Chapter 20

Public Transport - Buses

Auckland Transport
An Auckland Council Organisation

20 Public Transport - Buses

20.1 Introduction

This ATCOP chapter supersedes the ARTA “Bus Stop Infrastructure Guidelines” published in May 2009.

20.1.1 Purpose

These guidelines aim to assist all bus stop providers and designers but particularly Auckland Transport staff as the main provider of this infrastructure to provide consistent, safe and effective bus infrastructure.

Bus services are to be accessible to all passengers. This responsibility extends to both the bus service provider and the road infrastructure providers.

When designing facilities for bus passengers, designers should keep in mind the requirements of the following groups:

- The elderly
- The mobility, vision and hearing impaired;
- People with young children, strollers and prams;
- People with large or heavy luggage or shopping.

Designers should also keep in mind that a well-designed bus stop will:

- be fully accessible - meaning step and gap free access to buses at the bus stop itself as well as accessible and safe walking routes to and from the bus stop;
- have a consistency in design and provision, making it easy to identify, safe, comfortable, attractive and easy to use;
- help reduce bus travel times and improve reliability by providing optimal operational solutions;
- provide sufficient information on bus and (where applicable) other public transport services available from the stop;
- make a positive contribution to the community streetscape; and
- be designed to take other road users into consideration e.g. the through-movement of pedestrians.

It is not intended that this guideline be wholly prescriptive as it is recognised that in reality each site will present its own site-specific constraints and some flexibility and professional judgment will need to be exercised. Nevertheless, there is a strong aspiration to deliver a step-change in bus stop provision and it is envisaged that the ideal scenarios outlined in this guideline will be delivered on the ground, as much as possible.

Although this guideline is currently only concerned with the actual bus stop itself, it has been developed with a focus on the **whole journey concept** and aims to ensure that the bus user’s journey is accessible, comfortable and safe - right from their home door to their destination door and back again.

It is acknowledged that not all key stakeholders will necessarily agree with all aspects of the recommendations outlined in this guideline and that there are still some areas that need to be further investigated or trialed.

20.1.2 Flexibility of infrastructure design

Public transport technology/design is constantly changing and improving. To cater for these changes and improvements to the network - flexibility and adaptability of infrastructure is required.

20.2 Auckland Public Transport Network Plan Review

Auckland Transport is currently implementing the Auckland Passenger Transport Network Plan, with a view to completing a substantial step change in the way public transport is planned and managed. As part of these changes, a new classification entitled the Frequent Service Network (FSN) is proposed.

The FSN includes those services with their own separated infrastructure (the existing RTN now proposed to be named the Rapid Network) plus expanded frequent bus and ferry services (called the Frequent Network). The FSN (incorporating both the Rapid and Frequent Services) will operate seven days a week, with a minimum of fifteen minute frequencies between 7 am and 7 pm. Most services will also include a slightly reduced frequency between 6 am and 7 am, and between 7 pm and 11 pm. In addition to the FSN there will also be lower level services running with minimum frequencies of 30 minutes or 60 minutes (the Connector Network) as well as additional peak only and targeted services. These categories are illustrated in Figure 104

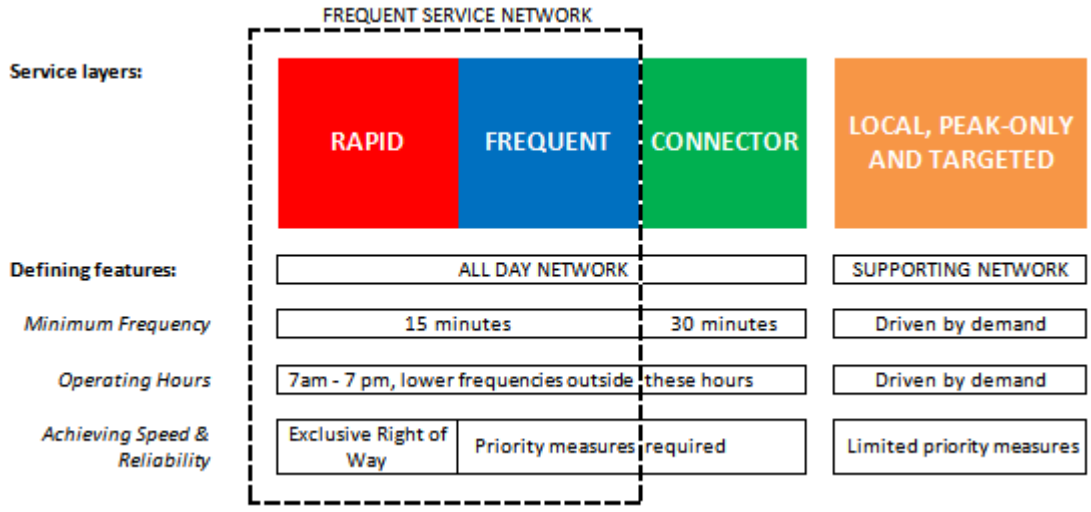

Figure 104: Proposed Service Categories

20.2.1 Public Transport Services Review

Auckland Transport is also currently in the process of reviewing all public transport services in the Auckland region with the introduction of the new Public Transport Operating Model (PTOM). PTOM is a new contracting model which will change the way public transport services are contracted and managed throughout the Auckland region. The services in each region in Auckland (North, South, East and West) will be reviewed and consulted on over the next three to five years, starting from 2013.

20.3 Providing An Accessible Bus Network

Providing an accessible bus passenger transport network requires two key components: an accessible bus fleet in operation and bus stops that are designed to complement these vehicles. This section outlines how these two components interact and what the bus stop design implications are.

20.3.1 Fully Accesible Buses

There is a significant shift within New Zealand, as in many other countries, towards the provision of low or super low floor buses as they provide greater levels of accessibility. By 2014 most urban buses operating in the Auckland region will be super low floor vehicles, and Auckland Transport expects all urban buses will meet this standard once older vehicles are phased out.

Low floor buses have a single step entry and a low floor in the front part of the vehicle. This reduces the height differential between the kerb and bus floor. Most buses are also able to 'kneel', reducing the step height even further. Whilst they are generally seen as a means of improving accessibility for disabled passengers, including wheelchair users, all passengers benefit from low floor bus services, including:

- people with pushchairs;
- people with young children;
- elderly people;
- passengers with shopping or luggage;
- wheelchair users;
- people with impaired vision; and
- ambulant disabled people.

20.3.2 Impacts of Bus Vehicle Types on Bus Stop Provision

The type of bus vehicle serving a bus stop has a direct impact on many aspects of its design.

A bus must be able to:

- pull into a bus stop in a safe and efficient manner;
- stop as close to the kerb as possible to pick-up or set-down passengers. Close proximity to the kerb ensures that all passengers, regardless of their level of mobility, are able to board or alight the bus in a comfortable and expedient manner; and
- pull out of a bus stop in a safe and efficient manner.

The bus stop layout and kerb provision has a direct impact on the ability of a bus to complete the above maneuvers. This in turn has an impact on bus accessibility, safety, bus journey time and reliability. It is therefore important that bus stops are designed for the bus type serving it so that key objectives in these areas are met.

20.3.3 Standard Bus Vehicle Dimensions

As there are a variety of bus vehicle types operating in the region, this section provides the critical dimensions of the general Auckland bus fleet. These dimensions need to be taken into account for all bus infrastructure design.

The dimensions and layouts included in this guideline have been based on a single deck tag axle bus vehicle that is 13.5 metres long and 2.5 metres wide. It is recommended that bus stops are designed, as a minimum, to accommodate this dimension of bus. Where other bus types will use a bus stop, designers will need to build appropriate dimensional tolerances or amend the bus stop design parameters outlined in this guideline to best suit the bus vehicle operating along a specific route. Double decker bus designs mostly fall in to this category but essentially the main criteria for these buses is allowance for height (minimum 4.25m) – in terms of width and length they are the same as a single decker vehicle. AT's PT Operations can assist with this information.

20.3.4 Design dimensions

Length

Notwithstanding comments in 3.3 above, bus vehicle lengths generally range between 10.5 and 13.5 metres, however some articulated buses, as long as 18.5 metres (see Photo 20.3.4.1B), are also in use in Auckland. There is increasingly more use of buses between 12.1 and 13.5 metres (see Photo 20.3.4.1A).

Width

Bus design widths in the industry are potentially changing. Currently a body width of up to 2.5m can be built but it needs to be remembered that in reality most buses are 2.85m wide including mirror widths. This latter measurement should be reflected in any designs of bus related infrastructure. This figure includes the 230-350mm extrusion of rear view mirrors on the bus.

Height

A legal maximum design height of 4.25m is allowable in New Zealand. This height must be taken into account when designing or maintaining bus infrastructure, to cater for double decker vehicles. Designers should be aware and reflect this height as a bare minimum. **A recommended safer design / maintenance height is 4.5m.**

Overhang and underside clearance

Front and rear bus overhangs must be taken into consideration when designing any infrastructure that requires a vertical deflection/deviation of buses, such as LATM devices, catch pits, kerbside infrastructure etc. **As a guide only**, the following overhangs and clearances are applicable to a normal 12.5m bus:

- Front 2.7m.
- Rear 3.5m.
- Underside clearance minimum 75mm (at axles) and 160mm when kneeling.

Note that the above measurements are not turning templates. Example bus plans are attached in Appendix 20A.

Bus door locations

Vehicles will normally have a two-door layout, with one in the front ('entrance doorway') and one in the back ('exit doorway). Door placement is not prescriptive – advice is given that the 'entrance doorway' will generally be located ahead of the front wheels and the 'exit doorway' will be located ahead of the rear wheels. The lack of a specific location for the exit doorway can impact on the ability to provide a correctly located hard standing area for passengers alighting from the rear doorway at some bus stops (where there is no continuous hard paving along the kerb edge already). This should be noted and consulted on (PT Operations) where bus stops are being designed.

For guidance only the door locations for typical bus types in Auckland's fleet are shown in Appendix 20A

Photo 20.3.4.1A - Standard 13.5 metre long rigid bus

Photo 20.3.4.1B – 18.5 metre articulated bus

Turning templates

To be inserted in the future.

Turning diameter

To be inserted in the future.

Access ramps

The new Requirements for Urban Buses (RUB) requires wheelchairs, prams etc. to load at the front. Wheelchair ramps currently in use are manually operated (the driver simply flips the ramp out). The wheelchair ramps of a bus are 800mm wide and 800mm long and are fitted to all new urban buses.

Kerb requirements to assist with these improvements in vehicle design are discussed more below and also in Section 20.7 but in summary a minimum 150mm kerb (ideally an access kerb) and a sealed area (preferably concrete) that is clear of obstructions is required to deploy the ramp correctly and improve on general accessibility standards (including the door clearances). If seating is provided at the bus stop then it must be positioned such that it does not interfere with the operation of the access ramp or boarding / alighting. See Section 20.5 for more detail.

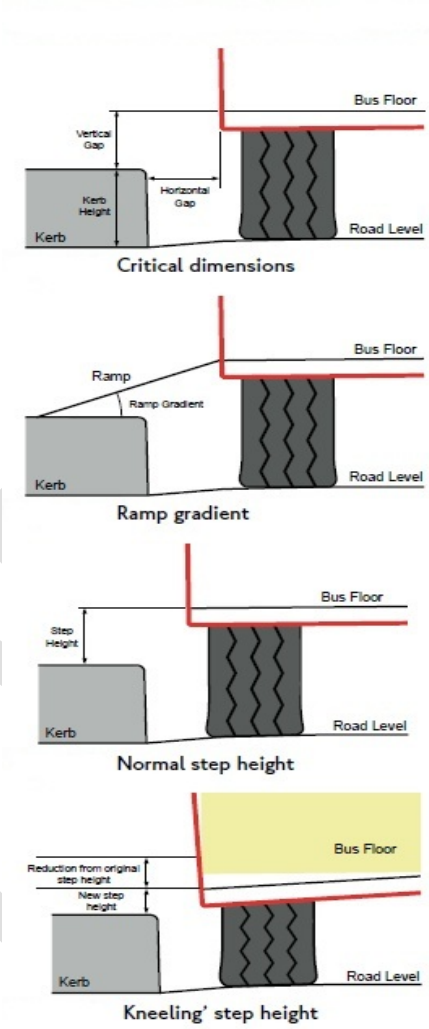

Figure 105: Bus Access Ramps

20.3.5 Fully Accessible Bus Stops

For a bus system to be truly accessible to elderly and disabled people, and to be attractive to car drivers, more is required than simply purchasing low floor buses. The vehicle is only part of the system and the whole journey - from door to door - must be accessible and attractive.

As already touched on above there is little point in having low floor fully accessible buses if people cannot reach them from the bus stop. The design of bus stops is therefore an essential complement to the requirements for accessible land public transport as envisaged in the NZ Disability Strategy and the Human Rights Inquiry.

This 'design' encompasses several factors, including: bus stop location and spacing, bus stop layout, paving and kerb treatment at and to/from bus stops, and the level and type of provision provided at a bus stop. However, two key areas specific to the interaction between a bus stop and a low floor bus vehicle are the bus stop layout and kerb height / treatment.

The bus stop layout should allow the bus to stop parallel to, and as close to the kerb as possible to allow effective use of the bus' facilities.

The critical dimensions to consider are the vertical gap, or step height, from the kerb to the bus floor and the horizontal gap from the kerb edge to the side of the bus. See Figure 105.

A well designed bus stop will provide features which co-ordinate with the facilities of the low floor bus and minimise these two distances.

Bus stop layouts are discussed in greater detail in Section 20.5 and Kerb Heights in Section 20.7 of this chapter.

20.4 Bus Stop Location, Spacing and Capacity

This section outlines a framework for the placement of new bus stops and for the review of existing ones.

20.4.1 Application

The requirement for new bus stops or re-siting of existing stops generally occurs when new developments open, changes are made to existing bus services or new bus routes are being planned.

In addition to the details outlined in *ATCOP Section 20.4*, wherever new bus stops are proposed, or an existing stop is to be moved, consultation should be held between the bus operators, Auckland Transport and the police, in order to determine the most suitable location.

Road and public transport authorities may also, from time to time, wish to review the location of existing bus stops as part of future bus route reviews, bus priority schemes or general accessibility or safety reviews.

Reviewing bus stop placements

Reviewing bus stop placements involves evaluating bus stops along an established bus route and, if required, developing a new pattern for optimal bus stop placement. This may

involve re-siting existing bus stops to more appropriate locations for passengers and/or bus operations; providing additional bus stops; or even reducing / consolidating the number of existing bus stops.

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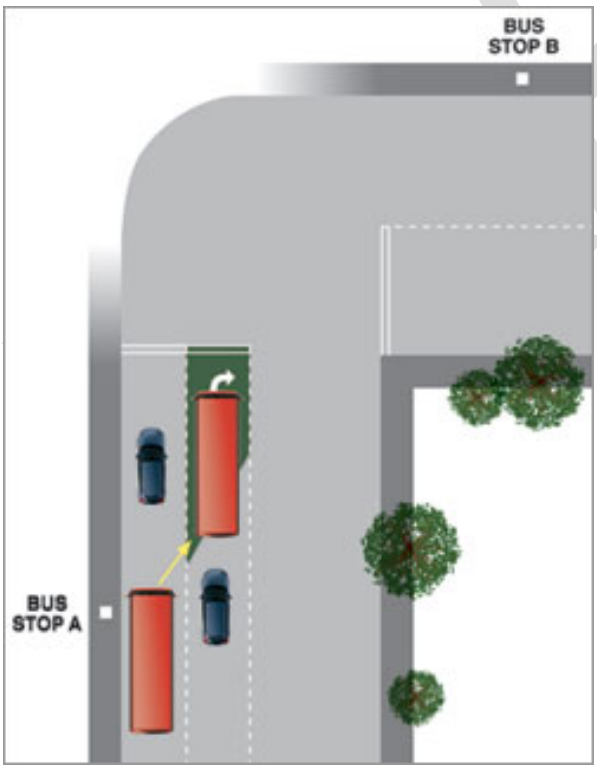
Reviewing bus stop placements may be particularly relevant in circumstances where:

- buses experience delay in rejoining the traffic stream; or
- there are too many bus stops along a route, increasing the proportion of stop time to travel time.

When an existing bus stop placement is reviewed, the criteria for bus stop location outlined in Figure 106 and Table 80 should always be considered.

Figure 106: Bus Stop Placement

(Picture source: http://www.ccc.govt.nz/BusPriority/Measures/BusStopRationalisation.asp)



20.4.2 Bus Stop Spacing and Location

For buses to offer a real alternative to the private car they must be within a comfortable walking distance from people's origins and destinations. Providing the appropriate bus stop

spacing is a balance between meeting passenger needs and operating an efficient bus service.

Table 80: Bus Stop Spacing Summary

Summary Only:

	Spacing	Reason
Urban Area (outside main centres)	**400m or 3 per kilometer**	**Equates to generally acceptable 5 minute walking distance**
Main Centre (e.g. CBD or Manukau TC)	**150m**	**More spacing in high density areas**

The spacing standard should not be applied too prescriptively as there are many other factors that influence the appropriate spacing of bus stops such as weather, topography, a person's age or whether they are carrying bags etc.

Wherever possible, bus stops will be located to maximise the number of people within 400 metres walking distance of a stop. This can be further achieved by locating bus stops close to intersections (provided they do not compromise safe operation), walkways or other pedestrian paths. Box 5 outlines the benefits of locating bus stops near intersections / pedestrian crossing facilities.

Bus stops must also be located to allow passengers to board and alight safely and conveniently; and as close as possible to main shopping and business areas, transport interchanges and other main origins and destinations. The needs of elderly and disabled people should also be taken into account.

Figure 106 and Table 80 outline the various primary and secondary criteria that practitioners should consider when determining the appropriate spacing and location of stops in their area. Figure 107 schematically illustrates some of these key principles.

Not all locations within the road network are legally permitted to be bus stops due to traffic safety concerns. The Land Transport (Road User) Rule 2004 and its amendments identify criteria where bus stops are not permitted. These points have been underlined in Figure 106 and Table 84. In practice, these criteria may not all be achievable in every instance, in which case safety considerations should dominate.

Wherever bus stops are provided, they should be:

- in pairs, i.e. boarding and alighting stops in close proximity. Accessible stops should have matching adjacent stops;
- pairs should be tail-to–tail (Box 4.1), where possible, on opposite sides of the road. This is for safety reasons and to allow sufficient space between the rear-ends of bus stop markings for other vehicles to pass.

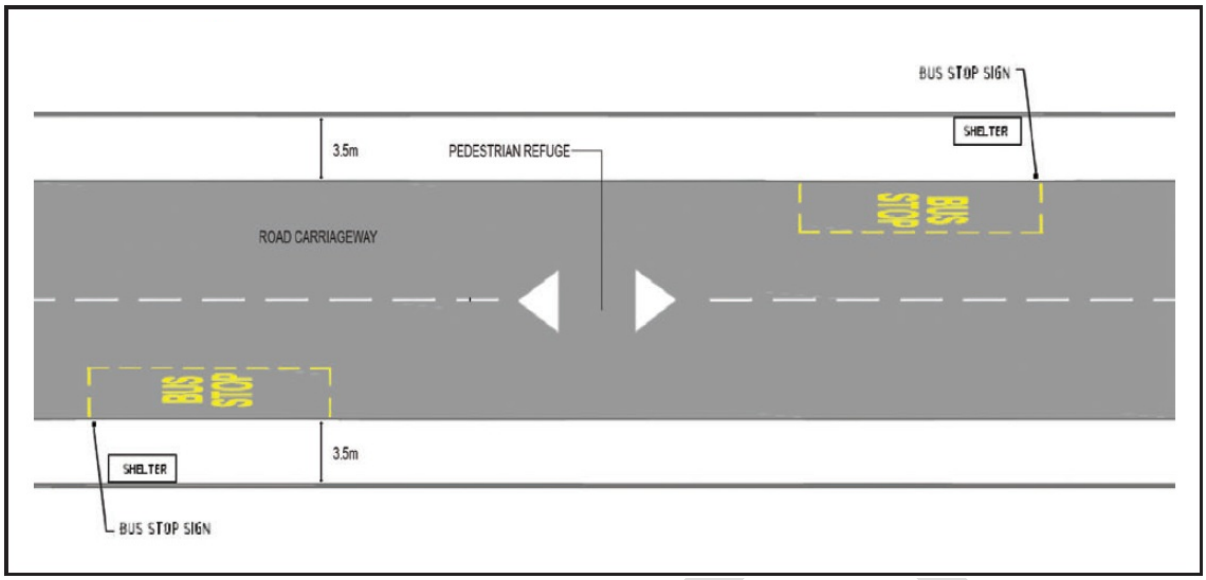


Figure 107: Tail to Tail Bus Stop Layout

Box 5 – Bus Stops and Proximity to Intersections and Pedestrian Crossing Facilities

Bus stops should be located in close proximity to intersections / pedestrian crossing facilities for the following reasons:

- existing crossing facilities for pedestrians (at intersections) are likely to be located where there is already a demand for people to cross the road;
- walking distances between origins, destinations and stops are reduced for bus passengers; and
- bus passengers are able to use/benefit from the existing pedestrian crossing features generally provided as part of intersections, such as dropped kerbs, pedestrian refuge islands or signals. This makes road crossings generally easier and safer at intersections.

Bus stops should be located on the departure side of intersections wherever possible for the following reasons:

- results in fewer traffic delays and better safety – bus clears intersection blocking fewer movements and sight lines;
- results in better pedestrian and vehicle sight distances;
- assists bus movements and reduces bus delays - a bus that must turn right at an intersection may have difficulty reaching the right-hand lane of a multi-lane approach from a kerbside stop immediately prior to the intersection.

However, a bus stop may be better located on the approach rather than the departure side of an intersection for the following reasons:

- if the road geometry and/or traffic movement requirements precludes buses from stopping soon after having passed through an intersection.
- there is high passenger demand (e.g. due to location of a key destination) for a

stop on the approach side of the intersection.

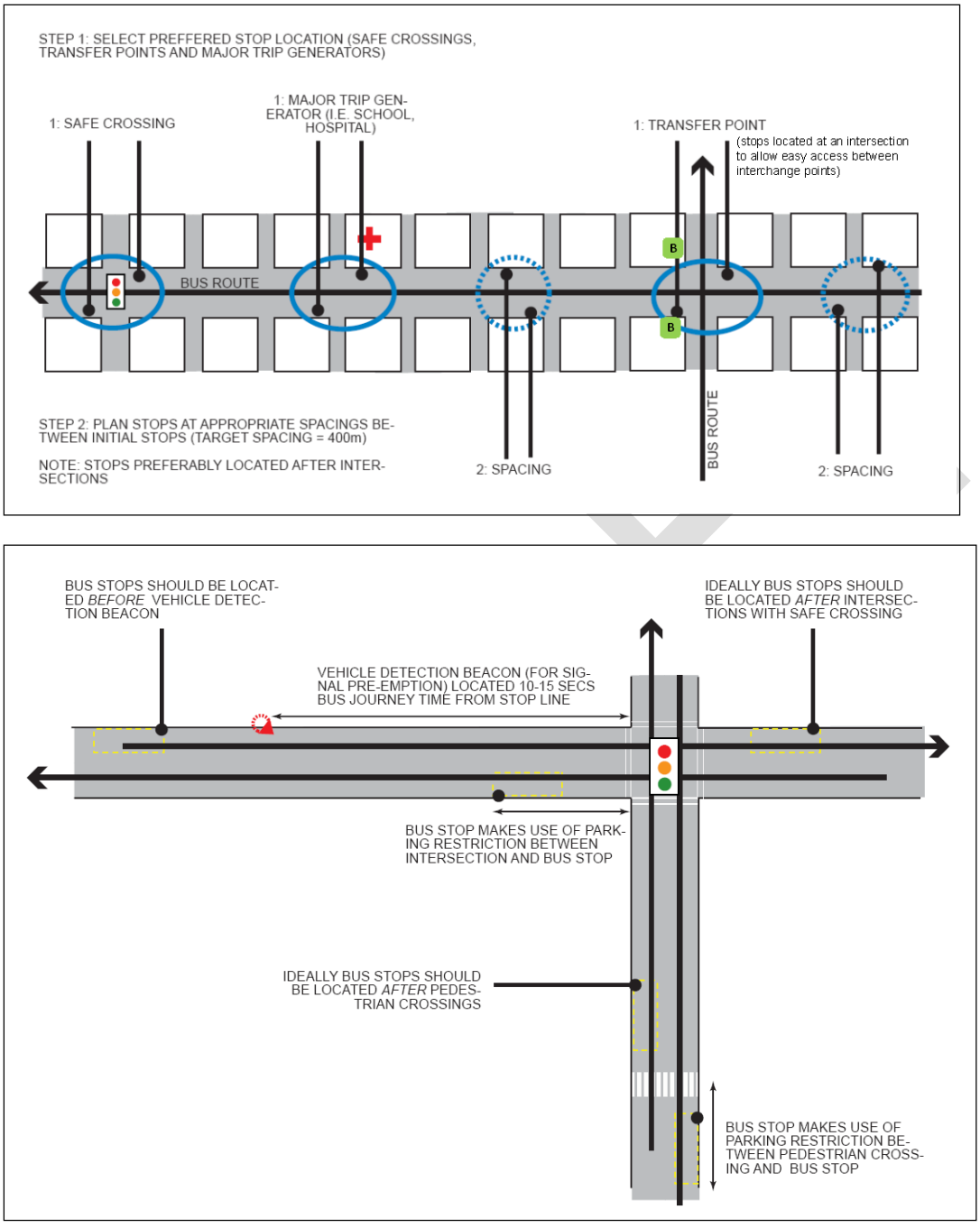


Figure 108: Schematic illustrations of good practice principles for bus stop spacing and location

Table 81 Primary factors to consider when locating new bus stops; or when reviewing/potentially relocating existing bus stops

Factors to consider for locating bus stops		Comments
1	**Convenient to access and maximises the catchment area (maximises the number of people in close proximity to the bus stop)**	- Route to bus stop should be as direct as possible. - Locate stops near intersections, side / minor roads, where possible to maximise coverage and decrease distance that passengers have to walk. Encourages bus to bus and bus to rail transfers - Co-ordinate 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' that lead directly to bus stops. Look for opportunities to link these with the wider pedestrian and cycling network.
2	**As close as possible to all major trip generators and key community facilities**	- A more frequent stopping pattern is appropriate in major CBD or town centres that are major trip generators or to serve key community facilities. - Major trip generators include employment, retail, commercial and educational centres etc. - Key community facilities include community halls / sports centres (e.g. pools), parks, libraries, daycare centres, rest homes / elderly persons' housing, laboratories, hospitals, pharmacies etc.
3	**Close to where there are likely to be journey transfers**	- Bus stops should be located close to where different bus routes, or other passenger transport services meet / intersect, to minimise walking time for transferring bus passengers. Key to Auckland's revised Public Transport Network.
4	**Close to intersections and pedestrian crossing facilities** (See Box 5 and Figure 108)	- Bus stop should be located near to and on the departure side of pedestrian crossings, but must not be on, or closer than 6 metres to a pedestrian crossing. - Bus stop should be located near to and on the departure side of intersections, but must not be on, or closer than 6 metres to an intersection. - Consideration must also be given to the location of barriers or pinch points that may increase actual walking distances (rather than area proximity), such as the need/ability to cross a railway, motorway, river or busy road only where a formal crossing has been provided.
5	**Population density[5] and land use form**	- In densely populated areas stops should be spaced closer than 400m. In higher density residential areas, stop spacing may be between 150m to 400 m. In areas with low densities, e.g. rural areas, stop spacing may be increased to one every 800m to 1000m, or more. The appropriate

[5] Austroads, A guide for Traffic Engineers – Road-Based Public Transport and High Occupancy Vehicles, 2002, pg 11.

Factors to consider for locating bus stops		Comments
		spacing should ultimately be determined by demand generators, identified needs and safe locations for buses to stop.
6	**Topography**	- In areas where the topography is hilly or very steep, closer spacing of bus stops may be required. Grade of road should not impede accessibility.
7	**Road Safety**	- Bus stop should be located where the road geometry provides safe sightlines for oncoming vehicles and bus drivers. - Bus stop must not be located near a corner, curve, hill/gully, traffic island or intersection, if it creates 'blind spots' / blocks sight lines for pedestrians and vehicle drivers along the road.
8	**Minimise opportunity for crime and increase perceptions of personal security**	- Locate in clearly visible locations e.g. away from vegetation and other objects that can be used to hide. - Locate near existing activity centres e.g. service stations, stops, rest homes, where natural public surveillance can occur – although it should be acknowledged that some residential properties will prefer some screening from stop. - Locate in well-lit areas e.g. near street lighting or other existing sources of illumination (should the shelter / stop not be provided with its own illumination e.g. through solar powered lighting).
9	**No Stopping Lines**	Bus stop must not be located: - on 'no stopping' lines - broken yellow lines within 1 metre of the kerb; - where a sign is placed to show that part of the road is reserved for classes of vehicles shown by that sign (e.g. taxi or goods service vehicle). In many cases this restriction is marked by a broken yellow line more than 1 metre from the kerb.

10	**Located away from certain other infrastructure items**	- Bus stops must not be located:
		  - on or closer than 0.5 metres to a fire hydrant; or
		  - on a yellow circle on the road containing the letters "FH" (Fire Hydrant) or between the circle and the footpath.
		- Bus stop should be located away from sewer and electricity pits, and be free from storm water drains or pits (to prevent buses from splashing pooled water when approaching and departing).
		- Note that where a bus shelter needs to be installed closer than 2.2m of a power pole/line, prior written consent is required from the line owner (NZ Electrical Code of Practice 34:2001).

Table 82: Secondary factors to consider when locating new bus stops; or when reviewing or potentially relocating existing bus stops

Factors to consider for locating bus stops		Comments
11	**Consider bus stop 'type' and potential impact on surrounding land-use**	- Some commercial and industrial businesses are more compatible with bus stops than others. The type of business in the surrounding area should be considered when bus stops are being positioned[6]. - Bus layover stops can negatively impact on adjoining landowners due to extended noise, fumes etc; and on the operation of intersections. Where possible, bus stops used for bus layovers should be located away from residential or other sensitive frontages i.e. where on-going noise and disturbance are undesirable. Bus layover stops should not be located in front of driveways. - Bus stop sign should not be positioned directly adjacent to the front door of a property, if possible, to maintain privacy. Use existing hedges / fences of private property as much as possible, without compromising too much on appropriate bus stop spacing.
12	**Consider location of signal pre-emption (bus priority) measures**	- Bus stop must not be located between a signal detector and a stop-line, where Selective Vehicle Detection / Signal Pre-emption is in use. - See Figure 108 for recommendations.
13	**Footpath widths**	- Where possible, bus stops should be sited on footpaths that are sufficiently wide to avoid obstruction to pedestrians by waiting bus passengers. This is especially important where bus stops are located alongside retail activity. - If an existing footpath is not wide enough, consideration should be given to locating the bus stop where the footpath is able to be widened, without compromising appropriate spacing / other location criteria. The use of bus boarders should also be considered (discussed in Section 20.6).
14	**Consider other potentially conflicting users**	Some sites may be undesirable for bus stop locations due to potential use by other conflicting users e.g.: - Adjacent to areas that generate large amounts of short-term high turnover parking. Examples include ATMs, lotto shops and video stores. This is because visitors to such locations often park illegally within bus stops. - Adjacent to a tourist facility where this would lead to an unnecessary conflict between urban and coach/charter operations. Where there is demand for access to the tourist facility by both urban and coach/charter services, both should be provided for at separate but nearby locations.
15	**Bus Service Coverage and Frequency**	- Designers may also wish to consider the proximity of potential passengers to bus stops with frequent services. For example, residents in a suburban area may be

[6] Christchurch City Council, Christchurch Bus Stop Locations Policy, December 1999.

Factors to consider for locating bus stops		Comments
		recorded as being within 400 metres of a bus stop. However, the stop may only be served by one bus service a day. The resident's level of bus service therefore is low or for some it may be considered non-existent. - Designers may wish to categorise bus stops by level of service e.g. low frequency, medium-frequency, and high-frequency of services, to determine the actual proximity citizens have to bus services that are likely to offer a realistic alternative to the private car. - Conversely, areas with a high density of bus routes and services will provide a bus passenger with more route choices and bus stops may be placed further apart on individual routes, in a co-ordinated manner. - Therefore, the location of other bus routes should be considered when bus stops are being located so that bus stops on all routes are co-ordinated to ensure convenience for bus passengers and efficiency for the bus services.
16	**Driveways**	- Many bus stops in Auckland will be located near driveways. However, bus shelters, especially ones with non-transparent advertising panels on the ends can impact on driveway sightlines of oncoming traffic, especially where bus shelters are located to the right of vehicles exiting the driveway. - The siting of bus shelters either side of driveways should take into consideration pedestrian and vehicle visibility splays from driveways. - Figure 5 in AS/NZS 28901.1 recommends a 2m minimum pedestrian visibility splay, whereas the LTSA's RTS6 recommends a 2.5m minimum visibility splay. - The appropriate (and feasible) visibility splay for each site will need to be considered on its own characteristics. However, it is worth noting 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. - Also, as mentioned in point 11 above, bus layover stops should not be located in front of driveways.

20.4.3 Bus Stop Capacity

Bus stop capacity is an important consideration in the planning of bus stops serving multiple and overlapping routes within urban centres, particularly where service frequencies are high. This includes bus stops along key passenger transport corridors and those located at main destinations such as the CBD, retail or business centres, town centres, hospitals, universities etc.

Poor capacity results in buses queuing on the road, with resulting confusion for passengers and drivers, as well as congestion of general traffic flows. Queued buses are also not able to stop at the bus stop kerb resulting in accessibly issues. It is therefore important to provide the appropriate level of capacity for a bus stop commensurate with the number of buses servicing it at any one time.

The capacity of a bus stop is typically expressed by the number of buses that can enter the stop area within a specified time period (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.

Figure 109 illustrates how the frequency of services influences the amount of space required at a stop. The required capacity at a bus stop should be determined on a case-by-case basis and, for very busy bus stops, will often require detailed analysis. Below are some best practice recommendations:

- bus stops served by more than 25 buses per hour (bph) may be best split. This enables buses on different routes to serve separate stops, thus reducing bus-on-bus delay and traffic congestion;
- however, bus routes with common destinations should ideally share the same stop;
- a balance should be sought between the advantages of splitting stops, reducing bus-on-bus delays and traffic congestion, and the disadvantages of reduced convenience for passengers;
- to determine required capacity, a 20 to 30 second dwell time for each bus should generally be assumed.

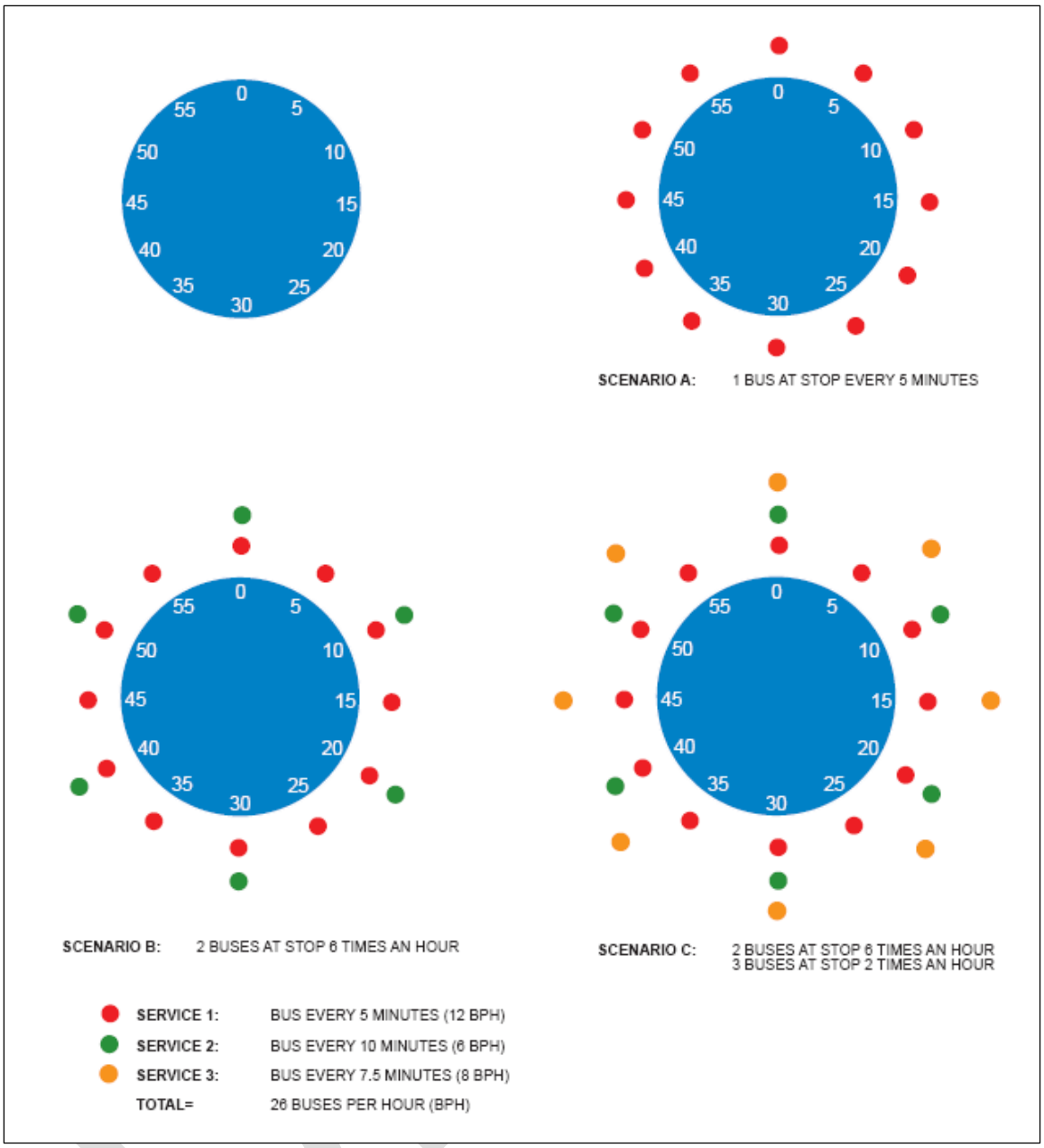


Figure 109: Bus Stop Capacity Clock Face

20.4.4 Connectivity – accessible walking routes to and from bus stops

When considering bus stops, it is important to take into account the 'whole journey', that is the door-to-door journey of the passenger, from origin to destination. There is little point in installing accessible bus infrastructure if the approaches to stops are inaccessible. When reviewing existing bus stops or providing a new bus stop, the following should be considered:

- There should be even and paved footpaths to / from bus stops, so as to be wheelchair/pram accessible. New footpaths or reconstruction of existing poor quality ones may be required.

- There should always be an informal (e.g. pedestrian refuge island) or formal (e.g. Signalised crossing or zebra crossing) pedestrian crossing facility in close proximity to bus stops. Where there are none, consideration should be given to providing a new accessible road crossing. The only exception may be for bus stops located on very low trafficked roads in residential areas. Signalised pedestrian crossing facilities should be provided near bus stops on multi-lane roads.
- Advice on choosing the most appropriate pedestrian crossing facility is contained in LTNZ's Pedestrian Planning and Design Guide (PPDG) (December 2007 or amendment). A spreadsheet is also available that assists this process by calculating delays and crash savings for the various options. Bus stop designers should refer to this guideline in conjunction with these guidelines.

When reviewing pedestrian crossing facilities for bus stops, the following should be considered:

- Bus stops near intersections may be able to make use of existing pedestrian crossing facilities.
- Bus stops located mid-block (i.e. in between intersections) should ideally be provided with a central refuge in between the pair of bus stops (located 'tail-to-tail' on either side of the road) so that it serves both directions of travel. It should also be placed behind the bus stop for the following reasons:
- It encourages pedestrians to cross behind the bus where they can see oncoming traffic (crossing in front of a bus blocks visibility).
- The bus driver can pull away from the bus stop as soon as passengers have left the bus.
- Reduces the chances of the bus driver accidentally hitting a pedestrian crossing in front of the bus, out of the driver's sightline.
- Crossing facilities for pedestrians in close proximity to bus stops should be placed in accordance with safe road geometry designs.
- They should also be designed with dropped kerbs to allow step-free access to and from the footpath and carriageway and with tactile ground surface indicators to aid vision-impaired users.
- Ensure there are pedestrian and cycling 'short cuts' to bus stops and that these are maintained and free of debris, obstructions, well drained etc.
- The question arises as to how far to take this as part of a bus stop audit and this very much depends on the nature of the area. All heavily trafficked pedestrian routes should be accessible as a matter of policy and works could be funded from sources other than bus stop infrastructure. Certainly, routes to well used local facilities such as health centres served by the bus stop should be examined for their entire length.

20.5 Bus Stop Types and Level of Infrastructure Provision

This guideline has divided bus stops into four main 'types' as a tool to help determine the appropriate level of bus stop infrastructure. In reality, bus stops across the region perform varying ranges of functions that may not easily fall into any of the four types and a degree of professional judgment will need to be exercised.

20.5.1 Bus Stop Types

20.5.1.1 Standard Stop

A Standard Stop is where there are predominantly low passenger volumes or the bus stop is only used by outbound services. These stops may have low frequency bus services (less than every half an hour) and are generally located in suburban, outer suburban or non-urban areas.

Figure 110: Schematic Illustration of a Standard Bus Stop

20.5.1.2 Regular Stop

A Regular Stop tends to experience moderate passenger volumes. These stops have moderate to high frequency bus services (at least every half an hour) and are generally located in both suburban areas and some major attractions (including shopping centres) and/or along main passenger transport corridors.

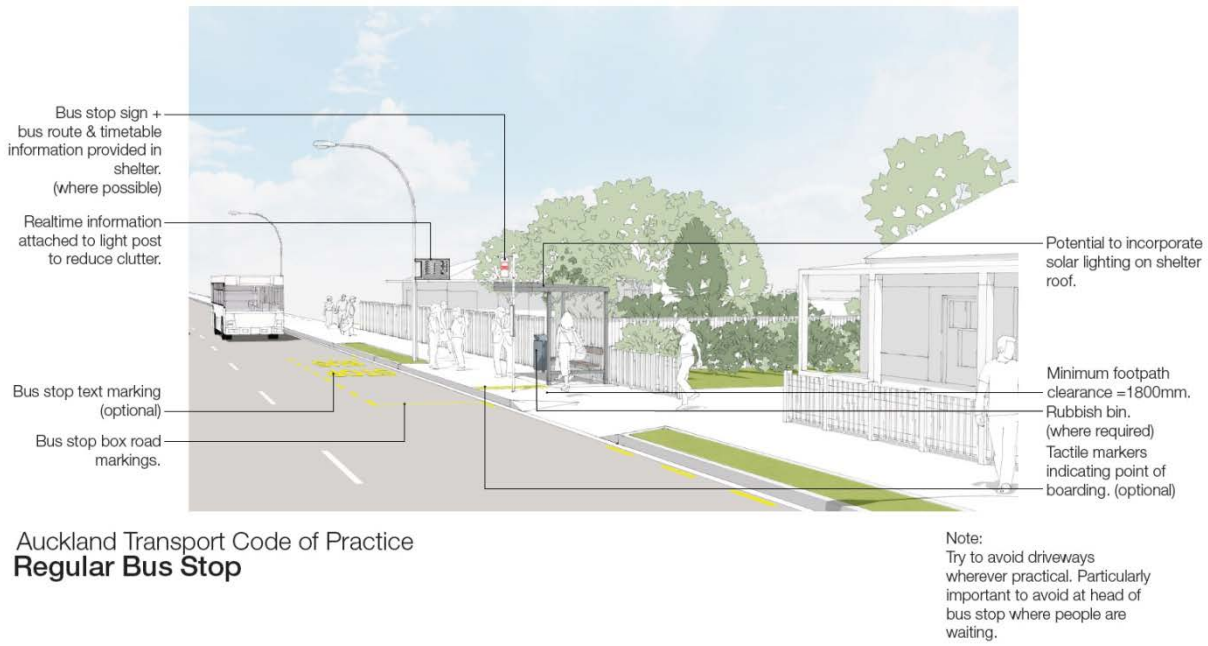


Figure 111: Schematic illustration of a Regular Stop

Figure 112: Schematic illustration of a Regular Stop in a Busy Location

20.5.1.3 Signature Stop

A Signature Stop experiences moderate to high passenger volumes and high frequency bus services (every 2 to 15 minutes).

These stops may service local, district and regional areas located on main passenger transport corridors. They may often need to provide adequate space for three or more high frequency buses.

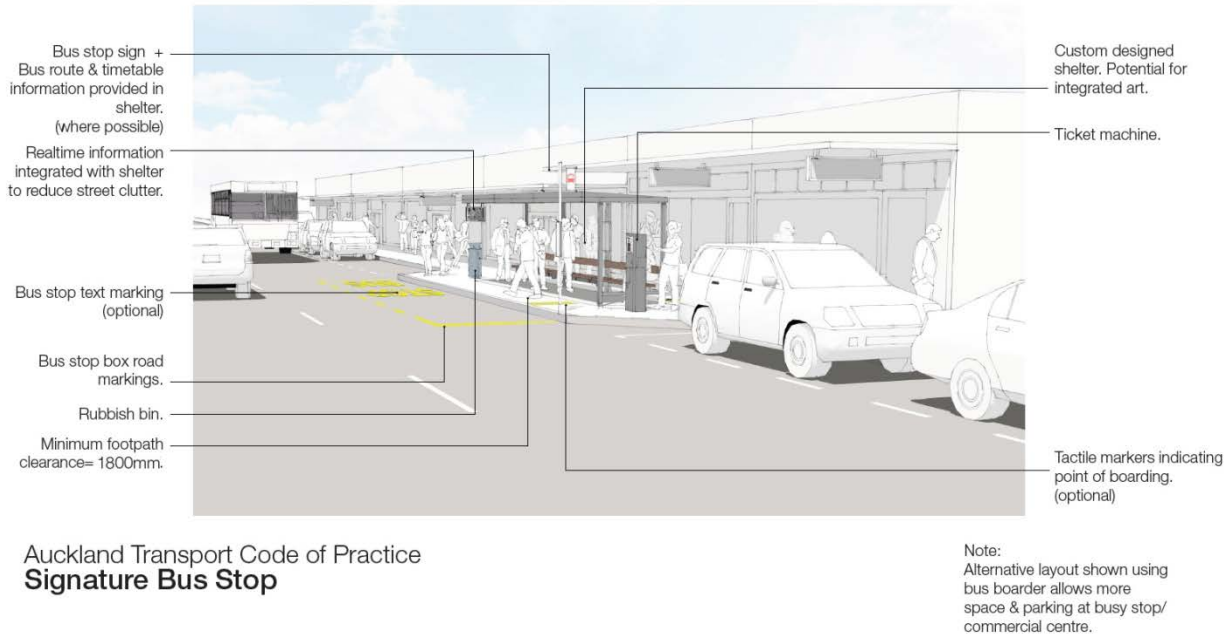


Figure 113: Schematic illustration of a Signature Stop

20.5.2 Bus Stop Infrastructure Components Ltd

Table 83 summarises the minimum level of provision envisaged for bus stops across the region. This currently reflects the requirements for LCN and QTN routes but will be re-worked to reflect requirements in the new PT Network Plan.

Although the bus stop sign and the bus box area are the only legal requirements at bus stops, the remaining components listed are necessary to achieve the passenger transport growth and accessibility aspirations of this guideline and the various national and regional transport policies within which it sits.

Table 84 outlines in greater detail the infrastructure provision for each of the three types of bus stops described. These are discussed more in Section 20.5.3 onwards.

Table 83: Minimum provision required at all bus stops across the region

M	Mandatory (Legally Required)
R	Required / Strongly Recommended (requires justification to not install)
HD	Highly Desirable / Preferred
O	Optional

Component		Standard Stop	Regular Stop	Signature Stop
Information				
1	Bus stop sign	M	M	M
2	Bus box area (road marking)	M	M	M
3	Stop number	M	M	M
4	Stop-specific timetable (departure times)	R	R	R
5	Stop-specific route diagram	R	R	R
6	Information telephone number	R	R	R
Accessibility				
7	Bus stop-specific hardstand area (1.8m wide x 8m-9.2m long – preference 9m+ long)	R	R	R
8	Tactile ground surface indicators	R	R	R
9	- Minimum kerb height of 150mm at front door area (and ideally rear door) - Ideal kerb height is 150 mm for standard kerbs OR 160mm if Kassel Kerbs (or other similar 'special type' of kerbing is used)	M	M	M
10	Connecting footpath to/from bus stop (with associated dropped kerbs where required)	R	R	R
11	Pedestrian crossing facility in close proximity to bus stop (either formal e.g. signalised; or informal e.g. pedestrian refuge islands)	R	R	R
Safety & Security				
12	Lighting	R	R	R

Table 84: Component parts list for bus stop types

M	Mandatory (Legally Required)
R	Strongly Recommended
HD	Highly Desirable / Preferred
O	Optional

Category	Component	Standard Stop	Regular Stop	Signature Stop
Information				
Regulatory – Signs and Road Marking	Bus sign	**M**	**M**	**M**
	Bus box area (road marking)	**M**	**M**	**M**
	NSAAT road marking – will be dependent on site-specific requirements and bus stop layout	HD	R	R
	"Bus Stop" road marking	O	R	R
	Coloured surface treatment of bus box	O	O	O
Stop-Specific	Stop number	**M**	**M**	**M**
	Stop name	HD	R	R
	Direction of travel	R	R	R
	Site-specific fare information	R	R	R
	Stop-specific timetable (departure times)	R	R	R
	Stop-specific route diagram(s)	R	R	R
	Information telephone number	R	R	R
	Real time information signs (See Note 1 at the end of this table)	O	HD	R
Wider Area	Wider area route map	HD	HD	R
	Wider area fare information and zone map	HD	HD	R
Accessibility				
	Bus stop specific hardstand area (1.8m wide x 8m-9.2m long – preference 9m+ long)	R	R	R
	Tactile ground surface indicators	R	R	R
	- Minimum kerb height of 150mm at front door area (and ideally rear door) - Ideal kerb height is 150 mm for standard kerbs OR 160mm if Kassel Kerbs (or other similar 'special type' of kerbing is used)[7]	**M**	**M**	**M**

[7] Where kerb heights are changed, carriageway and footpath crossfalls will need to be carefully considered. Ensure that footpath crossfalls have a gradient of no more than 1 in 25 or 4% (2-3% maximum recommended) - as a steep backfall from the kerb is undesirable. Transitional kerbs can be used to ensure appropriate footpath crossfalls.

Category	Component	Standard Stop	Regular Stop	Signature Stop
	Connecting footpath to/from bus stop (with associated dropped kerbs where required)	R	R	R
	Pedestrian crossing facility in close proximity to bus stop (either formal e.g. signalised; or informal e.g. pedestrian refuge islands)	R	R	R
Street furniture				
	Seating	HD	R	R
	Shelter (See Note 2 at the end of this table)	O	R	R
	Rubbish bin	O	R	R
	Ticket machine	O	HD	R
	Shopping trolley bay	O	O	O
	Cycle parking	O	O	O
Safety & Security				
	Lighting	R	R	R
	Shelter with lighting	HD	R	R
	Emergency help point	O	HD	HD
	Public telephones on-site or nearby	O	HD	HD
	Video surveillance	O	O	HD
Optional Enhancements				
	Landscaping	O	O	O
	Public art	O	O	O
	Community notice board	O	O	O
	Vending machine	O	O	O

Notes:

- The provision of real time information signs at Standard or Regular Stops should be determined following further criteria outlined in the Streetscape section (19.5.4.6).
- The provision of a shelter at Standard or Regular Stops should be determined on a case-by-case basis, and take into consideration other factors in addition to daily passenger boarding levels. Refer to Bus Stop section 19.5.4.3.

20.5.3 The Bus Stop Area

20.5.3.1 Bus Box

Bus stops are legally required to be marked out on the carriageway where the space reserved for the bus extends for more than six metres on either side of a single bus stop sign – this would encompass the majority of bus stops (if not all) within the Auckland region. The outer perimeter of the declared bus stop i.e. the bus box, should be marked out in broken yellow lines in line with design standards outlined in the Land Transport: Traffic Control

Devices Rule.

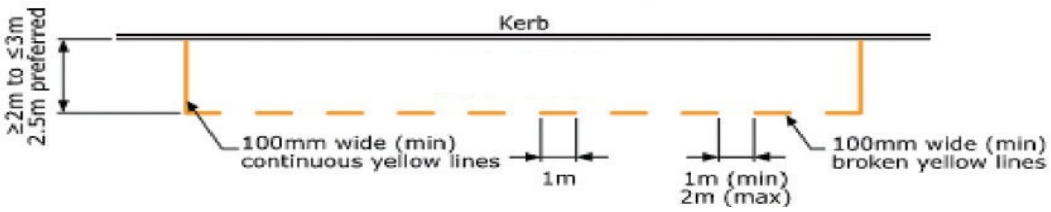


Figure 114: Bus Box Markings

The bus box area outlined in these guidelines is 15 metres long and 2.5 metres wide.

Although these guidelines are based on a 13.5-metre-long bus vehicle, the ideal bus box area should be slightly longer (hence 15m requirement) to allow the bus driver some margin for correction / space to straighten the vehicle to align flat with the kerb.

20.5.3.2 No Stopping at all times (NSAAT) Lines

Broken yellow lines (No Stopping At All Times or NSAAT), either side of a bus box, are a means of ensuring that the required approach and exit tapers remain unobstructed and the bus can approach the bus stop correctly.

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 / out of the bus stop at too sharp an angle. These two scenarios have implications on:

- accessibility – a bus vehicle stopped some distance away from the kerb creates a large stepping gap for passengers. This creates an uncomfortable - and for some - an unsafe height from which to alight or board the bus;
- efficiency – for the reason above, passengers may take longer to board / alight the bus. This in turn may have implications for the general flow of traffic.
- safety – a bus driver 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 general flow and safety of passing traffic. Conversely, when pulling out to rejoin the general traffic lane, inadequate exit tapers can result in the rear vehicle overhang colliding with waiting passengers and street furniture on the adjacent footpath (Section 6 discusses this in greater detail).

20.5.3.3 Bus Stop" Road marking

The TCD Rule Schedule 2 and the TCD Manual Part 138 indicate that the use of the words "BUS STOP" within a bus box is optional, and may be used if required, depending on the length of the reserved area.

[8] Land Transport Rule: Traffic Control Devices Schedule 2 and as further interpreted in the TCD Manual (TCDM), Part 13 Parking Control, December 2007, http://www.nzta.govt.nz/resources/traffic-control-devices-manual/

Although not a statutory requirement, this code of practice **strongly recommends** that the words “BUS STOP” are provided at locations where clear instruction is required, particularly in high volume urban areas. Bus stops within Auckland’s CBD should have this as a standard requirement. It is an important means of ‘advertising’ the use of the road by bus services. It also makes the bus stop more obvious thereby helping to raise driver awareness.

20.5.3.4 Coloured Surface Treatment

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 all: passengers, bus drivers and other general vehicle drivers. Although it is recognised that the treatment imposes additional costs, the raised profile of the stop may prove an effective deterrent to illegal parking and reduce enforcement problems. See Photo below.

This guide **strongly recommends** the use of this surfacing at bus stops with a high potential for road use conflict.

Bus box with coloured surface treatment

20.5.4 The Passenger Waiting Area

This section outlines the various components that are found within the passenger waiting area.

20.5.4.1 Bus Stop Sign

Figure 115: Bus Stop Sign

Bus Stop Sign on Existing Pole

The bus stop sign (RP-5, see Figure 115) identifies the area as a bus stop. It is an important indicator to passengers and bus drivers and acts as a 'control point' for the layout of bus stop facilities. The sign can be placed on a stand-alone pole or attached to an existing light post to reduce street clutter as shoiwn above in the photo. . However, it should always be placed at the head of the bus stop box area, unless it can be demonstrated that this would not be safe or effective. This allows for a consistent and predictable environment to be created at the bus stop. Bus drivers will know to always align the front door of the vehicle with the bus stop sign and pole, which is where key infrastructure components are provided, i.e. hard stand area, raised kerbs and use of tactile ground surface indicators. This is particularly important for disabled or vision-impaired passengers.

The road user rule states that where there is a bus stop sign and there is no road marking indicating the extent of the bus stop you may not stop, stand or park within six metres of the bus stop sign. When there is a bus stop sign and an area marked out – you may not stop, stand or park within the area marked out.

In addition to the RP-5 sign, stop-specific information can include bus stop number, bus stop name (if applicable), direction of travel, the bus service numbers that stop at the bus stop and the appropriate branding if applicable (e.g. Airbus) as illustrated in the following photo.

Bus Stop InformationSign

The NZTA TCD Manual Part 3 currently states that “when a marked bus stop is greater than 12m, two signs must be provided at either end. If the site is equal to or less than 12m, a single sign in the middle is sufficient”.

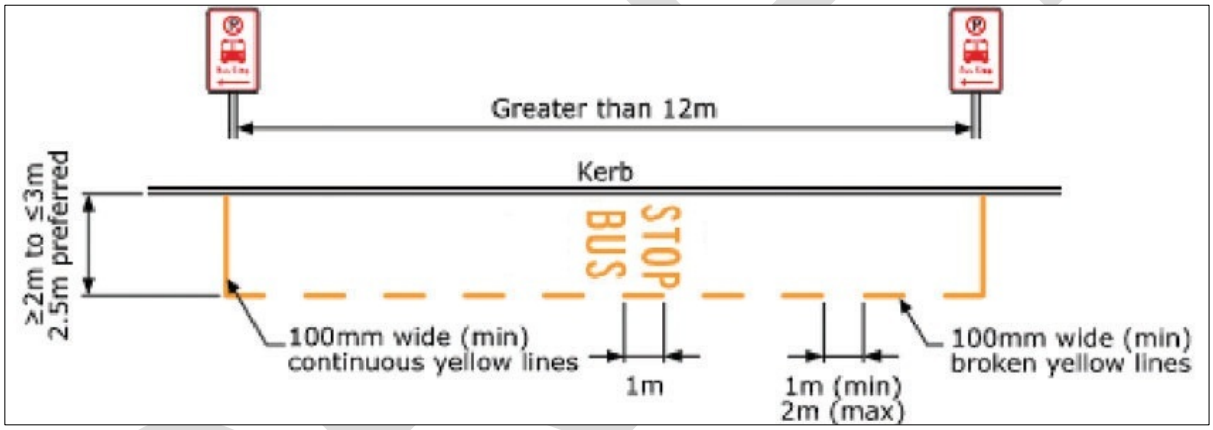


Figure 116: Sign Layout for Bus Stop Greater Than 12m

20.5.4.2 Passenger hard stand area

A passenger hardstand area with a sealed smooth surface connects the bus doors(s) with the nearby footpath, which 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. The extent of the hardstand area may vary depending upon the bus stop environment. However, as an absolute minimum a hard stand area should be provided at each bus stop adjacent to the front door of the bus, to ensure wheelchair access.

A driveway is not an acceptable location to drop off or pick up passengers due to the presence of dropped kerbs with the resultant gap between the bus door exit and the adjacent ground, which increases the possibility of falls.

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:

- directing people from the footpath to the kerb where the bus front door will be and from the bus back to the footpath;
- by warning people of the kerb and potential hazard beyond it.

The layout and specification of TGSIs should be in accordance with that outlined in the Road and Traffic Standards (RTS) 14 “Guidelines for facilities for blind and vision impaired pedestrians (2008).

The guideline states that TGSIs provided to identify access to public transport shall be installed as follows:

- warning indicators a minimum of 600mm wide x 600mm deep installed 300mm back from the front of the kerb edge, adjacent to a bus stop, preferably close to the entry door;
- directional indicators 600mm deep, installed where the warning indicators are not located in the direct line of the continuous accessible path of travel, forming a continuous path to the warning indicators.

Figure 117 outlines the recommended TGSI layouts at bus stops.

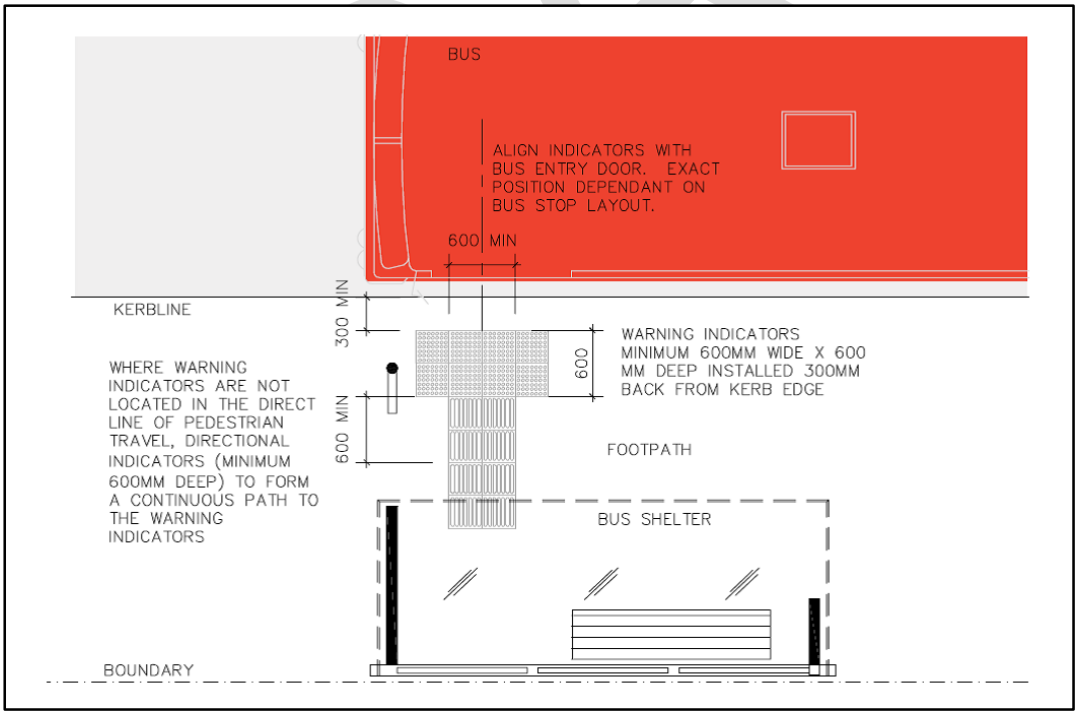


Figure 117: Recommended layout for TGSIs at bus stops

20.5.4.3 Bus stop passenger shelter

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

Currently there are many types of shelter designs within the region. The adjacent photo shows a typical CAM Shelter now being installed throughout Auckland as a 'base level' shelter. For the purposes of this chapter the exact type of preferred shelter is not specified (although a 'typical' shelter drawing is included for reference (in Appendix 20B – STANDARD CAM SHELTER). A key point is that the shelter meets the design and layout criteria specified further below.

When to provide a bus shelter or not

Ideally all bus stops (with the exception of end-of-route stops or those under canopies) should be provided with a shelter. However, the reality is that resources are finite and often some form of prioritisation will need to be undertaken to direct resources appropriately.

The following are considered to be the main priority criteria for shelter provision:

- provide at stops where there are more than 50 passenger boardings per day;
- where bus transfers occur; and/or
- at bus stops located on a high frequency bus route.

To obtain daily passenger boardings, bus stops should be surveyed mid week between the hours of 7 am and 6 pm, and not during school or university holidays or in a week that has a public holiday in it.

However, there are many other considerations that should be taken into account, particularly when patronage figures do not support shelter provision. Shelter provision should be considered in the following situations:

- proximity to senior housing / facility and a minimum of 10 daily boardings;
- development of a large new activity on a passenger transport route where patronage is projected to meet criteria;
- consolidation of bus stops, where combined patronage totals can justify shelter provision;
- when the shelter is to be funded and maintained by the private sector; and/or
- bus stop is served by an infrequent service. Passengers at these stops tend to arrive slightly earlier. This coupled with the infrequent service means that passengers have to wait longer for the bus, and therefore could arguably have more of a need for shelter than passengers at high frequency stops. The following criteria could be applied: minimum of 15 daily boardings on routes where peak headways are greater than 15 minutes.

Bus passenger shelters do not need to be provided at stops that are end-point stops i.e. where all or the majority of users only use the stop to alight from as it is located at the end of a service route.

Bus shelters may also not be required where there are building canopies, although where possible, seating should be provided. 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 and a shelter may still be justified.

Design and layout principles

The design and layout of shelters should meet a number of requirements. These are listed below:

- must be accessible with the necessary clearance and circulation spaces, particularly for people with physical or vision impairments. Refer to the following sub-section for clearance requirements;
- Shelter / seating should be as close to head of stop as practicable. If not possible within current layout, consider amending / widening bus stop area / footpath width.
- shelter should have at least three walls (1 back wall and two side panels), a roof and an entrance that together provide effective shelter to waiting passengers. Although it is recognised that at some narrow sites, only shelters with no side panels may be possible;
- where four panelled shelters are provided (with one front panel), two entrances should be maintained to reduce likelihood or perception of entrapment;
- maximise the use of transparent materials that enhance visibility and aid passive security. Materials and design must allow passengers to see the approaching bus (whilst standing or sitting down inside shelter);
- note that glass panels should be marked with a horizontal contrasting stripe between 700mm and 1000mm high to highlight the presence of the glass to users - refer to NZS 4223 Part 3 (clause 303, page 7) for more detailed guidance;
- maximise the use of easily maintained (anti-graffiti) materials;
- design should take into account the surrounding land-use, for example in many streets where heritage values have been identified, shelters with advertising on them may not be appropriate. Although advertising on bus shelters is acceptable in most urban situations, the design emphasis should be on amenity over advertising;
- incorporate seating and wheelchair/pram waiting areas;
- locate in a position where there are clear sight lines between the bus driver and waiting passengers;
- locate on the footpath without blocking the main pedestrian through route. Where there is ample width, bus shelters should be located to the back of the footpath.

Clearance requirements and example layouts

The preferred location for a bus passenger shelter is as shown in Figure 118 (for kerbside bus stop) and Figure 120 (for full bus boarder stop).

Ideally at least 1800mm clearance should be provided to give a continuous accessible path of travel for pedestrian through movements. However, in very constrained situations 1500mm is acceptable as an absolute minimum. The bus stop layout figures shown in this guideline show a minimum width of 1800mm on each side of the shelter. If the shelter has an advertising panel that is 1600mm wide, a minimum roadside width of 3.5 metres would be required for an ideal kerbside stop and 2.5m for a stop incorporating a bus boarder.

The bus stop layouts outlined in the text above and illustrated in Figures 118 – 121 present only some examples of layout. The area required for the pedestrian through route past a bus shelter needs to take into account the pedestrian flow along the route and obstruction by people waiting to board the bus.

For guidance on this, bus stop designers should refer to Section 14.2.2 and Table 14.3 in **NZTA's Pedestrian Planning and Design Guide (PPDG) (December 2007).** The PPDG should be referred to in conjunction with this chapter and *ATCOP Chapter 12 Footpaths and Pedestrian Crossings*.

All proposed layouts need to take cognisance of the surrounding context and urban/suburban environment. Surrounding boundary conditions, driveways, planting and buildings should be taken into consideration in the location and exact configuration of bus stops/shelters.

The ideal and minimum requirements to be maintained are as follows:

- ideally, a continuous accessible pedestrian through route of 1800mm is to be maintained for the full length of the bus stop;
- in very constrained locations an absolute minimum clearance of 1500mm is acceptable as an exception;
- the kerbzone is to be free of fixed obstacles to allow for potential overhang of a bus and its mirrors on entry and exit, to a distance 800mm from the kerbface;
- the boarding and alighting clear area of 1.8m x 8m (refer to Tables 83 and 84 – 1.8m x 8m-9.2m) should be free of fixed obstacles.
- in addition to the above, should the bus shelter back 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 property boundary/fence for maintenance access, etc.

Using the above criteria, five options have been identified for 'ideal' sites and for constrained roadsides where the ideal configurations cannot be applied. Each option has advantages and disadvantages that will need to be considered prior to determining the most appropriate solution for a particular site.

The alternative layouts include offsetting the bus shelter from the head of stop, a narrower shelter (with no advertising panels), and a bus boarder with shelter at the back of the footpath. Please refer to Figures 117 – 121.

Where the constrained dimensions cannot be met, the following options should be considered:

- Land acquisition to provide additional berm/footpath width
- Installing a bus boarder to widen the footpath/accommodate the bus shelter
- Repositioning the bus stop to a nearby location with wider footpath/berm 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 shelter roof dimension and whether it needs to be cut back to have sufficient kerb clearance.)
- Possible reduction in minimum accessible pedestrian route having regard for the likely utilization of the shelter and the pedestrian route.

Proposals to use non-standard shelter dimensions or an accessible pedestrian route clearance of less than 1500mm will require approval of Auckland Transport's PT Department and RCO Department and the proposal must be submitted with supporting documentation demonstrating that the above options have been fully considered.

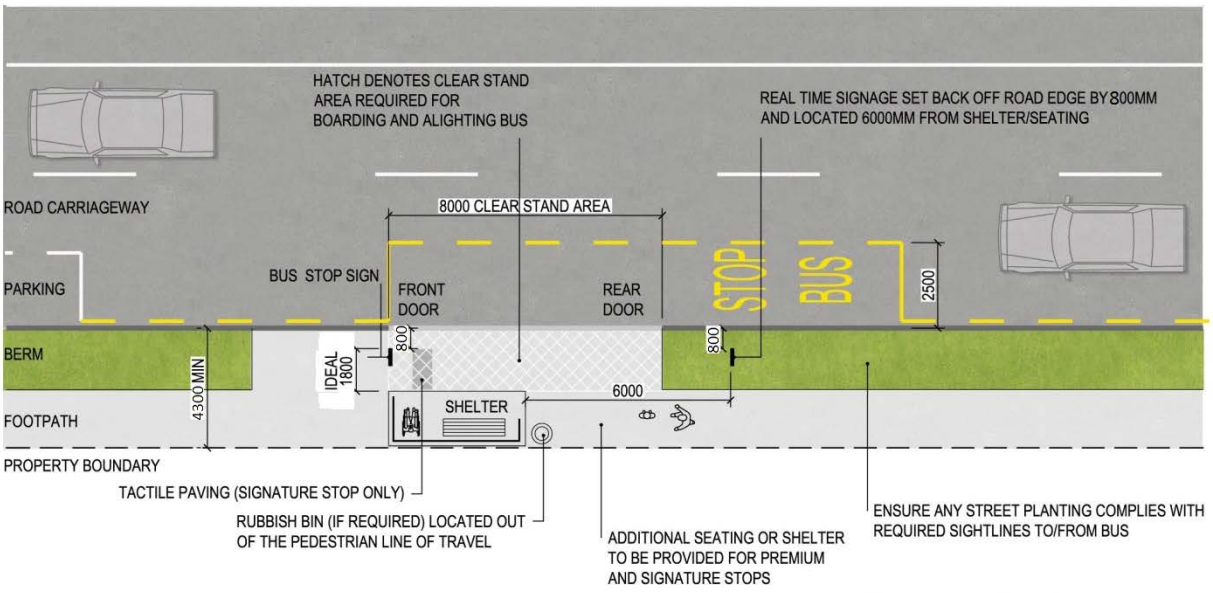


Figure 118: Kerbside Bus Stop Ideal Layout 4.3m

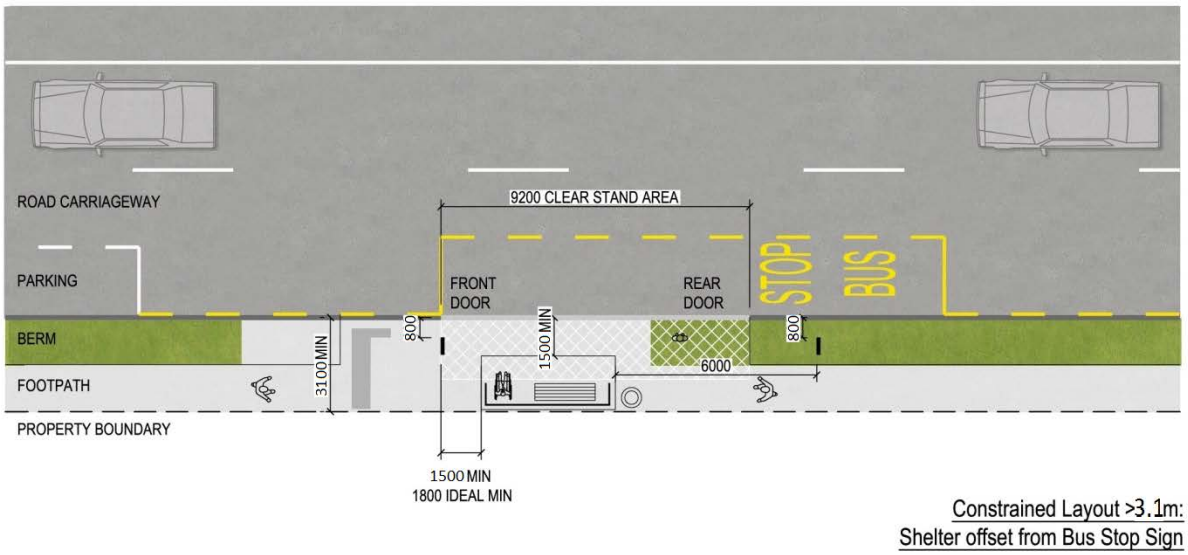


Figure 119: Kerbside Bus Stop Constrained Layout >3.1m Shelter Offset from Bus Stop Sign

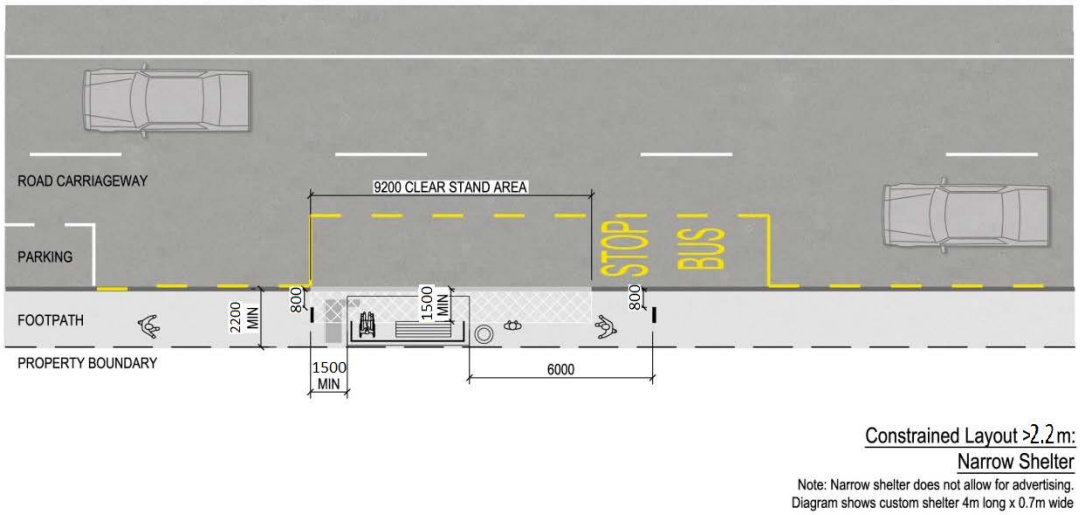


Figure 120: Kerbside Bus Stop Constrained Layout 2.2m Narrow Shelter

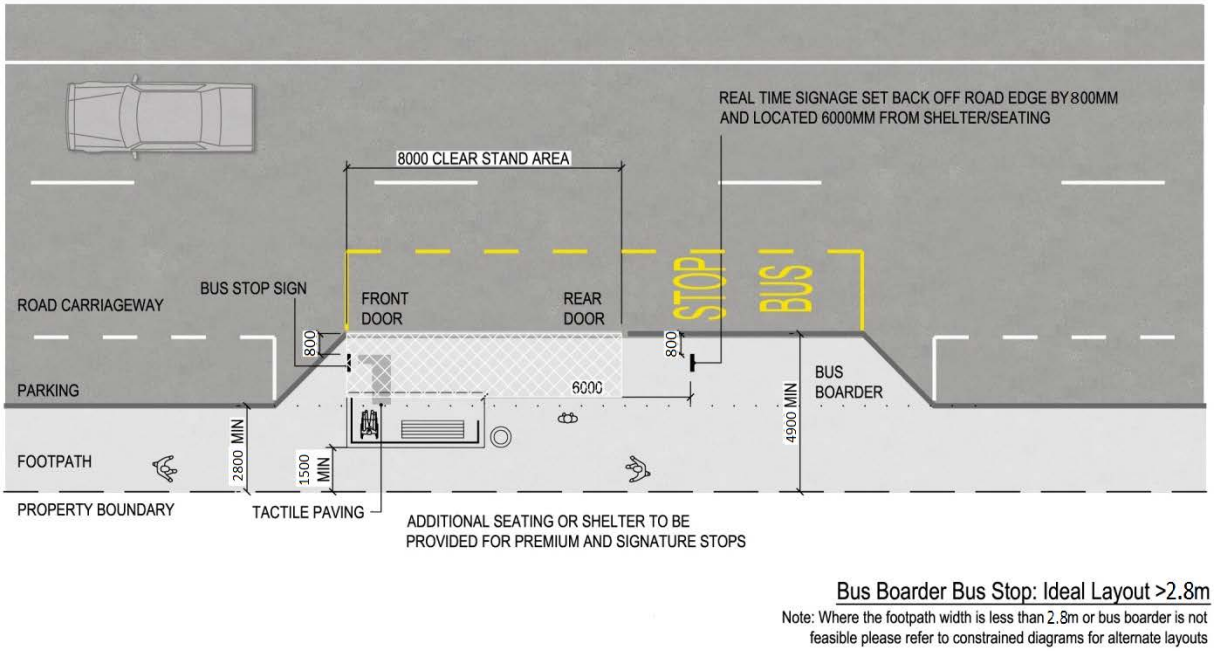


Figure 121: Bus Build Out Bus Stop: Ideal Layout >2.8m

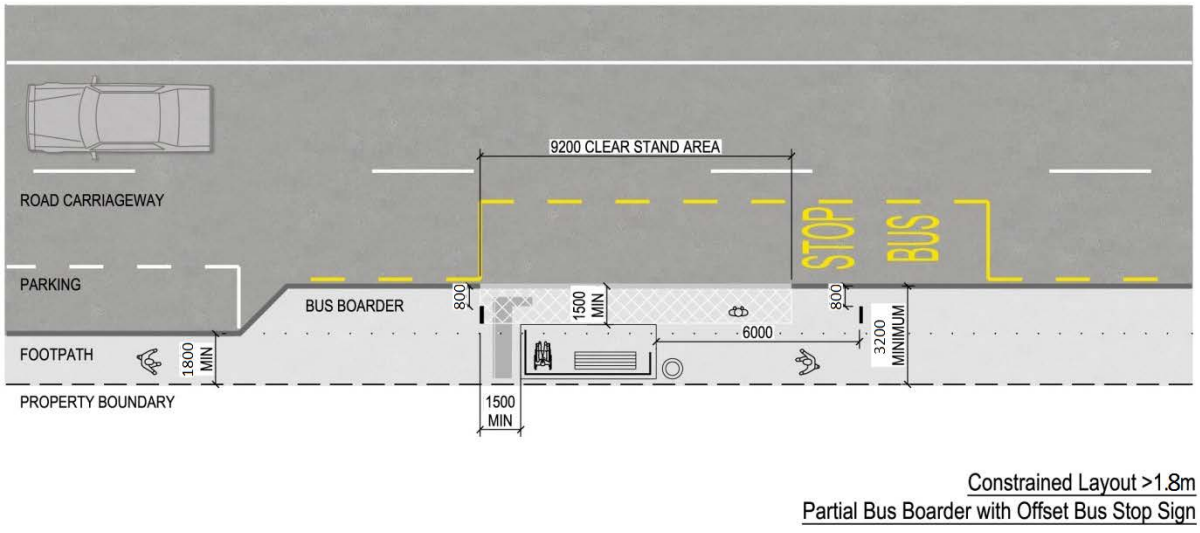


Figure 122: Half Bus Build-out: Constrained Layout .1.8m – with Offset Bus Stop Sign

20.5.4.4 Timetable Information

Up-to-date timetable information should always be provided at bus stops, even if the stop has a real time information display.

Table 84 outlines the type of information that should be included at each type of bus stop. In general, a printed timetable should provide users with 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 in relation to the whole route, direction of travel, fare information from the bus stop and fare zones.

Timetable cases should generally be mounted on the bus stop pole. It may be possible / desirable at some sites to place this on an existing light post to reduce street clutter. At main transfer points more extensive timetable information should be displayed on the bus passenger shelter. The area in front of the timetable information should always be clear of obstruction.

20.5.4.5 Lighting

It is important to provide lighting at bus stops so that when it is dark passengers can see and be seen. This enhances the security of passengers, improves perceptions of personal safety, enhances the bus journey experiences (whilst waiting, boarding and alighting) and ensures that bus drivers are able to see a waiting passenger.

Ideally, each bus stop should have its own source of illumination. This can be through an interior light powered from the grid or through use of solar power as outlined and illustrated I the box below. It is recognised that the use of interior lighting in bus shelters is vulnerable to vandalism, however, lighting is a key component to enhancing the safety and attractiveness of using a bus stop and, thus the overall passenger transport system.

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.

To ensure 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 taken as part of any bus stop improvement will be dependent on each site's specific characteristics.

- This guideline recommends greater use of solar power to illuminate the bus stop and associated infrastructure.
- The appropriate lighting level should be 30 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 metres of the stop should be lit to an appropriate level of 10-15 lux with a minimum uniformity ratio of 0.3[9]. Higher lighting levels should be considered where there is a defined need.
- Refer to the latest Australian/New Zealand standard AS\NZS1158 Practice for Road Lighting.

[9] Source: Safer Auckland: http://www.aucklandcity.govt.nz/auckland/introduction/safer/cpted/7.asp#7.3

Greater use of solar power at bus stops ▪ The use of solar power at bus stops to provide lighting is growing as it is seen as the perfect solution in areas where there are no street lights or ambient lighting from nearby land-uses. ▪ Auckland Transport has trialed a new installation at a bus stop on Great South Road with good results. ▪ While not mandatory this guidance recommends further installations are pursued given the trials have been successful.	

20.5.4.6 Streetscape – Street Furniture (including real time information signs)

Other street furniture such as rubbish bins, seats and real time information signs may also be provided 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.

Key considerations include:

- all street furniture should be located such that the boarding and alighting clear areas are maintained and the 1800mm continuous accessible path of travel (pedestrian through route) is provided throughout the bus stop area;
- street furniture - especially shelters with advertising - should not obstruct sightlines between approaching buses and waiting passengers;
- the amenities at bus stops should ideally be designed as a component of the 'kit of parts' to the overall streetscape e.g. as part of an overall corridor-based enhancement;
- consolidate street furniture as much as possible to maximise a barrier free space and create active public spaces;
- **all street furniture should be set back from the kerb by no less than 800mm** to allow for bus overhangs;
- street furniture should be as graffiti proof as possible, whist still retaining some comfort to users (e.g. seating) and degree of attractiveness;
- street furniture should be durable and long-lasting. Consideration should be given to the ease of on-going maintenance and replacement as required;
- location of seats should contribute to passengers' comfort by being well back from traffic and allowing good visibility to approaching services. Where footpath widths are narrow, seating may be provided in the street furniture zone at least 800mm from the kerb face but should face inwards for safety reasons.

Section 14.9 in **NZTA's Pedestrian Planning and Design Guide (PPDG) (December 2007)** also provides some guidance on street furniture and should be referred to by bus stop designers in conjunction with this guideline.

Real Time Information Signs

Table 84 indicates that bus stops classified as 'Regular Bus stops' or 'Signature Bus Stops' should be provided with real time information signs ('Highly Desirable' and 'Required' respectively). The following criteria provide further guidance on which bus stops should be prioritised for real time information sign provision:

- bus stops on major bus routes i.e. frequent or rapid network routes outlined in Auckland Transport's RPTP;
- bus stops near major traffic generators e.g. shopping centres, schools and colleges;
- bus stops near transport interchanges, such as rail stations or ferry terminals; and
- bus stops close to other bus routes to cater for transfers.

Guidance on where to install real time information signs is shown below. Technical drawings are available in **Appendix 20C**

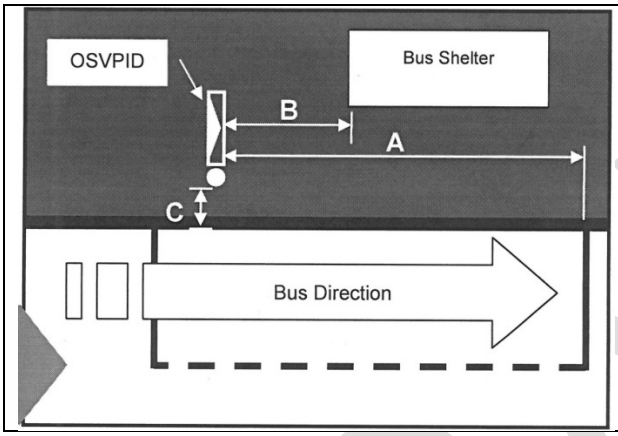
	**Guidance on Installation Measurements** **A = 8-15 metres (from head of stop)** **B = 1-2 metres (from shelter)** **C = 0.5-2 metres (from kerb)**

Figure 123: Installation of Real Time Sign Location

20.5.4.7 Streetscape - Landscaping

Trees and other natural landscaping may also 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 the 1800mm continuous accessible pedestrian path of travel throughout the bus stop area;
- Planting should not obstruct sightlines between approaching buses and waiting passengers, shelters or seats with advertising;
- Tall clean stem shade trees should be maintained where clear access can be established around them and they do not obstruct sightlines. Trees should be long-trunked with a minimum branch height of 4.5m;
- Where planting is to be provided on the approach side of a stop, this should be limited to ground cover or low shrubs (<0.5m high).

20.6 Bus Stop Layouts

Every bus stop layout should be long 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. For

most stops, room is required for only one standard bus at a time. Objectives of an ideal bus stop layout are outlined in **Box 10.**

In practice, buses are often prevented from achieving the above for two main reasons: the bus layout geometry is poor or vehicles are parked close to or at the bus stop, preventing buses from reaching the kerbside and forcing buses to stop in the carriageway. This causes difficulties for passengers trying to board or alight, especially for elderly or disabled people and people with children or shopping who have to walk on the road and negotiate a higher step onto the bus.

The provision of the appropriate type of bus stop layout - in conjunction with many other measures such as kerb heights, road markings etc. as discussed in this guideline – aim to enable the bus to stop close to the kerb.

Box 10 - Bus Stop Layout Objectives[10]

The ideal bus stop layout will achieve the following objectives:

- minimise time spent at the bus stop by the bus;
- prevent / dissuade other vehicles from parking in the stop area;
- allow the bus to line up within 50mm (ideal) of the kerb and parallel to it (or within 200mm as a maximum);
- minimise the use of kerb space where there are competing demands for frontage access; and
- maintain road safety.

The main types of bus stop layouts are:

- kerbside bus stop;
- indented bus bay; and
- bus boarder.

The bus layouts above and the required lengths for approach, stopping area and departure tapers are shown in Figures 124 – 133, further on in this chapter.

The layouts 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 will need to be adjusted.

As discussed in Section 20.5.3.1, the bus box area outlined in this guideline is 15m long and 2.5m wide, but the width may be reduced / increased slightly. Although this guideline is based on a 13.5m long bus, the ideal bus box area should be slightly longer to allow the bus driver some margin for correction / space to straighten the vehicle to align flat with the kerb.

The length of the bus stop area will also need to be amended if more than one bus is expected to serve the stop at the same time. Sufficient space needs to be provided for the second or third bus to be able to pull out past the first bus stopped in front of it.

[10] Transport for London, Accessible Bus Stop Design Guidance, January 2006, pg 6.

The overall aim is to permit buses to stop within 200mm of the kerbside (as a maximum), without overhanging or over-running the footpath. However, the proper use of 'special kerbs' such as Kassel Kerbs, as discussed in Section 20.7, could allow buses to stop within a few millimetres of the kerb without any damage to tyres. Ideally, where special kerbs are used, buses should aim to have a 50-75mm horizontal gap from the kerb.

20.6.1 Standard kerbside bus stop

A kerbside bus stop is generally the preferred bus layout for most urban and suburban streets. The majority of stops within the Auckland region are kerbside stops. These stops should be marked out with the appropriate road marking and signs as outlined in Section 20.5. Layout dimensions are provided in Figure 124, which show an overall length requirement of 38.5m – this is significantly more than outlined in previous TA guidelines in the region (26m) but is considered 'best practice' guidance based on worldwide experience and local feedback.

The length required for this type of layout can be reduced, whilst keeping the bus stop unobstructed by making use of existing clear road areas, such as those imposed near pedestrian crossings and intersections[11].

Two convenient locations for bus stops where this can be achieved are:

- the exit side of a pedestrian crossing – Figure 126; and
- the exit side of an intersection (open bus bay) – Figure 127.

These two layouts assist 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. Safety issues must always be considered when adopting such designs.

It is important to plan the bus box size for the frequency of buses, otherwise following buses could block the crossing or side road (see Section 20.4 for further information).

Any relocation of the stopping position of the bus closer to the intersection should have regard to visibility for drivers of vehicles leaving the side road. While a bus using the stop is a temporary obstruction, the bus stop sign, passenger shelter and waiting passengers should not obscure sight lines.

However, even with road marking, signs and surface treatments (as discussed in Section 20.5), buses often still experience difficulty in maneuvering to the kerbside, due to inconsiderate parking or loading vehicles at or near the bus stop. It should be noted that where on-street parking is provided too close to a kerbside bus stop, the effect for the bus is an informal indented bus bay. A bus stop 'boarder' layout can help to resolve this problem.

[11] Transport for London, Accessible Bus Stop Design Guidance, January 2006, pg24 – 25.

20.6.2 Bus Boarders

Bus boarders are areas of footpath built out into the carriageway enabling the bus to avoid pulling off the main carriageway. Bus boarders can be full-width or half-width. See Figures 128 - 130.

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 no need to provide for approach or exit tapers. Figure 128 shows that full-width boarders only require a 14.5m kerbside length, whereas half-width boarders (see Figure 130), require a total kerbside length of 34.5m, which is still less than the 38.5m required by kerbside bus stops;
- due to the above effects, buses are able to approach the bus stop at a straight angle and align in close proximity to the kerb, ensuring good accessibility for all passengers;
- higher kerb platforms can also be installed without risking damage to buses due to their overhang. The reduced height differential allows easy boarding and alighting and can reduce bus dwell time, especially when other measures are also introduced, such as quick ticketing, exact change etc;
- they allow more kerbside space for on-street parking provision either side of the boarder.
- they create passenger waiting areas that do not impede or conflict with the general pedestrian flow on the main footpath. Bus infrastructure can also be provided off the main footpath, contributing towards a barrier-free path;
- the additional, wider footpath provides opportunities for attractive streetscapes, landscaping, cycle parking and street furniture;
- they act as traffic calming devices by narrowing the road width and slowing traffic speeds.

Bus boarders are suitable in the following areas:

- where the posted speed limit is equal to or less than 50km/hr or where actual traffic speeds are below 50km/hr due to congestion etc.;
- where the road width is at least 3.5m - 4m wide. This allows at least 1.5m of road space (between the centre line and the side of a stationary bus) for on-road cyclists to pass a stationary bus;
- where bus numbers are high and where loss of kerbside parking needs to be minimised (areas with high kerbside parking demand). Generally suitable for CBD applications, town centres or shop frontages;
- where traffic calming measures are required to help reduce traffic speeds (unless delay is onerous to other buses and general traffic);
- where footpaths are narrow, bus boarders enable bus passengers to wait away from pedestrian paths.

The half-width bus build-out is 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 1m to 1.5m wide[12].

Half-width bus boarders should be used where:

- frequent delays to other vehicles are to be avoided;
- a full-width boarder would place the bus in, or too close to, the opposing traffic stream; and/or
- there is on-road provision for cyclists – requiring a minimum passing width between a stationary bus vehicle and the centre line of 1.5m.

Bus boarders should not be used in areas that do not meet the above criteria, specifically in high traffic speed areas (i.e. where the posted speed limit is over 50km/hr) and where the road width precludes following traffic or cyclists from overtaking a stationary bus safely.

Bus boarders do cause some delay to general traffic on the kerbside lane. However, on corridors where the movement of people is prioritised over the movement of vehicles, the potential delay to general traffic should not be a deterrent to its application.

20.6.3 Indented Bus Bays

The main purpose of indented bus bays is to remove bus vehicles from the general flow of traffic while they are stationary when picking up or setting down passengers.

They are provided to maintain the general flow of traffic or for safety reasons where the sudden stopping of a bus or the forced overtaking of a stationary bus might otherwise create an accident risk. Indented bus bays have also been traditionally provided at locations with poor sightlines, for example, where the stopped bus appears unexpectedly as a vehicle crests the brow of a hill.

Indented bus bays can be fully indented or partially indented (half-indent bus bay). It should also be noted that where on-street parking is placed too close to a kerbside bus stop, the effect for the bus is an informal indented bus bay.

Historically, in Auckland and many other cities around the world, bus bays were often the preferred layout for bus stops as the priority was to maintain the general flow of traffic. Consequently, there are many full or half-indented bus bays within the Auckland region.

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

- bus drivers often find it difficult to merge back into the mainstream of traffic causing delays of approximately 2 – 4 seconds at each stop[13]. This can be much longer in heavy traffic. This problem is particularly felt in Auckland as drivers are not legally required to give way to buses (as they are in many other countries) and consequently

[12] Transport for London, Accessible Bus Stop Design Guidance, January 2006
[13] Source: Accessible bus stop design guidance, Transport for London (TfL), January 2006.

often do not[14]. The variability of this hold up leads to unreliable and bunched services as well as general bus delay;

- bus bays require a significant area to ensure buses are able to pull in flush with the kerb. A 'standard' bus requires a full bus bay area to be 46.5m long from the start of the approach taper to the end of the exit lane. The impact on the surrounding land-use means that there is less area available for wider footpaths, streetscape, berms, landscaping, or on-street parking;
- the design of many existing bus bays is unsatisfactory, particularly where their geometry prevents buses from reaching the kerb effectively (ideal gap is generally within 50-75mm, maximum gap is 200mm), resulting in poor 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 mainstream of traffic;
- bus bays are also prone to attract inconsiderate parking or unloading, especially at high activity areas e.g. town centres, shop frontages etc. This again prevents the bus from reaching the kerbside, forcing passengers to board or alight from the road, causing difficulties for some passengers;
- bus bays widen the carriageway area creating the opposite effect of traffic calming measures, including encouraging speeding, increased difficulty for pedestrians to cross and an unattractive street environment.

Current thinking has shifted towards giving greater priority to buses as more 'efficient people movers', even if this is achieved at the expense of slowing down general traffic. In view of the above reasons, bus bays should only be provided where justified by compelling safety or operational reasons.

In fact, several cities (London, Portland for example) have a policy to infill or remove bus bays altogether from major arterial roads (or where the posted speed limit is 50km/hr or lower).

Research undertaken by Transport for London (see Appendix 20B) has shown that in-filling a bus bay and replacing it with a kerbside stop will:

- make it easier for the bus to stop adjacent to the kerb;
- make it easier and quicker for passengers to board / alight; and
- reduce delays to buses by between 2 – 4 seconds / bus.

20.6.3.1 Guideline recommendations on indented bus bays

This guideline recommends the following:

- full-indented bus bays should be avoided as the layout reduces the efficiency of bus services. They should only be provided where justified by compelling safety or

[14] Although the experience in Western Australia seems to suggest that even when placed in legislation, the 'Give Way' rule to buses can be ineffective. Western Australian motorists seem to have an ingrained behaviour of generally not giving way to buses leaving a bus bay – even though they are required to by law. This simply highlights further that bus bays negatively impact on bus journey times and reliability, and therefore their attractiveness to users (Design and Planning guidelines for Public Transport Infrastructure – Bus Route Planning and Transit Street, Public Transport Authority Government of Western Australia, pg 17-18).

operational reasons or where required on high occupancy vehicle / bus lanes, as outlined in Section 20.6.3.2 below;

- all existing bus bays should be reviewed in accordance with this guideline and, where possible, bus bays should be filled-in and/or relocated in such a way that the original reasons for providing an indented bus bay are addressed. The additional footpath space can be tailored to the boarding and alighting characteristics of the site and the land-use requirements;
- in line with the above, indented bus bays that have been provided on the grounds of poor sightlines (for oncoming vehicles) should be reviewed. Bus drivers also suffer from poor sightlines (of oncoming vehicles) at indented bus bays, which compromises safety for bus drivers attempting to re-enter fast flowing traffic streams. In exercising caution when pulling out, this also results in bus journey time delays.

20.6.3.2 When indented bus bays are considered to be appropriate

Full-indented bus bays should only be considered in the following situations:

- On any stretch of road with a speed limit of 80 km/hr or higher. In these cases, the following factors should be incorporated:
  - Appropriate approach and exit tapers (acceleration zone) are provided to facilitate ease and safe re-entry of the bus into the main stream of traffic
  - Appropriate location of the bus stop is provided to ensure good sightlines of approaching traffic.
- Where the bus will have a long dwell time at a bus stop and will unnecessarily obstruct traffic flows. For example for:
  - Operational reasons e.g. lay-over time in between the end and start of a service, or driver rest breaks
  - For schools and special events e.g. the need to arrive just prior to the end of the school session and long boarding times as passengers all arrive at the same time
  - At particularly busy bus stops with high numbers of passengers boarding and alighting e.g. at town centres or fare boundaries.

In principle, 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 in situations where there is on-road cycle provision.

Indented bus bay layouts are shown in Figures 131 to 133.

20.6.3.3 If ideal layout dimensions cannot be achieved

A clear exit distance of 9m is the minimum necessary for buses to leave the stop and rejoin the general traffic lane without the rear of the vehicle overhanging the kerb in the vicinity of waiting passengers[15].

[15] Transport for London, Accessible Bus Stop Design Guidance, January 2006, pg 29.

If the minimum dimensions outlined in this chapter cannot be achieved due to site-specific constraints, designers need to clearly understand the implications of this and design appropriately.

If the bus stop exit distance is reduced to below 9m, it is likely for the rear section of the bus to overhang the footpath. This effect could pose a conflict with pedestrians (or street furniture not placed at least 800mm away from the kerb face). Such inadequate offset provision is illustrated in the photo below. This risk is increased significantly in relation to double decker vehicles that have a second story of passengers.

If required minimum dimensions cannot be met, bus designers[16] should consider:

- remove on-street car parking / other barriers to provide the required minimum space, if possible;
- relocate bus stop slightly forward or back to where the minimum dimensions can be provided (subject to PT Operations agreement); or
- where bus overhang is a real possibility, ensure that the footpath width is sufficient to allow pedestrians to walk by without being potentially hit. The use of paving treatment or road marking to delineate overhang area should be considered. The positioning of street furniture, veranda cutbacks etc in this case should also be considered on a case-by case basis.

Inadequate offset from kerbface to pole is likely to result in conflict with bus tail swing

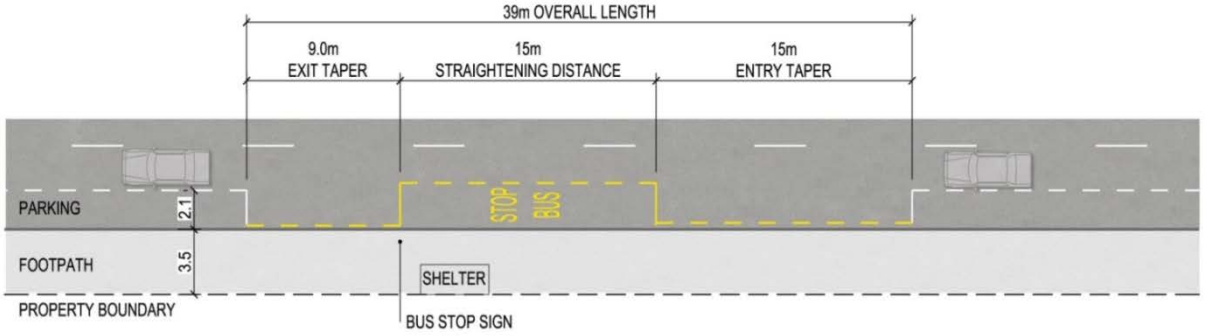


Figure 124: Kerbside Bus Stop with Parking Either Side for a 'Standard' 13.5 Metre Long Tag Axle Bus

[16] 'Bus designers' = anyone involved in bus stop planning, provision or implementation, e.g.: national, regional or territorial local authorities; developers; engineers or planners.

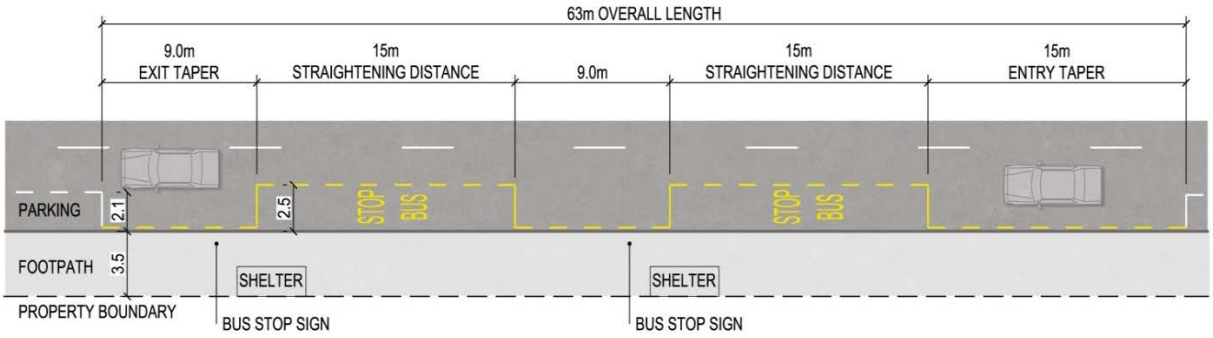


Figure 125: Kerbside Bus Stop with Parking on Either Side for Two 'Standard' 13.5m Long Tag Axle Buses

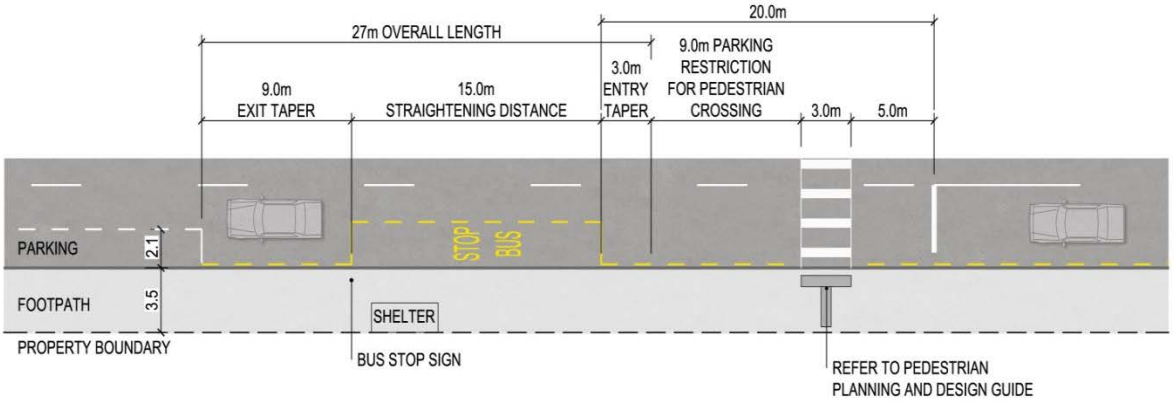


Figure 126: Kerbside Bus Stop on Exit Side of Pedestrian Crossing for a 'Standard' 13.5m Long Tag Axle Bus

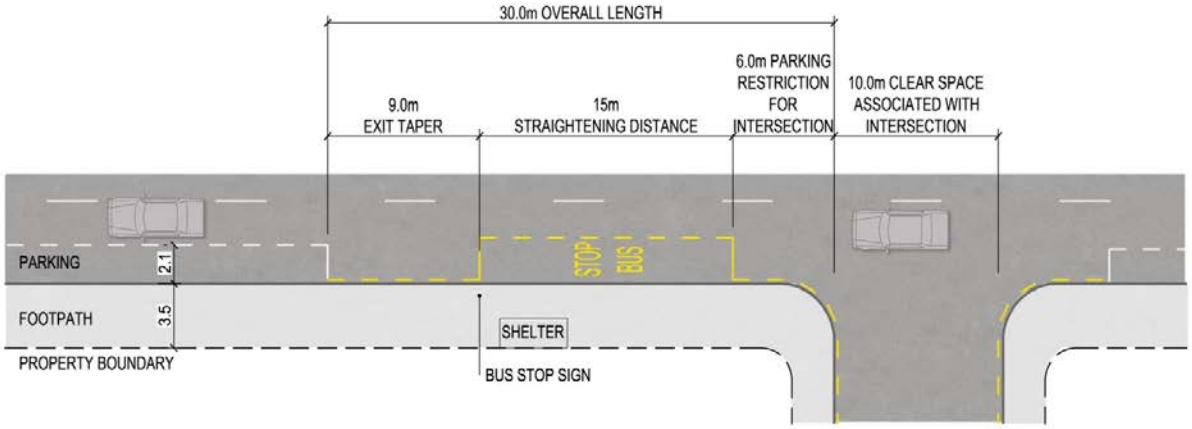


Figure 127: Kerbside Bus Stop on Exist Side of an Intersection for a 'Standard' 13.5m Long Tag Axle Bus

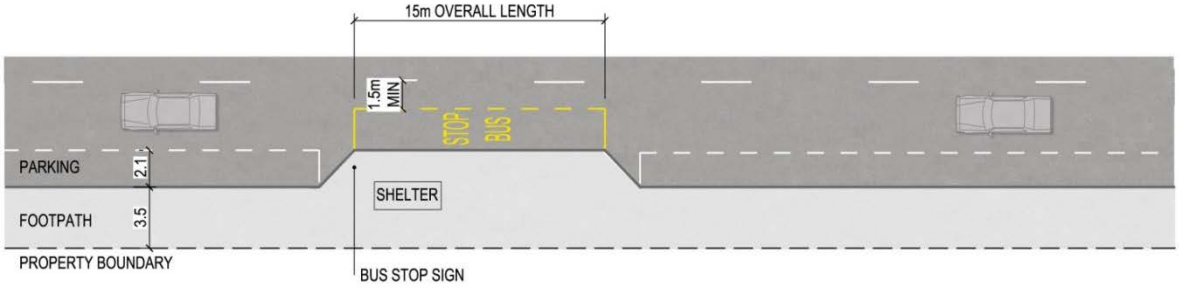


Figure 128: Full Width Bus Boarder for a Single 'Standard' 13.5m Long Tag Axle Bus

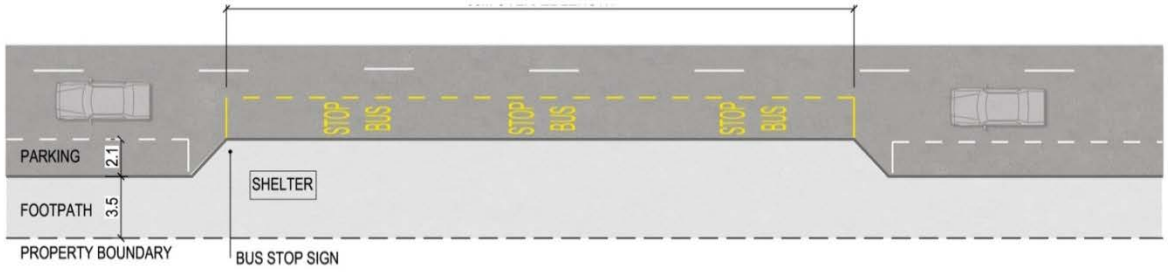
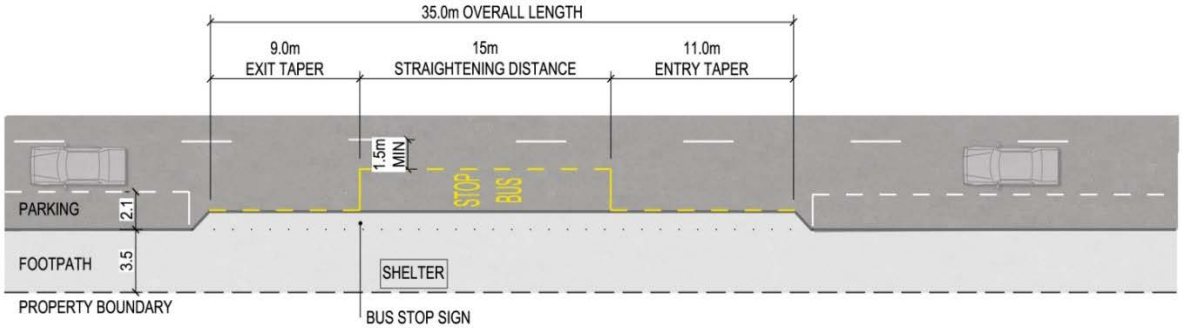


Figure 129: Full Width Bus Boarder for Two 'Standard' 13.5m Long Tag Axle Bus



Note: If this can not be achieved discuss with PT Operations

Figure 130: Half Width Bus Boarder for a 'Standard' 13.5m Long Tag Axle Bus

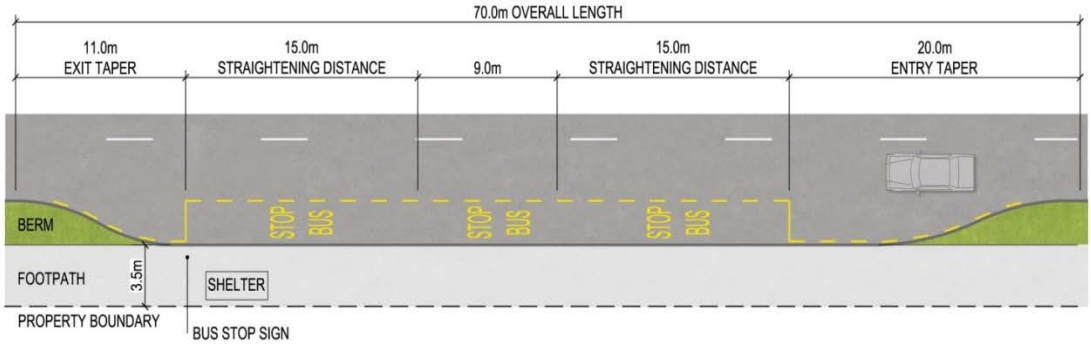


Figure 131: Fully Indented Bus Bay for Two 'Standard' 13.5m Long Tag Axle Buses

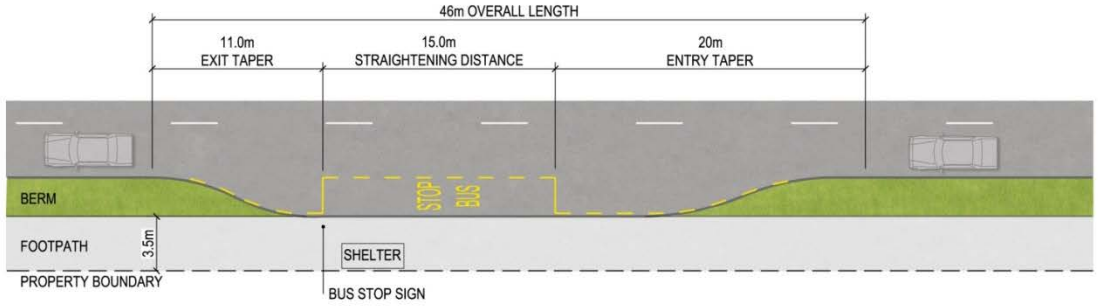


Figure 132: Fully Indented Bus Bay for a 'Standard' 13.5m Long Tag Axle Bus

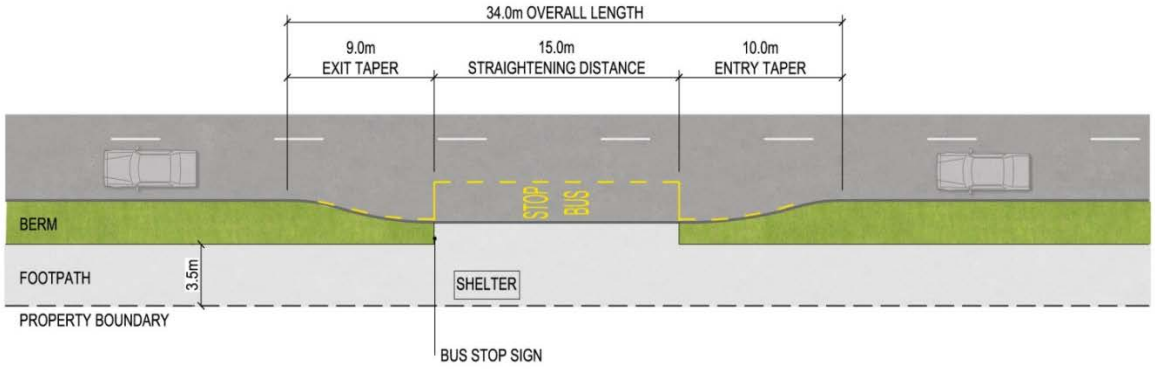


Figure 133: Half Indented Bus Bay for a 'Standard' 13.5m Long Tag Axle Bus

20.7 Kerb Profile

It is important to provide the appropriate height kerb and design at bus stops to provide good accessibility, meet the slope requirements for disability access when the ramp is deployed, provide good guidance for the bus driver and also meet basic design requirements.

20.7.1 Context

The kerb height at bus stops has an impact on bus accessibility. The size of the vertical gap between the kerb and floor of the bus will affect the ease with which passengers are able to alight or board a bus, as well as the gradient of the wheelchair ramp when it is deployed. If the gap is too high, some passengers will find it difficult to board or alight comfortably. If the gradient is too severe, some wheelchair users may be unable to enter or exit the bus safely.

Existing kerb heights and kerb cuts / dropped kerbs (or their absence) was identified as one of the many barriers to the ability of disabled people in New Zealand to use land passenger transport (HRC, para 4.3, pg 38; and HRC, para 5.15, pg 61)[17].

ATCOP Section 7.7 Kerb and Channel deals with kerb types and heights. The standard kerb height in the Auckland Region is often around 120mm at bus stop, or is inconsistent. A best practice review of several other comparator cities (similar to Auckland or recognised as best practice leaders) found that some cities specify kerb heights at bus stops of between 125mm to 175mm[18]. In general, there seems to be a preference for 140 to 150mm standard kerb heights at bus stops (London, Melbourne, Perth) and in Europe a preference for higher 'special kerbs' e.g. 160mm and above, where possible.

The preferred kerb height for bus stops should be driven by a desire to:

- reduce the step height between the bus floor and the bus stop kerb to provide easy boarding / alighting for all passengers, regardless of their mobility levels;
- reduce the gradient of a deployed ramp for users in a wheelchair, with a pram, with luggage or with small children (see step height illustrated in Figure 105 in Section 20.3);
- facilitate quicker boarding and alighting times - by achieving the above, combined with other measures such as integrated ticketing etc. thereby reducing bus dwell time and improving bus journey times and reliability.

The main issues identified with providing higher kerb heights in Auckland are:

- the risk that buses will overhang the kerb and damage the bus, as well as the kerb face;
- the risk that bus drivers fear the possibility of the above and will therefore not dock the vehicle accurately alongside the kerbface. This would negate the benefit sought from implementing such kerbs.

The above concerns can be eliminated by providing the correct bus layout, with correct entry and exit tapers and with appropriate driver training.

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[17] Human Rights Commission, The Accessible Journey: Report of the Inquiry into Accessible Public Land Transport, October 2005.

[18] London has a statutory minimum kerb height standard of 125mm, however, states a preference for 140mm maximum kerb heights at bus stops as they result in lower ramp gradients. Melbourne and Sydney require 150mm kerb heights at bus stops, Perth provides a required range of between 125 – 175mm in height, Portland appears to have a range of between 150 – 178mm (6 – 7 inches).

Box 11 – Standard requirements for ramp and footpath gradients

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 shall have a maximum slope of 1:8 / 12% / 7 degree maximum (pg 38). This is in line with the recommended gradients in several other similar cities (Vancouver, London);
- the allowable camber for crowned and banked footpaths and ramps shall have a maximum slope of 1:50 (pg 32).

20.7.2 Recommended Kerb Heights

Essentially, increased kerb heights are required at bus stops to achieve the aspired levels of accessibility and increase the attractiveness of bus use.

A kerb height of 150mm at the bus stop is required. Variables such as crossfall of the footpath and carriageway can influence the gradient of a bus ramp. The aim is to achieve a maximum slope of 1:8 / 12% / 7 degrees for a deployed ramp as per the requirements of the NZS 4121:2001.

It is recommended that kerb heights at bus stops of less than 120mm should be increased up to 150 mm (noting comments above). Heights above 150mm need to be checked to ensure that there is no risk of collision with the approach of a low floor or kneeling bus.

Kerb faces of between 120mm – 150mm high are less likely to require immediate alteration. However, where kerbs are already being altered at bus stops e.g. road reconstruction, to build a bus boarder, **serious consideration should be given** to the use of higher kerbs to reduce the step height, thereby improving access for all bus users including disabled users.

The risk of bus vehicles being damaged at bus stops can be eliminated with good bus stop layout designs as outlined in this guideline. However, it is likely that some existing bus stops in Auckland would not allow buses to correctly approach stops with higher kerb heights and would therefore not be suitable for this type of treatment, unless their configuration was amended.

20.7.3 Kerb Profiles and 'Special' Kerbs

Correct alignment of the bus with the stop is crucial for step-free access, but especially so with raised kerbs. The stopping of a bus at the kerb is a form of 'parallel parking' that is difficult for a bus driver to get right. Bus drivers will generally park at a distance from conventional vertical kerbs for fear of damaging or wearing out their tyres[19].

The ideal kerb profile for the closest possible bus driver approach is J-shaped, steeply sloping at the top but with a gentler, more horizontal slope near the bottom. The edge at the

[19] North Shore City Council (Chris Harris), Submission to the Human Rights Commission Inquiry, "The Accessible Journey: Report of the Inquiry into Accessible Public Land Transport, October 2005.

top of the kerb should be rounded and not sharp. Kerbs with a harsher and more vertical profile will encourage the driver to keep clear of the kerb in order to avoid tyre damage, while kerbs with a flatter profile will force the driver to park a long way from the top of the kerb for geometrical reasons[20].

However, this problem can be overcome by the use of the technology generically known as 'guided kerbs', of which a specific and perhaps most widely used example is the Kassel Kerb.

The 'Kassel Kerb' is a concave-section kerbstone which guides the bus tyres in the last few centimetres of bus approach. As the tyre rides up the concave surface, gravity pulls it back down. It is known that tyre wear is less with the 'Kassel Kerb' than with ordinary kerbs[21] and that proper use of them can consistently achieve a 50-75mm 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.

The Kassel Kerb is available in many heights but most regularly used are 160mm and 180mm heights. The basic unit is complemented by a range (of transitional kerbs) that allows the Kassel Kerb to be incorporated into existing kerb lines, without the need for remedial work at each end of the stop. In general Auckland Transport's preferred height for Kassel Kerb is 160mm, although there may be site specific circumstances where I higher kerb is appropriate but this needs to designed in consultation Auckland Transport's PT Department.

Photos illustrating some examples of Kassel Kerbs are shown on the following page.

High 'special kerbs' of 160mm or above should only be provided at bus stops where buses always have clear, unimpeded access on the approach and depart from the boarding point, with no likelihood of any obstruction that would prevent pulling parallel to the kerb without hitting it.

Box 12 – Availability of 'Special Kerbs' or Kassel Kerbs

A key issue for implementation is that Kassel Kerbs or other similar types of special kerb (there are several products available) have not been manufactured in New Zealand and therefore have had to be shipped from Germany directly. Auckland Transport has worked with local concrete suppliers to explore the opportunity of NZ manufacture and Busck Prestressed Concrete Ltd are now the official license holder in Australasia for this product

Auckland Transport Agreements for Application

There has been senior management agreement to install Kassel Kerb on certain parts of the public transport network.

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[20] Transport for London, Accessible Bus Stop Design Guidance, January 2006.

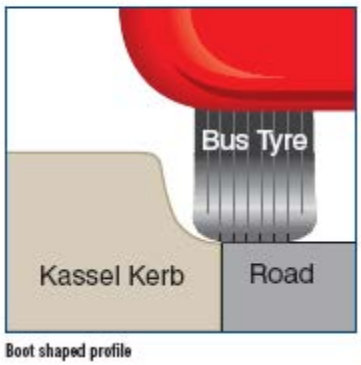
[21] Wood, C., Bus Stop Design Innovation: A Comparison of UK Trials Transition – The European Transport Conference, Proceedings of Seminar J: Traffic Management and Road Safety Association for European Transport, London (Centre for Independent Transport Research in London (CILT), 1998, http://www.cilt.dial.pipex.com/comparison.htm.

To date:

- Kassel Kerb should be a first consideration for kerb in all new or upgraded bus stations/interchanges
- Kassel Kerb should be a first consideration for kerb at any new Busway or dedicated bus road projects (eg AMETI)
- Kassel Kerb should be considered for fitment on any large scale streetscape project (eg Dominion Road)
- Kassel Kerb should be considered for fitment on sections of road that relate to the Frequent Network (see page 2)

Auckland Transport's PT Department should be consulted before a decision is made on the application, suitability or specification of any kerb product in the bus network.

Smooth contact face



Boot shaped profile

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Photos illustrating examples of Kassel Kerbs[22]

20.8 Aspects to consider when implementing raised Kerbs

- Designers should check site conditions to obtain the correct step height or gradient when a ramp is deployed at a bus stop as it may vary depending on several other factors, including:
    - type of ramp;
    - ramp length;
    - carriageway and footpath crossfalls;
    - 'kneeling' height of the bus floor;
    - whether the bus is laden or not;
    - whether there are any potholes or gullies below the road channel, which could affect bus operation.
- Raised kerbs only need to be provided at the point(s) where bus doors will open. Where kerb heights are changed, carriageway and footpath crossfalls will need to be carefully considered. Ensure that footpath crossfalls have a gradient of no more than 1 in 33 or 3% as a steep backfall from the kerb is undesirable. Transitional kerbs can be used to ensure appropriate footpath crossfalls.
- Prior to any increased kerb height provision, each bus stop's layout should be reviewed to ensure that no conflict will occur. Factors to take into consideration 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, for example, to inconsiderate parking;
    - where there is a possibility of the bus body overhanging the kerb, the height of the kerb should be no higher than the minimum ground clearance. Kerb heights greater than the ground clearance of the bus should only be used at locations where there is no likelihood of the bus overhanging the kerb e.g. at full bus build-outs. The use of high kerbs, standard, kerbs and the transition between them needs careful consideration at bus stops.

[22] Picture sources: http://www.profilbeton.de/EN/index.php; and http://www.essexgroundworksupplies.co.uk/index.asp?textpage=kassel&mainpage=skerbs.

- It is important that driver training and awareness is undertaken in conjunction with the infrastructure provision.
- To help facilitate driver awareness, the implementation of raised kerbs at bus stops should be done on a corridor approach rather than on an ad-hoc basis, subject to available funding.
- Many bus stops in Auckland are located in close proximity to vehicle driveways. This may impact on the ability to provide increased kerb heights. It could be that some bus stops may need to be relocated slightly to facilitate the provision of raised kerbs without adversely affecting driveways. Or, it may simply not be possible to install raised kerbs at some bus stops.

20.9 Traffic Calming on Bus Routes

The design of traffic calming is covered in *ATCOP Chapter 8 – Traffic Calming and Local Area Traffic Management. Section 8.3* specifically addresses traffic calming on bus routes.

20.10 Other Linkages

20.10.1 Driver Training

Although this guideline is focused on bus stop infrastructure provision, the appropriate use of that infrastructure e.g. aligning the bus into the correct stopping position and pulling fully into 'special' kerbs such as Kassel Kerbs, relies on the driver being aware.

It is therefore important that the implementation of design recommendations in this guideline is supplemented with driver training, as appropriate. For example, when the bus stop infrastructure on a whole route / corridor has been upgraded, route specific driver training may be required.

20.11 Enforcement

The good design of a bus stop is compromised if buses are prevented from using them due to inconsiderate or illegal parking at / near bus stops. This has an impact on all road users, however, it was highlighted as a particular issue by representatives of aged and disabled users, stating that illegal parking in bus stops impacts on their ability to access the correct bus services.

The use of consistent and visible road marking, road surface treatment, signs etc. as recommended in this guideline are aimed at informing other road users of the bus stop area and to seek compliance with the road rules. However, there will invariably be some people that will still park inconsiderately or illegally at bus stops, so an effective enforcement regime that prioritises quick removal or ticketing of vehicles parked on bus stops is an important requirement for bus stops. Some bus stops e.g. those located in high demand parking areas along retail frontages, are likely to require a more intense enforcement regime than others.

Bus stops are enforceable 24 hours a day, 365 days a year. Enforcement of bus stops is predominantly undertaken by the Auckland Transport parking wardens.

20.12 Maintaining Bus Stops

The following are some key considerations to maintaining and managing bus stops:

- vandalism and graffiti to bus stops should be addressed promptly to ensure that the bus stop does not detract from the streetscape or community;
- noise complaints in relation to lay over bus stops or bus stops in general should be taken seriously and addressed promptly and constructively;
- carriageways will be resurfaced during the normal course of maintenance routines. It is common for the general level of the carriageway to rise with successive surface repairs. **During resurfacing it is crucial that the kerb height at bus stops is maintained or improved, this is particularly important where 'special kerbs' or raised kerbs are in place.**

20.13 Implementing Bus Stop Improvements

A check list has been developed to assist practitioners undertaking on-site checks at locations where a bus stop or shelter is proposed. This is provided in Appendix 20D.

The provision for new individual bus stops on a case-by-case basis will always be required. However, to achieve a step-change in passenger transport provision within an area, this guideline recommends implementing improvements as part of an integrated package approach, in which improvements to the bus stops forms one part of an overall scheme.

This could be by improving bus stops as part of a town centre upgrade, or as part of Neighbourhood Accessibility Plans[23].

Another way is to apply a corridor-based approach to bus stop improvements. This could be expanded to include other corridor improvement aspects such as bus priority measures, streetscape improvements, junction upgrades, etc.

Applying a corridor-based approach allows Auckland Transport to apply for package funding for bus stop improvements from NZTA that is additional to the annual budgets set aside for individual bus stop improvements within the LTP.

When undertaking a corridor-based improvement approach, it is often useful to undertake a 'bus safari' with all relevant stakeholders to gain a better understanding of the issues affecting specific bus stop(s) on an existing route from both a bus operator and bus passenger point of view.

20.14 Linking with cycling

A designated cycle network to/from or near bus stops increases the catchment area of the bus passenger transport system. Where this is the case, consideration should be given to providing cycle parking at the bus stop. Cycle parking should be designed and located so as not to create a hazard, or impede access, for disabled people[24].

Examples where cycle parking provided at bus stops in The Netherlands[25]

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[23] http://www.nzta.govt.nz/resources/neighbourhood-accessibility-plans/
[24] Department for Transport (UK), Manual for Streets, 2007.
[25] Cambridge Cycling Campaign; Photo 1: http://www.camcycle.org.uk/map/location/11776/; Photo 2: http://www.camcycle.org.uk/map/location/11391/nearby.html.

Bus stop with covered cycle parking behind in the wooden shed.

Cycle parking right next to the bus stop and cycle path.

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2. Australian/New Zealand Standard Parking facilities Part 1: Off-street Car Parking or AS/NZS 2890.1:2004 (PDF 601KB).
3. Austroads, A guide for Traffic Engineers – Road-Based Public Transport and High Occupancy Vehicles, 2002.
4. Caiaffa, M., Tyler, N., & Brown, I, Bus stop infrastructure, in N. Tyler, ed, Accessibility and the Bus System: From Concepts to Practice (London: Telford), 2002.
5. Cambridge Cycling Campaign; Photo 1: http://www.camcycle.org.uk/map/location/11776/; Photo 2: http://www.camcycle.org.uk/map/location/11391/nearby.html.
6. Christchurch City Council, Christchurch Bus Stop Locations Policy, December 1999.
7. Department for Transport (UK), Manual for Streets, 2007.
8. Human Rights Commission (NZ), The Accessible Journey: Report of the Inquiry into Accessible Public Land Transport, September 2005
9. Land Transport New Zealand, Pedestrian Planning and Design Guide (PPDG), December 2007.
10. Land Transport New Zealand, Traffic Control Devices Manual (TCDM), Part 13 Parking Control, December 2007.
11. Land Transport Safety Authority, Road and Traffic Standards (RTS) 14 Guidelines for facilities for blind and vision impaired pedestrians, 2008.
12. Land Transport Safety Authority, Road and Traffic Standards (RTS) 6 Guidelines for visibility at driveways, May 1993 (PDF 640KB)
13. Manukau City Council, Manukau city Bus Stop and Bus Shelter Policy and Guidelines, September 2004.
14. Ministry of Consumer Affairs – Manager Standards and Safety, New Zealand Electrical Code of Practice 34:2001, 2001.
15. New Zealand Government, Traffic Regulations 1976 and amendments.
16. New Zealand Government, Land Transport (Road User) Rule 2004, SR 2004/427, Rule 61001.
17. New Zealand Standards, Design for Access and Mobility – Buildings and Associated Facilities NZS 4121:2001, undated.
18. New Zealand Standards, Glazing in Buildings NZS 4223 Part 1[26] and Part 3[27] (Section 303, page 7), various publication years and amendments. Also note AS/NZS 4666[28], 2000.

[26] **NZS 4223 Part 1 -** This is the Standard that covers the selection and installation of glass in buildings. A large part of this Standard has been superseded but it still contains many technical and installation principles.

[27] **NZS 4223 Part 3** - This is the Human Impact Safety requirements Standard which details glass requirements for all areas subject to human impact - that is all areas within 2 metres of the floor.

19. North Shore City Council, North Shore City Council Bus Stop Guidelines (Various), 2008.
20. North Shore City Council, North Shore City Council Submission to The Human Rights Commission Inquiry into Accessible Public Land Transport, 2005.
21. Portland (Trimet), Trimet Bus Stop Guidelines, 2002.
22. Public Transport Authority Government of Western Australia, Design and Planning Guidelines for Public Transport Infrastructure – Bus Route Planning and Transit Streets, October 2003.
23. Queensland Government (Translink), Public Transport Manual, June 2007.
24. The Institution of Highways and Transportation (IHT), Transport in the Urban Environment, June 1997.
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26. Transport for London, Accessible Bus Stop Design Guidance, January 2006.
27. Transit Co-operative Research Program (TCRP), Report 19, Guidelines for the Location and Design of Bus Stops, 1996.
28. Transit Related Road Infrastructure Programme (TRRIP) - Funding and Implementation Policy, Translink (Vancouver), February 2002.
29. Transit Stop Installation, Checklist, BC Transit (Vancouver), undated.
30. VicRoads (Melbourne), Bus Stop Guidelines, 2006.
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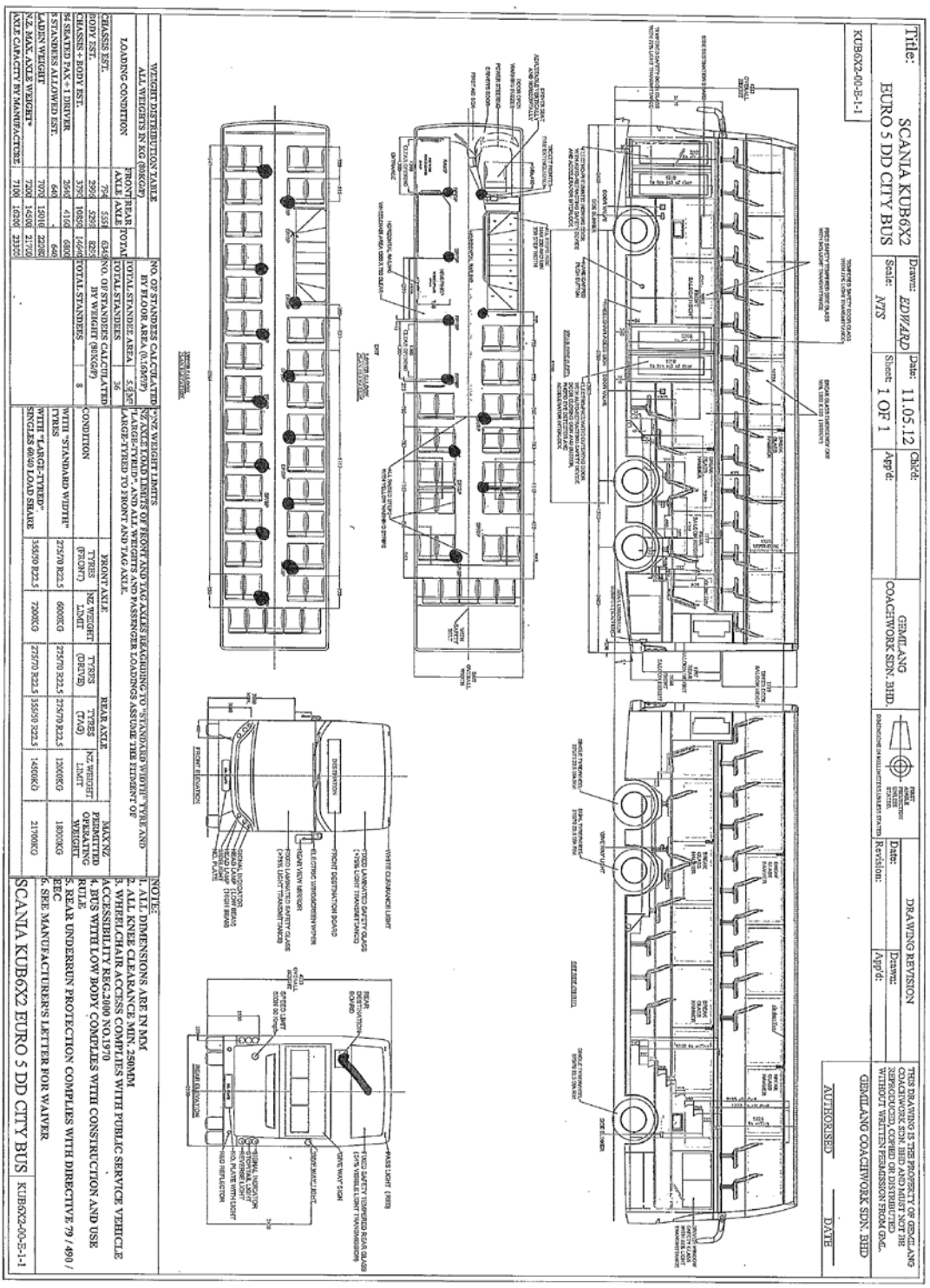
[28] **AS/NZS 4666 2000** - This is the new joint Australia/New Zealand Insulating Glass Unit Standard replacing NZS 4223 Part 2. This Standard covers the installation, performance and thermal and sound insulation of Insulating Glass Units.

Appendix 20A - Example bus plans



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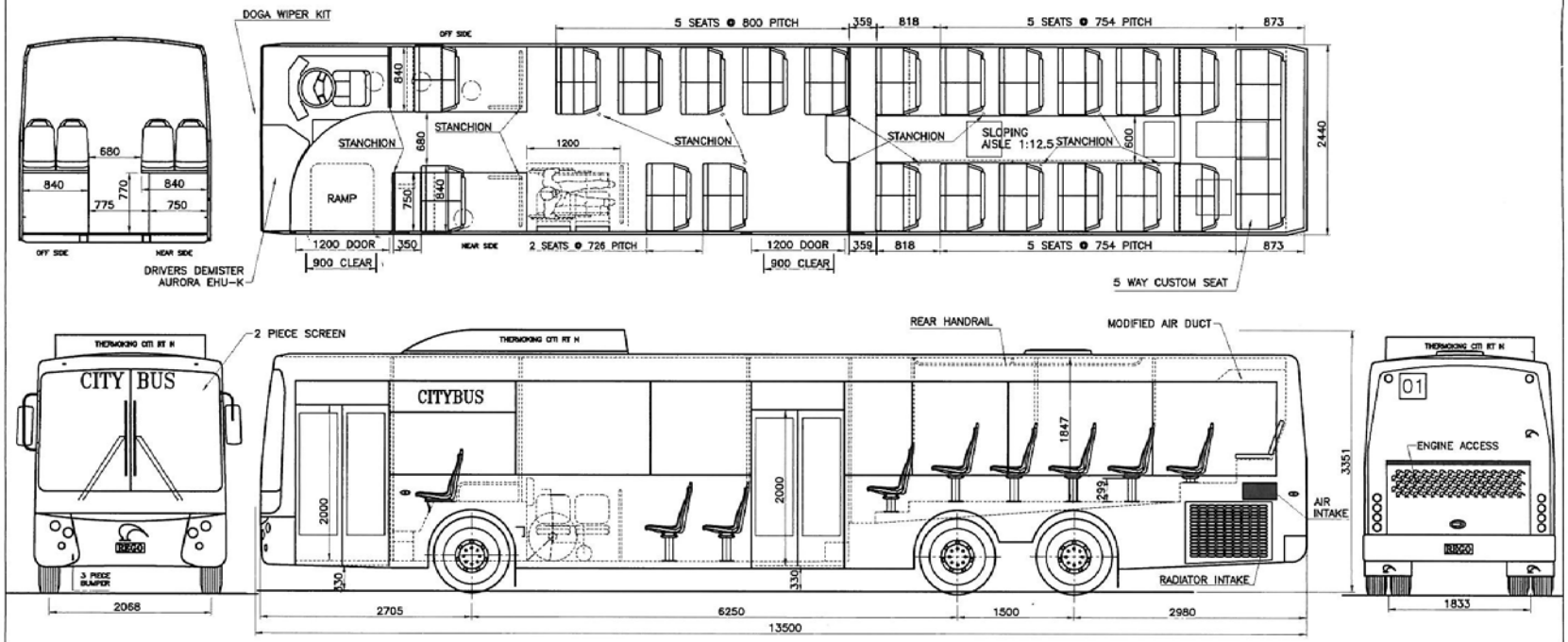
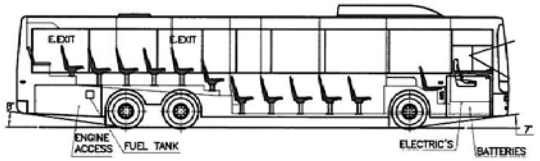
DO NOT SCALE	REPORT ANY ERRORS OR OMISSIONS TO ENGINEERING	IF IN DOUBT ASK



26 STANDEES = 14.7% OVER LOADING AT REAR-13764Kg/GMV=18540Kg
18 STANDEES = 9% OVER LOADING AT REAR-13124Kg/GMV=17900Kg

SCHEDULE OF WEIGHTS	FRONT AXLE	REAR AXLE	TOTAL
CHASSIS ESTIMATE	827	6813	7640
BODY ESTIMATE	2254	2566	4700
TARE	3081	9379	12460
49 PASSENGERS & DRIVER	825	3175	4000
18 STANDEE PASSENGERS	870	570	1440
FREIGHT	-	-	-
GROSS VEHICLE MASS	4776	13764	17900
LEGAL ROAD WEIGHT	6000	12000	18000
MANUFACTURERS G.V.M.	7100	17500	24600
LOAD DISTRIBUTION	%27	%73	100%

MAX. VEHICLE DIMENSIONS			
F. OVERHANG	MAX	MAX. HEIGHT	4250
R. OVERHANG	MAX	MAX. LENGTH	12800
FORWARD DIST.	MAX	MAX. WIDTH	2500
TYRE LOADING			
	FRONT	REAR	TAG
TYPE	RADIAL	RADIAL	RADIAL
SIZE	275 / 70 R22.5		
LOAD	2396	2166	2166
RATING	3825	5485	3825
PRESSURE	115 PSI	115 PSI	115 PSI



SALES DRAWING

AMENDMENTS	
ISSUE 2	2 FOLD DOWN SEATS ADDED GJ 14-8-9

49 SEAT CITY BUS
SCANIA K280UB6X2*4
N Z BUS

KIWI BUS BUILDERS LTD
TAURANGA, NEW ZEALAND
PH. 0064 7 571 0100
FAX 0064 7 571 0110
EMAIL - admin@kiwibus.co.nz

DRAWN	DATE	SCALE	DRG. NO.
GJ	5/8/09	1:50	60166-0000A ISSUE 2

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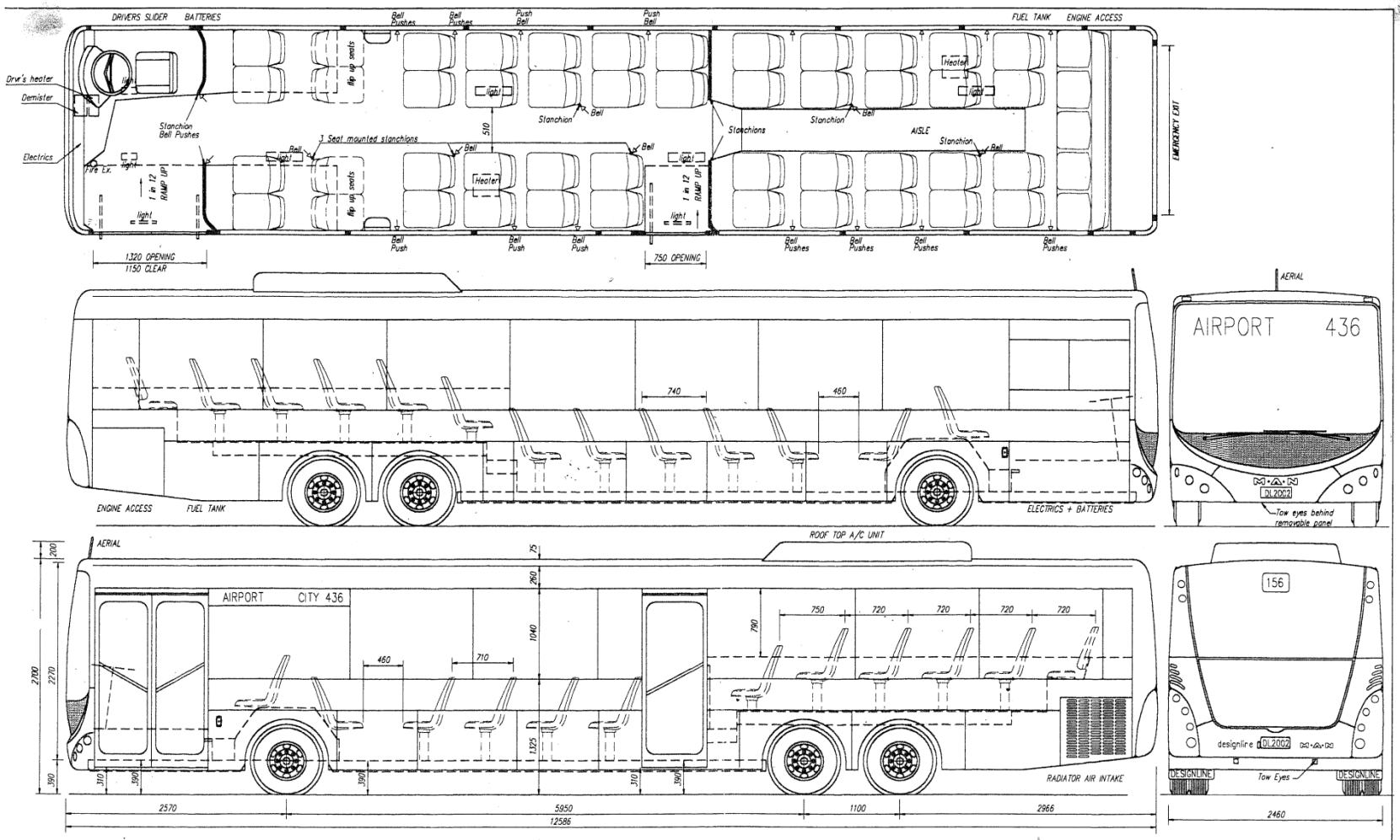


AXLE LOADINGS

	FRONT	REAR	TOTAL
CHASSIS TARE ESTIMATE	990	4610	5600
BODY TARE ESTIMATE	1932	2268	4200
TOTAL TARE ESTIMATE	2922	6878	9800
51 PASSENGERS + DRVR. X 80Kg	1360	2800	4160
26 STANDING PASSENGERS x 80Kg	560	1520	2080
GROSS VEHICLE WEIGHT	4842	11198	16040
MANUFACTURES GROSS RATING	6000	12000	16500
N.Z. MAX.AXLE WEIGHTS	6000	12000	18000
LOAD DISTRIBUTION	29%	71%	100%
CAPACITY OF 265/70R 19.5 TYRES	4900	12980	17880

51 SEAT LOW FLOOR COMMUTER BUS ON DESIGNLINE CHASSIS ALUMINIUM ALLOY FRAME

OPERATOR:

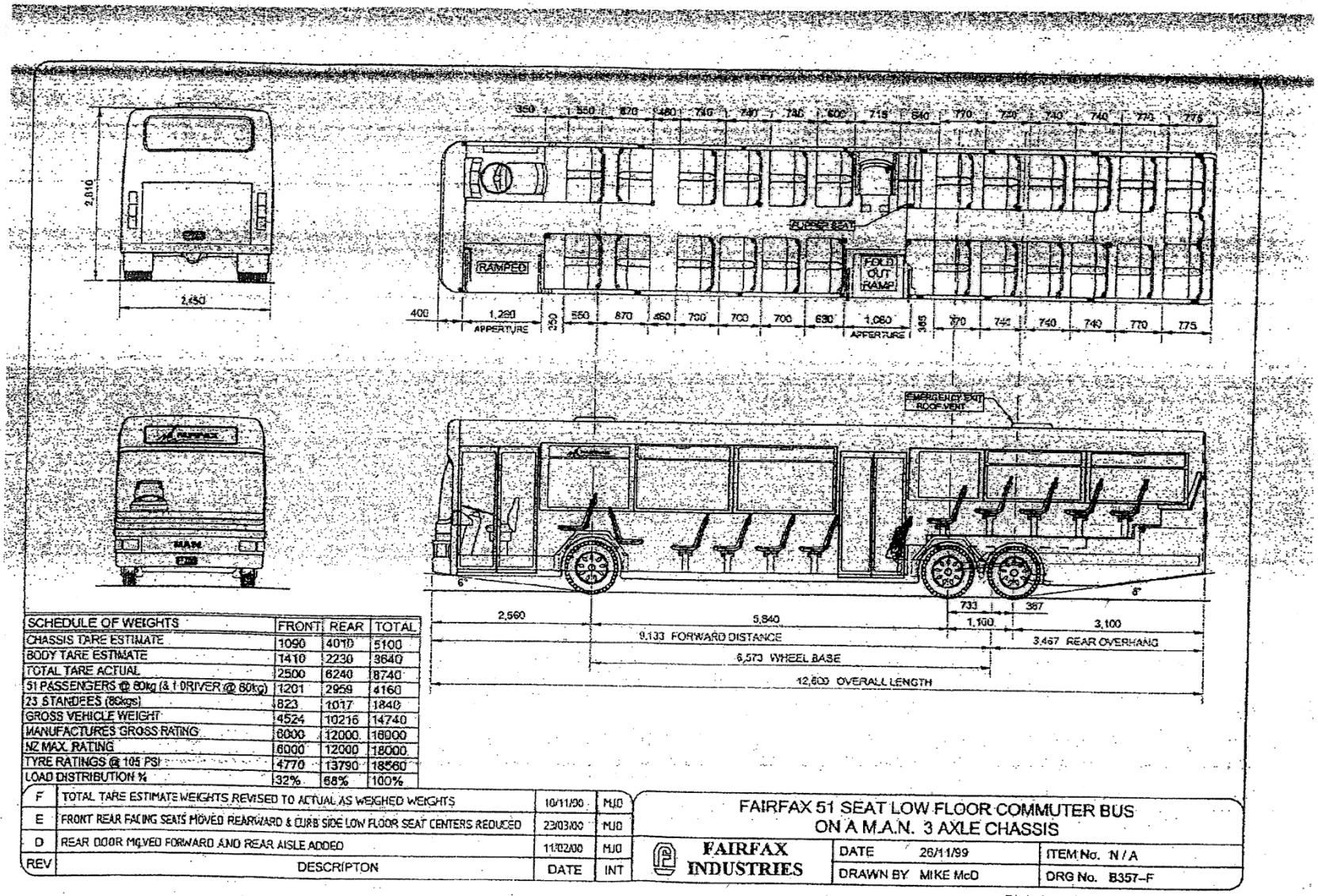
designline LIMITED

Phone (03) 308-4811
Fax (03) 308-4702

P.O. Box 463
ASHBURTON
NEW ZEALAND

SCALE	1 : 40
DATE	15/07/02
CLASS	OMNIBUS
SEATING	51 + 1
CHASSIS	DESIGNLINE
MODEL	CUSTOM
VENTILATION	
AIR CON. MODEL	ROOF TOP

DWG.NO. DL1476A



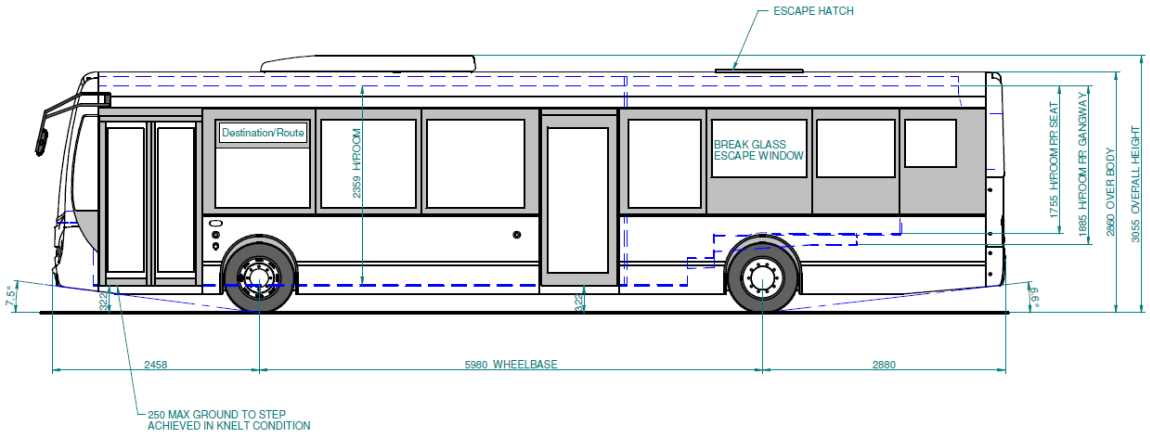
SCHEDULE OF WEIGHTS	FRONT	REAR	TOTAL
CHASSIS TARE ESTIMATE	1090	4010	5100
BODY TARE ESTIMATE	1410	2230	3640
TOTAL TARE ACTUAL	2500	6240	8740
51 PASSENGERS @ 80kg (& 1 DRIVER @ 80kg)	1201	2959	4160
23 STANDEES (86kgs)	823	1017	1840
GROSS VEHICLE WEIGHT	4524	10216	14740
MANUFACTURES GROSS RATING	6000	12000	18000
NZ MAX. RATING	6000	12000	18000
TYRE RATINGS @ 105 PSI	4770	13790	18560
LOAD DISTRIBUTION %	32%	68%	100%

REV	DESCRIPTON	DATE	INT
F	TOTAL TARE ESTIMATE WEIGHTS REVISED TO ACTUAL AS WEIGHED WEIGHTS	10/11/99	MJD
E	FRONT REAR FACING SEATS MOVED REARWARD & CURB SIDE LOW FLOOR SEAT CENTERS REDUCED	23/03/00	MJD
D	REAR DOOR MOVED FORWARD AND REAR AISLE ADDED	11/02/00	MJD

FAIRFAX 51 SEAT LOW FLOOR COMMUTER BUS
ON A M.A.N. 3 AXLE CHASSIS

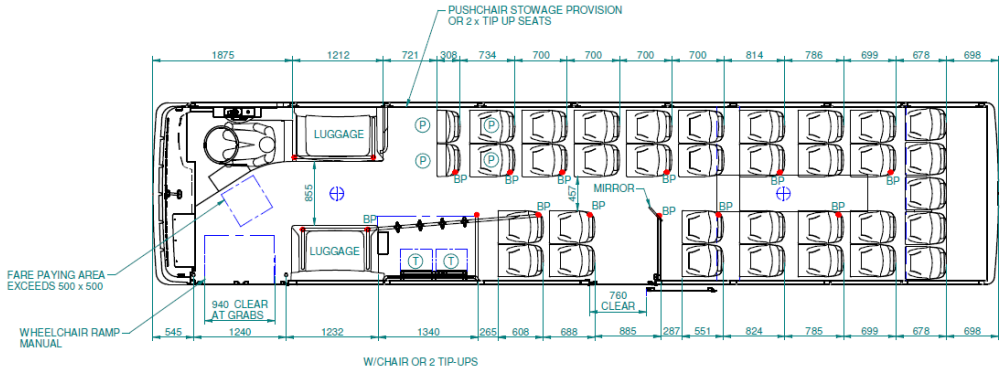
FAIRFAX INDUSTRIES

DATE 26/11/99 | ITEM No. N / A
DRAWN BY MIKE McD | DRG No. B357–F



LEFTHAND ELEVATION

ALEXANDER DENNIS	TITLE : 11.3 METRE E200 BODY ON THE DENNIS E200 CHASSIS (6 CYL) REF: 'NEW ZEALAND' (AIR CONDITIONED)	DRAWN : A. DRUMMOND DATE : 02-09-10 REG No : 2010/0602/HSD	SEAT TYPE : Practico High Back Light Weight	ISS No : 01 DRG No : A242GA	PAGE No : 1



SEATING CAPACITY -
37 SEATED OR 35 SEATED PLUS 1 WHEELCHAIR

STANDEES ESTIMATED AT 18

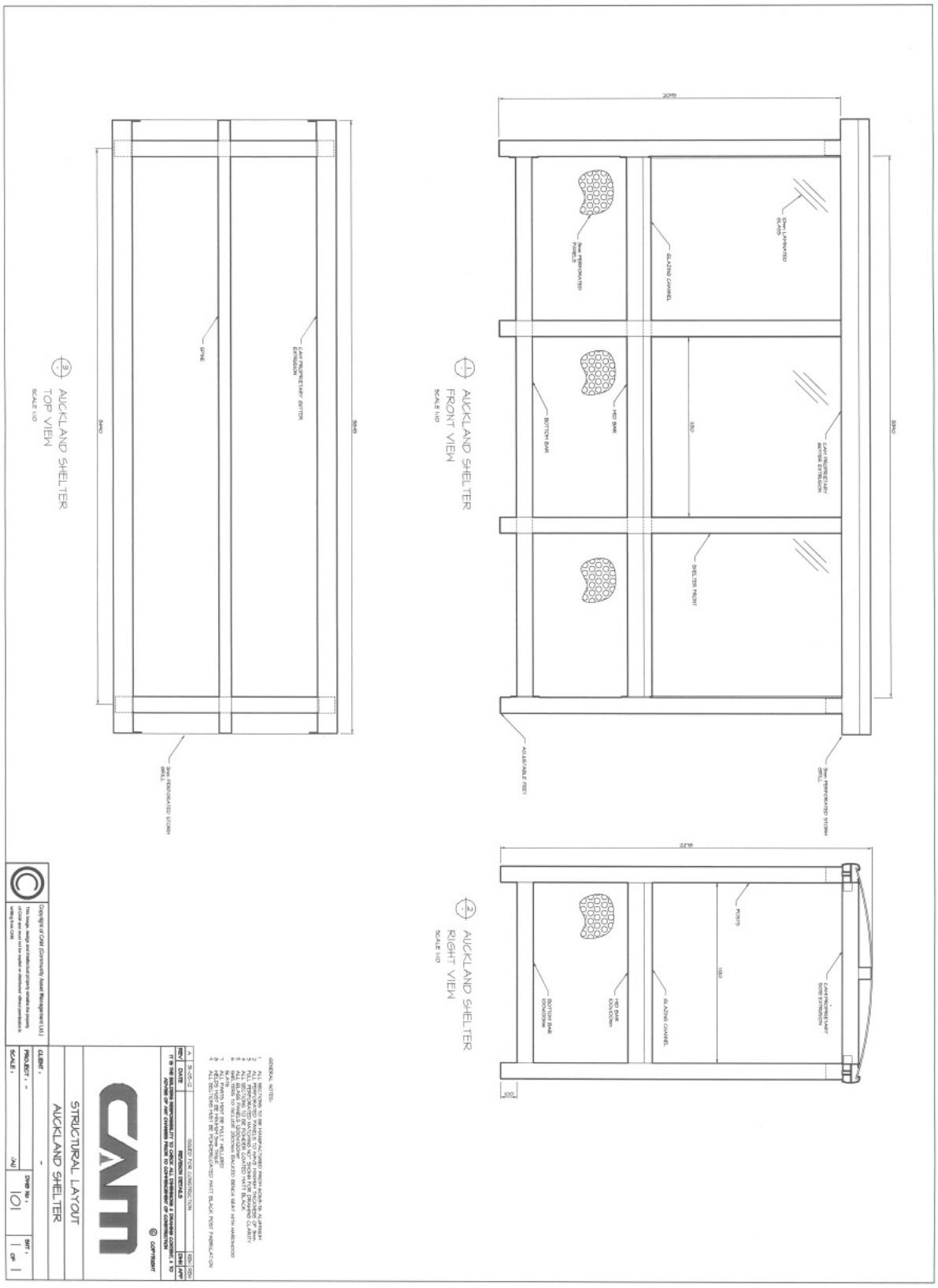
CHASSIS PLATED WEIGHT

FRONT AXLE	4480kg
SECOND AXLE	8720kg
GVW	13200kg

AVERAGE PASSENGER/DRIVER MASS = 80kg
STANDEE AREA = 0.17/MTR SQ

ALEXANDER DENNIS	TITLE : 11.3 METRE E200 BODY ON THE DENNIS E200 CHASSIS (6 CYL) REF: 'NEW ZEALAND' (AIR CONDITIONED)	DRAWN : A. DRUMMOND DATE : 02-09-10 REG No : 2010/0602/HSD	SEAT TYPE : Practico High Back Light Weight	ISS No : 01 DRG No : A242GA	PAGE No : 2

Appendix 20B – Standard CAM Shelter



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Appendix 20C – Real Time Sign Installation Information

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Appendix 20D – Bus Stop Checklist

Bus Stop Check List (Page 1/4)

1 Bus Vehicle Operating at Stop

1a ☐ Check the type of bus vehicle(s) currently serving stop. Length of vehicle is key dimension to consider.

1b ☐ Check with relevant bus operator and/or ARTA on potential future vehicle fleet and use of bus stop.

- *Guideline is designed for 13.5m long tag axle bus. If dimension of bus vehicle is longer than this, designers will need to build appropriate dimensional tolerances or amend bus stop design parameters to suit longer vehicle manoeuvring characteristics.*

2 Bus Stop Spacing and Location (Chapter 3 of guidelines)

2a ☐ Bus stops should be in pair.

- Boarding and alighting stops should be in close proximity of each other, tail-to-tail where possible, on opposite sides of the road.
- Accessible stops should have matching adjacent stops.

2b ☐ Check spacing of stops before and after stop being considered.

- General acceptable standard practice for bus stops within an urban area is a stop every 400m along a bus route.
- However, spacing standard should take into account other considerations, listed below:

Primary factors *to consider when locating new bus stops; or when reviewing/potentially relocating existing bus stops (refer to Table 3.1 of guidelines for further details):*

1 ☐ Convenient to access and maximises the catchment area (maximises the number of people in close proximity to the bus stop)
2 ☐ As close as possible to all major trip generators and key community facilities
3 ☐ Close to where there are likely to be journey transfers
4 ☐ Close to intersections and pedestrian crossing facilities
5 ☐ Consider population densities and land use form
6 ☐ Topography
7 ☐ Road safety
8 ☐ Minimise opportunity for crime and increase perceptions of personal security
9 ☐ No stopping lines
10 ☐ Located away from certain other infrastructure items

Secondary factors *to consider when locating new bus stops; or when reviewing/potentially relocating existing bus stops (refer to Table 3.2 of guidelines for further details):*

1 ☐ Bus stop 'type' and potential impact on surrounding land use
2 ☐ Location of signal pre-emption (bus priority) measure
3 ☐ Footway widths
4 ☐ Potential other conflicting users
5 ☐ Bus service coverage and frequency
6 ☐ Driveways

3 Bus Stop Capacity (Section 3.3 of guidelines)

3a ☐ How many buses will stop at the bus stop at any one time? ☐ buses/hour (at busiest hour)

3b ☐ Do any buses use the stop for lay-over? Yes ☐ No ☐

- Check bus stop timetable and wider service network.
- May need to contact relevant bus operators.
- Stops served by more than 25bph should be split.
- Bus routes with common destinations should share the same stop.
- A balance should be sought between the advantages of splitting stops, reducing bus-on-bus delays and traffic congestion, and the disadvantages of reduced convenience for passengers.

3c ☐ Incorporate capacity requirements to bus stop layout dimensions.

4 Bus Stop Connectivity – Accessible Walking Routes to/from Bus Stop (Section 3.4 of guidelines)

1 ☐ Even and paved footpaths to/from bus stop.
2 ☐ There should be either an informal or formal pedestrian crossing facility in close proximity to bus stops. Pedestrian crossings should be placed behind bus stops.
3 ☐ Pedestrian crossing facility should be placed in accordance with safe road geometry designs (visibility, distance from intersection).
4 ☐ Pedestrian crossing facilities and footpaths to/from bus stops should be designed with dropped kerbs to allow for step-free access and with tactile ground surface indicators.
5 ☐ There should be pedestrian (and to a lesser degree, cycling) shortcuts to bus stops. Ensure that these are maintained and free of debris and obstructions, and well-drained.
6 ☐ Paths to/from bus stops should be well-lit and ideally have some form of passive surveillance.

Bus Stop Check List (Page 2/4)

5 Bus Stop Type and Infrastructure Provision (Chapter 4 of guidelines)

5a ☐ Can the function of the stop be described as one of the three bus types? → Standard Stop ☐ / Regular Stop ☐ / Signature Stop ☐ — Check Table 4.2 in the guidelines for components list relevant to each type of stop.

5b **Check that the following 12 minimum infrastructure provision is provided at ALL bus stops:**

A) Information

1 ☐ Bus stop sign (RP-5)
2 ☐ Bus box area (road marking)
3 ☐ Stop number
4 ☐ Stop-specific timetable (departure times)
5 ☐ Information telephone number

B) Accessibility

6 ☐ Hardstand area for boarding and alighting (8m–9.2m in length)
7 ☐ Tactile ground surface indicators (indicating point of boarding)
8 ☐ – Minimum kerb height of 120mm at front door area, OR
– Ideal kerb height of 150mm; or higher where appropriate
9 ☐ Accessible connecting footpath to/from bus stop (Question 4)
10 ☐ Pedestrian crossing facility in close proximity to bus stop (Question 4)

NOTE:

– Where practicable, bus stop sign can be attached to light posts to reduce street clutter.

– Where no shelter is provided and where possible, bus route and timetable information can be attached to pole or light post.

C) Safety and Security

11 ☐ Lighting at bus stop, use:
– Existing street light, OR
– Adjacent land use lighting, OR
– Explore use of solar powered lighting. Also explore potential to incorporate grid or solar lighting on bus stop shelter roof.

12 ☐ Lighting to/from bus stop (extent this should be taken to should be determined on a case-by-case basis).

Bus Stop Shelter

5c ☐ **Is there a case for providing a bus stop shelter?** Yes ☐ No ☐ → **If No, then provide seating instead.**

The following are considered to be the main criteria for shelter provision:

1 ☐ There are more than 30 passengers boarding per day.
2 ☐ Where bus transfers occur.
3 ☐ Bus stop is located on a QTN route, i.e. high-frequency bus routes.
4 ☐ Other. Even if the bus stop does not meet any of the above criteria, there are many other considerations to take into account. See Section 4.4.5 for details.

5d **If shelter is provided, ensure the following ideal and minimum standards are applied** (see Figures 4.6 – 4.10):

1 Area must be accessible with the necessary clearance and circulation spaces, particularly for people with physical or vision impairments. Ideal and minimum clearance requirements are:

1.a ☐ **Ideal clear path:** a continuous accessible path of travel **1800mm wide** is to be maintained throughout the bus stop area to provide a continuous accessible path of travel for pedestrian through movements, OR
1.b ☐ **Absolute minimum clear path:** In constrained locations, a **1200mm wide** clear path is acceptable as a minimum.
1.c ☐ The area 600mm from the back of the kerb is to be free of fixed obstacles to allow for potential overhang of the bus and its mirrors on entry and exit.
1.d ☐ The boarding and alighting clear area of **1.2m x 8m-9.2m** should be free from fixed obstacles.
1.e ☐ Should the bus stop shelter back directly onto a property boundary, building or fence, the property owner may wish to have a 500–600mm gap between the back of the shelter and the property boundary/fence for maintenance access, etc.

2 ☐ Shelter/seating should be as close to head of stop as practicable. If not possible within current layout, consider amending/widening bus stop area/footpath width.
3 ☐ Shelter should have a minimum of three panels (one back wall and two side panels).
4 ☐ Where four-panelled shelters are provided, two entrances should be maintained to reduce feeling of entrapment.
5 ☐ Maximise the use of transparent materials that enhance visibility and aid passive security. Materials and design must allow passengers to see the approaching bus (whilst standing or sitting down inside shelter).
6 ☐ Glass panels should be marked with a horizontal contrasting stripe between 700mm and 1000mm high to highlight the presence of the glass to users.
7 ☐ Maximise the use of easily maintained (anti-graffiti) materials.
8 ☐ Design should take into account surrounding land use, e.g. heritage areas, residential areas (e.g. in some areas, shelters with advertising may not be appropriate).
9 ☐ Incorporate seating and wheelchair/pram waiting areas.
10 ☐ Be located in a position where there are clear sight lines between the driver and waiting passengers.
11 ☐ Be located on the footway without blocking the main pedestrian through route. Where there is ample width, bus stop shelters should be located at the back of the footpath (unless the specific bus stop layout allows for different configuration (e.g. with a bus boarder type bus stop).

Bus Stop Check List (Page 3/4)

Other Bus Stop Area and Passenger Waiting Area Features
Also check Table 4.2 in the guidelines for feasability/opportunity to provide highly desirable or optional features at bus stop.

5e ☐ Is there a need or benefit to be gained in implementing coloured surface treatment of bus box area? Yes ☐ No ☐

5f ☐ Is there need/opportunity to provide other street furniture at stop?

1 – Rubbish bins — Yes ☐ No ☐
2 – Additional seating (outside of shelter) — Yes ☐ No ☐
3 – Real time information signs (where not already a strongly recommended criteria) — Yes ☐ No ☐

The following criteria provide further guidance on which bus stops should be prioritised for real time information sign provision:

- ☐ Bus stops on major bus routes, i.e. QTN and RTN routes
- ☐ Bus stops near major traffic generators, e.g. shopping centres, schools and colleges
- ☐ Bus stops near transport interchanges, such as rail stations or ferry terminals
- ☐ Bus stops close to other bus routes to cater for transfers

4 – Ticket machine — Yes ☐ No ☐
5 – Vending machine — Yes ☐ No ☐
6 – Cycle parking — Yes ☐ No ☐
7 – Shopping trolley bay — Yes ☐ No ☐

NOTE:
- The amenities at bus stops should ideally be designed as a component of the 'kit of parts' to the overall streetscape, e.g. as part of an overall corridor-based enhancement.
- Consolidate street furniture as much as possible to maximise a barrier free space and create active public spaces.
- Refer to Chapter 4 for further details and recommendations for each type of bus stop infrastructure component.

5g ☐ Are there trees/natural landscaping at or in close proximity to bus stop? Yes ☐ No ☐

If Yes, ensure the following minimum requirements are met:
- Boarding and alighting clear areas are maintained
- Should not obstruct sightline between approaching bus and waiting passengers, shelters or seats with advertising
- Planting on the approach side of a stop should be limited to ground cover or low shrubs (<0.5m high). Trees should be long-trunked with minimum branch height of 4.5m.

If No – Is there opportunity to provide natural landscaping at/around bus stop to improve bus stop amenity? Yes ☐ No ☐

Landscaping should be in accordance with the minimum requirements listed above.

5h ☐ Is there opportunity to incorporate community streetscape features into bus stop shelter (e.g. bus top shelter art, poems, community notice board)? Yes ☐ No ☐

6 Bus Stop Layout (Chapter 5 of guidelines)

6a
Does the existing/proposed new bus stop layout meet the bus stop layout objectives? The most appropriate bus stop layout for the site achieves the following:

1 – Minimises time spent at the bus stop by the bus. Yes ☐ No ☐
2 – Prevents/dissuades other vehicles from parking in the stop area. Yes ☐ No ☐
3 – Allows the bus to line up within 50mm (ideal) of, and parallel with, the kerb (minimum 200mm). Yes ☐ No ☐
4 – Minimises the use of kerb space where there is competing demand for frontage access. Yes ☐ No ☐
5 – Maintains road safety. Yes ☐ No ☐

6b If No to any of the above – look at revising the bus stop layout design, location or surrounding environment. Factors to consider:

1 – Does the bus stop layout have the correct layout dimensions as outlined in the guidelines? Check bus vehicle type(s) and capacity requirements. Refer to figures 5.1 to 5.10. Yes ☐ No ☐

2 – Is the existing/proposed bus stop layout the most appropriate one for the location and use of the bus stop? Yes ☐ No ☐

Summary of bus stop layout options (refer to Chapter 5 of guidelines for more detailed recommendations):

A **Kerbside bus stop** – most common. Length required can be reduced if located in the following locations:
- The exit side of a pedestrian crossing.
- The exit side of an intersection.

B **Full-width or half-width bus boarder** – these are where areas of footway are built out into the carriageway enabling the bus to avoid pulling off the main carriageway (the half-width bus boarder is often a useful compromise). Suitable in the following areas:
- Posted speed limit is 50km/hr or below OR where traffic speeds are below this due to congestion.
- Where the road width is at least 3.5–4m wide. This allows at least 1.5m of road space for on-road cyclists to pass a stationary bus.
- Where bus numbers are high and where loss of kerbside parking needs to be minimised, e.g. CBD, town centres or shop frontages.
- Where traffic calming measures are required to help reduce traffic speeds (unless delay is onerous to other buses and general traffic).
- Where footways are narrow, bus-boarders could enable bus passengers to wait away from pedestrian paths.

C **Full or half-indented bus bay** – these remove bus vehicles from the general flow of traffic while they are stationary or temporarily stationary whilst picking-up or setting down passengers.
- **Full-indented bus bays should be avoided.** They should only be provided where justified for compelling safety or operational reasons or for the following reasons:
  - On roads with a posted speed limit of 80km/hr or higher.
  - Where the bus will have a long dwell time at a stop.
  - Where they will be located in high-occupancy vehicle/bus lanes (with 24hr or 7am – midnight operation).

6c If required minimum dimensions cannot be met, bus designers should consider:

1 ☐ Removing on-street parking/other barriers to provide the required minimum space, if possible.
2 ☐ Relocating bus stop slightly forward or back to where the minimum dimensions can be provided.
3 ☐ Where bus vehicle overhang is a real possibility, ensuring that the footpath width is sufficient to allow pedestrians to walk by without being potentially hit. The use of paving treatement or road marking to delineate overhang area should be considered. The positioning of street furniture in this case should also be considered.

Bus Stop Check List (Page 4/4)

7 Kerb Profile (Chapter 6 of guidelines)

7.a Each site will have variable footway and carriageway crossfall. For each bus stop, check that when a bus vehicle is stopped at the stop and has deployed its ramp, the deployed ramp slope does not exceed the maximum standard of 1:8/12⅝/7 degrees. Yes ☐ No ☐

7.b Does the site present an opportunity or need to provide 150mm or higher kerb heights or 'special kerbs' such as Kassel Kerbs? Note that 'special high kerbs' should ideally only be installed on a corridor-wide basis. Yes ☐ No ☐

↓ Investigate further.

Refer to section 6.2.2 of guidelines for list of aspects to consider when implementing raised kerbs.

8 Other Linkages (Chapter 7 of guidelines)

8.a Is specific driver training required as part of bus stop improvement scheme? Yes ☐ No ☐

8.b Has all the necessary consultation with key stakeholders been undertaken at the appropriate stages of the bus stop design and implementation process?

- ☐ Adjoining landowner
- ☐ Relevant bus operators
- ☐ ARTA
- ☐ NZTA (if appropriate)
- ☐ Within TA:
  - ☐ Transport strategy/transport planning (including walking and cycling officer(s), passenger transport team)
  - ☐ Policy advisor – disability issues
  - ☐ Land use planning team
  - ☐ Appropriate urban design staff
  - ☐ Traffic/road safety team
  - ☐ Implementation/project delivery team
  - ☐ Maintenance team (ensure that the appropriate maintenance departments are aware of new/amended bus stops as this impacts on maintenance budgets, etc).

8.c **Funding.** Ensure that the appropriate funding/implementation strategy has been applied to bus stop improvements, e.g:

- Is it appropriate/best to improve the bus stop as a stand-alone stop OR is it better to apply a corridor-based approach?
- Are there any other projects/schemes occuring in the near future in which the bus stop improvements could be undertaken at the same time, e.g. town centre upgrade, etc?

8.d Is there any opportunity to link bus stop improvements with cyclists/the cycle network? Yes ☐ No ☐

A designated cycle network to/from or near bus stops increases the catchment area of the bus passenger transport system. Where this is the case, consideration should be given to providing cycle parking at the bus stop. Cycle parking should be designed and located so as not to create a hazard, or impede access, for disabled people.