STREET MANUAL (Draft 3.0)

For Discussion Purposes

NOTE TO REVIEWERS: THE STREET MANUAL IS BASED ON THE FORMAT OF THE TRANSPORTATION ASSOCIATION OF CANADA (TAC) GEOMETRIC DESIGN GUIDE FOR CANADIAN ROADS (GDG). THE CONTENT IN THE STREET MANUAL CONSOLIDATES AND UPDATES DESIGN GUIDANCE PREVIOUSLY PROVIDED IN CALGARY'S DESIGN GUIDE FOR SUBDIVISION SERVICING (DGSS) SECTION II: ROADS AND THE COMPLETE STREETS POLICY AND GUIDE. THE STREET MANUAL WILL REPLACE SECTION 2 OF THE DGSS.

NOTE TO REVIEWERS: CROSS REFERENCES TO OTHER SECTIONS OF THE DGSS OR OTHER DOCUMENTS WILL BE REVIEWED AND UPDATED PRIOR TO FINALIZATION OF THE STREET MANUAL.

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Land Acknowledgment

NOTE TO REVIEWERS: TO BE DEVELOPED AND INCLUDED IN THE APPROVED VERSION OF THE STREET MANUAL.

Chapter 1.0 Introduction

1.1 Vision

Streets are a public asset that should always be available for public use. Streets offer space for movement and access and facilitate a variety of uses and activities. The Street Manual will help create a thriving city with inclusive communities that are supported by a network of streets that are safe for all Calgarians, regardless of how they move.

The Street Manual is a part of a library of documents that guides the planning and design of infrastructure for The City of Calgary. The Street Manual provides guidelines for street design consistent with the Calgary Plan and is intended to enable The City's policy direction that all mobility networks are to be safe, reliable, and easy to use. The Street Manual should be used with The City of Calgary *Roads Construction Standard Specifications* and other relevant City of Calgary standards and specifications.

1.2 Objectives

The livability of a city is highly dependent on its streets. Shaping how safe, comfortable, efficient, and vibrant a city's streets will affect how livable it is and how connected its citizens feel. The street is a public asset that should be available for public use.

The following objectives reflect what individual streets, and the street network overall must do to support mobility and a variety of uses and activities in the city. These objectives must be considered by The City, developers, and consultants throughout the decision-making process for the planning and design of all streets and rights of way. They will also inform The City's operational practices to ensure that design and operations work together to achieve consistent outcomes.

Through implementing the Street Manual, Calgarians will benefit from streets that achieve the following aspirational objectives:

1. **Safe:** Streets will be designed and operated using the Safe System Approach (described in 1.6), where no amount of death or serious injury is acceptable, and where protecting the most vulnerable users is the top priority.
2. **Connected:** Streets will connect Calgarians with each other and to the things that matter to them by enabling successful places, creating opportunities for social interaction and transitions between travel options, and contributing to practical all-season, all-hours mobility networks for all travel options.
3. **Environmentally Sustainable:** Streets will mitigate pollution and support climate action by expanding the urban forest, supporting biodiversity, managing stormwater, and providing Calgarians with more access to viable walking, wheeling, and transit options.
4. **Healthy:** Streets will support belonging, emotional wellbeing, and physical health by creating comfortable environments where Calgarians want to live near, connect to nature, and play, not simply travel through.
5. **Inclusive:** Streets will address the needs of equity-denied Calgarians by enabling more affordable travel options, incorporating universal design, and supporting independent mobility for all ages and abilities.

6. **Financially Responsible:** Streets will support both short- and long-term financial sustainability by minimizing costs from collisions, construction, maintenance, operational delays, and pollution.
7. **Productive:** Streets will create economic opportunities for Calgarians by enabling productive commercial and industrial areas, supporting the efficient movement of goods and services, equitable access for the labour force, and facilitating utility infrastructure.

The Street Manual provides guidelines in street design consistent with these objectives and is intended to address all types of streets, including Skeletal Roads.

1.3 Purpose

Consistent with the Calgary Plan, the Street Manual is to be used by designers, planners, and engineers working on behalf of The City of Calgary (The City) or private parties in the design and construction of public roads and streets. It is applicable to all types of roads and streets, in both greenfield and retrofit contexts.

All construction methodologies and materials are to follow the requirements of the current edition of The City's Standard Specifications for Road Construction. NOTE TO REVIEWERS: THE NAME OF THE ROADS CONSTRUCTION STANDARD SPECIFICATIONS MAY REQUIRE UPDATING IN THE STREET MANUAL DEPENDING ON WHETHER THE SPECIFICATIONS ARE RENAMED. AS SUCH, REFERENCE TO THE STANDARD SPECIFICATIONS ARE IN YELLOW HIGHLIGHTING.

While the Street Manual provides guidelines for the geometric design of streets, the Manual should not be considered a substitute for engineering judgment. Engineering judgment should be exercised in the selection and application of geometric design elements based on the land use context and the environment of the street. Nothing within the Street Manual removes the designer engineer's responsibilities to hold paramount the health, safety, and welfare of the public and to have regard for the environment.

1.4 Relationship to Other Design Documents

The Calgary Plan provides an overall vision and objectives for Calgary in terms of community experiences and priorities for the mobility system. The Calgary Plan also provides maps of the primary mobility networks planned for Calgary. These networks are designed to satisfy the mobility needs for Calgary, as well as align with the land use policies and urban context provided in the Calgary Plan. The Calgary Plan is a statutory document which establishes a planned mobility infrastructure system and requires mobility infrastructure to support the long-range vision for Calgary.

The Street Manual provides guidance on how to implement this vision. The Street Manual replaces the Complete Streets Policy (TP021) and Guide (2014) and the Design Guidelines for Subdivision Servicing (2020) Section II: Roads. Input from all other relevant sections of the Design Guidelines for Subdivision Servicing (2020), or future versions, should be considered in the design guidance for mobility systems.

The basis of the Street Manual's direction for geometric design is the most recent edition of the Transportation Association of Canada's (TAC) Geometric Design Guide for Canadian Roads (GDG). The Street Manual and the TAC GDG, when used together, form the collection of geometric design guidelines for the streets under the jurisdiction of The City of Calgary. The following should be used when applying design guidance from the Street Manual and TAC GDG in combination:

- If a design topic is addressed in both the Street Manual and the TAC GDG, but the Street Manual contains information that differs from the TAC GDG, the information in the Street Manual should be taken as The City standard.
- If a design topic is not addressed in the Street Manual but is addressed in the TAC GDG, the information in the TAC GDG should be used for guidance.
- If a design topic is not addressed in the Street Manual or the TAC GDG, but is addressed in another City of Calgary, Province of Alberta, Transportation Association of Canada, CSA Group, or National Association of City Transportation Officials publication, the guidance from the other publications can be used and will require approval by The City of Calgary. Submission of a Design Exception may be required for publications from organizations not noted above.

Design guidance from other publications include the most recent edition of the TAC Manual of Uniform Traffic Control Devices for Canada (MUTCDC), CSA Group, and National Association of City Transportation Officials (NACTO) Urban Street Design Guide. The Street Manual is consistent with the Standards included within the MUTCDC and provides further implementation direction that supports application of the Guidance and Options portions of the MUTCDC for Calgary.

Relevant standards, guidance, and background information from the GDG, MUTCDC, and other documents are typically not repeated in the Street Manual and designers should refer to the most recent edition of those documents in parallel with this Street Manual. To facilitate cross-referencing with the GDG, the same chapter structure is utilized for this Street Manual's first nine chapters.

A summary of industry standards and City documents referenced in preparing the technical recommendations in this manual is as follows:

- Transportation Association of Canada Geometric Design Guide for Canadian Roads (2017) (abbreviated in the Street Manual: TAC GDG)
- Transportation Association of Canada Manual of Uniform Traffic Control Devices for Canada (2021) (abbreviated in the Street Manual: MUTCD-C)
- Calgary Transit Bus Design Guidelines (Draft September 2021)
- Alberta Transportation's Roadside Design Guide (2019)
- Transportation Association of Canada's / Canadian Institute of Transportation Engineers' Canadian Guide to Traffic Calming (2018)
- Calgary Access Design Standards (2016)
- Calgary Development Guidelines and Standard Specifications: Landscape Construction (2024)
- Calgary Stormwater Management and Design Manual (2011)
- Calgary Design Guidelines for Bridges and Transportation Structures (2024)
- Calgary Standard Specifications and Design Guidelines Potable Water Feedermain Construction (2021)
- Calgary Standard Specifications Waterworks Construction (2022)
- Calgary Standard Specifications Sewer Construction (2022)
- Canadian Standards Association (CSA Group). Accessible design for the built environment. Standards Council of Canada. National Standard of Canada, Accessibility Standards of Canada, CSA/ASC B651:23. https://www.csagroup.org/store/product/CSA-ASC%20B651%3A23/ (2023) (abbreviated in the Street Manual: CSA)

- The Canadian National Institute for the Blind (CNIB) Foundation. Clearing Our Path Version 2.0. CNIB. https://clearingourpath.ca/ (Accessed 2024)
- National Association of City Transportation Officials Urban Street Design Guide (2013)
- CROW Design Manual for Bicycle Traffic (2016)

The guidance in the Street Manual is intended for application in typical Calgary contexts. Similarly, guidelines in other publications are intended for certain contexts. It is not possible for any manual or publication to cover every situation that will be encountered in the field.

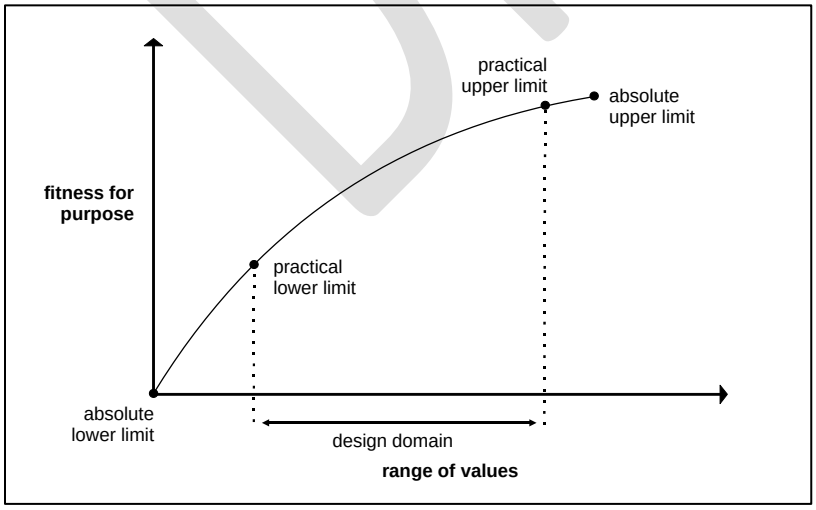
The fundamental responsibility of an Engineer is to exercise professional judgment in the best interest of the public. Standards and guidelines assist engineers in making judgments, but standards and guidelines are not intended as a substitute for professional judgment. Engineers must exercise judgment when applying the design guidance as written and when considering exceptions.

Exceptions to the guidance in the Street Manual requires justification and approval through the Design Exception Process. The approval process itself must not be considered an argument or justification for failing to consider an exception to the design guidance when it is judged to be in the public interest. See Section 1.9 for the Design Process and Section 1.9.4 for the Design Exception Process.

1.5 Use of the Street Manual

While the content of this Street Manual is framed as design guidelines, it is directive in nature and is not to be viewed as merely ideas or suggestions. Where a street design relates to a greenfield situation, the cross-sections and target values for design elements are to be utilized. In retrofit situations, the design guidelines are to be followed as closely as possible with the design process outlined in Section 1.9 to be followed when the cross sections cannot be incorporated as is.

Consistent with the Transportation Association of Canada's Geometric Design Guide for Canadian Roads (TAC GDG), this Street Manual incorporates the Design Domain concept. The Design Domain is the range of values that a design element might take, which will have a relationship with the fitness-for-purpose of the design element as illustrated in the figure below.



Source: Geometric Design Guide for Canadian Roads. Ottawa, Transportation Association of Canada, 2017.

As well as providing target values for the various street elements, the Design Domain concept also provides upper and lower bounds of values. Provision of a range of values is intended to respond to constraints, particularly those found in retrofit projects, without compromising functionality or policy objectives.

When alternative designs are required to meet the Objectives identified in Section 1.2, or to address needs based on the local context, these are to be approved through the Design Exception process identified in Section 1.10.

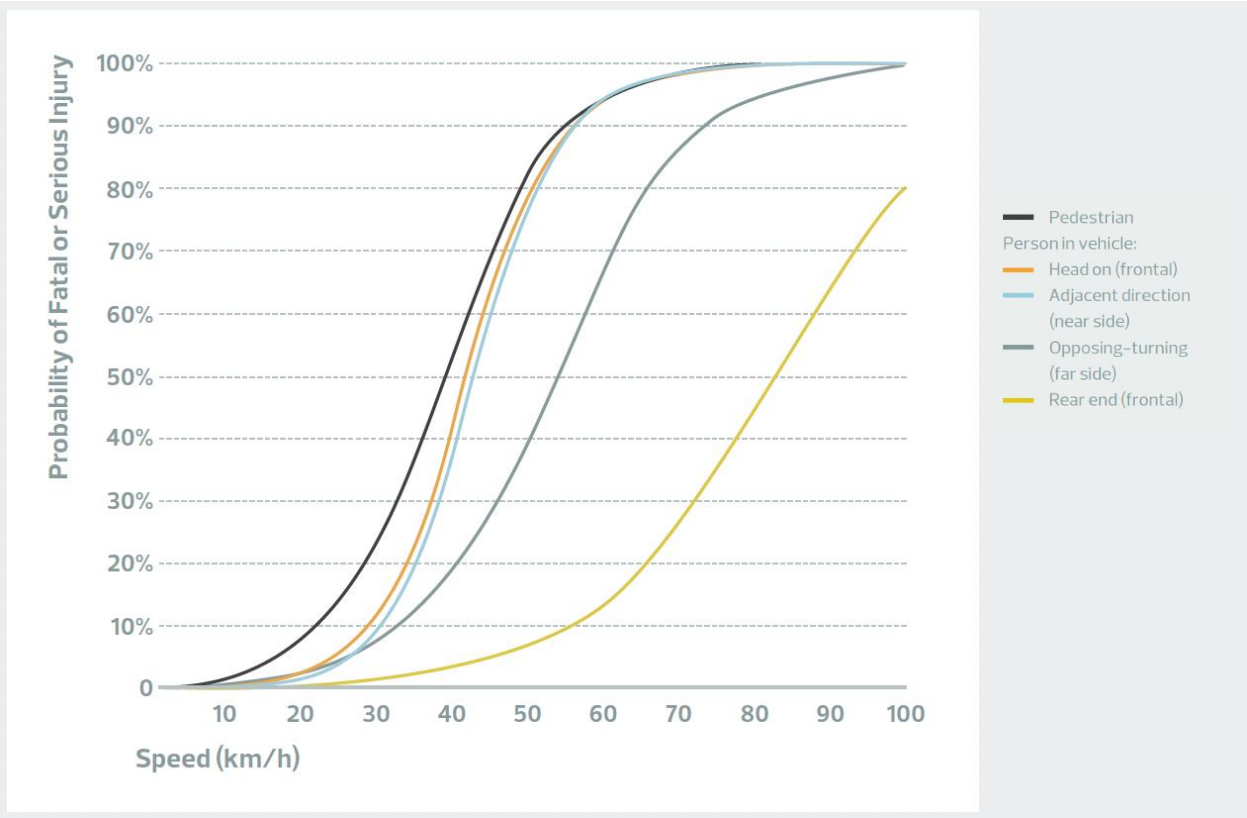
1.6 Safe System Approach

The Safe System Approach originates with Austroads, the association of the Australian and New Zealand transport agencies and has been adopted by other countries including Canada through the Transportation Association of Canada and the Canadian Council of Motor Transport Administrators.

The Safe System Approach views the transportation system holistically by addressing the interaction between the system's users, principally focusing on design to guide users to safe and appropriate behaviours. The approach acknowledges that even responsible people make mistakes when travelling. Given that mistakes are inevitable, the approach uses good design to lower the consequences of those mistakes, protecting people from death or serious injury.

There is no such thing as "absolute safety," despite efforts to maintain, improve, and operate mobility facilities to the highest level that funding allows. There is risk in all mobility situations, regardless of the travel options or combination of options considered. That risk is inherent due to the variability of user behaviours, environmental conditions, and other factors over which no individual or agency has absolute control.

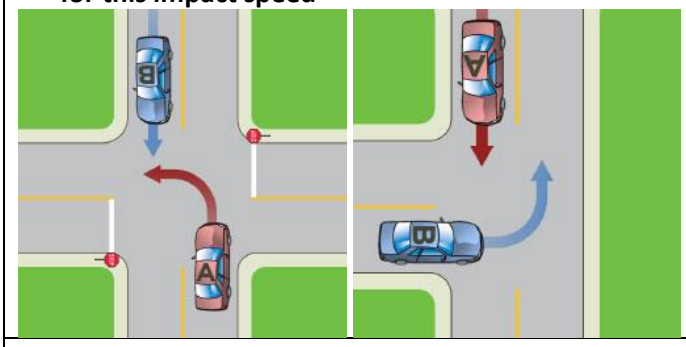
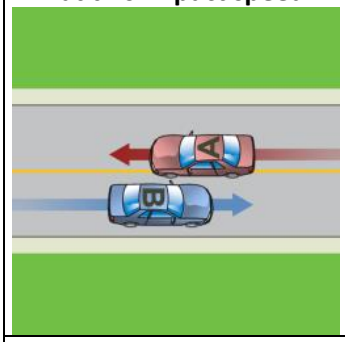
In particular, as vehicle speeds increase, the probability of a person experiencing a serious or fatal injury in a crash increase significantly as illustrated in the following figure.



Source: Edmonton Safe Mobility Strategy adapted from, Jurewicz C et al. Exploration of vehicle impact speed – injury severity relationships for application in safer road design. Transportation Research Procedia, 2016, 14:4247–4256.

Based on the crash speed-injury severity research, the transportation profession has identified "Safe Speeds" or "Survivable Speeds" that are used to make design decisions. The Survivable Speeds are the impact speeds at which the probability of serious injury or fatality starts to increase significantly. The following summarizes the "Survivable Speeds" for common conflict types that are used to make design decisions about separating users that have substantially different mass and are travelling at different speeds.

The City recognizes that the mobility system should be designed such that the likelihood of collisions is reduced and that, when collisions do occur, the potential for deaths should be minimized and the severity of injuries should be substantially reduced. The design approach adopted in this Street Manual reflects the Safe System Approach and addresses the inherent risks by focusing on minimizing conflicts in time and space, as well as minimizing the speed differential where conflicts remain.

Potential Conflicts	Survivable Speed	Examples of Design Decisions
• **Possible conflicts with vulnerable road users on travelled way, at intersections, or in shared space environments** 	30 km/h or less	• Shared cycling and driving lanes • Sidewalks provided
• **Possible right-angle and frontal conflicts between motorized vehicles** • **There should be no conflicts with vulnerable road users for this impact speed** 	50 km/h	• Sidewalks or Multi-Use Paths provided • Separated cycling facilities are provided • Leading pedestrian and/or bicycle intervals at signalized intersections • Roundabouts
• **Possible frontal conflicts between motorized vehicles** • **There should be no conflicts with vulnerable road users or no right-angle conflicts between motorized vehicles at this impact speed** 	60 km/h	• Sidewalks or Multi-Use Paths provided • Separated cycling facilities are provided • Protected left turn phase at signalized intersections • Roundabouts
• **There should be no conflicts with vulnerable road users, no right-angle conflicts between motorized vehicles, or no frontal conflicts between motorized vehicles at this impact speed**	80 km/h or above	• Multi-Use Paths provided • Centre crash barrier or wide median • Obstacles located outside the clear zone • Protected left turn phase at signalized intersections • Grade separated intersections (greater than 100 km/h)

Source: Derived from SWOV Institute for Road Safety Research, Sustainable Safety 3rd Edition – The advanced vision for 2018-2030. The Hague, SWOV, 2018.

NOTE TO REVIEWERS: THE DIAGRAMS IN THE FIGURE/TABLE ABOVE WERE SOURCED ONLINE FROM ICBC. THEY WILL BE REPLACED IN THE FINAL STREET MANUAL.

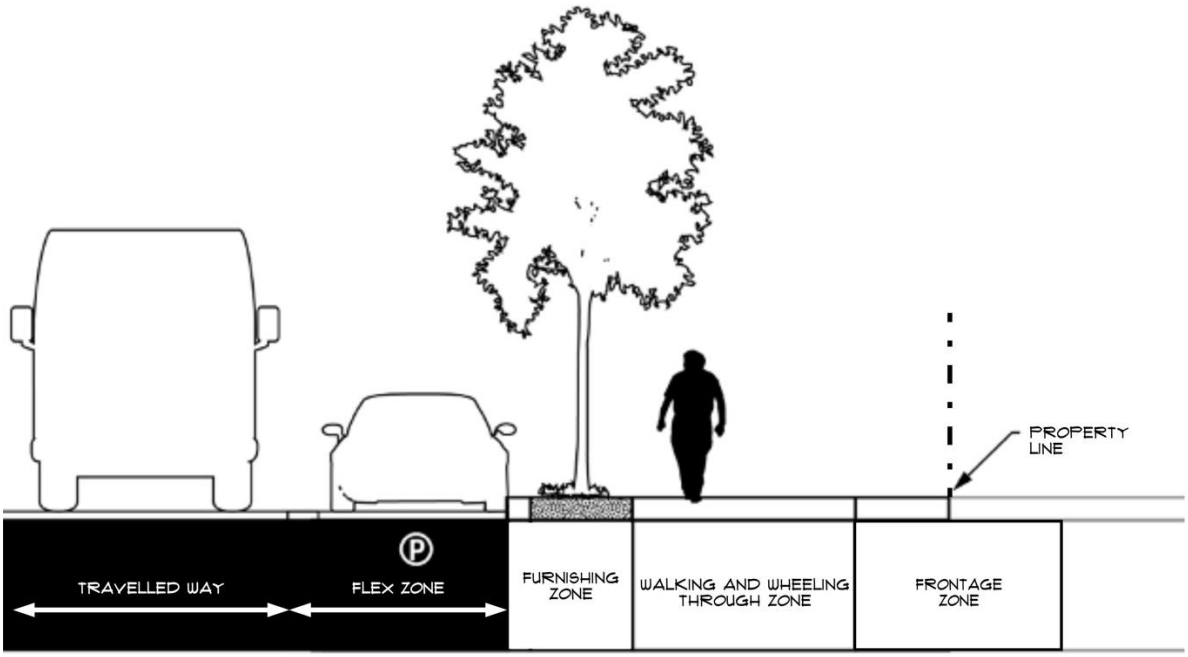
1.7 Universal Design Principles

To create an environment that is accessible for people with varying abilities, Calgary applies Universal Design Principles, which come from the Center for Universal Design (CUD) and are referenced in CSA B651-23 and the Calgary *Access Design Standards*. Universal Design is the "design of products and environments to be usable by all people, to the greatest extent possible, without the need for adaptation or specialized design." Below are the 7 Principles of Universal Design that are used in Calgary:

- **Equitable Use:** The design is useful to people with diverse abilities.
- **Flexibility in Use:** The design accommodates a wide range of individual preferences and abilities.
- **Simple and Intuitive Use:** Use of the design is easy to understand, regardless of the user's experience, knowledge, language skills, or current concentration level. Designs consider how people naturally move and include considerations like desire paths.
- **Perceptible Information:** The design communicates necessary information effectively to the user, regardless of ambient conditions or the user's sensory abilities.
- **Tolerance for Error:** The design minimizes hazards and the adverse consequences of accidental or unintended actions.
- **Low Physical Effort:** The design can be used efficiently and comfortably and with a minimum of fatigue.
- **Size and Space for Approach and Use**: Appropriate size and space is provided for approach, reach, manipulation, and use regardless of user's body size, posture, belongings, devices, or mobility.

1.8 Street Design Zones

The following defines the design zones for a street and provides a description for the elements that are included in each zone. The Street Manual provides design guidance for each zone; however, specific details for certain elements may be provided in another City design document.



Derived from: TAC Geometric Design Guide for Canadian Roads

Adjacent Land Uses: This space is the location of land uses that abut the street right-of-way and may also include utility easements.

Frontage Zone: In an urban context, adjacent to the building, this space is used as a support and/or extension of the land uses along the street. Uses can include ground floor retail displays, café seating, temporary signage, queuing areas, and other activities to support active use of the street by people and businesses. In the residential, or suburban context, the frontage zone is typically the private front yard space or offset between the sidewalk through zone and the property line. Stormwater infrastructure of varying types can exist in this zone as well.

Walking and Wheeling Zone: This space provides an area for active transportation mobility for people of all ages and abilities to access the land uses along the street. Typically reserved for people walking, in-line skating, roller skating, skateboards, scooters, and those using mobility aids, when 2.5m wide or wider, it may be shared with people cycling or using other forms of active transportation such as a multi-use pathway. This design zone may also include separate dedicated areas for those walking and those cycling. Within this design zone, an accessible walking route is required that is clear of all obstructions and supports Universal Design Principles. Shallow utilities and stormwater infrastructure can also be located within this zone.

Furnishing Zone: This space provides an area for signs, street light poles, street trees, landscaping, transit infrastructure, bicycle parking, benches, and seating for patios associated with adjacent businesses, in addition to underground and surface utilities and concrete curb. It typically provides a buffer area between the Walking and Wheeling Zone and the Flex Zone/Travelled Way. This is also the preferred location for snow storage and/or can be utilized for stormwater infrastructure or overland drainage.

Flex Zone: Located between the Travelled Way and the Furnishing Zone, when provided, this space provides the opportunity for various permanent and temporary street uses depending on the context and characteristics of the street. This space is typically considered “on-street” but is not designed for through traffic. The presence and use of this flexible space can vary along an individual block and between blocks. Uses can include motor vehicle parking, parklets, patios (public or associated with an adjacent business), bicycle parking, loading zones, accessible parking, curb extensions, transit stops, and taxi stands. This space also includes the gutter and overland drainage and, depending on the street design, may be used for snow storage. In cases where protected bicycle lanes are provided (i.e., part of the Travelled Way), the Flex Zone may be located between two parts of the Travelled Way. Underground utilities can also be located within this zone, including water lines.

Travelled Way: This space provides an area for travelling through a street or to access land uses along a street for people travelling by motor vehicle, bicycle, and transit, and for the delivery of goods. The space can include shared/general purpose lanes or exclusive/reserved lanes for cycling, transit, motor vehicles, and/or goods. Examples of reserved/exclusive lanes include protected and unprotected bike lanes, which are reserved for both bicycles and micromobility devices, or bus lanes. The Travelled Way may also include centre medians or islands, concrete gutters, refuge areas for people walking, wheeling, and cycling, and turning lanes. In some cases, the Travelled Way can also be closed at times to motor vehicle traffic to host events and festivals. The Travelled Way also includes space for people walking, wheeling, and cycling across the travel lanes at crossings, and is also the location for underground utilities including water, sanitary sewer, and storm sewer lines and overland drainage.

1.9 Design Process

1.9.1 Background

A complete mobility network is a key component of achieving the vision of the Calgary Plan. By taking a network perspective to support the travel needs for all Calgarians, as well as goods movement and utilities, the specific design requirements for individual segments of the network can vary.

Every street cannot deliver the highest quality travel experience for every user. Priorities are set based on the street's classification and role within the mobility network. The basic design process has three options to be considered in the order outlined in the following sections.

1.9.2 Use of Standard Cross Sections

To support the identified priorities for a street, designers should use the standard cross sections in Chapter 4 and recommended dimensions for the street and its associated design details based on its classification, context, and requirements. While projected traffic volumes may provide some indication of the street cross section to be utilized, and typical traffic volume ranges associated various street classifications are provided in Chapter 4, it is the context and role that defines the street classification.

1.9.3 Use of the Recommended Range of Design Domain Values

If there are constraints or unique surrounding context, a cross section for the street can be developed based on its classification using the recommended range of Design Domain values for the street's design zones and the selection and use of appropriate design elements that support the priorities for the street. Accepting lower or higher Design Domain values for other elements can be accommodated so long as they are not lower or higher than the recommended range limits and the resulting surface design can support suitable placement of underground utilities. The justification of these design decisions should be documented within the design report for the project.

1.9.4 Use of Design Exceptions

NOTE TO REVIEWERS: A MORE DETAILED EXPLANATION OF THE DESIGN PROCESS IS UNDER DEVELOPMENT BY THE CITY. THIS WILL BE CIRCULATED AT A LATER DATE FOR REVIEW AND COMMENT.

A supportive and complete mobility network addresses travel needs for all users, goods movement, and utilities. Individual segments of the mobility network often must fulfill multiple roles. At times, roles may conflict and accommodating all the desired elements of the street within the recommended Design Domain boundaries to provide a high-quality experience to all user groups may not be possible. Particularly when working in established areas, designers are frequently presented with situations where the available space, positioning of buildings, location of trees and utilities, and other factors make it challenging to serve all travel options equally well. There is often the need for trade-offs between the users sharing the space to achieve the end design.

While all streets, retrofit and greenfield, are to be designed to achieve each of the Objectives outlined in Section 1.2 as well as the design direction throughout the Street Manual, the context of an individual street may require a different design that is created and approved though the Design Exception Process.

Where the resulting initial prioritization of Objectives, selection of design elements, and allocation of widths or design values results in one or more street elements falling outside the Design Domain boundaries in the Street Manual, then the design exception process is initiated.

Deviations from the specified recommended range of the Design Domain may be based on the idea that the geometric design of the street is not “safe” or not “equitable” in terms of allocation of space. Proven effective strategies against these types of claims include compliance with policies related to flexible design, use of appropriate engineering judgment supported by quantitative analysis, and good, consistent documentation of the reason for the decision including a summary of mitigating strategies considered and implemented. The overarching design exception process is illustrated in the figure below.

The Design Exception Form is provided in Appendix A.

NOTE TO REVIEWERS: AN UPDATED APPROACH FOR DESIGN EXCEPTIONS RELATED TO CROSS SECTIONS IS UNDER DEVELOPMENT INCLUDING PROVIDING GUIDANCE ON TRADE-OFFS. THIS WILL BE CIRCULATED AT A LATER DATE FOR REVIEW AND COMMENT. THE DESIGN EXCEPTION FORM WILL BE PROVIDED IN APPENDIX A AND IS UNDERGOING REVIEW AND UPDATES.

Chapter 2.0 Design Controls and Street Classification

NOTE TO REVIEWERS: THIS SECTION ALIGNS WITH CHAPTER 2 OF THE TAC GDG AND CONSOLIDATES CONTENT FROM THE DGSS AND COMPLETE STREETS GUIDE, WHILE ADDING CONTENT WHERE REQUIRED SUCH AS TARGET SPEED AND DESIGN/CONTROL/MANAGED VEHICLES. UNLIKE THE PREVIOUS VERSION ON THE DGSS, NO TABLE IS ENVISIONED TO CORRELATE THE CURRENT PROPOSED STREET TYPES WITH PREVIOUS STREET TYPES.

2.1 Introduction

Calgary's street network has an important role in accommodating utilities and overland drainage flows and is used by a variety of people. Whether travelling by foot, wheelchair, bicycle, micromobility, bus, motor vehicle or emergency vehicle, design controls are required to recognize the travel characteristics and physical limitations of those travel options. This includes elements such as the size, mass, maneuverability, visibility, and potential speed of different travel options, as well as how vulnerable they are to risks from other street users. A designer must consider these characteristics and limitations to inform appropriate design controls to make streets safe and usable for anyone being welcomed into that space. The design controls for various travel options are detailed in Section 2.3, 2.4, and 2.5 inform the street and intersection design direction provided throughout the Street Manual.

Utilities using the street right-of-way have space and separation requirements to address regulatory and/or construction and maintenance needs. These can influence cross sectional requirements and need to be accommodated by designers.

Not every street is meant to accommodate or prioritize every travel option. Some are meant to transport large numbers of people at relatively higher speeds, while others are places where people can relax, interact, and access local destinations. Classification is the hierarchical grouping of streets depending on the role they play within the street network and in the context of the surrounding community. Classification assists in establishing the priorities and design features appropriate for each type of street. Properly grouped and designed individual streets form a coherent and complete network that allows everyone to access the parts of the city they need to and to participate in public life. The classifications of streets used in this manual are defined in Section 2.5.

Different streets sharing the same classification may still end up looking quite different from one another depending on the land use context, historical context, and any special purposes a street might be serving within the overall network. The classification system provides the starting point for design and operation of a street, with cross sections, Design Domain, and engineering judgement used to inform individual street designs.

2.2 Street Design Principles

There is no one-size-fits-all solution to street design. Different streets have different priorities depending on the street's location, its land use context, orientation of adjacent buildings, and its role within the mobility networks. Streets represent a significant portion of the public space within our city, and thus also need to accommodate non-mobility needs, including the provision and function of utilities, opportunities for community life, and space to support naturalization and the urban forest.

The key design principles of the street design philosophy, in order of priority, are:

1. Design using a Safe System Approach, including designing for desired vehicular operating speeds, and managing conflicts accordingly, to achieve the goal of eliminating deaths and serious injuries from collisions.
2. Design to provide the higher priority users on a street with the highest quality experience in that space, while applying universal accessibility and accommodating other travel options.
3. Design to accommodate street functions beyond mobility, such as appropriate stormwater management through overland flow routes, based on the surrounding context, as well as connectivity for utility networks, natural systems, and urban forest.
4. Design to minimize the amount of space required for streets and amount of impermeable surfaces to minimize environmental impact, control lifecycle costs, and to make space available for other purposes.
5. Design to minimize the capital and operating costs.

2.3 Target Speed

The Safe System Approach (see Section 1.6) aims to address all elements of the mobility system in an integrated way by ensuring that crash energy levels in a collision are below what would cause a fatality or serious injury. Vehicle speed, and the resulting difference in velocity between colliding objects, is one of the most significant determining factors in the outcomes of any collision, regardless of what caused the collision to occur. Appropriate vehicle speeds support safety and access for people walking and wheeling, improve the social and retail life of streets, and increase the value of adjacent land.

For the Street Manual, the concept of Target Speed is used for Design Speed. Design Speed is the philosophy of designing for the expected 85th percentile speed of motorists. Target Speed is the speed at which the designer intends for traffic to operate and is consistent with the Posted Speed Limit (i.e., legal speed limit).

A well-designed street encourages appropriate street user behaviour, makes the desired operating speed self-explanatory, and supports the posted speed limit. In some cases, especially on longer stretches of straight roadway where there are no obvious speed or sight line constraints for operators of motor vehicles, this may require introducing traffic management elements that encourage drivers to operate at the Target Speed.

Target Speeds for each street classification are noted in Section 2.5. For Design Speed related to bicycle facilities, see Section 2.4.2.

2.4 Design Users and Vehicles

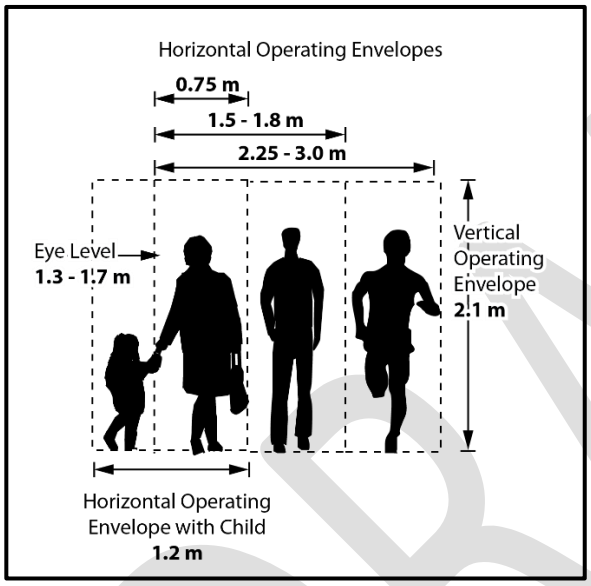
2.4.1 Walking

Walking and pedestrians are defined as: people walking, running, or standing; manual/motorized wheelchair or mobility scooter users; people using canes or walkers; people pushing strollers or carts; and users of various other low-speed forms of human locomotion (e.g., in-line skates, skateboards, kick scooters) that typically travel at speeds of 15 km/h or less with walking ranging from 3 to 5 km/h. Walking also includes forms of wheeling for the purposes of geometric design as noted.

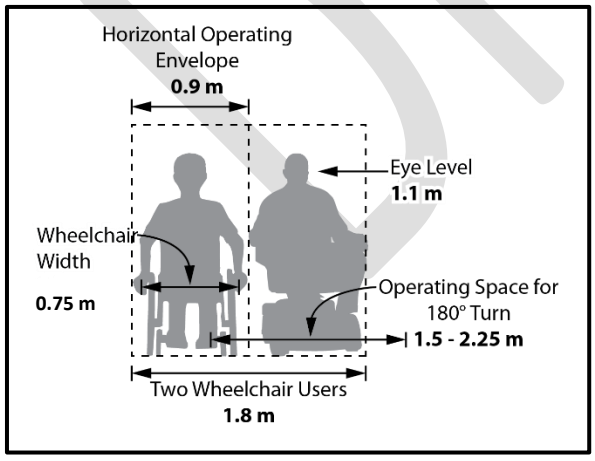
People walking have a minimum horizontal operating envelope[1] of 0.75 m and a vertical operating envelope of 2.1 m. Wheelchair users have a minimum horizontal operating envelope of 0.90 m. Designs should accommodate, at a minimum, two wheelchairs passing each other based on guidance in TAC GDG and CSA B651 Accessible Design for the Built Environment.

See Chapter 6 for additional design characteristics for people walking and wheeling and Chapter 9 for design guidance at intersections.

NOTE TO REVIEWERS: THE FIGURES FOR DESIGN USERS AND HORIZONTAL OPERATING ENVELOPE WILL LIKELY BE REPLACED WITH STREET MANUAL-SPECIFIC GRAPHICS FOR THE FINAL VERSION OF THE DOCUMENT. THE OPERATING SPACE FOR THE 180 DEGREE TURN FOR WHEELCHAIRS WILL BE REMOVED; SEE ALSO CHAPTER 6 FOR TURNING RADII OF DIFFERENT MOBILITY AIDS.

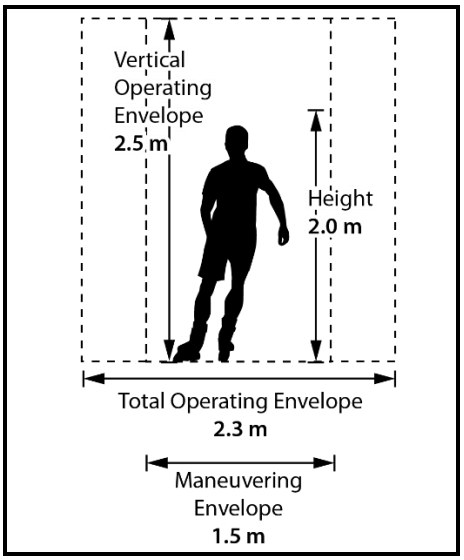


Source: TAC Geometric Design Guide for Canadian Roads



[1] Horizontal Operating Envelope refers to horizontal space to accommodate lateral shifts in the path of travel for Design Vehicles and Design Users.

Source: TAC Geometric Design Guide for Canadian Roads



Source: TAC Geometric Design Guide for Canadian Roads

2.4.2 Wheeling

Wheeling includes several human powered devices that are ridden or used by people. People riding two-wheeled pedal bicycles are the design basis for this user group, but users can include e-bike operators, cargo bike operators, e-scooter operators, riders of adaptive cycles, and other forms of micromobility devices.

People riding bicycles have a minimum horizontal operating envelope of 1.2 m to 1.5 m and a vertical operating envelope of 2.5 m. Using a wider horizontal operating envelope (e.g., 1.5 m to 1.8 m) should be considered for locations with slower cycling speeds (e.g., uphill sections) to account for increased horizontal movement of the rider due to greater physical exertion.

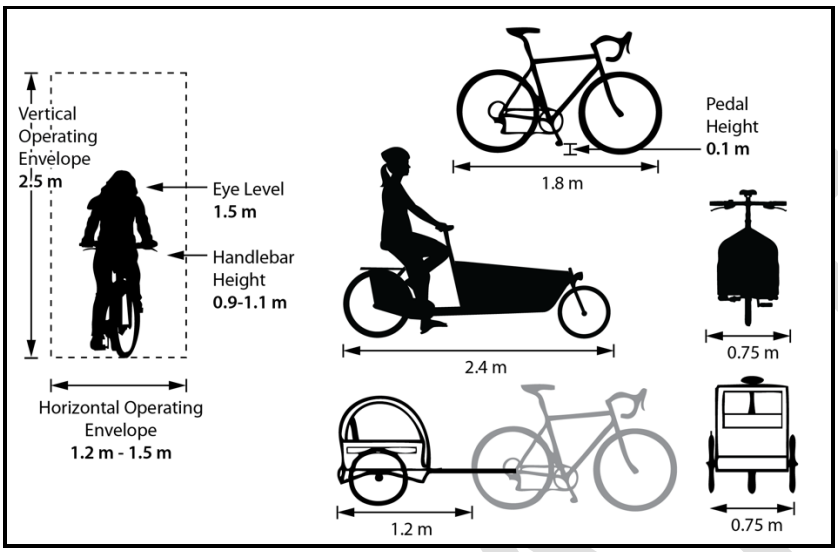
A two-wheeled pedal bicycle length is 1.8 m, cargo bikes are 2.4 m in length, and the length can be up to 3.0 m if a trailer is attached to a two-wheeled pedal bicycle. The Design Vehicle for design of features where bicycle users are stopped (e.g., median refuge areas, splitter island) and for intersection geometry and lateral shifts is a bicycle with trailer (i.e., 3.0 m in length). Where possible, designs should accommodate, at a minimum, two people riding bicycles side-by-side to allow for passing, which have been considered as part of the Design Domain for bicycle facility widths in Chapter 5.

People cycling typically travel at speeds between 15km/h and 30km/h, although they may reach 50 km/h when travelling downhill. Recent studies on the operation of e-bikes indicate 85th percentile operating speeds are 2 to 9 km/h faster. To promote safety for people cycling, a Design Speed is used that exceeds the bicycle Target Speed of 20 km/h to create safer curves and intersection sight distances. The Design Speed varies based on context as noted in the below table.

	Bicycle Design Speed
Typical	30 km/h
Downgrade Locations	40 km/h or more[1]
Unpaved	Less than 30 km/h[1]

NOTE:
1. See TAC GDG Sections 5.2.4 and 5.5.1 for more information.

See Chapter 5 for additional design characteristics of people cycling and Chapter 9 for design guidance at intersections.



Source: TAC Geometric Design Guide for Canadian Roads

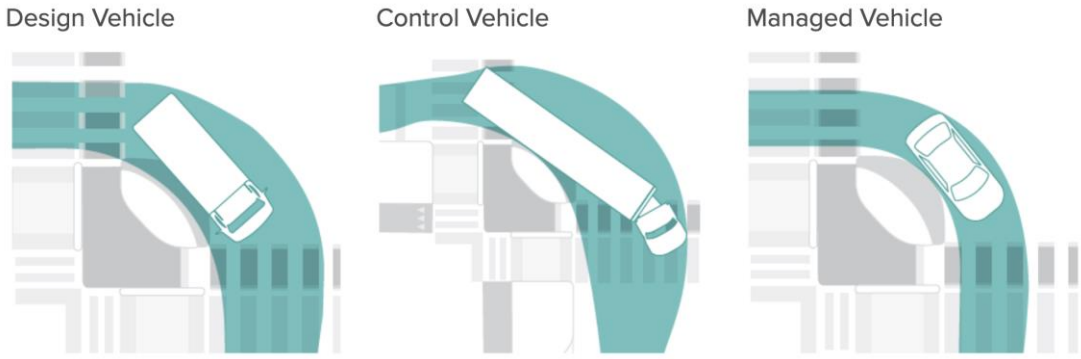
NOTE TO REVIEWERS: THE FIGURES FOR DESIGN USERS AND HORIZONTAL OPERATING ENVELOPE WILL LIKELY BE REPLACED WITH STREET MANUAL-SPECIFIC GRAPHICS FOR THE FINAL VERSION OF THE DOCUMENT. THE FIGURE WILL ALSO BE POTENTIALLY UPDATED TO INCLUDE TANDEM AND RECUMBENT BICYCLES AND INCLUDE MICROMOBILITY DEVICES.

2.4.3 Motor Vehicles

The **Design Vehicle** is the largest vehicle type that utilizes the street more than once per week. It influences several geometric design features including lane width, corner radii, median nose design, and other intersection design details. The Design Vehicle should be accommodated without encroachment into opposing traffic lanes; however, it is acceptable to have encroachment onto multiple same-direction traffic lanes on the receiving street or across the centre of lower-volume streets that do not have marked centre lines (e.g., Local Streets).

The **Control Vehicle** is the largest vehicle type required to be accommodated and occurs at a frequency once per week or less. Accommodation means allowing the vehicle to cross over the centre line into opposing traffic lanes and/or departing from the second travel lane to make a turning manoeuvre at an intersection and/or mount a roundabout apron.

The **Managed Vehicle** is the most common vehicle to use the street. In most urban streets, the managed vehicle is a personal vehicle or taxi.



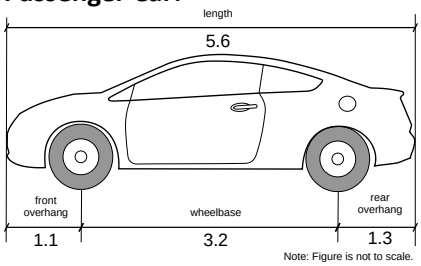
Source: NACTO

NOTE TO REVIEWERS: THE FIGURES FOR DESIGN VEHICLE, CONTROL VEHICLE, AND MANAGED VEHICLE WILL BE REPLACED WITH STREET MANUAL-SPECIFIC GRAPHICS FOR THE FINAL VERSION OF THE DOCUMENT.

Design, Control, and Managed Vehicles for each street type and reflecting adjacent land uses are defined in Section 2.5. Typical motorized vehicles include the following:

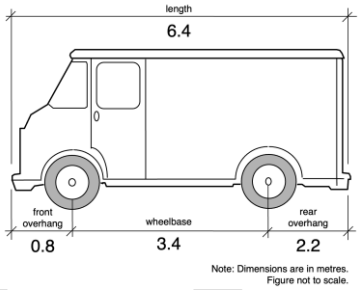
NOTE TO REVIEWERS: THE FIGURES FOR DESIGN VEHICLES WILL LIKELY BE REPLACED WITH STREET MANUAL-SPECIFIC GRAPHICS FOR THE FINAL VERSION OF THE DOCUMENT.

Passenger Car:



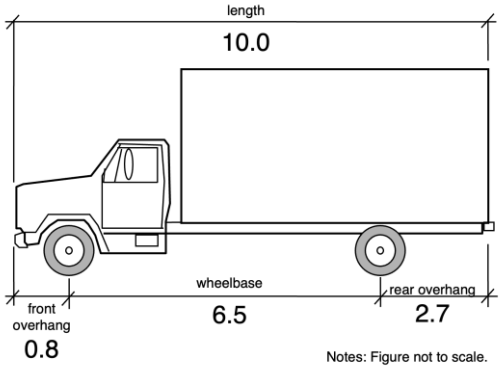
Width: 2.0 m

Light Single-Unit (LSU) Truck:



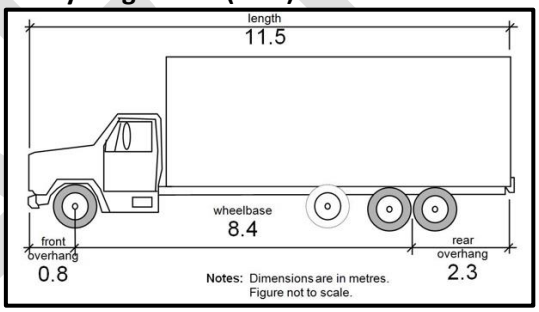
Width: 2.6 m

Medium Single-Unit (MSU) Truck:



Width: 2.6 m

Heavy Single-Unit (HSU) Truck:



Width: 2.6 m

WB-21 Tractor Semi-Trailer:

NOTE TO REVIEWERS: DESIGN VEHICLE FIGURE NEEDS TO BE DEVELOPED.

Width: 2.6 m

WB-36 Tractor Semi-Trailer:

NOTE TO REVIEWERS: DESIGN VEHICLE FIGURE NEEDS TO BE DEVELOPED.

Width: 2.6 m

Waste Collection Vehicle:

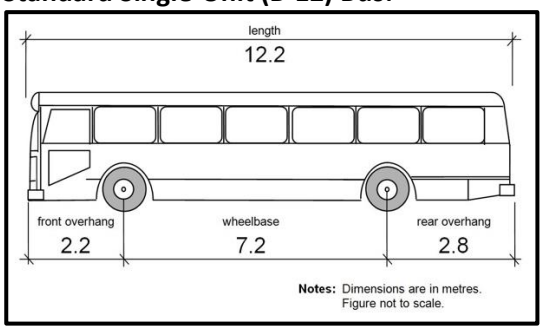
NOTE TO REVIEWERS: DESIGN VEHICLE FIGURE NEEDS TO BE DEVELOPED.

Width: 2.6 m

Fire Truck:

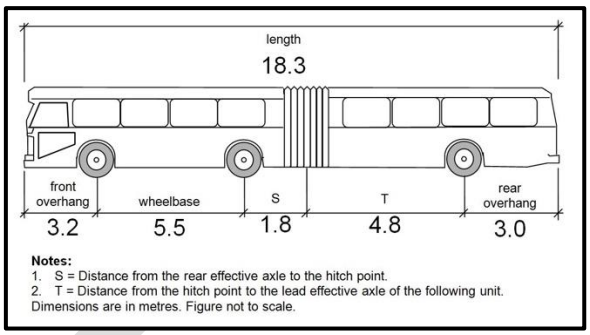
NOTE TO REVIEWERS: DESIGN VEHICLE FIGURE NEEDS TO BE DEVELOPED.

Standard Single-Unit (B-12) Bus:



Width: 2.4 – 2.6 m

Articulated Transit Bus:



Width: 2.4 – 2.6 m

Source: TAC Geometric Design Guide for Canadian Roads

2.5 Classification of Street Types (Purpose – Function – Design – Use)

The following sections outline the street classifications as related to purpose, functional requirements, and design characteristics. The purpose, functional requirements, and design characteristics are used to make design decisions consistent with the Safe System Approach, the Objectives presented in Section 1.2 of the Street Manual, and the specific land use context applicable at a street's location. Implementing the requirements and design characteristics will support the intended use of the street and desired user behaviour based on its function and role.

It should be emphasized that the following outlines the preferred characteristics and requirements for streets by classification, which may not currently exist and/or may not be possible to achieve in the short term.

2.5.1 Definitions

The **Classification** of streets is based on a street's purpose within the network and its interaction with its surrounding land uses which is determined by municipal policy.

The **Purpose** of a street is based on its function, design, and use to support mobility and access to destinations within the city or region and connectivity within the network.

The **Function** of a street is established by considering the continuum of flow and exchange along its segments and at its intersections. The function is used to define the mobility and access needs for the street and are described by functional requirements that are related to design controls as noted in the tables in Section 2.5.3.

The **Design** of a street is described through design characteristics to realize the functional requirements.

The intended **Use** and behaviours for the street environment result from the application of the design characteristics that create an intuitive, recognizable, and predictable environment for users, which minimizes human errors.

2.5.2 Flow & Exchange

A street's flow and exchange are defined as follows and used to establish the functional requirements.

- **Flow** is related to prioritizing movement and is designed to allow safe travel at relatively higher travel speeds.
- **Exchange** is related to prioritizing interactions and access with adjacent land uses, destinations, and intersecting streets. For some streets with very high levels of exchange, these may operate as places.

2.5.3 Street Classifications

There are four groups of street classifications as follows:

- Local
- Collector
- Arterial
- Skeletal

The function of each street is outlined in the following table based on segment and intersection flow and exchange expectations.

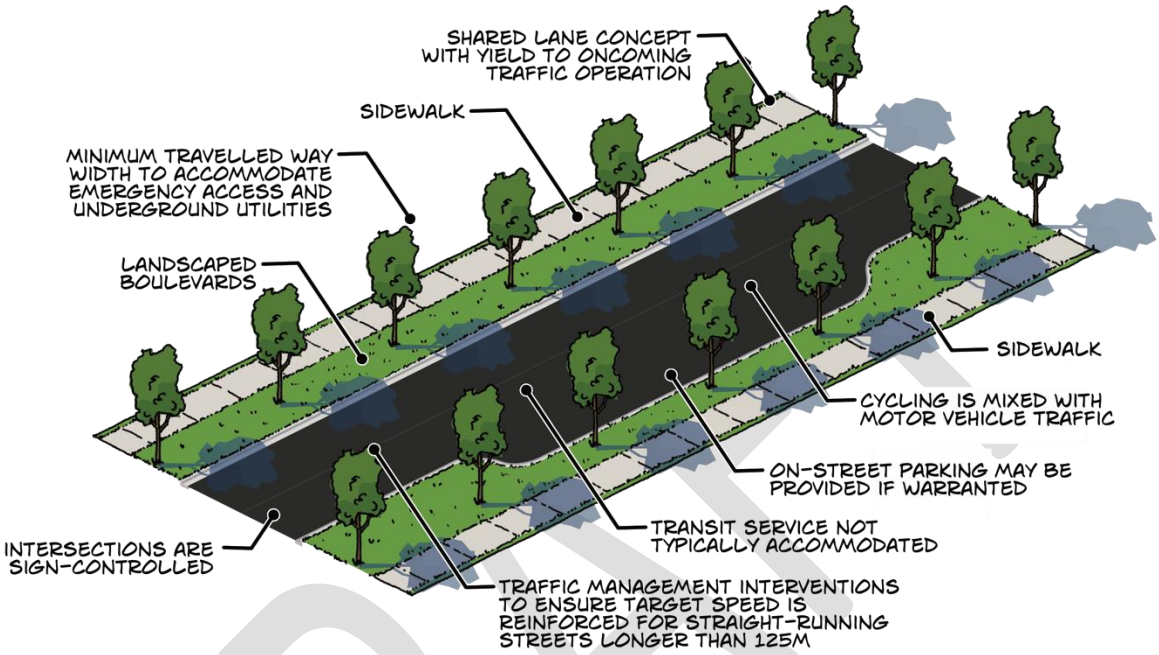
Street Classification	Segment	Intersection
Local	Exchange (Place)	Exchange (Place)
Collector	Exchange	Exchange
Arterial	Flow	Exchange
Skeletal	Flow	Flow

Sketches of example cross-sections for each street classification illustrating typical characteristics in terms of spatial separation of key elements are included. Detailed cross-sections as well as modifiers to address specific land use and movement contexts are contained in Chapter 4 of the Street Manual. While Design Users and Design Vehicles are noted for each street classification, designers should consider the land use context of the street they are designing, which may require selection of different design, control, and managed vehicles. More information on Design Vehicles and Design Users are noted in Chapter 4 for each cross section that modify each street classification by land use and mobility context.

NOTE TO REVIEWERS: DESIGN VEHICLES PRIMARILY IMPACT INTERSECTION CONFIGURATIONS. PROPOSED INTERSECTION CONFIGURATIONS WILL BE ADDRESSED IN CHAPTER 9. ONCE THE IMPACTS OF THE DESIGN VEHICLES IN THE FOLLOWING TABLES AND POSSIBLE VARIATIONS ARE UNDERSTOOD, THEN THE PROPOSED DESIGN VEHICLES MAY BE REVISED.

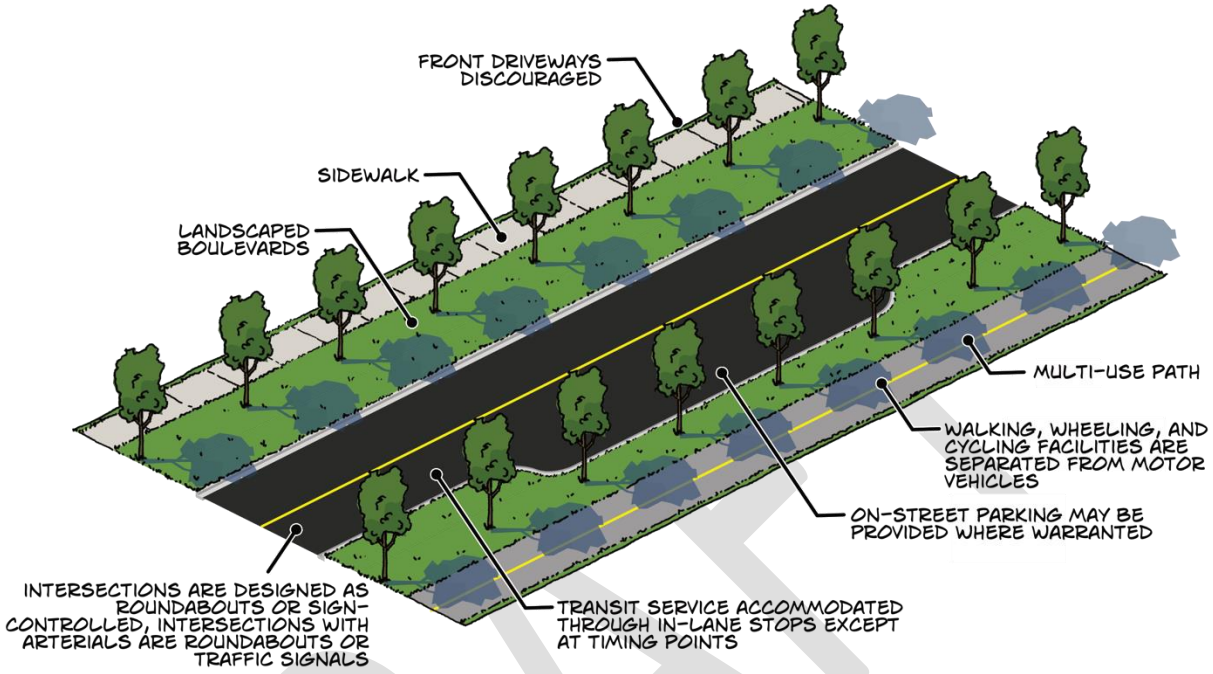
Street Type: **Local Street**	
Purpose	Small-scale streets that enable adjacent development and support social gathering, while accommodating low speed connections within communities and includes alleys
Functional Requirements	
Target Speeds	▪ 30 km/h or 15 km/h for alleys/lanes ▪ Design Speed matches Target Speed
Intersection Spacing	▪ 60 m
Access Type and Spacing	▪ Accesses and driveways allowed
Design Users: Vehicles	▪ Design Vehicle: MSU (or WB-21 in Industrial Areas) ▪ Control Vehicle: Fire Truck and Waste Collection Vehicle (or WB-36 in Industrial Areas) ▪ Managed Vehicle: Passenger car
Design Users: Walking & Wheeling	▪ People using wheelchairs or pushing strollers. ▪ Bicycles
Design Characteristics	
	1. Shared lane concept with yield to oncoming traffic operation (in Industrial Areas, lane widths adequate for trucks) 2. Minimum Travelled Way width to accommodate emergency access and underground utilities. 3. Sidewalks provided on both sides of the street. 4. Cycling is mixed with motor vehicle traffic. 5. Transit service not typically accommodated. 6. Intersections are uncontrolled or sign controlled. 7. Landscaped boulevards should be provided. 8. On-street parking may be provided 9. Traffic management interventions to ensure Target Speed is reinforced for straight-running streets longer than 125 m

Example Local Street



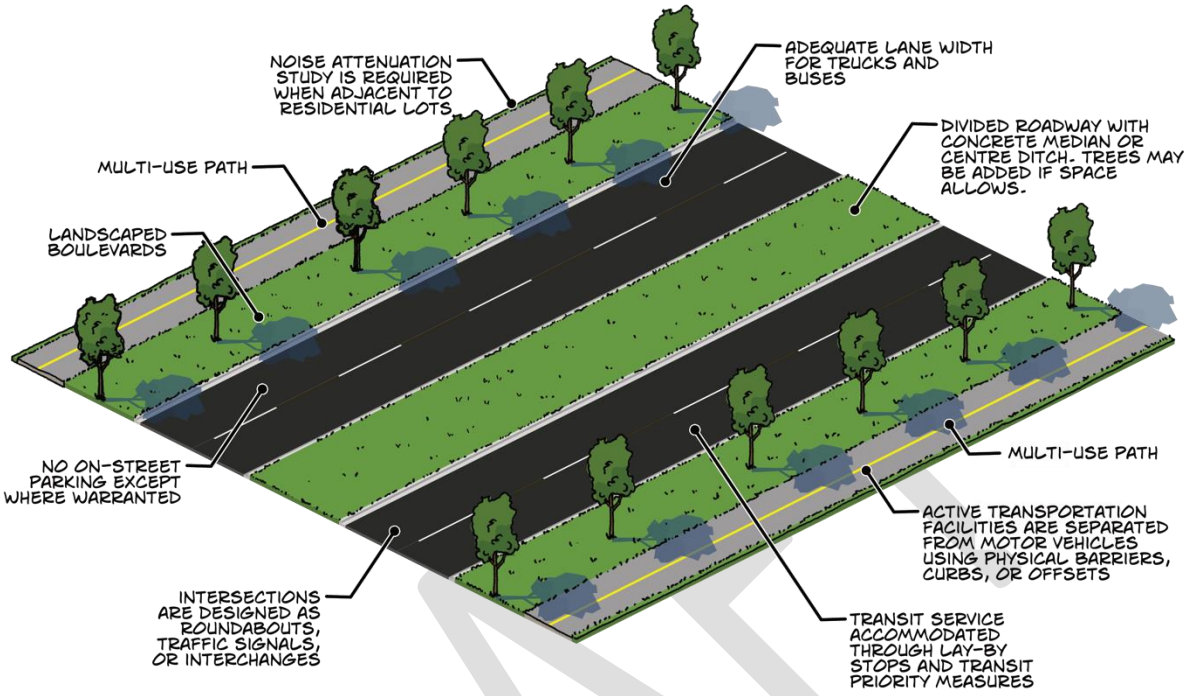
Street Type: **Collector Street**	
Purpose	Medium-scale streets that enable adjacent development and support social gathering, with low to medium speed connections between and within communities
Functional Requirements	
Target Speeds	▪ 40 km/h or 30km/h in certain areas such as playgrounds and high activity areas, such as schools and neighbourhood commercial areas ▪ Design Speed matches Target Speed
Intersection Spacing	▪ 120 m minimum spacing for intersections with Arterial Streets and Collector Streets ▪ 60 m minimum spacing for intersections with Local Streets
Access Type and Spacing	▪ Accesses allowed for Commercial and Industrial land uses. Driveways not allowed.
Design Users: Vehicles	▪ Design Vehicle: B-12 (or WB-21 in Industrial Areas) ▪ Control Vehicle: Waste Collection Vehicle and Fire Truck (or WB-36 in Industrial Areas); in some locations WB-21 based on land use. ▪ Managed Vehicle: Passenger car
Design Users: Walking & Wheeling	▪ People using wheelchairs or pushing strollers. ▪ Cargo Bicycles and Bicycles with Trailers
Design Characteristics	
	1. Walking, wheeling, and cycling facilities are separated from motor vehicle traffic; suitable facilities to include facility width for enhanced active transportation facilities along Primary Wheeling Network and Primary Walking Network 2. Transit service accommodated through in-lane stops except at timing points where a lay-by is used; suitable space for enhanced transit stops along the Primary Transit Network 3. Intersections with Collector Streets are designed as roundabouts, signalized or sign-controlled; intersections with Arterial Streets are roundabouts or traffic signals. 4. Motor vehicle speed management devices are used along the corridor with a maximum spacing of 125 m to reinforce target speed. 5. Landscaped boulevards except in High Activity Areas 6. Front driveways discouraged. 7. On-street parking may be provided

Example Collector Street



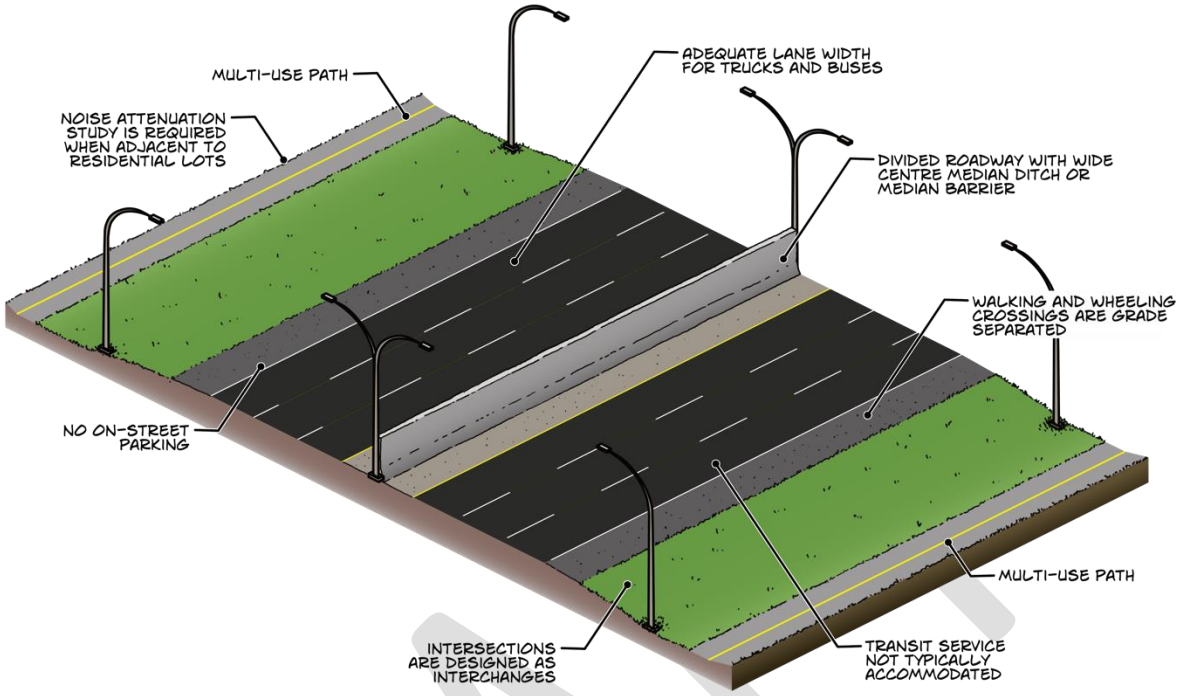
Street Type: **Arterial Street**	
Purpose	Large-scale streets that move people and goods at medium to high speeds between communities, while accommodating adjacent development
Functional Requirements	
Target Speeds	▪ 50 km/h or 70 km/h ▪ Design Speed is: ○ Target Speed plus 10 km/h for posted speed limits of 60 km/h or greater. ○ Target Speed plus 10 km/h for horizontal alignment, vertical alignment, and intersection sightlines ○ Target Speed for lane widths, tapers, and horizontal offsets for posted speeds of 50 km/h or less
Intersection Spacing	▪ 400 m minimum spacing for intersections with Skeletal Roads, Arterial Streets, and Collector Streets
Access Type and Spacing	▪ Limited access may be provided
Design Users: Vehicles	▪ Design Vehicle: B-12 or WB-21 (for 50 km/h or 70 km/h target speeds, respectively) ▪ Control Vehicle: WB-21 or WB-36 (for 50 km/h or 70 km/h target speeds, respectively) ▪ Managed Vehicle: Passenger car
Design Users: Walking & Wheeling	▪ People using wheelchairs or pushing strollers. ▪ Cargo Bicycles and Bicycles with Trailers
Design Characteristics	
	1. Adequate lane widths for trucks and buses 2. Divided roadway with concrete median or centre median ditch (for 70 km/h streets) 3. Active transportation facilities are separated from motor vehicle traffic by solid physical barriers or curbs or offset from street (e.g., multi-use paths, protected bike lanes); suitable facilities including facility width for enhanced active transportation facilities along Primary Wheeling Network 4. Transit service accommodated through lay-by stops for 70km/h streets; dedicated lanes, queue jumps, and other transit priority features are considered along the Primary Transit Network 5. Intersections are designed as roundabouts, traffic signals with left turn lanes, or interchanges (if traffic volumes warrant) 6. Noise attenuation study is required for residential lots adjacent to Arterial Streets to determine noise attenuation requirements except for Arterial Streets with speed limits of 50 km/h or less. 7. Landscaped boulevards except in High Activity Areas 8. No on-street parking except can be provided on Arterial Streets posted at 50 km/h in High Activity Areas

Example Arterial Street



Street Type: **Skeletal Road**	
Purpose	Large-scale roads that move people and goods at high speeds across the city and to regional highways with no adjacent development or development significantly setback and not accessed from the road
Functional Requirements	
Target Speeds	▪ 80 km/h to 100 km/h ▪ Design Speed is the Target Speed plus 10 km/h
Intersection Spacing	▪ Limited access other than intersections with only Skeletal Roads and Arterial Streets at a spacing of 2 km to 2.4 km or more ▪ There may be instances where Collector Streets connect to Skeletal Roads and the intersection spacing and design will be consistent with requirements for an Arterial Street intersection
Access Type and Spacing	▪ No driveways or accesses
Design Users: Vehicles	▪ Design Vehicle: WB-21 ▪ Control Vehicle: WB-36 ▪ Managed Vehicle: Passenger Car
Design Users: Walking & Wheeling	If facilities are provided: ▪ People using wheelchairs or pushing strollers. ▪ Cargo Bicycles and Bicycles with Trailers
Design Characteristics	
	1. Adequate lane widths for trucks and buses and provision of paved shoulders 2. Divided roadway with wide centre median ditch or median barrier, shoulders and roadside ditches or mountable curbs 3. Walking and wheeling facilities, when provided, are physically separated from the roadway. 4. Walking and wheeling crossings are required at all intersections and are grade separated except at ramp intersections, where they should be signalized. 5. Transit service stops not typically accommodated. 6. Intersections are designed as interchanges; at-grade intersection with traffic signals (and fully protected left turn phases) may be an interim design. 7. Noise attenuation study is required for residential lots adjacent to Skeletal Streets to determine noise attenuation requirements. 8. No on-street parking

Example Skeletal Road



2.6 Mobility Networks and Land Use Context

To support design decisions including confirming street classifications and design requirements for various modes depending on primary networks and land use context, refer to the Calgary Plan for maps including:

- Primary Wheeling Network
- Primary Transit Network
- Primary Goods Movement Network
- Road and Street Classifications
- Urban Structure
- Ecological Network

Subsequent chapters of the Street Manual specify how these networks and contexts may affect the design of streets including the width of the street zones and the mobility facilities that should be incorporated in the design. Designers should also refer to Local Area Plans to identify any supporting networks and design treatments or facility requirements to inform the design of the mobility network and streets.

Chapter 3.0 Alignment and Lane Configuration

NOTE TO REVIEWERS: THE INTENT OF THIS CHAPTER IS TO INCLUDE NON-INTERSECTION GUIDANCE FROM DGSS SECTION D. GENERAL INFORMATION, VERTICAL ALIGNMENT INFO FROM E. ROADWAY DESIGN STANDARDS, AND F. DEVELOPMENT OF SUPERELEVATION.

3.1 Introduction

The TAC Geometric Design Guide for Canadian Roads (TAC GDG) Chapter 3 outlines the design parameters for horizontal and vertical alignments, crossfall, and superelevation that should apply for street design in Calgary. The following sections detail specific design guidance that supplements or supersedes that contained in Chapter 3 of the TAC GDG. See Section 1.4 for guidance on how to apply Street Manual and TAC GDG design guidance.

For horizontal and vertical alignment design guidance for bicycle paths and off-street facilities, refer to Chapter 5 of the Street Manual.

Design guidance as it relates to drainage for streets is included below. Refer to Section IV of the DGSS and The City of Calgary *Stormwater Management & Design Manual* for detailed guidance and requirements for drainage.

3.2 Horizontal Alignment

3.2.1 Travelled Way Crossfall

Normal crossfall on all Local and Collector Streets should be 2%. Normal crossfall on all Arterial Streets and Skeletal Roads should be 3%.

3.2.2 Superelevation

Superelevation is required for Skeletal Roads and higher speed (Target / Design Speed of 70 km/h and higher) Arterial Streets. Superelevation requirements should be based on Table 3.2.6 of the TAC GDG (maximum e of 0.06 m/m). For retrofit situations, where necessary, superelevation requirements may be based on Table 3.2.8 of the TAC GDG (maximum e of 0.04m/m for Urban Design).

3.2.3 Transition Spirals

Transition spirals should be used on all superelevated curves and should be calculated as per the TAC GDG. The minimum length of a spiral is to be 60 m.

Compound spirals should be used as necessary to join curves of varying radii to provide a transition between two curves horizontally and vertically. Broken back curves, that is, two curves in the same direction separated by a short section of tangent, are not permitted.

3.2.4 Development of Superelevation

The length of a street required to develop superelevation consists of two components, tangent runout, and superelevation runoff, as illustrated in Figure 62.

The tangent runout is the distance required to eliminate the adverse crossfall. The tangent runout is normally achieved at the same rate as the superelevation runoff. The superelevation runoff is the

additional distance necessary to acquire the full superelevation rate and occurs over the calculated length of the spiral.

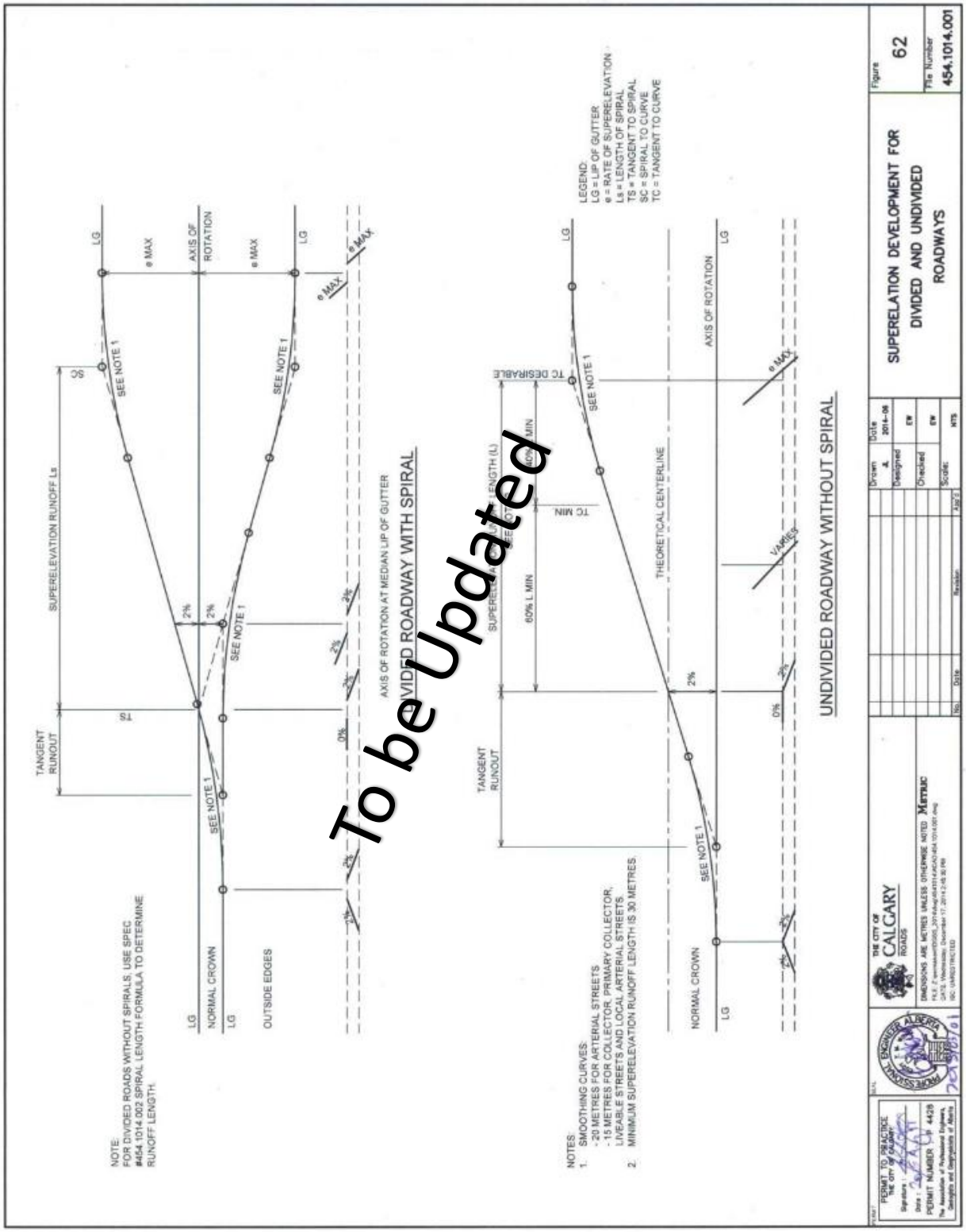
The total length required to remove the adverse crown and develop full superelevation may need to be adjusted to ensure that street drainage and minimum grade requirements are adequately met.

In super elevating an undivided street, Method 1 as shown in Figure 3.2.7 in the TAC GDG, where each direction is separately rotated about the centreline, should be used.

In super elevating a divided street, Method B as shown in Figure 3.2.8 in the TAC GDG, where each direction is separately rotated about the inside pavement edge, should be used. Where there is a possibility of future widening by adding lanes to the median (i.e., 4-lane Arterial Streets to 6-lane Arterial Streets), the superelevation should be developed by rotating about the inside pavement edge of the future widening.

Figure 62 illustrates the two methods. As shown in Figure 62, a 20 m smoothing curve is required at the point where the tangent runout is introduced and where the superelevation runoff ends and vice versa. Figure 63 provides superelevation tables.

NOTE TO REVIEWERS: FIGURE 62 FROM THE DGSS WILL REQUIRE EDITS TO HAVE A SPIRAL SHOWN FOR AN UNDIVIDED CROSS SECTION AND NOTES WILL NEED TO BE UPDATED TO ELIMINATE REDUNDANT INFORMATION. THE FIGURE'S NUMBER AND CROSS REFERENCE IN THE STREET MANUAL WILL ALSO REQUIRE UPDATING.


SUPERELEVATION DEVELOPMENT FOR DIVIDED AND UNDIVIDED ROADWAYS
Figure 62
File Number 454.1014.001
DIVIDED ROADWAY WITH SPIRAL
AXIS OF ROTATION AT MEDIAN LIP OF GUTTER
UNDIVIDED ROADWAY WITHOUT SPIRAL
THEORETICAL CENTERLINE
AXIS OF ROTATION
TANGENT RUNOUT
SUPERELEVATION RUNOFF Ls
NORMAL CROWN
OUTSIDE EDGES
SEE NOTE 1
e MAX
VARIES
LEGEND:
LG = LIP OF GUTTER
e = RATE OF SUPERELEVATION
Ls = LENGTH OF SPIRAL
TS = TANGENT TO SPIRAL
SC = SPIRAL TO CURVE
TC = TANGENT TO CURVE
NOTE:
FOR DIVIDED ROADS WITHOUT SPIRALS, USE SPEC #454.1014.002 SPIRAL LENGTH FORMULA TO DETERMINE RUNOFF LENGTH.
NOTES:
1. SMOOTHING CURVES:
- 20 METRES FOR ARTERIAL STREETS
- 15 METRES FOR COLLECTOR, PRIMARY COLLECTOR, LIVEABLE STREETS AND LOCAL ARTERIAL STREETS
2. MINIMUM SUPERELEVATION RUNOFF LENGTH IS 30 METRES.
THE CITY OF CALGARY ROADS
PERMIT TO PRACTICE THE CITY OF CALGARY
PERMIT NUMBER: P 4426
To be Updated

50 km/h eMAX = 0.060							
RADIUS	e	A		RADIUS	e	A	
		2 LANE	3&4 LANE			2 LANE	3&4 LANE
7000	NC	0	0	400	0.031	100	100
5000	NC	0	0	350	0.034	100	100
4000	NC	0	0	300	0.037	90	100
3000	NC	0	0	250	0.040	85	90
2000	NC	0	0	220	0.043	80	90
1500	NC	0	0	200	0.045	75	90
1200	NC	0	0	180	0.047	70	90
1000	RC	170	170	160	0.049	70	85
900	RC	150	150	140	0.052	65	80
800	RC	150	150	120	0.055	65	75
700	0.021	140	140	100	0.058	65	70
600	0.024	125	125	90	0.060	65	70
500	0.027	120	120	minimum R=90			

60 km/h eMAX = 0.060							
RADIUS	e	A		RADIUS	e	A	
		2 LANE	3&4 LANE			2 LANE	3&4 LANE
7000	NC	0	0	600	0.030	140	140
5000	NC	0	0	500	0.034	125	125
4000	NC	0	0	400	0.038	115	120
3000	NC	0	0	350	0.041	110	115
2000	NC	0	0	300	0.044	100	110
1500	RC	225	225	250	0.048	90	100
1200	RC	200	200	220	0.050	90	100
1000	0.021	175	175	200	0.052	85	100
900	0.023	175	175	180	0.054	85	90
800	0.025	160	160	160	0.056	85	90
700	0.027	150	150	140	0.059	85	90
				minimum R=130			

50 km/h eMAX = 0.040					
RADIUS	e	RADIUS	e	RADIUS	e
7000	NC	800	NC	200	RC
5000	NC	700	RC	180	RC
4000	NC	600	RC	160	RC
3000	NC	500	RC	140	RC
2000	NC	400	RC	120	RC
1500	NC	350	RC	100	0.026
1200	NC	300	RC	90	0.032
1000	NC	250	RC		
900	NC	220	RC		

60 km/h eMAX = 0.080			
RADIUS	e	A	
		2 LANE	3&4 LANE
7000	NC	0	0
5000	NC	0	0
4000	NC	0	0
3000	NC	0	0
2000	NC	0	0
1500	RC	225	225
1200	RC	200	200
1000	0.023	175	175
900	0.025	175	175
800	0.027	160	160
700	0.030	150	150
600	0.034	140	140
500	0.039	125	135
400	0.045	115	125
350	0.049	110	125
300	0.053	100	120
250	0.059	100	120
220	0.062	95	110
200	0.065	90	110
180	0.068	90	105
160	0.072	85	100
140	0.076	85	100
12[illegible]	0.080	85	95
[illegible]			

70 km/h eMAX = 0.080			
RADIUS	e	A	
		2 LANE	3&4 LANE
7000	NC	0	0
5000	NC	0	0
4000	NC	0	0
3000	NC	0	0
2000	RC	240	275
1500	0.021	255	250
1200	0.026	220	225
1000	0.029	200	200
900	0.032	180	180
800	0.035	175	175
700	0.038	165	165
600	0.042	150	160
500	0.048	140	150
400	0.054	125	150
350	0.058	120	150
300	0.063	120	140
250	0.069	110	135
220	0.073	110	125
200	0.075	110	125
180	0.078	110	120
minimum R=170			

To be Updated

LEGEND
A = SPIRAL PARAMETER IN METRES
NC = NORMAL CROSS SECTION
RC = REMOVE ADVERSE CROWN & SUPERELEVATE AT NORMAL RATE
e = RATE OF SUPERELEVATION

SPIRAL LENGTH FORMULA
$L = A^2/R$
L = LENGTH OF SPIRAL (m)
A = SPIRAL PARAMETER (m)
R = RADIUS (m)

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Date :
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SEAL

THE CITY OF CALGARY ROADS

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FILE: Z:\permanent\DGSS_2014\dwg\454\1014\ACAD\454.1014.002.dwg
DATE: Wednesday, December 17, 2014 2:47:02 PM
SEC: UNRESTRICTED

No.	Date	Revision	App'd

Drawn: JL Date: 2014-06
Designed: EW
Checked: EW
Scale: NTS

SUPERELEVATION TABLES

Figure 63
File Number 454.1014.002

3.2.5 Lane Widening on Curves

See notes in the cross section tables in Chapter 4 of the Street Manual.

3.2.6 Walking and Wheeling Through Zone Crossfall

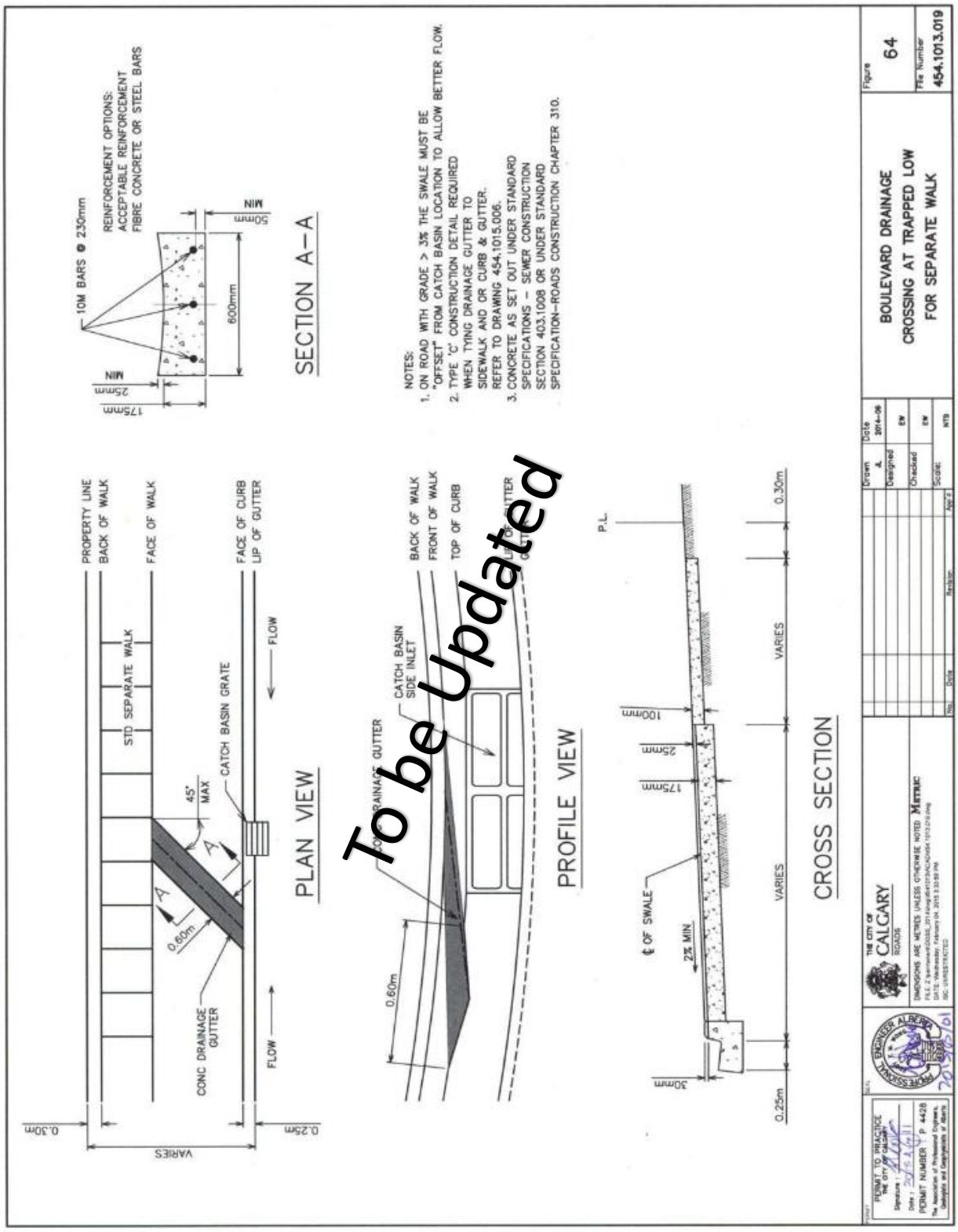
Refer to Chapter 6 for cross slope guidance.

3.2.7 Furnishing Zone Crossfall

The Furnishing Zone should have a minimum cross slope of 2% up from the top of curb to the sidewalk or multi-use path. However, if the Furnishing Zone is adjacent to a trap low of a depth of 0.3 m or greater, a drainage crossing as per Standard Specifications for Road Construction 454.1013.019 should be provided. The Furnishing Zone should have a cross slope of a minimum of 4% up from top of the curb to the front of the sidewalk or multi-use path to accommodate drainage of the sidewalk or multi-use path (see Figure 64).

The maximum cross slope of the Furnishing Zone should be 5% when hard surfaced and 10% when landscaped.

NOTE TO REVIEWERS: THE FIGURE NUMBER WILL BE UPDATED WHEN THE STREET MANUAL AND THE DESIGN DETAILS ARE CONFIRMED AND FINALIZED. THE REFERENCE TO THE CONSTRUCTION STANDARD SPECIFICATIONS WILL ALSO HAVE TO BE CHECKED AND UPDATED, AS REQUIRED.


BOULEVARD DRAINAGE
CROSSING AT TRAPPED LOW
FOR SEPARATE WALK
Figure
64
File Number
454.1013.019
NOTES:
1. ON ROAD WITH GRADE > 3% THE SWALE MUST BE "OFFSET" FROM CATCH BASIN LOCATION TO ALLOW BETTER FLOW.
2. TYPE 'C' CONSTRUCTION DETAIL REQUIRED WHEN TYING DRAINAGE GUTTER TO SIDEWALK AND OR CURB & GUTTER. REFER TO DRAWING 454.1015.006.
3. CONCRETE AS SET OUT UNDER STANDARD SPECIFICATIONS – SEWER CONSTRUCTION SECTION 403.1008 OR UNDER STANDARD SPECIFICATION–ROADS CONSTRUCTION CHAPTER 310.
SECTION A–A
10M BARS @ 230mm
REINFORCEMENT OPTIONS:
ACCEPTABLE REINFORCEMENT
FIBRE CONCRETE OR STEEL BARS
175mm
MIN
25mm
MIN
50mm
600mm
PLAN VIEW
PROPERTY LINE
BACK OF WALK
FACE OF WALK
STD SEPARATE WALK
FACE OF CURB
LIP OF GUTTER
CATCH BASIN GRATE
45° MAX
FLOW
CONC DRAINAGE GUTTER
0.60m
0.30m
VARIES
0.25m
PROFILE VIEW
CONC DRAINAGE GUTTER
CATCH BASIN SIDE INLET
BACK OF WALK
FRONT OF WALK
TOP OF CURB
LIP OF GUTTER
0.60m
CROSS SECTION
P.L.
100mm
175mm
25mm
℄ OF SWALE
2% MIN
VARIES
VARIES
0.30m
30mm
0.25m
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METRIC
PERMIT TO PRACTICE
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3.2.8 Flex Zone Crossfall

The cross slope of the Flex Zone should follow the cross slope of the Travelled Way and be graded toward the edge of the street. In some locations where grading constraints preclude this, the cross slope of paved surfaces in the Flex Zone (i.e., parking laybys, bus stops, etc.) may be graded toward the centre of the street. In these instances, a swale at the interface of the Flex Zone and Travelled Way can be used to facilitate longitudinal drainage flow.

3.3 Vertical Alignment

3.3.1 Grades

Longitudinal grades are to be struck with reference to the lip of gutter line and referenced to Geodetic Datum.

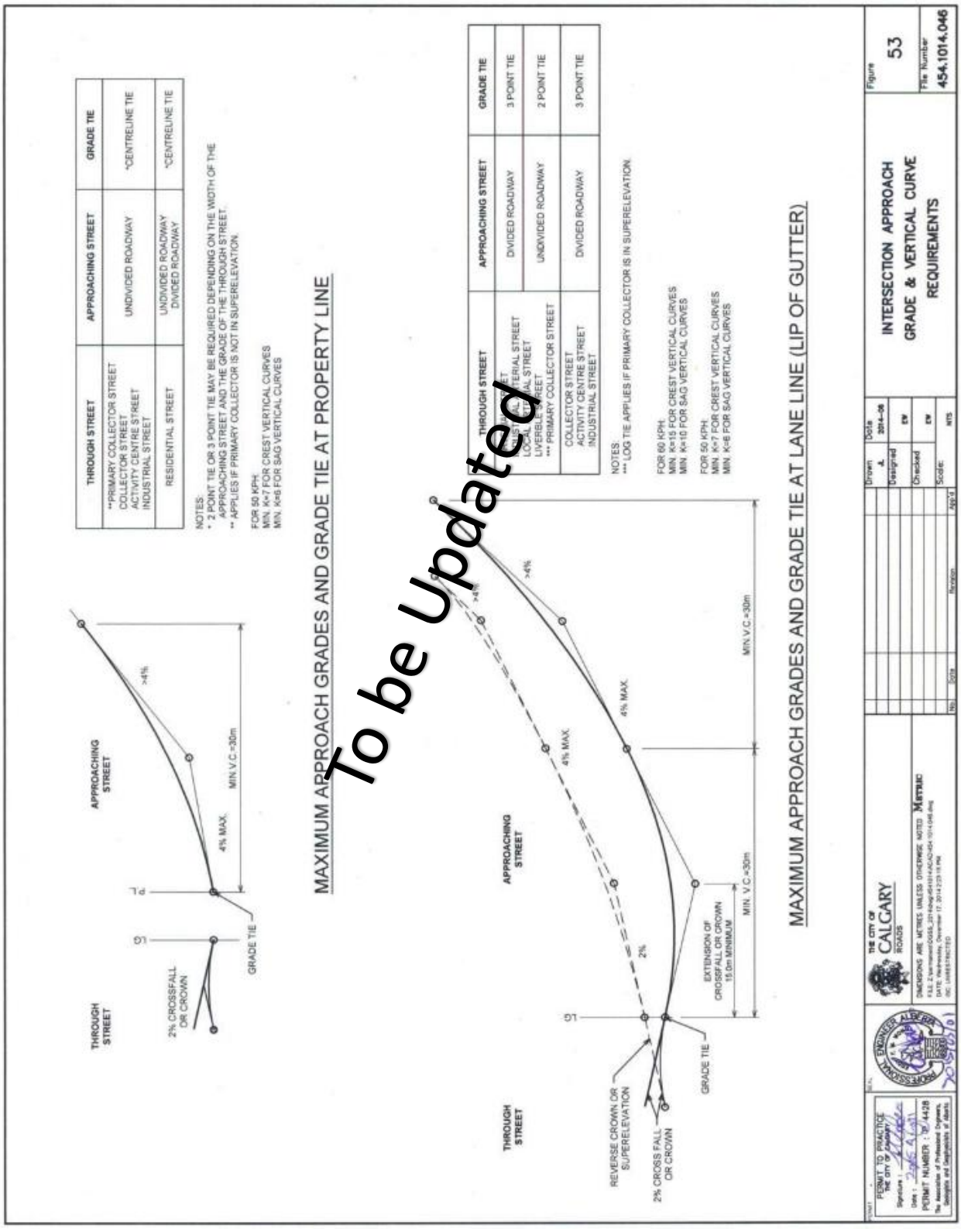
Maximum and minimum grades should be as per the Cross Sections in Chapter 4. The maximum and minimum grades also apply to the transition grades when developing superelevation. All streets and alleys shall have a minimum grade of 0.6%. Streets on the Primary Transit Network should have grades less than 6%.

Depending on the width of the approaching street and the grade of the through street (i.e., > 4%), 2-point ties (lip of gutter ties on both sides) or 3-point ties (lip of gutter ties on both sides and median tie) should be shown on the profiles as grade ties. See Intersection Approach Grades and Vertical Curve Requirements in Figure 53.

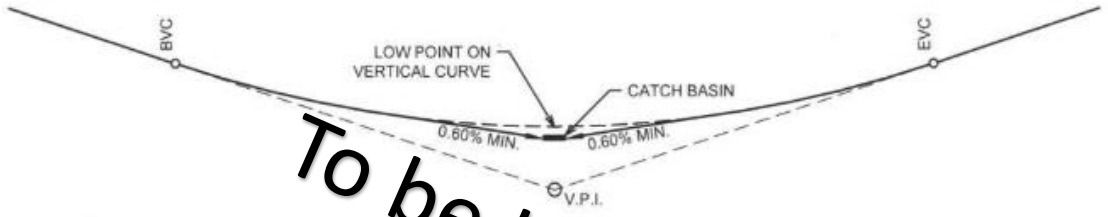
Gutter drainage at flat sag vertical curves should be in accordance with Figure 54.

Grading for sidewalks and paths are addressed in Chapters 5 and 6, respectively.

NOTE TO REVIEWERS: FIGURE 53 AND 54 FROM THE DGSS WILL REQUIRE UPDATING THE FIGURE NUMBER AND THERE MAY BE OTHER POTENTIAL CHANGES TO ALIGN WITH THE STREET MANUAL TEXT.



CATCH BASIN @ LOW POINT
ON FLAT VERTICAL CURVE



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Designed:	EW
Checked:	EW
Scale:	NTS

GUTTER DRAINAGE
AT FLAT SAG
VERTICAL CURVES

Figure: 54
File Number: 454.1003.020

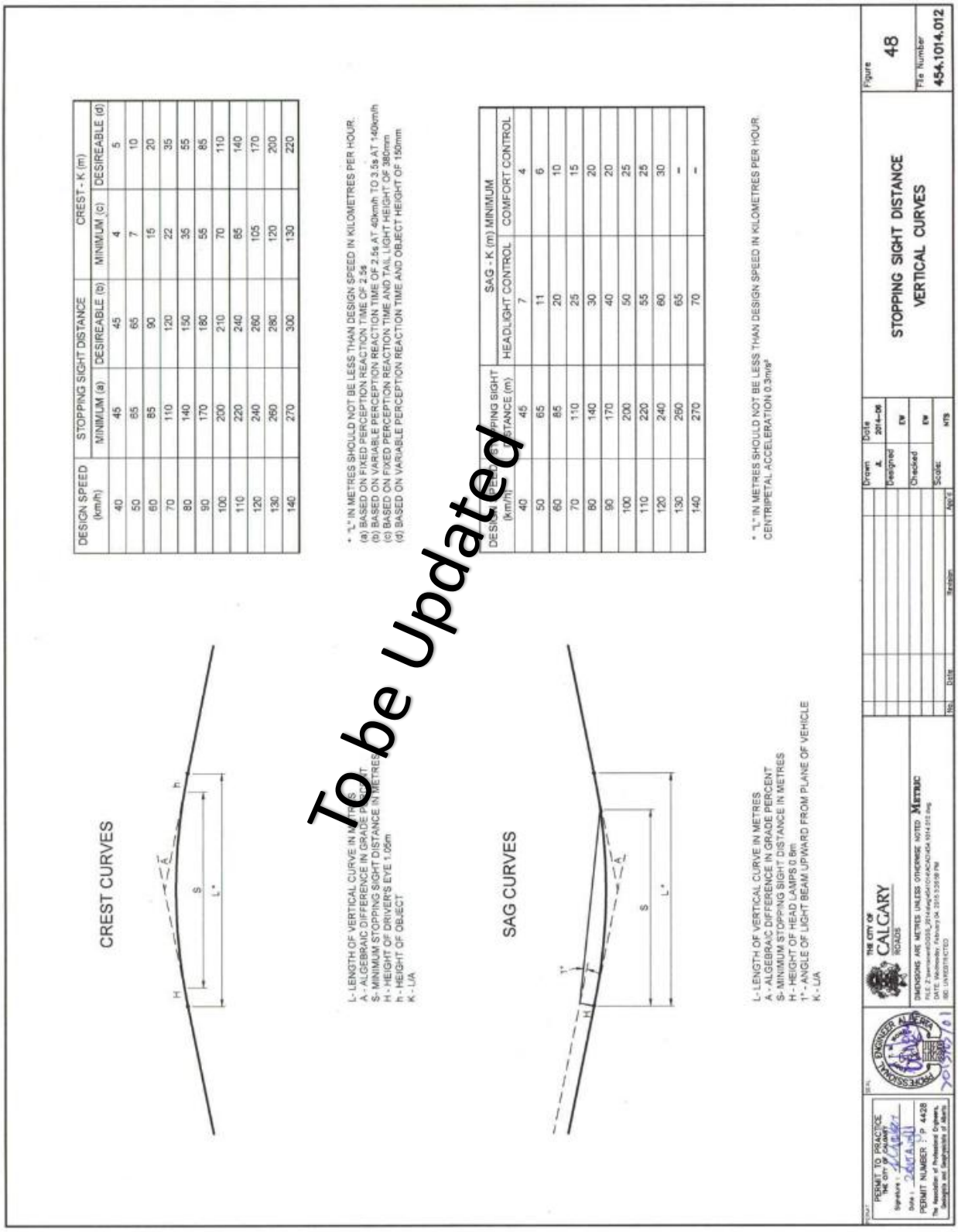
3.3.2 Vertical Curves

'M' is the algebraic difference in grade between two intersection grade lines on a street. Vertical curves are required at all points where a grade change results in an 'M' value of 0.03 or greater, including at the end of a tangent runout and a superelevation runoff.

The length of vertical curve should be calculated based on the stopping sight distance for the Target Speed. See Stopping Sight Distance Vertical Curves in Figure 48 which are based on specific City of Calgary design variable inputs as noted in the figure. See TAC GDG Section 3.3 for vertical curve length formula and variable inputs.

The minimum acceptable length for a vertical curve is 30 m except for the smoothing vertical curves used for superelevation runoff and tangent runout.

NOTE TO REVIEWERS: FIGURE 48 FROM THE DGSS WILL REQUIRE UPDATING THE FIGURE NUMBER AND THERE MAY BE OTHER POTENTIAL CHANGES TO ALIGN WITH THE STREET MANUAL TEXT.



DESIGN SPEED (km/h)	STOPPING SIGHT DISTANCE		CREST - K (m)	
	MINIMUM (a)	DESIREABLE (b)	MINIMUM (c)	DESIREABLE (d)
40	45	45	4	5
50	65	65	7	10
60	85	90	15	20
70	110	120	22	35
80	140	150	35	55
90	170	180	55	85
100	200	210	70	110
110	220	240	85	140
120	240	260	105	170
130	260	280	120	200
140	270	300	130	220

CREST CURVES

L - LENGTH OF VERTICAL CURVE IN METRES
A - ALGEBRAIC DIFFERENCE IN GRADE PERCENT
S - MINIMUM STOPPING SIGHT DISTANCE IN METRES
H - HEIGHT OF DRIVER'S EYE 1.05m
h - HEIGHT OF OBJECT
K - L/A

* "L" IN METRES SHOULD NOT BE LESS THAN DESIGN SPEED IN KILOMETRES PER HOUR.
(a) BASED ON FIXED PERCEPTION REACTION TIME OF 2.5s
(b) BASED ON VARIABLE PERCEPTION REACTION TIME OF 2.5s AT 40km/h TO 3.5s AT 140km/h
(c) BASED ON FIXED PERCEPTION REACTION TIME AND TAIL LIGHT HEIGHT OF 380mm
(d) BASED ON VARIABLE PERCEPTION REACTION TIME AND OBJECT HEIGHT OF 150mm

DESIGN SPEED (km/h)	STOPPING SIGHT DISTANCE (m)	SAG - K (m) MINIMUM	
		HEADLIGHT CONTROL	COMFORT CONTROL
40	45	7	4
50	65	11	6
60	85	20	10
70	110	25	15
80	140	30	20
90	170	40	20
100	200	50	25
110	220	55	25
120	240	60	30
130	260	65	-
140	270	70	-

SAG CURVES

L - LENGTH OF VERTICAL CURVE IN METRES
A - ALGEBRAIC DIFFERENCE IN GRADE PERCENT
S - MINIMUM STOPPING SIGHT DISTANCE IN METRES
H - HEIGHT OF HEAD LAMPS 0.6m
1° - ANGLE OF LIGHT BEAM UPWARD FROM PLANE OF VEHICLE
K - L/A

* "L" IN METRES SHOULD NOT BE LESS THAN DESIGN SPEED IN KILOMETRES PER HOUR.
CENTRIPETAL ACCELERATION 0.3m/s²

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Drawn A. Date 2014-06
Designed EV
Checked EV
Scales: N/S
Approved

STOPPING SIGHT DISTANCE VERTICAL CURVES

Figure 48
File Number 454.1014.012

Chapter 4.0 Cross Section Elements

NOTE TO REVIEWERS: THE INTENT OF THIS CHAPTER INCLUDES CONTENT THAT IS UPDATED TO ALIGN WITH TAC GDG CHAPTER 4 AND CONTENT FROM THE DGSS AND COMPLETE STREETS GUIDE. DETAILED CROSS SECTIONS FROM DGSS SECTION B. ROAD CLASSIFICATIONS – COMPLETE STREETS IS INCLUDED IN THIS CHAPTER. CONTENT FROM DGSS SECTION I. TRANSIT AND SIGNAL REQUIREMENTS SECTION 1) BUS ZONES AND FROM THE DRAFT CALGARY TRANSIT BUS DESIGN GUIDELINES ARE ALSO INCORPORATED. CONTENT FROM DGSS SECTIONS K. SOUND ATTENUATION AND VISUAL SCREENING AND DGSS SECTION E. ROADWAY DESIGN STANDARDS SECTION 2) STANDARD UTILITY DESIGN ELEMENTS ARE ALSO INCLUDED IN THIS CHAPTER OF THE STREET MANUAL.

4.1 Introduction

Cross sections and their elements are selected for each street classification (see Chapter 2)—local, collector, arterial, skeletal—to provide appropriate widths and elements based on land use and mobility network context. For example, while a street may have a Collector Street classification, a Collector Street will look different within a residential neighbourhood, industrial area, or high activity area. As such, typical cross sections have been developed for a Collector Street, a Collector Street – Industrial, and a Collector Street – High Activity Area. When designing in a retrofit situation, the design elements and their widths should be selected based on context from the Target Value and Design Domain tables should a typical cross section not be suitable due to right-of-way widths or other constraints.

The TAC Geometric Design Guide for Canadian Roads (TAC GDG) Chapter 4 outlines the design parameters for cross section elements that should apply for street design in the City of Calgary. It is supplemented by content in TAC GDG Chapters 5 and 6 for bicycle and pedestrian facilities, respectively. The following sections detail specific design guidance that supplements or supersedes that contained in Chapter 4 of the TAC GDG as well as sections of TAC GDG Chapter 6 on boulevard design elements. See Section 1.4 for guidance on how to apply Street Manual and TAC GDG design guidance.

Chapters 5 and 6 of the Street Manual provide additional supplemental guidance to Chapter 4.

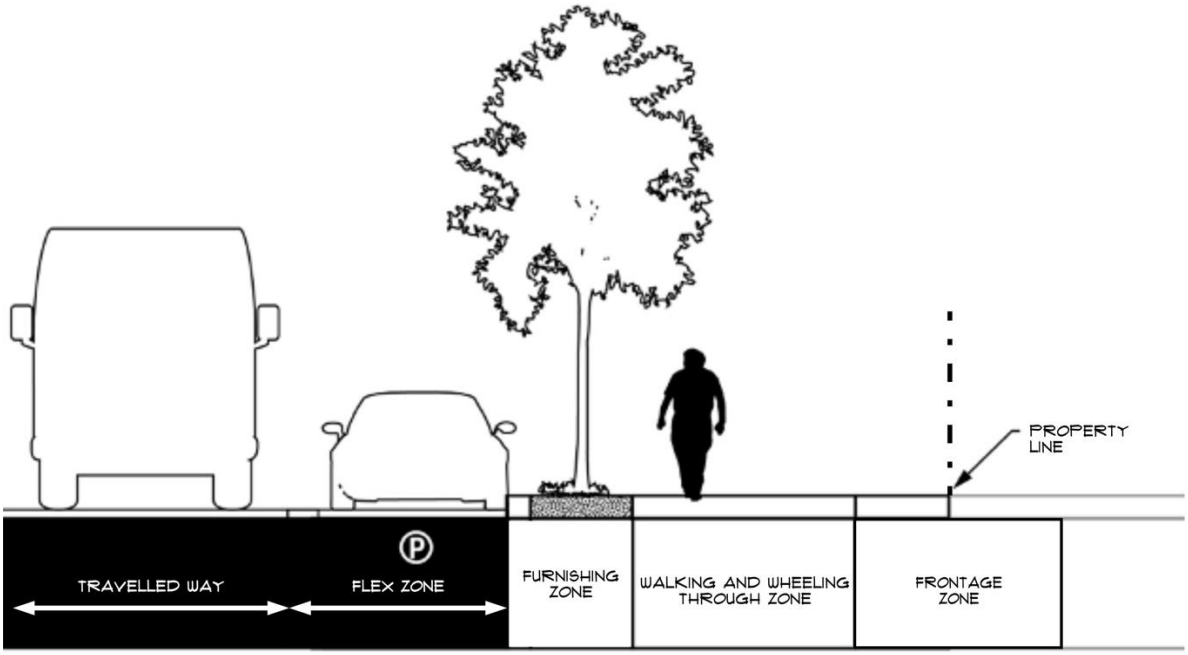
Chapter 4 is organized as follows:

- Section 4.2 provides an overview of the Design Zones and their design requirements within the cross section.
- Section 4.3 provides Target Values for the width of the elements within the Design Zones. These can be used to develop cross sections, particularly in retrofit locations, but may also be used for cross sections in new areas. If all the Target Values are met, a Design Exception is not required.
- Section 4.4 provides typical Cross Sections by street type with contextual variants. These cross sections can be used by designers and will also not require a Design Exception.
- Section 4.5 provides Design Domain widths for the elements within the Design Zones. These values, as well as those referenced in Chapters 5 and 6, can be used to develop custom cross sections when the Target Values cannot be met. Use of values within the Design Domain but outside of the Target Values will require submission of a Design Exception.
- Section 4.6 provides design guidance for Bus Stops.
- Section 4.7 provides design guidance for 4.4 Sound Attenuation, Visual Screening, and Fencing.

- Section 4.8 outlines the design process when custom cross sections are developed and include example cross sections that apply the process.

4.2 Design Zones

As outlined in Section 1.8, a street is composed of design zones that support mobility and the use of streets as public spaces. The zones of the street surface that are referred to in this Chapter are shown in the diagram below. The zones are used to provide Target Values (Section 4.3), Cross Sections (Section 4.4), and Design Domain (Section 4.5) dimensions for designers. The following provides general design guidance and considerations for the Design Zones and introduces the guidance provided in this Chapter.



Derived from: TAC Geometric Design Guide for Canadian Roads

4.2.1 Frontage Zone

The Frontage Zone is between the Walking Through Zone and the adjacent property line or building face. It provides space for maintenance works. Wider frontage zones support active uses of adjacent properties, for example seating and patios for restaurants. Where a utility easement exists, a Frontage Zone may not be provided.

Chapter 4 includes design guidance on cross section widths for the Frontage Zone:

- Section 4.3.1 for Target Values
- Section 4.4 for incorporation into cross sections
- Section 4.5.1 for Design Domain

Refer to TAC GDG Section 6.3.1.1 (Frontage Zones) for additional guidance, while Chapter 6 includes guidance associated with the accessibility of this zone.

4.2.2 Walking and Wheeling Through Zone

The Walking and Wheeling Through Zone is located between the Furnishing Zone and Frontage Zone (if any) or property line. The Walking and Wheeling Through Zone supports barrier-free and accessible travel for people walking, in-line skating, roller skating, skateboards, scooters and those using mobility aids as well as children and youth riding bicycles. In some cases, the Walking and Wheeling Through Zone is a shared facility that accommodates adults riding bicycles or people using other wheeled conveyances. Where these user groups are mixed, the facility is designed as a multi-use path, rather than a sidewalk. Refer to Chapter 5 for more details about when this mix of users is acceptable, and how to separate user groups when required. Also refer to Chapter 5 for additional facilities for people cycling or using other forms of micromobility.

Chapter 4 includes design guidance for Target Values for facilities in the Walking and Wheeling Through Zone:

- Section 4.3.2 for Target Values
- Section 4.4 for incorporation into cross sections
- Section 4.5.2 for Design Domain and Chapter 6

Refer to Chapter 6 for more guidance for the Walking and Wheeling Through Zone. Refer to Chapter 5 for additional design guidance for the design of multi-use path facilities and other in-boulevard paths.

4.2.3 Furnishing Zone

The Furnishing Zone is between the Walking and Wheeling Through Zone and the Flex Zone or the Walking and Wheeling Through Zone and Travelled Way where a Flex Zone is not provided. Some refer to it as the boulevard. When a Furnishing Zone is located between the Walking and Wheeling Through Zone and Travelled Way and there is no Flex Zone, the Furnishing Zone provides separation between people walking and vehicle traffic, which enhances the safety and comfort of vulnerable road users. This is also the preferred location for snow storage and/or can be utilized for stormwater infrastructure or overland drainage. T*he* City of Calgary *Development Guidelines and Standard Specifications: Landscape Construction* provide guidance on suitable treatments for landscape including planting material.

The Separating the Walking and Wheeling Through Zone from the Travelled Way also supports accessible intersection design through the provision of space permitting the alignment of curb ramps to the path and direction of pedestrian travel. The Furnishing Zone also provides clearer separation of active transportation facility types for people with vision loss and minimizes the potential for snow clearing to impact or obstruct the Walking and Wheeling Through Zone. In some cases, the Furnishing Zone may be between a sidewalk and a cycle track, where the cycle track / protected bike lane is part of the Travelled Way.

Chapter 4 for the Furnishing Zone includes design guidance for Furnishing Zone width dimensions:

- Section 4.3.3 for Target Values
- Section 4.3.4 for Curb and Gutter types and dimensions. The Furnishing Zone includes the curb and gutter and its associated width within the street right-of-way.
- Section 4.4 for incorporation into cross sections
- Section 4.5.3 for Design Domain

In all locations, a Furnishing Zone should be provided that allows for the placement of streetlight poles, signs, transit stops, trees, and other street furniture, such as benches, garbage receptacles and bicycle parking racks to ensure the street furniture does not encroach into or obstruct the accessible walking route / Walking and Wheeling Through Zone.

Refer to Chapter 6 for additional design guidance related to accessibility considerations for the Furnishing Zone. Refer to TAC GDG Section 6.3.1.3 (Furnishing Zone) for additional guidance.

4.2.4 Flex Zone

The Flex Zone, if provided, is located between the Travelled Way and the Furnishing Zone. Where protected bike lanes or raised cycle tracks are provided along a street, the Flex Zone is located between two parts of the Travelled Way (i.e., a bikeway and travel lane).

Flex Zone uses include the following:

- Parking including EV charging points.
- Pick-ups/Drop-offs and Loading, including temporary set-out of carts for waste collection.
- Deliveries
- Bus Stop Areas and Platforms (see Section 4.7)
- Curb Extensions (see Chapter 10)
- Parklets (temporary or permanent)
- Stormwater infrastructure (rain gardens, bio swales)
- Patios (temporary or permanent)
- Bicycle Parking (temporary or permanent)
- Boardwalks/Walkways (temporary or permanent)
- Livery Services

Chapter 4 provides design guidance for the width of the Flex Zone:

- Section 4.3.5 for Target Values
- Section 4.4 for incorporation into cross sections
- Section 4.5.4 for Design Domain

The design of the Flex Zone uses listed above without reference to other Street Manual Chapters or Sections can be accommodated within the Target Values and Design Domain dimensions of the Flex Zone. Design guidance for these is not provided in the Street Manual.

4.2.5 Travelled Way

The Travelled Way provides space within the street right-of-way for travel by people driving and cycling and is used to transport goods and facilitate public transit. It also is typically the area where deep utilities (water, sanitary and storm) are accommodated. Chapter 4 provides design guidance for travel lanes, bicycle facilities, transit facilities, turn lanes/bays, and medians:

- Section 4.3.6 for Target Values
- Section 4.3.8 for Medians
- Section 4.3.9 for Service Roads
- Section 4.4 for incorporation into cross sections
- Section 4.5.5 for Design Domain

Chapter 5 includes additional design guidance for bicycle facilities. Section 5.2 provides guidance for the selection of bicycle facility type, including shared use facilities with people walking, based on the street classification, motor vehicle volumes, motor vehicle speeds, and other operational factors.

4.2.6 Utilities and Trees

Underground and overhead utilities and trees can be located under, over, and within various Design Zones. Chapter 4 provides design guidance for utilities and trees:

- Section 4.3.7 for Standard Utility Elements and Tree Placement
- Section 4.4 for incorporation into cross sections

Refer to The City of Calgary *Stormwater Management and Design Manual* for more guidance on design of utilities.

4.3 Target Values

This section provides Target Values for each design zone as well as providing guidance on utility line assignments and tree placement. The Target Values presented in this section were used to develop the cross sections provided in Section 4.4. If Target Values cannot be achieved or a variation is desired for a specific circumstance, then Section 4.5 outlines the acceptable range of values within the Design Domain that can be considered.

4.3.1 Frontage Zone Target Value Widths

Target Values for the Frontage Zone based on context are as follows.

Context	Frontage Zone Width Target Value (m)
Alley	N/A
Local	0.3
Local – Industrial	0.3
Local – High Activity	0.0
Collector	0.3
Collector – Industrial	0.3
Collector – High Activity	0.0
Arterial	0.3
Arterial – High Activity	0.0
Skeletal Road	N/A (part of roadside, see Chapter 7)

4.3.2 Walking and Wheeling Through Zone Target Value Widths

The following section provides Target Values for widths of facilities for people walking, in-line skating, roller skating, skateboards, scooters, and those using mobility aids within the Walking and Wheeling Through Zone. Refer to Chapter 6 for additional design guidance for the design of pedestrian facilities.

4.3.2.1 Sidewalks

The width of sidewalks varies based on anticipated use and land use context. Target Values are as follows. In the cases below, the Walking and Wheeling Through Zone and Sidewalk Width are synonymous.

Context	Sidewalk Width [1] Target Value (m)
Alley	N/A[2]
Local	1.8
Local – Industrial	1.6[3]
Local – High Activity	2.5
Collector	2.0[4]
Collector – Industrial	1.8[4]
Collector – High Activity	2.5[5]
Arterial	2.0[4]
Arterial – High Activity	2.5[5]
Skeletal Road	N/A

NOTES:

1: Sidewalk width is for boulevard sidewalks. Add 0.3 m for monolithic sidewalks.

2: An Alley is an informal walking/wheeling/motorized vehicle space encouraged by the 15 km/h Posted Speed. Separate facilities for different users are not warranted.

3: Sidewalk width for Local Street – Industrial is at the Recommended Lower Limit to reflect the lower walking activity along these streets while providing the requirements for an accessible walking route.

4: 3.0 m wide multi-use path typically provided. Target Value for sidewalk is for situations when a segregated multi-use path (i.e., bike path with adjacent sidewalk) or a sidewalk and a cycle track are provided along the street.

5: See Design Domain values for very High Activity areas.

4.3.2.2 Multi-Use Path, Segregated Multi-Use Path, and Bike Path Widths

Target Values for multi-use path widths based on context are provided in the below table. Target Values for multi-use path/bike path widths in the table assume there is a Furnishing Zone between the path and the Travelled Way. Contexts with N/A are where multi-use paths are typically not provided. If there are provided where noted as N/A, the wheeling network status and design domain widths should be considered to select an appropriate width.

Where higher numbers of people walking and cycling require a wider facility to be provided, the designer should not be limited by the Target Values below. In this situation, the designer should also consider whether a separation of users is an appropriate facility type, for example a segregated multi-use path. See Chapter 5 for guidance.

For target values for other types of bicycle facilities, see Section 4.3.6.3.

Context	Multi-Use Path / Bike Path[1,2] Width Target Value (m)
Alley	N/A
Local	N/A
Local – Industrial	N/A
Local – High Activity	N/A
Collector	3.0[4]
Collector – Industrial	3.0
Collector – High Activity	3.5[3]

Arterial	3.0[4]
Arterial – High Activity	3.5[3]
River Pathways	4.0[5]
Skeletal Road	4.0

NOTES:

1: If a bike path is provided in combination with a separate sidewalk, the Target Values in the table are for the bike path component. See Section 5.1.2 for guidance on criteria to determine if a multi-use path should be segregated.

2: Where multi-use paths are provided in a monolithic configuration, a buffer of 1.0 m from lip of gutter is required for streets with posted speed limits of 50 km/h or less and 1.5 m for streets with posted speed limits of 60 km/h or greater.

3: Raised cycle tracks with separate sidewalks should be provided for High Activity area locations for Collector and Arterial Street classifications. If a multi-use path be provided instead due to site specific requirements and approved through a Design Exception, it should be a segregated multi-use path with a separate sidewalk and bike path. The Target Value width noted in the table is for the bike path component of a segregated multi-use path.

4: Where higher volumes of path users are anticipated, a target of 3.5 to 4.0 m should be used.

5: See Calgary Design Guidelines and Standard Specifications: Landscape Construction for design guidance for off-street paths and trails not within road right-of-way.

4.3.3 Furnishing Zone Target Value Widths

The Target Values for the Furnishing Zone widths based on context are as follows.

Context	Furnishing Zone Width Target Value (m)[1]
Alley	0.5 on one side and 1.5 on the other
Alley – Neighbourhood High Activity Area	N/A[2]
Local	2.65
Local – With Parking	2.40
Local – Industrial	2.6
Local – High Activity	2.55[3]
Collector	3.7
Collector – With Parking	2.6
Collector – Industrial	4.7
Collector – Industrial – With Parking	2.6
Collector – High Activity	2.45[3]
Arterial – 4 Lanes Divided 50 km/h	3.15
Arterial – 4 Lanes Divided 70 km/h	4.7
Arterial – 6 Lanes	4.7
Arterial – High Activity	2.4[3]
Skeletal Road	N/A (part of roadside, see Chapter 7)

NOTES:

1: Target Widths intended to provide minimum adequate width for trees and street light poles.

2: Alley – High Activity is hard-surfaced for its entire width within the right-of-way. See Target Values for Travelled Way.

3: Furnishing Zone in High Activity areas may be hard surfaced. The Furnishing Zone is typically located between a raised cycle track and a sidewalk for Collector and Arterial Street classifications in High Activity areas.

4.3.4 Curb and Gutter

Curbs are raised or vertical elements, located adjacent to a travel lane, parking lane, median, bike lane, or protected bike lane / cycle track. Concrete gutters are typically used to facilitate longitudinal drainage

along urban streets and are cast integrally with curbs. See the *Calgary Stormwater Management and Design Manual* for guidance on the use of gutters as part of the urban streets drainage system.

All dimensions for the Furnishing Zone, Travelled Way, and Flex Zone, including bicycle facilities, are taken to lip of gutter.

There are four general types of curbs: straight face or barrier curb, mountable, roll face, and bevelled.

- Straight face curb is a vertical or near vertical curb, with a typical height of 140 to 150 mm, and is intended primarily to control drainage and access. Straight face curbs can also be a reduced height when part of a delineator for an intermediate level raised cycle track. The width of a typical straight face curb and gutter from back of curb to lip of gutter is 415 mm.
- Mountable curb is mountable under emergency conditions or very slow-moving conditions. Its slope of face ranges from short (100 mm or less) and nearly vertical to a slope of 0.250 m/m to 0.625 m/m with a maximum vertical height of 125 mm. Mountable curbs can be used for mountable truck aprons on roundabouts or at intersection corners where corner radius is minimized, and truck access is still required.
- Roll face curb has a relatively flat sloping face (0.10 m/m to 0.25 m/m) to permit vehicles to cross over it easily. Roll face curbs are typically used in residential neighbourhoods to facilitate access to driveways or on higher speed facilities where a straight face curb would potentially create a safety hazard. The width of a typical roll face curb from back of curb to lip of gutter is 525 mm.
- Bevelled curb has an angled face can be up to 150 mm in height. Bevelled curbs are typically used adjacent to bicycle facilities to reduce pedal strike hazards for people cycling and to ease access to the sidewalk for people who have dismounted their bicycles. While a bevelled curb can have a 1:1 (vertical:horizontal) for a full height curb (i.e., 150 mm), a 1:3 bevelled curb can be used for intermediate-level raised protected bike lanes/raised cycle tracks.

Curbs of other heights can be used. However, the height must consider numerous factors including accessibility. The minimum curb height that is detectable for people with vision loss is 50 mm to 60 mm.

Details for standard City of Calgary curb types are contained in the Roads Construction Standard Specifications.

4.3.5 Flex Zone Target Value Widths

Section 2.5.3 (Street Classifications) provides general design characteristics by street type including where areas outside of the travel lanes for on-street parking and other uses by motorized vehicles may be provided. In general, a widened pavement to accommodate on-street parking is only provided when required. The cross sections in Section 4.4 outline situations where on-street parking is required in new construction.

4.3.5.1 On-Street Parking, Loading, or Delivery Lane/Bay Widths

The design of on-street parking, loading/drop-off, and/or delivery lanes or bays have similar dimensions when oriented parallel to travel along the street. Target Values for parallel parking/loading/delivery lane/bay widths based on context are as follows.

Context	Parking/Loading/Drop-off/Delivery Lane/Bay Width Target Value (m)
Alley	Parking prohibited where less than 6 m clear width if a vehicle is parked
Local	See Note 1
Local – Industrial	Parking prohibited
Local – High Activity	2.2
Collector	2.2
Collector – Industrial	2.2
Collector – High Activity	2.3
Arterial	Parking Prohibited[2]
Arterial – High Activity	2.3
Accessible Parking and School Bus Drop-off Area (see Section 4.3.5.2)	2.6
Skeletal Road	Parking Prohibited

NOTES:
1: Parallel parking/loading lanes or bays along local streets involves widening the Travelled Way on each side of the street where this use is required. See Section 4.4 for information within cross sections.
2: On-street parking along Arterial Streets may only be provided in very limited contexts, typically during off-peak hours, using the outside curb lane. The default for Arterial Streets is to prohibit parking, loading, and stopping.

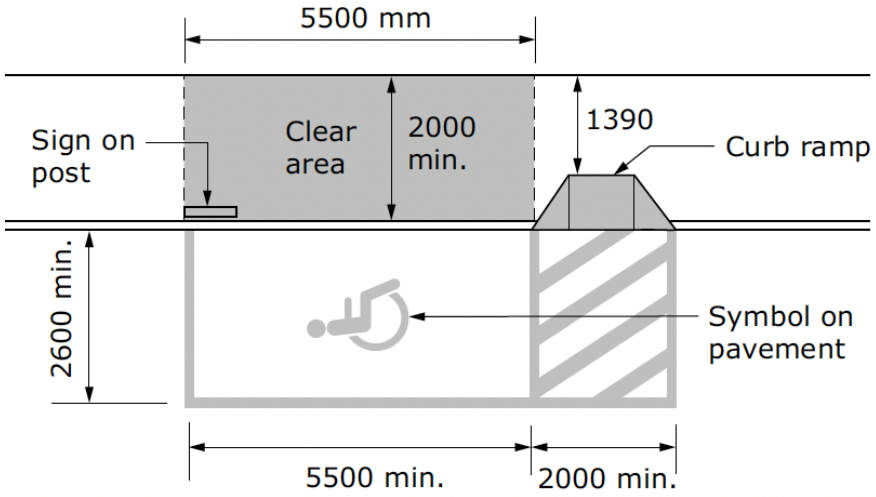
4.3.5.2 Accessible Parking

Accessible parking for motor vehicles is dedicated through signs for the use of people that have parking placards for persons with disabilities. The Flex Zone provides the opportunity for dedicated 24-hour or time-restricted accessible parking, increasing the accessibility of destinations along the street to a broader range of people.

The width requirements for accessible parking are larger than motor vehicle parking, particularly if accommodating wheelchair access for the driver to get into and out of the vehicle. The increased width to accommodate accessible parking can be achieved by reducing the width of the Furnishing Zone for a short segment at the location of the accessible parking space(s).

The placement of signs, street furniture, and landscaping should not impact access to the accessible parking stall. In addition, when located adjacent to land uses having high use accessible parking zones, such as senior homes, a connection to the adjacent sidewalk or path and a curb ramp should be provided at accessible parking stalls for access. The curb ramp should be located so as not to be negatively impacted by drainage infrastructure. Curb ramps should not be located at a catch basin nor in a trap low location. Unless the curb ramp used to access an accessible parking space is also used to cross the street, a Tactile Attention Indicator should not be used.

A clear area that is hard-surfaced adjacent and parallel to the accessible parking space that is 2.0 m wide should be provided behind the curb. A clear space behind the accessible parking stall within the Flex Zone with a minimum area of 2.0 m by 2.6 m should also be provided as an access aisle leading to the curb ramp. The following figure illustrates the parallel accessible parking space.



Source: CSA Accessible Design for the Built Environment

NOTE TO REVIEWERS: THE FIGURE IS BEING REVIEWED IN MORE DETAIL AND WILL BE UPDATED UPON FURTHER DIRECTION.

4.3.5.3 Bus Bays

Guidance on bus stops is provided in Section 4.6. Where a bus bay is warranted, it should be 3.3 m wide measured from the lip of gutter.

4.3.6 Travelled Way Target Value Widths

Design guidance for medians, which are part of the Travelled Way, is provided in Section 4.3.8. Design guidance for the Travelled Way at intersections and intersection configurations is provided in Chapter 9.

The overall width of the Travelled Way (and Flex Zone, if provided) needs to accommodate Fire Department requirements of 6 m clear travelled way. It may also be dependent on constraints based on underground utility line assignments and offsets noted in Section 4.3.7.

4.3.6.1 Travel Lanes Widths

Travel lanes are provided on streets to support access and mobility for vehicular traffic, including bicycle traffic. The Design Vehicles in Section 2.4 and those assigned based on street classification in Section 2.5.3 are the basis for establishing travel lane widths.

Target Values for travel lane widths based on context are as follows. These values have been used to develop the cross sections provided in Section 4.4.

Context	Travel Lane Width Target Value (m)
Alley	4.0[1]
Alley – High Activity	6.0[2]
Local	6.5[3]
Local – Industrial	9.0[4]
Local Street – High Activity	3.25
Collector	3.3[5]
Collector – Industrial	3.5

Collector – High Activity	3.3[5]
Arterial – 4 Lane - 50km/h	3.3 Inside Lane; 3.5 Outside Lane
Arterial – 4 or 6 Lane - 70 km/h	3.5 All lanes
Arterial Street – High Activity	3.3 All Lanes
Dedicated Transit Lane (any street classification)	3.5[5]
Skeletal Roads	Use Rural Road Target Values
Rural Road – 70 km/h or less posted speed	3.5
Rural Road – over 70 km/h posted speed	3.7

NOTES:

1: Shared two-way Travelled Way width. No defined travel lanes.

2: Wider Travelled Way to accommodate more frequent passing and turning movements.

3: Two-way Travelled Way width with no marked centreline and a low Target Speed (30km/h). Travelled Way width is controlled by emergency access needs (6.0 m) and offsets for underground utilities (see Section 4.3.7).

4: For Local Streets in Industrial Areas, turn movements by large vehicles into/out of driveways contribute to overall Travelled Way width requirements.

5: Transit requires a minimum 3.3 m lane width where there is an adjacent boulevard area or cycle track delineator. Wider lanes of 3.5 m are preferred where people cycling, people walking, signs, or parked cars are present at the curb line (i.e., without a 0.5 m buffer measured from lip of gutter).

4.3.6.2 Turn Lane/Bay Widths

Target Values for turn lane/bay widths are as follows. Accommodating these turn bay widths will typically require a widening of the street right-of-way at an intersection. See Chapter 9 for guidance on intersection treatments and addition of medians as required. See Section 4.3.8 for guidance on medians.

Context	Turn Lane/Bay Width Target Value (m)
Alley	N/A
Local	N/A
Collector	3.3[2]
Collector – Industrial	3.5[1]
Collector – High Activity	3.3[2]
Arterial	3.5
Arterial – High Activity	3.3[2]
Skeletal	3.7

NOTES:

1: For two-way centre left turn lanes in Industrial Areas, the target value width is 4.0 m. Medians should be used near intersections to manage access and control movements.

2: Transit requires a minimum 3.3 m lane width where there is an adjacent median or boulevard. Wider lanes/bays of 3.5 m are preferred where these are not provided.

4.3.6.3 Bicycle Facilities

The following provides Target Values for cycle track widths. For target values for multi-use paths and bike paths, see Section 4.3.2.2. For target values for other types of bicycle facilities, see Section 5.1.

Cycle track widths are measured from lip of gutter or edge of bikeway if no gutter is provided. The cycle track delineator is the buffer area between the cycle track and the rest of the Travelled Way or Flex Zone and can be provided using different design elements (see Section 5.1.1.1). Cycle track delineator widths

exclude the gutter if a gutter is part of the cycle track delineator. The width of a gutter must be added to the width of the delineator. Target cycle track delineator widths are noted for mid-block locations. Increased widths are recommended at intersections, driveways, and accesses to provide additional horizontal offset for turning motor vehicle traffic to yield to people cycling (see Chapter 9).

Note that cycle tracks are not typically provided along alleys or local streets due to the lower motor vehicle volumes and speeds. As such, values are not provided in the below table. If a cycle track is required along a local street, the wheeling network status and design domain widths should be considered to select an appropriate width.

Refer to Chapter 5 for design guidance of bicycle facilities within the street right-of-way.

Context	One-way Cycle Track Width Target Value (m)	Two-way Cycle Track Width Target Value (m)	Cycle Track Delineator Width Target Value (m)
Collector[1]	2.2	3.0	0.75
Arterial[1]	2.2	3.0	1.0[2]
Primary Wheeling Network	2.5	4.0	Select based on posted speed limit[2]
Bus Stop Boarding Islands	1.5[3]	2.5[3]	See Section 5.3.4
School Drop-off Area	2.5	3.0	2.0

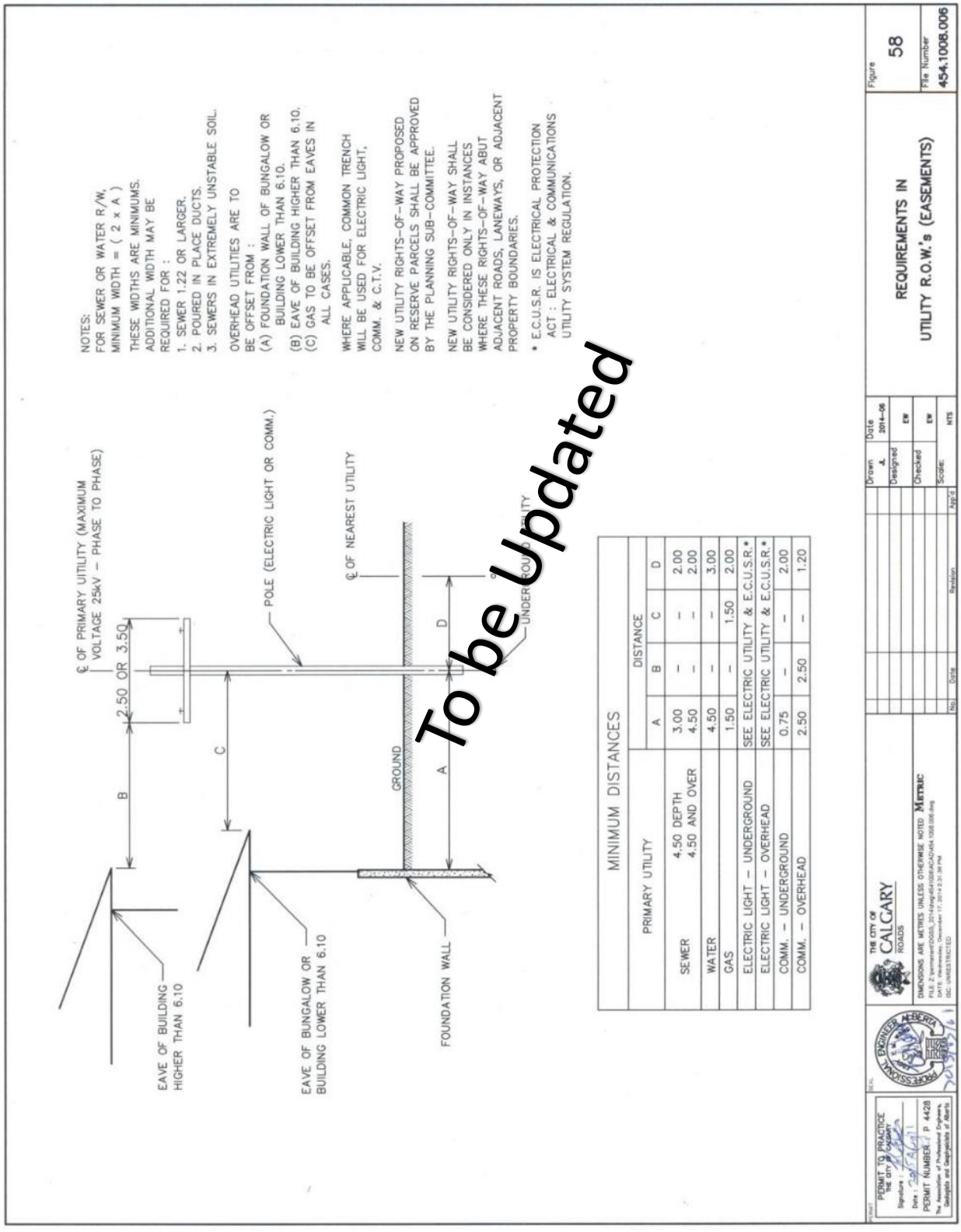
NOTES:
1: Multi-use path or segregated multi-use path (i.e., bike path plus sidewalk) typically preferred to provide increased separation, increased user comfort, and support winter maintenance activities. Cycle tracks are typical in High Activity Areas.
2: For streets with 50 km/h posted speed limit or less the Target Value is 1 m. Target Value increases to 2 to 5 m along higher speed streets. See also separation at intersections in Chapter 9.
3: Reduced width to reduce cycling speeds through bus boarding island areas.

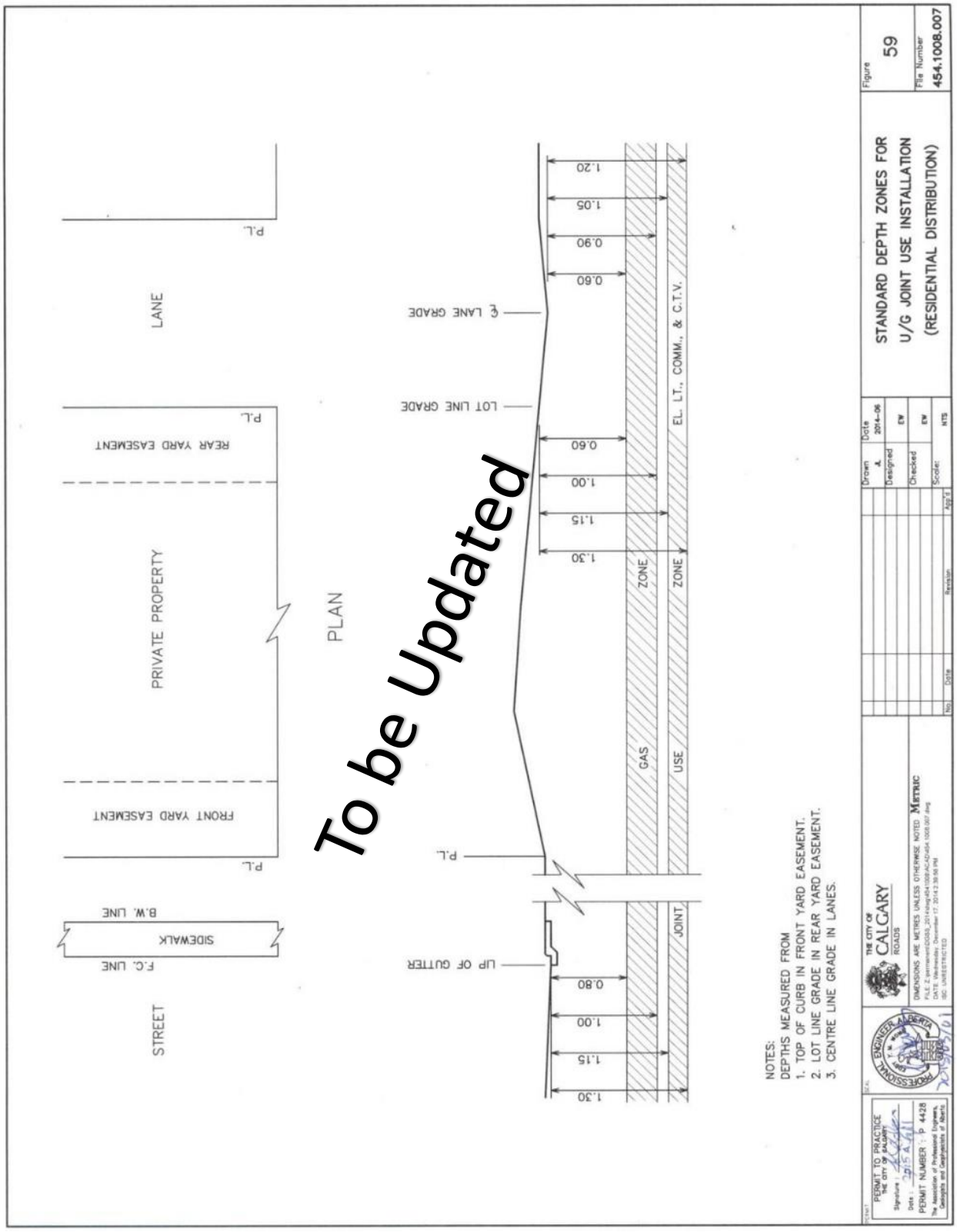
4.3.7 Standard Utility Elements and Tree Placement

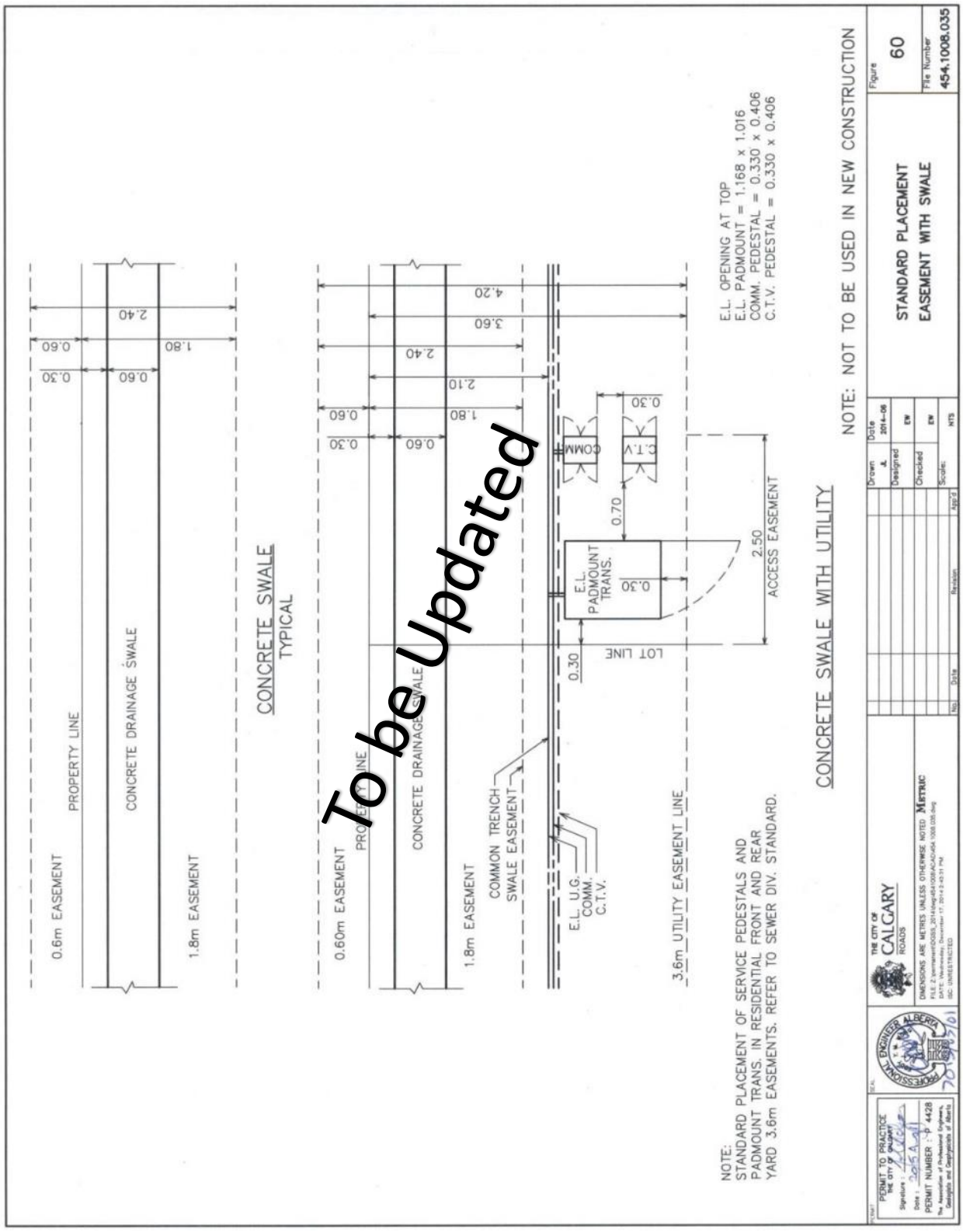
Standard Utility Elements located in the public street right-of-way, or in utility right-of-way easements on private property, includes shallow utilities (power, gas, telecommunications, streetlight cable, traffic signal cable) and deep utilities (storm sewer, sanitary sewer, water). Refer to *Calgary Standard Specifications: Water Construction and Sewer Construction, Feedermain Guidelines and Proximity Guidelines* for design guidance. Other utility equipment is installed on the surface including hydrants, transformer pedestals and cabinets, and overhead power. The separation of utility line assignments from one another and trees, including the use of a joint shallow utility trench, are indicated below. Figures 58 through 60 are drawings indicating standard utility design elements and their placement.

The separation of utilities from trees is provided in Section 4.3.7.1, while utility offsets are provided in Section 4.3.7.2.

NOTE TO REVIEWERS: THE DRAWINGS ARE UNDERGOING REVIEW TO ENSURE THE UTILITY LINE ASSIGNMENT DRAWINGS ARE REQUIRED AND MEET REQUIREMENTS.




STANDARD DEPTH ZONES FOR
U/G JOINT USE INSTALLATION
(RESIDENTIAL DISTRIBUTION)
Figure 59
File Number 454.1008.007
THE CITY OF CALGARY
ROADS
PERMIT TO PRACTICE
PERMIT NUMBER : P 4428
PROFESSIONAL ENGINEER ALBERTA
To be Updated
PLAN
LANE
PRIVATE PROPERTY
REAR YARD EASEMENT
FRONT YARD EASEMENT
SIDEWALK
STREET
P.L.
B.W. LINE
F.C. LINE
℄ LANE GRADE
LOT LINE GRADE
LIP OF GUTTER
GAS
USE
JOINT
ZONE
EL. LT., COMM., & C.T.V.
ZONE
0.60
1.00
1.15
1.30
0.90
1.05
1.20
0.80
NOTES:
DEPTHS MEASURED FROM
1. TOP OF CURB IN FRONT YARD EASEMENT.
2. LOT LINE GRADE IN REAR YARD EASEMENT.
3. CENTRE LINE GRADE IN LANES.


0.6m EASEMENT
PROPERTY LINE
CONCRETE DRAINAGE SWALE
1.8m EASEMENT
CONCRETE SWALE
TYPICAL
0.60m EASEMENT
CONCRETE DRAINAGE SWALE
1.8m EASEMENT
COMMON TRENCH
SWALE EASEMENT
E.L. U.G.
COMM.
C.T.V.
3.6m UTILITY EASEMENT LINE
LOT LINE
E.L. PADMOUNT TRANS.
COMM.
C.T.V.
ACCESS EASEMENT
E.L. OPENING AT TOP
E.L. PADMOUNT = 1.168 x 1.016
COMM. PEDESTAL = 0.330 x 0.406
C.T.V. PEDESTAL = 0.330 x 0.406
NOTE:
STANDARD PLACEMENT OF SERVICE PEDESTALS AND
PADMOUNT TRANS. IN RESIDENTIAL FRONT AND REAR
YARD 3.6m EASEMENTS. REFER TO SEWER DIV. STANDARD.
CONCRETE SWALE WITH UTILITY
NOTE: NOT TO BE USED IN NEW CONSTRUCTION
To be Updated
THE CITY OF CALGARY
ROADS
STANDARD PLACEMENT
EASEMENT WITH SWALE
Figure
60
File Number
454.1008.035

4.3.7.1 Tree Separations to Utilities and Other Elements within Street Right-of-Way

The minimum setback for a tree from a hardscaped surface such as sidewalk, cycle track, or multi-use path is 1.0 m and as shown in the cross sections in Section 4.4. The following table outlines minimum separation of a tree to various utility mains on alignments parallel to the street. Utility services, hydrants, and street light poles also have separation requirements that impact tree placement along a street, but generally do not impact the cross section and its related widths within the right-of-way. See the Calgary *Development Guidelines and Standard Specifications: Landscape Construction* for guidance on longitudinal spacing between trees.

Utility	Deciduous Tree (m)	Coniferous and Poplar Tree (m)
Deep Utilities		
Sanitary	3.0	4.0
Storm (less than 4.5m deep)	3.0	4.0
Water	3.0	4.0
Shallow Utilities		
Gas	2.0	2.0
Telephone	1.5	2.0
CTV	1.5	2.0
Power/Street Light Cable	1.5	2.0
Other		
Overhead Power	7.0 to 9.0	7.0 to 9.0

4.3.7.2 Deep and Shallow Utility Offsets

The following minimum horizontal offsets should be used for deep and shallow utilities. These are noted in the typical street cross sections included in Section 4.4.

- Water to Sanitary or Storm Sewer:
  - Regulated minimum centreline separation is 2.5 m
  - Required centreline separation is 3.0 m, except for rights-of-way widths of 20m or less, where 2.5m and minimum edge to edge separation of 1.0 m is acceptable.
- Sanitary Sewer to Storm Sewer:
  - For pipes 500 mm in diameter or less, minimum centreline separation is 1.5 m, which allows for two offset 1.5 m manhole barrels.
  - For pipes greater that 500 mm in diameter, minimum centreline separation is 2.0 m and minimum edge to edge separation of 1.0 m is acceptable.
  - For pipes greater than 1200 mm in diameter, additional separation is required with additional consideration given to separation to catchbasins
- Water, Sanitary Sewer, and Storm Sewer to Catch Basin or Lip of Gutter:
  - Minimum centreline separation is 2.0 m to catch basin.
  - Minimum centreline separation is 1.5 m to lip of gutter unless otherwise detailed in the Standard Cross Sections
- Gas to Power:

- Minimum centreline separation is 0.5 m except for small diameter gas lines typically located in a Joint Shallow Utilities Trench (see Figure XX)

Where four or more deep utilities are contained within a cross section, a custom cross section will be required. Where there are critical utility mains, additional separation may be required.

NOTE TO REVIEWERS: THE REFERENCE TO THE FIGURE FOR THE JOINT SHALLOW UTILITIES TRENCH WILL BE UPDATED AT A FUTURE DATE AND A DETAIL WILL BE DEVELOPED.

4.3.8 Medians

Medians should be a minimum of 3.5 m wide (measured from lip of gutter to lip of gutter) where required for access control (see Chapter 8) or to accommodate a single left turn bay for streets with posted speed limits of 50 km/h or less. On constrained corridors and where speed limits are 50 km/h or less and the median is not to be used for refuge for people walking or wheeling, a median of 2.5 m should be used.

Where single left turn bays are typically required at intersections and the posted speed limit is above 50 km/h, the minimum median widths should be 6.0 m. A minimum 9.5 m wide median may be required where dual parallel left turn bays are necessary at intersections. In order to reduce conflicts with opposing traffic flows within the intersection, widening to a minimum of a 13.5 m wide median is recommended where a dual slotted left turn bay is necessary.

A minimum median width of 3.5 m (measured from lip of gutter to lip of gutter) is required if the median is intended to provide a centre refuge for people walking or wheeling to cross in two stages. A preferred width of 4.0 m accommodates a more diverse set of cycling devices (e.g., cargo bicycles, bicycles with trailers). Providing a median refuge can occur at intersections or mid-block.

When used as a cycle track delineator, the curb-to-curb dimension of a median should meet the Target Values in Section 4.3.6.3.

4.4 Cross Sections

For new street construction, the design cross sections in this manual are to be used. Current cross sections are as follows:

Figure 1: Local
Figure 2: Local – Industrial
Figure 3: Local – High Activity
Figure 4: Alley
Figure 5: Local – Rural
Figure 6: Collector
Figure 7: Collector – Industrial
Figure 8: Collector – High Activity
Figure 8A: Collector – High Activity School Site
Figure 9: Arterial – 4 Lanes Divided 50km/h
Figure 10: Arterial – 4 Lanes Divided 70km/h
Figure 11: Arterial – High Activity

Figure 12: Arterial – 6 Lanes
Figure 13: Skeletal

NOTE TO REVIEWERS: THE DRAFT CROSS SECTIONS ARE IN AN ATTACHED PDF FILE.

Variations to these cross sections would be considered under the Design Exception Process outlined in Section 1.10.

4.5 Design Domain

For situations where constraints or wider elements preclude the use of the cross sections in Section 4.4, the Design Domain, as discussed in Section 1.5, allows deviation from Target Values within certain ranges. The following sections describe those elements and allowable values.

4.5.1 Frontage Zone Design Domain

The Design Domain for the Frontage Zone is shown in the table below. Wider Frontage Zones support active uses of adjacent properties, for example seating and patios for restaurants. Where a utility easement exists, a Frontage Zone may not be provided.

Design Domain: Frontage Zone Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit
Frontage Zone	0.0	0.3[1]	3.0

NOTES:
1: The Recommended Lower Limit can be 0.0 m if there is a utility easement on private property adjacent to the property line.

4.5.2 Walking and Wheeling Through Zone Design Domain

The Design Domain for the Walking and Wheeling Through Zone is provided in Section 6.1.1. Refer to Section 5.1.2 for Design Domain guidance for multi-use path and bike path widths.

4.5.3 Furnishing Zone Design Domain

The Design Domain width for the Furnishing Zone is shown in the table below. The Furnishing Zone is measured from edge of sidewalk to lip of gutter. See Section 4.3.4 for guidance on curb and gutter.

Design Domain: Furnishing Zone Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit
Furnishing Zone[1]	0.75[2]	1.0[3,4]	5.0

NOTES:
1: The widths for Furnishing Zone include the width of the straight face curb and gutter (0.415 m).
2: Practical Lower Limit value is based on absolute minimum width required to place signs.
3: Values less than 2.4m would typically preclude trees unless soil cells are utilized.
4: Where bus stops are provided, the Recommended Lower Limit is dependent on the design requirements for bus stops noted in Section 4.6.

4.5.4 Flex Zone Design Domain

The Design Domain width for on-street parallel parking, loading, and/or delivery lane or bay, measured from lip of gutter, is presented in the following table. The table also includes the Design Domain width for accessible parking.

The width requirements for accessible parking is larger than motor vehicle parking. Due to the width of accessible parking in relation to standard parallel parking, accommodating the geometric design requirements for accessible parking can be a challenge when requests for accessible parking are made after a street is constructed. In these post-construction request situations along Local Streets, the width requirements for accessible parking are typically accommodated as part of the combined Flex Zone and Travelled Way.

Design Domain: Parallel Parking/Loading/Delivery Lane/Bay Width (m)

Parameter	Recommended Lower Limit	Recommended Upper Limit
Parking, Loading, Delivery Lane/Bay Width Adjacent to Rolled Curb	2.1	2.4
Parking, Loading, Delivery Lane/Bay Width Adjacent to Barrier Curb	2.2	2.4
Accessible Parking Stall Width[1]	2.6	3.7

NOTES:

1: Accessible Parking Stall Dimensions are required in all contexts and are measured to face of curb.

NOTE TO REVIEWERS: THE VALUES IN THE TABLE FOR ACCESSIBLE PARKING DIMENSIONS ARE BEING REVIEWED IN MORE DETAIL AND WILL BE UPDATED UPON FURTHER DIRECTION.

On-street parking that is perpendicular or angled has different dimensions and has separate design requirements. The design of perpendicular or parallel parking requires review and approval by The City of Calgary.

4.5.5 Travelled Way Design Domain

4.5.5.1 Travel Lane Width Design Domain

The following Design Domain table provides a range of values for travel lane widths. For retrofit design or unique circumstances where right-of-way is limited and there are competing priorities for the right-of-way, a range of values are provided as guidance.

Design Domain: Travel Lane Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit	Practical Upper Limit
Urban Travel Lane Width[1]	2.7	3.0[3]	3.7	4.0
Rural Travel Lane Width[2]	3.0	3.5	3.7	4.0

NOTES:

1: Urban travel lane widths are measured from lip of gutter to centre line or lane line.

2: Rural travel lane widths are measured from edge of roadway or shoulder edge line to centre line or lane line.

3: Values less than Target Value may not be appropriate on truck and bus routes and context needs to be considered before selecting a value less than the Target Value.

4.5.5.2 Turn Lane/Bay Width Design Domain

Turn lane widths should be at the lower end of the recommended ranges for travel lanes to reflect the lower operating speeds that turn movements should occur at.

Design Domain: Turn Lane/Bay Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit	Practical Upper Limit
Turn Lane/Bay Width	2.7	3.0	3.5[1]	4.0

NOTES:

1: For streets with posted speed limits of 80 km/h or over, the Recommended Upper Limit is 3.7 m.

4.5.5.3 Bicycle Facility Design Domain

Sections 5.1.1.4, 5.1.2, 5.1.3, and 5.1.4 provides Design Domain widths for each bicycle facility type including the delineator that is used to separate cycle tracks (see Section 5.1.1.4) from other parts of the Travelled Way, Flex Zone, Furnishing Zone, and Walking Through Zone.

4.5.5.4 Median Design Domain

See Section 4.3.8 for design guidance for medians.

4.6 Bus Stops

The location of Bus Stops is determined and approved by Calgary Transit. More information on the design of bus stops in relation to intersections is provided in Chapter 9. For more detailed design guidance for bus stop design than provided below, including bus stop amenities, refer to the Calgary Transit Bus Design Guidelines.

Bus Stops are provided along streets and is a dedicated facility for use by transit passengers and transit operators to:

- Allow transit vehicles to safely approach, dwell, and depart a bus stop.
- Allow transit passengers to safety board and alight from the bus or transit vehicle.
- Provide a safe, accessible, and comfortable location for transit passengers to wait.

NOTE TO REVIEWERS: THE CURRENT DRAFT TRANSIT FACILITY GUIDELINES CAN BE UPDATED TO REMOVE ITEMS INCLUDED IN THE STREET MANUAL, WHILE RETAINING THE VARIOUS OTHER DESIGN CONSIDERATIONS THAT ARE NOT INCLUDED SUCH AS BUS STOP AMENITIES AS WELL AS OFF-STREET TRANSIT FACILITIES SUCH AS TRANSIT CENTRES.

4.6.1 Bus Stop Type

Bus stops include four types based on the neighbourhood context and type of transit service provided. The four types are:

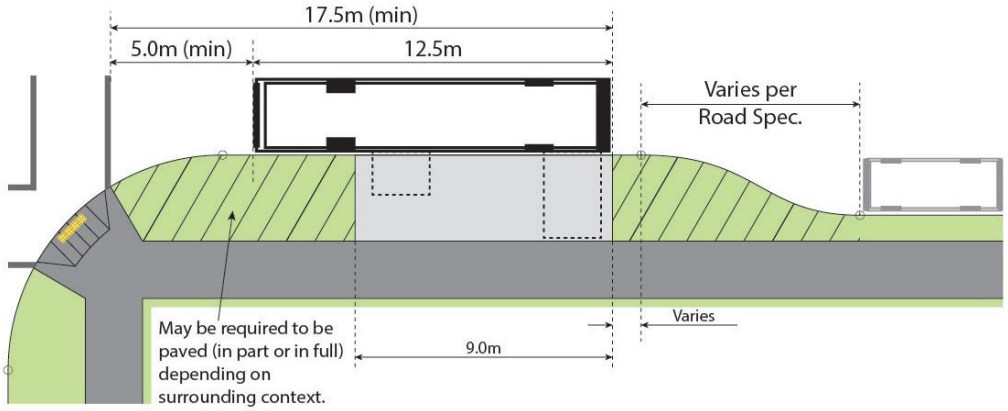
1. **Neighbourhood Stops:** are intended to be used sparingly in cases where ridership demand is low or is expected to be low, and where significant constraints exist in accommodating the normal accessibility and amenity requirements of a stop. They would most often be found in retrofit situations at lower densities of development. These should generally be avoided in new community development contexts, including where front-driveways are proposed.

2. **Community Stops:** are intended to be the most common typology in use, and applicable across a broad variety of development and street contexts. Community Stops are generally adequate for low-to-medium ridership demand applications and meet minimum accessibility and stop amenity requirements.
3. **Enhanced Stops:** are intended to offer a greater degree of accessibility and amenity for transit customers and serve higher density areas and locations with important city destinations. These are generally found in medium-to-high ridership applications where a MAX line is not present.
4. **MAX Stations:** offer the highest level of accessibility and amenity and form a core part in supporting the rapid transit network. The locations for these stations are determined through Bus Rapid Transit projects and may exist in a variety of development contexts.

Bus stops can be located far-side, near-side, or mid-block. There are two types of typical bus stops along city streets:

- **Curbside Bus Stops:** are adjacent to the curb and the bus stops in the outermost travel lane. A curbside bus stop can include a bus stop platform where a bus stop area is created in the Flex Zone using an extended curb extension.
- **Lay-By Bus Stops:** are when lay-bys in the Flex Zone are created and are used when it is desirable to provide a bus stop that is separated and protected from other traffic, for example a timing points or along higher speed streets (i.e., posted speed limits of 70 km/h or higher).

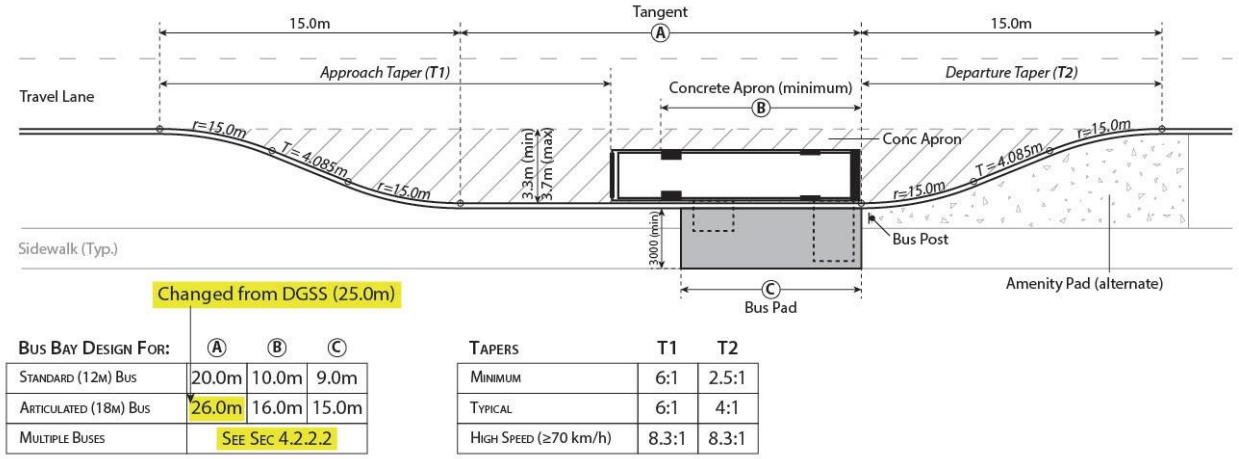
A far-side curbside bus stop, in a bus stop platform configuration, is illustrated below.



NOTE TO REVIEWERS: THE FIGURE WILL BE UPDATED DURING FUTURE VERSIONS OF THIS CHAPTER BASED ON FEEDBACK AND TO ADDRESS THE CURB RAMP STYLE SHOWN.

A typical layout for a bus stop lay-by at an Arterial Street or Collector Street location is illustrated below.

NOTE TO REVIEWERS: TYPICAL DRAWINGS THAT ARE CURRENTLY IN THE DGSS WILL BE REPLACED WITH VERSIONS OF BUS STOP LAY-BYS BASED ON THE STREET MANUAL CROSS SECTIONS FOR AN ARTERIAL STREET AND COLLECTOR STREET BUS STOP LAY-BY. THE FIGURE INCLUDED BELOW WILL BE USED AS A REFERENCE FOR THE ARTERIAL STREET BUS STOP LAY-BY AND THE COLLECTOR STREET BUS STOP LAY-BY AND IS CONSISTENT WITH FIGURE 67 OF THE CURRENT DGSS AND THE DRAFT CALGARY TRANSIT BUS DESIGN GUIDELINES.



Bus Bay Design For:	Ⓐ	Ⓑ	Ⓒ
Standard (12m) Bus	20.0m	10.0m	9.0m
Articulated (18m) Bus	26.0m	16.0m	15.0m
Multiple Buses	See Sec 4.2.2.2		

Tapers	T1	T2
Minimum	6:1	2.5:1
Typical	6:1	4:1
High Speed (≥70 km/h)	8.3:1	8.3:1

The construction of driveways and/or vehicular access across bus stop zones is prohibited. For bus zone designs, see Standard Specifications for Road Construction drawing file numbers 454.1012.001 to 454.1012.007.

4.6.2 Bus Stop Pad

Bus Stop Pads are a hard-surfaced area at bus stops designated for transit passenger waiting area and amenities. The standard bus stop pad is 9.0 m long by 3.0 m wide. The Bus Stop Pad dimension may be combined with sidewalks; if so, adequate space must be provided to allow installation of bus stop features and amenities without obstructing the Walking and Wheeling Through Zone (see Section 6.2.4). The Calgary Transit Bus Design Guidelines provide detail on bus pad types and requirements. Straight face curb and gutter is required as part of the Bus Stop Pad.

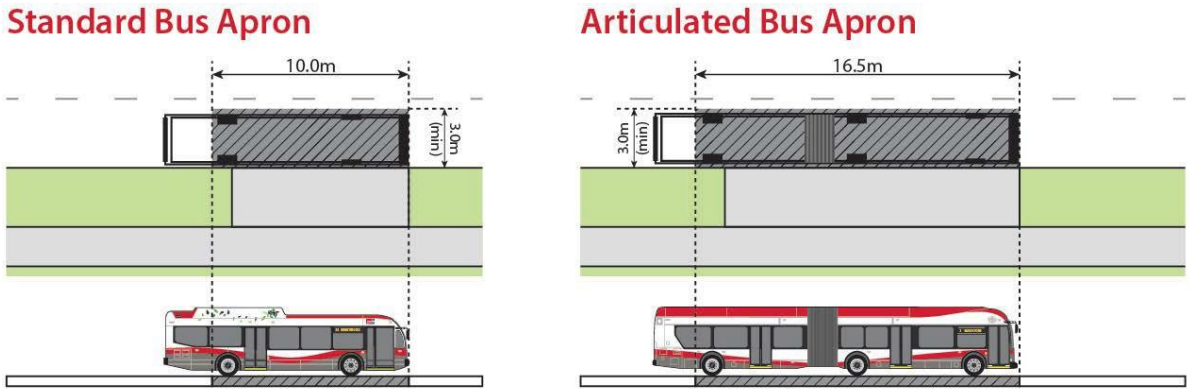
The length of the bus stop pad will increase if the bus stop is served by articulated buses, if the bus stop must accommodate multiple buses at the same time, or if there are high volumes of passengers that wait or are anticipated to wait at the bus stop as defined by Calgary Transit. In addition to this section, also refer to Section 5.3.4 for Bikeway Facilities at Transit Stops for design guidance on bus stop boarding islands that are separated from the Walking Through Zone or Furnishing Zone by protected bike lanes / cycle tracks.

4.6.3 Bus Stop Apron

A Bus Stop Apron is a reinforced concrete slab which replaces the Travelled Way or street surface at or near bus stops. The Bus Stop Apron should be at least as long as the wheelbase of the bus stop's design vehicle. The following table provides minimum bus stop apron length. The minimum width of a Bus Stop Apron is 3.0 m.

Minimal Bus Stop Apron Length (m)

Design Vehicle	Minimum Bus Stop Apron Length (m)
Standard Bus (B-12)	10.0 m
Articulated Bus	16.5 m
Multiple Buses	To be determined by Calgary Transit



NOTE TO REVIEWERS: THE FIGURE WILL BE UPDATED DURING FUTURE VERSIONS OF THIS CHAPTER.

4.7 Sound Attenuation, Visual Screening, and Fencing

NOTE TO REVIEWERS: THE CONTENT IN SECTION 4.7 IS UNDERGOING FURTHER REVIEW BY CITY OF CALGARY DEPARTMENTS TO UPDATE REQUIREMENTS. REVISIONS WILL BE INCLUDED IN FUTURE VERSIONS OF THE STREET MANUAL FOR REVIEW AT A LATER DATE.

4.7.1 Sound Attenuation

Prior to approval of any Tentative Plan or Development Permit and after finalizing lot and building grades, a noise analysis is to be submitted to and approved by the City of Calgary.

A noise analysis is required for all residential development adjacent to the Arterial Streets, Skeletal Roads, and LRT and other rail lines. The Surface Transportation Noise Policy for the City of Calgary (TP 003 and TT2017-0512) outline the requirements for noise attenuation. These documents are available from the City of Calgary website.

Where sound attenuation is warranted, a concrete noise fence or equivalent is to be provided in a 1.2m wide Maintenance Right-of-Way outside of the street right-of-way to the satisfaction of the City of Calgary.

4.7.2 Visual Screening Requirements

Visual screening cross sections should be submitted to the approving authority of the City of Calgary for review and approval prior to the approval of any Tentative Plan, Subdivision Construction drawings, or Development Permit, for residential developments adjacent to:

- Transportation and Utility Corridor (T.U.C.)
- Ring Roads (Stoney Trail, Marquis of Lorne Trail/Highway 22X, and Highway 8)
- Deerfoot Trail

The visual screening cross sections are to be drawn to scale and should demonstrate how trucks on the T.U.C., Ring Road, or Deerfoot Trail can be screened from the adjacent residential development.

The cross sections should use a line of sight drawn from an observer eye level 1.5 m above the main floor balcony, or main floor elevation for residential developments without a balcony, of the residential

development, to the top of a truck located 4.0 m above the centreline of the T.U.C., Ring Road, or Deerfoot Trail.

Any proposed back-sloping or surface disturbance of T.U.C. lands require Ministerial Consent from the Province of Alberta. Ministerial Consent must be acquired prior to approval of Subdivision Plans and construction drawings.

4.7.3 Fencing

Residential development along Deerfoot Trail, the Transportation Utility Corridor (T.U.C.), and Ring Roads (see Section 4.7.2) requires sound attenuation and visual screening analysis to determine the fencing requirements (see Sections 4.7.1 and 4.7.2). If visual screening is not required, the developer is responsible for installing a 1.8 m high chain link fence.

Residential development along Arterial Streets, Skeletal Roads, and LRT and other rail lines may require sound attenuation. If sound attenuation is not required:

- A uniform screening fence should be provided along Arterial Streets.
- Either a screening fence or a 1.8 m high chain link fence should be provided along Skeletal Roads. A 1.8 m high chain link fence is required along Municipal Reserve/Environmental Reserve land adjacent to Skeletal Roads.

Fencing and noise walls are to be accommodated within an easement adjacent to the right-of-way.

Lanes/alleys and streets, in residential development, require post and cable fencing when parallel to Arterial Streets. Lanes adjacent to open space areas also require post and cable fencing.

NOTE TO REVIEWERS: THE REQUIREMENT FOR POST AND CABLE FENCING ALONG STREETS THAT HAVE PARKS / OPEN SPACES ADJACENT TO THEM REQUIRES INPUT.

4.8 Retrofit Street Design

NOTE TO REVIEWERS: WHEN VALUES OUTSIDE THE DESIGN DOMAIN MUST BE USED IN RETROFIT DESIGNS, A DECISION TREE WILL BE PROVIDED TO ESTABLISH PRIORITIES IN POSSIBLE DEVIATIONS. IN ADDITION, A SELECT NUMBER OF RETROFIT DESIGN CROSS SECTIONS WITH EXAMPLES OF APPLYING A RETROFIT DESIGN PROCESS COULD BE INCLUDED IN A FUTURE VERSION OF THIS CHAPTER IF THAT WOULD BE OF VALUE TO DESIGNERS. CONTENT FOR THIS SECTION IS UNDER CONSIDERATION FOR DEVELOPMENT BASED ON CITY INPUT. FACTORS THAT WILL BE INCLUDED AS PRIORITIES ARE ENVISIONED TO BE SAFETY AND ACCESSIBILITY/EQUITY.

Chapter 5.0 Bicycle Facility Design

NOTE TO REVIEWERS: THIS CHAPTER ALIGNS WITH CHAPTER 5 OF THE TAC GDG AND CONSOLIDATES CONTENT FROM THE DGSS AND COMPLETE STREETS GUIDE RELATED TO THE DESIGN OF BICYCLE FACILITIES.

The guidelines in this chapter should be used for the design of bicycle facilities in Calgary. Bicycle facilities in Calgary are to be designed to reflect the City of Calgary's Network Guiding Principles for the Always Available for All Ages and Abilities (5A) Network. Specifically, the design of all bicycle facilities should meet safety and comfort requirements for people of all ages and abilities (see Chapter 2). This requirement has been included in this chapter. When bicycle routes are located along the Primary Wheeling Network, the bicycle facility types may vary, and facility widths may increase. Target Values and bicycle facility preferences for the different street cross sections are provided in Chapter 4.

The following sections provide specific design guidance that supplements or supersedes guidance contained in Chapter 5 of the TAC GDG, which can be consulted for additional context and background. See Section 1.4 for guidance on how to apply Street Manual and TAC GDG design guidance.

Certain elements of bicycle facility design are addressed in other parts of the Street Manual:

- For more information on Design User, see Chapter 2.
- For information on incorporating bicycle facilities into streets and cross sections, see Chapter 4.
- For information on intersection design including bicycle facilities, see Chapter 9.

5.1 Bikeway Facility Types

The following bikeway facility types are used in Calgary and are consistent with those defined in the TAC GDG (Section 5.3).

- Cycle Tracks / Protected Bike Lanes (including Raised Cycle Tracks)
- Multi-Use Paths / Bike Paths
- Local Street Bikeway
- Painted On-Street Bike Lanes

Each of these is described in this section of the Street Manual below. For unpaved trails, see The City of Calgary's *Development Guidelines and Standard Specifications: Landscape Construction*.

5.1.1 Cycle Tracks / Protected Bike Lanes

A cycle track is a bike lane separated from other modes of traffic and pedestrians by a physical delineator such as a barrier or defined by a curb face creating a raised elevation difference. Cycle tracks are a form of separated bikeway and are also called protected bike lanes. A cycle track can operate in either one-way or two-way directional configuration.

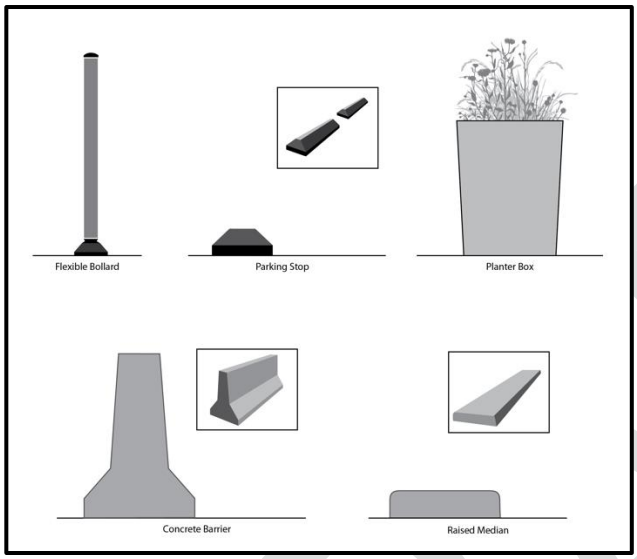
TAC GDG Section 5.7.5 (Protected Bike Lane Delineators) describes and TAC GDG Figure 5.7.4 (copy shown below) illustrates physical delineators used to define cycle tracks. More rigid delineator forms, such as concrete barriers, are required on higher speed streets (i.e., speed limits over 50 km/h). An alternative to using a rigid barrier is to provide an off-street bikeway such as a multi-use path or bike

path (see Section 5.1.2) or a raised cycle track (see Section 5.1.1.3). If parking is allowed beside a cycle track, a curb is required, which could include a raised median, parking curb stop, or a raised cycle track.

The type of cycle track delineator and its width should be selected to accommodate on-street waste collection carts, if required.

Breaks or openings should be provided along continuous cycle track delineators to ensure appropriate movement of drainage and avoid unintended pooling of runoff, as required.

Cycle Track Delineators



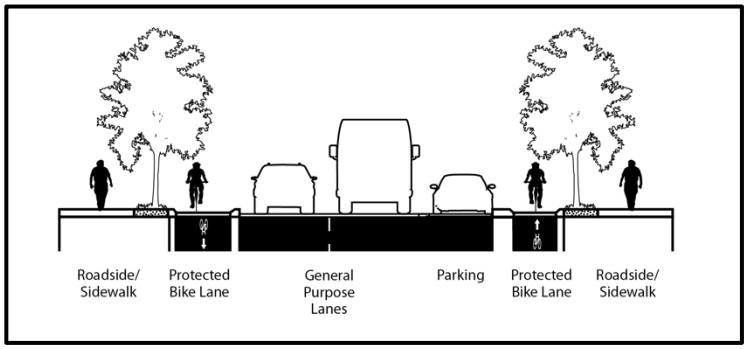
Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

5.1.1.1 One-Way Cycle Tracks

One-way cycle tracks run in one direction along a street, usually with people cycling in the same direction as adjacent general purpose travel lanes used by motor vehicle traffic; however, one-way cycle tracks may also be provided in a contra-flow configuration on one-way streets where people cycling travel in the opposite direction as motor vehicle traffic. One-way cycle tracks are often implemented in pairs, one for each direction of the street. They may be at the same elevation as the adjacent street (i.e., street-level), at the same elevation as the adjacent sidewalk (i.e., sidewalk-level), or at an intermediate elevation such as half a standard curb height (i.e., intermediate-level).

One-Way Cycle Track



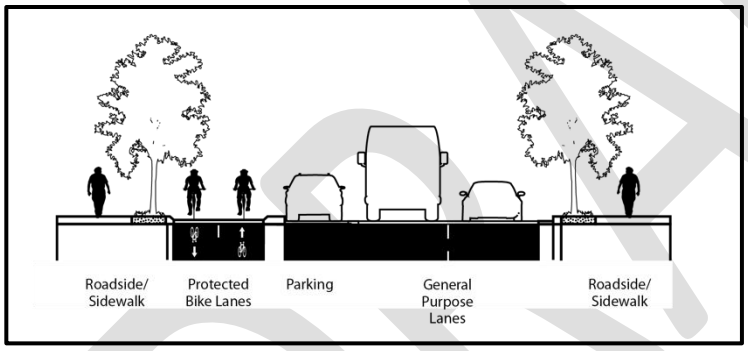
Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

5.1.1.2 Two-Way Cycle Tracks

Two-way cycle tracks run in both directions on the same side of a street, typically on a one-way street for motor vehicle drivers. They may be at street-level, intermediate-level, or sidewalk-level. Two-way cycle tracks share some of the same design characteristics as one-way cycle tracks but may require additional considerations at driveway and side-street crossings.

Two-Way Cycle Track



Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

5.1.1.3 Raised Cycle Tracks

One-way or two-way cycle tracks that are raised from the Travelled Way elevation are referred to as raised cycle tracks. Raised cycle tracks can be elevated relative to the adjacent motor vehicle travel lane typically by a half or the full height of a standard curb or bevelled curb. They are generally one-way cycle tracks in the same direction as adjacent motor vehicle traffic. In terms of the design elements of a cycle track, the delineator for a raised cycle track is provided by the vertical elevation difference to the rest of the Travelled Way and a horizontal offset buffer adjacent to the half- or full-height curb. Raised cycle tracks differ from bike paths because bike paths are located within the boulevard of the roadside.

The preferred configuration of the raised cycle track in very constrained locations is an intermediate-level raised cycle track that uses a bevelled curb as part of the Furnishing Zone (see Section 5.1.1.3 and Section 4.3.4). An intermediate raised cycle track also provides a vertical elevation difference between the cycling and walking facilities. However, in extraordinary conditions where a Furnishing Zone of only

0.3 m can be provided, a Tactile Edge Indicator should be installed within the Furnishing Zone (see Section 6.2.6 for more details on Tactile Walking Surface Indicators).

The design of raised cycle tracks should not interfere with the need for continuous overland drainage.

5.1.1.4 Cycle Track Design Domain

The following presents the Target Value and Design Domain widths for cycle tracks and the delineator component. Cycle track widths are measured from lip of gutter or edge of bikeway if no gutter is provided. Cycle track delineator widths exclude the gutter if a gutter is part of the cycle track delineator. The width of a gutter must be added to the width of the delineator noted in the Design Domain table.

Widths below the Recommended Lower Limits for the bike lane component of the cycle track can be used for distances less than 100 m where reducing cycling speeds is desired (e.g., bus boarding islands). A width of 1.5 m for one-way cycle tracks and 2.5 m for two-way cycle tracks can be considered in these locations.

Wider cycle tracks should be provided in locations with higher volumes of users or where speed differential among cycle track users is anticipated (e.g., uphill direction). Wider cycle track delineators should be provided adjacent to parking to support motor vehicle loading/unloading and along higher speed streets (i.e., speed limits over 50 km/h).

Delineator widths above the Recommended Upper Limit along street segments (i.e., not at intersections) may result in cycle tracks operating as bike paths (see Section 5.1.2).

In addition to the Design Vehicle (i.e., cargo bicycle) and user passing considerations, cycle track widths must also consider the width requirements of snow and ice control and sweeping equipment. The width of the cycle track delineators should also consider the width requirements for snow storage, particularly if a landscaped boulevard is not present.

See Chapter 4 for the incorporation of cycle tracks into cross sections.

Context	One-way Cycle Track Width Target Value (m)	Two-way Cycle Track Width Target Value (m)	Cycle Track Delineator Width Target Value (m)
Collector[1]	2.2	3.0	0.75
Arterial[1]	2.2	3.0	1.0[2]
Primary Wheeling Network	2.5	4.0	Select based on posted speed limit[2]
Bus Stop Boarding Islands	1.5[3]	2.5[3]	See Section 5.3.4
School Drop-off Area	2.5	3.0	2.0

NOTES:

1: Multi-use path or segregated multi-use path (i.e., bike path plus sidewalk) typically preferred to provide increased separation, increased user comfort, and support winter maintenance activities. Cycle tracks are typical in High Activity Areas.

2: For streets with 50 km/h posted speed limit or less the Target Value is 1 m. Target Value increases to 2 to 5 m along higher speed streets. See also separation at intersections in Chapter 9.

3: Reduced width to reduce cycling speeds through bus boarding island areas.

Design Domain: Cycle Track and Cycle Track Delineator Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit
One-way cycle track, bike lane component	1.5[1]	2.2[1,2]	2.5
Two-way cycle track, bike lane component	2.5	3.0	4.0
Cycle track, delineator component	0.3	0.6[3]	2.0

NOTES:

1: In retrofit design with constrained conditions, a cycle track width of 1.8 m may be acceptable. Discussion with Mobility Operations to confirm all-seasons maintenance is required.

2: The Recommended Lower Limit for one-way cycle tracks is based on the ability to support passing and winter maintenance.

3: A minimum delineator width of 0.6 m is required when bike lanes are adjacent to motor vehicle parking.

5.1.2 Multi-Use Paths / Bike Paths

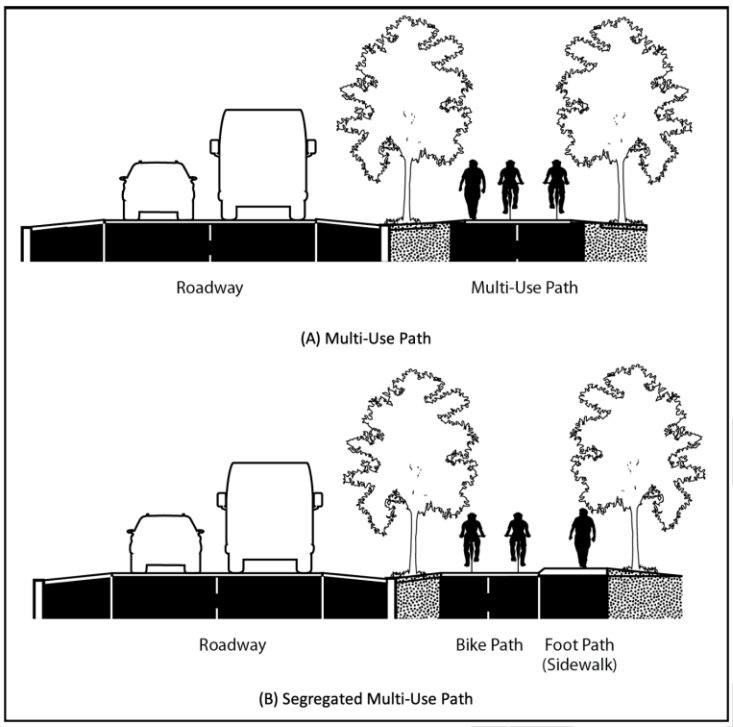
Multi-use paths and bike paths are off-street active transportation facilities commonly designed for shared use by people cycling, walking, and wheeling and are located within the boulevard of the roadside. Multi-use paths are shared by active transportation users while bike paths are used by people cycling and using other wheeling devices. A segregated multi-use path is a configuration with a bike path and a separate sidewalk.

Multi-use paths and bike paths can be provided through parks or within street right-of-way. Wider pathways should be provided where higher user volumes are anticipated or where a substantial speed differential between pathway users is anticipated and increased width for passing maneuvers is required.

Horizontal offsets for multi-use paths from the Flex Zone or Travelled Way, as provided by the Furnishing Zone, should be wider for streets with higher speeds, while pathways located along Skeletal roads should be located outside the clear zone. See Chapter 4 for design guidance on Furnishing Zone widths and cross sections that illustrate appropriate horizontal offsets for pathways for each street type.

For multi-use paths in off-street locations and through parks including unpaved trails, refer to The City of Calgary's *Development Guidelines and Standard Specifications: Landscape Construction*.

Multi-Use Path & Segregated Multi-Use Path/Bike Path



Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

In contexts involving frequent driveways and/or street intersections, a cycle track may be preferred over a multi-use path due to the frequency of interactions between pathway users and turning motor vehicle traffic. Another concern is the potentially unexpected contraflow operation of users on the pathway, especially those travelling faster than a walking pace.

Where the total volume of multi-use path users is high and there is a significant proportion of people walking, it is recommended to design (or re-design) the multi-use path to separate people cycling from people walking. In this case, the facility should be treated as two distinct facilities: a bike path and a foot path (i.e., sidewalk). TAC GDG Section 5.3.1.4 (Multi-Use Paths) states that segregation of multi-use paths should be considered where there is:

- a high percentage of pedestrians (more than 20% of users) and total user volumes greater than 33 persons per hour per metre of path width, or
- a low percentage of pedestrians (less than 20% of users) and total user volumes greater than 50 persons per hour per metre of path width.

Refer to TAC GDG Section 5.3.1.3 (Bike Paths) for guidance on the design of bike path facilities.

The Target Values and Design Domain width for a multi-use path, including the bike path component of a segregated multi-use path, are presented in the following tables.

Context	Multi-Use Path / Bike Path[1,2] Width Target Value (m)

Alley	N/A
Local	N/A
Local – Industrial	N/A
Local – High Activity	N/A
Collector	3.0[4]
Collector – Industrial	3.0
Collector – High Activity	3.5[3]
Arterial	3.0[4]
Arterial – High Activity	3.5[3]
River Pathways	4.0[5]
Skeletal Road	4.0

NOTES:
1: If a bike path is provided in combination with a separate sidewalk, the Target Values in the table are for the bike path component. See Section 5.1.2 for guidance on criteria to determine if a multi-use path should be segregated.
2: Where multi-use paths are provided in a monolithic configuration, a buffer of 1.0 m from lip of gutter is required for streets with posted speed limits of 50 km/h or less and 1.5 m for streets with posted speed limits of 60 km/h or greater.
3: Raised cycle tracks with separate sidewalks should be provided for High Activity area locations for Collector and Arterial Street classifications. If a multi-use path be provided instead due to site specific requirements and approved through a Design Exception, it should be a segregated multi-use path with a separate sidewalk and bike path. The Target Value width noted in the table is for the bike path component of a segregated multi-use path.
4: Where higher volumes of path users are anticipated, a target of 3.5 to 4.0 m should be used.
5: See Calgary Design Guidelines and Standard Specifications: Landscape Construction for design guidance for off-street paths and trails not within road right-of-way.

Design Domain: Multi-Use Path / Bike Path Width (m)

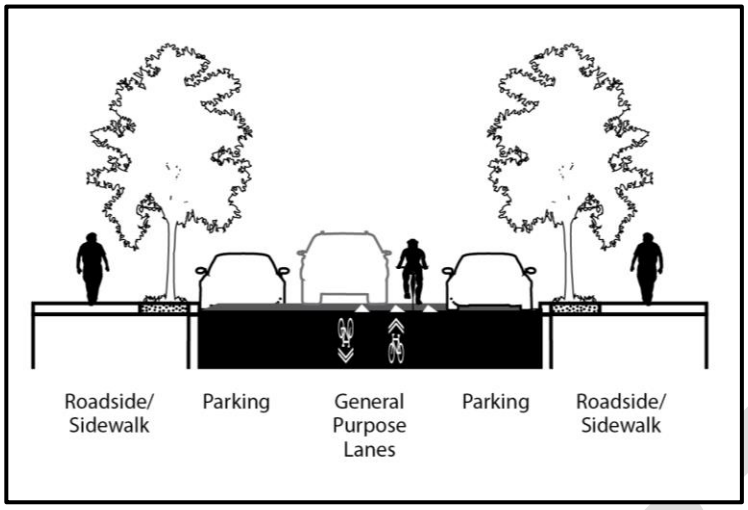
Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit
Multi-Use Path / Bike Path width	2.7[1]	3.0[1]	6.0[1]

NOTES: 1: Where multi-use paths are provided in a monolithic configuration, a buffer of 1.0 m from lip of gutter is required for streets with posted speed limits of 50 km/h or less and 1.5 m for streets with posted speed limits of 60 km/h or greater.
2: See Calgary Design Guidelines and Standard Specifications: Landscape Construction for design guidance for off-street paths and trails not within road right-of-way.

5.1.3 Local Street Bikeways

Local street bikeways are cycling facilities located on streets with low motor vehicle volumes and speeds, usually in residential areas. They are typically marked as shared lanes where people cycling share the Travelled Way with motor vehicle traffic.

Local Street Bikeway



Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

Local Street Bikeways can be a Neighbourhood Greenway or a Shared Roadway.

A Neighbourhood Greenway local street bikeway is designed to support sharing of the Travelled Way by bicycle design user group and motor vehicle traffic by creating a low-speed and low-volume environment. A Neighbourhood Greenway is suitable for people of all ages and abilities when motor vehicle daily volumes are below 1,000 and average speeds are 30 km/h or less. To support travel by all ages and abilities, Neighbourhood Greenways typically require traffic calming measures to manage and reinforce the low motor vehicle volumes and speeds thresholds. The traffic calming may be deployed throughout the route, including at intersections.

As stated in TAC GDG Section 5.3.2.3 (Shared Lanes), a shared lane is "a general-purpose lane that has sufficient width to facilitate sharing of the lane by motorists and a narrow range of cyclists" and further that "they are not recommended for the design user group, except on lower-speed lower-volume roads."

There are some streets in Calgary that are Shared Roadways. These streets have shared bicycle-motor vehicle Travelled Ways and may be marked as a shared roadways through pavement markings and signs; however, the motor vehicle volumes and speeds exceed the thresholds that are suitable for the design user group.

The widths for local street bikeways are based on the lane widths for the Travelled Way provided in Chapter 4 and noted in the cross sections (see Section 4.4).

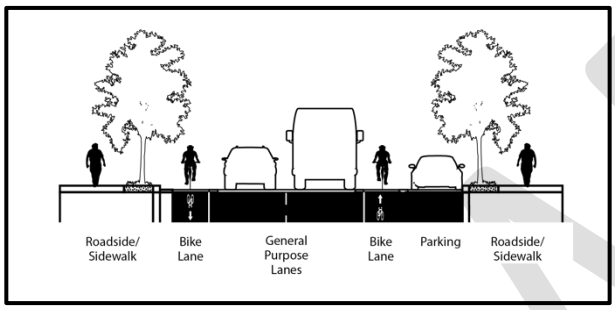
5.1.4 Painted On-Street Bike Lanes

A bike lane is defined as a portion of the roadway that has been designated by signage and pavement markings for use exclusively for cycling and other appropriate active transportation users. Bike lanes facilitate predictable behaviour and movements between people driving and people cycling or using other wheeled devices permitted for use in the bike lane and enable people to wheel at their preferred speed without conflicting with adjacent motor vehicle traffic.

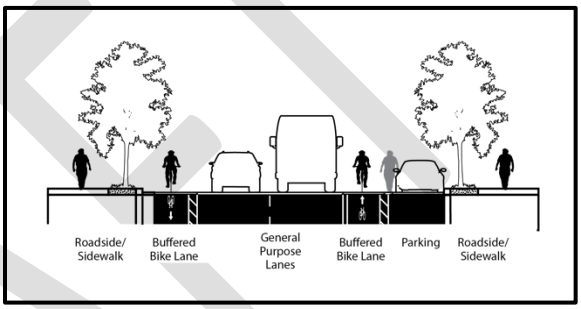
A bike lane is distinguished from a cycle track in that it has no physical barrier (e.g., bollard, median, raised curb) that restricts the encroachment of motorized vehicles. Bike lanes can run curbside (when no parking is present), or adjacent to cars parked on the side of the street (buffered bike lanes are preferred in this case). Bike lanes typically are one-way directionally and run in the same direction as adjacent motor vehicle traffic, though they may be configured in the contra-flow direction on one-way streets.

An unbuffered bike lane is defined by a longitudinal pavement marking on one or both sides and does not include a marked buffer space on either side. It is signed and has pavement markings (bicycle and diamond symbols) to indicate it is a reserved lane for people cycling. Buffered bike lanes are bike lanes paired with a marked buffer space separating the bike lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes provide more space and separation to increase comfort for the Design User and provide clearance to hazards including opening vehicle doors.

Unbuffered On-Street Painted Bike Lane



Buffered On-Street Painted Bike Lane



Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

There is a narrow range of streets where the motor vehicle speeds and volumes would make a painted bike lane a suitable facility for the Design User. In most contexts, painted bike lanes are not likely to meet the City of Calgary's 5A Principles. See Section 5.3 for more information for potential contexts for painted bike lanes. One example where a painted bike lane may be suitable is along a one-way local street where cycling in both directions is desirable.

If suitable, Target Values (based on context) and Design Domain widths for on-street painted bike lanes and bike lane buffers are provided the table below. Wider bike lanes and buffers should be used in locations where there are higher volumes of users or where there are steep grades where people cycling may not travel in a straight line uphill. Consideration for a cycle track instead of a buffered bike lane should be given when the buffer exceeds 0.6 m or is adjacent to parking.

Context	Bike Lane Width Target Value (m)	Buffer Width Target Value (m), if provided
Local Street	1.8	0.6
Collector Street	2.1	0.6
Contraflow Bike Lane	2.1	0.6

Design Domain: Painted On-Street Bike Lane & Buffer Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit
Bike Lane	1.5	1.8	2.1
Bike Lane Buffer[1]	0.0	0.3[2]	0.9

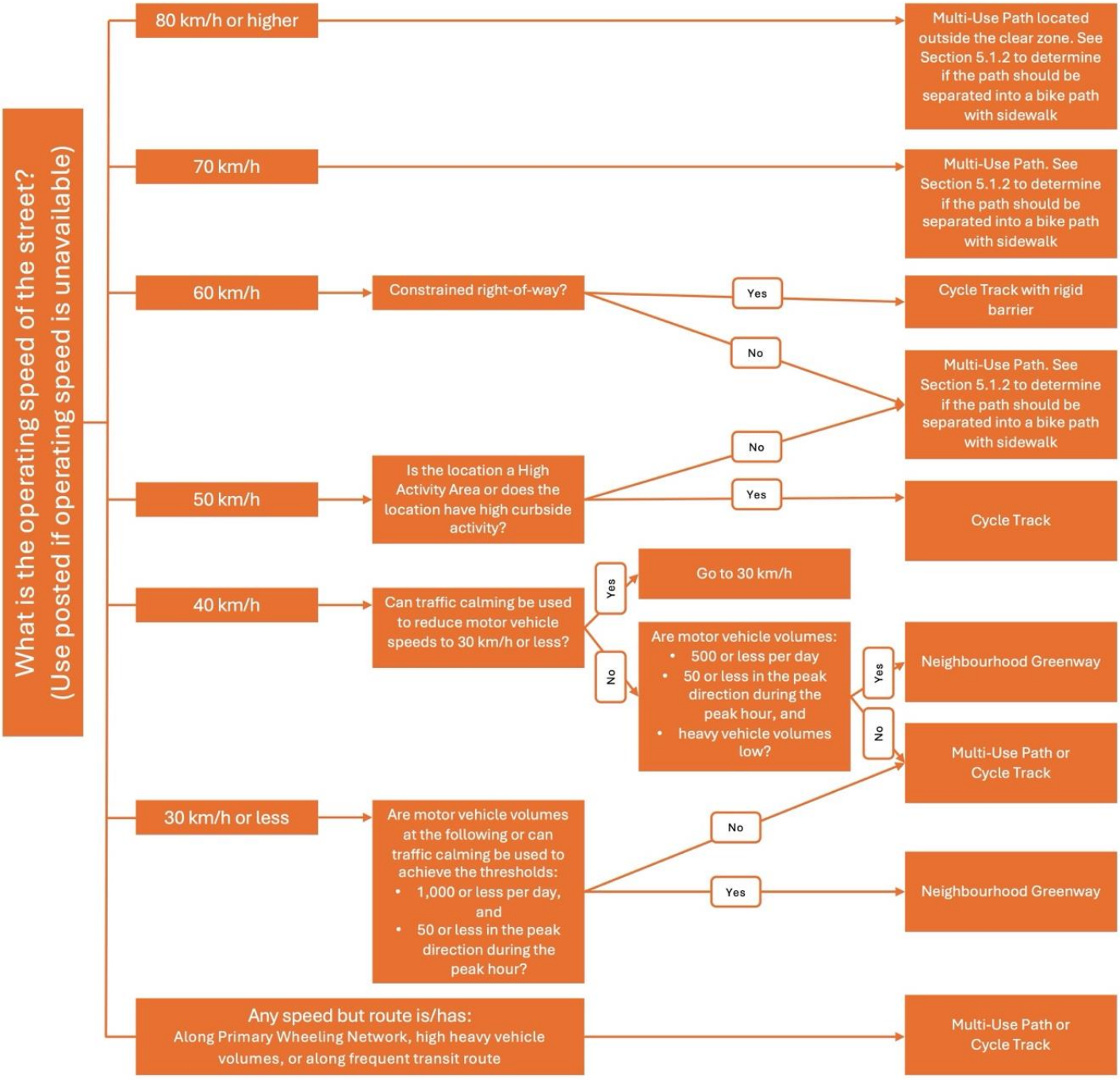
NOTES:

1: Although the buffer width is less than 1 m, the Safe Passing Bylaw requirement (minimum 1 m separation between a motor vehicle passing a person on a bicycle) remains in effect and will be enhanced by the presence of a buffer of any dimension within the Design Domain.

2: A minimum buffer width of 0.6 m is required when bike lanes are adjacent to motor vehicle parking.

5.2 Bikeway Facility Selection

The Bikeway Facility Selection Framework on the following page summarizes the factors, including motor vehicle speeds and volumes, at which each bikeway facility is most likely to be suitable for the Design User (see Chapter 2). The framework includes operational considerations related to street context, which can also influence the suitable bicycle facility type. For motor vehicle speeds, the suitable bikeways are based on the posted speed unless operating speeds are known, in which case operating speed should be used. Once motor vehicle speeds exceed 40 km/h, cycle tracks or multi-use paths should be provided.


What is the operating speed of the street? (Use posted if operating speed is unavailable)
80 km/h or higher
Multi-Use Path located outside the clear zone. See Section 5.1.2 to determine if the path should be separated into a bike path with sidewalk
70 km/h
Multi-Use Path. See Section 5.1.2 to determine if the path should be separated into a bike path with sidewalk
60 km/h
Constrained right-of-way?
Yes
Cycle Track with rigid barrier
No
Multi-Use Path. See Section 5.1.2 to determine if the path should be separated into a bike path with sidewalk
50 km/h
Is the location a High Activity Area or does the location have high curbside activity?
No
Yes
Cycle Track
40 km/h
Can traffic calming be used to reduce motor vehicle speeds to 30 km/h or less?
Yes
Go to 30 km/h
No
Are motor vehicle volumes:
• 500 or less per day
• 50 or less in the peak direction during the peak hour, and
• heavy vehicle volumes low?
Yes
Neighbourhood Greenway
No
Multi-Use Path or Cycle Track
30 km/h or less
Are motor vehicle volumes at the following or can traffic calming be used to achieve the thresholds:
• 1,000 or less per day, and
• 50 or less in the peak direction during the peak hour?
No
Multi-Use Path or Cycle Track
Yes
Neighbourhood Greenway
Any speed but route is/has:
Along Primary Wheeling Network, high heavy vehicle volumes, or along frequent transit route
Multi-Use Path or Cycle Track

5.3 Bikeway Design Elements and Details

5.3.1 Bikeway Alignment

In most urban roadway contexts, the horizontal and vertical alignment of a bikeway is dictated by the adjacent motor vehicle carriageway alignment.

Where a multi-use path is offset laterally away from the Travelled Way or where the side slopes of the ditch areas are significant, the design of a multi-use path may warrant a different alignment within the right-of-way. Refer to TAC GDG Section 5.5 (Bicycle Design: Alignment and Related Elements) for more information on the horizontal and vertical alignment of bicycle facilities that expands on the information provided below.

NOTE TO REVIEWERS: THE EXISTING DGSS CONTAINS A TABLE OF DESIGN ELEMENTS FOR "BICYCLE PATHS (REGIONAL & LOCAL PATHWAYS)" ON PAGE 131, WHICH INCLUDES SPECIFICATIONS ON RIGHT-OF-WAY WIDTH AS WELL AS HORIZONTAL/VERTICAL ALIGNMENT. THIS INFORMATION HAS BEEN REVIEWED AND INCORPORATED IN THIS SECTION OR UPDATED BASED ON REVISIONS AND UPDATES TO BEST PRACTICES RELATED TO DESIGN USER, DESIGN SPEEDS, AND ALIGNMENT GUIDANCE.

5.3.1.1 Surface Materials

Bicycle facilities should have a smooth surface with adequate traction. The surface should be colour contrasting to the Furnishing Zone, Walking Through Zone, and cycle track delineator. The preferred surface is asphalt, which is colour contrasting to sidewalks and hard-surfaced boulevards.

5.3.1.2 Grade

When not constrained by an adjacent street, the recommended range of longitudinal grades for bikeway facilities, including multi-use paths, is provided below. When setting grades, the designer should be cognizant that long, steep grades are a deterrent to cycling, walking, and wheeling. The following table provides Target and Design Domain values for grade.

Design Domain: Bikeway and Multi-Use Facilities Grades

	Recommended Lower Limit	Target Value	Recommended Upper Limit
Bike Path or other dedicated cycling facility	0.6%[1]	4.0% (or less)	6.0%
Multi-Use Path	0.6%[1]	2.0% (or less)	5.0%[2]

Notes:

1: Where surface drainage is provided by adequate cross-slope and lateral slope of the ground away from the bikeway, the minimum grade may be reduced to 0%.

2: Grades should not exceed 5% for a distance more than 100 m without a landing. Grades above 5% should consider the incorporation of accessible switchbacks to manage uphill level of effort and downhill speeds.

5.3.1.3 Cross Slope

Multi-use paths and bike paths may be crowned or have a constant cross slope while on-street bicycle facilities typically use a constant cross slope. Where the off-street path operation is two-way and drainage patterns permit, a crowned section may be preferable for better drainage of the path surface.

For asphalt-surfaced bikeways, the recommended cross slope is 2% to 3% and cross slopes greater than 3% should avoided. Cross slope for a concrete-surfaced bikeways is recommended to be 2.0%.

5.3.1.4 Vertical Curves

The desirable crest curve K value is 15 and the desirable sag curve K value is 2.5. The acceptable lengths for crest vertical curves are provided in the following table. Refer to TAC GDG Section 5.5.4 for more information on vertical curves.

A	4%	6%	8%	10%	12%	14%	16%	18%	20%
L	24 m	36 m	49 m	61 m	73 m	85 m	98 m	110 m	122 m
where: A = algebraic grade difference, and L = length of vertical curve									

5.3.1.5 Horizontal Curves

The minimum radius for a circular curve is a function of bicycle speed, superelevation, and coefficient of friction. For many on-street bikeways, the horizontal alignment will match the horizontal alignment of general-purpose travel lanes within the Travelled Way.

The absolute minimum centreline/centre of lane radius for bicycle facilities is 6.0 m, below which the operating speed reduces to less than 12 km/h which is the speed where stability is significantly impacted. Table 5.5.2 in the TAC GDG provides minimum radii for paved bikeways including superelevation. Superelevation is typically used for off-street pathways or trails (i.e., multi-use paths or bike paths). Where the centreline radius is less than 30 m, consideration should be given to introducing superelevation at the maximum rate of 0.04 m/m.

The recommended minimum centreline or centre of lane radius for bikeways based on the Design Speed is as follows by bikeway facility type:

- Cycle Track / Protected Bike Lane: 20 m
- Multi-Use Path / Bike Path: 15 m
- Major Intersection Approach: 10 m
- Minor Intersection Approach / Driveway: 6 m

NOTE TO REVIEWERS: AN ILLUSTRATION IS LIKELY HELPFUL FOR THIS SECTION AND IS UNDER CONSIDERATION FOR FUTURE REVIEW AND INPUT.

Lateral clearance to obstructions on the inside of horizontal curves is based on the need to provide sufficient sight distance to riders who notice an obstacle on their intended path of travel and need to stop. The line of sight to the object is taken to be the corner of the visual obstruction, and the stopping distance is measured along the intended path, which is taken to be the inside edge of the inner lane. Refer to TAC GDG Table 5.5.3 for the lateral clearance for a range of radii and stopping sight distances.

5.3.1.6 Lateral Alignment Shifts

Where there is a need to lateral shift in the alignment of a bikeway horizontally, it is often preferred to use a lateral alignment shift rather than back-to-back horizontal curves. Lateral alignment shifts can be easier to navigate for people riding cargo bicycles and those pulling trailers. A lateral alignment shift is also preferred to accommodate operational characteristics of snow and ice control equipment. Where the lateral shift of the bikeway is less than 2 times the path width, a linear alignment should be used to

develop the lateral shift. When the shift exceeds the threshold, the shift may be simply connected by a straight segment or back-to-back curves using the minimum centreline/centre of lane radii.

Lateral Alignment Shifts are noted in the below table as a ratio of Longitudinal to Horizontal dimension.

Design Domain: Bikeway Lateral Alignment Shifts

	Practical Lower Limit	Recommended Lower Limit	Target Value	Recommended Upper Limit
Taper	3:1[1]	5:1	10:1 to 12:1	12:1

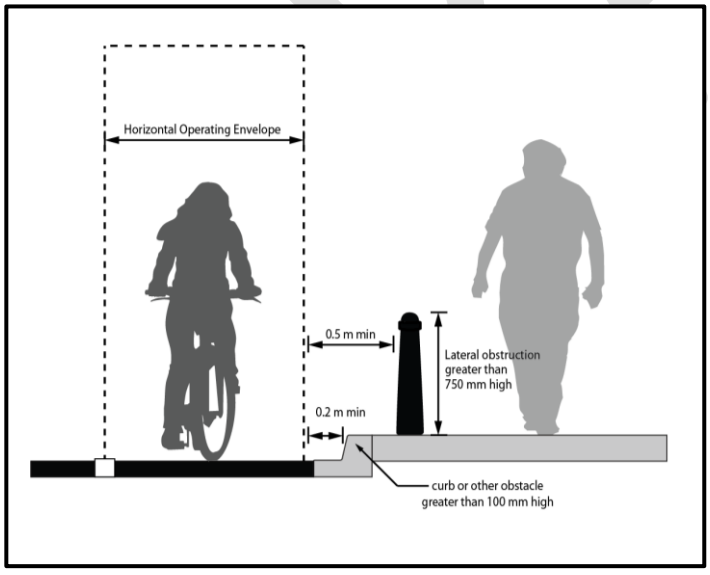
Notes:
1: The absolute minimum taper is 3:1 and should only be used where slowing people cycling is required or in very constrained locations.

NOTE TO REVIEWERS: AN ILLUSTRATION IS LIKELY HELPFUL FOR THIS SECTION AND IS UNDER CONSIDERATION FOR FUTURE REVIEW AND INPUT.

5.3.1.7 Horizontal Clearance

In addition to the horizontal operating envelope of the Design User, the following horizontal clearances should be provided if conducting case-specific bikeway design:

- Minimum horizontal clearance of 0.2 m is required from vertical obstructions of 100 mm to 750 mm in height.
- Minimum horizontal clearance of 0.5 m is required for vertical obstructions greater than 750 mm in height.
- Minimum horizontal clearance between two-way cycling facilities of 0.2 m.



Source: TAC Geometric Design Guide for Canadian Roads

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

5.3.1.8 Vertical Clearance

The recommended minimum vertical clearance for a bikeway is 3.6 m, measured from the highest point on the bikeway riding surface to the lowest point on the underside of the structure/foliage above the bikeway. This accommodates most small service vehicles and provides a comfortable buffer in addition to the required 2.5 m vertical operating envelope. See also The City of Calgary Design Guidelines for Bridges and Transportation Structures.

5.3.2 Bikeway Facilities at Grade Separations

In Calgary, bikeway facilities should be incorporated on both sides of the design of grade separations, such as bridges, overpasses, and underpasses. The grades for these structures and approaches should be consistent with Section 5.3.1.2.

The width of the bicycle facilities should be consistent with the Design Domain widths for the facility and towards the higher end of the Recommended Range. It is also important to consider and incorporate vertical and horizontal clearance requirements when designing bikeway facilities at grade separations (see Sections 5.3.1.8 and 5.3.1.7, respectively).

For bikeway tunnels, the width should be approximately 1.5 times the height (W = 1.5H). A tunnel entrance where the height dimension exceeds the width dimension (W < H) gives the impression of narrowness. Conversely, tunnels that are very broad in relation to their height (W > 2.0H) gives users the feeling that they may bump their head.

Also refer to TAC GDG Section 5.7.6 (Bikeway Facilities at Bridges or Tunnels) for more information. See also The City of Calgary Design Guidelines for Bridges and Transportation Structures.

5.3.3 Bike Ramps

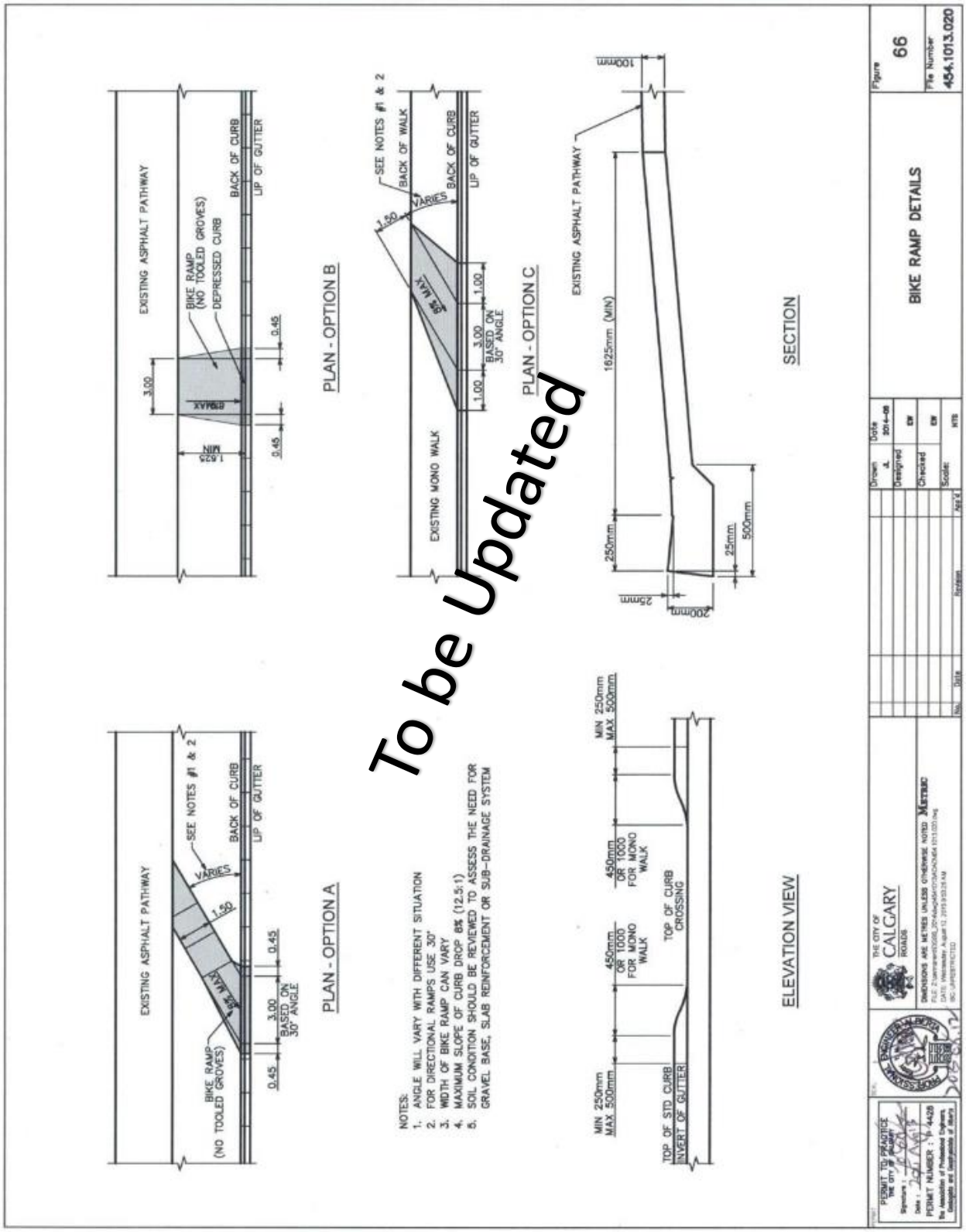
Bike ramps are used to transition between on-street and off-street bicycle facilities. As bike ramps are intended for the exclusive use of people cycling, the slopes do not need to comply with accessibility guidelines for people walking or using mobility aids, and typically range from 5% to 8%.

A flush curb lip at the gutter for bike ramps is required to provide a comfortable and hazard-free transition from the Travelled Way to the off-street bicycle facility.

Where a bike ramp connects directly into a sidewalk or multi-use path on the approach to and before an intersection, a Tactile Directional Indicator should be used at the top of the bike ramp to guide pedestrians away from the bike ramp. See Figure 66 for design details and TAC GDG Section 5.7.3 (Bike Ramps).

Bike ramps should be located outside bus stops (See Section 4.6).

NOTE TO REVIEWERS: THE FIGURE NUMBER WILL BE UPDATED WHEN THE STREET MANUAL AND THE DESIGN DETAILS ARE CONFIRMED AND FINALIZED. THIS FIGURE/DRAWING MAY ALSO BE RELOCATED TO THE CONSTRUCTION SPECIFICATIONS.



5.3.4 Bikeway Facilities at Transit Stops

NOTE TO REVIEWERS: THIS SECTION WILL BE WRITTEN FOLLOWING APPROVAL OF THE RAISED CYCLE TRACK DESIGN BULLETIN THAT IS CURRENT IN DEVELOPMENT.

5.3.5 Raised Cycle Tracks and Universal Design Elements

NOTE TO REVIEWERS: THIS SECTION WILL BE WRITTEN FOLLOWING APPROVAL OF THE RAISED CYCLE TRACK DESIGN BULLETIN THAT IS CURRENT IN DEVELOPMENT.

5.3.6 Bikeway Transitions

NOTE TO REVIEWERS: THIS SECTION WILL BE WRITTEN DURING DEVELOPMENT OF CONTENT FOR CHAPTERS 9 AND 10. THERE MAY BE A SECTION ON THIS TOPIC WITHIN THIS CHAPTER OR IT MAY BE PART OF CHAPTER 9.

Chapter 6.0 Walking and Wheeling Facility Design

NOTE TO REVIEWERS: THIS SECTION ALIGNS WITH CHAPTER 6 OF THE TAC GDG AND CONSOLIDATES CONTENT FROM THE DGSS AND COMPLETE STREETS GUIDE RELATED TO THE DESIGN OF PEDESTRIAN FACILITIES INCLUDING DGSS SECTION G. SIDEWALKS, WALKWAYS, CROSSWALKS, BOULEVARD GRADES, COMMUNITY MAILBOXES. NOTE THAT BOULEVARD GRADES ARE INCLUDED IN CHAPTER 4 RATHER THAN CHAPTER 6.

The guidelines in this chapter should be used for the design of pedestrian facilities in Calgary that are used by people walking and those using mobility devices. These design guidelines are based primarily on the following industry references, which can be consulted for additional context and background.

- Transportation Association of Canada. Geometric Design Guide for Canadian Roads: Chapter 6 - Pedestrian Integrated Design. Transportation Association of Canada. (abbreviated in the Street Manual: TAC GDG) (2017)
- Canadian Standards Association (CSA Group). Accessible design for the built environment. Standards Council of Canada. National Standard of Canada, Accessibility Standards of Canada, CSA/ASC B651:23. https://www.csagroup.org/store/product/CSA-ASC%20B651%3A23/ (abbreviated in the Street Manual: CSA) (2023)
- The Canadian National Institute for the Blind (CNIB) Foundation. Clearing Our Path Version 2.0. CNIB. https://clearingourpath.ca/ (abbreviated in the Street Manual: CNIB) (Accessed 2024)

The following sections detail specific design guidance that supplements or supersedes guidance contained in Chapter 6 of the TAC GDG. See Section 1.4 for guidance on how to apply Street Manual and TAC GDG design guidance.

Certain elements of pedestrian facility design are addressed in other parts of the Street Manual:

- For more information on Design User, see Chapter 2.
- For information on incorporating pedestrian facilities into streets and cross sections, see Chapter 4.
- For information on intersection design including pedestrian facilities, see Chapter 9.
- For more information on other facilities for bicycle facilities that can be used by people riding bicycles, micromobility devices, or other forms of wheeled conveyance, see Chapter 5.

6.1 Pedestrian Facility Types

Pedestrian facilities are located within the Walking and Wheeling Through Zone, which is the area intended to be clear and navigable (i.e., free of permanent and temporary obstructions) for people walking, in-line skating, roller skating, skateboards, scooters, and those using mobility aids. Different types of pedestrian facilities can be provided within this street design zone. The following pedestrian facility types are used in Calgary. See also guidance in the TAC GDG (Section 6.3).

- Sidewalks
- Multi-use paths (see Section 5.1.2)
- Walkways (not located within street right-of-way)

- Trails (not located within street right-of-way, see Calgary *Development Guidelines and Standard Specifications: Landscape Construction*)

Wheeling, including the use of bicycles, micromobility devices, and other forms of wheeled conveyance, can also occur within bicycle facilities (e.g., cycle tracks). See Chapter 5 for more information.

6.1.1 Sidewalks and Accessible Walking Routes

Target Values for sidewalks based on context are noted in the following table.

Context	Sidewalk Width [1] Target Value (m)
Alley	N/A[2]
Local	1.8
Local – Industrial	1.6[3]
Local – High Activity	2.5
Collector	2.0[4]
Collector – Industrial	1.8[4]
Collector – High Activity	2.5[5]
Arterial	2.0[4]
Arterial – High Activity	2.5[5]
Skeletal Road	N/A

NOTES:

1: Sidewalk width is for boulevard sidewalks. Add 0.3 m for monolithic sidewalks.

2: An Alley is an informal walking/wheeling/motorized vehicle space encouraged by the 15 km/h Posted Speed. Separate facilities for different users are not warranted.

3: Sidewalk width for Local Street – Industrial is at the Recommended Lower Limit to reflect the lower walking activity along these streets while providing the requirements for an accessible walking route.

4: 3.0 m wide multi-use path typically provided. Target Value for sidewalk is for situations when a segregated multi-use path (i.e., bike path with adjacent sidewalk) or a sidewalk and a cycle track are provided along the street.

5: See Design Domain values for very High Activity areas.

The Design Domain for sidewalks is a function of accessibility accommodation and projected or actual peak hour pedestrian volumes as outlined in the TAC GDG. The street classification and land use context typically imply a corresponding peak pedestrian volume. The Design Domain for sidewalk width is shown in the table below. The recommended lower limit width of 1.6 m for the Walking Through Zone is defined in CSA (see also Section 6.2.4) and should be met to provide an accessible walking route.

Design Domain: Sidewalk Width (m)

Parameter	Practical Lower Limit	Recommended Lower Limit	Recommended Upper Limit
Sidewalk Width[1]	1.5[2]	1.6[3]	3.0[4]

NOTE:

1: Where a sidewalk needs to be monolithic to a street curb, the Recommended Lower Limit width should be wider to allow for some separation of pedestrians from adjacent traffic, space for placement of signs, and space for snow storage. A minimum 1.6 m unobstructed sidewalk width is required based on CSA B651.

2: The Practical Lower Limit allows for two people to walk side by side.

3: The Recommended Lower Limit width is the sidewalk width requirement based on CSA B651 to meet the width for an accessible walking route. Sidewalk widths at the lower recommended limit should only be used where there is low walking

activity such as Industrial Areas. Streets in residential areas should have a wider sidewalk width (1.8 m).
4: In high activity areas such as the Greater Downtown and Transit Oriented Developments, sidewalks are frequently contiguous with adjacent paved surfaces such as hard-surfaced furnishing zones, public plazas, and private sites. A 3.0 m or wider unobstructed accessible walking route for people walking and using mobility aids or other wheeled devices to pass through is recommended in these contexts.

6.1.2 Multi-Use Paths

See Section 5.1.2 for design guidance on multi-use paths, including Target Value and Design Domain widths.

6.1.3 Neighbourhood Walkways

NOTE TO REVIEWERS: THESE FACILITIES ARE CURRENTLY CALLED SUBDIVISION WALKWAYS IN THE DGSS.

Neighbourhood walkways are located on a legal right-of-way designated as "walkway." Other terms used for these walkways include "catwalks," "cut-throughs," "subdivision walkways," and "engineered walkways."

Neighbourhood walkways typically connect the terminus-end of one or two neighbourhood culs-de-sac or break up longer blocks to provide a finer-grain scale of accessibility for people walking in the community. They provide a pedestrian or multi-use connection within, into, or out of, a subdivision. For design guidance on neighbourhood walkways intended to have multi-use path functionality, refer to Section 5.1.2. Refer to Chapter 9 for information on sight triangles at walkway intersections.

Design guidance for neighbourhood walkways intended for walking and wheeling includes the following.

- The maximum longitudinal grade for a walkway sidewalk should be 8%, but grades of 5% or less are preferred. Maximum grades of up to 10% may be utilized in exceptional circumstances where necessary due to topography. Level landings should be provided at grades above 5%. Level landings should be at least 1.7m long.
- Walkway sidewalks should be a minimum of 3.0 m wide. Where the walkway right-of-way width is 3.0 m or less, the sidewalk should be hard surfaced to the full width of the walkway.
- Walkway sidewalks are normally constructed to a crowned section.
- Walkways are often paired across a street to improve pedestrian permeability of a community. Where a mid-block crossing occurs on a street with a target speed greater than 30 km/h, a mid-block crossing design should be provided. See Section 6.2.8 for guidance on mid-block crossings, Chapter 9 for curb extensions, and Chapter 10 for raised crossings.

NOTE TO REVIEWERS: PREVIOUS GUIDANCE/REQUIREMENTS FOR SUBDIVISION WALKWAYS INCLUDED PROVIDING BOLLARDS. THIS IS NO LONGER BEST PRACTICE AS IT PRESENTS A SAFETY HAZARD FOR WALKWAY USERS. BEST PRACTICE NOW RECOMMENDS MONITORING OPERATION AND ONLY INSTALLING BOLLARDS WHERE POOR USER BEHAVIOUR IS EXHIBITED (I.E., DRIVING THROUGH THE WALKWAY). AS SUCH, THE CONTENT HAS BEEN REMOVED.

6.1.4 Trails

Unpaved trails are not typically included within the street right-of-way. See The City of Calgary's *Development Guidelines and Standard Specifications: Landscape Construction* for design guidance on unpaved trails through parks and other off-street locations.

NOTE TO REVIEWERS: SEE NOTE IN SECTION 6.1.

6.2 Pedestrian Design Elements and Details

6.2.1 Surface Materials

To provide an accessible walking environment for pedestrian facilities, a slip-resistant, stable, and smooth surface should be used that is free of trip hazards, does not have strong visual patterning, and is not high glare. Specific design guidance for pedestrian facilities and each of the Street Zones that are used by people walking is provided below.

Sidewalks & Multi-Use Paths

The preferred surface material for sidewalks is concrete.

The preferred surface material for multi-use paths is asphalt.

The surface for sidewalks and multi-use paths should be colour contrasting to the Furnishing Zone and Frontage Zone.

Frontage Zone

The Frontage Zone should be texturally different and colour contrasting to the Walking Through Zone. This may be achieved through landscaping or textured and tinted concrete.

Furnishing Zone

The Furnishing Zone should be detectable by people with vision loss. Methods to do this include materials that are texturally different and colour contrasting to the Walking Through Zone.

Flex Zone

The surface material for the Flex Zone is typically the same as the Travelled Way. In some locations, such as Main Streets, the surface material for the Flex Zone may differ and could include concrete, stamped concrete, pigmented concrete, or cobblestone/pavers. Where a Flex Zone is converted for temporary walking zone (e.g., to allow a patio on what is normally the sidewalk area), the preferred treatment is a raised boardwalk at sidewalk grade rather than temporary ramps up and down to the Flex Zone surface.

Covers and Grates

As stated in the City of Calgary Access Design Standards, manhole covers, tree grates, electrical vaults and other access covers/grates should be placed outside of the path of travel unless prevented by site constraints.

Where a cover or grate located within the Walking Through Zone in a retrofit situation cannot be avoided, it should have a maximum clear opening of 13 mm, and the long dimension of the openings should lie perpendicular to the path of travel.

6.2.2 Grade and Cross Slope

Pedestrian routes should be well-drained to prevent accumulation of ice and water. Unless otherwise specified, grades and cross slopes for pedestrian facilities should be as follows.

- The longitudinal grade typically follows that of the street, which have minimum longitudinal gradients of 0.6%.
    - To be accessible, the longitudinal grade should not exceed 5% unless level landings are provided along the length of the pedestrian facility.
    - Maximum grades of up to 12% may be utilized along local streets in exceptional circumstances where necessary due to topography. Level landings should be provided along the length of the pedestrian facility.
- The cross slope of pedestrian facilities should not exceed 2%, including at driveway aprons (see Section 6.2.7).

Curb ramps should not be located at a catch basin nor in a trap low location.

Examples of exceptions to the longitudinal grade specifications include Walkways (see Section 6.1.3) and Curb Ramps (see Section 6.2.5).

6.2.3 Vertical Clearance

Overhead obstructions, including overhanging branches or awnings, should be 2.1 m above the surface of the Walking Through Zone. If the walking facility is shared with people cycling, see Section 5.3.1.8 for vertical clearance requirements. See also The City of Calgary Design Guidelines for Bridges and Transportation Structures for vertical clearance requirements for bridges, underpasses, and tunnels.

6.2.4 Accessible Widths, Turning Areas, and Obstructions

6.2.4.1 Accessible Walking Route Width

The minimum width for a sidewalk or walking facility to comply with accessible design requirements for an “accessible walking route” per CSA is 1.6 m.

At locations with a curb ramp that extends into the Walking Through Zone (for example, a mid-block crossing or ramp to an accessible parking stall), the Walking Through Zone may be smaller than the 1.6 m width (see Section 6.2.5).

6.2.4.2 Mobility Aid Turning Radii

The following turning radii should be considered based on the ability of a mobility aid user to complete a 180-degree turn:

- Manual wheelchair: 2.10 m
- Powered wheelchair: 2.25 m
- Large mobility scooter: 3.15 m

If continuous turns cannot be accommodated within the sidewalk, these movements can occur at driveways (at single family homes along local streets), bus stops, mid-block crossing locations, intersection corners, or within a combined hardscaped width of the Frontage Zone, Walking and Wheeling Through Zone, and Furnishing Zone.

6.2.4.3 Walking Through Zone Obstructions

No obstructions should be present within the Walking and Wheeling Through Zone including signs and poles. All objects or appurtenances should be placed outside the Walking and Wheeling Through Zone and be placed in the Furnishing Zone or Frontage Zone.

6.2.4.4 Frontage Zone or Utility Easement Obstructions

Any street furniture or surface utilities located within the Frontage Zone or a Utility Easement should not encroach or obstruct the Walking and Wheeling Through Zone. If significant constraints exist where this cannot be avoided at isolated locations, the minimum Walking and Wheeling Through Zone width as noted above under "Accessible Walking Route Width" should be provided.

6.2.4.5 Furnishing Zone Obstructions

Where the Furnishing Zone is landscaped, planters and the plants should not encroach into the Walking and Wheeling Through Zone. Where planting material is soft or below the level of the Walking and Wheeling Through Zone, it should have edge protection of a minimum 100 mm in height.

Where benches are provided, the surface of the Furnishing Zone should provide an accessible surface for people of all ages and abilities and to allow the bench to be affixed. A level concrete surfaced area at least 0.85 m by 1.20 m should be provided adjacent to the bench for wheelchair companion seating.

All objects located in the Furnishing Zone should include a detectable edge that is a maximum of 100 mm from the surface, or the extension of the surface, of the Walking and Wheeling Through Zone for detection by people using a long white cane and should be placed within 600 mm of the Walking and Wheeling Through Zone.

See also Section 5.3.1.7 for horizontal offsets and clearances for bicycle facilities where the Furnishing Zone is located adjacent to an on-street or off-street bikeway.

6.2.5 Curb Ramps

Curb ramps provide access for people in wheelchairs, mobility devices, or scooters at crossings where there is an elevation change between a sidewalk and a street level crossing.

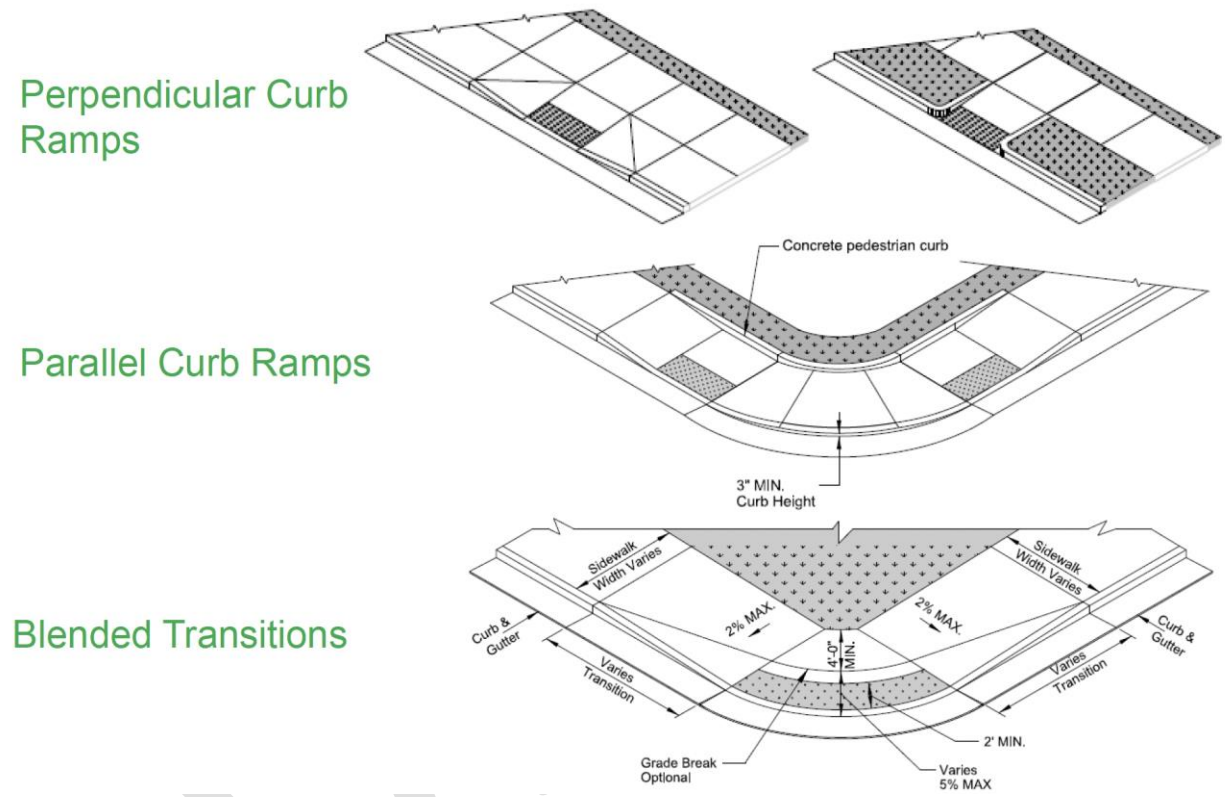
Curb ramps should be provided at all intersection corners, all traffic islands, all medians at crosswalks, and all mid-block crossings. Locations of curb ramps should align with the crosswalks and vice versa. Each crosswalk should have a curb ramp at each end and not be shared (i.e., two per corner for standard intersections as shown below). The orientation of the curb ramp at an intersection should direct a person across the pedestrian crossing rather than diagonally into the centre of the intersection.

The preferred configuration of curb ramps is perpendicular curb ramps because they provide better orientation for people with vision loss and do not create a potential hazard for people using mobility devices. An alternative configuration can be parallel curb ramps, which may be appropriate in locations with right-of-way constraints and where monolithic sidewalks exist (typically in retrofit locations).

If there is not enough space to construct two separate perpendicular or parallel curb ramps, a depressed corner or blended transition curb ramp may be used. This configuration is not ideal because it can be difficult for people driving to interpret which direction a person walking is trying to cross since both crossing directions use one shared landing space. Additionally, drainage can be an issue at the depressed

corner. Finally, safety considerations need to be evaluated when considering depressed corners. Users should not be in danger of being struck by a motor vehicle traffic tracking onto the sidewalk when a person walking is standing on the corner.

Wherever possible, depressed corners should be avoided as they can misdirect individuals into the intersection rather than to the safe pedestrian crossing route. Where these installations do exist, people with vision loss should be able to clearly identify the safe crossing route with tactile walking surface indicators and barriers should be installed to prevent vehicles from coming up onto the sidewalk. The use of bollards or other features that are colour/brightness contrasted to the surrounding environment are recommended at depressed curbs to prevent vehicles from entering pedestrian areas.



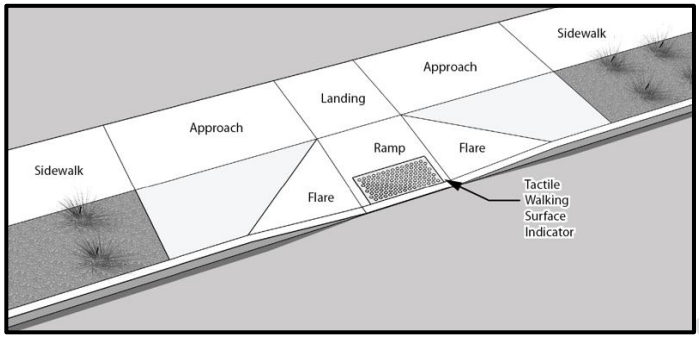
Source: Colorado Department of Transportation Curb Ramp Designers Resource

NOTE TO REVIEWERS: IMAGE WILL BE REPLACED FOR FUTURE DRAFTS AND WILL INCLUDE A NOTE THAT BLENDED TRANSITIONS ARE NOT DESIRABLE, BUT INCLUDED FOR SITUATIONS WHERE OTHER OPTIONS ARE NOT PRACTICAL.

A curb ramp is composed of the following as illustrated below:

- Ramp
- Flare
- Landing
- Approach (which should align with the ramp for intersection curb ramps, see Chapter 9)

NOTE TO REVIEWERS: IMAGES OF CURB RAMPS WILL BE REPLACED TO ENSURE ALL THE ELEMENTS DEPICTED MATCH THE TEXT. FOR EXAMPLE, THE CURB RAMP GRAPHIC FROM TAC DOES NOT SHOW THE TACTILE ATTENTION INDICATOR EXTENDING THE FULL WIDTH OF THE CURB RAMP.



Source: TAC Geometric Design Guide for Canadian Roads

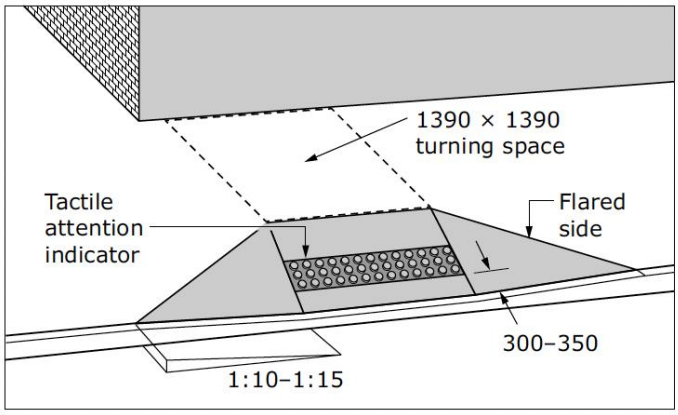
The ramp component of a curb ramps should be designed as follows:

- The curb ramp width should match the width of the sidewalk and crosswalk, and not be less than 1.6 m.
- The curb ramp should have a level transition to adjacent surfaces.
- The ramp slope should be between 6.66% and 10%, with a preferred maximum of 8.33%. The slope for a parallel curb ramp should be 7.5% in the direction of travel with a cross slope of 2% or less. See Section 5.3.3 for ramp slopes if the curb ramp is intended for use by people cycling (i.e., for multi-use paths).
- The algebraic difference in slopes (i.e., grade breaks) between the curb ramp and the Travelled Way surface should be a maximum of 11% to reduce the chances of contact between the bottom of a wheelchair and the curb ramp/street surface. Grade breaks for curb ramps should be perpendicular to the direction of travel for the ramp to minimize stability issues for mobility aid users. This may include a landing area at the bottom of the ramp that will require grading toward the gutter flow line at a slope of 2%.
- The curb ramp should have a Tactile Attention Indicator that extends the full width of the curb ramp and has a depth of 600 mm starting approximately 300 mm up from the face of curb (see Section 6.2.6).
- The curb ramp landing and ramp must not extend into an area that can be used as part of a mountable corner truck apron. The Tactile Attention Indicators must be located outside of this conflict area.

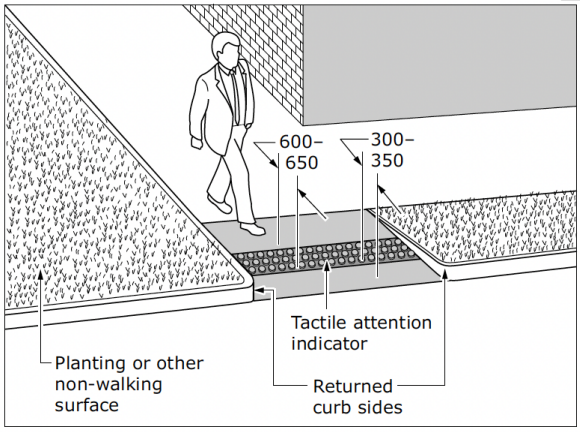
A curb ramp should provide appropriate drainage so that water does not accumulate on the pedestrian route and should have no catch basin covers within the crosswalk. The curb ramp should be flush with the gutter or street surface to decrease difficulties of access the curb ramp from the street for people using mobility devices such as wheelchairs.

Flares should be provided on a perpendicular curb ramp if it is located where people will likely walk laterally across it. Flares should have a slope, measured parallel to the curb line, between 10% and 6.66%. Where people are not likely to walk laterally across the ramp, a returned curb design can be used.

A landing or turning space should be provided at the top of the curb ramp and level with the Walking Through Zone. The absolute minimum dimension is 1.39 m by 1.39 m, with a recommended minimum dimension of 1.6 m by 1.6 m. Note that the landing is part of the ramp for a parallel curb ramp.



Source: CSA Accessible Design for the Built Environment (dimensions in mm)



Source: CSA Accessible Design for the Built Environment (Example of Returned Curb Ramp design, dimensions in mm)

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

6.2.6 Tactile Walking Surface Indicators

Tactile Walking Surface Indicators (TWSIs) are used to inform people, both visually and by contact underfoot or with a long white cane, of two possible situations:

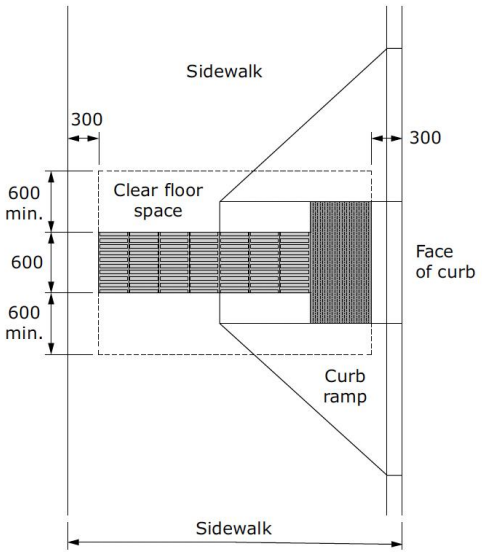
1. A need for caution at a change in elevation, a vehicular route, train tracks, etc.
2. To facilitate wayfinding in open areas and indicate a possible route that can be taken.

A Tactile Attention Indicator is used to communicate caution, while a Tactile Direction Indicator is used to facilitate wayfinding. A third TWSI, the Tactile Edge Indicator, is a device that can also be used to facilitate wayfinding by indicating the edge of an accessible walking environment.

All TWSIs should have a base surface that is level with the surrounding surface or with its edges bevelled and not more than 3 mm above the surface to which it is applied. All TWSIs should be slip-resistant and have an adjacent walking surface that is smooth for at least 600 mm in width.

TWSIs are typically made from inserts (metal, rubber, or plastic) or are built directly into concrete. The material used will affect the sound heard by people that tap the surface with a long white cane. For this reason, plastic may be preferred as it is distinctly different from the materials used for the Walking Through Zone and other walking elements such as curb ramps.

A typical application of Tactile Attention Indicators and Tactile Direction Indicators at a curb ramp is illustrated below.



Source: CSA Accessible Design for the Built Environment (dimensions in mm)

NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

6.2.6.1 Tactile Attention Indicators

Tactile Attention Indicators are truncated domes of a height of approximately 5 mm and top diameter of between 12 mm and 25 mm that are arranged in a grid with minimum gaps between the bases of the domes being a minimum of 15 mm.

The design and use of Tactile Attention Indicators should be as follows:

- **Location:**
  - Curb ramps.
  - An unprotected drop-off edge (e.g. a transit platform) where the change in elevation is greater than 250 mm.
  - Stairs.
  - Bus stop boarding islands.
  - Accessible bus boarding areas.
- **Installation:**
  - When a Tactile Attention Indicator is used to indicate a hazard, it should

be installed along the full width of the hazard to a depth of 600 mm in the direction of travel.

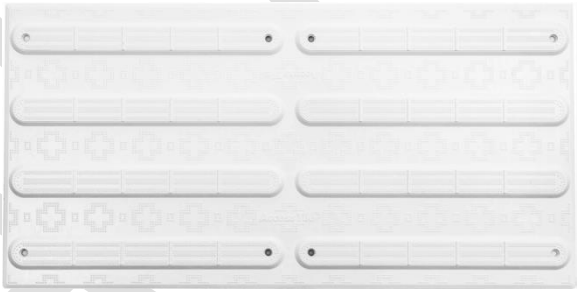
- **Luminance/Colour Contrast:**
  - Tactile Attention Indicators should have a luminance (colour) contrast of at least 50% with the adjacent surface. Yellow is the preferred colour. Refer to CSA for more information on luminance/colour contrast.

6.2.6.2 Tactile Direction Indicators

Tactile Direction Indicators are flat-topped, parallel, elongated bars with a height of approximately 5 mm, a top width of between 17 and 30 mm, a top length of not less than 270 mm, and a space between bars not more than 30 mm. Some people with vision loss will walk along Tactile Direction Indicators as they can be felt underfoot or with a long white cane. This differs from the typical use of Tactile Edge Indicators (see Section 6.2.6.3).

The design and use of Tactile Direction Indicators should be as follows:

- **Location:**
  - In large open outdoor spaces where widths of paving exceeding 6 m exist to facilitate wayfinding by indicating the primary route of travel.
  - To provide wayfinding and direction of travel to the location of crossings.

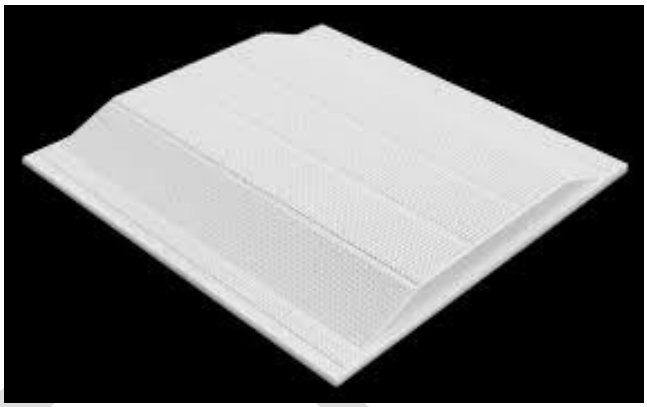


- **Installation:**
  - Where installed to define a walking route:
    - Tactile Direction Indicators should be between 250 mm and 300 mm wide and have 600 mm of horizontal clear space to obstructions.
    - The flat-topped elongated bars should be installed running in the direction of the route of travel.
    - Have turns and decision points at a 90° angle and identified by a 600 mm to 650 mm square surface area without a Tactile Walking Surface Indicator.
    - At an end point, have a clear space between 600 mm and 750 mm where terminating at a wall or obstacle.
  - Where installed across an accessible path of travel (accessible walking route) as an indicator of a facility or diverging route, such as bus shelters or curb ramps:
    - Tactile Direction Indicators should be between 600 mm and 650 mm wide.
    - Have the elongated bars running in the direction toward the facility or diverging route.
  - Where there is a risk of water ponding, the elongated bars can be interrupted by a drainage gap of 20 mm to 30 mm wide.
- **Luminance/Colour Contrast:**
  - Tactile Direction Indicators should have a luminance (colour) contrast of at least 50% with the surrounding surface
  - Tactile Direction Indicators must not be yellow.

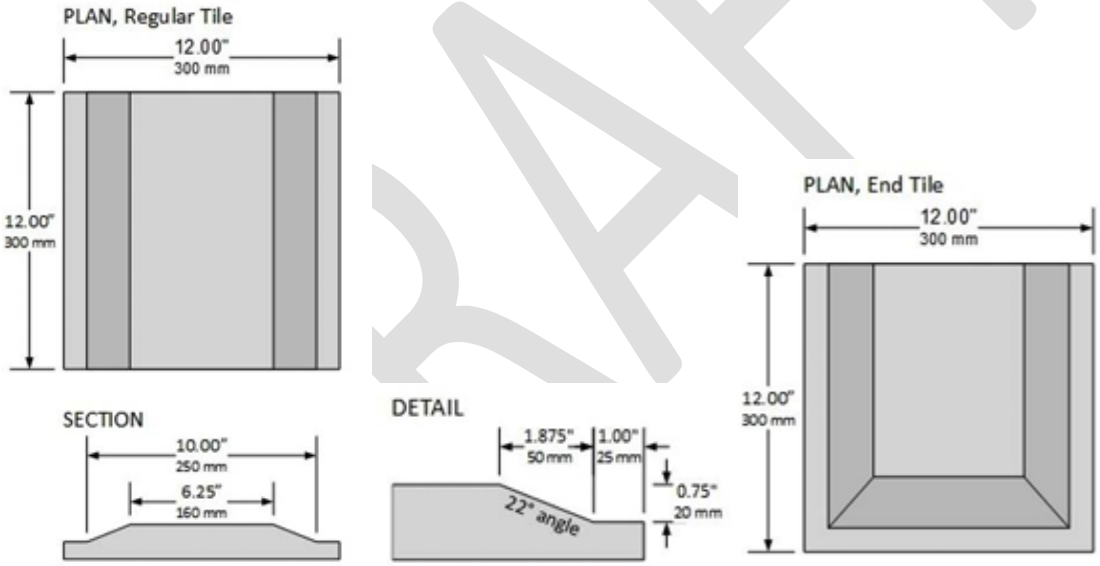
- Achieving the colour contrast can typically be accomplished with a light colour on a dark ground surface or a dark colour on a light ground surface.

6.2.6.3 Tactile Edge Indicators

A Tactile Edge Indicator is a continuous raised trapezoidal-shaped surface used as a delineator to indicate an edge condition and has been used for sidewalk-level raised cycle tracks and along curbless streets to indicate the edge of the accessible and obstacle-free walking area.



Tactile Edge Indicators should be a maximum of 20 mm high and should be a contrasting colour to the adjacent surface but not be yellow. Tactile Edge Indicators should be placed continuously with drainage gaps of 20 mm to 30 mm, as required.



NOTE TO REVIEWERS: GRAPHICS IS A PLACEHOLDERS AND WILL BE REPLACED PRIOR TO FINALIZING THE STREET MANUAL.

6.2.7 Driveway and Alley Crossings

At driveway and alley crossings, vehicle access aprons that extend into the Walking Through Zone can render a sidewalk impassable for people using wheelchairs, walkers, or crutches. A near-level walking surface is required to rest the supports of walkers or crutches and to avoid tipping or side-sliding risks for wheelchair users. To provide a continuous level walking route across driveways, aprons should be confined to the Furnishing Zone and the sidewalk carrying through the driveway (including sidewalk material). In locations with monolithic sidewalks, a minimum accessible walking route width noted in Section 6.2.4 should be provided without interruption by driveway ramps and aprons.

Additional reference information on this topic is available in TAC GDG Section 6.4.8 (Driveways and Alleys Crossing the Sidewalk).

NOTE TO REVIEWERS: FUTURE DRAFTS FOR THE CHAPTER COULD INCLUDE GRAPHICS OR PHOTOS TO ILLUSTRATE THE RECOMMENDED DESIGN PRACTICE AT DRIVEWAY AND ALLEY CROSSINGS.

6.2.8 Mid-Block Crosswalks

Crosswalks may be provided at non-intersection locations to increase the connectivity and access of the walking network and key destinations along a street. Mid-block crosswalks should consist of a curb ramp (see Section 6.2.5) and curb extensions or a raised crossing (see Chapter 9 and Chapter 10, respectively).

6.2.9 Pedestrian Overpasses

The design of pedestrian overpasses should meet Universal Design requirements and align with broader accessibility needs of people using other forms of active transportation. As such, both ramps and stairs should be provided. See Section 5.3.2 for pedestrian overpass design guidance.

6.2.10 Community Mailboxes

Community mailboxes should be located in the Furnishing Zone along sidewalks/walkways/pathways. Mailboxes should not be located along school frontages or within bus zones and should not block sightlines to pedestrian or multi-use crossings.

NOTE TO REVIEWERS: SHOULD ADDITIONAL DESIGN AND PLACEMENT GUIDANCE BE PROVIDED FOR COMMUNITY MAILBOXES? FOR EXAMPLE, SHOULD THE DIRECTION THEY FACE TO BE ACCESSED BY PEOPLE BE INCLUDED SUCH THAT PEOPLE ACCESS THEM FROM THE SIDEWALK RATHER THAN HAVING TO STAND IN THE STREET?

Chapter 7.0 Roadside Design

NOTE TO REVIEWERS: THE INTENT OF THIS CHAPTER IS TO CROSS REFERENCE TAC GDG WITH GUARDRAIL WARRANT INFO FROM DGSS SECTION J. GUARDRAILS. BASED ON A REVIEW AND DIRECTION FROM THE PROJECT TEAM, ALL CURRENT SPECIFIC DIRECTION CONTAINED IN THE DGSS INCLUDING TABLE II-J.1, J.2, AND J.3 HAS BEEN DELETED. THE CURRENT DIRECTION IN THE DGSS ONLY COVERS FILL SLOPES ON RURAL CROSS SECTIONS. THE ALBERTA TRANSPORTATION ROADSIDE DESIGN GUIDE PROVIDES SPECIFIC GUIDANCE ON MOST TYPICAL SITUATIONS FOR HIGHER SPEED STREETS.

7.1 Introduction

The TAC Geometric Design Guide for Canadian Roads (TAC GDG) Chapter 7 outlines the general principles for roadside design in Calgary. As noted in the TAC GDG, the guidelines are primarily intended for higher speed (greater than 70 km/h) streets, which would typically be classified as Skeletal Roads or streets with rural cross-sections. General guidance on streets in urban environments is provided in Section 7.7 of the TAC GDG and should be considered, most notably, that establishing a clear zone is not always practical and sometimes not desirable from the perspective of street character and context. However, as noted in Section 7.7 of the TAC GDG, this does not preclude instances in lower speed urban environments where roadside barrier will be warranted.

For specific guidance on roadside design for Skeletal Roads, higher speed streets, and rural streets related to clear zone requirements, barrier warrants, and barrier design, the current edition of Alberta Transportation's Roadside Design Guide should be utilized.

Chapter 8.0 Access

NOTE TO REVIEWERS: THE INTENT OF THIS CHAPTER IS TO INCLUDE ACCESS CONDITIONS FROM DGSS SECTION B. THIS CHAPTER INCLUDES CUL-DE-SAC DESIGN AND INCORPORATES DGSS SECTION L. EMERGENCY ACCESS TO PRIVATE SITES. ROAD CLASSIFICATIONS DEFINITION AND DESIGN ELEMENTS WILL NOW BE IN CHAPTER 4. DESIGN DETAILS OF DRIVEWAYS AND APRONS, AS NEEDED, WILL BE ADDED TO THIS CHAPTER. THIS RELATES TO THE DESIGN OF PEDESTRIAN AND BICYCLE FACILITIES WHICH IS CURRENTLY IN DRAFT.

8.1 Introduction

The TAC Geometric Design Guide for Canadian Roads (TAC GDG) Chapter 8 outlines the access management philosophy and typical street access design parameters that should apply for street design in Calgary. The following sections detail specific design guidance that supplements or supercedes guidance contained in Chapter 8 of the TAC GDG. See Section 1.4 for guidance on how to apply Street Manual and TAC GDG design guidance.

In general, driveway accesses should be limited, with a preference for use of shared access driveways where it is possible from a traffic operations perspective, to avoid unnecessary disruptions in walking and wheeling routes and increase the potential for tree planting. In all priority walking areas and crossings of the primary and secondary Primary Wheeling and Transit Networks, a maximum of one access per parcel is allowed. The design and configuration of accesses should also align with the Safe System Approach as outlined in Section 1.6.

8.2 Street Classification Access Conditions

Typical access conditions for each street classification are outlined below.

NOTE TO REVIEWERS: A TABLE SUMMARIZING ACCESS SPACING AND TYPES HAS BEEN REQUESTED TO BE INCLUDED IN THE STREET MANUAL. THE TABLE IS STILL UNDER DEVELOPMENT AND WILL BE CIRCULATED WITH FUTURE VERSIONS OF THE MANUAL.

8.3 Median and Turn Lane Requirements

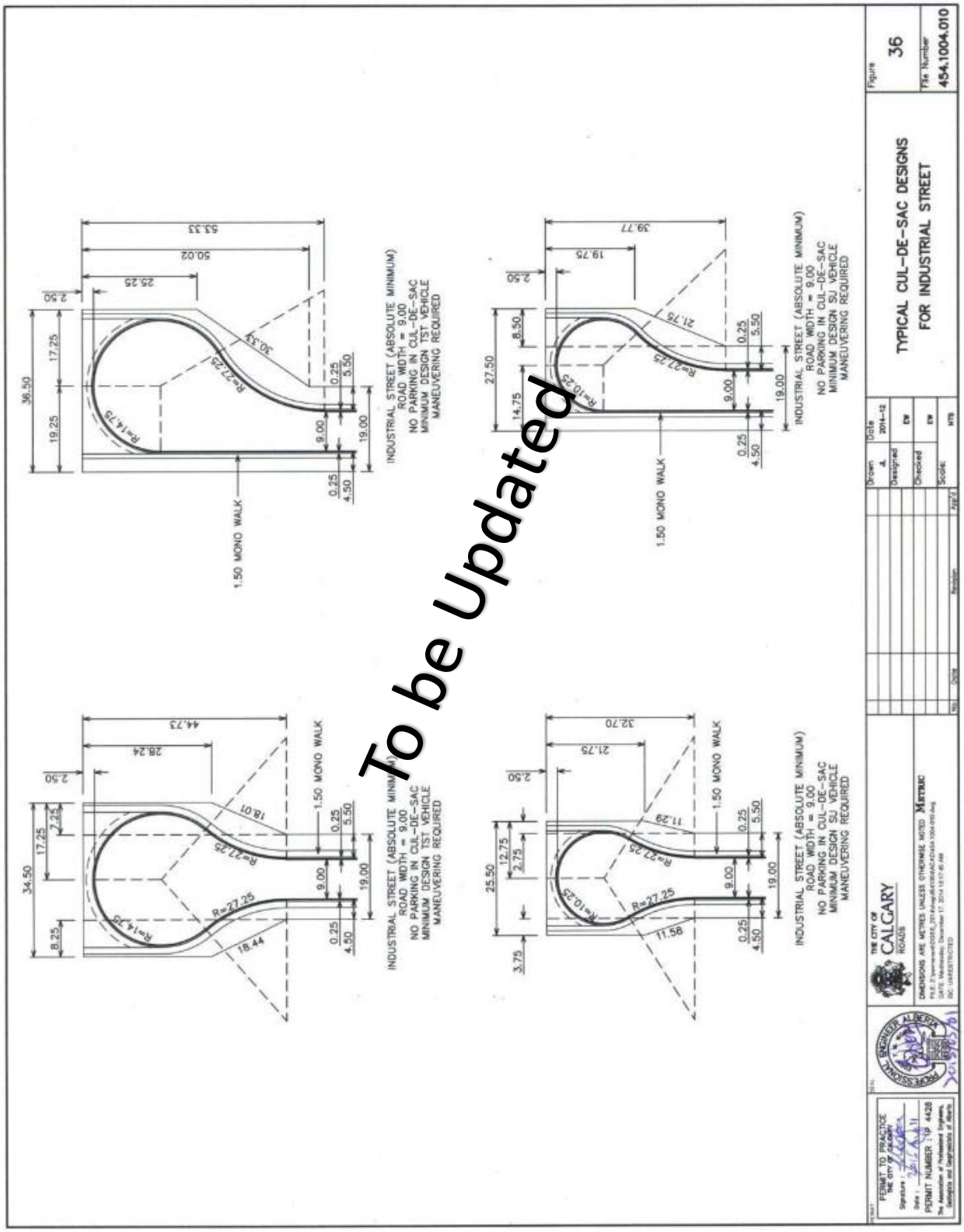
Median and turn lane requirements are summarized in Chapter 4.

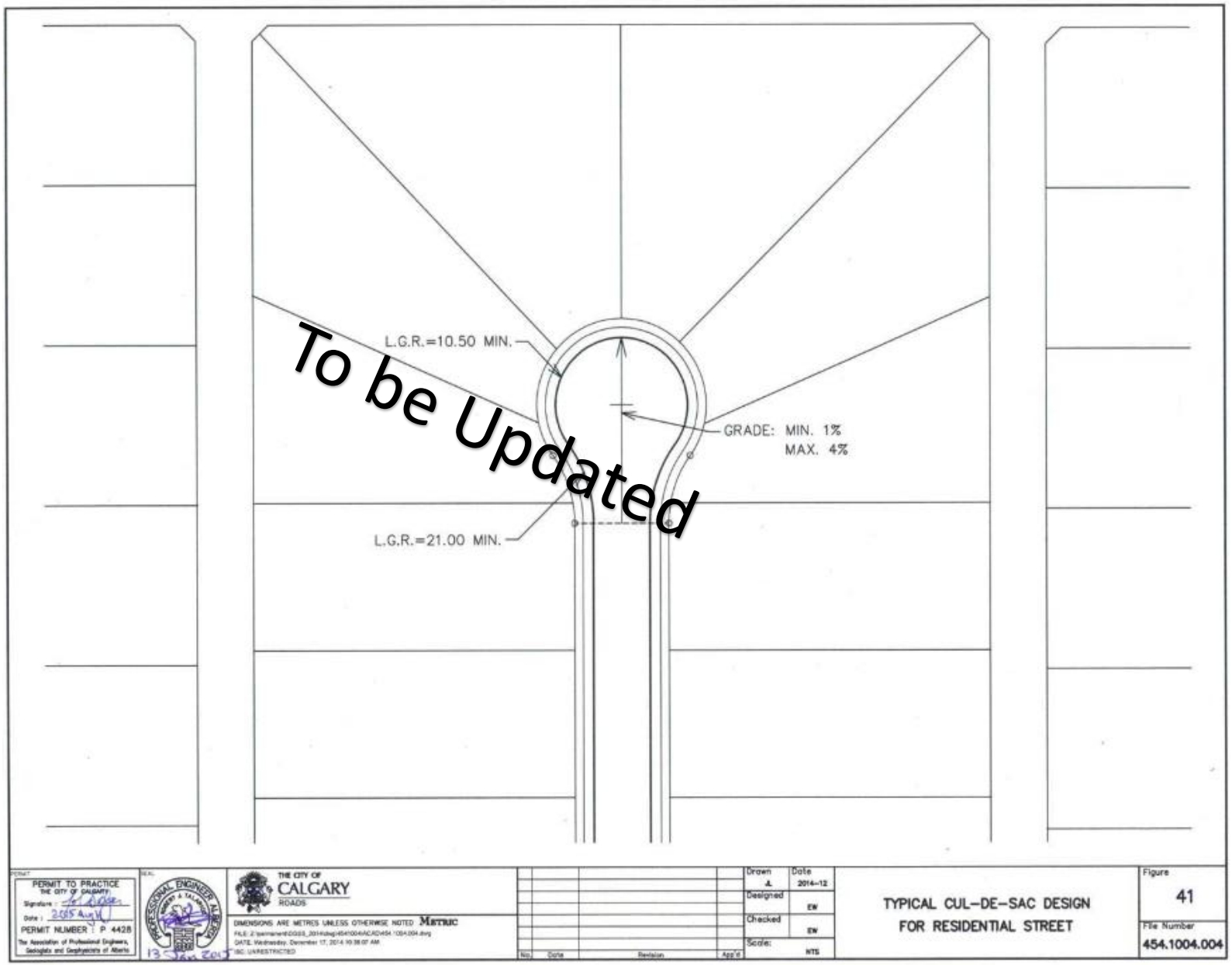
8.4 Dead Ends and “P” Loops

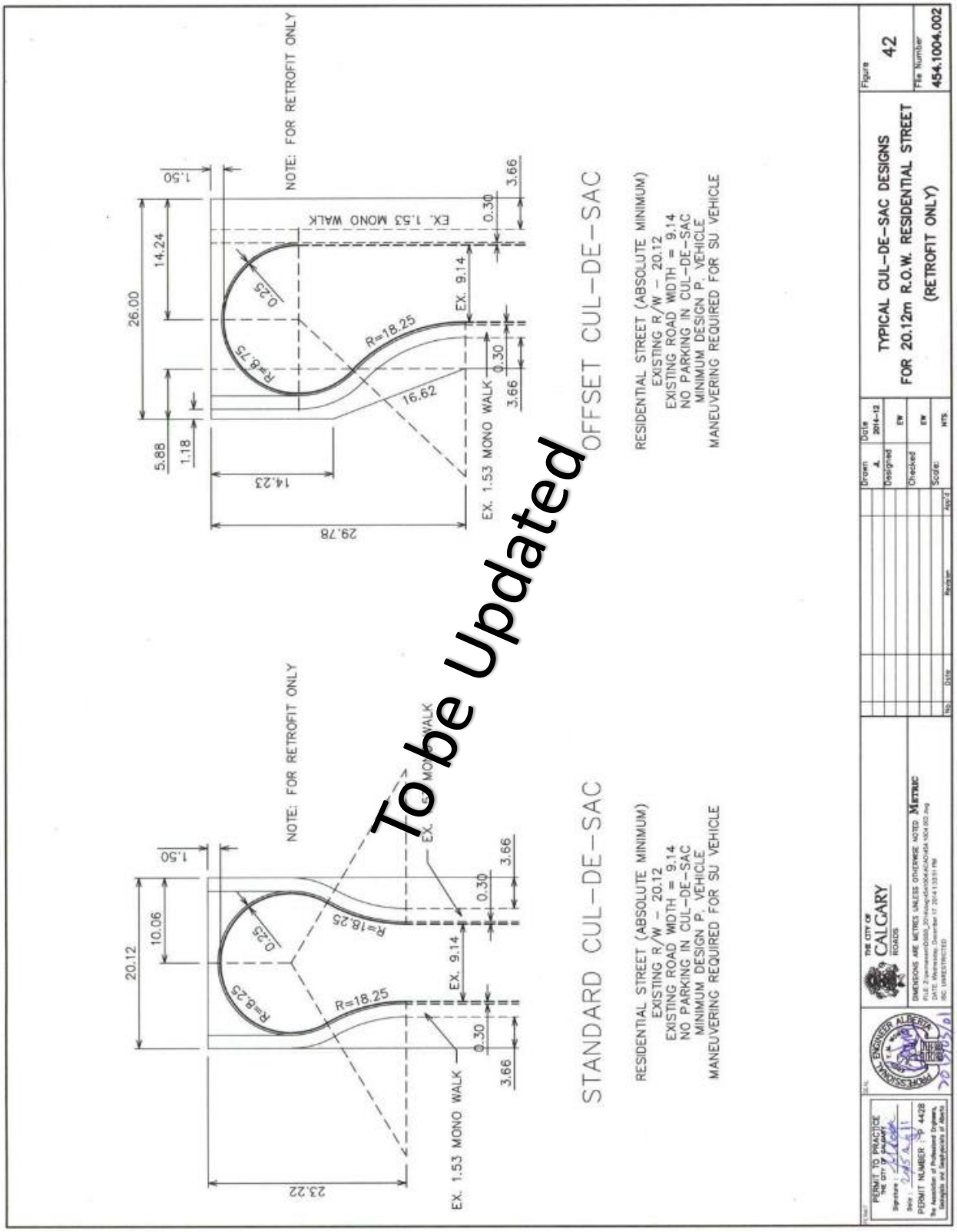
Any public street that comes to a dead end in a proposed subdivision must have a cul-de-sac with sufficient turning space for the design vehicle for the street based on its classification. See Typical Cul-de-sac Designs for each of the classifications. Alternative approaches such as hammerheads or no parking zones may be considered to accommodate vehicle turning movements in retrofit scenarios where a full or partial street closure is proposed.

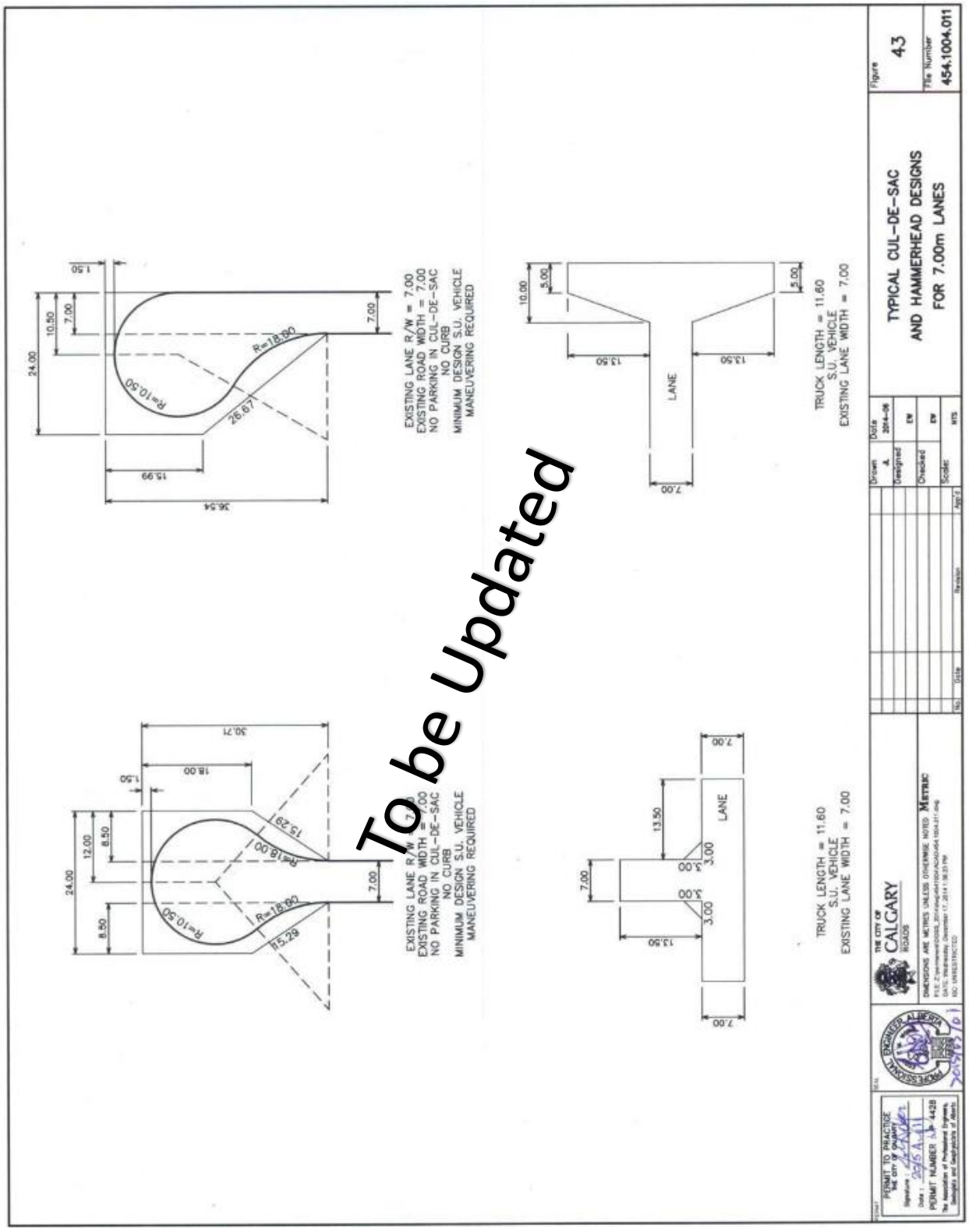
A walking and wheeling connection should be provided from the end of the cul-de-sac through to the street or pathway beyond the cul-de-sac.

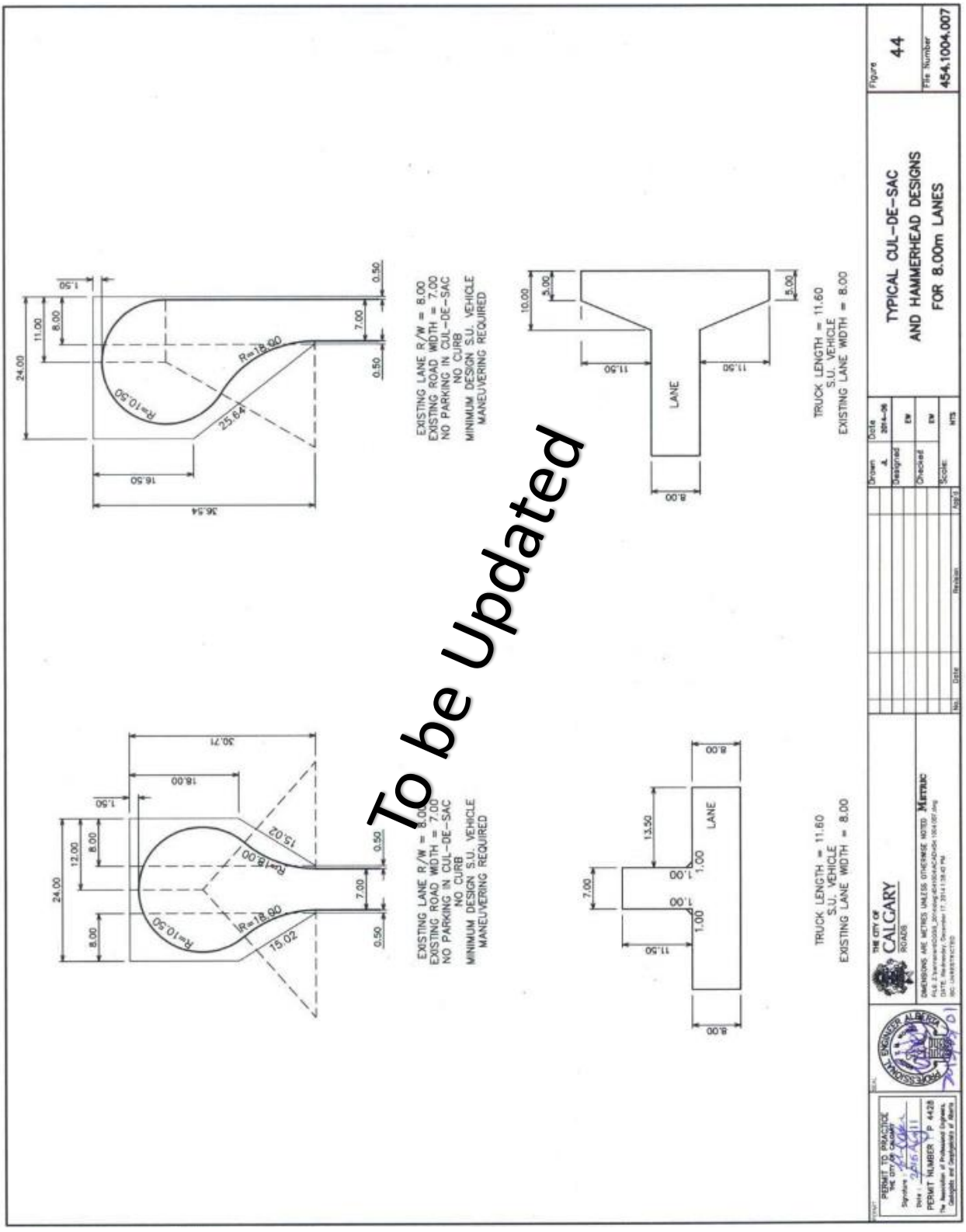
NOTE TO REVIEWERS: FIGURES FROM THE DGSS – FIGURES 36, 41, 42, 43, 44, 45 AND 46 – WILL REQUIRE MODIFICATION TO REFLECT REVISIONS TO TYPICAL CROSS SECTIONS AND TO UPDATE THE NUMBERING.

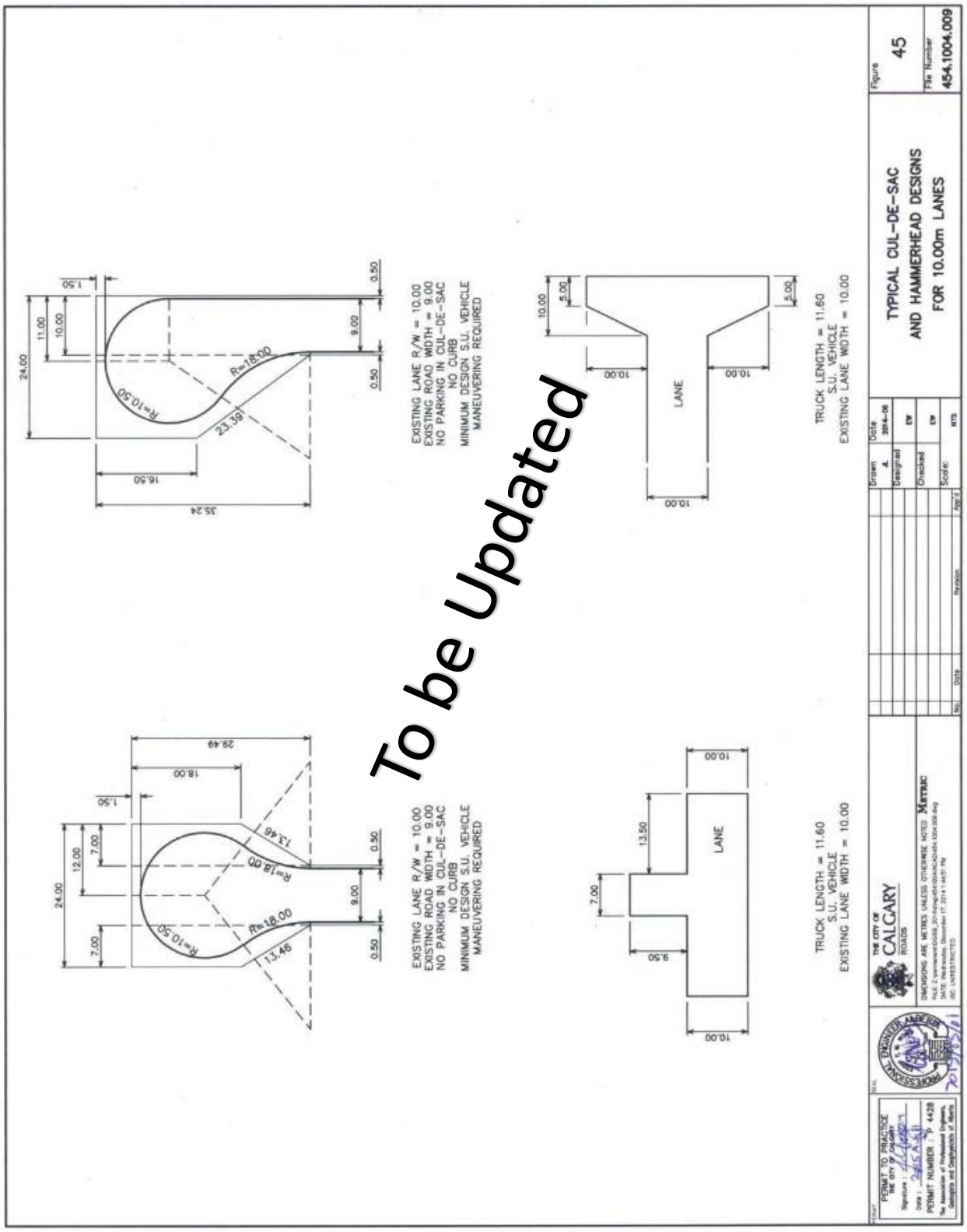


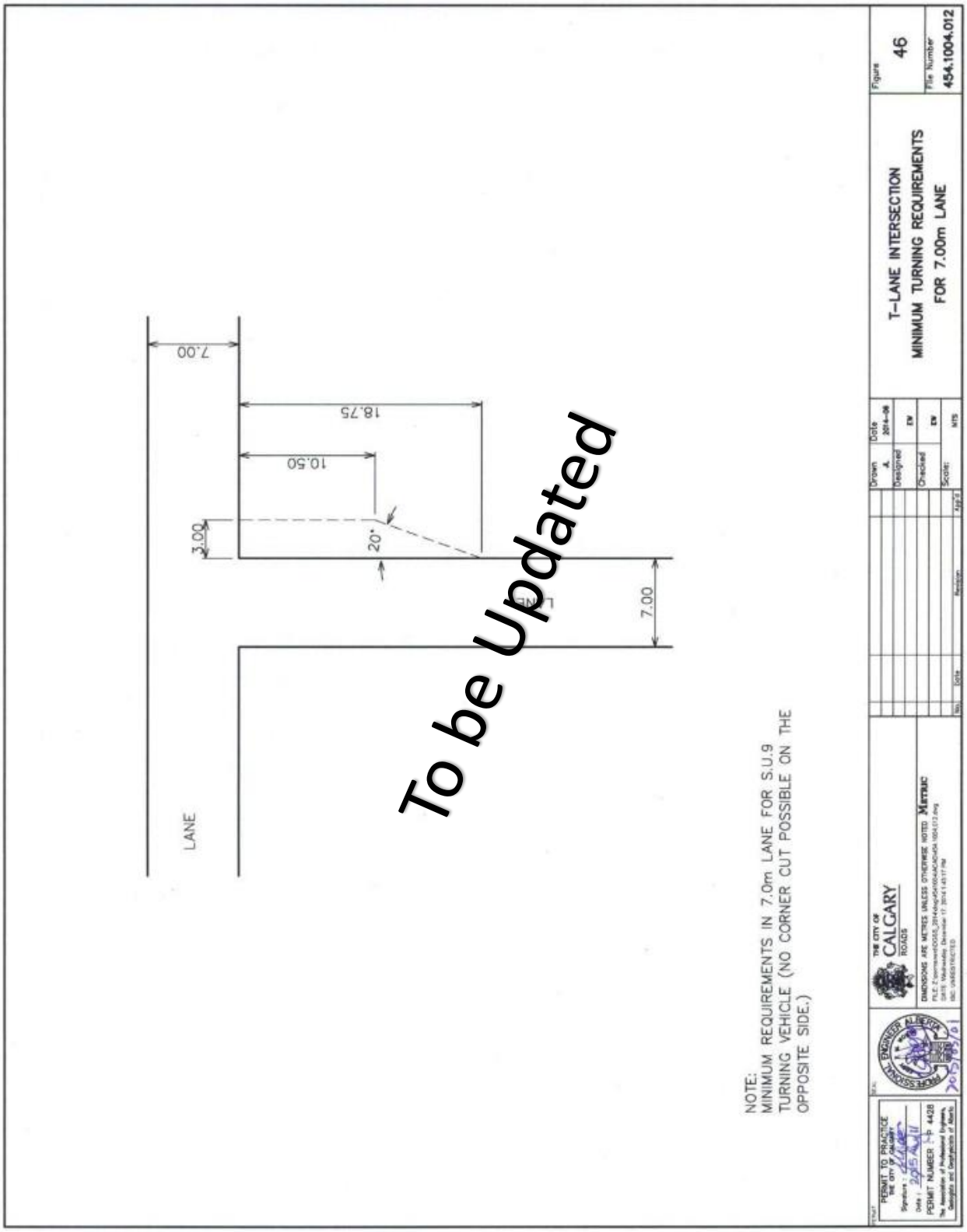

L.G.R.=10.50 MIN.
GRADE: MIN. 1%
MAX. 4%
L.G.R.=21.00 MIN.
To be Updated
PERMIT TO PRACTICE
THE CITY OF CALGARY
PERMIT NUMBER : P 4428
The Association of Professional Engineers, Geologists and Geophysicists of Alberta
THE CITY OF
CALGARY
ROADS
DIMENSIONS ARE METRES UNLESS OTHERWISE NOTED METRIC
No. Date Revision App'd
Drawn JL Date 2014-12
Designed EW
Checked EW
Scale: NTS
TYPICAL CUL-DE-SAC DESIGN
FOR RESIDENTIAL STREET
Figure 41
File Number 454.1004.004


STANDARD CUL-DE-SAC
RESIDENTIAL STREET (ABSOLUTE MINIMUM)
EXISTING R/W = 20.12
EXISTING ROAD WIDTH = 9.14
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN P. VEHICLE
MANEUVERING REQUIRED FOR SU VEHICLE
NOTE: FOR RETROFIT ONLY
EX. 1.53 MONO WALK
R=18.25
R=8.25
0.25
EX. 9.14
0.30
3.66
1.50
20.12
10.06
23.22
OFFSET CUL-DE-SAC
RESIDENTIAL STREET (ABSOLUTE MINIMUM)
EXISTING R/W = 20.12
EXISTING ROAD WIDTH = 9.14
NO PARKING IN CUL-DE-SAC
MINIMUM DESIGN P. VEHICLE
MANEUVERING REQUIRED FOR SU VEHICLE
NOTE: FOR RETROFIT ONLY
EX. 1.53 MONO WALK
R=18.25
R=8.75
0.25
EX. 9.14
0.30
3.66
1.50
26.00
14.24
5.88
1.18
16.62
14.23
29.78
TYPICAL CUL-DE-SAC DESIGNS
FOR 20.12m R.O.W. RESIDENTIAL STREET
(RETROFIT ONLY)
Figure
42
File Number
454.1004.002
THE CITY OF CALGARY
ROADS
PERMIT TO PRACTICE
PERMIT NUMBER: P 4428
To be Updated


TYPICAL CUL-DE-SAC
AND HAMMERHEAD DESIGNS
FOR 7.00m LANES
Figure 43
File Number 454.1004.011
EXISTING LANE R/W = 7.00
EXISTING ROAD WIDTH = 7.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED
TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 7.00
LANE
To be Updated


TYPICAL CUL-DE-SAC
AND HAMMERHEAD DESIGNS
FOR 8.00m LANES
Figure 44
File Number 454.1004.007
THE CITY OF CALGARY
ROADS
EXISTING LANE R/W = 8.00
EXISTING ROAD WIDTH = 7.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED
TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 8.00
LANE
To be Updated


TYPICAL CUL-DE-SAC
AND HAMMERHEAD DESIGNS
FOR 10.00m LANES
Figure 45
File Number 454.1004.009
EXISTING LANE R/W = 10.00
EXISTING ROAD WIDTH = 9.00
NO PARKING IN CUL-DE-SAC
NO CURB
MINIMUM DESIGN S.U. VEHICLE
MANEUVERING REQUIRED
TRUCK LENGTH = 11.60
S.U. VEHICLE
EXISTING LANE WIDTH = 10.00
LANE
THE CITY OF CALGARY
ROADS
To be Updated


7.00
18.75
10.50
3.00
20°
7.00
LANE
To be Updated
NOTE:
MINIMUM REQUIREMENTS IN 7.0m LANE FOR S.U.9
TURNING VEHICLE (NO CORNER CUT POSSIBLE ON THE
OPPOSITE SIDE.)
T-LANE INTERSECTION
MINIMUM TURNING REQUIREMENTS
FOR 7.00m LANE
Figure
46
File Number
454.1004.012
THE CITY OF CALGARY
ROADS

The maximum allowable length of a cul-de-sac is 120 m measured from the centerline of the intersection to the start of the bulb. Alternate emergency vehicle access is required for a cul-de-sac that exceeds 120m in length.

If the cul-de-sac is required for waste collection vehicles, a minimum radius of ??? Should be provided.

If the cul-de-sac is required for buses turning around, a minimum radius of 15.5 m should be provided. For temporary turnarounds, a radius of 18.5 m is required with post and cable fence.

The maximum length of the stem portion of "P" Loop should be 120 m. Alternative vehicle access is required within the stem if the length of the stem exceeds 120 m. NOTE TO REVIEWERS: P LOOP DOES NOT APPEAR TO BE DEFINED IN THE DGSS AND SHOULD BE ADDED.

Refer to Design Guidelines for Development Site Servicing Plans for additional requirements for emergency access through a P-Loop to private multi-residential, commercial and industrial sites. NOTE TO REVIEWERS: THIS REFERENCE WILL HAVE TO BE UPDATED PRIOR TO FINALIZING THE CHAPTER IF THE REFERENCED DOCUMENT NAME MAY CHANGE.

8.5 Emergency Access Requirements to Communities

NOTE TO REVIEWERS: THIS SECTION IN THE DGSS WAS ORIGINALLY PROVIDED BY THE FIRE DEPARTMENT. IT INCLUDED SIGNAGE AND MAINTENANCE DIRECTION NOT TYPICALLY FOUND IN A GEOMETRIC DESIGN MANUAL. THE OPTION TO CONSIDER COMPLETELY REMOVING THIS SECTION FROM THE STREET MANUAL AND INCLUDE IT AS PART OF THE LAND USE BYLAW OR FIRE DEPARTMENT ACCESS STANDARD USED FOR SITE DESIGN WAS NOT SUPPORTED. THE SECTION HAS BEEN EDITED TO LIMIT THE GUIDANCE TO THE NUMBER AND TYPE OF ACCESS REQUIREMENTS AND REFERENCE HAS BEEN ADDED TO THE FIRE DEPARTMENT ACCESS STANDARD.

The intent of this section is to provide direction with regard to minimum emergency vehicle access requirements to private roads, access lanes and parking lots within private sites. In addition to the guidance in this section and The City of Calgary Fire Department Access Standard, the developer must also ensure that all requirements of the National Building Code (Alberta Edition) are adhered to.

8.5.1 Public Access

Public and emergency access to a private site shall be provided through one or more access points from a public street with the access point built in accordance with the 2021 Standard Specifications for Road Construction.

8.5.2 Emergency Access

When required, an emergency access should be designed to the same minimum standards, with respect to width and grades, as the public access but has restricted access. The emergency access route will be made available to emergency vehicles and potentially the public during emergency situations for access and egress. A second or third public access route is preferred over an emergency access.

Residential Requirements - Based on Dwelling Unit Count

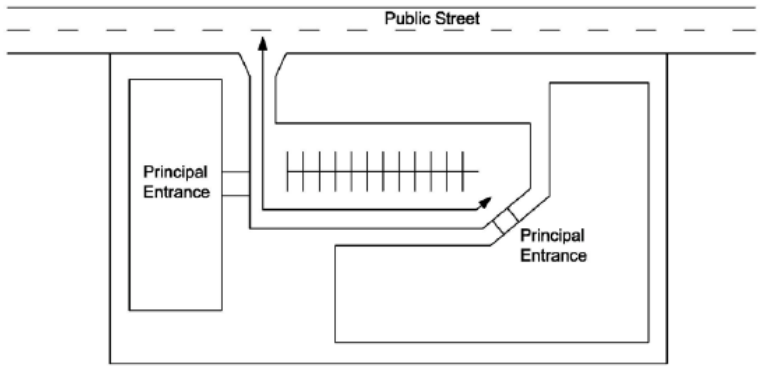
- Multi-residential projects with one to 100 dwelling units require at least one public access route. More access routes may be required when the access route distance exceeds 120m.

- Multi-residential projects with 101 to 600 dwelling units require at least one public access and one emergency access routes. A second public access route rather than an emergency access route is required when the access route distance exceeds 200m
- Multi-residential projects with 601 dwelling units or more require at least two public access routes and one emergency access route.

Residential Requirements - Based on Length of Access Route

The number and type of access routes may also be dependent on the length of the Measurement Line for projects with less than 600 dwelling units. The more stringent requirement between dwelling unit count and access route length will apply.

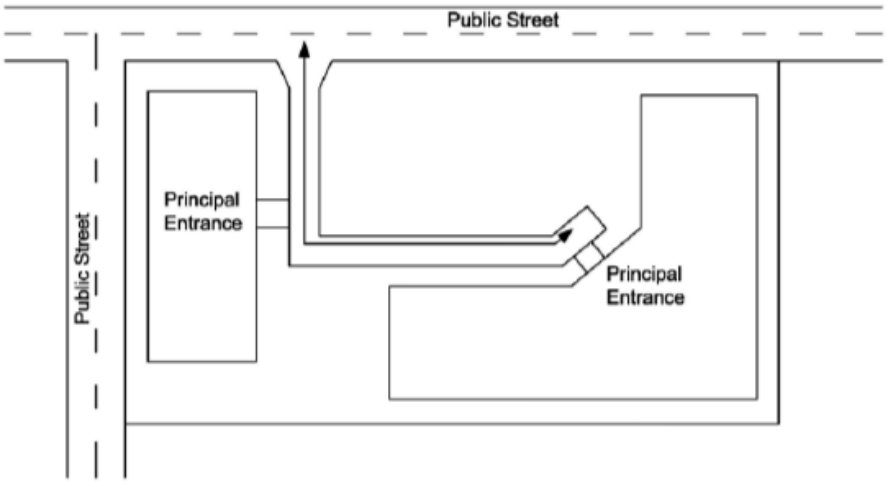
Measurement of Primary Access Route



The measurement of the first public access route (the "Measurement Line") is taken from the centre line of the public street to the closest point of the access route adjacent to the farthest building's principal entrance.

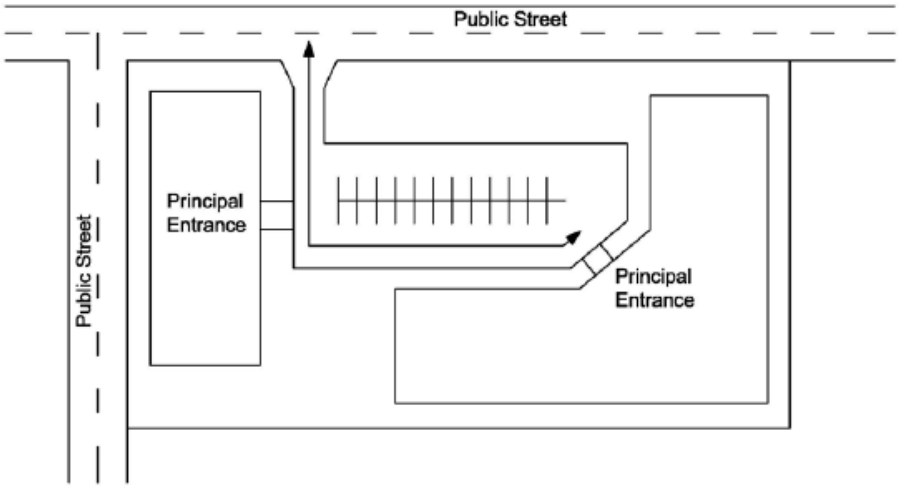
The number of access routes is also dependant on the length of the Measurement Line. The more stringent requirement between dwelling unit and access route length will apply. See the following sections.

Access Route less than 90m



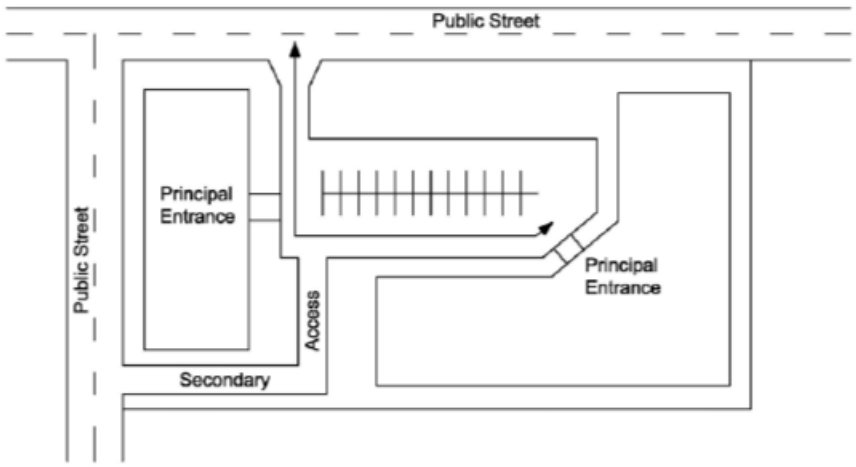
If the Measurement Line is less than 90m and the total number of dwelling units is 100 or less, no other access is required for Fire Department purposes.

Access Route Between 90m and 120m



If the Measurement Line is between 90m and 120m a turnaround is required. Turnarounds can be a parking area as shown, a hammerhead or bulb.

Access Route greater than 200m



If the Measurement Line is greater than 200 m, a second public access is required. The second public access should be connected to a public street. Right-in/right-out access/egress is acceptable when an all-turns access is not permitted.

The second public access is to be constructed as remote from the other public access as practical.

Residential Access Requirement Summary

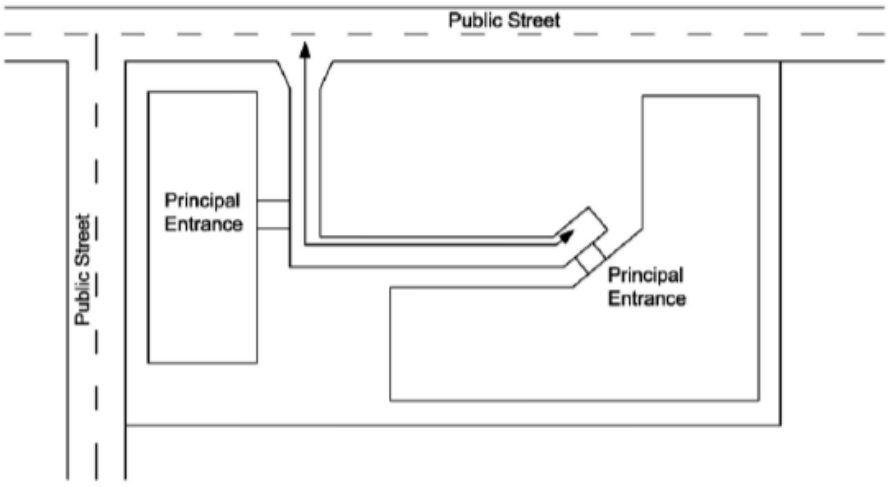
Below is the minimum access requirements based on dwelling units and Measurement Line length as detailed in the above sections.

	<90m	90m – 120m	120m – 200m	>200m
<101 Dwelling Units	Single access is suitable.	Single access with a turnaround required.	2 accesses required (second public or emergency access route).	2 accesses required (second public access route only).
101 – 600 Dwelling Units	2 accesses required (second public or emergency access route).			2 accesses required (second public access route only).
> 601 Dwelling Units	3 accesses required (only one emergency access is permitted).			

Non-Residential Requirements - Based on Parking Stalls

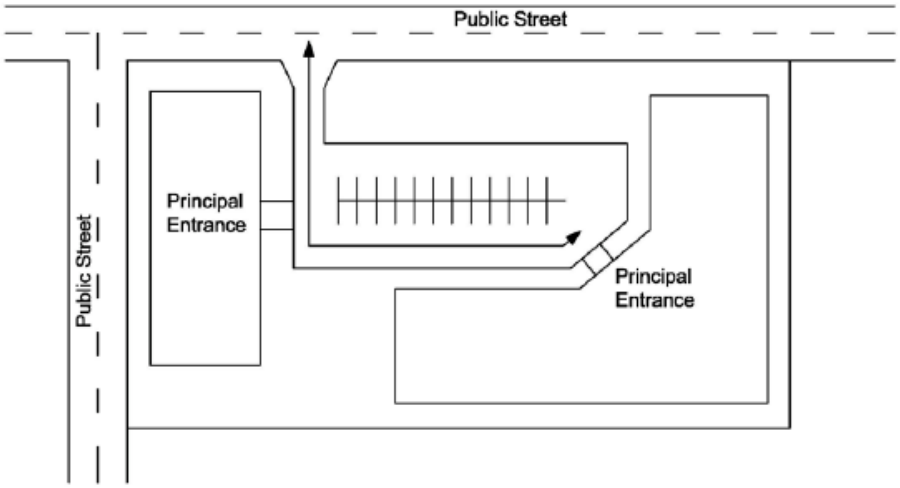
- Non-residential projects with 0 to 1,250 parking stalls require at least one public access
- Non-residential projects with 1,251 to 3,000 parking spaces require at least two access (one public access and a second public or emergency access point.
- Non-residential projects with greater than 3,000 parking stalls require at least three access points (two public accesses and a third public or an emergency access)

Access Route less than 90m



If the Measurement Line is less than 90m and the total number of dwelling units is 100 or less, no other access is required for Fire Department purposes.

Access Route Between 90m and 120m

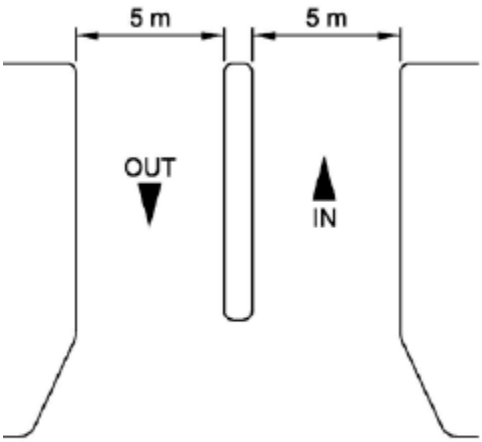


If the Measurement Line is between 90m and 120m a turnaround is required. Turnarounds can be a parking area as shown, a hammerhead or bulb.

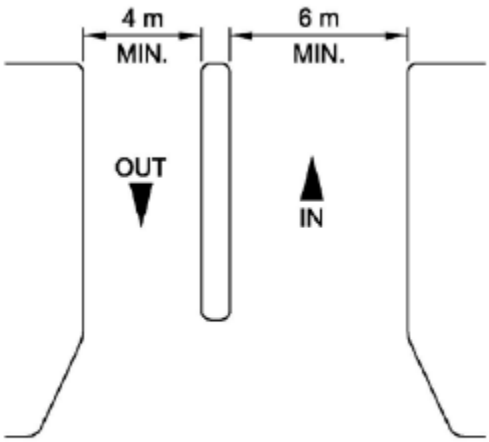
8.5.3 Split-Entry Access Driveways

A split-entry driveway (divided by a median creating an entrance and exit) will not be deemed to be the primary access on one side and an emergency access route or secondary access route on the other side.

One side of the access route driveway must be a minimum of 6 m wide.



Unacceptable Widths



Acceptable Widths
Access width not less than 6m

Chapter 9.0 Intersections

NOTE TO REVIEWERS: THE INTENT OF THIS CHAPTER:

- WILL ALIGN WITH CHAPTER 9 OF THE TAC GDG AND CONSOLIDATE CONTENT FROM THE DGSS AND COMPLETE STREETS GUIDE RELATED TO THE DESIGN OF INTERSECTIONS INCLUDING DESIGN ELEMENTS FOR WALKING, WHEELING, AND CYCLING
- WILL INCLUDE CONTENT FROM DGSS SECTION B. ROAD CLASSIFICATIONS – COMPLETE STREETS RELATED TO INTERSECTION DESIGN, SECTION C. CORNER RADII & CORNER DETAILS, SECTION E. ROADWAY DESIGN STANDARDS 1) STANDARD INTERSECTION DESIGN ELEMENTS, SECTION G. RELATED TO CROSSWALKS, AND SECTION I. RELATED TO TRAFFIC SIGNALS FOR TRANSIT
- WILL INCORPORATE CONTENT FROM THE DRAFT CALGARY TRANSIT BUS DESIGN GUIDELINE

Chapter 10.0 Traffic Calming

NOTE TO REVIEWERS: THE INTENT OF THIS CHAPTER:

- WILL CONSOLIDATE AND UPDATE CONTENT FROM THE DGSS AND COMPLETE STREETS GUIDE RELATED TO THE DESIGN OF TRAFFIC CALMING ELEMENTS

Appendix A: City of Calgary Design Exception Form

NOTE TO REVIEWERS: THE DESIGN EXCEPTION FORM IS CURRENTLY BEING REVIEWED AND UPDATED TO ALIGN WITH THE STREET MANUAL REQUIREMENTS AND CITY OF CALGARY REVIEW AND APPROVAL PROCESSES. AN UPDATED FORM WILL BE CIRCULATED WITH FUTURE VERSIONS OF THE STREET MANUAL.