The Way We Move

COMPLETE STREETS GUIDELINES

May 2013

TRANSFORMING | **EDMONTON**

BRINGING OUR CITY VISION TO LIFE

THE CITY OF Edmonton

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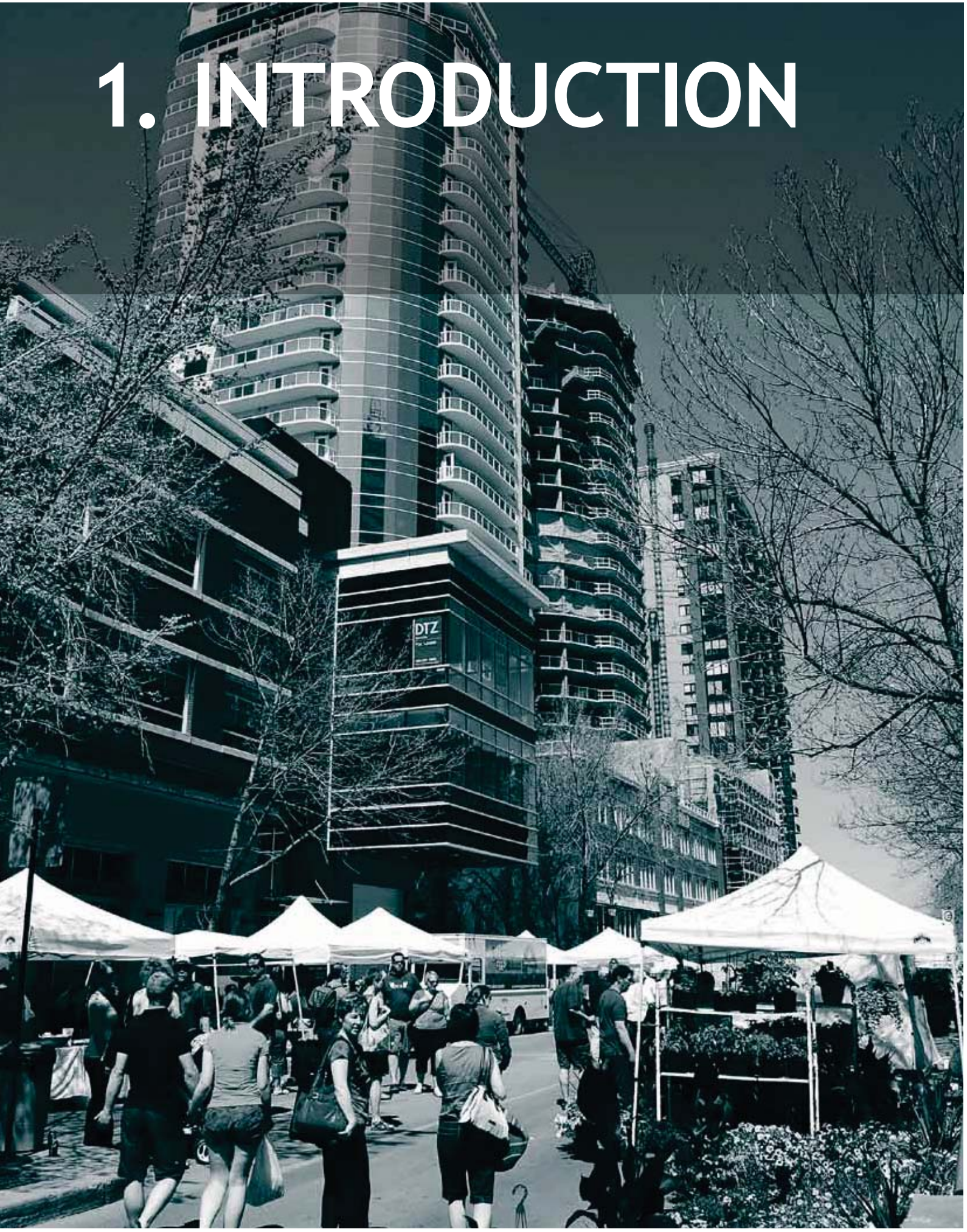
1. INTRODUCTION



1. INTRODUCTION

Complete Streets are safe, comfortable, and convenient for travel for everyone, regardless of age or ability – motorists, pedestrians, bicyclists, and public transportation riders.

www.completestreets.org

Streets contribute to the quality of life in our city by providing choice in how people get around and providing essential public space for us to connect with one another. Streets are used by many different people in many ways and for many different reasons: truck drivers use them to deliver goods, seniors to walk and get exercise, children to get to school and meet friends, drivers to run errands, bicyclists to ride to work and transit drivers to get their riders where they need to go. Streets also house essential infrastructure such as drainage pipes, gas service lines and street lights.

As one would expect with the many diverse roles that streets play and the different users they serve, not all streets look exactly alike nor should we expect that the design of every street be exactly the same.

The City of Edmonton's Strategic Plan, *The Way Ahead*, and the City's Transportation Master Plan, *The Way We Move* both establish the need to support multiple ways of living and moving within the city. *The Way We Move* recognizes that transportation is about more than simply moving people, goods, and services. Roadways are essential infrastructure that shape our urban form, impact our economic well-being and act as vital components of our community and quality of life. With these principles in mind, *The Way We Move* has identified the need for a Complete Streets strategy for Edmonton to better reflect these aspirations for the city through the design and operation of our streets.

The Edmonton Complete Streets Guidelines recognize that a network of roadways serving multiple modes has the potential to increase the overall capacity of the transportation network and facilitate a shift from a primarily automobile-focused system towards one that offers a wider range of viable transportation choices. The end goal is to create a network of streets that are safe, welcoming, attractive, comfortable and functional for all users and that support and enhance the unique characteristics of the neighbourhoods and districts that they serve.

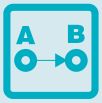
1.1 Supporting Edmonton's Vision – *The Way Ahead*

The spirit and content of this document is aligned with the four guiding principles of Edmonton's Strategic Plan, *The Way Ahead*:

- Integration: "A holistic view of strategic planning that acknowledges the inter-related and interdependent reality of complex urban environments."
- Sustainability: "A way of living that meets the needs of the present and does not compromise the ability of future generations to meet their own needs."
- Livability: "A set of interrelated factors that influence people in choosing where they live and reinforce their sense of well-being."
- Innovation: "A planning approach and operational culture within a municipality that encourages and enables continuous improvement and the exploration and adoption of new techniques, technologies, products and ways of operating in order to improve results and lead progressive change."

The City of Edmonton has developed these Complete Streets Guidelines as part of implementing its Transportation Master Plan, seeking to balance and support the seven goals established in ***The Way We Move***.

- **Transportation and Land Use Integration.** The transportation system and land use/urban design complement and support each other so that the use of transit and transportation infrastructure is optimized and supports best practices for land use.



- **Access and Mobility.** The transportation system is interconnected and integrated to allow people and goods to move efficiently throughout the city and to provide reasonable access with a variety of modes for people across demographic, geographic, socio-economic, and mobility spectrums.

- **Transportation Mode Shift.** Public transit and active transportation are the preferred choice for more people, making it possible for the transportation system to move more people more efficiently in fewer vehicles.

- **Sustainability.** Transportation decisions reflect an integrated approach to environmental, financial, and social impacts thereby creating sustainable, livable communities that minimize the need for new infrastructure and increase quality of life.

- **Health and Safety.** The transportation system supports healthy, active lifestyles, and addresses user safety and security including access for emergency services, contributing to Edmonton's livability.

- **Well-Maintained Infrastructure.** The transportation system is planned and developed so that the City is able to keep it in a good state of repair and future growth is accommodated in a fiscally responsible and sustainable manner.

- **Economic Vitality.** Efficient movement of goods, convenient mobility of the labour force, and access to a vibrant city centre are features of the transportation system that enhance the economic vitality and competitive advantage of Edmonton and the region.

The City of Edmonton has developed Complete Streets Guidelines as part of implementing the City's Transportation Master Plan: *The Way We Move*.

The Complete Streets Guidelines also support the goals of the City's Municipal Development Plan, (*The Way We Grow*), Edmonton's People Plan (*The Way We Live*), Edmonton's Environmental Strategic Plan (*The Way We Green*), and Edmonton's Economic Development Plan (*The Way We Prosper*).

1.2 Intent of the Guidelines

Complete Streets represents a change in roadway design philosophy. The intent of the Complete Streets Guidelines is to encourage a holistic approach to roadway design in order to develop a network of roadways that are designed to be safe, attractive, comfortable and welcoming of all users. The Edmonton Complete Streets Guidelines are intended to:

- Provide design guidance for new and rehabilitation road transportation projects;
- Accommodate the needs of all users. Users include, among others, pedestrians, bicyclists, transit and transit riders, goods and services vehicles, and automobiles;
- Provide innovative street builders with political and community support for doing things differently;
- Shift from a rigid design standard to a flexible approach acknowledging that "one size does not fit all" and the design of individual streets should reflect the context of the area, land uses, and types of users for which the street provides access;
- Be as efficient as possible with space;
- Acknowledge that Edmonton's existing street design generally provides complete streets as-is in many situations but additional guidance is needed for missing network pieces. The Guidelines provide additional recommendations for best practice and specific guidance for appropriate bike facilities;
- Work towards improving the aesthetics of roadways in the right contexts.

Adoption of the Complete Streets Guidelines over time will result in the creation of a transportation network that accommodates the needs for all modes of travel. A network approach will include facilities that prioritize certain modes and other facilities that balance the needs of all users in a safe, context sensitive manner.

As such, complete streets will not all look the same. A complete street in a shopping district may emphasize the pedestrian and public transportation experience while a freeway will provide for high quality commuter and goods transport. The modes not explicitly designed for on those special facilities will be accommodated on parallel and crossing routes.

With competing demands for limited space, there are a number of challenges that arise when designing a street:

- How can the often competing demands of pedestrians, bicyclists, public transportation, goods vehicles, and private vehicles be accommodated?
- How can the design accommodate the varying land uses along a corridor today and in the future?
- How can cost-effective innovations, such as sustainable practices and improved urban design, be incorporated?
- How can the design house essential infrastructure such as hydrants and lights?
- Where should place-making be encouraged on streets?

The Complete Streets Guidelines provide the framework for having a discussion around the challenges associated with the design and balancing the needs of a variety of stakeholders.

1.3 Applying the Guidelines

1.3.1 Who Will Use the Guidelines?

Complete Streets Guidelines will affect those who design, build and maintain streets, as well as citizens who live and travel on those streets.

For designers, the Guidelines do not dictate rigid standards for roadway design; rather, they provide greater flexibility to combine a range of appropriate design dimensions, depending on the location of the roadway, its function and the nature of the surrounding area. The Guidelines recognize that the range of acceptable design dimensions can include "standard" typical dimensions as well as "constrained" dimensions (generally smaller) to help enable the creation of a design that supports the multi-modal objectives of the street. This is consistent with established national road design guidelines, which "provide designers with a greater opportunity to exercise their critical judgment-with better information on which to base their judgment."[1] In particular, it is consistent with the Design Domain concept contained in the TAC Geometric Design Guide for Canadian Roads (see Glossary for additional description).

For citizens, the Complete Streets Guidelines are intended to be an accessible and understandable document to display the various designs that are possible for a roadway. These guidelines will allow designers and citizens to use a common language while working together using the Involving Edmonton framework, Edmonton's public consultation guidelines, to create roadways that meet the needs of their communities for both the present and the future.

Additional information to assist citizens in using the Guidelines is included in Appendix A.

1.3.2 When Are Typical Opportunities for Applying the Complete Streets Guidelines?

Numerous circumstances have been identified within the current municipal framework, where opportunities will most-frequently arise to apply the Complete Streets Guidelines:

- Rehabilitation of neighbourhoods (i.e. sidewalks, curb and gutter, roadways, and related amenities).
- Rehabilitation of street corridors (typically arterial roadways).
- Construction of new neighbourhood streets and corridors.
- Smaller projects, such as routine operations and maintenance work, that can be transformative over time.

1 TAC - Transportation Association of Canada (1999). Geometric Design Guide for Canadian Roads. Section 1.4 (page 1.1.4.3).

1.3.3 How Will the Guidelines Be Adopted and Updated Over Time?

Edmonton's Complete Streets Guidelines represent a change in approach, and are seen as a starting point rather than a finalized conclusion. There are numerous aspects of implementing the Complete Streets Guidelines (as outlined in the Implementation Strategy section of this document) which will be undertaken over the next five years. As experiences are gained in implementing the Guidelines, the document itself will be reviewed and updated on a regular basis to reflect what is learned.

The City of Edmonton has developed these Complete Streets Guidelines through a process of stakeholder and public consultation, including the articulation of principles as well as the review and testing of the Guidelines at several stages of their development. This commitment to working with stakeholders will continue into the implementation of the Guidelines as detailed procedures and practices evolve over time.

In new neighbourhoods, the City will collaborate with the development industry to understand the implications of Complete Streets. **As a result, the guidelines will not apply to the development of new neighbourhoods until the implications of implementing Complete Streets are better understood by the development industry and the City.** The implications will be explored and tested through pilot projects in greenfield areas, the development of a series of example Complete Streets cross-sections, and cost efficiency analysis. These steps are further discussed in Section 5.2 Greenfield Implementation and 5.10 Cost Efficiency Analysis.

In addition, the extent of implementation on rehabilitation and neighbourhood renewal projects needs to be assessed to understand the cost and process implications. As a result, the guidelines will have a phased application over the next few years.

1.4 Navigating the Document

Section 2 of this document contains a set of principles, developed in consultation with stakeholders, which represent the framework both for the creation of the guidelines themselves, and for the detailed design of streets.

Section 3 describes the process for designing Complete Streets in Edmonton, including each intended

step: defining the goals of the street design; establishing design priority amongst the different modes of travel; identifying the compound street type; selecting appropriate street elements to accomplish the goals of the design; determining how to make tradeoffs where different travel modes and priorities conflict; and confirming the final design based on comparison against Complete Streets principles and identified project goals.

Section 4 is a "toolkit" of complete streets elements and describes how and where the different options for street design should be applied. It also describes options for variations to the elements when a designer is forced to make tradeoffs to accomplish the goals of the project.

Section 5 lays out a number of implementation "next steps" for putting these guidelines into practice.

Appendix A provides information to assist citizens in using the Guidelines.

Appendix B is a glossary of terms used in this document.

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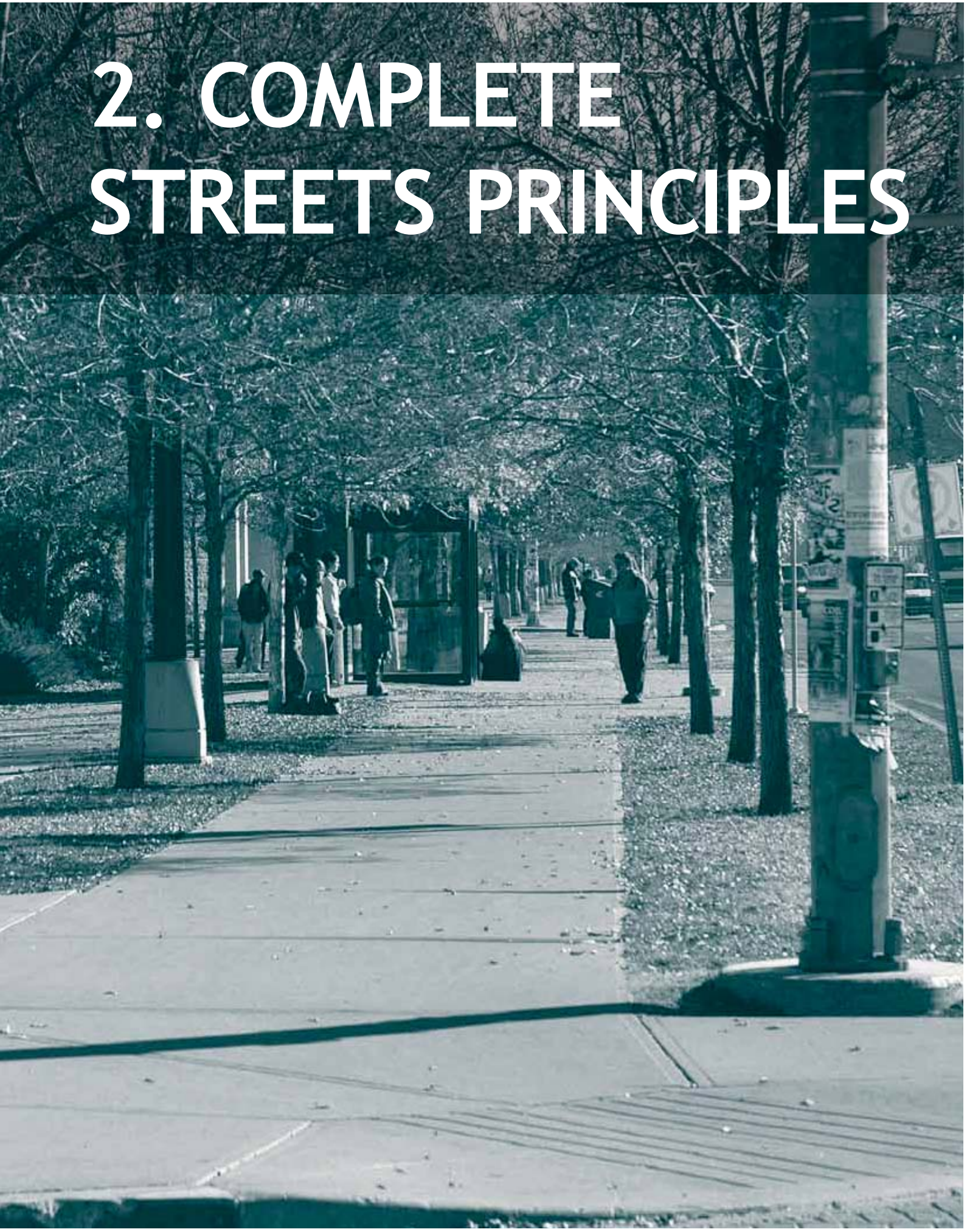
2. COMPLETE STREETS PRINCIPLES



2. COMPLETE STREETS PRINCIPLES

Principles: Complete Streets in Edmonton are intended to:

- *Provide travel options for all users and trip purposes in a safe, accessible, context sensitive way in all seasons.*
- *Form a network of streets that together accommodate all users and allow for efficient and high quality travel experiences.*
- *Be adaptable by accommodating the needs of the present and future through effective space allocation for the many functions of the street.*
- *Contribute to the environmental sustainability and resiliency of the city.*
- *Consider both direct and indirect costs, as well as the value of the roadway and the adjacent real estate.*
- *Be vibrant and attractive people-places in all seasons that contribute to an improved quality of life.*

Principles for Complete Streets were developed through engagement with City of Edmonton departmental representatives, external stakeholders, and members of the public.

The Principles are to be used to help shape the goals and objectives of any road design project, be it a new design or a redesign of an existing street. Additionally, they should be referenced throughout the development of the design to help reconcile tradeoffs. The Complete Streets Principles are not in order of importance; all principles should be addressed to determine if a design is complete.

The Principles do not prescribe a single way of developing a complete street; rather the principles guide the development of creative and innovative streets that reflect the surrounding characteristics and users.

2.1 Principles & Improving Completeness

The Complete Streets Principles are listed below, along with several bullets providing additional guidance on how each of the principles can improve the completeness of streets in Edmonton. These represent design ideas that are not mandatory but help to illustrate what implementation of the principles could look like.

2.1.1 Provide travel options for all users and trip purposes in a safe, accessible, context sensitive way in all seasons.

Implementation of this principle will generally improve completeness of streets by:

- Allowing for safe travel by all modes (pedestrians, bicyclists, transit, goods movement, automobiles) to connect destinations (homes, community gathering places, businesses, shopping, schools, work places, parks, recreation, and transit).
- Supporting active lifestyles for people of all ages and abilities (including barrier-free, age-friendly, and universal design).
- Providing appropriate access for waste removal, emergency vehicles, trucks and snow and ice control equipment that recognizes the need to balance the many users of a road.
- Considering the maintenance and operational requirements in all seasons based on the context and users.

2.1.2 Form a network of streets that together accommodate all users and allow for efficient and high quality travel experiences.

Implementation of this principle will generally improve completeness of streets by:

- Reflecting the character, scale and needs of the neighbourhood and surrounding area. That is, not all complete streets will look identical; some streets may need to accommodate all modes, while others may accommodate a more limited range of modes.
- Considering and evaluating the tradeoffs between efficiency and quality of journey for each mode.
- Including all streets: new streets and streets that require rehabilitation/renewal, repair/maintenance, or operational review.
- Including streets in all locations (residential, commercial / mixed use, industrial, and institutional) and for all functional types (freeways, arterials, collectors, locals, alleys).

2.1.3 Be adaptable by accommodating the needs of the present and future through effective space allocation for the many functions of the street.

Implementation of this principle will generally improve completeness of streets by:

- Anticipating implementation over a period of time, based on a clear framework for street design elements that guides how and where to achieve the most progress.
- Considering the appropriate amount of road right-of-way required today and in the future to support the adjacent communities.
- Considering flexibility to incorporate innovative and progressive design features.
- Providing places for basic elements in the street such as bus stop pads, utilities, fire hydrants, on street parking, technology such as Intelligent Transportation Systems, and lighting.

2.1.4 Contribute to the environmental sustainability and resiliency of the city.

Implementation of this principle will generally improve completeness of streets by:

- Encouraging and facilitating a shift towards sustainable modes of transportation.

- Enabling reduced storm-water runoff, greenhouse gas emissions, other pollution, and energy consumption.

2.1.5 Consider both direct and indirect costs, as well as the value of the roadway and the adjacent real estate.

Implementation of this principle will generally improve completeness of streets by:

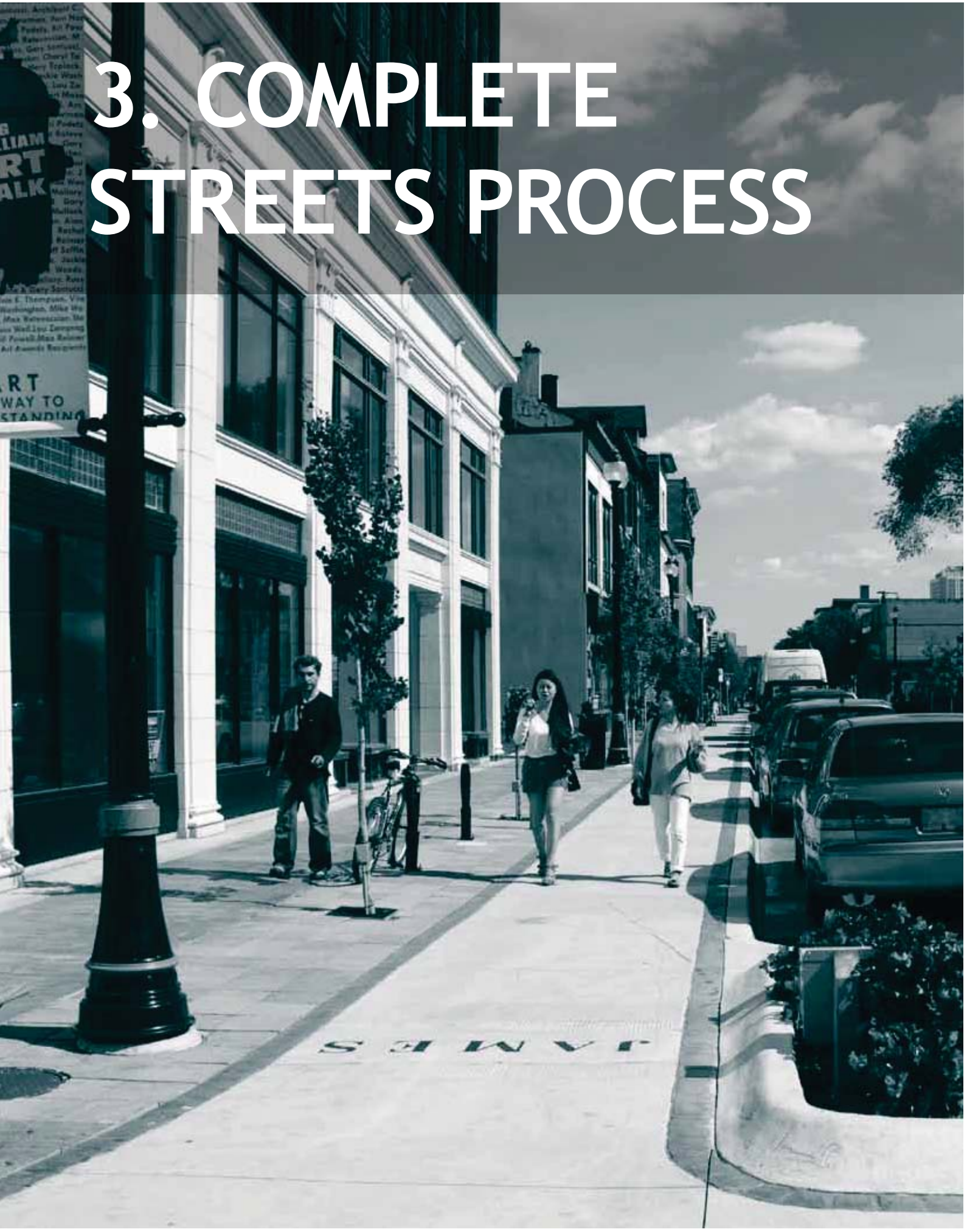
- Being cost effective to build, maintain and operate by considering the costs and trade-offs to tax payers, developers, home buyers, the City, and utility companies.
- Being mindful of health, safety, collision, emission, and urban design costs.
- Recognizing the appropriate cost of urban design elements and requirements for on-street parking will vary depending on the context.
- Supporting streets as destinations; for example vibrant shopping areas.
- Accommodating trucks in industrial areas and on key goods movement routes.

2.1.6 Be vibrant and attractive people-places in all seasons that contribute to an improved quality of life.

Implementation of this principle will generally improve completeness of streets by:

- Creating spaces that encourage citizens to interact with each other and their surroundings in all seasons through provisions such as wider sidewalks in the appropriate context.
- Considering attractive urban design elements, public art, street trees, street furniture and decorative lighting while reducing visual clutter in the appropriate context.
- Contributing to a sense of personal security.

3. COMPLETE STREETS PROCESS



3. COMPLETE STREETS PROCESS

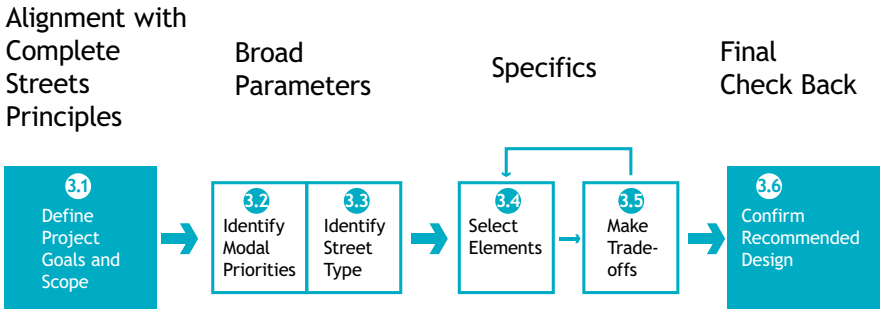
Integrating With Existing Processes
The Complete Streets design process has been developed to fit within Edmonton's existing planning and design processes. Though City of Edmonton staff may use this design framework in any context, it will be ultimately embedded in:

- the Facility and Capital Planning section work plan (arterial redesign / rehabilitation),
- the Neighbourhood Renewal Process (redesign / rehabilitation undertaken in existing neighbourhoods),
- new neighbourhood development planning (all roadways designed and constructed in developing areas of the city), and
- the Streetscape Initiatives Process (undertaken by Great Neighbourhoods or Sustainable Development as part of neighbourhood revitalization efforts).

Stakeholder & Public Involvement
Stakeholder and public participation occurs throughout the process according to the City's Public Involvement Policy (C513) and proceeds according to the Involving Edmonton Framework for each associated planning process.

It is anticipated that roadway reconstruction projects in existing neighbourhoods will require appropriate public involvement so that streets can consider community aspirations and concerns along with current design and operations through the design process. In newly developing neighbourhoods, interest from the general public or broader stakeholders can be welcomed, though in practical terms it is typically the land developer who would participate most extensively in stakeholder involvement in a newly developing area.

Process Flowchart
The process diagram will help guide the design process for Complete Streets and may or may not be applicable for every design. The level of effort required for each of these steps will be dependent on the scope of the project. Also, depending on the level of complexity for the project, the design process may be iterative. These steps are described in greater detail in the following sub-sections.



Process Flowchart

3.1 Define Project Goals and Scope

3.1.1 Description

As a foundational step in the Complete Streets design process, the design team and relevant stakeholders (as identified through the Involving Edmonton Framework) need to establish and confirm a clear understanding of the broad goals and objectives of the project. This understanding of scope needs to include an understanding of how the project will fulfill Edmonton's Complete Streets principles.

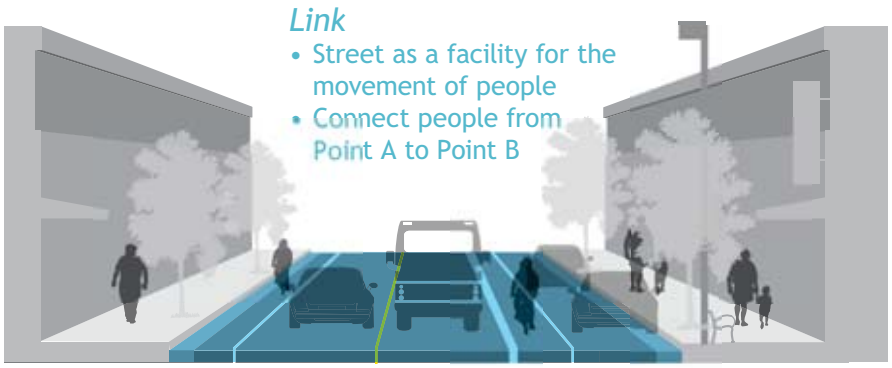
For existing city streets, relevant questions that the design team can explore include:

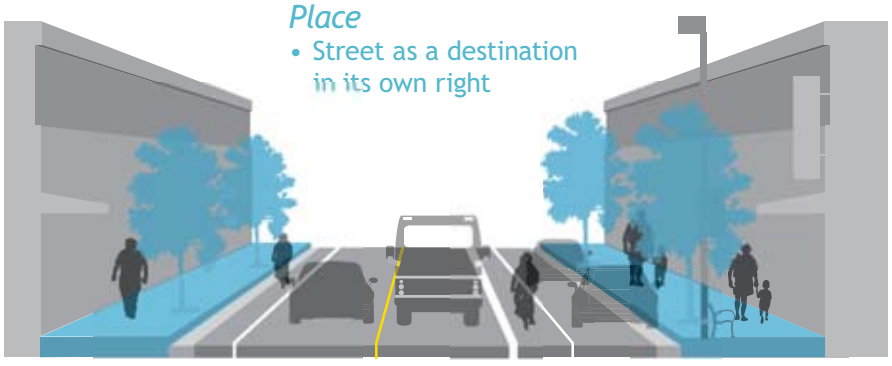
- Why are we redesigning / rehabilitating / re-striping this street?
- What are some of the current issues with the operation of the street or surrounding network?
- Are there missing pieces in the existing network for specific modes?
- What are the relevant community and land-use plans?
- How can the design of the street encourage appropriate driver behaviour to create a safe environment for all users?
- Is the street primarily a link or place?

For greenfield development, Designing New Neighbourhoods: Guidelines for Edmonton's Future Residential Communities provides direction on the vision for interaction between the transportation network and land uses in new neighbourhoods. In existing neighborhoods, this vision may be provided by an established Area Structure Plan or Area Redevelopment Plan, and should be consistent with the City's Transforming Edmonton strategic plans.

3.1.2 Link and Place

Historically, transportation systems have been designed based on roadway functional classification with the primary focus of accommodating automobiles to connect destinations. Roadways designed in this fashion typically function as a link that is designed only to connect point A to point B. However, the function of roadways is more than connecting destinations. Roadways also function as a social space and have a relationship with the places where people live, work and play. The Complete Streets Guidelines design philosophy is a shift to use both link and place concepts in designing





roadways. Designing for all modes with both link and place considerations has the potential to add richness to Edmonton's roadway system. This will help the city transition to a network that is more sustainable and safe, while providing public spaces that are inviting for people and businesses.

3.1.3 Relevant References

The following reference guidelines and/or policies should be reviewed for guidance on street design goals.

Designing New Neighbourhoods
Guiding the preparation of new Neighbourhood Structure Plans in urban growth areas, this document applies a performance-based approach to new neighbourhood design in Edmonton. Twelve specific outcomes, along with Designing New Neighbourhoods principles, guide the design of new neighbourhoods and specifically provide guidance on the street network in new neighbourhoods. Additional information is found in "Designing New Neighbourhoods: Guidelines for Edmonton's Developing Communities" for incorporation into Complete Streets design projects.

Wildlife Passage Guideline
The City of Edmonton is committed to protecting local and regional ecological connectivity. The intersection of roads and road crossings with natural habitat can limit wildlife movement and reduce ecological connectivity. Wildlife passages are one way to promote wildlife movement through more developed areas. They can range from simple measures (e.g., wildlife crossing signage or strategically placed vegetation plantings) to more complex structures (e.g., wildlife underpass).

The City's Wildlife Passage Engineering Design Guidelines promote the maintenance or enhancement of urban biodiversity by ensuring that wildlife populations are able to disperse throughout the City. This ensures that wildlife are able to access areas in order to fulfill life cycles, and prevents populations from becoming fragmented or isolated. The guidelines also help alleviate safety concerns associated with wildlife-vehicle interactions.

Active Transportation Policy (C544)
Active Transportation includes any form of human-powered transportation, the most common modes being walking and cycling. The purpose of the Active Transportation Policy is to optimize opportunities to walk, roll, and cycle for Edmontonians, regardless of age, ability, or socio-economic status; to enhance the safety, inclusivity and diversity of our communities, and to minimize the impact of transportation activities on Edmonton's ecosystem.

Transit Oriented Development Policy (C565) and Guidelines
Transit Oriented Development (TOD) is an approach to building a city which concentrates housing, shopping and employment along a network of walkable and bikeable streets within a five minute walk of transit stations – or 400 metres in any direction. TOD supports the City's vision of a vibrant, sustainable city with attractive, liveable and more compact communities.

3.1.4 Project Scope

Land uses and transportation needs change over time and can vary significantly throughout a given corridor or neighbourhood. It is therefore important to understand the existing and anticipated land uses within the project area. To aid in addressing these temporal and spatial changes, a defined project scope is required to address the extents of the project boundaries in terms of time horizons and geographic reach. In addition, subdividing the corridor into pieces of similar context is recommended to ensure that modal priorities and cross sections are sensitive to the local needs. It is recognized that cross sections may change along a corridor; therefore, the transitions between these context zones should give consideration to design consistency and continuity of modal networks. This step should consider the input of land use planners who will consider existing zoning and land use planning documents in place for the project area. It may be beneficial to perform supplemental small area planning or traffic studies as dictated by current City of Edmonton planning processes in areas where significant change in the short-term or long-term is planned. The Complete Streets Guidelines provide an increased level of flexibility that can be used to customize varying cross-sections along a project corridor or within a project neighbourhood, to achieve the end goal of multi-modal continuity and cohesiveness at the network scale.

3.2 Identify Modal Priorities

3.2.1 Description

It is important for the designer and relevant stakeholders to define the modal priorities for a particular street segment. In most situations, it will not be possible to provide the highest level of service for all modes at the same time. The five modes for which a design priority must be established (i.e. defined and documented) are: walking,

cycling, taking transit, movement of goods and services, and driving an automobile. On each roadway project the modes will be ranked from highest to lowest priority based on analysis of the character and function of the roadway and its land use context. This does not necessarily mean that modes with lower ranking will have substandard provision. However, the modal ranking does provide guidance for considering various street elements in the design. Lower priority modes will also be the first to face trade-offs if there are constraints. The design team may have to look to other parallel facilities to properly provide for the requirements of some mode users.

Generally, the modal priorities at this stage of the process can be established as being either of "higher priority" or "lower priority" status. More specific ranking of some individual modes relative to each other may be necessary as trade-offs (described later) are considered.

Table 3.1: Modal Priority Networks

Pedestrian Priority Areas

- Transit Oriented Development plan areas
- Pedestrian Commercial Shopping Street Overlay
- Whyte Avenue Commercial Overlay
- Alberta Avenue Pedestrian Commercial Shopping Centre Overlay
- Quarters Overlay
- Special Area Downtown (Capital City Downtown Plan area)
- Business Revitalization Zones (BRZ)

Bicyclist Priority Areas

- Community-Level bicycle facility requirements (as identified through the Bicycle Transportation Plan for existing neighbourhoods, or through neighbourhood-specific bicycle network planning for future neighbourhoods)
- Priority Cycling Facility Network

Transit Priority Areas

- Transit Avenues Map
- Frequent Service Corridors
- Current LRT Network
- Future Light Rail Corridors
- TOD Areas

Goods Movement Priority Areas

- Transportation Utility Corridors
- Streets within Industrial Areas as defined by Traffic Bylaw 5590
- Dangerous Goods Routes / High Truck Volume Streets
- Highway Connectors
- Inner Ring Road

3.2.2 City-Wide Modal Priority Networks

In defining modal priority, each mode (pedestrians, bicyclists, transit, goods and services, and autos) is to be ranked in order of importance for the particular segment in question. The City of Edmonton is in the process of developing and confirming city-wide modal priority networks for existing and future developed areas of Edmonton. These networks will define the locations of multi-modal routes and connections at a city-wide scale of influence, which will then assist street designers in determining which modes need to be given higher priority if space constraints require trade-offs among design elements.

The modal priority networks in many cases will build on network definitions such as the existing Edmonton Truck Route/Dangerous Goods Route network, the existing transit route map, or the recommended future bicycle network in the Bicycle Transportation Plan. The networks will reflect relevant, identified sub-areas such as those in Table 3.1.

In addition to the above, the modal priority networks will incorporate direction contained in any Neighbourhood/Area Structure Plan (NSP / ASP), Community Plan, Station Area Plan, Corridor Plan, Area Redevelopment Plan or other planning document or tool where a specific modal priority has been identified and approved by City Council.

It will be the responsibility of the designer and relevant stakeholders to document and justify the modal priority for the project. The following are several "rules" which should guide the determination of modal priorities.

- If the subject roadway is on a priority network or in a priority area as described above, then the applicable mode should be ranked among the top three modes (out of the five modes listed). For example, if the subject roadway is in a TOD area and is part of the city-wide bicycle network, then the transit, pedestrian and bicycle modes should be the three travel modes that are deemed most critical to accommodate if space constraints require trade-offs among design elements.
- In commercial Street Oriented areas, walking should be in the top two modal priorities.
- Access to transit is typically done by walking and therefore walking should be ranked no more than one position below transit in the modal priorities, unless there are limited transit stops along the street, such as those streets serving express routes only.

3.2.3 Multi-Modal Level of Service (MMLOS)

The City of Edmonton is also developing a MMLOS framework to evaluate how well a street accommodates user needs based on modal priority. The MMLOS assessment is a tool that will be used for existing roadways to understand what the quality of journey is for each mode. This evaluation may assist in identifying modes that require improvements to address MMLOS deficiencies. Evaluation in the MMLOS will produce an associated score for each mode. Identified deficiencies that can be addressed through mode-specific improvements in roadway design will be considered as a guide to selecting enhancements.

The MMLOS tool is not intended to be the only aspect of evaluating a street's function for all modes, and is anticipated to add relevant insights in determining the roadway design. Other steps in this process such as the discussion of trade-offs and answering the question "does the proposed design meet the goals of the project" are just as critical to achieve a street that meets user needs.

3.3 Identify Street Type

The street type is a three part definition of the relationship of the buildings to the street, land use context, and functional classification.

3.3.1 Relationship of Buildings to the Street

The design process will identify the street relationship to the built environment, identifying project areas as either Street Oriented or Non-Street Oriented. The distinction to be made is the typical character of individual site design.

Street Oriented

Areas that are Street Oriented are characterized by buildings that are built to minimum setbacks with building entrances directly on the street. Street Oriented areas will commonly have a pedestrian bias in their design, taking advantage of the public sidewalk to attract or serve pedestrians, with street operations that are comfortable for bicycles and other slower-moving types of traffic, and (especially in non-residential areas) often providing vehicular parking to the rear of buildings or underground.

Non-Street Oriented

Non-Street Oriented areas are characterized by greater setbacks from the street, and building entrances that face areas internal to their sites, most often surface parking lots. Non-Street Oriented areas will commonly have a bias towards automobile access in their design, setting aside portions of the site immediately adjacent to the street for vehicular access and parking, making vehicular access easy but conversely making the built environment less functional for pedestrians by separating buildings and increasing walking distances.

Changes Over Time

While it is important to consider the relationship of existing built form to the character of the street, any planned changes to the built form in the future must also be considered in the definition of the street relationship. For instance, overlays or other planning tools such as an Area Redevelopment Plans (ARP) may identify specific areas for transition from a Non-Street Oriented to Street Oriented character during future redevelopment. Roadway design should support this by including elements that are associated with Street Oriented design.

Street Oriented

Non-Street Oriented

Residential

3.3.2 Land Use Context

In addition to the relationship of the buildings to the street, roadways will also consider the adjacent land use context. The land use context categories outlined here have some similarity to typical land use planning classifications, but the divisions are focused on distinct transportation characteristics of different land uses, which do not always equate directly with the definitions of the Zoning Bylaw or planning documents. The land use context categories are as follows:

Residential

Residential areas include a range of different building forms and densities, from single and semi-detached homes to townhouses to low, medium and high-rise apartment buildings. They are defined by their predominant character as places where people live. Residential areas may also include school sites, parks and stormwater management areas, but these are considered extensions or modifications of the basic context for street design purposes, rather than defining contexts in and of themselves.

Major Public Spaces and Institutions

This category includes major activity generators like district parks, high schools, recreation centres, hospitals and major health centres, universities and colleges and other public and institutional areas that drive their own distinct transportation behaviour.

Industrial

Industrial areas include warehouses, storage yards, manufacturing establishments and large industrial plants. They also include industrial business areas that appear very similar to commercial

office parks, but which differ from such land uses in their truck access requirements.

Commercial/Mixed Use
These areas include a range of different development types, from office parks in suburban locations to office towers in the downtown, main street-style retail areas such as Whyte Avenue or 118 Avenue, transit-oriented developments (TOD), strip malls, big box stores and shopping malls. Also included is mixed use areas, which are defined by a combination of commercial (typically retail or services) and residential uses developed side-by-side or with residential above commercial. By co-locating these two types of uses, mixed use areas typically drive different types of transportation behaviour than exclusively residential areas.

3.3.3 Functional Classification

The system of functional classification for Edmonton roadways is not proposed to change with the implementation of Complete Streets. The functional classifications will continue to be similar to those defined by the Transportation Systems Bylaw.

- Arterial – generally carrying larger volumes of traffic between areas ("through" traffic) with relatively fewer access points to adjacent developments.
- Collector – provide neighbourhood travel between local and arterial roads and direct access to adjacent land. Buses generally operate on collector roadways within a neighbourhood.
- Local – provide direct access to adjacent lands and serve neighbourhood travel.

Major Public Spaces and Institutions

Industrial

Commercial/Mixed Use

Arterial

Collector

Local

Assessment of functional classification should take into consideration future changes in the character of the roadway that may be anticipated or deemed desirable.

Other street types that could be supported by design elements in the Edmonton Complete Streets Guidelines include Non-Auto Streets and Alleyways. Non-Auto Streets would have value in very specific contexts where a combination of pedestrian, cycling, and transit traffic is high, or where regular street events such as markets and festivals suggest the possibility of more permanent restriction of automobile access, assuming that automobile traffic can be redirected to other corridors.

Alleyways are also included in the City of Edmonton's collection of approved roadway cross-sections. The Complete Streets Guidelines elements could support an elaboration upon the roles that alleys can fulfill in the transportation network, in consideration of land use policies and plans surrounding secondary suites and other redevelopment considerations.

Freeway and Expressway facilities (as defined in the Transportation Systems Bylaw) are designed according to applicable parameters (e.g., as per the TAC Geometric Roadway Design Guide for Canada), but should address Complete Streets principles through accommodation of appropriate multimodal network facilities along parallel routes and across them.

3.3.4 Composite Street Typology

Potential street typology names are formed by combining one term from each of the following three categories:

Relationship to Street
- Street Oriented
- Non-Street Oriented

Land Use Context
- Residential
- Major Public Spaces and Institutions
- Industrial
- Commercial/ Mixed Use

Functional Classification
- Arterial
- Collector
- Local

The resulting description of street type then guides detailed street design. For example, a high volume roadway in a main street retail area in which buildings front onto the public sidewalk will be described as a Street Oriented Commercial Arterial. A low volume roadway in an industrial area where parking lots or loading areas are located between buildings and the street will be described as a Non-Street Oriented Industrial Local. Building upon existing functional classifications, the new street types will more clearly recognize the type and character of the land uses that they are serving and which will help guide the details of their design.

In some contexts, Industrial areas for instance, there may be little or no existence currently of Street Oriented Industrial development. However, the Complete Streets design process is intended to allow for all possible future combinations of land use conditions and functional requirements. Therefore, this analytical step will remain important regardless of the existing context of any particular project.

3.4 Select Elements

Section 4 of the Edmonton Complete Streets Guidelines provides a toolkit of design elements, which can be used as building blocks of a street, to select suitable alignment and cross-section design features consistent with Complete Streets principles. The process of identifying suitable street design elements depends on the type of project being undertaken.

For new neighbourhood streets and corridors (which are frequently in greenfield situations), the Complete Streets Guidelines implementation will result in preparation of a set of example cross-sections for various composite street typologies. The example cross-sections will provide a starting point for the street design, similar in application to existing street design standards, for some new neighbourhood street contexts. However, dependent on the modal priorities and goals identified for each street in the neighbourhood, it may be appropriate to either (a) modify an example cross-section using the elements toolkit, or (b) develop a customized cross-section using the elements toolkit.

For rehabilitation/reconstruction projects, the starting point is the existing road geometry, which is evaluated as described previously in Section 3, based on MMLOS, priority modal networks in the area, traffic volumes, operational factors, and land use relationships (current and anticipated future conditions). There are no template cross-sections for rehabilitation/ reconstruction projects since each such project is unique. The overall process involves modifying the existing cross-section based on the elements toolkit, or developing a customized cross-section using the elements toolkit. Customization to accommodate right-of-way constraints and trade-offs is typically necessary.

Complete Streets Context Illustrations in Section 4.6 provide examples of how the elements may be combined in a cohesive and comprehensive design approach, based on “link and place” concepts, street type, and modal priorities. For example, when pedestrian mode is prioritized, the width ranges for various sidewalk components such as the frontage, through, and furnishing zones are modified. These width ranges are used to construct the potential cross-section. Ideally, the cross-section can accommodate all desirable elements, but when conditions are constrained priority should be focused on maintaining more room for higher-priority elements. Each draft cross-section needs to be reviewed for constructability and practicality (e.g. appropriate accommodation of utilities relative to available right-of-way).

The Complete Streets Guidelines provide an overall approach to roadway design and does not seek to be a comprehensive design manual for all aspects of complete streets. For each of the elements in the toolkit, references to other

industry-standard or industry-leading sources are provided, linking the designer to general and specific guidance as to where to find more information, i.e. places to start or continue looking for design specifics.

3.5 Make Tradeoffs

The consideration of tradeoffs (i.e. balancing and prioritizing competing demands for street space within limited rights-of-way) should occur implicitly throughout the process, through consideration of modal priority and determination of the cross-section elements and corresponding widths. Constrained right-of-way design requires prioritization of cross-section elements and emphasis on elements that meet the vision and goals established for the corridor.

In constrained conditions, modes identified on a priority network must be accommodated. In addition, on priority networks for goods movement, transit, autos, biking or walking, the priority mode should be accommodated by using standard dimension elements whenever possible. It may be necessary to examine modal priorities in greater detail at this point, to establish a more definite ranking of modal priority in order to inform specific trade-off decisions.

When working in a constrained situation and determining how to fit multiple modes into the cross-section, the following potential adjustments should be applied, wherever practical, and in this order:

A. Reduce lane widths to constrained dimensions
B. Use constrained dimensions for all elements except those accommodating priority modes
C. Remove parking lane on one side of the road
D. Determine if a lower priority mode is better served on an adjacent roadway
E. Reduce Design Speed
F. Remove medians
G. Remove auto lanes
H. Use shared lane markings where constrained widths of lanes for traffic and bicyclists cannot be achieved
I. Place pedestrian facility next to curb removing boulevard buffer
J. Consider acquiring land

Examples of elements which may be subject to constrained dimensions independent of design speed include medians or frontage space. When considering trade-offs, utility requirements (including underground utilities that are not visible at the surface) may represent significant constraints that must be addressed.

Where the right-of-way is constrained and sub-optimal dimensions are considered, it will be necessary for proponents to justify the use of dimensions that are less than standard facility widths.

3.6 Confirm Recommended Design

As a final step, the designer should re-examine whether the project design meets the goals and objectives established at the beginning of the design process and if the intent of the Edmonton Complete Streets principles (see Section 2.0) has been achieved. Through discussion with stakeholders and consideration of tradeoffs, interested parties will come to agreement that the recommended design meets the established goals and objectives, and the detailed design can proceed.

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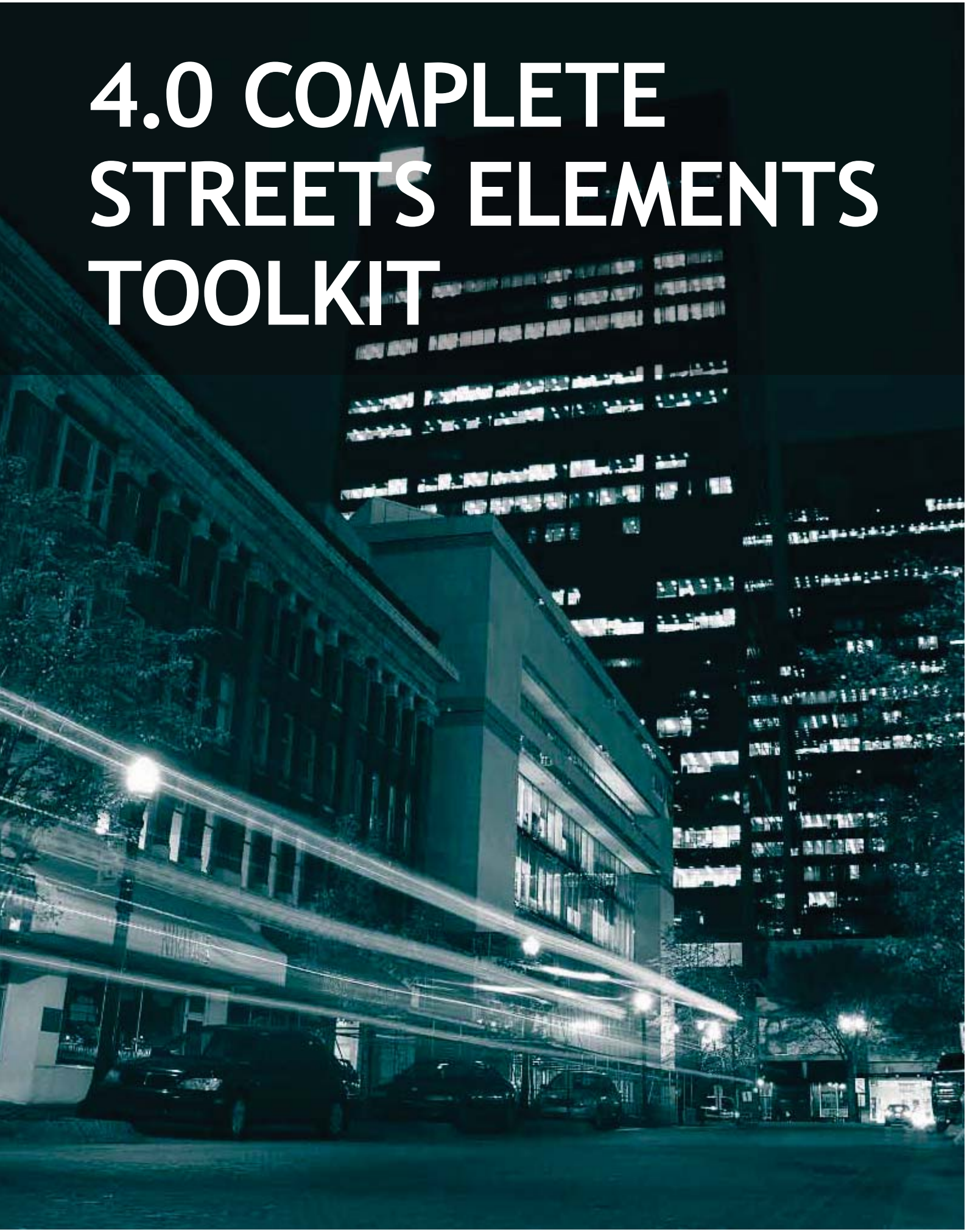
4.0 COMPLETE STREETS ELEMENTS TOOLKIT



Contents

4.0.1 Introduction

This section of the Guidelines provides a "toolkit" of design elements in support of Complete Streets in Edmonton. It depicts a range of general elements for street design as well as more-detailed guidance to street designers for the inclusion of design elements in support of multiple travel modes. Examples have been included to illustrate some considerations for the design of intersections in a few sample contexts. Definitions of various street elements are shown in Section 4.0.2 and 4.0.3.

General considerations that affect design for all modes are shown in Section 4.1. These include appropriate roadway widths, lane widths, and alternative configurations for travel lanes that may be useful on streets where width is constrained. Also important to consider in the design of a street is the intended speed at which automobiles will travel, as this will be different depending on the type of land uses that are present, as well as the intended function of the street within the City's overall network. The presence of on-street parking also has impacts on various aspects of street design, as it tends to calm automobile travel speeds, and serves land uses by providing convenient adjacent parking supply and access. Landscaping will vary for each street depending on land use context and available street width, so guidance is provided to designers as to standard dimensions and how to ensure attractive and healthy landscape adjacent to roadways. These considerations for designers all relate to the interactions of all of the elements of the street, how they must fit together, how they will operate once a street is built or reconstructed, as well as what a street will look like and how it will feel to those who use, live or work on it.

Considerations for design elements specific to each mode are explored in Sections 4.2 through 4.5. Pedestrians, bicyclists and motorists of various vehicle types all engage with the street in different ways due to their size relative to other traffic, the speed at which they are able to move, and the unique characteristics of their locomotion. Trucks and buses, for instance, have a larger turning radius than other smaller vehicles, while bicyclists and pedestrians are the most vulnerable of road users. Pedestrians in particular use the street in a very different way to other modes, moving at a slower speed than any other user; the visual experience of the street is perhaps of most importance to these users, as are street amenities such as extended corners at intersections to increase safety, benches along the route to provide places for rest, and the possibility of social engagement with other pedestrians in the middle of their journey. Various specifics of different modes are described and guidance is provided to designers to ensure the best street experience for each mode, balanced by the physical constraints of available space and the reduction of conflicts with the needs of other users.

Finally, the application of Complete Streets principles and design elements is explored through figures showing a few conceptual intersection types in Section 4.6. These figures are not intended to guide the details of actual intersection design, but are useful in illustrating a wide range of conceptual applications of Complete Streets concepts. Intersections pose particularly difficult design challenges, as they are the points of greatest potential conflicts between different travel modes, and will require further investigation through the implementation of these guidelines.

4.0.2 Street Component Definitions (Abutting Property to Curb)

These illustrations define the functional areas of a street that are necessary to consider when designing streets and provide useful definitions when applying the Complete Streets elements.

Alleyway
Alleyways provide a through zone for rear access, and an opportunity for public art (i.e., murals).

Frontage Zone
Adjacent to the property line, this space accommodates active uses such as ground floor retail or cafe seating.

Through Zone
This space provides for pedestrian mobility. Large through zones are important in areas of high pedestrian volumes.

Furnishing Zone
This space provides an area for signs, light poles, street trees or vegetation in addition to under ground utilities. This is the preferred location for snow storage.

Cycle Track
A protected bikeway, separated from pedestrians, and physically protected from the roadway.

Edge Zone
The edge zone is often a simple curb and gutter, but may be extended to protect cyclists if a cycle track is adjacent to parked cars. When extended, the edge zone may function in place of a furnishing zone and be used for snow storage.

4.0.3 Street Component Definitions (Curb to Middle of Street)

Curbside Parking/ Loading
This lane is for short-term vehicle storage/ loading, and may also act as a space to further buffer the sidewalk from moving traffic. Curb extensions and bike corrals may occupy this space where appropriate.

Bike Lane
A dedicated travel lane for use by bicyclists.

Transit Only Lane
A dedicated travel lane for use by transit vehicles.

High Occupancy Vehicle (HOV) Lane
A lane dedicated for use by vehicles meeting a minimum occupancy criteria (usually two or three persons) and buses.

General Purpose Travel Lane(s)
A lane (or lanes) dedicated to serve a broad range of vehicles.

Centre Median/ Turn Lane
This space typically separates road users moving in opposite directions. Centre medians may be landscaped or hardscaped, and may include pedestrian refuge areas. Turn lanes may be uni-directional or bi-directional (shared).

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4.1 General Street Design & Operation

4.1.1 Roadway Design, Travel Lanes and Lane Widths

Description

Roadway and travel lane width have a significant effect on the perception and behaviour of all users. Multiple, wide travel lanes may be appropriate on **High Truck Volume** streets, whereas similar roadway width in pedestrian-oriented areas can act as a barrier for desired uses.

The selection of appropriately sized lanes is important to ensure safe, efficient use of the transportation network.

Application Context: Land Use, Street Type and Orientation[1]

Lane width can vary. Most types of motor vehicles can operate with 3.2 m wide lanes, while 3.5 m wide lanes are desirable on High Truck Volume Streets. Street Oriented land use areas should use narrower lane widths to encourage appropriate travel speed.

TAC states "… empirical evidence indicates that there is little safety benefit to be derived by widening lanes beyond 3.3 m, and that widening beyond 3.7 m may be to the detriment of safety (except for widened lanes on curves and shy distances to curbs)."

Roadway Width

The minimum two-way roadway width is 8 m with parking on one side and 9 m with parking on two sides, most commonly seen on Street Oriented Residential Local streets.

Truck and Transit Network Considerations

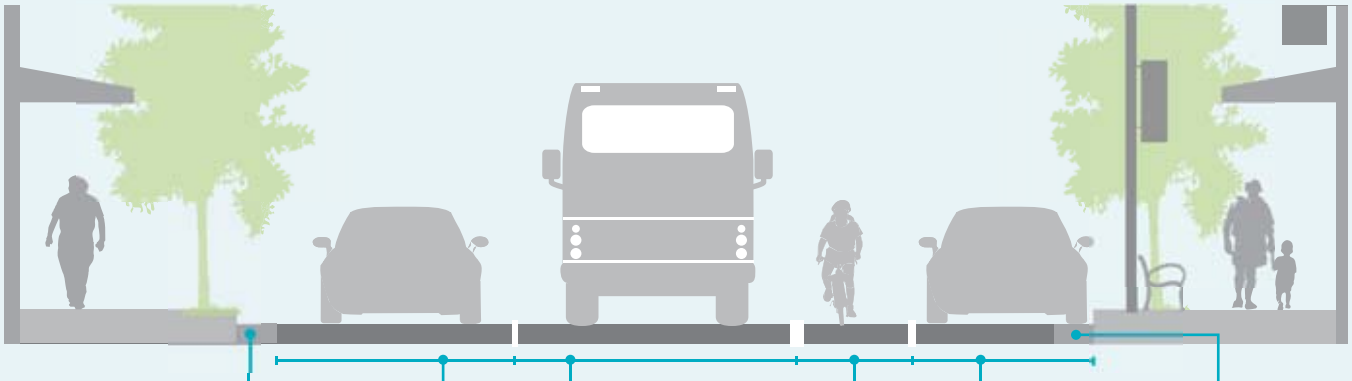
Standard lane width on streets with High Truck Volumes is 3.5 m for travel lanes. Transit Network streets may consider providing wider than standard travel lanes, but only if such provision would not negatively impact pedestrians and bicyclists.

Constrained Lane Widths

In constrained conditions, lane widths may be reduced to 3.0 m. On Transit Network Streets, the constrained width is 3.2 m. On High Truck Volume streets, the constrained width is 3.4 m.

Service Roads

Edmonton has many service roads today, which provide a buffer from through traffic for pedestrians. Retrofitting service roads is possible, but operational factors must be considered when evaluating the case for service roads.



1 Travel lane dimensions (except for bike lanes) for outside travel lanes are measured from the lip of gutter, and exclude the gutter adjacent to the curb (typically 0.25 m). Parking lanes should be measured from face of curb, and bike lanes may be measured from face of curb if adequate ridable surface adjacent to the lip of gutter (at least 1.2 m) is provided.

Dimensions Considerations

Note that all motor vehicle lane widths are referenced to either:

- the centre of the lane marking that defines the lane
- or the lip of gutter (i.e. where the pavement meets the edge of the horizontal concrete gutter pan).

All on-street bicycle lane widths are referenced to either:

- the centre of the lane marking that defines the lane
- or the face of curb (i.e. where the pavement or horizontal concrete gutter pan meets the vertical flat face of the curb),
- with the proviso that all bicycle lane dimensions must include a minimum 1.2 m rideable width, free of longitudinal joints.

Bicycle lanes > 2.1 m should be configured as buffered bicycle lanes.

Cycle tracks require buffer separation of at least 0.5 m (from adjacent travel lane) or at least 1.0 m (from adjacent parking lane).

Parking lane widths are referenced to face-of-curb on the curb side. On the non-curb side, they are referenced to the edge of the adjacent travel lane, which may or may not be physically delineated.

The application of the clear zone concept is of lower priority for most streets in Edmonton, especially for street oriented areas, but it is still desirable to position rigid objects as far away from the active travel way as possible.

In situations where constrained dimensions are being considered, Table 4.1 should be used as a guide to rationalize trade-offs. This table is only to provide guidance in constrained situations, primarily in retrofit situations, and should not be used as a primary reference to justify sub-optimal dimensions for a particular mode. In addition, it is not desirable to build a cross-section using only constrained dimensions, and it will be necessary to justify when constrained dimensions have been used.

Table 4.1: Constrained Dimension Considerations for ≥2 Lane Streets

Dimension	Constrained	Standard
Motor Vehicle Travel Lane Widths		
lane width (general purpose travel lanes)	3.0 m	3.2 m
lane width (transit route / lanes)	3.2 m	3.2 m
lane width (high truck volume streets)	3.4 m	3.5 m
Parking Lane Widths		
motor vehicle parking	2.4 m	2.5 m
motor vehicle parking (on local roads)	2.2 m	2.5 m
Bicycle Facilities		
wider curb lanes or shared use lanes (for side-by-side shared use)	4.0 m	4.0 m
wider curb lanes or shared use lanes - on transit route or high truck volume streets (for side-by-side shared use)	4.2 m	4.2 m
bicycle lane width	1.5 m	1.8 - 2.1 m
cycle track lane width (one-way)	1.5 m	2.1 - 2.7 m
shared use path	2.5 m	3.0 m
Pedestrian Facilities		
sidewalk - in Street Oriented context	1.5 m	1.8 m
sidewalk - in Non-Street Oriented context	1.5 m	1.5 m

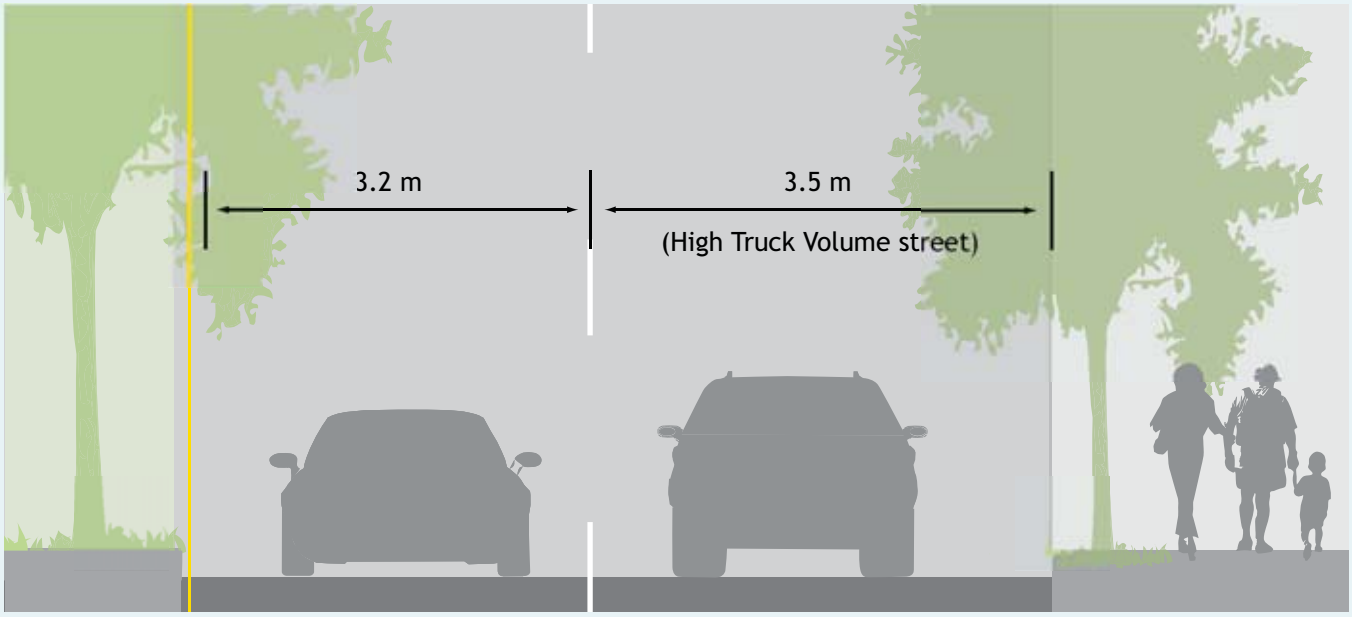
Snow Removal and Maintenance Considerations

Snowplows function on lanes 3.1 m wide or larger without issue by using a 3 m blade.

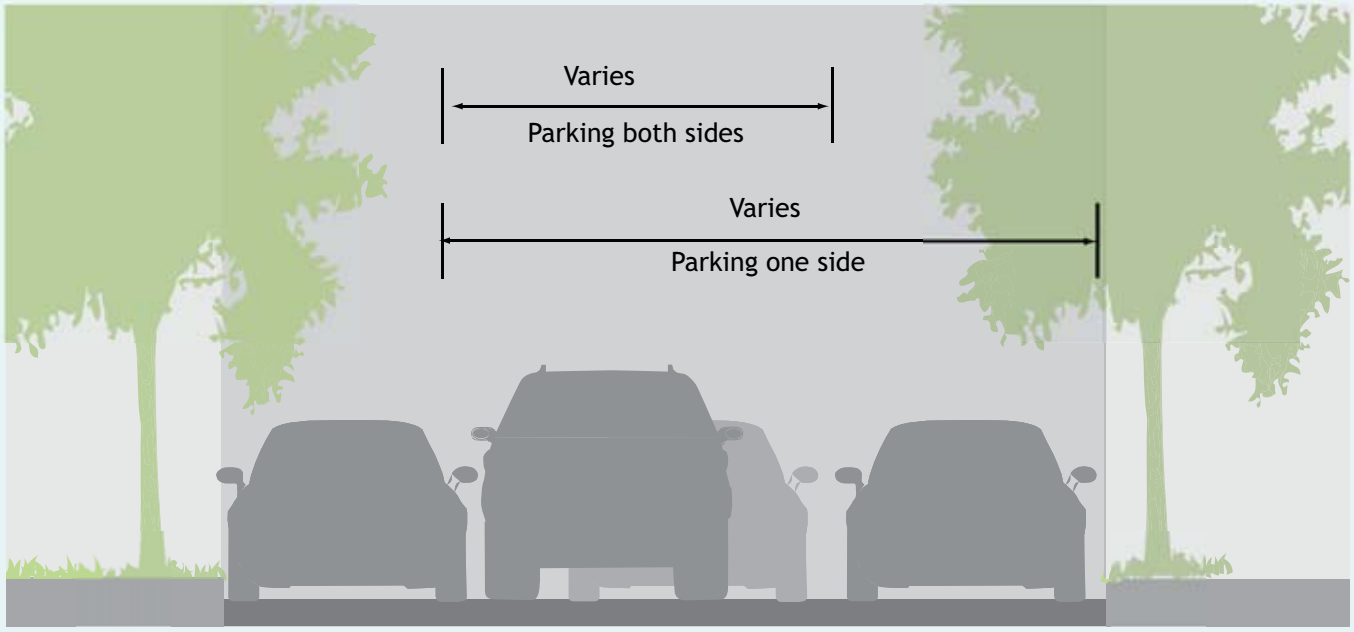
References

Geometric Design Guide for Canadian Roads, Transportation Association of Canada, 1999

Standard Lane Width:



Local Street Lane:

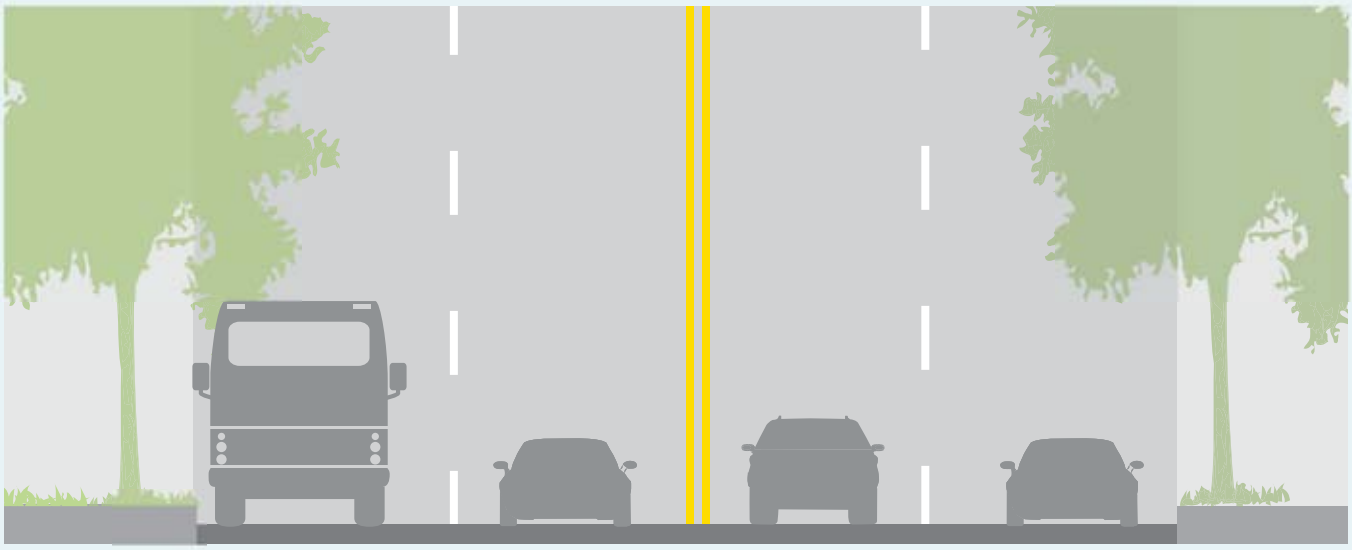


Local streets may not have defined lanes, and may operate as a single bi-directional lane. Parking configuration will impact the amount of space available for vehicle travel.

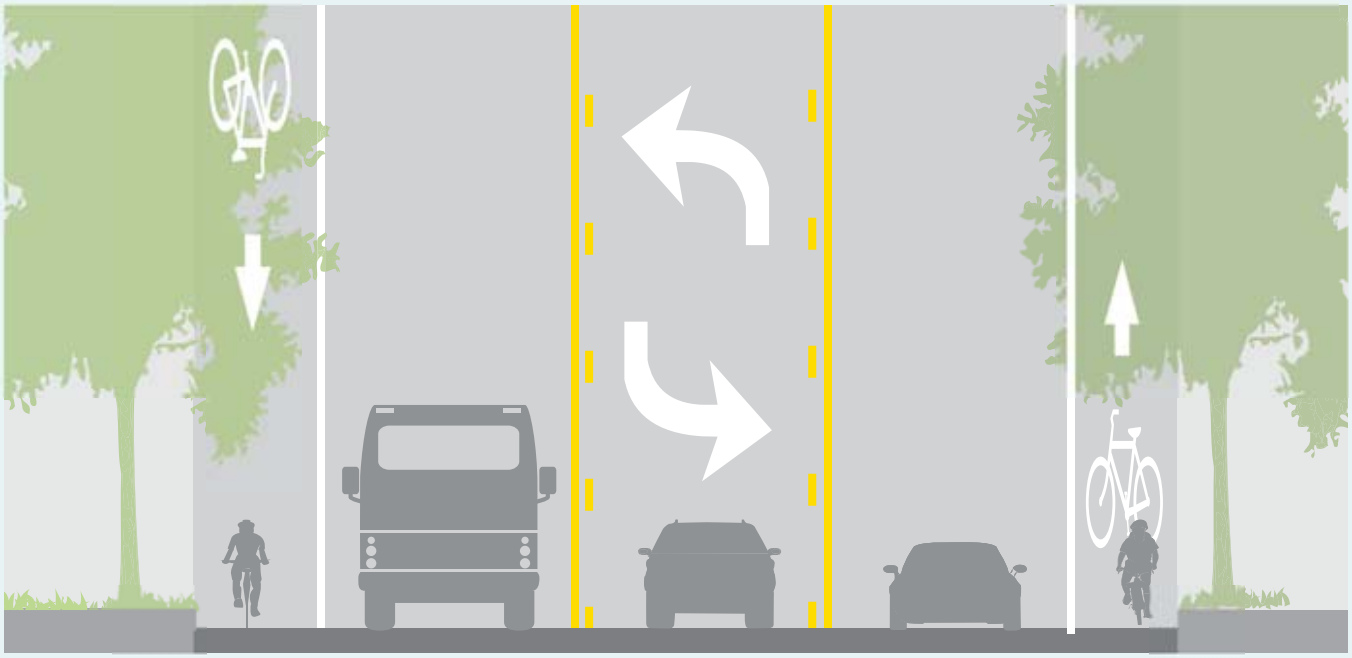
Lane Width and Lane Reconfiguration

Wide roadways configured with multiple or wide travel lanes may offer the potential for lane reconfiguration. Travel lanes may be narrowed or reconfigured to add On-Street Parking, widen Sidewalks or add on-street bikeways such as Bike Lanes or Cycle Tracks. One retrofit example is to adapt a 4-lane undivided roadway to a 3-lane roadway with a continuous two-way center turn lane. This type of reconfiguration could be considered on streets with 20,000 vehicles/day or fewer.

Before - 4 Lanes Undivided



After - 3 Lanes with Bike Lanes



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4.1.2 Design Speed

Description

Travel speeds of roadways significantly impact the safety and efficiency of a roadway. Roadways in **Street Oriented** land use areas should be designed for slower, pedestrian-compatible motor vehicle travel speeds as a response to higher levels of pedestrian activity.

The placement and location of furnishings in pedestrian oriented environments may be dependent on roadway speed.

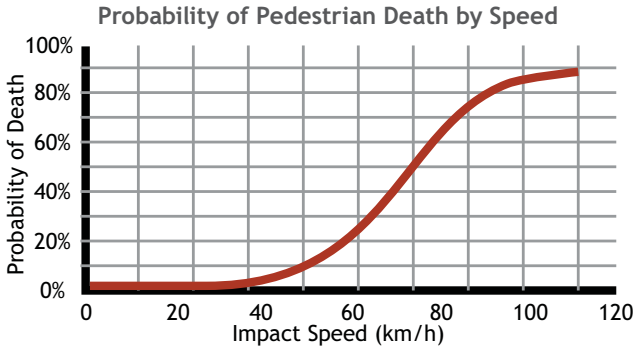
Mitigating the Impacts of High-Speed Design

Pedestrians and bicyclists are likely to be found on all streets, even in **Non-Street Oriented** land use context where higher speeds are common. Consider ways to mitigate the negative impacts of high-speed design on these users:

- Pedestrians will benefit from increased ***Sidewalk*** buffer widths, and safe convenient crossing opportunities.
- Bicyclists often benefit from increased facility width and/or physically protected ***Cycle Track*** bikeways.

Travel Speed and Pedestrian Safety

Traffic speeds have been proven to impact survival rates in the event of a collision involving a motor vehicle and a pedestrian. This figure summarizes data from three separate collision studies undertaken over the last 30 years. The data from each study shows that above 50km/h the probability of death increases rapidly. Further, the researchers examining these studies noted that "(a)lthough the risks of pedestrians being killed at 50km/h is relatively low, approximately half of pedestrian fatalities occur at this impact speed or below" (Richards 2010).



Suggested Roadway Speed Limits

Under ideal circumstances, a unified speed should be used to guide the design, operation and regulatory aspects of Complete Streets. Design speed should equal the speed limit.

Suggested Roadway Speed Limits (km/h)

	Residential		Commercial/Mixed Use		Industrial		Major Public Spaces and Institutions	
	Street Oriented	Non-Street Oriented	Street Oriented	Non-Street Oriented	Street Oriented	Non-Street Oriented	Street Oriented	Non-Street Oriented
Arterial	50	50-70	50-60	50-70	50-60	50-70	50-60	50-70
Collector	40-50	40-50	50	50	50	50	50	50
Local*	30-50	30-50	50	50	50	50	50	50

*City of Edmonton Policy C566 allows the consideration of 40 km/h speed limits on residential local or collector streets under certain conditions.

Snow Removal and Maintenance Considerations

If traffic calming is used to manage travel speeds, implement these features with snowplow friendly designs for horizontal and vertical deflection, such as appropriately designed curb extensions or sinusoidal profile speed humps.

References

Geometric Design Guide for Canadian Roads, Transportation Association of Canada, 1999.

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Publication No. RP-036A. Institute of Transportation Engineers, 2010.

Richards, D. (2010) Relationship between speed and risk of fatal injury: pedestrians and car occupants. Road Safety Web Publication, No 16, Transport Research Laboratory

4.1.3 On-Street Vehicle Parking

Description

On-street parking is an important part of roadways adjacent to **Street Oriented** land uses. On-street parking can calm roadway travel speeds, provide direct access to businesses and residences, and reduce the demand for off-street parking provision.

On-street parking also acts as a buffer to protect pedestrians and bicyclists on cycle tracks (if present) from moving motor vehicle traffic.

Application Context: Land Use, Street Type and Orientation

On-street parking should be considered for the following land uses:

- **Street Oriented Commercial**
- **Street Oriented Public Institutions**

On-street parking is recommended where possible on all other **Street Oriented** land use categories.

Best on Roadways with:

- **Street Oriented** land uses.
- Locations where a buffer between moving cars and people on foot is desired, for example near schools and parks where children are present.

Other Considerations

In constrained roadway conditions, such as when adding ***Bike Lanes*** to an existing street, it may not be possible to maintain on-street parking on both sides of the roadway. In these conditions, the roadway designer should consider the following options in order of preference:

- Reduce the width or number of travel lanes
- Pursue cross-section modifications to reallocate space
- Provide parking on only one side of the roadway
- Reduce the size of the ***Sidewalk*** frontage zone within acceptable dimensions
- Consider acquiring land

Additional Benefits

Parking lanes provide an opportunity to serve other uses, such as space for ***Curb Extensions*** or on-street bicycle parking.

Design Details and Dimensions[1]

The standard dimension of on-street parking lanes is 2.5 m (2.4 m in constrained locations). Wider parking lanes may be considered on high speed roadways, streets with on-street goods loading zones, or **Transit Network** streets where buses pull into the parking lane for passenger boarding.

On **Bike Network** streets, TAC standard parking lanes width is 2.5 m and defined with markings to encourage parking as close to the curb as possible.

On **Local** streets parking lanes are not marked, and on 9 m roadways, they may be measured as 2.2 m wide.

Single Side Parking

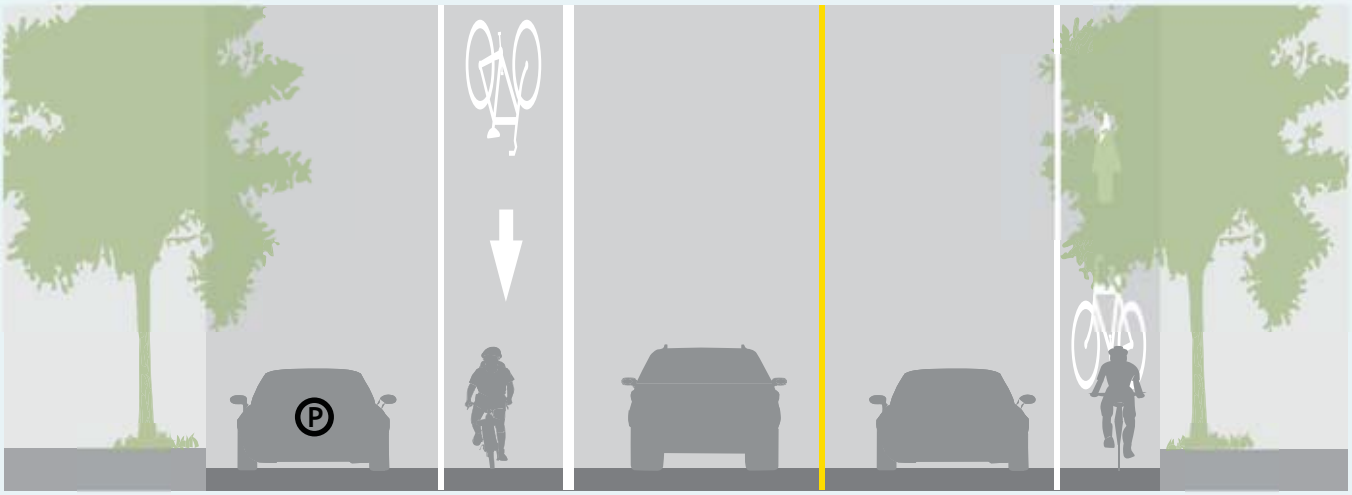
If the provision of parking is only possible on one side of the roadway, preference should generally be given to the side with the following types of conditions:

- High density of storefronts
- Schools
- Places of worship
- Fewer driveways
- Fewer fire hydrant access points

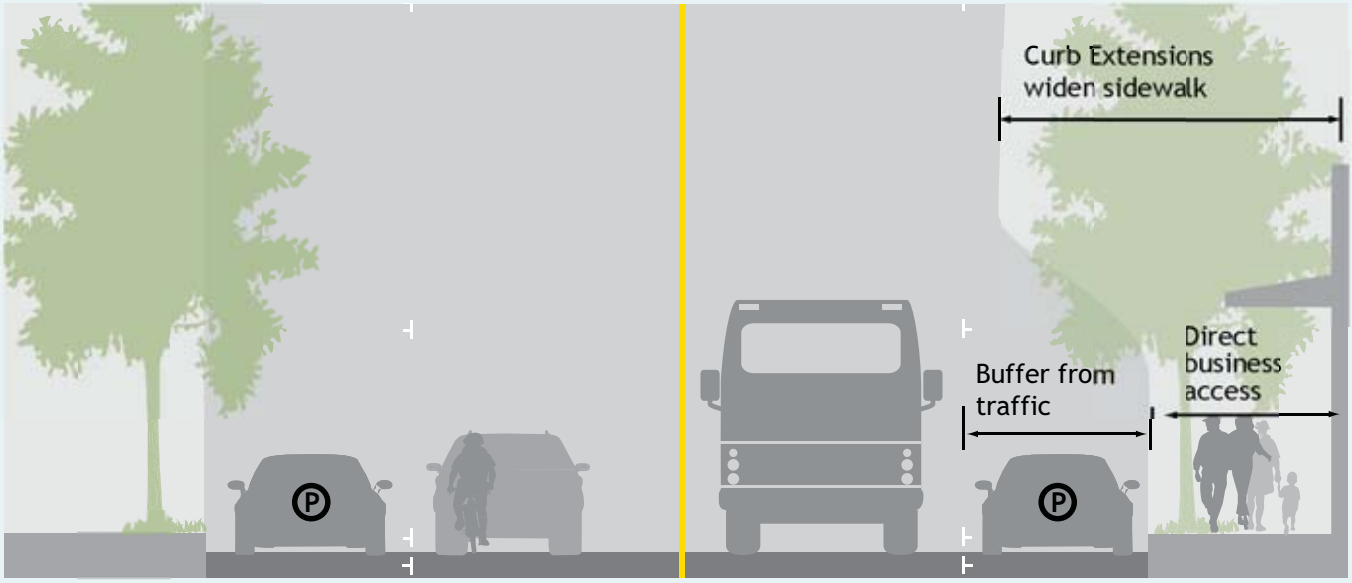
Consider increased ***Sidewalk*** furnishing zone width on the side without parking to improve conditions for pedestrians on that side.

1 All dimensions for outside travel lanes are measured from the lip of gutter, and exclude the gutter adjacent to the curb (typically 0.25 m).

Bike Lanes and Parking in Constrained Conditions



Benefits of On-Street Parking



Snow Removal and Maintenance Considerations

On street parking can create complications for routine snow plow operations during snow events if vehicles are not removed from the parking lane. Seasonal parking bans or snow event parking bans may minimize such problems.

References

Geometric Design Guide for Canadian Roads, Transportation Association of Canada, 1999.

4.1.4 Speed and Volume Management Techniques

Description

Speed and volume management techniques exist to adjust the prevailing conditions of vehicle operation on streets. Most often, these elements are used on local residential streets to create more neighbourhood compatible conditions. These techniques are designed to apply to motor vehicles only. Street designers should permit the safe, comfortable passage and access of pedestrians and bicyclists.

The City of Edmonton's *Effective Engineering Measures that Address Speeding Issues on Residential Roadways in Edmonton* provides more information on selecting appropriate treatments.

Application Context: Land Use, Street Type and Orientation

- Most appropriate on **Local** streets. Particularly effective at creating conditions compatible with ***Bicycle Boulevard*** bikeways.
- Limited use on **Collector** streets.
- Inappropriate on **High Truck Volume** streets and **Arterial** streets.

It is highly recommended that the system wide impacts be assessed. This includes impacts to the surrounding area and the impacts along the length of the corridor. Application of these techniques should always consider potential impacts to transit and emergency response vehicles.

Volume management techniques are combined with bike priority measures on Vancouver's 10th Avenue Bikeway

Speed Management

Speed management measures have a proven effect on speed reduction by creating self-enforcing environments. The five techniques that have been identified as appropriate for Edmonton are: Speed Tables, Raised Crosswalks, Traffic Circles, Pinchpoints or Chokers, and Raised Centre Islands.

Volume Management

Volume management techniques control access into and out of streets at intersections. Common volume management techniques include:

Speed Table or Raised Crosswalk

Right-In Right Out

Neighbourhood Traffic Circle

Partial Closure

Pinchpoints or Chokers

Diagonal Diverter

Raised Centre Island

Median Diverter

Snow Removal and Maintenance Considerations

Horizontal and vertical deflection measures may affect snow removal and street sweeping activities but are not incompatible. Application of these techniques should always consider impacts to snow and ice control.

References

Canadian Guide to Neighbourhood Traffic Calming. Transportation Association of Canada and Canadian Institute of Transportation Engineers. 1999.

Effective Engineering Measures that Address Speeding Issues on Residential Roadways in Edmonton. City of Edmonton Office of Traffic Safety.

4.1.5 Landscape Amenities

Description

Street trees are a fundamental element for designing complete streets. Street trees make a quantifiable contribution to the liveability of our city. In addition to their aesthetic and environmental value, street trees can slow traffic and improve safety for pedestrians. Trees add visual interest to streets and narrow the street's visual corridor. The city of Edmonton currently has over 173,000 trees within our roadway right of way. This makes up 54% of the City's publicly owned trees. Continuing to provide street trees in boulevards and medians could play a role in achieving the Urban Forest Management Plan's goal of doubling our tree canopy to a coverage of 20%.

Application Context: Land Use, Street Type and Orientation

Landscape amenities are preferred on all streets everywhere, and are most beneficial on all types of streets in **Street Oriented** land uses.

The speed reduction effect of landscaping is particularly beneficial for the transportation objectives of ***Bicycle Boulevard*** streets.

Tree Planting Approval

Approval is necessary to ensure that trees planted on City property are the right species in the right location and spaced appropriately apart for future maintenance. Approval is also required to ensure that the planting location is free of underground utilities and is not in an area designated for future municipal development, i.e. utility installation, road widening, etc.

Benefits of Street Trees

- Improves air quality by filtering dust and absorbing ozone, carbon monoxide, sulphur dioxide, nitrogen oxides, airborne ammonia and heavy metals. Edmonton's forest removed 531 tonnes of pollutants in 2009 alone.
- Reduces stress of people who travel along street lined corridors.
- Manages the speed of traffic.
- Trees in furnishing zones and along roadways provide shade to people along the roadway.
- Reduces damage from storm water runoff by absorbing rainfall or delaying its flow into drainage areas.

Retrofitting Streets with Mature Street Trees

When retrofitting streets with sidewalks or other Complete Streets elements it is important to preserve existing street trees.

- ***Curb Extensions*** may be used to expand the landscaped area around mature trees.
- Narrowing the through zone of the sidewalk to wrap around large mature trees.

Constrained Conditions

If furnishing or frontage zones are too narrow, if sidewalks are adjacent to curbs, or if ordinances and setback requirements eliminate trees from the furnishing or frontage zones, street trees could be planted outside the established street right-of-way on private property in accordance with acquired easements. Narrow furnishing zones may accommodate plantings/shrubs as an alternative to street trees.

Design Details and Dimensions

Trees require adequate area for healthy growth:

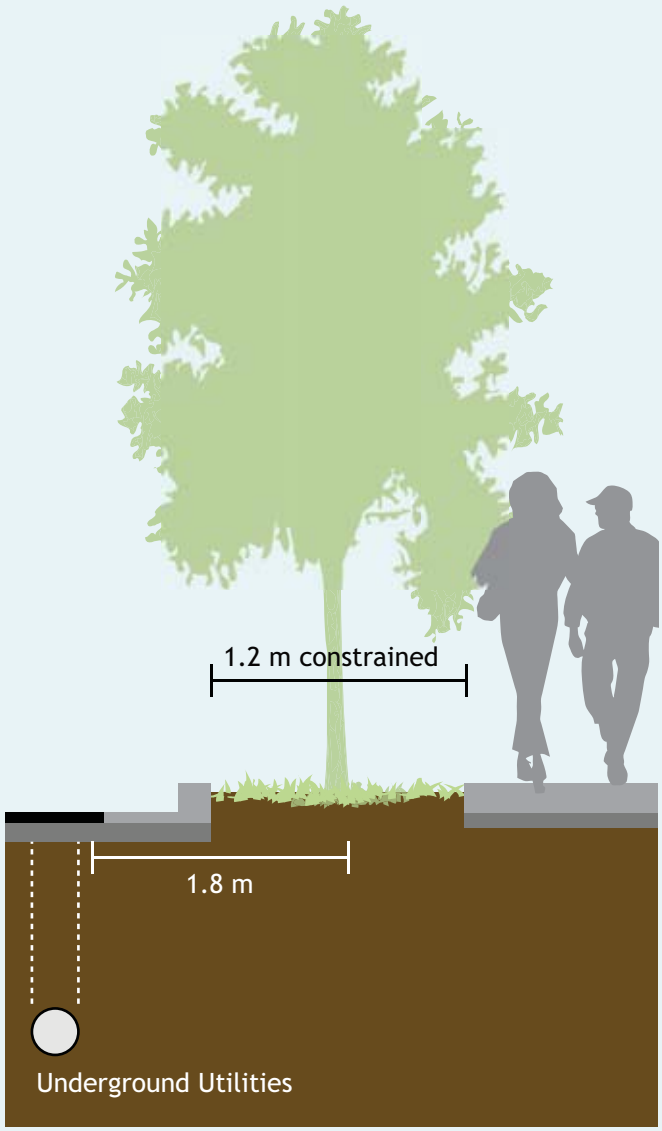
- 2.0 m standard width furnishing zone (1.2 m constrained).
- Furnishing zones narrower than 1.2 m may accommodate plantings/shrubs.
- No underground utilities closer than 1.2 m.
- Tree spacing varies from 6.0 m to 13.5 m depending on species. Consult the City to identify site-appropriate species.

- Do not compromise adequate roadway or intersection sightlines when considering trees or landscaping features.

Setback from other streetscape elements (in metres):

• Distance from corner	7.5
• Distance from light poles	3.5
• Distance from fire hydrants	3.5
• Distance from Stop or Yield signs	3.5
• Distance from bus stops	3.5
• Distance from signs	2.0
• Distance from driveway	2.0
• Distance from deep underground utilities	1.8

Street Tree Placement Dimensions



Snow Removal and Maintenance Considerations

The City of Edmonton has high standards for the protection of trees during construction activities. During neighbourhood renewal, mature street trees are to be protected to the highest degree possible.

References

Urban Forest Management Plan. City of Edmonton. 2012.

Corporate Tree Management Policy #C456A. City of Edmonton. April 2010.

Low Impact Development Best Management Practices Design Guide. City of Edmonton. 2011.

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4.1.6 Utilities

Description

The required locations of the utilities and the required clearances in many cases are what dictate the placement of many of the other roadway elements in the cross section. Utilities include sewer, water, gas and telecommunications for traffic signals, street lights and cable. Properties need to be sufficiently and adequately serviced and many of the requirements such as clearances are provincially and federally mandated and must be accounted for.

Application Context: Land Use, Street Type and Orientation

Utilities are provided on the majority of streets, regardless of street type and orientation.

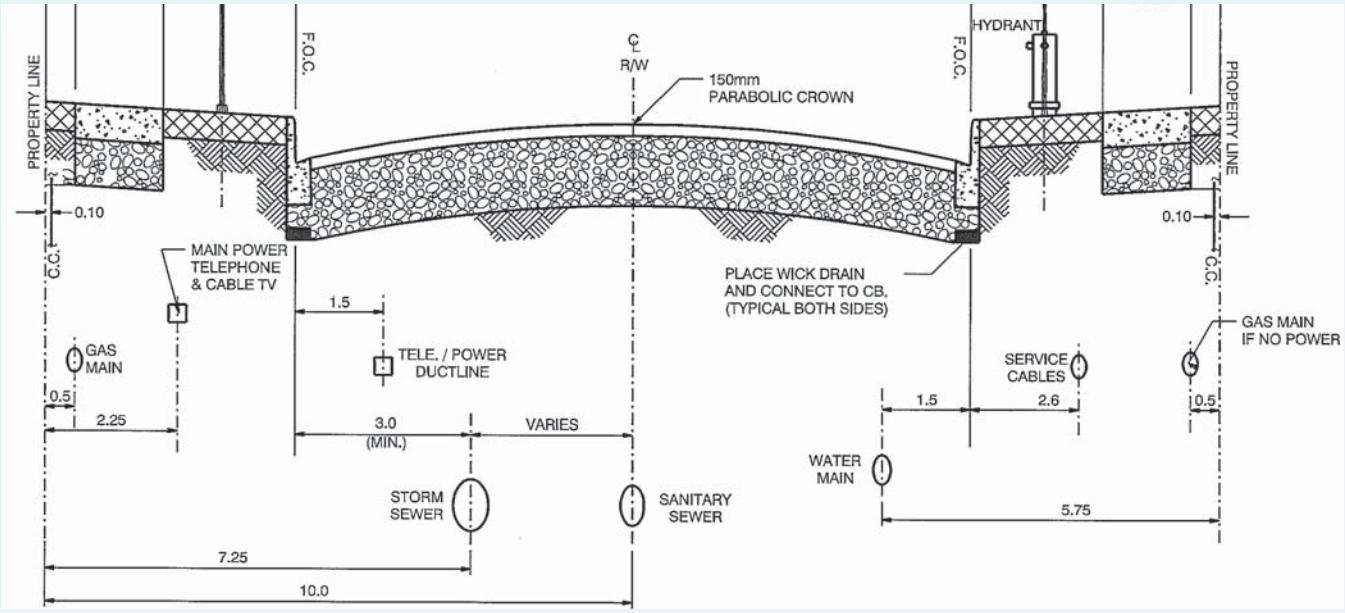
Design Details

- Sewer (Storm/Sanitary) to water must have a minimum of 2.5 m horizontal separation as mandated by provincial standards.
- Hydrants must be 1.5 m to face of curb for separate walks and 3 m to face of curb for mono walks and may require a larger furnishing zone.
- Trees must maintain a minimum of 1.8 m horizontal clearance to deep utilities and services.
- Trees must maintain a minimum of 3.5 m horizontal clearance to hydrants.
- Shallow utilities (street lighting, power, and distribution gas) must maintain 1.8 m to all deep utilities
- Locate utilities so that manholes are away from wheel paths and travel areas for pedestrians and bicyclists.

Costs

When evaluating this element, costs for the utility operations and maintenance costs will be considered as these can be a major factor in the overall costs of the rights-of-way maintenance

Typical Utility Locations



Snow Removal and Maintenance Considerations

Often, maintenance of utilities can require the road surface to be reconstructed.

References

Roadways – Design Standards Construction Specifications. City of Edmonton, 2011.

4.2 Pedestrians

4.2.1 Sidewalks

Description

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from motorized traffic. Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb and usually a landscaped planting strip area.

Sidewalk Provision

Wherever possible, sidewalks should be included on both sides of all street and land use types. Every effort should be made to add sidewalks where they do not exist and complete missing links.

Sidewalks are allowed on one side, to the discretion of the City, on roadways:

- Where there is front drive access on at least one side of the roadway and on streets that are 400 m away from a major pedestrian generator. Pedestrian generators may include: schools, district park sites, neighbourhood commercial sites, and transit centres.
- Short cul-de-sacs may not be required to have any sidewalk at all, or may require sidewalk on one side.[1]

Sidewalks are desirable on both sides of the roadway in the following land use and street types:[2]

- **Residential**
- **Major Public Spaces and Institutions**
- **Transit Network**
- **Street Oriented**

Landscaping Accommodation

Furnishing zones should be 2.0 m to accommodate trees, but may need to be wider depending on the species. Furnishing zones narrower than 1.2 m may accommodate plantings/shrubs.

Boulevard Sidewalk Design

Boulevard sidewalks are preferred. Furnishing zones may be planted as a landscaped boulevard, or paved as a hardscape design with tree wells to maximize the pedestrian through area.

Monowalk Sidewalk Design

Monowalk sidewalk designs lack a defined furnishing zone. Monowalk sidewalks are acceptable in certain applications but it is the designer's responsibility to justify to the City why monowalk is preferred.

1 See Drawing 3540 of the Roadways Design and Construction Standards for more detailed information.

2 Where sidewalks on both sides of the street are impractical or unwarranted, the street designer should seek approval from the City.

Standard Dimensions (metres)

Sidewalk Zone	Residential	Other Street Oriented	Other Non-Street Oriented
Frontage Zone	0.5	0.8	0.5
Through Zone	1.5	≥ 1.8	1.5
Furnishing Zone	≥ 1.2	≥ 1.2	≥ 1.5

Wider than standard through zone dimensions should always be considered in Street Oriented land use areas.

Dimensions under Constrained Conditions (metres)[1]

Sidewalk Zone	Residential	Other Street Oriented	Other Non-Street Oriented
Frontage Zone	0.3	0.6	0.3
Through Zone	1.5	1.5	1.5
Furnishing Zone [2]	0.9	0.9	0.9

Sidewalk Zones

Snow Removal and Maintenance Considerations

The sidewalk should be designed to accommodate a normal level of snow storage without blocking the pedestrian through zone. Preferred snow storage location is within a wide furnishing zone. The City clears snow from sidewalks adjacent to city owned land within 48 hours to meet the requirement of Community Standards Bylaw #14600. It is the property owner's responsibility to do the same at sidewalks adjacent to private property.

References

Geometric Design Guide for Canadian Roads, Transportation Association of Canada, 1999.

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Publication No. RP-036A. Institute of Transportation Engineers, 2010.

1 Based on recommended dimensions from *Designing Walkable Urban Thoroughfares: A Context Sensitive Approach*. Publication No. RP-036A. Institute of Transportation Engineers. 2010.

2 0.9 m furnishing zones may preclude tree plantings, increase to 1.2 m to provide minimum space for street trees. Confirm final design with the Community Services Department.

4.2.2 Curb Extension

Description

Curb extensions or bulb-outs extend the line of the curb into the roadway, reducing the width of the street crossing for pedestrians, increasing the visibility of the pedestrians to motorists, providing additional space for pedestrian queuing and permitting buses to stop in the travel lane when passengers are boarding and alighting.

Curb extensions may be used in retrofit situations to calm traffic on oversized roads. Consider the impact to underground utilities and how these are accessed.

Application Context: Land Use, Street Type and Orientation

Curb extensions are eligible for use on all streets with 24 hour ***On-Street Parking*** lanes, and are most appropriate on:

- All **Street Oriented** land uses.
- On arterials and collector crossings along ***Bicycle Boulevard*** streets.
- At bus stops on high frequency **Transit Network** streets.
- In **TOD Areas**

Best at Locations:

- On-street parking.
- Corners with marked pedestrian crosswalks in retail districts, directly adjacent to schools, at intersections with demonstrated pedestrian safety issues, on wide streets, or in areas of high foot traffic.
- School crosswalks.
- Mid-block crossings with zebra crossing markings.
- Feasibility of curb extensions should be evaluated based on engineer review of design vehicle turning movements and vehicle turning volumes.

Retrofit Considerations

- May impact on-street bicycle facilities and efforts should be made to avoid encroaching into bike lanes.
- May impact street drainage or require catch basin relocation.
- May require loss of curbside parking.
- May complicate delivery access and garbage removal.
- May impact snow plows and street sweepers.
- May impact transit operations.

Design Details and Dimensions

Corner radii should be minimized whenever possible to reduce speeds of turning vehicles. A radius of 4.5 m will allow street cleaning vehicles to turn all inside and outside corners of curb extensions.

- Curb extensions occupy the area of the parking lane and are typically 2.2 m x 6.0 m (min).
- Curb extensions require a 0.6 m offset, also known as horizontal clearance, from moving vehicles.

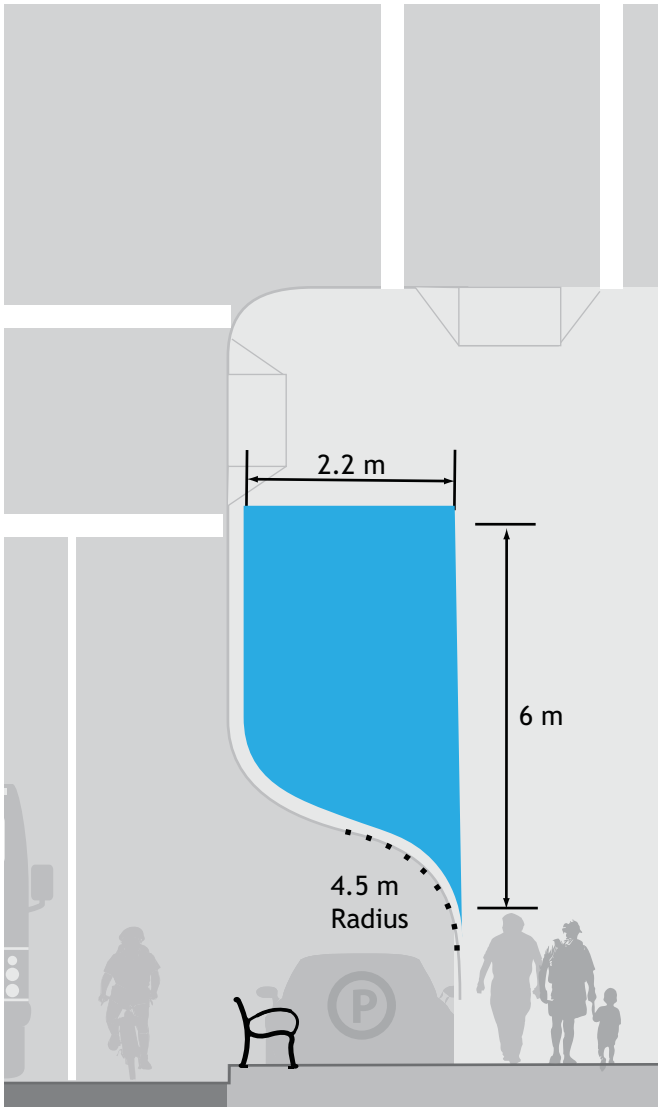
When space permits, curb extensions can be lengthened to provide additional space for pedestrian and bicyclist amenities such as lighting, benches, and bike parking, or planting/stormwater management areas.

Curb extensions should not encroach into adjacent bike lanes or travel lanes, as they may negatively impact traffic, goods and emergency vehicle operations. A special type of curb extension that extends into travel lanes is a ***Speed Management*** technique.

Bus Stop Curb Extension

Always maintain adequate pedestrian crossing sightlines when implementing bus stop curb extensions. Near-side installations of bus stop curb extensions may be most appropriate to ensure visibility of crossing pedestrians.

Typical Curb Extension



Snow Removal and Maintenance Considerations

Design curb extension radius dimensions for compatibility with snow removal vehicle turning ability.

References

Pedestrian Crossing Control Manual. Transportation Association of Canada. 1998.

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Publication No. RP-036A. Institute of Transportation Engineers. 2010.

Transit Oriented Development Guidelines. City of Edmonton. February 2012.

4.2.3 Streetscape Amenities

Street Furniture and Amenities

The furnishing zone is used to store functional street furniture, such as signal boxes, street lights, fire hydrants, and utility poles, while providing road and pedestrian shade, water retention, filtering, urban design improvements, beautification and creating gathering places.

It can also be used to store pedestrian-oriented items that enhance the walking environment such as pedestrian lighting, hanging baskets, benches, waste receptacles, art sculptures, bike racks, banners, and wayfinding signage. Pedestrian benches and seating areas could be provided that are safe and appealing. Through the use of vegetation and decorative paving the perception of privacy can be given to the seating area.

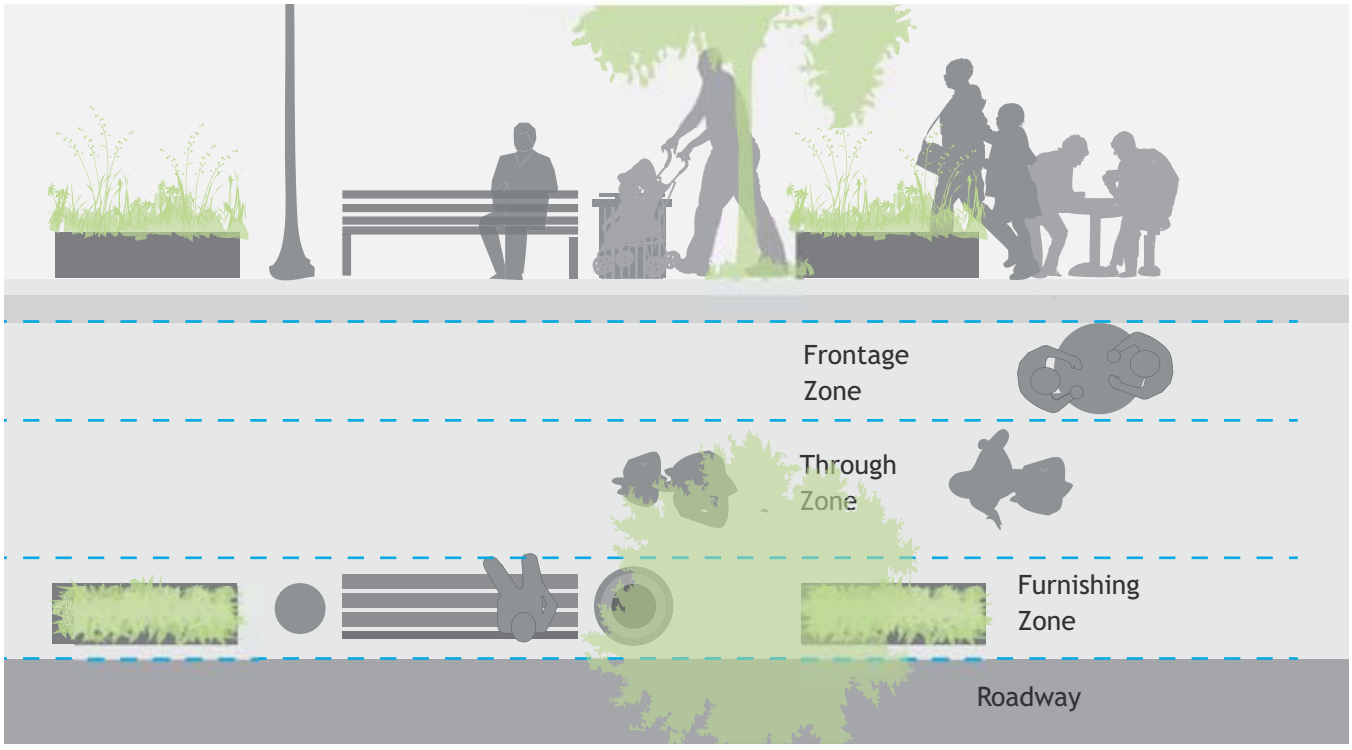
Best at Locations:

- In **TOD** Areas
- With **Street Oriented** land uses

Design Details and Dimensions

Pedestrian-oriented street furniture includes newspaper kiosks, drinking fountains, trash receptacles, public art, bike parking and street cafes.

- Benches should be approximately 0.5 m tall to accommodate elderly pedestrians comfortably.
- If alongside a parking zone, place furniture to minimize interference with opening doors.
- Where street trees cannot be provided due to lack of space or conflicts with utilities, vegetation should be provided in the form of shrubs, potted trees and raised planters.



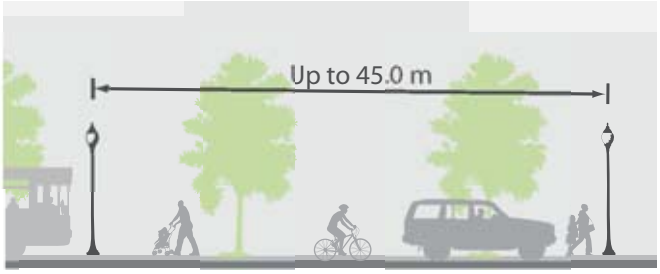
References

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Publication No. RP-036A. Institute of Transportation Engineers. 2010.

Pedestrian Oriented Lighting

Pedestrian-scale lighting improves visibility for both pedestrians and motorists - particularly at intersections and in areas of high pedestrian activity.

Pedestrian scale lighting is characterized by shorter light poles (standards about 5.0 m high), closer spacing of standards, lower levels of illumination (except at crossings), and the use of LED lamps to produce better colour rendition, long service life and high energy efficiency.



Best at Locations:

- In **TOD** Areas
- With **Street Oriented** land uses

Design Details and Dimensions

- Typical placement spacing should consider the context of the area for pedestrians. The Light Efficient Community Policy (expected in 2013) will specify different pedestrian lighting requirements for the different context areas.
- Spacing should provide minimum illumination levels, while limiting excess light pollution.
- Luminaries with no uplight (U0) should be used.
- Lighting poles should be installed in the furniture zone of the sidewalk corridor.

Both street and pedestrian lighting levels should be considered, especially in areas with tree canopy. “Dark Sky” lighting should be considered to reduce light pollution within residential districts, but should not interfere with street ambiance, particularly in street-oriented commercial areas.

References

Transit Oriented Development Guidelines. City of Edmonton. 2012.

Wildlife Passages Engineering Design Guidelines. City of Edmonton. June 2010.

Surface Materials

While sidewalk surfaces should be smooth and free of debris and obstacles, the choice of sidewalk construction materials provides an opportunity to enhance the visual aesthetics and experience for pedestrians.

Always consider the impacts of decorative paving on the mobility challenged and visually impaired. Slippery materials or uneven surfaces should never be used in the pedestrian through zone of a sidewalk.

Best at Locations:

- In **TOD** Areas
- With **Commercial** or **Mixed Use Street Oriented** land uses

Design Details and Dimensions

For most sidewalks, concrete offers the most effective travel service. Decorative scoring patterns may be laid into concrete as a simple way to add visual interest to the walkway.

Decorative materials, such as permeable pavers may be desired in:

- The sidewalk furnishing zone.
- Curbside parking lane.
- To separate a sidewalk from an adjacent bikeway such as a cycle track.

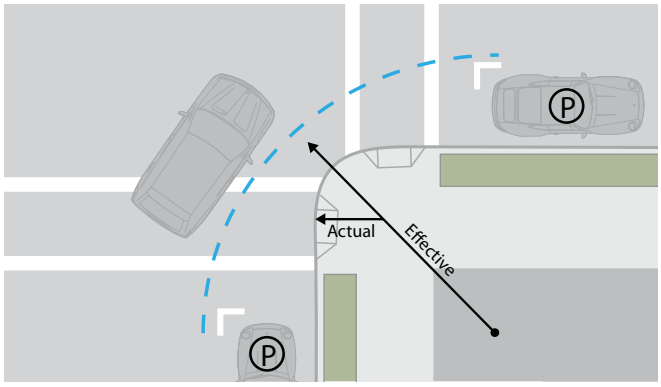
References

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Publication No. RP-036A. Institute of Transportation Engineers. 2010.

4.2.4 Pedestrians at Intersections

Corner Radii

In general, the smaller the curb radius, the better for pedestrians. In comparison to a large curb radius, a tight curb radius provides more pedestrian area at the corner, allows more flexibility in the placement of curb ramps, results in a shorter crosswalk, and requires vehicles to slow more as they turn the corner.



Best at Locations:

- In **TOD** Areas
- Streets with low volumes of truck traffic

Design Details and Dimensions

Several factors govern the choice of curb radius in any given location. These include:

- Traffic turning movements.
- The turning radius of the design vehicle.
- The geometry of the intersection, the street networks.
- The presence of a parking or a bike lane (or both) between the travel lane and the curb.

The presence of a lane for parking or bicycles creates an “effective radius” that allows the designer to choose a radius for the corner that is smaller than the turning radius required by the design vehicle.

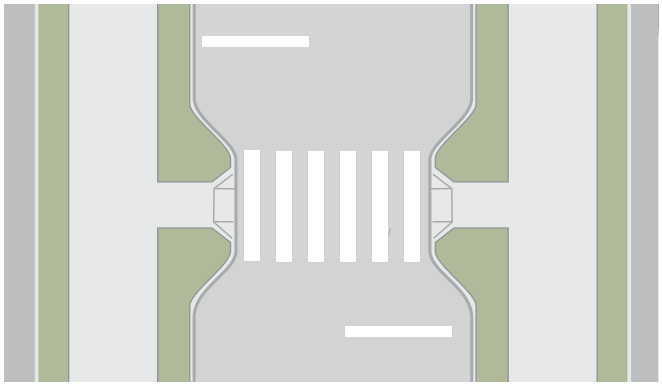
References

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Institute of Transportation Engineers. 2010.

Pedestrian Crossings

All intersections are legal crossing points, regardless of whether there is signage, pavement markings or active devices indicating a crosswalk, unless the crossing is specifically banned. Motorists should therefore expect to encounter pedestrians at every intersection. Pedestrian controls indicate to motorists a higher-than-typical level of pedestrian activity, and encourage pedestrians to cross at designated locations. Pedestrians must still exercise due caution and care when crossing any roadway.

An objective evaluation process is used to determine the appropriate level of pedestrian control at crossing points, in accordance with current guidelines.



Considerations include:

- Pedestrian activity and vehicle volumes
- Roadway width, vehicle speeds
- Sightline restrictions
- The distance to the nearest alternative crossing

Construction of crossing locations should be considered at:

- Mid-block shared-use path connections
- Right-turn cut-offs
- Other mid-block locations where appropriate desire lines exist

References

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Institute of Transportation Engineers. 2010.

Pedestrian Signal Timing

Signalized crossings in areas of high pedestrian use or street orientated areas should consider providing a pedestrian crossing phase during every signal cycle.

Design Details and Dimensions

To service pedestrians and promote user compliance, consider the following signal timing characteristics:

- Provide more frequent crossing opportunities.
- Longer walk intervals provide time to cross and accommodate slower walking speeds.
- Provide quick response to push button actuation or feedback to pedestrians.
- If implementing pushbuttons in areas with high levels of pedestrian activity consider operating the signal with a regular pedestrian phase when reasonable.

Intersections need to be evaluated on case by case basis and provision of a pedestrian phase during each cycle may or may not be practical depending on other road user priorities and context of the location.

References

Pedestrian Crossing Control Manual. TAC. 1998.

NCHRP. Accessible Pedestrian Signals. 2011.

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4.3 Bike Network Streets

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4.3.1 Bicycle Facility Selection

Description

Selecting the best bikeway facility type for a given roadway can be challenging due to the range of factors that influence bicycle users' comfort and safety. There is a significant impact on cycling comfort when the speed differential between bicyclists and motor vehicle traffic is high and motor vehicle traffic volumes are high. As a starting point to identify a preferred facility, the tables below can be used to determine the recommended type of bikeway to be provided given a roadway type.

User Types

It is important to consider bicyclists of all skill levels when creating a non-motorized plan or project. An understanding of bicyclist skill and interest is illustrated below. The definitions have been developed and supported by data collected nationally, and the findings were based on survey responses in Edmonton. This classification defines four user type categories to address varying attitudes towards bicycling in North America:

- Strong & Fearless: Will ride a bicycle regardless of roadway conditions and the bicycle facilities provided. Riding a bike is a strong part of their identity.
- Enthused & Confident: Are comfortable sharing the roadway with vehicles but prefer to do so on their own facilities and have been attracted to cycling by improvements to the bicycle infrastructure.
- Interested But Concerned: Are curious about cycling, like to ride a bicycle for recreation or for other reasons, and may have fond memories of cycling as a child but are afraid to ride and therefore do not ride regularly. They are afraid to ride with vehicles that are operating at high speeds but would ride if they felt safer on the roadways.
- No Way / No How: Are not going to ride a bicycle for reasons of topography, inability, or simply a lack of interest.

Edmonton's goal is to design bicycle facilities to target the user group "interested but concerned" as well as families, to serve the largest proportion of Edmonton's bicyclists and to attract more users to the facility.

Other Factors

Other factors beyond roadway type affect facility selection, including traffic mix of automobiles and heavy vehicles, roadway grade, the presence of on-street parking, intersection density, surrounding land use, and roadway right-of-way and roadway sight distance.

These factors are not included in the tables below, but should always be a consideration in the facility selection and design process.

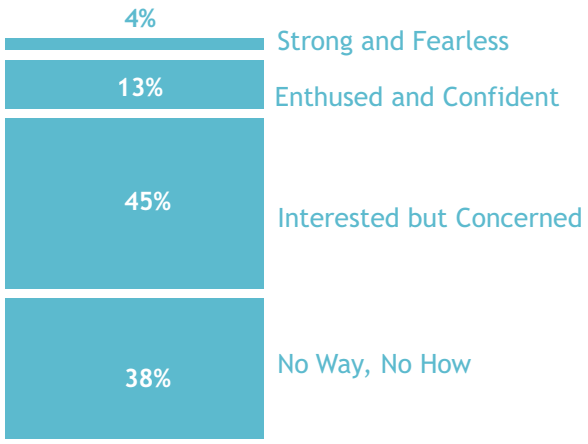
Non-Bike Network Facility Selection Guidance

Street Type	Potential Bicycle Facility
Local	Not Required
Collector	No Facility; Shared Lane Markings; Bike Lanes; Buffered Bike Lanes
Arterial	Wide Curb Lane; Shared Use Path with Wide Curb Lane

Bike Network Facility Selection Guidance

Street Type	Potential Bicycle Facility
Local	Bicycle Boulevard; Shared Lane Markings; Bike Lanes
Collector	Shared Lane Markings; Bike Lanes; Buffered Bike Lanes
Arterial	Bike lanes; Buffered Bike Lanes; Cycle Tracks; Shared Use Path with a Wide Curb Lane

Classification of Edmonton's Bicyclists



4.3.2 Marked Shared Use Roadway

Description

Marked shared use roadways are general purpose travel lanes marked with shared use lane markings (known as sharrows). They encourage bicycle travel and proper positioning within the lane and increase the awareness of motorists to expect bicycles along the road.

This configuration is different from a Bicycle Boulevard due to a lack of traffic calming and other enhancements designed to provide a higher level of comfort for a broad spectrum of users.

Application Context: Land Use, Street Type and Orientation

- Streets on the connector **Bike Network**.
- This facility is most likely to be installed on **Local** streets.

On roadways with steep grades (> 3%), consider pairing sharrows with a 1.8 m ***Bike Lane*** in the uphill direction to provide dedicated space for manoeuvering.

Bikeway facility selection should be based on an analysis of roadway volumes and speed and other local characteristics.

Best on Roadways with:

- < 4500 vehicles/day (Higher volumes may be acceptable for side-by-side operation.)
- < 40 km/h speed limit[1] (50 km/h maximum for in-line use, 60 km/h maximum for side-by-side.)

Other Considerations

Most appropriate when roadways are straight with few bends, inclines or sightline obstructions.

In-line operation design encourages bicyclists to occupy the entire travel lane. If this is not desired, explore ways to provide for side-by-side operation.

In all conditions, sharrows should be placed outside of the door zone of parked cars.

Design Details and Dimensions

Place within 15 m after an intersection and space longitudinally at intervals of 100 m along long blocks on curvilinear streets.[2]

Design Details for Side-by-Side Operations[3]

Side-by-side operation is only encouraged on wide outside lanes 4.0 m or greater, with a minimum of 4.2 m on **High Truck Volume** streets or **Transit Network** streets.

- Adjacent to on-street parking, minimum distance is 3.4 m from face of curb to the centre of the marking.
- Adjacent to a curb, with no on-street parking, minimum distance is 1.0 from face of curb to the centre of the marking.

Design Details for In-Line Operation

On most streets without bicycle lanes there is not enough room for bicyclists and motor vehicles to safely operate side-by-side (less than 4.0 m wide).

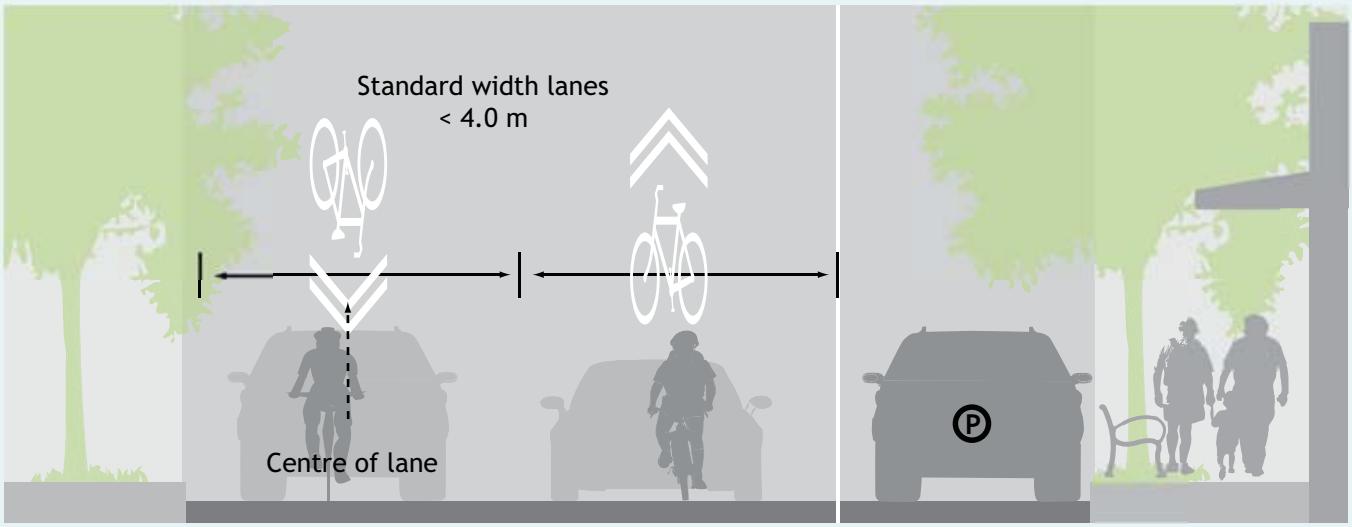
- Place sharrow in the centre of the travel lane.
- On Collector and Arterial streets, in-line sharrows are generally not appropriate for long distances.

1 TAC specifies a 50 km/h maximum speed limit for roadways with in-line sharrow application and a 60 km/h maximum speed limit for side-by-side operation.

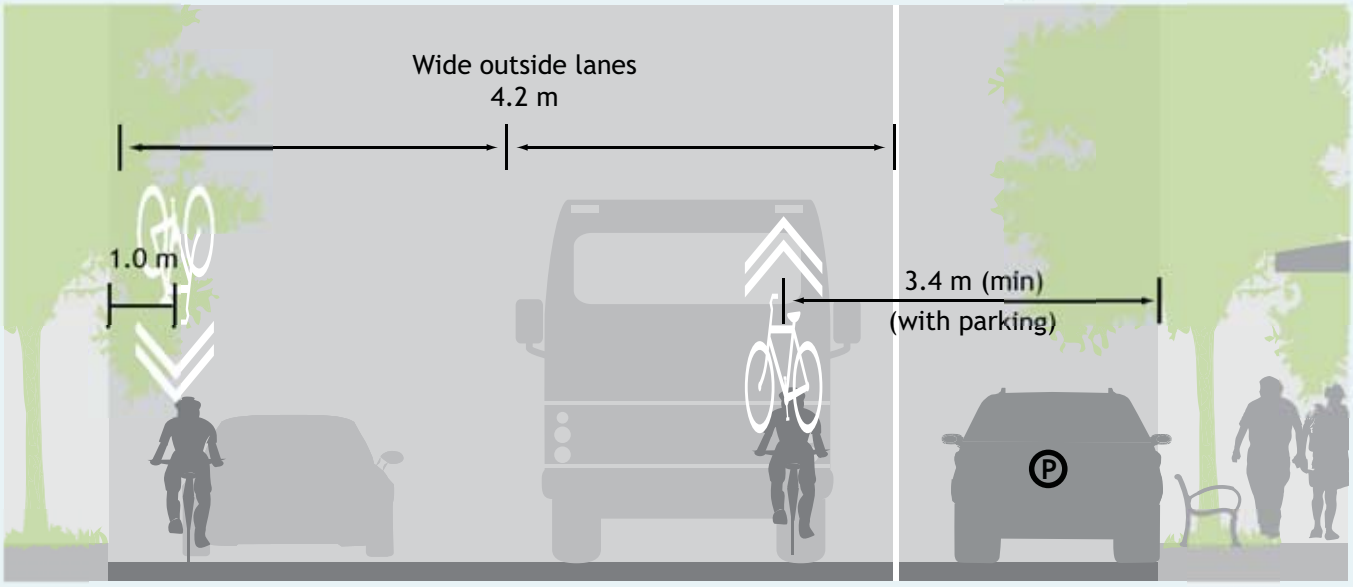
2 TAC specifies more frequent 75 m spacing, and placement 10 m before the end of the block. This may be more appropriate on collector and arterial streets.

3 All dimensions for outside travel lanes are measured from the lip of gutter, and exclude the gutter adjacent to the curb (typically 0.25 m).

Shared Use Lane Markings for In-Line travel on Regular Lanes



Shared Use Lane Markings for Side-by-Side travel on Wide Lanes



Snow Removal and Maintenance Considerations

All types of streets may be subject to snow clearing operations throughout the winter months (mid-October to mid-April). City of Edmonton practices for snow removal on bike facilities are currently being reviewed.

References

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

4.3.3 Bike Boulevards

Description

Bicycle boulevards are low-volume, low-speed streets modified to enhance conditions by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments allow through movements of bicyclists while discouraging similar through trips by non-local motorized traffic.

Application Context: Land Use, Street Type and Orientation

- Routes classified as bike boulevards on the **Bike Network**.

Bike Boulevards are most common on **Street Oriented Residential Local**, and **Street Oriented Commercial Local** streets, although they may potentially be implemented on any **Local** street, regardless of land use and form.

If speeds and volumes meet the requirements here, Bike Boulevards may also be applied on **Collector** streets.

Best on Roadways with:[1]

- < 1500 vehicles/day (3000 vehicles/day max)[2]
- ≤ 40 km/h speed limit (50 km/h max)

Bicycle Boulevard Route Placement

Use of streets where a relatively continuous route for bicyclists exists and/or where treatments can provide wayfinding and improve crossing opportunities at offset intersections.

Bicycle boulevards parallel to commercial streets improve access for "interested but concerned" bicyclists and should be used to complement separated bikeways on major streets.

Design Requirements

Route Signing/Marking

Wayfinding signs and bike boulevard pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard, assuming it meets automobile volume and speed guidelines. Together, signing and markings visibly designate a roadway to both bicyclists and motorists. Wayfinding signs may be standard network signs or may be specially branded for the bicycle boulevard network. Pavement markings may be Sharrows or a unique bicycle boulevard specific marking.

Speed Management

Maintaining motor vehicle speeds closer to those of bicyclists' greatly improves bicyclists' comfort on a street. Slower vehicular speeds also improve motorists' ability to see and react to bicyclists and minimize conflicts at driveways and other turning locations. Appropriate application of speed management techniques is necessary to create bicycle-friendly conditions.

Volume Management

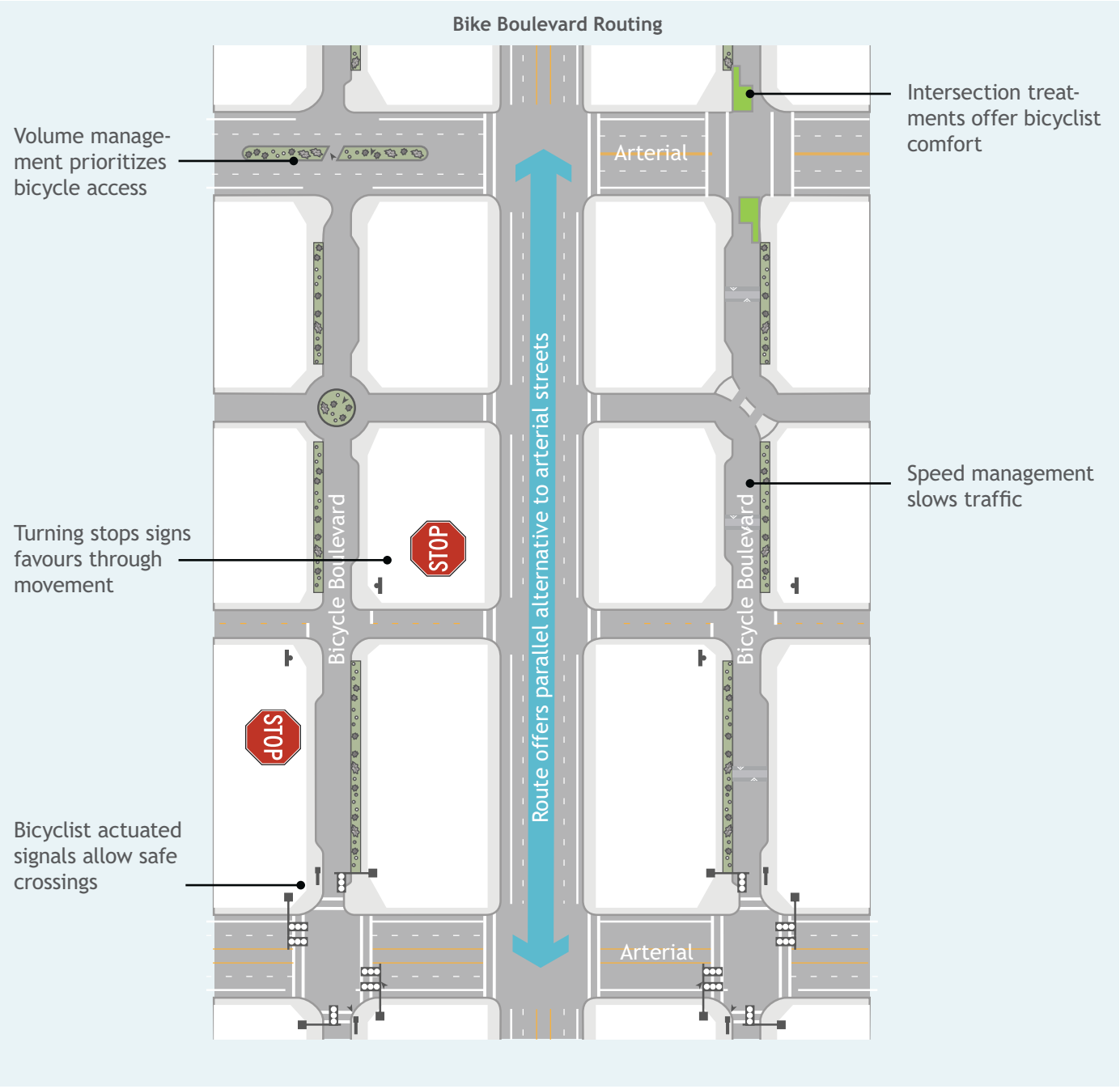
Higher vehicle volumes reduce bicyclists' comfort and can result in more frequent conflicts. Implement volume control treatments based on the context of the bicycle boulevard, using engineering judgment. Volume management techniques should be used to create bicycle friendly automobile volumes by limiting automobile through access while preserving full bicycle access.

Crossing Improvements

Bicycle boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Bicycle activated lights, pedestrian and bicycle warning beacons, and physical improvements should be implemented to increase bicyclist safety and comfort when crossing major streets. Signals should automatically detect, or be easily actuated by bicyclists without requiring people to dismount their bicycles.

1 Route selection should emphasize connecting riders with destinations and efficient, direct travel. Motor vehicle volumes and speeds should be managed through speed and volume management techniques.

2 NACTO Urban Bikeway Design Guide.



Snow Removal and Maintenance Considerations

City of Edmonton practices for snow removal on bike facilities are currently being reviewed.

References

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012. Bicycle Boulevard Planning and Design Handbook.

4.3.4 Bike Lanes

Description

Bike Lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is typically located on the right side of the street, between the adjacent travel lane and curb or parking, and is used in the same direction as motor vehicle traffic.

Application Context: Land Use, Street Type and Orientation

- City wide bike routes on the **Bike Network**
- Connector bike routes on the **Bike Network**

Bike Lanes can be used on **Arterials** and **Collectors** of any land use or building orientation type.

Bikeway facility selection should be based on an analysis of roadway volumes and speed and other local characteristics.

Best on Roadways with:

- > 3000 vehicles/day[1]
- > 40 km/h speed limit
- Frequently congested roadways

Other Considerations

- Care should be taken to avoid parked vehicles' door-zone conflicts. Consider the use of a buffered bike lane.
- Standard dimensions should be used unless the other street elements have been reduced to their constrained dimensions.
- Bike lanes should be marked with pavement markings and signs.
- Bike lanes may be painted green where needed to enhance the visibility of the bike lane, or to identify potential points of conflict.
- Utility covers and pavement joints are ideally flush with ground level and oriented to avoid conflicts with bike tires.

Impact of Truck Volumes on Bike Lane Dimensions

Truck Volume (% of total vehicles/day)	Standard Bike Lane Width (metres)
≤ 5.0%	1.5
> 5.0%	2.0

Design Details and Dimensions[2]

Bike lane dimensions are measured from the center of the bike lane line to the face of curb or parking lane.

- Standard width: 1.8 m
- Constrained width: 1.5 m
- Bike lanes of 2.1 – 3.0 m width should be configured as ***Buffered Bike Lanes***.
- In constrained conditions with low-moderate traffic volumes, a ***Marked Shared Roadway*** may be an acceptable alternative to this treatment for short distances.
- Wider than the standard width bike lanes are desirable in areas with high parking turnover, uphill travel, or areas of high bicyclist volumes where passing may be common.
- It is not ideal to have manholes in bike lanes, but this may happen in retrofit situations, on occasion.

Contra Flow Bike Lanes

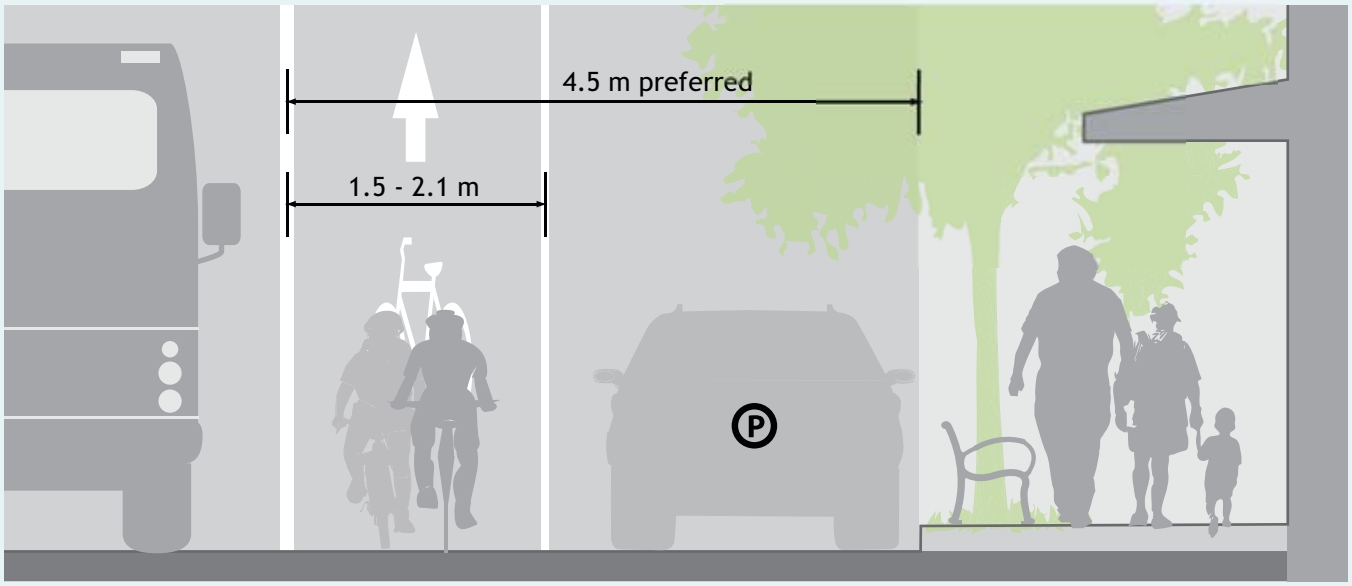
Contra-flow bicycle lanes are bicycle lanes designed to allow bicyclists to ride in the opposite direction of motor vehicle traffic.

- Standard width: 1.8 m
- Consider configuration as a ***Buffered Bike Lane*** for further separation from opposite direction traffic.

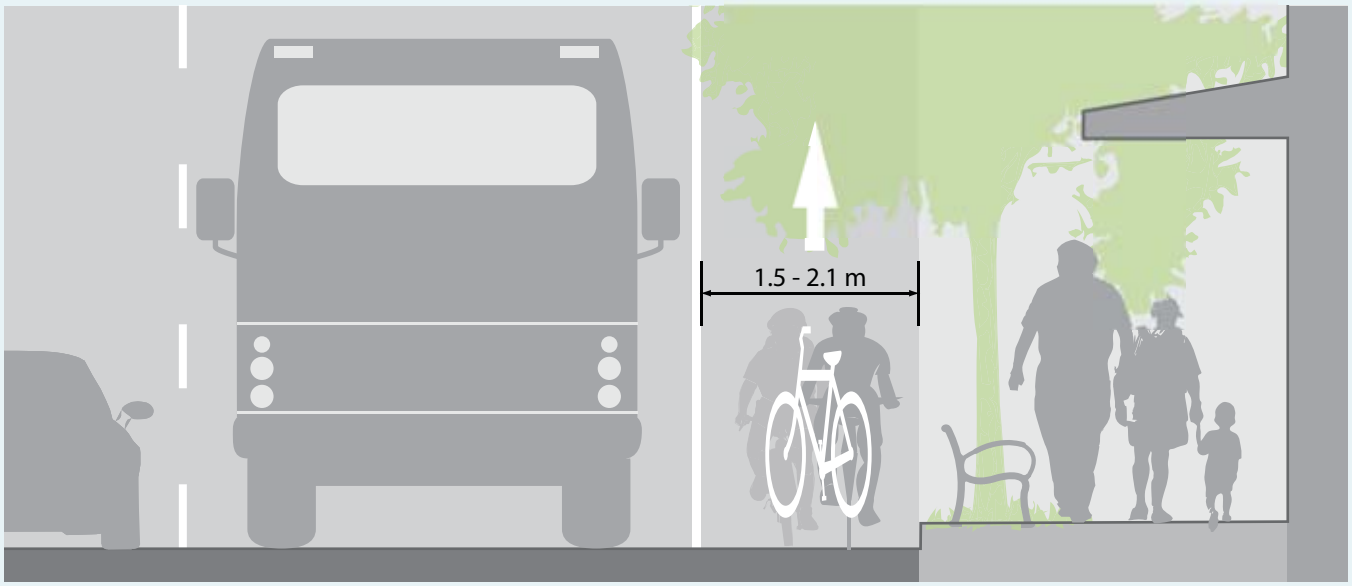
1 *London Cycling Design Standards*. Transport for London. 2005.

2 Designers should consider the impact of the lip of gutter on the surface of the bike lane. All dimensions are shall include a minimal ridable surface of 1.2 m beyond gutter longitudinal joints.

Bike Lane Adjacent to Parking



Bike Lane Adjacent to Curb



Snow Removal and Maintenance Considerations

City of Edmonton practices for snow removal on bike facilities are currently being reviewed.

References

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

4.3.5 Buffered Bike Lanes

Description

Buffered bike lanes are an enhancement to ***Bike Lanes***, adding a designated buffer space to separate the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.

Buffered bike lanes increase the distance between bicyclists and motor vehicles, providing additional comfort for bicyclists without making the bike lane appear so wide that it might be mistaken for a motor vehicle travel lane or parking lane.

Application Context: Land Use, Street Type and Orientation

- City wide bike routes on the **Bike Network**
- Connector bike routes on the **Bike Network**
- This facility type is most likely to be installed on **Collector** or **Arterial** streets with high motor vehicle volumes and speeds.

Bikeway facility selection should be based on an analysis of roadway volumes and speed and other local characteristics.

Best on Roadways with:

- > 10,000 ADT[1]
- > 50 km/h speed limit
- High Truck Volume streets
- Transit volumes are high
- Extra available roadway width

Consider a parking-side buffer where:

- On-street parking turn-over is high
- Bicycle volumes are high
- Where bicyclists are expected to pass
- Extra roadway width is available

Design Variations

- Buffered bike lanes may be painted green to enhance the visibility of the bike lane, or to identify potential points of conflict.
- Where physical separation from motor vehicles is desired, consider a ***Cycle Track***.

Other Considerations

Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

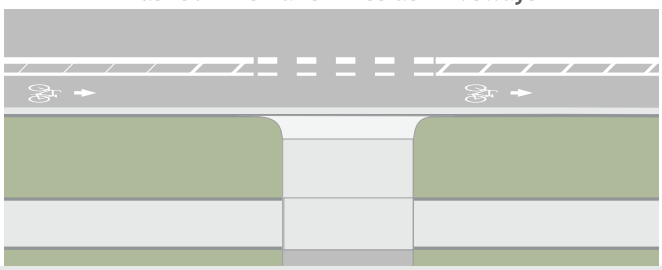
Design Details and Dimensions

- Standard width of bicycle travel area is 1.5 m.
- Minimum width of buffer area is 0.5 m, maximum width of buffer area is 1.5 m.
- If 0.9 metres or wider, mark the buffer interior with diagonal or chevron hatching.
- If interior markings are used, high frequency of striping may increase motorist compliance.
- It is not ideal to have manholes in bike lanes, but this may happen in retrofit situations, on occasion.

Intersections and Driveways

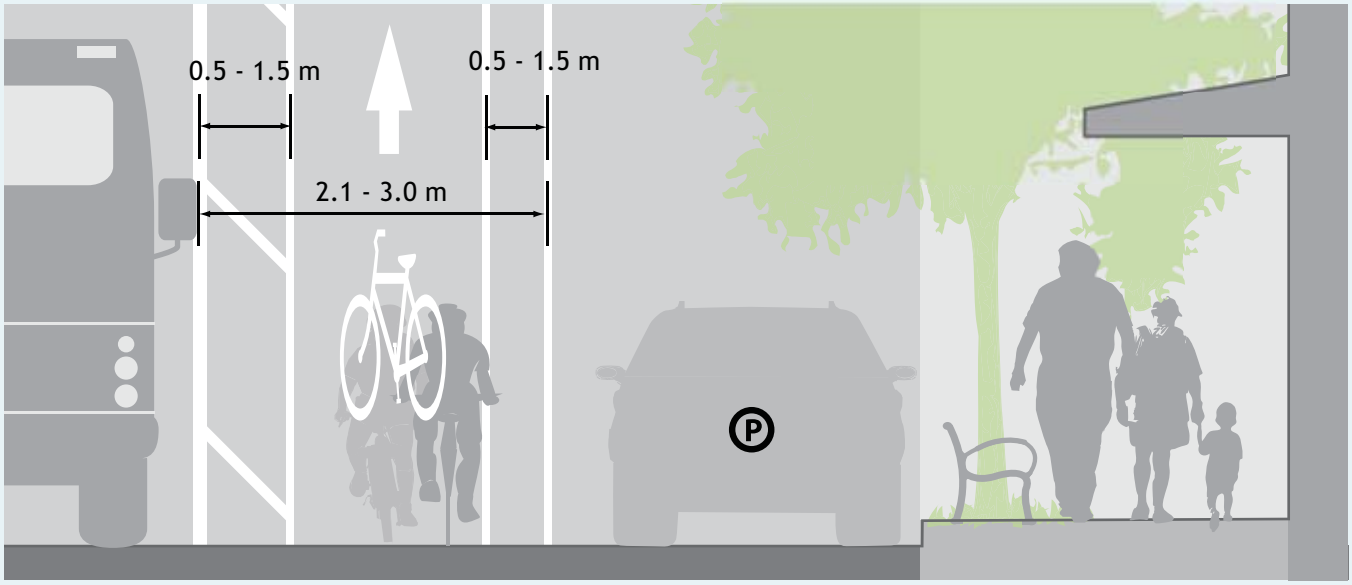
- On intersection approaches with no dedicated right turn only lane, the buffer markings may transition to a conventional dashed line. Consider the use of a ***Bike Box*** at these locations to position cyclists safely in front of queued vehicles, rather than next to the curb.
- On intersection approaches with right turn only lanes, the bike lane should be transitioned to a through bike lane to the left of the right turn only lane, or a combined bike lane/turn lane in constrained conditions.
- For clarity at driveways or minor street crossings, consider dashed bike lane lines where cars are expected to cross.

Dashed Bike Lane Lines at Driveways

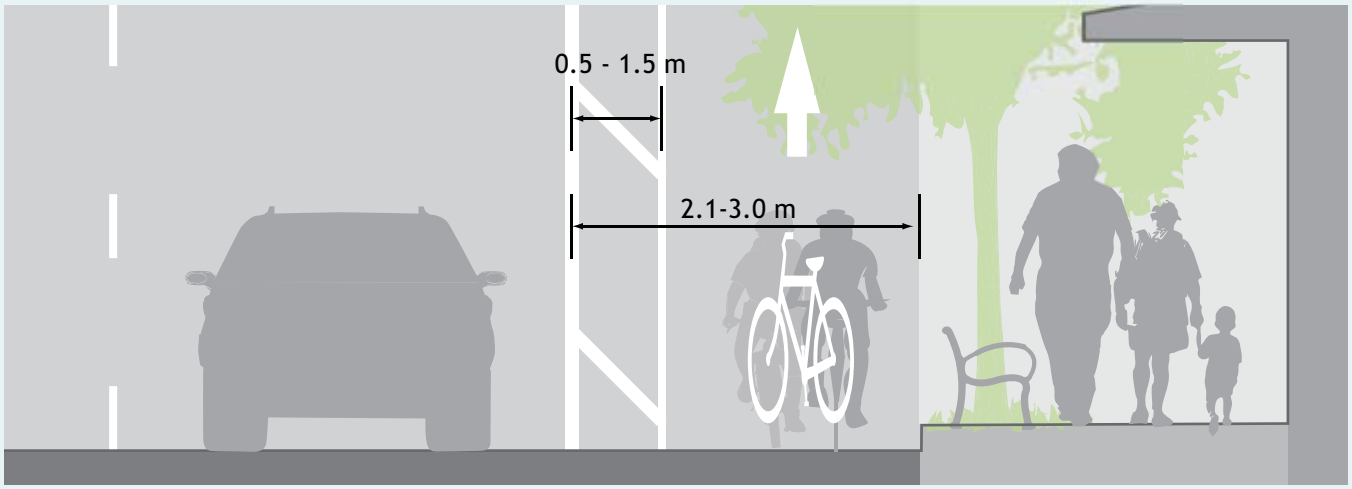


1 *London Cycling Design Standards*. Transport for London. 2005.

Travel-Side and Parking-Side Buffers



Travel-Side Buffer



Standard width of a bike lane and associated buffers is 2.1 - 3.0 m.

Snow Removal and Maintenance Considerations

City of Edmonton practices for snow removal on bike facilities are currently being reviewed.

References

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

4.3.6 Cycle Tracks

Description

A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a bike lane. A cycle track is physically protected from motor vehicle traffic and distinct from the sidewalk. Protection methods include on-street parking, raised median curbs, or a raised bikeway surface.

By separating bicyclists from motor vehicle traffic and pedestrians, cycle tracks can offer a higher level of comfort than ***Bike Lanes*** or ***Shared Use Paths*** and are attractive to a wide range of the public.

Application Context: Land Use, Street Type and Orientation

- City wide bike routes on the **Bike Network**
- This facility type is most likely to be installed on **Arterial** streets with high motor vehicle volumes and speeds.
- On **Transit Network** streets consider integration with bus stops. See **Transit Integration with Cycle Tracks**

Bikeway facility selection should be based on an analysis of roadway volumes and speed and other local characteristics.

Best on Roadways with:

- > 10,000 vehicles/day[1]
- >50km/h speed limit
- Frequently congested roadways
- High Truck Volume streets
- High Transit volumes
- Extra available roadway width
- Best on the left side of a one-way road

Driveway and Intersection Crossings

Crossings of driveways and intersections are a challenge for cycle track design. Strategies to mitigate potential crossing conflicts include:

- Reduce the density of driveways and simplify movements through access management.
- Prohibit parking 10-15 m in advance of the crossing.
- Sidewalk furnishings should accommodate a sight triangle of 3.0 – 6.0 m from a crossing.
- Colored pavement and yield signs should be used to identify the conflict areas.

Design Details and Dimensions

Cycle tracks generally require wider dimensions than ***Bike Lanes***, to provide a higher level of comfort and separation, to permit bicyclists to pass one another. Consider the placement of utilities when designing bike facilities with physical separation and the access to fire hydrants.

One-Way Cycle track through zone:

- Standard width: 2.1[2] m

Cycle track buffer zone:

- Standard adjacent to parking: 1.0 m
- Standard adjacent to travel lane: 0.5 m (1.0 m preferred for snow storage).

Two-Way Cycle Track:

Application best on one way streets. This is similar to a ***Shared-Use Path Adjacent to Roadways***. See the NACTO Urban Bikeway Design Guide for details.

Two-way cycle tracks function best on the left side of one-way streets.

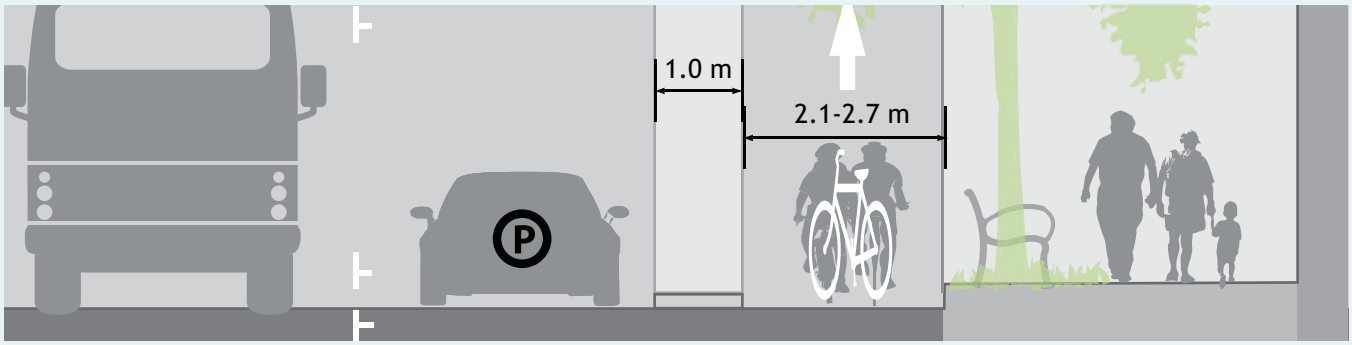
Raised Median Curb Protection

- Consider bicycle compatible curb profiles to minimize conflict with pedals and maximize ridable surface.

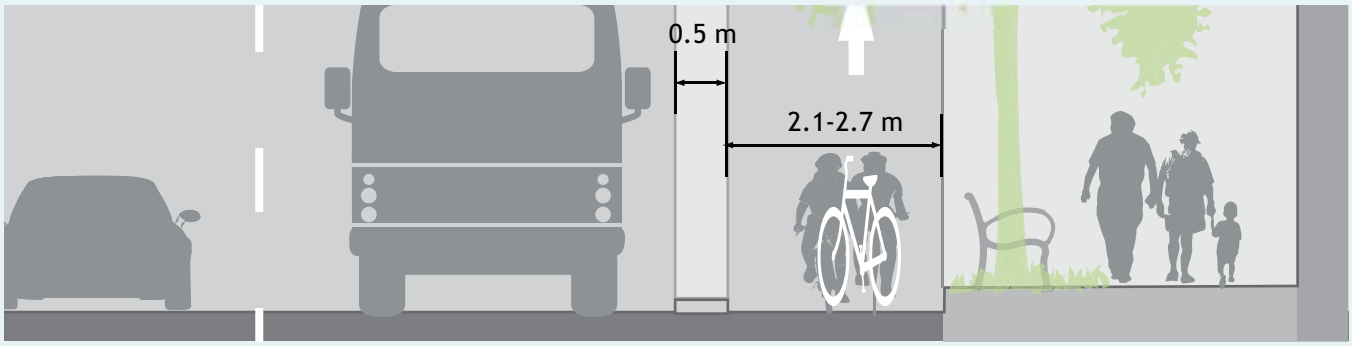
1 *London Cycling Design Standards*. Transport for London. 2005.

2 Constrained width for short distances is 1.5 m

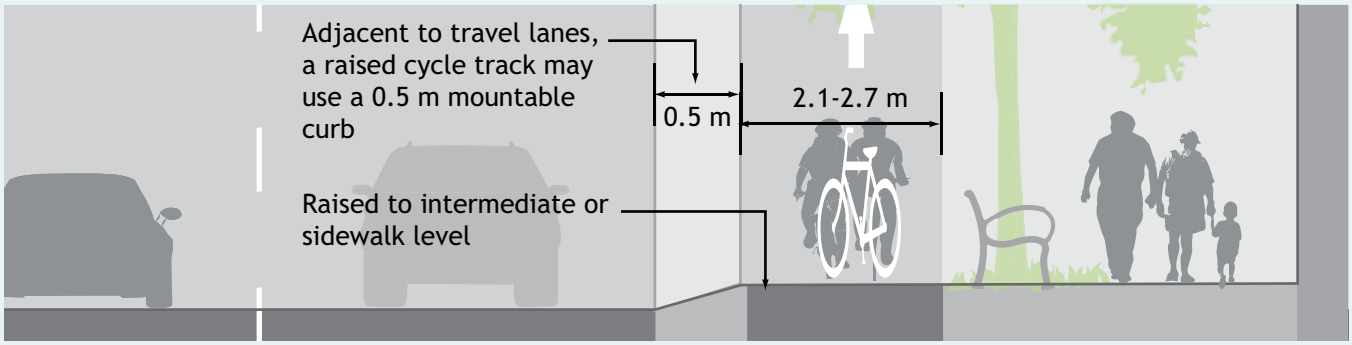
On Street Cycle Track With Parking



On Street Cycle Track Without Parking



Raised Cycle Track



Snow Removal and Maintenance Considerations

City of Edmonton practices for snow removal on bike facilities are currently being reviewed. On cycle tracks the expectation is that snow windrows will be cleared away and not remain on the cycle track.[1]

References

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012. Bicycle Boulevard Planning and Design Handbook.

1 WinterCity Strategy Executive Research Study Findings. "Clearing biking paths needs to be made a priority for snow removal."

4.3.7 Shared Use Paths Adjacent to Roadways

Description

Shared use paths adjacent to roadways provide for two-way travel for bicyclists and pedestrians separated from motor vehicle traffic. Shared use paths adjacent to roadways are appropriate where there are very few conflicts, low bicyclist volumes, and recreational uses are high.

Potential safety concerns stem from the difference in speed, level of skill, and the range of users on the facility, and conflicts with motor-vehicles at crossings, particularly for bicyclists travelling in the opposite direction.

Application Context: Land Use, Street Type and Orientation

Most appropriate for use on **Arterial** streets with strict access management and few conflict points. On **Arterial** streets, provide a wide curb lane for the experienced bicyclists to use if they choose.

Shared use paths are generally inappropriate for use at **Street Oriented** land uses.

On city wide or connector bike routes within the Bike Network, consider the potential user preference for the provision of on-road accommodation such as ***Bike Lanes*** or ***Cycle Tracks***.

Implementation and Retrofit Considerations

Existing or new shared use path adjacent to roadways in the City of Edmonton should consider the following design measures:

- Reduce the density of driveways and simplify movements through access management.
- Design driveways and intersections to reduce vehicle speeds when turning.
- Design intersection crossings to facilitate bicycle access to and from the road or driveway being crossed.
- Keep approaches to intersections and major driveways clear of obstructions.
- Consider adding stop bars for vehicles pulling up to the shared use path crossing.
- At signalized intersections, prohibit right turns on red from the crossing roadway.
- Provide a leading pedestrian interval for path users.
- On Arterial streets, provide a wide curb lane (≥4.0 m) for the experienced bicyclists to use if they choose.

Design Details and Dimensions

Through travel area:

- Standard width: 3.0 m
- Constrained width: 2.5 m

Where space is available, a greater path width (3.4 to 4.2 m) is advisable in the following situations:

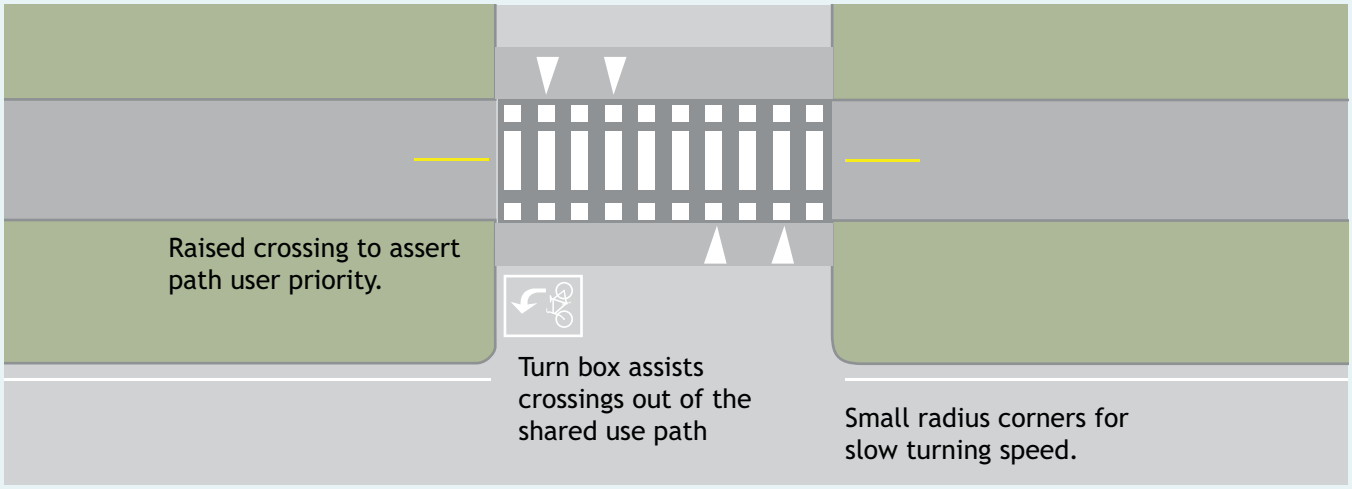
- In locations that are anticipated to have high total user volumes;
- In locations that are anticipated to serve a high percentage of pedestrians;
- In locations where there is significant use by inline skaters or children;
- In locations where the path is used by larger maintenance vehicles;
- On steep grades or through curves.

In such situations, consideration should also be given to separation of pedestrians and bicyclists using markings, materials, physical barriers or planted boulevards. This will have maintenance implications depending on treatment.

Shared use paths should be separated from moving vehicles by at least 1.5 m. Where less than 1.5 m is available, a physical barrier should be included and should be designed to inhibit motor vehicles or active transportation users from straying from their path or lane.

Shared Use Path Standard Dimensions

Street Crossing Design Details



Snow Removal and Maintenance Considerations

City of Edmonton practices for snow removal on bicycle facilities are currently being reviewed.

Timely and thorough clearing of snow from Shared Use Paths is important for bicycle users who typically lack other equivalent route options. Narrow snow blowers may be used to clear snow from Shared Use Paths.

References

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012. Bicycle Boulevard Planning and Design Handbook Geometric Design Guide for Canadian Roads. Transportation Association of Canada. 2011.

4.3.8 Bikeways at Intersections

Signal Detection and Actuation and Timing

Proper bicycle detection should accurately detect bicyclists and provides clear guidance to bicyclists on how to actuate detection (e.g., what button to push, where to stand). This may involve placement of loop detectors within bike lanes, bike boxes and turn boxes. Bicycle loops and other detection mechanisms can also provide bicyclists with an extended green time before the light turns yellow so that bicyclists of all abilities can reach the far side of the intersection.

Elephant's Feet Crossings

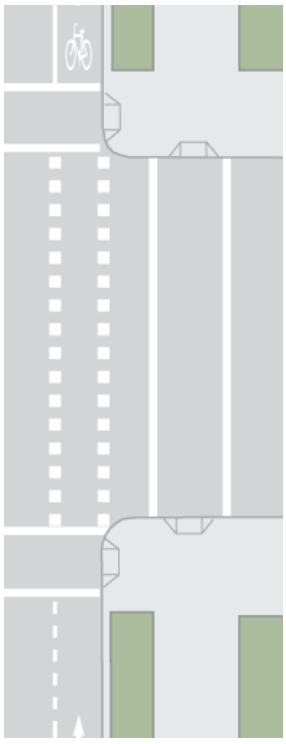
Elephant's feet bicycle markings are used to define a bicyclist crossing areas adjacent to a crosswalk, and increase awareness at potential intersection conflict areas.

Best at Locations With

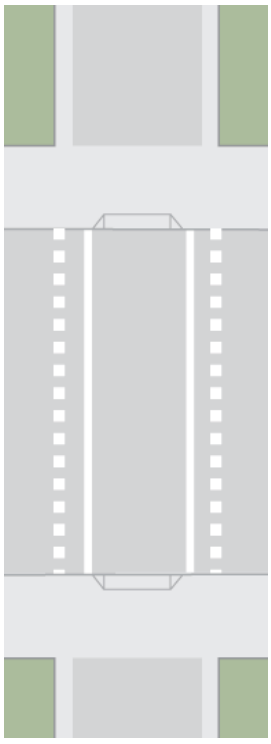
- ***Shared-Use Path*** crossings
- ***Bike Lane*** or ***Cycle Track*** crossings
- Across signalized intersections, particularly through wide or complex intersections

Elephant's Feet Examples

Elephant's feet parallel to a pedestrian crosswalk are used with Bike Lane or Cycle Track bikeways.



Combined Elephant's Feet/Crosswalk for use with shared-use path crossings.



References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

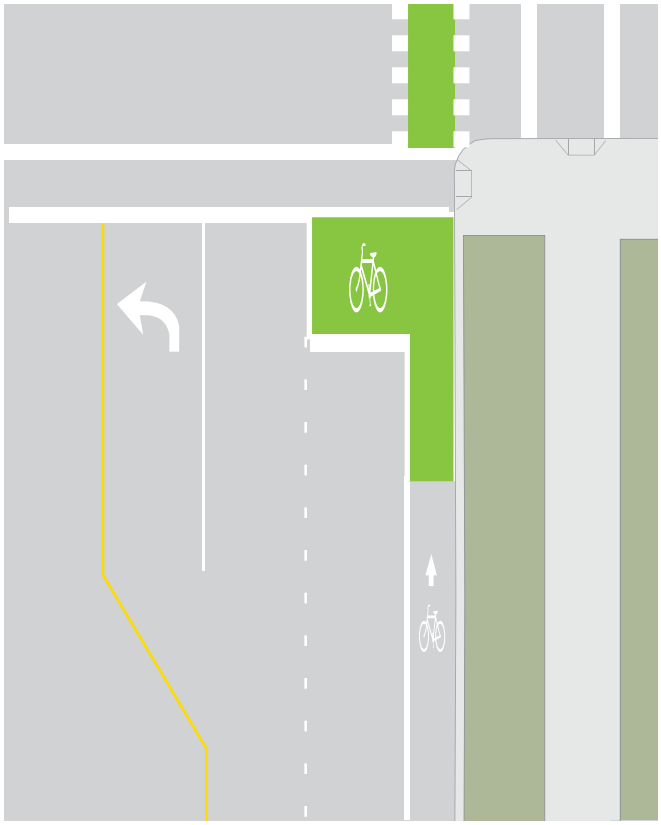
Bike Box

A bike box is a designated area at signalized intersections that provides bicyclists with a safe and visible space to get in front of queuing motorized traffic during the red signal phase.

Best at Locations With

- Intersections with high-moderate volumes of right turning motor vehicles
- Intersections with long red-light phases
- At Bike Boulevard crossings of major streets

Typical Bike Box



References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

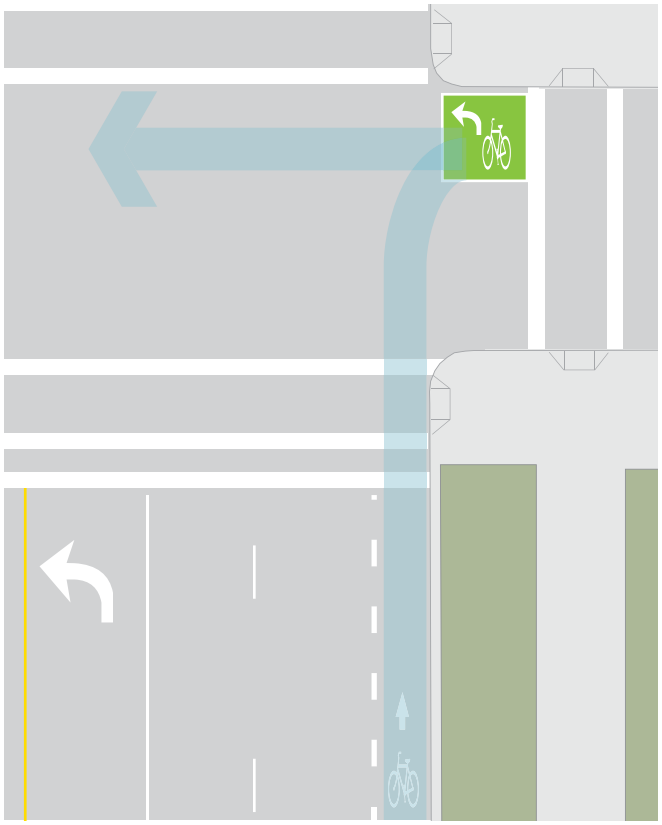
Two-Stage Turn Box

Two-stage turn queue boxes offer bicyclists a safe way to make left turns at multi-lane signalized intersections from a right side cycle track or bike lane.

Best at Locations With

- Signalized intersections
- Multilane, high volume streets, where bicycle access to the left turning lane may be difficult
- Bikeways crossing one another

Typical Two-Stage Turn Box



References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

4.3.9 Bikeways at Right Turn Only Lanes

Through Bike Lane Adjacent to Right Turn Lanes

Through bike lanes at right turn lanes offer through-travelling bicyclists an opportunity to correctly position themselves to avoid conflicts with turning vehicles.

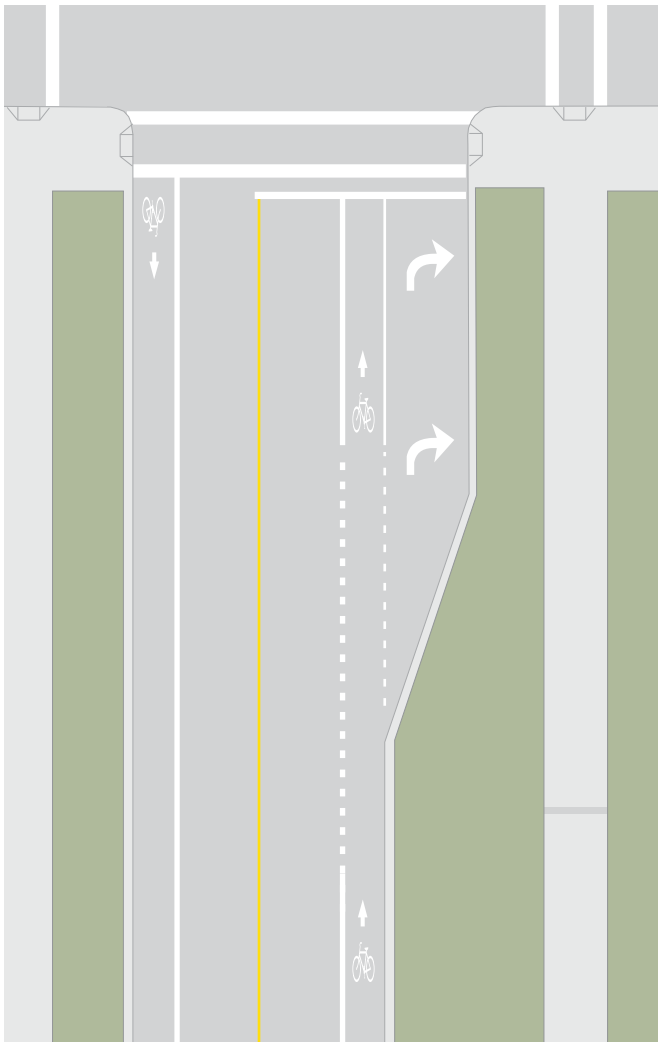
Best at Locations With

- Streets with right turn lanes and bike lanes

Design Details and Dimensions

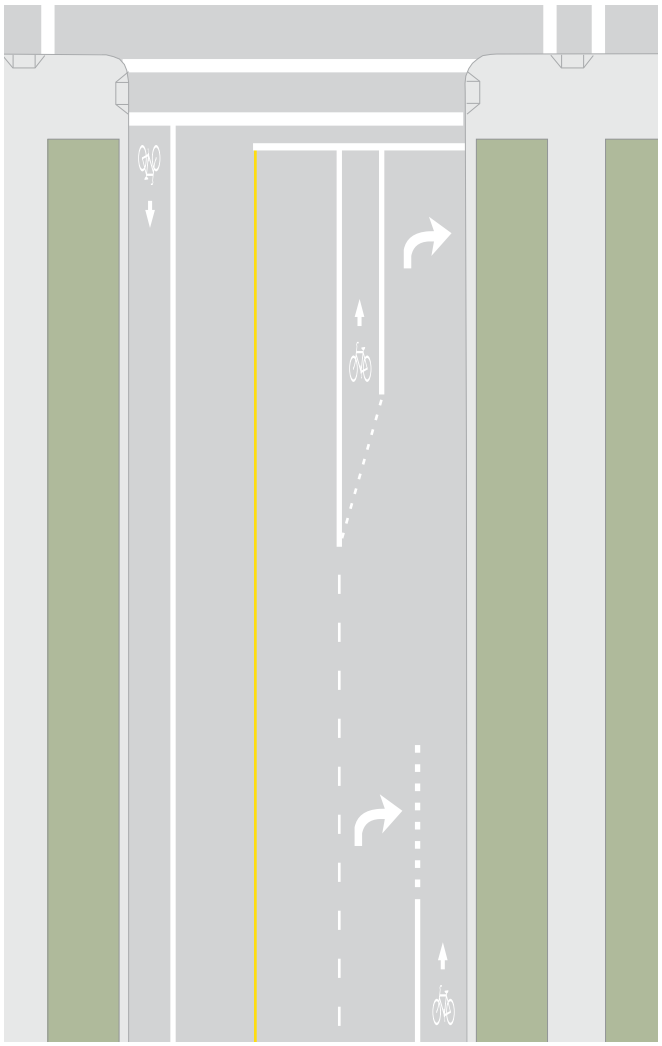
When a right turn lane is introduced, use dashed lines to mark the merge area of the bicycle lane and emphasize priority of through bicyclists.

Bike Lane Adjacent to Introduced Right Turn Lane



When a through lane transitions into a right turn lane, use dashed lines to offer bicyclists flexibility in negotiating the transition area.

Bike Lane Adjacent to Curb Lane Transition



References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

Bikeway Traffic Control Guidelines for Canada, 2nd Ed. Transportation Association of Canada. February 2012.

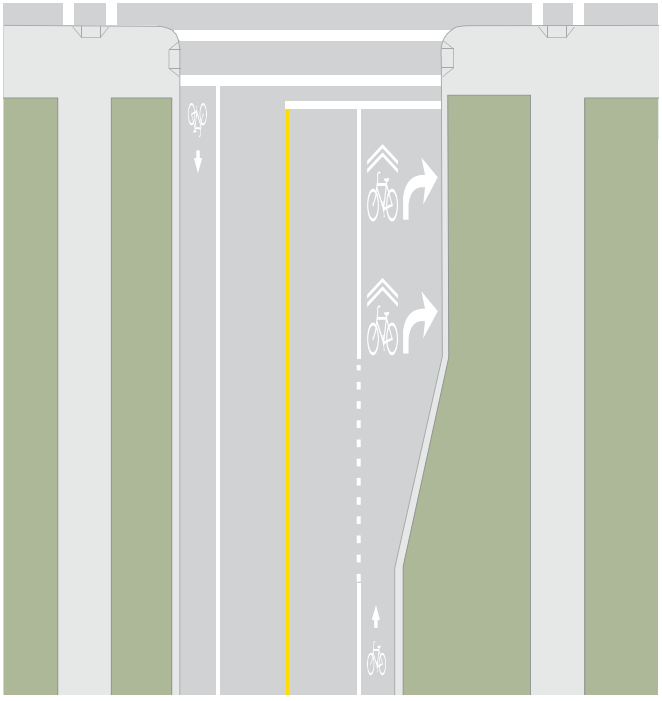
Combined Bike Lane/Turn Lane

A combined bike lane/turn lane is a shared use lane for turning motor vehicles and through or turning bicycles.

Best at Locations With

- Low-moderate volumes of turning motor vehicles
- Insufficient width for separate bike lane and right turn lane
- ***Bike Lanes*** or ***Cycle Track*** bikeways

Combined Bike Lane/Turn Lane



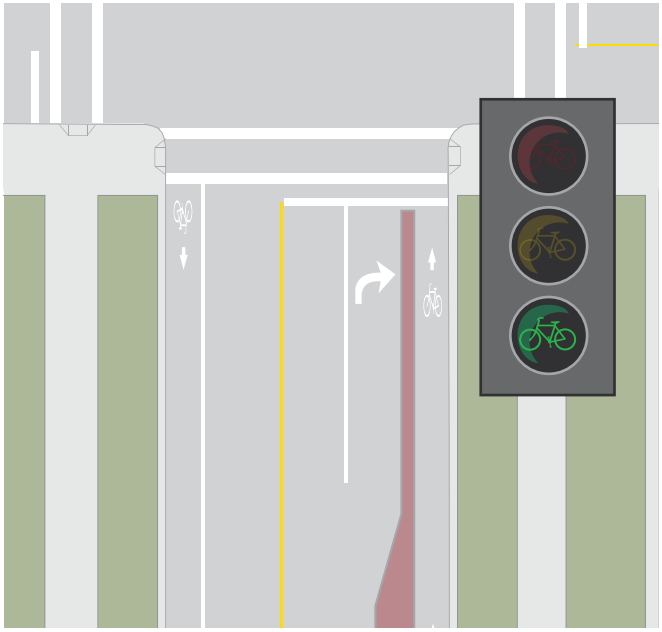
Bike Signal

A bicycle signal is a traffic control device that should only be used in combination with an existing conventional or pedestrian signal.

Best at Locations With

- A ***Cycle Track*** or path running parallel to arterial streets.
- High volume of bicyclists at peak hours.
- High numbers of bicycle/motor vehicle crashes, especially those caused by turning vehicle movements.
- A confluence of an off-street bike path and a roadway intersection.

Bike Signal with Exclusive Phase to Remove Conflict with Right Turn Lane



References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

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4.4 Transit

4.4.1 Bus Stop Location and Accessibility

Description

Accessible bus stops ensure that all people can use the bus system.

On routes where bi-directional service is provided (as opposed to a loop route), an accessible inbound stop should correspond to the nearby accessible outbound stop. A stop should not be deemed fully accessible until this can be achieved.

Near-side vs. Far-side

The placement of a transit stop before or after an intersection is referred to as a near-side or far-side bus stop, respectively. The placement of the bus stop on one side or the other of an intersection is based on a number of factors, not limited to visibility, safety, transit operation, bus signal priority, intersection operations, parking restrictions, passenger demand, pedestrian access, or roadside constraints.

Far-side bus stops are preferable, with near-side locations acceptable in some conditions. Potential reasons for near-side configuration include:

- Locations with clear single direction transfer activity.
- Locations adjacent to signalized intersections.
- Locations where the head of the bus stop can be set back 35 m from the intersection.
- Locations where a bus stop Curb Extension is desired.

Design Details and Dimensions

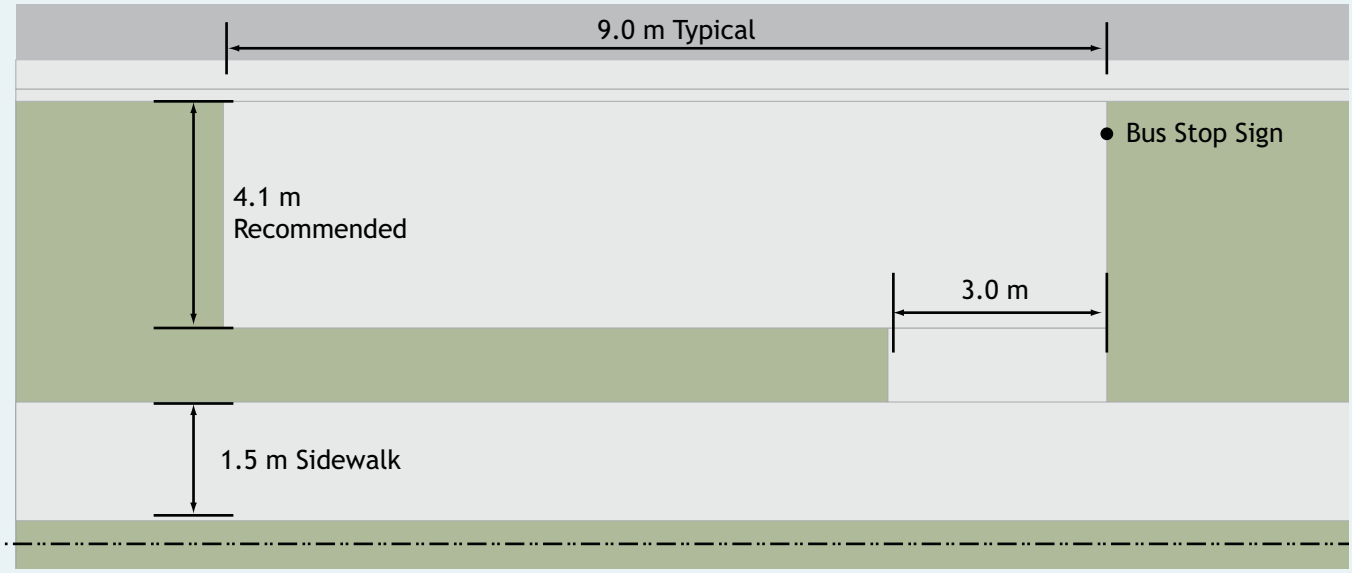
- The City of Edmonton requires an appropriate bus stop and amenity pad be constructed as part of new bus stop pad construction in all new developments wherever sufficient right-of-way is available.
- The unconstrained accessible pad dimensions are 4.1 m x 9.0 m. Provide a 0.3 m minimum clearance to the property line. Pads with a constrained width of less than 3.6 m may require additional length.
- The length of the pad should be an additional 3.0 m for multiple or frequent routes, or an additional 5.0 m for articulated buses.
- To connect to a sidewalk, provide a 3.0 m wide walk connection at the head of the pad or if the pad is less than 1.0 m from the sidewalk, fully connect the concrete pad to the sidewalk.
- Maintain 3.5 m distance from bus stop to adjacent trees.
- If bus stop amenities or street furniture are provided, maintain 1.5 m wide clear for the pedestrian path. Keep clear of the transit loading and unloading area.
- Benches within bus stop areas should not be placed within the 2.1 m x 9.0 m clear zone to the curb.

Safety and Security

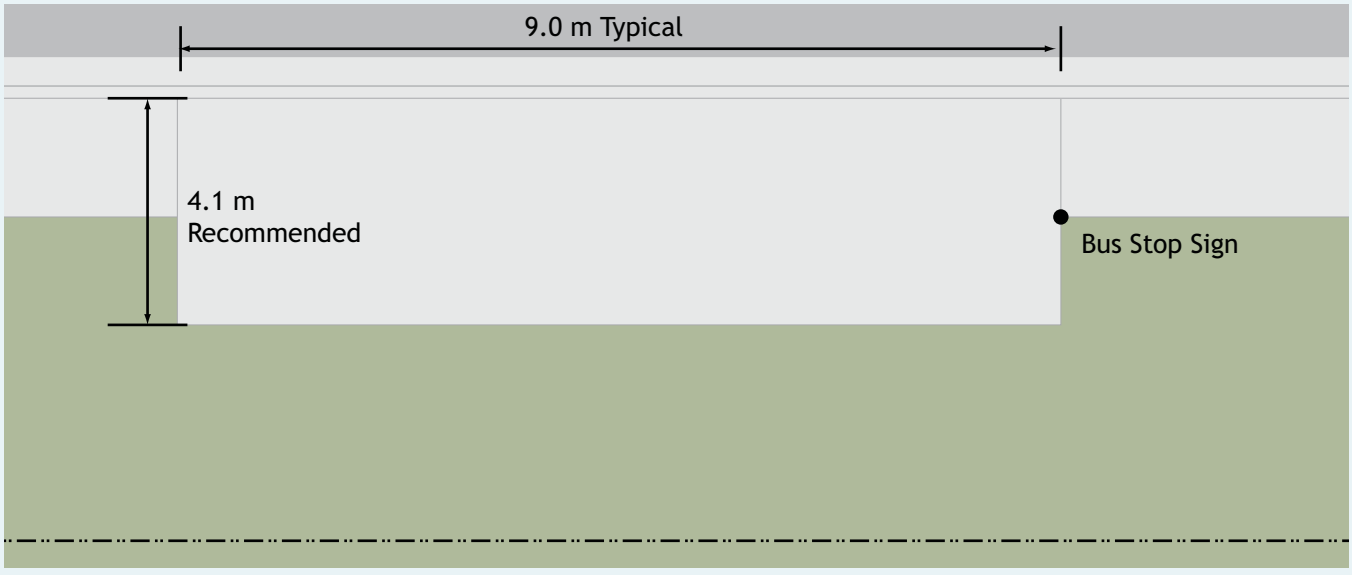
In locating bus stops, safety and security concerns are addressed through Crime Prevention Through Environmental Design (CPTED). Proper design can effectively create a built environment that reduces the potential for crime and increases safety for users.

Bus stops with curb extensions provide additional space to accommodate wheelchairs

Transit Stop and Amenities Pad in Furnishing Zone



Transit Stop and Amenities Pad behind Sidewalk



Snow Removal and Maintenance Considerations

City Policy C409G requires that snow is cleared from all sidewalks, ramps, stairs and bus platforms at transit facilities within 24 hours after the snowfall. The City will clear snow from all transit zone pads within 48 hours after the snowfall.

References

Design Guidelines for Pedestrian Accessibility. Alberta Transportation and Utilities. March 1996.

Edmonton Transit Planning Handbook. Edmonton Transit System. May 2004.

4.4.2 Bus Stop Amenities

Description

Providing comfortable space for transit users to wait is an important aspect of quality of service which helps retain riders and grow ridership. The waiting areas should be designed to accommodate all user groups, including those with impairments, parents with strollers, bicyclists, and the elderly.

Priority for shelter installation should be given to waiting areas that serve a high concentration of elderly customers and/or people with impairments.

Application Context: Land Use, Street Type and Orientation

It is recommended to consider enhanced transit stop amenities in the following areas:

- **Arterial** streets
- **Collector** streets
- **Street Oriented** land uses
- **Commercial/Mixed Use** land uses streets
- **TOD Areas**

Shelter Provision Prioritization

Consider prioritizing shelter placement at locations:

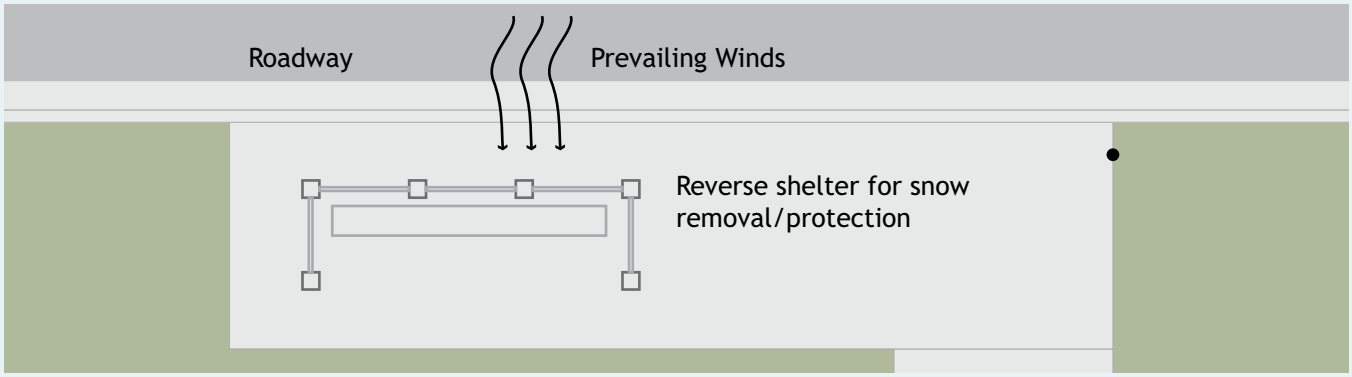
- Headed inbound, serving high numbers of morning commuters traveling to work.
- In areas that serve a high concentration of elderly customers and/or people with impairments.

Protection from the Elements

Protective awnings and building overhangs can be used to provide protection from wind, rain, snow, and excessive heat or sunlight.

Shelter orientation and design may protect patrons from the "splash zone" created by vehicles on wet streets.

Shelter Design to Promote User Comfort



Amenities	Advantages	Disadvantages
Shelters	• Provide comfort for waiting passengers • Provide protection from elements • Can be heated for passenger comfort • Help identify the transit system • Can provide a venue for lighting at a site • Can provide a space to install route and schedule information	• Require maintenance, trash collection • Potential for vandalism
Benches	• Provide comfort for patrons • Help identify the stop • Low cost	• Require maintenance • Potential for vandalism
Lighting	• Increases visibility • Increases perceptions of comfort and security by patrons • Discourages “after hours” use of bus stop	• Requires maintenance of lighting elements • Can be costly
Trash Receptacles	• Provide place to discard trash • Keep bus stop clean	• May be costly to maintain • May be used by customers of nearby land uses • May smell
Additional Amenities (Art, Banners, Bike Racks)	• Provide shade, privacy, buffer from moving traffic and beautification	• Requires regular or seasonal maintenance
Route/Schedule Information	• Is useful for first time riders • Helps identify the bus system • Can communicate general system information	• Must be maintained to provide current route or schedule information

Snow Removal and Maintenance Considerations

City Policy C409G requires that snow is cleared from all sidewalks, ramps, stairs and bus platforms at transit facilities within 24 hours after the snowfall. The City will Clear snow from all transit zone pads within 48 hours after the snowfall.

References

Design Guidelines for Pedestrian Accessibility. Alberta Transportation and Utilities. March 1996.

Guidelines for the Location and Design of Bus Stops. Transportation Research Board. 1996.

4.4.3 Transit Priority Measures

Description

Transit Priority Measures reduce delay to transit vehicles at known problem areas in a network. The measures may take the form of changes to existing infrastructure, addition of technology, or can be service adjustments. For Complete Streets, changes to the existing infrastructure and the addition of technology are the most common applications.

Application Context: Land Use, Street Type and Orientation

It is recommended to consider enhanced transit stop amenities in the following areas:

- **TOD Areas**
- **Transit Network** streets with **Street Oriented** and **Non-Street Oriented** land uses.

High-Occupancy Vehicle (HOV) Lanes

HOV lanes are a type of preferential lane similar to transit-only lanes, but which permit lane use by automobiles with high occupancy levels (2 – 3 passengers or more).

Signal Priority

The addition of a sensor at a signal allows for the green or red time at the intersection to be adjusted and priority given to the approaching transit vehicle. This results in travel time savings because of fewer stops at signalized intersections, which benefits the rider and the operator of the transit service. There are two types of bus signal priority at conventional intersections:

Green Extension - Where the green phase of a signal is maintained beyond regular timing to permit bus passage

Red Truncation - Where the red phase of a signal is reduced, to allow for quicker progression back to green.

Signal Priority Examples

Transit-Only Lanes

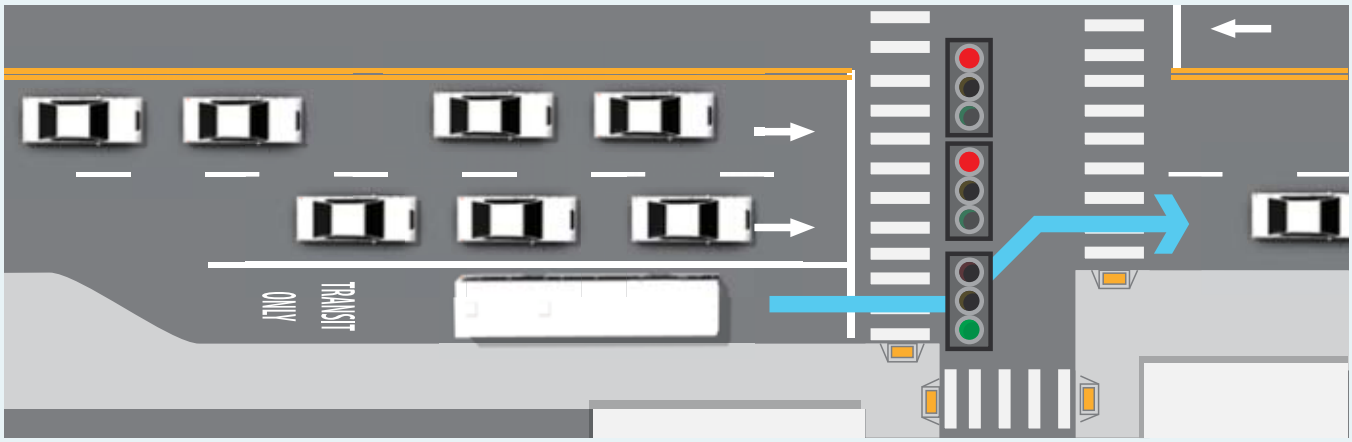
Transit-only lanes are preferential lanes that relieve transit congestion and reduce costs by reducing the number of conflicts between transit and private automobiles. They are most suitable in handling peak hour transit volumes, which are subject to congestion and ridership-related factors that can increase operating times. Transit-only lanes may also operate contra-flow to provide more direct and quicker service. Taxis and bicycles are also permitted to use these lanes.

Consider the use of colored pavement to provide a strong sense of identity to transit-only lanes and to distinguish them from general purpose travel lanes.

Bus Only Lane Examples

Queue Jump at Signals

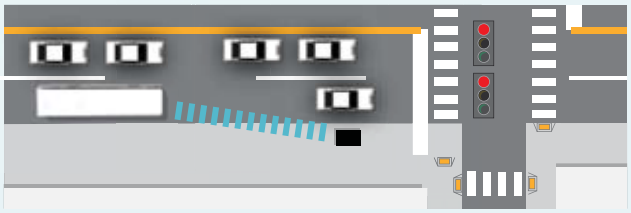
Allows a transit vehicle to proceed into an intersection and make the required lane change or turn prior to any other vehicle being allowed into the intersection.



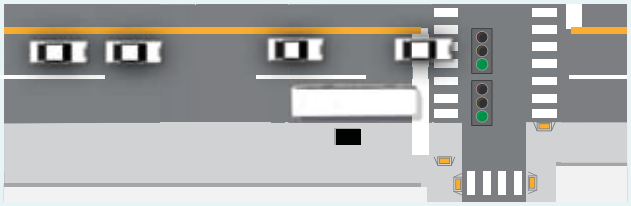
Signal Priority

Red Truncation

Bus approaches red signal



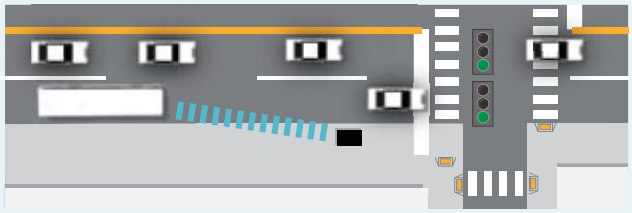
Signal controller detects bus; terminates side street green phase early



Bus proceeds on green signal

Green Extension

Bus approaches green signal



Signal controller detects bus; extends current green phase

Bus proceeds on green signal

Snow Removal and Maintenance Considerations

Similar considerations for ***travel lanes*** apply.

References

Edmonton Transit Planning Handbook. City of Edmonton. May, 2004.

Transit Capacity and Quality of Service Manual – 2nd Edition. Transit Cooperative Research Program. 2003.

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4.4.4 Transit Integration with Bike Facilities

Description
Selection of the recommended facilities that maximize comfort for both transit users and bicyclists rely on bus volume, bicyclist volume, bus operation speed, lane dimensions and safety considerations.

Application Context: Land Use, Street Type and Orientation
It is recommended to consider transit stop placement in the following areas:

- **Arterial** streets
- **Collector** Streets

Suggested general lane dimensions and design guidelines:
- Standard 4.2 m width for shared bicycle / bus lanes where side-by-side operation is expected.
- In **Street Oriented** land use areas where buses and bicyclists are not expected to pass one another, a standard lane width of 3.2 m is appropriate.
- Design should provide both modes with safety, comfort and directness (neither mode should be unnecessarily delayed).

Recommended Design Treatments

Criteria	Indicator	Recommended Design Treatment
Bus Volume	≥20 buses/hr	Dedicated bike lane, dedicated bus lane, mixed traffic lane
	<20 buses/hr	Dedicated shared bike and bus lane, or mixed traffic lane
Speed Limit	≥60 km/hour	Dedicated bus lane
	<60 km/hour	Dedicated bus lane, dedicated shared bike and bus lane, or mixed traffic lane

Typical Bike/Bus Lane Configurations:
No dedicated facility: Bicycles and buses share a mixed-traffic lane.

Mixed Traffic with Sharrows: The pavement markings reinforce the idea to all users that bicyclists should be expected within the lane.

Dedicated Bike Lane: Bicyclists travel within a dedicated lane. Buses are typically required to pull into the bicycle lane to access the curb.

Dedicated Bike Lane, Dedicated Bus Lane: Both bikes and buses have their own lane. Bike travel lane may be placed to the left or right of the bus lane. If the bicycle lane is placed to the right of the bus lane, the bus may be required to pull into the bicycle lane to access the curb.

Dedicated Shared Bicycle / Bus Lane: Buses and bicycle share a lane. These lanes are typically wider than normal to accommodate passing manoeuvres.

Dedicated Bus Only Lane (bicycles in general purpose travel lane): This should be avoided as motorists expect bicyclists as far to the right as possible

Snow Removal and Maintenance Considerations
Busways are a Priority 1 for City of Edmonton snow clearing. Collector/Bus Route roadways and Transit Park and Ride access roads are Priority 2.

References
McNeely, S. G, Donaher. Design Treatments for Bicycles and Buses on Arterial and Collector Roads. ITE 2010 Meeting Exhibits and Presentations. 2010.

4.4.5 Transit Integration with Cycle Tracks

Description

Cycle Track bikeways offer unique design challenges at transit stops because of their use of physical protection and separation from traffic. Strategies to mitigate conflicts between bicyclists and transit passengers involve clear delineation of travel paths for each mode.

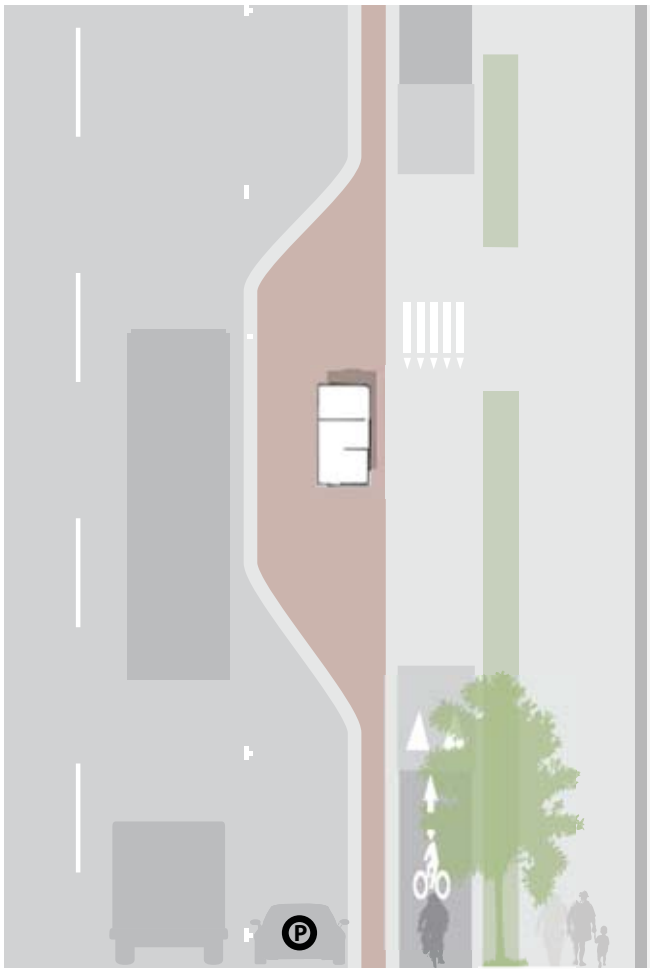
Application Context: Land Use, Street Type and Orientation

It is recommended to consider enhanced transit stop amenities in the following areas:

- City wide **Bike Network** streets with ***Cycle Track*** bikeways
- **Transit Network** streets with curbside transit stops.

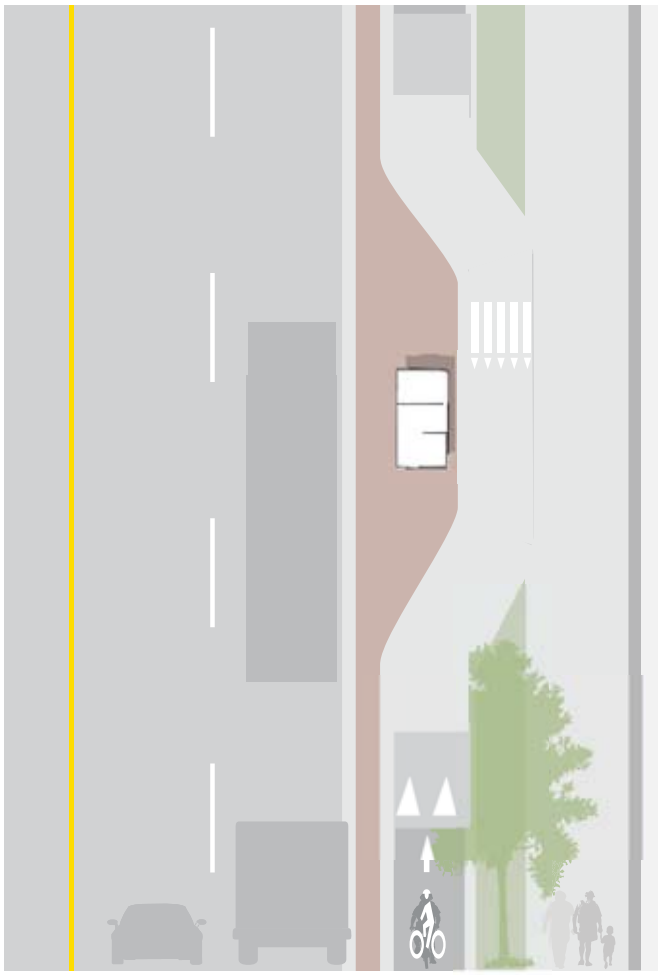
Wide Separation or Parking Protected Cycle Track

A bus stop ***Curb Extension*** may be configured in the cycle track buffer area to accommodate transit stops.



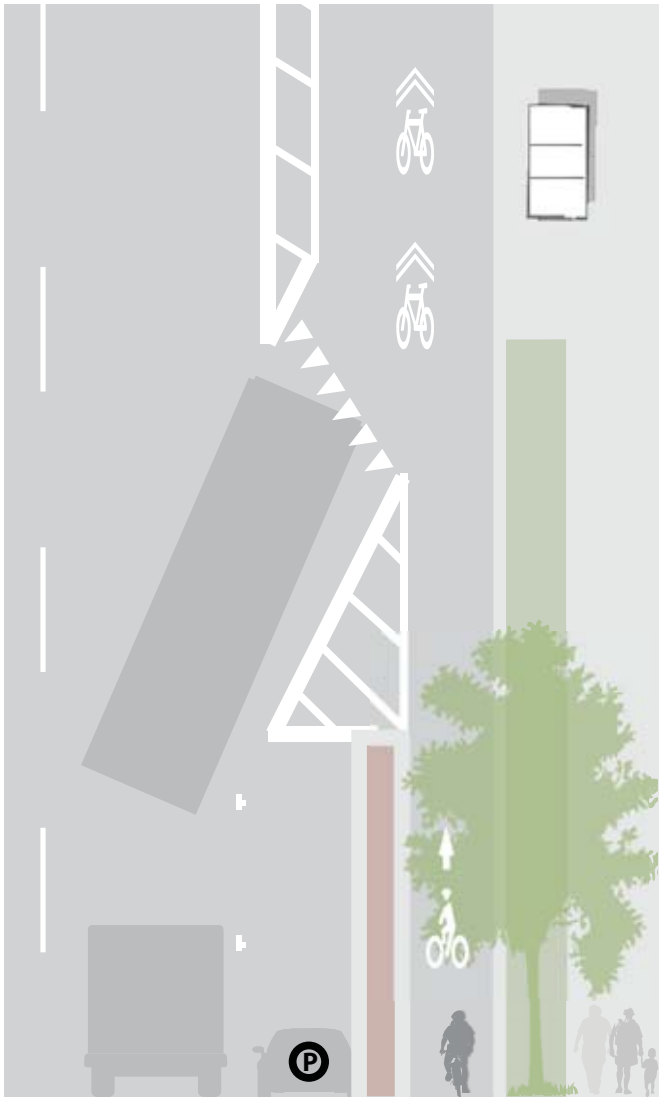
Narrow Separation Cycle Track

Wrap the cycle track behind the transit stop zone to reduce conflicts with transit vehicles and passengers. Bicyclists should yield to pedestrians in these areas.



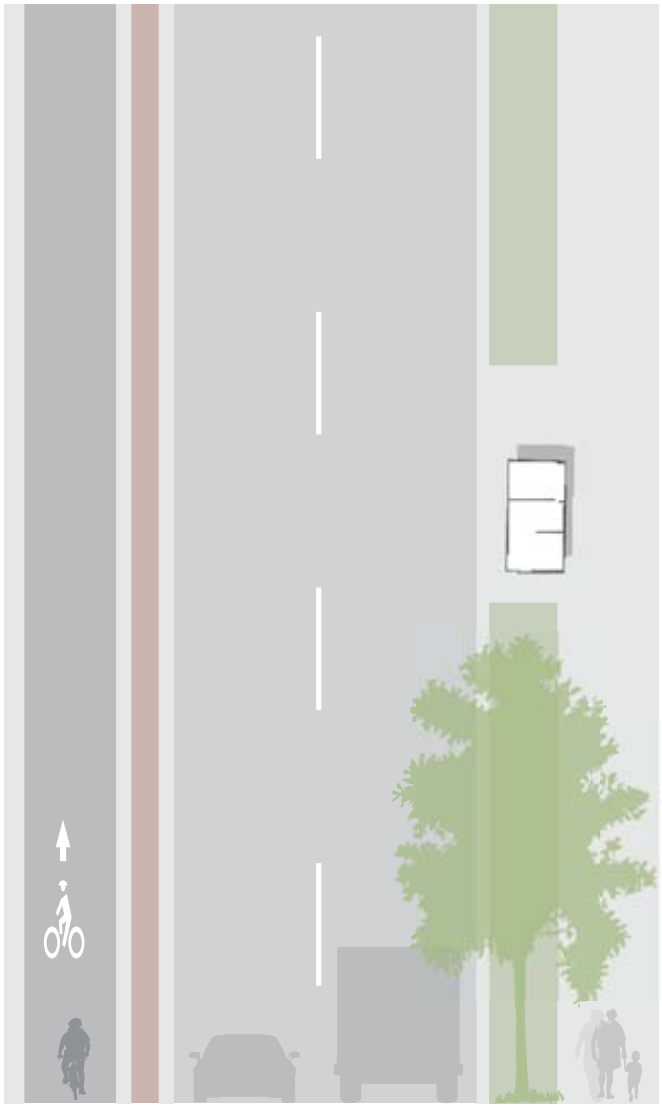
On-Street Mixing Zone

At bus stops, an extended mixing zone may be provided with signage directing bicyclists to yield to stopped buses.



Left Side Configuration

Cycle tracks may be configured on the left side of a one-way street to avoid conflicts.



Snow Removal and Maintenance Considerations

Considerations for ***Cycle Tracks*** apply.

References

Urban Bikeway Design Guide. National Association of City Transportation Officials. September 2012.

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4.5 Goods Movement

4.5.1 Designing for Goods

4.5.2 Goods Design Enhancements

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4.5.1 Designing for Goods

Description

To accommodate the turnings of large vehicles, curb radii are typically adjusted in roadway design. Generally, the larger the goods vehicle, the larger the turning radii required. This larger corner radii impacts other users in a variety of ways. Smaller vehicles can navigate the turns at a faster speed, which impacts the pedestrians and bicyclists crossing at the intersection, and the pedestrian crossing distance is increased, which increases exposure within the intersection.

Emergency vehicles and fire trucks have similar movement needs as large trucks, and design dimensions should consider the potential impact to those vehicles.

Application Context: Land Use, Street Type and Orientation

It is recommended to fully *design for* goods turning movements in the following land uses:

- All **Industrial** land uses
- Where **High Truck Volume** streets intersect

In other land use areas, consider the impact truck turning design has on all users such as bicyclists and pedestrians. In these areas consider *accommodating* goods movement through reduced service standards as described below. It is also appropriate to choose a smaller truck as the standard design vehicle for these land uses. The Accommodate Goods Movement design approach is not advisable if it results in vehicles traveling in an opposing lane, other than for short distances that can be mitigated by pavement markings such as shown in the exhibit below.

Design For Goods Movement

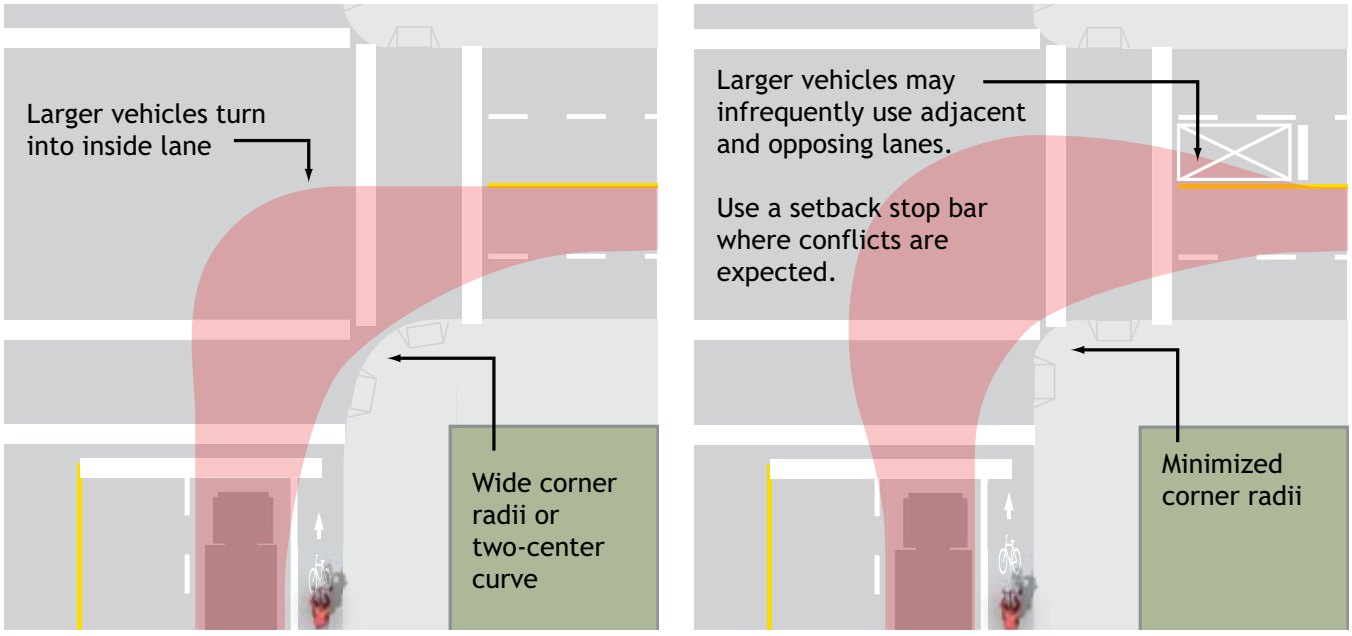
In Industrial land uses and on High Truck Volume streets, goods movement may be prioritized over other modes. In some cases, curb radii should be designed to fully serve the needs of goods movement. In these cases, the designer may establish the travel path that allows the design vehicle to remain entirely within its designated lanes.

Consider the use of a two-centered curve, rather than a simple radius, to provide a better fit to the transitional turning paths of tractor/semitrailer design vehicle.

Accommodate Goods Movement

In TOD Areas, Bike Network streets, or Street Oriented land uses, the designer should assume more latitude for the vehicle path, including encroachment on adjacent lanes approaching and/or departing the intersections. In these cases, larger vehicles may infrequently use adjacent and opposing lanes while turning.

The pink area represents the path covered by a turning truck.



4.5.2 Goods Design Enhancements

Description

Street design features to facilitate goods movement may impact the safety and comfort for other users. Roadways in **Street Oriented** land use areas should be designed for slower, pedestrian-friendly truck operation as a response to higher levels of pedestrian activity.

Emergency vehicles and fire trucks have similar movement needs as large trucks, and design dimensions should consider the potential impact to those vehicles.

Mitigating the impacts of designing for goods

Pedestrians and bicyclists are likely to be found on all streets, even on **High Truck Volume** streets. Consider ways to mitigate the negative impacts of designing for goods movement:

- Pedestrians will benefit from increased ***Sidewalk*** buffer widths.
- Bicyclists often benefit from increased facility width and/or physically protected ***Cycle Track*** bikeways

Additional Design Considerations

Driveway Access

Provide width for accommodation, but maintain a reduced radii corner to promote slow speeds for other users.

Sidewalks

Consider opportunities to include protected medians at corners to ensure that trucks do not endanger pedestrians. Provide boulevard sidewalks wherever possible.

Cycling facilities

Adjacent to high volumes of freight traffic consider bicycle facilities with additional separation or protection.

General Purpose Travel Lane

Travel lanes should be 3.5 m wide if a separated bikeway (cycle track or bike lane) is provided.

If no bikeway is provided consider the provision of a wide outside lane (4.2 m wide) to accommodate bicyclists within the general purpose travel lane.

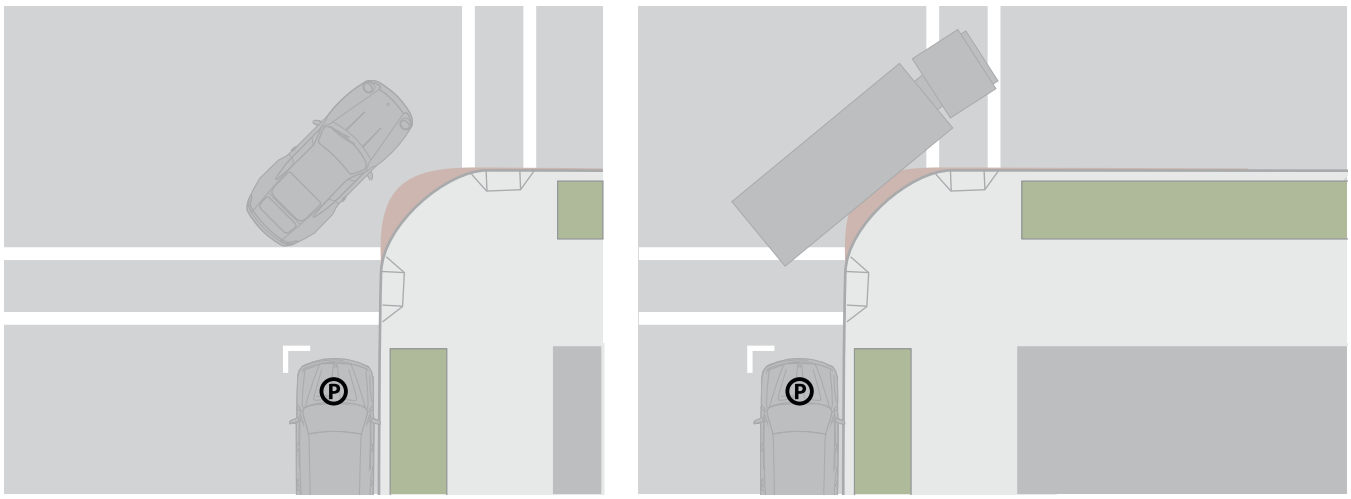
Curb Radii Enhancements

Compound radii use buffers such as curb extensions or curbside parking to create a larger turning radius for turning vehicles while maintaining a smaller radius at the crosswalk. This approach accommodates larger vehicles while reducing encroachment on adjacent and opposing travel lanes.

Truck Apron Corner Design

Textured paving treatments between the large and small turning radius can discourage high-speed turns by smaller vehicles while accommodating low speed turns by larger vehicles.

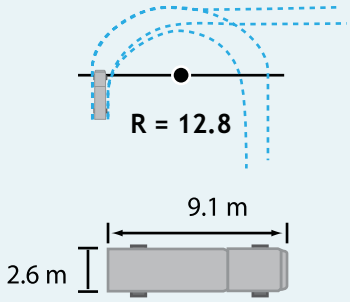
Truck Apron Corner Design Example



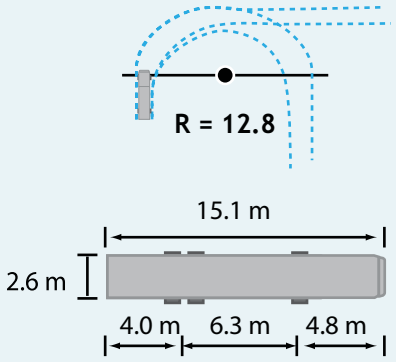
Dimensions

The turning requirements of various different vehicles are shown below. Generally, the larger the vehicle the larger the turning radii requirement.

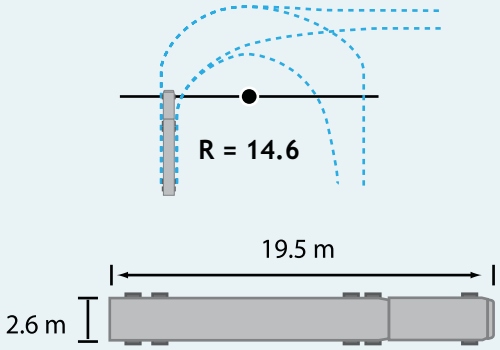
SU9
Single Unit Truck



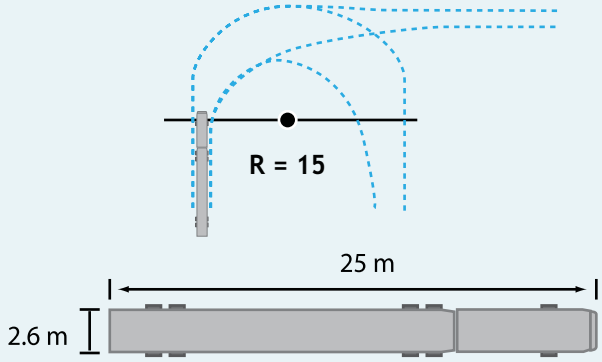
Fire Truck - 15



WB17
Semi-Trailer Combination



WB21
Semi-Trailer Combination



Snow Removal and Maintenance Considerations

Snow plows may not be able to navigate tightly along reduced radius corners. Snow clearance crews will clear snow from curb ramps and crosswalks, and should ensure that the pedestrian through zone is clear.

References

Geometric Design Guide for Canadian Roads. Transportation Association of Canada. 2011

Designing Walkable Urban Thoroughfares: A Context Sensitive Approach. Publication No. RP-036A. Institute of Transportation Engineers. 2010.

Designing for Truck Movements and Other Large Vehicles in Portland. City of Portland. July 2008

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4.6 Complete Streets Context Illustrations

4.6.1 Arterial Intersection Context

The figures below are examples of potential combinations of Complete Streets elements and provide references to other sections of the Guidelines which may be helpful. These figures are for illustration purposes only, and do not constitute an approved or compulsory design.

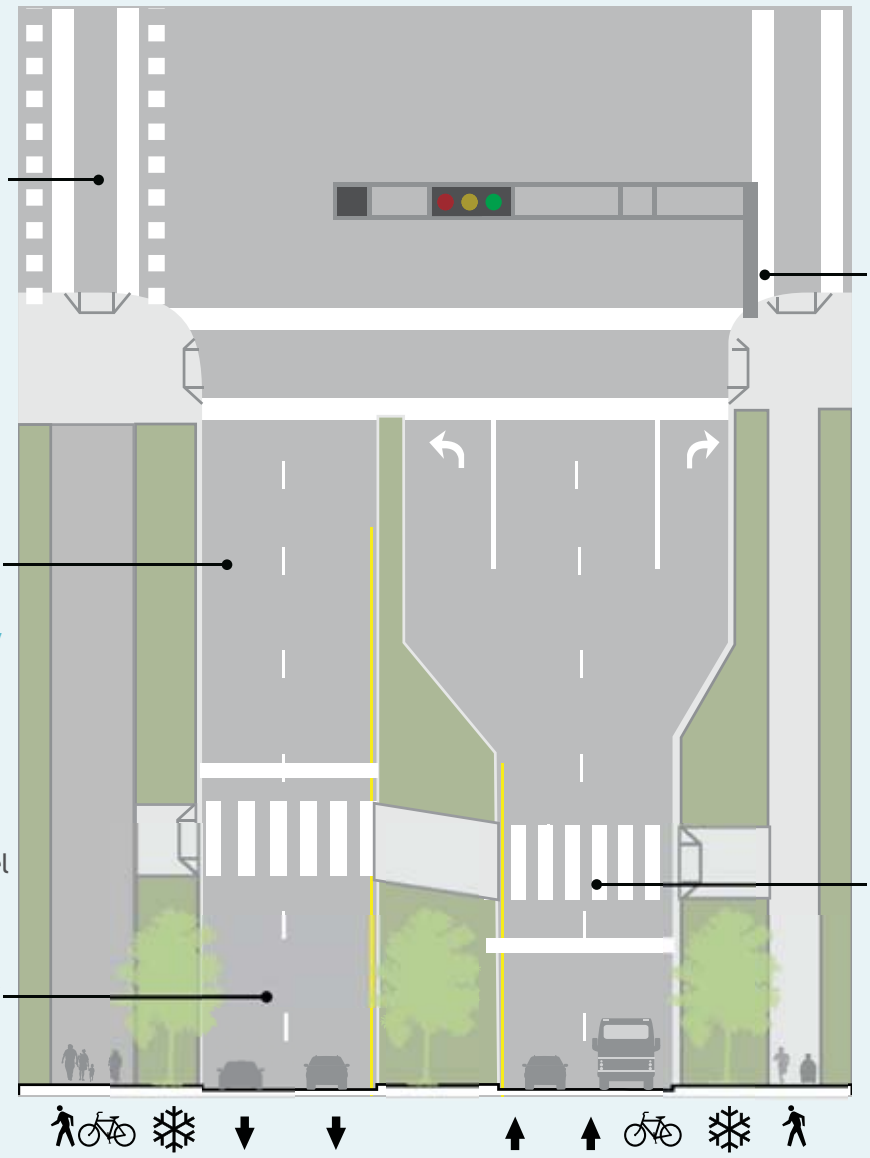
Non-Street Oriented Arterial

This example is focused on auto mobility and long distance travel. A bikeway is provided in the form of an off-street path. Turn lanes minimize automobile delay and maximize intersection capacity.

Shared use paths adjacent to roadways are appropriate where there are very few conflicts, low cyclist volumes, recreational uses are high. 4.3.7 Shared Use Paths Adjacent to Roadways

On Bike Network streets, select a bikeway appropriate for prevailing roadway conditions. 4.3.1 Bicycle Facility Selection

Roadway and travel lane width have a significant effect on the perception and behaviour of all users. 4.1.1 Roadway Design, Travel Lanes and Lane Widths

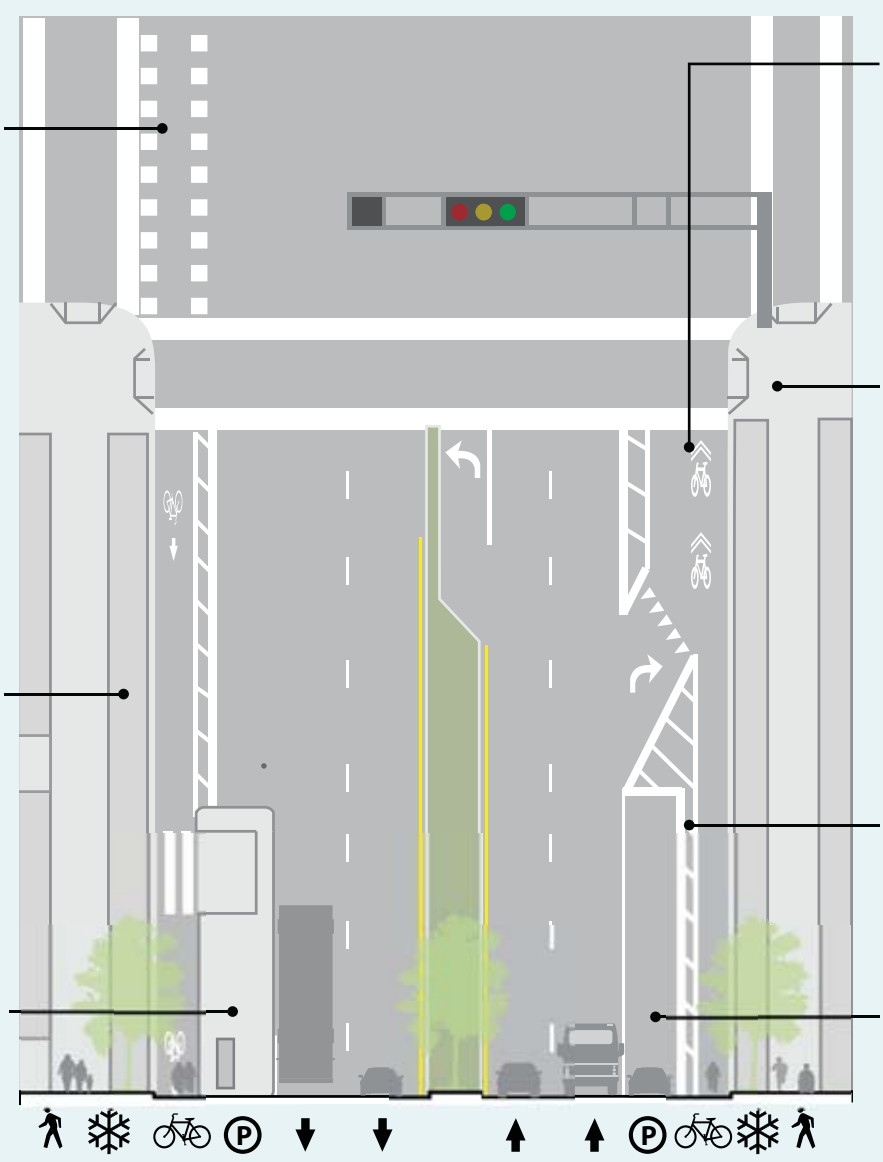


Design and select intersection control to accommodate pedestrians. 4.2.4 Pedestrians at Intersections

Well placed mid-block crosswalks help pedestrians safely reach destinations. 4.2.4 Pedestrians at Intersections

Street Oriented Arterial

This example is focused on direct access to adjacent properties. On-street parking is provided where possible and features to support transit and bicycle use are prioritized.



Treatments emphasize the bikeway crossing. 4.3.8 Bikeways at Intersections

Curb extensions minimize crossing distance for pedestrians. 4.2.2 Curb Extension

In Street-Oriented area with high volumes of pedestrians, attention to pedestrian oriented details such as lighting and materials is important. 4.2.3 Streetscape Amenities

Separate bicyclists and transit vehicles/ passengers to reduce conflict. 4.4.5 Transit Integration with Cycle Tracks

Manage interactions between bicyclists and motorists at right-turn-only lanes. 4.3.9 On-Street Bikeways at Right Turn Only Lanes

Sidewalk dimensions should consider the potential for high pedestrian volumes. 4.2.1 Sidewalks

Cycle Tracks offer a high-quality protected experience for bicyclists. 4.3.6 Cycle Tracks

On-street parking is desirable in street-oriented land use areas. 4.1.3 On-Street Vehicle Parking

4.6.2 Collector Intersection Context

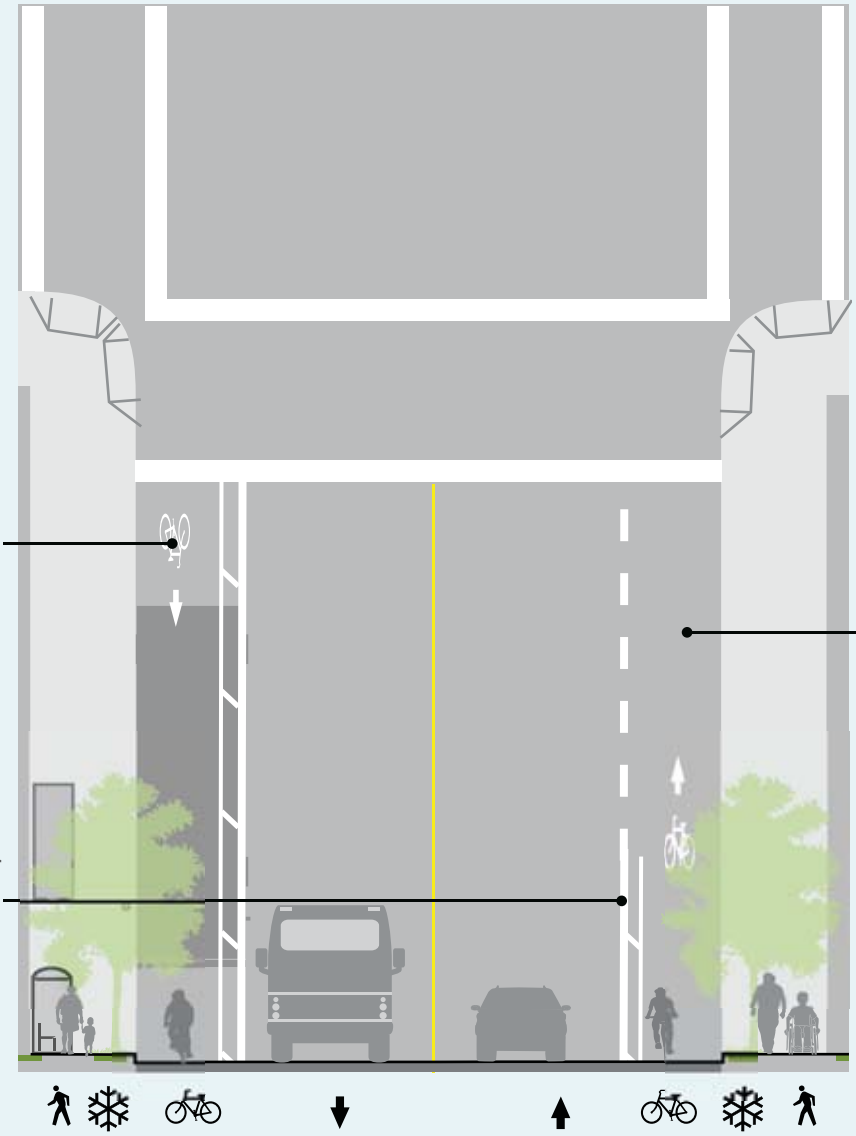
The figures below are examples of potential combinations of complete streets elements and provide references to other sections of the Guidelines which may be helpful. These figures are for illustration purposes only, and do not constitute an approved or compulsory design.

Non-Street Oriented Collector

This example is focused on connecting local roadways to arterial roadways. No on-street parking is provided, and buses pull to the curb at bus stops. If this route is on the bikeway network, a buffered bike lane may be an appropriate bikeway type to offer comfort from high-speed travel.

On high volume, high speed roadways, select appropriate dimensions to balance travel and safety. 4.1.1 Roadway Design, Travel Lanes and Lane Widths

On streets with fast traffic, extra separation is helpful for bicyclists. 4.3.5 Buffered Bike Lanes



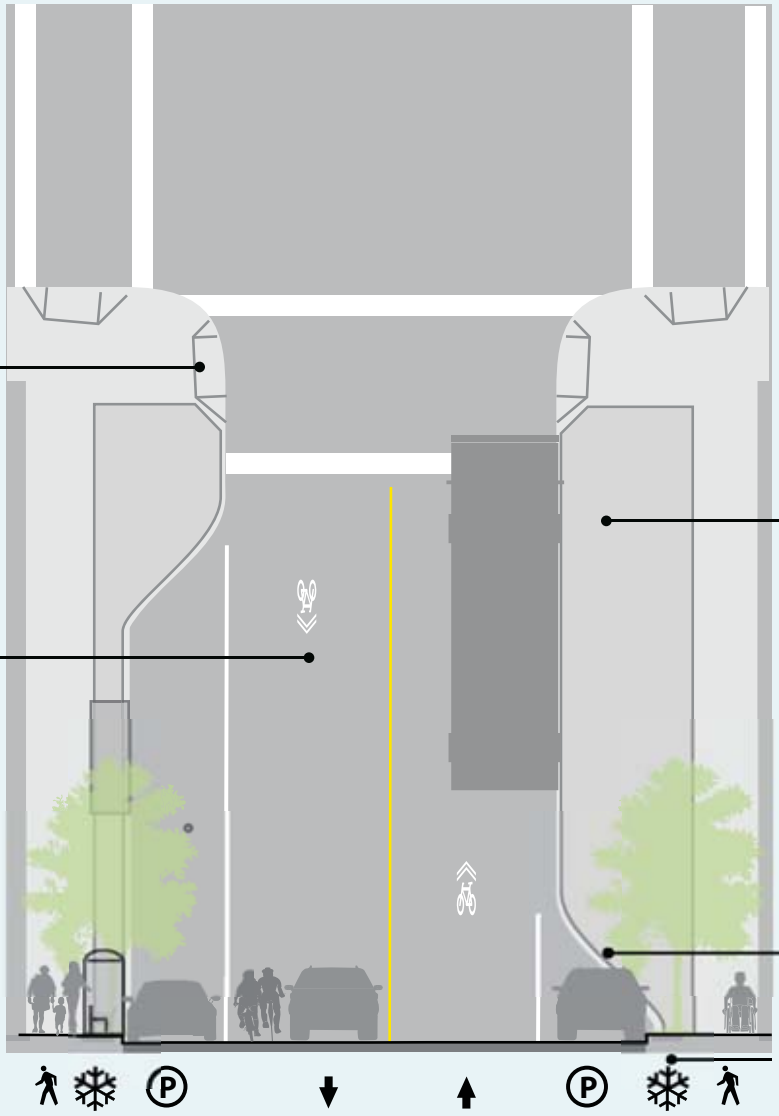
On-street parking is not necessary in all land use areas. 4.1.3 On-Street Vehicle Parking

Street Oriented Collector

This example is focused on balancing the needs of direct access to adjacent properties with the connections to arterial streets. If roadway conditions are slow enough, sharrows encourage bicyclists to share the space with automobiles. Curb extension bus stops speed up transit service and encourage slower travel in the roadway.

Curb extensions minimize crossing distance for pedestrians. 4.2.2 Curb Extension

On streets with appropriate motor vehicle speed and volume, bicyclists may share the road safely with automobiles. 4.3.1 Bicycle Facility Selection



Curb extension bus stops speed up passenger loading/unloading. 4.2.2 Curb Extension

On-street parking is prioritized in street oriented land use areas. 4.1.3 On-Street Vehicle Parking

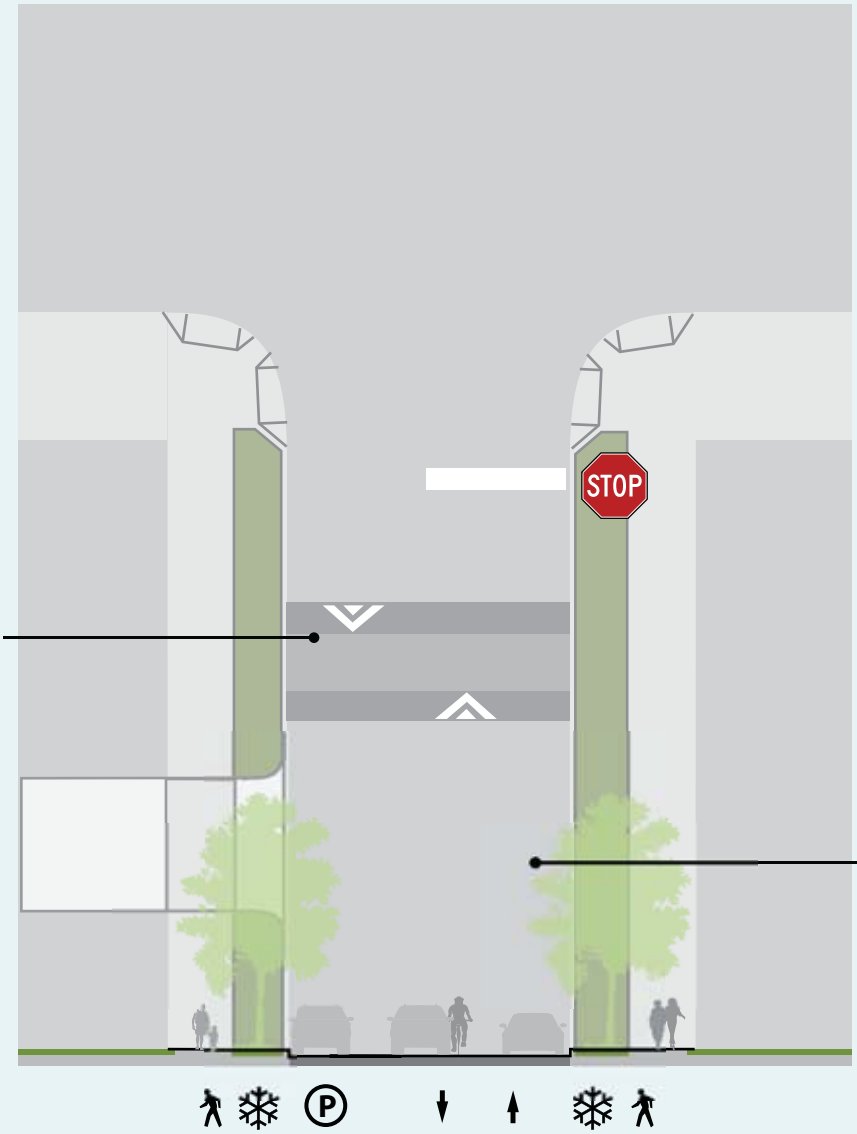
4.6.3 Local Intersection Context

The figures below are examples of potential combinations of complete streets elements and provide references to other sections of the Guidelines which may be helpful. These figures are for illustration purposes only, and do not constitute an approved or compulsory design.

Non-Street Oriented Local

In non street oriented areas, on-street parking is a lower priority than other needs. Even in these areas local streets are designed for access rather than mobility, and speed and volume management techniques may be appropriate.

Depending on context, speeds and volumes may need to be managed on local streets. 4.1.4 Speed and Volume Management Techniques

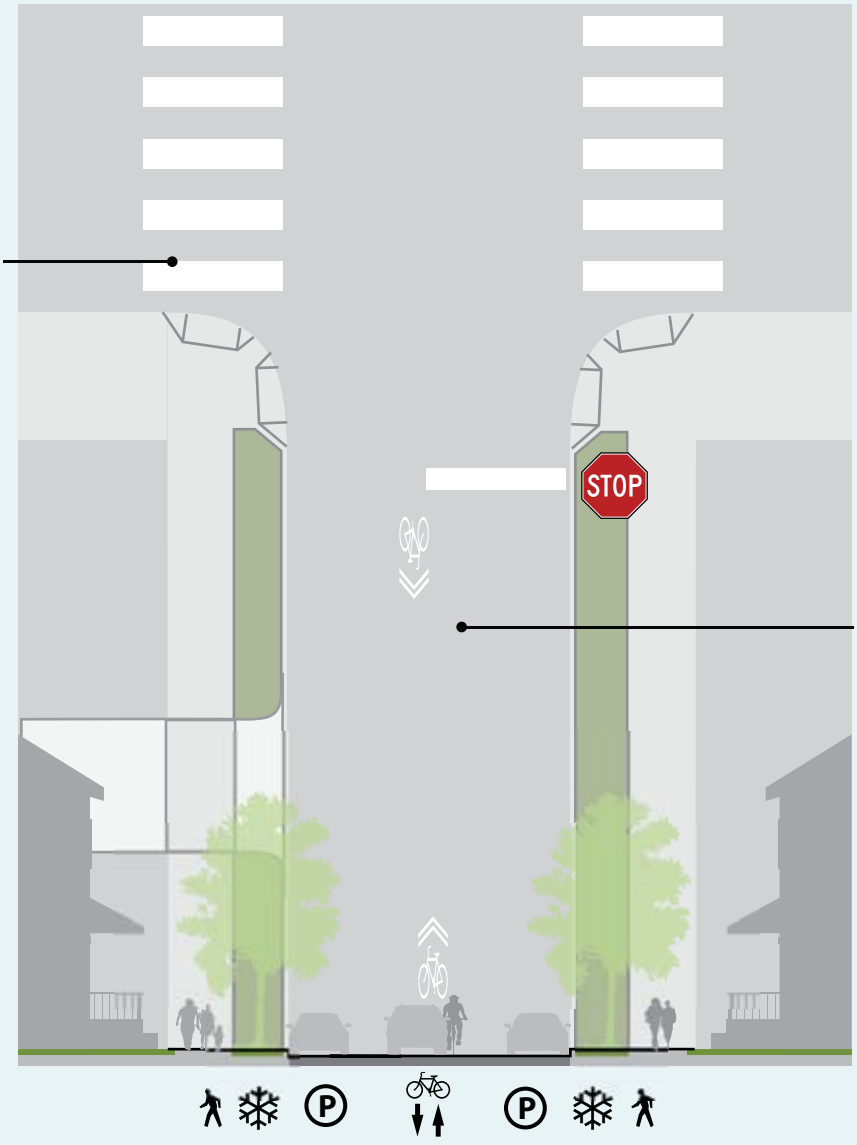


On-street parking is a low priority in non-street oriented areas. 4.1.3 On-Street Vehicle Parking

Residential Local Bikeway

Implemented as a Bike Boulevard, these streets have carefully managed speed and volume to create appropriate conditions for bicycle travel.

On bike network streets, crossings of arterial roadways should be enhanced for low-stress crossing. 4.3.8 Bikeways at Intersections



On bike network local streets, bicycles are given priority in the roadway. 4.3.3 Bike Boulevards

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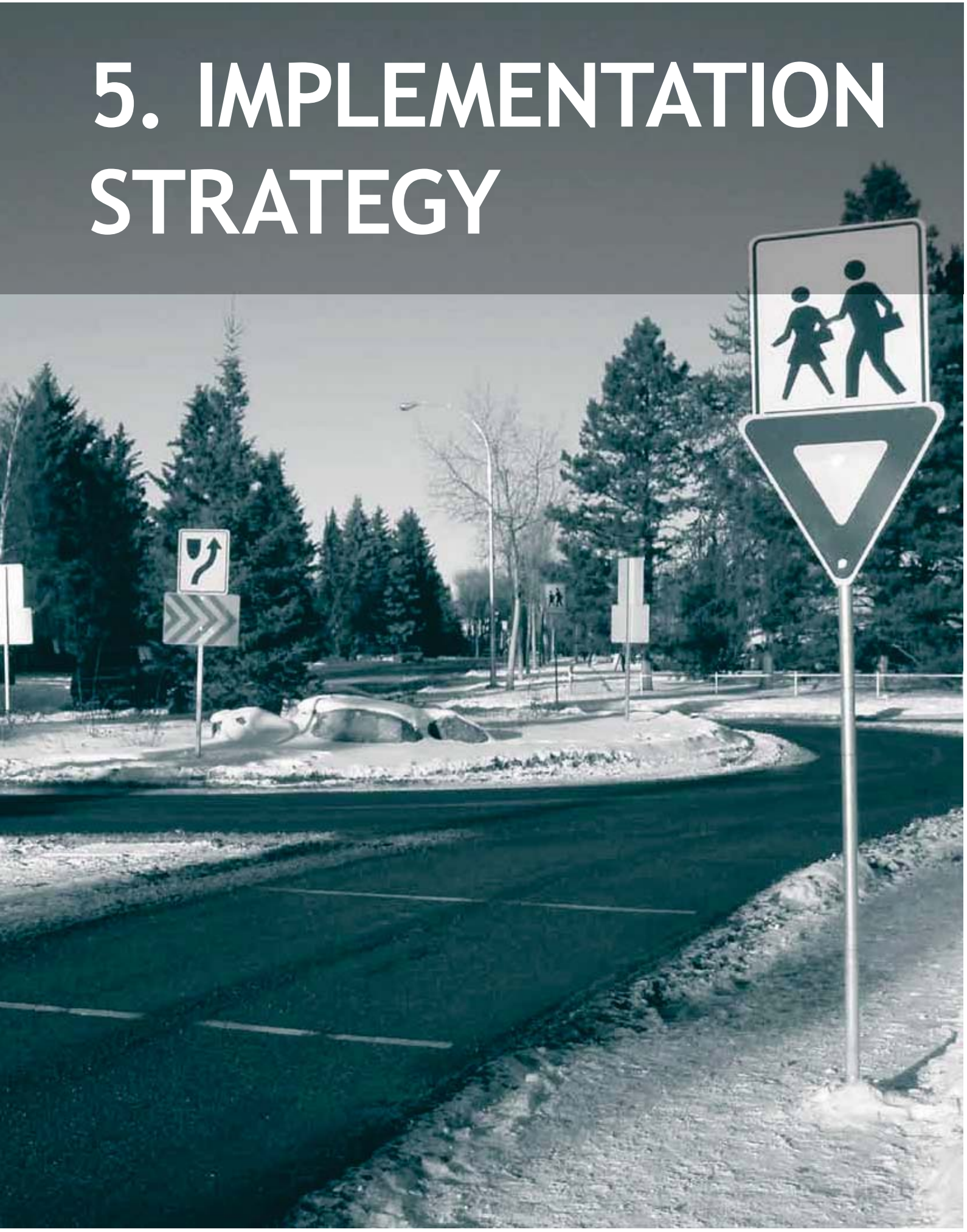
5. IMPLEMENTATION STRATEGY



5. IMPLEMENTATION STRATEGY

The Complete Streets Guidelines represent a change in approach and, as a result, the guidelines are seen as a starting point rather than a finalized conclusion. There are numerous tasks of implementation that will be necessary to undertake. The timeframes for completing these tasks range from immediate to over the next three to five years. All aspects of implementation will be led by the City of Edmonton. **Complete Street implementation will not commence for greenfield until the implications of Complete Streets is understood with the development industry and other relevant stakeholders.**

5.1 Priority Network Maps

[Timeframe for implementation: 1 year]

An important part of the Complete Streets design process is identifying the modal priorities on a street. Priority Network Maps will be developed for walking, biking, transit, auto, and goods. These networks will show where the City will strive to maintain a higher quality of journey for the individual modes. These maps will be used to help inform what cross-sections and elements should be used for the implementation of Complete Streets and for determining priority areas for investment.

It will also be necessary to determine a process for identifying modal priorities as input into other City initiatives, projects and plans affecting mature and established neighbourhoods; modal priorities may need to be considered for Area Redevelopment Plans (ARPs) and major redevelopment proposals (including Large Site, Corridor and Station Area Plans), Neighbourhood Revitalization Strategies, Urban Design and Streetscaping Plans, as well as others.

5.2 Greenfield Pilots and Example Cross Section Development

[Timeframe for implementation: 0-2 years]

The implementation of the Complete Streets Guidelines will not commence for greenfield development until the implications of Complete Streets are understood both by the City and

the development industry. The City will work collaboratively with the representatives from the development industry and other relevant stakeholders over the next year to better understand these implications.

This collaborative process will identify opportunities for pilot projects in greenfield areas to create built examples based on the Complete Streets principles established in this document. This process will also include the development of example Complete Streets cross-sections and a cost efficiency analysis of these cross-sections. As part of this process, it may be appropriate to update the guidelines based on what is learned.

Even though the Complete Streets Guidelines represent a shift from a rigid design process to a flexible one, there is still a desire from both the City and industry to have example cross-sections to ensure the approval process is not overly impacted by this process. When a developer has a desire to implement a concept that is different than the Complete Streets example cross-sections, the guidelines provide flexibility and design ranges that are typically acceptable to the City.

The City's Terms of Reference for the Preparation and Amendment of Residential Neighbourhood Structure Plans will be aligned with the Designing New Neighbourhoods document to operationalize the design guidelines. The update should provide clarity around how new plans are to demonstrate their alignment with the guidelines, the level of planning detail expected at the NSP stage, and technical report requirements. For implementation of Complete Streets, this is particularly important for implementation of the bike network. Enhanced bike facilities will not be required on every street, but a network approach that provides connections to major destinations and to the existing bike network will be necessary.

5.3 Arterial Rehabilitation and Neighbourhood Renewal Pilot

[Timeframe for implementation: 0-2 years]

The extent of implementation for arterial rehabilitation and neighbourhood renewal projects needs to be assessed to understand the cost and process implications. In 2013, the City will assess one neighbourhood renewal project and one arterial rehabilitation program as pilot projects for application of Complete Streets principles and then determine a phased approach for implementation of the Complete Streets Guidelines for these types of projects. It will be critical for stakeholders to work together to align and leverage the process and resource synergies between these two initiatives.

5.4 Cost Efficiency Analysis

[Timeframe for implementation: 0-2 years]

A cost efficiency analysis will be completed for the pilot projects that will allow for the analysis of the impacts of adopting the Complete Streets Guidelines design approach as compared to the existing design standards. The analysis should include a full cost accounting to incorporate the life cycle financial and non-financial costs and implications (beneficial or otherwise) of implementing Complete Streets, including safety, environmental, and social factors. The analysis should include the cost implications for the City of Edmonton, residents, businesses, and the development industry.

5.5 Standards / Bylaw / Policy Amendments

[Timeframe for implementation: 2-5 years]

Complete Streets' impacts to the Zoning Bylaw will be investigated. New utility arrangements and building set back considerations could modify right-of-way requirements. Other bylaw and policy amendments will be identified through the findings of pilot project testing. If applicable, specific items will be investigated and reviewed to identify amendments that support or provide compatibility with the Complete Streets Principles. Investigations may include allowing mid-block pedestrian crossings in Street Oriented areas, or amending Zoning Bylaw requirements related to on-street parking.

5.6 Additional Projects and Processes

[Timeframe for implementation: 0-5 years]

Additional implementation work will address the following.

- How to integrate Complete Streets with other City directives such as The Winter Cities Strategies. The concept of "White of Ways" may have implications on the design of roadway right-of-way design.
- Future integration of parks and pathways projects could be an opportunity to elevate pathway design to Complete Streets standards (e.g. pathway lighting) as well as to identify or construct missing links in the pedestrian and cycling network.

- Investigation into the implications of application of the Complete Streets Guidelines around school sites.
- The development of a Bridge Investment Strategy that includes bridge design elements that implement Complete Streets Principles.
- Integration with Sustainable Transportation's Active Transportation Maintenance Guidelines (to be developed in 2013) and Bikeway Design Guidelines for Edmonton (to be developed in 2014) to ensure compatibility and consistency.
- Investigation of relationship between design speed and roadway operating characteristics to be done jointly with the Office of Traffic Safety.

5.7 Future Element Investigations

[Timeframe for implementation: 0-5 years]

The Complete Streets Guidelines is a 'living document' and will be reviewed annually and amended over time to reflect new thinking and keep up to date with best practices. In addition, it may be necessary for the City to work with TAC to revise and/or develop best practices for Canada for Complete Streets Design. Some of the elements that require further investigation and development include:

- Updates to bicycle facilities guidance to stay current with rapid change in this field.
- Storm water management tools for use within the roadway right-of-way, such as Low-Impact Development (LID). Such tools can help environmental problems associated with runoff as well enhance the aesthetics of a street.
- Traffic Calming measures, including a roundabout element for the Guidelines.
- Special paving treatments including development of a material selection tool. (Paving can be used to define and visually enhance spaces, and visually clarify hierarchies in public spaces.)
- Alley design guidance.
- One-way street design guidance.
- Bus stop pad construction, timing, and flexibility in location.
- Undertake pre- and post-implementation analysis of new street elements being introduced by the Complete Streets Guidelines (e.g. narrower travel lanes, new bike facilities such as cycle tracks, etc.) to better understand their impacts.

5.8 Utilities and Landscaping

[Timeframe for implementation: 2-5 years]

This will entail collaboration with utility providers to investigate new utility arrangements that continue to satisfy utility requirements. The results of this process could involve updating road right-of-way requirements, or support other Complete Streets principles.

5.9 Education and Outreach

[Timeframe for implementation: 0-5 years]

Education and awareness campaigns regarding Complete Streets are essential to successfully implement Complete Street ideas for City staff, industry and citizens. Education strategies will be developed to help the various affected Branches and Departments within the City gain an understanding of how to use this document. Educational campaigns to involve community groups, activists, residents and public agencies will provide public support with the implementation of Complete Streets projects.

5.10 Update Design and Construction Standards

[Timeframe for implementation: 0-4 years]

The Design and Construction Standards for roadways will be updated to incorporate the flexible approach outlined in the Complete Streets Guidelines. The timing of this update, as well as the extent of where the update will apply, will be rationalized in collaboration with the development industry, internal stakeholders, and relevant utility stakeholders and departments. This will not be done until the Greenfield Implementation, Cost Efficiency Analysis, and Education and Outreach for city staff and industry are completed as outlined in Sections 5.2, 5.4, and 5.9 above.

APPENDIX A: UNDERSTANDING THE GUIDELINES FOR CITIZENS

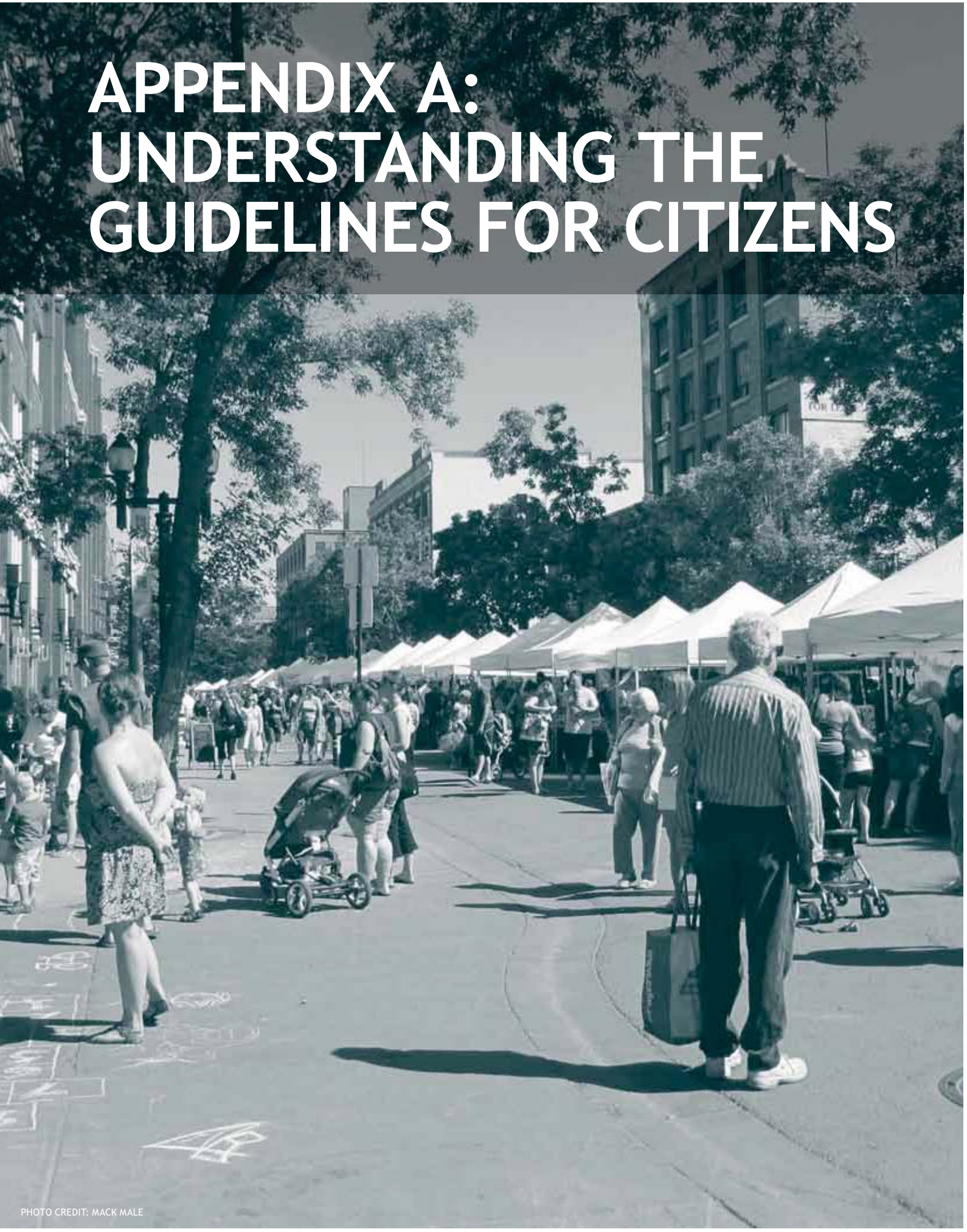


PHOTO CREDIT: MACK MALE

UNDERSTANDING THE GUIDELINES FOR CITIZENS

This document has been written to be as accessible as possible to the general public while also providing clear guidance to street designers. Inevitably, there will be terms or specifications within the Guidelines that may be unfamiliar for readers who are not involved with street design. With that in mind, we have provided some resources to aid citizens in understanding technical terms, to better understand the different aspects of the street design process, and to understand the different elements of a street.

Technical Terms

A glossary describing a wide range of terms used in the Guidelines can be found in Appendix B at the end of the document.

The Street Design Process

In general terms, the historical street design process in Edmonton involves the identification of transportation needs for any given street, and the creation of a design to satisfy those needs. Although Edmonton streets have usually included provision for a range of users, from pedestrians and bicyclists to transit, goods vehicles and automobiles, it is being increasingly recognized that many of our street designs work better for some users than others. Although this document does not propose to completely transform the street design process, it does propose to insert a number of explicit design questions for streets that have not always been asked in the past.

Designers will now be expected to consider in greater detail what the land use context of the street is and what role the street is expected to play for each mode of travel. Each street will have its own defined modal priority (on some streets, pedestrians will be identified to be the highest priority, on others bicycles, transit, trucks or automobiles). In situations where the amount of street width is insufficient to provide each mode with its ideal facility, these modal profiles will guide designers as to where design tradeoffs should be made first. The result of this revised street design process will be designs that are sensitive to their context and provide more complete networks across the city for all modes of travel.

Elements of a Street

A street is more than just the hard surface on which vehicles move; it includes all of the publicly-owned space in between private property lines, from sidewalks and treed boulevards to street furniture such as benches and newspaper boxes, to the roadway surface itself. The roadway surface can be designed to accommodate multiple modes of travel, from transit and trucks to private vehicles and bicycles. Street designers have defined several different typical components of streets, and these are referred to throughout this document. Typical street components include elements to be found within the roadway surface itself, and also other elements located between the edge of private property lines and the edge of the roadway surface.

Between the edge of private property lines and the curb, possible elements of a street include the following:

- Through Zone: this is the clear width of sidewalk itself, designed to accommodate the movement of pedestrian traffic without obstruction.
- Frontage Zone: this is an area between the front of buildings and the Through Zone of the sidewalk that permits outdoor activities such as outdoor patio seating for restaurants, outdoor retail displays for stores, or other extensions of activities from inside of buildings that may interact with public space. Planning for this type of area is primarily a consideration in streets serving pedestrian-oriented commercial areas.
- Furnishing Zone: this is an area of a street, usually located between the through zone and the road surface, designated for benches, light poles, transformers, fire hydrants and other "street furniture".
- Edge Zone: this area includes the curb and gutter, but may also be wide enough to provide space for plowed snow to pile-up in winter, or for other street purposes.
- A Cycle Track (a relatively new type of dedicated cycling facility) may be located between the Furnishing Zone and the Edge Zone on streets where it is desirable to separate bike traffic from automobile traffic. (A cycle track may also be located on the roadway surface next to a parking or travel lane.)

On the roadway surface itself, possible elements of a street include the following:

- Curbside Parking/Loading: especially important in residential areas and commercial areas where buildings are built to the front property line, this portion of the roadway surface allows for on-street parking, loading areas for trucks, and transit stops.
- Bike Lane: this type of dedicated cycling facility could be found on streets where it is desirable to place bike traffic side-by-side with automobile traffic.
- Dedicated Bus Lane: located on streets where smoother movement of transit vehicles is a high priority, dedicated bus lanes are typically located in the outside lane of a roadway, closest to the curb.
- Travel Lanes: of varying widths depending on context and whether or not transit or goods vehicles will be frequently using the street, these are the driving lanes to be found on every roadway.
- Centre Median/Turn Lane: most typically a part of large arterial roadways, centre medians and turn lanes can be found where sufficient traffic volumes and speeds justify separating the two directions of traffic from each other, allowing turning vehicles to pull out of the main flow of traffic, and/or, if the width of the street allows, for landscaping in the centre of the roadway.

Depending on the context and desired function of the street, street designers will select appropriately from this range of elements to come up with a final design. Additional detail and visual descriptions of the different street elements described above can be found in Section 4.

The Complete Streets Guidelines are to be used to understand the design possibilities, as one part of a complex design process that involves working with a broad range of roadway and associated technical components (including drainage and utilities). In selecting the appropriate elements, the engineer will use an evidence based approach, and evaluate the overall network for missing pieces, the total cost in the decision making and safety impacts.

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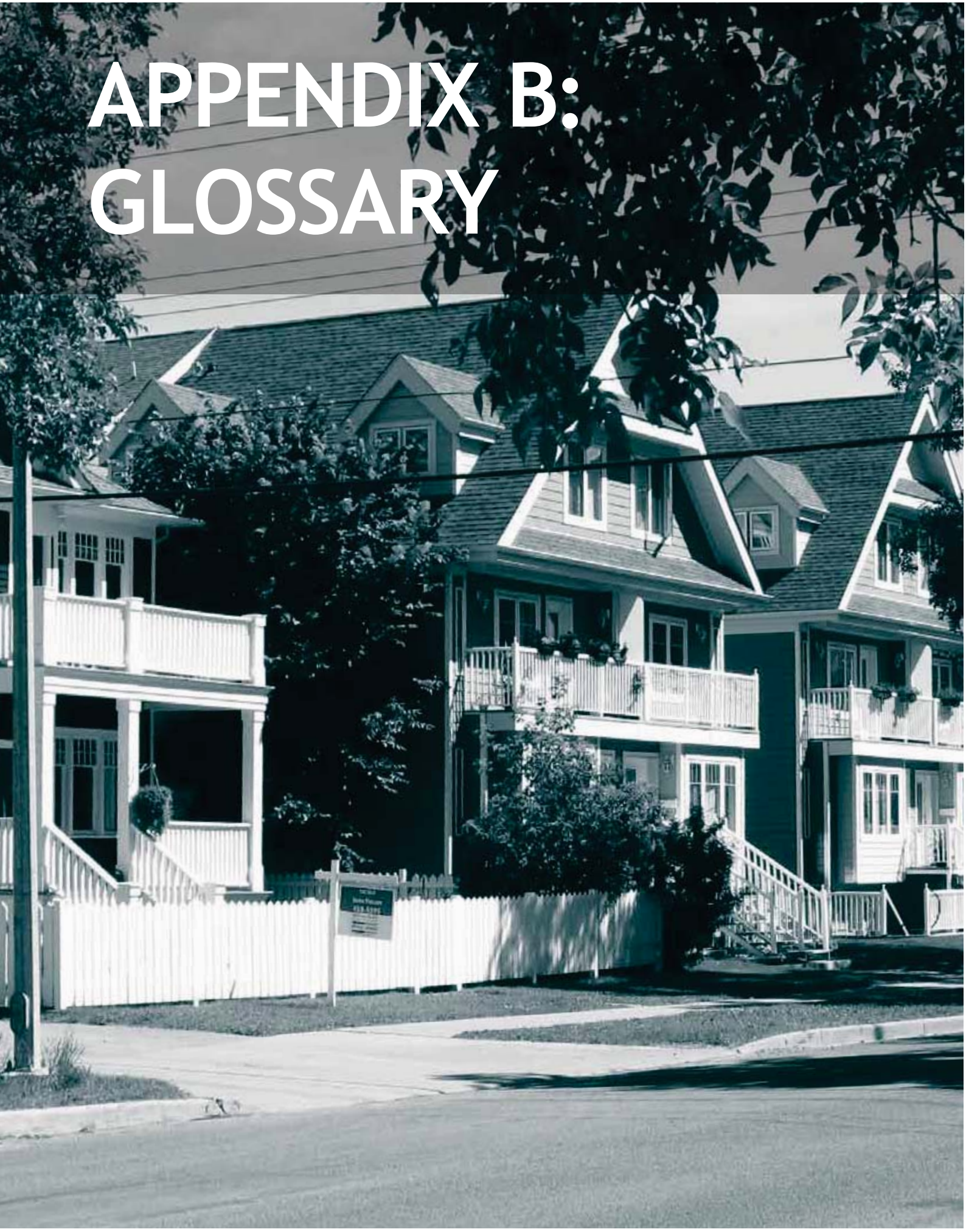
APPENDIX B: GLOSSARY



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Accessibility The ease of access to goods, services, activities, buildings and destinations.

Active Modes See Active Transportation.

Active Transportation Any mode of transportation by which people use their own energy to power their motion, including walking, running, cycling, cross-country skiing, skateboarding, snowshoeing, inline skating and use of a manual wheelchair.

Age Friendly Design An age friendly built environment includes a safe pedestrian environment, safe street crossings, easy to access shopping centres, a mix of housing choices, nearby health centres and recreational facilities. Additional age friendly urban design features could include non-slip materials on footpaths, adequate street and park furniture and awnings for weather protection, legible and pedestrian scale signage, well-lit walking areas, and the incorporation of Crime Prevention Through Environmental Design principles.

Arterial Roads Intended to carry large volumes of traffic between areas ("through" traffic) with fewer access opportunities to adjacent developments and are defined by the Transportation System Bylaw.

Barrier-free A design characteristic that maximizes accessibility for persons with physical or cognitive difficulties.

Capacity (Roadway) Maximum hourly rate at which vehicles can reasonably be expected to pass a given point given prevailing roadway, traffic, and control conditions.

Collector Roads Provide neighbourhood travel between local and arterial roads and direct access to adjacent lands. Buses generally operate on collector roads within neighbourhoods.

Community Traffic Management Processes and techniques to mitigate locations where excessive volumes of shortcutting traffic and high speeds affect the safety and livability of a neighbourhood. "Shortcutting" traffic are not residents of the community, nor do they have a destination within the neighbourhood. Engineering solutions are implemented to minimize access for through traffic and to make neighbourhood roads undesirable as shortcuts. The procedure provides a holistic approach in investigating the causes of the problem, the immediate area as well as adjacent neighbourhoods and corridors.

Complete Street Elements A tool kit of design features that can be used to improve comfort, safety and efficiency for various roadway users; to make a street more attractive and improve ecological function.

Constrained Dimensions Describes the range of horizontal design dimensions that might be considered when allocating space within a limited right-of-way.

Crime Prevention Through Environmental Design (CPTED) A pro-active crime prevention strategy that focuses on an analysis of how the features of the environment and the policies that govern its management and use can constrain criminal activity. CPTED strategies are based on the premise that the proper design and effective use of the built environment can lead to a reduction in the incidence and fear of crime and improve the quality of life. Emphasis is placed on the physical environment, productive use of space, and behaviour of people to create environments that are absent of environmental cues that cause opportunities for crime to occur.

Dangerous Goods Route (DGR) A route which is part of the City's Truck Route system, designated for heavy vehicles carrying specified dangerous goods.

Density The number of dwelling units, square metres of floor space, or people per acre or hectare of land.

Design Domain Design domain is a design approach described in the TAC Geometric Design Guide for Canadian Roads (Section 1.1.5) which establishes that a given design parameter (e.g. lane width) can vary within a range of values. Typically the design domain is the practical range of values that falls somewhere between the absolute lower limit and the absolute upper limit for the design parameter.

Design Speed As defined in the TAC Geometric Design Guide for Canadian Roads (Section 1.2.3.3), design speed is the speed selected as a basis to establish appropriate geometric design elements for a particular section of road.

Designing New Neighbourhoods Designing New Neighbourhoods is the name of a new set of guidelines for Edmonton's developing communities, to be approved by City Council in 2013. These guidelines will inform the physical structure and layout of brand new neighbourhoods in Edmonton's Urban Growth Areas, establish a collective vision for our communities, and encourage them to

develop in ways that are unique, innovative and sustainable.

Frequency (Transit) The number of transit units (buses or trains) on a given route or line, moving in the same direction, that pass a given point within a specified interval of time, usually 1 hour.

Functional Classification Functional classification is the process by which streets and highways are grouped into classes according to the land use, service function, traffic volume and speed, flow characteristics, vehicle type, and connections.

Geometric Design Guide for Canadian Roads A publication of the Transportation Association of Canada (TAC). Generally considered a primary reference informing the design of roads in Canada, particularly in the absence of locally-defined design guidance that may have been established in a particular jurisdiction.

Goods Movement The transportation of goods (freight or commodities) by road, rail or air.

Greenfield Development Urban development where there is no need to demolish or rebuild any existing structures. Typically this development occurs on the periphery of the City of Edmonton.

High Occupancy Vehicle (HOV) A vehicle occupied by multiple occupants, usually 2-3 or more occupants. Often HOVs are defined by a local regulation or sign, indicating how many occupants are required for the vehicle to be able to travel in a separate lane for HOVs. Buses are usually considered HOVs in this context.

High Truck Volume Street For the purpose of the Complete Streets Guidelines, a High Truck Volume Street is defined as a street with greater than 5% trucks and/or a high frequency of interactions (> 1,000 trucks/day). A High Truck Volume Street may or may not be an official Truck Route as defined in the Transportation System Bylaw #15101.

Level of Service (LOS) An indicator of the quality of operating conditions for the transportation system that may be applied to cycling or walking facilities (to reflect connectivity, convenience and comfort), transit service (to reflect speed, reliability, frequency and passenger comfort) or roadways (to reflect the ratio of vehicle demand to roadway capacity and resultant delay).

Link The role of the street in serving as a facility for the movement of people through the corridor.

Involving Edmonton Involving Edmonton is the City's public involvement framework which defines the strategic approach to be used in all City public involvement processes. The Framework includes the Core Commitments and Standards of Practice, the Spectrum of Public Involvement and the Public Involvement Road Map. It is based on three key features: clear purpose, consistent approach, and commitment to involve.

Local Roads Provide direct access to adjacent lands and serve neighbourhood travel.

Modal Priorities A ranking of transportation modes order to identify which mode should be given higher consideration in decisions concerning physical design and operations.

Modal Priority Networks Modal priority networks are in preparation by the City of Edmonton for existing and future developed areas of Edmonton, defining the locations of multi-modal routes and connections at a city-wide scale of influence. The modal priority networks in many cases will build on existing network definitions, but will be customized and updated (e.g. the 2013 draft Priority Bicycle Network, which is made up of Spoke Routes and Cross-town Routes that provide long, continuous bikeways across the city and connect numerous neighbourhoods to important destinations).

Mode Share The percentage of person-trips made by one travel mode, relative to the total number of person-trips made by all modes.

Mode Shift The shift away from single occupant vehicle use and dependency to an increased variety of transportation mode usage for various types of trip.

Multi Modal Level Of Service (MMLOS) MMLOS is a rating system that is used to broadly assess the travel experiences for pedestrians, bicycles, autos, transit and trucks along a specified corridor or location. The measure considers journey quality.

NACTO National Association of City Transportation Officials. NACTO is an association of sixteen of the largest US cities, with a mission to provide interaction with other cities on best practices, while providing a forum for a unified urban voice in U.S. transportation policy. Of particular relevance, NACTO has produced an Urban Bikeway Design Guide.

NACTO Urban Bikeway Design Guide The purpose of the NACTO Urban Bikeway Design Guide is to provide cities with state-of-the-practice solutions that can help create complete streets that are safe and enjoyable for bicyclists, based on the experience of the best cycling cities in the world. Most of the treatments in the Guide are not directly referenced in the current version of the US AASHTO Guide to Bikeway Facilities, although they are virtually all (with two exceptions) permitted under the US Manual on Uniform Traffic Control Devices (MUTCD). All of the NACTO Urban Bikeway Design Guide treatments are in use internationally and in many cities around the US and Canada.

Neighbourhood A residential area with an appropriate mix of housing types with convenience-type commercial facilities and where appropriate, schools or park facilities.

Operating Speed The prevailing speed of traffic on a transportation facility. Typically quantified as the 85th percentile speed (i.e. the speed at which 85 per cent of vehicles are travelling at or below).

Pedestrian Friendly See Walkable

Pedestrian Oriented See Walkable

Place The role of the street in serving as a destination for people to spend time.

Placemaking Placemaking is the process of creating spaces, such as squares, plazas, parks, and streets, that will attract people because they are pleasurable or interesting. (Source: Wikipedia)

Posted Speed See Speed Limit

Public Transportation Public transportation is a shared passenger transportation service which is available for use by the general public, as distinct from modes such as taxicab, carpooling or hired buses which are not shared by strangers without private arrangement. (Source: Wikipedia). Edmonton Transit is the public transportation operator in Edmonton, and the system is comprised of bus, LRT, and DATS services.

Rehabilitation (of Infrastructure) The action of restoring a component, system, infrastructure asset, or facility to a former condition or status.

Replacement (of Infrastructure) The action of replacing a component, system, infrastructure asset or facility.

Safety Freedom from the occurrence or risk of injury, danger or loss.

Security (Personal Security) The real or perceived sense of personal security including the condition of being protected from criminal activity such as assault, theft, and vandalism.

Shared Use Path A facility for active transportation modes (including walking, wheel chair use, jogging, cycling, and in-line skating) which is generally constructed to a wider, asphalt standard, but may be concrete or granular.

Speed Limit The legally-defined maximum speed of vehicles on a transportation facility. In Edmonton, speed limits are defined by the Speed Zones Bylaw (#6894). The speed limit is sometimes referred to as the Posted Speed, though not all speed limits are "posted" (since the default speed limit on all streets within Edmonton is 50 km/h as per the provincial Traffic Safety Act, unless otherwise defined by the Speed Zones Bylaw).

Speed Management Processes and techniques to preserve neighbourhood livability by mitigating excessive traffic speeds in neighbourhoods where traffic volume or "shortcutting" is not the concern. An education first approach is used to raise awareness within the neighbourhood. Enforcement or engineering measures may be implemented where education programs prove to be ineffective.

Street Type Defines a street, taking into consideration the land use context, relationship of buildings to the street and the number of travel lanes, volume, type and speed of traffic.

Streetscape All the elements that make up the physical environment of a street and define its character, including: the road, boulevard, sidewalk, building setbacks, height and style. It also includes paving treatments, trees, lighting, pedestrian amenities and street furniture.

TAC Transportation Association of Canada. A national association with a mission to promote the provision of safe, secure, efficient, effective and environmentally and financially sustainable transportation facilities. In urban areas, TAC's primary focus is on the movement of people, goods and services and its relationship with land use patterns. One of TAC's flagship publications is the Geometric Design Guide for Canadian Roads. TAC publishes many other relevant documents, including Bikeway Traffic Control Guidelines for Canada.

Trade-Offs The process of balancing and prioritizing competing demands within a constrained right-of-way

Traffic Calming The elements of a streetscape that are designed to slow the speed of traffic.

Transit See Public Transportation

Transit Avenue Linear corridors served by one or more bus routes that provide all day service and connect major trip generators, LRT stations and transit centres, as illustrated in Figure 4.1 of *The Way We Move*. The bus routes serving these areas operate with at least 15 minute frequency during weekday peak, weekday midday periods, Saturday midday periods and Sunday midday periods, seven days a week. Land uses along these corridors (residential, commercial, and/or employment) are oriented toward the street, have existing or planned higher density, pedestrian orientation and design and may have existing pedestrian traffic.

Transit Centre / Transit Station Locations where multiple buses (transit centres) and/or LRT trains (transit stations) can stop simultaneously to allow transfers between routes.

Transit Oriented Development (TOD) Intensified development around LRT stations and transit centres, which creates attractive, livable and compact neighbourhoods with housing, jobs, shopping, community services and recreational opportunities all within convenient walking distance of a node. All TODs are not the same; each development has a unique context and may serve different purposes. Some intensified and mixed use development will also occur along Transit Avenues at a lower level of magnitude.

Transit Priority Measures Strategies used to increase transit operating speeds and/or travel time reliability, particularly for transit services in mixed traffic; including traffic signal priority, bus activated signals, queue jumps, queue bypasses, and bus lanes as well as exclusive right-of-way options such as LRT corridors.

Transportation Utility Corridor (TUC) A ribbon of land around the city, under the direct control of the Province of Alberta, which is intended to be used for the Outer Ring Road, Anthony Henday Drive, power lines, and sewers.

Travel Mode The selected method of travel, such as automobile use (driver or passenger), public transportation (bus, LRT, DATS), or active transportation (including walking, wheel chair use, jogging, cycling, and in-line skating).

Truck Route System A network of designated roadways that have been designed and constructed to permit and withstand use by heavy trucks. See also definition of High Truck Volume Streets in this glossary.

Universal Design The design of buildings, streets, services, transportation systems, and public spaces that accommodate the widest range of potential users. This is accomplished by removing barriers for those with mobility, visual and hearing impairments, and accounting for other special needs. The Seven Principles of Universal Design are (1) Equitable Use, (2) Flexibility in Use, (3) Simple and Intuitive Use, (4) Perceptible Information, (5) Tolerance for Error, (6) Low Physical Effort, and (7) Size and Space for Approach and Use.

Utilities Facilities for gas, electricity, telephone, cable television, water, storm and sanitary sewer.

Walkability The extent to which the built environment allows people to walk to get to everyday destinations for work, shopping, education, and recreation and can be affected by street connectivity, mix of land uses, destinations, and pedestrian infrastructure.

Walkable An environment designed to make travel on foot convenient, attractive, and comfortable for people of various ages and physical or cognitive abilities. Considerations include the directness of the route, safety, amount of street activity, separation of pedestrian and auto circulation, street furniture, surface material, sidewalk width, prevailing wind direction, intersection treatment, curb cuts, ramps and landscaping.

Wildlife Passage Guidelines Wildlife Passage Guidelines are engineering design guidelines promoting the maintenance or enhancement of urban biodiversity by ensuring that wildlife populations are able to disperse throughout the city. The guidelines are intended to ensure that wildlife are able to access areas in order to fulfill their life cycles, prevent populations from becoming fragmented or isolated, and alleviate safety concerns associated with wildlife-vehicle interactions.

Winter City A concept for communities in northern latitudes that encourages them to plan their transportation systems, buildings, and recreation projects around the idea of using their infrastructure during all four seasons, rather than just two seasons (summer and autumn).

Zoning Bylaw The bylaw that divides the city into land use zones and establishes procedures for processing and deciding upon development applications. It sets out rules which affect how each parcel of land in the city may be used and developed. It also includes a zoning map.

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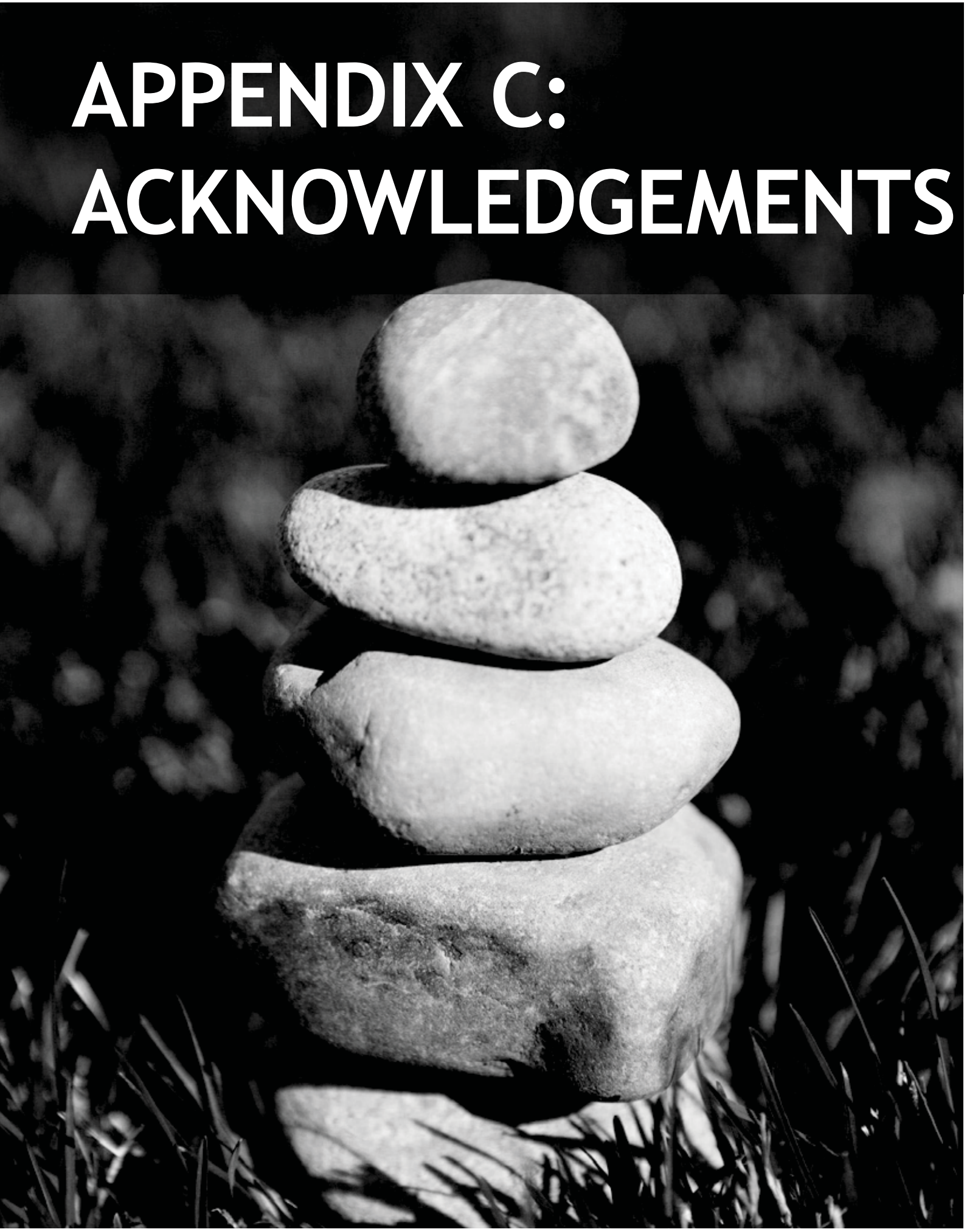
APPENDIX C: ACKNOWLEDGEMENTS



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Acknowledgements

The Edmonton Complete Streets Guidelines were created as a result of a highly-collaborative process combining the knowledge and efforts of City staff, the consulting team, and representatives of key stakeholders. The contributions of all these people are greatly appreciated.

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National Complete Streets Coalition
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Smart Growth America
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Designing Streets For People
- Michael Ronkin, Geneva

Mathews Nielsen Landscape Architects
- Signe Nielsen, New York

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Edmonton Federation of Community Leagues
Central Area Council of Community Leagues
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University of Alberta Researchers
Edmonton Business Association
Edmonton Bicycle Commuters
Utility representatives from EPCOR, ATCO, TELUS, Shaw, Direct Energy
Alberta Health Services
Emergency Medical Services
Edmonton School Boards
Joint Land Use Committee
NextGen
City of Edmonton - Transportation Services
- Transportation Planning
- Roads Design and Construction
- LRT Design and Construction
- Edmonton Transit
- Transportation Operations

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