
# Public Transport Interchange Design Guidelines

February 2013

Auckland Transport

An Auckland Council Organisation

# Public Transport Interchange Design Guidelines

## 2013

## Quality Assurance Statement

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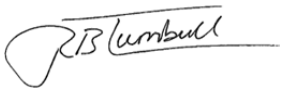

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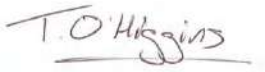

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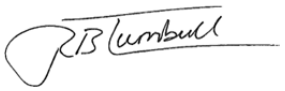

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# Table of Contents

# Glossary

| | |
|---|---|
| Connector service | Moderate frequency services (generally half hourly) with connections to metropolitan and town centres, employment and activity centres |
| Customer | Public transport passenger |
| Early morning | Before 7am |
| Evenings | 7pm onwards |
| Frequency | The number of vehicles per hour per route |
| Frequent services | A core network of bus services that provide frequent connections between key growth centres, and to and from the Auckland city centre |
| Headway | The number of minutes between each service in the timetable |
| Intermediate time | A point on the timetable between the start and the end of the trip where a bus can be expected to pass at a certain time and / or is scheduled to depart no earlier than |
| Inter-peak | In Auckland this is normally between 9am and 3pm weekdays |
| Journey time | The time taken for a bus to travel from the start to the end of its route |
| Layover | A requirement to, or physical space for, a bus to wait in-between a scheduled arrival and its next scheduled departure |
| Peak | In Auckland this means 7am-9am and 3pm-7pm weekdays |
| Platform | Specific location within the interchange where customers board and alight from the bus (or train), typically indicated by a number or letter correlated to other media (e.g. timetables) |
| Out of service | Where buses are repositioning to / from the start / finish of their scheduled routes and do not carry customers |
| Rapid services | Frequent connections on the rail network and Northern Busway |
| Recovery time | Time put specifically in the bus schedule where the bus sits still until the start of its next service or part of the route |

# Foreword

Auckland is undergoing a transformational shift in its approach to provision and use of public transport.

The 2012 Auckland Regional Public Transport Plan (RPTP), a statutory document prepared by Auckland Transport, looks to deliver on the *Auckland Plan's* target of doubling the number of customers using the city's public transport system over the next 10 years.

To deliver this quantum increase in customers, Auckland Transport is to make significant changes to the way rail, ferries and especially buses operates to provide a simpler, more connected network.

This more connected network will focus on integration between services and remove unnecessary duplication. The key components of integration are the development of convenient interchange facilities, high frequency services and a simple integrated fare system.

From a specific policy perspective, the Auckland RPTP requires public transport infrastructure to be of a high standard that supports service provision and enhances customer experience. This is provided through the following actions:

- Integration of infrastructure and service provisions,
- Provisions of well-designed transport interchanges on the frequent service network,
- Provision of accessible customer-focused facilities appropriate to the public transport route and the immediate locality,
- Provision of bus priority measures on key corridors,
- Provision of Park and Ride facilities at appropriate sites, and
- Integration of public transport with cycling and walking.

This document aims to provide guidance on the delivery of interchange facilities that will enable customers to move easily between services.

Primary to a successful interchange design will be a focus on customer experience. It is expected that those using this guide will not only apply their own skills and experience to the specific project concerned, but also work closely with Auckland Transport public transport operations staff to gain their understanding of and input into the design process. The input of bus, rail and ferry operators, and surrounding land use stakeholders to the design process, is also critical to Auckland Transport.

Through a collaborative, customer focused approach, well-designed interchanges will be key assets in the delivery of the vision for Auckland to become the world's most liveable city.

*Throughout this document, we refer to the public transport passenger as a 'customer.' The key focus for Auckland Transport is the delivery of high quality customer orientated outputs. In response, these interchange guidelines focus on customer led design.*

# 1. Introduction

## 1.1 Why this document?

Auckland Transport's Code of Practice Chapter 19, titled "Bus Stop Infrastructure Design Guidelines", aims to ensure consistency in the approach to design and presentation of bus stops throughout Auckland. This code of practice provides specific direction on the design of stops on the Quality Transit Network (QTN) and Local Connector Network (LCN)[1]. Interchange requirements are not described.

This document is to provide design guidelines primarily for bus-to-bus interchanges and **should be read alongside** Code of Practice Chapter 19 for related technical design information. Chapter 19 outlines requirements such as kerb profiles and bus stop lengths, which must also be considered in interchange design.

## 1.2 What is an interchange?

An interchange is a location where customers transfer from one mode of transport to another or between two services of the same mode. In addition, it may be a place where customers join or leave the public transport system on foot, by bicycle, motorcycle, or car. Interchanges represent one of the major interaction points people have with the public transport system, as well as being the largest and most noticeable forward facing physical aspect of the transport system (with the exception of the vehicle fleets) and as such have a huge impact on the perception of the public transport system.

An interchange may also be a convenient location for a journey to be broken in order to allow access to facilities within or close to the interchange. This could include customers wishing to use retail, commercial services or even childcare facilities.

## 1.3 Why do customers transfer?

Customers transfer modes when there is no direct, convenient through service or route for their journey, or when transferring offers a faster, or more comfortable journey overall. The ability to transfer easily provides access to a wider choice of destinations not provided for by a single service and encourages fuller network utilisation.

## 1.4 Why might customers not transfer?

Customers may not transfer because they do not need to, they are unaware of the benefits of transferring or simply do not make the journey because they do not want to transfer. A well-designed interchange can increase awareness of the opportunity to transfer and reduce the barriers to transfer by making it easy and safe.

[1] As per "Auckland Passenger Transport Network Plan 2006-2016"

## 1.5 Where do customers transfer?

Customers can transfer at any location where two or more services meet and there is an advantage or perceived advantage in speed, cost and / or available destinations in travelling on the alternative mode. This is compared to using a single mode or not using the service at all.

## 1.6 Who are these guidelines for?

The purpose of this guide is to aid architects and engineers in the design of bus-to-bus public transport interchanges in Auckland. Although primarily for bus-to-bus transfer, it is also appropriate for the bus sections of bus-to-rail and bus-to-ferry interchanges. Unique rail and ferry interchange components, especially relating to safety and operations, are not included in these guidelines as they are subject to their own specific rules and regulations.

This guide is both a starting point for the design process and an assessment tool of the draft outcome to test for compliance. It is the expectation that the development of these guidelines will result in reduced design costs, improved levels of service, and increased uniformity.


**Figure 1: Eastern entrance to Otara Interchange**

# 2. High Level Approach

Before commencing detailed design, the project team should take into account the following high-level considerations so as to understand the key drivers for a successful outcome.

### Physical needs

Such as:

- Location, area boundaries, connectivity to street network,
- Customer forecasts (arrival, departure by mode including transfers, peaks),
- Bus number forecasts (peaks, type of bus, layover requirement), and
- Primary interchange purpose (terminus, Park and Ride, intermodal transfer).

### Customer needs

Such as:

- Customer movements (bus to bus, bus to rail, Park and Ride to bus),
- Travel type (commuters, tourists, special events),
- Volume considerations (mode separation),
- Safety (mode conflicts, personal security), and
- Accessibility.

### Bus operation needs

Such as:

- Volume considerations (mode separation),
- Bus movements (terminus, through, pulse timing),
- Driver break location and shuttle car parking,
- Bus types (size), and
- Safety of drivers and turning manoeuvres.

### Land use integration

Such as:

- Integrated facilities (toilets, retail) provided by adjacent land use,
- Connectivity (pedestrian desirelines),
- Complementary development opportunities (TOD, retail, cafes),
- Local context, and
- Safety.

Considerations should include thinking on potential opportunities, constraints and dependencies across or in the region of the interchange site.

# 3. Design Principles

This document is designed to ensure collective understanding of the interchange environment Auckland Transport wishes to create. The starting point is to understand the essence of the functionality of an interchange.

As described in the high-level approach in Section 2, the primary purpose of an interchange is to facilitate the movements of:

- Customers, and
- Various transport modes.

How an interchange does this is the focus of this section.

## 3.1 Focus on the customer

The design of an interchange should firstly accommodate the four main functions that customers may use it for. These are:

- Start of a public transport journey,
- End of a public transport journey,
- Transfer – continue a public transport journey by changing service / route, and
- Pass-through – continue a public transport journey on the same service / route.

The attributes of the interchange which customers place the most importance or priority on, will usually reflect the type of journey that they are making. For example, whether they are travelling to work or making a leisure trip, and the period of time that customers may spend waiting between services.

To understand these priorities the interchange process can be broken down into a series of steps.

### Breaking down the interchange process

Figure 2 below shows a customer's primary interactions with the interchange, be it that they arrive on a bus or enter the interchange by some other mode (for instance by foot).

The customer priorities are highlighted in **bold**.

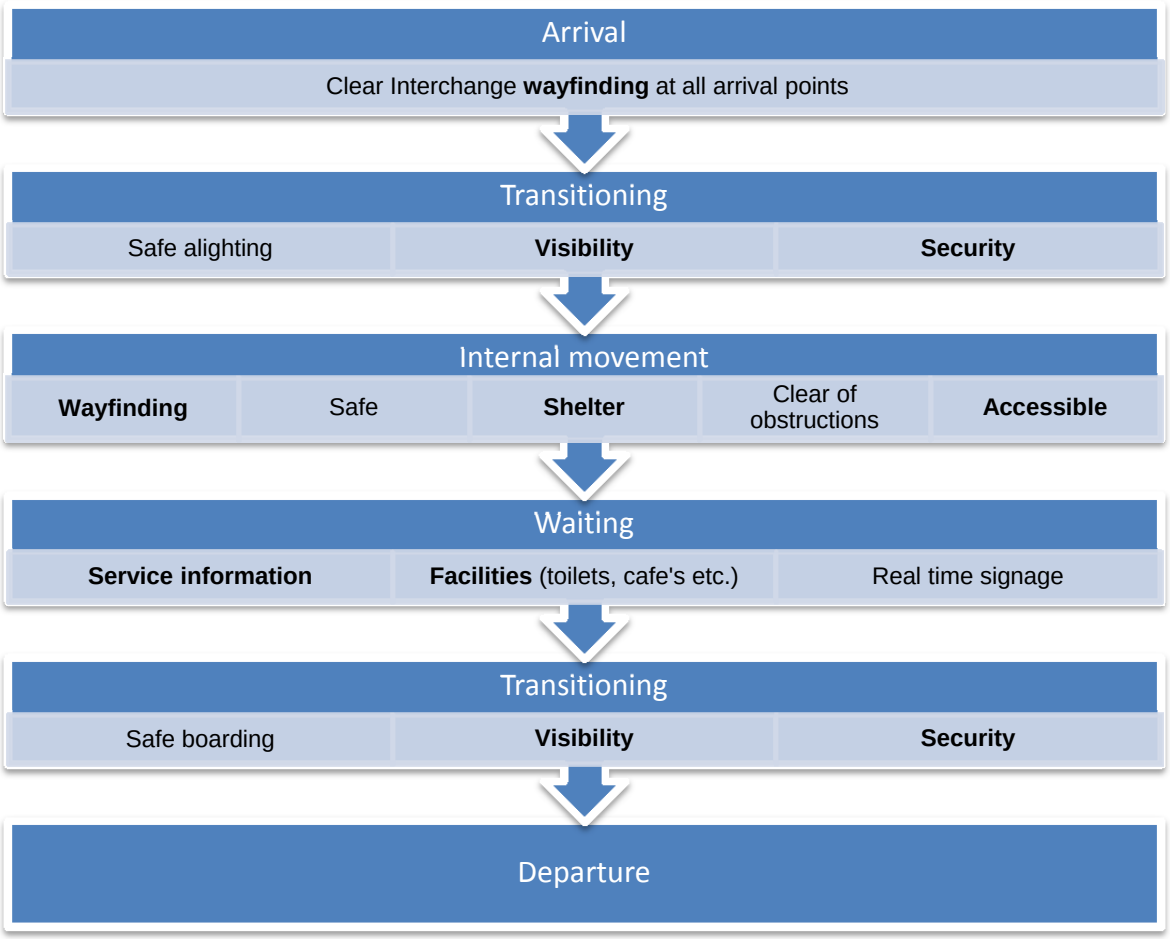



**Figure 2: Primary requirements of customer use of interchange**

The customer priority attributes of an interchange are therefore:

- Visibility,
- Wayfinding,
- Shelter,
- Security,
- Accessibility,
- Service information, and
- Facilities.

These attributes are described further in Section 3.4.

As described in Section 1.6, these guidelines focus on bus-to-bus interchange design. Figure 3 below describes the primary interaction between the bus, the bus driver and the interchange. Buses (and their drivers) may also be required to wait lengthy periods either at the main stop or at a 'layover' location. Where a layover point is required, facilities for drivers, such as access to toilets, would almost always be necessary.

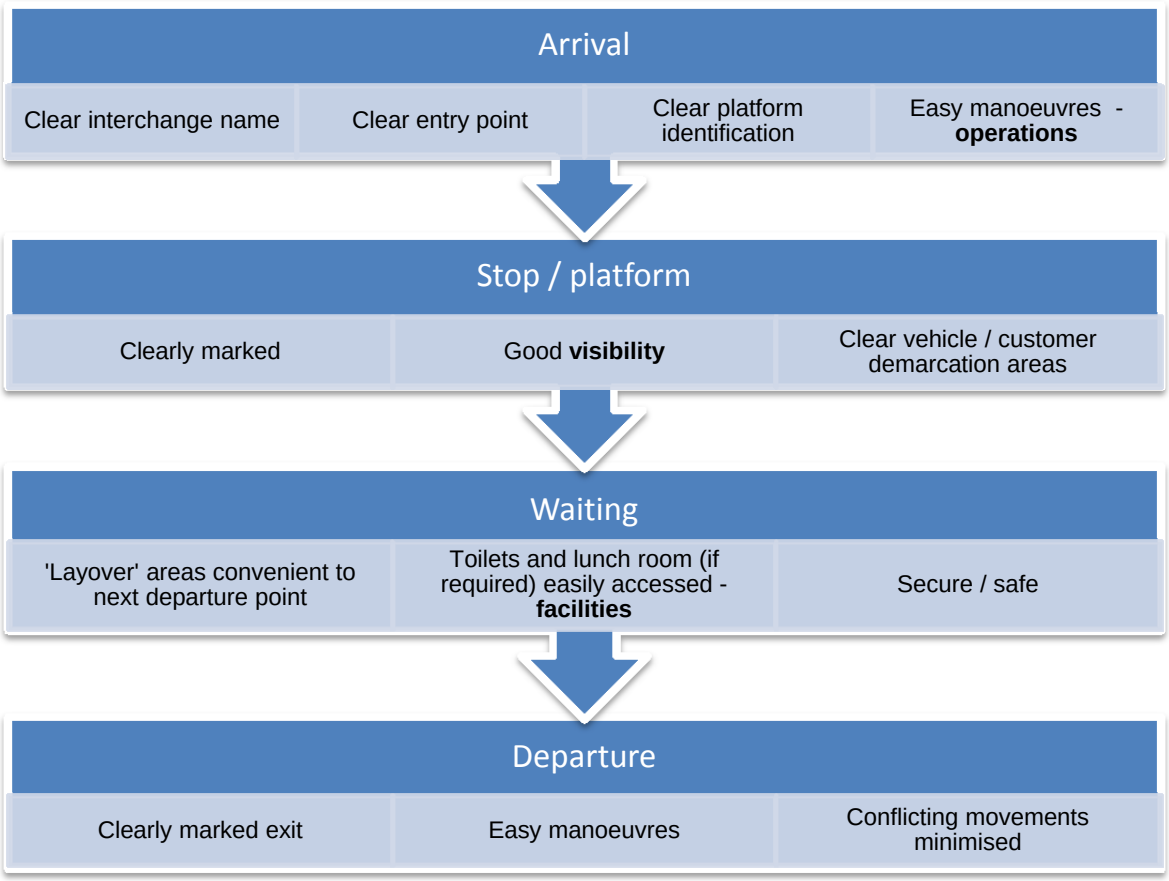



**Figure 3: Primary requirements of bus driver's use of interchange**

## 3.2 Consideration of best practice

In writing this guide, Auckland Transport examined (via a desktop study) a number of similar and related guides from around the world to establish common themes and align with best practise.

Cities / regions examined included:

- London (England),
- Sydney (New South Wales),
- Denver (Colorado), and
- Washington DC.

In addition, reference has also been made to the Transit Cooperative Research Program's "Transit Capacity and Quality of Service Manual - 2nd Edition" at points throughout this document.

### 3.2.1 Categories of interchange

Internationally, interchange categories usually follow land use planning categories (i.e. suburban, regional and sub-regional).

The following are examples of interchange categorisation:

### International / Regional

Examples of international / regional interchanges include:

- Airports,
- Intercity bus terminals, and
- Train stations covering international / long distance services.

These interchanges are often located at the cities hub where several, if not all, transport modes meet, and therefore have logistical, geographical, operational and financial constraints that are beyond the scope of this document.

Britomart is an example of such an interchange in Auckland.

### Major / Specialised

Major / specialised interchanges are normally located in central business district locations or at facilities such as sports grounds where multiple modes converge to service an exceptional destination. Typically, major interchanges:

- Are often located at destinations (non-residential) rather than origins such as residential areas, and
- Generally do not provide commuter car parking because primary access is by extensive public transport, walking and cycling.

(N.B. whilst technically people do not 'interchange' between modes at locations such as stadiums, the infrastructure required is very similar to that of a good interchange, i.e. Eden Park).

New Lynn, Manukau and Takapuna would be examples of current major Auckland interchanges.

### Local interchange

Local interchanges can range in size from a single bus stop where a few local distributor bus routes meet, to a fully undercover bus station, ferry wharf or railway concourse. The local interchange serves a local community and is generally the first contact customers have with the public transport system, other than visually recognising vehicle fleets. As such, the appearance and operational success of the interchange can have a significant effect on the perception and use of the public transport services provided. Local interchanges can take on a number of forms and can be categorised by size or the way in which the majority of users access them. Typically, they may:

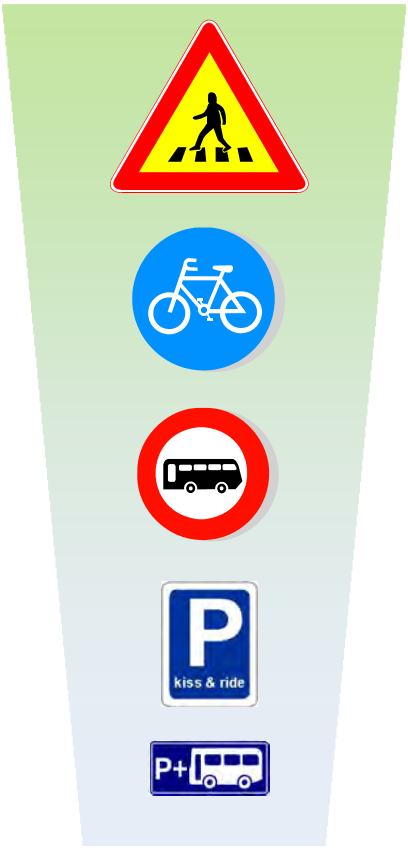
- Have walking / cycling and buses as the dominant access mode,
- Allow interchanging between local and high frequency bus routes, or
- Connect local activity centres such as hospitals, schools and shopping centres via cross-regional bus services.

A local interchange may in fact be the front door to the final destination for many customers, for instance at a hospital or shopping centre. For convenience, these interchanges are often "built into the destination" either as part of the building infrastructure or connected into the location by direct covered walkways that specifically cater for pedestrian desire lines.

Examples of current Auckland local interchanges include St Lukes, Highbury and Otara.

## 3.3 Access hierarchy

As it is neither possible nor necessarily desirable to give all modes of access to the interchange equal priority, an access hierarchy should be considered in interchange design.




| | |
|---|---|
| Pedestrians | The most important and most vulnerable users should be afforded the best access to the interchange and given priority at all crossing points. |
| Bicycles | Giving priority to this mode recognises both the desirability to increase usage of this mode and the vulnerability of the mode. |
| Buses | The need for reliability and the concentrated usage (by customers) of this mode means there is a need to give priority to buses. |
| Kiss and Ride | Optimum function of this mode requires close access to interchange entrance/s. This mode includes taxi stands. |
| Park and Ride | Whilst an important part of many interchanges, it is the access mode that should least affect the others. |

## 3.4 Key design attributes of Interchange

Considering the key aspects of Figure 2 and Figure 3 on pages 7 and 8 and the predominant observations of our best practice research, the following list summarises the key priority attributes that contribute to the efficiency and effectiveness of the operation of an interchange.

- Visibility,
- Wayfinding,
- Shelter,
- Security,
- Accessibility,
- Service information,
- Facilities, and
- Bus operations.

The following sub sections of this document describe each of the attributes and their importance to the interchange environment with an accompanying example of best practice.

### 3.4.1 Visibility

The consideration of visibility should apply both from within the interchange and from land uses in the vicinity. Within the interchange, this means providing clear sightlines along pedestrian desire lines, use of transparent materials and good lighting. It can also mean siting ticket offices, operations rooms and even driver facilities within sight of much of the public area as possible.

Good visibility can assist with the following:

- Making the interchange feel secure,
- Making the interchange accessible, and
- Making the interchange easier to use.

#### Components of interchange visibility

| | |
|---|---|
| **Within interchange zone** | Wide visibility within the interchange zone facility enables passive security which helps users (and bus drivers) feel safe. |
| **To oncoming bus services** | Customers appreciate being able to see their bus approaching from a comfortable location. This enables them to ready themselves to board the bus and helps to decrease dwell time. |
| **To wayfinding signage** | Signage needs to be visible in order to serve its purpose appropriately. |
| **Of bus operations area** | Buses should be able to manoeuvre safely with good sightlines and lighting to see obstructions and customers waiting at stops. |

#### Examples of visibility good practice

| Otara Interchange | Component | On-site Example |
|---|---|---|
|  | Within Interchange zone | Singular platform open to road and retail viewing |
| | Oncoming bus services | Buses approach direct on from a distance, easily seen by waiting customers |

| | | |
|---|---|---|
|  <br>  | Wayfinding signage | ‘Totem’ pole marking bus station location clearly visible<br>Little internal signage required but evident |
| | Bus operations area | Clear demarcation of roadway from platform |
| **New Lynn Station** | **Component** | **On-site Example** |
|  <br><br>  <br> | Within interchange zone | Singular platform open to road and retail viewing<br>Use of glass walls for greater visibility |
| | Oncoming bus services | Buses approach direct on from a distance, easily seen by waiting customers |
| | Wayfinding signage | Platform signage easily seen<br>Directional signage clearly visible |
| | Bus operations area | Clear demarcation of roadway from platform |

### 3.4.2 Wayfinding

Wayfinding within an interchange facilitates the most efficient customer movement to / from and within the facility. Ideally, an interchange design will be 'self-explaining' thus minimising the amount of signage required.

Wayfinding measures work within a hierarchical environment where more detail is provided the closer to the destination the customer gets.

Wayfinding affects the following:

- Informing choice at journey decision points,
- Providing reassurance,
- Identification of obstacles, and
- Identifying the location of supporting facilities such as toilets and ticket offices.

#### Components of interchange wayfinding

| | |
|---|---|
| Within interchange zone | Signage outlining where service connections can be made must be visible in predictable locations, whilst paint markings on footpaths may aid wayfinding. Ensure interchange zone maps are visible at all times. |
| To external facilities | Include in interchange zone map and sign post. |
| Pedestrian desire lines | Employ audit processes that confirm pedestrian desire lines are appropriately catered for. |
| Basic service directions | Ensure basic directional information is clearly shown, e.g. to north / south, city bound etc. |

#### Examples of wayfinding good practice

| New Lynn Station | Component | On-site Example |
|---|---|---|
|  | Within interchange zone | Clear signage to bus platforms and interchange facilities |
| | To external facilities | Information signage shows interchange 'in situ' with surrounding land use. |

| | | |
|---|---|---|
|  <br>  | Pedestrian desire lines | Pedestrian crossings directly outside main entrances to interchange |
| | Basic service directions | Provided, not in photos shown. |
| **Otara Interchange** | **Component** | **On-site Example** |
|  <br>  | Within interchange zone | Clear signage of bus platforms |
| | To external facilities | Clear signage showing interchange ‘in situ’ with local land use |
| | Pedestrian desire lines | Pedestrian crossing points to shops clearly demarcated. Fencing discourages pedestrian crossing in unsafe areas |
| | Basic service directions | Service directions shown on real time displays |

### 3.4.3 Shelter

Shelter typically provides protection from wind, rain, sun, heat and cold. Shelter can also protect against noise and can assist safety by being a barrier between conflicting use (i.e. roadway and pedestrian area).

Shelter affects the following:

- Comfort of waiting,
- Security of waiting,
- Visibility of vehicles and customers, and
- Operational costs.

#### Components of interchange shelter

| | |
|---|---|
| Waiting area | Should shelter customers where they would wait for their service and shelter as much of the movement between a waiting area and boarding area as possible. |
| Between stops | When an interchange requires users to walk between bus stops, shelter from the rain is desirable. When users are required to wait at traffic signals, canopies over the waiting area are recommended. |
| Windbreaks | Vertical panes of glass are recommended to give shelter to the wind and rain whilst maintaining natural security. Keep windbreaks off ground to enable wind to blow rubbish / debris out from corners. |
| Enclosed spaces | Ensure isolated locations are designed out of interchange zones to reduce the risk of crime and increase user safety. |

#### Examples of shelter good practice

| **Albany Bus Station** | **Component** | **On-site Example** |
|---|---|---|
|  | Waiting area | Waiting area adjacent to bus platforms<br>Platforms all have awnings |
| | Transitioning | Covered walkways provided from car park area to bus platforms |

| | | |
|---|---|---|
|  <br>  | Windbreaks | Wind breaks of internal and external structures are placed slightly off the ground to provide natural debris removal and ventilation |
| | Enclosed spaces | Enclosed spaces minimised<br>'Far end' platforms sheltered but 'open' |
| **Otara Interchange** | **Component** | **On-site Example** |
|  <br>  | Waiting area | Waiting area adjacent to platforms |
| | Between stops | Fully covered between stops |
| | Wind breaks | Vertical panes of glass are slightly raised off the ground for natural debris removal |
| | Enclosed spaces | Enclosed spaces minimised<br>Waiting space open to road and retail for passive security |

### 3.4.4 Security

The security of customers at an interchange should be paramount in design. Security considerations include customers, bus drivers, interchange employees, buses, other transport modes and the public. Security in design might also consider the type and maintenance of physical assets of the interchange.

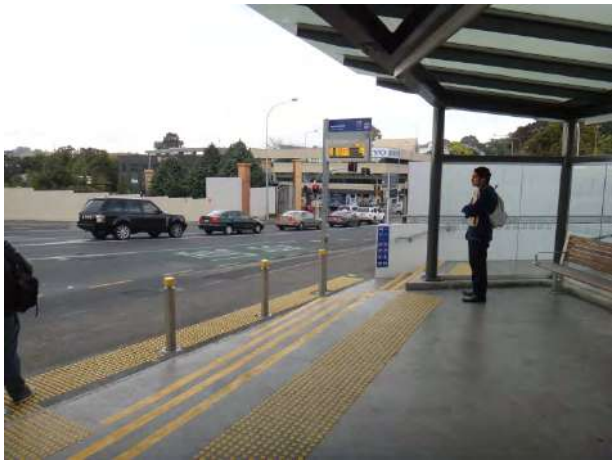
Security affects the following:

- Layout of the interchange,
- Construction materials used,
- Lighting used,
- Electronic systems such as CCTV, and
- Operations.

#### Components of interchange security

| | |
|---|---|
| **Natural surveillance** | Use open plan design, see-through materials and design out isolated spaces. |
| **CCTV** | Use CCTV cameras effectively in busy interchange zones. |
| **Discourage loitering** | Play deterrent music. |

#### Examples of security good practice

| Grafton Station | Component | On-site Example |
|---|---|---|
|  | Natural surveillance | Bus waiting area open to major road |
| | Use CCTV cameras effectively in busy interchange zones | CCTV Cameras covering bus stops and train platforms |
| | Play deterrent music | Not provided at this site |

| | | |
|---|---|---|
|  | | |
| **Albany Bus Station** | **Component** | **On-site Example** |
|  | Natural surveillance | Platforms open to passing roads and car parks |
| | Use CCTV cameras effectively in busy interchange zones | Good CCTV coverage |
|  | Play deterrent music | Not provided at this site |

### 3.4.5 Accessibility

Accessibility considerations should not only reflect mobility but also connection within and to surrounding land use. The Accessible Journey, a Report of the Inquiry into Accessible Public Land Transport by the Human Rights Commission recognised that accessible transport is a 'whole of journey' consideration. Interchange design should not only comply with all Building Code requirements but should also consider an approach that creates an 'accessible environment'.

Accessibility affects the following:

- Layout of the interchange,
- The need for clear routes free of obstructions,
- Providing for pedestrian desire lines, and
- Integration with surrounding land use.

#### Components of interchange accessibility

| | |
|---|---|
| **Stair-free routes** | Ensure stair-free movement within an interchange zone is possible. Use signage to indicate these routes. |
| **Provide access from surrounding attractions** | Enable direct access to external commercial activities such as malls and town centres. |
| **Bus stop proximity (local interchanges only)** | Integrate interchange entry and exit points into signalised intersections to allow easier access. Where practical, bring bus stops closer to intersections and thus closer together. This could also include removal of left turn slip lanes. |

#### Examples of accessibility good practice

| Akoranga Bus Station | Component | On-site Example |
|---|---|---|
|  | Stair-free routes | Lifts provided for overhead walkway access |
| | Provide access from surrounding attractions | Links directly to AUT Akoranga Campus |
| | Bus stop proximity | N/A |

| Otara Interchange | Component | On-site Example |
|---|---|---|
|  <br>  <br><br>  | Stair-free routes | N/A |
| | Provide access from surrounding attractions | Interchange is connected directly into local shopping centre and is adjacent to MIT (tertiary training) |
| | Bus stop proximity | The interchange exit is incorporated into the intersection traffic signals allowing easy exit |

### 3.4.6 Service Information

Whereas wayfinding provides directions, service information provides the 'what, where, when and how much' information that a customer might need to make their journey. Service information within an interchange environment can also include opening hours, directions to points of interest and geographic placement of the interchange in the local area.

Service information involves the following:

- Provision of static network, timetable and fare information,
- Local area maps,
- Electronic access to information including real time arrival and departure information, and
- Integration with wayfinding measures.

#### Description of service information components

| | |
|---|---|
| **Timetables** | Timetables and route information must be displayed at all times. Optimise the accessibility of this information by positioning it near thoroughfares and under shelter. |
| **Platform and bus stop identification** | Distinguish platforms at multi-platform interchanges with a universal identification system and identify bus stops as per Auckland Transport's bus stop numbering requirements. |
| **Real time information** | Where needed, real time information signs should be positioned in the line of sight of a waiting customer looking towards the direction of the arriving bus and not obscured by canopies. |
| **Electronic departure board** | Screens showing real time departures of all bus stops should be displayed centrally within the interchange zone. |

#### Examples of service information good practice

| Albany Bus Station | Component | On-site Example |
|---|---|---|
|  | Timetables | Timetables displayed at all bus stops and in central locations |

| | | |
|---|---|---|
|  <br>  <br>  | Bus stop and platform numbering | Clear platform numbers |
| | Real time info | Double sided real time information provided at each platform |
| | Centralised electronic departure board | Real time electronic departure information provided in waiting area |

### 3.4.7 Facilities

Facilities typically add value to the interchange environment and the level and provision is often unique to the interchange type and / or location. Facility considerations include; seating, public telephones, help points, toilets, clocks, public address systems, ticket kiosks, retail outlets, café / refreshments, cycle lockers and / or stands, vehicle parking, taxi areas, drivers rooms, control room, security room and luggage storage.

Facility aspects to consider:

- How long might customers be waiting?
- How many customers will be using the facility?
- Where are the majority of customers waiting?
- Where have customers come from? and
- What complementary facilities are provided in adjacent land use?

#### Components of interchange facilities

| | |
|---|---|
| **Toilets** | Having toilets present at or near interchange zones increases convenience for users. Toilets located away from interchange zones must be sign posted in predictable locations. |
| **Rubbish bins** | Rubbish bins are a cost effective method to keep the interchange zone clean. |
| **Ticket machines** | Self-service ticket machine. |
| **Ticket retail outlet** | Staffed ticket outlet that can also help with service information queries. |
| **Commercial facilities** | Outlets such as convenience stores and coffee outlets. |
| **Construction materials** | Good quality and aesthetically pleasing. Resilient and as vandal proof as possible. |

#### Examples of facilities good practice

| **Albany Bus Station** | **Component** | **On-site Example** |
|---|---|---|
|  | Toilets | Toilets located within interchange zone and clearly visible |
| | Rubbish bins | Rubbish bins provided |

| | | |
|---|---|---|
|  <br>  | Ticket machines | Provided, not in photos shown |
| | Ticket retail outlet | Provided at peak times |
| | Commercial facilities | Coffee outlet provided at peak times |
| | Construction materials | Easy to clean surfaces<br>Clean lines |
| **New Lynn Station** | **Component** | **On-site Example** |
|  <br>  | Toilets | Toilets provided and clearly signed |
| | Rubbish bins | Rubbish bins located near entrances |
| | Ticket machines | Ticket machine located on train platforms |
| | Ticket retail outlet | Ticket and information outlet located at ground floor |
| | Commercial facilities | Coffee cart located in waiting area |
| | Construction materials | Durable materials used throughout |

### 3.4.8 Operations

In this guide the operations component largely focuses on the environment required for safe, efficient and future proof bus manoeuvring. This means consideration of both the bus driver and the physical requirements for the buses.

Operational aspects to consider:

- Bus operational areas need to be well signed and well lit,
- Good demarcation required between bus areas and customer areas,
- Bus manoeuvres are easy to make with margin allowed for bus type variances,
- Vehicle conflict areas should be avoided or engineering controls put in place, and
- Reasonable allowance for growth in bus numbers and type using the interchange in the future.

#### Description of components

| | |
|---|---|
| **Bus manoeuvring areas** | Ensure a fail proof environment for bus drivers. |
| **Bus capacity** | Ensure number and size of bus stops can accommodate all scheduled services with allowance for future growth. |

#### Examples of operations good practice

| New Lynn Station | Component | On-site Example |
|---|---|---|
|  | Bus manoeuvring areas | Well marked platform numbers<br>Clear demarcation between platform edge and roadway<br>Pedestrian crossing points clearly marked<br>Bus movements easy to undertake |
| | Bus capacity | Long platforms and multi-sided interchange for bus capacity flexibility |

| | | |
|---|---|---|
|  | | |
| **Albany Bus Station** | **Component** | **On-site Example** |
|  | Bus manoeuvring areas | Well marked platform numbers<br>Clear demarcation between platform edge and roadway<br>Pedestrian crossing points clearly marked<br>Bus movements easy to undertake |
|  | Bus capacity | Good length platforms on either side of interchange |

# 4. Auckland Interchange Hierarchy

As described in the Foreword and Introduction, the new service network structure is built around a core network of frequent services which includes the existing rapid transit services (rail and Northern Busway) supplemented by high frequency bus routes servicing major centres.

Complementing the frequent service lines (and importantly connecting with them) will be a network of connector routes, local services, peak only and targeted services.

Along with integrated ticketing, one of the most important factors in making the new network work is the provision of convenient well-designed interchanges that provide accessible customer focused facilities appropriate to the public transport routes they connect, and to the environment, they are located.

Auckland Transport has defined in its RPTP various layers of interchange. The following layers have been designed to align with *The Auckland Plan* urban centres hierarchy (See Appendix E for an extract of this hierarchy).

## 4.1 Major Interchange

Major Interchanges can be located as follows:

- At the city centre or at metropolitan centres,
- Where a rapid service terminates or passes through,
- Where several or more frequent services terminate or pass through,
- Where local and connector services terminate,
- Where inter-regional services may terminate or pass through, or
- Where the interchange facility is a landmark feature within its environment.


## 4.2 Intermediate Interchange

Intermediate Interchanges can be located as follows:

- Within town centres,
- Where a rapid service may terminate or pass through,
- Where one or more frequent services may terminate or pass through,
- Where local and connector services terminate, or
- Where the interchange may be a landmark feature or integrated into other land use.


A different type of interchange also fits into this category where it is a dedicated piece of infrastructure required for connection between two modes, such as ferry to bus or train to bus. In this situation, the location is fixed by the access requirements of one of the modes (ferry or train)

and may often not be part of any urban centre and will thus need to be fully self-serving (i.e. no opportunity for shared facilities).

## 4.3 Minor Interchange

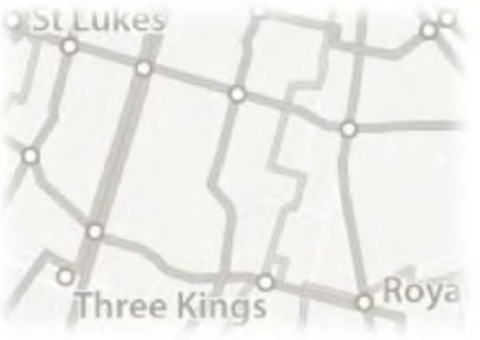
Minor Interchanges can be located as follows:

- At local centres,
- Where a rapid service may pass through,
- Where one or more frequent services may terminate or pass through,
- Where local and connector services may terminate or pass through, or
- Where the interchange facility is more likely to be integrated within or subservient to surrounding land use.


## 4.4 Neighbourhood Connection

A Neighbourhood Connection can be located as follows:

- Within a neighbourhood centre,
- Where frequent services pass across each other and provide a connection opportunity, or
- Where the connection points are generally on-street stops and subservient to surrounding land use.




See Appendices A and B for Intermediate, Minor and Neighbourhood Connection concept designs.

**Attributes by Auckland interchange type**

Given the above four types of interchange in Auckland, the high level attributes to meet the broad customer focused attributes (see Section 2) for each interchange type are summarised in the following table.

### 4.4.1 Visibility

| Visibility | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Use of clear panels (glass) where possible | Wide visibility within the interchange zone enables passive security which helps users (and bus drivers) feel safe. | Required | Required | Required | Required |
| Good sightlines to arriving vehicles | Customers appreciate being able to see their bus approaching from a comfortable location. This enables them to ready themselves to board the bus, and helps to decrease dwell time. | Required | Required | Required | Required |
| Clear signage | Signage needs to be visible in order to serve its purpose appropriately. | Required | Required | Required | Required |
| Safe bus operation | Buses should be able to manoeuvre safely with good sightlines and lighting to see obstructions and customers waiting at stops. | Required | Required | Required | Required |
| Passive security | Waiting and transition areas should be designed to include passive security from surrounding land uses. | Required | Required | Required | Required |


**Figure 4: Otara Interchange**

### 4.4.2 Wayfinding

| Wayfinding | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Interchange name | The name of the interchange should be clearly visible at each entry point to the interchange and for arriving customers at each platform and stop. | Required | Required | Required | Required |
| Bus platform numbering / designator | For multiple platform interchanges, each platform should be clearly distinguished by a numbering / letter system. | Required | Required | Required | Required |
| Bus stop numbering / designator | Each bus stop should be numbered according to Auckland Transport's bus stop numbering requirement. | Required | Required | Required | Required |
| Stand specific bus route numbers and destination | Each bus stop should indicate what routes depart from the stop and where (at least) their primary destination is. | Required | Required | Required | Required |


**Figure 5: Albany Bus Station**

### 4.4.3 Shelter

| Shelter | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Entry points | Continuous cover linking interchange pedestrian entrances to platforms. | Required | Desirable | Desirable, especially if between modes such as ferry and bus | Not required |
| Platforms | Continuous cover over length of platform. | Required | Desirable. Extended bus stop shelters may be used | Similar approach for inter-connecting modes preferred such as same style for bus and ferry at ferry wharf | Standard bus stop shelters may be used |
| Links between platforms | Continuous cover linking all platforms. | Required | Desirable | Desirable | Desirable |
| Taxi rank | Continuous cover over length of taxi rank. | Required | Individual shelter may be more appropriate | Not required except for larger ferry wharves | Not required |
| Kiss and Ride | Continuous cover over core pick-up / drop off zone. | Required | Desirable | Desirable | Not required |
| Park and Ride | Continuous cover over centralised walkways. | Required | Desirable | Location dependent | Not required |


**Figure 6: Constellation Bus Station**

### 4.4.4 Security

| **Security** (incl. safety) | **Description** | **Interchange** | | | |
|---|---|---|---|---|---|
| | | **Major** | **Intermediate** | **Minor** | **Neighbourhood** |
| Security room | Room that may be separate to interchange control room for security staff to be stationed and easily accessible to public waiting areas. | Required | May be required | Not required | Not required |
| Lighting | Lighting provided to industry standard for lighting of interchanges and maximisation of available natural light. | Required | Required | Required | Required |
| CCTV | Monitored video surveillance. | Required | Required | Desirable | Not generally required but dependent on location |
| Emergency help point | Direct two way audio (backed up with CCTV) communication point with security control room. | Required | Required | Desirable | Not required |
| Public address system | Enables specific route or timetable announcements and / or general announcements to waiting customers. | Required | Required | Not generally required but dependent on location | Not required |


**Figure 7: Albany Bus Station**


**Figure 8: New Lynn Station**

### 4.4.5 Accessibility

| Accessibility | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Between platforms | Easy safe movement between platforms. | Off street, grade and mode separated where possible | Off street, mode separated where possible, crossing of streets between stops avoided | On-street, crossing of streets between stops possible | On-street, crossing of streets between stops likely |
| Integrated with surrounding land use | Interchange is sympathetic to, yet adds appropriate value to, surrounding land use. | Wholly integrated with surrounding land use<br>Provides direct connection to major employment and retail destinations<br>Interchange is a landmark and will add value to local land use | Interchange ideally integrated into surrounding land use as much as is possible<br>Interchange may stand apart from or make use of current street infrastructure, and may or may not add value to local land use | Interchange may make use of current street infrastructure and is likely to be subservient to local land use<br>Interchange between modes may be co-joined, i.e. ferry to bus | Interchange may make use of current street infrastructure and is likely to be subservient to local land use |
| Bicycles | Covered cycle stands and lockers provided near interchange entrance/s with CCTV surveillance. | Required | Required | Covered cycle stands only except at ferry wharfs and rail stations where lockers may be considered | Covered cycle stands could be provided |
| Kiss and Ride | Drop off / pick up zones located near interchange entrance/s with CCTV surveillance. | Required | Required | Desirable | Not required |
| Park and Ride | Parking for commuters using the interchange provided within the interchange zone. | Not usually provided | Provided where consistent with RPTP | Provided where consistent with RPTP | Not required |


**Figure 9: Albany Bus Station Park and Ride**


**Figure 10: New Lynn Station**

### 4.4.6 Service information

| Service information | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Staffed kiosk | A staffed kiosk selling tickets and providing travel information. | Required and open seven days for most of the day | Ideally provided at least in peak periods | Not required | Not required |
| Ticketing machine | A ticket vending machine including card tops ups. | Required and provided in quantities according to expected demand | Required and provided in quantities according to expected demand | Desirable but not required, except where demand is high. | Not required |
| Help point | Direct audio link to centralised enquiry point. | Required | Ideally provided | Desirable but not required | Not required |
| Interchange map | Showing layout of interchange with stops and facilities marked. | Required near each main interchange entry point | Required near each main interchange entry point | Required near each main interchange entry point | Required near each main stop |
| Local area map | Showing local streets and destination. | Required at each main platform / bus stop | Required at each main platform / bus stop | Required at each main platform / bus stop | Required at each main stop |
| Timetables | All timetables and route maps for routes serving this interchange. | A network map, local routes and timetables on display in central waiting locations and local routes and timetables on display at each platform / stop | A network map, local routes and timetables on display in central waiting locations and local routes and timetables on display at each platform / stop | Local routes and timetables on display at each platform / stop | Local routes and timetables on display at each stop |
| Real time | Real time arrival and departure screens plus service disruption information. | Real time screens in central waiting locations with all routes from the interchange displayed and route specific double sided displays at each platform / stop | Real time screens in central waiting locations with all routes from the interchange displayed and route specific double sided displays at each platform / stop | Route specific double sided displays at each platform / stop | Route specific double sided displays at each stop |

| Service information | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Fare information | Fare types, zones and prices displayed. | Required at each main platform / bus stop | Required at each main platform / bus stop | Required at each main platform / bus stop | Required at each main stop |


**Figure 11: Customer information Otara Interchange**

### 4.4.7 Facilities

| Facilities | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Toilets | Provision of accessible toilets either in the interchange or located immediately adjacent and available at all times the interchange is open. | Required and preferably within the interchange | Required but toilets in adjacent land use could be acceptable | Desirable but could be located close by in adjacent land use | Not required but ideally located close by in adjacent land use |
| Baby change facilities | Provision of separate baby change and feeding area should be considered. | Provided where possible | Not required | Not required | Not required |
| Kiosk / newsagent | Could be incorporated into other retail. | Highly desirable | Desirable | Not required | Not required |
| Café | Could be outwardly faced as well as inwardly focused. | Highly desirable | Desirable | Not required | Not required |
| Vending machine / food and beverage | Placed centrally in waiting areas. | Required | Desirable | Desirable | Not required |
| Other retail | Could include drycleaners, convenience stores, and mobile phone shops. | Highly desirable | Desirable | Not required | Not required |
| Drivers room | Room suitable for meal breaks and possibly own toilets. Could also be used by interchange staff. Could include a 'change machine' and lockers for cash boxes. | Likely to be required, consult with bus industry | Likely to be required, consult with bus industry | Unlikely to be required, consult with bus industry | Not required |

| Facilities | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Interchange control room | Room for interchange operation monitoring, including equipment and staff. | Required | Likely to be required, may not be staffed | Not required | Not required |


**Figure 12: Otara Interchange**

### 4.4.8 Operations

| Facilities | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Manoeuvring space | Bus drivers should be able to consistently manoeuvre their vehicle safely through the interchange. | Crossing points within the interchange are mainly grade separated<br>Pedestrian desire lines are catered for safely<br>The need for reversing manoeuvres are minimised | Crossing points within the interchange are grade separated where practicable<br>Pedestrian desire lines are catered for safely<br>The need for reversing manoeuvres are minimised | Crossing points within the interchange are controlled<br>Pedestrian desire lines are catered for safely<br>The need for reversing manoeuvres are minimised | Controlled crossing points of roads are provided close by<br>The need for reversing manoeuvres are minimised |
| Driver orientated signage | Bus entry and exit points well marked. Platform numbers well displayed.<br>Layover areas well marked. | Required | Required | Most likely required | Unlikely to be required |

Bus lay-up area with electronic signs

**Figure 13: New Lynn Station bus lay-up area**

#### Seating

Although not one of the eight priority attributes, seating is an important aspect of interchange facility design.

There are no standard international guidelines on the amount of seating that should be provided at an interchange. The following follows closely the guidelines for seating at interchanges in New South Wales, Australia.

| Seating | Description | Interchange | | | |
|---|---|---|---|---|---|
| | | Major | Intermediate | Minor | Neighbourhood |
| Platforms | Seating should be supplied at each platform / bus stop. | Seating for at least 10 people per platform / stop | Seating for at least 10 people per platform / stop | Seating for at least 6 people per platform / stop | Seating for at least 4 people per platform / stop |
| Waiting areas | Seating should be supplied in waiting areas according to peak projected demand. | Seating for 30% of projected waiting customers[2] | Seating for 30% of projected waiting customers | N/A | N/A |
| Taxi rank | Seating should be supplied in waiting areas according to projected demand. | Seating for 5-10 people | Seating for 5-10 people | N/A | N/A |
| Kiss and Ride | Seating should be supplied in waiting areas according to projected demand. | Seating for 5-10 people | Seating for 5-10 people | N/A | N/A |

Seating designed to accommodate waiting bus customers

**Figure 14: New Lynn Station**

[2] Waiting customers would be defined as the maximum number likely to be waiting for the 'next bus'. This would be the peak passenger demand derived from all 'next' services leaving the interchange. This should never be more than the number of platforms multiplied by the number of customers that can fit on a fully laden bus.

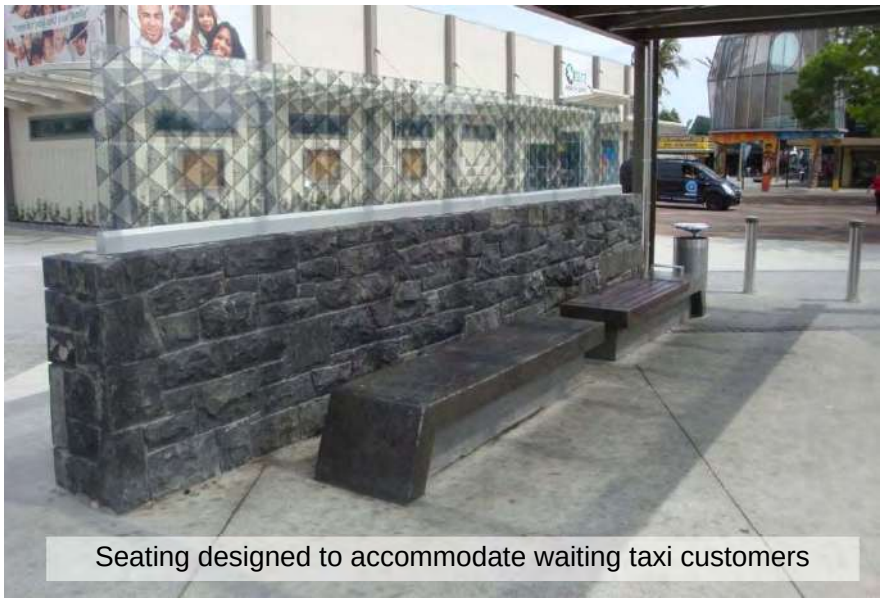



**Figure 15: Otara Interchange taxi rank**

# 5. Prioritising Attributes and Assessment of Design

Not every site or every budget will allow best practise, as described in Sections 3.2 and 3.4, to be applied for every function of the interchange.

Areas for compromise or elasticity of design standards can be broadly categorised as follows:

- Customer requirements, and
- Bus operation requirements.

*Public transport interchanges need a clear image and identity so that arriving customers get a sense of having arrived at a specific place and can easily access available transport modes and other amenities.*

*The interchange should be a place where current and potential public transport customers can be confident multiple travel possibilities are available.*

## 5.1 Customer priorities

There is a quantum of research available to provide direction on prioritisation of interchange attributes.

The outcomes of the following six studies have been considered:

- Oscar Faber – Ameliorating the Disbenefits of Rail Interchange (2006),
- Greater Manchester Passenger Transport Executive (GMPTE) – Bus Station Audit,
- Caltrans – Evaluating Connectivity Performance at Transit Transfer Facilities (2007),
- George Street Research - Haymarket Station Facilities Research Summary (2006),
- South Yorkshire Passenger Transport Executive (SYPTE) – Surveys of Interchange Attributes (1991, 1993 and 1996), and
- Transit Cooperative Research Program (TCRP) – Report 46 (1999).

Each study was very consistent in reporting the importance of the following five attributes. The order shown below attempts to portray a correlation between the studies of the relative importance of each attribute.

1. Security (including safety),
2. Service information (including ticketing and wayfinding),
3. Shelter (the general waiting environment including seating and cleanliness),
4. Accessibility (including access between modes - ease and distance), and
5. Facilities (toilets, food, retail etc.).

Extracts from two reports below provide further background on the importance of shelter, service information and seating.

### TCRP Report 46

TCRP Report 46, which looked at the role of transit amenities[3] and vehicle characteristics in building transit ridership, used a technique called "The Transit Design Game" where customers 'buy' different levels of amenity for their transit journey from a fixed budget. Five different United States cities were surveyed.

In relation to interchanges, customers were asked how much they would pay for:

- Shelter (none, basic, basic with walls or basic with walls plus heating),
- Seating (none, standard or deluxe),
- Information (none, maps and schedules or maps, schedules and real time),
- Lighting (standard or special bus stop lighting), and
- Other (none or phone, rubbish bin and newspaper vending machine).

Importantly, customers were told that not spending on amenity would lead to a fare reduction, so there was active 'trade off' between amenities and fare reductions.

The outcome of the research showed that:

- Shelter was the most important and the majority of respondents were prepared to spend more on quality shelter and forgo a fare reduction,
- Stop information was the next most important with more than 50% willing to pay for good information and forgo a fare reduction. Approximately one third would pay more for real time information, and
- Lighting and seating were placed similarly equal next with almost 50% prepared to pay for higher quality seating. Customers were more likely to forgo a fare reduction for seating at stops and almost 40% would forgo a fare reduction for improved lighting.

As noted, the survey was also measuring on-bus amenities including room for storage, on-board information, ride quality, driver courtesy, the quality of seating, CCTV and low floor entry. Customers surveyed were prepared to spend more on "Stop other" amenities (phone, rubbish bin and newspaper vending machine) then they were on low floor, CCTV or ride quality.

### Haymarket Multi Modal Interchange

Research undertaken in 2006 for the development of the Haymarket Multi Modal Interchange to the west of Edinburgh's city centre looked at factors of importance of interchange users. Whilst not exhaustive it does provide guidance to the interchange designer on where priorities should lie given constraining factors.

This research noted the most important customer amenities at an interchange were:

- Shelter,
- Information, and
- Lighting.

Appendix C provides more detail on this research.

[3] In this study 'amenity' means "practical features that customers find attractive and which have a positive effect on ridership".

## 5.2 Pedestrian levels of service

The success of an interchange design will not only be measured by effective bus operations, by safety, the number of seats or information provided, it will also be determined by its ability to accommodate pedestrian movement efficiently.

Those responsible for design of interchange environments need to consider pedestrian movement patterns so as to provide the appropriately scaled facility. Where space is constrained, the effect on pedestrian levels of service needs to be carefully considered in prioritisation of attributes.

To design the spaces required the designer will need to understand the interrelationships between customer numbers, direction of flows, impacts of grade changes via stairs, escalators or lifts and location of access points, platforms and waiting areas.

The calculations for customer accessibility requirements at interchanges are normally through level-of-service (LoS) standards[4]. These standards, for an interchange, are measures related to four typical customer access requirements as follows:

Walkways

| Area (sq. m) per person | | | Flow rate[5] | |
|---|---|---|---|---|
| LoS A | > 3.24 | | 23 pmm | |
| LoS B | 3.24 | 2.32 | 33 pmm | |
| LoS C | 2.32 | 1.39 | 49 pmm | |
| LoS D | 1.39 | 0.93 | 66 pmm | |
| LoS E | 0.93 | 0.46 | 82 pmm | |
| LoS F | | <0.46 | 82 pmm | |

Stairs

| Area (sq. m) per person | | | Flow rate | |
|---|---|---|---|---|
| LoS A | > 1.85 | | 17 pmm | |
| LoS B | 1.85 | 1.39 | 23 pmm | |
| LoS C | 1.39 | 0.93 | 33 pmm | |
| LoS D | 0.93 | 0.65 | 43 pmm | |
| LoS E | 0.65 | 0.37 | 56 pmm | |
| LoS F | | < 0.37 | 56 pmm | |

[4] John J. Fruin, PhD developed pedestrian facility level of service standards in his 1971 book "Pedestrian Planning and Design" and has since been the most often used resource for this purpose and is referenced as a resource by the "Transit Capacity and Quality of Service Manual," NZTA's "Pedestrian planning and design guide" and the NSW Ministry of Transport's "Guidelines for the Development of Public Transport Interchanges."

[5] Flow rate is measured in people per minute per metre width (PMM)

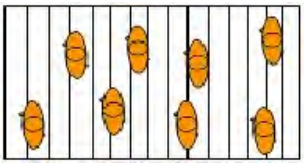
Queues

| Area (Sq. Metres) | | | | |
|---|---|---|---|---|
| **LoS A** | >1.21 | 1.21 | Free circulation | |
| **LoS B** | 1.21 | 0.93 | Restricted circulation | |
| **LoS C** | 0.93 | 0.65 | Comfort zone | |
| **LoS D** | 0.65 | 0.28 | No-touch zone | |
| **LoS E** | 0.28 | 0.19 | The Body ellipse | |

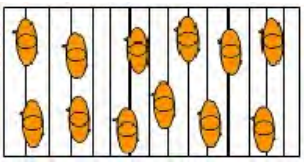
Platforms

| Area (Sq. Metres) | | |
|---|---|---|
| **Danger Level** | 3.59 people per $m^2$ | |
| **Jam Capacity** | 2.15 people per $m^2$ | |
| **Desirable Max** | 1.08 people per $m^2$ | |

A graphical representation of LoS B and C for walkways is shown below:



LoS B



LoS C

LoS C is the preferred design standard for peak time flows, interchange walkways, stairs, queues and platforms. Where constraints exist and pedestrian controls could be applied, LoS D could be considered.

Those utilising this guide should refer to NZ Building Standards and local best practice as well as "The Transit Capacity and Quality Service Manual – Part 4 Terminal Capacity" for guidance.

Design capacity should be assessed at the 15-minute peak period, of the peak day of the peak design year forecast. Consideration of special event needs may also be relevant given the location of the interchange in question.

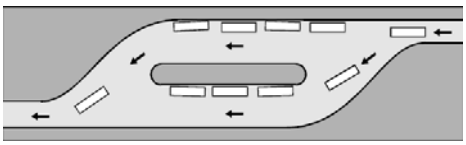
## 5.3 Bus operations

### 5.3.1 Platform layout

There are four typical bus platform layouts that can be considered in interchange design. These are:

- Linear (parallel),
- Sawtooth (drive-in, drive out),
- Angle (drive-in, back out), and
- Drive through.

The following table illustrates each type of platform layout with comments on their benefits and constraints. Layout examples sourced from "Transit Capacity and Quality of Service Manual."

| Type and comment | Example | Evaluation |
|---|---|---|
| **Linear**<br>Typically used for on-street bus stops where buses will stop for only short periods.<br>Bus stops can be independent or dependent. Independent stops require greater space for pull in and pull out manoeuvres.<br>Can be less conducive to aligning doors to kerb lines (than other designs).<br>This design is typically the most demanding on land area requirements (when independent stops are required). |  <br>**Figure 16: Otara Interchange**<br>  <br>**Figure 17: Linear layout** | Land use efficiency<br>= LOW<br>Safety and Security<br>= MED<br>Operational effectiveness<br>= MED<br>Flexibility and simplicity<br>= HIGH |
| **Sawtooth (drive-in, drive out)**<br>Not commonly used in NZ but is generally more land space efficient (than linear stops) whilst allowing independent movement and not requiring reversing manoeuvres.<br>Allows better alignment of front and rear doors to the kerb line (than linear stops). |  <br>**Figure 18: Madrid bus station** | Land use efficiency<br>= MED<br>Safety and Security<br>= MED<br>Operational effectiveness<br>= HIGH<br>Flexibility and simplicity<br>= MED |

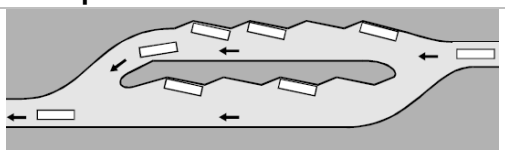
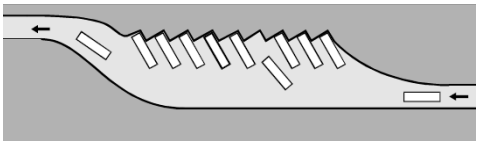
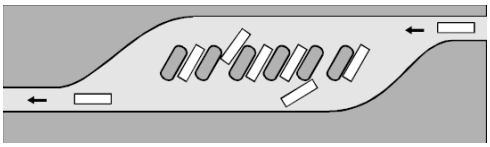
| Type and comment | Example | Evaluation |
|---|---|---|
| |  <br>**Figure 19: Sawtooth layout** | |
| **Angle (drive-in, back out)**<br>Requires buses to drive in and back out. Typically used when buses are likely to occupy the stop for longer lengths of time. I.e. at a terminus.<br>Design may or may not allow access to the rear door.<br>Very efficient where availability of land area is constrained.<br>Most often allows a central platform waiting area that provides greater safety and security. |  <br>**Figure 20: Hamilton Transport Centre**<br>  <br>**Figure 21: Angle layout** | Land use efficiency<br>= HIGH<br>Safety and Security<br>= MED[6]<br>Operational effectiveness<br>= LOW<br>Flexibility and simplicity<br>= LOW |
| **Drive through**<br>Efficient use of land area.<br>Use of multiple platforms reduces safety and security by spreading customers over many waiting areas and creating more bus / pedestrian conflict points.<br>Can lead to greater bus vs. bus and bus vs. pedestrian conflict. |  <br>**Figure 22: Tel Aviv**<br>  <br>**Figure 23: Drive through layout** | Land use efficiency<br>= HIGH<br>Safety and Security<br>= LOW<br>Operational effectiveness<br>= MED<br>Flexibility and simplicity<br>= MED |

**Table 1: Bus platforms layout types**

Note: Where buses park at angle or sawtooth options, inadvertent forward movement beyond the stop line would lead the bus to enter pedestrian wait space. Bollards or similar to protect against this occurrence should be considered.

[6] Where pedestrian desire lines do not draw customers into the bus manoeuvring area.

## 5.4 Summary of prioritisation

Customers clearly rate quality shelter, good information, lighting and seating as the most important parts of an interchange.

This means the most effort should go into these areas and in a constrained environment, facilities such as retail or coffee stands could be traded off against better seating, lighting and shelter.

Additionally, if adequate seating can only be provided at the expense of moving to LoS D in a walkway then that decision could be made on a short to medium term basis with potentially the seating being removed when and if passenger volumes impacted on the constrained walkway area.

Similarly, for bus operations, the trade-offs on space use should be clearly understood by all parties when discussing layouts affecting operations. For instance, if in attempting to put bus company shuttle cars and separate lunch room space on a constrained site means angled bus stops are required - then the option might be not to have these facilities in favour of more conventional bus stops.

## 5.5 Assessment of design

Transport for London developed a very useful interchange design assessment tool within their suite of interchange guideline documents.

We have adapted this tool for Auckland use, which can be applied to both concept, and final designs for any proposed interchange.

The PT Interchange Assessment Tool is attached in Appendix D.

# 6. Stakeholder Consultation

Good design will come from consideration of many inputs. Inputs from major stakeholders will assist not only good design but also acceptance of any site-specific requirements that may be less than best practice, or different to normal operating practices.

Stakeholder consultation refers to a wide range of activities and processes involving: "A genuine dialogue between decision-makers and stakeholders with the objective of influencing decisions, policies or programmes of action."

Potential outcomes of a well-managed stakeholder consultation process include:

- Better quality decisions and proposals,
- Better co-ordination and use of resources,
- Identifying a broader range of options for consideration,
- Greater public awareness of decisions,
- Informed and empowered communities,
- Improved relationships with the community,
- Improved public acceptance and buy-in to decisions,
- Improved public perception of the organisation, and trust in its actions,
- Greater public involvement and interest in democratic processes,
- Services, activities and facilities that are aligned to community needs, and
- Improved efficiency and effectiveness.

Stakeholders to be consulted and the reasons to consult with them are outlined in the following sections. This list is not exhaustive and reference to Auckland Transport for further guidance and a list of contact people is recommended.

## 6.1 Auckland Transport Public Transport - Operations

### Network Planning

This part of Auckland Transport is responsible for specifying what is required from a service / patronage perspective and is to be consulted on:

- Patronage forecasts (peak, off-peak and weekends),
- Bus number forecasts (peak, off-peak and weekends),
- Types of bus,
- Number and scale of different operators,
- Routeing of buses, and
- Timetables.

### Facilities

This part of Auckland Transport will be responsible for the on-going operations and maintenance of the facility and is to be consulted on:

- Construction materials to be used (cleaning, maintenance costs, operation costs i.e. electricity),
- Operations room,
- Staff rest facilities (could be combined with bus driver's area),
- CCTV and other security requirements,
- Contractual agreements (retail, taxi access, bus access),
- Bike locker management,
- Cleaning arrangements and cleaning facilities,
- Access arrangements (keys, cards, locks),
- Suppliers (cleaning, security, maintenance, communications),
- Income from non-transport operations (advertising, retail space leasing, concessions and joint development),
- Flexibility of operation (maximise ability to adapt to operational changes), and
- Flexibility for expansion (costs could be saved when it is expanded 'just in time').

## 6.2 Operators

Operators, specifically but not exclusively bus companies, should be directly involved in the operational design of the interchange. They will want to be involved in planning of:

- Bus manoeuvres,
- Driver facilities (rooms for rest breaks, toilets, change facilities),
- Customer information,
- Shuttle car parking (for driver shift changes),
- Layover bus parking, and
- Operational procedures.

Note that ferry and train operations have separate platform / wharf design requirements, which will need to be considered in multi-modal interchange design. Consultation with KiwiRail, Veolia, and Fullers etc. would be required in this instance.

## 6.3 Auckland Transport Public Transport – Customer Channels

The part of Auckland Transport responsible for information provision, marketing and branding is to be consulted on:

- Location and type of static information,
- Location and type of real time information,
- Wayfinding to and around site,

- Help points,
- PA systems,
- Ticketing and information,
- Opening event/s, and
- Consultation with stakeholders.

## 6.4 Emergency services

Emergency services (police, ambulance, and fire) will want to be involved with:

- Safety and security features, and
- Access.

## 6.5 Public transport user groups

Any specific organisation representing public transport users groups should be consulted. In Auckland, this could include the Campaign for Better Transport, Grey Power and Cycle Action Auckland. Their interests are likely to be wide ranging across the whole interchange and could include:

- Waiting areas,
- Toilets,
- Walking access,
- Ticketing and information,
- Shelter,
- Seating, and
- Cafés and retail.

## 6.6 Cyclist groups

This group (for instance Cycle Action Auckland) will want to be involved with:

- Cycle access to the site,
- Cycle storage, and
- Access to showers and changing facilities.

## 6.7 Disabled community

In addition to designing to the NZ Building Code, additional consultation should be undertaken with the disabled community.

Specific groups to involve include:

- Auckland Council's Disability Strategic Advisory Group (DSAG), and
- Auckland Transport's Transport Accessibility Advisory Group (TAAG).

Points for consultation on include:

- Access points to the interchange,
- Wayfinding and information,
- Access to facilities within the interchange, and
- Platform design.

## 6.8 Taxi companies

Where taxi facilities are provided taxi companies should be consulted on:

- Location,
- Security and safety,
- Number of spaces,
- Operations, and
- Contracts (if required).

## 6.9 Neighbouring land users

Those groups representing land use near the interchange should be consulted. Users could include:

- Business Associations and major employers,
- Ratepayers Associations and neighbourhood groups,
- Local societies and major recreation facilities,
- Existing private tenants, and
- NZTA where appropriate.

# 7. References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Guidelines for the Development of Public Transport Interchange Facilities. NSW Department of Transport. 2008

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Public Transport Guidelines for Land Use and Development. Department for Transport, Victoria.

Intermodal Transport Interchange for London – Best practice guidelines. Transport for London. 2001

## Appendix A

Intermediate Interchange – Concept Layout

## Intermediate Interchange

A concept layout for an intermediate style interchange is shown below so as to portray the various interchange components within the context of reasonable best practise.

This design uses a traditional central island interchange with parallel bus stops as shown in Figure 24 below.

It considers a largely unconstrained land use opportunity and provides:

- One central platform,
- Bus only access, and
- One large structure for weather protection.

**Figure 24: Intermediate Interchange with a central island**

Space for Kiss and Ride and taxi stands is shown in Figure 25 below. Specific features include:

- General vehicle access separate to buses,
- Covered walkway,
- Sheltered waiting areas, and
- Seating.

**Figure 25: Intermediate Interchange – example of Kiss and Ride facilities**

Cycle lockers and bike stands are provided where there is ample passive security as shown in Figure 26 below. Specific features may include:

- Cycle lockers,
- Cycle stands,
- Central location, and
- Covered.

**Figure 26: Intermediate Interchange – example of cycle lockers and racks**

Pedestrian access to the centralised platform is via a single main entry point centred on the internal waiting area. The following features can be seen in Figure 27 below:

- Controlled pedestrian crossing, and
- No obstructions.

**Figure 27: Intermediate Interchange – example of pedestrian access to platform**

Figure 28 shows an internal waiting area which includes a coffee stand, tables and chairs and has:

- Spacious waiting area,
- Chairs and tables provided, and
- Rubbish bins.

**Figure 28: Intermediate Interchange – example of an internal coffee stand inside waiting area**

Internal waiting also includes centralised travel and ticket information with:

- Real time information for all departures,
- Seating,
- Ticket machine/s, and
- Information counter.


**Figure 29: Intermediate Interchange – example of centralised information and ticket sales**

Further retail is provided outside as per Figure 30 below. This may include features such as:

- Newsstand, and
- Dry-cleaning.

**Figure 30: Intermediate Interchange – example of further retail opportunities such as a newsstand**

Each stop not adjacent to the internal waiting area has a shelter which provides:

- Shelter from wind and driven rain,
- Seating, and
- Wayfinding information.

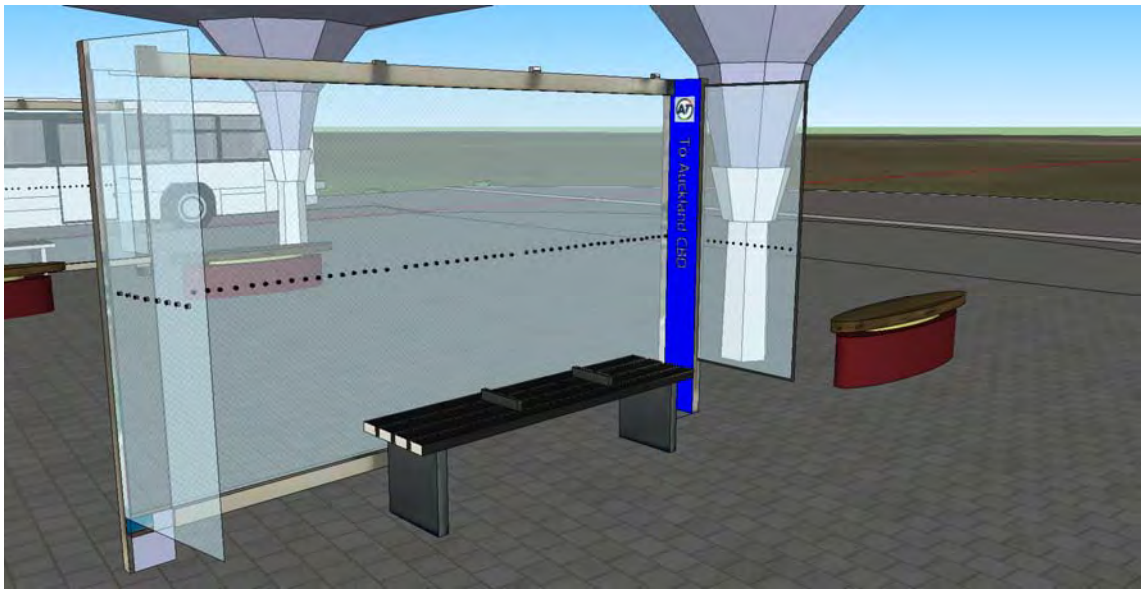


**Figure 31: Intermediate Interchange – example of an internal waiting area**

A driver's room is provided for scheduled rest breaks and may include:

- Staff only (could include interchange staff too),
- Microwave, sink, kettle, tables and chairs provided,
- Lockers for driver cash boxes,
- Possibly a change machine (notes to coins), and
- One-way windows to provide in-to-out surveillance of platforms.


**Figure 32: Intermediate Interchange – example of a driver's room**

Information provided at each platform stop is extensive, see Figure 33 below, and may include:

- Double sided real time,
- Platform numbering,
- Timetable, and

- Wayfinding (service direction).


**Figure 33: Intermediate Interchange – example of a platform / stop information**

**Appendix B**

Minor and Neighbourhood Interchange – Concept Layout

# Neighbourhood Interchange – Working Example

## Corner of Dominion and Balmoral Road

The corner of Dominion and Balmoral Roads has been indicated in the RPTP as the location for a Neighbourhood Interchange.

The location of stops and infrastructure currently provided here would fall well short of what is envisaged in the RPTP. This site was therefore chosen to demonstrate how changes to stop locations and provision of suitable infrastructure, given best practice, could improve the current situation.

Using the existing layout, two concepts have been shown to demonstrate how a Neighbourhood Interchange or a Minor Interchange could be implemented in this location.

## *Walking distance discussion*

*'A Pattern Language. Towns - Buildings - Construction' by Alexander et al discusses in depth the impacts of walking distance on attractive interchange design. The report suggests that time spent walking between two platforms in the area of interchange should not exceed three minutes.*

*The report also suggests maximum walking distances between different mode interchanges:*
*30 m while transferring from bus/tram to bus/tram,*
*60 m while transferring from mass rapid transit to bus/tram, and*
*90 m while transferring from light rapid transit such as trams, to mass rapid transit such as subways.*

*Note: The importance of the value of time in interchanging has an impact on economic evaluations. Reducing delays also reduces perceived barriers to transfer.*

A current layout of the Dominion Road / Balmoral Road intersection with walking distances between key stops is shown in Figure 34 below.


**Figure 34: Current layout Dominion and Balmoral Roads**

Two options to consider for an improved interchange layout are presented below.

Option 1 demonstrates a Minor Interchange style of layout whilst option 2 shows a Neighbourhood Interchange in this location. It is noted that these designs are indicative only and are not to scale and should be considered as a guide to the placement and inclusion of various interchange components.

# Option 1 – Minor Interchange

A concept layout, accounting for the location of the corner of Dominion and Balmoral Roads as a 'Minor Interchange', is shown in Figure 35 below.

This design uses a traditional placement of all stops on the far side of each leg of the intersection and has the following features:

- A longest point-to-point walk of not much more than 100m,
- Covered walkways and covered intersection corner waiting areas,
- Slip lanes removed, and
- All bus stops at far side of the intersection.

In general, this results in higher supporting infrastructure cost than a Neighbourhood Interchange (shown in Option 2).

**Figure 35: Concept layout – Minor Interchange, Balmoral**

Figure 36 below shows a single platform view of the interchange. This provides:

- General information on the intersections corner pylon, and
- Covered walkways and intersection corner waiting areas.

**Figure 36: Minor Interchange – example view from corner of intersection**

Figure 37 below shows a closer view of shelter and information boards including:

- Double side real time sign,
- Platform number on pylon,
- Timetable information on pylon,
- General area information on back of shelter,
- Seating for four or more people, and
- Rubbish bin.


**Figure 37: Minor Interchange – example of a typical shelter and information provision**

# Option 2 – Neighbourhood Interchange

A second option concept layout, accounting for the location of the corner of Dominion and Balmoral Roads as a 'Neighbourhood Interchange' is shown in Figure 38 below.

This approach considers a popular North American practice of keeping interchange stops closer together by having one stop on the 'far side' of the intersection paired with a stop at the stop line.

This utilises only two of the corners of the intersection and can result in shorter walking distances for some transfers. The effect of stopping the bus at the stop line causes delay to left turning traffic (and probably means it can't be an intermediate timing point), but does create good interconnectivity.

A Neighbourhood Interchange usually has the following features:

- A longest point-to-point walk of not much more than 100m,
- Covered walkways and intersection corner waiting areas,
- Slip lanes removed,
- Primary travel direction bus stops on far side of intersection, and
- Secondary bus stops at stop lines.

**Figure 38: Concept Layout – Neighbourhood Interchange, Balmoral**

Figure 39 below shows a closer view of the corner arrangement.  This has the following features:

- General information on intersection corner pylons,
- Clear platform numbering, and
- Covered walkway and intersection corner waiting areas.

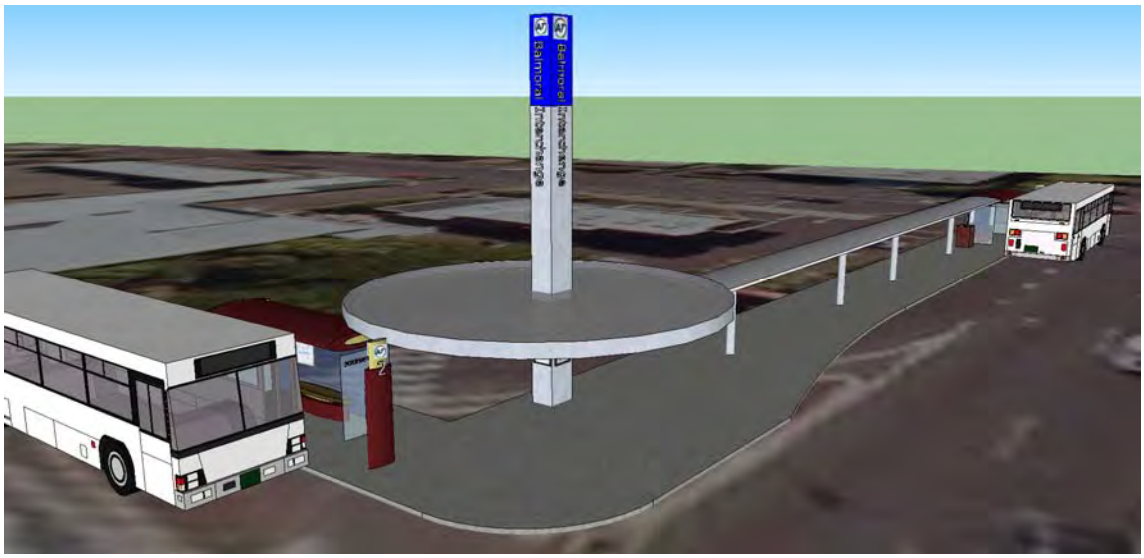


**Figure 39: Neighbourhood Interchange – example of a suitable corner arrangement**

**Appendix C**

Haymarket Multi Modal Interchange

# Haymarket Multi Modal Interchange

Research undertaken in 2006 for the development of the Haymarket Multi Modal Interchange to the west of Edinburgh's city centre looked at factors of importance of interchange users.

The three key areas looked at were:

- Factors of importance within the station,
- Factors of importance outside the station, and
- Factors of importance for passengers transferring between modes or services.

Whilst not exhaustive it does provide guidance to the interchange designer on where priorities should lie given constraining factors. Over the next three subsections, the Haymarket survey has been utilised to graph the relative importance of each attribute for each part of the interchange environment.

Note the scale as it also shows the relative importance of each component in the interchange environment as a whole. For example, having shelter and lighting for the outside areas is considered more important than having retail or left luggage counters inside the interchange.

### Within the station

The following was the priority of attributes relating to the internal areas of the station.

Users could include those transferring between long and short distance services and those waiting on others to arrive from a long distance service. Those utilising a central waiting area may therefore have a longer waiting time before their service departure or may be a tourist or visitor with luggage. The attributes also describe what people would expect to find in the central waiting area of an interchange (i.e. toilets).

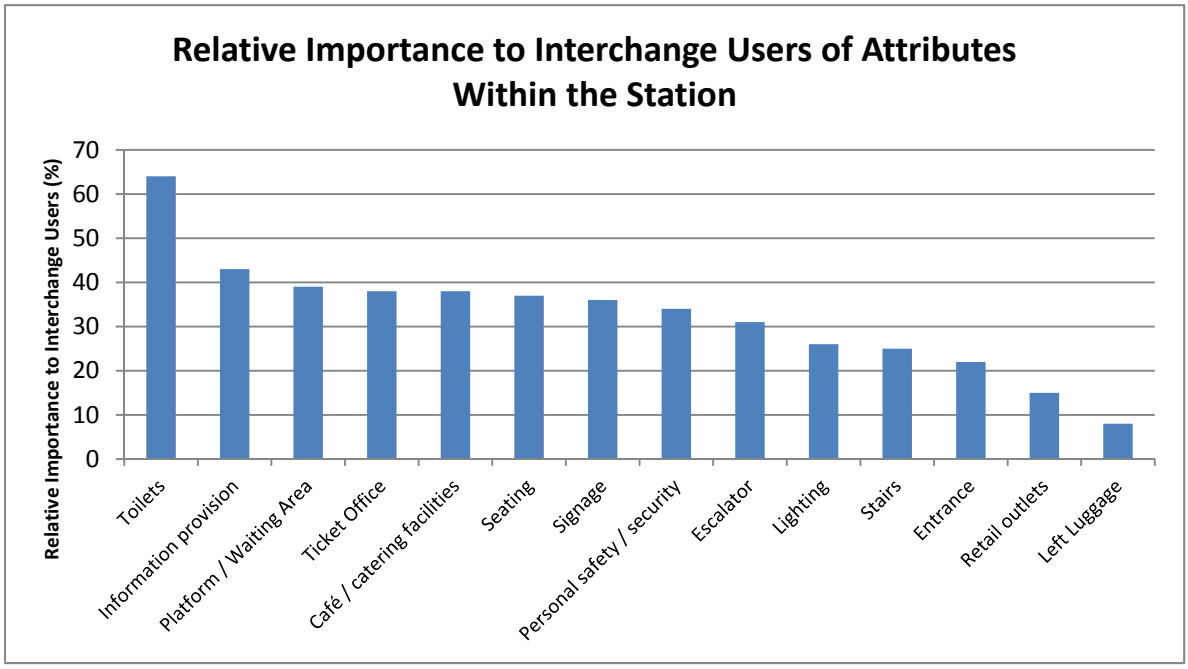


**Figure 40: Priority of attributes within the station to interchange users**

## Outside the station

For those areas outside the interchanges internal area, the following was the relative importance of each attribute. It is noted that the people interested in these attributes may not necessarily be interested in going into the main interchange concourse and simply want to go directly to their normal platform to await their departure.

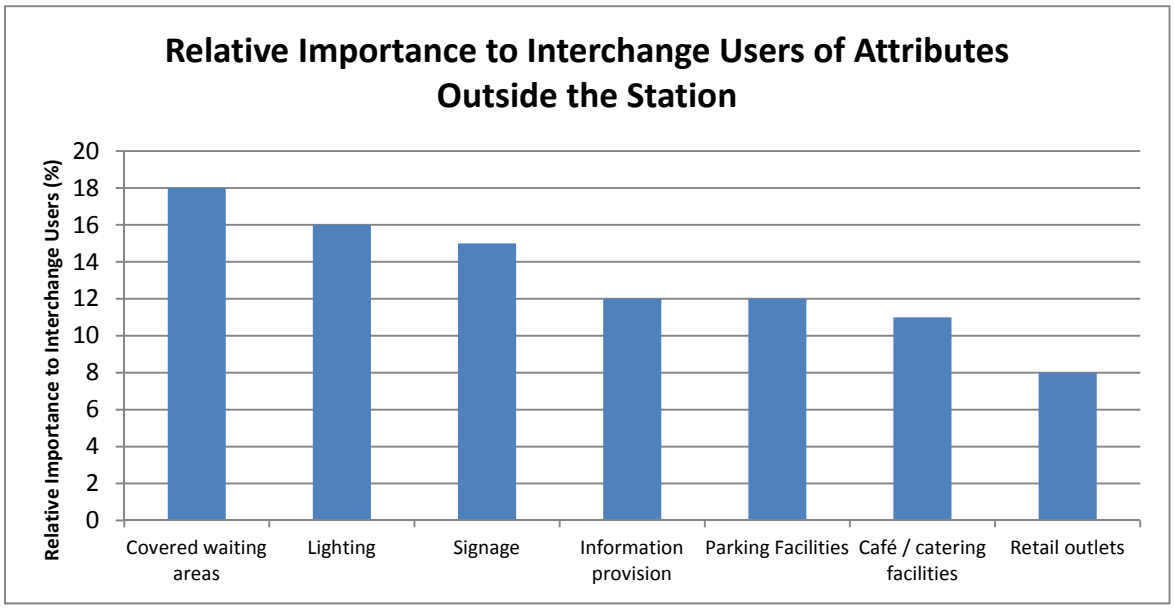


**Figure 41: Priority of attributes outside the station to interchange users**

## Transferring between modes of travel

Considering the interchange attributes when moving between modes of travel the following were each of the attribute's level of importance.

These attributes should be viewed in the context of people directly changing between modes, i.e. bus-bus, bus-train etc.

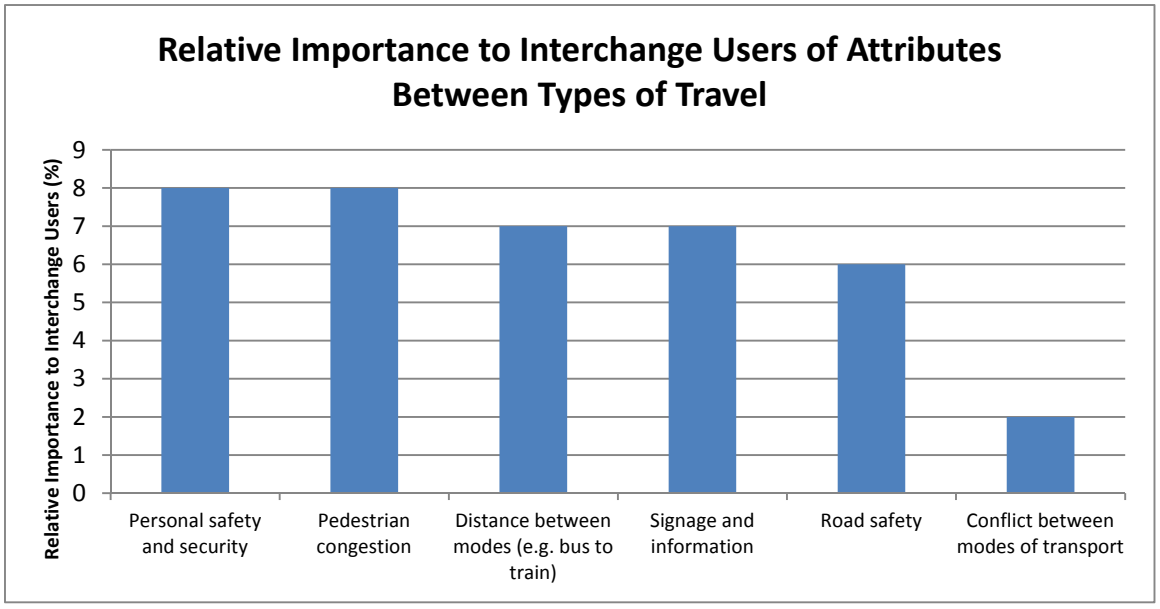


**Figure 42: Priority attributes of interchange users transferring between modes of travel**

## Appendix D

PT Interchange Assessment Tool

# PT Interchange Assessment Tool

The following tables may be used as an assessment tool when assessing the usability and efficiency of an existing or proposed interchange. Where a green rating is excellent, amber is average and red is poor.

| Usability | | |
|---|---|---|
| Environment |  | Comments |
| Is there appropriate shelter from the weather? | | |
| Do the shelter materials maintain natural surveillance? | | |
| Is the interchange facility comfortable? | | |
| User Interface |  | Comments |
| Does the layout make it easy to find your way around? | | |
| Is there appropriate lighting to highlight routes and destinations? | | |
| Do construction materials have good visual and physical contrast? | | |
| Is directional signage adequate? | | |
| Is signage appropriate? | | |
| Service Information |  | Comments |
| Does information meet the needs of all users? | | |
| Is pre-journey information adequate and located appropriately? | | |
| Is real time information legible and located appropriately? | | |
| Quality |  | Comments |
| Does the interchange facility maximise user convenience? | | |
| Is the interchange facility clean? | | |
| Have quality materials been used and finished to a high standard? | | |
| Does the interchange facility add value to the surrounding area? | | |
| Are commercial facilities on offer appropriate for the interchange facility? | | |

# Efficiency

| Operations |  | Comments |
|---|---|---|
| Are the different functions / modes integrated well? | | |
| Is there sufficient capacity to meet demand? | | |
| Are facilities easy to maintain? | | |

| Safety |  | Comments |
|---|---|---|
| Does the layout of the facility provide good natural surveillance? | | |
| Have isolated areas been minimised? | | |
| Are waiting areas appropriately lit? | | |
| Are passenger-vehicle interfaces safe? | | |
| Are facilities capable of emergency evacuation? | | |
| Is CCTV being used appropriately? | | |
| Have vandal-proof materials and fittings been used? | | |

| Movement |  | Comments |
|---|---|---|
| How easy is movement between feeder modes and primary modes? | | |
| Are pedestrian routes free of obstacles / obstructions? | | |
| Is internal movement logical and intuitive? | | |
| Is the interchange facility well connected with external facilities? | | |
| Can all areas of the facility be reached by avoiding stairs? | | |
| Are stair and obstacle free routes clearly sign posted? | | |
| Are lift / escalator locations optimal? | | |

| Future Proofing |  | Comments |
|---|---|---|
| Is there adequate spare capacity for growth? | ○ ○ ○ | |
| Are construction materials robust and durable? | ○ ○ ○ | |
| Is the interchange facility sustainable and energy efficient? | ○ ○ ○ | |

**Appendix E**

Auckland Plan Urban Centres Hierarchy

# Auckland Plan Urban Centres Hierarchy

## The City Centre

The focus of national and international business, tourism, educational, cultural and civic activities. It provides significant capacity for business and high-density residential development within a variety of precincts. It is the focus for regional transportation services. It is surrounded by the city fringe, and lies within a 2km walkable catchment (approximately): it provides complementary living, business and entertainment activities within traditional and higher-density neighbourhood living and specialist precincts.

## Metropolitan centres

Are regional catchments or have strategic roles within the region. They provide a diverse range of shopping, business, cultural, entertainment and leisure activities, together with higher-density residential and mixed-use environments. They have good transport access and are served by high-frequency public transportation. These centres have the greatest opportunities for additional business and residential growth.

## Town centres

These act as local hubs for communities, providing a wide range of retail and business services and facilities, and community facilities. They are generally accessible by frequent public transport services, and provide a range of residential living options, including mixed-use and higher-density options. They have variable capacity for accommodating new residential and business development.

## Local centres

Acts as a focus for a community and provide a range of convenience shops and small business services together with some community facilities. These centres are focused on walkable catchments supported by public transport services. They have variable capacity for accommodating new residential and business development, but to a lesser extent to town centres, due to their individual and accessibility constraints.

## Neighbourhood centres

Provides day-to-day convenience shopping within walkable neighbourhoods. Based on a small group of shops, they may also be aligned with a community facility, such as a school.