Transit Passenger Facility Design Guidelines

TRANSLINK

Cover image

Vertical circulation through up and down escalators provides efficient passenger movement.

YVR-Airport Station, Richmond

Version 1.0

Transit Passenger Facility Design Guidelines

Enquiries pertaining to this document can be directed to:

TRANSLINK

TransLink Infrastructure Planning:

1600 – 4720 Kingsway, Burnaby, BC V5H 4N2

t. 604-453-4500

translink.ca

Foreword

TransLink's Vision is for a better place to live, built on transportation excellence. To support this vision we have set a target that, by 2040, more than half of all trips will be made by walking, cycling, or transit. Meeting this target will require a significant and sustained increase in transit ridership. We recognize that high quality transit passenger environments are key to attracting this growth.

The Transit Passenger Facility Design Guidelines provides a framework for designing transit passenger facilities and their surrounding context that can be consistently applied to the development of all new transit facilities, facility upgrades and transit-oriented communities across the region.

The document distills examples of international and local best practice – together with TransLink policy and design precedents – into a set of principles, goals, strategies and guidelines. It can be used throughout all stages of a project and tailored to the varied contexts of the Metro Vancouver region.

Addressed to those involved in all aspects of passenger facility planning, design and maintenance, the Guidelines are aimed at creating passenger environments that are accessible, safe, comfortable and operationally efficient, and that contribute to the health and viability of communities and the environment, with design excellence at their core. Of equal importance, by providing a consistent framework within which transit passenger facilities are planned, designed and implemented, the Guidelines will allow projects to be completed more quickly and cost-effectively.

Publication of the Transit Passenger Facility Design Guidelines is the result of a year-long process involving multiple disciplines and departments within the TransLink family of companies. Supporting and supplementing existing policy, design, engineering and environmental standards and requirements, this document is a key component of how TransLink will continue to deliver on its commitment to transportation excellence.

Ian Jarvis

CEO, TransLink

Contents

Introduction

1

Responsibility for delivering effective transit facilities is often shared between local jurisdictions, developers, TransLink and its many project partners. With so many different players potentially involved in the delivery of transit passenger environments, this document serves as a principal reference for ensuring design consistency and excellence across all projects, modes and environments.

This document is intended for all parties involved in the planning, design, implementation and operation of transit passenger facilities, including:

- Planners
- Designers
- Architects
- Landscape Architects
- Engineers
- Operators
- Developers
- Other Stakeholders

Chapter 1 sets out the purpose and scope of the Transit Passenger Facility Design Guidelines (hereafter Design Guidelines or Guidelines). Chapter 2 covers the planning and design process and explains how the component parts of the document combine to create a systematized approach to the design of transit passenger facilities and their context for Metro Vancouver. The Design Guidelines are contained in Chapter 3.

SeaBus view.

Waterfront Station, Vancouver


Free Spirit
Getting To/From Vancouver International Airport
424 Airport/Airport Station
Frequency
Fare Payments

1.1 The Need for Transit Passenger Facility Design Guidelines

TransLink operates an integrated regional network of transit services that includes automated rail rapid transit, commuter rail, passenger ferry, highway coach, bus, trolley bus, community shuttle and para-transit. Every transit stop, station, exchange and their surrounding environments acts as a gateway to the transit system and represents the public face of TransLink.

TransLink has set a target for 2040 that more than half of all trips in Metro Vancouver will be made by walking, cycling or transit. TransLink has also articulated a Vision, Mission and Values Statement that focuses on building transportation excellence and enhancing livability by providing a sustainable transportation network that is embraced by the communities and the people it serves.

This document has been prepared to support TransLink in achieving its long-term targets, with the following objectives to:

- ensure consistent quality and design of transit passenger facilities across transportation modes, facility types, and community contexts;
- strategically focus future transit passenger facility investment; and
- reduce the cost for scoping, design and maintenance of new and upgraded facilities.

While this document supports existing TransLink policies, it is also intended to guide the development of new policies and design processes. As the Design Guidelines are implemented and with new understanding of best practices, this document will be regularly reviewed and updated.

TRANSLINK VISION:
A better place to live built on transportation excellence.

TransLink's Vision, Mission and Values Statement

"There is a demonstrated correlation between high quality facilities and increased ridership. The Rosa Parks Transit Centre in Detroit, for example, completed in July 2009 with integrated retail amenities, showed an 11% increase in ridership in the first year of operation."

Lighting, Design and Application (LD+A), the Illuminating Engineering Society of North America monthly magazine. November 2010

Provision of accessible transit facilities and information contributes to a positive transit experience for all users.

Waterfront Station, Vancouver

1.2 Document Purpose and Scope

TRANSIT-ORIENTED COMMUNITIES

Transit-Oriented Communities (TOCs) are places that, by their design, allow people to drive less and to walk, cycle and take transit more.

In practice, this approach means concentrating higher-density, mixed-use, human-scale development around frequent transit stops and stations in combination with mobility management measures to discourage unnecessary driving.

Ultimately, transit-oriented communities are really walking- and cycling-friendly communities focused around frequent transit.

TransLink, Transit-Oriented Communities: A Primer on Key Concepts.

1.2.1 Document Purpose

The Guidelines serve as a comprehensive resource for producing consistently excellent transit passenger facilities through a systematized and integrated design process. They are intended to supplement, rather than replace, existing design, engineering and environmental standards and requirements.

Passenger facility design should take account of Metro Vancouver's varied and complex urban conditions; thus, ensuring they are tailored to meet the needs and opportunities of each particular context. To help achieve this goal, the Guidelines leave ample room for choice, creativity and professional judgement.

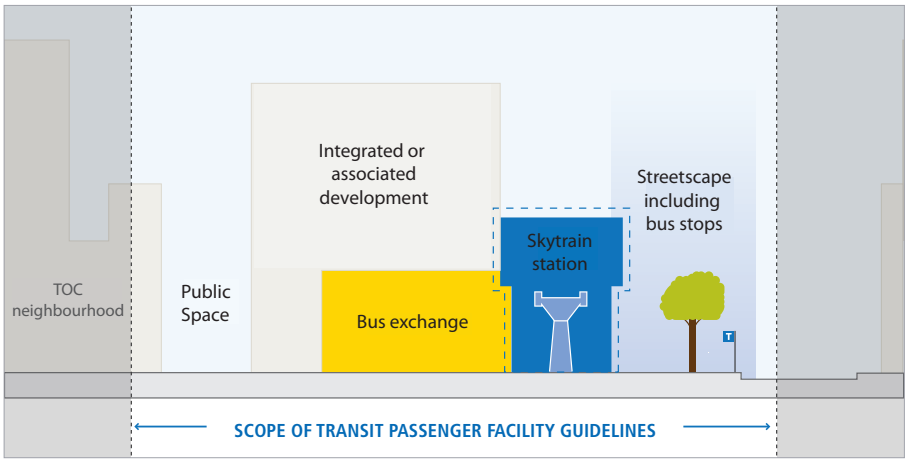
1.2.2 Document Scope

The Design Guidelines provide process and design guidance for the design, construction and operation of new or existing TransLink transit passenger facilities, including stops, stations, exchanges and their environments. [See: 2.3.1 Types of Transit Passenger Facilities]

TransLink facilities not intended for use by the travelling public, such as bus operating and maintenance garages or head offices, are not included in the Guidelines.

Transit passenger facilities exist in the context of the surrounding urban environments through which people travel. The planning and design of transit facilities, therefore, requires consideration of issues beyond the transit facility itself – including community integration, land use, urban development and sense of place.

The Guidelines focus on transit passenger facilities and their immediate surroundings (i.e., within one block). Further guidance on design of the neighbourhoods and communities around frequent transit stops, stations and exchanges will be included in the forthcoming Transit-Oriented Community Design Guidelines.



Scope of the Design Guidelines and relationship of transit facilities to surrounding developments.

1.2 Document Purpose and Scope

1.2.3 Definition of Terms

Planning and design terminology used throughout this document ranges from high-level vision to prescriptive specifications for implementation. These terms are defined as follows:

TERM	EXAMPLE
Vision: the approach that shapes the overall direction of the Guidelines Transport 2040 is the primary reference point as the vision for the Design Guidelines.	**Vision:** transit will be the travel mode of choice in Metro Vancouver
Principles: the overarching concepts that frame application of the Goals and Strategies	**Principles:** inclusive design must be an automatic design consideration, which means developing places that are attractive, convenient and easy to use for all people
Goals: the desired outcomes that TransLink seeks to realize with the Guidelines	**Goals:** put passengers and pedestrians first
Strategies: design objectives that should be met for TransLink to achieve its stated goals	**Strategies:** make transit passenger facilities universally accessible and inclusive
Guidelines: direction on how designs should be developed to achieve the objectives set by the strategies, without prescribing solutions This document provides the Design Guidelines for transit passenger facilities.	**Guidelines:** ensure sufficient spatial capacity is provided to avoid bottlenecks where passenger and pedestrian flows meet
Standards: measurable design requirements, typically based on technical, safety or passenger movement requirements Relevant standards are referred to, but are not included in these Guidelines.	**Standards:** the minimum clear width of an accessible route shall be 1830 mm (72 in) for primary, highly-frequented routes and 1525 mm (60 in) for secondary routes (1800 mm preferred at all routes)
Specifications: prescriptive design solutions, technical descriptions or requirements, which can include such elements as dimensions, materials and placement Specifications are referred to, but are not included within these Guidelines.	**Specifications:** where concrete is used as the basic floor and walkway finish, it will be steel-trowelled with aggregate sufficiently exposed at the walking surfaces to provide slip resistance of .55 to ASTM C1028-96 for wet or dry conditions

PRIMARY FOCUS OF THIS DOCUMENT

"... land value uplift and regeneration along the Docklands Light Rail corridors in East London resulted in 50% of capital costs being recaptured through transport cost reductions, reduction in congestion and accidents. A further 50% was recaptured through overall office development and job creation..."

Value of Design
UK Commission for Architecture and the Built Environment (CABE).

1.3 Policy Context

TransLink Transport 2040

TransLink's existing and emerging policies support a customer-focused approach to transit design and provision. The 2008 publication of the TransLink Transport 2040 strategic plan set its course for the next 30 years.

Transport 2040, the long-range transportation plan for the Metro Vancouver region, includes six goals and four strategies. The Transit Passenger Facility Design Guidelines help to realize these goals, particularly by ensuring a safe and comfortable experience for the travelling public (Goal 4) and using attractive and high-functioning facilities. These facilities, in turn, attract more trips by transit (Goal 2) , which reduces greenhouse gas emissions (Goal 1). Well designed facilities that more easily and seamlessly integrate with development can help to increase the number of people living and working close to frequent transit (Goal 3). This type of development serves to optimize the use of existing transportation assets (Strategy 2) and to foster communities that are good for walking, cycling and transit (Strategy 1).

RELATIONSHIP OF THE GUIDELINES TO OTHER TRANSLINK DOCUMENTS

This document is one of a suite of existing or planned regional level design guideline documents that includes:

- Transit Service Guidelines
- Transit Infrastructure Design Guidelines
- TransLink Wayfinding Standards
- Transit Fleet Design Guidelines (forthcoming)
- Universal Accessibility Guidelines for TransLink Fleet & Facilities
- Universally Accessible Bus Stop Design Guidelines
- Bicycle Infrastructure Guidelines (Draft)
- Transit-Oriented Community Design Guidelines (forthcoming)

TRANSPORT 2040: GOALS AND STRATEGIES	
Goal 1	Greenhouse gas emissions from transportation are aggressively reduced in support of federal, provincial and regional targets.
Goal 2	Most trips are by transit, walking and cycling.
Goal 3	The majority of jobs and housing in the region are located along the Frequent Transit Network.
Goal 4	Traveling in the region is safe, secure and accessible for everyone.
Goal 5	Economic growth and efficient goods movement are facilitated through effective management of the transportation network.
Goal 6	Funding for TransLink is stable, sufficient and appropriate and influences transportation choices.
Strategy 1	Make early investments that encourage development of communities designed for transit, cycling and walking.
Strategy 2	Optimize the use of the region's transportation assets and keep them in good repair.
Strategy 3	Build and operate a safe, secure and accessible transportation system.
Strategy 4	Diversify revenue sources and pursue new and innovative ways to fund transportation.

1.4 Process Goals and Strategies

A series of process goals and strategies were formulated at the outset of the development of the Design Guidelines that provide the means towards the ends. They are intended to ensure that the Design Guidelines are fully understood, supported, and consistently applied by all TransLink departments, operating entities, and project partners.

TRANSLINK MISSION:
Together, TransLink connects the region and enhances its livability by providing a sustainable transportation network embraced by Metro Vancouver's communities and people.

TransLink Transport 2040

PROCESS GOALS AND STRATEGIES	
PROCESS GOAL 1 – Adopt an integrated planning and design approach	
Process strategy 1.1	Involve all relevant planning and design disciplines to establish project goals and objectives.
Process strategy 1.2	Facilitate cross-disciplinary teamwork and processes in the design and delivery of projects.
Process strategy 1.3	Agree upon and clearly communicate roles and responsibilities for all stakeholders.
PROCESS GOAL 2 – Systematize use of, and adherence to, the design guidelines	
Process strategy 2.1	Integrate the guidelines within the design process from project brief through project completion to operation and management.
Process strategy 2.2	Encourage provincial and municipal partners to use the design guidelines within their own planning and design processes.
Process strategy 2.3	Establish a clear and consistent design review process.
Process strategy 2.4	Widely engage with stakeholders to promote, communicate and build support for the design guidelines.


SWITCH
314
FP
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How to Use the Guidelines

2

The Integrated Design Process (IDP) is an iterative and participative approach to transit passenger facility design. It is intended to be a stimulating and outcome-focused problem-solving process to achieve excellent and efficient design solutions from a multi-disciplinary and collaborative team. Members make decisions based on a shared vision and a holistic understanding of the project. The IDP follows the design through its full life-cycle, from pre-design, through occupancy, and into operation.

The IDP differs from conventional design processes in that it brings together all key stakeholders and design professionals to work collaboratively and interactively from the early planning stages through to facility completion and occupation. It allows the design team to identify and better understand the design goals of each party, and it provides a forum to take advantage of complementary systems and design principles that can satisfy multiple design goals.

The general approach to integrated design promoted in this document is consistent with the Roadmap for Integrated Design, developed by the BC Green Building Roundtable.[1]

Marine Drive Station, Vancouver

[1] Roadmap for the Integrated Design Process, BC Green Building Roundtable, 2007

2.1 The Integrated Design Process

In conventional design, "the architect or designer and the client agree on a design concept consisting of a general massing scheme, orientation, fenestration and the general exterior appearance of the building. Then the mechanical and structural engineers are asked to implement the design and to suggest appropriate systems. The problem with conventional practice is that this design process is too quick and simple, often resulting in high operating costs, poor comfort and few sustainable gestures that fall within the client's restrained budget."

Pearl, Danny. 'An Integrated Design Process'. Canadian Architect. (June 2004).

The IDP establishes priority on the setting of goals, objectives and directions, from the outset of a project, with input from a multi-disciplinary team. It includes regular feedback loops to evaluate decisions throughout design development and, subsequently, through commissioning and post-completion evaluation.

Following are key stages in the IDP (as illustrated on the facing page):

Stage 1 Pre-Design: exploration of the relationship between the project and its surrounding environment to establish goals, objectives and direction through a visioning session: The Design Guidelines should be used to support identification of contextual issues, characteristics, opportunities and functional requirements.

Stage 2 Brief: preparation of project brief and appointment and briefing of planners and designers: The Design Guidelines should inform and be included within the brief.

Stage 3 Concept Design: development of design options and feasibility of concepts and consideration of innovative technologies, new ideas and fresh application methods in working towards the goals and objectives set out in the brief: The Design Guidelines should be the basis for evaluation of concept designs.

Stage 4 Design Development: development of preferred concept(s) and assessment of architectural, electrical and mechanical systems for their expected performance and impact on other systems: The Design Guidelines should be used to evaluate variations against the design brief.

Stage 5 Documentation: preparation of construction staging plans, fabrication and construction documentation: The Design Guidelines should be referred to within documentation as necessary.

Stage 6 Implementation: supervision of fabrication, construction and preparation of maintenance and management manuals: The Design Guidelines should be used to evaluate any modifications to the built design that may be required post-completion.

Stage 7 Operations and Maintenance: monitoring of sustainability (environmental impact, energy efficiency and cost-in-use) of facilities and operations: The Design Guidelines should inform transit passenger facility maintenance and management plans.

Stage 8 Evaluation and Monitoring: post-implementation monitoring and evaluation to ensure that project successes and/or issues are identified: Lessons learned should be fed back into the Design Guidelines where necessary.

2.1 The Integrated Design Process

The Design Guidelines in this document should be considered at all stages of the integrated design process – from informing development of the brief, through concept design, to detailed design and delivery. In this way, TransLink and its project delivery teams can ensure that design consistency and integrity are retained throughout the project's life-cycle.

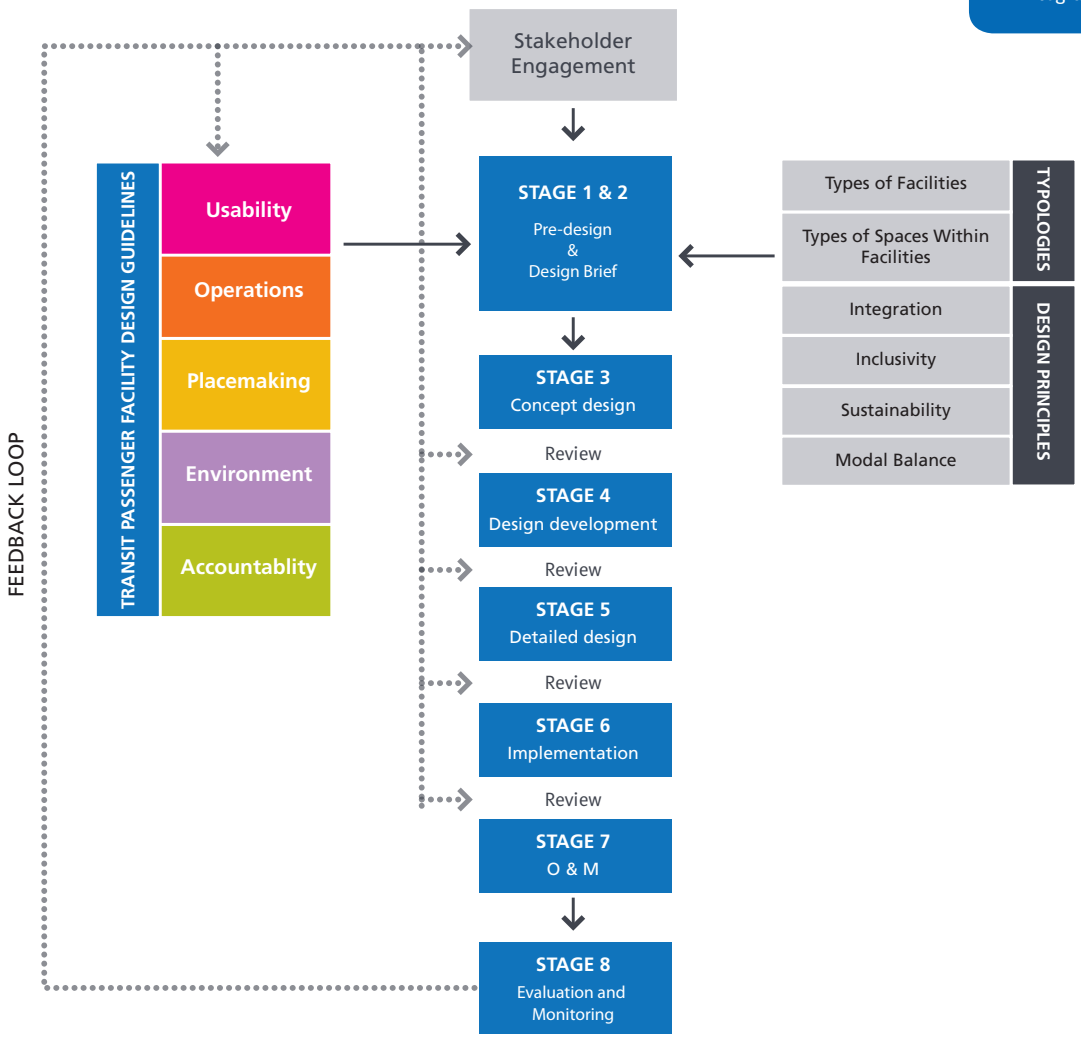
IDP REFERENCE:

Primary responsibility will shift as the project progresses through design to implementation and post-commissioning and evaluation. For further information on roles and responsibilities, please refer to:

Roadmap for the Integrated Design Process, BC Green Roundtable, 2007

» www.metrovancouver.org/buildsmart/design/Pages/Integrateddesignprocess.aspx

THE INTEGRATED DESIGN PROCESS



2.2 Stakeholder Engagement

TransLink's commitment to engagement

TransLink is committed to meaningful and effective engagement with stakeholders, governments and the public. TransLink will work closely with the region's municipalities to encourage land use decisions that support public transit and encourage walking and cycling. To ensure the best use of resources, TransLink will coordinate its efforts with Transport Canada and the Ministry of Transportation and Infrastructure – as well as with airport and port authorities and non-governmental agencies – on appropriate strategies, plans and initiatives to support the goals identified in Transport 2040.

TransLink's Principles for Public Consultation and Community Engagement

2.2.1 Iteration and Participation

A mindset of continuous learning and improvement is central to a successful IDP. Iteration and participation ensure that decisions reflect the team's collective knowledge, that different elements are considered and that solutions go through the required steps for optimization. Provision for these activities takes two interrelated forms:

- an iterative review process between TransLink and the designer/planner of outputs at key stages of design development: This process ensures there are no surprise project outcomes, allows timely incorporation of changes of direction or emphasis and avoids abortive work.
- a participatory review process with TransLink's internal and external stakeholders and, if appropriate, with community and public interest groups: The TransLink project team should also be involved in this process.

2.2.2 Stakeholder and Public Consultation

TransLink has developed a full, inclusive public consultation approach for all of its plans and projects. Principles for Public Consultation and Engagement will help TransLink develop and implement projects and plans that reflect the organization's and the region's desire for a sustainable transportation system.[1]

Stakeholder engagement should take place as early as possible in the design process: it should aim to identify the needs and perceptions of all interested parties; to allow for their consideration and balance during the planning and design stages of any project; and to review design outcomes in terms of transit facilities, their services and their context.

To ensure effective stakeholder involvement for all transit passenger facility projects, the following guidelines should be taken into consideration:

- establish a comprehensive stakeholder engagement plan and process for all projects;
- identify internal and external stakeholder groups relevant to the project, such as customers, transit operators, municipalities, community organizations;
- people with disabilities, business owners, seniors and schools;
- provide a framework for public input to address a range of issues, such as facility and urban design, customer services at the facility and community integration;
- provide a forum for stakeholder input early in the life of a project and throughout the facility design process;
- engage widely with stakeholders to build awareness of, and support for, transit passenger facility projects.

[1] TransLink's Principles for Public Consultation and Community Engagement (www.translink.ca/en/Be-Part-of-the-Plan/Public-Consultation/Principles-for-Public-Consultation.aspx)

2.3 Typologies

2.3.1 Types of Transit Passenger Facilities

Transit passenger facilities can be usefully categorized into three distinct types (as illustrated on the following pages):

- stations
- exchanges
- stops

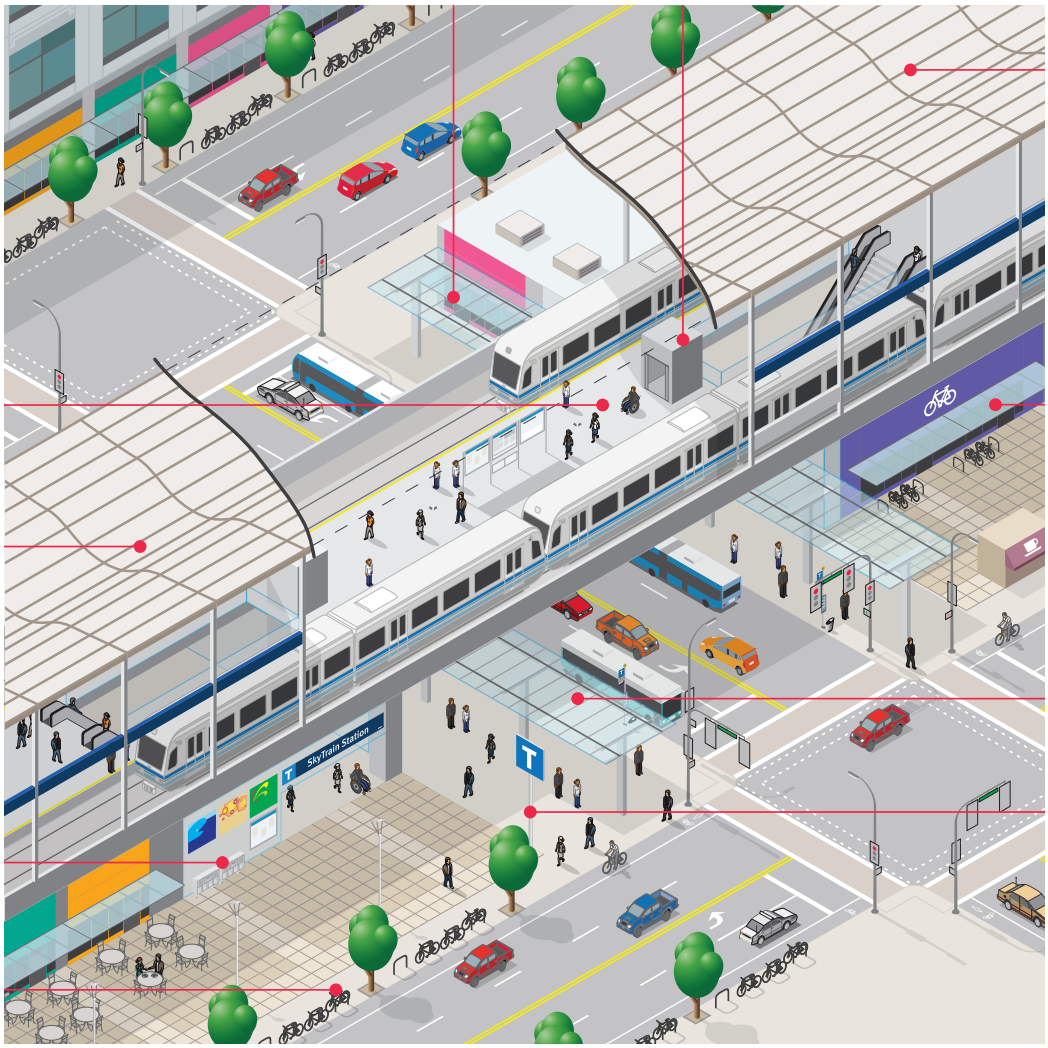
While the Design Guidelines apply broadly to all passenger facility types, to develop effective and context-sensitive solutions designers must consider the unique characteristics of each facility at the outset of any design project.

- **Mode:** Transit technology and service type shape passenger access, circulation, and amenity requirements. Multiple modes will require effective information and integrated design for ease of connection.
- **Frequency:** Facilities with higher frequency services may require more complex queuing and circulation configurations whereas facilities with lower frequency services and longer average wait times may benefit from more comfortable waiting areas.
- **Passenger Demand:** Higher current or projected passenger volumes typically require larger, higher-amenity facilities or facilities that are capable of adapting to future growth.
- **Network Role/Urban Context:** The role that each facility plays in the wider network (e.g. major transfer point? terminus? urban centre? major leisure destination?) will determine transit operating requirements and shape passenger volumes and patterns of use.
- **Site Context:** The physical form and specific location of each facility (e.g. above/at/below grade, within the road Right-of-Way, or on a development parcel) will present different access, circulation, legibility, and safety considerations.

2.3 Typologies

2.3.1 Types of Transit Passenger Facilities

STATIONS

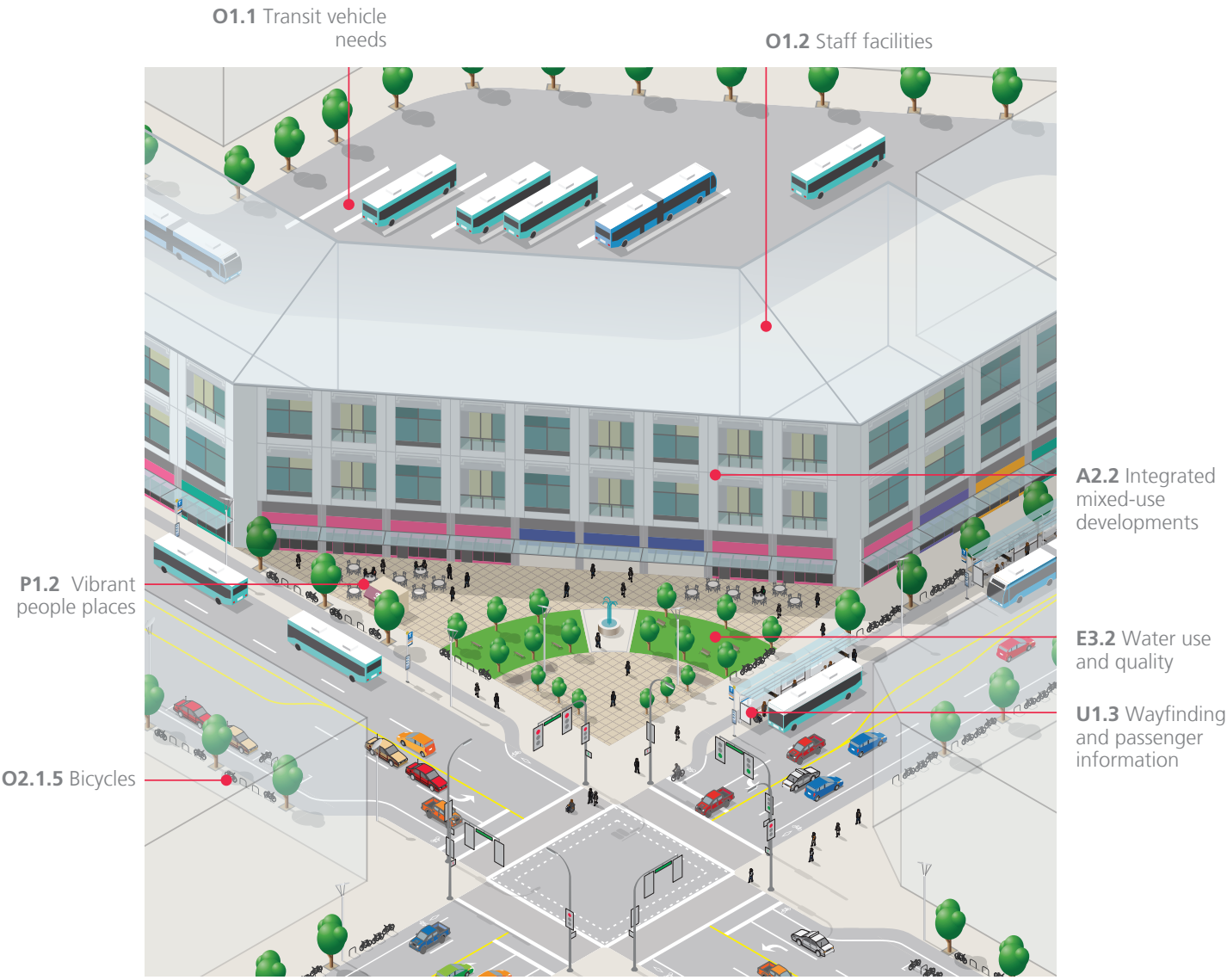


Stations are broadly defined as passenger facilities serving high-capacity and rapid transit services, including SkyTrain, West Coast Express, SeaBus, future Bus Rapid Transit and Light Rail.

2.3 Typologies

2.3.1 Types of Transit Passenger Facilities

EXCHANGES



Exchanges are broadly defined as passenger facilities that serve multiple bus routes, provide layover space for buses and may or may not be associated with a Station. Though Stations and Exchanges are identified here as separate facility types, most stations are associated with exchanges, and both elements should be conceived and designed as a single facility to ensure a seamless travel experience.

2.3 Typologies

2.3.1 Types of Transit Passenger Facilities

STOPS

Stops are defined as facilities, usually on-street, that serve one or more road-based bus routes.

2.3 Typologies

2.3.2 Types of Spaces Within Transit Passenger Facilities

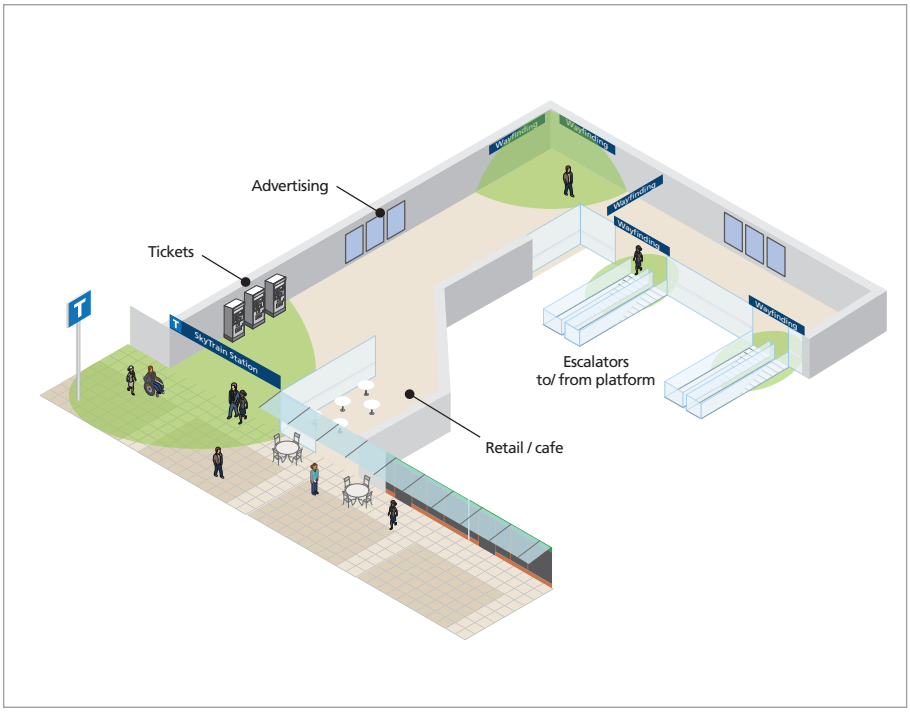
Adopting a passenger-centered perspective that considers how people actually use and move through the transit system helps point to three different types of spaces that exist within all transit passenger facilities (from curb-side bus stops to major multi-modal hubs):

- Decision Spaces
- Circulation Spaces
- Opportunity Spaces

Each type of space has different functional demands and design requirements as explained in the illustrations that follow.

DECISION SPACES

- Decision spaces are areas where passenger and pedestrian decisions take priority; examples include entrances, ticket halls and corridor intersections. These locations require good sightlines and clear signage. Temporary information, advertising, retail branding or other spatial uses that may confuse passengers or delay passenger movements should be integrated into the physical design and located adjacent to, but not within, decision spaces.

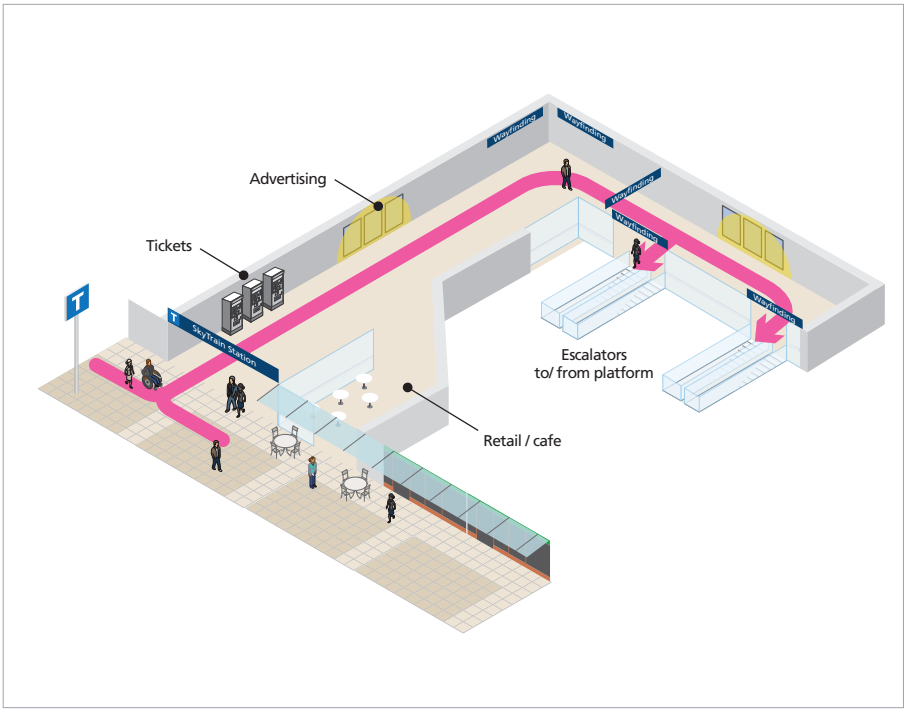


2.3 Typologies

2.3.2 Types of Spaces Within Transit Passenger Facilities

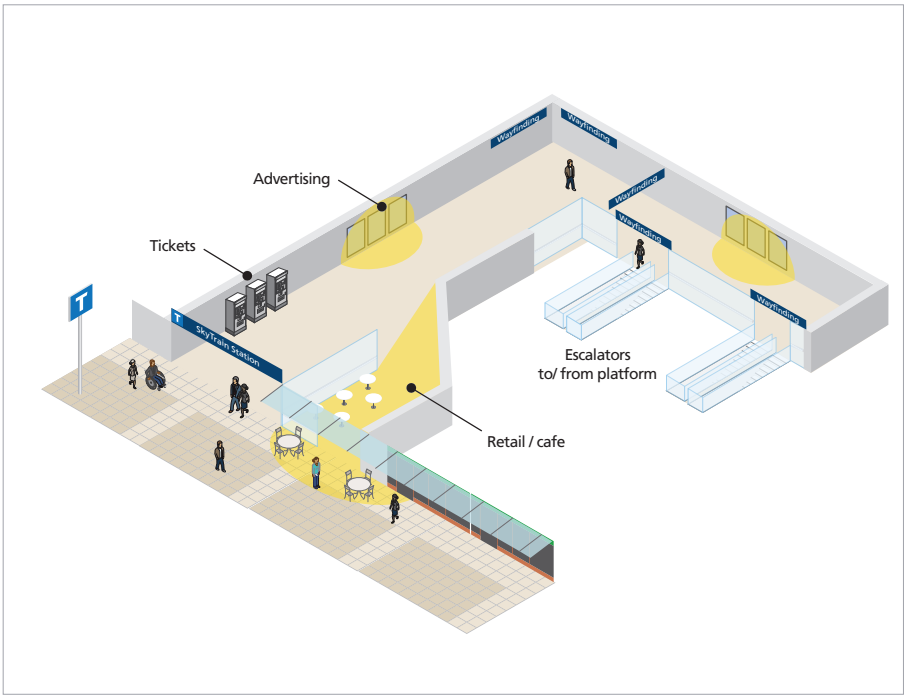
CIRCULATION SPACES

» Circulation spaces connect decision spaces. They typically include corridors and paths especially reserved for passenger movement and connections to, from and between transportation modes or the surrounding area. These spaces should provide clear, unobstructed movement routes matched to desire lines. Street furniture, plantings, advertising, information displays, retail boards, retail kiosks or any other fixed items should not obstruct these spaces (but may be located adjacent to them).



OPPORTUNITY SPACES

» Opportunity spaces include those areas of a facility and its context not dedicated to decision making or circulation. They can accommodate passenger amenities such as cafés, retail entrances, retail displays, retail kiosks, advertising, public art, seating or landscaping. Fixed or temporary information or infrastructure located in these spaces must be positioned and configured so as not to obstruct or interfere with the requirements of decision or circulation spaces in adjacent areas.



2.4 Design Principles

Design excellence requires consideration of the following design principles, summarized under four broad headings that form the foundation of the guidelines in Chapter 3:

- Integration
- Inclusivity
- Sustainability
- Modal Balance

These principles fully support TransLink's values, permeating the planning and design of high-quality transit passenger facilities and supporting the realization of efficient, cost-effective and affordable outcomes.

Their outcomes should be self-evident. Though design excellence is sometimes assumed to be synonymous with higher costs, the quality of design outputs needs to be considered as part of whole life costs of the facility.

Achieving design excellence requires the balanced consideration of such design factors as:

- function and performance
- sustainability and cost-efficiency
- ease of use, adaptability and flexibility
- quality of appearance and attractive aesthetic
- innovation and responsiveness to new technology and opportunities

TRANSLINK VALUES

Safety	**Integrity**
The safety and security of our customers and employees is paramount. We will operate safely at all times.	We will act with honesty and integrity at all times. We will treat others with dignity and respect and conduct ourselves in a manner that fosters trust.
Customer Service	**Excellence**
We will provide excellent service to our customers. We understand that our customers expect accuracy, timeliness and reliability; delivering on their expectations is essential to our success. Our plans and actions are driven by customer needs.	We will strive for excellence in all that we do and will be a leader in enhancing sustainability through the transportation services we provide. We will encourage innovation and the implementation of best practices throughout our organization.
People	**Sustainability**
We value our employees and the contributions they make to serving our customers.	Sustainability will be a key factor in all of our strategies, business plans, decisions and operations. We will incorporate economic, environmental and social factors in our decision-making.
Inclusiveness	**Accountability**
We value teamwork and partnerships. We recognize that our success depends on effective communication and consultation with the public and with our employees and stakeholders.	We will be results-oriented and fiscally responsible. We will set measurable targets and hold ourselves accountable to achieve them.

2.4 Design Principles

2.4.1 Integration

The most effective planning and design results will be achieved when transit and its context are fully integrated, with each adding value to the other. Developing integrated networks for walking, cycling and transit in the public realm has resulted in some of the world's most liveable cities and best regarded transit systems.

Integrated design should include balanced consideration of design factors such as:

- balanced integration of inter-modal transit systems and facilities into land use planning and the urban fabric;
- engagement in a structured, integrated program that involves all key professional disciplines and stakeholders in the planning and design process;
- integration of transit facilities and the public realm with their context to add value to both.

Integrated and inclusive design. Kongens Nytorv Station, Copenhagen, Denmark

2.4 Design Principles

2.4.2 Inclusivity

Buildings, facilities and spaces must be designed to maximize accessibility to transit for all users. Users include the mobility-impaired and people with learning difficulties and other disabilities, especially those in wheelchairs, and people with strollers or young children or with heavy or bulky baggage, shopping trolleys or bicycles.

Inclusive design includes consideration, as appropriate, of barrier-free, step-free spaces and shared-use, single-surface areas; provision of ramps, elevators and stairs and design of cross-slopes, gradients and level areas – including tactile and audio treatments – to regulatory or statutory standards.

Inclusive planning and design should also involve balanced consideration of the needs and requirements of all relevant special interest groups, as well as their communities, as both users and non-users of transit services and facilities.

Bus accessibility ramp.
Main Street trolley bus, Vancouver

2.4 Design Principles

2.4.3 Sustainability

TransLink is committed to being a recognized world leader in sustainability and has published its commitments in its corporate Sustainability Policy and Sustainability Report.[1]

Sustainability means meeting the needs of the present without compromising the needs of future generations by balancing the three factors of sustainability – social, environmental, economic – through the decision-making progress.

Environmental sustainability means maximizing energy efficiency and minimizing the generation of greenhouse gases and the consumption of fossil fuels and non-renewable energy and materials. Sensitivity to natural systems through site selection, building and landscape design are also key considerations.

Social and economic sustainability requires the flexibility to lead and respond to changing demographic and development factors, improve existing contexts and stimulate future growth and diversity.

Key factors in achieving sustainability across all categories include:

- maximizing use of energy-efficient transit and cycling and walking modes and
- planning and developing complete, compact and resilient communities that minimize the need to travel and that support reduced automobile use.

Achieved LEED Gold certification. Downtown Transit Station, Charlottesville, Virginia

[1] TransLink's Sustainability Policy and Sustainability Report www.translink.ca/en/About-TransLink/Corporate-Overview/Sustainability.aspx APTA Sustainability Guidelines, and CUTA Sustainability Guidelines for Transit Systems, June 2010 provide further reading on sustainable transit planning and design policy.

2.4 Design Principles

2.4.4 Modal Balance

Transit passenger facilities need to accommodate multiple transportation modes. Ultimately, all transit passengers are pedestrians – including those using mobility devices and those who may have arrived by bicycle, car, or other transit mode. Transit passenger facilities should, therefore, be designed to create environments that are safe, welcoming and reliable for pedestrians, cyclists and transit passengers.

Pedestrians, cyclists, and people with cognitive and physical disabilities are the most vulnerable users of the transportation system. Transit passenger facilities generate concentrated levels of activity by these user groups. Accordingly, the planning and design of transit facilities and their surroundings should prioritize the creation of an environment that is accessible, easy to use, safe, secure, and comfortable for all passengers – especially for these more vulnerable users.

Resolving conflicts between modes is part of the normal process of designing transit passenger facilities. In finding balanced solutions that promote safety, comfort, reliability and a welcoming environment, the needs of pedestrians, cyclists and transit riders should be collectively and respectfully considered.

Modal priority for station access given to cyclists, pedestrians and bus. Flintholm Station, Copenhagen, Denmark

3

Design Guidelines

The Design Guidelines are organized as a thematic framework that supports TransLink's wider corporate, community and public aspirations, visions and policies.

Consideration of these guidelines at all stages of the planning and design process will provide a balanced understanding of the complex needs of transit passenger facility planning and design and lead to consistent, cost-effective and systematized outcomes.

Lansdowne Station, Richmond

3.1 Using the Design Guidelines

Broadway-City Hall Station, Vancouver

3.1.1 The Design Guidelines Structure

The Design Guidelines are structured around five design themes. Each theme is supported by a series of design strategies and guidelines that should be considered and applied during the planning and design of new or upgraded transit passenger facilities.

The relative significance or importance of each theme, strategy and guideline will vary depending on context, local objectives and strategic priorities. For example, revitalization or transit-oriented community development may be the highest priority at one location, high-capacity transit provision may be the priority at another, whereas accessibility improvements to on-street bus stops may be the priority elsewhere. These priorities should be agreed upon jointly with stakeholders at the project outset and contained within the design brief.

The design themes are:

Usability: Public transit exists for passengers, and all passengers are pedestrians. Accordingly, the planning and design of transit facilities, their environments and the communities they serve should prioritize passenger and pedestrian needs through the provision of safe, secure and accessible spaces that make it easy and comfortable to get around on foot or mobility devices, or by bicycle or transit.

Operations: Transit facilities that are efficient for transit operations also benefit passengers through more reliable journey times and more frequent services made possible by operational cost-savings. Optimizing transit efficiency means providing easy access for transit vehicles, seamless integration with other modes and effective maintenance.

Placemaking: Public transit is a vital civic resource and forms a focal point for community activity. When designed well, transit facilities of all sizes can help create 'great places' that feature a strong sense of place and identity, attractive public spaces where people feel comfortable spending time and a positive mix of activity by a wide variety of people. The public realm along transit routes can also be designed and integrated to form great linear places between facilities.

3.1 Using the Design Guidelines

Environment: Transit passenger facilities and their surrounding communities should be designed to reflect TransLink's sustainability vision by balancing the three factors of sustainability – social, environmental, economic – through the design process. Beyond realizing operational cost savings over the life of the building, environmentally responsible design contributes to the long-term health and well-being of transit passengers, local communities and the natural environment.

Accountability: Transit passenger facilities and their context must provide good value for public funds. Fiscally responsible design considers both short-term and long-term operations and expenditures; takes advantage of opportunities for revenue generation where appropriate; and helps to realize wider social, economic and environmental benefits without compromising operational efficiency or passenger experience.

U USABILITY - Put passengers and pedestrians first

- **U1** Make it easy
- **U2** Make it universally accessible
- **U3** Make it safe and secure
- **U4** Make it comfortable

O OPERATIONS - Optimize transit efficiency

- **O1** Facilitate transit operations
- **O2** Support transit by integrating with other modes
- **O3** Facilitate effective management and maintenance

P PLACEMAKING - Create great places

- **P1** Make transit a community asset
- **P2** Seamlessly integrate transit, urban development and the public realm

E ENVIRONMENT - Be leaders in environmental sustainability

- **E1** Minimize negative environmental impacts of transit facilities
- **E2** Reduce energy consumption
- **E3** Design healthy sites

A ACCOUNTABILITY - Be fiscally responsible

- **A1** Design with whole life costs in mind
- **A2** Optimize economic benefits through design
- **A3** Design responsive and flexible facilities and spaces

3.1 Using the Design Guidelines

3.1.2 The Design Evaluation Framework

To support the use of the Design Guidelines, the Design Evaluation Framework provides a project team with a means for assessing how well each guideline has been applied on a given project and to identify areas for improvement, either in subsequent stages of design, or on future projects.

An example page of the framework is presented overleaf. The complete evaluation framework is provided as Appendix 4.2.

A simple approach to evaluation is to use a 'traffic lights' rating system whereby design topics are presented as questions that are then rated as green, amber or red:

- a green light signifies that all guidelines under that topic have been considered and addressed;
- an amber light signifies that a number of guidelines have been considered and addressed but that others may require further thought;
- a red light signifies that few, if any, guidelines have been considered and addressed.

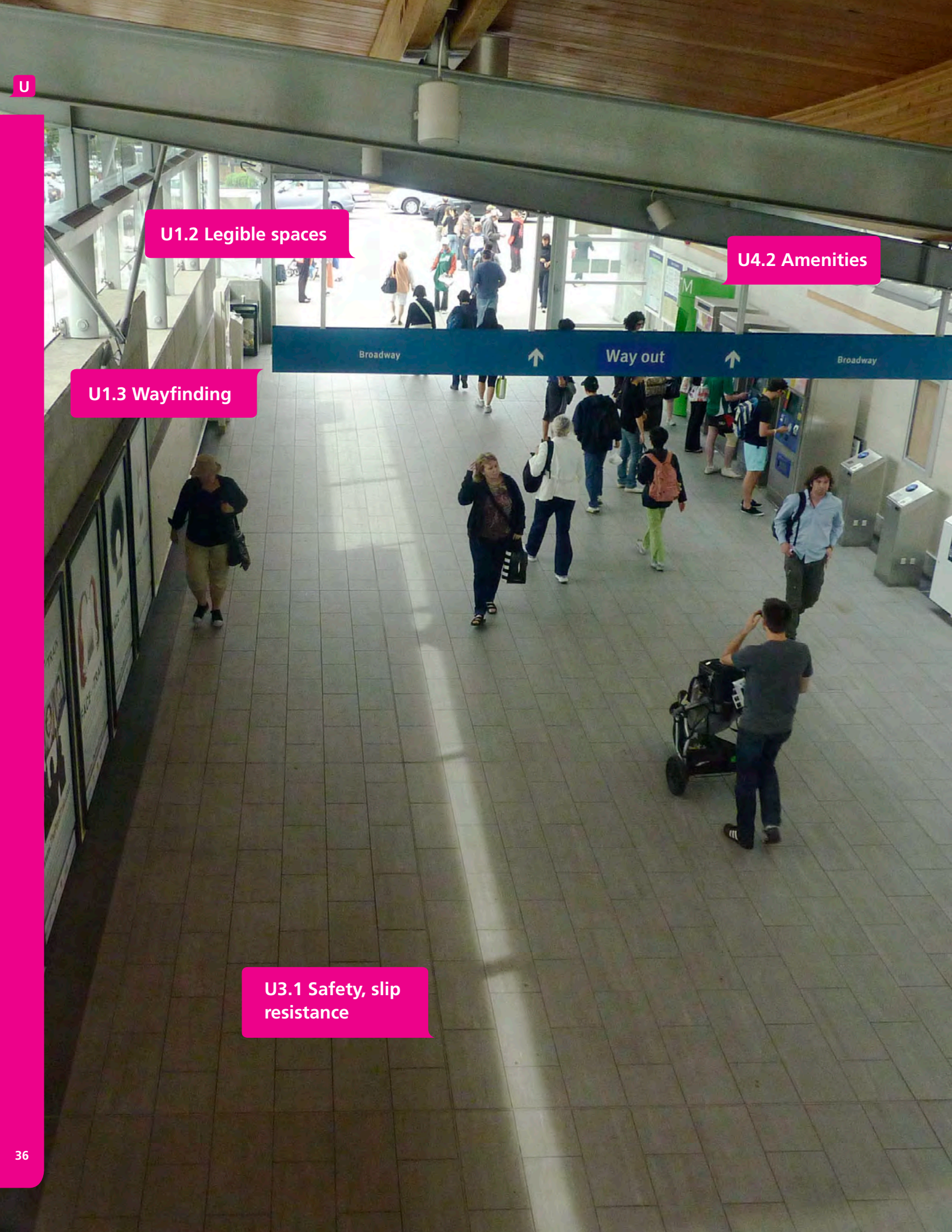
Those topics rated 'red' or 'amber' may require further consideration if the design is to meet with best practice.

The evaluation framework is not intended to limit flexibility and, as such, no weightings are applied; however, when design choices require tradeoffs between different guidelines it may be appropriate to identify those guidelines that best reflect the objectives of the project and to consider them accordingly.

The optimal configuration of a transit passenger facility will be informed by understanding and balancing the needs of all themes across the framework.

3.1 Using the Design Guidelines

Usability	Rating			Comments	Actions
U1 Make it easy					
U1.1 Movement and capacity					
U1.1.1 Does spatial provision meet with locational and functional needs?					
U1.1.2 Does the spatial configuration and sequence provide for logical passenger movement?					
U1.1.3 Does the spatial design minimize conflicts of movement?					
U 1.2 Legible spaces					
U1.2.1 Does the spatial design provide clear sightlines and views to destinations?					
U1.2.1 Does the facility design include legible, distinctive spaces with clearly defined edges and transitions?					
U 1.3 Wayfinding and passenger information					
U1.3.1 Has a Facility Wayfinding Plan been developed?					
U1.3.2 Is wayfinding and passenger information consistent with TransLink's Wayfinding Standards Manual?					
U2 Make it universally accessible					
U2.1 Physical accessibility					
U2.1.1 Does the facility design provide for barrier-free access and movement?					
U2.1.2 Does the design of bus stops comply with TransLink's Universally Accessible Bus Stop Design Guidelines?					
U2.1.3 Does vertical circulation provide for the needs of all users?					
U2.2 Accessible information					
U2.2.1 Is information provision able to be accessed and understood by all users?					
U3 Make it safe and secure					
U3.1 Safety					
Have potential hazards and accident risks been minimized?					
U3.2 Security					
U3.2.1 Has a risk assesment for natural or criminal threats been undertaken?					
U3.2.2 Have CPTED principles been followed?					
U3.2.3 Has effective use been made of CCTV?					
U3.3 High quality lighting					
U3.3.1 Does lighting comply with IESNA standards to provide for good spatial understanding, ambience and safety?					
U3.3.2 Has a daylighting strategy been developed that supports effective use of managed daylight and transition between illumination types?					
U3.3.3 Has at-grade facility lighting been integrated with third-party systems, appropriate to the facility lighting zone?					
U4 Make it comfortable					
U4.1 All-weather and sensory protection					
Does the facility design provide appropriate protection from the full range of weather conditions, unpleasant smells and noise?					
U4.2 Amenities					
Have passenger amentities, such as waiting rooms, been provided appropriate to use and context?					


U1.2 Legible spaces
U4.2 Amenities
Broadway
Way out
Broadway
U1.3 Wayfinding
U3.1 Safety, slip resistance

USABILITY:
Put passengers and pedestrians first

Public transit exists for passengers, and all passengers are pedestrians. Accordingly, the planning and design of transit facilities, their environments and the communities they serve should prioritize passenger and pedestrian needs through the provision of safe, secure and accessible spaces that make it easy and comfortable to get around on foot or by bicycle or transit.

Guidelines for **Usability** are organized under four broad design strategies:

» **U1** Make it easy
» **U2** Make it universally accessible
» **U3** Make it safe and secure
» **U4** Make it comfortable

Good spatial organization supports legible spaces and unobstructed movement with amenities and facilities such as TVMs, ATM, advertising and public art located in adjacent areas.

Broadway-City Hall Station, Vancouver

Design strategy U1:
Make it easy

Passengers and pedestrians should be able to easily access and move through transit passenger facilities. The design of internal and external spaces should be legible and intuitive, with direct and convenient routes located along natural desire lines.

An integrated and coordinated system of signing, passenger information, lighting and transit facility identity will create easily understood environments that prioritize passenger and pedestrian needs.

U1.1 Movement and capacity

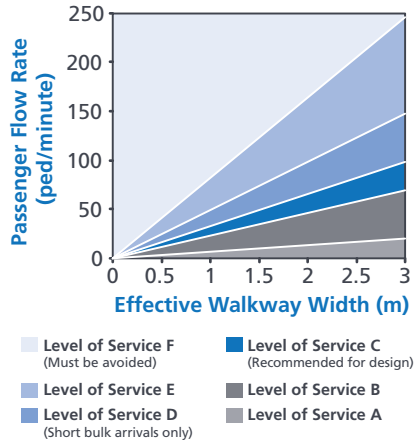
A station is a dynamic environment, involving movement and potential conflicts among a range of station users. The design of all transit passenger facility spaces should be logical and should be optimized to minimize conflict on opening day and into the future.

U1.1.1 SPATIAL REQUIREMENTS

- Establish the capacity, configuration and sequence of spaces at transit facilities to support predicted passenger volumes and peak movements by various modes, including foot, bicycle or inter-modal connections.
- Identify internal and external origins and destinations and levels of demand.
- Plan for passenger journey stages, routes and desire lines.
- Provide sufficient spatial capacity where passenger and pedestrian flows meet to avoid bottlenecks and to enable pedestrians to move against the predominant flow.
- Provide separate connecting areas for each direction of travel where pedestrian flows fall below Level of Service (LOS) C.

U1.1.2 SPATIAL CONFIGURATION AND SEQUENCE

- Design internal and external spaces to minimize the potential for conflicting flows of movement between transit modes, access modes (walking, bicycle, taxi or private vehicle) and destinations, and also at entrance, decision and exit points.



Level of Service:
Relationships between pedestrian flow rate and effective walkway width.

Source: TRB Highway Capacity Manual

- Reinforce natural desire lines whenever possible to avoid circuitous routes that could tempt people to take unsafe shortcuts.
- Fare gates, ticket vending areas and machines and passenger information and waiting areas should be sized and located to minimize conflict with queuing areas and primary pedestrian and passenger priority zones.

LEVEL OF SERVICE:

Spatial capacity recommendations for pedestrian movement areas are based on Level of Service (LOS) criteria ranging from A (for good conditions) to F (for poor conditions).

Transit facility design should typically be based on LOS C, with recommended maximum capacities for differing facility spaces as set out below:

- two-way connecting areas such as corridors: 23-33 passengers per minute per metre width[1]
- one-way connecting areas: 50 passengers per minute per metre width[2]
- escalators: 100 people per minute per metre width[2]
- one-way staircase: 35 passengers per minute per metre width[2]
- two-way staircase: 28 passengers per minute per metre width[2]
- waiting areas: 0.7-0.9 square meters per person[1]

[1] Source: TRB Highway Capacity Manual

[2] Source: Transport for London Station Planning Standards and Guidelines (2007)

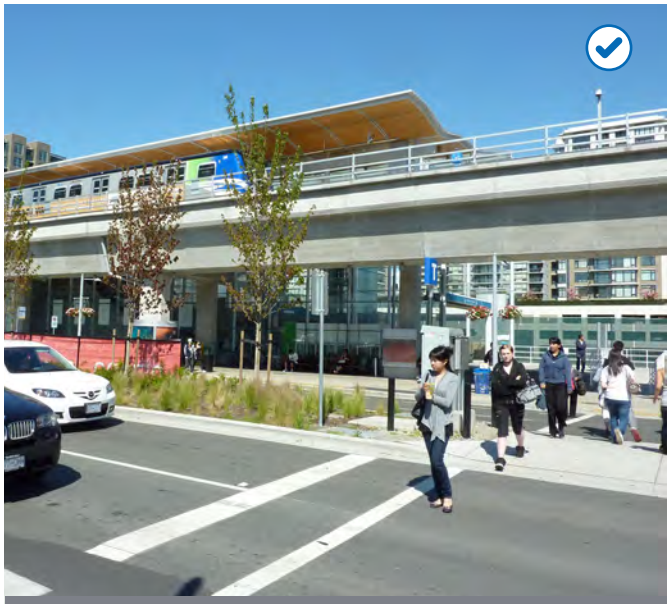
U1.1 Movement and capacity

PRIORITIZE IMPROVEMENTS TO:

- remove barriers to movement
- improve circulation and permeability
- meet predicted future passenger capacities
- meet predicted pedestrian desire lines
- minimize conflicting pedestrian flows
- provide clear sight lines to all destinations
- provide consistent, high-quality lighting and wayfinding
- remove blind corners and redundant infrastructure

U1.1.3 CONFLICTS OF MOVEMENT

- Use pedestrian modeling software, where appropriate, to test capacities and identify potential conflicts of movement at locations such as entrances, exits and points of vertical circulation.
- Give priority to bus and HandyDART stop locations at transit passenger facility entrances without putting pedestrians or bicyclists at risk through constrained pedestrian or bicycle movements, insufficient waiting space or restricted sightlines.
- Locate bicycle parking and taxi ranks adjacent to desire lines, and as close as possible to transit passenger facility entrances, but not in locations that obstruct pedestrian movements.
- Provide convenient and clearly marked paths between bicycle parking and bicycle access points at the perimeter of facilities.
- Keep movement, queuing and circulation areas clear of unnecessary obstructions, including temporary information materials that could be integrated as part of the built design.



Pedestrian crossing located on desire line from station entrance to retail mall. Richmond-Brighouse Station, Richmond.

Temporary information display obstructs passenger movements. Commercial-Broadway Station, Vancouver.

U1.2 Legible spaces

A legible space is one where navigation and movement are intuitive, allowing passengers to orient themselves and reach their destination without the need for excessive directional signage. Legible spaces help to make movement easy and to reduce anxiety caused by uncertainty in complex or unfamiliar environments.

U1.2.1 SIGHTLINES, VIEWS AND DISTANCES

- Orient primary facility entries and exits towards inter-modal connections and public spaces.
- Minimize visual obstructions to provide easy access and movement through the physical layout of transit facilities and their surrounding streets and paths.
- Optimize sightlines within facilities and visibility of their surrounding context, particularly at inter-modal connection areas, through architectural design and maximum use of transparent materials.
- Identify opportunities to integrate transit and general infrastructure to rationalize street furniture, thus aiding legibility and security, enhancing sense of place and minimizing clutter.

U1.2.2 FACILITY IDENTITY AND DESIGN COHERENCE

- Adopt a consistent and integrated palette of colours, materials and surface treatments to create coherence across the network and to foster a distinctive identity for the facility.
- Design building elements (e.g., overhangs, canopies, entries) and vegetation and landscape features (e.g., low walls, lighting, public art, planters, surface treatment, texture, color) to define a system of legible and memorable spaces in and around transit facilities.
- Clearly define edges and transitions in and around facilities through distinct materials, finishes and landscape elements.

Transparency and high quality lighting connects interior and exterior spaces. Aberdeen Station, Richmond.

REFERENCES

TRANSLINK REFERENCES

SkyTrain RTP 2000 Design Manual (2006): 3.4.4 (Spatial and Organizational Principles).

TransLink Infrastructure Design Guidelines (2002): 4.2 (Transit Exchange).

Universal Accessibility Guidelines for TransLink Fleet & Facilities (2007): 2.0 (Space Allowance, Reach Ranges, and Controls), 4.0 (Protruding Objects).

OTHER REFERENCES

Pedestrian and Planning Design: Revised Edition (1987), Fruin, J.

The Green Guide 5th Edition (2008), UK Government: (pedestrian modelling flow rates).

Highway Capacity Manual: Third Edition (2000), Transportation Research Board.

Station Planning Standards and Guidelines (2007), Transport for London.

U1.3 Wayfinding and passenger information

Wayfinding is more than just signing; it is a system of information elements that support movement at all stages of a trip. Effective wayfinding information will help passengers and pedestrians to have a positive, stress-free experience. Successful wayfinding strategies integrate and utilize signage, spatial planning, lighting, structural elements and surface finishes, alongside other building elements, to create a coherent whole; thus, communicating clear and consistent messages and directions across the transit network.

U1.3.1 WAYFINDING REQUIREMENTS

- Closely integrate wayfinding and passenger information needs with transit passenger facility design through the preparation of Facility Wayfinding Plans during the earliest stages of a project.
- Facility wayfinding plans must identify, at a minimum:
  - a Movement Strategy showing the progressive disclosure of information through various spatial zones within a transit passenger facility;
  - a Typology of Signage indicating the range of signs to be applied to meet the information needs of each facility (e.g., transit passenger facility signage, journey planning, bus stop signage);
  - a Location Plan showing the placement of sign types;
  - an Information Schedule identifying the specific sign types required at each location.

TRANSLINK WAYFINDING STANDARDS

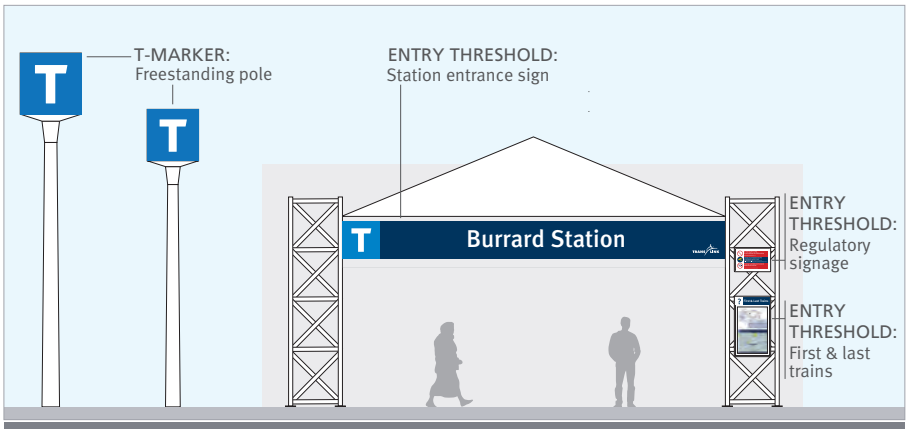
The TransLink Wayfinding Standards Manual (2010) provides principles, guidelines and standards for developing a legible, consistent and systematized approach to wayfinding and signage across the transit network, with an emphasis on rail rapid transit stations, bus exchanges and bus stops.

The Manual's 11 wayfinding principles provide the rationale for a systematized approach to planning and designing wayfinding information at transit passenger facilities. The principles focus on the following three objectives:

- encourage multi-modal journeys;
- provide consistent information;
- deliver usable, suitable and manageable information.

Wayfinding principles

1. provide seamless information
2. understand complex journeys
3. be predictable
4. name the places
5. utilize consistent codes
6. progressively disclose information
7. don't make the rider think
8. provide just the right amount of information
9. ensure information has integrity
10. help riders to learn
11. use an appropriate tone of voice



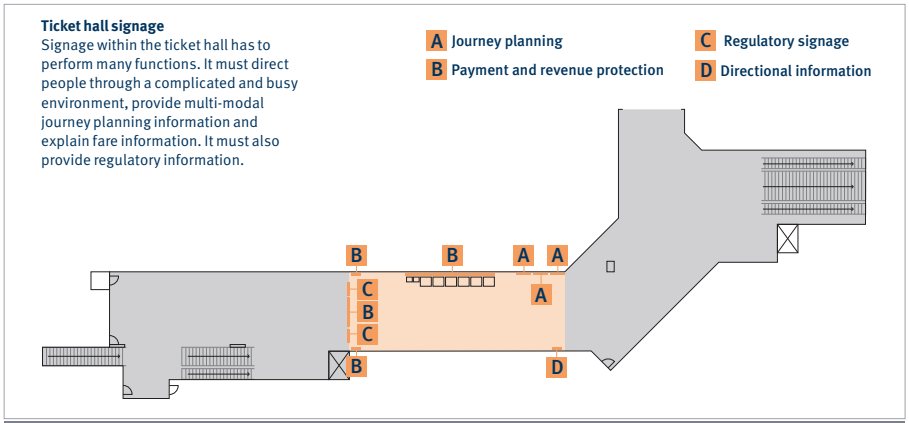
Sign Typology, Transit Facility - External.
Source: TransLink Transit Wayfinding Standards Manual V2.

U1.3 Wayfinding and passenger information

U1.3.2 WAYFINDING AND INFORMATION PLACEMENT

- Ensure that all passenger facility wayfinding adheres to the guidelines and standards set out in the TransLink Wayfinding Standards Manual (2010) in support of high-quality, consistent and efficient delivery of customer information across all transit modes.
- Integrate design and placement of wayfinding and customer information with lighting design and material selection.
- Integrate temporary customer information and bulletins as part of facility design.
- Incorporate passenger information and announcements within waiting areas. [See: U2.2 Accessible Information]
- Extend design and placement of facility wayfinding and customer information beyond the transit facility to direct passengers to and from surrounding streets, bicycle routes and nearby destinations.
- Support static wayfinding, where appropriate, with integrated, real-time passenger information.
- Avoid advertising media placement that conflicts with wayfinding and passenger information; where there are conflicts, wayfinding and passenger information should take precedence.
- Work with commercial tenants, either within or adjacent to transit facilities, to ensure that commercial signage does not compete in size, density or location with transit facility wayfinding and customer information, particularly at facility entrances and decision points.
- Position backlit information screens away from direct daylight and electric illumination and provide glare protection if direct light is unavoidable.
- Ensure CCTV cameras are not obscured by signing, advertising or passenger information. [See: U3.2.3 CCTV]

Information monolith with TransLink T-Marker, located outside Waterfront Station. Vancouver.



Transit facility ticket hall signage.
Source: TransLink Transit Wayfinding Standards Manual V2.

REFERENCES

TRANSLINK REFERENCES

Wayfinding Standards Manual (2010).

Design strategy U2: Make it universally accessible

Transit facilities must be designed to provide convenient connections and minimize inconvenience and discrimination for all users, including those with reduced mobility. Universal accessibility allows all people to take advantage of public transportation and saves costs associated with custom transit services such as HandyDART.

Users include the elderly and visual or mobility-impaired; people with learning difficulties and other disabilities, especially those in wheelchairs; people with strollers or young children; and people with heavy or bulky baggage, shopping trolleys or bicycles.

U2.1 Physical accessibility

Transit facilities that are free of physical barriers will increase access to transit for all users.

U2.1.1 BARRIER-FREE ACCESS

- Design facilities with the minimum number of levels possible and, where level change is unavoidable, provide elevators and escalators (up and down) in addition to steps.
- Provide step-free and obstacle-free access, with no level changes from access points to transit vehicles wherever possible, including connections to HandyDART, Taxi and Park & Ride points.
- Clearly distinguish and provide signs for stepped routes where they are unavoidable; step-free routes should be clearly visible from the main pedestrian flow.
- Provide dropped curbs and tactile surfacing at all street crossings, consistent with municipal street design standards.
- Provide HandyDART vehicle parking spaces at all stations, with mandatory loading space for a 9m x 3m vehicle, and sufficient space to deploy a 3m rear lift to an accessible sidewalk close to the station entrance.
- Provide disabled drop-off and parking at Park & Ride facilities within easy access of the station, with level or ramp access (under covered area if possible) located so that people with disabilities are not compelled to wheel or walk behind parked cars (other than their own).
- Provide platform boarding edges with a detectable warning surface along the full length of the public use area of the platform.
- Provide seating and, as appropriate, washrooms accessible to disabled users within and around transit passenger facilities.

U2.1.2 ACCESSIBLE BUS STOPS

- Design bus stops to be wheelchair accessible, as per TransLink's Universally Accessible Bus Stop Design Guidelines (2007).

Platform edge high-contrast, tactile warning strip. Canada Line, Vancouver.

Before and after. Making bus stops universally accessible improves waiting conditions for all users. Bridgeport Road, Richmond.

U2.1 Physical accessibility

VERTICAL CIRCULATION:

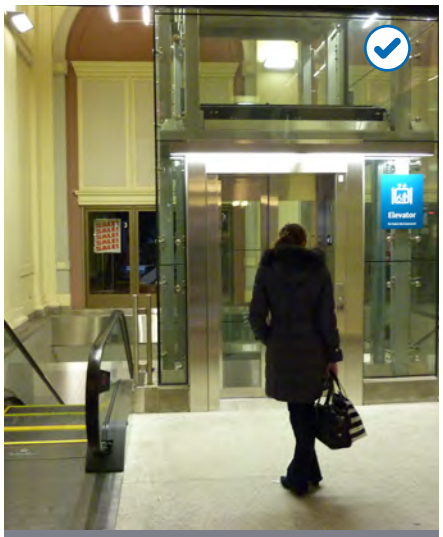
In the absence of network-wide standards, the following standards adapted from TransLink and London Underground design guidelines are recommended as a guide:

- Level changes should be resolved as follows:
  - less than 0.5 metres: ramp
  - 0.5 metres to 3 metres: elevator and staircase (minimum of three steps) unless patron volume warrants the use of escalators
  - 3 metres and over: escalator in both directions and elevator
- Where ramps are used for level changes greater than 0.5 metres, provide a secondary means of access.
- Headroom over escalators should be no less than 3 metres.
- Ensure that elevator operating switches or plates provide appropriate contrast, are operable with a closed fist and are easily reached by people walking or in wheelchairs; the switch must be located so that the person using it is not in the way of the opening door.
- Calculate escalator requirements on an assumed capacity of 100 passengers per minute.
- Provide at least 0.8 square metres per waiting passenger for entry and exit to elevators.

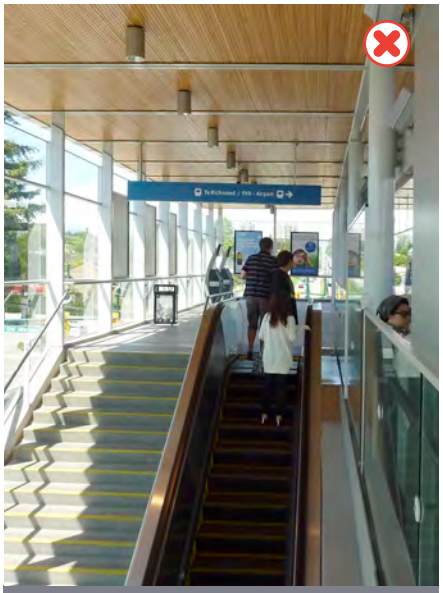
Source: TransLink Transit Infrastructure Design Guidelines and Transport for London Station Planning Standards and Guidelines April 2007

U2.1.3 VERTICAL CIRCULATION

- Elevators should be the main or secondary vertical circulation to achieve step-free access between street, ticket vending areas and platform.
- Optimize elevator and escalator locations to achieve direct routes over multiple levels and avoid the need for mezzanine connections where possible.
- Optimize elevator and escalator capacity and number based on facility use and function.
- Consider all users when determining the capacity and location of elevators, including those with mobility impairments, strollers, baggage and bicycles, and, where possible, provide large two-door elevators to accommodate wheelchair and bicycle movement.
- Make elevator and escalator locations clearly visible from platform/concourse areas and on or adjacent to main pedestrian flows, with clear directions for alternative routes in case of breakdowns.
- Consider the need for redundancy in the provision of elevators and escalators to accommodate service interruptions, commensurate with expected passenger volumes.
- Ensure that handrails contrast with their visual background.



Elevator located on pedestrian desire lines with positive use of transparency. Waterfront Station, Vancouver.



Single-direction escalators limit accessibility. Escalators should always be installed in two directions, combined with stairs and elevators. Marine Drive Station, Vancouver.

U2.2 Accessible information

To make transit information accessible to as wide a range of people as possible, its design must be easily accessible. Accessibility will benefit all users, including those with vision, language or cognitive difficulties.

- Provide real time passenger information in both audio and visual formats.
- Provide the same or equivalent information in a visual format where public address systems convey audible information.
- Provide at least one ticket vending machine (TVM) with audible information at appropriate reach ranges for people in wheelchairs.
- Design facilities with acoustic properties that ensure audio information is fully audible.
- Provide customer help telephones that are clearly signed and that can accommodate wheelchair users.
- Design information and signs with appropriate font sizes.
- Use colour tones that are as high contrast as possible and effective for users with colour vision deficiencies, such that they provide optimum levels of legibility and distinctiveness between different design elements.
- Signage design should include consideration of:
  - cultural differences
  - language differences
  - cognitive impairments
  - visual impairments
  - mobility impairments
- Ensure that information is accessible to those who have difficulties with language – either through learning difficulties or speaking English as a second language – with the appropriate use of consistent naming as well as symbols, pictograms, colour coding and other elements of intuitive design not based on textual language.
- Coordinate signs with lighting:
  - illumination on the face of front-lit signs should be five to ten times higher than the level of ambient illumination in the area and should be uniform across the entire face for better readability;
  - select low-glare materials and finishes and consider the angle of reflection among the location of the lights, the position of the sign and the position of the viewer, as some people with partial sight are particularly sensitive to glare.

Accessible passenger information helpline. Millennium Line, Burnaby.

REFERENCES

TransLink references

SkyTrain RTP 2000 Design Manual (2006): 3.6 (Accessibility Standards).

Universal Accessibility Guidelines for TransLink Fleet & Facilities (2007).

Universally Accessible Bus Stop Design Guidelines (2007).

Wayfinding Standards Manual (2010): 2.2 (Inclusivity Principles).

Other references

ADA Standards for Accessible Design (2010), US Government.

Design strategy U3: Make it safe and secure

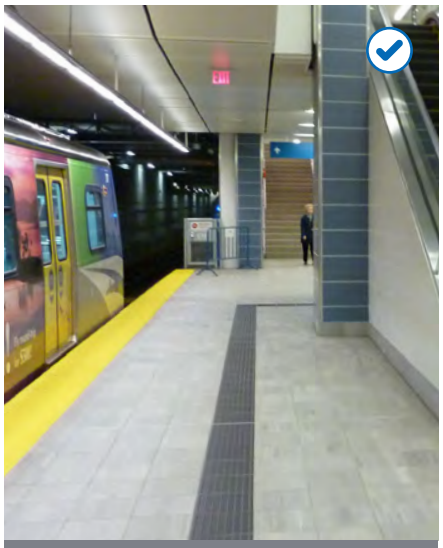
Safe and secure passenger transit facilities minimize the potential for accidents, conflicts and collisions as well as criminal harm through careful design, effective lighting and security measures such as CCTV.

U3.1 Safety

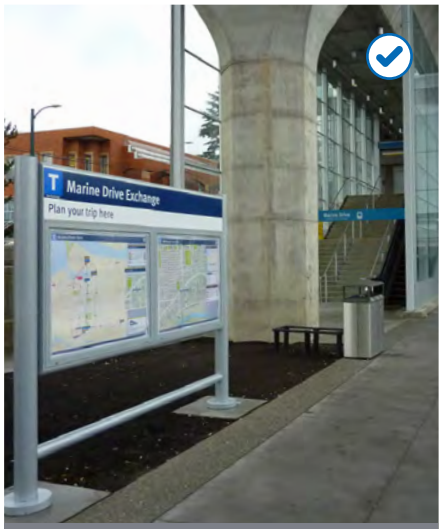
Transit facilities should be designed so that passengers, transit staff and others are able to use the facility safely and without fear of injury or accident.

SEE CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

- Minimize conflicting and crossing flows between pedestrians and transit vehicles, cyclists and cars.
- Rationalize and carefully locate all street furniture and other infrastructure – including temporary signs, public art, retail kiosks and newspaper vendors – to minimize obstruction and maximize the use of available space.
- Use anti-slip flooring appropriate to location and use and that meets all relevant local standards.
- Use high contrast finishes to minimize the possible risk of accidents and to identify potential hazards such as ramps, platform edges and change of grade at stairs and ramps.
- Design for low speed limits for vehicles in areas where conflict with pedestrians is highest.
- Design spaces to enable safe pedestrian movement without the need for barriers or fences.



Tactile path and high-contrast platform edge strip. Waterfront Station, Vancouver.



Passenger information and street furniture located parallel to passenger movements. Marine Drive Station, Vancouver.

SLIP RESISTANCE OF FLOOR AND TREAD FINISHES

MATERIAL	DRY AND UNPOLISHED	WET
Clay tiles	Good	Poor to fair
Clay tiles, textured finish or non-slip granules	Very good	Good
Concrete	Good	Poor to fair
Concrete, textured finish or non-slip aggregate	Very good	Good
Linoleum	Good	Poor to fair
Rubber, sheet or tiles	Very good	Good
Sheet vinyl	Good	Poor to fair
Sheet vinyl, non-slip granules	Very good	Good
Terrazzo	Good	Poor to fair
Vinyl asbestos tiles	Good	Poor to fair

NOTE: Slip resistance of very good and good is acceptable. Slip-resistance of fair and poor is not acceptable.

Source: TransLink, Universal Accessibility Guidelines for Fleet and Facilities

U3.2 Security

SEE CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

Unwelcoming pedestrian approach to Columbia Station, New Westminster.

Reinforced vehicle penetration barriers form an integrated feature in the streetscape. Arsenal Football Club, London, UK.

Transit passenger facilities that feel secure deter crime. Security can be achieved through incorporating active uses to generate natural surveillance, ensuring open sightlines, using vandal resistant materials and designing high quality lighting. Security also requires design to be resilient to possible risks and threats, both natural and human-made.

Transit passenger facilities should aim to optimize the balance between facilitating crime prevention through design and meeting the wider design principles set out in these Design Guidelines.

U3.2.1 RESILIENCE

Resilience requires that the planning, design and construction of transit passenger facilities anticipates all hazards and risks presented to occupants, structures and operations. Mitigation involves the balanced design of operational, technical and physical safety methods.

- Designs should consider a hazard assessment that covers the full range of threats (e.g., natural, terrorist, criminal, accidental) for a given facility and location.
- Designs should consider a vulnerability assessment and risk analysis to identify areas of needs, priorities and countermeasures that address high-risk threats.

U3.2.2 CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN

Crime Prevention Through Environmental Design (CPTED) encourages people in stops, stations or exchanges and surrounding areas to look out for each other. Isolation should be avoided by designing spaces that provide good natural surveillance combined with visible staff presence. If individuals perceive that they can be observed (even if they cannot) a crime is less likely to occur, given the increased potential for intervention, apprehension and prosecution.

The following CPTED principles should be applied to reduce fear and incidence of crime and to maintain quality of life:

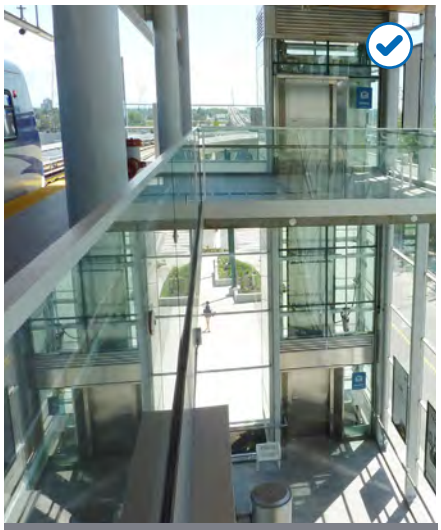
- Involve crime prevention professionals to determine required measures for crime prevention.
- Involve local communities in identifying security threats and helping to achieve safe routes for people walking or cycling in areas surrounding transit passenger facilities.
- Maximize visibility and views to and from transit passenger facilities and their surrounding streets and neighborhoods. [See: U1.2 Legible Spaces]
- Design high-quality streetscapes adjacent to facilities with wide sidewalks that encourage active use.
- Orient doors and windows of surrounding buildings towards transit facilities to encourage natural surveillance.

- Avoid locating transit facilities to the rear of surrounding developments.
- Use transparency positively and avoid designing blind corners, recesses and other places where people could hide.
- Locate staff facilities and ticket machines in areas where the greatest portions of the transit passenger facility (or those areas most prone to crime) are directly visible.
- Design elevator lobbies, passenger waiting areas and locations where information is provided to enable natural surveillance by passengers and others working within the facility.
- Clearly identify Designated Waiting Areas, help points and emergency refuge areas.
- Provide uniform lighting that eliminates dark areas and keeps entrances well lit at all times.
- Design for all hours of facility operation.
- Vary staff duty locations throughout the day to offer the greatest coverage.
- Add vitality at different times of the day and night by bounding movement and decision spaces with active spaces or frontages.
- Design for potential condensed night-time operations to enhance passenger security.
- Use visible crime prevention elements, such as posting information concerning security cameras and providing ample and accessible telephones.

U3.2.3 CLOSED CIRCUIT TELEVISION

Closed Circuit Television (CCTV) monitoring provides numerous benefits, including the recording of criminal activity and crowd management in transit passenger facilities. Used overtly, it can also act as a deterrent to crime and reduce fear of crime in transit facilities, on the street and in transit vehicles.

- Place cameras to allow clear, uninterrupted views of all public areas that are both internal and external to the transit passenger facility. Placement should include platforms, concourse areas and ticket vending areas, as well as entrances and waiting areas.
- Incorporate CCTV cameras in the design, both noticeably to give the user a feeling of safety and discreetly to avoid obstructing sightlines to passenger information and signing.
- Prevent obstruction of, and reflection on, CCTV cameras and screens through considered placement of lighting and signage. [See: U3.3 High Quality Lighting]
- Design CCTV installations as part of a package of security measures, along with other measures described in these Design Guidelines.



Open transparent design provides good natural surveillance. Marine Drive Station, Vancouver.

REFERENCES

TransLink references

SkyTrain RTP 2000 Design Manual (2006): 3.4.5 (CPTED), 3.8.5 (Reflectance, Contrast and Glare), 3.8.13 (Floor and Walkway Finishes), 3.15 (Station Control and Security).

Transit Infrastructure Design Guidelines (2002): 3.0 (Bus Stop Location and Design).

Universal Accessibility Guidelines for TransLink Fleet & Facilities (2007): Facilities-4.0 (Protruding Objects).

Other references

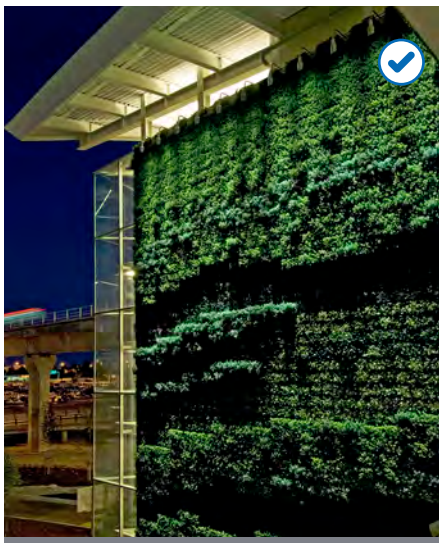
Creating Safer Communities (1998), RCMP.

Design Guidelines (2010), Design Centre for CPTED Vancouver.

Draft Transit Sustainability Guidelines (2010), APTA: 2.D.1 (Enhance Safety and Security).

U3.3 High-quality lighting

SEE CASE STUDY:
4.1.1 CANADA LINE LIGHTING STRATEGY



Feature lighting. Vancouver International Airport, Richmond.

Positive transition from daylight to electric light. King Edward Station, Vancouver.

Lighting quality plays a central role in creating safe and pleasant environments for customers, staff and other facility users. Lighting that is appropriate to location and function will result in increased safety, legibility, accessibility, security, ambience and, therefore, public satisfaction. Carefully planned lighting will improve wayfinding and make orientation intuitive; thus, ensuring that transit passenger facilities and their immediate context will be easy to use and navigate.

The following guidelines support the design intent and performance goals of the Illuminating Engineering Society of North America (IESNA) Lighting Standards, which should be used as a design guide for all lighting of transit passenger facilities.

U3.3.1 LIGHTING

- Use IESNA visual task categories to establish luminance requirements.
- Ensure that mandatory emergency lighting is compliant with the requirements of the Electrical and Building Codes and IESNA recommended practices.
- Define a task-based lighting strategy for functional areas to deliver light where and when it is needed without overlighting; include horizontal and vertical illumination to provide consistent light levels for visual comfort, understanding and safety needs.
- Coordinate luminaire types and locations with CCTV, TVMs, signage, public address and passenger information systems and other such facilities to ensure provision of effective illumination without obscuring CCTV cameras and signs.
- Maintain lighting consistency throughout by lighting all surfaces to improve visibility, visual comfort and adaptation and to prevent dark corners and potential vandalism. [See: U2.1 Physical Accessibility]
- To reduce energy consumption and operating costs, consider using occupancy sensors, automated time devices and photocells where appropriate to manage light levels when spaces are unoccupied or when there is sufficient daylight.
- Include feature lighting where appropriate to enhance sense of place – and the experience of space and art – and to add enjoyment to the experience of using public transit.
- Ensure that luminaire mounting heights are appropriate to location and function and with intensity appropriate to mounting height to avoid glare.
- Avoid the use of luminaires with complicated repair, removal and disposal requirements.

U3.3 High-quality lighting

U3.3.2 LIGHTING AT TRANSIT FACILITIES

- Develop daylighting strategies at planning and concept design stages for:
  - orientating and massing of the building,
  - locating windows and architectural glare control devices,
  - maximizing energy savings through the use of controlled daylight and electric lighting integration.
- Design transition zones to facilitate adaptation between natural and electric lighting and between other areas with significantly different light levels.
- Use high light-reflectance materials in matte finishes to improve brightness and diffusion, and minimize light absorption to reduce quantity of lighting required and overall energy consumption.

U3.3.3 LIGHTING THE PUBLIC REALM

- Design exterior lighting according to a facility's local context, with light levels appropriate to the facility's lighting zone, including reasonable use of outdoor lighting for nighttime safety, security, productivity, enjoyment and commerce.
- Comply with maximum allowable Backlight, Uplight and Glare (BUG) ratings.
- Integrate transit facility and third-party lighting for bus exchanges, loops and surrounding areas to support efficient operations and legibility and to create a unified design.
- Establish a lighting curfew (typically one hour after the close of business) and reduce non-essential exterior lighting by a minimum of 30% to reduce environmental impact, save energy, improve visibility for drive-by police patrols and improve sleeping conditions for neighboring residents.

Poor integration with third-party lighting resulting in glare and dark areas. Edmonds Station Bus Exchange, Burnaby.

INTEGRATION WITH THIRD PARTY LIGHTING SYSTEMS

Lighting requirements vary according to context (e.g., ranging from protected wildlife corridors to high-intensity business and industrial districts). A coordinated lighting strategy should be developed between municipal, TransLink-owned and, where possible, third party-owned lighting systems, with the common goals of:

- increasing visibility, safety and sense of security
- minimizing light pollution
- identifying hazards
- avoiding energy waste
- minimizing visual clutter
- creating a positive aesthetic experience

REFERENCES

TRANSLINK REFERENCES

Transit Infrastructure Design Guidelines (2002): 3.6 (Bus Stop Lighting Levels).

Universally Accessible Bus Stop Design Guidelines (2007): 7.0 (Illumination).

OTHER REFERENCES

ASH-118-09: Energy Efficiency Guide for Existing Commercial Buildings (2009), ASHRAE.

Lighting Handbook: Reference and Application (Current Edition), Illuminating Engineering Society of North America. (2010)

Standard 189.1: Standard for the Design of High-Performance Green Buildings (2009), ANSI/ ASHRAE/USGBC/IES.

Design strategy U4: Make it comfortable

Attending to the physical comfort of passengers means protecting them from the elements, providing places to rest and minimizing such unpleasant sensory experiences as noise or smells. Comfortable transit facilities will attract new users and will be valued by those who use them on a regular basis.

U4.1 Protection from the elements

Passengers should feel comfortable in waiting environments, in or out of doors. All-weather protection should be combined with appropriate lighting, heating and ventilation.

- Design transit facilities to ensure that passengers are protected from the full range of weather conditions (e.g., wind, rain, snow, sun and extreme heat and cold).
- Provide continuous coverage for passengers connecting between different modes or services.
- Design indoor and outdoor spaces to maximize the thermal comfort of passengers and pedestrians through the use of canopies, overhangs, awnings and landscapes.
- Site and size canopies and shelters to accommodate projected volumes of waiting passengers without impeding pedestrian movement.
- Integrate shelters, canopies and awnings architecturally, where possible, into the design of transit passenger facilities and/or adjacent buildings.
- Use passive cooling and heating design strategies in transit passenger facility architecture to maximize the comfort of waiting passengers.
- Apply noise reduction techniques to minimize ambient noise and to provide for comfortable conversation and audible passenger announcements.

Bus shelters sized to accommodate large passenger volumes. SFU, Burnaby.

Covered walkway between transit facility and retail development. Brentwood Station, Burnaby.

U4.2 Amenities

Mix of amenities including, ATM and retail kiosks. Commercial-Broadway Station, Vancouver.

Amenities are features that enhance passenger comfort, convenience and pleasure and that help to instill passenger confidence. Provision of amenities within and around transit will offer practical advantages for transit passengers and surrounding communities – encouraging activity resulting in informal surveillance and contributing to a sense of personal security that is vital to promoting ridership and social activity around transit.

- Consider the inclusion of amenities at project planning and concept design stages. [See: Amenities list on facing page and P1.2.3 Public Art]
- In light of TransLink's stated vision, goals and objectives, consider public art opportunities at the outset of a project and provide long-term maintenance of artworks.
- Design amenities to be fully integrated with transit facilities and with surrounding developments and buildings and to be adaptable, comfortable, universally accessible, safe and easy to use, preferably during all hours of transit operations. [See: P1.2 Vibrant People Places]
- Design amenities, activities and spaces to be viable, sustainable, coordinated and shared as appropriate between the transit facility and the surrounding community.
- Provide for a mix of ancillary activities that will animate spaces throughout the day and evening, both inside and outside of the facility.
- Provide waiting facilities appropriate to transit passenger facility capacity and use and that incorporate seating, weather protection and passenger information. [See: U1.3 Wayfinding and Passenger Information]
- Provide seating areas located outside of the primary flow of pedestrian circulation and located to disperse passenger loads.
- Consider the provision of washrooms appropriate to facility scale, function and context.
- Integrate leaning rails into facility design where space is constrained.
- Consolidate newspaper boxes and locate them adjacent to facility entrances to avoid obstructing pedestrian movements.

REFERENCES

TransLink references

SkyTrain RTP 2000 Design Manual (2006): 3.4.2.1 (Environmental Functionality), 3.7.3 (Hard Landscaping Components - Station Specific), 3.8.16 (Canopies), 3.13 (Acoustics and Noise Control).

Transit Infrastructure Design Guidelines (2002): 3.5 (Bus Stop Passenger Amenities), 6.0 (Shelters).

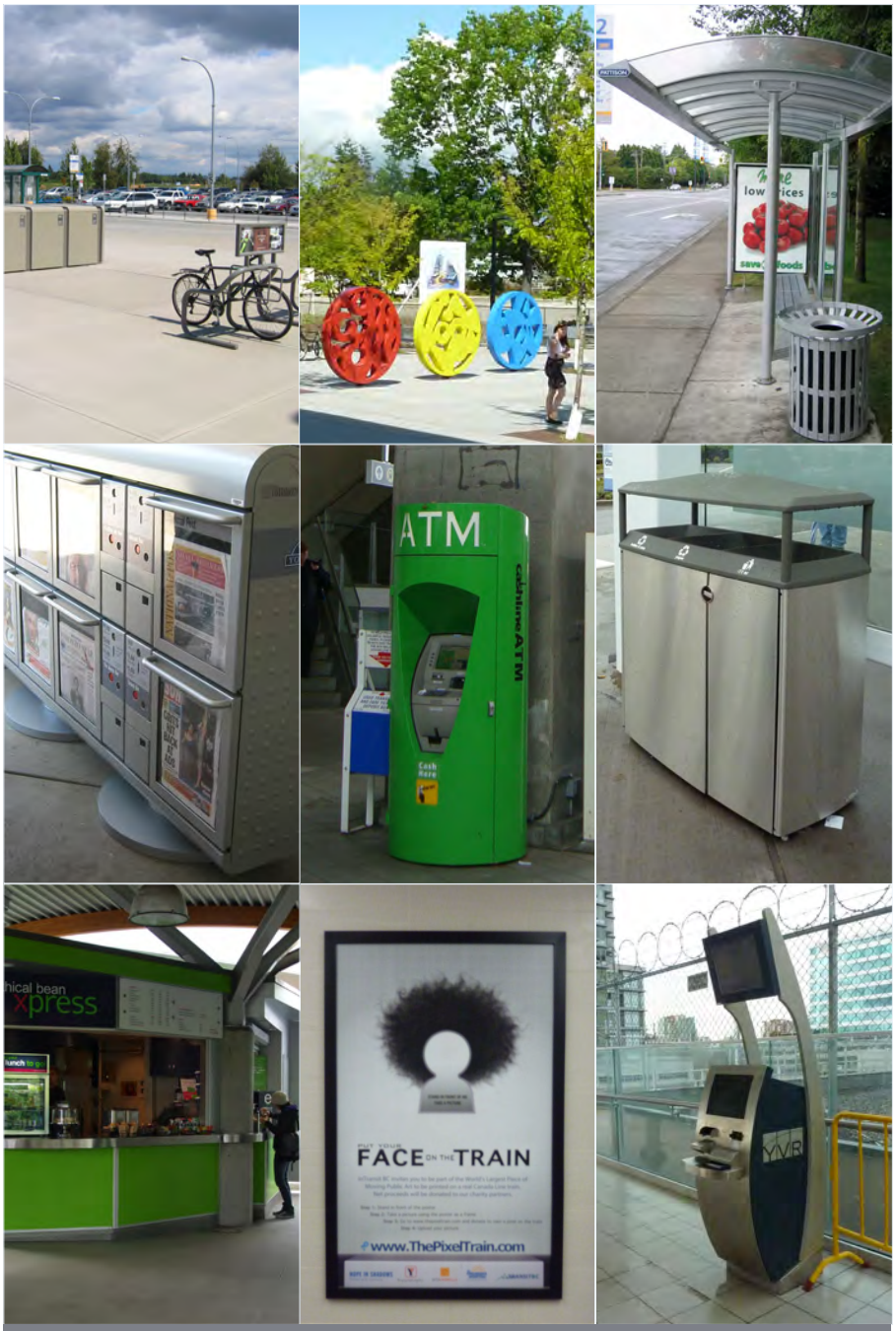
Universal Accessibility Guidelines for TransLink Fleet & Facilities (2007): Facilities-6.0 (Passenger Loading Zones).

Universally Accessible Bus Stop Design Guidelines (2007): 3.0 (Stop Configuration), 5.0 (Seating).

Other references

Draft Transit Sustainability Guidelines (2010), APTA: 2.D.3 (Provide comfortable experience).

U4.2 Amenities



Passenger amenities, left to right from top: bicycle racks and lockers at a Park & Ride facility, permanent public art, sheltered waiting area with seating and waste bin, consolidated newspaper boxes, ATM, recycling bins, retail kiosk, temporary public art, station airport check-in machines.

AMENITIES

Features considered to be amenities can change over time as a result of raised passenger expectations and new legislation.

Consideration should be given to the inclusion of amenities as practical, effective features that enhance the experience of transit passengers and that translate into increasing ridership.

Examples of amenities include:

- washrooms and baby-changing facilities
- public art
- retail, food and leisure amenities
- clocks
- telephones
- waste and recycling bins
- cash machines
- landscaping

Consider the provision of amenities at all bus stops, including:

- shelters and weather protection with integrated lighting
- public art
- telephones
- waste and recycling bins
- clocks


O2.1.2 Inter-modal connections, bicycles
O1.1 Transit vehicle needs
O1.2 Staff facilities
O2.1.1 Integration requirements
London Buses

OPERATIONS:
Optimize transit efficiency

Transit facilities that are efficient for transit operations also benefit passengers through more reliable journey times and more frequent services made possible by operational cost-savings. Optimizing transit efficiency means providing easy access for transit vehicles, seamless integration with other modes and effective maintenance.

Guidelines for **Operations** are organized under three broad design strategies:

» **O1** Facilitate transit operations
» **O2** Support transit by integrating with other modes
» **O3** Facilitate effective management and maintenance

Good spatial organization supports comfortable, convenient and safe transit, pedestrian and cyclist movements. Dedicated staff facilities are integrated within the facility.

Stratford Interchange, London, UK

Design strategy O1: Facilitate transit operations

The design of transit passenger facilities must provide for the needs of all those who may use the facility –including passengers, transit vehicles, transit staff, service vehicles and maintenance crews – and must ensure efficient operations now and into the future that make the best use of available resources and serve customers well.

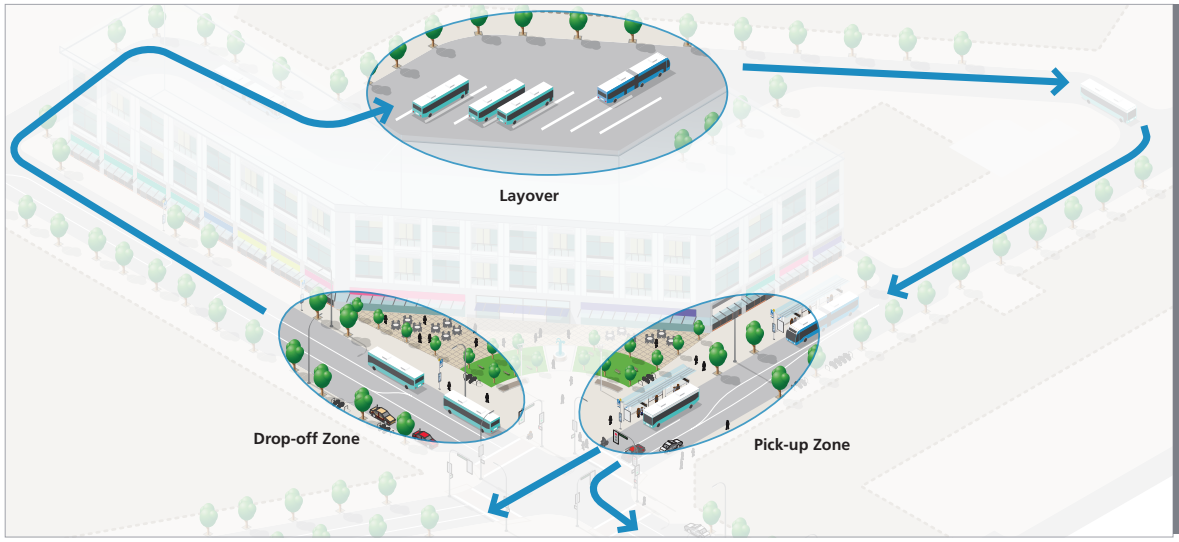
O1.1 Transit vehicle needs

Transit vehicles include transit passenger vehicles (e.g., buses, HandyDART, trains) and transit service vehicles, such as those used for facility maintenance and service, and those used for transit supervisors, security staff, and police. Facility design should consider general spatial requirements for these vehicle types and ways to promote their efficient operations.

- Provide appropriate space for transit vehicles and passengers according to the expected lifespan of the facility, considering potential changes to vehicle technologies and dimensions.
- Establish vehicle dimensions and manoeuvring space requirements from TransLink's Transit Infrastructure Design Guidelines. [See: TIDG 1.3–1.5]
- Plan transit vehicle paths to minimize potential conflict with other road users and pedestrians. [See: TIDG 4.2.2]
- Plan transit facility spatial configuration to avoid conflict with efficient transit operations.
- Design arrival, drop-off, layover and pick-up locations for all transit services to ensure that paths within the facility minimize travel distances and avoid conflicts.
- Consider locating bus layover areas away from passenger pick-up and drop-off areas to minimize visual and noise impacts on passenger environments, while minimizing distances that add travel time and operating costs.

CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

Poor use of barriers creates conflict and encourages use of more direct routes that may cause conflict. Metrotown Bus Exchange, Burnaby.



Arrival, drop-off and layover areas planned to minimize travel distances and avoid conflicts. Proposed Newton Bus Exchange Concept Design, Surrey.

O1.1 Transit vehicle needs

SEE CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

Bus bulges help buses operate more efficiently by avoiding the need to wait for a gap in traffic before leaving a stop.

- Design layover areas to be safe and secure. [See: U3 Safety and Security]
- Design functional relationships within facilities in accordance with TransLink's Transit Infrastructure Design Guidelines. [See: TIDG 4.2]
- Provide adequate parking space for a minimum of two transit service vehicles as close as practical to a transit station or exchange.
- Consider parking provision as part of a multi-purpose or shared space, without compromising service vehicle access needs.
- Minimize the potential for conflicting pedestrian and vehicular movements and avoid the use of fences or barriers:
  - ensure pedestrian crossings are provided along desire lines,
- Locate crossings with good sight lines behind, rather than in front of, bus layover locations, in accordance with TransLink's Transit Infrastructure Design Guidelines: [See: TIDG 2.5-2.6]
  - locate transit passenger facility entries so that connections do not require crossing of a major arterial roadway.

Layover and pick-up spaces organized to minimize conflict.
Bridgeport Station and Bus Exchange, Richmond.

REFERENCES

TransLink references

SkyTrain RTP 2000 Design Manual (2006): 3.12.2 (Ancillary Rooms), 3.12.5 (Staff & Maintenance Services).

Transit Infrastructure Design Guidelines (2002): 1-3-1.5 (Bus Operation Specifications), 2.5-2.6 (Sight Distances & Sight Lines), 4.2 (Transit Exchange), 4.4 (Passenger Pick-up and Drop-off Facilities).

O1.2 Staff facilities

Staff facilities (including lockers, wash and mess rooms and changing rooms appropriate to the transit facility type) will enable staff to work comfortably and efficiently, optimizing day-to-day operations.

- Provide dedicated staff facilities and amenities appropriate to transit facility type. [See: RTP 2000 3.12.5]
- Coordinate and integrate provision of staff facilities with facility architecture to minimize stand-alone buildings which are incompatible or that use site space inefficiently.
- Provide basic staff facilities (washrooms and crew rooms) as close as possible to transit layover locations, preferably as dedicated facilities or part of an existing commercial development.
- Provide adequate ventilation and lighting for staff working in enclosed spaces, and ensure that temperature and noise levels fall within safe and comfortable limits. [See: RTP 2000 3.13 Acoustics and Noise]
- Provide space for transit operations supervisor vehicles at transit stations and exchanges.
- Ensure that operating hours of basic staff facilities accommodate the first and last transit service each day.

This security building is poorly integrated into the passenger facility behind it and blocks sightlines that would otherwise offer better natural surveillance from the surrounding area.

Dedicated staff facilities building integrated within Marine Drive bus exchange, Vancouver.

Design strategy O2:
Support transit by integrating with other modes

Modal integration makes transit efficient and convenient and builds transit mode share. Consideration should be given to the modal balance required when prioritizing the integration of transit with other modes.

O2.1 Inter-modal connections

SEE CASE STUDY
4.1.6 FLINTHOLM STATION BICYCLE INTEGRATION

Efficient connection between transport modes and services is a core function of TransLink's passenger facilities. Effective design will minimize wait times and ensure that connections are as easy and as logical as possible.

O2.1.1 INTEGRATION REQUIREMENTS

- Review relevant regional and local land use and development plans and policies to establish transit integration and priorities by location.
- Balance vehicular traffic flows between transit and other modes to provide optimum priority for transit services at and around transit passenger facilities and include a traffic management plan with transit priority measures.
- Use passenger forecasts (and pedestrian data outside of fare-paid zones) to:
  - identify and quantify connection demand between transit and non-transit modes,
  - plan spatial requirements for transit vehicles and passengers, and
- identify opportunities for Park & Ride. [See: TransLink TIDG 4.3]

Elevated walkway at Commercial-Broadway Station helps to reduce at-grade inter-modal transfer movements. Vancouver, BC.

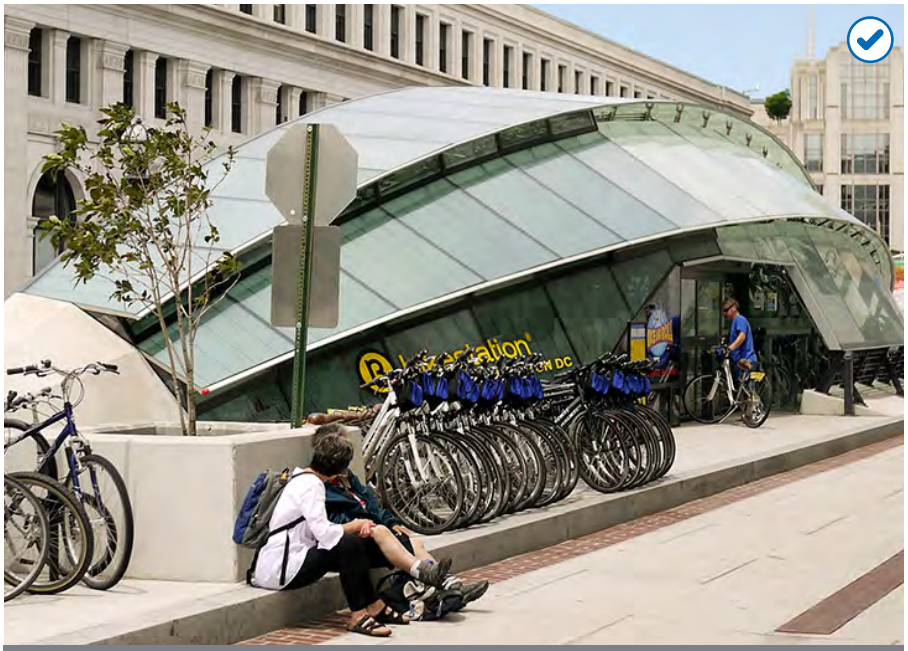
Bus priority lane, outside Broadway-City Hall Station. Vancouver.

O2.1 Inter-modal connections

Taxi and private car drop off adjacent to Joyce-Collingwood Station. Vancouver.

O2.1.2 PEDESTRIANS

- Provide convenient, multiple and direct pedestrian access points to the transit facility for all origins and destinations, leading to a single gate array where practical.
- Safely accommodate existing and potential passenger and pedestrian routings.
- Design fare-paid areas, particularly at connections and exchanges, to facilitate user understanding and seamless movement.
- Site bus stops to minimize walking distances between connections.
- Group bus routes with similar destinations at single or adjacent stops.



Washington Bikestation provides secure parking, showers, lockers and bicycle rental and integration with public transit. Union Station, Washington, DC.

O2.1.3 BICYCLES

- Establish bicycle access and parking requirements based on passenger demand, transit passenger facility usage and local context.
- Provide safe and convenient bicycle access, egress and parking appropriate to the facility type and in well-lit areas close to transit access routes, while minimizing conflict with other modes:
  - provide long-term bicycle parking, such as a bicycle station, lockers or cages;
  - provide short-term bicycle parking, such as bicycle racks, preferably sheltered and close to the transit passenger facility;
  - design bicycle access routes to be separate from motor vehicle traffic, comfortable for all users, with even, well-drained surfaces.
- Locate bicycle parking as close as possible to transit passenger facility entrances/ exits, in areas with good natural surveillance from other transit passenger facility users and passers-by and readily accessible from every entrance (at transit passenger facilities with more than one entrance) without obstructing pedestrian movement.

O2.1 Inter-modal connections

- Provide clear and consistent signage for bicycle parking facilities that is visible from all approaches.
- Design bicycle parking facilities to be compatible with transit facility street furniture, allowing adequate space for both users and maintenance activities.
- Consider using CCTV to improve security for bicycle parking and access routes. [See: U3.2.3 CCTV]

O2.1.4 TAXI AND KISS & RIDE

- Identify and quantify separate passenger pick-up and drop-off for taxis and private vehicles appropriate to the facility type, with drop off locations placed as closely as possible to facility entrances to deter use of bus stops and avoid conflict. [See: TIDG 4.4]

O2.1.5 PARK & RIDE

- Provide continuous, direct and safe pedestrian access between parking and the transit facility.
- Consider the provision of priority parking spaces for car share and car pool vehicles.

SEE CASE STUDY
4.1.6 FLINTHOLM STATION BICYCLE INTEGRATION

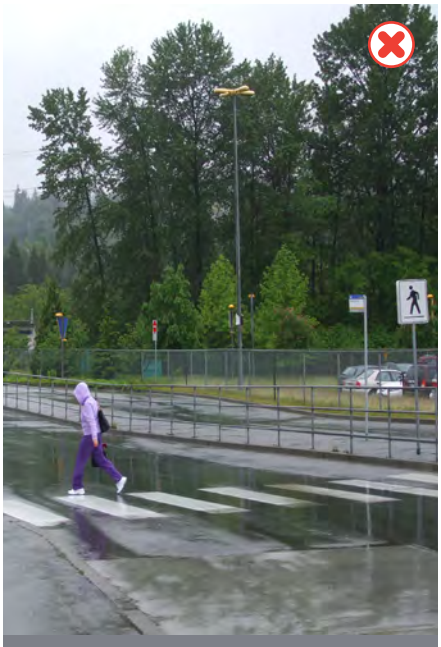
REFERENCES

TRANSLINK REFERENCES

SkyTrain RTP 2000 Design Manual (2006): 3.7.2.5 (Bike Racks), 3.7.3.10 (Bike Storage Facilities).

Transit Infrastructure Design Guidelines (2002): 3.0 (Bus Stop Location and Design), 3.3 (Bus Stop Placement), 4.2 (Transit Exchange), 4.4 (Passenger Pick-up and Drop-off Facilities).

Passengers queuing into Commercial-Broadway station entrance area from the 99-B line bus stop in the morning peak, creating an obstruction to cross-movements for pedestrians on the sidewalk. Vancouver, BC.



No weather protection between the car park and station. Coquitlam Park & Ride and bus exchange. Coquitlam, BC.

Design strategy O3: Facilitate effective management and maintenance

Clear and effective management and maintenance plans will ensure the safety and efficiency of transit facility operations and the durability of built structures and materials. They will also help to manage whole life costs and make the facility safe and appealing to users.

O3.1 Management and maintenance arrangements

Effective management and efficient maintenance coordinated across agencies will enhance the passenger experience and extend the life of the facility.

SEE CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

O3.1.1 MANAGEMENT AND MAINTENANCE PLANS

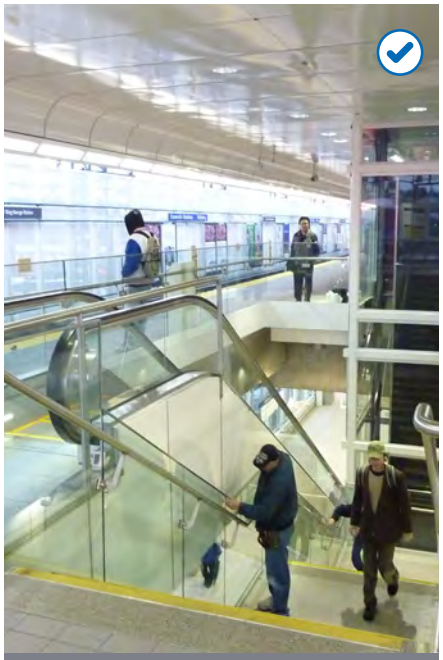
- Explicitly define the rights and responsibilities of all stakeholders with regard to management, maintenance, and emergency procedures as well as Operations, Maintenance and Renewals (OMR) and future capital improvement projects.
- Take account of operating hours, including peak and off-peak periods, in management and maintenance plans to minimize disruptions to passengers or transit services.
- Ensure that emergency repair plans are in place for transit facilities that have elements operated by other agencies (e.g., escalators) to keep them operational in a timely manner.
- Avoid conflicts among transit, emergency services vehicles and staff and passenger emergency escape routes.
- Ensure that customer emergency help and information points are available within both hfare-paid and non-fare-paid zones.

O3.1.2 VANDAL RESISTANCE

- Design and construct fixtures and fittings to deter vandalism by using tamper-proof materials that minimize maintenance and repair, including graffiti-resistant materials or finishes that are easy to clean.
- Deter vandalism by locating TVMs and other passenger facilities in areas of good natural surveillance.
- Design elevators with transparent walls and locate elevator entrances in positions of good natural surveillance.
- Specify luminaires to be vandal-resistant by type, location and construction, with recessed and lensed luminaires preferred where practical. [See: U3.3 High Quality Lighting]
- Use materials that balance durability and aesthetic qualities.

O3.1.3 EFFICIENT MAINTENANCE

- Ensure that facility design allows for effective maintenance, helping to promote cleanliness and comfort.
- Identify and quantify access requirements for operational maintenance and servicing vehicles, including hours of operation.
- Provide access and timing for operational maintenance and servicing vehicles that avoids conflict with transit operations and passenger movements.
- Provide operational zones as required, such as storage and maintenance facilities.



Regular in-station maintenance. SkyTrain, Vancouver.

REFERENCES

TransLink references
CMBC Properties Jurisdiction and Responsibilities Guide


P1.2.2 Distinctive architecture
P2.1 Integration with context
P1.2.1 Public spaces

PLACEMAKING: Create great places

Public transit is a vital civic resource and forms a focal point for community activity. When designed well, transit facilities of all sizes can help create 'great places' that feature a strong sense of place and identity; they provide attractive public spaces where people feel comfortable spending time and promote a positive mix of activity by a wide variety of people. The public realm along transit routes can also be designed and integrated to form great linear urban corridors between facilities.

Creating great places with transit requires close coordination between TransLink, local jurisdictions, property owners, and residents to weave the various transportation, urban development and place-making elements into a coherent whole.

Guidelines for **Placemaking** are organized under two broad design strategies:

» **P1** Make transit a community asset

» **P2** Seamlessly integrate transit, urban development and the public realm

This document focuses on transit passenger facilities and their immediate context (roughly within a one-block radius).

Design guidance for the wider neighbourhoods around frequent transit stops, stations and exchanges will be included in a future companion document to be organized according to the "Six D's" of successful Transit-Oriented Communities:

» **Destination:** Align major destinations along a reasonably direct corridor so they can be efficiently served by frequent transit.

» **Distance:** Provide an interconnected system of pedestrian routes so that people can walk to the transit service quickly and conveniently from the places where they live, work, shop and play.

» **Design:** Design high-quality, pedestrian-friendly spaces that invite walking and cycling.

» **Density:** Concentrate higher densities as close as possible to frequent transit stops, stations and exchanges to minimize walking distances to more destinations for more people.

» **Diversity:** Provide a rich mix of pedestrian-friendly uses to facilitate more street-level activity throughout the day and night and to increase affordability and enliven the public realm.

» **Demand Management:** Discourage unnecessary driving while providing attractive transportation alternatives.

The distinctive Beatrixlaan Viaduct is 400 metres long and constructed from mild steel rings interconnected by diagonally set tubes. Spans of 40 to 50 metres require few supporting columns at street level, providing for comfortable pedestrian movement, good natural surveillance and an active public space.

Beatrixlaan Light Rail Viaduct, The Hague, Netherlands

Design strategy P1: Make transit a community asset

In order to make transit a community asset, instead of a community nuisance, the design of both transit passenger facilities and non-passenger transit infrastructure (e.g., tracks, guideways, trolley overhead) should seize opportunities to create vibrant people places featuring high quality urban design, distinctive architecture, and public art.

When new transit infrastructure or renovations are designed, full advantage should be taken of the opportunities provided to focus passenger and general public activities to develop a sense of place, recognizing that responsibility for achieving this focus is shared among TransLink, the municipality and property owners.

P1.1 Community and stakeholder requirements

The planning and design of transit facilities requires consideration of issues beyond the transit facility itself, including its location in the region and community and its role in the wider transit network. For transit to be a community asset, it should be planned and designed to reflect community needs in ways that maximize its use and value.

SEE CASE STUDIES:
4.1.4 LA METRO PUBLIC ART PROGRAM
4.1.5 LIGHT RAIL AND PUBLIC REALM INTEGRATION

- Engage with local communities and stakeholders at the beginning of a project to align goals, interests and opportunities.
- Establish the requirements for transit facilities and associated urban development to be in social, physical and functional accord with their local community context, while also meeting needs of the transit system as a whole.
- Plan transit and its surrounding public spaces in collaboration with local stakeholders to provide amenities and activities appropriate to a particular facility's context and role in the transit network. [See: U4.2 Amenities]
- Identify opportunities for collaborative arrangements with local schools, institutions, arts organizations and other non-governmental groups, as well as commercial sponsors, to create and maintain public art.
- Identify opportunities to create partnerships with community organizations to sponsor and maintain shared amenities and spaces.
- Synthesize needs, perceptions and spatial requirements to develop facilities, related activities and spaces that can attract and accommodate predicted passenger and pedestrian flows.

Community engagement at the beginning of a project.

Multi-disciplinary stakeholder site visit.

P1.2 Vibrant people places

SEE CASE STUDY:
4.1.5 LIGHT RAIL AND PUBLIC REALM INTEGRATION

Frame public spaces and pedestrian access routes adjacent to transit facilities with active uses and frontages. Vancouver, BC.

A community garden demonstrates positive use of residual land under elevated trackway. Joyce-Collingwood Station, Vancouver, BC

Incorporating transit passenger facilities and infrastructure into their local context in a way that respects and enhances the existing character of the neighbourhood – with open spaces and landscaping integrated as part of transit passenger facility and route design in larger developments – will help to create attractive environments with clear identities and structures.

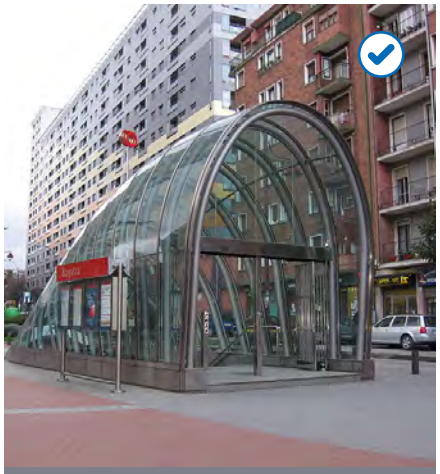
P1.2.1 PUBLIC SPACES

- Locate important public spaces along key pedestrian, bicycle and transit routes.
- Design public spaces surrounding transit to complement the cultural preferences of the local population.
- Incorporate the heritage and cultural diversity of locations in facility design, including public art, linking the transit network to its communities to create a positive identity for transit and foster community pride.
- Provide for an integrated mix of ancillary activities to meet the needs of a broad range of passengers and local communities – such as farmers' markets, musical performances and temporary art installations – to animate public spaces throughout the day and evening, both inside and outside of transit facilities.
- Design amenities to be fully integrated with transit facilities, surrounding developments and buildings and to be adaptable, comfortable, universally accessible, safe and easy to use, preferably during all hours of transit operations. [See U4.2 Amenities]
- Frame public spaces and pedestrian access routes adjacent to transit facilities with active uses and frontages – such as windows, storefronts and residential entrances – to support activities and hours of use that are compatible and complementary to those of transit services. [See: U1.1 Movement and Capacity]
- Provide safe and comfortable areas to sit, incorporating sheltered areas protected from the rain and wind to encourage their use in most weather conditions. [See: U.4 Make it Comfortable]
- Provide pedestrian-scale lighting to extend the active use of public spaces.
- Incorporate feature lighting, where appropriate, to enhance safety and sense of place. [See: U3.3 High Quality Lighting]
- Use residual lands beneath guideways to add to the inventory of public open space and support active transportation (e.g., community gardens or multi-use paths).
- Locate parking lot and garage entrances away from pedestrian routes, and minimize parking entrance widths.
- Follow CPTED principles to encourage natural surveillance and other passive security measures. [See: U3.2 Security]

P1.2 Vibrant people places

P1.2.2 DISTINCTIVE ARCHITECTURE

- Design individual transit facilities to foster a distinctive identity that respects the local context while still conforming to network-wide standards through the use of common, standardized components for a consistent passenger experience.
- Identify qualities and characteristics of local architecture and the public realm that should be reflected in transit facility design or that can be enhanced through high quality facility design.
- Consider modern, innovative design that complements local architectural styles through scale, massing, siting and colour rather than replicating existing building forms.
- Where local architectural styles are indistinct or of poor quality, employ imaginative and innovative transit facility design to improve the visual and functional quality of the area and to create a strong sense of place.



Distinctive architecture in the design of Bilbao's Metro entrance structures by Foster+Partners. Bilbao, Spain.

ACTIVE FRONTAGE SCALE

A

Grade A

B

C

Grade C

D

E

Grade E

GRADE A FRONTAGE	
More than 15 premises every 100m	No blind facades and few passive ones
More than 25 doors and windows every 100m	Much depth and relief in the building surface
A large range of functions	High quality materials and refined details
GRADE B FRONTAGE	
10–15 premises every 100m	A few blind or passive facades
More than 15 doors and windows every 100m	Some depth and modelling in the building surface
A moderate range of functions	Good quality materials and refined details
GRADE C FRONTAGE	
6–10 premises every 100m	Very little depth and modelling in the building surface
Some range of functions	Standard materials and few details
Less than half blind or passive facades	
GRADE D FRONTAGE	
3–5 premises every 100m	Flat building surfaces
Little or no range of functions	Few or no details
Predominantly blind or passive facades	
GRADE E FRONTAGE	
1–2 premises every 100m	Flat building surfaces
No range of functions	No details and nothing to look at
Predominantly blind or passive facades	

Source: The Urban Design Compendium, UK Homes and Communities Agency (2007–2009)

P1.2 Vibrant people places

The Lion of Stalingrad by Xavier Veilhan, created as part of the Bordeaux light rail project, France.

Integrating art within and around transit facilities provides a number of benefits, including enhancing people's journey; creating engaging, democratic public spaces; and reflecting and enhancing the physical and cultural identity of the neighbourhood.

P1.2.3 PUBLIC ART

- Consider public art opportunities at the outset of a project in light of TransLink's stated vision, goals and objectives and provide for long-term maintenance of artworks.
- Engage with local community and cultural groups to identify public art opportunities.
- Commission artwork of high quality, innovation and creativity.
- Use fair and transparent artist selection processes.
- Remain open to proposals for public art from arts organizations and institutions and include consideration of partnerships.
- Provide a balance of opportunities for temporary and permanent works of art, including performance based works, appropriate to the location, context and scale of each facility.
- Provide the use of advertising spaces for occasional and temporary artworks.
- Integrate artworks into transit facility design to complement and contribute to the design of transit passenger facilities and transit infrastructure.
- Coordinate art infrastructure needs with architectural design and budget to achieve cost-effectiveness and integrated results.
- Design hard and soft landscaping at and around transit facilities in ways that allow incorporation of public art, such as:
  - sculpture
  - murals and displays
  - water features and fountains
  - lighting features and displays
  - banners, flags, mobiles and suspended features
  - live, perfomance-based works
- Specify appropriate types and materials for public art works and features so they are durable, safe, attractive and consistent with transit and street maintenance requirements.
- Design transit facilities to accommodate public art works that support passenger wayfinding and movement.
- Provide multiple forms of information about the artworks for the general public.

REFERENCES

TransLink references

Principles for Public Consultation & Community Engagement:

- www.translink.ca/en/Be-Part-of-the-Plan/Public-Consultation/Principles-for-Public-Consultation.aspx

SkyTrain RTP 2000 Design Guidelines (2006): 3.3.3 (Public Consultation - Station Design), 3.10.7 (Station Art).

Other references

Placemaking for Communities, Project for Public Spaces:

- www.pps.org.

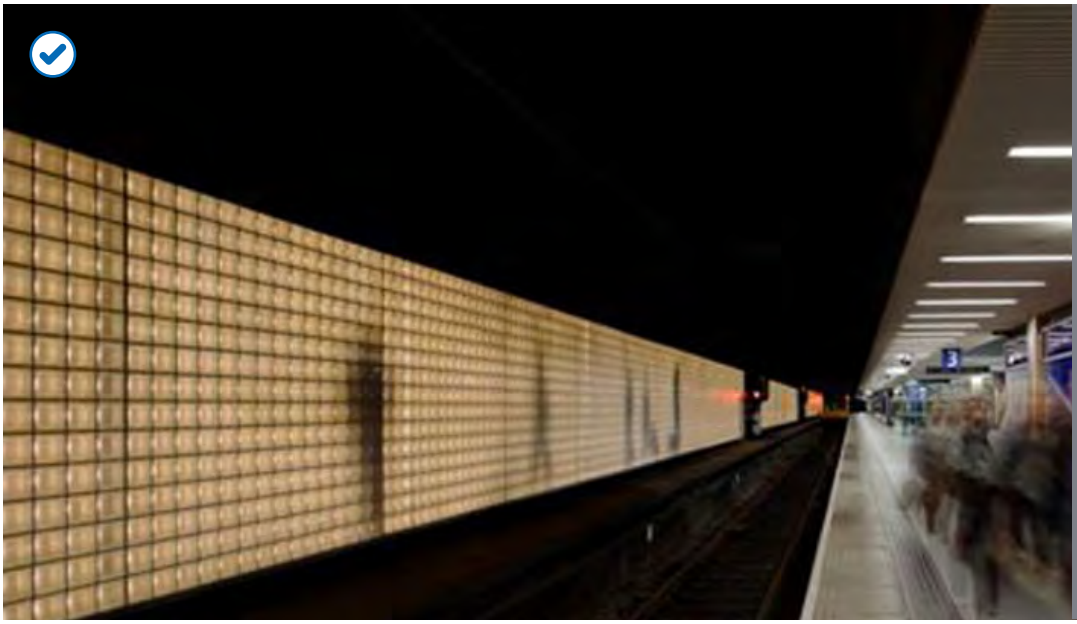
Public Art Guidelines and Policies (online), City of Vancouver:

- www.vancouver.ca/commsvcs/cultural/publicart/policies.htm

The Urban Design Compendium (2007–2009), UK Homes and Communities Agency.

P1.2 Vibrant people places

SEE CASE STUDY:
4.1.4 LA METRO PUBLIC ART PROGRAM



A screen made from more than 10,000 LED-lit glass blocks runs along the length of platform 5. Shadowy figures based on local people are set in motion when a train arrives.

Living Wall, Sunderland Mainline Rail Station. England, UK.

Designed by Jason Bruges Studio, London.

The seven photographs at Waterfront Station by Tamara Leigh, feature various tunnels and stations at different phases during construction of Canada Line.

Under Construction. Vancouver, BC.

Design strategy P2: Seamlessly integrate transit, urban development and the public realm

The planning and design of transit facilities requires consideration of issues beyond the transit facility itself, including its location in the region, its role in the wider transit network and its surrounding urban structure, urban form and land use.

Concentrating higher-density, mixed-use, pedestrian-friendly development within a 5–10 minute walk (400m–800m radius) of frequent transit stops, stations and exchanges increases the cost-effectiveness of the transit system. It also creates places that enable and encourage people to drive less and to walk, bicycle and take transit more.

P2.1 Integration with context

SEE CASE STUDY:
4.1.5 LIGHT RAIL AND PUBLIC REALM INTEGRATION

Transit facilities function best and attract customers when they are integrated into their surroundings and are able to serve passengers' day-to-day needs. Context-sensitive transit passenger facilities that deliberately shape and animate the public spaces surrounding them will be well-suited to becoming active and integrated fixtures embraced by their communities.

- Design transit facilities and the public realm to respect the local context, respond to community objectives, and be appropriate to the character and topography of the site.
- Consider issues of facility layout, scale, proportion and massing, natural features and soft and hard landscaping.
- Design amenities and spaces to be fully integrated with surrounding developments and buildings and to be adaptable, comfortable, universally accessible and safe and easy to use, preferably during all hours of transit operations.
- Orient buildings and maintain sightlines to key local landmarks or natural features to help in passenger orientation and wayfinding. [See: U1.3 Wayfinding and Passenger Information]
- Integrate public places and activities into existing circulation, open space and ecological networks.
- Integrate lighting, signage, wayfinding and hard and soft landscaping with transit facilities and surrounding areas. [See: U1 Make it Easy and U3.3 High Quality Lighting]
- Coordinate materials and surfaces used for transit facilities to be consistent, where appropriate, with those of their context, while also being consistent along transit routes.

THE PUBLIC REALM

The public realm forms the physical link between transit facilities and the wider communities they serve. In this context, the public realm is defined as the spaces between and around buildings, including streets, that are accessible and usable by people. Its elements include the spaces, building frontages, landmarks and views that define it, as well as the streets, sidewalks, paved and natural areas, hard and soft landscaping, water features, lighting and public art that help to animate it. Together, these elements give the public realm its identity, character, value and 'sense of place'. Importantly, the public realm is also dynamic space, enlivened by movement, activities and people.

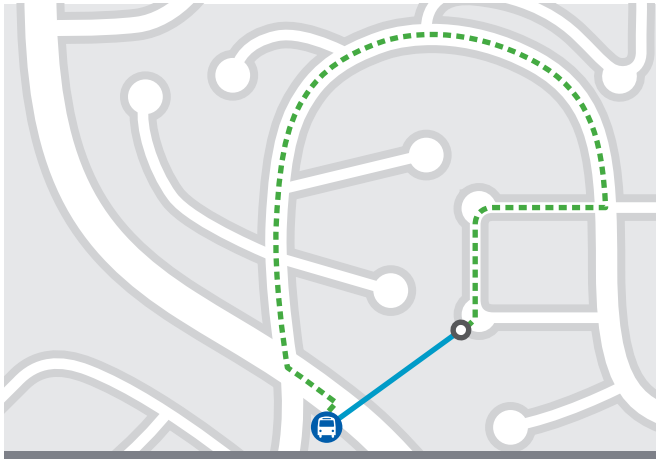
This facility entrance structure is surrounded by active, animated public space and is integrated with underground retail and office developments to provide accessible, animated and safe use during hours of transit operations. Vancouver City Centre Station, Vancouver.

P2.2 Interconnected streets

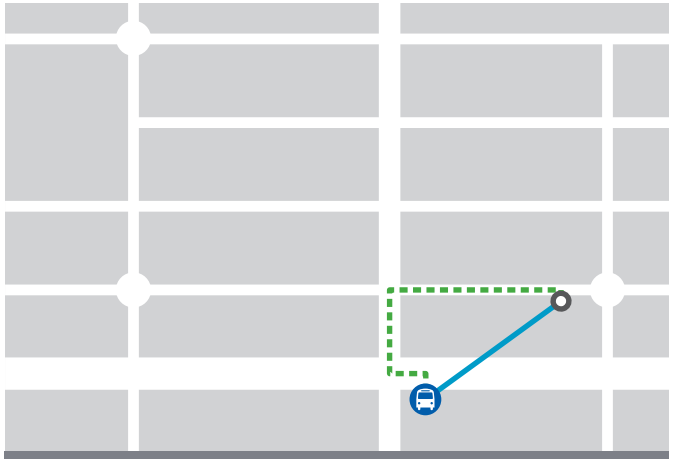
Pedestrian movement prioritized in and around transit. Montpellier, France.

Integrated development that builds around an interconnected system of streets will invite more walking, cycling and transit use by offering more route choices and direct connections.

- Prioritize and balance access by mode, giving due priority to pedestrians and cyclists.
- Design access for pedestrians with high-quality sidewalks, direct connections and sightlines to the transit passenger facility from surrounding areas so that people can walk to transit facilities quickly and conveniently.
- Prioritize pedestrian movements in and around facilities by providing continuity between transit facility buildings and adjacent sidewalks and by incorporating traffic-slowing measures where appropriate, such as widening for pedestrian bulges at intersections that prioritize pedestrian circulation.
- Design access for cyclists with direct connections to surrounding bicycle routes and convenient locations of bicycle parking for transit facilities and their context.
- Provide small urban blocks and sufficient curb space to:
  - meet peak bus demands, allow buses to turn around easily and maximize connectivity;
  - allow for taxi and auto access for passenger drop-off that does not compromise transit facility operations.
- Design service access for facilities to be consistent with adjacent developments, including deliveries to transit facilities and adjacent retailers.



A disconnected, dendritic street network full of cul-de-sacs results in long walking distances and lower efficiency of transit networks.



A well-connected, fine-grained network enables shorter and more direct walking connections, making it more efficient and easier to serve by transit.

P2.3 Support a mix of pedestrian-friendly land uses

Transit and development will be mutually supportive when facilities and the mix of uses are easily accessible by pedestrians and fully integrated with the public realm that connects them.

SEE CASE STUDY:
4.1.5 LIGHT RAIL AND PUBLIC REALM INTEGRATION

- Identify building types, forms and densities that accommodate a range of transit-supportive uses and activities, including residential, commercial, office and ground-level retail shops, as well as services that support surrounding neighborhood needs.
- Design transit facility building height, where appropriate, to increase transit visibility from the surrounding neighbourhood and to mark the location as a neighbourhood centre.
- Design the transit facility and its public realm to provide a high level of pedestrian comfort on all streets, considering sidewalk capacity, frontage definition and furnishings and sidewalk edge zones, as well as buffers from vehicle traffic, through the use of on-street parking or a continuous landscaping strip. [See: High Performance Infrastructure Guidelines – Integration of Best Management Practices]
- Provide for high quality landscaping, lighting and weather protection throughout the public realm, integrating transit and general street infrastructure to minimize clutter.

Streetscape adjacent to Broadway–City Hall Station organized to provide good pedestrian comfort, including sidewalk capacity, frontage definition, furnishings and sidewalk edge zones. West Broadway, Vancouver.

REFERENCES

OTHER REFERENCES

Transit & Land Use Planning (1994), BC Transit.

TDM Encyclopedia, Victoria Transport Policy Institute.

- www.vtpi.org/tdm


E2.1 Energy efficiency
E1.2 Explore innovative design and construction practices
E1.1 Use materials responsibly

ENVIRONMENT:
Be leaders in environmental sustainability

Transit passenger facilities and their surrounding communities should be designed to reflect TransLink's sustainability vision by balancing the three factors of sustainability – social, environmental, economic – throughout the design process.

Beyond realizing operational cost savings over the life of the building, environmentally responsible design contributes to the long-term health and well-being of transit passengers, local communities and the natural environment.

Guidelines for **Environment** are organized under three broad design strategies:

» **E1** Minimize negative environmental impacts of transit facilities
» **E2** Reduce energy consumption
» **E3** Design healthy sites

Positive environmental design practices include use of locally sourced materials, passive heating and cooling strategies and modular design of roofing components.

Richmond-Brighouse Station, Richmond

Design strategy E1: Minimize negative environmental impacts of transit facilities

Employing green building practices in the construction and renovation of transit passenger facilities takes a long view towards sustainability, considering value and environmental impact from pre-construction through to operations and end-of-life reuse.

E1.1 Use materials responsibly

Material selection and sourcing have significant effects on the long-term environmental impact of new facilities. When sourcing materials for transit facilities it is important to consider all phases of a material's effective life and to evaluate alternatives in terms of cost and environmental impact. Designers should prioritize construction materials that minimize negative environmental impacts.

SEE CASE STUDY:
4.1.3 CHARLOTTESVILLE DOWNTOWN TRANSIT STATION

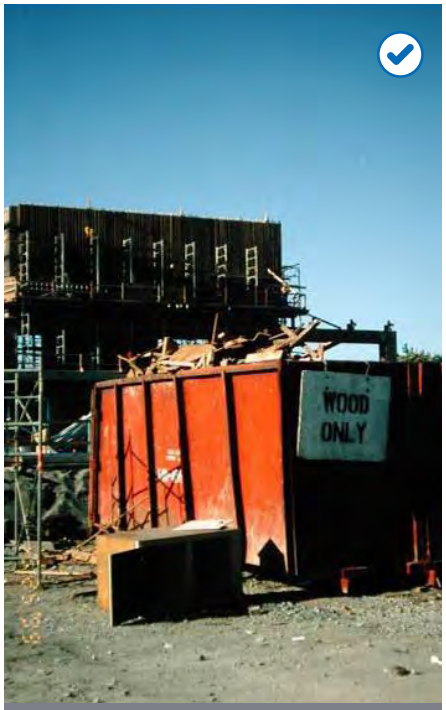
E1.1.1 SOURCING

The sourcing of materials for transit facilities should consider the energy and resource consumption required for extraction, production, transportation and maintenance. Material procurement should also reflect a commitment to healthy environments for installers and end users.

- Use materials that minimize the embodied energy, carbon and water used in the manufacturing process.
- Select locally-sourced and manufactured materials, where possible, to reduce embodied energy and greenhouse gas (GHG) emissions from the transportation of materials.
- Give preference to rapidly renewable materials where applicable.
- Use materials that are responsibly extracted or harvested.
- Reuse or salvage materials where applicable and possible.
- Prioritize post-consumer, recycled materials when transit-specific requirements that include longevity, durability and low maintenance are met.
- Avoid use of materials that are toxic to the health of users and the environment, including those containing volatile organic compounds (VOC).
- Use products and materials sourced, where possible and suitable, from producers and manufacturers who employ fair labour practices.

Locally sourced and milled timber used in Millennium Line station canopies.

E1.1 Use materials responsibly



Consider opportunities to reuse existing structures and site components to reduce waste where feasible.

E1.1.2 DURABILITY AND MAINTENANCE

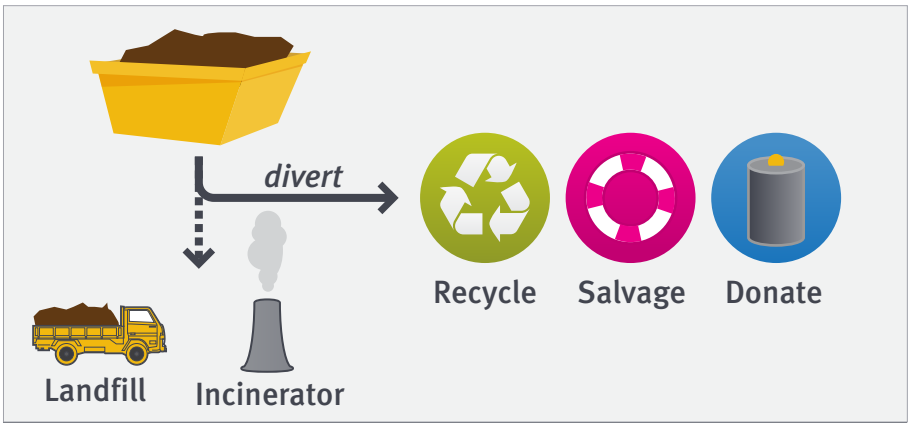
Material selection and design greatly impacts the maintainability and durability of transit facilities. Choosing durable and long-lasting materials will protect against the premature and costly replacement of building components. [See: A1 Design with whole life costs in mind]

- Use materials with an agreed minimum lifespan for their application. [See: Canadian Standards Authority Guidelines on Durability in Buildings CSA S478]
- Avoid materials with complicated repair, removal and disposal requirements, minimizing health and safety, air quality, and waste management impacts.
- Research recommended materials and processes to ensure proven performance in similar applications.
- Avoid materials with potential negative environmental impacts, especially those materials likely to be regulated within a facility's service life, to minimize cost of future replacement.
- Design for durability and weather resistance of materials, including interfaces between dissimilar materials that may result in reduced performance.

E1.1.3 REUSE AND DISPOSAL

The cost of raw materials and their disposal is both unpredictable and likely to increase in the future. Transit passenger facility designers should consider opportunities to minimize waste and allow for a positive reuse of building components at the end of a building's life-cycle.

- Consider opportunities to reuse existing structures and site components to reduce demolition waste where feasible.
- Consider modular design and off-site fabrication to further reduce construction waste through more efficient production techniques.
- Avoid use of materials or building components that require complex or costly disposal.
- Use building materials that can be recycled or reused at the end of their lifespan.
- Design building components to be salvageable or capable of disassembly to the greatest extent possible.

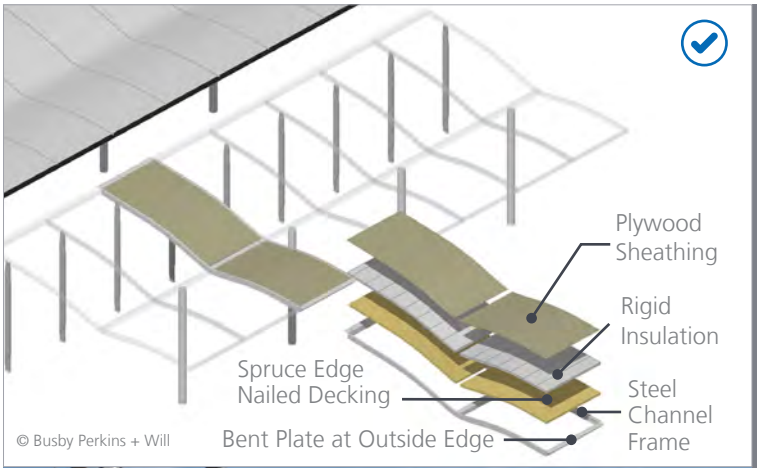


Construction waste diagram.

E1.2 Explore innovative design and construction practices

Minimize the adverse environmental impact of transit facilities with innovative planning and design solutions that creatively address efficiency, sustainability and cost-effectiveness.

- Employ modular and prefabrication methods, where applicable, to minimize construction waste.
- Optimize the use and adaptation of existing infrastructure and facilities and/or components.
- Size facilities to accommodate changes in programs and capacity over time. [See: A3.1 Future Readiness]
- Utilize materials excavated on-site, where possible, instead of transporting them off-site.



Modular roof canopy, construction elements and pre-fabricated component installation.

REFERENCES

OTHER REFERENCES

CSA S478-95 Guideline on Durability in Buildings (2007), CSA International.

LEED for New Construction (2009), US Green Building Council.

Precautionary List, Perkins + Will.

- http://transparency.perkinswill.com

Design strategy E2: Reduce energy consumption

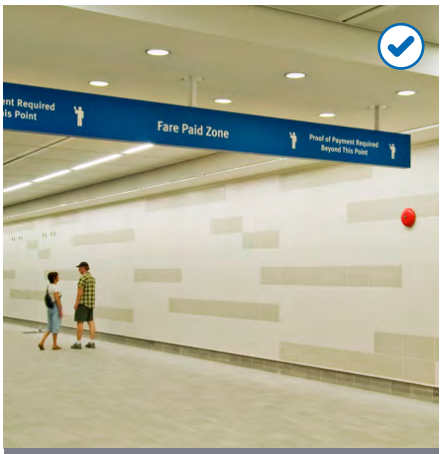
Transit passenger facility design should minimize overall energy consumption and prioritize renewable sources of energy production, reducing environmental impact and greenhouse gas emissions.

E2.1 Energy efficiency

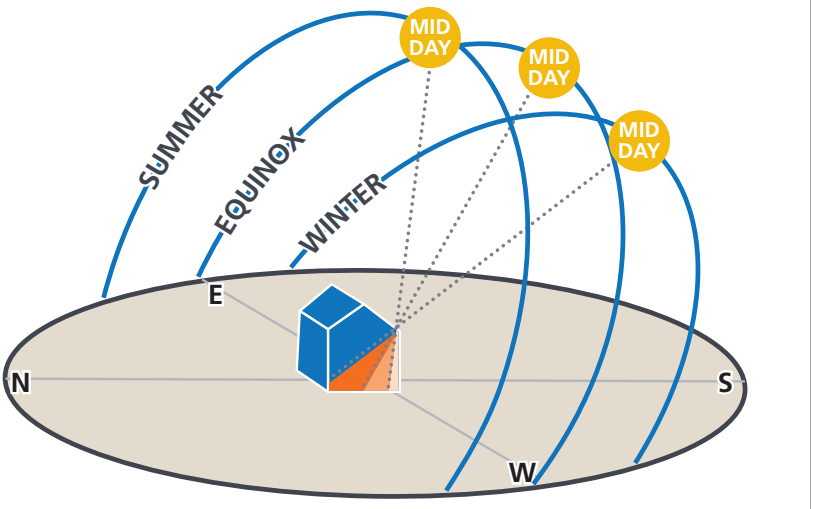
Efficient energy usage over the life of a building is a major contributor to reducing its environmental impact and overall operational costs.

SEE CASE STUDIES:
4.1.1 CANADA LINE LIGHTING STRATEGY
4.1.3 CHARLOTTESVILLE DOWNTOWN TRANSIT STATION

- Use external rating systems, such as LEED or BREAAM, to evaluate and measure energy efficiency of design solutions.
- Plan the size and orientation of transit facilities to optimize energy consumption without compromising operational efficiency or the passenger experience.
- Maximize use of building design technologies where appropriate to harness and reuse solar, wind, water power, geoexchange and daylight.
- Use passive heating and cooling strategies where applicable, including solar shading and window treatment, to minimize cooling loads.
- Use intelligent control systems (e.g., daylighting controls to integrate with electric lighting, lighting sensors in staff-only maintenance areas, motion sensors that activate escalators only when in use) to optimize energy usage where appropriate.
- Identify prevailing wind patterns during design, and explore opportunities to use natural ventilation to assist or replace mechanical ventilation.
- Optimize daylighting opportunities to minimize the use of electric light sources.
- Specify energy-efficient lighting fixtures consistent with or exceeding IESNA Lighting Standards. [See: U3.3 High Quality Lighting]
- Design for both efficient lighting (lumens per watt) and task lighting. [See: U3.3 High Quality Lighting]
- Design cost and energy-efficient mechanical and engineering systems. [See: A1.2 Efficient Built Design]
- Minimize energy waste through use of optimum wall and roof insulation, including consideration of green roofs.



High reflectance surfaces with matte finishes are used to reduce quantity of lighting and overall energy consumption. Canada Line, Vancouver.



A sun location calculation will inform facility orientation and fenestration design to manage solar heat gain and provide comfortable and economical heating and cooling and efficient lighting.

E2.2 Renewable energy opportunities

REFERENCES

OTHER REFERENCES

90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings (2007), ASHRAE/IESNA.

Net Metering (‹50 kW) and Standing Offer Program (50kw-10mW), BC Hydro:

- www.bchydro.com/planning_regulatory/acquiring_power/net_metering.html
- www.bchydro.com/planning_regulatory/acquiring_power/standing_offer_program.html

PowerSmart, BC Hydro:

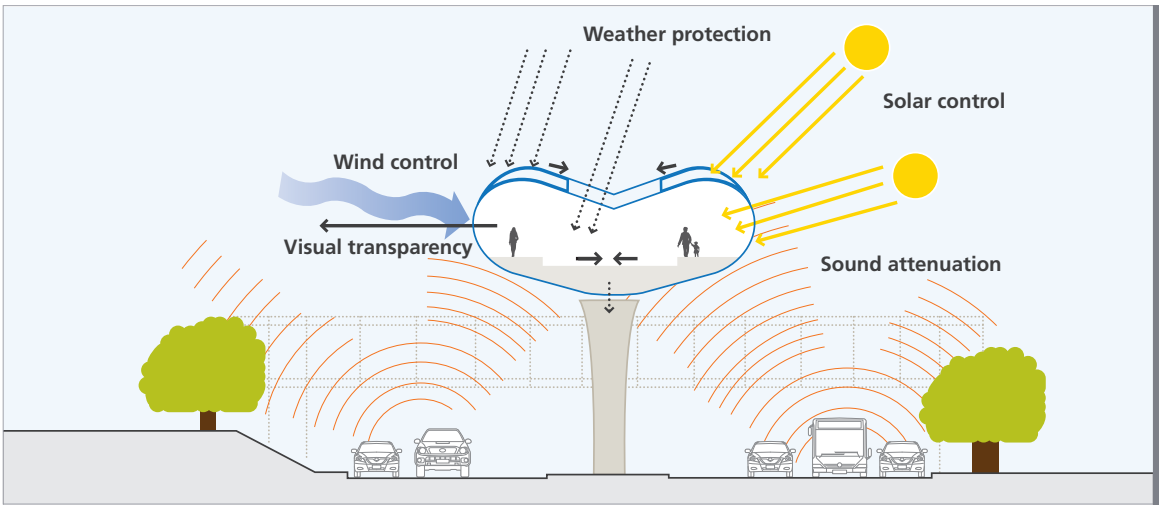
- www.bchydro.com/powersmart/other_programs.html

LEED for New Construction (2009), US Green Building Council.

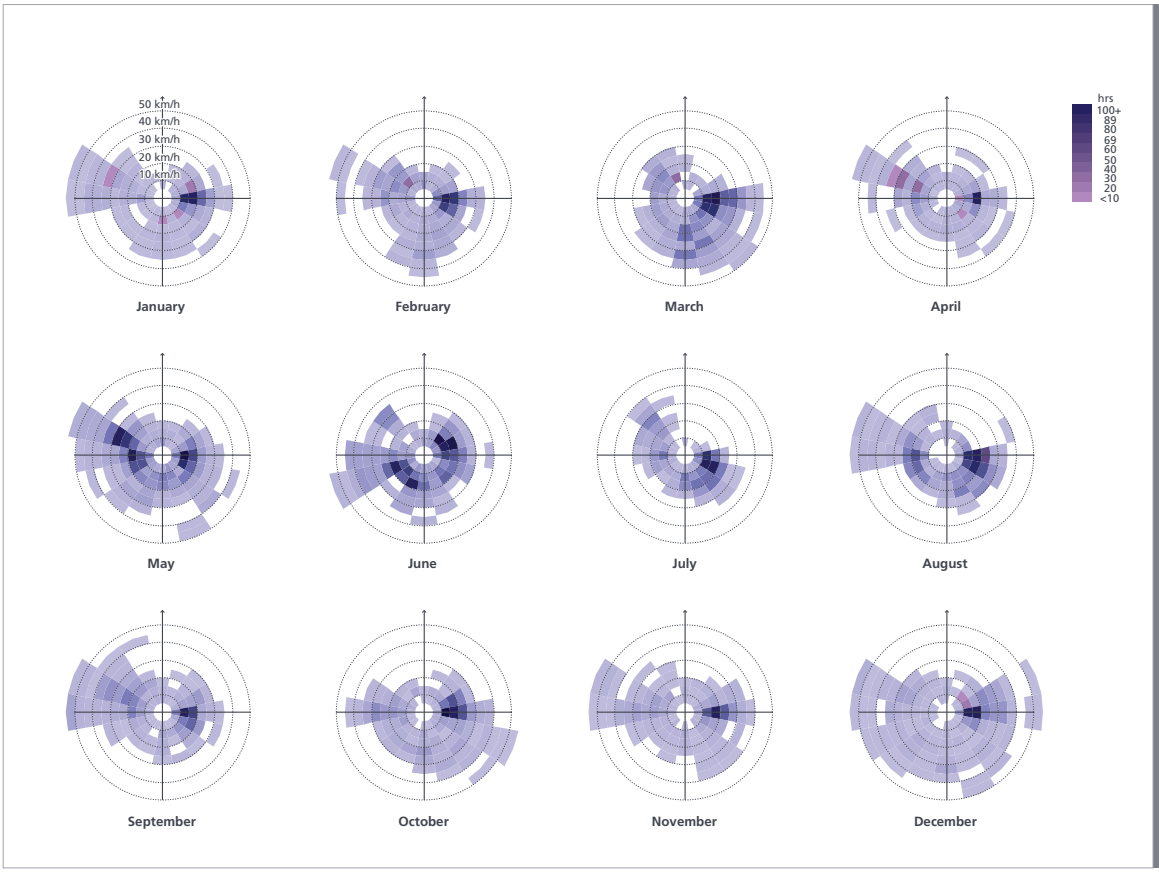
Taking advantage of renewable energy sources is an important component of reducing energy impacts. On-site renewable energy can be a source of energy cost savings and can also protect against the uncertainty of future energy costs and sources.

- Identify and develop opportunities for on-site solar power generation.
- Identify and develop opportunities for on-site wind power generation.
- Identify and develop opportunities to partner with neighbouring facilities/buildings to recover waste heat or to provide geoexchange heating.
- Identify and develop opportunities for the provision of electric vehicle charging points at transit facilities (for TransLink staff) and at Park & Ride facilities (for passengers).
- Forge partnerships with local power utility companies to deliver renewable and on-site energy generation.
- Investigate other renewable energy sources, including ground source heating or cooling and cogeneration.
- Take embedded energy into account when evaluating alternative energy systems and installations.

Solar panels installed on the roof canopy power the lighting for this bus exchange. Vauxhall, London, UK.



Passive heating and cooling strategies, including transparency, solar shading and window treatment.



Vancouver area average monthly wind speed and direction. Data taken from weather station at YVR airport. Consider monitoring local microclimate if wind is a primary concern.

Design strategy E3: Design healthy sites

Facility sites are intrinsically linked to the wellbeing of regional watersheds, microclimates and biological diversity. Disruptions to air, water, soil and ecosystem health within project sites can have compound effects on greater ecological networks.

Well designed transit facilities can mitigate these negative on-site ecological impacts and contribute to the overall maintenance and enhancement of local ecology.

E3.1 Urban heat islands

Transit facilities and their environments should be designed to minimize absorption and radiation of solar energy, lowering their contribution to temperature increases in surrounding areas and minimizing their contributions to local and regional heat island effects.

Roof and site materials should be specified with a high albedo (Solar Reflectance Index), or use vegetated roofing to mitigate the effects of heat gain on local microclimates and reduce cooling loads for the building itself.

- Use high albedo or green roofing where appropriate.
- Use open-grid pervious pavement for paved areas of the site.
- Maximize site vegetation and shading without compromising visibility or natural surveillance.

Green roofing. Lausanne Metro, Switzerland.

Site vegetation providing natural shade and water retention. Operations Building, City of White Rock.

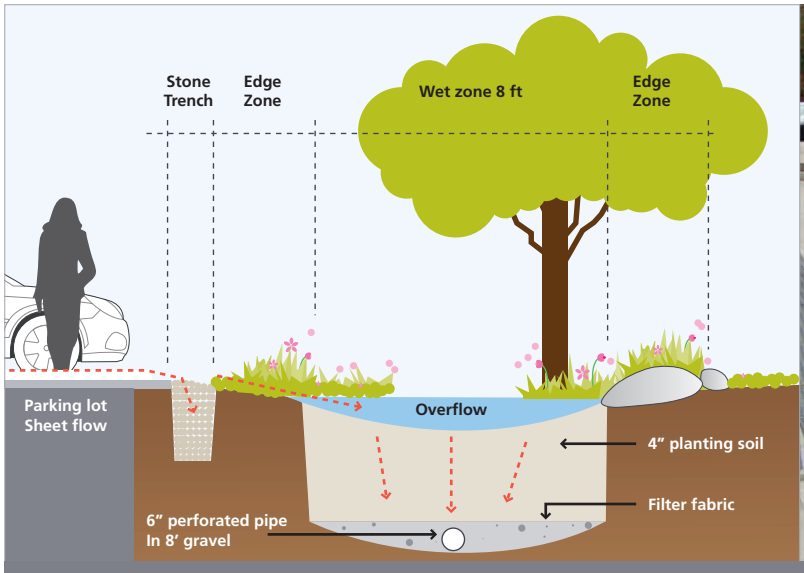
E3.2 Water use and quality

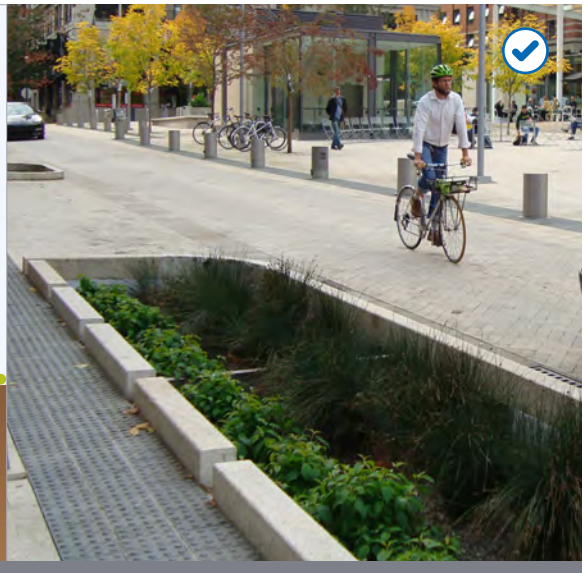
SEE CASE STUDY:
4.1.3 CHARLOTTESVILLE DOWNTOWN TRANSIT STATION

Bioswale for stormwater infiltration.

Site and transit facility design should replicate and enhance natural conditions, where possible, including controlling the quality and quantity of site water and stormwater runoff. Site runoff should be designed to control the content of sediments and contaminants to avoid potential harm to local water quality.

- Design to protect site water quality against contamination and erosion during construction and operations.
- Use integrated building and landscape design strategies to manage stormwater on site.
- Explore opportunities to reuse rain water for irrigation and non-potable uses on site.
- Integrate wastewater reclaim systems within transit facility and site designs.
- Design buildings, infrastructure, and landscapes to use on-site stormwater management techniques, such as pervious pavements, rain gardens, vegetated roofs and landscaped filtration areas to minimize impervious surfaces and maximize the natural permeability and filtration of contaminants.
- Design landscapes with appropriate site vegetation to control soil erosion and minimize the need for irrigation.
- Specify efficient plumbing fixtures in transit facilities to minimize water usage.





Illustrated cross-section of bio-infiltration techniques.

E3.3 Site ecology

The design of transit facilities should improve upon the natural ecology and site characteristics of their location. Site selection, lighting, building massing and orientation should minimize negative impacts on surrounding ecosystems.

- Location of new transit facilities should give consideration to brownfield sites to avoid disruption of undeveloped sensitive ecosystems.
- Undertake a risk assessment of brownfield site remediation measures to ensure transit facility development does not result in further ecological impacts.
- Optimize building footprints to reduce site impact and protect important environmental site features without compromise to passenger needs and operational efficiency. [See: Usability and Operations]
- Design to control and manage soil erosion during construction and operations.
- Maximize protection of existing vegetation, including trees and shrubs, by using native or adopted vegetation to enhance local ecology.
- Design interior and exterior lighting to minimize light pollution for adjacent properties, nocturnal ecosystems and dark-sky conditions.

Bioswale using attractive native vegetation and flowers to manage site runoff. Operations Building, City of White Rock.

REFERENCES

OTHER REFERENCES

Achieving Water Independence in Buildings (2009), Central City Concern.

Guidelines and Performance Benchmarks (2009), Sustainable Sites Initiative.

LEED for New Construction (2009), US Green Building Council.

Living Building Challenge 2.0 (2010), Cascadia Green Building Council.


A1.3 Standardized and modular design elements
A2.2.1 Development opportunities
A2.1.2 Advertising

ACCOUNTABILITY:
Be fiscally responsible

The design of transit passenger facilities and their context must provide good value for public funds. Fiscally responsible design considers both short-term and long-term operations and expenditures, takes advantage of opportunities for revenue generation where appropriate, and helps to realize wider social, economic and environmental benefits without compromising operational efficiency and passenger experience.

Design guidelines for **Accountability** are organized under three broad design strategies:

» **A1** Design with whole life costs in mind
» **A2** Optimize economic benefits through design
» **A3** Design resilient, responsive and flexible facilities and spaces

Responsible, resilient design includes energy efficiency, use of modular components, provision for future growth and new development opportunities.

Brentwood Station, Burnaby

Design strategy A1
Design with whole life costs in mind

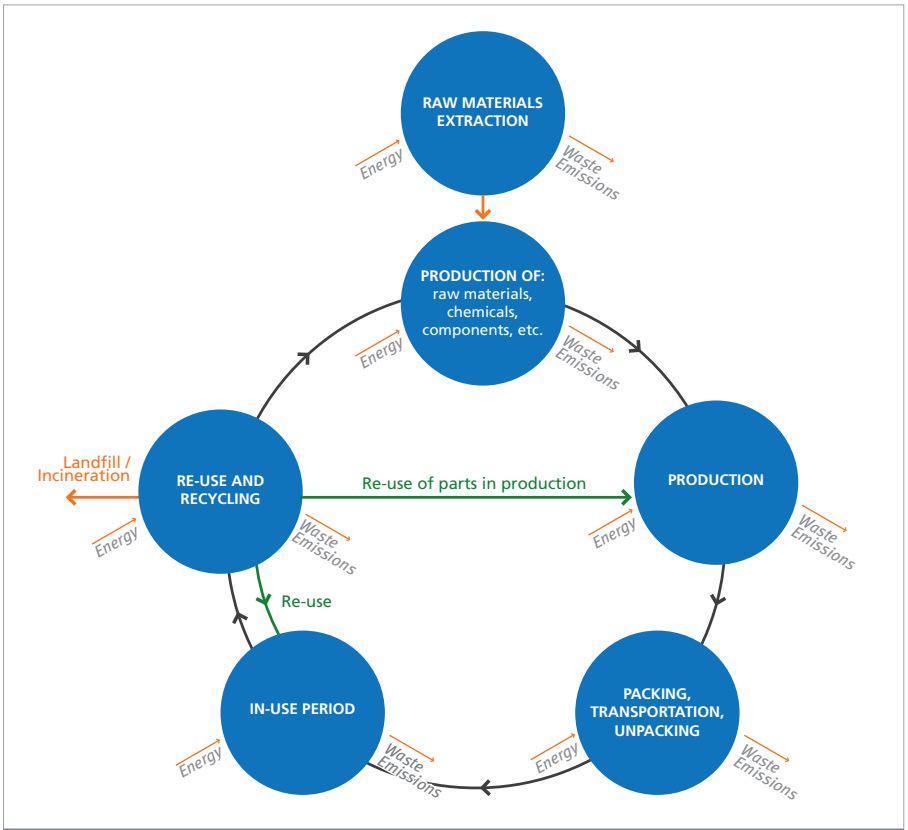
Consideration of a facility's whole life-cycle costs means accounting for the net present value (NPV) of all monetary costs (design and procurement; construction methods and sourcing; operations, maintenance and management; disposal and renewal) as well as accounting for its commercial, social and environmental value over its life-cycle.

Facility planning and design should aim to minimize operational costs and consumption of natural resources over the life of the building through design innovation, component standardization and facility optimization.

A1.1 Life-cycle costs

Lifetime operating expenses for transit facilities often exceed the initial cost of construction, and total life-cycle building costs can vary greatly depending on the design approach adopted. In many cases, high quality design and upfront investment can either provide future value in the form of operational savings or add long-term social, commercial and environmental value. Consideration of all phases of a facility's life, from design and procurement through to operations and end-of-life salvage, is necessary when evaluating the most efficient allocation of fiscal resources.

- Design for efficient facility planning decisions that allow for future growth, but also optimize land acquisition costs.
- Site, orientate and design transit passenger facilities to optimize energy consumption without compromising operational efficiency or the passenger experience. [See: E2.1 Energy Efficiency]
- Conduct a life-cycle cost analysis (LCCA) to establish specific life-cycle costs and to assess the relative merits of design options, including their long-term social, commercial and environmental value.
- Perform a systematic LCCA during each design phase.
- Prioritize the allocation of capital finance to maximize efficiency and return on investment over the life of the project and beyond.
- Minimize site disturbance and associated costs by working with existing site configurations to the greatest extent possible (e.g., re-grading, curb cuts, pedestrian and vehicle transportation routes).
- Consider strategies for material reuse in the design, construction and future dismantling of transit facilities.



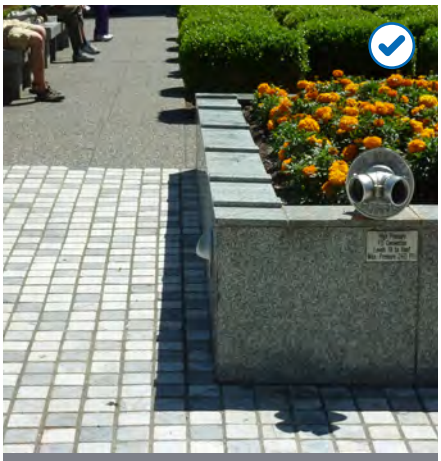
Life-Cycle Cost Analysis

A1.2 Efficient built design

SEE CASE STUDY:
4.1.1 CANADA LINE LIGHTING STRATEGY

The design of transit facilities should aim to minimize ongoing maintenance and operational costs, including labour, materials and training, as well as consumption of natural and energy resources [E1.1 Use Materials Responsibly]. Designing with operating costs in mind can yield significant cost and energy savings over a facility's whole life-cycle.

- Plan and design facility configuration and specify materials and equipment to minimize operating costs and facilitate maintenance without loss of, or reduction to, passenger services.
- Minimize energy consumption and costs through the use of passive environmental design strategies as appropriate. [See: E.2.1 Energy Efficiency]
- Design simple and easily understood building systems, avoiding overly complex operating and maintenance practices.
- Specify energy-efficient fixtures, and heating, ventilation and air-conditioning (HVAC) equipment to reduce energy consumption and costs. [See: E2.1 Energy Efficiency]
- Use materials and systems with lifespans appropriate to their function and application. [See: CSA S478 – Guideline on Durability in Buildings]
- Design for ease of access for cleaning, repair or replacement of building fixtures and components, and design for preventive versus corrective maintenance for minimal impact on transit services, passengers and other facility users. [See: O3 Management and Maintenance]
- Use materials and finishes that are vandal- and graffiti-resistant and difficult to deface, damage or remove. [See: O3.1.2 Vandal Resistance]



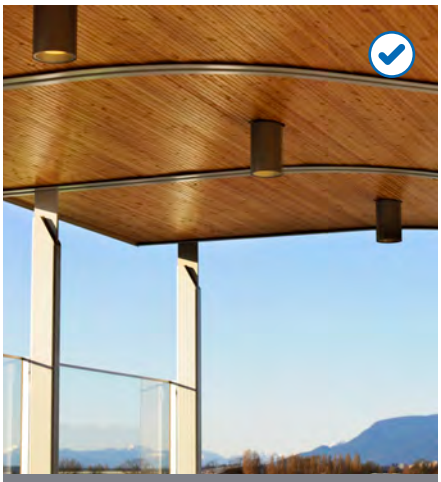
Anti-skateboard strips on seating. Vancouver, BC.

Use of passive environmental design strategies to minimize energy consumption and costs. Brentwood Station, Burnaby.

A1.3 Standardized and modular design elements

Using standardized and modular design elements across the transit network can provide safety, operational, maintenance and economic advantages. Facility designers should use modular design principles and identify opportunities to standardize components where possible and practical to minimize cost and maintenance.

- Identify opportunities to minimize initial construction costs, and long-term maintenance costs through use of modular designs and standardized components where these are compatible with high quality, distinctive architecture that is appropriate to its context.
- Use common, readily available components, where appropriate, to minimize replacement costs and stocking of custom components.
- Project components that cannot be easily repaired or replaced should be sufficiently durable to minimize expensive replacement and retrofitting.
- Use standard architectural modules and 'kit-of-parts' components for repetitive elements to achieve consistency, continuity and economy across the network, including:
  - signing and wayfinding
  - lighting
  - furniture
  - general architectural components and elements (e.g., canopies)
  - entry areas
  - ticket vending machines
  - vertical circulation components (e.g., elevators, escalators, stairs)



Economy of scale was achieved on the Canada Line through use of a family of 6 luminaire and 5 lamp types.

Use of standardized platform furniture module. Millennium Line, Burnaby.

REFERENCES

TransLink references

Skytrain RTP 2000 Design Manual (2006): 3.4.3 (Systemwide Design) – an example of system-wide guidelines for standardized components

Wayfinding Standards Manual (2010): 6.2 (General Specification-Kit of Parts).

Other references

CSA S478-95 Guideline on Durability in Buildings (2007), CSA International.

Design strategy A2: Optimize economic benefits through design

The planning and design of transit facilities should take advantage of opportunities to generate additional commercial revenues beyond the fare box – where these activities enhance the passenger experience without compromising operational efficiency.

Revenue-generating opportunities include retail, advertising and integration of mixed-use development (with a strong retail component) above, under, around and within transit facilities.

A2.1 Revenue generating opportunities

Integrating high quality design and revenue-generating opportunities into transit facilities and the public realm can both enliven the customer environment and generate a higher financial return from investments. These opportunities should be designed into facilities at the outset and effectively managed to avoid any compromise to transit operations, passenger movement and customer service and information, while also adding value to transit and its context.

SEE CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

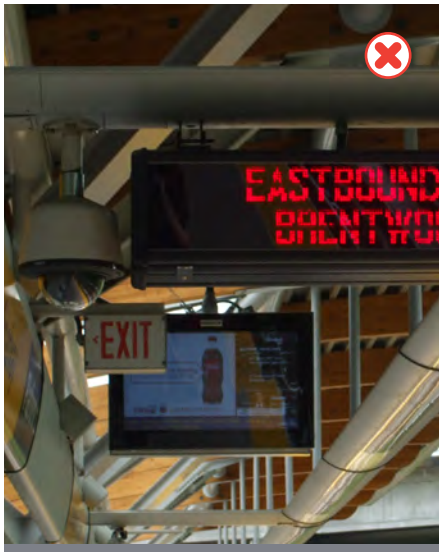
A2.1.1 RETAIL INTEGRATION

- Integrate space for retail opportunities into the design of transit facilities.
- Coordinate the planning and design of transit facility retail with existing or planned commercial development.
- Locate retail spaces where they will attract the most use and provide effective natural surveillance without compromising transit passenger movement sightlines or emergency access.
- Design retail spaces to integrate architecturally and functionally into transit passenger facility interiors and exteriors.
- Ensure that retail signage does not compete in location, density and size with transit facility wayfinding and customer information.
- Design retail to minimize clutter, keeping movement spaces free of unnecessary obstructions; reducing the potential for accidents, conflicts and collisions with items such as temporary signs, retail kiosks, vending machines, or newspaper vendors (particularly near facility entry and exit points) and optimizing the design of transit infrastructure and the surrounding public realm. [See: U1.1 Movement and Capacity]

A2.1.2 ADVERTISING

- Integrate and consolidate advertising media in facility design to minimize obstruction of movement or sight lines and to avoid competing – in terms of density, location and prominence – with wayfinding and customer information signage. [See: U1.3 Wayfinding and Passenger Information]
- Locate bus shelter advertising to avoid obscuring views of arriving vehicles or compromising CPTED principles, in coordination with municipalities that manage bus stops.
- Ensure that digital advertising media do not obstruct, or conflict with, passenger information systems.
- Consolidate newspaper boxes in a single area outside of transit facilities, preferably within a unified structure like a vending machine. [See: U4.1 Amenities]

Integrated retail under elevated station. Surrey Central Station, Surrey.



Passenger information, signage, advertising and CCTV competing for space and attention. Commercial-Broadway Station, Vancouver.

A2.2 Integrated mixed-use developments

Transit stop integrated with leisure centre. Montpellier, France.

Transit facilities should be community hubs around which higher-density, mixed-use, pedestrian-friendly development is focused. Design and planning should aim to encourage vibrant and diverse activities and public spaces above, under, around and within transit facilities as appropriate, offering advantages for both transit and adjacent uses.

A2.2.1 DEVELOPMENT OPPORTUNITIES

- Prioritize transit route alignment and siting of transit passenger facilities to encourage appropriate future development, create great spaces, and stimulate market growth in accordance with the Metro Vancouver Regional Growth Strategy. [See: A2 Optimize Economic Benefits Through Design]
- Design for the extent and mix of uses based on location, context, user types and expected pedestrian flows.
- Design facilities and integrated developments at a human scale that feature green building practices, distinctive identity features and seamless connections to the surrounding neighbourhoods and that provide attractive public spaces and high-quality architectural and natural elements that reflect the identity and needs of the community. [See: P1.2 Vibrant People Places]

Mixed use development over station. Mater Hill BRT Station. Brisbane, Australia.

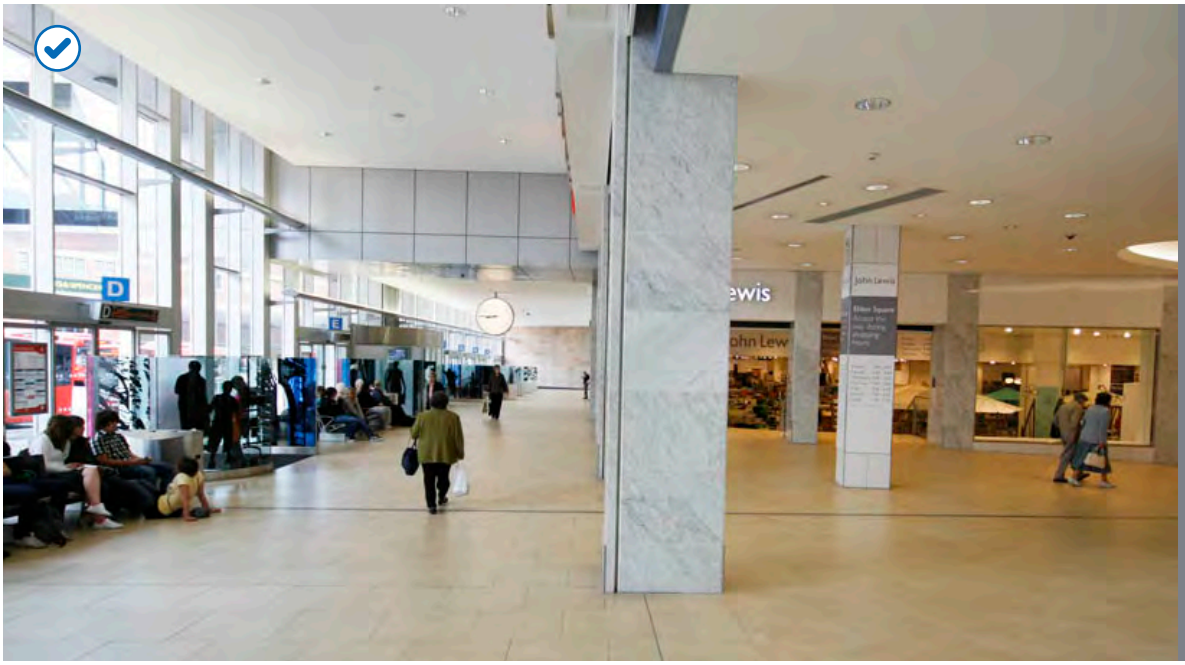
A2.2 Integrated mixed-use developments

A2.2.2 DEVELOPMENT INTEGRATION

- Design transit facilities and infrastructure, including guideways, that anticipate future development in terms of transit passenger facility location, orientation and internal layout.
- Design guideways and platforms to integrate seamlessly and at appropriate floor levels with adjacent developments.
- Wrap parking garages or any other blank walls with active-use frontages along all primary pedestrian access routes to transit.
- Design to incorporate transit branding/identity, wayfinding and customer information systems into adjacent developments, and ensure that prominence is given to transit facility entrances.
- Design for development integration so that transit passenger facility capacity, transit operations and internal circulation requirements are maintained or enhanced.

SEE CASE STUDY:
4.1.2 ELDON SQUARE BUS EXCHANGE

Retail signage dominates transit station signifier. Columbia Station, New Westminster.



Bus exchange waiting area integrated within retail mall. Eldon Square, Newcastle, UK.

Design strategy A3: Design responsive and flexible facilities and spaces

Transit facilities and services are subject to changes in demand, natural and human-made hazards and evolutions in technology and operation. Developments and communities may grow, mature or decline, and they may change in character, needs and demand for transit services.

Planning and design for transit services and facilities should mitigate risks, take account of changing technologies and demand characteristics and be flexible in reducing the costs associated with responding and adapting to such circumstances.

A3.1 Future readiness

Transit passenger facility design should consider long-term requirements, anticipating the need for change and minimizing the cost of any future resizing or reconfiguration that may be needed. Expansion, enhancement and/or redevelopment of facilities may be driven by one or more factors, including network capacity constraints, new transit vehicle types, new technologies and regeneration of surrounding areas, as well as the need or desire for landmark architecture or local centres.

- Design transit and inter-modal facilities and activities based on future passenger demand and flow projections, including spatial requirements for passenger movement areas, platforms, ticket vending machines and ticket areas, together with appropriate circulation space for queuing without obstruction to general passenger movement and through-circulation. [See: U1.1 Movement and Capacity]
- Assess and optimize access between transit facilities and their context, including identification of current or possible future needs to reconfigure or enhance spatial capacities. [See: P2 Seamlessly Integrate Transit, Urban Development and the Public Realm]
- Design for flexibility in relation to system expansion, increased ridership, changing vehicle technologies and dimensions, and alternative uses of adjacent facilities.
- Design to provide easy access to existing and future external destinations, adjacent developments and surrounding public spaces through pedestrian friendly urban design and planning.
- Design and plan transit facilities to take account of current and future ticketing, passenger information and communications systems and technologies applicable to the transit modes involved.

ADAPTABILITY:

TransLink encourages adaptable designs for all transit buildings and systems.

- Design to accommodate changes that are expected to occur in the near future.
- Apply common sense principles that are known to facilitate a wide range of possible changes.
- Incorporate 'adaptability' features that can be justified for other reasons.
- Adopt features that enhance adaptability with little or no additional capital or resource investment (e.g., pre-wiring transit exchanges for real-time bus arrival displays).

Escalator capacity constraints result in pooling of exiting passengers. Burrard Station, Vancouver.

REFERENCES

OTHER REFERENCES

CSA S478-95 Guideline on Durability in Buildings (2007), CSA International.

Whole Building Design Guide (online), National Institute of Building Sciences:

- www.wbdg.org


Kitchen Kaboodle

Appendices

4

Covered bicycle shelter.

Portland, Oregon

4.1 Case Studies

The case studies included in this section provide examples of high quality transit passenger facility design in practice. References to the case studies are included alongside the relevant design guidelines throughout Chapter 3.

4.1.1 Case Study: Canada Line Lighting Strategy

Project: Canada Line Lighting Strategy

Location: Vancouver, British Columbia

Client: Canada Line Rapid Transit Inc. / SNC-Lavalin

Date: 2009

Architects: Busby Perkins + Will, Walter Francl Architect Inc., Hotson Bakker Boniface Haden Architects + Urbanistes, Hywel Jones Architect Limited, Kasian Architectural Interior Design and Planning Ltd., Stantec Architectural Ltd., Via Architecture

Electrical Engineers: Genivar, Stantec, MCW Consultants Ltd.

Lighting Consultants: Total Lighting Solutions

Grouped downlights create a pool of light at this ticketing and passenger information area.

PROJECT SUMMARY

The Canada Line was completed in August 2009, three months ahead of schedule. It connects Metro Vancouver's growing residential, business, healthcare and educational centres, as well as the port, convention centre and airport. The system comprises 16 above- and below-ground stations along 19km of track. The line was originally projected to carry 100,000 passengers daily and up to 130,000 during the 2010 Olympics, with initial operating figures consistently exceeding predictions.

A Lighting Master Plan was developed, incorporating contemporary best practices, and a Master Lighting Concept that formed a framework for lighting designs for all 16 stations. The lighting design supports the Canada Line brand and improves brightness, visual comfort and perception of safety. A limited vocabulary of luminaires and lamps ensured easier installation and ongoing maintenance.

New lighting standards were established for the Master Plan, based around two goals:

- improving vertical illuminance and uniformity criteria to achieve better visibility and perception of brightness and safety;
- integrating lighting design criteria with materials/finishes design criteria, enabling achievement of desired surface luminance without over-lighting.

KEY FEATURES:

- development of an overall lighting concept that could be scaled and applied to detailed design for all 16 stations;
- provision of a strong wayfinding tool through repeated circulation patterns and a 'line of light', with luminaires focused in the direction of movement for intuitive orientation;
- realization of economies of scale through use of a limited palette of six luminaire families and five lamp types (plus LED);
- specification of reflectance values to address lighting quality and quantity;
- simplification of maintenance through a reduced number of lighting components;
- grouping of round downlights to create pools of light in areas requiring user attention, such as transition to a fare-paid zone or vertical circulation.

The lighting design minimizes energy consumption through energy-efficient technologies, efficient design and daylight harvesting, resulting in an overall lighting power density of 0.64 watts per sq. ft., 36% less than the ASHRAE 90.1–2004 energy standard of 1 watt per sq. ft.

Energy savings with 20/7 operation top 1.5 million kWh, which earned a $120,000 utility rebate.

Positive use of transparency and excellent transition from daylight to interior/electric illumination.
Broadway-City Hall Station, Vancouver.

4.1.2 Case Study: Eldon Square Bus Exchange

Project: Eldon Square Bus Exchange

Location: Newcastle, UK

Client: Newcastle City Council, Nexus (Tyne and Wear Passenger Transport Executive)

Date: 2007

Architects: Haskoll Architects, London

Integration with the retail mall directly from the bus exchange.

Eldon Square is a bus exchange in central Newcastle in the north of England. The nine-bay bus station forms part of a city centre revitalization project. It re-opened on 18 March 2007 after redevelopment and modernization of the previous underground bus exchange and is managed by Nexus, the regional transit authority.

Design of the station integrates with Eldon Square Shopping Centre, using consistent, high quality products, materials and finishes to deliver a retail-quality experience and to provide passengers with a comfortable, legible and barrier-free environment across building thresholds. Features of the exchange include innovative use of Intelligent Transportation Systems to facilitate bus movements and operations within the interchange zone, automated doors at the nine boarding areas, digital departure displays and seamless integration with the adjoining retail mall.

Stakeholder input formed an important element of the design process. Negotiation and agreement gained with bus operators for the use of technology to manage back-in bus movements in a constrained area enabled Nexus to provide an enlarged passenger environment.

Arriving vehicles are directed by a large digital display advising drivers of their bay allocation; an underground sensor in the bay triggers a message on an LCD screen to turn off the engine.

Departing vehicles are required to reverse out of the bay with movement sensors triggering lights in the road surface behind the vehicle to advise arriving vehicles of the danger and live video of the rear view is transmitted to the driver's LCD screen. The technology required approval of bus operators and the local council safety committee.

Passenger access to vehicles is via automated doors controlled to open on arrival of the bus at the bay, helping to maintain a constant temperature and improve passenger safety and comfort in the waiting area(s). Electronic information boards at each bay display real-time transit information.

Spatial organization within the bus exchange is good, with doors to bus bays sited adjacent to a central movement spine. There are clear sightlines between the retail mall, the bus bays and the local area, and the movement area is clear of permanent or temporary obstructions. Signage is clearly located and legible with good visibility. An operations and help centre is centrally located in a glazed office, providing excellent natural surveillance and a strong staff presence that adds to passenger security.

The retail mall maintenance team services the bus exchange and the mall, resulting in consistent levels of cleanliness across operational thresholds and a high level of customer satisfaction.

Light and comfortable passenger waiting area, award winning public art dividing screens and central operations room.

Bay allocation screen advises drivers of the availability of parking bays; layover space is provided to the right for use when bays are occupied.

Bus bay movement sensors are located under the granite sets; the driver LCD is located in front of the vehicle.

4.1.3 Case Study: Charlottesville Downtown Transit Station

Project: Downtown Transit Station

Location: Charlottesville, Virginia, USA

Client: City of Charlottesville

Date: 2007

Architects: Wallace Roberts & Todd Architect

Viewpoint looking south along the western facade.

Charlottesville's downtown transit station serves as its principal inter-modal transfer point, facilitating bus, trolley and bicycle trail connections and reinforcing the City's commitment to sustainability with LEED Gold certification. The facility includes a central transit hall containing retail outlets and an art gallery, as well as a visitor center for tourists. It was designed to leverage public investment in infrastructure by providing the framework for adjoining development, which included two mixed-use buildings and an amphitheatre park intended to serve as a regional attraction.

The transit station incorporates a number of sustainable construction techniques that enabled it to gain LEED Gold certification.

The narrow, north facade is a nearly seamless membrane of double-insulated structural glass, while the southern elevation is topped by a deep overhang and shielded from solar heat gain and glare at street level by a wood canopy. The second floor is wrapped by pre-patinated, 90% recycled copper cladding and louvered windows.

The plaza is lined with an insulated glass curtain wall, and the western facade is similarly protected by a continuation of the copper cladding alongside a cantilevered roof and mahogany screen.

Extending inside the building through the curtain wall, the plaza's grand stair leads from the passenger waiting room to the upstairs café and visitor's center creating an atrium-like space that connects interior and exterior spaces.

Other measures helped the building reduce its energy costs by up to 45% including:

- 24 geothermal wells were dug 300–600 feet deep in the surrounding area.
- An energy recovery wheel was installed to facilitate heat transfer between incoming and outgoing air, as were automated temperature, ventilation and lighting controls.
- A reflective, high-albedo roof membrane was installed to mitigate the heat-island effect by reflecting solar heat.
- Innovative wastewater and water reduction technologies, including the installation of waterless urinals and ultra-low flow fittings, resulted in a 30% reduction in water use.

Interior view from the plaza, showing ticket office and grand stair.

South and west elevations showing the deep wooden canopy shielding the building from solar heat gain and louvred windows wrapping the second floor to manage glare.

4.1.4 Case Study:
LA Metro, Public Art Program

Project: LA Metro Public Art Program

Location: Los Angeles, California, USA

Client: Los Angeles County Metropolitan Transportation Authority

Date: 1989–ongoing

Artists: For details see: www.metro.net/about/art/

The Los Angeles County Metropolitan Transportation Authority (Metro) commissions artists to incorporate art into a wide array of transportation projects throughout Los Angeles County. From bus stops to rail stations, streetscapes to bus interiors, construction fences to poetry works, art creates a sense of place and engages transit riders.

Established in 1989, Metro's Art Department has commissioned over 300 artists for a variety of projects. Half a percent of rail construction costs are allocated to the creation of original art works. Artists are selected through a peer review process with community input; all works are created specifically for their transit-related sites.

Described as "one of the most imaginative public art programs in the country," Metro has received numerous design and artistic excellence awards. Known for its interdisciplinary approach as well as for its broad range of commissioned artists, Metro is also recognized for its innovative and successful community involvement. Strong support has been demonstrated by municipal and corporate contributions of over $1.5 million US.

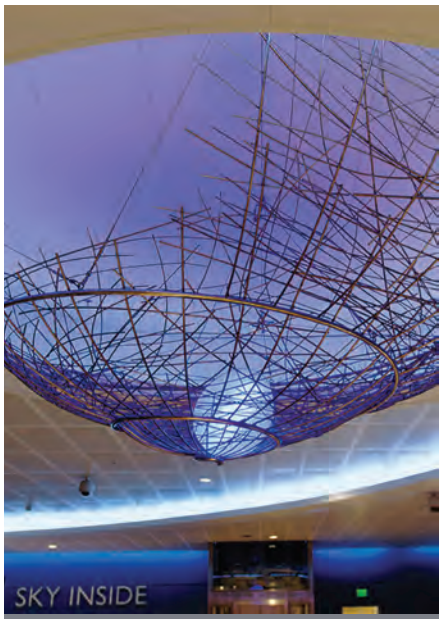
Source: www.metro.net/about/art/

Title: Everyday People
Artist: Pat Ward Williams
Location: Lake Station

Title: People Coming/People Going
Artist: Richard Wyatt
Location: Wilshire/Western Station

Title: Alignment Landscaping
Artist: Jud Fine
Location: Orange Line Alignment

Title: Untitled
Artist: Robert Millar
Location: Vermont/Santa Monica Station



Title: Landings
Artist: Nobuho Nagasawa
Location: Soto Station

4.1.5 Case Study: Light Rail and Public Realm Integration

Project: Light Rail and Public Realm Integration

Location: Strasbourg, France

Client: Greater Strasbourg Authority (CUS)

Date: 1994, with future extensions and additions

Routes in suburban areas are, where possible, located on the secondary road network, enabling the light rail to access existing neighbourhood centres.

Driven by the desire to realize a step change in the local urban landscape, the Mayoral election in 1989 became a choice between an underground rail system and a street-running light rail system. Victory for Mme. Trautmann kick-started a process of urban revitalization and a transformation of local citizens' interactions with their city. Her strategy – to improve the public realm, reduce car use and deliver a street-running light rail network – resulted in a 100% increase in transit system users and drew shoppers from outside of the metropolitan area. City centre pedestrianization created larger and more accessible places for people, with increased pedestrian and outdoor activities.

Strasbourg selected street-running light rail as the new mode of transportation to complement existing bus and underground rail systems. Strasbourg's citizens were involved in the selection process, which clearly pointed to a modern street-running light rail system rather than an automated underground rail system, as built in Lille, Lyon and Copenhagen.

The carriages were specially designed for traffic at eye level, with large, low windows providing a good view from both inside and outside the vehicles and creating the sensation for passengers of being part of the street scene. The light rail is the backbone of the system, but the overall success relies on coordination with other modes of public transit, including rail, bus, bicycle, taxi and car sharing. Each light rail vehicle can carry 240 passengers, and the low floor carriages provide universal accessibility for boarding and alighting passengers. Vehicle exteriors and interiors are characterized by high quality design and provide a premium travel experience. The additional cost of delivery is justified by passenger and environmental benefits that tie into a planning policy focused on benefits for pedestrians and the environment.

Goals and strategies included:

- adding inside the urban context, not on the edge; meaning that planning of new public transit should be approached as an integrated layer within the city, not displaced and added to the urban edge;
- creating a hierarchy of streets and spaces;
- providing high quality design of all aspects;
- pedestrianizing and revitalizing the city centre, closing major roads to automobile traffic and removing parking in the downtown core and replacing it with Park & Ride lots in the suburbs.

After opening of the first line in 1994, public transit ridership increased 43% in three years, with more passengers being gained through frequent opening of new sections. The centre of Strasbourg now has less car traffic, and shops benefit from more customers.

A kit-of-parts approach has been adopted for the system, ensuring that such core components as information monoliths and platform furniture are consistent across urban environments.

Light rail and bus transfer station.

Landmark design creates a strong sense of place and promotes a positive image of the light rail as an integrated part of the urban fabric.

4.1.6 Case Study: Flintholm Station, Bicycle Integration

Project: Flintholm Station, Bicycle Integration

Location: Flintholm, Copenhagen, Denmark

Client: Banestyrelsen/DSB

Date: 1999-2004

Architects: KHR Arkitektur, Denmark

Flintholm Station in suburban Copenhagen is an important transit exchange that connects two commuter rail lines, an automated light rail line, several bus routes and local and regional bicycle routes. The station was opened in 2004, and roughly 60,000 passengers flow through the station each day, about 70% of whom transfer from other modes or services. The station was designed to facilitate cross-town journeys, avoiding the need for a trip to the town centre.

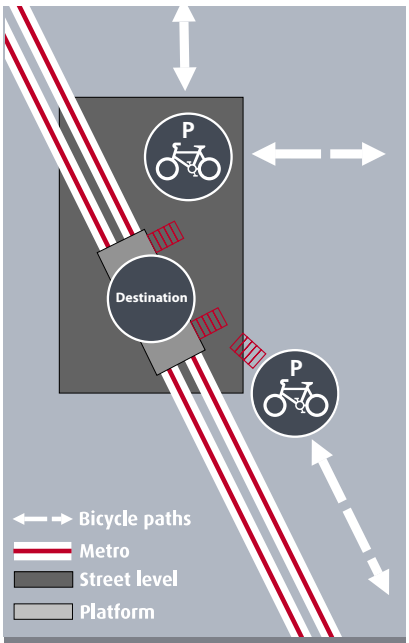
The station is constructed over two levels. The lowest level is made up of two rail platforms on the Ring Line; the upper level consists of another rail and the automated light rail platforms. The upper level platforms are connected to both lower level platforms by stairs, escalators and elevators.

Parking for bicycles, cars and taxis is located at the eastern entrance. Priority is given to bicycle parking, with 400 covered and uncovered spaces, while car parking is limited to 37 spaces. Bicycle parking is located directly on desire lines to the station from the local area and is provided undercover and adjacent to the station entrances.

The station design incorporates a large glass roof that covers the rail, bus and bicycle facilities and creates an open, well-lit environment that supports passenger movements – both to transit from other modes and to transfer between services within the station. The open and transparent nature of the design also promotes passenger safety and security and provides sightlines through the station from the lower to the upper level. On-site retail and kiosks further animate the facility, providing amenity and safety benefits to transit passengers.

Key features include:

- connection of bicycle path network to the station via a large park on either side of the station, providing convenient and enjoyable bicycle access;
- bicycle parking under cover, but in an informal manner with no fees;
- bicycle parking in an open area with clear sightlines and good natural surveillance;
- bicycle parking directly adjacent to the station entrance for easy access and transfers to the public transit network.



Bicycle access routes and parking at Flintholm Station.

Bicycle parking located adjacent to the station entrance under cover of the roof canopy.

Priority given to bicycles over private cars; bicycles have 400 spaces and cars have 37.

The open and transparent design provides sightlines through the station from the lower to the upper level, aiding transfer movements and promoting passenger safety and security.

4.2 Evaluation Framework

The evaluation framework summarized in Chapter 3 is set out over the following pages. The digital file is available from TransLink in Microsoft Excel format.

The framework provides a simple approach to transit passenger facility evaluation, using a 'traffic lights' scoring system whereby the design topics are presented as a series of questions and rated as green, amber or red:

- a green light signifies that all guidelines under that topic have been considered and addressed;
- an amber light signifies that a number of guidelines have been considered and addressed but that others may require further thought;
- a red light signifies that few, if any, guidelines have been considered and addressed.

Those topics rating 'red' or 'amber' may require further consideration if the design is to meet with best practice.

The evaluation framework is not intended to limit flexibility and, as such, no weightings are applied (though decisions about transport functionality would always be expected to take precedence over aesthetics). Where there is a competition for one or more aspects of design, however, it may be appropriate to identify those topics that best reflect the objectives of the project and to consider them accordingly.

The optimal configuration of a transit passenger facility will be informed by understanding and balancing the needs of all themes across the framework.

Usability	Rating			Comments	Actions
U1 Make it easy					
U1.1 Movement and capacity					
U1.1.1 Does spatial provision meet with locational and functional needs?					
U1.1.2 Does the spatial configuration and sequence provide for logical passenger movement?					
U1.1.3 Does the spatial design minimize conflicts of movement?					
U 1.2 Legible spaces					
U1.2.1 Does the spatial design provide clear sightlines and views to destinations?					
U1.2.1 Does the facility design include legible, distinctive spaces with clearly defined edges and transitions?					
U 1.3 Wayfinding and passenger information					
U1.3.1 Has a Facility Wayfinding Plan been developed?					
U1.3.2 Is wayfinding and passenger information consistent with TransLink's Wayfinding Standards Manual?					
U2 Make it universally accessible					
U2.1 Physical accessibility					
U2.1.1 Does the facility design provide for barrier-free access and movement?					
U2.1.2 Does the design of bus stops comply with TransLink's Universally Accessible Bus Stop Design Guidelines?					
U2.1.3 Does vertical circulation provide for the needs of all users?					
U2.2 Accessible information					
U2.2.1 Is information provision able to be accessed and understood by all users?					
U3 Make it safe and secure					
U3.1 Safety					
Have potential hazards and accident risks been minimized?					
U3.2 Security					
U3.2.1 Has a risk assesment for natural or criminal threats been undertaken?					
U3.2.2 Have CPTED principles been followed?					
U3.2.3 Has effective use been made of CCTV?					
U3.3 High quality lighting					
U3.3.1 Does lighting comply with IESNA standards to provide for good spatial understanding, ambience and safety?					
U3.3.2 Has a daylighting strategy been developed that supports effective use of managed daylight and transition between illumination types?					
U3.3.3 Has at-grade facility lighting been integrated with third-party systems, appropriate to the facility lighting zone?					
U4 Make it comfortable					
U4.1 All-weather and sensory protection					
Does the facility design provide appropriate protection from the full range of weather conditions, unpleasant smells and noise?					
U4.2 Amenities					
Have passenger amentities, such as waiting rooms, been provided appropriate to use and context?					

Operations	Rating			Comments	Actions
O1 Facilitate transit operations					
O1.1 Transit vehicle needs					
Does the spatial design provide for efficient transit vehicle access and manoeuvring, while minimizing conflicts of movement between vehicles and pedestrians?					
O1.2 Staff facililties					
Have staff facilities been provided appropriate to the facility type?					
O2 Support transit by integrating with other modes					
O2.1 Inter-modal connections					
O2.1.1 Does the design provide for balanced and efficient modal integration?					
O2.1.2 Does the design facilitate convenient and safe access for pedestrians?					
O2.1.3 Have appropriate bicycle facilities been provided?					
O2.1.4 Does the design include conveniently located pick-up and drop-off areas for taxis and private vehicles?					
O2.1.5 Does the design facilitate direct and safe access between Park & Ride lots and facility entrances?					
O3 Facilitate effective management and maintenance					
O3.1 Management and maintenance arrangements					
O3.1.1 Have management and maintenance requirements been considered and agreed to with all relevant stakeholders?					
O3.1.2 Does the design include vandalism deterrents?					
O3.1.3 Can regular maintenance be undertaken efficiently, with minimal impact to transit operations?					

Placemaking	Rating			Comments	Actions
P1 Make transit a community asset					
P1.1 Community and stakeholder requirements					
Have local community and stakeholder needs been considered and understood?					
P1.2 Vibrant people places					
P1.2.1 Do active public spaces contribute to, and integrate with, the transit facility?					
P1.2.2 Does the facility design foster a distinctive identity?					
P1.2.3 Has public art been considered and integrated as part of the built design?					
P2 Seamlessly integrate transit, urban development and the public realm					
P2.1 Integration with context					
Is the facility design appropriate to its local context?					
P2.2 Interconnected streets					
Does the local area support comfortable pedestrian and cyclist access and movement through interconnected blocks and streets?					
P2.3 Support a mix of pedestrian-friendly land uses					
Does the facility design support a wide mix of pedestrian friendly land uses?					

Environment	Rating			Comments	Actions
E1 Minimize negative environmental impacts of transit facilities					
E1.1 Use materials responsibly					
E1.1.1 Have materials been sourced giving due consideration to energy and resource consumption and the producers' working environments?					
E1.1.2 Have materials been selected for durability and ease of maintenance?					
E1.1.3 Has end of life reuse and disposal been considered to minimize waste and allow for positive reuse?					
E1.2 Explore innovative design and construction practices					
Have design innovations been considered to maximize efficiency and minimize any adverse environmental impacts?					
E2 Reduce energy consumption					
E2.1 Energy efficiency					
Does the design exploit opportunities to maximize energy efficiency over the full life of the facility?					
E2.2 Renewable energy opportunities					
Have renewable energy opportunities been considered to reduce energy impacts?					
E3 Design healthy sites					
E3.1 Urban heat islands					
Have measures been included to minimize absorbtion and radiation of solar energy?					
E3.2 Water use and quality					
Has water quality been protected from contamination?					
Have stormwater management techniques been incorporated?					
E3.3 Site ecology					
Have negative impacts on surrounding ecosystems been minimized?					

Accountablilty	Rating			Comments	Actions
A1 Design with whole life costs in mind					
A1.1 Life-cycle costs					
Have all phases of the facility's life been considered?					
A1.2 Efficient built design					
Has the design been optimized to minimize ongoing maintenance and operational costs?					
A1.3 Standardized and modular design elements					
Have standardized and modular elements been considered where appropriate?					
A2 Optimize economic benefits through design					
A2.1 Revenue generating opportunities					
A2.1.1 Does the design provide for effective retail integration without compromise to transit operations?					
A2.1.2 Has advertising space been integrated within the built design to avoid conflict with transit operations?					
A2.2 Integrated mixed-use developments					
A2.2.1 Does the design provide for development opportunities appropriate to context?					
A2.2.2 Does the design allow for effective integration with developments?					
A3 Design responsive and flexible facilities and spaces					
A3.1 Future readiness					
Does the design anticipate the need for future change in either capacity, technology or surrounding land use?					

4.3 Glossary

A

Adaptability – the ability to be flexible in terms of adapting to the needs and functions of the future

Albedo – the reflective power of a surface

Amenity – features that enhance passenger comfort, convenience and pleasure and that help instil passenger confidence

B

Bicycle – a human-powered vehicle having any number of wheels on which a person may ride, including motor-assisted bicycles but not including skateboards, roller skates or in-line skates

BREEAM: Building Research Establishment Environmental Assessment Method – an internationally recognized green building certification program used to verify the sustainable development qualities of buildings

BRT: Bus Rapid Transit – driver-operated bus technology with unique branding that provides faster, more frequent and more reliable service than conventional bus service that uses dedicated lanes

C

CCTV: Closed Circuit Television – a system of connected video cameras, usually used for security purposes, that relay images to a specific location

CPTED: Crime Prevention Through Environmental Design – a multi-disciplinary approach to deterring criminal behaviour through design; CPTED strategies rely upon the ability, primarily through changes to the built environment, to influence offender decisions that precede criminal acts

D

Desire Lines – the routes that pedestrians favour in getting from point A to point B; usually the most direct route that often cuts across informal spaces, including plazas, fields, parks, parking lots and open spaces, as well as across streets (at points without crossings) and through private developments

E

Exchange – a transit passenger facility serviced by more than one mode of transit, more than one rail-based transit route, or a significant number of bus-based transit routes where transit passengers use the facility to transfer from one route to another

G

Green Roof – a method of roofing involving the planting of vegetation on the roof surface to provide reduction of urban heat island effect, excellent insulation, habitat for birds and insects and capture and filtration of stormwater

I

IDP: **Integrated Design Process** – a collaborative, multi-disciplinary process that engages design professionals, key stakeholders and the public – from conception to completion – and involves developing collective goals and objectives that will meet the design outcomes

L

LEED: Leadership in Energy and Environmental Design – an internationally recognized green building certification program used to verify the sustainable development qualities of buildings

Legibility – the characteristics of a space (indoor or outdoor) that support personal orientation, enabling an individual to navigate the space intuitively to reach their destination without the need for excessive directional signage

Life-Cycle Cost – the total cost of a piece of infrastructure that takes into account all costs of acquiring, owning, maintaining and disposing of a building or a building system

LRT: Light Rail Transit – driver-operated, electrically-powered, urban rail technology – primarily at-grade and within a dedicated right-of-way – that provides interurban services using unique vehicle and station design to integrate into communities

M

Massing – the external size and proportions of building form

N

NPV: Net Present Value – the excess or shortfall of cash flows (present value) once financing charges are met

P

Paratransit – individualized transit service with no fixed route, usually provided for passengers with mobility impairments; HandyDART is TransLink's paratransit service

Pedestrian – any individual that moves by human-powered means, including an individual using a human-powered vehicle that is not a bicycle (e.g., skateboard, in-line skates) or a wheelchair

People on foot – all individuals using only their bodies for movement, including those with mobility aids, such as walkers, wheelchairs and mobility scooters

Public Realm – publicly accessible external space, including streets, squares and parks as well as the space between and around buildings

S

Safety – the condition of being protected against any type of non-criminal harm

Security – the degree of protection against potential criminal activity

Station – broadly defined as passenger facilities serving high-capacity and rapid transit services, including SkyTrain, West Coast Express, SeaBus, future Bus Rapid Transit and light rail

Stop – a transit passenger facility serviced by bus-based transit

Streetcar – a variant of light rail transit, the key difference being that it runs in mixed traffic or segregated right-of-way, providing a local service with more frequent stop spacings

Systematized – to arrange in accordance with a definitive plan; in this document, the Guidelines have been arranged to function as a whole and to fit into the Integrated Design Process

T

TOC: Transit-Oriented Communities – places that, by their design, allow people to drive less and walk more; in practice, TOC means concentrating higher-density, mixed-use, human scale development around frequent transit stops and stations, in combination with mobility management measures to discourage unnecessary driving

Transit Passenger Facility – any component of the transit network whose main function is to interface with passengers and provide them with access to the transit network; stops, stations and exchanges are the three main types of transit passenger facilities

Transit Passenger Vehicle – a shared passenger transportation vehicle that is part of a service intended for use by the general public; for the purpose of this document, "transit passenger vehicle" refers to vehicles that operate as part of TransLink's public transit network and includes buses, trains and ferries

Transit Priority – an infrastructure measure that gives transit vehicles priority over other road users to improve the speed, efficiency and reliability of the service

Transit Service Vehicle – any vehicle used for maintenance and servicing of the public transit network, as well as vehicles used for transit supervisors, security staff and police

U

Urban Heat Island – the localized climate effect whereby an urban area experiences higher air temperatures than adjacent rural areas, largely due to the proliferation of more light absorbent surfaces (e.g., dark roof materials, asphalt), vehicle and industrial emissions, increased stormwater runoff and waste heat from energy sources

W

Wayfinding – the way in which people orient themselves and navigate their movements from place to place; the design, coordination, location of information (e.g., signs, maps, diagrams) and architectural and interior design serve to aid wayfinding and help travelers plan and execute their journeys

Whole Life Costs – see Life-Cycle Cost

4.4 Index

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4.5 References

TransLink Reference Documents

Bicycle Infrastructure Design Guidelines (DRAFT). (2010)

Mission, Vision and Values.
www.translink.ca/en/About-TransLink/Corporate-Overview/Vision-Mission-and-Values.aspx

Principles for Public Consultation and Community Engagement.
www.translink.ca/en/Be-Part-of-the-Plan/Public-Consultation/Principles-for-Public-Consultation.aspx

Sustainability Policy. (2009)

Sustainability Report. (2010)

Transit Infrastructure Design Guidelines. (2002)

Transit Service Guidelines. (2004)

Transport 2040. (2008)

Universal Accessibility Guidelines for TransLink Fleet & Facilities. (2007)

Universally Accessible Bus Stop Design Guidelines. (2007)

Wayfinding Standards Manual. (2010)

Other Reference documents

American Public Transportation Association (APTA).
DRAFT Transit Sustainability Guidelines. (2010)

ANSI/ASHRAE/USGBC/IES. Standard 189.1: Standard for the Design of High-Performance Green Buildings. (2009)

ASHRAE. ASH-118-09: Energy Efficiency Guide for Existing Commercial Buildings. (2009)

ASHRAE/IESNA. 90.1: Energy Standard for Buildings Except Low-Rise Residential Buildings. (2007)

BC Green Building Roundtable. Roadmap for the Integrated Design Process. (2007)
www.metrovancouver.org/buildsmart/design/Pages/Integrateddesignprocess.aspx

BC Hydro. Net Metering Program (<50 kW).
www.bchydro.com/planning_regulatory/acquiring_power/net_metering.html

BC Hydro. PowerSmart.
www.bchydro.com/powersmart/other_programs.html

BC Hydro. Standing Offer Program (50kw-10mW).
www.bchydro.com/planning_regulatory/acquiring_
power/standing_offer_program.html

Cascadia Green Building Council. Living Building Challenge 2.0. (2010)

Central City Concern. Achieving Water Independence in Buildings. (2009)

City of Vancouver. Public Art Guidelines and Policies.
www.vancouver.ca/commsvcs/cultural/publicart/policies.htm

CMBC. Properties Jurisdiction and Responsibilities Guide.

CSA International. CSA S478-95 Guideline on Durability in Buildings. (2007)

Design Centre for CPTED Vancouver. Design Guidelines. (2010)

Fruin, J. Pedestrian and Planning Design: Revised Edition. (1987)

Illuminating Engineering Society of North America (IESNA).
Lighting Handbook: Reference and Application. (2010)

London Underground. Station Planning Standards and Guidelines. (2007)

National Institute of Building Sciences. Whole Building Design Guide.
www.wbdg.org

Project for Public Spaces. Placemaking for Communities.
www.pps.org.

Rapid Transit Project 2000. SkyTrain RTP 2000 Design Manual. (2006)

Royal Canadian Mounted Police (RCMP). Creating Safer Communities. (1998)

Sustainable Sites Initiative. Guidelines and Performance Benchmarks. (2009)

Transportation Research Board. Highway Capacity Manual. (2000)

Transport for London, INterchange Best Practice Guidelines (2009)
www.tfl.gov.uk/interchange

UK Government. The Green Guide 5th Edition. (2008)

US Government. ADA Standards for Accessible Design. (2010)

US Green Building Council. LEED for New Construction. (2009)

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Michael J. Shiffer, VP Planning, Strategy and Technology, TransLink

Sany Zein, Director, Roads Department, TransLink

Brian Mills, Director, Service and Infrastructure Planning, TransLink

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Mark Johnston, Director, Infrastructure, Engineering and Environment, Coast Mountain Bus Company

Martin Lay, Director, Contracted Transit Services, Coast Mountain Bus Company

Greg Blasco, Director of Operations and Maintenance, West Coast Express

Design Guidelines Team:

Moreno Rossi, Program Manager, Infrastructure Planning, TransLink

Joanne Proft, Project Manager, Infrastructure Planning, TransLink

Rachel Jamieson, Senior Transportation Engineer, TransLink

Andrew Curran, Senior Planner, TransLink

Jeff Deby, Project Planner, TransLink

Design Guidelines Review:

Angela Otto, Manager, Enterprise Marketing, TransLink

Ed Harrington, Plant Supervisor, BC Rapid Transit Company

Harjit Sidhu-Kambo, Manager, Transit Engineering, Coast Mountain Bus Company

Helmina Kim, Architectural Design Consultant, TransLink

Jim Dawe, Manager, Transition and Quality Assurance, TransLink

Justin Pedley, Program Manager, Engineering and Implementation, TransLink

Liz Watts, Urban Design Planner, TransLink

Lyle Walker, Transportation Planner, Strategic Planning, TransLink

Marco Bonaventura, Project Manager, TransLink

Matt Craig, Senior Transportation Planner, TransLink

Mike Fitzsimmons, Manager, Real Estate, TransLink

Norm Langerhorst, Manager, Wayside Maintenance, BC Rapid Transit Company

Peter Hill, Manager, Access Transit, TransLink

Consultant Team:

Steer Davies Gleave

Busby Perkins + Will

Gehl Architects

Nelson Nygaard

Total Lighting Solutions

Cole Projects

AECOM

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Jason Bruges Studio 77

Karl Fjelstrom 66

Jeff MacDonald 28, 117

Jeffrey Totaro 116

Barry Halkin 117

Enquiries pertaining to this document can be directed to:

TransLink Infrastructure Planning:

1600 – 4720 Kingsway, Burnaby, BC V5H 4N2

t. 604-453-4500

translink.ca