclist enough time to clear the intersection.

In cases where cyclists may be waiting in a less defined crossing zone, the effectiveness of the detectors is limited if the cyclist is not properly located in the "actuation zone". Distinct pavement markings such as a small bicycle symbol with a directional arrow and optional signage may be used to improve the effectiveness of this form of bicycle detection advisory system.

Several concepts for bicycle detection markings and supplementary signage are shown in Exhibit 8-5. The applications shown here should be considered on a project by project case, as needed.

Exhibit 8-5. Sample of Bicycle Detection Marking & Supplementary Signage

Recommended pavement marking and signage details



Source: TAC Bikeway Traffic Control Guidelines

Source: TAC Bikeway Traffic Control Guidelines

Sample applications of pavement markings & signage

Source: NACTO Urban Bikeway Design Guide

Source: NACTO Urban Bikeway Design Guide

Beyond the use of loop detectors, a variety of other technologies are used to detect cyclists and may be considered for specific projects. These detection types are summarized in Exhibit 8-6.

Exhibit 8-6. Alternative Forms of Detection

Microwave Microwave detectors are mounted above the ground similar to video and beam a cone shaped area to an approaching bicycle, which reflects some of the microwave energy back to the detector. This type of detection can be considered in areas where detector pavement installation is not possible.	**Optical** Optical detection uses pulsed infrared light-emitting diodes (LEDs) technology to detect the return time of light from the object to the sensor. This technology can detect many types of motor vehicles and bicycles in all weather conditions, any time of the day. The system can also determine the direction of travel of vehicles, thereby preventing false calls to traffic signal controllers.
Radar There are two forms of radar detection. The above-ground is similar to microwave detection. The wireless in-ground detection systems communicate by radio with a backbone paired with the traffic control system and are capable of differentiating between motor vehicles and bicycles in the same lane.	**Video** Detection methods that utilize image recognition from video detectors are capable of detecting a cyclist at an intersection over a larger area than a loop detector. However, video detectors have been shown to have a reduced effectiveness in the dark, including registering false calls when shadows appear within the detection zone. An example of video detection with bike differentiation is the SmartCycle Bike Indicator, which includes an illuminated display to indicate when a bicycle has been detected at an intersection.

Source: Adapted from OTM Book 12A

Where loops or other forms of automatic detection are not feasible, a cyclist pushbutton can also be used on side streets or trail crossings where cyclists may not otherwise call a green signal. Where a pushbutton is used, the design should ensure that cyclists can easily access the pushbutton (preferable without dismounting), and appropriate signage should be used to indicate to cyclists that they must use the pushbutton (refer to Exhibit 8-7).

Exhibit 8-7. Cyclist-friendly Pushbutton Design & Placement

Cyclist-friendly pushbutton placement

Source: John Luton

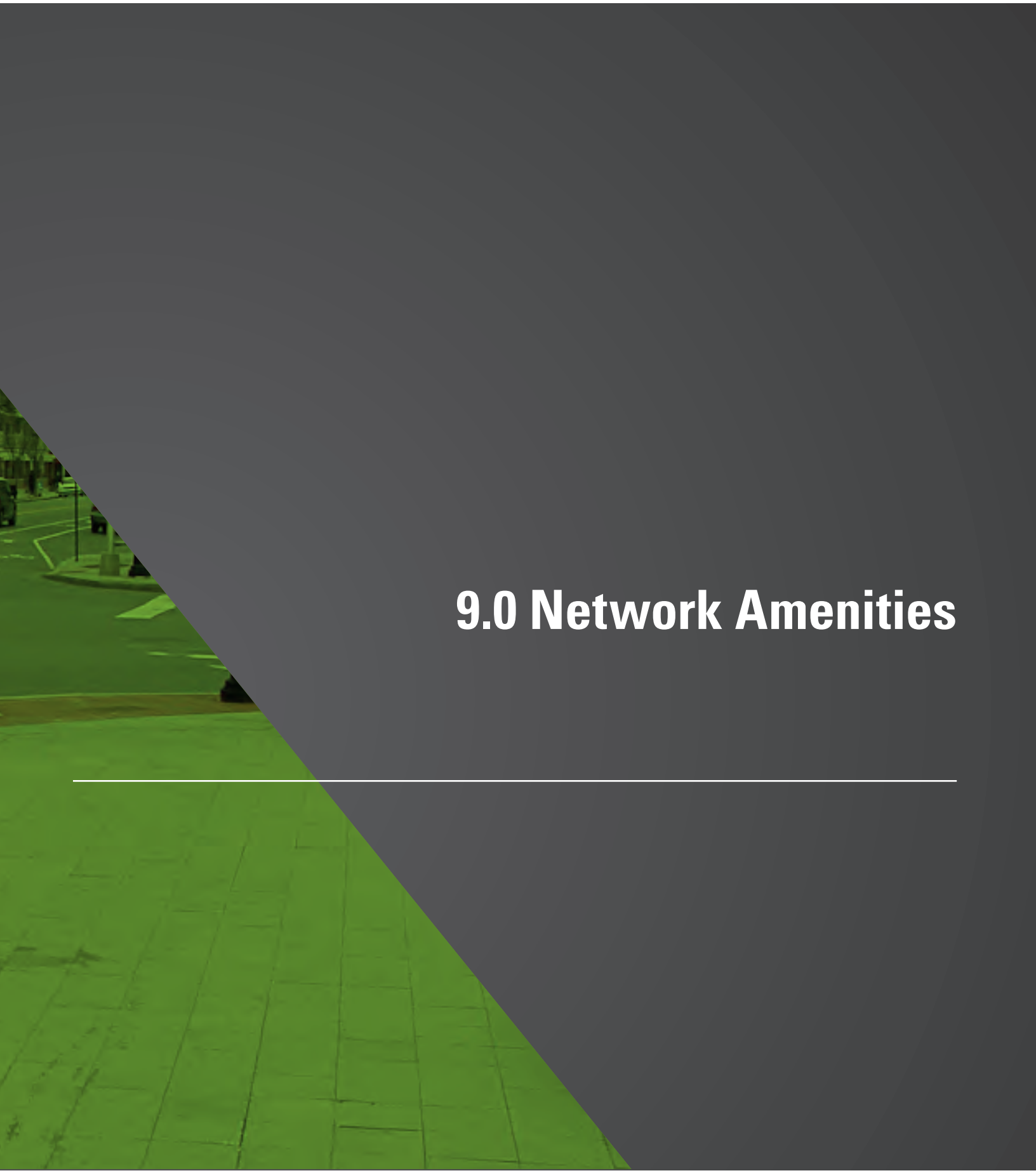
Sample of a pushbutton mounted on a bike rail

Source: IBI Group

Recommended Signage

OTM Ra-14L (R)


ONLY
ONLY



9.0 Network Amenities

9.1 STREET FURNITURE AND STREETSCAPING

York Region has a number of existing standards and guidelines regarding the provision of street furniture and planting. These include:

- York Region Streetscape Standards
- South Yonge and Yonge/Davis Streetscape Master Plans
- York Region Transit Street Furniture Design Guidelines
- York Region Street Tree Preservation and Planting Design Guidelines

This section addresses street furniture and planting from the perspective of active transportation users. In particular, it discusses how street furniture and vegetation play a role in creating an attractive and safe environment for the use of active transportation.

9.1.1 Street Furniture

Street furniture plays an important role in encouraging the use of active transportation. In addition to increasing user comfort, it helps to enhance the vibrancy of the street and instill a sense of place. The street furniture most commonly used by pedestrians and cyclists includes benches, trashcans, public transit shelters, and bicycle racks. Other street furniture which passersby may use include mailboxes, newspaper distributors, public telephones, and parking meters.

Placement of Furniture

Street furniture must be carefully placed in the boulevard to be accessible to pedestrians and cyclists without encroaching into operating spaces, so as not to create obstacles or hazards.

Any vertical object must be a minimum of 0.25 m away from the edge of the pedestrian clearway. The required clearance for cycling facilities, including multiuse paths, is considerably wider, given that cyclists have a larger operating space and move faster than pedestrians. The following lateral clearance from the edge of the facility are recommended:

- 0.5 m preferred clearance from the edge of the facility for non-linear, fixed objects more than 750 mm high
- 0.25 m minimum clearance from the edge of the facility for non-linear, fixed objects 100 to 750 mm high

The only exception to the above is posts with pushbuttons, for activating crosswalk and crossride signals. These may be placed at 0.25 m for the edge of the facility, to be within easy reach for pedestrians and cyclists. Minimum lateral clearances for pedestrian and cycling facilities are discussed in more detail in Section 4.5.

Placement of benches and seat walls

Public benches and seat walls allow passers-by to sit down, rest and socialize. Benches are most frequently placed parallel to the street and oriented to face a pedestrian clearway or multiuse path. However, benches at bus stops are often oriented towards the roadway. On a street with a very wide planting and furnishing zone, it may also be possible to place benches perpendicular or at an angle to the street.

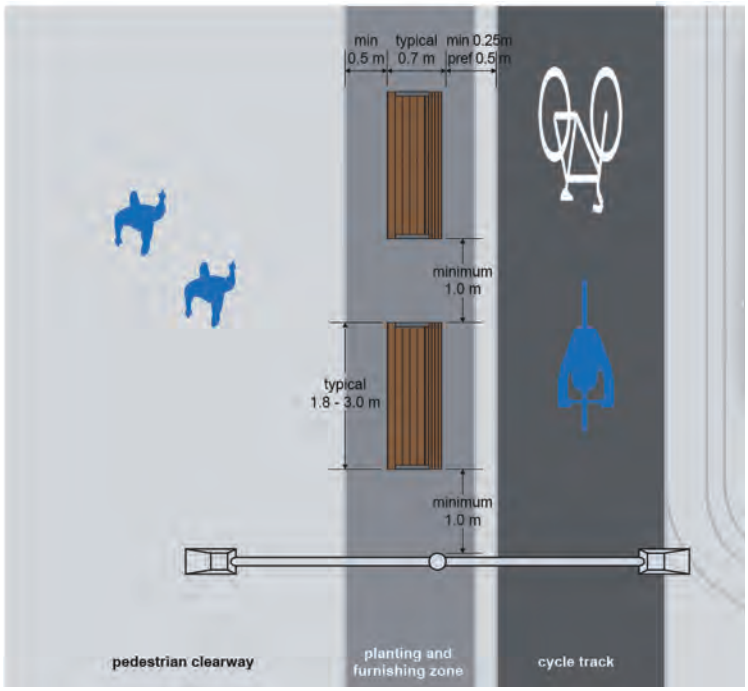
Benches come in different lengths however most require a space that is at least 1.5 m deep. The front edge of the bench should set back at least 0.5 m from the edge of a pedestrian clearway so that user's legs don't protrude into the clearway. Similarly, a seat wall should be set back at least 0.5 m.

If there is a roadway behind or next to the bench, it should be placed outside the prescribed edge zone, as required by the Designing Great Streets guidelines. If there is a cycling facility beside the bench, the clearance between the edge of the cycling facility and the bench should follow the general rules provided above—preferably 1.0 m from the edge of the cycle track and at minimum of 0.5 m from the edge in a constrained situation.

Benches should be placed at least 1.0 m from other furnishings and street trees so as not to impede pedestrian movement and maintenance operations. Benches can be removed in the winter so that they do not impede snow clearing and removal operations. If benches are to be left in place, they should be made of weather-resistant and water-repellent materials.

These dimensions are illustrated in Exhibit 9-1.

Exhibit 9-1. Placement of benches



9.1.2 Trees and vegetation

Trees and other vegetation planted along streets have more than just an aesthetic function. They have a direct impact on active transportation users' comfort and safety. Trees and shrubs must be carefully selected and placed within boulevards and medians to maximize the comfort and attractiveness of the street for active transportation users while also ensuring their safety.

The most elementary function of trees is to provide shade, which is especially valuable to pedestrians and cyclists on bright and hot summer days. Planting areas along streets also accumulate less heat than paved surfaces and can provide localized relief the urban heat island effect, which is also of value to pedestrians and cyclists.

Trees, shrubs, and planters can also be used to provide separation between different traffic streams. When planted along the edge of a roadway, they can help buffer pedestrians and cyclists in the boulevard from the noise and air pollution generated by vehicles on the roadway. For retrofit projects, planters can be placed on the roadway to create a protected bicycle lane. This approach is possible only if a sufficiently wide buffer can be provided between the cycle track and the adjacent travel lane, although emerging designs of self-watering planters can be placed in buffers as narrow as 0.5 m. Although these types of treatments are less likely on Regional roads, they may be considered in retrofit situations.

Trees and other vegetation planted between a pedestrian clearway and a raised cycle track can provide a clear visual barrier between the two facilities and discourage pedestrians and cyclists from encroaching into each other's spaces. This kind of robust separation between the pedestrian and cycling realms is desirable where high volumes of either pedestrians or cyclists or both are expected.

Exhibit 9-2. Planters provide physical separation on a retrofit cycle track

Source: IBI Group

Exhibit 9-3. Tree planting between a raised cycle track and pedestrian clearway

Source: Bartek Komorowski/Vélo Québec

Placement of Trees and Vegetation

As with furniture, trees and other plants must be positioned carefully in relation to pedestrian and cycling facilities. Key considerations include:

- Avoiding encroachment of trunks or branches into pedestrians' and cyclists' operating spaces
- Maintaining required lateral clearances from the edge of the pedestrian and cycling facilities
- Avoiding obstruction of sight lines at intersections, driveways, transit stops and other potential points of conflict

Trees

Tree trunks must be outside the required lateral clearance from the edge of a pedestrian clearway, multiuse path or cycling facility. The York Region Street Tree Preservation and Planting Design Guidelines (2013) require that trees be planted at least 1.0 m and preferably 1.5 m from the edge of a sidewalk. However, in very constrained ROWs, an offset as small as 0.5 m from the edge of a sidewalk can be tolerated. The same is recommended for distance from the edge of a cycling facility or multiuse path.

To avoid encroachment into the pedestrian and cycling operating space, a minimum vertical clearance of at least 2.1 m between the surface or the sidewalk, cycle track, or multiuse path and the lowest overhanging branch is necessary. This vertical clearance must be maintained throughout the tree's lifecycle, from the moment the tree is planted to full maturity. Overhanging branches may need to be pruned if they encroach into pedestrian or cyclist operating space.

Ground Cover

Protrusion of grass and other short ground covering plants into pedestrian and cycling facilities is less of a risk than it is for trees and shrubs. Nevertheless, it is preferable to select slow growing varieties that do not require frequent trimming and watering operations, which can interfere with walking and cycling.

Planters

Planters can add a touch of greenery to streets otherwise dominated by asphalt, concrete and other hard, impermeable surfaces. Planters may be hung from lampposts or placed on a painted buffer or median on the roadway, atop a concrete median, or in a hardscaped space within the boulevard.

Planters must be placed so as not obstruct the free flow of pedestrians, especially wheelchair users. Sidewalk planters must therefore be positioned outside of the pedestrian clearway and beyond the required lateral clearance from a cycling facility. Hanging planters should be at least 2.5 m above the ground.

References

For more detailed guidance on street furniture, trees and vegetation in York Region, planners and designers should consult the York Region Streetscape Standards and the York Region Street Tree Preservation And Planting Design Guidelines. Some location specific guidance is also provided in the South Yonge and Yonge/ Davis Streetscape Master Plans.

9.2 RAILINGS, BARRIERS AND FENCES

9.2.1 Railings

Railings are retention devices used along paths on steep embankments and on bridges or overpasses. They should be high and strong enough to hold back a pedestrian, cyclist or wheelchair user who has strayed from their path of travel.

Design

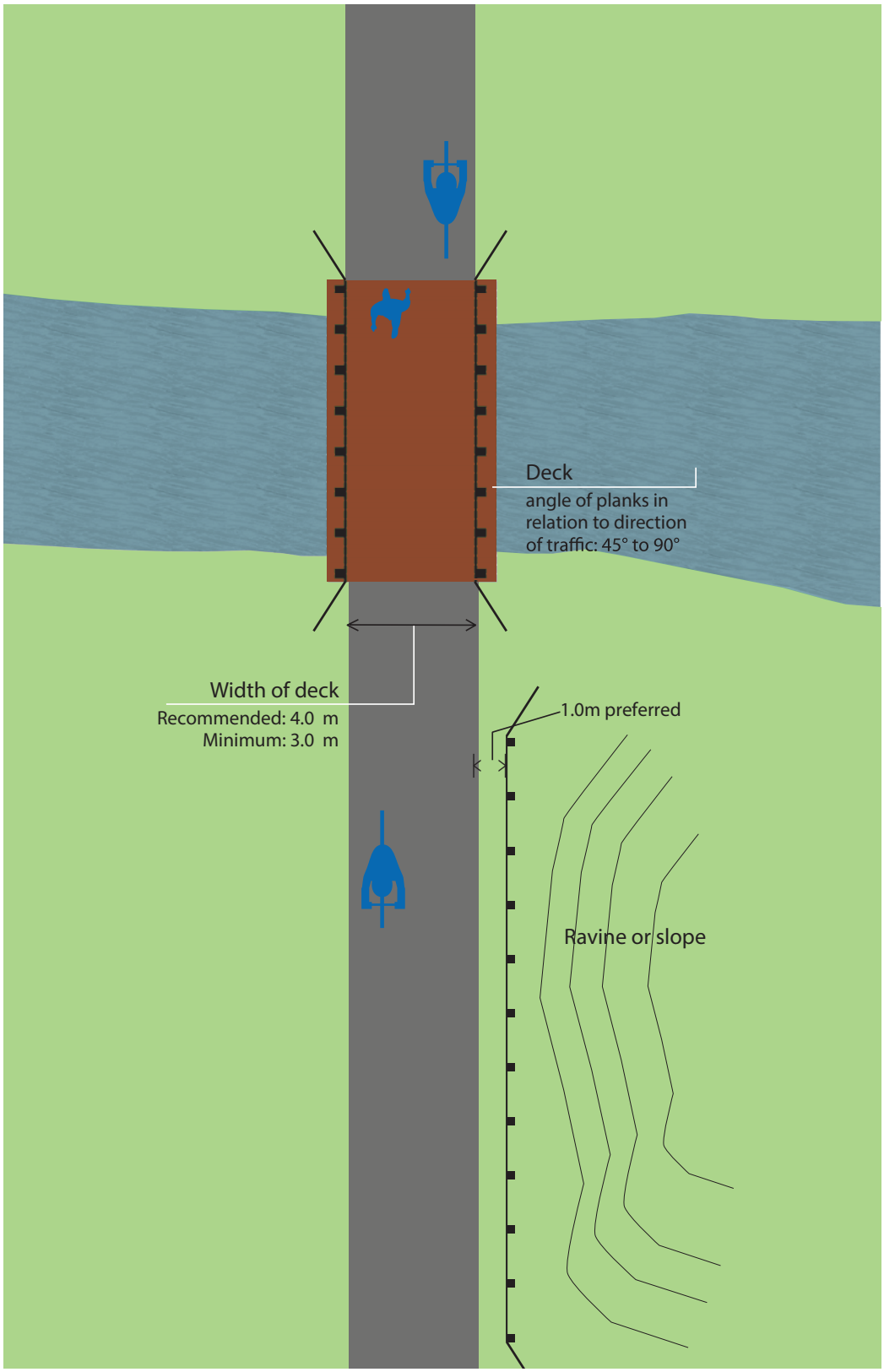
On roadway bridges, railing height is dictated by the Canadian Highway Bridge Design Code, which require that railings be 1.37m high to protect cyclists. Other design requirements depend on whether the railing is intended for pedestrians and cyclists only or whether it is also serving as a guardrail for vehicles.

On stand-alone overpasses or along paths on steep embankments,[1] a height of 1.1 m is usually sufficient to hold back pedestrians or cyclists. Higher railings tend to obstruct users' views. A lateral clearance of 1.0 m from the edge of the path to the railing is preferred. If the recommended clearance cannot be achieved on the span of the bridge or overpass, the railings should taper outward at no more than a 30° angle to the path until they reach a clearance of 1 m (Exhibit 9-4). This funneling of the railings helps cyclists in particular avoid colliding with the ends of the railing.

A railing may consist of a wooden or metal fence, a concrete or brick wall, or a wall with a fence on top. The horizontal and vertical components of the railing should be close enough together to hold back a falling pedestrian or cyclist. Smooth horizontal components on the inside of the railing should act as a guardrail and prevent cyclists from catching if their knees, hips or handlebars if they come into contact with the railing. A round handrail with a 5 cm in diameter should be placed atop the railing, about 1.0 m high. This will help deflect a cyclist's handlebars or hips, which are usually situated between 90 cm and 110 cm above the ground.

[1] Railings are necessary when the path sits atop an embankment sloped more than 30% with a vertical drop greater than 1.0 m.

Exhibit 9-4. Railing alignment along a multiuse path



Adapted from: Vélo Québec 2010

9.2.2 Guardrails and Safety Barriers

The purpose of guardrails and safety barriers along roads is to hold back vehicles that have strayed from their course. They are used primarily in rural settings along active transportation facilities next to roads with high traffic volumes and speeds. They are also used in cases where cyclists travel in the opposite direction to the vehicles in the adjacent lane. This is often the case when a multiuse path or bidirectional bicycle path is routed over a road bridge or underpass. Concrete barrier and highway guardrail design should consider provincial standards such as the Ontario Provincial Standards for Roads & Public Works.

9.2.3 Fences

Fences are used along active transportation facilities to protect the privacy of neighbouring properties and to discourage users from taking shortcuts through them. Similarly, they stop neighbouring property owners from encroaching on AT path right-of-way. In rural settings, they can also help to keep prohibited vehicles, all-terrain vehicles and farm vehicles, from accessing the path.

Clearances between cycling and pedestrian facilities and longitudinal objects such as fences are preferred to be 0.6 m – 1.0 m (refer to Section 4.5); however, this maybe reduced to 0.25 – 0.50 m in constrained circumstances.

Design

Fences can take many forms, including chain-link fences, plank fences, stone or brick walls, impassable ditches or hedges (Exhibit 9-5).

Fences should be installed only where they are essential. To prevent pedestrians and cyclists from taking shortcuts, a wet drainage ditch, thorny hedge or mesh fence 1.2 m high will suffice. However, to ensure the complete privacy of neighbouring properties, a wall, solid wooden fence or dense hedge at least 1.8 m tall may be required. If a fence is used, gates can be installed to provide access to trailside properties. When a ditch borders a path, bridges or culverts are required to link neighbouring properties to the path.

Exhibit 9-5. Multi-use path with a hedge (left) and chain-link fence (right)

9.3 TRAFFIC CALMING

The volume and speed of vehicular traffic on roads has an impact on the safety and comfort of pedestrians and cyclists. A variety of physical features, described below, can be implemented on a street to limit either the speed or the volume of vehicles that use it.

These types of measures should be considered on regional streets with:

- Two vehicular travel lanes (one travel lane per direction)
- Relatively high volumes of pedestrians and/or cyclists
- Operating speeds that exceed posted speeds

Based on the street typologies defined in the Designing Great Streets manual and reflected in these guidelines, the Main Street and Rural Hamlet types are the most appropriate types for consideration of traffic calming interventions. Traffic calming may not be desirable on wider street types designed to carry higher volumes of traffic (both active transportation and motor vehicle traffic), such as: City Centre Streets, Avenues, Connectors, or Rural Roads.

Streets can be designed to bring operating speeds closer to the desired speed limit through a variety of design considerations discussed throughout the Designing Great Streets manual (corner radii, lateral friction and reduced vehicular lane widths).

The traffic-calming potential of the above measures can be further enhanced through the systematic use of measures such as:

- Vertical deviation
  - Speed humps
  - Raised crossing
  - Raised intersections
- Horizontal deviation
  - Curb extensions
  - Chicanes
  - Median islands
  - Traffic circles

These measures are described in more detail in Exhibit 9-6.

Note that measures that entail a vertical deviation of the vehicle, namely speed humps, raised crossings, and raised intersections, cannot currently be implemented on streets served by York Region Transit (YRT) route, and may impact emergency services. Therefore, any traffic calming measures planned for Regional roads must be subject to internal consultation and design modifications to accommodate specific design vehicles.

Exhibit 9-6. Common traffic calming measures

		POTENTIAL APPLICATIONS		BENEFITS			
MEASURE	DESCRIPTION	RURAL HAMLET ROAD	MAIN STREET	SPEED	VOLUME	CONFLICTS	COST
Vertical deviation (refer to Exhibit 3)							
Speed hump	Speed humps are raised sections of the roadway designed to discourage motor vehicle drivers from travelling at excessive speeds	May be considered where speeding is a major concern (subject to review)		●	◒	◒	$1,000-$5,000
Raised crossing	Raised crossing are pedestrian crossings placed atop a speed hump	May be along intersections with side streets (subject to review)		●	◒	◒	$2,000-$5,000
Raised intersection	A raised intersection is one that is constructed at a higher elevation than the adjacent roadway. Pedestrian crossings are placed atop the raised part of the intersection.	Likely not warranted due to lower anticipated pedestrians & cycling volumes	May be considered at the central intersection of the main street (subject to review)	◒	○	◒	$50,000-$180,000
Horizontal deviation (refer to Exhibit 4)							
Curb extensions	A curb extension is a horizontal intrusion of the curb into the roadway, resulting in a narrower cross-section. If combined with a pedestrian crossing, it increases the visibility of pedestrians preparing to cross and reduces the distance over which pedestrians are exposed to vehicles	✔	✔	◒	○	●	$15,000-$50,000
Raised median islands	Traffic Islands have the effect of narrowing the road and reducing the speed of passing traffic. They are not intended for pedestrians, as they have no dropped curbs and tactile paving.	✔	✔	◒	○	◒	$5,000-$15,000
Chicane	A chicane is a series of curb extensions or traffic islands on alternate sides of a roadway that narrow it and require drivers to steer from one side to the other when traveling through	✔	✔	●	◒	◒	$50,000-$100,000
Traffic circles	A traffic circle is a raised island located in the centre of an unsignalized intersection. Vehicles must travel through the intersection in a counter-clockwise direction around the island. It used to calm roads with relatively low volumes of traffic.	✔	Likely not appropriate due to higher anticipated traffic volumes	●	◒	○	$15,000-$50,000

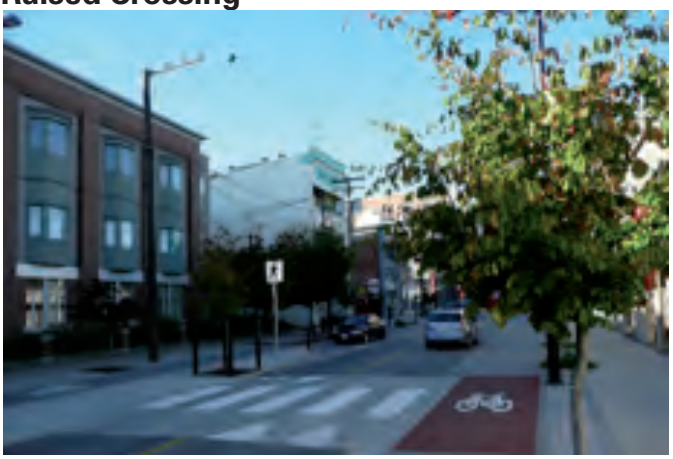
Source: Adapted from the Traffic Calming Guide for the City of Toronto (2016) & the Canadian Guide to Neighbourhood Traffic Calming Guide (1998)

Exhibit 9-7. Vertical deviation traffic calming measures

Speed hump

Source: IBI Group

Raised Crossing



Source: NACTO

Raised intersection

Source: HUB Surface Systems

Exhibit 9-8. Horizontal deviation traffic calming measures

Curb extension

Source: NACTO

Raised Median Island

Source: IBI Group

Chicane

Source: NACTO

Traffic Circle

Source: IBI Group

The horizontal deviation measures described above can also be accomplished through inexpensive, temporary measures involving the use of bollards, planters, and precast curbs and other moveable objects (Exhibit 9-9).

Exhibit 9-9. Choke point created with flexible bollards (Aurora, ON)

Source: Town of Aurora

9.4 BICYCLE PARKING

9.4.1 On-Street Parking

The provision of bicycle parking facilities is essential for encouraging cycling in York Region. The lack of adequate parking supply or type can deter many from considering using their bicycle as a basic mode of transportation. Bicycle parking should be provided in the public right-of-way wherever on-street automobile parking is provided. Bicycle parking is essential along streets with shops and services, especially where buildings are set close to the public right-of-way. It is also recommended to provide bicycle parking at transit stops to encourage bicycle-transit intermodality.

9.4.2 Layout

On-street bicycle parking is typically placed in the following areas:

- In a hardscaped area in a planting and furnishing zone
- In the on-street parking zone (where on-street parking has been provided)
- On curb extensions near intersections or midblock

On-street bicycle parking racks must be placed with care to allow unobstructed access while avoiding encroachment of parked bicycles into adjacent pedestrian and cyclist operating spaces.

Standard bicycles are typically 1.8 m long and 0.75 m wide at the handlebars. Two bicycles on either side of a post-and-ring or inverted-U bicycle rack, will occupy roughly a 1.0 m by 2.0 m space.

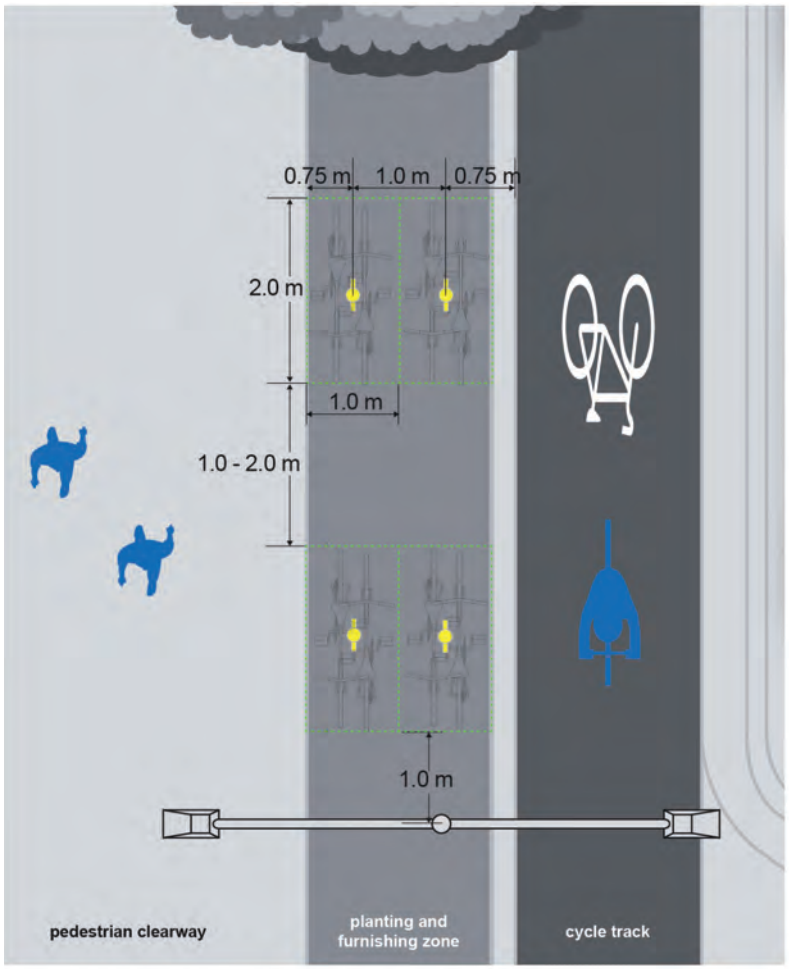
Source: IBI Group

For in-boulevard bicycle parking parallel to the street, the centre of the bicycle rack should be:

- 1.1 m from the roadway curb face (for 0.6 door zone clearance)
- Preferably 1.0 m and at minimum 0.75 m from the edge of a pedestrian clearway, cycling lane, or multiuse path (for preferred 0.5 m and minimum 0.25 m clearance respectively)
- 2.0 m laterally typically from other vertical objects (for 1.0 m clearance from street furniture, lampposts, trees, first hydrants, etc.; some elements may require wider clearances as specified by departmental standards)
- 1.0 m minimum – 1.2 m laterally between neighbouring bicycle racks
- 3.0 m to 4.0 m between rows of bicycle racks (for 1.0 m to 2.0 m gap between rows of parked bicycles)

A sample layout for bicycle parking oriented parallel to the street is illustrated schematically in Exhibit 9-10.

Exhibit 9-10. Bicycle parking parallel to the street

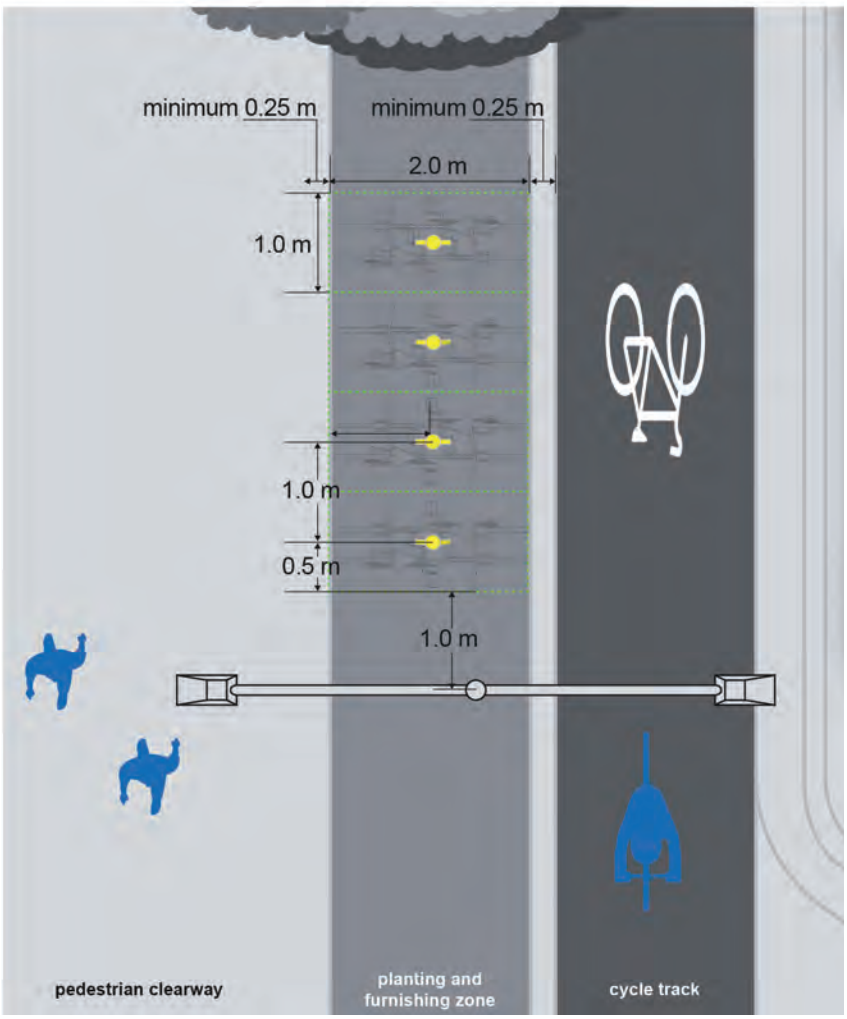


For in-boulevard parking perpendicular to the street, the centre of the bicycle rack should be:

- 1.6 m from the roadway curb face (0.6 m door zone clearance required)
- Preferably 1.6 m and at minimum 1.25 m from the edge of a pedestrian clearway, cycling lane, or multiuse path (for preferred 0.6 m and minimum 0.25 m clearance respectively)
- 1.0 m from the edge of a pedestrian clearway
- 1.5 m medially from other vertical objects (for 1.0 m clearance from street furniture, lampposts, trees, first hydrants, etc.; some elements may require wider clearances as specified by departmental standards)
- 1.0 m between neighbouring bicycle racks in the same row

A sample layout of bicycle parking oriented perpendicular to the street is illustrated schematically in Exhibit 9-11.

Exhibit 9-11. Bicycle parking perpendicular to the street



When bicycle parking is located in on-street car parking stalls, bicycle racks are typically oriented perpendicular to the street (Exhibit 9-12). The centre of the racks should be at least 1.0 m from the curb face. The first and last rack in a row should each be at least 1.0 m from the adjacent parking stall.

Exhibit 9-12. Car parking stall converted to 10 bicycle parking spaces

Source: Cyclehoop

Bicycle parking can also be angled with respect to the street. In this case, the designer must ensure that there is a 1.0 m separation between racks (perpendicular to the axis of the racks) and that parked bicycles don't encroach into the door zone or lateral clearances for multi-use paths and cycle tracks.

9.4.3 Racks

For on-street bicycle parking, simple racks that allow the attachment of bicycles of different shapes and sizes with U-lock are preferable. The most popular are inverted-U shaped racks or post-and-ring style racks. While these are available in various materials and finishes, the most durable option is stainless steel due to its superior scratch and corrosion resistance.

When multiple inverted-U racks are provided side-by-side, they can be welded to long rails to reduce the number of anchoring points. Rail-mounted racks are especially useful for temporary bicycle parking applications, where bicycle racks are required at an event site or outside a construction side. Rail-mounted racks are also commonly used for converting on-street car parking stalls to bicycle parking.

Signposts, lampposts, and parking meters posts can be used for bicycle parking when their placement respects required lateral clearances. Bicycle parking hoops can be added to legitimize their use as bicycle parking (Exhibit 9-13).

Exhibit 9-13. Bicycle parking hoop attached to a signpost

Source: Cyclehoop

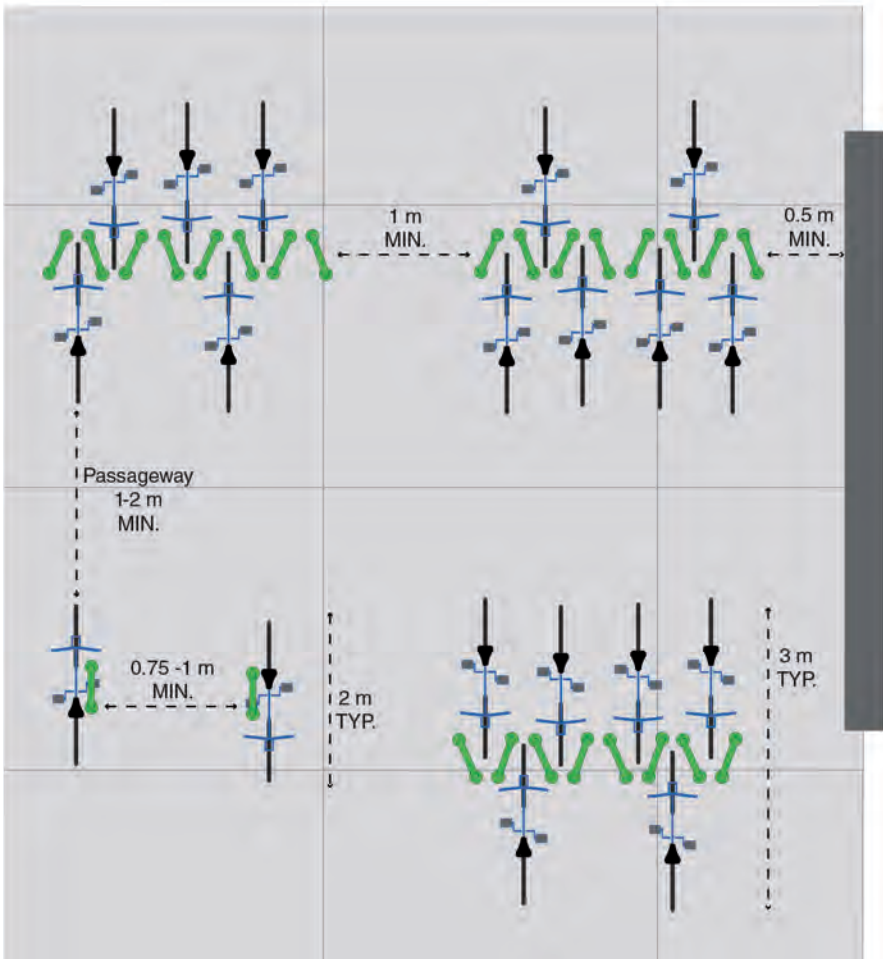
9.4.4 Off-street Parking

For ease of access, off-street bicycle areas must be carefully laid out. In areas where parking turnover is not very high, off-street parking can be arranged more densely than on-street parking, with neighbouring racks slightly closer together to maximize capacity. The following minimum clearances are suggested for the sake of convenience and ease of use:

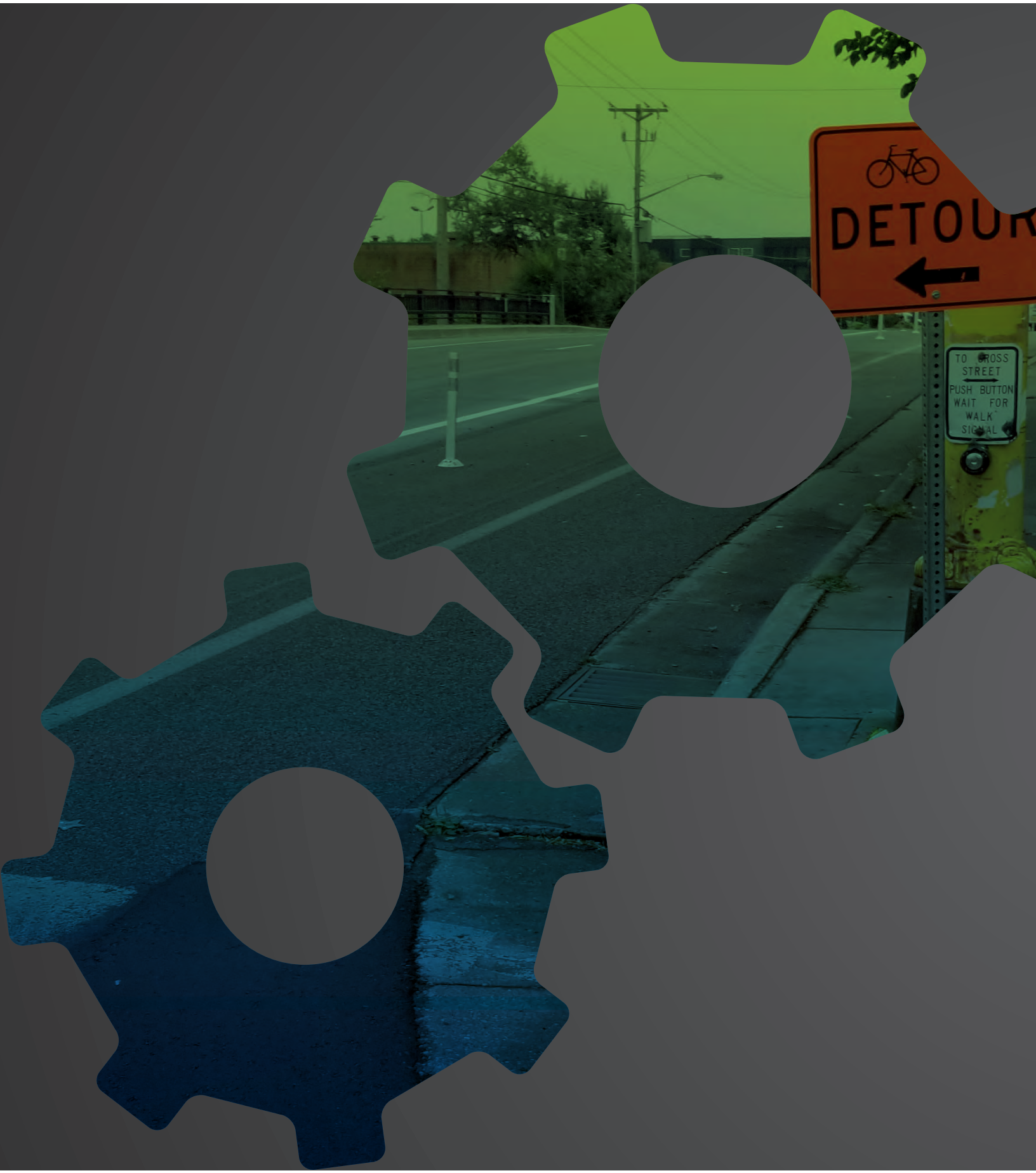
- 0.75 to 1.0 m between neighbouring inverted-U or post-and-ring racks
- 0.5 m clearance from the end of a row of racks to a wall or other vertical object
- For ease of circulation:
  - 1.0 to 2.0 m passageways between rows of racks
  - 1.0 m clearance for gaps in a row of racks

These general principles are illustrated in Exhibit 9-14 below.

Exhibit 9-14. Recommended clearances for layout of bicycle parking areas



Adapted from Velo Quebec


DETOUR
TO CROSS STREET
PUSH BUTTON
WAIT FOR WALK

10.0 Maintenance and Operations

10.1 MAINTENANCE OF PEDESTRIAN AND CYCLING FACILITIES

10.1.1 General Maintenance Considerations for Active Transportation

Maintenance is a key consideration for pedestrian and cycling facilities. Maintenance regiments impact the attractiveness, comfort and viability of year-round travel by active modes. A variety of activities are completed to maintain active transportation facilities on a seasonal basis. A summary of these activities is shown in Exhibit 10-1.

Exhibit 10-1 . Summary of Maintenance Activities for Active Transportation Facilities

Type	Maintenance Activity
Year-Round	• **Inspection & Patrol** – Routine inspection and patrolling to ensure that facilities are in a state of good repair
	• **Pothole & Surface Discontinuity Repair** – Ensuring a smooth walkable/rideable surface free of major cracks and/or discontinuities
	• **Pavement Markings & Signage** – Ensuring visibility of signage and pavement markings and refreshing pavement markings following winter months
	• **Sweeping** – Clean-up of leaves, debris and dirt that accumulate along active transportation facilities.
Winter	• **Snow Clearing & Snow Removal; Prevention of Ice Formation** – All of the winter maintenance activities that help to create a navigable active transportation facility year-round.
Others – As Needed	• **Vegetation Trimming** – Ensuring grass and other plantings do not impact the surface through regularly cutting and trimming • **Litter collection** – Removing/collecting garbage accumulated in boulevards and through open spaces

10.1.2. Ontario Regulation 239/02 – Minimum Maintenance Standards for Cycling & Walking Facilities

Ontario Regulation 239/02, a regulation under the Municipal Act, 2001, identifies minimum maintenance standards for municipal highways. These standards are optional for municipalities, however many municipalities choose to adopt them as policy since they provide some protection from liability when they are met under Section 44 (3) of the Municipal Act. The standards focus on the end outcome, without providing prescriptive details of how the results are to be achieved. As a result, municipalities are free to implement a variety of techniques to achieve the desired results and to adapt maintenance practices based on local conditions.

Historically, these standards focused largely on municipal roadways, however a recent amendment to Ontario Regulation 239/02 includes proposed minimum maintenance standards for walking & cycling facilities. The amendment represents a major step forward for municipalities with active transportation facilities as it provides a benchmark for municipalities hoping to provide access to cycling and walking facilities throughout all four seasons.

The overview of the amendment identifies the purpose of the proposed changes:

> The intent is to encourage Ontario municipalities to continue to expand the number of active transportation facilities that they own and maintain, for year-round use, without fear of undue legal/liability risks being the excuse not to do so, by providing clear and achievable winter maintenance standards.
>
> Those municipalities who (pursuant to their existing powers to do so as granted under the Municipal Act, 2001) must close portions of their public highways during Winter months, due to lack of sufficient funding for proper inspection and maintenance, will continue to be able to do so and will also have clearer guidance and enhanced protections under the updated regulation. This will better permit municipalities, especially in rural or smaller centres with limited tax bases, to focus their resources and provide better service on those highways that remain open for winter use. Increased certainty for municipalities and clarifying expectations for all road and sidewalk users will result from these proposed amendments to the regulation.

These maintenance standards provide a baseline level of service for municipalities across Ontario, and are being incorporated into the Region's Maintenance Practices.

A summary of the new service levels identified in the updated standards for active transportation facilities for each mode is included below.

Sidewalks

The revised standards incorporate guidance on winter maintenance of sidewalks. The specific requirements are noted below:

16.3 1. Subject to section 16.4, the standard for addressing snow accumulation on a sidewalk after the snow accumulation has ended is,

a. to reduce the snow to a depth less than or equal to 8 centimetres within 48 hours; and

b. to provide a minimum sidewalk width of 1 metre. O. Reg. 366/18, s. 15.

2. If the depth of snow accumulation on a sidewalk is less than or equal to 8 centimetres, the sidewalk is deemed to be in a state of repair in respect of snow accumulation. O. Reg. 366/18, s. 15.

3. If the depth of snow accumulation on a sidewalk exceeds 8 centimetres while the snow continues to accumulate, the sidewalk is deemed to be in a state of repair with respect to snow accumulation, until 48 hours after the snow accumulation ends. O. Reg. 366/18, s. 15.

Source: O. Reg 239/02, Section 16.3

Bicycle Lanes/Separated Bicycle Lanes

The MMS now addresses winter maintenance of bicycle lanes and separated bicycle lanes. The specific requirements are noted below:

4.2 1. Subject to section 4.3, the standard for addressing snow accumulation on bicycle lanes is,

c. after becoming aware of the fact that the snow accumulation on a bicycle lane is greater than the depth set out in the Table to this section, to deploy resources as soon as practicable to address the snow accumulation; and

d. after the snow accumulation has ended, to address the snow accumulation so as to reduce the snow to a depth less than or equal to the depth set out in the Table to this section to provide a minimum bicycle lane width of the lesser of 1 metre or the actual bicycle lane width. O. Reg. 366/18, s. 7.

2. If the depth of snow accumulation on a bicycle lane is less than or equal to the depth set out in the Table to this section, the bicycle lane is deemed to be in a state of repair in respect of snow accumulation. O. Reg. 366/18, s. 7.

TABLE SNOW ACCUMULATION – BICYCLE LANES		
Class of Highway or Adjacent Highway	Depth	Time
1	2.5 cm	8 hours
2	5 cm	12 hours
3	8 cm	24 hours
4	8 cm	24 hours
5	10 cm	24 hours

O. Reg. 366/18, s. 7.

Source: O. Reg 239/02, Excerpt from Section 4.2

10.2 PEDESTRIANS AND CYCLISTS IN CONSTRUCTION ZONES

During construction or rehabilitation of a roadway, the environment through a construction zone often introduces rough pavement, narrow or restricted lanes, impeded sidewalks and heavy machinery, which can create a particularly uncomfortable situation for a pedestrian or cyclist.

It is important to maintain safe and convenient access for pedestrians and cyclists through construction zones. As a general principle, if access is maintained for motor vehicles, then access should also be maintained for pedestrians and bicycles. Ideally, the contractor should provide a temporary facility for pedestrians and bikes if space is available within the road allowance. While this is not always possible, alternatives to accommodate pedestrians and cyclists should always be considered. If phasing of the construction requires that access to the roadway is closed to vehicular, pedestrian and bicycle traffic at any time during construction, a well-signed detour route should be provided. **Traffic management plans submitted to the Region should also be reviewed by the active transportation group to ensure these needs are met.**

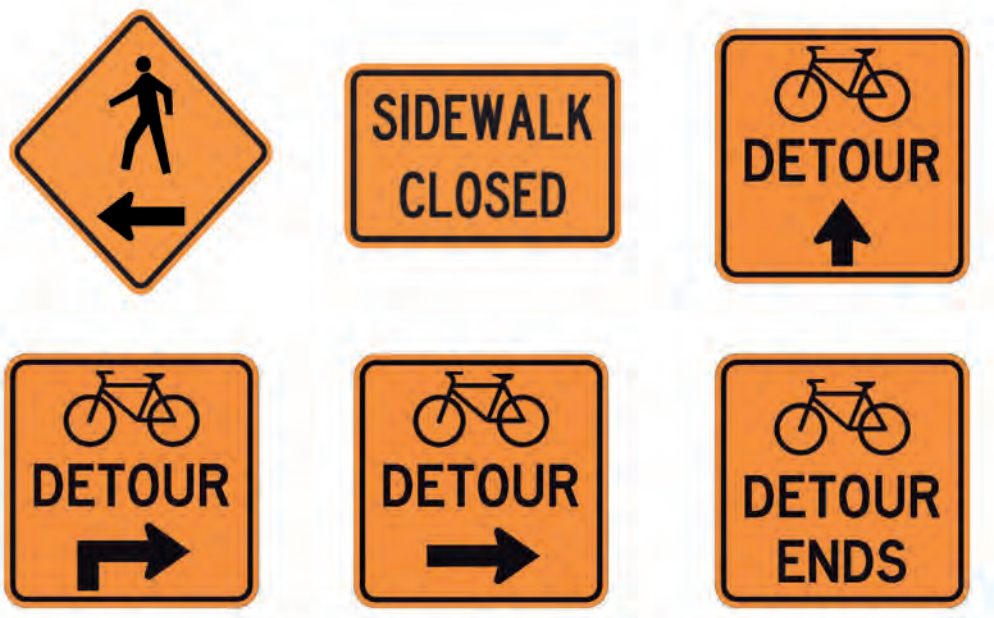
The AODA requirements for exterior paths of travel apply even to temporary paths provided through construction zones. Therefore, every effort should be made to meet basic AODA requirements during longer term construction staging. As a minimum, where pedestrian access is maintained, appropriate clear widths and ramps of appropriate slopes to permit mobility devices should be provided at any crossings.

Temporary road conditions through the construction zone that are compatible with motor vehicles may not be compatible with pedestrians or bicycles. For example, steel plates and timber decking are typically used to cover holes in the roadway. Steel plates should be coated with a non-slip surface and timber decking should be placed at right angles to prevent a bicycle wheel from falling into the cracks.

Appropriate signage is also important in providing information to pedestrians, cyclists and drivers. OTM Book 7 suggests that detours do not require special signage for cyclists unless it is a bicycle-specific detour. Bicycle-specific detours should be considered if work zone or motor vehicle detour conditions cannot be made acceptable for cycling, or if a potential detour route for cyclists exists that is safer or more convenient than the detour route for motor vehicles.

A sampling of cyclist and pedestrian detour signage is shown in Exhibit 10-2.

Exhibit 10-2. Pedestrian and cycling detour signage



Source: OTM Book 7

OTM Book 7 provides additional guidance on provisions for pedestrians and cyclists through workzones.

As needed, pedestrian or cyclist detours may incorporate physical delineation, such as the example shown below in Exhibit 10-3.

Exhibit 10-3. Temporary Cyclist Detour

Source: CROW Design Manual for Bicycle Traffic

Appendix A – Additional References and Resources

References and Additional Resources

Appendix A

In addition to the standards and guidelines in York Region, the following references were used in the development of these guidelines and provide supplementary guidance on a number of the concepts presented in this memo.

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