2.0 LANE WIDTHS GUIDELINE

Road Engineering Design Guidelines

Version 2.0.1

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City of Toronto, Transportation Services

TORONTO

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. Roadway design engineers in Canada have historically relied on the Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads (GDGCR) (1999) as the basis for engineering roadway designs. However, most guidelines within this document were developed decades ago, have not been substantially revisited, and have not always fully considered all modes of travel.

While attempts are being made to provide separate guidance suitable for urban areas as a part of the TAC GDGCR update, it has been determined that the City of Toronto would benefit from more context sensitive and in-house engineering design, an approach taken by several other municipalities.

In response, Transportation Services has embarked on updating technical guidance on street design. This guideline is the result of extensive 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.
- Complete Streets Guidelines of other comparable jurisdictions such as Chicago, Philadelphia, and Boston.
- Ontario Ministry of Transportation. Ontario Traffic Manuals
- Transportation Association of Canada (TAC) (1999). Geometric Design Guidelines for Canadian Roads
- American Association of State Highway and Transportation Officials. (2004). A Policy on Geometric Design of Highways and Streets (5th ed.). Washington, DC: AASHTO.

This guideline is primarily for use by engineering staff to determine **appropriately sized lane widths on roads with delineated lanes**. This document will eventually be part of a future document containing all City of Toronto specific engineering design guidelines for road works.

2.0 Lane Widths

2.1 Introduction

Lane widths have impacts on vehicle types, vehicle speeds, pedestrian crossing distances, on-street parking, transit routes, and accommodation for cyclists. All these factors must be considered and balanced when determining the appropriate width of lanes. These guidelines were designed to provide appropriate motor vehicle accommodation while improving cyclist and pedestrian safety, improving cyclist accommodation, and making effective use of the limited right-of-way and pavement width.

There are many benefits of appropriately sizing and reducing lane widths. Research conducted by various organizations has found that there is a direct correlation between lane widths and vehicle speeds. Wide lanes allow for and can encourage vehicles to travel at excessively high speeds. Implementing lane widths that are not excessively wide encourages drivers to travel slower and not exceed the speed limit resulting in reduced impact speed in the event of a collision and provides drivers with more reaction time. Reducing lane widths also allows for space within the roadway to better accommodate cyclists by providing urban shoulders, wide shared curb lanes, or by providing dedicated cycling facilities where possible. Narrowing lane widths also reduces the pedestrian crossing distance which reduces the time a pedestrian is exposed to vehicular traffic while crossing the road.

The Highway Capacity Manual indicates that there are no impacts to capacity when reducing lane widths down to 3.0m when traffic flow is interrupted by intersections.

Lane widths are determined using various design controls such as road classification, existing and planned dedicated cycling facilities, speed limit, surface transit routes, and truck volumes. The guidelines provided should be used with experiential knowledge and good engineering judgement to determine appropriately sized lane widths.

2.1.1 Definitions

Lane Width
A lane width is the cross sectional dimension of a lane, perpendicular to the direction of travel, measured from the centre of lane markings and the faces of curbs.

Vehicular Travel Lane
Vehicular travel lanes are lanes used by vehicles travelling along a route. Bus bays, bike lanes, and 24 hour parking lanes are not considered vehicular travel lanes.

2.2 Lane Types

Through Lane
A through lane is a vehicular travel lane that is not a curb lane and is used primarily for through traffic. The through lane closest to the left in the direction of travel may be used to make left turn movements where dedicated left turn lanes are not provided. Through lanes should be from 3.0m to 3.5m wide.

Curb Lane
A curb lane is the vehicular travel lane closest to the curb on the right side that is not a right turn lane. Curb lanes are typically located adjacent to the curb. Where there are urban shoulders, dedicated cycling facilities, dedicated parking lanes, or dedicated right turn lanes, the through lane closest to the right side is considered the curb lane. Curb lanes may be used to make right turn movements where dedicated right turn lanes are not provided. Curb lanes should be a minimum width of 3.3m wide where possible. Curb lanes on roads with a speed limit of 60km/h should be 3.5m wide where possible. Curb lanes on roads with urban shoulders or dedicated cycling facilities should be from 3.0m to 3.5m wide. Curb lanes on roads without urban shoulders or dedicated cycling facilities are considered to be shared curb lanes. A curb lane should never be narrower than the adjacent through lanes.

Shared Curb Lane
A shared curb lane is a curb lane used by bicycles and motor vehicles, where there are no dedicated cycling facilities. When sufficient width is available, an urban shoulder delineated by an edge line should be provided. Shared curb lanes without an adjacent urban shoulder should be 3.0m to 4.3m wide. Shared curb lanes adjacent to an urban shoulder should be 3.0m to 3.5m wide.

Urban Shoulder
An urban shoulder is a space, delineated by an edge line that a cyclist may choose to ride in instead of riding in the vehicular shared curb lane where dedicated cycling facilities are not provided. An urban shoulder is not an alternative to a dedicated cycling facility. An urban shoulder may be used for snow storage in the winter.

Vehicles parked on-street are expected to park according to City by-laws with the tires of vehicle within 30cm of the curb face. Where a vehicle is unable to fit entirely within the urban shoulder, the vehicle will be expected to park in the urban shoulder with the vehicle extending into the curb lane.

Urban shoulders should be provided wherever possible. An urban shoulder delineated by an edge line shall be a minimum width of 1.2m and may be as wide as 2.3m where space is available.

Two-Way Left Turn Lane (Continuous Left Turn Lane)

A two-way left turn lane is a left turn lane located between through lanes of opposing directions. The two-way left turn lane is used to make left turns in either direction. Two-way left turn lanes should be 3.0m to 3.3m wide. Two-way left turn lanes may be wider than 3.3m to match the width of a left turn lane adjacent to a median.

Dedicated Left Turn Lane

Left turn lanes are primarily used to make left turns at intersections and occasionally driveways. Dedicated left turn lanes should be 3.0m to 3.3m wide. Dedicated left turn lanes should only be provided when technically warranted. Double left turn lanes may be up to 3.5m wide where determined necessary by District Traffic Operations.

Dedicated Right Turn Lane

Right turn lanes are primarily used to make right turns at intersections and occasionally driveways. Dedicated right turn lanes should be 3.0m to 3.3m wide. Right turn lanes that are part of TTC bus routes are often combined with bus stop lay-bys and bus queue jump lanes and may be widened to 3.3m. Right turn lanes may be widened beyond the maximum to be used as a shared lane on road segments with dedicated cycling facilities or at T-intersections where cyclists are required to make a right turn. Right turn lanes should only be provided when technically warranted. Double right turn lanes may be up to 3.5m wide when determined necessary by District Traffic Operations.

Dedicated Parking Lane

A dedicated parking lane is a lane located between the curb lane and the curb that is only used for parallel parking. A dedicated parking lane does not facilitate vehicular travel. Dedicated parking lanes should be 2.0m to 2.8m wide. Dedicated parking lanes should only be wider than 2.4m where there is a high volume of parked trucks or if a horizontal alignment curve prevents vehicles from parking within a 2.4m wide parking lane.

Dedicated Cycling Facility

A dedicated cycling facility is an exclusive travel lane for use by cyclists that provides separation from vehicular traffic in the form of a painted line, painted buffer, bollards, raised curb, raised surface or other physical barriers. Refer to Ontario Traffic Manual Book 18: Cycling Facilities for additional information on dedicated cycling facilities.

2.3 Design Controls

The following design controls should be used to determine lane widths. Assumptions taken into consideration for each design control are described below. The impact of design controls is shown in Table 2.4.1.A Lane Width Dimensions.

Dedicated Cycling Facilities
The curb lane should not be designed as a shared curb lane on road segments with dedicated cycling facilities.

Speed Limit
Lane widths should vary depending on the speed limit of a road segment. Wider lanes are allowable on roads with higher speed limits.

TTC Bus Routes
Lane widths for curb lanes that are part of a TTC bus service route should be a minimum width of 3.3m. Queue jump lanes and bus stop lay-bys may have a width of 3.3m where possible and an absolute minimum width of 3.0m in retrofit scenarios. Planned bus routes that are confirmed to be operational in the near future should also be considered.

TTC Streetcar Routes
Lane widths for lanes used by TTC streetcars should be a minimum width of 3.1m. Wider lanes are required at locations with horizontal alignment curves. Lane widths should be determined using TTC streetcar vehicle envelopes.

High Truck Volume
There should be consideration for wider lane widths on corridors with high truck volumes. Intersections with 700 or more 8-hour two-way truck volumes are considered to have high truck volumes. A road segment with a series of intersections that have high two way truck volumes are indicative of a corridor with high truck volumes. There should also be consideration for wider turn lanes at intersections with high volumes of turning trucks.

A link to maps identifying locations with high through truck volumes can be found in Section 2.5 Supplemental Information.

Other justifiable measures of truck volume may also be used to determine segments with high truck volumes. Consultation with District Traffic Operations and use of available count data is recommended when determining segments with high truck volumes.

Horizontal Alignment Curves
There should be consideration for wider vehicle lanes on road segments with horizontal alignment curves. Large vehicles including trucks occupy a wider cross section when travelling along horizontal curves.

2.4 Lane Width Design

2.4.1 Lane Width Dimensions

The following table identifies minimum, target, and maximum widths for through lanes, curb lanes, urban shoulders, turn lanes, and parking lanes. The design controls identified in Section 2.3 should be used to determine lane widths along a corridor. Lane widths are typically only widened beyond the target width if there is space available in the cross section and if there is a requirement to accommodate TTC streetcars, high truck volumes and significant horizontal alignment curves. In Table 2.4.1.A Lane Width Dimensions, the 'x' shows that the influencing design control has no impact on the lane widths and the '+' shows that the influencing design control gives reasoning to provide a lane width wider than the target, up to the maximum lane width.

Table 2.4.1.A Lane Width Dimensions

			Minimum (m)	Target (m)	Maximum (m)	TTC		High Truck Volume	Horizontal Alignment Curves
						TTC Bus Routes	TTC Streetcar Routes		
Through Lane	**60km/h or more**		3.0	3.0	3.5	x	+[1]	+	+
	50km/h			3.0	3.3				
	40km/h or less			3.0	3.0				
Curb Lane	**Shared Curb Lane without Urban Shoulder**		3.3	4.3	4.3	+[2]	x	+	+
	Shared Curb Lane with Urban Shoulder or Curb Lane with Dedicated Cycling Facility	**60km/h or more**	3.0	3.5	3.5				
		50km/h		3.3	3.5				
		40km/h or less		3.3	3.5				
Urban Shoulder			1.2	2.3	2.3				
Two-way Left Turn Lane			3.0	3.0	3.3	x	x	+	+
Dedicated Left Turn Lane			3.0	3.0	3.3	x	x	+	+
Dedicated Right Turn Lane			3.0	3.0	3.3	+	x	+	+
Dedicated Parking Lane			2.0	2.4	2.8	x	x	x	+
Dedicated Cycling Facility			Note 1						

Note 1 – Refer to Ontario Traffic Manual Book 18: Cycling Facilities

[1] Through lanes should be a minimum width of 3.1m on TTC streetcar routes.

[2] Curb lanes should be a minimum width of 3.3m on TTC bus service routes.

2.4.2 Lane Width Priorities

The desired cross section with preferred lane types and lane widths cannot be provided on all corridors due to limited road widths. Lane types and widths have been prioritized into a list of items to determine which lanes and widths should be provided at locations where there is insufficient road width to accommodate the desired cross section. The following list of items have been prioritized from most important to least important. Items should be allocated to a cross section in order of priority. Any specific item should not be allocated to a cross section until all items with a higher priority have been provided.

1. Minimum Curb Lane Width
2. Minimum Through Lane
3. Minimum Turn Lane Width
4. 3.3m Wide Curb Lane Width
5. Minimum Urban Shoulder Width if possible
6. Minimum Conventional Bicycle Lane Width where identified
7. 3.5m Wide Curb Lane Width on 60km/h roads if applicable
8. Minimum Separated Bicycle Lane Width where identified
9. Target Curb Lane with Urban Shoulder if applicable
10. Target Curb Lane with Dedicated Cycling Facility if applicable
11. Target Through Lane Width
12. Desired Bicycle Lane Width
13. Target Curb Lane Width
14. Target Turn Lane Width
15. Curb Lane Width Above Target if required
16. Through Lane Width Above Target if required
17. Turning Lane Width Above Target if required

2.4.3 Design Considerations

Various factors should be considered when determining lane widths.

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

Road Width Surplus
Where there is a surplus in road width after allocating the preferred lane widths, shoulder widths, and buffer widths, the road should be narrowed if possible to provide the minimum pedestrian clearway width and increase the boulevard between the sidewalk and curb.

Insufficient Road Width
Where there is insufficient road width, the road may be widened to accommodate the required lanes if minimum pedestrian clearway widths are provided. Where dedicated cycling facilities are provided, the width of the facility should not be narrowed. A curb lane should not be narrower than the adjacent through lanes. Lane widths as narrow as 2.7m may be considered on localized sections at the sole discretion of District Traffic Operations.

Cycling Facilities and Shared Curb Lanes
Dedicated cycling facilities should be provided with sufficient lane widths where possible. Where dedicated cycling facilities are not provided, curb lanes should be designed as shared curb lanes with urban shoulders where possible. Cycling Infrastructure and Programs should be consulted on all corridors that are part of the Toronto Cycling Network Plan.

Horizontal Alignment Curves
The ability for large vehicles including trucks, buses and street cars to track within a lane should be reviewed on road segments with high volumes of large vehicles and significant horizontal alignment curves. Lane widths may need to be widened beyond the maximum specified width on road segments with significant horizontal alignment curves and high truck volumes.

Lane Transitions
Lane widths may need to be wider at locations with lane shifts and transitions that are substandard to ensure that vehicles are able to manoeuvre through the lane shift or transition within the marked lane. Lane shifts and transitions are often found at intersections to provide turning lanes.

Future Development
Future development and transportation plans should be considered when determining lane widths. Lane widths should be designed to accommodate future development. Design controls should be selected based on post development conditions where possible. Development could result in changes for volumes of vehicles, trucks, transit, cyclists and pedestrians.

2.4.4 Design Methodology

Lane widths should be designed to be appropriately sized for vehicles, cyclists and pedestrians along a road segment. Good engineering judgement should be used to ensure that lane widths are not undersized or oversized.

Table 2.4.1.A summarizes the minimum, target and maximum lane widths for through lanes, curb lanes, shared curb lanes, urban shoulders, two-way left turn lanes, dedicated turn lanes and dedicated parking lanes.

Lane widths wider than the target lane widths specified should only be used where there is evidence of high truck volumes or significant horizontal alignment curves.

Lane widths should be allocated in order of priority according to the lane width priorities list in Section 2.4.2.

Design considerations in Section 2.4.3 should be reviewed for each corridor where lane widths are being designed.

In constrained locations, lane widths less than the minimum, as narrow as 2.7m may be considered on localized sections at the sole discretion of District Traffic Operations.

2.4.5 Application

The lane width guidelines should be applied in the following scenarios:

- All road works projects that involve the application or reapplication of lane markings including new road construction, road reconstruction, road resurfacing, bike lane marking, and large scale utility cut repairs.
- Road corridors identified 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 (SMC) Traffic Engineering Subcommittee for consideration.

2.5 Supplemental Information

Maps of all supplemental information can be found at the following link under the Road Engineering Design Guidelines heading:

https://www.toronto.ca/services-payments/building-construction/infrastructure-city-construction/construction-standards-permits/standards-for-designing-and-constructing-city-infrastructure/

High Through Truck Volume Map

The high through truck volume map identifies signalized intersections with 700 or more 8-hour two-way truck volumes. The two-way truck volume includes all the trucks leaving an intersection and entering the receiving leg of an intersection for an opposing pair of intersection legs. The north-south through volumes include all trucks leaving the intersection and entering the north and south receiving legs. The east-west through volumes include all trucks leaving the intersection and entering the east and west receiving legs. This volume includes all vehicles turning at the intersection and entering a receiving leg.

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.