Practice Note 04

Cycling Infrastructure - Interim Facilities

Supplement of Engineering Design Code – Cycling Infrastructure
03 Approved facilities within the road reserve
3.7 Interim Facilities
Edition 1, July 2024

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1. Purpose

This Practice Note (PN) is supplemental guidance, further to that provided in AT TDM for Cycling Infrastructure. It expands on those standards, and in places supersedes it, but does not replace the original standards.

It is intended specifically to guide design of Interim Facilities (design life up to 15 years) for installation within the existing built environment in Auckland.

The interim facilities (separated cycleway) design is intended to reallocate road space largely without moving kerblines although some kerb changes may be required for example at bus stops, loading bays, side road entries and other intersections. The approach enables quick roll-out of an interim cycle network that could be upgraded in future if necessary.

Interim facilities are designed to work with existing infrastructure as much as is practicable to strike an effective balance between cost effectiveness and ideal usability, legibility, attractiveness, and aesthetic outcomes for street users. Safety must not be compromised.

The current standards for AT Transport Design Manual Engineering Design Code (EDC) – Cycling Infrastructure and for Auckland Council Code of Practice for Land Development and Subdivision (AC CPLDS) Chapter 3 Transport, and specifically section 3.5 Cycling Infrastructure) are focused on best practice standards for new long-term infrastructure catering for all ages and abilities (AAA). It is recognised from past projects that working within the constraints of the existing kerb lines, the preferred cycle infrastructure dimensions cannot always be achieved alongside the other functional requirements of the road.

It is based on research of good practice in New Zealand and elsewhere, and lessons learnt from project delivery.

2. Scope

This PN applies to cycling and infrastructure projects which aim to provide for cycling in the short or medium-term, while minimising changes to the existing built environment, rather than completely re-designing the street to fully meet AT TDM Cycling Infrastructure standards. It can also be used where new infrastructure inserted into brownfield development, such as a new development frontage upgrade or road improvement, is tied into an existing road corridor where there are constraints, to ensure that the new cycle connection ties in meaningfully with the adjacent existing street and cycle network. These cases include:

i) all AT projects initiated after implementation of this PN.
ii) all Consents or Engineering Approvals lodged after implementation of this PN where:
   a. existing roads may not have sufficient space for cycle infrastructure meeting TDM or AC CPLDS standards, or
   b. adjoining sections of existing roads do not have space for cycle infrastructure meeting TDM or AC CPLDS standards and an interface with future or existing infrastructure in accord with this Practice Note is not practicable. “Space” includes existing road reserve width, designation width or land that could be vested as part of the Consent.
iii) any AT project commenced but not yet constructed or any Consent or ENG lodged with Auckland Council:
   a) if the Manager – Design & Engineering considers that a safety issue would arise if the design were not changed.
   b) if it is practicable to change the design prior to construction.

c) where the cost of changing the design is approved by the client.
iv) Any review of the safety of existing cycling infrastructure.

The PN should be applied in a manner that:

- all infrastructure complies with AT's and AC's Vision Zero. AT is a Vision Zero (VZ) organisation, hence all measures will either have to improve or as a minimum maintain safety levels as part of the Road to Zero towards Vision Zero.
- transport infrastructure complies with AT's Transport Design Manual requirements. It does not replace the original standards, except where this Practice Note conflicts, in which cases this Practice Note supersedes TDM version 1.
- implementation is effective from the date of this PN.

This PN does not apply to new development where the existing environment is not deemed to be a constraint that prevents full application of Transport Design Manual document.

This PN voids the requirement for Departure from Standards stated in EDC Cycling Infrastructure under section 3.3 Alternatives Requiring Specific Approval; for sub-section:

- Two-way Cycleway, and
- Reduced Width Cycleway (refer to Table PN04-3: Cycleway Width Dimension).

3. Context

3.1 Design Period

This Practice Note is informed by recent practical experience of deliver cycling infrastructure projects in Auckland. The Innovating Streets programme of 2020/21 led to the rollout of several demonstrations (one day to one month), pilot (one month to one year) and interim (five+ year) cycleways which provide a range of cycling infrastructure types based on the lifespan of the separator material. The recent Cycling and Micromobility Programme Business Case (CAM-PBC) programme adopted the use of separator material options based on the interim design spectrum to reallocate space between existing kerbs quickly and in a way that appears permanent. The interim design provides a flexibility to work within the roadway and have the safest outcomes compared with demonstration and pilot designs (short-term) based on the selection of separator material types.

The Practice Note took lessons learnt and tried to demonstrate a design approach that will achieve a balanced outcome for road users in the medium-term / interim projects spectrum as shown in the second column of the Design Period timeline below.

Location: Market Place	Location: Ian McKinnon Drive	Location: Karangahape Road
Short-term/ Trial projects	Medium-term/Interim projects	Long-term/Capital projects
1 – 5 years	5 – 15 years	Above 15 years

Figure 1: Design periods
(Source: Auckland Transport)

3.2 Strategic Network Priorities

Strategic documents such as the Auckland Transport Alignment Project and the Auckland Plan together with Future Connect feed into the Roads and Streets Framework providing strategic direction. In turn, the Road and Streets Framework provides the vision for streets, guiding the Transport Design Manual, while the Road and Streets Framework will help to define user prioritisation. In addition to that, AT have adopted the Room to Move strategy to help in repurposing kerbside space to improve the safe movement of people, goods, and services on some of the major critical roads in Auckland.

Network information must be checked against current Auckland Transport defined networks such as Future Connect, or network changes approved under Precinct, Framework Plans or Resource Consents. AT Subject Matter Experts must review the design proposals when interim facilities are proposed on bus routes, freight routes or Fire Emergency New Zealand (FENZ) critical routes. This can be done through the Design Review Process at concept level and through the later stages of design. It is also important to ensure that key stakeholders are appropriately involved. Further details can be discussed with the AT Design Review team.

3.3 Design for Safety: Vision Zero

Vision Zero acknowledges human error and fragility but doesn't accept that death or serious injury should be inevitable or an acceptable outcome of travelling on the transport network. This is based on the harm minimisation approach. AT has adopted Vision Zero and committed to safety as a critical priority for investment and decision making. As outlined in AT Urban Street and Road Design Guide page 35, the Guiding Principle: Design for Safety requires the greatest Safe System alignment possible to maximise the safety return from each project. Safety of all street users, especially the most vulnerable users (children, the elderly, and people with disabilities) and modes (people walking and cycling) should be paramount in any street design.

This PN recommends options for installing Interim facilities (separated cycleways) to increase safety and to enable mode shift in a way that offers a consistent level of service.

3.4 Design for People

In some cases, there will be interim facilities sections that might interact with pedestrian (including bus passenger) space. For these specific locations, AT Urban Street and Road Design Guide page 35, the Guiding Principle: Design for People prescribes that careful attention must be given to providing a comfortable, safe, interesting and engaging experience to those who use the street on foot, and making sure the most vulnerable people (children, the elderly and people with disabilities) can travel safely within the road reserve. The project team needs to provide clarity on the impact of interim facilities to pedestrians and consider universal access: every street must be accessible to people of any age and any ability. AT's adopted the Accessibility Action Plan policy to make the transport system more equitable to all users. This is critical as some of the interim measures may be perceived not to be entirely in line with this policy.

When interim (design) interventions have impacts on the public realm and pedestrians, the delivery of benefits needs to be scoped clearly with the client to maintain consistency with long-term network planning. The approach must also be communicated clearly with stakeholders.

3.5 Quality of Service

The type of user and user experience (such as type of expected user and level of confidence) needs to be defined, with the design scope. A reduced quality of service and/or focus on a limited cycle user type (e.g., more confident riders, 'interested but concerned') may be considered when providing an interim intervention. Any change to existing cycling infrastructure must not lead to a reduction in the Level of Service for existing users. This is something to be worked through with relevant communities to test the appropriate threshold that creates balance between existing users and targeted users.

While specific arrangements will need to be made in some places, design should always aim to provide a safe, direct, connected, obvious, comfortable route for anyone cycling. Any compromises should be around widths and aesthetics rather than user experience, safety and functionality.

Further reductions compared to the Practice Note design standards may be allowed by exception through the Departure from Standards process, e.g., reduced widths or the use of materials that have a shorter life span if there are site-specific constraints. However, reasoning for a Departure from Standards request must be robust, including details of all other options explored and the reasons that they cannot be used.

4. Design Outcome

4.1 Reallocating Roadway Space

In addition to providing a safe separated space for people to cycle in, reallocation of the roadway to create separated cycleways can deliver wider benefits such as:

- reduced roadway width which supports safer traffic speeds.
- reduce crossing distances for people walking, and separation of conflict points.
- safer space for each mode to interact by providing a separation along the corridor and managing conflict with kerbside activity.
- features that minimise risks/conflicts and the speed (energy) of vehicles where people cycling and walking interact with motor traffic at intersections and crossings.
- fewer light wheeled devices using the footpath by providing their users a more appealing facility. This is safer and more comfortable for people walking, particularly people with disabilities or accessibility needs.

Reallocation of roadway space usually provides better outcomes on existing roads compared to building separated cycleways within berms. This is because paths in berms, impact environmental and health outcomes by reducing green space, shorten sightlines at driveways and junctions, can be challenging to differentiate physically and visually from the footpath, and generally incur greater construction costs. Another alternative, e.g. Shared Paths also often provide an inferior and less equitable outcome; this is discussed as part of PN04 section 4.2.

Cycling infrastructure that is placed in an existing street environment affects everyone using that road. The street as a system and how the interim cycle facilities would alter this system should be considered in the context of the design framework. Street types defined in One Network Framework as: Activity Street, Main Street and Urban Connector are equivalent to most urban arterial and collector roads.

4.2 Separated Facility

On this Practice Note, Auckland Transport aims to achieve separated space for each mode when reallocating road space. The design outcome is to ensure that delineation is provided to give clear cues for people using each mode in the new road arrangement. Therefore, Shared Path design sits outside the scope of this Practice Note because:

- Shared Paths are not an approved infrastructure type and can only be used in carefully considered specific cases, given the significant safety and access issues they generally present to people cycling as well as to people walking.
- Shared Paths are mainly inappropriate due to mixing two different user profile with different needs, speeds, and unsafe interactions. The sheer number of people walking or cycling in urban road and street environments requires separate facilities.
- Shared Paths are not usually appropriate along urban roads due to the frequency of driveways, side roads, bus stops, building frontages and other features, and therefore they exacerbate the unsafe interactions and higher propensity for conflict between people walking, cycling and driving.
- This Practice Note covers interim measures with a focus on cost-effectiveness, while Shared Paths are generally more expensive than space reallocation within existing kerblines.

Further discussion about Shared Path should be made through Departure process. Departure document needs to capture site-specific context. See further explanation on EDC Cycling Infrastructure Section 4.4 Shared paths.

Shared pedestrian/cycle surfaces are acceptable in limited circumstances. These are:

- alongside motorways, interurban and suburban roads where there are very few pedestrians present and there are few side roads and driveways per kilometre;
- away from the roads in reserves, boardwalks or where there is redundant roadway repurposed for walking/cycling following a road improvement scheme;
- ‘Shared Corners’ and other short sections of route that connect to pedestrian/cycle crossings. Shared Corners must be examined on a case-by-case basis;
- roundabouts where there is insufficient space:
  - to form separated paths for people to walk and cycle; or
  - for people cycling and driving to circulate the roundabout together safely;
- core urban areas as part of an ultra-low-speed urban design environment e.g. Lower Queen Street, and which are typically public plazas such as Te Komititanga. As in shared spaces, the governing speed for a wheeled device is 10km/h in these urban areas.

The disadvantages of Shared Paths, compared to separated footpaths and cycleways include:

- The higher speed required to operate wheeled devices would usually create unsafe interactions for pedestrians, particularly those who have disabilities or accessibility needs. Such barriers can result in displacement or deterrence of a pedestrian trip. Many footpath users are unlikely to sense when a wheeled user is approaching, and may be startled, or be hit by, a faster-moving wheeled user passing them at speed. This is especially the case given that walking is the most human-scale mode, and a lot of people therefore aren't accustomed to the level of control which is required for safety and efficiency of other modes, such as give way rules and keeping left.

- The Perceptions of Walking and Cycling Report 2022 found that New Zealanders perceive walking in a space shared with scooters and cycles as the second most dangerous aspect of walking, behind only walking at night.
- Faster-moving users, such as those on wheels, require longer sightlines. Shared Paths are often located closer to boundaries at vehicle crossings, intersections, and on bends resulting in poor sightlines which increase the risk of conflict. While people cycling need a greater sightline distance due to speed, the higher speed may not be registered intuitively by a driver who perceives the environment to be a footpath, so creating unintentional unsafe interactions.
- Kerbside activities such as parking, loading, waste collection and bus stops can result in pedestrians crossing or standing in the shared space, which creates conflict with moving cyclists, as pedestrian movements are less predictable in these circumstances.

It is recommended that clearly separated cycleways and footpaths are continued through street elements such as intersections and bus stops. Careful design of these spaces is particularly important due to the greater risk of conflict in these areas.

The preference for road space allocation is therefore to provide dedicated space for people to cycle within the roadway. When designing separated cycleways on the roadway, the type of separation and the width of the separator and cycleway will be determined by the actual speed and volume of traffic (including proportion of heavy vehicle), anticipated cycle use and the accommodation of kerbside activities along the corridor. This is discussed in further detail in PN04 Section 7.

4.2 Safe Speed

Interim cycle facilities are generally suitable for roads with a posted speed limit of 50km/h or less. Use of an interim facility within a 60km/h environment can be considered on a case by case basis as temporary infrastructure. Speed limits can be changed as part of interim cycling projects (road space reallocation often includes scope to reduce operating speeds), further discussion with AT Road Safety team.

Alternatively, at the specific conflict location, designers should manage speed by installing design elements such as traffic calming as part of such projects: refer to EDC Traffic Calming. Where possible, in the local road environment or in busy areas a 30km/hr or lower speed limit is preferable.

Wider separation between vehicle and cycle traffic should be considered if the posted speed limit is 50km/h or 60km/h.

5. Design Parameters

The Practice Note uses the same design parameters as TDM Cycling Infrastructure, which covers user dimensions, cycling speeds, speed in a specific spatial context, and geometric design.

When designing facilities, a designer needs to:

1) consider the design measure to address the safety issues. An interim cycling facility needs to ensure that a Safe Systems Assessment is completed (assessing each of the options considering safety for vehicle drivers, bus passengers, pedestrians, cycle riders, and motorcycle riders). Further information can be found in NZTA Waka Kotahi website, for example Safe Systems Assessment guidelines document from NZTA Waka Kotahi. For further discussion contact AT Technical Lead Transport Safety and AT Technical Lead Active Modes Integration;
2) develop a method of assessing the risks associated with the design: an accessibility audit or non-motorised audit (not equal but similar) must be considered. This is particularly relevant if shared facilities are involved. Alternative tools can be found The Separated Cycleway Options Tool;
3) achieve a balanced outcome between the width of cycleway surface and separation from traffic. In some cases where traffic lanes are narrow, separation width is more important in order to keep people cycling in a safer user envelope. See PN04 section 5.2.1 Traffic Lane Width to check requirements.

5.1 Cycleway Design

The Separated Cycleway Options Tool from NZTA Waka Kotahi is a useful tool for a high-level risk analysis and comparison of one-way and two-way facilities. Comparing one-way and two-way cycling facilities is an important step to ensure that the facility fits into the existing road environment. While two-way cycleways require less roadway space, they add complexity at junctions and crossings (see Tables PN04-1 and PN04-2).

Table PN04 - 1: One-way Cycleway consideration

One-way / Uni-Directional Cycleway	
Best Use cases: Considered to be the most accessible and safest facility for most streets.	
Advantages	**Disadvantages**
Provides cycle access to destinations both sides of a street; of significant benefit on streets which are wide, carry high volumes and/or high-speed vehicles.	Infrastructure changes on both sides of a street, so construction is more disruptive.
Safer at intersections and driveways.	Requires wider road space allocation for effective cycleway width and separators.
People travelling on the left side of a street is consistent and legible for all users (similar to vehicle movement).	Riders are unable to overtake if width is below 2.0m.
Legal right of way through unsignalised side streets is simpler to implement.	

Table PN04 - 2: Two-way consideration

Two-way / Bi-Directional Cycleway	
Best Use cases: Two-way cycleway can be considered when this would lead to a better-quality outcome. It can be a safe and attractive option where there are few side roads on one side of the road compared to the other, for example when a road is parallel to an open space/reserve, seafront, or railway corridor.	
Advantages	**Disadvantages**
Generally reduced cost, as only one row of separators is required, as well as treatments for bus stops and side streets are required only on one side of the street.	Complicated intersection design. For priority intersection - movement restrictions and / or speed management measures are likely to be required to minimise risks. Constraints at intersections can compromise safety or Level of Service.

Reduced space requirements, due to only one row of separators being required.	Other road users are less likely to perceive people travelling along the right-hand side of a street, such that there is an increased chance of crashes at vehicle crossings, side streets, and through bus stops.
Provides more space for manoeuvring and overtaking within the cycle facility, catering to a wider range of users	Crashes between people cycling on the right side of the street and turning traffic are more likely to be severe. Refer to intersection treatments (PN04 section 6) for more detail and options to mitigate this hazard.
	Cycle access to the other side of the street can be more difficult and may require additional crossing points.
	Waste collection requires engagement with operators to determine local arrangements since the two-way cycleway width is (potentially) above the maximum arm reach of a rubbish collection truck (depending on vehicle).
	On tight radius kerbs, tracking needs to be checked for two cycles with trailers or two cargo cycles passing in opposite directions of travel. This may require some widening through the inner lane of the bend.
	There will be a speed differential between riders on uphill-downhill movements leading to potential conflict within the cycle facility. This is particularly the case on steep road gradients, e.g. above 5%.

5.1.1 Cycleway Width

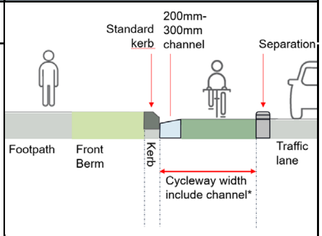
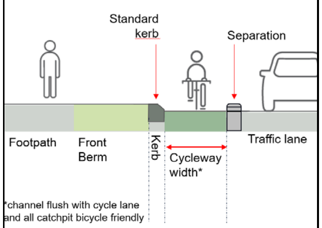
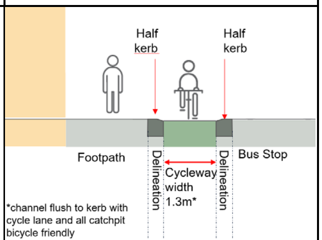
A cycleway design that is suitable for a wide range of user types depends on the usable width and the anticipated volume of cycle traffic. The ideal width would accommodate two people riding side by side for social cycling or space to overtake.

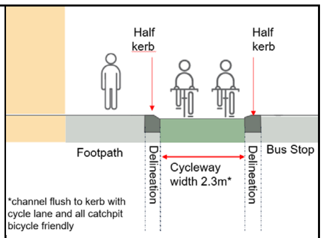
Localised reduced width is not generally acceptable as it will deter some users. A Departure from Standards to 'absolute minimum' might be acceptable if justified strongly on grounds of safety (i.e. where there is a net safety benefit compared to a 'do nothing' alternative). This might be the case at bridges and tunnels or where a road corridor is bounded by retaining walls, steep embankments, or other physical constraints.

Cycleway width should also consider the full road cross-section including the number of traffic lanes. Contexts such as categories of road (for example FENZ, freight, and PT routes) combined with design speeds are important to be integrated with the cycleway width below. 'Wider than minimum' is recommended for high-volume cycle routes where possible.

The cycleway width in Table 3 below includes channel width with the condition that the channel should be made suitable for cycling (flush channel and with cycle-friendly catchpits). See PN04 section 5.2.4 Channel Condition. Lateral clearance needs to be considered when selecting the width.

Table PN04 - 3: Cycleway Width Dimension

Cycleway Width				
	One-way	**Two-way**	**Notes:**	**Supporting Diagram**
Preferred	2.0m	3.0m	-	PN04-3 Diagram 1: Cycleway Width
Minimum	1.8m	2.6m	- Cycleways steeper than 5% longitudinal grade must consider greater width. - Not appropriate for high-volume cycle routes. Check Future Connect and wider cycle network (to determine if there is an alternative route to complement the proposed route).	
Minimum for constrained environment - with maximum length.	1.6m	2.6m	- Applicable only on a constrained environment for short distance (maximum 100m length). In locations such as: bridge, signal-controlled crossing, or intersection. - For existing bridges, conditions need to be checked during the design investigation. Bridges usually have a higher kerb which requires designer to consider horizontal clearance in the design. - For bus stops, kerb separation at full height to the traffic lane and delineation between the path and bus customer platform is required. PN04 section 7.1 Bus Stop Design. - Surface level across channel and seal is flush so as not to pose a hazard. - This compromised solution doesn't allow for comfortable overtaking nor side-by-side riding. Safety must be justified when selecting this width.	PN04-3 Diagram 2: Cycleway Width in a constrained environment
Absolute minimum (one-way)	1.3m		- Applicable only on Bus Stop Design (maximum 15m length). - Departure required for longer length on Bus Stop location (above 15m to enable two-bus platform) and other constrained locations. - Requires checks for vertical constraints and review through Departure from Standards process. - Safety considerations should be included in the Departure justification. - Kerb separation is full height to the traffic lane and delineation between the path and bus customer platform is required. See PN04 section 7.1 Bus Stop Design. - Surface level across channel and seal is flush so as not to pose a hazard. - This compromised solution doesn't allow for comfortable overtaking nor side-by-side riding.	PN04-3 Diagram 3: One-way Cycleway Minimum Width in a constrained environment

Absolute minimum (two-way)		2.3m	- Departure from Standards required. - Only applicable on Bus Stop design (maximum 15m length) through the Departure process. Safety consideration in Departure justification must be explained well when selecting this width. - Kerb separation is full height to the traffic lane and delineation between the path and bus customer platform is required. See PN04 section 7.1 Bus Stop Design. - Surface level across channel and seal is flush so as not to pose a hazard.	 PN04-3 Diagram 4: Two-way Cycleway Minimum Width in a constrained environment

A separated cycleways not in accordance with Table PN04-3 may only be used if it is approved through a Departure from Standards, in specific cases:

- in a constrained location.
- for testing a new item.

5.1.2 Clearance Width

5.1.2.1 HORIZONTAL CLEARANCE

Clearance (a "shy zone") is required from any hazard that may be impacted by a pedal or a handlebar. Clearance distances need to be considered in addition to the usable width of the cycleway, refer to EDC Cycling Infrastructure Section 3.7.1 Interim Facilities – Design Life up to 15 years, table 13 Edge Clearances for clearance to vertical features; and Section 8.5 Drainage – Water Sensitive Design for clearance to stormwater devices. In addition, if there is a retaining wall drop of 1.0m or more downwards, provide at least 1.0m clearance. If 1.0m is not achievable, clearance may be reduced to 0.5m minimum for localised constraints, and barriers or fences will be required.

5.1.2.2 VERTICAL CLEARANCE

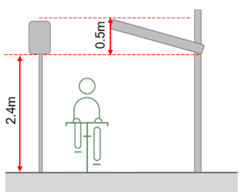


Figure 2: Vertical clearance to structure or signs
(Source: Auckland Transport)

The minimum vertical clearance (headroom) to structure and signs (such as directional signs or electronic signs) is 2.4m (refer to SED Geometric Design 001) based on the standard height range for cycle riders between 1.8 to 2.2m.

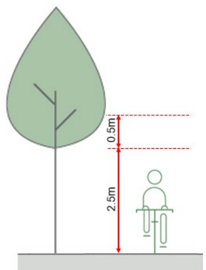


Figure 3: vertical clearance to vegetation
(Source: Auckland Transport)

While the vertical clearance requirement to vegetation is 2.5m and an additional 0.5m allowance must be added for seasonal growth for vegetation (refer to SED Geometric Design 002).

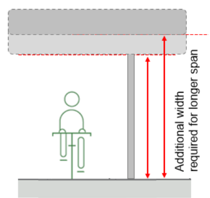


Figure 4: Vertical clearance to (underpass) structure
(Source: Auckland Transport)

Underpasses should have a minimum 2.5m height clearance for spans under 15m, or 16approx. 3m if longer. Underpasses should be a minimum width of 4m if sides are vertical; 3m is acceptable where the sides are sloped outwards to be wider at the top than the bottom (refer to EDC Cycling Infrastructure section Ancillary features – Bridges & Underpasses).

5.1.3 Separation Width

5.1.3.1 CYCLEWAY AND ROADWAY

The separation between the cycleway and the roadway provides several functions. Most importantly it is the safety margin between faster moving traffic and people on bikes and other kerbside elements. The separation width determines what it can be used for. Separation width contains two elements: physical separation, which is the cycle separator (refer to PN04 section 5.1.4 for Types of Separation) and non-physical separation such as shoulder hatch marking and/or edge line. In some cases, if the gap between physical separators is longer, then those gaps should be filled by hatched markings.

There are two types of separation on roadway:

a. Between the cycleway and the live traffic.

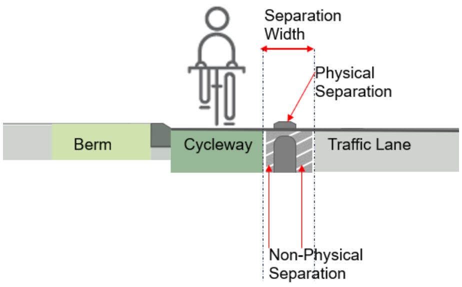


Figure 5: Separation to live traffic
(Source: Auckland Transport)

Table PN04 – 4: Separation consideration: Between cycleway and live traffic

Preferred	1.0m
Acceptable	0.6m
Minimum	0.4m (able to fit narrower – low height separator 300mm concrete separator SED CY0007 or plastic/rubber separator CY0010, CY0011, CY0012, CY0013, CY0014). Designer needs to justify during design process (consideration within existing environment). Only where speed limit is 50km/h or lower.
Minimum width with Departure from Standards (only applicable at specific location)	0.3m (able to fit RPM)
Note: More width is required for comfort/safety where there are greater volumes, greater speeds, a greater proportion (>10%) of heavy vehicles, and/or for over-dimension routes*. In general, a wider cycleway, and narrower separator will be most comfortable for people cycling.	

**Separation width should also increase where the traffic lane is a designated Over Dimension routes which cater for occasional use by over-dimensional loads. Over Dimension routes within the Auckland Region can be found in AT's GIS database. See PN04 section 5.2.1 for information on traffic lane width requirement.*

b. Between cycleway and kerbside activity

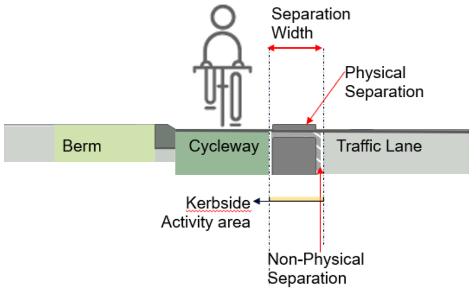


Figure 6: Separation to kerbside activity
(Source: Auckland Transport)

Table PN04 – 5: Separation width consideration to enable kerbside activity

Kerb side bus platform* **Further bus stop information covered in section 7.1*	1.2m (minimum) + delineation width (various between 300mm to 600mm)
Vehicle crossing ramp	0.9m (minimum)
Traffic pole, push button, signposts, wayfinding	0.85m (minimum)
Rubbish bin between separators (depends on rubbish bin. Refer to Auckland Council information)* **Further waste collection information covered in section 7.3*	0.8m – 0.6m
Loading activity* **Further loading zone information covered in section 7.6*	0.8m (minimum)
Kerb side parking (car door opening)	0.6m (minimum)
Note: Designer to consider separation width between the road markings (non-physical separations) and separators (physical separation) on the traffic lane side.	

5.1.3.2 CYCLEWAY AND FOOTPATH (BERM SPACE)

This separation width will encourage cycleway and footpath users to stay in their respective spaces, for the comfort and safety of both groups. Separation on footpath or delineation can be achieved through level difference as well as horizontal features. A cycleway may be placed at half-height to the footpath or at the same level as the footpath. Delineation is important for pedestrians, especially people with disability or accessibility needs, who often find it very uncomfortable, even dangerous sharing with faster-moving wheeled users. This will also enable people cycling to maintain a steady speed for a good level of service.

The more differentiation is applied (colour, surface material, level difference, width of separator and use of signs/markings), the more effective the delineation will be:

Table PN04 – 6: Delineation consideration: Between cycleway and footpath (berm space)

Most effective	→	Very limited effectiveness	
200 – 300mm wide Kerb vertical separation / level difference (65mm)	600mm wide Grey warning tactiles* **Bend/corner might be difficult for 2x300mm tactile pavers, different arrangement can be considered through AT design review or SME's consultation.*	200 – 300mm wide Thermoplastic adhesive strip / White tactile line marking	100 – 150mm wide Painted line
Standard recommended treatment.		By Departure from Standards process only.	

The preferred delineation between the cycleway and footpath is vertical separation / level difference (using mountable kerb) or flush surface level using 600mm wide grey warning tactile pavers. When selecting the kerb, between cycle kerb type 14 or 15 from AT SED Kerb Design, EDC Cycling Infrastructure prescribed bevelled kerb with gradient 1:3 as the preferred delineation between footpath and cycle path.

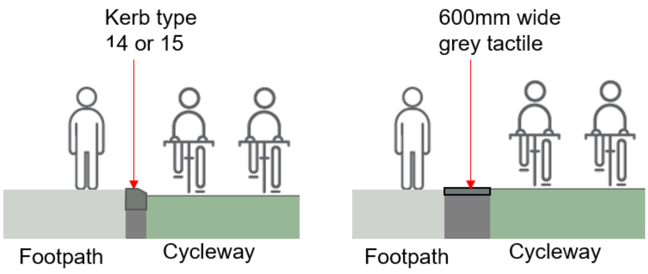


Figure 7: Separation to footpath area
(Source: Auckland Transport)

When selecting cycle kerb as delineation, consideration needs to be given to the active modes user ability to cross along the separation. For example, kerb 14 with gradient 1:1 is cycle-friendly kerb, but not mountable. Further explanation can be found in NZTA Waka Kotahi Choice of separator or protection Sub-section Mountable Kerb. Mountable kerb types must comply with the acceptable coefficient of friction (wet) to maintain slip resistance for Auckland Transport pedestrian assets (see EDC Footpath and Public Realm section 3.6.2 Pedestrian surfaces table 4 & 5)

It's important wherever possible to keep footpaths and cycleways separated around intersections and through bus stops. Refer to PN04 section 4.2 Separated Facility for further explanation.

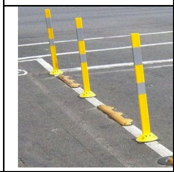
5.1.4 Types of Separation

5.1.4.1 SEPARATOR PROFILES

Suitable separators should be placed to provide additional protection between people on the cycle path and live traffic. The separation width should be wider than the physical separator. This to ensure that the physical separation can be placed inside the edge line. At the start of the physical separation, edge and lane markings, hatching, reflective paint and vertical marker posts can help improve visibility of the first separator (see notes below).

This Practice Note provides examples of separator types in the Standard Engineering Details for Cycling Infrastructure. The following table summarises separator profiles with a drawing number reference for each.

Table PN04 – 7: Physical Separator

	Rubber/ Plastic Kerb Separator	Rubber Raised Separators (Flexible Traffic Separator)	Rubber Mountable Separators	Rubber Raised Separators (Modular Traffic Islands)	Precast Concrete Separators	"Copenhagen Type" Mountable / Concrete Kerb Separators
						
Design Period	0-1 years	0-5 year	5-10 years	5-10 years	Up to 15 years	Up to 15 years
Note	*(see note 4)*	*(see note 4)*	Use for Driveway Treatments		*(see note 5 and 6)*	By Departure from Standards process only. Departure required on the basis that there is no separation width to roadway. *(see note 7, 8, and 9).*
Length	1-2m	1m module can be formed to 3-5m	*(Depending on the driveway length)*	2-5m	2-5m	-
Width	150 – 160mm	200 – 250mm	400 – 900mm	500mm	300 – 800 mm	150 – 300mm
Height	50 mm	50 – 100mm	50 – 75mm	130 mm	120mm 150mm	65 mm
Vertical Elements	Narrow separator width might require vertical elements (flexi post) on top of the separators as a combination.		-	On the first separator after intersection or long gap		-
Colour	Black and/or yellow	• Black and/or yellow • White or Grey can be an option if considered safe.	Black and yellow	Grey or red islands with white edge paint. RRPMs.	All concrete separator edges (or minimum leading edges) to be pre-painted with reflectorized white paint.	Concrete colour.
Drawing Number SED	CY0010, CY0011	CY0012, CY0013, CY0014	CY0015	CY0016	CY0004, CY0005, CY0006, CY0007	NA
Perception of Safety	*	**	**	**	***	**
Cost	$	$$	$$	$$	$$	$$$
Durability/ Maintenance	*	*	*	*	**	***
Environment	Requires consideration of SW devices for micro plastics				Preferred material	

Notes:

1. Alternative material (such as recycled glass) may be used with the approval of the Auckland Transport Chief Engineer and Chief Scientist. The materials need to consider safety, sustainability (such as life-cycle and carbon), and have a minimum design life of 5 years.

2. Waste collection needs to be considered when selecting the separator profiles (separator height and width).
3. Design treatment will be required for at least the first few separators to ensure they are extremely visible to approaching motorists.
4. Use of plastic/rubber separator with longer gap distance/ spacing to allow for overtaking by people riding cycles – has been installed with a combination of RRPMs and “safe-hit” posts to further guide vehicle lane behaviour.

Figure 8: Upper Harbour drive Example of use of rubber Flexible Traffic Separator
(Source: Auckland Transport)

5. All edges of the concrete separator (or as a minimum the leading edges) should be pre-painted with reflectorized white paint. Ensure there is a gap between separator and the white edge line for the traffic lane side. RPM should be considered to be placed within this gap (see image below).

Figure 9: Painted concrete cycle separator
(Source: Auckland Transport)

6. Concrete cycle separators arrangement can refer to standard drawing SED CY0008 and arrangement for first concrete cycle separator treatment (transition zone) can refer to standard drawing SED CY0009.
7. “Copenhagen Type” can be considered depending on the context. For example, a short section on the transition ramp to a separated cycleway, or on the bridge location.
8. Concrete mountable kerbs can be used to form the raised lane along the cycleway (“Copenhagen Type”). When selecting the kerb type, further consideration needs to be given to kerbside activity and driver behaviour. Kerb Type 14 has an angled profile to keep the vehicle on the traffic lane, while Type 15 might be suitable for a driveway access/vehicle crossing. Concrete mountable kerb separators can be used on short section lengths of up to 200m (in a low speed (40km/h) and low volume, single-lane residential street context) to enable vehicle crossings while maintaining the effective width and crossfall of the cycleway.

Figure 10: Raised lane separator using mountable kerb on St.Georges Road, Avondale
(Source: Auckland Transport)

9. Mountable kerb is not effective when parking activity can occur because mountable kerb type enables drivers to mount the kerb and park in the cycleway space. Specific controls (for reinforcement) will need to be considered for a case-by-case basis, depending on the location and nearby land use. When frequent enforcement cannot be relied upon then mountable kerb should not be used. If mountable kerb is used, BYLs should be installed and potentially if there is buffer space, a flexible bollard with permanent appearance can be used to discourage drivers from mounting the kerb.

Figure 11: Mountable kerb design treatment on Orakei Station, Remuera
(Source: Auckland Transport)

The NZTA Waka Kotahi guides Choice of separator or protection and Separation Matrix can be used for additional consideration.

5.1.4.2 SEPARATOR MATERIAL

Concrete separators are preferred as these are the most resilient and have the least negative environmental and biodiversity impact. Conventional standard concrete can be used where low carbon-emission concrete cannot be used. The next option is rubber, followed by plastic (both utilising recycled material).

In the case where recycled rubber or plastic separators are used, adequate stormwater treatment is required to prevent microplastics from entering and polluting the ecosystem. A filter treatment device needs to be installed where catchpits will collect separator debris.

A timber separator (Case: Orpheus Drive, Onehunga) is not generally considered safe because timber can be broken into sharp section if it is hit by vehicle. The separator material should offer good tonal contrast to its surroundings in daylight and dark conditions to ensure separators can be observed easily by road users (cycle riders and drivers).

5.1.4.3 PLACEMENT OF SEPARATORS

Cycle separators could become a potential trip hazard for pedestrian. Placement of separators need to consider pedestrian movements, especially when the separators placed near the pedestrian through route (e.g. crossing point), close to bus stop, and / or any pedestrian attraction (e.g. city landmark, sculpture, mural, etc.).

In general, separators are typically placed with 0.5m – 1.0m gap spacings for drainage purposes.

Larger gaps (up to 2.0m) can provide opportunities for faster riders to overtake slower ones by entering the adjacent traffic lane in the roadway. This provides for the better integration of people riding more slowly, e-bike riders, and sport cyclists. There is an inherent risk to people cycling when they enter an adjacent live traffic lane, so permeability should be considered with reference to traffic conditions. Gaps wider than 2.0m can increase the risk of vehicle striking a separator.

A gap wider than 2.0m will be required in some circumstances, for example at a driveway access or non-FTN bus stop. A 1.5m clear space next to a vehicle crossing can allow space for wheely bin placement (refer to PN04 section 7.3 Waste Collection for information regarding kerbside and non-kerbside waste collection). Vehicle tracking should be undertaken if there is any uncertainty, for example where driveways enter the road at an acute angle or where larger vehicles are expected.

5.1.4.4 OTHER CONSIDERATIONS OF PLACEMENT

It is important to highlight the start of the physical separation to minimise the risk of vehicles or cycles crashing into the separator. The following should apply wherever a run of separators begins:

Bridge Marker Post

Bridge Marker Post is especially important where a separation starts after an intersection or bend. The vertical features of bridge marker post help to highlight the start of the physical separation. Bridge marker post can be easily hit by vehicle, therefore is it recommended to added two yellow flex posts behind the bridge marker post in case the bridge marker post is hit. In particular where high volumes of heavy turning vehicles are present, which means a higher chance of the sign being hit. Alternatively, designer should investigate and propose a more flexible solution (not rebound) so it will remain in place if vehicles hit.

Bridge marker post should be placed on top of the separator but with the blade lowered to the socket to be less obstructive to handlebars.

Figure 12: Bridge Marker Post
(Source: Auckland Transport)

Alternatively, bridge marker post can be placed in front of cycle separators. The purpose is to keep the installation bridge marker height below the handlebar height (1100mm).

Lambie Dr: *On top of cycle separator* Franklin Rd: *In front of cycle separator*

Figure 13: Bridge Marker Post Location
(Source: Auckland Transport)

Raised Pavement Marker (RPM)

This additional treatment may be used on the traffic lane side to highlight the start of the run of separators and to highlight every separator.

Figure 14: Raised Pavement Marker Location
(Source: Auckland Transport)

"Safe-hit" Posts / Flexi-Post

Can be used where there is a short, localised constraint such as at an intersection or through a corner. They do tend to get damaged quite easily and are not a preferred treatment. Any proposed usage must be reviewed by the SME.

White Line Marking

It is necessary to use painted lines to delineate the border between the cycleway and the general traffic lane. The white line provides a continuous 'edge of lane' reference for drivers wherever the cycleway separator is not continuous. In the same way, an edge line on the inside of the separators will provide continuous guidance for people cycling, particularly at night.

Hatch marking

Hatch marking should be used when physical separation cannot be achieved in certain places. This is usually due to a kerbside activity along the cycling infrastructure. Hatch marking can be used to used where there is indented parking, refer SED CY0017.

When distance between separators is more than 2.0m, it is necessary to consider additional measures, such as thermal plastic marking, Audio Tactile Profiled (ATP) line marking, or RRPM. This will provide visual, audible, and tactile cues for people driving alongside the cycleway. When selecting the additional measures, designer need to consider context and surrounding environment.

5.2 General Design

Practice Note#4 Interim Cycling Facilities refers to the main documents EDC Cycling Infrastructure for detailed information on General Design (see Section 08 General Design), with additional consideration contained in:

- (Engineering Design Code) – EDC Footpath and Public Realm requirement, and
- (Engineering Design Code) EDC Urban and Rural Roadway Design, Section 4.3, for safe use design general requirements.

5.2.1 Traffic Lane Width

Lane width needs to follow AT TDM EDC Urban and Rural Roadway Design Section 7.4 Line Widths sub – Curve Widening under table 5 and table 6. Sufficient width must be retained in the adjacent traffic lane to safely accommodate all the intended classes of vehicle at the posted speed limit. Tracking needs to be checked to ensure that sufficient lane width is retained through bends (at normal vehicle operating speeds) or the application for Curve widening needs to be applied (see EDC Urban and Rural Roadway Design Section 7.4 Line Widths – Curve Widening under Figure 1). Tracking should reflect real life use based on site observations. The tracking exercise is not to find minimum clearance at 10km/h but check that there is sufficient tolerance for normal operating speeds.

AT standard bus tracking (for both directions of travel) must be undertaken along FTN bus routes. Design must ensure that separators are not in the vehicle swept path and that bus drivers can continue to operate safely and confidently at normal bus operating speeds.

It is important to consider the operational aspect of the traffic lane when designing separated cycleways, including bus and over-dimension routes. Over-dimension routes need to allow for clearance to the cycle and traffic lane envelopes as in Figure 15 below. Consider installing wide centreline or flush median to enable general traffic stay in lane, while ensuring that wide loads are able to achieve the required horizontal clearance.

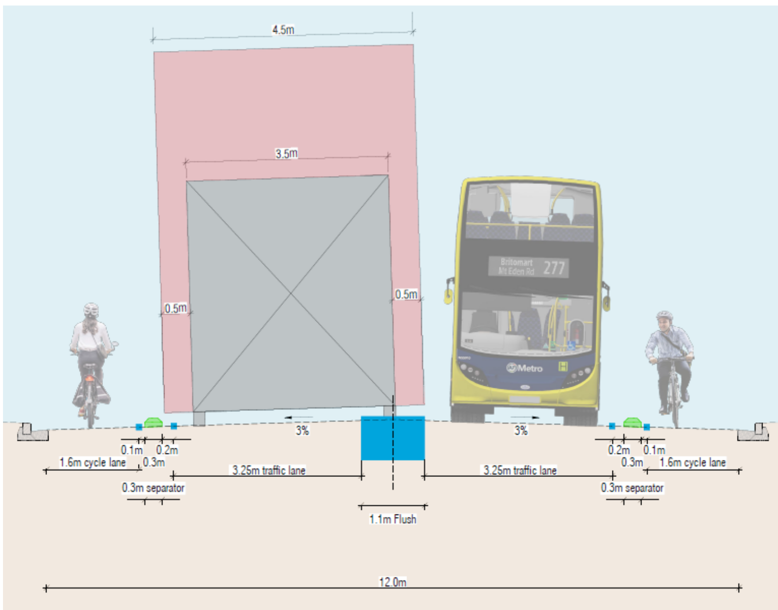


Figure 15: Example of minimum dimension to achieve Over Dimension clearance on road with one traffic lane in each direction – SED CY0026

(Source: Auckland Transport)

5.2.2 Horizontal Geometry

Swept path tracking should be used to confirm safe and accessible design. Width on bends should account for the swept path of cargo cycles. The width of the path swept by a person cycling through a curve widens with decreasing radius (refer to EDC Cycling Infrastructure section 8.3 Curve Widening).

At constrained locations or where forward visibility and/or the intervisibility between drivers and cyclists at vehicle crossings is restricted (e.g. obscured by parked vehicles and / or high fences along the boundary lines), it may be desirable to have people on bikes pass through the bend in single file. If this is so, they must be able to recognise the constraint in sufficient time to adjust their speed and to move into single file. Surface markings or signs may be needed. On two-way paths, a white centreline may be marked at a hazard point, with direction arrows in advance. An example of swept path analysis as shown in Figure 16 below.

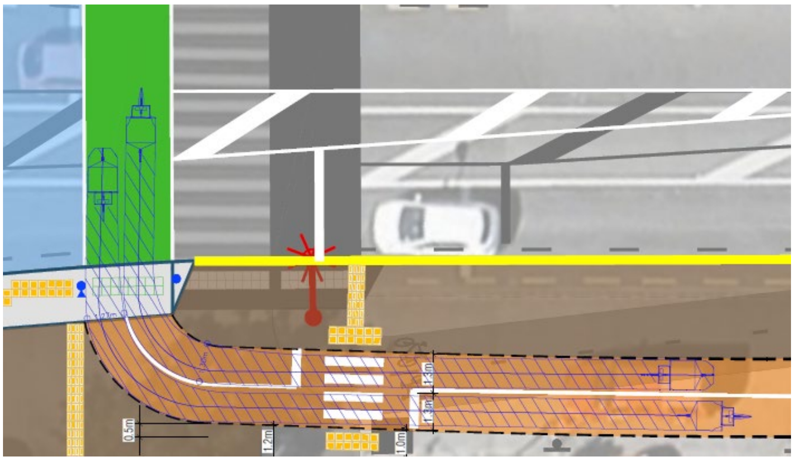


Figure 16: Example of cargo bike swept path analysis on a cycle crossing
(Source: Auckland Transport)

The placement of direction signs, lighting columns and other street furniture must not impede the swept path. For example, in the crossing illustrated in Figure 17 below, the give-way sign and lighting pole on the left side of the image result in a narrowing of the usable width of the cycleway. This situation occurs where there is no front berm or where a buffer to the roadway was not accounted for.

Figure 17: Bend/turning tracking and signage location need to be accounted on the design. Location: St Georges Rd, Avondale
(Source: Auckland Transport)

Horizontal Geometry for cycle ramp / transition ramp between on-road and off-road; refer EDC Cycling Infrastructure Section 09 Ancillary Features.

5.2.3 Vertical Geometry

Refer to EDC Cycling Infrastructure Section 8.2 Horizontal and Vertical Alignment.

There are few options to reduce the gradient for separated cycleways within existing roads. The TDM acknowledges that uphill and downhill have different design characteristics for naturally slower speeds travelling uphill, and faster speeds travelling downhill. Therefore, different treatments (for each direction) in one corridor are accepted if the design offers an appropriate Level of Service.

Longitudinal Gradient

People cycling uphill often move from side to side; and a cyclist will wobble while maintaining balance at low speeds. A larger dynamic envelope (1.5 m wide) should be assumed for cycle paths in excess of 5% uphill grade. When high-speed cycling is anticipated on long gradients, an additional 0.5 m clearance is suggested between opposing flows of riders.

Crossfall

In road space reallocation scenarios, crossfall between 3% to 5% can be accepted with the condition that the designer can provide justification. This is important since interim cycling infrastructure along an existing kerbside needs to deal with existing road and channel gradients. Crossfall above 3% will not be accessible for many disabled people cycling and it could be a barrier for them to cycle.

Ramp Gradient

Ramp gradients need to comply with AT standards (refer to EDC Cycling Infrastructure Section 09 Ancillary Features sub Kerb Ramps). Combined ramp and crossfall design assessment should be considered when gradient is steeper than the preferred.

5.2.4 Stormwater considerations

In view of the AT's principles outlined in the Vision Zero for Tāmaki Makaurau and Road to Zero strategies and is road safety related, cycleway where existing major OLFP and 1% AEP flood plain exists should be demonstrated to comply with TDM – Road Drainage. Design rainfall intensity to use for cycleway should be managed within the road reserve to maintained to acceptable levels of service for people walking and cycling, while limiting hazards and nuisance.

Road drainage through raised safety platforms (RSP) and pedestrian crossings should be demonstrated to comply in accordance with minimum requirements for the safety of cyclists and pedestrians.

Cycle-friendly catchpit

Catchpit grates should be upgraded to cycle friendly and replaced with spring latched (spring) Class D to AS3996 Grate weight minimum 62.5kg.

Level Surface

In some locations, successive pavement layers create a significant raised edge along the kerb channel where a person may be cycling. This raised edge gives rise to a wheel entrapment issue for cycles and can reduce the ability for non-standard cycles to use the full width of cycleway. This issue is worse when travelling at higher speeds, or where plant debris accumulates. An inspection of the condition of the existing pavement including whether existing catch pits need to be raised and reinstated should be undertaken to determine the actual usable width.

Existing condition

Upgrade to the existing

Figure 18: Example of catch pits upgrade
(Source: Auckland Transport)

Raised Platform

Channels need to be avoided through raised platforms. Project scopes sometimes do not account for changing kerbs or catchpit positions which can be seen as a helpful interim compromise. However, 20-30% grade change through the channel can be hazard for faster-moving wheeled users, especially less able ones. Stormwater assessment should be checked when considering raised entry treatments and drainage catch pit locations should be noted at the concept design stage.

Aco Kerb

Cycle-friendly catchpit

Figure 19: Example of catch pits at raised safety platform
(Source: Auckland Transport)

5.2.5 Pavement

Cycleway on roadway

Project teams should check at the outset for alignment opportunities with planned renewals or other planned works such as stormwater separation. If the existing road surface is in acceptable condition, it will not usually be resurfaced as part of the cycle facility installation. This includes chipseal roads, where the existing surface will be accepted as part of cycleway delivery. Asphalt surfacing is preferred where resurfacing is required. Asphalt should be flush or slightly above (generally <5mm) channel lip level to ensure positive water flow plus construction tolerance. This aligns with NZTA M10:2020 cl 10.1. See [EDC Cycling Infrastructure] Section 8.4 guideline on asphalt surfacing for all new cycling infrastructure.

Cycleway on berm space

To enhance the separation between the footpath and cycleway, the cycleway should normally be darker in tone than the footpath. The cycleway material (darker colour) should have a 30% luminance contrast to the footpath material (lighter colour). Using the approved surface types for the footpath (concrete) and cycleway (asphalt) will ensure this colour difference. The use of other materials for the surface requires a Departure from Standards.

- Cycle path – Asphalt: 40mm DG10 asphaltic Concrete with 200mm granular basecourse as per FP0003 Heavy Duty Asphalt Footpath
- Cycle path – Concrete: 150mm thickness with 20 Mpa concrete from a registered manufacture as per FP0001 Heavy Duty Concrete Footpath and using 8 kg/m^3 Black Oxide. If heavy vehicles need to use part of the concrete cycle path, a 30 Mpa concrete can be considered through Departure from Standards process. It needs a Departure on the basis that 30MPa concrete has higher carbon content. Surface can be broom finished, unless exposed aggregate is selected to achieve a texture contrasting with the footpath.
- Where mountable kerb is used along the cycleway, designer must consider Heavy Duty specifications.

Further details can be discussed with AT Pavement Design Specialist.

5.2.6 Road Lighting

Lighting levels must be checked during the route investigation. Lighting must be appropriate for the activity and to enhance safety for people cycling. Lighting level should provide a clear view of any defects, debris, or obstructions within the facility and should enable people cycling to identify road reserve elements, such as:

- Intersections;
- Kerbside activity;
- Separators;
- Sign poles;
- Ground markings;
- Transition points to a connecting route;
- Mid-block crossing points.

All lighting should be consistent with the EDC Street Lighting.

5.2.7 Traffic Calming Features

It is the preference of AT that speed controls be considered holistically and in line with the function of the street shown in Future Connect. See EDC Traffic Calming, and SED Traffic Calming for further information.

Where possible, design cost effective solutions that are in line with Safe Systems principles without vertical deflection elements, such as (but not limited to):

- horizontal devices such as kerb-build out, side islands, chicanes;
- speed limit;
- ITS solutions such as safety cameras;
- gateway treatments.

Vertical Features

Vertical features might need to be used as speed management along a route, to ensure that drivers maintain safe speeds, especially on long downhill routes, or approaching constrained locations. It is important however that these features are not hazardous to users and are clearly visible in daylight and in darkness. When considering raised devices for speed management, please refer to the current edition of Practice Note 02 'Use of Raised Devices on the AT Network' in Auckland Transport TDM Website Section 4: Practice Notes, which sets out how they are to be used.

Raised Safety Platforms can be considered as a side road entry treatment in order to reduce the speed of both motor vehicles and cycles to minimise the energy and thus degree of harm at the point of conflict. They can be especially useful on two-way cycleways due to the complexity of conflict points. Further details can be discussed with AT Technical Lead Transport Safety, and Transport Design Specialist.

See section 5.2.4 Stormwater, for considerations regarding raised platforms drainage.

Horizontal Features
When horizontal features are installed along a route, where possible the cycleway needs to continue through them (cycle bypass). It should be designed to allow manoeuvring space for people on large cycles to ride through.

5.2.8 Cycle transition ramp

Transition ramp detail can be found on EDC Cycling Infrastructure Section 9 Ancillary Features, which provides explanation under sub-section Transition Ramps, and Cycling Infrastructure Standard Engineering Details CY0025 Cycle transition ramp detail for the drawing. Care in the design of these is necessary to avoid becoming a barrier for people riding non-standard cycles, e.g. wide cycles. Transition ramps should be angled so that riders can leave and enter the berm or roadway level safely and conveniently. The person cycling should be positioned in an angle suitable to enable observation to other road users. Tracking, and clearance to vertical features for the cyclist's kinetic envelope should be taken into consideration.

5.2.9 Marking, Signage and Wayfinding

Marking: Broken Yellow Line – NSAATs
It is required to include BYLs in all on-road cycle facilities including protected cycleways. This is to ensure consistency of enforcement across the network. Where parking is to be permitted on the offside of the separators, designers must resolve this expressly as a parking place and use appropriate signs and markings to indicate this.

Marking: Green Paint and Cycle Symbol
Placement of green box and cycle (and pedestrian) symbols as ground markings at the beginning and end of facilities, and at transition/decision/conflict points help users to understand the network/connections. Customer testing has shown that when cycling people look for green ground markings (on ramps and other facilities).

Green boxes /strips (with white cycle symbols) can highlight conflict points, for example:

- at the start/end of a cycleway,
- at signalised intersections (i.e. Advance Stop Box). See PN04 section 6.2 Signalised Intersections,
- where a cycleway crosses the end of a side road. See PN04 section 6.3 Unsignalised Intersections,
- in mid-block crossing locations. See PN04 section 6.4 Crossing,

- on high-use vehicle crossings. See PN04 section 7.4 Vehicle Crossing.
- where a separated cycleway turns into an off-road path.

Refer to EDC Cycling Infrastructure Section 8.6 Signs and Marking, Traffic control devices manual part 5: traffic control devices for general use – between intersections: Cycling facilities and NZTA Coloured Surfacing Principles for green paint and cycle symbol.

For other road marking guidance designers can refer to Traffic Control Devices manual (TCD manual).

Signage and Wayfinding
Refers to Transport Design Manual – Signage for the detail information and liaise with the Wayfinding team and AT Creative for the latest designs and standards. AT Wayfinding team have devised new wayfinding arrangements on low mounted signs, for the guidance of people cycling.

6. Intersection treatment

EDC Cycling Infrastructure Section 6 provides the requirements for accommodating people cycling through intersections. It is important that protection provided for people on bikes at intersections aligns with Vision Zero.

Most intersections on the Urban network are priority junctions, roundabouts, and signalised intersections, with some grade separation where local roads intersect with the motorway network. This PN comments on preferred technical treatments for at-grade intersections.

Safety, speed, volume and mix of traffic; simplicity, legibility, tracking of vehicles and cycles through the intersection must all be considered, as well as ensuring that the route available to people cycling is functional for their journeys. Lighting levels must be checked at intersections to enhance safety for people cycling.

There are a range of ways that cycling can be catered for between intersections, from those that are completely on-road where people who cycle share with other traffic to full separation from traffic. Design of cycling infrastructure between intersections generally requires consideration of road space allocation and this is well explained in the NZTA Waka Kotahi website on road space allocation. It is important to ensure a facility that is appropriate to a given road, can be accommodated within the space available.

6.1 Roundabouts

When developing designs for separated cycleways through roundabouts, it is important to consider design matters related to:

- Circular movement – geometric design for the roundabout (where cycles mix with general traffic) should be able to lower vehicle speeds below 30km/h. If the roundabout has separated cycling infrastructure, motor vehicle speeds need to be at or below 50km/h.
- Approach/ entry speed to each crossing location – the horizontal geometric design of a roundabout needs to ensure vehicle speeds approaching each crossing point are no higher than 30 km/h. If vehicle speed at crossings cannot be controlled to 30 km/h by roundabout geometry, raised devices for speed management may be used only as given in PN02 – Use of Raised Devices on the AT Network.

- Visibility – ensure that approaching drivers are able to observe people walking and cycling and predict where they are likely to go.
- Location of paired/dual crossings – if it is necessary to provide space at an exit for one car to stop clear of the circulating vehicle path before giving way at the crossing, the alignment of the crossing point might not be on the pedestrian/cyclist desire lines.

- Designers also need to ensure that signs and markings provide clear cues for people cycling.

When compared to other intersection types, roundabouts generally provide a slower speed environment, but without any traffic calming measures can be dangerous for people walking and cycling. If all legs provide consistency and legibility and cater to the desire lines for all movements, they can provide better accessibility for active mode users.

Further information can be found in NZTA Cycle-friendly roundabouts intersection design.

6.1.1 Single-lane roundabout

Single-lane roundabouts should always be used unless capacity requires a multi-lane design. Single lane approaches and exits might not need raised safety platforms, vertical traffic calming to channel traffic such as speed cushions, or horizontal traffic calming should be considered in the first place. Using flow metering signal upstream can help to manage the capacity of a roundabout and it is considered a safer intersection control with less residual risks than a signalised intersection.

Shared Circular Movement

Circular movement space shared between people cycling and people driving should only be used when speed within the roundabout is 25-30km/h. People cycling should be able to take the primary position and merge with general traffic. Sharrow markings may be applied on the approaches to the roundabout to indicate that people cycling will be sharing the lane.

Separated Circular Movement

If cycle separators cannot be fitted into the roadway, then transition ramps should be provided on each approach arm to enable people cycling to leave the roadway before reaching the roundabout. Transition ramps should enable people cycling to use the crossing points, alongside pedestrians. Crossings must be provided between the entry and exit transitions of all arms. Crossings must have design measures such as raised safety platforms or other forms of traffic calming, which ensure that slower approach speeds are achieved. If separated corners are unable to be designed for people walking and riding, a Shared Corner is permissible subject to agreeing a Departure from Standards with the Design & Engineering SME.

Figure 20: Separated cycleway on the single lane roundabout on Taniwha St – Elstree Ave
(Source: Auckland Transport)

6.1.2 Multi-lane Roundabout

Existing multi-lane roundabouts should be reduced to a single lane if acceptable traffic capacity allows; or be managed by having raised safety platforms on the approaches. If there are no design mitigations, multi-lane roundabouts should be avoided as they make gap acceptance more difficult for people cycling or walking. Multi-lane roundabouts might require vertical elements, to manage traffic speed and to provide gaps for people walking and cycling to cross safely. If there is a case for metering signals at a multi-lane roundabout, designers need to have further discussions with AT Road Safety and ATOC.

Separated Circular Movement

Separated Circular movement needs to be provided for multi-lane roundabout due to complexity of the traffic movement. A cycle transition ramp from road to berm space (Shared or Separated Corner) should be allocated on each approach to the roundabout, and transition ramps returning from the berm to the road surface at each exit arm. At multi-lane entries or exits, signal controlled crossings may be required for crossing priority. These signals can also be used to meter entry traffic.

6.1.3 Crossing Arrangements

Crossings should be provided on the entry and exit transitions of all arms. Paired/dual crossings come with design measures, such as traffic calming, which ensure slower speed approach is achieved. If paired/dual crossing is not necessary, for example on a cul-de-sac or other low-volume side street, kerb crossings can be considered. For kerb crossings, refuge island width should accommodate the length of a non-standard cycle.

6.2 Signalised Intersections

Key aspects for interim cycleways are:

- Low-speed interactions between people on bikes and pedestrians can be controlled by the existing Road User Rules (e.g., riders with a solid green cycle signal, who are turning left across a green pedestrian signal, are required to give way to pedestrians crossing).
- Interaction between drivers, cyclists and pedestrians for all permitted movements must be always considered.
- Traffic phasing can minimise the conflicts between road users, optimise the operation, and improve Level of Services for all users.
- Where there is known to be an issue with high traffic speeds, then speed mitigation must be considered. ITS solutions can be the option to manage the speed.

The designers or consultant must refer to the latest version of the “Traffic Signal Design Guidelines” document when designing traffic signals in order that the standards used across the region are consistent. All the traffic signals plans are required to be reviewed and approved by the ATOC.

Special consideration needs to be given to separating left-turning vehicles and ahead/through-moving cyclists at intersections where the demand for both movements is high or there is any potential for conflict.

Note: Provision for controlling a safe movement through an intersection for people cycling may not be possible without upgrading the signal controller and installing new cabling and additional cycle lanterns and poles. Vehicle detection loops may need to be removed or repositioned and cycle detection devices installed. This cost can be considerable, but such changes are essential.

Four topics which merit further discussion are: separated cycleway arrangements, treatment of shared through and left-turn lanes, and cycle advanced stop boxes, and jug handles on signalised intersection.

6.2.1 Cycleway Arrangement

Consistent connection is important for people to navigate along the network by bike. A continuous facility helps people to understand especially the layout of an intersection. A one-way cycleway can turn into a two-way cycleway, and *vice versa*. Example intersection as follows:

- Two-way straight: Quay St – Tangihua St, Auckland
- Two-way switching sides: Beach Rd – Te Taou Cres, Auckland
- Two-way splitting to separated one-way: Nelson Street – Victoria St West, Auckland
- One-way straight: Victoria St West, Auckland

Where possible the cycleway separation should continue through the head of the T at an intersection. Cyclists still need to stop for any conflict with pedestrians but may proceed through the intersection when safe. This behaviour can be guided through the traffic rule elements either by signs, markings, or traffic signals. When Future Connect categorises a side road as part of the cycle network, provision must be made for people cycling from the side road to cross the intersection and join the cycleway.

Western approach to head of T-intersection Mount Albert Road and Frost Road

Cyclist progressing through Head of T-intersection

Photo from SE corner

Figure 21: Separation through head of a signalised T intersection of Mount Albert Rd and Frost Rd
(Source: Auckland Transport)

Slip lanes should be avoided as they can lead to unsafe conditions. Even creating a wide painted buffer between the roadway with cycleway in the middle of two lanes before a conflict point can create a dangerous situation. Cycling facility should be placed along the kerbside (see PN04 section 6.2.2) or taken off road, as a cycle path (refer to PN04 section 5.1 Cycleway Design).

Footpath and cycleway arrangement on the intersection should allow for safe waiting space for both users. If the buffer between a cycleway and a traffic lane is not deep enough to allow space in which pedestrians can wait safely, consideration should be given to keep the pedestrian waiting space on the footpath and place the push-button on a dedicated pole as shown on Bremner Road – Tributary Parade intersection.

6.2.2 Treatment of shared through and left turn lane.

Left turning traffic movement can be hazardous for people cycling ahead to an ASB. Rather than create a painted cycle lane between the two moving traffic lanes, a protected cycleway to an intersection is required to provide an inclusive facility that a wide range of people can use comfortably. The cycleway should run along the kerb side and have continuous protection up to stop line. See diagram below:

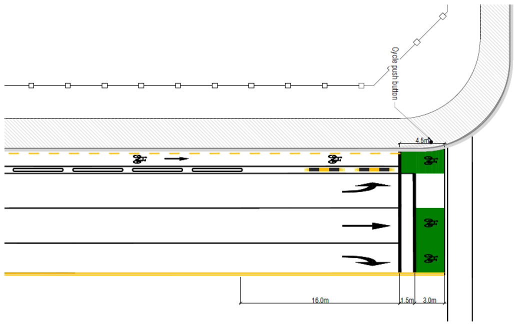


Figure 22: Cycleway kerbside intersection on approach to intersection – SED CY0018
(Source: Auckland Transport)

The diagrams above show a one-way cycleway. Two-way cycleway arrangement needs to consider the whole intersection layout (signalling for safer movement) and requires case-specific design.

'Hold the left turn':
This facility provides additional protection for the people cycling up to the stop line. This arrangement works when:

- there is an exclusive phase for cycle riders.
- there is a red signal hold back the left turning traffic such that there will be no conflict between left turning drivers and cyclists riding ahead. There needs to be a cycle-specific lantern and stop line that will show a red aspect when left-turning drivers are shown their green phase.
- alternatively, a cycle phase can be integrated with a pedestrian phase (dependent on the type of movement occurring and how design mitigation allows for it). For example:
  - Nelson Street where the cycle phase runs in parallel with the pedestrian phase across Wellesley St and Victoria St (straight-ahead movement).
  - Ponsonby Road to Karangahape Road (southbound turning eastbound), there is no dedicated cycle left turn, but zebra markings placed on the cycleway provide clear cues, that people cycling must give way to pedestrians.
  - Customs Street West to Lower Hobson Street (eastbound turning northbound), there is cycle signal phasing on the primary pole and a supplementary low-level cycle signal.

Placement of the separators needs to consider that people cycling must be able to change lanes to reach the Right Turn ASB. Width of cycle separator should account for safe clearance (consider the vehicle tracking envelope) of a cyclist entering the intersection and/or waiting safely for the signal.

Figure 23: Physical separators change to hatch marking buffer to allow people cycling to move across to the right-turn ASB on Carlton Gore Road – Park Road intersection
(Source: Auckland Transport)

Designers need to review phasing to minimise conflict between cyclists and drivers. This can be done by providing an exclusive (protected) phase, head starts for the cycle phase, or all-red extensions for the cycle phase – designer need to consider removal of overlapping phases if there is safety risk. The proposed design needs to address ATOC traffic signal design guidelines.

At intersections where space is at a premium, narrower separators (for example width between 0.3m to 0.5m) may be considered. It is important that tracking at intersections be undertaken considering all expected vehicle types including buses and heavy vehicles as these have the potential to ride over separators. This would cause damage, but more importantly would nullify the safer space created for people on bikes.

6.2.3 Advanced Cycle Boxes (Advanced Stop Box)

Advanced cycle boxes should be provided if a movement is not provided for e.g. separated facilities do not facilitate right turns and so some cyclists may right turn from the general traffic lane. Where there are multiple lanes, the safety of a person on a bike occupying an ASB should be considered (especially operating speed and traffic volume). If an ASB is provided, a gap between separators needs to be considered to allow confident cyclists to enter the traffic lane to turn right. It is important not to place an ASB on a shared through / left-turn lane, if at any time the two movements are subject to filters or overlaps. This is because a person waiting to turn left while a parallel pedestrian movement runs across the left-turn exit arm will be at risk from drivers behind wanting to go ahead on green.

In some cases where an intersection is raised, consideration must be given to cycle detector devices as these cannot be installed in a concrete raised platform.

Further explanation can be found in TCD Manual – Part 4 Traffic Control Devices for General Use – for Intersections, Section 6.7.3. Waiting Infrastructure.

6.2.4 Jug handle on signalised intersection

Where people cycling need to access a crossing facility to make a turn, usually of around 90 degrees, this arrangement is known as a `jug handle' turn. A jug handle can be installed to allow a right turning rider at a T-intersection to wait out of the path of the straight-ahead cyclists. The traffic signal for Jug handle users will give a green phase at the same time as the pedestrian crossing. A separate push button is needed for people cycling. Design treatments such as darker surface material and kerb edging should be provided. The jug handle can maintain the same surface level as the road; or have a slight transition ramp to manage the level difference between berm and road). Jug handle space occupies the front berm as a dedicated waiting space for people cycling, which creates delineation between pedestrians and people on bikes.

Figure 24: Jug handles provide waiting space for people cycling who want to turn right at the T-intersection of Tamaki Dr and Ngapipi Rd
(Source: Auckland Transport)

Alternatively, if cycleway arrangements have wide separator width (minimum is 1.3m), a waiting space for the right turning cycle signal can be formed within the separator.

Figure 25: Separator gap: waiting space for people cycling to turn right at T-intersection of Karangahape Rd and Howe St
(Source: Auckland Transport)

6.2.5 Cycle handrails, push buttons, and low-level cycle signal installation with respect to signal poles

Cycle handrails installed behind or in front of signal poles need to consider the location of (pedestrian/cycle) push button). Standard drawing for cycleway handrail can be found in SED CY0001.

Figure 26: Eastern approach shows left turn cycle traffic light control with separators up to the stop line on Mount Albert Rd and Frost Rd
(Source: Auckland Transport)

In some cases, there is only cycle-specific signal on the primary signal pole, which restricts riders' ability to observe the lantern. Auckland Transport is currently installing Low Level Cycle Signals (LLCS). LLCS is a supplementary lantern consisting of red, amber, and green cycle aspects to advise and control the cyclists' movement on a signalised intersection. The supplementary low-level cycle lantern is at an appropriate eye height for people cycling to see and respond to the traffic signals. Further details can be discussed with AT Traffic Operations team. The placement of LLCS should consider if other elements are installed (such as a push-button).

Figure 27: Low level cycle signal as supplementary lantern at Customs Street West, eastbound at Lower Hobson Street
(Source: Auckland Transport)

6.3 Unsignalised Intersection (Side Road)

When choosing the intersection treatment for a side road, consideration should be given to creating a 30km/h speed environment at the conflict point. Designers need to understand the existing safety issues along the proposed cycleway route; e.g. no gaps in the arterial flow, causing side-road drivers difficulty to move across/into the arterial road movement, can trigger unsafe decisions leading to conflicts.

6.3.1 Design Treatment

Designers need to consider which one or combination of the following bullet points can be changed to reduce the speed of turning vehicles, to force or enable them safely to stop or give way when a person cycling is present:

- generous kerb radii and flared corners,
- multiple traffic lanes enabling drivers to swing-out and then cut across the apex of the corner,
- presence of deceleration/acceleration lanes either side of the junction,
- drivers using a flush median as a merge/diverge space when turning right into/out of a side road,
- car parks on the main road either side of the junction mean that the path taken by vehicles is the same as if the corner was flared,

Key design points for separators around junctions:

- It is important to consider Safe System Assessment for busier side roads, especially if the flush median is being removed to accommodate separated cycleways.
- Depending on the speed and volume of turning movements (and tracking requirements), discontinuing physical separation before the side road can be considered, to achieve cycle movement "priority" over turns into and out of the side road.
- Continue the physical separation to within 5m of the kerb radius, thereby reducing the speed of turning traffic. Distance between physical separators, on the side road across the T-intersection, can be narrowed with non-physical separators (such as white edge line marking, hatch marking, RPMs) based on the vehicle tracking check.
- Drainage catch pits are often located within side roads in Auckland and locations should be noted at concept design investigation if considering raised entry treatments. See PN04 section 5.2.4 Channel Condition.
- Consider introducing a "keep clear" (yellow hatch marking) on the intersection of side road and busy arterial road.

For interim cycle facilities, design measures need to account for safe approach speeds such as tightening the corner radii and/or narrowing the side road. These can be achieved by installing physical separators (to re-shape the intersection corner), white edge line markings, hatch markings, RPMs, and/or side islands on side road. A raised safety platform on side road can be considered if there is higher risk or safety concern, subject to the criteria set out in PN02 on vertical features.

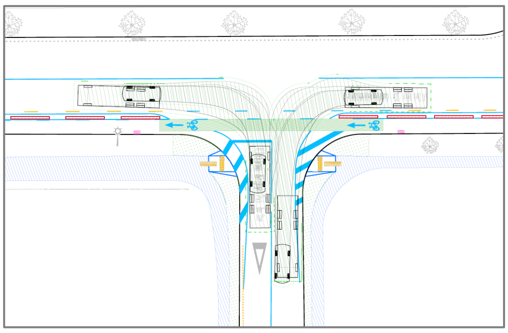


Figure 28: Example of Side Road Treatment for one-way cycleway with tracking
(Source: Auckland Transport)

Two-way cycleways are more dangerous at intersections because of the higher probability and severity of collision. Raised safety platforms should be considered for two-way cycleways to manage the risk. For urban arterial, gaps in the arterial flow, visibility, and speed at intersection, are important to be taken into design consideration. Further assessment can be done through Separated Cycleway Options Tool Technical Note. Design mitigation for risks where a two-way cycleway meets a side road may include:

- separation of cycleway and roadway to improve intervisibility,
- high friction surface marking at the intersection,
- flashing in-ground studs light,
- limiting some traffic movements,
- removal of right turn movement(s) if the traffic volume to the side road is high,
- traffic calming measures,

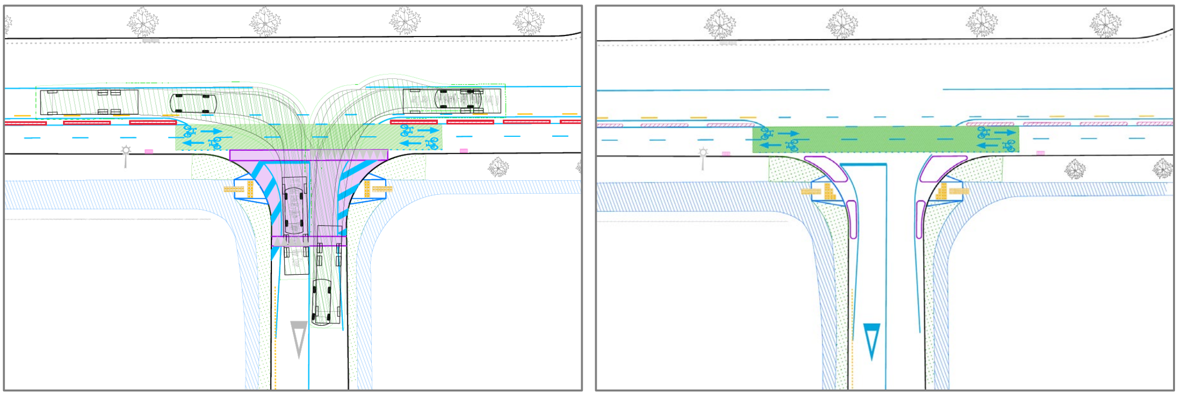


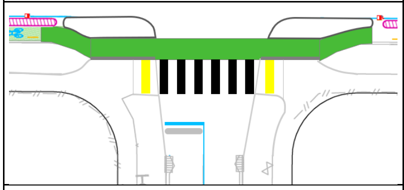
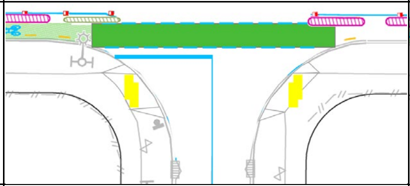
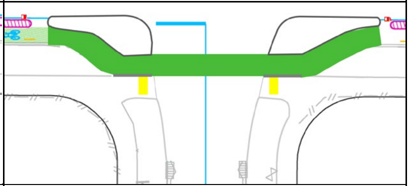
Figure 29: Example of Side Road Treatment for two-way cycleway with tracking
(Source: Auckland Transport)

6.3.2 Side Road Arrangement

Various arrangements can be used at side roads, depending on how priority is allocated with regard to the movement of people cycling along the major road. Without a specific priority crossing installed across a side road, people cycling along the major road still can achieve priority if the cycleway is built as a cycle lane across the intersection with the side road. As per current legislation, a cycle lane is part of the 'roadway' and normal give way rules apply, i.e. turning traffic must give way to people cycling along the cycle lane. However, a layout that transition an off-road cycleway to an on-road cycle lane is only appropriate for one-way cycleways where riders are cycling in the with-flow direction.

For two-way cycleways, other traffic control devices are required to establish priority. Further discussion with AT Transport Controls Manager is needed. When designer is selecting the cycleway arrangement, they need to ensure there are sufficient ASD / CSD / MGSD (not only DSD) to ensure sufficient visibility is catered for VRUs. The table below shows various cycling infrastructure arrangements.

Table PN04 – 8: Cycling Infrastructure Arrangement on Side Road

Priority		No Priority
Cycle path arrangement with priority crossing	Cycle lane arrangement	Cycle path arrangement
• Cycle crossing legal priority based on its location with zebra crossing. • Vehicle turning to/from side road must give way. • Priority for cyclist on cycle path and pedestrian on footpath, crossing over paired/dual crossing.	• Priority for cyclist on cycle lane (painted in green) as part of roadway movement on main road. • Pedestrians need to give way to vehicle turning to/from side road.	• Cyclists and pedestrians need to give way to vehicle turning to/from side road. • Additional mitigation needs to be provided (cyclists have no right of way) Once accessibility rule [Accessible Streets consultation | Waka Kotahi NZ Transport Agency (nzta.govt.nz)] is in place it will allow priority crossing for the path users (pedestrian and people on bikes) over the side roads.
		
Paired/dual crossing arrangement across the side road which provides priority and clear cues of priority for cyclists over the side road movement. It is expected that the paired crossing location considers the pedestrian/cycle desire line (and does not deviate noticeably from it).	Separated cycleway becomes cycle lane across the mouth of the side road. Must be highlighted with suitable line marking and coloured surface to indicate the presence and priority of cyclists to other road users. This cycle lane arrangement provides priority for people cycling (along the main movement) over the side road movement.	Cycle path arrangement crossing a side road without a paired crossing (with current legislation) requires cyclist to give-way to side road movement (the same as a pedestrian – no priority). Give-way markings will be needed on the cycle path, to provide clear indication to people cycling that they must give way. The speed of people cycling speed should be managed on the approach to the side road.

Bent-in, straight, and bent-out arrangements are described in section 6.4 of the AT TDM Cycling Infrastructure guide and NZTA Waka Kotahi Technical Note#2 and NZTA Waka Kotahi Priority or Uncontrolled intersections.

6.4 Crossing

When a cycleway switches from one side of a corridor to the other, or connects to other cycling networks, a crossing is needed to ensure safe crossing for people cycling. In some cases (Shared Path, on-road painted cycle lane, or separated cycleway connections) it can be difficult to provide clear options for people cycling. The key is to ensure that the transition happens in a safe speed environment. This needs further assessment and coordination with AT Road Safety team and Design & Engineering team. Traffic volume and gap opportunity need to be considered when selecting the type of crossing facility.

6.4.1 Paired Zebra Crossing

For further details on crossing width, refer to EDC Cycling Infrastructure Section 6.5 Midblock Crossing. In the EDC Cycling Infrastructure, it is prescribed that the zebra crossing should be designed to the standard width (preferred 3.5m as per AT, with 2.5m as per legal minimum width requirement), while the cycle crossing should be designed according to the movements on the path (one-way or two-way movements) between 2m to 3m wide (1.5m width can be considered for one-way movement). Figure 30 supplements the explanation above.

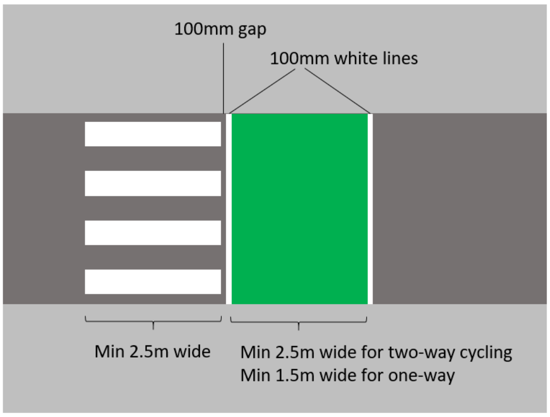


Figure 30: Width of paired/dual crossing
(Source: Auckland Transport)

Along line of travel movement (side road)
It is important to retain delineation between cycle path and footpath up to the crossing location over the side road. Delineation can be formed with kerb type, tactile, or berm space between the path (similar to Taniwha St – Hilton Place intersection on Figure 31) Green warning tactile pavers are not needed if the delineation continues up to the kerblines. As long as warning tactiles are aligned directly to the opposite side, delineation between cyclists and pedestrians over the crossing point can be formed with a white line marking.

Figure 31: Paired crossing with delineation to the kerbline, Taniwha St – Hilton Place intersection
(Source: Auckland Transport)

Perpendicular path of travel (mid-block crossing)
Perpendicular crossing movement may need to have green tactile indicators, depends on how the delineation designed on the crossing point.

Figure 32: Mid-block paired zebra crossing, Taniwha St
(Source: Auckland Transport)

This Practice Note provides two updated diagrams to supplement the EDC document (please note that zebra crossing elements need to comply with Pedestrian Zebra Crossing design requirement, such as Belisha location, markings, etc.).

Raised crossings on Figures 33 and 34 below and [EDC Cycling Infrastructure]should consider PN-04 Section 5.2.7 Traffic Calming Features and AT design documents for Raised Safety Platforms. Alternatively, if crossing is flush and speed is under 40km/hr, a speed cushion can be considered.

Updated diagrams shown below (these two diagrams show a Shared Path environment which is not an approved facility, and for which a Departure from Standards would be required):

- Figure 9 in EDC Cycling Infrastructure is replaced by Figure 33 PN-04 with update: no red surfacing and updated zebra marking.

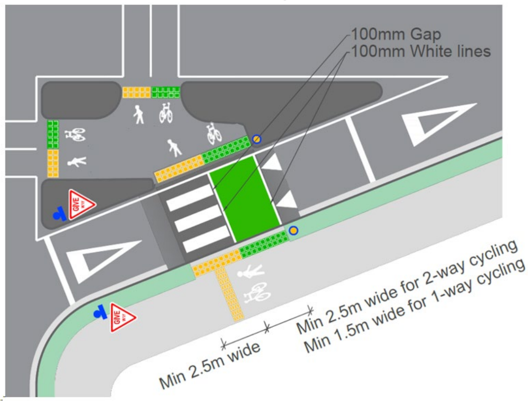


Figure 33: Paired Crossing – one-way traffic
(Source: Auckland Transport)

- Figure 10 on EDC Cycling Infrastructure is replaced by Figure 34 PN-04 with update: no red surfacing and updated zebra marking.

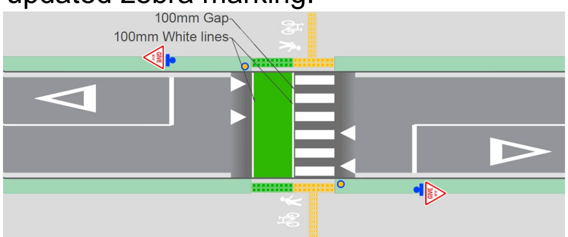


Figure 34: Paired crossing – two-way traffic
(Source: Auckland Transport)

6.4.2 Dual Signal Crossing

Signal crossing helps a one-way directional cycleway transition into a two-way directional and *vice versa*; or a two-way cycleway to switch sides or connect one type of cycling infrastructure with another. The arrangement should ensure that people cycling notice the push button location and are able to access a transition ramp safely. Green tactile indicators need to be provided if signal crossing waiting space has no delineation between footpath and cycleway (for example Figure 35 where two-way cycleway connects into Shared Path facility). Refer to Part 4: Traffic Control Devices for General Use – for Intersections for signalised crossing markings.

Figure 35: Mid-block Dual crossing connecting two-way directional cycleway and existing shared path
(Source: Auckland Transport Project Drawing)

Dual signal crossings need to be reviewed when there is a parallel separated cycleway facility at the signalised intersection. Two facilities crossing over an intersection in parallel might complicate the signal operations and increase cycle time. Early engagement with ATOC team might be needed.

6.4.3 Pram crossing

If people cycling are expected to cross through a refuge island, it may require longer storage space to accommodate non-standard cycles. To accommodate a cargo cycle, tandem or trailer cycle, the storage space needs to be 2.0m to 2.5m long as per EDC Cycling Infrastructure section 2.1 Design Parameters, sub-section Design User Dimensions.

Figure 36: Refuge Island on pram crossing St Jude St, Avondale
(Source: Auckland Transport)

6.4.4 Other Consideration

Connecting cycling infrastructure in an obvious and safe way is really important and will enable people to use these new pieces of infrastructure. Figure 37 below shows the transition from a two-way cycleway into a Shared Path facility (westbound) and cycle lane (eastbound). This arrangement might create confusion for people on bikes who are trying to access painted cycle lane on the opposite side.

If there is no crossing, alternatively a central refuge can be provided, which narrows the roadway and provides a two-stage crossing for cyclist across a road. Designers need to ensure that the refuge is wide enough to protect a cycles comfortably, and ideally a range of cycles types (standard bike and non-standard bike).

Figure 37: Shared Path, one-way directional on-road cycle lane, and separated two-way directional cycleway connection on Tamaki Dr
(Source: Auckland Transport)

7. Kerb side activities

When designing a separated cycleway it's best to check the Kerbzone Management Framework, which sets out a process for determining how kerbzone space (between the property boundary and the first roadway lane) should be allocated.

7.1 Bus stops

The Transport Design Manual prescribes floating bus stop designs that will provide safer interaction between people on bikes, bus passengers, and moving traffic. As always, minimum widths should not be used as the default – the width provided needs to make sense in the streetscape next to the other elements of a design – in this case the width of the cycle lane and the width of the primary footway space; and other uses of the footway including bus shelters, shop fronts etc.

There are three types of floating bus stop design prescribed in the Transport Design Manual:

- The Type 1 floating stop gives the best outcome for all users as there is no immediate pedestrian movement across the cycleway from a shelter or other waiting area as the bus approaches, so less disruption to people on bikes who are expected to give way to people on foot crossing their path. People alighting are more obvious to people riding as they can't appear until the large and very obvious bus is stationary, hence there is more time to react to their approach and to slow, if necessary, ready to give way.
- The Type 2 provides a good customer waiting area but will result in people crossing the cycleway 'at short notice', moving across to the boarding platform when they see

their bus approach, which in the case of with-flow single-direction cycleway, the rider won't be able to see and anticipate.
- The Type 3 provides a minimal safe alighting space so that as people step out of a bus they're not immediately in the path of a cycle or scooter user who hasn't given way as required. Those waiting to board will probably queue across the cycle path if there's more than one person waiting, causing more delay than is desirable to those cycling through – it is anticipated that the behaviour of both user groups will develop as people get used to the concept.

A proper floating bus stop design has space for customer facilities on the 'island', the whole bus platform is separated from the walking, cycling, and other parts of the street. Consequently, there is no time-critical movement of people across the cycleway i.e. when a bus arrives, people aren't immediately crossing to board it. That's why in TDM the 'Type 1' layout is specified as the preferred design, with lesser provision allowed only where space isn't available for the full-size layout.

7.1.1 Frequent Transit Network

Bus stops serving FTN (higher frequency) bus routes are usually placed in higher catchment areas, the routes can be checked through the Future Connect map. The Roads & Streets framework needs to be considered in the design. A higher pedestrian volume (including all bus customers when off the bus) needs to have wider pedestrian spaces.

Bus Stop – Cycleway Dimensions:

- Cycleway width through bus stop is minimum 1.3m (see table PN04-3). It is narrower to encourage cyclists to slow down or at least to travel in single file. A 1.3m width is the minimum in order to accommodate cargo cycles (non-standard bikes).

Type 1 – Full island design*

- The island width is minimum 2.5m from kerb face to the edge of cycleway delineation, with breakdown as below:
  a. 1.2m is the absolute minimum for boarding platform width,
  b. while the minimum bus shelter is 1.3m – it is preferred to have standard bus shelter 1.5m (designer to reconfirm with AT Metro regarding bus shelter requirement for each specific site).

Type 3 – Boarding strip*

- The minimum boarding platform is 1.2m from kerb face to the edge of cycleway delineation.

*Island allocation, bus shelter placement, and/or boarding strip width can be achieved by managing the front berm width, although this will depend on the existing condition.

Bus stop at Victoria Street West cycleway

Temporary bus stop at Ngapipi Rd cycleway

Bus stop at Taniwha Street cycleway

Figure 38: Bus Stop Type 3
(Source: Auckland Transport)

Bus Stop Design Elements:

- Delineation: the preferred delineation of the edges of the cycleway is a level difference using mountable kerb types 14 or 15. When there is no level difference between pedestrian and cycle spaces, a 600mm strip of grey warning tactile indicators* should be used.

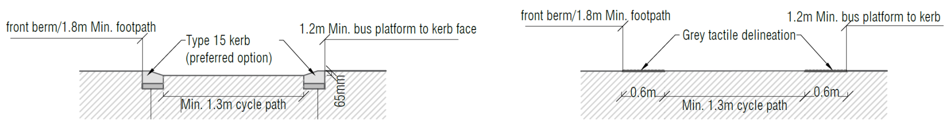


Figure 39: Delineation type between footpath-cycleway-bus platform – SED CY0024
(Source: Auckland Transport)

*Grey warning tactile indicators are to be aligned as a continuation of the yellow tactile indicators at the pedestrian crossing over cycleway.

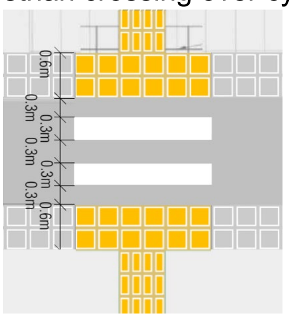


Figure 40: Example of 600mm grey tactile delineation with zebra marking on 1.5m cycleway
(Source: Auckland Transport)

- Pool fence: can be considered if bus passengers need to be guided to the crossing location; or prevented from walking into the cycleway from a position that is hidden from people approaching on cycles. Horizontal clearance needs to be provided between cycleway and fence.
- Surface material: cycleway surface should be darker (asphalt or darker concrete 8kg/m3 oxide), footpath and bus platform should be lighter concrete (4kg/m3 oxide)

Bus stop design drawing can be found in SED Cycling Infrastructure. Below are examples of bus stop design for one-way and two-way cycleway with kerb delineation (preferred delineation type to achieve inclusive design.

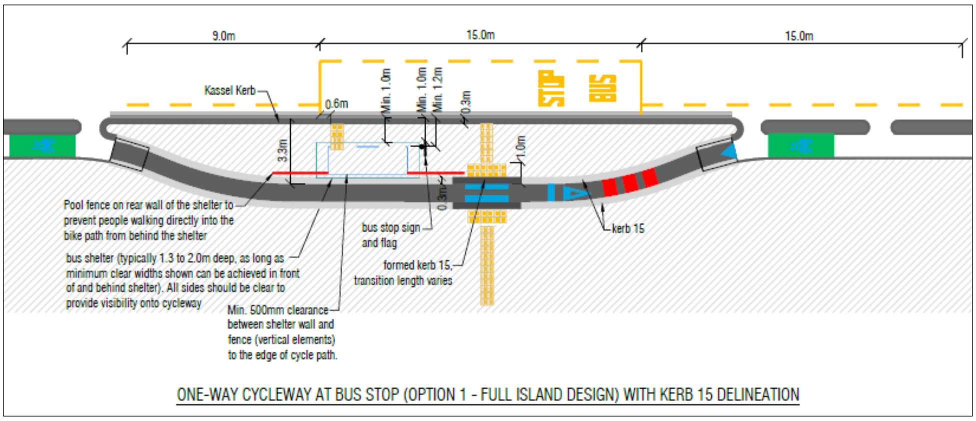


Figure 41: Bus stop Frequent Network One-way Cycleway (Option 1) – SED CY0020
(Source: Auckland Transport)

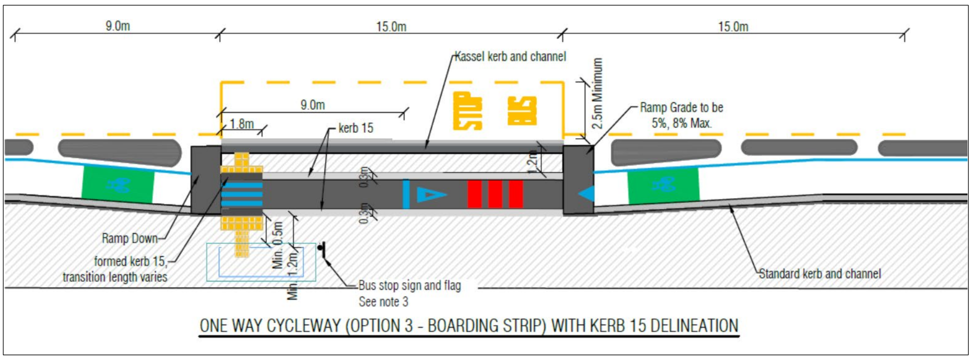


Figure 42: Bus stop Frequent Network One-way Cycleway (Option 3) – SED CY0021
(Source: Auckland Transport)

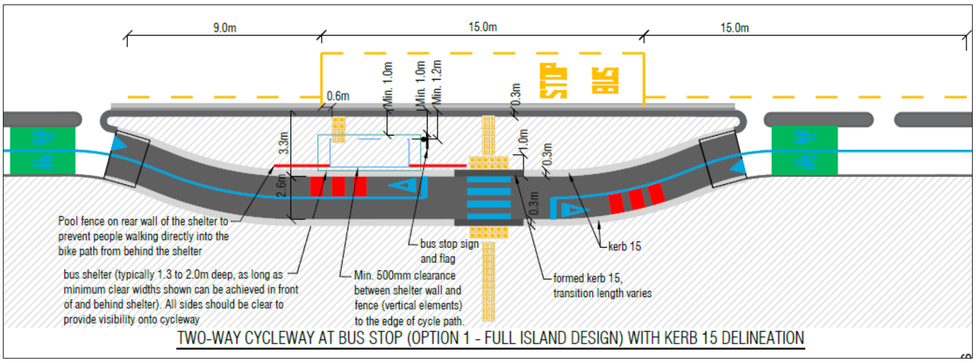


Figure 43: Bus stop Frequent Network Two-way Cycleway (Option 1) – SED CY0022
(Source: Auckland Transport)

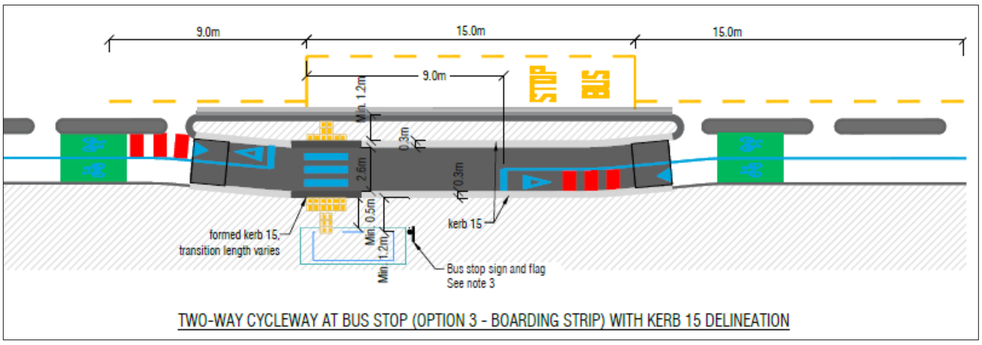


Figure 44: Bus stop Frequent Network Two-way Cycleway (Option 3) – SED CY0023
(Source: Auckland Transport)

7.1.2 Low frequency bus routes (Non-FTN routes only)

The low frequency routes design is applicable only to one-way directional cycleways through a Departure from Standards process. For two-way cycleways, designers must refer to the standard bus stops design PN04 section 7.1.12 Frequent Transit above.

Figure 45: Low frequency bus route in line bus stop Mt Albert Road
(Source: Auckland Transport)

The low frequency bus routes design option requires the TDM-standard minimum bus stop lead-in distance of 15m and lead-out distance of 9m (in addition to the minimum 15m box). This dimension is applicable when there is 2.0m wide object upstream, however when the cycleway is wider than 2.0m (including the separator/buffer) the lead-in and lead-out would need longer distances. At minimum, the separators should be installed at 15m and 9m either side of the bus stop. Internal dimension is 15m for one bus, and 30m for two buses. Green cycle boxes should be placed at either end of the bus stop box. Concrete or rubberised separators should be changed to a painted separator through the bus manoeuvring areas.

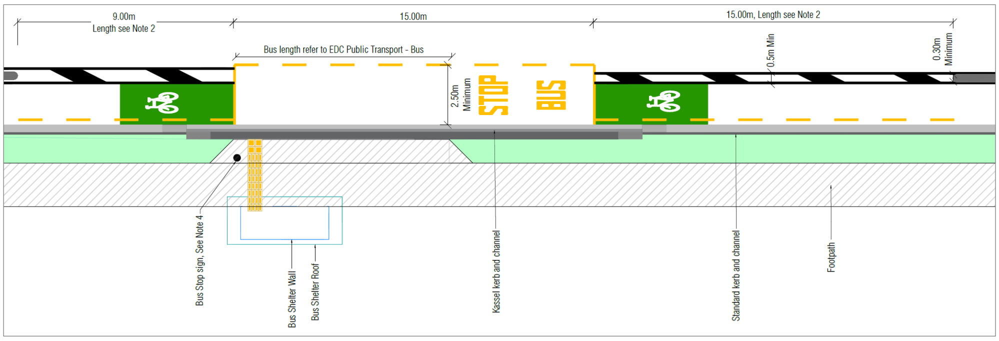


Figure 46: Bus stop – non frequent network – SED CY0019
(Source: Auckland Transport)

7.2 Waste Collection

In general, the provisions for all three bin types (general rubbish, recycling, food scraps) requires a minimum area approximately 800mm deep and 2.4m long so designers need to ensure space allocation for this. This space allocation will need to be accompanied by good communication with residents to ensure they know where bins are to be placed. When allocating the space, designers also need to think about the development type along the cycleway, as additional spaces will be needed if there is multi-lot housing / terraced housing along the cycling facility. The minimum depth of rubbish bin allocation needs to allow for general rubbish and recycling bin options:

- 120-litre bins (545mm wide)
- 240L bin (730 x 730mm wide)
- 360L (848 x 848mm wide) – the larger size requiring wider depth.

For food scraps, the bin size is smaller, therefore, designer need to check the arrangement of rubbish bin to fit. Further information can be check on Auckland Council website.

Waste collection trucks in Auckland have maximum arm reach of 2.5m, therefore a wider cycling facility (combined cycleway and physical cycle separator width) above the maximum arm distance needs to:

- allow waste collection truck to straddle into cycleway in a safe manner; or
- allocate rubbish bin collection in the buffer/separator area (see figure 47).

Designers need to understand that having the arm reach across the cycleway is a danger for people cycling along the cycleway and so should be avoided. Further coordination with AC Waste Management team might be needed.

For a two-way cycleway, there is an additional hazard compared to one-way directional cycleway. One-way cycleway still provides options for a person cycling to overtake a rubbish truck using the traffic lane. However, in a two-way cycleway when riding in the direction opposite to the adjacent general traffic lane, a person cycling who meets with a rubbish collection in operation would be unable to ride safely around the truck as they would be riding into on-coming traffic. Meeting a rubbish truck in this way will cause delay for the person cycling that might lead to unsafe behaviour, choosing either to ride into the face of traffic, or along the footway around the bins.

7.2.1 Kerbside waste collection

Where rubbish trucks are collecting bins that are positioned on the kerb, they will need to straddle the separators in order to align against the kerb.

For all rubbish trucks to be able to straddle the separators, the separators should be no more than 120mm high and no more than 600mm wide (the absolute maximum height which can be straddled by rubbish trucks is 140mm – the 120mm high separator gives some allowance for construction tolerance along with the adhesive). The separators would need to be laid so as to be no higher than 130mm proud of the pavement surface (an epoxy adhesive should be used as a grout base is likely to add too much additional height). The placement of vertical features (such as marker posts) on top of a separator; or selecting a vertical separator (for example flexi post) needs to consider the waste collection operation because the truck will not be able to straddle in to or out from the cycle lane (truck may become trapped inside the separators). If the first cycle separator is higher than 140mm (maximum height) a gap needs to be provided between the first and second separators to allow a waste collection truck to enter the cycleway and straddle the separators downstream.

If a narrow separator width (below 600mm) is selected as physical delineation on a buffer area, designer is to ensure that the placement of the separator is closer to the cycle lane, however, the distance between the edge of the separator and the cycle lane edge line must comply with PN04 section 5.1.2 Width Clearance Table PN04-2 (Horizontal clearance to vertical element).

7.2.2 Non-kerbside waste collection

Bin collection from behind the kerb wherever parking occurs is difficult for operators since the arm needs to reach across the cycleway width and the parking width to collect bins. Having the arm reach far across cycleway, while the waste truck is not within cyclist visibility and vice versa, is dangerous for cyclists travelling along cycleway and so should be avoided. If allowing for 3m gaps between edge of vehicle crossing and separator, this should allow for enough space for all 3 bins from one household. Where rubbish bin collection is not a kerbside collection, it needs to show where bins are to be placed – i.e., between separators or within the 3.0m gap distance of separator and vehicle crossing ramp. This can be done with marking stencils, as in Figure 47.

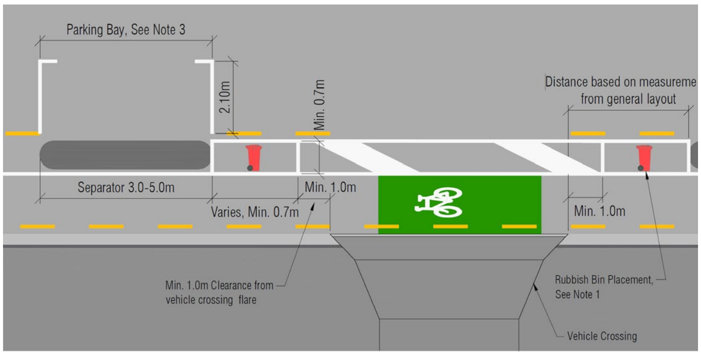


Figure 47: Waste collection arrangement on vehicle crossing – SED CY0027
(Source: Auckland Transport)

Further details can be discussed with AC and AT to address site-specific context that might not be covered in this Practice Note.

7.3 Maintenance

Maintenance needs to be considered in design. This may include:

- Not using concrete separators where wheel tracking has identified there will be conflict with wheel paths.
- Careful placement of rubberised separators to minimise placement in areas of high vehicle movement such as across left turn slip lanes.
- Consideration of access for utility vehicles to service major junction boxes in the footpath.
- Consideration of cycleway width.
- Consideration of access for a road sweeping machine into the cycle facilities. Frequent maintenance of cycleways is required to ensure that they do not accumulate debris and litter that would normally be collected by a street sweeper in routine road maintenance.

The raised separators on narrow width cycleways can make it difficult for resurfacing and pavement repair works because separators may need to be removed prior to carrying out work.

Normal size road sweeper might not be able to access a cycleway therefore a specialist sweeping machine with smaller capacity or manual sweeping should be used, however this may not be practical in some cases.

7.4 Vehicle Crossings

Where there are multiple or high-use vehicle crossings then the use of rubberised median separation may be considered similar to the application in Beach Road and Market Place, illustrated in Treatment of vehicle crossings – Drawing CY0015 (Figure 48).

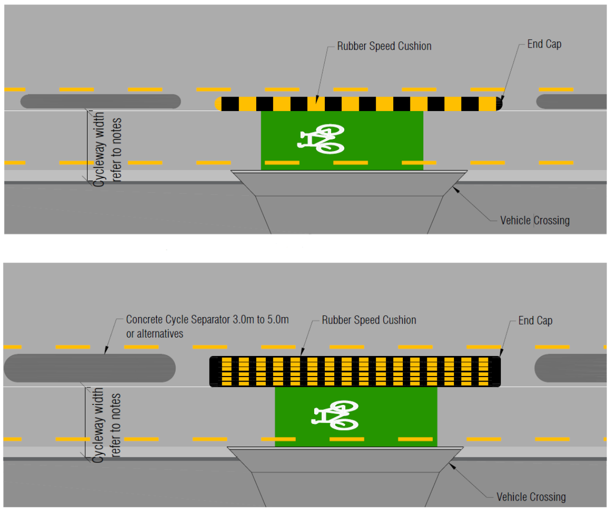


Figure 48: Treatment of vehicle crossings – SED CY0015
(Source: Auckland Transport)

For a high-use driveway, detailed design elements and supporting measures guidance can be found on NZTA Waka Kotahi High-Use Driveway Treatment For Cycle Paths and Shared Paths.

7.5 Parking

Ideally, cars should not cross a cycleway to access a parking bay. The cycleway should be designed to run up the inside of parking bays, not around the outside. A cycleway placed in between an indented parking bay and a traffic lane creates a hazard for cyclists, for example Clark Street, New Lynn and Franklin Rd, Freemans Bay. This arrangement can be proposed only by a Departure from Standards process following discussion with the Chief Engineer's team.

See PN04 section 5.1.3.1 Cycleway and Roadway Width for the car door zone width for parking activity.

Mobility parking along cycleway routes should be designed carefully: check the accessibility parking design and dimension requirements on EDC Parking Design and NZS 4121. A pram ramp access should be formed to ensure an accessible route between mobility parking and footpath. Pram ramp gradient should be maximum 5% and gap distance between separators should comply with wide access aisles mobility parking requirement (minimum is 1.2m as per AC Universal Design Checklist Parking, and absolute minimum is 1.1m (as per NZS 4121 aisle space for mobility parking).

Figure 49: Mobility Parking on [Karangahape Road, Auckland CBD]
(Source: Auckland Transport)

7.6 Loading Zone

Loading can be provided along the cycleway facility for short sections. It is important for the designer to understand the specific loading requirements of a site, by talking to the business and observing how it currently operates. Consider how the timing of loading activities could affect design. Early engagement with business could see benefits for them in improving the operation of the loading space that they use as part of the cycle project.

Figure 50: Loading bays on Nelson St and Market Pl.
(Source: Auckland Transport)

Designers need to consider the gap between separators and the width of separators to allow safe loading activity. Kerb should be designed with a ramp for the loading. Yellow hatch marking can be used to emphasise loading space area along the separator (figure 51). Greening the cycleway, as per Lower Hobson Street (figure 52), can also help increase awareness in this conflict area.

Figure 51: Loading Bay on Custom St West, Auckland CBD
(Source: Auckland Transport)

If high loading activity occurs, removable bollards can be placed to delineate cycleway and loading activity. This requires a Departure from Standards process to justify the need to replace cycle separators with removable bollards. A consideration needs to be given to the risk of handlebar strike: typically cycle handlebar height is 1.0 m from surface.

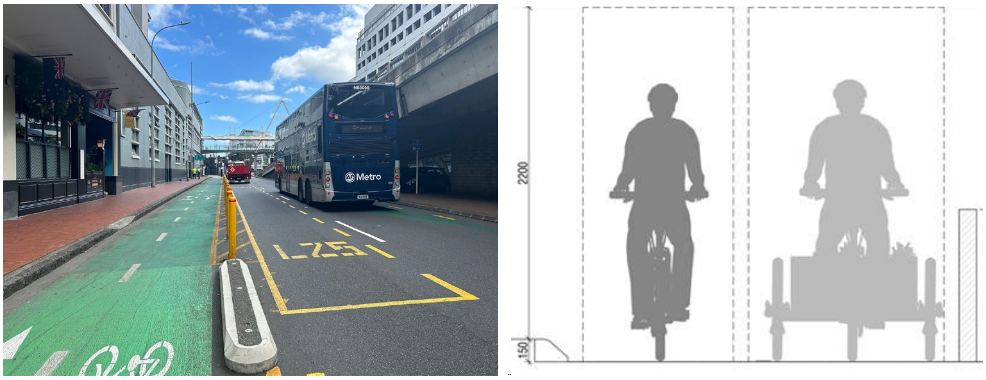


Figure 52: Loading Bay on Lower Hobson St, Auckland CBD
(Source: Auckland Transport)

8.0 Definitions

Term	Definition
Quick-Build	In the context of cycleway infrastructure and this technical note it is guidance on information about the best infrastructure options for installing quick build (interim 5 to10-year options) for separated cycleways to increase safety and encourage mode shift in a visually, physically, and aesthetically consistent manner in the Auckland Region. It is intended that these may be applied where there is an appropriate route that requires additional protection to encourage and provide additional protection for cycling in a manner more cost-effective than the provision of an 'all ages and abilities' facility to the full TDM standards.
Cycleway	The generic term 'cycleway' is not found in New Zealand legislation but is commonly understood by the public and practitioners to mean any type of facility (cycle lane, separated cycle lane, cycle path, shared path, neighbourhood greenway) that is meant for people on bikes.
Cycle Lane	A division of a road marked off with separated painted lines. The lane is marked with a continuous edge line and green surface patches with cycle symbols. The cycle lane may only be used for one-way travel, the same direction as the adjacent traffic lane.
Cycle Path	Cycle paths are separated physically from the roadway. This facility is described under 'separated cycleways' in TDM. The separation may involve horizontal and / or vertical components. Further definition can be found in Traffic control devices manual part 5: traffic control devices for general use – between intersections.
Brownfield	Brownfield land is land in a town or a city that has already been developed and has existing infrastructure. Source: Auckland Design Manual

Greenfield	Greenfield is land identified for future urban development that has not been developed previously. It may also refer to an area where there is no existing infrastructure. Source: Auckland Design Manual

9. Supporting Information

Supporting documents	• Auckland Transport – Transport Design Manual • Auckland Design Manual Section Regulations: Infrastructure Code of Practice Chapter 3: Transport
Related documents	1. 5794-tdm-engineering-design-code-cycling-infrastructure-version-1.pdf (at.govt.nz) 2. The Auckland Code of Practice for Land Development and Subdivision - Chapter 3: Transport, April 2022, Draft Version 1 (aucklanddesignmanual.co.nz) 3. cycle-infrastructure.pdf (at.govt.nz) 4. Separated cycleways | Waka Kotahi NZ Transport Agency (nzta.govt.nz) 5. Integrating bus stops with cycling | Waka Kotahi NZ Transport Agency (nzta.govt.nz) 6. Technical note #2: Separated cycleways at side roads and driveways - updated 10 August 2020 (nzta.govt.nz) 7. Protected cycle lane barrier selection matrix (nzta.govt.nz) 8. Research Note 006 - Infrastructure for quick-build cycleways – June 2022 Waka Kotahi 9. A guide for accessible cycling (Waka Kotahi, 2024)

10. Approval

Practice Note Contact	Putri Kusumawardhani Senior Specialist – Active Modes Design	DocuSigned by: Putri Kusumawardhani 5A65DE60174B4D9...	15 July 2024
PN 04 Team	Ken Lee-Jones Principal Specialist	Signed by: [signature] B1CBD7AD689447E...	15 July 2024
	Danny Song Design Specialist	DocuSigned by: Danny Song A791A52031E74E4...	15 July 2024
Reviewed by:	Mitra Prasad Technical Lead – Active Modes Integration	Signed by: [signature] D6B8E99EF80242B...	16 July 2024
	Irene Tse Technical Lead – Road Safety Engineering	Signed by: Irene Tse F2184139D64E497...	15 July 2024
	Andy Irwin Principal Specialist – Transport Design	DocuSigned by: AL Irwin E0C59C1A0AD541D...	15 July 2024
	Adrian Grant Principal Specialist – Public Transport	DocuSigned by: Adrian Grant 736FF1C79C2B435...	15 July 2024
Endorsed by:	Adrian Lord Head of Active Modes	Signed by: Adrian Lord 730DB33111054E0...	15 July 2024
Authorised by	Chris Beasley Transport Design and Standards Manager	DocuSigned by: CBeasley 646D1613508748A...	17 July 2024
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AT reserves the right to review, amend or add to this Practice Note at any time upon reasonable notice to users of the Transport Design Manual and related documents.