CITY OF MISSISSAUGA
CHANGING LANES
COMPLETE STREETS GUIDE

MISSISSAUGA

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DRAFT

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1.0 INTRODUCTION

The Mississauga Complete Streets Guide (the Guide) is the City's reference on street design policies, process, and techniques. Use Chapter 1 to gain an understanding of the policy context for Complete Streets in Mississauga and how and when to use the Guide.

1.1 Purpose

The Guide provides direction to staff, developers, and others so they can incorporate Complete Street concepts into the planning, design, rehabilitation and maintenance of new and existing City streets.

Defining Complete Streets
Complete Streets in Mississauga are designed for all ages, abilities, and modes of travel. Safe and comfortable access for pedestrians, bicycles, transit users and people with disabilities is not an afterthought, but an integral planning feature of Complete Streets.

Adapted from www.completestreetsforcanada.ca

"In order to create a complete community and develop a built environment supportive of public health, the City will: ...design streets that facilitate alternative modes of transportation such as public transit, cycling, and walking..."

Mississauga Official Plan (2021 Consolidation): 7.1.3 Complete Communities

"In Mississauga, everyone and everything will have the freedom to move safely, easily, and efficiently to anywhere at any time."

Mississauga Transportation Master Plan (2019): Vision Statement

The vision for a safe, livable, multi-modal, environmentally conscious and future-ready street network is found in the City's policy documents, including the City of Mississauga's Official Plan (MOP), the Transportation Master Plan (TMP), and the Vision Zero Action Plan (VZ). The Guide includes the process, techniques, and performance indicators to assist in the delivery of this vision.

The Guide defines what a Complete Street is and what it should do. Staff, developers, and other street providers will use the Guide as they plan and design streets.

The Guide emphasizes performance monitoring. By measuring performance, Mississauga will learn how to effectively deliver Complete Streets, with each project building upon the lessons learned and successes of those that come before.

Street design teams will endeavour to make each project as complete as possible with available resources, regardless of the category, project type, scale or complexity.

1.2 Application and Limits of the Guide

All Mississauga street projects—public and private, large and small—will use the Guide to inform planning and design.

This Guide applies to all City of Mississauga street projects. A street is the entire right-of-way, from property line to property line. Streets in Mississauga often include a private setback, referred to as the frontage zone, or front onto a public space such as a park.

The Region of Peel is responsible for Regional roads in Mississauga. Region of Peel standards and guidelines apply to Regional roads. This Guide informs the intersection design of City streets with Regional roads.

The Guide directs street design practitioners to design and operate the entire right-of-way to prioritize safer, slower speeds in a way that enhances quality of life, while improving the functionality of the integrated network.

The Guide does not provide prescriptive street design templates that the designer will apply. Street design will respond to each specific project type and context to deliver on the City's complete communities vision.

The Guide is a foundational document and is applicable when developing Secondary Plans, Environmental Assessments (EAs), Integrated Road Projects, corridor studies, new street design and street rehabilitation.

To help implement the Guide, Chapter 7 identifies high-priority street improvement projects in Mississauga.

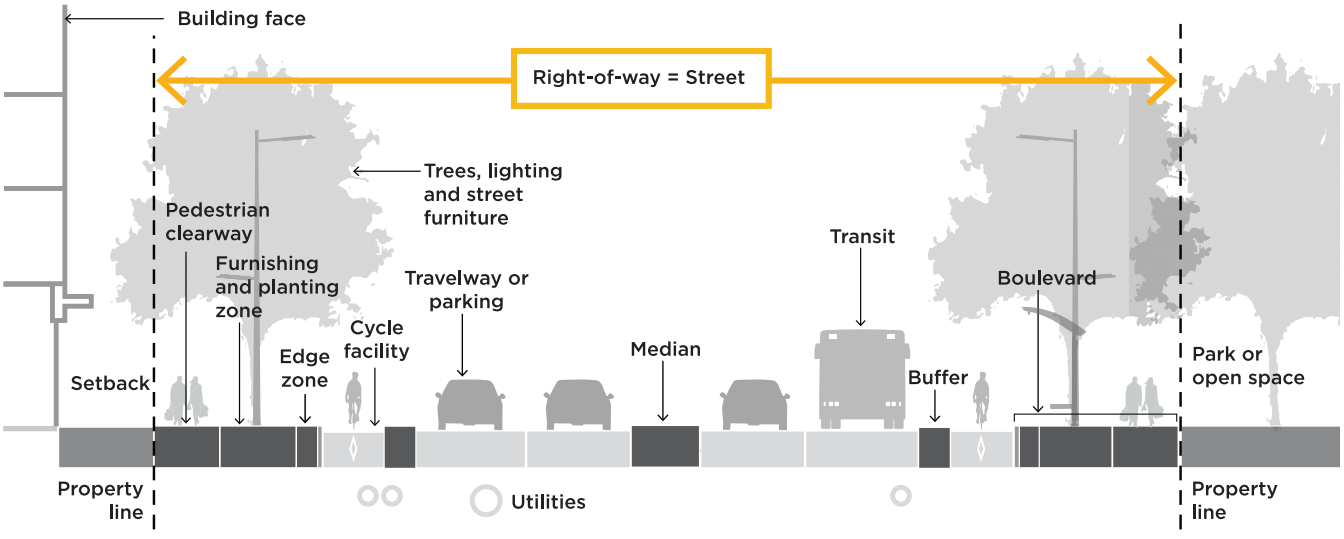


Figure 1.1. A Mississauga Street is the entire right-of-way, from property line to property line.

1.3 Range of Street Projects

Not all street projects are the same. Some are simple maintenance exercises while others are complex, highly involved, and carried out over many years. Regardless of these differences, every street project provides an opportunity to advance the goals of Complete Streets.

There are two categories of street projects in Mississauga:

1. **Capital/Operational Projects:** initiated by the City of Mississauga.

2. **Development Projects:** undertaken by private interests on behalf of the City.

The Guide applies to all work on City streets—from maintenance to operational changes, to retrofits, new construction and reconstruction. Applying the Complete Streets way of thinking is just as relevant to a small project as a large one, as on a Local Neighbourhood Street or an Arterial Strategic Growth Street. Refer to Chapter 3 for street classification definitions.

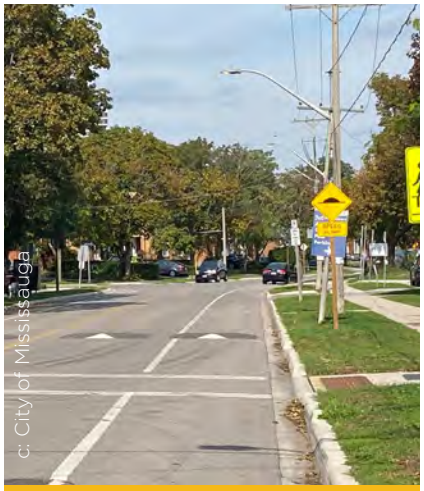
While new streets or full reconstruction efforts afford the greatest opportunity to rethink streets in a comprehensive manner, new streets only represent a small proportion of the City's street network and annual projects.

Table 1.1 The Guide applies to the following project types

	Capital/ Operational	Development
Reconstructions	X	
Resurfacings	X	
Environmental Assessments	X	
Integrated Road Projects	X	
Transit infrastructure	X	
Water/sewer/stormwater management	X	
Utility cut rehabilitations	X	
Safety/local improvements	X	
Traffic calming	X	
New sidewalk construction	X	X
Sidewalk improvements	X	
Bikeway construction/markings	X	X
Street furniture installations	X	X
Street tree planting or green infrastructure installations	X	X
Site plan applications		X
Development applications		X
On-street parking facilities	X	X

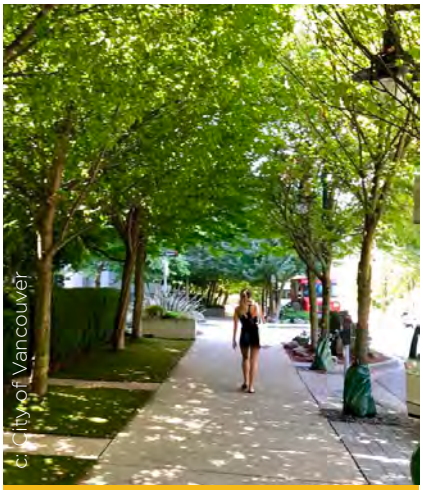
Transit

On-street parking/cycling



Safety/local improvements

Traffic calming



Street tree planting

Resurfacing

Bikeway construction

Green infrastructure

Site plan applications

Figure 1.2. Range of sample street projects.

1.4 Approach to the Guide

Complete Streets is a process and a product to deliver safe and comfortable streets.

Complete Streets applies not only when a street is designed, constructed, or reconstructed, but throughout all phases of street design, operations, and maintenance.

The City's ambition is that everyone in Mississauga, from professionals involved in street design and repair, to residents and political leaders, will understand, apply, and promote the Complete Streets way of thinking. The key to achieving Complete Streets is to ensure the simple question of "how do we make this street more complete?" is asked as part of all street projects.

The process, techniques, and performance indicators in this Guide build upon:

- Policy ambitions and experiences of designing streets in Mississauga.
- Current City of Mississauga work flows and collaborative multi-divisional efforts.
- Best practices from around North America.

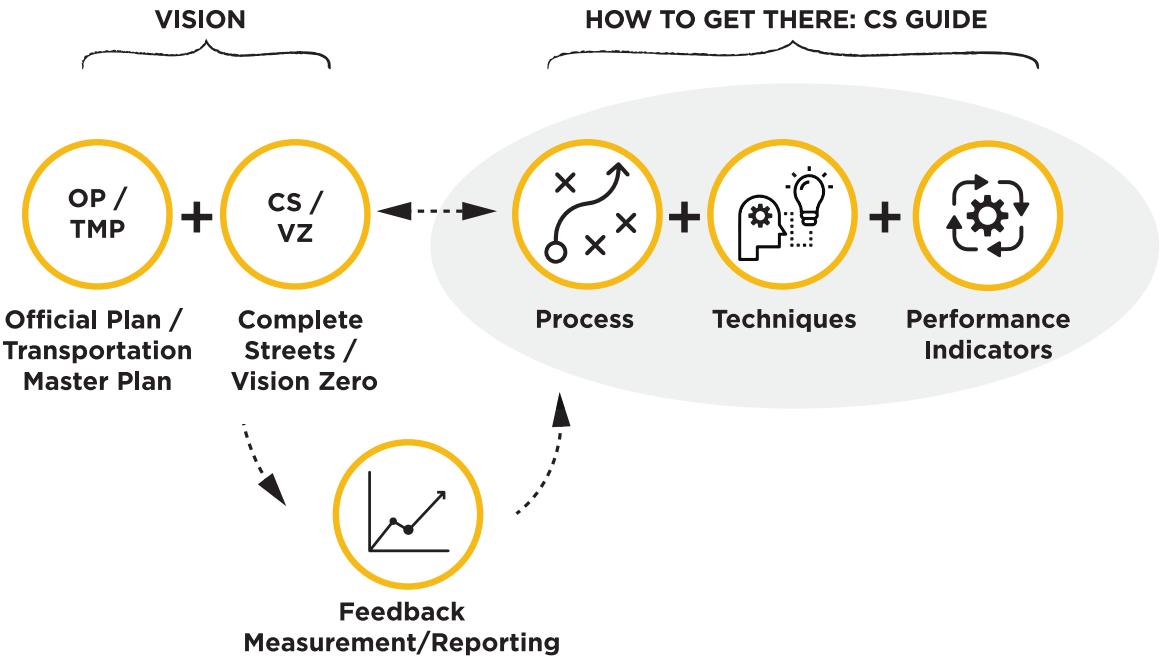


Figure 1.3. The process, techniques, and performance indicators within the Guide will assist in the delivery of Complete Streets in Mississauga.

Complete Streets
AS A PROCESS

Brings a holistic lens
to the street design process

Integrates multiple points of view
within the street design process

Helps prioritize the many demands
placed upon Mississauga's streets

Integrates social, economic and environmental priorities
within the street design process

Identifies ways to reallocate public rights-of-way
for a wide range of different modes and uses

Complete Streets
AS A PRODUCT

Creates a safe environment
that offers improved mobility options for all users, especially people whose needs have not been met through a traditional transportation approach

Helps create complete communities

Provides opportunities for improved health and recreation

Promotes economic well-being

Each Complete Street is unique
and there is no one solution that fits all streets

Creates a public space
within the street

Figure 1.4. Complete Streets is both a process and a product.

1.5 Guide Structure

The Guide's structure allows for quick reference. Additional resources and hyperlinks are provided throughout. These resources will direct the reader to best practices, related programs, funding opportunities, and implementation techniques.

The Guide has seven chapters that reflect the steps of the street planning, design, and implementation process.

1.0 INTRODUCTION
Use Chapter 1 to gain an understanding of how and when to use the Guide and the policy context for Complete Streets in Mississauga.

2.0 PROCESS
Use Chapter 2 for guidance on the street design and planning process.

3.0 DEFINING STREET CONTEXT
Use Chapter 3 to define a street's mobility and place function, building upon the street classification defined in Mississauga's Official Plan.

4.0 TECHNIQUES
Use Chapter 4 for guidance on how to plan and design more complete cross-sections and intersections. Chapter 4 is organized by street component starting with pedestrian realm and place-making, followed by infrastructure, transit, cycle facilities, travelway, and intersections.

To follow* {

5.0 ENSURING SUCCESS
Chapter 5 includes tools to audit Complete Street achievements as the decision-making process unfolds. Use this chapter to ensure that Complete Streets techniques are integrated at all stages of the project and to understand expectations for oversight and compliance.

6.0 DEMONSTRATIONS
Chapter 6 includes demonstration views illustrating potential outcomes of how a street or intersection may look when applying the techniques within the Guide.

To follow* {

7.0 IMPLEMENTATION
Use Chapter 7 for direction and guidance on project prioritization, costing and further recommended actions.

APPENDICES
Street Classification Map, typical cross-section by street class and glossary.

*Chapters 5 and 7 are to follow. They will provide implementation strategies for the Guide and are not included in the draft. They will be added to the Guide when it is brought to Council in summer 2022.

1.6 Policy Direction

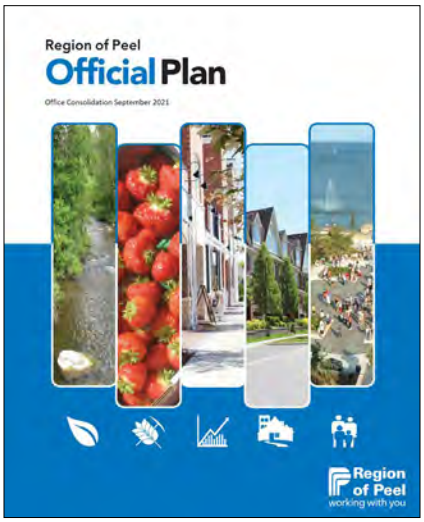
Provincial, Region of Peel, and City policies call for safe and inclusive streets for all uses and users. This Guide will support these policy directions.

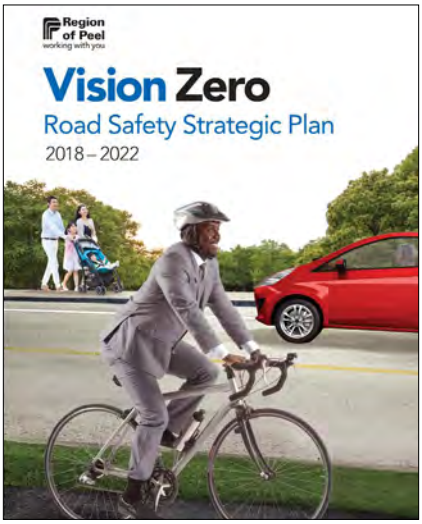
All levels of policy have the goal of creating a healthy, complete community environment that provides a mix of uses, promotes diversity, encourages walkability and accessibility, and builds community identity. This Guide ensures that all Mississauga streets are designed with all users and uses in mind.

Figure 1.5. Provincial policy documents and guides.

PROVINCIAL POLICY
Growth Plan for the Greater Golden Horseshoe (Ontario Ministry of Municipal Affairs, 2017): requires that "in the design, refurbishment or reconstruction of the existing and planned street network, a Complete Streets approach will be adopted that ensures the needs and safety of all road users are considered and appropriately accommodated" (3.2.2.3).

2041 Regional Transportation Plan (Metrolinx, 2018): sets out a broad vision for transportation within the Greater Toronto and Hamilton Area. It includes policies to improve integration between transportation and land use planning decisions. The Plan requires the adoption of a Complete Streets approach when designing, refurbishing, or reconstructing existing or planned streets and street networks. The Plan highlights the importance of active transportation, particularly as a first mile/last mile solution for connecting to transit (page 20). Many streets in Mississauga, such as Eglinton Avenue, Britannia Road, and Derry Road, are identified as Priority Bus Routes by 2041.





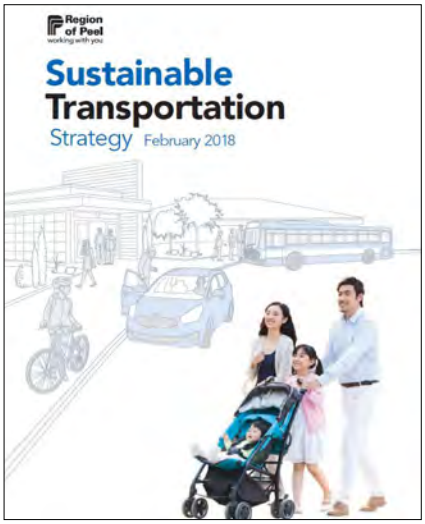


Figure 1.6. Region of Peel policy documents and guides.

REGION OF PEEL POLICY

Region of Peel Official Plan (2021 Office Consolidation): provides a long-term policy framework for decision making by setting a regional context for detailed planning. The Official Plan (ROP) promotes a predictable and sustainable multi-modal transportation system for the Region that: includes all modes of travel; moves goods and people efficiently (with a focus on moving people by modes other than single-occupant automobiles); maximizes the use of existing transportation infrastructure; increases travel choices to meet diverse needs; minimizes the environmental and health impacts of transportation; supports economic development; considers social and cultural objectives; and integrates transportation planning and land use planning.

As part of the Peel Official Plan and Municipal Comprehensive Review, the Region is developing a strategy and policies to guide how growth is accommodated within Major Transit Station Areas (MTSAs) within Mississauga.

Vision Zero Road Safety Strategic Plan 2018-2022 (2018): sets out the Region's Vision Zero framework, under which no loss of life from a collision is considered acceptable. The City of Mississauga passed a resolution to adopt Vision Zero in February 2018. The City has prepared an Action Plan that describes how Vision Zero will be achieved through education, enforcement and street design.

Long Range Transportation Plan (2019): is a five-year plan that guides transportation planning and infrastructure needs in the Region and sets out the blueprint to accommodate anticipated growth to 2041.

Sustainable Transportation Strategy (2018): sets out guidance and actions for active transportation and transportation demand management programming and infrastructure to move the Region towards a 50% sustainable mode share (at AM peak, including walking, cycling, transit, carpooling) by 2041 (also reflected in Peel's Long Range Transportation Plan).

Region of Peel Road Characterization Study (2013): sets out a direction for future roadways that respect multiple transportation modes, ensuring that the Regional road network considers all users, transportation options, health impacts, and local contexts, with an eye towards intensification. Six street typologies are identified.

Streetscaping Toolbox Update (Peel Region, 2017): provides guiding principles for incorporating streetscaping best practices into infrastructure along Regional roads. The Toolbox aims to work with Mississauga's specific land uses by: enhancing streetscape appearance and character; improving active transportation infrastructure; and incorporating green infrastructure along Regional roads. The Streetscape Toolbox will be superseded by the Region's streetscape guide, which is forthcoming.

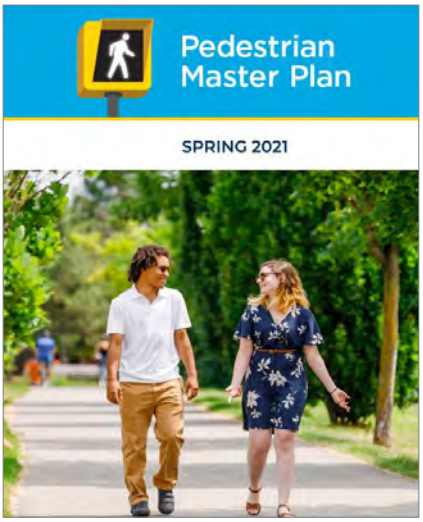


Figure 1.7. City of Mississauga's policy documents and guides.

Mississauga Official Plan (MOP) (Oct 2021 Office Consolidation): provides policies that guide and direct the land use and physical structure of the City. The MOP identifies streets as a critical component of complete communities and encourages: compact, mixed use development that reduces travel needs; streets that facilitate alternative modes of transportation, such as public transit, cycling, and walking; and streets that reinforce the sense of identity of Mississauga's neighbourhoods. The City is currently undertaking its ten-year review of the MOP. The updated MOP will include the new city-wide street classification system included in Chapter 3 of this Guide.

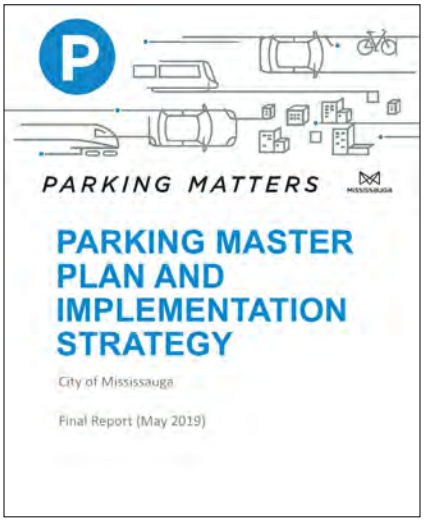
Transportation Master Plan (2019): presents the vision, goals, and action items that will guide Mississauga's transportation system to 2041. The City of Mississauga's inaugural Transportation Master Plan (TMP), approved by Council in 2019, provided the City with an important first step in identifying a transformative vision: "... In Mississauga, everyone and everything will have the freedom to move safely, easily, and efficiently to anywhere at any time". This Guide is an action of the Transportation Master Plan.

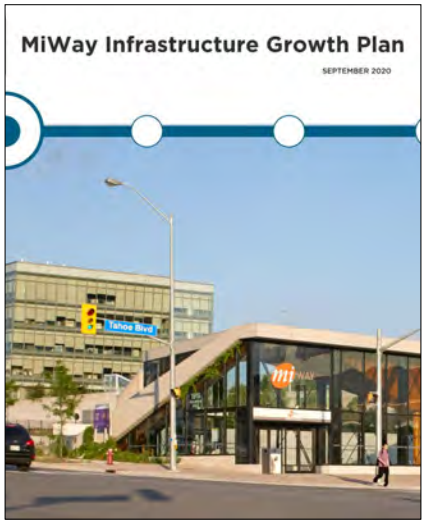
Cycling Master Plan (2018): outlines cycling infrastructure planning and design best practices to improve cycling in Mississauga. The recommended cycling network integrates new facilities with the existing network, providing continuous and barrier-free routes to key destinations, transit, and neighbourhoods that are safe and comfortable.

Transit and Road Infrastructure Plan (forthcoming): will develop a long-term transit network and a long-term road network, which will offer additional transportation infrastructure to support and encourage more modes of travel, such as transit, cycling, and walking. The plan will guide actions, policies, and transportation investment in Mississauga over the next 20 years.

Pedestrian Master Plan (2021): shapes how pedestrian connections are designed and implemented across Mississauga. The Plan is the go-to reference for pedestrian infrastructure projects until 2041, supporting the City's commitment to a Vision Zero approach.

Downtown Core Streetscape Guidelines (forthcoming): will be undertaken in parallel to the Region's upcoming streetscape guide.





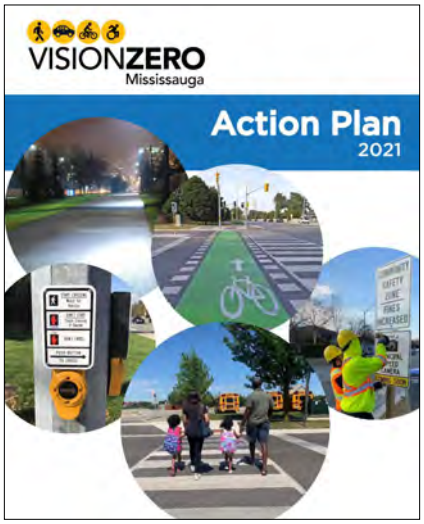


Figure 1.8. City of Mississauga's policy documents and guides (continued).

Parking Matters - Parking Master Plan and Implementation Strategy (2019): includes strategies to improve the efficiency and effectiveness of current and future resources dedicated to parking and identifies opportunities to use parking as a tool to realize city building objectives. Parking Matters includes policies and practices that define parking as a key element in city building, transportation choices and economic development. Parking Matters recommends a precinct based approach to parking provision and management. On-street parking is an important component of Complete Streets.

MiWay Transit Service Plans (ongoing): guide the refinement and expansion of the City's transit network. Service Plans are created for a five-year term and their main goal is to continue growing the system and improving connectivity to deliver transit service that will be fast, efficient, attractive, and easy to use. MiWay also has annual transit service plans.

MiWay Infrastructure Growth Plan (2020): identifies a 10-year capital investment strategy for transit infrastructure to accommodate the City's planned growth and change, maximize benefits to transit passengers, and improve operational efficiencies.

The Vision Zero Action Plan (2021): provides City staff with actions they can apply to their current and ongoing projects so they contribute to the Vision Zero goal of eliminating fatalities and serious injuries in the transportation system. The plan also consists of education and engagement actions that the City can take to help inform residents about road safety and create transportation-related behaviour change.

1.7 Guidance for Practitioners

All engineers, designers, and developers are to comply with this Guide. Use the Guide together with all other government-required standards, specifications, manuals, guidelines, best practices, and requirements as referenced in this document.

The Mississauga Complete Streets Guide is the primary resource for the planning and design of City streets. Other tools and resources are referenced within the Guide, where additional detail is necessary.

All streets are different and no single design solution exists. The Guide establishes minimum and preferred design values that provide for flexibility in street design while still meeting the test of good engineering judgment. It is the practitioner's responsibility to confirm all guidance and ensure all necessary independent investigations are conducted prior to inclusion in any proposal or application to the City.

The Guide is based on extensive consultations with City staff and leading planning and design professionals, as well as best practices and research from local, provincial, national, and international sources. It incorporates and builds upon current City of Mississauga standards and guidelines, as well as other provincial, federal, and non-governmental organizations; for example, Ontario Provincial Standards (OPS), Transportation Association of Canada (TAC), Institute of Transportation Engineers (ITE), and National Association of City Transportation Officials (NACTO). The Guide also works within existing Provincial and Federal legislation pertaining to street design and is a set of tools to implement it within Mississauga contexts.

The Guide does not promote prescriptive or restrictive standards, nor does it discourage innovation. The concept of the Design Domain (TAC 2017) acknowledges that, for many elements in the transportation right-of-way, there is no absolute value that is the "correct" design dimension. A designer shall consider the overall impact to make an informed decision that will suit the context and users. Further, a designer should also understand the consequences of reducing a value for a design requirement, particularly if it influences safety performance and impacts other outcomes.

The Guide will evolve as the state of the practice evolves. Practitioners shall also consider the latest research and practices when applying the Guide. Practitioners have the liberty to introduce innovative techniques, novel elements, and pilot projects to meet the challenges outlined herein.

The Guide recognizes that street design is a complicated process that occurs often in a complex environment and that it is impossible for any such document to cover all circumstances. Therefore, field experience, local knowledge, and good engineering judgment are all essential in deciding what to do in the absence of specific direction from this Guide, and in selecting a variation in design. To assist practitioners in implementation, the Guide articulates the need to document the rationale for the designs selected, and the decision-making process that lead to their selection.

The Complete Street approach is not meant to replace land use or transportation policies contained within existing plans; it is meant to enhance them. This Guide does not supersede any existing City or Provincial laws, rules, or regulations. All projects remain subject to existing review processes.

All work on City streets, from maintenance to operational changes, to new construction or reconstruction, shall have regard to the Guide.

2.0
PROCESS

Chapter 2 defines the street delivery process and how to make decisions. This will ensure that building Complete Streets is central to all street projects in Mississauga.

2.1 Street Delivery Process

Making streets more complete requires a thoughtful and comprehensive process that considers all phases of a project.

In Mississauga, street projects vary in scale and complexity with their own workflows and funding sources. This Guide recognizes these differences, and that not all street projects offer the same opportunities for change. For example, a re-striping effort or curb maintenance project will not require a large integrated project team nor a complex evaluation in the same way as a new or fully reconstructed street. However, every project type, no matter how big or small, can improve and contribute to the overall goal of Complete Streets.

The process discussion that follows is more applicable to complex projects, which typically have multidisciplinary teams who are focused on the planning and design of new streets or reconstruction of existing streets. However, the guidance within this document will still inform all project types, such as rehabilitation and spot improvements. This Guide will inform the City's Engineering Design Standards update, which is the primary reference providing information about the minimum acceptable standards for Capital and Development projects. Once the update has occurred, all street projects in Mississauga will have the most recent reference material to deliver Complete Streets.

The Mississauga Street Delivery Process (SDP) is shown in Fig. 2.1. The SDP summarizes how the project team will integrate Complete Streets into each stage of planning, design, implementation, and maintenance.

This workflow draws on existing processes, such as the current Developer Built and Capital Built streetscape processes, the Integrated Road process, and the Environmental Assessment (EA) process. It outlines the typical technical tasks undertaken during the planning, design, construction, and operations phases of a project.

This Guide focuses on the first three stages of the SDP (Project Definition, Context Definition, and Preliminary Design and Decision Making) where significant opportunity exists to best integrate the Complete Streets approach. The completion of steps 1 to 10, including any additional public and stakeholder input, should provide enough rationale to select the design option that best matches the context and future expectations relative to the street project.

Chapter 5 provides a compliance process, ensuring that this Guide is being applied. Further, performance measurements and oversight during the Design through to Operations and Maintenance stages are also discussed in Chapter 5.

The level of detail for each step will require adjustment based on the complexity of the street project. Design teams shall continually seek to improve the completeness of every street no matter the budget or level of intervention.

High Level Responsibilities for Each Street Project Category:

Capital Projects:
Transportation & Works leads and coordinates projects. Review is provided by Planning & Building and Community Services.

Development Applications:
Planning & Building coordinates review. Transportation & Works and Community Services provide comment.

See Table 2.1 for a detailed description of the roles and responsibilities of each department and external agency.

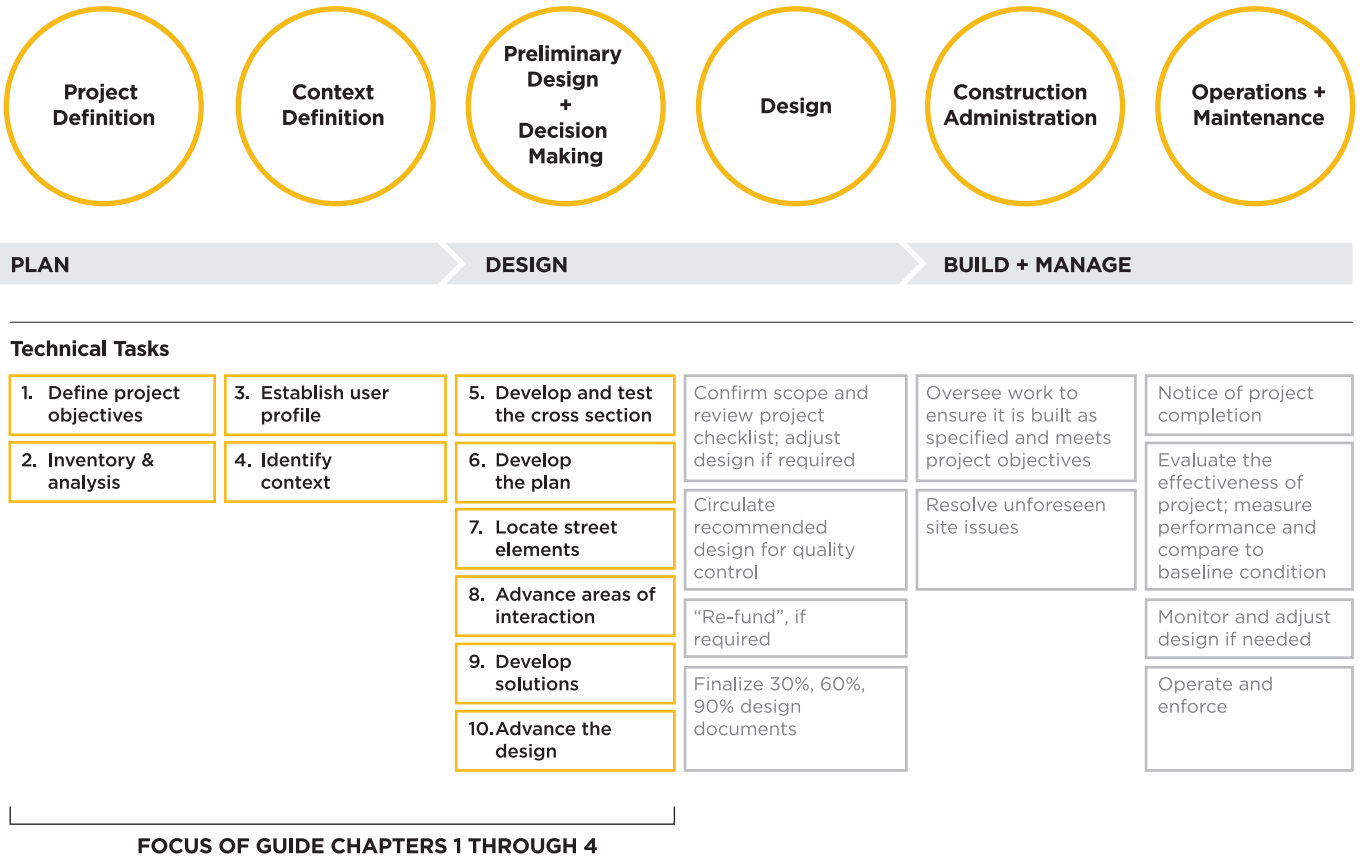


Figure 2.1. Mississauga Street Delivery Process (SDP). Refer to the following pages for a detailed breakdown of each of the 10 steps. This SDP is intended for Capital and Development Projects but is helpful for practitioners involved in all project types to understand what to consider during each phase of work.

PROJECT DEFINITION

1. Define Project Objectives

Identify the project type, project objectives and establish need.

Define the project goals and project budget.

2. Inventory and Analysis

Gather all available information regarding the project before beginning the design process. If information is not available, but required, the design team will identify how to best collect the outstanding data.

Gather and review existing utility records and determine if the commissioning of detailed utility plans are required. Accurate utility information will confirm what is possible with regards to green infrastructure (GI), tree planting or low impact development (LID).

Review the City's current standards, as applicable.

Review current policy and guidance related to all users (such as Region of Peel Healthy Development Index, Ontario Traffic Manual (OTM): Book 18 for Cycling Facilities, and the City's Parking Master Plan).

Define design criteria and/or design values. Design criteria are the explicit goals that a project must achieve to succeed.

Review Step 1 (Define Project Objectives) and Step 2 (Inventory and Analysis) as part of oversight and compliance defined in Chapter 5 before moving to the next stage.

CONTEXT DEFINITION

3. Establish User Profile

Prepare a user profile to identify who uses the streets today, who you want to use the street in the future, when and where.

Identify priority users. The most vulnerable users, such as pedestrians, are always the default priority, but overlays such as network plans for transit or goods movement may suggest how to approach the design of the roadway and intersections.

4. Identify Context

Recommend the street context, based on the process defined in Chapter 3. This process includes using the Mississauga Official Plan to identify the street class and assessing overlays such as place type, bicycle network, transit network, or other contextual factors. The street's context and its key objectives will inform decision making throughout all stages of a project.

Document the rationale behind the decisions. This step may include a recommendation for any necessary adjustments to the land use and/or transportation policies for the street's surrounding area. Subsequent land use and transportation decisions must recognize and support the street context resulting from this step.

Street context will inform the necessary elements for users, such as bike lanes, transit priority infrastructure, transit stops, signalized intersections, roundabouts, crosswalks, parking and green infrastructure.

5. Develop and Test the Initial Cross-sections

Using the techniques defined in Chapter 4, define and assemble the desired elements to create the initial mid-block cross-sections. Given how many critical interactions between users take place at intersections, we suggest that cross-sections are also prepared closer to key intersections to understand space requirements within the available right-of-way and how the mid-block and intersection relate to one another. Often it helps to start from the intersection and work towards the mid-block so any spatial constraints are more evident.

Develop different cross-sections for different street segments if street context varies along its length.

Test the initial cross-sections against the defined project objectives (Step 1), user profile (Step 3), and street context (Step 4), and identify any conflicts or constraints. Refer to Sections 2.4 to 2.5 for guidance related to identifying exceptions and resolving trade-offs. The project team may have considered many of these constraints earlier in the process. However, this step should clearly identify which constraints may prohibit the use of the initial defined cross-section.

Review the initial cross-section, conflicts, and constraints with stakeholders.

If the initial, "ideal" cross-section can be applied, then this step is easy: the initial cross-section is the preferred cross-section. However, refinement is often necessary to satisfy the project objectives and the design team is usually faced with making trade-offs during or after the initial cross-section is developed. These refinements are often related to the trade-offs, requirements of each group of stakeholders, or the variety of design elements. See Section 2.4 for guidance to navigate the trade-off process.

Once the trade-offs are resolved, develop refined cross-sections.

Review the refined cross-section with stakeholders. This is a critical step to demonstrate transparency and clearly understand the decision-making process that has led to the recommended cross-section.

PRELIMINARY DESIGN + DECISION MAKING

6. Develop the Plan

Transfer the preferred cross-section to a conceptual or schematic plan, identifying the horizontal alignment and intersection design.

Projects within an Amended Boulevard Zone must include a Streetscape Corridor. Refer to Chapter 4 for information about the placement of elements within this zone.

Review the plan as part of oversight and compliance (refer to Chapter 5) to highlight any potential issues not readily illustrated by the plan and identify any changes required to ensure the cross-sections and intersections function properly. New trade-off discussions may arise after the cross-section is translated into the schematic plan.

7. Locate Street Elements

Refer to the techniques in Chapter 4. Incorporate into the schematic plan elements such as pedestrian and cycling facilities (e.g., bike parking, benches, bike share stations), transit priority infrastructure, transit stops, transit station entrances, green infrastructure (e.g., trees or low impact development), major utilities (e.g., signal controller boxes, telecommunication boxes, and hydrants), and curb-side management elements (e.g., parking or laybys).

Steps 6 & 7 should take place in parallel.

8. Review Areas of Interaction

Review the plan and assess potential flows and volumes of movement for all users; identify the areas of the street where different users interact and intersect; and identify where street elements may create conflicts and potentially obstruct safe movement. These areas will generally include the following:

- Junctions of all types (all users).
- Secondary access points (e.g., rear lanes and parallel streets in network - all users).
- Transit stops and bicycle parking areas (pedestrian and bicycle).
- On-street parking (vehicles and bicycle).
- Crossings (pedestrian, transit, bicycle, and motor vehicle).
- Goods movement.

9. Develop Solutions

After determining the context and areas of interaction, develop solutions for the conflict areas. Refer to the techniques in Chapter 4. Consider all conflicts as they relate to each other, as each potential solution will result in street design variations. Combine solutions for specific locations, if possible.

10. Advance the Design

The design team will begin to advance the material details for the street. This step will include surfacing materials, planting palettes, lighting selection, furnishing, and selection of any elements that contribute to character and place-making.

2.2 Roles and Responsibilities

The following table summarizes the roles and responsibilities of key City departments, divisions and external agencies when designing and operating Mississauga streets. The table may require updates to reflect changes over time. Note that this is not an exhaustive list of all who may participate on an as-needed basis.

Table 2.1 City departments, divisions, and external agencies: roles and responsibilities

	CAPITAL/OPERATIONAL PROJECTS	DEVELOPMENT APPLICATIONS
City of Mississauga: Planning & Building Department		
Development & Design	• Reviews and comments on boulevard requirements and proposed design. • Identifies trees in paving locations in Amended Boulevard Treatment Areas.	• Coordinates review of all development applications. • Circulates application materials to City divisions and external agencies, as required. • Provides consolidated comments to developers. • Identifies trees in paving locations in Amended Boulevard Treatment Areas, and reviews and approves Streetscape Corridor, when appropriate. • Approves Site Plan Application.
City of Mississauga: Community Services Department		
Parks, Forestry and Environment	• Reviews, comments on, and manages impacts to municipally-owned trees. • Reviews, comments, and approves tree planting locations and technical requirements, including those for Amended Boulevard Treatment Areas.	• Reviews and provides comment on street tree corridor, tree planting locations, and technical requirements, including those for Amended Boulevard Treatment Areas. • Monitors, inspects, and assumes construction of tree corridor and plantings, including in Streetscape Corridor. • Maintains tree corridor and plantings after end of warranty, including in Streetscape Corridor. • Manages Municipal Tree Preservation process.
Fire	• Comments on fire service requirements, including emergency access and fire hydrants.	
Arts & Culture	• Comments on public art and heritage requirements.	
City of Mississauga: Transportation & Works Department		
Infrastructure Planning and Engineering Services	• Leads planning, design, and construction of capital built street infrastructure, including new, rehabilitation, and retrofit projects. • Plans, designs, and constructs stormwater infrastructure, often in coordination with street capital projects. • Develops design and circulates to City divisions and external agencies, as required, for comment.	• Reviews development applications for stormwater requirements, traffic impact studies, and engineering review according to T&W Standard Drawings and the CS Guide. • Signs off and inspects construction.

	CAPITAL/OPERATIONAL PROJECTS	DEVELOPMENT APPLICATIONS
City of Mississauga: Transportation & Works Department (Continued)		
MiWay	• Comments on MiWay transit operation requirements (stop placement, stop amenity requirements, transit priority measures).	
Works Operations and Maintenance	• Inspects roadways per maintenance standard, provides utility cut permits and manages public utility coordination committee (PUCC). • Provides other roadway permits (e.g., occupation permits), as required. • Maintains roadway elements, including pavement, sidewalks, curbs, and cycling facilities. • Provides winter maintenance.	
Traffic Management and Municipal Parking	• Comments on traffic signals, road safety, traffic operation, and street lighting requirements. • Leads traffic operation interventions, including road safety improvements. • Designs, constructs, and operates on-street parking and related technology.	• Comments on traffic signals, road safety, traffic operation, and street lighting requirements. • Leads traffic operation interventions, including road safety improvements. • Designs, constructs, and operates on-street parking and related technology.
Province of Ontario Agencies		
MTO	• Reviews projects within 400m of a provincial highway for traffic and infrastructure impact • Provides funding or grants, as well as policy/direction.	
Metrolinx	• Reviews projects as required for operational requirements and impacts to Metrolinx projects.	
Regional Agencies		
Region of Peel	• Leads planning, design, and construction of capital built street infrastructure on Region of Peel rights-of-way, including new, rehabilitation, and retrofit of infrastructure. • Leads planning, design, and construction of all water and wastewater infrastructure. • Updates and manages the Goods Movement Strategic Plan and Network. • Comments on City of Mississauga projects when intersecting with Region of Peel rights-of-way.	• Provides comment, as required, on development applications regarding water and wastewater requirements, and access to Region of Peel rights-of-way
Conservation Authorities (TRCA, CVC, HRCA)	• Comments on watershed resource impacts, and considers stormwater runoff. • Advocates for low impact development techniques.	
Other		
Business Improvement Areas	• Undertake street beautification projects, including plantings, sign, and seating, and advocates for street needs in their areas.	
Transit providers operating in Mississauga	• Comments on operating needs, if necessary.	
Neighbouring municipalities	• Comments on projects adjacent to boundary, identifying areas of coordination. • Work cooperatively on rehabilitation of streets on boundary.	

2.3 Coordination and Engagement

Coordination between City departments and external agencies, and engagement with public stakeholders, should occur at important planning and technical milestones.

	Project Definition	Context Definition	Preliminary Design + Decision Making	Design	Construction Administration	Operations + Maintenance
	PLAN		**DESIGN**		**BUILD + MANAGE**	
Coordination: Relevant City Departments and External Agencies	Review Complete Streets project checklist. Submit for compliance review.	Coordinate planned improvements from opportunities, scope and budget/financial contributions.	Submit preliminary design for compliance review.	Circulate recommended design for quality control. Submit final documents for compliance review. Coordinate construction schedule.	Coordinate construction staging.	Notice of project completion. Monitor and evaluate effectiveness of project and provide input to City.
Engagement and Communications: Public and Stakeholder	Projects may originate from community and city-wide priorities, plans and consultations.	Consult with key users and stakeholders if required (not all project types will require same level of input).	Consult with all affected community members, depending on project scope. Input on alternatives/ preliminary design.	If required, provide further input to inform specific project design elements.	Keep all community members informed on issues such as construction staging and detours.	Notice of project completion. Evaluate effectiveness of project and provide input to City.

Figure 2.2. Coordination, engagement and communications should link to important planning and technical milestone points throughout the Street Delivery Process.

2.4 Assessing and Deciding Trade-Offs

Rights-of-way in Mississauga are often constrained, and discussions occur during the Preliminary Design and Decision Making stages to refine dimensions and elements. Thoughtful street design requires all stakeholders to understand the perspectives and needs of others.

Following assembly of the initial cross-section, refinement is often necessary to better satisfy the project objectives. Any refinements should result from a fair, thoughtful and collaborative discussion of the trade-offs between competing uses on the street and within the available right-of-way.

Some design elements will benefit some users more than others, and some design elements that benefit one user group may work to the disadvantage of other users. The intent is to ensure that the procedures, techniques, and performance indicators in this Guide are applied in a context-sensitive way, and that the safety of all users is of highest concern—with the most vulnerable road users first. Document any related plan or cross-section modifications to reflect the outcome of the trade-offs. Street class and project objectives are useful to inform decisions.

Different project team members and stakeholders will often express different interests or perspectives for what they believe is "good" street design.

The recommended method for evaluating the trade-offs is similar to the Ontario Municipal Engineers Association (MEA) Municipal Class Environmental Assessment (MCEA) Process. This process is familiar to street practitioners and has resulted in several of the best complete street planning and design examples in Mississauga. Similar to an EA, the design team can establish a robust multi-variable set of criteria informed by the project and design objectives in the Context Definition Stage. The evaluation of each option should include qualitative and quantitative measures for each criteria. Criteria should include social and environmental factors as related to the project or context-specific objectives. If required, consult the Oversight and Compliance Committee if the stakeholders from all departments cannot reach consensus or if the mitigation solutions result in adverse impacts to social, environmental or cultural characteristics.

The design team can also consider applying a MMLOS (Multi-Modal Level-of-Service) assessment as part of the evaluation. This step is not necessary with each project, but such a tool can assist with the trade-off discussion to ensure that priorities are optimized and the needs of vulnerable users are met sufficiently. While this process can assist in addressing mobility inputs, it requires balance alongside other design objectives for the specific street class identified in Chapter 3. For example, wide boulevards with street tree planting are a key design objective for Arterial Strategic Growth Streets, whereas balancing pedestrian safety and goods movement is a key design objective along Arterial Employment Streets.

Table 2.2 identifies common street project trade-offs in Mississauga.

Table 2.2 Common street project trade-offs in Mississauga

Faster transit (e.g., higher order transit) vs. reduction of general purpose lanes with limited occupancy	Bicycle lanes vs. wider sidewalks
Vehicle delay vs. longer crossing time	Rural clear zones vs. urban lateral offsets
Vehicle delay vs. active transportation needs	Transit shelter vs. bike facilities
High speed roadways vs. context sensitive urban streets	Lead vs. lag turns, and impacts on pedestrian/bike movements
Centre median vs. driveway access	Curb-side bus queue jump lane vs. shorter crossing distance for pedestrians
Right turn on red vs. bike lanes through intersection	Parklets and other temporary curbside animation vs. on-street parking to help reduce traffic speeds
Left turn lane vs. bike lane through intersection	Emergency vehicle access vs. speed reduction
Streetscape corridor vs. cycling infrastructure or on-street parking	Use of on-street parking as a buffer for cyclists vs. curbside vehicle travel lane
Street trees vs. below-grade utilities	Cost: capital vs operations/maintenance

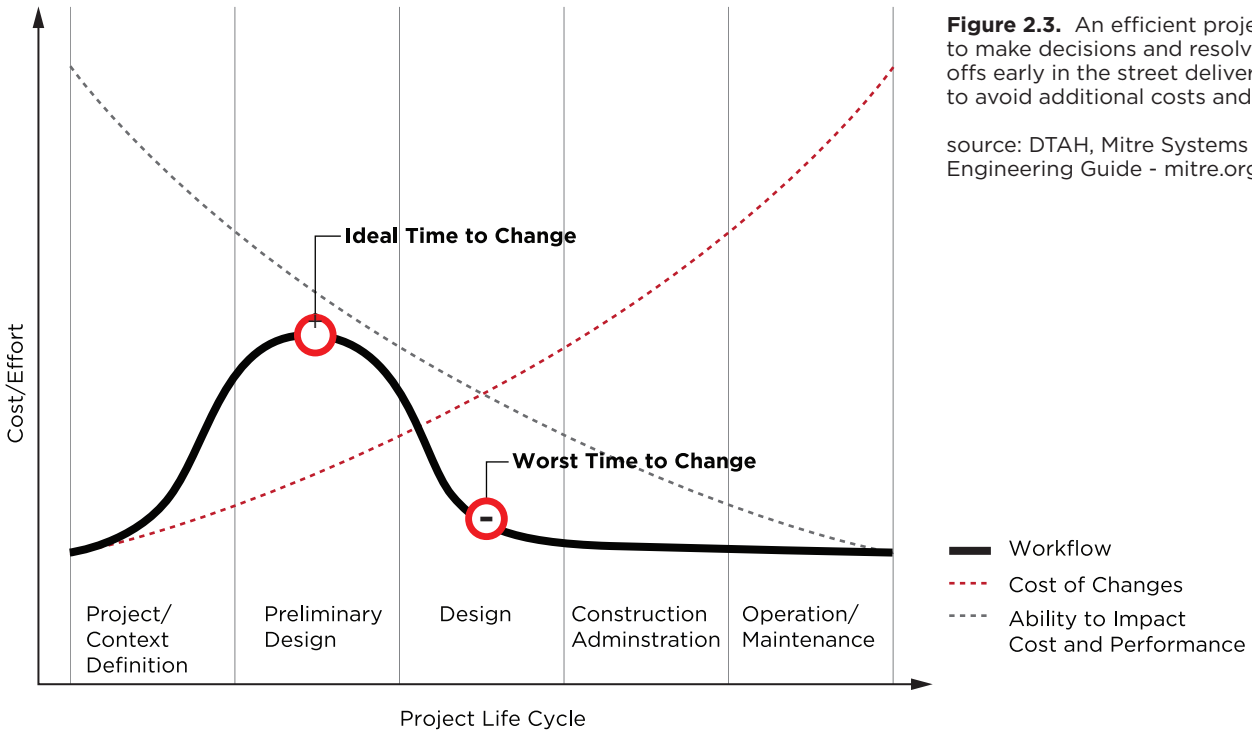


Figure 2.3. An efficient project needs to make decisions and resolve trade-offs early in the street delivery process to avoid additional costs and effort.

source: DTAH, Mitre Systems Engineering Guide - mitre.org

TRADE-OFF SCENARIOS

Two typical Mississauga trade-off scenarios demonstrate how to make decisions. Each scenario illustrates a range of possible trade-offs to assist in finding space for all the desired uses.

In parallel with the street delivery process is deciding how to assemble the various components of the street to best respond to sometimes competing considerations.

The two scenarios that follow illustrate the potential trade-offs a design team can consider to find space for all the desired uses within a right-of-way.

Not all trade-offs will relate to every type of project or street context (for example, changes to the boulevard are often not included in roadway resurfacing projects unless funds are assigned to do so).

These potential trade-offs are representative and suggest the range of decisions that the team can consider before eliminating an element entirely.

Decision making should always ask first how to make the street safer for vulnerable users before addressing the needs of other users. Given this emphasis, when assembling cross-sections, the overall boulevard width should first accommodate the preferred pedestrian clearway, then assign available space to other zones after this requirement is satisfied.

Scenario 1: Too Little Right-of-Way

A common situation in Mississauga occurs when there is insufficient space to meet the needs of all users within the right-of-way. This happens in both retrofit projects and new build projects.

Potential Trade-Offs

Reduce widths of travel lanes, medians, and edge zones to minimum dimensions.

Reduce storage space to minimum length and minimize tapers at nearside, far-side and mid-block stops with bus bays to 15m maximum length to free up space in the street for other elements such as on-street parking, street trees, green infrastructure (GI), and other pedestrian and cycling infrastructure.

Reduce the frontage zone, if within the right-of-way, to minimum dimensions. In Strategic Growth Areas, be mindful of the impact on street vibrancy and local economy.

Consider converting travel lanes to bike lanes or dedicated transit infrastructure to increase overall person capacity, and improve safety and operations.

Reduce transit lane width and platform length while ensuring both customer and operational safety.

Reduce the width of on-street parking, if present.

Reduce two-sided on-street parking to one-side before removing completely.

Remove parking if insufficient demand or established need. In Strategic Growth Areas, where there is ground floor retail, ensure that the projected district parking demand is accommodated (but not necessarily all on streets).

Remove the furnishing and planting zone or reduce it to the minimum dimension. Not recommended to reduce this zone on higher speed and volume streets. See Section 4.3.1 for opportunities to allocate more space for GI.

Replace a separate sidewalk and cycle track with a combined multi-use path that will accommodate both pedestrians and cyclists.

Refer to Section 4.6.1 Road Diets for additional techniques for re-assigning roadway space.

Scenario 2:
Too Much Right-of-Way

On some existing streets, space is not used effectively. Reconfiguring the street can lead to more efficient assignment of available space for other users and uses.

The potential trade-offs may vary based on street class and project objectives. For example, requirements for cycle facilities will vary by street and context.

Potential Trade-Offs
Add on-street parking if enough demand and context, and not currently part of the cross-section.
Widen the furnishing zone to improve tree planting conditions and overall streetscape quality.
Widen the pedestrian clearway.
Widen the edge zone to increase vertical separation from the travel way and pedestrians.
Upgrade cycling facilities and add buffers to bike lanes if none present.
Widen frontage zone on streets with retail at grade to accommodate a wider range of uses.
Upgrade transit facilities, adding additional space to bus stops.
Increase median widths, if present, and add additional planting if sufficient space permits.

2.5 Exceptions

If confronted with a special circumstance, the project team may apply for a design exception to address unusual conditions that may arise.

The exceptions process allows for innovative design that still meets the principles and guidance in this document but requires further information for why the project team considers an exception necessary.

Exceptions occur when it is necessary for the designer to choose techniques or values that fall outside the techniques defined in Chapter 4. This is only to occur in exceptional circumstances, and requires justification.

Exceptions will receive final approval only following compliance review (see Chapter 5: Oversight and Compliance).

Exceptions may happen for several reasons, for example:

- Certain streets need not accommodate every mode, such as limited-access streets (from which pedestrians and cyclists are prohibited) or pedestrian-only streets (such as segments of existing or future streets in the Downtown, Major Nodes, or other redevelopment projects).
- The cost is excessively disproportionate to the need or probable future use.
- There is an indisputable lack of need for a certain mode, element, or feature at present and in the future.
- A specific location or segment requires an exception, rather than along the entire corridor.

If the street design team believes that an exception is warranted, they should document why early on, preferably during the early stages of the project, either in Project Definition or Context Definition. The street design team should submit the exception request for oversight and compliance review.

Documentation for submittal should include the following:

- Proposed cross-section.
- Justification for requested exception.
- Example graphics or photos of the desired condition.
- Explanation why the desired condition will produce a better solution.
- Description of any proposed innovation in street design.
- Description of the street context and how the desired condition serves these uses.
- Description of how the desired condition satisfies the overall Complete Street objectives.

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3.0 DEFINING STREET CONTEXT

Understanding how streets respond to their context is an early step in the Complete Streets process. Use Chapter 3 to define a street's mobility role and place status, informed by the City's Street Classification system.

3.1 Street Context

Defining street context happens in the early stages of a street planning and design process when typical cross-sections are assembled.

Streets are classified in the Mississauga Official Plan. This Guide introduces how to use the classification system with overlays and user profiles to define street context, and how they fit within the overall Street Delivery Process, as shown in Figure 3.1.

A street's class and its key objectives are referenced in the initial 'Plan' and 'Design' phases and used to inform decision making throughout all phases of a project.

Refer to Appendix A.1 (Street Classification Map) for the location of each street class within the City and Appendix A.2 for illustrative cross-sections of each street class.

Overlays (see Section 3.4) are the other key input, working with street classification to provide further refinement to both the mobility role and place status of a given street.

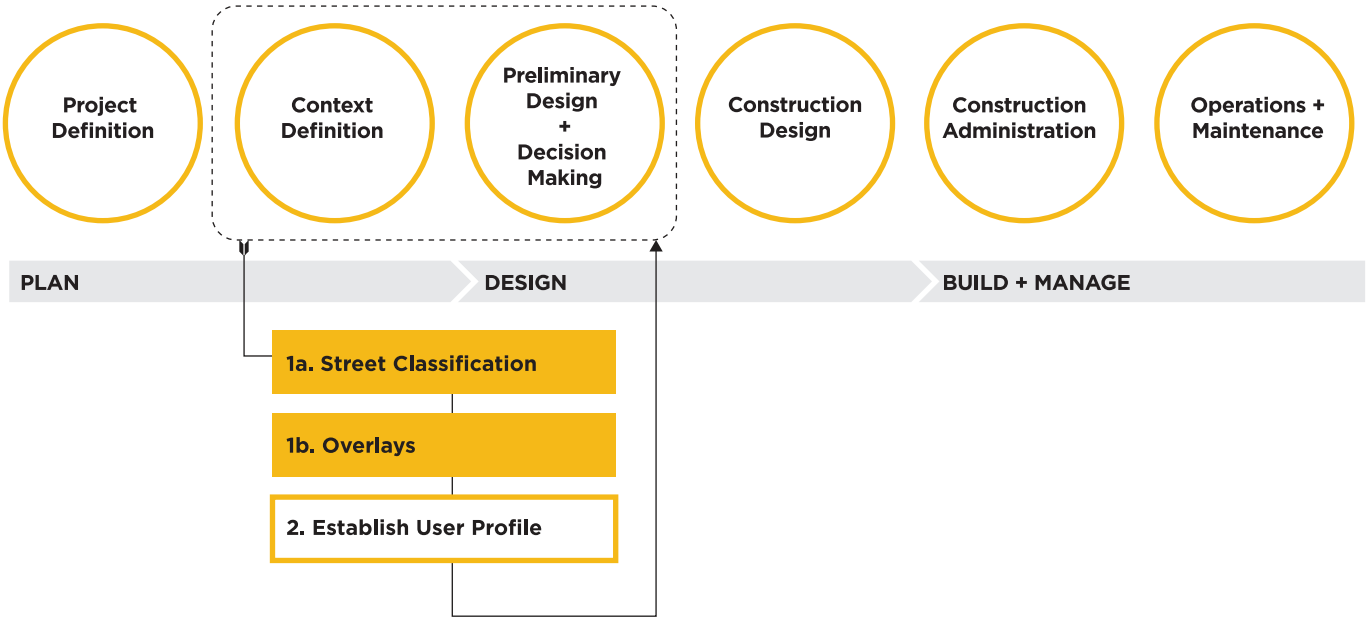

Figure 3.1. Defining Street Context as part the Street Delivery Process.

3.2 Street Classes

A Complete Streets approach to street classification.

There are 14 street classes organized by the four functional categories (arterial, major collector, minor collector, and local) and the corresponding place inputs (Strategic Growth, Neighbourhood, and Employment).

Place inputs enable the street classes to address urban design context and built environment variations along a segment or between blocks.

Scenic Routes are categorized as either minor or major collectors and classified because of their distinctive features or location in the city.

Laneways in Mississauga are also defined as local streets.

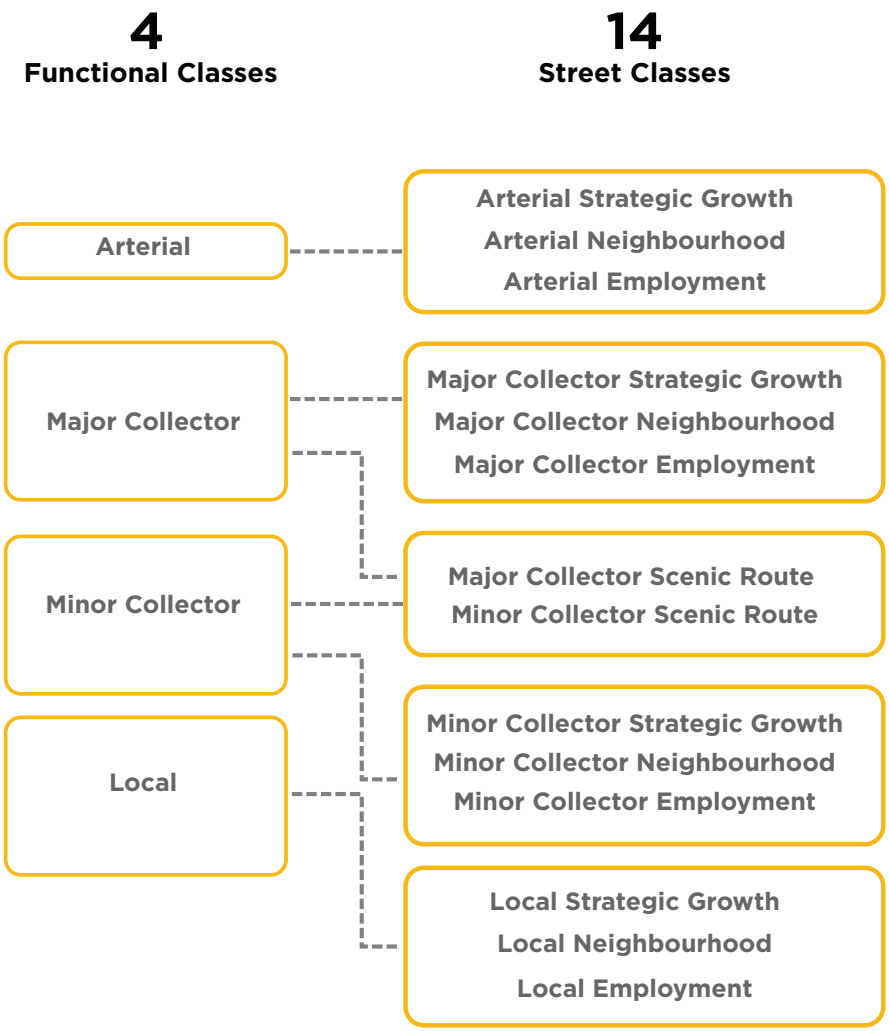

Figure 3.2. Mississauga street classification and relationship to functional classification.

3.3 The Starting Point

Streets have both a link function and a place status. The link function is about moving people and the place status is about attracting and supporting people. The relative importance of these two inputs varies for each street class.

Streets will have different characteristics depending on their function and context. Figure 3.3 and narrative on this page identify the primary inputs of 'link' (mobility) and 'place' (livability) informing street classification.

Updates to the Guide will reflect any changes to the Mississauga Official Plan (MOP).

DESIGNATED RIGHT-OF-WAY: SETTING THE 'CONDITION' FOR THE STREET

Right-of-way (ROW) is defined in Schedule 8 (Designated Right-of-Way Widths) of the MOP. The City protects rights-of-way for the development of its transportation network. This involves identifying lands for future acquisition. ROW widths are identified by the City to accommodate the range of possible transportation and infrastructure facilities including: boulevards and pathways; travelways (for cars, trucks, bicycles, transit vehicles and on-street parking); infrastructure (e.g., street trees and landscaping, lighting, and public utilities); and spaces for street-side transit amenities (e.g., bus stops and shelters). Tables 8-1 to 8-4 in the MOP identify the designated right-of-way widths based on street class.

LINK INPUTS: LONG-TERM ROAD NETWORK

Link is informed by MOP Schedule 5 (Long-Term Road Network), which defines the City's existing and planned road network. Schedule 5 also includes Scenic Routes, which are classified because of their distinctive features and location in the city.

PLACE INPUTS: URBAN SYSTEM, INTENSIFICATION AREAS, LAND USE

Place is informed by MOP Schedule 1B - Urban System - City Structure and Schedule 10 and Part 3 (Land Use Designations), which define existing and planned land use, and the built environment surrounding Mississauga's streets. A street's place status is informed by its surrounding land use character and built form relationship and considers not only what is existing but what it aspires to become.

The characteristics of each place input is described in Table 3.1. All new development and growth in Mississauga is expected to contribute to building compact, complete, transit-supportive communities.

Table 3.1 Place inputs

Place	Characteristics	MOP Reference
Employment	• Support a mix of industrial and business operations. • Where feasible and appropriate, development will be encouraged to provide methods to absorb demand for parking structures. • Infrastructure in Employment Areas will be planned to support goods movement.	Schedule 1B (Urban System - City Structure) Schedule 10 and Part 3 (Land Use Designations)
Neighbourhood	• Contains predominantly residential land uses. • Can include community infrastructure and amenities. • When development does occur, it is anticipated to be sensitive to the Neighbourhood's existing and planned character.	
Strategic Growth Area	• Areas where growth through redevelopment or intensification is targeted. • Special emphasis on character and quality of the public realm, finer grain walkable and bikeable street network with access to transit • Includes: Downtown, Major Nodes, Community Nodes, Corporate Centres, and MTSAs • Generally contains buildings that are oriented towards the street and contribute to a vibrant and dynamic urban environment.	Schedule 2 (Intensification Areas) Schedule 10 and Part 3 (Land Use Designations)

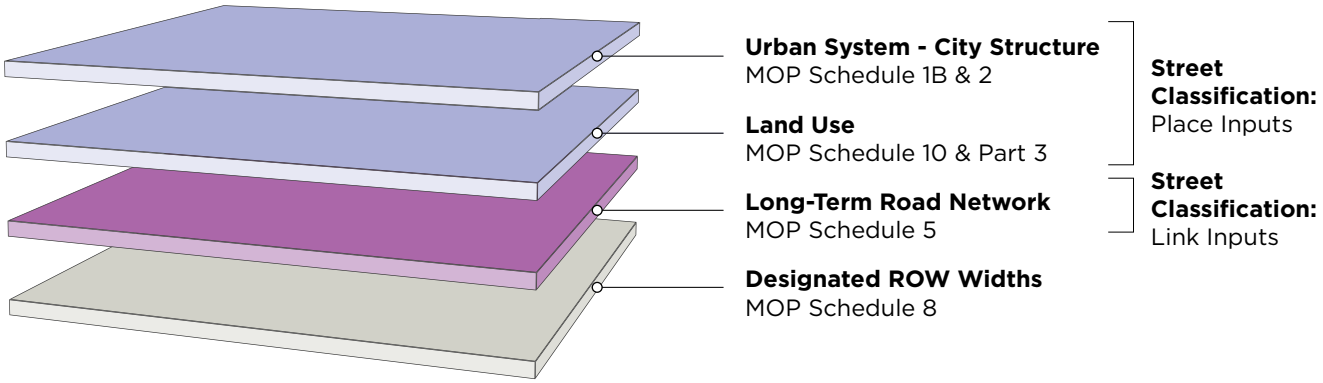

Figure 3.3. Complete Street classification: link and place inputs.

3.4 Overlays: Refining Street Context

Overlays are data layers that provide additional information about a street or area. They introduce additional objectives for streets beyond the underlying classification.

Figure 3.4 identifies three types of overlays:

LINK OVERLAYS

Mississauga Official Plan (MOP) Schedule 6 (Long-Term Transit Network) that identifies transit network priorities.

MOP Schedule 7 (Long-Term Cycling Routes) that identifies cycling network priorities.

Plans and studies that inform street design, such as the Cycling Master Plan (2018), the Pedestrian Master Plan (2021), the 2019 Development Charges Transportation Background Study, the Metrolinx Regional Transportation Plan, the MiWay Infrastructure Growth Plan (2020), and MiWay Transit Service Plans (ongoing),

Inter-municipal/inter-regional transit services such as GO Transit, TTC, Oakville Transit and Brampton Transit. Maintaining network continuity is critical, so overlays do not necessarily stop between classes.

At the time of writing this Guide, the City has started the Transit and Road Infrastructure Plan (TRIP), which will inform the link overlays.

PLACE OVERLAYS

Local Areas Plans that provide detailed policy direction for four areas (Downtown Core, Port Credit, Lakeview, and Southdown).

MOP Chapter 9 (Build a Desirable Urban Form) that directs built form and the public realm.

Amended Boulevard Treatment for Rights-of-Ways Within Areas of the City of Mississauga that require unique design standards within Strategic Growth Areas. (Amended Boulevard Treatment Report).

OTHER OVERLAYS

In addition to the link and place overlays, other inputs can inform the street design process, assist in setting the design priorities, and inform decision making. These include:

- Existing and forecasted growth in pedestrians, cyclists, transit riders, and motor vehicles.
- Trip generators.
- On-street parking.
- Demographics.
- Safety data and analysis.
- Goods movement routes.
- Equity indices.
- Cultural Heritage Resources.
- Business Improvement Areas.
- Neighbourhood Index (Region of Peel).
- Cultural Districts.
- Pedestrian pathways.
- Parking Master Plan and Implementation Strategy (2019).
- Green infrastructure.

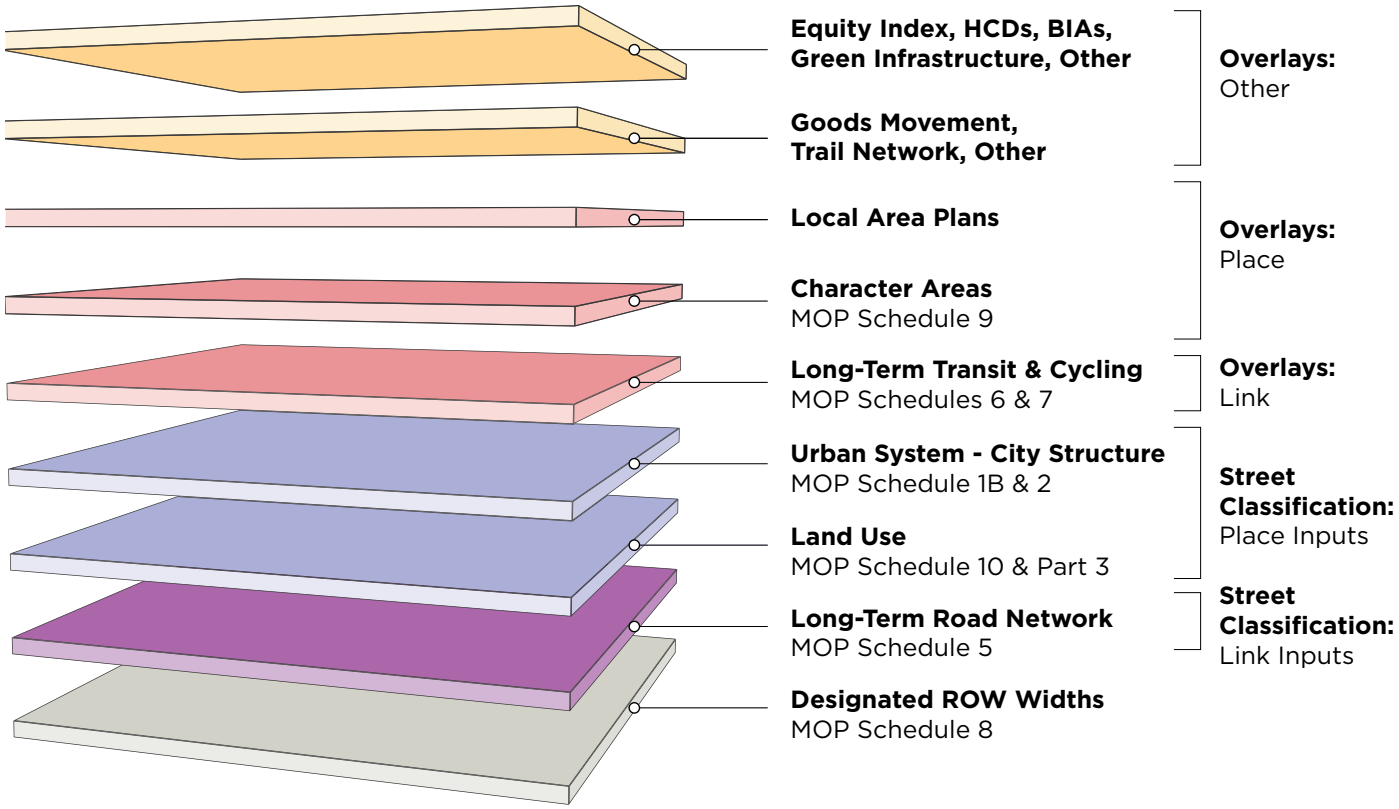

Figure 3.4. Overlays (overlays included in the figure are examples and not an exhaustive list)

3.5 Street Classification Matrix

Each street class includes a description of location and overarching design objectives. Access to transit and pedestrian and cyclist safety is a design objective for all street classes. Refer to Appendix A.1 and A.2 for locations, cross-sections and full descriptions.

Table 3.1 Street Classification Summary Matrix

	STRATEGIC GROWTH	NEIGHBOURHOOD	EMPLOYMENT
Location	Downtown, Nodes, Corporate Centres, and MTSAs	Neighbourhoods	Employment Areas
Arterials			
Link Objectives	• Move the highest volume of people • Include surface transit routes and priority bus corridor routes • Focus of active transportation (AT) facilities	• Move medium to high volume of people • Include surface transit routes and priority bus corridor routes	• Serve as major links through Employment Areas • Include either dedicated higher order transit lanes or bus priority lanes • Accommodate frequent large vehicles and goods movement
Place Objectives	• Vibrant mixed-use destination streets • Support higher density transit-supportive development	• Wide boulevards, improved street tree planting and stormwater control measures	• Landscape frontages • Wide boulevards, improved street tree planting and stormwater control measures
Collectors: Major			
Link Objectives	• Move medium to high volumes of people • Focus of AT facilities • Often near major transit hubs and include surface transit routes	• Move medium to high volume of people • Include surface transit routes and priority bus corridor routes	• Serve as major links through Employment Areas • Includes surface transit routes and priority bus corridor routes • Accommodate frequent large vehicles and goods movement
Place Objectives	• Vibrant mixed-use destination streets • Supports higher density transit-supportive development	• Wide boulevards, improved street tree planting and stormwater control measures	• Landscape frontages • Wide boulevards, improved street tree planting and stormwater control measures
Scenic Routes	Found throughout the city where there is a strong relationship with cultural, scenic, or environmental features		

Table 3.2 Street Classification Summary Matrix (CONTINUED)

	STRATEGIC GROWTH	NEIGHBOURHOOD	EMPLOYMENT
Location	Downtown, Nodes, Corporate Centres, and MTSAs	Neighbourhoods	Employment Areas
Collectors: Minor			
Link Objectives	• Move low to medium volume of people • Focus of AT facilities • Often near major transit hubs and include surface transit routes	• Move low to medium volumes of people • Include surface transit routes	• Move low to medium volume of people • Accommodate frequent large vehicles and goods movement • Includes surface transit routes
Place Objectives	• Vibrant mixed-use destination streets • Support higher density transit-supportive development • Street tree planting	• Wide boulevards, improved street tree planting and stormwater control measures	• Wide boulevards, improved street tree planting and stormwater control measures
Scenic Routes	Found throughout the city where there is a strong relationship with cultural, scenic or environmental features		
Local			
Link Objectives	• Move low volume of people in a slow speed environment • Pedestrians typically have the highest priority • Can sometimes be designed as shared streets	• Move low volume of people in a slow speed environment • Can sometimes be designed as shared streets	• Provides access to industrial or commercial businesses
Place Objectives	• Vibrant mixed-use destination streets • Support higher density transit-supportive development	• Pedestrian and bicycle safety is priority • Support active neighbourhood life	• Balance elements for maneuverability of large trucks and transit with elements that create a safe and comfortable public realm

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4.0 TECHNIQUES

Chapter 4 provides the techniques to plan and design more Complete Streets. This guidance is organized by street component, starting with the pedestrian realm and place-making, followed by infrastructure, transit, cycle facilities, travelway, and intersections.

4.1 OVERVIEW

The techniques are informed by local, national, and global best practice, discussions with City of Mississauga and Region of Peel practitioners, and applicable policies.

Chapter 4 is written for two audiences: the street designer and the street design reviewer. It describes the techniques for street planning and design.

The recommendations within this chapter supplement rather than replace existing sources of detailed engineering guidance.

References are provided to established National, Provincial or City guidance where applicable. For example, the Ontario Traffic Manual (OTM) Book 18 (2021) Facility Selection Tool and the City's Cycling Master Plan (2018) are useful to determine the most appropriate cycling facility type for a specific street, in addition to the direction provided in this guide.

All street projects in Mississauga will carefully consider the techniques and incorporate them into designs when appropriate. Flexibility in design is possible as context, specific site conditions, and inputs will influence the ultimate design.

Best practice Complete Streets Guides, road engineering design standards and transportation master plans informed the development of this Guide. Below are a few of the best of the best:

- Transport Association of Canada's (TAC) Geometric Design Guide for Canadian Roads, 2017
- Toronto Complete Streets Guidelines, 2017
- London Complete Streets Design Manual, 2018
- York Region's Designing Great Streets and Road Construction Design Guidelines and Standards, 2019/2020
- Kitchener Complete Streets, 2019
- Edmonton Complete Streets Design and Construction Standards, 2018
- Vancouver Engineering Design Manual, 2019
- Chicago Complete Streets, 2013
- Seattle Streets Illustrated, 2019
- New York Street Design Manual, 2020
- CROW Design Manual for Bicycle Traffic, 2016

ORGANIZATION

This Chapter is organized into the six components of a Mississauga street:

4.2. Pedestrian Realm and Place-Making describes the techniques and guidance for elements typically found in the boulevard, such as the pedestrian clearway, the planting and furnishing zone, the edge zone, and other curbside management or place-making opportunities.

4.3 Infrastructure describes the techniques and guidance for green infrastructure, street trees and landscaping, utilities, and urban soundscape.

4.4 Cycle Facilities focuses on where people cycle. Depending on the context, cycle infrastructure can either be part of the boulevard or part of the roadway.

4.5 Transit describes transit infrastructure (e.g., access to transit, dedicated transit lanes and transit stop infrastructure).

4.6 Travelway describes techniques for the design of the parts of the street where transit, trucks, vehicles, emergency vehicles, on-street parking and curbside management elements are located.

4.7 Intersections focuses on techniques and guidance to improve safety, accessibility, and mobility for all users in the design of intersections, including roundabouts.

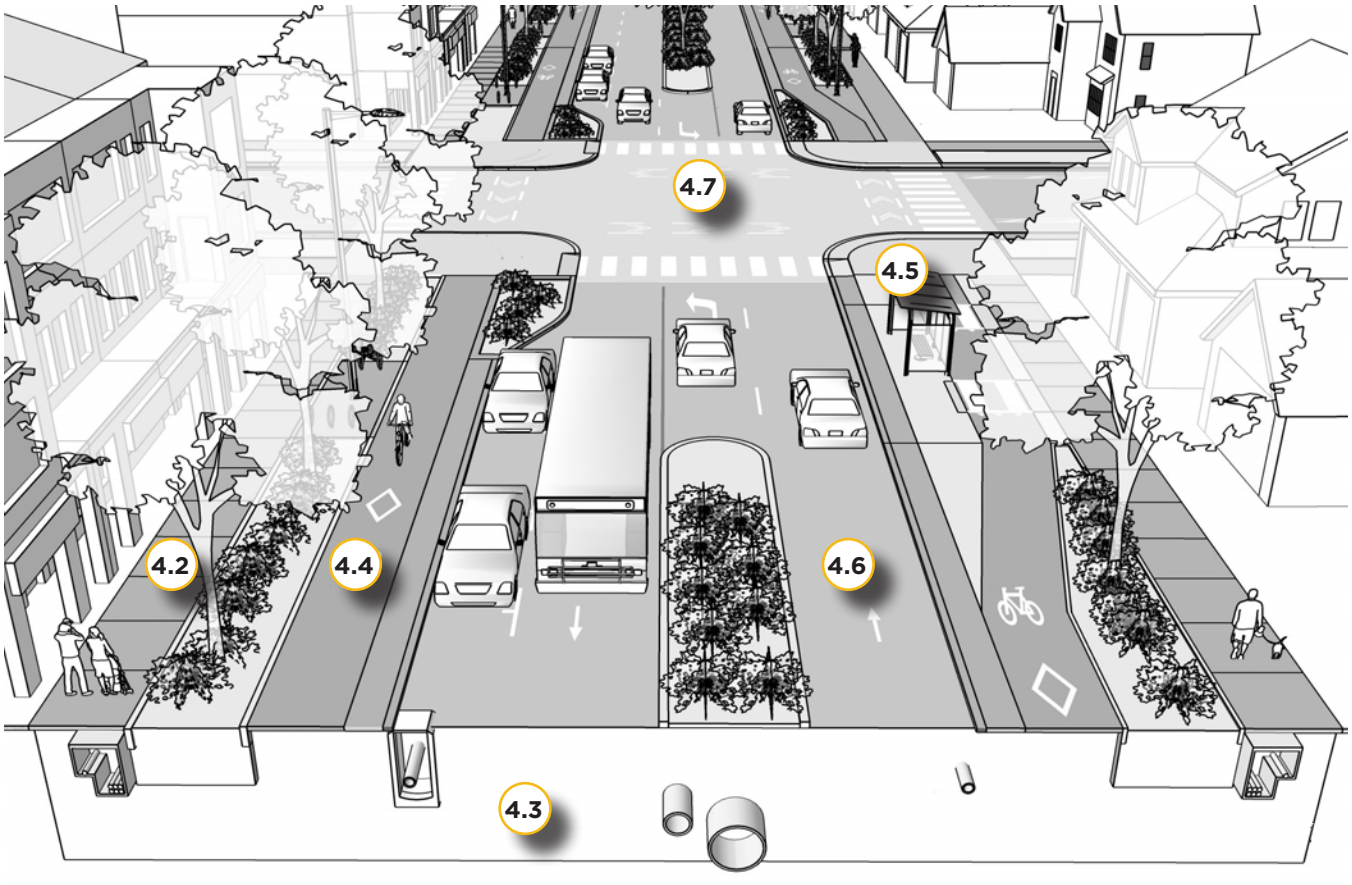
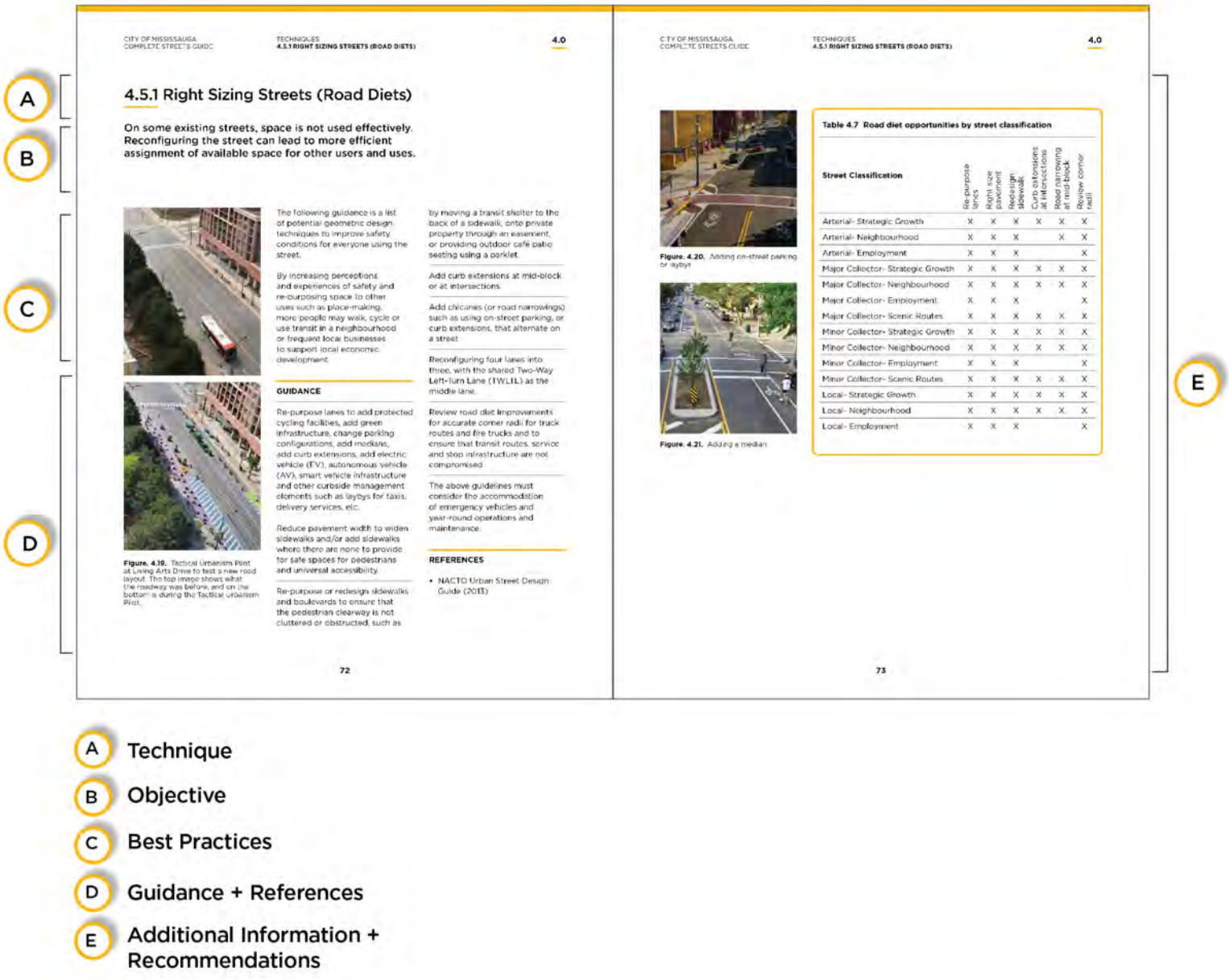


Figure. 4.1. How to Use Chapter 4: Organization of Techniques by Street Component

PAGE STRUCTURE

Chapter 4 follows a consistent page structure illustrated in Figure 4.2 below.



A Technique
B Objective
C Best Practices
D Guidance + References
E Additional Information + Recommendations

Figure. 4.2. How to use Chapter 4: example of page structure

4.2 PEDESTRIAN REALM & PLACE-MAKING

Complete Street design creates a pedestrian realm that is vibrant and accessible for all, with enhanced place-making and improved safety. The pedestrian realm is typically located in the area between the face of the building or property line to curb edge, also known as the boulevard.

4.2.1 Elements of the Boulevard

Boulevards are a key component of streets and play an important role in facilitating walking and cycling as a safe, accessible, and attractive choice for people of all ages and abilities.

In Mississauga, boulevards are an important extension of the public realm and provide vibrant spaces for people to gather and socialize. The design of boulevards should reflect adjacent context, and support a mix of activities. Boulevards in Mississauga are defined by five sub-zones:

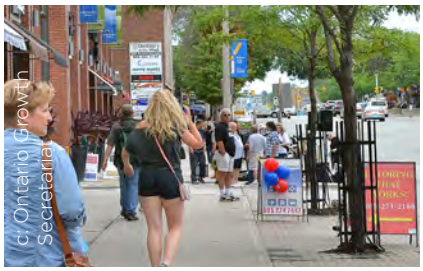


Figure. 4.3. Mississauga has a diverse range of boulevard characters.

FRONTAGE AND MARKETING ZONE

This is where the street interfaces with adjacent properties. This area includes building entrances, doorways, gates to front yards, stoops, space for window shopping, vending, café seating, and building-related utilities such as gas meters. In Mississauga, this area is often on private property. The dimension of this area will vary and often increases only after other space requirements are met, particularly the Pedestrian Clearway.

On streets with active commercial ground floors within Strategic Growth Areas (where space permits), provide: 0.9m minimum width zone for sidewalk advertising boards; 1.2m for lineup areas and 1.75m for restaurant tables.

In high pedestrian volume areas with a concentration of shops, this zone could increase to allow for café tables and seating, benches, planting, merchandise displays, and other amenities, and higher volumes of window shopping.

PEDESTRIAN CLEARWAY

This is the most important area of all streets. It is where people walk, interact, and wait to cross the roadway. Refer to Section 4.2.2.

FURNISHING AND PLANTING ZONE (STREETSCAPE CORRIDOR)

This is the space typically between the pedestrian clearway and edge zone or cycle facility, although it may possibly be located elsewhere, such as the other side of the pedestrian clearway. Street trees, street lighting, bus stop amenities, street furniture, bike parking, and public wayfinding signs shall be located within the furnishing and planting zone. Green infrastructure, parking meters, kiosks, parking signs, and electric vehicle (EV) charging stations are possible within this zone. This area is referred to as the Streetscape Corridor within Strategic Growth Areas. The width of the furnishing and planting zone varies based on location and context:

- Within Strategic Growth Areas: 2.0m minimum.
- On streets with street trees: 2.0m minimum is the preferred furnishing and planting zone to accommodate open tree pits, planters or grates. 1.5m minimum is acceptable if a minimum 30m^3 of soil per tree can be achieved. Refer to Section 4.3.2.
- On streets without street trees: 1.2m minimum width to accommodate street furniture, signs and other amenities.

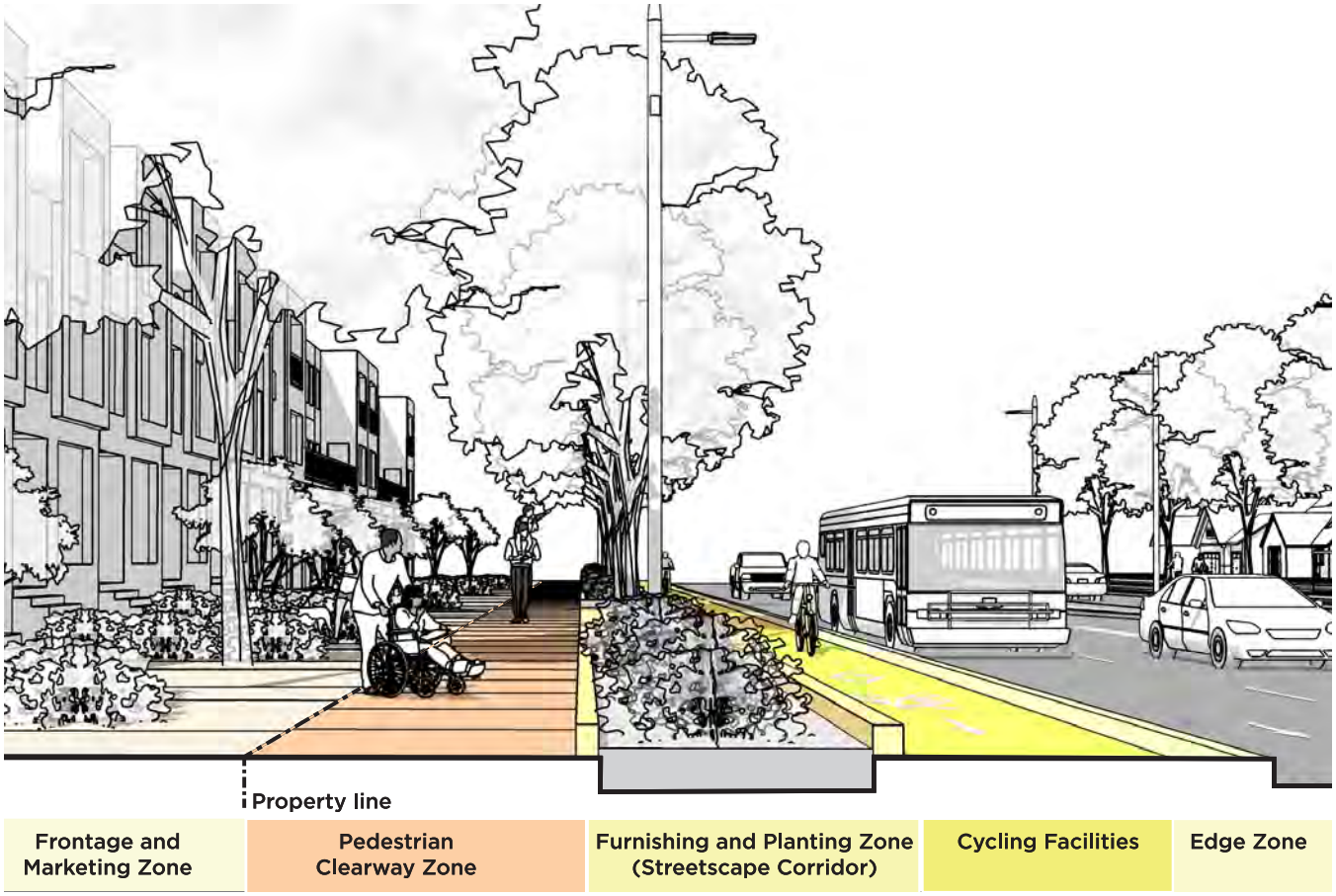


Figure. 4.4. Boulevard sub-zones (typical mid-block condition).

Refer to Section 4.5.3 for guidelines at transit stops where wider dimensions are needed to accommodate a shelter and a platform (pedestrian landing pad).

CYCLING FACILITIES

This is the area dedicated to cyclists. It is ideally raised to sidewalk level and placed in the boulevard; however, it may be in the travelway as another type of facility. Refer to Section 4.4.

EDGE ZONE

This is the space that typically occupies from the face of curb to the edge of the furnishing and planting zone. The edge zone is a hard surfaced area to accommodate sign, bollards, door swings (on-street parking), salt splash, and snow storage. In Mississauga, the edge zone is 0.75m from the face of curb.

City of Mississauga streets are urban streets and according to TAC (2017) a clear zone requirement does not apply. This is due to the typical conditions along urban streets with lower-target operating speeds, denser development, limited rights-of-way, closely spaced intersections, and multimodal street users. Refer to TAC 7.7 Roadside Design in Urban Environments for further guidance.

4.2.2 Pedestrian Clearway

The Pedestrian Clearway is one of the most important parts of the street. It is the unobstructed portion designated for pedestrian movement.

GUIDANCE

Provide pedestrian clearways on both sides of all streets, within the right-of-way.

Provide pedestrian clearway widths based on street class and intensity of existing and anticipated future pedestrian volumes. Provide wider clearways in Strategic Growth Areas where higher pedestrian activities are anticipated. In all cases the clearway width should be determined in accordance with Table 4.1.

When assembling cross-sections, overall boulevard width should first accommodate the preferred pedestrian clearway, assigning available space to other zones second.

All streets in Mississauga will have pedestrian clearways of 1.8m or higher.

Design the clearway to meet and/or exceed Accessibility for Ontarians with Disabilities Act (AODA) and City of Mississauga Facility Accessibility Design Standards (FADS) for horizontal and vertical clearances and slope

Provide sufficient cross slope and long slope to clear storm water runoff without compromising pedestrian safety.

Use materials to communicate changes of function effectively with all users. Examples include pedestrian ramps, detectable edge treatments or colour contrasting materials.

Provide continuous clearways without obstruction and connected across intersections with suitable pedestrian crosswalks.

Ensure clearway material finishes are stable, firm, and slip resistant. Minimize the number of different materials across the boulevard (curb line to property line) to assist in ease of maintenance.

Avoid locating ventilation grates and covers within the clearway.

REFERENCES

- Pedestrian Master Plan, City of Mississauga (2021)
- City of Mississauga Facility Accessibility Design Standards (FADS) (2015)
- Accessibility for Ontarians with Disabilities Act (AODA) 2005. The legislation identifies standards (ON. Reg. 413/12) pertaining to both transportation and the design of public spaces (built environment)

Table 4.3 Pedestrian clearway width by street classification

Street Classification	Desired
Arterial Strategic Growth	3.0 - 6.0m
Arterial Neighbourhood	1.8 - 2.4m
Arterial Employment	1.8 - 2.4m
Major Collector Strategic Growth	3.0 - 6.0m
Major Collector Neighbourhood	1.8 - 2.4m
Major Collector Employment	1.8 - 2.4m
Major Collector Scenic Routes	1.8 - 2.4m
Minor Collector Strategic Growth	3.0 - 6.0m
Minor Collector Neighbourhood	1.8- 2.4m
Minor Collector Employment	1.8 - 2.4m
Minor Collector Scenic Routes	1.8 - 2.4m
Local Strategic Growth	1.8 - 2.4m
Local Neighbourhood	1.8m
Local Employment	1.8m

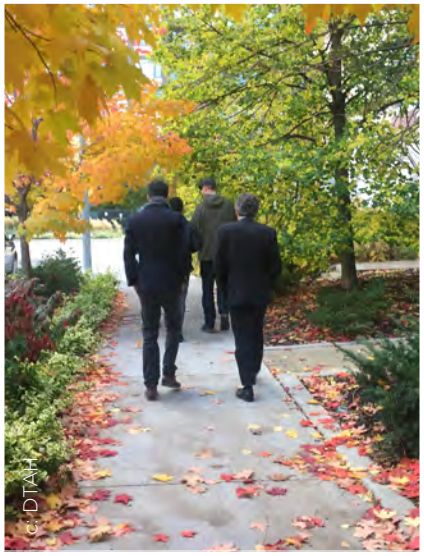


Figure. 4.5. Context specific pedestrian clearway width: wider clearways are required on streets with higher pedestrian volumes.

4.2.3 Place-Making

Streets are public spaces where people interact. Design boulevards to invite with seating, trees, sidewalk cafés, streeteries, public art, and lighting. Provide places to gather and create opportunities to support the street's context.

Streets in Mississauga are more than just corridors for movement. They shape the experience and memory of the city, and are unique places to interact and enjoy.

Street designers shall consider how to enhance and support the social and cultural richness of the streetscape. Seek opportunities to provide places for respite, not just movement, such as curb extensions on side streets where seating and plantings add to local character. The City of Mississauga recognizes that a high-quality public realm benefits our health, generates economic activity, fosters social connections, and makes our city more exciting and inspiring.

GUIDANCE

Street furniture includes street trees and planters, transit shelters, benches, bicycle parking, information and wayfinding signs, litter and recycling bins, kiosks, poster boards and poles, parking meters, electric vehicle and automated vehicle equipment, and automated public toilets. Ensure street furniture does not obstruct intersection site-lines or the pedestrian clearway by locating them in the furnishing and planting zone or on private property using building setbacks and easements. Target seating opportunities every 40m along streets within Strategic Growth Areas.

Street lighting supports safety, pedestrian activity, sense of place, and economic vitality. It includes roadway lighting and pedestrian scale lighting. Pedestrian scale lighting for sidewalks and crosswalks ensures that pedestrians are visible to motorists. Where cycling facilities are located within the boulevard, these benefits also extend to cyclists.

Outdoor cafés and streeteries are seating/dining areas located on the sidewalk or in temporary curbside patios that are operated and maintained by an adjacent restaurant or café owner. Outdoor cafés or marketing displays must not impede the pedestrian clearway.

Public art, culture and heritage help to celebrate the identity, history, and sense of place that makes Mississauga's neighbourhoods unique. Public art, culture and heritage features enhance the sense of enjoyment and well-being of people using city streets. These elements can include street art, sculptures, plaques, painted traffic controller boxes, murals, and heritage features, structures, or sites.

Animated building façades include elements such as glazing, doors on the street, or canopies to create a welcoming microclimate or connect the inside of a building to the life of the street.

Decorative hanging baskets, planters for trees and landscaping, and other visually attractive initiatives by local businesses and communities help to improve the public realm and create a sense of place. These are possible within the furnishing and planting zone or frontage and marketing zone. Placing hanging baskets, planters or landscaping in the right-of-way requires coordination and approval with the City.

Figure. 4.6. Temporary winter tree wraps (Hurontario Street).

Figure. 4.7. Outdoor cafes (Streetsville).

Figure. 4.8. Parklets.

Table 4.4 Place-making opportunities by street classification

Street Classification	Street furniture	Street lighting	Outdoor cafes	Public art / heritage	Animated building facade	Decorative hanging baskets	Planters for trees and landscaping
Arterial Strategic Growth	X	X	X	X	X	X	X
Arterial Neighbourhood	X	X	X	X	X		X
Arterial Employment	X	X	X	X			X
Major Collector Strategic Growth	X	X	X	X	X	X	X
Major Collector Neighbourhood	X	X	X	X	X	X	X
Major Collector Employment	X	X	X	X	X	X	X
Major Collector Scenic Routes	X	X		X		X	X
Minor Collector Strategic Growth	X	X	X	X	X	X	X
Minor Collector Neighbourhood	X	X	X	X	X	X	X
Minor Collector Employment	X	X	X	X		X	X
Minor Collector Scenic Routes	X	X	X	X		X	X
Local Strategic Growth	X	X	X	X	X	X	X
Local Neighbourhood		X		X	X		X
Local Employment		X	X	X			X

4.3 INFRASTRUCTURE

Street trees, stormwater management (including the application of green infrastructure and low-impact development facilities) and above and below ground utilities are critical parts of street design. Coordinate the location and positioning of these various elements of green infrastructure and utilities when planning and designing streets in Mississauga.

This section includes techniques for green infrastructure, street trees and landscaping, utilities, and the urban soundscape.

4.3.1 Green Infrastructure & Sustainability

Incorporate green infrastructure strategies within all new and retrofit street designs to improve the environmental health, comfort and visual appearance of Mississauga streets.

Figure. 4.9. Permeable concrete sidewalk and rain garden curb extension on a Local Neighbourhood Street (Alpha Mills, Mississauga).

Figure. 4.10. Adding a stormwater rain garden without modifying existing curbs and catch basins.

Figure. 4.11. Deeper front yard setbacks with tree planting and increased permeable surfaces (Port Street, Mississauga).

Street improvements offer an opportunity to incorporate green infrastructure (GI), such as permeable surfaces, stormwater management systems, vegetated curb areas, urban forests, and street trees into the public right-of-way. These green streetscape design elements work together as part of a system to provide ecological, hydrological and place-making functions. Allocating more space in the ROW for GI is possible by:

- narrowing the travelway (roadway) through a road diet
- widening the median
- widening the boulevards
- incorporating quick-win solutions that don't significantly modify existing curb locations, drainage patterns and catch basin locations (e.g., adding rain gardens or tree planting as part of traffic calming or within a strip of on-street parking)
- requiring adjacent developments to incorporate deeper front yard setbacks with GI elements, such as tree planting or softscape.

The following strategies provide guidance for developing and implementing more detailed, sustainable solutions.

WATER: REDUCE RUN OFF AND FILTER

Maximize on-site infiltration and moisture retention (through vegetated swales, absorbent landscape, infiltration planters and galleries, rain gardens and soil cells).

Reduce impervious area by minimizing paved areas, or using permeable pavements (subject to ground conditions and context).

Slow, detain and filter runoff with GI (e.g., flow-through planters, rain gardens, vegetated swales, rain gardens, permeable pavements).

HABITAT: ENHANCE URBAN FOREST CANOPY

Improve biodiversity, reduce the urban heat island effect and improve air quality (use diverse native vegetation and create a layered canopy).

Increase urban tree health and canopy (through mature trees and optimal growing conditions).

Increase habitat connectivity (through wildlife corridors, crossings and passages).

Table 4.5 Green Infrastructure opportunities by street classification (subject to soil and geotechnical conditions)

Street Classification	Street trees	Bio-retention planters	Swales	Bio-retention curb extensions / rain gardens	Permeable paving: furnishing and planting zone	Permeable paving: lay-bys, parking
Arterial Strategic Growth	X	X		X	X	
Arterial Neighbourhood	X		X	X	X	
Arterial Employment	X		X	X	X	
Major Collector Strategic Growth	X	X		X	X	
Major Collector Neighbourhood	X		X	X	X	
Major Collector Employment	X		X	X	X	
Major Collector Scenic Routes	X		X	X	X	
Minor Collector Strategic Growth	X	X		X	X	X
Minor Collector Neighbourhood	X			X	X	X
Minor Collector Employment	X			X	X	X
Minor Collector Scenic Routes	X			X	X	X
Local Strategic Growth	X	X		X	X	X
Local Neighbourhood	X			X	X	X
Local Employment	X			X	X	X

AIR: MITIGATE CLIMATE CHANGE

Design networks and streets to prioritize walking and cycling.

Enhance the urban forest (through maximum tree planting and optimum growth conditions).

Reduce energy demand (with energy conservation and alternative energy systems).

Select and locate GI based on right-of-way width, street class and context. Streets within lower intensity areas, like Neighbourhoods, have a wide range of GI possibilities in different locations (e.g., the furnishing and planting zone, setbacks, medians and combined with traffic calming elements such as curb extensions). Streets within higher intensity areas, like Strategic Growth Areas, are required to include Streetscape Corridors, which is an ideal location for GI. Refer to Table 4.3 for guidance in prioritizing GI by street class.

RECOMMENDED FUTURE ACTION

The City should develop new standards for GI and tree planting. These standards should include criteria, standardized ROW sections with GI, specifications, and drawings by street class.

REFERENCES

- Green Development Standards, Mississauga (2012)
- City of Mississauga (2012) Living Green Master Plan
- Sustainable Technologies Evaluation Program (STEP). Low Impact Development Planning and Design Guide WIKI
- Toronto and Region Conservation Authority. SNAP: Sustainable Neighbourhood Action Plan
- Region of Peel's Urban Forest Best Practice Guidelines (2011)
- National Green Infrastructure Certification Program
- City of Toronto Green Street Technical Design Guidelines (2017)

4.3.2 Street Trees and Landscaping

Plan and design streets to include large, healthy trees and landscaping. The image, quality and resilience of Mississauga will improve as the urban forest improves. Street tree planting and landscaping are integral parts of the equation.

Figure. 4.12. Street trees (Living Arts Drive, Mississauga).

Figure. 4.13. Consider including understory planting along streets within BIAs, which provide enhanced maintenance opportunities.

Large, healthy street trees provide substantial benefit beyond the aesthetic; they support biodiversity by providing habitat and food for wildlife, they contribute to a healthy and robust tree canopy, absorb stormwater, clean the air, reduce the urban heat island effect, and contribute to pedestrian and cyclist comfort.

The value of street trees to the urban environment is enhanced when they are combined with understory planting and additional landscaping such as shrubs, grasses and herbaceous plants.

Landscaping can contribute to the aesthetic value and environmental performance of the street when included in and combined with green infrastructure approaches such as bioswales and rain gardens.

GUIDANCE

Provide adequate root space, high quality soil, aeration, enough water and sunlight, protection from pedestrian traffic, and regular maintenance.

Coordinate street tree locations with above or below ground utilities to avoid conflicts.

Provide appropriate tree spacing and ample uncompacted, well-draining soil volume, 30m^3 for a single tree. 20m^3 per tree when soil volume is shared. When adequate soil volumes are not achievable, use soil cells to increase soil volumes and connect root zones under paving.

Use open planters for tree planting where space and maintenance agreements permit. 5m^2 is desired per tree pit, with a minimum of 2m^2.

Protect trees from road salt, and ensure proper soil flushing every spring, prior to bud break.

Strategically plan plantings for maximum public and ecological benefit and to provide a “sense of place” critical to the vitality of neighborhoods and their business districts.

Use plant material that is native or well adapted to the area and sourced locally wherever possible.

Tree species diversity is encouraged by selecting a mix of trees for individual projects. No single species representing more than 5% of the tree population, no genus representing more

Figure. 4.14. Street trees should have appropriate spacing and soil volume.

than 10% of the tree population, and no family representing more than 20% of the tree population is recommended.

Develop canopy and soft landscape ROW cover requirements by street class for all new street projects. As an interim measure, target 25% tree canopy cover and a 25% shrub and grass cover (canopy cover currently within Mississauga's existing ROW's is 15% (2014 Urban Forest Canopy by Land Use Assessment).

In Strategic Growth Areas, the Amended Boulevard Treatment tree planting standards apply. This is a higher quality standard than the City's typical tree planting detail. As the City continues to mature and special study areas are identified, the areas subject to an Amended Boulevard Treatment may be expanded.

REFERENCES

- City of Mississauga Living Green Master Plan (2012).
- Sustainable Technologies Evaluation Program (STEP). Low Impact Development Planning and Design Guide WIKI.
- Toronto and Region Conservation Authority. SNAP: Sustainable Neighbourhood Action Plan.
- National Green Infrastructure Certification Program
- City of Toronto Green Street Technical Design Guidelines (2017).
- City of Mississauga Urban Forest Canopy Assessment.
- Amended Boulevard Treatment Areas Tree Planting Details

4.3.3 Above and Below Grade Utilities

The space below grade is often congested and in high demand. The performance of the street above often relies on how elements are arranged beneath. Utility design and coordination needs to ensure operational and maintenance efficiency and protect for the needs of other users and uses such as green infrastructure and illumination.

GUIDANCE

Procure an accurate existing utility plan based on physical locates to guide the design and determine the total cost of the proposed elements.

Collaborate across departments to incorporate Complete Streets design guidance with utilities planning at the early stages of the design process and at critical review points.

Coordinate the location and positioning of the various elements of below-grade infrastructure and access points with standards for street trees, soil cells and bio-swales, and consider practices for maintenance and repair of infrastructure.

Place utilities below grade. Standard practice is for water, stormwater and wastewater within the travelway, and telcos, hydro, and gas in the boulevard section of the right-of-way as part of a new construction and reconstruction.

Within Strategic Growth Areas, where the Amended Boulevard Treatment is applied, locate hydro boxes and utility boxes on private property or buried within the boulevard.

Wherever possible, locate above-ground utilities away from intersections, day-lighting triangles, and visual axes such as the end of T-intersections or other view corridors.

Where possible, screen street grade public utilities (e.g., transformer pads, telephone switching stations, junction boxes) using similar treatments to the surrounding context. Where appropriate, the municipality, in consultation with the appropriate utility authority, shall support the installation of visually appealing utility and telecommunications infrastructure.

Locate utilities to enable ease of access for emergency or maintenance services. Maintenance holes must remain accessible at all times.

Adhere to required offsets for all structures within municipal rights-of-way.

Ensure all the City's stormwater and sewer infrastructure and the Region's existing water/ wastewater infrastructure service connections are identified and adequately protected.

The Region's input during the planning, design and construction phases is required.

Perform all relocations and protection of the Region's water/ wastewater infrastructure, if any, in conjunction with the Region of Peel's design standards for linear infrastructure.

Figure. 4.15. Soil cells (Central Parkway, Mississauga).

4.3.4 Urban Soundscape

People in urban centres can often be exposed to noise levels considered harmful to health. Street noise in Mississauga results from several sources including buses, automobiles, trucks, motorcycles, and construction activities.

Urban sound in Mississauga streets is primarily addressed through policies, legislation and the City's Noise Abatement Guidelines (2015 Review). As Mississauga grows, the health and wellness of the city benefits from streets designed to reduce noise. EV, AV and smart vehicles are designed to emit less noise.

The urban soundscape is a critical consideration in designing Complete Streets that are comfortable for the people that use and live around them.

Noise walls are commonly used as a form of noise mitigation along Mississauga streets. However, they can block views and result in urban environments with little sense of animation or eyes on the street.

GUIDANCE

Continually review and update policy and bylaws relevant to noise and the acoustic environment to ensure that streets enhance the acoustic ecology and wellness.

Collaborate with Region of Peel Public Health and relevant stakeholders to identify steps the City can take to address the health and environmental impacts of noise.

Encourage and promote good acoustic design and best practice in noise reduction and control in the design and maintenance of streets.

In new developments, seek opportunities for enhancing and protecting quiet and tranquil places.

In retrofit projects, consider noise-dampening pavement, sound barriers, or absorptive materials to mitigate noise. Design noise walls to enhance the streetscape character with visual effects, greening, and architectural qualities in accordance with the City's Noise Attenuation Barriers Policy (2013).

Design site plans and subdivisions to reduce the need for noise walls. For example, use planted setbacks, sculptural mounding or land use variations to mitigate noise instead of noise walls along rear-facing yards.

REFERENCES

Noise Attenuation Barriers on Major Roadways (2013)

Figure. 4.16. Planting and earth mounding noise mitigation along an Arterial Neighbourhood Street.

4.4 CYCLING FACILITIES

Cyclists are vulnerable road users. It is essential to prioritize cyclist safety by minimizing exposure to potential conflicts. Further, it is critical to consider context-sensitive and comfortable cycling on all Mississauga streets as part of the Street Delivery Process.

4.4.1 Cycling Facilities

Design cycle facilities to minimize risk exposure, create a more comfortable cycling environment, and make cycling a welcoming travel option in Mississauga.

A key step in the Street Delivery Process (refer to Chapter 2) is identifying whether the proposed project is part of the existing or planned cycle network or other corridor plans. The Cycling Master Plan provides guidance on the location and design of cycling facilities throughout the city.

Cycling facilities in Mississauga can either be in the travelway zone (buffered, separated, shared), in the boulevard (boulevard multi-use trail, raised cycle track) and/or off-road (park multi-use trail). Practitioners should refer to the Ontario Traffic Manual (OTM) Book 18 (2021) facility selection process and the City's Cycling Master Plan (2018) to help determine the most appropriate cycling facility type for a specific street, in addition to the direction provided in this guide.

Careful attention is needed to organize the interactions that occur between cycling, transit stops, on-street parking, and other curbside uses like outdoor cafes or parklets. Refer to Section 4.6.5.

The benefits of incorporating cycle infrastructure include increased cycling mode share, reduced motor vehicle traffic volume, reduced air and noise pollution, changes in the demands/needs of vehicle parking, and increased public health benefits.

GUIDANCE

Select and design cycle facilities for an All Ages & Abilities cycling environment, based on a street's posted speed and volume in accordance with Figure 4.17 and the City's Cycling Master Plan. Separated and protected facilities often meet the All Ages & Abilities criteria, particularly in higher speed, higher volume, or unpredictable conditions.

Design the street to minimize bicycle Level of Traffic Stress. Target LTS1 on local streets and collectors and LTS2 on arterials. See Figure 4.18.

Design multi-use trails, cycle tracks and cycle lanes at bus stops in accordance with MiWay Infrastructure Growth Plan (2020) standard drawings 2240.083, 85,89 and 90-92.

Consider using on-street parking to provide a buffer between the travelway and cycling lane.

Consider the following design, operational, and network strategies to transform streets, address sources of cycling stress and conflict, change demand for access and movement, and improve cycling comfort:

- **Change Design.** Change the cross-section of a street to provide dedicated space for cycling.
- **Change Operation.** Incorporate speed reduction, signalization and proactive curbside management to improve bicycling conditions by reducing the level of cycling traffic stress.
- **Change the Network.** Divert motor vehicle traffic from a street, change travel direction, (dis)allow specific types of curbside access, and make other changes to the role of a street within the network to provide dedicated space for cycling.

REFERENCES

- Cycling Master Plan, City of Mississauga (2018)
- Ontario Traffic Manual Book 18 (2021)
- MiWay Infrastructure Growth Plan (2020)
- NACTO Designing for All Ages & Abilities Contextual Guidance for High-Comfort Bicycle Facilities (2017)
- NACTO Urban Bikeway Design Guide (2014)
- Mineta Transportation Institute: Low-Stress Bicycling and Network Connectivity (2012)

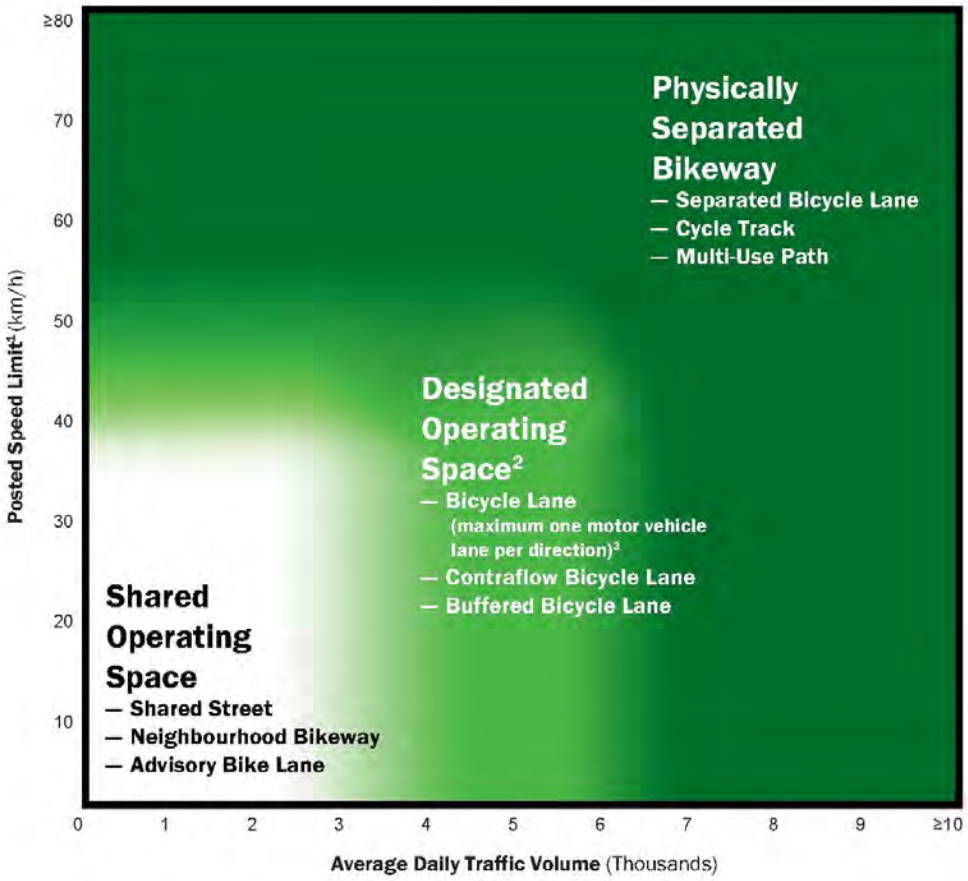


Figure. 4.17. Desirable Cycling Pre-Selection Nomograph Urban/ Suburban Context (OTM Book 18, 2021) is a first step in the facility selection process

LTS 1	• Low traffic stress and requiring less attention from cyclists. Suitable for almost all cyclists, including children (interested but concerned cyclists).
LTS 2	• Low traffic stress but requiring attention and therefore suitable for most adult cyclists (interested but concerned cyclists).
LTS 3	• More traffic stress than level 2, suitable for adults who are confident cyclists (enthusiastic and confident cyclists)
LTS 4	• Highest level of stress, suitable for strong and fearless cyclists.

Figure. 4.18. Level of Traffic Stress. Target LTS1 on local streets and collectors and LTS2 on arterials. Figure adapted from the City's Cycling Master Plan (2018).

Bicycle Lane

Buffered Bicycle Lane

Protected Bicycle Lane

Raised Cycle Track

Shared Bicycle Route

Sharrows and Signs

Boulevard Multi-Use Trail

Advisory Bike Lanes

Paved Shoulders

Figure. 4.19. Types of bicycle routes and facilities (Source: Cycling Master Plan, City of Mississauga)

4.5 TRANSIT

Making transit an accessible, safe and competitive mode of transportation is essential to building a multi-modal transit-oriented city.

4.5.1 Access to Transit

Design the street and path network to provide safe, comfortable, and convenient access to public transit for all users.

Mississauga is committed to planning for compact patterns of development at densities capable of supporting transit service. The establishment of a strong pedestrian and cycling network within walking distance to transit is fundamental for providing transit access.

Areas that have limited or poor pedestrian accommodations (e.g., limited crossings, intersections that prioritize vehicular movement, sidewalks that are uncomfortable during the hot summer or cold winter months) can be barriers and discourage walking to and from a transit stop or station.

y of Mississauga

Figure. 4.20. MiWay stop marker

GUIDANCE

Seek opportunities to provide convenient and comfortable pedestrian access to transit, particularly on streets within a 5-10min walk of transit stops. This can include providing sidewalks along both sides of the street, incorporating wider clearways in areas with high volumes of pedestrian traffic, providing enhanced connectivity for youth, the elderly and persons with disabilities, or regularly spaced places to sit and rest.

Walkshed analysis (of both sides of the street) can be used on corridor projects and large developments to confirm actual walking time to transit for both pedestrians and those using mobility assistance.

Incorporate bike racks, scooter parking, bike or scooter share facilities, lockers, and cycling amenities, such as air pumps and drinking fountains, at stations and terminals to support inter-modal connections.

Provide a comfortable user experience at stops and stations through the integration of seating, lighting, shelter, and information. Refer to Section 4.5.3.

REFERENCES

- Pedestrian Master Plan, City of Mississauga (2021)
- MiWay Infrastructure Growth Plan (2020)
- MiWay Five Service Plan (ongoing)
- Ministry of Transportation Transit Supportive Guidelines (2012)

4.5.2 Dedicated Transit Lanes

Dedicated transit lanes increase service reliability and frequency by facilitating more efficient movement of buses, or light rail transit vehicles through dense city areas.

Providing transit with a strategic advantage in Mississauga's transportation network is critical to meeting the growing need for mobility and to offset congestion. Several different kinds of dedicated transit lanes can be applied within Mississauga streets:

Bus Rapid Transit Lanes (BRT) are designed specifically for bus transit vehicles and are a dedicated bus lane, either within a dedicated median or curbside lane. These lanes typically accommodate emergency vehicles and maintenance vehicles.

Light Rail Transit (LRT) is separated from motor vehicle traffic and designed as dedicated median lanes. These lanes typically do not accommodate emergency vehicles and maintenance vehicles.

Queue Jump Lanes are at the intersection approach and discontinued either at or just beyond the intersection. They are used by buses to "jump" the queue at major intersections, and may or may not accommodate right turning vehicles.

HOV Lanes are designated for use by vehicles with a specified number of occupants. They can offer travel-time savings to those who choose to carpool or take transit. HOV lanes can move a greater number of people than a general traffic lane.

GUIDANCE

Refer to the MiWay Infrastructure Growth Plan (MIGP) for recommended transit priority measures and design guidelines.

Design transit priority measures as integral streetscape elements that contribute to the character and image of the street, enhance travel times and reliability, and improve the safety and comfort of pedestrians, cyclists and other users of the street.

Consider designated transit signal intervals for queue jump lanes. This signal interval would allow buses to merge into the travel lane before through-traffic enters the intersection.

Avoid channelized right-turn lanes as this takes space away from other uses and users. If a channelized right-turn lane is justifiable, an 'urban smart channel' can be considered. Urban smart channels reduce the pedestrian crossing distance under signal control resulting in shorter exposure distance, shorter signal cycles, and reduced potential for pedestrians to be in conflict with vehicles.

Design transit lane width per the recommended lane width in Table 4.7.

Seek opportunities to incorporate Intelligent Transportation Systems (ITS) technology within transit priority projects.

Use red pavement treatment for bus only lanes, bays, and entrances.

REFERENCES

- MiWay Infrastructure Growth Plan (2020)
- NACTO Transit Street Guide (2016)
- Ministry of Transportation Transit Supportive Guidelines (2012)
- MiWay Five Service Plan (ongoing)

Figure. 4.21. Priority bus lanes can become part of a transit priority corridor network across the city (image: Eglinton East in Toronto).

4.5.3 Transit Stop Infrastructure

Design transit stop infrastructure to improve customer experience and enhance the quality and character of the street.

Stop infrastructure location and design can organize the interactions that occur at transit stops, including customer boarding and alighting, and interaction with adjacent pedestrians, cyclists, and on-street parking.

GUIDANCE

Refer to MiWay's Infrastructure Growth Plan (2020) for guidance on transit operational considerations, stop placement and stop design standards. The amenities provided at transit stops, such as benches and bike parking, should reflect MiWay's stop typologies.

Minimize tapers at near, farside and midblock stops to free up space in the street for other elements such as on-street parking, street trees, GI and other pedestrian and cycling infrastructure.

At stops where on-street parking is provided, use bus-bulbs (bulb-outs) to facilitate passenger loading and create space for passenger amenities. Bus-bulbs can help people board or alight faster and make it easier for transit vehicles to pull back into traffic.

Integrate GI into sidewalks, medians, curbs, and other features, including bioswales, flow-through planters, or previous strips, to assist in calming traffic and enhancing comfort while waiting for transit.

Meet and exceed AODA requirements, including accessible crossings, sufficient platform width for mobility device users, curb cuts and tactile strips to alert the visually impaired to the presence of various stop elements (e.g., shared cycling /boarding platform or curb cuts).

Increase safety measures when bus stops are integrated with cycling infrastructure (e.g., pavement markings, sign, lighting).

Provide a dedicated area for snow storage.

Provide bicycle parking adjacent to the stop based on bicycle volume and transit ridership.

Minimize trees and street furniture, such as multi-publication boxes or waste receptacles, within the immediate boarding and alighting area.

When transit stops don't have shelters, use identifiable and consistent MiWay Standards, such as bus markers on poles separate from existing poles, where possible.

Where shelters are provided at an intersection, they should not block the daylight triangles.

Where safe pedestrian crossings cannot be provided, mid-block transit stops should be avoided.

REFERENCES

- Pedestrian Master Plan, City of Mississauga (2021)
- MiWay Infrastructure Growth Plan (2020)
- MiWay Five Service Plan (ongoing)
- Ministry of Transportation Transit Supportive Guidelines (2012)

4.6 TRAVELWAY

The travelway (or roadway) extends from the curb on one side of the street to the other and is used for the movement of cars, trucks, emergency vehicles, transit and cyclists. It can also include additional uses such as drop-off zones, lay-by or on-street parking, and medians.

A Complete Streets travelway will provide an environment that maximizes safety for all road users and optimizes and balances the street functions of mobility, access, place, and sustainability.

4.6.1 Right Sizing Streets (Road Diets)

On some existing streets, space can be used more effectively. Reconfiguring the street can lead to more efficient assignment of available space for other users and uses.

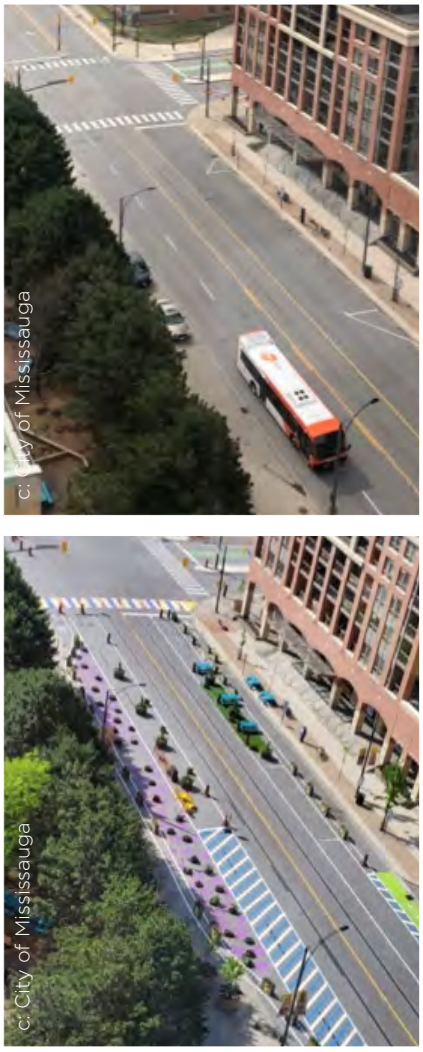


Figure. 4.22. Tactical Urbanism Pilot at Living Arts Drive to test a new road layout. The top image shows what the roadway was before, and on the bottom is during the Tactical Urbanism Pilot.

The following guidance is a list of potential geometric design techniques to improve safety conditions for everyone using the street.

By increasing perceptions and experiences of safety and re-purposing space to other uses, such as place-making, more people may walk, cycle or use transit in a neighbourhood or frequent local businesses to support local economic development.

GUIDANCE

Re-purpose lanes to add protected cycling facilities, add green infrastructure (GI), change parking configurations, add medians, add curb extensions, add electric/autonomous/smart vehicle infrastructure, and add other curbside management elements such as lay-bys for taxis and delivery services.

Reduce pavement width to widen sidewalks and/or add sidewalks (where there are none) to provide safe spaces for pedestrians and universal accessibility.

Re-purpose or redesign sidewalks and boulevards to ensure that the pedestrian clearway is not cluttered or obstructed, such as by moving a transit shelter to the back of a sidewalk or onto private property through an easement, or by providing outdoor café patio seating using a parklet.

Add curb extensions at mid-block or at intersections.

Add chicanes or road narrowings, such as curb extensions or on-street parking, that alternate sides along a street.

Reconfigure four lanes into three, with the shared two-way left-turn lane (TWLTL) as the middle lane.

Review road diet improvements for accurate corner radii for truck routes and fire trucks ensuring that transit routes, service and stop infrastructure are not compromised.

The above guidelines must consider the accommodation of emergency vehicles and year-round operations and maintenance.

REFERENCES

- NACTO Urban Street Design Guide (2013)

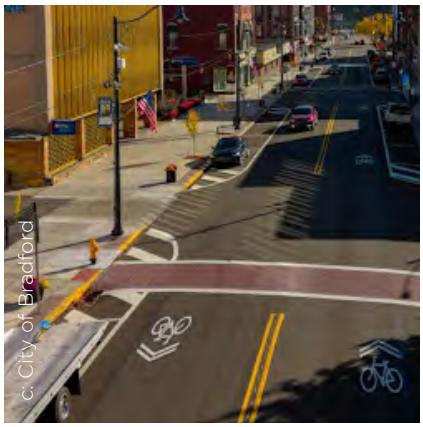


Figure. 4.23. Adding on-street parking or laybys.

Figure. 4.24. Adding a median.

Table 4.6 Road diet opportunities by street classification

Street Classification	Re-purpose lanes	Right size pavement	Redesign sidewalk	Curb extensions at intersections	Road narrowing at mid-block	Review corner radii
Arterial Strategic Growth	X	X	X	X	X	X
Arterial Neighbourhood	X	X	X		X	X
Arterial Employment	X	X	X			X
Major Collector Strategic Growth	X	X	X	X	X	X
Major Collector Neighbourhood	X	X	X	X	X	X
Major Collector Employment	X	X	X			X
Major Collector Scenic Routes	X	X	X	X	X	X
Minor Collector Strategic Growth	X	X	X	X	X	X
Minor Collector Neighbourhood	X	X	X	X	X	X
Minor Collector Employment	X	X	X			X
Minor Collector Scenic Routes	X	X	X	X	X	X
Local Strategic Growth	X	X	X	X	X	X
Local Neighbourhood	X	X	X	X	X	X
Local Employment	X	X	X			X

4.6.2 Design Speed

Reduce and manage motor vehicle operating speeds to accommodate a wider range of modes safely and conveniently within the right-of-way.

Design speed is the maximum vehicle operating speed that streets are designed for. Geometric design inputs are informed by the intended design speed.

Actively designing for safe vehicle speeds is critical to safety. Vehicle speed is a significant factor in crash severity— higher speeds bring exponentially higher risks. Reducing vehicle speed opens a range of design options that allow a street to function and feel like part of a city, rather than a highway.

New and reconstructed streets shall adhere to the values in Tables 4.5 and 4.6.

GUIDANCE

Plan and design streets to manage speed to the intended maximum, identified in the tables to the right. Best practice in urban areas is to design streets so that operating speeds are the same as posted speed.

For multi-lane arterials, with posted speed 50km/h or above, the design speed may exceed the posted speed by 10km/h, similar to best practices in other Canadian jurisdictions.

Design the street to discourage speeds above the design speed and to promote a safe mixing of multiple modes. There is extensive evidence that design treatments, such as narrow lanes, traffic calming measures, on-street parking, street-oriented buildings, and trees located closer to the street, result in drivers traveling at lower operating speeds. As a result of lower speeds, drivers are more cautious on streets designed in this manner. Self-regulating design is critical. Refer to Speed Reduction Mechanisms, Table 4.8.

Monitor and adjust Mississauga's Time of Day (TOD) signal timing to support variations of pedestrian, bicycle, and motor vehicle demand by direction and during different times of the day and night. As an example, a street in the morning may carry mainly vehicle, bike, and transit commuters in the peak direction, while at mid-day or evening the street may accommodate a greater number of pedestrians. Based on this daily rhythm, adjust traffic signal timing to meet various modal and directional demands.

REFERENCES

- ITE Technical Resources. Setting Safe Speed Limits.
- NACTO City Limits: Setting Safe Speeds Limits on Urban Streets (2020)
- World Sustainable and Safe: A Vision and Guidance for Zero Road Deaths. World Resources Institute, Global Road Safety Facility (Ben Welle et al 2018).

Table 4.7 Range of recommended design and posted speeds by street class

	Arterial	**Major Collector Minor Collector Local**
Posted speed more than or equal to 50km/h	Design speed = posted speed + 10km/h	Design speed = posted speed
Posted speed less than 50km/h	Design speed = posted speed for the following elements: lane widths, tapers, and horizontal offsets	design speed = posted speed for all elements
	Design speed = posted speed + 10km/h for the following elements: horizontal alignment, vertical alignment, and intersection sightlines.	

Table 4.8 Range of recommended design and posted speeds, related to street class

Street Classification	Design speed (km/h)	Posted speed (km/h)
Arterial Strategic Growth	40-70	40-60
Arterial Neighbourhood	40-70	40-60
Arterial Employment	40-70	40-60
Major Collector Strategic Growth	40-50	40-50
Major Collector Neighbourhood	40-50	40-50
Major Collector Employment	40	40
Major Collector Scenic Routes	40-50	40-50
Minor Collector Strategic Growth	40-50	40-50
Minor Collector Neighbourhood	40-50	40-50
Minor Collector Employment	40	40
Minor Collector Scenic Routes	40-50	40-50
Local Strategic Growth	30-40	30-40
Local Neighbourhood	30-40	30-40
Local Employment	30-40	30-40

4.6.3 Lane Widths

The width of a travel lane (and the overall roadway) has a direct influence on driver speed and behaviour.

Figure. 4.25. Narrower lane widths have a positive impact on a street's safety without impacting traffic operations.

Table 4.7 describes lane widths for use in Mississauga. The City of Mississauga intends to narrow existing lane widths, reduce extraneous pavement, and eliminate highway-like features such as shoulders and acceleration lanes.

GUIDANCE

Use Table 4.7 to establish lane widths based on design speed and use.

Narrow lanes where current width is in excess of widths in Table 4.7.

Prioritize narrowing of lanes on streets with speeding or safety concerns.

Provide wider dimensions for the curb lanes along multi-lane streets with transit or goods movement in accordance with Table 4.7.

REFERENCES

- TAC's Geometric Design Guide for Canadian Roads (2017)
- NACTO Urban Street Design Guide (2013)

Table indicating lane width by design speed. The speeds are informed by TAC's Geometric Design Guide for Canadian Roads (2017) and best practices. Note: lane dimensions are to face of curb. Include gutter dimension within the lane dimension.

Table 4.9 Lane width by design speed

Lane Type	Minimum	Maximum	Target
Streets with Design Speed 50km/h or greater			
Curb	3.0	3.5	3.35
Through	3.0	3.5	3.0
Transit or Strategic Goods Movement Network*			
Curb	3.5	3.75	3.5
Through	3.35	3.5	3.5
Streets with Design Speed less than 50km/h			
Curb	3.0	3.5	3.35
Through	3.0	3.5	3.0
Transit or Strategic Goods Movement Network*			
Curb	3.5	3.75	3.5
Through	3.35	3.5	3.5
All Streets			
On-Street Parking and Laybys	2.0	3.0	2.6

* Lane width to accommodate transit will vary depending on street class, route frequency, and consider existing and future transit service plans.

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

A **Curb Lane** (also known as an outside lane) is a 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. Curb lanes may be used to make right-turn movements where dedicated right-turn lanes are not provided.

4.6.4 Traffic Calming

Traffic calming refers to a set of physical measures that help to slow vehicle speed and improve neighbourhood safety and place-making.

Traffic calming techniques are applicable to local or collector streets to reduce vehicle operating speeds, minimize conflicts between street users, improve general road safety, and provide opportunities for place-making.

In all cases, maintain emergency vehicle access and ensure that traffic calming projects do not significantly impact transit service. Consider pedestrian and bicycle movement alongside vehicle movement when designing traffic calming projects. Avoid diverting traffic to non-arterial roadways using traffic diversion devices.

Traffic calming can include either vertical or horizontal measures. Vertical measures, such as speed cushions, raised crossings and raised intersections, have a physical effect on motor vehicles and are typically the most effective measure at reducing vehicle speeds. Horizontal calming features, such as curb extensions, pinch points, median refuge islands, on-street parking and chicanes, physically narrow the roadway and reduce the crossing distance for pedestrians and cyclists.

Traffic calming elements are often combined with green infrastructure elements to provide increased opportunities for planting and stormwater management.

Figures 4.27 to 4.33 and Tables 4.8 to 4.9 indicate potential traffic calming measures by street class.

GUIDANCE

Design and maintain traffic calming elements to accommodate emergency vehicles and winter maintenance requirements, and to minimize impacts on transit service.

Allow pedestrians and cyclists to travel safely and comfortably through traffic calming elements.

Consider horizontal deflection measures for all street types: curb radii reductions, curb extensions, traffic islands, raised medians.

Consider physical vertical deflection on neighborhood streets: speed cushions, speed tables, raising crossings.

Consider opportunities for place-making, such as green infrastructure or public art, within the traffic calming elements.

Remove channelized right-turn lanes (also known as pork-chops or slip-lanes) where possible. If removal is not possible, provide an urban smart channel. Urban smart channels incorporate a sharp angle of entry into the cross street and delineate a narrow turning path for motor vehicles using pavement markings. Control the pedestrian crossing with either stop signs and a raised crosswalk, or traffic signals with a NO TURN ON RED prohibition and exclusive pedestrian signal phase, to assist pedestrians to safely cross. Refer to Figure 4.26.

REFERENCES

- OTM Book 18: Cycle Facilities (2021)
- TAC's Geometric Design Guide for Canadian Roads (2017)
- TAC's Canadian Guide to Traffic Calming – Second Edition (2018)
- City of Mississauga Traffic Calming Policy (10-09-03)

Table 4.10 Speed reduction mechanism examples by street class

Street Classification	Arterial Strategic Growth	Arterial Neighbourhood	Arterial Employment	Major Collector Strategic Growth	Major Collector Neighbourhood	Major Collector Employment	Major Collector Scenic Routes	Minor Collector Strategic Growth	Minor Collector Neighbourhood	Minor Collector Employment	Minor Collector Scenic Routes	Local Strategic Growth	Local Neighbourhood	Local Employment
Traffic calming measures**														
- Vertical deflection					X		X	X	X	X	X	X	X	X
- Horizontal deflection	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- Roadway narrowing	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- Surface treatment	X	X	X	X	X	X	X	X	X	X	X	X	X	X
- On-street parking	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Synchronize signals to the intended target speed	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eliminate super elevation	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Remove or reduce shoulders, except where there are shoulder cycle facilities along rural roads	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Use trees and other vertical elements to create visual friction	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Eliminate channelized right-turn lanes or replace with urban smart channel	X	X	X	X	X	X	X							
Use speed limit, warning, and advisory signs and devices	X	X	X	X	X	X	X	X	X	X	X	X	X	X

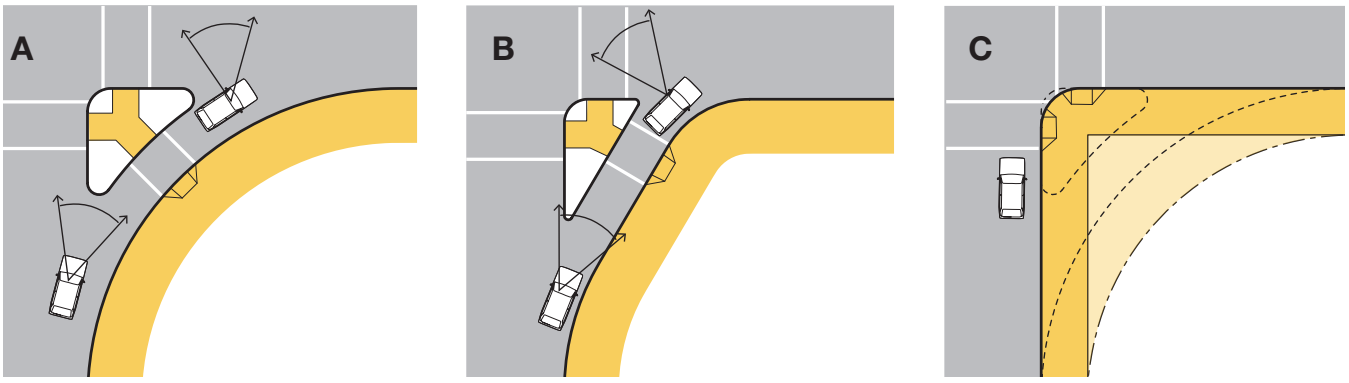


Figure. 4.26. (A) A larger turn radius results in faster turns and less visibility of pedestrians waiting to cross. (B) Replacing a channelized right-turn lane with an urban smart channel results in shorter crossing for pedestrians and safer conditions at the intersection. (C) Replacing a channelized right-turn lane with a smaller turn radius slows traffic, and improves visibility of pedestrians and on-coming traffic.

Table showing the potential different traffic calming techniques that can be applied to each street class. (Source: TAC's Canadian Guide to Traffic Calming)

Table 4.11 Examples of traffic calming techniques based on Mississauga's street classification
(Source: TAC's Canadian Guide to Traffic Calming)

Traffic calming measures		Applicability
Vertical deflection	Raised crosswalk Raised intersection Speed cushion Speed table	Local Neighbourhood Local Strategic Growth
Horizontal deflection	Chicane Curb radius reduction Lateral shift Speed kidney Traffic circle	Major Collector Neighbourhood Minor Collector Neighbourhood Local Neighbourhood Local Strategic Growth
Roadway narrowing	Curb extension Lane narrowing On-street parking Raised median island Road diet	All Street Classes
Surface treatment	Sidewalk extension Textured crosswalk Textured pavement	Minor Collector Strategic Growth Minor Collector Neighbourhood Local Strategic Growth Local Neighbourhood
Design elements	Shared space	Local Strategic Growth Local Neighbourhood

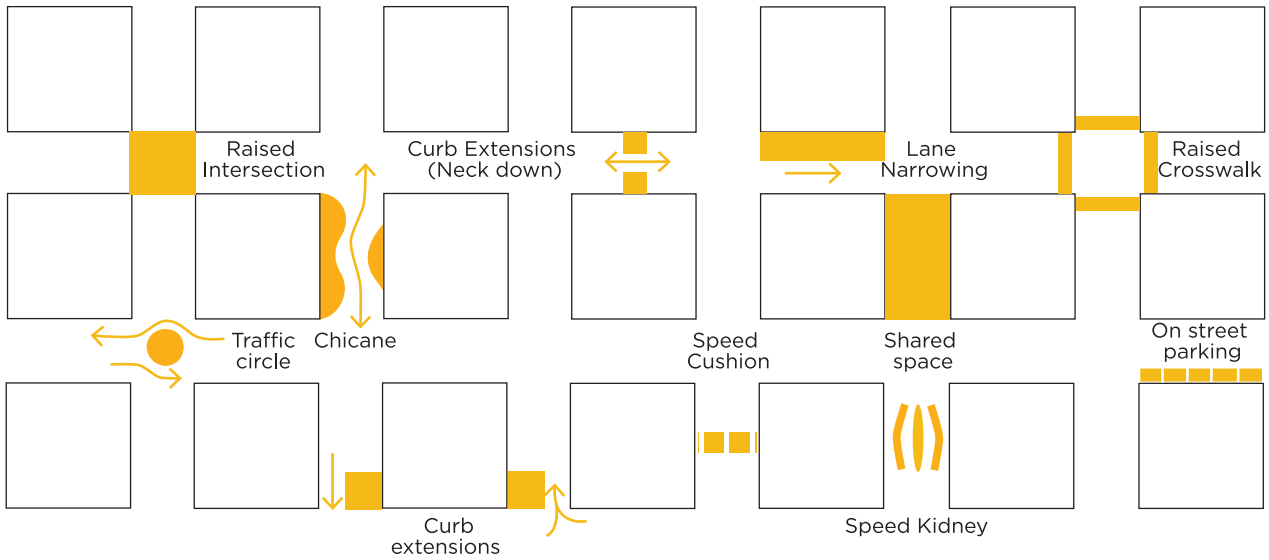


Figure. 4.27. Examples of traffic calming measures

Figure. 4.28. Mississauga Slow Streets program.

Figure. 4.29. Chicanes.

Figure. 4.30. Raised mid-block median.

Figure. 4.31. Raised crossing.

Figure. 4.32. Mid-block curb extensions.

Figure. 4.33. Intersection curb extensions.

4.6.5 Curbside Management

Curbside space has generally been focused on activities such as parking, transit stops and driveway entrances. As Mississauga grows and intensifies, the curbside area is becoming more important with many competing interests.

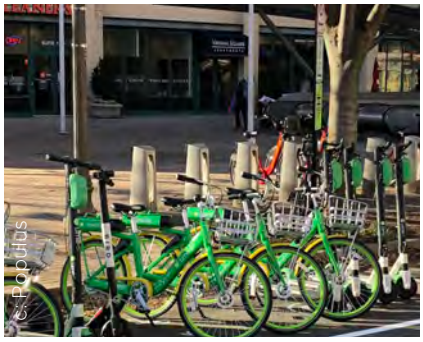


Figure. 4.34. Examples of curbside activities

Future proofing Mississauga streets requires the curbside zone to actively support adjacent land uses, encourage newer forms of mobility, and continue to support the transit and cycling network. Potential curbside activities in Mississauga can include but are not limited to, loading and courier zones, temporary uses (e.g., construction), green infrastructure, traffic calming elements (e.g., curb extensions, chicanes), streeteries, parklets, cycling facilities, and transit priority infrastructure.

GUIDANCE

Consider designated delivery, short-term drop-off and ride-sharing drop-off locations to assist in limiting blocked vehicle lanes.

Survey local businesses and institutions to identify delivery and private-passenger loading needs, potentially finding patterns to minimize curb space allocation.

Where appropriate, incentivize app-driven ride-shares, zero-emission electric vehicles (EV) and automated vehicles (AV) by reducing parking spaces for private cars and allocating more curbside space for pick-up/drop-off. This could have knock-on effect of improving access to restaurants, cafes and shops during peak periods.

As outlined in the Parking Master Plan and Implementation Strategy (2019) parking needs to be managed proactively. This can include variable pricing to influence on- and off-peak periods, removing on street parking in the peak direction, and other regulatory measures.

Where feasible, within Strategic Growth Areas and where there is an anticipated high use of commercial sidewalk activity, encourage side street or off-street parking to free up curbside space for other uses such as seating, greenscape or parklets.

Consider EV docking, EV charging points and smart parking equipment and technologies. Care should be taken to locate charging points away from busy locations within civic spaces.

Provide transit stop amenities and cycling infrastruture to enhance the customer experience (e.g., larger heated shelters, bicycle rings).

Provide sufficient buffer space between cycling facilities and on-street parking.

Ensure that on-street parking does not obstruct critical sightlines at intersections.

As the transition to AV use matures, consider and evaluate opportunities to reallocate curb-side space to pedestrians, cyclists, transit, pick-up and delivery, and other functions.

Adaptable street design options are a cost-effective way to re-imagine existing rights-of-way and new streets. These are typically focused on creating inexpensive, temporary solutions and can include:

Support for Modal Priorities: converting curbside lanes into expanded sidewalks; bike lanes; shared streets; rush hour or bike/walk lanes; dedicated transit lanes and/or transit priority measures and adding enhanced bus stop amenities such as shelters, seating and screens with digital schedules.

Access for Commerce: pavement to parks (Parklets); weekend markets; art installations; designating sidewalk or street space for cafe seating or outdoor dining areas; queue zones for people waiting to enter small businesses; encouraging curbside spaces to be used differently according to times of day or seasons (e.g., mornings may accommodate freight deliveries, lunch hour accommodates street cafes, and the evening emphasizes moving people as they grab dinner or drinks, pick up children, or head to evening events).

Accesses for People: temporary animations; tactical urbanism or public art.

Greening: adding street trees or landscaping; adding Green Infrastructure (GI) such as rain gardens or other low impact development (LIDs)

Storage
Converting curbside lanes into lay-bys, delivery areas or on-street parking.

REFERENCES

- City of Mississauga Parking Master Plan and Implementation Strategy- Parking Matters (2019)
- NACTO, Curb Appeal: Curbside Management Strategies for Improving Transit Reliability (2017)
- Institute of Transportation Engineers (ITE) Curbside Management Practitioners Guide (2018)

Table 4.12 Possible curbside use priorities by context

	Strategic Growth	Neighbourhood	Employment
1	Support for Modal Priorities (i.e. transit, cycling, etc.)		
2	Access for Commerce	Access for People	Access for Commerce
3	Access for People	Access for Commerce	Access for People
4	Activation	Greening	Storage
5	Greening	Storage	Activation
6	Storage	Activation	Greening

Adapted from ITE: Curbside Management. A Practitioners Guide.

Figure. 4.35. Farmers markets.

Figure. 4.36. On-street parking.

Figure. 4.37. Enhanced transit stops with shelters and seating.

Figure. 4.38. Electric vehicle charging stations.

Figure. 4.39. Public art.

Figure. 4.40. Outdoor patios and cafes.

4.7 INTERSECTIONS

Intersections are where various modes of travel, uses and users come together. They often serve as meeting places, gateways, transit hubs and transfer points. As a result, intersections generate many potential conflicts. People who travel along streets and through intersections of Mississauga should feel safe and comfortable, with reduced exposure to risk. Intersections also offer opportunities for place-making and green infrastructure.

This section presents techniques for designing more complete intersections.

4.7.1 Design and Control Vehicle

Select the most frequent large vehicle as the design vehicle to inform street geometry, not the occasional largest vehicle.

All too often intersections in Mississauga have been designed to accommodate the rare large vehicle – at the expense of other users, their safety, and the environment.

Designing for infrequent vehicles yields excessively large intersections with large corner radii. In turn, crossing distances are longer, turning speeds are dangerously higher, and the extra pavement produces more stormwater runoff.

Going forward, the City will use both design and control vehicles specific to each street class and receiving street. A design vehicle is the most frequent large vehicle. A control vehicle is the largest occasional vehicle, such as a moving van. This approach will yield more compact intersections. Emergency vehicles responding to a call are control vehicles and are permitted to use the entire roadway per the Ontario Highway Traffic Act.

Best practices recommend that in urban settings smaller corner radii are preferred, and that a large corner radius should not be used to facilitate a truck turning from the right lane into the right lane.

GUIDANCE

Table 4.11 lists maximum design and control vehicle types per street class. It is based on the "receiving" street.

The design vehicle may use multiple receiving lanes where other traffic is controlled. Turns on red is not a justification to widen a corner.

The control vehicle may use the entire intersection.

While not ideal, emergency vehicles are permitted to make full use of the right-of-way in both directions, including opposite lanes, especially in case of a tight corner radii.

Design and control vehicles shall maintain a minimum 300mm offset from the face of curb.

REFERENCES

- TAC 2017 Design Vehicle Dimensions for Use in Geometric Design. (2017)
- NACTO Urban Street Design Guide. (2013)
- Institute of Transportation Engineers and Congress for the New Urbanism. Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. (2010)
- City of Toronto. Curb Radii Guidelines. Transportation Services. (2018)
- NACTO Webinar – Fire Trucks and Vision Zero (2018)

Table 4.13 Design vehicle, control vehicle, and corner radii by street class and receiving street

Receiving street	Design vehicle*	Control vehicle	Target corner radii (m)**
Local (Strategic Growth+ Neighbourhood + Employment)	P: Passenger	LSU: Light Single Unit	4.0
Minor Collector (Strategic Growth+ Neighbourhood)	LSU: Light Single Unit	B-12: Mississauga Bus	6.0
Minor Collector (Employment)	MSU: Medium Single Unit	WB-20: Tractor/Trailer	9.0
Major Collector (Strategic Growth+ Neighbourhood)	LSU: Light Single Unit	B-12: Mississauga Bus	6.0
Major Collector (Employment)	MSU: Medium Single Unit	WB-20: Tractor/Trailer	9.0
Arterial (Strategic Growth+ Neighbourhood)	B-12 Mississauga Bus	WB-20: Tractor/Trailer	9.0
Arterial (Employment)	HSU: Heavy Single Unit	WB-20: Tractor/Trailer	9.0

* On designated transit routes, transit vehicles will be the design vehicle.
**The final corner radii design will be confirmed using a swept path analysis. The resultant radii is informed by what is included in the overall cross-section (e.g., a cross-section with parking or cycle lanes may enable a tighter corner radii).

Figure. 4.41. Examples of Light SIngle Unit (left) , Medium SIngle Unit (centre) and Mississauga Bus (right)

4.7.2 Corner Radii

Design corners with the smallest radii possible. Smaller corner radii reduce the length of crosswalks, slow turning speeds, can reduce the amount of impervious surfaces, and provide more space for people waiting at the corner.

GUIDANCE

Where there are no turns, such as at intersections with one way streets, corner radii can be as small as 1m.

Corner radii in excess of 9m require approval.

Corners where transit routes turn require a case by case analysis and should use a Mississauga bus as a design vehicle.

Corner radii is not necessarily the same as effective turning radii. The latter is to be used for design/ control vehicles.

Turning speed: 5-10km/h default. Confirm the minimum radii with swept path analysis software based on maximum turning speed (10 km/h) and design vehicle.

In applying a design vehicle turning radius, use the largest possible turning area. For example, from the outside of the turning lane to the median or center line of the receiving street.

At a signalized or all-way stop intersection, the design vehicle may use all receiving lanes. Additionally, the stop line may be recessed to enable the vehicle to use a portion of the entire width of the receiving roadway. At other intersections, use other design treatments to maintain a smaller corner radius.

In applying a control vehicle turning radius, use the entire intersection area. Pulling the stop bar back from the intersection provides more space to turn around tight curb radii.

On-street parking and bikeways may provide space for a larger effective radius for transit vehicles to turn.

Right turns on red, left turns and other permissive movements are to be restricted if they cannot be safely accommodated with a smaller corner radius.

Along Strategic Goods Movement Corridors (SGMCs) and in Employment Areas where frequent freight and truck use is anticipated, use a two or three compound curve to best match the pathway of a truck. Using this approach will allow for a tighter radius corner and minimize the need for additional roadway surface.

Where large vehicles make turns (off the SGMC and outside Employment Areas), install mountable aprons that reduce the turning radius for cars but provide sufficient space for trucks.

6.0m clear width is required to accommodate fire trucks at hydrants and through intersections. This can include the width of opposing lanes.

Do not use acceleration/ deceleration lanes.

REFERENCES:

- OTM Book 18: Cycle Facilities (2021)
- TAC's Geometric Design Guide for Canadian Roads (2017)
- TAC's Canadian Guide to Traffic Calming – Second Edition (2018)
- City of Mississauga Traffic Calming Policy (10-09-03)
- NACTO Transit Street Design Guide (2016)

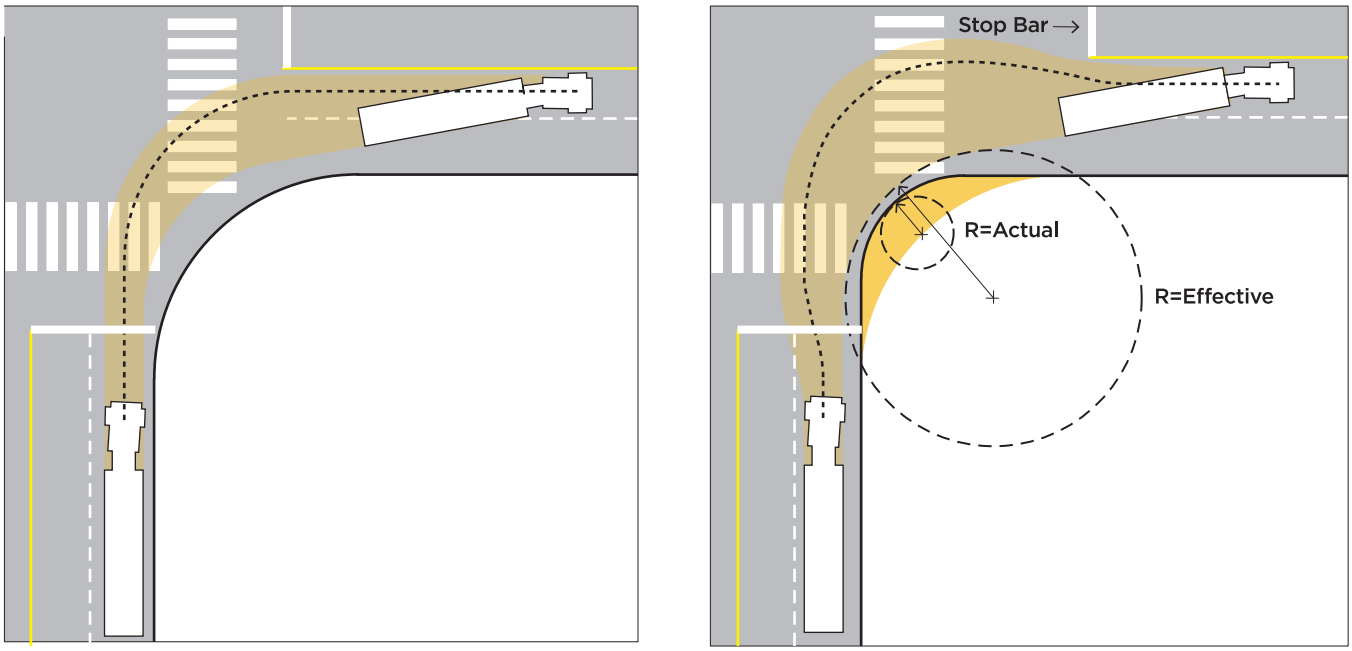


Figure. 4.42. Narrowing corner radii can reduce vehicle turning speeds as well as reduce the length of pedestrian crossing distances. Accommodating for a vehicle allows encroachment of other lanes, shoulders, advance stop lines or other elements to complete the required maneuver. This allows for tighter corner radii with multiple safety benefits for vulnerable users.

Table 4.14 Right sizing opportunities by street class

Street class	Arterial Strategic Growth	Arterial Neighbourhood	Arterial Employment	Major Collector Strategic Growth	Major Collector Neighbourhood	Major Collector Employment	Major Collector Scenic Routes	Minor Collector Strategic Growth	Minor Collector Neighbourhood	Minor Collector Employment	Minor Collector Scenic Routes	Local Strategic Growth	Local Neighbourhood	Local Employment
Use a two or three compound curve	X	X	X	X	X	X		X		X				X
Restricting truck movement							X	X			X	X	X	X
Redesign sidewalk	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Curb extensions at intersections	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Road narrowing at mid-block	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Review corner radii	X	X	X	X	X	X	X	X	X	X	X	X	X	X

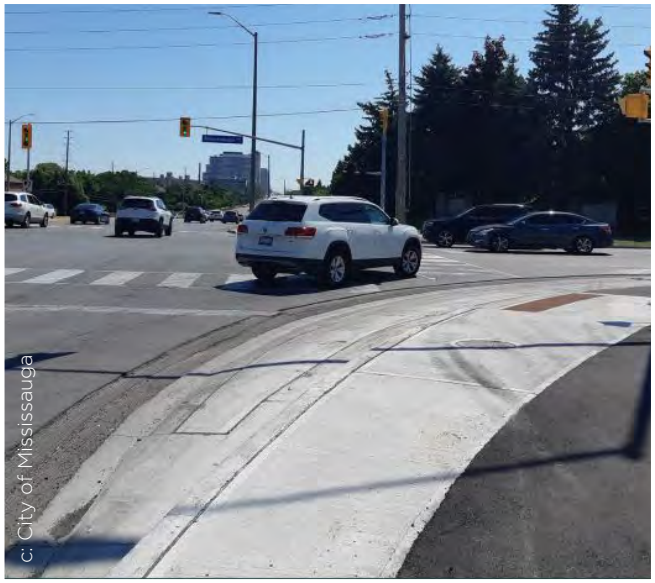


Figure. 4.43. Mountable truck apron (Eglinton Avenue and Mississauga Road).

Figure. 4.44. Mountable truck aprons created with striping and change of surfacing materials.

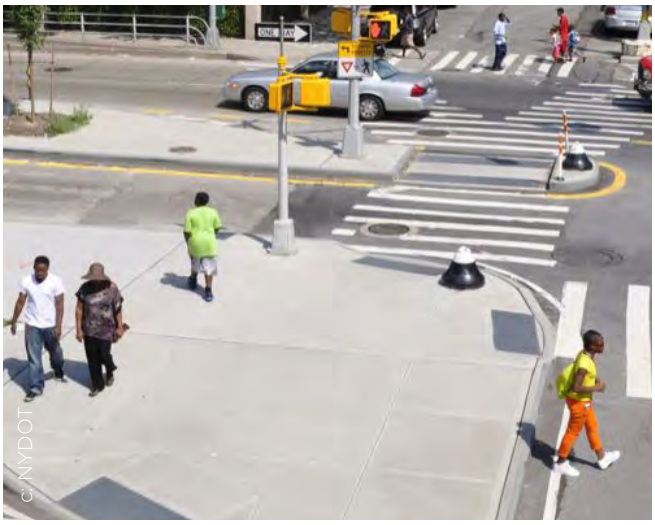


Figure. 4.45. Smaller corner radii can substantially shorten pedestrian crossing distance.

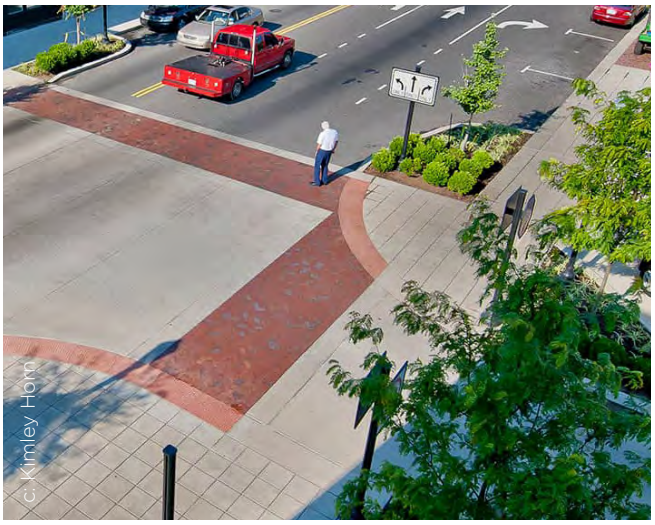


Figure. 4.46. Curb extensions.

4.7.3 Context-Sensitive Intersection Design

Intersections are the most complex aspect of street design.

Some of the factors that contribute to this complexity include the density of pedestrian interaction, inherent conflict points, capacity restrictions, transit transfers and the high level of destination access in proximity to intersections.

The most important intersection design principle is always safety, starting with those pedestrians who are most vulnerable: people with physical disabilities; those using mobility assistive devices; caregivers; seniors and children. The importance of other design principles such as place making, areas dedicated to pedestrians (including transit amenities) and capacity/efficiency, will depend on the specific context and type of intersection.

Intersection design considerations include the context of the street, the presence of bicycle facilities or transit stops, the form and function of the dominant corridor, and the network of adjacent intersections.

At all intersections, incorporate accessible design features, such as tactile walking surface indicators, curb ramps or depressed curbs, accessible pedestrian signals, walk speeds at crossings for all ages and abilities, and access to transit stops. When considering installation of street furniture or plantings, care should be taken not to block the daylight triangles at the intersection.

An overarching goal is to make compact intersections with the smallest corner radii. Compact intersections lead to lower operating speeds and provide more opportunities for eye contact between drivers, cyclists, and pedestrians, which increases safety. This can include re-assigning reclaimed space from motor vehicle traffic to facilities that support other users, such as pedestrian amenities, cycling facilities, transit facilities and street furniture.

This section identifies examples of common types of Mississauga intersections based on the adjoining street class and their considerations for Complete Streets design.

Demonstration graphics of intersection typologies are included in Chapter 6.

REFERENCES

- OTM Book 18: Bicycle Facilities (2021)
- City of Mississauga, Cycling Master Plan (2018)
- City of Mississauga, MiWay Infrastructure Growth Plan (2020)
- NACTO, Don't Give Up at the intersections (2019)

Intersections at Local Streets

Local street intersections are characterized by low traffic volumes and slower speeds.

GUIDANCE

Enhance pedestrian safety with traffic calming measures, such as bulb-out curb extensions, crosswalks, raised intersections, paving materials/textures, mini-roundabouts, and reduced corner radii.

Minimizing delay for motor vehicles is not a primary design principle for these intersections. Due to the typically low volume and speed of motor vehicles through these intersections, cyclists can often be accommodated in a similar manner to motor vehicles.

Design so that larger vehicles (moving vans, fire, waste collection, snowplows) may use the entire intersection to turn.

Figure. 4.47. Local-to-local street intersection example.

Figure. 4.48. Raised intersection.

Intersections between Local or Collector Streets and Arterials

Where local or minor collector streets intersect with major collector or arterial streets, mitigating risk becomes more complex and other design principles such as capacity (particularly on arterial roads) are considered. These intersections are typically two-way stop controlled, signalized, or a roundabout.

Pedestrians often access the nearest bus stops along arterials from adjacent locals or collectors.

GUIDANCE

Clearly mark controlled pedestrian and cyclist crossings – of all legs of the intersection.

One-way cross streets will provide opportunities for tight curb radii and curb extensions.

Analyze and design the intersection in a network context. It may not be possible or practical to always accommodate all movements (e.g., through or left-turn movements from the side street) at a two-way stop-controlled intersection.

The introduction of side street turn prohibitions could occur if there are heavy traffic flows on the arterial street or intersection design does not provide for safe maneuvers.

Move the stop bar back to achieve tighter corner radii. This allows larger vehicles (moving vans, fire, waste collection, snowplows) to use the entire intersection to turn into the local street.

c: Harisonthebike

Figure. 4.49. Arterial-to-local street intersection example.

c: Google Maps (2021)

Figure. 4.50. Collector-to-local street intersection example.

Intersection Between Two Arterial Streets

The intersection of two arterial streets is characterized by high traffic volumes, higher approach speeds, bus stops, and cycling and pedestrian activity. Practitioners shall mitigate risk to all road users, while accommodating reasonable, multimodal intersection capacity and turning movements for larger vehicles. Due to the larger physical size of these intersections, provide pavement marking guidance for all road users to maximize the predictability and visibility of every movement.

GUIDANCE

Use pedestrian refuges, crosswalk markings, crossrides, reduced corner radii, leading pedestrian signal intervals and other measures to enhance pedestrian safety comfort.

Improve cyclist safety by ensuring they are visible and protected on the intersection approach, by avoiding excessive corner radii and by marking bicycle facilities through the intersection, including bike boxes or queue boxes, bike yield lanes, bike lane crosswalk signs and corner islands.

Provide designated bicycle signal phases and provide regulatory and warning signs for motorists where notable conflicts exist.

Analyze intersection capacity from a multimodal perspective and focus on users rather than single occupancy vehicles. For instance, balance delays experienced by passengers in buses with minimal pedestrian crossing delays and the service provided to general traffic.

Figure. 4.51. Arterial-to-arterial street intersection example.

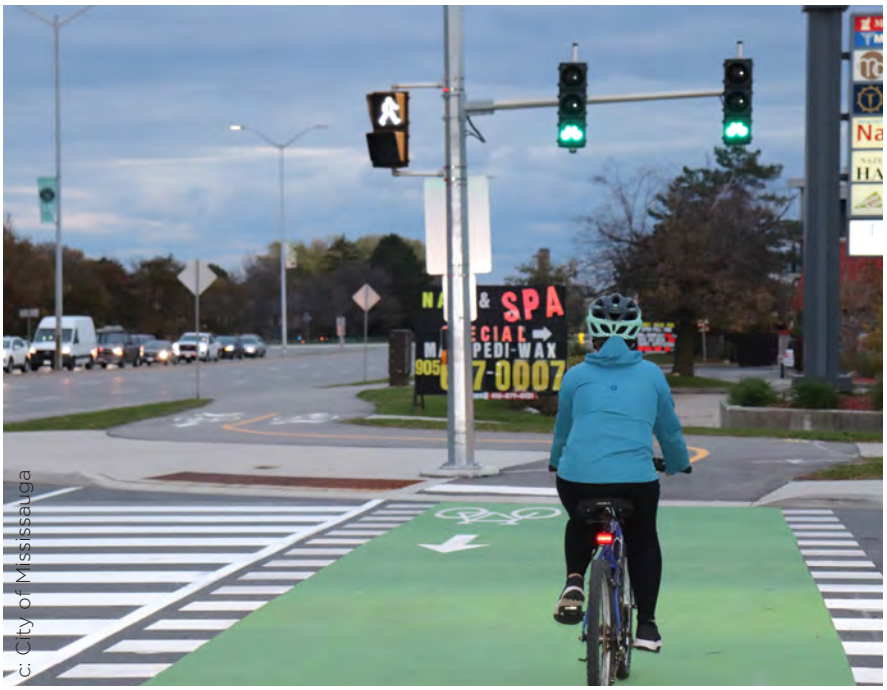


Figure. 4.52. Crosswalk and crossride markings.

Roundabouts

Roundabouts occur as gateways to the Downtown and are typically located at the intersection of two collector streets. Roundabouts are an intersection control device with a central island where traffic flows counter-clockwise in an uncongested traffic situation around a raised central island, allowing freer movement of vehicles than traditional signalized and unsignalized intersections.

Roundabouts can reduce the severity of collisions, but also pose accessibility challenges and are often a high-stress experience for pedestrians and cyclists. All planned and future roundabouts in Mississauga are anticipated to be yield controlled.

GUIDANCE

Design roundabouts in Mississauga to encapsulate their place – making function using landscape treatments or public art.

Landscape treatments should provide adequate stopping sight distance and sightlines, particularly where pedestrians, cyclists, and crosswalks are present.

Mark the through-path for cyclists with dedicated cycling facilities.

Figure. 4.53. Roundabout example.

Figure. 4.54. Duke of York Boulevard and Square One Drive, Mississauga.

4.7.4 Traffic Signals and Traffic Controls

Enhance street crossing safety and comfort for the most vulnerable street users by incorporating traffic signals and other control measures.

Figure. 4.55. Leading pedestrian intervals.

Figure. 4.56. Rapid flash beacons.

Mississauga has a specific range of operational controls currently in use: traffic control signals (TCS); all-way stop control (AWSC); side street stop control; yield signs; and school crosswalks. Unsignalized roundabouts are included as gateways to the Downtown.

The City's first automated speed enforcement camera has recently been installed and two locations are planned. Additionally, Mississauga has a neighbourhood speed watch program.

The choice of traffic control signal or device is often determined by technical warrants outlined by the Ministry of Transportation Ontario's, Book 12 - Traffic Signals. However, the practitioner must identify existing and aspirational pedestrian desire lines, active transportation networks or transit networks at the start of a project to identify opportunities to introduce and coordinate intersection controls. Enhanced street crossing protection afforded by these devices increases safety and comfort for the most vulnerable street users. Mississauga currently uses coordinated signal timing to synchronize traffic movements and manages the progression speed of specific modes where uninterrupted flow is desired along a corridor.

GUIDANCE

Consider how to best accommodate people who walk slowly through the provision of the shortest possible crossing distance and adequate signal time.

Provide a pedestrian refuge in all instances where a pedestrian must cross more than three vehicle lanes.

Design traffic signal timing and phasing to minimize delay for all users and all approaches by implementing the optimal cycle length. Longer signal cycles may be considered using the data collected at the intersection. This practice enables city streets to function as a network, rather than a series of major corridors.

Two-phase signals, with leading pedestrian/bicycle intervals and lagging turn internals, are preferred.

Calculate pedestrian delay using Average Pedestrian Delay Component as per Table 4.13.

Consider improving visibility at high-conflict intersections by installing curb extensions.

Average pedestrian crossing delay component. Source: Ottawa Multi-Modal Level of Service (MMLOS) Guidelines (2015). People walking generally begin to disregard signals after waiting 30 seconds.

Table 4.15 Average pedestrian crossing delay component

$$\text{Delay} = 0.5 \times \frac{(\text{Cycle length} - \text{Pedestrian effective walk time})^2}{\text{Cycle length}}$$

< 10 s per intersection leg	LOS A
≥ 10 to 20 sec	LOS B
> 20 to 30 sec	LOS C
> 30 to 40 sec	LOS D
> 40 to 60 sec	LOS E
> 60 sec	LOS F

Use signal priority tools along corridors with desired modal priority and where heavy right or left turning volumes create consistent conflicts and safety concerns between vehicles, pedestrians, and/or cyclists (e.g., leading pedestrian intervals, synchronized signals for bicycles, transit signal priority).

Depending on the crossing distance, provide pedestrians with a minimum head start of 3–7 seconds. A head start of up to 10 seconds may be appropriate in Strategic Growth Areas and/or along arterials where pedestrian volumes are high or the crossing distances are long.

Consider no right turn when facing a red traffic light to reduce collisions of right-turning vehicles with vehicles proceeding on their green light, and between right-turning vehicles and pedestrians crossing with their WALK signal.

Avoid right turns on red near schools, places of worship, parks, transit centres and shopping streets.

For local streets, consider the City's Slow Streets initiative where signs can be placed in the middle of the street to slow down speeding.

Consider exclusive pedestrian phase or "scramble" at the intersection of Arterial Strategic Growth and Major Collector Strategic Growth streets where there is high intensity of pedestrian activity.

Avoid leading vehicle turn signals.

REFERENCES

- OTM Book 15: Pedestrian Crossing Facilities (2010)
- TAC Pedestrian Crossing Control Guide (2018)
- NACTO Urban Street Design Guide (2013)
- Mississauga Slow Streets Policy
- Mississauga neighbourhood speed watch program
- Average Pedestrian Crossing Delay Component. Source: Ottawa Multi-Modal Level of Service (MMLOS) Guidelines (2015)

4.7.5 Crossings

Design crossings to make motorists aware of the potential interaction with pedestrians and cyclists, the most vulnerable users, and inform their behaviour.

Pedestrian crossings are provided as either controlled (crosswalks) or uncontrolled crossings. At a crosswalk, drivers must yield to pedestrians, while at uncontrolled crossings, pedestrians must yield to vehicles. Pedestrian crossings are marked with any of the following: stop lines, yield-to-pedestrian lines, standard crosswalk markings (lateral lines), ladder crosswalk markings, raised crosswalks, zebra markings and textured or coloured pavement.

GUIDANCE

Locate crossings at all intersections and transit stops. Locations where a multi-use path meets a street is considered an intersection.

Align crossings with desire lines and minimize crossing distance to accommodate slower pedestrians.

Align crossings with the pedestrian clearway to the extent possible. Maximum deviation 1:5.

Improve all signalized intersections with full ladder crosswalks.

Introduce curb extensions at all intersections where a permanent parking lane exists to improve sight lines between pedestrians and drivers.

Place refuge islands in the centre of the street at high traffic volume locations and streets where pedestrians must cross more than three lanes of traffic (total).

Provide mid-block crossings with a pedestrian refuge island on arterial and collector streets at mid-block bus stops or other locations of moderate crossing activity.

Coordinate the location of drop curbs with catch basins to prevent ponding and ice build up.

Locate and design tactile paving and drop curbs in accordance with OTM Book 15. Meet and exceed AODA requirements including curb cuts, tactile strips and gradients.

Place curb cuts and raised tactile walking surface indicators so as to cover the full width of the crosswalk where it meets the sidewalk.

In Strategic Growth Areas, or other areas where there is a high intensity of pedestrians, provide 5.0m wide crosswalks or wider to meet LOS-C as per the Highway Capacity Manual.

In Neighbourhoods and Employment Areas provide 3.0m minimum crosswalks or wider.

Set back stop lines 3.0m minimum.

Provide >0.6m^2/person queuing area (LOS-C) as per the Highway Capacity Manual. Curb extensions can create extra space at the corner for pedestrian queuing, street furniture, green infrastructure or low plantings.

Avoid unprotected turns such as right turns on red.

Avoid locating crosswalks at driver decision points.

Avoid intersection legs without crossings.

REFERENCES

- OTM Book 15: Pedestrian Crossing Facilities (2010)
- TAC Pedestrian Crossing Control Guide (2018)
- Pedestrian Master Plan, City of Mississauga (2021)
- Highway Capacity Manual, Sixth Edition: A Guide for Multimodal Mobility Analysis (2016)

Figure. 4.57. Mid-block crossing.

Figure. 4.58. Piano key crosswalk (Lakeshore Rd./Hurontario St.).

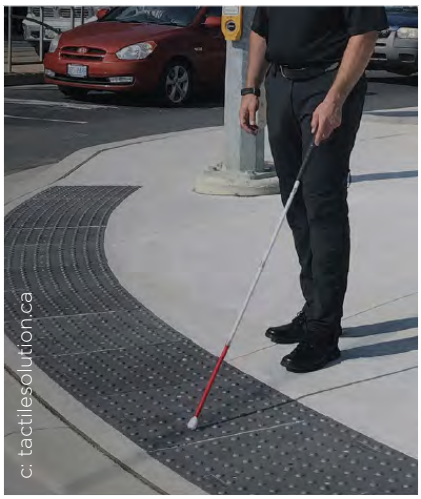


Figure. 4.59. Accessibility improvements

Figure. 4.60. Pedestrian refuge.

4.7.6 Transit at Intersections

Transit accommodation at intersections is essential for developing a transit-oriented city. Transit stop planning involves identifying the optimal transit stop location and configuration to increase passenger safety and reduce delay.

Figure. 4.61. Bus stop along a collector street.

Figure. 4.62. Higher order transit within Strategic Growth Areas.

GUIDANCE

Place transit stops close to crossings.

Provide amenities such as shelters, seating, route information, system maps, real time next vehicle arrivals, tactile strips, sign poles and curb cuts and display panels in accordance to MiWay Infrastructure Growth Plan (MIGP 2020) stop classification and MiWay Standards. Provide higher levels of amenity at higher volume locations or at significant points of interchange within the system.

Provide bus bays only at locations where routes terminate or have scheduled wait times.

Provide transit signal priority at all locations with dedicated transit lanes or queue jump lanes and at locations where a transit vehicle crosses through a traffic signal from a roadway with low signal priority.

Implement queue jump lanes at intersections where transit experiences significant delay.

Avoid mid-block bus stops.

Limit multiple driveways and corner retail driveways (such as gas stations), which cause transit stops to be located away from the intersection (to mid-block locations).

Provide a 3m min. set back from front of bus to stop line at intersections.

REFERENCES

- MiWay Infrastructure Growth Plan (2020)
- MiWay Five Service Plan (ongoing)
- MTO Transit Supportive Design Guidelines (2016)
- NACTO Transit Street Design Guide NACTO (2016).

4.7.7 Cycling at Intersections

Intersections are an essential part of the cycling network and where cyclists are exposed to greater risk. Many cyclists are not comfortable crossing high volume and high speed intersections, and may choose to not cycle at all if the exposure to risk is too great.

Figure. 4.63. Raised cycle crossing for local streets.

Figure. 4.64. Mid-block crossing to a multi-use trail.

This section provides high level guidance to ensure that practitioners incorporate cycling accommodation at intersections. The type of accommodation will depend on many factors, including: right-of-way width, form of intersection control, presence of dedicated turn lanes, motor vehicle travel speeds, crossing distance, and the volume of pedestrian, cyclist, transit, and motor vehicle movement.

Detailed guidance for the facility selection, use and placement of sign and pavement markings is included in OTM Book 18, and the Cycling Master Plan.

GUIDANCE

Consider a protected intersection design at locations where two major bicycle thoroughfares with high volumes of through bicycle and turning movements cross. See Figures 4.66 to 4.70. This design includes bicycle lanes located behind motor vehicle turning radius curbs and crossing paths recessed further from the intersection. Further study is required, perhaps with a pilot implementation, to better understand user behavior with this design before permanent or Mississauga wide-scale implementation.

As described above, stop lines should be placed 3m or more from crosswalks. This provides a de facto bike box, or queue space for cyclists to wait ahead of motor vehicles. An explicit bike box may be provided at turn lanes and/or to provide route continuity.

Maintain physical separation of a cycle track from a motor vehicle lane.

At locations where there are transit stops:

- Clearly communicate desired yielding behaviour through sign, pavement markings and bend out/ins in advance of a stop.
- Provide sufficient transit user waiting space with consideration for peak period boardings and headways.
- Provide adequate sightlines between bus operators and approaching cyclists and between pedestrians and cyclists.
- Design for accessibility by providing accessible crossings, tactile walking surface indicators, and sufficient platform width for mobility device users.
- Refer to the MiWay Infrastructure Growth Plan (2020) with respect to transit operational considerations and stop placement.

Mark the through path for cyclists at all intersections of all streets with dedicated cycling facilities. Use a skip line with chevron treatment for on-street cycling facilities and a crossride treatment for cycling facilities within the boulevard zone. Consider the following for crossrides:

- For most sidewalk zone cycling facilities, use a separated crossride.
- Where active transportation volumes are low and a bicycle path is located in close proximity to the sidewalk or a multi-use path is provided in place of a sidewalk, consider a combined crossride.
- Consider a mixed crossride at low-volume, stop-controlled intersections.
- For trail crossings not at intersections, use a symmetrical crossride with zebra stripes on both sides of the square elephant feet.
- Where a two-way cycling facility crosses an intersection, alert motorists using sign and pavement markings.

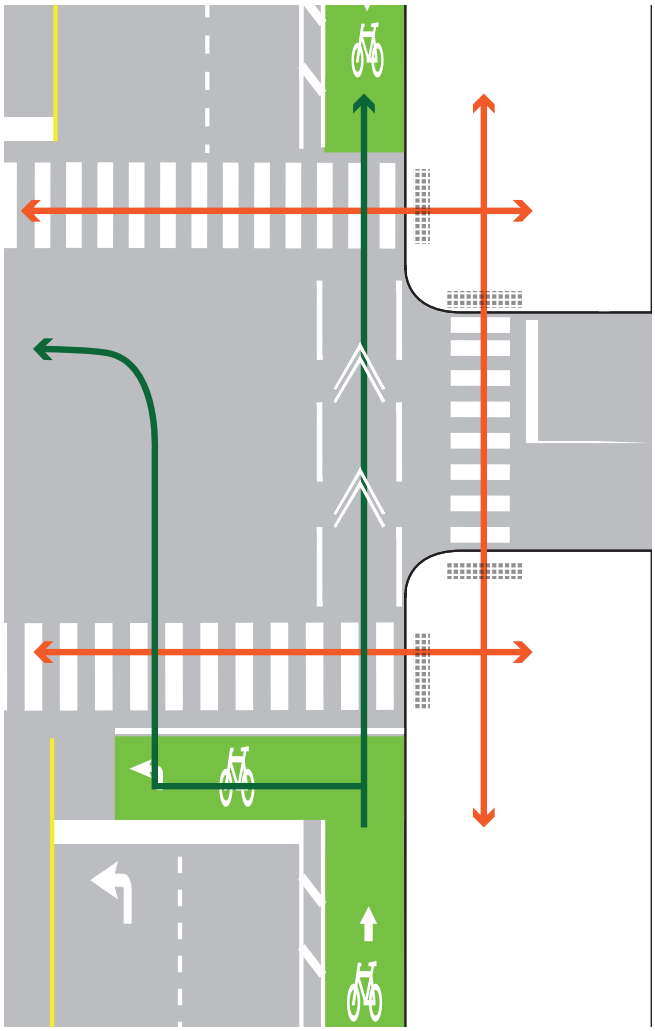
Restrict parking at signalized intersections within 30m of the stop bar where the cycling facility is located behind parking. Consider similar restrictions at non-signalized intersections to provide adequate sightlines.

Consider restricting right turns on red where a left-turn queue box obstructs this path.

Consider replacing 4-way stop control with 2-way stop control and a raised intersection or mini-roundabout at low-volume intersections on designated cycling routes.

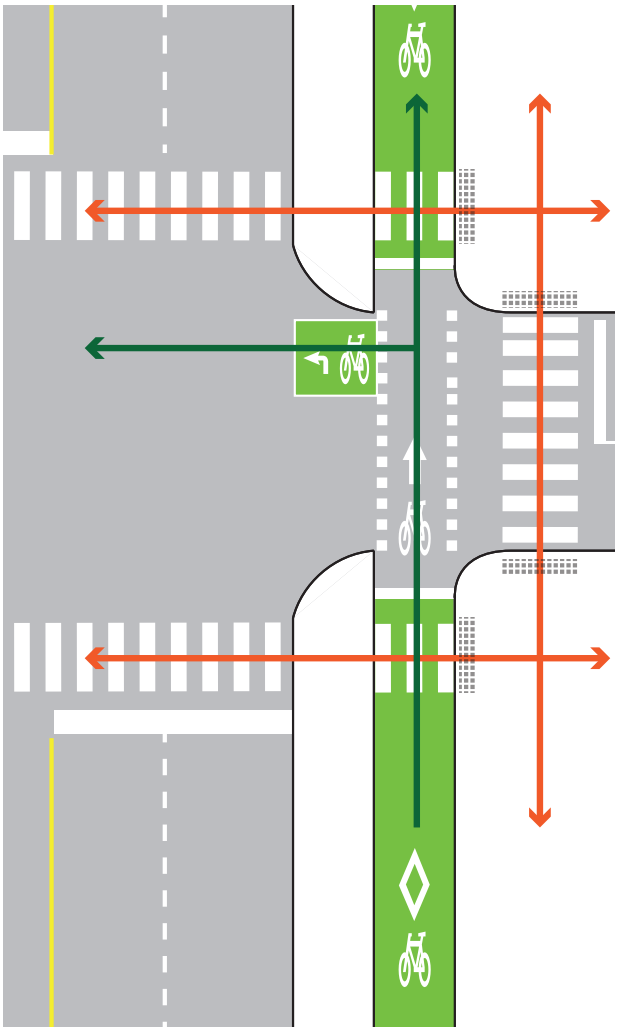
REFERENCES

- Cycling Master Plan, City of Mississauga (2018)
- MiWay Infrastructure Growth Plan (2020)
- Ontario Traffic Manual Book 18 (2013)
- NACTO Designing for All Ages & Abilities Contextual Guidance for High-Comfort Bicycle Facilities (2017)
- NACTO Urban Bikeway Design Guide (2014)
- Mineta Transportation Institute: Low-Stress Bicycling and Network Connectivity (2012)



Pedestrian Flow
Cyclist Flow

Figure. 4.65. Bike boxes.



Pedestrian Flow
Cyclist Flow

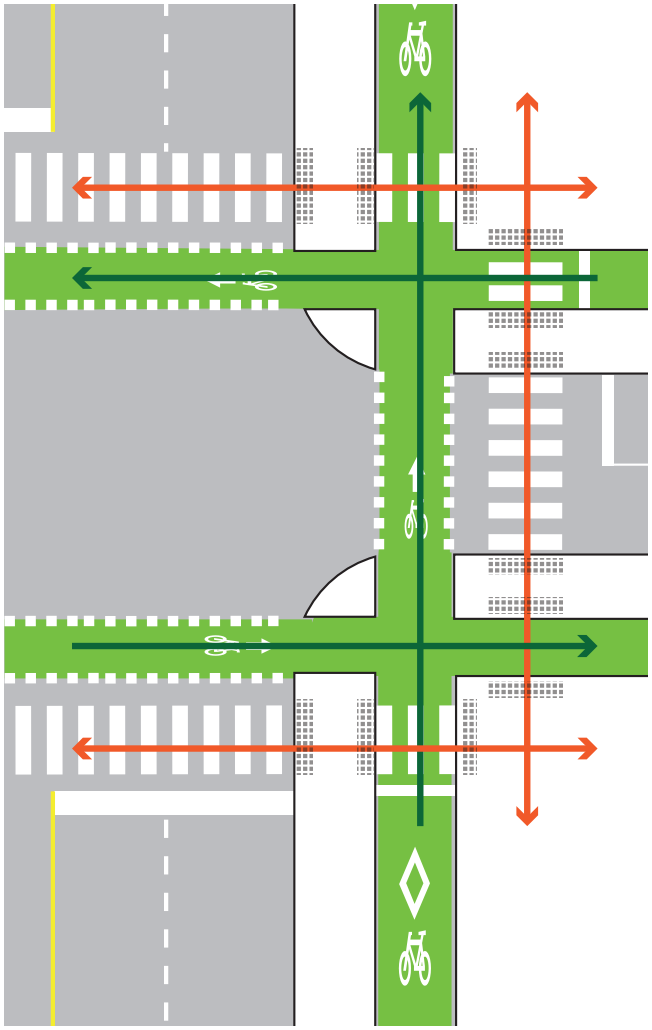
Figure. 4.66. Queue boxes.

c: NACTO

Figure. 4.67. Signalized intersection with separated cycling facilities and bicycle boxes.

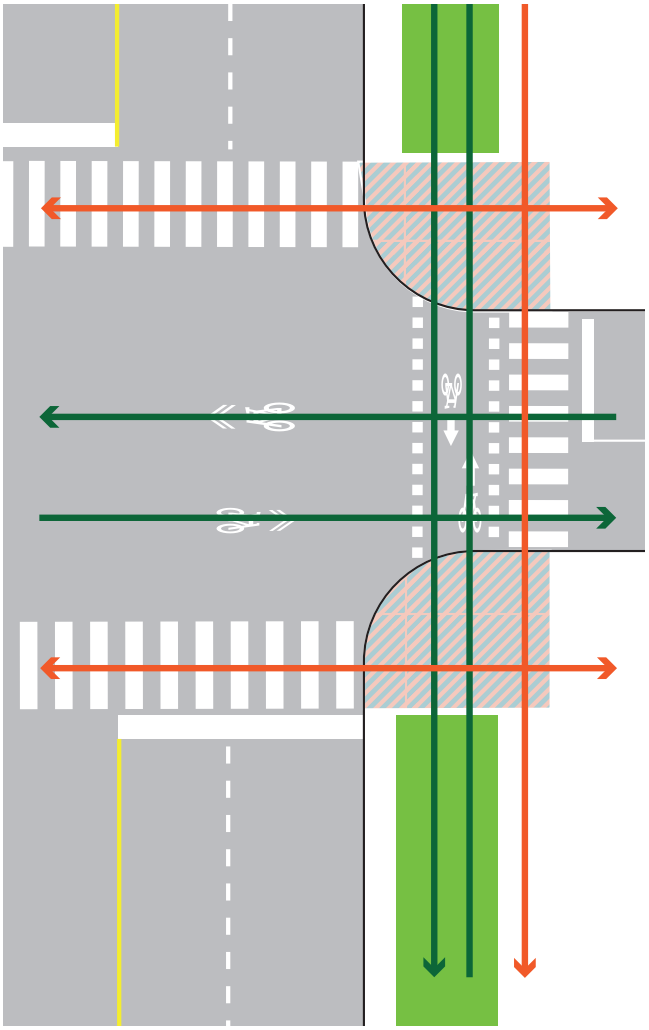
c: Google Maps (2019)

Figure. 4.68. Signalized intersection with separated cycling facilities and bicycle two-stage left.



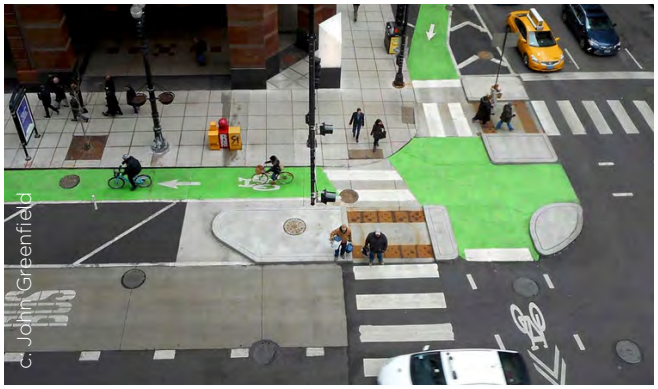
Pedestrian Flow
Cyclist Flow

Figure. 4.69. Protected intersection.



Pedestrian Flow
Cyclist Flow
Mixing Zone

Figure. 4.70. Mixing zone.



c: John Greenfield

Figure. 4.71. Signalized intersection with cycle track queuing areas for crossing cycle tracks.

c: DTAH

Figure. 4.72. Crossride markings and signs.

4.6.9 Driveways and Access

Driveways are points of conflict between different users and require special treatment to create a safe crossing environment for the most vulnerable. Design driveways to provide a continuous pedestrian and cycling facility across the vehicle path that prioritizes pedestrians and cyclists over turning vehicles.

Figure. 4.73. A raised driveway emphasizes safe pedestrian and cycling movements over turning vehicles. Note how the boulevard materials continue through the driveway to indicate to motorists that they are not the priority.

Figure. 4.74. Raised driveway into a high volume parking garage entrance. The pedestrian clearway and bi-directional cycle track are extended across the driveway.

GUIDANCE

Avoid driveways and lower driveway boulevard parking at intersections to avoid obstruction of sight-lines

Prioritize pedestrian clearway and cycling facilities across driveways by raising the vehicle portion to the same grade as the rest of the boulevard. Ramping will occur in the portion of the boulevard between the roadway and pedestrian clearway.

Continue paving materials and boulevard appearance for pedestrian clearway and cycling facilities across driveways.

Provide the minimum acceptable pedestrian clearway widths across all driveways.

Driveways should flare to meet the roadway. Do not use a corner radius for this will increase turning speeds.

Reduce driveway widths to the smallest possible dimension to reduce the amount of time vulnerable users are exposed to turning vehicles. If more than two access lanes (in total) are required, provide a central median for pedestrian refuge.

Consolidate driveways that serve multiple buildings to minimize the number of interruptions on the sidewalk and reduce the number of potential conflicts with pedestrians and cyclists.

REFERENCES

- TAC Canadian Guide to Neighbourhood Traffic Calming (Second Edition, February 2018) – pages 52-56.
- MassDOT. Separated Bike Lane Planning & Design Guide. (2018). Chapter 4: Intersections, Section 4.4.2 Reduce Conflict Points.

6.0 Demonstrations

Chapter 6 demonstrates potential applications of the Complete Streets approach to different intersection types. The demonstrations are not exhaustive or prescriptive. They illustrate one possible outcome for each scenario. Many different solutions are possible, with each solution informed by several factors including context, user profile, available funds, and stages of the street's life cycle.

6.1 What is a Demonstration?

The following illustrations 'demonstrate' how the Complete Streets approach can help re-imagine intersections in Mississauga to advance safety, promote walking and cycling, improve transit operations, reduce environmental impacts, and support place-making.

This chapter suggests what is possible for four representative intersection types commonly found throughout Mississauga. Other intersection arrangements exist. This exercise is not intended to suggest all possible solutions, only to provide examples for how the Complete Streets approach can lead to different outcomes and help satisfy broader city building goals.

Each of the demonstrations includes a brief description and illustration of the existing condition and illustrations showing a range of techniques that can be applied to a retrofit and reconstructed condition. Annotations are included to highlight the techniques.

The retrofit suggests what is possible as a low-cost solution to improve the existing intersection using simple elements such as paint, bollards, planting, and signs. The retrofit establishes the essential geometric adjustments and design changes until reconstruction is possible.

Improvements can happen incrementally across the city, with critical matters dealt with in the short-term and other features added over time as resources become available or the street is scheduled for reconstruction. New streets will not require retrofits and should proceed to the ideal end state.

A **Retrofit** includes a range of techniques applied in situations when it is not desirable or feasible to move curbs or reconfigure a street's drainage. Retrofit improvements can include lower cost elements such as paint, bollards, trees and plantings. Retrofit improvements can apply to any existing intersection in Mississauga. They are often combined with state-of-good-repair improvements or implemented as a low-cost trial before making a full investment in the ultimate solution.

A **Reconstruction** involves transforming and redesigning existing streets to add green infrastructure, provide amenities to support pedestrians, bicycles, and public transit, and improve safety for all modes. A reconstruction project sometimes includes moving the curbs, or reconfiguring drainage or major utility upgrades.

Figure. 6.75. Intersection Demonstrations

6.2 Neighbourhood: Local to Local

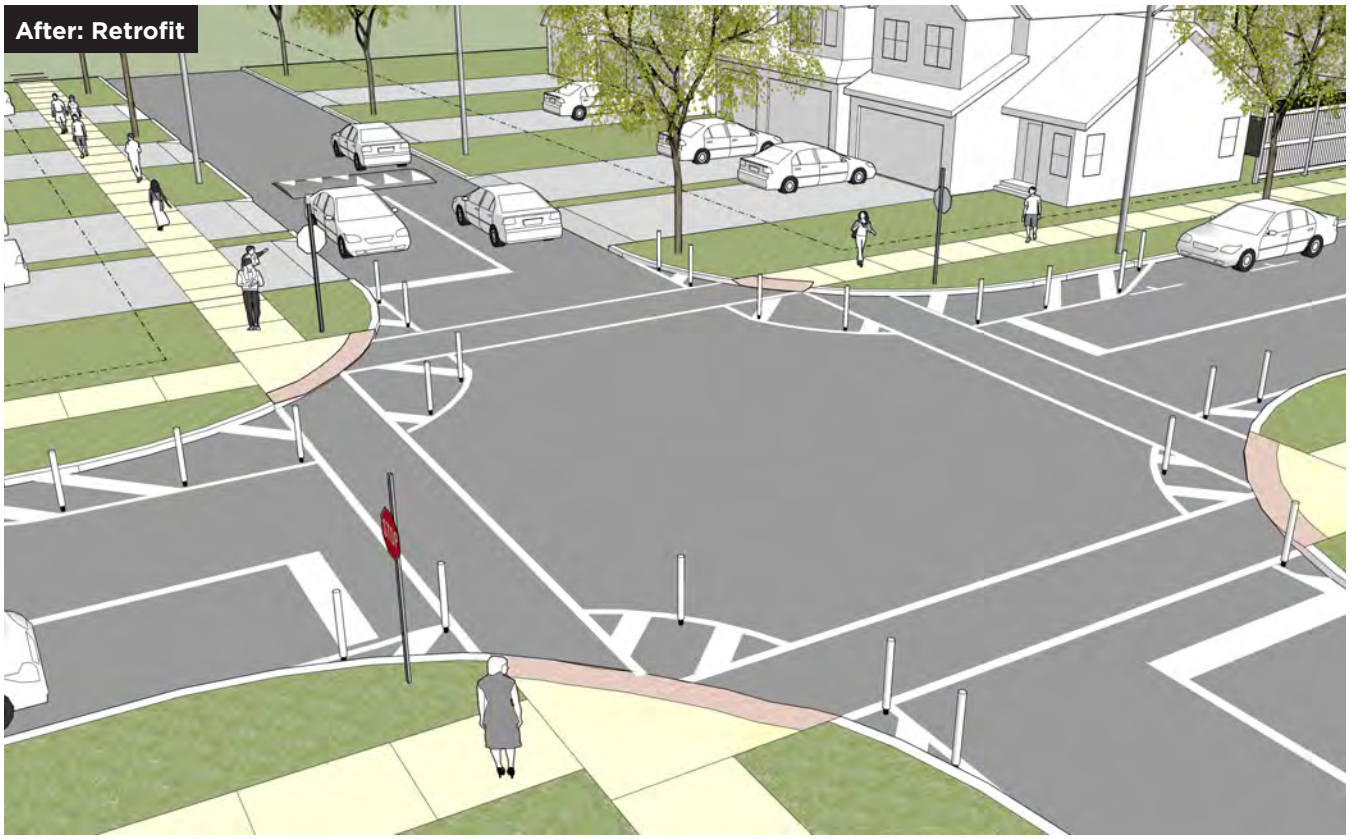
Local street intersections are characterized by low volumes and slower speeds. People of all ages and abilities may walk or cycle in the neighbourhood for activities such as getting to and from school or transit stops, or visiting nearby destinations.

This demonstration is an example of a four-way stop sign controlled intersection within a typical Mississauga neighbourhood. The local streets have neither a formal cycling facility nor transit service.

The demonstrations illustrate how the design of a Local Neighbourhood Street to a Local Neighbourhood Street intersection prioritizes pedestrian and bicycle safety to create places where active neighbourhood life is prioritized.

EXISTING ISSUES AND NEEDS TO CONSIDER	RETROFIT TECHNIQUES
Travelway pavement is oversized	Add flexible bollards and paint to tighten corner radii
Corner radii are oversized	Lower posted speed
Several vehicles operating over posted speed limits	Add parking lane
Missing crosswalks and long pedestrian crossing distances	Add crosswalks
Missing sidewalks	Add traffic calming
Multiple driveways	Add cycle wayfinding
Existing mature trees	


Before: Existing


After: Retrofit

RECONSTRUCTION TECHNIQUES

1. Narrow lane width
2. Reconstruct corner radii
3. Add crosswalks
4. Formalize parking lanes
5. Greening or rain gardens to curb extensions
6. Add street trees
7. Add traffic calming (raised intersection, speed cushions, neckdowns, travel lane narrowing)
8. Add cycling infrastructure or wayfinding if a designated route
9. Accessibility improvements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6.3 Strategic Growth: Collector to Collector

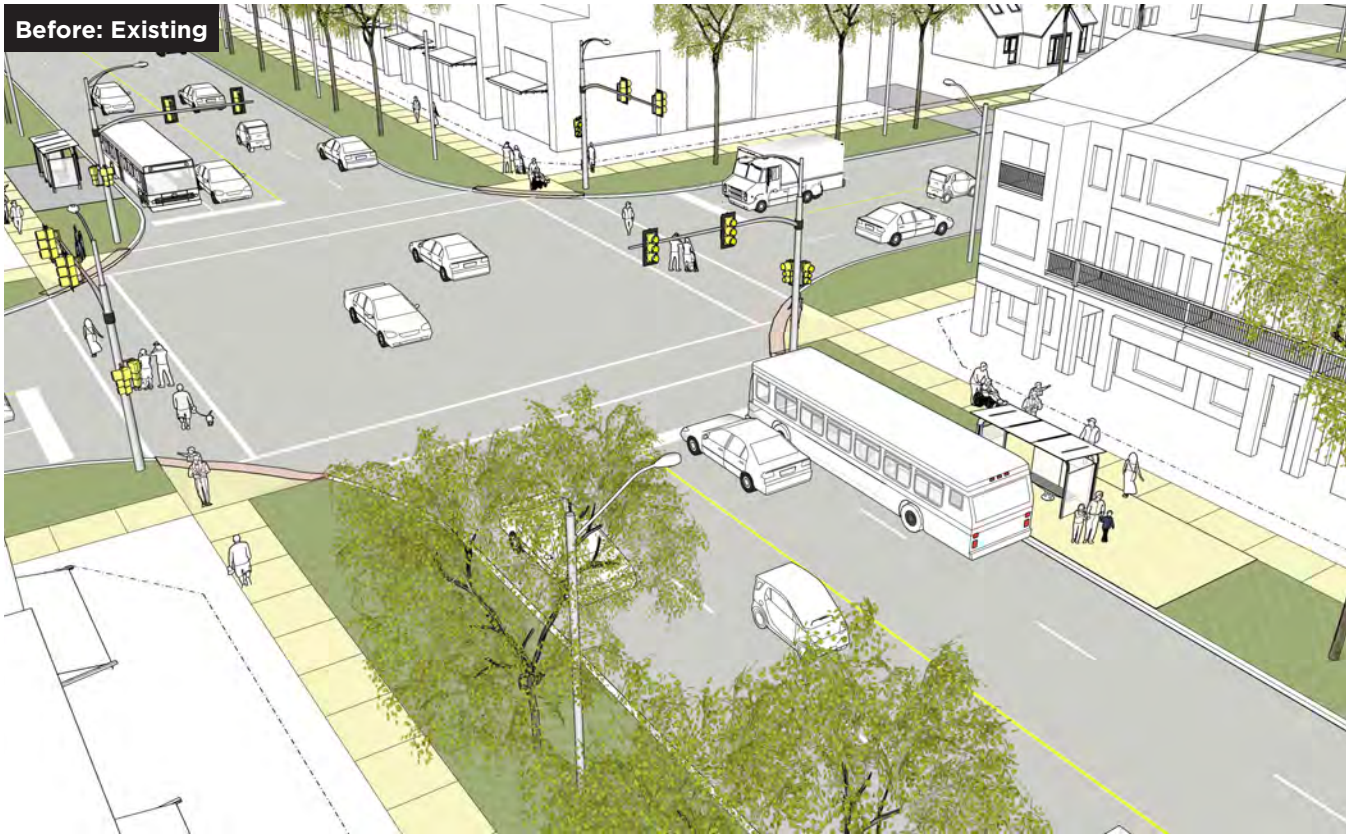
Collector street intersections move medium-to-high volumes of people and often have a combination of transit stops and significant pedestrian and cycling activity.

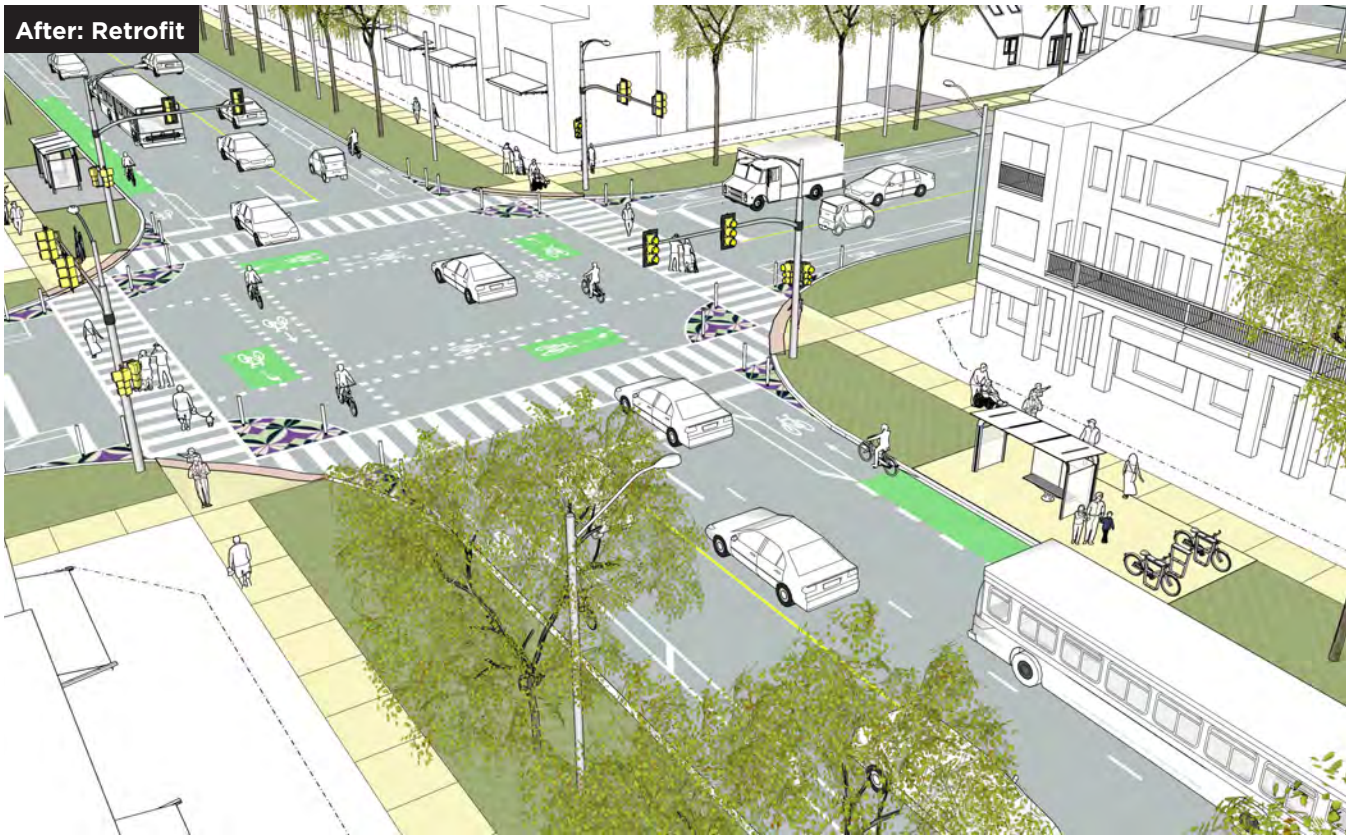
This demonstration is a common example of an intersection of two Minor Collector Strategic Growth Streets.

Ensuring safety for people cycling and walking and providing safe access to transit is a priority. The demonstrations illustrate how a number of techniques are used to provide clear and well-marked crossing features for all users.

EXISTING ISSUES AND NEEDS TO CONSIDER
Travelway pavement is oversized
Corner radii are oversized
Several vehicles operating over posted speed limits with higher speed turning movements
Long pedestrian crossing distances
Missing cycle infrastructure
Local transit service
No formal drop-off areas, laybys or on-street parking
Existing mature trees

RETROFIT TECHNIQUES
Road diet: convert a travel lane to bike lanes or cycle track and add left-turn lanes
Add flexible bollards and paint to tighten corner radii
Add two-stage left-turn bike boxes
Add signal priority tools, such as leading pedestrian intervals, synchronized signals for bicycles, or transit signal priority
Locate travel lane stop bar approximately 1.0m further from the intersection than the cyclist stop bar to improve the visibility of cyclists at the intersection
Add street tree planting
Provide transit stop amenities (e.g., larger heated shelters) along with cycling infrastructure (e.g., bicycle rings)


Before: Existing


After: Retrofit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RECONSTRUCTION TECHNIQUES

1. Add separated cycling facilities (cycle tracks)
2. Add protected intersection
3. Narrow motor vehicle lanes
4. Reconstruct corner radii
5. Add layby parking
6. Add signal priority tools, such as leading pedestrian intervals, synchronized signals for bicycles, or transit signal priority
7. Provide transit stop amenities (e.g., larger heated shelters) along with cycling infrastructure (e.g., bicycle rings)
8. Widen sidewalks
9. Add street trees
10. Push stop bar back to accommodate transit turning

6.4 Strategic Growth: Arterial to Arterial

Arterial street intersections are characterized by high volumes of people, high approach speeds, transit stops and significant pedestrian and cycling activity.

This demonstration represents a large intersection of two Arterial Strategic Growth Streets. It highlights several features that are unique to a transit priority corridor.

Arterial Strategic Growth Streets are vibrant mixed-use destination streets located in the Downtown, Nodes, Corporate Centres, or MTSAs where higher density transit-supportive development is intended to occur. Due to the larger physical size of these intersections, ensuring safety for people cycling and walking and accessing transit is a priority.

The demonstrations illustrate how a number of techniques provide clear and well-marked crossing features for all users, support the City's cycling and transit network, and create an active public realm with street tree planting and broad boulevards for pedestrian activities.

EXISTING ISSUES AND NEEDS TO CONSIDER	RETROFIT TECHNIQUES
Travelway pavement is oversized	Add tabletop pedestrian crossings to slip lanes to improve pedestrian accessibility and visibility and permit motor vehicle turning, but with reduced speed (urban smart channels)
Corner radii are oversized	Add paint to tighten corner radii
Several vehicles exceeding posted speed limits, with higher speed turning movements	Add boulevard multi-use trails
Long pedestrian crossing distances	Add street tree planting
Right-turn channels (A.K.A pork chops or slip lanes) with poor sightlines, and significant barriers to persons with disabilities	Provide transit stop amenities (e.g., larger heated shelters) along with cycling infrastructure (e.g., bicycle rings). Add left turn bumper rails
Local transit service	Add raised left-turn guide lines
E/W street identified as a Transit Priority Corridor	Add signal priority tools, such as leading pedestrian intervals, synchronized signals for bicycles, or transit signal priority
Both streets are part of the cycle network	
Sidewalk design needs to support higher density development	
Existing mature trees	


Before: Existing


After: Retrofit


After: Reconstruction
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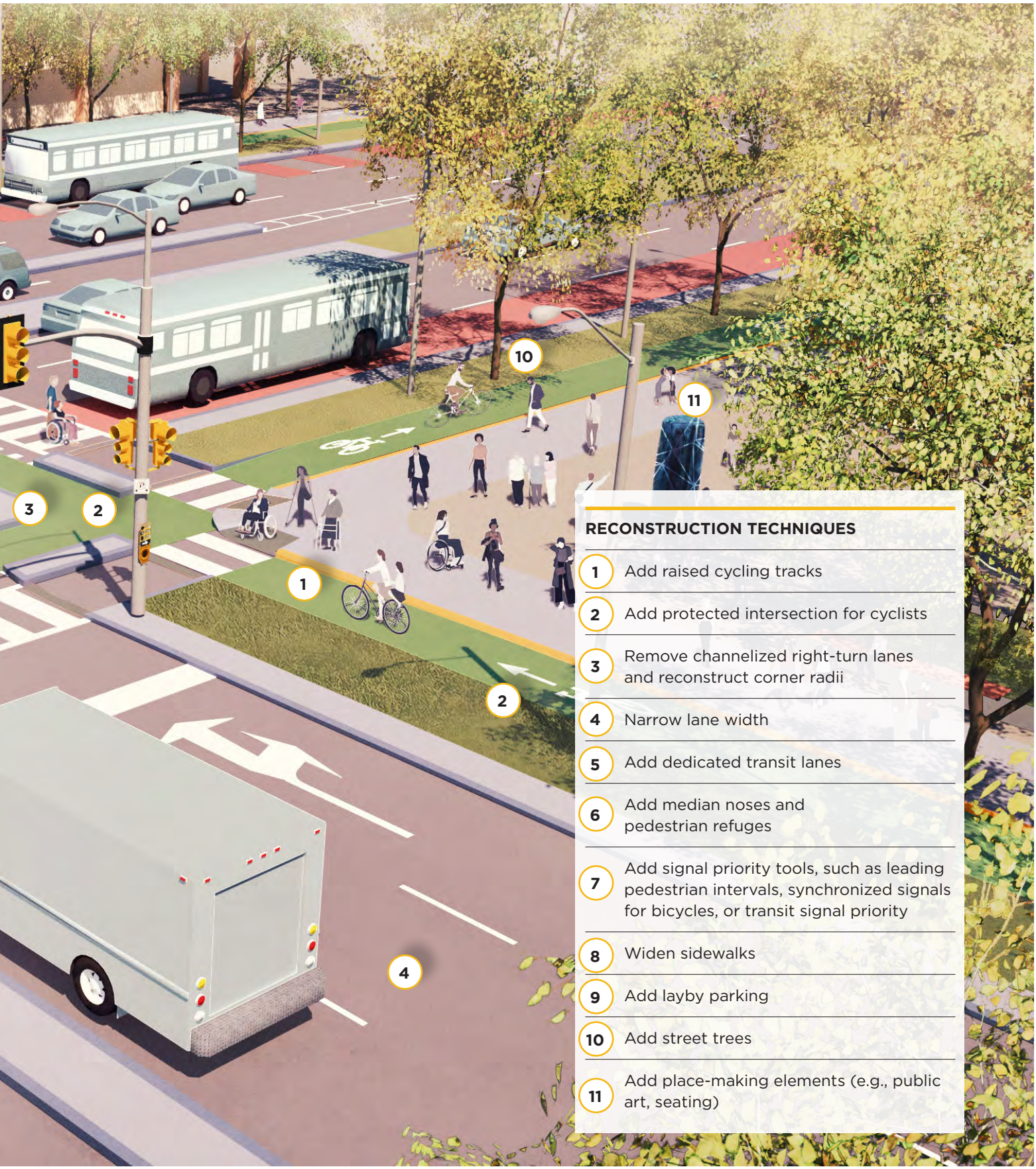

RECONSTRUCTION TECHNIQUES

1. Add raised cycling tracks
2. Add protected intersection for cyclists
3. Remove channelized right-turn lanes and reconstruct corner radii
4. Narrow lane width
5. Add dedicated transit lanes
6. Add median noses and pedestrian refuges
7. Add signal priority tools, such as leading pedestrian intervals, synchronized signals for bicycles, or transit signal priority
8. Widen sidewalks
9. Add layby parking
10. Add street trees
11. Add place-making elements (e.g., public art, seating)

6.5 Trail Crossing

The primary objective of multi-use trail crossing design is to provide a safe and direct connection for trail users.

This demonstration is an example of the intersection of a typical trail and a Neighbourhood Minor Collector where a sidewalk is present.

Trails are an important component of Mississauga's active transportation network. They connect destinations such as neigbourhoods, schools, and cultural facilities, and their separation from the roadway offers a comfortable environment for users of all ages an abilities. Due to Mississauga's unique system of linear parks, rivers, and creek valleys, there are numerous locations where trails meet streets. However, the design of trails has historically, largely neglected intersection and crossing treatments.

The demonstrations illustrate a range of techniques to improve the safety, comfort and continuity of trail intersections. The demonstration assumes that this street is not part of the City's transit network.

EXISTING ISSUES AND NEEDS TO CONSIDER
Trail users without a safe connection from one side of street to the other, despite the presence of destinations and clear desire lines
Lacking adequate signs and markings
Lack of curb cuts
Travelway pavement is oversized

RETROFIT TECHNIQUES
Add a stop-controlled combined crossride for cyclists and pedestrians
Add tactile walking surface indicators and flush curbs spanning the width of the crossride
Add traffic calming in the centre of travelway upon approach to crossride (e.g., neckdowns using bollards and paint)
Add pedestrian/bicycle signals
Add signs and wayfinding
Add a collapsible or removable bollard to prevent vehicles from entering the trail


Before: Existing


After: Retrofit


After: Reconstruction
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6

RECONSTRUCTION TECHNIQUES

1. Add a stop-controlled combined crossride
2. Add traffic calming: raised table and raised median islands and a pedestrian refuge
3. Add tactile walking surface indicators spanning the width of the combined crossride
4. Add pedestrian/bicycle signals
5. Add signs and wayfinding
6. Add a collapsible or removable bollard to prevent vehicles from entering the trail
7. Add crosswalk from sidewalk to sidewalk (applies to high volume locations)

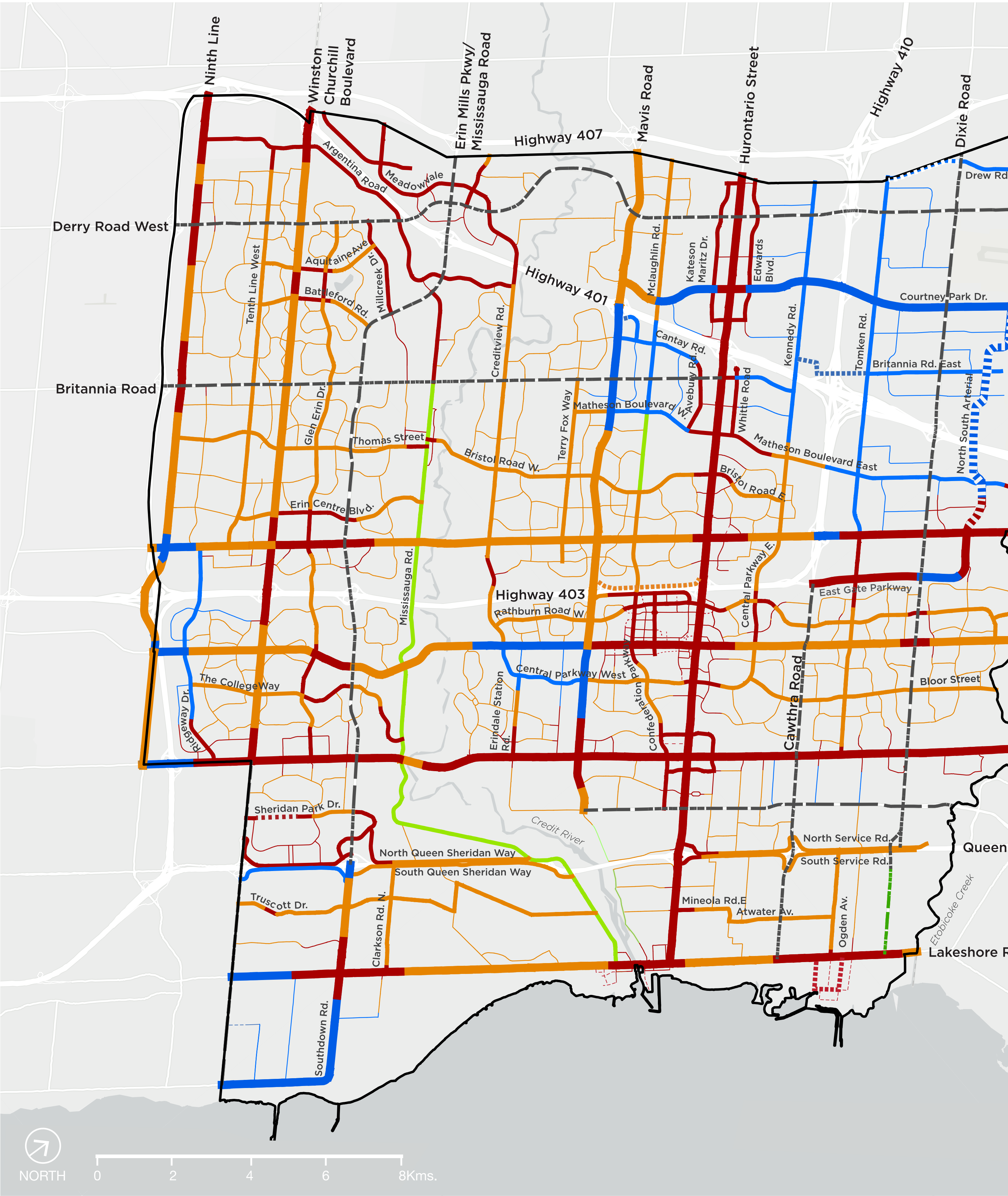
c: City of Mississauga

APPENDICES

A.1 Street Classification Map

Appendix A.1 includes a map of the new street classification system. This system will be incorporated into the Official Plan. Additionally, a map is included showing an overlay of 'place' status to demonstrate how this street classification system has been developed. Local streets are not shown on the maps. They are classified using the same approach.

Refer to **Appendix A.2** for a cross-section and description of each street class.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Erin Mills Pkwy/ Mississauga Road
Highway 407
Mavis Road
Hurontario Street
Highway 410
Dixie Road
Drew Rd
Argentina Road
Meadowvale
Derry Road West
Aquitaine Ave
Tenth Line West
Battleford Rd.
Millcreek Dr.
Highway 401
Mclaughlin Rd.
Kateson Maritz Dr.
Edwards Blvd.
Courtney Park Dr.
Creditview Rd.
Cantay Rd.
Kennedy Rd.
Tomken Rd.
Britannia Rd. East
Britannia Road
Glen Erin Dr.
Terry Fox Way
Matheson Boulevard W.
Avebury Rd.
Whittle Road
North South Arterial
Thomas Street
Bristol Road W.
Matheson Boulevard East
Bristol Road E.
Erin Centre Blvd.
Central Parkway E.
Mississauga Rd.
Highway 403
Rathburn Road W.
East Gate Parkway
The CollegeWay
Central Parkway West
Ridgeway Dr.
Erindale Station Rd.
Confederation Parkway
Cawthra Road
Bloor Street
Sheridan Park Dr.
Credit River
North Queen Sheridan Way
South Queen Sheridan Way
North Service Rd.
South Service Rd.
Queen
Truscott Dr.
Clarkson Rd. N.
Mineola Rd.E
Atwater Av.
Ogden Av.
Etobicoke Creek
Lakeshore R
Southdown Rd.
NORTH
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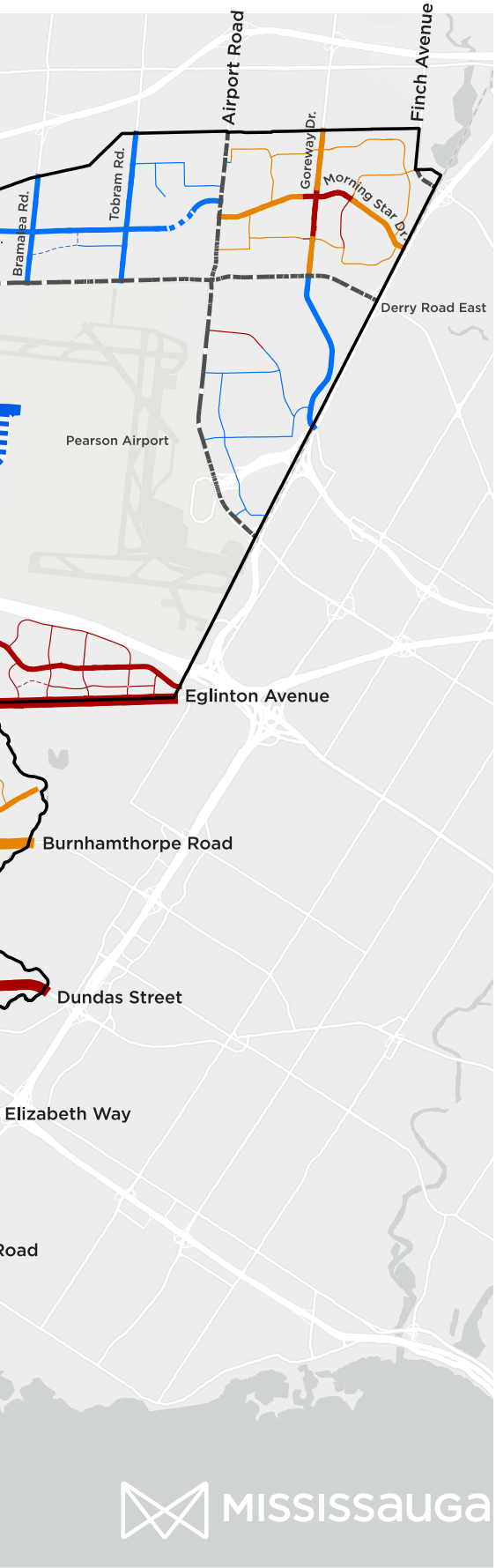
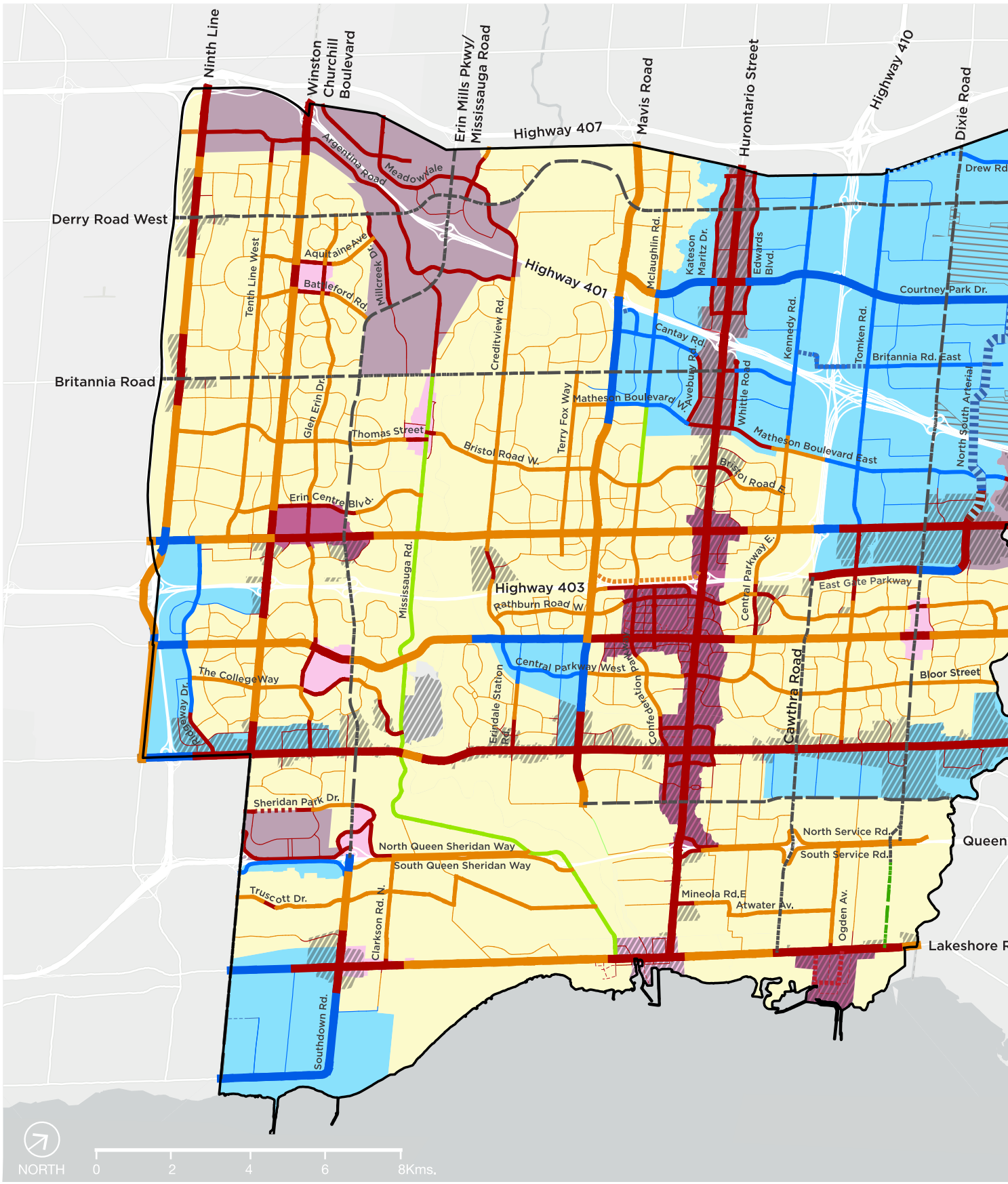


A.1.1 Street Classification Map

- Municipal Boundary
- Region of Peel Arterial
- Region of Peel Scenic Route

Street Classification

	Arterial	Major Collector	Minor Collector
Strategic Growth			
Neighbourhood			
Employment			
Scenic Route			
Future Link			


Ninth Line
Winston Churchill Boulevard
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Highway 410
Dixie Road
Highway 407
Derry Road West
Britannia Road
Highway 401
Highway 403
Argentina Road
Meadowvale
Aquitaine Ave.
Battleford Rd.
Millcreek Dr.
Tenth Line West
Creditview Rd.
Mclaughlin Rd.
Kateson Maritz Dr.
Edwards Blvd.
Drew Rd
Courtney Park Dr.
Cantay Rd.
Kennedy Rd.
Tomken Rd.
Britannia Rd. East
Aveburn Rd.
Whittle Road
Matheson Boulevard W.
Matheson Boulevard East
North South Arterial
Glen Erin Dr.
Thomas Street
Bristol Road W.
Terry Fox Way
Bristol Road E.
Erin Centre Blvd.
Mississauga Rd.
Rathburn Road W.
Central Parkway E.
East Gate Parkway
The CollegeWay
Central Parkway West
Bloor Street
Cawthra Road
Confederation Pkwy
Erindale Station Rd.
Sheridan Park Dr.
North Queen Sheridan Way
South Queen Sheridan Way
North Service Rd.
South Service Rd.
Queen
Truscott Dr.
Clarkson Rd. N.
Mineola Rd.E
Atwater Av.
Ogden Av.
Lakeshore R
Southdown Rd.
NORTH
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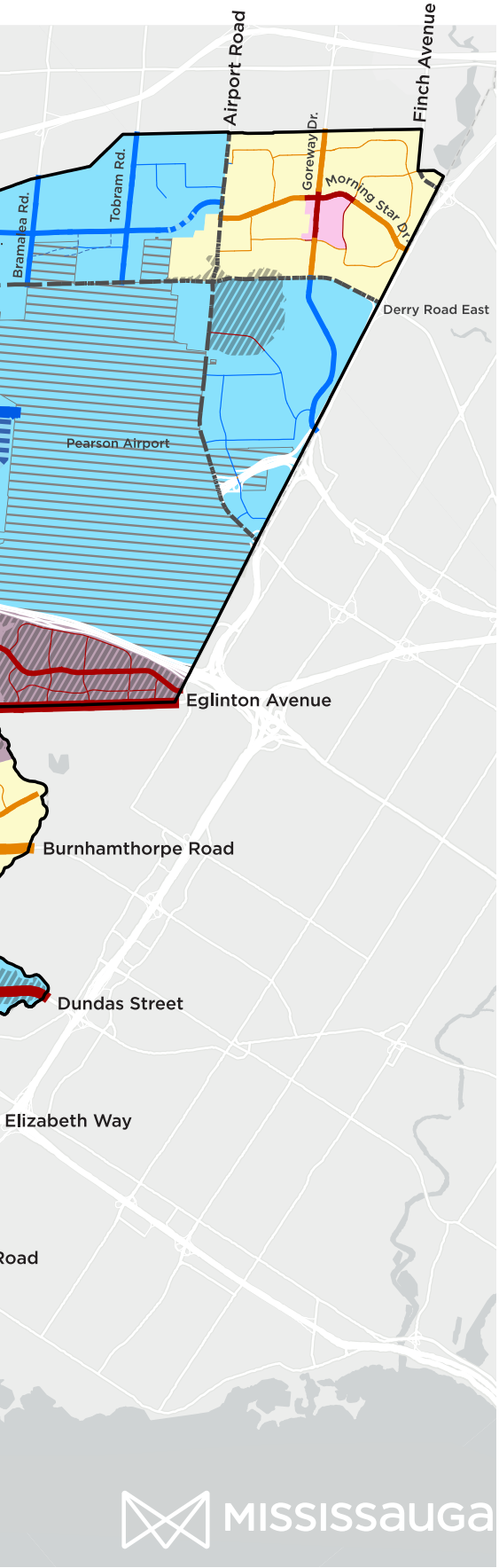

A.1.2 Place Overlay

- Municipal Boundary
- Region of Peel Arterial
- Region of Peel Scenic Route

Street Classification

	Arterial	Major Collector	Minor Collector
Strategic Growth			
Neighbourhood			
Employment			
Scenic Route			
Future Link			

Place Status

Strategic Growth Area

- RoP Major Transit Station Area
- Corporate Centre
- Community Node
- Downtown & Major Node

Neighbourhood

- Neighbourhood

Employment

- Employment Area
- Aiport Special Purpose Area (SPA)

A.2 Demonstration Cross-sections

A demonstration cross-section is used to illustrate one potential arrangement for each street class. Each street class includes a description of its link and place characteristics and overarching design objectives. Access to transit and pedestrian and cyclist safety is a design objective for all street classes.

Refer to **Appendix A.1** for the location of each street class.

1. Arterial Strategic Growth

Arterial Strategic Growth Streets move the highest volumes of people and often include surface transit routes, priority bus corridor routes and active transportation (AT) facilities.

Arterial Strategic Growth Streets are vibrant mixed-use destination streets located in the Downtown, Nodes, Corporate Centres, and MTSAs where higher density transit-supportive development is intended to occur.

Development along these streets should support an active public realm with mid-to-tall buildings lining both sides of the street, wide boulevards with street tree planting and broad sidewalks for pedestrian activities and AT. While these streets must accommodate movement of all mode types, their design clearly communicates that walking, cycling and transit are prioritized.

Arterial Strategic Growth Streets are prominent elements of Mississauga's overall urban structure and often in areas with specific design requirements for street tree planting, materials, furnishings and lighting.

These streets can include on-street parking to support development and local businesses.

Figure A.1. Arterial Strategic Growth Demonstration Cross-section (40m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

2. Arterial Neighbourhood

Arterial Neighbourhood Streets move medium-to-high volumes of people and include surface transit routes and priority bus corridor routes.

Arterial Neighbourhood Streets serve as major links through residential neighborhoods and often have longer distances between signalized intersections and higher motor vehicle speeds. Additional care is needed to ensure these streets and intersections are designed as safe and inviting environments for pedestrians and cyclists.

Arterial Neighbourhood Streets generally have rights-of-way that allow for wide boulevards on both sides of the street. Many of these streets can accommodate improved street tree planting and storm water control measures in the planting zone between the curb and the sidewalk (if present).

These streets typically have residential buildings along their edges, which are set back from the street edge or rear-facing residential lots with backyard fences along the street. Sometimes there are occasional businesses or stretches of commercial plazas or park lands along the street edges.

Figure A.2. Arterial Neighbourhood Demonstration Cross-section (35m ROW)

Figure A.3. Arterial Neighbourhood Transit Overlay (40m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

3. Arterial Employment

Arterial Employment Streets serve as major links through Employment Areas. These streets include either dedicated higher order transit lanes or bus priority lanes. These streets accommodate frequent large vehicles and goods movement.

Buildings along Arterial Employment Streets usually range from multi-storey commercial offices to wholesale or large-format retail, industrial, warehousing, distribution, manufacturing and processing facilities. Buildings are often set back from the property line with landscaped frontages and parking between the building and the street.

Similar to Arterial Neighbourhood Streets, blocks are often long and uninterrupted, and additional care is needed to ensure streets and intersections are designed to facilitate goods movement while also being safe and inviting environments for pedestrians and cyclists.

Arterial Employment Streets also generally have rights-of-way that enable wide boulevards on both sides of the street. Many of these streets can accommodate improved street tree planting and storm water control measures in the planting zone between the curb and the sidewalk (if present).

Figure A.4. Arterial Employment Demonstration Cross-section (35m ROW)

Figure A.5. Arterial Employment Transit Overlay (40m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

4. Major Collector Strategic Growth

Major Collector Strategic Growth Streets provide access to Mississauga's Downtown, Nodes, Corporate Centres, and MTSAs. These streets move medium to high volumes of people and are often the focus of active transportation facilities. Major Collector Strategic Growth Streets are often near major transit hubs and include surface transit routes.

These streets are located in mixed-use developments or as part of pedestrian-oriented developments. A high-quality pedestrian realm, street tree planting, active street frontages and multi-modal travel options are high priorities for Major Collector Strategic Growth Streets.

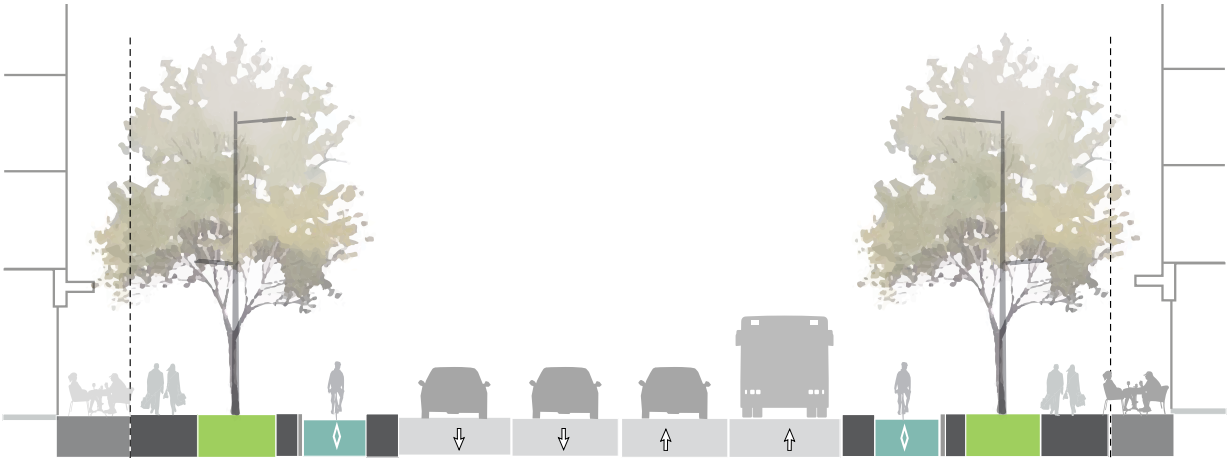

Figure A.6. Major Collector Strategic Growth Demonstration Cross-section (30M ROW)

Figure A.7. Major Collector Strategic Growth Demonstration Cross-section (26M ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

5. Major Collector Neighbourhood

Major Collector Neighbourhood Streets move medium-to-high volumes of people traffic. These streets provide access to residential areas of the city and often mark the entrances to Mississauga's Neighbourhoods.

These streets are often longer and more continuous, providing direct travel routes that span and connect several neighbouring communities with longer distances between signalized intersections. When congested conditions occur, these streets often provide an attractive alternative route, or "cut-through," so additional care is needed to ensure streets and intersections are designed for the most vulnerable people walking and cycling. Major Collector Neighbourhood Streets include surface transit routes and priority bus corridor routes.

Major Collector Neighbourhood Streets generally have rights-of-way that allow for wide boulevards on both sides of the street. Many of these streets can accommodate improved street tree planting and stormwater control measures in the planting zone between the curb and the sidewalk (if present).

Predominately residential uses face the street, though stretches of rear-facing lots and businesses are sometimes present. Buildings along these streets vary in scale and are generally set back from the property line with well-established front yards and gardens.

Figure A.8. Major Collector Neighbourhood Demonstration Cross-section (26m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

6. Major Collector Employment

Employment Major Collector Streets provide access to and from Mississauga's employment areas. These streets move medium-to-high volumes of people and include cycle routes, surface transit routes and priority bus routes. Major Collector Employment Streets are designed too facilitate goods movement and transit while being safe and inviting environments for pedestrians and cyclists.

Major Collector Employment Streets generally have rights-of-way that allow for wide boulevards on both sides of the street. Many of these streets can accommodate improved street tree planting and storm water control measures in the planting zone between the curb and the sidewalk (if present).

Buildings usually range from multi-storey commercial offices, to lower-rise wholesale or large-format retail, warehouse, and manufacturing buildings. Buildings are often set back from the property line with parking or landscaping between the building and street.

Figure A.9. Major Collector Employment Demonstration Cross-section (30m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

7. Minor Collector Strategic Growth

Minor Collector Strategic Growth Streets are found within the Downtown, Nodes, Corporate Centres, and MTSAs. These streets move low to medium volumes of people. Minor Collector Strategic Growth Streets include surface transit routes.

Minor Collector Strategic Growth streets typically have a mix of different land uses and building types along them with a variety of physical configurations and relationships with the street. Sometimes buildings are located further away from the street with landscaping or a parking lot between the street and the building. Buildings are also found closer to the street with front entrances and active ground floor uses facing the street.

These streets are located in mixed-use developments or as part of pedestrian-oriented developments. A high-quality pedestrian realm, street tree planting, active street frontages and multi-modal travel options are high priorities for Minor Collector Strategic Growth Streets.

These streets can include on-street parking to support development and local businesses.

Figure A.10. Minor Collector Strategic Growth Demonstration Cross-section (26m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

8. Minor Collector Neighbourhood

Minor Collector Neighbourhood Streets move low to medium volumes of people and include surface transit routes.

A range of building types and heights are permitted in Neighbourhoods, including detached dwellings and low-rise dwellings.

A high-quality pedestrian realm, street tree planting, active street frontages and multi-modal travel options are high priorities for Minor Collector Neighbourhood Streets.

These streets can include on-street parking to support local residents.

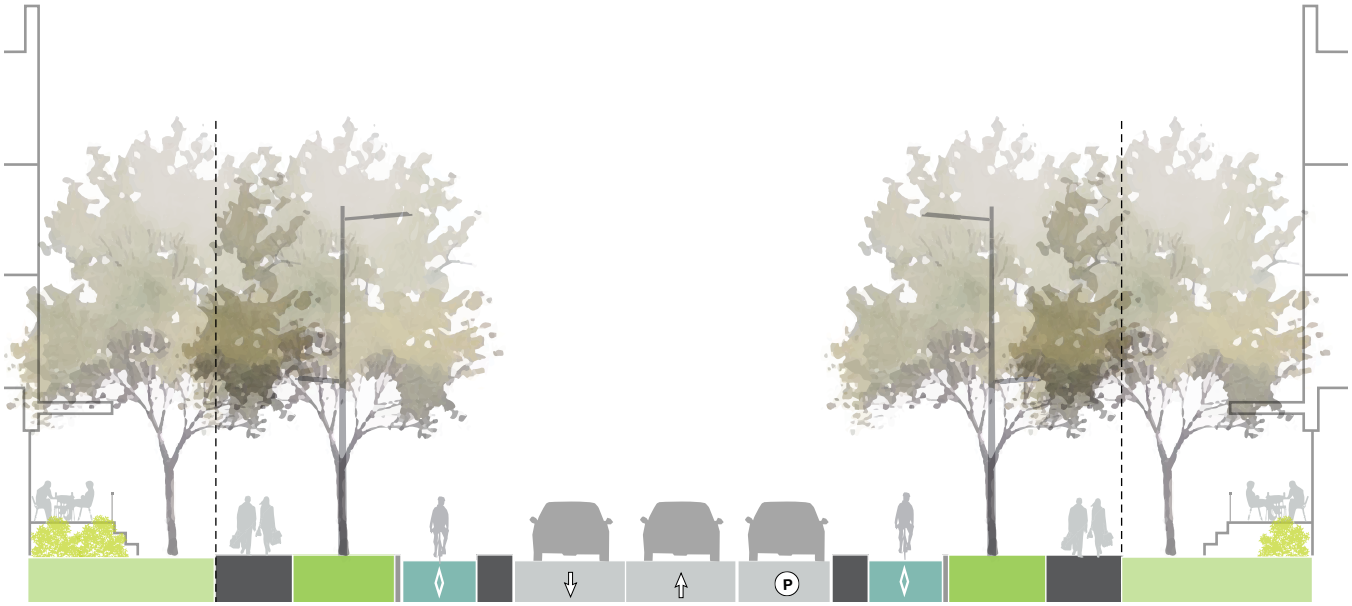

Figure A.11. Minor Collector Neigbourhood Demonstration Cross-section (23m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

9. Minor Collector Employment

Minor Collector Employment Streets support mainly industrial or commercial uses inside Employment Areas. They move low to medium volumes of people and are designed to accommodate frequent large vehicles such as trucks, tractor trailers and other delivery vehicles. Major Collector Employment Streets include surface transit routes.

A significant number of users of these streets arrive by car, but this is not the only mode of access. Employment streets should facilitate goods movement and provide a safe and inviting environment for pedestrians, cyclists, and transit use, especially where they serve as a link between adjacent neighbourhoods.

Buildings usually range from warehouse and manufacturing to commercial offices, large-format retail, and manufacturing buildings. Buildings are often set back from the property line with parking or landscaping between the building and street.

These streets can include on-street parking to support local businesses.

Figure A.12. Minor Collector Employment Demonstration Cross-section (26m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

10. Local Strategic Growth

Local Strategic Growth Streets are most often found in areas supported by a high level of pedestrian activity, usually in mixed-use areas of the Downtown, Nodes, Corporate Centres, or MTSAs. Pedestrians typically have the highest priority.

These streets are sometimes designed as shared streets, but motor vehicle volumes and speeds are very slow.

Local Strategic Growth Streets will include mixed-use buildings with street related active ground floors. Buildings are typically located closer to the sidewalk as compared to Local Neighbourhood or Local Employment Streets. These streets can support a variety of uses, including shopping, entertainment, cafés, dining, and are often in areas with specific design requirements for finishes, materials, furnishings and lighting.

On-street parking is often included to support development and local businesses.

Figure A.13. Local Strategic Growth Demonstration Cross-section (18m ROW)

Figure A.14. Local Strategic Growth Cycle Overlay Demonstration Cross-section (20m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

11. Local Neighbourhood

Local Neighbourhood Streets move low volumes of people at lower speeds and do not play a major role in the broader transportation network. Pedestrians typically have the highest priority and these streets should be designed as safe, comfortable places where active neighbourhood life is prioritized.

Buildings range from detached dwellings to low-rise dwellings. Residential buildings are typically set back from the property line.

Local Neighbourhood Streets are places that support social gatherings and cultural activities, such as yard sales, festivals, or block parties. Transit service is less often provided on this type of street.

Local Neighbourhood Streets are sometimes designed as shared streets, but motor vehicle volumes and speeds are very slow.

On-street parking is often included to support local residents.

Figure A.15. Local Neighborhood Demonstration Cross-section (20m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

12. Local Employment

Local Employment Streets are found within Mississauga's Employment Areas and provide access to industrial or commercial businesses. The design of Local Employment Streets needs to balance elements for maneuverability of large trucks and transit with elements that create a safe and comfortable public realm, recognizing that many people traveling on these streets will be visiting businesses along them or passing through.

Buildings along Local Employment Streets typically include distribution and manufacturing warehouses, offices, and occasionally, restaurants and retail. These streets typically have less active street frontages and frequent large driveways, loading docks, or other auto-serving facilities.

Local Employment Streets are often wider than other local streets and blocks are often longer to accommodate more land -extensive uses and large buildings. While traffic volumes and speeds are low, the presence of large trucks requires careful attention to the design of pedestrian and cycling infrastructure.

On-street parking is often included to support local residents.

Figure A.16. Local Employment Demonstration Cross-section (23m ROW)

Figure A.17. Local Employment Cycle Overlay (20m ROW)

Streetscape Corridor / tree planting- not to contain running lines for underground utilities, lateral crossings only

13. Scenic Routes

Scenic Routes are found throughout the city where there is a strong relationship with cultural, scenic or environmental features. Demand for walking or cycling is often high, as these streets follow, or are adjacent to, areas for recreational use. Scenic Streets may also include surface transit routes. There are usually few crossings on these streets, but where present, they should safely allow connectivity and crossings for recreational path users. Typically, Scenic Streets do not have on-street parking.

Scenic Streets often have large and healthy trees that together create a substantial canopy. The adjacent open spaces present many opportunities to introduce stormwater control measures or use 'borrowed landscape.' The Mississauga Road Scenic Route Urban Design Guidelines have been developed to provide guidance for future developments along the Mississauga Road Scenic Route.

Figure A.18. Scenic Routes Demonstration Cross-section (26m ROW)

Classification Design Features

The table below identifies likely design elements for each street class. Different elements may have a range of widths or configurations based on adjacent elements or context (for example narrower bike lanes if next to a curb, but wider if next to parked cars).

The need and justification of some design elements, such as left-turn lanes, are based on detailed review and analysis (refer to Chapter 2). While the design elements are suggested as minimums, they may not be feasible in specific contexts. For example, on-street parking is possible in all classes but not necessarily required or encouraged in all cases, subject to context, the City's parking strategy, and opportunities for off-street or side street parking.

Table A.1 Street classification design features

	Street classification													
	Arterial			**Major Collector**				**Minor Collector**				**Local**		
Typical ROW	30-60m			20-35				20-26m				18-20**		
Design elements	SG	N	E	SG	N	E	S	SG	N	E	S	SG	N	E
Planted median	●	●	●											
On-street parking	●	●	●	●	●	●	●	●	●	●	●	✔	✔	✔
Left-turn lanes	✔	✔	✔	✔	✔	✔	✔							
Right-turn lanes														
Curb extensions	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Transit priority lanes	✔	✔	✔	✔	✔	✔	✔							
Expanded pedestrian realm	✔			✔				✔				✔		
Standard sidewalk		✔	✔		✔	✔			✔	✔			✔	✔
Cycle facility	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔			
Street furniture	✔	✔	✔	✔				✔				✔		
Transit stops	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	●	●	●
Enhanced (wider) crosswalks	✔			✔				✔				✔		
Street trees	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Green infrastructure (e.g., rain garden)	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Coordinate utilities with boulevard and roadway elements	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔

✔ Likely elements within the streetscape
● Possible elements within the streetscape

SG: Strategic Growth
N: Neighbourhood
E: Employment
S: Scenic

** The MOP includes Local streets with 15m rights-of-way and up to 26m, identified as exceptions.