

11.0 RAISED CROSSWALK AND INTERSECTION GUIDELINE

*Road Engineering
Design Guidelines*

Version 1.0

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City of Toronto, Transportation Services

Background

In early 2014, Transportation Services initiated a review of the Division's design guidelines and standards to move our organization in a direction consistent with the transportation departments of many other large North American cities. In addition to currently available national guidelines, the City of Toronto would benefit from more context sensitive and in-house engineering design.

In response, Transportation Services has embarked on updating technical guidance on street design. This guideline is the result of research and consultation with key partners and reviewing relevant policy and design documents such as:

- National Association of City Transportation Officials (2013). Urban Street Design Guide. Island Press, Washington
- Ontario Ministry of Transportation, Ontario Traffic Manuals
- Transportation Association of Canada (TAC) Geometric Design Guidelines for Canadian Roads (2017)
- TAC Canadian Guide to Neighbourhood Traffic Calming (Second Edition, February 2018)

This guideline is primarily for use by engineering staff to determine the design of **raised crosswalks and intersections**. *Please note: this guideline does not speak to where crossings are warranted or should be located, only to where existing or planned crossings should be elevated.* This document will eventually be part of a future document containing City of Toronto specific engineering design guidelines for road works.

11.0 Raised Crosswalks and Intersections

11.1 Introduction

Raised crosswalks and raised intersections are higher in elevation than the adjacent roadway. Raised crosswalks may be constructed at an intersection or a mid-block location.

Raised crosswalk surfaces improve the visibility of pedestrians to traffic on the roadway, and increase motorist awareness of the crosswalk location in general. Raised treatments require drivers to slow down, and similar to horizontal treatments like curb extensions, raised crosswalks also provide 'visual friction' which can result in more cautious driving and lower vehicle speeds. With increased visibility and a lower speed, drivers benefit from a longer reaction time and should a collision occur, the impact speed is reduced.

Contributing to the safety benefit is the absence of a low spot at the start and end of a crosswalk; this reduces the amount of accumulated water/slush/ice that pedestrians have to walk through or around.

Raised crosswalks and intersections can be found as standalone pedestrian safety improvements to address particular concerns, or in more generic traffic calming applications as applied to a whole street or neighbourhood. In both cases they are found to reduce speed on a roadway and may increase compliance with posted signage.

Raised crosswalks and intersections are designed using various design controls such as road classification, lane width, road width and on-street parking. These guidelines should be used with experiential knowledge and good engineering judgement.

11.1.1 Exclusions

This document provides guidance for raised treatments at stop controlled locations; signal controlled, yield controlled and uncontrolled locations should be evaluated as part of a traffic calming strategy.

11.2 Raised Crossing Types



Figure 1- Raised Intersection
Source: nacto.org

Raised intersection

A raised intersection is where the entire area of the intersection, inclusive of all crosswalks, is elevated above the adjacent road surface and usually ties in to the sidewalk at, or close to grade.



Figure 2 - Raised Crosswalk at Intersection
Source: nacto.org

Raised crosswalk at an intersection

A raised crosswalk at an intersection is where the intersection crosswalk surface is elevated from the adjacent roadway and usually ties in to the sidewalk at, or close to grade.



Figure 3 - Raised Crosswalk Mid-Block
Source: nacto.org

Raised crosswalk mid-block

A raised crosswalk mid-block is where the surface of a crosswalk located between two intersections is elevated above the grade of the adjacent roadway and usually ties in to the sidewalk at, or close to grade.

11.3 Design Controls

Traffic Conditions

Posted speed limit should be less than or equal to 50km/h on roadways with raised treatments. There is no restriction on traffic volumes.

Road Geometry

Raised crosswalks and raised intersections should be avoided on grades over 8% (as per Canadian Guide to Traffic Calming – 2018).

Special consideration should also be given to the proximity of horizontal curves and availability of good sightlines; raised intersections and raised crosswalks may not be appropriate in all locations.

Location

The installation of raised treatments should be considered at the following locations:

- Where low compliance with stop control is posing a collision hazard;
- Where drivers are failing to yield to pedestrians;
- Where poor sightlines toward a pedestrian crossing would be best improved by raising the crossing;
- Where children frequently cross (i.e. at the frontages of schools), particularly if unaccompanied by adults.

Vehicle and Pedestrian Control

The installation of raised intersections should be restricted to where vehicles are already coming to a stop, i.e. at all-way stop-controlled intersections (unless part of a traffic calming initiative).

Raised crosswalks can also be installed at all-way stop-controlled intersections across select legs; this may be desirable if the other legs have bus routes, or other characteristics which might make a fully raised intersection not recommended. Take care when proposing/designing raised crosswalks on adjacent approaches; this may pose a challenge to right turning vehicles (who may in turn drive over the sidewalk to avoid the drop between the crosswalks).

The installation of raised crosswalks at an intersection should be restricted to where vehicles are already coming to a stop, i.e. at two-way stop controlled intersections across the legs controlled by stop signs. For crossings controlled by a PXO, see below.

The installation of a raised crosswalk at a PXO (at an intersection or mid block) should be part of a traffic calming strategy, as the raised crosswalk will act like a speed-hump when pedestrians are not present in the crosswalk.

Raised treatments at signalized intersections (including mid-block signals) should be part of a traffic calming strategy, as the raised treatment will act like a speed hump when through traffic has a green light.

Accessibility

Tactile Walking Surface Indicators (TWSIs) must be installed at all new or reconstructed raised intersections and crosswalks.

Emergency Response Routes

Raised crosswalk treatments near hospitals and fire stations should involve consultation with the Toronto Paramedic Services and Toronto Fire Services.

Heavy Vehicles

Raised crosswalk treatments are not recommended on routes frequently used by heavy vehicles; engineering judgement should be applied in evaluating surrounding land uses and identifying roadways with frequent heavy vehicles. Functional road classifications can be used to determine heavy vehicle usage; local 'residential' roads will carry fewer heavy vehicles than local 'commercial/industrial'.

TTC

Locations with regularly scheduled TTC bus service should be evaluated on a site-specific basis, and concerns regarding service efficiency and ride quality mitigated (e.g. with a gentler ramp grade).

Sidewalks

The presence of sidewalks leading to raised crosswalks should be considered and sidewalks or connections to sidewalks should be installed if appropriate.

Cycling Facilities

Existing or planned cycling facilities should be identified. Consult with the Cycling & Pedestrian Projects unit to ensure any proposed raised crossings provide a positive net benefit to road users.

On-Street Parking

On-street parking restrictions, permit parking, and metered parking should be identified to assess the impact of a raised crossing (if any).

Roadway Material

Unless other materials are typical at the location, raised crosswalks are to be constructed of asphalt pavement for ease of maintenance and visibility of pavement markings. A concrete base should be considered for long term durability.

Traffic Calming

As raised crossings have traffic calming effects, any local traffic calming initiatives should be considered.

Curb Extensions

For additional visibility of waiting pedestrians, raised crossings should be combined with curb extensions when possible.

11.4 Raised Crosswalk and Intersection Design

11.4.1 Design Considerations / Elements

Raised intersections and crosswalks should be designed as per the drawings *Raised Intersection Standard* and *Raised Crosswalk Standard* respectively.

Height

The intersection or crosswalk should be raised 100mm above existing road grade.

Ramp Dimensions

A rise of 100mm over 1.5m is recommended for approach ramps.

Tactile Walking Surface Indicators

TWSI should be installed as per T-310.030-10.

Signage

All signage shall conform to the Ontario Traffic Manual, Book 5: Regulatory Signs and Book 6: Warning Signs. No additional signage is required for raised intersections or crosswalks, with the exception of WA-50 Speed Hump signs for all mid-block raised crosswalks.

Pavement Markings

All pavement markings shall conform to the Ontario Traffic Manual, Book 11: Pavement, Hazard and Delineation Markings.

Ramps should be painted with arrows as per T-540.02.

Crosswalks should be painted as zebras as per T-310.030-5.

Drainage

Installation of a raised crossing may necessitate moving/installing catch basins or other drainage measures, which should be considered during road design.

Installation

The installation of raised intersections and crosswalks should be considered and bundled with planned road rehabilitation projects when possible.

Installations can be standalone projects as well, typically to address existing safety concerns.

Raised intersections and crosswalks should be combined with other safety countermeasures (i.e. curb extensions) to maximize overall safety benefits.

11.4.2 Design Methodology

Good engineering judgement should be used to ensure that the crossings/intersections operate effectively and promote safety for all road users. Raised crosswalks and intersections should be designed according to the dimensions identified in this guideline. Design considerations should be reviewed for all raised crossing treatments.

11.4.3 Application

The raised crosswalk and intersection guidelines should be applied to all raised crossing treatments that are being newly constructed, reconstructed, or as directed by Transportation Services.

District Traffic Operations may recommend minor deviations from the guideline to address site specific safety or operational issues. Significant deviations from the guideline should be brought to the Safety and Mobility Committee's (SMC) Traffic Engineering Subcommittee for consideration.

11.5 Supplemental Information

TAC Canadian Guide to Neighbourhood Traffic Calming (Second Edition, February 2018) – pages 52-56

National Association of City Transportation Officials (2013). Urban Street Design Guide.

Ontario Ministry of Transportation, Ontario Traffic Manuals

Transportation Association of Canada (TAC) Geometric Design Guidelines for Canadian Roads (2017)

City of Toronto Cycling Network Plan

The cycling network plan identifies existing and planned cycling infrastructure such as bike lanes, cycle tracks, trails, quiet street routes, and major corridor studies.

Existing Raised Crosswalks

The locations of existing raised intersections and crosswalks in Toronto as of October 2018 are included in the Appendix for reference.

Appendix - Existing Raised Intersections and Crosswalks (as of October 2018)

District	Type	Location - Street Name	From - Street Name	To - Street Name	Date Constructed	Number of raised treatments ^{*1}	Raised height (mm)	Ramp length (m)	Ramp slope (%)	Notes
TEY	Raised Intersections	Heath Street West	Deer Park Cres		2005	1				
SC	Raised Intersections	Blantyre Ave	Parkland Rd		2012	1	150	3	5	
TEY	Raised Intersections	High Park Blvd	Indian Rd		2017	1	100	2	5	
TEY	Raised Crosswalks	Ava Road	Glencedar Road	(blank)	1997	4				
TEY	Raised Crosswalks	Ava Road	Strathearn Road	(blank)	1997	1				
TEY	Raised Crosswalks	Ava Road	Westover Hill Road	(blank)	1997	3				
TEY	Raised Crosswalks	Avenal Drive	Chiltren Hill Road	(blank)	1997	2				
TEY	Raised Crosswalks	Avenal Drive	Glencedar Road	(blank)	1997	2				
TEY	Raised Crosswalks	Chiltren Hill Road	Dewbourne Avenue	(blank)	1997	3				
TEY	Raised Crosswalks	Dewbourne Avenue	Glencedar Road	(blank)	1997	2				
TEY	Raised Crosswalks	Glen Cedar Road	Warwick Avenue	(blank)	1997	2				
TEY	Raised Crosswalks	Strathearn Road	Westover Hill Road	Warwick Avenue	1997	1				
TEY	Raised Intersections	Huron Street	Bloor Street West	Harbord Street	1997	3	100+20	1.42+	2	2 stage ramp, rise & length of ramp varies based on location
TEY	Raised Intersections	Balliol Street	Mt. Pleasant Road	Cleveland Street	1997	5	100	2	5	
TEY	Raised Intersections	Arlington Avenue	Durham Avenue	(blank)	1998	1	100	1.5	6.67	
TEY	Raised Intersections	Arlington Avenue	Winnett Avenue	(blank)	1998	1	100	1.5	6.67	
TEY	Raised Crosswalks	Atlas Avenue	Vaughan Road	(blank)	1998	1				
TEY	Raised Intersections	Atlas Avenue	Ava Road	(blank)	1998	1	100	1.5	6.67	
TEY	Raised Intersections	Atlas Avenue	Belvedere Avenue	(blank)	1998	1				
TEY	Raised Intersections	Atlas Avenue	Durham Avenue	(blank)	1998	1	100	1.5	6.67	

¹ A fully raised intersection appears as 1

District	Type	Location - Street Name	From - Street Name	To - Street Name	Date Constructed	Number of raised treatments* ²	Raised height (mm)	Ramp length (m)	Ramp slope (%)	Notes
TEY	Raised Intersections	Ava Road	Winnett Avenue	(blank)	1998	1	100	1.5	6.67	
TEY	Raised Intersections	Ava Road	Winona Drive	(blank)	1998	1				
TEY	Raised Intersections	Belvedere Avenue	Winona Drive	(blank)	1998	1				
TEY	Raised Intersections	Durham Avenue	Winnett Avenue	(blank)	1998	1	100	1.5	6.67	
TEY	Raised Crosswalks	Dewbourne Avenue	Peveril Hill North	(blank)	1999	1				
EY	Raised Intersections	Humbercrest Boulevard	St. John's Road	Dundas Street West	2000	1				
NY	Raised Crosswalks	Grandravine Drive	Derrydown Road	Driftwood Avenue	2003	4				
NY	Raised Intersections	Grandravine Drive	Derrydown Road	Driftwood Avenue	2003	4				
TEY	Raised Intersections	Heath Street West	Tweedsmuir Avenue/ Lower Village Gate	(blank)	2004	1	100	1	10	
EY	Raised Intersections	Old Mill Drive	Riverside Drive	(blank)	2005	1	80	1.2	6.67	
EY	Raised Intersections	Glenholme Avenue	Holland Park Avenue	(blank)	2005	1				
TEY	Raised Intersections	The Esplanade	Market Street	Jarvis Street	2001		100	1.5	6.67	

² A fully raised intersection appears as 1