DS-13
LIGHT RAIL TRANSIT (LRT) ARCHITECTURE DESIGN STANDARD

Version 1.0

Metrolinx Design Standards
Metrolinx Light Rail Transit (LRT) Architecture Design Standard
Publication Date: June 1, 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-13 Metrolinx Light Rail Transit (LRT) 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 LRT 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 and station 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 he regional network, highlighting priorities and principles, through to elaboration via built environment requirements.

This standard is applicable to all Metrolinx LRT projects, and provides architectural and urban design requirements for stops and stations, and associated customer-facing infrastructure. Operator-specific requirements and amenities are not in the scope of the standard.

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 Light Rail Transit (LRT) is to deliver a seamless and integrated end-to-end customer experience that is supported and reinforced by appropriate architectural, landscape, and urban design 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 easy 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 a **One Network** experience that shall feel like a seamless trip. From planning, booking, payment, access, use, and transfer to arrival at a final destination.

GO Expansion, together with extensive Subway, Light Rail, and Bus programs, will be the backbone of an integrated transit network. Metrolinx requires a consistent consideration for the entire end-to-end customer journey, 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 Greater Golden Horseshoe Area (GGHA) for the foreseeable future, it is imperative that Metrolinx and its partners employ a future thinking mindset, 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 such as noise, smells, and sight lines that may impact the quality of a customer's experience. The design principles are underpinned by safety and making all of our customer journeys as safe as possible.

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

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 site 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 other multi-modal transit services and adjacent local transit services and highlight potential future opportunities for integration with the surrounding community and urban fabric.

   i. Coordination shall be made during the early stages of the design.

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, electrical, and plumbing systems, shall be seamlessly integrated.

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

   ii. Simplicity in the appearance of 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 must be identifiable, 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 Station and platform. These pathways shall create seamless connections through the Station environment and also become important Station identifiers.

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

d) 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 shall 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 the clarity of 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 straightforward and enjoyable customer experience. Designs shall present balanced, clutter-free spaces that are distinct and easily understood by all users.

Customer 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 whenever possible.

1.2.3 Inclusive

1.2.3.1 The end-to-end customer experience must 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.

Customer needs and amenities

b) Placement of elements, services, and amenities shall be such that they do not impede passenger flows but 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 create a sense of customer safety and reassurance throughout their end-to-end journey, at any time of day and at any location.

Site and public realm

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/sightlines

   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 while considering building energy performance.

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

Customer needs and amenities

d) Consideration of locations of equipment, such as fare payment devices and vending that supports a customer's safety (both actual and perceived).

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

1.2.5 Reliable

1.2.5.1 If public transit is to be a trusted choice of travel in the region, the system must be 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 aide 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.

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

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

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

Sustainability

f) 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 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, minimizing regional environmental impacts, and reducing GHG emissions and embodied carbon.

1.2.6 Thoughtful

1.2.6.1 Metrolinx 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.

Site and public realm

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) Stations shall 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.

   ii. Infrastructure shall be integrated with the neighbourhoods in which it resides, align entrances to work with site circulation, and demonstrate a coordinated approach to Station elements that clearly links to the adjacent community.

   iii. 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.

c) Accommodation shall be provided 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 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.

Architecture and interior

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 I&IT system cabinets, etc., shall be generally screened from public view using a consistent architectural 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 & DESIGN APPROACH

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

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 capital 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.

In recent years, and around the world, the LRT represents one of the alternative transportations that have evolved as a solution to move people, fostering within and between communities and neighbourhoods.

When the Yonge Subway Line opened in the city of Toronto, in 1954, there was a common architectural language for all Stops and Stations, defined by simple, rectilinear shapes and consistent materials, such as 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 LRT Architecture Design Standard provides a framework for the development of public-facing elements of the LRT network. A 'kit of parts' approach is used to enable projects to be scoped relative to their need, budget and projected ridership such as the Eglinton Crosstown in the city of Toronto. 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 LRT identity.

1.4 THE CUSTOMER JOURNEY

The customer journey diagram (Figures 1-1 and 1-2) illustrates the stages and touchpoints that customers experience when planning and executing their journeys. A customer journey starts well before they leave their home – it begins when they have identified a reason to travel.

The LRT customer experience can include circulation along all or some of the network's segments. Customers may circulate from one LRT Stop to another, from one LRT Stop to an LRT Station or from Station to Station without connecting to the LRT system at grade.

The customer's first interaction with the identity of the customer experience is at the planning stage of their trip. At this point, the customer decides whether or not to use the 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.

At each stage of the journey, there are touchpoints where the customers interact with a Metrolinx product, service, system, or facility. The customer journey diagram captures these touchpoints and notes the elements that are important to customers, which shall inform the design development process.

The journey diagram is organized into eight 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.

Each phase of the journey contains touchpoints where customers interact with a specific Metrolinx 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 Stations.

1.4.1 Stops

The following are customer experience touchpoints at Stops:

a) Arrival

   i. Arrival is the first physical touchpoint. Customers will reach the LRT Stop on foot or on a mobility device, or by bicycle, car, or other transportation modes.

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

b) Access to the LRT network

   i. Access to the LRT network refers to the point of entry at a Stop. For the at-grade LRT Stop, the platform entry point is this step in the customer journey.

For grade-separated Stops or Stations, this would be the building entrance.

ii. Consistent architectural expression along the LRT network, entry access point, and identification provides a sense of familiarity and aids in wayfinding and navigation.

iii. For at-grade LRT stops, the vertical circulation in the shape of a sloped walkway is located at the access points.

c) Transaction

i. Transaction refers to all the transactional touchpoints that a customer expects at a Stop, specifically

1) planning of their trip;

2) receiving assistance;

3) waiting for the next LRT vehicle; and

4) paying the fare for their trip.

d) Connections

i. In the LRT network, associated infrastructure supports the customer journey, such as guideways, and dedicated lanes.

ii. Once the customer alights from the LRT, connectivity around and through the site shall be enhanced through prioritized pedestrian circulation that provides direct, accessible connections to and from the LRT Station to the Stop. This includes:

1) walkway paths

2) signage and wayfinding; and

3) continuity of the LRT network architectural language and its identity.

1.4.2 Stations

The following are customer experience touchpoints at Stations:

a) Arrival

i. Arrival is the first physical touchpoint; customers arrive at the LRT Station on foot, mobility device, or by bicycle, or other mode of transportation, including the municipal bus, bus rapid transit (BRT).

ii. The LRT Station provides a series of characteristics that make it easily recognizable: these include paving, crossing, preceding plaza, Station building (pavilion), and bicycle shelters.

iii. The Station building or head house is the next step in the customer journey. Consistent architectural expression, entry portal, and identification provide a sense of familiarity and aid in wayfinding and navigation. Station buildings may include vertical circulation from street level if the Station is not located at grade.

b) Transaction Zone

i. At LRT Stations, certain transactional activities may occur; such as:

1) retail and Washrooms, present at interchange Stations.

2) supporting infrastructure (e.g. vertical circulation required at grade separated Stop/ Station typology).

3) station Attendant Booth.

4) fare devices; and

5) closed-circuit camera (CCTV) and surveillance.

ii. The Unpaid Zone

The unpaid zone is the area where customers plan their journeys, view the maps, purchase fares, and obtain assistance if required. This zone forms an important part of the customer experience, and the kit of parts approach is the key to delivering consistent and predictable design. Where provided, fare threshold separates unpaid zones from paid zones and shall be a consistent element at grade-separated Stations throughout the network.

iii. The Paid Zone

The paid zone connects the fare threshold to the platform and can expand on different levels, depending on whether the Station platform is below or above ground. This zone typically includes customer amenities, including retail, washrooms, and advertising. Vertical circulation systems are important elements in this step and consistent design is essential in accomplishing customer satisfaction.

c) Platforms

Platforms are the most identifiable environment in any transit system. Customer amenities include trip confirmation, digital displays of times of next trains, seating, advertising, public announcements, and other information systems. Platforms must be designed to service both arriving and departing passengers.

d) Connections

i. Once a customer alights from the LRT, connectivity around and through the site shall be enhanced through prioritized pedestrian circulation that provides direct, accessible connections to and from the LRT station to stop

1) walkway paths

2) signage and wayfinding; and

3) continuity of the LRT network architectural language and its identity.

1.5 CUSTOMER JOURNEY TOUCHPOINTS AND INFRASTRUCTURE

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

LRT Stop Customer Journey:
Touchpoints & Infrastructure

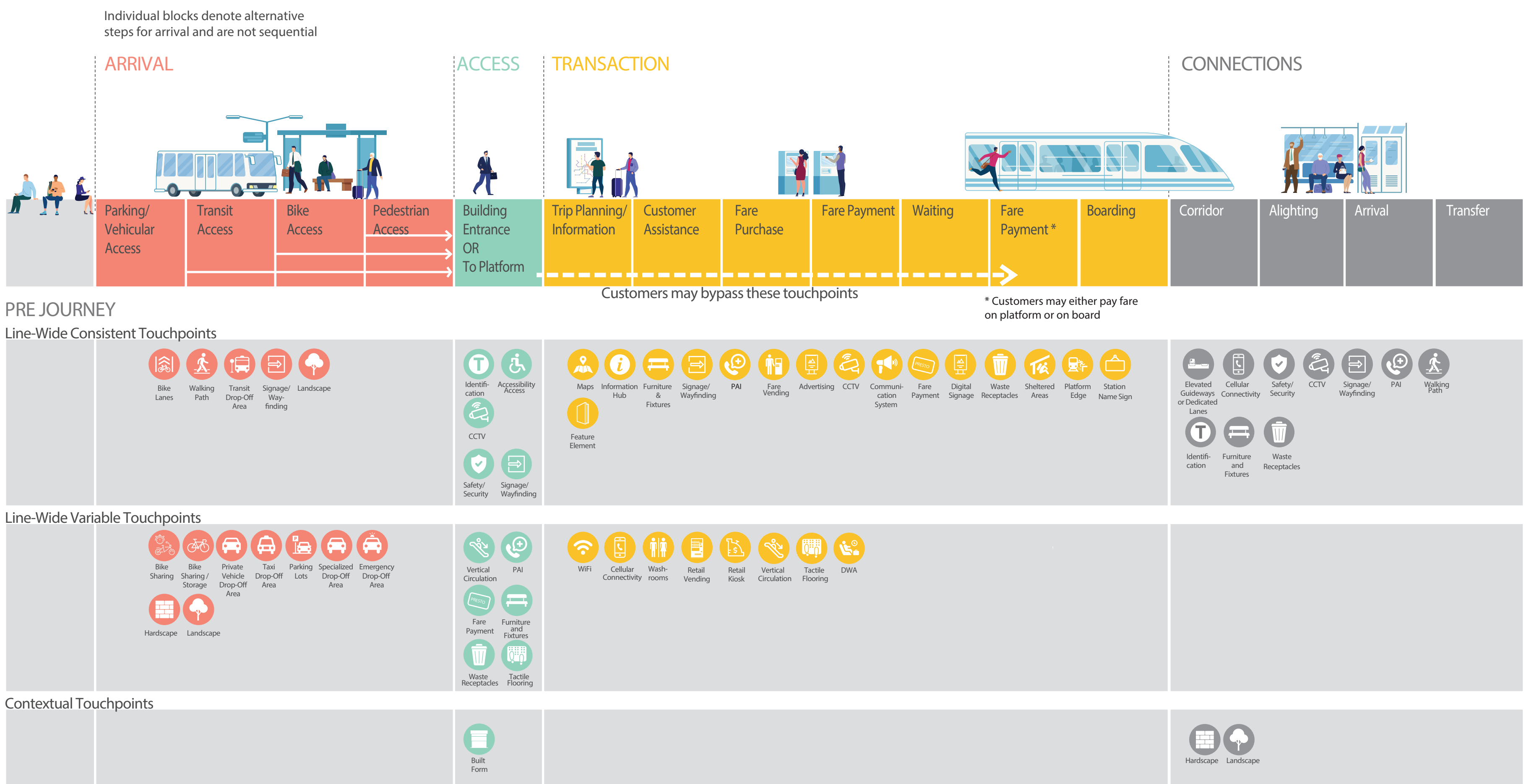


Figure 1-1: LRT Stop Customer Journey – touchpoints and infrastructure

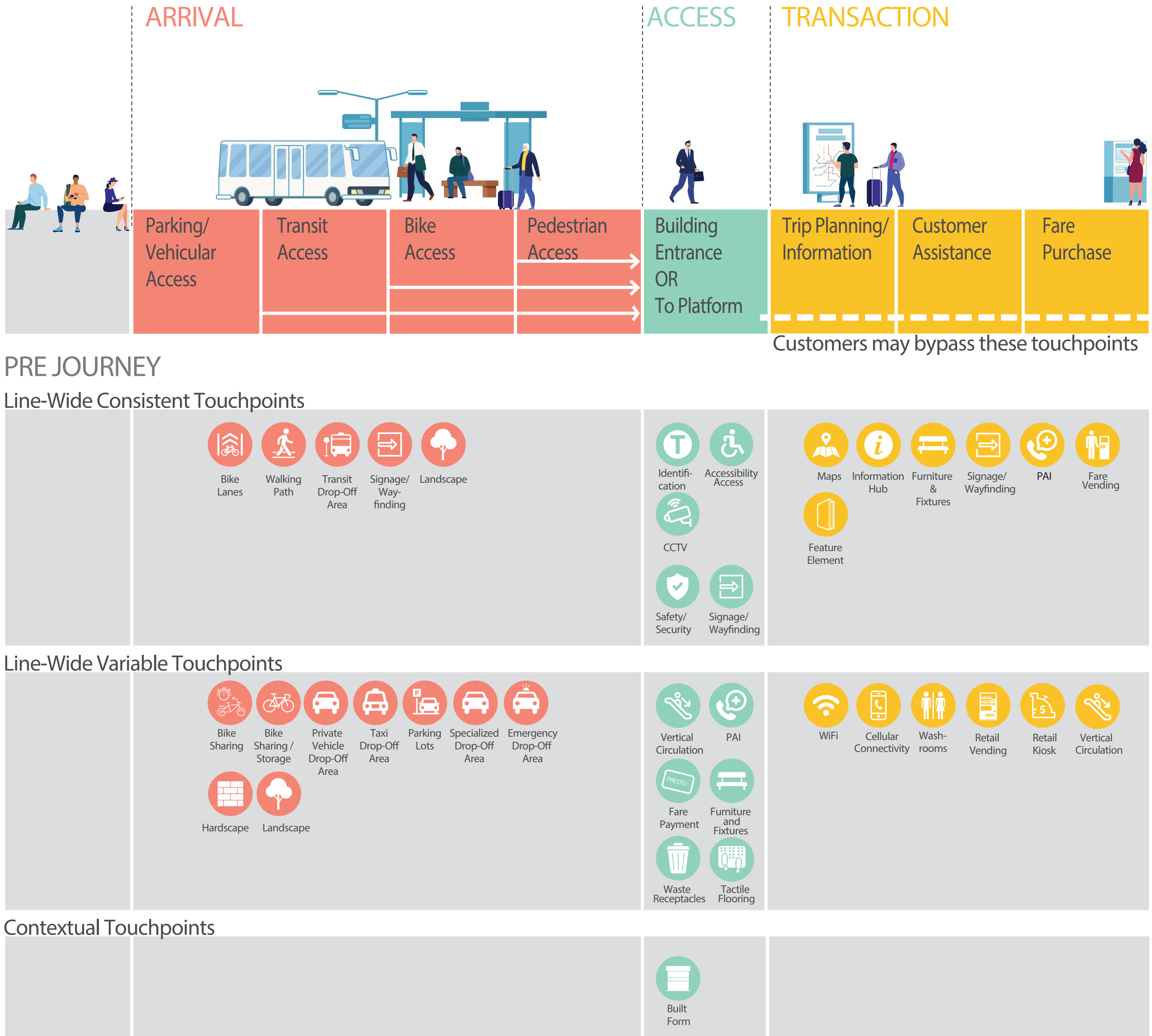


Figure 1-1A: LRT Stop Customer Journey – touchpoints and infrastructure

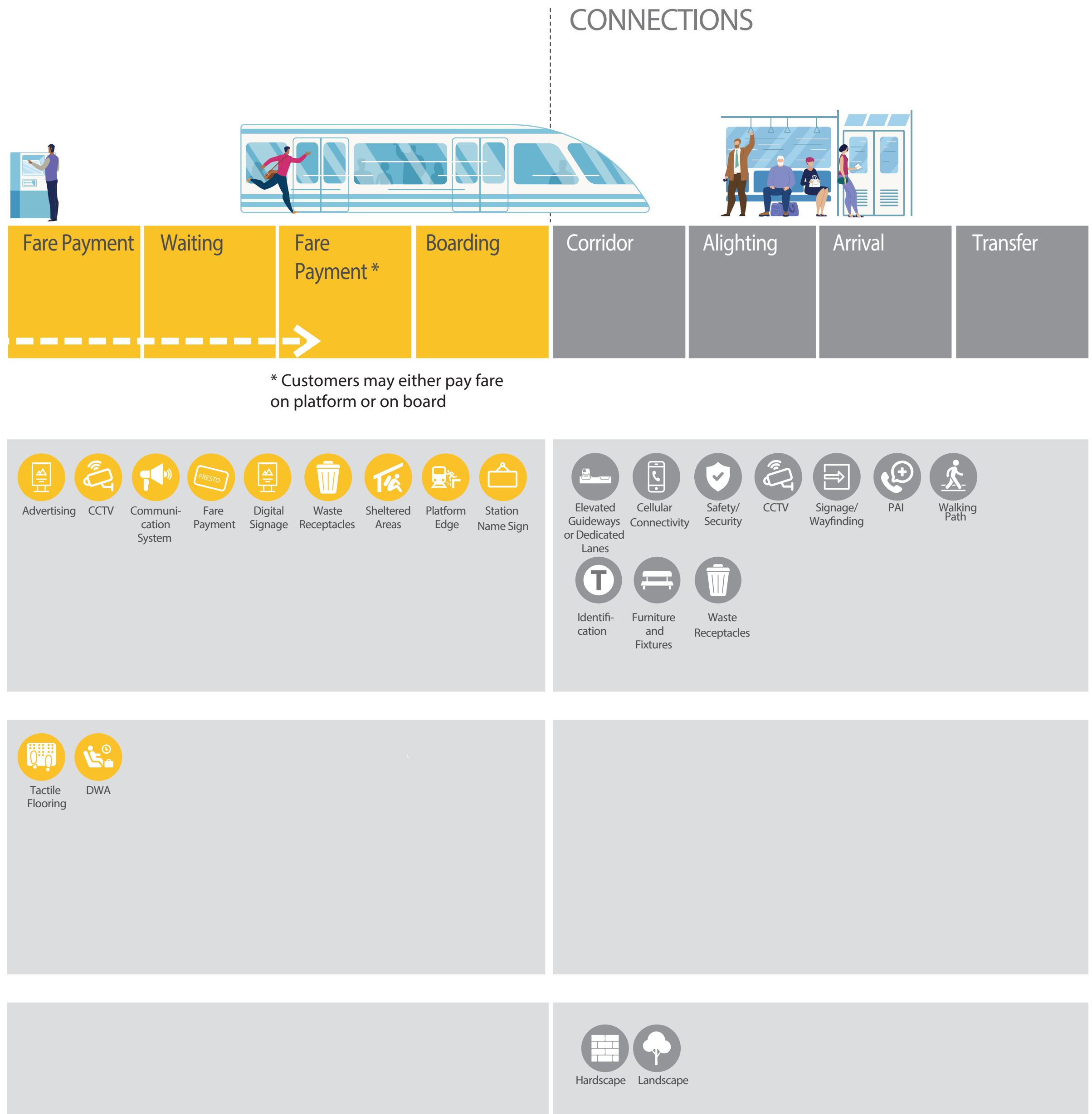


Figure 1-1B: LRT Stop Customer Journey – touchpoints and infrastructure

LRT Station Customer Journey:
Touchpoints & Infrastructure

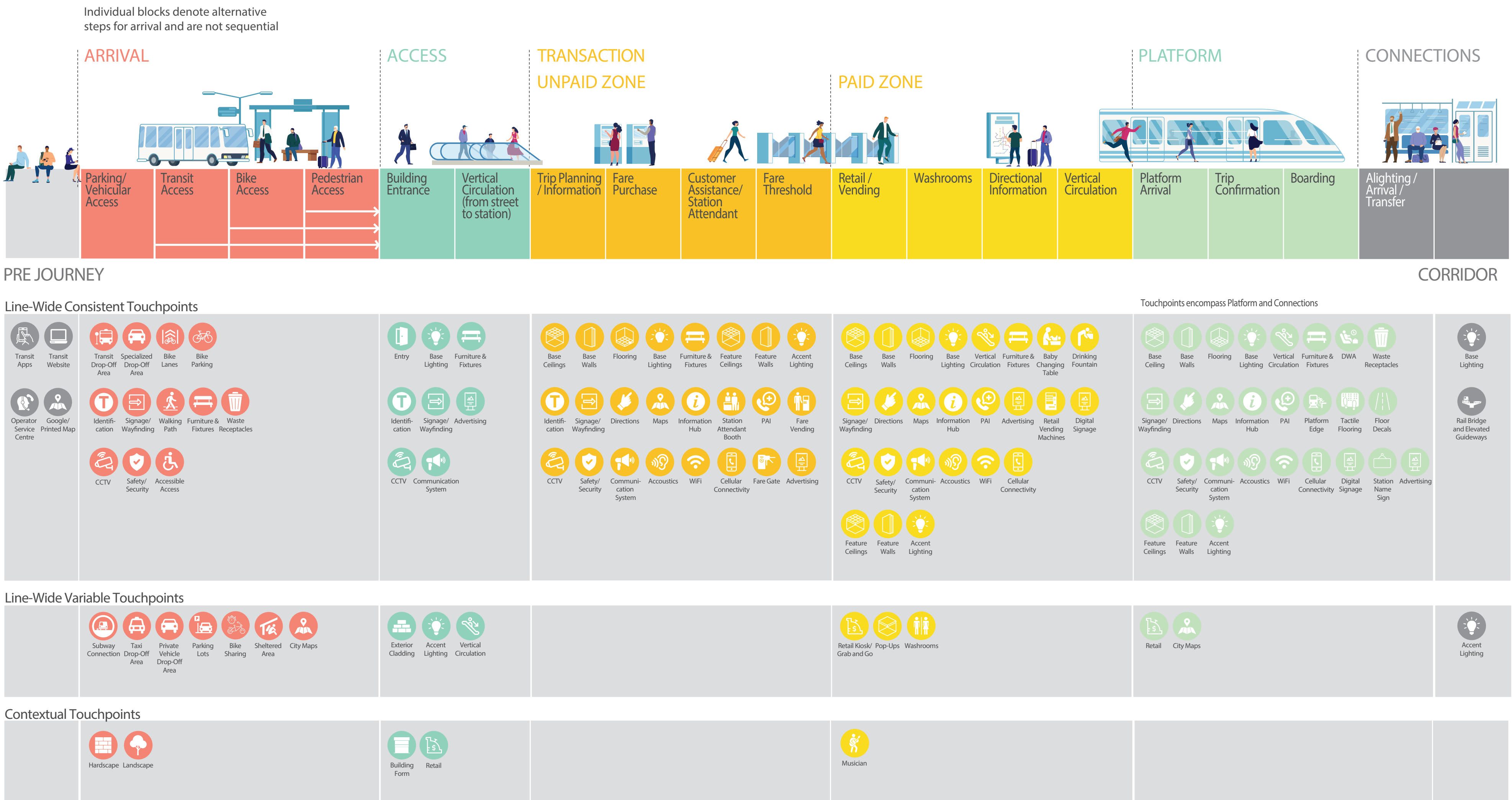


Figure 1-2: LRT Station Customer Journey - touchpoints and infrastructure

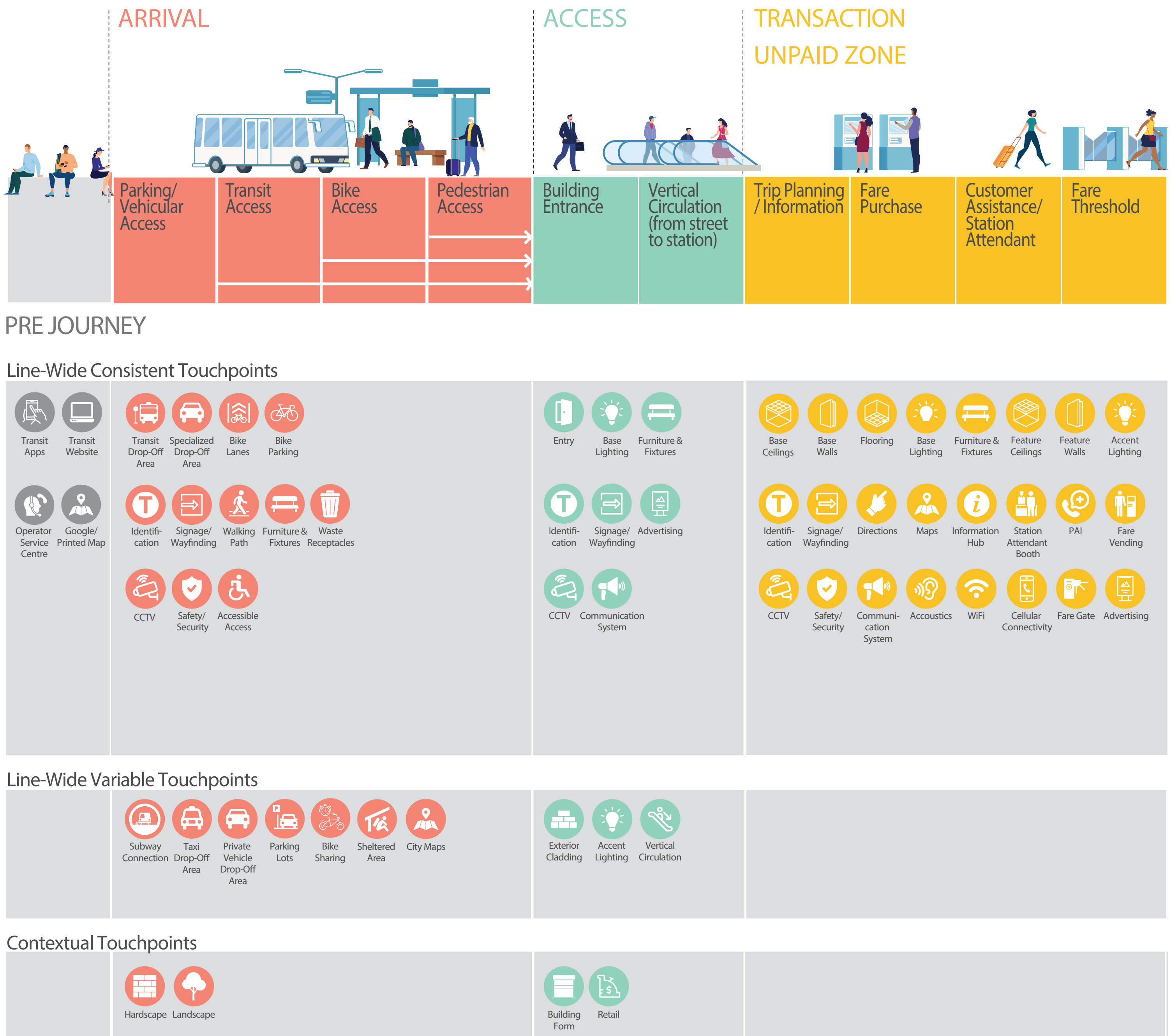


Figure 1.2A: LRT Station Customer Journey – touchpoints and infrastructure

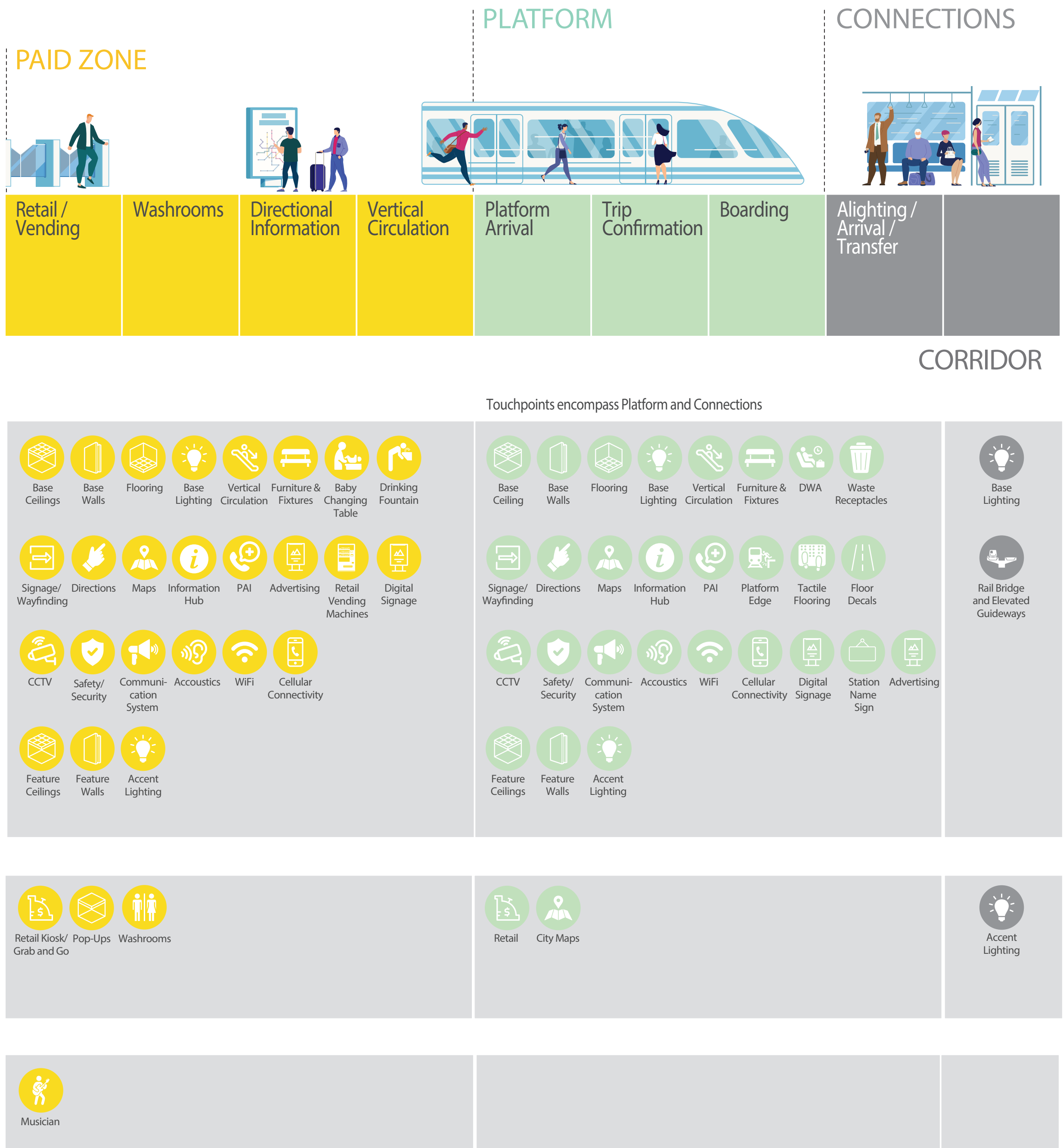


Figure 1.2B: LRT Station Customer Journey – touchpoints and infrastructure

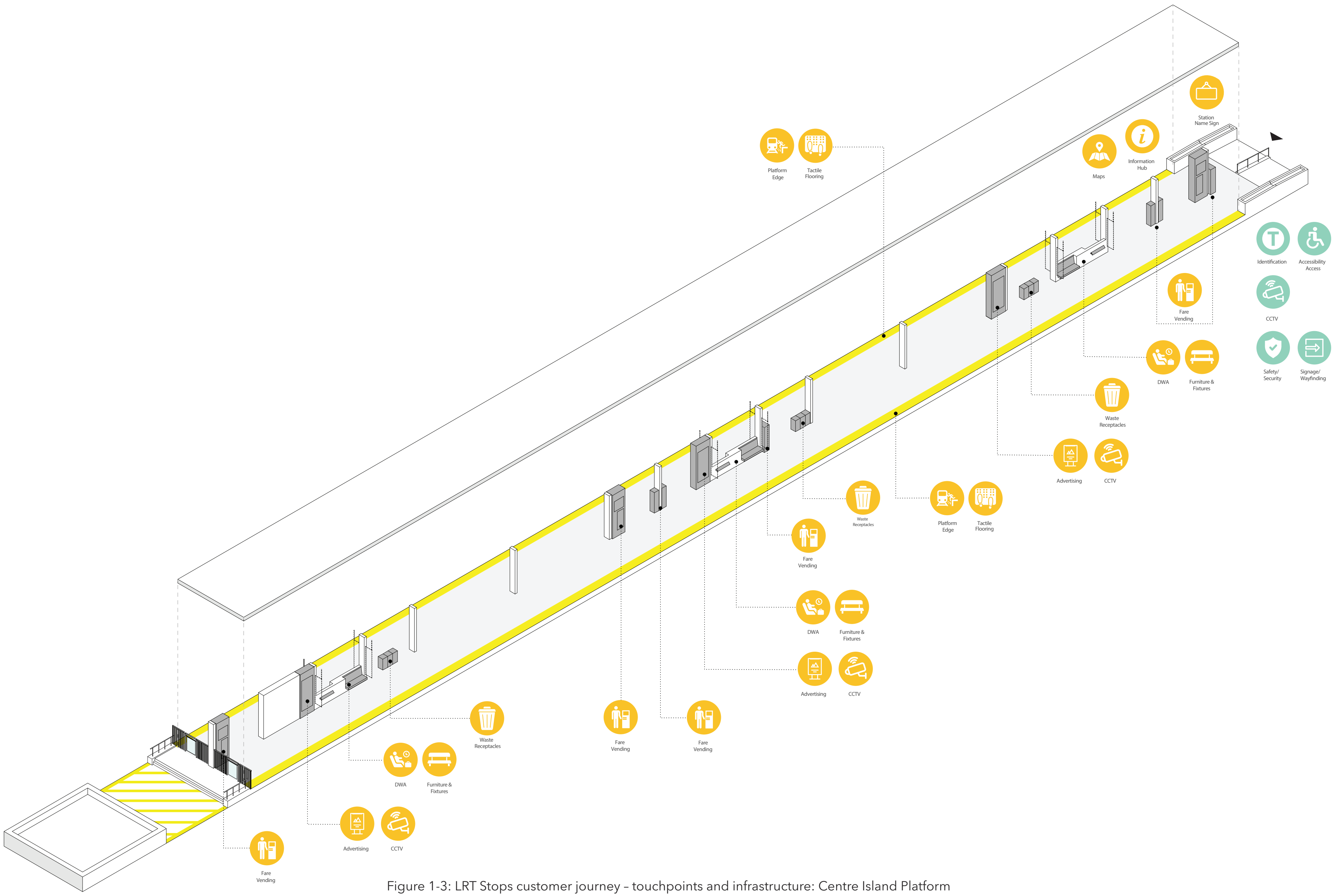


Figure 1-3: LRT Stops customer journey – touchpoints and infrastructure: Centre Island Platform

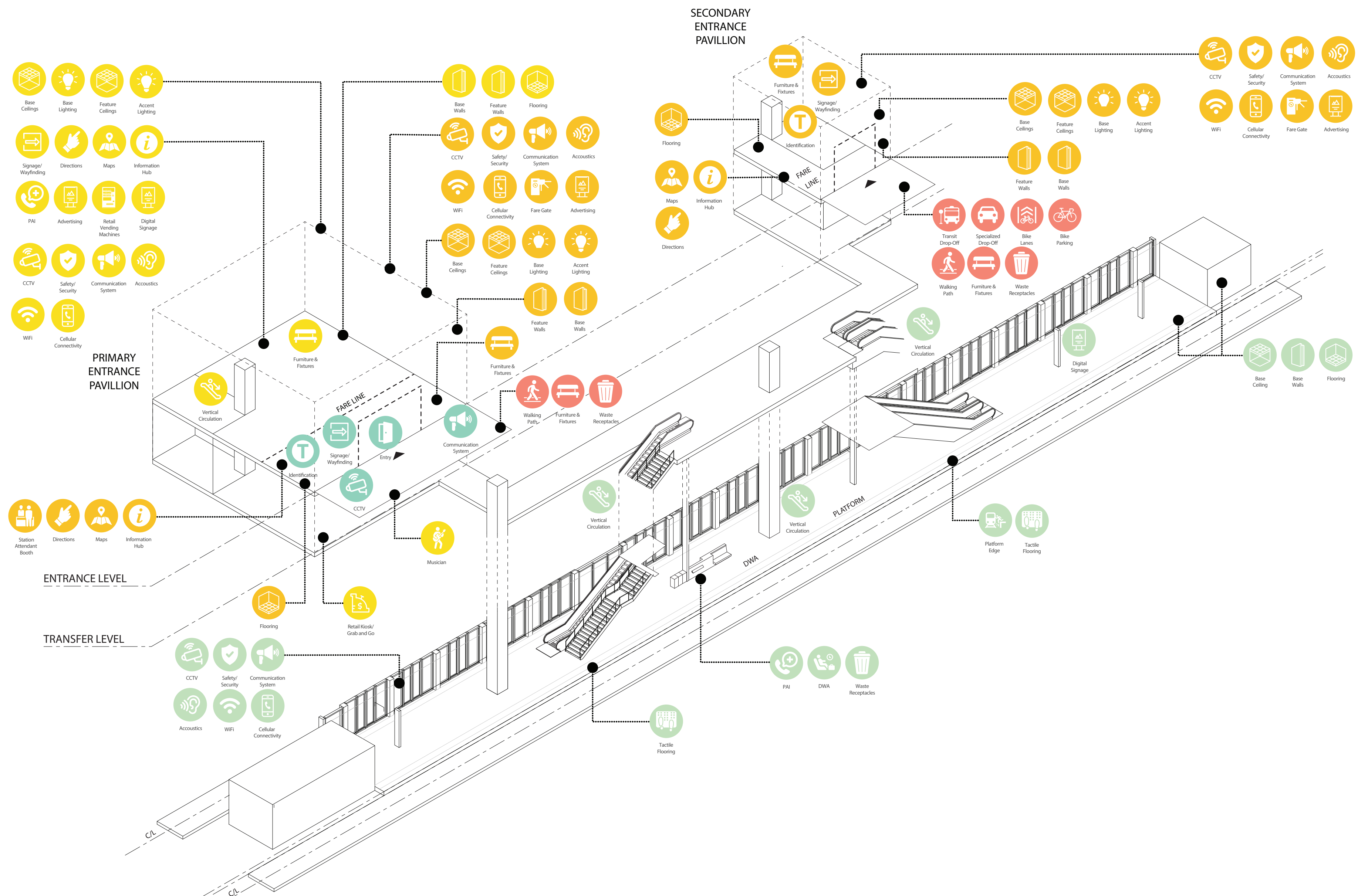


Figure 1-4: LRT Stations customer journey – touchpoints and infrastructure: Underground Station with Centre Platform

1.6 LIST OF FIGURES

2.0 Administering Standards

2.1 HOW TO USE THIS DOCUMENT

2.1.1 Overview

The DS-13 Metrolinx LRT Architecture Design Standard provides design direction and requirements for customer-facing elements of new LRT infrastructure. This standard shall be applied together with the project contract documents.

These requirements include guidance to develop the architectural design for LRT projects as well as prescriptive requirements that need to be followed to meet the minimum required conditions in the design.

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."

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

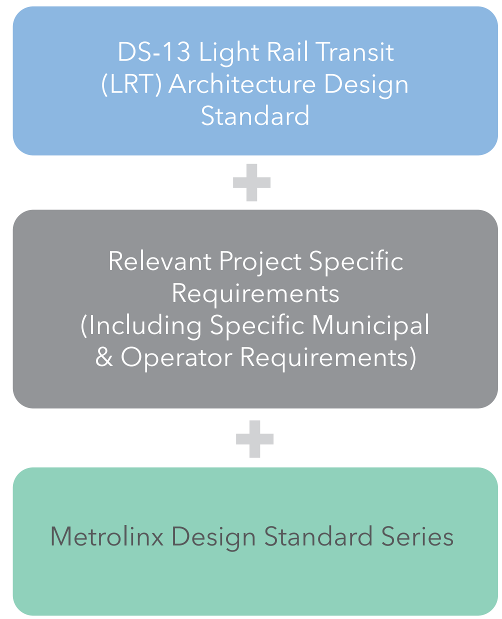


Figure 2-1: Relationship between LRT Architecture Design Standard, project-specific requirements, and Metrolinx standards

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 & STANDARDS

a) 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) Codes and regulatory requirements shall be met in all cases and this document is intended to provide additional requirements but is not intended to replace codes and regulatory requirements.

Acts, Codes and Municipal By-Laws:

Accessibility for Ontarians with Disabilities Act (AODA)

Ontario Building Code (OBC)

Ontario Building Code Supplementary Standard

Ontario Fire Code

Occupational Health and Safety Act (OHSA)

Occupational Health and Safety Act - Regulation 851, Industrial Establishments

Ontario Electrical Safety Code

Applicable municipal, standards and by-laws as required on a project by project basis.

Referenced Standard Organizations:

National Fire Protection Association (NFPA)

Canadian Standards Association (CSA)

International Standards Organization (ISO)

Metrolinx Design Standards:

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
- Part 2b: Sign Implementation Manual - LRT/Subway 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 Subways Stations

PRESTO Service Design Standard

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) Standard 55

2015 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 Standards

National Association of City Transportation Officials (NATCO) Transit Street Design Guide

2.3 DESIGN REVIEW, SUBMITTAL PROCESS, AND REQUIREMENTS

For design review, and 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

ASTM - American Society for Testing and Materials

ATM - Automatic Teller Machines

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

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

DWA - Designated Waiting Area

EAB - Emergency Assistance Button

EAM - Engineering and Asset Management

EAS - Electronic Article Surveillance

EEB - Emergency Exit Building - also referred to as Emergency Egress Building

ELE/ITS - Electrical and IT System Cabinets

FACP - Fire Alarm Control Panel

FFE - Finish floor elevation

FVM - Fare Vending Machine

GFCI - Ground fault circuit interrupter

GO - GO Transit

HMMA - Hollow Metal Manufacturers Association

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

MSF - Maintenance and Storage Facility (also referred to as Operations and Maintenance Storage Facility (OMSF)

MSP - Municipal Service Provider (also referred to as Transit Agencies)

MPI - Master Painter institute

Mx – Metrolinx

NAFS - North American Fenestration Standard

NCS - Natural Colour System

NFPA - National Fire Protection Association

NRC - National Resource Council

NRC - Noise Reduction Coefficient

OBC - Ontario Building Code

OCC - Operations Control Center

OCS - Overhead Catenary System

OPS - Ontario Public Service

OHSA - Occupational Health and Safety Act

PA - Project Agreement

PAI - Passenger Assistance Intercom

PAS - Public Address System

PED - Platform Edge Doors

POPS - Privately-Owned Public Space

PPUDO - Passenger Pick-up and Drop-off

PSI - Pounds per Square Inch

PVC - Polyvinyl Chloride

PVIS - Passenger Visual Information System

RAL - International colour matching system

ROW - Right of Way

SR - Solar Reflectance

STC - Sound Transmission Class

TA - Transit Agencies

TAI - Tactile Attention Indicators

TDI - Tactile Direction Indicators

TGS - Toronto Green Standard

TOC- Transit Oriented Community

TPS - Traction Power SubStation (interchangeable with TPSS)

TTMAC - Terrazzo Tile & Marble Association of Canada

TTC – Toronto Transit Commission

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

VCE - Vertical Circulation Element

VMS - Variable Message Signs

VOC - Volatile Organic Compound

2.4.2 Terminology:

"Stop" location along a street, either at-grade or grade separated, with a platform and shelter, where passengers can board and alight vehicles on a light rail transit system as described in this document.

"Station" fully-enclosed passenger facility with an underground, at-grade or above ground platform where passengers can board and alight vehicles on a light rail transit system as described in this document.

"Kit of parts" 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, recognizable and reinforces the systems identity.

2.5 LIST OF FIGURES

3.0 Fundamental Requirements

3.1 OVERVIEW

Successful LRT 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 Stop 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-centered 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.

3.1.2.1 Envision

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, particularly for a new LRT line or extension.

3.1.2.2 LEED

Suitability of LEED certification at each Station shall be evaluated on a case by case basis. Where LEED certification is not pursued, select credit requirements shall be included in the project agreement in lieu of the requirement of LEED certification.

In general, the pursuit of LEED certification is required when:

a) the Station meets LEED Minimum Program Requirements;

b) the Station has enclosed and actively heated and cooled public spaces that will be regularly occupied by people;

c) achievement of all prerequisite credits is possible; and

d) the implementation of enough credits is possible such that LEED certification can be achievable.

A minimum of LEED Gold certification is required at the MSF, unless stated otherwise in the Project Agreement. 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. Applicability may vary depending on the size and nature of Stops and Stations.

Refer to Appendix A: LEED Requirements at MSF.

3.2 SAFETY AND SECURITY

Metrolinx's key design principles prioritize being safe. Fundamental requirements ensure all customers feel safe throughout their end-to-end journey, at any time of day and at any location, include fire life safety, and safety by design requirements.

3.2.1 Life Safety

3.2.1.1 Life Safety and Fire Protection

The following guiding principles for life safety and fire protection shall be applied to the LRT Station design:

a) Fire and life safety designs that limit fire spread and impacts on patron safety, damage to property, and business continuity shall be provided.

b) Stations shall be designed so that in the event of an emergency occurring at platform level, all passengers, including those who are unable to self-evacuate can be quickly evacuated as required by OBC.

c) Means shall be provided to restrict the overcrowding of platforms during peak operating conditions.

d) Stations shall be designed to be open and spacious in recognition of the volumes of people that may use them during peak hours and in emergency conditions.

e) Stations shall be designed to include the infrastructure required for emergency smoke ventilation. Notwithstanding the above, Station egress shall be designed to reduce the reliance on emergency smoke ventilation systems.

f) Fire protection systems shall be provided for emergency responders, where required.

g) An analysis of evacuation shall be carried out during the design phase to ensure safety of customers for Stops and Stations.

h) Design shall maintain the tenability of the Station and make provisions for emergency scenarios (e.g., inclusion of areas of refuge, areas to ensure life and safety provisions for those who are unable to self-evacuate).

3.2.1.2 Ventilation

Ventilation systems in LRT Stations are provided to control the ambient climate for passengers' comfort, preserve occupant safety, and assist emergency responders during fire emergencies. The design of ventilation systems is case specific, based on the geometry of the Station and subject to analysis. It is governed by the OBC, ASHRAE, and NFPA 130.

The design of the ventilation system shall incorporate the intended objective(s) and provide a system that can serve multiple purposes. The ventilation system is part of a holistic approach to fire life safety that incorporates a fire protection system, communications, accessibility, security, operating protocols, risk, emergency responders, and municipal agencies.

Retrofits and upgrades of existing infrastructure could have an impact on existing systems; the extent of those impacts and the viability of the retrofits and upgrades shall be analyzed relative to the life safety value that they provide. Where additional systems are installed (such as platform edge doors, or PEDs), their impact on the ventilation shall be evaluated so that there is no degradation in performance.

3.2.2 Crime Prevention Through Environmental Design

Crime Prevention Through Environmental Design (CPTED) encompasses design decisions that provide an environment where criminal behaviour is reduced or eliminated. CPTED design principles address visibility, lighting, access control, security hardware, landscaping, vandal resistance, and ease of maintenance. It is, therefore, essential to incorporate CPTED during the initial design stages.

CPTED principles include:

a) Build Stations and Stops environments that minimize opportunities for crime;

b) Help deter and control crime of any type;

c) Increase actual and perceived safety and security of customers; and

d) Create a clean, well-lit, and safe environment.

Achieving CPTED principles in the LRT network design is the basis upon which other security measures are incorporated through other engineering requirements. These other requirements include fire life safety; structural; heating, ventilation and air conditioning (HVAC); communication systems (CCTV, two-way communication for passenger assistance and audio speakers); and electrical and lighting requirements.

3.2.2.1 Design Requirements

a) Straight sight lines for natural surveillance and safe travel through the site shall be provided. The design shall provide clear sight lines for leased concession employees and the Station ambassador office.

b) Routes through the site shall be open and with clear views that are unobstructed by landscaping and landscape elements such as walls, protective barriers, furniture, and bollards.

c) Station landscaping shall be planned to eliminate concealment areas. The design shall demonstrate maximum passenger sight lines and not impede area lighting.

d) Transparency: Designs shall demonstrate maximum transparency and openness along all public-facing façades, between different levels, and from one space to another through clear, unobstructed views, and use of transparent materials.

e) Site design shall demonstrate safe routes between associated surface facilities, LRT Station entrances, and the surrounding area for pedestrians and cyclists.

f) Unobstructed access to Station entrances for emergency response agencies shall be provided.

g) Station entrances, passenger transfer zones, and platforms shall provide optimum openness to aid in navigation and support the principles of CPTED.

h) Designs shall eliminate opaque enclosures around vertical transportation elements, except where demonstrated that it is not possible.

i) Dead end corridors shall not be included, and corridors in public areas shall be avoided.

j) Designs shall address safety and terrorism prevention by eliminating blind corners and entrapment areas such as alcoves and nooks where one can hide, or where suspicious packages can be hidden.

k) All waste and recycle streams shall be visible on all sides using a clear and transparent material to aid in preventing terrorism-related activity.

l) Furniture seating bases shall have clear sight lines to prevent concealment of packages.

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

n) Station signage shall be located in accordance with Metrolinx DS-03, Part 1, Wayfinding Design Standard and Part 2b: Sign Implementation Manual - LRT/Subway Edition.

o) For normal operation (no fire alarm), elevators shall automatically return to the lowest landing with doors closed when not in use.

p) Appropriate signage shall be installed where the area is under video surveillance and the CCTV camera operates when the passenger assistance intercom (PAI) is activated.

q) Lighting placement shall not create blind-spots for potential observers and miss critical areas. Potential problem areas – including pathways, stairs, entrances/exits, parking areas, automatic teller machines (ATMs), phone kiosks, and service areas shall be well lit.

r) Security lighting shall not create blinding glare or deep shadows, hindering the view for potential observers.

s) PEDs should be implemented on platforms to further enhance safety and security by restricting access to the track, preventing accidents, and acts of vandalism or terrorism.

Figure 3-1: CPTED , clear sight lines, and intuitive design are part of the CPTED principles

3.2.3 LRT Safety

One of the most important aspects in the design of an LRT network is the safety of customers, pedestrians, and the surrounding population. The LRT vehicle plays an important role by being the moving piece that customers board to circulate from one LRT Stop to another LRT Stop or Station, or to other transit networks, as well as it being the major fire source in the network.

Considerations such as the location of the emergency tunnel ventilation shafts at grade, clearances to adjacent properties, and evacuation routes mitigate any risk and provide a safe environment within the LRT network.

a) LRT network design shall be coordinated with Metrolinx and the authorities having jurisdiction.

b) LRT Stops and Stations shall be designed to accommodate the LRT cars.

c) LRT network shall be designed to fulfill the fleet operation.

d) LRT network shall make provisions of clearances for the circulation and parking of the fleet, as follows:

   i. Dynamic envelope of the train.

   ii. Vertical clearance to overhanging elements (e.g. canopy at stops).

iii. Signal for drivers.

iv. Rail systems (e.g., overhead contact system requirements).

Refer to Sections 5.0 (Stops) and 6.0 (Stations) for specific design requirements for the LRT network.

3.2.4 Closed Circuit Television

The LRT network is driven to provide a sense of safety and comfort to the public. Customers shall be safe and feel safe along their entire journey while on or within Metrolinx property, the built environments, and all forms of transit including buses, streetcars, subways, and trains.

Video surveillance plays an important role in the security infrastructure that aids in mitigating criminal activities, and overseeing customer circulation flows, while monitoring and providing customer safety. Although it is recommended that the design mitigates any risk of vandalism and crime, video surveillance, however, provides an extra layer of control and safety during the journey as well as the conditions for improved behaviour since people will be aware that they are being seen and recorded.

The Closed Circuit Television (CCTV) system shall provide live monitoring and recording of all public and non-public, exterior and interior areas, for new line-wide Station safety and security in the surveillance of passenger movement and flow, monitoring of train and bus arrivals and departures, MSF, vehicle movement, intrusion detection, security control, and operational control measures for assistance to customers throughout the transit system. The primary use of cameras is for security purposes.

The Project Agreement (PA) shall include the definition and level of criminal activity (whether high or low) on a Station-by-Station, project-by-project basis.

3.2.4.1 Functional Design Requirements

a) The maximum mounting height of CCTV cameras shall not exceed 3000 mm, unless verified by the security consultant. Final placement shall be confirmed by the security consultant and approved by the operator.

b) The minimum mounting height of CCTV cameras shall not be less than 2440 mm to prevent issues of access to damage or vandalism. Final placement shall be confirmed by the security consultant and approved by the operator.

c) Back-up power for all CCTV cameras shall be provided to maintain operation and recording upon loss of utility power.

d) Cameras shall be positioned and aligned to eliminate unwanted glare as a result of the rising or setting of the sun and reflections. Final placement shall be confirmed by the security consultant and approved by the operator.

e) For new facilities CCTV layout shall be coordinated with other elements – such as lighting, speakers, and signage to form an integrated appearance. Where CCTV cameras are mounted on poles, cameras shall be integrated seamlessly and exposed fasteners are maintained to a minimum.

f) There shall be no visual impact or perception of cameras positioned or directed towards neighbouring properties.

g) The visual impact of CCTV cameras and related devices, including mounting brackets and straps shall be reduced and the colour of the devices, including camera housing, trim, and raceways, shall match adjacent walls or the ceiling surface finish.

h) Mounting brackets shall only be used where direct fixation is demonstrated to be not feasible or would reduce CCTV performance.

   i. Pole extensions or arms shall be avoided, especially to mount extra communication or electrical equipment.

i) Mounting location of all CCTV cameras shall be coordinated with security personnel and structural design subject to evaluation as part of the Threat and Vulnerability Assessment (TVA).

j) The final CCTV placement/location shall be by the operator and it shall be reviewed and approved by Metrolinx's Corporate Security.

k) CCTV image quality criteria, especially those that are located at the Station building entrance/exit doors shall provide dedicated CCTV coverage at the following levels, at minimum:

   i. Identify - 250 pixels/metre.

   ii. Recognition – 125 pixels/metre.

   iii. Monitor - 75 pixels/metre.

3.2.4.2 Functional Design Requirements

a) At Stops:

   i. Cameras shall be located such that they cover the entire length of the platform, including the access and rear points.

   ii. Cameras shall be laid out in coordination with other elements located in the ceiling, following the overall modulation.

   iii. Cameras shall be ceiling-mounted where located in the platform.

   iv. Cameras mounted on poles shall use brackets with the same colour as the background.

b) At Stations: Cameras used to monitor the safety of customers shall be located as follows:

   i. Cameras shall be located to provide 95% coverage of all public facing areas excluding public washrooms, both within the Station and the Metrolinx property, and outside within the public realm.

   ii. Cameras shall be placed to specifically cover all Station entrances and exits, fare thresholds, fare vending machines (FVMs), passenger assistance intercoms (PAIs), elevator cabs interior, elevator lobbies, escalators and public stairs, all passenger tunnels, pedestrian bridges, platforms, co-located with all platform edge doors, interior bicycle storage facilities, and exterior bicycle parking, parking lots, and parking garages. CCTV shall be included at Universal Washrooms, where provided

   iii. Cameras shall be located at all choke points where Stations with multiple entrances branch from a single hallway in lieu of at each entrance and exit.

   iv. Cameras shall be located in all sensitive back-of-house areas, such as corridors, views to all rooms and all entries/exits.

   v. CCTV cameras shall be co-located in close proximity where waste and recycling units are located to follow potential suspicious activities.

3.2.4.3 CCTV at Platform

a) Cameras shall be required at platform edges to detect track intrusion and overcrowding conditions.

b) Each platform camera shall visually cover the full height of all specific Platform Edge Doors (PEDs) and all train doors. The locations of cameras shall be coordinated with the locations of PEDs.

c) A minimum of one camera on each platform shall be positioned to include the electronic article surveillance (EAS) so that each EAS location is covered by a camera.

d) At least one camera shall be positioned on each platform to monitor staff door intrusions so that each staff door is covered by a camera.

e) CCTV cameras shall be mounted above, co-located, and interfaced with all PEDs. Supporting infrastructure for CCTV cameras, digital signage, and speakers, shall be concealed in continuous horizontal chase, above the PEDs, as an integrated part of the PED assembly.

f) CCTV cameras shall be positioned to monitor both ends of each platform, facing access to the service corridors and tracks.

g) Where PEDs are installed, cameras shall be positioned towards door openings.

3.2.4.4 Camera Housing Design Criteria

a) CCTV cameras shall be vandal resistant with a minimum impact protection rating of IK10.

b) CCTV cameras shall be selected to integrate within the architectural aesthetic of the Station and its surroundings.

c) All CCTV camera enclosures shall be weatherproof, moisture and dust-proof, vandal resistant, and tamper proof. Cameras mounted outdoors shall withstand -35°C.

d) A sunscreen shall be fitted to protect cameras located in the path of direct sunlight.

e) Indoor housings shall be fabricated using high impact polycarbonate or epoxy coated steel, dust-proof, with top mount assembly, suitable for cameras with fixed focal length.

f) Cameras for both interior and exterior use shall be of a tinted dome enclosure type to conceal the direction of the camera. Such optical domes shall be constructed of vandal-resistant hardened shells able to withstand temperature extremes and not become brittle or cloudy with exposure to solar and ultraviolet radiation. Materials that lose transparency with age in sunlight are unsuitable for outdoor camera use.

g) Sealed housings shall be required for cameras placed in hostile environments, or in areas where electrical components are sealed to prevent a possible explosion. A sealed housing requires gaskets to prevent contamination from the outside environment. Pressurized housings employ chemically inert nitrogen gas to replace the air inside the housing.

h) Impact-resistant housings or anti-vandal housings shall be required in high crime areas. These housings shall be made of heavy gauge steel, and the optical surfaces shall be of thick acrylic or polycarbonate plastic. Wire cages over the acrylic domes shall be required in areas where greater protection is required.

i) Tamper-resistant housings shall be required to be of the same hardened protective material as that for impact-resistant housings, with additional protection against the use of tools to vandalize the camera. A tamper-resistant housing shall be lockable and designed to withstand cutting, hammering, or prying.

j) Lenses fixed with auto-iris: Aspherical lenses shall be used on platforms to suit lighting conditions. The viewing ports of enclosures shall be reflection inhibiting.

k) All exterior camera housing materials shall be noncorrosive.

l) Sunshades shall be installed on all outdoor cameras that are exposed to high temperatures and direct sunlight in order to reduce the heat load on the camera and lens components, maintain image quality, and potentially extend the life of the camera.

m) Wipers for cameras shall not be recommended as the use of a wiper can cause debris to erode the optical surface. Wipers also add to the maintenance requirements where rubber wiper blades must be replaced periodically, and washer fluid reservoirs must be kept filled.

n) Heaters and Ventilator: Temperature differences between the interior and exterior of the camera housing may cause fogging, moisture problems, and icing. Therefore, certain camera housings may require additional hardware or capabilities to ensure that the camera can operate under extreme conditions. Heaters and ventilators are often used to address environmental issues with cameras, although the need for additional electrical power increases the operational costs. Regular cleaning and maintenance as recommended by the manufacturers shall be followed to prevent potential maintenance issues with heated or ventilated camera housings.

o) CCTV mounting brackets, straps, and extension posts shall not be used, except where surface mount conditions are not suitable, or where the camera must be positioned away from the surface to provide optimal viewing. In these scenarios, mounting bracket type shall be consistent throughout the LRT environment and meet the following requirements:

   i. The visual impact of CCTV cameras and related devices, including mounting brackets and straps, shall be reduced; the devices' colour, including camera housing, trim and raceways, match adjacent wall or ceiling surface finish;

   ii. The mounting bracket shall be fabricated of a continuous diameter that can be demonstrated to be the minimum required to carry the design loads of the respective device;

p) The length of the mounting bracket shall not extend beyond what is required to support the CCTV device;

q) The finish colour and sheen of the mounting bracket shall match the colour of adjacent finishes (background colour);

r) All infrastructure, such as conduit, cabling, and wiring shall be concealed;

s) Mounting brackets shall be integrated with the wall or ceiling design and finishes where mounting brackets align with reveals, joints, or intersection of materials;

t) Fasteners shall be concealed and tamper proof;

u) Where exterior pole mounting is required, all connections from pole to camera mount shall be shop fabricated with shop finishes and integral corrosion protection. Field installation of mounting brackets that compromises the corrosion performance is not permitted;

v) Mounting brackets shall not be attached to poles using straps or loops around the diameter of the pole. Unless the strap colour matches the pole colour. Refer to Figure 3-1 for an example of unacceptable mounting method;

w) Mounting brackets shall not be bulky, fabricated from square stock, coloured to contrast with the background colour, or include exposed fasteners.

Figure 3-2: CCTV – example of an unacceptable colour and sheen.

3.2.5 Audio/Public Announcement System

3.2.5.1 Customer Experience: Clarity

Clear audible information is designed to be reliable, consistent, and provided in real time to inform all customers such that the outcome ensures that all messages are understood at the first broadcast. Audible and visual information shall be synchronized for all customers at the same time, while addressing customers' needs to provide equitable access.

In addition to using speakers within a public address (PA) system, alternate means of providing information using a passenger visual information system (PVIS) or hearing loop system, are provided for those who are hard of hearing.

Audible information made available to all customers in real time is critical to ensuring customer safety and comfort, while informing customer journey decisions. Clear public address messaging through both audio (speakers) and visual means such as variable message signs (VMS) is an essential form of communication that aids in informing the customer. Audible information shall be provided in both English and French in accordance with the French Language Services Act.

3.2.5.2 Functional Design Requirements: General

a) The PA system including speakers shall be placed in all public facing areas of the Station including all Station interior and exterior entrances and exits, fare thresholds, fare vending machines , PAIs, elevator cab interiors, elevator lobbies, escalators and public stairs, all passenger tunnels, pedestrian bridges, platforms, interior bicycle storage facilities, exterior bicycle parking, parking lots, and parking garages.

b) The PA system shall provide a consistent and reliable signal coverage within all transit facilities, regardless of whether they are below, at, or above grade. The audio system shall be the primary means of voice communication and shall provide support for emergency services such as fire, police, and emergency medical services.

c) The PA and call systems shall be capable of being zoned to key areas, rather than blanketing all areas of the Station at all times. The PA system in Stations shall be divided into zones in all reasonable separable areas, such as fare vending, elevators, elevator lobbies, pedestrian passageways, pedestrian bridges, all washrooms, waiting areas, concourse, and platforms.

d) Essential audible signals, such as fire alarm signals or elevator arrival call systems, shall be loud / distinct enough to be heard above normal ambient sounds by persons with sensory disabilities.

e) Speakers shall be mounted with the purpose of integrating with exterior and interior environments including ceilings, walls, structure, and enclosures.

f) Colour of public facing speaker trim including raceways, shall match the colour of the mounting surface/ background to eliminate colour contrast and appear visually less prominent for aesthetic consistency.

g) Microphone locations for system announcements shall be located and be made available for staff at the Station ambassador office, at both ends of the platform in a dedicated box adjacent to the EAS cabinet, and Station manager hubs located in specific Stations.

h) The PA system shall be designed with loop wiring and continuous fault monitoring to ensure it provides high availability of its functionality consistent with its role as an emergency voice communication system.

i) Sound level from the PA system shall be designed to reduce unwanted noise to nearby residences and shall not exceed 50 dBA at the property line of the transit facility when conveying general information. This limit shall not apply for emergency signals.

j) The PA system shall maintain a spatial uniformity and shall achieve a maximum 3 dB deviation between minimum and maximum levels measured at 1500 mm above the floor. A sound level survey shall be conducted to verify spatial uniformity.

k) The PA system shall dynamically self-adjust volume to compensate for ambient noise. It shall be designed for maximum clarity under all known conditions.

l) Speaker housing shall be recessed and concealed in a suspended ceiling system where the speaker cover plate is flush with the ceiling. Speakers shall be fully integrated within the architectural ceiling system, and be positioned and coordinated in relation to all other ceiling elements to minimize clutter. Placement shall discourage vandalism and other damage. Where suspended ceilings do not occur, speakers shall be surface mounted. The colour of all surface-mounted speakers and mounting brackets shall match the background colour. All infrastructure, including conduit and cabling, shall be concealed. The maximum mounting height shall not exceed 4000 mm and shall be reviewed in coordination with the operator. Where speakers are required to be pole mounted, they shall be integrated with the Station lighting.

m) The PA and VMS systems shall be synchronized and capable of communicating audible and visual information by automatically announcing train arrivals, departures, and other real time and schedule-based information to inform customers.

n) The PA and VMS systems shall allow for synchronized messages in real time.

o) PA messaging shall be clear and intelligible, whether it is conveying emergency or general information.

p) Technologies shall support and be able to automatically convert speech to text, to allow real-time information to be easily conveyed to digital signs for customers who are hard of hearing; or the PA and VMS systems shall allow for synchronized messages in real time for pre-recorded and unplanned messages.

q) PA announcements shall be clearly audible with ambient noise cancelling and supplemented by visual information.

r) Audible information through Station speakers and visual information via digital signage, shall be bilingual in both English and French in accordance with the French Language Services Act.

3.2.5.3 Functional Design Requirements: Platforms

a) Microphones installed at both ends of a side platform, shall broadcast messages to the speakers on both sides or on one side, depending on the information being provided.

b) Microphones installed at the end of a centre platform shall be equipped with a toggle switch to allow announcements to be broadcast to the speakers installed at either or both edges of the platform.

c) At Station platforms, PA sound levels shall be automatically adjusted to be audible above ambient noise levels with the use of microphones. Noise monitors shall be installed to monitor ambient noise levels.

d) The minimum sound level at Station platforms shall be the greater of 10 dB above ambient noise level to a maximum of 98 dBA.

3.2.6 TWO-WAY COMMUNICATION FOR PASSENGER ASSISTANCE INTERCOM – RESERVED

This element is under development and will be updated once information is available.

3.2.7 Placement and integration of CCTV, Public address (PA), Amenities, and Services

Requirements:

a) Elements shall be centered and aligned with a 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 concealed from view.

f) All systems shall be accessible for maintenance with minimal deconstruction of the LRT 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.

3.2.8 WI-FI

a) Wi-Fi and supporting infrastructure including concealed conduit and cabling shall be provided. Empty conduit an associated shell space be provided for all pedestrian tunnels.

3.3 LIST OF FIGURES

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 LRT network, that includes both the public areas that are associated directly with the Stop, Station, and ancillary structures – referred to as the LRT Realm – and those that comprise the boulevards and streetcapes that are within the territory of the municipalities- 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 LRT corridor.

The Metrolinx vision is for a harmonized LRT system focused on consistent design language, detail, and civic quality across the entire LRT 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 LRT PRIORITIES

4.2.1 Design Narrative

A strong conceptual narrative across the system ensures that the LRT 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, landscapes will create consistency in form, experience, and service. This ensures that the customer experience at the arrival will be well connected, convenient, and friction-free to keep customers "on the move".

The shaping and deployment of common elements support the seamless approach to the Stop and Station. This ensures that the customer's experience at arrival shall be well-connected, convenient, and friction-free to keep customers on the move.

a) Deliberate and coherent design narrative for the LRT realm:
   i. Similar architectural expression, look and feel of infrastructure (consistent materials, architectural elements, design expression, and detailing).
   ii. High quality at-grade surface materials that embody the civic character of the public realm.

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

c) 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.

d) For ease of maintenance and operation, the architectural approach shall be based on high functionality, and without non-essential form-making, with a simple, predominately rectilinear language at its core:

   i. Design shall be of high-quality with simplicity in detailing and carefully resolved material intersections, connections, and transitions.

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

e) Finishes and textures shall have an organized and consistent visual appearance.

f) Design shall reflect 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.

g) Consideration of embodied carbon, life-cycle costs and ease of operation and maintenance shall be demonstrated in all aspects of specifications, design, and detailing.

h) 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, responses to micro-climates, and to future development.

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

i) Integration of right of way into public realm treatment shall be limited to public-facing, publicly accessible facilities.

j) 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

k) Development of a modular and systematic approach to architectural and landscape expression, including structural, mechanical, and electrical.

4.2.2 Passenger Experience at Stops and Stations

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 and 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) Maximized flow:

  i. At Stops, all passenger amenities, service and security items shall be integrated into the shelter structure to achieve maximum visibility, circulation space, and pedestrian flow.

c) Comfort and protection:

  i. Stops shall provide passengers comfort and protection from precipitation, wind, and sun.

  ii. Canopies on the platform shall be coordinated and located such that they align with the train doors.

  iii. Provisions for passenger protection shall extend beyond the Stop platform, providing a clear strategy to avoid conflicts between pedestrians and cyclists within the network.

d) Inclusive and equitable design:

  i. Access shall be provided for all through the implementation of the principles in alignment with 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) Consistent and appropriately scaled civic materials and landscaping that harmonize with the Stop, Station, open spaces, and medians:

i. Open spaces and medians shall have a consistent palette of high-quality materials, colour, and pattern, scaled in proportion to reflect the typical cladding and glazing module of the Stops and Stations.

ii. At Stop platforms, including the space beyond the platform (tapered area, medians, and open spaces), planting opportunities shall be maximized.

iii. 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.

iv. 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.

b) Scale, massing, and exterior treatments that are informed by civic considerations:

i. Civic-scale-informed, monolithic building massing shall be used as a way of establishing the civic and urban scale of the MSF.

ii. Stops and Stations shall use large-module, high-quality glazing and exterior cladding panels selected for visual lightness and smoothness, with concealed fasteners to achieve an elegant modern design.

c) Stops and Stations shall be resistant to vandalism through the provision of tamper-proof design including graffiti-proof, easy-to-clean surfaces.

4.2.4 Integrated Design

Integrated design ensures all infrastructure and systems are organized in such a manner to create one cohesive design. This cohesion of elements would provide customer-facing clarity and simplicity in the design. The Strategies and Common Elements, Sections 4.3 and 4.4, elaborate on this approach.

a) Integrated structural, mechanical, and electrical systems, as well as drainage and speakers at Stops, Stations, and public realm-facing elements of the TPS and MSF:

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.

   v. Special lighting shall be provided to highlight interesting architectural and landscape design features.

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

   i. Wayfinding shall conform to DS-03 Part 1 Metrolinx Wayfinding Design Standard and Part 2b: Sign Implementation Manual - LRT/Subway Edition.

   ii. The location of wayfinding and signage shall always take precedence over the location of advertising.

   iii. Visual clutter and conflicts with other visual elements, such as third party art, advertising, and the fare collection system, shall be limited.

c) Clearly organized and integrated passenger amenities:

   i. A clear strategy shall be developed for organizing the hierarchy of passenger amenities, including fare vending equipment, seating, and garbage receptacles, with amenities that are directly associated with transit usage being prioritized over secondary amenities.

   ii. Passenger amenities shall be integrated into the built structure of Stops and Stations to avoid visual clutter while facilitating ease of use and maintenance, including the ability to clean or replace components.

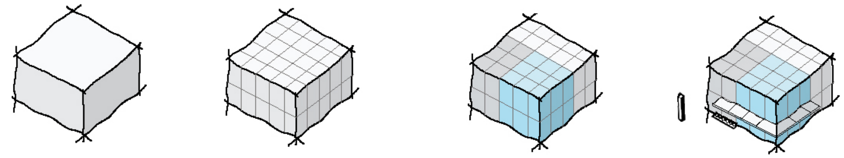


Figure 4-1: Hierarchy of line-wide identity

4.2.5 Responsiveness to Climate and Context

a) Decisions shall be taken to use more natural light to reduce the amount of energy consumption (e.g., increasing glazing façades in the main entrance and addition of skylights) while also providing valuable shade.

b) The Station entrances and MSF buildings shall meet DS-05 Sustainable Design Standard, where applicable.

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 LRT infrastructure shall be developed to minimize blocking visibility towards heritage buildings.

e) The distinct LRT realm shall be seamlessly integrated with the municipal realm.

   i. Effort shall be made from the early stages of the design to coordinate with the respective municipalities.

   ii. Coordination between architecture, urban planning, landscape, civil and traffic shall be made to achieve this integration.

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

   i. Vent and mechanical units shall be placed out of the public access.

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

g) Vents and mechanical units shall consider surrounding operable windows in adjacent properties.

h) 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 links 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.

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

j) Local context: 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.

Smart city technologies: Provide the flexibility to allow for future technologies and recognize key trends in transportation technology to ensure Station environments remain responsive and relevant in the future.

4.3 STRATEGIES

Strategy deployment will be dependent on scale and proportion of the available public realm zone in front and around the LRT Stops and Stations. The public realm in the LRT network shall be designed using clear strategies, based on incremental increases in scale and scope, with arrival and identity as priority regardless of project size. The following sections are strategies and requirements and they shall be followed.

4.3.1 Public Realm: LRT Realm and 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 LRT 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) In order to achieve the best results when designing places, it is important to keep the customer in mind and specifically their places to meet, socialize, interact, and remember.

d) 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.

e) The municipal realm may play a dual role in expressing both the singular recognizable identity of the entire LRT 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.

f) The design of the LRT 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, and 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.

g) 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 may share a multi-use path.

h) 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 LRT Stops and Termini Stations.

i) The integration between the LRT 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.

j) The elements of the LRT 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.

k) The interconnection of these two zones – the LRT 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.

l) The Station and the expanded LRT 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.

PUBLIC REALM:
MUNICIPAL REALM + LRT REALM

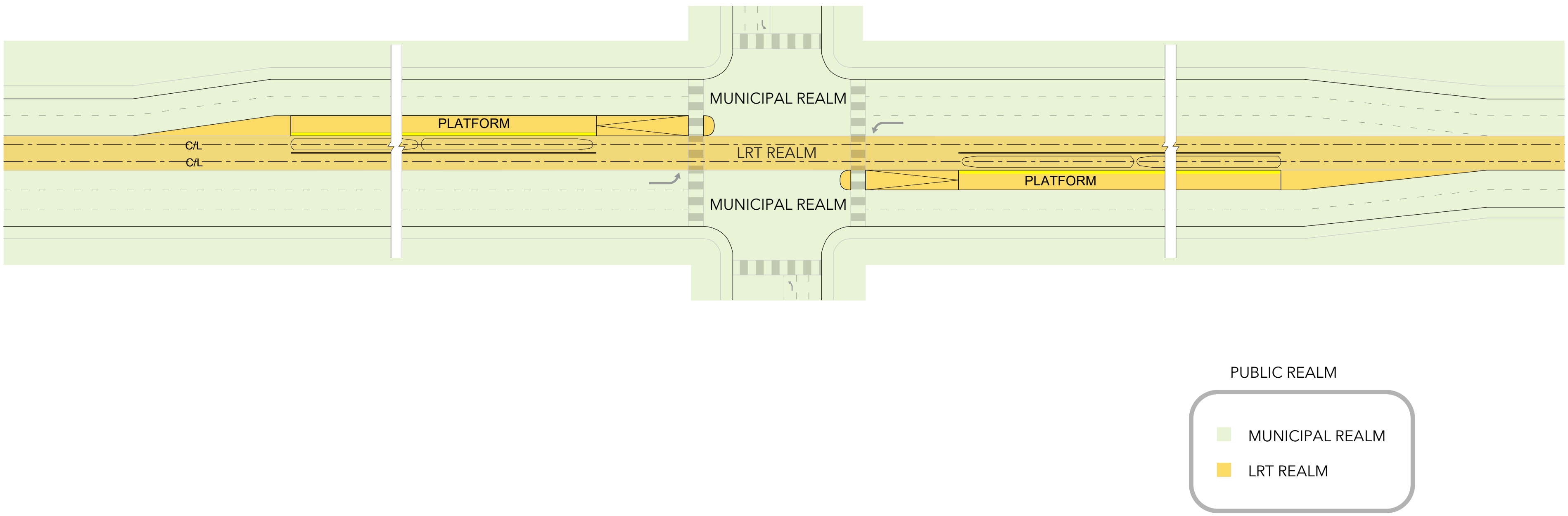


Figure 4-2: Public Realm - LRT Realm and Municipal Realm

4.3.2 Station Public Realm

Strategy deployment will be dependent on scale and proportion of the available public realm zone in front and around the LRT Stations. The public realm in the LRT network shall be designed using three clear strategies: the streetscape, the plaza at the LRT Station entrance, and finally the forecourt which takes advantage of additional space by adding landscape strategy to the plaza and the streetscape.

The public realm strategies are introduced below as the streetscape, the plaza, and the forecourt. These strategies are based on incremental increases in scale and scope, with arrival and identity as priority regardless of project size. At minimum, the public realm will be established with a clear material character in the right of way that draws on the streetscape strategy. This expands to include the setback area at the Station entrance forming the plaza. On even larger sites, the plaza entry will be supplemented with expanded planting creating the forecourt.

i. Forecourt

ii. Plaza

- Mid Block Plaza
- Corner Plaza
- Streetscape

4.3.2.1 Forecourt

In the LRT network, the forecourt occurs where the site is large enough that adds preceding space to the plaza, so it can accommodate planters and landscape to frame the pedestrian flow and gathering around the building.

The forecourt can generously provide extra buffer of space to the plaza to better frame and signify building entrance. Depending on the scale of the forecourt, it can be treated with planters and landscape to emphasize spaces.

The metrics that determine the addition of the forecourt to the plaza are based on site conditions and respective design parameters, including pedestrian flow modelling on a site-by-site basis.

The forecourt is particularly important when there is a standalone pavilion Station typology whether within a development or within a park. The plaza introduces a setback to the LRT Station entrance, creating an expanded entry space that stretches from the curb edge to the face of the building.

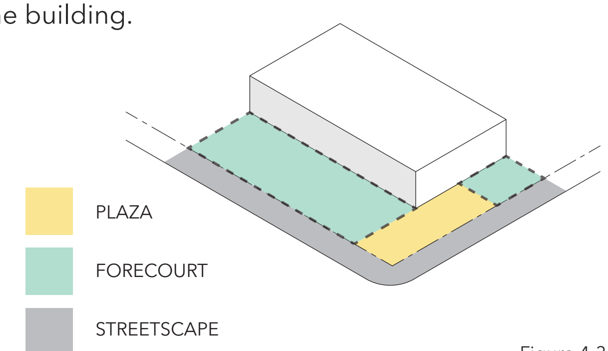


Figure 4-3 Forecourt

Figure 4-4: Plaza at intersection with building entrance

4.3.2.2 Plaza

Plazas are the preceding space to the LRT building entrance and serve as an integration tool to connect the exterior of the building and surrounding areas with the interior of the building: transparency in the entrance building façade is therefore important.

The plaza is an essential element of the public realm and its accurate proportions and expression will guarantee the success of the integration of the building with the context and the surroundings with the building. The plaza hosts by default public activities, such as gathering, social events, circulation, and connections.

The plaza can be categorized into the following spaces:

a) Midblock plaza where the building entrance is set back from the sidewalk, creating a preceding space; or where there is a connecting passageway between the buildings, that is wide enough to host activities.

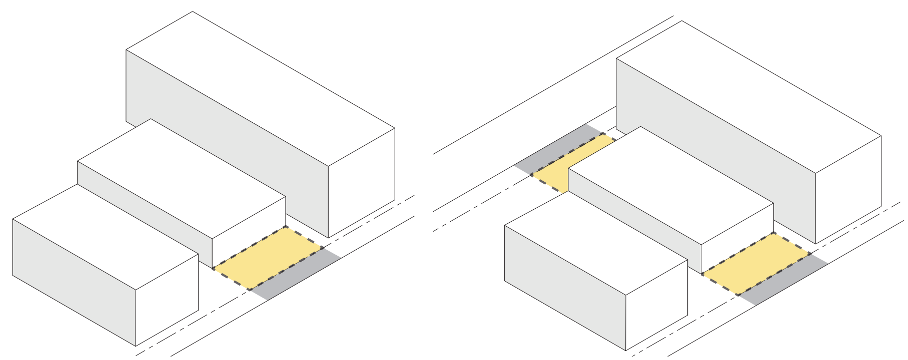


Figure 4-5: Midblock plaza with access from one street (left) or two streets (right)

b) Corner plaza: where the entrance building is recessed so the front space creates an open space towards the intersection.

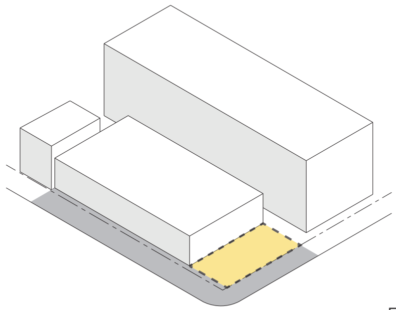


Figure 4-6: Corner Plaza

c) Streetscape: Treatment of the preceding circulation space that emphasizes the LRT building entrance. This smallest strategy addresses sites where the public realm is the scale of the sidewalk. This public realm strategy transforms the zone of the public right of way and pedestrian clearway to establish a clear sense of arrival in a limited space.

Figure 4-7: Mid block Plaza

4.3.3 LRT Realm Modular Design

One of the key aspects in the LRT 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) A consistent, line-wide module shall be utilized to set the rhythm for all elements, including all Stops, Stations, facilities such as TPS, MSF, and ancillary structures, as well as open spaces, plazas, medians, and any infrastructure along the line.

b) Acceptable module range shall be between 1200 mm and 1500 mm.

c) 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 2x).

4.4 CONTINUITY AND VARIABILITY

A clear architectural strategy for applying elements of continuity and variability shall be developed. LRT 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 LRT design language within the LRT realm.

This Section shall be read in conjunction with:

- Section 4.0: Architecture and Public Realm;
- Section 5.0: Stops Architecture; and
- Section 6.0 Station Architecture

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 LRT infrastructure. The 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 LRT 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 for 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.

i. Line-wide consistent touchpoints: The infrastructure that must be consistent across the line regardless of Station typology in order to ensure customers can rely on a minimum set of infrastructural requirements that meet their needs anywhere on the line. For example, "as a customer, I know I can plan my trip, purchase my fare, pay my fare when I get to my stop or at the Station." The consistent elements shall be the same to contribute to identity and continuity through their form, materiality, and repetitive identity.

These include the following:

1) Paving
2) Canopies and Shelters
3) Furniture
4) Light Standards
5) Vertical Circulation Elements
6) Raised Planters
7) Tree Grates
8) Soil Cells
9) Stormwater Management

b) Variability

At a system-wide level, variability can occur within the public realm, Stops, and Stations as an adaptation to, or recognition of local context, and to identify locations at a glance (e.g., the 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 and Stations. Transition elements between Stations and municipal property – such as retaining walls, bumpers, and grade changes – 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, Stop/Station massing, and Stop/Station-specific feature elements.

The consistent identity of all Metrolinx LRT infrastructure shall be developed through the deployment of consistent and variable elements across a variety of strategies related to exterior elements (the streetscape, plaza, forecourt, etc.) as well as interior elements (Station entrance, corridors, seating areas, platforms, etc.). For each destination, there will be a set of design parameters to work within as determined by the scale and context of the LRT infrastructure at the Station site.

i. Line-wide variable touchpoints: Specific contextual factors, including geographic features, history, natural and built heritage, and other items identified on a project.

Kit of Parts Elements	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		●
Stations		
Canopy	●	
Entrances	●	
Vertical Circulation	●	
Feature Wall/ Element		●
Platforms	●	
Furniture	●	
Lighting	●	
Amenities	●	
Signage & Wayfinding	●	
Plaza	●	
Public Realm		
Elevated Guideways	●	
Portals	●	
Landscape (hardscape & softscape): Signature elements	●	
Heritage & third party integration		●
Furniture (municipal)		●

Table 4-1: Continuity and Variability

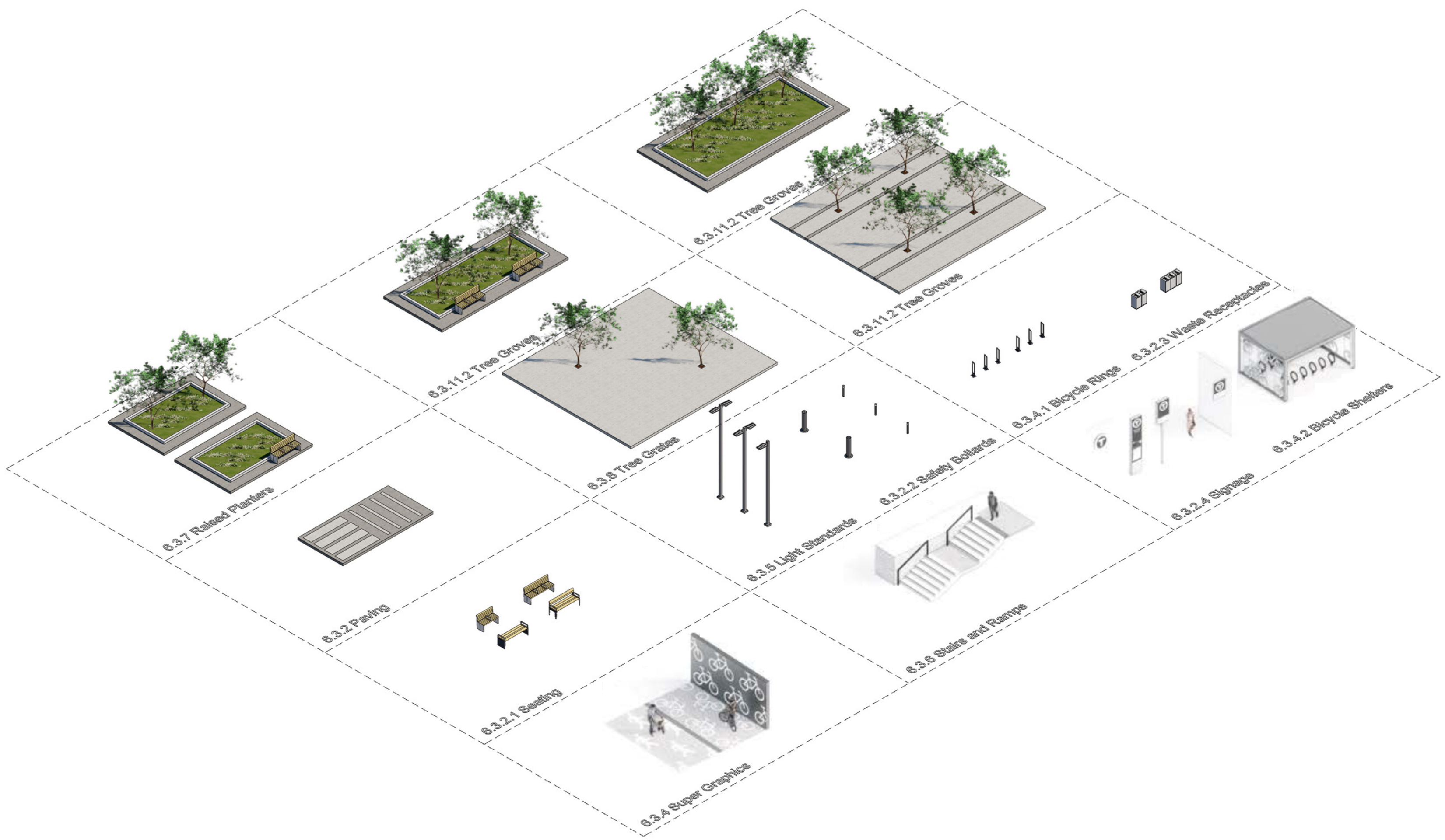


Figure 4-8: Consistent elements

4.4.1 Consistent Elements

4.4.1.1 Paving

Pavement systems and other hard surfaced areas form the direct connection between the street, Stop, and the Station in the form of streetscapes, plazas and forecourts. Interior finishes shall be aligned with exterior paving modulation to welcome customers and communicate the continuity of the public realm within the Station.

Paving shall be designed for openness and maximized flow. Where Stations are integrated with TOCs, paving materials shall be coordinated with third party designs in order to avoid difference in treatments and preference, strength of identity, simplicity, and continuity.

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

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

a) Paving 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. Paving shall be constructed of consistent, high-quality materials that connect the exterior to the interior.

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

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

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

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

vii. Paving systems shall follow the maximum colour contrast and shall be in alignment with DS-02 Universal Design Standard.

viii. The paving strategy and design shall contribute to the principles of protection, openness, and transparency in the Crime Prevention Through Environmental Design (CPTED).

ix. A clear strategy for organizing passenger walkways and roadways shall be prioritized in compliance with Municipal Standards and Accessibility for Ontarians with Disabilities Act (AODA) requirements.

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

b) 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 LRV points difference and shall be in alignment with the DS-02 Universal Design Standard.

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

iv. A minimum of 5% 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 non-revenue vehicle parking (service vehicle).

c) Drains

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

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

iii. Drains shall not interfere with the TAIs.

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 correlate 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.

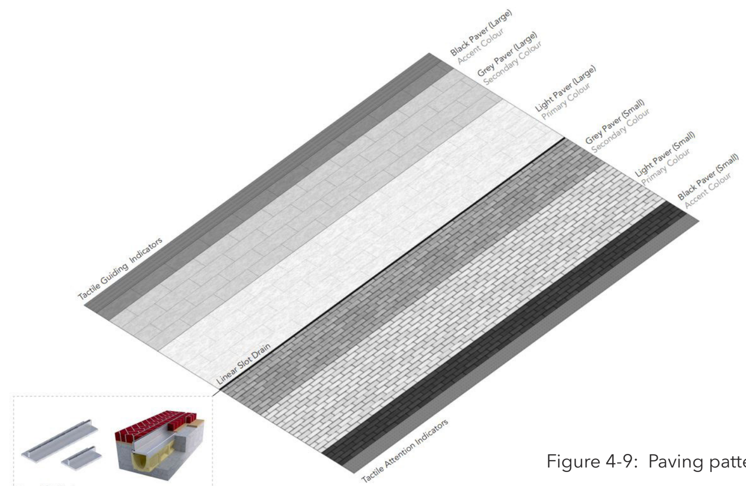


Figure 4-9: Paving patterns

4.4.1.2 Covered Connections to Stops and Stations

A covered connection provides protection from precipitation, winds and shading in the summer. Consideration shall be given to the placement and orientation of the canopy structure to encourage high visibility from the Stop/Station and street. As well, it aides customer experience when transferring between transit.

a) The canopy shall extend the overall line wide design language (including materials, colour, finish, modules) connecting to and seamlessly integrating with the Stop/Station.

b) The canopy height shall align with Stop/Station datum, except where the height of the canopy would reduce effectiveness for weather protection.

c) The canopy coverage shall provide uninterrupted weather protection.

d) The canopy structure shall maintain clear views along its length as well as following all CPTED principles.

e) For seating areas requirements along the accessible route, refer to DS-02 Universal Design Standard.

f) For exterior lighting requirements, refer to 4.3.1.4.

4.4.1.3 Furniture

All furniture in the LRT 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 LRT 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.

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

   iii. 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. Secure finishes and materials using engineered connections and enough 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 are to 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.

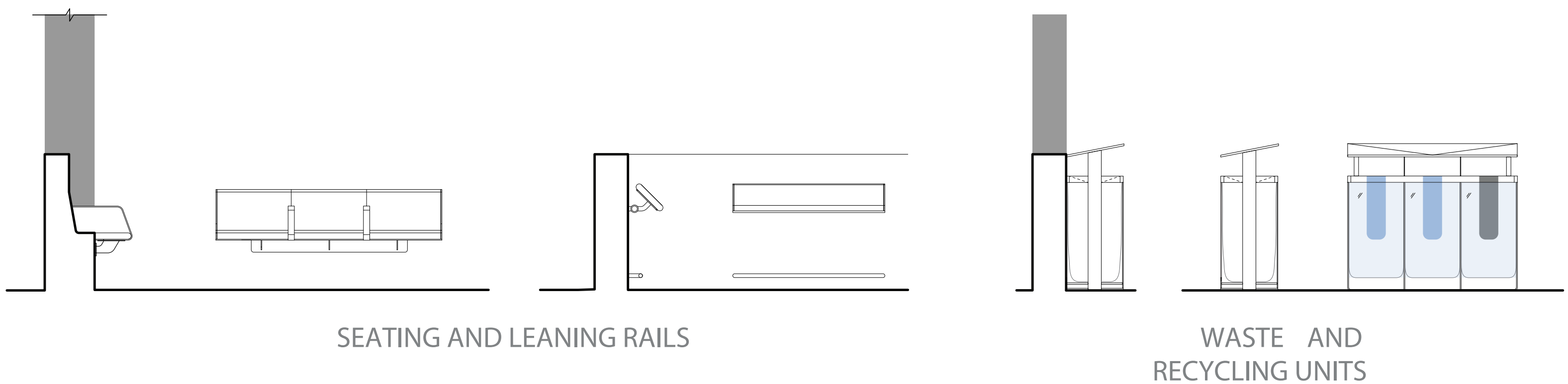


Figure 4-10: Furniture Types along LRT Corridor

4.4.1.3.1 Seating

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 one (armchair), 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 4-12: 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.

Figure 4-11: Bench Seating

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.

   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 and Station platform, for each LRT vehicle direction of travel. Seating requirement shall be scalable based on length and number of trains, as per Project Agreement. Refer to drawings in Section 5 and 6.

1) This standard assumed that the seating number corresponds to ridership and analysis as determined in the Project Agreement

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

vi. Accessible seating areas shall be strategically located in close proximity to boarding points aligning with LRT vehicles doors to allow priority boarding.

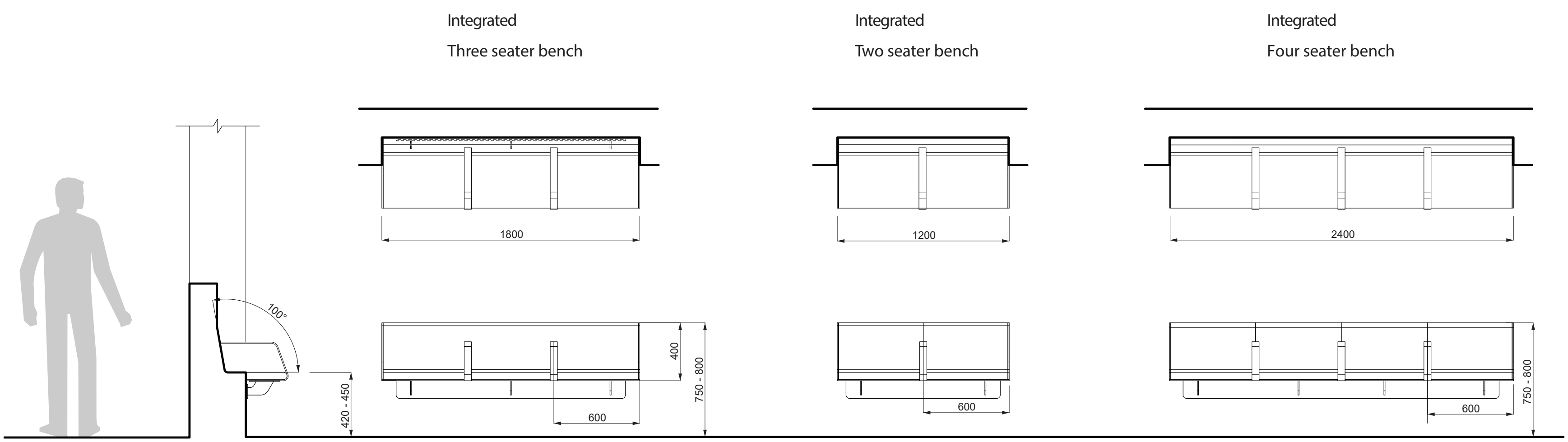


Figure 4-12: Customer Seating

4.4.1.3.2 Leaning Rail

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 4-13: 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.

   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.

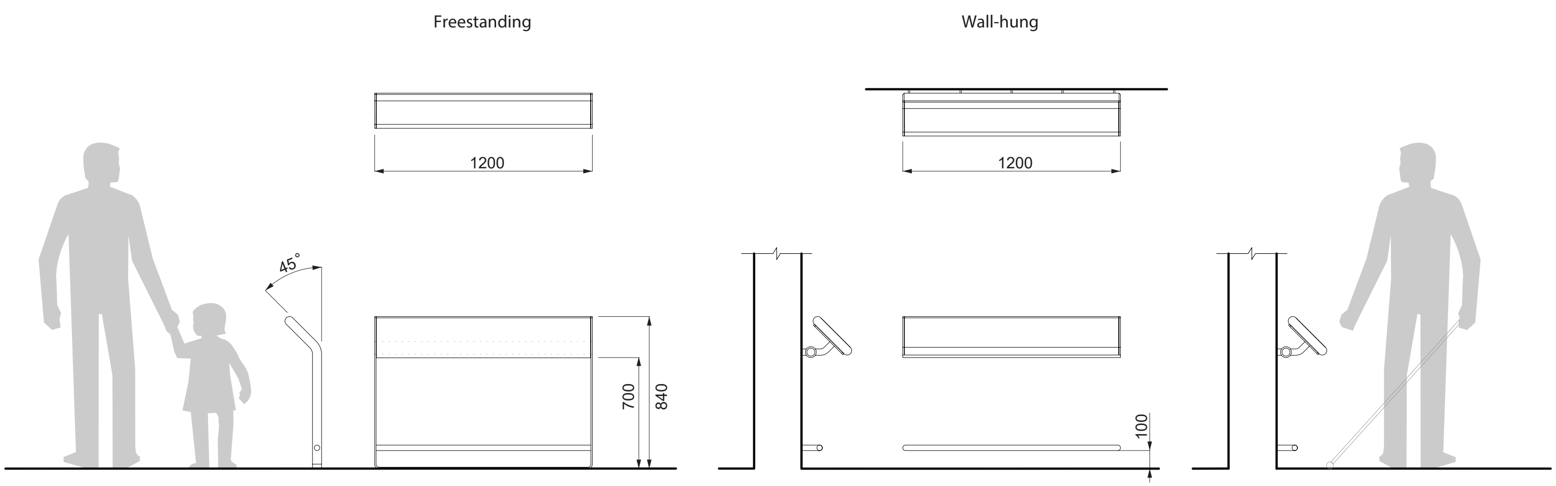


Figure 4-13: Leaning rails, freestanding and wall-hung

4.4.1.3.3 Waste Receptacles

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

b) 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.

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

d) 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.

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

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

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

h) 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.

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

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

k) Waste receptacles shall be fabricated to have tamper-proof and/or hidden fasteners.

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

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

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

o) 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.

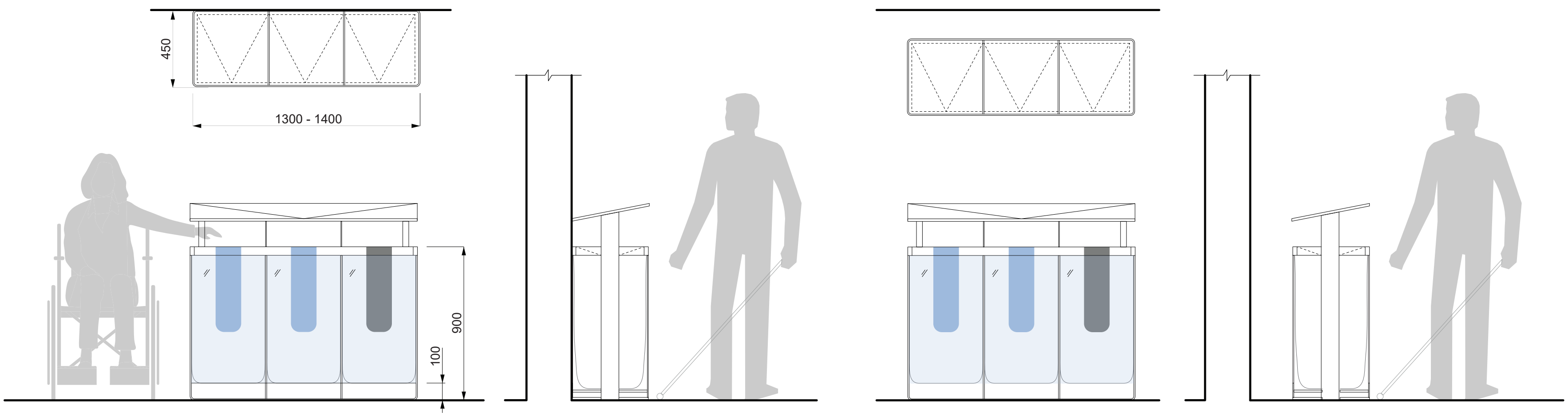


Figure 4-14: Waste Receptacles and Recycling Units

p) Coordination shall be done with DS-03 Wayfinding Design Standards to ensure signage, graphics, and colour to clearly identify and differentiate the various waste/recycling streams.

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 and DWA's on the platform.

t) A minimum of two waste receptacle units shall be evenly distributed throughout the Stop 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) Placement of waste receptacles shall enable easy retrieval of waste and transfer to refuse rooms.

w) Refer to Figure 4-14 Waste Receptacles and Recycling Units for illustrative dimensions.

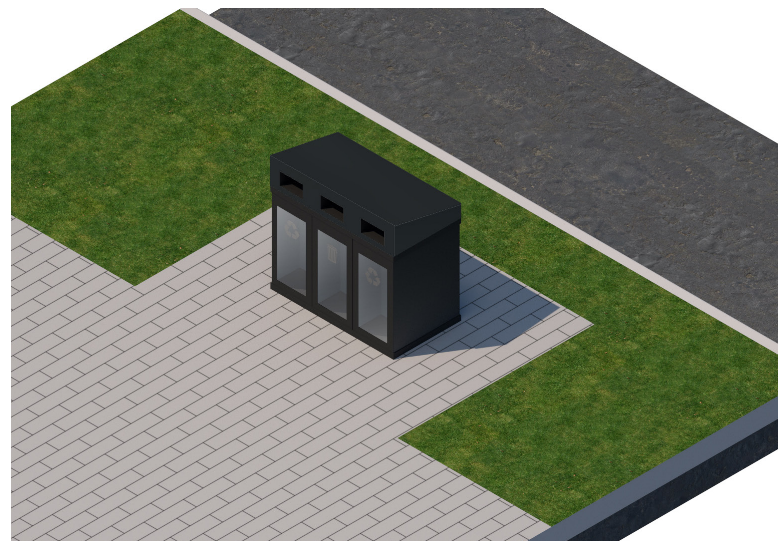


Figure 4-15: Example of Waste Receptacles

4.4.1.3.4 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 1200 mm clear width where pedestrian access is intended between them.

   iv. Where there is an interface 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.

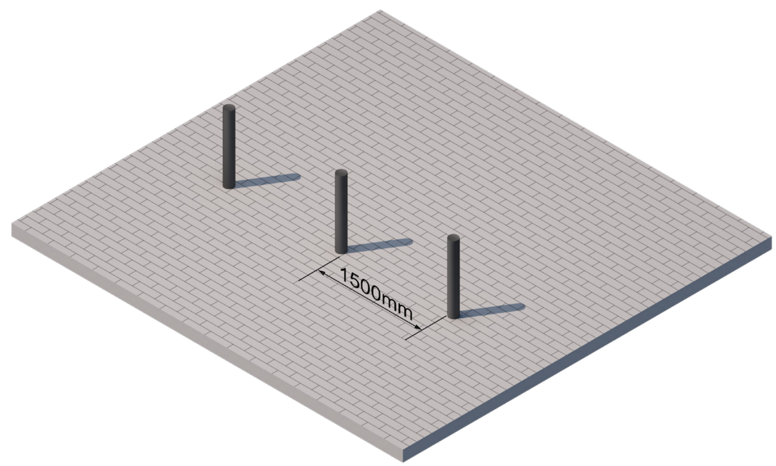


Figure 4-16: Safety Bollards

4.4.1.3.5 Bicycle Parking

Providing good access to Stations for cyclists and well-located, secure, and fit-for-purpose bicycle parking is important for promoting sustainable transport and modal integration. Bicycle parking infrastructure is an important element of the LRT network since it not only provides parking for cyclists, but also encourages customers to use flexible modes of transportation other than vehicles, thus reducing gas consumption and carbon emissions.

a) The number of bicycle parking spaces shall be provided in accordance with the project agreement.

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

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

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

   i. Be integrated with the Station building.

   ii. Should the above option not be functional / feasible, it shall 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) These connections shall eliminate long stretches where cyclists must wheel their bikes across pedestrian areas, transit areas, and vehicular areas which will also help reduce cyclist conflicts with other modes.

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

h) The basis of any cycling infrastructure shall be as follows:

   i. It shall provide a strong colour contrast with the ground surface and shall be located within the detection range of a long white cane, to assist individuals with low vision and blindness in navigating around it.

   ii. Where bicycle parking shall be provided on the street or in the public realm and it shall not clutter the footway.

   iii. It shall be located close to the platform access points and be well overlooked and allow for bicycles of all types to be securely locked.

   iv. The bicycle parking both covered and secured must be visible and well marked and be at a maximum distance of 20 m from the Stop entrance.

i) Bicycle Racks

   i. Bicycle rack/ring design shall be durable, clean, consistent across the Metrolinx identity and shall have two contact points for locking the frame and the wheel.

ii. The bike racks shall have a steel loop frame finished in dark grey powder coating or high density polyurethane foam. The bike racks must be embedded.

iii. The bike racks shall require durability testing for impact resistance, colour fastness, corrosion resistance, UV resistance, and scratch resistance.

iv. The bike racks shall meet the Association of Pedestrian and Bicycle Professionals (APBP) guidelines.

v. Bicycle racks shall be designed to be cane-detectable

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

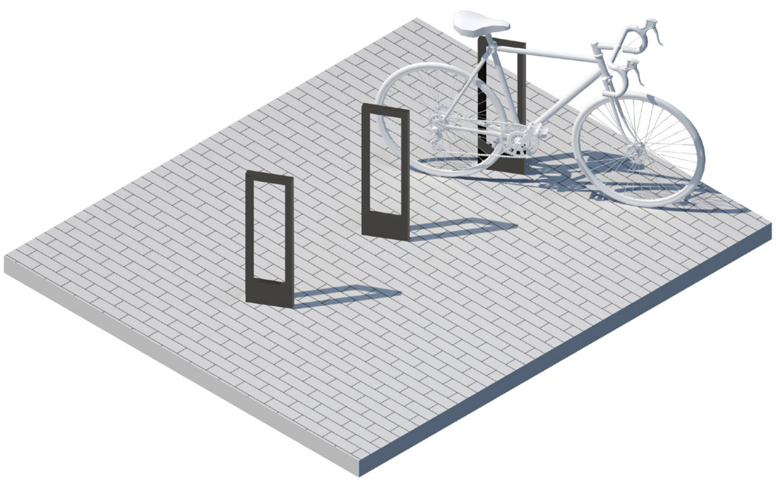


Figure 4-17: Bicycle Racks

4.4.1.4 Exterior Lighting

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

4.4.1.4.1 Design Requirements:

a) Exterior lighting shall be designed to:
   i. Meet dark sky standards;
   ii. Be aimed downwards to reduce light pollution; and
b) Shielded to reduce glare and light trespass to neighbourhood.
c) Lighting shall be integrated:
   i. Into built site elements;
   ii. Site furnishings; and
   iii. Wayfinding signage (as indicated in Metrolinx DS-03).
d) Pedestrian scale illumination shall be provided for areas of rest and waiting to enhance customer comfort and safety.

e) 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.

f) 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.

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

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

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

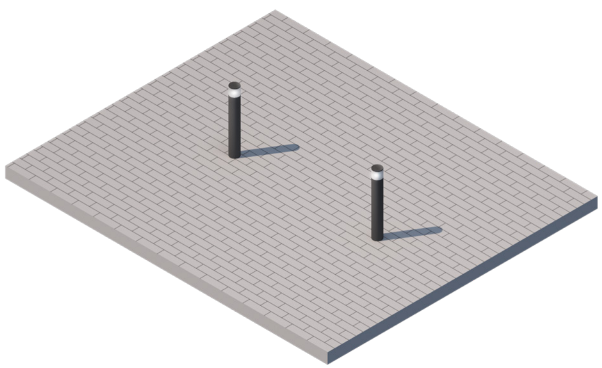


Figure 4-18: Light Bollards

j) With regards to maintenance and operations exterior lighting shall:

   i. Provide illumination to address CPTED principles;

k) Be energy efficient LED sources of lighting; and

l) Be vandal-proof and rated for appropriately rated for outdoor installations.

m) Controls for exterior lighting shall:

   i. Be dimmable and integrated to the lighting controls scheme;

   ii. Be controlled by photocells, occupancy sensors, central override switches or contractors with a manual override;

   iii. Have a computer-based lighting control system that controls the various lighting circuits through the building; and

   iv. Be Programmable to allow revision of illumination levels during or after commissioning as needed.

n) All exterior lighting shall have:

   i. Lens rating of IK10;

   ii. IP65 weatherproof rating;

   iii. Vandal-proof feature; and

   iv. 0-10V dimming capability.

o) 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.

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

s) Light bollars and planting bed lighting may be used for pathway lighting.

t) For lighting requirements at Stops and Stations, refer to Section 5.9 and 6.9.

Zone	Min. Average Maintained Illumination Level (lux)
Exterior Lighting (parking, passageways and plazas/public areas/PPUDO)	50
Stairs/Elevators/Escalators/Ramps	200
Pedestrian crossings to LRT Realm *in coordination with municipal standard	110*

Table 4-2: Illumination Level Per Zone

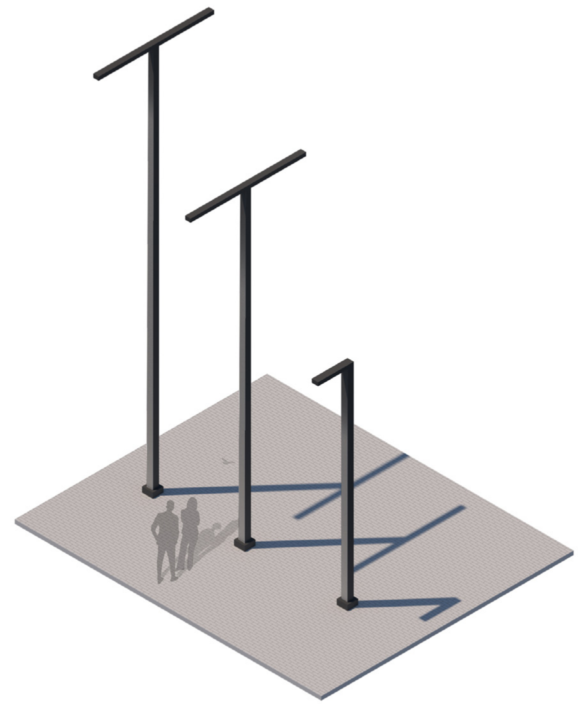


Figure 4-19: Light Poles

4.4.1.5 Vertical Circulation

The LRT network responds to scenarios where vertical circulation elements may be required to access its facilities. These scenarios include changes in road elevations, access to the LRT Stops and Stations, and exceptional circumstances where stairs, ramps, and even elevators are required.

Whereas the LRT design shall eliminate grade changes between the public realm and Stations access, the eventual use of these shall meet the following requirement:

a) Stairs and ramps shall follow all applicable building codes, AODA requirements, and DS-02 Universal Design Standard.

b) The design of the handrails and balustrades at stairs and ramps shall take into account CPTED principles.

c) Handrails shall be consistent along the LRT network:

   i. Handrails shall be round and of stainless steel finish. Colour contrast shall conform with requirements in DS-02.

d) Handrails shall follow DS-02 requirements

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

f) Use of enclosed vertical circulation elements (VCEs) shall be avoided, unless there is a significant grade elevation change between the access route and the stop platform that requires the use of an elevator. Where changes in level are greater than 2.5 m, an elevator shall be installed.

g) Ramps and sloped floors shall be design to minimize their overall length, by adding resting spaces and seats in landings.

h) Where ramps and sloped floors have more than two landings, consider adding access point to help assist people with disabilities.

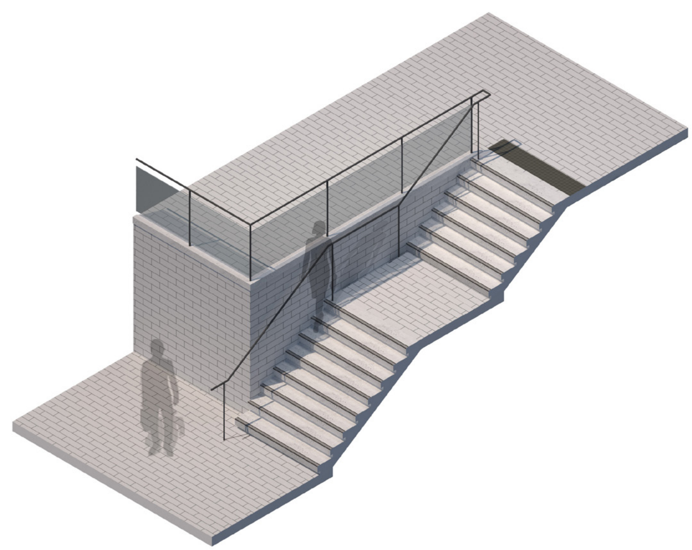


Figure 4-20: Stairs

4.4.1.6 Raised Planters

Tree groves and planted areas within the LRT network are framed by raised planters, which allow for integration with furniture, reinforce important flow directions, and act as 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 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 planters shall be higher (150–405 mm) than raised curbs used on site to protect plant material from salt spray and animal damage. A maximum height of 405 mm is recommended, so a 50 mm thick bench top will meet the universal design seating height recommendation of 460 mm. This maximum height shall be adjusted accordingly if the bench top thickness changes. A 405 mm-high planter is recommended in a plaza or where sub-grade conditions restrict soil depth. A 150 mm-high planter is recommended in other conditions, such as forecourt and streetscape.

c) Finish and material shall be consistent with the 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) Raised planters at median shall have a minimum usable width of 400 mm for planting.

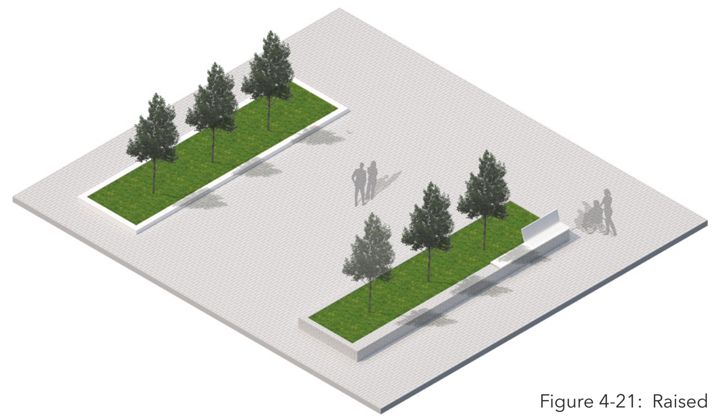


Figure 4-21: Raised Planters

4.4.1.7 Tree Grates

Around the LRT Station, trees planted in tree grates are used where pedestrian flow requires continuous movement over the soil volume zones. Soil volumes will 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 that allows for maximum movement under their canopy within a minimum number of years post-planting.

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

d) In the streetscape context, tree species selection shall be unique to the LRT network but matching local species. In other words, the trees shall be the same across the front of the midblock entry but be distinct from adjacent street trees in order to establish identity for the public realm.

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 them to thrive and grow.

g) Tree grates are 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 in conditions where pedestrian traffic is medium or low but there is a space constraint.

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

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

j) Tree grates shall be outside of the accessible path of travel and shall conform to AODA and DS-02 Universal Design Standard.

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

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

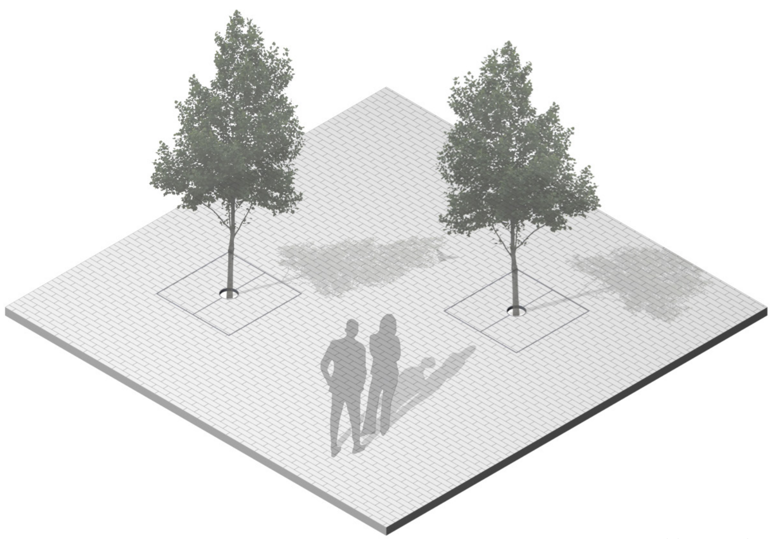


Figure 4-22: Tree Grates

4.4.1.8 Soil Cells

Soil cells consist of plastic or concrete structures, in a variety of shapes and sizes, that provide structural support for the overlying pavement while providing uncompacted planting soil within the tree root zone.

a) A healthy tree canopy shall be the hallmark of passenger experience at the Stations.

b) 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.

c) 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.

d) 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.

e) 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.

4.4.1.9 Stormwater Management

For site stormwater runoff requirements, refer to DS-05 Sustainable Design Standard.

a) Any downspout discharge of water shall be collected or oriented away from the plazas, sidewalks and pedestrian path of travel to avoid slip and fall.

4.4.1.10 Sustainability

The LRT sustainable design is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In the LRT context, sustainability represents an enhancement of the typical transit lines as a regular and reliable service as well as the selection of materials and systems. For this, the designers shall explore alternate solutions based in local experiences. The main aim of sustainable transportation is to move goods and people, while at the same time contributing towards the realization of economic, social, and environmental sustainability.

a) Sustainable transportation goals shall include the delivery of efficient, effective, and safe access to transportation in the future while also taking into consideration social, environmental, and economic aspects.
   i. Local species of vegetation shall be incorporated in the design

b) Exploration of local materials and context shall be investigated and incorporated in the LRT system by designers.

c) The LRT network shall meet the needs of society to move freely, gain access, trade, establish relationships, and communicate without sacrificing other essential human or ecological values today or in the future.

Refer to the DS-05 Sustainable Design Standard.

4.4.2 Variable Elements

Within the LRT network, there are elements that repeat continuously to create a pattern that results in a transit language (Consistent Elements), with the subsequent sense of safety and comfort, and there are elements that communicate singularities of the site (variable elements) that express the local identity, such as historic and heritage places, and that connect the LRT public realm with the municipal streetscape (local or municipal realm), acknowledging local conditions.

Variable elements within the LRT network include the following:

- Trees
- Groundcover Plant Material
- Landscaping
- Heritage and Third Party Integration

4.4.2.1 Trees

The use of local vegetation is highly encouraged in the LRT network. Trees in plazas and passageways create a canopy that screens and filters sunlight, reducing the high temperatures of summer, resulting in a comfortable and friendly environment where customers can circulate, rest, and interact.

The use of trees and vegetation also creates lighting effects on the pavers that enhance the passenger experience, framing the building entrances in different tonalities of colours and light during the day, that is accompanied by the visit of local species of birds.

a) Local species of tress and low vegetation shall be used along the LRT network. Further investigation is required to define the types that comply with the LRT requirements of height, shape, and durability.

b) Colour, size, and texture of vegetation material shall be used to define the boundaries of and areas within the site

c) The presence of protective barrier shall be buffered with the use of native vegetation.

d) Tree planting will enhance the structure of spaces by acting as an active space creator, their arrangement as individual or groups must respond to purposely reinforce design moves of the built environment.

e) Selection and layout shall comply with CPTED principles, support intuitive wayfinding, natural surveillance and help screening views to service areas and neighbouring properties.

f) Tree planting to enhance the site's microclimate (shading, wind screens).

g) Tree location and arrangement shall have enough soil to thrive and grow to maturity. The minimum soil volume shall be 30 m^3 per single tree or 20 m^3 per tree where two or more trees are planted together.

h) Tree selection shall not rely on an irrigation system or high maintenance.

i) The tree planting palette shall be consistent and support overall identity. Shape, height, and canopy density are also key aspects to follow along building main entrances and plazas. The planting palette for areas not visible to the public may be determined on a project-by-project basis.

j) Tree planting shall be selected such that it does not impact overhead or below grade utilities.

k) In a scenario where no trees (or only one) can be sustained given the site area or sub grade conditions, it may be more effective to interrupt the street tree line and have no trees in order to prioritize placement of Station identity elements.

l) All trees, shade, and understorey, shall be offset a minimum of 3 m from any building face.

m) All planters shall be offset a minimum of 1.8 m from any building face.

4.4.2.2 Groundcover Material

Whereas LRT Stops provide limited footprint at grade, LRT Stations provide a bigger impact and occupy more land. The LRT network may use planters and vegetation to rationalize order around the stops and provide placement of elements to enhance the customer intuitive orientation and experience.

The following are considerations during the design process of the LRT network:

a) Layout: Groundcover plant material shall be arranged according to their role and location within the site.

   i. Arrangement of understorey plant material and ground cover shall complement the built environment and correlate to the circulation flow.

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

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

c) Plant material shall be selected to provide seasonal interest, such as variation in texture, colour, and form and shall create a meaningful pedestrian experience.

d) 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.

e) Groundcover species: Groundcover plant material has an important role in the support of the built environment around the LRT 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 and to reinforce directionality and wayfinding. They provide with a useful tool to achieve intuitive design and customer orientation. Plant species shall be drought-tolerant, inundation tolerant and beneficial for stormwater retention. Use of ground cover and perennial grass plantings shall follow the following principles:

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

   ii. A minimum of 50% of plant material shall be native plant species.

f) Plant species shall include perennial grasses and forbes (including groundcovers and vines). They shall be hardy, drought and salt tolerant.

g) Plant selection shall respond to CPTED guidelines and principles.

h) Plant selection shall maintain visual interest throughout the seasons.

i) Plant selection shall deploy a selective species palate.

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

k) Species shall always be grouped in a minimum of three plants of the same species.

l) Planting beds shall be fully vegetated.

4.4.2.3 Heritage & Third Party Integration

Heritage and historic places are part of the urban memory, and their preservation represents not only acknowledgment but also respect and subsequent continuity of the country's values and history. The LRT network, in the form of Stops, Stations, and maintenance facilities provide an opportunity to accommodate and frame these pieces, restoring their heritage features to their original conditions and bringing them back for public enjoyment.

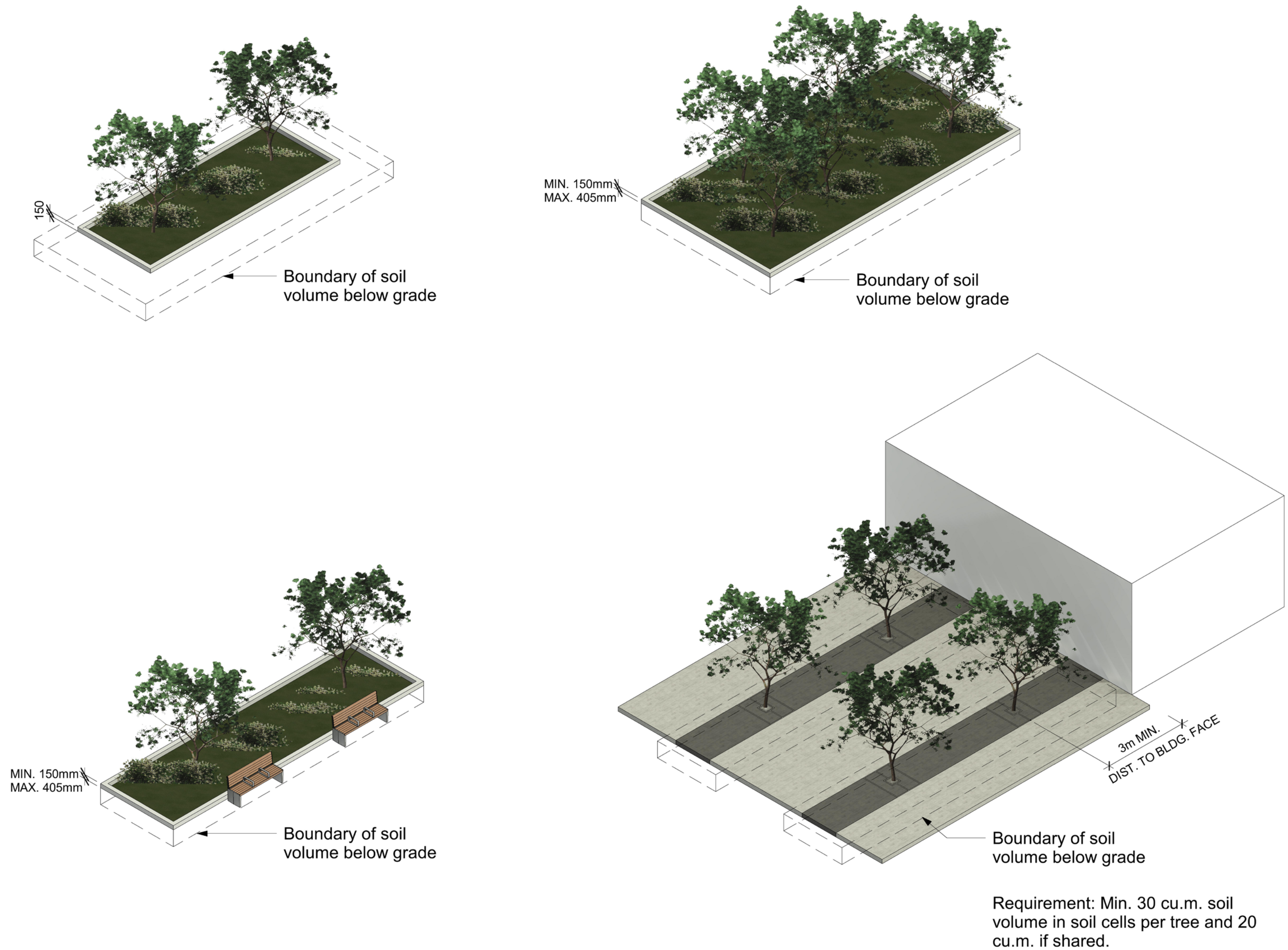


Figure 4-23: Tree groves in planters and tree grates – trees in small planters (top left), trees in planters (top right), trees in large planters (bottom left), and trees in tree grates(bottom right)

a) The LRT shall provide the opportunity to accommodate heritage and third-party integration.

b) Each LRT Stop and Station shall provide a designated area for third-party advertising integration:

    i. For Stops, third-party integration shall be incorporated in the back wall of the canopy.

    ii. At Stations, third party integration shall be coordinated with Metrolinx along different levels and circulation spaces.

c) Third-party integration location shall not interfere with the LRT information display systems and signage.

d) Where the LRT Stop is located in close proximity to a heritage building, then:

    i. Transparency in the LRT stop shall be explored; and

    ii. LRT stop elements may be adjusted to minimize visual impacts on local cultural heritage.

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

f) Where the LRT Station is in close proximity to a heritage building, then:

    i. Station entrance design, including elements located in plazas, shall be located such that they do not obstruct visibility towards the heritage building;

    ii. Signage and advertising elements shall be located such that they maximize wayfinding and other elements; and

    iii. No element from the LRT network shall be attached to a heritage building (e.g., Station identification).

g) Where the LRT is integrated with a heritage building, then:

    i. Station entrances design shall be coordinated with Metrolinx and the City and Provincial Heritage, in order to maintain the heritage character of the building;

    ii. Station design shall restore and maintain heritage attributes to their original condition; and

    iii. The use of modern elements shall not outstand heritage elements.

Figure 4-24: Heritage facade integrated with transit

4.4.2.4 Municipal District Signage (Business Improvement Area, BIA) Strategy:

a) Where municipal signage is considered for a project, the following shall apply:

   i. The location shall not block visibility to the Station

b) When located in the median in front of the Station, it shall be placed away from the projection of the building entrance façade.

c) It shall be coordinated during the early stages of the design with the respective municipality, specially for its approval.

d) Its design shall not conflict with the Station design or deviate customers attention.

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

4.5 STREET ELEMENTS AND CONNECTIONS

The LRT network is not limited to Stops and Stations located in Metrolinx lands, along the corridor it serves. There are a number of elements that enhance the pedestrian experience and create links between the context and the LRT infrastructure, making a merged environment that, while maintaining a clear demarcation of respective uses, creates and maintains streetscape continuity, resulting in a welcoming and friendly progression towards the transit system.

These elements include the following:

- Crosswalks
- Enhance Crosswalks
- Median Refuge Island
- Bullnoses
- Traffic Demarcation
- Traffic Signals
- Signage

4.5.1 Street Elements

4.5.1.1 Typical Crosswalks

A crosswalk is a marked part of the road where pedestrians have the right of way to cross.

The following requirements provide guidance on typical crosswalks adjacent to Stations and Stops:

a) All crosswalks shall be located and designed according to municipal standards.

b) Unless noted otherwise in the Project Agreement, typical crosswalks in general comprise:

   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 or Stops, the use of enhanced crosswalks is recommended to create an elevated customer experience. Various strategies that can be used to create an Enhanced crosswalk to add contrast and visual interest, reinforce the identity of the line, and strengthen the higher order civic role, are identified below.

Recommendations:

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.

b) Use of colour.

c) Use of texture.

d) All work within the roadway, including crosswalks, shall be approved by the relevant municipality.

4.5.1.3 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 the visual pedestrian signals. Two audible tones are used to indicate the direction in which the pedestrian has the right of way. At some signals, the APS operates automatically, while at other signalized intersections, a pedestrian pushbutton must be pushed and held for at least three seconds.

a) Provisions shall be made in the design of the LRT network for the consistent placement of the APS system:

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

b) At median refuge islands, mounted in the lighting pole at a height of not more than 1100 mm from the finished floor elevation (FFE), in a consistent location, unless noted otherwise in municipal requirements.

4.5.1.4 Curb Extensions and Median Refuge Islands

These features are countermeasures that reduce crossing distances and increase the safety of pedestrians.

a) Curb extensions: These 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 LRT public 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.

   i. 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 to pedestrians and cyclists. Proper demarcation and measurements to encourage cyclists to demount the bicycle while crossing pedestrian zones shall be implemented.

d) Median refuge islands: These allow pedestrians to cross one direction of travel at a time. Median refuge islands are protected spaces in the centre of the street that facilitate bicycle and pedestrian crossings. Crossings of two-way streets are facilitated by allowing cyclists and pedestrians to navigate only one direction of traffic at a time.

   i. The width of the median refuge island shall be coordinated with the crosswalk width. The absolute minimum width is 2 m.

   ii. When applied on a two-way street, the median refuge island shall be placed along the centre line of the roadway between the opposing directions of travel.

e) The approach edge of the raised median shall be outlined in retroreflective white or yellow material.

f) In areas with snow accumulation, reflective delineators shall be used to mark the island for increased visibility to snow plow crews.

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

h) Median refuge islands shall be visible to snow plow crews and shall be kept free of snow berms that block access.

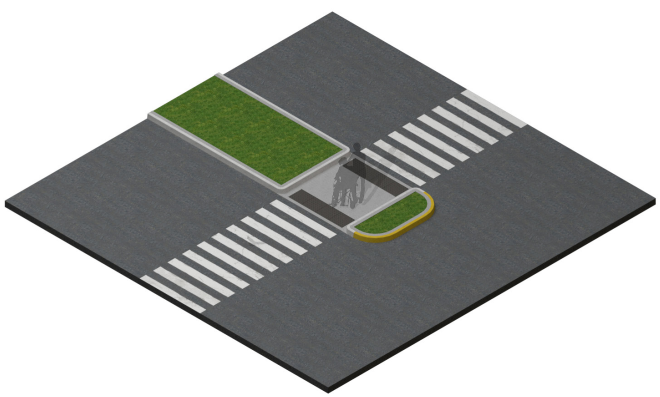


Figure 4-25: Median Refuge

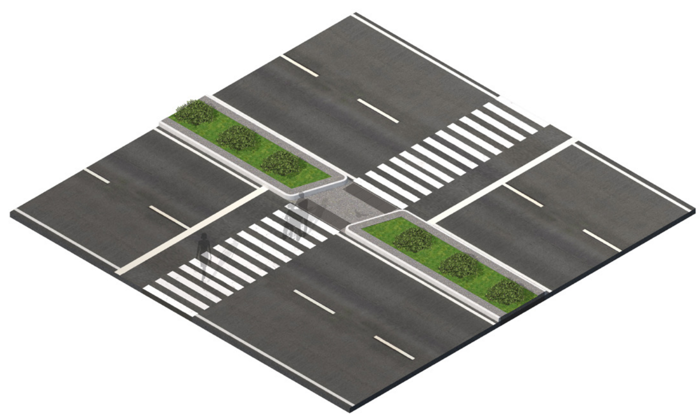


Figure 4-26: Median Refuge with offset cross-walk

i) Median refuge islands shall include tactile indicators before the crossing and in coordination with authority having jurisdiction.

In both cases, the application of alternative pavement markings or wider crosswalk widths are subject to discussions with the relevant municipalities.

Potential conflicts between pedestrians and cyclist shall be considered when implementing demarcation and traffic signals, in coordination with civil traffic engineering and respective municipalities and standards.

4.5.1.5 Passenger Protection (Bullnose)

The bullnose as a traffic barrier is an element located at the head of the LRT platform island intended to reduce possible harm to pedestrians and Station/signal infrastructure in the event of a head-on collision.

a) Bullnose in the shape of a low curb and landscape shall be provided in the LRT network.

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

b) Refer to Section 4.3.1.6 Raised Planters.

c) Bullnose shall be coordinated with the traffic/civil discipline.

d) High bullnose passenger protection (maximum 1000–1100 mm) shall be provided where the speed of traffic and the risk of collision are proven to be higher, through risk analysis assessment. In this case, the bullnose barrier shall be designed to resist vehicular crashes by stopping vehicles and avoiding a ramp effect.

e) High bullnose shall be designed to maximize visibility and protect sight lines for pedestrian and vehicles in the opposite direction.

f) In addition to the bullnose, side traffic barriers on the pedestrian ramp, facing the public driveway and facing the LRT track are encouraged to be integrated with the canopy structure.

g) Cross-ride and crosswalk shall be separate when crossing a road, and not be combined. The cross-ride shall be in front of the bullnose.

h) Cross-ride, crosswalk, and bullnose shall be coordinated to ensure that pedestrian safety is prioritized.

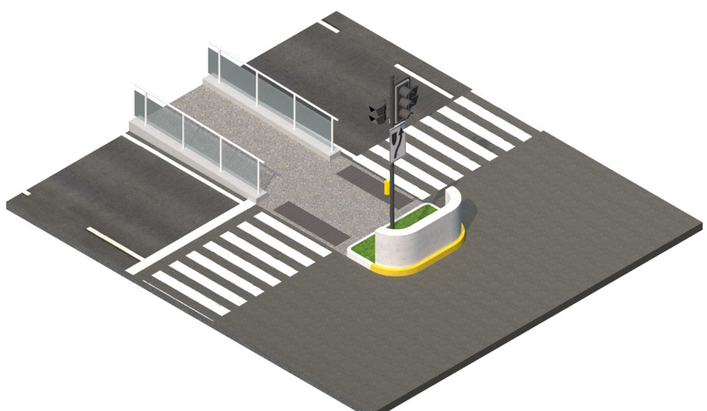


Figure 4-27: Bullnose

4.5.2 Transit Connection

The LRT 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 transportations include subways, bus routes, and heavy rail networks.

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 LRT network, the Stops and Stations, shall be designed to be simple and intuitive, promoting ease of navigation for customers and seek to minimize customer confusion.

b) Where the LRT 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.

c) The size of the waiting areas and sheltered spaces shall be commensurate with the anticipated volume of customers at each location.

d) Public realm hardscape treatments shall support safe and intuitive wayfinding at the connections between transit stations and adjacent mobility functions. Coordination shall be 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.

e) 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 special design focus.

f) 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.

g) 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.

h) 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.

i) Refer to Sections 5 and 6 for the design and planning of LRT Stops and Stations.

j) Signage shall conform to the Metrolinx DS-03 to provide a positive customer experience and ease of navigation at LRT 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. Yonge station in the ECLRT, that allows the connection between the LRT network, the subway Line 1 and TTC buses).

Inline, interchange, and terminal Stations can all be intermodal.

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

a) Intuitive design shall be maintained when integrating the LRT 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.

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. Transit vehicle change of direction is achieved with a turnback rail system that may include crossovers.

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 LRT 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 Streetscape Continuity

The streetscape may include a variety of elements such as vehicle travel and parking lanes, bicycle lanes, sidewalks, street trees, tree border areas, street furniture, bicycle parking, LRT Stops, bus Stops, utility lines, accent planting, and signage.

Along the LRT network, the integration with the urban context is of extreme importance since the public realm is a result of proper coordination of all these elements to achieve seamless transitions and, therefore, pedestrian comfort.

a) Transit public realm encounter with the municipal realm shall be a seamless transition that allows pedestrians to become customers without affecting their circulation or path of travel.

b) Coordination shall be made with municipal authorities to validate the urban intervention.

c) Streetscape continuity shall be analyzed during the early stages of the design to take decisions and coordination actions with different municipalities and stakeholders.

d) Design shall consider existing buildings and urban constraints as well as propose future developments.

e) Transit facilities shall consider the flexibility for future integration to new developments.

Figure 4-28: Streetscape along the LRT network

4.5.4 Safety By Design

Safe and efficient movement of passengers between the platforms, adjacent bus infrastructure, city sidewalks, and along guideways in the community is required with considerations of personal comfort, security, and safety. The LRT network shall be intuitive and easily identifiable for its use. The environment that has an order translates a sense of confidence and perception of safety: It also conditions behaviours and sets a language within the city.

a) To ensure safety, lighting levels across the plaza shall be at 50 lux with higher lighting levels at key customer journey decision points.

b) To ensure safety, the design and dimension of the urban plazas serving the customer journey shall be based on capacities and pedestrian volumes associated with the LRT Station location.

c) Alignment of pedestrian crossing components of crosswalks between the municipal sidewalk and the LRT Station entrance shall be in accordance with the provisions as set out in DS-02 Universal Design Standard.

d) Due to the complexity of the LRT system, special attention shall be made to the design of simple and coherent circulation, reducing decision points, and making its navigation easy and secure.

e) Signage shall be carefully located to be seen from different angles and locations, in support of the architectural layout.

4.5.4.1 Surrounding Community Protection

a) The pedestrian approach to the Station shall have an enhanced sense of protection in accordance with the guidelines on openness and transparency as set out in Section 3.2.2 CPTED and Transparency.

b) Pedestrian connections and walkways shall use dedicated and continuous routes, throughout the Station and connections to surrounding areas. Pedestrian clearways shall have a minimum width of 1800 mm, subject to coordination with the relevant municipality and/or AHJ.

c) When a pedestrian entrance is provided from a multi-use path, a clear opening of at least 1200 mm shall be provided.

d) When the entrance includes a gate, bollard, or another type of barrier, it shall be raised and constructed of hard and materials that are slip resistant.

e) Provisions shall be made to prevent potential conflicts between pedestrians and road vehicles as outlined in Section 3.2 Barrier Free Access and DS-02 Universal Design Standard.

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

g) Exterior passageways shall be protected with an ice melting system installed in exterior ramps and stairs:

   i. Coordination for the installation of the ice melting system shall be made during the early stages of the design

   ii. Selection of the ice melting system shall be coordinated with Metrolinx.

h) Engineering rooms supporting the ice melting system shall be integrated in the service rooms of the Station building, with access from a service corridor, avoiding exterior doors facing the public realm.

i) Rainwater from canopies and other structures shall discharge away from pathways, plazas, and sidewalk:

   i. Downspouts shall be provided.

      1) This element shall be integrated with the backwall of the stop/Station canopy.

      2) If it cannot be integrated, colour and materiality shall match adjacent structures to avoid visual clutter.

j) Irrigation water for landscaped areas shall be collected and oriented away from public passageways and plazas

4.5.4.2 On-Site Protection

a) Provision shall be made for access by emergency vehicles, including fire trucks, police cars, and ambulances. Designated fire routes and no parking zones shall comply with municipal, local fire department, and Ontario's Building Code regulations. Access to Station facilities shall address safety, service, convenience, and proximity to Station entrances.

b) The safety and convenience of passengers are of paramount importance as is their efficient transfer between transit modes and direct access to the transit system.

c) Pedestrian path shall not ice during winter weather conditions.

d) When exterior stairs and ramps are present, heat tracing and snow melt shall be included to reduce slip and fall incidents.

e) When exterior stairs and ramps are present, exterior ramps shall be designed in accordance with the requirements set out in DS-02 Universal Design Standard.

f) Design details for pedestrian travel paths, ramps, and curb cuts shall meet the requirements of the local municipality, Ontario's Building Code, AODA, and DS-02 Universal Design Standard

g) Appropriate means of egress from the Stations shall be provided.

h) Access protection from unwanted vehicles and trucks shall be prevented using bollards. Refer to Section 4.3.1.3

4.5.4.3 Crosswalk Protection

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

b) APS buttons for crossings shall be provided. APS shall comply with AODA requirements and municipal standards.

c) Provisions shall be made to prevent potential conflicts between pedestrians and road vehicles. All work within the roadway, including crosswalks, shall be approved by the relevant municipality.

4.5.5 Pedestrian/ Cyclist Zone

The public realm shall prioritise pedestrian movement, followed by cycle, transit, and then vehicular movement. A Station's public realm must balance pedestrian and cycle movement with various types of road traffic movement.

Each type must be understood separately, along with the interactions between them and the relative levels of each. An appropriate hierarchy of needs shall be agreed early in the conceptual design process.

At-grade Station entrance approach defines the approach to an entire LRT system facilitating passenger safety, security and convenience. The customer experience upon arrival to the Station shall be direct and easy to navigate. They must be able to orient themselves quickly and safely transition from their mode of arrival to the Station entrance.

The following requirements of pedestrian and cyclist zones shall be met in the design:

a) Pedestrian Priority: For reasons of safety, pedestrians shall be given priority. This includes customers requiring barrier-free access.

b) Critical Distances for Pedestrians: Buses, Streetcars, Light Rail Vehicles, and specialized transit vehicles serve the largest volume of passengers and therefore pedestrian access to and from other modes of transportation shall be a priority in terms of optimizing distance between LRT Station Entrances and Stops or Stations for other modes of transit.

c) Bicycle elements and facilities shall be separated from other modes of transportation and pedestrian foot traffic

4.5.5.1 Pedestrian Zone

The design of the public realm shall enable, encourage and empower people to choose walking for a portion of their journey.

Pedestrian zones are areas of a municipality that are reserved for pedestrians only and in which most or all automobile traffic may be prohibited.

a) Within the pedestrian zone in front of the Station all movement shall be non-vehicular and focused on the needs of the pedestrian. The zone extends from inside the Station building to the curb.

b) The design of the pedestrian zone shall provide easy, efficient and enjoyable connections from the Station to key local destinations and other transport.

c) Any pedestrian crossings shall be understood to be part of the pedestrian zone and shall be in areas that enable pedestrians to follow their desire lines and accommodate the highest likely level of demand.

d) The most direct routes between key destinations and modes of transport and making them clear and free from physical clutter shall be provided.

e) Dimensioning of pedestrian paths, including street crossings shall be demonstrated through calculations and analysis.

f) Clear sightlines along routes that promote intuitive wayfinding shall be provided.

g) Clear wayfinding signage at decision point locations and at extended pedestrian paths shall be provided.

h) Additional space for conflicting pedestrian movement outside Station entrances shall be considered.

i) Lighting levels shall meet the requirements specified in Sections 5 and 6.

4.5.5.2 Cyclist Zone

Cyclist Zone Design of the public realm shall give priority to cyclists over mechanized vehicles by:

a) Considering the relationship between cyclists and other road users, and providing paths protected from vehicular traffic including but not limited to segregated cycle routes.

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

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

d) Locating the cycling route between the road and sidewalk.

e) Resolving potential conflicts between the crossing pedestrians and the cycling routes, by creating demarcated crossing paths and signaling.

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

4.5.6 Passenger Pick-Up and Drop-Off/ Layby/ Specialized Transits

Passenger pick-up and drop-off (PPUDO) facilities consist of a layby off an adjacent roadway that shall accommodate specialized transit vehicles. Pick-up and drop-off area's provide a benefit to passengers and encourage a modal shift with a change in drive-alone commuting. Designating a space for this use also reduces potential conflict with other road users and transit vehicle operations by reducing pick-up and drop-off from occurring arbitrarily and in mixed traffic where there are on-street transit stops. PPUDO requirements vary by site and shall be determined in the Project Agreement. PPUDO location and size shall be co-ordinated with municipalities and municipal transit service providers.

4.5.6.1 Design Requirements:

PPUDOs shall be provided in the form of a layby within view of, and in close proximity to the LRT Station entrance. Where space is not available, at a minimum, street treatments such as signage, painting, and curb cuts, shall be provided for dedicated specialized transit drop-off.

a) An accessible vehicle drop-off area shall be designated within the PPUDO zone that accommodates all specialized transit vehicles and accessible taxis.

b) PPUDO shall be barrier-free and meet requirements in the DS-02 Universal Design Standard.

c) PPUDO shall be clearly marked and meet requirements in the DS-03 Wayfinding Design Standard.

d) PPUDO and their accommodation of non-transit and accessible taxi vehicles are subject to demand, land availability and TOC partnerships. Project specific requirements shall be in the Project Agreement.

e) In the case of TOC, PPUDO shall be integrated and/or coordinated with drop off areas for the mixed use development.

f) PPUDO shall be convenient to the station entrance and adjacent to the shortest accessible path of travel making a direct connection from Street Level to Station areas and platforms.

g) PPUDO areas shall be integrated with the Subway Station landscape/streetscapes.

h) Passenger Pick-up and Drop-Off (PPUDO): Barrier Free PPUDO enable high volumes of passengers to access Stations in short periods of time and serve as the specialized transit vehicle drop-off. They provide an incentive for safe and convenient access to the subway.

However, PPUDO activity related to LRT Stations in an urban context may sometimes be so low that it can be accommodated curbside, without any special facilities such as laybys or off-street PPUDO. Refer to Section 4.4.6 passenger Pick-Up and Drop-Off (PPUDO) / Layby / Specialized Transit.

The specialized transit stop shall comply with requirements for barrier-free PPUDO under the DS-02 Universal Design Standard.

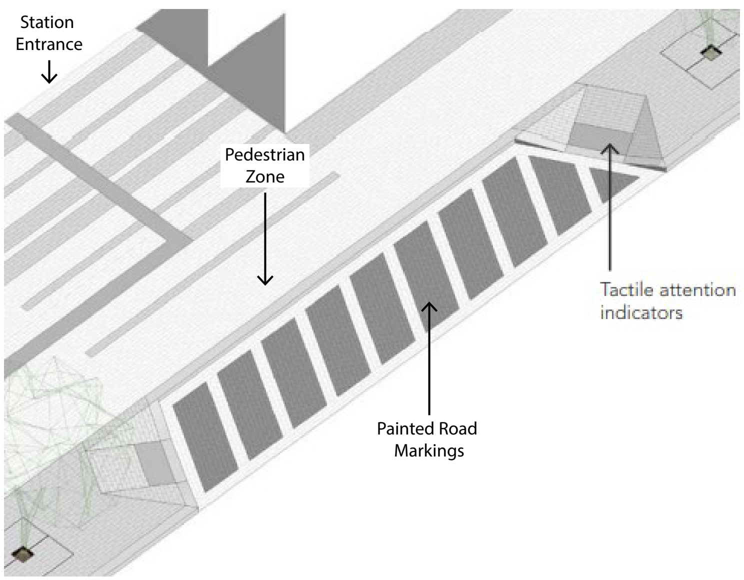


Figure 4-29: Passenger pick-up/drop off (PPUDO) layby

4.5.7 Parking Requirements

Passenger and non-pubilc vehicle parking shall be included where required on a project by project basis.

a) Parking shall be designed to consider future re-development and be negotiated with Transit-Oriented Community project stakeholders, developers and municipalities.

b) Where parking is required, it shall be designed in compliance with DS-02 and number of accessible parking stalls shall comply with AODA.

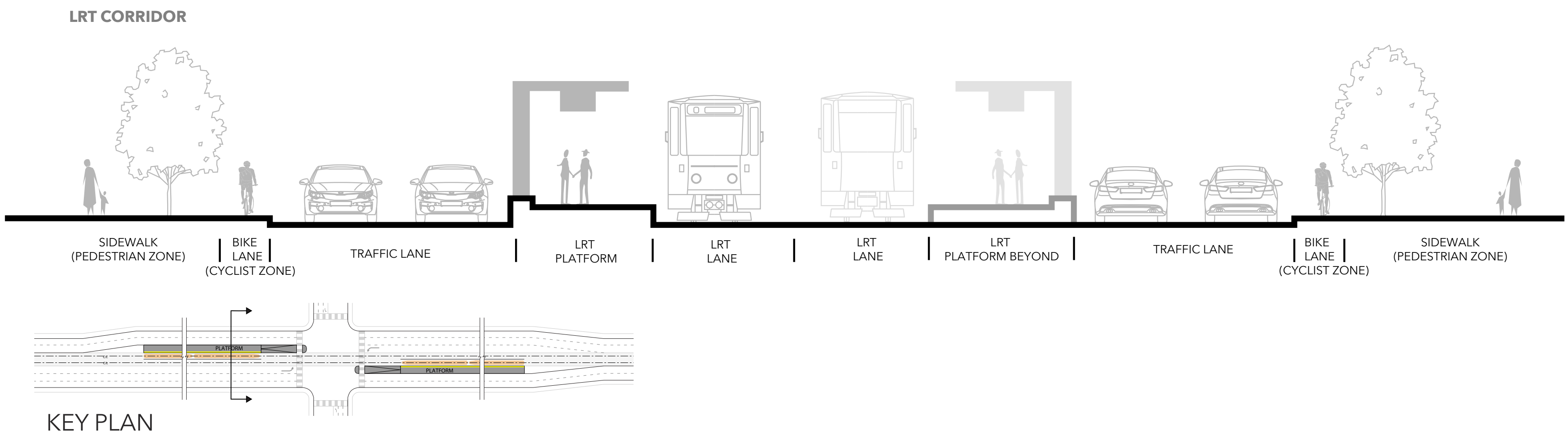


Figure 4-30: LRT Pedestrian and Cyclist Zone

On more constrained roadways, some of the elements shown on Figure 4-29 may not be feasible; this is to be confirmed on a project-by-project basis.

4.6 CORRIDOR IDENTITY

Corridor identity is intended to cover the line-wide infrastructure within the LRT realm that works in conjunction with the municipal realm to create a cohesive line-wide design language through deployment of the LRT kit of parts. The linear infrastructure through the corridor should emphasize local architectural expression and integration with urban areas.

The design of customer facing elements require special attention to ensure a cohesive identity that links the LRT Stops, Stations, and other facilities along the corridor. This includes thoughtful deployment of the kit of parts, including materials, finishes, datums, geometry, and proportions. The design of the corridor elements shall seek to mitigate impact on adjacent communities.

a) The spaces between the limits of the guideway and the Metrolinx property shall be a softscape environment with the exception of maintenance roads to access the corridor and the infrastructure within it.

b) Where variations in grade occur between the train envelope/access roads, the softscape shall conform to standard industry practices to prevent soil erosion.

4.6.1 Protective Barriers

Protective barriers are a physical layer that surrounds facilities and lands to delineate them, to prevent trespassing, vandalism and to control and restrict access to unauthorized people. Depending on the level of security, protective barrier can be transparent or opaque.

Protective barriers within this section shall apply to highly visible, public areas along the LRT network. The application of these barriers and screen elements may include the following:

- TPS and EEB
- Portals and guideways
- At grade mechanical units
- Roof top mechanical enclosures
- Acoustic barriers
- Bridges

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

Figure 4-31: Corridor Material Palette

b) All protective barriers shall be modulated, following the overall modulation of the LRT network.

c) Protective barriers shall be built in durable, resistant materials therefore analysis and selection shall be made during the design process.

d) Design for these elements shall include:

- visibility;
- contextual response;
- scale;
- modulation;
- seamless integration with architecture and infrastructure;
- kit-of-parts approach;
- consistent/complementary PA requirements;
- ventilation;
- materiality;
- security performance including grounding;
- maintenance including graffiti and vandalism;
- consistency with Municipal standards; and
- property acquisition extent to accommodate appropriate design response.

e) Where more than one LRT vehicle consist services the platform, an operable barrier may be required to protect the gap. To be coordinated with the Universal Design team and Stations and Facilities Engineering and Asset Management.

4.6.1.1 Transparent Protective Barrier

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

b) Transparent protective barrier shall be metal wire grid and powder coated to have a medium to dark grey colour/finish.

Figure 4-32: Transparent Protective Barrier Example

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 security, directional, crowd control, and fall protection.

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

4.6.1.2 Opaque Protective Barrier

This protective barrier provides a higher level of security since it hides from public the facilities that is being surrounded. The intent is to avoid visual contact to special equipment or areas susceptible to vandalism.

a) The use and type of public facing opaque protective barrier shall be coordinated with and approved by Metrolinx Engineering and Asset Management group.

4.6.2 Traffic Barriers

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. It shall employ elements that are complementary or consistent with other site furniture and infrastructure elements.

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

b) Continuous barriers shall consist of raised planters, refer to Section 4.3.1.6. or bollards, refer to Section 4.1.3.3.

Figure 4-33: Opaque Protective Barrier Example

c) Jersey barriers or similar prefabricated traffic barriers are not permitted.

d) Traffic barriers shall include graffiti resistant surface treatments and shall be vandal resistant. Refer to 4.5.12.2 for Anti Graffiti requirements.

e) 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.

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

Figure 4-34: Traffic Barriers

4.6.3 Sound Barriers, Retaining Walls and Upstands

In the LRT network, the use of barriers (sound, retaining, and upstand) requires special attention since they occupy a considerable vertical surface that has a presence in the Public Realm. Where possible, noise barriers, retaining walls, and upstands shall be combined with vegetation and opportunities for planting shall be coordinated in the noise barrier geometry and structure. The irrigation and drainage system shall integrate with the design.

4.6.3.1 Sound Barriers

The use of sound barriers within the LRT corridor will provide sound attenuation as well as screening. Where sound barriers are required in a project, they shall be of a high level of design that is durable and low maintenance and consistent in its appearance throughout the corridor, and shall satisfy all project requirements including those described in Environmental Assessment / Transit Project Assessment Process.

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.

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. In accordance with DS-25 Noise Barrier Requirements

e) Sound barrier materials shall:

   i. be durable and low maintenance; and

   ii. include transparency, where possible.

4.6.3.2 Retaining Walls

A retaining wall is a structure that holds or retains soil behind it. Retaining walls may be required to accommodate changes in grades between adjacent surfaces.

a) The design and aesthetics 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 drains or weep holes where necessary.

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

   i. Coloured concrete

   ii. Form liners and/or patterns

e) Sand blasted or bush hammered

f) All retaining walls shall have graffiti protection. Refer to 4.5.12.2 for Anti Graffiti requirements.

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

h) 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.

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

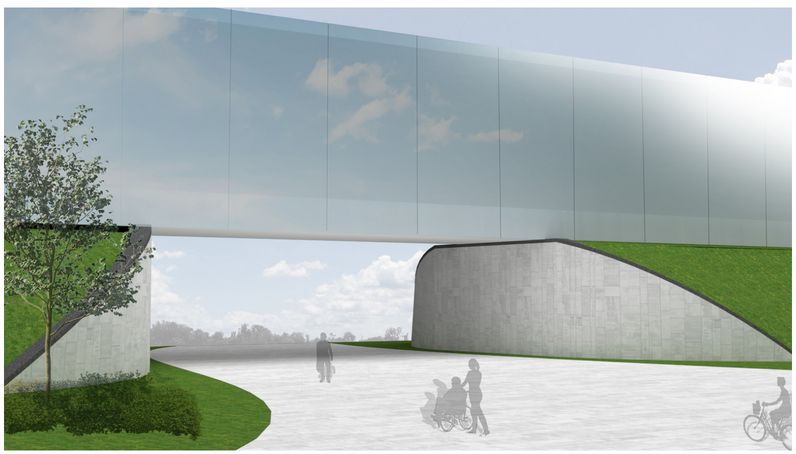


Figure 4-35: Retaining Walls facing public areas

4.6.4 Railings/ Balustrades/ Guards

a) Design shall be rectilinear and shall maintain a consistent design language (e.g., materials, proportion, profile, colour, and finish) across the line.

b) Materials shall be durable and low maintenance.

c) Refer to DS-02 Universal Design Standards for additional requirements.

4.6.5 Platform End Tapers

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

a) Platform end taper design shall maximize planting opportunities such as low vegetation.

b) For platform end gate requirements, refer to Section 5.3.6 Guardrails, Handrails, and Gates.

4.6.6 Portals

Portals occur when the at grade guideway transfer to an underground portion. The portal is the end of a U section trackway that defines the starting point of the tunnel.

Design of the U section and portal requires special attention since they are hosts for numerous engineering systems required.

a) Engineering systems located in the side walls of a U section trackway and Portals shall be concealed and not exposed to public (e.g. conduits feeding lightings or cameras).

b) Publicly visible walls shall be designed with material characteristics (for example, texture, modules, patterns, and colour) consistent with retaining walls throughout the corridor. Refer to Section 4.5.3.2 for retaining wall requirements.

   i. Electrical and systems conduits shall be aligned with joints or seams.

c) Finish on surface shall facilitate maintenance and cleaning.

d) Side concrete walls shall have graffiti protection. Refer to Section 4.5.12.2 for anti-graffiti requirements.

e) Lighting shall be strategically located and integrated into the design of the retaining walls, visible to the public to increase safety.

f) Provisions for conduits and pipes shall be made so they are not mounted on walls but located in dedicated zones on the side walls and portals.

g) Emergency evacuation from the portal through the U section wall shall meet OBC and NFPA requirements. Risk analysis shall be performed to guarantee an uninterrupted evacuation route from the station portal to the point of safety in the exterior of the station) e.g. side walk), considering that the trains may block access to evacuation routes and that certain portions of the guideway may not have embedded tracks for people to circulate safely.

h) Signage and warning signs shall be located at the entry point of the U section preceding the portal to discourage people from trespassing.

4.6.7 Ancillary Structures

Along the LRT corridor many types of ancillary structures, such as Traction Power Substations (TPS) or Electrical and Communications cabinets service Stations, Stops, and MSF as part of the LRT network or serve as an interface between other suppliers and the transit network. These structures are generally not publicly accessible.

The consideration for their materials, size, number and location within the urban context shall be a driving priority, incorporating urban design, architectural and landscape treatments that enhance a seamless transition to the immediate municipal realm.

a) Where parking and access are provided:

   i. Paving shall conform with requirements of DS-05 and use of asphalt shall be minimized.

   ii. A single street access and parking shall be contained within the designated site.

b) Parking and maintenance access shall be made from a single rear lane or side street where possible.

c) Size of driveway and number of parking shall be minimized on site and coordinated with relevant Operations and Maintenance groups.

d) Screening shall be provided, as required by AHJ or property agreements, between parking and adjacent properties.

e) Site shall:

   i. Be designed to minimize their size, visual impact and property requirements.

      1) Placement, orientation, and landscape shall be used as an acceptable form of screening.

f) Be designed as single storey configurations to minimize the visual impact on neighbouring sites, unless integrated with a Station.

g) Be laid out with the short dimension facing the street.

h) Be located at 90° angle to the street to minimize street frontage use on the Municipal ROW and maximize the use of site.

i) Include working setbacks around the ancillary structure.

j) Be coordinated with AHJ.

k) Contain all supporting equipment such as switchgear, disconnect switches, manholes, and other utility structures where required for the ancillary structure.

l) Architectural expression

   i. Where an ancillary structure is adjacent or in close proximity to a Station, the ancillary structure shall be located within the building.

      1) Where this is demonstrated not possible, a purpose-built structure/building shall be designed.

      2) If 1) is not possible, the structure shall be located in service lanes, out of the public view with the addition of cladding and screening.

m) A visual relationship with the LRT facilities and Stops shall be established through the use of similar architectural language, materials, finishes, colours and patterns.

n) The roof plane shall be treated as the fifth elevation and designed with a similar strategy to that used on the main walls.

o) Architectural elements

  i. Materials shall:

    1) Be climb-proof, cut proof, and vandal proof;

    2) Be durable and low maintenance;

    3) Not be made of wood, concrete, stone or plastic;

    4) Be rigid material and modulated to avoid warping and bending of material; and

    5) Have anti-graffiti coating applied to exterior surfaces up to 3000 mm high.

p) Where cladding is used as an additional layer (i.e., separate screening), a visually perforated metal (or approved equivalent) of complimentary colour complete with a galvanized, self-supporting structural frame shall be employed. Refer to Figure 4-39 for examples.

  i. The free area of this cladding shall be coordinated with Electrical, Mechanical and Systems team to meet the ventilation requirement of adjacent equipment.

q) Where the roof is not flat, extent of cladding shall be from the base to the highest point of the ancillary structure.

r) Integrated design

  i. Ancillary structure shall limit all exterior mounted mechanical components and serviceable modules to a single elevation, screened (for example: with landscape buffer, orientation) from the public.

s) Mechanical and electrical units and panels shall be concealed within or match colour of ancillary structure.

t) Additional elements attached to the ancillary structure (e.g., CCTV cameras) shall be:

  i. aligned with joints or seams;

  ii. mounted to minimize the use of additional mounting frames, to reduce visual clutter;

  iii. mounted away from the reach of the public to minimize vandalism; and

  iv. lighting shall be placed and coordinated with the CCTV cameras layout to reduce vandalism.

u) Landscape Enhancement

  i. Ancillary structure shall be screened with landscape using local vegetation.

1) The use of landscape shall not interfere with the ancillary equipment systems, so early coordination of irrigation and drainage shall be made to avoid conflicts.

v) Noise

i. Coordination efforts shall be made to reduce the number of openings to reduce the noise impact to the surroundings, especially when facing a residential area.

w) Ancillary structures shall be positioned away from residential occupancies so as not to exceed 55 Db noise level at the property line.

x) CPTED

i. The design and placement of ancillary structures shall conform with CPTED design principles.

y) CCTV cameras and lighting shall be used around the site for security to minimize vandalism and public access.

z) Where protective barrier is required (subject to analysis), it shall conform with Section 4.5 and shall be limited to the immediate surrounding of the ancillary structure (minimum horizontal distance of 1500 mm) to allow for circulation, ventilation of mechanical units, etc.

aa) Lighting

i. Uniform lighting shall be provided, avoiding up-lighting that may affect surrounding buildings.

ab) Accent lighting shall be used:

i. Where located in proximity of public areas, strategic use of accent lighting in combination with other features (e.g., colour) shall be coordinated with Metrolinx.

ii. Accent lighting shall avoid excessive intensity that may affect surrounding communities at night.

4.6.7.1 Minor Ancillary Equipment (Third Party)

In certain circumstances Hydro infrastructure and other minor ancillary equipment are required to be in the LRT Stations at grade due to the need of power distribution. In the case of hydro infrastructure, included transformers, they are cubes of approximately 3 m side and require certain clearance around for access and for this reason requires considerable area to be accommodated and out of the public view. The challenge starts on how the design guarantees access by the service provider and at the same time avoiding the addition in the building exterior and landscape areas. Refer to Section 6.8.3 for specific requirements.

a) Where a minor ancillary equipment is required, coordination shall be made to locate them out of the public view:

i. Inside the building, as a first choice

Figure 4-36: TPS on second floor integrated with a secondary entrance building

b) In service lanes, out of the public view in the case it cannot be located inside the building.

c) Integrated with the building façade, where located outside the building.

d) Where the minor ancillary equipment is in proximity to public view, screening and colour shall minimize their presence and visual impact.

e) Where the minor ancillary equipment is in proximity to public view, screening and colour shall minimize their presence and visual impact.

4.6.7.2 Emergency Exit Buildings

The Emergency Exit Buildings (EEBs) are minor structures located in the adjacencies of a transit underground line and functions as emergency exit from underground Stations and guideways.

a) Location
   i. EEBs, similar to the TPS, shall be integrated seamless with the adjacent developments and avoid being the focus of attention.

b) Non-integrated standalone EEB shall be located parallel to the street; this is to maximize the use of space.

c) Non-integrated standalone EEB shall use single story configurations.

d) EEB shall respect zoning set back and where this information is not available, coordinated with the respective jurisdiction.

e) EEBs shall not be located at intersections where they reduce visibility and result in a blank facade at the corner when integrated with new development over time.

f) Screening and design
   i. EEB shall be designed to not appear or be confused with a public entrance.

g) EEB shall be screened using the cladding palette of colours and materials (including louvers) used in the adjacent Station where is located.

h) EEB shall be screened using the cladding palette of colours and materials (including louvres) used in the adjacent Station where is located.

i) Exterior cladding shall prevent from climbing.

j) Size of the EEB shall respond to evacuation requirements and footprint of the building shall me minimal.

k) Doors shall open in the direction of travel.

l) Exit facade with exit doors shall include signage as per the DS-03 P1 Metrolinx Wayfinding Design Standard & Part 2b: Sign Implementation Manual - LRT/Subway Edition.

m) Exit route from the EEB door to the closest hardscape shall be paved, with a minimum width of 1800 mm.

Figure 4-37: Stainless steel perforated sheet for wall screening

n) Gathering zones is required adjacent to the EEB, size shall be calculated following the OBC.

o) Engineering systems (e.g. mechanical ventilation, electrical conduits, etc) shall be integrated with the architectural elements and shall not be visible on the surface. Where exposed, engineering systems shall be coordinated to reduce visual clutter.

p) Anti-graffiti coating shall be applied on exterior surfaces up to 3000 mm high.

q) CPTED

   i. The design and placement of the EEB and ancillary structures shall conform with CPTED design principles.

r) EEB shall use anti climbing materials.

s) CCTV cameras around the EEB site as well as lighting shall be used to minimize vandal actions.

4.6.8 Overhead Catenary System Poles and Support

The OCS infrastructure has a direct impact for both the transit customer and the communities that the system traverses through. The location and number of OCS poles are critical to the overall visual impact along the guideway, elevated guideway, grade separations and through portals. In addition to the impact of the poles and wires, there may be additional infrastructure attached to these poles that will need to be accounted for as part of the design, such as antenna's and conduit.

Where required, the Catenary / Overhead Contact System (OCS) is an integral overhead power distribution system for train propulsion by the use of a continuous element stretching along all sections of the guideway.

a) OCS poles and associated support arms shall relate to the other components in the LRT identity, by using similar materials, colour and finishes and by maintaining a simple, uncluttered and minimalist appearance.

b) OCS poles shall be a prefinished tubular steel assembly that has a lightly pronounced taper towards the top, terminating in a slightly rounded cap, the minimum required for water shed purposes.

c) Base plates and anchor bolts connecting the OCS support poles to foundations shall be concealed with conical covers, where poles integrate with platform assemblies.

d) OCS poles and base cover plates shall be round over square in shape.

   i. Coverplate finish and colour shall match pole.

e) The cantilever assemblies that carry wires shall be self-finished and constructed with standard off-the-shelf components using minimal quantities of parts and connections.

f) Opportunities to minimize the number of poles within the corridor environment shall be maximized in order to reduce visual clutter.

   i. The OCS pole layout shall be developed to maintain consistent span lengths along the line, unless demonstrated not feasible.

   ii. The OCS pole layout shall emphasize the system wide modularity, the requirements of the pocket track and turnout catenary.

g) OCS support poles and associated elements shall be simplified and lessen the visual impact of the power cable system, antennas, conduit and any additional infrastructure fixed to the pole.

   i. By matching materiality and colour

h) Conduits shall be placed inside the pole as a first choice, and where not feasible, out of visual contact to public by the use of protective encasement that match the colour and materiality of the pole.

i) OCS poles and their parts shall not block the pedestrian path of travel and shall not impede pedestrian flows/ circulation to and from the platform by implementing pole anchors and downhaul wires.

j) Consistent OCS pole height shall be prioritized. Where it is not feasible, prioritize consistency along the guideway, especially at and adjacent to all Stops and Stations.

k) Consistent OCS pole placement at all Stops (including sloped walkways and platforms) shall be prioritized.

l) To reduce visual clutter and enhance the customer experience, non-typical poles (poles with feeder, spring tensioner, switch connection, added equipment, and other related parts) shall be located away from visibility from the Stop platform and street intersections.

m) Where OCS poles are near/adjacent to the pedestrian path of travel, a colour contrast cover plate shall be provided. Refer to DS-02 Universal Design Standard for Light Reflectance Value.

n) In portal sections, wherever possible OCS elements should be mounted on the U-section walls rather than poles.

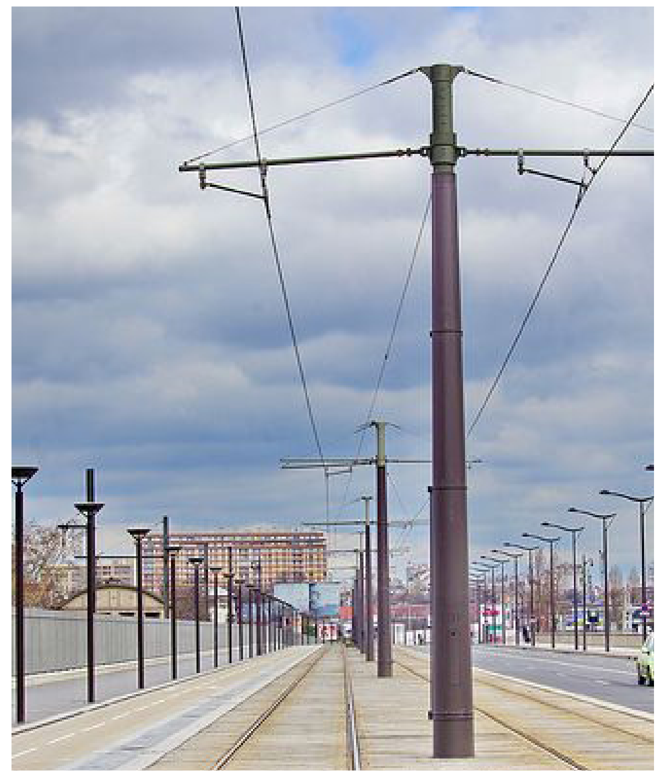


Figure 4-38: Overhead catenary system (OCS) poles

4.6.9 Antennas

Antennas are vertical metal structures required for the communication of different systems along the network. They are commonly located along the guideway and some are required to be on the roofs of Stations.

a) Antennas shall be recessed from the edge of the roof of facilities to minimize exposure to public.

b) Antennas located on facilities roofs shall avoid attached elements (e.g. communication boxes)

c) Antennas shall be coordinated in early stages of the design between Architecture, Structure and Systems.

d) Coordination shall also include the respective municipality.

4.6.10 Elevated Guideway

Elevated guideways are sections of track infrastructure between Stations/Stops that are raised above grade or street level. The elevated guideway superstructure consists of girders and diaphragm structures while the substructure consists of pier columns and pier caps. They form a highly visible and thus critical element in the overall design language of the LRT system, as they include many components that impact the functionality and the aesthetic perception of the LRT corridor. The associated components, elevated guideway screening devices, catenary and support structures comprise the strongest visible continuous element of the LRT line.

4.6.10.1 Civic Scale, Materiality, and Quality

a) The elevated guideway shall be of an appropriate civic scale, and, through its design and materiality, it shall contribute to the urban design quality of the LRT corridor.

b) The architectural form of the guideway shall elevate public transit beyond the merely functional and imbue the entire line with a strong civic presence.

c) The guideway design shall incorporate significant architectural and landscape enhancements to areas where the elevated guideway meets grade and for orphaned or remnant areas surrounded by guideway infrastructure.

d) The elevated guideway shall demonstrate a high degree of visibility within local.

e) Land distant environs, presenting an opportunity to communicate high design values, contemporary expression, and contextual sensitivity characteristic of its host transit line.

f) Elevated sections of guideway structures shall be clear, spanning over major arteries, plazas, ravines, and watercourses, with a potential of serving as gateways to key urban centres.

g) Provide emergency walkways on the centre of the tracks and on the sides, based in evacuation analysis.

h) Overflow drainage shall be provided in the elevated guideways to avoid water accumulation. Measures to ensure water accumulation is avoided shall be explored and implemented during the design phase.

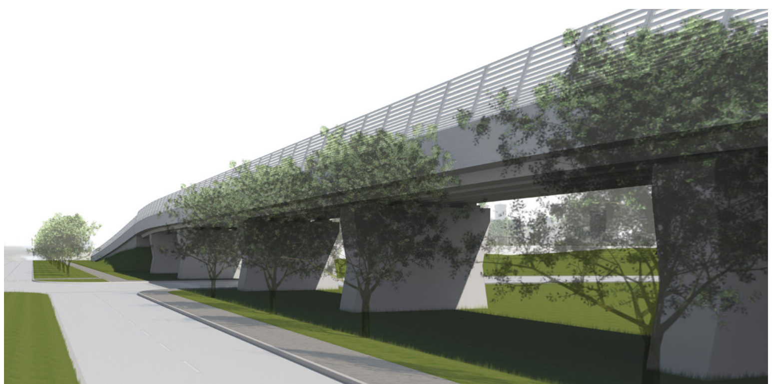


Figure 4-39: Elevated Guideway

4.6.10.2 Architectural Expression

a) Coordination at early stages of the design shall be undertaken with civil structures engineering and local municipalities for the selection of shape, modulation, texture, and colour.

b) Elements of the elevated guideways shall be modulated, using scalable module range that visually relates to the prevailing rhythm set by the Stations/Stops.

c) Modulation in elevated guideways shall be achieved through the use of pattern or reveals in the concrete finish that aligns with the line-wide design language.

d) Structural elements shall be designed to create a simple, linear, low-profile, gently arcing bridge that dissolves into landscaped embankments at each side

e) Vertical structural elements shall be designed to maximize sightlines underneath the elevated guideway along pedestrian and vehicle routes and avoid the creation of visually concealed areas beneath the guideway.

f) At highly visible portions of elevated guideway, accent lighting, architectural concrete and other treatments shall be used to create a visual amenity to mitigate any perceived negative visual impact from the new structure and enhance the public realm.

g) The elevated guideway substructure shall maintain consistent form across the family or pier typologies with common geometry and appearance.

h) The location and number of the OCS poles are critical to the overall visual impact of the elevated guideway. Careful consideration shall be given to the disposition of these elements:

   i. Centre of pole shall align with centre of pier below.

   ii. Poles shall be located to minimize the amount required.

4.6.10.3 Linear Form and Transparency

a) Structures shall be simple, light and elegant to minimize the visual impact on surrounding development, public streets, and green space / park users.

b) The guideway shall demonstrate visual lightness with the potential application of materials such as skin screening panels along both sides with a visual transparency to act as a guardrail or for sound attenuation.

c) The use of any modular prefabricated panels shall provide visual permeability from within the revenue vehicle or when viewed from the valleys or underpasses and which serves to tie all of the discrete span elements of the bridge structure into a continuous built form.

d) Railings and guards on the guideway shall be:

   i. Transparent and unadorned.

   ii. Neutral in colour to blend with the material tone of the guideway.

e) All pier columns shall have a uniform pier width/ dimension, and overall shape/form.

f) External diaphragms are not permitted.

g) Structures shall have modular span lengths to minimize the number of piers and minimize the visual impact of piers.

h) Horizontal structural elements shall be a continuous form without abrupt transitions between sections, systems, and components; and shall:

   i. Provide seamless transitions, without steps, or bulkheads on soffits, fascias or parapets across the superstructure transitions.

i) Have a constant structural depth throughout the elevated guideway for the superstructure.

j) Planar steps not permitted in superstructure soffits and facias. All superstructure fascia, soffit, and rail deck/ parapet transitions shall be co-planar, without steps and form part of a continuous guideway;

k) Provide smooth superstructure edges and profiles that work with the rail alignment between different superstructure types.

l) Align the side fascias of adjacent superstructures at superstructure transitions and at piers.

m) Drainage or utilities shall be visually concealed and integrated with the structure:

   i. There shall be no surface mounting of any service conduits or drainage pipes to the soffit or external faces of the elevated guideway superstructure. All service conduits and drainage pipes shall be cast-in or sleeved through the superstructure.

   ii. Pier columns shall have utility recesses with removable cover plates along to accommodate and conceal drainage downpipe and service conduit.

n) Pier caps shall have the drainage pipe cast-in and embedded.

4.6.10.4 Lighting

a) The underside of the guideway shall demonstrate a strong linear quality with the concrete girders prominently separated by deep shadows at night; this banding may be reinforced at specific locations with a system of feature lighting at the supporting piers.

b) Lighting strategies shall include exploration of third party art, opportunities inherent in the structure and the kinetic qualities of the train movements.

c) At highly visible portions of elevated guideway, accent lighting shall be provided at top of OCS poles.

4.6.10.5 Architectural Finishes and Structure Requirements

a) All exposed concrete surface finishes shall be smooth architectural concrete.

b) Use of an architectural concrete for all cast-in-place or precast concrete exposed to view shall incorporate the following requirements:

   i. Special care in selection of the concrete materials, forming, placing, and finishing to obtain the desired architectural appearance.

c) Be of a high-quality surface finish as defined by having a smooth, even concrete surface free of all honeycombs, protrusions, bulges, projections, offsets, streaks or other surface imperfections.

d) Consistent and compatible material colour of all elevated guideway structural components.

e) Matching texture and finish between cast-in-place and precast elements.

f) Minimize differences in appearance, texture, and colour between concrete and, where used, steel elements.

g) Piers shall be sculpted concrete forms transitioning from the required bearing head width to a lesser cross section at the waist and increasingly tapered to the base. Location of construction joints along the height of all pier columns shall be consistent.

4.6.10.6 CPTED

a) Elevated guideways shall avoid dead ends and hidden spaces from the public visual view.

b) Elevated Guideways shall be provided surveyance system.

c) Side walls and partitions shall be provided with visual transparency in their materials (e.g. fence and noise barriers).

d) Elevated guideways underneath spaces shall be open and avoid hidden spaces or unaccessible situations as a result of the configuration of supporting structural elements or other engineering systems.

e) Space underneath shall be provided with lighting and surveillance.

4.6.10.7 Other considerations

a) Elevated guideways shall provide means of evacuations in compliance with the OBC and other applicable codes and standards.

b) Elevated guideways shall be provided by engineering systems to avoid overflow of rain water or accumulation of big quantities of water or ice in their surface.

4.6.11 Finishes

In the LRT network, materials and finishes shall be durable and shall provision for tamper-proof design to resist vandalism and graffiti (e.g., hammer blows, felt markers, spray paint, burning, and scratching).

4.6.11.1 Concrete Treatment Requirements

Refer to Section 5.6 for requirements on Stops and Section 6.14 for Stations.

4.6.11.2 Anti-Graffiti Requirements

a) LRT infrastructure (horizontal and vertical surfaces) along the corridor, shall be protected with an anti graffiti coat up to 3000 mm high measured from the finish floor elevation

b) 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.

c) Coatings shall not change the appearance of the base material.

4.6.12 Opportunities for Vegetation

The use of vegetation between the LRT track at grade shall be assessed for all new track or extensions. Potential benefits include microclimate temperature moderation to benefit customer comfort and relieve some heat stress on the tracks, storm water quantity and quality improvements, and aesthetic improvements.

Requirements:

a) Track vegetation shall be subject to a life-cycle cost assessment per DS05.

b) Vegetation used shall be in the form of grasses, sedums or low height species.

c) Vegetation shall be drought and salt resistant .

d) Vegetation shall not be planted where vehicular traffic crosses the tracks.

e) Design the vegetation and tracks to clearly demarcate the hazard to pedestrians.

Figure 4-40: Use of vegetation along the Eglinton Crosstown light rail transit (LRT) corridor

4.7 MAINTENANCE & STORAGE FACILITIES

The Maintenance and Storage Facility (MSF) serves as the main operations and maintenance facility for light rail vehicles (LRT vehicles). Its main functions include:

- Storage and service facilities for LRT Vehicles.
- Crew facilities for operating personnel.
- Maintenance and repair for LRT Vehicles.
- Workplace for maintenance and operations employees.

Figure 4-41: Hurontario LRT maintenance and storage facility (MSF) street view

The MSF could be built as one or more separate but interrelated buildings, accommodating the functional components noted above.

Figure 4.42: Hamilton LRT MSF Overhead View

4.7.1 Context, Massing, and Site Response

While the MSF site is typically located in large, vacant, and greenfield lands located outside the cities; there may be cases where they are adjacent to suburban or highly populated areas.

The site layout and design of the MSF will have dependencies such as the immediate context, extent of land, geographic location, as well as adjacencies and proximity to other buildings.

The building massing(s) shall be a clear response to the site conditions and informed by the track layout, functional requirements, urban design and any existing or new developments or expansion of the adjacent lands. Refer to the requirements set out in the Project Agreement for setbacks, building height, stepping, access and parking.

a) The MSF site shall be designed with appropriately scaled landscaping to mitigate visual impact of the maintenance yard.

b) The MSF site shall be secured with a protective barrier surrounding the perimeter of the land to limit public access and reduce vandal activities. Refer to Section 4.5.1 for protective barrier design requirements.

c) Where noise mitigation is required, a variety of treatments, materials, vegetation or a combination shall be considered. The design shall complement the design language of the MSF building.

d) Number of access points to the MSF site shall be minimized and consolidated.

e) If operations and maintenance are in separate buildings, access shall be provided between sites.

f) Service elements such as delivery, loading, garbage collection docks and any yard storage shall be:

   i. Consolidated and located to the back of the site.

   ii. Hidden from view through the means of integrated building components, landscaping, or screening consistent with the language introduced for ancillary buildings.

4.7.2 Architectural Expression and Concept

a) The architectural concept shall be clear, rigorously applied and celebrate the sense of scale with an architectural gesture that responds to its local environs.

b) The built form facing the primary street, site access, and along any public face of the MSF shall create an architectural expression that formally addresses the street. Visible and tangible components of the overall MSF appearance shall create an identity along the publicly visible facades. Through the primary site access, parking shall be distributed to the side and behind the main volume of the building.

c) The overall exterior expression of the building shall be simple, with a clean geometry, and consistent with the line wide design language.

d) The building volumes shall express their linear character with a simple, pragmatic, consistent vocabulary.

e) The steel structure of the buildings shall be carefully considered and detailed simply yet elegantly, since this structural system is the primary architectural element to achieve a compelling visual order, strong geometry and a powerful expression of the rhythm, scale, purpose and quality of the interior spaces that are goals of the design.

f) Exterior elevations shall be thoughtfully designed to express the interior uses.

g) The design shall convey the sense of a vibrant, pragmatic workplace that maximizes natural light and creates a good work environment, celebrating these elements inside and out.

   i. Lighting of the buildings shall be primarily achieved through natural lighting (including windows, clerestory lighting, skylights, or a combination).

   ii. Linear views out of the facility shall be implemented in the design. At maintenance shops, transparency shall be maximized in large-scale access doors for the LRT vehicle.

h) Maintenance and Storage Facilities shall be designed to communicate primarily their technical function.

i) Number of access points to the MSF site shall be minimized and consolidated.

4.7.3 Architectural Elements

4.7.3.1 Main Entrance Requirements:

a) The main entrance shall be easily identified from a distance when approaching from the primary street entrance.

b) The entrance area shall visually communicate the Metrolinx and/or specific LRT line identity with the use of the kits of parts strategy.

c) A public outdoor amenity space or courtyard shall delineate the main entrance area. It shall incorporate both hard and soft landscape elements connecting both interior and exterior spaces.

d) Bicycle parking shall be incorporated near the main entrance for both conveniences for cyclists and to convey the sustainability goals of the facility.

4.7.3.2 Roof Requirements

Design of the MSF roof is important from a sustainability and an aesthetic perspective. The roof represents an opportunity to reduce the building's heat island effect, through a combination of green roof and high albedo roofing materials.

a) The roofscape shall explore the possibility of rainwater collection that can be used in the washing of LRT vehicles.

b) Roof design shall be simple as seen from above. The design shall carefully mask and organize the mechanical units.

4.7.3.3 Building Envelopes, Glazing, and Materiality

a) The material palette shall be durable, beautiful in an elemental way and consistent with the line-wide design language.

b) Particular attention shall be paid to the articulation of the roof/wall and the resolution of aesthetic/functional details, including the incorporation of glazing and the way the wall engages the ground plane.

c) Glazing shall not extend below 300 mm for functional reasons and to maintain the strong, dynamic quality of the building.

d) High natural lighting levels in working areas shall be achieved through a combination of clerestory glazing and transparency (e.g. skylights, etc.) incorporated in the roof.

4.7.3.4 Sustainability

The LEED requirement for the MSF is Gold Certification. Refer to DS-05 Sustainable Design Standard for additional requirements.

4.7.4 Landscape and Urban Design

The landscape and urban design plan represent an opportunity to extend the sustainability principles of the building design into the surrounding site and its participation in regional watersheds. The landscape approach shall incorporate the following:

a) Maintain the continuity of open spaces within the urban area through:

   i. Develop a sustainable landscape strategy that aids in place-making and encourages a bio-diverse environment.

b) In the MSF, any storm water management pond shall be appropriately positioned and take advantage of opportunities to provide visual interest from adjacent streets and designed to provide attractive and comfortable outdoor break amenity areas for employees in addition to enhancing wildlife habitat.

c) The landscape plan shall also reflect the site sustainability requirement and storm water management plan.

d) Landscaping shall restore/enhance ecological function to the site through feature optimal naturalization and the use of native planting materials species (which both provide habitat and reduce the need for irrigation and chemical application), the use of permeable surfaces, and the use of native trees, LID (low impact development) features such as and bioswales around all parking areas and maintenance buildings, with minimal use of grass mown turf and annual planting. Native trees are generally preferred, particularly adjacent to natural areas. In harsh planting conditions, non-native trees can be used to increase survivability and planting health. Refer to DS-05 Sustainable Design Standards for the allowance of non-invasive non-native species.

e) Hardscape elements of the landscape design shall complement the design language of simple, clear rectilinear architectural elements, reflect a simple and contextually considerate design, integrating with adjacent landscape, patterns and colours, and reflect higher standards in terms of materials and finishes using prefinished, vertical and horizontal flat bars rather than wire.

f) Where possible, protective barrier shall be buffered with native "meadow" or shrub planting to minimize visual impact. Where protective barrier is required at public facing areas, decorative protective barrier that complements the architectural expression of the building shall be used.

g) Where protective barrier is required, it shall not obstruct clear views into and from the public areas following the principles of CPTED.

4.7.5 Ancillary Buildings

a) Any building in the MSF compound used for storage of servicing vehicles and equipment shall be treated with the same design requirements as the main MSF building, including design language, cladding type and materials, windows and doors.

   i. Placement shall be behind the main MSF building (relative to the main public view/approach) unless demonstrated not possible.

b) Where the ancillary building is large enough to visually integrate with the main building to a significant degree, the building shall be located to act in concert with the main MSF building to help in developing elements of the site to a higher degree with elements such as street edges, forecourts/plaza, entry sequence, etc.

Figure 4.43: Hurontario LRT MSF Building

4.8 LIST OF FIGURES & TABLES

5.0 Stops Architecture

5.1 PLATFORMS

The Stop platform is a destination point with amenities to serve the customers as they wait for the next train. The platform comprises of design elements that have a direct relationship with one another, and it is essential to account for these synergies and adjacencies during the early planning stages.

The platform design elements include:

- Access: horizontal or vertical (for elevated platforms)
- Circulation space
- Seating and Designated Waiting Area (DWA)
- Platform Edge Doors (PEDs) and interface with train
- Service areas (electrical panels, among others)
- Information panels
- Furniture and fixtures
- Third-party advertising

The main platform locations include:

i. At grade

ii. Elevated (or above grade)

iii. Below grade

The varying platform locations above shall create a consistent customer experience and maintain a consistent look and feel based on the kit-of-parts approach developed across the line. The elements that make up the kit-of-parts include but are not limited to vertical circulation, DWA, materials and finishes, modularity, and feature elements such as walls and/or ceilings.

Information such as ridership, exit surges, queuing areas and site-specific requirements related to platform detailed design will inform platform sizing.

5.1.1 Platform Typologies

In the LRT network, different site conditions will influence the track alignment, impacting the platform configuration and customer experience.

The following diagrams represent the typical platforms:

- Centre Island Platforms
- Parallel Platforms
- Far Side Platform
- Staggered: Near Side Platform
- Staggered: Curb Side Platforms
- Stacked Platforms

a) Tapered area (space beyond the platform) shall be landscaped and coordinated with the respective municipality.

b) Centre island platform shall be designed with seating and static signage facing both boarding sides.

c) Platform location shall be coordinated with the respective municipality and Traffic engineering.

d) For elevated structures, noise walls and screening shall be provided to mitigate the visual and physical impact to adjacent properties.

5.1.1.1 Centre Island Platform

A centre island platform is a single platform that can be placed at either side or above the intersection. For at-grade locations, centre island platforms (with two vehicles in opposite directions stopping at the same time) provide a convenient use of the space as well as centralizes the amenities and equipment on one platform with a canopy.

For above-grade locations, centre island platforms are preferred over side platforms as they allow a more efficient utilization of vertical circulation, offer convenient cross-platform transfer where required, and accommodate higher capacity of surges in traffic flow especially during service interruptions. This configuration also provides more flexibility for planning queuing to get off/on stairs, escalators and elevators and pedestrian circulation.

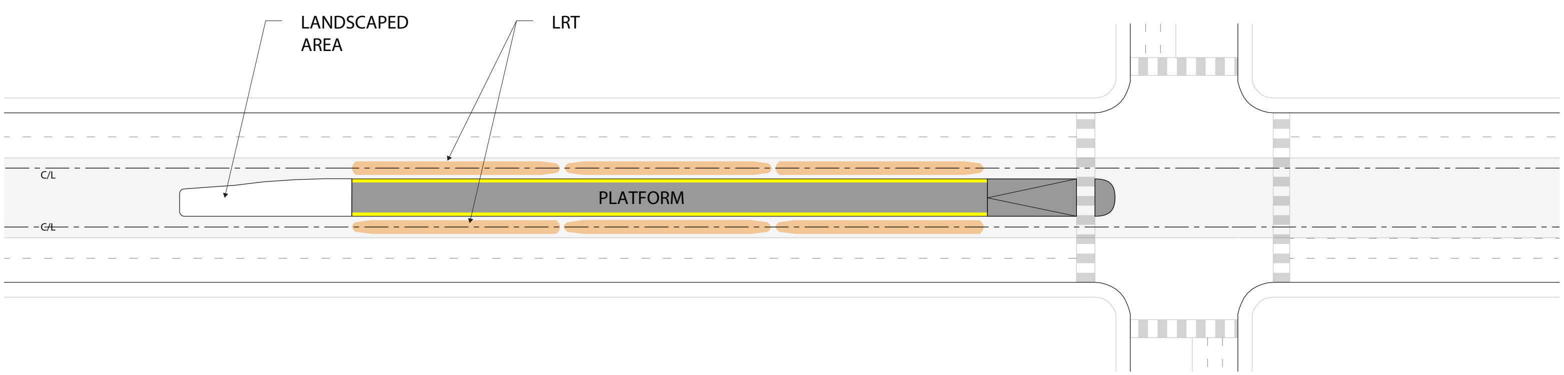


Figure 5-1: Centre Island Platform

5.1.1.2 Parallel Platforms

Parallel platforms are two side platforms that can be placed before or after the intersection. For at-grade locations, parallel platforms are more commonly used. This configuration allows boarding and alighting to be on the same side of the platform.

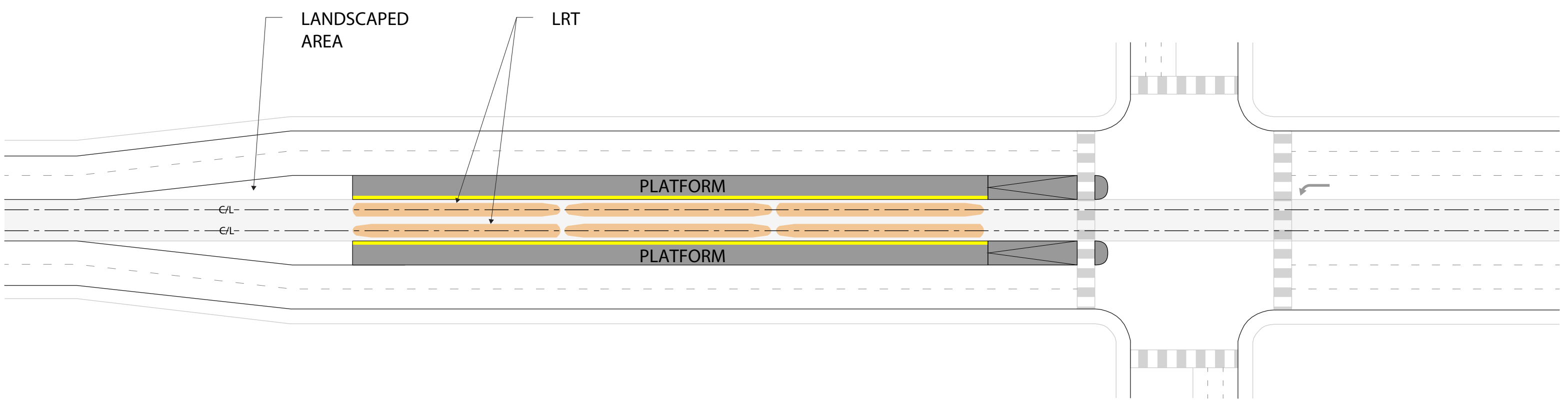


Figure 5-2: Parallel Platforms

5.1.1.3 Staggered: Far Side Platform

Far side platforms (or staggered) are located beyond the intersection in the direction of travel, where deboarding and alighting happens after the LRT vehicle passes the intersection. Far side platforms are provided at most locations where eastbound and westbound left turn lanes are permitted because they best conform to the intersection geometry and minimize the impact to adjacent property.

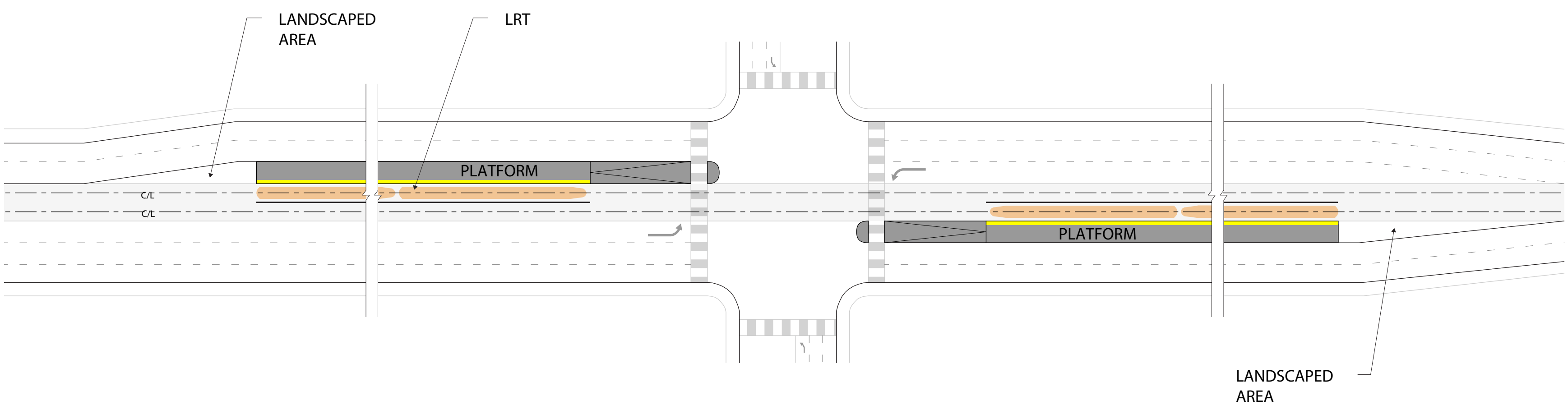


Figure 5-3: Far Side Platform

5.1.1.4 Staggered: Near side Platform

Near side platforms (or staggered) are located before the intersection in the direction of travel, where boarding and alighting happens before the LRT vehicle reaches the intersection. They are provided at major intersections where east and west left turns are prohibited. Near side platforms are provided at these locations because they do not require the LRT from double-stopping (e.g., stopping once at a red light, and then stopping again at the platform).

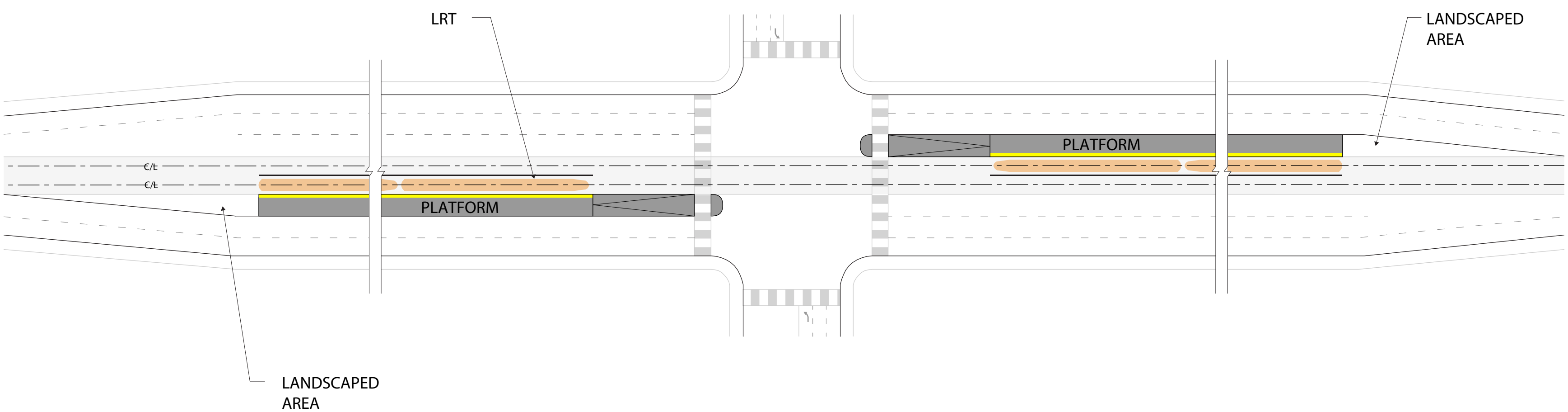


Figure 5-4: Near Side Platform

5.1.1.5 Curbside Platform

Curbside platforms may be a more convenient configuration for customers as access is from the sidewalk and crossing the road is not necessary. This configuration requires major traffic and signaling coordination when the corridor is shared with road vehicles.

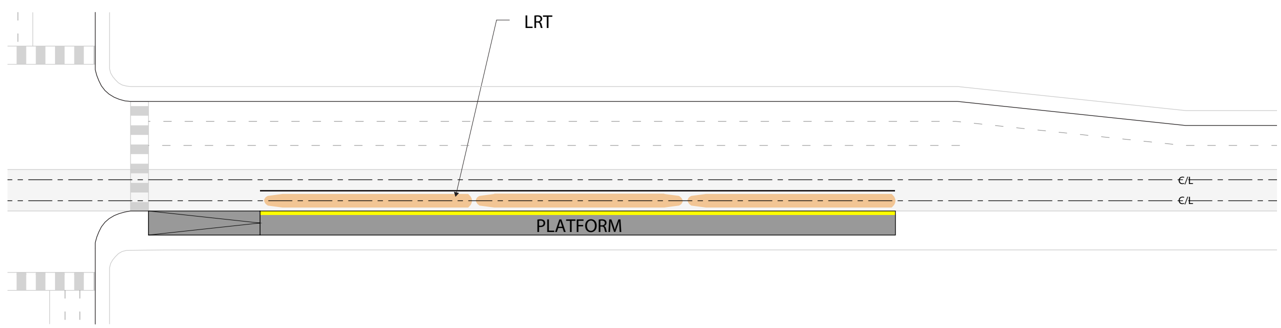


Figure 5-5: Curbside Platform

5.1.1.6 Stacked Platforms

Stacked platforms occur when a platform for each track is split onto two or more levels. This configuration may be the result of a narrower corridor and high ridership, requiring the platforms to be stacked above each other.

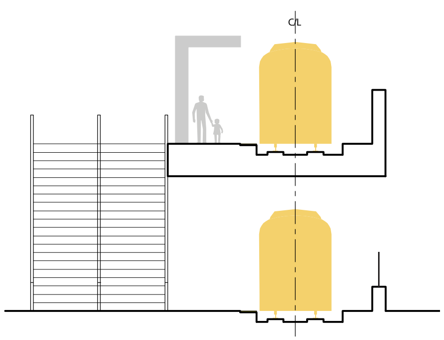


Figure 5-6: Stacked Platforms, Above grade

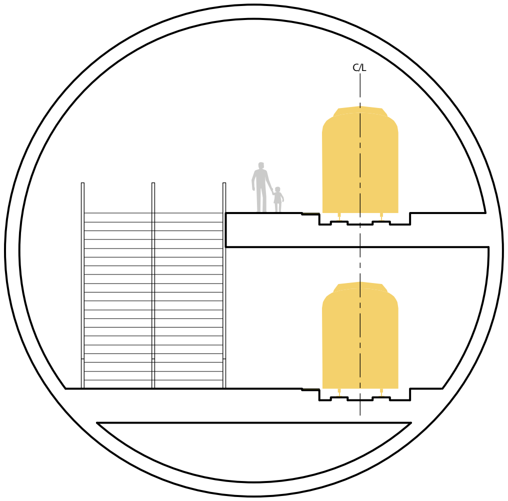
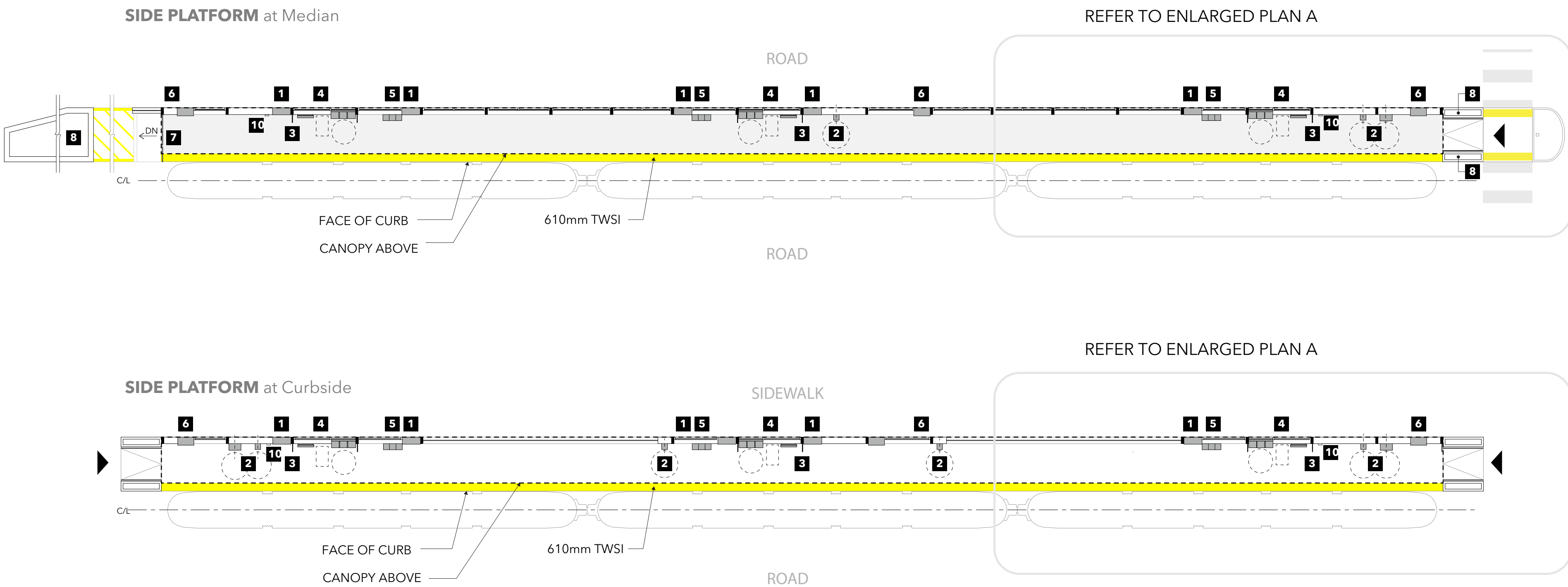


Figure 5-7: Stacked Platforms, Underground

5.1.2 Detailed Plan Layouts



- **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, GFCI and USB outlets
- **7** Platform Endgate
- **8** Planters
- **9** TDI
- **10** PAI

Figure 5-8: Side platforms at median and at curbside

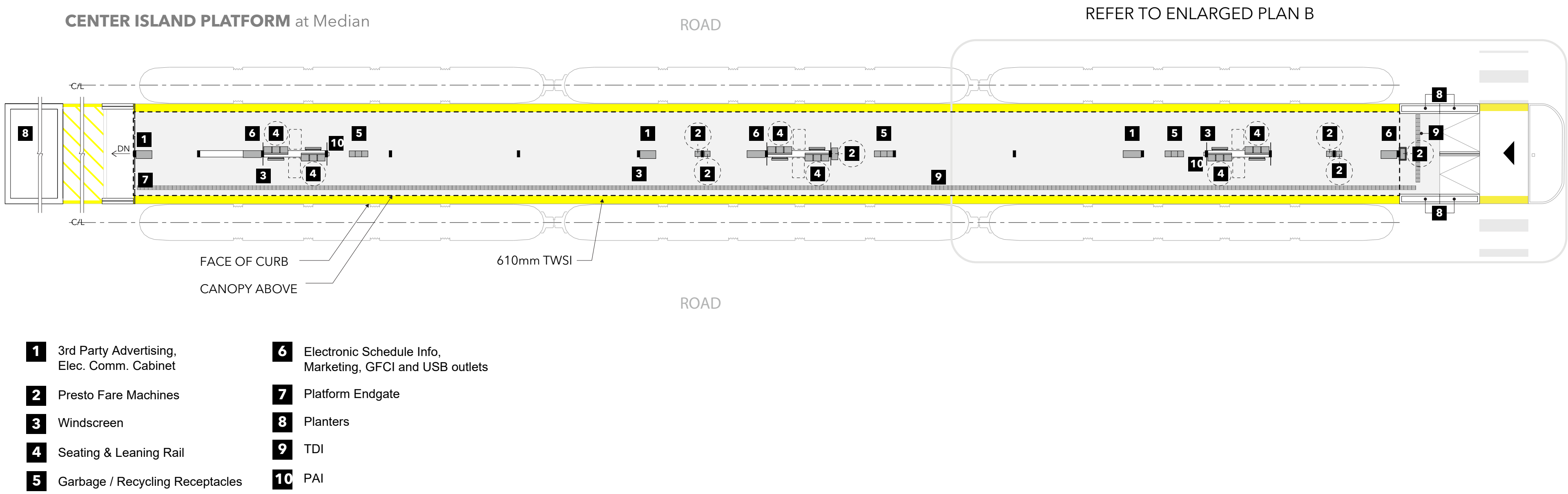


Figure 5-9: Centre island platform at median

5.1.3 Design Criteria

a) Platform width shall be subject to analysis. Where it can be demonstrated that existing corridor widths are insufficient to allow for any identified clearance requirement, the designer may seek permission from the appropriate Metrolinx SME team and/or Engineering to deviate or 'seek relief'.

b) 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 and curbside platforms.

c) The platform height shall be coordinated with the fleet finish floor elevation height.

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

e) Platform edge shall accommodate the Tactile Attention Indicator of 610 mm wide.

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

g) The horizontal gap between the platform edge and stationary vehicle shall be no more than 76.2mm (3 inches).

h) Platforms shall have reduced 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.

i) Vertical and horizontal circulation leading to the Stop platform shall satisfy the minimum width requirements by code and standards as well as the pedestrian modelling analysis based on the ridership at peak hours.

j) The key dimensions that define the platform shall be as follows (Figure 5-10 to 5-12):

   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 and device spacing.

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

   iv. 610 mm Tactile Attention Indicator.

k) Railings in slope floors shall be placed following OBC.

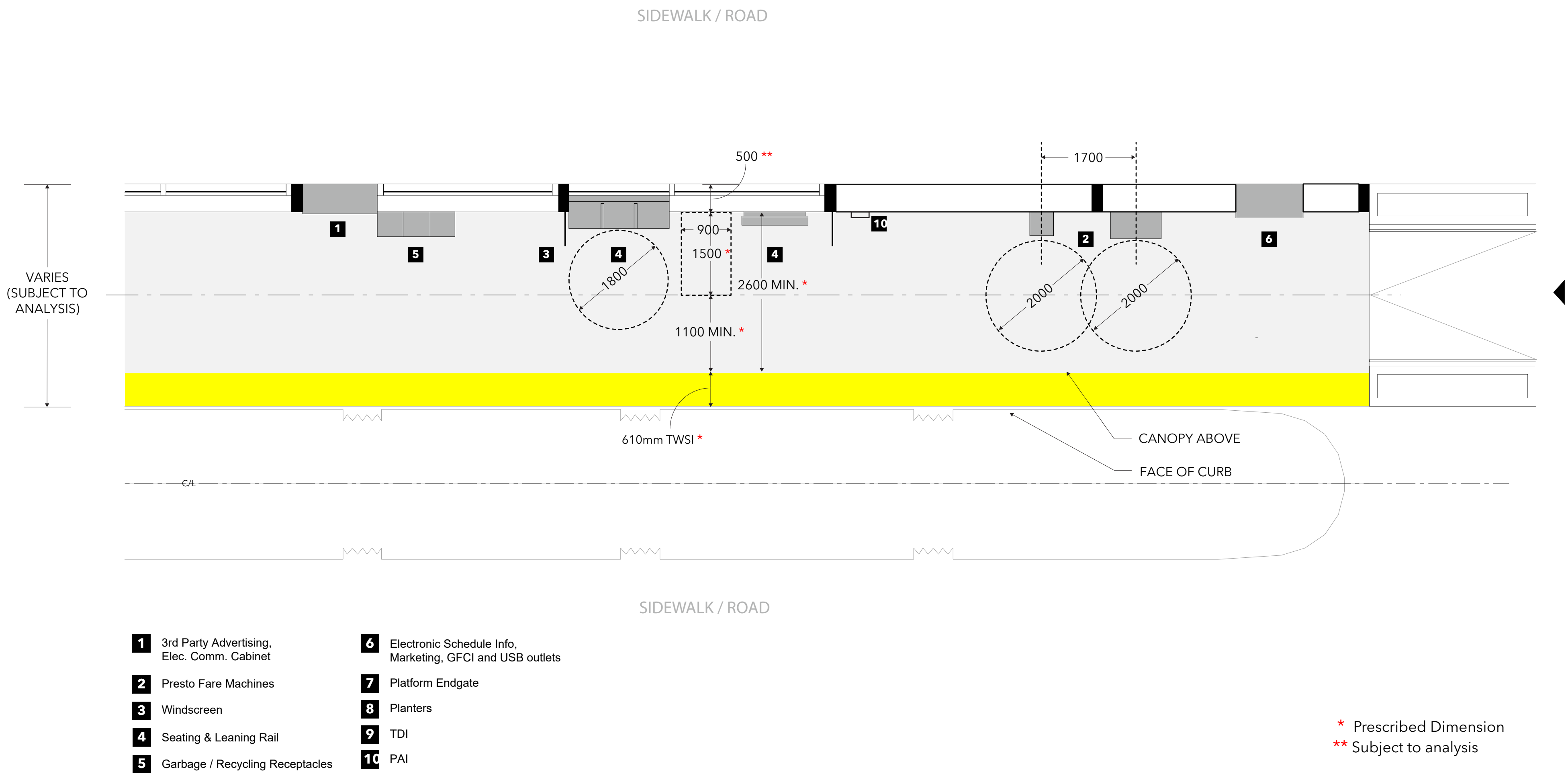
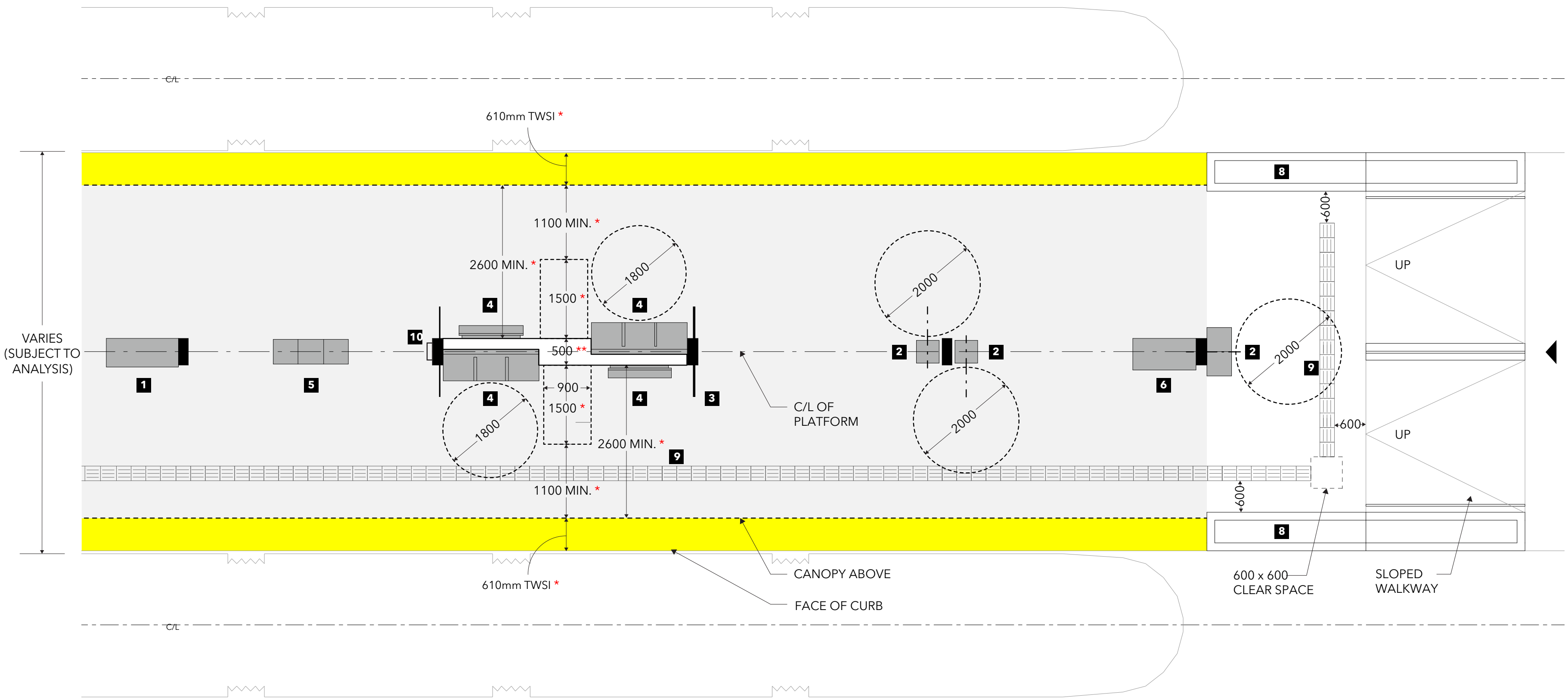


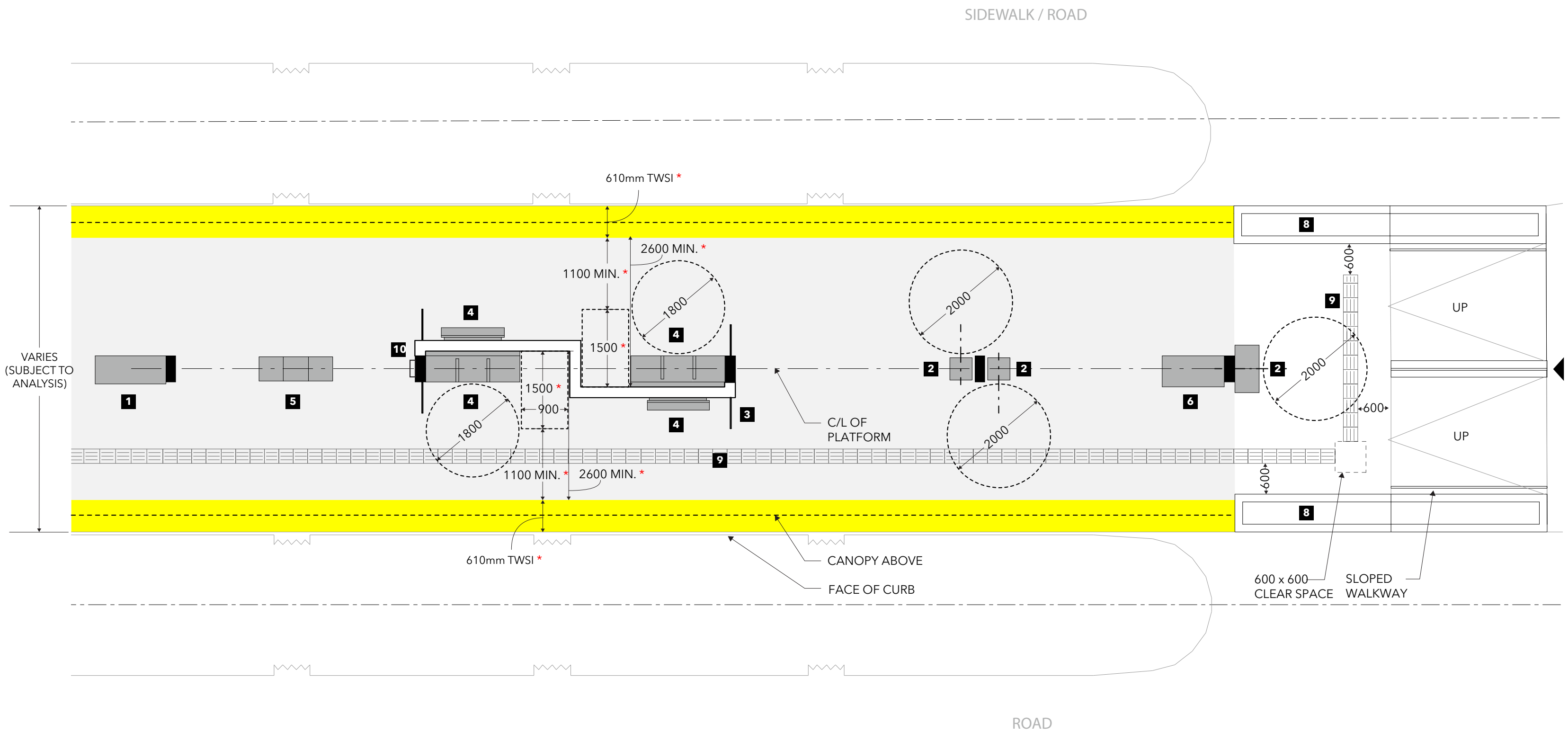
Figure 5-10: Enlarged plan of a typical side platform



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, GFCI and USB outlets
7 Platform Endgate
8 Planters
9 TDI
10 PAI

* Prescribed Dimension
** Subject to analysis

Figure 5-11: Enlarged plan of a typical centre island platform



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, GFCI and USB outlets

7 Platform Endgate

8 Planters

9 TDI

10 PAI

* Prescribed Dimension
** Subject to analysis

Figure 5-12: Enlarged plan of a centre island platform with reduced platform width

5.1.4 Platform Access and Accessibility

5.1.4.1 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 enroach on or overlap with the Tactile Attention Indicator surface or painted warning strip at the edge of the platform.

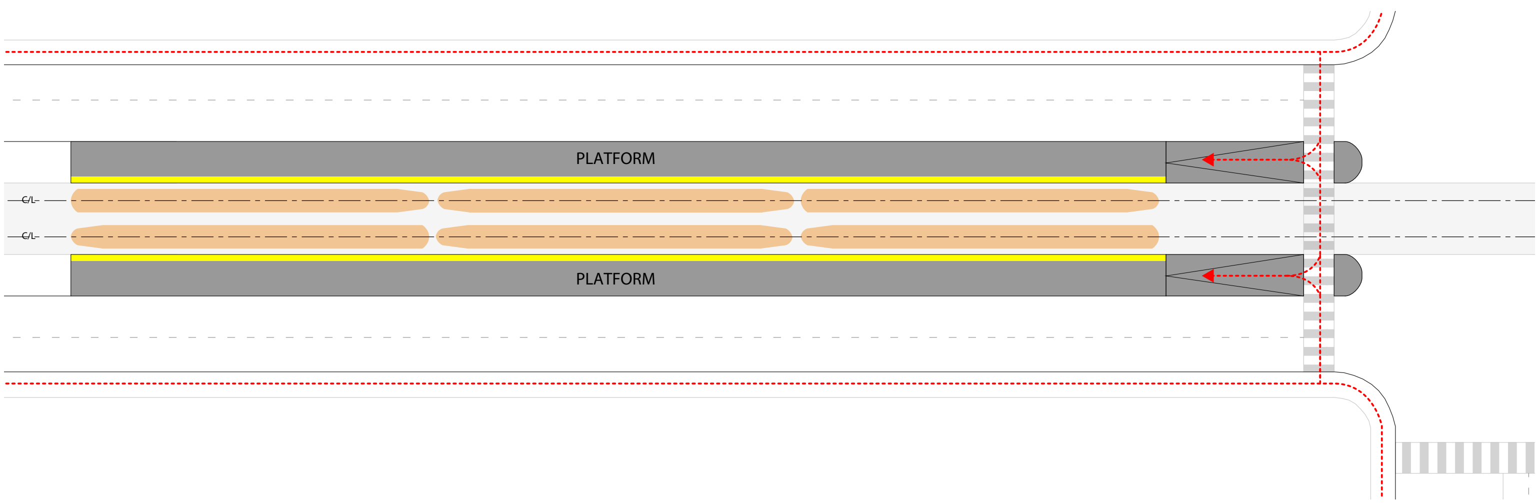


Figure 5-13: Horizontal Access - Centre Island Platform

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 platform may be designed to allow access from the sidewalk at either end of the platform.

b) Vertical Access:

Typically, for at grade tops, there will not be significant grade elevation changes that require vertical circulation elements to access the platform such as stairs and elevators.

LRT platforms are located at a fixed vertical distance from the top of the rail, to have a consistent rail system along the network. This vertical distance makes the top of the platform slightly elevated from the adjacent sidewalk; therefore, a sloped floor or ramp to access the platform at the access point is required.

In certain scenarios where the LRT stop platform is located in a U street section (trench), see figure below, vertical circulation elements from adjacent areas is required:

i. Stairs shall be provided.

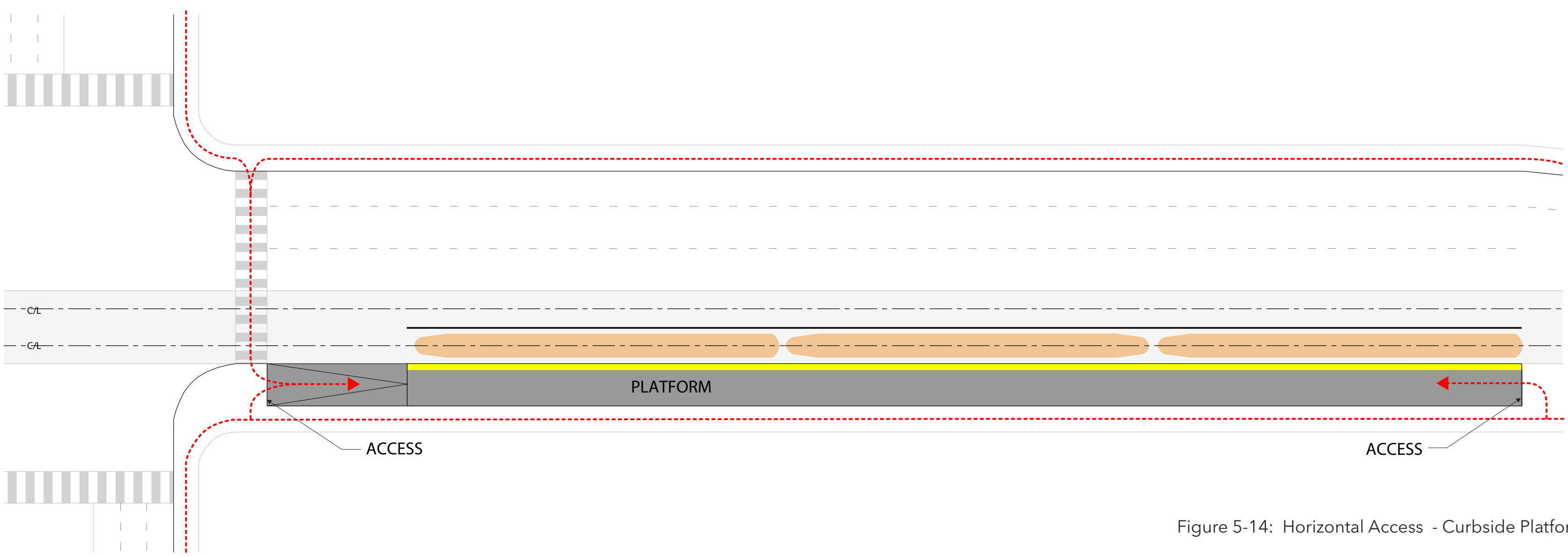


Figure 5-14: Horizontal Access - Curbside Platform

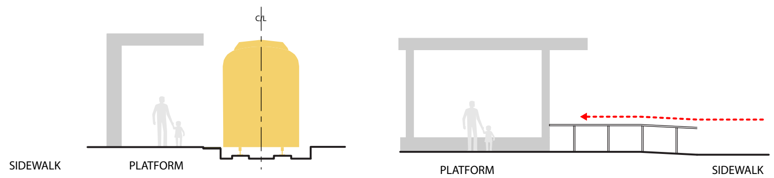
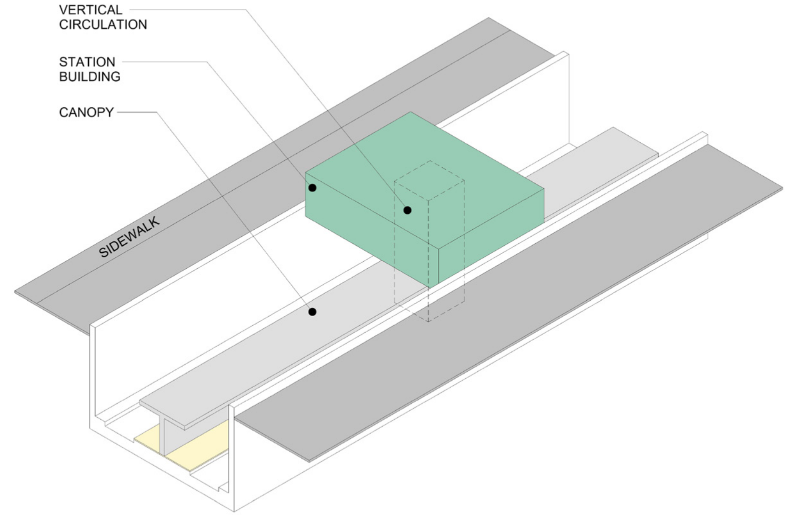


Figure 5.15: Access

b) Elevator, ramps or Sloped floors shall be used to provide barrier free access.

c) Vertical circulation elements shall be required to be enclosed and fire protected.

For accessibility requirements refer to DS-02 Universal Design Standard and the Ontario Building Code. Colour contrast and luminance for elements in the LRT network shall be designed in conformance with the requirements in DS-02 Universal Design Standard.



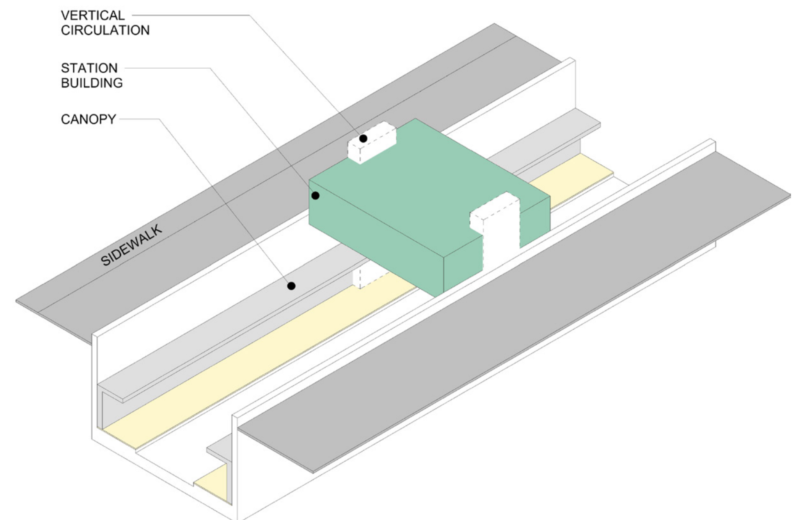


Figure 5-16: Vertical access – curbside island and side platforms

5.1.5 Tactile Walking Surface Indicators

There are two different TWSI types to be used within the Metrolinx LRT Network:

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.

   ii. Tactile directional indicator surface (elongated flat top bar surface) facilities 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.

c) Tactile attention indicators (TAIs) shall:

   i. Meet the technical, functional and application requirements under DS-02 Universal Design Standard.

   ii. Be included across the entire width of the hazard with a depth of 610 millimetres,

   iii. Have one side against the edge of the hazard, unless otherwise indicated in this Standard;

d) TAIs shall be located:

   i. At the top of stairs;

   ii. At curb cuts;

   iii. At all unprotected platform edges.

   iv. An entry into a vehicular route or area where no curbs or other elements separate the vehicular route from a pedestrian route such as a level median refuge island.

e) Tactile direction indicators (TDIs) shall:

   i. Be installed on at-grade centre platforms along the full length of the platform.

   ii. Be consistently offset closer to the northbound and westbound platforms to provide consistency and predictability.

   iii. Include an "L" shape catchment area at the top landing of the sloped walkway leading to the platform, extending across the full width of the sloped walkway.

   iv. Not be provided at side platforms for at-grade stops.

   v. Be configured to be simple and direct, with changes in direction at 90-degrees.

vi. Be minimum 300 mm in width.

vii. At turns and decision-making points the direction tiles shall stop on either side of a 600 x 600 mm level and unobstructed ground/floor area.

viii. Have a clear space of 600 x 600 mm at an end point.

ix. Have minimum 600 mm smooth and obstruction-free floor walking surface on both sides of the TDIs to assist with tactile differentiation.

x. Be simple and intuitive by limiting the number of decision points along the TDI path.

xi. Be located 1000 mm from a fare payment device.

xii. Consist of integrated tiles with tonal contrast through colour.

xiii. Comply with Metrolinx Universal Design Standard (DS-02) and CSA B651, Accessible Design for the Built Environment.

For additional information regarding Tactile Walking Surface Indicators (TWSI) including both attention indicators and guiding indicators, refer to the DS-02 Universal Design Standard. Figure 5-12 provides an example design solution of the TDI path.

5.1.6 Platform Edge Doors

In the LRT network, the provision of Platform Edge Doors (PED) will reduce the risk of people accessing or falling on the track. PEDs shall be considered and required on a project basis.

For requirements regarding the Underground LRT Stops refer to Section 6.6.4.

5.2 SHELTERS

Shelter design 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 to accommodate all amenities and services . Passenger comfort and protection from weather and road-side vehicles shall be prioritized in shelter design. Careful integration of these 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 weather as they proceed from the platform to revenue vehicle. Refer to Section 6.2.5.1 for alignment with Station kit of parts.

a) Amenities such as seating, glass wind protection, waste receptacles, fare devices, information, signage, and advertisements shall be integrated so as to maintain a clean and uncluttered space.

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

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

d) Vision glass shall be laminated and tempered.

e) Shelter and platform designs shall meet accessible maneuvering clearances as per the DS-02 Universal Design Standards.

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) Shelters shall be provided with CCTV surveillance cameras to provide coverage of entire platform areas including access, as set out in Project Agreement.

h) Shelters shall be designed with durable, easy to clean, resistant materials.

i) Shelters base walls shall resist vehicular accidental impacts.

j) Shelters shall be designed with seating. Refer to Section 4.4.1.3 Furniture.

k) Shelter lighting shall be in accordance with Section 5.5 Lighting.

l) Fare vending equipment and signage shall be strategically located on the amenity wall so that the passengers may use the equipment/signage in the same sequence as their general direction of travel.

m) Windscreens shall be provided in the LRT stops, based on the need from 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 back wall 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.

n) 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.

o) 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.

p) Drainage system shall:

   i. Be hidden in the back wall.

   ii. Be located to facilitate maintenance and access; and

      1) Access panels shall match design language of adjacent surface.

   iii. Discharge water away from the platform or adjacent areas to avoid slip and fall.

q) Where possible, stormwater diverted from the canopy shall be used for passive irrigation of planters.

r) Trench drain or catch basin shall be located away from the path of travel.

s) 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.

t) Canopy and shelter size shall respond to the following considerations:

   i. Ridership:

   This design standard assumes that the preliminary analysis has taken place including the analysis of projected ridership, track alignment and existing conditions.

      1) Shelter size shall respond to the pre-established platform size.

2) Shelter size shall cover seating area and fare devices.

3) Full canopy coverage shall be provided along the platform as a minimum at Stops with heavy customer volume. Where heavy customer volumes are not achieved, canopies on the platform shall be coordinated and located such that they align with the train doors.

4) Shelter design and size shall be confirmed with Metrolinx Stations and Facilities EAM.

ii. Location and connection to other lines:

1) Design of the shelter shall be coordinated considering existing conditions (e.g. slope).

2) Early coordination with the Civil and Track disciplines shall be made to ensure the feasibility of the shelter design.

3) Shelters access and connections shall be designed considering surrounding transit facilities (e.g. Subway, BRT Stations)

iii. Fleet:

1) Extent of the shelter size shall consider the length of the operating fleet model in the LRT network.

u) All elements such as lighting, signage and cameras shall be organized and aligned with ceiling design, including alignment with seam or joint.

v) The LRT Stop shall organize amenities and passenger flows in alignment with right-hand-flow principles on approach to Stop.

w) 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.

ii. Mechanical piping for drainage and electrical lighting fixtures shall be accommodated between canopy structural supports.

iii. Routing of piping and conduits shall be made in spaces between the structural supports avoiding adding thickness to the canopy.

iv. Connections to vertical risers in the back wall of the canopy shall be coordinated with structural elements, avoiding increasing the thickness of architectural elements.

x) Stepping of the shelters due to slops 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.

Figure 5-17: Stops Canopy

5.2.2 Feature Elements

a) Feature elements shall provide a unique and recognizable Stops identifier;

b) Feature elements shall provide architectural expression that provides visual interest and contrast with base walls, ceiling and floors.

c) Feature elements shall be located such that they provide physical cues that support intuitive wayfinding along the journey from entrance to platform and vice versa.

d) Where applicable, feature elements shall provide additional functions, such as:

   i. Solar screening when located on the exterior; and

   ii. Acoustic attenuation within the Stops.

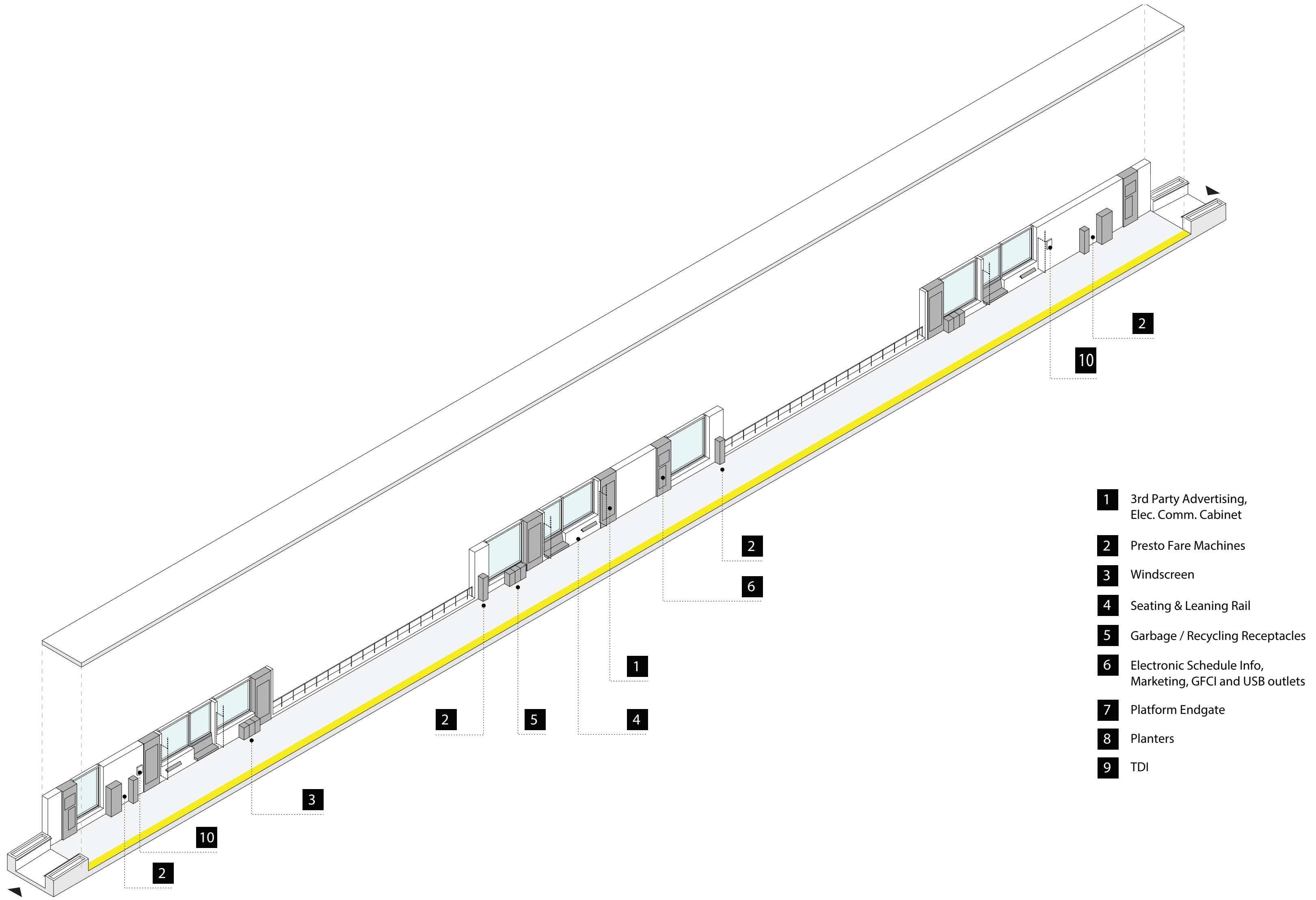


Figure 5-18: Open Shelter at Curbside, Side Platform

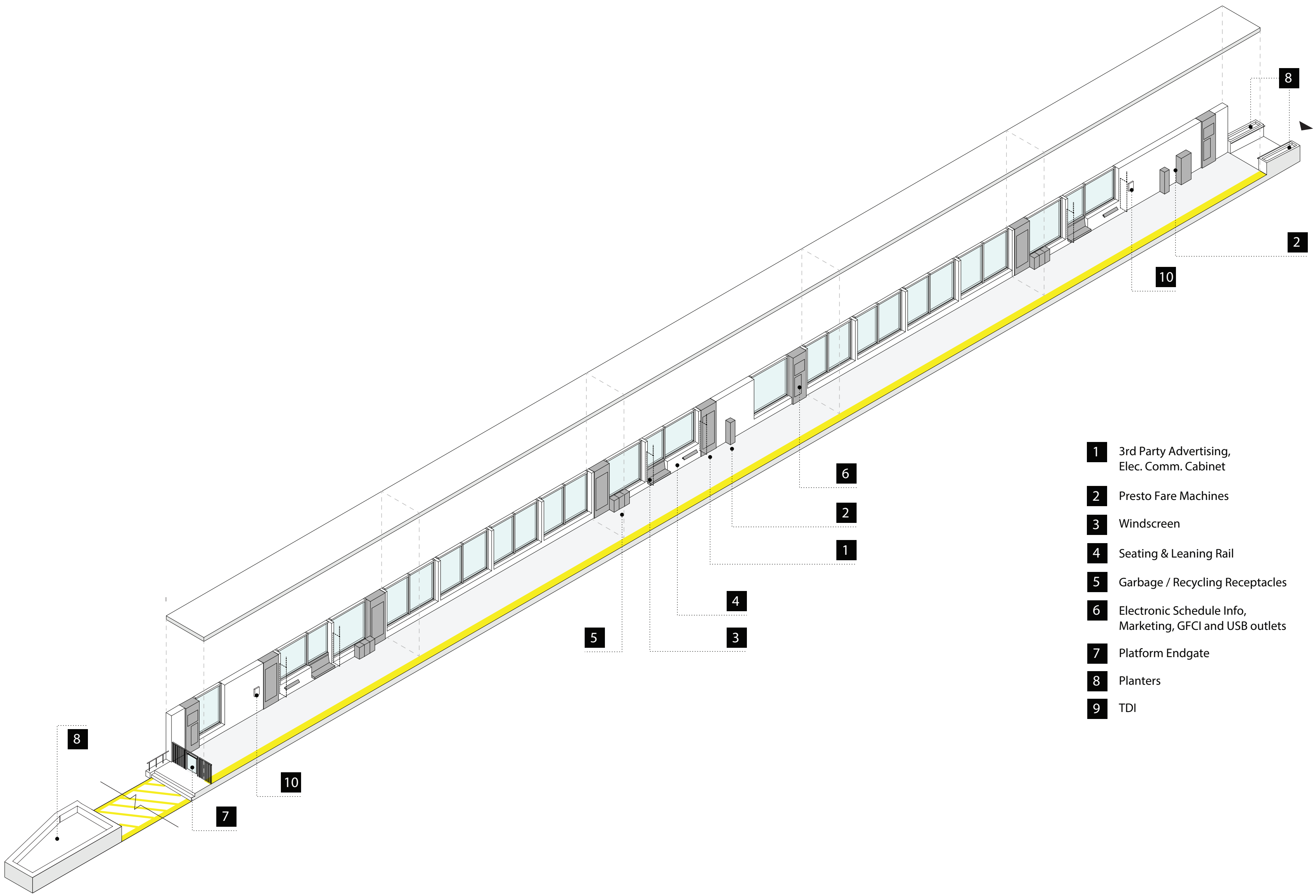


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Figure 5-19: Shelter at median, Side Platform

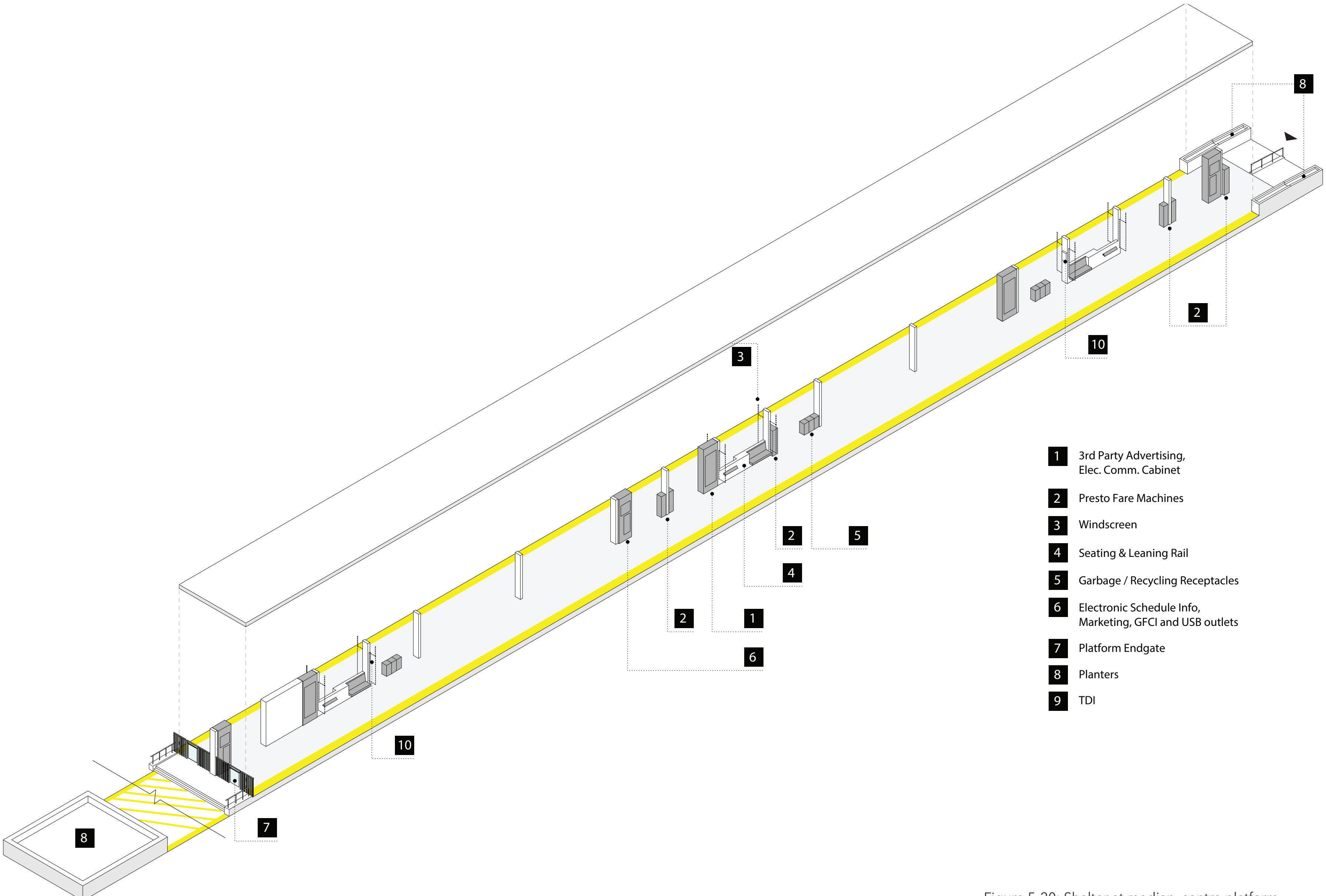


Figure 5-20: Shelter at median, centre platform

5.3 FIXTURES AND FURNISHINGS

Note: Refer to Section 4.4.1.3. 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 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 interaction with vehicles.

   ii. Where the permits, raised planters shall be provided in lieu of guardrails.

      1) Plants shall be 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 to requirements in DS-02 Universal Design Standard.

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 (e.g., materials, proportion, profile, colour, and finish) across the line.

5.3.2 Ticket Vending and Fare Purchase

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.

a) Fare vending devices shall be on each platform, so that crossing tracks is unnecessary.

b) To facilitate device upgrades in the future, fare vending devices shall be installed on level ground, and restrictive architectural elements (e.g., narrow alcoves) shall be avoided.

c) Fare vending devices shall be sheltered.

d) Fare devices shall have stronger lighting level that the rest of the platform. Refer to Section 5.5 Lighting.

e) For additional information on PRESTO fare vending device installation (including device number, space allocation, positioning, and accessibility requirements), refer to the PRESTO Service Design Standard.

5.3.3 Off-Board Fare Payment Devices

Offboard fare equipment 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 face 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 don't have to tap or scan their fare payment media as they board.

a) Offboard fare payment devices shall be close to each platform entrance, so that payment can always occur before boarding.

b) Minimum of two offboard fare payment devices shall be provided at each entrance, for redundancy.

c) The offboard fare payment devices shall be arranged to enable safe and easy use whether entering or exiting the platform, in case tap-out for integrated fare by distance is enable in the future.

d) For additional information o 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: Advertising

All advertising shall follow requirements as per DS-02 Universal Design Standard.

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 conflict with the LRT operational signage, information maps and arrival times, and visibility of the platform 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.

5.4 ANCILLARY ELEMENTS

5.4.1 Electrical and Utility Cabinets

a) All ancillary equipment (uninterruptible power supply [UPS], power, communications, etc.) shall be integrated with the shelter backwall.

b) Where it is demonstrated physically impossible to integrate and pending Metrolinx team 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

      2) At adjacent land for curbside platforms and in coordination with Metrolinx and the respective municipalities.

      3) Utilize the same colour and finish as the shelter design.

d) Electrical cabinets, mechanical elements, vents, and IT system cabinets, etc. shall be screened from public view using material palette that is consistent with the shelter design language.

e) Access panels shall be detailed with carefully resolved material intersections, connections, and transitions for seamless integration and appearance.

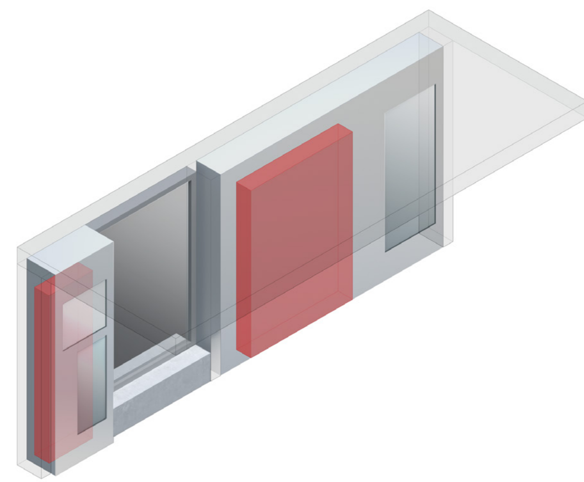


Figure 5-21: Electrical and utility cabinets

5.4.2 Access Hatches and Handwells

a) LRT Stops design shall incorporate access for installation, cleaning, inspection and maintenance without jeopardizing the safety of LRT 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) Access hatches and handwells shall be laid out efficiently to minimize the amount and size and shall be consolidated to reduce visual impact.

d) Access hatches and handwells shall visually blend with the surrounding areas. When located on the floor and walls, these elements shall accommodate surrounding finishes.

e) Coverplates for access hatches shall be integrated with the adjacent surface at Stop 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.

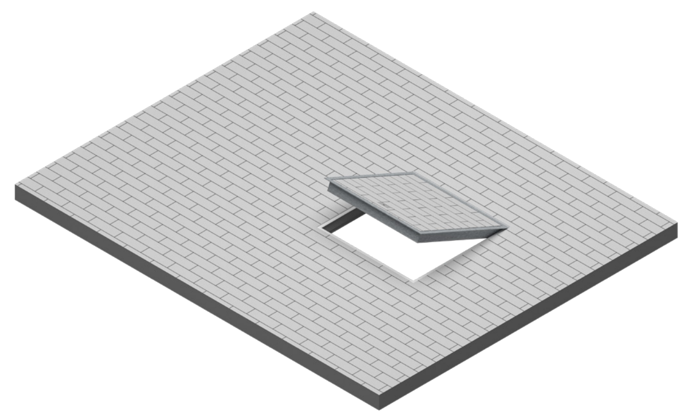


Figure 5-22: Access hatch

5.5 LIGHTING

Lighting at Stops 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 4.3.1.4.

5.5.1 Design 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.

c) Lighting of the general waiting area shall emphasize system graphics, information messages, and fare 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) Platform edge shall be uniformly lit.

f) Lighting strategy shall mitigate shadows cast by passengers and this shall be demonstrated in photometric analysis.

g) Wayfinding and information signage shall be well illuminated.

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, integrated and be integrated into shelters wall or ceiling treatments 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 to complement the architectural finishes and colour palette.

   iv. be selected to complement the architectural design and scale.

j) Ceiling lights shall be accessed 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 (IENSA) 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/DWA/PAI	250
Fare Equipment/Signage Areas/Digital Signage	250
Uncovered Platform Ends (service areas)	50

Table 5-1: Illumination Level Per Zone

5.6 FINISHES & MATERIALS

Architectural finishes and materials along the customer journey in the LRT network contribute significantly towards the customer experience. The design shall be applied in an elegant, and modern architectural expression. More specifically, finishes that are smooth and designed to emphasize movement, are recommendations that support and reinforce this statement.

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.

Refer to Appendix B: Finishes and Materials for additional information.

a) Materials used shall be integral and homogeneous throughout. Materials with applied coatings that can be easily scratched shall be prevented from being specified.

b) In heritage or retrofit conditions, existing Station finishes may inform the design strategy of the new Station.

c) Lifecycle costs and ease of operations and maintenance shall be factored into material and finish selection.

d) At Stops, the knee wall acts as a traffic barrier and service spine, shall comply with the following:

   i. Connections shall be concealed and flush to member faces.

e) Concrete shall be modulated following the platform canopy modulation.

f) Exposed vertical concrete shall be treated with light sandblasting finish and a transparent anti graffiti coat.

g) Horizontal walking concrete finish at Stops shall be firm, level and anti-slip resistant. Refer to DS-02 – Universal Design Standard.

5.6.1 General Requirements

a) The stop design shall employ the kit of parts in service of a consistent and recognizable Station identity.

b) Materials, finishes, colour and texture shall be composed in an organized visual appearance.

c) A minimalistic approach shall be employed with detailing to support massing concept.

d) Material intersections, connections and transitions shall be carefully resolved with elegance in detailing.

e) Cabinets in general shall be screened from public view using consistent screen and material palette from the kit-of-parts.

f) The design shall comply with sustainability requirements identified in Section 3.1.2 – Sustainable Design Requirements.

g) The Stop design shall comply with CSA S478 Guidance on Durability in Buildings.

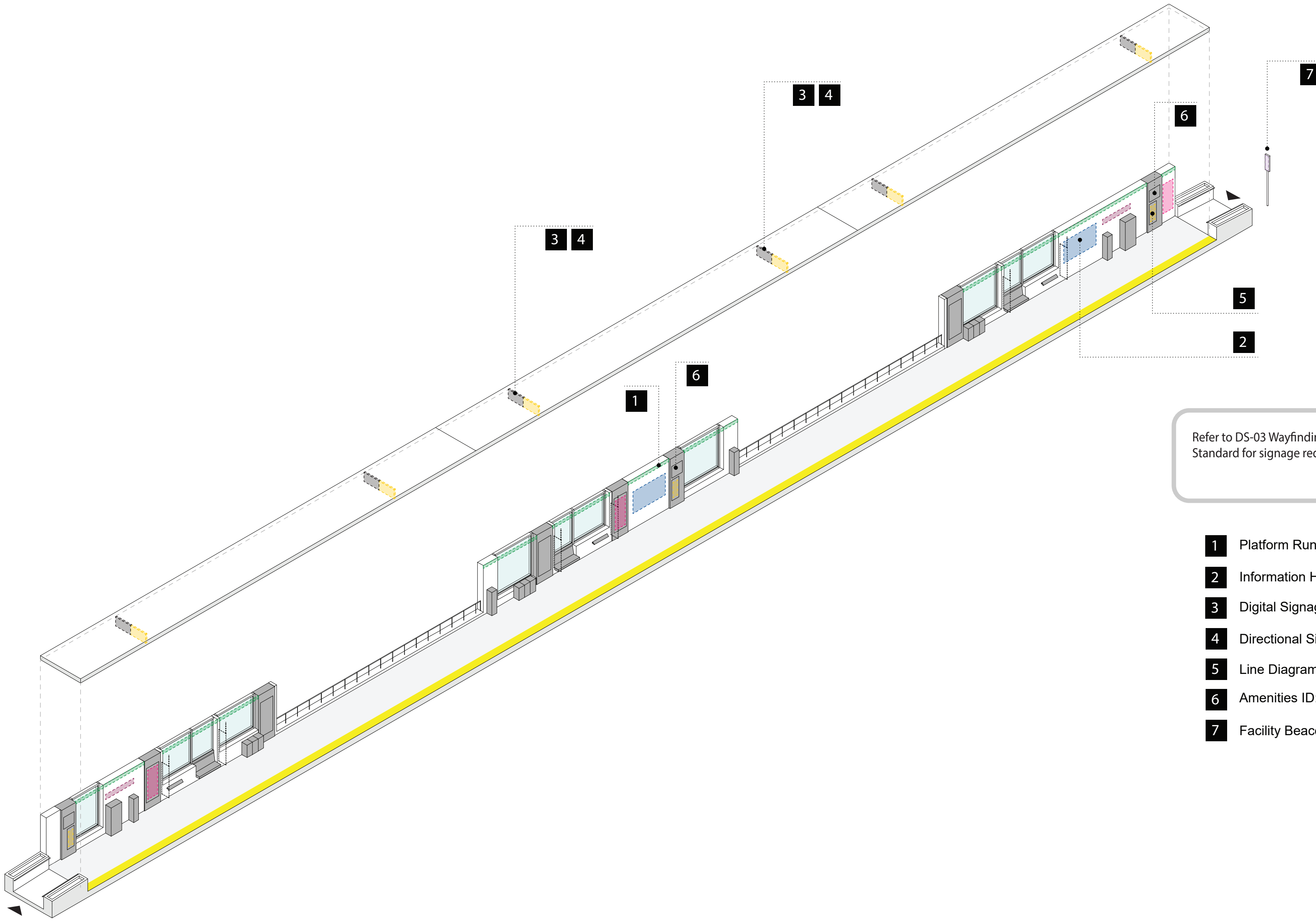
h) All architectural elements that provide a ledge shall incorporate mitigation for bird rousting that is elegant and woven into the building details, including canopies, exterior screen near the sidewalk and exterior signage.

5.7 SIGNAGE: WAYFINDING & DIGITAL SIGNAGE

The objectives of the LRT wayfinding strategy is to provide a complete wayfinding signage solution that delivers all the necessary elements included in Metrolinx DS-03 to ensure a high quality customer experience.

a) All wayfinding tools for Metrolinx LRT projects shall conform to Metrolinx DS-03 Wayfinding Design Standard.

b) Refer to Metrolinx DS-03 for signage requirement and their mounting methods. Figure 5-23, Figure 5-24 and Figure 5-25 show typical zones where signage requirement shall be prioritized.



Refer to DS-03 Wayfinding Design Standard for signage requirements

1. Platform Running Frieze
2. Information Hub: Type D.7
3. Digital Signage, Platform Level
4. Directional Sign
5. Line Diagram
6. Amenities ID: Wall Mounted
7. Facility Beacon, Pedestrian Lollipop

Figure 5-23: Typical LRT platform signage at curbside, side platform

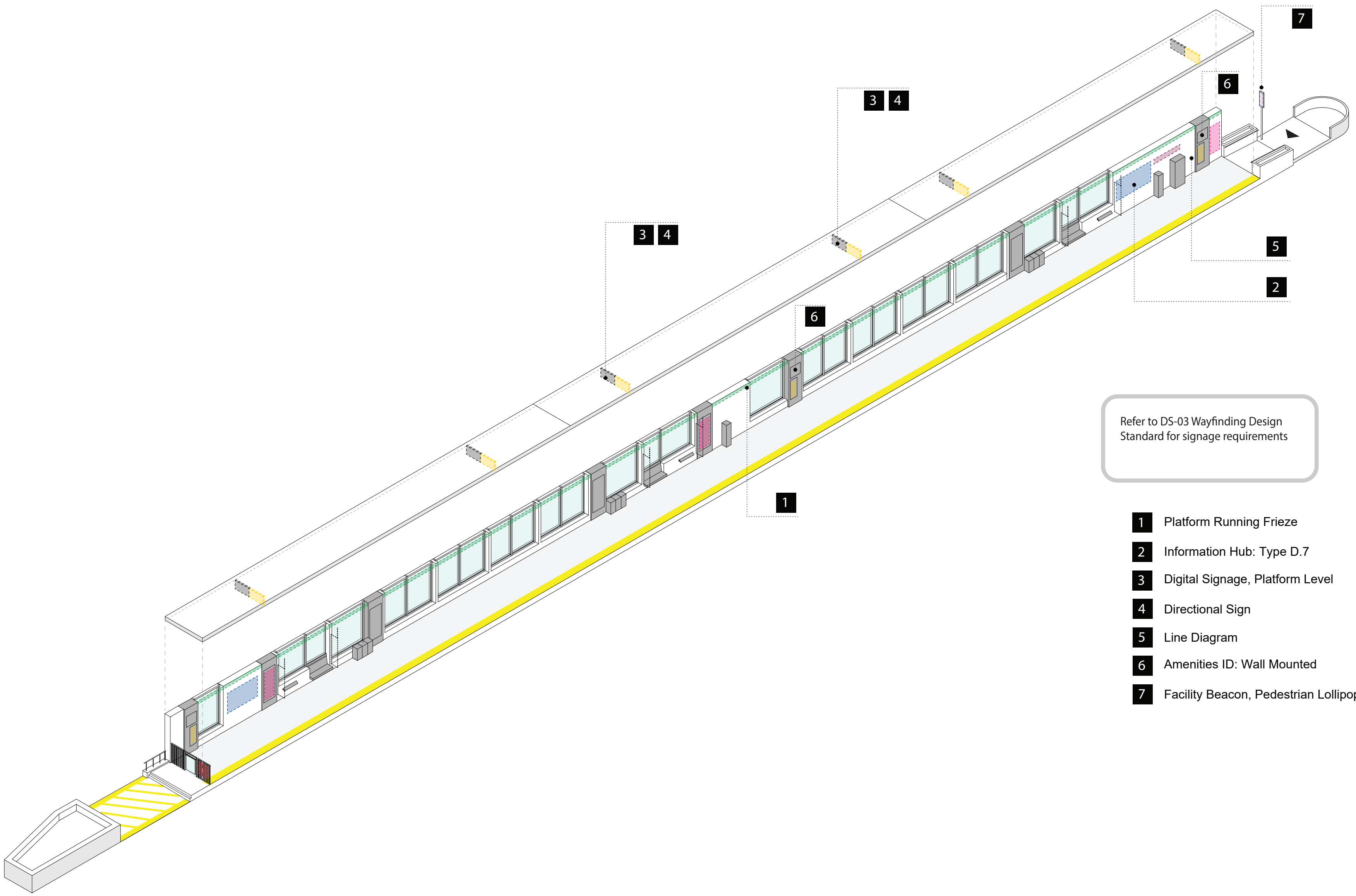


Figure 5-24: Typical LRT platform signage at median, side platform

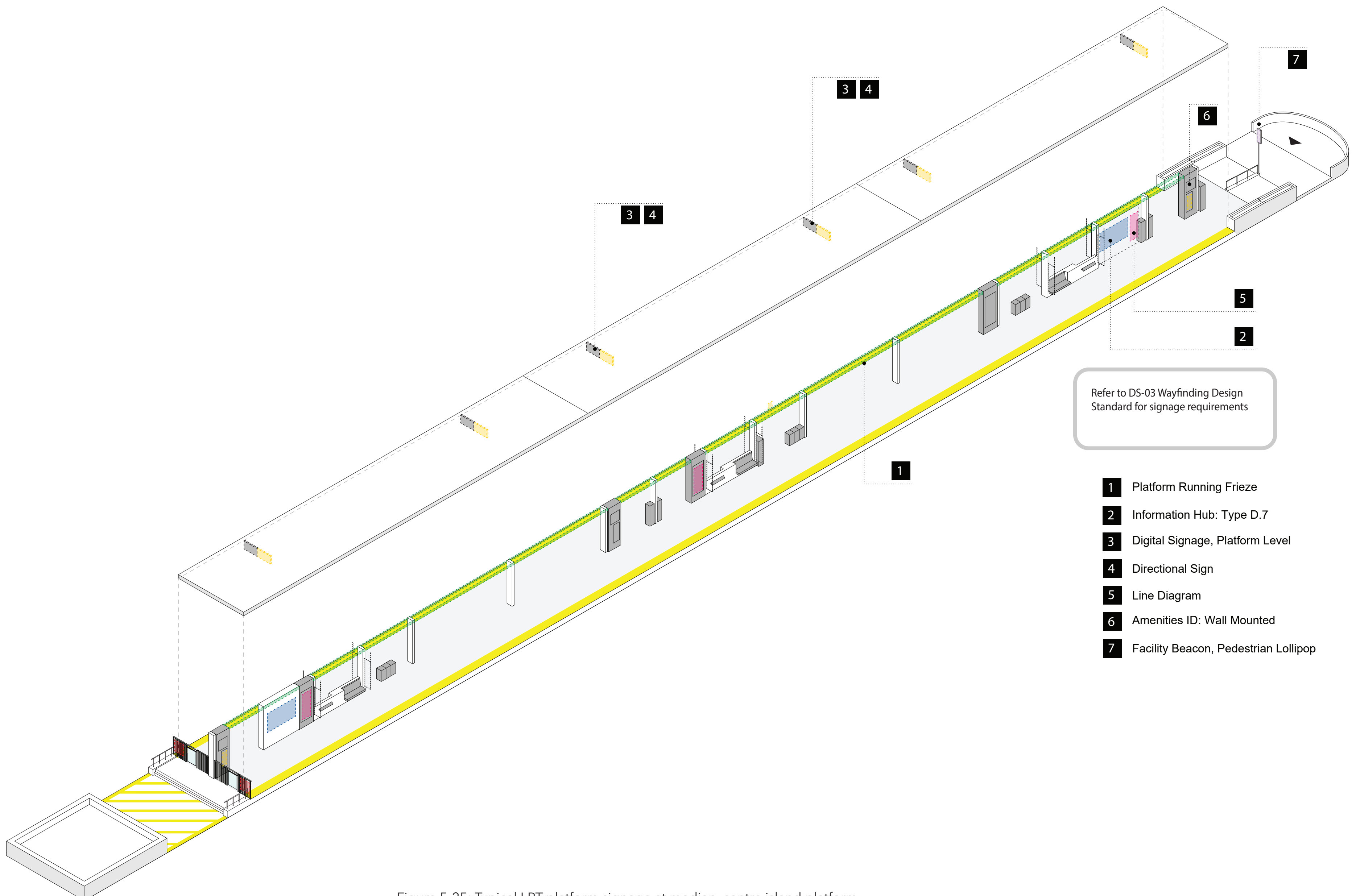


Figure 5-25: Typical LRT platform signage at median, centre island platform

5.8 LIST OF FIGURES & TABLES

6.0 Station Architecture

6.1 SITE AND BUILDING RELATIONSHIP

The relationship between the public realm and the station building is an important aspect that requires careful consideration and integrated planning between exterior and interior spaces to ensure a seamless and consistent customer experience. The LRT infrastructure includes the main entrances and exits, fare thresholds, circulation routes, LRT platforms, service and ancillary spaces, and leased areas. Exterior planning includes plazas, forecourts, connections, customer pick up and drop off areas.

In order to enhance and integrate the public realm into the LRT network, the design shall include the following key aspects:

a) The transition between the exterior and the Station shall be consistent and seamless, connected through:

   i. Direct sight lines, with transparent materials in the building facades;

   ii. A consistent design language of base materials from indoor to outdoor;

   iii. Station entrances that are clearly discernible from other elements of the urban realm.

b) A consistent modulation shall be provided from the exterior to the interior to provide sense of continuity and seamless integration:

   i. Joints of exterior finishes (e.g. paving) shall be scalable to align with the modulation of the Station interior and exterior.

   ii. Dimensions of exterior furniture elements (e.g. benches, waste receptacles) shall align with the interior furniture.

c) Station sites and buildings shall:

   i. Contribute to place-making;

   ii. Provide a positive presence in the various site-specific contexts.

   iii. Use natural light through the use of glazed facades and, where required by Project Agreement, skylights.

d) Station sites and buildings shall meet Section 3.1.1 Universal Design Requirements and 3.1.2 Sustainable Design Requirements.

Stations are facilities that meet the criteria described in the Ontario Building Code Section 3.13. They are normally large facilities with Tunnel Ventilation System and many other complex provisions to ensure the safety of people.

6.2 BUILDING MASSING, MODULARITY, AND TYPOLOGIES

The Station building volume, proportions, modules, and typologies will need to have consideration to the various constraints, such as platform configuration and context.

6.2.1 Massing Overview

Massing of the LRT infrastructure plays a significant role in developing the Stations identity, design language and customer experience. Buildings proportions and architectural expression provides the sense of public use, and order, that can translate to a feeling of safety. The clarity in the disposition of the architectural elements is important to create an intuitive environment, with a clear directional understanding of the station.

LRT Station buildings are an important part of the customer journey starting points, transitions, and ends. They are significant places along the network that shall provide a consistent, seamless and intuitive customer experience through a common design approach through the system.

LRT Stations serve a variety of inner-core urban, outer-urban and suburban applications.

a) Each specific Station identity shall be adapted to the individual character or development quality of each site, neighbourhood and/ or community. This system allows for maximum flexibility while adapting to site specific conditions, functional requirements and sharing functions with third party developers.

b) The architectural language shall be based on high functionality and durability at its core.

c) Each Station shall maintain the holistic line wide language while including local character to the architecture.

6.2.2 Massing Modules

This design standard utilizes a repetitive and modular kit-of-parts approach to Station planning and development of a design that results in a clear, intuitive and seamless customer experience.

6.2.2.1 LRT Stations Sizes

a) The LRT Stations size shall be determined by a number of factors evaluated during the preliminary design process that includes:

   i. Volume of customers to be served at specific dates in the future, based in calculations and projections of users to be using the Stations at day one and a future target date.

ii. Type of LRT Station: Line Station, Terminal Station, Interchange Station or Intermodal Station (Refer to Section 6.2.3 Typologies).

iii. Space available: depending on its location and site conditions, some Stations may represent the actual size and some other will need to be accommodated in limited conditions (e.g. heritage building).

d) The LRT Stations are comprised of the following modules:

i. Preceding elements: Plazas, forecourt, bicycle parking, connections, customer pick up and drop off. Refer to Section 4.2 Strategies.

ii. Entrance: The entrance to the LRT Station will be at grade and shall be an enclosed structure with contactless sliding, lockable doors. Refer to Section 4.2 Entrances/Exits.

iii. Unpaid transaction zone: The unpaid transaction zone is located immediately upon entry to the Station and includes fare vending, the self serve hub, and information and journey planning. Refer to Section 1.4.2 Stations.

iv. Fare threshold: is a threshold where customers transition from the unpaid to the paid fare zones. This threshold can be accompanied by fare devices or fare gates. When a Station ambassador office is provided, it shall be located adjacent to the fare thresholds.

v. Paid access zone: The paid access zone includes retail vending and leased retail, washrooms (if applicable), and back of house elements. Refer to Section 1.4.2 Stations.

vi. Vertical Circulation: Stairs, Escalators, Elevators and ramps are elements that connect vertically different levels in the LRT Stations, independently of being in the paid or unpaid zone. Refer to Section 6.5.3 Vertical Circulation.

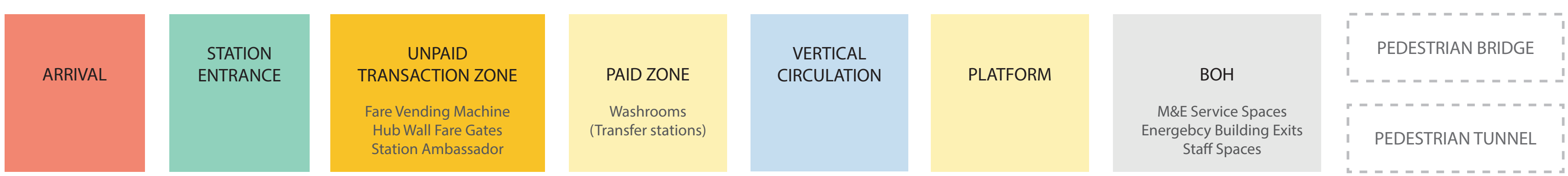


Figure 6-1: Massing Scenario

vii. Platform: The platform space can be below grade, at grade or elevated. Platform configurations include centre, side and stacked platforms. Refer to Section 6.6 Platforms.

viii. Back of house spaces are necessary components that support the operation of the Station and indirectly the customer experience. Back of house spaces include mechanical & electrical services, staff spaces and emergency building exits. Content in this document for mechanical and electrical services addresses the design impact of these services on the customer experience. Refer to Section 6.8.1 Back or House.

e) Additional modules that may be used as required include cross-over space, pedestrian tunnels and pedestrian bridges. The combination and arrangement of these modules will vary on a site by site basis.

i. Pedestrian tunnels are underground passageways for pedestrians. These passageways are an opportunity to make connections to the surrounding community and other TOCs below grade. Refer to Section 6.10 Pedestrian Tunnels.

ii. Pedestrian bridges are above grade passageways for pedestrians. These passageways are an opportunity to make connections to the surrounding community and other TOC's above grade. Refer to Section 6.11 Pedestrian Bridges.

6.2.3 Massing Typologies

The following massing diagrams represent typologies on how modules are positioned and how to achieve the most direct connections for customers.

Note that the massing diagrams demonstrate customer facing elements only and do not show back of house or ancillary spaces.

a) Below Grade/ Underground – Covered Station (under street)

b) Below Grade/ Underground - Covered Station (under developments)

c) Below Grade – Uncovered

d) Elevated Platform – Above median

e) Elevated Platform – Above sidewalk

f) At Grade Station

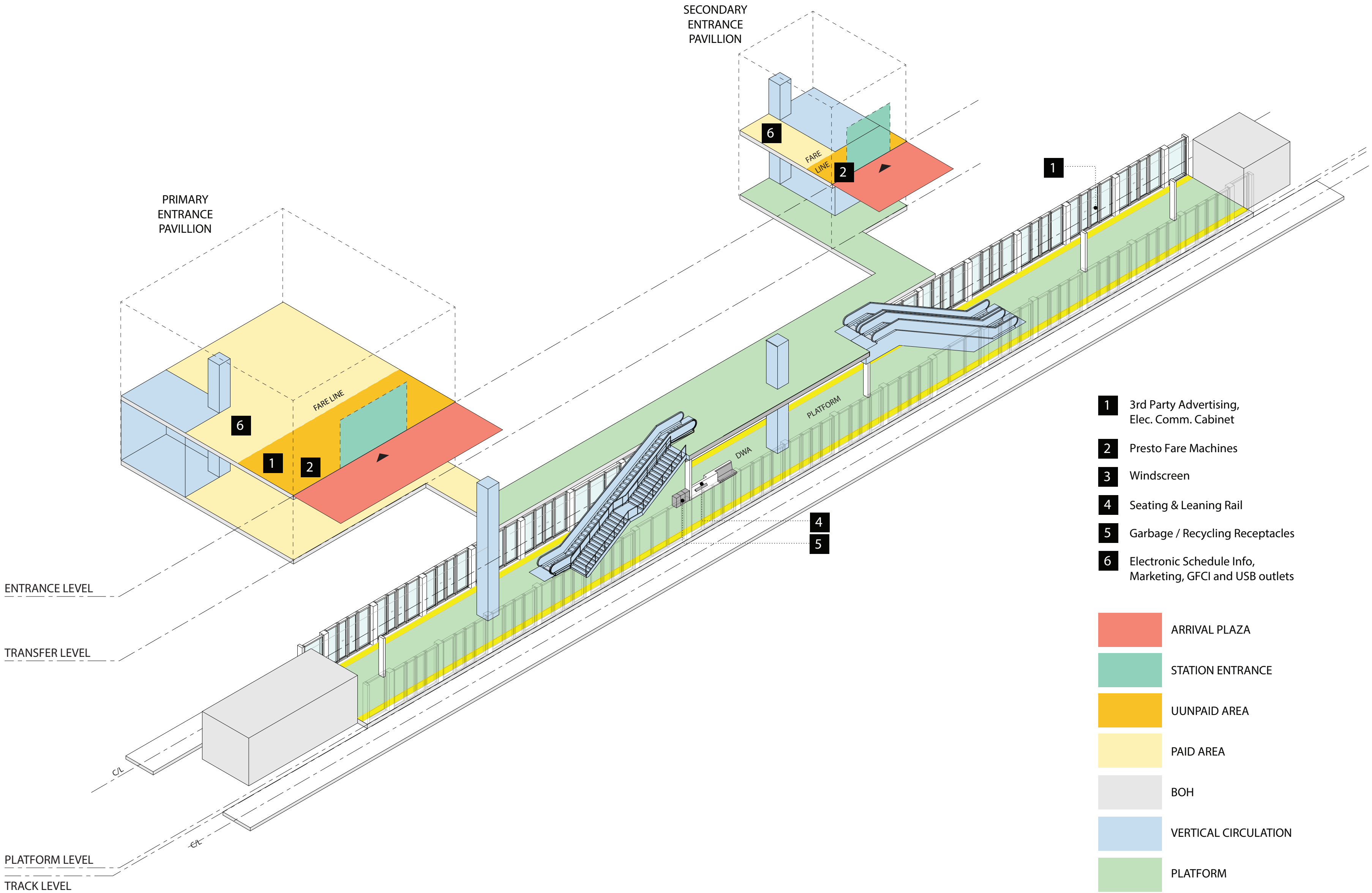


Figure 6-2: Below Grade/ Underground Station (axonometric projection)

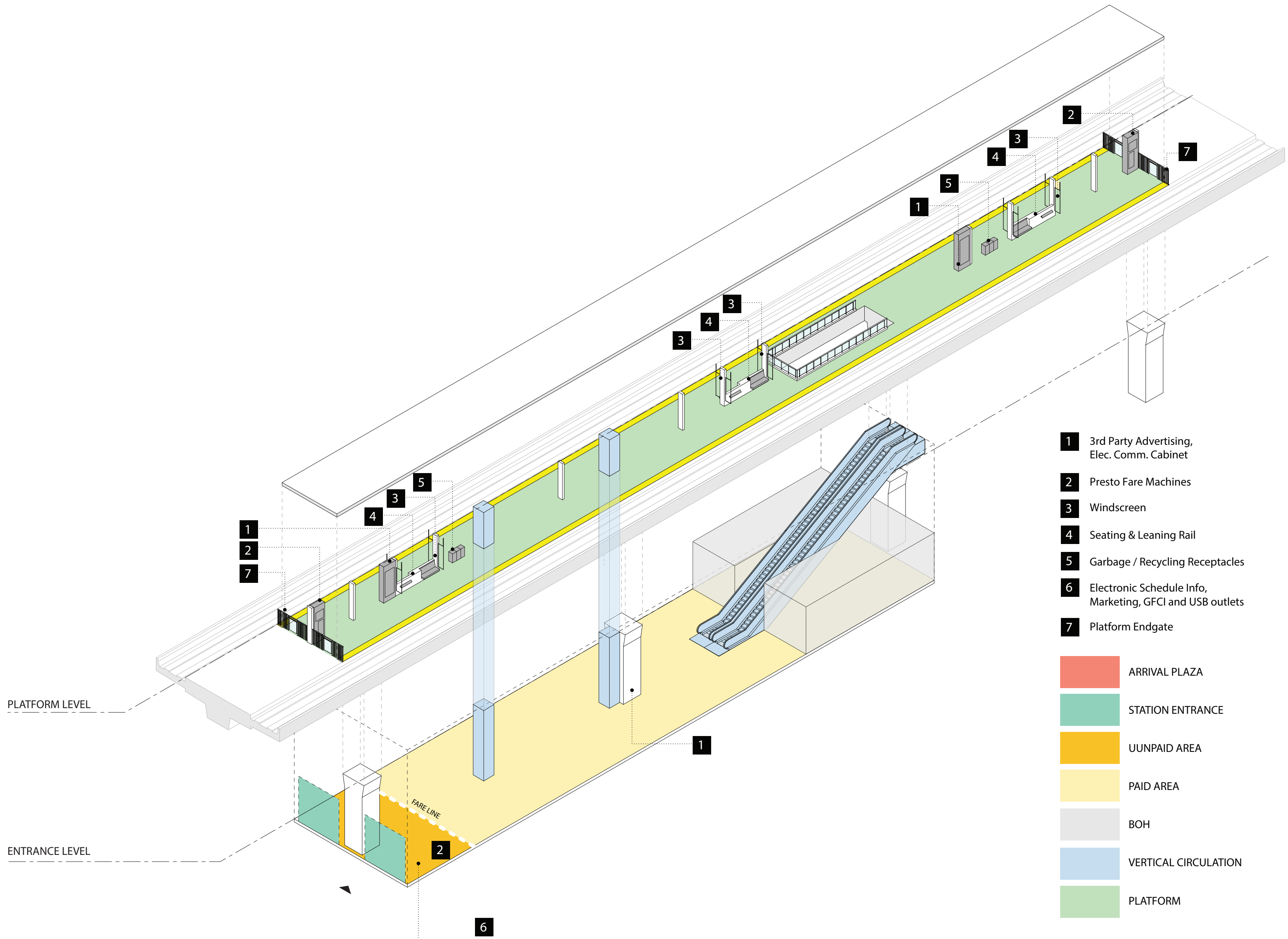


Figure 6-3: Elevated Station (axonometric projection)

6.2.3.1 Below Grade - Covered Station: Platform Under Street

When the platform under the street, the track alignment uses the street corridor underground for the development of the network within the city, without affecting existing and future developments.

This massing typology may have a main Station entrance integrated with existing developments or a standalone pavilion at grade. It also requires a secondary -or in some cases a tertiary entrance that connects to the other side of the platform via vertical circulation.

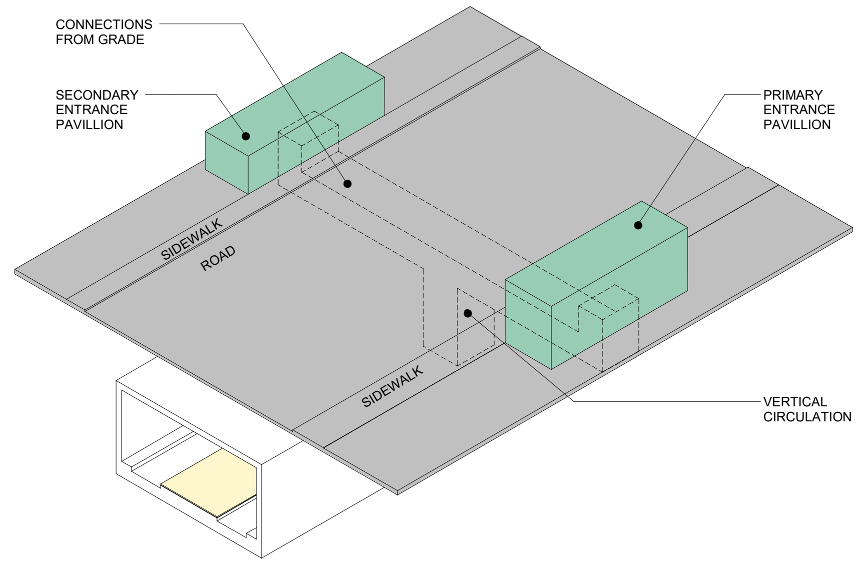


Figure 6-4: Below-grade covered LRT Station – platform under street

6.2.3.2 Below Grade - Covered Station: Platform Under Developments

This Station platform is right below existing developments that require integrated Station entrance, and in some cases a gap between these developments that allows the use of a pavilion.

This configuration has a more direct access to the platform via vertical circulation and reduces the number of elevator transfers.

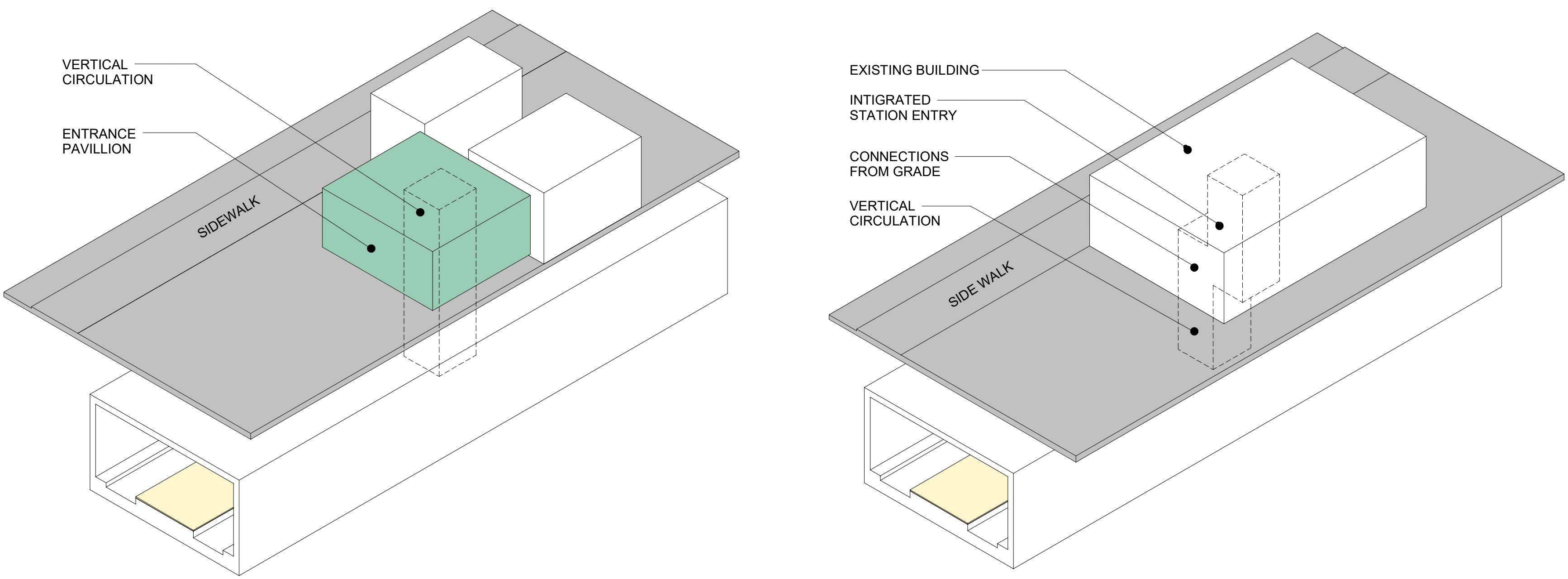


Figure 6-5: Below grade covered LRT station, standalone entrance (left) and integrated entrance in existing building (right)

6.2.3.3 Below grade – uncovered

In certain cases, underground Stations - open air may exist in an LRT network. They are usually connected to grade with an enclosed building with the vertical circulation and other services. Although it is open air, it may still require a smoke dispersion analysis.

In the Right of Way (median): access is more restricted to crossings, and it may face challenges for evacuation that has to be coordinated with local authorities.

Out of the Right of Way: Access is more convenient since it is directly connected to the sidewalk.

i. At grade protective barrier shall be installed to avoid object being thrown to the track and public platform below.

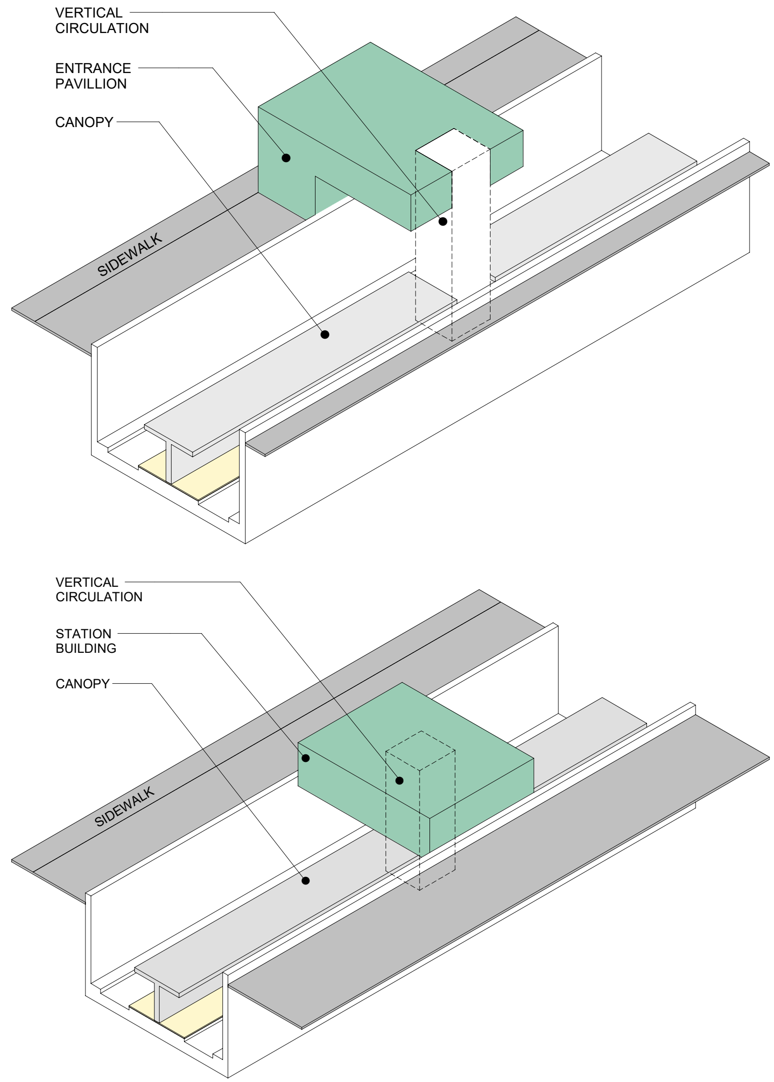


Figure 6-6: Below grade uncovered LRT Station

6.2.3.4 Elevated Station - Platform above median

a) Centre platform:

i. Access to the Station may occur from the median, via crosswalks or underground crossing, if there is enough space for the vertical circulation elements placement and if coordination with the respective municipality and fire department allows it.

ii. An additional transfer level may be required if the vertical circulation is from the adjacent sidewalks or buildings via bridges. Coordination with the respective municipality is required.

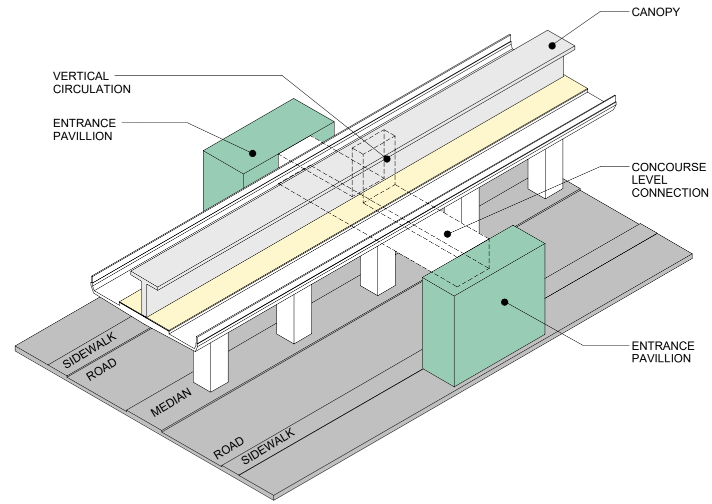
b) Parallel side platforms:

i. An additional transfer level may be required to transfer customers from one side platform to the other and for the location of the fare equipment.

ii. Access to the Station occurs from the adjacent sidewalks or buildings via bridges. Coordination with the respective municipality is required.

iii. Access to the Station may occur from the median, via crosswalks or underground crossing, if coordination with the respective municipality and fire department allows it.

iv. Massing modules with additional services are located under the platform in the transfer level.



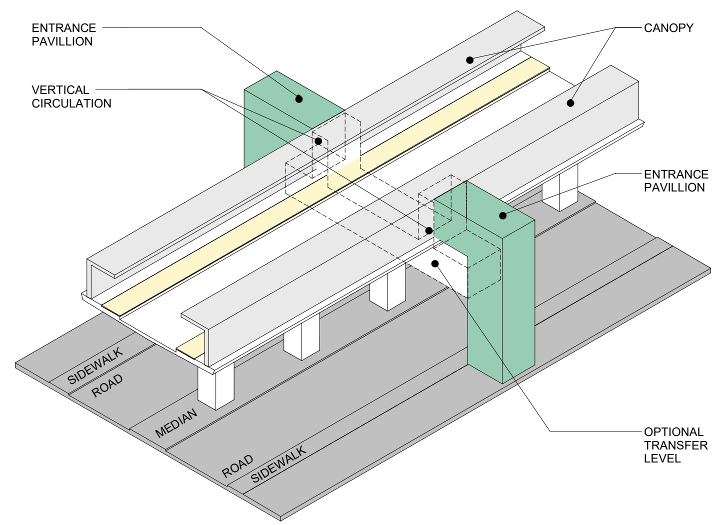


Figure 6-7: Elevated LRT Station above median – side platform

6.2.3.5 Elevated Station - Above Sidewalk

When the guideway is on one side of the street, above sidewalk, access to the Station entrance is either from the sidewalk via vertical circulation elements and entrance pavilion, or adjacent buildings, via bridges.

a) Centre Platform:

i. Access to the Station may occur from the side walk (via vertical circulation elements in the Station entrance) if there is enough space for the vertical circulation elements placement and if coordination with the respective municipality and fire department allows it.

ii. An additional transfer level maybe required if the vertical circulation is from the adjacent sidewalks or buildings via bridges. Coordination with the respective municipality is required.

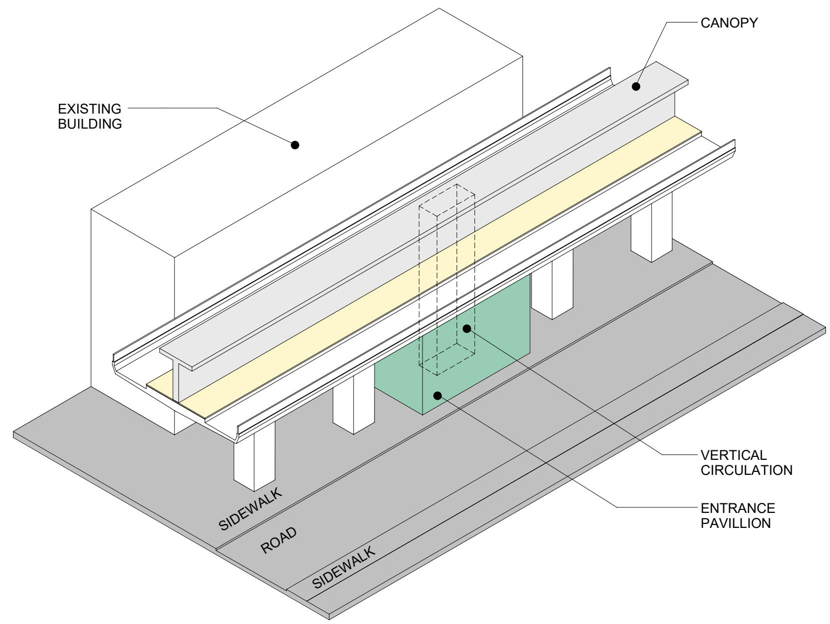


Figure 6-8: Elevated Station above sidewalk – centre island platform

6.2.3.6 Parallel Side Platform

a) An additional transfer level may be required to transfer customers from one side platform to the other and for the location of the fare equipment.

b) Access to the Station occur from the adjacent sidewalks or buildings via bridges. Coordination with the respective municipality is required.

c) Access to the Station may occur from the median, via crosswalks or underground crossing, if coordination with the respective municipality and fire department allows it.

d) Massing modules with additional services are located under the platform in the transfer level.

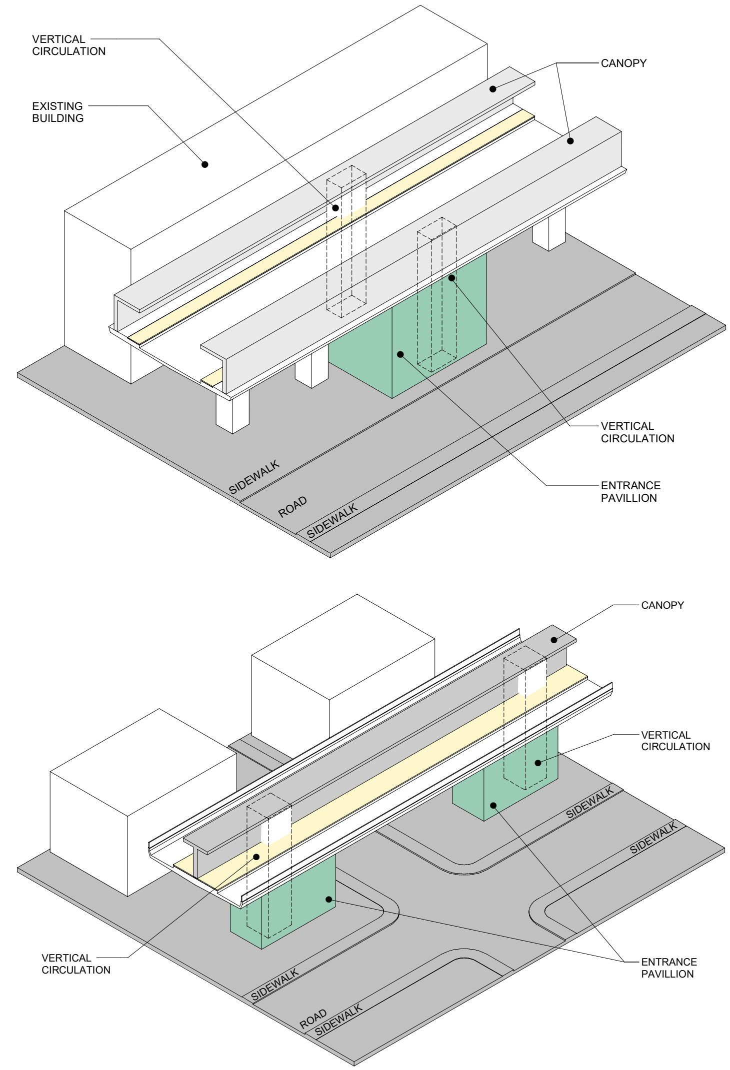


Figure 6-9: Elevated platform above sidewalk – side platform

Figure 6.10: Elevated platform creates an opportunity of developing a plaza and Station entrance below

6.2.3.7 At Grade Station

In this typology, the Station entrance shall face directly the street with a glazed pavilion or integrated entrance to an existing development.

The platform is located away from the access point, behind the buildings or in a shared corridor.

The connection to platform occurs via pedestrian corridor or transfer level where the fare thresholds and other service uses can be conveniently located, at grade, below grade or above grade.

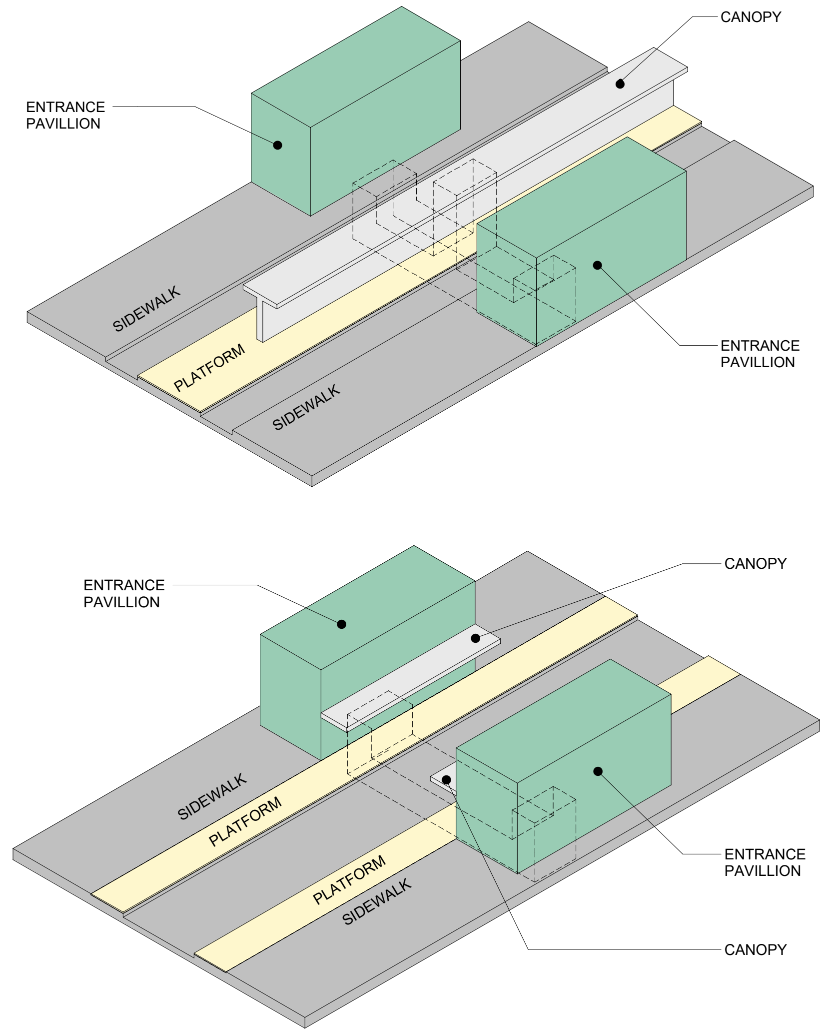


Figure 6-11: At-grade Station – side platform

6.2.4 Massing Requirements

6.2.4.1 Responsiveness to the Site

a) The functional configuration of the LRT Station shall respond to the site conditions. Station massing shall be civic scale informed and respond/contribute to the surrounding context.

b) Station massing shall respond to existing and planned adjacent development horizontal datum lines and setbacks.

c) Station massing and design shall be coordinated with existing infrastructure to maintain and/or enhance existing circulation patterns and systems.

d) Building footprint(s) shall be minimal and limited to requirements based on applicable codes and standards including the OBC, NFPA 130, Level of Service, the DS-02 Universal Design Standard, and this document.

e) Building zone adjacencies shall be defined by the customer journey route from entrance, to unpaid transaction zone, to paid access zone, to platform with Vertical Circulation Elements located where required.

6.2.4.2 Public Transit Language

a) The entrances and the customer transfer zone shall be built, where possible, at grade to allow for access to natural light.

b) Massing shall be arranged for the fewest number of elevator transfers in the journey from the entrance to the platform. Refer to Section 6.5 Vertical Circulation.

c) Massing shall be arranged to provide the minimum travel distances between the entrance and the platform of a Station.

d) Vertical circulation elements shall be grouped together and clearly visible on the customer path towards the Station entrance.

e) For Stations where it is demonstrated that grouped vertical circulation elements are not applicable, they shall be visible from the entrance with clear signage and guidance.

f) Multiple entrances shall lead to the fare thresholds zone and where the Station ambassador is located.

g) Number and space provision of fare devices shall be demonstrated with the estimated number of people to use the facility at day one and in the future.

h) Where additional connections to the Station are required (e.g. adjacent development), from adjacent sites and developments, they shall:

i. Comply to the applicable codes and standards as well as taken in consideration for the pedestrian modelling analysis and tunnel ventilation dispersion analysis.

ii. Include fare thresholds to access the platform and coordinate with the requirements outlined in the respective Project Agreement; and

iii. Coordinate with the requirements outlined in the respective Project Agreement.

i) Mechanical and electrical services, service and maintenance rooms, operator and staff facilities shall be:

   i. Consolidated and integrated away from public and customer zones and paths of travel;

   ii. Placed below grade, or to the back of Station buildings;

   iii. Strategically placed to obscure their visibility using building massing and screening.

j) Mechanical and electrical services (e.g. risers) shall be consolidated with exit stairs and other back of house elements integrated into the design approach.

k) The placement of service rooms at grade shall be avoided.

l) Where service rooms such as waste collection are required at grade, these shall be located at the back of the Station, or on a service lane and away from public and customer zones and paths of travel. Waste removal shall not be through Station entrances.

m) Secure bicycle storage shall be provided and integrated with the Station building massing or TOC development.

n) Where the minimum bicycle parking requirements cannot be accommodated on Metrolinx property due to space constraints, the remaining quantity may be incorporated within adjacent and integrated TOC development to satisfy the requirement, where space allows and agreements are in place.

o) Secure bicycle storage planning and design shall:

   i. Reflect the same design language established by the Station architecture;

   ii. Meet the requirements in the DS-07 Bike Infrastructure Design Standard;

   iii. Meet the requirements in the DS-03 Wayfinding Design Standard & DS-03 P2B Sign Implementation Manual.

p) Where a secondary entrance is provided:

   i. It shall allow for better transfer from street level to platform

   ii. Its location and configuration shall be demonstrated by a pedestrian modelling analysis
   iii. It shall be integrated with the surrounding facilities
   iv. Its location and dimensions shall be coordinated with the respective municipality
   v. The second elevator provided for redundancy shall be located in this entrance

q) Station design shall be integrated and coordinated with existing development to achieve an intuitive design.

r) Station access shall be provided by signage at all decision points since there would be pre-existing conditions that constraints the design of the LRT access to platform.

s) Open air platforms shall be designed with a continuous canopy covering customer's path from Station entrances to the platform waiting area.

t) Engineering systems (e.g. pipes, conduits, lighting and others) shall be integrated in the side walls and not surface mounted.

u) Platforms (elevated and underground) shall be provided with a cane detectable end gate to restrict access to service areas beyond the end of the platform.

v) Platform and transfer zone shall be rectilinear to allow easy oversight and understanding.

w) Where Stations are integrated into A Transit Oriented Community (TOC) developments the Station massing modules shall be incorporated in the composition of the facade of the TOC and articulated as a LRT Station through architectural materials, building form, and architectural language.

x) Where Stations entrances and circulation are incorporated inside a TOC, these elements shall be articulated through the kit of parts materials and finishes together with wayfinding signage as per the DS-03 Wayfinding Design Standard & DS-03 P2B Sign Implementation Manual.

6.2.5 Architectural Expression

The design requirements in this document ensure a consistent customer experience across the LRT Stations whether a stand-alone pavilion building or integrated into a TOC development, as well as for underground public spaces within the transit system. These design requirements use a kit of parts approach to overall massing and proportion, material location, texture, colour and transparency, signage, lighting and feature elements. Site specific identities can be expressed through the feature elements of each location. When integrated within another development, this approach allows for flexibility in architectural expression and integration with a proposed development character.

a) The building design shall employ the kit of parts in service of a consistent and recognizable Station identity.

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

c) Materials, finishes, colour and texture shall be composed in an organized visual appearance. See below kit of parts for elaboration on strategies for materials.

d) A minimalistic approach shall be employed with detailing to support massing concept.

e) Material intersections, connections and transitions shall be carefully resolved with simplicity and elegance in detailing.

f) Vents, mechanical elements, platform-based Electrical & IT system cabinets, etc. shall be screened from public view using consistent screen and material palette from the kit-of-parts.

g) The design shall comply with sustainability requirements identified in Section 3.1.2 Sustainable Design Requirements.

h) The building design shall comply with CSA S478 Guidance on Durability in Buildings.

i) All architectural elements that provide a ledge shall incorporate mitigation for bird rousting that is elegant and woven into the building details, including canopies, building screen near the sidewalk and exterior signage.

6.2.5.1 Kit of Parts

a) Canopy: Requirements

This element functions as both a system-wide identity element that is associated with the Station entry and a canopy that provides protection from the elements. The canopy materials, dimensions and strategies of incorporation into the various site conditions shall be as follows:

i. The canopy shall follow the 1200 to 1500 mm modulation of the façade and with minimal joints between panels.

ii. The canopy shall not exceed 400 mm in depth.

iii. Where bicycle parking is adjacent to a building façade, a canopy shall be provided and cantilever at least 1500 mm from the face of the building.

iv. The Station canopy shall visually reduce its thickness and maintain consistent design language with the Stops.

1) Mechanical piping for drainage and electrical lighting fixtures shall be accommodated between canopy structural supports.

2) Routing of piping and conduits shall be made in spaces between the structural supports.

v. Canopy extensions around the building shall follow the modulation of the façade.

vi. The underside height of the canopy shall be not less than 3000mm from the finish floor elevation

vii. For heritage buildings, if the minimum clearance of 3000 mm is not achievable, coordination efforts shall be made to incorporate the canopy in the façade as well as required elements like signage

b) Entry portal: Requirements

Station entries are defined by a consistent entry portal frame with fully transparent sliding entry doors.

i. Automatic sliding Station double doors shall be used at all entry locations.

ii. The entry portal frame shall be constructed with composite metal panels with colour contrast finish.

iii. Entry portal depth dimension shall be 500 millimetres.

iv. Entry portal depth shall be 150 mm, continuously around the door.

v. The underside of the entry portal frame shall be 2850 mm to accommodate doors and Routing of piping and conduits shall be made in spaces between the structural supports.

vi. Canopy extensions around the building shall follow the modulation of the façade.

vii. The underside height of the canopy shall be not less than 3000 mm from the finish floor elevation

Figure 6-12: Kit of Parts: Canopy

Figure 6-13: Canopy within the LRT network, kit of parts, highlighted in orange

viii. For heritage buildings, if the minimum clearance of 3000 mm is not achievable, coordination efforts shall be made to incorporate the canopy in the façade as well as required elements like signage. This dimension of 2850 mm plus 150 mm of portal width, totals 3000 mm of canopy height.

ix. Vision glazing shall surround the entry portal.

x. Entry portal shall contain Station identity signage.

xi. Entry portal shall facilitate integrated CCTV and PA speakers, and any additional entrance threshold lighting where all infrastructure is concealed within the portal frame and exposed elements of these items are colour matched to the portal frame colour.

c) Base: Requirements

The wall base is a strong grounding gesture for the Station building.

i. The exterior wall base shall be granite.

ii. The exterior wall base height shall be maximum 300 millimetres.

iii. The exterior wall base depth shall be 400 millimetres and match or exceed the depth of the facade baffles.

iv. Façade baffles are vertical aluminum sunshade fins that are a part of the curtain wall system.

Figure 6-14: LRT Station Entry Portal

1) These elements shall be used on ground floor entry facades to identify Station entries as part of a network and provide additional shading.

2) Facade baffles may be rotated to achieve varying shading.

3) Facade baffles shall match overall facade colour scheme.

Figure 6-15: LRT Station – front exterior

d) Curtain wall: Requirements

The curtain wall system is a glazed aluminum wall system with ceramic frit patterning. A high degree of transparency is desired for visibility balanced with varying degrees of ceramic frit to mitigate heat gain and better manage thermal comfort together with natural ventilation and to adhere to municipalities bird friendly guidelines.

i. To be applied to horizontal and vertical divisions of the curtain wall panels, in a gradation from transparent to opaque.

ii. For areas where self serve hub or information zones back on to a primarily glazed wall, opaque panels shall be used.

iii. Joints between glazing shall be butt joints that are consistent in width, as minimal in width as proven technically achievable, and neutral in colour to blend with the colour scheme of the project.

iv. Where fasteners are used, they shall be concealed.

v. Custom designed curtain walls are encouraged as described in the project agreement and shall meet or exceed the performance requirements for the curtain wall system (CW) outlined in this document and shall be subject to Metrolinx review and approval.

vi. Ceramic frit pattern shall be used in all exterior glazing including facades, windows and skylights.

vii. Insulated glazing shall be consider in the pavilion entrances design to help achieve the required temperature specially in summer season.

e) Back of House: Requirements. The following are acceptable applications:

i. Aluminum panel

ii. Glazed Spandrel System

f) Wall system: Requirements

Opaque wall cladding consists of sintered ceramic tile and aluminum panel.

i. Opaque ceramic tile shall be used for the underside of the canopy.

ii. Aluminum panel shall be used for back of house areas.

g) Exterior shading: Requirements

The exterior shading system consists of perforated aluminum panels. These elements are a clean and functional approach to provide shading together with a simple modern design strategy that can be customizable for site specific locations and integrated with design strategies of other developments. This material shall:

i. Be employed over glazing for sun shading on elevated platform massing, to reduce solar heat gain in warm weather, and achieve customer comfort and natural ventilation;

ii. Be used as an exterior feature element on elevated platform massing;

iii. Be used as the primary facade material on stand-alone emergency exit buildings, ventilation structures and other small ancillary buildings when located in prominent public realm settings;

iv. Create a site-specific identity for the Station location through creative variable perforation patterns, or printing of imagery or motifs to create a facade that is on par with or exceeding adjacent buildings, structures, and community context; Further coordination with local communities via municipal jurisdiction shall be required.

v. Be used as a site specific feature wall material for elevated platforms by including an additional layer of perforated aluminum panel on the exterior of the building facade that is visible from the interior platform area.

vi. The Station building shall include the Station name super graphic.

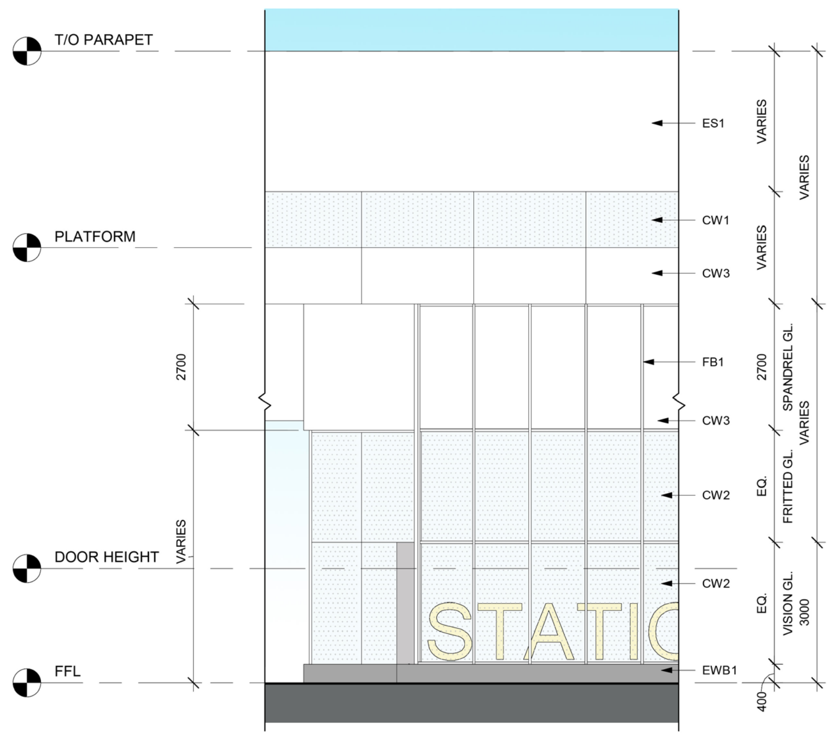


Figure 6-16: Elevation - Station

6.3 STRUCTURES, ASSOCIATED ENCLOSURES & INTEGRATION DESIGN REQUIREMENTS

The visual impact of clutter on a customer navigating through an environment can be a significant distraction from directional signage and other design and massing cues. Incorrect placement can create obstacles and block views. Strategies to eliminate design clutter around elements such as canopies, rooftops, parapets, windscreens, and equipment screening shall be incorporated and demonstrated in the Station design.

a) Clarity and simplicity of architectural expression shall be achieved through integrated design of all systems and elements.

b) Designs shall consolidate mechanical and electrical servicing with structural and massing elements to reduce visual clutter (for e.g. drains at canopies).

c) Designs shall incorporate canopies, parapet, windscreens, and equipment screening with massing and materials to reduce visual clutter.

d) All exterior equipment and maintenance elements including roof top fall arrest shall be hidden from view at street level through strategic positioning and incorporation with the overall massing. These units shall be grouped together, located at the back of the roof and screened, using mechanical louvers to match Station modulation and finishes in the façade.

e) The rooftop shall be treated as a 5th elevation where it can be viewed from above, for example in urban areas, and care shall be taken to compose a visually organized and consolidated grouping of rooftop elements. Screening of these units shall be provided if they are viewed from adjacent properties.

f) Skylights and/or clerestories shall be included to allow for natural light penetration where site conditions prevent access to natural light available through exterior vertical walls.

g) Skylights shall be positioned:

   i. For diffusion of light deep down through escalator/stairwells and other vertical openings;

   ii. To help mark and light logical routes through Stations;

h) Skylight geometries shall be developed to demonstrate minimal heat gain and to maximize natural light temperature and colour.

i) Skylights shall be in compliance with applicable building codes and be subject to risk analysis to prevent accidents that result in pieces of glass fall to the public space in the event of material failure.

j) Skylights shall have:

   i. Proven water and air tightness performance characteristics in both heated and unheated spaces;

   ii. Allowance for maintenance and cleaning without lifts or staging

k) Provide enclosures to all exterior access stairs at entrances, complete with all necessary signage. Doors to enclosures shall be lockable from the interior, during Station shut down periods.

6.4 ENTRANCES/EXITS

The introspective approach to the station architecture can create a welcoming and inviting entrance, when the Station is placed and oriented in highly visible locations. The preferred locations are at grade and in close proximity to a main intersection, to provide greater visibility and aid in modal transfers. Station locations shall emphasize visual connection to street and avoid placement of back of house areas along primary facades. Where feasible, multiple entrances are desired to minimize travel distances and create a greater presence at street level. Land availability, transit connectivity, Station area conditions, TOC development opportunities, and use of existing infrastructure all play a role in determining the number, location and type of entries to the Station.

6.4.1 Requirements

a) Station entrances and exits shall be provided at grade and be highly visible. Entrances shall be the most transparent element of the Station building and be visually discernible from site access points to encourage intuitive site navigation and Station access.

   i. Direct barrier-free access from the street shall be provided for each Station, with clear wayfinding. This access shall be optimized from a location perspective to serve the highest pedestrian volume.

b) The number of public entrances to a Station shall depend on the demographic that it serves, volume of passengers, their mode of arrival, land availability, site constraints and opportunities.

c) Entry locations shall be:

   i. In an optimal location to serve the area with the highest pedestrian volume;

   ii. For Stations where it is demonstrated that a single entrance at an intersection is not possible, the Station shall have access to each of the streets at the intersection. The development program, site organization of a development, or configuration of the development massing will influence the location of additional entrance connections.

   iii. Be adjacent to connecting surface transit services for quick and convenient transfer points.

   iv. Placed at intersections to reduce pedestrian crossing at midblock crosswalks and reduce impacts to traffic.

d) For Stations where it is demonstrated that a single entrance at an intersection is not possible, the Station shall have access to each of the streets at the intersection. The development program, site organization of a development, or configuration of the development massing will influence the location of additional entrance connections.

e) Stations shall have more than one entrance where it provides significant benefits to the urban fabric and/or is warranted by customer volumes to destinations in the local context.

f) Where Stations have two or more entrances, entrances shall be placed so as to serve the highest sources of pedestrian volumes, provide the most direct customer access routes, and most direct relationships to other modes of transportation including bus and streetcar stops. Direct access from the Public Right of Way shall be provided in all Station entrances, provided with an easily recognizable wayfinding to the Station door and beyond.

g) Entrances shall include an entryway with automatic sliding doors (DR1) and full-width x 3000 mm deep foot grille including recessed drainage pan.

h) Where foot grilles longer that 3000 mm deep are provided at entrance doors, the foot grille may not overlap with the clear fare threshold queuing clearance requirements.

i) A 3000 mm depth runoff clearance space shall be provided at entrance doors without overlapping other runoff spaces or clearances.

j) Entrances/exits shall enable Station opening and closing procedures and support the concept of safety and security.

k) Station entrances shall be capable of being locked during non-operating hours.

l) Entrances shall be designed with the kit of part elements for Station entries.

m) Rain canopies shall be provided at entrance doors to prevent the passage of water into the vestibule and provide interim shelter to exiting customers. Refer to Section 6.2.4.1 Kit of Parts.

n) Provide doors required as means of egress during non-operating hours per OBC and AHJ requirements. Emergency egress is through Station entrances as well as emergency exits if required.

o) Minimum clear exit widths per most restrictive criteria of OBC, NFPA 130 and AHJ shall be provided.

p) There shall be no freestanding object placed within 2000 mm of the front entrance façade.

q) Station entrances shall be sized to accommodate waiting areas:

   i. Seating shall be placed with visual connection to the exterior.

   ii. Refer to Section 6.6.5 Designated Waiting Area.

r) If operations and maintenance are in separate buildings, access shall be provided between sites.

s) Operationally at all entrances:

   i. Entrances/Exits shall enable station opening and closing procedures, and support the concept of safety and security.

   ii. Boundaries between lines at interchange stations shall enable crowd control in the event of service disruption on a line.

   iii. Interchange stations shall enable passenger movement from entrance to any line, and any line to any exit.

6.4.2 Entrance Types

The following entrance types identified are intended to cover typical configurations. These typologies do not outline all possible permutations in complex urban environments.

6.4.2.1 Pavilion Entrance:

A pavilion entrance is a standalone building not attached to any other volume. These buildings represent important landmarks usually located at intersections and with limited opportunity to be integrated with future developments. It represents a very strong conceptual design for an entrance since expresses a focal point on the site.

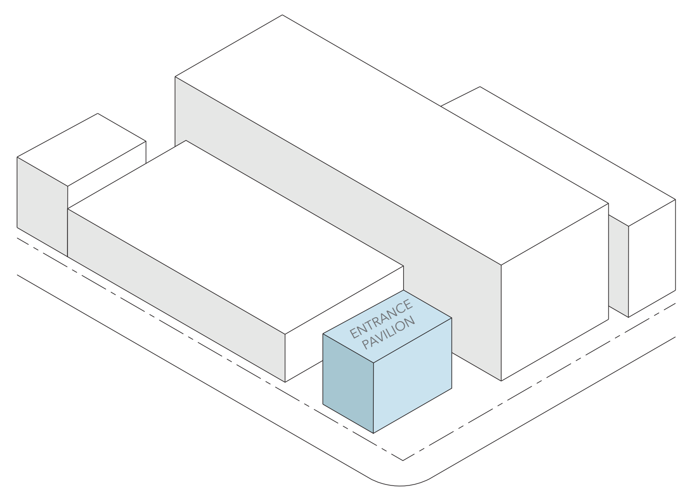


Figure 6-17: Pavilion Entrance

6.4.2.2 Wrapped Entrance

Wrapped entrances are a freestanding pavilion building that is or will be surrounded by future development. A wrapped entrance has limited integration with an existing development or undetermined integration with a future development where timing or logistics of the adjacent development cannot include for a context entrance. Wrapped entrances can be on the corner or mid-block. Wrapped entrances can become context entrances when future developments are built.

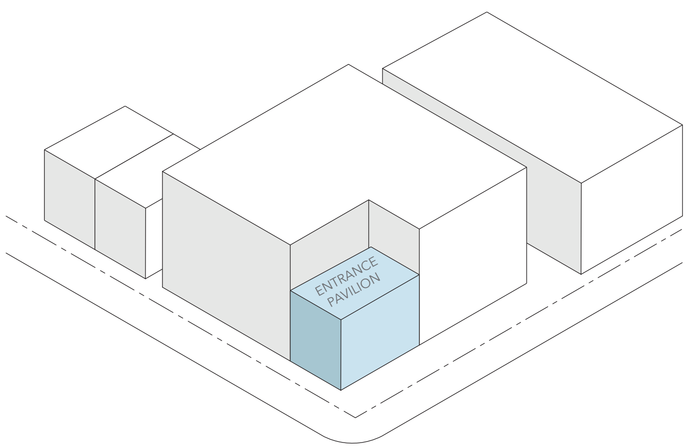


Figure 6-18: Wrapped Entrance

6.4.2.3 Context Entrance

This type of entrance occupies the street level of the host building where is located, therefore its architectural expression is integrated with the existing building architecture and may respond to its modulation, mixed of materials and structure. Context Entrances shall be designed to have prominence, without having adverse impact on commercially viable street frontages. Context entrances are incorporated into Transit Oriented Community developments where there is a need to balance access to the Station with other viable aspects of the development program such as at-grade retail and other street frontages of commercial value.

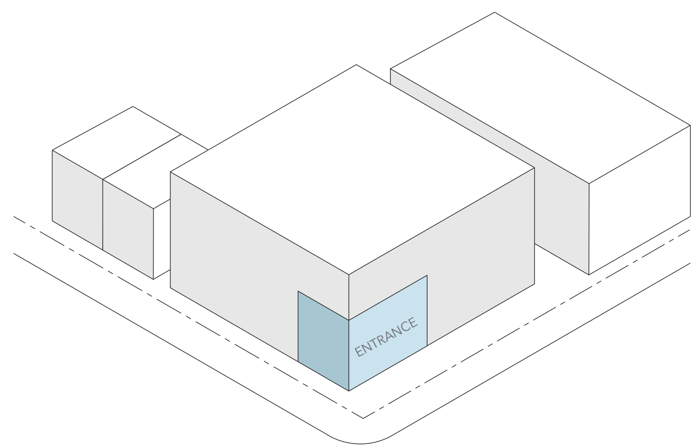


Figure 6-19: Context Entrance

6.4.2.4 Heritage Integration

a) Station entrances shall:

i. Respectfully and sensitively integrate additions or modifications to heritage structures using simple, modern, clean materials;

ii. Balance achieving a visible and predictable entrance with simple and elegant design that does not overpower the architectural language of the heritage building;

iii. Provide Station entrances adjacent to designated heritage structures to provide the greatest visual exposure of the heritage building; and

iv. Maintain existing access to and functions of heritage resources.

v. Where applicable, modification to the existing heritage elements shall be coordinated with the architectural specialist

6.4.2.5 Integration with Context and Wrapped Entrances

a) Design of the context and wrapped entrance building façades shall:

i. Be clean, simple and respectfully integrate with adjacent development;

ii. Maximize its visibility in the development for clear access;

iii. Employ the portal frame from the architectural kit of parts to achieve prominence and act as a consistent visual identity as a Station entrance;

iv. Provide for additional setbacks for extra sidewalk room or small plazas; and

v. At a minimum, reinforce a consistent setback with adjacent development; iv. be given primacy of location and visibility within the development context.

vi. Entrance shall occupy the minimum amount of frontage to optimize uses along ground floors for commercial value.

vii. Entrance shall be sized based on what is required by Level of Service, applicable DS-02 Universal design Standard, and OBC requirements to provide access to the LRT Station and sustain transit operation.

viii. Entrance shall be of a height that provides prominence to the transit entrance relative to the scale of the development and its associated built-form components, for example, provide a double height entrance within a podium of several storeys.

ix. Where it is demonstrated that an entrance to the Station is required from within a development, the entrance shall be placed in a highly visible location, be clearly signed with transit identifier and identity elements including the portal frame from the architectural kit of parts and be of a width that provides sufficient capacity to accommodate the Level of Service for transit.

x. Design and siting of Station vent shafts shall be grouped with entrance building for an efficient footprint and coordinated with adjacent development plans if known.

6.5 CIRCULATION

Circulation elements within Stations include entrances, fare zones, vertical circulation elements (stairs, elevators and escalators), pedestrian passageways, pedestrian tunnels, pedestrians Bridges. The size, configuration and number of these elements is determined by the volume of people, ridership, length of the train, site conditions, available space, proximity to other spaces, connectivity to other systems, among others.

a) Circulation and Level of Service: While the length of platforms is a function of the train length and the length of passageways is a function of site geography, the width is determined by both the Ontario Building Code (OBC) and the level of comfort to be provided to passengers in peak and emergency conditions.

b) The level of comfort is often referred to as Level of Service (LOS). Level of Service is the relative measure of the amount of floor area available to each passenger. It is a measure of comfort and maneuverability within the Station.

c) Ridership provides the expected number of people at the Station at peak hours.

d) Ridership shall be provided by Metrolinx.

    i. Ridership data is essential for planning the Station circulation system. This information shall be used to determine the platform area, the width of vertical and horizontal circulation, the number of escalators, number of fare lines and the emergency egress requirements.

    ii. The ridership data shall be reviewed at regular intervals to confirm the operating performance and safety of the Station.

6.5.1 Design Requirements

a) The circulation system shall be planned such that customers can comfortably and safely move within the Station, without obstruction or confusion.

b) Circulation routes shall be:

    i. clear of obstructions, simple, and straight-forward;

    ii. without backtracking and include no unnecessary turns and dead ends.

c) Circulation patterns shall be based on right-hand flows.

d) Benches, recycling/waste receptacles, telephones, bottle filling Stations, and floor-mounted signs shall be kept clear of primary circulation routes.

e) Circulation elements shall be sized in accordance with the capacities and flow rates as defined in the Ontario Building Code (OBC) and the Project Agreement, together with ridership information provided by Metrolinx and be demonstrated through pedestrian modelling.

f) The circulation elements within a Station shall be designed to accommodate the projected ridership for Level of Service and emergency evacuation requirements.

g) The capacity and distribution of means of escape to accommodate emergency conditions shall be calculated in accordance with the OBC.

h) Fire ventilation requirements shall be considered into the final selection of vertical and horizontal egress widths.

i) The waiting and circulation areas shall be configured to ensure that movement between Station entrance and train boarding (and vice versa) is obvious and sensibly progressive.

j) Distances shall be demonstrated to be the most direct between Station elements.

k) Circulation from entrance to fare thresholds to vertical circulation shall be direct. Each touch point shall be visible from one to the next.

l) Circulation routes shall be kept short, direct and wide enough to accommodate moving and queuing customers. Clear sightlines shall be provided for visibility from one touch point to the next touch point on the journey. Columns located in main passage ways shall be avoided.

m) Changes in grading shall be avoided.

n) The minimum width of all internal public passageways shall be 5000 millimetres.

o) The Station and site design shall provide an intuitive approach to platforms.

p) The customer journey circulation routes shall be marked with clear, legible, and consistent signs and graphics in accordance with the DS-03 Wayfinding Design Standard & DS-03 P2B Sign Implementation Manual in support of a wayfinding strategy that maximizes intuitiveness.

q) CPTED (Crime Prevention through Environmental Design) principles shall be implemented into new design or retrofit of Station planning.

r) Selection of materials shall promote intuitive wayfinding. Circulation routes shall be lit.

s) Surge spaces, queuing and run offs:

   i. Surge spaces and places of rest shall be provided.

   ii. Sufficient surge, queuing and run-off space shall be provided for entrances, fare collection areas, and at all vertical circulation elements so as not to block pedestrian circulation and allow for changes in circulation direction or mode.

t) Entrance minimum runoff clearance shall be 3000 millimetres.

u) The minimum queuing dimension on either side of the fare barrier shall be 5000 mm millimetres.

v) The minimum runoff at the top and bottom of escalators shall be 5000 millimetres.

w) The minimum surge space at the top and bottom of public stairs shall be 5000 millimetres.

x) The minimum runoff space in front of an elevator shall be 3000 millimetres, measured the width of elevator door frame.

y) Surge Spaces, Run-offs and Queuing spaces do not overlap and they shall be designed cumulative.

z) Circulation, specially the barrier free access route, shall avoid crossing surge spaces, run offs and queuing spaces.

aa) Surge areas shall be planned so as not to interfere with boarding or alighting from trains.

6.5.2 Platform Access

Platform access shall conform with the following requirements:

a) Access to platforms shall be distributed along its length, including vertical circulation elements, and not limited to only one side.

b) Platform access shall be visually connected to the vertical circulation elements.

c) Platform access shall be intuitive from other Station locations without the help of signage.

d) Vertical circulation elements connecting to platform shall be sized based in the ridership, building code considering peak hours and in the event of evacuation.

e) Platform access shall be located at equal distance to each other, ideally at both ends and the centre, as geometry and site conditions allow.

6.5.3 Vertical Circulation

Vertical circulation is the means of how building users access specific areas of a Station, including: internal stairs. Internal ramps, elevators, and escalators. In the case of an LRT Station is not only limited to the customer but extended to the staff.

The main objective for vertical circulation elements is to connect customers safely from the entrance to the platform level, or vice versa.

6.5.3.1 Requirements:

a) Vertical circulation elements shall be grouped together to ensure spatial efficiency, minimize building footprint and to orient passengers clearly to the platform or street level.

b) Provide vertical circulation including stairs, escalators and elevators and ramps to connect all zones and Station components on different levels.

c) All public areas, specially platform, shall be provided by a combination of stairs, escalators and elevator.

d) Dimensioning of these elements at platform shall be made based in the rise and time to evacuate the platform.

e) Provision for future shall be accounted while dimensioning these elements.

f) Vertical circulation elements shall be located outside of the net platform area and shall be distributed in order to provide balanced train loading and convenient platform exiting.

g) Vertical circulation elements shall be located in direct sight line from the exterior of the building entrance.

h) Stairs materials shall maximize light penetration and transparency, Elevator cabs and enclosures and escalators balustrades shall be constructed of glass and be transparent. Vertical circulation elements shall avoid opaque materials and be expressed as opaque volumes. Glass escalator balustrades shall be provided to reinforce the perception of openness. Between levels, transparent guards shall be used around all openings. Guards shall meet OBC requirements.

i) Voids between levels shall be provided to encourage a more open environment. Stair and escalator openings in the Station between levels shall include gaps on both sides between the stair and escalator and the adjacent walls to create a high level of openness and allow natural light to penetrate as far below grade as possible.

j) Gaps between stairs and escalators and adjacent walls shall be a minimum of 600 mm, with appropriate fall protection required by the OBC, unless proven not feasible.

6.5.3.2 Stairs

a) Stairs and stair elements including nosings, handrails, and landings shall comply with the DS-02 Universal Design Standard.

b) Stairs shall be located offset of the path of travel but in direct proximity and visually connected.

c) Where possible, stairs shall achieve end-to-end visibility to transmit sense of safety to customers.

d) Stairs shall be sized based in pedestrian flow analysis and emergency exit calculations, but not less than 2400 mm wide.

e) Public stairs shall have a slope of 30 degrees.

f) Exposed conduits and ducts shall be avoided in stairs, they shall be concealed or integrated with the surrounding partitions or structure.

g) Stairs shall be provided by a 100 mm bike rail on the right hand side facing up for bike access and a continuous 100 mm channel on side to run water when cleaning occurs.

6.5.3.3 Elevators

a) Passenger elevators shall meet DS-02 Universal Design Standard.

b) Passenger elevators shall comply with the OBC and Appendix E of ASME A17.1/CSA B44.

c) Elevators shall be easy to find, recognizable and located in the main path of travel, avoiding hidden locations for the rest of the customers.

d) Elevators shall be signalized with wayfinding and signage according with, OBC, CSA and Metroinx Design Standards.

e) Elevators shall be designed as pass-through to avoid turning elements inside (stretcher, wheelchair or carts).

f) Passenger elevators shall be sized to accommodate emergency stretcher with two emergency providers.

g) Stations shall be provided with redundant barrier free access in the form of two elevators from street/ grade level to each platform.

h) In Stations with only one entrance, two elevators adjacent to each other shall be provided.

i) In Stations with two or more entrances the number of elevators provided shall be considered based on the location, travel distance, pedestrian modelling analysis, connection to other transit networks and adjacent developments.

j) Entrances located more than 400 m apart shall be provided with elevators that satisfy the pedestrian modelling analysis demands.

k) Standard passenger elevator approaches, interior car layouts and controls, shall be provided for customer orientation and ease of access.

l) Interior elevator button designators shall have clear messaging that make sense to customers.

m) Elevators shall be provided with elevator cab controls that shall be located on the longest side wall inside the car.

n) Call buttons, car controls, and Passenger Assistance Intercoms shall be provided at each elevator landing.

o) All elevators shall have CCTV camera mounted inside elevator cab.

p) Generator standby power shall be provided to permit continued operation of the elevator(s).

q) All electric elevators shall be provided with their own back-up battery power system.

r) All elevators shall be provided with battery powered emergency lighting.

s) Camera mounted in vestibules and lobbies shall view inside and outside of each elevator at each level.

t) All elevators shall have a two-way emergency call system.

u) All elevators shall be provided with two speed ventilation fans with HVAC systems.

v) Elevators shall be equipped with remote monitoring.

w) Elevators shall be provided with glazed enclosure and doors to allow visibility to the interior cabin.

x) When leading to the exterior, elevators shall be provided with an access vestibule.

6.5.3.4 Escalators

a) Escalators for vertical transportation between levels shall be designed to meet requirements ASME A17.1/CSA B44.

b) Escalators shall be provided from the Station entrance to platform level.

c) Escalators shall be provided in pair. In one hand this allows dual direction for passengers and in the other allows the use of an escalator when one is not in operation.

d) Number of escalators shall be validated by a pedestrian modelling analysis.

e) When escalators are located adjacent to stairs the lower working point shall align with the stair bottom working point (located one threat from the first step).

f) Escalators shall be design to 30 degrees slope.

g) Anti climb barrier shall be provided at all escalator locations to avoid incidents:

   i. Protective balustrade shall be provided between escalators and stairs at the top landing, to prevent falls from the escalator to the stairs.

   ii. Protective barrier shall be placed in front of the escalator at the top landing.

h) Escalators shall be provided with an accessing vestibule when leading to exterior areas.

6.5.3.5 Ramps and Sloped Floors

a) Ramps and Sloped floors shall meet the requirements in DS-02 Universal design standard, as well as meet with the criteria established by the authority having jurisdiction (AHJ). The most restrictive shall be applied.

b) Sloped floors, as defined in the OBC are preferred over ramps. This is because they are less challenging for people with mobility impairment, even though they maybe longer and occupy more space.

c) Where sloped floor or ramps are applied, non-slip materials shall be specified.

6.5.4 Circulation and Accessible Path of Travel

The circulation along the public spaces in transit Stations is unequivocally linked to the accessible path of travel. The inclusive transit environment considers the accommodation for accessible features, enlarged corridors, ramps and sloped floors, bars, communication systems and numerous other tools to make the pedestrian experience good for everyone, as a Universal Design.

a) Station shall be for all customers without distinction of their condition. Accessible routes to entrances, public transfer levels, services like washrooms, platform and trains shall be provided.

b) A barrier free path of travel shall be provided to the building connections to other networks.

c) All pedestrian circulation routes shall maintain an accessible path of travel, clear of obstructions and meet OBC, DS-02 Metrolinx Universal Design Standard. The most stringent shall apply.

d) Stations shall accommodate redundant barrier free access circulation routes from street level to platform level.

All circulation routes shall demonstrate that travel distances are minimized between transportation modes, to fare zones, and to/from Station entrance to platform.

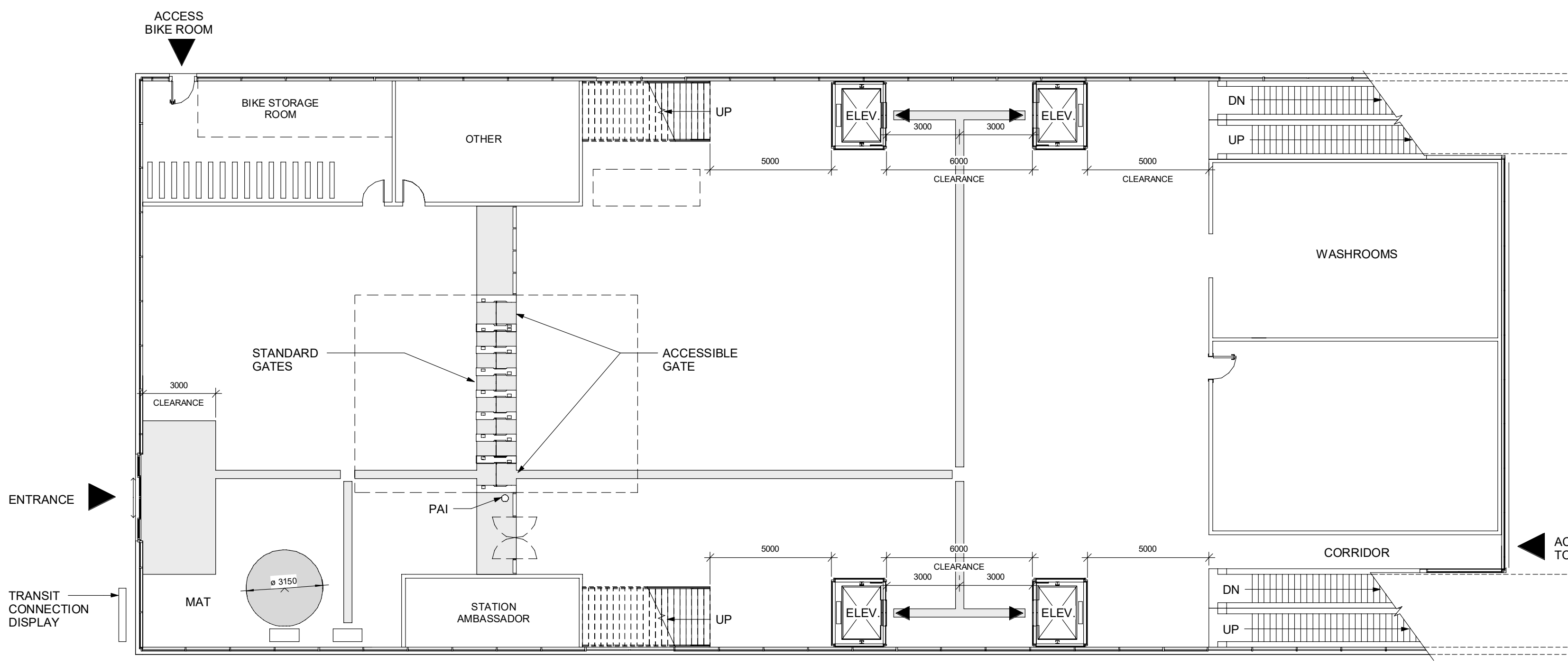


Figure 6-20: Entrance Plan

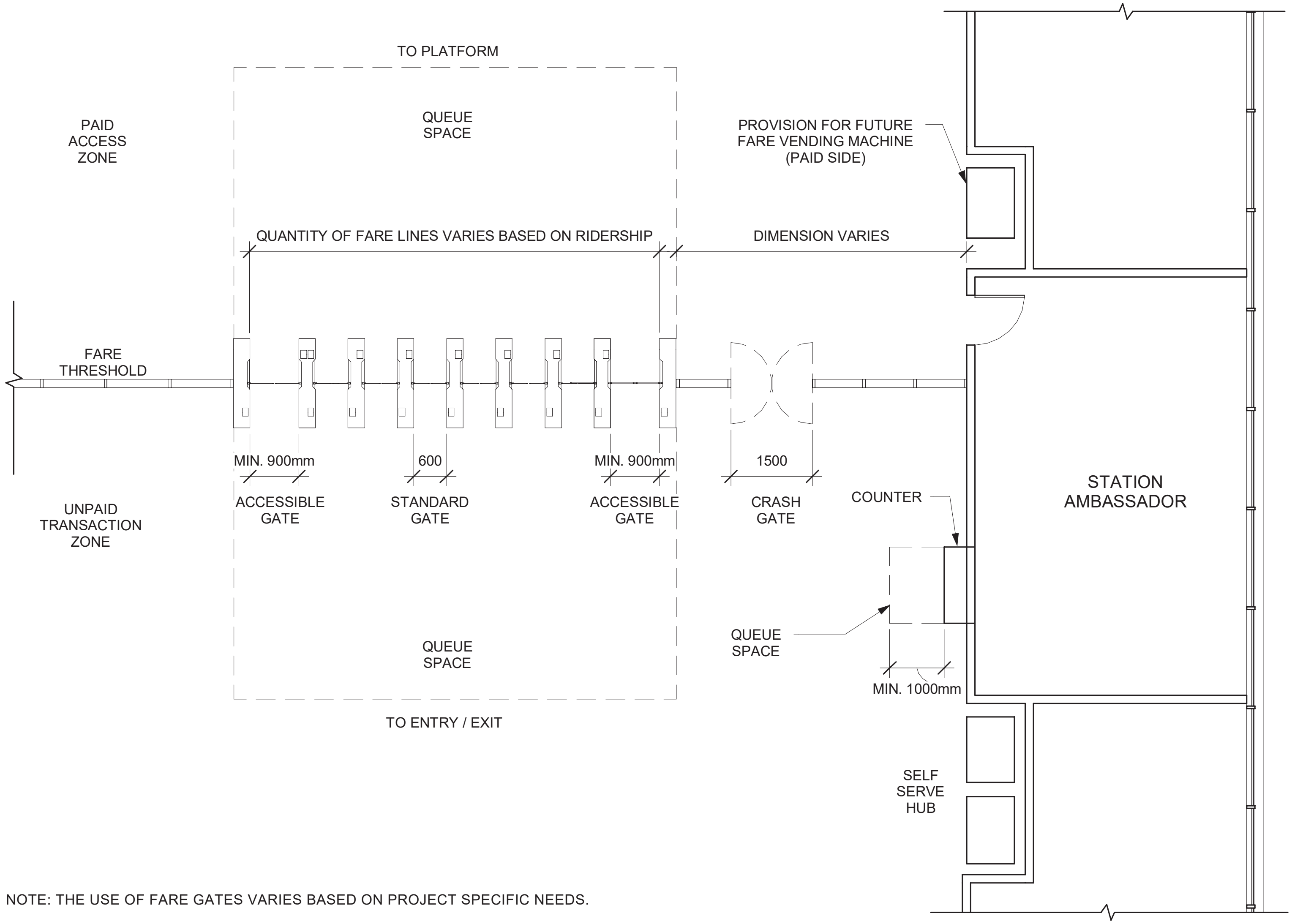


Figure 6-21: Fare Threshold Area

6.6 PLATFORMS

At Stations, the platforms occupy a significant space with many customer facing elements. Efficient planning of the platform while maximizing transparency and flexibility are key factors that shall be accounted for during the early planning stages.

There are design elements specific to the platform, that need to be incorporated, and that have a direct relationship with one another, so it is essential to understand these synergies and adjacencies to allow for maximum efficiencies when planning.

The platform design elements are:

a) Platform access, horizontal or vertical;

b) Circulation space;

c) Seating and Designated Waiting Area (DWA);

d) Platform Edge Doors (PEDs) and interface with train;

e) Platform service areas (electrical rooms, among others, located beyond the public area);

f) Platform Information Display Systems (IDS);

g) Platform furniture and fixtures;

h) Platform third-party advertising.

Platforms may be located below grade, elevated above grade and at grade. These platform locations shall be fully functional while maintaining a consistent look and feel based on a kit of parts approach across the transit network. The elements that make up the kit of parts include vertical circulation, DWA, PEDs, general walls and ceilings, and feature walls and ceilings.

For existing Stations, the requirement for PEDs shall be reviewed with existing condition analysis and structural and mechanical consideration. Information such as ridership, exit surges, queuing areas and site-specific requirements related to platform detailed design will inform platform sizing.

6.6.1 Platform Layouts and Configurations

Platform configurations include:

a) Centre Island platforms

b) Side platforms

6.6.1.1 Design Requirements: Planning

a) Platforms shall be designed to provide clear sightlines and maximize transparency to aid in visibility for security purposes.

b) Back of house spaces shall be planned based on a minimal footprint in order to maximize customer facing areas on platforms while avoiding creating blind spots.

c) Vents, mechanical elements, and electrical/IT cabinets located at the platform area, shall be screened from public view using a consistent screen material and colour.

d) Transparent materials for centrally located elements including elevators shall be specified to enhance visibility from all areas of the platform.

e) Platform floor finish material and colour shall be consistent through all the station platforms.

f) General walls and ceiling finishes to follow finishes as outlined in Appendix B: Finishes and Materials.

g) Designated areas of feature walls and ceilings within the platform, shall be consistent across stations, where possible. Refer to Appendix B: Finishes and Materials.

h) Feature walls shall not obstruct or interfere with integrated digital information and or wayfinding signage.

i) Digital and static wayfinding shall be integrated with the architectural design of the platform.

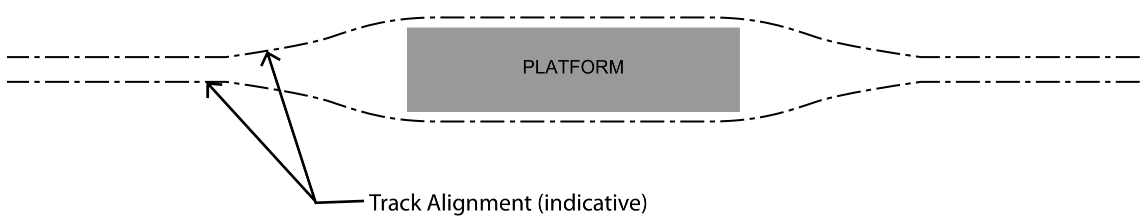


Figure 6-22: Centre Island Platform

j) All forms of advertising shall not interfere with wayfinding and information elements. Refer to Section 6.7.5 Non-Fare Revenue Advertising.

k) Special signage shall be provided for Designated Waiting Areas (DWA). Refer to DS-03 Wayfinding Design Standard & DS-03 P2B Sign Implementation Manual.

l) Minimum clear exit widths shall be provided per most stringent criteria of OBC, NFPA 130 and AHJ.

m) Sufficient surge, queuing and run-off space shall be provided for vertical or horizontal circulation elements so as not to block pedestrian circulation and allow for changes in circulation direction or mode.

n) Where intermodal or interchange stations allow for crossplatform access, fare vending machines shall be included on the shared platform.

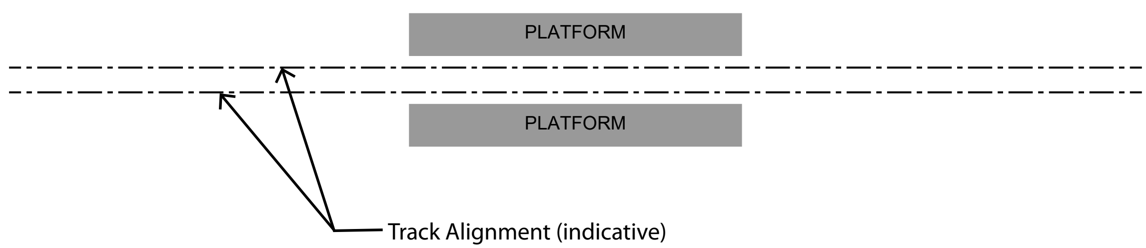


Figure 6-23: Side Platform

6.6.2 Tactile Walking Surface Indicators/ Tactile Attention Indicators

The platforms shall feature non-slip concrete finishes. Tactile Walking Surface Indicators shall be designed in conformance with the requirements of DS-02 (Metrolinx Universal Design Standard).

There are two different TWSI types to be used within the Metrolinx network:

a) Attention indicator (truncated domes) signals a need for caution at a change in elevation, a vehicular route, train platforms, etc. This is applied in the LRT.

b) Tactile Directional Indicator (elongated flat top bar surface) facilitates wayfinding in open areas and indicates a possible route that may be taken.

6.6.2.1 Tactile Attention Indicator

Tactile Attention Indicator (TAI) technical specifications, arrangement and height shall be according to ISO 23599 Assistive Products for Blind and Vision Impaired Persons and the DS-02 Universal Design Standard.

A tactile attention indicator surface shall be located:

a) At the top of stairs.

b) At platform edge of all platform typologies.

c) At curb cuts where a crosswalk facilitates safe pedestrian access to the transit stop.

d) At entry into a vehicular route or area where no curbs or other elements separate the vehicular route from a pedestrian route; for example at both sides of every flush pedestrian crossing at the end of median stops.

6.6.2.2 Tactile Directional Indicator

The Tactile Directional Indicators (TDI) are elements installed on walking surfaces used to warn blind and vision-impaired pedestrians of a nearby hazard. These elements shall:

a) Be provided from the accessible Station entrance(s) to the elevator, along the continuous accessible path of travel to the Station platform.

b) Be provided to each accessible door where more than one entrance doorway is provided within the same Station entrance structure. Where possible, the separate indicator paths shall come together prior to passing through the fare thresholds. Only one TDI path shall pass through each fare threshold, and it shall use the accessible fare threshold providing the most direct accessible path of travel.

c) Be provided between elevators only, at concourse level;

d) Be provided along the full length of platform, to help locate vertical circulation elements by providing a continuous path to the stairs, escalators and elevators.

e) Be consistently offset closer to the northbound and westbound platforms to provide consistency and predictability at platform level.

f) Include a double-wide section of TDI tiles parallel to the Designated Waiting Area (DWA) to help identify its location along the platform.

g) Provide catchment areas at locations such as vertical access points, to help ensure that customers will locate the main path. These catchment areas shall be shaped like a "lower case h" in order to provide 90-degree turns at decision points.

h) Be configured to be simple and direct, with changes in direction at 90-degrees.

i) Be minimum 300 mm in width.

j) At turns and decision-making points the direction tiles shall stop on either sde of a 600 x 600 mm level and unobstructed ground/floor area.

k) Have a clear space of 600 x 600 mm at an end point.

l) Have minimum 600 mm smooth and obstruction-free floor walking surface on both sides of the TDIs to assist with tactile differentiation.

m) Be simple and intuitive by limiting the number of decision points along the TDI path.

n) Be located 1000 mm from a fare payment device.

o) Consist of integrated tiles with tonal contrast through colour.

p) Comply with Metrolinx Universal Design Standard (DS-02) and CSA B651, Accessible Design for the Built Environment.

6.6.3 Platform Clearances

Platform is the busiest place in the Station since is where the boarding and deboarding occurs. The fast pace of activities occurring in this space at the same time deserves clear spacing for each of the elements that are part of the platform. This section shall be read in conjunction the requirements in OBC.

a) The clear space from any object to the edge of the platform shall not be less than 2500 mm.

b) A minimum of 2500 mm passenger circulation clearance shall be maintained to any object at the platform (including from the Platform Edge Doors).

c) The surge space in front of stairs is 5000 mm and shall not occupy the direct access or exit of trains.

d) The surge space in front of stairs is 5000 mm and shall not occupy the direct access or exit of trains.

e) The runoff space for elevators is 3000 mm and shall not extend in front of the PED where the direct access or exit of trains occur.

f) The runoff for escalators is 5000 mm and shall not extend in front of the PED where the direct access or exit of trains occur.

g) For central island locations the DWA shall be centered in the platform. For side platforms the DWA shall be located against the wall.

h) Clear minimum height for the ceiling is 4000 mm.

i) Clear minimum height for mounting elements conform to Metrolinx Standards.

6.6.4 Platform Edge Doors

For all Stations, provisions shall be made for the installation of full or partial segregated platform edge doors (PEDs) with continuous, integrated overhead louvers. If in the event that PEDs are to be installed at some future date, the initial design approach of the tunnel ventilation system shall take future PED systems into account in order to meet the requirements for both tunnel ventilation and fire ventilation as determined by Subway Environment Simulation (SES) and, computational fluid dynamics (CFD) simulations. Additionally, an Emergency Response Room (ERR) shall be dedicated for future PED control cabinet hardware. Such room shall be provided with appropriate ventilation, cooling and power provisions for this use. In addition, space for conduits to and from the PED header shall be space-proofed in the service zone above the platform. The platform drainage strategy shall be designed to accommodate a future PED provision, which falls to the centre of the platform.

Platforms design shall meet the latest technology and customer communication systems in hand. The intent is to use the PEDs for all the Stations, both for new lines and extensions and allows the opportunity to integrate information regarding the direction of travel, next train(s), and real time dynamic information and alerts on digital displays located above the platform doors. Dynamic displays may also provide important operational information and serviceability messages.

Clear signage for the entrance doors shall be provided on the platform floor finish. Signage shall also be identified at all boarding areas specific for special need passengers.

6.6.4.1 Functional Design Requirements: Planning

a) When Automated Train Control (ATC) is installed, PEDs shall be provisioned continuously along all LRT stop platform edges at all the new stops.

b) All PEDSs being specified shall meet CSA standards.

c) Door positions along the PED partition shall correspond with LRT Vehicle doors.

d) Leveling between platform and train shall be provided. Refer to DS-02 Universal Design Standard.

e) PED provisions and installation shall meet applicable code requirements. PEDs shall be installed with 610 milimetres wide platform safety edge and a horizontal gap between the platform edge and Stationary vehicle shall be no more than 76.2 milimetres (3 inches).

f) A slab recess shall be provided at platform edge to receive PEDs in the new Station design.

g) PEDs shall be constructed of:

   i. Maximum amount of glazing; and

   ii. Stainless steel.

h) Tactile attention indicator shall be installed at platform edge across the width of the platform edge door opening to indicate location of the LRT vehicle doors.

i) Design of PEDs shall be coordinated with the fleet to minimize any impact on potential future design and procurement of the vehicles.

Figure 6-24: Platform edge doors (PEDs)

6.6.4.2 Functional Design Requirements: Code

a) Horizontal sliding platform screens or PEDs shall be provided to separate the platform from the trainway in Stations as opposed to guards in compliance with NFPA 130 requirements, and shall meet the following criteria:

  i. The doors shall permit emergency egress from the train to the platform regardless of the stopping position of the train;

  ii. The doors shall provide egress when a force not exceeding 220 Newton (50 lb.) is applied from the train side of the doors;

b) The doors shall be designed to withstand positive and negative pressures caused by passing trains.

c) At grade stops PED shall use laminated glass for safety of the customers.

6.6.4.3 Functional Design Requirements: Lighting and Electrical

a) Where PEDs are installed, the areas around the doors shall have a higher level of illumination with a gradual reduction towards the platform area while maintaining the minimum illumination standards.

6.6.4.4 Functional Design Requirements: Structural and Mechanical

a) Platform Edge Doors shall be designed to resist the wind, pressures created by the movement of the LRT train.

b) In underground LRT Stations, pressure rating of doors shall be in accordance with values and procedures prescribed in Subway Ventilation System Standards and further engineering analysis.

c) Coordination shall be made with dispersion analysis in order to close the gap above the PED.

6.6.5 Designated Waiting Area

The designated waiting area is a central safe and secure space provided at all LRT Stations and is comprised by seat, accessible space for wheel chair, PAI, waste receptacle, information points, Information Display Systems, CCTV cameras and special lighting.

6.6.5.1 Design Requirements

This section is to be read in conjunction with DS-02 Universal Design Standards.

a) DWAs shall be provided on all platforms according to requirements in the DS-02 Universal Design Standard.

b) One DWA shall be located in the centre of the platform length, per the direction of travel.

c) When platform is at grade, DWAs shall be weather-protected.

d) DWAs shall include seating (minimum of 2 benches) and waste receptacles.

e) DWAs shall incorporate sufficient unobstructed clear space adjacent to seating and be clear of circulation routes, to accommodate mobility devices such as wheelchairs, scooters and strollers.

f) CCTV cameras, PAI, and standardized signage shall be located in all DWAs.

g) A double-width section tactile direction indicator shall be provided by the Designated Waiting Area (DWA) to help identify its location.

6.6.5.2 Functional Design Requirements: Lighting & Electrical

a) The Designated Waiting Area (DWA) shall be illuminated to a higher level than the general waiting area, to delineate the emphasized area. The luminaires shall be selected and located to demonstrated minimum glare to passengers and the Closed- Circuit Television (CCTV) cameras in particular.

b) Lighting shall reduce up-lighting as much as possible, particularly in residential areas, and ensure high 'K' lighting in passenger designated waiting areas and intermodal pathway areas, particularly afterhours (e.g backlighting).

c) Lighting will visually assist the passenger along the preferred circulation paths. The unpaid area lighting emphasizes system graphics, informational messages, fare vending equipment, and fare thresholds. The paid area lighting directs the passenger to the elements of circulation which leads to the platform.

d) Standard power receptacles in public access areas of Stations (especially adjacent to rest areas/seating) shall be available/accessible to the public, and thus shall not include lockable covers.

6.6.6 End of Platform Protection

For customer safety, the ends of platforms shall be protected and clearly demarcated to persons with a disability by installing a physical barrier.

a) Ends of platforms shall be protected and clearly demarcated to all customers including people with disabilities by implementing a railing located within the detection range of a visually impaired person using a cane. Persons using a cane can detect objects in their line of travel if their lowest leading edge is at or below 680 millimetres from the floor.

b) A blue light fixture will be located at the platform end walls near the tunnel entrance to clearly identify the Emergency Alarm Station (EAS).

c) A low gate shall be located at the end of the platform to the access to the service walkway. Signage shall be provided (refer to DS-03 Wayfinding Design Standard)

6.6.7 Area of Refuge

a) Areas of Refuge shall be tenable spaces subject to the following:

   i. The tenability criteria shall be maintained for the time for emergency personnel to search for, locate and evacuate all those who cannot self-rescue.

b) Areas of Refuge shall be provided at Stations for all public levels below grade that provide a barrier-free path of travel.

c) Areas of Refuge shall be enclosed, unless located at a designated point of safety in conformance with NFPA 130.

6.7 FUNCTIONAL SUPPORT ELEMENTS (AMENITIES)

LRT Stations comprise elements and services that support the customer experience. These elements are located in different parts of the Station, from the main entrance and concourse level to the platform level, depending on the nature of the service provided, space available, Station type (in-line, interchange, or intermodal), prioritizing Station design requirements, and specific needs.

6.7.1 Self-Serve Hub

The fare vending devices are a modular integrated element combining an automated fare system and real-time information wall that provides the necessary data for customers to plan their journey. This element is required to be consistent, highly visible, and recognizable within the unpaid transaction zone. The self-serve hub can be found at the Station entry points within the unpaid transaction zone, as well as within paid access area for interchange and intermodal Stations.

The elements that make up the self serve hub include:

a) Information hub including journey planning represented in the form of static maps (this includes information related to “Regional Transit”, “Buses from Here”, and “Facility Map” (refer to DS-03 Wayfinding Design Standard and DS-03 P2B Sign Implementation Manual);

b) Fare devices (refer to 6.7.1.2 for requirements);

c) Identity and digital signage displaying information such as vehicle departures and arrivals, system delays, and elevator outages with touch screen technology; and

d) Waste receptacle and recycling unit(s).

6.7.1.1 Planning Requirements:

a) The self-serve hub and supporting fare equipment shall be located on the right hand side of the passenger flow as a customer enters/exits the Station. All other configurations shall be presented to Metrolinx for review and approval.

b) Self-serve hub shall be:

   i. Visible from the entrance door;

   ii. Located where there is a high volume of passengers;

   iii. Located to provide a direct line of sight to the Station ambassador office;

   iv. Located at all entry points.

6.7.1.2 Information Hub

Information hubs are planned to be the first stage in the customer journey where information is provided on a series of static visual maps for customer context and journey planning. It indicates arrival and departure times, relevant line delays and events (e.g., broken elevator at any Station so customers can plan their trip in advance), as well as relevant news.

a) With future advances in digital technologies, provision for power and data infrastructure including empty conduit for future digital screen and audible technology shall be provided.

b) There are typically three maps that make up the information hub, namely:

   i. Overall Regional Transit Map;

   ii. “Buses from Here” Map; and

   iii. Facility Map.

c) Infrastructure provisions for future digital signage shall be planned for at the self-serve hub. This future digital information will enhance the customer journey by providing live information such as times of arrival, departure, delays, and closures of train and bus networks. Signage shall be placed closest to the path of travel. Placement of digital departure screens at the self-serve hub shall be mounted at eye level, at a height of between 1500–1525 mm from the floor and shall conform to DS-02 Universal Design Standard. For further information specific to digital signage, refer to DS-03 Wayfinding Design Standard and DS-03 P2B Sign Implementation Manual.

The intent of indicating all subway and LRT lines and extensions within the Regional Transit Map is important to show context, allowing the customer to plan their end-to-end journey, showing transfers and any other integrated fare payments scenarios.

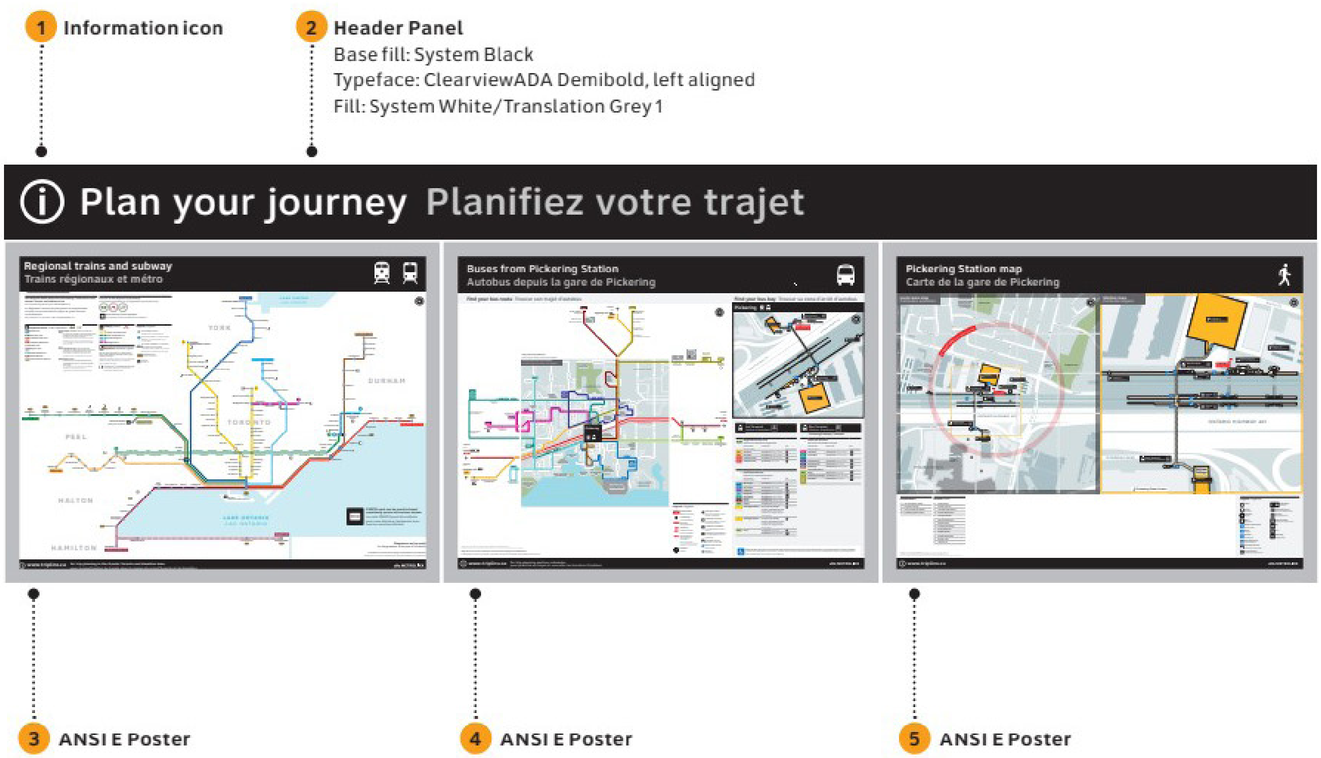


Figure 6-25: Station Information Hub

6.7.1.3 Fare Device and Fare Purchase

Fare devices are very important elements in the LRT Stations and network in general. Customers plan their trip around the purchase of the ticket; therefore, a convenient location of these devices will facilitate the customer experience. With the current change in technology, these devices are now designed with a friendlier system and look (e.g., a front touch screen with simpler design).

a) Fare threshold is the threshold dividing paid and unpaid area. This threshold shall be accompanied by fare validation/payment device (eg. fare gate, SFTP) in accordance with the project scope as defined within the Project Agreement.

b) Fare vending devices shall be located at all Station entrances /access points, along the barrier free path of travel, within the unpaid transaction zone of the LRT Station at grade, at concourse level, or split between the two levels.

c) When a station ambassador office is provided, it shall be located adjacent to the fare gate or devices.

d) Number, type and redundancy of fare devices at entrances shall conform with PRESTO Service Design Standard and in accordance with the project scope as defined within the Project Agreement.

e) The location of fare devices and related fare equipment shall provide clear unobstructed access and egress in the event of an emergency.

f) While the queue space in front of fare devices is expected to be a demonstrated minimum dimension, It shall be provided as follows:

   i. Clear queue space shall be provided for a minimum of three people standing perpendicular in front of each machine.

   ii. Queue space shall allow for 1400 mm/person in accordance with the National Fire Protection Association (NFPA). Where dimensions are in conflict, the most stringent shall be implemented.

   iii. Queue space for three people shall not interfere with the egress, path of travel, or other fare thresholds queue space. In the case where more than three people are queuing directly behind one another, it is allowable for FVM queue space to overlap with the fare threshold queue space.

g) Queuing space may need to be increased based on historical peak Station demand information provided by Metrolinx.

h) The required infrastructure, including power/data, shall be provided. Conduits shall be concealed and not exposed to public areas.

i) Fare devices shall be located at least 1000 mm from the adjacent inside corners and return walls.

j) Placement of fare devices shall be in a highly visible location, comply with CPTED principles and avoid the creation of hiding places.

k) Fare devices shall be mounted directly on the finished floor, with no special base being required.

l) The depth of area or gap behind fare devices and partition shall accommodate specific maintenance and operations requirements.

m) Where fare devices are placed in front of a glass curtain wall, power access shall be from the floor. The gap behind fare devices shall be clear and easily accessible for maintenance.

n) All Station elements shall be anchored securely to prevent them from being stolen, damaged, or used as a weapon. All fasteners shall be concealed and vandal proof.

o) A minimum of one PAI shall be provided within each unpaid transaction zone.

p) Where fare gates are provided, refer to PRESTO Service Design Standard for minimum number of devices and dimension for accessible fare gate.

q) Turning space/ maneuvering area in front of fare devices shall conform with requirements in DS-02 Universal Design Standard

r) Fare device clearances and dimensions shall conform with requirements in PRESTO Service Design Standard

6.7.2 Public Washrooms

Cleanliness, safety and accessibility of public washrooms are important in the context of customer experience. Washrooms shall be designed to serve all user groups and meet the requirements set out in DS-02 Universal Design Standard and the Ontario Building Code (OBC). Account for implementing gender-neutral washrooms to uphold transparent, inclusive and forward-thinking principles.

6.7.2.1 General Requirements

a) Refer to the requirements set out in the Project Agreement for public washrooms at LRT Stations. Typically, public washrooms are located at terminal, interchange, and intermodal Stations

b) Public washrooms shall be highly visible, safe, accessible, durable, and easy to maintain.

c) Public washrooms shall be placed within the paid access area, in visual proximity to the Station ambassador office, and co-located with waiting areas.

d) Public washrooms shall include gendered men's and women's washrooms, a universal / gender-neutral washroom, janitor's closet, and drinking fountains/ bottle filling Stations.

e) All washrooms shall be ventilated and conditioned (heat only). A minimum temperature of 22 degree Celsius shall be achieved.

f) Fixtures containing operable devices shall be accessible in design to the full range of users and shall meet all forward and side reach requirements outlined in the DS-02 Universal Design Standard.

g) Design shall account for proven demonstrated minimum maintenance and operations requirements.

h) All plumbing fixtures, fittings, and washroom accessories shall be standardized throughout the transit system.

i) Dedicated maintenance access to a concealed pipe chase/ space serving all washroom facilities with a full height access door, shall be provided outside washrooms or in adjoining janitor closet.

j) Where doors are required, all gendered washrooms shall have a clear opening with a lockable steel shutter door that can be closed during regular cleaning or maintenance intervals. Door shall be either swing door or sliding door concealed from view within a recessed pocket. Door pocket with door shall be secure and tamper-proof such that when the door is within the recess or pocket, the recess is sealed with lockable pocket door.

k) Vertical acutation bar shall be provided for universal washroom doors to allow the door to be operated by hand, arm, crutch, cane, wheelchair footrest, foot, or hip shall be incorporated, in accordance with DS-02 Universal Design Standard.

l) Public washrooms shall eliminate a direct line of sight into washrooms with either:

   i. Use of walls in front of the door to eliminate direct line of sight once the door is open, or

   ii. Use of full height stall partitions and doors.

m) The number of fixtures shall be set out in the Project Agreement.

n) Floor drains shall not be located in pedestrian or wheelchair paths and shall not interfere with toilet partitions.

o) Universal washroom and accessible washroom stalls shall be provided in accordance with OBC. Where there is conflict between the requirements, the most stringent shall take precedence.

p) PAIs shall be provided in all universal washrooms.

q) The janitor closet shall be fire separated, in accordance with OBC.

6.7.2.2 Fixtures and Partitions Requirements

a) Fixtures for all public washrooms shall be equipped with OBC-compliant sensor modules for electronic no-touch operation and boxes containing sensor modules shall be vandal proof.

b) All piping shall be concealed behind finished surfaces. Any exposed plumbing drain lines that emerge from finished surfaces shall be chrome-plated or stainless steel.

c) Water closets and urinals shall be wall hung with touchless flush valve.

d) Required number of lavatories shall be wall-hung/mounted and shall include barrier-free access, in accordance with the OBC. All lavatories shall meet all forward and side reach requirements outlined in DS-02 Universal Design Standard.

e) All water faucets shall be contactless, robust, reliable, and commercial grade, where material finish is easily cleanable and durable to withstand harsh cleaning products.

f) All plumbing fixtures shall be located on interior walls. CSA compliant, non-combustible with antimicrobial properties.

g) Stall doors shall default to an open-in position unless closed and locked by an occupant. This indicates availability, speeds traffic flow, and dissuades vandalism.

h) In multi-use public washrooms and maintenance facilities, toilet partitions shall be embossed stainless steel and ceiling mounted.

6.7.2.3 Washroom Accessories Requirements

a) All hand dryers shall be accessible to the full range of users and shall meet all forward and side reach requirements as outlined within the DS-02 Universal Design Standards.

b) All hand dryers shall be contactless / hands free operation, and contain HEPA filter than can be easily accessed and maintained. Paper towel dispensers shall not be specified. Recessed or semi-recessed stainless steel waste receptacles shall be required.

c) Provisions shall be made for an adult change table (810 mm x 1830 m) future-ready for installation in the universal washroom in compliance with OBC. Engineered structural support shall be integrated within adjacent wall assembly to support the change table under load in compliance with OBC.

d) One baby change table shall be provided in each men's, women's, and universal washroom. Engineered structural support shall be integrated within the adjacent wall assembly to support the table under load.

e) Toilet paper dispensers shall be surface-mounted, commercial grade stainless steel, lockable, and of the multi-roll vertical type.

f) Soap dispensers shall be wall-mounted, commercial grade, battery operated, and contactless.

g) One coat hook at barrier-free height shall be provided for each accessible washroom stall and universal washroom in accordance with OBC and CSA B651.

h) Tilt mirrors shall accommodate the needs of children, customers who use wheelchairs, and those who have small stature. Mirror frame shall be stainless steel.

i) All hand dryers shall be high speed dryers versus standard warm air dryers, based on less energy use and improved life-cycle performance.

j) All hand dryers shall be robust, reliable, and commercial grade, fabricated using durable materials such as stainless steel for easy maintenance and cleaning.

k) One electric hand dryer shall be provided for every two lavatories, located close to sinks to prevent dripping onto floors. In situations where there is one lavatory only, one electric hand dryer shall be provided.

6.7.3 Drinking Fountains

Access to safe drinking fountains and water bottle filling stations is an essential convenience provided at all stations to support the comfort, health and well-being of transit customers. The amenity is required to serve all users, including children, elderly citizens and those with physical disabilities, and shall be easy to find, safe and simple to use.

The fountain station is defined as a fully integrated dual functioning water fountain and bottle filling station and shall be conveniently located along the customer route. It is required to be durable, vandal-proof and easy to maintain.

a) A minimum of one (1) fountain station/bottle filling station shall be provided at all interchange and terminal stations, and where washrooms occur, although more is encouraged.

b) A fountain station/bottle filling station shall be located in clear public view, off the main circulation path and adjacent to public washrooms

c) Drinking fountain stations shall be wall-mounted.

    i. Fountain stations shall be recessed into the wall to allow for uninterrupted circulation space beyond.

d) All fixtures shall be securely anchored with tamper-proof hardware secured to the wall.

e) Two drinking fountain stations shall be provided: 1 standard and 1 barrier free access.

f) Drinking fountains shall be cane detectable and comply with CSA B651.

g) Drinking fountains shall comply with forward and side reach requirements in accordance with DS-02 Universal Design Standard and at heights suitable for both standing and seated users. Controls shall be centrally positioned at the front of the unit, or, if at the side, on both sides, not more than 180 mm from the front.

h) Design of the fountain station shall specify exterior finish materials such as stainless steel for long-term durability and ease of maintenance, and it shall conform to CSA-S478 "Guideline on Durability in Buildings".

i) The operation of the unit shall be touchless, sensor activated for safe easy use.

j) Water fountains shall be composed of impervious material which is easily maintained and cleaned. The installation shall be robust with resistance against vandalism, oxidation and corrosion.

k) To protect against water contamination, the fountain station shall have an internal removable water filter, efficient drains to prevent accumulation of water in the bowls, a slanting jet nozzle and protective guard, a steady flow rate and sufficient water pressure to eliminate customers mouth and nose coming into close proximity with the nozzle.

l) Allowance for queuing space in front of the fountain station shall be based on National Fire Protection Association (NFPA) Standards and ensure path of travel is not interrupted.

m) Allowance for queuing space in front of the fountain station shall be based on National Fire Protection Association (NFPA) Standards and ensure path of travel is not interrupted.

6.7.4 Retail

Retail supports the customer experience, offering an amenity along the customer journey and providing additional security. The retail strategy may include the following and in consultation with Metrolinx Non-Fare Revenue:

i. Retail vending with potential for future ready virtual vending;

ii. Kiosks/ pop-up retail;

iii. Leased tenant retail

6.7.4.1 Retail Vending Hub

In certain Stations and under Metrolinx's coordination, retails hubs may appear as a localized commercial services to customers.

a) The retail vending hub shall be strategically located along the main circulation path in areas of high visibility and shall not obstruct:

   i. Station circulation or wayfinding signage;

   ii. Sight lines to and from public areas, to aid safety, egress, and uninterrupted circulation;

   ii. Views; or

   iii. Access to daylight.

d) The retail vending hub shall maintain clear and unobstructed view of the Station ambassador office.

e) The retail vending hub shall be located along main circulation routes to provide demonstrated maximum customer awareness, particularly at grade, which is accessible both from within and outside the Station environment.

f) The retail vending hub shall be integrated into the Station architecture, eliminating placement where the rear of vending machines is visible to the customer.

g) All retail vending machines shall be located a minimum horizontal distance of 5000 mm from any exit doors, stairs, escalators, or elevators.

h) A minimum of one waste and one recycling unit shall be located within 3000 mm of a retail vending hub.

i) Where site conditions allow, customer amenities, including retail vending machines, shall be consolidated to prevent visual clutter where customer traffic is greatest.

j) Power and data rough-ins for retail vending areas shall be provided. Conduit and additional power/data infrastructure shall be future ready to allow for future retail expansion. All infrastructure, including conduit and power and data cabling, shall be concealed. All retail vending power feeds shall be equipped with individual revenue-grade metering.

k) One water line shall be provided for each retail vending hub and for those vending machines requiring water supply.

l) Where specified, retail space shall be provided with a dedicated fire suppression system.

m) Vending machines shall conform to forward and side reach range requirements in accordance with DS-02 Universal Design Standard.

n) All retail vending hub areas shall include floor drain(s) located flush with floor finish and shall not obstruct path of travel.

o) Vending type and number of machines, placement, mechanical, electrical, maintenance requirements and clearances, etc. shall be coordinated with Metrolinx Non-Fare Revenue team.

   i. Where vending machines are in scope, allow 3500 - 4500 mm of uninterrupted queue space perpendicular to front of the vending machines.

p) Where Automatic Teller Machines (ATM's) are to be included, they shall be located in sight of and/or in proximity to station ambassador office.

q) No retail storage shall be provided on site; storage for Popup retail is the only exception.

6.7.4.2 Leased retail / kiosk

a) Leased retail shall be located in close proximity to public areas:

   i. In the paid area.

   ii. With direct sight lines from the public corridor; and

b) In close proximity to the Station ambassador office.

c) Leased areas queuing space shall not interfere with the Station circulation.

d) Where the retail is located adjacent to a glazed wall of the Station entrance, it shall be provided with opaque or translucent glazing to mask visibility over furniture or equipment.

e) Distinction between leased areas and station areas shall be maintained in terms of both station identity and operations, while aligning with the ceiling and floor materials and module of the Station.

f) Allow for shared retail Pop-up retail unit with a minimum 3050 millimetres x 3050 millimetres footprint in the unpaid transaction zone where conditions and space allows. Position in high traffic area without impeding traffic flow and ensure required clearances are maintained. Provide power / data and ensure all conduit/infrastructure is concealed. Where Popup retail is provided, include a storage area approximately 2440 millimetres x 2440 millimetres within close proximity to station ambassador office to accommodate promotional material and/or retail cart.

g) Walls shall be extended to the underside of the structural ceiling to provide vertical fire separation from the remainder of the station floor area.

h) Finishes shall be consistent with all aspects of surrounding station finishes and be subject to Metrolinx review/approval.

i) Design shall prove a demonstrated maximum use of transparent materials in order to provide clear sightlines to and from public areas.

j) Design of all leased areas shall comply with the Ontario Building Code (OBC) for construction type, interior finish flame spread, and separation from public circulation areas.

k) Leased areas shall have walls that extended to the underside of the structural slab so that there is fire separation between them and the remainder of the Station floor area. Openings in the fire separation shall be protected in accordance with OBC.

l) Power/data infrastructure shall be provided as required for each tenant. Conduit and additional power/data infrastructure shall be future ready and allow for future retail expansion. All retail and concession power feeds shall be equipped with individual revenue-grade metering.

m) Leased areas for food and beverage tenants shall be provided with hot and cold water supplies and drainage systems.

n) Capped mechanical service connections – including plumbing, drainage, natural gas, and ventilation systems shall be provided for future fit-out of retail tenants.

o) Retail signage shall not confuse or interfere with wayfinding information. Proposed retail signage shall conform to the following process, where applicable:

    i. All retail store front signage shall be submitted to Metrolinx for review and approval prior to installation.

p) Design shall comply with Metrolinx's requirements for standardization of signage at all locations in accordance with DS-03 Wayfinding Design Standard &and DS-03 P2B Sign Implementation Manual.

q) All retail elements shall meet requirements as set-out in DS-02 Universal Design Standards.

r) Where retail is in scope, design of the facilities to support anticipated waste generation and removal needs. (E.g Design co-ordinated with anticipated retail needs.)

6.7.5 Advertising

Stations shall be designed to incorporate varying methods of advertising and shall form an integral part of the architecture and appearance of the Station without compromising passenger safety or journey planning. The current advertising format uses both static and digital advertising means. With continuous advances in digital technology and changing dimensional sizes of advertising products, the design strategy developed identifies strategic advertising locations, with built-in flexibility, integrated within the architectural environment, while ensuring critical wayfinding elements including signage and feature elements are not compromised.

6.7.5.1 Typologies

The advertising strategy may include the following and in consultation with metrolinx Non-fare revenue:

Below is a list of current advertising products supplied.

a) Static back-lit advertising display panels; portrait format.

b) Digital advertising panels - portrait format.

c) Landscape digital screens, large format media matrix video walls.

d) Large format indoor or outdoor LED (Light emitting diode) boards.

e) Pop-up advertising.

f) 3 dimensional elements.

g) Infotainment screens - must not be located within 2000 millimetres, distance from any digital or wayfinding signage.

h) Environmental decals.

6.7.5.2 Requirements

a) Third party advertising shall be located in public-facing areas, specifically in high-traffic, high-dwell time areas within the paid access area, including areas of vertical circulation (except in elevators). Third party advertising shall prioritize the customer by creating waiting areas, transfer levels, pedestrian tunnels, pedestrian bridges, shelters, and Station platform side walls; it shall also be incorporated at strategic locations within fixed glazing segments along PEDs. Floor mounted, free standing third party advertising on all platforms shall not be permitted.

b) Placement and installation of advertising shall be designed such that advertising can be updated during revenue service and without impact to passenger/vehicle flow.

c) Placement of static third party advertising applied to glazing beside PEDs shall be spaced along the platform to demonstrate proven minimum impacts to views and to promote CPTED.

d) The number of advertising panels shall meet the requirements set out in the Project Agreement and its distribution shall be agreed upon and approved by Metrolinx.

e) Clear glazing shall be required on both sides of static advertising, where advertising is integrated within full glass segment of PED extending to vertical and horizontal mullions. Advertising shall not extend beyond one PED glass segment bound by mullions. The backside of advertising facing the rail corridor shall be opaque, where colour and material re selected purposefully to be consistent with the Station colour, finishes, and materials.

f) Third party advertising shall be permissible in unpaid transaction zones, only in areas that do not conflict within the fare transaction zone as this may interfere with or distract customers from performing fare transactions or wayfinding. All proposed locations of third party advertising within unpaid zones shall be presented to Metrolinx for review on a case-by-case basis.

g) Both static and digital wayfinding signage shall take priority over advertising in all areas within the station and along the customer journey while achieving visual balance.

h) Advertising shall not be located within a 2000 milimetres radius of key transactional points, or within a 2000 milimetres radius of key decision making points, and shall not obstruct or impede sight lines or access to designated Waiting Area (DWA) or passenger Assistance Intercom (PAI). These include:

   i. Key transactional points including where fare purchase and fare payment information, equipment and devices are located;

   ii. Key decision making points, where static and digital signage and wayfinding are the primary visual elements, shall not be a competing element that impacts a customer's ability to successfully navigate throughout the station. Key decision making points include where directional information is provided prior to access to platforms, where service and schedule information is provided, and adjacent to elevators.

i) Non-fare revenue advertising shall not obstruct or impede the minimum corridor width, floor to ceiling clearances, main paths of circulation, or egress in emergency.

j) Advertising panels and screens shall be surface-mounted on opaque vertical tiled surfaces within dedicated wall niches; they shall not project more than 100 mm and shall comply with OBC and DS-02 Universal Design Standard. All wall-mounted advertising elements shall be integrated and flush within the wall assembly and not protrude causing a hazard to customers.

k) Where advertising display panels are installed adjacent to each other, each panel shall require 130 mm minimum of ventilation space on all sides.

l) Typical wall niches dedicated for advertising shall:

   i. Be recessed 100 mm where display does not protrude further than 100 mm;

   ii. Have a continuous base that is flush with the main wall assembly;

   iii. Have a running length in equal increments of 1220 mm to suit extent of advertising media. Where longer wall run occurs, such as in pedestrian tunnels, niches shall be equally spaced where they are a minimum of 1220 mm apart;

   iv. Display dimensions to be coordinated with Metrolinx.

   v. Be a minimum of 2610 mm high with a minimum opening dimension 2460 mm high;

m) Ensure all corners and return surfaces are protected with a stainless steel edge trim;

n) Be installed within an active partition type (see Item 9.4.4 m) where wall tiles are consistent in size as a general wall tile and are designed to be removable to access services;

o) Have continuous raceway to access to power and data connections.

p) All wall-mounted advertising products shall be mounted:

   i. 300 mm above finished floor;

   ii. A minimum of 1200 mm from the nearest inside and outside corner; and

   iii. A minimum 1200 mm and equally spaced from adjacent advertising product(s), especially in pedestrian tunnels.

q) In consultation with the Metrolinx “Non-fare sales team”, all final locations of advertising shall be positioned at the discretion of Metrolinx.

r) Active walls with an integrated wall cavity shall be provided where advertising is located and shall accommodate the depth of advertising elements and access to supporting infrastructure.

s) Power and data conduit shall be located at all advertising locations in order to be future ready for all digital advertising. Electrical and data cables to advertising screens and panels shall be concealed and accessible from behind the wall assemblies. Exposed conduit running from floor or ceiling to advertising is not acceptable.

t) Communication racks and infrastructure required to support the advertising content management system shall be provided within a separate third-party communications room within the services module.

u) Power and data infrastructure shall be provided for non-fare revenue advertising and charging Stations.

v) Non-fare revenue advertising shall not be applied/ displayed to:

   i. Any floor surfaces including pylon advertising on platforms;

   ii. Stair runs or risers;

   iii. on or in front of glazing, glass balustrades or glass doors. Note: The exception to this rule is on PED's, customer side, only in strategic locations where stair, escalator, and/or elevator landings occur;

w) Advertising shall not obstruct other design elements and Station infrastructure such as benches, garbage receptacles, and light fixtures.

x) All non-fare revenue advertising, enclosures, and screens shall be non-reflective and non-glare in accordance with DS-02 Universal Design Standards.

y) All non-fare revenue advertising shall be durable and easy to maintain.

z) All non-fare revenue advertising shall be securely fastened using concealed, tamper-proof fasteners.

aa) All non-fare revenue advertising shall incorporate suitable mounting heights for all customers and shall conform to DS-02 Universal Design Standard.

ab) All forms of advertising shall be silent.

6.7.6 Station Ambassador Office

The Station Ambassador is also commonly known as service counter/station attendant office. This is a public facing office with a service counter provided at the fare threshold location, with direct line of sight over the public area, with the intended purpose of providing information and support to customers while in the Station.

The Station ambassador office shall be designed as a flexible and modular component to accommodate future changes and staffing needs, advances in technology, and customer service demands. While the current model is based on an enclosed type, design shall be flexible to be able to adapt to an open transaction space between the Station ambassador and customers.

Allocation of space for station ambassador facility shall be determined by the operational model. This design standard assumes customer facing and back of house space is required to support the station ambassador function.

a) The Station ambassador office shall be designed as a series of modular elements and be sized to accommodate a maximum of two transit personnel. The number of personnel shall be confirmed in the Project Agreement and coordinated with the operator.

b) The Station ambassador office shall be located:

   i. adjacent to the fare thresholds and self serve hub, facing the unpaid area, to provide customer assistance, surveillance, and customer-related support;

   ii. to have uninterrupted direct line of sight/views of the self-serve hub and Station interior;

   iii. at a primary entrance;

   iv. at secondary entrance subject to need (eg. pedestrian flow, safety/security, travel distances, site constraints, etc); and

   v. such that seating in close proximity to the Station ambassador office and staff door access does not impede the path of travel, queue space, or customer movement, and is not positioned in a blind spot such that the Station ambassador is not able to see seated customer.

c) The Station ambassador office shall be ventilated and conditioned.

d) The Station Ambassador office shall be an element of continuity across all new line LRT Stations.

e) The Station ambassador office shall be located on the right hand side as customers enter the primary Station entrance. Where this is proven not to be technically feasible, an alternative design solution shall be presented to Metrolinx for review and approval and to ensure that the Station ambassador office and self-serve hub are co-located and configured to prevent cross-circulation.

f) The customer-facing elements of the Station ambassador office shall meet all accessibility requirements in accordance with AODA, and DS-02 Universal Design Standard. Back of House shall be designed in accordance with barrier free design requirements under OBC.

g) Power and data connections shall be provided for all the required operable workstations while ensuring that they are mechanically protected. Power and data conduit and wiring shall be concealed from view.

h) The door location to the Station ambassador office shall be designed to be accessible on either the paid or unpaid side where location shall be confirmed in the Project Agreement and coordinated by the operator. All doors accessing the Station ambassador office shall include glazing for increased visibility and shall incorporate automatic door operators with push-to-open door buttons. Door(s) to the office shall be secure and equipped with a form of authorized access.

i) A communication box / hands-free intercom at one location within the Station attendant office and wired through the counter shall be provided to enable customers to communicate with staff.

j) Station ambassador office shall be designed to anticipate possible future needs. The following shall be considered:

   i. Power and data infrastructure rough in shall be provided to allow for future flexibility/expansion of services in response to future requirements.

   ii. Power and data to all workstations shall be on emergency battery power.

   iii. Station ambassador office to be designed "future ready" and include supporting infrastructure for future power and data demands.

Figure 6-26: Station Attendant Office

k) A built-in hearing induction loop intercom system shall be installed at all service counters to aid in communication for customers who are hard of hearing. Hearing induction loops shall meet the requirements of the IEC 60118-4 Standard. Service counters equipped with hearing induction loops shall be clearly identified with the ISO international T-Coil Symbol.

l) The Station ambassador office shall be consistent along the LRT line. It shall be a recognizable element for customers where the interior identity wall, wall finishes, datums, physical form, and signage are consistent.

m) The Station ambassador office shall be constructed as a glass and stainless steel clad enclosure. Glazing shall be impact-resistance with an anti-scratch coating.

n) Lighting shall include under counter LED lighting to highlight panel below counter and provide definition; recessed LED lighting located above the information transaction surface; and internally illuminated "information" signage recessed flush with front face.

o) A centre glass opening for unassisted audible communication shall be provided; it shall comprise a lockable sliding glass panel for security.

p) CCTV and digital screen shall be coordinated with operational model to ensure adequate safety, function and service level.

q) Provisions for combination intercom and audio loop systems shall be included as alternate means of communication when glass is in closed position, as well as a speak-through device with spit guard.

r) Optional individually controlled variable direction and volume airflow below the attendant's work surface may be provided for individual comfort control.

s) Concealed storage below counters shall be provided for all staff computer-related equipment such as CPUs and cabling. All equipment shall be accessible for maintenance, clear of operator and causing no interference.

t) Back storage shall be provided with counter top. Storage shall be concealed with doors or drawer fronts. Hardware shall comprise discreet door pull hardware or hidden push latch. All doors/drawers shall be lockable and keyed alike. Millwork doors in excess of 600 mm in width shall have heavy duty hardware.

u) Gable supports shall be provided as required at the midpoint of each shelf to prevent warping/deflection when loaded with supplies.

6.7.7 Fixtures and Furnishings

Refer to Section 4.3.1.3. for Furniture Requirements.

6.8 ANCILLARY ELEMENTS

6.8.1 Back of House

Ancillary spaces house critical service infrastructure necessary for Station building operations. This include:

a) Mechanical Room,

b) Electrical Room,

c) Communications Room; and

d) Service Building.

a) The relationship between the mechanical room, electrical room, and communications room shall always be consistent. Together, these ancillary areas form a repeatable yet adaptable ancillary module that will provide for consistent operations across the LRT network.

b) Additional mechanical, electrical, and communication spaces required for the site and platform shall be provided within the service module. The Station building shall accommodate the following ancillary areas in accordance with the following requirements:

i. Mechanical Room:

1) Shall have direct access at grade; and

2) Fixtures and furnishings may include:

- Power receptacles
- Floor drains
- Spare and additional filters, etc.;
- Storage shelves; or cabinets
- Eye-wash Station; and
- Exterior non-freeze hose bib.

ii. Electrical Room:

1) Shall have direct access from building exterior for after-hour access; and

2) Shall provide spare wall space for future equipment due to additions or renovations.

iii. Communications Room:

1) Shall have direct access from building exterior for after-hour access; and

2) Shall be located in proximity to the electrical room.

iv. Maintenance Rooms:

The maintenance room is critical to successful operations and maintenance within the Station building. The maintenance room is required at staffed Stations within the Station ambassador module and shall be in close proximity to the public washrooms. In an unstaffed Station, the maintenance room shall be incorporated within the service allocation areas. Maintenance room requirements are as follows:

1) It shall be provided with direct access to building interior and located away from primary pedestrian circulation to minimize confusion.

2) Lighting shall be provided in accordance with Section 6.9.

3) It shall have key fob access.

6.8.2 Staff Facilities

Although staff washrooms and offices are not in direct contact with the public, these spaces are visited daily by employees and contractors; therefore, certain requirements and guidelines shall be applied. These spaces, while providing all the elements needed for their work, shall promote equity, inclusion, a healthy environment, and the well-being of staff.

a) Staff washrooms, including change rooms and lockers, as well as staff offices shall have barrier-free access. Refer to DS-02 Universal Design Standard and OBC for compliance.

b) Coordination shall be made with the operator of the LRT network to align with standards and guidelines.

c) Materials and finishes shall follow the LRT network line-wide modulation.

d) When offices are seen from public areas through glass-walls or windows, special attention shall be made to the selection of finishes and modulation of walls, ceilings, and flooring materials.

e) Washrooms shall be designed with the use of the following materials:

   i. 70% colour contrast wall base (between floor and wall base, and wall base and wall finish)

   ii. Non slip flooring tile or terrazzo.

c) Uniform lighting shall be provided.

d) Non reflective surfaces, including on stall partitions.

f) Access to washrooms shall be screened from the access corridor using a vestibule entry.

g) Staff lunch rooms shall be provided with accessible features, including tables. Refer to DS-02 Universal Design, OBC, AODA, and CSA for compliance.

6.8.3 Ancillary Equipment

6.8.3.1 Service Building

Service rooms contain critical equipment required for a Station to operate. These rooms can include fuel storage, back-up generator room, snow melt equipment, as well as the main mechanical, electrical, and communications rooms that service the Station site. These rooms are required in both staffed and unstaffed Station buildings.

a) Service areas shall be consolidated where possible to reduce the amount of rooms or need for separate structures.

b) Though a discreet module, the service area shall be seamlessly integrated into the overall building composition.

c) Where service areas are not located adjacent to the Station building, they shall be positioned such that they avoid dominating the public paths of travel and they shall be designed in accordance with CPTED principles.

6.8.3.2 Minor Ancillary Equipment - Hydro Infrastructure

a) Hydro infrastructure and any similar ancillary equipment shall be coordinated during the early stages of the design with the respective hydro supplier in order to accommodate sufficient space inside the electrical rooms for them.

b) The number of hydro infrastructure shall be simplified, where possible.

c) Hydro infrastructure located in the exterior of the building shall be located in service lanes and away from visual contact with the public, away from plazas, entry ways, and Station access.

d) Hydro infrastructure shall be provided with enough clearance for access and service, without interrupting traffic of the service lane where it is located.

e) Where located in public view, colour of the hydro box shall match the line-wide colour consistency.

f) Medians and opposite sidewalks shall be explored for the location of hydro infrastructure and other ancillary elements.

g) Hydro infrastructure and big ancillary equipment shall be screened from the public view by the use of landscape, especially where it is located in urban areas. Where it is located in suburban areas, coordination shall be made to ensure that it is not subject to vandalism.

6.8.4 Access Hatches and Handwells

6.8.4.1 Access Hatches

LRT Stations design shall incorporate access for installation, cleaning, inspection, and maintenance without jeopardizing the safety of LRT operations, pedestrians, and customers.

a) Location and placement of access hatches, handwells, and other means shall be carefully considered in the Station design to avoid customer disruption, during the regular daily use of the system, when maintenance access may be required.

b) The location of the access hatches, handwells, and any other means shall be coordinated with the Station design, minimizing their number in public areas (plazas, platforms, public corridors, and sloped public walkways).

c) Access hatches and handwells shall be located out of the path of travel, especially the public access to the Stations.

d) All elements in pedestrian and customer paths of travel are required to be designed as barrier-free and in conformance with the requirements of DS-02 Universal Design Standard.

e) Access hatches and handwells shall be secured when located in public areas.

f) Access hatches and handwells' location shall be organized and coordinated with the Station modulation, to align with the Station geometry and to reduce visual clutter.

g) Access hatches located in public areas shall be provided with the same finish floor as surrounding areas, except for fire fighters access.

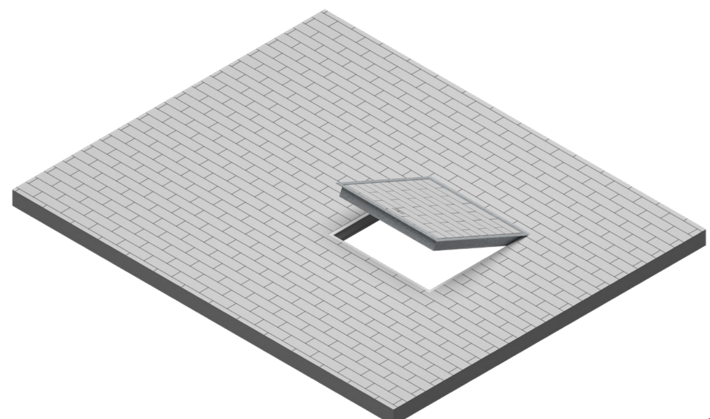


Figure 6-27: Access Hatches

6.8.4.2 Fire Fighters Access

LRT Stations require access from the fire department directly from the street to each end of the Station platform. In some cases, this access is through dedicated emergency exit egress and in other cases through access hatches located at grade.

a) Firefighters access hatches at grade shall be located facing the fire fighters access route from the street.

b) Firefighters access hatches shall be flush with the surrounding finish.

c) Firefighters access hatches visibility shall not be blocked from the street by any of the Station elements (e.g., garbage bins, panels, and bike racks).

d) Firefighters access location shall be coordinated with the respective fire department and municipality.

e) Standard fire fighter access model is to be provided/ coordinated with the respective fire department.

f) Provision for removable railing shall be provided in surrounding area of the hatch.

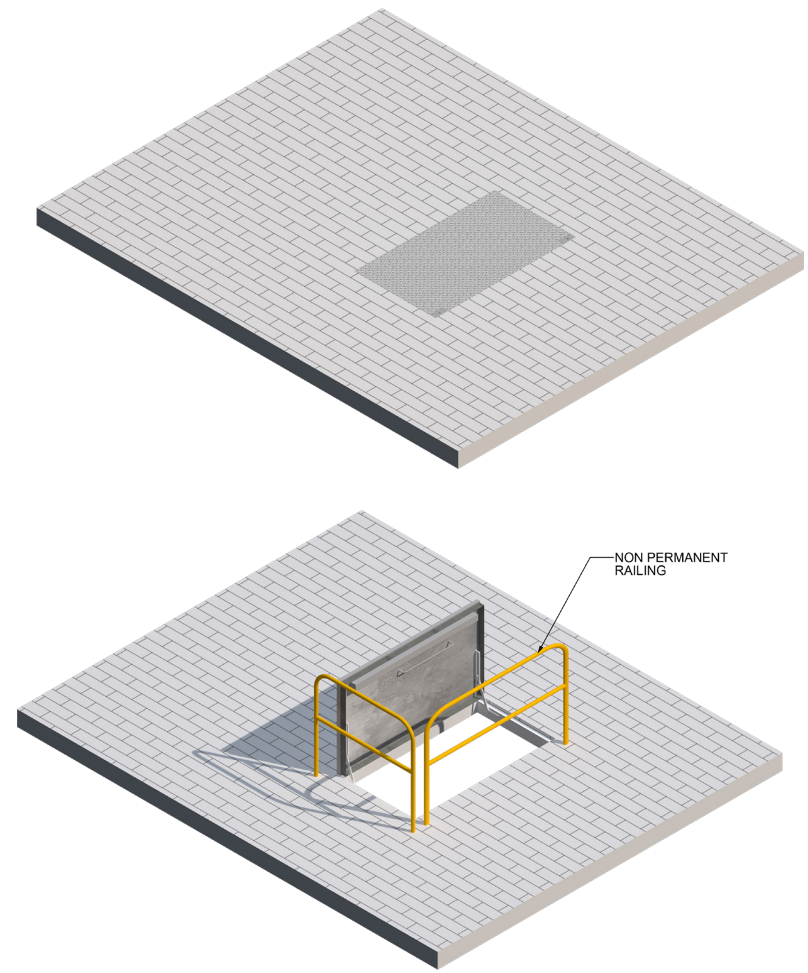


Figure 6-28: Firefighter Hatch

6.8.5 Ventilation Shafts

Ventilation shafts are structures connected to the Station ventilation system (mechanical and emergency) that need to be connected to the exterior air since they bring fresh air to the Station or they discharged interior air or smoke. These structures can be seen at grade or in the roof.

a) Ventilation shafts shall be integrated with the Station entrances of service buildings rather than individual volumes.

b) Modulation of the Station entrance or service building shall not be affected by the integration of the ventilation shafts in their structure.

c) Ventilation shafts at grade shall be integrated or screened by landscape, where possible.

d) Metal grating is required for ventilation shafts located at grade or in the roof. Considerations shall be made when certain loads are expected in gratings (i.e., vehicles) for the selection of supporting elements and metal grating model.

e) Standalone ventilation shafts shall be designed:

   i. They shall be integrated with the LRT network holistic view.

   ii. They shall not be climbable by the public.

   iii. They shall respect CPTED principles of design (not creating hidden places).

   iv. They shall integrate other uses (e.g., benches).

6.8.6 Portals

The LRT guideways may include portal structures effecting the transition from surface running to an underground tunnel condition. The portals are significant structures and represent distinct moments of the passenger experience and, as such, warrant design consideration beyond the engineering requirements to enhance the transit experience and become positive urban elements within the street space.

a) All portals shall occur within the LRT ROW. Because the portals are relatively large and visually prominent structures, they must be designed to contribute to the quality of both the LRT corridor and the municiapl realm.

b) In particular, portal design shall support the overall line-wide identity, thus promoting a positive user experience through their materiality and detailing.

c) The portals shall be cast-in-place concrete structures with walls extending above the adjacent finished grade to the required guard height. Parapet walls that are open to public view shall include continuous coping details and an architectural finish achieved through form liners. Jointing and other surface patterns will reflect an established module typical of all LRT buildings and structures that are characteristic of the parent LRT system.

d) Portal walls on track-side shall be clad with modulated panels to enhance acoustic attenuation.

e) Transition zones at the heads of these portals may offer opportunities for generous plantings of ornamental grasses. These plantings shall improve the experience of passing motorists, and contribute to the LRT line-wide identity. The flanking walls of the portal shall be set back from the edge of the adjacent travel route to protect the structure and provide snow storage.

6.9 LIGHTING: EXTERIOR AND INTERIOR

Lighting at Stations 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 exterior lighting requirements, refer to Section 4.3.1.4.

6.9.1 Design Requirements

a) Lighting shall complement station architecture and surrounding station elements.

b) Surfaces including walls, ceilings, floors and columns, shall be a non glare finish where the Unified Glare Rate (UGRL) shall not exceed 25 for circulation areas as per DS-02 Universal Design Standard.

c) Key elements in the customer journey shall have focused lighting to support wayfinding.

d) Lighting levels shall complement signage and readability of signage.

e) Adequate lighting levels shall be provided to ensure clear visibility of CCTV coverage and resolution.

f) The lighting design shall ensure adequate vertical lighting illuminance of customer faces for identification purposes. The vertical lighting design height shall be between 914 millimetres and 2134 millimetres.

g) Lighting levels shall be coordinated with CCTV camera capabilities.

h) Lighting fixtures and associated louvers/grilles/reflectors specified shall be fabricated of a non glare finish and shall not exceed the Unified Glare Rate (UGRL) of 25 as per DS-02 Universal Design Standard.

i) The luminaires shall be selected and located to reduce glare to customers, transit operators and the CCTV as per the DS-02 Universal Design Standard.

j) The lighting design shall visually assist the customer along the preferred circulation paths.

k) Lighting in the unpaid transaction fare zone shall emphasize system graphics, informational messages, fare vending equipment and fare thresholds.

l) The paid access zone area lighting shall direct the customer to the elements of circulation which leads to the platform.

m) The platform area shall be illuminated to enhance the customer's ability to detect, recognize, and identify objects and events. This can be achieved with upward lighting components and lighting contrast to enhance the overall lighting effect and to eliminate the relatively dark ceilings. Lighting with a good colour rendering and colour temperature supports comfort, well-being and health.

n) The Designated Waiting Area (DWA) shall be illuminated to a higher level than the general waiting area, to delineate the emphasized area.

o) Lighting strategy shall mitigate shadows cast by passengers and this shall be demonstrated in photometric analysis.

p) Platform edge shall be uniformly lit and shall account for passenger shadows.

   i. Lighting shall be designed and selected to achieve optimal colour accuracy and uniformity across the platform.

q) Illumination level of the trackway shall be significantly less than the platform edge to purposefully highlight the contrast with the platform edge.

r) Different colour temperatures shall be utilized to distinguish different areas of the station and provide a different customer experience.

s) Colour temperature range shall be between 3000-4000k.

t) Colour Rendering Index (CRI) shall be a minimum of 80.

u) Surface Reflectance shall be as follows:

   i. Ceilings shall be 80% reflective;

   ii. Walls shall be 50% reflective;

   iii. Floors shall be 20% reflective.

v) Daylight and Natural Light

   i. Natural daylight shall be incorporated into the overall lighting design to support intuitive wayfinding, as a visual refreshment and energy saving. This natural lighting shall be diffused so as to not create glare.

   ii. Where natural daylight is proven not physically feasible, lighting design shall integrate artificial lighting components to replicate daylight, including at vertical circulation shafts where natural light can signify vertical movement up.

   iii. Daylight modelling shall be completed for all public areas of the building using industry recognized and accepted modelling software.

w) Maintenance and operations

   i. No light fixture shall be located over escalators or stairs unless they can be readily serviced by maintenance without the use of an aerial lift.

   ii. Lighting fixtures and poles shall be designed for ease of maintenance, and readily serviceable by system maintenance equipment.

   iii. Corridor areas that are not easily accessible due to operations shall have light fixtures with quick connects / support system and safety chains. The light fixtures shall come with a plug and play wiring system.

iv. Lighting shall consist of energy-efficient, low maintenance lighting fixtures such as LED lighting.

v. LED lamp modules shall conform to IESNA LM-79, LM80 and shall have a minimum rated life of 60,000 hours at 70% (L70).

vi. All interior lighting in public spaces shall be vandalproof.

vii. Ceiling lights shall be accessible independent of the removal of ceiling panels.

x) Emergency Lighting

i. Emergency lighting shall be provided upon power loss.

ii. Emergency lighting power shall be provided via battery or generator power.

iii. Emergency illumination levels shall meet the minimum code requirements.

iv. Battery operated emergency lighting meeting code requirements shall be provided in rooms such as the Emergency Generator Room, Electrical Rooms, Mechanical Rooms.

y) Controls

i. Interior lighting shall be controlled daylight sensors, occupancy sensors, central override switches and/or contactors with a manual override.

ii. A computer-based lighting control system shall control the various lighting circuits through the building.

iii. All lighting fixtures shall be dimmable and sensor based to provide ability to be reduced when there are no customers and increased when customers are present.

iv. Minimum lighting levels while dimmed shall meet the CCTV system requirements.

v. The lighting controls scheme shall be programmable to revise illumination levels to suit Metrolinx requirements.

z) The lighting system shall be designed to align with Illuminating Engineering Society of North America (IENSA) recommendations. Refer to Table 6.1 for illumination levels per zone.

Zone	Minimum Average Maintained Illumination Level (lux)
Station Entrance Day/Night	200 / 100
Stairs/Elevators/Escalators/Ramps	200
General Ambient Lighting	200
Platform	110
Edge of Platform	220
Seating Area/DWA/PAI	250
Fare Equipment/Signage Areas/Digital Signage	250
Uncovered Platform Ends (Service Areas)	50

Table 6.1: Illumination Level Per Zone

6.9.2 Luminaires

a) All interior light fixtures shall have IK10 rated lens.

b) All light fixtures in the Platform shall have IP65 weatherproof rating.

c) General ambient linear lighting shall be:

   i. 75 millimetres wide recessed linear lighting;

   ii. Wet location listed;

   iii. Of corrosion resistant materials;

   iv. With extruded aluminum housing;

   v. Provided with a built-in reflector;

   vi. Lensed;

   vii. A unit easily removed from housing for maintenance.

d) Supplemental ambient lighting shall:

   i. Be 609 millimetres diameter, recessed architectural round;

   ii. Include extruded aluminum housing that is rolled and welded for seamless finish with 20 millimetres trim;

   iii. Include built-in reflector;

   iv. Be lensed;

   v. Be a unit easily removed from housing for maintenance.

e) Artificial skylights shall be:

i. Minimum 1830 millimetres diameter or square artificial skylight;

ii. Recessed;

iii. Diffused regressed lens;

iv. Dimmable;

v. Minimum reveal of 305 millimetres to provide the appearance of a real skylight.

f) Vertical circulation LED Handrail shall:

i. Be a linear LED handrail suitable for indoor or outdoor applications;

ii. Be dimmable;

iii. Be of stainless or extruded aluminum LED housing;

iv. Include polycarbonate lens;

v. Be 24 volt DC operation with remote power supply;

vi. Be a long life minimum 100,000 hours;

vii. Be quick connect "plug and play";

viii. Be custom lengths to suit application.

g) Platform directional luminaire shall be:

i. Continuous 75 millimetres luminaire complete with bat-wing distribution;

ii. Glare free;

iii. Suspended or recessed;

iv. Extruded aluminum housing.

6.10 PEDESTRIAN TUNNELS

Pedestrian Tunnels are a part of the transit network of barrier-free pedestrian circulation that is required to access subway platforms in various site and grade conditions. Pedestrian tunnels can connect pedestrians to other modes of transportation in a more direct and safe way, such as eliminating the crossing of other modes of transportation like bus loops or busy roadways. Pedestrian tunnels can provide community connection points on either side of the tracks or roadways or from adjacent developments.

General tunnel design requirements include the following:

a) Tunnels shall be linked to the platform access module.

b) Minimum dimensions for pedestrian tunnels shall be 5000 millimetres minimum clear width and 3000 millimetres minimum clear height unless a larger dimension required based on Level of Service and the required egress capacity or is existing to remain. These dimensions are exclusive of finishes.

c) The Station functional layout shall be tailored to allow not only pedestrian bridged but also pedestrian tunnels to act as a community connection, with circulation through the primary platform access pavilion and the entrance building. This condition is observable in existing transit stations in the city of Toronto, where underground paths were built connecting the buildings with the transit underground network.

d) Inside the precast design there shall be ENT or PVC raceways placed to feed boxes in the ceiling for mounting speakers, cameras, antennas (cell and Wi-Fi coverage), exit signs, fire alarm systems, digital signs, advertising, and all electrical and IT elements.

e) The precast and cast-in-place concrete areas shall have a coordinated design so that the chases and cavities are continuous and linked to connections at the platform access modules and at rail platforms in a concealed fashion, not visible to customers. The design shall include a method of mounting the raceways to the ceiling in a clean organized manner.

f) The location of raceways and crossovers shall be coordinated.

g) If the tunnel is capable of being extended, the design shall include an easy way of extending the chases in the future.

h) Digital signage shall require both power and communication systems.

i) The tunnels shall include at a minimum: elevators, pump rooms, and (if not on the platform) HUB rooms for electrical and communications distribution.

j) Power and communication raceways shall be separate (they cannot be mixed). Each shall have, at a minimum, a hand well or manhole feeding or exiting the tunnel and at each 90 degree turn.

k) Ceiling finish shall be metal panel ceiling system.

l) Floors shall include tactile guiding indicator in accordance with Universal Standard, and finished with concrete.

m) Tunnels shall be designed to:

   i. Be compatible with CCTV requirements;

   ii. Prevent CCTV field view from being obscured by overhead signs;

   iii. Have a minimum of 2.7 m clear headroom, inclusive of floor finish;

   iv. Have a minimum slope of 0.3% for drainage;

   v. Include side-gutters 40 mm deep X 80 mm wide;

   vi. Not locate drains, pits, or other obstructions at the bottom of stairs or in front of service doors and elevator doors; and

   vii. Include pump rooms with pits.

n) Corners shall be 45 degree angled (300 mm x 300 mm minimum corner cuts at 45 degree) or approved alternate if required for safety and passenger flow.

o) Convex mirror units shall be provided at internal 90 degree corners and angled wall corners at directional changes.

p) Tunnels shall have a hose bib every 30 m or less along the length of the tunnel, unless noted otherwise in the Project Agreement.

6.11 PEDESTRIAN BRIDGES

Bridges connect the platforms and entrance buildings through stairs and elevators. The Station pedestrian bridges are elements of continuity across the LRT network.

a) Bridges shall be constructed of full-height exposed steel trusses that are painted and supported on concrete piers and abutments, integrated into the entrance buildings or entrance pavilion at either end.

b) The bridge shall be fully covered by a metal deck roof covered with single roofing membrane and provided with integrated drainage elements concealed from view.

c) The bridge walls shall be fully glazed windscreens consistent with the Stations and shall have an exposed concrete floor for durability and ease of maintenance.

d) The Station pedestrian bridge design shall incorporate passive conditioned with lighting, system elements visually integrated with the interior treatment and conduits and other system elements concealed from view.

e) The Station functional layout shall be tailored to allow the Station pedestrian bridge to act as a community connection, with circulation through the primary platform access pavilion and the entrance building.

f) Single elevators shall serve both ends of the bridge, providing barrier-free access for people of varying abilities, cyclists, or patrons using strollers.

g) Pedestrian bridges connecting platforms shall have unobstructed interior barrier-free routes and turn-around spaces. Corridors shall be free of overhead and protrusion hazards.

h) Stair centre handrails shall terminate at landings to permit crossover

i) Intermediate supports are not allowed.

j) Maintenance access shall be provided around the bridge in the form of a catwalk or similar structure.

k) Corridors shall be free from protruding hazards.

l) Enclosed overpasses and stairs shall have windows/ skylights, including at the ends.

m) Where pedestrian overpasses over the ROW have stairs/elevators down to an island platform, the bridge structure shall be cable-stayed to uphold the bridge in case of derailment.

n) Pedestrian bridges over tracks shall be single-span structures with supports beyond the operating ROW, to the approval of the railway authority.

o) Bridges at public thoroughfares may have intermediate supports, subject to the approval of the AHJ.

Figure 6-29: Pedestrian bridge

6.12 INTERCHANGE/ INTERMODAL INTEGRATION: ARCHITECTURAL ELEMENTS

6.12.1 Architectural Elements

The approach to the integration of the Station entrances into the surrounding urban context shall be based on civic scale, materiality, and quality.

a) The integration of LRT interchange Stations with the existing transit infrastructure, occurs in two main areas:

   i. The spatial and materiality characteristics; and

   ii. With regard to item (I), the simplicity of the line-wide identity at interchange Stations is challenged by the interface with other operators, primarily the subway, bus, and GO trains. At these locations, material choices and the design expression shall be kept independent, with a deliberate and clear demarcation or threshold. There may be exceptions where both subway and the LRT line share a new primary entrance and lower concourse. While the primary design principles surrounding forms, volumes, materiality, and modulation shall still be acknowledged, it shall be recognized that a new joint identity shall be considered.

   iii. The operational and structural aspects of the stations.

   iv. With regards to item (ii), emphasis shall be placed on minimizing impacts and simplifying constructibility.

b) The approach related to the interface with the integration of transit subway shall be to:

   i. Minimize structural complexities;

   ii. Minimize underpinning of the subway box as well as adjacent structures;

   iii. Reduce impacts to transit operations during construction;

   iv. Minimize impacts to surrounding utilities;

   v. Improve the overall transit experience for the user; and

   vi. Integrate into the surrounding infrastructure, minimizing operational impact on existing and future neighbouring developments. The following design criteria are central planning guidelines in addressing Station design:

      1) Seamless integration link between all transit modes including multi-purpose pathways, in particular subway, LRT Stations, and heavy rail modes.

      2) Provision of integrated and complementary design.

3) Provisions for future expansion of additional transit infrastructure.
4) Celebration of the public realm through main entry plazas, generous green spaces, and pedestrian and cycle links.

6.13 SIGNAGE: WAYFINDING & DIGITAL SIGNAGE

All wayfinding tools for Metrolinx LRT projects shall conform to Metrolinx DS-03. The objectives of the LRT wayfinding strategy to is provide a complete wayfinding solution that delivers all the necessary elements included in Metrolinx DS-03 to ensure a high quality customer experience.

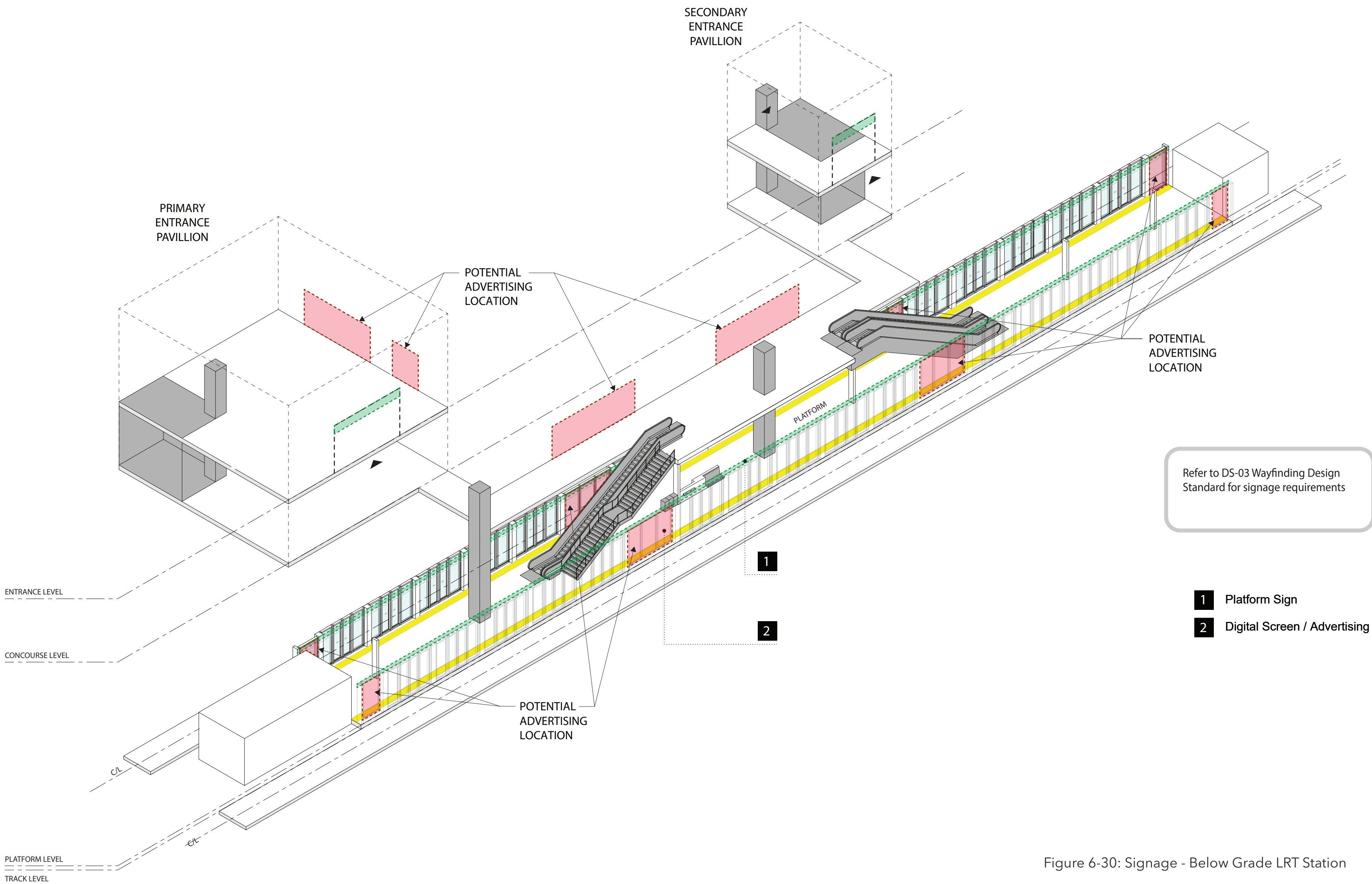


Figure 6-30: Signage - Below Grade LRT Station

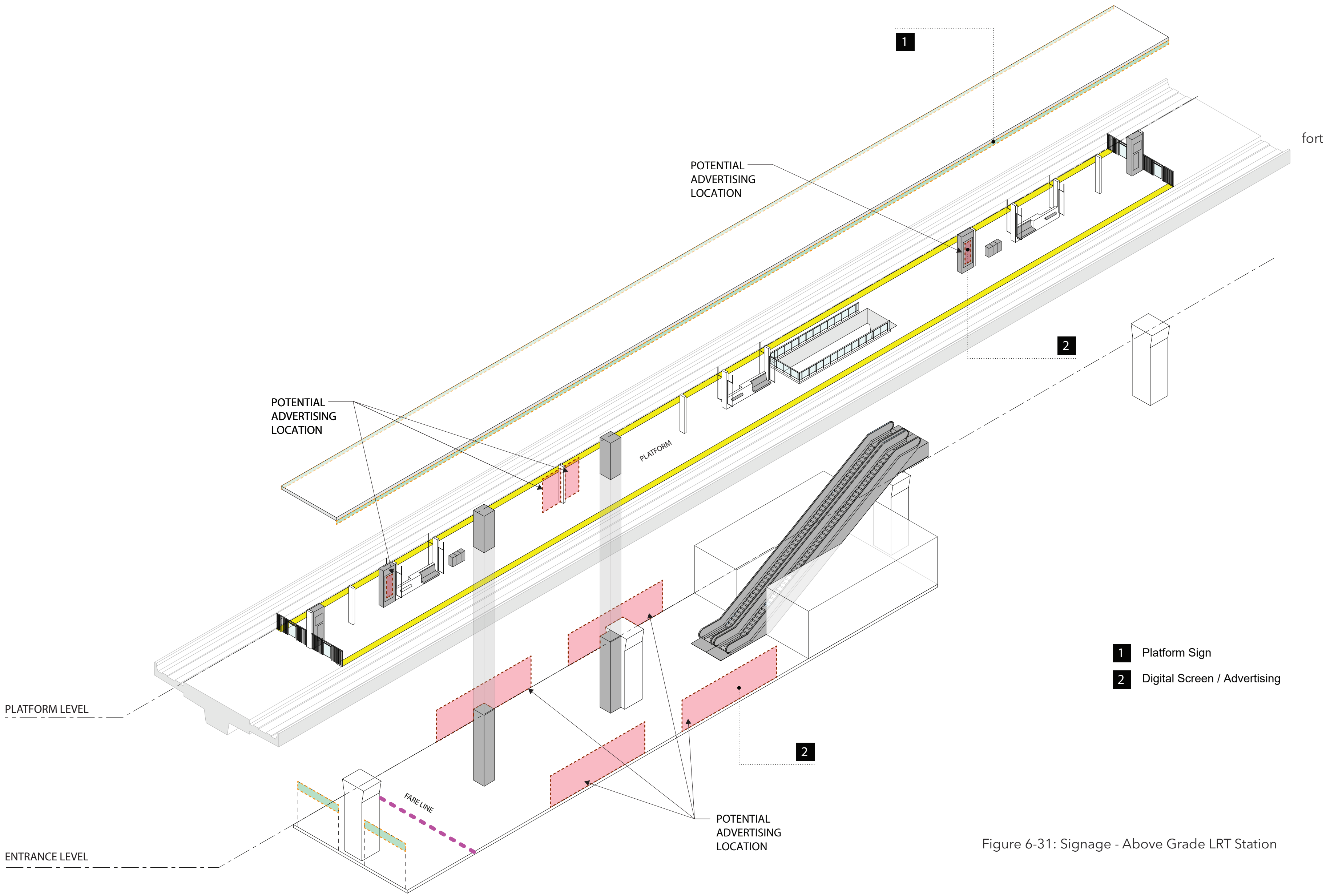


Figure 6-31: Signage - Above Grade LRT Station

6.14 THERMAL COMFORT

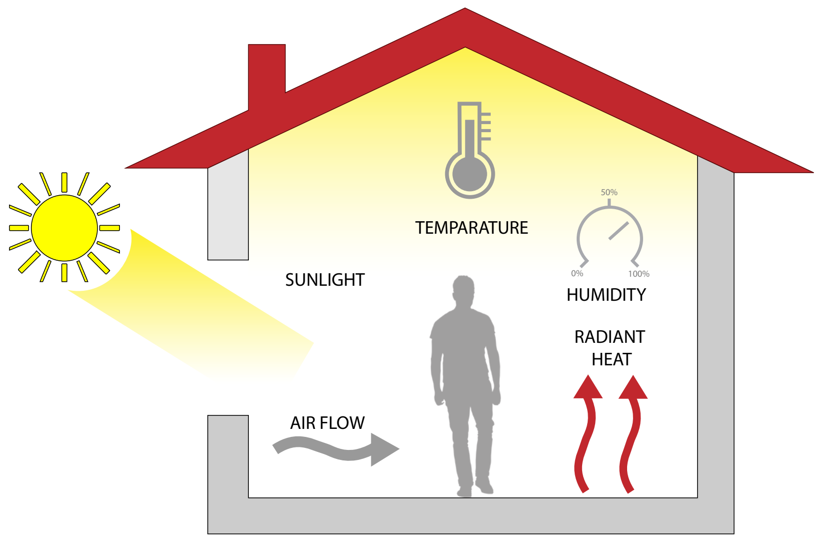


Figure 6-32: Thermal Comfort

6.14.1 Customer Experience

a) Stations shall be designed to optimize occupant comfort by designing with the following factors of thermal comfort:

i. Metabolic rate

ii. Clothing level

iii. Mean radiant temperature

iv. Air speed

v. Humidity

b) Correct analysis of these design conditions shall serve to improve customer health and well-being, while mitigating stress and discomfort.

6.14.2 Description

a) Thermal comfort shall be analyzed for both transient and occupied areas.

b) Design Principles of ASHRAE 55 - Thermal Environmental Conditions for Human Occupancy shall be applied in the design of conditioned and non-conditioned spaces.

c) For all station designs it must be demonstrated, through a CIBSE AM 10 compliant Dynamic Thermal Model, and in subsequent commissioning that each station maintains the following comfort criteria in all interior public spaces, including platforms through the year 2050:

i. A maximum indoor temperature less than or equal to 2°C Wet bulb Globe temperature (WBGT) above the outdoor air temperature (WBGT) when the outdoor temperature is above 25 °C (WBGT) for any hour during transit service, up to a maximum temperature limit of 32.5 °C measured via Wet Bulb Globe Temperature (WBGT) method, to ensure customer and staff safety and comfort. Indoor wet-bulb globe temperature (WBGT) shall not exceed 32.5°C more than 1% of the annual Revenue Service

Hours. For any temperature days above 32.5 °C, the proponent shall demonstrate, how customer and staff comfort and safety will be ensured without providing additional burden on operator budgets, and provide detailed analysis and evidence as proof, subject to Metrolinx approval.

ii. A minimum temperature for all station interior space, including platforms of -5°C dry bulb temperature, at any hour during transit service, except where stations are not underground and do not utilize platform edge doors.

iii. Dynamic Thermal Modelling shall be developed for customer facing areas, including the station headhouse and the platform area.

iv. Simplified tunnel modelling shall be used to model heat accumulation and contributions from the piston effect within tunnels, to understand impacts on modelling for customer areas.d) All thermal modelling shall use projected median temperature increases up to the year 2050 unless noted otherwise in the project agreement, using data from the Canadian Centre for Climate Services (CCCS), and assuming an RCP 8.5 scenario.

v. The building energy model shall use the most current 12 consecutive months of complete historical climate data (from Environment and Climate Change Canada) available as a base unless otherwise noted in the Project Agreement.

1) The historical weather data including but not limited to temperature, humidity and wind data, shall be incorporated as a base from which to escalate the temperature increases, while all other variables (humidity, wind) remain constant.

6.14.3 Functional Requirements

a) All staff areas, including the station ambassador office shall be ventilated and conditioned in accordance with Section 7.7.6

b) Elevators shall be ventilated, heated and cooled.

c) All other public facing areas accessible to customers (except for washrooms) may not be conditioned but shall comply with requirements in Section 6.7.2.

d) A microclimate analysis shall be carried out for each station area, unique to each project, in order to determine the best design practices for ensuring passenger thermal comfort for each area.

e) Where pedestrian tunnels connect to the LRT platform, ventilation shall be provided by the piston effect of the moving LRT Vehicle.

f) Where pedestrian tunnels do not connect to the LRT platform:

   i. mechanical ventilation shall be provided;

   ii. air intake shafts / relief wells shall be provided to enable ventilation of the tunnels.

g) For non-conditioned areas, ventilation systems shall be designed in a manner that improves thermal comfort of occupants.

h) In general, the entire LRT station shall be designed in a manner that minimizes rider exposure to the elements. Glazing and shading elements such as canopies and screening shall be incorporated in a manner that reduces occupant exposure to undesired solar loads, while still accounting for desired natural daylight requirements.

6.15 AIR QUALITY

Stations are enclosed facilities with many mechanical and electrical systems that may lead to accumulation of smoke and limited air circulation. Customer experience is not only about the quality of space, natural light but also ventilated spaces that would sustain the air quality for respiratory requirements, absence of odors and in general a healthy environment.

a) Station entrances shall be provided with louvres for the relief of the piston effect and to proper air circulation from platform, concourse to street level.

b) Mechanical ventilation system shall be activated during the summer season when the temperature inside the Station reaches 40 degrees or above. This may be achieved by the addition of a separate mechanical ventilation system or by the activation of the emergency ventilation system for this purpose.

c) Station public spaces are to be designed meeting a minimum height of 4 metres in the platform and other public areas. Considerations shall be made for the use of ceiling materials that allows air circulation (i.e. perforated metal ceiling or ribs).

6.16 LIST OF FIGURES

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LIGHT RAIL TRANSIT (LRT) ARCHITECTURE DESIGN STANDARD

APPENDIX A
LEED REQUIREMENTS AT MSF

A minimum of LEED Gold certification is required at the MSF, unless stated otherwise in the Project Agreement. LEED substitution is permitted for all credits. Projects are to pursue a minimum of 5 'buffer' points over and above the number of points required for the LEED certification level pursued. The following tables list mandatory credits, optional credits, and credits which are not to be pursued.

MANDATORY	OPTIONAL	NOT TO BE PURSUED	CERTIFIED: 40-49 POINTS SILVER: 50-59 POINTS GOLD: 60-79 POINTS PLATINUM: 80 POINTS AND ABOVE	AVAILABLE POINTS
41	64	5		110
0	**1**	**0**	INTEGRATIVE PROCESS (IP)	**1**
0	1	0	Integrative Process	1
1	**14**	**1**	LOCATION AND TRANSPORTATION (LT)	**16**
0	1	0	Sensitive Land Protection	1
0	2	0	High Priority Site	2
0	5	0	Surrounding Density and Diverse Uses	5
0	5	0	Access to Quality Transit	5
0	1	0	Bicycle Facilities	1
0	0	1	Reduced Parking Footprint	1
1	0	0	Green Vehicles	1
3	**7**	**0**	SUSTAINABLE SITES (SS)	**10**
	Prerequisite		Integrative Process	1
0	1	0	Site Assessment	1
0	2	0	Site Development - Protect or Restore Habitat	2
0	1	0	Open Space	1
0	3	0	Rainwater Management	3
2	0	0	Heat Island Reduction	2
1	0	0	Light Pollution Reduction	1
8	**3**	**0**	WATER EFFICIENCY (WE)	**11**
	Prerequisite		Outdoor Water Use Reduction	
	Prerequisite		Indoor Water Use Reduction	
	Prerequisite		Building-Level Water Metering	
1	1	0	Outdoor Water Use Reduction	2
6	0	0	Indoor Water Use Reduction	6
0	2	0	Cooling Tower Water Use	2
1	0	0	Water Metering	1

Table A-1: LEED Credit Requirements at MSF

MANDATORY	OPTIONAL	NOT TO BE PURSUED	CERTIFIED: 40-49 POINTS SILVER: 50-59 POINTS GOLD: 60-79 POINTS PLATINUM: 80 POINTS AND ABOVE	AVAILABLE POINTS
41	64	5		110
15	**16**	**2**	ENERGY & ATMOSPHERE (EA)	33
Prerequisite			Fundamental Commissioning and Verification	
Prerequisite			Minimum Energy Performance	
Prerequisite			Building-Level Water Metering	
Prerequisite			Fundamental Commissioning and Verification	
6	0	0	Enhanced Commissioning	6
7	11	0	Optimize Energy Performance	18
1	0	0	Advanced Energy Metering	1
0	2	0	Demand Response	2
0	3	0	Renewable Energy Production	3
1	0	0	Enhanced Refrigerant Management	1
0	0	2	Green Power and Carbon Offsets	2
5	**6**	**2**	MATERIALS & RESOURCES (MR)	13
Prerequisite			Storage & Collection of Recyclables	
Prerequisite			Construction Waste Management Planning	
0	3	2	Building Life-Cycle Impact Reduction	5
1	1	0	BPDO: Environmental Production Declarations	2
1	1	0	BPDO: Sourcing of Raw Materials	2
1	1	0	BPDO: Material Ingredients	2
2	0	0	Construction Waste Management	2

Table A-1 (continued): LEED Credit Requirements at MSF

MANDATORY	OPTIONAL	NOT TO BE PURSUED	CERTIFIED: 40-49 POINTS SILVER: 50-59 POINTS GOLD: 60-79 POINTS PLATINUM: 80 POINTS AND ABOVE	AVAILABLE POINTS
41	64	5		110
8	**8**	**0**	INDOOR ENVIRONMENTAL QUALITY (EQ)	**16**
Prerequisite			Minimum Indoor Air Quality Performance	
Prerequisite			Environmental Tobacco Smoke (ETC) Control	
0	2	0	Enhanced Indoor Air Quality Strategies	2
3	0	0	Low-Emitting Materials	3
1	0	0	Construction IAQ Management Plan	1
2	0	0	Indoor Air Quality Assessment	2
1	0	0	Thermal Comfort	1
1	1	0	Interior Lighting	2
0	3	0	Daylight	3
0	1	0	Quality Views	1
0	1	0	Acoustic Performance	1
1	**5**	**0**	INNOVATION (IN)	**6**
0	5	0	Innovation	5
1	0	0	LEED Accredited Professional	1
0	**4**	**0**	REGIONAL PRIORITY (RP)	**4**
0	4	0	Regional Priority Credit	4

Table A-1 (continued): LEED Credit Requirements at MSF

DS-13
LIGHT RAIL TRANSIT (LRT) ARCHITECTURE DESIGN STANDARD

APPENDIX B
FINISHES AND MATERIALS

APPENDIX B:

B.1 FINISHES AND MATERIALS

The creative use of colours, materials and permissible textures is encouraged in the design of all Station finishes (in combination with Third Party Art, work, to provide an individual feel and aesthetic to each Station.

B.1.1. Overall Finishes Strategy

Exterior and interior architectural finishes and materials along the customer journey contribute significantly towards the customer experience. The design direction shall reflect the sentiment to "move at the speed of urban life" and 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.

Note: The materials and finishes outlined in this document present a kit of parts for a consistent experience for transit customers. In some cases, the Project Agreement (PA) may suggest alternate materials and finishes. In scenarios such as where adjacency to heritage structure occurs, another material may be more appropriate. As such, where an alternate material or finish is proposed, the material or finish shall meet the performance requirements of the material that is being replaced according to requirements included in this document. All alternate materials and finishes shall be reviewed and are subject to Metrolinx approval.

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.

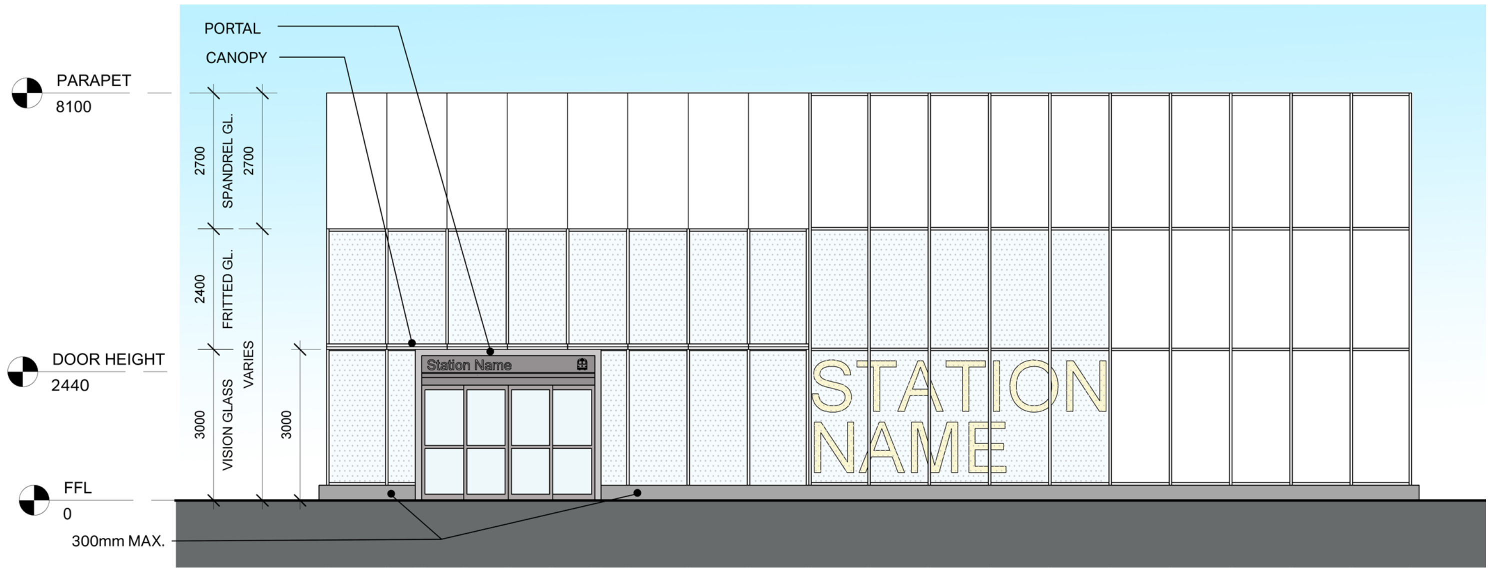


Figure B-1: Entrance Pavilion Finishes and Materials

a) Materials shall require demonstrated minimal maintenance and shall be easily repaired on site or replaced.

b) Use of colour, texture, pattern, and graphics as it relates to materials shall be implemented that either reflect local context, support intuitive wayfinding, and/or highlight key decision-making points.

c) Materials used shall be integral and homogeneous throughout. Materials with applied coatings that can be easily scratched shall be prevented from being specified.

d) Design strategies around existing Station finishes shall not be ignored, but rather, used to help influence design direction of future Station design, connecting the past to future.

e) Material and finish life cycle costs and ease of operations and maintenance shall be accounted for.

f) In conditions where new Station walls/facades/roofs adjoin adjacent existing buildings, materials between existing and new construction shall be delineated with the intent to break the plane of finishes using a continuous vertical reveal 100 millimetres in width and 100 millimetres deep.

B.1.2. Design Strategy

Interior The interior finishes strategy is organized into two distinct layers, including a consistent and a variable approach. General finishes shall be presented as a simple, neutral, and formalized background, where colour, pattern, and texture are consistent within the Station environment and along the customer journey. Feature elements including walls and ceilings are variable and shall differentiate between Stations. These elements shall be strategically allocated and shall function to support the customer in more than one way such as creating identity, aiding in wayfinding, providing environmental comfort, and/or provide visual interest through colour, texture, contrast, and pattern.

B.1.2.1 General Floors

a) All floors located in public facing interior areas shall be a consistent element throughout all zones within the Station, and across the subway network. This would include the unpaid transaction zone, paid access zone, stairs, platform, passenger tunnels, pedestrian bridges, washrooms and all interior waiting areas.

b) Size, colour, texture and pattern shall be consistent, where colour shall be neutral and shall contrast with vertical wall surfaces. For required contrast levels refer to DS-02 Universal Design Standards.

c) Materials to be accounted for include high performance porcelain tile or poured terrazzo selected for their long term durability, easy maintenance, quality, through and through consistency, and slip resistance.

B.1.2.2 General Walls

a) Most wall surfaces located in public facing interior areas shall be a consistent element throughout all zones within the Station and across the subway network. This would include the unpaid transaction zone, paid access zone, stairs, platform, passenger tunnels, and all interior waiting areas.

b) Size, colour, texture and pattern shall be consistent, where pattern shall be stacked and colour shall be neutral and shall contrast with horizontal surfaces. For required contrast levels refer to DS-02 Universal Design Standards.

c) Materials shall be a high performance rectangular porcelain tile mounted to a wall frame system selected for its durability, flexibility, easy maintenance, quality, colour fastness, and through and through consistency.

d) Newly constructed public facing wall partitions shall be constructed as either an active or passive partition assembly.

i. All active wall assemblies shall be constructed using an integrated wall frame system, designed as a wall cavity to be built out from the structural wall a minimum of 250 mm deep to accommodate where the following infrastructure/services are located, including signage, mechanical, electrical, and data infrastructure, fire extinguisher cabinets, fire hose cabinets, and digital advertising screens.

ii. Modular wall tile panels shall be designed to be removable by maintenance personnel only, where access for servicing/maintenance purposes is required within wall cavity.

iii. Wall panels shall not be easily removed by the public and all fasteners shall be concealed and be tamperproof.

iv. All integrated wall elements shall be recessed and made flush with face of wall plane finish with no voids or gaps.

v. All passive partition assemblies shall be designed without a wall cavity in areas where infrastructure, or access to infrastructure behind wall is not required.

vi. Attachment of any items to face of either wall system shall not be allowed. Any exceptions shall be presented for Metrolinx review and approval.

e) Wall datums - Finishes shall be aligned with the following horizontal datums above finished floor: 150 millimeter base tile; standard door frame height; 2300 millimeter to underside of signage; allow for 450 millimeter signage band/information above 2300 millimeter. Other datums for alignment include horizontal datums at glass panels within curtain wall assembly.

f) Where wall access panels are required in wall assemblies other than active wall tile assemblies, they shall be concealed from view and shall match the colour of adjacent wall finish material colour.

g) All wall mounted safety related equipment, including, but not limited to, Fire Hose Cabinets (FHC), shall be integrated flush into wall assemblies and shall be installed to align with horizontal/ vertical wall tile reveal datums. Where an FHC is not technically feasible to be integrated into a wall assembly, stand alone floor mounted FHC's are permissible and shall not obstruct path of travel and shall be encased on all sides with a stainless steel shroud where overall dimensions are minimized to prevent impeding CPTED.

B.1.2.3 Feature Walls and Feature Elements:

Overview Feature walls and ceilings are variable design elements both within and across the subway line, providing unique identity and differentiation. In order for these elements to have the greatest impact and support the customer experience, this unique element is required to function in multiple ways to demonstrate maximum proven value and benefit. The feature walls support intuitive wayfinding in two ways: they draw a customer to vertical circulation points and, at platform level, they provide a visual cue (beyond the station name) to customers on the train where they are along the line.

Feature walls comprise of station-specific colours, and at platform level shall also contain a graphic element that may be distinct or consistent from station to station.

The following are required functions of feature walls and feature elements:

a) Provide a unique and recognizable Station identifier;

b) Provide architectural expression that provides visual interest and/or contrast with base walls/ceiling/ floors;

c) Be located such that it provides physical cues that support intuitive wayfinding along the journey from entrance to platform and vice versa;

d) Where applicable, feature elements shall provide additional functions:

   i. Solar screening when located on the exterior,

   ii. Acoustic attenuation within the Station.

B.1.2.3.1 Feature Walls and Feature Elements: Guidance

a) Colours shall appear inviting and welcoming.

b) Station-specific colours shall not repeat along the line. No two adjacent stations shall have the same colour tone in varying shades.

c) Digital advertising shall not be integrated into feature ceilings, but can be integrated into feature walls at platform level.

d) If finish materials such as back painted glass and/ or glazed terracotta are proposed as a feature wall material, it shall have low-reflectivity and shall not exceed 25 Unified Glare Rate (UGRL) as per DS-02 Universal Design Standard.

e) Wall surfaces that are not directly or indirectly in view of the customer, shall be less of a priority.

f) Monochromatic gradient patterns to highlight movement and/or direction vertically or horizontally are acceptable but not required.

B.1.2.3.2 Feature Walls and Feature Elements: Required Approvals

a) All colour selections and patterns of feature elements are subject to Metrolinx approval (Design Division, others as required). Designs shall be submitted to Metrolinx Design Division for review and approval.

b) Metrolinx reserves the right to provide design and graphic collateral in line with requirements contained in this standard, at its sole discretion

B.1.2.3.3 Station-specific Colour and Graphics

a) Distinct colours shall be used to uniquely identify each Station to ensure differentiation across the line.

b) Station-specific colours along the line/extension shall complement each other and complement the line-wide colour.

c) Station-specific colours shall not be neon/fluorescent, black, or metallic tones.

d) Station-specific colours shall not repeat. No two adjacent stations shall have the same colour tone in varying shades.

e) Where located, acoustical backing material shall be a custom colour coordinated with the colour selections for each Station and contrast with exposed painted metal face.

f) All ceiling access panels shall be concealed and colour of access panel shall match adjacent finish material colour of surroundings.

g) The selection of the graphic element on feature walls shall support a customer from distinguishing one station from another. The graphic pattern may be repeated from station to station, but may be distinguished by colour. If the graphic pattern is distinct from station to station, they must complement each other cohesively. Station-specific colours and graphics shall take inspiration from any of the following elements within the community in which it is situated:

   i. Characteristic streetscapes

   ii. Natural features, topographical elements and/or vegetation

   iii. Architectural landmarks and common architectural features

   iv. Street art and murals

   v. Heritage, historical, and community landmarks

h) Station-specific patterns shall not include people's faces, words, or any derogatory or inappropriate images.

i) Graphic patterns on the feature wall shall span at least 70% of the length of the feature wall and should be easily visible from the train. The height of the patterning on the feature wall may be determined by the consultant considering the locations of signage, advertising, other wall-mounted elements, and the overall wall height.

B.1.2.3.4 Feature Walls and Ceilings: Finish and Material

a) All wall and ceiling finishes shall have low-reflectivity and shall not exceed 25 Unified Glare Rate (UGRL) as per DS-02 Universal Design Standard.

b) For Stations that do not use Platform Edge Doors (PED), materials such as tile or back painted glass may be used in the feature wall strategy provided that glare from the material will not exceed requirements as per DS-02 Universal Design Standard. When back painted glass is used as a feature element, low iron glass shall be used to ensure true likeness of colour is achieved.

c) Any natural materials being incorporated for feature walls and/or ceilings, shall:

  i. Be a through and through natural consistent material void of any synthetic binders;

  ii. Be resistant to moisture absorption, and shall meet required absorption rates specific to the material;

  iii. Not shrink, expand, or warp due to fluctuations in moisture content and temperature such that elements do not warp, expand, or contract in any direction more than 1 millimetre over 10 metres in length;

  iv. Be flame retardant and meet minimum smoke generation requirements;

  v. Be resistant to fading due to exposure to UV rays;

  vi. And shall be presented to Metrolinx for review and approval.

B.1.2.3.5 Feature Walls and Ceilings: Location Criteria

a) Placed as specified in this standard, and,

b) In line with the above-noted required functions of feature walls, and,

c) At vertical circulation elements, feature walls shall be installed on ceiling and/or walls outside of easy reach.

  i. At platform level, feature walls shall be installed for the full length of the wall.

  ii. Where possible, feature walls at platform level shall be installed outside of easy reach but shall be easily visible to a customer in the train approaching the station.

d) Wall and ceiling surfaces suitable for feature treatments shall include planes that are uninterrupted and directly visible to the customer on approach to platform and/or approach to exit along main circulation path.

e) When feature element materials transition from interior to exterior, materials shall appear consistent while ensuring materials are suitable to their respective environments and the conditions with which they will be exposed/subject to. All materials shall be:

i. Non-combustible and with the exception of acoustic backing material which shall be fire rated.

ii. Provide waterproofing and moisture control for all structures including Stations and associated facilities.

iii. Meet sufficient moisture absorption ratings where water absorption is to meet the following requirement: (ASTM C373): 0.3%.

iv. Provide exterior finish materials with sufficient freeze/thaw resistance ratings to achieve 30 year lifespan or unless stated otherwise in the Project Agreement.

B.1.2.3.6 Feature Walls and Ceilings: Pattern

a) Patterns shall be unique to each Station whereby no two Station are the same.

b) Custom textural patterns shall be used to reinforce movement and direction to support intuitive wayfinding.

c) If the feature wall selected is perforated metal panels, the panels shall be of equal size, organized in a modular rectangular format. Refer to image Figure B.2: Perforated metal panel.

Figure B-2: Perforated Metal Panel

d) Pattern-making shall be achieved through custom perforations in metal panels with acoustic backing, utilizing different sizes of perforation openings, spaces between openings, density, and gradations:

i. The maximum perforation size in acoustic feature elements is: 100 millimeters,

ii. The minimum perforation size in acoustic feature elements is: 3.175 millimeters (1/8”),

iii. And shall achieve a minimum 20% open area.

e) Physical relief of feature element materials shall not protrude from the wall surface more than 100 millimeters.

f) To demonstrate minimum potential for "oil canning" and "dished" panels, maximum deflection of panels measured normal to the panel surface after application and removal of the design loads, must not exceed L/800 of distance between supported edges of panel or distance between stiffeners where stiffeners are used. Stiffeners, where used, shall not deflect more than L/180 of span under load.

g) Where vertical wall planes transition to horizontal ceiling planes, materiality shall be continuous to support a seamless approach.

B.2 Finish and Materials: Overall General Requirements

All finishes and materials listed in this section shall follow best practices as per the architectural and design industry and shall follow requirements for compliance, certifications and specifications established and endorsed by national and provincial manufacturers associations as outlined below.

B.2.1. Safety and Security

a) Materials shall be selected so as to reduce the risk of hazard to customers, transit and maintenance personnel.

b) All finishes and materials shall be non-combustible and meet all Ontario Building Code (OBC) and National Fire Protection Association (NFPA) requirements.

c) Shiny surfaces shall be prevented as these produce glare and reflection which can disorientate customers. The Unified Glare Rate (UGRL) shall not exceed 25 for circulation areas as per DS-02 Universal Design Standard.

d) Ensure colour and tonal contrast between surfaces follows levels outlined in DS-02 Universal Design Standard to assist the visually impaired.

e) Secure finishes and materials using proper fasteners and adequate bond strength to eliminate hazards from dislodgement due to temperature change, vibration, wind, seismic forces, aging, and vandalism.

f) All fastenings shall be concealed and tamper proof.

g) Ensure non-abrasive finishes where passengers are likely to brush against such as stairwells, elevator cars, and customer passageways.

h) Use colours to complement standard safety colours and enhance lighting levels.

i) Combustible materials that produce toxic fumes and /or smoke such as plastics, resins, fabric, synthetic materials, shall not be used.

B.2.2. Durability and Performance

a) Carefully account for finish and material value engineering aspects and life cycle costs.

b) Provide building and finish materials of proven high quality with excellent wear, strength, and weathering qualities while accounting for both initial and replacement costs.

c) Provide colourfast building materials that maintain good appearance throughout their useful service life and are sufficient for cold weather climate.

d) Materials shall maintain their good appearance throughout their useful life and shall have a minimum 30 year lifecycle or unless stated otherwise in the Project Agreement.

e) For ceiling and canopy finishes/systems and their application, materials shall allow for commissioning, adjustment, and future retrofitting of subsystems such as CCTV and public address systems

f) Waste during construction and regular operations to be diverted from landfill back to the manufacturing process and reused.

g) All finishes and materials shall be selected with respect to costs by balancing initial material costs against long-term maintenance costs.

h) All finishes and materials shall be easily replaced/repaired, such as including a wear surface separate from the structural slab to facilitate replacement when a floor is in a heavy wear area.

i) All finishes and materials shall be selected, where appropriate, with reference to the potential need for access to service ducts, etc.

j) All finishes and materials shall be chemically inert, acid and alkali-resistant, dense, non-porous and non-staining.

k) Materials shall be able to withstand corrosion, uphold their intended use and function, and maintain their good appearance (no rusting or fading in colour) throughout their useful life and shall have a minimum 30 year lifecycle or unless stated otherwise in the Project Agreement.

l) All finishes and materials in public areas that are within a vertical 2500 millimeter touch zone shall be resistant to vandalism including hammer blows, felt markers, spray paint, burning, and scratching.

m) Requirements shall be developed using CSA S478 as a guideline.

n) Eliminate maintenance costs using standard materials that, if damaged, are easily repaired or replaced with little or no impact on Station operations.

o) Provide materials and details that are difficult to deface, damage, or remove, and operational and maintenance strategies that discourage vandalism.

p) Provide public areas finishes allowing common maintenance methods to readily remove casual vandalism.

q) Protect surfaces subject to graffiti with a sacrificial and non-sacrificial type scratch and graffiti-resistant coating. Apply all coatings full height of all public facing walls, from grade to 2500 millimetres high, including retaining walls. Coatings to be colourless and there shall be no appreciable colour difference to the coated surface when compared to non coated surface.

B.2.3. Maintenance and Cleaning

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

b) Finish and materials shall be selected for ease of cleaning, repair, or replacement.

c) Finish and materials in public areas must withstand and not be damaged by the rigors of regular cleaning, washing and high-pressure water spray. The cleaning process shall require only a one step operation.

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

e) Access to windows for cleaning shall not be obstructed except where absolutely necessary such as a required structural member.

f) Windows above ground level shall be placed such that they can be accessed from below using a lift and shall not require the use of scaffolding on stairs or escalators to maintain. Accessing windows for cleaning shall not require getting into traffic or onto tracks.

g) All fasteners of finishes and materials shall be concealed to create simple and sleek architectural aesthetic.

h) Removal and replacement of damaged materials shall be easily accessible without damage occurring to adjacent areas.

i) Select materials which have proven maintenance procedures.

j) All finish and materials shall not be located in areas where access for purposes of maintenance/repair is difficult or unsafe.

k) Provide a minimum number of small, non-absorbent, flush joints to reduce potential maintenance issues.

l) Correctly designate and space control expansion joints fit for purpose in floors and walls.

m) Ensure secure access to roof for maintenance/ repairs.

B.2.4. Unit Size

a) Units shall be large enough to reduce the number of joints yet small enough to facilitate replacement if damaged.

b) Monolithic materials may be used that are easily repaired without being noticeable.

c) Standardized grids shall be designed to accommodate for standardized glazing for windscreens and vertical elements of shelters.

B.2.5. Installation and Application

a) All finishes and materials shall be detailed and specified to be installed in accordance with industry standards and manufacturers printed directions for long life, low maintenance, and compliance with warranty requirements.

b) All finishes and materials shall be installed using tested and proven methods, in accordance with established trade standards

c) All finishes and materials, hardware, and fasteners shall be able to withstand the anticipated pressures of ground-borne vibration, as well as air pressure changes generated by wind and by the passage of the transit vehicle.

d) Reduce dislodgement hazards due to temperature change, vibration, air pressure changes generated by wind and by the passage of the transit vehicle, seismic forces, aging, vandalism or other causes using secure mechanical attachment systems, fasteners, and sufficient bonding materials. For bonding strength, materials shall be required to meet a bonding strength or peel strength of 20 pounds per square inch (psi).

e) All finishes and materials shall be secured in a manner which deters and prevents tampering and vandalism. All ceiling tile at platform level to be secured/clipped in place to meet 2kpa pulse created when train/vehicle approaches/departs Station.

f) Installation of finishes and materials shall generally facilitate their removal without affecting the integrity of adjacent materials.

B.2.6. Colour, Pattern, Tonal Contrast and Texture

a) Highly pattered flooring surfaces shall be prevented.

b) Pattern and tonal contrast shall comply with DS-02 Universal Design Standard.

c) Textures shall not conflict with those used in the information and guidance system.

d) Materials with staining and colour shall have through colour properties and non-fading characteristics.

e) Finishing of steel shall be appropriate to the location of the material, i.e. exterior vs. interior.

f) All interior stainless steel, such as handrails, door hardware, shall be Grade 304.

g) All exterior stainless steel such as handrails, door hardware, shall be 316 Grade. Galvanized metal shall not be permitted.

h) Ensure metal anchor material and metal fastener materials are not dissimilar or provide separation in order to prevent galvanic corrosion.

i) Finishing of steel in the field shall be kept to a minimum by designing structures that can be shop fabricated in sections, primed, and finished off-site, and bolted together on site.

j) The need for field welding shall be prevented.

k) Field painting on site shall be limited.

B.2.7. Contact Zones: High and Low

High Contact Zone

a) Shall include areas within normal passenger reach within interior and public realm areas, and extends from the floor/grade, up to 2500 millimetres above the floor.

b) Ceilings less than 3800 millimetres shall also be treated as high contact zones.

c) The selection of materials for use in this zone shall reflect outstanding durability, especially in and around passenger circulation routes or public amenities.

d) Finishing and materials used in the lowermost 500 millimetres of this zone must be unaffected by salt and slush, and shall be capable of being quickly and easily cleaned.

e) Edges of finishing materials shall be reinforced where vulnerable to damage. This shall include platform edges, stair nosings, outside corners and projecting sills.

f) Paint and / or sealers applied to walls and ceilings shall be graffiti-resistant.

g) Hardware and fastenings in this zone shall be designed to be tamper proof.

Low Contact Zone

h) This zone is less susceptible to public contact and extends up from 2500 millimetres above the finished floor.

i) Materials in the low contact zone are subject to less convenient service access, and are still vulnerable to vandalism, dirt, and grime.

B.2.8. Bird-Friendly Design

a) Comply with requirements as per applicable standards.

b) Interior and exterior elements designed with projecting horizontal surfaces where birds can roost shall be discouraged.

B.2.9. Acoustics

a) Acoustic requirements for walls and ceilings to be in accordance with Section 5.7 – Acoustics requirements.

b) Provide public area sound absorbing materials where appropriate to reduce noise levels, echoes and reverberation that can cause interference with Station Public Address (PA) systems.

c) Provide building elements such as doors and windows to prevent transmission of noise between various public and non-public areas.

d) Typical locations for implementing sound absorbing materials include ceilings, under platform edge, platform ceilings, trainway walls, and walls out of public reach.

e) Provide public area ceiling and wall acoustic treatment 2500 millimetres minimum above finish floor.

f) Provide prefabricated panel or spray-on coating acoustic treatment materials as per NFPA and OBC.

B.2.10. Use

a) Provide finish elements that will provide durability and perform in a very heavy use environment throughout the year.

b) Design finish elements on the basis that such elements are not protected from the exterior environment and are expected to accommodate a minimum lifespan of 30 years when properly maintained unless stated otherwise in the Project Agreement.

B.2.11. Moisture and Frost Resistance

a) Provide waterproofing and moisture control for structures including Stations and associated facilities.

b) Provide public area floor, wall, ceiling and stair finish materials with sufficient moisture absorption ratings where water absorption is to meet the following requirement: (ASTM C373): 0.3%.

c) Provide exterior finish materials with sufficient freeze/ thaw resistance ratings to achieve 30 year lifespan or unless stated otherwise in the Project Agreement.

d) Provide assemblies to prevent condensation, water, and frost damage.

e) Control moisture and water penetration through building envelopes to prevent:

   i. Dimensional change of materials;

   ii. Surfaces corrosion and staining;

   iii. Decay of materials;

   iv. Flooding of pedestrian areas and service rooms;

   v. Breakdown of system roofing and finished walls;

   vi. Efflorescence of masonry surfaces;

   vii. Surface spalling by freezing;

   viii. Equipment damage; and

   ix. Condensation.

f) All materials and finishes to withstand temperature fluctuation of non condition spaces.

B.2.12. Corrosion Resistance

Provide protective coating films or insulating membranes where potential for electro-chemical corrosion between metals occurs, for example:

- Aluminum to stainless steel, brass, bronze,copper;
- Stainless steel to brass, bronze, copper zinc;
- Metals to concrete.

B.2.13. Appearance

a) Provide finish elements on the basis that such elements are not protected from exterior elements and that they have the capability of maintaining a consistent appearance and level of performance throughout all four seasons and their respective temperature variations.

b) Finish elements shall not fade, degrade or wear prematurely throughout their useful life and shall have a minimum 30 year lifecycle or unless stated otherwise in the Project Agreement.

c) Material integrity shall not be broken, cracked, scratched, damaged, dented, deformed, or contain any visual defects such that they are detectable from a distance of 3000 millimetres. Any materials that show any form of damage or defection as per above, shall not be acceptable.

B.2.14. Exposure

Station elements will be exposed to all four seasons and their respective climatic conditions and temperature variations as indicated in the OBC including but not limited to the following:

a) Design temperature: January 1%, July 2 1/2%.

b) Hourly wind pressures: 1 in 100 year occurrence.

c) UV exposure: as per Environment Canada year-to-date UV index Graphs.

B.2.15. Abrasion Resistance

a) Station elements to provide excellent resistance to abrasion caused by friction due to rubbing, scraping, leaning, and contact with other materials.

b) Design Station elements to resist wear due to abrasion caused by passengers.

B.2.16. Ease of Replacement

a) Provide Station elements that are readily available locally.

b) Design Station elements to allow for ease of maintainability with easy removal and replacement of individual components within the same system and plane without having to remove several adjoining components.

c) Design Station elements capable with "plug and play" technology for ease of replacement.

B.2.17. Shrinkage Resistance

a) Design Station elements to accommodate the following requirements without producing detrimental effects:

   i. Average daily maximum and minimum temperatures.

   ii. Cyclic minimum 40 degree Celsius daily thermal swing excluding direct exposure to sunlight.

   iii. Cyclic, dynamic loading and release of loads such as wind loads.

b) Eliminate cracking due to shrinkage and expansion with the use of control joints and expansion joints.

B.2.18. Visual Contrast and Glare

Refer to DS-02 Universal Design Standard.

B.2.19. Constructibility

a) Design Stations that are easily constructed using materials that are part of the system standard kit of parts.

b) Complicated designs with façades that are rounded, complex and atypical shapes or incorporate acute angles shall not be permitted.

B.3 Exterior Elements: Technical Requirements

B.3.1. Glazed Aluminum Curtain Wall System (CW)

The standard technical requirements listed below shall not preclude higher design curtain walls to be accounted for. Preference is for more robust and/or higher quality glass curtain walls for increased durability and life cycle cost benefits as described in the Project Agreements (PA) and is subject to Metrolinx review and approval. The following requirements shall be followed for the above finish/material.

a) Glazed aluminum wall system to be designed as a 4 sided capless structurally glazed system. Pressure caps will not be accepted.

b) Nominal wall thickness of framing system: 3 millimetres min.

c) Thermally broken framing to have complete separation of interior/exterior components with no bridging by fasteners permitted. Use of fiberglass pressure plates to achieve performance ratings will not be accepted.

d) Minimum recommended NAFS performance: Class CW PG70.

e) Maximum allowable air leakage: 0.2 L/s*m² (0.04 cfm/ft²).

f) No water penetration when tested to ASTM E547 at 730 Pa.

g) Float glass: to CAN/CGSB-12.3.

h) Tempered glass: to CAN/CGSB-12.1.

i) Laminated glass: to CAN/CGSB-12.1.

j) Insulating glass units: to CAN/CGSB-12.8, ASTM E2190 and IGMA requirements utilizing approved black stainless steel edge spacer. Dual seal with a black PIB primary seal and black silicone secondary seal.

k) Ceramic frit: ceramic enamel frit fused to glass substrate to provide a homogeneous glass substrate. Solid or pattern as indicated. Where frit is applied, glazing shall consist of low iron glass. Glass alternates to low iron glass that can be shown to not perceptibly tint the appearance of the frit from true white from all viewing angles may be accounted for if the comparative testing and mock-ups that are provided are acceptable to Metrolinx, subject to Metrolinx Design Division review and approval.

l) Finish: Fluoropolymer conforming to AAMA 2605.

m) All glazing shall include distraction pattern on glass as per requirements found in DS-02 Universal Design Standard and DS-03 Wayfinding Design Standard and DS-03 Wayfinding Design Standard.

n) Design exterior glazing units and interior glass feature wall as a 4 sided capless structurally glazed system. Pressure caps will not be accepted.

B.3.2. Sintered Tile (EW1)

The following requirements shall be followed for the above finish/material.

a) 6 millimeter thick minimum, faced modular wall system conforming to the following minimum criteria:
   i. Moisture expansion (C370 American Society for Testing and Materials (ASTM)): less than 0.1%.
   ii. Water absorption capacity (ASTM C373): 0.2% maximum.
   iii. Thermal shock (ASTM C484): No defects or damage.
   iv. Chemical resistance (ASTM C650): Class A.
   v. Resistance to freeze-thaw cycling (ASTM C1026): No visible damage, 0.02% weight loss maximum.
   vi. Resistance to deep abrasion (ASTM C1027): 105 millimetres maximum.
   vii. Surface burning characteristics of materials (ASTM E84): FS: 7; SD 36.
   viii. Fire test of exterior wall assemblies (Underwriters Laboratories of Canada - CAN/ULC S134): Noncombustible.

B.3.3. Natural Granite (EWB1)

The following requirements shall be followed for the above finish/material.

a) Exterior base for all main subway Station buildings: 19 millimeter thick natural granite having the following criteria:
   i. Density (ASTM C97): 2867.3 kg/m3.
   ii. Modulus of rupture (ASTM C99): 12.88 MPa.
   iii. Compressive strength (ASTM C170): 152.53 MPa.
   iv. Flexural strength (ASTM C880): 20.2 MPa.

B.3.4. Aluminum Panel

The following requirements shall be followed for the above finish/material.

a) 3 millimeters thick minimum.
b) Aluminum: Aluminum association alloy 3003- H14, paint quality, tensioned levelled sheet. Fluoropolymer conforming to American Architectural Manufacturers Association AAMA 2605.
c) Surface burning characteristics of materials (ASTM E84).
d) Fire test of exterior wall assemblies (CAN/ULC S134).

B.3.5. Exterior Shading Systems: Perforated Aluminum Panels (ES1)

The following requirements shall be followed for the above finish/material.

a) Aluminum: Minimum 3 millimeters thick, Aluminum association alloy 3003-H14, paint quality, tensioned levelled sheet.

b) Finish: Fluoropolymer conforming to AAMA 2605. Finish to be applied after panel has been cut and perforated.

c) Perforation open area: 50%.

d) System to be designed to allow for window cleaning operations.

e) Cutting of prefinished panels on site shall not be acceptable.

f) To demonstrate minimum potential for "oil canning" and "dished" panels, maximum deflection of panels measured normal to the panel surface after application and removal of the design loads, must not exceed L/800 of distance between supported edges of panel or distance between stiffeners where stiffeners are used. Stiffeners, where used, shall not deflect more than L/180 of span under load.

B.3.6. Facade Baffles (FB1)

The following requirements shall be followed for the above finish/material.

a) Design feature shading system independent of glazed aluminum wall system.

b) Design shading system with adjustable vertical fins that shall project perpendicular or at an angle to the glazing plane.

c) Shading system support system to tie back to structural building elements.

d) Shading system support system to be thermally broken and to have complete separation of interior/ exterior components with no bridging by fasteners permitted.

e) Nominal wall thickness of tubular fins to be minimum 3 millimeters.

f) Fins to run vertically full height of glazed wall system and shall be 300 millimeters deep.

g) Finish: Fluoropolymer conforming to AAMA 2605.

B.3.7. Precast and Cast In Place Concrete (EW1B)

The following requirements shall be followed for the above finish/material.

a) Design members and their connections to withstand, within acceptable deflection limitations as specified, their own weight, the weight of loads imposed by the motion of operable elements, minimum design loads and combinations of loads, due to pressure and suction of wind and internal pressures and seismic loads.

b) Inserts, hardware and connections: Stainless steel, ASTM A167, Type 304 stainless steel.

c) Design exposed surfaces of concrete consisting of seamless concrete with a smooth glass like finish and a consistent and uniform colour and appearance. Colour of concrete shall be white. There shall be no visible tie holes, panel joints, or other visible defects visible from a distance of 1500 millimeters.

d) Formwork shall be plywood overlaid with a bonded phenolic resin that does not transfer grain or defects to provide a smooth glass finish.

e) Portland Cement shall be white, Type GU in accordance with CAN/CSA-A23.1/A23.2.

f) Aggregates shall be white or light coloured in accordance with CAN/CSA-A23.1/A23.2.

g) Pigments shall be white non-staining, non-bleeding, non-fading, titanium dioxide.

h) Material integrity of structural elements such as precast concrete panels and steel shall not be broken, cracked, scratched, damaged, dented, deformed, or contain any visual defects such that they are detectible from a distance of 3000 millimetres. Any precast concrete panels or steel that do show any form of damage or defection as per above, shall not be acceptable.

i) All coatings such as anti-graffiti coatings shall be non-sacrificial such that it will not change the appearance of the base material.

j) Concrete for use in Ultra High Performance Concrete (UHPC) shall be self consolidating.

B.3.8. Terracotta (EW1C)

The following requirements shall be followed for the above finish/material.

a) Extruded through body colour terracotta clay tile elements with natural finish shall have the following minimum criteria:

    i. Pore size in clay body shall not exceed 1.0 millimetre.

    ii. Diagonal flatness: Deviation of the tile flatness shall not exceed 0.25% of the diagonal measurement.

iii. Straightness: Deviation shall not exceed 0.25% of total module size.

iv. Water absorption (ASTM C67): Absorption by submersion shall not exceed 5 percent average, 6 percent individual specimen.

v. Water absorption (ASTM C67): Absorption by boiling shall not exceed 7 percent average, 8 percent individual specimen.

vi. Freezing and thawing (ASTM C67): No sample to lose more than 0.5 percent of its original dry weight. Samples to show no signs of cracking, crumbling or fracturing and shall conform to approved colour range samples before and after testing.

vii. Modulus of rupture (ASTM C67): Not less than 2500lb/inch 2.

viii. Thermal shock resistance (ASTM C484): Samples to pass minimum of 2 cycles.

ix. Efforescence (ASTM C67): Samples to be rated “No effervescent”.

B.3.9. Hardened concrete (FL3)

The following requirements shall be followed for the above finish/material.

a) For shared platforms where both exterior and interior conditions occur, floor finish shall be hardened concrete and shall use a surface hardener to establish a durable and long wearing surface.

b) This broadcast-applied surface hardener shall combine natural emery aggregates, cement and special wetting agents providing the most durable finish available using mineral aggregates.

c) This product shall be broadcast into the wet concrete and forms an integral floor surface. Installation requirements shall be applied to the surface in 2 or 3 broadcasts, each being floated using power equipment. The surface shall then be power-troweled and hand-troweled to meet the coefficient.

B.3.10. Vertical Circulation: Elevator Enclosure

The following requirements shall be followed for the above finish/material.

a) Fire-rated, glazed, stainless steel elevator enclosure complete with self supporting supplementary support framing.

b) Stainless steel sheet, channels, shapes, etc.: Type 304 in accordance with ASTM A269 and ASTM A666. Finish AISI No. 4.

c) Structural steel: CAN/CSA-G40.20/G40.21, Grade 350W.

d) Glass: Safety glass to CAN/CGSB-12.1. or fire rated glass to CAN/ULC-S106 to meet required rating. Wired glass will not be accepted.

e) Framing system and glazing to be tested as a complete system to achieve required fire resistance rating.

f) Alternate solutions to achieve the look and feel described in the Project Agreement. In this scenario:

   i. The design intent shall be demonstrated to and approved by Metrolinx;

   ii. the proponent shall be responsible for securing applicable approvals of the Authority Having Jurisdiction (AHJ).

B.3.11. Vertical Circulation: Escalator Balustrade

The following requirements shall be followed for the above finish/material.

a) Stainless steel sheet, channels, shapes, etc.: Type 316 in accordance with ASTM A167 and ASTM A279.

b) Glass: Safety glass: to CAN/CGSB-12.1.

c) Glazed escalator handrails to be cantilevered from escalator framing system. Joints in glazing to be maximum 12 millimeters and sealed with structural silicone. Mounting system to be concealed.

d) Escalator LED lighting to be provided under handrail.

e) Additional protective balustrades shall be stainless steel type 304 and safety glass as per vertical circulation balustrades.

B.3.12. Vertical Circulation: Balustrades

The following requirements shall be followed for the above finish/material.

a) Stainless steel sheet, channels, shapes, etc.: Type 316 in accordance with ASTM A167 and ASTM A279.

b) Glass: Safety glass to CAN/CGSB-12.1.

c) Glass sealant: Dry gasket type.

d) Glazed balustrades to be cantilevered from escalator framing system. Joints in glazing to be maximum 12 millimeters and sealed with structural silicone. Mounting system to be concealed.

e) Balustrade mounting system, handrails, and all components to be fabricated from stainless steel.

f) All balustrades to be mounted to raised 150 millimeters terrazzo base.

g) Where stairs occur between escalators and/or walls, ensure no space allows for collection of dust, dirt and debris.

B.3.13. Automatic Exterior Sliding Aluminum Doors (DR1)

The following requirements shall be followed for the above finish/material.

a) Heavy duty clear anodized aluminum automatic sliding doors with laminated tempered glass in aluminum frame where doors are required to be accessible and controlled by emergency ventilation system.

b) Design automatic door equipment to accommodate traffic loading of 100,000 cycles.

c) Nominal wall thickness of framing system: 3 millimeter minimum.

d) Thermally broken framing to have complete separation of interior/exterior components with no bridging by fasteners permitted. Use of fiberglass pressure plates to achieve performance ratings will not be accepted. Exterior doors shall be insulated.

e) Glazing: Safety glass to CAN/CGSB-12.1. All doors shall demonstrate maximum transparency/visibility.

f) Finish: Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes. AA-M12C23A41. Clear anodized aluminum finish shall be Architectural Grade 2 Finish for greater durability. Door frame finish to match adjacent wall framing system.

g) All other door requirements including clear opening dimensions, contrast, distraction patterns on glass, opening force, shall follow requirements outlined as per DS-02 Universal Design Standard.

B.3.14. Manual Exterior Swing Aluminum Door (DR2)

The following requirements shall be followed for the above finish/material.

a) Heavy duty clear anodized aluminum proven high quality door with laminated tempered glass in aluminum frame. The aluminum frame must sit on a concrete or masonry curb of 150 mm minimum when exposed to weather conditions and salt.

b) Aluminum extrusions and channels: to ASTM B211 and ANSI H35.1 AA6063 alloy, T6 temper.

c) Reinforcements and anchors: ASTM A167, Type 304 to

AISI No. 2B finish.

d) Glazing: Safety glass to CAN/CGSB-12.1. Wire meshed glass shall not be permitted.

e) Stiles to be approximately 88 millimeters (3 ½”).

f) Door hardware including door pulls, push bars, kick plates, hinges to be stainless steel and suitable for heavy use.

g) Clear anodized aluminum finish shall be Architectural Grade 2 Finish for greater durability. Door frame finish to match adjacent wall framing system.

h) All hardware as per TTC technical specifications.

i) All other door requirements including clear opening dimensions, contrast, distraction patterns on glass, opening force, shall follow requirement.

B.3.15. Manual Hollow Metal Door and Frames (DR3)

The following requirements shall be followed for the above finish/material.

a) Doors in this sub-section refer to doors accessible from interior pubic areas to non-public areas exterior doors that are within public facing facades.

b) Provide doors and door frames in accordance with requirements of Canadian Steel Door and Frame Manufacturing Association (CSDMA) and Hollow Metal Manufacturers Association (HMMA).

c) Doors and frames to be heavy duty, fully welded, steel stiffened doors in accordance with CSDMA requirements.

d) Face sheets and frames: Tensioned levelled steel in accordance with ASTM. A924/A924M. Galvanized in accordance with ASTM A653/A653M, Commercial Steel (SC), Type 6. Minimum coating designation, ZF75 (A25) for internal use and ZF180 (A60) for exterior use.

e) Glazing: Safety glass to CAN/CGSB-12.1.

f) Colour of all door and door frames shall match adjacent wall finish colour. Paint for doors and frames to be a DURANAR XL fluoropolymer coil coating. Finish: Powder coating meeting the requirements of AAMA 2605.

g) All hardware as per TTC technical specifications.

h) Fire rated doors and door frames to be label and listed in conformance with CAN4/ULC-S104M and CAN4/ULC-S105M.

i) All other door requirements including clear opening dimensions, contrast, distraction patterns on glass, opening force, shall follow requirements outlined as per DS-02 Universal Design Standard.

B.3.16. Platform Edge Doors

The following requirements shall be followed for the above finish/material.

a) All PED's and fixed glazed panels aligned with PED's, shall be required to include a high colour contrast (minimum 50%) distraction pattern along the full length of all platforms, including all doors and shall follow requirements as per DS-02 Universal Design Standard.

b) Amount of glazing shall be proven to be maximized to promote transparency and visibility for customers.

c) Horizontal sign band shall be continuous and integrated within PED assembly and appear as a consistent element. Integrated digital information signage shall be located above all PED doors. Static internally illuminated Station identity signage shall be integrated and provided between digital signage.

d) Horizontal sign band to facilitate integrated (Closed Circuit Television) CCTV and Public Address (PA) speakers where all infrastructure is concealed and colour of exposed elements shall match to sign band colour. Provide access panels for maintenance/ repair. Colour of access panels to match adjacent finishes. All fasteners to be concealed and tamperproof.

e) Where at or above grade platforms occur, projecting and continuous rain canopies shall be integrated into building platform architecture to eliminate intrusion of rain or snow through gaps between train doorways and PEDs.

f) Design doors at platform level to withstand 2 kPa pressure suction/pulse created when train approaches/ departs Station.

B.3.17. Mechanical Louvers (LV1)

The following requirements shall be followed for the above finish/material.

a) Provide stormproof louvres with center watershed in blade and concealed mullions to limit water and snow penetration.

b) Aerodynamic performance: Minimum 46% free area when tested in accordance with Air Movement and Control Association (AMCA requirements).

c) Limit deflection of louver members to not more than 1/180 of span between supports when subjected to wind load of 1 kPa applied horizontally to louvre face.

d) Blade: ASTM B209, 1.7 millimetres thick minimum; maximum blade length 1500 millimetres.

e) Frame and mullion: ASTM B211, AA 6063-T5, extruded, minimum wall thickness 2.06 millimeters.

f) Finish: Fluoropolymer conforming to AAMA 2605.

g) Colour: To match adjacent wall finish.

h) Louver framing shall not be exposed or visible to public.

i) Louvers shall appear as continuous linear horizontal element.

j) Where perforated panel occurs in front of louver, required minimum open area percentage shall be achieved.

B.4 Finish and Materials: Interior General and Technical Requirements

B.4.1. Floors: General Requirements

The following requirements shall be followed for the above finish/material.

a) Terrazzo or tile flooring shall be provided in all high occupancy areas. Flooring shall be designed and installed in the form of a modular rectangular grid to allow for isolated repair / replacement / maintenance while allowing for greater flexibility and reduced impact on customer inconvenience.

b) Floors shall be non-slip where dynamic coefficient of friction (ASTM C1028) of floors to be: 0.70 (dry); .060 (wet).

c) Highly patterned walking surfaces shall be prevented.

d) Shiny surfaces shall be prevented as these produce glare and reflection which can disorientate customers. The Unified Glare Rate (UGRL) shall not exceed 25 for circulation areas.

e) Joints shall be coordinated with structural grids and thresholds.

f) Floors shall be flush with exterior surroundings across door openings to create a visually continuous surface.

g) Thresholds shall be beveled to accommodate different floor materials.

h) Sprinklered floor areas and those containing plumbing fixtures or water lines or are subject to weather penetration shall be sloped and drained. Maximum slopes shall conform to DS-02 Universal Design Standard.

i) Floor drains shall be screened and capped flush with finished floor.

j) Large surfaces areas such as wall, floors, columns and furniture shall achieve Light Reflective Value (LRV) points difference with their surrounding surfaces as per DS-02 Universal Design Standard.

k) Flooring shall be low moisture absorption, require minimal demonstrated maintenance, non-staining, non-cracking, chemical and salt resistant, and abrasion and wear resistant, particularly at pivot points at stairs landings, and fare threshold areas. Refer to Table 6 3: Interior finishes schedule and technical requirements.

l) Flooring shall be dry, ice free, and well drained.

m) Tactile Walking Surface Indicators (TWSI) including both attention indicators and guiding indicators shall be designed to be integrated and conform to the DS-02 Universal Design Standard requirements for configuration and location and shall be included as part of the overall provision for sensory information within the transit environment.

n) Where flooring is being applied to structural substrates with a deflection of l/360 or greater, provide an anti-fracture membrane as part of the flooring system to ensure flooring will not crack due to substrate deflection.

o) Epoxy grout shall be used for all washroom tile floors and base. Sanded grout shall be used for all other flooring tile areas. Grout colour to match floor tile colour. Maximum floor grout size shall be 3.175 millimeters (1/8").

B.4.2. Terrazzo (FL1A): Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Terrazzo system to consist of 22 millimeters underbed and 16 millimeters topping matrix in accordance with the TTMAC 09 66 00 Terrazzo Specification guide.

b) Marble chips: Uniform, sound and abrasion resistant, graded in accordance with TTMAC standards, free from flats and flakey particles.

c) Slip resistant aggregate: White aluminum oxide (AL203) 36 grit.

d) Provide a chemical resistant sealer for terrazzo used in washroom facilities.

e) For radius of inside and outside terrazzo corners refer to TTMAC 09 66 00 Terrazzo Specification Guide.

B.4.3. Floor Tile and Base (FL1B): Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Unglazed, dry-pressed, single fired, porcelain tile conforming to ANSI A137.1, Class P1 and meeting the following:

   i. Slip resistance: Provide materials having a minimum DCOF 0.5 dry/wet, when tested in accordance with ANSI A137.1 with the BOT 3000 Digital Tribometer. Note that this slip resistance requirement supercedes any/all previous requirements within the current TTC Master Specifications.

   ii. Water absorption (ASTM C373): 0.3%

   iii. Resistance to Deep Abrasion (ASTM C1243): 150 millimetres max.

   iv. Chemical resistance (ASTM C650): Class A

   v. Combustibility (CAN/ULC S114): Non-combustible.

   vi. LRV: 23%

   vii. Interior base: meeting the same criteria as floor tile complete with nominal 100 millimetres high vertical let and internal radius of nominal 12 millimetres from vertical to horizontal.

viii. Tactile, wayfinding, and platform edge tile: Shall comply with ISO 23599.

ix. Tile setting beds and grouts: Setting beds: salt resistant, non-polymer, 100% aluminate cement, having the following criteria: Grout: salt, chemical, and stain resistant.

x. Exterior base for all other buildings (EEB's, MSF's, Ancillary): Concrete base with clear sealer.

xi. Construct build-up of 150 millimetres high terrazzo base to receive balustrades that occur at stair and escalator openings.

B.4.4. Natural Granite (WB3)

The following requirements shall be followed for the above finish/material.

a) 10 millimetre thick minimum, fiberglass backed, faced modular wall system conforming to the following criteria:

i. Density (ASTM C97): 2867.3 kg/m3.

ii. Modulus of rupture (ASTM C99): 12.88 MPa.

iii. Compressive strength (ASTM C170): 152.53 MPa. e) Flexural strength (ASTM C880): 20.2 MPa.

B.4.5. Walls: General Requirements

The following requirements are specific for interior walls that are customer facing and do not include train tunnel walls:

a) Wall finish shall be smooth, non-glossy, and nonabrasive.

b) Wall bases shall be provided at 150 millimetres up from the finished floor; Electrical boxes and other wall-mounted equipment shall not project into this base; The bases of floor-anchored equipment shall be continuous, matching adjacent wall base details; Thresholds shall be flush with the finished floor; Thresholds higher than 10 millimetres from the finished floor shall be beveled to a 30 degree angle.

c) Structural columns shall be clad with finish as per Figure 7-3 Interior Finishes and Materials Schedule. Column cladding to conceal all downspouts and exposed conduit and infrastructure.

d) Provide protection for outside corners and ease of maintenance for inside corners.

e) Shiny surfaces shall be prevented as these produce glare and reflection which can disorientate customers. The Unified Glare Rate (UGRL) shall not exceed 25 for circulation areas.

f) Wall finishes shall be a hard and durable surface, low moisture absorption, require minimal demonstrated maintenance, washable, cleanable, non-staining, non-cracking, chemical resistant, scratch and graffiti resistant, and abrasion and wear resistant, particularly at pivot points at stairs landings, and fare threshold areas. Refer to Table 7-3 Interior finishes schedule and technical requirements.

g) Wall finishes shall be non-combustible, and nontoxic when exposed to flame.

h) Large surfaces areas such as wall, floors, columns and furniture shall achieve LRV points difference with their surrounding surfaces as per DS-02 Universal Design Standard.

i) All finishes and materials to be composed of non-designated substances defined in Occupational Health and Safety Act (OHSA).

j) Flame spread ratings for wall and ceiling finishes are as per NFPA 130 and OBC.

k) For wall bracing system installation, use invisible fixation system continuously vertically and horizontally to allow for easy installation, repair, and replacement.

l) Acoustic materials such as perforated acoustic panels to be installed above 2500 millimetres.

m) Wall base to be Integral 150 millimetre high base tile.

n) Wall systems at platform level to be secured in place to meet 2 kPa pressure suction/pulse created when train approaches/departs Station.

o) Light reflectance of wall surfaces shall be 50% reflective.

B.4.6. Walls: Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Sintered ceramic tile: 6 millimetres thick minimum, faced modular wall system conforming to the following minimum criteria:

   i. Moisture expansion (ASTM C370): less than 0.1%.

   ii. Water absorption capacity (ASTM C373): 0.2% max.

   iii. Thermal shock (ASTM C484): No defects or damage.

   iv. Chemical resistance (ASTM C650): Class A.

   v. Resistance to freeze-thaw cycling (ASTM C1026): No visible damage, 0.02% weight loss max.

   vi. Resistance to deep abrasion (ASTM C1027): 105 millimetres max.

   vii. Surface burning characteristics of materials (ASTM E84): FS: 7; SD 36.

   viii. Fire test of exterior wall assemblies (CAN/ ULC S134): Non-combustible.

b) Porcelain tile: Unglazed, dry-pressed, single fired, porcelain tile conforming to ANSI A137.1, Class P1 and meeting the following:

i. Water absorption (ASTM C373): 0.3%

ii. Resistance to deep abrasion (ASTM C1243): 150 millimetres max.

iii. Chemical resistance (ASTM C650): Class A

iv. Combustibility (CAN/ULC S114): Noncombustible.

B.4.7. Feature Walls: Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Aluminum: Minimum 3 millimetres thick, Aluminum Association alloy 3003-H14, paint quality, tensioned levelled sheet. Perforation open area: 50%

b) Finish: Fluoropolymer conforming to AAMA 2605. Finished after perforating.

c) Perforation Open area: 50%.

d) System to be designed to allow for window cleaning operations.

e) Backing panel: Galvanized steel in accordance with ASTM A653/A653M, Z275 zinc coating or aluminum sheet conforming to ASTM B209, T6 Temper.

f) Acoustic insulation: ASTM C665, Paperless, semi-rigid, spun stone wool fibre.

g) Acoustic backing material as required to achieve specified minimum 0.70 NRC performance.

B.4.8. Ceilings: General Requirement

The following requirements shall be followed for the above finish/material.

a) Flame spread ratings for wall and ceiling finishes are as per NFPA 130 and OBC.

b) Provide interior wall and ceiling acoustic finishes to achieve a minimum Noise Reduction Coefficient (NRC) per ASTM Test Method C423 as outlined in Section 5.9 Acoustics.

c) Ceiling substrate and finishes shall be a hard and durable surface, dent resistant, low moisture absorption, requiring minimal demonstrated maintenance, washable, cleanable, scuff resistant, non-combustible, non-staining, and non-corrosive. Refer to Table 7.3 Interior Finishes Schedule and technical requirements.

d) Ceiling finish shall be durable to resist potential impact where ceilings and suspended elements are within 3000 millimetres reach of passengers carrying large packages or long objects.

e) Provide easy access to ducts and equipment above ceiling and ensure exposed ceiling infrastructure is screened from public view.

f) Shiny surfaces shall be eliminated as these produce glare and reflection which can disorientate customers. The Unified Glare Rate (UGRL) shall not exceed 25 for circulation areas.

g) All ceiling tile at platform level to be secured/ clipped in place to meet 2kpa pulse created when train approaches/departs Station.

h) All ceiling access panels shall be concealed and colour of access panel shall match adjacent finish material colour of surroundings.

i) All ceiling mounted elements including mechanical diffusers, lighting, speakers, CCTV cameras, etc. shall be integrated within ceiling plane where elements are organized in a modular and consistent arrangement and align within ceiling grid.

B.4.9. Ceiling Systems: Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Metal: Acoustic panel system conforming to the following:

   i. Galvanized steel: ASTM A653/A653M, Z275 zinc coating.

   ii. Aluminum sheet: ASTM B209, T6 Temper.

   iii. Acoustic material: Factory adhered non-woven fiber mat with minimum 0.70 NRC.

   iv. Surface burning characteristics of materials (ASTM E84).

B.4.10. Manual Interior Swing Aluminum Door (DR4)

The following requirements shall be followed for the above finish/material.

a) All public facing doors and door finishes shall be durable, low maintenance, non-combustible, dent resistant, washable, cleanable, non-staining, and non-corrosive, vandal proof, contain sound attenuation, and allow for ease of repair and/or replacement. Refer to Figure 7-3 Interior Finishes and Materials Schedule.

b) Highly visible public facing doors such as door to Station ambassador, shall be a thin profile aluminum frame with laminated tempered glass in aluminum frame.

c) Aluminum extrusions and channels: to ASTM B211 and ANSI H35.1 AA6063 alloy, T6 temper.

d) Extrusion finish: Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A41.

e) Reinforcements and anchors: ASTM A167, Type 304 to AISI No. 2B finish.

f) Glazing: Safety glass to CAN/CGSB-12.1. Wire meshed glass shall not be permitted.

g) Low profile door frame where stiles shall have the following maximum dimension:

   i. Door thickness: 45 millimetres.

   ii. Vertical stiles: 55 millimetres.

   iii. Top rail: 60 millimetres.

   iv. Bottom rail 100 millimetres.

h) Design interior doors to demonstrate maximum glazing

i) Wall thickness of door framing: 2 millimetres min.

j) Door hardware including door pulls, push bars, kick plates, hinges to be stainless steel and suitable for heavy use.

k) Clear anodized aluminum finish shall be Architectural Grade 2 Finish for greater durability.

l) Where power-assisted doors open into a barrier free route of travel, cane detectable guardrails shall be provided or other form of barrier(s) at right angles to the wall containing the door.

m) Controls for power assisted doors and automatic doors shall conform to the DS-02 Universal Design Standard.

n) All hardware as per TTC technical specifications.

o) All other door requirements including clear opening dimensions, contrast, distraction patterns on glass, opening force, shall follow requirements outlined as per DS-02 Universal Design Standard.

B.4.11. Foot Grilles

The following requirements shall be followed for the above finish/material.

a) Foot grille with recessed pan shall be depressed flush with floor finish at all interior public entry / exit doors. Width of foot grille shall align with width of door opening as a minimum. Length of foot grille shall be a minimum of 3000 millimetres. Where space allows, extending length of foot grill to meet requirements outlined in Section 3.1.2 Sustainable Design Requirements may contribute towards additional LEED score credits. Pans requiring integrated drains are a maintenance and operations decision, and are based on a project by project basis.

b) Stainless steel sheet, angles, shapes, etc.: Type 316 in accordance with ASTM A167 and ASTM A279.

c) Frame and Grid: recessed, level base frame complete with 1.5 millimetre drain pan, minimum 46 millimetre deep by area indicated. Tread rails joined mechanically by key lock bars.

d) Drain: 50 millimetre I.S.P PVC drain complete with stainless steel strainer.

e) Finish: Exposed: AISI No. 4 finish. Concealed: Mill finish.

f) Tread insert: Serrated stainless steel

B.4.12. Tactile Walking Surface Indicators (TWSI): Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Tactile Walking Surface Indicators (TWSI), including tactile attention indicators and tactile direction indicators, shall be provided. TWSI specifications for dimensions, arrangement and height shall be according to ISO 23599 assistive products for blind and vision impaired persons. Functionality and application of TWSI systems shall be according to ISO 21542, Annex B and CSA B651. In addition, TWSI shall follow requirements including spacing, dimensions, colour contrast as outlined in the DS-02 Universal Design Standard.

b) Where site conditions challenge locations of decision points along path of guiding indicators, locations shall be coordinated with Metrolinx Design Division and operator as per the Project Agreement.

c) Both guiding and attention indicators shall be configured as single unit (integrated tile). Discreet type TWSIs shall not be permitted.

B.4.13. Paint and Caulking: Technical Requirements

The following requirements shall be followed for the above finish/material.

a) Perform painting work to Master Painter Institute (MPI) requirements for premium grade first line products.

b) All materials including but not limited to, primers, stains, and paints are to have low VOC content limits.

c) Provide paint products meeting MPI "Green Performance Standard GPS-2-12.

d) All paint to be scuff resistant.

e) Ensure demonstrated minimum amount of caulking due to concerns around vandalism.

f) All exterior painted surfaces shall have a gloss level from 20-70 units at 60 degree angle.

Finishes and Materials

B.4.14. Finishes and Materials: Exterior

Notes:

1. All finishes shall comply with DS-02 Universal Design Standard.
2. The materials and finishes outlined in this document present a kit of parts for consistent experience for transit customers. In some cases the Project Agreement (PA) may suggest alternate materials and finishes. In scenarios such as where adjacency to heritage structure occurs, another material may be more appropriate. As such, where an alternate material or finish is proposed, the material or finish shall meet the performance

requirements of the material that is being replaced according to requirements included in this document. All alternate materials and finishes shall be reviewed and approved by Metrolinx.

3. * Asterix denotes alternate finish/condition.

Table B.1: Exterior Finish and Materials Schedule

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
CURTAIN WALL SYSTEM	CW	• Capless, glazed aluminum structural silicon joint wall system with ceramic frit pattern (for glare, heat gain, and bird deterrent). • Internal Frame colour: Light Grey • CW-1 – Vision glass with the minimum ceramic frit pattern required to meet bird friendly requirements; • CW-2 – Gradient Fritted Vision Glass - Same as CW- 1 with gradient ceramic frit on surface #2, 20% - 80% consistent gradient to bridge CW-1 and CW-3; • CW-3 – Fritted Glazed Spandrel Panel – Same as CW-1 with 80% ceramic frit on #2 surface, and back painted white on #3 surface • Distraction pattern shall be required.	Above grade station building envelope.	Demonstrated maximum transparency to ensure CPTED;- access to daylight and views; fritted glass aids in light and heat gain control.

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
EXTERIOR SHADING SYSTEMS	ES1	• Perforated aluminum panels • Colour: White • Pattern and % of opening: Variable • Finish: 20-70 units gloss at 60 degree angle.	Above grade station wall shade system, EEB's, MSF's, Ancillary buildings.	Lightweight, modular panels for ease of installation, repair and replacement. Variation in perforation pattern and % opening for sun/light, heat gain control. Rust and weather resistant.
OPAQUE CLADDING	EW1A	• High performance sintered / porcelain tile • Pattern: Rectilinear • Colour: White/Light Grey • Size: Large format (305mm x 1220mm min.)	Station cladding	Durable, long term life span, modular for ease of repair, replacement; thru and thru material; UV and weather resistant.
	EW1D	• Prefinished composite metal panels • Pattern: Rectilinear • Colour: White/Light Grey	Station wall shade system, EEB's, MSF's, Ancillary buildings.	Durable, modular for ease of repair, replacement; proven cladding material; UV and weather resistant.
	*EW1B	• Precast and cast in place concrete panels • Pattern: Rectilinear • Colour: Light Grey	EEB's, MSF's, Ancillary buildings.	Durable, modular for ease of repair, replacement; proven cladding material; UV and weather resistant.
	*EW1C	• Terra cotta • Pattern: Rectilinear • Colour: Light Grey	Station building cladding Used in Heritage conditions.	Durable, scratch and dent resistant; concealed fixing; non combustible, UV and weather resistant.
SOFFIT CEILING	ECF3	• Metal ceiling panels • Custom size • Colour: White	Entry soffit ceiling	Durable, proven cladding material; UV and weather resistant, dent resistant, accessible for maintenance.

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
WALL BASE	EWB1	• Granite Wall Base • Size: 400mm high • Format: Rectangular • Colour: Medium Gray	Exterior base of main station building.	Natural material, durable, proven material, low maintenance.
	EWB2	• Concrete Base • Size: 400mm high • Finish: Clear sealer	Base of all non customer facing building exteriors including EEB's, MSF's, and Ancillary Buildings.	Durable, cost effective, low maintenance.
FACADE BAFFLES	FB1	• Vertical metal shade baffles • Colour: Light grey	Station entry, southern exposure	Multi purpose sun shade and station identity element; durable
PLATFORM EDGE DOORS	PED	• Door and mullion frame colour: Dark grey • Transom colour: Black	Platform edge, PED louvers	Safety, transparency
CANOPIES	*CAN1	• Cantilevered metal building integrated canopy • Colour: Light Grey	Above grade station where recessed entry/exits with identity canopy proven not technically feasible.	Year round weather protection
	CAN2	• Metal stand alone canopy • Colour: Light Grey	Bicycle storage areas	Year round weather protection

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
DOORS	DR1	• Exterior sliding doors • Frame finish: Anodized aluminum frame • Glazing: Safety glass with distraction pattern as per OBC.	Main station entry / exit doors	Durability, contactless, transparency
	DR2	• Exterior swing doors • Frame finish: Anodized aluminum frame • Glazing: Safety glass with distraction pattern as per OBC.	Station entry exit doors	Durability, transparency
	DR3	• Exterior hollow metal doors and frames • Colour to match adjacent wall finish	Exterior doors accessing service rooms/ back of house doors at stations, EEB, FSC, Ancillary Buildings.	Durability, functionality.
MECHANICAL LOUVERS	LV1	• Exterior metal louvers at mechanical rooms integrated into building walls, rooftop screening • Colour: Match adjacent exterior wall finish	Main station, EEB's, Ancillary Buildings, with half-height PEDs at platforms.	

B.4.1. Finishes and Materials: Interior

Notes:

1. All finishes shall comply with DS-02 Universal Design Standard.
2. The materials and finishes outlined in this document present a kit of parts for consistent experience for transit customers. In some cases the Project Agreement (PA) may suggest alternate materials and finishes. In scenarios such as where adjacency to heritage structure occurs, another material may be more appropriate. As such, where an alternate material or finish is proposed, the material or finish shall meet the performance requirements of the material that is being replaced according to requirements included in this document. All alternate materials and finishes shall be reviewed and approved by Metrolinx.
3. * Asterix denotes alternate finish/condition.

Table B.2: Interior Finish and Materials Schedule

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
FLOORS	FL1/FL1A	• Non slip poured terrazzo with zinc strips. • Colour: Light grey • Finish: Non slip, with required slip resistance • Stairs (rise, run, curbs, ramps) • Colour: Dark grey • Finish: Non slip, with required slip resistance • Terrazzo samples shall be provided to Metrolinx and shall be approved based on overall acceptable colour; aggregate size, type, and colour; proportion of aggregate to matrix; trim divider finish; sealer finish	All customer facing floor areas including entry, unpaid and paid zones, pedestrian tunnels, pedestrian bridges, washrooms, platform.	Durable, Monolithic material, long lasting, non slip.

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
FLOORS	*FL1B	• Large format, rectangular, non slip high performance porcelain tile. • Size: Large format (Minimum 305mm x 1220mm) • Colour: Light Grey • Finish: Non slip, with required slip resistance • Stairs: High performance porcelain tile with preformed treads, nosing and risers with integral cove to comply with OBC.	Same as above	Durable, low maintenance,thru and thru material,long lasting,non slip, easy repair/replacement.
	*FL2	• Granite slab/tile • Colour: Dark Grey • Finish: Non slip, with required slip resistance • Stairs: Granite preformed treads with nosing and risers with integral cove to comply with • OBC	Stairs and ramps only	Durable,thru and thru material,non slip
	TWSI	• Tactile Walking Surface Indicators: Attention and guidance Indicators • Type: Attention - Integral with truncated domes; Guidance - Integral with parallel flat topped elongated bars	· Attention: Platform edge where platform edge door openings occur; full width of door opening · Attention: Top of all stairs, ramps; full width of door opening · Guidance: Located starting at main station entry continuous to elevators, escalators, DWA	Safety, durable, less labour intensive than discreet type

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
FLOORS	FL3	• Hardened Concrete • Colour: Light Grey	For At Grade Platforms	Durable, long lasting, non slip
FLOORS GRILLES	FL4	• Recessed metal floor pan with foot grille flush with finished floor • Floor grille with integral floor drain as per Project Agreement (PA) and to be confirmed with maintenance and operations. • Tread insert: Serrated stainless steel. • Size: Minimum width of all entry/exit doors; length as per Section 4.0 Sustainability.	Interior of all entry / exits	Durable, long lasting, non slip
WALL BASE	WB1	• Terrazzo Wall Base • Height: 150 millimeter high with integral cove • Colour: Medium Grey • To be used in combination with terrazzo floor	Throughout all public facing areas	Durable, easy maintenance, seamless, continuous

WALL BASE	*WB2	• Wall Base porcelain tile • 150mm high • Colour: Medium Grey • To be used in combination with porcelain tile floor	Throughout all public facing areas	Durable, easy maintenance
	*WB3	• Granite base • 150mm high • Colour: Medium Grey	Throughout all public facing areas.	Durable, easy maintenance
GENERAL WALL TILE	WF1	• Large format high performance porcelain tile on wall framing system. • Size: Minimum 610mm x 1220mm • Pattern: Modular, rectilinear, stacked • Colour: Medium Grey • Finish: Matt	All customer facing wall areas including entry, unpaid and paid zones, pedestrian tunnels, pedestrian bridges, washrooms, platform, stairs	Durable, dent and scratch resistant, thru and thru material, replaceable if damaged
	WF2	• Large format high performance porcelain tile on wall framing system. • Size: Minimum 610mm x 1220mm • Pattern: Modular, rectilinear, stacked • Colour: Dark Grey • Finish: Matt	Recess at advertising niches	Durable, dent and scratch resistant, thru and thru material, replaceable if damaged
	WF3	• Large format high performance porcelain tile on wall framing system. • Size: Minimum 610mm x 1220mm • Pattern: Modular, rectilinear, stacked • Colour: TBC with Metrolinx Design Division • Finish: Matt	Recess at self serve hub	Durable, dent and scratch resistant, thru and thru material, replaceable if damaged
GENERAL WALL FINISH	WF4	• Painted extreme impact resistant drywall • Colour: Off white	Washroom ceiling, miscellaneous walls and ceilings	Durable, dent resistant, enhanced moisture, mold, and sound transmission resistance

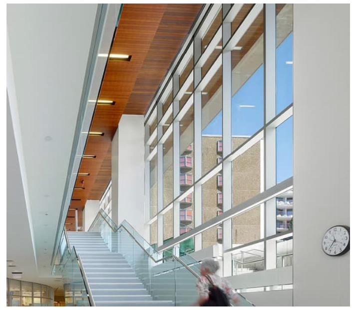
ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
FEATURE WALLS	WF5A	• Metal panels on wall framing system • Size: Minimum 610mm x 1220mm • Colour: Varies • Pattern: Solid and perforated • Solid metal panel below 2750mm datum; Perforated metal above 2750mm datum	· Located at vertical circulation areas including stairs, escalators · Co-located with feature ceilings · Co-located with exterior cladding	Durable, modular for easy replacement/repair, solid or perforated, acoustic opportunities, versatile substrate to receive colour and perforation pattern options, semi transparent or opaque, access to daylight
	WF5B	• Back painted low iron glass • Size: Minimum 610mm x 1220mm • Colour: Varies	· Located at vertical circulation areas including stairs, escalators · Co-located with feature Ceilings · Co-located with exterior cladding	Modular sizing, true colour renditioning
GENERAL CEILING	CF1	• Suspended acoustic metal ceiling panels with integrated linear lighting • Linear plank or rectangular panels • Size: Minimum 610mm x 1220mm format • Colour: White • Acoustic properties: NRC 0.7 • Anchor to suspended grid/frame	· Located throughout all customer facing areas	Durable, dent resistant, accessible for maintenance, concealed, acoustic properties, linear direction to support wayfinding
	CF2	• Suspended acoustic metal ceiling panels with integrated linear lighting • Linear plank or rectangular panels • Size: Minimum 610mm x 610mm format • Colour: White • Acoustic properties: NRC 0.7 • Anchor to suspended grid/frame	· Station Ambassador Office, back of house areas	Durable, dent resistant, accessible for maintenance, concealed, acoustic properties, linear direction to support wayfinding

ELEMENT	CODE	DESCRIPTION	LOCATION(S)	SELECTION RATIONALE
BALUSTRADE	BL1	• Tempered glass balustrade with stainless steel vertical stantions. • 150mm high base • Stainless steel handrail • Protective balustrade at escalators	All Escalator and stair balustrades	Transparent aids in safety and wayfinding, clean, modern
DOORS	DR4	• Interior aluminum door frame with demonstrated minimal frame dimension and safety glass vision panel • Finish: Anodized aluminum • Glazing: Safety glazing with distraction pattern	Station ambassador	Transparent aids in safety and wayfinding, clean, modern, slim profile
	DR5	• Hollow metal door and frame • Colour: to match adjacent wall finish	Doors within public areas to back of house/service areas	
GLASS	GL1	• Laminated safety glass	Station ambassador office	
FILM	FLM	• Privacy film • Frosted semi transparent film	Station ambassador office, curtain wall glazing	

B.4.15

EXTERIOR SHADING SYSTEM (ES1)

Material: Perforated aluminum panels
Colour: White
Pattern: Variable
Location: Exterior cladding on Station



GLASS CURTAIN WALL (CW)

Material: Glazed aluminum wall system
Colour: Light grey
Location: Main entry/exits

LOUVERS (LV1)

Material: Aluminum slats
Colour: To match building facade
Location: Exterior stations, EEB's, Ancillary Buildings

FACADE SUN BAFFLES (FB1)

Material: Aluminum baffles
Colour: Light grey
Location: Exterior facade with southern exposure

OPAQUE CLADDING (EW1A)

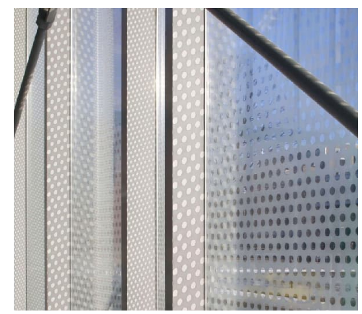
Material: High performance porcelain/ceramic panels
Colour: Light grey
Finish: Matte
Location: Exterior cladding stations

OPAQUE CLADDING (EW1B)

Material: Prefinished composite metal panels
Colour: Light grey
Finish: Smooth
Location: Exterior cladding stations

OPAQUE CLADDING (EW1C)

Material: Precast and cast in place concrete
Colour: Light grey
Location: Exterior cladding on Ancillary buildings, EEB's



GLASS FRIT/MARKER (CW-1,2,3)

Material: Ceramic frit
Colour: White

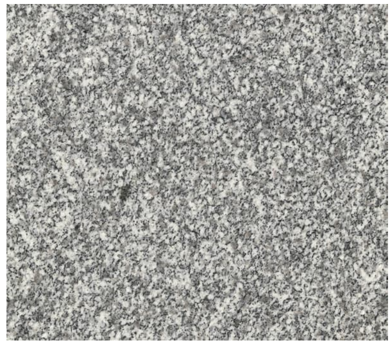
Figure B-3: Finishes and materials palette: exterior (to be read in conjunction with Sections 6.2, 6.3 and 6.14)

CANOPY (CAN1)

Material: Steel

Colour: Light grey

Location: Station exterior entry/exits



GRANITE BASE

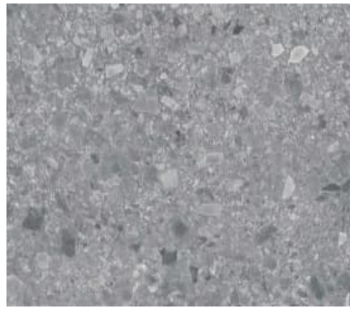
Material: Granite 400 millimetres base height

Colour: Medium grey

Location: Exterior station

Figure B-4: Finishes and materials palette: exterior (continued)

FLOORING (FL1)
Material: Poured Terrazzo
Colour: Light grey
Finish: Smooth with anti-slip
Location: Throughout all public areas

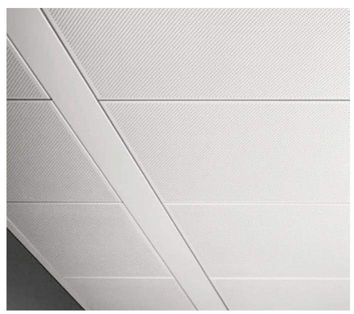


FLOORING ACCENT (FL1A STAIRS/ACCENT)
Material: Poured Terrazzo
Colour: Medium grey
Finish: Smooth with anti-slip
Location: Stairs

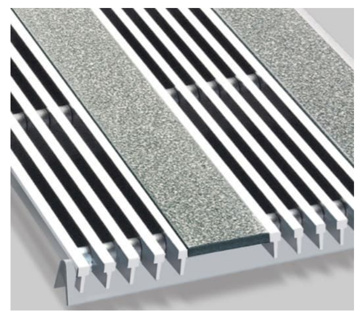
FLOORING (FL1B - ALTERNATE)
Material: High performance porcelain tile
Colour: Light Grey
Finish: Matte with anti-slip
Location: All public areas

COVE WALL BASE (WB1)
Material: Terrazzo
Colour: Medium grey
Finish: Smooth with anti-slip
Location: All public areas

WALLS (WF1)
Material: Porcelain tile
Colour: Medium grey
Finish: Matte
Location: All public areas



CEILINGS (CF1, CF2)
Material: Perforated acoustic metal ceilings
Colour: White
Finish: Matte
Location: All public areas



FLOOR GRILLES (FL4)
Material: Stainless steel tread insert
Finish: Anti slip coating
Location: Interior side of all entry/exits

TACTILE FLOORING (TWSI)
Material: Integral attention and guidance indicators
Colour: Yellow
Finish: Anti-slip
Location: Platform edges; top of stair/ramps; wayfinding path

Figure B-5: Finishes and materials palette: interior, general

FEATURE WALLS (WF5A)

Material: Perforated aluminum panels
Colour: Variable
Pattern: Variable
Finish: Smooth
Location: Vertical circulation, platform

FEATURE WALLS (WF5B - ALT.)

Material: Back painted glass, low iron
Colour: Variable
Pattern: Variable
Location: Vertical circulation, platform

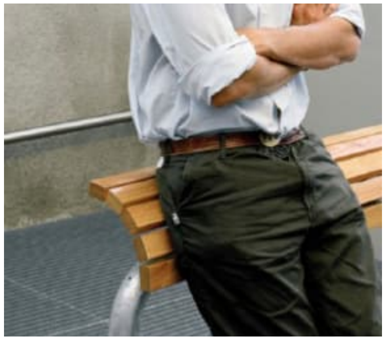
FEATURE CEILING (CF4)

Material: Perforated acoustic metal panels
Colour: Variable
Pattern: Variable
Location: Ceiling(s) at vertical circulation

FEATURE CEILING (CF4 – ALT.)

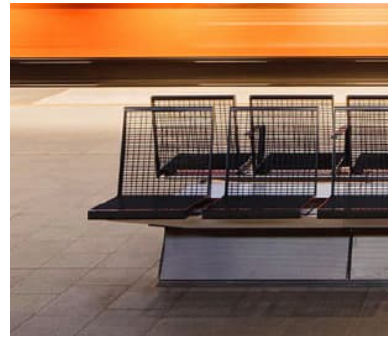
Material: Solid and perforated aluminum panels
Colour: Variable
Pattern: Variable
Location: Ceiling(s) at vertical circulation

Figure B-6: Finishes and materials palette: interior feature elements

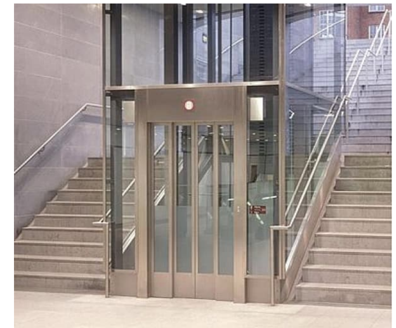


LEANING RAILS

WASTE RECEPTACLES



SEATING

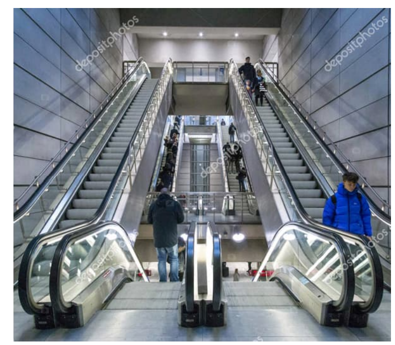


ELEVATORS

FARE VENDING MACHINES

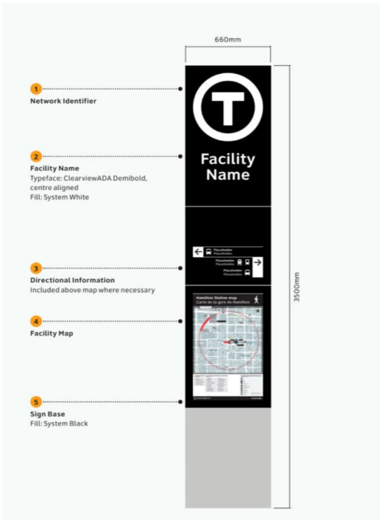
PLATFORM EDGE DOORS

BICYCLE RACKS



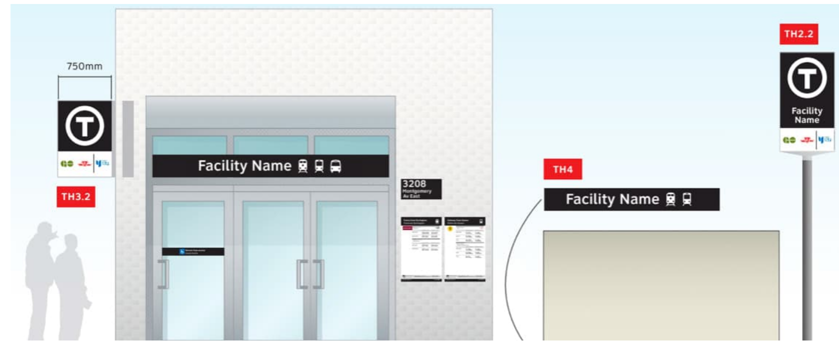
ESCALATORS/HANDRAILS WITH INTEGRATED LIGHTING

Figure B-7: Finishes and materials palette: components



TOTEM

FARE GATES



SIGNAGE AND WAYFINDING

SKYLIGHTS

CLOCK

Figure B-8: Finishes and materials palette: components (continued)

B.5 LIST OF FIGURES