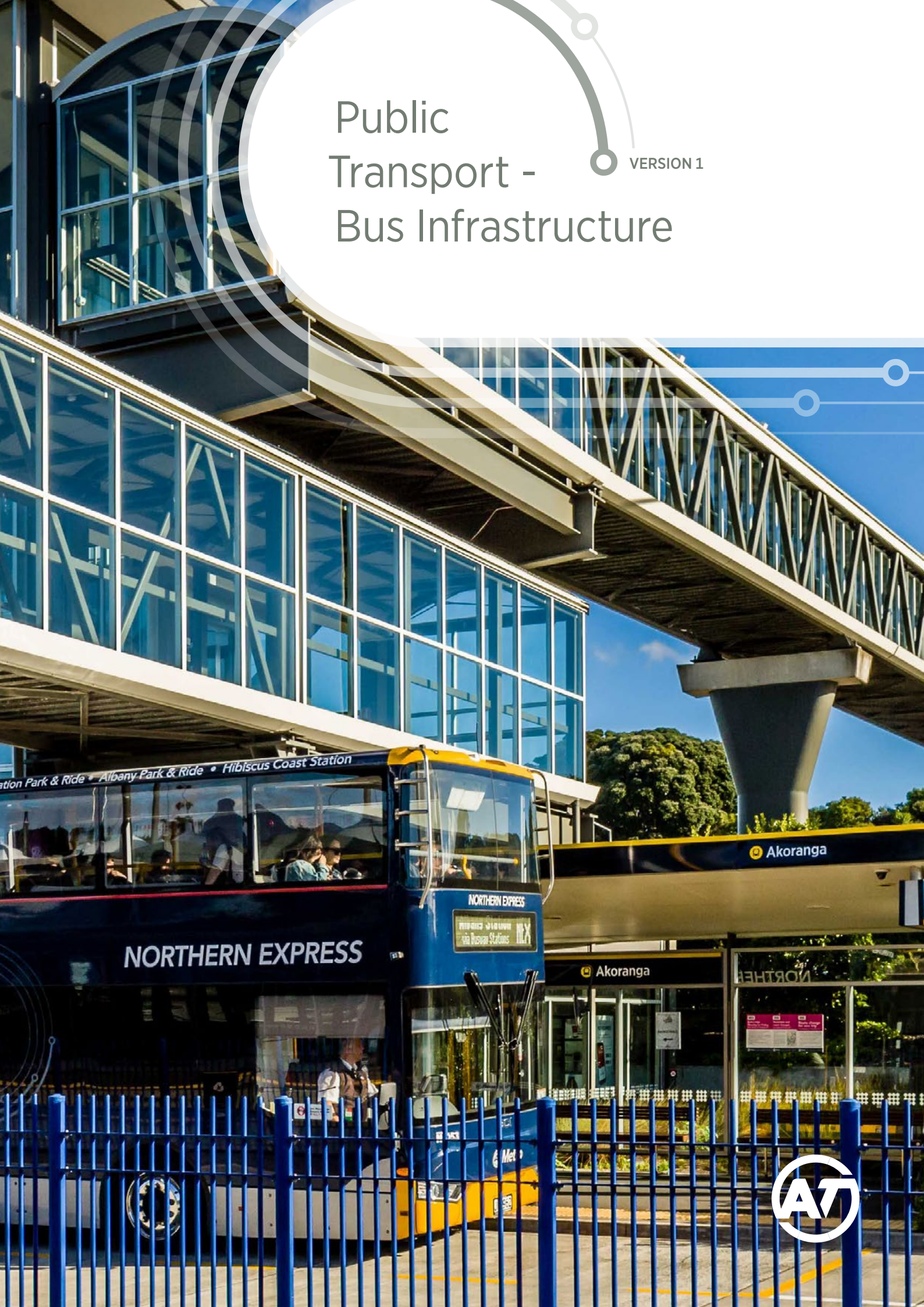
Public Transport - Bus Infrastructure

VERSION 1



In this chapter

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01 Introduction

PURPOSE

Well-designed bus infrastructure must:

- **Provide easy access for buses** through
  - accessible and safe walking routes to the bus stop
  - consider all user groups who will have different needs
  - making it easy and accessible to board and alight from the bus.
- **Be consistent** in design and provision, making it easy to identify and easy to use.
- **Help reduce bus travel times** and improve bus service reliability through relation to road space.
- **Provide sufficient information** on public transport services available from the stop.
- **Enhance the streetscape** through its appearance.
- **Consider other road users**, e.g. passing pedestrians and cyclists.
- **Be safe**.

DEPARTURES

Where any deviations from the standards are necessary, they must be clearly documented and must follow the AT Departures from Standard process.

ROADS AND STREETS FRAMEWORK (RASF)

The Framework sets out the process for planning or altering a transport network.

It provides guidance on the strategic types of street and the functions and features to be expected in each street, together with modal priorities.

It also describes the process for resolving conflicts for priorities. This should be used to resolve the common issues around general traffic provision with other modes of transport.

URBAN STREET AND ROAD DESIGN GUIDE (USRDG)

This sets out principles for design of the various street types.

CHAPTER 1 | **Design principles.** These principles must be understood by all designers as the basis for decisions, and the approach to be taken in the design process. In particular, this sets out how safety must be incorporated in all design work.

CHAPTER 2 | **Neighbourhood design** focuses on design aspects of planned networks, either as a means of designing the relationship between land use and movement, or for evaluating the local design context for a specific street or place within a neighbourhood. It also includes guidance on environmental design within a neighbourhood.

CHAPTER 3 | Street users takes each user group in turn, and describes their needs, specific design principles and the features that can be provided for them. Having understood principles and context, this chapter guides the choice of elements for each user to meet the planned function.

CHAPTER 4 | Design controls deals with the issues of geometric design that need to be considered, to ensure that drivers of vehicles in particular are guided to behave reliably in the way planned for them, safely and efficiently.

CHAPTER 5 | Street types and

CHAPTER 6 | Intersections can then be used to put the elements together in accordance with the design principles into street and intersection layouts that will effectively deliver the planned outcomes. Typical layouts are shown, not as finished designs, but to illustrate the design considerations required to fit elements together into the design of a whole place.

RURAL ROADS DESIGN GUIDE

This is to be developed later, to set principles for design of the various rural road types.

URBAN AND RURAL ROADWAY DESIGN

The Engineering Design Code–Urban and Rural Roadway Design should be used with this chapter to design traffic lanes and intersections for bus use and to integrate bus infrastructure design with other vehicle users.

FOOTPATHS AND THE PUBLIC REALM

The Engineering Design Code–Footpaths and the Public Realm should be used with this chapter to fully define the overall road margin and to integrate bus infrastructure design with other footpath users and infrastructure.

02 Design parameters

2.1 Design vehicles

REQUIREMENTS

The type of bus serving a bus stop has a direct impact on many aspects of its design. The infrastructure must be designed so that the bus can:

- Pull into and out of a bus stop safely and efficiently.
- Stop close and parallel to the kerb to pick up or set down passengers, so that all passengers can board or alight the bus in a safe, comfortable and easy manner.

STANDARD BUS DIMENSIONS

Buses are generally large vehicles designed to carry large numbers of passengers per vehicle. While there are a variety of differing bus types operating in the Auckland region, they share many similar, but not all, characteristics. The dimensions and layouts included in this guideline have been primarily based on a single-deck tag-axle bus that is 13.5m long and 2.5m wide (2.85m – 2.9m with mirrors) however designers need to consider other bus types that may be used on each bus route (e.g. double deckers).

Typical 13.5m AT Metro bus

Typical 12.6m AT Metro double decker bus

Bus infrastructure in general should be designed to accommodate the above dimension of bus. Where other bus types will use bus infrastructure, designers must allow appropriate dimensional tolerances, or amend the bus stop design to suit the bus operating on the specific route. Alternative design vehicles for a particular route are to be approved only by AT Metro.

DOUBLE-DECKER BUSES

Double-decker buses are being used increasingly in Auckland. These buses are a maximum of 12.6m in length and comparable in width to single-decker buses. The main additional design requirement for double-decker buses is allowance for their greater height. Vertical clearance of 4.3m plus a minimum of 0.25m additional clearance is required, with a relatively level lateral road surface gradient. Crossfall should generally be 3% or less, with smooth transition where it changes.

LENGTH

The most common bus lengths are 11.3–13.5m. However, urban buses can be as short as 10.5m, while some articulated buses reach 18.5m.

WIDTH

Designers should currently consider a standard bus body width of up to 2.55m. It is important to also note the total width of the bus increases to between 2.85m – 2.93m with mirrors added.

HEIGHT & GENERAL CLEARANCE
Typical 18.5m AT Metro articulated bus

These requirements vary from the standard clearance envelopes in the Engineering Design Code–Urban and Rural Roadway Design. Reduced clearances below may only be used where existing constraints require a Departure from Standard.

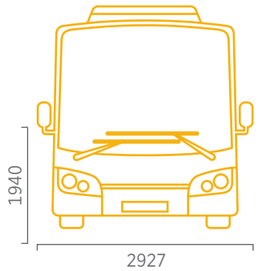


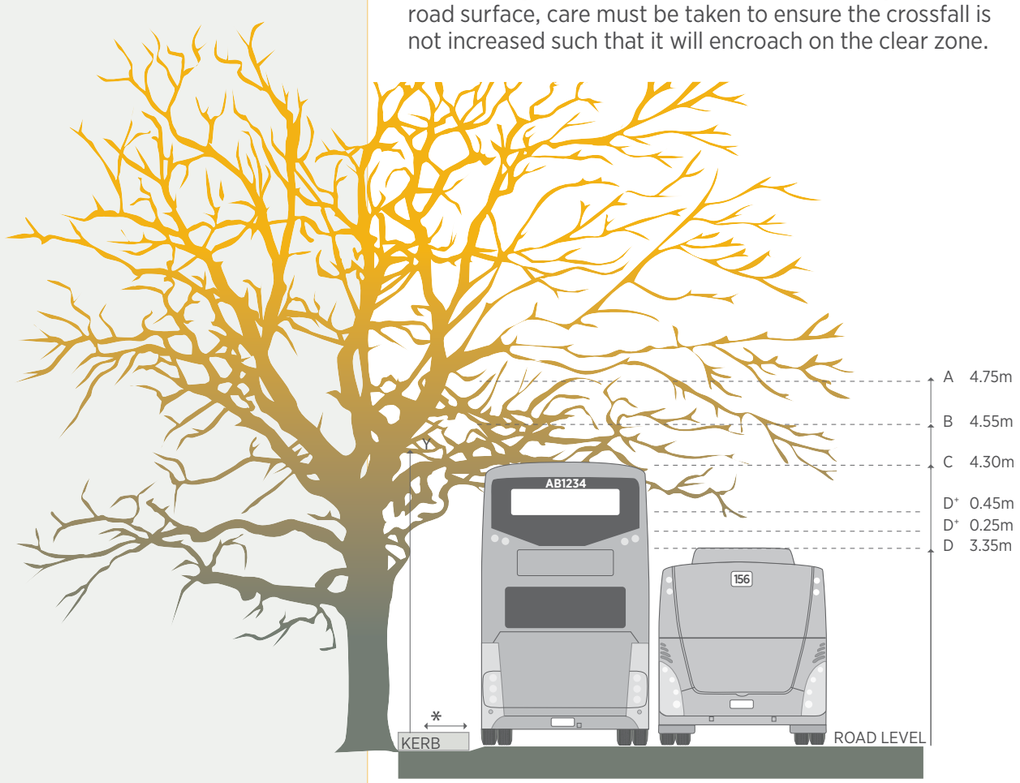
Figure 1 Standard bus body width

The legal maximum height of a bus in New Zealand is 4.3m. This height PLUS safety margin must be considered when designing or maintaining bus infrastructure, to cater for double-decker vehicles.

The recommended minimum safe design height should therefore be 4.55m to clear hard infrastructure, however for tree clearance and tree pruning purposes a recommendation is for trees to be trimmed at 4.75m to allow for growth as well as wind and rain effects.

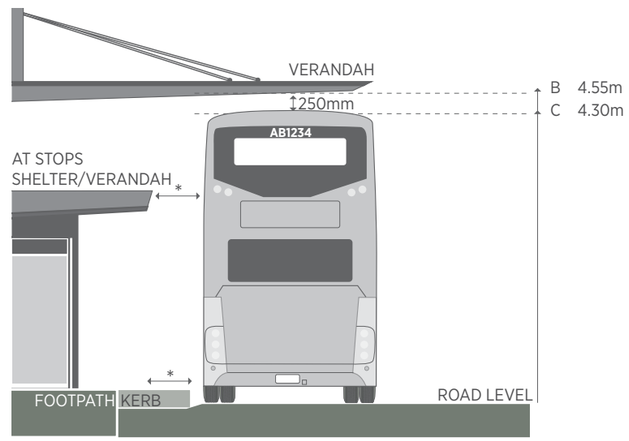
For bus routes that only use single deck buses, designers should note these buses in general have a maximum height of 3.35m (see Figure 2).

The camber of the road should be taken into account when determining a clear zone for buses. When re-laying the road surface, care must be taken to ensure the crossfall is not increased such that it will encroach on the clear zone.



NOTE: * AT BUS STOPS - KERB WIDTH = 1M
* ON ROAD - KERB WIDTH = 500MM

Figure 2 Clearance from soft obstacles (such as trees)



NOTE: * AT BUS STOPS - KERB WIDTH = 1M
* ON ROAD - KERB WIDTH = 500MM

Figure 3 Clearance from hard obstacles (such as building verandas and shelters)

OVERHANG AND UNDERSIDE CLEARANCE

Front and rear bus overhangs must be considered for any infrastructure where height is a factor, e.g. speed limiting devices, catch pits and kerbside infrastructure. A standard 13.5m bus has the following overhangs and clearances:

- Front 2.7m
- Rear 3.5m
- Underside clearance at axles 75mm
- Underside body clearance when kneeling 160mm.

TURNING CIRCLE AND SWEEP: CLEARANCE ENVELOPE

Auckland buses have a significant tail swing when turning that must be considered in design, especially at (but not limited to) bus stops. Buses with a steering rear axle have a tighter minimum turn radius but a greater tail-swing. For this reason, all changes to the road corridor that affect a bus route (operational or repositioning routes) must be designed so that both types of bus can operate safely. For further information on the design and 'check' vehicles (steering and non-steering axle) to be used, refer to Engineering Design Code – Urban and Rural Roadway Design and Appendix B. CAD files of the Design Vehicles are provided in the EDC – Design Tools.

Front and rear overhang of all buses must be considered for clear width beyond kerb line where buses turn close to the kerb.

Bus stops must be designed to permit approach and departure without intrusion beyond the kerb, but also to remove risks of collision with fixed objects if a bus has to approach or depart more acutely.

The increased height of double decker buses means that any camber on the road surface will cause the upper corners of a decker to lean to a wider kinetic envelope when turning and to penetrate further across the kerb than a single deck bus given the same angle of approach into or departure from the stop. For this reason, every stop at which double deck buses might in future use must maintain a clear space of 1000mm behind the kerb face within the whole of the 15m bus stop box, and in the 10m of the lead-in space closest to the box.

If a stop design proposal cannot achieve this then the location must be reviewed in conjunction with AT Metro.

BUS DOOR LOCATION

Buses normally have a two-door layout, with one at the front (entrance doorway) and one near the centre, usually used only as an exit. The entrance doorway is generally ahead of the front wheels and the exit doorway between the front and rear wheels. Continuous hard paving and kerb is required so that both front and centre doors will always align with a safe boarding/alighting platform.

APPENDIX B: BUS PLANS

Example bus plans are attached in Appendix B.

2.2 Design for bus drivers

CONSISTENT EXPERIENCE

Bus drivers ideally need to have a consistent experience. Therefore, bus infrastructure design must consider existing layouts that are familiar to bus drivers. The design must not require bus drivers to perform unfamiliar or difficult maneuvers.

To help facilitate driver awareness, the implementation of elements such as raised kerbs at bus stops should preferably be done on a corridor basis, rather than ad hoc. Although there are still benefits to formatting individual stops such as hospitals for improved accessibility.

LEGIBILITY

Any stop and its layout should be visible to approaching bus drivers so that they can signal and maneuver correctly to stop parallel to the kerb at the head (front) of the stop.

VISIBILITY

The stop should be positioned so that a departing bus can be seen by approaching drivers and that the bus driver can see all traffic approaching, including cyclists and turning traffic.

GAP ACCEPTANCE

Sight distance should be sufficient for a bus driver to identify a safe gap to pull out.

2.3 Design for bus users

WHOLE OF JOURNEY

The bus is only part of the system and the whole journey – from door to door – must be accessible and attractive to passengers.

TYPE OF PASSENGERS

When designing facilities for bus passengers, consideration must be given for the requirements of the following groups:

- Impaired mobility, vision, hearing or cognitive skills (vulnerable road users).
- Passengers with young children, pushchairs and prams.
- Passengers with large or heavy luggage or shopping.

2.3.1 Design for boarding

NUMBER OF BOARDINGS

The number of passengers using a bus stop could influence its design. To determine daily passenger boardings, bus stops should be surveyed midweek between 7am and 6pm, and not during school or university holidays or in a week that has a public holiday in it. AT Metro hold data on patronage at all existing official stops. For stops on future bus routes or where services are changing, forecast patronage must be discussed with AT Metro.

STEP HEIGHT AND HORIZONTAL GAP

The bus stop layout should allow the bus to stop parallel to, and as close to the kerb as possible to make it easy and safe for passengers to get onto and off the bus. The critical dimensions to consider are:

- The vertical gap, or step height, from the kerb to the bus floor.
- The horizontal gap from the kerb edge to the side of the bus.

The design should aim to minimise these two distances.

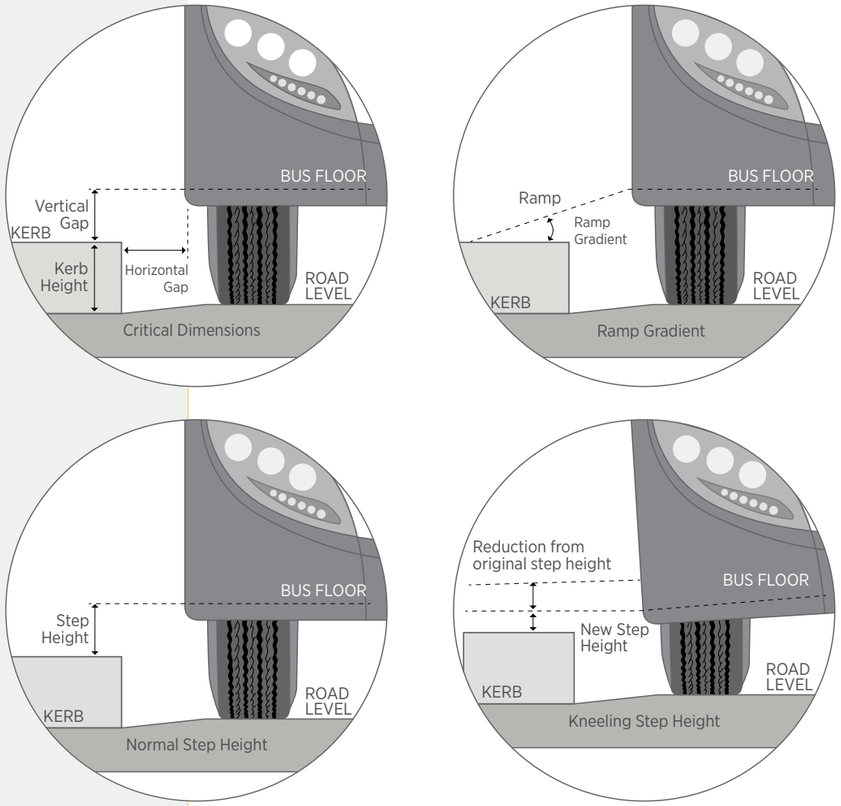


Figure 4 Horizontal gaps, ramp gradient and step height

BUS STOP LAYOUTS

Bus stop layouts are discussed in greater detail in Section 5.1, and kerb heights in Section 8.1.

UNIVERSAL DESIGN

The design of bus stops is an essential complement to the requirements for accessible land public transport, as envisaged in the NZ Disability Strategy and the Human Rights Inquiry. For further information on accessible design refer to NZS 4121:200 for key information.

CONTINUOUS HARD SURFACE

In order that all customers can board and alight safely, a hard, non-slip surface must be provided alongside where the bus will stop. This is to ensure that customers stepping from footpath to bus or vice versa have a firm footing; and so that the wheelchair ramp can be deployed safely when required for wheelchair users.

SCOPE

The hard surface must extend as a minimum for 9m measured from the head of the stop box. It must have a continuous kerb at minimum 150mm height (ideally 160mm), with no drops for crossings of any kind. Where a bus stop is required at a location without continuous footpath, the hard-stand must be formed as a short section of footpath with kerb, at least 10m long and a minimum of 2m wide for the whole of the 10m length.

LOW-FLOOR BUSES

Most urban buses in Auckland are of a 'super low floor' type.

The benefits of low-floor bus construction are realised when the floor height matches closely the kerb height at bus stops, which is assisted by 'kneeling' suspension systems. By matching the kerb and bus door heights, all customers are provided with the safest, easiest and most comfortable boarding and alighting environment, and those with mobility difficulties are enabled to make use of bus services much more independently. Efficient boarding and alighting also reduces stop dwell times for bus services.

Kerb heights at bus stops therefore become very significant to both customers and to operators. In order to minimise the height differential between kerb and bus, a minimum kerb height of 160mm is recommended and must be provided at every stop where the kerb is broken out and replaced or the kerb line extended by any project. For accessible kerb advice (e.g. kassel kerb), see Section 8.1.2. Where kassel kerbs are used a kerb height of 160mm will be achieved.

ACCESS RAMPS

The requirements for new urban buses are that wheelchairs, prams, etc., load at the front. Wheelchair ramps of 800 mm wide and 800 mm long are fitted to all new urban buses. To deploy the ramp correctly a minimum kerb height of 150mm (ideally 160mm) and a sealed area clear of obstructions must be provided.

DESIGNING FOR RAMPS

Where kerb and bus door heights can be brought to within 40mm and the bus docked close and parallel to the kerb, it should be possible for most users including those using wheelchairs to board and/or alight without the use of the integrated ramp. Where the kerb height and bus door height cannot be synchronised to that extent, it must be possible to deploy the ramp from the front door with the bus docked close and parallel alongside the kerb. Drivers must not be obliged to position the bus differently in order to deploy the ramp, as non-ramp users must also be able to board and alight with the bus in the same position. Consistency of experience is very important.

Wheelchairs must be able to maneuver on to and off the bottom of the ramp safely, conforming to the minimum space requirements for wheelchairs set out in NZS 4121:2001.

2.3.2 Design for accessibility

PEDESTRIAN MOVEMENT

The bus stop design should allow for the safe and easy movement of pedestrians along the side of the road where the bus stop is located, as well as crossing the road, particularly for those transferring between services

FOOTPATH WIDTH

Bus stops should be sited where footpaths are wide enough, so that waiting bus passengers do not obstruct passing pedestrians. This is especially important for bus stops alongside retail activity. If an existing footpath is too narrow, consider locating the bus stop where the footpath can be widened, without compromising other location criteria. The use of bus boarders should also be considered. (For bus boarders, see Section 5.1.2.)

3.3 Design for inclusive access

DESCRIPTION

The inclusive access, which is also referred as the ‘first and last mile’, describes the beginning or end of an individual trip made primarily by public transport. In many cases, people will walk to public transport if it is close enough. However, at either end of a public transport trip, the origin or destination may be difficult or impossible to access by a short walk.

In reality, the last mile connection is more complex. Walking is often an acceptable connection, but typically only for short distances. Transport agencies may be concerned about key destinations that are located further away than is ‘reasonable’ from the nearest PT stop. Sometimes even walking is not an option, perhaps due to poor infrastructure. In other cases, a long-distance public transport service like a train may serve destinations with infrequent or non-existent (local) public transport connections

DESIGN ELEMENTS

Key design elements that should be included within the first and last mile design guidelines include the following

- **Universal Design**, which should generally include
  - Walking
  - Cycling/e-scooters
  - Private vehicles
- **Signage and wayfinding**, which should generally include
  - Audience
  - Type of signage
  - Content of signage
  - Location of signage
  - Out of vehicle experience
- **Safety and comfort**, which should generally include
  - Street furniture
  - Landscaping and shade
  - Lighting
  - Enhanced bus waiting areas
  - Traffic calming
  - Paving and surface enhancements
- **Taxi/transportation network companies**
- **Bikeshare/E-scooter faciliti**es, which should generally include
  - Location and placement
  - Parking facilities
  - Safety
  - Legislation
  - Effects on local services

02 Movement or upgrading of bus stops

EXISTING ROUTES

Any development or project which requires an existing bus stop to be moved, or which results in a change to the expected usage of a stop, shall be discussed with AT Metro. The legal requirements for moving a stop may affect the project or its timescale; and private developers must be made aware of their responsibility for preparing Resolution Reports and Plans for their own projects where the road corridor is affected.

NEW DEVELOPMENT

Once routes are agreed with AT Metro, stops shall be provided in accordance with these guidelines. In some cases, where services are not able to start immediately, installation of shelters and other elements may be deferred, subject to agreement with AT Metro.

04 Bus stop location

SCOPE

This section provides a framework for the placement of new bus stops and for the review of existing stops. It indicates where they can be placed in relation to other road and environment features.

4.1 Decisions about bus stop location

TRIGGERS

Decisions about the location of bus stops are usually triggered when:

- New developments are planned
- Changes are made to existing bus services
- New bus routes are being planned
- Transport authorities review bus stops

REVIEWS

AT Metro may review the location of existing bus stops:

- as part of future bus route planning or bus priority schemes
- following routine audits of accessibility or safety
- where buses experience delay in re-joining the traffic stream
- where there are too many bus stops along a route, increasing the proportion of stop time to travel time

On review, new optimal bus stop placement may be achieved by:

- moving existing bus stops to more appropriate locations
- providing additional bus stops
- consolidating existing bus stops

CONSULTATION

“The decision on the location of every new or relocated bus stop rests with AT Metro, subject to statutory processes. AT require that consultation should be undertaken with Local Boards, the Police and the owners and occupiers of adjacent properties. AT Metro will undertake consultation with bus operators.”

4.2 Bus stop spacing

PRINCIPLE

For buses to offer a real alternative to private cars, they must be within a comfortable walking distance from people's origins and destinations. Spacing for bus stops must consider the street's place and movement functions and passengers demand for use of the stop. Bus journey times are affected by the number of stops on a route. Therefore, to achieve optimal spacing, a careful balance must be achieved between the passenger need and the bus operator's requirement to run an efficient service.

TABLE 1 BUS STOP SPACING GUIDANCE

Location	Recommended spacing	Reason
Urban area (outside main centres)	400m (or 3 per km)	Equates to generally acceptable 5-minute walking distance.
Main centre (e.g. CBD)	150m – 400m	More demand in higher density areas; pedestrian delays at controlled crossings.

INFLUENCING FACTORS

The recommended spacing may be varied for other factors:

- **Population density**. In densely populated areas, stops should be spaced closer than 400m. In higher density residential areas, stop spacing may be 150–400m. In areas with low densities, e.g. rural areas, stop spacing may be increased to one every 800m or more. The appropriate spacing should ultimately be determined by demand generators, identified needs and safe locations for buses to stop.
- **Walking network.** The layout of streets and walkways may limit access to stops. All properties in new development areas, and as many as practicable in existing areas, should be within 500 m of a bus stop.
- **Frontage access.** Where land use along the bus route has few access points for pedestrians, specific trip generators and the walking network accessible to the route will be more significant than spacing.
- **Passenger characteristics.** If passengers are likely to be elderly, carrying bags, or have their mobility impaired in any way, bus stops may have to be spaced more closely.
- **Topography.** In hilly or very steep areas, bus stop spacing may have to be closer together.
- **Trip generators.** A more frequent stopping pattern is appropriate in major CBD or town centres that are major trip generators, or to serve key community facilities.
- **Bus service level.** The longer the time between buses arriving, the shorter the distance to the bus stop that will attract passengers. Conversely, areas with a high frequency of services will allow passengers to 'turn up and go', attracting passengers from a wider catchment, so that bus stops may be placed further apart.

4.3 Bus stops for school bus routes

PRINCIPLE

Provision of access to bus services on routes operated only by school buses must follow the same principles as on other routes. Different design standards may apply to the layout of bus stops, as they will generally be required only at certain periods of the day, and only during Mondays to Fridays. The primary design different plus time use difference is to enable the space required by buses to approach, stop and depart safely and efficiently to be reserved for their use only at the appropriate time, and thereby to allow other uses of the space at other times.

INFLUENCING FACTORS

Location of stops at or near schools will be influenced by the age group of the children expected to use the service; by any constraints on the routing of the school bus service; by other land uses/trip generators in the vicinity from which customers will use the stop. If a school stop is not required outside school bus hours, its hours of operation should be limited to an appropriate period.

Provision of shelter at school stops can be demanded strongly by the community and is desirable. Locations of school stops should be designed so that they can accommodate shelter even if this is later on when funding permits. Peak waiting demand is very compressed, requiring potentially larger shelters than the total patronage might otherwise suggest.

Stops served only by school buses to collect children in the mornings or drop them home in the evenings should also be designed to be effective only at limited hours. A bus shelter is desirable for pick-up stops.

4.4 Bus stop capacity

PURPOSE

The bus stop capacity (space for buses) must suit the number of buses servicing the bus stop at any one time. Poor capacity bus stops may force buses to queue on the road, causing traffic congestion and reducing accessibility for passengers.

PROBLEM AREAS

Bus stop capacity is typically an issue where bus stops serve multiple Frequent Service routes in urban centres. This includes bus stops along key transport corridors and those at main destinations such as the CBD, retail or business centres, town centres, hospitals, universities, and at Interchanges.

MEASURES OF BUS STOP CAPACITY

The capacity of a bus stop is usually expressed by the number of buses that can enter the stop area within a specified time, usually an hour. A bus stop's capacity is determined by the length of time a bus spends occupying the bus stop (dwell time) and the number of buses that could pass through the stop within an hour. To determine the required capacity, assume a minimum of 20–30 second dwell time for each bus (note in certain locations this can be much higher).

Determining the appropriate capacity may require detailed analysis of the particular stop, especially at major destinations.

At transfer points, timing may require at least two buses to occupy the stop to enable transfers. The 'clock-face' diagram shown in Figure 7 indicates how the frequency of services influences the space required at a stop. This shows the estimated volume of buses at a single bus stop, depending on the frequency of the respective services.

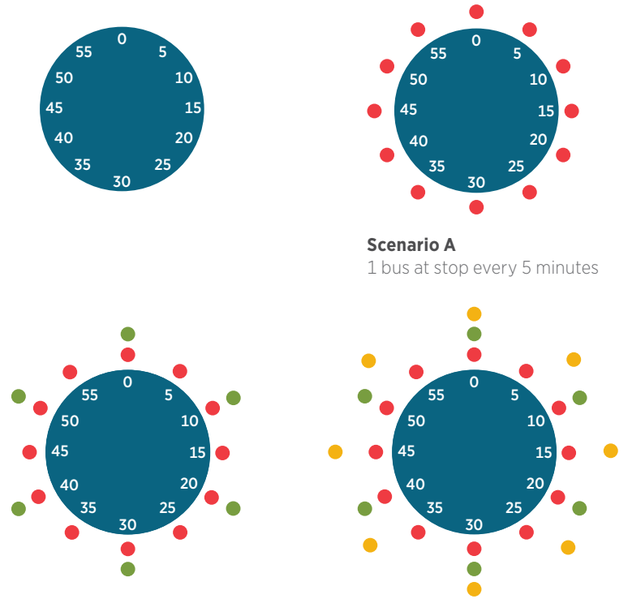


Figure 5 Bus stop capacity

Scenario A
1 bus at stop every 5 minutes

Service 1
Bus every 5 minutes (12 BPH)

Service 2
Bus every 10 minutes (6 BPH)

Service 3
Bus every 7.5 minutes (3 BPH)

Total 26 Buses per hour (BPH)

Scenario B
2 buses at stop 6 times an hour

Scenario C
2 buses at stop 6 times an hour
3 buses at stop 2 times an hour

Other measures of the capacity of a bus stop include total passenger demand and ease of pulling out from the bus stop.

Decisions on merging or splitting stops should therefore be based on observations of the actual performance of the stop, rather than only looking at buses per hour.

It may be best to split bus stops served by more than 25 buses per hour. This enables buses on different routes to use separate stops, reducing bus-on-bus delay and traffic congestion. On the other hand, bus routes with common destinations should ideally share the same stop, to make them more useful to passengers. A balance should be sought between these two opposing requirements. Where stops are split, the connection between the stops and real-time customer information noting where the next available services will stop will be critical. Every location at which this question arises must be brought to the attention of AT Metro immediately. AT Metro will consider the customer and operational issues on a case by case basis and will direct the design approach to be taken.

4.5 Bus stop placement

OPTIMUM PLACEMENTS

The optimum placement of bus stops depends on a wide range of factors that have to be balanced, as outlined below.

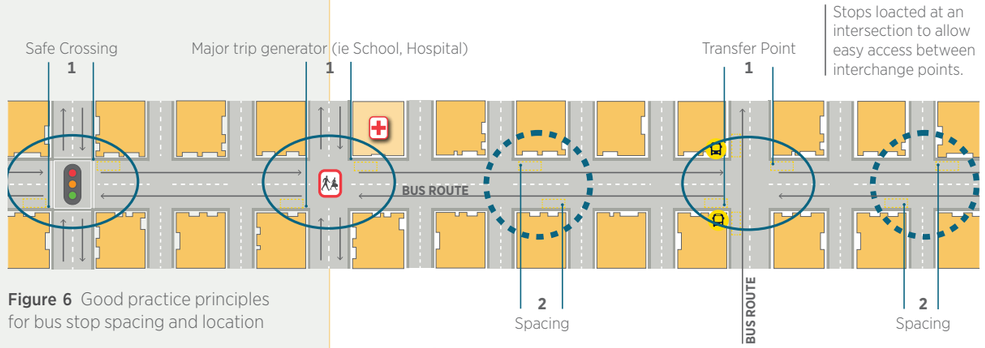


Figure 6 Good practice principles for bus stop spacing and location

Step 1 Select prefered stop location
(Safe crossings, transfer points and major trip generators)

Step 2 Plan stops at appropriate spacings between initial stops
(target spacing = 400m)

Note Stops preferably located after intersections

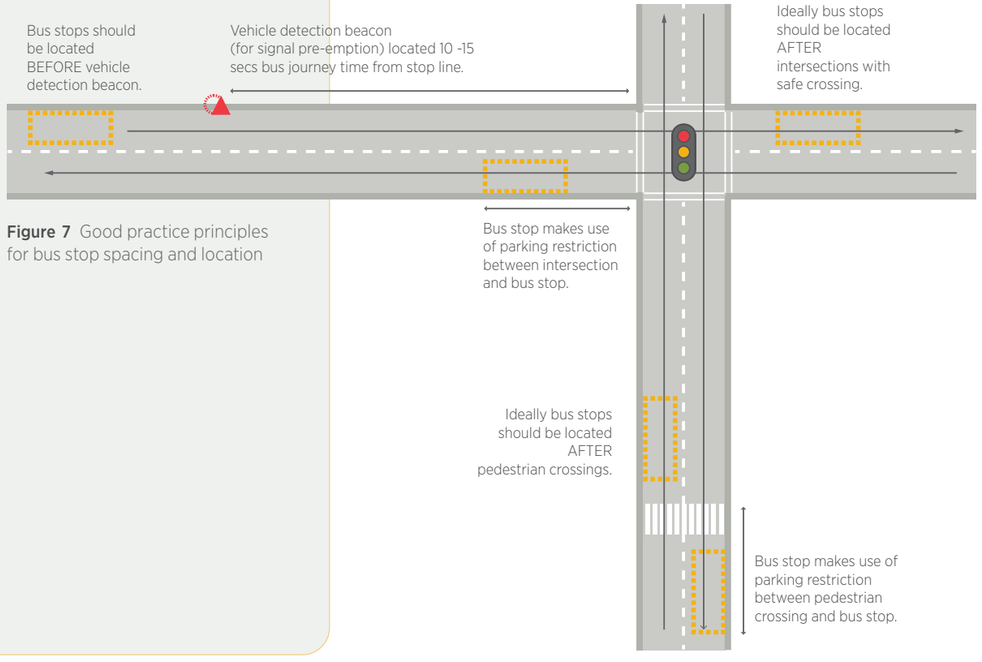
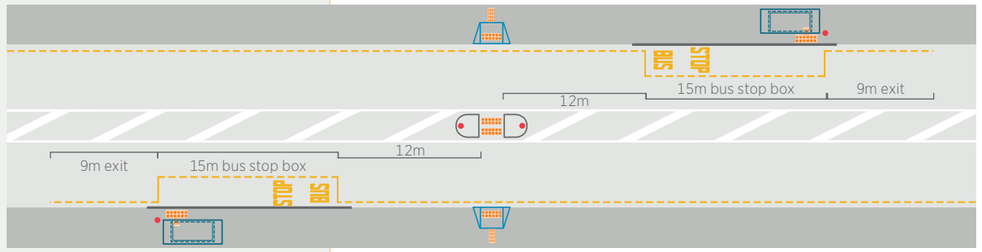


Figure 7 Good practice principles for bus stop spacing and location

IN PAIRS

Bus stops should ideally be provided in pairs, i.e. boarding and alighting stops must be in close proximity. Where possible, pairs should be tail to tail (see Figure 8), on opposite sides of the road. This is for safety and to allow sufficient space between the rear ends of bus stop markings for other vehicles to pass. Separation will depend on road width for safe deflection of vehicle path to pass a stopped bus. It will also depend on the opportunity and need to provide a safe crossing point.

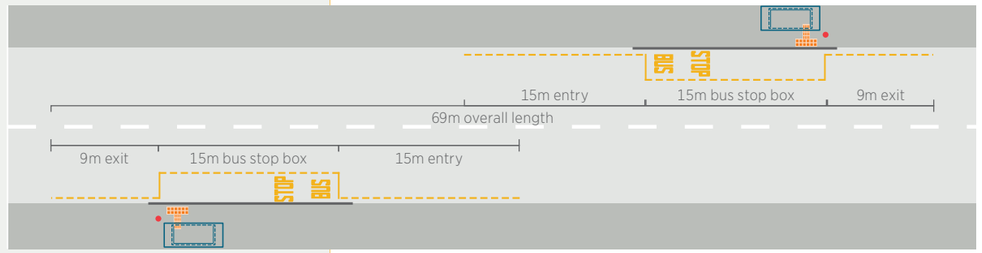
Figure 8 Tail to tail bus stop layout



Standard stop - on opposite side of 2 lane carriageway

Bus shelter

Bus stop sign and flag



4.5.1 Where bus stops should be located

ROAD SAFETY

Bus stops must be located where the road geometry provides safe sight lines for approaching vehicles and bus drivers. If this creates blind spots or blocks sight lines for pedestrians and drivers along the road, bus stops must not be located near a corner, curve, hill/gully, traffic island or intersection. Sight line assessment should be undertaken in accordance to Austroads Part 4A and RTS 6 (Guidelines for visibility at driveways).

CRIME PREVENTION THROUGHENVIRONMENTAL DESIGN (CPTED)

Bus stops and shelters should be located to minimise the opportunity for crime and to increase the perception of personal security. Therefore, locate bus stops:

- **In clearly visible locations**, e.g. away from tall vegetation (or remove it) and other objects that can be used to hide.
- **In well-lit areas**, e.g. near street lighting or other existing sources of illumination, if the stop does not have its own illumination.
- **Near activity centres**, e.g. service stations, stops, rest homes, where natural public surveillance occurs. (However, note that some residential properties prefer to be screened from the stop).

ACCESS AND CATCHMENT

Bus stops should be located where they:

- are easy to access
- maximise their catchment, i.e. where there are many people near the bus stop.
- Within close proximity to on-street pedestrian facilities (signals, refuge islands) to promote safe crossing movements for pedestrians transferring between public transport services.

WALKING ROUTE

The walking route to and from the bus stop should be as direct as possible. To this end, locating stops near intersections, can reduce the distance that passengers have to walk and help passengers complete the rest of their journey safely. Coordinate the location of bus stops with neighbourhood walking and cycling path connections and building entrances. If there are no existing paths, investigate the feasibility of creating new pedestrian and cycling short cuts to bus stops. Look for opportunities to link these with the wider pedestrian and cycling network.

TRIP GENERATORS

Bus stops should be located as close as possible to all major trip generators and key community facilities, e.g. places of employment, retail, commercial and educational centres, community halls, pools, sports centres, parks, libraries, day care centres, rest homes, medical centres, hospitals, pharmacies, etc.

TRANSPORT LINKS

Where relevant, bus stops should be located to encourage transfers between buses, trains and ferries. Therefore, they should be close to where different bus routes or other passenger transport services intersect, to minimise walking time for transferring bus passengers. Routes for transfers must be legible, accessible and with minimal delays.

TAXI STANDS

Bus stops should be located in front of taxi stands. Positioning taxi stands in front of bus zones will result in taxis queuing back into the bus zone.

FOOTPATHS

There must be even and paved footpaths to bus stops that are accessible to wheelchairs and prams. This may require new footpaths or reconstruction of existing ones of poor quality.

PEDESTRIAN CROSSINGS

There should always be a pedestrian crossing close to the bus stop. This can be informal (e.g. pedestrian refuge island) or formal (e.g. signalised crossing or zebra crossing). Where there are none, consider providing a new accessible road crossing. The only exception may be bus stops on low trafficked roads in residential areas, which should have low operating speeds.

At pedestrian crossings, bus stops should be located on the departure side to reduce the risk of passengers crossing the road in front of a stopped bus. The bus stop shall not be on the crossing or within 6m of it.

GRADE SEPARATION

If bus stops are to be located on high traffic or high-speed roads where signalised crossings are not practicable, a grade separated crossing (footbridge or underpass) may be considered. This is likely to be appropriate only near transport Interchanges or associated with major developments. Consideration should be given to the length of the accessible route using the crossing. Lifts may be considered only at AT Interchanges or where provided and maintained by private development management.

4.5.2 Special cases: Intersections and pedestrian crossings

INTERSECTIONS

The location and placement of bus stops within close proximity of intersections should always be considered on a case-by-case basis. Bus stops should not be located opposite T-Intersections. At intersections, bus stops should be located on the departure side (i.e. past the intersection), as this will:

- **Improve safety** –The bus clears the intersection, blocking fewer movements and sight lines.
- **Reduce traffic delays** – The bus clears the intersection, blocking fewer movements
- **Assist bus movement** – reducing bus delays. E.g. a bus that must turn right at an intersection on a multi-lane road may have difficulty reaching the right-hand lane from a kerbside stop just before the intersection. (See figure 9 below.)

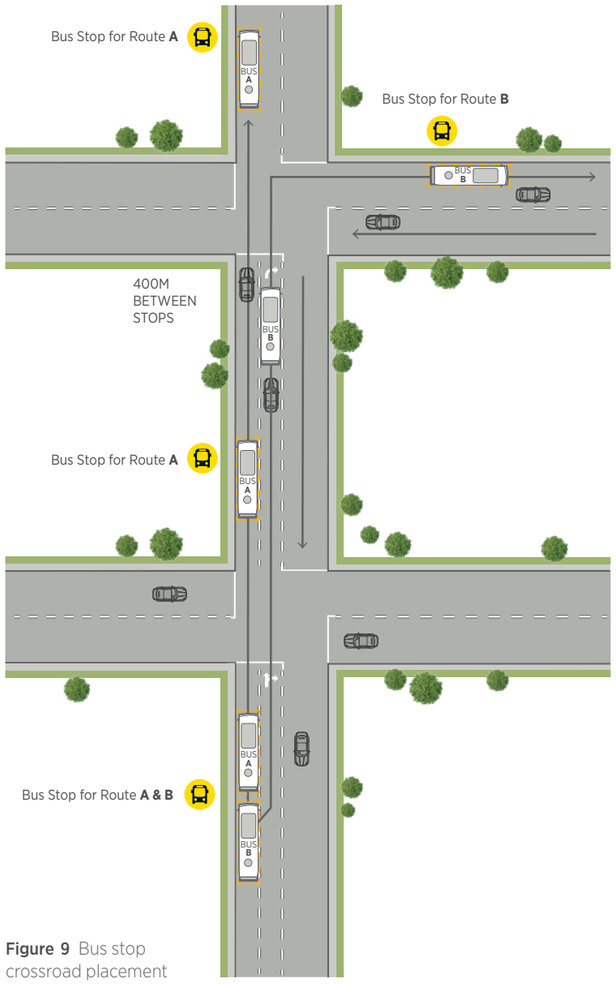


Figure 9 Bus stop crossroad placement

However, a bus stop may be better located on the approach side of an intersection if:

- the road geometry and/or traffic movement requirements prevent buses from stopping soon after the intersection.
- there is high passenger demand for a stop on the approach side of the intersection, e.g. due to presence of a key destination.
- interchange between diverging routes requires a common stop

DIFFICULT INTERSECTIONS

Stops may be placed mid-block if the available road width does not allow safe and efficient location close to an intersection, provided block length does not adversely affect walking catchment. Consideration of safe pedestrian crossing facilities will be important relative to mid-block stops.

PRIORITY SIGNALS

If bus priority signals are provided at an intersection, their operation should be designed in conjunction with bus stop placement and bus lanes. Bus lanes at intersections are mandatory where bus priority signals are to be implemented. The Engineerng Design Code – Urban and Rural Roadway design indicates that bus lanes wider than 3.4m can lead to poor channelling of traffic, higher speed and reduced safety, however there will be situations where this is required. For further information on space allocation required for bus lane lanes refer to Engineering Design Code – Urban and Rural Roadway Design.

4.6. Bus stop locations to avoid

LEGAL RESTRICTIONS

Due to traffic safety concerns, not all locations within the road network are allowed legally to be bus stops. The Land Transport (Road User) Rule 2004 and its amendments identify criteria where bus stops are not permitted.

TRAFFIC RESTRICTIONS

Bus stops must not be located:

- on No Stopping lines.
- where a signposted part of the road is reserved for certain classes of vehicles, e.g. taxis or service vehicles.
- on or closer than 1m to a fire hydrant.
- on a yellow circle on the road containing the letters “FH” (Fire Hydrant) or between the circle and the footpath.

TRAFFIC CALMING

The use of traffic calming measures particularly on the immediate approach to, and departure from, bus stops should be carefully considered. For example, the use of speed cushions should be avoided as there may be a risk of falling for passengers intending to alight who are walking within the bus as it traverses the cushion.

PROPERTY FRONT DOORS

To maintain privacy, bus stops should not be positioned at the front door of a residential property. Use existing hedges or fences of private properties to give occupants privacy where possible, without compromising appropriate bus stop spacing or requiring customers to wait in secluded locations.

BUSINESSES

Some commercial and industrial businesses are more compatible with bus stops than others. Consider the type of business in the surrounding area when locating bus stops.

CONFLICTING USERS

Some sites may be undesirable for bus stops due to potential use by other conflicting users, e.g.:

- Near an area that generates large amounts of short-term, high-turnover parking, e.g. ATMs, dairies and lotto shops. This is because visitors to such locations often park illegally at bus stops.
- On the approach side of a high-use vehicle access, where bus operation and pedestrian safety may be compromised by turning movements
- Near a tourist facility visited by many coach or charter buses. Where both urban and coach services need access to the tourist facility, separate locations should be provided for them.

BUS TIMING POINTS

Bus timing point stops can affect adjoining landowners negatively and hinder the operation of intersections. Where possible, bus timing points should be located away from residential or other sensitive frontages, i.e. where continuous noise and disturbance or visual blocking are undesirable. Bus timing point stops must not be located across driveways.

BUS PARKING

Bus parking must be provided away from service stops for buses not in service, as required for operational reasons. Locations must be discussed with AT Metro, and should usually be close to welfare facilities as well as convenient for access to the first bus stop for each service supported by the parking. A bus stop parking sign (PP2) should be installed instead of a bus stop sign (RP-5).

05 Bus stop layout

SCOPE

This section gives guidance on the appropriate bus stop layouts to use in different circumstances. The layouts below apply to urban conditions, i.e. roads with posted speed limits up to 70km/hour, and for a 13.5m bus. If other bus dimensions are used, the designs may have to be adjusted accordingly.

PURPOSE

Appropriate bus stop layout – together with other measures such as kerb heights, road markings, etc. – help the bus to stop close and parallel to the kerb, making it easier for passengers to board and alight. Every bus stop layout should be long and straight enough to allow a standard bus to pull in at the correct angle, so that it can stop closely parallel to the kerb and maneuver out of the stop safely. Buses should also be able to approach and leave stops without delay or obstruction and without sweeping over the kerb with either front or rear overhang.

THE IDEAL BUS STOP

The ideal bus stop layout should:

- Maintain road safety.
- Minimise bus dwell time.
- Minimise the use of kerb space where there are competing demands for frontage access.
- Prevent or dissuade other vehicles from parking in the bus stop area.
- Allow the bus to align and stop parallel to the kerb within 200mm without overhanging or over-running the footpath.

CAUSES OF FAILURE

In practice, buses are often prevented from achieving the ideal for two main reasons:

- The bus layout geometry is poor.
- Vehicles are parked close to or at the bus stop, preventing buses from reaching the kerbside.

EFFECTS OF FAILURE

Failure to align the bus properly with the bus stop can result in the bus driver either stopping too far away from the kerb or being forced to pull in or out of the bus stop at too sharp an angle. This impacts on:

- **Accessibility**. A bus that has stopped some distance away from the kerb, leaves a large stepping gap for passengers.
- **Efficiency**. For the reason above, passengers may take longer to board or alight from the bus. This, in turn, may impact on the general flow of traffic.
- **Safety**. A bus that has pulled into a bus stop too sharply due to an inadequate or obstructed approach taper, often ends up with the rear of the bus poking out into the traffic lane, restricting the flow and safety of passing traffic. Conversely, when pulling out to rejoin the traffic lane, inadequate exit tapers can result in the vehicle tail overhang hitting pedestrians or street furniture on the adjacent footpath.

Failure to align bus properly and pull in at a sharp angle.

ADDRESSING CONSTRAINTS

If the minimum dimensions outlined in this section cannot be achieved due to site-specific constraints, there may be an option to:

- Remove additional on-street car parking and other barriers to provide the space required to facilitate optimal bus positioning at a stop.

- Relocate the bus stop slightly forward or back to where the minimum dimensions can be provided. This requires approval from AT Metro.
- Widen the footpath, so that pedestrians can walk by without being potentially hit by bus overhang.
- Using a paving treatment or road marking to delineate the overhang area.

MORE THAN ONE BUS

The length of the bus stop area will have to be amended if more than one bus is expected to serve the stop at the same time. Sufficient space will usually have to be provided for the second (or third) bus to pull out past the bus in front. (See 4.4 for advice on bus stop capacity.)

5.1 Bus stop layout types

LAYOUT TYPES

The main types of bus stop layouts are:

- Kerbside
- Bus boarder
- Indented bus bay.

5.1.1 Kerbside bus stop

DESCRIPTION

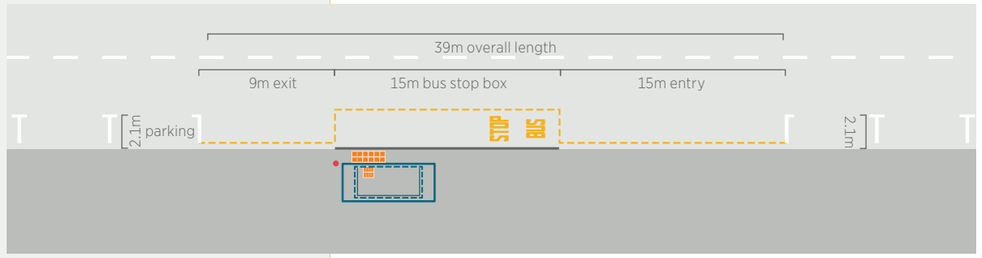
A kerbside bus stop is one where the line of the kerb does not deviate for the bus stop. This is the preferred bus layout for most urban and suburban streets. Most stops in the Auckland region are kerbside stops. Entry and exit spaces are required where the bus needs to pull out of a traffic lane to the kerbside.

ROAD MARKING AND SIGNS

These stops should be marked out with the appropriate road marking and signs (see Section 06). Layout dimensions are provided in Figures 10 and 11 below. No Stopping at Any Time is required over the length of entry and exit space for clearways and part-time Special Vehicle Lanes for bus operation at other times.

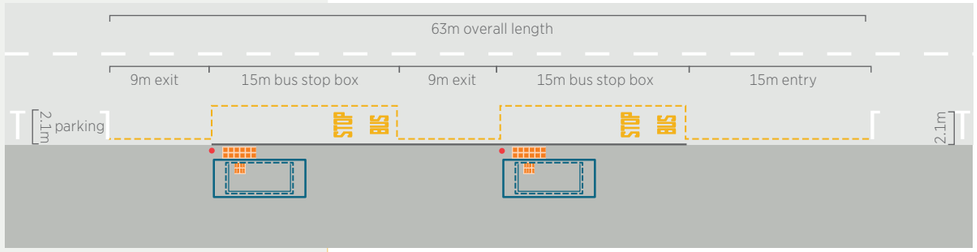
ENTRY AND EXIT LENGTH

Entry and exit lengths in Figures 10 and 11 are based on standard parking bays. These lengths must be increased by 0.4 m for every 0.1 m width of bay over 2.1 m.



Bus shelter Bus stop sign and flag

Figure 10 Kerbside bus stop with parking either side for a standard 13.5m-long tag-axle bus[1]

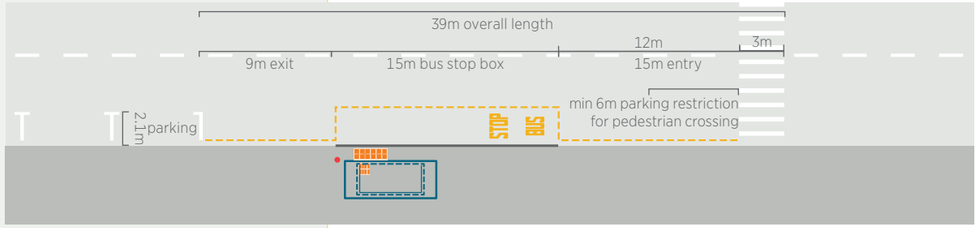


40m Kassel kerb Bus shelter Bus stop sign and flag

Figure 11 Kerbside bus stop with parking on either side for two standard 13.5m-long tag-axle buses

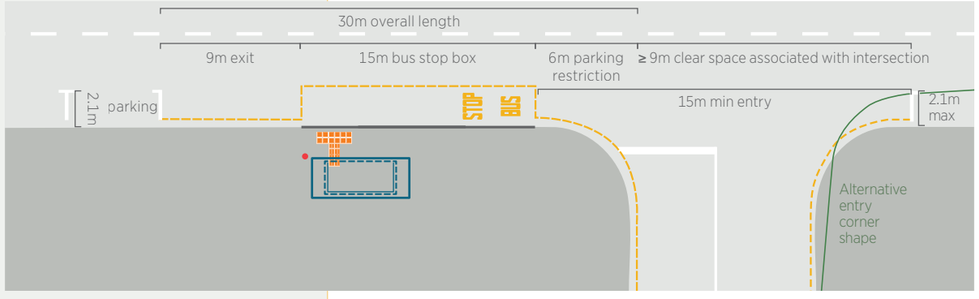
USING CLEAR ROAD AREAS

The length of kerb required to be restricted against other activities can be minimised by making use of existing clear spaces, such as driveways, and parking restrictions imposed near to pedestrian crossings and intersections. This aids bus access, while minimising the length specifically required for a bus stop. They also have the advantage of placing stops near to where passengers may wish to cross the road. (See Figures 12 and 13 below.)



Bus shelter Bus stop sign and flag

Figure 12 Kerbside bus stop with parking either side for a standard 13.5m-long tag-axle bus



Alternative entry corner Bus shelter Bus stop sign and flag

Figure 13 Kerbside bus stop on exit side of an intersection

5.1.2 Bus boarders

DESCRIPTION

Bus boarders are areas of footpath built out into the carriageway, so that the bus does not have to pull out of the traffic lane. Bus boarders can be full width (minimum 2.1m wide) or half width (0.5–1.5m wide).

Full-width bus boarders are shown in Figure 14 and 15.

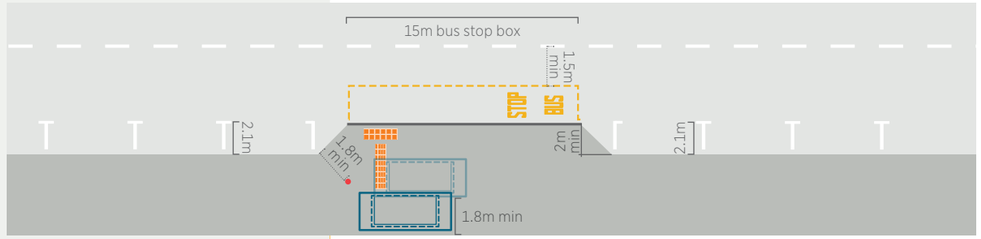


Figure 14 Full-width bus boarder for a single standard 13.5m-long tag-axle bus

Figure 15 Full width bus boarder for two standard 13.5m-long tag-axle buses

WHY USE BUS BOARDERS

In some locations, buses have difficulty maneuvering to the kerbside, due to inconsiderate parking or loading vehicles at or near the bus stop. A bus boarder layout can help to resolve this problem, and to provide more kerbside parking space where demand is high. Bus boarders may also be appropriate where buses have difficulty re-entering the traffic flow.

WHERE TO USE BUS BOARDERS

Bus boarders are suitable where:

- The posted speed limit is ≤50km/h or where actual traffic speeds are below 50km/h due to congestion, etc.
- The traffic lane is at least 3.5–4m wide. This allows at least 1.5m of road space between the lane or centre line and the side of a stationary bus for on-road cyclists to pass.
- Both bus numbers and kerbside parking demand are high. Generally, this occurs in a CBD or town centre.
- Traffic calming measures are required to help reduce traffic speeds, unless the resulting delay is onerous to other buses and general traffic.
- Footpaths are narrow, causing conflict between waiting passengers and passing pedestrians.

ADVANTAGES

The advantages of bus boarders are:

- They provide an effective deterrent to inconsiderate kerbside parking/loading at the stop itself.
- Full width bus boarders require the least kerbside length of all the layouts, as there is normally no need to provide for entry and exit space. Figure 14 above shows that full-width boarders only require a 15m kerbside length, whereas half-width boarders (see Figures 16–18, below), require a total kerbside length of 32m, which is still less than the 39m required by kerbside bus stops.

- Due to the above, buses can approach the bus stop in a straight line and align close to the kerb, ensuring good accessibility for all passengers.
- Higher kerb platforms can also be installed without risking damage to buses as the bus will never need to overhang the kerb. The reduced height differential allows easy boarding and alighting and can reduce bus dwell time.
- They create passenger waiting areas that do not impede or conflict with the pedestrian flow on the footpath. Bus infrastructure can also be provided off the main footpath.
- The wider footpath provides opportunities for improved customer waiting facilities, attractive streetscapes, landscaping, cycle parking and street furniture.
- They act as traffic calming devices by narrowing the road.

PRIORITIES

Bus boarders can cause some delay to traffic in the kerbside lane. However, on corridors where the movement of people is prioritised over the movement of vehicles, this should not be a deterrent to their application.

Where a boarder is desirable, but kerbside space is very restricted, then AT Metro is prepared to consider a boarder of reduced length, subject to an absolute minimum of 10m at the outer kerb face.

HALF-WIDTH BUS BOARDER

Half-width bus boarders are often a useful compromise solution. The build-out from the kerb can range from 500mm up to the width of a full boarder, although they are commonly 1–1.5m wide.

A minimum width of 1.5m between the end of the bus bay and traffic lane should be provided to accommodate cyclists.

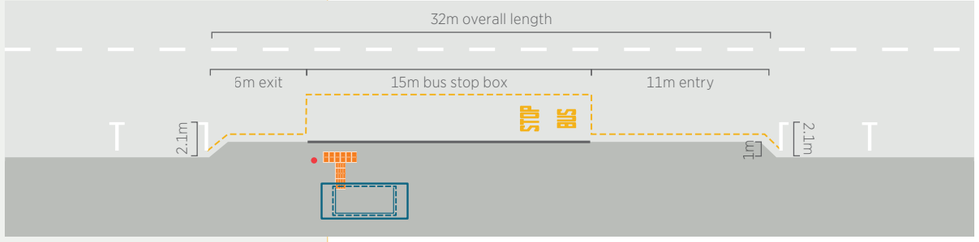


Figure 16 Half-width bus boarder for a single standard 13.5m-long tag-axle bus

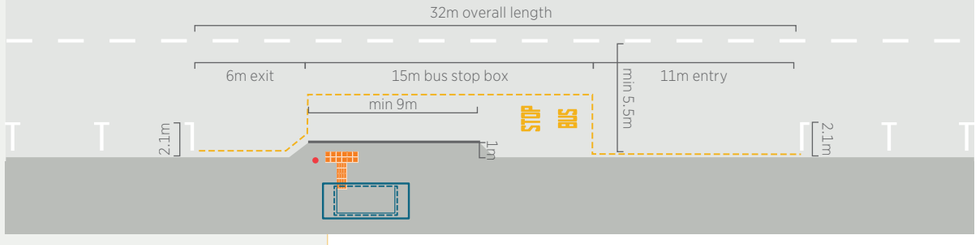


Figure 17 Half-width bus boarder – (Alternative 1) for retrofit to existing street kerbline.

Note: Alternative for retrofit to existing street kerbline

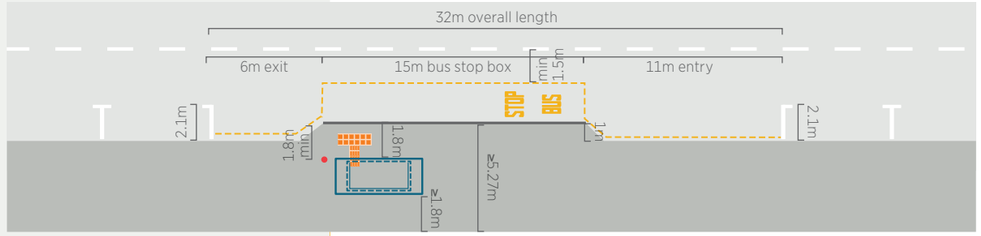


Figure 18 Half-width bus boarder – (Alternative 2) for retrofit to existing street kerbline.

Note: Alternative for retrofit to existing street kerbline

WHERE TO USE HALF-WIDTH BUS BOARDERS

Half-width bus boarders should be used where:

- Frequent delays to other vehicles must be avoided.
- A full-width boarder would place the bus in, or too close to, the opposing traffic stream.
- There is on-road provision for cyclists, giving them a minimum passing width of 1.5m between a stationary bus and the lane line.

5.1.3 Indented bus bays

DESCRIPTION

Indented bus bays are set into the kerb, so that the bus is out of the traffic lane when it stops. Indented bus bays can be fully indented or partially indented. Note that where on-street parking is placed too close to a kerbside bus stop, the effect for the bus is just like an indented bus bay.

PURPOSE

The purpose of indented bus bays is to remove buses from traffic lanes while they stop. This maintains the general traffic flow and improves safety where a stationary bus in the traffic lane would create a safety risk.

DISADVANTAGES OF INDENTED BUS BAYS

Bus bays, however, present inherent operational problems for buses and passengers. The disadvantages of this type of layout are:

- **Difficult merging**. Bus drivers often find it difficult to merge back into the main stream of traffic, causing delays at each stop, which adds considerably to overall journey times. This problem is particularly felt in Auckland, as drivers are not required legally to give way to buses. The variability of this hold-up leads to unreliable, delayed and bunched services. This effect is reduced where the kerbside lane is a Special Vehicle Lane, as the reduced density of traffic is likely to provide more opportunity for the bus to depart.
- Wasted space. Indented bus stops require a significant distance to ensure that buses can pull in 'flush' with the kerb. A standard bus requires a fully-indented bus bay area to be 63m long from the start of the entry kerb to the end of the exit kerb. This means that there is less area available for wider footpaths, streetscape, berms, landscaping, or on-street parking.
- **Poor accessibility**. The design of many existing bus bays is unsatisfactory, particularly where their geometry prevents buses from reaching the kerb, which reduces accessibility for passengers. Some drivers may also choose not to pull in close to the kerb, to ensure that the bus is at a better angle to re-enter the main stream of traffic.
- **Illegal parking**. Bus bays are prone to attracting inconsiderate parking or unloading, especially in high-activity areas such as town centres, shop frontages, etc. This prevents the bus from reaching the kerbside, forcing passengers to board or alight from the road, causing difficulties for some passengers.
- **Wider carriageway**. Bus bays widen the carriageway area, encouraging speeding, making it more difficult for pedestrians to cross, and detracting from the aesthetics of the street environment.

REQUIREMENTS

- **Avoid full-indented bus bays** wherever possible, as they reduce the efficiency of bus services. They should only be provided where justified by compelling safety or operational reasons, or where required on Special Vehicle Lanes, as outlined below.
- **Review all existing bus bays** within the extent of any affected road in line with this guideline. Where possible, bus bays should be filled in and/or the stop relocated to address the original reasons for providing an indented bus bay. The additional footpath space can be used to improve the bus stop environment. Where indented bus bays have been provided on the grounds of poor sight lines for oncoming vehicles, bear in mind that bus drivers may also suffer from poor sight lines of oncoming vehicles at indented bus bays. This compromises safety when bus drivers try to re-enter fast-flowing traffic streams, and increases journey times.

WHEN TO CONSIDER FULLY-INDENTED BUS BAYS

Fully-indented bus bays (see Figures 19 and 20) should only be considered:

- **Where the speed limit is 80km/h or higher**. In these cases, ensure:
  - good sight lines of approaching traffic.
  - lead-in and lead-out spaces provide for easy and safe maneuvering of the bus out of and back into the main stream of traffic.
- where possible an indented bay should be situated immediately downstream of a traffic signal, to provide breaks in the passing traffic into which the bus can depart. **Where the bus will have a long dwell time** at a bus stop and will unnecessarily obstruct traffic flows. This may apply:
  - at busy bus stops with many passengers boarding and alighting or where large amounts of buses operate and it may be more efficient to indent stopping buses to allow others to pass, e.g. at city and town centres.
  - for operational reasons
  - for schools and special events, due to long boarding times, as passengers all arrive at the same time.

- **Where there is a significant crash risk** for traffic overtaking a stopped bus conflicting with oncoming traffic. This may happen with poor sight lines due to curves or concealed entries.
    - It will usually be preferable to locate the stop differently rather than indent it.
    - On high-frequency bus corridors where not all buses will need to call at every stop.

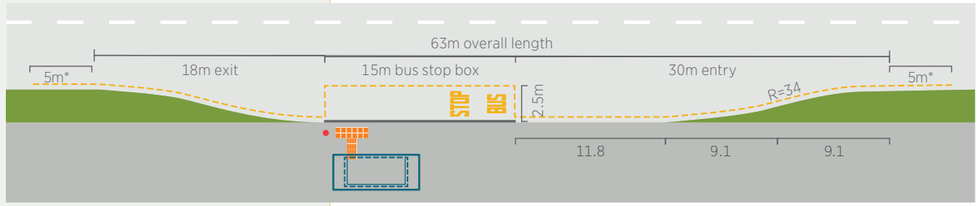


Figure 19 Fully indented bus bay for a standard 13.5m-long tag-axle bus

Bus shelter Bus stop sign and flag

*extension of NSAAT if parking permitted at kerbside

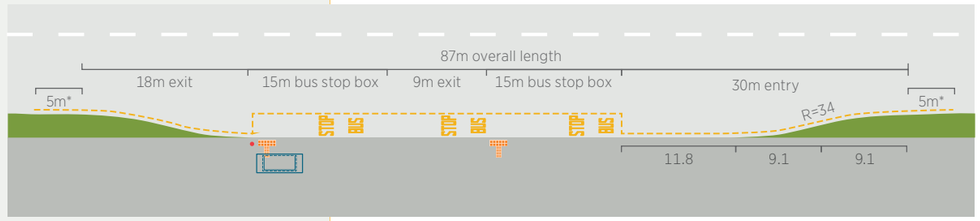


Figure 20 Fully indented bus bay for two standard 13.5m-long tag-axle buses

Bus shelter Bus stop sign and flag

*extension of NSAAT if parking permitted at kerbside

WHEN TO USE FULLY-INDENTED BUS BAYS

Half-indented bus bays may be considered where there is only one wide lane of traffic. A half-indented bus bay allows general traffic to overtake the stationary bus safely, while still keeping the bus within the main stream of traffic. It is particularly important to provide enough space for cyclists to overtake stationary buses where there is on-road cycle provision, unless an off-road bypass is provided (See Figure 21).

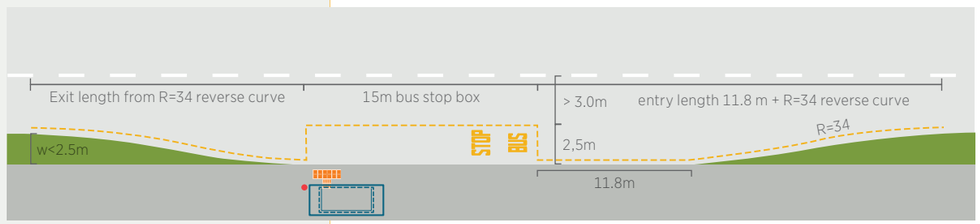


Figure 21 Half-indented bus bay for a standard 13.5m-long tag-axle bus

Bus shelter Bus stop sign and flag

06 Bus stop signs and markings

SCOPE

This section outlines the markings required on the road area of bus stops. Bus stops are required legally to be marked out on the carriageway where the space reserved for the bus extends for more than 6m on either side of a single bus stop sign. This will 'in time' include all bus stops in Auckland.

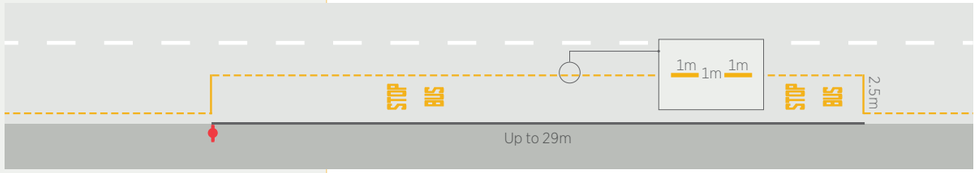


Figure 22 Sign and marking layout for bus stop up to 29m

100mm wide (min) continuous yellow line
100mm wide (min) broken yellow lines
Bus stop sign and flag
Kerb

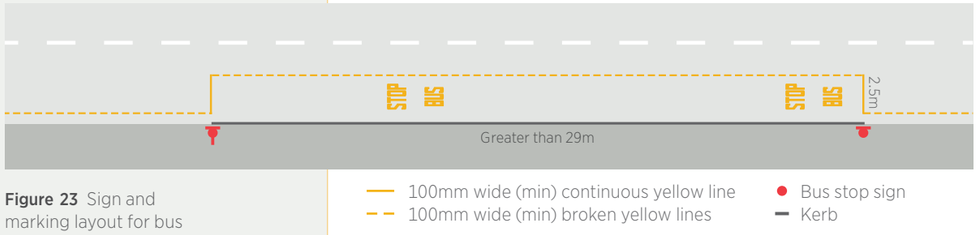


Figure 23 Sign and marking layout for bus stop longer than 29m

100mm wide (min) continuous yellow line
100mm wide (min) broken yellow lines
Bus stop sign
Kerb

6.1 Bus stop sign

DESCRIPTION

The bus stop sign (RP-5, Figure 24) is required by law. It identifies the area as a bus stop. It is an important indicator to passengers, bus drivers and motorists and acts as a control point for the layout of bus stop facilities. See also 8.5.2 for Information sign paired with this sign.

TCD MANUAL PART 13

The TCD rule for bus stops indicates anything over 6m requires a bus stops sign and marking.

BUS STOP SIGN PLACEMENT

To minimise dwell time and improve boarding speed, it is critical that the sign is positioned at the head of the bus stop (ideally in line with the head of the bus box) so that the bus driver has a cue on where to stop and the passenger knows where the door will be. Signs which are not placed at the head of the stop may be hit due to front or rear overhang, therefore drivers will not pull up close to the kerb, which will result in greater step lengths required to board the bus.

The RP-5 signs must always be placed within 1m of the head of the box and at least 1m from the kerb face. The bus stop sign must not be placed outside the box, nor more than 1m from the head of the stop.

Figure 24 The Bus Stop sign (RP-5)

ONE OR TWO SIGNS

Up to a maximum box length of 29m only one RP-5 sign is required, which must be placed at the head and display no arrow. When the bus stop box is longer than 29m, signs must be provided at both ends and both must display an arrow pointing to the other.

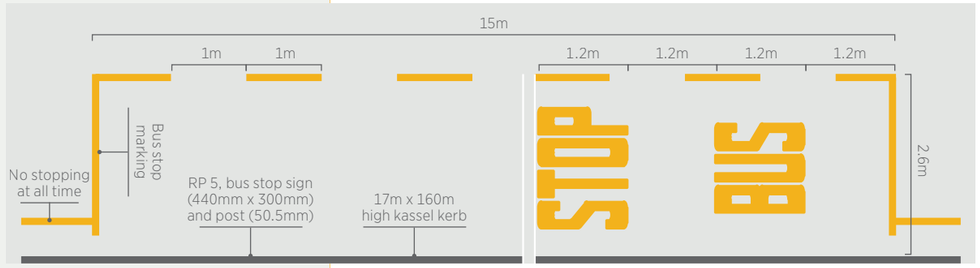
6.2 Bus box road marking

DESCRIPTION

The bus box is the outer perimeter of the declared bus stop. It must be marked out in broken yellow lines as per the design standards in the Land Transport: Traffic Control Devices Rule.

This helps create a consistent environment at the bus stop. Bus drivers will know to stop their vehicle at the head of the box which is where key infrastructure components are provided, e.g. clear stand areas, raised kerbs and tactile ground surface indicators if used. This is particularly important for disabled or vision-impaired passengers.

Figure 25 Typical Bus box markings



DIMENSIONS

The dimensions of the bus box should be as shown in the layouts above.

6.3 No stopping at all times road marking

PURPOSE

The No Stopping at All Times (NSAAT) road marking consists of broken yellow lines. Used either side of a bus box, they ensure that the lead-in and lead-out remain unobstructed and the bus can approach and depart from the bus stop correctly. They should also be used in part-time Clearways and part-time Special Vehicle Lanes.

6.4 Bus stop road text

DESCRIPTION

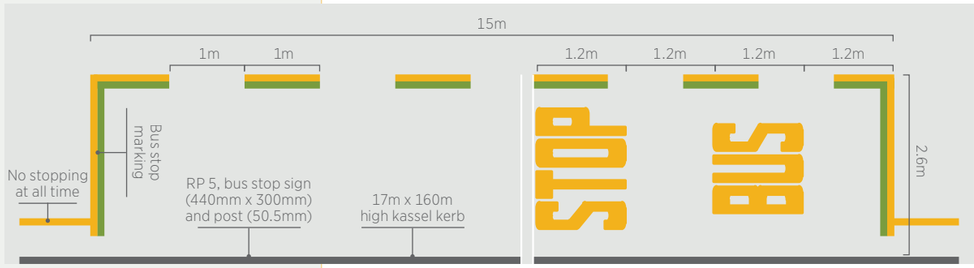
The law requires that in order to enforce against parking within a bus stop box that is marked with a single RP-5 sign, the words “BUS STOP” are applied on the road surface within the box. Auckland Transport have adopted the single-sign form of marking bus stops up to 29m, therefore it is mandatory to apply the road text. It is also an important means of identifying to drivers and pedestrians that the road is used by bus services and can therefore encourage compliance. The specification for applying road text is to be set out as shown in Figure 25.

6.5 Coloured surface treatment

DESCRIPTION

The profile of the bus box area can be raised further by highlighting the area with coloured surface treatment. This makes the bus stop area more prominent to passengers, bus drivers and other drivers. Although the treatment imposes additional costs, the raised profile of the stop may prove an effective deterrent to illegal parking and reduce enforcement problems. Auckland Transport strongly recommends the use of this surfacing at bus stops with a high potential for road user conflict.

Figure 26 Bus box with coloured surface treatment



07 Bus stop types

SCOPE

This section outlines the different bus stop types in Auckland and the provision of amenities at each type of stop.

THREE TYPES OF BUS STOP

In terms of the infrastructure they require, AT Metro divides bus stops into three main types, to help determine the appropriate level of bus stop infrastructure.

TABLE 2 BUS STOP TYPES

Type name	Passenger volume	Bus frequency	Area serviced
Signature	Moderate to high	High (every 2 to 15 minutes)	Local, district and regional areas on Frequent Service Network
Regular	Moderate	Moderate to high (at least every 30 minutes)	Suburban areas and attractions (e.g. shopping centres), and/or on Frequent Service Network.
Standard	Low	Low (less than every 30 minutes)	Suburban, outer suburban or non-urban areas

INBOUND VS OUTBOUND

Away from the major trip attractors and urban centres, AT Metro differentiate between inbound and outbound bus stops, at which customers have very different needs for roadside amenities.

'Inbound' stops are those from which customers catch buses to destinations or interchange points: typically, they are on routes inbound to a suburban centre, major shopping destination or the CBD. 'Outbound' stops are those to which people travel, disembark and immediately disperse. For these reasons, at inbound or interchange stops a higher level of waiting facility is to be expected; whereas at outbound stops customers are unlikely to spend any amount of time.

On routes between significant trip attractors, it is likely that most stops could be considered 'inbound' in either direction, whereas on a route that terminates in one of the outer suburbs there is likely to be a clearer distinction between stops where customers board on one side of the road, and alight on their return at the other side.

Auckland's New Network has introduced a number of one-way loop services that run from an interchange hub through local suburbs back to the hub. On such routes all stops can be described as inbound.

BUS STOPS FOR SCHOOL ROUTE

On routes that are served by school buses only, stops must still be laid out to facilitate safe and efficient access both for the bus and the customers. It is likely that the parking restrictions formed by the stop box and the lead-in and out might not be necessary nor desirable during the rest of the day. This can be designed by forming the three elements into a single long box of at least 39m and making that single box effective for during school morning (8:00 to 9:30am) and afternoon (2:30pm to 3:30pm) drop off periods, to suit the required hours of the school service. This avoids the unnecessary use of NSAAT markings that cannot be time-limited.

A normal bus stop sign can be used with a supplementary restriction, as shown below.

A typical school bus stop

A supplementary sign restricting no parking during school hours

SHELTER AT SCHOOL STOPS

There is a strong demand for shelter to protect children from inclement weather, despite an infrequent need (once per day). It is desirable to provide shelter at all inbound stops used as boarding points by school children. This includes the stop close to the school from which children board their return buses in the evening. These will often need a larger shelter, probably of at least Intermediate size.

JUDGEMENT

While most bus stops will be of a standard type, busier or more complex locations will require a degree of professional judgement in conjunction with the advice and specification of AT Metro as the client.

Figure 27 Schematic illustration of a Signature stop

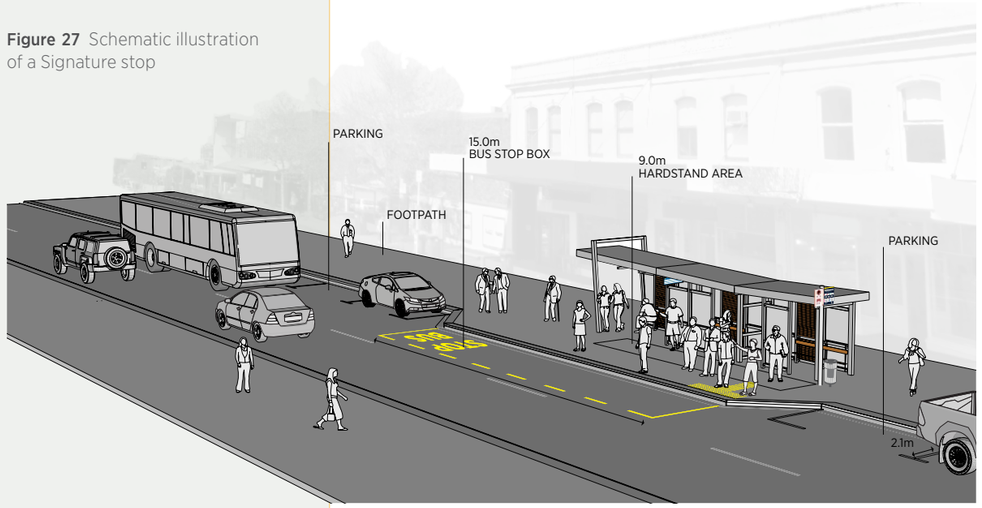


Figure 28 Schematic illustration of a Regular bus stop

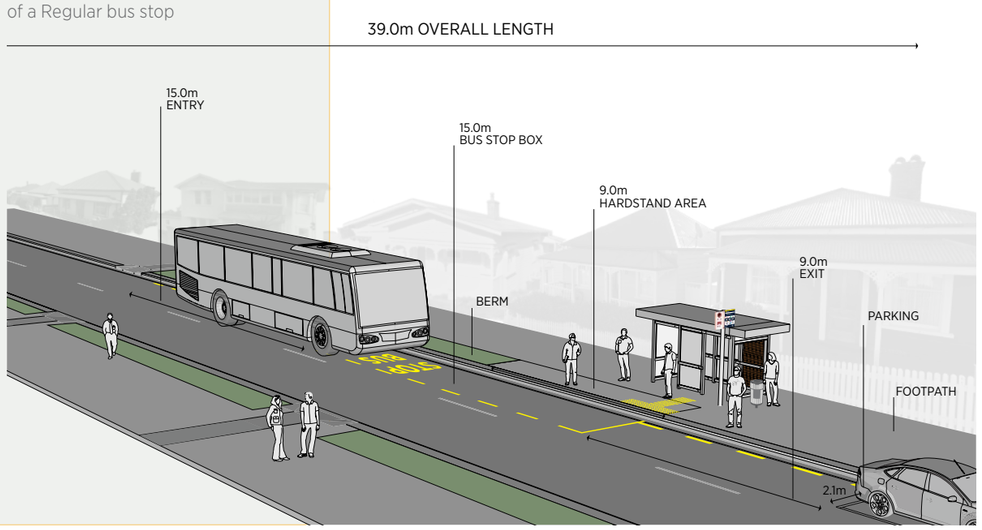
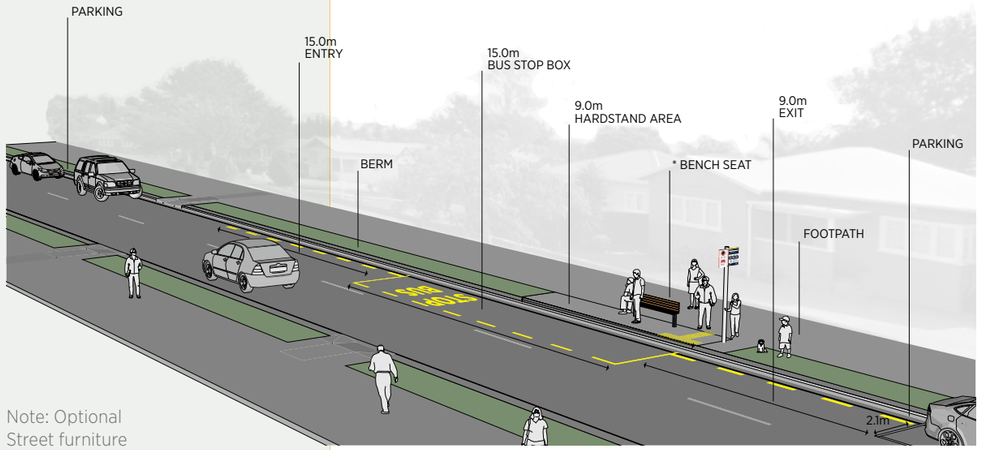


Figure 29 Schematic illustration of a Cantilever Shelte bus stop

Figure 30 Schematic illustration of a no shelter bus stop



Note: Optional
Street furniture

TRAFFIC CALMING

Traffic calming implemented on bus routes should consider the comfort for both drivers and passengers. Features should not be located too close to a stop, where passengers may be standing up while the bus is moving. AT Metro typically accept ramp heights of 100mm (1 in 15) and 75mm (1 in 10). For additional information on the height, length and type of traffic calming measures appropriate along bus routes, refer to Engineering Design Code – Traffic Calming.

PREFERRED LAYOUTS

- Do not attach bus stop signs nor customer information to lighting columns either/or power poles. These items must remain under the control of AT Metro on an independent pole or on the bus shelter and positioned appropriately to fulfill the needs of TCD and customer service.
- At stops for multiple buses allow a clear standing area for customers at the position at which each bus will stop.
- A clear walking route at least 1.8 m wide must be provided where possible. A reduced width of 1.5 m should only be considered where existing constraints prevent a wider path and where conflict between through movement and bus boarding is not significant.
- Vehicle crossings must never exist within the forward 9m of a bus stop. It is preferable (but sometime unavoidable) to have no vehicle crossings within any part of the 15m length of a bus stop box. Crossings should never be made through a length of kassel kerb. At timing points or termini, no part of the 15m box can be over a driveway.
- Street trees should be located clear of the through route and boarding spaces. Tree trunks must be at least 1000mm inside the face of the kerb if within the 15m length of a bus stop box. It is preferred not to design new stops to have street trees within the 15m box at all. No new street tree is to be permitted within the 15m length of an existing stop. Tree canopy must be capable of being maintained clear of the bus envelope for entry, stopping and exit.
- Trees and other street furniture must not obstruct sight lines between people waiting at the bus stop, and the driver of an approaching bus.

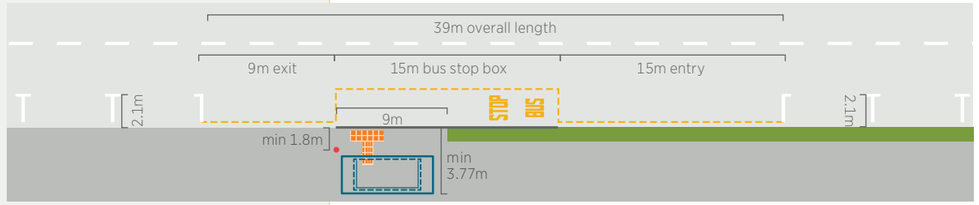


Figure 31 Schematic illustration of a Standard bus stop

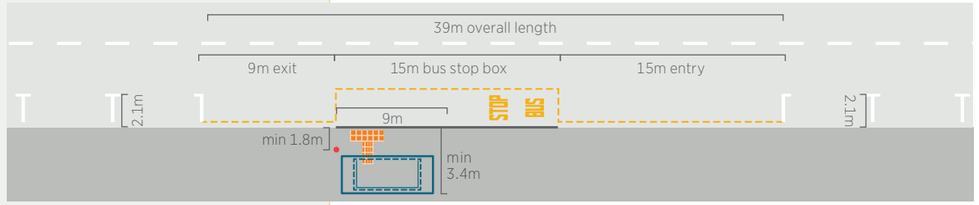


Figure 32 Layout for a standard kerbside bus stop at a constrained site

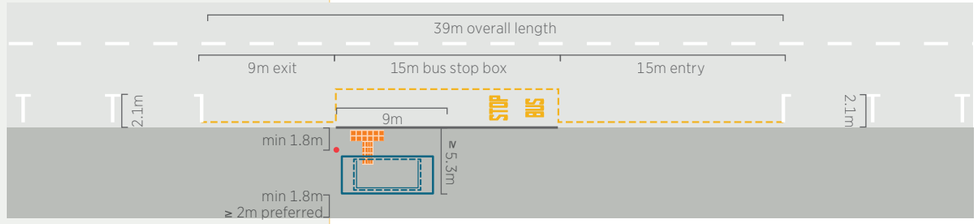


Figure 33 Layout for a standard kerbside bus stop with a wide divided pedestrian route

08 Bus stop elements

MINIMUM PROVISION FOR BUS STOP TYPES

Legal requirements for the enforcement of parking controls at bus stops are the presence of a single RP-5 sign at the head of the box; the stop box; and the road text 'BUS STOP'. Other components are required by AT Metro to meet customer service standards.

Table 3 below outlines the infrastructure provision for each of the three types of bus stops described, in principle. Relevant factors listed elsewhere in this chapter will have to be considered as well.

TABLE 3 INFRASTRUCTURE PROVISION FOR DIFFERENT BUS STOP TYPES

Component	Signature Stop	Regular Stop	Standard Stop
Accessibility			
Minimum kerb height at front door (and ideally rear door): 150mm for normal kerb, 160mm for kassel kerb	M	M	M
Paved clear stand area	M	M	M
Tactile ground surface indicators			
Connecting footpath to/from bus stop	M	M	M
Pedestrian crossing close to bus stop	M	M	R
Signs and road markings			
Bus Stop sign (RP-5)	M	M	M
Bus box road marking	M	M	M
No Stopping at All Times road marking	M	M	M
Bus Stop road marking	M	M	M
Coloured surface treatment			
Safety & security			
Street lighting	M	M	R
Shelter with lighting	M	R	P
Emergency help point	P	P	O
Public telephones on-site or nearby	P	P	O
Video surveillance	P	P	O
Street furniture			
Seating	M	M	P
Shelter	M	R	O
Rubbish bin	R	R	O
Ticket machine	R	P	O
Shopping trolley bay	O	O	O
Cycle parking	P	P	O
Stop-specific information			
Stop number	M	M	M
Direction of travel	M	M	M
Site-specific fare information	M	M	M
Stop-specific timetable (departure times)	M	M	M
Stop-specific route diagram(s)	M	M	R
Information telephone number/ web address	M	M	M
Stop name	M	M	M
Wider area fare information and zone map	M	M	R
Wider area route map	M	R	P
Real time information signs	M	M	P
Enhancements			
Landscaping	O	O	O
Public art	O	O	O
Community notice board	O	O	O
Vending machine	O	O	O

M Mandatory R Recommended P Preferred O Optional

8.1 Bus stop kerbs

PURPOSE OF KERBS

The kerb should:

- Provide safe delineation between the road surface for vehicle movement and the footpath or waiting areas for passengers and pedestrians.
- Provide good guidance for the bus driver.
- Reduce the step height between the bus floor and the bus stop to help passengers board and alight more easily.
- Reduce the gradient of a deployed ramp for wheelchair users, people with prams, luggage or small children.
- Facilitate quicker boarding and alighting, reducing bus dwell time and improving bus journey times and reliability.

DESIGN STANDARDS FOR STEP RAMPS

The Standard for New Zealand Design for Access and Mobility – Buildings and Associated Facilities (NZS 4121:2001) recommends:

- Step ramps formed between two horizontal surfaces must have a maximum slope of 1:8. (Note that variables such as crossfall of the footpath and carriageway can influence the gradient of a bus ramp.)
- step ramps shall conform to the requirements for kerb ramps having a maximum length of 1520 mm
- The allowable camber for crowned and banked footpaths and ramps must have a maximum slope of 1:50.

Small gap between the kerb and bus floor make it easy for passengers to board or alight.

CONSULT AUCKLAND TRANSPORT FIRST

AT Metro must be consulted before a decision is made on the application, suitability or specification of any kerb product in the bus network.

8.1.1 Kerb height

REQUIRED KERB HEIGHT

Kassel kerb should be used for all proposed bus stops, all existing kerbs must be removed and replaced with kassel kerb.

Constraints preventing the use of kassel kerb must be notified to AT Metro, and addressed with the relevant team whose asset or issue prevents the standard minimum kerb being achieved.

CONCERNS WITH HIGHER KERBS

The main issues identified with higher kerb heights are the risks that:

- Bus overhang will ground and damage the bus and the kerb face.
- Bus drivers fear this possibility and will therefore not dock the vehicle flush with the kerb face, negating the benefit of these kerbs.

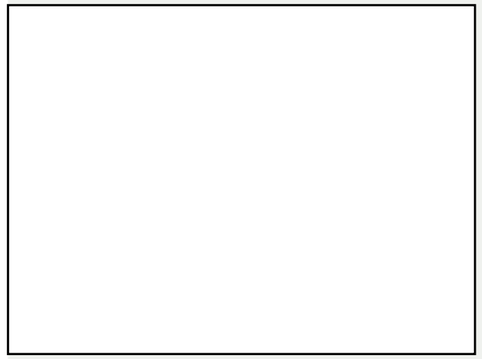
SOLUTION

These risks can be eliminated in part by providing the correct bus stop layout, with correct lead-in and lead-out and with appropriate driver training. However, some existing bus stops with higher kerbs may not allow buses to approach correctly, would therefore not be suitable for this type of treatment, unless their configuration is amended. These issues must be discussed with AT Metro.

MAINTENANCE EFFECTS ON KERB HEIGHT

Carriageways are resurfaced routinely during the normal course of maintenance. It is common for the level of the carriageway to rise with successive surface repairs thus diminishing the relative height of the kerb above the running surface of the road. Therefore, it is crucial that the kerb height at bus stops is maintained or improved during resurfacing. This is particularly important where special kerbs or raised kerbs are in place. Refer to Engineering Design Code – Road Pavements and Surfaces.

KASSEL KERB



Bus stopped close to kassel kerb

8.1.2 Kerb profiles and special kerbs

The kassel kerb is a concave-section accessible kerbstone that guides the bus tyres in the last few lateral centimetres of bus approach. As the tyre rides up the concave surface, gravity pulls it back down. Proper use of them can consistently achieve a 50mm loading gap, without undue tyre wear. Another benefit of these kerbs is that they are clearly visible to the driver and help guide the driver to stop in the correct position relative to the bus infrastructure.

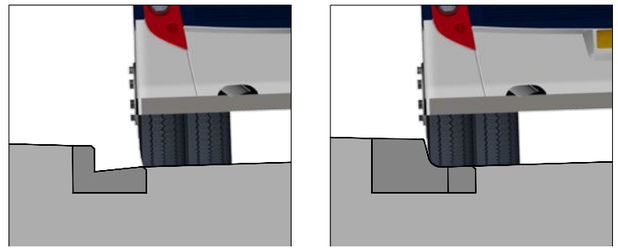


Figure 34 Kassel kerb profiles

ADOPTION OF KASSEL KERBS

Auckland Transport has decided to install kassel kerbs on parts of the public transport network.

- Kassel kerbs must be used:
  - in all new or upgraded bus stations, interchanges or town centre stops.
  - on any new busway or dedicated bus road projects.
  - stops on the Frequent Service Network
  - any large-scale streetscape projects
  - At every bus stop where existing kerb is being broken out as part of road works.

PREFERRED KASSEL KERB HEIGHT

Kassel kerbs are available in different heights, 160mm and 180mm being most common. Auckland Transport's preferred height for kassel kerb is 160mm, although there may be site-specific circumstances where a higher kerb is appropriate.

High special kerbs of more than 160mm should only be provided at bus stops where buses always have clear, unimpeded access on the approach and departure from the boarding point, with no likelihood of any obstruction that would prevent the bus arriving parallel to the kerb without hitting it. This must be designed in consultation with AT Metro.

The basic Kassel kerb unit is complemented by a range of transitional kerbs that allow the Kassel kerb to be incorporated into existing kerb lines, without the need for remedial work at each end of the stop.

8.1.3 Installing higher kerbs

Raised kerbs are required for the length of the clear stand area. Kassel kerbs should be provided for the full length of the bus stop box, with transition kerbs beyond, to allow the bus to approach and straighten smoothly and dock correctly.

CROSSFALLS

Where kerb heights are changed, carriageway and footpath crossfalls have to be considered carefully. Ensure that footpath crossfalls have a gradient of no more than 3% within the clear stand area, as a steep backfill from the kerb is undesirable for customer safety and comfort.

CHECK THE SPECIFIC BUS STOP

Before increasing kerb height, the layout of each bus stop should be reviewed to ensure that no conflict will occur. Factors to consider include:

- The ground clearance of buses. Although bus stop layouts have been designed to avoid the need for buses to overhang the kerb on arrival or departure, this may occur at particular sites due to, for example, inconsiderate parking. In this case, the kerb should be no higher than the minimum ground clearance of the bus.
- The proximity of driveways. If the bus stop is close to a driveway, this may limit the ability to increase the kerb height. Some bus stops may have to be relocated slightly to facilitate raised kerbs without adversely affecting driveways

8.2 Bus stop passenger area

SCOPE

This section contains design guidance on the various components on the pedestrian approaches to the bus stop and within the passenger waiting area.

SECTION 13.7: BUS STOP TYPES

See Figures in Section 07 for layout of passenger areas.

8.2.1 Hard stand area

DESCRIPTION

A passenger clear stand area with a sealed, smooth surface connects the bus doors with the nearby footpath. This is particularly important for the accessibility of wheelchair users, parents with prams, etc. It also defines the waiting and circulating space around the bus stop area.

EXTENT

The extent of the clear stand area may vary. However, as an absolute minimum, a clear stand area should be provided at each bus stop to align with both front and centre doors of all bus types, to ensure safe access and egress for customers both on foot and in wheelchairs. The access and egress areas should comply with the Standard for New Zealand Design for Access and Mobility – Buildings and Associated Facilities (NZS 4121:2001). A suitable pedestrian connection that complies with NZS 4121:2001 should be provided from the hard stand area to the nearest sealed footpath. To achieve this the minimum acceptable length of clear, hard-surfaced and level area is 9m measured along the kerb.

DRIVEWAY NOT ACCEPTABLE

A driveway is not an acceptable location to drop off or pick up passengers. Dropped kerbs cause a too large gap between the bus door and the ground, which poses as a trip/fall hazard the clear stand area should be away from any vehicle crossing, and the side slopes of any nearby crossing may need to be adjusted for pedestrian accessibility.

GULLIES NOT ACCEPTABLE

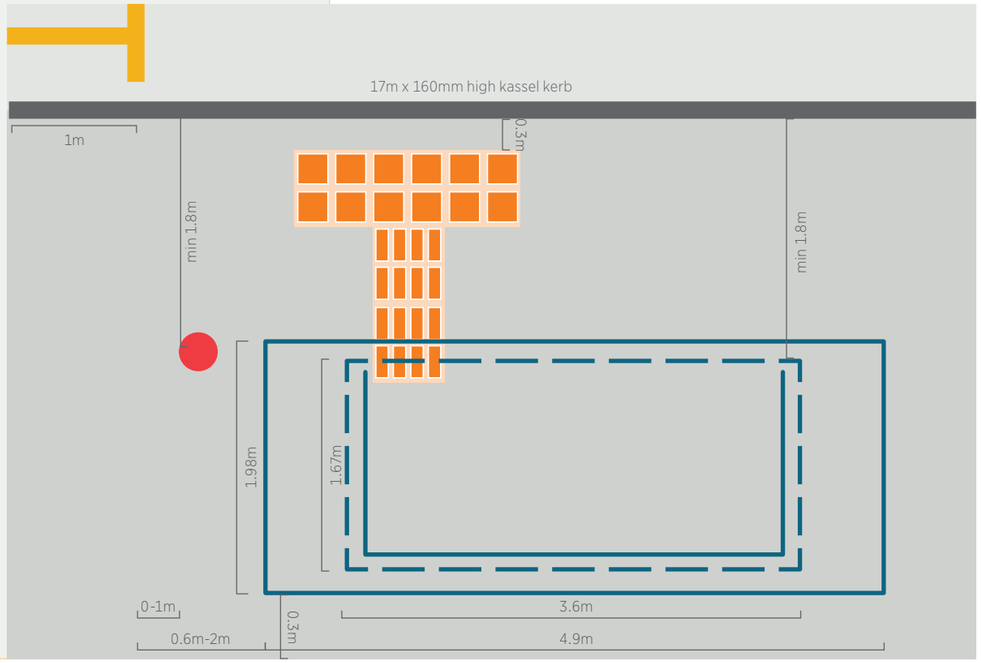
The use of gullies in the hardstand area should be avoided or fitted with a frame to ensure that the ramp, when deployed, is stable and so that passengers will not trip or become trapped in the event they step into the carriageway before stepping onto the bus.

TACTILE GROUND SURFACE INDICATORS

Tactile ground surface indicators (TGSIs) provide visual and sensory information about the road environment. They assist people with vision impairment to access the bus from the adjoining footpath by:

- **Warning** people of the kerb and potential hazard beyond it. Warning indicators should be installed a minimum of 600mm x 600mm, placed 300mm back from the front of the kerb edge, adjacent to a bus stop, preferably close to the location of the entry door.
- **Directing** people from the footpath to the kerb where the bus front door will be and from the bus back to the footpath. Where the warning indicators are not in the direct line of the continuous accessible path of travel, directional indicators of 600mm wide should be installed to form a continuous path leading to the warning indicators.

Figure 35 Recommended layout for tactile ground surface indicators at bus stops



RELEVANT GUIDANCE

For more on tactile ground surface indicators and mobility access, see:

- Engineering Design Code: Footpaths and public realm.
- Road and Traffic Standards (RTS) 14 Guidelines for facilities for blind and vision impaired pedestrians (2008).
- New Zealand Design for Access and Mobility – Buildings and Associated Facilities (NZS 4121:2001).

8.3 Bus shelters

PURPOSE

Bus stop shelters provide waiting passengers with protection from the sun, wind, and rain. They also define the bus stop area strongly, as bus shelters are the most visible permanent indicator of the presence of a bus service.

SURROUNDING CONTEXT

The location and configuration of all proposed bus shelters should have to take the surrounding context into account, e.g. boundary conditions, driveways, planting and buildings.

8.3.1 Where bus shelters are needed

DESCRIPTION

Ideally all inbound bus stops (as defined in Section 07), with the exception of end-of-route stops or those stops already under canopies, should be provided with a shelter.

HIGH PRIORITIES

It is a priority to provide shelters:

- at bus stops located on a High Frequency bus route.
- where customers connect between services
- where there are generally more than 20 passenger boardings per day

Even if the above do not apply, shelters have to be considered:

- near retirement or nursing housing with a minimum of 10 daily boardings.
- where development means patronage is projected to meet criteria.
- where bus stops are being consolidated and combined patronage justifies shelter provision.
- where the shelter is to be funded and maintained by the private sector.
- where the bus stop is served infrequently. Passengers at these stops tend to arrive slightly earlier which means that passengers wait longer. As a guide, provide shelters where there is a minimum of 15 daily boardings on routes where peak waits are greater than 15 minutes.

LOW PRIORITIES

Bus shelters do not need to be provided at stops where passengers only use the stop to alight (“outbound” stops).

Bus shelters may also not be required where there are building canopies, although seating should be provided if possible. This should be determined on a case-by-case basis, as at some exposed sites, a building canopy may not give shelter from wind-driven rain.

8.3.2 Bus shelter layouts

PLACEMENT

The bus shelter should be:

- Close to the head of the stop. If this is not possible within the current layout, consider amending or widening the bus stop area or footpath.
- On the footpath, without blocking the main pedestrian through route. Where there is enough width, bus shelters should be located to the back of the footpath, further from the carriageway. The area for the pedestrian through route has to cater for the pedestrian flow along the route and the potential obstruction caused by waiting passengers. Placing the shelter to the rear of the path enables the remaining width to be made available undivided to pedestrian movement, but can require the main flow along the path to weave around the shelter. Where space permits, shelters can be placed in front of the main pedestrian movement alignment, so long as the minimum space requirement of 1.5m between the shelter and the kerb can be achieved.
- Accessible with the necessary clearance and circulation spaces, particularly for people with physical or vision impairments.

CLEARANCES

Minimum clearances must be maintained; greater clearances are preferred in many situations.

- The kerb zone must be free of fixed obstacles for at least 1000mm from the kerb face, to allow for potential overhang of a bus and its mirrors on entry and exit.
- The boarding and alighting clear area of 1.8m x 9m should ideally be free of fixed obstacles.
- Maintain a continuous accessible pedestrian through route of 1.8 m for the full length of the bus stop. In very constrained locations, an absolute minimum clearance of 1.5m is acceptable as an exception.
- In addition to the above, if the bus shelter backs directly onto a property boundary or fence, the property owner may wish to have a 500–600mm gap between the back of the shelter and the boundary for maintenance access, etc.
- In constrained sites, a minimum of 350 mm should be provided between the property boundary and bus shelter.

DRIVEWAYS

The placing of bus shelters either side of driveways should consider pedestrian and vehicle visibility splays from driveways. Bus shelters can impact on sight lines of oncoming traffic, especially where bus shelters are to the right of vehicles exiting the driveway.

The appropriate (and feasible) visibility splay for each site has to be considered on its own merits. Note that set back from the road carriageway may be more important than the distance from the driveway in determining the ability to see past the shelter.

POWER LINES

Where a bus shelter has to be installed closer than 2.2m to a power pole or line, prior written consent is required from the line owner.

THREE LAYOUT OPTIONS

Three bus shelter layout options have been identified for ideal sites and for constrained roadsides where preferred configurations cannot be achieved. The alternative layouts include offsetting the bus shelter from the head of the stop, a narrower shelter, and a bus boarder with the shelter at the back of the footpath. Each option has advantages and disadvantages to consider when choosing the solution for a particular site.

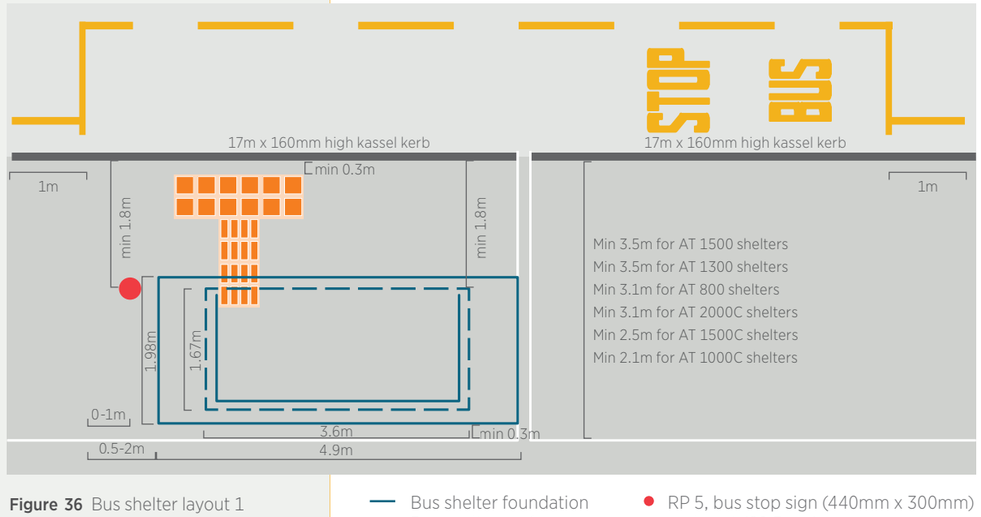


Figure 36 Bus shelter layout 1

Bus shelter foundation
Bus shelter roof
RP 5, bus stop sign (440mm x 300mm) and post (60.5mm)

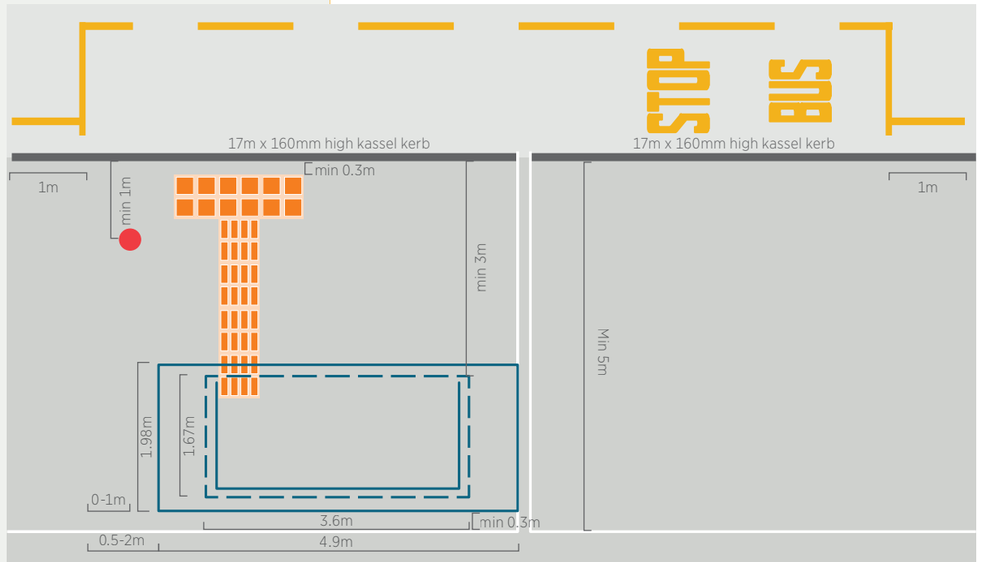


Figure 37 Bus shelter layout 2

Bus shelter foundation
Bus shelter roof
RP 5, bus stop sign (440mm x 300mm) and post (60.5mm)

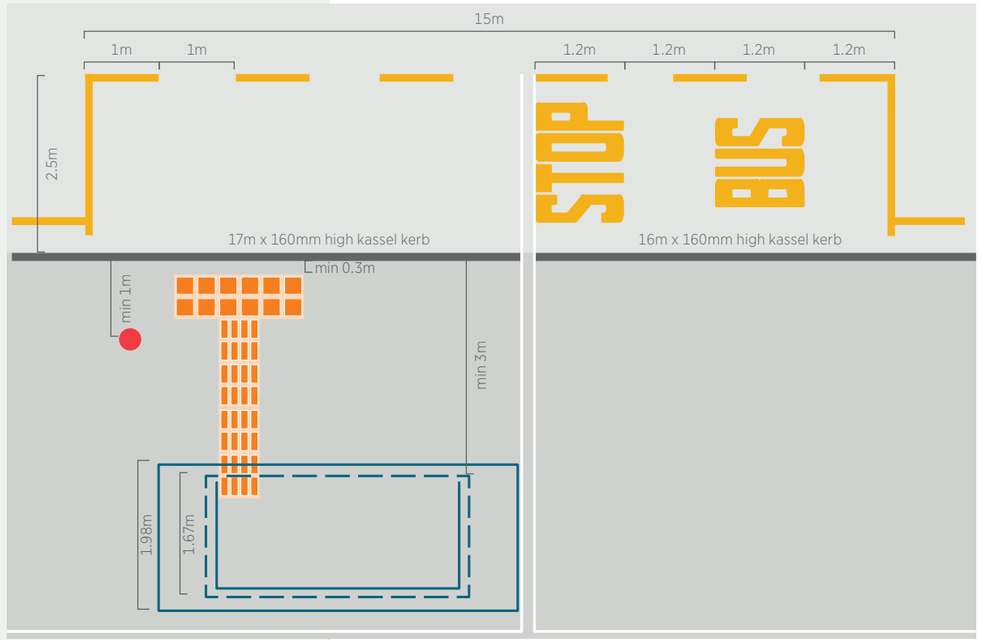


Figure 38 Bus shelter layout 3

Bus stop marking
No stopping at all time
RP 5, bus stop sign (440mm x 300mm) and post (60.5mm)

OPTIONS IF DIMENSIONS CANNOT BE MET

Where the constrained dimensions cannot be met, consider:

- Installing a bus boarder to widen the available area.
- Repositioning the bus stop to a nearby location with more space.
- Using a non-standard shelter with reduced dimensions. Cutting back the end walls of the shelter may accommodate the required clear footpath width. However, also consider the dimensions of the shelter roof and whether it needs to be cut back to provide sufficient kerb clearance.
- Reducing the minimum accessible pedestrian route, bearing in mind the respective usage levels of the shelter and the pedestrian route.
- Acquiring land to provide additional width.

NON-STANDARD PLANS REQUIRE APPROVAL

Non-standard shelter dimensions or a pedestrian route of less than 1500 mm requires approval of AT Metro and Traffic Operations departments. The proposal must be submitted with documentation demonstrating that the minimum standards cannot be met and why; and that the options above have all been considered before selection of the scheme proposed.

RELEVANT GUIDANCE

For more on pedestrian facilities, see:

- Engineering Design Code – Footpaths and public realm
- NZTA's Pedestrian Planning and Design Guide Section 14.2.2 and Table 14.3 (December 2007).

8.3.3 Bus shelter design

SHELTER TYPES

AT Metro has procured a new shelter design to form a suite of shelters assembled from modular components. Using this

system, a range of shelter sizes are available to suit the space available to specific sites. Three lengths (Minor, Intermediate, Major) and three depths (1500, 1300, 800) are available as standard. Some bespoke designs have been developed from the modular concept for specific sites. A cantilever derivative is also available for use in exceptionally constrained sites.

The modular shelter suite is configurable to use timber, metal or glass panels in different positions. There is a 'standard' layout, but if local circumstances call for it, different panel configurations can be proposed. All non-standard panel layouts must be approved by AT Metro Infrastructure.

The New Network concept will cause a considerable amount of customer interchange to occur between arterial and cross-town routes. At key nodes it is expected that 'neighbourhood interchanges' will be created to facilitate interchange with continuous cover between stops as far as is possible. The AT Metro modular shelter system must be used to promote this connectivity through familiar, recognisable infrastructure linking the stops. Continuity of customer information signing must also be provided.

Any proposal to use a shelter that is not part of the AT Metro modular shelter suite is subject to the approval in advance of AT Metro Infrastructure.

AT Metro should be consulted at first instance to determine the type of bus shelter to be implemented.

MINOR SHELTER

The Minor 1500 shelter is used as the standard type at a typical stop. The Minor 1300 can be used if it is not possible to fit the 1500 safely. AT Metro must be consulted before anything smaller is proposed to be installed.

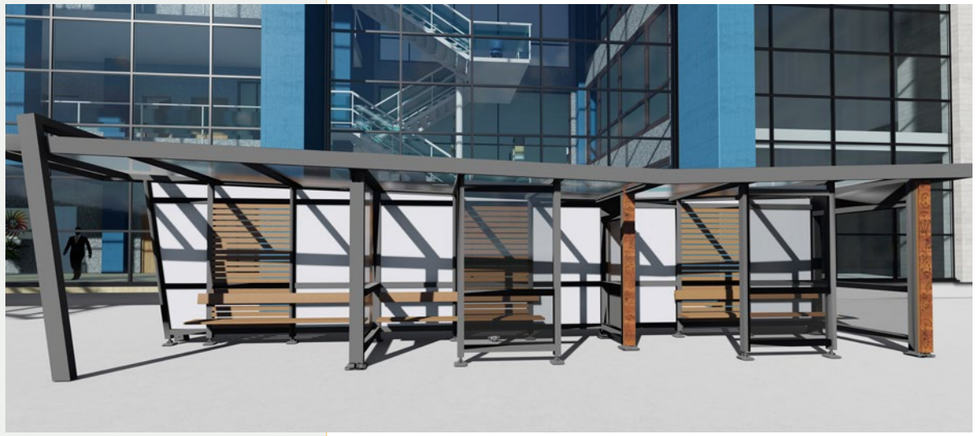
Minor shelter example

INTERMEDIATE/MAJOR SHELTER

At stops with high peak boarding demand (e.g. in town centres or outside schools or railway stations) it might be necessary to provide greater capacity; in which case the default shelter will be the Intermediate 1500 or the Major 1500. The same limitations apply to the use of shallower shelters.

Intermediate shelter example

Major shelter example



APPENDIX C: SHELTER DRAWINGS

For technical drawings for bus shelters refer to Appendix C.

LIGHTING

See Section 09

GLASS MARKING

See NZS 4223 Part 3 (clause 303, page 7) for more detailed guidance on marking glass.

8.3.4 Street furniture

PURPOSE

Street furniture such as seats, shelters, rubbish bins and information signs may improve the amenity at a bus stop. To ensure that bus stops make a positive contribution to the streetscape it is important to ensure that these features are well-designed and do not impede access.

CLEAR AREAS

All street furniture at bus stops should be set back from the kerb faceby at least 1000mm to account for bus overhang. Within the road corridor there should be a 500mm set back from the kerb face All street furniture should be located to maintain

clear boarding and alighting areas, as well as keeping the 1.8 m pedestrian through route clear. Consolidate street furniture as much as possible to maximise a barrier-free space.

SEATING

Additional seats should be located to be comfortable for passengers, e.g. well back from traffic and allowing good visibility to approaching services. Where footpaths are narrow, seating may be provided in the street furniture zone, at least 1000mm from the kerb face. In these cases, the seat should face away from the road, for safety.

SIGHT LINES

Street furniture should not obstruct sight lines between approaching buses and waiting passengers.

STREETSCAPE

The amenities at bus stops should ideally be designed as a component of the overall streetscape, e.g. as part of an overall corridor-based enhancement.

CYCLE PARKING

Cycle parking should be designed and located so it does not create a hazard, or impede access, for disabled people.

Example cycle parking at bus stops

MAINTENANCE

Street furniture should be easy to maintain and replace, durable and long-lasting. It should also be as resistant as possible to vandalism, without detracting from comfort or its aesthetic impact.

RELEVANT GUIDANCE

For more on street furniture, see:

- Engineering Design Code – Footpaths and the public realm
- NZTA Pedestrian Planning and Design Guide, Section 14.9 (December 2007).

8.4 Landscaping

DESCRIPTION

Natural landscaping may be provided at a bus stop to enhance the bus stop amenity. Key considerations specific to trees and landscaping include:

- No planting should be located in the boarding and alighting areas or in the 1.8 m pedestrian path of travel.
- Planting must not obstruct sight lines between approaching buses and waiting passengers. On the approach side of a stop it should be limited to ground cover or low shrubs, less than 0.5m high.
- Use tall, clean-stem shade trees towards the rear boundary of the road reserve with clear access around them. They must not obstruct sight lines.
- Trees must not overhang a bus shelter, but may provide shade to open standing areas.

CLEARANCE ENVELOPE

Trees must be capable of mature growth that can be easily maintained outside the clearance envelope.

13.8.5 Passenger information signs

PURPOSE

Customers and prospective customers require information to use bus services to best effect. Passing drivers and pedestrians also need to be informed that the bus stop is there. Most of this information is conveyed through road markings, signage and street furniture. However, there is an increasing need to provide electronic signage as well. All of this has to be considered in the design of bus infrastructure.

Customer information signs alert customers and passers-by to the presence of a bus stop. They also:

- provide useful information about available bus services
- provide one official shared source of information that is consistent across the whole region
- form a wayfinding system that is logical, legible and free of ambiguity
- use a common, shared and consistent visual language
- connect Auckland with a single wayfinding system
- demonstrate the benefits of cross-council agency initiatives with a strong customer focus
- encourage and support cross-modal travel
- connect local facilities to public transport and vice versa
- provide more route information and options
- can showcase local facilities and attractions

8.5.1 Bus Stop sign

MANDATORY SIGN

The bus stop sign (RP-5, in Figure 24) is required by law to be displayed at the head of a bus stop. It identifies the area as a bus stop and prohibits parking. It is an important indicator to passengers and bus drivers and acts as a legal control point for the layout of bus stop facilities.

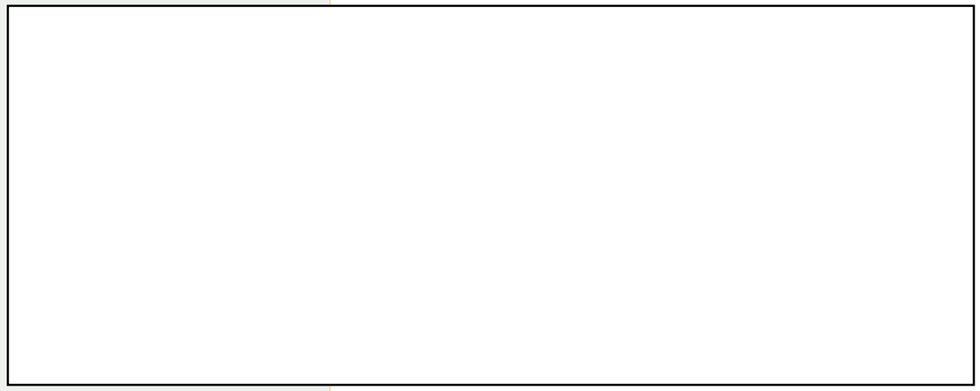
BUS STOP SIGN PLACEMENT

The RP-5 sign should ideally be placed in a direct line with the head of the bus stop box. It must not be positioned more than 0.5m from the head of the box.

Outside the CBD the RP-5 and bus stop flag (see Section 8.5.2) must be co-mounted on a bus stop-specific pole. Mounting on existing poles is not acceptable. The pole must be installed

so that no part of either sign nor the pole shall be closer than 1000mm behind the kerb face. This can be achieved by installing the pole 1000mm behind the kerb with both signs on the inside of the pole. In order to mount either the RP-5 or the flag between the pole and the kerb, the pole must be installed sufficiently far from the kerb that the sign achieves the 1000mm clearance. The requirement for a clear walking path will be critical to the positioning of the bus stop pole.

Bus stop sign (RP-5) and flag on separate pole



8.5.2 Bus stop information sign

Figure 39
A bus stop information sign

PURPOSE

A bus stop information sign, known as a bus stop flag, shows stop-specific information, e.g. the bus stop number, bus stop name, direction of travel, the routes that use that stop. It must be mounted perpendicular to the kerb. Where possible it should be mounted on the same pole as the RP-5, and both signs must be at least 1000mm inside the kerb face.

At town centres and CBD stops, the information sign may take the form of a double-sided plinth, which must be located with close regard to walking lines along the footpath as well as to and from the doors of a stopped bus.

8.5.3 Timetable information

PURPOSE

Passengers need to be informed when they can expect the bus they want to use. Current timetable information should always be provided at bus stops, even if the stop also has a real-time information display.

TYPES OF INFORMATION

Table 3 outlines the type of information that should be included at each type of bus stop. In general, the type of information should be provided to users includes:

- RP5 sign
- Bus flag sign
- Timetables including bus stop number, AT contact details, links to AT website and apps etc
- Fare zone map.
- Information on the schedule of services that operate from the stop or within the local area during the weekday and weekend.
- A figure showing the service routes and the location of the specific bus stop relative to the whole route.
- Direction of travel.

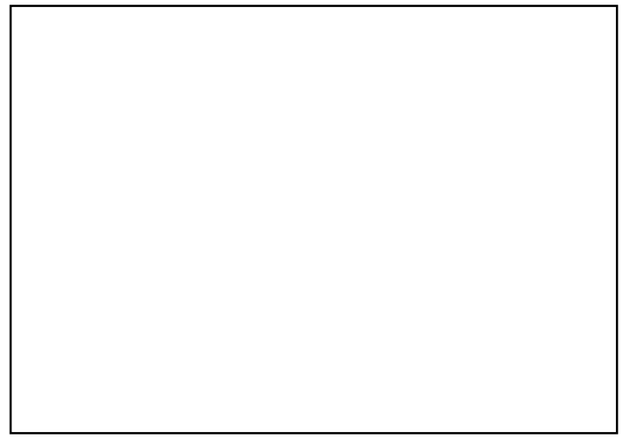
MOUNTING

Timetable cases must be mounted on the bus stop pole or within a bus shelter.

MAIN TRANSFER POINTS

At main transfer points, more extensive timetable information should be displayed within the bus shelter.

Timetable information at a bus stop



APPENDIX D: CUSTOMER INFORMATION

Guidance on the location, type and placement of signs around customer information signs at bus stops are shown in Appendix D: Customer Information.

8.5.4 Electronic public information displays

PURPOSE

Electronic public information displays at bus stops are used primarily to give prospective customers current information about the expected arrival times of buses. They can be used also to give public information about other services or facilities in the local area or further afield.

WHICH BUS STOPS TO PRIORITISE

When deciding where to provide electronic public information displays, give priority to bus stops:

- On major bus routes, i.e. Frequent or Rapid Network routes.
- Near major trip generators, e.g. shopping centres, schools and colleges.
- Near transport interchanges, e.g. railway stations or ferry terminals.
- Close to other bus routes, to cater for transfers.

FORM OF INSTALLATION

Real-Time information signs can be installed as a stand-alone item, or integrated within AT Metro standard shelters.

APPENDIX E: REAL-TIME INFORMATION SIGN INSTALLATION

Guidance on where to install real time information signs is shown below. Technical drawings are available in Appendix E: Electronic Public Information Display Installation.

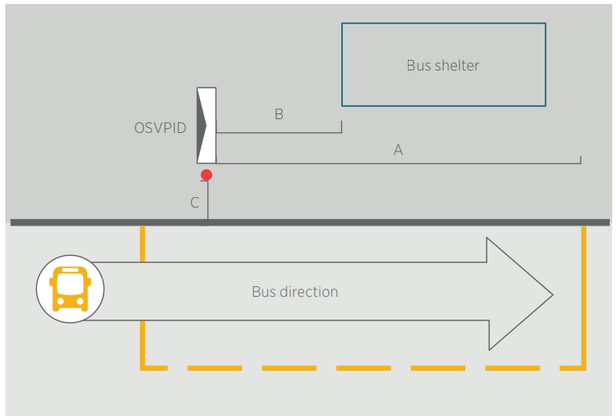


Figure 40 Location of real-time information signs

09 Bus stop lighting

PURPOSE

Lighting at bus stops enhances the security of passengers, improves the perception of personal safety, enhances the bus journey experiences (while waiting, boarding and alighting) and ensures that bus drivers can see waiting customers.

Bus stop shelters lighting example

SOURCE OF ILLUMINATION

Ideally, each bus stop should have its own source of illumination. As a minimum, bus stops should make use of existing street lighting and/or lighting from adjacent land-uses as the first source of illumination. Where street lighting is inadequate, independent lighting should be installed which can be solar charged and mounted on the bus stop pole.

SOLAR POWER

Solar power should be considered where connection to electricity network is not practicable. AT's new shelter are all fitted as standard with solar lighting.

SURROUNDING LIGHTING

To ensure that passengers can access the stop, the surrounding paths to and from the bus stop should also be well lit. The extent that this should be included as part of any bus stop installation or improvement depends on the specific site with decisions to be made by AT Metro.

LIGHTING LEVELS

The appropriate lighting level should be 30-40 lux with a minimum uniformity ratio of 0.5 within the immediate waiting area. Higher lighting levels should be considered where there is a defined need.

Approaches within 15 m of the stop should be lit to 10-15 lux with a minimum uniformity ratio of 0.3. Higher lighting levels should be considered where there is a defined need.

RELEVANT GUIDANCE

For further guidance on lighting design, refer to:

- Engineering Design Code–Street lighting
- AS\NZS1158 Practice for Road Lighting.

10 Bus stop branding

PURPOSE

Consistency of application of the AT Metro Brand makes it easier for Aucklanders and visitor to recognise the city's integrated public transport system and helps build customer confidence in our ability to deliver a professional service.

RELEVANT GUIDANCE

For more guidance on bus stop branding, see: AT Branding Manual

11 Public transport interchanges

PURPOSE

Major public transport interchanges share many requirements across the different public transport modes – bus, train and ferry.

RELEVANT GUIDANCE

Auckland Transport is currently developing another guideline for Public Transport –Major Interchanges. For further information regarding the requirements, please refer to the public transport interchange guideline once it is released.

12 Electric buses

CHARGING STATIONS

Charging stations for electric buses at key locations should be considered at bus layovers/interchanges and terminuses. The number of charging stations will be determined by the number of electric buses travelling on each specific route. Vector should be

contacted in order to ensure adequate power supply is provided to charging stations.

Electric buses that have been implemented in Auckland, so far include a charging unit at the rear of buses, as such all charging stations should be located at the rear of each bus location. Allowance for a 5x1.5m area with offset 1000 mm from the kerb face.

13

Cycleways at bus stops

PURPOSE

The following section provides three designs that can be implemented to ensure cyclists are protected around bus stops, and at bus layovers.

FACTORS TO CONSIDER

- Bus stop operation and frequency – The bus stop island design needs to consider bus flows using the stop; such as high frequency bus routes, and where driver changeovers occur. Bus stops with infrequent bus service (fewer than about 10 buses per hour) with sufficient carriageway width may not require the installation of any on-road/off-road cycle lanes and associated bus stop islands.
- Road network – Roads that have been identified with focus on cycling should consider cycle lanes behind bus stops, where bus stops are to be installed.
- Road corridor – The road corridor width, driveway locations, proximity to intersections, land use (commercial versus residential area) will determine the type of treatment that can be installed.
- Proximity to intersections – Given the potential conflict for left turning vehicles in front of cyclists, there needs to be careful consideration when implementing cycle lanes behind bus stops near intersections.
- Proximity to driveways – Cycle lanes behind bus stops should not be installed within proximity to driveways (residential areas).
- Cycle volumes – Roads with high volumes of cyclists need to consider provision of a safe cycle facility around bus stops.

Pedestrian and cycle interaction – Pedestrians may have to cross separated cycleways to access bus stops, pedestrian crossing facilities, car parking and the footpath. The choice of mitigation measure for these conflicts is a function of how much space is available; ideally people stepping off buses, or out of parked cars should not step directly into a separated cycleway.

DESIGN OPTIONS

The three options are as follows:

- Option 1 – Full island design
- Option 2 – Partial island design
- Option 3 – Boarding strip

FULL ISLAND DESIGN

Option 1 is the ideal layout (Figure 41) as bus patrons do not have to cross the cycleway when transitioning between the waiting area and the bus.

A raised cycleway to footpath level reinforces priority to crossing pedestrians, while a lowered cycleway design with drop-down pedestrian ramps shall be considered to give priority to cyclists; the provision of this will be site-specific.

In constrained corridors, a shared path could be provided behind the bus stop. However, care should be taken to ensure that adequate width is still provided for this, with adequate path markings.

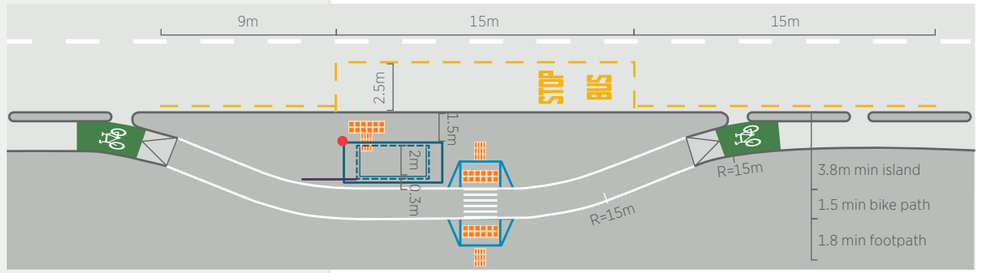


Figure 41 Full island design (Preferred)

— Physical barrier to prevent conflict at "blind corner" (eg railing,planters)
● Bus stop sign and flag
— Bus shelter

PARTIAL ISLAND DESIGN

Where there is not enough room to achieve a full bus stop island, the entering / exiting area can be separated from the other component, creating a "partial island" between the cycleway and the road (Figure 42)

The island should be wide enough for an entering or departing passenger (possibly with a pram, walker, etc) to stand clear of the cycleway next to the bus. Care must be taken to ensure any design does not limit full accessible boarding.

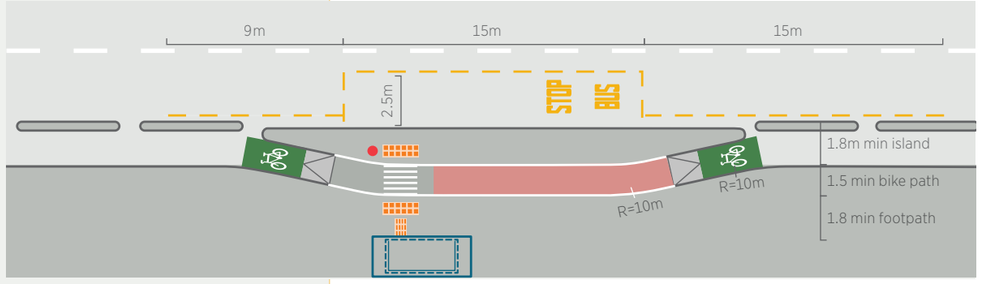
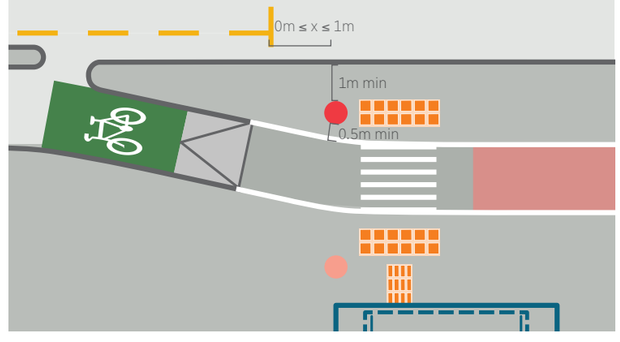


Figure 42 Partial island design

— Bus shelter
■ Red surfacing
● Bus stop sign and flag
● Alternative sign location

Note: If minimum dimensions can't be achieved, sign needs to be installed at alternative location



BOARDING STRIP

In scenarios where it may not be possible to provide an island between the cycleway and the road. Bus patrons will therefore have to enter and exit the bus directly from / to the cycleway (Figure 43).

Option 3 should only be considered if there are geometric constraints to achieving the full island/partial bus stop island. This treatment should be implemented with caution, particularly on roads with frequent buses and / or high volumes of cyclists. This option will create conflict between left turning buses at intersections/junctions where the cyclist might approach alongside the bus. Quality of services for buses will be limited with significant volumes of cyclists and potentially creates accessibility issues for wheel chair users. This option should not be used for a bi-directional cycleway, due to the increased safety concerns with the additional conflict points created. This option should not be implemented if the bus stop has high dwell times.

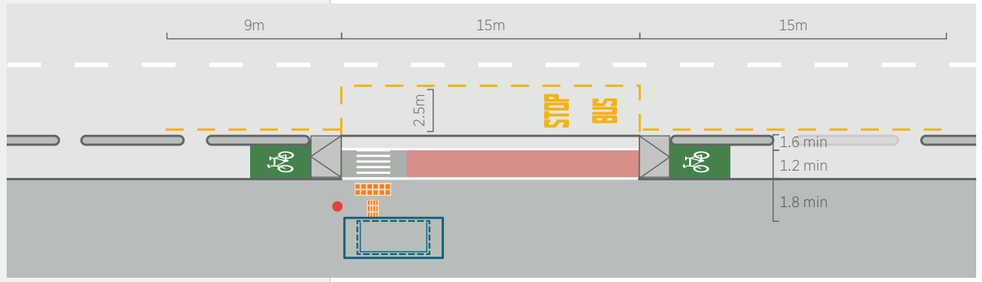


Figure 43 Boarding strip design

ADDITIONAL CONSIDERATIONS

For all other elements at bus stops such around accessibility, additional signs and road markings, safety and security, street furniture, stop specific information and enhancements refer to Table 3 in Section 8.

RELEVANT GUIDANCE

For more on design for people on bikes, see:

Engineering Design Code – Cycling infrastructure

14 Bus layover and driver facilities

EMPLOYMENT RELATIONS AMENDMENTS ACT 2018

The Employments Relations Amendments Act 2018 provides drivers with the right to set rest and meal breaks. Prior to the 6 May 2019 change, the Employment Relations Act required that employees receive reasonable and appropriate rest breaks, without outlining the number, duration or position within the work day. The changes provide greater clarity of rest and meal break entitlements and to benefit workplaces by helping employees work safely and productively.

A transport operator who holds a public transport service contract(s) with a regional council (including Auckland Transport) should discuss with the council the potential impact of implementing the new rest and meal break provisions and how to manage those impacts. This will include determining the potential financial impact of increased breaks and how any additional costs will be met. Costs may differ from operator to operator, unit to unit, and region to region.

Due to the above, there needs to be consideration to provide adequate bus layover and driver facilities

SCOPE

A bus layover is a bus stop which requires buses to wait for prolonged periods. The provision of layovers has the potential to allow more efficient bus operations by decreasing the number of trips between depots and operating service, and minimise dead running.

14.1 Factors Influencing bus layover location

ECONOMIC OPPORTUNITIES

Consideration to integrate bus layover with large commercial centres

LOCAL NETWORK EFFECTS

The location and placement of bus layovers should have minimal impacts to the safety and operation to the local road network should be avoided. Bus layovers should not be situated in locations that have adverse effects pedestrian safety and general traffic.

BUS NETWORK

Bus layovers should typically be located at the commencement/ termination of a bus service.

PROXIMITY TO DRIVEWAYS

Bus layovers must not obstruct driveways.

14.2 Bus layover design

NUMBER AND FREQUENCY OF BUSES

Typically determined by the number and frequency buses of buses at that particular location.

BUS DRIVER LAYOVER FACILITIES

Facilities such as kitchen area with sufficient bench space, sink / wash-up area could be included in bus driver layover facilities

ROAD GEOMETRY

Given most bus lay over facilities are required at the start and end of bus routes, there needs to be sufficient space for buses to turn around and travel in either direction. Bus layover facilities should not be located on roads effect visibility and safety of pedestrians and vehicles.

SECURITY

Transport security requirements including security camera connectivity, on-site recording could be installed at off-site operations centres.

PAVEMENT DESIGN

Bus layovers which includes high turning movements (particularly u-turning), should consider providing a more robust road pavement in accordance with Austroads Pavement Structural Design and other relevant design standards.