CITY OF BRAMPTON COMPLETE STREETS **GUIDE**

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BRAMPTON

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c: Deanna Curry

1 INTRODUCTION

Streets are vital to the overall health of Brampton. They are essential corridors for travel—moving people and goods to support the economy of the city and the nation. They also contribute to the experience and quality of place, providing a common setting to bind the community together.

1.1 Overview

Brampton has evolved over time, from a rural agrarian settlement to a post-war suburb to a thriving urban centre with expanding ambitions for the future. As in any growing city with a largely defined road network, there is robust competition for space to move autos, buses, freight vehicles, bicycles, and pedestrians, while still retaining room to support social and cultural exchange and environmental improvement.

Figure 1.1. Complete Streets will help create livable communities, especially for the most vulnerable people who use our streets.

Complete Streets are a holistic approach to planning and design. Each Complete Street is unique and there is no one solution that will fit all streets. Well-considered street design depends on many factors, including the available right-of-way dimension, the role in the larger transportation network, land uses and development character, and the unique qualities of place.

The Complete Streets lens is applied not only when a street is constructed or reconstructed, but throughout all phases of street design, construction, operation and maintenance. Over time, everyone in Brampton, from professionals involved in their delivery and repair to residents and political leaders will understand, apply and promote the Complete Streets way of thinking, and ask themselves this simple question: how can we make our streets more complete?

To assist with the delivery of Complete Streets in Brampton, this Guide:

- Provides a unified vision for streets and establishes common design directives and principles that align with the City's overarching policy directions.
- Optimizes every opportunity to improve the safety, health, environmental resiliency and vitality of Brampton's streets with guidelines and implementation recommendations for better design, construction, operations, and management.
- Provides a clear and coordinated process that enhances collaboration in street design, use and maintenance across agencies and divisions to facilitate and accelerate efficient delivery of street projects.
- Provides City staff, consultants, private developers and community groups with the best resources to design streets to contribute to meeting larger community and network objectives.

1.2 Importance of a Complete Street Approach in Brampton

The City of Brampton promotes a multi-modal transportation system, with the objective of designing, building, and maintaining streets (including multi-use paths) that safely and comfortably accommodate all users, including motorists, motorcyclists, bicyclists, pedestrians, individuals with disabilities, transit and school bus riders, delivery and service personnel, freight haulers, and emergency responders.

These ambitions are stated in the Official Plan, Transportation Master Plan, Active Transportation Master Plan and Vision 2040.

Although the auto-mode is still dominant in Brampton today, a gradual shift has occured over the previous years to consider active transportation and transit infrastructure, and significant work has helped to advance Vision Zero. This Guide builds upon these achievements and adds other users and inputs such as public health, socio-economic health, environmental health, equity, accessibility, land use, and built form.

Building Complete Streets provides many benefits. First and foremost, embracing Complete Streets will create balanced transportation systems by providing accessible, safe, and efficient connections between destinations.

Complete Streets will encourage economic growth, increase property values, reduce risks through safety improvements, improve public health and fitness and contribute to mitigation of climate change. Allowing people to replace motor vehicle trips with active transportation options helps to reduce greenhouse gas emissions and the demand on our roadways.

Using active transportation increases physical activity, which can help reduce the onset of health conditions such as obesity and type 2 diabetes. Well-designed healthy complete communities are safer, improve social connectivity and allow residents to age in place.

Further, the development of recreational trails for pedestrians and bicyclists—in parts of the city such as parkland, hydro corridors and ravine lands—is integral in creating a multi-modal transportation system. This document supports their contribution to the overall active transportation network.

Complete Streets are often represented as a product, an image of a street that includes certain elements and looks a particular way. However, to get to that result, everyone involved in street projects need to understand and apply a consistent process. The street design process considers a myriad of inputs, establishes priorities to inform decision making, and provides tools for measuring performance.

The overall intent of this Guide is to define the process that will lead to intended outcomes, including:

- An integrated, and connected transportation network that supports compact, sustainable development and provides livable communities.
- Improved safety, ease of use, and ease of transfer between modes for all users of the transportation system.
- Context sensitive design flexibility for different types of streets, areas, and users.
- Direct guidance and implementation plans that consider Complete Streets as the default condition—not the exception—when developing the transportation system.

1.3 Guide Development

The Guide draws from global best practices in both process and design techniques. It builds upon and integrates a multitude of reports, policies, by-laws, guidelines, standards and other documents and practices that relate to street design in Brampton.

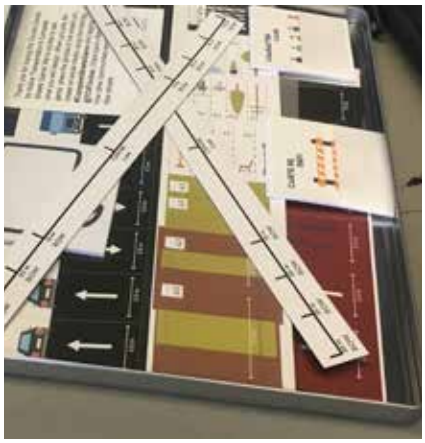


Figure 1.2. Technical Advisory Committee.

The preparation of this Guide, led by Brampton Transportation Planning, was developed through a collaborative and iterative process that incorporated the knowledge and perspectives of various City and Regional departments and divisions.

The overall project governance structure included the following:

- **Corporate Leadership Team:** Led by the Office of the CAO and senior leadership from core City Departments.
- **Steering Committee**: Provided overall project direction and was co-sponsored by the Commissioners of Planning, Building and Economic Development and Public Works & Engineering.
- **Core Project Team**: Comprised of members from Transportation Planning, the Core Project Team led day-to-day project management, stakeholder consultation processes, product evolution and delivery.
- **Technical Advisory Committee**: Comprised of representatives of agencies and units across City and Regional governments, the Technical Advisory Group (TAC) provided advice and subject matter expertise. TAC was critical in defining the need for the Guide, and ensuring that the recommendations are usable and relevant in their independent processes and practices.

1.4 Application of the Guide

All Brampton streets are intended to become Complete Streets—great places that are safe and accessible for all users regardless of mode choice. As such, the City envisions that this Guide applies to all public and private roads in all areas of the City. The Guide is the rule not the exception.

All street projects provide the opportunity to advance the goal of Complete Streets for Brampton. This includes large and small initiatives that are part of the City's capital roads program: from state of good repair maintenance projects and operational improvements to major capital construction projects and everything in-between.

It is intended that the Region of Peel will consider this Guide during their projects and when updating their Road Characterization Study. The Guide is not applicable to provincial highways running through Brampton, but it will inform the design of streets where they intersect highway facilities.

This Guide provides opportunities to improve streets at all scales and to assist in the coordination of efforts for every project. The nature and scope of each initiative will determine the degree to which the Guide is applied.

This Guide will inform planning and development projects and become part of all Environmental Assessments, comprehensive redevelopment initiatives, planning studies, public realm plans, secondary plans and other revitalization efforts. As such, it will shape the ways in which new or reconfigured streets become more complete.

This Guide encourages and reinforces the need for thoughtful engagement and outreach throughout the project delivery process.

This Guide provides an overview of the various types of streets and outlines the objectives and desired outcomes of each street type. Using street types as a model, public stakeholders can advocate for designs that will accomplish these objectives.

1.5 A Made in Brampton Guide

Each city or town is unique and has its own corporate culture. The different departments, agencies, and staff that contribute to the planning and design of streets are also unique with their own processes and procedures.

This Guide builds upon policy ambitions and the experience of designing streets in Brampton, informed by current work flows and collaborative multi-divisional efforts, as well as best practices from around North America and beyond.

Rather than start from scratch, the Guide works within the processes that currently exist, suggests surgical refinements, and focuses on how to make decisions that will lead to more Complete Streets and satisfy broader city building policy objectives.

This Guide reinforces that the priority for street design is to consider the needs of vulnerable users first. From this starting point all other decisions that are made will work to strengthen this priority.

The Guide also builds on the current functional road classifications that inform funding, operations and maintenance, and includes a realistic plan for implementation with actions that the city will carry out to advance the development of the transportation network in a more complete way.

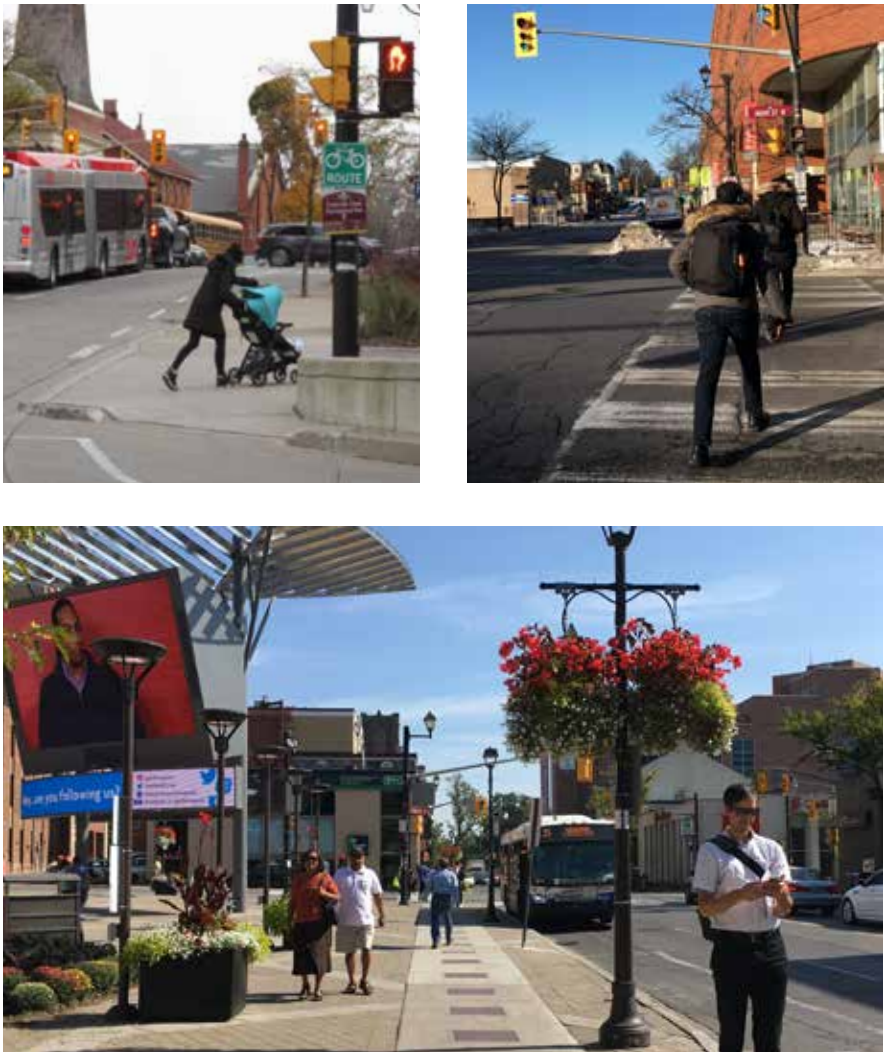


Figure 1.3. The Brampton Guide prioritizes the safety of vulnerable users first.

1.6 Policy Integration

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

PROVINCE OF ONTARIO

Ontario Ministry of Municipal Affairs, Growth Plan for the Greater Golden Horseshoe (2017). Ontario become the first province in Canada to adopt a Complete Streets policy as part of a major update to the Growth Plan for the Greater Golden Horseshoe in May 2017. The updated Plan 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).

Metrolinx 2041 Regional Transportation Plan (2017). 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, and highlighting the importance of active transportation, particularly for transit as a first mile/last mile solution.

REGION OF PEEL

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. City of Brampton Council adopted the Region's Vision Zero framework in 2019.

Region of Peel Sustainable Transportation Strategy (2018). Aims to strengthen the multi-modal function of regional roads. It stresses the role of these roads as public places through two key actions: adopting a Complete Streets policy approach to design and undertaking traffic safety pilot projects that are aligned with Complete Streets initiatives.

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.

Region of Peel Streetscaping Toolbox (2018). This document has recently been updated to align with the Peel Road Characterization Study. A study update is anticipated in the near-term and will consider this Guideline document as well as efforts in other municipalities in the Region.

Region of Peel Goods Movement Strategic Plan (2017): A five-year blueprint for action on goods movement in the Region. The streets that form the goods movement network will facilitate, support, and prioritize the safe and efficient movement of larger vehicles.

The Region of Peel has a number of additional policy documents outlining the goal of creating healthy, complete community environments, such as: the Health and the Built Environment policies included in Region of Peel Policy Region of Peel Official Plan (2021 Office Consolidation); the Healthy Development Assessment (2016); and the Peel Healthy Development Index (2009).

CITY OF BRAMPTON

Living the Mosaic, Brampton 2040 Vision (2018). The Vision was unanimously endorsed by Council in May 2018 and underpins this Guide. Brampton's 2040 Vision includes a section dedicated to the importance of designing and retrofitting Brampton's streets to become more complete.

City of Brampton Official Plan (2015). Identifies that Brampton will develop Complete Streets, and that their design and operation will provide for the needs of all users, including pedestrians, bicyclists and transit passengers of all ages and abilities, as well as trucks, buses and automobiles. The Official Plan also speaks to a desire to increase in the share of cycling, walking, and transit use in Brampton by improving the infrastructure dedicated to these modes of travel.

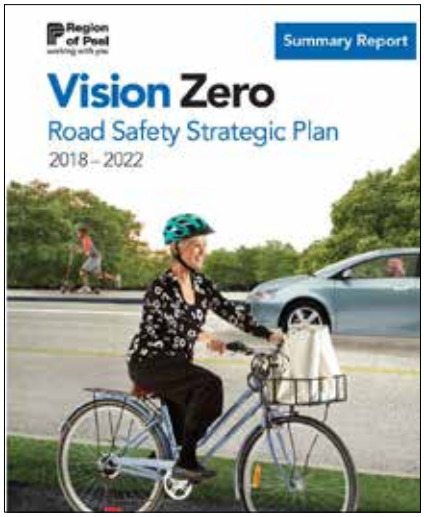
City of Brampton Transportation Master Plan (2015). Provides a blueprint for strategic planning and decision-making to achieve a balanced transportation network that addresses the City's growth and development needs over the long-term.

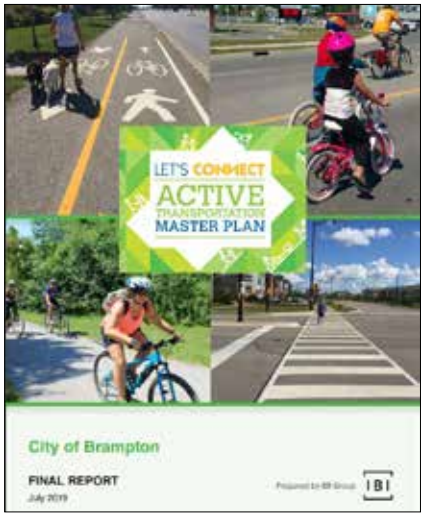
Brampton Road Classification System (RCS). A hierarchy providing "the orderly grouping of roads into systems according to the type and degree of service they provide to the public" as defined by the Transportation Association of Canada (TAC) Manual of Geometric Design Standards for Canadian Roads (2017). The RCS is primarily oriented around the volume of travel accommodated on a corridor but also considers the number of travel lanes, available right of way, and diverse modes operating on the street. It establishes five basic road classes with variants – local, collector, minor arterial, major arterial (City) and major arterial (Region) and notes the location of Provincial highways. The current RCS is included in the Official Plan as "Schedule B: City Road Hierarchy." Further, the RCS informs the 200 Series Design Standards for roads in Brampton.

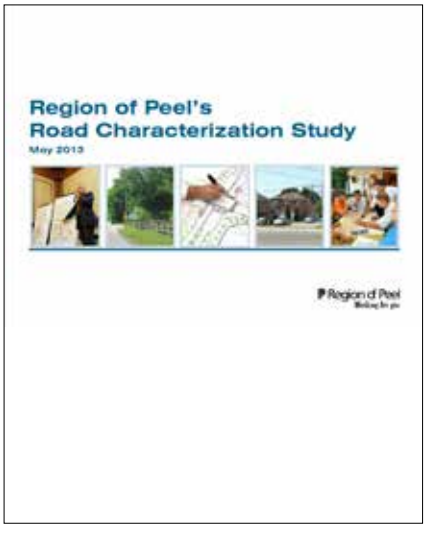
City of Brampton Active Transportation Master Plan (2019). Establishes an implementation strategy to build a connected cycling and pedestrian network throughout Brampton and to adjacent municipalities, enabling safer, more convenient travel by non-motorized modes, and encourages cycling as a viable means of transportation for both recreational and utilitarian purposes. The Active Transportation Master Plan Design Compendium (2019) provides detailed direction for cycle facility selection and design.

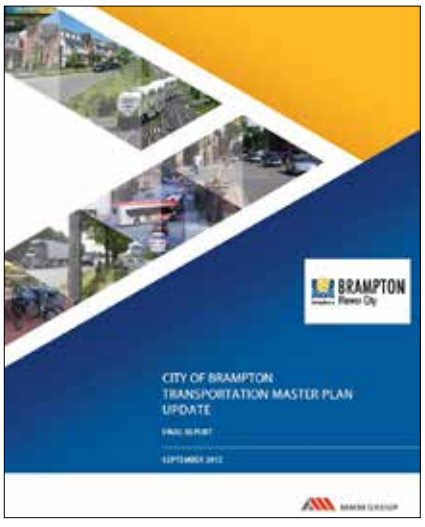
The Community Energy and Emissions Reduction Plan (CEERP 2020). A comprehensive plan to drive innovation, employment, and economic development while achieving the City's environmental and climate change goals, alongside its associated social benefits. One of the key goals of the CEERP is to reduce community-wide greenhouse gas emissions by 50% by 2041 and establishing a pathway to reduce emissions by 80% by 2050. Specific targets related to the themes of green communities and transportation efficiency are established in the CEERP, and can be supported through the establishment of Complete Streets.

City of Brampton Sustainable Community Development Guidelines (SCDGs/ Part 8 of the Development Design Guidelines) (2013). Provides a basis for the City to review development applications, with a focus on new development. The SCDGs include specific metrics with detailed requirements, for Complete Street aspects such as walkability, accessibility to active transportation, transit supportive streets, and green infrastructure. The SCDGs and Sustainability Metrics a compendium tool street design in Brampton.









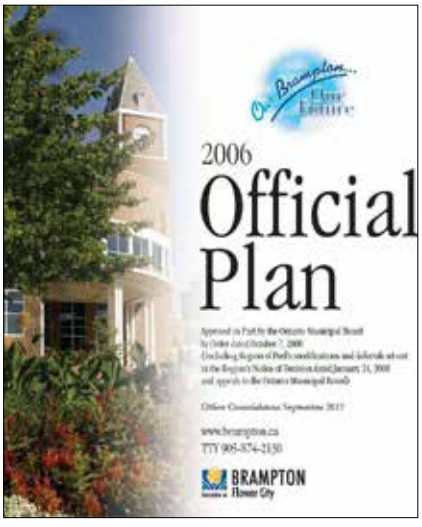


Figure 1.4. City and regional policy documents and guides.

1.7 Vision + Guiding Principles

Streets in Brampton are a critical component to create and support a healthy, prosperous, and beautiful city for everyone.

Brampton will have a comprehensive, integrated transportation network with streets that provide safe, equitable and convenient travel for people of all ages and abilities

To help achieve this Complete Streets vision for Brampton, all street projects will adhere to the following principles:

- **Create Safe and Accessible Streets.** Improving safety is of paramount importance. Streets that consider all users and abilities—and prioritize the most vulnerable—can make Brampton safer and more accessible. Making safer streets will encourage people with and without automobiles to make different transportation choices.
- **Improve Sustainability and Resiliency.** Complete Streets can help to create a more sustainable and environmentally friendly Brampton. Integrating green infrastructure into street design can reduce life-cycle costs, improve street tree health, treat stormwater runoff, and improve environmental quality. Further, Complete Streets can reduce transportation-related greenhouse gas emissions and improve air quality.
- **Promote Healthy and Active Living.** Streets that support walking and cycling within a comfortable and inviting environment can improve overall community health and advance efforts by the City and Region to overcome public health issues related to levels of inactivity.
- **Improve Transportation Choice and Balance Priorities.** Streets that are "complete" are more equitable, providing everyone with a choice of mobility and allowing all users and abilities to travel to and from work, school, and other destinations with the same level of safety and convenience. Complete Streets provide transportation choices not only to those who desire to travel by different modes, but also for those who cannot drive and must use an alternative.
- **Develop Connected Networks.** Complete and connected networks can better support communities, encourage healthier lifestyles, improve road safety and reduce reliance on auto-oriented travel. In Brampton, human-scaled networks will efficiently disperse traffic, facilitate route choice and create a more comfortable setting for people who travel by foot, bike or transit. By viewing streets as part of a larger network, the City can provide design flexibility and provide mobility for all users.
- **Respect Existing and Planned Context**. Streets support places as well as facilitate movement; this is what makes streets different from roads. In Brampton, streets occur within a range of adjacent land uses with a varied intensity of users and uses. Streets

Figure 1.5. Streets in Brampton will be planned, designed, operated, and maintained to enable safe, convenient and comfortable travel choices and access for users of all ages and abilities.

designed to serve the place they occur within alongside their functional role will lead to more Complete Streets.

- **Create Vibrant and Beautiful Places.** Streets in Brampton will invite social interaction, instill community pride, encourage health and well-being, and contribute to the interest and diversity of the city. Streets represent the largest public resource by area in Brampton. Their design and function will enhance the public realm and create beautiful places that attract people and commerce. Street design will maintain, and in some cases accentuate, the history and identity of each neighbourhood, commercial area and corridor while allowing for flexibility in design to strengthen unique attributes.
- **Enhance Economic Vitality.** The design of Brampton's streets will support sustainable neighbourhoods with more efficient multi-modal access and by creating streets that attract people and strengthen local economies. Funds not spent on inefficient transportation are potentially available in other ways to support local businesses.

1.8 Liability Statement

A central goal of the City of Brampton is to make its streets as safe, sustainable, efficient, accessible, and as beautiful as possible. To that end, the City has created the Guide.

This Guide is intended as the primary resource for the planning and design of streets in the City of Brampton.

Other tools and resources are referenced within the Guide where additional detail is necessary. The Guide is based on the principle that streets are different, and that no single design solution is appropriate for all. The Guide establishes minimum and preferred design values that provide for flexibility in street design, while still meeting the test of good engineering judgment.

This Guide is based on consultations with City staff and leading planning and design professionals, as well as on best practices and research from local, provincial, national, and international sources. This Guide incorporates and builds upon current City of Brampton standards and Guidelines, as well as those of other provincial, federal and non-governmental organizations, for example, Ontario Ministry of Transportation (MTO), Professional Engineers of Ontario (PEO), Ontario Provincial Standards (OPS), Transportation Association of Canada (TAC), Institute of Transportation Engineers (ITE), National Association of City Transportation Officials (NACTO) and other sources. This Guide also works within existing Provincial and Federal legislation pertaining to street design.

This Guide will evolve as the state of the practice evolves and practitioners are encouraged to also consider the latest research and practices. The Guide is not prescriptive and therefore will not be interpreted as being restrictive or discouraging of innovation. Practitioners have the liberty to experiment with innovative techniques, novel elements, and pilot projects to meet the challenges outlined herein.

This Guide recognize that street design is a complicated process that occurs in a complex environment. It is impossible for any Guide to cover all circumstances. Field experience, local knowledge, and good engineering judgment are all essential in deciding what to do in the absence of specific direction, and in selecting design variations from other street design references. To assist practitioners in implementation, the Guide articulates the need to document the rationale for the decision-making process.

All work on city streets, from maintenance to operational changes to new construction or reconstruction, will have regard to this Guide.

1.9 Limits of the Guide, Updates and Revisions

Streets are dynamic places. The approach to Complete Streets is equally dynamic. This Guide is not static; it is a living document. Most policies are incorporated by reference. Therefore, as standards are updated in their source document, this Guide will also become updated.

This Guide provides a framework for thinking through the design and operation of streets in Brampton, and is outcome oriented.

This Guide is intended to support and enable Brampton's vision for Complete Streets, but also recognizes that there are many means to a desired end.

Although the Guide suggests ways in which Complete Streets in Brampton may look different than the current standards of today, the street types and demonstrations within are not intended as prescriptive street templates that the designer will apply. Street assemblage, elements, and design details will respond to each specific project type and context.

The Guide emphasizes performance monitoring and post-construction evaluation, as discussed in Chapter 5 (Implementation). Communities throughout North America are continuing to learn and innovate around Complete Street design.

By measuring performance, Brampton will incrementally learn the most effective and acceptable techniques for street design, with each project building upon the successes of those that come before. The intent is that the City will update the Guide on a regular basis with these ever-evolving methods.

1.10 Structure of the Guide

The Guide is organized in five chapters that reflect the typical steps of the Brampton street design and development process.

- **Chapter 1** provides an overview explaining how to use this Guide, and outlines Brampton's vision and principles for Complete Streets.
- **Chapter 2** describes the various types of streets in the city, the places they aspire to become and the transportation function they must serve.
- **Chapter 3** outlines key street planning and design directives and the framework for decision making.
- **Chapter 4** describes the design standards of individual elements and modal facilities located within the street right-of-way. It provides additional guidance where modification or flexibility is needed to fit the right-of-way and defines the priority needs of each street type.
- **Chapter 5** outlines how to make Complete Streets happen by describing the project delivery process, engagement and outreach, overview and compliance, and performance measures.

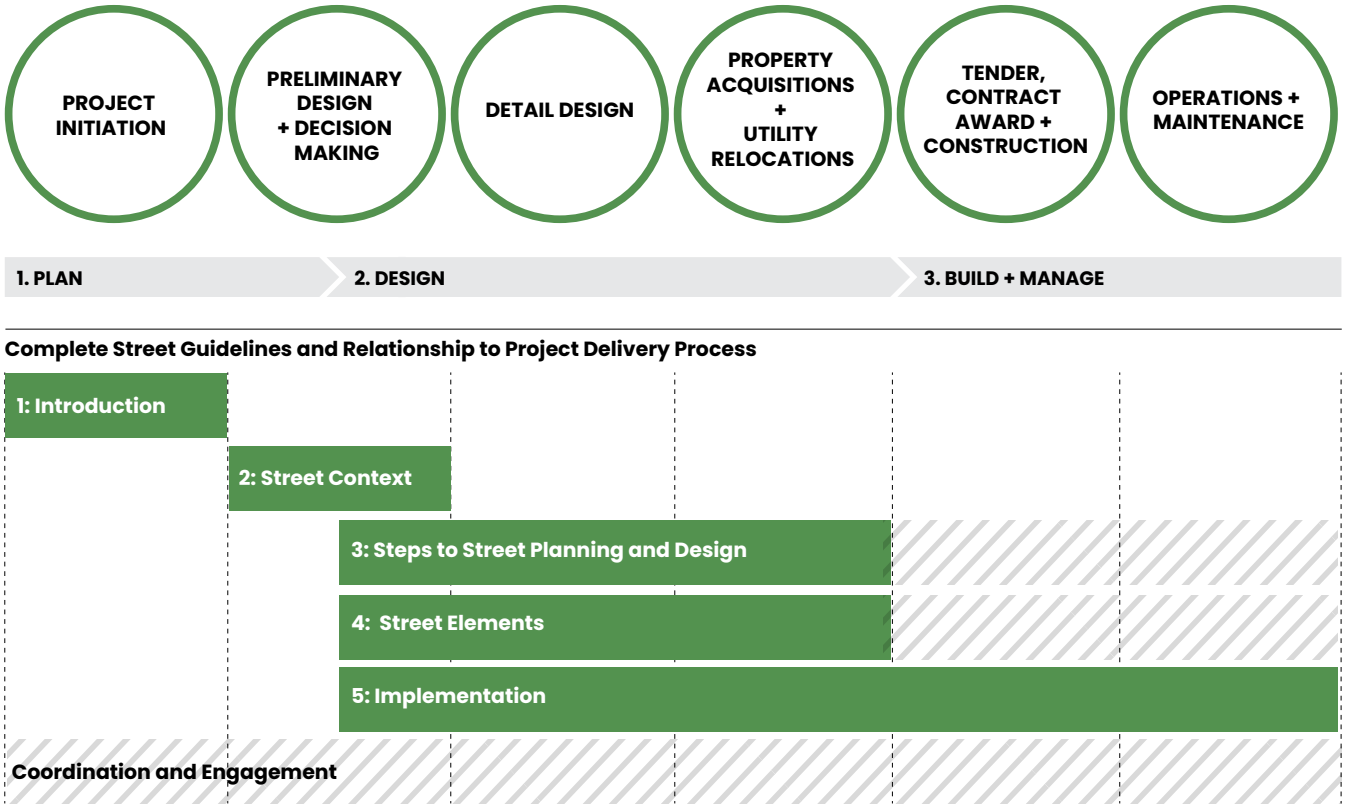


Figure 1.6. Structure of the Guide and relationship to Project Delivery Process.

c: Jack Alexander, Unsplash

2

STREET CONTEXT

This chapter introduces the fundamental concept of streets in context, often described as street types. There are 11 Brampton Street Types, each with their own set of design objectives and demonstration to illustrate one potential outcome of how the street may look when applying the Guide. These street types serve as a starting point in the early stages of a street planning and design process when typical cross sections are assembled.

Also included in this chapter is a Draft Street Network Plan that shows where in Brampton these street types would occur.

2.1 Understanding and Defining Street Context

Understanding how streets exist and respond to their context is an important starting point in Complete Street design. The Brampton Street Types and their key objectives should be referenced when documenting how and why street design decisions are made.

Figure 2.1. Varied street contexts in Brampton.

Street context considers more than the current functional classification, which places the primary emphasis on the safe and efficient movement of motor vehicles. It equally considers land use, built form, intensity of users and destinations as essential inputs to designing context-sensitive streets. The result is a range of street types that support the wide-range of uses and users that occupy Brampton streets today and in the future.

Street context and the resulting Brampton street types build upon the existing roadway functional classification system and are valuable:

- At the onset of any street project to inform the user profile, overall objectives and design priorities.
- To help the broader public and stakeholders understand how streets are not all the same and how they work together within the City.
- To demonstrate how to improve streets and make them more complete.
- To re-imagine and re-consider how to improve existing and future streets.

Street types reflect the transportation function of a corridor while preserving and improving the unique place characteristics of blocks or street segments. Brampton's street types consider the needs of all users—such as pedestrians, cyclists, transit, motor vehicles, goods movement, utilities and green infrastructure—with the overall goal to deliver truly great streets.

When properly applied, and consistently used, street types will assist designers in:

- Improving safety for all.
- Designing streets that balance local character and context with transportation function.
- Selecting features and facilities appropriate to both street function and land use aspiration.

2.2 Link and Place: A Model for Defining Street Types

Street types are a useful way of understanding streets with similar 'link' and 'place' functions.

While each street is unique, many of Brampton's streets share common features.

Every street has a certain functional role, often informed by factors such as the volume of vehicles per day or network connectivity. These are commonly described as arterials, collectors, and local streets. In addition, every Brampton street exists in a place with different land uses, building stock, and levels of activity such as downtown, industrial park, residential neighbourhood, or park.

Street types are a useful way of understanding streets with similar 'link' and 'place' functions. The 'link' and 'place' model describes a street in terms of their mobility (link) and livability (place) characteristics, and further considers streets as either places you go 'through' or 'to.' These inputs are the starting point to inform and define street types for Brampton.

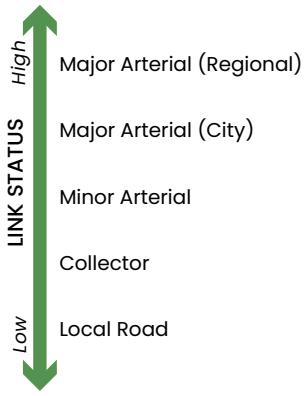


Figure 2.2. Link Status illustrates the priority of street types for movement by functional classification.

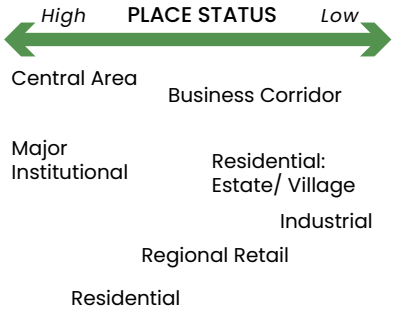


Figure 2.3. Place Status illustrates the priority of street types as land use types by context.

Figure 2.4. 11 Brampton Street Types, organized by their link and place objectives.

2.3 What Informs Brampton's Street Types

Brampton's Street Types were informed by an existing and planned conditions analysis, best practices review and workshops with City staff and stakeholders. In particular, Brampton's 2040 Vision establishes the foundational aspirations for streets as both conduits for movement and destinations for activities.

A street's 'link' status is informed by its transportation function, often defined by the volume and intensity of all users, its network role, or modal priorities. 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.

Some Brampton streets have an important civic role, as well as an important transportation role. Referring to the Link and Place model, such a street would have a high 'place' and 'link' status. Another street may accommodate a high volume of people but is not considered a destination. This street would have a high 'link' but low 'place' status. Depending on local context, some streets will have a greater need to move people or goods, while others may focus on providing an environment to support a wide-range of social and recreational activities.

Some streets may bustle with activity, while others are quiet and provide an environment to get to know your neighbours.

Each Brampton Street Type is based on a specific classification that is articulated in Brampton's City Road Hierarchy (Official Plan Schedule B).

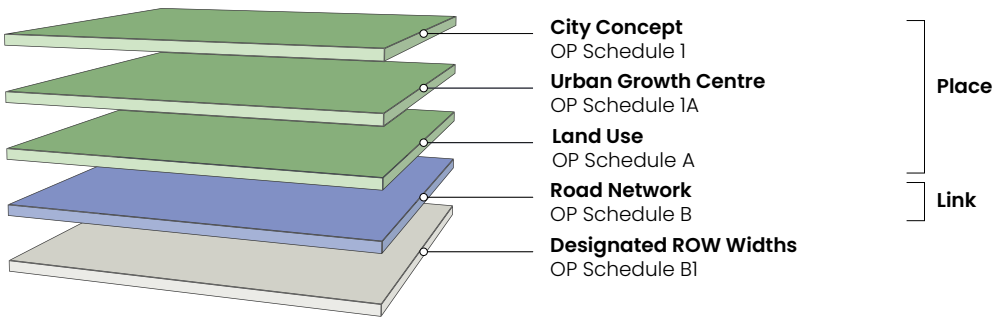


Figure 2.5. The Brampton Street Types are informed by link, place and available space within the right-of-way.

2.4 Street Types and Overlays

Setting the context for a specific street is a process that starts with understanding project needs, objectives and priorities. Overlays are applied at many stages of the street design and decision-making process to inform the 'place' and 'link' context. This process must also incorporate the City and Region's plans to accommodate growth as to expand the pedestrian, cycling, and transit networks.

Overlays are data layers that provide additional information about a street or area.

Overlays provide information on existing context (such as historical collisions or counts for pedestrians, cyclists, transit ridership, and motorized vehicles) or future conditions (such as planned land uses and infrastructure networks). Overlays may include special designations – such as streets identified to emphasize one mode or another. Overlays may introduce additional objectives or considerations for streets beyond the objectives of the underlying street type.

One street may have several different overlays of additional information. This, in turn, further informs the allocation of space in the street right-of-way, and any necessary trade-offs. For example, streets overlaid with a transit emphasis have the additional objective to provide even more attractive and efficient transit service. Streets overlaid with school zones must anticipate and accommodate a greater concentration of school aged children travelers in the area.

Applying overlays to street design projects may help suggest which stakeholders should participate in the project. Different stakeholders will highlight the importance of their overlays, so it is important to become familiar with this information when engaging them.

In addition to overlays, other categories which affect design and operation within Brampton include, but are not limited to, truck routes, infrastructure networks, transit routes, snow routes, historic districts, transit-oriented development areas, and stormwater and community amenities.

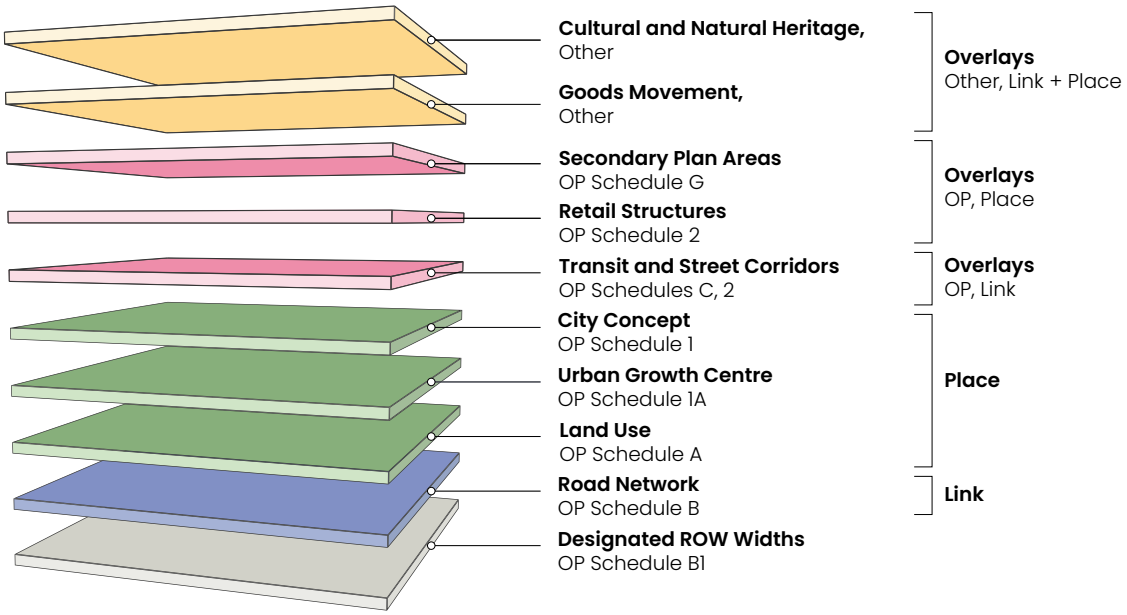


Figure 2.6. Street Types and Overlays.

2.5 Defining Brampton's Street Types

The Guide defines 11 Street Types to reflect and respond to the range of existing and planned contexts in Brampton. The Brampton Street Types are aspirational and meant to inform and motivate well-considered design. This is not an exhaustive list of every possible street that could exist in Brampton but is intended as one of the starting points in the street design process.

Not every street will fit neatly within a specific category. The Street Types recognize the need for flexibility in their implementation and some streets may be a combination of two or more Street Types. A Street Type may change along its length as different segments have different uses and contexts.

Each Street Type includes a brief description, a series of key design objectives and demonstration rendering to help illustrate what each street could look like. The demonstration rendering is aspirational and illustrates one potential way of assembling the street elements within the right-of-way to accommodate different users and functions.

The demonstration renderings are examples of how a street could be designed and serve as a starting point for the design process described in the next chapter. The illustrations should not be seen as definitive designs. The right-of-way, network function and adjacent land uses are all important factors, which the practitioner should consider in developing the design.

REGIONAL ROADS

8% of streets with Brampton are owned and maintained by the Region of Peel. The City of Brampton and the Region of Peel have a shared interest in making all streets in Brampton great places and safe for all users. The Region's Road Characterization Study (2013), which is currently being updated, applies to all Regional roads within Brampton. This document—alongside the implementation of Vision 2040, ongoing precinct planning and the future update to the Transportation Master Plan—affords the opportunity for the City and Region to collaborate and make all streets more complete.

STRATEGIC SEGMENTS

Strategic segments are parts of streets located within places identified for transit supportive development such as the Downtown, Uptown and Centres. Strategic Segments are important places where people interact and experience public life. They should convey beauty, invite activity, and promote a sense of civic pride. Where strategic segments are located along regional roads collaboration between the City and the Region is essential to achieve Brampton's City building goals.

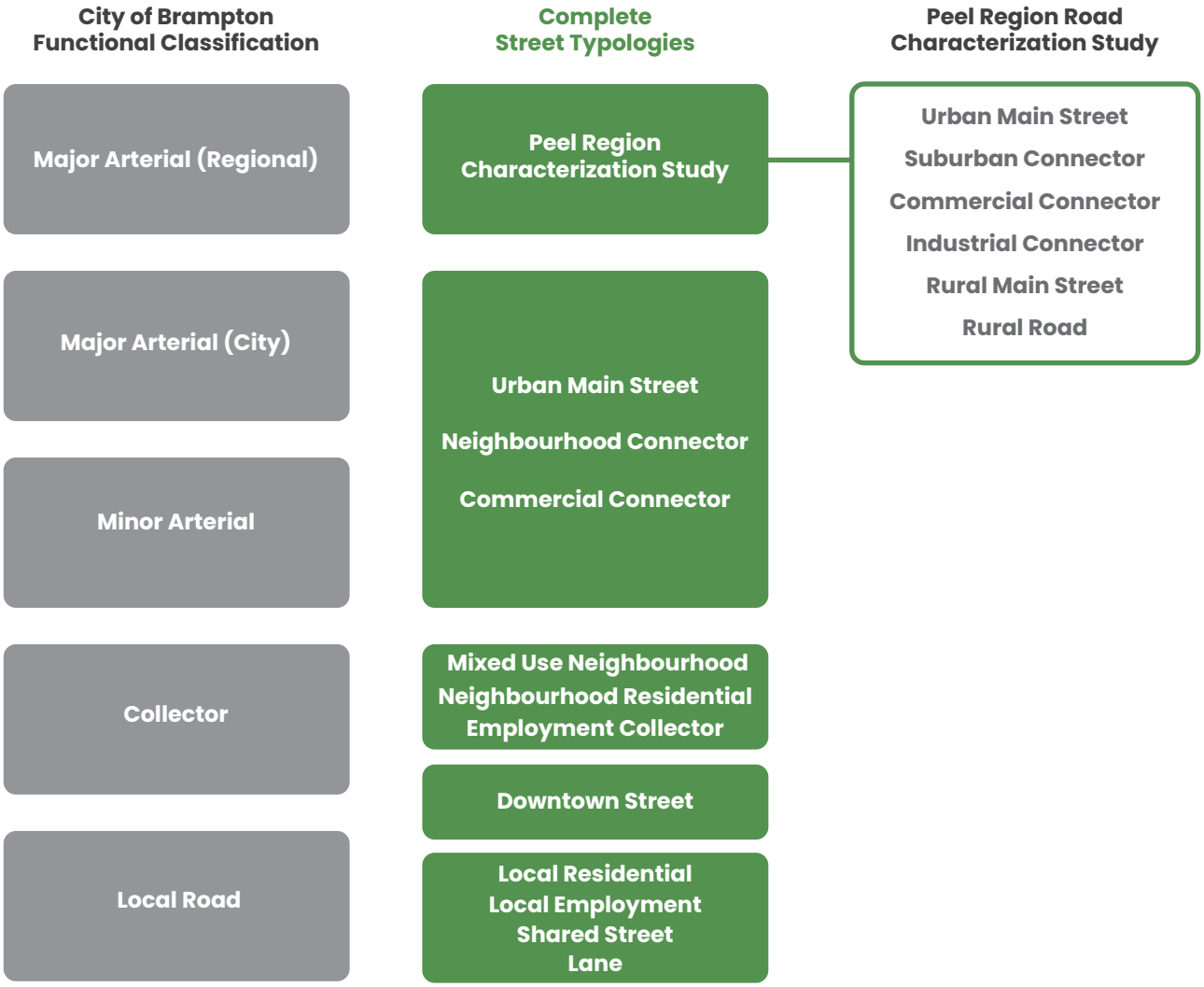


Figure 2.7. Brampton Street Types.

2.5.1 Urban Main Streets

Urban Main Streets are vibrant mixed-use 'destination streets' located in the Uptown and Downtown and along the corridors where higher density transit-supportive development is intended to occur. These streets are often important higher order transit routes in the City's Transportation Master Plan. While Urban Main Streets must accommodate the movement of all modes, their design clearly communicates that walking, cycling and transit access are prioritized.

Figure 2.8. Urban Main Street as demonstrated in the Brampton 2040 Vision document.

Figure 2.9. Sidewalks that support high levels of pedestrian activity and a mix of uses are key components of Urban Main Streets.

Urban Main Streets are prominent elements of Brampton's overall urban structure and may be along goods movements routes or in areas with specific design requirements for finishes, materials, furnishings and lighting.

Development along these streets will be designed to 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.

Urban Main Streets are a typology that could manifest in different forms depending on context and network function. The Downtown Reimagined work along Main Street from Wellington Street to Church Street is an example of an Urban Main Street with distinctive quality of materials and furnishings to signify an important civic role within the City.

APPLICATION

- City Major and Minor Arterials
- Uptown, Downtown and transit supportive corridors
- ROW: 25-45m

SAMPLE STREETS

- Queen Street East (Highway 410 to McMurchy Avenue)
- Main Street (Charolais Ave and Steeles Ave.)

DESIGN OBJECTIVES

Pedestrian

- Prioritize an expanded pedestrian realm that supports high levels of pedestrian activity and the mixed-use character of the street.
- Provide wide sidewalks and boulevards with high-quality pedestrian-scaled streetscapes and amenities to encourage walking, lingering, dining and shopping.
- Use building setbacks, curb extensions or parklets to expand the space for sidewalks, outdoor seating, cafes, patios, planting, trees and frontage or marketing zones.
- Include strategically located and safe opportunities to cross the street so the street is not a barrier that separates neighbourhoods or discourages pedestrian activity.

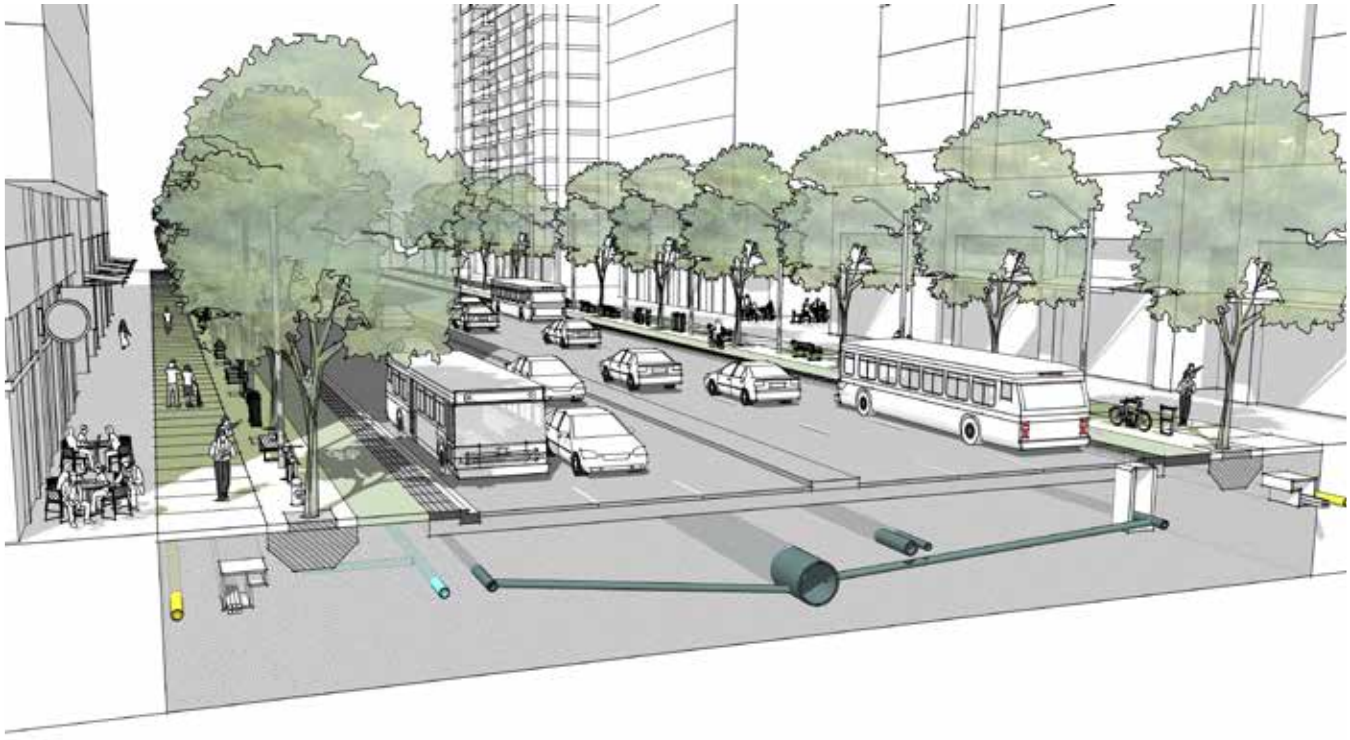


Figure 2.10. Demonstration of Urban Main Street

- Where possible, include curb extensions at side streets to expand the pedestrian realm along the main street, shorten crossing distance and reduce motor vehicle turning speed.

Cycling

- Provide separated cycle facilities, either protected bike lanes or cycle tracks along both sides of the street.
- Include generous bicycle parking areas in the boulevards.
- Plan for safe movement of cyclists through intersections, including reduced motor vehicle turn speeds, bike boxes, cross rides and/or protected intersections.

Transit

- Prioritize frequent and efficient transit use, including higher order BRT and LRT transit and Züm.
- Provide enhanced transit stops and stations, including sheltered seating, landscape elements and waiting areas.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

Motor Vehicles

- On-street parking and laybys are encouraged to support adjacent land-uses and provide traffic calming. Suitable replacement parking at off-street locations should be explored to minimize on-street conflicts.
- Locate vehicle driveways, loading and access points on side streets to minimize the visual and functional impact on the public realm.

Sustainable Infrastructure

- Support healthy street tree growth and greening with large open planters, tree pits or trenches with sufficient un-compacted soil volume to grow trees to a large and useful size.
- Integrate green infrastructure such as bioretention and native vegetation.

2.5.2 Neighbourhood Connectors

Neighbourhood Connectors are through streets that serve as major links between residential neighbourhoods. These streets typically have residential buildings along their edges, which are setback 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 parklands along the edges. Blocks are often long and uninterrupted, and the emphasis is on moving through the street rather than lingering along it.

Figure 2.11. Neighbourhood Connectors commonly include wide planting zones which buffer the roadway and the adjacent homes.

Figure 2.12. Neighbourhood Connectors often include multi-use paths within the boulevard.

Neighbourhood Connectors are an integral part of the transportation network and support medium to high volumes of vehicle traffic and often include surface transit routes.

While Neighbourhood Connectors play a role in enabling longer-distance travel and movement, it is important that these streets be incrementally improved to help create a safer and more inviting environment for pedestrians and cyclists. This includes providing increased greening and incorporating measures to reduce stormwater run-off**.**

Above ground utilities or other undesignated open spaces are often found along these streets. Strategies should be adopted to coordinate utilities and boulevard elements (e.g., cycle facilities and green infrastructure) to ensure that adequate access is provided for repairs.

APPLICATION

- City Major and Minor Arterials
- Residential Areas
- ROW: 25-50m

SAMPLE STREETS

- McLaughlin Road
- Bramalea Road

DESIGN OBJECTIVES

Pedestrian

- Include sidewalks or multi-use paths on both sides of the street to encourage active transportation for recreational and commuting purposes. Separate the pedestrian facility from vehicle lanes by trees, landscape strips, light standards, utility poles, signage, transit shelters, etc., to enhance the sense of security for pedestrians, improve splash protection and provide an area for snow storage.
- A higher pedestrian clearway width can be used where there are high volumes of pedestrian traffic, such as near schools or long-term care facilities.
- Provide safe controlled crossings to connect destinations, especially at mid-block transit stops, stations or schools or along blocks that are long and uninterrupted.

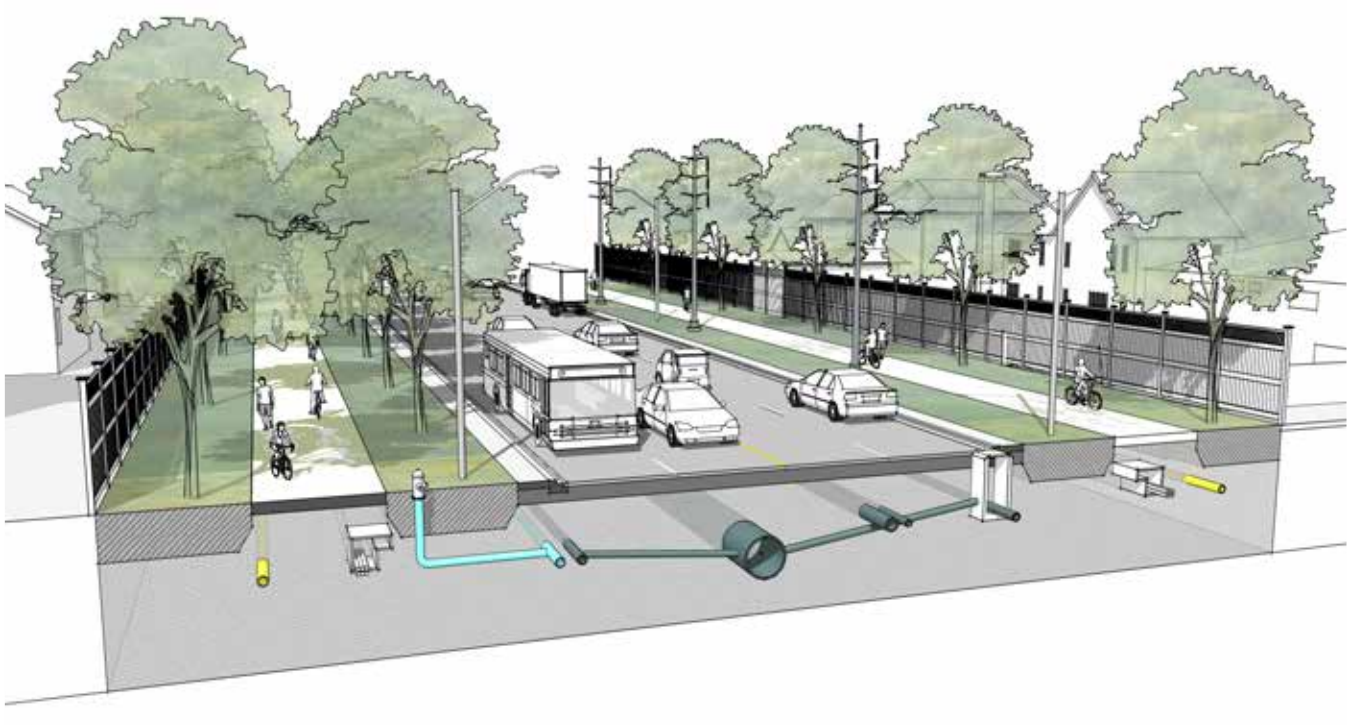


Figure 2.13. Demonstration of a Neighbourhood Connector Street

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide boulevard facilities for all ages and abilities on both sides of the street.
- For cycling infrastructure not included in the Active Transportation Master Plan, provide either boulevard facilities as above or either protected/ buffered bike lanes at roadway level.
- Plan for safe movement of cyclists through intersections, including reduced motor vehicle turn speeds, bike boxes, cross rides and/or protected intersections.
- Cycling infrastructure that intersects with transit stops must clearly indicate the need to stop when transit vehicles are boarding and alighting.

Transit

- Locate transit stops close to signalized intersections or other safe locations for pedestrians to cross.
- If transit stops are not located close to an existing crossing, relocate or introduce a new crossing to provide safe and accessible connections.
- Provide enhanced transit stops and stations, including sheltered seating, landscape elements and waiting areas.
- Provide frequent and convenient paths from adjacent neighbourhoods to the primary street and transit stops.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

Motor Vehicles

- Discourage and minimize cut-through traffic onto nearby residential streets.
- When entering neighbourhoods, raised crosswalks, tighter turning radii are encouraged to signal to vehicles that slower speeds are expected. Consider raised crosswalks or curb extensions to signal to motorists that slower speeds are expected.

Sustainable infrastructure

- Boulevards should have a predominantly soft landscape character with exceptions for transit stops or high-volume pedestrian areas such as schools.
- Buffer the sidewalk from adjacent homes and roadway with wide boulevard planting zones.
- Enhance environmental and landscape quality and character by incorporating tree planting, low maintenance native plantings and low impact stormwater management facilities within boulevards and setbacks.

2.5.3 Commercial Connectors

Commercial Connectors are through streets that serve as major links between Employment Areas in the City. Buildings along Commercial Connectors usually range from multi-storey commercial offices, to wholesale or large format retail, industrial, warehousing and distribution, manufacturing and processing facilities. Buildings are often set back from the property line with parking or landscaped frontages between the building and street.

Figure 2.14. Wide boulevards and setbacks along Commercial Connectors provide opportunities for enhanced environmental and landscape quality and character, and active transportation facilities.

Commercial Connectors are designed to accommodate frequent large vehicles such as tucks, tractor trailers and other delivery vehicles and must be supported with attractive transit facilities, cycle facilities and provide comfortable and accessible pedestrian facilities with enhanced tree canopy coverage.

Similar to Neighbourhood Connectors, blocks are often long and uninterrupted, and the emphasis is on moving through the street rather than lingering along it. Commercial Connectors generally have rights-of-way that enable the provision of wide boulevards on both sides of the street. Many of these streets are candidates to improve street tree planting and introduce stormwater control measures in the planting zone between the curb and the sidewalk (where present).

APPLICATION
- City Major and Minor Arterials
- Employment Areas
- ROW: 25-50m

SAMPLE STREETS
- Torbram Road (South of Walker Drive)
- Rutherford Road South

DESIGN OBJECTIVES

Pedestrian
- Provide attractive mobility options for workers and customers, especially to support reliable and convenient transit to employment and reduce motor vehicle congestion.
- Create a street environment that is safe and comfortable for pedestrians and cyclists to connect with transit stops or stations.
- Incorporate sidewalks on both sides of streets where there is an existing sidewalk on one side.
- Sidewalks should continue through driveways to prioritize safe and comfortable pedestrian movement.
- Provide improved crossing facilities and sidewalk connections to transit stops.

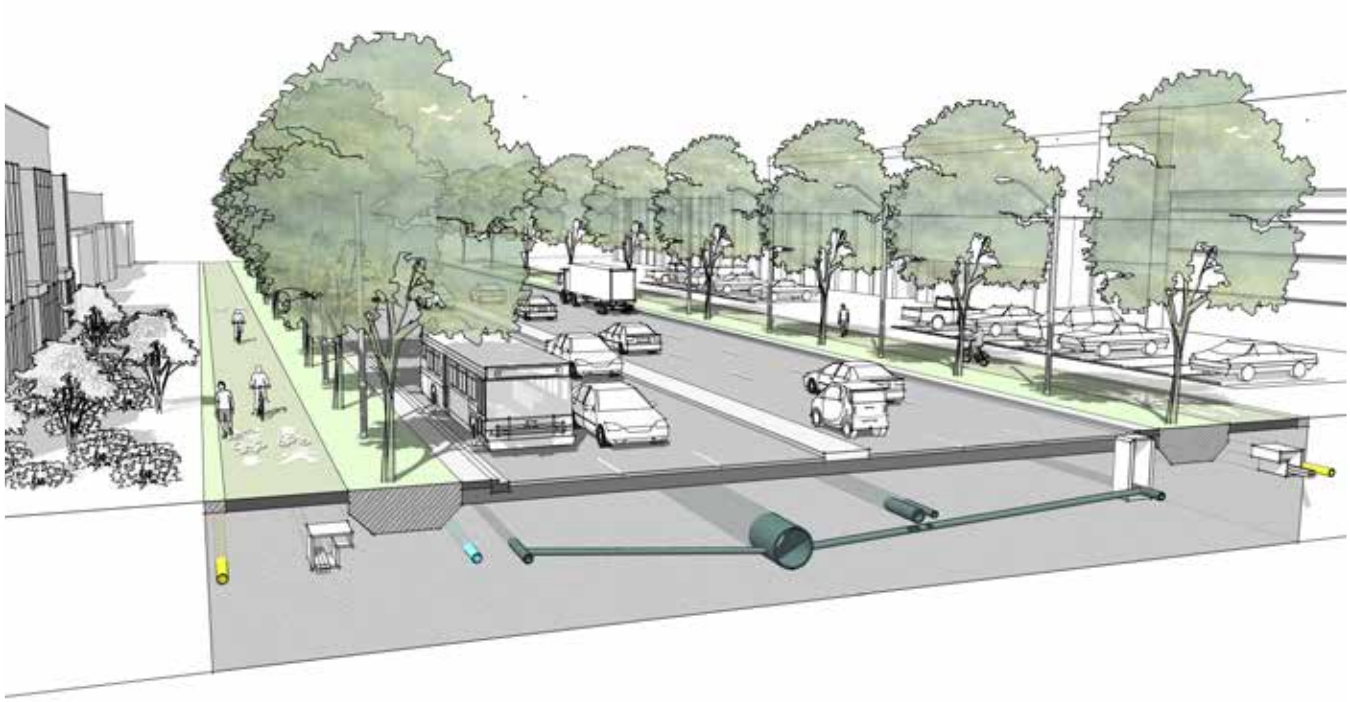


Figure 2.15. Demonstration of a Commercial Connector Street

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide boulevard facilities for all ages and abilities on both sides of the street.
- For cycling infrastructure not included in the Active Transportation Master Plan, provide either boulevard facilities as above or either protected/ buffered bike lanes at roadway level.
- Plan for safe movement of cyclists through intersections, including reduced motor vehicle turn speeds, bike boxes, cross rides and/or protected intersections
- Cycling infrastructure that intersects with transit stops must clearly indicate the need to stop when transit vehicles are boarding and alighting.

Transit

- Locate transit stops close to signalized intersections or other safe locations for pedestrians to cross.
- Provide enhanced transit stops and stations, including sheltered seating, landscape elements and waiting areas.
- Provide improved crossing facilities and sidewalk connections to transit stops.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.
- Encourage employers to participate in transportation demand management programs that promote ride-sharing, flexible work hours, bicycle parking, lockers and showers.

Motor Vehicles

- Accommodate access, loading and circulation by large vehicles on routes frequented by trucks.
- Design turning movements at intersections to accommodate large vehicles, while also providing safe and comfortable travel by pedestrians, cyclists.
- Discourage and minimize cut-through traffic onto nearby residential streets.

Sustainable Infrastructure

- Boulevards should have a predominantly soft landscape character with exceptions for transit stops or high-volume pedestrian areas.
- Enhance environmental and landscape quality and character with trees and low maintenance native plantings and low impact storm water management facilities within boulevards and setbacks.

2.5.4 Mixed-Use Neighbourhood

Mixed-Use Neighbourhood Streets are a new street typology recently developed in Mount Pleasant. As Brampton continues to intensify, Mixed-Use Neighbourhood Streets will serve a focus within the emerging Town Centres and nodes beyond the Downtown, and will serve as the focus for Brampton's future neighbourhoods. Mixed-Use Neighbourhood Streets are typically lined with buildings of a more modest low to mid-rise scale and have narrower rights-of way then Urban Main Streets.

Figure 2.16. Mixed Use Neighbourhood Streets include street tree planting and amenities to support a vibrant pedestrian environment.

Figure 2.17. Mixed Use Neighbourhood Streets often include on-street parking to support local businesses.

Mixed-Use Neighbourhood Main Streets will often occur near major transit hubs and or along transit priority routes and should be designed to support transit to the greatest extent possible.

These streets are often included as part of mixed-use pedestrian supportive developments. Moderate to high intensity pedestrian and cycling activity is anticipated. A high-quality pedestrian realm, active street frontages, and multi-modal travel options are high priorities.

APPLICATION

- City Local Streets or Collectors
- Town Centres and transit supportive nodes
- ROW: 18-30m

SAMPLE STREETS

- Inspire Boulevard

DESIGN OBJECTIVES

Pedestrian

- Provide boulevards with high quality design and pedestrian-scale amenities to encourage walking, lingering, dining and shopping and support high levels of pedestrian activity and mixed-use character.
- Use building setbacks, curb extensions or parklets to expand the space for sidewalks, outdoor seating, cafes, patios, planting, trees and frontage or marketing zones.
- Include strategically located and safe opportunities to cross the street so the street is not a barrier that separates neighbourhoods or discourages pedestrian activity.
- Include curb extensions on side streets to expand the pedestrian realm along the Main Street, shorten crossing distance and reduce motor vehicle turning speed.

Figure 2.18. Demonstration of a Mixed Use Neighbourhood Street

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide separated cycle facilities such as a protected bike lane or cycle track.
- For cycling infrastructure not included in the Active Transportation Master Plan, provide either boulevard facilities as above or either protected/buffered bike lanes at roadway level.
- Plan for safe movement of cyclists through intersections, including reduced motor vehicle turn speeds, bike boxes, cross rides and/or protected intersections.

Transit

- Locate transit stops close to signalized intersections or other safe locations for pedestrians to cross.
- Provide enhanced transit stops, including sheltered seating, landscape elements and waiting areas.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

Motor Vehicles

- On-street parking and laybys are encouraged to support adjacent land-uses and provide traffic calming.
- Restrict or consolidate driveways to minimize conflict between pedestrians and vehicles. Motor vehicle access for parking and materials handling is ideally provided behind buildings.

Sustainable Infrastructure

- Consider alternating on-street parking with planting strips in extended boulevards.
- Street trees and greening are highly desirable to provide a high-quality aesthetic and improve pedestrian comfort.
- Support healthy street tree growth and greening with large open planters, tree pits or trenches with sufficient un-compacted soil volume to grow trees to a large and useful size.
- Where space is constrained consider covered tree pits.
- Integrate green infrastructure such as bioretention, rain gardens, and native vegetation in curb extensions.

2.5.5 Neighbourhood Residential

Neighbourhood Residential Streets provide access to residential areas of the city and often mark the entrances to Brampton's Neighbourhoods. Predominately residential uses face the street, though stretches of rear facing lots and businesses may sometimes be present. Buildings vary in scale and are generally set back from the property line with well-established front yards and gardens.

Figure 2.19. Transit is often located on Neighbourhood Residential Streets.

Figure 2.20. Neighbourhood Residential Streets often include safe dedicated cycling facilities and multiple places for pedestrian to cross the street.

Neighbourhood Residential streets are collectors that are planned and designed to provide access to and from residential neighborhoods. These streets are not intended for the use of non-local traffic and are often found in areas with longer distances between signalized intersection.

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. Safety for people walking and cycling is priority and sidewalks should be designed for low to medium volumes of pedestrians with clear and well marked crossing features.

APPLICATION

- City Collectors
- Residential Areas
- ROW: 23-30m

SAMPLE STREETS

- Fernforest Drive

DESIGN OBJECTIVES

Pedestrian

- Provide sidewalks and safe controlled crossings to connect destinations, especially to the many trail crossings in the City, transit stops and neighbourhood destinations such as schools, playgrounds or recreation centres.
- Incorporate a planting strip between the curb and pedestrian clearway, where possible, to separate pedestrians from vehicle traffic and provide space for additional greening.

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide designated cycling facilities. Typically this would include on-road painted bike lanes and/or parking or protected/buffered bike lanes at roadway level.

Figure 2.21. Demonstration of a Neighbhourhood Residential Street

- Plan for safe movement of cyclists through intersections, including reduced motor vehicle turn speeds, bike boxes, cross rides and/or protected intersections.

Transit

- Locate transit stops close to signalized intersections or other safe locations for pedestrians to cross.
- Provide enhanced transit stops, including sheltered seating, landscape elements and waiting areas.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

Motor Vehicles

- When entering neighbourhoods, raised crosswalks, tighter turning radii are encouraged to signal to vehicles that slower speeds are expected.
- Frequent spacing of intersections and traffic calming should be included to reduce the speed of vehicles and reduce the amount of cut-through traffic.
- Individual front driveways, common to many of the established neighbourhoods, should be designed to meet sidewalks at grade.
- In more dense residential neighbourhoods, shared driveways or rear-accessed parking is encouraged to reduce conflicts between pedestrians and turning vehicles and sidewalks should be designed support a higher number of pedestrians.

Sustainable Infrastructure

- Include wide planting zones, especially using the frontage zone, to support a continuous tree canopy, low maintenance native planting and to integrate low impact stormwater control measures.
- Consider curb extensions and other traffic calming or diversion elements as ideal locations for green infrastructure.

2.5.6 Employment Collectors

Employment Collector Streets provide access to and from the Brampton's employment and industrial areas and often mark the entrances to Brampton's employment districts.

Figure 2.22. Employment Collectors are designed to accommodate frequent large delivery vehicles.

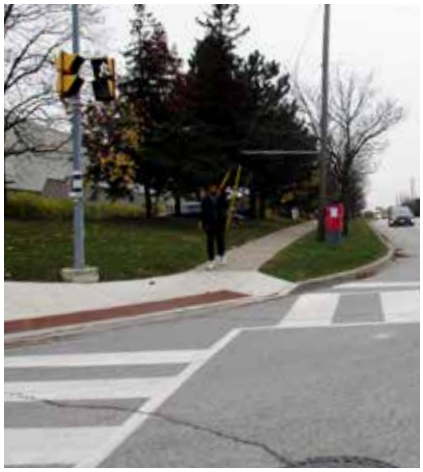


Figure 2.23. Employment Collectors will have safe controlled crossings to connect destinations, especially to transit stops and adjacent neighbourhood destinations.

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

Employment Collectors are designed to accommodate frequent large vehicles such as trucks, tractor trailers and other delivery vehicles and must be supported with attractive transit facilities, cycle facilities and provide comfortable and accessible pedestrian facilities.

APPLICATION

- City Collectors
- Employment Areas
- ROW: 23-30m

SAMPLE STREETS

- Clark Boulevard, east of Airport Road

DESIGN OBJECTIVES

Pedestrian

- Provide sidewalks and safe controlled crossings to connect destinations, especially to transit stops and adjacent neighbourhood destinations.
- Incorporate sidewalks on both sides of streets where there is an existing sidewalk on one side.
- Incorporate a planting strip between the curb and pedestrian clearway or multi-use path, where possible, to separate pedestrians from vehicle traffic and provide space for additional greening.
- Maintain sidewalk/multi-use path treatment and elevation across driveways.

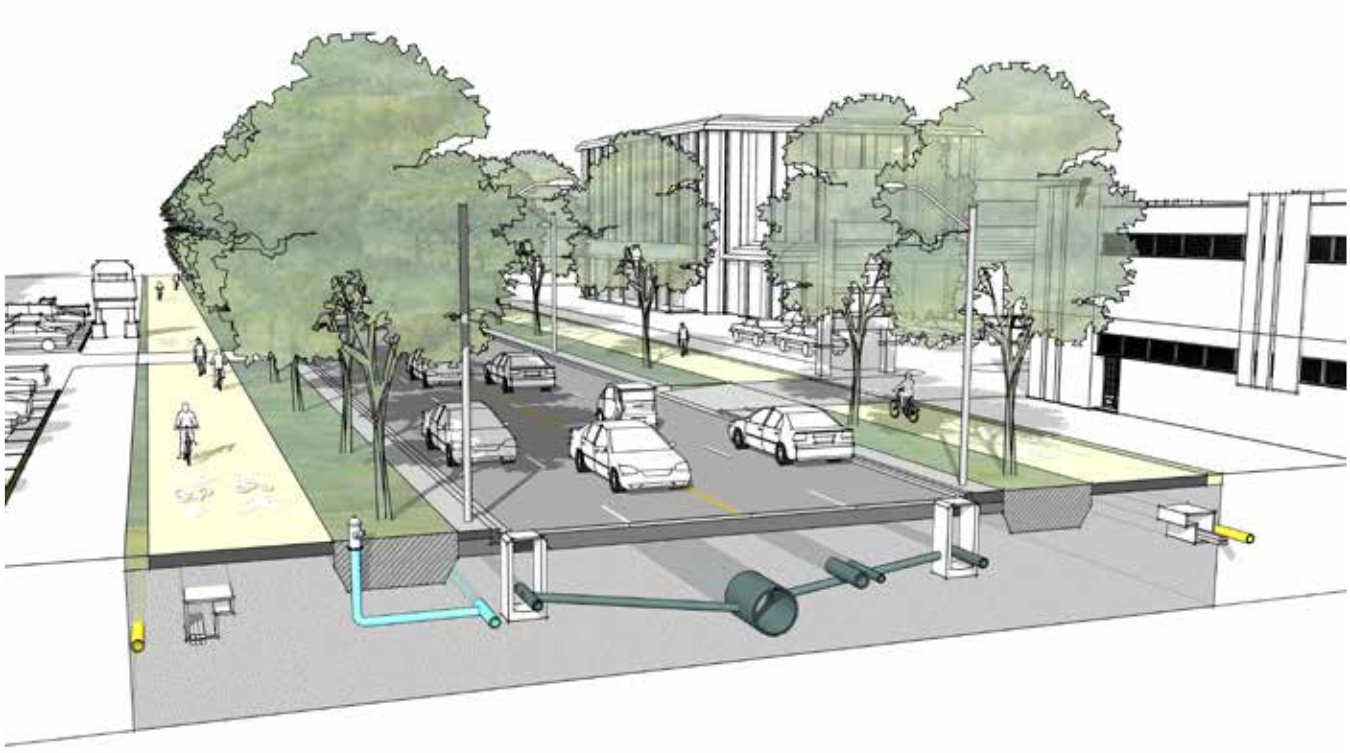


Figure 2.24. Demonstration of a Employment Collector Street

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide either boulevard facilities or protected/buffered bike lanes at roadway level.
- On-street bicycle facilities are preferred over boulevard facilities when there are many uncontrolled driveway crossings.
- Plan for safe movement of cyclists through intersections, including reduced motor vehicle turn speeds, bike boxes, cross rides and/or protected intersections.

Transit

- Provide attractive mobility options for workers, especially to support reliable and convenient transit to reduce motor vehicle congestion.
- Facilitate pedestrian access to transit stops with safe and convenient pedestrian crossings.
- Locate transit stops close to signalized intersections or other safe locations for pedestrians to cross.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

Motor Vehicles

- Balance the efficient movement of freight and truck traffic with the benefits of managing motor vehicle speeds.
- Design turning movements at intersections and site access to the smallest possible radius that can accommodate large vehicles.
- Use shared access management to reduce the frequency of access points and conflicts and to help manage traffic flow and safety.

Sustainable Infrastructure

- Include wide planting zones, especially using the frontage zone, to support a continuous tree canopy, low maintenance native planting and low impact stormwater control measures.

2.5.7

Downtown Streets

Downtown Streets are smaller streets concentrated within Brampton's historic downtown and serving important commercial, office and institutional uses as well as a growing mixture of residential and retail uses. The majority of people travelling along these streets are visiting shops or businesses and as such have lower traffic speeds and volumes then the collectors and connectors. Due to their importance, visibility, and high levels of pedestrian activity, Downtown Streets should have high levels of pedestrian amenities, and distinctive, formal design treatments.

Figure 2.25. Downtown Streets support a high level of pedestrian activity,

Downtown streets have shorter block lengths and handle high pedestrian volumes and high levels of activity. Buildings typically have their front door directly onto the sidewalk with active uses at the street level. Downtown Streets typically connect destinations such as the Riverwalk, Town Hall and Garden Square and are major streets in the transportation network.

Pedestrians are the priority and a generous and well-appointed public realm is expected along these streets. These streets should be designed to support a high level of pedestrian activity, retail uses and accommodate activities to enliven the sidewalks, like patios and outdoor seating, where space permits.

APPLICATION

- City Collector and Local Streets
- Right-of-Way 15-30m

SAMPLE STREETS

- George Street

DESIGN OBJECTIVES

Pedestrian

- Provide a high level of pedestrian amenities and street furniture
- Include strategically located and safe opportunities to cross the street so the street is not a barrier or discourages pedestrian activity.
- Consider ways to create an attractive environment that complements and extends the life of adjacent Urban Main Streets.
- Where possible, include curb extensions at intersections to calm traffic, shorten pedestrian crossing distances and expand the pedestrian realm.
- Consider patios, parklets and street cafes to contribute to an intimate, vibrant urban setting.

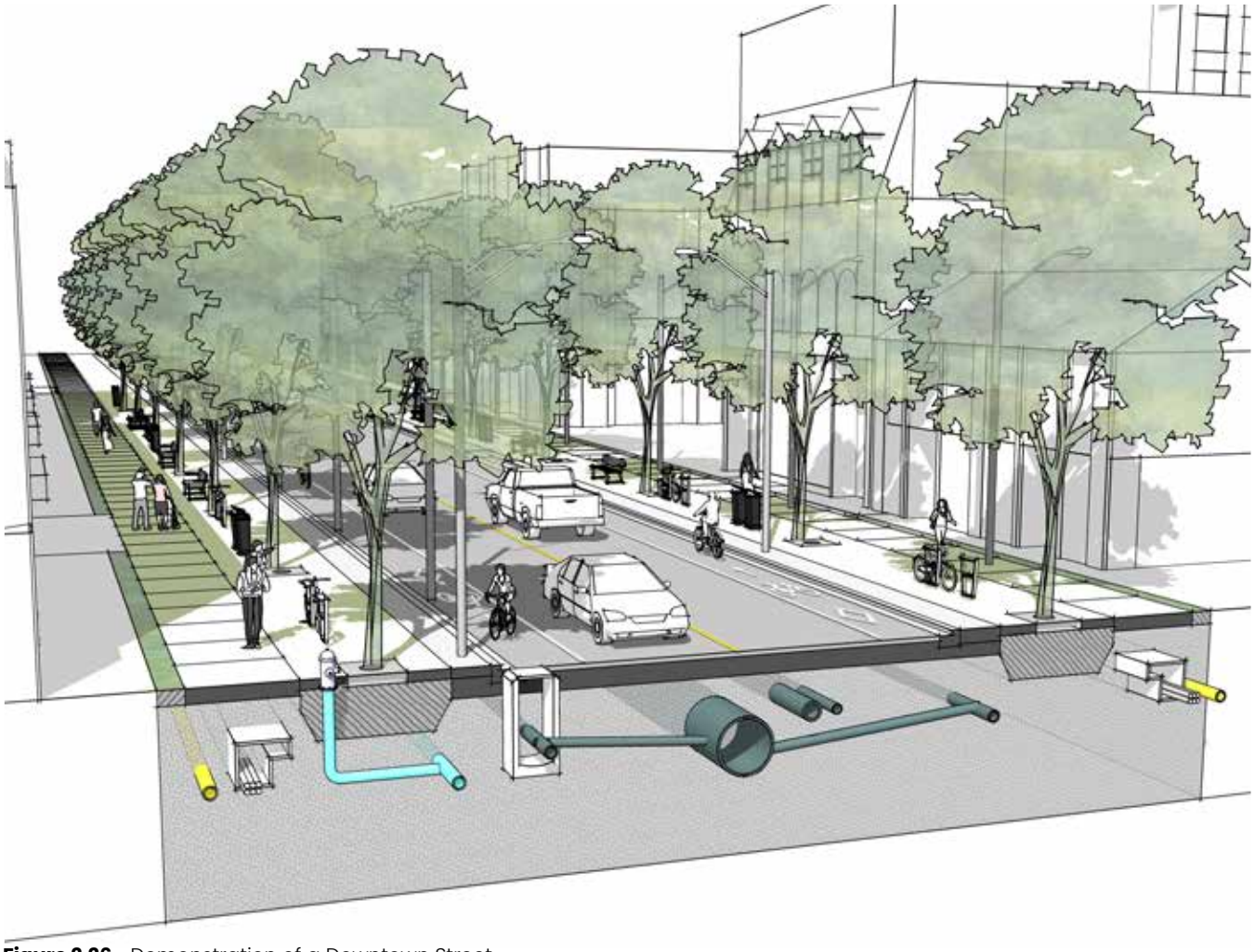


Figure 2.26. Demonstration of a Downtown Street

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide dedicated cycle facilities. Due to high levels of pedestrian activity, separate cyclists and pedestrians to avoid conflicts.
- Provide short term cycle parking in the furnishing and planting zone to separate and buffer the sidewalk from the roadway and in the form of clusters within curb extensions.

Transit

- Provide enhanced transit stops and stations, including sheltered seating and waiting areas integrated into the streetscape.
- Ensure clear and accessible paths from sidewalks and stops to vehicles.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

• Motor Vehicles

- Rear-accessed parking and loading is encouraged to reduce conflicts between pedestrians and turning vehicles.
- Where space is available provide on-street parking and loading to support local businesses.

Sustainable Infrastructure

- Where space permits use trees, planters and other greening to provide a high quality aesthetic experience. Soil cells, tree grates or planter beds may be required where soil volumes are limited by available space.
- Where possible, replace paved areas with permeable materials (e.g., medians, dedicated parking lanes/ lay-bys). However, do not use permeable materials within the pedestrian clearway.

2.5.8 Local Residential Streets

Local residential streets have relatively low traffic volumes and lower speeds and prioritize active neighbourhood life. Local Residential Streets are the most numerous streets in Brampton.

Figure 2.27. Local Residential Streets in Brampton generally have a planting zone between the curb and sidewalk.

c: Unknown

Figure 2.28. Local Residential Streets often include curb extensions to calm traffic.

Buildings range from single family homes, low-rise multi-family and mid-rise apartments, to high-density residential apartments in the downtown and town centres. Residential buildings are typically set back from the property line, though in the core and centres the buildings may be closer to the sidewalk. Local Residential Streets places that support social gatherings and cultural activities, such as yard sales, festivals or block parties.

These streets serve local movement, are not intended for through vehicle traffic, and do not play a major role in the broader transportation network. Pedestrian and bicycle safety is priority on these streets and Local Residential Streets should feel safe, comfortable, and be places where you get to know your neighbours.

APPLICATION

- City Local Streets in Residential Neighbourhoods
- ROW: 17-20m

SAMPLE STREETS

- Craig Street
- Reigate Avenue

DESIGN OBJECTIVES

Pedestrian

- Where possible, provide curb extensions and reduced turn radii at intersections to calm traffic, reduce pedestrian crossing distances and improve sightlines for all users.
- Promote social and community interaction and activities, both across and along the street, including accommodating community events such as street parties, yard sales or children playing.

Cycling

- Expected to operate in mixed traffic, since volumes and speeds are low.
- Include raised crossings at intersections to reduce the speed at which vehicles turn by bringing the vehicle crossing up to (or near) the sidewalk level. In addition, the raised crossing is a signal to turning cars that through-moving bikes and

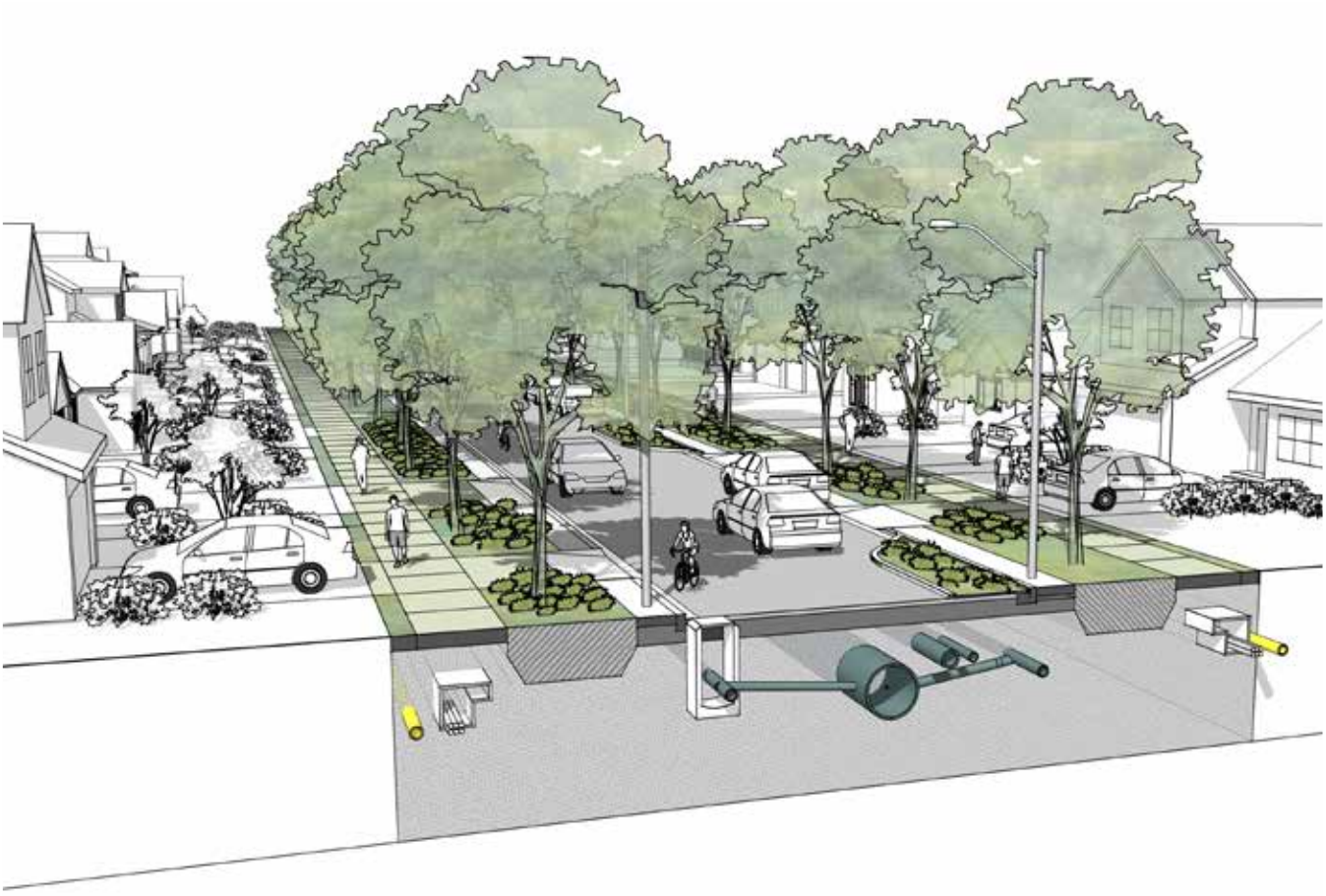


Figure 2.29. Demonstration of a Local Residential Street

pedestrians have the right of way.
- Include accessible access points to park paths and recreational trails.

Transit
- Often not anticipated in residential areas.
- Provide dedicated walkways to connect with transit stops, stations and local destinations, particularly in culs-de-sac and crescents.

Motor Vehicles
- Focus on slowing traffic, providing usable space and amenities, and making improvements that encourage residents to take pride and ownership of the streetscape outside their front door.
- Frequent spacing of intersections and traffic calming should be included to reduce the speed of vehicles and reduce the amount of cut-through traffic.
- Individual front driveways, common to many of the established Local Neighbourhood Streets, should be designed to meet sidewalks at grade.
- In more dense residential neighbourhoods, shared driveways or rear-accessed parking is encouraged to reduce conflicts between pedestrians and turning vehicles. Sidewalks should be designed support a higher number of pedestrians.
- Where parking is provided, elements such as curb extensions and bump-outs should be used to create visual and physical perception of a narrower roadway that is more conducive to slower speeds.

Sustainable Infrastructure
- Provide green space and landscaping and promote a robust canopy of trees. Consider opportunities to manage stormwater at source as much as possible to reduce impact on sewers and promote natural water infiltration.
- Planting zones between the clearway and the curb provide a buffer and improve the environment for pedestrians and neighbourhood residents.

2.5.9 Local Employment Streets

Local Employment Streets are typically found outside of the Downtown and Centres and provide access to industrial or commercial businesses. The design of Local Employment Streets needs to balance elements for maneuverability of large trucks 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.

Figure 2.30. Local Employment Streets often have multiple driveway access points.

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 may be longer to accommodate more land extensive uses and large building footprints. While traffic volumes and speeds are low, the presence of large trucks requires careful attention to the design of pedestrian and cycling infrastructure.

APPLICATION

- City Local Streets in Employment Areas
- ROW 23m or less

SAMPLE STREETS

- Bramtree Court

DESIGN OBJECTIVES

Pedestrian

- Provide continuous sidewalks or multi-use paths on both sides of the street.
- Incorporate a planting strip where possible, to separate pedestrians from vehicle traffic and provide space for additional greening.
- Where driveways intersect with sidewalks maintain the sidewalk/multi-use path elevation across driveway and maintain the surfacing materials treatment (concrete) of the sidewalk.

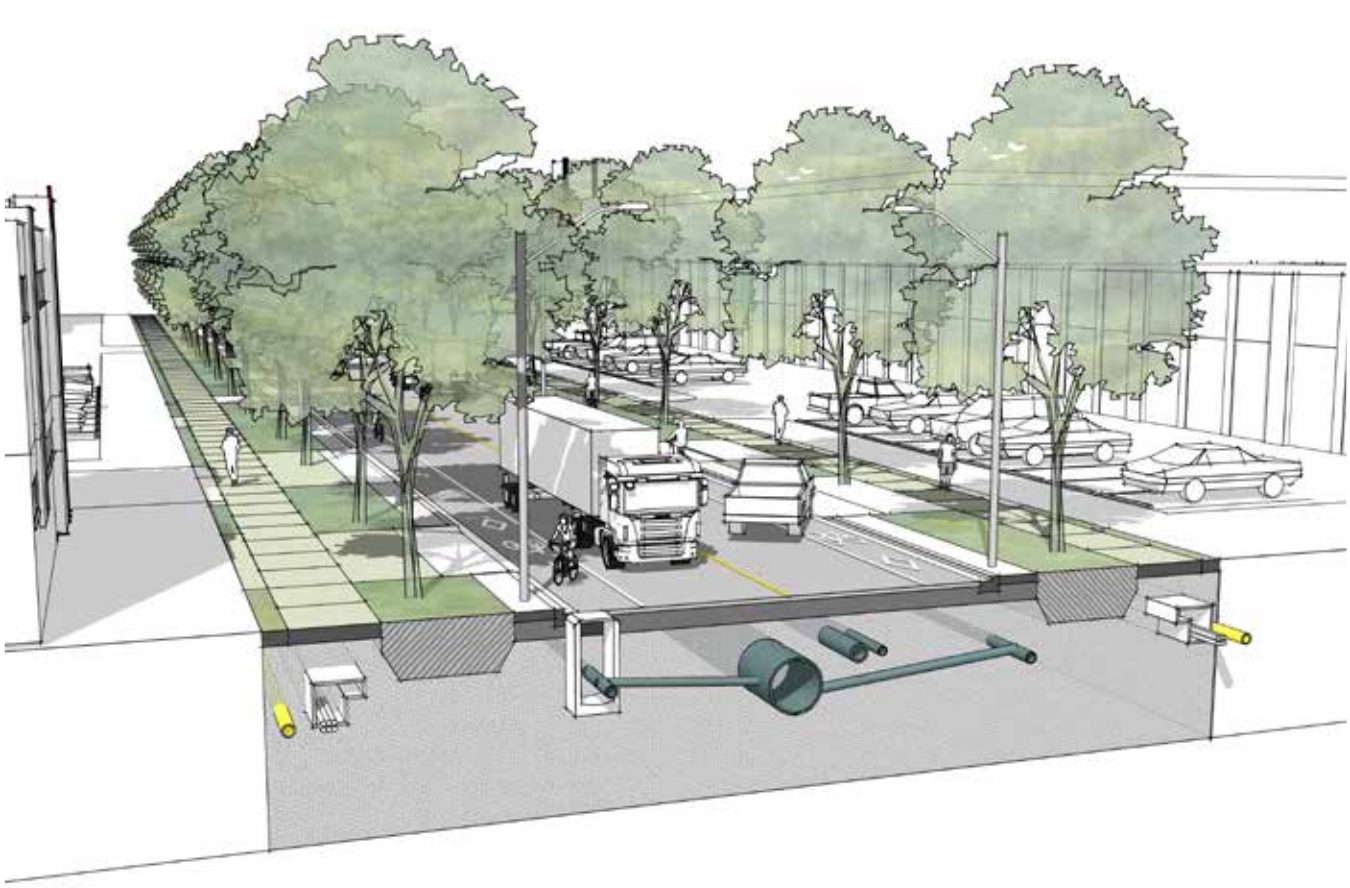


Figure 2.31. Demonstration of a Local Employment Street

Cycling

- For bicycle routes identified in the Active Transportation Master Plan provide dedicated or shared cycle facilities.
- On-street bicycle facilities are preferred over in-boulevard facilities where there will be many uncontrolled driveway crossings.

Transit

- Provide attractive mobility options for workers, especially to support reliable and convenient transit to reduce motor vehicle congestion.
- Provide dedicated walkways to connect with transit stops, stations and local destinations, particularly in culs-de-sac.
- Provide enhanced amenities (e.g. benches/shelters) and transit operations priority where transit service is present.
- Design stops to consider safe and predictable interface with cycling facilities, if provided.

Motor Vehicles

- Balance the efficient movement of freight and truck traffic with the benefits of managing motor vehicle speeds.
- Design turning movements at intersections and site access to the smallest possible radius that can accommodate large vehicles.
- Use shared access management to reduce the frequency of access points and conflicts and to help manage traffic flow and safety.

Sustainable Infrastructure

- Include a wide planting zone especially using frontage zones to support a continuous tree canopy and to integrate stormwater control measures
- Consider landscape medians for additional greening opportunities and place-making

2.5.10 Shared Streets

Shared Streets are a new street typology for Brampton's Downtown and those areas supported by high levels of pedestrian activity.

Figure 2.32. Shared Streets are designed to have all users move at the same speed as pedestrians to ensure a safe and accessible environment.

Shared Streets are typically designed without raised curbs to define the travelway, with all parts of the street blended together as a single grade or surface. All modes of travel are welcome but move at extremely low speeds. Buildings are generally located close to the property line and clearly define the street edges. Shared Streets can support a variety of land uses, including commercial, entertainment, dining, and residences. Shared Streets can have a flexible design to support different uses and seasons.

The design of shared streets should emphasize their pedestrian scale and calm traffic. They enable a generous pedestrian realm on narrow streets and create pockets of usable open space to act as front yards in residential areas or places for gathering or seating in commercial areas.

DESIGN OBJECTIVES

- Create street conditions for low motor vehicle volumes and slow travel speeds to facilitate shared use of the street by pedestrians, cyclists and motor vehicles.
- Design the streetscape to be flexible in nature to support the variation of mixed-uses and accommodate the access requirements to private development.
- Incorporate surface treatments that read as pedestrian territory on which vehicles can trespass with care.
- Provide delineation of uses and cues to users across the width of the right-of-way by using variations in paving materials or elements such as tree planting, rolled curbs or street lighting.
- Restrict vehicular access and prohibit parking. Delivery vehicles can be allowed during certain times of day if required, but generally plan for deliveries to the rear access of properties.
- Provide street furniture to add character and support a range of activities.
- Include programmable spaces for community needs. In residential settings, shared streets can function as public space for recreation and socializing.

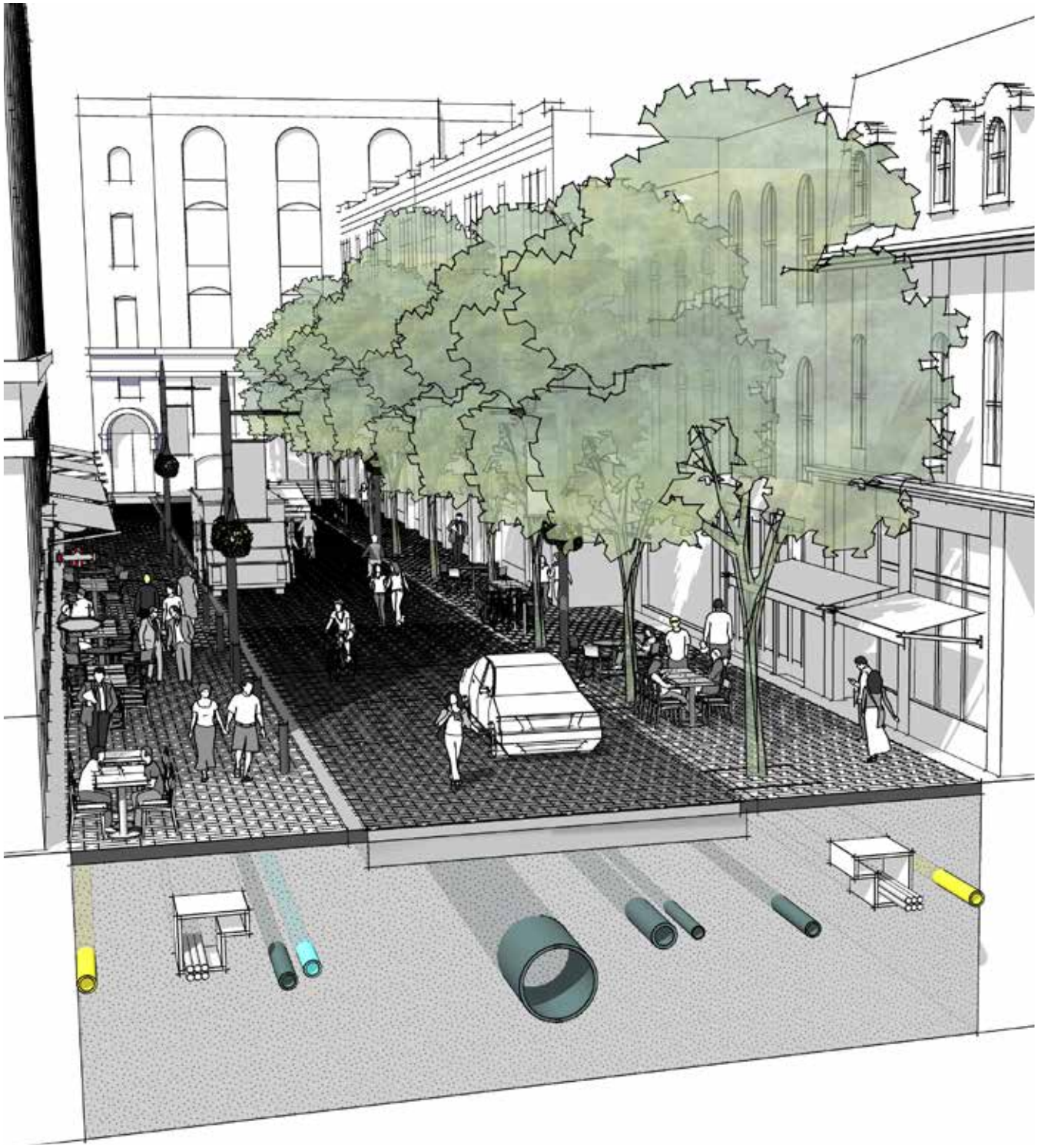


Figure 2.33. Demonstration of a Shared Street

2.5.11

Lanes

Lanes are currently found in the Downtown and are applicable to other planned mixed-use areas in the city. Lanes support servicing access to mid- and high-rise buildings of various uses. They are typically narrow access routes flanked by the rear or side faces of abutting properties. Lanes provide access for deliveries, waste collection and parking garage entrances.

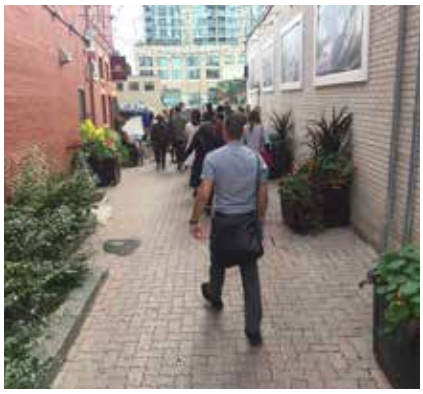


Figure 2.34. Lanes provide access to properties for pedestrians and vehicles, and can include enhanced elements and materials to elevate its design quality.

Where active commercial uses address the lanes, they can become part of a vibrant pedestrian network. Lanes help to restrict or minimize driveway access from the Urban Main Streets and improve the pedestrian and cycling environment. Lanes are typically significantly narrower than Local Streets and much shorter–commonly just one block long.

Lanes are a very minor link in the overall transportation network. Although their primary role is for service and access, lanes can be used as shortcuts or mid-block connections to neighbourhood destinations by pedestrians and bicyclists.

Lanes should be designed to be pedestrian-scale and emphasize pedestrian use.

DESIGN OBJECTIVES

- Lanes may also include seating, landscaping, and pedestrian lighting to create usable public spaces.
- Lanes should anticipate through-access by cyclists and the use of lanes as an informal public space
- Locate Lanes to connect to transit stops.
- Support adjacent commercial and residential uses by providing access to the rear of buildings for service, delivery, loading and parking garage access.
- Minimize cut-through vehicle traffic and design for slow moving speeds.
- Include traffic calming devices to reduce speeds.
- Although space for tree planting is limited, Lanes provide opportunities to introduce stormwater control measures and planting to create more inviting and useful spaces.
- Consider opportunities for permeable paving where other LID stormwater management techniques are possible.

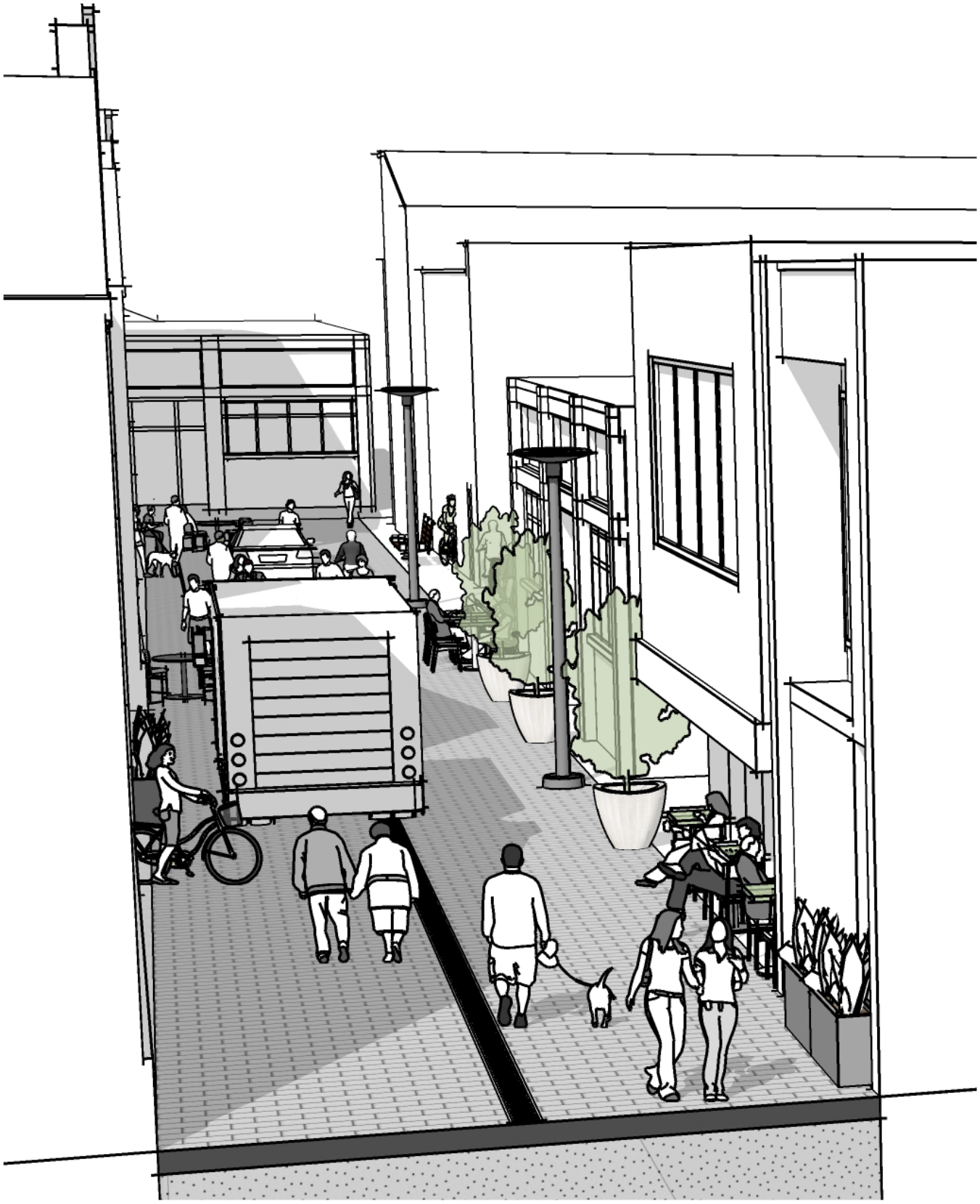


Figure 2.35. Demonstration of a Lane

2.6 Draft Character-Based Network Plan

Complete street treatments will play a vital role in transforming Brampton's roads into active streets that promote greater integration between land uses and the local context that surrounds and serves them. The figure on the next page identifies the potential location of the 11 Brampton Street Types.

The Draft Character Based Network Plan was created based on the existing street type and usage, land use and built context, overlays (including modal priories and special use), and aspirations in the Official Plan.

The plan is a tool to assist the practitioner understand the relationship of a street with its context and does not reflect or consider every possible planned condition, segment or technical issue that may influence the design of a street.

The context of a street may change as new plans are developed over time. As such, the City may wish to refine the typology maps presented in the Guide to ensure the process of street design incorporates the most current planning information that is available.

Local Streets make up the largest proportion of the network, which means that cost-effective Complete Streets solutions are likely to have the greatest impact on these streets. While major redesigns and investments on specific local streets are sometimes appropriate, the benefits are seen mostly by those who live nearby.

Urban Main Streets, Mixed-Use Neighbourhood Streets and Downtown Streets, on the other hand, make up a small proportion of the street network, but are generally used by a greater majority of residents and visitors. Unique, transformative solutions may be more relevant for these street types to allow them to reach their full potential and benefit more people.

Neighbourhood and Employment Connectors make up a moderate proportion of the network and smaller cost-effective enhancements as well as larger transformative redesign may be applicable.

Shared Streets and Lanes are not included on the plan.

Figure 2.36. Streets under Region of Peel jurisdiction (Source: City of Brampton, September 2020)

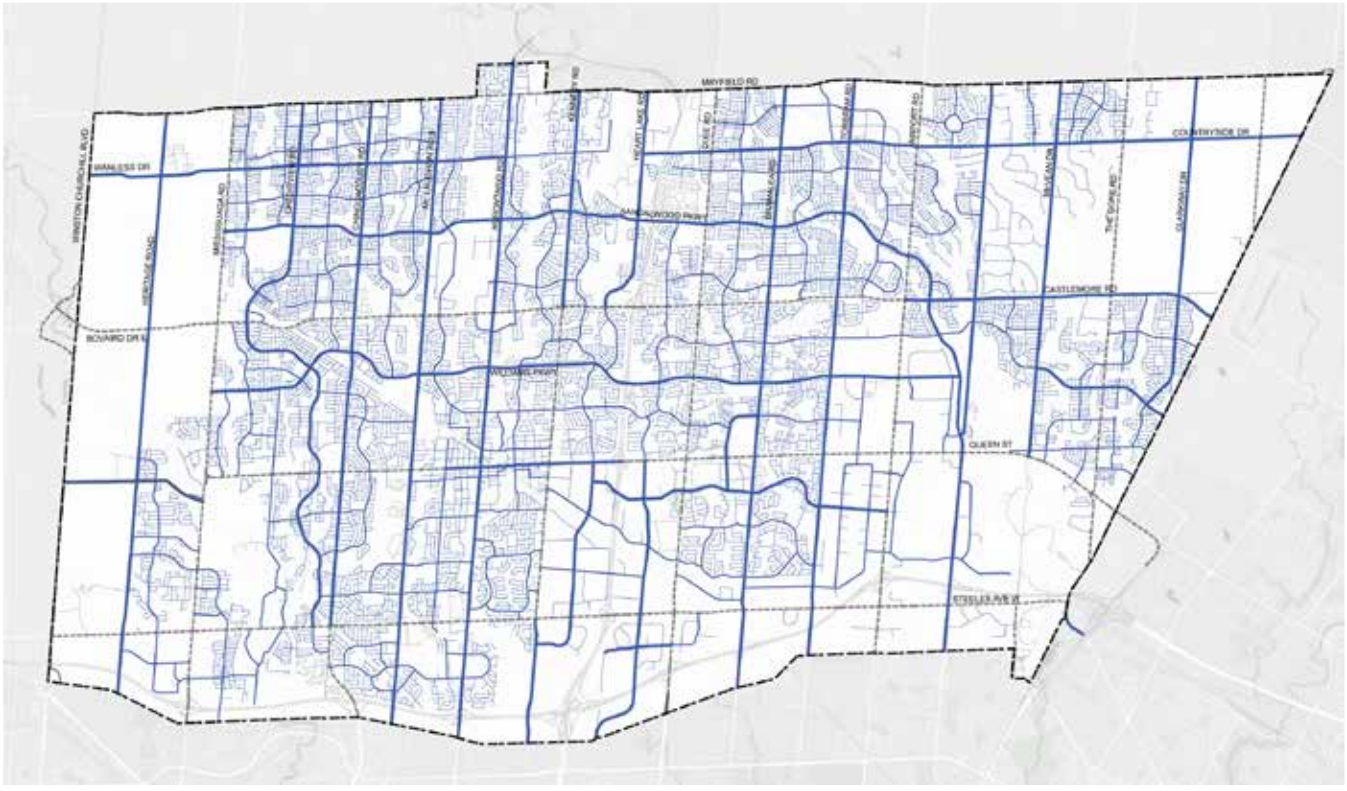


Figure 2.37. Streets under City of Brampton jurisdiction (Source: City of Brampton, September 2020)

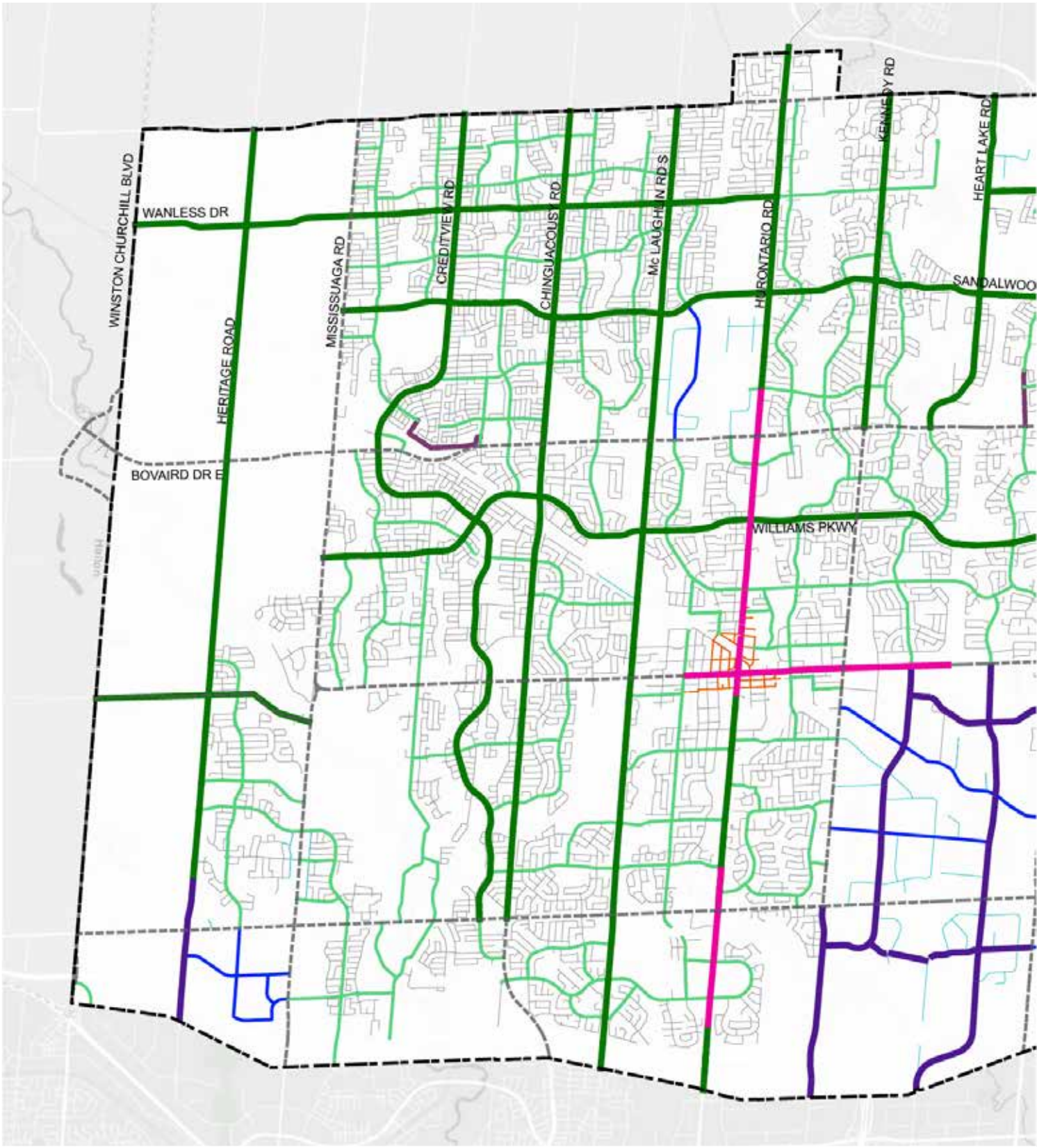
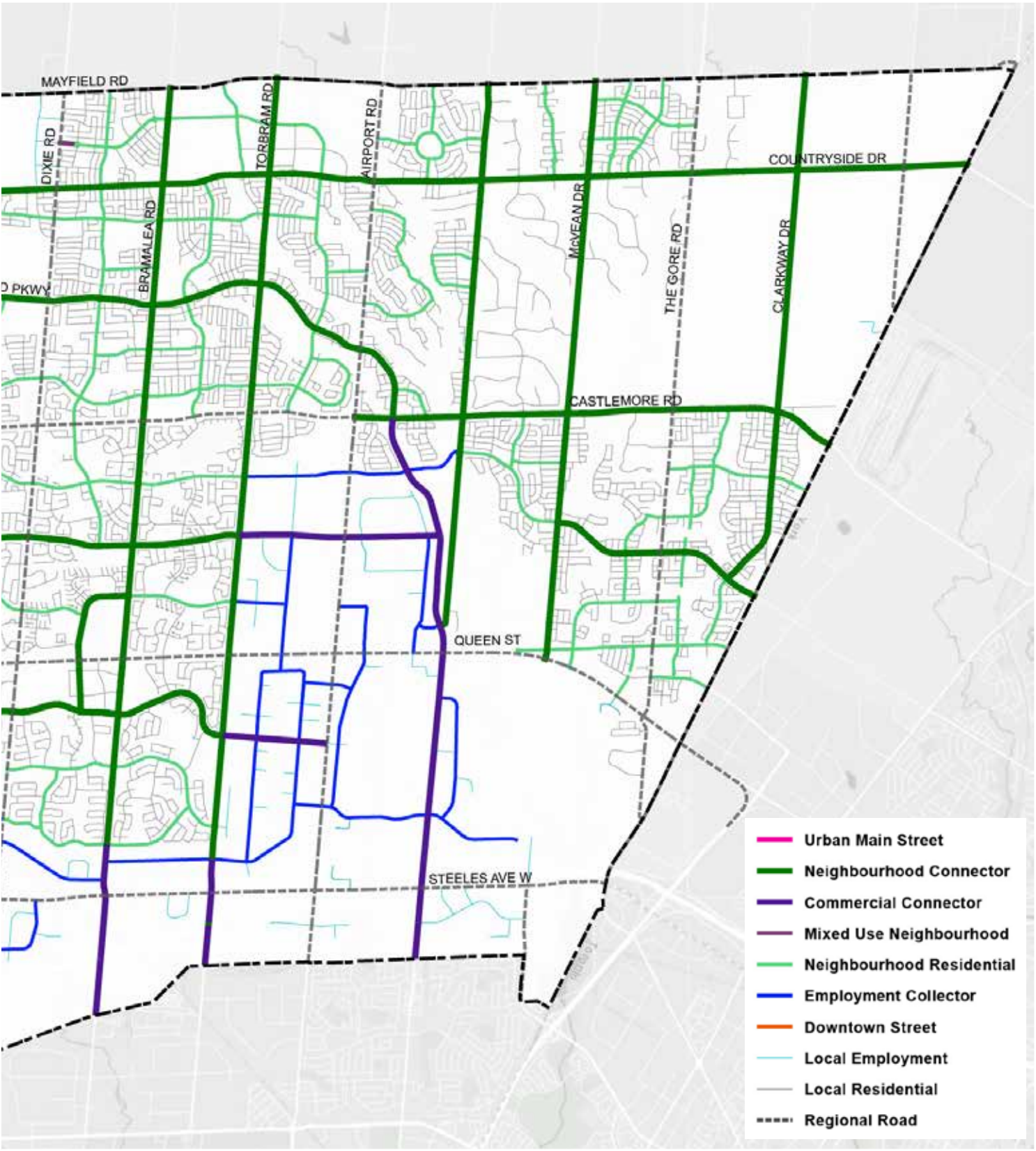
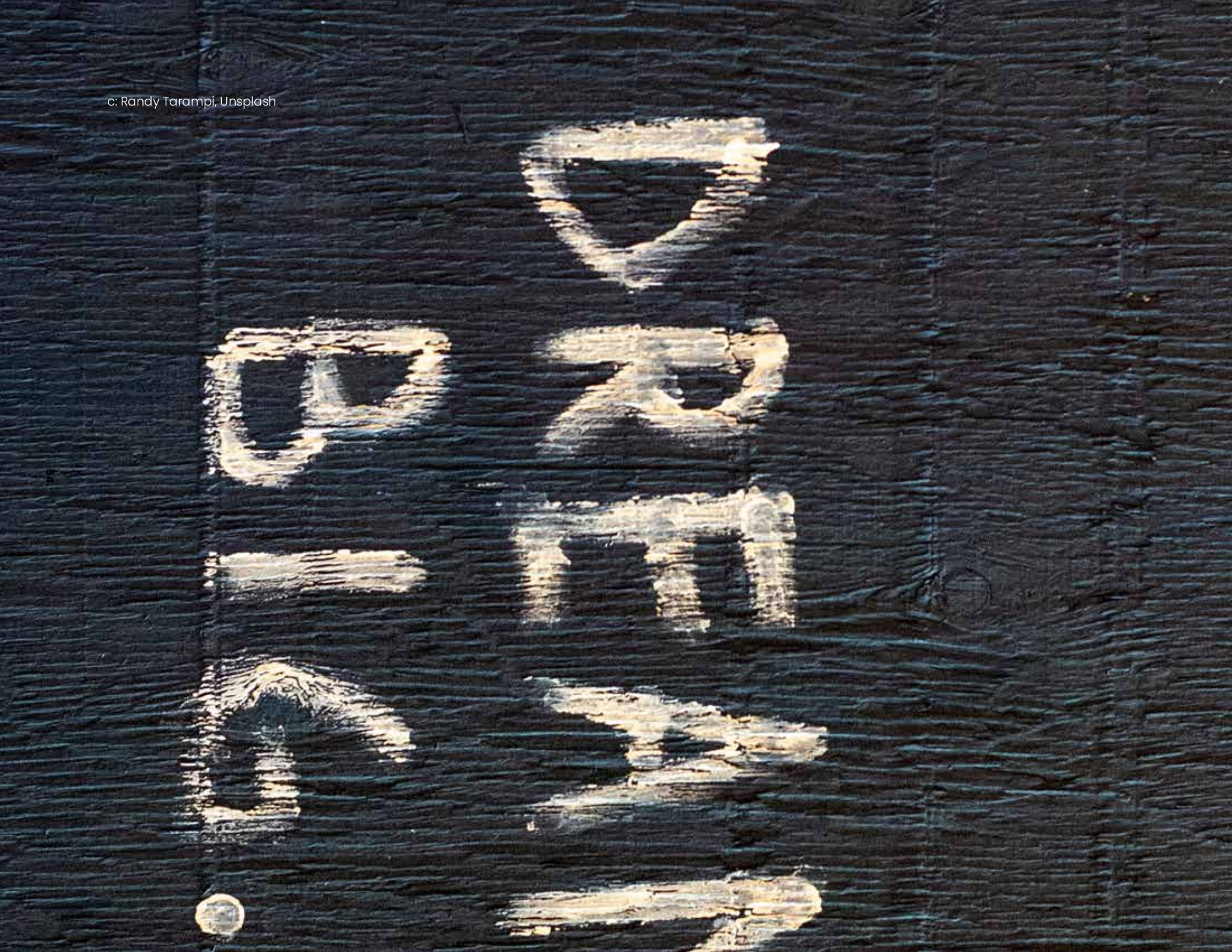


Figure 2.38. Draft Character-Based Network Plan


MAYFIELD RD
DIXIE RD
TORBRAM RD
AIRPORT RD
COUNTRYSIDE DR
BRAMALEA RD
McVEAN DR
THE GORE RD
CLARKWAY DR
CASTLEMORE RD
QUEEN ST
STEELES AVE W
Urban Main Street
Neighbourhood Connector
Commercial Connector
Mixed Use Neighbourhood
Neighbourhood Residential
Employment Collector
Downtown Street
Local Employment
Local Residential
Regional Road



c: Randy Tarampi, Unsplash

3

STEPS TO STREET PLANNING AND DESIGN

Chapter 3 provides an overview of key tactics to consider throughout the street design process, with each working together to achieve Brampton's Complete Streets vision and guiding principles introduced in Chapter 1.

3.1 Key Directives for Decision Making

The guidance that follows will form the decision making framework for Complete Streets. This framework builds upon the vision and guiding principles stated in Chapter 1 and the fundamental concept of street context discussed in Chapter 2.

Making decisions for Complete Streets requires all involved in the planning and design process to understand and consider a wide range of subjects for every project, from beginning to completion, no matter the scale or complexity.

The decision making framework will help to ensure that Brampton streets can achieve and satisfy official policy direction from the Province of Ontario, Region of Peel and Brampton City Council, as well as implement the latest best practices and industry trends.

To achieve Complete Streets, design teams will take on the challenge of re-balancing the limited space available in a public right-of-way. Enhancing and accommodating new activities on a street requires moving away from an auto-centric approach that privileges drivers over all others. Design teams will consider the full range of users, uses, issues and details. Sometimes it is clear how to satisfy project objectives and deliver a Complete Street. Other times it is challenging, particularly when competition arises for available space and between the optimal needs of each user. This chapter will inform the design process and assist with the sometimes-difficult decisions that arise when assembling a street.

This section introduces 16 key directives under five categories: safety, link, place, greening, and life-cycle and maintenance. Each directive includes an introductory statement with elaboration, guidance to consider when designing streets, and sources for more information (City of Brampton policies, provincial or national guidance, or best practices).

Figure 3.1. The Complete Streets Decision Making Framework and Key Directives

Table 3.1 Key Directives for Decision Making

Safety	Link	Place	Greening	Life-Cycle and Maintenance
Prioritize Vulnerable Users	Understand and Accommodate Desire Lines	Respect Context	Street Trees	Understand the Total Cost
Reduce and Manage Vehicle Speed	Design for Person Throughput and Mobility	Ensure Pedestrian Comfort	Stormwater Management	Support Four-Season Use of Streets
Accommodate the Smallest Possible Design Vehicle	Design Complete Streets to Support a Complete Network		Preserve Existing Vegetation	Select Robust Materials
Minimize Exposure Risk	Enhance Network Connectivity			
Maximize Predictable and Self-Regulating Design				

3.1.1 Safety Directives

Safety is of paramount importance in Complete Street design. All decisions will first consider, without compromise, the safety of all road users. The key directives to inform safer street design are to prioritize vulnerable users, manage vehicle speed along corridors and at intersections, minimize risk and improve predictability.

Figure 3.2. Pedestrians are the most vulnerable road users.

Figure 3.3. Cyclists are also vulnerable road users and have a high risk of injury and mortality during a collision with motor vehicles.

PRIORITIZE VULNERABLE USERS

Vulnerable users such as pedestrians, especially children, the elderly, and individuals with disabilities, and cyclists are at greater risk of injury and mortality during a collision than vehicle occupants. All users will feel safe on Brampton streets always.

Design and operate streets to accommodate a wide variety of users and uses while prioritizing the safety of the streets most vulnerable. The mass differential between street users results in more serious injuries to the lighter of the two colliding bodies. The force of the collision increases as user weight and speed increases.

Reducing speed is a critical aspect to improve safety for the most vulnerable. Street design will not exclude any one user or put them in harm's way because they are too small, too young, or too slow. The practitioner will consider the safety of vulnerable users throughout every stage of the street project delivery process.

Street design that prioritizes vulnerable users will consider:

- Lower speeds to reduce severe injuries and deaths.
- Fewer and narrower travel lanes to slow speeds and shorten crossing distances and exposure.
- Curb extensions and tighter corners to slow turning speeds.
- Separation between different users, and greater separation with increasing speeds.
- Bicycle facilities that respond to street context and inputs such as vehicle volumes and operating speeds.
- Make cyclists and pedestrians more visible at conflict points (for example, to turning vehicles at intersections).
- Fewer and narrower driveways with proper ramps to privilege people on sidewalks.

More Information

- TAC 2017. Geometric Design Guide for Canadian Roads Part 1, 1.2.5.2 - 1.2.5.4.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.
- Region of Peel (2018). Vision Zero Road Safety Strategic Plan 2018-2022.
- Global Road Safety Partnership, World Bank Group (2015). https://www.grsproadsafety.org/resources/good-practice-manuals/

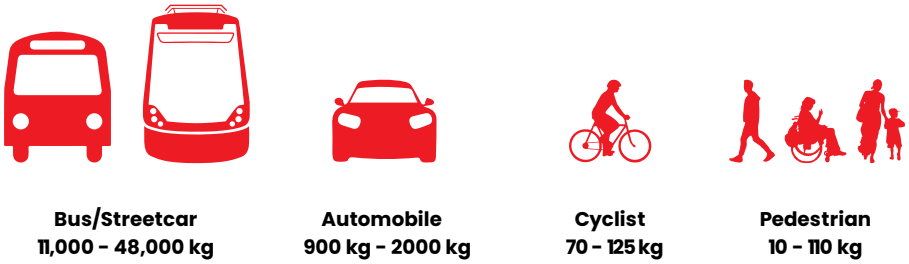


Figure 3.4. Mass of Various Street Users.

The severity of a crash increases as the mass and/or the speed increases. The lighter of the two objects will always sustain the more severe injuries or damage.

source: Adapted from NACTO Urban Street Design Guide; DTAH

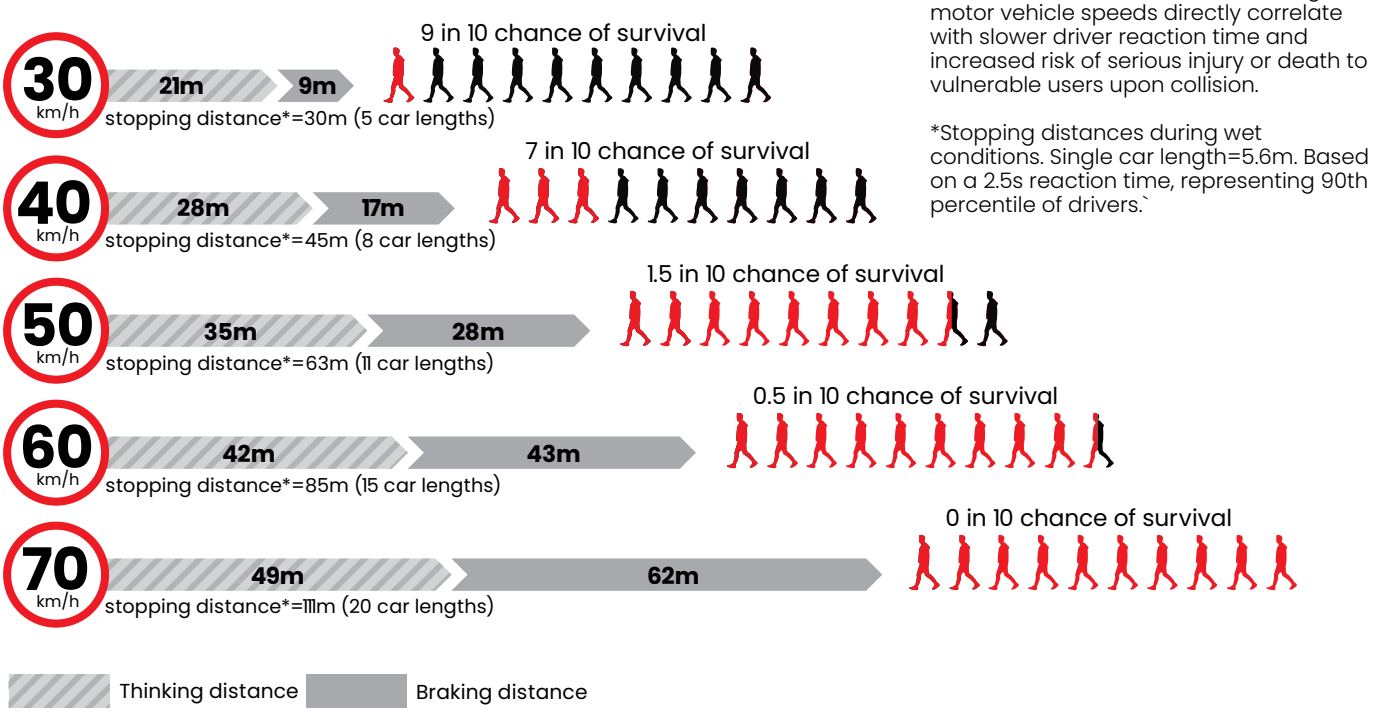


Figure 3.5. Vehicle Speed, Stopping Distance, and Chance of Survival. Higher motor vehicle speeds directly correlate with slower driver reaction time and increased risk of serious injury or death to vulnerable users upon collision.

*Stopping distances during wet conditions. Single car length=5.6m. Based on a 2.5s reaction time, representing 90th percentile of drivers.`

Figure 3.6. Source: Adapted from World Health Organization, 2008. Speed management: a road safety manual for decision-makers and practitioners; Transportation Association of Canada, 2017. Geometric Design Guide for Canadian Roads Figure 2.3.1,.; DTAH

REDUCE AND MANAGE VEHICLE SPEED

Reducing vehicle speed is the single most important design control. Simply, lower speeds lead to safer streets, better places, and improve opportunities to support a wider range of users and uses. A well-designed street will inform users of the speed they should travel through their visual and psychological interpretation of their surroundings.

Vehicle speed is a significant factor of crash severity; higher speeds bring exponentially higher risks. Vehicle speeds are critical at points of conflict, such as driveways, intersection, off-ramps, and mid-block crossings. While speed is often desired to shorten trip travel time, it must logically respect local context. For example, high speeds on a highway are appropriate; high speeds on urban arterials or collectors are not. Lower vehicle speeds lead to a broader range of design options. Limited-access highways are often uniform for the most part, but lower-speed streets are unique with more inventive and locally informed designs.

Design speed is a selected speed used to determine the various geometric design features of the street. Design speed influences the choice of many features such as lane width, shoulder width, median width, lateral clearance, sight lines, and curb radii. For example, features such as clear zones are well suited for highways and rural arterials, but their use is not applicable, practical or desirable for urban streets, as stated in the Transportation Association of Canada's Geometric Design Guidelines (2017), Section 7.7.

Many jurisdictions use a design speed that is 10 or 15 kilometres above the actual posted speed for that street. This results in an inferred speed (the speed drivers sense they should travel based on cues from the street design) of 25 or 30 kilometres per hour greater than the posted speed.

Environmental cues influence driver speed far more than posted signage. Design streets to convey an inferred speed to the driver—the target speed for that street. Target speed is the speed you want people to travel. In most cases, target speed should match the posted speed on a given urban street. Best practice in urban areas is to ensure posted speed, design speed and inferred speed are all the same. Conversely, establishing a posted speed that is artificially low relative to the design of the street will only result in operating speeds that are higher than desirable and that are difficult to enforce.

The design of Complete Streets will start with the selection of a target speed, which is then applied to geometric design elements. Numerous jurisdictions in Canada now employ the target speed approach in their Complete Street guidelines and road engineering standards, with Calgary, Edmonton, Kitchener and York Region using the target speed approach for urban streets that have operating speeds of 50 to 60km/h or lower.

Streets designed to reduce and manage vehicle speed will consider:

- A target speed informed by the street context.
- The application of design elements that limit the maximum vehicle speed to the target speed
- The smallest practical curb radii and lane width to serve the necessary design vehicle.
- Designing streets without super elevation.
- The exclusion of shoulders, except for bicycle lanes or rural roads.
- Eliminating or modifying channelized right-turn lanes to reduce turning speeds and improve safety.
- Setting signal timing for moderate speeds.

More Information

- Transportation Association of Canada (2017). Geometric Design Guide for Canadian Roads.
- Institute of Transportation Engineers and Congress for the New Urbanism (2010). Designing Walkable Urban Thoroughfares: A Context Sensitive Approach.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.

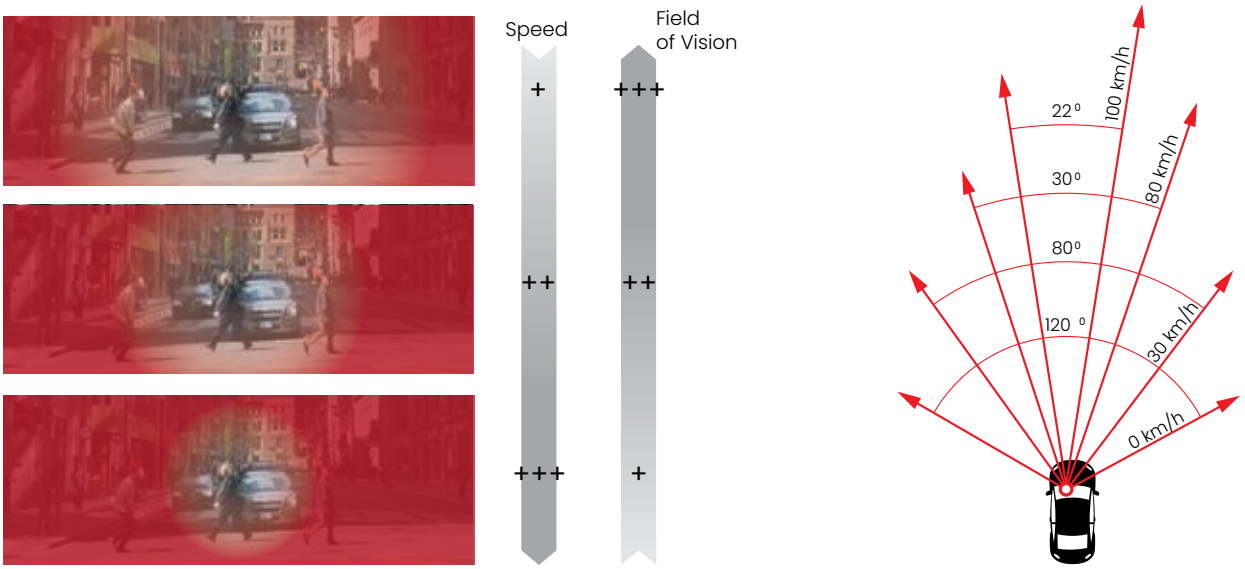


Figure 3.7. Speed and Field of Vision
Speed is especially lethal to vulnerable users like people walking or riding a bicycle. The risk of severe injury increases as a driver's field of vision narrows and misses potential hazards. Field of vision is the area a person sees when their eyes are fixed in one position.

source: base image: mark.watmough flickr: cc.2.0; Federal Motor Carrier Safety Administration; DTAH

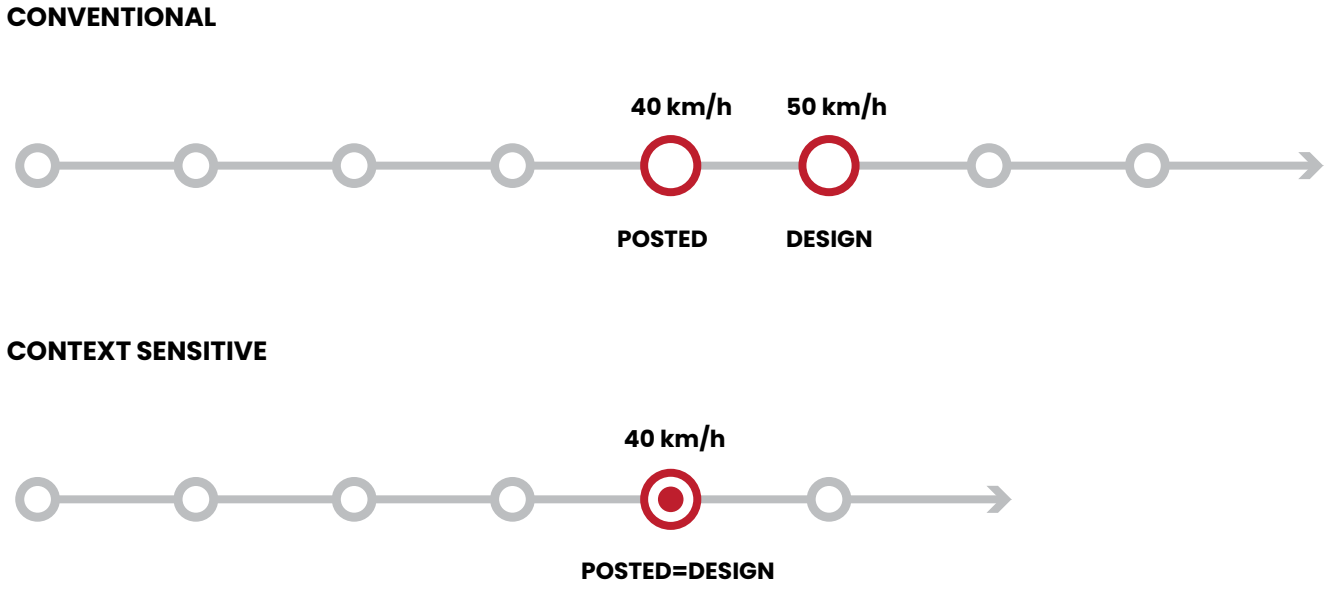


Figure 3.8. Target Speed
Conventional street design considers a posted maximum speed as lower than the design speed. Context-sensitive design promotes that the street includes elements so that both are the same, so that drivers are not comfortable exceeding the intended posted speed.

source: NACTO ; ITE; FHWA; DTAH

ACCOMMODATE THE SMALLEST POSSIBLE DESIGN VEHICLE

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

While street design must accommodate the occasional larger vehicle—especially emergency vehicles—it must not subordinate or degrade the safety or comfort for most daily users. The selection of a design vehicle dictates the physical characteristics of the street (such as curb radii and lane width) which, in turn, affect the safety and operations of a roadway by informing the turning speed of vehicles. Best practice suggests that Complete Streets should design "for" the most common vehicle and "accommodate" the most common large vehicle.

The most common vehicle is the design vehicle, with the largest being the control vehicle. Design vehicles are typically the largest frequent vehicle type manoeuvring a right turn at an intersection corner. The turning movement of design vehicles are frequent, and the intersection design should allow for turning with relative ease. Control vehicles are typically the largest vehicle type required to manoeuvre a right turn at an intersection corner. Control vehicles make up a small fraction of all vehicles and manoeuvre turns at intersection corners at a relatively low frequency. Control vehicles use more space than design vehicles to manoeuvre right turns. Designing a street using the control vehicle would lead to oversized intersections, wider lanes and larger curb radii than necessary for local conditions.

For the majority of Brampton streets, which are local and within residential neighbourhoods, the design vehicles are either Passenger (P) or Light Single Unit Vehicle (LSU). At these intersections, the turning of large trucks is uncommon. For these same streets, accommodation of control vehicles – such as Medium Single Unit Vehicle (MSU), garbage trucks (SU-12), snow plows (or tractor trailer (WB-20) – can include use of multiple lanes and full stoppage of the corridor or intersection given the relative rarity of such encounters. As the volume, operating speed, and frequency of large trucks increases so should the design and control vehicles for different intersection types. For all street and intersection types, apply aerial fire trucks as additional control vehicles.

More guidance related to design and control vehicles for each street and intersection type and curb radii is provided in Chapter 4.

Streets that accommodate the smallest possible design vehicle will:

- Identify a design vehicle that may differ from the control vehicle.
- Define for intersections a crawl speed instead of using a design speed; this will provide more flexible turning for large vehicles at slower and safer speeds.
- Design intersections and curb radii based on the design vehicle turning to the receiving street.

More Information

- Transportation Association of Canada (2017). Design Vehicle Dimensions for Use in Geometric Design.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.
- Institute of Transportation Engineers and Congress for the New Urbanism (2010). Designing Walkable Urban Thoroughfares: A Context Sensitive Approach.

Figure 3.9. Design vehicles are the most common large vehicles that use city streets, similar to a Canada Post or other courier trucks.

Figure 3.10. Control vehicles, like fire trucks, are the largest vehicles that use city streets. They are permitted to use more of the street to maneuver.

Table 3.2 Design vehicles and control vehicles in other municipalities

	Toronto		Kitchener		Edmonton	
Road Types	**Design**	**Control**	**Design**	**Control**	**Design**	**Control**
Arterial	WB-20/MSU	WB-20/MSU	Transit bus	Heavy single-unit truck, medium single-unit truck	B-12	WT,FT
Arterial (Main Street)	MSU	MSU	Passenger car	Snow plow/ Transit bus	WB-21	WB-36
Arterial (Industrial)	WB-20	N/A	Heavy single-unit truck	WB-19, WB-20, A-Train Double, B-Train Double	WB-21	WB-36
Collectors (Industrial)	WB-20/MSU	WB-20/MSU	Passenger car	Snow plow/ Transit bus	WB-21	WB-36
Collectors	LSU	MSU	Passenger car	Snow plow/ Transit bus	B-12	WT, FT
Local (Industrial)	WB-20/MSU	WB-20/MSU	Passenger car	Snow plow	WB-21	WB-36
Local	P	MSU	Passenger car	Snow plow	P	WT, FT, MSU

MINIMIZE EXPOSURE RISK

All street design will minimize the exposure of all users to the risk of collision—especially the most vulnerable—pedestrians and cyclists.

The factors that inform risk exposure are speed, time, distance, and vertical separation.

Safety is often measured by exposure risk – the time that one is exposed to the risks of vehicular traffic. Small increases in maximum pedestrian crossing distance and time can lead to a significant increase to the risk of pedestrian fatality. People are exposed to less traffic when crossing a two-lane street as opposed to a four-lane street. A street design can lower exposure risk by separating users and/or movements and minimizing speeds (which allows more time for users to see one another and react).

Street design to minimize exposure risk will consider:

- Reduced vehicle speed.
- Shortest possible pedestrian crossing distance.
- Vehicle lanes as narrow as possible.
- For wider streets (typically more than 4 lanes wide or 13m pedestrian crossing distance) introduce medians or pedestrian safety refuges at intersections.
- Increased vertical separation between users.
- Provide a dedicated traffic signal or phase that allows the subject user or users to proceed without conflict.

More Information

- Welle, Ben (ND). Cities Safer by Design: Guidance and Examples to Promote Traffic Safety through Urban and Street Design. World Resources Institute. WRI.org
- National Association of City Transportation Officials (2013). Urban Street Design Guide.

Figure 3.11. Curb extensions increase the overall visibility of pedestrians by reducing the crossing distance for pedestrians

Figure 3.12. Median crossing reduces the crossing length and exposure to vehicle traffic for pedestrians.

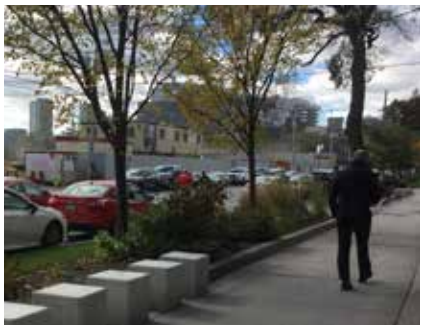


Figure 3.13. Trees and other vertical elements cause visual friction between users

MAXIMIZE PREDICTABLE AND SELF-REGULATING DESIGN

All street users need to know what to expect. A well-designed street should provide clear choice and well understood expectations and create an environment where all users are focused and alert.

Many traffic-related collisions result from user uncertainty or unintended behaviors that "self-regulating" or self-explaining design could diminish. These behaviours often occur at "decision points" with a high level of risk exposure such as turn lanes and pedestrian crosswalks.

Streets are generally safer if the actions of all users are more predictable. A classic example occurs at intersections without designated left turn lanes--if a user must guess if a vehicle is going to turn left or continue through an intersection, this could lead to movements that increase risk. Other examples where users can predict with a high level of certainty the actions of others include the use of brake lights (which notify to other users the intention of a vehicle to slow down and/or stop) and at roundabouts (where everyone yields-on-entry). On streets and at intersections with lower speeds, different users can make eye contact and communicate their intentions.

Street design that considers predictability and self-regulating design will:

- Minimize complexity for each user—especially at intersections.
- Naturally regulate all speed factors (approach speed, turning speed, decision-point speed).
- Accommodate desire lines across streets to key destinations such as transit stops.
- Put users where they can see one another.
- Provide adequate sightlines between different users to increase predictability. Target speed should inform the sight lines. If satisfactory sightlines are not available given the surrounding context (buildings, vertical elements, etc.) then reduce speeds accordingly. This highlights that speed is an output, rather than the defining element of street design.
- Not rely on signage to tell the user how to behave, although the street may include supplementary signs and other traffic controls.

More Information

- Welle, Ben (ND). Cities Safer by Design: Guidance and Examples to Promote Traffic Safety through Urban and Street Design. World Resources Institute. WRI.org
- Davis, Colin J. (2014). Street Design for All: An update of national advice and good practice. Public Realm Information and Advice Network and England Department for Transport. CJDA Ltd.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.
- NYC DOT (2013). Making Safer Streets.

Figure 3.14. Midblock crosswalks facilitates crossing along desire lines across streets to transit stops, parks or schools

Figure 3.15. Protected intersections increase driver visibility of people in the crossbike and crosswalk by setting back the crossbike from the motor vehicle travel lane.

3.1.2 Place Directives

Understanding and considering the place that a street exists is foundational and critical to making streets more complete. The key directives to consider place are respect the context or setting for each street, and ensure the comfort of pedestrians—the most vulnerable users and fundamental unit for the planning and design of a walkable, sustainable, accessible and equitable Brampton.

RESPECT CONTEXT

Design Brampton streets to respond to and respect their context—the land uses, buildings and open spaces that are adjacent to and help to shape the street itself. This context will define and dictate the street design and inform project objectives and priorities.

Traditional roadway design focused on a "centreline-out" approach where the basis of street design began from the center of the roadway and designed outwards, meeting the transportation needs first without an understanding of the place that the street exists within.

A "building-in" approach emphasizes local context as a critical input. The land use, building scale, level of pedestrian activity, and place within the city all inform context. These outside realms include various spaces used by residents, business storefronts, people walking or cycling, and plantings. Context will inform the scale of non-auto portions of the street, choice and quality of materials, need for furnishings and user amenities, and planting schemes.

Street designers should consider how to enhance and support the social and cultural richness of place. Local character is highly important. Seek opportunities to provide spaces and places for respite, not just movement, such as curb extensions at side streets where seating and plantings adds to local character. Distinct furnishings, pedestrian scale lighting, and public art will also contribute to the identity of a street. BIAs introduce identity and wayfinding elements and other streetscape improvements to create visual interest and support the local economy, which for the most part is supported by those on foot and bike, the shorter trips from within the neighbourhood.

In Chapter 2, overlays were introduced to inform street type by understanding an area's context. In this chapter, a list of additional overlays is provided to further inform street design considerations and trade-offs. For example, street tree and health maps may reflect the degree to which practitioners should add to the existing tree canopy.

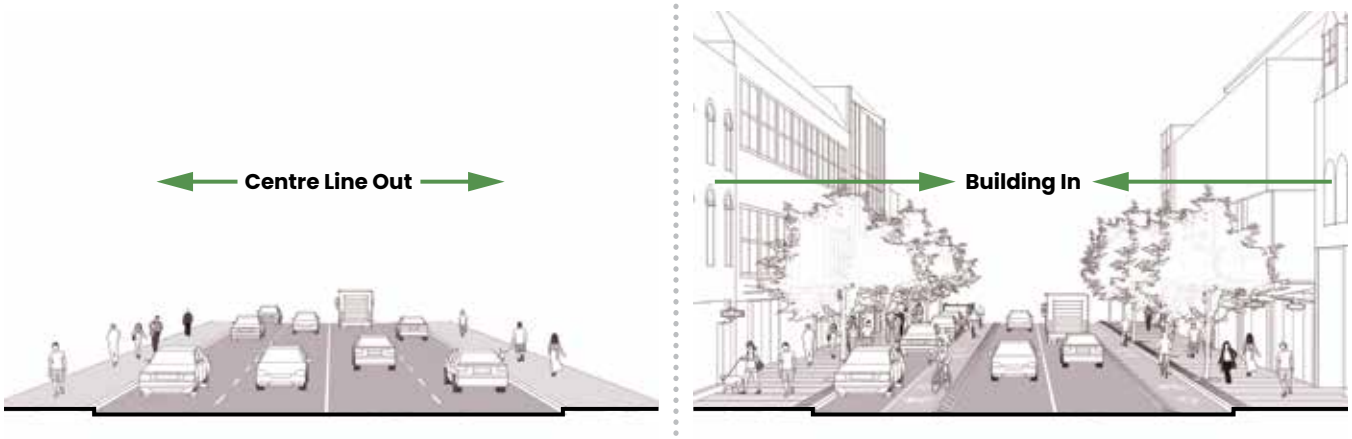
Streets that respect context will:

- Respect the edge condition first—land uses, buildings, and needs of the pedestrian—and still provide a well-functioning transportation network.
- Use street types and the overlays to inform land use context.
- Seek opportunities to improve local character and support the local economy.
- Use this information to assist in the preparation of a user profile.

More Information

- National Association of City Transportation Officials (2013). Urban Street Design Guide.
- People for Project Spaces. Streets as Places: How Transportation Can Create a Sense of Community. (http://www.pps.org/reference/streets-as-places-how-transportation-can-create-a-sense-of-community/)

Figure 3.16. Enhancing the quality of city sidewalks not only attracts more pedestrians, but also helps to create enjoyable public spaces where people want to spend their time.



FOCUS OF TRADITIONAL APPROACH

Auto-Mobility
Automobile Safety

COMPLETE STREETS APPROACH

Multi-modal Mobility + Access
Public Health/Safety
Economic Development
Environmental Quality
Livability/Quality of Life
Equity

Figure 3.17. "Centreline-out" Approach to "Building-in" Approach

ENSURE PEDESTRIAN COMFORT

Design streets to offer a comfortable pedestrian environment, with enough space to support walking and reduce crowding of sidewalks and crosswalks. Streets should also provide suitable microclimatic conditions to reduce cooling winds in winter, provide shade in summer, and protection from rain and snow where possible.

Walking is a free, enjoyable and healthy way to move about with many other benefits. Streets should encourage and support walking, especially for shorter trips within a smaller territory, no matter the street type.

In certain parts of the city with higher pedestrian volumes, design sidewalks and pedestrian clearways with enough width to accommodate the existing and anticipated volumes without crowding. Crosswalks should also align with the primary path of movement and have suitable capacity to support the number of people who use them.

Provide Furnishing and Planting Zones for every street suitable to its in context and anticipated use. In higher volume pedestrian areas, this zone may include areas for gathering, street trees in hard surface boulevards or raised planters, seating, public art and decorative lighting. In settings with higher vehicular volume and fewer pedestrians, this zone may include trees planted in a grass verge to serve as a physical and psychological buffer for pedestrians and cyclists. Street trees in any context will offer microclimatic benefit such as shade, filtered light, and reduce wind speed. Transit stops in any context should consider shelters for protection from the elements with safe crossings in proximity to pedestrian desire lines.

Further, design streets to drain water effectively from walking surfaces and reduce pooling at curbside, especially at crosswalks.

Streets that ensure pedestrian comfort will:

- Make informed decisions based on existing and anticipated pedestrian volumes and an understanding of the experience as one walking down the street.
- Understand the demands on the street for different times of day and days of the week, possibly as part of a multi-modal assessment for street users.
- Provide unobstructed Pedestrian Clearway Zones that relate to street context.
- Include Furnishing and Planting Zones (benches, shade trees, buffer from moving autos) that support pedestrian activities.
- Provide level walking surfaces and smooth grade transitions in pedestrian clearways and crosswalks at intersections.

More Information

- Transport for London (2010). Pedestrian Comfort Guidance for London.

Figure 3.18. Designing streets to ensure pedestrian comfort will encourage more people to walk. Providing weather protection, safe and accessible sidewalks and crosswalks, and opportunities to stop, rest and linger will make a more active and healthy city.

3.1.3 Link Directives

Complete Streets are corridors for movement that consider the functional needs of all users, but do not, as a default, privledge vehicle operations over the needs of others. The key directives to ensure that streets in Brampton are complete are to understand and accomodate desire lines, design for person throughput and mobility (not just vehicles), and develop a network of complete and connected streets.

UNDERSTAND AND ACCOMMODATE DESIRE LINES

Safe streets are easier to use. To understand and accommodate desire lines—how pedestrians or cyclists move or want to move in an environment—will contribute greatly to safe street design and inform the placement of elements and features.

Thoughtful location of pedestrian crossings should support the walking network and walking patterns. At intersections, crossings should align with the corresponding sidewalks and consider nearby places of importance. At midblock locations, crossings should align with the primary desire line (potentially a building entrance or path). Likewise, consider the actual movements that cyclists want to make when designing an intersection.

There are several possible techniques to better understand desire lines. Tracking surveys are simple mapping exercises that illustrate actual movements by pedestrians and cyclists over several hours (or longer) at intersections and mid-block locations, including where they go and how they get there. The survey can record volume and direction of movement. This data can inform decisions about the installation of new crossings or signals, where traffic calming measures are best placed, and how to best design an intersection to accommodate cyclist behaviour. Other techniques include photo or video recordings, noting paths made in the snow or mud, identifying cuts in fences and other obstacles, and plotting origins and destinations.

Street design that considers desire lines will:

- Assess the existing context and identify key destinations and routes.
- Provide simple and clear paths with minimized complexity and waiting time for pedestrians and cyclists.
- Include clearly marked pathways and routes for each movement and user.
- Separate conflicting movements between vehicles and other users, with each given their own space and time for movement.
- Make informed decisions about accomodating desire lines that may challenge the primacy of vehicle operations over all other factors.

More Information

- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- OTM Book 15 (2016): Pedestrian Crossing Facilities.
- Gehl, J, and Svarre, B. (2013). How to Study Public Life.
- NYC DOT (2013). Making Safer Streets.
- William H. Whyte (1980). The Social Life of Small Urban Spaces.

Figure 3.20. This image demonstrates how to consider the desire lines of trail users who want to cross a busy street. Providing a signalized junction with markings makes the connection more safe and convenient.

Figure 3.19. Missing crosswalks when recreational trails meet major roads.

Figure 3.21. Mid-block crosswalks facilitate crossing along desire lines across streets to recreational trails, transit stops and schools.

Figure 3.22. Left turn bike box is an example of preventing of conflicts arising from bicyclists queuing in a bike lane or crosswalk.

DESIGN FOR PERSON THROUGHPUT AND MOBILITY

Street rights of ways are limited and finite. Optimizing their use requires that designers evaluate alternatives based on the maximum use and throughput by persons rather than vehicles. Street design should support and encourage travel by higher volume and more space efficient modes.

Streets can change and become more efficient when we consider how to move people rather than vehicles. In conventional design, when assessing vehicle delay for a bus or a private automobile, both count as a single vehicle even though the bus may be carrying 50 times as many people as the car. Further, streets designed to accommodate the peak hour demands above all else do not take advantage of all the excess capacity during the rest of the day. In the off-peak times of day, vehicles tend to move faster which reduces overall safety for all users. Design approaches that evaluate person through-put equally values the mobility demands of all individuals whether they choose to travel by car, transit, foot or bicycle.

Good examples of the efficient use of space to increase person capacity and improve operations exist throughout Ontario and across Canada. Converting travel lanes to bike lanes or reassigning space within an existing right-of-way to introduce dedicated transit infrastructure can lead to a dramatic increase to overall person capacity, improve safety and operations.

Multi-Modal Level of Service (MMLOS) is a tool to assess the overall suitability of a street to meet the mobility needs of all users, not just vehicles. A draft MMLOS approach is included in this guide's Appendix to assist with this evaluation, and to inform the upcoming Transportation Master Plan update.

Streets designed for person throughput and mobility will:

- Make efficient use of available space within the right-of-way.
- Accommodate and provide choice for all users, and increase opportunities for non-auto travel.
- Allocate the public right-of-way to anticipated multi-modal transportation demand.
- Apply a Multi-Modal Level of Service (MMLOS) assessment to determine the mobility needs of all users.
- Prioritize non-auto travel and include a broader set of objectives such as equity, public health, and sustainability.
- Use the fewest travel lanes, narrowest lane width and tightest curb radii as possible based on the identified design vehicle.
- Understand the actual demand for parking, both on and off street, in order to meet corridor needs through a broader strategy.

More Information

- Litman (2015). Evaluating Complete Streets: The Value of Designing Roads For Diverse Modes, Users and Activities. Victoria Policy Transport Institute.
- Victoria Transport Planning Institute (2015). Multi-Modal Level-of-Service Indicators: Tools For Evaluating The Quality of Transport Services and Facilities. http://www.vtpi.org/tdm/tdm129.htm
- AARP (2015). Evaluating Complete Streets Projects: A Guide for Practitioners.
- Dumbaugh, E., Tumlin, J., and Marshall, W. (2014). "Decisions, Values and Data: Measuring Bias in Transportation Performance Measures". ITE Journal, August.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.
- CEQA Guidelines Update (2018). https://opr.ca.gov/ceqa/guidelines/updates.html

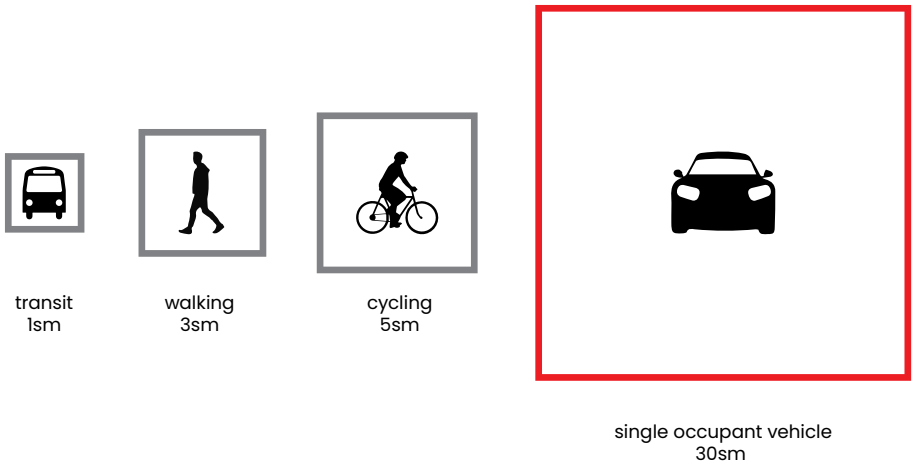


Figure 3.23. Road Space Required Per Passenger For Various Travel Modes.
Road space requirements increase with vehicle size and speeds (faster vehicles require more distance between them and other objects), and declines with more passengers per vehicle.

Single occupant automobile travel on arterials requires many times more space than people who are walking, cycling and taking public transport.

source: Adapted from Litman (2015). Victoria Policy Transport Institute; DTAH

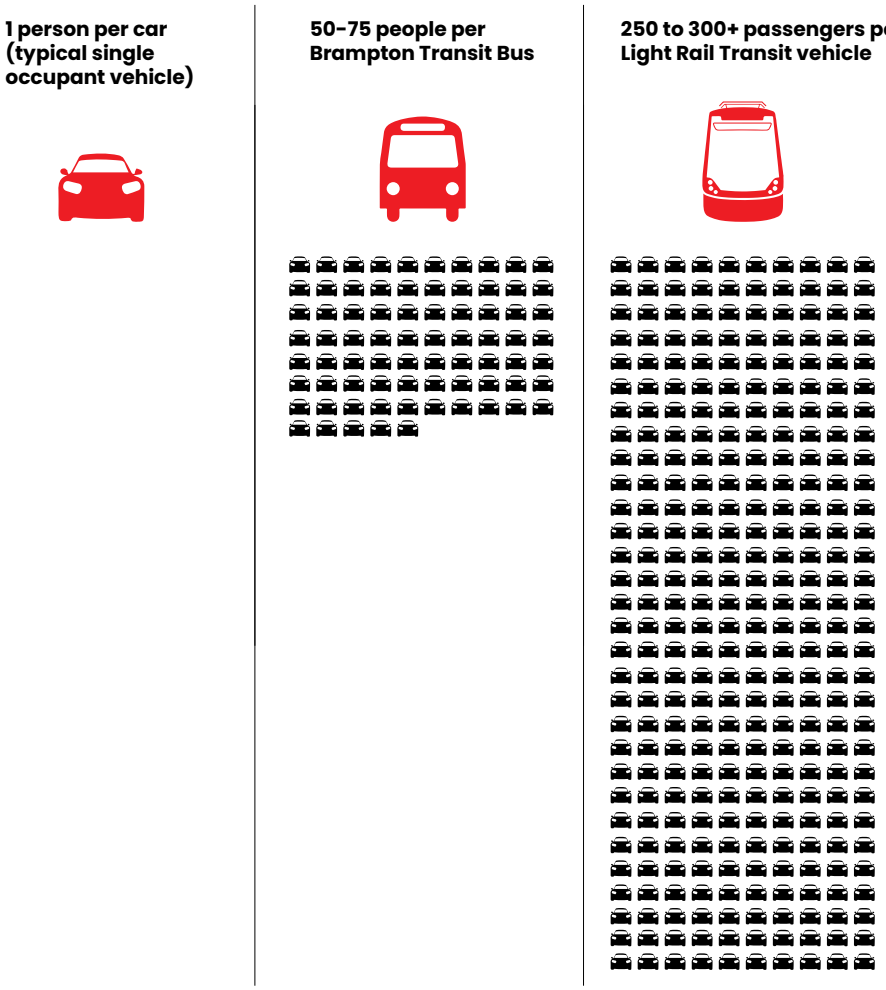


Figure 3.24. Mode Priority and Person Capacity. For longer trips, transit can move far more people and with greater efficiency than single occupant vehicles.

source: Metrolinx; Brampton Transit; DTAH

DESIGN COMPLETE STREETS TO SUPPORT A COMPLETE NETWORK

It is well established that Complete Streets are designed to meet the needs of all users. However, some streets may emphasize and enhance one mode of travel over others. Streets identified as critical links in a modal network—such as the priority transit, bicycle, pedestrian, or freight networks—may have enhancements to facilitate movement of the identified mode.

In the early stages of every project, the design team will identify the street context and any existing or planned mode priority networks (such as surface transit or cycling). Future planned conditions will receive preference over existing conditions.

In Brampton, as with many other jurisdictions that have developed and evolved in a similar way, many of the city's corridors are considered a priority for several networks. Yet few streets have enough space to accommodate the ideal facility for each, thus leading to a collaborative trade-off discussion (see Chapter 3 Section 3.2.3 – Assessing and Deciding Trade-offs). The design team should use data driven decision making to inform the initial cross section, refine design preferences, and inform standards and required quantities (for example, existing or anticipated volumes for the different users, collision data).

Designing streets to support a complete network will:

- Respect adjacent existing and planned land uses and intensity of use.
- Accommodate the intended uses and mobility for all permitted modes.
- Not compromise the safety for vulnerable users.

More Information

- City of Brampton (2015). Transportation Master Plan.
- City of Brampton (2019). Active Transportation Master Plan.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- A Report of Medical Officers of Health in the GTHA (2014). Improving Health by Design in the Greater Toronto-Hamilton Area. Second Edition.

Figure 3.26. Streets with transit routes will be designed to enhance operations and mobility that respects adjacent existing and planned land uses and intensity of use

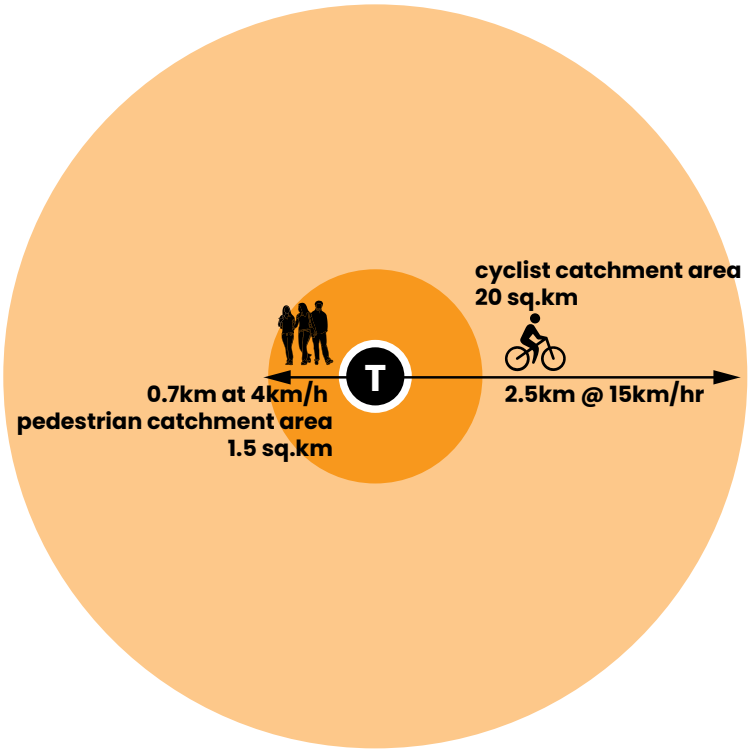


Figure 3.25. 10 Minute Catchment Area From Transit Station Or Stop. Networks for different modes of travel work best if coordinated and supplemented by one another. The quality of a public transit system is enhanced greatly if the pedestrian and cycling network is complete and convenient.

source: trendy-travel.eu, DTAH

ENHANCE NETWORK CONNECTIVITY

A well-functioning and connected street network is a fundamental framework for creating safe, livable, legible and efficient communities[1]. A fine-grained network of streets provides greater flexibility and redundancy, more direct routes for travel, better distribution of travel demands and enhanced access to land uses and destinations. Modal networks must have continuity and seamless, accessible connections between segments and across intersections.

Brampton has street network patterns that range from a fine grid of connected blocks in the older parts of Downtown to large blocks and few street connections for much of the City. Limited street network connectivity results in a concentration of travel demands on a limited number of streets increasing the risk of conflict and collision and decreasing overall network efficiency. In these areas, look for opportunities to complete missing links and connect disconnected segments.

While it is preferred that connected networks accommodate all modes of travel, it is essential to serve pedestrian connectivity as this is the basic unit of travel that serves all other modes. Connectivity is essential. Plan and design streets as continuous routes and corridors, not as isolated or interrupted segments. Ensure that all users can move safely and efficiently from their origin to destination in the network without lengthy detours or elevated risk.

Streets that strengthen network connectivity will:

- Emphasize walking as the fundamental unit of design, which in turn will improve connectivity for other users.
- Contribute to higher intersection density and link to node ratio, two measures for calculating the scale and connectedness of the street network.
- Make use of parallel streets to develop a corridor.

More Information

- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- [1]Congress for the New Urbanism. Sustainable Street Network Principles.
- Smart Growth America. Networks of Complete Streets. https://smartgrowthamerica.org/resources/networks-of-complete-streets/
- Institute of Transportation Engineers and Congress for the New Urbanism, Federal Highway Administration and US Environmental Protection Agency (2010). Designing Walkable Urban Thoroughfares: A Context Sensitive Approach, "Chapter 3 – Network and Corridor Planning".

Figure 3.27. Block Pattern and Network Connectivity.
Six examples from different parts of Brampton. Note the higher amount of possible routes in some parts of the city than others. The greater the number of intersections in a given area, the more connected and complete the network.

source: DTAH

3.1.4 Greening Directives

Beyond their role as places and corridors for movement, streets have a critical contribution to the sustainability, resilience, identity, and beauty of Brampton. Greening streets will enhance safety, help to expand the overall urban forest, efficiently manage stormwater, help Brampton mitigate and adapt to climate change, and improve place-making. The key directives for greening include street trees and managing stormwater.

PLANT STREET TREES TO SUCCEED

Street trees are a highly desirable element for making pleasant, comfortable, and sustainable streets. Consider street trees an integral component of Brampton's green infrastructure. Ensure street trees have non-compacted soil volume and growing conditions to grow trees to be healthy and mature and not just placed in a space thats available.

At the time of writing this guide, the City of Brampton has a target to plant 1 million trees by 2040 and initiated an Urban Forest Management Plan that builds upon similar work by the Region of Peel. One of the likely outputs is to recommend a substantial increase in the amount of tree canopy in all areas of the city, including along streets. Street trees have numerous benefits related to safety, micro-climate, land value, and well-being. Their presence can lead to slower vehicle speed and serve as a buffer between users traveling at different speeds. When they can reach a healthy size, trees offer shade to the roadway and sidewalk, which can reduce speeds, make more comfortable walking environments, improve air quality and intercept rainwater.

Trees are part of the city's infrastructure along with gas, hydro, and water, and are an integral component of our streetscapes along with other elements such as sidewalks, street lights, benches, and bicycle racks.

In order to successfully plant trees within a streetscape comprised of so many elements, it is essential that the design team consider the required conditions for tree planting as integral to the design, planning and construction of all projects. Particularly important is the early coordination between the tree planting plan and utilities.

Street design that considers tree planting for healthy growth and positive contribution to the vibrancy of streets will:

- For street reconstruction projects, include street tree planting with available space and suitable growing conditions. Ensure suitable tree planting budget is included in the overall cost.
- For other street projects, seek opportunities to introduce street trees and improve growing conditions (for example, in curb extensions or rain gardens).
- Provide non-compacted soil volume targets, typically between 30 cubic metres per tree
- Introduce open tree planters wherever possible, providing the best possible streetscape growing condition for trees and an opportunity for further greening and stormwater management
- Coordinate utilities to minimize impact on the root zone.
- Ensure enough budget for on-going maintenance.
- Ensure trees have adequate water for the first 5 years of establishment.
- Take advantage of resurfacing projects to upgrade planting conditions.

More Information

- City of Brampton (2019). Landscape Development Guidelines.
- City of Brampton (forthcoming). Urban Forest Management Plan
- City of Brampton (2020). Environmental Master Plan.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018). Sustainability Metrics.
- City of Brampton (2020). Community Energy and Emissions Plan (CEERP).
- Region of Peel (forthcoming). Urban Forest Best Practices Guides.
- Toronto and Region Conservation Authority (2011). Peel Region Urban Forest Strategy.

Figure 3.28. Different street tree planting details are available to ensure healthy growth: the most common are the soil trench (top left), soil cells (top right) and open planters (bottom). Further, each can provide storm water management opportunities.

MANAGE STORMWATER

Streets play a major role in stormwater management and can help to reduce point source volumes, improve water quality, help to mitigate the urban heat island effect, support human health and well-being, create ecologically important streetscapes, and enhance the streetscape environment.

This section outlines the Complete Streets approach to stormwater management. Several Ontario cities and agencies have prepared technical guidance for green infrastructure that Brampton can learn from.

In Brampton, a "green street" is a right-of-way that through a variety of design and operational treatments, manages stormwater at-source through green infrastructure and low impact development (LID) techniques and achieves the broad objectives of the City of Brampton Environmental Master Plan (2014). Green streets provide a wide range of benefits: they enhance local ecology, provide a more aesthetically pleasing street environment, and help to reduce hard infrastructure cost. Green street measures can serve a traffic calming role as well when combined with bulb outs, chicanes and medians.

Streets that consider green infrastructure for managing stormwater within the public right-of-way will:

- Seek to introduce green infrastructure as part of every street reconstruction project.
- Combine green design into traffic calming elements.
- Include trees and other plantings in curb extensions, chicanes, planting strips, medians and islands as part of on-street stormwater collection.
- Maintain sight lines at intersections and driveways.
- Incorporate stormwater management and landscape features that aim to maximize permeable surfaces.

More Information

- City of Brampton (2019). Landscape Development Guidelines.
- City of Brampton (2020). Environmental Master Plan.
- City of Brampton (2009). Stormwater Management Master Plan.
- City of Brampton (2015). Stormwater Management Retrofit & Enhancement Study.
- Credit Valley Conservation (2013). Grey to Green Road Retrofits.
- City of Toronto (2017). Green Streets Technical Guidelines.
- National Association of City Transportation Officials (2017). Urban Street Stormwater Guide.

Figure 3.29. Storm water management techniques are possible in many different street types and parts of the right of way, and can contribute to place making and traffic calming.

3.1.6 Life Cycle and Maintenance Directives

The value of Complete Streets is far beyond the money it takes to build and retain streets in a state of good repair. The key directives for understanding the life cycle and maintenance of completes are to understand the total cost, support four seasons of use, and select robust materials.

UNDERSTAND THE TOTAL COST

Complete Streets are necessary to safely accommodate existing and future users. They need not cost more than in-Complete Streets, can lead to new funding opportunities and will add lasting value. Defining and addressing maintenance and operations needs should happen at the beginning of the street design process to ensure overall success.

Design teams should analyze the full cost of Complete Streets in the context of the economic and societal impact of in-Complete Streets, not simply capital and maintenance costs. Many Complete Street improvements are modest in size and cost.

During reconstruction projects, Complete Streets can lower initial construction and ongoing maintenance costs by requiring less roadway, which requires more costly pavement structure than sidewalks. For interim or incremental improvements, some Complete Street features have no added costs (e.g., changing signal timing) or limited costs (e.g. line paint and signs as part of road diets), and can tremendously improve the economic and physical health of the community. Even if a Complete Street design increases the upfront cost of a project, it can reduce total life-cycle cost and have larger community economic benefits by supporting more sustainable modes of travel, lessening roadway wear and maintenance, reducing congestion, improving air and noise quality, reducing crashes and fatalities, and improving local property values.

Beyond the immediate capital costs are the costs to the well-being of our broader society. Physical inactivity is a major health issue in Ontario. Neighbourhood and city walkability are fundamental inputs to the health of our communities. Providing opportunities for people to increase their daily activity levels through walking and biking will have a considerable impact on overall public health levels and add value to our cities, reduce the burden on our health care systems for treating illnesses such diabetes and cardiovascular disease that are influenced by low levels of activity, improve mental health, reduce the number and length of absences from work due to illness, and strengthen our collective sense of wellness.[1]

A Complete Street that understands the total cost will:

- Evaluate the economic and health benefits of a Complete Streets
- Seek opportunities to make improvements of any scale for street users
- Coordinate improvement projects where possible to reduce total capital cost
- Look ahead for opportunities to make improvements
- Examine life-cycle costs when comparing project alternatives and the difference between complete and in-Complete Streets
- Make coordinated decisions for all users up front in the process leading to reduced overall construction schedule

More Information

- TAC Bulletin, January 22 (2019). Harvey, J. T et al. (2018). "Framework for Life Cycle Assessment of Complete Streets Projects". UC Davis: National Center for Sustainable Transportation. Retrieved from https://escholarship.org/uc/item/0vw335dp
- [1]Public Health Ontario. https://www.publichealthontario.ca/en/health-topics/health-promotion/physical-activity
- [2]Complete Streets Coalition. https://smartgrowthamerica.org/wp-content/uploads/2016/08/safer-streets-stronger-economies.pdf
- Peel Healthy Development Index (2009) https://www.peelregion.ca/health/urban/pdf/HDI-report.pdf
- Complete Streets Coalition (ND). Complete Streets: Guide to Answering the Costs Question. Smart Growth America.

Figure 3.30. Designing streets that consider four season use means ensuring clear and accessible facilities for all users, and providing enough space for snow storage while maintaining suitable pedestrian clearway.

SUPPORT FOUR-SEASON USE OF STREETS

Complete Streets safely accommodate all users during all seasons. This in itself increases their value. Convenient, comfortable and safe facilities will experience use for the entire year, contribute to an active and healthy lifestyle, improve accessibility and equity, and help to manage congestion beyond the warmer months.

Complete Streets are four season streets. Cities around the world with climates like Brampton have high rates of walking and cycling in the winter, although more popular in the warmer months. What they all have in common is a connected network and well-maintained facilities to support winter cycling, and clear and comfortable sidewalks and crosswalks.

Following a snow event, consider clearing sidewalks, transit stops and bike facilities first to indicate that they are priority street users. Reduce salt use for ice clearance on sidewalks and roadways to minimize impact on street trees and other planting, degradation of materials and infrastructure, and to improve overall water quality.

Streets that consider all seasons will:

- Improve cycling and pedestrian infrastructure to invite accessible and equitable use during less than ideal conditions
- Maintain sidewalks, bike facilities, and the roadway so they are clear and safe all year
- Clear snow and ice from sidewalks, crosswalks, and priority on- and off-street bike facilities first
- Ensure that sidewalk ramps are clear of ponding, ice and snow
- Clear snow and ice from around transit stops so customers can comfortably access transit vehicles
- Include suitable space for snow storage or negotiate snow removal on streets when storage is not possible
- Define winter maintenance service levels and costs for the entire street network informed by Complete Street principles of safety first for the most vulnerable users. This includes priority to clear the sidewalks, transit stops, and bike facilities.

More Information

- City of Edmonton (2016). Winter Design Guidelines.
- City of Edmonton (2013). For the Love of Winter: Winter City Strategy Implementation Plan.
- City of Saskatoon (2020). Winter City YXE: Saskatoon's Winter Strategy.

Figure 3.31. Material selection should consider context along with durability and life cycle cost.

SELECT ROBUST MATERIALS
Brampton streets will use durable, cost effective, high-quality materials that are context sensitive, safe, inviting and comfortable.

Material selection is important for all parts of the street. The longevity of all construction and maintenance in the public realm is directly related to the quality of the materials and methods of installation. Weigh the impulse to achieve short-term cost savings against the potential higher maintenance costs if inferior materials are used.

Streets that consider materials will:

- Select materials based on durability, life cycle cost and suitability for street type, zone of the street, user group and context.
- Ensure minimal grade differences between adjacent materials unless the intent is to indicate a grade or texture change for safety and accessibility purposes.
- Include consistent materials along a street from a limited palette, and on both sides, for clear legibility
- In areas where different users interact, use contrasting colours to indicate a change in use.
- For roadways and intersections, a well-designed base with smooth surface that drains water quickly is essential for the safe travel of pedestrians, cyclists, and vehicles.
- For sidewalks, level and well-drained surfaces are also important but further technical factors will influence their completeness.
- All materials for the sidewalk should improve universal accessibility.
- Select materials that minimize cracking which can lead to unsafe conditions. Further, use techniques and materials to minimize damage from tree roots and snow clearance.

More information

- City of Brampton (2019). Landscape Development Guidelines.
- City of Toronto (2021). Accessibility Design Guidelines.
- ASTM International Standard E3028. Standard Practice for Computing Wheelchair Pathway Roughness Index as Related to Comfort, Passability and Whole Body Vibrations from Longitudinal Profile Measurements.
- Federation of Canadian Municipalities and National Research Council (2004). Sidewalk Design, Construction, and Maintenance: A Best Practice by the National Guide to Sustainable Municipal Infrastructure.
- NACTO (2016). Transit Street Design Guide. Chapter 5, Transit Lanes and Transit Ways, Pavement Materials.
- David K. Hein, P.Eng. (2016). "Pavement Design For Large Element Paving Slabs". Paper Offered for Presentation at the Innovations in Pavement Management, Engineering and Technologies – Design Applications Session, Transportation Association of Canada Conference, 2016.

3.2 Making Decisions

This section describes what all designers will consider when "assembling" a Complete Street and how to make informed, collaborative decisions when confronted with choice.

Many different elements are combined to form a street. Using the existing or planned right-of-way, understanding the street's unique priorities, the definition of the street type, and using a "building-in" approach, the design team will begin to assemble the street section using known widths for various street elements.

Assembling the street will require collaborative decisions and making choices. Different elements may have a range of widths based on adjacent elements (for example narrower bike lanes if next to a curb, but wider if next to parked cars). It may also benefit to combine elements within a certain zone, such as full time on-street parking, space for tree planting, and curb extensions to reduce pedestrian crossing distances.

The element-specific dimensions listed in Chapter 4 of this guide are ideals or preferred, not minimums or maximums. As the elements are assembled, trade-offs will happen, especially where the right-of-way is constrained.

At each step in the design process, a collaborative multi-disciplinary design team assigned to the street project and composed of staff from various internal and external departments (alongside consultants if necessary) will work "from the building in" – examining each piece of the street for how it responds to the overall project objectives and key directives in Section 3.1 of this chapter, until a draft cross section and plan is assembled.

After this, designers are asked to articulate the draft cross section and plan's contribution and impacts on the objectives and directives beginning with safety, place, link and so forth. If the configuration does not meet the overall project objectives and directives, the designers will generate new alternatives until the design is satisfactory.

This iterative street design process and impact assessment is also useful as part of design review to determine whether proposed projects meet the intent of the Complete Streets policy, principles and project objectives. Further guidance is provided in Chapter 5 in the form of a sample checklist with prompts to assist with questions to ask at each stage of the street design process.

3.2.1 Cross Section Zones

This Guide encourages the design team to consider the street as being composed of three zones: sidewalk, roadway, and in-between (or interstitial). These zones apply to all street types, except laneways.

For the purpose of this Guide, the Cross Section Zones address the mid-block portion of the street. Detail regarding the three cross section zones, elements, and intersection design is discussed in detail in Chapter 4.

The distinction between the three zones is important for it highlights that many of the difficult decisions take place within the "in-between" for almost every street will have a roadway and sidewalk, but not all will have elements such as street trees, on-street parking or bike lanes.

For all projects, the design team will consider each zone as it relates to the street's context, as well as all other subjects in this chapter. This will lead to a context sensitive design solution that moves beyond the application of minimum standards.

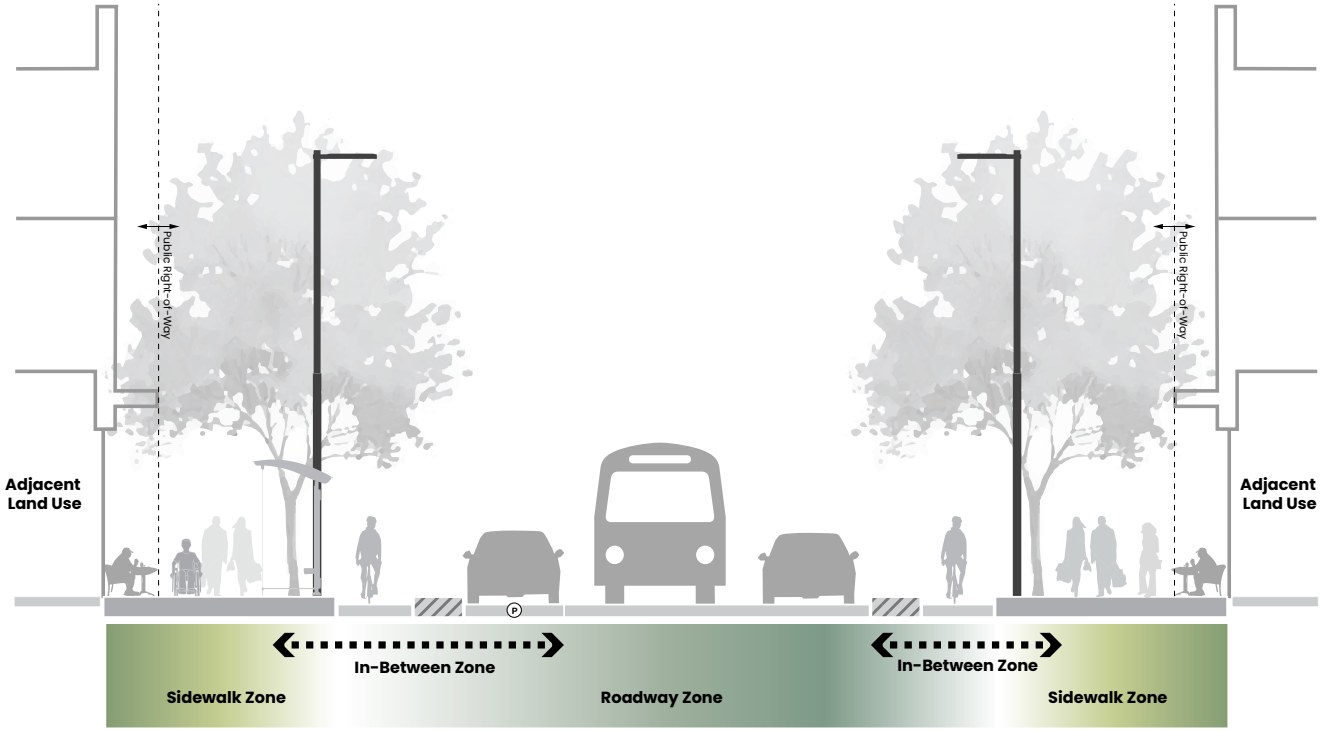


Figure 3.32. The three street zones that compose the cross section: Sidewalk, Roadway, and In-Between

3.2.2 Steps to Assembling the Street

Each of the following steps to assembling the street should take place in sequence. These steps should take place no matter the project type, given that all of Brampton streets should become more complete over time.

The level of detail for each step will require adjustment based on the complexity of the street project (if required at all for the less involved projects), but the intent is to ensure that design teams continually seek to improve the completeness of every street no matter the budget or level of intervention. Stakeholders should be engaged at important planning and technical milestone points throughout the process. See Section 5.4 Project Engagement.

1. **Define Project Objectives.** The design team will establish the project objectives. The guiding principles in Chapter 1 and directives from earlier in this chapter will inform the project objectives. Include transportation and place making expectations

2. **Inventory of Existing Conditions and Background Policy Review.** The design team will gather all available information regarding the project before beginning the design process. If information is not available but required, identify among the design team how to best collect the outstanding data. Review current policy and guidance related to all users (such as MTO Book 18 for Cycling Infrastructure).

3. **Identify Context.** The design team should recommend the street type, based on the process defined in Chapter 2. The team should document the rationale behind the typology classification. This step may include a recommendation for any necessary adjustments to the place and transportation policy for that area. Since the street type and the ultimate design are defined, in part, according to the land use context, subsequent land use decisions are expected to recognize and support the agreed-upon street type and design.

4. **Establish User Profile.** The design team will prepare a user profile to identify who uses the streets, when and where. Consider the existing and anticipated users. Identify the priority users as part of this step and the following.

5. **Identify Networks**. The design team will review all existing network plans and overlays to understand the projected volumes and anticipated routes for the different users: pedestrians, cyclists, transit, and motor vehicles. This step will lead the design team to identify the necessary support elements for the various users (bike lanes, transit stops, signalized intersections, crosswalks) and demonstrate how the street should fit within and complement the broader network context.

6. **Develop the Initial Cross Section.** Next, the design team will define the initial mid-block cross-section informed by street type, keeping in mind that some typologies may allow more than one option and different sections for different street segments. Once the preferred option is identified by the design team and informed by stakeholder consultation, introduce the design features and ideal dimensions for certain elements related to that street type.

7. **Test the initial cross-sections against street type and defined project objectives.** The design team should identify any constraints to delivery of the initial, ideal cross-section. Possible constraints may include:

- Not enough space in right-of way.
- Underground utilities.
- Overhead utilities.
- Location of existing light poles.
- Drainage/grading/location of catch basins.
- Existing trees or other environmental features.
- Topography.
- Location and number of driveways.

Many of these constraints the design team will consider earlier on, but this step should clearly identify which constraints may prohibit use of the initial defined cross-section. Note that the design team is usually faced with making trade-offs after the initial cross section is developed. See the following section for further guidance for how to navigate the trade-off process.

8. **Develop the Plan.** The design team will transfer the preferred cross section to conceptual or schematic plan, identifying the horizontal alignment and intersection design. This step will highlight any potential issues not readily illustrated by the cross section and may require changes to ensure the intersections work properly. Spend time consulting maintenance staff to understand how to maintain the design. Consider: how snow removal will happen for bike lanes, sidewalks, MUT's, maintenance of shrubs and trees on busy roads; and how maintenance vehicles will move about a site, etc.

9. **Locate Street Elements.** The design team will incorporate into the schematic plan elements such as pedestrian and cycling amenities (such as bike parking, benches, bike share stations), transit stops, lay-bys for taxi, accessibility and deliveries, transit station entrances, and major utilities (for example signal boxes, telecommunication boxes, and hydrants).

10. **Identify Areas of Interaction.** The design team will consider the potential flows and volumes of movement for all users, identify the areas of the street where different users interact and intersect, and assess 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 (for example, rear lanes and parallel streets in network - all users)
- Transit stops and bicycle parking areas (pedestrian and bicycle)
- Crossings (pedestrian, transit, bicycle, and motor vehicle)

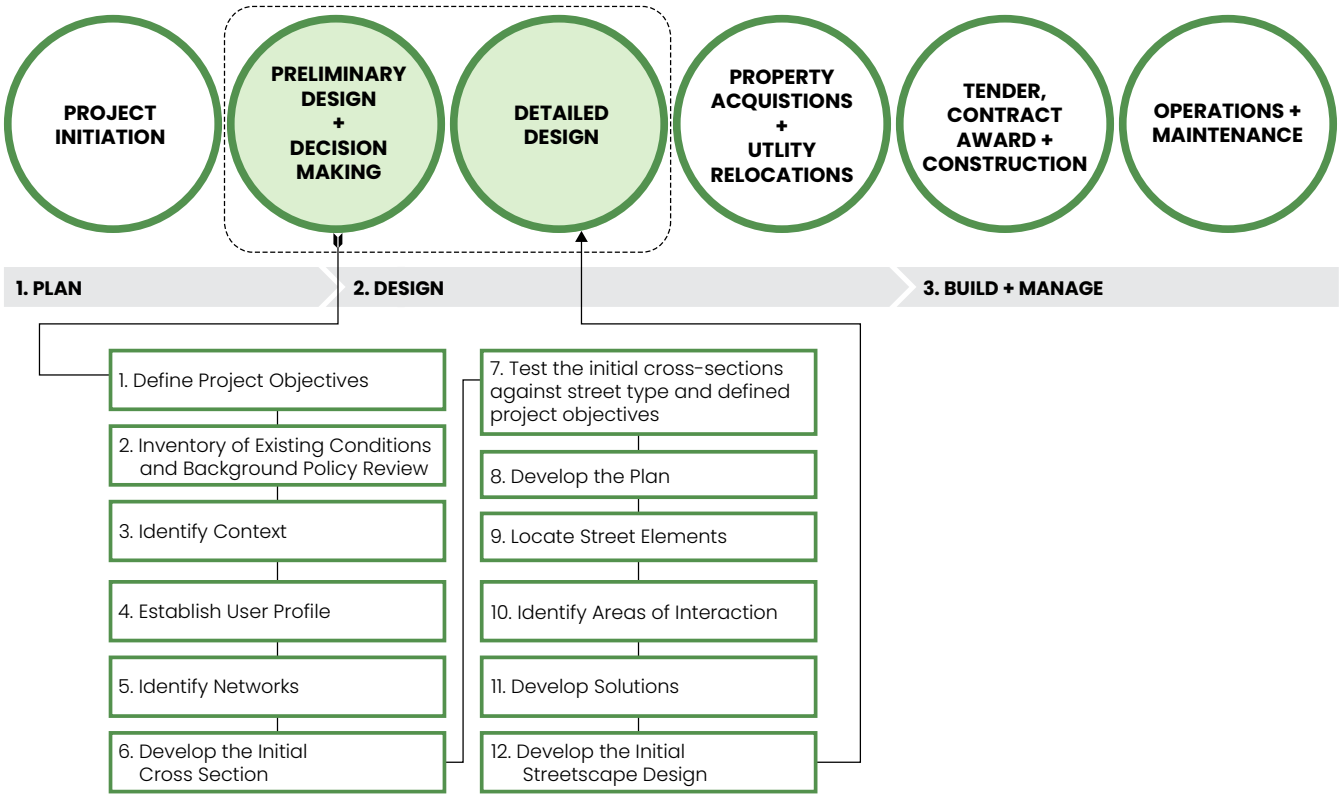


Figure 3.33. Steps to Assembling the Street as part of the Project Delivery Process

11. Develop Solutions. After determining the context and user interactions along a street, the design team will develop solutions for the conflict areas. The solutions must not compromise safety under any circumstance. Of highest priority is the safety for all street users, especially the most vulnerable users: pedestrians and cyclists.

The design team will develop solutions using the guidance in Chapter 2 and earlier in this chapter, alongside the guidance related to elements in Chapter 4.

A useful scenario to demonstrate how to develop a potential solution is consider what happens when a sidewalk or multi-use path intersects mid-block along a high volume arterial street. Does the design team prioritize vehicle operations over the safety of the vulnerable users who at some point will risk the crossing or will they add a new mid-crossing to ensure safe passage at the expense of negligible overall trip delay? A Complete Streets solution favours the latter response.

Context will inform the final solutions given that every street will have different user networks and desire lines. The design team will 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, but never at the expense of safety for the most vulnerable users.

12. Develop the Initial Streetscape Design. The design team will begin to advance the functional and aesthetic details for the street. This step will include materials, pavement, planting, lighting furnishings—any elements that contribute to character and place-making.

3.2.3 Assessing and Deciding Trade-offs

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.

This discussion, which should happen early on in the process, requires all stakeholders to understand the perspectives and needs of others.

The trade-offs should relate to the requirements of each stakeholder group (internal staff, external groups, and in certain cases the broader public) and the variety of design elements that can best accommodate those requirements.

Clearly, some design elements will have wide ranging benefit. For example, sidewalks, bike lanes, and planting strips may fall into this category. However, different stakeholders will often express different interests or perspectives for what they believe is "good" street design.

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. That, along with the likelihood of right-of-way constraints, heightens the need to thoroughly assess trade-offs between different perspectives during the collaborative design process. Table 3.3 includes common trade-offs that take place in Brampton and other municipalities.

The steps outlined below suggest a linear process leading to an ideal solution. In some instances, the process may not follow the exact sequence described. Some information may not be available or even applicable for some conditions. The intent is to ensure that the guidelines and standards in this Guide are applied in a context sensitive manner, all users of the street are considered equally, any related plans are modified to reflect the anticipated outcome, and that decisions are honest and documented.

The following discussion is informed by a similar section in the Charlotte North Carolina Urban Street Design Guidelines (with kind permission) that offers a robust and thorough description of the assemblage and trade-off process. The Brampton guide modifies and expands the content to best address the local context.

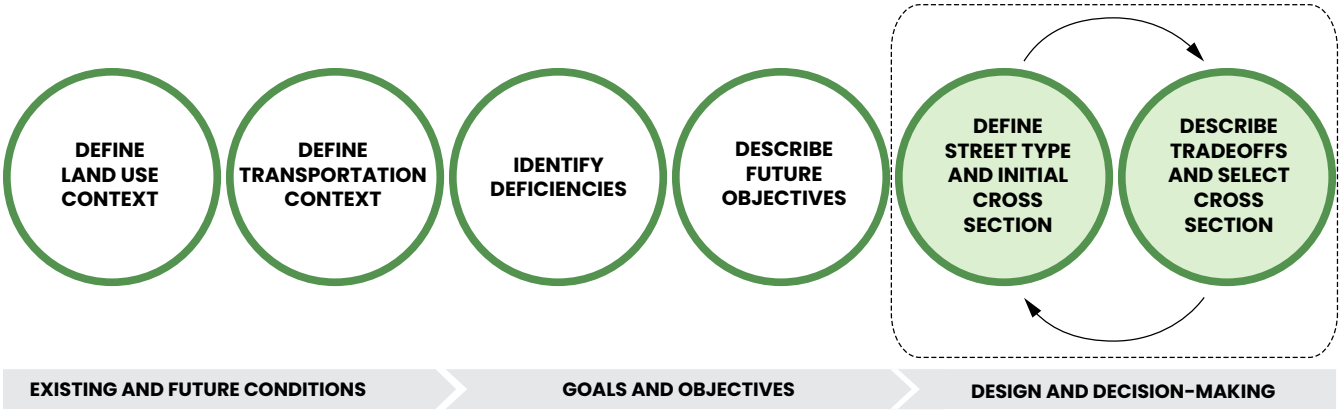


Figure 3.34. Six-step process for assessing and deciding trade-offs.
source: adapted from Charlotte's Urban Street Design Guidelines

1. **Develop Ideal Cross Section/ Prepare Alternative Designs.** If the initial, "ideal" cross-section can be applied, then this step is easy: the initial cross-section is the recommended cross-section. In most cases, though, the initial cross-section will need refinement to better address the land use and transportation objectives. Often, the design team will develop more than one alternative design.

2. **Establish Trade-Off Methodology.** The recommended method for evaluating the trade-offs is like the Ontario Ministry of the Environment and Climate Change Environmental Assessment process. This process is familiar to street practitioners and has resulted in several of the best Complete Street planning and design examples in Brampton (such as Queen+ Main/Downtown Reimagined and current efforts on Queen Street East and the Brampton North LRT on Main Street).

   Similar to an EA, the design team will establish a robust multi-variable set of criteria informed by the project objectives and Complete Street principles and evaluate each option in a qualitative and quantitative manner for how they satisfy the criteria. The design team will include interdisciplinary content experts to assist with specific issues. This step serves as a reminder to consider all users equally in the design process. It also provides accountability and direction for future street design projects. It is important that those evaluating the trade-offs are honest about why a decision is being made and the implications of that decision (see Section 5.5 – Oversight and Compliance).

   The design team should also consider applying a MMLOS assessment as part of the evaluation (draft MMLOS approach included in the Appendix and further developed as part of the upcoming Transportation Master Plan update). This step is not necessary with each project, but such a tool can certainly assist with the trade-off discussion in challenging ones that have reached a critical decision point to ensure that priorities are optimized and the needs of vulnerable users are met sufficiently.

Table 3.3 Common Street Trade-offs in Brampton

Faster transit vs. more stops
Vehicle delay vs. longer crossing time
Vehicle delay vs active transportation needs
High speed roadways vs context sensitive urban streets
Centre median vs. driveway access
Curb extension and full-time parking lane vs. pedestrian refuge median at intersections
Right turn on red and impacts on bike queues
Left-turn lane vs. bike lane through intersection
All-purpose motor vehicle capacity vs. bus lanes or diamond lanes vs. pedestrian realm
Street trees vs. cycling infrastructure
Street trees vs below grade utilities
Bicycle lanes vs. wider sidewalks
Rural clear zones vs urban lateral offsets
Near-side vs. far-side bus stop and attendant bike facilities
Lead vs. lag turns, and impacts on pedestrian/bike movements
Curb-side bus queue jump lane vs. shorter crossing distance for pedestrians
Mid-block bus bays vs. bus stopping in curb lane, and the bus operations implications
Parking on both sides of the road vs. parking on one side and bike lanes in each direction

3. **Refine Cross Section.** Once the trade-offs are evaluated, the design team should develop a refined (or more than one alternative) cross-section and suggested design treatments. Refinements should result from a thoughtful consideration of trade-offs among competing uses of the right-of-way. The trade-offs are often related to the requirements of each group of stakeholders and the variety of design elements that can best accommodate those requirements.

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

5. **Finalize and Document Decision.** The conclusion of all the previous steps, including any additional stakeholder input, should provide enough rationale to select the alternative that best matches the context and future expectations relative to the street project. Upon making a final decision, it is important that the design team document the process so that it can inform future similar street projects and serve as a reference for any questions that may arise about why a decision was made.

The trade-off discussion should take place early on and throughout the project delivery process. This will ensure that the more difficult and conflicting trade-offs are addressed in planning and early stages of design and are not passed on to the later stages where making changes is more problematic, both technically and budget-wise.

DESIGN PRIORITIES WITH TOO LITTLE RIGHT-OF-WAY

A common situation in street design occurs when there is not enough space to achieve the ideal cross section. In Brampton this happens where streets are already defined with few opportunities to widen the right-of-way more than what is defined in the Official Plan.

Once the difference between the preferred cross section and limited right-of-way is determined, the design team should follow the generalized steps outlined below to guide the street design process. The design team will develop their own list of design priorities specific to the street context and project objectives which may lead to a different order of steps. Not all steps will relate to every type of project or street context (for example, changes to the sidewalk zone are often not included in roadway resurfacing projects unless funds are assigned to do so); they are representative and suggest the range of decisions that the team should consider before eliminating an element entirely.

1. Reduce widths from preferred to minimum dimensions, beginning with elements such as travel lanes, medians, and edge zones.

2. Reduce the frontage zone to minimum dimensions except where the street accommodates outdoor seating areas. Be mindful of the impact on street vibrancy and local economy.

3. Reduce the furnishing zone to the minimum dimension and install tree grates and relocate or eliminate benches, utility poles, or other street furniture. Not recommended to reduce this zone on higher speed and volume streets.

4. Where included, reduce the availability of on-street parking. Two-sided on-street parking should be reduced to one-side before it is removed completely. On streets where there is ground floor retail, ensure that the projected area parking demand is adequately accommodated (but not necessarily all on street).

5. Eliminate a motor vehicle lane.

6. Reduce transit lanes and in-street platforms to their minimum possible dimensions while still accommodating projected volumes of transit riders.

7. Replace separate sidewalk and cycle track with multi-use path.

DESIGN PRIORITIES WITH TOO MUCH RIGHT-OF-WAY

A far less common situation in street design is when there is too much right of way.

However, in cases where new requirements or existing conditions define a wider right-of-way than the preferred dimensions, determine if the extra land could serve other purposes, such as improving dimensions for existing elements or adding in absent elements. Importantly, do not reflexively assign excess space to widen or add travel lanes as this may detract from place making opportunities. Design streets in new developments with the smallest possible right-of-way.

Once the difference between the preferred cross section and excessive right-of-way is determined, the design team should follow the generalized steps outlined below to guide the street design process. The design team will develop their own list of design priorities specific to the street context and project objectives which may lead to a different order of steps, for example requirements for cycle facilities will vary by street type.

1. Add on-street parking if enough demand and context, and not currently part of the cross section

2. Widen the furnishing zone to improve tree planting conditions and overall streetscape quality

3. Widen the pedestrian clearway

4. Widen the edge zone to increase vertical separation from the travel way and pedestrians

5. Upgrade cycling facilities and add buffers to bike lanes if none present

6. Widen frontage zone on streets with retail at grade to accommodate a wider range of uses

7. Upgrade transit facilities, adding additional space to in-street stops

8. Increase median widths and add additional planting if enough space provided

3.2.4 Exceptions

Complete Streets require that safety and mobility for all users is considered above all else in every case, and is the default approach to street design in Brampton. However, not all street projects will require the same elements or the same level of accommodation for the various users and uses.

If confronted with a special circumstance, the street design 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 an exception is considered necessary by the design team. Exceptions will require receive final approval only having been reviewed for compliance (see Section 5.5 - Oversight and Compliance).

Common 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 Downtown, Uptown, Central Area or other redevelopment and intensification projects).
- The cost of establishing facilities for a user is excessively disproportionate to the need or probable future use
- There is an indisputable lack of need for a certain mode 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 initial pre-planning stage of the project. The street design team should submit the exception request for oversight and compliance review. In no case will an exception receive approval if it will compromise user safety.

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 principles defined in Chapter 2 of this guide and project objectives.

c: SCAPE

4 DESIGN ELEMENTS

This chapter provides design guidance for the individual elements that combine to make a street. The design guidance is organized by components of the cross section (boulevard, cycle infrastructure, and roadway), intersections, and green infrastructure.

4.1 Overview

The information in this chapter is provided to support a collaborative and informed complete street design and implementation process.

This chapter is organized into five sections that designers should consider when assembling a Complete Street in Brampton.

4.2 / Boulevard Design describes street elements typically found in the pedestrian zone such as a pedestrian clearway, street furnishing and planting zone, and the edge zone.

4.3 / Cycle Infrastructure Design focuses on ensuring safety for cyclists. Depending on the context, cycle infrastructure can either be part of the boulevard or part of the roadway.

4.4 / Roadway Design describes the parts of the street where the transit and motor vehicles are located.

4.5 / Intersection Design focuses on where streets meet and describes the elements typically found in and around intersections.

4.6 / Green Infrastructure Design refers to the natural and man-made elements that provide ecological and hydrological functions and discusses sustainable stormwater and green infrastructure elements.

USING THE STREET ELEMENT GUIDELINES

Each section begins with a discussion of design principles that apply to each street element in that section. The dimensions for the various elements will depend on the street type, available right-of-way, adjacent land uses and intensity and type of uses expected along a segment. In most instances, where dimensions are provided, they include a range from minimum to maximum- the design domain- to offer a degree of flexibility. Dimensions are intended to guide decision making during assemblage. In constrained areas where there is limited space in a right-of-way, refer to the trade-off discussion in Chapter 03.

Guidelines for streets elements should be used together with best practices and city policies and standards. The City of Brampton currently has a number of area specific guidelines such as Brampton's Landscape Development Guidelines (2019) or the Downtown Civic Design Guide. Where relevant, these policies and guidelines are cited at the end of each element section where appropriate. Recommendations for City standards updates to align with this Guide are included in Chapter 05.

Figure 4.1. Complete Street examples.

BUILDING UPON BEST PRACTICES

In preparing the Guide, the project team reviewed guidelines and policies from other comparable mid-sized cities and best practice from across North America. These are identified as 'Best Practice Boxes' and included throughout this chapter. The practitioner is encouraged to refer to these sources as a point of reference during the complete streets process. While these Best Practice Boxes do not have formal jurisdiction in Brampton, they employ best practices and have informed this guide.

RESPONSIVE AND FLEXIBLE GUIDELINES

For the most part the Guide is flexible so that street design can respond to the project objectives, context, and user profile. Too often, practitioners reflexively rely on the minimum standards listed in traditional roadway design guidance. This Guide offers desired outcomes. The intent is that by describing the desired condition of the street, practitioners will become better equipped to design streets that are complete, responsive to different conditions and embraced by the community.

Given that design guidance for elements changes and evolves on a regular basis, this Guide establishes the way we want Brampton practitioners to think about Complete Streets. The actual dimensions in this Guide may differ over time so regular updates and referring to the latest best practices and standards is an important part of the Complete Streets design process.

4.2 Boulevard Design

The boulevard includes the area between the curb edge and the face of a building or a property line. Boulevards are a key component of public streets and play an important role in facilitating walking as a safe, accessible and attractive choice for people of all ages and abilities.

In Brampton, boulevards are a key element of the public realm and an important extension of the open space network, providing vibrant spaces for residents, employees and visitors to gather and socialize. Boulevards also serve as vital public spaces that contribute to the city's economic, social and environmental well-being. The design of boulevards should reflect adjacent context, pedestrian volume and anticipated mix of activities.

For major road reconstruction projects and new street design, boulevard width should relate to the scale of the street, the height of adjacent buildings and the surrounding land use context. A useful urban design starting point is to target 40% of the public right-of-way as a combined sidewalk dimension from both sides of the street, with no less than 35%. This range ensures that the pedestrian environment will proportionally fit within the street context. However, the ultimate boulevard dimension will result from the need to accommodate the various users. A building setback on private property adjacent to the street right-of-way can further contribute to the overall boulevard dimension.

Brampton Complete Streets builds on the City of Brampton Active Transportation Master Plan Design Compendium (2019), a compendium of recommended practices for the design of active transportation facilities. In designing boulevards, practitioners should refer to the Design Compendium in addition to the direction provided in this guide.

Of all the street types, Urban Main Streets, Mixed Use Neighbourhood Streets and Downtown Streets require special attention to ensure adequate boulevard design to support higher intensity pedestrian activity, the local economy, and place making objectives.

DESIGN PRINCIPLES

- **Accessibility and Mobility.** Provide accessible pedestrian clearways and other facilities that meet and exceed AODA. Ensure clear, direct, unobstructed continuous paths of generous context-sensitive width to serve existing and anticipated pedestrian volumes.
- **Visibility.** Ensure unobstructed sightlines among road users at intersections. Design and locate crosswalks to improve the visibility of pedestrians and reduce physical barriers and visual clutter.
- **Safety.** Design streets with the most vulnerable users in mind. Pedestrian friendly design considers the frequency of crossing opportunities, target speed, street width, intersection geometry, visibility, signal timing and walk speeds for vulnerable pedestrians, such as seniors and individuals with disabilities.
- **Continuous Pedestrian Network.** Create a network of continuous sidewalks with dedicated space for pedestrians separated from cyclists and motor vehicles. Pedestrians often transition to other modes of public transport and need to access transit stops safely. It's important that sidewalks are connected and integrated within larger transport networks.
- **Place-making.** Boulevard are places where people interact. Design boulevards as places with street furniture, trees, cafes, public art, lighting and places to slow down and mingle. Design boulevards to invite use and provide comfort. Use boulevards and intersections to create opportunities for place-making wherever enough space exists.

Figure 4.2. Boulevards are a key element of the public realm and an important extension of the open space network, providing vibrant spaces for residents, employees and visitors to gather and socialize.

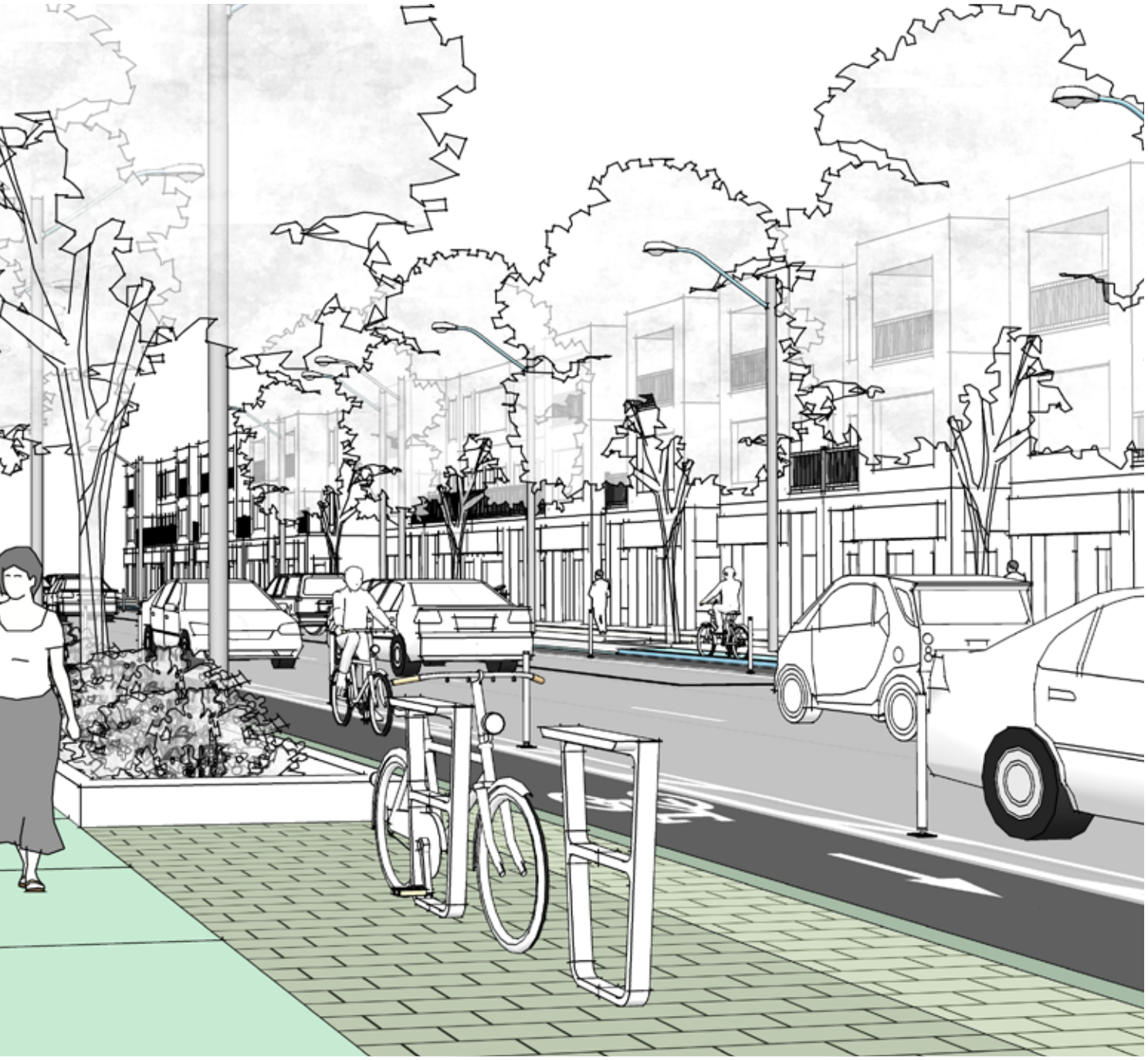
- **Design for Comfort.** Provide comfortable, efficient, and four-season sidewalks, with street trees offering shade and relief from wind, sun, rain and snow. Carefully arrange street elements to support and encourage pedestrian activities.
- **Flexibility.** Design boulevards and curbside spaces to evolve with changing demands and technology. Consider the street's context for current and future uses.
- **Greening Infrastructure and Stormwater Management.** Incorporate vegetation and passive stormwater measures, where possible, to improve the City's green infrastructure and enhance the quality of the street. Divert stormwater into rain gardens, planting beds, or permeable paving to reduce the potential for ponding.
- **Design for Efficient Maintenance.** Well-considered sidewalks are durable and easier to maintain. Provide adequate access to utilities. Coordinate new utilities and upgrades to minimize impact to pedestrian movement and provide enough soil and water for street trees to reach maturity.

ORGANIZATION OF BOULEVARD ZONE

Boulevards in Brampton can be broken into four zones. The width required for each zone depends on its context and pedestrian activity levels.

- **Pedestrian Clearway Zone.** This is an unobstructed path for pedestrians, which offers safe, accessible, and efficient movement for those not traveling by other modes. Clearway width is informed by street context and the level of pedestrian intensity, with more generous clearways on streets in places such as Downtown, Town Centres and busy transit routes.
- **Furniture and Planting Zone.** This zone provides space for a wide range of street elements such as trees, streetlights, benches, fire hydrants, signs, litter and recycling bins, bike racks, benches, and transit shelters.
- **Edge/Curb Zone.** The space behind the curb face that acts as a buffer between moving/parked vehicles and the other boulevard functions. This zone may include signposts, parking meters, car door swing paths, and snow storage.
- **Frontage and Marketing Zone.** This zone is adjacent to properties and includes building entrances, front yards, window shopping areas, café seating, and building-related utilities. This area may become part of the public right-of-way or remain in private ownership if a building setback is present.

Figure 4.3. Boulevard zones.



Furnishing and Planting Zone

Edge Zone

In-Between Zone

4.2.1 Pedestrian Clearway Zone

The Pedestrian Clearway Zone is the most important part of the boulevard.

It is the unobstructed portion designated for pedestrian movement, often referred to as the sidewalk. Before committing to the ideal sidewalk design and preferred width, ensure the total user profile and functional requirements of the street and roadway are considered.

Preferred clearway widths build on the City's Active Transportation Master Plan Design Compendium (2019) and are informed by street context, intensity of use, place-making objectives, available space and any further inputs. Wider pedestrian clearways are recommended on streets that bring more people to the sidewalk, e.g., busy transit routes, or other sites with large volumes of pedestrians. In these instances, space is needed for a greater number of pedestrians to pass each other, window shop, push strollers or delivery carts or support someone needing assistance.

Benefits

- Improved accessibility.
- Greater pedestrian safety and comfort.
- Enhanced local economy.
- Improved place-making.

Guidance

- Provide continuous sidewalks and clearways without obstruction.
- Connect sidewalks across intersections with suitable pedestrian crosswalks.
- Determine clearway width based on street type and intensity of existing and anticipated future pedestrian volumes. Wider clearways are applicable along Urban Main Streets, Mixed Use Streets and Downtown Streets with greater pedestrian activities. In all cases the clearway width should be determined in accordance with Table 4.1.
- In constrained locations the clearway width must meet the practical lower limit.
- Justification is needed when unable to achieve the recommended lower limit clearway width. Refer to Chapter 03.
- The width of the boulevard should first accommodate the pedestrian clearway, assigning available sidewalk space to other zones once the clearway dimension is satisfied.
- All sidewalks must adhere to AODA requirements for clearance width and slope at a minimum. Provide enough slope to clear stormwater runoff but not to create unsafe walking conditions.
- Sidewalk paving should include stable, firm, and slip resistant materials. Minimize the number of different materials in the clearway and across the sidewalk cross section.
- Coordinate utilities and streetscape work to minimize interference with the pedestrian clearway.
- Ventilation grates and covers are not considered part of the clearway.
- Signage is not permitted within or projecting into the pedestrian clearway.

More Information

- City of Brampton (2019). Active Transportation Master Plan.
- City of Brampton (2019). Landscape Development Guidelines.
- City of Brampton (2015). Accessibility Technical Standards - Version 2.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- Accessibility for Ontarians with Disabilities Act (AODA) 2005.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.

Figure 4.4. Wider pedestrian clearways are required on streets with greater pedestrian activities

Figure 4.5. Pedestrian clearway should designed to accommodate pedestrians of all ages and abilities.

Table 4.1 Pedestrian Clearway Width by Street Type

Street Type	Recommended Minimum Target Width
Urban Main Street	3.0m
Neighbourhood Connector	2.1m
Commercial Connector	2.1m
Mixed Use Residential	3.0m
Neighbourhood Residential	2.1m
Employment Collector	2.1m
Downtown Streets	3.0m
Local Residential	2.1m
Local Employment	2.1m
Shared	Entire Street
Lane	Entire Street

4.2.2 Furnishing and Planting Zone

The Furnishing and Planting Zone is typically between the edge zone and the Pedestrian Clearway Zone, providing a buffer between pedestrians and the adjacent roadway.

It is an appropriate location for street trees, street furniture and street lighting. It is also the preferred location for other elements such as signage, pedestrian lighting, hydrants, and above and below grade utilities. Clearance and setback requirements apply to elements located in the Furnishing and Planting Zone. When cycling facilities are at boulevard level the Furnishing and Planting Zone is often located between a cycle facility and the Clearway and Edge/Curb Zone acting as a buffer to the travelway.

Benefits

- Contributes to place-making.
- Provides amenities to pedestrians.
- Enhances the attractiveness of the public realm.
- Enhances adjacent businesses and support economic vitality.
- Encourages pedestrians to linger and interact, supporting sense of community.
- Reduces heat island effect, provides cooler streets and more shade.
- Creates a more inclusive environment.

Guidance

- On streets without street trees provide a 1.0m minimum width Furnishing and Planting Zone to accommodate street furniture, signs and other amenities.
- On streets with street trees, 1.8m is the preferred Furnishing and Planting Zone to accommodate open tree pits, planters or grates.
- 1.2m minimum is acceptable if a minimum 30m^3 of soil per tree can be achieved. See Section 4.5 Green Infrastructure Design.
- For boulevards 5.5m in width or greater, provide the 1.2m minimum Furnishing and Planting Zone.
- Locate street trees, street furniture and public wayfinding signage within the Furnishing and Planting zone.
- Incorporate street furniture elements such as regularly spaced benches to accommodate individuals with disabilities, such as those with physical and visual disabilities or impairment, as well as children and the elderly.
- The Furnishing and Planting Zone can include hardscape or softscape surfaces or include a mix of both depending on the street type and context.
- Place street furniture to maintain adequate sightlines for all users and not interfere with the pedestrian clearway or with transit boarding, queuing or disembarking.
- Do not locate street furniture: within 2.0m of the end of corner radius; within 1.0m of curb cut; within 0.5m of the face of curb; within 0.6m of a driveway; within 2.0m of fire hydrant; within 1.0m of traffic signal pole, utility pole or tree; or, on top of utility maintenance hole.
- While consistency in design is generally preferred, customization of some parts of the street furniture is encouraged to reflect different conditions or neighbourhood identities.
- Use an enhanced palette of street furniture for Urban Main Streets, Mixed-use Neighbourhood Streets and Downtown Streets where place-making is a priority.

More Information

- Refer to 4.2.1.

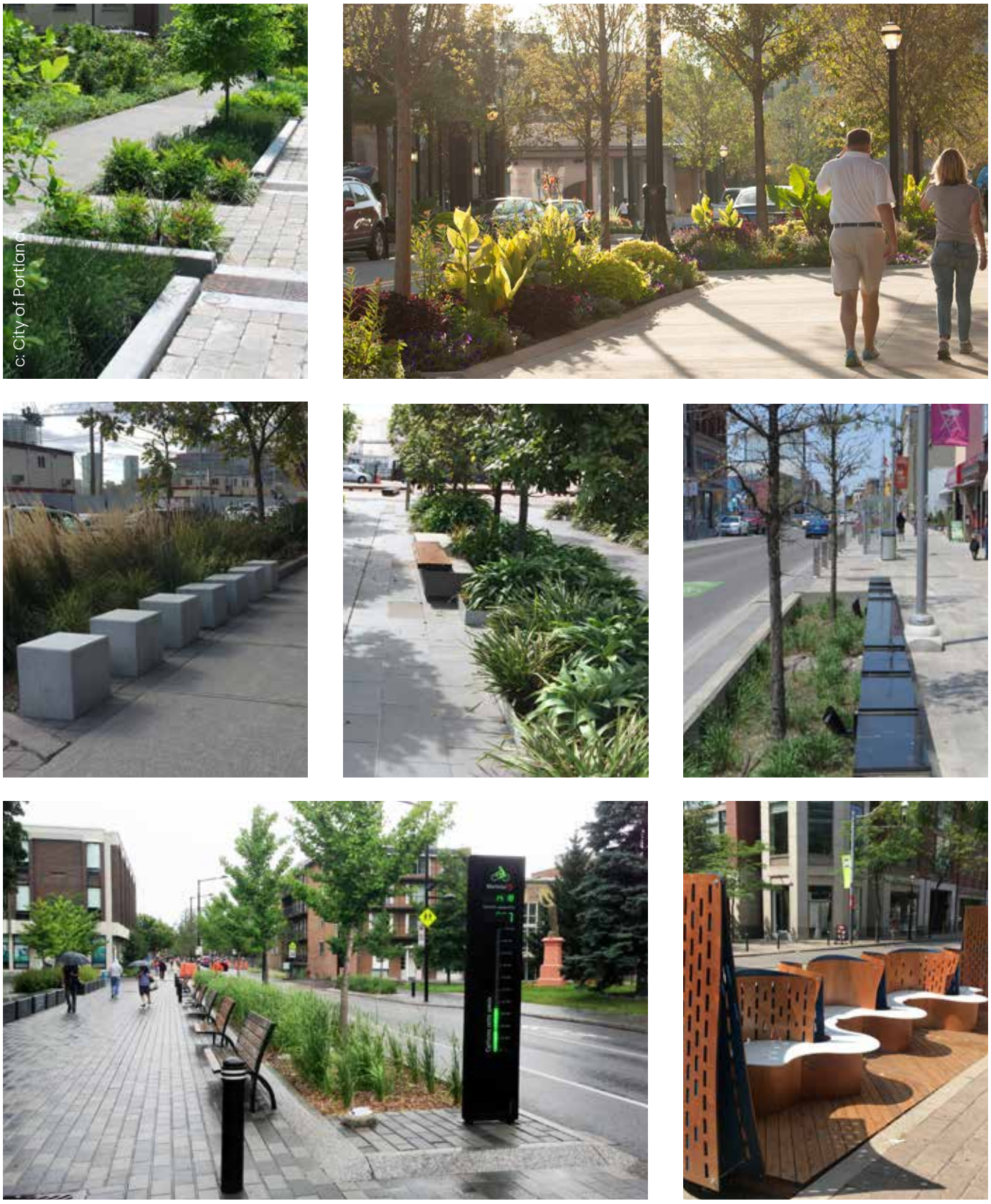


Figure 4.6. Provide street trees and landscaping in a dedicated Furnishing and Planting Zone to maintain a continuous, unobstructed pedestrian clearway.

4.2.3 Frontage and Marketing Zone

The Frontage and Marketing Zone is the space typically located between the Pedestrian Clearway Zone and building frontage on streets with active commercial uses at-grade and with higher pedestrian volumes.

This zone can occur on either public or private lands. Often, this zone accommodates outdoor seating areas for cafes and restaurants and supports local businesses. The design and configuration of sidewalk cafes and marketing elements are subject to Zoning By-law and business owners must obtain relevant permits from the City's Municipal Licensing Division to operate these elements in the public right-of-way.

Benefits

- Enhances the public realm and provides an attractive and desirable amenity.
- Increases available space for pedestrian activity and improves the vibrancy of the street.
- Supports local businesses.

Guidance

- On streets with active commercial ground floors such as Urban Main Streets, Mixed Use Neighbourhood Streets or Downtown Streets (where space permits), provide: 0.9m min. width zone for advertising boards; 1.2m for lineup areas and 1.75m for restaurant tables in accordance with the ATMP Design Compendium.
- In high pedestrian volume areas with a concentration of shops the Frontage and Marketing Zone could be wider to allow for café tables and seating, benches, planting, merchandise displays, and other amenities, and higher volumes of window shopping. Greater clearways are required in busier pedestrian areas, so people do not spill onto the roadway and can comfortably access and enjoy café, marketing, and vending areas (see section 4.3 on the importance of the Pedestrian Clearway Zone).
- Where there is relatively little pedestrian traffic, along residential streets or where there are building setbacks, the Frontage Zone may be decreased or eliminated altogether, as determined on a case-by-case basis.
- Since pedestrians are given the highest priority in the boulevard, outdoor cafés or marketing displays must not infringe on the Pedestrian Clearway Zone (clearway).
- Select and combine café types to provide the best sidewalk configuration that maximizes clear and straight clearways and optimum public realm experience.
- Consider alternate means of delineating the perimeter of cafés to maximize openness, including the use of portable fencing or plant boxes.
- Coordinate configuration of sidewalk cafés with other sidewalk elements such as street trees and lighting to reduce clutter and any curbside activities.
- Where platforms are provided, ensure all accessibility requirements of the AODA and Ontario Building Code are met.
- Respect the built character of the context, especially at heritage buildings or precincts.
- Maintain clear access and minimum separation to other sidewalk elements, building entrances, exits and adjacent residential properties.
- Maintain sightlines at intersections.
- All café and marketing display elements including perimeter fencing, furniture, temporary enclosures, etc. must be sturdy and durable, and meets the various required clearway criteria noted above.

More Information

- City of Brampton (2019). Active Transportation Master Plan.
- National Association of City Transportation Officials (2013). Urban Street Design Guide.
- City of Toronto Sidewalk Café Manual (DRAFT).
- Refer to 4.2.1.

c: Unknown

c: Redbankgreen.com

c: City of Royal Oak

c: af9bell1_admin, The Dram Shop

c: Brian Rose

Figure 4.7. Frontage and marketing display elements should be provided to maximize a clear and straight Pedestrian Clearway Zone

4.2.4 Edge/Curb Zones

The Edge/Curb Zone is located between the roadway and the Furnishing and Planting Zone.

The Edge/Curb Zone provides a buffer between moving or parked motor vehicles and the other boulevard functions. This zone plays an important role in street maintenance, especially for snow storage in winter. This zone may include signposts, parking meters, car door swing paths, and snow storage. An Edge/Curb Zone may not be present as a separate area on all streets and will sometimes overlap with the Furnishing and Planting Zone.

Benefits

- Greater pedestrian safety and comfort.
- Minimizes clutter to the planting and furnishing zone.

Guidance

- Provide a minimum 1.0m Edge/Curb Zone, measured from outside face of curb. Wider dimensions may be required depending on context, user profile and available space within the ROW. In accordance with the Active Transportation Master Plan Design Compendium (2019) a 1.8m Edge Zone is recommended for higher speed and higher volume streets.
- No vertical obstructions within a minimum 0.5m from face of curb and 0.9m at intersections. This distance may increase if space permits and other uses in boulevard are satisfied.
- The Edge/Curb Zone is distinct from the Furnishing and Planting Zone
- The Edge/Curb Zone should not overlap with cycling facilities.
- On boulevards without a Furnishing and Planting Zone, utility fixtures, sign posts, parking meters can be located within the edge zone given they meet the minimum lateral offsets. In these instances, place vertical fixed objects as close to roadway as possible to increase the safety of and reduce exposure of vulnerable users to potential conflicts with vehicles. Minimum horizontal offset for all vertical objects are described in more detail in Clear Zone/Lateral Offsets (4.4.3).
- Construct the Edge Zone of durable materials appropriate for snow storage and street cleaning.
- Use an enhanced palette of paving materials for Urban Main Streets, Mixed-use Neighbourhood Streets and Downtown Streets where place-making is a priority.
- Decorative paving is often used to distinguish the Edge/Curb Zone from other boulevard elements.

More Information

- Refer to 4.2.1.

Figure 4.8. The Edge/Curb Zone may have some vertical elements, such as street lights, utility poles, parking meters and parking signs. It's also used for snow storage in the winter months.

4.3 Cycle Infrastructure Design

In the street design process, it is critical to consider the characteristics and needs of existing and potential cyclists. This includes cyclists of various ages, skill and comfort levels, as well as various trip purposes such as cycling for recreation, commuting, and other utilitarian purposes such as shopping, visiting friends or making deliveries.

A key step in the street design process is identifying whether the proposed project is part of the existing or planned cycle network or other corridor plans. The City of Brampton Active Transportation Master Plan and Active Transportation Master Plan Design Compendium (2019) provides guidance on the location and design type of cycling facilities through-out the city.

A variety of factors influences the design of cycling infrastructure. Cycle infrastructure design should start with a consideration of the typical user characteristics to determine the minimum space needed. The right amount of space is determined by examining typical cyclists' dimensions, space needed to maneuver, expected cyclist volumes, motorized vehicular volumes, road speed, road geometry, topography and the presence of other users and uses.

The benefits of incorporating cycle infrastructure are well documented and include increased cycling mode share reduced motor vehicle traffic volume, reduced air and noise pollution, reduced motor vehicle parking demand and increased public health benefits.

DESIGN PRINCIPLES

- **Safety:** prioritize the most vulnerable road user. Cyclists and pedestrians are more vulnerable than motorists or transit riders because they are not protected by a vehicle. Prioritizing vulnerable users means providing separation or protection between motor vehicles and cyclists and cyclists and pedestrians. In designing cycling facilities consider how to mitigate conflicts between users with design treatments and elements that respond to both pedestrian and cycling speeds.

- **Context appropriate.** Select the appropriate cycle facility type and design elements based on street type, speed and volume and adjacent context. Faster busier streets require more protection, while quieter streets with low traffic volumes and low speeds may provide a comfortable cycling experience without a dedicated facility.

- **Design for present and future users.** Cycling ridership will grow if a cycling facility is provided in a place where it was previously uncomfortable for cycling. Build it and they will come, as they say.

- **Continuous, visible and intuitive cycling facilities.** Clear delineation of the cycling path of travel and wayfinding can improve safety of all road users. Use pavement markings, signage, grade changes between users to provide cyclists with intuitive guidance. This guidance should extend for the length of a corridor through intersections and crossings and connect with Brampton's broader off-street cycling network.

- **Supply adequate cycling-supportive facilities.** Support and encourage cycling by providing conveniently located and reasonably secure bicycle parking especially in mixed-use, institutional and commercial areas and around transit. Consider adding bicycle fixing stations (e.g. secured pumps and tools) in important locations where on-and-off street cycle infrastructure converge.

- **Provide a comfortable experience.** Provide smooth riding surfaces with regular maintenance. Ensure catch basin covers are bike-friendly, and that debris, water and ice do not accumulate where people will be cycling. Acknowledge that cycling is more than a two-season activity and consider winter snow clearing of important cycle routes. Cycling facilities, bicycle parking, bike-sharing and bicycle wayfinding are the key elements that should be considered for complete streets improvements.

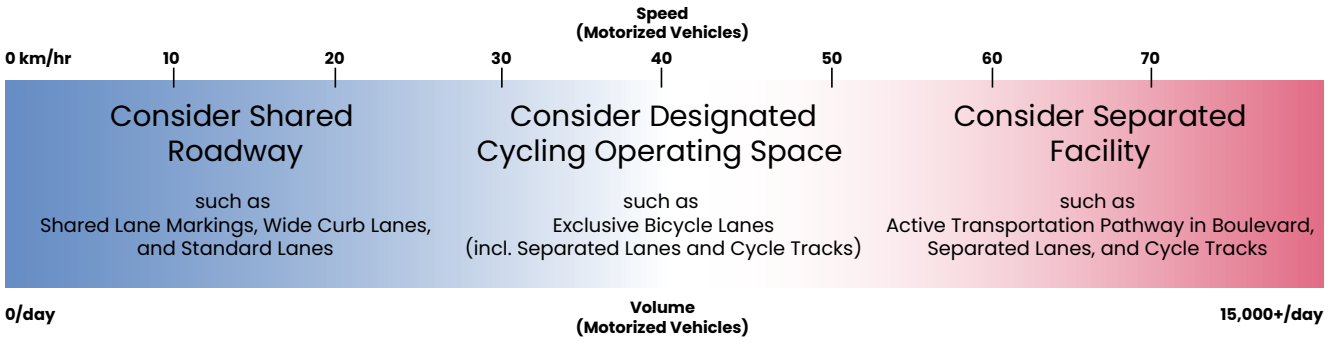


Figure 4.9. The Relationship of traffic speed and volume to types of cycling facilities. (Source: Adapted from OTM Book 18)

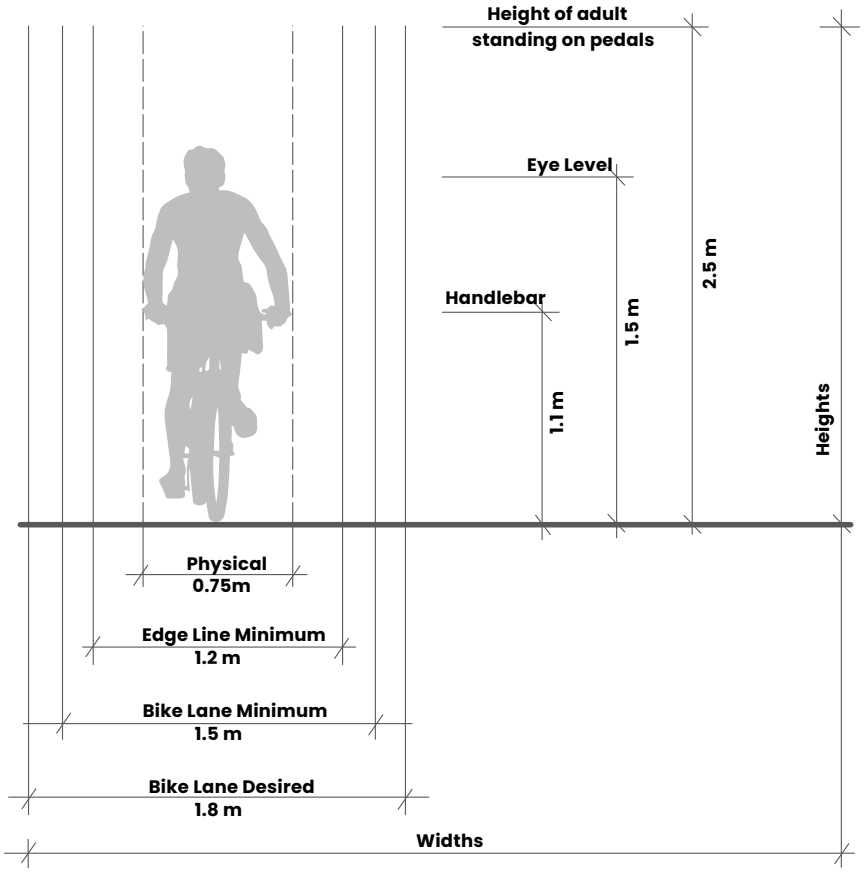


Figure 4.10. The minimum typical user characteristics for physical space and height. (Source: Adapted from OTM Book 18).

4.3.1 Key Cycling Elements

Practitioners should refer to the OTM Book 18 (2021) facility selection tool and the City's Active Transportation Master Plan Design Compendium (2019) to help determine the most appropriate cycling facility type for a specific street, in addition to the direction provided in this guide. Cycling facilities in Brampton can be divided into categories based on street operating speeds and anticipated volume of users:

- Streets operating equal to or higher than 50km/h: separated facilities (multi-use paths, cycle tracks or protected bike lanes. The volume threshold for a separated facility is 10 000 AADT.
- Streets operating equal to or less than 50km/h and over 3,000 AADT: designated or separated facilities (cycle tracks, protected bike lanes, bike lane or buffered bike lanes)
- Streets operating equal to or less than 40km/h and under 3000 AADT: bike lanes or shared facilities

Refer to Section 4.4 for guidance on cycling elements within intersections.

Shared Space	Bicycle Boulevards Sharrows Super Sharrows Signed Routes	Volumes of < 3,000 AADT Operating speeds <40km/hr Local Roads
Designated Space	Bike Lanes Buffered Bike Lanes Paved Shoulders Buffered Paved Shoulders	Volumes of 3,000 to 15,000 AADT Operating speeds of 40 to 50km/hr Collector Roads/Minor Arterial Roads
Separated Space	Boulevard Multi-use Paths Separated Bike Lanes or Cycle Tracks	Volumes of >10,000 to >15,000 AADT Operating speeds of equal to or > 50km/h Minor Arterial Roads/Major Arterial Roads

Figure 4.11. Summary of Brampton cycling facility classes (Source: City of Brampton Active Transportation Master Plan Compendium, (2019).

Figure 4.12. Boulevard multi-use paths (Courtsey: City of Brampton).

Figure 4.17. Cycle tracks.

Figure 4.16. Buffered bike lanes.

Figure 4.15. Separated two-way facility.

Figure 4.13. Sharrows.

Figure 4.14. Bike boulevards.

4.3.2 Multi-Use Paths

Multi-use paths (MUP) are typically located within the boulevard and designed to accommodate a mixture of modes of active transportation including pedestrians, cyclists and other non-motorized modes of movement.

The objective of a multi-use path is to provide a safe, dedicated well-protected space to encourage alternate modes of travel. MUP's can also provide important connections to the larger cycling networks within Brampton and the Region.

Benefits

- Improved safety outcomes due to separation between cyclists and motorists.
- Increased cycling mode share when connected to a network of separated cycling facilities, due to the broader range of cyclists comfortable using cycling facilities in the boulevard.
- 'AAA': 'A'ccommodate all 'A'ges and 'A'bilities.

Applicability

- Neighbourhood Connectors, Commercial Connectors, Employment Streets and other streets with wide rights-of-way, high permitted vehicle speeds and volume, lower density land uses, low pedestrian and cyclist volume, frequent large trucks, minimal conflicts (such as driveways or intersections volumes of greater than 10,000 AADT, and operating speeds of 50km/h or greater. Otherwise, consider a one or two-way cycle track and a sidewalk.

Guidance

- 4.0-5.0m width MUP when on one side of the street, as recommended by the ATMP. This dimension will comfortably accommodate one person cycling in one direction and two people walking abreast in the other direction. This dimension is exclusive of the buffer noted below.
- 3.0m minimum width or when a MUP is provided on both sides of the street, as recommended in the ATMP. This dimension is exclusive of the buffer noted below.
- 1.5m-2.5m buffer, excluding curb as recommended in the ATMP. The buffer zone can be grass or pavement (asphalt or concrete), provided the materials has a visual contrast and tactile difference to the MUP.
- Where additional width is available, consider increasing the width of the a buffer zone.
- In areas of higher anticipated pedestrian and cycling volume consider a pathway treatment designed to distinguish between walking and cycling. In these cases, the pathway should ideally measure 4.5m in total, and be comprised of a min. 1.5 area for pedestrians and 3.0m for cyclists.
- The preferred MUP surfacing material is asphalt.
- Should be marked with pedestrian and bicycle stencil and directional arrows at major access points or street crossings.

More Information

- OTM Book 18 (2021): Cycle Facilities.
- Transportation Association of Canada's Geometric Design Guide for Canadian Roads (2017).
- NACTO (2018). Urban Bikeway Design Guide.
- City of Brampton (2019). Active Transportation Master Plan.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).

Figure 4.18. Multi-use paths should be separated from vehicular traffic with a landscape or paving buffer.

4.3.3 Cycle Tracks

Cycle tracks are physically delineated bicycle lanes that are located within the boulevard.

Cycle tracks can be located adjacent to the edge of the curb or set further away from the roadway and are often separated from the curb by the furnishing and planting zone. Many forms of delineation are possible such as flex bollards, raised curbs (barrier or semi-mountable), planters, or medians. The cycle track itself is located at the same level as the sidewalk or at an intermediate elevation between the elevation of the road and the sidewalk. When a cycle track is located adjacent to a pedestrian clearway the interaction between cyclists and other sidewalk zone activities is of particular importance.

Benefits

- Improved safety outcomes due to more separation between cyclists and motorists.
- Increased cycling mode share when connected to a network of separated cycling facilities, due to the broader range of cyclists comfortable using cycling facilities in the boulevard.

Applicability

- Urban Main Streets, Downtown Streets, Mixed-Use Neighbourhood Streets or other streets where separation from motor vehicles is warranted due to motor vehicle travel speed of 50km/hr or higher and over 3,000 AADT, where observed cycling volumes make the implementation and operation of separated one-way facility on both sides of the roadway difficult to justify, where there are shorter blocks with multiple driveways or to separate higher volumes of pedestrian and cyclists.

Guidance

- Consider one-way facilities on streets with infrequent driveways and relatively high observed or potential cycling volume.
- Consider two-way facilities carefully, as two-way operation can create significant challenges at intersections. Such facilities are most appropriate where intersections are very infrequent and have low motor vehicle volumes on the cross streets.
- Design one and two-way facilities to meet the criteria set out in the ATMP, summarized in Table 4.2 and 4.3.
- Where located adjacent to parking, provide 1.2m width or greater barrier zone. The barrier zone can be paved with concrete or unit pavers. Minimum width to meet OTM Book 18.
- Where constructed at sidewalk level and located adjacent to a drop curb, provide a minimum 0.5m buffer between the cycling facility and the drop curb; consider a beveled curb to reduce risk for cyclists, unless a drop curb is necessary to restrict motor vehicle encroachment.
- Flank driveway crossings with “elephant feet” markings and include a bicycle stencil(s) and directional arrow(s) at every driveway.
- Integrate the cycling facility into transit stop platforms or bend around transit stop platforms (refer to Chapter 4.4 for further details).
- Use curb cuts with tactile plates as well as zebra markings across the cycling facility to mark pedestrian crossings at island transit stops, designated loading zones and accessible parking spaces.

Figure 4.19. Where there is enough space, landscape areas provide good buffer between different activities in a boulevard.

Figure 4.21. High visibility treatment for cycle tracks at driveways.

Figure 4.20. Cycling tracks separated from the pedestrian clearway through a change of paving material.

- Every effort should be made to provide a separate sidewalk for pedestrians, exceptions should only be made where right-of-way constraints are prohibitive or combined bicycle and pedestrian peak hour volumes are expected to be very low. Distinguish the cycling facility from the pedestrian clearway, either through use of different pavement, a beveled curb, or a distinct tactile surface treatment such as unit pavers, tactile indicators or vegetation.
- At high volume driveways, consider the use of green pavement markings and signage, in addition to pavement markings.
- The preferred surfacing material is asphalt, though unit paver construction is possible in high profile locations such as Downtowns or Town Centres. In either case, a different material is required for the cycling facility from the pedestrian clearway to clearly convey the different users

More Information

- Refer to 4.3.2.

4.3.4 Bike Lanes

Bike lanes are located in the roadway zone and include designated bicycle lanes which are either of a conventional, contra-flow, buffered, or protected design.

A complete streets approach means that cyclists are considered on all streets but does not define or require specific cycling facilities for all streets. Cyclists can travel on any street in Brampton, except expressways where cycling is prohibited. Many streets with low traffic volume and travel speeds may provide a comfortable cycling experience with a designated cycling facility.

Mitigating conflict with motorists is a key concern since roadway cycling facilities either share space with or are located adjacent to travel lanes and/or parking lanes.

Dedicated bike lanes are defined by pavement markings and are typically located between a travel lane and the curb or parking lane.

Contra-flow bike lanes are similar to conventional bike lanes but operate in the opposite direction of travel on motor vehicle one-way streets.

Buffered bike lanes are often between a travel lane and the curb, between travel lane and a parking lane or between a parking lane and the curb. The buffer is typically located between the bike lane and parking lane to provide further protection from the door zone, though it is often located between the bicycle lane and an adjacent travel lane.

Where no on-street parking is present, or where the buffered bicycle lane is located between a parking lane and the curb, bollards or planters help to reinforce the separation provided by a painted buffer.

Benefits

- Improved safety outcomes by increasing connectivity on low-volume, low-speed streets and designating space for cyclists and motorists on other streets.
- Increased convenience for cyclists as overtaking and direct left turns are facilitated with most on-street bicycle facility types.
- Increased cycling mode share when connected to a network of cycling facilities due to greater convenience and comfort for many cyclists.

Applicability

- Neighbourhood Residential, Employment Collector and Downtown Streets
- Streets operating equal to or less than 40km/h and over 3,000 AADT

Guidance

- Bike lanes that are adjacent to travel lanes improve the visibility of cyclists and allow for greater maneuverability. A buffered bicycle lane is preferred over a conventional bicycle lane when on-street parking is provided.
- Consider bollards and/or planters wherever illegal parking within a bicycle lane is a frequent occurrence.
- Consider the conversion of bicycle lanes with high bicycle volumes to cycle tracks when roadway reconstruction is planned.
- Typical design criteria for protected bike lanes are shown Table 4.2 and 4.3.

More Information

- Refer to 4.3.2.

Figure 4.23. An example of buffered bike lane in Brampton.

c: City of Columbus

Figure 4.22. On-street parking can provide a buffer to bike lanes.

Table 4.2 Design Criteria for Uni-Directional Protected Facilities

Bicyclists/ Peak Hour (One-Direction)	Bike Lane/Cycle Track Width (m)	
	Recommended	Minimum
<150	1.8m	1.5m
150-750	2.4m	2.0m

Table 4.3 Design Criteria for Bi-Directional Protected Facilities

Bicyclists/ Peak Hour (Both-Direction)	Bike Lane/ Cycle Track Width (m)	
	Recommended	Minimum
<150	3.0m	2.4m
150-400	3.4m	3.0m

4.3.5 Shared Facilities

Shared facilities include bicycle boulevards and signed routes. They are well suited for streets with low motor vehicle volumes and speeds optimized for bicycle traffic.

Bicycle boulevards discourage cut-through motor-vehicle traffic but permit local access. They are designed to give priority to bicyclists as through-going traffic. They are intended as a low-cost, way to create a connected network of streets with good bicyclist comfort and/or safety.

Signed routes simply include wayfinding such as sharrow road-way markings or other directional signs that connect to other parts of the active transportation network.

Figure 4.24. Shared facilities on low-volume and low-speed streets.

Benefits

- Improved safety outcomes by increasing connectivity on low-volume, low-speed streets and designating space for cyclists and motorists on other streets.
- Increased cycling mode share.
- Secondary benefits associated with greater cycling mode share including reduced motor vehicle traffic volume, reduced air and noise pollution, reduced motor vehicle parking demand and increased public health benefits.

Applicability

- Streets operating equal to or less than 40km/h and under 3,000 AADT
- Local Residential, Local Employment and Downtown Streets

Guidance

- Use wayfinding and identification signs to create a strong visual identity for the street and designate the corridor as a bicycle route.
- Prohibit parking at minimum 10m upstream from driveways to provide adequate sightlines.
- Flank driveway crossings elephants' feet marking and include a bicycle stencil(s) and directional arrow(s) at every driveway.
- Consider the use of green pavement markings and signage at high volume driveways in addition to the pavement markings noted under Critical Design Details.
- Consider side inlet catch basins or catch basins with a herringbone pattern for streets with curb side cycling facilities.
- Ensure proper connections to park paths and "street-to-street connections".

More Information:

- Refer to 4.3.2.

4.3.6 Bicycle Wayfinding

c: City of Toronto

c: Unknown

Figure 4.25. Bicycle wayfinding provides route and distance information to facilitate convenient travel.

Bicycle wayfinding is essential to encourage greater use of cycling.

Bicycle wayfinding consists primarily of signs and pavement markings that are legible to cyclists. Directional signage focuses on routes that are included in the cycling network.

Benefits

- Increased safety by facilitating decision making in advance of intersections rather than in intersections.
- Coordination of bicycle wayfinding with other wayfinding systems.
- Greater visibility of cycling as a viable travel mode.

Applicability

- Cycling wayfinding should be implemented at all locations where cycling routes intersect, as well as in the vicinity of key destinations.

Guidance

- Avoid clutter by integrating bicycle information, such as a bicycle stencil, into conventional street name signs and by mounting bicycle signage on existing poles.
- Ensure visibility through sign font and placement guidelines.
- Use consistent naming strategies based on street names.
- Provide distance indicators at regular intervals for key corridors and destinations
- Provide signage to confirm destinations, corridors and distances on the far-side of intersections where high volumes of cyclists are expected, a high proportion of tourist cyclists are expected or where distances to the specified corridors and destinations are significant and confirmation is comparatively more important.
- Provide directional sharrows to guide cyclists through intersections on designated cycling routes especially when a route does not continue straight through an intersection. Sharrows indicate the proper positioning for cyclists to make the marked movement (turn or continue straight)
- Bicycle wayfinding is to be applied to detours away from the Recreational Trails.

More Information

- Refer to 4.3.2.

4.4 Roadway Design

A roadway designed using complete streets principles will provide an environment that maximizes safety for all road users, optimizes and balances the key street functions of mobility, access and place, and promotes sustainability.

As described in Chapter 3, roadway design begins with the initial cross section of the entire street informed by the context, user profile and project objectives. Decisions on the final cross section are resolved through a collaborative decision-making process, followed by more detailed design of all the street zones.

Further guidance is available in TAC 2017 Geometric Design Guide for Canadian Roads (Chapter 2), and the NACTO Urban Street Design Guide (2013).

DESIGN PRINCIPLES

- **Design for safe motor vehicle speeds.** Fully consider road users who are particularly vulnerable in a crash or in interactions with other road users such as pedestrians, cyclists, children, older adults or individuals with disabilities.

  Lower speeds lead to safer streets, better places, and improve opportunities to support a wider range of users and uses. A well-designed street will inform users of the speed they should travel.

- **Set context-sensitive target speeds.** Create safer streets for everybody by using a target speed to facilitate the intended speed of travel for drivers. Slower speeds result in fewer and less severe incidents that can cause delays and vehicular congestion. Coordinated signals, along with target speed, can help improve consistency in travel times. Peak hour restrictions for turn movements and curbside activities like stopping and parking can improve travel times along key routes. This helps to manage demand and road capacity during critical moments of the day.

- **Support a range of modes.** Give reliable, convenient and attractive mobility choices to people and support more efficient, active and healthier forms of travel (by foot, by bicycle, transit). Benefits include reduced greenhouse gas emissions and congestion relief.

- **Create places.** Seek opportunities to reduce roadway widths and use the reclaimed space to provide better facilities for other users and to improve place making.

- **Contribute to sustainability and resiliency.** Limit the area of impervious materials and maximize the use of landscape features and water retention and treatment strategies. Select materials that contribute to sustainability, improve life cycle performance and reduce the urban heat island effect.

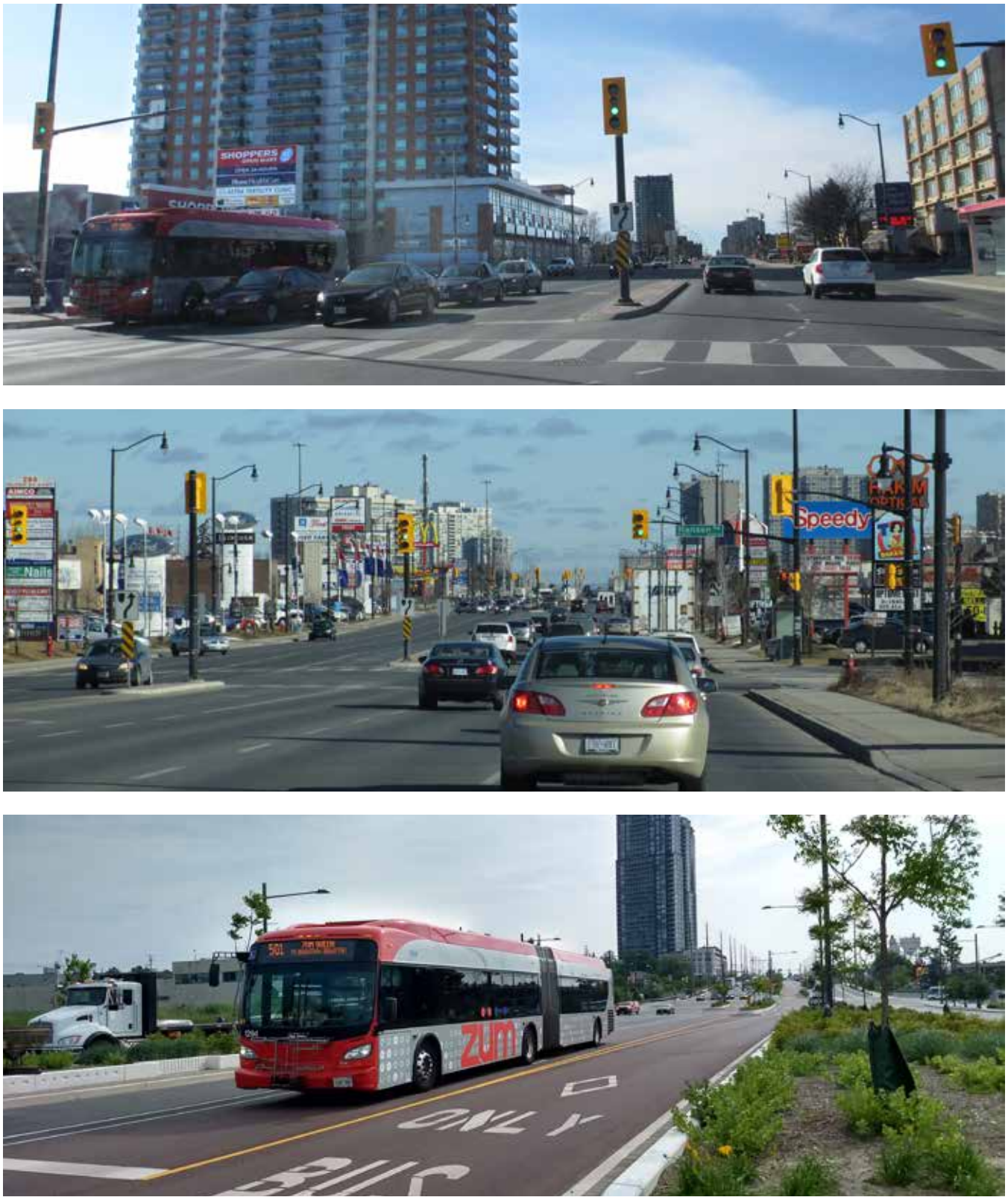


Figure 4.26. Brampton roadway design will maximize safety for all road users.

4.4.1 Design Speed

Reducing and managing vehicle speed is the single most important design control.

As discussed in Chapter 3, we know that the probability of death or serious injury from a collision between a vulnerable user and a vehicle increases significantly when impact speeds are above 50 km/h. To mitigate these negative impacts, we need to design urban streets differently.

All streets in the City of Brampton are or will become urban streets. This includes the existing network and new streets through redevelopment and intensification.

Transport Canada defines urban streets as having posted speeds of 60km/h and below. Numerous jurisdictions throughout Ontario and Canada are reducing their posted and design speeds and adjusting elements to manage speed on their urban streets, places such as Kitchener, London,, Region of York, Calgary, and Edmonton (see Table 4.7). Many of these places have also lowered their default posted speed limits informed by a speed reduction study.

In the City of Brampton, the official default maximum posted speed is 50 km/h with greater design speeds. The arterial streets in Brampton are designed for and facilitate the greatest vehicle operating speeds. The City of Toronto has identified arterials as the overwhelming street type with Killed and Serious Injuries (KSIs). Toronto's current speed management plan reduces several arterials streets throughout the city from posted speeds of 70 km/h to 60 km/h, 60 km/h to 50 km/h, and 50 km/h to 40 km/h. This is the first step before implementing physical design measures to influence speed. If Brampton were to undertake a similar analysis, it is likely that arterials in Brampton are also the streets that experience the highest number of fatalities and injuries.

Also Introduced in Chapter 3 is the concept of target speed, which arises from a design philosophy where the physical roadway design is used to influence operating speeds. The objective is not simply to reduce speeds, but to provide a roadway planned and designed in such a way to manage speed to the intended maximum. Best practice in urban areas is to design streets so that operating speeds are the same or less than the posted speed.

Vehicle speed is a significant factor in crash severity; higher speeds bring exponentially higher risks. Vehicle speeds are critical at points of conflict, such as driveways, intersections, off-ramps, and mid-block crossings.

While speed is often desired to shorten trip travel time, it must logically respect local context. For example, high speeds on a highway are appropriate; high speeds on a narrow residential or main street are not. Lower vehicle speeds open a range of design options. Limited-access highways should be uniform, but low-speed shared streets can be unique with more inventive and locally informed designs.

Changing a streets speed limit can happen at the same time as undertaking physical changes to reduce vehicle speed. The physical design of a street is always more effective in shaping behavior than posted speed limits. 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

Table 4.4 Comparison of Design Speeds and Posted Speeds from Sample Jurisdictions

	Kitchener		London		Edmonton		York Region	
Approach to Design and Posted Speeds	Design= Posted for design speed under 50km/hr		Design speed and posted speed should be selected, balancing the need for forgiving design and the desire to discourage inappropriately high travel speeds		Design= Posted, for Local, Collector and Arterial streets with posted speed under 50km/hr Design= Posted +10km/hr, for Arterial streets with posted speed more than 50km/hr		Design=Posted, for design speed under 60km/hr	
Road Types	**Design**	**Posted**	**Design**	**Posted**	**Design**	**Posted**	**Design**	**Posted**
Arterial: Main Street, Street-oriented	40-50	40-50	50-60	-	50	50	40-50 (Main Street)	40-50 (Main Street)
Arterial	40-50	40-50	60-70	-	70	60	60-70 (Connector) 50-60 (City Centre, Avenue)	60-70 (Connector) 50-60 (City Centre, Avenue)
Major Collector	40-50	40-50	40-60	-	50	50	-	-
Minor Collector	40	40	40-60	-	50	50	-	-
Local	40	40	40-50	-	50	50	-	-

operating speeds. As a result of the lower speeds, drivers are more cautious on streets designed in this manner. Self-regulating design is a critical component of Complete Streets as well as other street safety focused approaches such as **Safe Systems** and **Vision Zero**.

Safe Systems is an approach to road safety management based on the principle that our life and health should not be compromised by our need to travel. No level of death or serious injury is acceptable in a City's road transport network.

Vision Zero is an action of continuously and preemptively removing the very possibility of violence (and that means serious injury as well as death) from our transportation systems. True Vision Zero systems prioritize the safe passage of our most vulnerable populations, whether they are walking or using any number of light mobility devices from bicycles to wheelchairs. From: https://visionzero.ca/

Table 4.5 Recommended Maximum Target Speed Ranges by Brampton Street Type (km/hr)*

Road Classification	Street Type	Design Speed	Posted Speed
Arterials	Urban Main Street	40-60	40-50
	Neighbourhood Connector	60-70	50-60
	Commercial Connector	60-70	50-60
Collectors	Mixed Use Residential	40-50	40-50
	Neighbourhood Residential	40-50	40-50
	Employment Collector	40	40
	Downtown Streets	40	40
Locals	Local Residential	30-40	30-40
	Local Employment	30-40	30-40
	Shared	20	20
	Lane	20	20

Note: * subject to recommended speed reduction study

Benefits
Setting context-sensitive design speeds can provide the following benefits:

- Safer overall vehicle operating speeds.
- Reduced frequency and severity of collisions involving motor vehicles due to reduced motor vehicle travel speeds and volumes and reduced risk for vulnerable road users.
- More efficient use of available road space with opportunities to accommodate facilities that support other street users such as cyclists, pedestrians, and green infrastructure.

Applicability
All City of Brampton streets. Does not apply to Region of Peel streets.

Guidance
- Apply the recommended target speeds for each Brampton street type in Table 4.5.
- Introduce other elements to manage and limit the maximum vehicle speed in new street design and retrofits (see Table 4.7 and Section 4.4.7).

Recommended Future Actions
The City should conduct a speed reduction study to determine the possibilities for reducing the default maximum speed limits, defining additional slow speed zones, and a focused effort to update posted and design speeds on major corridors and throughout the City.

More Information
- Transportation Association of Canada (2017). Geometric Design Guide for Canadian Roads.
- ITE Technical Resources. Setting Safe Speed Limits. https://www.ite.org/technical-resources/topics/speed-management-for-safety/setting-speed-limits/
- NACTO (2013). Urban Street Design Guide.
- NACTO (2020). City Limits: Setting Safe Speeds Limits on Urban Streets.
- Ben Welle et al (2018). World Sustainable and Safe: A Vision and Guidance for Zero Road Deaths. World Resources Institute, Global Road Safety Facility.

Table 4.6 Recommended Brampton Design and Posted Speeds, Related to Road Classification

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

Table 4.7 Example of Speed Reduction Mechanisms

Speed Reduction Mechanisms	New	Retrofit
Introduce mid-block curb extensions to "right size" a roadway (e.g. creating pinch points as a visual cue). See Traffic Calming for further details about when and where mid-block curb extensions apply.	X	X
Synchronize signals to the intended target speed	X	X
Eliminate super elevation	X	X
Remove or reduce shoulders, except for bicycle lanes or rural roads		X
Use the smallest practical curb radii and lane width to serve the necessary design vehicle	X	X
Include on-street bicycle lanes and/or motor vehicle parking	X	X
Use trees and other vertical elements to create visual friction	X	X
Eliminate channelized right-turn lanes		X
Use paving materials with texture	X	X
Use speed limit, warning, and advisory signs and devices	X	X

4.4.2 Lane Widths

Travel lanes are the part of the roadway dedicated to vehicle movement.

On streets with more than one lane per direction, the lanes are defined by lane markings. Travel lane widths vary by road classification, street type and traffic characteristics. The width of a travel lane has a direct relationship to vehicle operator behavior. Wider lanes promote higher speeds, while narrower lanes promote slower and safer speeds. Complete Streets and related initiatives like Safe Systems and Vision Zero encourage context-sensitive lane widths to increase safety and reduce the risk of severe collisions with vulnerable road users. Narrower travel lanes in a corridor also support safer speed approaching an intersection where turning movement speed is also being managed.

Benefits

- Reduced frequency and severity of collisions involving motor vehicles due to reduced motor vehicle travel speeds and volumes and increased protection for vulnerable road users.
- More efficient use of available road space enables public space to be re-allocated for other uses and other users, e.g., active transportation, green infrastructure, transit, increased pedestrian clearways.

Applicability

All streets and all types of street projects. The street designer must always contend with numerous variables which may impact the final design of the street. If a street accommodates a high number of large vehicles, is a transit or trucking route, or is considered an "emergency route", it may require slight design modifications. Variables such as lane width must provide flexibility to address the range of possible design inputs and solutions.

TAC 2017 provides a framework to determine lane width based on design speed, intended volume of traffic, number and types of heavy vehicles, number and volume of pedestrians and cyclists. This resource is the starting point for design practitioners. Further, recent best practices from other jurisdictions with streets like Brampton (such as Toronto, Kitchener and Edmonton) have advanced and supported the thinking around lane widths.

Guidance

- Refer to Table 4.9 for guidance on the width of travel lanes. Dimensions are measured from face of curb for the curb lanes.
- On lower speed and lower vehicle volume streets, lane widths will tend towards the minimum dimensions.
- On multi-lane streets where transit or freight vehicles are present and require a wider travel lane, the wider dimension for the outside lane (curbside or next to parking) may be applicable. Inside lanes should continue to be designed at the minimum possible width.

- On streets with on-street cycling facilities, the designer will need to consider this additional element and dimension when selecting lane widths and assembling the cross-section.
- The designer will need to consider the impacts of underground utilities and winter operations when defining the overall roadway zone width.
- For local streets, the minimum roadway zone width is 8.0m to accommodate offsets for underground utilities and emergency vehicle access.
- For smaller and lower speed local streets, shared streets, and lanes it is possible to provide a single combined lane of no less than 4.1m to accommodate two way travel.

Recommended Future Action
Develop City of Brampton Lane Width Guidelines for use by engineering staff to determine appropriately sized lane widths on roads with delineated lanes. Refer to the City of Toronto Road Engineering Lane Width Guidelines, May 2018 as a benchmark for the potential subject matter and level of detail.

Table 4.8 Roadway Lane Widths: Best Practices

Lane Type	Recommended Minimum
TAC 2017	3.0m-3.7m Min.3.3m (Truck and buses routes)
City of Toronto	3.0 to 3.5m through 3.0 to 3.5m curb 3.0 to 3.3m left turn 3.0 to 3.3m right turn
Institute of Transportation Engineers	3.3 to 3.7m through 3.25 to 3.7m left turn 3.25 to 3.7m right turn
NACTO	No greater than 11ft (3.35m)
City of Kitchener	3.3 to 3.5 m (Transit routes) 3.0 m (Non-transit routes)

Table 4.9 Brampton Roadway Lane Width Guidelines (metres)

Lane Type	Minimum	Maximum	Target
Streets with Design Speed 50km/h or less			
Curb	3.0	3.5	3.3
Through	3.0	3.5	3.0
Transit or Trucking Route			
Curb	3.5	3.7	3.5
Through	3.3	3.5	3.3
Streets with Design Speed greater than 50km/h			
Curb	3.5	3.9	3.5
Through	3.3	3.7	3.3
All Streets			
Turning	3.0	3.5	3.0
Dedicated Parking	2.4	3.0	2.5

4.4.3 Lateral Offsets for Vertical Elements

Traditionally, clear zones are provided on highways and higher speed rural roads throughout Canada. While Brampton has historically applied this concept to its suburban arterials, Brampton's Planning Vision 2040 aspires to design and retrofit Brampton Streets so not a single person is sacrificed to the demands of fast mobility. In this urban context, clear zones are not desirable or applicable.

TAC 2017 (Section 7.3) defines a clear zone as an unobstructed, relatively flat area beyond the edge of the traveled way that allows a driver to stop safely or regain control of a vehicle that leaves the traveled way. This guidance was initially developed for higher speed roadways such as controlled access highways and rural roads.

Based on TAC 2017 (Section 7.7.2, page 77, "Roadside Design in Urban Environments"), the use of a clear zone ..."is not applicable, practical, or desirable for urban arterial, collector, and local streets. This is due to the typical conditions along urban streets with lower target operating speeds, denser development, limited right of way, closely spaced intersections, and multi-modal street users "

Lateral offsets for utilities, while existing in the same space, are not clear zones. They are meant to ensure an adequate, function distance between the roadway and utilities. The offset between certain elements (e.g., water mains and sanitary sewer) and the roadway are legislated at the Provincial level. The offsets to street lighting, poles, traffic-related cabinets, and trees are informed by TAC 2017 (Section 7.3) and best practices.

Benefits

- Increased safety of vulnerable users and reduced exposure to risk when vertical elements are located between the roadway and other boulevard facilities such as cycling infrastructure and pedestrian clearways.
- Reduced potential conflicts between in-motion vehicles and overhang of elements such as mirrors with vertical elements.
- Reduced potential conflicts between curbside activities such as parking and boulevard uses.
- Placement of vertical elements closer to the face of curb between roadway and vulnerable users provides for improved boulevards.

Applicability

All Brampton streets

Guidance

The guidance that follows is consistent with TAC 2017 Section 7.7. "Roadside Design in Urban Environments".

- Clear zones are not desirable or applicable for Brampton streets given the urban setting and recommended design speeds.
- Place vertical fixed objects at a desirable lateral offset between the roadway and boulevard elements to increase safety of vulnerable users and reduce exposure to potential errant vehicles.
- For streets with curbs, which is most Brampton streets, provide a minimum lateral offset of 0.5m for all vertical elements measured from face of curb.
- At intersections provide a minimum lateral offset of 0.9m from face of curb to reduce the risk of overhanging trucks hitting objects.
- In urban environments, approximately 80% of roadside collisions involve objects with a lateral offset from the curb face equal to or less than 1.2m and approximately 90% of urban roadside collisions have lateral offsets less than or equal to 1.8m. An enhanced lateral offset of 1.2m to 1.8m is therefore desirable.

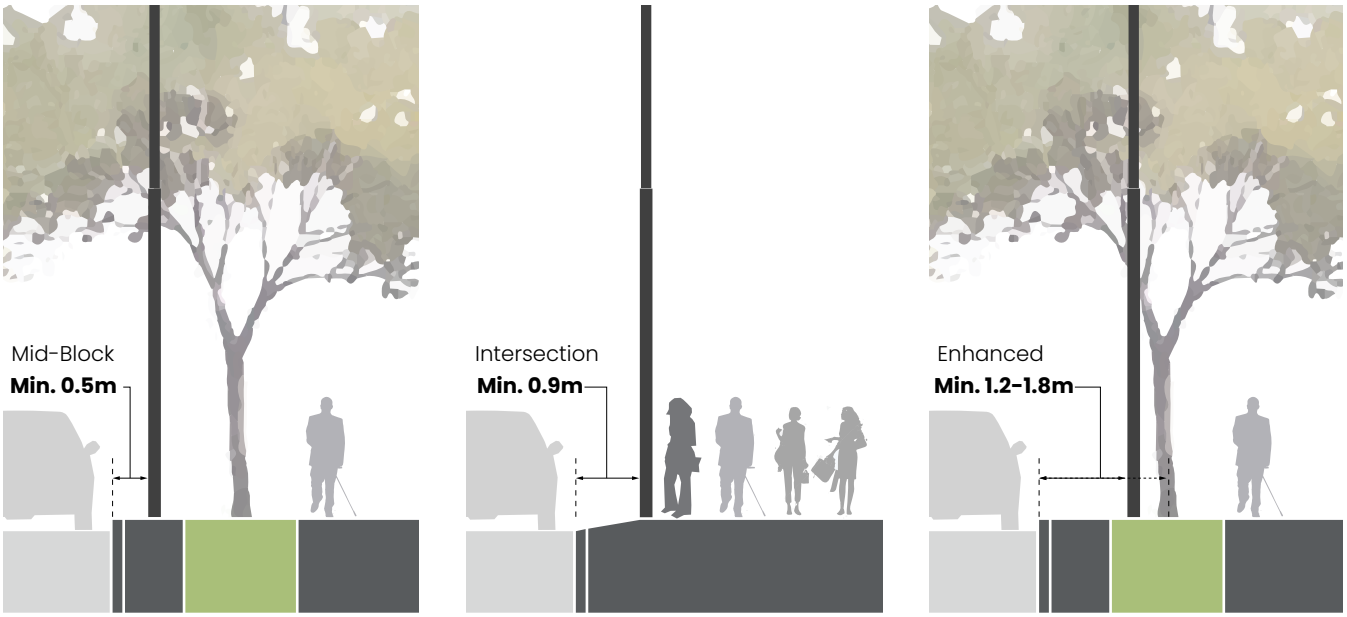


Figure 4.27. Lateral Offsets for Brampton Streets, based on TAC 2017 Guidance. All measurements from face of curb. Mid-block: minimum 0.5m; Intersections: minimum 0.9m; Enhanced offset for Urban Streets where space permits: 1.2m to 1.8m.

- Expand lateral offsets only when the needs of other users are met. A greater lateral offset is possible for most of Brampton's street types given the width of rights-of-way and boulevards.
- Coordinate the lateral offset of vertical elements in the Edge Zone and Furnishing and Planting Zone.
- Locate utility fixtures and appurtenances to not interfere with the Pedestrian Clearway.
- If a greater lateral offset is desired for higher speed streets but not practical, the design team should identify and treat critical urban roadside locations (TAC 2017, 7.3.4.1).
- Locations prone to increased collision risk on higher speed urban or rural-urban transition area corridors include the following:
  - » Objects located on the outside of horizontal curves.
  - » Objects near lane merge points (e.g., lane drop, termination of an acceleration lane, etc.).
  - » Object at driveway and intersection locations and on the inside of tight horizontal curves that create sight line obstructions.
  - » Objects too close to the curb in the curb return region of an intersection.
  - » Objects obstructing sight lines to pedestrians at intersections.

Recommended Future Action

The City of Brampton should develop its own design standards for roadside safety based on the guidance from TAC 2017. This includes specific lateral offsets based upon design speeds given constrained urban conditions and the need to apply context sensitive design.

More Information

- Transportation Association of Canada (2017). Geometric Design Guide for Canadian Roads. Chapter 7.
- NACTO (2013). Urban Street Design Guide.
- AASHTO (2018). A Policy on Geometric Design of Highways and Streets, 7th Edition. Chapter 4, Cross Section Elements, Section 4.6 Roadside Design.

4.4.4 Access for Fire, Police and Emergency Vehicles

Emergency vehicle access and response time is a critical aspect of community health and safety.

In order to reduce response times, emergency vehicles may use all parts of the roadway including cycling facilities, sidewalks, and opposing traffic lanes. Fire trucks are the largest and heaviest emergency response vehicles and require a wider clearway and additional space for turning movements. The movement of emergency vehicles through signalized intersections is addressed in Section 4.5.7, Signal Control and General Principles of Signalization.

Benefits
A coordinated and balanced approach to emergency vehicle access will provide the following benefits:

- Efficient response times by designating preferred emergency response routes with adequate clearway widths and limited traffic calming measures. This requires a comprehensive evaluation of a broad range of factors that contribute to response times including dispatch locations, traffic congestion, navigation technology, street design, signal operation, etc.

Applicability
This Guide differentiates between "design" and "control" vehicles. The former represents the most common large vehicle that would use the street a few times a day. The latter represents fire trucks and other larger vehicles that make infrequent use of a street.

On many residential streets in the Brampton, consider emergency vehicles as the control vehicle. For many arterial and some collector roadways, particularly those in proximity to a dispatch location, consider emergency vehicles as the design vehicle.

The development and use of a preferred emergency response network is helpful to determine how to accommodate emergency vehicles on specific streets. When designing the street, consider the ability of emergency vehicles to use the entire street when selecting elements such as curb radii and lane width.

Figure 4.28. As the largest emergency vehicle, fire trucks may use all parts of the street and are an additional control vehicle for all intersections in Brampton.

Guidance

- Emergency vehicles shall always have access to all streets.
- Always maintain a minimum 1m clearance area around fire hydrants with uninhibited access.
- Move fire hydrants to the edge of the travelway via curb extension or other. This minimizes the risk of the hydrant being blocked by a vehicle and allows the fire pumper to drive straight to the hydrant.
- If bollards are part of a street design, ensure that emergency vehicles can move around or remove when responding to a call.
- Consider traffic calming measures that can accommodate emergency vehicles such as speed tables with shallow ramp gradients or speed cushions that allow wider wheelbase vehicles to pass through unimpeded.
- Delineate cycling facilities with flex bollards that vehicles can drive over without damage. Space flex bollards so that motorists may "nose" into a bicycle facility to provide clearance for responding emergency vehicles.

More Information

- NACTO (2000). Emergency Response Traffic Calming and Traditional Neighborhood Streets.

4.4.5 Curbside Space

Figure 4.29. Greening opportunities, parking lanes, parklets.

There is often a relationship between the design and function of the Edge/Curb Zone and the adjacent edge of the roadway, or curbside.

This area can function as an extension of the boulevard (with bulb-outs or parklets), for green infrastructure, or for roadway activities (e.g., as parking, loading and/or cycling facilities).

Curbside management begins with understanding the competing demands for the use of the area within the in-between zone. In high-demand locations, such as Urban Main Streets, Downtown Streets and Mixed-Use Neighbourhood Streets, detailed inventories of parking and loading activities will inform possible opportunities. Management includes the potential control (regulation) and design accommodation to facilitate the preferred uses and to discourage or prevent undesirable or less crucial activities in the immediate area. Since there are many demands from many users for the limited space in this zone, curbside management often involves making collaborative trade-offs.

Regulating and managing curbside activities is an important part of Complete Streets. Curbside uses vary extensively and include but are not limited to: parking, electric vehicle (EV) charging, taxi stands, transit stops, motor coach areas, loading and courier zones, waste collection, driveway entrances, permitted temporary uses (e.g., food vendor, film production, construction), turn lanes, curbs, curb extensions, parklets, and cycling facilities.

On larger roads, it is the primary place where bike lanes are located. The area is also used for snow storage, recycling and waste collection, newspaper boxes, and garbage receptacles.

Benefits

Identifying priority uses of the in-between zone early in the project delivery process results in:

- Reduced stakeholder conflicts by comprehensively considering and prioritizing the needs of competing demands for available space.
- Fewer design iterations at later stages of design development.
- Greater amenity and functionality for all road users.

Applicability

Curbside management applies to all streets. This process is particularly important for streets where the in-between zone is either constrained or heavily used for different functions, such as

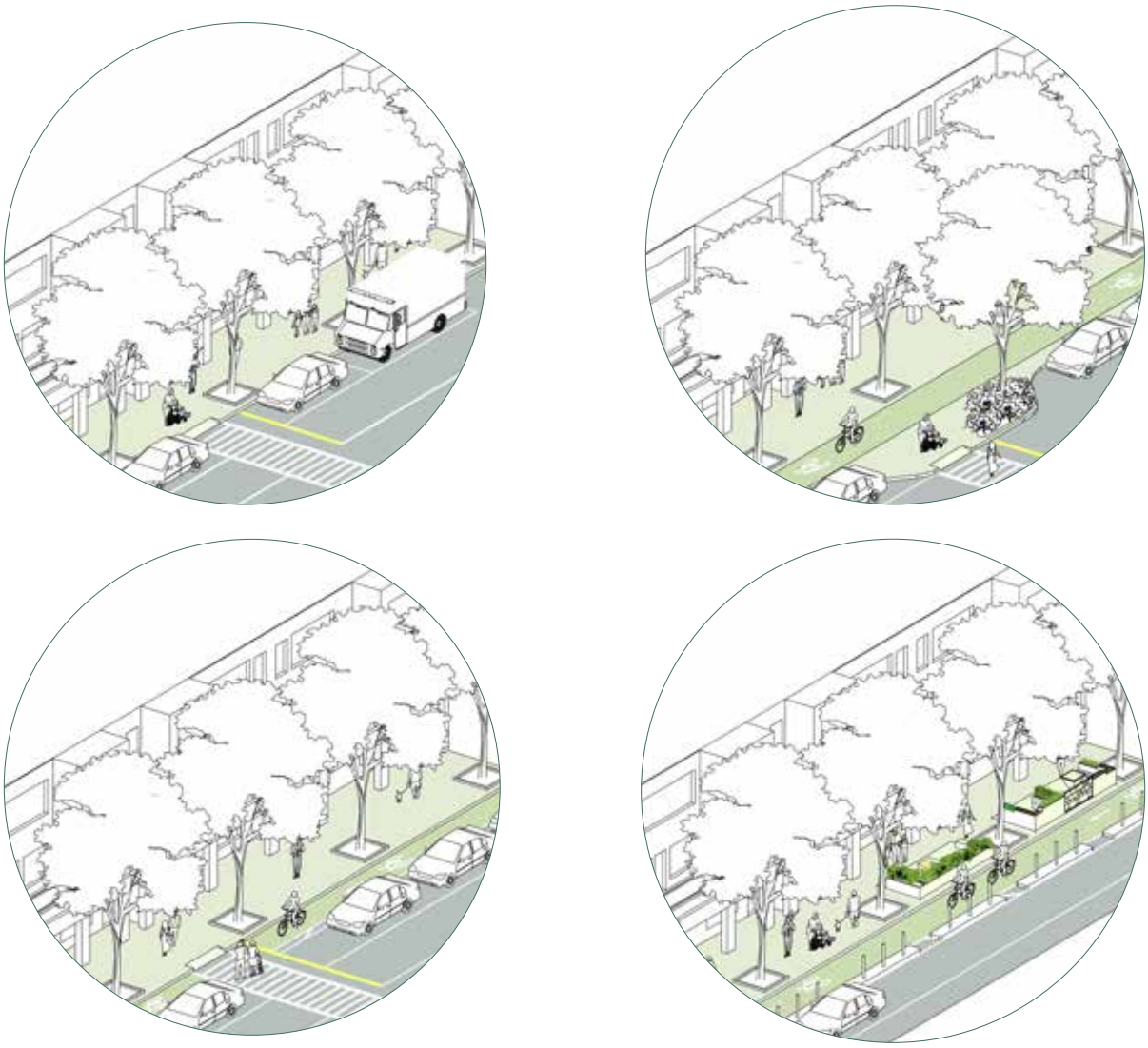


Figure 4.30. Potential assemblage options for various uses within the in-between zone: parking and loading; curb extensions, cycle facilities; and parklets.

Urban Main Streets, Downtown Commercial Streets and Mixed-Use Neighbourhood Streets, and streets identified in the Active Transportation Master Plan – Proposed Cycling Network.

The illustrations above identify potential assemblage options for various uses within the in-between zone, namely parking and loading, parklets, curb extensions, and cycling facilities. Different elements may have a range of widths based on adjacent elements (for example narrower bike lanes if next to a curb, but wider if next to parked cars). It may also benefit to combine elements within a certain zone, such as full time on-street parking and curb extensions.

RECOMMENDED FUTURE ACTIONS

Develop guidelines to ensure the best design of AV, EV and ride-share within the curbside of Brampton streets. Guidelines should aim to support local business, improve multi-modal safety, enhance public space and improve access to transit.

4.4.6 Mid-Block Pedestrian Crossings

Figure 4.31. Example of a median to create a two-stage pedestrian crosssing.

Figure 4.32. Mid block curb extensions integrated with mid block crossings.

A mid-block pedestrian crossing refers to any pedestrian and cycling crossing not close to an intersection.

Given how Brampton developed as a post war city and its resulting superblock system there are many long streets. Consider mid-block crossings where there are significant pedestrian desire lines, mid-block bus stops, adjacent parks, plazas, or connections with multi-use paths. Refer to OTM Book 15 to help determine the appropriate mid-block crossings facilities for a specific street.

Opportunities to accommodate pedestrian crossings such as cross walks, refuge islands should be investigated at all mid-block transit stops; the importance of providing a pedestrian crossing at a mid-block transit stop increases with the motor vehicle traffic volume, traffic speed and distance to the nearest pedestrian crossing. Mid-block crossings provide opportunities to improve transit customer access but are less common than intersection stops, which typically provide greater pedestrian access as well as better opportunities for safer pedestrian crossings and transit transfers. Common factors to inform their inclusion are destination access, boarding and alighting volume, type of transit service provided (express or local) and adjacent land use context. Refer to Section 4.5.4 for transit stop guidance adjacent to or within intersections.

Consideration should also be given to accommodating pedestrians at uncontrolled pedestrian crossings. At these locations, pedestrians must wait for a gap in traffic. Pedestrians may benefit from a centre median or pedestrian refuge island in order to divide the crossing into two separate movements.

Benefits

- Increased safety by decreasing random and unexpected pedestrian crossings.
- Increased destination access.
- Improved transit customer access.

Applicability

Features that may warrant a mid-block stop include trail crossings, mid-block transit stops, intersections spaced more than 400m apart or significant destinations located between intersections. Significant destinations could include institutions such as hospitals or schools, attractions such as cultural or sporting venues, transit stations or employment uses. The availability and use of TransHelp services should also inform these locations.

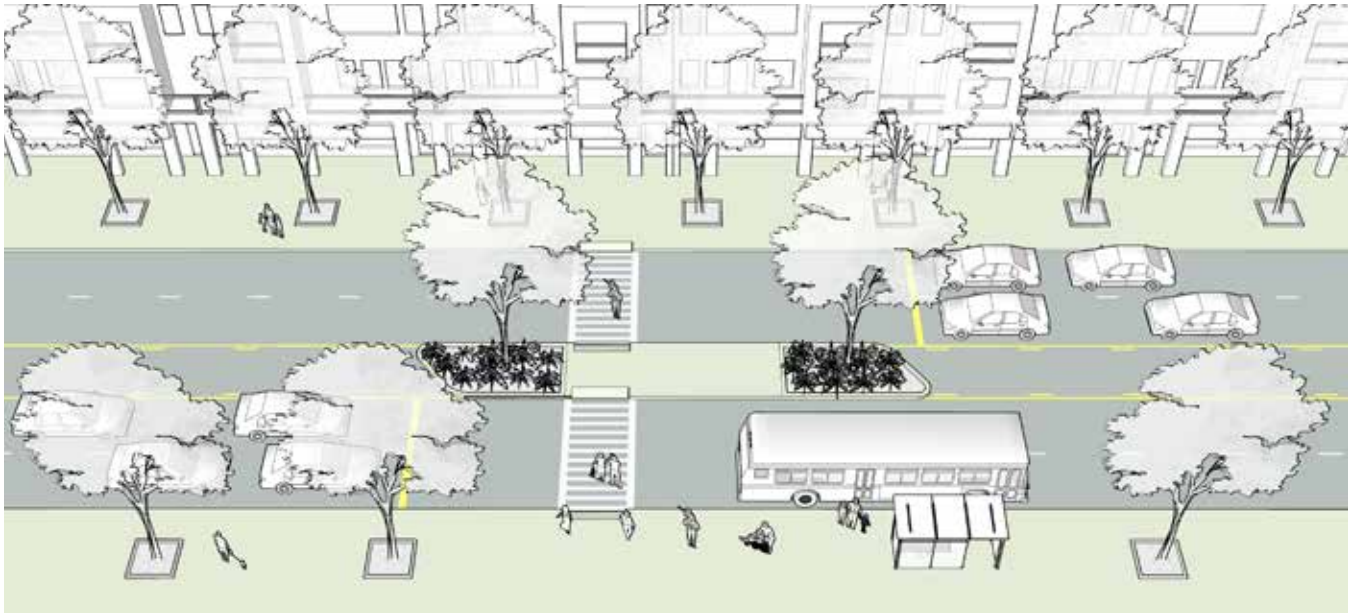


Figure 4.33. Consider mid-block cross walks where there are significant pedestrian desire lines. Frequent applications include mid-block bus stops, parks, plazas, connections with multi-use paths and building entrances.

Guidance

- Consider appropriate crosswalks at trail intersections with streets.
- Design mid-block crossings in accordance with OTM Book 15.
- Sightlines, particularly between motorists and crossing pedestrians, must be considered in the design of mid-block crossings adjacent to transit stops, as transit vehicles may obstruct these sightlines if the transit vehicle stops in a curb lane and the crossing is located downstream of the transit stop. Mitigating measures include shifting the crossing to upstream of the stop or ensuring a minimum distance between the stop and a crossing appropriate to the observed motor vehicle travel speed.
- Consider bus bulbs (a curb extension that serves the function of a transit platform) on streets with permanent on-street parking. The bus bulb must have sufficient length to include a landing zone for all doors of any transit vehicles that serve the stop.
- Include a median or safety island to create a two-stage pedestrian crossing on streets wider than four lanes.
- Include bike platforms at transit stops to accommodate protected bike lanes.

More Information

- OTM Book 15 (2016): Pedestrian Crossing Facilities.
- NACTO (2013). Urban Street Design Guide.
- TAC (2017). Geometric Design Guide for Canadian Roads.
- Institute of Transportation Engineers and Congress for the New Urbanism (2010). Designing Walkable Urban Thoroughfares: A Context Sensitive Approach.

Recommended Future Action

Undertake a city-wide study to identify locations, funding opportunities and feasibility of constructing mid-block crossings. The study should examine streets with mid-block transit stops and streets adjacent to destinations with a high proportion of children, elderly or individuals with disabilities.

4.4.7 Traffic Calming

Traffic calming refers to a set of physical measures that help to slow vehicle speed.

Common measures include speed humps, chicanes, mini-roundabouts (traffic circles), curb extensions/bulb outs, diverters and raised medians.

Traffic elements can be combined with green infrastructure elements to provide increased opportunities for landscaping and stormwater management by reducing the area of non-permeable surfaces. Over the past few decades, traffic calming has evolved in unison with the principles and practices of complete streets, to the point where numerous traffic calming measures are now considered standard practice in street design.

Example traffic calming measures include:

- Signals synchronized to target speed.
- Reduced curb radii.
- Narrower traffic lanes alone, or in conjunction with double centre lines and/or white edge lines
- Single lane (yield streets), especially on moderate to low density residential streets with low traffic volumes.
- Travelway narrowed through bicycle facilities or on-street parking.
- Terminating vistas, such as at a T-intersection or at a traffic circle, where drivers cannot see to the horizon.
- Rhythm and visual friction created with trees, poles, landscaping, and crosswalks.

Some of these measures are unique to intersections. They are included in this section to provide a comprehensive and convenient reference to the range of traffic calming measures and the current approach to this crucial design category. In many cases, the practitioner should consider a combined series of traffic calming measures for greater effect and for both intersection and mid-block locations.

Benefits

- Improved safety by slowing the speed of motor vehicles.
- Increased pedestrian and cycling activity.
- Reduced effect of motor vehicles on the environment.
- Improved quality of life for residents.
- Increased opportunities for landscaping and stormwater management by reducing the area of non-permeable surfaces.

Applicability

Traffic calming generally applies to local and collector streets with the intent of reducing infiltration and speed, while Complete Streets design principles can be applied to arterials and more broadly to achieve safer healthier and more equitable streets.

The City's Neighbourhood Traffic Management Guide (2007) defines traffic calming measures for residential collector streets as well as the criteria and process for applying them to streets.

Figure 4.34. Examples of potential traffic calming measures.

Guidance

- Practitioners must understand the current traffic calming adoption process to evaluate the impact on their project. The Neighbourhood Traffic Management Guide (2007) is a comprehensive guide that describes the process for: study; warrant application and reporting; anticipated process timelines; stakeholder communication and sample reports; and descriptions of the various approved measures.
- Design and maintain traffic calming elements to accommodate emergency vehicles and winter maintenance requirements and allow cyclists to travel safely and comfortably through them.
- Consider horizontal deflection measures for all street types and physical vertical deflection on all local residential streets.
- Horizontal deflections include curb radii reductions; curb extensions; traffic islands and raised medians.

- The most common vertical deflection measure is the speed hump on local residential streets. These are often controversial given their impacts to emergency fire and ambulance vehicles, and to transit vehicles including school buses. One option to consider that mitigates negative speed hump impacts on larger vehicles is the use of speed "cushions", where the vertical deflection is not continuous across the width of the road. Instead, vehicles with wider wheelbases can pass through the gaps. Locate the "cushions" to align with the cyclist's path of travel and discourage motor vehicle drivers to cross the roadway centreline.
- Consider speed tables on collector streets; at entrances to quiet residential areas; and/or along transit and emergency response routes. Where applied, speed tables may be designed as raised mid-block crossings or raised intersections.
- If the roadway is not narrowed during a project, contemplate the use of painted edge lines and/or a wider centre line treatment to narrow the lanes.
- Consider the calming and landscaping benefits of traffic circles for Local Residential Streets.

Recommended Future Action

Update the City's Neighbourhood Traffic Management Guide to include residential and non-residential local streets and non residential collectors.

More Information

- City of Brampton (2007). Neighbourhood Traffic Management Guide.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- OTM Book 18 (2021): Cycle Facilities.
- TAC's Geometric Design Guide for Canadian Roads (2017).
- OTM Book 15: Pedestrian Crossing Facilities (2016).

4.4.8 Traffic Calming (Mid-Block Curb Extensions)


c: FHWA

Figure 4.35. Curb extensions in local residential streets as a traffic calming measure.


c: Emeryville.ca.us

Figure 4.36. Curb extensions in a parking lane provide additional greening and stormwater management opportunities.

Mid-block curb extensions (often referred to as bulb-outs, bump-outs, and curb bulbs) are extensions of the sidewalk area and/or landscaped boulevard which protrude beyond the normal curb alignment at other locations other than intersections.

Mid-block curb extensions are typically used in connection with on-street parking (in permanent parking lanes), or to reduce road or lane width, and are a recognized traffic calming treatment. They are referenced separately from intersection bump outs/curb extensions and have some different design considerations.

Benefits

- Improved sightlines between pedestrians and drivers.
- Reduced crossing distances.
- Increased space for pedestrians to dwell.
- Contributes to traffic calming.
- Provides opportunities for landscaping and stormwater management.

Applicability

Consider curb extensions in the Downtown, Town Centres, and neighbourhood and employment area streets. On street types with lower vehicle volume and slower speeds, place curb extensions on alternating sides of the road to shift the centre line to create a chicane effect. This is an effective arrangement on long residential streets. Refer to OTM Book 15 (2010) for the location and design of mid-block crossings.

Guidance

- 11.0m min in length including tapers to accommodate elements such as cross walks, street furniture, landscaping or street trees.
- 2.8m maximum width in parking lane.
- 2.0m maximum width where curb extensions are used to reduce pavement or lane width.
- Consider how to accommodate cyclists when introducing curb extensions. Cyclists are more at risk if their travel way is obstructed by a curb extension. At no time shall a curb extension obstruct a bike lane. In some instances, it is possible to integrate a cycling facility into a curb extension, such as continuing the bike lane through the curb extension.

More Information

- Refer to 4.4.7.

4.4.9 Driveways

Raised crossings can improve safety at driveways.

Driveways are points of conflict between different users that may require special treatment to create a safe crossing environment for the most vulnerable.

Raised crossings are an effective element that emphasizes the movements of pedestrians and cyclists above turning vehicles. Such a design strategy reduces vehicle turning speeds, increases visibility of vulnerable users, improves motorist reaction time, and contributes to a safer operating environment.

Raised crossings are suitable for all types of driveways and laneways, including those with higher frequency large vehicle turning movements. They are also suitable for slower speed intersections that require large turning radii to accommodate large turning vehicles, and at channelized intersections.

Benefits

Raised crossings have the following benefits:

- Improved safety and accessibility.
- Improved motorist reaction time.
- Reduced risk of death or serious injury in the event of a collision between turning vehicles and vulnerable users.

Applicability

- All driveways, site access points and lanes.

Figure 4.37. Two examples of raised driveways that emphasize safe pedestrian and cycling movements over turning vehicles. On the left is a high volume parking garage entrance with pedestrian clearway and bi-direction cycle track. Note how the arrangement of materials de-emphasizes the turning radii. On the right is the primary parking and service entrance for a large urban development. Note how the boulevard materials continue through the driveway to make clear to motorists that they are not the priority in this space.

Guidance

- Prioritize the continuity of pedestrian clearway and cycling facilities across all 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.
- Ensure minimum acceptable pedestrian clearway widths across all driveways with raised crossings.
- Minimize turning radii of driveways to limit vehicle speed to a maximum of 10km/h. Use Auto Tracking software to determine the maximum turn radii.
- Reduce driveway widths to the smallest possible dimension to reduce amount of time vulnerable users are exposed to turning vehicles. If more than two access lanes are required, provide a central median for pedestrian refuge.
- Encourage consolidation of driveways that serve multiple buildings to minimize the number of interruptions in the sidewalk and reduce the number of potential conflicts with pedestrians and cyclists.
- In constrained locations where the width of a sidewalk is insufficient for a fully raised crossing consider an intermediate crossing with a partially raised roadway.

More Information

- City of Brampton (2019). Landscape Development Guidelines.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- TAC Canadian Guide to Neighbourhood Traffic Calming (Second Edition, February 2018) – pages 52-56.
- City of Toronto (2020). Road Engineering Design Guidelines. 11.0 Raised Crosswalk and Intersection Guideline.
- MassDOT (2018). Separated Bike Lane Planning & Design Guide. Chapter 4: Intersections, Section 4.4.2 Reduce Conflict Points.

4.5 Intersection Design

Intersections are where streets meet. They often serve as meeting places, define the entrances to residential or commercial neighbourhoods and are where street types transition from one to another. Intersections generate a lot of interaction and potential conflict among all modes. Some of the factors that contribute to this complexity include the density of pedestrian interaction, inherent conflict points, people moving capacity, transit transfers and the high level of destination access in proximity to intersections.

A key starting point in the intersection design process is to understand the primary needs of each modal user. Some street elements that improve the conditions of one mode may reduce the comfort and convenience of another, but these should never supersede the need for safety of all users, especially the most vulnerable.

DESIGN PRINCIPLES

- **Safety first.** The most important intersection design principle is always safety. Consider safety from the perspective of all users, starting with those pedestrians who are most vulnerable: individuals with disabilities, those using mobility assistive devices, caregivers, seniors and children, ensuring that all designs comply with AODA standards.
- **Predictability.** Provide clear guidance to all users on where crossing movements are expected and the correct path of permitted movements.
- **Visibility.** Ensure unobstructed sightlines for all users. Locate crosswalks close to intersections to improve visibility of pedestrians to drivers and reduce physical barriers and visual clutter.
- **Multi-modal.** Select traffic controls based on equitable consideration of all users, street context and role in the network. Analyse capacity from a multi-modal perspective, focusing on movement of people rather than vehicles.
- **Accessibility.** Incorporate accessible design at intersections such as tactile walking surface indicators, curb ramps or depressed curbs, accessible pedestrian signals, set walk clearance times crossings for all ages and abilities.
- **Compact design and short crossings.** Compact intersections tend to slow motor vehicle speeds near conflict points and enable more eye contact, which increases safety.
- **Active transportation.** Observe and anticipate pedestrian and cyclist desire lines to inform design. For example, provide crosswalks in locations with high pedestrian volumes and bike boxes where needed to enhance safety for cyclist making turns.

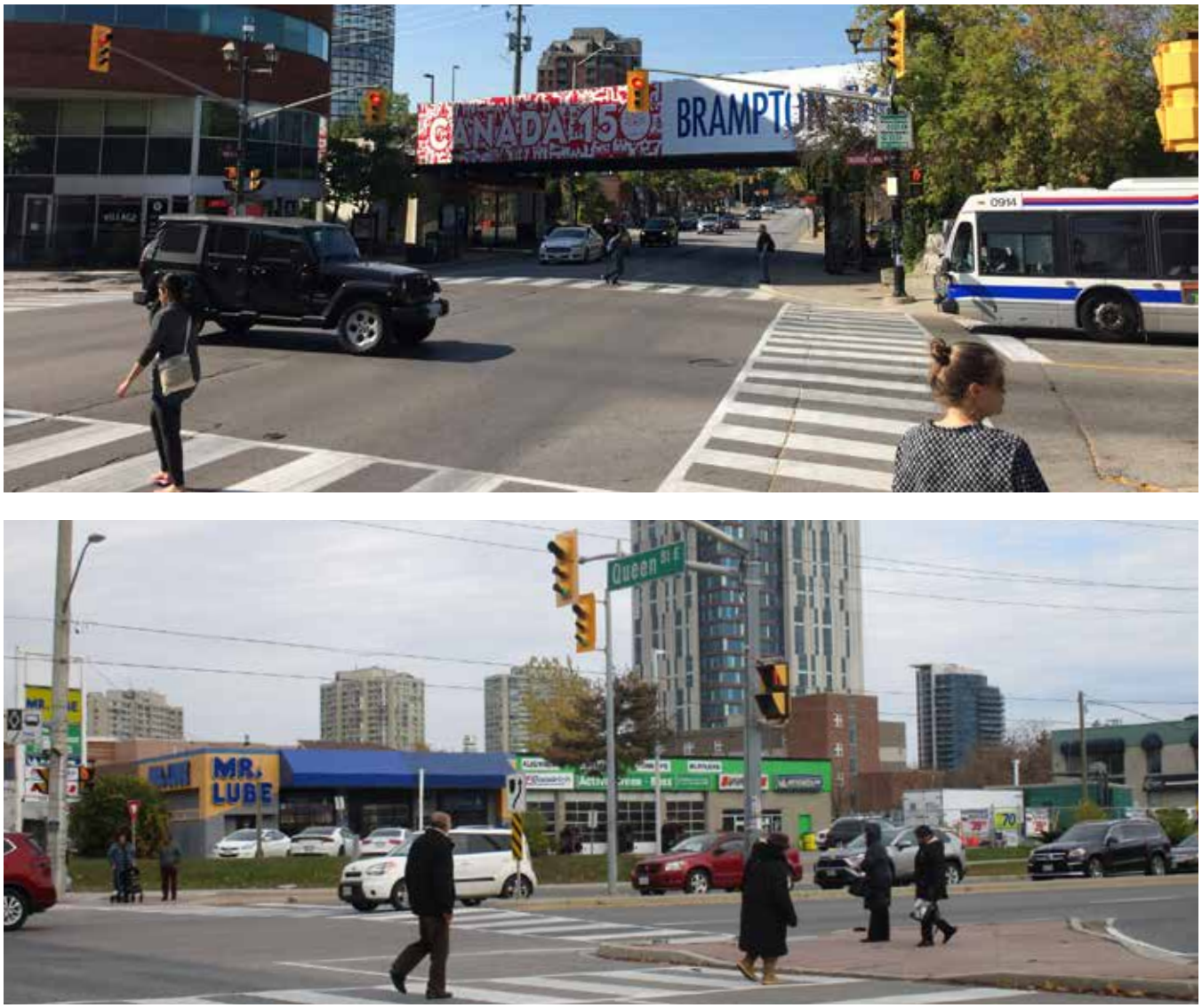


Figure 4.38. Street intersections in various contexts in Brampton.

- **Transit.** Incorporate highly accessible transit stops at intersections to allow for convenient transfers for transit users. Place-making. Depending on the street context and width, utilize excess space as public space to enhance quality of life with greening, street furniture or public art gateways, especially to define entrances into neighbourhoods.
- **Maintenance and operations.** Intersections should function well for all users all year.
- **Manage stormwater.** Incorporate green street elements depending on context and width, such as planted curb extensions or passive irrigation to street tree pits to reduce stormwater run-off.
- **Design for the future.** Consider existing and future land uses as well as projected and induced demand.

4.5.1 Context Sensitive Intersection Design

The variety of Brampton intersections is wide ranging. Local conditions will play a role in determining the design and selection of elements.

This section identifies examples of common types of Brampton based on the adjoining street types and their considerations for Complete Streets design. While each individual intersection is unique the example intersections are intended to show how the principles below can be applied taking into consideration all users and street context, rather than serving as definitive designs.

An overarching goal is to make compact intersections with the smallest turn 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 and streetscape.

Applicability
All Brampton Streets.

Benefits
A context sensitive approach to intersection design has the following benefits:

- Assists in making intersections more intuitive and predictable.
- Increases the sense of shared space at intersections, so users are aware of each other and can make predictable movements.
- Prioritizes pedestrian movement, accessibility and safe turning movements for cyclists.

Figure 4.39. Example of a street redesigned in Ottawa to accommodate cycling facilities and bulb outs at intersection for increasing pedestrian safety.

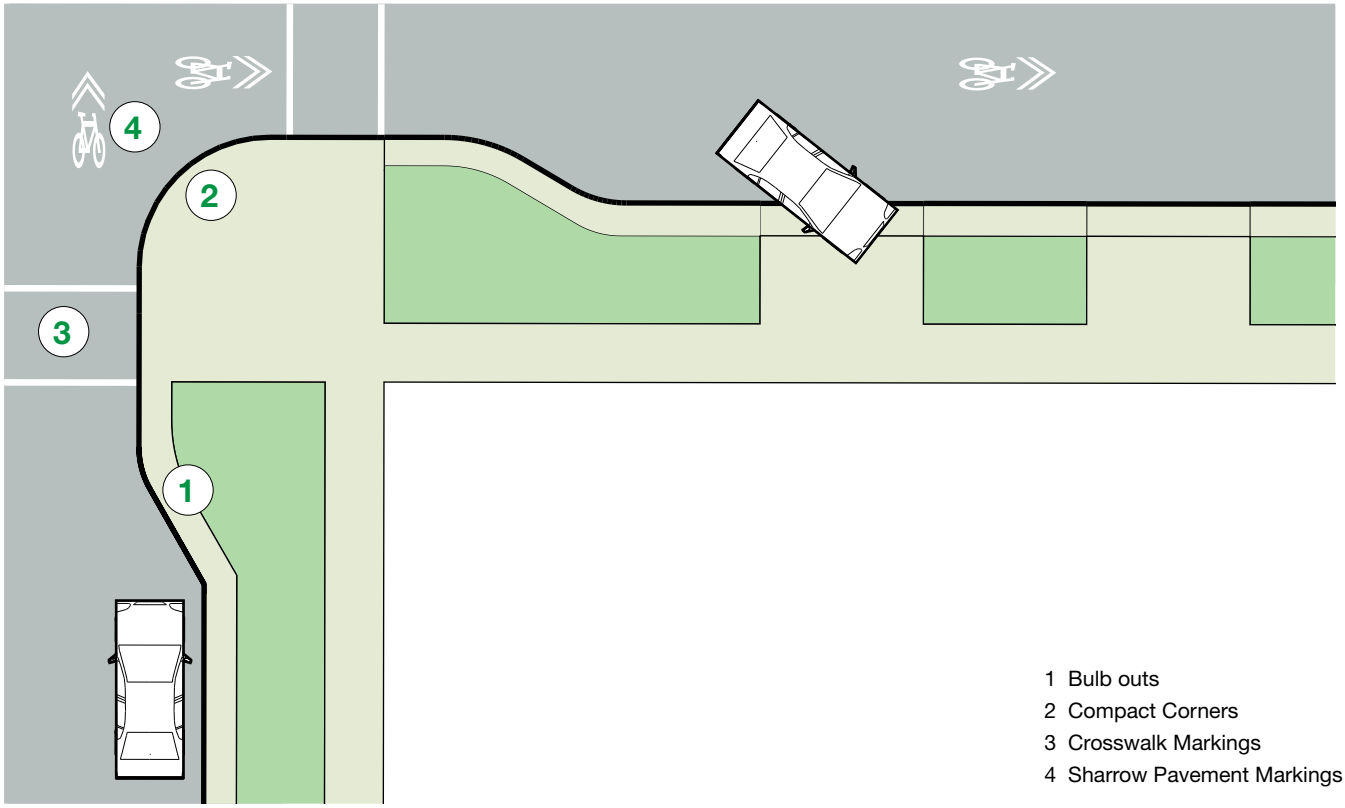


Figure 4.40. Example of a local street intersection.

INTERSECTIONS AT LOCAL STREETS

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

Guidance

- Enhance pedestrian safety with traffic calming measures, such as bulb-out curb extensions, crosswalks, intersection tables, various paving materials and textures, mini-roundabouts, reduced corner radii, the suitable stop controls and various complementary mid-block traffic calming measures.
- 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 are often accommodated in a similar manner to motor vehicles.
- While larger vehicles such as fire, waste collection and snow-plow trucks are important to consider, the turning movements for these vehicles will typically require the use of opposing, low-volume traffic lanes.

INTERSECTIONS AT LOCAL STREETS WITH COLLECTOR STREETS AND ARTERIALS

Where local or collector streets intersect with collector or arterial roadways, 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 or signalized.

- Clearly mark controlled pedestrian and cyclist crossings (i.e. crossings with stop control, PXOs or signals) wherever they exist.

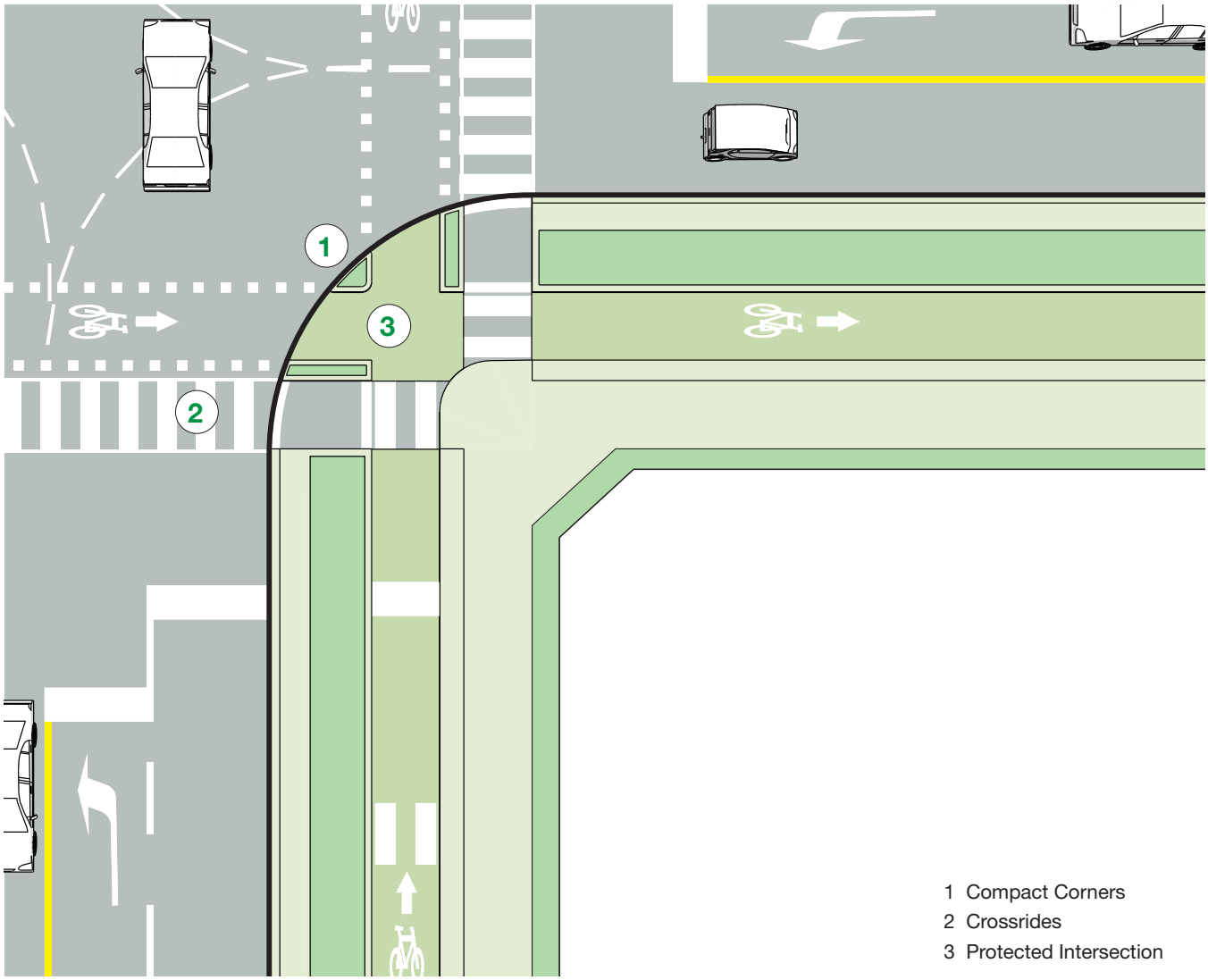


Figure 4.41. Example of an intersection of Collector and Arterial: protected cycling.

- Where signals, PXOs and AWSC are not warranted based on the observed or projected volume of crossing pedestrians, provide vulnerable road users with a pedestrian refuge island.
- One-way cross streets provide opportunities for tight curb radii and bulb outs.
- Consider introducing left turn prohibitions to side streets if no dedicated left-turn lane exists an heavy traffic flows on the arterial road do not provide sufficient gaps in traffic for safe maneuvers.
- Consider planned land uses, anticipated mode split shifts and latent demand for pedestrian, cycling and transit use during the design process.
- Clearly mark controlled pedestrian and cyclist crossings.

INTERSECTIONS BETWEEN ARTERIAL STREETS

The intersection between arterial streets is characterized by higher traffic volumes, and higher approach speeds, often with bus stops, and depending on context, significant pedestrian activity. Practitioners shall mitigate risk to all road users, while still accommodating reasonable, multi-modal intersection capacity and turning movements for

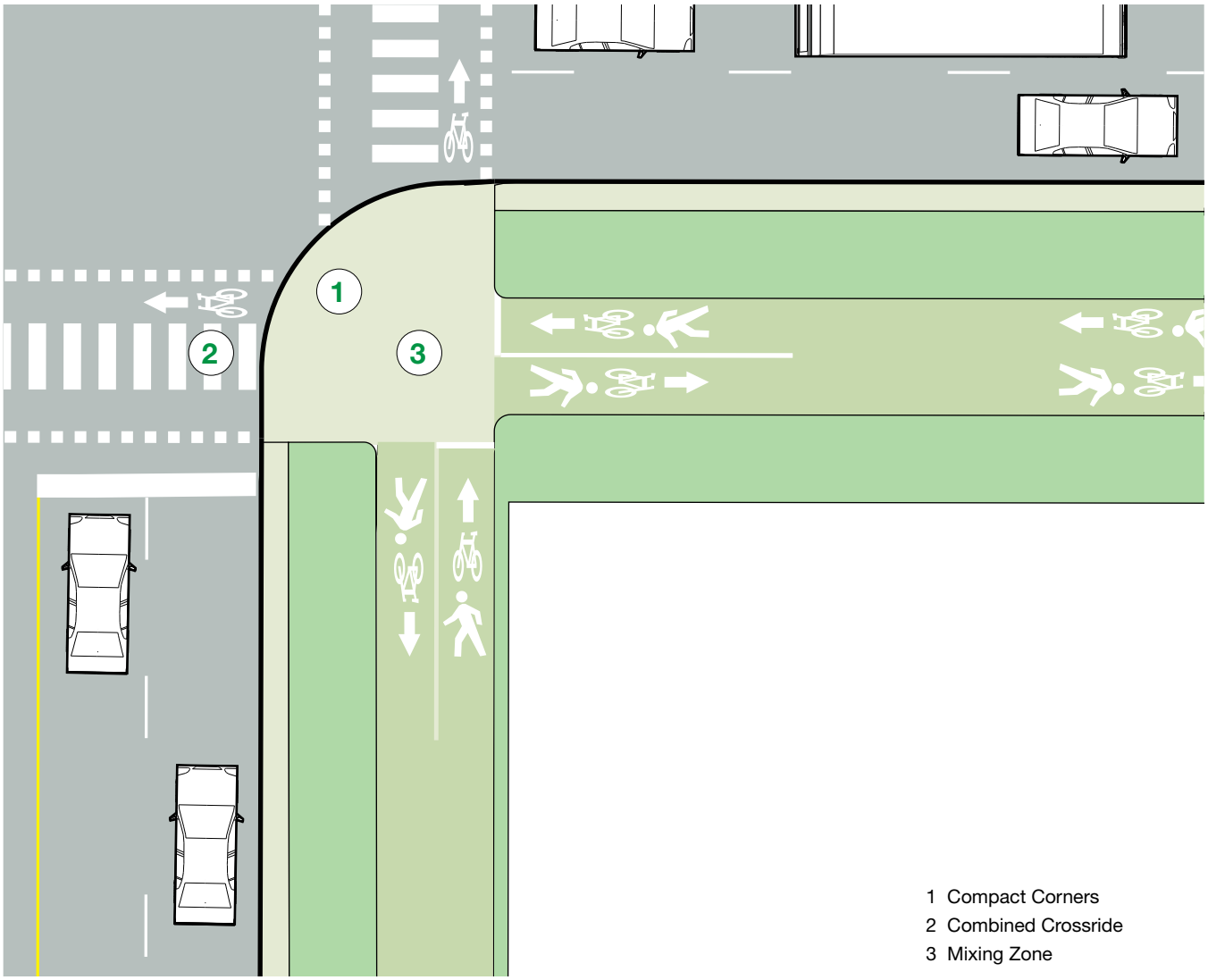


Figure 4.42. Example of an intersection of Collector and Arterial: mixing zone.

larger vehicles. Due to the larger physical size of these intersections, it is important to provide pavement marking guidance for all road users to maximize the predictability and visibility of every movement.

- Use pedestrian refuges, crosswalk markings, tighter corner radii, leading pedestrian signal intervals and other measures to enhance pedestrian and transit customer safety and comfort.
- Improve cyclist safety by ensuring cyclists are visible on the intersection approach, avoiding excessive corner radii, marking bicycle facilities through the intersection, including bike boxes or queue boxes, providing designated bicycle signal phases where appropriate and providing appropriate regulatory and warning signs for motorists where notable conflicts exist.
- Analyze intersection capacity from a multi-modal perspective and focus on users rather than single or low occupancy vehicles. For instance, balance delays experienced by passengers in buses with minimal pedestrian crossing delays and the service provided to general traffic.

Recommended Future Action
Develop a multi-modal set of objective metrics for non-vehicular travel modes to inform intersection improvements, fill mobility gaps and enhance area safety.

4.5.2 Corner Design and Curb Radii

Figure 4.44. Smaller curb radii shorten crossing distances and reduce vehicle turning speeds (Seattle, WA).

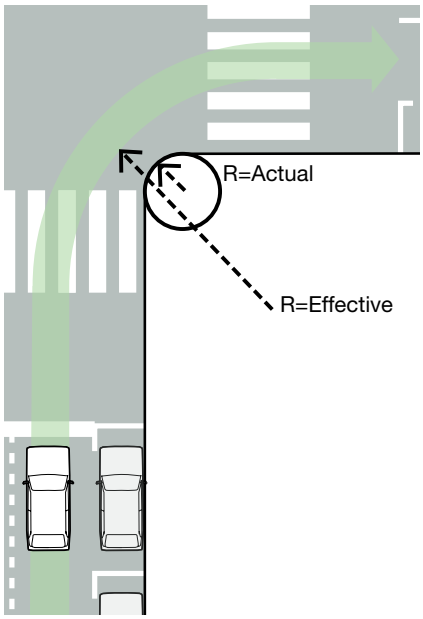


Figure 4.43. Corner Radii: Effective Vs Actual.

Curb radii are one of the most critical design elements to improve the completness of Brampton Streets.

Curb radii are the curved segments that connect two perpendicular curbs, forming an intersection of two streets or street to driveway. The shape and geometric design of curb radii have a significant impact on the overall operation and safety of an intersection and assist in balancing the safety and needs of pedestrians, cyclists, drivers, transit users/operators, trucks, and emergency service providers.

The street designer must consider numerous variables to determine the appropriate size of each curb radius such as how many vehicles will turn the corner, what design vehicles to consider, and the design of the pedestrian accommodation. The goal is to reduce driver speeds, improve visibility of pedestrians, reduce crossing distances, and improve pedestrian accommodation.

Table 4.10 identifies the target curb radii based on the right-turn movement of specific design and control vehicles. The guidance considers the receiving road width, truck volume, intersection angle, and width of approach lane. These guidelines recommend that the designer use vehicle tracking software to confirm (or improve upon) design table values or used in place of the tables (such as when the corner is part of a bus route, or the road has cycle lanes or all-day parking.

Other significant design criteria include known safety issues and whether the intersection will significantly benefit from reduced pedestrian crossing distances. Pedestrian sightlines often benefit from smaller curb radii and corner bulb (bump) outs enhance sightlines further.

Benefits

- Reduced vehicle turning speeds.
- Reduced pedestrian crossing distances.
- Improved visibility of pedestrians.
- Increased pedestrian storage.
- Improving signal timing by reducing crossing distances at signals.

Applicability

All Brampton Streets.

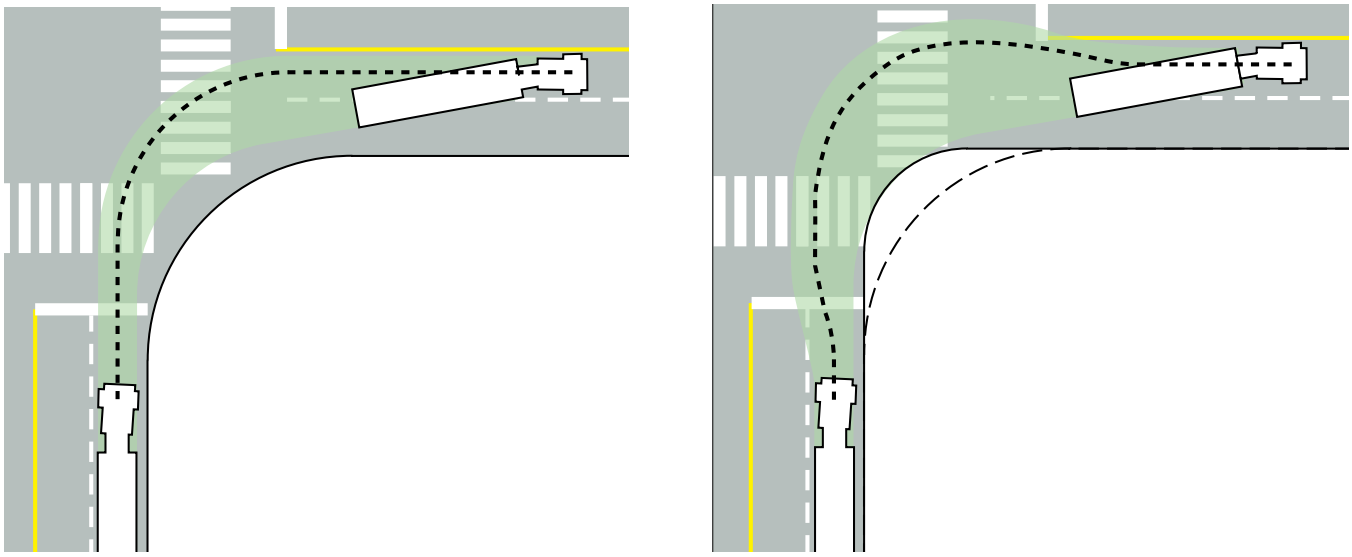


Figure 4.45. Design For (left) Vs. Accommodate For (right).

Table 4.10 Design Vehicle, Control Vehicle, and Curb Radii by Receiving Street

Receiving Street	BCSG Design Vehicle	BCSG Control Vehicle	Curb Radii* (m)
Minor Local	P: Passenger	LSU: Light Single Unit	4.0
Local	P: Passenger	LSU: Light Single Unit	4.0
Collector	LSU: Light Single Unit	B-12: Brampton Bus	6.0
Collector (Industrial)	MSU: Medium Single Unit	WB-20: Tractor/Trailer	9.0
Arterial	B-12: Brampton Bus	WB-20: Tractor/Trailer	8.0
Arterial (Industrial)	HSU: Heavy Single Unit	WB-20: Tractor/Trailer	9.0

*The final corner radii design will require 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 4.46. Examples of Light SIngle Unit (left) , Medium SIngle Unit (centre) and Heavy SIngle Unit (right).

Guidance

- Design the corners with the smallest curb radii possible. The selected radii for the receiving street should facilitate: a design vehicle that is the largest vehicle that must routinely be accommodated; and a control vehicle which must be accommodated, but less frequently for the receiving street types identified in Table 4.10. These preferred radii are the starting point for street design and additional street context should be considered. E.g., intersection angle, elevation, sight triangles, receiving lane width, and land use.
- Use "effective turn radii" in the following instances:
  - » On low volume two-lane streets corner design should assume that an emergency vehicle can use the entire width of the departing and receiving travel lanes, including the oncoming traffic lane.
  - » At signalized intersections corner design should assume the largest vehicle will use the entire width of the receiving lanes on the intersecting street.
  - » At signalized intersections where additional space is needed to accommodate large vehicles consideration can be given to recessing the stop line on the receiving street to enable the vehicle to use a portion of or the entire width of the receiving roadway.
- At alternative track access routes, consider restricting turning movements by large vehicles at certain intersections and driveways to enable tighter curb radii.
- Confirm the minimum radii with tracking software based on the intended maximum turning speed and design vehicle. Turning speed: 5-10km/h default.
- Along goods movement routes where frequent freight and trucks 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.
- 6.0m clear width is required to accommodate fire trucks on all streets and through intersections. This can include the width of opposing lanes on local streets.
- On designated transit routes, transit vehicles will be the design vehicle.

Recommended Future Action

Consider developing a Brampton-specific curb radii guideline as part of the planned update to road engineering design standards.

More Information

- City Brampton (2007). Neighbourhood Traffic Management Guide.
- TAC (2017). Geometric Design Guide for Canadian Roads.

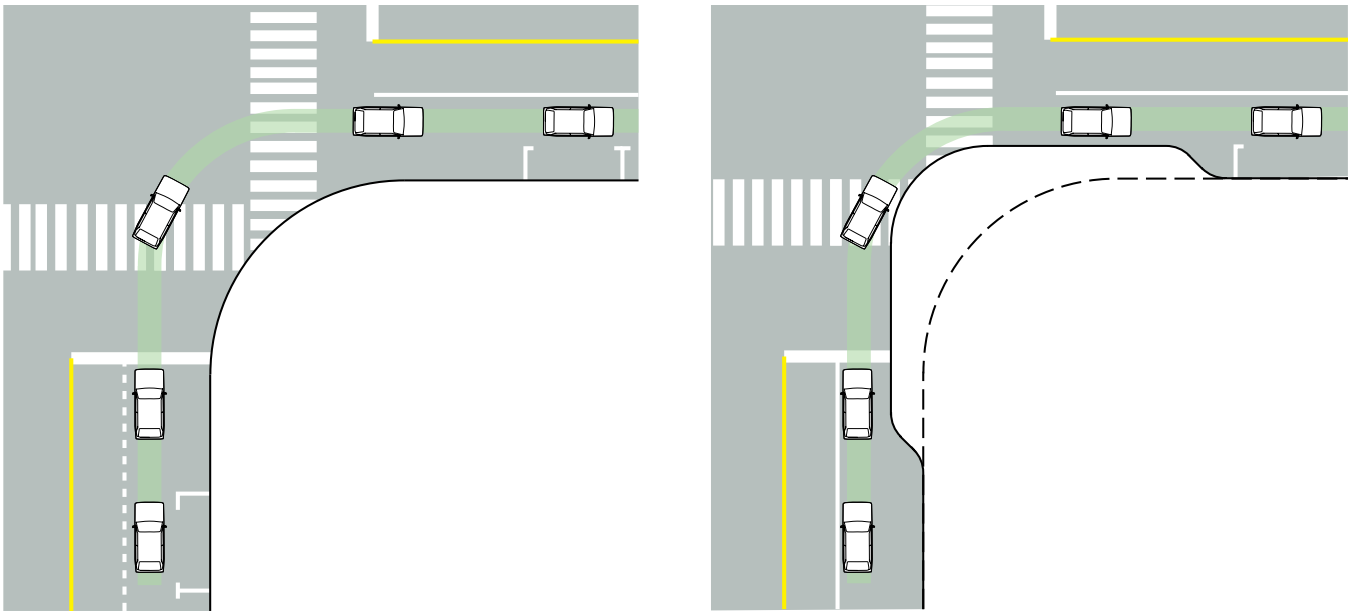


Figure 4.47. Design Vehicle Turning Radii: Existing (Left) Vs Complete Street measures (Right). Minimizing the size of a corner radius is critical to creating safe and compact intersections. Narrowing corner radii can reduce vehicle turning speeds as well as reduce the length of pedestrian crossing distances.

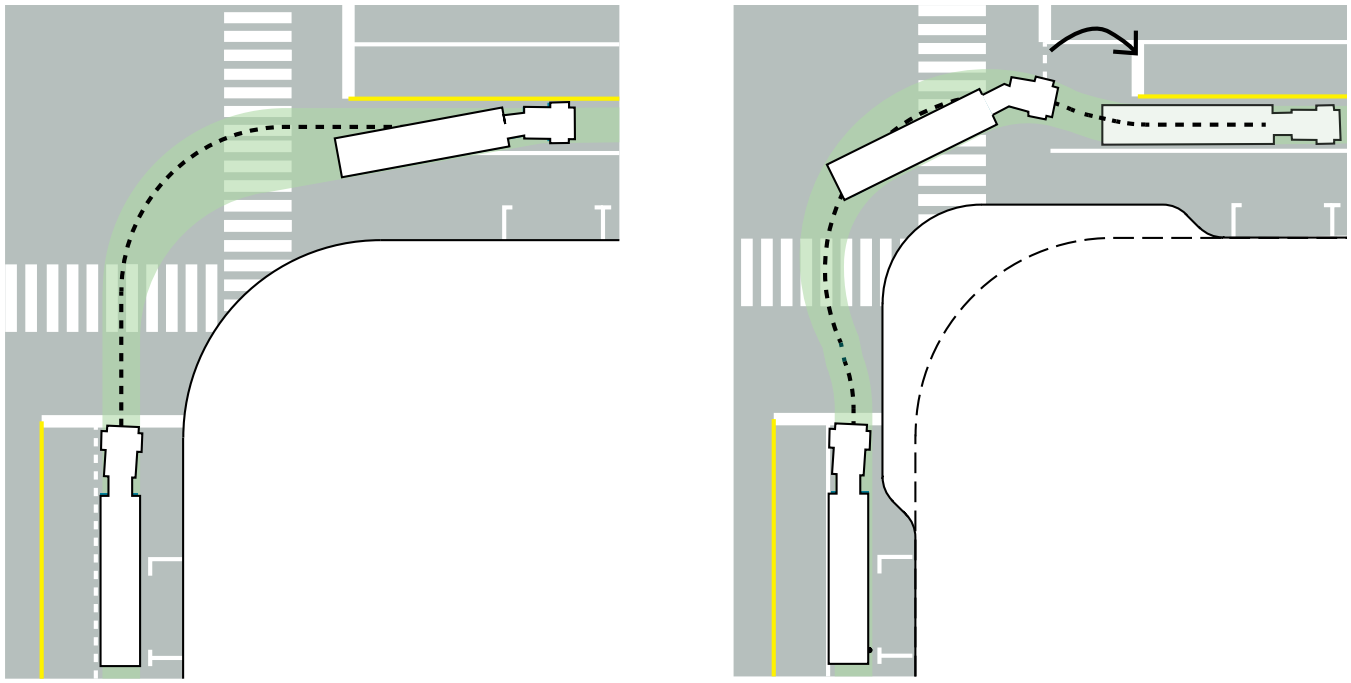


Figure 4.48. Control Vehicle Turning Radii: Existing (Left) Vs Complete Street measures (Right). The "effective turn radii" assumes the largest vehicle will use the entire width of the receiving lane on the intersecting street. Consideration can be given to recessing the stop line on the receiving street to enable the vehicle to use a portion of or the entire width of the receiving roadway.

4.5.3 Bicycle Facilities at Intersections

Cyclists, as with all users, are more vulnerable and exposed to greater risk when within an intersection.

Intersections are an essential part of the cycling network. They allow cyclists to navigate through the City and choose their preferred travel route. Several strategies to ensure that the interaction of motorists, cyclists and pedestrians is consistent, predicable and safe are described below.

Benefits

- Increased visibility of cyclists.
- Reduced vehicle travel speeds through intersections.
- Increased predictability and more clear yielding behaviour when providing pavement markings, signs and cycling facility barriers on the intersection approach.
- Reduced risk associated with crossing light rail transit tracks by providing a clearly marked path at safe angles.
- Designated queuing space that increases the level of comfort associated with all cycling turning movements.
- Reduced delay for cyclists.
- Greater cycling mode share with several associated secondary benefits such as reduced motor vehicle traffic volume, reduced air and noise pollution, reduced motor vehicle parking demand and increased public health benefits.

Applicability

Consider specific measures to accommodate cyclists at any every intersection with a cycling facility on one or more cross streets. The type of accommodation will depend on many factors, including: form of intersection control, the alignment of the bicycle facility mid-block, presence of dedicated turn lanes, motor vehicle travel speed through the intersection, intersection crossing distance and the volume of turning and through movements for pedestrians, cyclists, transit vehicles and motor vehicles and the available street width or right-of-way.

Guidance

This section provides high level guidance to ensure that practitioners consider a broad range of cycling accommodation at intersections. The practitioner should refer to OTM Book 18 (2021) and the City's Active Transportation Master Plan Design Compendium (2019) for the design of cycling elements and use and placement of all signage and pavement markings.

- Implement a bicycle lane between motor vehicle through and right turn lanes at intersections with heavy right turn volumes and comparatively moderate or low cycling volumes; mark the conflict area with green pavement markings.
- Provide bike boxes at intersections with designated cycling facilities and significant volumes of cyclists.
- Require right turning motorists to yield to through cyclists where the volume of cyclists is high and the volume of right turning motorists is comparatively low. Use green pavement markings, a recessed motor vehicle stop bar as well as appropriate signs and maintain physical separation until the turning radius begins.
- 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.
- Where a two-way cycling facility crosses an intersection, alert motorists using signage 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
- Where a multi-use or dedicated cycling path or trail crosses a street in close proximity to an intersection, or where a cycling

Figure 4.49. Example of bike boxes at an intersection.

Figure 4.50. Example of a protected intersection with dedicated waiting area for cyclists.

Figure 4.51. Example of a multi-use crossing with signage and pavement markings.

Figure 4.52. Example of chevron treatment for on-street cycling facilities at intersections.

route is off-set by a short distance on a cross street, accommodate cyclists at sidewalk level of the cross street and direct to a designated crossing at an intersection. Discourage signage that directs cyclists to dismount and walk their bicycle on a sidewalk to an intersection

- Consider restricting right turns on red where a left-turn queue box obstructs this path
- Consider replacing a 4-way stop control with a mini-roundabout at low-volume intersections on designated cycling routes
- Consider "SLOW: Watch for Turning Vehicles" signs and pavement markings on all two-way cycling facilities
- Consider a protected intersection design at locations where two major bicycle thoroughfares with high volumes of bicycle through and turning movements cross. This design includes bicycle lanes located behind motor vehicle turning radius curbs and crossing paths recessed further from the intersection.
- Apply concepts of a protected intersection to boulevard facilities.

More Information

- Refer to 4.3.2.
- OTM Book 18 (2021): Cycle Facilities.
- C.R.O.W. 25 Design Manual for Bicycle Traffic: Chapter 6: Intersections.

4.5.4 Transit at Intersections

Intersections play a critical role in transit operation for two reasons: they are strategic locations for transit stops, and are critical sources of delay and unpredictability.

Accommodating transit at intersections typically involves identifying the optimal transit stop location and configuration for a transit stop and taking measures to reduce delay.

Strategies to address this challenge are described in the design details section below. Further guidance can be found in the Ontario Ministry of Transportations (MTO) Transit Supportive Guidelines (2012), the National Association of City Transportation Officials' (NACTO) Transit Street Design Guide (2016), and Active Transportation Master Plan Design Compendium (2019).

The design of transit stops is informed by intersection characteristics and the transit routes that are served by it. Key variables in the design of transit stops include:

- Stop length and the number of landing pads, which are the specific areas that transit customers board from and disembark to.
- Stop location (near-side/far-side).
- AODA features (tactile strips, sign poles and curb cuts) and clearance dimensions.
- Integration of cycling and pedestrian facilities.
- Shelters and/or seating.

Several factors affect the delay that a transit vehicle experiences at an intersection, including: provision of a dedicated or queue jump lane; provision of transit signal priority; location of stop either near-side or far-side; intersection Level of Service/motor vehicle delay; and boarding / alighting/payment procedures.

Benefits

- Minimized conflicts between all road users.
- Improved transit priority by consider total person throughput and delay over a conventional focus on vehicle level of service and delay.
- Enhanced comfort for pedestrians, cyclists and transit users.
- Facilitating transfers between transit lines and between modes such as transit and cycling.
- Reduced clutter at the intersection.
- Facilitating efficient maintenance of the stop area.

Applicability

Apply the design and location of transit stops as well as other transit accommodations at intersections on a case-by-case basis.

Transit accommodations are informed not only by the characteristics of the street but also a wide range of transit operational factors. For instance, transit operational factors such as the number of boardings per day, the headway between transit vehicles, and the distance to the next stop are some of the inputs that inform the need for a transit shelter. By contrast, the characteristics of the street such as sidewalk and boulevard widths, pedestrian volumes, intersection sightlines, and the placement of other nearby street furniture should inform the design and placement of the shelter.

Coordinated decision making must take place early on, and include City staff and representatives from affected transit agencies as well as local stakeholders.

Guidance

- Maintain cycling facilities through curbside and bay bus stops in accordance with the City's Active Transportation standards. The typical location of cycling facilities between the roadway zone and the clearway zone is inherently challenging with respect to transit stops, for the key function of a transit stop is to physically link these zones.

Figure 4.53. Include amenities such as shelters, seating, route information, system map and a real time next vehicle arrival tactile strips, sign poles and curb cuts display panel. Integrate with transit shelters as much as possible.

- At two-way stop-controlled intersections, seek opportunities to accommodate pedestrian crossings such as cross walks, refuge islands and PXOs; the importance of providing a pedestrian crossing increases with the motor vehicle traffic volume, traffic speed and distance to the nearest pedestrian crossing.
- Avoid providing both near and far-side stops at the same intersection.
- Satisfy AODA requirements including curb cuts, tactile strips to alert the visually impaired to the presence of various stop elements, such as a shared cycling / boarding platform or a curb cut.
- Where possible, reduce clutter by using existing poles to mark transit stops and minimizing trees and street furniture such as multi-publication boxes or waste receptacles within the immediate boarding and alighting area.
- Provide a dedicated area for snow storage.
- Include amenities such as shelters, seating, route information, system map and a real time next vehicle arrival tactile strips, sign poles and curb cuts display panel. Integrate with transit shelters as much as possible.
- Provide bicycle parking adjacent to the stop based on bicycle volume and transit ridership.
- 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.
- Provide curb extension platforms on streets with permanent on-street parking.
- Integrate ride-share, pick-up/ drop-off locations and micro-transit services at major transit stops and stations.

More Information

- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- OTM Book 15: Pedestrian Crossing Facilities(2016).
- TAC (2018). Pedestrian Crossing Control Guide.
- NACTO (2013). Urban Street Design Guide.
- Average Pedestrian Crossing Delay Component. Source: Ottawa Multi-Modal Level of Service (MMLOS) Guidelines (2015).

4.5.5 Cross Walks

Crosswalk design is critical to make motorists aware of the potential interaction with pedestrians, the most vulnerable user, and inform their behaviour.

Pedestrian crossings are designated facilities for pedestrians to cross a roadway, and are provided as either controlled or uncontrolled crossings. At a controlled crossing, vehicle drivers must yield to pedestrians crossing legally, while at uncontrolled crossings, pedestrians must wait for a safe gap in traffic before crossing. 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. Marked crosswalks should only happen at controlled crossing locations.

Benefits

- Improve accessibility.
- Alerting motorists to the possibility of crossing pedestrians.
- Clarity as to which user has the right-of-way.
- Increased pedestrian comfort and network connectivity, potentially reducing pedestrian trip distances.
- Reduced risk exposure for all road users.

Applicability

A number of controlled and uncontrolled crossing types are possible, as noted in the table to the right. OTM Book 15 provides a Decision Support Tool (DST) to determine the appropriate crossing facility type. DST is based on the seven guiding principles contained in the Pedestrian Crossing Control Guide produced by the Transportation Association of Canada: safety, delay, equity, expectancy, consistency, connectivity, and pragmatism.

Guidance

- Place curb cuts and raised tactile walking surface indicators so as to cover the full width of the crosswalk where it meets the sidewalk.
- Align pedestrian crossings to minimize crossing distance to accommodate slower moving pedestrians.
- Retrofit all crosswalks at all signalized intersections with ladder crosswalk markings to increase the visibility of the crossing.
- Retrofit all crosswalks at signalized intersections with tactile walking surface indicators at both ends.
- Introduce curb extensions at all intersections where a permanent parking lane exists to increase 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 two lanes of traffic.
- Consider introducing raised crosswalks as a traffic calming measure on local streets.
- Coordinate the location of drop curbs with catch basins to prevent ponding and ice build up.
- Provide mid-block crossings with a pedestrian refuge island on arterial roads, at mid-block bus stops, or other locations of moderate crossing activity. A quick win is to assess all of Brampton's mid-block transit stop and provide a safe mid-block crossing.
- Locate tactile paving and drop curbs in accordance with OTM Book 15 (2010).

More Information

- OTM Book 15: Pedestrian Crossing Facilities (2010).
- Pedestrian Crossing Control Guide TAC (2018).
- City of Brampton (2019). Landscape Development Guidelines.
- City of Brampton (2015). Accessibility Technical Standards - Version 2.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).

Figure 4.55. Refuge islands in the centre of wide streets with high traffic volume locations reduces the exposure time experienced by a pedestrian in an intersection.

Figure 4.54. Introduce curb extensions at all intersections where a permanent parking lane exists to increase sight lines between pedestrians and drivers.

Table 4.11 Controlled and Uncontrolled Crossings (Adapted from OTM Book 15)

Controlled Crossings	Uncontrolled Crossings
• Traffic Control Signals • Intersection Pedestrian Signals • Mid-block Pedestrian Signals • Pedestrian Crossovers (four types) • STOP Sign • YIELD Sign • Supervised School Crossing	• Unmarked Mid-block Crossings (in the absence of traffic control signals, intersection pedestrian signals or pedestrian crossover)

4.5.6 Urban Smart Channels

Traditional channelized right-turn (slip) lanes facilitate fast, and often uncontrolled, right-turn vehicle movements without signal control or delays.

They help to increase motor vehicle capacity at the intersection but also introduce more conflicts with pedestrians and cyclists and provide poor (skewed) sight lines. Traditional slip lanes are counter to the principles and directives of Complete Streets and are generally discouraged within the City of Brampton.

If a slip 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. Urban smart channels can assist in reducing driver workload by reducing the angle of shoulder check upon entry, improve visibility of pedestrians by reducing viewing angle, and reduce turning speed.

Benefits

- Turn and slip lanes are discouraged to improve safety and accessibility and provide opportunities for other public realm and place making improvements.

Applicability

- Discouraged city-wide.
- Urban smart channels should only be considered at signalized intersections, with high right-hand turning volumes.

Guidance

- Remove channelized right-turn lanes where possible.
- If removal is not possible, 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 further assist pedestrians to safely cross the street.
- Provide a raised pedestrian refuge island of sufficient size to accommodate accessible features such as curb ramps (usually in three separate directions) or channels cut through the raised island that are flush with the surrounding pavement. If the crossing of the right-turn lane is signalized, the island needs to be large enough to contain pedestrian push buttons. A painted island is not acceptable.
- Important details include the crosswalk marking, placement of traffic control signs in advance of the crosswalk, and warning by way of signs and pavement markings on the approach. Ideally, the slip lane design should include a stop sign to control vehicle movements and a raised crosswalk to offer a higher order of pedestrian safety and accessibility. Provide pedestrian signals to cross the slip lane under signalized control.
- Protocols for slip lane selection are as follows:

» First, minimize intersection size as discussed above.
» Second, analyze the traffic network to determine if the turn can happen elsewhere and/or if the turns can be redistributed throughout the network. For example, it is usually possible to turn before or after a diagonal street. Also, turns for large vehicles can be restricted.
» If a slip lane is used, protect the pedestrian crossing with traffic signals or stop control and a raised crosswalk.
» See the illustration on the next page for slip lane dimension guidance

More Information

- City Brampton (2007). Neighbourhood Traffic Management Guide.
- OTM Book 18 (2021): Cycle Facilities.
- TAC (2017). Geometric Design Guide for Canadian Roads.
- NACTO (2014) Urban Bikeway Design Guide.
- Pedestrian Facilities Users Guide (Report No. FHWA-RD-01-102).

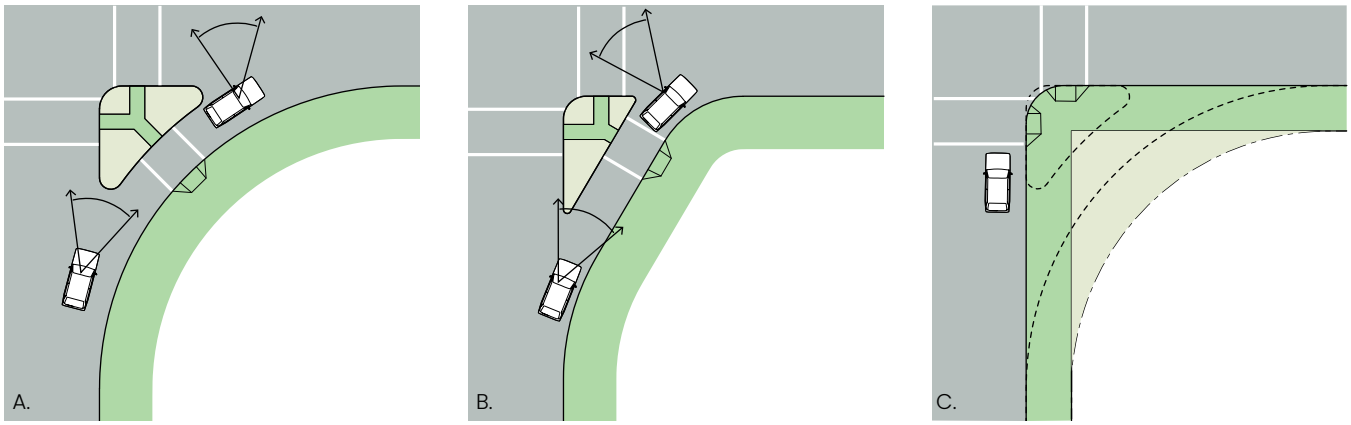


Figure 4.57. (A) A larger turn radius result in faster turns and less visibility of pedestrians waiting to cross. (B) A smaller turn radius results in need for vehicles to slow to enter traffic, as well as improved visibility of pedestrians and on-coming traffic. (C) Removing the slip lane results in shorter crossing for pedestrians and safer conditions at the intersection.

Figure 4.56. A tabletop pedestrian crossing in an existing slip lane permits turning but reduces speed and improves accessibility and visibility of vulnerable users.

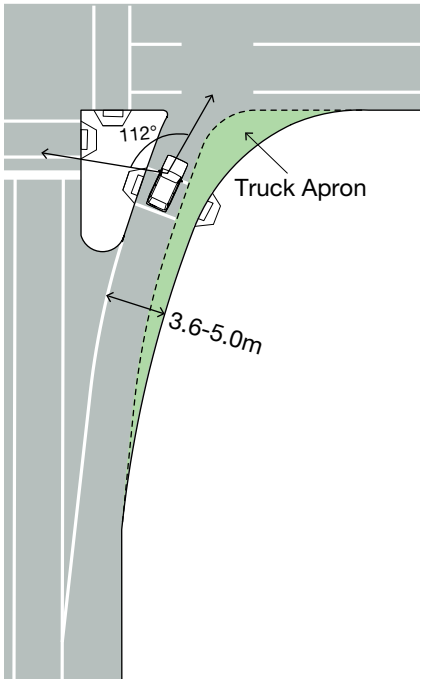


Figure 4.58. Urban smart channel.

4.5.7 Intersection Control and General Principles of Signalization

The City of Brampton uses various intersection signals and other traffic control devices to facilitate safe movement of all road users, guided by the Ontario Traffic Manual (OTM) Book 12, the Ontario Highway Traffic Act (HTA), the Manual for Uniform Traffic Control Devices (MUTCD) for Canada, and the Transportation Association of Canada Geometric Design Guidelines (2017).

The choice of intersection control is often determined by the technical warrants that get updated from time to time. The practitioner must identify existing and aspirational pedestrian desire lines and active transportation networks at the start of a project to reveal opportunities to introduce intersection controls. Consideration of traffic and bicycle signals in the design process can improve efficiency, assist in reducing delay and influence mode choice. Enhanced street crossing protection afforded by these devices increases safety and comfort for the most vulnerable street users.

The following is a list of issues which the design practitioner should consider at an early stage of project development.

Safety first. Focus on the safety, comfort and accommodation of the more vulnerable street users by adopting designs which favour pedestrians, cyclists and transit customers. The placement and operation of the vast of traffic control signals throughout the city sets the character of transportation movement and establishes the relationship between transportation modes. The equilibrium between pedestrian, bicycle and motor vehicle traffic is greatly influenced by the traffic signal operational practices.

Use future not past data. Use future and not past or existing data for all modes in the analysis and review of future infrastructure, new developments and environmental assessment studies. Consider the presence of major trip generators, adjacent land uses and network connectivity in estimating the potential for cyclists and pedestrians

Connect the network. Determine if the street project is currently or planned as part of a networked system of traffic control, and review the requirements for general design and infrastructure parameters.

Reduce the need for push buttons and use fixed time mode. In Downtowns, Town Centres, and strategic nodes where there are regular intervals of pedestrian, bicycle, and vehicular demand from numerous directions, fixed-time signal phasing on a regular interval is preferred as it promotes predictability and enables users on all sides of the intersection to be familiar with their “turn” to cross. Exceptions may include transit priority streets where signals may “hold” a green slightly longer to aid an incoming transit vehicle in crossing the intersection. In other areas, Intelligent Transportation System/Advanced Traffic Management System technologies can automatically detect pedestrians without the use of push buttons. Adaptive and responsive control software can give pedestrian/cyclist traffic priority when heavy demand is present without resorting to fixed time operation.

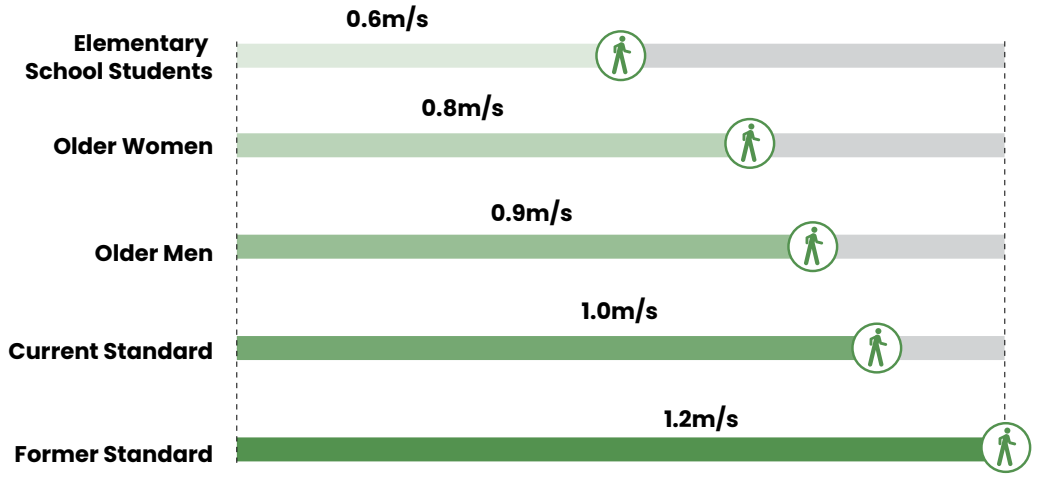


Figure 4.59. Walking speeds varies for different users. A Leading Pedestrian Interval gives pedestrians a five second head start, making them more visible to turning motorists.

c. L. Asher, M. Aresu, E. Falaschetti, J.Mindell (2012). Most older pedestrians are unable to cross the road in time: across-sectional study. Age and Ageing, Oxford Press; L. J. H. Schulze (2006). Evaluation of cross-walk timing and the application of a standard crossing light timing formula, International Ergonomics Association.

Accommodate all abilities. Consider how to best accommodate slow walkers through the provision of the shortest possible crossing distance and adequate signal time through a combination of road diets, curb extension and other measures. A pedestrian refuge may be necessary where there are long distance crossing situations. The Figure above identifies the crossing time of various users. A leading pedestrian interval signal (about 5 seconds ahead of the green traffic signal) can be used to give pedestrians time to become visible in the crosswalk to drivers. Using smart technologies and software can allow the City to expand pedestrian and cyclist phases when necessary.

Reduce signal cycle length where possible. Design traffic signal timing and phasing to minimize delay for all users and all approaches by implementing the optimal cycle length. Longer signal cycles are possible using the data collected at the intersection. This practice enables city streets to function as a network, rather than a series of major corridors. Consider the use of adaptive signal control software to change cycle lengths in real-time based on actual pedestrian and cyclist demand. Consistency in real-time can still be achieved by time of day based on database parameters and thresholds.

Different times of day and night. Anticipate the variations of pedestrian, bicycle and motor vehicle demand by direction and during different times of the day and night. The nature and roles of streets may change throughout the course of the day. As an example, a street in the morning may carry mainly vehicle, bike, and transit commuters in peak directionality, while mid-day or evening times the street may accommodate a greater number of pedestrians. Based on this daily rhythm, traffic signal timing should be adjusted to meet various modal and directional demands.

Consider the use of responsive and adaptive control software that can make changes in real-time based on demand. These types of advanced solutions would automatically adapt to changing traffic flows and travel conditions as they occur.

More Information

- OTM Book 15: Pedestrian Crossing Facilities (2010).
- TAC (2018). Pedestrian Crossing Control Guide.

4.5.8 Transit Stop Locations

Transit stop placement directly impacts the convenience and accessibility of the system by pedestrians and cyclists and can impact transit operations.

Benefits

- Improved safety and convenience before and after trips for transit customers.
- Respond to the local street context

Guidance

- Key considerations for locating stops include: spacing between stops; ease of operation; pedestrian transfer situations; space availability; adjacent trails and paths; and stop location relevant to existing and planned land use.
- The optimum spacing of stops is between 300-400m in most locations to balance access to transit with travel time for passengers, though this may vary based on context.
- Signalized intersections are preferred locations to allow safe pedestrian crossing and the likelihood of route transfers.
- Avoid mid-block bus stops. If required to serve new significant pedestrian generators, introduce a controlled facility to ensure safe movement to and from the destination.
- Table 4.12 highlights the advantages and disadvantages of near and far-side locations based on Complete Streets principles. Each configuration presents its own opportunities, benefits, and challenges, interacting differently within street, passenger, and transit operations context.

More Information

- MTO Transit Supportive Design Guidelines. Section 2.2 Creating Complete Streets.
- NACTO (2016). Transit Street Design Guide.

Figure 4.60. Example of near-side(left), far-side (centre) and mid-block (right) stops.

Table 4.12 The Advantages and Disadvantages of Near and Far-Side Locations

	Near-side	Far-side
Advantages	• Places the stop as close to the crosswalk as possible, thereby reducing jaywalking. • Boarding and alighting can occur during a red interval. • Street lighting is typically better closer to the intersection.	• Improved traffic and transit operations at intersections with heavy right turn volumes, as the bus is neither affected by, nor does it contributes to long right turn lane queues. • Gaps in traffic flow caused by signal operation can improve merging opportunities. • Improved transit signal priority operations in combination with near and far-side queue jump lanes. • Improved lane alignment for median transit lane design, due to left turn lane shadow.
Disadvantages	• Boarding and alighting may cause a bus to miss a green interval. • Motorists may try and make a right turn in front of a bus, increasing the risk of collision. • May reduce sightlines at crosswalks • Bus may be required to merge within the intersection, which may increase risk, especially for cyclists.	• Traffic may queue behind a stopped bus and block the intersection. • Motorists may not expect a vehicle to stop at the far-side of an intersection, which may increase the risk of collision. • May require extended parking prohibitions. • Bus may be required to stop twice.
Mitigating Measures	• Additional driver training may mitigate increased collision risk with right turning motorists.	• Bus bays may alleviate concerns around queue volumes and increased collision risk.

4.6 Green Infrastructure Design

Green infrastructure (GI) refers to the natural and man-made elements that provide ecological and hydrological functions. In addition to these functions, green infrastructure contributes to making streets more pleasant, comfortable and sustainable. Components may include: Natural Heritage features and systems; stormwater management systems; street trees; urban forests; permeable surfaces; green roofs and active and sustainable transportation choices.

Brampton's Sustainable Community Design Guidelines (2013) and the Grow Green Environmental Master Plan (2020) provides additional guidance on how to maximize opportunities and incorporate green infrastructure within the street design process.

The following guidance is a starting point. Further study and development of municipal green infrastructure standards are recommended to support the City's overall sustainability and resilience objectives and to deliver Complete Streets.

PRINCIPLES

Street trees and landscaping. Street trees are a highly desirable element for making pleasant, comfortable and sustainable streets. Consider street trees an integral component of Brampton's infrastructure. Where provided, street trees should have non-compacted soil volume and growing conditions to vigorously grow and become healthy and mature.

Stormwater management. Streets play a major role in stormwater management and can help to reduce point source volumes, improve water quality, mitigate the urban heat island effect, support human health and well-being, create ecologically important streetscapes, and enhance the streetscape environment.

Coordination of Infrastructure. Trees and planting are infrastructure themselves. The coordination of below-grade infrastructure and access points should integrate with the standards for street-tree planting and GI and will consider practices for infrastructure maintenance. This requires GI to happen at early stages of design development and early engagement with utility companies to resolve potential conflicts.

Operations and Maintenance. It is critical that the requirements for the operations and maintenance of GI options be considered from inception of the conceptual design through the extent of their life-cycle. Like all infrastructure, green infrastructure requires regular inspections and maintenance to assure proper function.

Figure 4.61. Examples of green infrastructure design incorporated within the boulevard.

RECOMMENDED FUTURE

GI Toolkit. The City of Brampton should develop their own GI standards to assist with their inclusion in street projects. This effort should include standard drawings and specifications, as well as direction for:

- Making underground components of GI identifiable by utilities, contractors, and City staff.
- Lowering maintenance hurdles and extending the life of GI through pre-treatment.
- Mandatory stormwater management criteria that apply to various types of ROW projects, and guidance on how GI can contribute to achieving these criteria.
- Funding and implementation, including potential partnering opportunities, funding sources, and maintenance requirements.

Landscape Development Guidelines Update. The City should update their current Landscape Development Guidelines (2019) to include direction for soils/growing mediums, aeration, drainage, and irrigation systems to ensure good street tree growing conditions. These standards should include a plant list with native or well adapted species to the area and sourced locally wherever possible.

Storwater Master Plan Update. Evaluate the vulnerability of road infrastructure to climate change and set out appropriate actions through a Climate Adaptation Plan as part of the next update to the City's Stormwater Master Plan

Low Impact Development (LID) Terms of Reference. The City should establish a model Terms of Reference for LID feasibility that project managers and consultants can incorporate into the scope of work for projects planned in the road ROW.

Stormwater Management Criteria. Confirm mandatory stormwater management criteria applicable to ROW works through the Consolidated Linear Environmental Compliance Approval from Ministry of Environment, Conservation and Parks (MECP) anticipated in 2022.

4.6.1 Street Trees and Landscaping

The most important component of great streets around the world are street trees.

Street tree planting and landscape plantings should follow the City's Landscape Development Guidelines (2019) and the Sustainable Community Design Guidelines (2013) in addition to the guidance that follows.

Large, healthy street trees provide substantial benefit beyond the aesthetic; they form a significant part of a city's urban forest and are found on all types of streets. Like street lights or benches they are considered an integral component of our streetscapes and should receive the same regard as other infrastructure such as gas, hydro, telecommunications and water.

Consider adding street trees wherever a gap in the tree canopy is present. Street trees are generally planted as a single specimen or groupings in many possible configurations including soft (open planters) or hard landscapes (within a pavement system supported by a soil cell system or structural slab/pavement bridge). For trees in hard surfaces, open planters provide the best condition for tree planting and the most opportunities to enhance the streetscape. In some case, tree pits may offer a better option instead of open planters.

Like all infrastructure, street trees are an investment. Providing generous, well draining, non-compacted soil volume is a fundamental requirement for healthy tree growth. When confronted with limited space in the ROW, the trade-off for street tree planting is often between an open planting detail or a structural system like tree trenches or soil cells. Further, street trees do require a maintenance program to ensure maximum benefit, but once established and provided with the right conditions for healthy growth, they will need comparatively little effort.

Although individual projects in the City have included and promoted leading edge tree planting details, Brampton does not yet have contemporary city-wide tree planting requirements, details and specifications.

Beyond trees, additional plantings and landscaping are integral to streetscape design. Consisting of several horticultural elements such as trees, shrubs, grasses and herbaceous plants, landscaping can contribute to the aesthetic value and environmental performance of the street.

Landscaping is generally placed in one of five locations:

- Within the Furnishing and Planting Zone of a boulevard.
- Within the building setback/ frontage zone.
- Within the roadway, typically on medians, islands, and circles.
- On curb extensions, typically integrated with parking.
- Hanging on street poles or trellises as part of a streetscape improvement.

Benefits

- Creates an attractive and comfortable environment.
- Contributes to the city's urban forest and helps reduce heat island effect.
- Improve overall air and water quality.
- Provide shade and protection from rain and wind.
- Provide traffic calming and speed reduction.
- Provide visual and physical separation between the roadway and the boulevard.
- Increases property value, enhances adjacent businesses and supports economic vitality
- Improve stormwater management
- Provide wildlife habitat and maintains continuous ecosystem

Figure 4.62. Street trees should have appropriate spacing and soil volume.

Figure 4.63. Example pavement markers to identify below the surface GI.

Applicability

Street trees and landscaping are suitable for all streets in Brampton, especially streets with wide boulevards and locations where there is a need to more actively manage stormwater, streets with associated leisure activity, and within residential areas.

While landscaping is often incorporated into medians, it may provide more impact and better value to the street when placed where pedestrians can appreciate their benefit.

Guidance

- Take care to not inhibit visibility between users (including pedestrians, cyclists and drivers) especially at street corners.
- Do not create blind spots with landscaping that decrease security.
- Ensure landscaping does not obscure traffic lights or road signs
- Ensure no trees in the sight triangle at intersections and driveways.
- Provide adequate root space, high quality soil, enough water and sunlight, protection from pedestrian traffic, and regular maintenance.
- Provide appropriate tree spacing and ample uncompacted, well-draining soil volume, 30m^3 per tree.
- Provide enough openings for trees pits: A minimum of 1.5m is preferred.
- Coordinate landscaping with above or below ground utilities to avoid conflicts.
- Consult the City's native plant list when selecting planting species.
- Use open planter system for tree planting where space and maintenance agreement permits.
- Ensure plantings are salt-tolerant.
- Protect trees from road salt, and ensure proper soil flushing every spring prior to bud break. Where surface runoff is directed into soil cell systems, provide an under-drain connecting to the storm sewer to allow positive drainage year round and soil flushing by spring rainfall.
- Locate landscaping to take advantage of ground surface runoff (passive irrigation) such as a rain garden.
- Organize landscaping with street furniture such as benches and bus stops.
- Include markers to identify to utility companies tree roots and GI below the surface.
- Include a planting and maintenance plan, either through City or private resources.
- Incorporate landscaping into mini-roundabouts and pedestrian safety islands.
- Celebrate large and historic trees by diverting sidewalks and roadways around them rather than removing them.

More Information

- City of Brampton (2019). Landscape Development Guidelines.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- City of Toronto (2021). Green Infrastructure Design Standards.

4.6.2 Low Impact Development (LID)

All municipalities have a responsibility to improve the quality of stormwater and seek ways to assist with the recharge of our natural systems, minimize peak loading on servicing infrastructure, and address the impacts of more frequent and more intense storm events, particularly in our changing climate.

One of the core functions of City streets is to collect, convey and manage stormwater. To the City's benefit is a growing body of knowledge on how to introduce LID techniques in public rights-of-way. Conservation Authorities are leading the efforts, and Brampton has contributed to the Sustainable Neighbourhood Action Program, which tests the introduction of green infrastructure (GI) in different settings. Still, numerous opportunities exist for Brampton streets to contribute further.

On streets with large boulevards, there is ample space within the cross section to accept elements like street trees in different planting systems, bioretention, swales, and perhaps underground storage. Other streets could introduce permeable pavements, photocatalytic pavements, and underground filtration systems.

Consider LID feasibility when planning all projects in the road right-of-way (e.g. reconstruction, resurfacing, safety and active transportation). LID design should weigh the benefits to other users, the water cycle and the overall ecosystem, including consideration for other stormwater management approaches that are planned or already provided elsewhere in the system.

Although there are several existing sources, the City of Brampton should develop their own municipal GI design standards in public rights-of-way.

Benefits

- Improved accessibility by reducing surface ponding.
- Minimized stormwater load on the City's sewer system.
- Improved water quality in streams, rivers and lakes.
- Improved air quality.
- Lessens the impacts of more frequent storm events.
- Provides a more pleasant environment for bicycling, walking or sitting.
- Contributes to traffic calming when used in curb extensions, edge islands, medians, and other speed management features.

Guidance

- Limit impervious pavement to the minimum necessary, typically driving lanes, bike lanes, and the Pedestrian Clearway Zone of the boulevard.
- Design areas such as parking, medians, planting strips, tree pits with permeable surfaces, where practical.
- Incorporate passive irrigation techniques wherever landscaping is considered.
- Consider opportunities for permeable paving materials in Shared Surface Streets, Lanes, and or other streets where LID stormwater management techniques are possible.
- Consider opportunities for permeable pavement within the Edge/Curb Zone and Furnishing and Planting Zones.
- Incorporate rain gardens at curb extensions and planting zone between the curb and the pedestrian clearway.
- Incorporate bioswales and other devices to hold and process larger amounts of stormwater where space allows.
- Extend the life of LID infrastructure with pre-treatment components that capture sediment and debris at the inlet for easy, effective maintenance

Figure 4.67. Bio-swale at County Court Boulevard, Brampton.

Figure 4.65. Example of a rain garden.

Figure 4.64. Example of a parking lane with permeable paving.

Figure 4.66. Example of a rain garden incorporated into a curb extension.

More Information

- City of Brampton (2020). Grow Green Environmental Master Plan.
- City of Brampton (2021). Landscape Development Guidelines.
- City of Brampton (2013) Sustainable Community Development Guidelines and Sustainability Metrics, Chapter 2, Sustainable Community Development Program (2018).
- Sustainable Technologies Evaluation Program (STEP). Low Impact Development Planning and Design Guide WIKI. https://wiki.sustainabletechnologies.ca/
- Toronto and Region Conservation Authority. SNAP: Sustainable Neighbourhood Action Plan. (https://trca.ca/conservation/sustainable-neighbourhoods/)
- National Green Infrastructure Certification Program (https://ngicp.org/about-ngicp/)
- City of Toronto (2017). Green Street Technical Design Guidelines.

c: Nikita Ignatev, Unsplash

5 IMPLEMENTATION

This Guide is an early part of the overall process to make streets more complete in Brampton. Decisive action is required to make this way of thinking an integral part of all street project design, delivery, and maintenance.

5.1 Introduction

Developed as a living reference document, this Guide includes principles, street context, directives, a decision making framework, street elements and tools for implementation and measuring performance so that every street project can help to improve the next.

This Guide promotes collaborative decision making among many city divisions, departments, and internal and external agencies.

Further, the intent is to provide education and training to practitioners, decision makers, elected officials, the public and stakeholders about the Complete Streets process and the product that can result from this holistic, collaborative way of approaching street planning and design.

By using this guideline document, the following outcomes are expected:

- **More informed participants:** Practitioners, elected officials, stakeholders, and public will become more aware of what is happening at each step in the street design process, from the project objectives and principles that guide each undertaking, to the data inputs and way decisions are made collaboratively.
- **Engaging and inclusive processes:** The public and key stakeholders will know how and when to engage every street project and see clearly how all uses and users are considered and included in the project.
- **Greater clarity and transparency:** Documenting the process will "daylight" how difficult choices are made, trade-offs between different uses, users and elements are resolved, and how exceptions are granted to the guidance provided in this document.
- **Improved consistency and efficiency:** One of the main goals of Complete Streets is to improve consistency and efficiency in how projects are delivered and to establish a common starting point for what is considered during street projects.

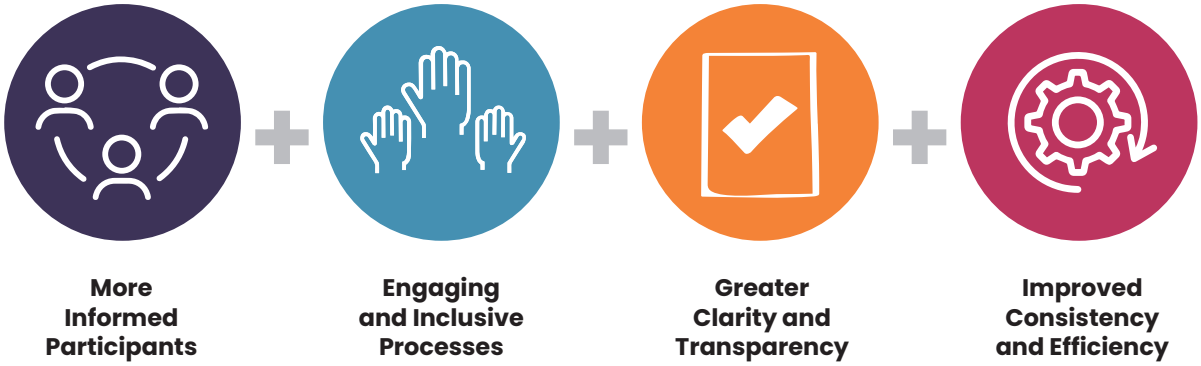


Figure 5.1. Four expected outcomes of the Guide.

5.2 Applicability

As stated in Chapter 1, this Guide applies to all new street projects in the City of Brampton, but will not change approved projects or projects under construction. The Guide is also useful to assess current projects, and inform policy updates. All practitioners will use the Guide during all stages of a street design project, from initiation and planning to construction and maintenance.

All types of projects afford an opportunity to make streets more complete, from planning to construction to maintenance.

Not all projects will offer the same opportunities to make streets more complete, but the City will endeavor to make all streets as complete as possible within the boundaries of both scope and initial budget for each project.

Large projects, such as Environmental Assessments, new construction and reconstruction, offer the opportunity to more comprehensively apply the Guide. They tend to have higher budgets, a broader scope, and a longer timeline. Small projects offers tremendous potential for making streets more complete since they frequently take place in every part of the city and can often achieve project objectives with a few and relatively simple measures.

All City of Brampton staff divisions, and business units working in street planning design and operations have a role in the application of Complete Streets. In every instance, practitioners are encouraged to apply their best professional design judgment and to work collaboratively to find a suitable solution.

Table 5.1 identifies examples of different types of projects in the City of Brampton that will follow the Guide to the greatest extent possible. This list is not exhaustive and subject to change .

Table 5.1 Potential Types of Projects to Apply the Guide

	Description	Project Type examples	Brampton Example
Planning Projects	Plans that articulate the vision for a community	Area plans, secondary plans, master or precinct plans, corridor studies.	Shoppers World, Queen Street East Precinct Plan
Major Street Projects	Higher budgets, often funded through capitol improvements happens less often	New construction, reconstruction or revitalization, resurfacing, Environmental Assessments	Williams Parkway, Brampton LRT Extension, Downtown Reimagined
Medium to Smaller Scale Projects	Lower budgets, can be funded through state of good repair, capitol improvements or development, More constrained scope, shorter design and construction duration, happens more often	Development applications, localized road resurfacing, new sidewalks or other pedestrian links, new bicycle infrastructure or facilities, local safety and transportation improvements, streetscape improvements (furniture, beautification, public art, wayfinding, etc.), Signs, signal installations, lighting, utility cut repairs, pavement markings	Mountainash Road (between Bovaird Drive and Countryside Drive) - adding parking lanes, bump-outs centre median and improved crossings
Maintenance	Ongoing programs	Snow and ice control, detours , signals	Snow Clearing Operations, Request Maintenance

5.3 Opportunities for Change

Street planning and design is complicated and must balance the need of many different users across a diversity of contexts. As public or private development projects are identified, designed, and reviewed, make use of the following key implementation strategies to aid the project delivery process and to make informed, holistic decisions regarding the future of Brampton's streets.

UNDERSTAND THE SCALABILITY OF STREET NETWORKS

Streets are finite and do not exist in isolation. They are part of networks and systems, such as stormwater drainage, urban forest canopy, transit routes, goods movement routes, main streets, and bicycle routes. If an element does not "fit" on a street, perhaps it can move to another. Conversely, some elements are necessary to complete a network. Working in multiple scales helps to understand a street, its network, and the role they both play in the larger context.

LEVERAGE FUNDING AND INVESTMENT

Streets are expensive and budgets are limited, but with strategic phasing, collaboration, and creative approaches to design, budget constraints do not have to preclude street improvements.

Pavement markings and non-permanent fixtures (e.g. bike corrals, plastic bollards, planters, and rubber curbing) dramatically change the character of a street quickly and at relatively low cost. Phase more permanent improvements over time as development projects come on-line, utility upgrades are conducted, or routine maintenance projects advance.

Coordinating efforts between different owners, partners and agencies (for example Brampton Public Works and Region of Peel) can improve municipal services while at the same time satisfy multiple complete street objectives, such as enhanced safety, mobility, place making sustainability and public health. Practitioners shall seek opportunities to leverage investment in the City's rights-of-way that ensure maximum performance of its streets.

CONNECT TO FUNDING STREAMS

Transportation infrastructure is the largest infrastructure asset in the City of Brampton. The delivery of new Complete Streets and making existing streets more complete will rely on different funding streams, piggybacking on multiple capital works programs (such as transit, stormwater, green infrastructure, cycling, infrastructure upgrades, climate change) and leveraging funding from different levels of government (Regional, Provincial and Federal).

Apart from the Regional concessions, Brampton has developed most of its street network through greenfield development. The capital for constructing new streets over time has been largely provided by development charges (DCs), a one-time fee collected from new development to help pay for new infrastructure that is related to growth, such as roads, transit, community centres, libraries, fire stations and parks. Historically, many of the streets funded by DCs have supported lower density development. As Brampton intensifies and redevelops, further contributions will become necessary to support a growing population. Given that Brampton must update the DCs on a regular basis, and the DCs are informed by the Transportation and Transit Master Plans, any modifications required to ensure that a Complete Street approach is applied consistently for new streets throughout the City is through potential adjustments to this mechanism.

The maintenance of Brampton streets is funded through different sources including but not limited to local taxation and infrastructure funding for the different levels of government. As with development charges, the budgets established for the repair, rehabilitation and replacement of Brampton streets should consider any potential additional elements required to deliver Complete Streets.

GET GOING WITH QUICK WINS

A good first step to implementing the recommendations in this Guide is to work with what you already have, and to identify how you can begin to deliver complete streets as part of your existing operations.

The delivery of streets in Brampton are most successful when City divisions bundle their projects with road works, either as new streets or rehabilitation of existing facilities. This practice ensures that the City can deliver a Complete Streets approach, coordinate the respective scopes of work, reduce or avoid public disruption, and potentially result in overall cost savings.

The City of Brampton's 10-Year Roads Capital Program (RCP) identifies new projects throughout the city. Each project is identified in the City's Transportation and Transit Master Plan. Council endorses the 10-year Roads Capital Program and the first year of the Capital budget is approved, with the following years approved in principle. The City also has a Road Maintenance Program to ensure that the existing network is within a State of Good Repair (SOGR). Together these two programs define all street related projects that the City will undertake each year.

Potential quick wins in Brampton include:

- Road resurfacing
- Pavement markings
- Sidewalk, curb and pothole repairs
- Catch basin repairs
- New sidewalks and pedestrian facilities
- New and enhanced cycling infrastructure
- Transportation infrastructure enhancements (e.g., intersection improvements)
- Streetscape enhancements and other neighbourhood improvements
- Geometric design and other safety improvements
- Improving maintenance programs to better align with Complete Streets

Select quick win projects that prioritize improving safety for vulnerable users. Simple and cost-effective quick wins could include adjusting the location of lane markings or reducing a corner radius. Others may require additional yet minor funds like adding a crosswalk or signal or adding a buffer to a bike lane to elevate the facility type. Hundreds of street projects take place every year so numerous improvements are possible to make a difference in the short-term. This practice should occur every year from this point forward.

PRIORITIZE THE MOST VULNERABLE

There are numerous locations in Brampton where Complete Street efforts are difficult to challenge. An early opportunity to apply a Complete Streets approach is around places like schools, hospitals, senior housing and long-term care facilities. A Complete Streets approach would seek to ensure safe and equitable movement by considering speed limit reductions, introducing context-appropriate traffic calming measures, and improving intersections and crosswalks.

TEST WITH PILOT PROJECTS

Municipalities throughout Ontario have tested several street reconfigurations over the years with great success. Pilots, or temporary installations, are a great way to try out street concepts and evaluate the trade-offs empirically rather than theoretically. It is possible to safely and attractively implement pilots with minimal cost. Additionally, pilots can generate and engender positive public outreach. Keys to a successful pilot include:

- **Clear communication.** Make sure all stakeholders and the public know about the pilot, its objectives, its duration, and who to contact with any comments or concerns. Provide stakeholders and the public with the post-pilot findings and recommendations.
- **Defined measures for evaluation.** A pilot is a test of a concept and as such requires evaluation. Relate evaluation measure to the objectives for the street as defined in the Street Type section. Establish clear methodology and accountability for data collection prior to the pilot.
- **Finite duration.** Pilots are temporary and may only last for a couple of days over a single weekend or for months. Communicate to all stakeholders the duration of the pilot and ensure the pilot does not exceed this period, unless it is made permanent.

5.4 Project Engagement

Brampton has long recognized the importance of effective engagement. The Complete Streets Project Delivery Process described in this Guide formalizes the technical tasks and engagement activities so that internal and external stakeholders can contribute to street projects in a thoughtful and constructive manner.

The goal of proper engagement is to ensure transparency and provide accountability for the decisions that are made.

All street projects will follow an inclusive and open process led by the principles and directives defined in this Guide. All stakeholders have a vested interest in what happens within the public right-of-way. Demystifying how streets are planned, designed and built will lead to informed decision making and streets that better respond to community needs.

Everyone is welcome to share their opinion and provide input. Participants in engagement activities often include residents, businesses, ratepayer and resident associations, city officials, city staff and other agencies. The City also seeks the input from numerous advocacy groups, many of who specialize in their subject matter and are valuable resources for many aspects of street design and city building. Streets in Brampton as well as this Guide are informed by the contribution of many.

The City should make efforts to broaden their reach to include stakeholders and groups who do not often take part through conventional methods. Public meetings, stakeholder advisory groups, and design workshops are common engagement techniques. Site walks, moving conversations, and pop-up stations are effective ways to expand how input and feedback is gathered. Testing new ideas through pilot projects of varied scale and duration offers the City, stakeholders and the broader public a way to learn more before making a significant change or investment. Decision makers leading street project engagement processes should ensure that participants understand what is open for influence through their participation (and what is not).

The level and type of engagement will vary by project category and type. Streets with considerable capital investment that offer a significant opportunity for change will require a high level of oversight and engagement. Less intensive projects with a reduced opportunity for change typically need less oversight and engagement.

Table 5.2 (following page) summarizes the project categories, level of oversight required, and when engagement and communications takes place throughout the Project Delivery Process. In some projects, the level of engagement will only become clear if opportunities for change are defined during the planning stage, for example during resurfacing projects.

Acronyms for Table 5.2

RCO: Review and Coordination, Oversight (Individual or Committee)

IAC: Inter-Agency Coordination

PEC: Public Engagement and Communications

*: Level of oversight and engagement informed by opportunities defined during Plan Initiation

Table 5.2 Typical Project Oversight, Coordination and Engagement by Project Category

		PLAN		DESIGN		BUILD & MANAGE	
	Project Category	**Project Initiation**	**Context Definition**	**Preliminary Design & Decision Making**	**Construction Design**	**Construction Admin.**	**Operate Maintain**
Oversight- High	New streets	RCO IAC PEC	RCO IAC PEC	RCO IAC PEC	-- IAC PEC	RCO IAC PEC	RCO IAC PEC
	Full reconstruction	RCO IAC PEC	RCO IAC PEC	RCO IAC PEC	-- IAC PEC	RCO IAC PEC	RCO IAC PEC
	Resurfacing*	-- -- PEC*	-- -- --	RCO IAC --	-- IAC --	RCO IAC --	RCO -- PEC
	Intersection redesign	-- IAC --	RCO IAC PEC	RCO IAC PEC	-- IAC --	RCO -- --	RCO -- PEC
	EAs	RCO IAC PEC	RCO IAC PEC	RCO IAC PEC	-- -- --	-- -- --	-- -- --
	Citywide or Local TMPs	-- IAC PEC	RCO IAC --	-- -- --	-- -- --	-- -- --	-- -- --
	Secondary Plans	-- IAC PEC	RCO IAC PEC	-- -- PEC	-- -- --	-- -- --	-- -- --
	Official Plan	-- IAC PEC	RCO IAC PEC	-- -- PEC	-- -- --	-- -- --	-- -- --
Oversight- Medium	Traffic Impact Studies	-- IAC --	-- -- PEC	RCO IAC --	-- -- --	-- -- --	RCO -- --
	Site Plan Reviews	-- IAC --	RCO IAC PEC	-- -- --	-- -- --	-- -- --	RCO -- --
	Structural Rehabilitation Projects	-- IAC PEC	-- -- --	RCO IAC --	-- -- --	RCO -- --	-- -- --
Oversight- Low	Maintenance	-- IAC --	-- IAC --	-- -- --	-- -- --	RCO -- --	-- -- PEC
	Restoration	-- IAC --	-- -- --	-- IAC --	-- -- --	RCO -- --	-- -- PEC

5.5 Oversight and Compliance

Oversight and compliance are an important aspect of the Complete Streets project delivery process, helping to ensure that the principles and directives from this Guide are adhered to and that projects are as complete as possible.

Project oversight plays an important improvement role in implementing lessons learned. The idea is to create consistency and to learn from every project. Project oversight:

- Improves decision making so all involved understand where and how decisions are made.
- Establishes performance based expectations rather than simply applying minimum standards.
- Documents decisions transparently, with the intent to reduce arguments that slow projects down and to inform future projects.

OVERSIGHT AND COMPLIANCE COMMITTEE COMPOSITION

This Guide recommends that the city establish a Complete Street Oversight and compliance Committee. This committee should include a Coordinator, a Complete Street Champion and a committee of four to five staff members from street design related departments. One member should have extensive experience in engaging utility companies to coordinate utilities with active transportation and GI Brampton. The Coordinator is responsible for administering and coordinating the committee and should be a senior staff member that provides support to the Complete Street Champion. The Complete Street Champion should be a City Councillor or other local elected official.

COMMITTEE PROCESS

The Oversight and Compliance Committee provides peer review at different stages throughout the project delivery process.

Reviews at different stages could happen quickly, require broader peer review, or need arbitration if conflicting opinions are not resolved by the project team, or may involve an audit. Decisions made by the individual or committee charged with oversight and compliance would seek to resolve any disputes at any number of points in the process. For example, in the project scoping phase decisions could determine whether a project is a simple maintenance effort and limited to that level of investment or a major rehabilitation or reconstruction effort.

Different types of projects may require different levels of oversight, coordination and engagement as shown in Table 5.2. Typically, the 10% design level oversight and compliance could resolve issues like lane width dimensions and street element disputes. At the 60% design level the role may need to make final decisions on design controls and elements such as curb radii, tree placement, and crosswalk locations.

Oversight and compliance are essential as practitioners become more familiar with this step and the overall process. Once the complete streets approach and guidance provided in this document is well en-grained in the culture of project delivery, the intent is that the number of decisions that require oversight and compliance will reduce for the project team will have learned how to resolve many of the issues in advance of submitting the project for review.

5.6 Design Checklist

The design checklist will help the project team develop design options that adhere to the principles, directives and technical guidance within this document.

To comply with the Guide and City of Brampton Official Plan and Transportation and Transit Master Plan Complete Streets policies means that the project team will plan, design, construct all street projects to provide safe and context sensitive accommodation for all users, and not compromise the most vulnerable.

The checklist applies to all public and private street projects in the City of Brampton. The checklist focuses on the initial stages (Project Initiation, Context Definition and Preliminary Design and Decision Making) so that additional scope items are included in the project budget before moving to Construction Design. The project manager will complete the checklist and work with the project team to ensure that the checklist is complete before advancing to the Construction Design phase.

Five checklists are provided that correspond with the five Steps to Street Design and Decision-Making in Chapter 4. They should be used as prompts to support design and decision-making by the project team.

1. Identify Context and Select Street Type(s) – to assist in considering all relevant inputs to assess a street's context, and that this step includes an appropriate level of engagement, commensurate with scope and budget.

2. Establish Design Priorities and Objectives – to ensure the project's priorities and objectives are aligned with Complete Streets guidance and reflect the street's context.

3. Decision-Making Framework and Metrics – to confirm that a project's decision-making framework is aligned with Complete Streets guidance and multi-modal level of service objectives and builds on the priorities and objectives from Checklist 2.

4. Assemble, Evaluate and Refine – to ensure that the street design options are applying the Complete Streets design principles and that the rationale behind decisions and trade-offs are documented.

5. Recommended Design and Rationale – to confirm that full documentation is provided for the recommended design, and that long-term maintenance has been agreed upon and approved by key maintenance owners.

To some extent, major street projects such as Environmental Assessment (EA) studies provide detailed documentation that reflects the Complete Streets approach. Brampton's Complete Streets Guidelines promote the use of these checklists to help project teams to apply a more consistent approach to street projects for large and mid-sized projects. Smaller projects with smaller scope, short timelines and fewer resources may not find it applicable to use these checklists.

The project manager and team members should refer often to the checklists and use them at the early stages of street planning and design.

The checklists are intended to support collaborative analysis, decision-making and administrative sign-off for the recommended street design. Street designs should be reviewed again during construction design to ensure that agreed-upon project designs are carried forward.

Complete Streets Checklist #1: Identify Context and Select Street Type(s)

The following prompts are to help design teams, and others to think of important considerations when assessing a street's context. The lists are not exhaustive, but highlight key inputs.

	What are the "place-making" and "green infrastructure" roles of the street or project location?
☐	Consult Official Plan policies and maps, e.g., city concept, land use designations, secondary plans or other area plans, cultural heritage, and growth forecasts
☐	Consult public realm and streetscape policies and urban design guidelines that are relevant to the project
☐	Consult the green infrastructure policies and guidelines that are relevant to the project
☐	Is the street located in a business improvement area and are there streetscape or master plans?
☐	What are the nearby trip generators and destinations, e.g., schools, institutions, parks, etc.?

	What is the "transportation" role of the street or project location?
☐	Consult Official Plan policies and maps (e.g. planned right-of-way widths, etc.)
☐	Align with the City's pedestrian-related policies and obtain data, e.g. existing and future volumes, trip generators, safety heat maps, walking conditions and site observations
☐	What are the transit networks and stops, i.e. Official Plan transit network maps, Brampton Transit and Metrolinx plans, forecasts and data that inform the project?
☐	What bike projects are planned in the Cycling Network Plan and/or obtain various cycling data, e.g, existing and future volumes, trip generators, safety and conditions to inform the project?
☐	Consult the Road Classification System, obtain safety data (e.g. collisions), existing and future volumes, truck volumes, speed, and multi-modal travel times?
☐	What are the curbside needs and uses at all times of day and days of the week (e.g. parking (on- and off-street supply), deliveries, taxi stands, food trucks, bike parking)?
☐	Available space (e.g. right-of-way widths along the street)

Examples Of Key Reference Documents To Help Identify Context

- City of Brampton (2015) Official Plan
- Heritage Conservation District Plans
- City of Brampton (2015) Transportation Master Plan
- CIty of Brampton Active (2019) Transportation Master Plan
- City of Brampton Road Classification System
- City of Brampton (2009) Stormwater Management Master Plan
- City of Brampton (2015) Stormwater Management Retrofit & Enhancement Study
- City of Brampton (2020) Community Energy and Emissions Plan (CEERP)
- City of Brampton Sustainable Community Design Guidelines (2013) and Sustainability Metrics (Draft 2021)
- City of Brampton (2019) Eco Park Strategy
- Region of Peel (2018) Vision Zero Road Safety Strategic Plan 2018-2022
- Region of Peel (2017) Goods Movement Strategic Plan

Complete Streets Checklist #1: Identify Context and Select Street Type(s) (Continued)

What is the profile of users of the street or project location?	
☐	What are the current and future demographics (e.g. seniors, school children, etc.)? Who uses the street?
☐	Consider people of all ages, abilities and genders, and universal design
☐	Consider all times of the day, different days of the week, and times of the year (all seasons)
☐	Consider anticipated routes for different users, and their desire lines (typical paths and destinations)
☐	Consider emergency services and operations and maintenance (year-round, all times of day)
☐	Identify existing and planned utilities, both above and below ground. Sub-surface utility investigations can provide a high degree of accuracy
What is the most similar street type(s) for the street or project location?	
☐	Which street type or types have the greatest similarities (e.g. aspirational components) to the project?
☐	What consultation (e.g., public and stakeholder input and feedback) has been conducted on the above roles and users of the street, and the potential street type(s) that contribute to the street project's objectives?

Examples of key internal stakeholders to consider (in no particular order)

- Active Transportation Unit
- Transportation Planning
- Facility Operations and Maintenance
- Road Maintenance, Operations and Fleet
- Capital Works
- Building
- Development Services
- Policy Planning
- Urban Design
- Environment
- Forestry
- Recreation
- Parks Maintenance
- BIA Office
- Cultural Services Office
- Utilities (e.g. hydro, water, sanitary communications, etc.
- Operational Access (e.g. Paramedics, Fire Services, Waste Management, Parks, etc.)

Complete Streets Checklist #2: Establish Design Priorities and Objectives

The following prompts are meant to remind the design team and others to take into account the City's directions and context-sensitive information, including consultation, to develop the project's priorities and objectives.

Confirm that project objectives align with the City's policies and plans:	
☐	Alignment with Official Plan's city-building vision and goals
☐	Alignment with Brampton's Complete Streets vision, goals, and design guidance
☐	Consult any area studies or plans that exist or are underway
☐	Confirm if there are strategic opportunities for stormwater management in the ROW. Identify the stormwater management criteria
☐	Alignment with the City's CEERP targets and goals
Confirm that the project objectives reflect the context-sensitive information from Checklist #1:	
☐	Use context-sensitive information from Checklist #1 to develop the project's objectives for moving pedestrians, cyclists, transit, and motorized vehicles
☐	Use the context-sensitive information from Checklist #1 to develop the project's objectives for place-making, green infrastructure, and users of the street
☐	Compare the project objectives with the street type(s) design objectives to align them to reflect a Complete Streets approach

Examples of key external stakeholders to consider

- Councillors and their staff
- Area residents and local businesses or institutions (schools, hospitals, seniors facilities, recreational facilities, etc.)
- Community organizations and interest groups (e.g. advocacy and industry groups)
- Pedestrians and transit riders groups
- Disabilities organizations
- Cycling groups
- Drivers and goods deliveries (e.g. couriers and logistics)
- Parks, conservation authorities, environmental groups
- Arts, cultural groups, and film industry
- Taxi services
- Car sharing
- Tourism
- Developers

Complete Streets Checklist #3: Decision-Making Framework and Metrics

The following prompts are meant to remind the design team and others to develop a Complete Streets decision-making framework prior to exploring and generating street designs. This framework will be used to evaluate different design options. Development of the evaluation criteria should include consultation and engagement of internal and external stakeholders. This step in the process will be commensurate with the project scale (budget and scope).

Establish an evidence-based decision-making framework using the Complete Streets guidance:	
☐	Review the Complete Streets template for the decision-making framework (see Table 5.3 below) and develop a project-specific framework
☐	Incorporate priorities and objectives resulting from Checklist 2 into the framework
☐	Conduct internal and external stakeholder consultation for input on the framework
☐	Identify qualitative and quantitative measures for the evaluation criteria
☐	Collect any data required to produce the qualitative and quantitative analysis including consulting multidisciplinary and subject matter experts for advice.
☐	Ideally, "before" data is collected at this stage to provide a baseline against which "after" data can be compared once the project has been completed to track impacts over time.

Table 5.3 Complete Streets Template for Decision Making Framework

Complete Streets Criteria (based on guiding principles)	Description (based on guiding principles)	Criteria and Measures (may be qualitative or quantitative with a score or rank)
Create Safe and Accessible Streets		
Promote Healthy and Active Living		
Improve Transportation Choice and Balance Priorities		
Develop Connected Networks		
Respect Existing and Planned Context		
Create Vibrant and Beautiful Places		
Enhance Economic Vitality		
Improve Sustainability and Resiliency		

Complete Streets Checklist #4: Assemble, Evaluate and Refine

The following prompts are meant to remind the design team and others of Complete Streets guidance when assembling, evaluating and refining the street designs. Documentation is needed to explain the rationale behind decisions made at these stages for clarity, consistency and transparency.

	Assemble street cross-sections using Complete Streets design guidance:
☐	Review and apply project design objectives – prioritizing space and attention to design for priorities resulting from Checklists 1, 2 and 3
☐	Review and apply key design principles and select elements using the Chapters on Pedestrians, Cycling, Transit, Green Infrastructure, Roadways and Intersections
☐	Review and apply additional resources including detailed design guidelines, construction standards, and best practices (e.g. City's Lane Width and Corner Radii Engineering Guidelines, On-Street Bikeway Design Guidelines, Green Streets Technical Design Guidelines, Streetscape Manual, etc.)
☐	Review and apply the City's Sustainability Community Design Guidelines, the Landscape Development Design Guidelines and integrate standards from the Sustainability Metrics
☐	Coordinate designs with other projects in the area (e.g. new buildings or developments)
☐	Ideally, "before" data is collected at this stage to provide a baseline against which "after" data can be compared once the project has been completed to track impacts over time.

	Evaluate street design options using the evidence-based decision-making framework:
☐	Review each design option against the framework (developed from Checklist 3) and document the pros/cons of each option, any trade-offs made in the option, and any qualitative and quantitative measures
☐	Ensure that all users of the street are taken into account
☐	Collect any data required to produce the qualitative and quantitative analysis of the design options (including consulting interdisciplinary and subject matter experts for advice)
☐	Conduct internal and external stakeholder consultation for feedback on the evaluation of options
☐	Document the evaluation using qualitative and quantitative data and analysis and feedback

	Refine street design options using the decision-making framework and various inputs:
☐	Foster collaborative problem-solving among key stakeholders, using a multi-disciplinary approach, to address issues that arise and to refine street design options
☐	Review and apply additional resources including detailed design guidelines, construction standards, and best practices
☐	Refine and produce the preferred street designs, including schematics and streetscape details
☐	Consult internal and external key stakeholders, using a multi-disciplinary approach to gather input and feedback on their needs
☐	Document the rationale for any trade-offs made, conflict resolution, and innovative solutions to design issues including life-cycle costs and obtain agreement and approvals on operations and maintenance (i.e. who will maintain the street elements)

Complete Streets Checklist #5:
Recommended Design and Rationale

The following prompts are meant to remind the design team and others of important documentation for the recommended street design to provide clarity, consistency and transparency to stakeholders.

Finalize the preferred street design:	
☐	Finalize the preferred street design, including cross-sections, plan views (of the whole block, segments and/or intersections and approaches to the intersection), and streetscape details
☐	Include the documentation of any analysis
☐	Include the documentation on consultations
☐	Include the documentation on the evaluation
☐	Include the documentation on the written agreement and approvals on operations and maintenance for the long term (i.e. who will maintain the street elements for the long-term)
☐	Note that depending on the lead division or agency that some streetscape elements will require a formal encroachment or maintenance agreement with the City

Examples of street elements that require an agreed-upon and approved maintenance owner include but are not limited to:	
☐	Street trees, landscaping and planters
☐	Pavers (e.g. in the furnishing or edge zones, sidewalk, or roadway)
☐	Green features such as permeable materials
☐	Other streetscape details, e.g., lighting, street furniture, decorative installations
☐	Document the evaluation using qualitative and quantitative data and analysis and feedback

Examples of maintenance owners that need to have provided agreement and approval include but are not limited to:	
☐	Business Improvement Areas (BIAs)
☐	Parks, Forestry and Recreation
☐	Property managers (e.g. commercial or condominium building owners)
☐	Brampton Hydro
☐	Brampton Water
☐	Transportation Services
☐	Environment

5.7 Measuring Success

Complete Streets is an approach and process to inform street design. The product of following this approach is safer and more efficient, equitable and beautiful streets. To understand how well you are achieving success will require a better and broader understanding of performance.

At a high level, measuring success will begin with assessing to what degree a street satisfies the overall vision and guiding principles stated in Chapter 1 and the directives for decision making in Chapter 3. At a more detailed level, there is the need to expand the range of measures deployed to reflect all users of the street focusing on te themes identified in the table below.

Many other jurisdictions in Ontario and beyond are considering a broader set of factors that also address public health, safety, resilience, and accountability. Measuring performance and reporting on progress is an important step towards more complete streets and satisfying official policy direction.

"Before" and "after" data help to assess and communicate the results and benefits of street projects. Resources for data collection, analysis, and communications are often not included in budgets. Ideally, resources for measuring street performance are thought of in advance and integrated into the project budgets, corresponding with the scale of the project.

Table 5.4 Complete Street Performance Measurement Themes

Theme	Example
Safety and Accessibility	• Collision data and observational data (e.g. conflict and near misses) for all modes • Injuries and fatalities for all modes • Number of audible traffic signals • Number of students who walk or bike to school
Mobility Choice & Connected Networks	• Volumes of pedestrians, cyclists, transit passengers and vehicles (at intersections and midblock) • Percentage of city that is within 1Km of a 'low stress' bike route
Healthy & Active Living	• Environmental and public health benefits (e.g. tree cover) • Bike route connections to off-road trails
Beautiful & Vibrant Public Space and Local Area Context	• Use of public space (e.g. observation studies, surveys or safety audits) • Photographs and visuals to demonstrate the changes in the street design
Green Infrastructure	• Canopy Cover or number of street trees • Percent of ROW with permeable surface • % of ROW treated for standard stormwater management criteria, e.g. 80% TSS control & 5 mm retention • Number of LID elements
Social and Economic Vitality	• Socio-economic data (e.g. mix of land uses, employment data, café permits, vacancy rates, etc.)
Flexibility & Cost Effectiveness	• Life Cycle Cost Benefit Analysis

5.8 Keeping Streets Complete

Complete Streets are those are planned, designed, built, and maintained to consider the needs of all street users. Complete Streets is an on-going commitment throughout the life cycle of the street.

Figure 5.2. Snow maintenance

Begin with the end in mind. What is the vision for a complete street 2 years, 5 years, 10 years after it is built and how will it function and improve.

During the design and planning stages fully coordinate the complete streets designs with maintenance and utilities staff and organizations to ensure a highly functioning street that meets levels of service.

Maintenance concerns should not limit complete street designs. In fact, maintenance can contribute to making streets more complete. For example, a Complete Streets approach applied to a maintenance plan may lead to a snow removal protocol that considers sidewalk clearance as a priority in higher volume pedestrian areas or in the vicinity of transit stops, schools or senior centres.

The clearing of cycling facilities will encourage this active mode of travel beyond the fair weather months. Such an approach to maintenance leads to a better use of the total transportation network.

Such a maintenance plan places a high value on safety and equity for the most vulnerable users and promotes walking and transit as the first choices for moving about.

The City should aim to provide consistency in the types of new infrastructure installed to support efficient maintenance. This includes new cycle infrastructure and green infrastructure standards.

Overall, a context and user responsive maintenance plan that plans for the full life cycle of a street and related infrastructure can help to satisfy the City's official Complete Streets policy direction.

5.9 Implementation Action List

This Guide is only the start of the process to make streets more complete in Brampton. Decisive action is required to achieve the goals of the Guide.

The following Implementation Action List lays out the steps, projects or process that the City can undertake in the short, medium and long term. Certain initiatives, already underway, must push onward and the momentum from these leveraged to initiate new actions.

City staff from many departments will need to work together to successfully deliver the recommendations presented in the Guide. This implementation plan should link to department workplans to ensure the efficient delivery of each action.

The actions are organized in the following themes:

Policy: Establish or update the rules and regulations that govern complete streets.

Standards and Guidelines: Establish or update the reference documents and tools used to design, operate and maintain complete streets.

Process : Implement new ways of doing things or adapt existing practices and operating procedures to align with complete street goals. Invest in programs to plan, design, construct, operate, and maintain complete streets.

Plans and Studies: Conduct research or strategic planning projects to establish clear, well-informed directions for complete streets.

Projects: Initiate a review of current design standards to inform updated technical guidance on street design that fully addresses considered all modes of travel.

Evaluation and Monitoring: Invest in processes that improve the implementation of lessons learned and establish a higher degree of consistency across the multiple practitioners involved in street projects

Communication and Engagement: investment in tools, training or outreach to bring new knowledge and skills to the organization, foster broader community support for making Brampton streets more complete.

Acronyms for Table 5.5

Lead	Acronym
Planning, Building & Growth Management	
Transportation Planning	TP
Planning and Design	PD
Development Services	DS
Public Works & Engineering	
Capital Works	CW
Road Maintenance, Operations & Fleet	RMOF
Environment	E
Community Services	
Parks Maintenance & Forestry	PMF
Corporate Support Services	
Strategic Communications, Culture & Events	SCCE

Table 5.5 Implementation Action List

Theme	Action		Description	Time Frame/ Lead
Policy	1	Street Type Updates	Review and update the Draft Network Plan and Street Types on a regular basis to ensure the street design process incorporates the most current planning information available.	Ongoing/ TP
	2	Complete Street Network Plan	Consider incorporating the Draft Network Plan into the future Transportation Master Plan update (TMP). Explore the utility of an on-line Network Plan to enable regular updates, ease of policy coordination and hyper-linked information (street type assignments, right of way requirements, modal plan recommendations, etc.).	Short Term/ TP
	3	Policy Updates	Include updated Complete Street (CS) policy objectives within the current Official Plan Review. Refer to Chapter 05 'Elements of a Complete Street Policy' for guidance on current policy gaps and recommendations. Review and update By-laws to incorporate new Complete Street practices (e.g., Boulevard By-law).	Short Term/ TP
	4	MMLOS	Advance the implementation of the multi-modal level of service recommendations within the future TMP and other transportation studies. Refer to the Multi-Modal LOS (MMLOS) approach to decision making included in the appendix of the Guide.	Medium Term/ TP
	5	Climate Adaptation Plan	Incorporate the Guide recommendations within the forthcoming Climate Adaptation Plan.	E
Standards and Guidelines	6	Engineering & Design Standards Update	Review and update Brampton's Engineering & Design Standard Drawings (200 Series) to reflect the guide recommendations as well as documents such as TAC 2017 and the Ontario Traffic Manual. Review the financial implications of incorporating and maintainign complete streets designs and update funding structures to accommodate these new standards. The standards update should be coordinated with the GI Toolkit, which is separate from the Engineering & Design Standards Update.	Short Term/ CW
	7	Design Guidelines Updates	Review and harmonize the City's Development Design Guidelines with the Guide recommendations.	Short Term/ PD
	8	Neighbourhood Traffic Management Guide (2007) Update	Review and update the Neighbourhood Traffic Management Guide to reflect the Guide recommendations, TAC 2017 and best practice. Incorporate treatments for local streets. Involve neighbourhood residents to assist in identifying traffic concerns and issues on their local streets.	Medium Term/ RMOF

Theme	Action		Description	Time Frame/ Lead
	9	Green Infrastructure Toolkit	Develop a city-wide toolkit of green infrastructure techniques and guidelines applicable to Brampton rights of way. This effort should include standard drawings and specifications, as well as direction for: making underground components of GI identifiable by utilities, contractors, and City staff; lowering maintenance hurdles and extending the life of GI infrastructure through pre-treatment integration with works in the ROW; mandatory stormwater management criteria that apply to various types of ROW projects, and guidance on the extent to which GI can contribute achieving these criteria; and funding and implementation, including potential partnering opportunities for funding sources, and maintenance. Coordinate the GI standards and specifications with the Engineering Standards Update (#5). Integration of Green Infrastructure into the City's Asset Management Plan.	Short Term/ E and PMF
	10	Sidewalk Cafes Guideline & Parklet Guidelines	Develop standards for the design, establishment and maintenance of Sidewalk Cafés and Parklets in Brampton. The intent is to encourage the use of public spaces to advance a café and sidewalk culture that enhances the vitality of the street while maintaining pedestrian flow and safety standards. The updated standards can be applied in the review of each Sidewalk Café application.	Medium Term/ RMOF
	11	Native Planting Maintenance Standards	Review and update the Boulevard Maintenance and Highway Obstruction By-law to include standards for native planting details and specifications and other GI elements recommended in the Guide.	Medium Term/ RMOF
	12	Landscape Development Guidelines Update	Review and update the current Landscape Development Guidelines (2019) to include direction for soils/growing mediums, aeration, drainage and irrigation systems to ensure good street tree growing conditions. These standards should include a plant list with native or well adapted species to the area and sourced locally wherever possible.	Medium Term/ PMF
	13	Stormwater Master Plan Update	Evaluate the vulnerability of road infrastructure to climate change and set out appropriate actions through a Climate Adaptation Plan as part of the next update to the City's Stormwater Master Plan.	Medium Term/ E and RMOF
	14	Curbside Automated Vehicle (AV), Electric Vehicle (EV), Ride-share Strategy	Develop guidelines to ensure the best design of AV, EV and ride-share within the curbside of Brampton streets. Guidelines should aim to support local business, improve multi-modal safety, enhance public space and improve access to transit.	Medium Term/ TP

Theme	Action		Description	Time Frame/ Lead
Process	15	Use the Guide as a Reference Point in all Street Projects	The direction within this Guide applies to all street projects in the City of Brampton, no matter the scale or complexity. Clearly some project types will permit the opportunity to deliver more comprehensive application of the guidance. However, as a first step begin to follow the overall process, adopt the vocabulary, reference the principles and street types, and apply the framework for decision making to all works.	Ongoing/ All
	16	Street Design Process Update	Update the current '5 Step Process to Plan and Implement a Capital Project' to incorporate the CS Project Delivery Process recommendations (Chapter 03). Monitor and document the process (both internally and externally) to review and supplement and the street design process map on an ongoing basis.	Short Term/ CW
	17	Development Review Process Update	Review and update the development application process to include requirements for CS compliance. Include a requirement that large developments (Official Plan and/or Zoning By-law, Draft Plan of Subdivision or applications that include new streets) undertake a CS compliance review. This review may include specific reference to the guide principles, street types and project objectives and apply the checklists included in Chapter 5. Smaller projects such as an Site Plan applications with individual building parcels could require a CS compliance review for the interface of the building and public boulevard.	MediumTerm/ DS
	18	Infrastructure Rehabilitation Initiatives List	Develop a list of infrastructure projects with opportunities to integrate CS improvements. This can be an ongoing list and include streets with changes to surface conditions or underground utilities or streets scheduled for rehabilitation and/or renovation. Identify the additional costs to alter the street and reflect its broader context, but also the incremental cost of incorporating complete street treatments within an existing rehabilitation project. Identify opportunities to share costs between departments and divisions when evaluating potential improvements such as adding crosswalks, curb extensions, traffic calming or green infrastructure.	Ongoing/ TP
	19	Project Prioritization List	Identify a list of priority projects for CS improvements. The recommended improvements will be informed by the Guide, the Infrastructure Rehabilitation Initiatives List, the TMP and ATMP, City's Capital Improvement Plan, DC Collection and Brampton's planning framework. Include a strategy to bundle projects and achieve the overall project objectives efficiently in both cost and time. Consider the range of potential project types, from simple to complex. Categorize projects into quick wins, low, medium and high priority. Determine the mechanisms for constructing, operating and maintaining the complete streets projects. Develop a funding source to design, construct, operate and maintain.	Short Term/ All

Theme	Action		Description	Time Frame/ Lead
	20	Partnership with the Region of Peel	Work with the Region of Peel in their update to the Road Characterization Study and implementation of the Vision Zero Framework. Participate as an active member of the Peel Region Goods Movement Task Force and The Peel Region Vision Zero Task Force.	Ongoing/ TP
	21	LID Terms of Reference	The City should establish a model Terms of Reference for LID Feasibility that project managers and consultants can incorporate into the scope of work for projects planned in the road ROW.	E and CW
Projects	22	Speed Reduction Study	Undertake a speed reduction study following TAC 2017 to determine the updated speeds for the City. Develop a funding source to implement the recommendations. Many similar jurisdictions are lowering their posted speed to make streets safer and more accessible for vulnerable users.	Short Term/ TP and RMOF
	23	Mid-block Crossings Audit	Assess existing and projected pedestrian volumes along arterial streets to identify warrants for new mid-block crossings. Focus the assessment on locations in the City where there are significant pedestrian desire lines, mid-block bus stops, schools, parks, where off-road trails intersect roads or other areas that historically been overlooked or difficult to access.	Medium Term/ TP and RMOF
	24	Slip Lane and Exclusive Turn Lane Audit	Review existing slip lanes and exclusive turn lanes where safety issues have been found and identify opportunities for removal or upgrades based on complete streets best practice. Consider partnering with the Region to address locations where City and Regional streets intersect.	Medium Term/ TP and RMOF
	25	Complete Streets Pilot Project (Temporary Installation)	Select locations within the city to apply the principles of the Guide in a temporary way. A pilot project can help to quickly test ideas, engage stakeholders and transform spaces. The pilot may include a Downtown and a suburban Street context to demonstrate application to different contexts. Types of pilots projects could include: interim bike lanes; cone and line painting exercises to illustrate tighter turning radii and a road diet for example. In initial discussion with the Study a four lane collector that is operating under its design capacity such as Ray Lawson Boulevard may be a good sample site.	Short Term/ TP
Evaluation and Monitoring	26	Identify a Complete Streets Champion	Complete Streets policy is one way to create safer streets, but political leadership is critical. Select a Complete Streets Champion to advocate for and support Complete Streets. The Complete Streets Champion should be a City Councillor or other local elected official and be supported by a senior City staff member working in street design.	Short Term/ TP

Theme	Action		Description	Time Frame/ Lead
	27	Establish an Oversight and Compliance Committee	Oversight and compliance are an important aspect of the Complete Streets project delivery process, helping to ensure that the principles and directives from this Guide are adhered to and that projects are complete. Establish an Oversight Committee based on the requirements, procedures and staffing recommendations outlined in Chapter 5.5 of the Guide.	Short Term/ TP
	28	Performance Evaluation Criteria Model	Develop a Performance Evaluation Criteria Model to understand how well you are achieving success. This should include criteria for each stage of Project Delivery Process. In the early stages measuring and evaluating options will begin with assessing to what degree a street design satisfies the overall vision and guiding principles stated in Chapter 1 and the directives for decision making in Chapter 3. At a more detailed stage, and to evaluate the performance of projects, develop and use a complete streets evaluation table: TCAT https://www.tcat.ca/wp-content/uploads/2015/03/Complete_Streets_Evaluation_19Mar2015-1.pdf. Develop and use total cost model that includes the economic and health metrics, not simply capital and maintenance costs: https://smartgrowthamerica.org/wp-content/uploads/2016/08/safer-streets-stronger-economies.pdf	Short Term, Ongoing/ TP
	29	Stormwater Management Criteria and Monitoring	Establish a stormwater monitoring program to comply with the MECP requirements through the City's forthcoming Consolidated Linear Environmental Compliance Approval. Confirm mandatory stormwater management criteria applicable to right-of-way works through the Consolidated Linear Environmental Compliance Approval from Ministry of Environment, Conservation and Parks (MECP) anticipated in 2022.	Short Term/ E

Theme	Action		Description	Time Frame/ Lead
Engagement + Communication	30	Community Outreach	Develop a community outreach program to assist staff, residents and City Councillors in knowledge building around the importance of complete streets in Brampton. Focus on providing the community with the tools to enable meaningful feedback on community street designs as they are being developed and implemented. Make the Guide and its influence on potential outcomes visible throughout the community using various forms of digital and direct communications and engagement. Provide targeted education and outreach to groups with distinct needs and opportunities, including newcomers, new parents, post-secondary students, and those benefiting from recent transportation improvements.	Short Term/ All and SCCE
Training	31	Complete Street Training	Develop a training program to provide ongoing complete streets education and technical assistance to help those involved in the street design and maintenance process. This program should help trainees to identify and overcome complete streets policy and implementation barriers. A workshop of TAC 2017 could be a good first session. Use a variety of media (web-based or printed materials, presentations, workshops) to educate staff and build local capacity, share knowledge and experience, and strengthen working relationships. Focus the program on how to provide staff with the tools to effectively balance the needs of all users and create and maintain complete streets.	Ongoing/ TP

5.10 Review and Updates

The City should revisit and update the Guide on a regular basis to capture any changes in priority or addition of new planning tools that may assist with the delivery of street projects.

This Guide was developed between 2018 and 2022 with extensive input and review by a Technical Advisory Committee (TAC) comprised of representatives of agencies and units across City and Regional governments. It also included the review and input from a Corporate Leadership Team led by the Office of the CAO and senior leadership from core City Departments, and a Steering Committee co-sponsored by the Commissioners of Planning & Development Services and Public Works & Engineering.

As a principle-based living document, this Guide is expected to evolve and change over time with supplementary guidance and regular updates on specific subjects, but still retain its guiding principles and directives. Practitioners should ensure that they are always familiar with the most current version of this Guide and other City of Brampton technical guidance.

This Guide recommends that the City establish a regular review of the technical content and processes, preferably with members of the TAC who are most familiar with the subject matter and represent the broad spectrum of interests in street design. The update to materials could take place as a release notice to all practitioners if replacing sections or adding new content, or as part of the next version of the overall guide.

c. Benedikt Geyer, Unsplash

COMPLETE STREET CROSS-SECTIONS

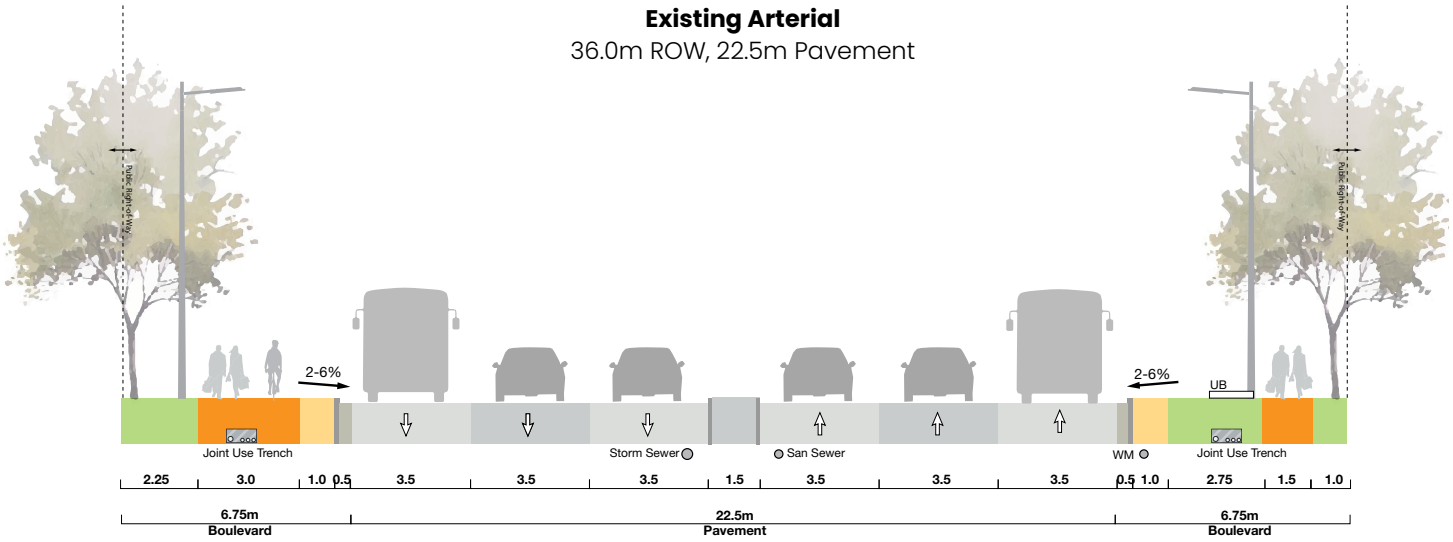
Dimensioned street cross-sections were developed for each aspirational proposed Street Type discussed in Chapter 2. The cross-sections apply the recommended CS guidelines to typical Brampton Rights-of-Way (included in the existing functional street cross-sections-200 series).

The cross-sections are included for illustrative purposes only and are not intended to replace the existing standards. Each cross-section sheet includes a comparison to Brampton's existing functional classification types*. It is important to remember that the cross-sections are a starting point, not the solution.

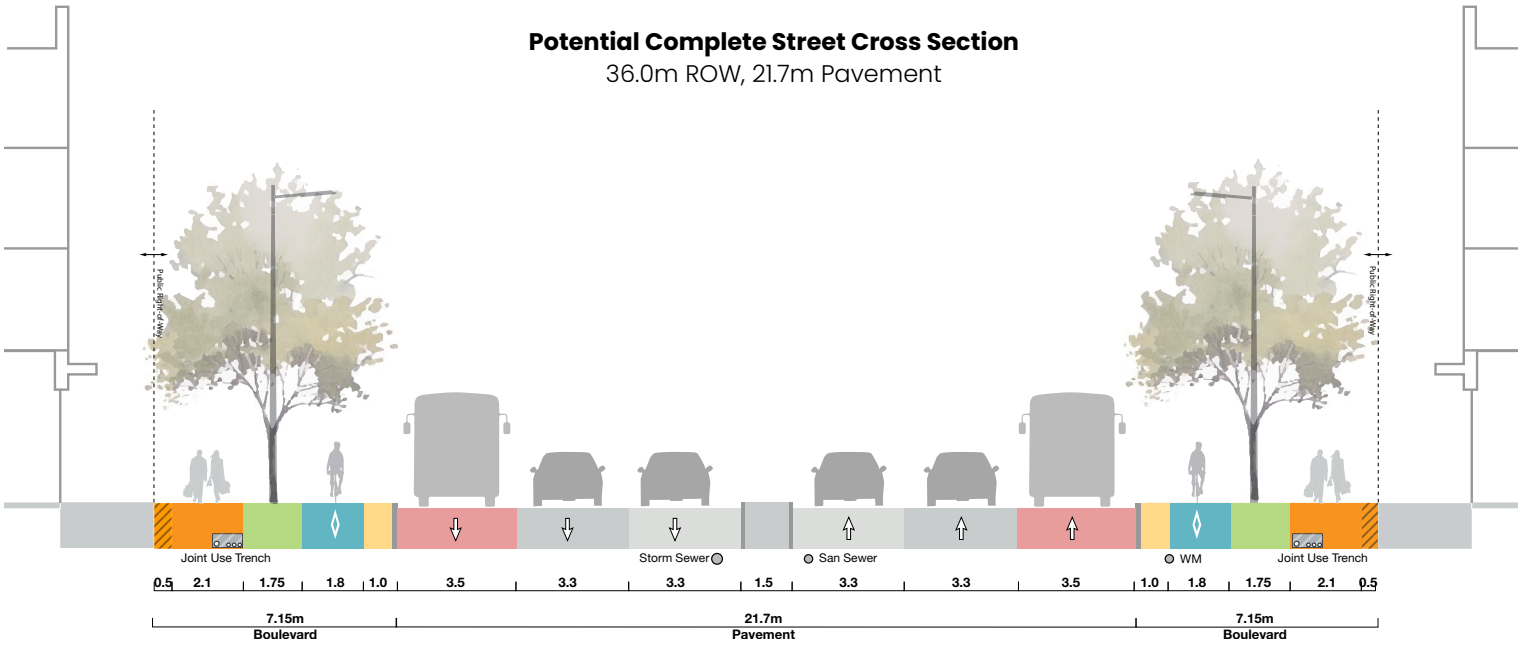
*Note: Existing condition/functional classification sections are based on City of Brampton Engineering & Design Standard Drawings at the time of commencing this study and may have changed.

A.1 Urban Main Streets

Existing Arterial
36.0m ROW, 22.5m Pavement

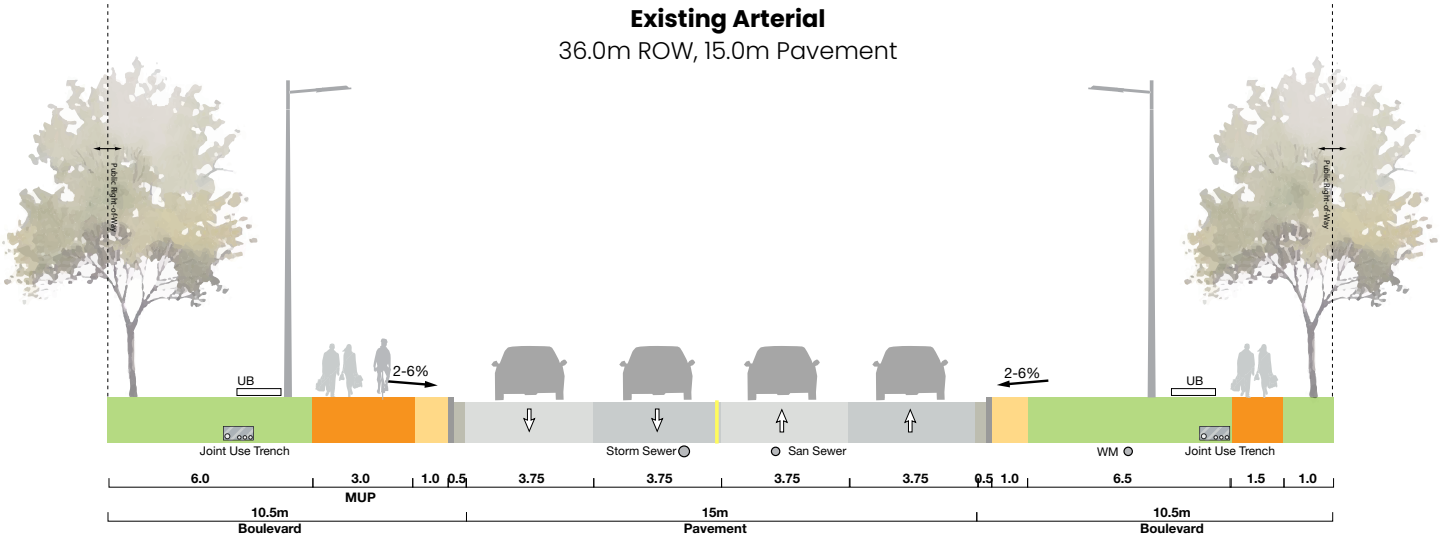


Potential Complete Street Cross Section
36.0m ROW, 21.7m Pavement

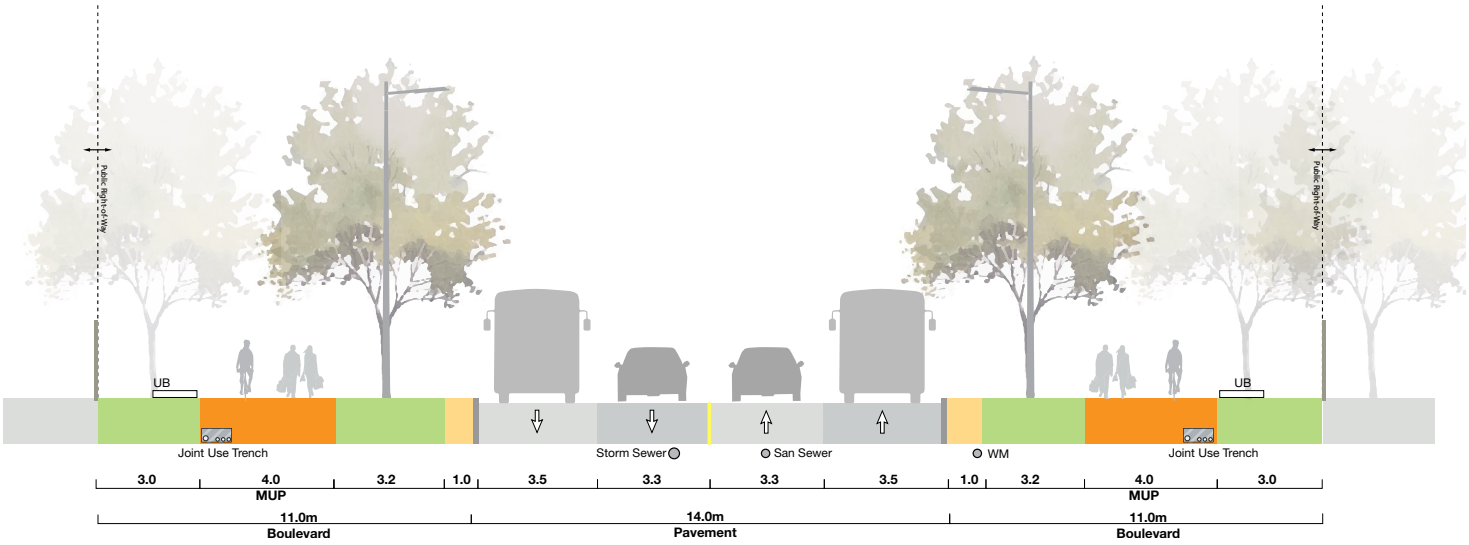


A.2 Neighbourhood Connectors

Existing Arterial
36.0m ROW, 15.0m Pavement

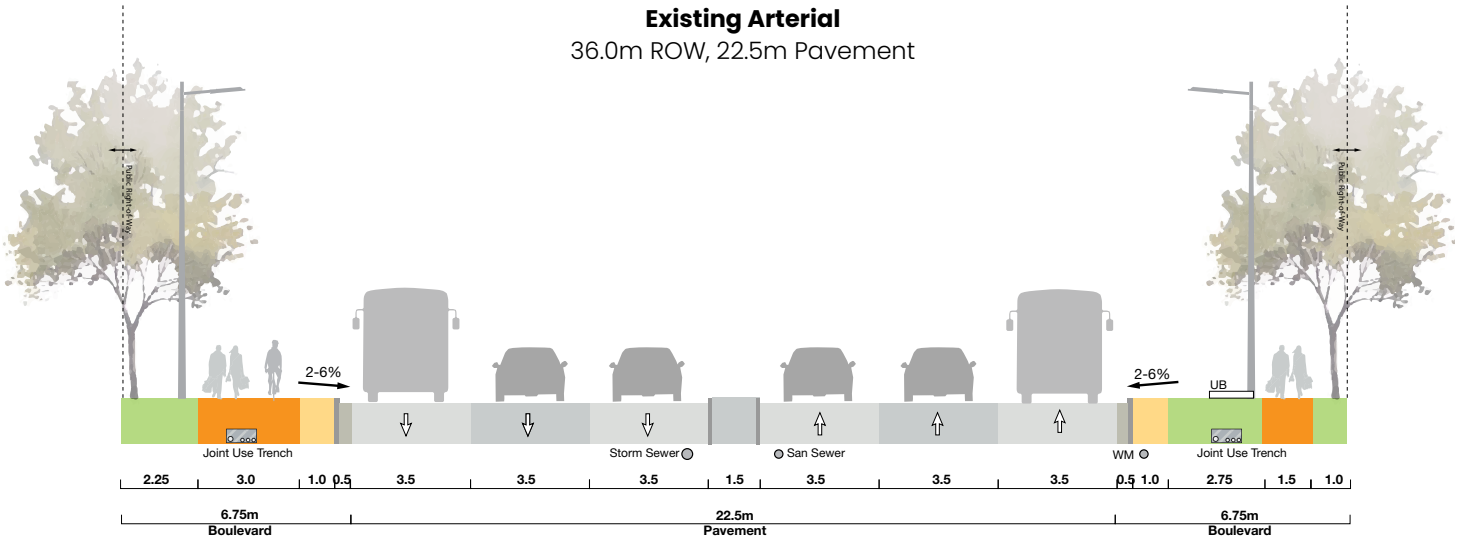


Potential Complete Street Cross Section
36.0m ROW, 14.0m Pavement

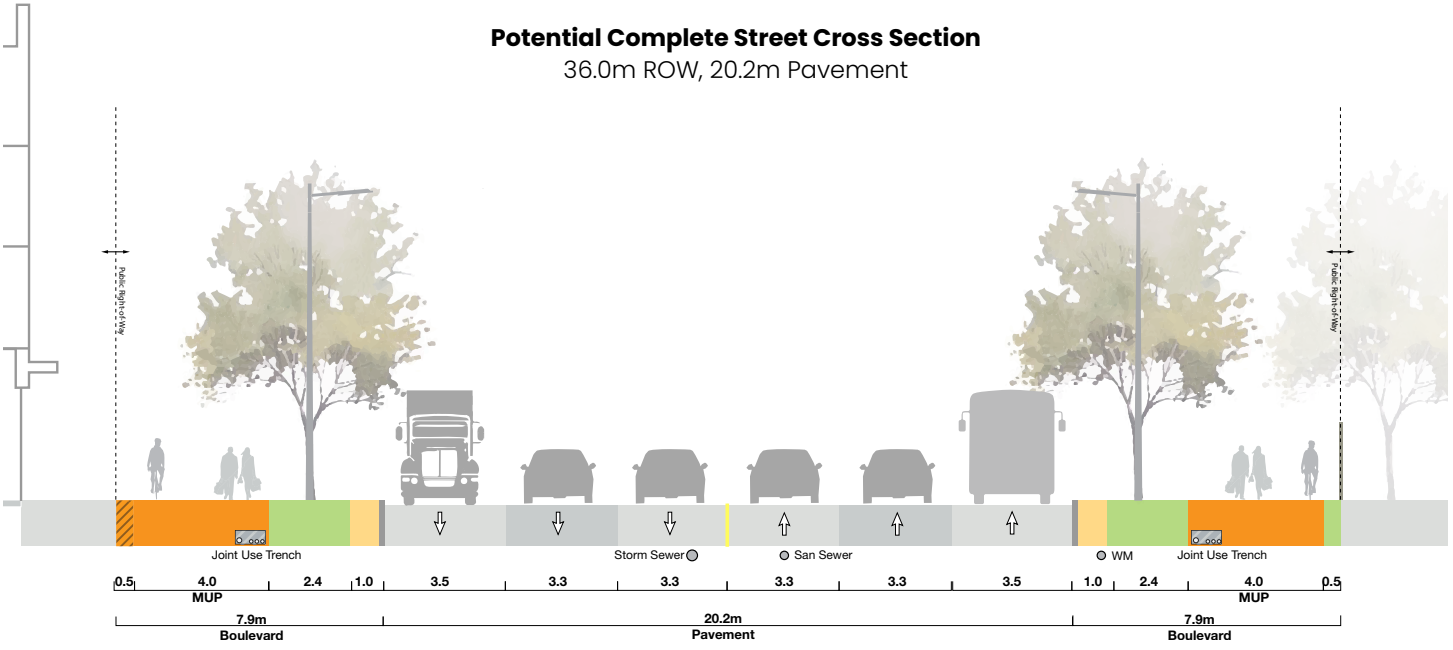


A.3 Commercial Connectors

Existing Arterial
36.0m ROW, 22.5m Pavement

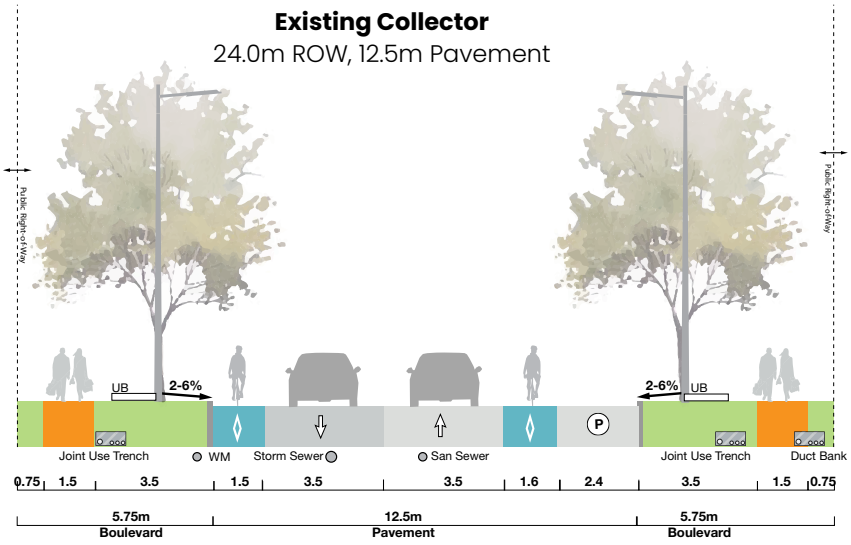


Potential Complete Street Cross Section
36.0m ROW, 20.2m Pavement

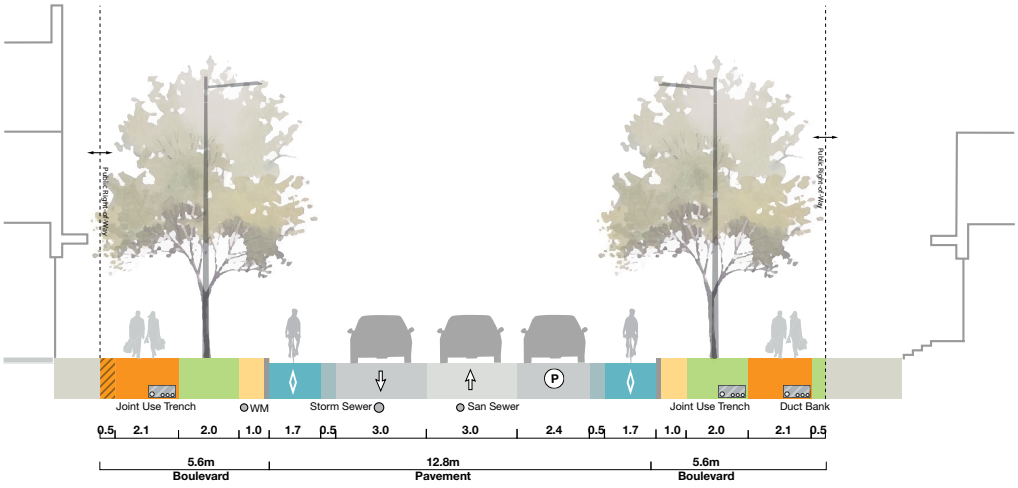


A.4 Mixed Use Neighbourhood

Existing Collector
24.0m ROW, 12.5m Pavement

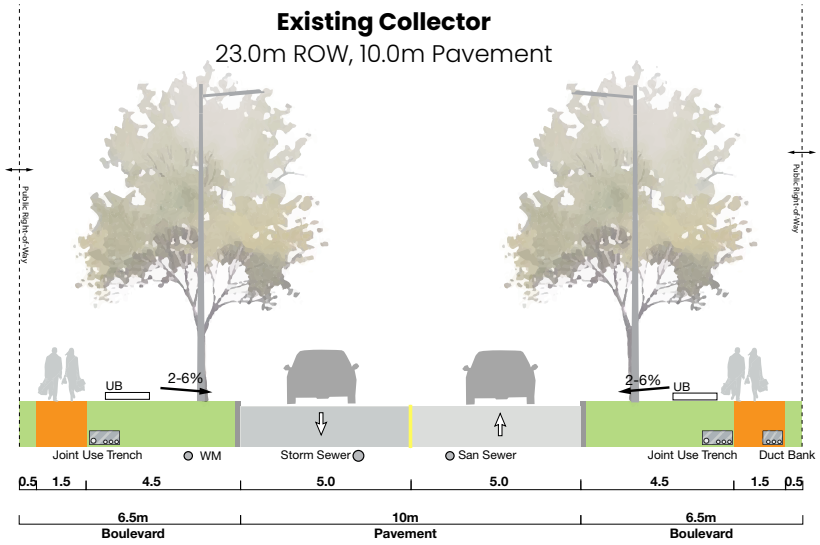


Potential Complete Street Cross Section
24.0m ROW, 12.8m Pavement

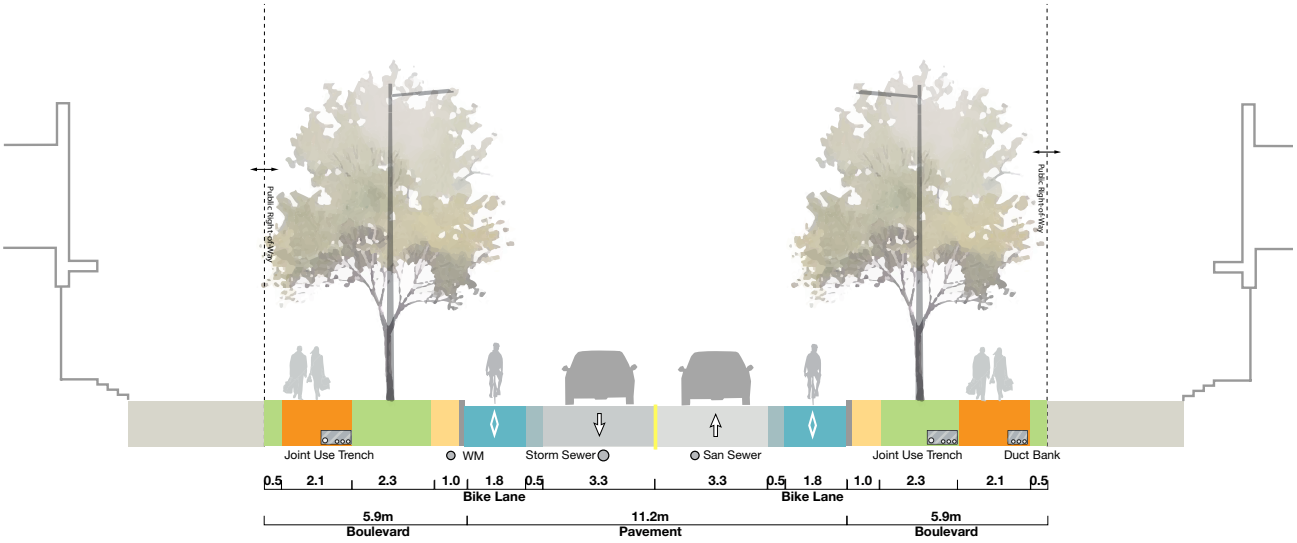


A.5 Neighbourhood Residential

Existing Collector
23.0m ROW, 10.0m Pavement

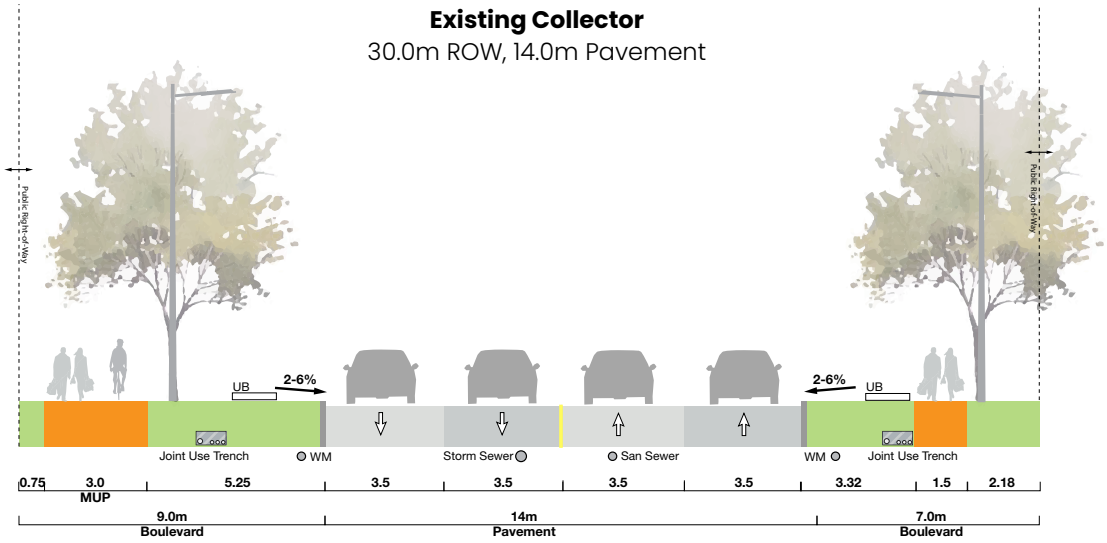


Potential Complete Street Cross Section
23.0m ROW, 11.2m Pavement

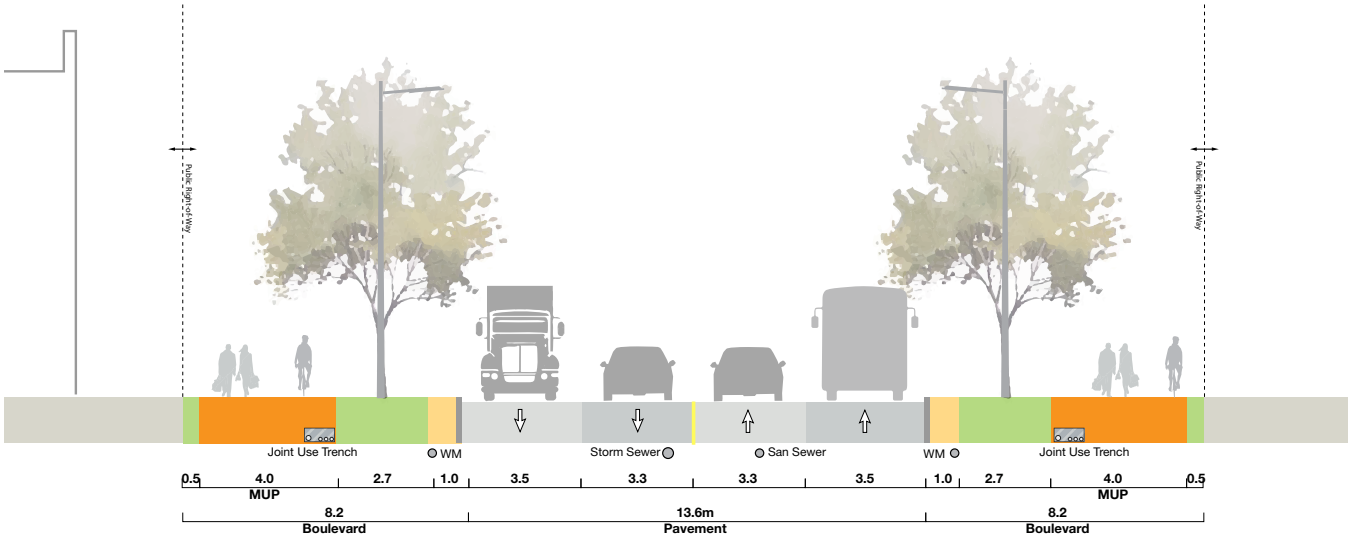


A.6 Employment Collectors

Existing Collector
30.0m ROW, 14.0m Pavement

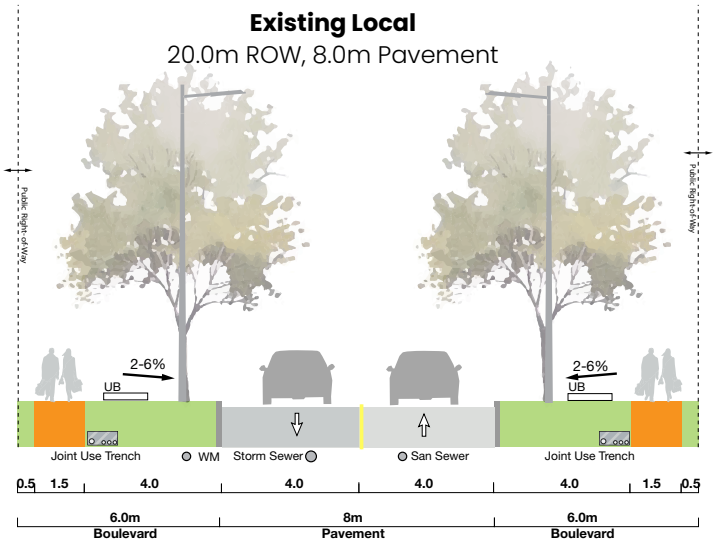


Potential Complete Street Cross Section
30.0m ROW, 13.6m Pavement

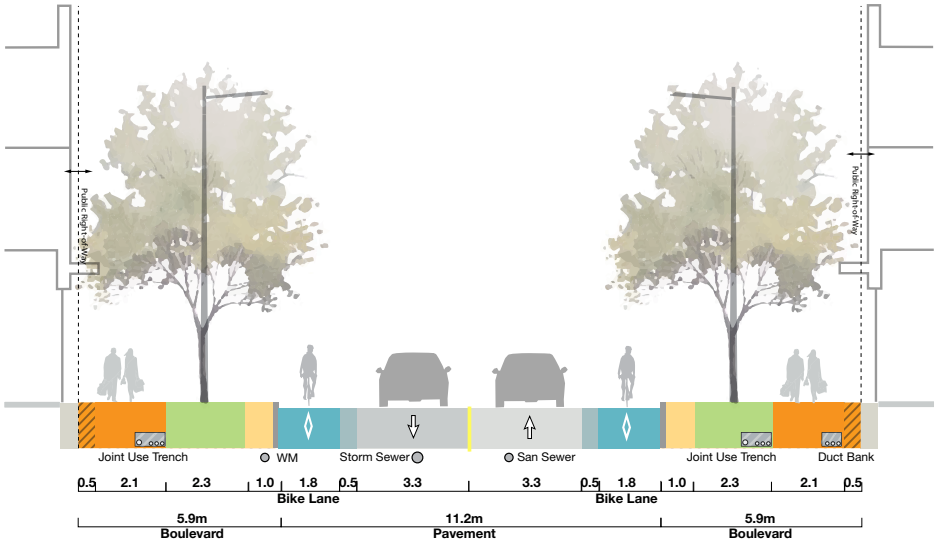


A.7 Downtown Streets

Existing Local
20.0m ROW, 8.0m Pavement



Potential Complete Street Cross Section
20.0m ROW, 8.4m Pavement



A.8 Local Residential Streets

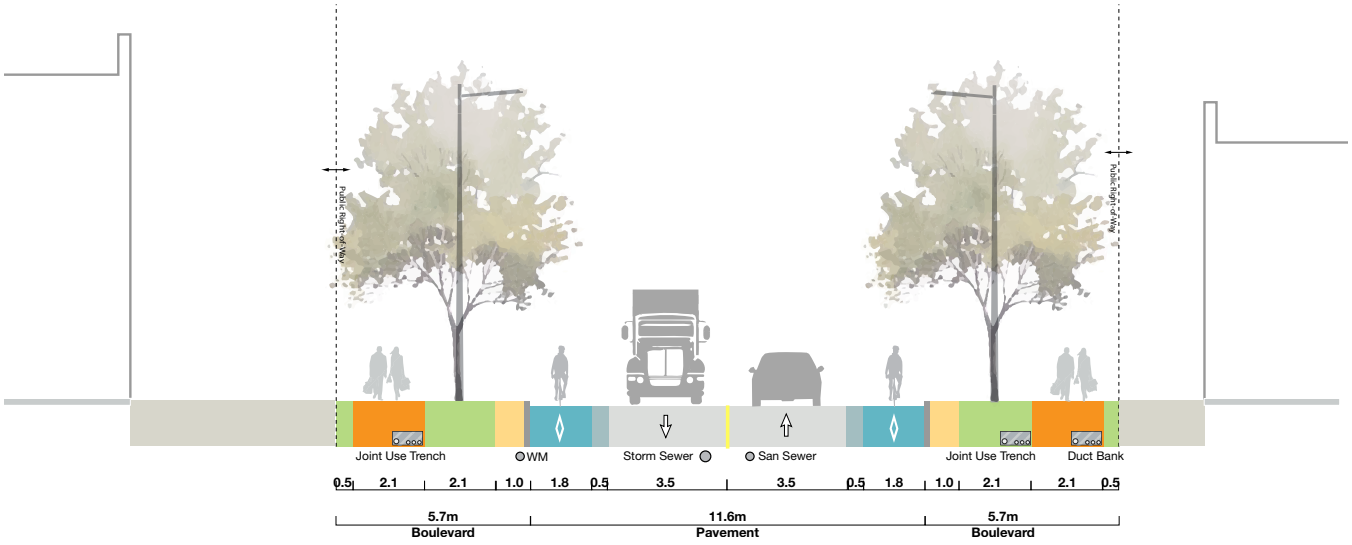
Existing Local
23.0m ROW, 10.0m Pavement

Potential Complete Street Cross Section
23.0m ROW, 11.8m Pavement

A.9 Local Employment Streets

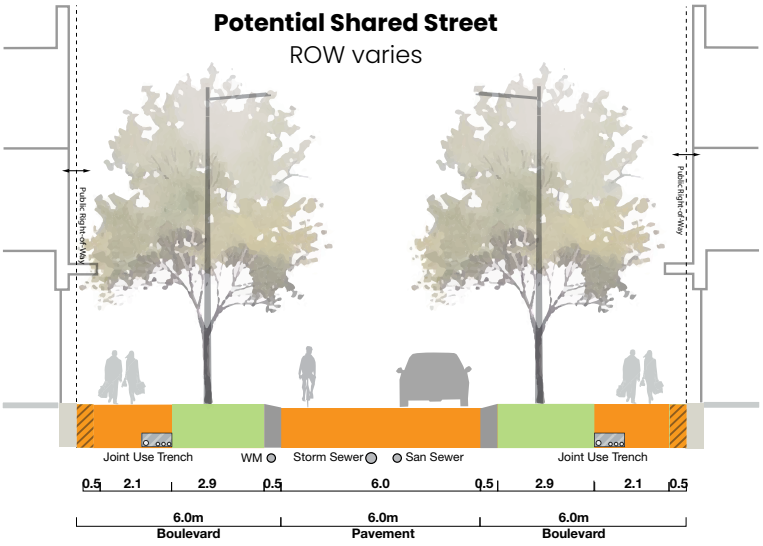
Existing Local
20.0m ROW, 8m Pavement

Potential Complete Street Cross Section
20.0m ROW, 8.4m Pavement

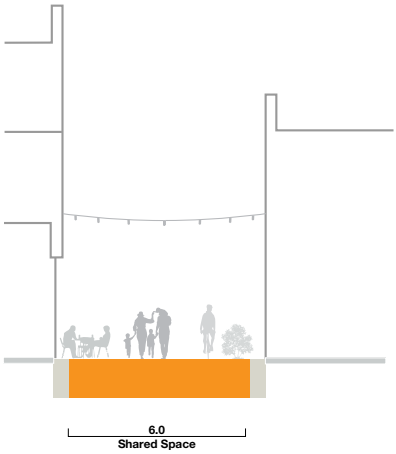


A.10 Shared Streets and Lane

Potential Shared Street
ROW varies



Potential Lane
Width varies



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B

MULTIMODAL ANALYSIS FRAMEWORK RECOMMENDATIONS