DS-27
BUS RAPID TRANSIT (BRT) ARCHITECTURE DESIGN STANDARD

Version 1

February 2023

THIS SECTION COVERS:

- Public Realm
- Stop Architecture (Platform & Shelter)

Metrolinx Design Standards
Metrolinx Bus Rapid Transit (BRT) Architecture Design Standard
Publication Date: February, 21, 2023

This document was prepared by AECOM

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1.0 Introduction

1.1 PREFACE

This is the first edition of the DS-27 Bus Rapid Transit (BRT) Architecture Design Standard document.

The purpose of this document is to ensure a consistent, seamless, safe and inclusive customer experience, as well as a highly functional and maintainable transit environment for Metrolinx BRT assets. It incorporates conclusions from lessons learned on similar projects as well as contemporary and emerging design paradigms that facilitate efficiency and maintainability while optimizing the customer experience. The focus of this document is on assets within the immediate stop environment and emphasizes coordination with municipal partners and their relevant standards for shared and interface conditions. The content of this document has been sequentially organized to guide the user from the overall vision of the regional network, highlighting priorities and principles, through to elaboration via built environment requirements.

This standard is applicable to all Metrolinx BRT projects, and provides architectural and urban design requirements for at-grade stops and associated customer-facing infrastructure.

Suggestions for revision or improvement should be sent to Metrolinx Stations & Facilities Engineering, Attention: Senior Manager, Design Standards.

1.2 DESIGN PRINCIPLES FOR A REGIONAL NETWORK

The Metrolinx vision for transit in the Greater Golden Horseshoe Area (GGHA) is to deliver a seamless and integrated end-to-end customer experience that is supported and reinforced by appropriate architectural, landscape, urban design, and integrated engineering solutions across the network. Metrolinx is planning, designing, and building projects that will shape the regional transit network of the future. ***Everyone in the region is a potential customer***. A positive customer experience for all customers will:

- support increased cross-boundary travel, and increased transfers;
- enable more seamless and easier first and last mile options;
- support a shift in primary trip purpose from commuting to local and regional travel; and
- ultimately build ridership and revenue across the network.

The objective is to provide a **One Network** experience that feels like a seamless trip – from planning, booking, payment, access, use, and transfer to arrival at the destination station.

Metrolinx seeks to develop an integrated transit network and is responsible for delivering GO Expansion, subways, light rail, and bus programs, including BRT. A consistent consideration for the entire end-to-end customer journey is required to create a highly functional system with a connected customer experience.

Understanding and thoughtfully addressing the customer experience across the many touchpoints of the transit journey form the foundation of this holistic design process. In addition, given the capital investment in transit infrastructure intended to serve and drive economic development in the GGHA for the foreseeable future, it is imperative that a future thinking mindset is engaged, with design solutions that strive to be adaptable, enduring, and responsive to the evolution of customer needs and the future of mobility.

The Principles

The following six design principles are overarching values that shall inform and guide the design of customer facing elements and strive to integrate the physical, digital, and human aspects of the end-to-end customer journey:

- Seamless
- Intuitive
- Inclusive
- Safe
- Reliable
- Thoughtful

These principles largely apply to customer-facing elements and touchpoints such as payment experience and transfer experience, while thoughtfully considering spatial adjacencies and sensory aspects of back-of-house elements that may impact the quality of a customer's experience. The design principles are underpinned by safety and making all customer journeys as safe as possible.

These guiding principles are set out to ensure that the architectural, interior, landscape, and urban design includes the following:

1.2.1 Seamless

1.2.1.1 The end-to-end customer experience shall be well-connected, convenient, and friction-free to keep customers on the move.

a) Stop and Station sites and applicable infrastructure shall be seamlessly connected to the public realm and right of ways and shall maximize opportunities to integrate into the surrounding community and urban fabric. Design solutions shall thoughtfully consider future expansions, and existing and future connections to adjacent local and other multi-modal transit services and shall highlight potential future opportunities for integration with the surrounding community and urban fabric.

b) Travel distances shall be minimized for all customers at all journey touchpoints, particularly at the points of transfer between one transit service/mode to the next.

   i. Routes taken by customers shall be clear, direct, and as short as possible.

   ii. The design shall promote and facilitate ease of transfer between transit modes and connections.

c) Infrastructure elements, such as structural, mechanical, and electrical shall be seamlessly integrated.

   i. An integrated approach to all systems including drainage, lighting, and audio equipment shall ensure that these elements are visually less prominent for aesthetic consistency, acoustical performance, and overall quality.

   ii. Simplicity in the appearance of the infrastructure shall be optimized to conceal systems and prevent vandalism.

   iii. Lighting shall be well organized and, where possible, integrated into the structure and built environment.

1.2.2 Intuitive

1.2.2.1 The end-to-end navigation experience shall be simple, predictable, and consistent throughout the region.

a) Landscape shall provide a consistent vision that includes a primary strategy of tree groves and ornamental grasses of low maintenance native species.

   i. Landscaping shall maximize planting opportunities and complement site and architectural design.

b) Consistent design treatments shall be applied along major pedestrian routes to provide a recognizable experiential cue to customers and guide them towards the Stop or Station and platform. These pathways shall create seamless connections through the Stop or Station environment and also become important identifiers for customers.

c) Visual cues, features and elements shall support intuitive wayfinding and highlight key decision-making points, such as pedestrian access points and vertical circulation, through the use of lighting, colour, and/or materiality.

d) Simplified volumes and forms shall be constructed along consistent horizontal and vertical data. Consistent approach to form making, building volumes, and detailing, shall reinforce an architectural signature that is recognizable across the system.

e) The composition of elements and their visual hierarchy should reinforce a sense of order and help customers find their way.

   i. Strategy for wayfinding and signage shall always take precedence over advertising.

   ii. Space plan shall support wayfinding, simplicity and accessibility, and aid in clarity of the locations of fare purchase and payment devices.

   iii. Visual clutter, distractions and conflicts with other visual elements shall be limited. Services shall be concealed yet accessible. A sense of order, comfort, and security shall be created to ensure a straight forward and enjoyable customer experience. Designs shall present balanced, clutter-free spaces that are legible and easily understood by all users.

Customers needs and amenities

f) The design shall facilitate passenger flows.

   i. All passenger amenities, services, and security items shall be thoughtfully consolidated to achieve maximum visibility, circulation space and clear, direct pedestrian flow.

ii. The strategy for organizing the hierarchy and consistency of customer amenities, including fare equipment and devices, seating, and waste receptacles shall be clear.

g) The end-to-end information/notification experience shall be holistically considered.

i. Infrastructure that supports the end-to-end information and travel notifications experience for customers shall be holistically considered, including static, digital, reliable Wi-Fi connectivity and on-board strategies. Alignment between physical and digital messaging and alerts, both on site and on the move, shall be ensured.

ii. Elevator transfers shall be minimized wherever possible.

1.2.3 Inclusive

1.2.3.1 The end-to-end customer experience shall serve the diverse needs and abilities of all travellers regardless of age, gender, income, or familiarity with the transit system.

a) Access shall be provided for all through the implementation of the principles of Universal Design.

i. An integrated, convenient, usable, and safe experience shall be provided for customers accessing the site using diverse modes and services, such as Specialized Transit, through designs that are inherently accessible to people with diverse abilities, are simple and intuitive to use, convey perceptible information, minimize hazards, and are designed with appropriate size and space for use regardless of a user's age, body size, posture, or mobility to promote ease of movement for all.

ii. The design shall aim to elevate the customer experience when accessing from the public realm onto the site. It shall acknowledge diversity and respond to customer's varying needs and abilities along every point of the customer journey. Provision of an equitable and inclusive experience for customers with disabilities shall be at the forefront to inform the design.

iii. Designs shall prioritize step-free routes as the main path of travel that are as direct as possible.

Customers needs and amenities

b) Placement of elements, services, and amenities shall be such that they do not impede passenger flows; instead, they shall be consistently and prominently located to facilitate ease of use for the full spectrum of users.

c) Where appropriate, customer information may need to be provided in other formats that best meet the needs of a broad range of customer needs, including physical and language.

1.2.4 Safe

1.2.4.1 The design shall ensure customers feel safe throughout their end-to-end journey, at any time of day and at any location.

a) Crime Prevention Through Environmental Design (CPTED) principles shall be adopted and thoughtfully considered across all touchpoints of the journey.

b) Provisions shall be made to prevent any potential conflicts between pedestrians and vehicles.

Architecture

c) Openness through clear views/sight lines.

i. Visual transparency to, from, and between the infrastructure shall be optimized to support the principles of CPTED, increase safety and security (actual and perceived) and promote ease of wayfinding.

ii. Transparency and openness along all public-facing façades or façades facing open spaces shall be emphasized while considering building energy performance.

d) Lighting design shall aim to enhance a customer's sense of safety and security.

Customer needs and amenities

e) Consideration of locations of equipment, such as fare payment devices and vending shall support a customer's safety (both actual and perceived).

f) Consideration of locations and function of safety devices, such as Passenger Assistance Intercoms around Station site shall support a customer's safety (both actual and perceived).

1.2.5 Reliable

1.2.5.1 Public transit must be a trusted choice of travel in the region, with a system designed to support reliability through ease of maintenance and operations, durable assets, and a consistent customer experience from end to end. The journey should include real time, location-based information, on time service, and the design shall be clean, durable, and comfortable.

Site and public realm

a) A clear strategy shall be provided for detailing repeated architectural elements using a Kit-of-Parts to aid a customer's recognition of essential journey touchpoints.

Architecture

b) Simplified, integrated, and modular materials and hardware design that is consistent across the line shall be provided.

   i. Provision shall be made for consistent elements, placement, and installation methodology.

   ii. Provision shall be made to promote ease of maintenance and a consistent and current appearance that provides a sense of order, comfort, and security.

   iii. Materials and finishes shall be durable and resistant to vandalism through the provision of tamper-proof design including graffiti-proof, easy-to-clean surfaces.

   iv. Materials and finishes shall have a consistent palette of high-quality materials, colour, and pattern, scaled in proportion to reflect the typical cladding and glazing module.

Sustainability

c) The design shall reflect sustainability and climate resiliency requirements as per DS-05 Sustainable Design Standard, and redundancy to ensure continuous access to all public areas in the Stop or Station.

   i. Infrastructure shall be designed to reduce climate vulnerabilities over the projected asset life cycle.

   ii. Architecture and landscape design shall support a robust transportation system that contributes significantly to regional sustainability goals through a comprehensive approach to sustainability that is resilient now and in the future with an emphasis on minimizing energy use, maximizing daylight, managing stormwater, and minimizing regional environmental impacts, and reducing GHG emissions and embodied carbon.

1.2.6 Thoughtful

1.2.6.1 Customer-facing facilities shall be designed to be traveller-centric, personalized, and future-ready. Thoughtful consideration shall be given to address pain points and create a positive, innovative, and delightful experience.

a) Customer-facing infrastructure shall be timeless and enduring with massing and design that respond to the existing and planned urban context and character of the municipalities and their diverse neighbourhoods along the corridor.

b) The design should draw inspiration from the unique history and context of the site and reflect the values and character of its community; celebrate locality, highlight unique landscapes, and celebrate heritage. Its location and orientation on site shall be responsive to the neighbourhood and municipal stakeholder considerations, services, and retail that respond to local community needs.

   i. It is important to acknowledge the idiosyncratic nature of the system and the fact that the infrastructure has developed in response to its unique place and time of creation.

c) Accommodate for future change including changing climatic conditions, development opportunities, socio-economic trends, customer profiles and behaviour, and the evolution of mobility service delivery.

d) The design shall respond to the impact of local site conditions. Properties impacted and demolished for the project shall be left in an interim condition that includes a primary landscape strategy that limits the need for protective barrier.

e) The design shall provide the flexibility to allow for future technologies and recognize key trends in transportation technology to ensure Stop or Station environments remain responsive and relevant in the future.

f) All Infrastructure, including ancillary structures, shall be located to support the potential for future development and minimize impact to communities.

g) Lighting shall enhance customer experience.

   i. Special lighting shall be provided to highlight architectural, interior, and landscape design features and zones to reinforce and aid in safety and intuitive wayfinding.

h) Vents, mechanical elements, electrical and IT System Cabinets, etc. shall be generally screened from public view using consistent screen and material palette that is part of the overall line-wide language.

Customer needs and amenities

i) Customer comfort and protection

   i. Where required, the design shall maximize customer comfort and protection from rain, wind, snow, and sun, and maintain customer thermal and acoustical comfort levels.

1.3 VISION AND DESIGN APPROACH

Metrolinx is committed to the delivery of a world-class, connected, and sustainable transit network. The agency's stated goal is to provide a safe, reliable, convenient, and seamless customer experience that encourages the use of the transit system to reduce traffic and carbon emissions.

A strong public transit architectural language, an urban design integration responding to local scenarios, and a well-connected transport system are essential to ensuring that Metrolinx responds to and exceeds current customer needs and expectations, as well as the future projected growth, building ridership, and revenue across the network. To help meet the transformational vision and aspirations of Metrolinx, architects and designers must embrace a holistic, forward-thinking mindset that delivers solutions that are future-proof, creative, adaptable, enduring, and responsive to the changing world of intelligent transport and mobility.

The success of this ambitious program depends on raising customer satisfaction and fostering loyalty and confidence. The design imperative is to ensure the comfort and wellbeing of every single user of whatever gender, age, ability, or level of comprehension.

Different modes of mobility have in recent years been created and implemented around the world and the BRT represents one of the alternatives that have evolved as a solution connecting urban and suburban areas, reaching remote locations, and connecting them with the main transit hubs.

When the Yonge Subway Line opened in the City of Toronto in 1954, it presented a common architectural language for the network, stops, stations, and facilities, defined by simple, rectilinear shapes and consistent materials. For stops, this was portrayed by the metal framing with glass and the iconic transit logo, while in the stations, it was through the use of brick, concrete, and Vitrolite glass. This deliberate repetition of materials across stops and stations brought a sense of consistency and coherence to the entire line and formed the basis for the transit network of uniquely Torontonian identity. The strong visual thread tying the system together or kit-of-parts approach adopted back then has been used many times and has very clear advantages.

The BRT Architecture Design Standard provides a framework for the development of public-facing elements of the BRT network. A kit of parts approach is used to enable projects to be scoped relative to their need, budget, and projected ridership. The approach prioritizes the customer by creating uniform, intuitive journeys. The end result is a sense of familiarity with the network environment, which in turn delivers a consistent customer experience and promotes the recognition of a clear BRT identity.

1.4 THE CUSTOMER JOURNEY

The customer journey diagram (Figure 1-1) illustrates the stages, challenges, emotions, and touchpoints that customers experience when planning and executing their journeys. A customer's journey starts well before they leave their home – it begins when they have identified a reason to travel.

The customers' first touchpoint is at the planning stage of their trip. At this point, the customer decides whether or not to use the BRT transportation network. Important factors in this decision-making process will be availability through digital channels of user-friendly, accurate information, seamless connectivity across all modes, and easy access to the network. If customers cannot immediately see how to get to their destination and back again, or access an onward connection, they are less likely to make a positive choice.

Each phase of the journey contains touchpoints where customers interact with a specific BRT product, service, system, or part of the actual facility. The journey diagram captures these touchpoints, identifies the elements that are important to customers and informs design development of future BRT infrastructure.

The journey diagram is organized into four main phases, which, starting with arrival, mirror the chapters presented in this document. Each of these phases contains one or more steps relating to the architecture of the site or building.

1.4.1 Arrival

a) Arrival is the first physical touchpoint. Customers will reach the BRT Stop on foot or by bicycle, car, or other mode of transportation.

b) Irrespective of customers' choice, the definition of planning area is typically considered by walking time to the Stop, neighbourhood characteristics, and density around it.

1.4.2 Access to the BRT Network

a) Access to the BRT network refers to the point of entry at a Stop or Station. In the at-grade BRT Stop, the platform entry point is this step in the customer journey. For grade-separated Stops or Stations, this would be the building entrance.

b) Consistent architectural expression along the BRT network, entry access point, and identification provides a sense of familiarity and aid wayfinding and navigation.

c) For at-grade BRT Stops, the vertical circulation in the shape of a sloped walkway is located at the pedestrian access points.

1.4.3 Transaction

a) Transaction refers to all the transactional touchpoints that a customer expects at a Stop or Station, specifically:
   i. planning of their trip;
   ii. receiving assistance;
   iii. waiting for the next BRT bus; and
   iv. paying the fare for their trip.

b) At BRT stations, certain transaction activities may occur, such as:
   i. retail and washrooms, which are present at interchange stations; and
   ii. supporting infrastructure (i.e., vertical circulation required at grade-separated Stop/Station typology).

1.4.4 Platforms

a) In the BRT network, associated infrastructure supports the customer journey, such as guideways and dedicated lanes.

b) Once the customer alights the BRT network, there are supporting elements that help the customer during their progression towards their final destination, such as:
   i. walkway paths;
   ii. signage and wayfinding; and
   iii. continuity of the BRT network architectural language and its identity.

1.5 CUSTOMER JOURNEY TOUCHPOINTS & INFRASTRUCTURE

Customers interact with the BRT facilities at the customer touchpoints. Providing a similar look and feel throughout the BRT network fosters a sense of consistency and familiarity for customers, aiding in providing a seamless and user-friendly transit experience. The customer touchpoints and infrastructure diagrams (Figure 1-1, Figure 1-2, and Figure 1-3) are intended to visualize a consistent approach to the placement of customer-facing infrastructure and site elements across the BRT line.

BRT Stop Customer Journey:
Touchpoints & Infrastructure

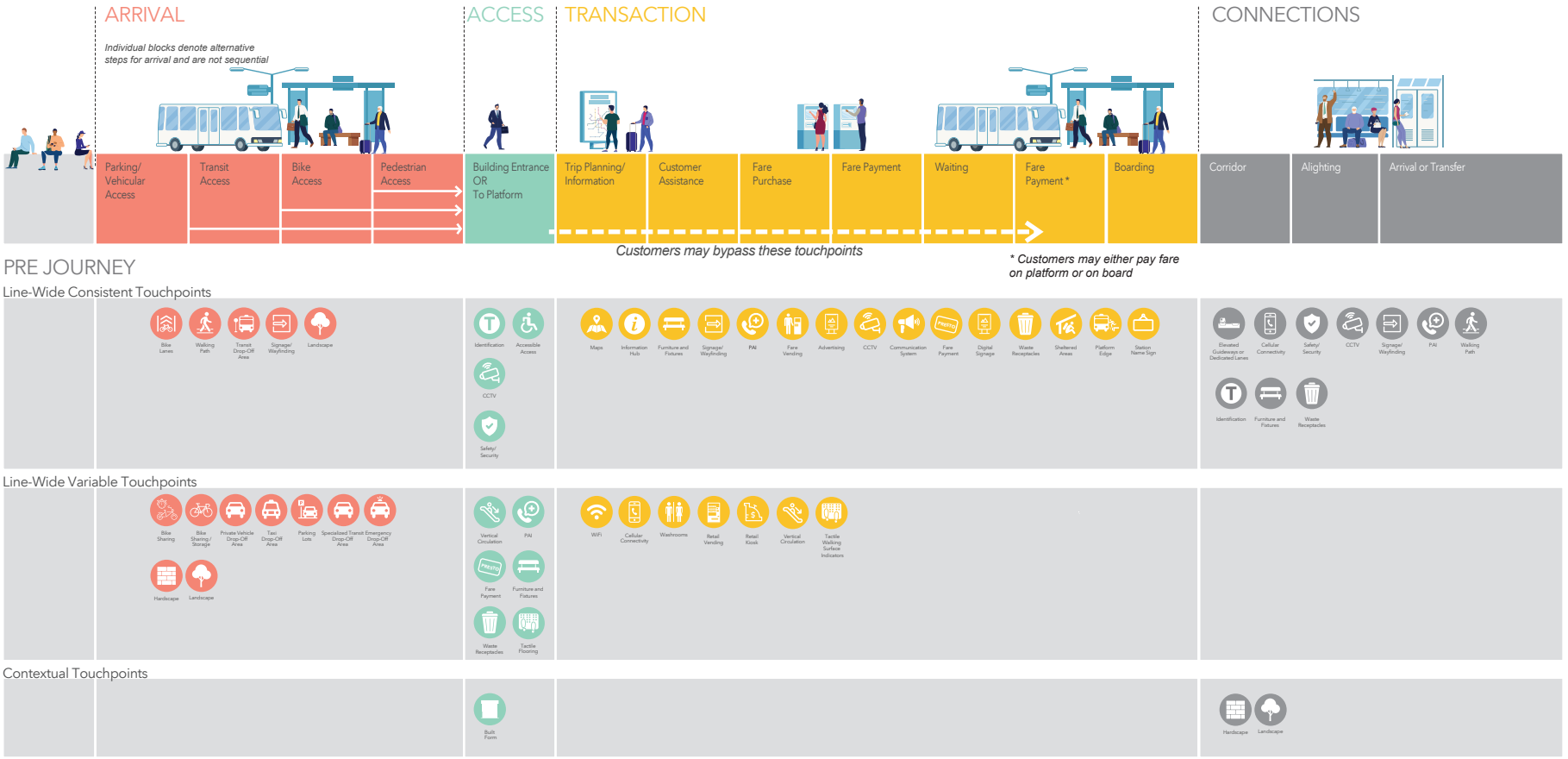


Figure 1-1: Customer journey: touchpoints and infrastructure – BRT Stop

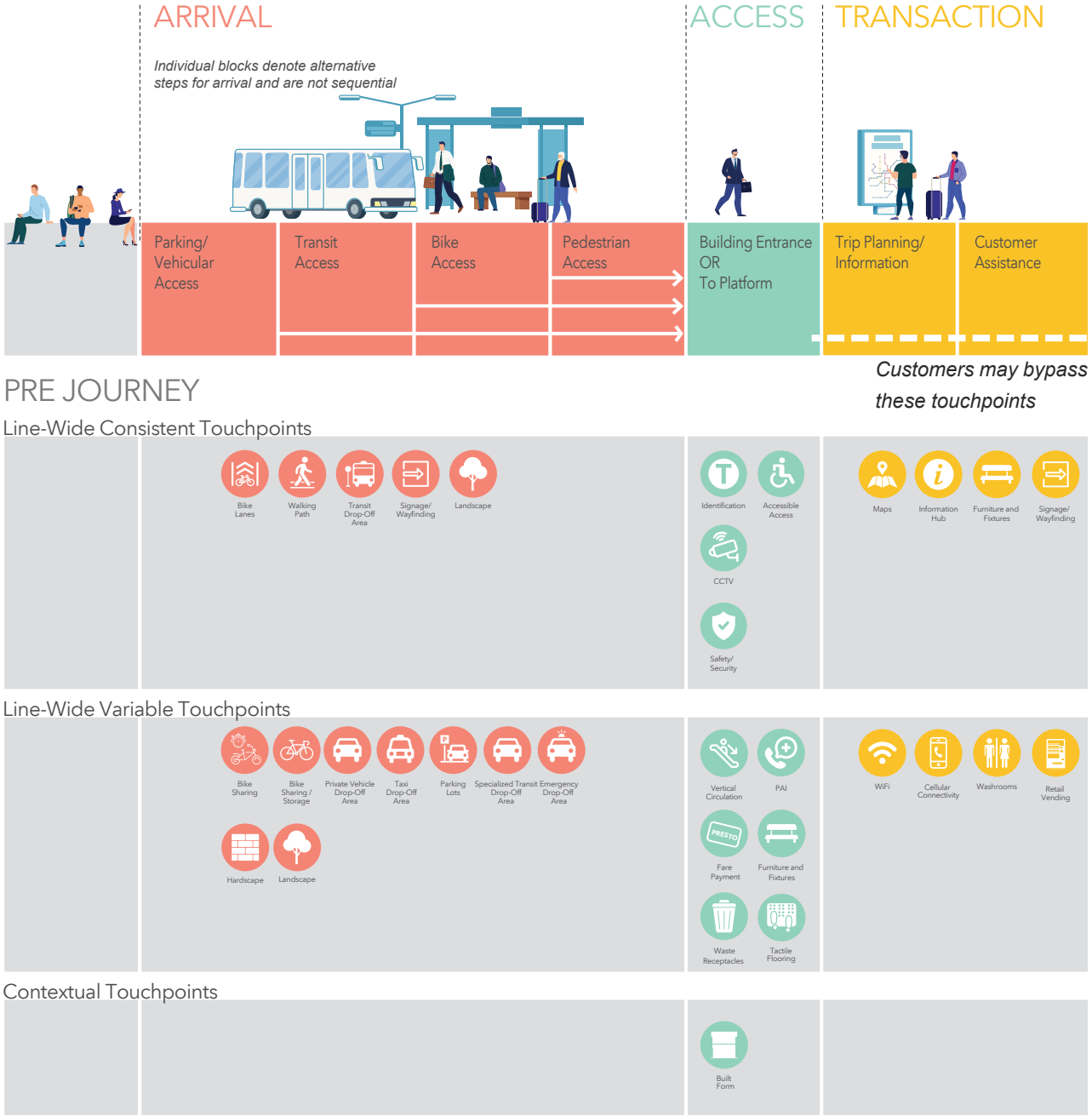


Figure 1-1A: Customer journey: touchpoints and infrastructure – BRT Stop

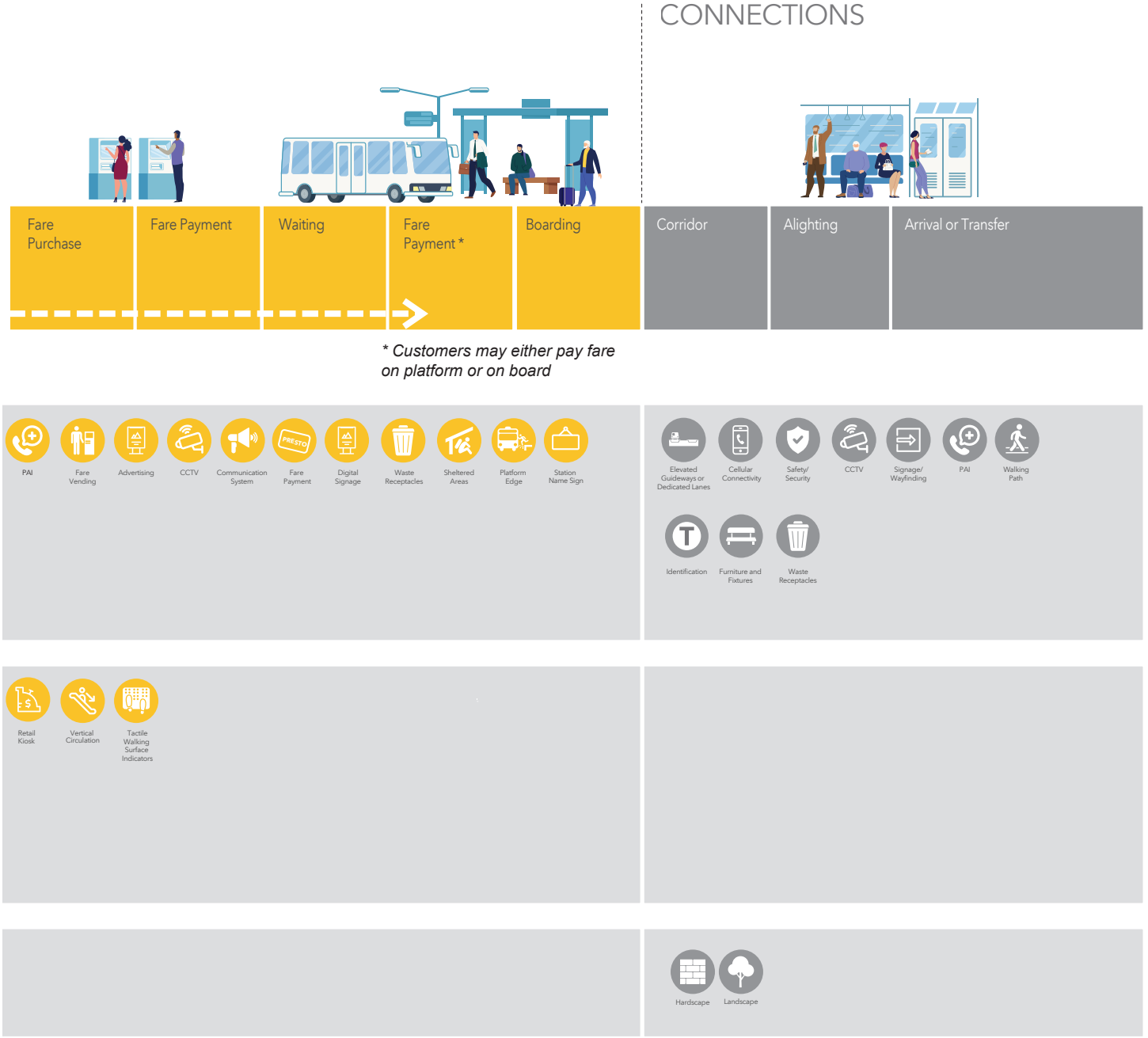


Figure 1-1B: Customer journey: touchpoints and infrastructure – BRT Stop

BRT Stop Touchpoints:

Open Shelter

ARRIVAL

Line-Wide Consistent Touchpoints

Bike Lanes, Walking Path, Transit Drop-Off Area, Signage/ Wayfinding, Landscape

Line-Wide Variable Touchpoints

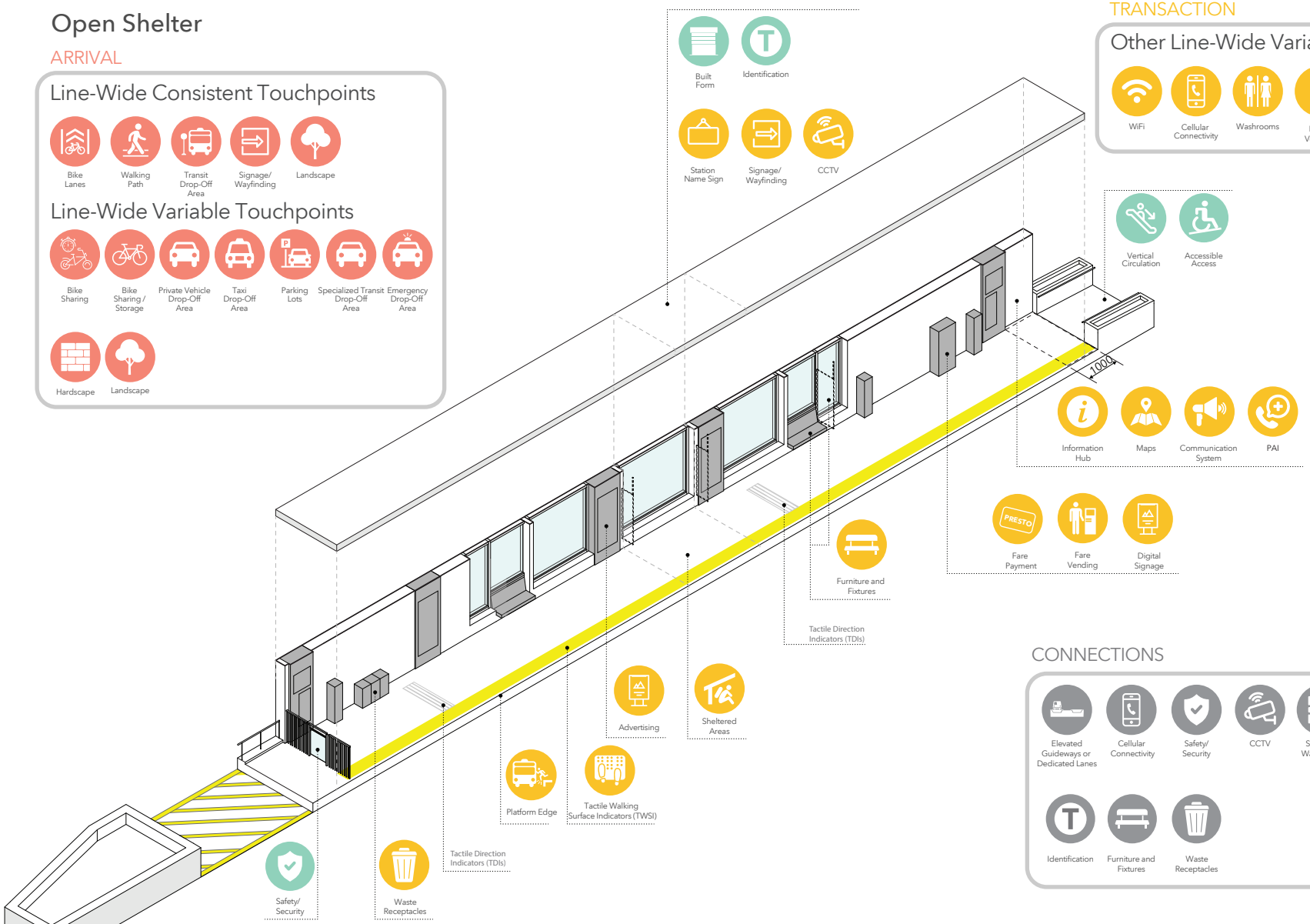
Bike Sharing, Bike Sharing / Storage, Private Vehicle Drop-Off Area, Taxi Drop-Off Area, Parking Lots, Specialized Transit Drop-Off Area, Emergency Drop-Off Area

Hardscape, Landscape

ACCESS + TRANSACTION

Other Line-Wide Variable Touchpoints

WiFi, Cellular Connectivity, Washrooms, Retail Vending, Retail Kiosk, Vertical Circulation



CONNECTIONS

Elevated Guideways or Dedicated Lanes, Cellular Connectivity, Safety/ Security, CCTV, Signage/ Wayfinding, PAI, Walking Path

Identification, Furniture and Fixtures, Waste Receptacles

Figure 1-2: Customer journey: touchpoints and infrastructure – median BRT Stop – open shelter

BRT Stop Touchpoints:

Pass-Through Shelter

ARRIVAL

Line-Wide Consistent Touchpoints

Bike Lanes, Walking Path, Transit Drop-Off Area, Signage/ Wayfinding, Landscape

Line-Wide Variable Touchpoints

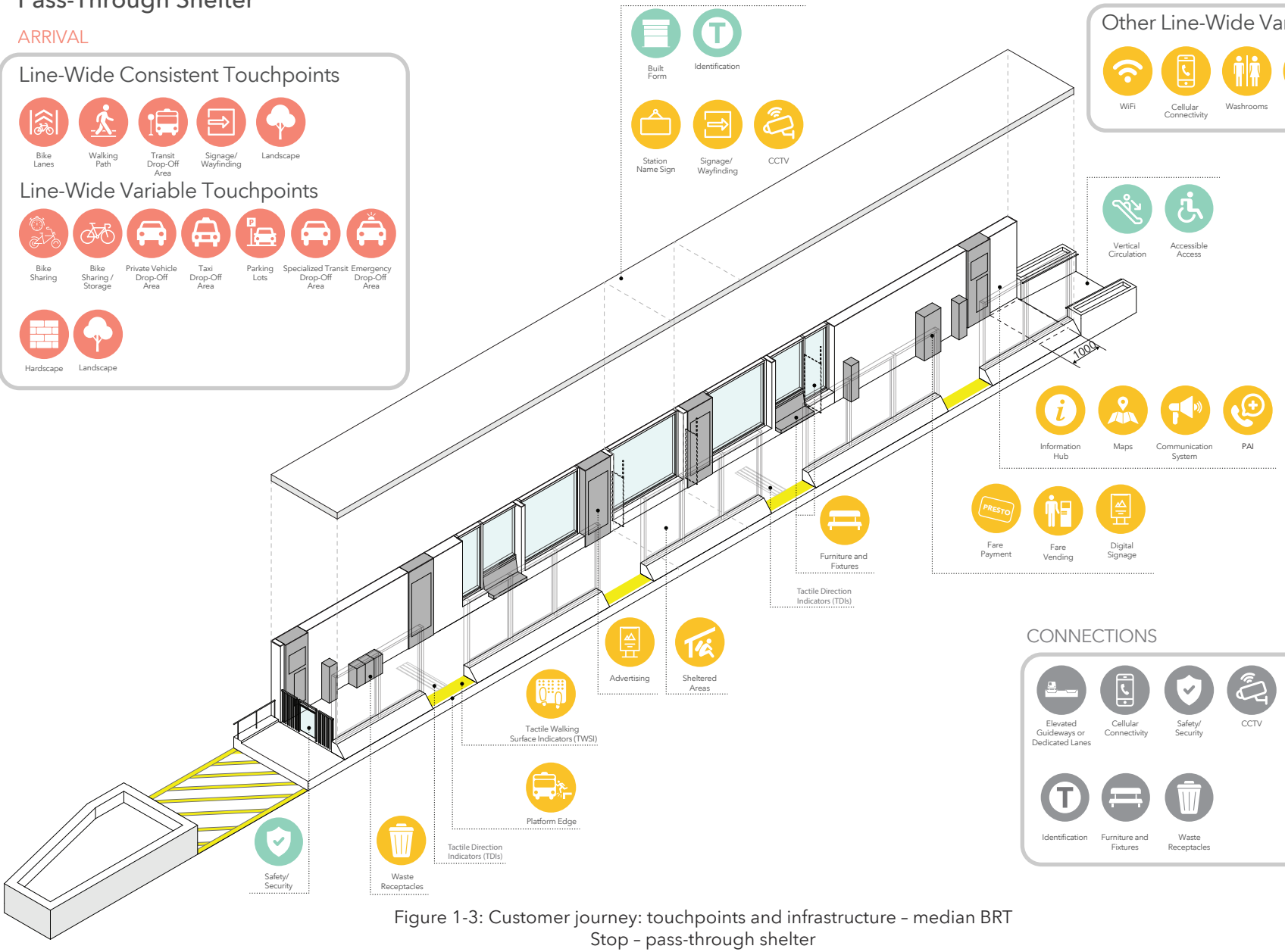
Bike Sharing, Bike Sharing / Storage, Private Vehicle Drop-Off Area, Taxi Drop-Off Area, Parking Lots, Specialized Transit Drop-Off Area, Emergency Drop-Off Area

Hardscape, Landscape

ACCESS + TRANSACTION

Other Line-Wide Variable Touchpoints

WiFi, Cellular Connectivity, Washrooms, Retail Vending, Retail Kiosk, Vertical Circulation



CONNECTIONS

Elevated Guideways or Dedicated Lanes, Cellular Connectivity, Safety/ Security, CCTV, Signage/ Wayfinding, PAI, Walking Path

Identification, Furniture and Fixtures, Waste Receptacles

Figure 1-3: Customer journey: touchpoints and infrastructure – median BRT Stop – pass-through shelter

1.6 BRT LANE OPTIONS

Traffic congestion, waiting at traffic signals, and roadway incidents are sources of bus delay. The amount of separation between buses and general traffic is one of the important elements for consideration in the design of a fast and reliable BRT. Common right-of-way types include:

a) **Mixed traffic lanes**, where buses share the road with cars, trucks, high-occupancy-vehicles (HOVs), taxis, and other vehicles. Queue jump/bypass lanes and transit signal priority can be used to reduce delays at intersections.

b) **Dedicated bus lanes**, where buses use a lane that is designated for transit only and separated from other traffic. Traffic signal priority and turn prohibitions across bus lanes can further minimize delays at intersections. Curbside lanes can face more delays than median lanes from turning vehicles, deliveries, taxis/drop-offs, and parking.

c) **Exclusive busways**, where buses operate in a completely separate lane that is usually grade separated and is not delayed by traffic signals for general traffic. This option provides the highest degree of separation, speed, and reliability.

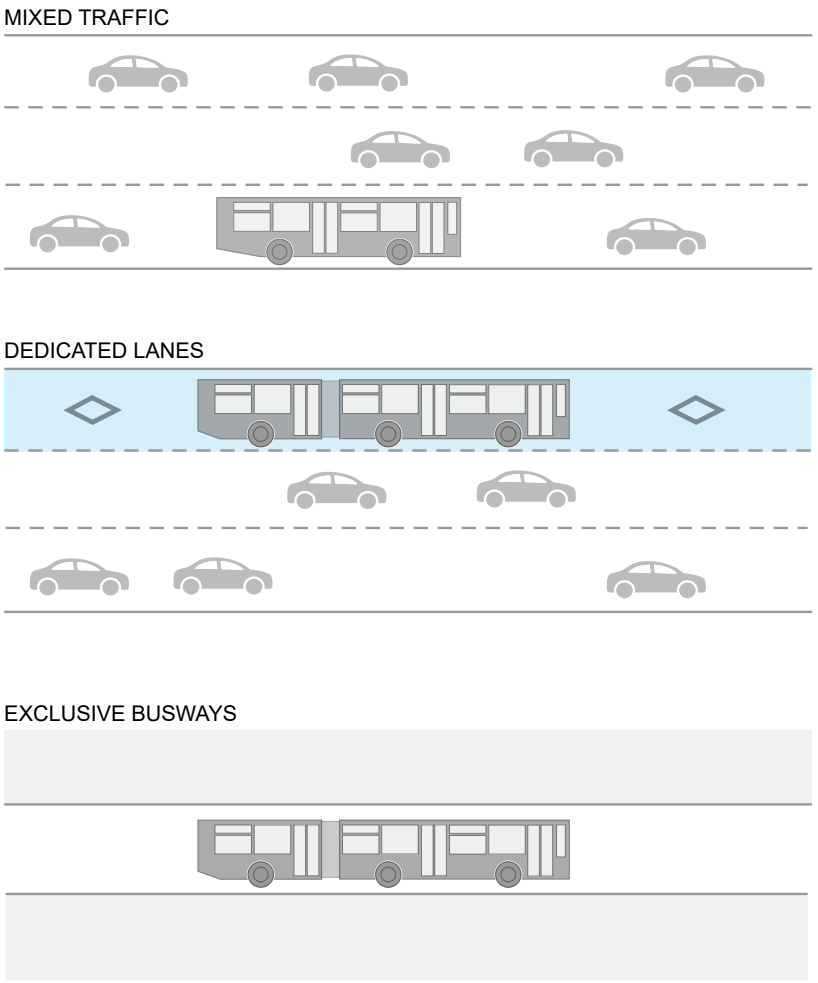


Figure 1-4: BRT lane options

1.7 FIGURES LIST

2.0 Administering Standards

2.1 HOW TO USE THIS DOCUMENT

2.1.1 Overview

The DS-27 BRT Architecture Design Standard provides design direction and requirements for customer-facing elements of new BRT infrastructure. This standard shall be applied together with the project agreement documents.

2.1.2 Relationship with Other Standards

a) This design manual shall be read together with other Metrolinx standards, including the respective bulletins and updates.

b) A complete list of relevant standards is included in Section 2.2

c) Some of these standards are referenced in this document. In these cases, an accompanying statement will be included. For example, the statement may read:

   i. "Refer to Metrolinx DS-03, Wayfinding Design Standard for detailed requirements," or

   ii. "Refer to Metrolinx Standard Drawings and specifications."

d) As required, this standard shall be read together with Municipal standards and by-laws to ensure coordination.

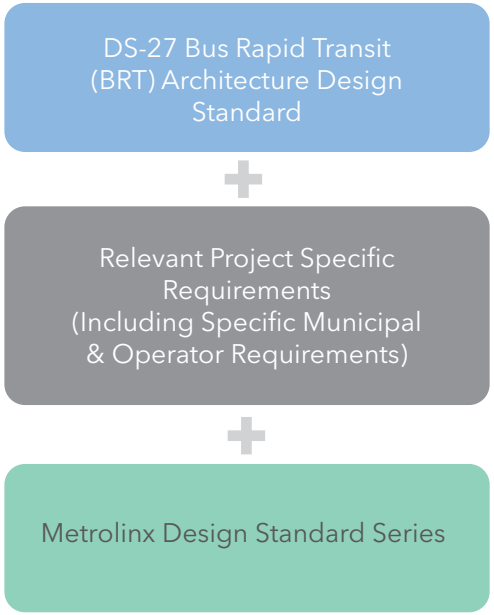


Figure 2-1: Relationship between BRT Architecture Design Standard, project-specific requirements and Metrolinx standards

2.1.3 Relationship to Other Technical Standards

Reserved.

2.1.4 Conflicts

Where conflicts arise between legislative codes and standards, the more stringent requirement shall apply.

2.2 LEGISLATIVE CODES AND STANDARDS

The following is a list of codes and standards that have been referenced in this document; it is not intended to provide an exhaustive or definitive list of applicable codes and standards.

a) Acts and codes

Ontario Building Code

Ontario Building Code Supplementary Standard

Ontario Fire Code

Occupational Health and Safety Act - Regulation 851, Industrial Establishments

Ontario Electrical Safety Code

b) Municipal by-laws

Accessibility for Ontarians with Disabilities Act (AODA)

Occupational Safety and Health Act (OSHA)

Toronto Green Standard (TGS)

Leadership in Energy and Environmental Design (LEED)

c) Referenced standard organizations

National Fire Protection Association (NFPA)

Canadian Standards Association (CSA)

International Standards Organization (ISO)

d) Metrolinx Design Standards Series include

DS-00 Master Front End

DS-02 Universal Design Standard

DS-03 Wayfinding Design Standard (Published in two parts)

- Part 1: Wayfinding Design Standard
- Part 2a: Sign Implementation Manual - GO Transit Edition

DS-04 GO Station Architecture Design Standard

DS-05 Sustainable Design Standard

DS-06 Rail Corridor Design Benefits Management

DS-07 Bike Infrastructure Design Standard

DS-08 GO Bus Park & Ride Design Standard

DS-09 Subway Station Architecture Design Standard

DS-11 Third Party Entrance Connection Requirements

DS-25 Climate Change Informed Data Standard

DS-01-S TOC Design Guidelines for Subway Stations

PRESTO Standard (currently under development)

e) Other design guidelines

Ministry of Environment, Conservation and Parks, NPC 300 Environmental Noise Guideline

Canadian Hard of Hearing Association, Universal Design and Barrier-Free Access, Guidelines for Persons with Hearing Loss, Section 6.0 Desirable Acoustics

Canadian National Institute for the Blind (CNIB), Clearing our Path, Section 2.4.0 Acoustics

Crime Prevention Through Environmental Design (CPTED)

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 55

2019 ASHRAE Handbook – HVAC Applications, Chapter 48 – Noise and Vibration Control

Illuminating Engineering Society of North America (IESNA)

Ontario Information and Privacy Commissioner - Guidelines for the Use of Video Surveillance Cameras in Public Places

Privacy and Video Surveillance in Mass Transit Systems - A Special Investigation Report MC07-68

Applicable municipal / municipal transit design standards and guidelines

2.3 DESIGN REVIEW, SUBMITTAL PROCESS AND REQUIREMENTS

Refer to document DS-00 Master Front End.

2.4 ACRONYMS AND TERMINOLOGY

2.4.1 Acronyms:

AAMA – American Architectural Manufacturers Association

AHJ – Authority Having Jurisdiction

AMCA – Air Movement and Control Association

ANSI – American National Standards Institute

AODA – Accessibility for Ontarians with Disabilities Act

APBP – Association of Pedestrian and Bicycle Professionals

APS – Accessible pedestrian signal

ASHRAE – American Society of Heating, Refrigerating and Air-Conditioning Engineers

ASTM – American Society for Testing and Materials

ATM – Automatic Teller Machine

BIA – Business improvement area

BUG rating – Backlight, uplight, and glare rating

CAN/CGSB – Canadian General Standards Board

CAN/ULC – Underwriters Laboratories of Canada

CCTV – Closed Circuit Television

CFD – Computational Fluid Dynamics

CNIB – Canadian National Institute for the Blind

CPCI – Canadian Precast/Prestressed Concrete Institute

CPTED – Crime prevention through environmental design

CS – Commercial Steel

CSA – Canadian Standards Association

CSDMA – Canadian Steel Door and Frame Manufacturing Association

dB – Decibel

DRM – Design Requirements Manual (also referred to as GO DRM)

EAB – Emergency Assistance Button

EAS – Electronic Article Surveillance

ELE/ITS – Electrical and IT System cabinets

FACP – Fire Alarm Control Panel

FFE – Finish Floor Elevation

FVM – Fare Vending Machine

GO – GO Transit

GTHA – Greater Toronto and Hamilton Area

HMMA – Hollow Metal Manufacturers Association

IENSA – Illuminating Engineering Society of North America

IK – Impact Protection

ISO – International Organization for Standardization

kN – Kilo Newtons

LAN – Local Area Network

LEED – Leadership in Energy and Environmental Design

LID – Low Impact Development

LOS – Level of Service

LRV - Light Reflectance Value

MASK – Metrolinx Accessible Self-service Kiosk

MPI – Master Painter Institute

MSF – Maintenance and Storage Facility

MSP – Municipal Service Provider (also referred to as Transit Agencies or Local Transit Provider)

Mx – Metrolinx

NCS – Natural Colour System

NFPA – National Fire Protection Association

NRC – National Resource Council

OBC – Ontario Building Code

OCC – Operations Control Centre

OHSA – Occupational Health and Safety Act

OPS – Ontario Public Service

PA – Project Agreement

PAI – Passenger Assistance Intercom

PAS – Public Address System

POPS – Privately-Owned Public Space

PPUDO – Passenger Pick-Up and Drop-Off

PSI – Pounds per Square Inch

PSOS – Project Specific Output Specification

PVIS – Passenger Visual Information System

RAL – International colour matching system

ROW – Right of Way

SR – Solar Reflectance

STC – Sound Transmission Class

TGS – Toronto Green Standard

TOC – Transit-Oriented Community

TTMAC – Terrazzo Tile & Marble Association of Canada

TVA – Threat and Vulnerability Assessment

TWSI – Tactile Walking Surface Indicator

UDS – Universal Design Standard

UGRL – Unified Glare Rate

UHPC – Ultra High Performance Concrete

ULC – Underwriters Laboratories of Canada

UV – Ultraviolet

VCE – Vertical Circulation Element

VMS – Variable Message Sign

VOC – Volatile Organic Compound

2.4.2 Terminology

"Bus sweep" refers to the radius sweep of the overhang of the body at the front and rear of the bus when undertaking a turning manoeuvre. This is utilized when assessing the required setback from the face of the curb at platforms.

“Bus sweep analysis” is the calculation and analysis of the movement and path of different parts of a vehicle when that vehicle is undertaking a turning maneuver.

"Kit of parts" means the use of repetitive architectural elements – such as materials, forms, colour, patterns, modularity, and design language – to establish a system-wide design approach that is consistent and recognizable and reinforces the system’s identity.

“Station” means a fully enclosed passenger facility with a platform where passengers can board and alight vehicles on a bus rapid transit system as described in this document.

“Stop” means a location along a street, either at-grade or grade separated, with a platform and shelter, where passengers can board and alight vehicles on a bus rapid transit system as described in this document.

"Project Agreement" is used generally in this document to refer to any contract that sets out Metrolinx Design requirements for a given project.

2.5 FIGURES LIST

3.0 Fundamental Requirements

3.1 OVERVIEW

Successful design solutions provide a fully inclusive, integrated passenger experience throughout the entire journey. The quality of the passenger experience hinges on fundamental requirements such as ease of identification, intuitive understanding and navigation of the environment, accessibility, standard of construction, and the seamless integration of its amenities.

3.1.1 Universal Design Requirements

Universal design is a fundamental requirement that responds to the diversity of ridership and does not impose barriers of any kind to its users of varying abilities and different trip purposes. By applying innovative universal design solutions and adopting a user-centred approach, Metrolinx strives for inclusivity, safety, equity, and ease of movement for all.

Refer to DS-02 Universal Design Standard.

3.1.2 Sustainable Design Requirements

Sustainability is a critical component of how Metrolinx plans, designs, builds, and operates its transit facilities and is the core concept framing the vision of the Metrolinx 2041 Regional Transportation Plan. The Sustainable Design Standard DS-05 implements the principles of sustainability throughout the design phase of projects and is an important tool in ensuring that Metrolinx's facilities are practical, durable, and reliable.

The pursuit of Envision, a framework for assessing sustainability, resiliency and equity in civil infrastructure, is preferred and must be evaluated at a minimum, through completion of the Envision Pre- Assessment checklist.

Refer to DS-05 Sustainable Design Standard for consistent requirements and design best practices to apply to the delivery of capital and operationally cost-efficient buildings, facilities, and sites with high life-cycle sustainability performance.

3.2 SAFETY AND SECURITY

3.2.1 Life Safety

Applying methods to minimize occupational hazards early in the design process, with an emphasis on optimizing health and safety throughout the life cycle of a project, will be critical in the design and delivery of Metrolinx capital infrastructure. Metrolinx adheres to Safety by Design, a concept that encourages construction and product designers to identify and mitigate health and safety risks to the greatest extent during the design development phase. Along with quality, programme, and cost, safety must be factored into all considerations as it increases the cost-effectiveness of enhancements to occupational safety and health.

As an added layer of safety, Crime Prevention Through Environmental Design (CPTED), also known as defensible space, is defined as a multi-disciplinary approach for reducing crime through urban and environmental design and the management and use of built environments. CPTED strategies aim to reduce victimization, deter offender decisions that precede criminal acts, and build a sense of community among inhabitants so that they can gain territorial control of areas and reduce opportunities for crime, and minimize fear of crime.

Future expansions and connections should be built avoiding interruption in the BRT network service and without attempting against the safety and security of pedestrians and customers.

3.2.2 CPTED

Crime Prevention Through Environmental Design (CPTED) is a multi-disciplinary approach to conceive a built environment in ways that would minimize or remove identifiable crime risks. It is essential to incorporate CPTED principles in the design to build BRT environments that deter opportunities for crime. CPTED strategies aim to reduce victimization, deter offender decisions that precede criminal acts, and build a sense of community among inhabitants so they can gain territorial control of areas, reduce crime, and minimize fear of crime.

The main CPTED design principles include:

a) natural surveillance and safe travel throughout the site;

b) natural access control;

c) territorial reinforcement; and

d) maintenance.

For CPTED submission requirements, refer to DS-00 Front End.

3.2.2.1 Natural Surveillance

Natural surveillance is the state and condition of a site that is under human senses – observed by eyes and heard by ears. Under this notion, various parts of the site are observable without any electronic devices (cameras or audiovisual recorders) during both the day and night. The real and perceived risk of legitimate users 'witnessing' criminal activity acts as a deterrent to crime being committed. Based on this concept, CPTED principles are designed on the basic condition of safety through the use of human senses. As a design strategy, natural surveillance is based on the built environment and directed to minimize fear of crime and loss. Natural surveillance gives the sense that any conduct in public space is under the direct observation of the occupants' space and surrounding site context.

3.2.2.2 Natural Access Control

Natural access control focuses the movement of people by strategically directing them towards areas of heightened natural surveillance and away from crime opportunities. It verifies who should have access to the site. The physical setting is created to make potential intruders uncomfortable through a sense that their behaviour is constantly (as a minimum) under passive observation. Design strategies developed should eliminate unobservable or unsecurable spaces to mitigate creation of potential entrapment areas.

3.2.2.3 Territorial Reinforcement

Territorial reinforcement occurs when design is used to realize people's sense of ownership, which can translate into users taking responsibility for public safety and security. This can be encouraged by creating a defensible space featuring a well-defined and observed area which provides strong transition from public to private space. Design solutions bring about this sense at various levels of articulation from the obvious to the subtle expression. Therefore, in its implementation, territorial strategies will often include both natural surveillance and natural access control strategies. Territorial reinforcement, together with natural surveillance and access control, promotes more responsiveness by users in protecting their territory. A well-designed territorial environment is defensible in nature.

3.2.2.4 Maintenance

Maintenance is an expression of ownership of property. Lack of site maintenance indicates less control by the intended users of a site and suggests disorder. Maintaining a positive image in the community shows a sense of pride and self-worth. A maintenance program outlining daily, weekly, and monthly tasks is to be created for all BRT infrastructure to ensure lasting improvements and strengthen CPTED principles.

3.2.2.5 Design Requirements

a) Natural surveillance and safe travel shall be provided through site design.

b) Accessible clear paths of travel shall be provided to site destinations.

c) Pedestrian sight lines shall be protected through the elimination of concealment areas. Sight lines shall be protected throughout the design of all site elements, including signage, site furnishing, site facility form and material, and plant species selection, placement, and maintenance.

d) Lighting shall provide sufficient visibility, including eliminating blind-spots, glare or deep shadows.

e) An active relationship with the surrounding site context shall be fostered.

f) Safety and CPTED requirements shall be prioritized over other requirements.

g) A maintenance program outlining daily, weekly, and monthly tasks shall be created for all BRT infrastructure to ensure lasting improvements and to strengthen the CPTED principles.

h) Station landscaping shall be planned to eliminate concealment areas. The design shall demonstrate clear passenger sightlines.

i) Ancillary structures, such as bicycle storage shall be designed using transparent materials.

j) Unobstructed access to entry points for emergency response agencies shall be provided.

k) Designs shall demonstrate maximum transparency and openness along public facing façades.

l) Designs shall address safety and terrorism prevention by eliminating the existence of blind corners and entrapment areas such as alcoves and nooks where offenders can seek refuge, or suspicious packages can be hidden.

m) All waste and recycle streams shall be visible on all sides using clear transparent material.

n) Furniture seating bases shall have clear sightlines to prevent package concealment.

o) Waste receptacles shall be clearly visible to passengers and staff, positioned such that view is unobstructed and in clear view from strategically located CCTV cameras.

p) Equipment layout shall not impede passenger sight lines of signage, access to intercom panels, or CCTV coverage.

3.2.3 Bus Safety

Safety is an important aspect for customers using the BRT network. The development of BRT infrastructure shall incorporate the following bus safety requirements.

a) BRT Stops shall be designed to accommodate the BRT bus fleet.

b) BRT Stops shall make provisions of clearances for the unobstructed circulation and parking of the fleet:

   i. Horizontal clearance to enclosure elements

   ii. Vertical clearance to canopy

   iii. Signal for drivers

Refer to Section 5.0 for specific design requirements for BRT Stops.

3.2.3.1 Design Requirements

a) Risk assessments for BRT infrastructure shall be coordinated with the Safety and Security team design development.

b) Where a bus loop is required, it shall provide separate access and egress for buses, segregated from other vehicular, bicycle, and pedestrian traffic.

c) Sight lines between pedestrians and drivers shall be reviewed to confirm clear visibility on the platform, for all turning movements within the BRT sites, and for all facility entrances and exits. The recommended dimensions of the clear sight triangles are determined by the types of buses using the BRT network.

d) Bus driver sight lines shall not be obscured by any signage, landscaping, or buildings for both the pull-in and pull-out movements.

e) Parking shall be designed such that potential conflicts between pedestrians and bus movements are avoided.

f) Bus movements within the BRT network shall be free flowing between the entrance and exit.

g) Stops, layovers, and bus parking shall be designed so that no reversing or backing up movements are required by a bus. Bus platforms shall be designed so that pedestrians shall never cross a bus route or designated bus pathway.

3.2.4 Closed Circuit Television (CCTV)

a) CCTV cameras shall be installed at strategic locations of the BRT infrastructure.

b) The primary purpose for using CCTV cameras shall be to enhance passenger security and safety, automate facility monitoring, and act as crime and vandalism deterrent.

c) In addition, CCTV cameras shall provide a tool to record events which can potentially help in the collection of evidence in case of security incidents and assist in further decision making. CCTV cameras are particularly instrumental in improving emergency response due to proactive monitoring.

d) The following areas shall be covered by CCTV:

   i. Fare devices

   ii. Elevators (portal and cab interiors)

   iii. Platforms

   iv. Corridors and passageways

   v. Stairs

   vi. Bicycle parking

   vii. Other high risk areas or facilities determined by safety and security

e) CCTV shall be coordinated with the relevant I&IT authority as set out in the Project Agreement.

3.2.5 Audio/ Public Announcement System

The PA system is generally used to make public and emergency announcements at the facility, thus aiding in facility safety and security. Assembled messages will be generated based on various inputs (e.g., bus late, bus on time, bus early, arrival time, bus coming from).

3.2.5.1 Design Requirements

a) The PA system speakers for announcements shall be placed at BRT shelters in close proximity to the waiting area.

b) Speakers shall be suitable for exterior installation.

c) The number of PA speakers shall be distributed along the platform.

d) PA speakers shall be installed externally with all PA headend equipment, such as the distribution amplifiers and ambient noise sensor, installed inside the communications cabinet.

e) The PA system shall be IP based to enable the broadcasting of audio messages to passengers.

f) PA systems shall be coordinated with passenger visual information systems where appropriate in both design and operation to reinforce consistent messaging.

g) The PA system shall have the capability to perform live, pre-recorded messaging, as well as remote (networked) messaging with multi-level messaging prioritization.

h) PA speakers shall be coordinated with the relevant I&IT authority as set out in the Project Agreement.

i) PA speakers shall be coordinated with the relevant I&IT authority.

3.2.6 Two-way Communication for Passenger Assistance Intercom (PAI) – RESERVED

This element is under development by Metrolinx as part of the regional customer amenities program and will be updated once information is available.

3.2.7 Lighting

Lighting is a required infrastructure that is important at arrival, access, and transaction areas of BRT Stops. It shall be provided in accordance with the requirements set out in Section 5.5.

3.2.8 Placement and Integration of CCTV, PA, Amenities, and Services

3.2.8.1 Design Requirements

a) Elements shall be centred and aligned with seam or joint for an uncluttered ceiling.

b) Layout shall be coordinated with other elements, such as lighting and signage, for an integrated and organized visual appearance.

c) All devices shall be designed so that they are supported and fastened to a structural element.

d) Exposed fasteners shall be minimized.

e) All cables shall run neatly and orderly in a conduit system and shall be concealed from view.

f) All systems shall be easily accessible for maintenance with minimal deconstruction of the BRT structure.

g) CCTV, cameras and other fixtures shall be mounted on the ceiling or on the backwall without affecting the circulation area and the edge of the platform.

4.0 Public Realm

4.1 INTRODUCTION

At its most basic level, the public realm consists of spaces for people to use. The public realm is a broad term that refers to the public spaces associated with the BRT network, that includes both the public areas that are associated directly with the Stop, Station, and ancillary structures – referred to as the 'BRT Realm' – and those areas that comprise the boulevards and streetscapes within the jurisdiction of the municipality – further referred to in this document as the 'Municipal Realm.' The integration and complementarity of these two zones are critical to the overall design excellence of the entire network being brought to the BRT corridor.

The Metrolinx vision is for a harmonized BRT system focused on consistent design language, detail, and civil quality across the entire BRT line. The following sections provide a summary of the priorities and requirements, and they shall be followed to support Metrolinx's design goals.

Note: The following priorities shall be read in coordination with DS-02 Universal Design Standard.

4.2 BRT PRIORITIES

4.2.1 Design Narrative

A strong conceptual narrative across the system ensures that the BRT realm is recognizable from the distant, middle, and close views as the customer reaches the Stop and Station. A recognizable rhythm and proportion of material, furnishings, and landscapes will create consistency in form, experience, and service. This ensures that the customer experience at arrival will be well connected, convenient, and friction-free to keep customers "on the move."

a) Deliberate and coherent design narrative for the BRT realm.

   i. Similar architectural expression, look and feel of infrastructure (consistent materials, architectural elements, design expression and detailing).

   ii. A systematic and codified use of landscape, materiality, and pattern that act as the BRT realm identifier and support passenger experience.

   iii. Visible and functional sustainable features, including a landscape vision that uses a primary strategy of tree groves and ornamental grasses of low maintenance native species, planted at Stop platform end tapers, plazas, medians, and open spaces as a system signature.

b) Develop a modular and systematic approach to architectural and landscape expression, including structural, mechanical, electrical, etc.

c) For ease of maintenance and operations, the architectural approach shall be based on high functionality and without non-essential form-making, with a simple, predominantly rectilinear language at its core.

   i. High-quality design with simplicity in detailing and carefully resolved material intersections, connections, and transitions.

   ii. Simple, repeated modules and concealed fasteners used throughout the system.

   iii. Organized and consistent visual appearance of finishes and textures.

   iv. Design that reflects the heavy everyday use of a busy transit system, with the application of sustainable, recyclable, robust, and high-quality materials that will enhance the quality of the transit environment.

   v. Consideration of life-cycle costs and ease of operations and maintenance demonstrated in all aspects of specifications and design.

d) A clear strategy for determining and applying consistent and variable elements.

   i. Consistent elements shall include shelters, platforms, paving, and signage.

   ii. Variable elements shall include streetscapes, heritage, and third-party integration, and shall respond to micro-climates and future developments.

   iii. Deployment and detailing of all common elements shall be considered holistically.

e) Integration of the ROW into public realm treatment shall be limited to public-facing, publicly accessible facilities.

f) Design solutions shall thoughtfully consider future expansions.

   i. Including future connections to other multi-modal transit services and adjacent local transit services and highlight potential future opportunities for integration with the surrounding community.

   ii. Consider future integration with potential adjacent development through transit-oriented communities.

4.2.2 Passenger Experience

The public realm design shall elevate the quality of the customer journey and serve the diverse needs and abilities of all customers regardless of age, gender, income, or system familiarity. Equally, this experience shall remain a priority to ensure customers feel safe throughout their passage across the public realm at any time of day, at any location.

a) Openness through clear views and spatial penetration:

   i. Visual transparency to, from, and between the Stop and Station shall be optimized to support the principles of CPTED, increase safety and security (both actual and perceived), and ease of wayfinding.

   ii. Facilities shall require maximum transparency and openness along all street-facing façades or façades facing open spaces.

b) Inclusive and Equitable

   i. Access shall be provided for all through the implementation of the principles in alignment with the DS-02 Universal Design Standard.

      1) Inclusive: The public realm shall provide an integrated, convenient, usable, and safe experience for customers through designs that are inherently accessible to people with diverse abilities.

      2) Equitable: The public realm shall be designed with appropriate size and space for use regardless of a user's age, body size, posture, or mobility to promote ease of movement for all. The public realm shall support equitable convenience and opportunity for enjoyment.

4.2.3 Civic Scale, Materiality, and Quality

a) Ground and floor surface treatment shall be consistent (for example, orientation, colour, transition, joints, etc.) throughout the Stop and Station precinct.

b) Public realm shall complement Stops and Stations

   i. The public realm shall have a consistent material, colour, proportions, and data that align with the architecture

   ii. Public realm surface materials shall define a stop zone characterized by distinctive surface expressions and patterns, with base dimensions aligned with the architecture. Unique architectural design elements, such as glass/glazing pieces, that may require costly future capital replacement and spare parts regime, shall be limited.

   iii. Where there is an interface in the public realm with adjacent development(s) or third party, material surfaces shall be coordinated to create a seamless appearance.

4.2.4 Integrated Design

Integrated Design includes the integration of all infrastructure and systems to provide customer-facing clarity and simplicity. The public realm **Strategies** and **Common Elements to Continuity and Variability** sections elaborate on this approach.

a) Integrated structural, mechanical, and electrical systems, as well as drainage and speakers at Stops and Stations.

   i. The appearance of the Stop canopy soffit (ceiling) shall optimize simplicity to conceal infrastructure and prevent vandalism.

   ii. Lighting shall be visually well organized and integrated with the design and set at a consistent datum that defines movement and directs spatial continuity.

   iii. Higher lighting levels shall be provided at decision points or area where required for safety and convenience.

   iv. The exterior illumination approach shall be coordinated with the municipality where required.

b) A clear hierarchy and plan for user-centred integrated information and navigation.

   i. Advertising shall not be placed in critical location where wayfinding and signage are expected, including at decision point and where customer information is provided.

   ii. Wayfinding shall be characterized by clarity and simplicity of information delivery for all customers of all abilities.

   iii. DS-03 Wayfinding Design Standard shall be incorporated throughout the system.

   iv. Simplified, integrated modular signage and hardware language shall be consistent across new and retrofit BRT realm spaces and infrastructure.

   v. Consistent sign elements, installation methodology, and placement shall be provided.

c) Integrated system identifiers and coordination of common elements, including regional transit identity, Stop and Station name, line number, and logo.

d) Clearly organized and integrated passenger amenities.

   i. A clear strategy for organizing the hierarchy of passenger amenities shall prioritize transit usage amenities over secondary amenities.

   ii. Passenger amenities shall be integrated into the built structures of Stops and Stations to avoid visual clutter while facilitating ease of use.

4.2.5 Responsiveness to Climate and Context

a) Responding to climate considerations shall not be limited to following the relevant standards of sustainability but through the development of a consistent plan that addresses future climate change scenarios.

b) Decisions shall be taken for the use of more natural light to reduce the amount of energy consumption while also providing valuable shade. When possible, back wall and side walls shall be provided with transparent materials to bring natural light to the Stop and Station.

c) Use of vegetation and creation of microclimates around facilities shall be increased to mitigate heat during the summer while contributing to recovering local vegetation species.

d) Urban design shall be integrated with historical context and the attributes and values associated with unique heritage properties. The design of BRT infrastructure shall be developed to minimize blocking visibility towards heritage buildings.

e) The distinct BRT realm shall be seamlessly integrated with the public right of way.

f) Mechanical elements shall be screened using a consistent screen and material palette that is part of the overall design language.

    i. Mechanical units shall be placed out of the public access.

    ii. Mechanical units shall be placed in consideration to adjacent properties, specially if they are residential or health facilities.

g) Common elements shall be responsive to the community and municipal stakeholder considerations and services.

    i. Public realm infrastructure shall be integrated with the neighbourhoods in which it resides, bridging these community streetscapes with a coordinated approach to common elements that link to the adjacent communities.

    ii. Within the landscape forecourt, trees, and landscaping, shall be used to frame views and circulation routes giving them prominence on the site and making them part of the customer journey and experience.

    iii. Future proofing: The design shall accommodate for future change including changing climatic conditions, development opportunities, socio-economic trends, customer profiles and behaviour, and the evolution of mobility service delivery.

    iv. Local context: The design shall respond to the impact of local site conditions. Contextual design response may include accommodation for heritage conservation districts, business improvement areas, civic/governmental precincts, and other areas with a distinct urban identity.

    v. Properties impacted and demolished for the project shall be left in an interim condition that includes a primary landscape strategy that limits the need for a protective barrier.

    vi. Smart city technologies: The design shall provide the flexibility to allow for future technologies and recognize key trends in transportation technology to ensure Stops and Stations environments remain responsive and relevant in the future.

4.3 STRATEGIES

The public realm is an integral part of the BRT experience and it shall be designed using clear strategies to balance the BRT identity with responsive integration into the urban context.

4.3.1 Public Realm: BRT Realm + Municipal Realm

The public realm consists of the connecting points between buildings and the right of ways that define how people move around the municipality and what modes of transportation they use, whether cycling, walking, driving, or transit. The recognized capacity of a well-designed public realm to spur quality developments and the quality of urban life forms an elemental part of the method to achieve a strong, intelligible connection between the BRT network and the broader city and regional context of neighbourhoods, retail, and mixed-use developments to come.

a) All actions along the corridor shall prioritize pedestrians through the use of street trees and pedestrian lighting, minimize clutter through the judicious placement of street furniture, be designed for barrier-free access, and be oriented to human scale.

b) The quality of the evening/nighttime experience shall be recognized and enhanced through the provision of a well-lit public realm for safety, comfort, and attractiveness.

c) The transit system and the supporting built form shall be designed at a human scale, with a quality streetscape and a critical mass and fine grain of uses that support and encourage walking. Such environments can provide vitality and create comfortable, convenient, and successful places.

d) The municipal realm may play a dual role in expressing both the singular recognizable identity of the entire BRT network, and the unique identities of the municipality, linking into each city's aspirations for enhanced on-the-ground urbanity as described through their respective planning documents.

e) The design of the BRT realm shall adopt a "complete street" approach. Planning for a complete street means aiming to create a balance between all modes of movement, by providing space and amenities to encourage pedestrians, cyclists, ad transit in addition to motor vehicles. The aim is to achieve a safe, attractive, accessible, and comfortable environment, particularly for pedestrians. This concept nourishes the quality of life of people, since it not only provides better conditions to stay but also a sense of comfort and safety and contributes to people's social interaction.

f) The elements of the boulevard/streetscape municipal realm may include pedestrian sidewalks with consistent widths and legible continuity, hardscaped and landscaped light pole zones with street furnishing, wider planting zones, and the provision of raised cycle tracks. Within those zones are street furnishings, bus shelters, soft landscaping of ornamental grasses and trees, and street and pedestrian light poles. Where the availability of land does not permit dedicated and delineated pedestrian zones, pedestrians and cyclists share a multi-use path. These elements combine to bring continuity along the entire breadth of the corridor, and to additionally bring a complementarity and safe, universally designed physical connections through pedestrian crosswalks to the Stops and Stations.

g) The integration between the BRT and local transit infrastructure through the considered connections between bus shelters, streetscape and Stop entrances is of key importance to prioritize for the enhancement of the 'first mile / last mile' journeys of each transit system passenger.

h) The elements of the BRT realm shall include hardscaped and landscaped zones at the thresholds to the Stops, both at the street intersection with the 'bull-nose' entrance, and at the ends of the Stop platforms where pedestrians can access passages through the widened guideways to reach the adjacent intersection in shorter blocks.

i) The interconnection of these two zones – the BRT realm and the municipal realm – is necessary to provide a cohesive legible transit network, with both systems mutually reinforcing each other's importance. This shall be achieved through the considered design of the elements of both zones, not through the use of identical materials, but through the use of materials that complement each other, recognizable as part of a larger comprehensive vision of the corridor.

j) The Station and the expanded BRT public realm shall also make strong connections between the elements of plazas and landscape with the corresponding civic spaces of the adjacent boulevards, making seamless and generous public spaces at these important intersections between the city and transit. The public space design shall express the importance of strong connections between future Stops and existing transit terminals to ensure fast, efficient connections for customers transferring between the different transit systems.

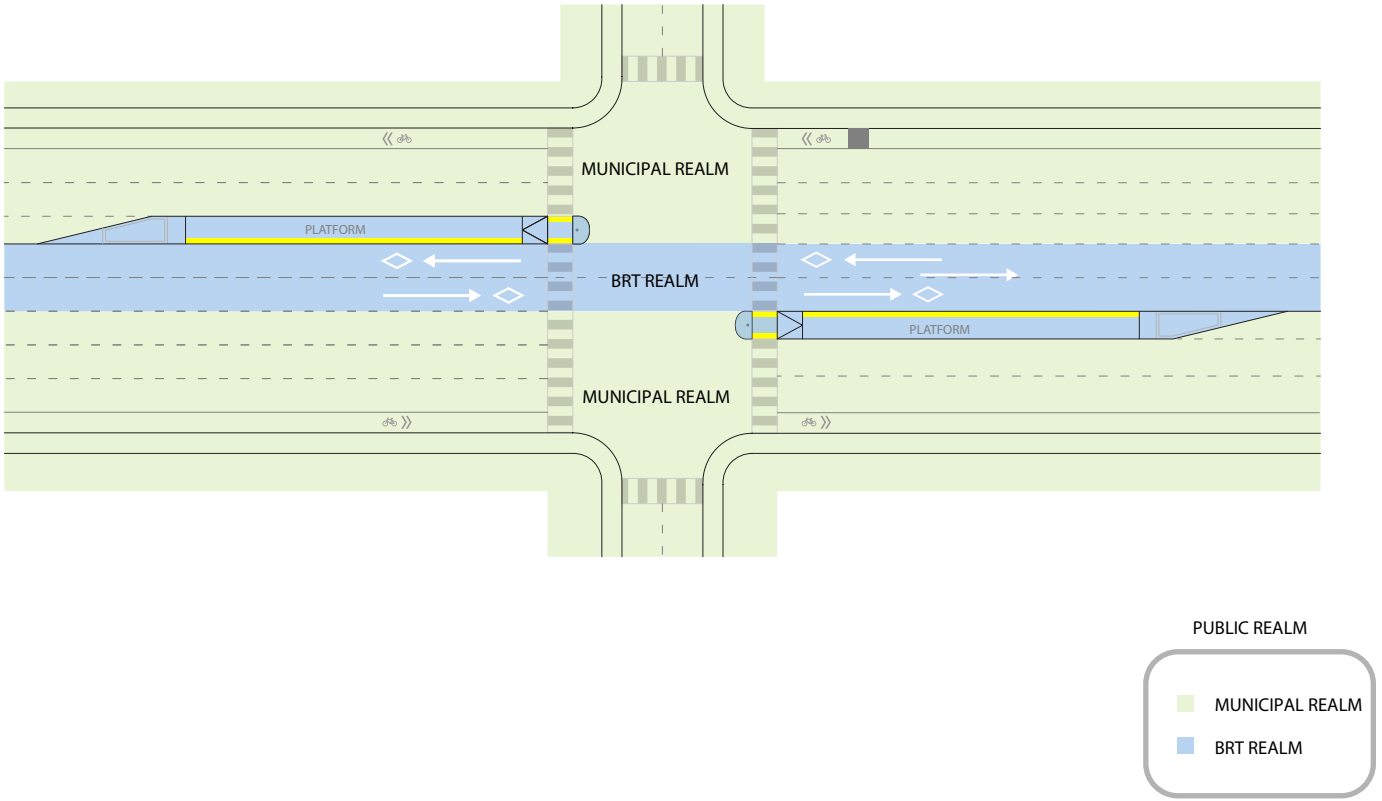


Figure 4-1: Public realm: municipal realm and BRT realm

4.3.2 A Distinctive "Kit of Parts"

Public realm, architecture and design can play a significant role in establishing a consistent and recognizable line-wide design language. A distinctive kit of parts approach shall be used in the design of the BRT realm, where repetitive elements are assembled according to a common set of details to reinforce the BRT identity.

a) The kit of parts shall be developed using elements such as the overall massing and proportion, materials and placement, texture, patterns, colour, transparency, signage, lighting, and feature elements.

   i. Development of a kit-of-parts shall include:

      1) Implementation of a line-wide kit-of-part elements and their response to the context.

      2) Transition and coordination between municipal realm and BRT realm.

      3) Coordination with the respective municipalities involved, where required.

b) The kit of parts shall be both recognizable and flexible. The primary means of achieving this shall include:

   i. Hardscape

      1) Large panel paving for plazas.

      2) Poured-in-place concrete for sidewalks and at grade platforms.

      3) Coordination for tactile walking surface indicators in the ROW to maximize consistency.

   ii. Plantings

      1) Groves of deciduous trees planted in open soil or in pavements.

      2) Ornamental grasses in large, raised planters or medians.

      3) Plantings shall be native species of the surrounding context to the extent feasible. However, in harsh planting conditions, up to 50% non-invasive, non-native species are permitted, applying the limit separately to trees, shrubs, and non-woody species. Harsh conditions may include LIDs, trees in tree grates, and plantings immediately adjacent to roads.

      4) To the extent feasible, native plants for naturalization.

   iii. Furnishings

      1) Furnishings consist of benches, waste receptacles, bicycle racks, and pedestrian/ accent lights, etc. They shall be designed as a consistent kit of parts across the transit line.

c) The kit of parts shall comprise clean and simple elements that allow for flexibility along the line, while maintaining network consistency.

4.4 CONTINUITY AND VARIABILITY

A clear architectural strategy for applying elements of continuity and variability shall be developed. BRT infrastructure shall exhibit a high degree of continuity in design, with variability as defined in Table 4-1 and shall use the same architectural palette along the line. This section describes a suite of consistent and variable public realm, Stop and Station components that will work together to form an identifiable design language within the BRT realm.

This section shall be read in conjunction with:

- Section 4.0 Public Realm; and
- Section 5.0 Architecture.

The consistent identity of all Metrolinx BRT infrastructure will be developed by the deployment of Consistent and Variable Elements across a variety of strategies in the BRT realm. For each destination, there will be a set of design parameters to work within as determined by the scale and context of the BRT infrastructure.

a) Continuity

The design shall demonstrate visual continuity across the entire length of the corridor that is sensitive to the surrounding urban context, complementing the design approach applied to the BRT infrastructure. Design language of the system at large shall achieve a sense of consistency and continuity with the overall design expression. The Consistent Elements are those that without changing their form, repeat along the BRT network, creating transit identity.

A clear strategy for elements of continuity shall be established such as canopies, structural and glazing assemblies, lighting, paving materials, floors, signage, platform, guardrails, hardware, fixtures, and furniture to present an identity at street level. It shall create a harmonized system focused on consistent landscape and architectural language, detail, and civic quality across the lines. This is particularly important to customer-facing elements of the system. The creation of a unified and repeatable language and a consistent approach to detailing are key design challenges. The design of the canopy and shelter structures shall further reinforce the architectural language and continuity established through the integration of consistent signage and wayfinding, incorporation of the same surface pattern/language, sections, shapes, and similar approach to details and materials. Refer to Section 4.4.1 Consistent Elements.

b) Variability

At a system-wide level, variability can occur within the public realm and Stops as an adaptation to, or recognition of local context, and to identify locations at a glance (e.g., use of platform walls as a systematic visual cue). Elements identified as variable shall be consistently applied as such. Minor variability happens with customized design of urban and landscape design elements surrounding Stops. Transition elements between Stops/Stations and Municipal property such as retaining walls, bumpers, grade changes, and more may vary to tie into the streetscape, whether existing or planned. A clear strategy for elements of Variability shall be established such as urban and landscape design and Stop-specific feature elements. Refer to Section 4.4.2 Variable Elements.

Element	Line -Wide Continuity Within Project	Line -Wide Variability Within Project
Stops		
Sloped Walkway	•	
Canopy	•	
Shelter Back Wall	•	
Feature Wall/Element		•
Platforms	•	
Furniture	•	
Landscape Platform End Taper		•
Lighting	•	
Amenities	•	
Signage & Wayfinding	•	
Guideway between stops		•
Public Realm		
Elevated Guideways	•	
Portals	•	
Landscape (hardscape & softscape): Signature elements	•	
Heritage & third party integration		•
Furniture (municipal)		•

Table 4-1: Elements of Continuity and Variability

4.4.1 Consistent Elements

Consistent elements create identity and continuity along the municipal and BRT realm. They include the following elements applicable to Stations and Stops context:

a) Paving

b) Furniture

   i. Seating

   ii. Waste receptacles

   iii. Bollards

   iv. Bicycle parking

c) Light standards

d) Vertical circulation

e) Raised planters

f) Tree grates

g) Soil cells

h) Stormwater management

4.4.1.1 Unit Paver (Paving)

a) For Stations, pavement systems and other hard surfaced areas shall form the direct connection between the street and the Station in the form of connecting pathways, streetscapes, plazas, and forecourts.

   i. The paving shall be designed for openness and maximized flow.

   ii. Where these Stations are integrated with the TOC, paving materials shall be coordinated with third party designs in order to avoid difference in treatments and to preference.

b) For Stops, paving may appear as an extension of the streetscapes, plazas, and forecourts, or along the guideway within medians or bullnose.

c) The paving approach shall embed durability, low maintenance, and life cycle considerations.

d) In all applications, the colour contrast of the pavers shall be in alignment with the DS-02 Universal Design Standard.

e) The use of permeable pavers is allowed in non-vehicular public areas of the BRT network in accordance with DS-05 Sustainable Design Standard.

f) Hardscape strategies:

i. Paved areas shall support intuitive wayfinding by providing clear direct access to and from destinations with open unobstructed paths to support safety of passengers.

ii. A hierarchy of patterns shall be used to define primary, secondary, and transitional spaces.

iii. A systematic use of colour and pattern shall be applied to reinforce network identity as a feature of passenger experience.

iv. Paving colours shall follow a logical system of accents. These accents shall be part of contextual assimilation, perception of space, and identity.

v. The paving colour system shall be used to create a safe and efficient differentiation between passenger and staff areas to avoid disruptions.

vi. Paving shall include pavement marking made from preformed thermo-plastic material that is set into the pavers using reheating technology.

vii. Paving systems shall conform with colour contrast requirements in DS-02 Universal Design Standard.

viii. The pedestrian approach to the Station shall have a sense of protection, openness, and transparency as defined in CPTED guidelines.

ix. A clear strategy for organizing passenger walkways and roadways, including paving materials, finishes, and patterns, shall be prioritized in compliance with the Municipal Standards and Accessibility for Ontarians with Disabilities Act (AODA).

x. Grading of pedestrian surface shall follow best practices and building codes for ideal performance slopes for surface materials and shall align with DS-02 Universal Design Standard.

g) Patterns:

i. Paving patterns and textures shall be used to create clear and seamless transition between pedestrian pathways, trails, bicycle lanes and vehicular paths.

ii. Paving patterns shall be minimized to below 20 Light Reflectance Value (LRV) points difference and shall be in alignment with the DS-02 Universal Design Standard.

iii. Overall paving patterns shall have solar reflectance (SR) of at least 0.29. Paving patterns shall comply with DS-02 Universal Design Standard.

iv. A minimum of 5 percent of total paver quantity shall be retained to allow for maintenance and repairs. This quantity shall be in line with the requirements of the operator.

v. All pavers shall accommodate:

1) Emergency and service vehicle access and circulation (same or distinction in paving); and

2) Off-street on-revenue vehicle parking (service vehicle).

h) Drains

i. Drains shall be avoided in the path of travel towards any entrance.

ii. Drains shall be kept away especially from the accessible path of travel and shall conform to AODA and DS-02 Universal Design Standard.

iii. Drains shall not interfere with the TWSIs.

iv. Drains shall be flush to the paving surrounding.

v. All surfaces shall have positive drainage, eliminate ponding, and icing, and grade away from buildings and structures.

vi. Drain size and shape shall be integrated into the paving system, and located in logical positions that co-relate to the overall paving patterns.

vii. Drain shapes can vary, provided that they are sized to capture and discharge the volumes of water that are required as per the storm water requirements of the hard surface capture area. Linear drains integrated with the paving pattern are preferred.

viii. Drain openings shall comply with DS-02 Universal Design Standards.

4.4.1.2 Furniture

All furniture in the BRT realm consists of seating (optional leaning rails), waste receptacles, etc. These elements provide an essential service, while enhancing the customer experience, where synergies can be maximized.

a) Furniture selection and location shall respond to and reflect the needs of customers throughout their journey.

i. Furniture placement shall be coordinated with the neighbouring property owners (municipality and others). This early coordination will ensure the avoidance of unnecessary redundancy such as Metrolinx waste receptacle placement on plaza directly near municipality waste receptacle on municipality sidewalk.

b) All furniture including integrated space for passengers with mobility devices shall not interfere with the path of travel and be located within “slow zones” (where pedestrian circulation is slower or null, such as at waiting or line up areas) outside the areas of customer circulation, alighting the BRT vehicle, and emergency exit zones.

c) Furniture shall have a rectilinear design language and be made up of a consistent suite of elements that include a standard colour and material palette across the line. These physical attributes will create an identity throughout the line as well as establish a relationship between inside and outside where there is a Station building.

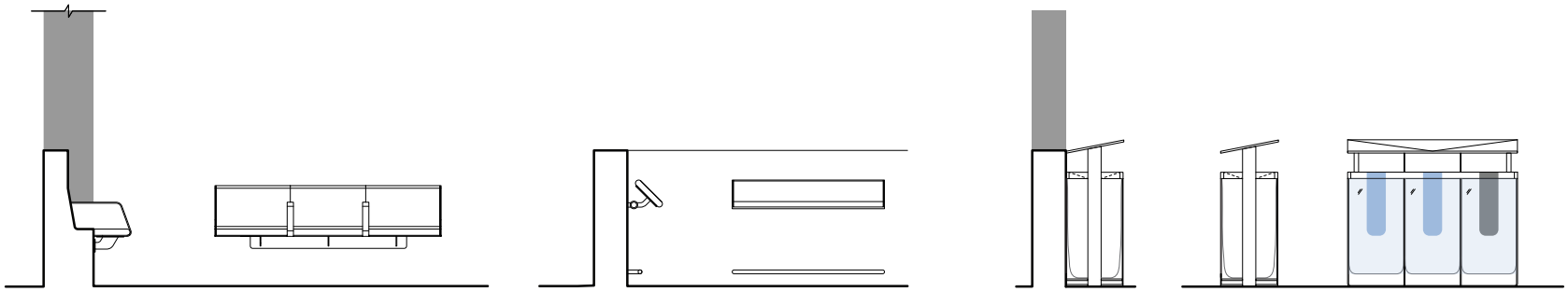
   i. Furnishings shall be chosen for durability, functionality, ergonomic comfort and as signature elements.

d) Design and fabrication of furniture shall be based on a kit of parts system, providing flexibility and modularity for a variety of customer types.

   i. Furniture shall be easy to assemble, repair, and replace.

e) Stops and Stations furniture shall conform with the following requirements.

   i. Furniture shall be located on the right hand side, with clear circulation and boarding on the left (edge of the platform). This principle is consistent with standard universal practices of passenger flow models for transit. These models anticipate the tendency of passengers to stop to the right, either to pause on their journey or access service areas (ticketing, maps, etc.), and allows other passengers to continue circulating to the left.



SEATING AND LEANING RAILS

WASTE AND RECYCLING UNITS

Recycled material and waste

Figure 4-2: Furniture typologies

1) Where the rule cannot be met, location on the left can be considered, in coordination with pedestrian modelling, accessibility, CPTED, and Metrolinx.

ii. Furniture arrangements and orientation of seating elements shall provide direct sight lines to vehicular connections, transit information, and path of travel, while ensuring customer safety.

f) Materials and maintenance requirements:

i. Furniture materials shall be integral throughout. Materials and finishes with applied coatings that are subject to being scratched, chipped, or easily damaged shall not be used.

ii. Finish and materials selected shall have matching replacement stock available for the expected life of the material.

iii. Finish and materials shall be selected for ease of cleaning, repair, and replacement.

iv. Finish and materials shall resist soiling and be cleanable with commonly used equipment and environmentally benign cleaning agents.

v. All fasteners of finishes and materials shall be concealed and tamper proof to create simple and sleek architectural aesthetic.

vi. Removal and replacement of damaged materials shall be possible without specialized or proprietary tools, and without damage occurring to adjacent areas.

vii. All furniture finishes and materials in public areas shall be generally resistant to vandalism and graffiti including hammer blows, felt markers, spray paint, burning, and scratching.

viii. Finishes and materials shall be secured using engineered connections and adequate bond strength to eliminate hazards from dislodgement due to temperature change, vibration, wind, seismic forces, aging, and vandalism.

ix. Fastenings shall be concealed; where they cannot be so, they shall be tamper-proof and match the colour of the base material.

x. Stainless steel and metal fabrications shall be factory finished pre-fit Grade 316 stainless steel in accordance with ASTM A167.

xi. Furniture shall be designed and fabricated with small perforations or slots to prevent ponding and facilitate faster drying and natural snow melt.

4.4.1.2.1 Seating Requirements

a) Customer seating shall include back/lumbar support for customers.

b) Backrest shall be made of the same material as the bench.

c) Seating shall accommodate seating for two (bench), three (bench), or four (bench) customers with the intent of providing flexibility while responding to customers individual needs.

d) Dimensions of seating types shall be as per Figure 4-4: Customer seating.

e) The bench shall:

   i. Have a mid-dark toned, high density and rot-resistant hardwood toppers, which provide a warmer, more inviting place to rest;

   ii. Be designed to work with backrests; and

   iii. Maintain a consistent design language across the line.

f) Armrest profile shall be of bent, flattened tube.

g) One end of bench shall be armless adjacent to accessible seating to facilitate transfers.

h) Accessible seating areas shall be located at the ends of benches per DS-02 Universal Design Standard; Accessible seating areas shall enable person who use wheelchairs to sit alongside other seated users (ie., so that the back of the wheelchair is aligned with the backrest of the benches).

   i. Design of seating shall conform to requirements outlined in DS-02 Universal Design Standard.

i) Design shall eliminate opportunities for items to be concealed from view.

j) Benches and seating units shall be of designs that inhibit skateboard use.

k) Stops and Stations seating shall conform with the following requirements. This standard assumed that the seating number corresponds to ridership and analysis as determined in the Project Agreement.

Figure 4-3: Bench seating

i. Glazing shall not be designed to be used as a backrest.

ii. A gap shall be incorporated between seat and seat back to allow for easy maintenance.

iii. Seating shall be wall mounted for ease of maintenance.

1) Anchoring shall be coordinated during early design planning with structural engineer to ensure wall structure and anchoring are firmly secured to prevent damage due to vandalism.

2) All fasteners shall be concealed and vandal proof.

iv. A minimum of 2 seating units (3-4 seater) shall be evenly distributed throughout the Stop as per locations identified on drawings in Section 5.

l) The location of platform seating shall not interfere with access to overhead lighting and equipment.

m) Accessible seating areas shall be strategically located in close proximity to boarding points aligning with BRT vehicles doors.

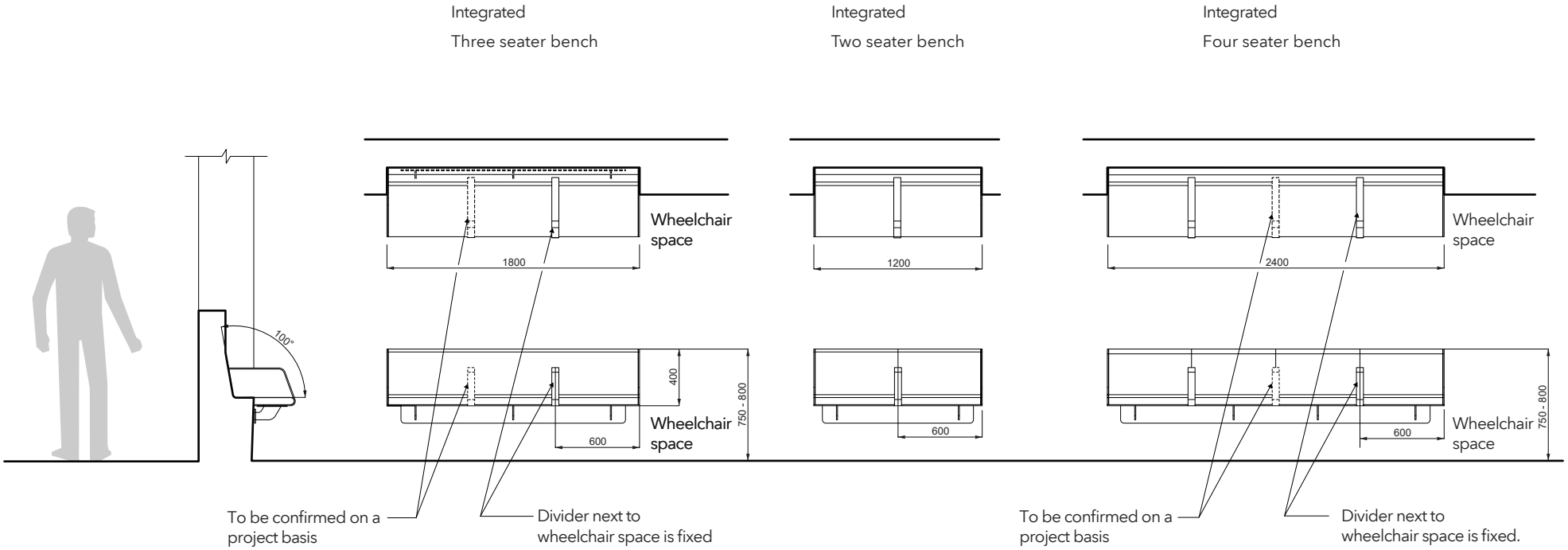


Figure 4-4: Customer seating

4.4.1.2.2 Leaning Rail Requirements

Leaning rails are an optional amenity and shall be strategically located to respond to customer needs where short rest is required. Leaning rails include a horizontal support member with the intention for customers to lean on.

a) Leaning rail shall be required primarily at platform where a minimum of 2 leaning rail units may be provided in lieu of seating due to site constraints. Units shall be evenly distributed throughout the Stops and Stations, subject to ridership, pedestrian flow, and crowding analysis.

b) Leaning rails shall be mounted where height of horizontal leaning rail is 700 millimetres above finished floor. Other dimensions shall be as per Figure 4-5: Leaning rails, freestanding and wall-hung.

c) Leaning rails shall be designed to be either floor or wall mounted.

   i. Where leaning rails are wall mounted, anchoring of leaning rails to wall to be coordinated during early design planning with structural engineer to ensure wall structure and anchoring is firmly secured to prevent damage due to vandalism.

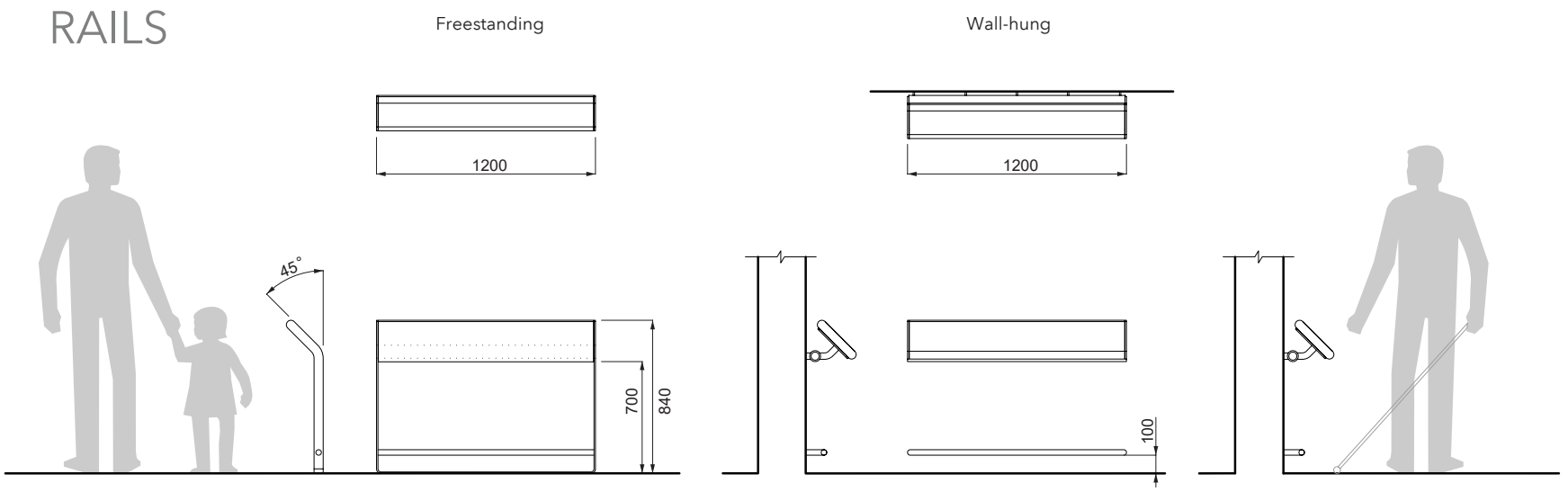


Figure 4-5: Leaning rails

ii. For floor mount, design shall reflect a clean and minimalist approach that allows for easy maintenance.

iii. All fasteners shall be concealed and vandal proof.

d) Provide integrated horizontal guard rail integrated within base of leaning rail to meet the needs of visually impaired people using cane detection as per DS-02 Universal Design Standard.

4.4.1.2.3 Waste Receptacle Requirements

a) The design of waste receptacles shall be coordinated from a functional and operational perspective with the operational and maintenance needs and agreements as set out in the Project Agreement.

b) Waste receptacles shall be accessible to all customers, including those who use wheeled mobility aids and/or scooters and the visually impaired.

c) All waste receptacles shall be located adjacent to high traffic areas along main path of travel. Specific locations include area adjacent to fare vending machines, waiting areas, retail areas, and platforms.

d) All waste receptacles shall be adjacent to seating areas and approximately 3m from nearest seat/bench.

e) Coordination shall be done with DS-03 Wayfinding Design Standard to ensure consistent signage, graphics, and colour to clearly identify the various waste/recycling streams and examples of typical items that belong in each stream across all Stops and Stations.

f) All waste receptacles shall conform to the DS-02 Universal Design Standard including requirements for clear space for side or front access approach and reach and space ranges.

g) Waste units shall not obstruct any part of an accessible route and ensure access is along a barrier-free path.

h) Any protrusion hazards along the pedestrian path shall conform to hazard detection requirements as per DS-02 Universal Design Standard.

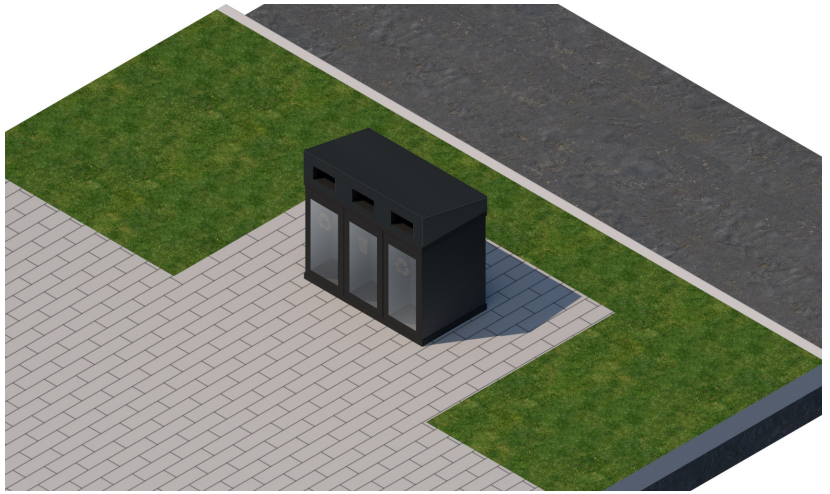


Figure 4-6: Waste receptacles

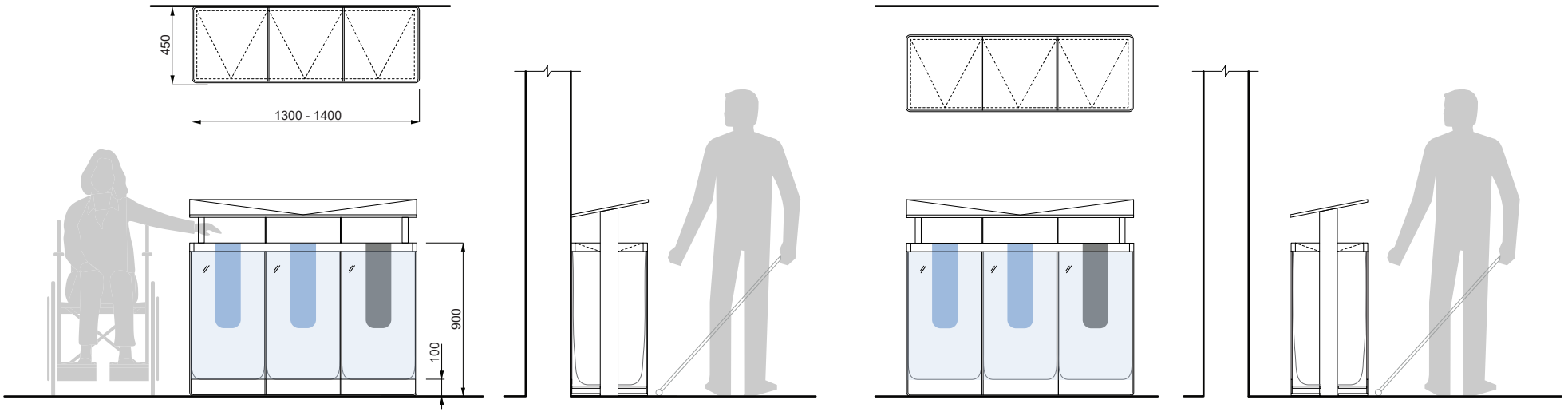


Figure 4-7: Waste receptacles and recycling units

i) Ensure longevity using robust design and durable materials. Material performance and durability requirements shall meet those outlines in this section and shall conform with CSA-S478.

j) All waste receptacles shall be security anchored to floor or wall using tamper proof hardware.

k) Waste receptacles shall be fabricated to have tamperproof and/or hidden fasteners.

l) Provide installation tolerances and operational requirements to facilitate ease of ongoing site operations and maintenance.

m) Materials shall be non-combustible and corrosion resistant.

n) Waste receptacle unit shall be consolidated and incorporate: one waste receptacle; one recycled glass/ plastic receptacle, one recycled paper receptacle. Potential for additional compost stream for organics to be determined by operations and governed by municipal requirements.

o) Design shall remove the need for customer to touch/ operate waste receptacle.

p) Access for depositing waste/recycling shall be from the top and all sides.

q) All waste and recycle units shall be visible on all sides using removable clear transparent bags and a clear outer covering fabricated using a transparent material such as rigid lexan and/or plexiglass. Outer covering shall be designed to be removable in future to allow for potential replacement. All waste and recycling units shall be positioned such that views to contents are unobstructed and in clear view of strategically located CCTV cameras.

r) Acceptable waste/recycling unit materials include stainless steel frame; main container shall be transparent and scratch resistant plexiglass/lexan to allow for clear visibility of contents within.

s) Waste and recycling units shall be provided adjacent to all waiting areas on the platform.

t) A minimum of two waste receptacle units shall be evenly distributed throughout the Stop/Station as per locations identified on drawings.

u) Design of waste receptacles shall not include horizontal flat surfaces to discourage customers from placing waste and recyclables such as empty cups, plastic bottles and waste.

v) Refer to Figure 4-7 Waste Receptacles and Recycling Units for illustrative dimensions.

4.4.1.2.4 Bollards

Bollards are vertical barriers used to restrict traffic of vehicles through pedestrian paths or to direct traffic circulation.

a) All bollards shall conform with the following requirements.
   i. Bollards along pedestrian circulation, including colour contrast, shall conform with requirements in DS-02 Universal Design Standard.
   ii. The clear distance between adjacent bollards shall not exceed 1500 mm.
   iii. Bollards shall be installed with a minimum of 1200 mm clear width where pedestrian access is intended between them.
   iv. Where there is an interference in the public realm with the municipality, bollard location shall be coordinated.

b) Vehicular bollards shall be round and of stainless steel finish.

c) Pedestrian bollards shall conform with the following requirements.
   i. The profile shall be coordinated and aligned with the line wide design language.
   ii. The colour shall be grey with colour contrast in accordance with DS-02 Universal Design Standard.
   iii. Selection of materials shall consider their resistance to impact and their durability.

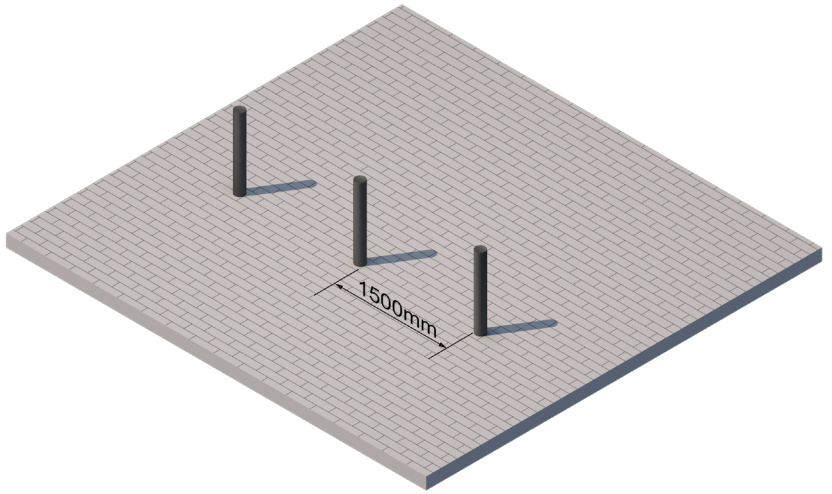


Figure 4-8: Safety Bollards

4.4.1.2.5 Bicycle Parking Requirements

Providing good access to Stations and well-located, secure, and fit-for-purpose bicycle parking is important for promoting sustainable transport and modal integration.

a) The number of bicycle parking spaces shall be provided as set out in the Project Agreement.

b) Covered bicycle parking shall be integrated with the Station building where possible ie., under overhang or canopy.

c) Where bicycle parking is required, placement shall not impact the path of travel or direct access to Station entrance. It shall not clutter the footway.

d) Where secure bicycle parking is required in the scope, it shall:

   i. Be integrated with the Station building.

   ii. Be in proximity of the Station, clearly visible and feel safe to access.

e) Accommodation for current and future planned Bike Share areas shall be accounted for in the design.

f) The way cyclists get from surrounding streets to the bicycle parking area shall be accounted for in the design.

   i. These connections shall eliminate long stretches where cyclists must wheel their bikes across pedestrian areas, which will also help reduce pedestrian-cyclist conflicts.

g) Bike Share locations shall be easily reached by the most direct route.

h) Bicycle parking shall:

   i. be located close to the Station pedestrian access points and be well overlooked and allow for bicycles of all types to be securely locked.

   ii. be visible, well marked and be at a maximum distance of 20 m from the Station entrance.

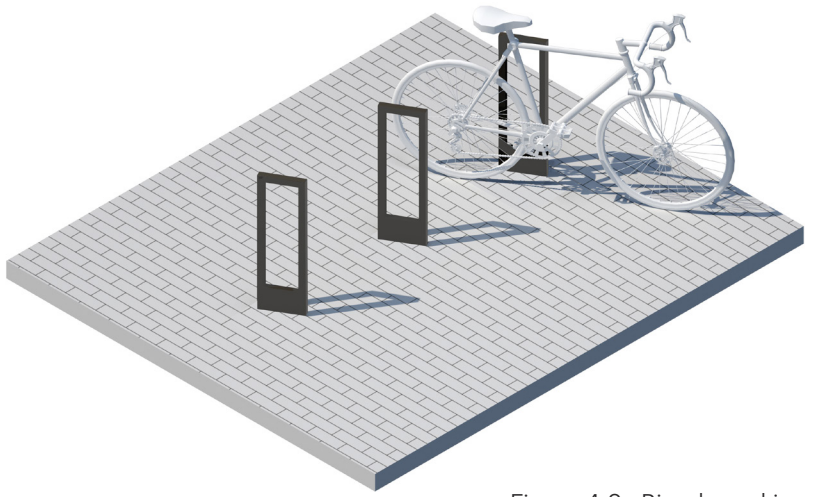


Figure 4-9: Bicycle parking

i) Bicycle racks shall:

   i. be durable, clean, consistent across the line and shall have two contact points for locking the frame and the wheel.

   ii. have a steel loop frame finished in grey powder coating or high density polyurethane foam with colour contrast that conforms with requirements in DS-02 Universal Design Standard. The bike racks shall be embedded.

   iii. undergo durability testing for impact resistance, colour fastness, corrosion resistance, UV resistance, and scratch resistance.

   iv. meet the Association of Pedestrian and Bicycle Professionals (APBP) guidelines.

   v. be designed to be cane- detectable to assist individuals with low vision and blindness in navigating around it.

j) This section shall be read in conjunction with DS-07 Bike Infrastructure Design Standard.

4.4.1.3 Exterior Lighting Standards (Site Lighting, Pedestrian-scale Lighting)

Lighting shall be uniform across the BRT network. Illumination levels shall be coordinated between the municipal realm, BRT realm, and third party/development areas to ensure consistency in levels, elimination of contrasts and dark spots, and light level spreads.

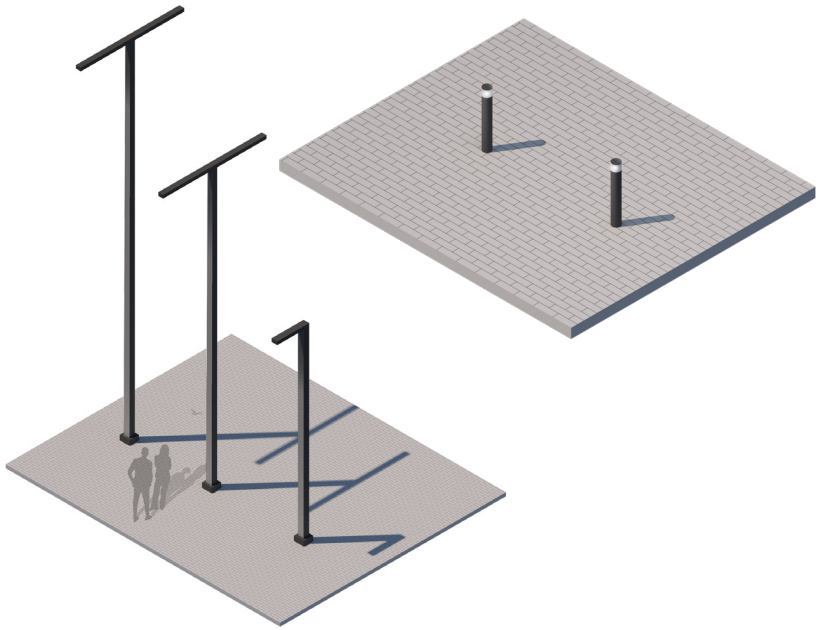


Figure 4-10: Light poles (Left), Light bollards (Right)

4.4.1.3.1 Design Requirements

a) Exterior lighting shall be designed to:
   i. meet dark sky standards;
   ii. be aimed downwards to reduce light pollution; and
   iii. be shielded to reduce glare and light trespass to neighbourhood.

b) Lighting shall be integrated into:
   i. built site elements;
   ii. site furnishings; and
   iii. wayfinding signage (as indicated in Metrolinx DS-03)

c) The selection of luminaires and their use shall be consistent along the line.

d) Pedestrian-scale illumination shall be provided for areas of rest and waiting to enhance customer comfort and safety.

e) Pedestrian-scale light pole height shall not exceed 6 m.

f) In areas of vehicular movement and parking, the lighting shall meet the Backlight, Uplight, and Glare (BUG) rating system, be uniform and have no glare.

g) A gradient of illumination levels shall be used to aid in intuitive wayfinding and will assist to provide a visually comfortable transition from the street.

h) Light bollards and planting bed lighting may be used for pathway lighting.

i) All exterior lighting shall be coordinated with the locations of CCTV cameras to prevent light glare.

j) All exterior lighting shall provide illumination to address CPTED principles.

k) With regards to maintenance and operations, exterior lighting shall:
   i. provide illumination to address CPTED principles;
   ii. be energy efficient LED sources of lighting; and
   iii. be vandal-proof and rated for appropriately rated outdoor installations.

l) Controls for exterior lighting shall be:
   i. dimmable and integrated into the lighting controls scheme;
   ii. controlled by photocells, occupancy sensors, central override switches, and contactors with a manual override;
   iii. through a computer-based lighting control system that controls the various lighting; and
   iv. programmable to allow revision of illumination levels during or after commissioning as needed.

m) All exterior lighting shall have:

   i. lens rating of IK10;

   ii. IP65 weatherproof rating;

   iii. vandal-proof features;

   iv. 0-10V dimming capability.

n) All exterior lighting shall have a uniformity ratio at:

   i. maximum to minimum: 4 to 1 or better;

   ii. average to minimum: 3 to 1 or better.

o) Light standards shall be finished in grey powder coating with colour contrast that conforms to the requirements in DS-02 Universal Design Standard.

p) Colour temperature shall be 3500k unless otherwise noted in Project Agreement. Selected colour temperature shall be consistently utilized across the line.

q) The lighting system shall be designed to align with Illuminating Engineering Society of North America (IENSA) recommendations. Refer to Table 4-2 for illumination levels per zone.

r) For lighting requirements at Stops, refer to Section 5.5 Lighting.

Zone	Minimum Average Maintained Illumination Level (lux)
Exterior lighting (plazas/ public areas/ passenger pick-up & drop-off areas)	50
Stairs/ elevators/ ramps	200
Pedestrian crossings to BRT realm	110*

* in coordination with municipal standard.

Table 4-2: Lux level per zone

4.4.1.4 Vertical Circulation

Vertical circulation is defined as the means for movement of people between floors, or levels, which includes stairs and elevator enclosures. The BRT network shall respond to scenarios where vertical circulation elements may be required. These scenarios include changes in road elevations, access to the customer infrastructure, and exceptional circumstances where stairs, and elevators may be required.

The design shall eliminate or reduce where possible grade changes between the public realm and Stops/Stations access. When required, vertical circulation shall meet the following design requirements:

a) Vertical circulated and all related elements shall conform with the requirements in DS-02 Universal Design Standard and all applicable standards, regulations, and codes to the approval of all authorities having jurisdiction. Where accessibility requirements vary between documents, the most stringent requirements providing the most inclusive/accessible solution shall apply.

b) Surge spaces at the top and bottom of stairs and ramps shall be free of any obstruction and be not less than 5 m.

4.4.1.4.1 Stairs

a) Stairs shall be positioned in close proximity to primary entrance.

b) Stairs shall have a minimum slope of 30 degrees.

c) The design of the handrails shall take into account CPTED principles.

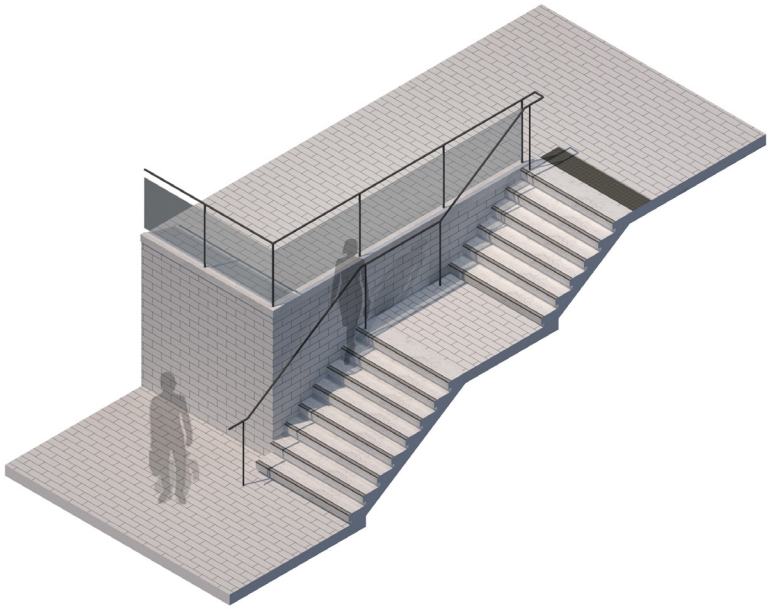


Figure 4-11: Stairs

d) Handrails' configuration and finish shall be consistent along the BRT network:

   i. Handrails shall be round and of stainless steel finish. Handrail shall conform to the requirements in DS-02 Universal Design Standard for bumble bee strip or hazard strip.

e) Stairs and inclined surfaces shall serve distinct paths along a route. Integrated stairs and ramps, referred to as "stramps," shall not be permitted.

f) Stairs shall maximize light transmittance and transparency between levels through the use of transparent materials and with stairwell openings that extend between grade and platforms for daylighting.

g) Provide 100 mm minimum width continuous runnel channels at the stair edges, flush with the inside corner of the tread and riser beneath the handrails for water runoff and bicycle access.

4.4.1.4.2 Elevators

a) Elevator cabs and enclosures shall be constructed of glass and be transparent.

b) Elevator cab to be sized to accommodate patient gurneys with wheels as per OBC including space for a minimum of two emergency responders or capable of accommodating equipment for maintenance procedures.

c) Elevators shall be configured as flow through to avoid turning stretchers, wheelchairs, inside the elevator cab.

d) Elevators to be designed in accordance with DS-03 Wayfinding Design Standard and DS-03, P2B Sign implementation Manual.

e) In addition to adhering to the DS-02 Universal Design Standard, elevators shall comply with Appendix E of ASME A17.1/CSA B44.

f) Elevators shall be designed with a minimum technical overrun with no rooftop projections.

g) Stations shall be equipped with redundant barrier free access to all platforms by means of two elevators.

h) For single entry Stations, two co-located elevators shall be provided in close proximity to primary entrance.

4.4.1.5 Planters and Planting

Tree groves and planted areas shall be framed by raised planters. Raised planters allow for integration with furniture, reinforce important flow directions, and are an effective tool to maintain and ensure the survival of planting in areas of high pedestrian traffic. These structures are also needed in conditions where planting is installed above built areas. Their careful use in isolation or in relation to the building and other structures such as ramps and stairs is a powerful way to shape the open space and to give proper balance of hardscape and softscape in the overall public realm.

a) Raised planters shall be located to reinforce major pedestrian flows and to allow for gathering pockets and resting places.

b) Raised planter:

   i. is recommended to be 405 mm high to protect plant material from salt spray and animal damage.

   ii. intended as seating shall be higher than raised curbs used on site to follow universal design principles. The seat shall have a mid-dark toned, high density and rot-resistant hardwood toppers. Refer to Section 4.4.1.2.1 for additional seating requirements.

c) Finish and material shall be consistent with strategy and location within the site. Emphasis in material quality shall be placed on areas that serve the public and more modest forms of planters may be considered in service areas not visible to the public.

d) Raised planters shall be designed to discourage skateboarding along planter edges. The 50 mm thick bench top creates a natural break in the smooth surface of the planter, thereby discouraging skateboarding.

e) When raised planters form part of traffic barriers,

   i. the width of the planter shall match the width of the traffic barrier where it is integrated;

   ii. low vegetation shall be placed in the planter, so as not to block visibility of users and vehicles; and

   iii. a planter drain shall be included, and water discharged to the street shall be directed away from the customer's path.

f) Raised planters shall be provided at (median) platform end taper, having a maximum width equal to the platform end width.

   i. Where raised planters cannot be provided, unit paver shall be considered as a second choice.

Figure 4-12: Raised planters

4.4.1.6 Trees and Tree Grates

Trees planted in tree grates shall be used where pedestrian flow requires continuous movement over the soil volume zones. Soil volumes shall be accommodated in soil cells under paving in these conditions.

a) Tree species in this context shall be deciduous, upright, single stem, high canopy shade trees.

b) Trees shall be selected for form and higher branching height to allow for maximum movement under their canopy within a minimum number of years post-planting.

c) Trees shall have a minimum branch clearance of 2000 mm from finished grade, or upright branching habit to allow for movement under their canopy.

d) Tree trunks shall be upright and relate to an architectural structuring language of defining the pathway.

e) Tree grates shall feature narrow slits to allow for moisture, light, and air to pass through.

f) Tree grates shall be deployed to protect trees from urban traffic, mitigate salt infiltration into soil from winter maintenance activities, and allow trees to thrive and grow.

g) Tree grates shall act as protective barriers for trees in areas with high pedestrian traffic and shall be used as an alternative to planting beds.

h) Tree grates shall also be used where there is space constraint even if pedestrian traffic is medium or low.

i) Tree grates shall be installed at the same level as the surrounding pavement and shall allow for soil to stay uncompacted.

   i. The size, shape, and material finish of tree grates shall follow the line wide identity principles and material standards set by adjacent paving surfaces and specific requirements of tree maintenance and growth.

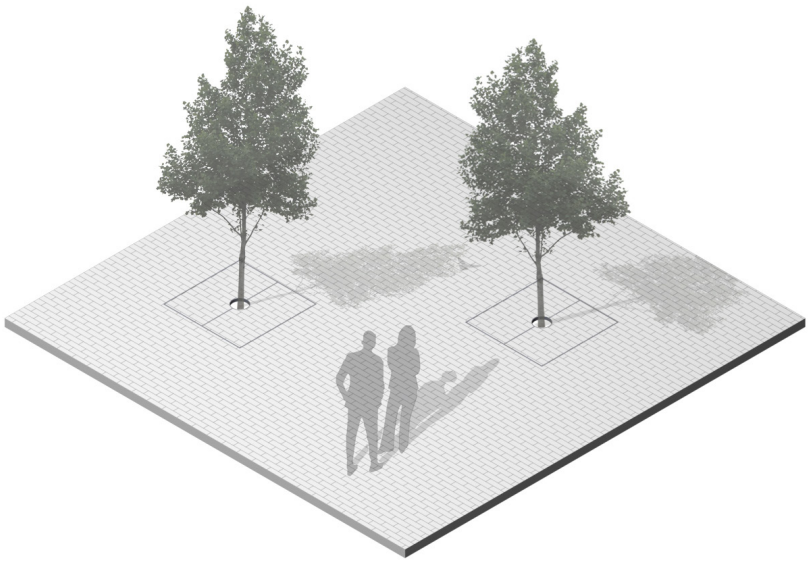


Figure 4-13: Tree grates

ii. Tree grates shall comply with DS-02 Universal Design Standard.

iii. Tree grates shall be used in conjunction with soil cells to ensure compliance with the required soil volume.

iv. Tree grates shall be levelled to match adjacent paving taking special precautions to eliminate tripping hazards.

4.4.1.7 Soil Cells

a) Soil cells pavement systems shall use uncompacted soil material below ground to support large tree growth while allowing above ground infrastructure, such as pavement and other infrastructure, to be incorporated into the design.

b) Soil cells shall be used in areas where a hardscape surface is required to maintain maximum pedestrian flow together with the need to provide deciduous trees within the hardscape environment.

c) The use of soil cells shall be determined by the requirement to provide a minimum of 30 m3 of topsoil per single tree or 20 m3 of topsoil per tree in shared soil zones.

d) Smaller trees can be used when there is not enough soil volume for canopy trees. These can be planted closer as long as there are no safety concerns.

4.4.1.8 Stormwater Management

Site stormwater runoff shall be managed using low impact development (LID) measures. Refer to Sustainable Design Standard for requirements. Plant species selected for the BRT network shall be beneficial for stormwater retention.

4.4.2 Variable Elements

Along the BRT network there are elements that repeat continuously to create a transit language (consistent elements) as well as elements that connect the public realm of the BRT system with the municipality streetscape (local or Municipal Realm).

Some of the variable elements within the BRT network are:

a) trees;

b) groundcover plant material; and

c) heritage and third-party integration.

d) Municipal District Signage (business improvement area, BIA) Strategy

4.4.2.1 Trees

The use of local vegetation is encouraged in the BRT design. Refer to Section 4.6.5 for signature planting within the BRT realm.

4.4.2.2 Groundcover Plant Material

a) Layout

i. Groundcover plant material shall be arranged according to their role and location within the site.

ii. The arrangement of understorey plant material and ground cover shall complement the built environment and correlate to the circulation flow.

iii. CPTED principles and guidelines shall be used to ensure proper visibility and safety.

iv. Spacing of planting shall ensure proper massing and absence of visible gaps. It shall respond to the species' space requirement.

v. Plant material shall be selected to provide seasonal interest; vary in texture, colour, and form; and create a meaningful pedestrian experience.

vi. Plant material shall be contained within a planting bed or raised planter. The edge of the planting bed shall have a distinctive edge treatment that is a minimum of 150 mm above the adjacent pavement covered in raised planter.

b) Groundcover Species

i. Groundcover plant material has an important role in the support of the built environment around the BRT network. Groundcovers, vines, perennials, and ornamental grasses are highly related to the human scale and are primary in the experience of the space. Groundcover plantings shall be used to reinforce the built environment, directionality, and wayfinding. They provide a useful tool to achieve intuitive design and customer orientation.

ii. Plant species shall be non-invasive, hardy, drought tolerant and predominantly native species.

iii. Use of ground cover and perennial grass plantings shall follow the following principles:

1) Selection of plant material shall respond to its location according to hardiness, immediate context (neighbourhood) and line-wide identity.

2) Plant species shall include deciduous and coniferous groundcovers, vines, perennials, and ornamental grasses. They shall be hardy, and drought- and salt-tolerant.

3) Selection of plant material shall follow CPTED requirements.

4) Selection of plant material shall maintain visual interest throughout the seasons.

5) Selection of plant material shall deploy a selective species palette.

6) Plant placement and spacing shall be consistent; incorporate mass groupings, and repeat plant groupings, materials, or design elements.

7) Groundcover species shall always be grouped in a minimum of three plants of the same species.

8) Planting beds shall be fully vegetated.

4.4.2.3 Heritage and Third-party Integration

BRT infrastructure provides an opportunity to accommodate heritage and third-party integration.

a) Where third-party integration is within scope:

   i. At Stops, third party integration shall be integrated to the back wall of the canopy.

   ii. Third party integration location shall not interfere with the BRT information display systems and BRT signage.

b) Where the BRT infrastructure is located in close proximity to a heritage building:

   i. BRT infrastructure shall maximize transparency and protect/maintain views.

   ii. BRT elements shall minimize obstructing views. Where feasible, BRT design may warrant expression of heritage architecture.

4.4.2.4 Municipal District Signage (business improvement area, BIA) Strategy

These opportunities shall be further explored during detail design, in consultation with the public and municipal staff.

a) Municipal signage shall be coordinated during the early stages of the design with the respective municipality.

b) Municipal signage shall be located out of Metrolinx property.

c) Municipal signage shall not interfere with the BRT facility's infrastructure visibility and access.

d) Requirements for municipal signage shall be coordinated with Metrolinx and the respective municipality (e.g., power and water).

4.5 STREET ELEMENTS AND CONNECTION

The BRT network includes elements that enhance the customer experience and create links between the BRT realm and the municipality. These features are pedestrian priority measures that reduce crossing distances and increase the safety of pedestrians. Road infrastructure shall be governed by the relevant municipal requirements.

Elements recommended for use to prioritize pedestrian safety include but are not limited to the following:

- Crosswalks
- Median refuge islands
- Bullnoses
- Traffic demarcation
- Accessible Pedestrian Signals
- Signage

4.5.1 Street Elements

4.5.1.1 Crosswalks

A crosswalk is a marked part of the road where pedestrians have the right of way to cross. All crosswalks shall be located and designed according to municipal standards and Ontario Traffic Manual.

a) Unless noted otherwise in the Project Agreement or in municipal requirements, crosswalks adjacent to Stations and Stops shall comprise of:

   i. accessible pedestrian signals (APS); and

   ii. median refuge islands and protective bullnose

4.5.1.2 Enhanced Crosswalks

Where crosswalks are adjacent to Stations and Stops, the recommendation is to use enhanced crosswalks to create an elevated customer experience. Various strategies that can be used to create an Enhanced Crosswalk are identified below.

a) Enhanced crosswalks include one or more of the following and shall be applied to all four legs of the intersection:

   i. Wider paving marking: Where pedestrian flow modelling determines a significantly higher than normal pedestrian volume, wider crosswalk widths of 4 m shall be provided. These wider crosswalks will further aid in intuitive wayfinding, and elevate the pedestrian's stature, security, and comfort.

   ii. Use of colour.

   iii. Use of texture.

4.5.1.3 Accessible Pedestrian Signals

Accessible Pedestrian Signals (APS) advise pedestrians who are visually impaired when they have the right of way to cross at a signalized intersection and in which direction they may cross the intersection. APS are linked to visual pedestrian signals. Audible tones are used to indicate the direction in which the pedestrian has the right of way.

a) Provisions shall be made in the design of the BRT network for the consistent incorporation of the APS system.

   i. At all crosswalks adjacent to Stations and Stops, at each crossing starting point.

   ii. At median refuge islands, mounted at a height of not more than 1100 mm from the finished floor elevation (FFE), in a consistent location and adjacent to the crosswalk.

   iii. Placement of the APS where there are cross-rides and crosswalks should be considered to minimize potential conflicts with pedestrians.

4.5.1.4 Curb Extensions

Curb extensions are projections of the adjacent sidewalk on the street to reduce the crossing distance. Their presence not only functions from a safety point of view but also contributes significantly in building the BRT realm, providing sensibility for pedestrians and scaling down the size of the road acknowledging human presence. They shall include tactile indicators before the crossing, unless noted otherwise in the Project Agreement.

a) Curb extensions shall be located where street parking is allowed.

b) Curb extensions shall be located where crossing distance reduction is required (e.g., in proximity to schools and hospitals)

c) Coordination shall be made when designing curb extensions by considering the hierarchy of pedestrians and cyclists. Proper demarcation and measurements to encourage cyclists to demount the bicycle while crossing pedestrian zones shall be implemented.

4.5.1.5 Median Refuge Islands

Median refuge islands are protected spaces located in the centre of the street to facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing bicyclists and pedestrians to navigate only one direction of traffic at a time.

a) Median refuge islands shall be located within the crosswalk that provides access to the BRT Stop or Station. For additional protection, a bullnose shall be provided where median refuge islands are located.

b) When applied on a two-way street, the median refuge shall be placed along the centreline of the roadway between the opposing directions of travel.

c) The approach edge of the raised median (and in some instances the base of the bullnose) may be outlined in retroreflective white or yellow material.

d) Maintenance considerations:

   i. In areas with snow accumulation, reflective delineators may be used to mark the island for increased visibility to snow-plow crews, subject to operational requirements.

   ii. Median refuge islands may collect road debris and may require somewhat frequent maintenance.

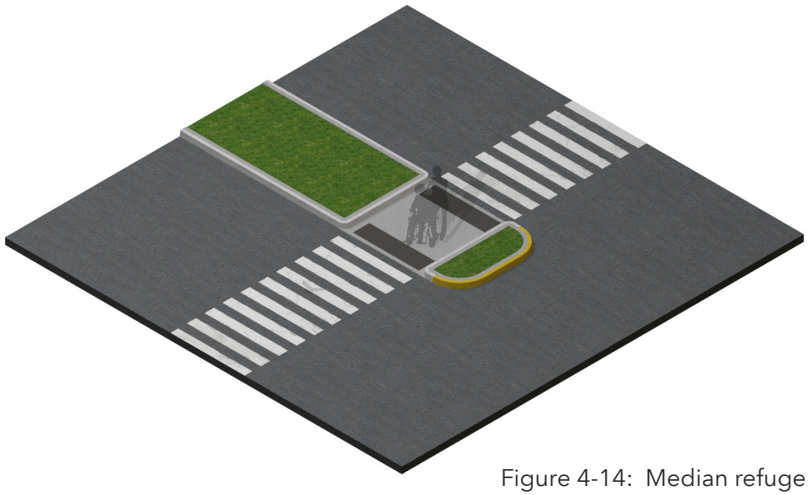


Figure 4-14: Median refuge

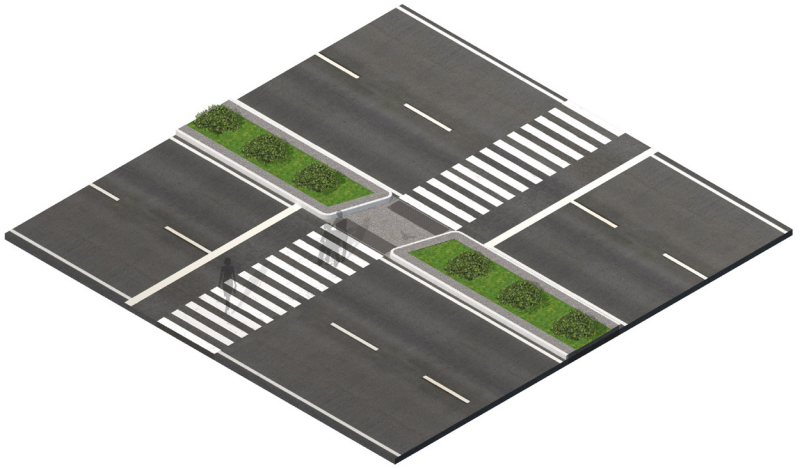


Figure 4-15: Median refuge with offset cross-walk

iii. Median refuge islands should be visible to snow-plow crews and should be kept free of snow berms that block access.

e) Median refuge islands shall be provided with tactile walking surface indicators at both edges facing the road.

f) Median refuge islands shall be provided with an APS to allow for a two-stage crossing.

4.5.1.6 Passenger Protective (Bullnose)

The bullnose as a traffic barrier is an element located at the head of the BRT median platform intended to reduce possible harm to pedestrians, Stops and signal infrastructure in the event of a head-on collision.

a) A low curb and planting (where feasible) shall be provided in the BRT network.

i. Plant material shall contain low-growing plants that are resilient to their environment.

ii. Refer to Section 4.4.1.5 Planters and Planting.

b) Bullnose height requirements shall be coordinated with the traffic civil discipline.

i. A risk analysis assessment shall be conducted to determine the height of the bullnose. Where a higher bullnose is required, it shall be designed to maximize visibility and protect sight lines for pedestrians and vehicles in the opposite direction. The bullnose barrier shall be designed to resist crashes, stop vehicles, and avoid a ramp effect.

c) Cross-rides and crosswalks should be separate when crossing a road and not be combined to minimize conflicts with pedestrians. The cross-ride should be in front of the bullnose.

i. Cross-ride, crosswalk, APS location and bullnose shall be coordinated to ensure pedestrian safety is prioritized.

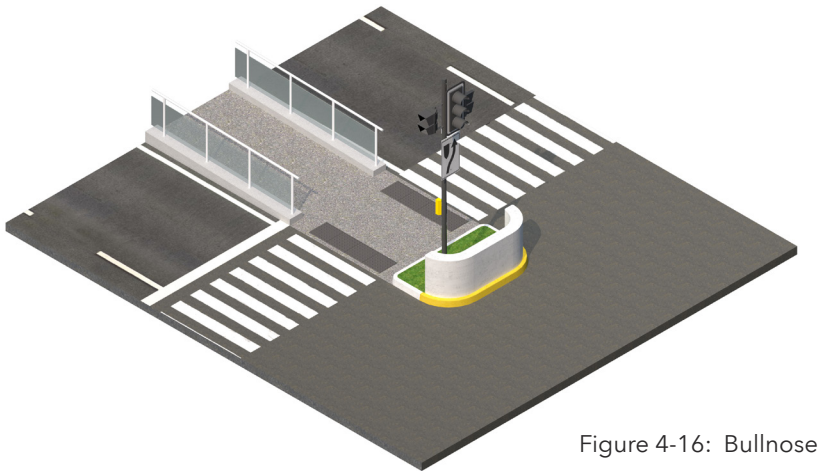


Figure 4-16: Bullnose

4.5.2 Transit Connection

The BRT network is a dynamic environment that includes linear means of transportation from end to end, nodes where other means of transportation cross paths allowing customers to switch lines and reach their destinations in a timely manner.

These other means of transportation may include subways, bus routes, Light Rail Transit and heavy rail networks. Seamless customer experience is achieved through coordination with the relevant AHJs regarding proximity to the BRT Stop/Station and other modes of transportation (intermodal, interchange, or terminal stations).

Coordination is made with other major transportation systems to analyze the current and future needs, plan the immediate and future growth of the existing network and develop expansions.

a) In the BRT network, at Stops and Stations, transit connection shall be simple and intuitive, avoiding scenarios where customers face confusion or complex decisions.

   i. Visibility shall be maintained between the BRT Stop/Station and connecting route to other modes of transportation.

   ii. Where the BRT Stop connects to transit stations, surface transit improvements (such as pavement, minimized travel distance, and enhanced waiting areas) shall be made in coordination with the respective authorities and other networks.

   iii. The size of the waiting areas and sheltered spaces for on-street Stops shall be commensurate with the anticipated volume of customers at each location.

   iv. Public realm hardscape treatments shall support safe and intuitive wayfinding at the connections between transit stations and adjacent mobility functions. Coordination shall be made with local AHJ. Adjacent mobility functions may include connecting transit, Bike Share, car share and ride-hailing services. These shall account for the natural behaviour of customers to seek the shortest distance and most direct route.

   v. Lighting shall be designed at appropriate heights and levels of illumination to aid safe and intuitive wayfinding to the transit connections and consider places/locations where customers will be waiting. Lighting shall ensure there are no dark areas as they can be perceived as unsafe by customers. Areas of increased personal vulnerability, such as waiting areas or payment spaces, require a special design focus.

vi. Widths of connecting routes shall be designed to safely and comfortably accommodate pedestrian flows, as determined through a pedestrian flow modelling for maximum flows, in addition to the required minimum dimensions required by the applicable codes and standards.

vii. Pedestrian safety, including CPTED, shall be prioritized in the design of the connections. Improvements within the public ROW shall ensure that street crossings, where required, are safe and convenient and shall account for the natural behaviour of customers to seek the shortest distance and most direct route. This includes the provision of crosswalks, elimination of blind spots, provision of signalized crossings, separation of modes of transportation such as walking and cycling, and pavement markings and treatments.

viii. Wayfinding and digital service customer information shall be designed holistically to provide accurate, timely, and synchronized information to passengers. As passengers navigate all transit portions of their trip, progressive disclosure that is location-based shall be provided.

b) Refer to Section 5 for the design and planning of BRT Stops.

c) Signage shall conform to the Metrolinx DS-03 to provide a positive customer experience and ease of navigation at BRT Stops and Stations.

4.5.2.1 Transit Connection to Interchange and Intermodal

An interchange Station is a transfer Station with more than one route in a public transport system that allows passengers to change from one route to another, often without having to leave a Station or pay an additional fare.

An intermodal Station is a Station that integrates different transport modes, such as rail, road, bus, and mass transit, (e.g., Eglinton station of the Eglinton Crosstown, which allows the connection between the LRT network and the subway network at Toronto Transit Commission Yonge subway station).

Inline, interchange and terminal Stations can all be intermodal.

The connection between the BRT network and other modes of transportation requires special attention to the design at transfer points:

a) Intuitive design shall be maintained when integrating the BRT network with other modes using passageways and minimizing decision points.

b) Signage shall be installed at arrival, decision points, transfer corridors, passageways, and entry points to the other transit network, including weather and schedules information

c) The design and configuration of layouts shall allow for an integrated paid area and minimize the need for additional fare thresholds.

4.5.2.2 Transit Connection to Terminal Stations

A terminal Station is located at the end of a transit line.

Similar to intermodal Stations, the transit connection shall meet the following requirements:

a) Corridors or transfer passageways connecting the two modes: Intuitive design shall be maintained when integrating the BRT network with other modes of transport using passageways and minimizing decision points.

b) Signage shall be installed at arrival, decision points, transfer corridors, passageways, and entry points to the other transit network.

c) The design and configuration of layouts shall allow for an integrated paid area and minimize the need for additional fare thresholds.

4.5.3 Safety by Design

Safe and efficient movement of passengers between the platforms, other modes of transportation, adjacent developments, and the municipal sidewalks is required with considerations of personal comfort, security, and safety. Refer to Section 3.2.2 CPTED for additional guidelines on safety by design.

Crosswalks between the municipal sidewalk and the entrance to the BRT realm shall be coordinated with the provisions in DS-02 Universal Design Standard.

4.5.3.1 Surrounding Community Protection

a) Coordination shall be done with the AHJ to provide an enhanced sense of protection along the pedestrian approach to the BRT realm.

b) Pedestrian connections and walkways shall use dedicated and continuous routes, throughout the BRT realm and connections to the surrounding areas.

   i. Pedestrian clearways shall have a minimum width of 1800 mm, subject to coordination with the relevant municipality and/or AHJ.

c) Provisions shall be made to prevent potential conflicts between pedestrians and road vehicles as outlined in DS-02 Universal Design Standard.

d) Higher lighting levels shall be provided at decision points.

4.5.3.2 On-site Protection

a) Access to the BRT realm shall be clear, safe, and convenient from the municipal sidewalk.

b) Slip-resistant materials shall be provided on the platform and at pedestrian access points.

4.5.3.3 Crosswalk Protection

a) Crosswalks in the BRT network shall be installed in conjunction with signs and accessible crosswalk markings to provide guidance for pedestrians and alert road users to the designated pedestrian crossing point.

b) Provisions shall be made to prevent potential conflicts between pedestrians and road vehicles.

4.5.4 Pedestrian/Cyclist Zone

The BRT realm must balance pedestrian and cycle movement with various types of road traffic. Each type must be understood separately, along with the interactions between them. The public realm must in general prioritize pedestrian movement, followed by cycle and then vehicular movement. The following needs of pedestrian cyclist zones shall be met in the design:

a) Pedestrians shall be given priority. This includes customers requiring barrier-free access.

b) The distance connecting the BRT Stop/Station entrances to other modes of transportation shall be optimized.

c) Cycling infrastructure shall be separated from other modes of transportation and pedestrian foot traffic.

d) This section shall be read in conjunction with Section 4.3.1.2.3 Bicycle Parking.

4.5.4.1 Pedestrian Zone

The pedestrian zone within the BRT realm shall be delineated from the municipal sidewalk, developments and, in some cases, other transit modes. Crossings shall be clearly identified, demarcated, and signalized for pedestrian safety.

The design of the public realm should aim to enable, encourage and empower people to choose walking for a portion of their journey. This can be achieved by providing:

a) A clear path of travel with the most direct routes, minimizing decision points.

b) Appropriately dimensioned routes that create a comfortable walking experience even at the busiest times.

c) Clear sightlines along routes that promote intuitive wayfinding.

d) Clear wayfinding signage at appropriate locations.

e) A well-lit and pleasant environment that feels safe and secure.

4.5.4.2 Cyclist Zone

The following serve as recommendations for safety of pedestrians and cyclists:

a) Considering the relationship between cyclists and other road users and providing paths that are protected from vehicular traffic including segregated cycle routes.

b) Managing potential conflicts between cyclists and pedestrians on the sidewalk and those using public transport and pedestrian crossings:

   i. Potential conflicts between cyclists exiting the cycling zone for parking and pedestrians shall be mitigated by the use of buffering zones.

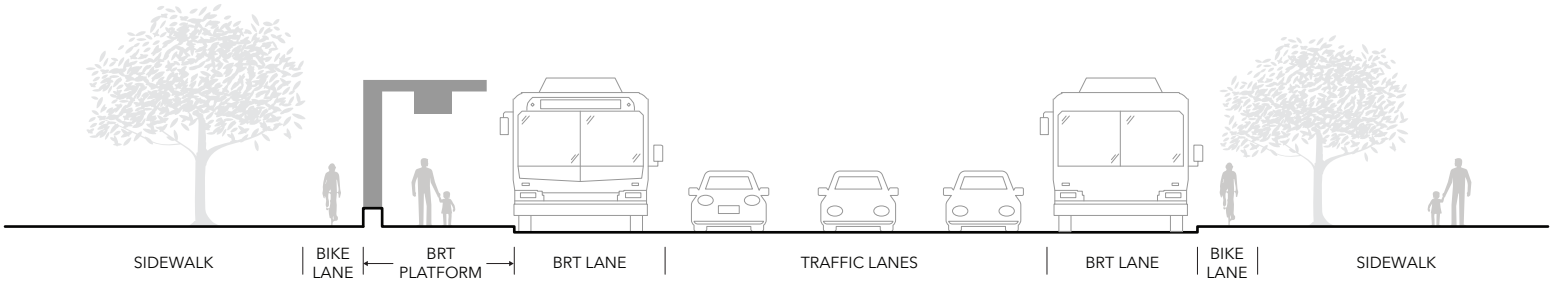
   ii. When bikeways run parallel and adjacent to pedestrian routes, a cane-detectable and visually contrasting separation strip shall be used to indicate priority zones for the various users.

   iii. When pedestrian pathways and bikeways intersect and a high level of pedestrian cross-traffic is anticipated, pedestrian access shall be clearly identified with signage and tactile walking surface indicators, including tactile attention indicator surfaces delineating the line between the pedestrian path and the bikeway. In addition, the bikeway shall provide clear direction to cyclist when they are expected to yield to pedestrians crossing the bikeway.

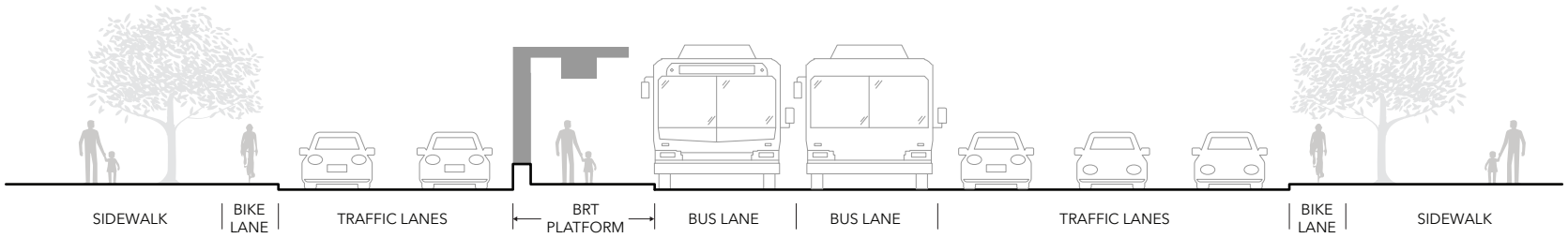
c) Minimizing the distance between bicycle routes and bicycle parking and encouraging cyclists to dismount where there is a need to leave the bicycle path.

d) Delineating appropriately the cycling zone from the vehicular zone by providing physical separation and distance between them, as well as traffic signals especially at cycling zone access points.

BRT STOP AT CURBSIDE



BRT STOP AT MEDIAN



Note:
Diagram assumes provision of bike lanes and pedestrian access points to be configured according to site conditions, municipal requirements and in line with NACTO principles and best practices.

Figure 4-17: Cyclist zone at a BRT public realm

4.6 CORRIDOR IDENTITY

4.6.1 Protective Barriers

Whereas the public realm requires uninterrupted sight view and transparency, there are scenarios where the use of a protective barrier is required, from a safety and restricted access point of view. Protective barriers within this section shall apply to all areas visible to the public along the BRT network:

a) All protective barriers shall have consistent materiality and identity that can be deployed at varying degrees of transparency to support natural surveillance.

b) All protective barriers shall be designed to follow the line-wide module.

c) Design for these elements shall include:

   i. visibility;

   ii. contextual response;

   iii. scale;

   iv. seamless integration with architecture and infrastructure;

   v. kit-of-parts approach;

   vi. consistent/complementary PSOS requirements;

   vii. ventilation;

   viii. materiality;

   ix. security performance including grounding;

   x. maintenance including graffiti and vandalism;

   xi. consistency with municipal standards; and

   xii. property acquisition extent to accommodate an appropriate design response.

d) Project barriers shall be built from durable and low maintenance materials.

e) The use of protective barrier shall be minimized. Where required, the need shall be demonstrated by a safety and security analysis.

f) A continuous planting buffer shall be provided along the protective barrier to minimize the visual impact. Plant material selection and placement shall adhere to CPTED guidelines.

   i. Seasonal variation and maintenance requirements shall inform plant material and selection.

g) Height requirements for protective barrier shall be governed by the requirements of municipal by-laws as they relate to the purpose of adjacent uses for which the protective barrier is provided. Protective barrier heights shall meet functional and security requirements.

4.6.1.1 Opaque Protective Barriers

a) The use and type of public facing opaque protective barrier shall be coordinated with and approved by Metrolinx Engineering and Asset Management group or relevant approval authority subject to the Project Agreement.

4.6.1.2 Transparent Protective Barriers

a) Transparent protective barrier shall be used around facilities facing the public realm that require limited access from the public while maintaining visual surveyance.

b) Transparent protective barrier shall be metal wire grid and powder coated to have a grey colour/finish. Colour contrast shall comply with the requirements in DS-02 Universal Design Standard.

c) Transparent protective barrier shall use seamless look and detailing.

d) Utilitarian types of transparent protective barrier, such as chain link, shall be prohibited at all areas visible to the public, including directional, crowd control, and fall protection.

e) A safety analysis shall demonstrate the requirement for protective barriers between tracks.

4.6.2 Sound Barriers

The use of sound barriers within the BRT corridor will provide sound attenuation as well as screening. Where sound barrier are required in a project, they shall be of a high level of design that is durable, low maintenance, and consistent in its appearance throughout the corridor.

4.6.2.1 Design Requirements

a) Sound barriers shall meet the requirements outlined in the environmental impact assessment and other noise impact evaluations.

   i. This includes density of materials and minimum heights.

Figure 4-18: Transparent protective barrier example

b) Sound barriers shall have graffiti protection; they shall include an approved graffiti protection coating that can be applied to concrete.

c) When a combination of a retaining wall and sound barrier is required, the wall design shall integrate the two functions to eliminate separate structures running adjacent to each other.

d) The design of all sound barriers shall express the overall line-wide design approach in terms of:

   i. materiality

   ii. texture

   iii. modulation and pattern

   iv. colour

   v. lighting

e) Sound material shall:

   i. be durable and low maintenance; and

   ii. include transparency where possible.

f) Where possible, noise barriers shall be combined with vegetation and opportunities for planting shall be coordinated in the barrier geometry and structure.

   i. The irrigation and drainage system shall integrate with the design.

4.6.3 Retaining Walls and Upstands

Retaining walls may be required to accommodate changes in grades between adjacent surfaces.

a) The design of the retaining wall shall be consistent throughout the corridor and shall be durable, add visual interest, and include colour, texture, and a variety of form.

b) Materials for retaining may need to include cast-in-place concrete, precast modular, or a substructure clad with a precast concrete veneer.

c) Retaining walls shall also provision for proper drainage behind the wall and water shall not be directed to the pedestrian travel.

d) Cast-in-place concrete walls shall have design qualities that include a combination the following techniques:

   i. Coloured concrete

   ii. Form liners and patterns

   iii. Sandblasted or bush hammered

e) Precast modular style retaining walls shall be consistent with the Metrolinx identity and may include supergraphics. Single colour modular blocks are not permitted.

f) Lighting shall be strategically located and integrated into the design of the retaining walls (adjacent to the Stops), visible to the public to increase safety and security, and to add visual interest.

g) All retaining walls shall have graffiti protection; they shall include an approved graffiti protection coating that can be applied to concrete.

h) Connections shall be concealed and flush to member faces.

i) Where possible, retaining walls and upstands shall be combined with vegetation and opportunities for planting shall be coordinated in the barrier geometry and structure.

   i. The irrigation and drainage system shall integrate with the design.

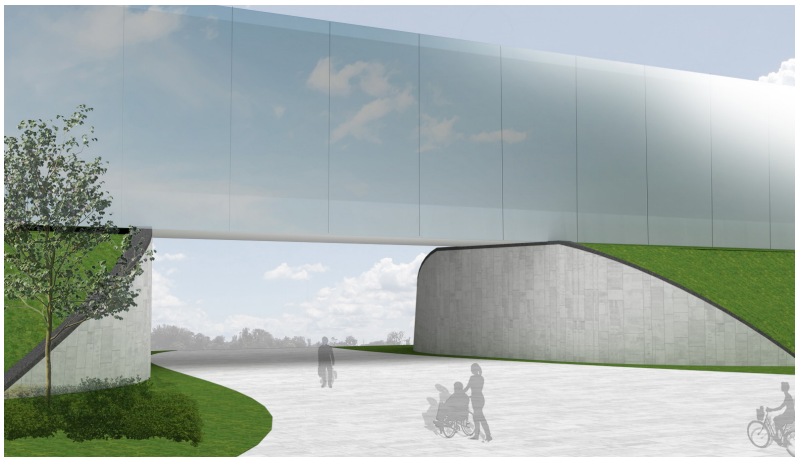


Figure 4-19: Retaining walls facing public areas

Figure 4-20: Traffic barriers protect public spaces from vehicles

4.6.4 Traffic Barriers

a) Traffic barriers shall be designed to withstand the direct horizontal force of a vehicle as well as conform to the overall identity of the corridor design.

b) Traffic barriers shall employ elements that are complementary or consistent with other site furniture and infrastructure elements.

   i. Traffic barrier styles shall be either continuous or segmented in a consistent repetitive pattern.

   ii. Continuous barriers shall consist of raised planters. Refer to Section 4.4.1.5 for requirements.

iii. Utilitarian type (generic), off-the-shelf Jersey barriers are not permitted. Any traffic barrier shall maintain a consistent design language across the line.

iv. Traffic barriers shall include graffiti-resistant surface treatments and shall be vandal resistant.

v. A segmented traffic barrier refers to the use of a single element such as a bollard that is laid out in a rhythm and spacing consistent with the requirements needed to prevent vehicular passage. Refer to Section 4.4.1.2.4 Bollards.

vi. Traffic barriers shall maintain the required clearances for accessibility and not obstruct the accessible path of travel.

4.6.5 Signature Planting within BRT Realms

a) Landscape design shall integrate with the adjacent natural environment. To the extent feasible, native species of trees and low vegetation shall be used along the BRT network to integrate within prevailing vegetation patterns.

b) A streetscape that is environmentally sustainable shall be provided in compliance with all applicable municipal guidelines for sustainability.

c) Trees shall be suitable to the urban environment and shall be salt and drought tolerant. Colour, size, and texture in vegetation material shall be used to define the boundaries of the site and areas within the site.

d) Plant material that does not obstruct access to maintenance devices shall be provided. A minimum clear space of 1 m shall be maintained between trees or shrubs and building or civil structures.

e) The size of plant material at various stages of growth shall be considered.

f) The presence of protective barriers and barriers shall be buffered with the use of context's native vegetation to the extent feasible.

g) Landscape designs for grade separations and surrounding areas, including sidewalks, shall be in accordance with CPTED principles and shall facilitate accessible routes for pedestrians and cyclists.

h) Snow storage areas shall be located in areas that are free from plant material. Snow storage areas shall have size based in calculations and shall drain away from surrounding planting beds to minimize the impact of salt damage

4.6.5.1 Planting Criteria

a) The plant material palette shall conform to the applicable municipal standards and specifications; it shall not include species that are identified as a threat of infestation by invasive pests within Canadian Food Inspection Agency's regulated areas.

b) Plant material shall be hardy to urban conditions and winter maintenance requirements. It shall be designed to be low maintenance both in the short and long terms. Plant material shall be moderate growth plants, with clean appearance and small leaves. Plant material used along pedestrian travel paths and vehicular driveways shall be salt tolerant.

c) Plant material shall not obstruct sight lines, security cameras, signage and wayfinding, and site lighting, and it shall not be planted in close proximity to overhead lines and wires. The size of plant material at various growth stages shall be considered.

d) The plant material palette shall include a variety of deciduous and coniferous trees and shrubs to provide year-round shade, texture, shape, colour, seasonal variation, and a bio-diverse canopy.

e) Vegetation species shall be predominantly native. All plant material shall meet the requirements of Canadian Standards for Nursery Stock.

4.6.6 Platform End Tapers

Platform end tapers refer to the area beyond the platform in a median condition, where the width may taper and customers would not typically board and de-board the BRT vehicle.

a) Platform end tapers shall be built of raise planters and low vegetation, to discourage the area being used by pedestrians crossing to the platform or drivers laying over and stopping.

b) Platform end tapers shall be coordinated with the respective municipality during the early stages of the design.

c) For platform end gate requirements, refer to Section 5.3.1 Guardrails, Handrails & Gates.

4.6.7 Portals

Portals will form an integral part of the BRT alignment and will occur at areas where the BRT guideway transitions from grade to an underground tunnel. Portal walls will be composed of retaining structures or if land availability permits, terraces. The appearance of the retaining walls shall be consistent throughout the BRT corridor.

a) Traffic barriers at portals shall be designed to withstand the direct horizontal force of a vehicle as well as conform to the overall identity of the corridor design (i.e., modularity and materiality).

b) Refer to Section 4.6.3 for retaining wall requirements.

c) Lighting shall be strategically located and integrated into the design of the retaining walls, visible to the public to increase safety and security, and to add visual interest.

d) Signage and warnings shall be coordinated at entry points of the portal to communicate to drivers any potential conflicts in traffic.

e) Where there is a potential to misperceive the portal as part of the roadway, special attention shall be provided to winter conditions. The height of portal parapet walls shall be designed to maximize visibility and protect sight lines for pedestrians and vehicles. The design strategy for portal parapets shall minimize the use of protective barriers

4.6.8 Large Ancillary Buildings

Ancillary structures are low-profile facilities that will be located within the BRT Stop/Station precinct, or as stand-alone elements along the BRT line. These may include:

- platform-based electrical and IT system cabinets (ELE/ITS);
- electrical transformer or switchgear boxes;
- wind or visual screens;
- advertising panels and pylons; and
- leased/retail kiosks.

Although in some locations they may not be publicly accessible; however, where they are publicly visible, their design shall use the same design and material language as the Station or Stop, conforming to the following requirements:

a) Using cleanly articulated design geometry.

b) Low-maintenance surface treatments around them.

c) Where landscaping is possible, it shall be used to positively respond to and connect with contextual local and future conditions.

d) Any cladding and screening used shall be secure and attractive and has the features of being climb-proof, cut-proof, and vandal-proof.

e) Venting of these units shall be located to minimize their visual impact.

f) The integration of the ELE/ITS shall not reduce CPTED visibility and shall extend the architectural design language of the host municipality.

g) The integration with the urban context shall be a driving principle, incorporating urban design, architectural and landscape treatments that enhance a seamless transition to the immediate municipal realm, supporting and protecting for the future development and intensification of adjacent properties.

h) Where the ability to screen ancillary structures is limited, these elements may be treated as unique architectural elements as justified by the surrounding urban context envisioned for the area, governed by a clear rationale, and complying with the principles of design excellence.

i) In certain situations, the BRT may be in close proximity to ancillary structures that belong to other transit networks. Early coordination shall be prioritized to minimize impacts to pedestrian path of travel and CPTED, and to reduce visual clutter.

4.6.9 Tunnel Ventilation Shafts

Where portions of BRT network are underground, tunnel ventilation shafts may be required in accordance with NFPA 130, and CFD modelling requirements . Where tunnel ventilation shafts are susceptible to a BRT bus crash, traffic barriers shall be designed to withstand the direct horizontal force of a vehicle as well as conform to the overall identity of the corridor design. When Station entrances are combined with additional intermodal station infrastructure, such as ventilation shafts, vents, heating ventilating and air conditioning (HVAC) equipment, and ancillary structures, the design shall integrate all elements to create a consistent configuration in accordance with the following requirements:

a) They shall be located in consideration of adjacent properties and integrated into their context and minimize impacts and constraints on adjacent properties.

b) Except where specifically instructed otherwise, vent shaft terminations shall be integrated into Station buildings.

c) Ventilation towers shall terminate not lower than 3 m above finish grade with louvres positioned away from public view.

4.6.10 Delineated BRT Lanes

a) Dedicated BRT lanes shall be differentiated from other road traffic lanes and utilize a consistent approach across the corridor.

   i. The use of the following are acceptable approaches:

      1) Colour;

      2) rumble strip;

      3) course material;

      4) change of material; and

      5) painted or overhead signage

b) Durable materials shall be used in the demarcation of the dedicated BRT lane.

c) Traffic barriers, where used, shall be designed to withstand the direct horizontal force of a vehicle as well as conform to the overall identity of the corridor design. Refer to Section 4.6.4 Traffic Barriers.

4.7 FIGURES AND TABLES LIST

5.0 Architecture

5.1 PLATFORMS

5.1.1 Introduction

The BRT platform is a destination point for customers who travel through the BRT network, either starting or ending their journey. It comprises several elements that service the customer, namely:

- Stop platform and shelter elements;
- Information panels;
- Fare devices;
- Seating;
- Tactile walking surface indicators; and
- Wind screens.

The BRT Stop design is based on an adaptable chassis structure bearing the distinctive signature of the BRT line while allowing for variations that may be formulated due to site-specific conditions, neighbourhood characteristics, and contextual sensitivity.

a) Elements shall appear to be part of a unified whole, with local variations on a theme that adds interest and diversity to the system.

b) BRT Stops shall be designed with a consistent design language of landscape punctuation to assist in Stop identification, adding visual texture and interest.

c) The Stops shall support sustainability at a local scale by aspiring to meet the intent of the local municipality's Greening Strategies, connecting where possible to public open spaces.

   i. Planting opportunities shall be created primarily at the ends of platforms, where the vehicular travel lanes transition back to the normal alignment adjacent to the BRT route.

   ii. Ornamental grasses may be planted in curbed planters that extend the full length of the transition.

d) The siting strategy shall contribute to transit interconnectivity, providing pedestrians with safe and comfortable access to and from the platforms.

e) The platform areas shall function as a pedestrian destination within the public right-of-way at each Stop location.

5.1.2 Platform Layouts

The platform configuration responds to the customer's progression along the platform to board the bus. Their journey includes platform access, trip information, fare devices, and waiting experience. As such, the layout of platforms shall have consideration for the sequence of events and follow the right-hand rule for the location of elements to minimize conflicts in passenger flow. Analysis conducted for platform layouts shall also adhere to the requirements for accessibility, queuing spaces, shelter types, fleet, as well as local conditions (e.g., slope).

5.1.2.1 Design Requirements

a) The design of the platforms shall include the following:

   i. The location of the platforms shall respond to the local environmental constraints as well as opportunities as the design is developed. Platforms at intersection shall be located to reduce customer path of travel, including between platforms.

   ii. This design standard assumes that the platform length is 40 m with intention to accommodate two 18 m articulated buses; platform length shall be confirmed according to project needs.

   iii. Stop shelter and canopy design shall be capable of responding to a variety of bus types.

   iv. Platform width shall be the sum of the prescribed dimensions as per Figure 5-1 and Figure 5-2, and confirmed according to project needs.

   v. Passenger safety shall be given consideration when locating the passenger platform to minimize danger from overhead ice accumulation which may occur on hydro cables and support structures.

   vi. The platform design shall protect for a sloped walkway (with a maximum slope of 1:20) to provide access from the crosswalk to the median platforms.

   vii. At constrained curbside locations, the length of the platform may be reduced to 20 m.

b) The curb height for BRT platforms is typically 150 mm, in line with standard municipal curb heights. The curb height and profile shall be determined in coordination with the relevant codes and standards, including Metrolinx and municipal requirements for bus platform heights.

c) The platform shall have a maximum cross slope of 2% sloping away from the platform edge and a maximum longitudinal slope of 1%.

d) Platform edges shall comprise of the following requirements:

   i. When the platform height is 250 mm or greater:

      1) 610 mm yellow tactile attention indicator surface shall be provided at the platform edge;

2) it shall be extended to the full length of the platform;

3) refer to Section 5.1.4 Tactile Walking Surface Indicators; and

4) refer to DS-02 Universal Design Standard.

ii. When the platform height is less than 250 mm:

1) a 610 mm yellow painted (e.g., thermoplastic, or similar approved MTO paint) warning strip shall be provided at the platform edge;

2) it shall be extended to the full length of the platform; and

3) at pass-through shelters, the tactile attention indicator surface or painted warning strip shall be aligned to the inside face of glazing (Figure 5-2).

iii. Tactile attention indicator or painted warning strip shall be set back from the edge by 100-125 mm to protect it from bus wheel damage.

e) All platforms shall have a non-slip surface with a coefficient of friction of 0.8.

i. Bus boarding and alighting areas shall have firm, stable surface and be clear of any landscape or streetscape elements.

f) The maximum horizontal gap between the finished platform and bus shall be in accordance with DS-02 Universal Design Standard.

g) Platforms shall reduce visual clutter by aligning all elements with the concrete upstand wall, as a primary datum.

i. The seating shall be a secondary datum to align elements.

ii. The design shall minimize non-aligned horizontal or vertical elements.

h) The key dimensions that define the platform shall be as follows (Figure 5-1 and Figure 5-2):

i. 500 mm minimum crash barrier (600 mm high) for the back wall of the canopy. The dimensions shall be subject to analysis.

ii. 1500 mm length for accessible/wheeled mobility aid seating area. Clear floor space of 2000 mm X 2000 mm shall be provided and centred on the element that customers are expected to interact with. Refer to DS-02 Universal Design Standard for accessibility requirements.

iii. 1100 mm minimum space in front of the accessible wheeled mobility aid seating area.

iv. 610 mm tactile attention indicator surface or yellow painted warning strip.

v. 100-125 mm concrete curb at the edge.

i) When required in the project scope, maintenance vehicle parking shall be located beyond the end of the median platform.

   i. Length shall be coordinated with the BRT maintenance operator.

   ii. Width shall be the same as the Stop platform width.

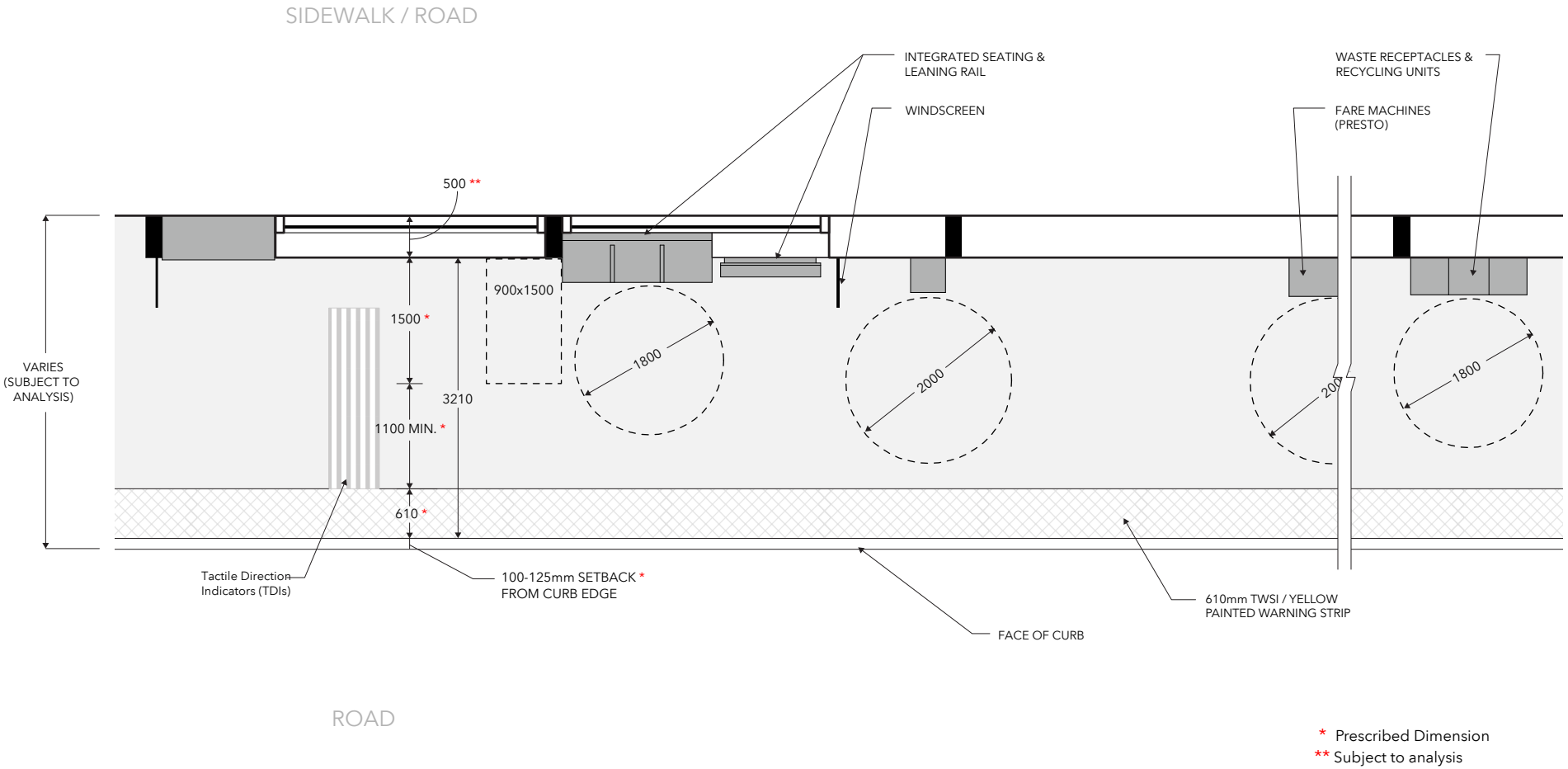


Figure 5-1: Typical dimensions of open shelters (dimensions in millimetres)

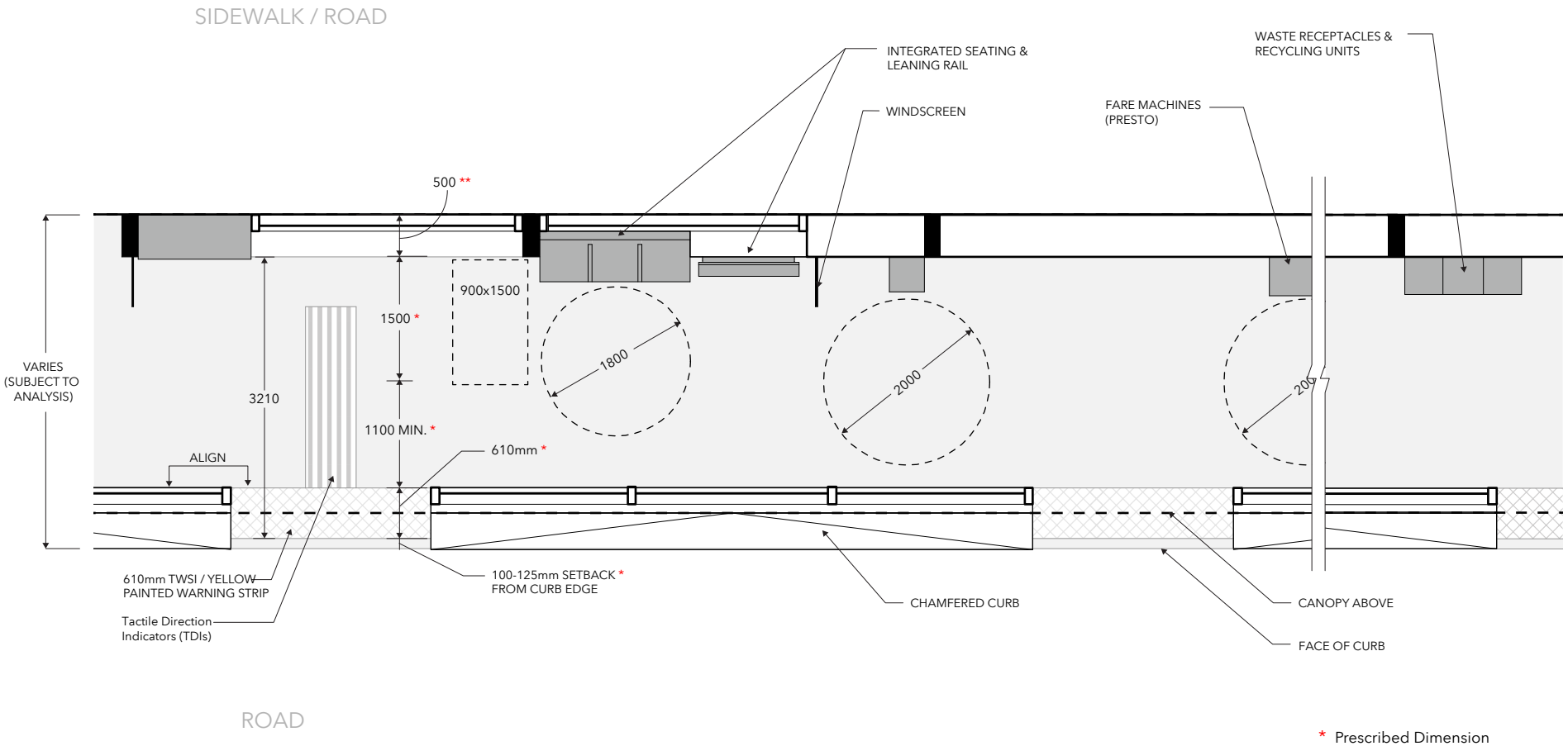


Figure 5-2: Typical dimensions of pass-through shelters (dimensions in millimetres)

5.1.3 Platform Access and Accessibility

Universal design and inclusive design are guiding principles that shall be employed for the design of the BRT Stops. All designs shall be universally accessible and in compliance with DS-02 Universal Design Standard, all relevant building codes, and applicable legislation. In the case of conflicting or overlapping requirements when developing the design, the most stringent measures shall govern.

The following are minimum requirements for accessibility compliance:

a) The design shall be without physical barriers and account for the total integration of individuals with disabilities and able-bodied persons.

b) The design shall be accessible, with safe, direct, convenient, and barrier-free travel paths for persons with disabilities, able passengers, and the general public.

c) If special devices are required, they shall be useable and without the need for special knowledge by the disabled individual or for assistance from others.

5.1.3.1 Design Requirements

a) Barrier-free access shall be provided throughout the public areas of the Stops.

b) All Stops shall be located at signalized intersections for a clear, simple and safe route to guide pedestrians to the platform.

   i. Access to the platform shall be provided from a crosswalk or mid-block crossing.

c) The Stop platform shall be designed with a sloped walkway linking the platform with the crosswalk.

   i. The sloped walkway shall be located perpendicular to the crosswalks and parallel to existing curbs.

d) For median platforms:

   i. Platforms shall be located in the median island and accessed by existing pedestrian crosswalks to maximize efficiency and passenger safety.

   ii. The pedestrian crossings and platform area shall comply with DS-02 Metrolinx Universal Design Standard minimum clear maneuvering area of 2000 mm turning diameter and maneuvering clearances shall not encroach on or overlap with the tactile attention indicator surface or painted warning strip at the edge of the platform.

iii. The pedestrian route shall be perpendicular to vehicular traffic.

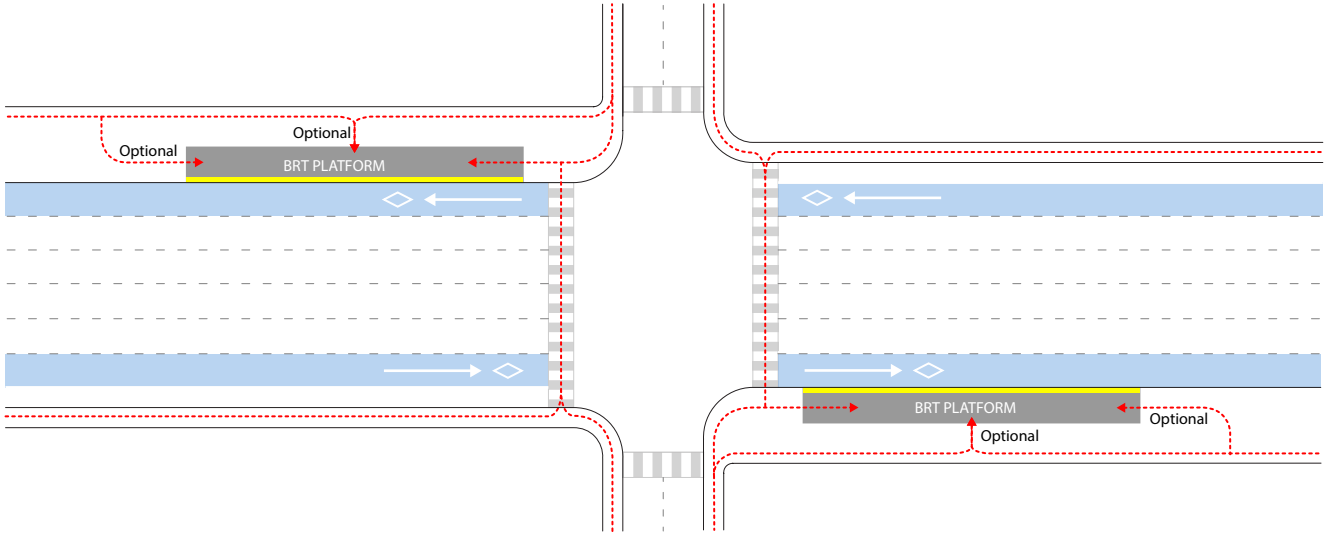
e) For curbside platforms:

i. Platforms shall be located adjacent to the sidewalk and within close proximity at an intersection.

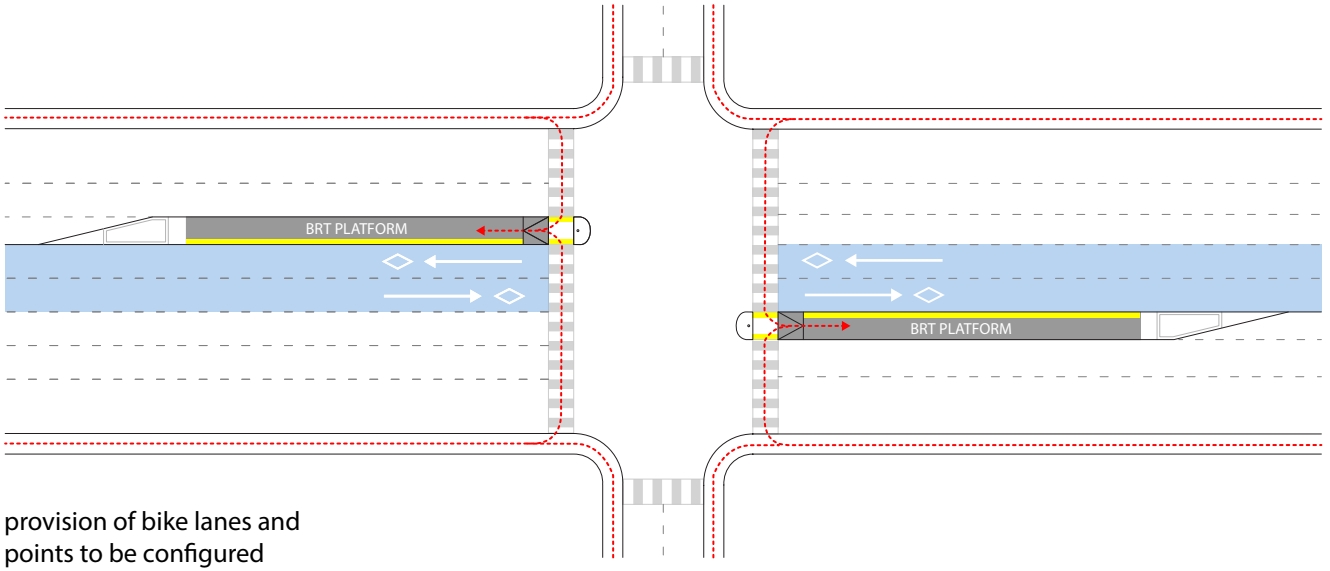
ii. The shelter may be designed to allow access from the sidewalk into the shelter at various points along the platform.

Figure 5-3: Example illustration of a BRT Stop entrance with sloped walkway

CURBSIDE



MEDIAN



BRT LANE

Note:
Diagram assumes provision of bike lanes and pedestrian access points to be configured according to site conditions, municipal requirements and in line with NACTO principles and best practices.

Figure 5-4: BRT platform access in different stop configurations

5.1.4 Tactile Walking Surface Indicators

a) Tactile Walking Surface Indicators (TWSIs) shall be designed in conformance with the requirements of DS-02 Metrolinx Universal Design Standard:

   i. Tactile attention indicator surface (truncated dome) signals a need for caution at a change in elevation, a vehicular route, train platforms, etc. This maybe applied in the BRT.

   ii. Tactile directional indicator surface (elongated flat top bar surface) facilitates wayfinding in open areas and indicates a possible route that may be taken.

b) Materiality for TWSI shall be selected for durability, maintainability, and replaceability. Effectiveness of the detectability of the domes shall be considered in material selection, particularly after winter maintenance.

5.1.4.1 Tactile Attention Indicator Surfaces

a) Tactile attention indicator surface technical specifications, arrangement, and height shall be according to ISO 23599 Assistive Products for Blind and Vision Impaired Persons and DS-02 Universal Design Standard.

b) A tactile attention indicator surface shall be located:

   i. at the top of stairs;

   ii. at platform edge, where required:

      1) set back by 100-125 mm from the edge to protect from the bus wheel.

   Note: Based on observed defects along different BRT networks, the platform standards have been improved to include a concrete curb of 100-125 mm at the edge to mitigate damage from wheels (Figure 5-5);

   iii. at curb cuts where a crosswalk facilitates safe pedestrian access to the transit Stop;

Figure 5-5: Tactile walking surface indicator at edge, damage observed (left) and tactile walking surface indicator set back 125 mm (right)

iv. At entry into a vehicular route or area where no curbs or other elements separate the vehicular route from a pedestrian route

1) for example, at both sides of every flush pedestrian crossing at the end of median Stops.

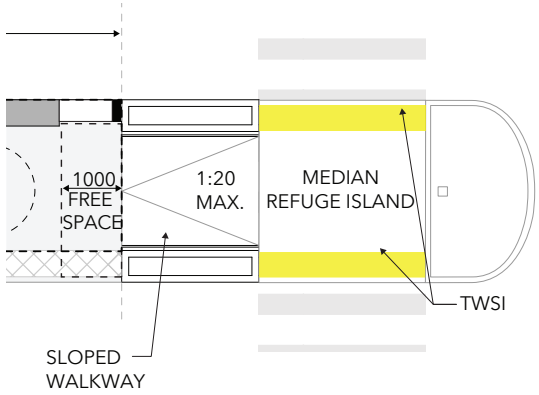


Figure 5-6: Illustration showing tactile attention indicator located at pedestrian crossing

5.1.4.2 Tactile Direction Surface Indicator

a) Bus boarding points at all shelter types shall be identified with a 600 mm wide tactile direction surface indicator, located perpendicular to the path of travel (entire depth of the platform) leading from the closest cane-detectable shoreline to the bus boarding point(s). Tactile Directional Indicators shall be coordinated and approved by Metrolinx Universal Design Subject Matter Experts. Refer to Figure 5-1.

5.1.5 Platform Clearances

This section has been developed to clarify all the elements driving the design of the platform and the minimum required resulting customer space.

5.1.5.1 Protruding Objects

a) Generally, objects shall be integrated onto the back wall to eliminate tripping hazards.

b) Side panels and benches shall be integrated to the back wall, where possible, and shall not exceed the maximum height of 0.68 m for cane detectability, in accordance with Metrolinx DS-02 Universal Design Standard.

5.1.5.2 General Requirements

There are two main types of service providers in the BRT network:

- local transit provider (LTP) bus; and
- GO coach.

a) Where BRT Stops will be serviced by a combination of LTP and GO, the most stringent bus clearances shall govern. For GO bus clearances refer to Section 5.1.5.3 GO Bus Clearances.

b) Refer to Metrolinx Standard Drawings, Rolling Stock Standard Drawings, FEA-002 – Bus Infrastructure for further details.

c) Refer to Figure 5-8 for options applicable to GO Transit.

5.1.5.3 GO Bus Clearances

The following are vertical and horizontal clearances, setbacks, and clear accessible areas for GO Transit. Refer to GO DRM for detailed requirements, including coach types.

a) Overhead canopies, or other roof assemblies, with a vertical clearance of 4.5 m or less shall be set back 2 m minimum from the face of curb at the bus platforms to accommodate the bus sweep.

b) A clear accessible area with 3 m depth X 6 m length (long side parallel to the platform) shall be provided from the face of the curb to any structure at all BRT platforms to accommodate the wheelchair lift deployment zone on the fleet.

c) Bus sweep analysis shall be provided to:

   i. support the clearances of the platform, specially for overhanging elements (i.e., canopy); and

   ii. be performed during the design process considering the specifics of bus fleet and location.

d) For bus bay requirements, refer to Metrolinx Standard Drawings Bus Bay Guidelines.

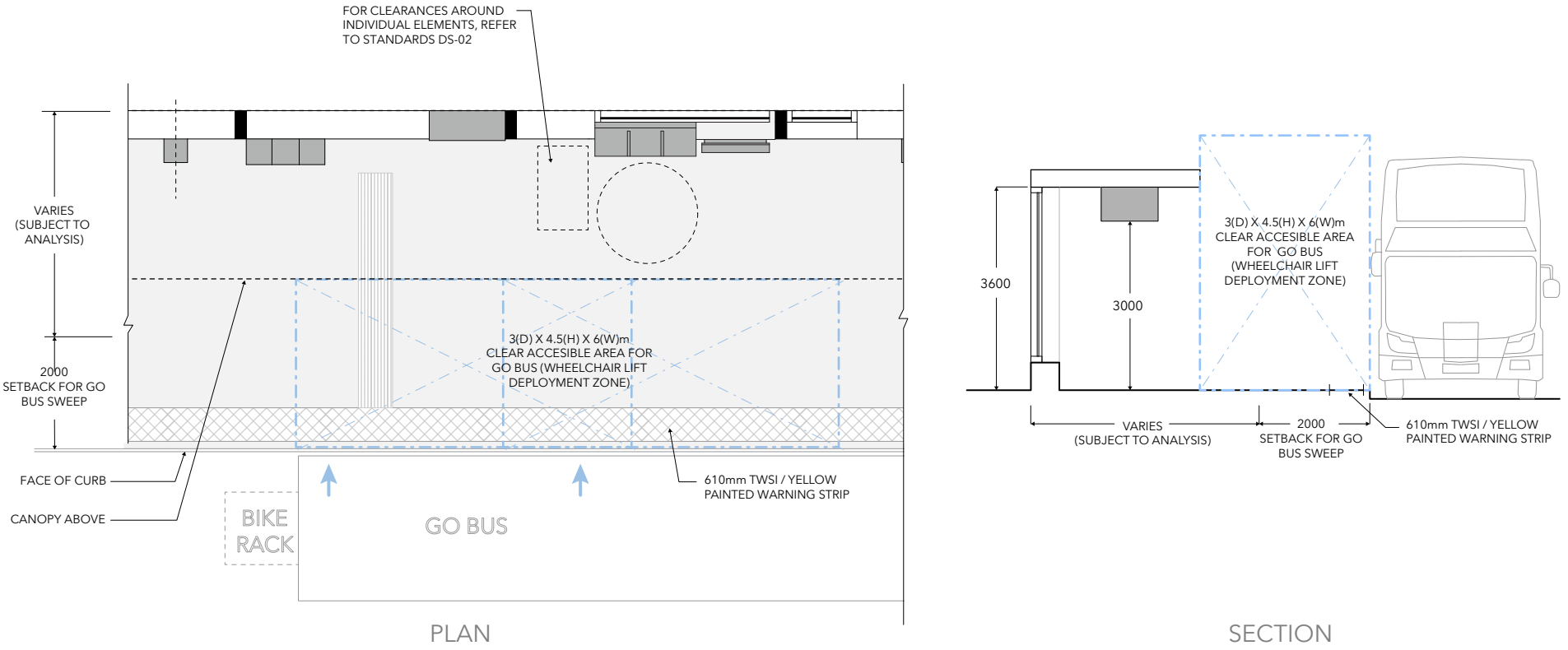


Figure 5-7: Illustration showing GO Bus Clearance Requirements

5.2 SHELTERS

Shelter designs shall optimize transparency, clarity, and simplicity. The platform and canopy shall be well lit allowing passengers to see and be seen. Shelters shall include a canopy and a glazed back wall with panels scaled to accommodate all amenities and services. Passenger comfort and protection from the weather and roadside vehicles, shall be prioritized in shelter design. Careful integration of elements such as seating, lighting, signage and service components will minimize conflicts with passenger flow.

5.2.1 Shelter Requirements

Shelter shall be designed to provide appropriate coverage to protect passengers from the weather as they proceed from the platform to the bus. In the BRT network, shelters design shall conform with the following:

a) Shelters shall have a rectilinear design language. Design shall be simple and without non-essential form making.

b) The BRT shelter design shall be modular, with its first module near the intersection and pedestrian crossing.

c) The shelter canopy and backwall shall visually reduce its thickness and maintain a consistent design language.

   i. Canopy thickness shall not exceed the width of the walls that support them.

d) Vision glass shall be laminated and tempered.

e) Shelter and platform designs shall meet accessibility requirements as outlined in DS-02 Metrolinx Universal Design Standard.

f) Canopy height shall comply with the following:

   i. Clearance to underside of the signage shall be as per DS-03 Wayfinding Design Standard.

   ii. Canopy design shall accommodate clearances of proposed signage and mounting systems.

   iii. 3000 mm minimum to 3600 mm maximum to underside of canopy, to provide enhanced customer comfort and experience.

g) Side traffic barriers on the pedestrian ramp, facing the public driveway and the BRT driveway road, are encouraged to be integrated with the canopy shelter structure.

h) Shelters shall be provided with CCTV surveillance cameras to provide coverage of entire platform areas including access, as set out in Project Agreement and subject to approval by asset owner.

i) Shelter materials shall be durable, easy to clean, resistant materials.

j) For curbside shelters, the floor finish shall be differentiated from that of the sidewalk to enhance customer experience. Control joints of adjacent sidewalk flooring shall align with the shelter structure and module. Curbside floor finish shall be consistent with that of the median.

k) Shelters base walls shall resist accidental vehicular impacts.

l) Shelters shall be designed with seating. Refer to Section 5.2.

m) Fare vending equipment, customer amenities, and signage shall be strategically located so that the passengers may use the equipment/signage in the same sequence as their general direction of travel.

n) Windscreen shall be provided, based on the need from the wind study.

   i. Windscreens shall be designed following the Stop modulation design and forming part of the kit-of-parts strategy of design.

   ii. Windscreens shall be supported by the backwall of the canopy.

   iii. Windscreens shall have a round colour contrast edge.

   iv. Windscreens shall be cane detectable. Refer to DS-02 Universal Design Standard.

   v. Glazed shelter wall and windscreen shall have colour-contrasted distraction pattern and shall be designed in conformance with the requirements in DS-02 Universal Design Standard.

   vi. Windscreens shall not be located on either side of an accessible seating area / open space, so as not to restrict the movement of a customer using a wheeled mobility aid.

o) Drainage system shall:

   i. be hidden in the back wall;

   ii. be located to facilitate maintenance and access:

      1) access panels shall match design language of adjacent surface; and

   iii. discharge water away from the platform or adjacent areas to avoid slip and fall.

   iv. Where possible, stormwater diverted from the canopy shall be used for passive irrigation of planters.

p) Trench drain or catch basin shall be located away from the path of travel.

q) The roof shall be designed as a fifth elevation.

i. A visual relationship with the shelter design shall be established through the use of similar architectural language including materials, finishes, colours, and patterns.

ii. Any elements on the roof including drainage shall have an organized visual appearance.

r) Canopy coverage shall not extend beyond into the movement zone of the bus and shall be coordinated with fleet.

s) Shelter size shall cover seating area and fare devices.

t) Full canopy coverage shall be provided along the platform as a minimum at Stops with heavy customer volume.

i. Where heavy customer volumes are not achieved, canopies on the platform shall be coordinated and located such that they align with the bus doors.

u) Elements such as lighting, signage, cameras, etc., shall be organized and aligned with the ceiling design, including alignment to seam or joint.

v) Stepping of the shelters due to slopes along the Stop platform shall be minimized.

i. Where grading requires stepping to occur, the canopy shall be continuous, and the shelter walls shall conceal and reduce the visual appearance of the stepping in materials.

ii. Grading along Stop platforms and shelters shall consider the heights of seating to ensure compliance with accessibility requirements.

5.2.2 Shelter Typologies

In the BRT network, there are different site conditions and scenarios that drive the selection of the shelter typology that best responds to these constraints. The design of shelters shall consider many factors, including provision of weather protection to customers awaiting and deboarding the buses.

The following shelter types, decision tree (Figure 5-8) and diagrams represent acceptable typologies for the BRT line. The different typologies are as follows:

a) Type 1: low canopy – open shelter;

b) Type 2: low canopy – pass-through shelter;

c) Type 3: low canopy with setback – open shelter; and

d) Type 4: shallow low canopy – open shelter.

5.2.2.1 Design Requirements

a) Shelters shall provide demonstrated weather protection (through testing, including computer modelling) while accommodating all services on the canopy backwall side.

b) Pass-through shelter design requirements:

   i. The addition of a front glazing partition shall not compromise the integrity of the existing structure; the glazing partition shall be structurally independent from the canopy to facilitate flexible placement.

   ii. The location of openings in the front glazing shall be coordinated with the expected fleet to operate in the BRT line on a case-by-case basis.

   iii. The front glazing shall be set back and protected with a low barrier (ie. chamfered curb) to prevent any collisions by the bus if it sweeps over the edge of the platform.

   iv. Amenities such as seating including the space for accessible / wheeled mobility aid, waste receptacles and fare devices shall be located away from the opening of the front glazing to avoid congestion at the opening and improve customer safety.

c) Open shelter Type 3 and 4 design requirements:

   i. The canopy shall not extend beyond the clear accessible area for GO bus (wheelchair lift deployment zone).

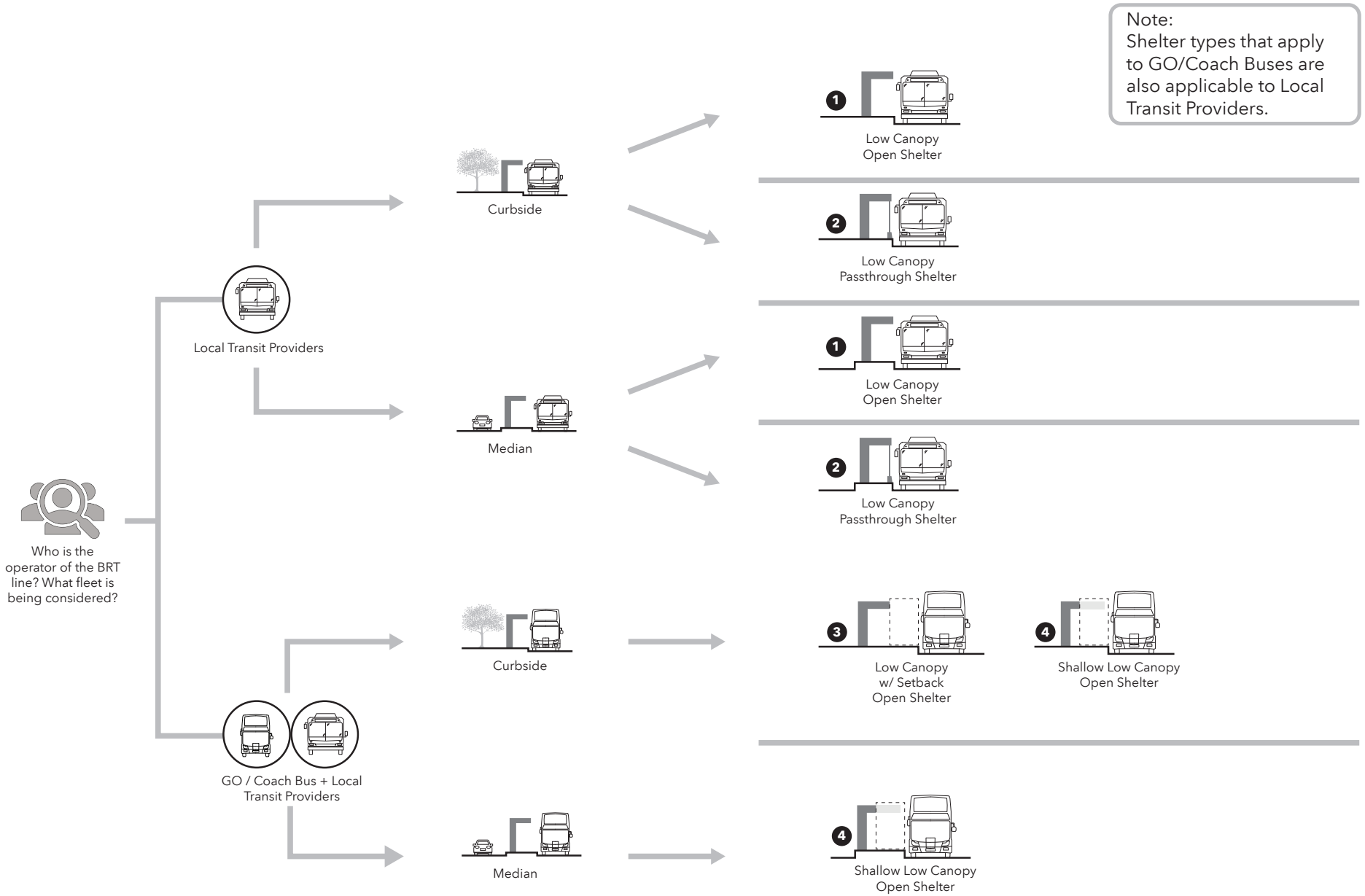


Figure 5-8: BRT shelter typologies decision tree

5.2.2.2 Type 1 – low canopy – open shelter

a) Curbside: This shelter provides access from the adjacent sidewalk at both ends with an optional access at the centre.

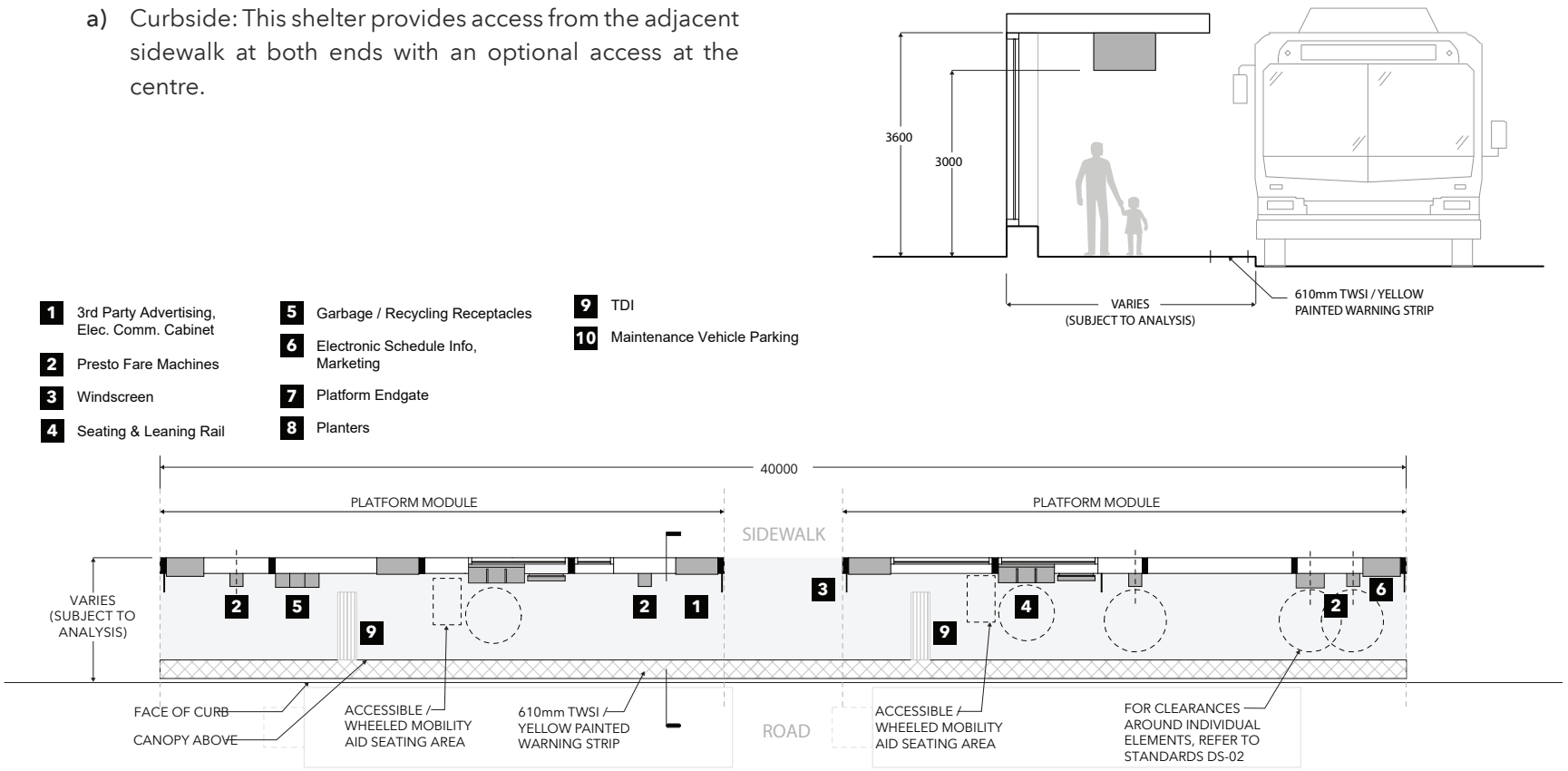


Figure 5-9: BRT shelter type 1 – low canopy, open shelter - curbside

b) Median: This shelter provides access from the platform end, closer to the pedestrian crossing.

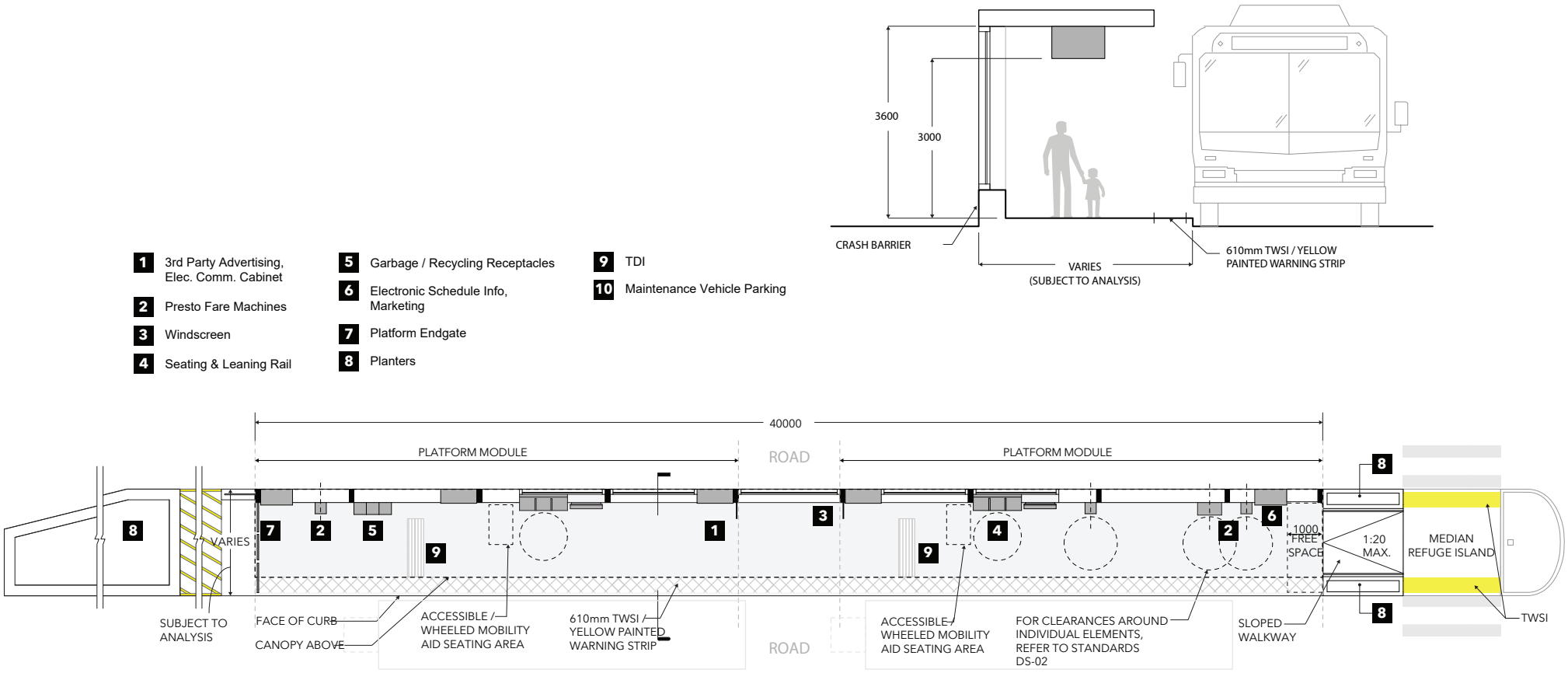


Figure 5-10: BRT shelter type 1 – low canopy, open shelter - median

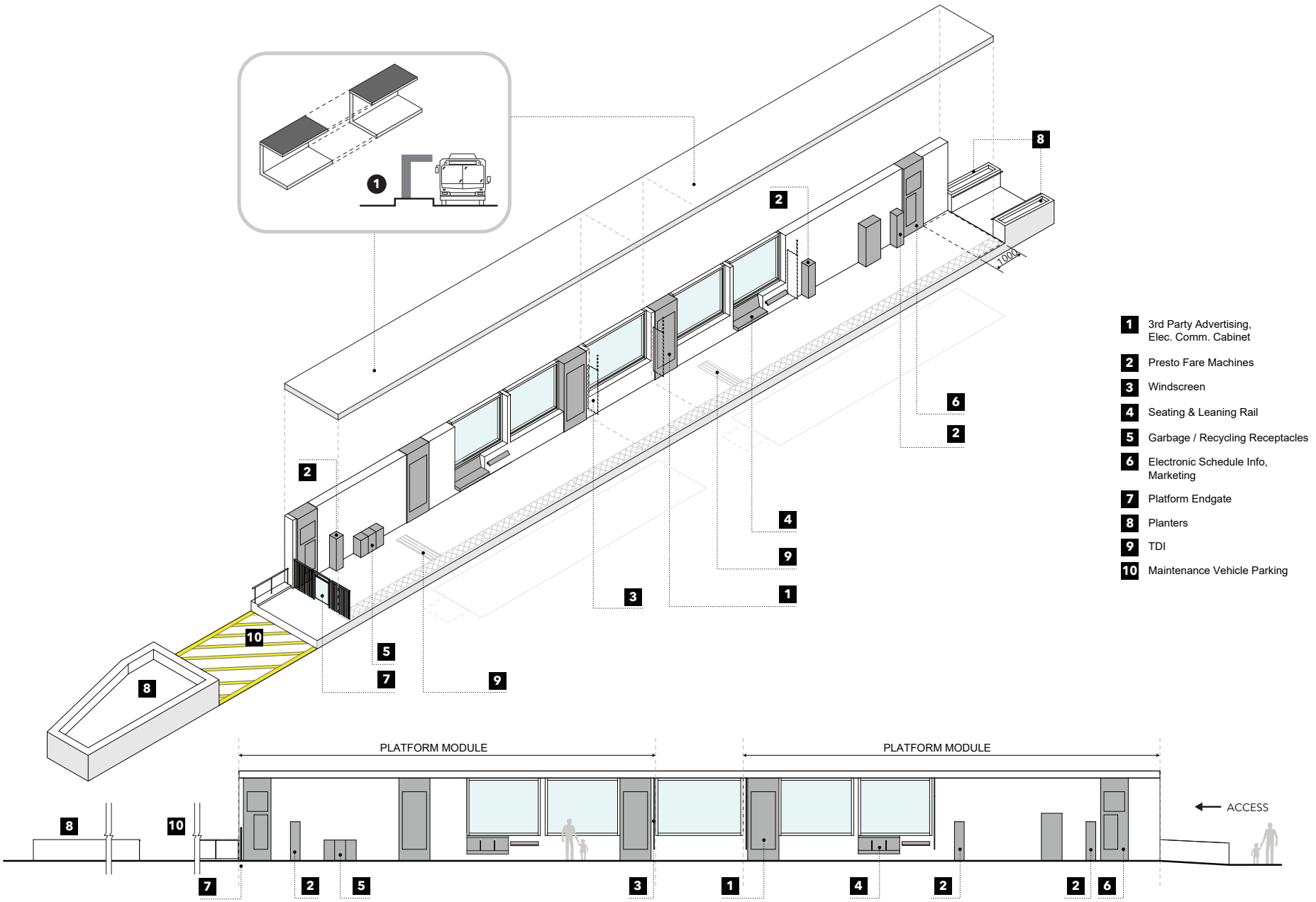
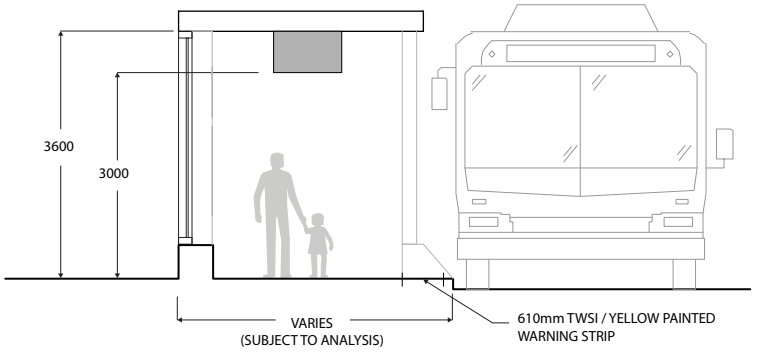


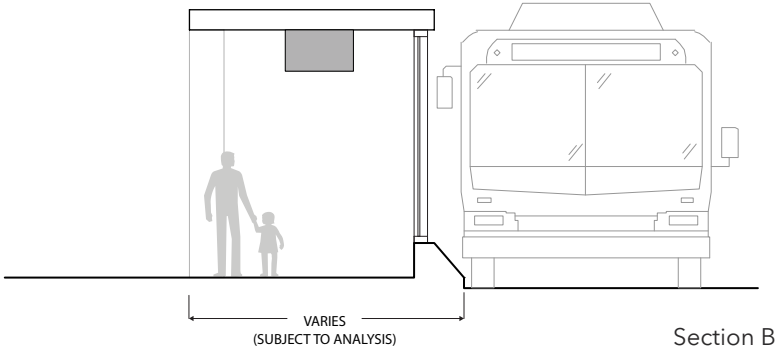
Figure 5-11: BRT shelter type 1 – low canopy, open shelter - median

5.2.2.3 Type 2 – low canopy - pass-through shelter

a) Curbside: This shelter provides access from the adjacent sidewalk at both ends with an optional access at the centre. A front glazing provides additional weather protection.



Section A



Section B

1 3rd Party Advertising, Elec. Comm. Cabinet
2 Presto Fare Machines
3 Windscreen
4 Seating & Leaning Rail
5 Garbage / Recycling Receptacles
6 Electronic Schedule Info, Marketing
7 Platform Endgate
8 Planters
9 TDI
10 Maintenance Vehicle Parking

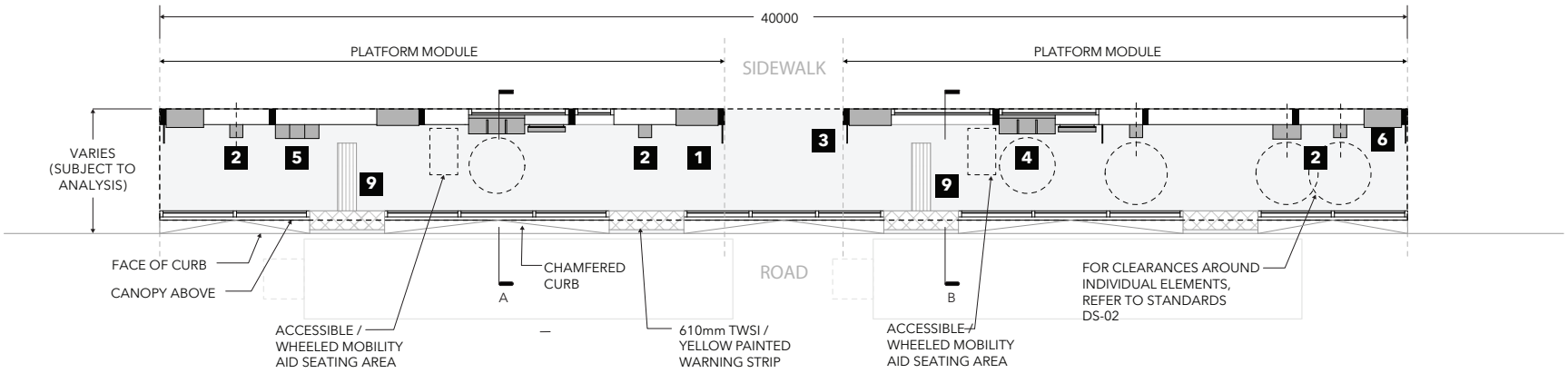
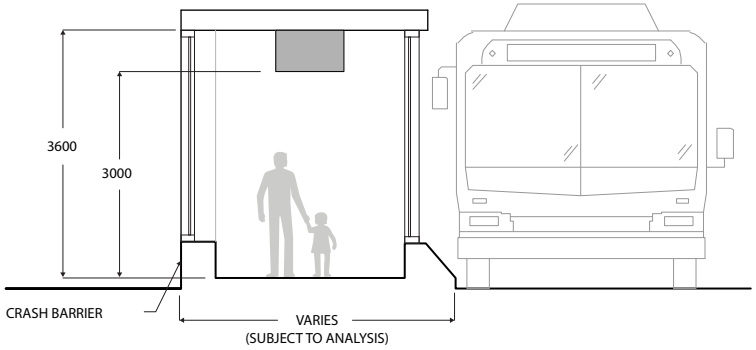
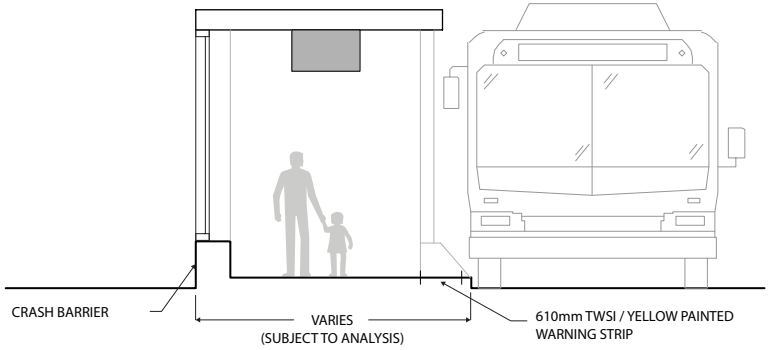


Figure 5-12: BRT shelter type 2 – low canopy, pass-through shelter - curbside

b) Median: This shelter provides access from the platform end, closer to the crossing. A front glazing provides additional weather protection.



Section A



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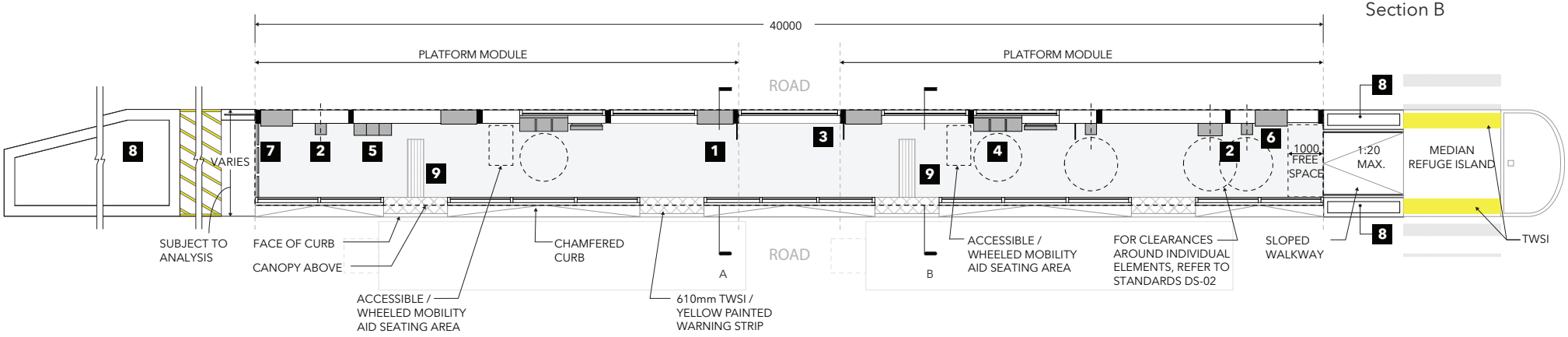


Figure 5-13: BRT shelter type 2 – low canopy, pass-through shelter - median

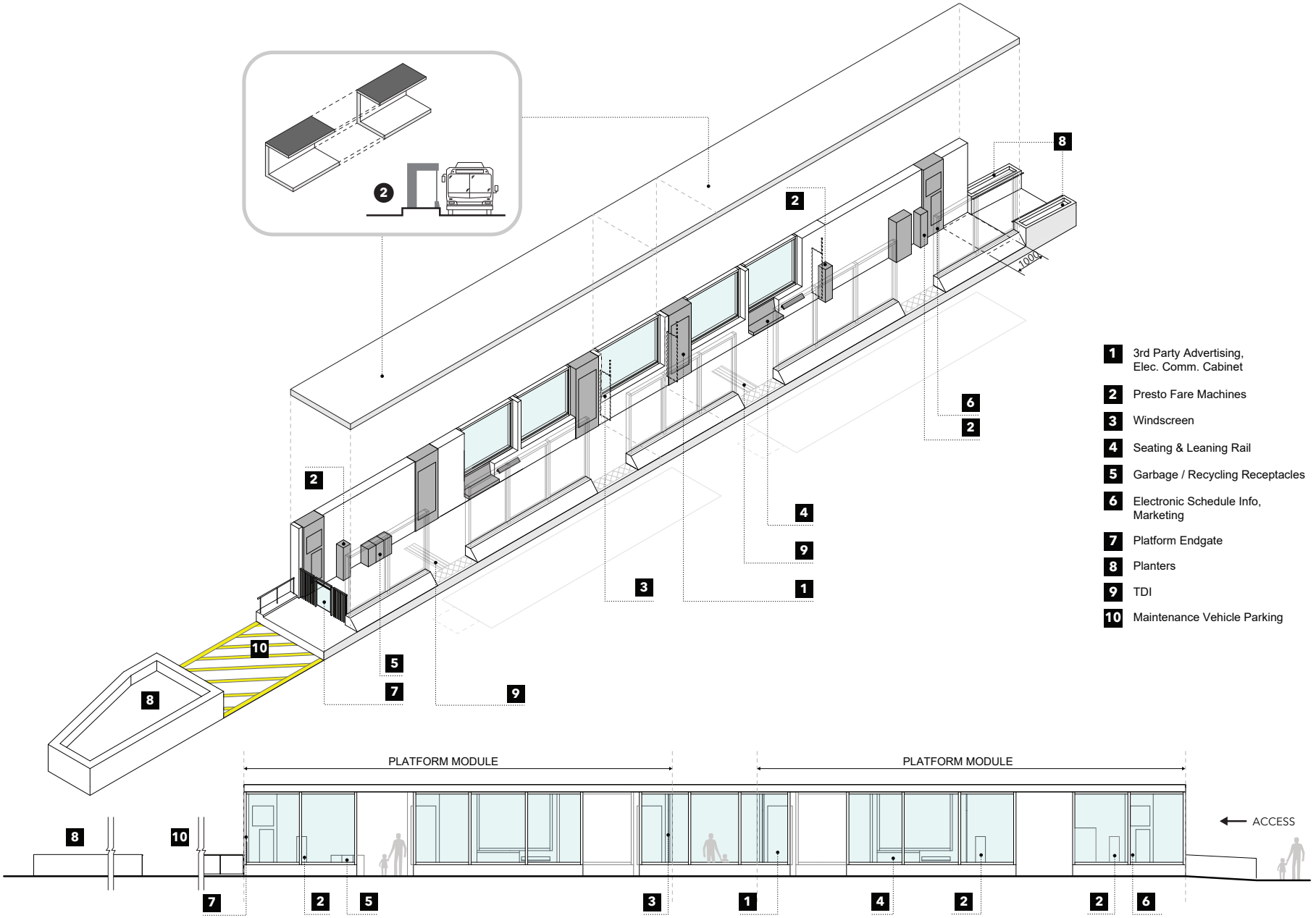
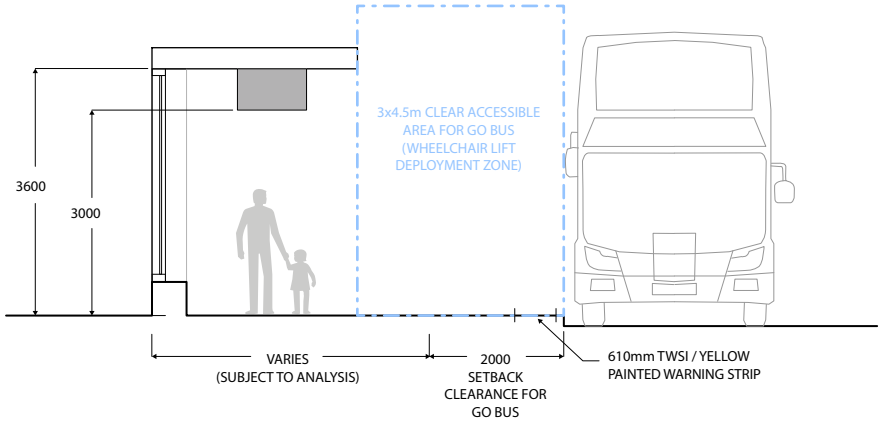


Figure 5-14: BRT shelter type 2 – low canopy, pass through shelter - median

5.2.2.4 Type 3 –low canopy with setback – open shelter

a) Curbside: This shelter provides access from the adjacent sidewalk at both ends with an optional access at the centre. The platform depth expands to accommodate GO bus clearances.



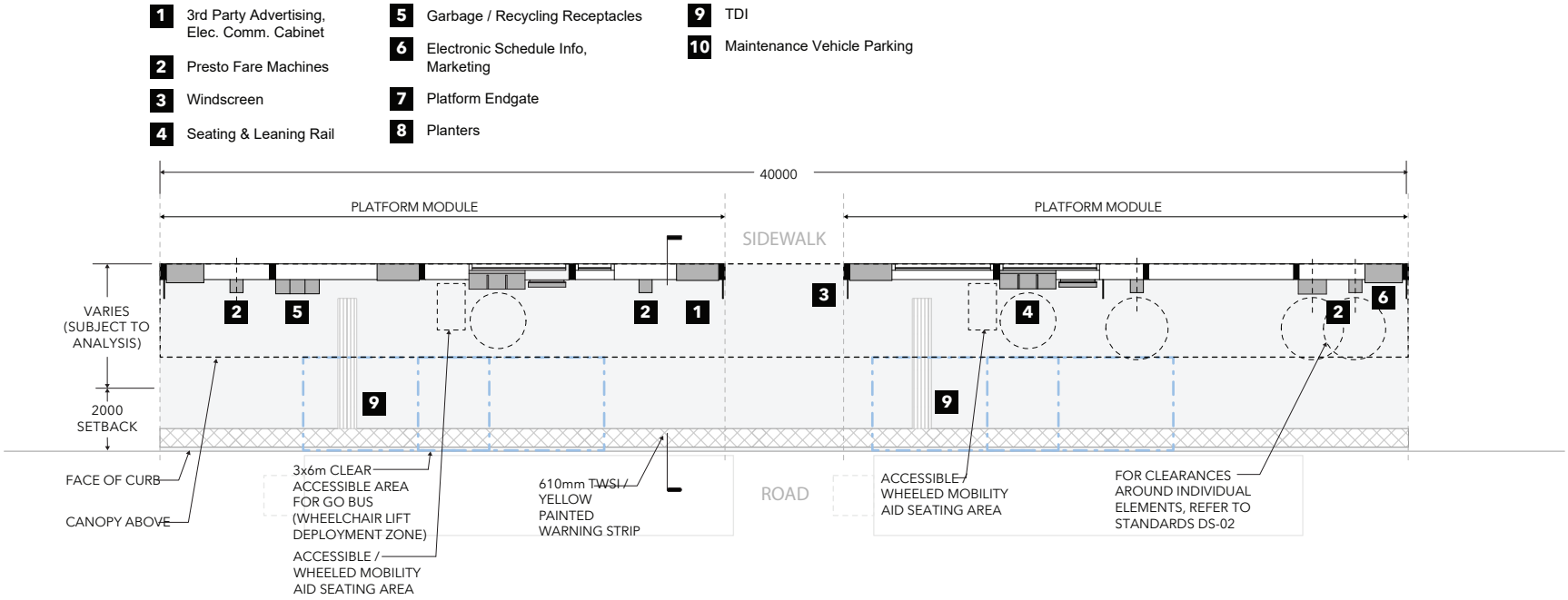


Figure 5-15: BRT shelter type 3 – low canopy with setback, open shelter - curbside

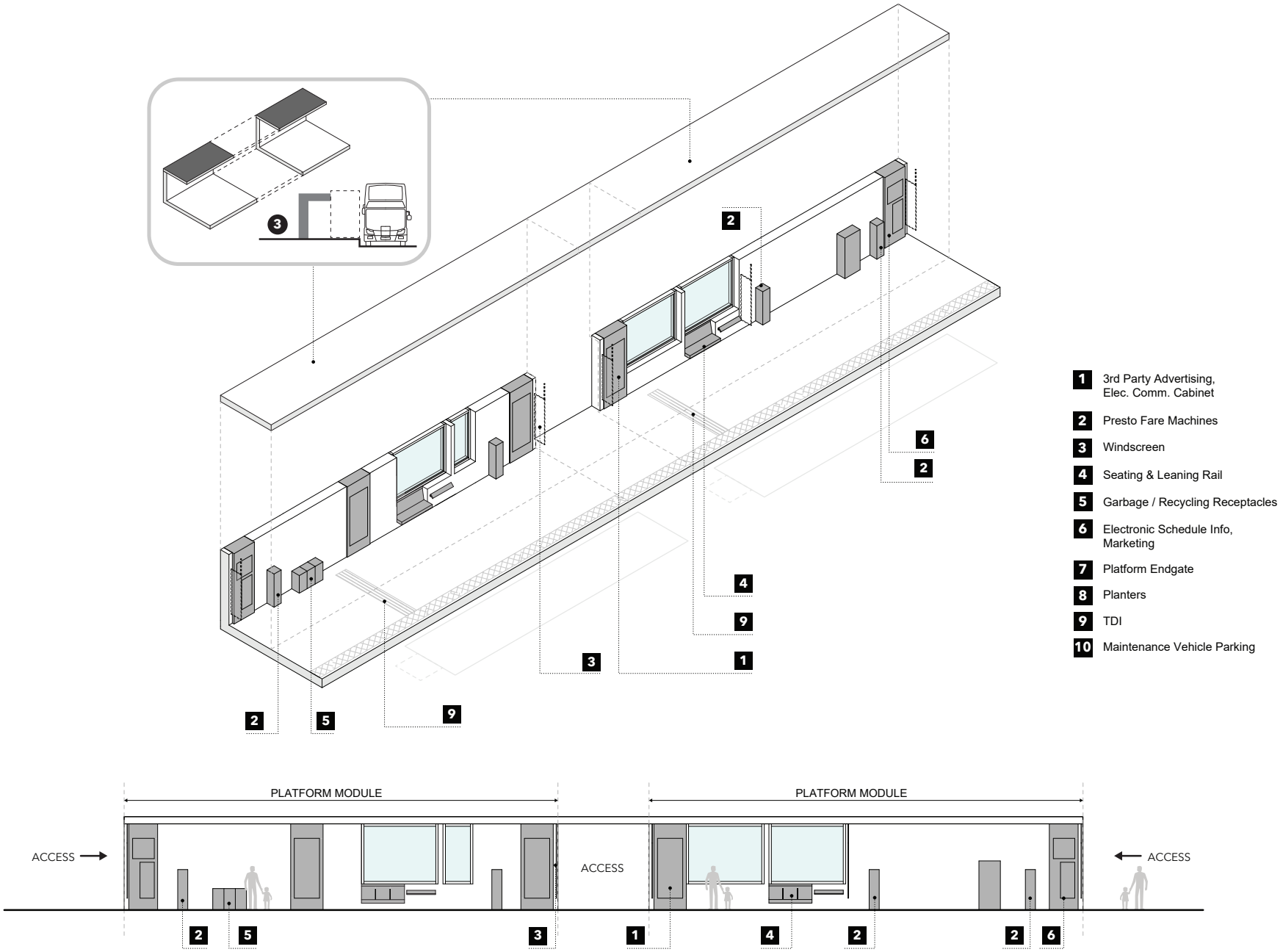
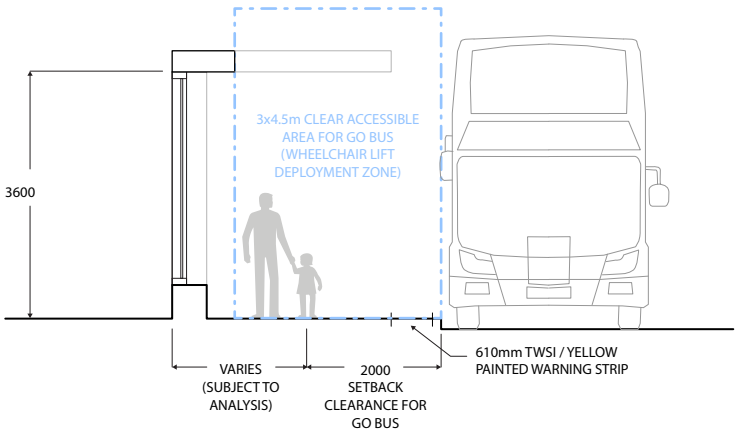


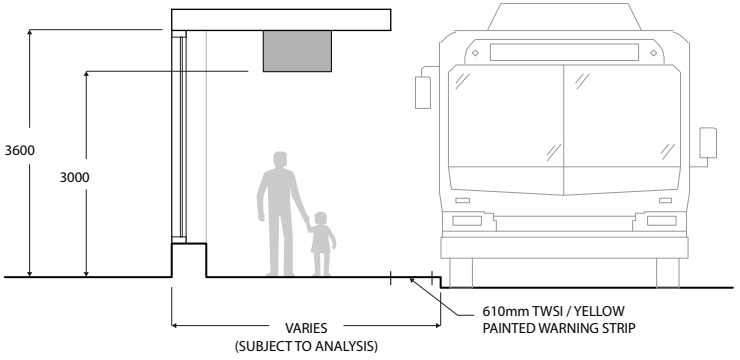
Figure 5-16: BRT shelter type 3 – low canopy with setback, open shelter - curbside

5.2.2.5 Type 4 – shallow low canopy – open shelter

a) Curbside: This shelter provides access from the adjacent sidewalk at both ends with an optional access at the centre. The canopy pulls back to accommodate GO bus clearances.



Section A



Section B

1 3rd Party Advertising, Elec. Comm. Cabinet
2 Presto Fare Machines
3 Windscreen
4 Seating & Leaning Rail
5 Garbage / Recycling Receptacles
6 Electronic Schedule Info, Marketing
7 Platform Endgate
8 Planters
9 TDI
10 Maintenance Vehicle Parking

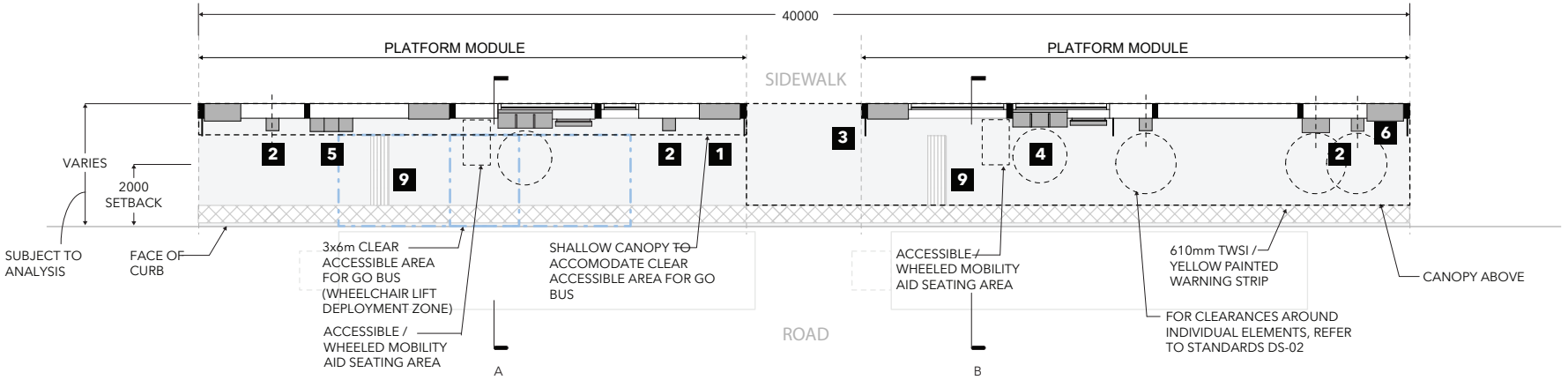
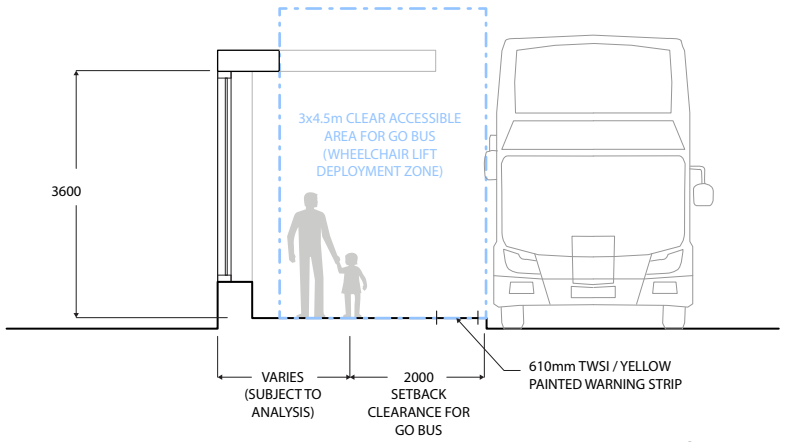
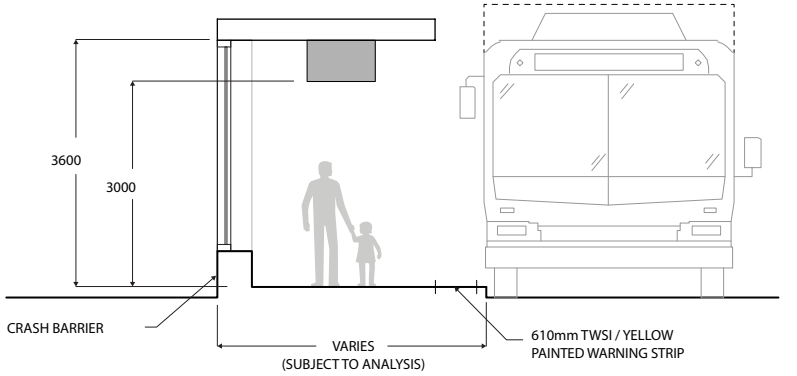


Figure 5-17: BRT shelter type 4 – shallow low canopy, open shelter - curbside

b) Median: This shelter provides access from the platform end, closer to the pedestrian crossing. The canopy pulls back to accommodate GO bus clearances.



Section A



Section B

1. 3rd Party Advertising, Elec. Comm. Cabinet
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7. Platform Endgate
8. Planters
9. TDI
10. Maintenance Vehicle Parking

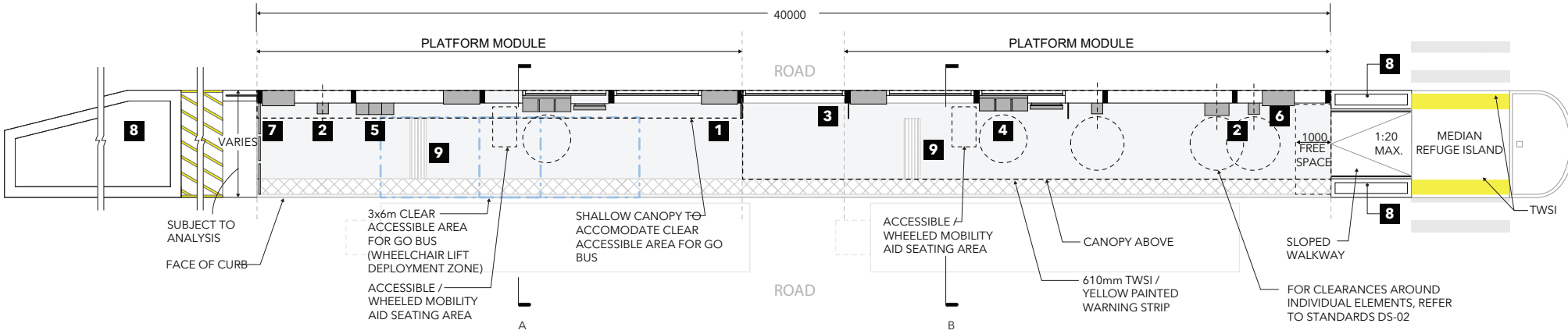


Figure 5-18: BRT shelter type 4 – shallow low canopy, open shelter - median

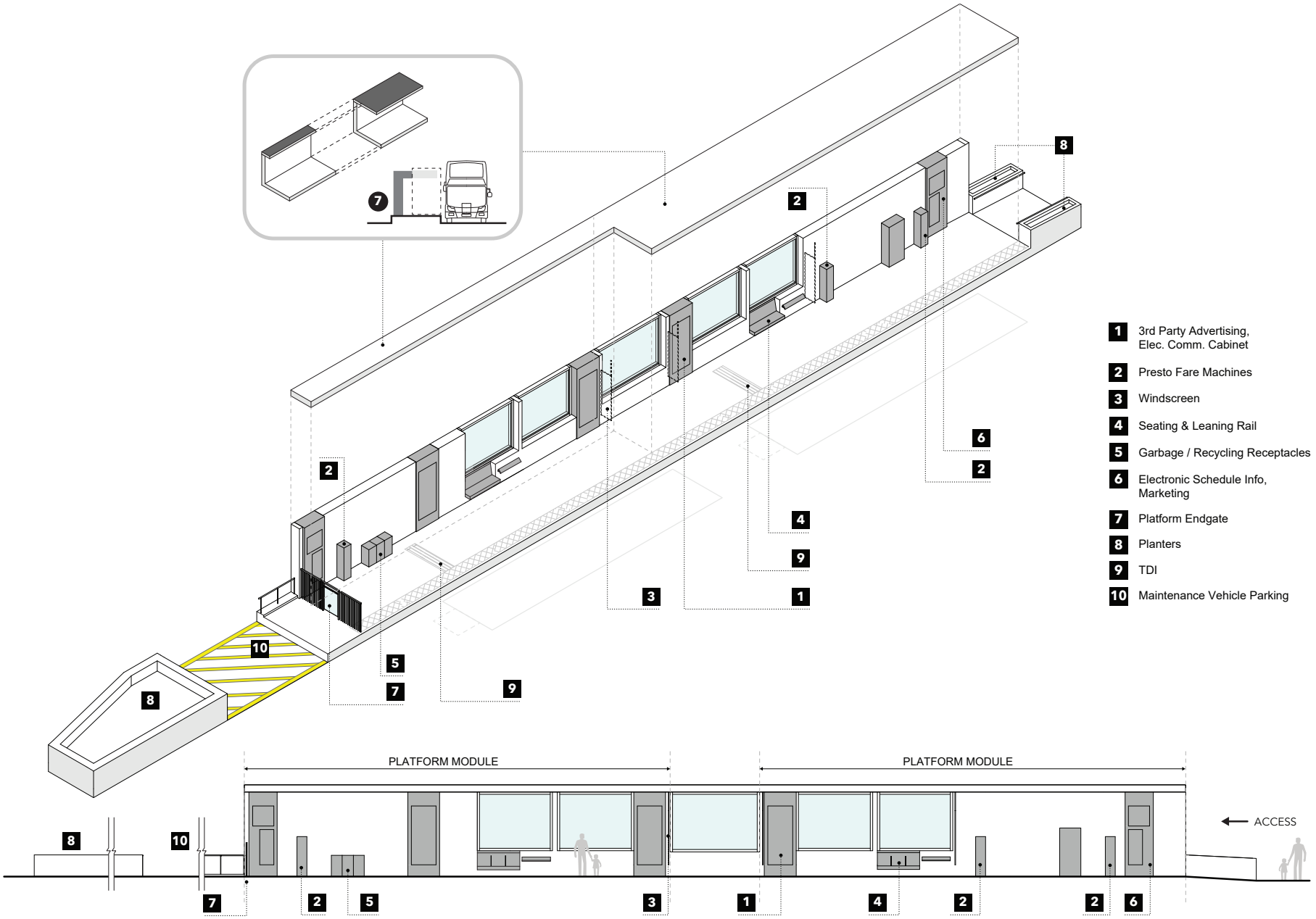


Figure 5-19: BRT shelter type 4 – shallow low canopy, open shelter - median

Figure 5-20: BRT open shelter

Figure 5-21: BRT pass-through shelter

5.2.3 Feature Elements

a) Feature elements shall be designed:

   i. to provide a unique and recognizable Stops identifier;

   ii. to provide an architectural expression that provides visual interest and/or contrast with base walls/ ceiling/floors; and

   iii. in a location that provides physical cues that support intuitive wayfinding along the journey from entrance to platform and vice versa.

b) Where applicable, feature elements shall provide additional functions.

   i. Solar screening when located on the exterior.

   ii. Acoustic attenuation within the Stops.

c) here a third party art or feature is located within the BRT realm, it shall holistically work with the kit of parts and provide an opportunity to establish local identity for the community.

5.3 FIXTURES AND FURNISHINGS

Note: Refer to Section 4.4.1.2 for furniture requirements.

5.3.1 Guardrails, Handrails, and Gates

Guardrails and handrails shall be provided where required by governing codes and standards and in accordance with the following:

a) Irrespective of the grade of the sloped walkway up to the platform, handrails and guardrails shall be provided to improve customer safety and assist with navigating to and from the platform.

   i. Guardrails shall be set back sufficiently from the edge of the platform to reduce the likelihood of damage due to unintended interactions with vehicles.

   ii. Where space permits, raised planters shall be provided in lieu of or in combination with guardrails.

      1) Plants shall have a width not less than 400 mm to accommodate low growing plants that are resilient to their environment.

   iii. Guardrails shall be located within the detection range of a long white cane. Detection range shall conform with the requirements in DS-02 Universal Design Standards.

b) Glazed splash protection from vehicles shall be provided and mounted on a continuous curb above the pedestrian walking surface.

c) For median Stops, the end of the platform shall be designed with a guardrail and operable gate (including signage). The guardrail and gate have two main functions:

   - Act as a barrier for customers not to circulate beyond the end of the platform.
   - Prevent customers from crossing the street to access the platform or sidewalk.

d) Guardrails, handrails, and gates shall be rectilinear and shall maintain a consistent design language (for example, materials, proportion, profile, colour and finish) across the line.

Figure 5-22: Guardrail and handrails

5.3.2 Fare Vending Machines (FVMs)

Fare vending machines are self-serve devices that enable customers to purchase fares, in the form of tickets, PRESTO cards, and PRESTO reloads. Fare vending devices are essential to ease the process of ticketing, and to enhance and automate the passenger experience. At BRT Stops:

a) Vending devices are required on each platform, so that crossing tracks is unnecessary.

b) To facilitate device upgrades in the future, fare vending devices are to be installed on level ground and restrictive architectural elements (e.g., narrow alcoves) are to be avoided.

c) Fare devices shall be located away from boarding and de-boarding areas to not impact passenger flows and conflict with queuing spaces.

d) For additional information on PRESTO fare vending device installation (including device numbers, space allocation, positioning, and accessibility requirements), refer to the PRESTO Service Design Standard.

5.3.3 Offboard Fare Payment Devices

Offboard fare payment devices (also called station fare transaction processors, SFTP, or validator machines, VM) are pedestal-mounted self-serve devices that enable customers to tap or scan machine-readable fare payment media such as PRESTO cards, credit/debit cards and barcoded tickets. Offboard fare payment allows customers to pay for their journey before the transit vehicle arrives. This enables faster boarding because customers do not have to tap or scan their fare payment media as they board. At BRT Stops:

a) Offboard fare payment devices are required close to each platform entrance, so that payment can always occur before boarding.

b) Two offboard fare payment devices are to be provided at each entrance, for redundancy.

c) The offboard fare payment devices are to be arranged to enable safe and easy use whether entering or exiting the platform in case tap-out for integrated fare by distance is enabled in the future.

d) For additional information on PRESTO offboard fare payment devices (including device numbers, space allocation, positioning, and accessibility requirements), refer to the PRESTO Service Design Standard.

5.3.4 Non-fare Revenue and Advertising

a) Location of advertising shall be coordinated during the early stage of the design.

b) Advertising elements shall comply with OBC (i.e., protruding objects in the path of travel).

c) Advertising location shall be limited to the backwall of the canopy, and not conflicting with the BRT operational signage, information maps and arrival times, and not conflicting with the visibility of the Station and its natural surveillance.

d) Advertising infrastructure and devices shall be separate from all Metrolinx infrastructure and systems and have separate access panel to avoid interference with Metrolinx systems.

e) All advertising shall follow the requirements as set out in DS-02 Universal Design Standard.

5.4 ANCILLARY ELEMENTS

5.4.1 Electrical and Utility Cabinets

a) All ancillary equipment (UPS, power, communications, etc.) shall be integrated with the shelter backwall.

b) Where it is demonstrated physically impossible to integrate and pending Metrolinx approval, then proceed to clause c).

c) Standalone equipment and cabinets at Stops shall:

   i. be located out of the path of travel:

      1) at platform taper for median platforms; and

      2) at adjacent land for curbside platforms and in coordination with Metrolinx and the respective municipalities.

   ii. utilize the same colour and finish as the shelter design.

d) Electrical cabinets, mechanical elements, vents, IT system cabinets, etc., shall be screened from public view using material and palette that is consistent with the line-wide design language.

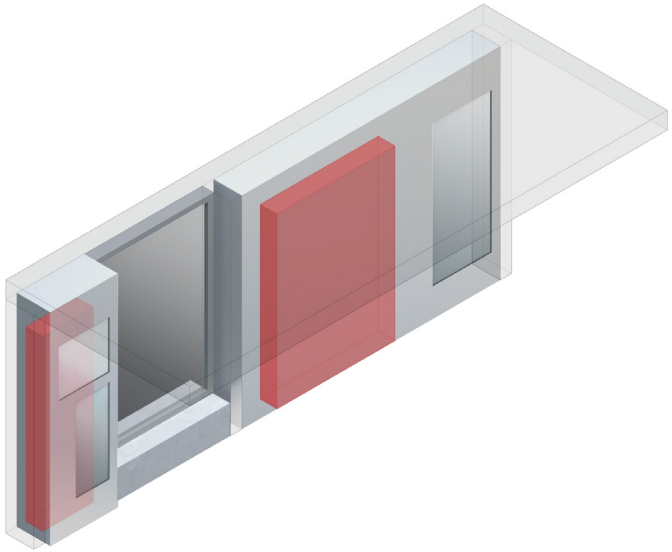


Figure 5-23: Electrical and utility cabinets

5.4.2 Access Hatches, Handwells, etc.

a) BRT Stop design shall incorporate access for the installation, cleaning, inspection, and maintenance of access hatches, handwells, etc., without jeopardizing the safety of bus operations, pedestrians, and customers:

   i. Access hatch hooks shall be flush with the finish of the area where it is located.

   ii. Access hatches shall be even with the surrounding finish.

b) Where possible, access hatches and handwells shall be located out of the path of travel.

   i. The location of the access hatches, handwells, etc., shall be coordinated with the platform access, pedestrian, and customer paths, waiting area and vehicle path in order to minimize interference.

   ii. All elements in the pedestrian and customer paths of travel shall conform to the requirements of DS-02 Universal Design Standard.

   iii. Access hatches shall not be located in the platform area or in sloped walkways (i.e., sloped floor or ramps).

c) Coverplates for access hatches shall be integrated with the adjacent surface at Stops and Station plazas using the same material, colour, and finish. The coverplates shall be seamlessly integrated with the adjacent surface so that there is no visual difference between them. Coordination with suppliers shall be made to accommodate finishes to the cover plates.

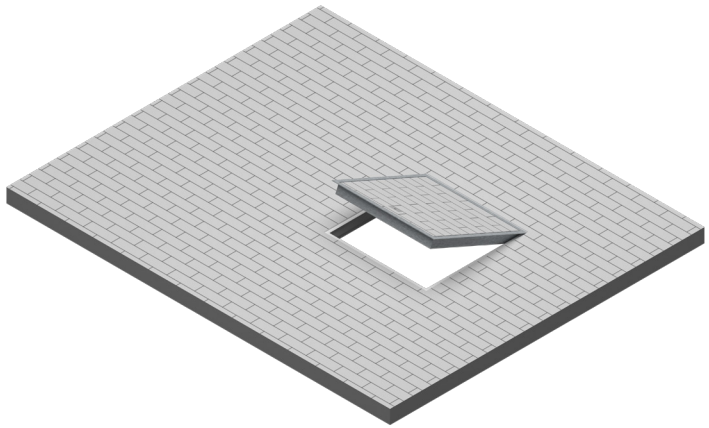


Figure 5-24: Access hatch

5.5 LIGHTING

Lighting is an important feature for customer comfort and safety. Continuous levels of lighting shall be provided to ensure that primary paths of travel are well lit and enhanced lighting levels shall be used at key points along the customer journey.

For additional exterior lighting requirements, refer to Section 4.4.1.3.

5.5.1 General Requirements

a) Lighting shall support CPTED, sustainability and accessibility requirements.

b) For the shelter typology selected, a lighting design study shall be conducted to ensure consistency in lighting design, placement and uniformity along the platform

   i. For pass-through shelters, glare and reflection on the front glazing shall be minimized.

c) Lighting of the general waiting area shall emphasize system graphics, information messages, and fare vending equipment.

d) Exterior lighting shall be outdoor rated, full cut-off and dark sky compliant, and shall minimize light trespass and nuisance glare onto adjacent properties, traffic, and visibility.

e) Lighting strategy shall mitigate shadows cast by passengers and this shall be demonstrated in photometric analysis.

f) The platform edge shall be uniformly lit and shall account for passenger shadows.

g) Wayfinding and information signage shall be well illuminated. Refer to Figure 5-25 for process to determine the appropriate method to provide sufficient illumination for signage.

h) Shelters shall be well illuminated and be visible inside and from the exterior.

   i. Lighting shall reduce shadows and dark areas to enhance safety and security.

   ii. Lighting coverage shall eliminate dark spots, and where required, be coordinated with the municipality so that illumination and light spreads minimize overlaps and contrasts.

i) Luminaires shall:

   i. be well organized and integrated into shelter walls or ceiling treatment and be vandal resistant;

   ii. be selected for their durability, recyclability, content, energy efficiency, and ease of installation and maintenance;

   iii. have a colour temperature that complements that of the architectural finishes and colour palette; and

   iv. be selected to complement the architectural design and scale.

j) Ceiling lights shall be accessible independent of the removal of ceiling panels.

k) Lighting requirements for advertising and other retrofitted information units shall be visually well organized and integrated with wall or ceiling treatments.

l) Lighting shall be designed and selected to achieve optimal colour accuracy and uniformity across the platform.

m) The lighting system shall be designed to align with Illuminating Engineering Society of North America (IESNA) recommendations. Refer to Table 5-1 for illumination levels per zone.

Zone	Minimum Average Maintained Illumination Level (lux)
Sloped walkway	110
Platform	110
Edge of platform	220
Shelter	110
Seating area / PAI	250
Fare equipment/ signage areas/ digital signage	250
Uncovered platform ends (service areas)	50

Table 5-1: Illumination Level Per Zone

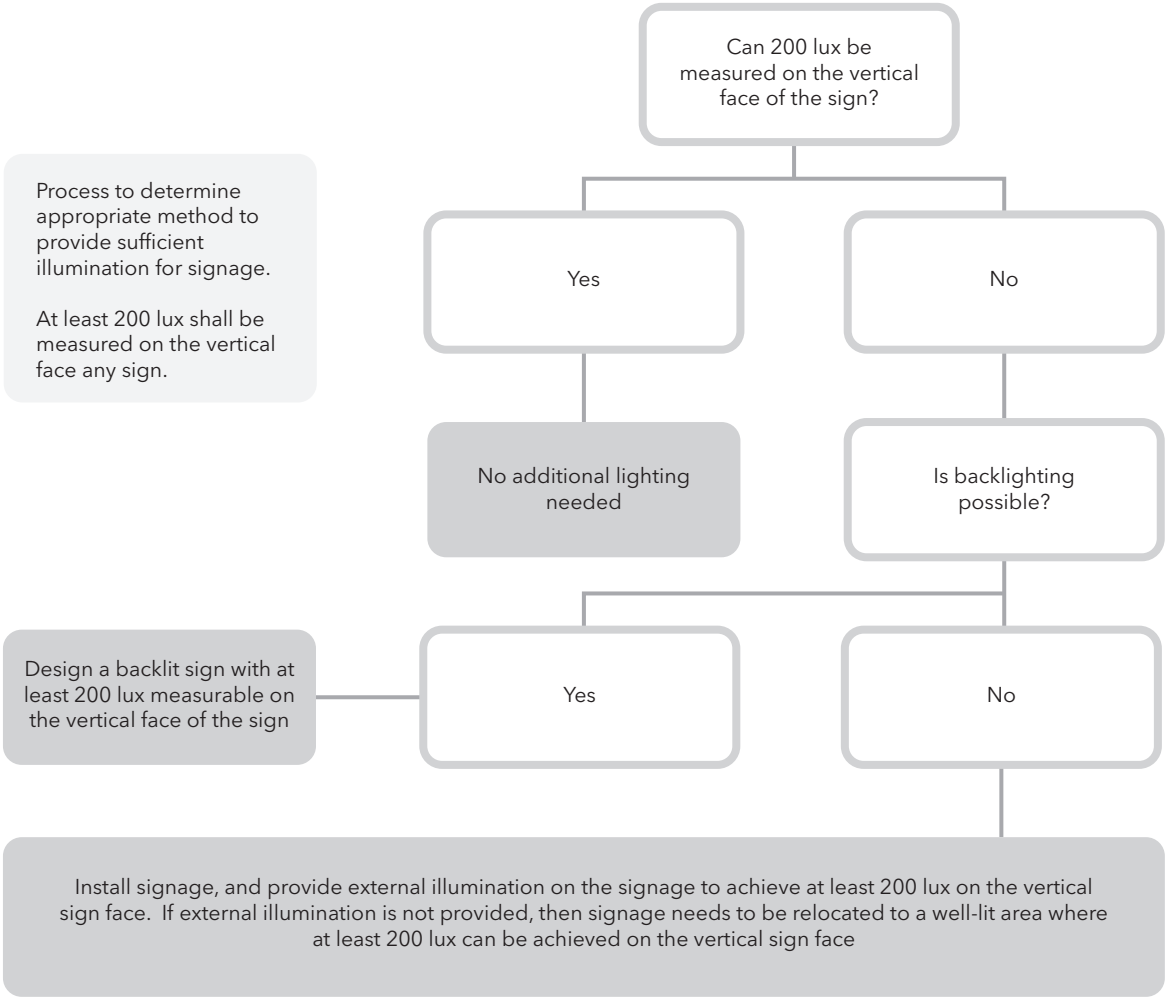


Figure 5-25: Process to determine illumination for signage

5.6 FINISHES AND MATERIALS

5.6.1 General Requirements

a) Architectural finishes and materials along the customer journey in the BRT network contribute significantly towards the customer experience. The design shall be applied in a simple yet elegant and modern architectural expression. More specifically, finishes that are smooth and designed to emphasize movement in a linear form are recommendations that support and reinforce this statement.

b) The following strategy informs the design direction to be implemented, with the goal of providing a long-term, durable, and sustainable solution, while continually enhancing the customer experience.

c) The overall design strategy shall represent finishes that create a strong and coherent design direction that is simple yet highly organized, providing the customer with a sense of order, comfort, and security.

d) The design expression shall carry a consistent architectural expression of materials for familiarity, while allowing opportunities for variable expression at strategic locations to allow for differentiation across Stops.

e) The material palette shall consist of a variety of high-quality, robust, sustainable, and recyclable materials, scaled in proportion to the environment.

f) The materiality strategy shall be modular, adaptable, and repeatable while following a kit-of-parts approach with simple installation methodologies.

g) Detailing shall be simple and consistent and shall be carefully resolved at material intersections, connections, and transitions.

h) Durable finishes and materials shall be resistant to vandalism through the provision of tamper-proof design, including graffiti-proof, easy-to-clean surfaces.

i) Materials shall require demonstrated minimal maintenance and shall be easily repaired on site or replaced.

j) Use of colour, texture, pattern, and graphics as they relate to materials shall be implemented to either reflect local context, support intuitive wayfinding, or highlight key decision-making points.

k) Materials used shall be integral and homogeneous throughout. Materials with applied coatings that can be easily scratched shall not be used.

l) Design strategies around existing BRT finishes shall not be ignored, but rather used to help influence design direction of future BRT infrastructure design, connecting the past to the future.

m) Material and finish life cycle costs and ease of operations and maintenance shall be accounted for.

n) In conditions where new Stops (canopies, shelters, and vertical circulation elements) adjoin adjacent existing buildings, materials between the existing and new construction shall be delineated with the intent to break the plane of finishes using a continuous vertical reveal 100 mm in width and 100 mm in depth.

o) The design of the infrastructure shall employ the kit-of-parts in service of a consistent and recognizable BRT identity.

p) Materials, finishes, colour, and texture shall be composed in an organized visual appearance.

q) A minimalistic approach shall be employed with detailing to support the massing concept.

r) Material intersections, connections, and transitions shall be carefully resolved with simplicity and elegance in detailing.

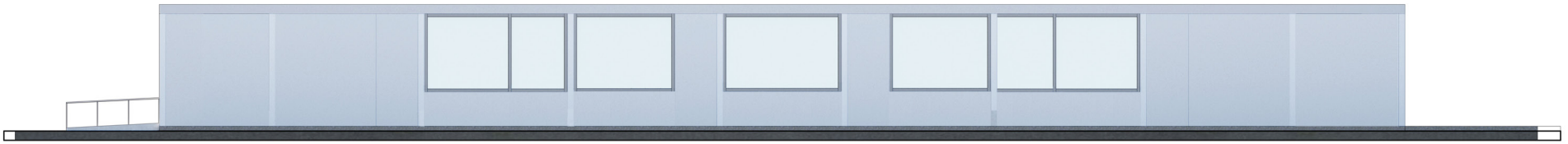
s) Cabinets in general shall be screened from public view using consistent screen and material palette from the kit-of-parts.

t) The design shall comply with sustainability requirements identified in Section 3.1.2 – Sustainable Design Requirements.

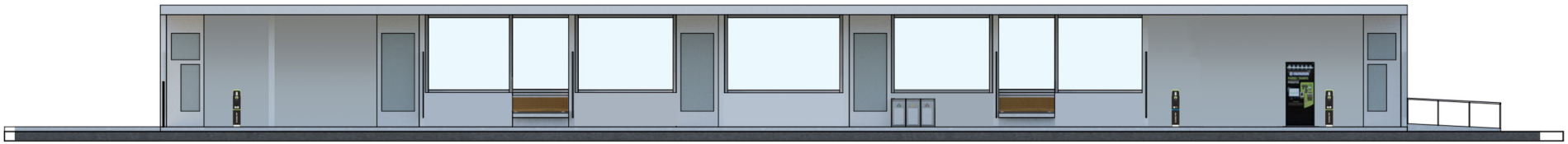
u) The Stop design shall comply with CSA S478 Guidance on Durability in Buildings.

v) All architectural elements that provide a ledge shall incorporate mitigation for bird roosting that is elegant and woven into the building details, including canopies, exterior screen near the sidewalk, and exterior signage.

OPEN SHELTER



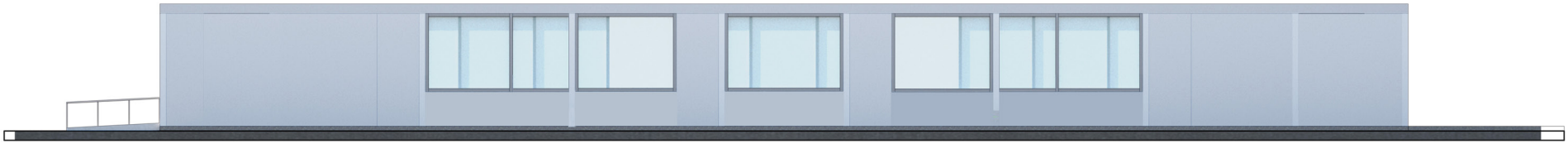
STREET / ROAD SIDE ELEVATION



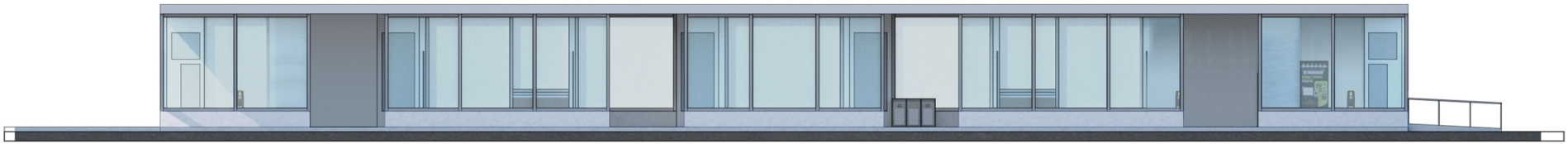
BUS SIDE ELEVATION

Figure 5-26: Elevations of a typical open shelter

PASS-THROUGH SHELTER



STREET / ROAD SIDE ELEVATION



BUS SIDE ELEVATION

Figure 5-27: Elevations of a typical pass-through shelter

5.6.2 Modulation Design

One of the key aspects in the BRT network design is the selection of a standardized module that is clear, legible and unifies all project elements. Modular approaches allow for a clean, economical, simple, and uncluttered design and material application that create an organizational structure for the integration and organization of all building systems.

a) Design Requirements

i. A consistent, line-wide module shall be utilized to set the rhythm for all elements, including all Stops, Stations, facilities such as ancillary structures, as well as open spaces, plazas, medians, and any infrastructure along the line.

ii. Acceptable module range shall be between 1200 mm and 1500 mm.

iii. Module and datum shall be scalable to respond to local context and site conditions based on a subdivision of the established module (e.g., 0.5x or 0.2x).

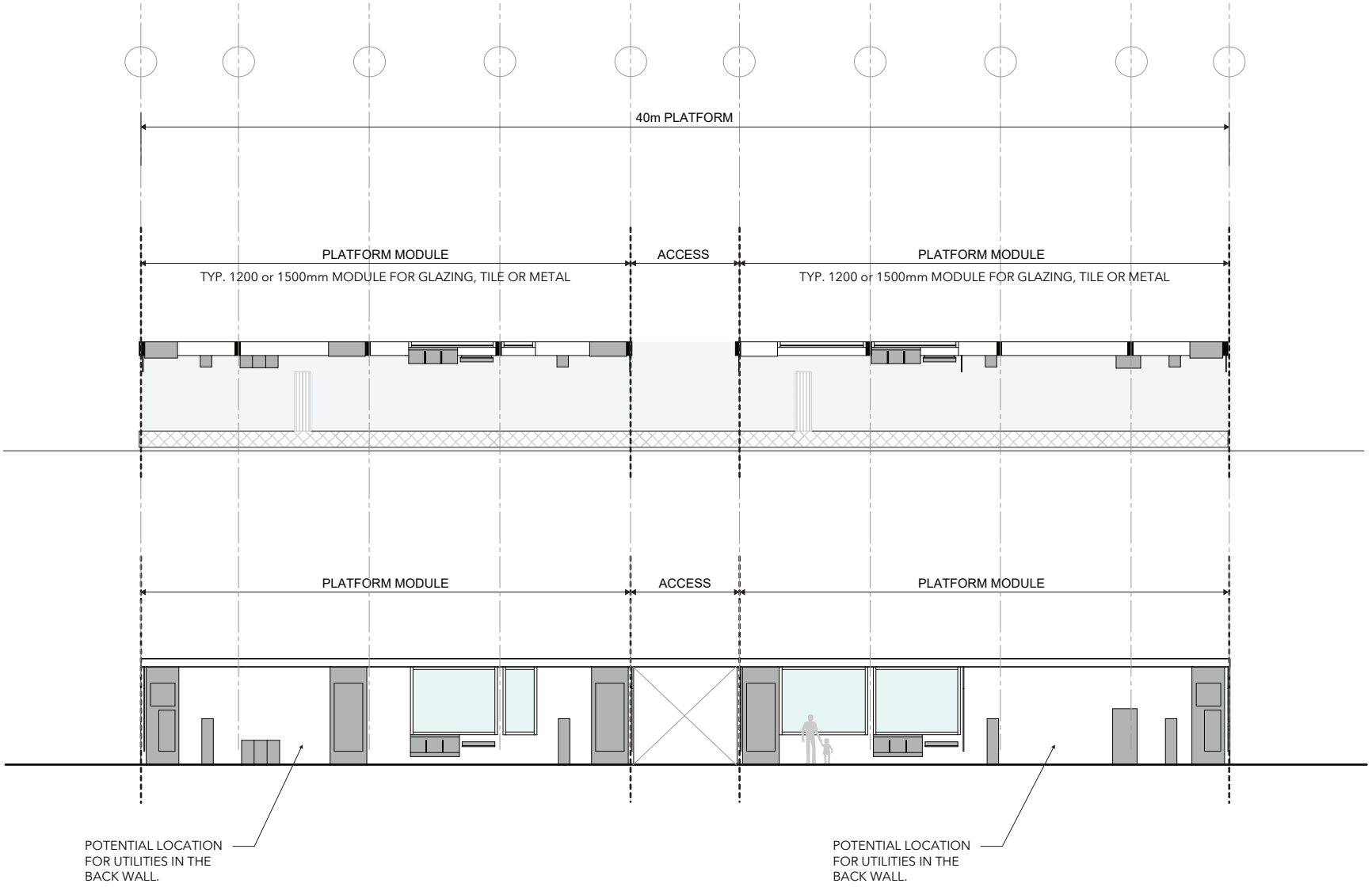


Figure 5-28: Typical BRT platform modularity at curbside

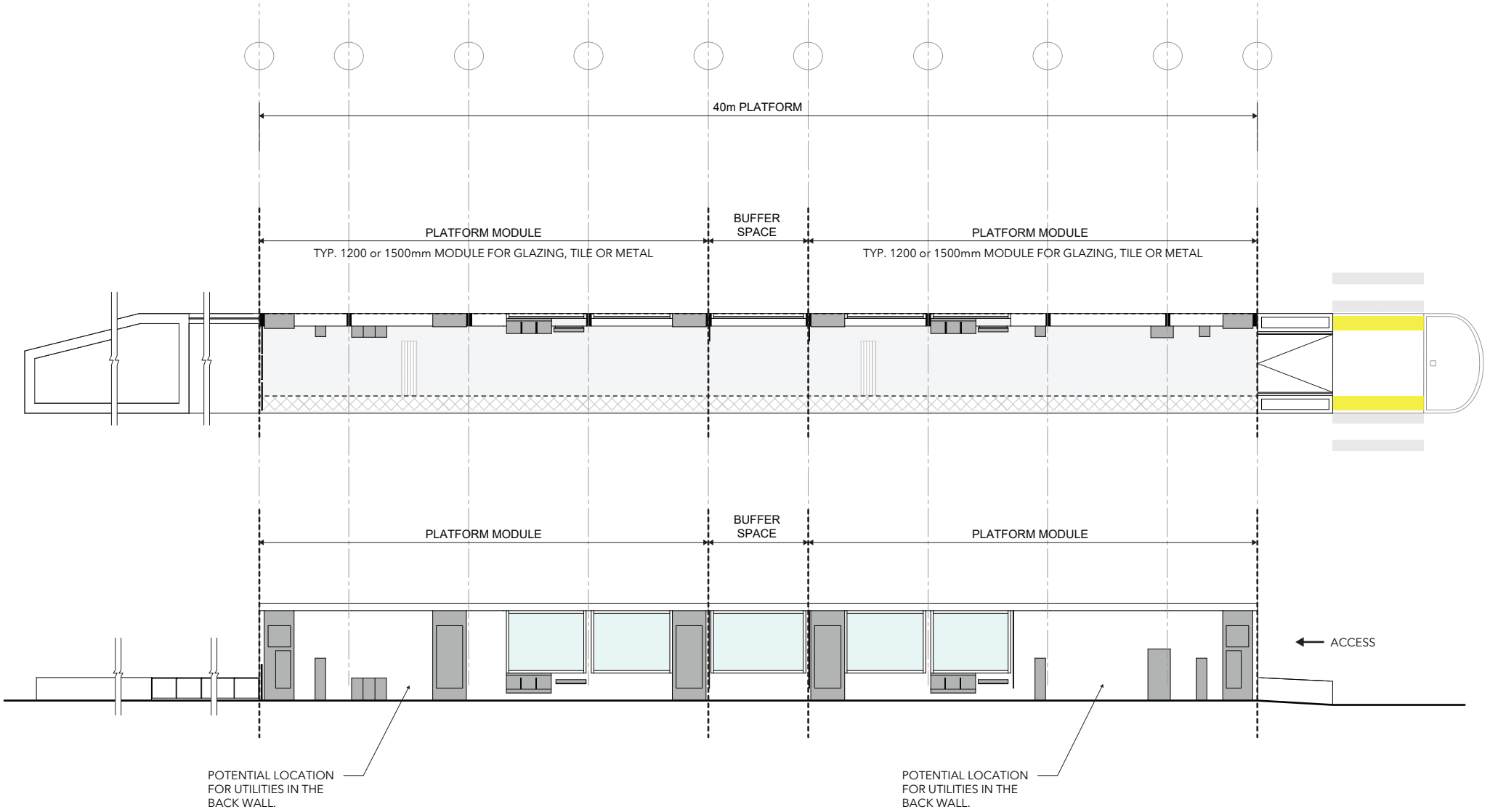


Figure 5-29: BRT platform modularity at median

5.6.3 Concrete Treatment

In the BRT network, materials and finishes shall be durable and shall provision for tamper-proof design to resist vandalism and graffiti (for example, hammer blows, felt markers, spray paint, burning, and scratching).

a) At Stops, the knee wall acts as a traffic barrier and service spine and shall comply with the following requirements:

   i. Provisions and coordination with precast concrete fabricators shall take place to achieve the desired finishes.

b) Connections shall be concealed and flush to member faces.

c) Concrete shall be modulated following the platform canopy modulation.

d) Exposed vertical concrete shall be treated with light sandblasting finish and a transparent anti graffiti coat.

e) Horizontal walking concrete finish at Stops shall be firm, level, and slip resistant. Refer to DS-02 Universal Design Standard.

5.6.4 Anti Graffiti

a) In the BRT network, materials and finishes shall be durable and resistant to vandalism through the provision of proof design including graffiti-resistant, easy-to-clean surfaces.

b) BRT infrastructure, including ceilings and vertical surfaces along the corridor, shall be protected with an anti graffiti coat up to 3000 mm high measured from the finished floor elevation.

c) Anti-graffiti coatings shall be permanent and non-sacrificial.

   i. Coatings shall be colourless and there shall be no appreciable colour difference to the coated surface when compared to non-coated surface.

   ii. Coatings shall not change the appearance of the base material.

d) Paint and sealers applied to walls and ceilings shall be graffiti resistant.

5.6.5 Colour

The use of colour along the BRT network helps to create identity and easy recognition by the public.

a) Use of colour in the BRT network shall be coordinated with Metrolinx.

b) Recognition of BRT line colour within the transit network shall be made (holistically rather than localized) as an overall idea of communication and recognition along the network.

c) Identification of elements that can transmit the colour identity message:

   i. In the kit-of-part elements identifying the BRT network, the following are included:

      1) Canopies

      2) Furniture

      3) Accent walls

      4) Signage

5.7 SIGNAGE: WAYFINDING AND DIGITAL SERVICE CUSTOMER INFORMATION

a) All wayfinding tools for Metrolinx BRT projects shall conform to Metrolinx DS-03 Wayfinding Design Standard. The objectives of the BRT wayfinding strategy is:

   i. to provide a complete wayfinding signage solution that delivers all the necessary elements included in DS-03 to ensure a high quality customer experience.

   ii. Provide an effective signage solution that addresses all identity, directional, operational, safety and security requirements by delivering signage tools that include static and illuminated signs and other visual cues, as required.

b) Signage requirements shall be coordinated and approved by Metrolinx Wayfinding Subject Matter Experts.

   i. Next vehicle arrival signage, one per shelter module. Placement shall be in close proximity to the front of the bus and customers shall have a clear sight line to signage from the platform access.

   ii. One sign band shall be provided per shelter module; placement shall be across the top of the shelter.

   iii. One transit identifier (lollipop with T) shall be provided at each platform.

   iv. For median platforms, signage placement shall be consistent and in close proximity to the pedestrian entrance.

   v. For curbside platform, signage placement shall be in close proximity to the pedestrian entrance and subject to pedestrian flow analysis to determine the greatest volume (as there are multiple entrances).

c) One information hub map shall be provided for each shelter module; placement shall be in close proximity to the fare device, at minimum one “buses from here” map per information hub.

d) One bus stop marker shall be provided for each shelter module; placement shall be in close proximity to the front door of the bus; signage shall be suspended from the canopy to avoid impact with bus movement (i.e., no pole shall be placed on the platform).

e) For dedicated guideway with below-grade platform and entrance pavilion (e.g., Mississauga Transitway stations), a complete wayfinding solution that conforms to the DS-03 shall be provided.

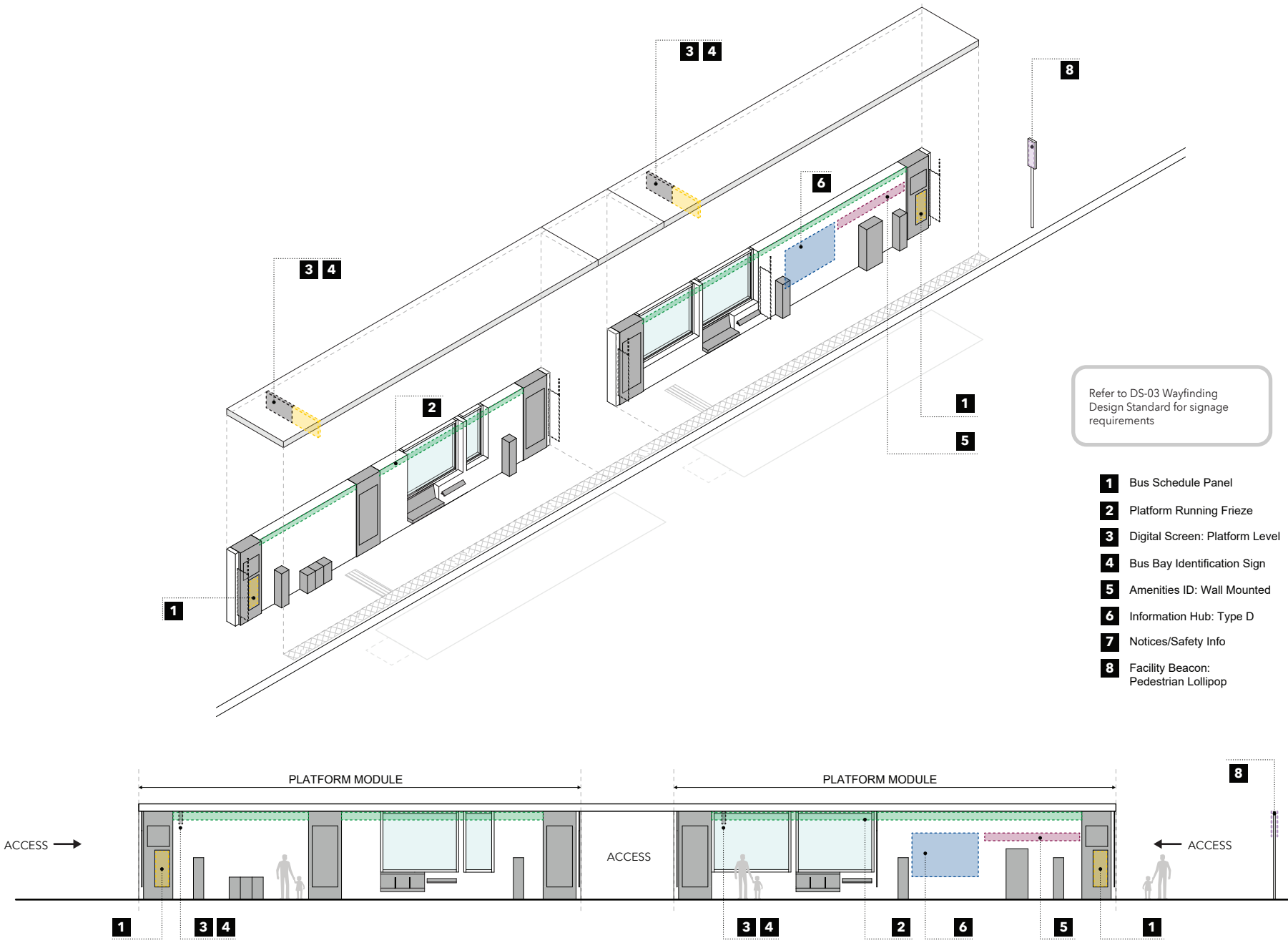


Figure 5-30: Illustration showing signage zones at curbside Stop

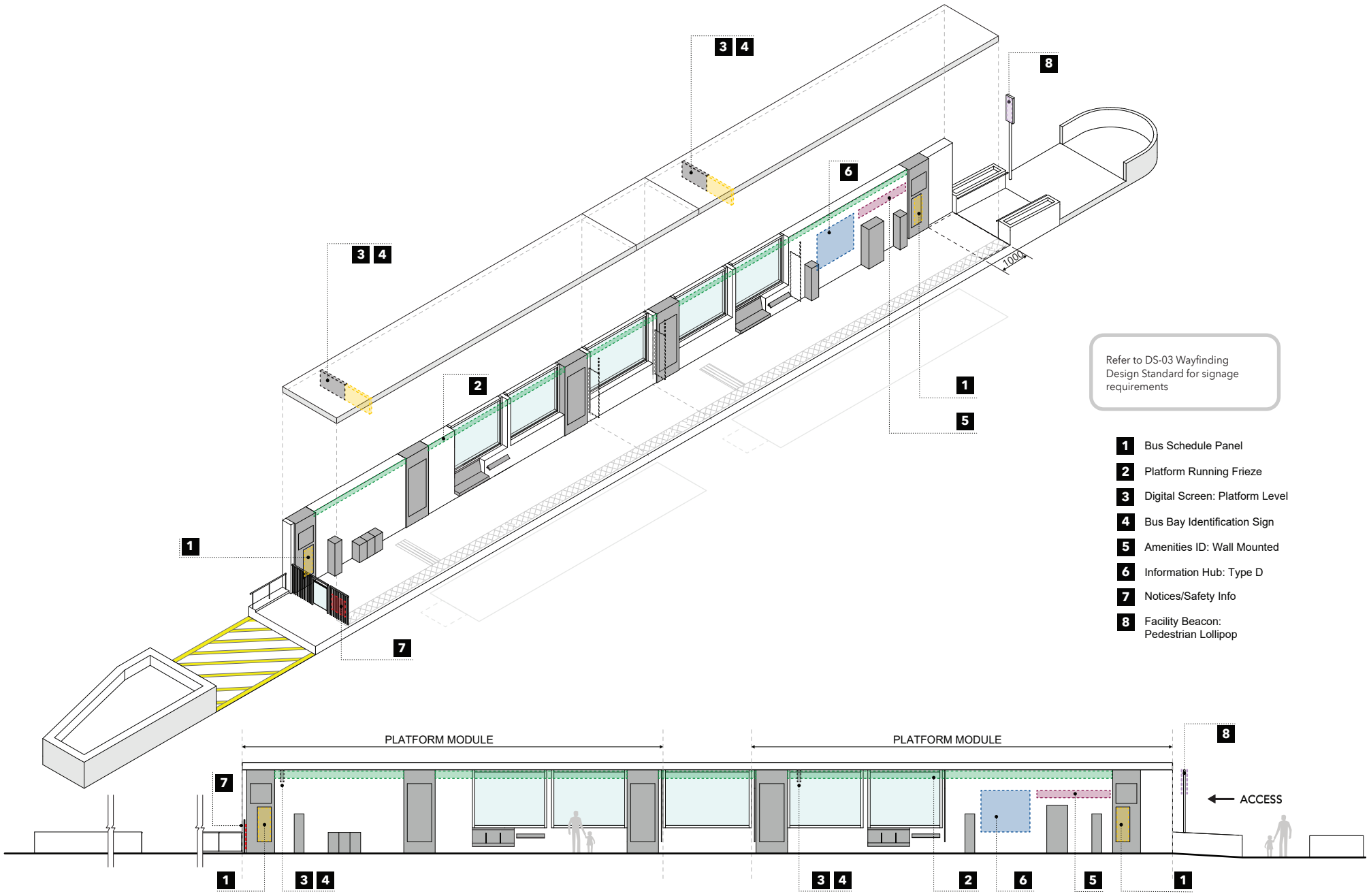


Figure 5-31: Illustration showing signage zones at median Stop

5.8 ENGINEERING SYSTEMS INTEGRATION

Collaboration between disciplines is key in seamless integration of systems such as piping, air conditioning, lighting, and many other services. The integration of these elements shall follow the BRT infrastructure modulation and be coordinated with the architectural intent. Similarly, the architecture shall consider the systems' constraints and sizing to reshape volumes, consolidate services, and refine design solutions. All systems shall be easily accessible for maintenance with minimal deconstruction of the BRT infrastructure.

This shall be achieved through:

a) Concealing drainage pipes internally through modulated opaque panels such as those that display advertising or information. These external panels shall be removable to allow for the maintenance of the elements behind them.

b) Stormwater management by utilizing rainwater collection in the landscape design and implementation of bioswales. Refer to Section 4.4.1.8 Stormwater Management.

c) Alignment of the lighting layout on the ceiling and walls with the facility modulation rather be placed independently. Integration with the infrastructure shall ensure illumination levels are met.

d) Locating mechanical units behind architectural elements, hidden from the public view.

e) Selection of architectural elements shall prioritize the reduction of energy consumption, resulting in smaller mechanical equipment to be integrated with the architecture.

5.9 FIGURES AND TABLES LIST

DS-27
BUS RAPID TRANSIT (BRT) ARCHITECTURE DESIGN STANDARD

APPENDIX A

FINISHES AND SCHEDULE

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
OPAQUE CLADDING	EW1A	• Prefinished aluminum panel, rainscreen assembly with concealed fasteners. • Pattern: Rectilinear Colour: Grey toned to achieve adequate contrast with brushed concrete floor Secondary colour: Feature/Accent colour to be determined on a project by project basis in consultation with Metrolinx Stations & Facilities Engineering and Asset Management & municipal stakeholders	Vertical shelter elements including cladding	Durable, readily available systems and module sizes for ease of repair & replacement; UV resistant finishes, colour-fastness, Corrosion resistance, impact resistance and durability testing, CSA S478-1995 (R2007)
WALL BASE	EW1B	• Sandblasted Architectural Precast Concrete. • Pattern: Rectilinear • Colour: Grey toned to achieve adequate contrast with brushed concrete floor	Shelter element bases	Durable, smooth finish, graffiti-resistant coating.
	*EW1C Cast-in Place	Sandblasted Architectural Cast-in Place Concrete Colour: Grey toned to achieve adequate contrast with brushed concrete floor	Shelter element bases	Durable, smooth finish, graffiti-resistant coating.
FLOOR FINISH	FF4	• Brushed concrete • Colour: Natural	Platform surface	non-slip and shall retain their slip resistance under both wet and dry conditions Joints coordinated with structural grids and thresholds
SOFFIT CEILING	ECF3	• Metal ceiling panels • Modules per kit of parts • Primary colour: Gray – Pantone to be confirmed with Metrolinx Design Standards, Stations & Facilities • Secondary colour: Feature/Accent colour to be determined on a project by project basis in consultation with Metrolinx Stations & Facilities stakeholders.	Canopy soffit ceiling	Durable, readily available systems and module sizes for ease of repair & replacement;; UV resistant finishes, colour-fastness, Corrosion resistance, impact resistance and durability testing, CSA S478-1995 (R2007)

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
Glazing	GL	• Capless, glazed aluminum structural silicon joint wall system with ceramic frit pattern (for glare, heat gain, and bird deterrent). • Internal Frame colour: Light Grey • GL-1 – Vision glass with the minimum ceramic frit pattern required to meet bird friendly requirements; • Distraction patterns as required, per DS-02	Platform enclosures	Tempered, laminated Demonstrated maximum transparency to ensure CPTED; **Key Performance Attributes** - Impact resistance - Transparency Note: fritted glass aids in light and localized reduction in heat gain.
Guards & Rails	SS	• SS-1 Stainless Steel hand rails	Stairs, ramps, where handrails are required	304 grade stainless steel 316 grade where high exposure to salt is anticipated
Roofs	R1	• High solar reflectance (SRI) membrane roof system	Shelter Elements (canopy)	High solar reflectance (SRI) membrane roof system (to reduce heat gain/heat island)