Transit Design Guide

Bus Terminals

Figure 1: High-quality bus terminal design at Pioneer Village station, Toronto (Photo Credit: Wade Zimmerman, Azure Magazine)

City of Toronto

Transit Design Guide

Acknowledgements:

Access Planning

Perkins&Will

1.0 INTRODUCTION

1.1 Definition

Bus terminals are a foundational element of the transit system that must be designed to recognize both their critical importance to the transportation network and transit connectivity as well as the value that they create as vital urban places. Bus terminals are more than a terminus for bus routes.

First and foremost, they are places of passenger exchange where transit riders seamlessly move through the system connecting between buses, rapid transit, and surrounding destinations. They are critical to the operations of a high-capacity bus network, as well as the entire rapid transit system, by providing buses with a location to take recovery time for schedule adherence and operator breaks. Further to this, they are important access and egress points to the transit network where pedestrian and cyclist access is particularly important.

Bus terminals are also hubs that anchor placemaking and activity. The Official Plan speaks to the importance of using transit investment to “enhance and extend the public realm, create civic destinations and facilitate the creation of complete communities”. Furthermore, Ontario’s planning framework is increasingly requiring intensification around transit stations including through integrated development. In Toronto, bus terminals generally refer to off-street facilities that are integrated into rapid transit stations. The TTC was a North American pioneer in the design of fully integrated bus and subway systems. This principle played an important role in the ridership success of the transit system and remains a key guiding design direction. Bus terminals may also take different forms than their most common off-street manifestation at transit stations. For the purposes of this guide, bus terminal guidance may also apply to major on-street transfer points at rapid transit stations, stand-alone, off-street bus terminals and bus loops.

Stand-alone terminals are typically rare within Toronto and generally occur at major destinations which are geographically far from the existing rapid transit system, such as Humber College or the University of Toronto Scarborough. On-street transfers to rapid transit stations are common throughout the existing and planned network and can be found at many

Toronto Examples.

Victoria Park: Single direction bus loop allowing Housing Now development

Figure 2: Victoria Park Bus Loop, Toronto (Photo Credit: Wikipedia)

Figure 3: Victoria Park Bus Loop, Toronto (Photo Credit: Google Maps)

York Mills: Overbuild with operational limits

Figure 4: York Mills Station Bus Loop, Toronto (Photo Credit: Marcus Bowman)

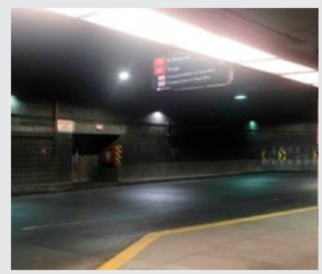

Figure 5: York Mills Station Bus Loop, Toronto (Photo Credit: Marcus Bowman)

Science Centre: Shifting bus terminal to accommodate development block

Figure 6: Science Centre Station, Toronto (Photo Credit: Metrolinx)

Figure 7: Science Centre Station, Toronto (Photo Credit: Metrolinx)

Imperatives for New Approaches:

- Provincial TOC Program and MTSA Designation
- Rapid Transit Expansion
- Housing Crisis
- Rising Land Values
- New Technologies and Policies
- Customer Amenities

stations on the future Line 5. These are found primarily at places where rapid transit connections occur mid-route on a frequent bus line. End of route terminus points typically occur at the municipal boundary where TTC service ends and may connect to a neighbouring municipal transit operators. The primary function of these sites is to accommodate bus layover and schedule recovery time.

The guidance in this document is specific to bus terminals and are distinct from on-street stops which constitute a separate transit element with a unique set of design requirements[1].

The core components of bus terminal function relevant to this guide include:

- **Bus Bays and Platforms:** Designated stopping locations for buses to accommodate pick-up and drop-off functions, typically signed for specific routes through static or variable signage. May be arranged in a saw-tooth, linear or drive-through configuration to allow efficient ingress and egress of vehicles.
- **Ingress & Egress Points:** Access points for buses between the bus terminal and the public right of way, typically crossing the sidewalk and curb bike lane (where existing).
- **Building Envelope:** Terminal station buildings including footprint on the site plan and massing.
- **Pedestrian Crossings:** Designated places for interaction with pedestrians and buses.
- **Layover Space:** Spaces for buses to take scheduled recovery time or to park while out of revenue service, may be separate from or combined with the pick-up/drop-off bay.
- **Operator Facilities:** Washrooms and break space for bus operators during layovers.
- **Vertical Circulation:** Stairs, escalators and elevators providing connections between the bus terminal and concourse levels connecting to other parts of the transit station and surrounding areas.
- **Urban Edges:** The interface between the perimeter of the bus terminal and the urban realm.

The supportive components of bus terminal function relevant to this guide include:

- **Transit Priority Measures:** Infrastructure and Intelligent Transportation Systems (ITS) measures to improve the reliability of travel time for buses in the immediate vicinity of the terminal such as slip lanes or transit signal priority.
- **Future-Ready Utilities:** Provisions for future systems such as dynamic signage and electrification infrastructure for buses and other modes.
- **Active Transportation Integration:** Interface between bus terminal and active modes such as walking and cycling and their associated infrastructure.
- **Climate Resilience Measures:** Measures to mitigate the impacts of extreme weather events such as stormwater management and heat resistance.

The TOD components of bus terminal function relevant to this guide include:

- **Overbuild Protections:** Structural accommodations necessary for future overbuild including support columns.
- **Adjacent Development Parcels:** Areas of land protected in bus terminal planning for future development opportunities with necessary frontages and access opportunities to make development viable.

1 Where terminal functions are occurring on-street at rapid transit stations, this guidance should be read in conjunction with the forthcoming guidance for On-Street Stops. This guidance focuses on the terminal and transfer functions of an on-street facility. The On-Street Stop guidance provides direction on the standard elements of the bus stop such as interaction with the sidewalk, canopies, etc.

1.2 Areas of Influence

The Zones of influence allow for the bus terminal guidance to be applied in a way that respects agency jurisdiction while recognizing the need to coordinate overlapping objectives and manage/mitigate impacts. The internal design and operation of the bus terminal itself, particularly in off-street situations, is recognized as being with the jurisdiction of the TTC (or other relevant transit operator). Considerations such as network design, layover function, scheduling and stop assignment are core areas of transit authority jurisdiction. Design considerations in this guidance pertaining to this Zone 3 are therefore limited to how it interacts with and influences the other zones.

The size and footprint of the terminal itself inside Zone 3, as well as its access points, have profound implications for other areas outside of the bus operator's jurisdiction. Furthermore, the surrounding urban context has important implications for transit operations. The immediate surrounding transportation network accommodates bus access to the terminal, while plazas or other public realm provide pedestrian and cyclist access to the transit station. Integrated and surrounding development also helps to increase transit mode share and may provide important amenities to transit users that enhance the customer experience and attractiveness of transit.

Figure 8: Illustration depicting how the Zones of Influence apply to bus terminals

In the context of Bus Terminals, the Zones of influence can be defined as follows:

Zone 1 Urban Context Connections: Includes the lands surrounding the bus terminal and all the immediate public rights of way used to access it. This includes transit priority measures at surrounding intersections and the structure of urban street grid supporting bus circulation. All parties in bus terminal design and planning have interests and roles in this zone. For example, operators have a critical interest in adjacent signalized intersections and access routes to the terminal. It encompasses the remaining footprint of the facility outside of the other zones as well as any immediately adjacent development parcels or public spaces that are impacted by the design of the Bus terminal whether as adjacent development or overbuild. It also encompasses pedestrian and active transportation connections to the site such as sidewalks and bike lanes. This Zone incorporates adjacent development TOD opportunities as well as site access and servicing for integrated development.

Zone 2 Buildings and Access Points: Includes the interface between the public realm and the transit station. This includes the immediate urban integration of the station access buildings as well as the public space between the terminal entrances and the main right of way. It also addresses the urban edges of the bus terminals including areas of fencing and landscaping. This includes pedestrian permeability and recognition of desire lines for pedestrian paths. Importantly, it also includes the points of interaction between pedestrians and buses at site access points, including transit priority measures used to access the bus terminal entry and egress points. This zone may include integrated TOD opportunities.

Zone 3 Core Transit Facilities: Includes the core area of the bus terminal and is largely within the jurisdiction of the transit agency. The Guide's influence on this zone focuses on how it impacts and interacts with other zones and considerations. This includes the siting, orientation, and overall footprint of the facility, and access points. Zone 3 will be the most clearly defined in off-street terminals. At locations where on-street terminals are connecting to rapid transit, this zone may be smaller or less clearly defined. TOD considerations in this zone includes integrated development such as structural elements for overbuild and circulation connections such as elevators and knock-out panels.

1.3 Applications of Bus Terminals

The application of bus terminal design is derived both from its role in the transit network and its immediate urban context. As such, two groupings of applications have been developed to help understand bus terminals and provide more nuanced guidance to their context. The applications may not be mutually exclusive.

Service and Form Applications

Applications based on service and form describe the key ways that bus terminals are influenced by their network role. This includes the number of routes being served, the distances riders are travelling to reach stations and the layover and recovery function being accommodated within the terminal.

Figure 9: Bus Network configured to provide heavy service to the current subway terminus at Finch Station, Toronto (Photo Credit: TTC, Wiki Commons)

Figure 10: Local transit hub, Rosedale Station, Toronto (Photo Credit: TTC, Wiki Commons)

Major Bus Terminals

This application refers to major bus terminals that must accommodate many different routes, and large volumes of vehicles. Often, such facilities are located at rapid transit stations with large catchment areas served by an extensive bus network.

Local Hub

This application refers to smaller bus terminals that serve primarily local routes. These hubs may also serve arterial routes, providing important connections to rapid transit. This typology may be combined with On-Street Transfers for express or arterial routes.

Service and Form Applications (cont.)

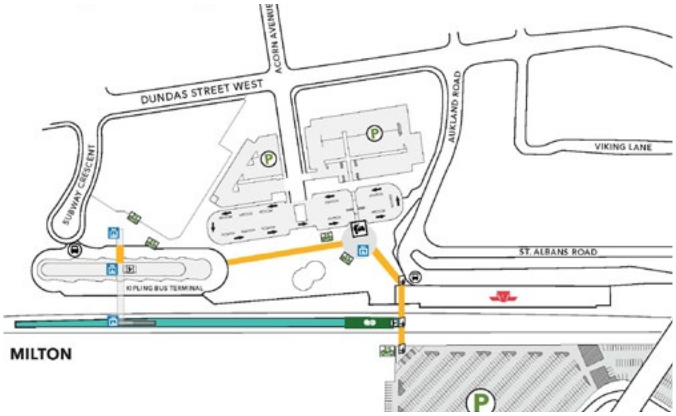

Figure 11: Kipling Station (Photo Credit: Metrolinx)

Multi-Agency

This application refers to terminals that accommodate multiple transit agencies. This typically occurs near the municipal boundary or at hubs also served by regional and intercity buses. Design processes at such terminals may experience increased demand for the duplication of components from each operator potentially requiring deliberate processes to seek shared facilities and operational arrangements.

Figure 13: Integrated facility, UBC Exchange (Photo Credit: Marcus Bowman)

Integrated Facility

This application refers to bus terminals that are fully integrated into a larger facility that includes uses other than transit. This may include either large mixed-use developments or public facilities. Public facilities may include civic or educational uses such as libraries, educational buildings or municipal offices. Bus facilities may be fully or partially integrated within the facility, typically at- or below-grade.

Figure 12: On-street transfer at Dufferin Station (Photo Credit: Wiki Commons)

On-Street Transfer[1]

This application refers to bus terminals where transit routes stop on-street outside of a rapid transit station. Although similar to on-street stops, these locations involve a higher ridership and multimodal considerations. On-street transfers may also accommodate other bus terminal functions such as recovery time and layover functions. Bus routes are typically through routed high-frequency services. This typology may be combined with an off-street local hub.

1 On-street transfers are distinct from Bus terminals, application of this guidance to these facilities should be read in conjunction with forthcoming guidance for on-street stops.

Situational Applications

Applications of situation describe important context of the immediate surrounding area that impact the design of the facility. Bus terminals have a fundamental connection to their surrounding urban environment which must be included throughout the design process, the applications described below represent some key drivers of design influence and are not exclusive of all considerations.

Figure 14: TOD Program at Exhibition Station, Toronto (Photo Credit: Infrastructure Ontario)

Figure 15: Bus terminal siting for future redevelopment in the Mount Dennis Mobility Hub Study (Photo Credit: Metrolinx)

Emerging TOD

This situational application refers to areas that have been identified as major sites of transformation and intensification through Transit Oriented Development. These sites are characterized by the need for highly coordinated transit infrastructure and land development planning. Transit footprints must be carefully designed to both provide the space and interfaces needed for highly connected development while also providing capacity for high ridership and connectivity.

Figure 16: Hydro Corridor condition at Kipling Station (Photo Credit: Wiki Commons)

Within Utility Corridors

This application refers to bus terminals that are situated in areas defined by other infrastructure or utilities that constrain uses. This may include adjacency to major highways or locations within major utility corridors such as pipelines or high-voltage power lines.

Temporary Terminus

This application refers to conditions where a major rapid transit terminus is considered to be temporary subject to a planned future extension of the transit line. The significant requirements of the transit terminus typology are only required for a definitive period after which the site will have more capacity for placemaking functions. The length of time that a site may serve as a terminus can vary significantly based on the planning and funding status of any future rapid transit extension. Experience in Toronto has demonstrated that even following a rapid transit extension, such terminals remain bus transfer points where substantial bus volumes are accommodated.

1.4 Typical Project Delivery

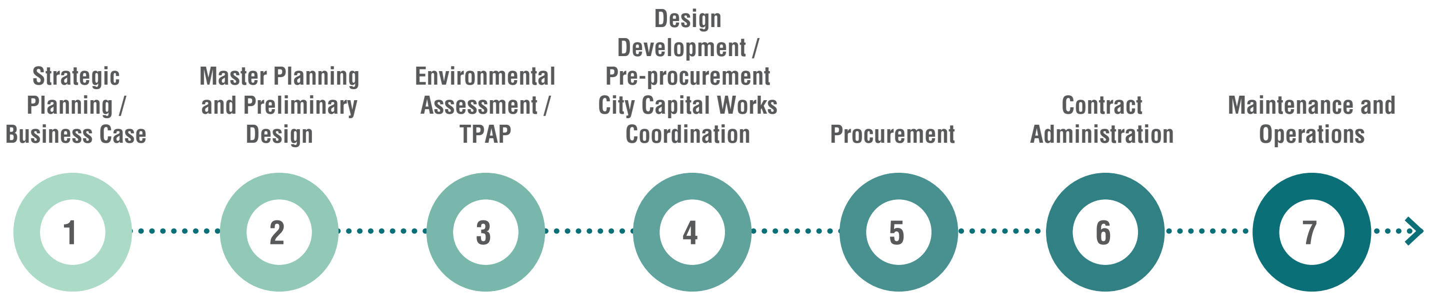

Figure 17: The typical delivery process for transit infrastructure

At the **Strategic Planning and Business Case Stage**, work should be undertaken to begin identifying typologies and the role of the bus network in supporting a rapid transit project. This may include understanding the importance of connecting bus transfers to driving ridership and other benefits as well as identifying the key area(s) of interaction between the project and the overall bus network.

At the **Master Planning and Preliminary Design Stage**, work should focus on refining and confirming the typological and network role of Bus Terminal sites and incorporating these with other city-building objectives. This includes understanding which sites will be the focus of integrated development opportunities as well as the type of development anticipated. Identifying the shared objectives of sites early enough in the process will allow for integration with master planning and for transit operators to properly understand potential implications for network design. This stage should also identify the major goals of adjacent site circulation, including connections to area master-planning work, potential transportation network modifications and servicing requirements. At this stage, operational needs from transit operators including TTC should be identified along with where specific design interventions may be required. Undertaking substantial work in this area early in the process will allow for well-informed inputs to reference concept and detailed designs.

In the **Design Development / Pre-Procurement, City Capital Works Coordination Stage**, work should focus on translating the master planning and site work into specific reference concept designs and requirements. Drawing on previous work identifying requirements of shared interest is important under tight timelines during a procurement process. Design needs from all collaborators can be adapted to the site-specific context and balanced with shared objectives through a design process that accommodates urban integration, site circulation and optimal transit operations.

Collaborative Design Process

Inter-agency planning processes are constructive and lead to outcomes acceptable to participants when they are structured and managed to identify and involve stakeholders from an early stage, when stakeholders understand basic elements of the process such as timelines, constraints and limitations, requirements, and anticipated outcomes. Bringing together the objectives of all project partners and realizing the principles of the Guide and other existing guidance requires a collaborative process that begins early with a common understanding of shared objectives and outcomes for the site. These shared objectives can then be translated into specific operational and design needs to meet overall objectives.

Unconstrained cumulative requirements can result in negative impacts to the urban environment and make other objectives such as TOD, unviable. Recognizing this, trade-offs in program and design must be identified to meet the most important operational requirements of specific interest and objectives, supported by analysis to demonstrate the site function. Through the design process, site requirements and needs can be adapted to the specific context of a site in question with regard for constraints including the overall project budgets and value of land.

A design process that is collaborative and iterative can incorporate and balance objectives. Specific testing and proof of concept development can be used to assure all parties that requirements are being satisfied. Outputs of the design process provide the specifications necessary for project delivery and to support design review meetings with delivery proponents. An indicative design process is mapped below.

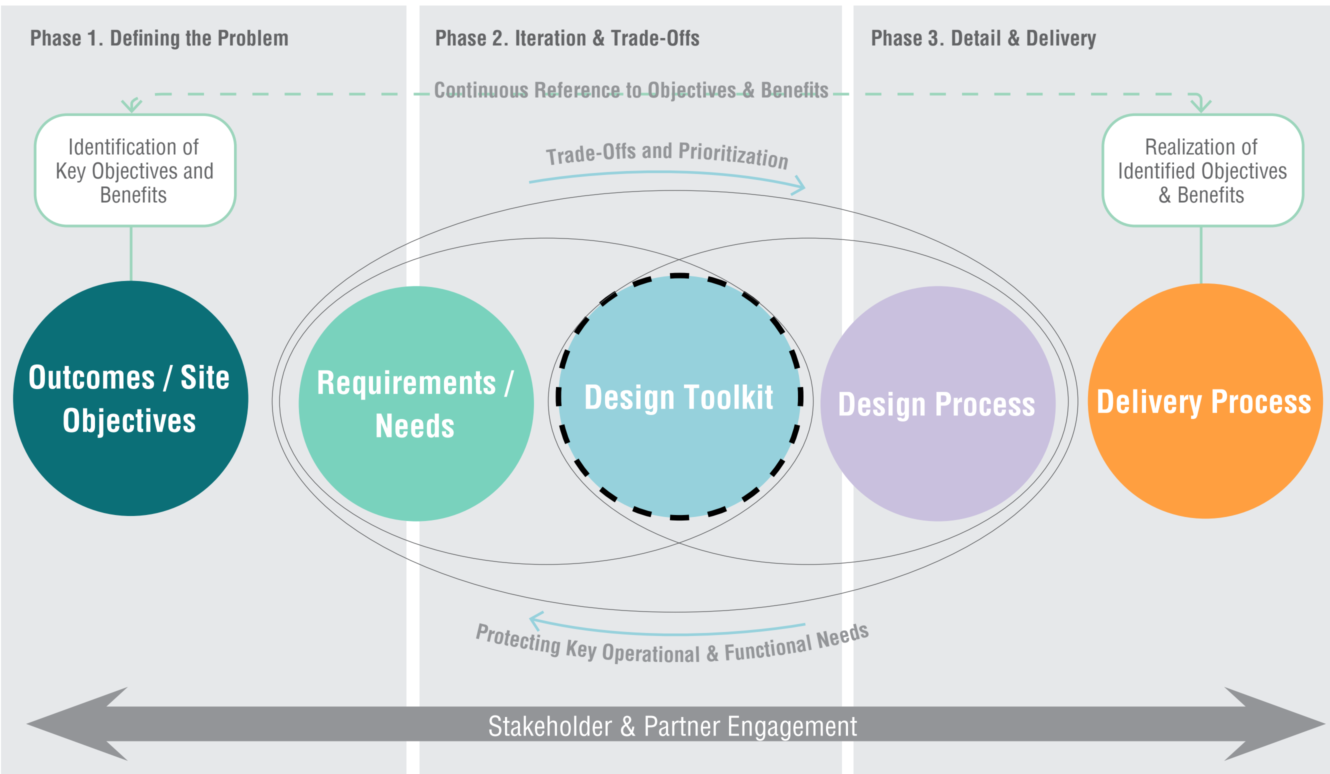

Figure 18: Representation of an iterative design process

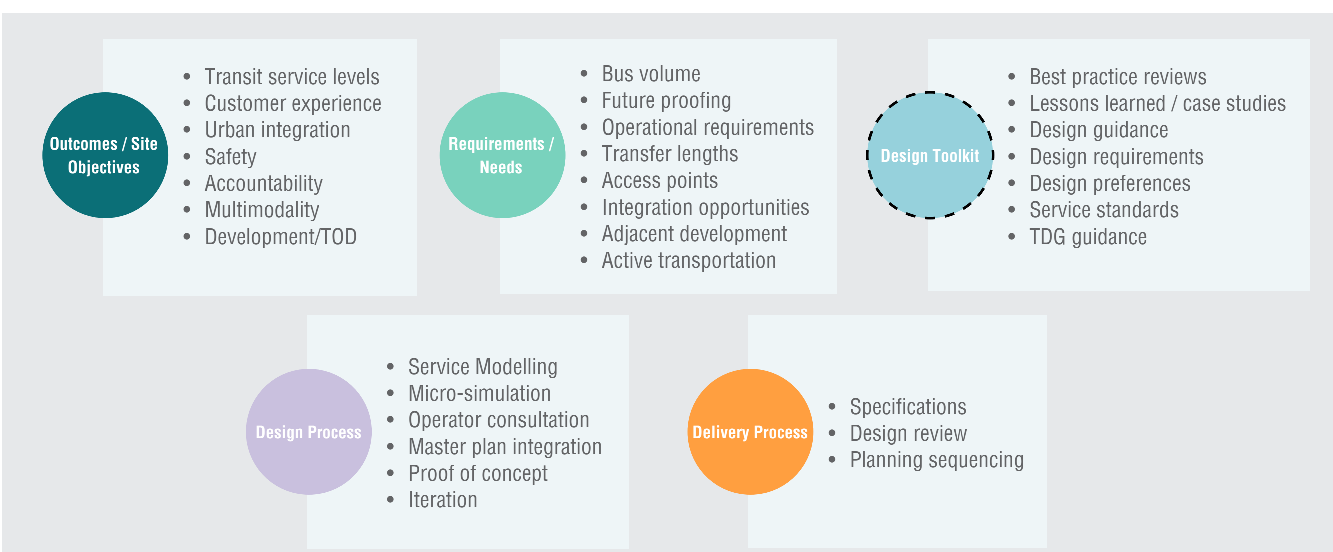

Figure 19: Details of each step of the iterative design process

2.0 EXISTING GUIDANCE

Guidance for bus terminals has largely been provided by the TTC and Metrolinx, together with general City policies, guidelines and standards for built form and public realm. Bus terminal guidance currently focuses on the geometric designs of facilities with a strong focus on operational requirements. Specifications are provided by the TTC and Metrolinx for elements like lay-bys, platforms, and driver rest facilities as well as service standards. The Guide addresses gaps in existing guidance for incorporating these operationally focused technical requirements into broader City objectives, particularly around urban integration.

The following is a non-exhaustive, illustrative list of existing guidance and requirements that should be read together with this Guide.

- **TTC Design Manual:** The TTC maintains a comprehensive Design Manual that provides specifications for design elements like bus platform size, station orientation, and includes facilities designed to meet forecasted operational needs for a terminal. This document also includes facility requirements to meet operational needs.
- **TTC Service Standards:** Updated periodically, the TTC publishes specific standards for its network design and service delivery. This public document includes reliability metrics, performance targets and weighted travel times for the components of a transit trip.
- **Metrolinx Design Requirements Manual:** Metrolinx provides a comprehensive Design Requirements Manual that specifies the design of bus terminals oriented to the current suburban GO Bus network.
- **Mobility Hub Guidelines:** Metrolinx also maintains Mobility Hub Guidelines that speak to broader site planning coordination, of which bus terminals are a part.

3.0 OBJECTIVES

Bus terminals serve an important connectivity and exchange function within the larger transit system. As land intensive facilities, they should integrate with the existing and planned urban context and take advantage of the physical infrastructure to create a sense of place within the public realm.

Urban Integration

Bus terminals should be planned and designed to enable future development and public infrastructure that is integrated with, or physically connected above and/or adjacent to the station infrastructure. Importantly, the siting, massing and design of bus terminals should allow for optimization of future overbuild, secondary transit entrances and/or active TOD frontages.

User Experience

They should maintain, enhance and/or establish new opportunities for safe, accessible and direct access for all modes of active transport to the surrounding public realm rather than create barriers within a community. They should also provide efficient and convenient connections to other transit services.

Sustainability & Resilience

They should be sustainably designed with low-carbon materials, optimal use of green infrastructure and increased resilient to climate change.

Intermodal Operations

From a transportation operations perspective, the design of bus terminals must provide good access to the surrounding street network and minimize weather impacts to offer a good level of uninterrupted, reliable service, and ensure safety for both vehicles and passengers and users around the bus terminal.

Accountability

Bus terminal design should consider the entire lifecycle, using materials and construction methods that account for whole life cost, and foresee the need to accommodate new transit lines, improved service, changes in capacity and new technology.

4.0 DESIGN GUIDANCE

Urban Integration

4.1 Urban Integration

1. Maximize opportunities for continuous active street frontages and avoid blank walls or fences along public streets.
2. Minimize the street frontage of bus terminal and operational functions while maintaining access to the site for pedestrians and bus terminal users.
3. Identify opportunities to wrap operational structures such as operator break rooms with active frontages. Such operational structures may also be located away from exterior walls and as close to bus bays and layover spaces as possible.
4. Recognize the intrinsic connection of the local street grid to the operation of the bus terminal by designing the street grid surrounding the bus terminal to:
    a. Provide options for direct access routes to the bus terminal that provide efficient bus travel times and network redundancies.
    b. Design access roads and impacted road right-of-way elements to support future multi-modal mobility and community intensification under a Complete Streets lens
    c. Support complimentary development and TOD opportunities
    d. Provide multiple access routes to the bus terminal entrance using the urban street grid to allow for spreading bus volumes to different streets, reducing bottlenecks and pedestrian conflict points where possible.
    e. Assess the need to accommodate 180 degree turning movements and associated large curb radii within the bus terminal and minimise where feasible by providing efficient on-street options for turning movements, phased with the realization of a necessarily supportive street grid.
    f. Allow for single direction of travel within the bus terminal site by providing efficient access and egress routes in all directions from consolidated set of bus terminal driveways.
5. Consider bus terminal design that supports a regular and urban street grid.
6. Assess the number and location of bus driveways along the street to balance pedestrian and bus movement objectives, including redundancy.
7. Enable flexibility to use on-street pick-up/drop-off and layover as part of the bus terminal operation where feasible for operations.
8. Consider bus circulation routing as part of road network designs through area plans and studies.
9. Recognize the need to accommodate scheduled layover and recovery times at terminals sites and incorporate planning for layover spaces into overall site design.
10. Where on-street layover is considered, plan for specific locations and include design features that mitigate the impacts layover and address operational concerns including:
    a. Plantings, screening and setbacks that minimize impacts on adjacent properties and the pedestrian realm
    b. Maintain sightlines and visibility for pedestrians.
    c. Pavement treatments that mitigate the visual impact of oil staining.
    d. Minimize circulation routes to the pick-up/drop-off area.
    e. Reasonable walking distances for vehicles operators to station facilities.

Best Practices
Urban Integration at Bus Terminals

Throughout the world bus terminals are recognized as civic assets that leverage their accessibility to unlock great urban places. In Christchurch, NZ, the new central bus interchange was designed as a civic statement of the City's commitment to rebuilding following a devastating earthquake. At University of British Columbia (UBC), an incredibly busy new bus exchange has been built into a new residence building. On the Canada Line in Vancouver – innovative operational practices allowed a bus terminal footprint that unlocked a massive mixed-use development project. Lastly, at Stratford station in London, a large bus terminal is seamlessly located at the heart of a major crossroads between rail connections, regional shopping, office and residential projects

Figure 20: Prioritizing active urban frontages, Christchurch (Photo Credit: Michal Klajban)

Figure 21: Site permeability and visual cues, London Stratford, UK (Photo Credit: Marcus Bowman)

Figure 22: Integrated terminal overbuild, UBC Exchange, BC (Photo Credit: Translink)

Figure 23: Integrated and adjacent TOD, Cambie/Marine, British Columbia

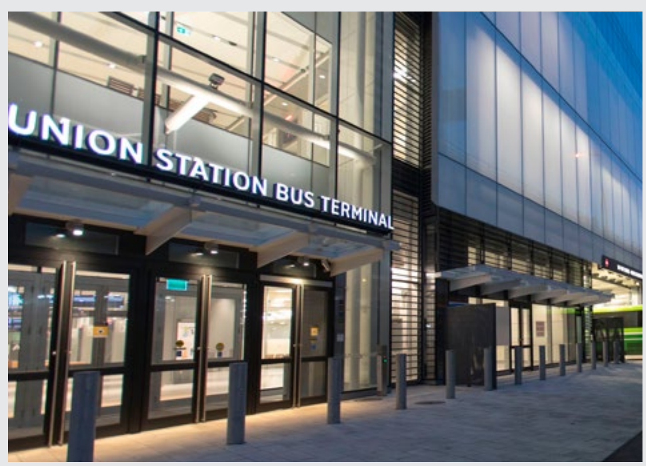

Figure 24: In the middle of Downtown Toronto, the newly opened Union Station Bus Terminal is integrated directly inside the large station building. This location and design help with preserving the urban landscape of the neighbourhood characterized by high-class towers.

11. Optimize the design of the bus terminal as well as the street grid to create feasible development parcels.
12. Plan for appropriate interim conditions on development parcels if development is scheduled to place following project completion such as through low-impact landscaping and preserving site access points.
13. Design terminals with rectangular or regularly shaped footprints and avoid irregularly shaped or remnant parcels. For example, a terminal organized around the perimeter of the site to allow for viable development parcels fronting principal streets.

Best Practice
Supportive Urban Street Grid Surrey Centre, BC

As part of a comprehensive master planning exercise for a major urban node centered around the SkyTrain, TransLink engaged in a process to reconfigure its bus exchange in conjunction with the development of an expanded urban street grid. Operations at the existing bus terminal were constrained by a limited number of access routes with congested intersections. The planning process identified that a new bus exchange could be fully integrated into the urban plan through the creation of new road access points. The new urban street grid was planned to support efficient bus routing to the exchange and the reconfiguration of the exchange was phased to take place in conjunction with the opening of the new supportive streets.

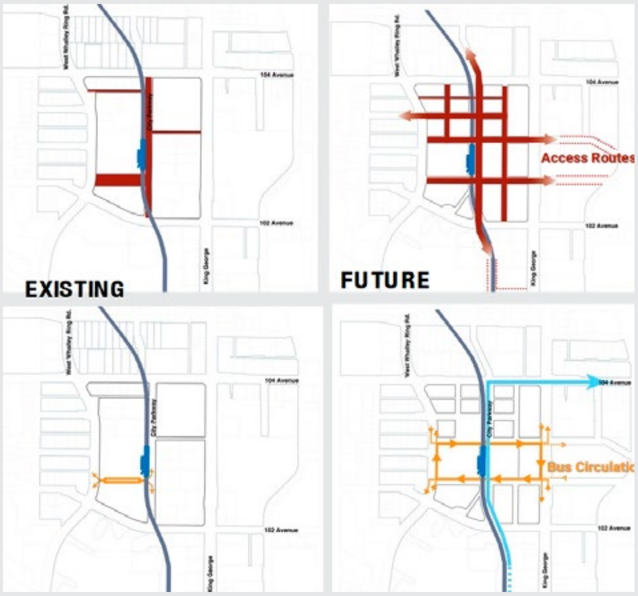

Figure 25: Existing and future configurations of the streets and blocks, to support efficient bus routing

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Figure 26: Bus terminal setbacks to preserve a development parcel on the street frontage, Science Centre Station (Photo Credit: Metrolinx)

Figure 27: Bus terminal configuration around perimeter of site allowing for future redevelopment of commuter parking at 777 Victoria Park Ave. The yellow boundary denotes entire property, not specific to development site (Photo Credit: CreateTO)

14. Position adjacent development parcels to optimize active frontages, such as retail space, fronting onto principal streets.

Encourage

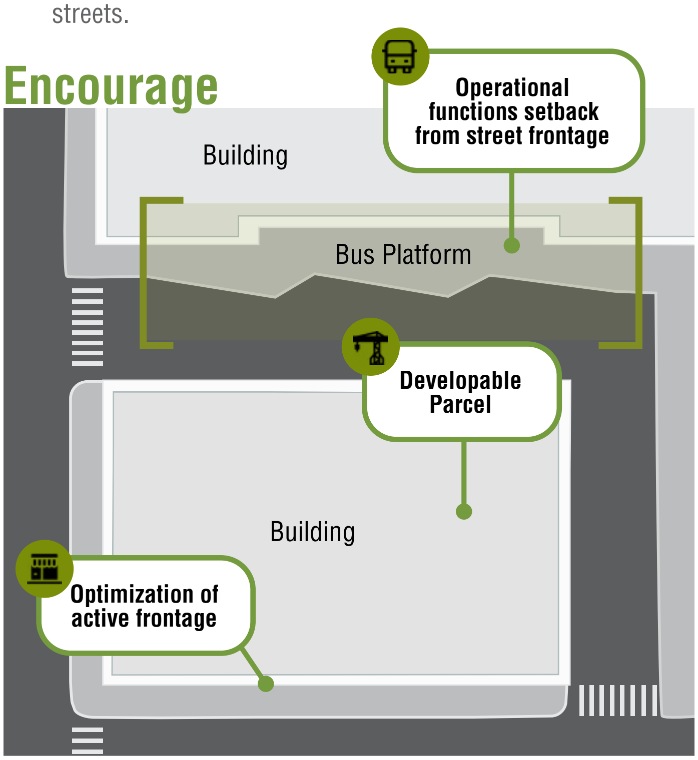

Figure 28: Desirable bus terminal integration that allows for developable parcels on the street

Discourage

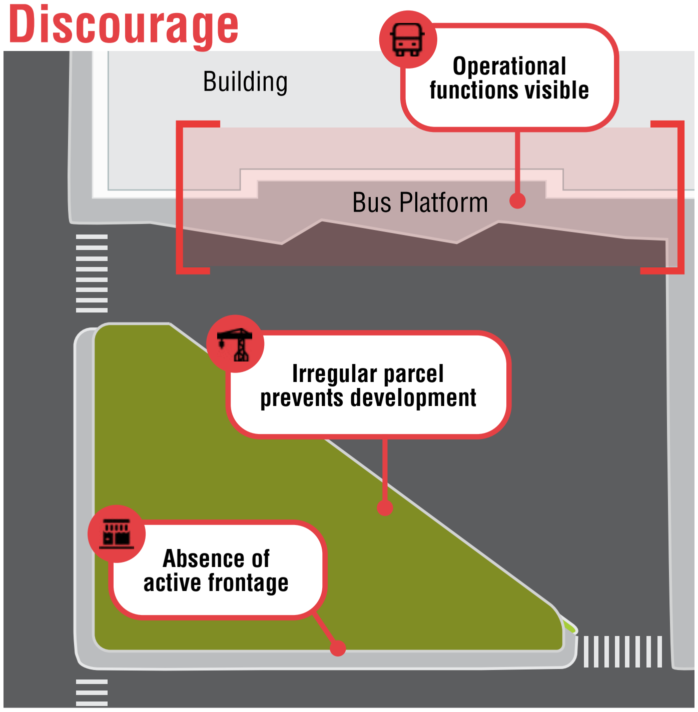

Figure 29: Undesirable bus terminal integration that prevents development on the street front and increases visibility of operational functions

15. Minimize driveways, blank walls and operational areas along street frontages.

16. Provide a clear visual presence for the station pedestrian entrance.

17. Where TOD includes overbuild of the Bus terminal:

    a. Clearly identify objectives of built form characteristics.

    b. Include necessary structural protections during initial design and construction for potential overbuild to reduce disruption once the terminal is operational.

    c. Avoid structural elements that impede visibility for safety, wayfinding, pedestrian and bus circulation and avoid significant column placement on platforms and passenger waiting areas.

    d. Plan ground floor layout elements such as lobbies, elevator cores, loading docks, servicing areas and parking access ramps to promote active street frontages and minimize impacts on the public realm.

    e. Locate overbuild and integrated development above layover functions to maximize daylighting of passenger waiting areas.

18. Preserve seamless pedestrian access between the bus terminal and the street by providing clear through pedestrian access paths.

19. Connect pedestrian circulation networks through integrated development including access to the street and vertical circulation with direct access to the platforms.

20. Prioritize at-grade retail frontages where bus terminals are situated within a continuous at-grade retail context.

21. Provide design treatments along street fronting portions of the bus terminal to mitigate impacts on the street frontage, including public art, landscaping and enhanced fencing where necessary.

22. Seek opportunities to optimize the footprint sharing by facilities such as access points in a way that combines uses while maintaining operational requirements such as TTC standards.

Figure 30: Example of bus terminal overbuild with active street frontage and strong transit visual cues at Production Way - University Station, Burnaby, British Columbia (Photo Credit: LoopNet)

Case Study

Urban Integration Focus Christchurch Bus Interchange, New Zealand

In 2011 a powerful earthquake caused significant damage to the City of Christchurch, New Zealand. A new central bus interchange was used as a catalyst for development and signal of the government's commitment to the downtown area. Urban Integration, including active frontages and development potential were heavily prioritized in the design. This unique development context offers several innovative approaches for a how a bus terminal may optimize its urban integration.

How Urban Frontages Were Achieved:

Active frontages were achieved on two of the four sides (west and north) with the east and south sides enable future integrated development or the expansion of the facility. The L-Shaped concourse provides a "strong urban edge" on the north and west streets, which are the prominent sun-lit aspects for a building in the southern hemisphere. A strong contextual link is created by the materiality and façade articulation along a main arterial, which references the adjacent historic buildings that survived the earthquakes. On Christchurch's main street, a large folding roof shape provides scale and articulation to signal the building's civic function.

With strong visual linkages to both the main street and buses on the interior of the site, the hall provides a point of arrival and departure that looks to celebrate public space and make use of the public transport system an enjoyable experience for all.

*The case study of Christchurch is used here to demonstrate some potential approaches to active street frontages. It is not intended to provided a direct example of how to design a bus terminal in Toronto as it is not consistent with TTC operating practices.

Figure 31: Christchurch frontage (Photo Credit: Christchurch Council)

Figure 32: Christchurch frontage and synergy with bus terminal (Photo Credit: Christchurch Council)

Urban Integration

23. Explore opportunities for signature design elements that can contribute to civic placemaking where appropriate.
24. Seek opportunities to consolidate bus terminal operational buildings, such as operator breakrooms, with other ancillary transit structures, such as transit power substations (TPSS) or emergency exit buildings (EEB) facilities to consolidate facility footprints.
25. Consider desire lines for pedestrian movements within and around the bus terminal site and accommodate the most direct paths in the configuration of the bus terminal.
26. Minimize the inclusion of key circulation paths within the fare-paid area to allow for transit infrastructure to be used by all pedestrians.
27. Allocate space for public realm around bus terminal entrance areas, allowing for:
    a. Animated, active and inviting spaces a focal point of bus terminal activity;
    b. Comfortable resting space for short lingering and informal waiting; and,
    c. Minimized transfer walking distances.

Encourage

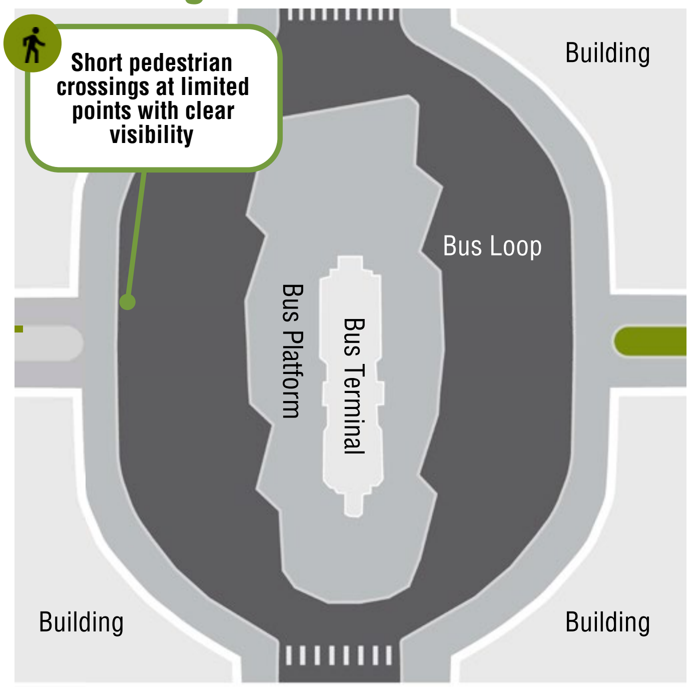

Figure 33: Desirable bus terminal integration with a permeable site design allowing for fluid and safe movement of users

Discourage

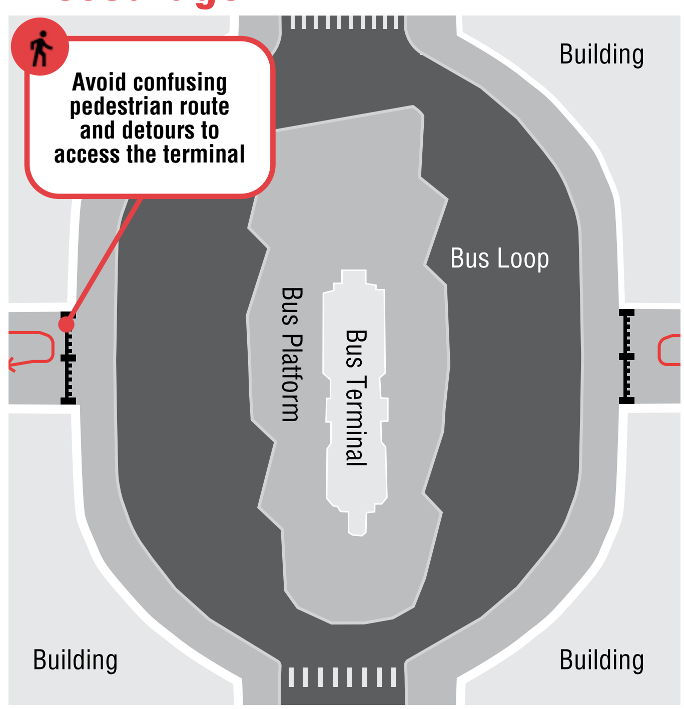

Figure 34: Undesirable bus terminal integration with multiple site barriers preventing easy access to the terminal

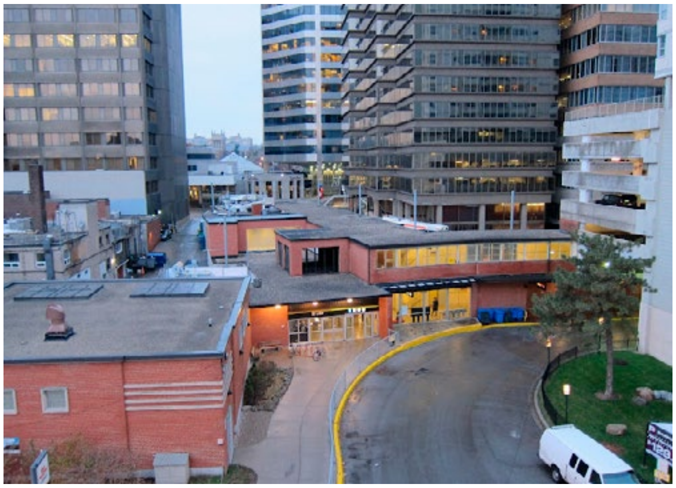

Figure 35: Urban integration at the St Clair Station, with the terminal positioned behind existing development, Toronto (Photo Credit: Station Fixation)

Figure 36: Extended disruptions to the street frontage should be avoided, Sheppard-Yonge Station, Toronto (Photo Credit: Google Maps)

Figure 37: High-quality design in civic placemaking, Chatham Waterfront, UK (Photo Credit: Wiki Commons)

Figure 38: Retail frontages as a design priority at Christchurch Bus Interchange, Christchurch, New Zealand (Photo Credit: Google Maps)

User Experience

4.2 User Experience

1. Consider the use of special pavement treatments and traffic calming measures to demarcate pedestrian crossing and encourage slower driving speeds.
   a. Minimize widths and radii of pedestrian crossing at bus access points.
   b. Use curb bump-outs to reduce pedestrian crossing distances at crosswalks within the terminal and near access points, minimizing pedestrian-bus conflicts.
2. Ensure waiting areas are located in highly visible areas and well-lit.
3. Promote intuitive wayfinding through architectural expression.
4. Balance system-wide branding with materials that respond to the local context.
5. Maintain clear and consistent wayfinding in integrated developments.
6. Provide clear sightlines to transfers to other services and modes.
7. Avoid multi-level terminals, particularly in locations with significant transfer volumes between buses.
8. Avoid changes in grade where possible such as island platforms connected by a concourse level.
9. Minimize walking distance between bus platforms and between rapid transit and the bus terminal.
10. Minimize uncomfortable weather conditions such as wind tunnel effects through orientation, windscreens and management of surrounding building massing.
11. Protect for a high-quality passenger experience in the bus terminal, including in overbuild conditions by considering:
    a. Enclosed passenger waiting areas to provide a greater degree of climate control.
    b. Access to natural light in passenger waiting areas through daylighting or light wells.
    c. Benches and rest opportunities for passengers.
    d. Visually attractive ceiling treatments to delineate customer waiting areas.
    e. Amenities such as bathrooms, vending machines, water bottle filling stations, trash receptacles
12. Provide comfortable, weather-protected paths between transfer facilities.
13. Ensure consistent application of weather protection that continues through customer journey.
14. Provide redundancy in vertical circulation elements to ensure accessibility.
15. Minimize the travel distances between the bus terminal and street
16. Provide direct access to bus platforms from street and station building without vertical circulation where possible.

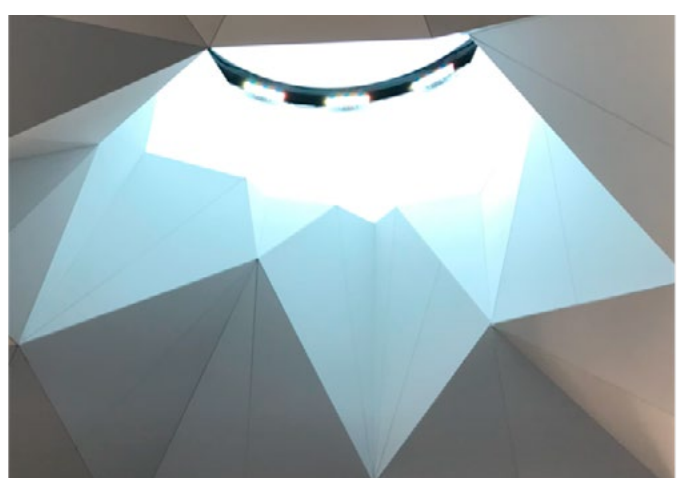

Figure 39: Lightwell integrated into bus terminal overbuild at Lonsdale Quay Exchange, North Vancouver (Photo Credit: Translink)

Case Study
Lonsdale Quay Exchange, North Vancouver, BC

Located at the northern terminus of the SeaBus ferry service, the Lonsdale Quay Exchange is an important transit gateway between Downtown Vancouver and the north shore municipalities. The terminal accommodates 12 routes and over 5,000 passengers daily. Overbuilt with an office complex in the 1980s, the facility suffered from poor customer experience with poor lighting and isolated waiting areas. In conjunction with a new RapidBus project and SeaBus service expansion the bus exchange was completely renovated in 2020 to provide and vastly improved customer experience.

Ceilings were raised and replaced with brighter, reflective cladding. Lighting was increased throughout the facility. Paving was replaced with brighter materials. Signage and wayfinding was expanded and updated. These improvements were extended through public spaces connecting the bus terminal to the ferry quay. A new public art installation was included along a blank wall frontage within the terminal.

Guidance Lessons for Customer Experience:

- Bright paving materials
- Enhanced lighting
- High ceiling
- Incorporate public art

Figure 41: Lonsdale Quay Exchange (Photo Credit: Translink)

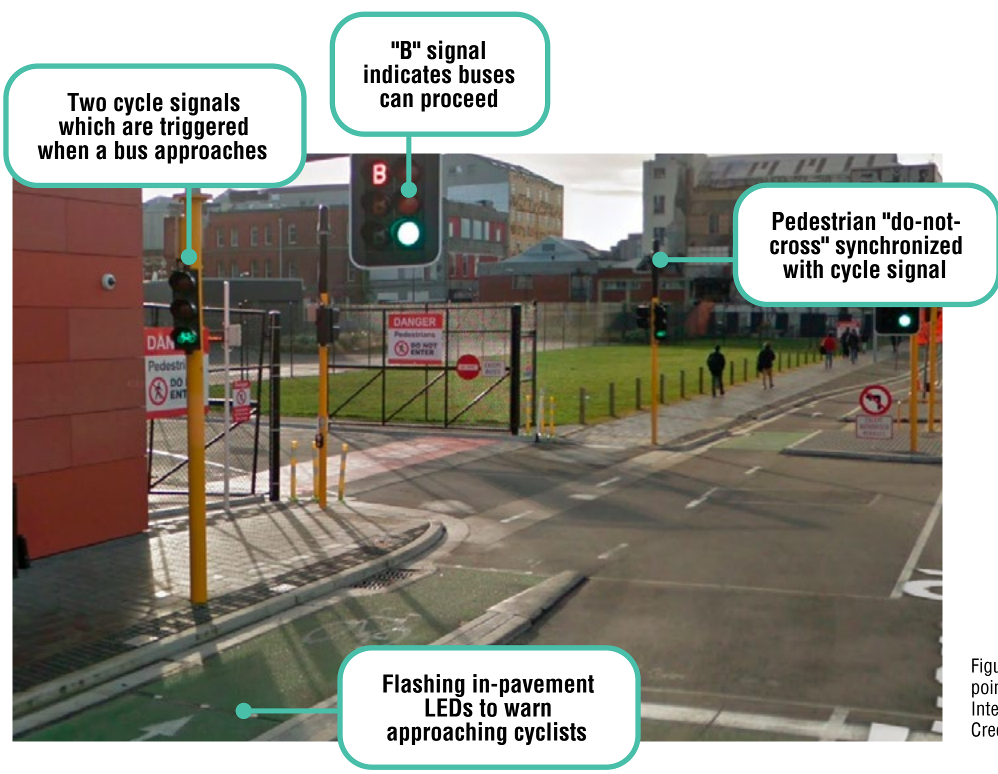

Figure 40: Signalized cycling and bus interaction point at the entrance to Christchurch Bus Interchange, Christchurch, New Zealand (Photo Credit: Google Earth)

Sustainability & Resilience

4.3 Resiliency and Sustainability

1. Provide green roof or solar energy generation where overbuild is not planned or feasible (e.g. hydro corridor).
2. Locate pedestrian and waiting areas away from bus idling areas.
3. Minimize the circulation distances required by buses, within and around terminals, to reach pick-up and drop-off bays, to reduce vehicle kilometers travelled and associated emissions.
4. Avoid large areas of impermeable surface and consider incorporating the use of bioswales and natural planting areas; these features may also be used to help discourage unsafe pedestrian crossings.
5. Include durable plantings in traffic islands and boulevards.
6. Incorporate opportunities to integrate facilities with natural surroundings such as parks, corridors and trail networks
7. Incorporate bird-friendly design practices, treating glass surfaces to prevent bird-crashing incidents.

Best Practice
Bioswales at Bus Terminals, Springfield, OR

With large areas of paved surface, bus terminals can present an opportunity to mitigate stormwater runoff. Landscaping elements can be combined to direct pedestrian paths and prevent conflicts with bus circulation. Bioswale functions may make use of remnant parcels.

Opened in 2006 the Springfield Bus Terminal prioritized stormwater management with extensive landscaping in the design. A central landscaped area within the island platform connects to an adjacent bioswale for treating stormwater quantity and quality.

Figure 42: Springfield Bus Terminal (Photo Credits: Google Maps)

Figure 43: Landscaping around Springfield Bus Terminal (Photo Credits: Federal Transit Administration)

4.4 Intermodal Operations

1. Delineate bus terminal spaces from general public realm elements through design treatments to achieve a clear visual distinction between the two spaces.
2. Avoid encroachments of bus bays and bus terminal circulation areas into the public sidewalk at access points at the interface between bus terminals and the public realm.
3. Provide sufficient frontage for site access and consolidate access points at signalized intersections for adjacent development parcels and integrated development sites.
4. Avoid lane configurations and travel directions that may be unexpected for pedestrians and other road users.
5. Minimize the number and width of driveways crossing the public realm.
    a. Consider opportunities for sharing access driveways between buses and site servicing for integrated and adjacent development, segregating these accesses only as necessary to manage potential delays to buses that would impact the operator's ability to maintain schedule adherence.
    b. Ensure that such consolidated access points provide sufficient transit priority to prevent delay for buses.
6. Design all driveway crossings of the public realm to maximize safety and comfort of pedestrians and cyclists in mixing zones while meeting the minimum operational geometric requirements of transit vehicles as described in standards documents.
7. Provide transit-prioritized signalized crossings at points of interaction between pedestrians, cycle paths and bus access points.
8. Minimize walking distances between bus bays and rapid transit connections and provide direct paths without visual encumbrances that include strong visual cues between the rapid transit and bus facilities.
9. Ensure that buses and pedestrians have a high priority of access to and from the terminal.
    a. Consider the use of dedicated bus lanes, transit signal phases and transit priority measures at the approaches to bus terminals as necessary to avoid delaying buses in mixed-traffic bottlenecks.
    b. Repurposing general purpose or median turn lanes for reserved bus lane to avoid widening roadways.

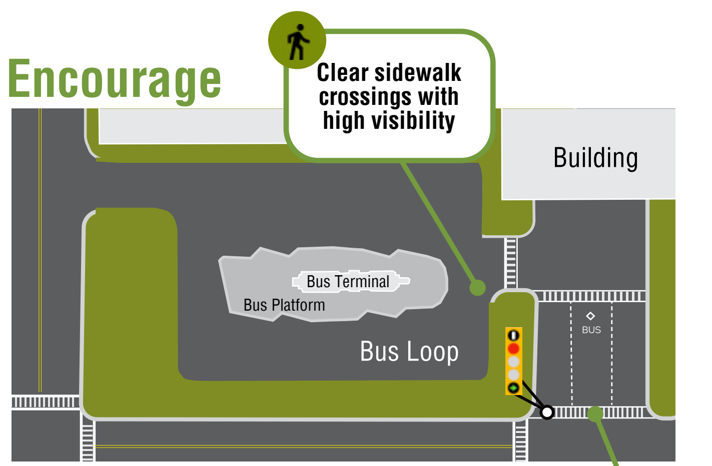

Figure 44: Desirable bus terminal integration with consolidated access points and visible crossing allowing for safe movement of users

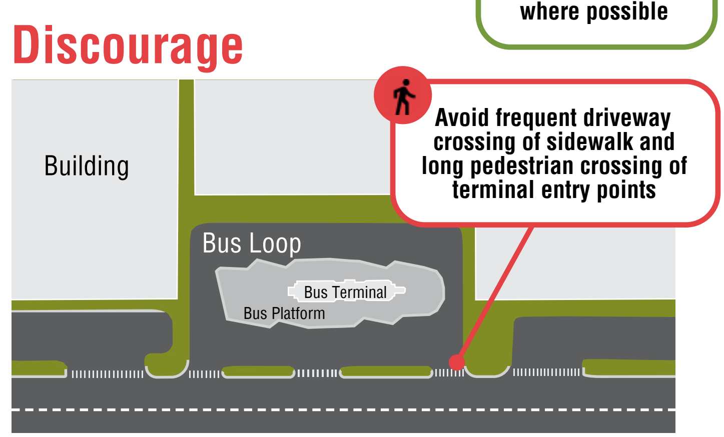

Figure 45: Undesirable bus terminal integration with multiple crossings and no clear access point to the terminal

Intermodal Operations

10. Seek opportunities to consolidate access points for integrated development and bus terminal where feasible to minimize pedestrian conflict points on the sidewalk.
    a. Consider the use of special design treatments and measures to limit access to transit-only spaces.
11. Use special treatments for pedestrian and cyclist crossing and mixing zones when priority bus access measures are necessary, such as:
    a. Providing protections for cyclists, such as protected turns and raised lanes
12. Incorporate distinct paving materials for bus waiting areas to direct passenger boarding and queuing at high volume transfers.
13. When designing on-street terminals, use high-quality materials and paving treatments to clearly indicate terminal locations within the street right of way and assist with wayfinding between connections.
14. Incorporate weather protection and shelter canopies into adjacent buildings.
15. Test bus terminal and supporting road network designs to ensure operations meet TTC requirements, undertaking supportive multimodal micro-simulations including bus and pedestrian simulation, if necessary, as part of an iterative design process.
16. Locate operator break and washroom facilities close to layover spaces to reduce time needed for breaks.
17. Minimize internal bus circulation time between layover bays and pick-up/drop-off bays by locating both in close proximity and providing direct routing between them.
18. Identify and mitigate potential points of bus-bus conflicts with appropriate safety measures.
19. Include appropriate space and provision for multimodal active transportation infrastructure early in the planning process such as for bike share stations.

Figure 46: Visual cues to and through the bus terminal promoting ease of transfer and permeability to surrounding uses, London, Stratford, UK (Photo Credit: Marcus Bowman)

Figure 47: Weather protection integration into adjacent building frontages, clear prioritization of bus space and sidewalk markings to support loading areas - Commercial Broadway Station, Vancouver, BC (Photo Credit: Wiki Commons)

Figure 48: Transit station plaza area, Fairbank Station (Photo Credit: Metrolinx)

4.5 Accountability

1. Consider future adaptive re-use opportunities where bus terminals may be replaced or otherwise become obsolete.
2. Consider design implications of potential near-future changes in policy and technology such as:
   a. Different fare payment models that may reduce the need for fare-paid areas;
   b. New technologies such as autonomous vehicles; and
   c. New service delivery models such as micro-transit.
3. Protect for electrification facilities for bus operations in bus terminal planning.
4. Include protection for electrification of other ancillary functions and multimodal access modes including e-bike and bike share charging.
5. Seek opportunities to accommodate growth through increased efficiency rather than additional space allocation.
6. Consider dynamic passenger messaging systems or dynamic bus bay assignment where appropriate that may help to marginally increase bus terminal capacity in case of future demand growth.

Best Practice

Temporary Terminus Point, Mount Dennis Mobility Hub Study, Toronto

Terminus rapid transit stations typically require large bus terminals to accommodate large catchment areas and extensive intermodal connections. Once the rapid transit line is extended the former terminus may no longer need to accommodate the same volume of buses. In cases where the terminus point is very likely to be part of a future extension of the rapid transit line, it is valuable to plan accordingly for the design and orientation of the bus terminal.

The Mount Dennis Mobility Hub Study (2011) included specific strategies to locate and the design the bus terminal such that it could be converted into a development site in the future, should its terminal bus function no longer be required. This included siting the terminal in an appropriate development site, aligned with potential supporting extensions to the local street network.

*Not all terminus stations will see reduced volumes if a line is extended, careful coordination with service planning is required to understand network assumptions.

Figure 49: Mount Dennis Mobility Hub Study - Short term (Photo Credit: Metrolinx)

Figure 50: Mount Dennis Mobility Hub Study - Long term (Photo Credit: Metrolinx)

Accountability

Best Practice
Dynamic Bus Bay Assignment

In select cities throughout the world, dynamic bus bay assignment has been used to improve customer experience and increase capacity at urban bus terminals. The technology allows for buses to be assigned to a different bay upon arrival and communicates this information to passengers in real time. This reduces the risk that a bus will not have access to its scheduled bay upon arrival and allows for some added flexibility in service planning. Dynamic assignment was first used in Canada recently at the new Union Station Bus Terminal opened in summer 2021.

Application of the technology requires an extensive planning process and is suitable only in specific network and operational conditions, typically in integrated development sites. In many cases, the technology is not utilized in operations, but its capabilities allow for increased flexibility in the design process.

Potential Benefits of Dynamic Bay Assignment:

- Allows for a centralized passenger waiting area with access to amenities
- Modern 'airport like' feel to transit experience
- May reduce spatial requirements in specific network and operational conditions

Figure 51: Leiden, Netherlands (Photo Credit: Marcus Bowman)

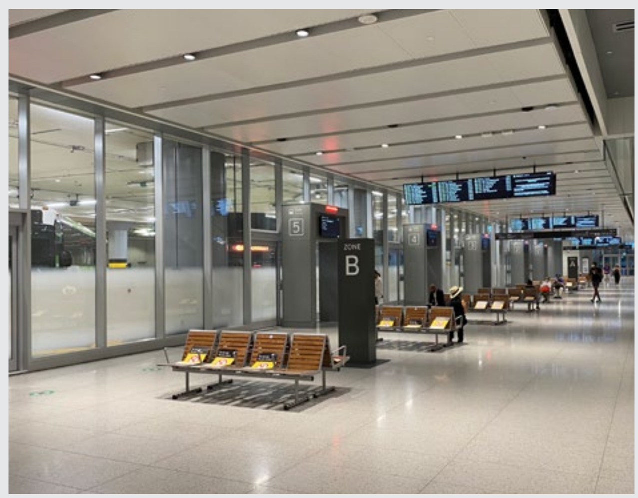

Figure 52: Union Station Bus Terminal (Photo Credit: Marcus Bowman)

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Figure 53: York University Station, Toronto (Photo Credits: Shai Gil)

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