

Biking and micro-mobility

Code of Practice

OCTOBER 2024



**Hamilton
City Council**
Te kaunihera o Kirikiriroa

FOREWORD

In 2022 Hamilton City Council endorsed the [Biking and Micro-mobility Programme: Single Stage Business Case \(2022\)](#). This included endorsing the Connected Neighbourhoods vision:

“I can go anywhere on my bike”

Connected Neighbourhoods aims to create a network and environment that is safe and convenient for people to go anywhere by bike or micro-mobility, using quality separated facilities on busy roads, cycle-friendly local road designs, and dedicated connections to key destinations.

To achieve the vision “I can go anywhere by bike” all streets and roads must eventually be suitable for biking for people of all ages and abilities. This will take time to achieve and may not immediately be possible in every location. Furthermore, while it often makes sense to incorporate All Ages and Abilities (AAA) treatments with other road works programmes, there will be times when it is necessary to wait for specific BaMM programmes or provide interim improvements that move towards accommodating all ages and abilities.

This Code of Practice specifies the parameters under which a treatment can be applied, and the characteristics required for each treatment. Designers should always aim to design cycle facilities in accordance with this document, including that the facility caters for AAA in the context in which they are proposed. Where any deviations from the specifications are considered necessary, they must be clearly documented and approved by Hamilton City Council.

This Code of Practice details the requirements for planning and designing biking and micro-mobility (BAMM) facilities in Hamilton Kirikiriroa. It reflects changes to design standards, emerging research, best practice, and changes of user needs, both at national and international level.

The delivery of safe biking and micro-mobility infrastructure to encourage more people choose active and sustainable modes of transport is strongly supported by local strategies and plans. The following is a non-exhaustive list of the other relevant strategies and policies:

- Access Hamilton Strategy – Our transport network enables everyone to connect to people and places in safe, accessible, and smart ways.
- Our Climate Future: Te Pae Tawhiti o Kirikiriroa – Hamilton Kirikiriroa is a thriving, low-carbon city that responds and adapts to climate change.
- Hamilton Biking Plan 2015 – 2045: A bike friendly city

The content set out in this Code of Practice provides guidance on design for new and upgraded facilities across Hamilton. For any biking and micro-mobility facility or route, there will be numerous site-specific considerations and constraints, the process of selecting and designing the appropriate midblock, intersection and transition treatments is iterative and involves consideration of multiple options that are best suited and aligns with key design

principles. This Code of Practice is supplementary to national design guidelines and regulatory requirements; designers should be familiar with the following national guidance:

- Cycling Network Guidance (CNG)
- Traffic Control Devices (TCD) Manual
- Pedestrian Network Guidance (PNG)
- Public Transport Design Guidance (PTDG)

It is noted that as new legislation is introduced and the needs of users are re-defined, the content of this Code of Practice will be updated.

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Issue	Reason for Issue	Author	Reviewer	Date
1	First edition – final version (no notes)	ViaStrada Ltd (lead: Megan Gregory)	George Lane and Honor Young (HCC) Axel Downard-Wilke (ViaStrada)	24 October 2024
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FUNDAMENTALS OF PROVIDING FOR BIKING AND MICRO-MOBILITY

There are five core design fundamentals for providing for biking (and, by association, micro-mobility): safety, coherence, directness, comfort, and attractiveness. To achieve inclusive design and accessibility the principles should be applied through the lens of the [All Ages and Abilities \(AAA\)](#) target audience, to cater for both existing users and those who might be interested in travelling by bike or micro-mobility.

PART 1 - SAFETY

There are two ways of considering safety – how safe people *feel* (“perceived safety”) and how safe they really are (“actual safety”).

1.1 Actual safety

Transport users’ actual safety depends on four elements: roads and roadsides, vehicles, speed, and road users – this framework is known as the [Safe Systems Approach](#). This Code of Practice focusses on designing safe biking and micro-mobility infrastructure (i.e. components of roads and roadsides), which may also influence vehicle speeds and road user behaviour / awareness.

Designs should minimise the likelihood of crashes occurring and minimise the severity of crashes that do occur. It is not usually desirable to minimise the exposure to crashes as the purpose of providing safe infrastructure is usually to encourage more people choose to travel by bike or micromobility.

1.2 Perceived safety

Even if routes and networks are technically safe, it is essential that people *feel* comfortable and secure when using them – otherwise, fewer people will choose to do so. Given that personal perceptions of safety can differ, facilities should generally be designed to make people of [All Ages and Abilities \(AAA\)](#) feel at ease. Selecting the appropriate facility type, to increase separation from high-volume and high-speed motor traffic is crucial. Furthermore, aspects such as providing suitable access and discouraging anti-social behaviour should be considered.

PART 2 - COHERENCE

It should be clear to biking and micro-mobility users where they should ride, especially where there is a change in type or alignment of their facility, or where a designated route turns a corner. Effective wayfinding signs and markings aids newcomers and visitors in navigating the BaMM network.

Consistency is crucial at a specific project level, especially when various types of links are integrated. For instance, when the provision shifts from a quiet street to a separated cycleway, the transition should be seamless and easy to understand. Coherence is also particularly important at intersections, where users may be faced with multiple options and limited physical infrastructure to channel them.

PART 3 - DIRECTNESS

Directness can be evaluated based on physical distance, time and energy spent. BaMM users prefer direct route options with minimal delays at intersections and minimal gradients – depending on the location and the options available, they may compromise on one or two of these factors, e.g. take a slightly longer route that avoids hills and reduces energy spent.

HCC has endorsed the Connected Neighbourhoods vision “I can go anywhere on my bike”, which means BaMM users of [All Ages and Abilities](#) will be able to choose the most direct route for their journey.

The existing network will be upgraded incrementally, generally on a route-by-route basis so that the whole network eventually meets the vision. Until then, users may prefer to use a route or link that is slightly longer but avoids steep inclines or busy intersections.

Ultimately, the BaMM network should be at least as direct as the network for driving. However, the BaMM network can be more direct by introducing options like contraflow BaMM facilities and BaMM-only links.

PART 4 - COMFORT

Facilities for biking and micro-mobility should be planned, designed and maintained to ensure user comfort. Any factors leading to unnecessary discomfort or delays are likely to decrease the overall comfort and appeal of the facility. Several factors can affect the comfort of a BaMM facility, such as ensuring adequate width for the number and type of users, avoiding excessive gradients, reducing delays and detours, maintaining a smooth and well-drained surface, minimising exposure to harsh weather conditions, and regularly cleaning and maintaining the facility in good condition.

PART 5 - ATTRACTIVENESS

Biking and micro-mobility users are in close proximity with the environment they traverse. Therefore, it is essential for this environment to be as enjoyable and engaging as possible. People typically find routes through well-designed urban areas, parks, and waterfronts to be the most appealing. Introducing separation from motor traffic can significantly enhance the attractiveness of a BaMM route and minimise the adverse effects of vehicle noise and air pollution. Moreover, such separation can create space for greenery and sustainable drainage systems, further elevating the aesthetic appeal of the route.

PLANNING FOR BIKING AND MICRO-MOBILITY

PART 6 - IDENTIFYING THE TARGET AUDIENCE

6.1 All Ages and Abilities (AAA)

In Hamilton, biking and micro-mobility routes should be available to everyone, so we have selected an “All Ages and Abilities” (AAA) target audience.

It is envisaged that the entire network will eventually be AAA-friendly, to achieve the Connected Neighbourhoods vision “I can go anywhere on my bike”. This will take time to achieve and may not be possible in every location. Furthermore, while it often makes sense to incorporate AAA treatments with other road works programmes, there will be times when it is necessary to wait for specific BaMM programmes.

When designing for All Ages and Abilities, we consider people with particular needs or limitations. AAA users include:

Table 6-1: People in the All Ages and Abilities target audience

User type	Description
Children	Learning to ride a bike, and being able to transport oneself, has long been a rite of passage for children. People who learn biking and micro-mobility skills and confidence as children are more likely to continue using these modes later in life, making this a vital demographic to cater for. However, children are more vulnerable and less visible to drivers, and their lower cognitive ability makes them less able to identify potential conflicts, compared to adults.
Seniors	Biking and micro-mobility can be an enjoyable activity and means of transport for people 65 and over. These people also have greater risks associated with increasing fragility and potentially decreasing vision or hearing ability.
Women	In Hamilton, like the rest of New Zealand, about 1.8% of women who travel to work or education go by bike, compared to 4.9% of men ¹ . Research shows that women have a stronger desire to avoid injury from unsafe roads or aggressive drivers and are more vulnerable to harassment or assault than men. Women are also more likely to be involved in child-care or domestic duties that require multiple trips per day and carrying children and / or goods. Furthermore, mothers of young children have expressed a fear of cycling injuries affecting how they are able to care for their children. ²

¹ From Stats NZ census 2018 data

² See Russell, M., Davies, C., Wild, K., and Shaw, C. (2021) Pedalling towards equity: Exploring women’s cycling in a New Zealand city. Journal of Transport Geography, February 2021.

Low-income riders	People with lower incomes are shown to be less likely to own or have access to a bike and are less likely to commute by bike ³ . These are also the people who are most affected by increases in transport-related costs such as petrol, parking, or public transport charges. Having better access to bikes and suitable cycling facilities connecting their neighbourhoods and destinations can improve their transport options and quality of life.
People with disabilities	The disabled community comprises people with a wide range of disabilities, and therefore diverse needs and challenges regarding biking and micro-mobility. Some may have mobility issues and ride specialised bikes or devices that have different spatial requirements. Others may have vision or cognitive disabilities and have special needs regarding the infrastructure or surrounding environment.
People transporting children, goods, or cargo	Cargo bikes, long-tail bikes and bike trailers are increasingly used to transport larger goods or passengers. These are longer than standard bikes and have wider turning circles. A particular subset is parents and caregivers transporting children – the riders may be especially concerned about safety and the “precious cargo” also has the potential to be distracting.
Micro-mobility device users	Small-wheeled devices such as scooters and skateboards, especially electric-powered ones, are becoming more popular. People riding these devices travel much faster than pedestrians and should use a cycleway rather than a footpath. They have a much lower wheel-base than bikes, so are more susceptible to changes in gradient (e.g. at kerb crossings) and their smaller wheels without shock absorption make riding on rough surfaces less comfortable than for most bike riders. Micro-mobility devices can be used on footpaths, shared paths, separated cycleways and in general traffic lanes on the roadway. They are not currently legally permitted to use on-road painted cycle lanes (although this would be addressed by the Accessible Streets package).
Confident riders	Riders who are more concerned about delays incurred along their route and generally comfortable mixing with motor vehicles. In some locations, it may be beneficial to provide one option for more-confident riders (e.g. on-road) and a second option for others (e.g. separated cycleway).

Until recently, the alternative to motor vehicles has been unpowered bicycles, as reflected in the provision, symbology and terminology – e.g. bike networks, cycle lanes, cycle signals etc. While unpowered bicycles are still popular, they now form part of a wider “biking and micro-mobility” category. This Code of Practice uses terminology such as “cycleways” and “cycle signals”, as a reflection of the current traffic control device rules, but it is intended that these generally encompass the broader biking and micro-mobility family.

The types of bikes and micro-mobility devices ridden by AAA users include:

³ Waka Kotahi (2022) [Understanding attitudes and perceptions of cycling and walking](#).



Figure 6-1: Standard bike (source: ViaStrada)



Figure 6-2: Children's bikes (source: ViaStrada)



Figure 6-3: cargo bike (source: ViaStrada)



Figure 6-4: long tail bike (source: Xtracycle Inc)



Figure 6-5: bike towing a trailer (source: ViaStrada)



Figure 6-6: tricycle (source: Let ideas compete)



Figure 6-7: recumbent bike (source: m66roepers)



Figure 6-8: tandem bike (source: Richard Masoner)



Figure 6-9: electric bike (source: Lars Plougmann)



Figure 6-10: electric scooter
(source: ViaStrada)



Figure 6-11: electric unicycle
(source: Mitch Altman)



Figure 6-12: skateboard (source: Brett Chalupa)

6.2 Exceptions to providing for All Ages and Abilities

To introduce AAA-friendly provision to a street, intersection, or route, it will be necessary to change aspects of the existing road layout, operation, or network function. Hamilton City Council recognise that it will not be possible to provide for All Ages and Abilities everywhere, all the time. When an AAA-appropriate design cannot be achieved, the designer must consult with HCC and alternatives may be considered.

PART 7 - ASSESSING DEMAND

See the CNG section on [assessing cycle demand](#).

PART 8 - IDENTIFYING ROUTE OPTIONS

There are four types of biking and micro-mobility route for towns and cities in the Waikato:

Table 8-1: Waikato biking and micro-mobility route types

Route type	Description
Cross-city connection	Major routes that traverse a city / town, linking key destinations. May coincide with arterial or collector streets, or may be on alternative parallel corridors, or may be removed from the road network (e.g. along rivers or rail corridors).
Community link	Link suburbs to the cross-city connections.
Local link	Provide for people biking and micro-mobility users travelling to key local destinations such as schools, shops, and recreation centres.
Recreational route	Primarily for people travelling for recreation rather than transport to a specific destination. They may be provided along scenic routes, or in challenging terrain for sports enthusiasts.

Regional routes that travel between towns and cities may interact with any of the above route types.

HCC has endorsed the Connected Neighbourhoods vision “I can go anywhere on my bike” While HCC has developed a strategic network for biking and micromobility with some defined

routes, AAA users could live in any residential location and will want to access many key destinations such as schools, shopping centres, workplaces, and recreation facilities. Therefore, practically every street in the network should provide adequately for biking and micro-mobility (the exceptions being heavily trafficked transit corridors with access control where a parallel BaMM alternative may be provided instead). Part 9 - Selecting facility types indicates appropriate facility types for different road characteristics. Designers working on a specific route should think about all BaMM movements at the intersections, i.e. not just movements along the route but also to and from connecting streets.

The CNG section on [identifying cycle route options](#) provides further guidance.

PART 9 - SELECTING FACILITY TYPES

9.1 Key principles

The key principles for selecting a biking and micro-mobility facility type for a given location, as based on [CROW Design Manual for Bicycle Traffic](#) are:

- Choose a facility that is as safe and comfortable as possible for people on bikes or micro-mobility devices.
- Consider the entire traffic situation – including speed and volume of motor vehicles, and interactions at intersections. Often the spatial constraints and operational requirements at intersections will govern the type of facility that can be used on the midblock – e.g. a two-way cycleway may work well on the midblock, but may not work with the intersection layout and imposes additional complications on the phasing.
- Boundaries between appropriate treatments are blurred, guides can be offered but there are no rigid limits.

9.2 Indicative facility selection

The various midblock facility options for biking and micro-mobility are detailed in [midblock design fundamentals](#). The following chart is based on these principles and gives an indication of which facility type will best satisfy the [fundamentals of providing for biking and micro-mobility](#) for AAA users, given combinations of motor vehicle speed and volume:

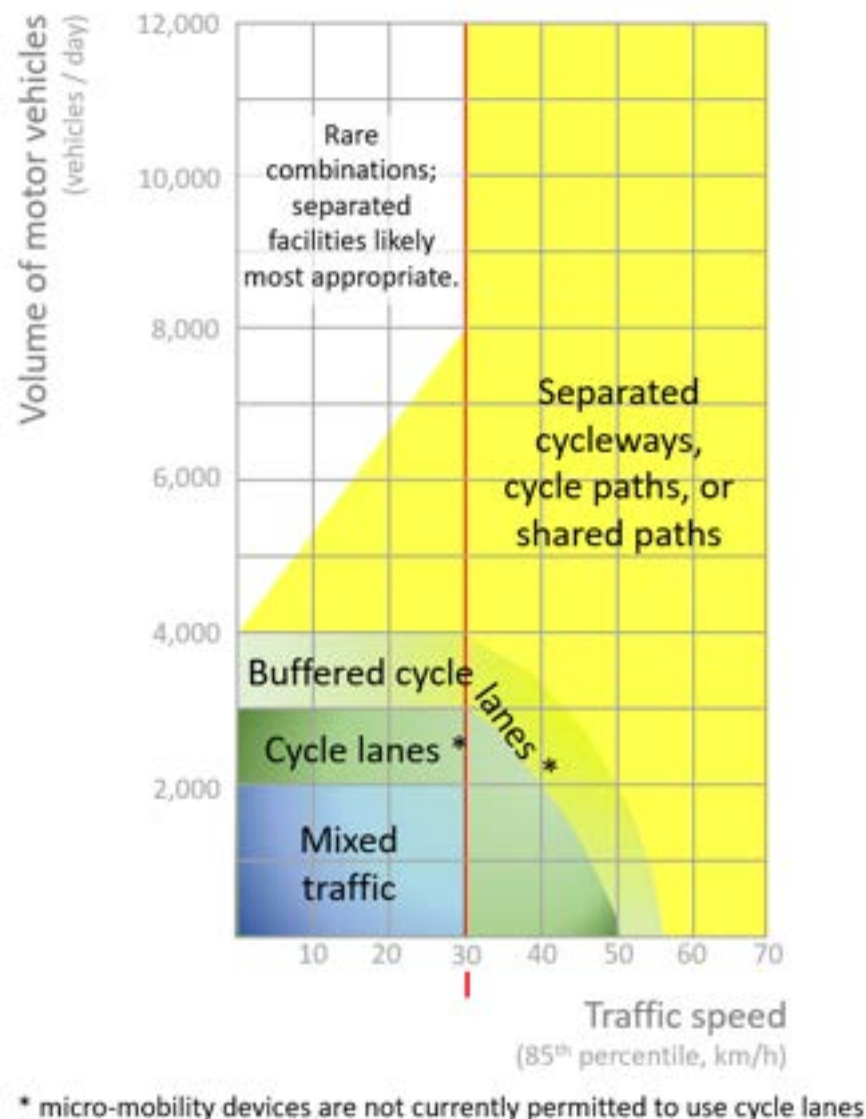


Figure 9-1: Indicative facilities for AAA biking and micro-mobility

Note:

- This chart is indicative only, there are other site-specific factors that need to be considered before confirming a facility type; these are detailed in subsequent sections.
- In particular, designers should have a good understanding of the surrounding land use and future growth.
- At a given traffic speed – traffic volume combination, a facility type suitable for higher speeds and volumes will also be appropriate. For example, at 2,500 vehicles per day and 30 km/h, cycle lanes are an acceptable treatment, but buffered cycle lanes or even separated cycleways could also be considered.

- * Micro-mobility devices are not currently permitted to use on-road painted cycle lanes (the [Accessible Streets Package](#) would address this). If a cycle lane is proposed, it should also be considered whether the footpath provision is suitable for micro-mobility users.

Table 9-1: Facility examples

Separated cycleway: Ruakura Road, Hamilton (50 km/h, 15,000+ veh/day)



Buffered cycle lane: King Street, Hamilton (50 km/h, approx. 3,500 veh/day)



Cycle lane: Skyhawk Road, Christchurch (40 km/h, approx. 2,000 veh/day)



Malcolm Street, Hamilton (40 km/h posted speed limit, but slower 85th percentile, approx. 220 veh/day)



9.3 Additional factors to consider

The final facility selection will also consider factors such as:

- Opportunity to decrease motor vehicle volumes and / or speeds
- Width requirements for the facility type (including width of separators for separated cycleways)
- Layout and operation at intersections along the route
- Special purpose vehicles that may be affected by the facility, e.g. emergency vehicles, recovery vehicles, waste collection vehicles
- Connections with other routes, key destinations etc
- Gradient
- Site-specific factors
- Facility duration – long term vs [quick-build](#)

9.3.1 Quick-build facilities

Permanent biking and micro-mobility treatments are preferred over temporary ones. However, limitations such as time, community perception, and funding can make quick-build treatments a pragmatic option. A clear scope and agreement on a long-term plan must be agreed on and effectively communicated to stakeholders prior to implementation.

Quick-build is an umbrella term that covers pilot and interim facilities which have lifetimes ranging from 1 month to 15 years and require minimal road reconstruction (such as drainage) to implement.

The key characteristics of quick-build facilities are:

- **timeline** (total design process in months and installation in days),
- **budget and design life** (temporary, relatively cheaper, flexible materials durable enough to provide time, political capital, and budget to evaluate and iterate upon the initial design),
- **materials** (maintaining existing drainage, anchoring to the pavement or remaining in place due to weight),
- **process** (a people-centric, holistic, scalable process providing a pathway to permanence).



Figure 9-2: Quick-build projects within the tactical urbanism spectrum of change (based on [CRCOG, 2020](#))

Following the decision to implement quick build treatments, determining the most appropriate treatment type is important to maximise level of service and achieve the desired durability.

Further information and details of possible separator options can be found in Waka Kotahi's research note 6, [Infrastructure for quick build cycleways](#).

Separator options for pilot facilities (intended installation of one month to one year) include:

- flexible delineator posts,
- jersey barriers, and
- light planters.

The use of these treatments is preferred in areas of low traffic or speed and only when a plan to upgrade or reconstruct the area is confirmed and will take place in 12 months or less.

Interim design treatments (lifetime estimate of around 1 to 15 years) have many options for separator type, including:

- planter boxes (wooden, plastic, or other materials),
- deformable posts (bollards),
- wooden raised lane separators,
- pre-cast concrete kerbs,
- pre-cast concrete separators,
- riley kerb cycle lane delineator,
- plastic raised lane separators without post attachments,
- mountable rubber raised kerb separators,
- concrete raised lane separators, and
- low lane separator / divider with posts.

Generally, these should only be implemented where a significant upgrade or change is confirmed to be taking place in 15 years or less.

PART 10 - SAFETY EVALUATION

Waka Kotahi's [Safe System audit guidelines: Safe System auditing procedures for transport projects Road to Zero edition \(2022\)](#) is New Zealand's current safety auditing guidance. It contains two components, a Safe System assessment, and an identification of safety concerns.

Table 10-1: Description and application of Safe System audit components

Safe System audit guidelines component	Description
Safe System assessment (see Austroads' research report AP-R509-16, Safe System Assessment Framework (2016) for further guidance)	Comparison of existing conditions and proposed options by assessing the extent to which each aligns with the Safe System principles.
Identification of safety concerns	Similar to the traditional road safety audit process: list specific concerns with a proposed design, and rate these according to probability of resulting in a crash and likely severity outcome if a crash occurs.

Each project stage should consider both components, although the comparative level of input between the two will shift as the project progresses. Safe System assessment should be completed at every stage, but it should not change substantially beyond concept stage. During earlier project stages it may be possible to identify some high-level safety concerns, but this process is most relevant at latter, more-detailed stages.

PART 11 - EVALUATING PROVISION OPTIONS

When choosing between provision options two assessments should be used:

1. A Safe Systems assessment (see Part 10 - Safety evaluation)
2. A multi-criteria analysis, as per one or more of:
 - a. Standard multi-criteria analysis for options evaluation
 - b. Quality of Service comparison for route alignment options
 - c. Risk comparison for separated cycleways

11.1 Standard multi-criteria analysis for options evaluation

In most cases considering the aspects and weightings outlined in Table 11-1 and using the scoring system detailed in Table 11-2 will be sufficient to compare project options.

Table 11-1: Multi-criteria analysis for options evaluation

	Category	Weight	Aspects to consider	Score range
Design Context (50%)	Target audience	Go / No-Go	Feasible to achieve an All Ages and Abilities design?	Go / No-Go
	Safety	Go / No-Go	Safe Systems assessment (see section Part 10 -) identifies improvement over existing provision. Appropriate facility types and intersection provisions, given traffic speeds and volumes.	Go / No-Go

		15%	Aligns with safe system principles to reduce conflict and severity for all users at: Intersections Crossing points High-risk driveways Residential driveways Within facilities (between facility users)	2 to -2
	Directness and coherence	15%	Limited changing of facility types Caters to major desire lines Minimises travel time and distance Few complicated manoeuvres Route can be clearly communicated, with minimal turns	2 to -2
	Connectivity to amenity within the corridor	10%	Good connections to: Local schools Shops Parks Other public spaces / buildings	2 to -2
	Attractiveness, Social Safety and Comfort	10%	Aligns with CPTED Passive surveillance from buildings / adjacent roads etc Clear sightlines along routes Greenspace routes have open aspect Good lighting No hiding places Pleasantness of biking and micro-mobility experience Comfort of user experience Mitigates undesirable: Noise Pollutants Slope	2 to -2

Community / Stakeholder Interests (30%)	Local Business Impact	10%	Minimal negative impact on local business interests Remaining car parking can accommodate observed demand for access to businesses Loading zones retained or added, where necessary Effects on access minimised Patronage retained or increased	2 to -2
	Local Resident Impact	10%	Minimal negative impact on local residents Retains access to properties Remaining car parking can accommodate observed demand Minimal impact on journey times Addresses resident concerns with the existing network	2 to -2
	Operational and Network Impacts	10%	Minimal negative effects of changes to the network (signals, cul-de-sacs etc) Minimal negative effects to public transport routes Minimal operation costs for street cleaning, waste bin collection Minimal effect on maintenance operations	2 to -2

Project Costs and Programme Risks (20%)	Budget Risks	10%	Minimises costs due to: Property purchase Complicated facilities Requires supporting asset replacement Contingencies and risks are well-understood	0 to -2
	Timing Risks	10%	Limited potential for programme delays due to: Land / property acquisition Legal processes – consents Legal processes – access	0 to -2

Table 11-2: Scoring system for multi-criteria analysis

Score	Description
2	Highly contributes to achieving the desired outcome
1	Somewhat contributes to achieving the desired outcome
0	Neutral / potential adverse effects that could be managed through design
-1	Somewhat detracts from achieving the desired outcome
-2	Significantly detracts from achieving the desired outcome
X	Fatal flaw to achieving the desired outcome – aspect needs to be modified before option can be considered.

11.2 Quality of Service comparison for route alignment options

If a more detailed analysis is required, the [Auckland Transport quality of service evaluation tool for cycle facilities](#) can be used to help decide between different route alignment options.

11.3 Risk comparison for separated cycleways

Where choosing between one-way and two-way separated cycleways, the CNG's [separated cycleway options tool \(SCOT\)](#) goes into more detail than the Auckland Transport Quality of Service tool (see 11.2 Quality of Service comparison for route alignment options), and the two should be used together.

PART 12 - ALLOCATING ROAD SPACE

See the CNG section on [road space allocation toolbox](#) for ideas of how to accommodate the desired biking and micro-mobility facility in the existing corridor space.

PART 13 - ESTABLISHING A BIKING AND MICRO-MOBILITY NETWORK PLAN

See the CNG section on [the cycle network plan](#).

PART 14 - PRIORITISATION

See the CNG section on [prioritisation](#) for possible approaches to determining the order in which the network will be developed.

PART 15 - IMPLEMENTATION

See the CNG section on [implementation](#) for how to implement the agreed network plan and related initiatives.

PART 16 - MONITORING AND REPORTING

See the CNG section on [monitoring and reporting](#) for individual BaMM facilities, routes and networks.

DESIGN PARAMETERS AND CONTROLS

This section covers the essential design parameters (size, speed and accelerations of cyclists) which are important inputs to Part 18 - Sight distance requirements.

PART 17 - DESIGN PARAMETERS

17.1 Cyclist dimensions

The dimensions and minimum turning circles for the AAA cycle design vehicle are shown in Table 17-1; this takes into account the size and manoeuvrability of the various types of bikes used by AAA riders.

Table 17-1: Size and minimum turning circles for design cycle

Design length (m)	Design width (m)	Minimum turning circle (m)	
		Outer radius	Inner radius
2.8	1.2	3.4	2.5

These parameters have been factored into the specification of base facility widths, curve geometry and cycle parking design etc. Designers are only likely to require them if unable to satisfy the [sight distance requirements](#) in tight spaces and need to examine a layout from first principles.

E-scooters and other micro-mobility devices are smaller than a standard bicycle, meaning they are accommodated within the cycle dimensions specified in Table 17-1.

17.2 Design speed

Cycle speeds vary based on rider power, cycle type, and gradient – Figure 17-1 gives the design speed envelope to be used in this Code of Practice.

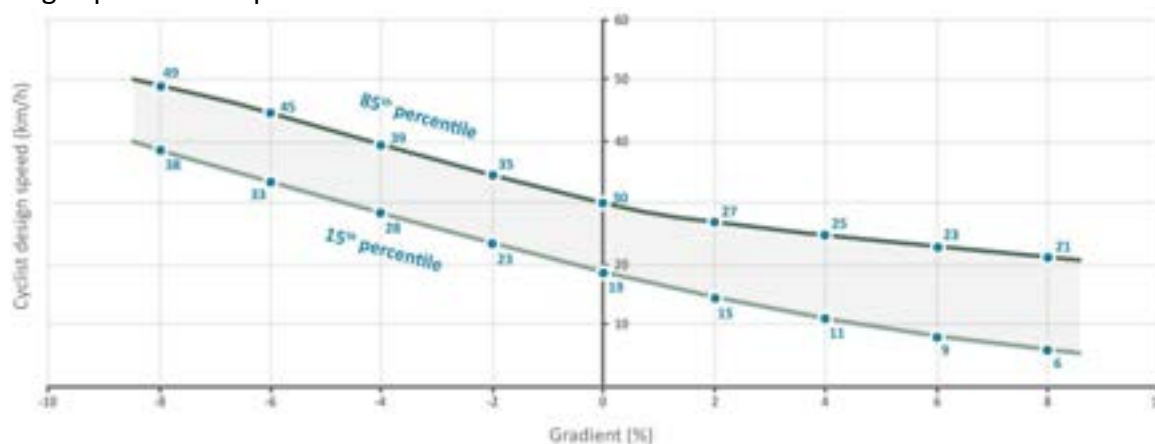


Figure 17-1: Cyclist design speed envelope based on gradient (see footnote 4)

⁴ Based on speed data taken from several sites across New Zealand, including both unpowered and electric-assisted bikes. The methodology for that data collection is detailed in [Speed surveys of powered transport devices](#) but note more recent data have been added to the analysis.

While there is currently no speed limit for e-scooters in New Zealand, and some can travel above 30 km/h, it will be assumed that these riders will have to conform to the design speed of the cycle facilities, if choosing to ride in them.

This code of practice applies the worst-case design speed in each situation. The 85th percentile design speed is used for calculating:

- [Stopping sight distance and forward sight distance](#)
- [Horizontal alignment \(curves\)](#)
- Horizontal curve widening (see width requirements for various facility types in [midblock design fundamentals](#))

The 15th percentile design speed factors into parameters such as:

- [Crossing sight distance](#)
- Widening for uphill facilities (see width requirements for various facility types in [midblock design fundamentals](#))
- Passing dynamics, which determine facility base widths for the facility types in [midblock design fundamentals](#))

PART 18 - SIGHT DISTANCE REQUIREMENTS

Cyclists and micro-mobility users require sufficient visibility to see the way ahead of them, identify their trajectory and any hazards, and take appropriate action to avoid these hazards.

18.1 BaMM users travelling along a path: stopping sight distance and forward sight distance

Where a hazard or obstacle does or could exist, biking and micro-mobility users need time to observe the hazard or obstacle, react, and stop or slow. Where the hazard does not require biking and micromobility users to stop (such as a curve), users will need to slow to the design speed of the hazard, called the hazard negotiation speed.

BaMM facilities should provide the following forward sight distance (stopping sight distance or hazard negotiation distance) based on the facility gradient and the required hazard negotiation speed.

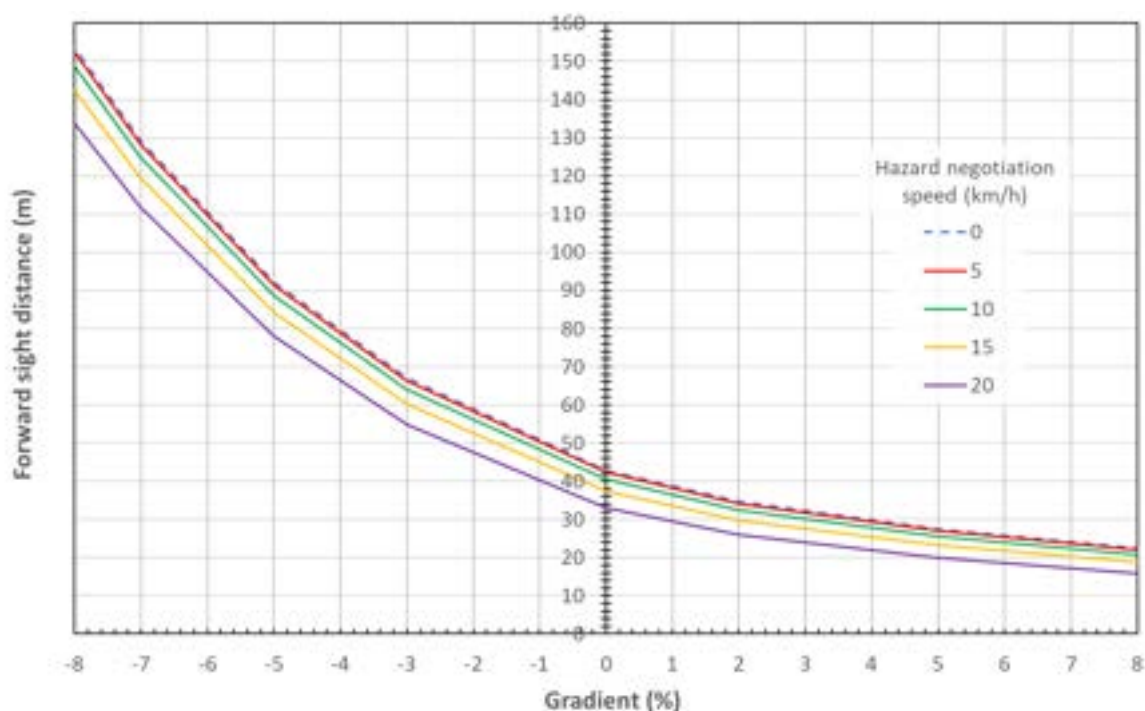


Figure 18-1: Forward sight distance required for BaMM users to slow or stop for a hazard

When assessing stopping sight distance at horizontal curves, the line of sight for stopping sight distance should not cross private land unless covenants protect the line of sight. The stopping distance may be measured on the expected path of cyclists or micro-mobility users.

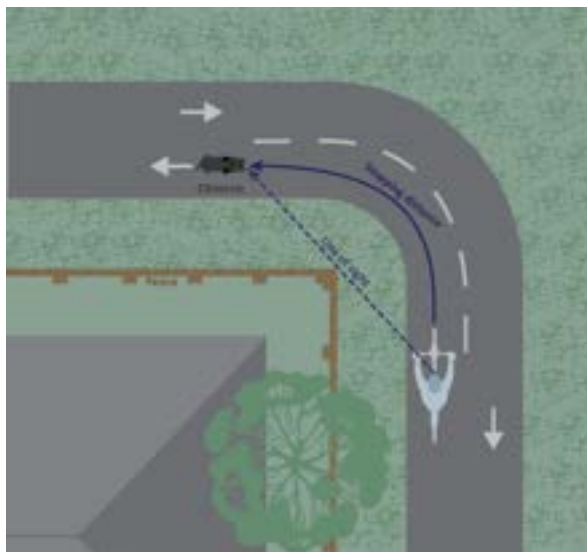


Figure 18-2: Horizontal curve sightline

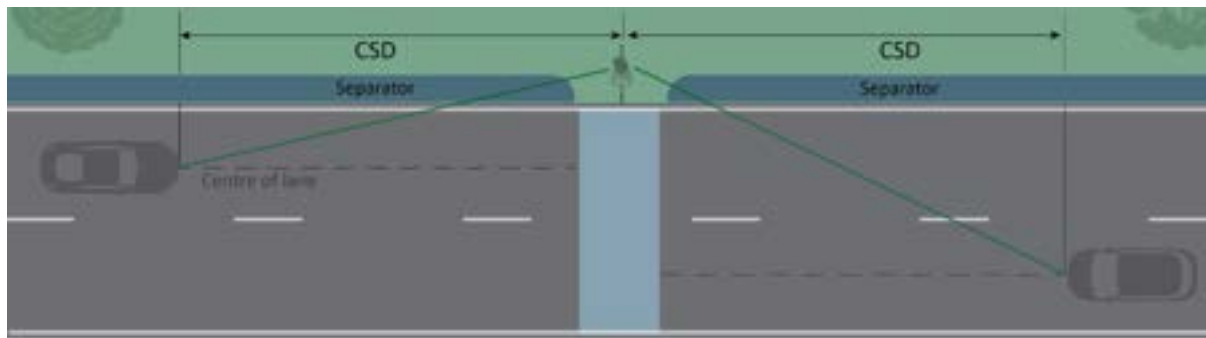
18.2 BaMM users at a crossing: crossing sight distance

Where BaMM users cross a road, especially where they must give way to road traffic, they need sufficient visibility to assess whether they can proceed clear of any conflicting road user – this is known as “crossing sight distance” and is indicated in Figure 18-3. BaMM facilities must provide the following crossing sight distance:

Table 18-1: Crossing sight distance where BaMM facility gives way to road traffic

		85 th percentile motor vehicle speed (km/h)		
		30	40	50
Crossing distance (m)	4	43	58	72
	7	52	70	87
	10	60	80	99

Crossings where BaMM users have to give way to conflicting road traffic should not exceed 10 m in length.



■ Crossing
CSD - Crossing sight distance (for BaMM users approaching non-priority crossing)

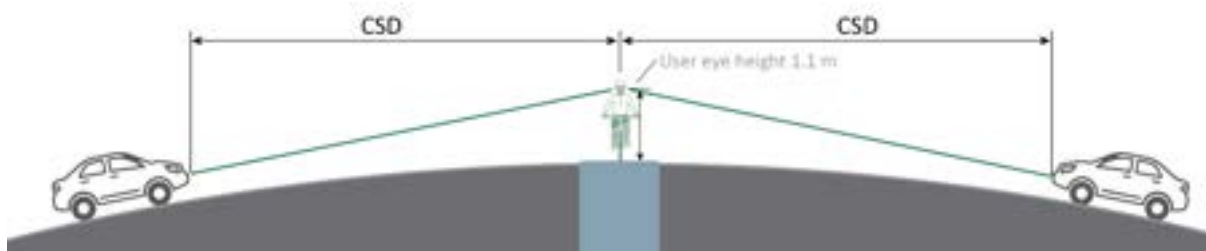


Figure 18-3: Crossing sight distance

18.3 Road users approaching a crossing: approach sight distance and safe intersection sight distance

Where BaMM users cross a road, approaching drivers must be able to see there is a crossing in time to stop if necessary. Approach sight distance (ASD) should be provided at all formal, marked pedestrian crossings, including dual priority crossings. Approach sight distance is indicated in Figure 18-4; it should be calculated as detailed in the Pedestrian Network Guidance page on [sight distances](#).

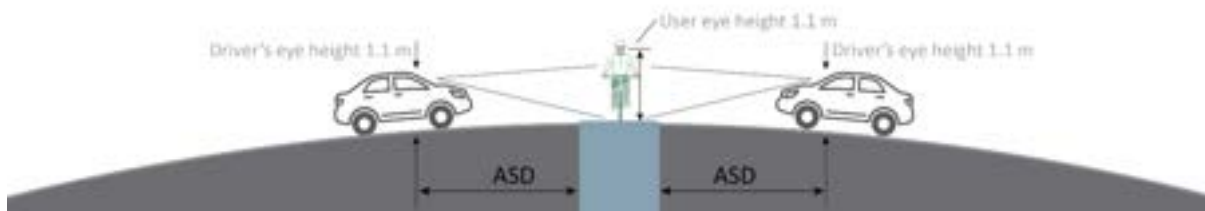
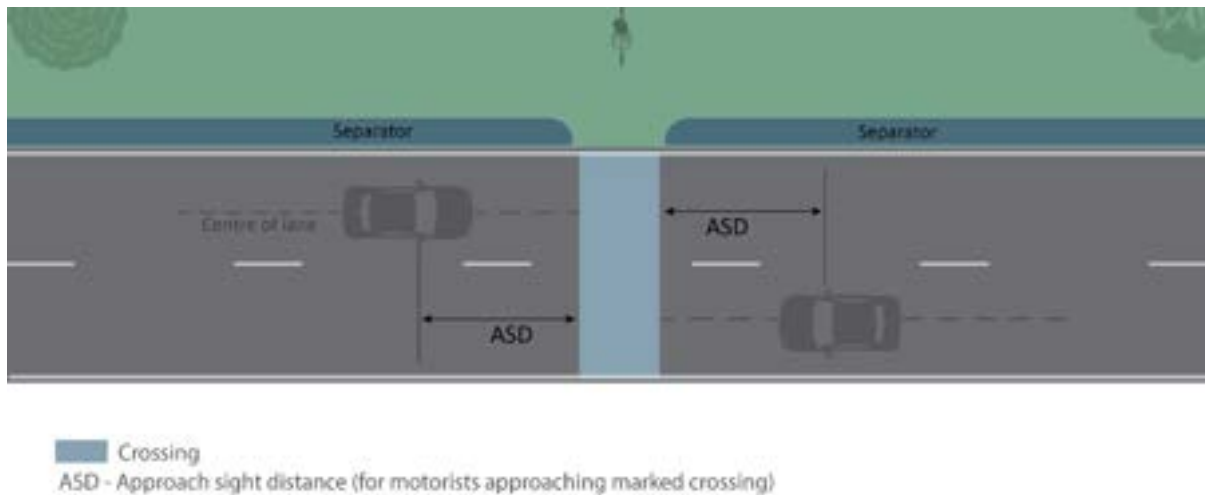


Figure 18-4: Approach sight distance

Where BaMM users have priority on the crossing, drivers at the limit line also need to have sufficient visibility of the BaMM approach paths so they can judge whether it is safe to proceed across the crossing point. Such crossings should be treated as an intersection, and safe intersection sight distance (SISD) should be provided as per Figure 18-5 and the value from Figure 18-6 which are based on [Austroads Guide to Road Design part 4A](#). Where the combination of path geometry, cyclist approach speed and site visibility constraints does not achieve SISD, priority-control is not suitable for the crossing.

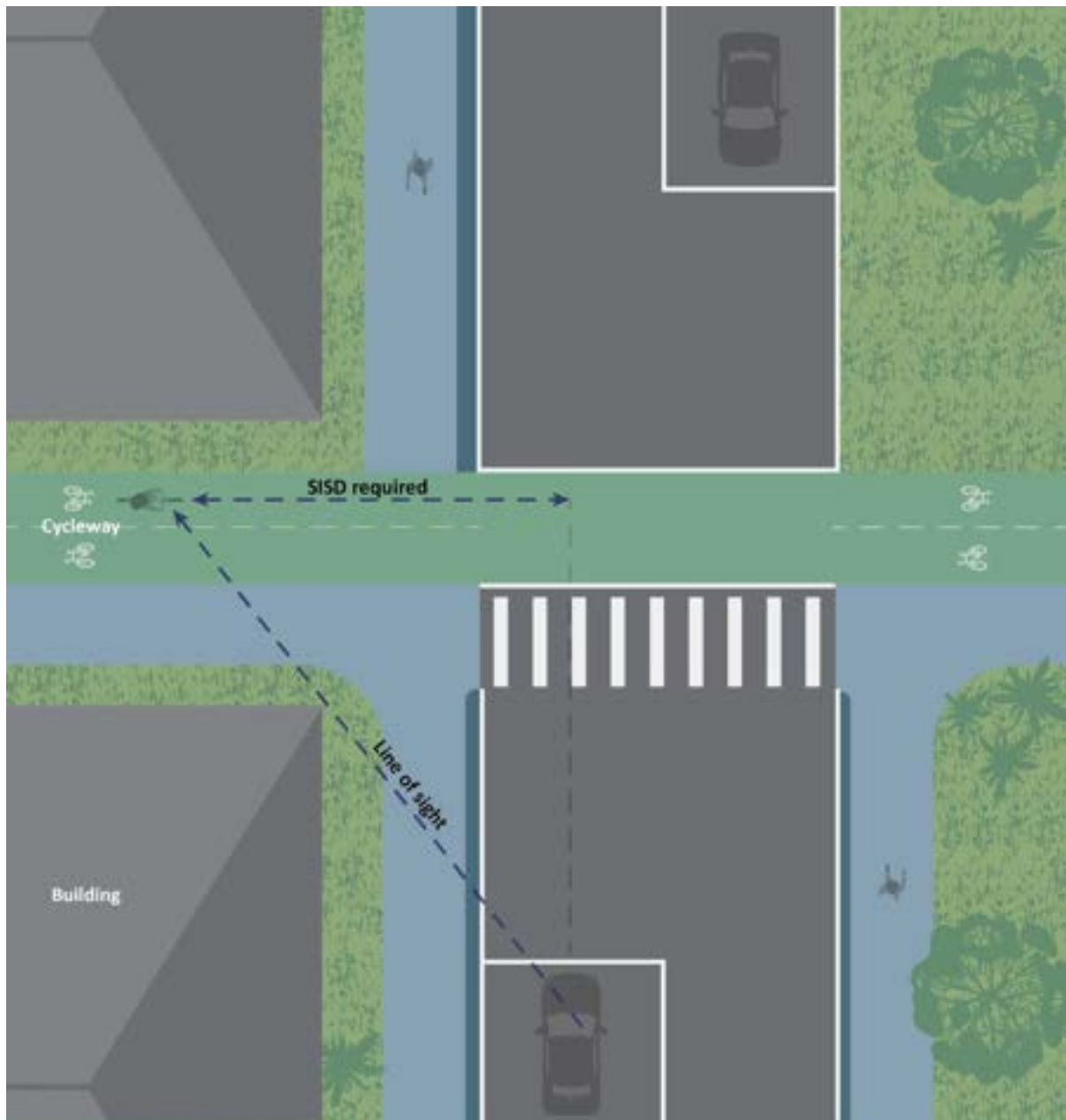


Figure 18-5: Safe intersection sight distance (SISD) for BaMM priority crossing – concept

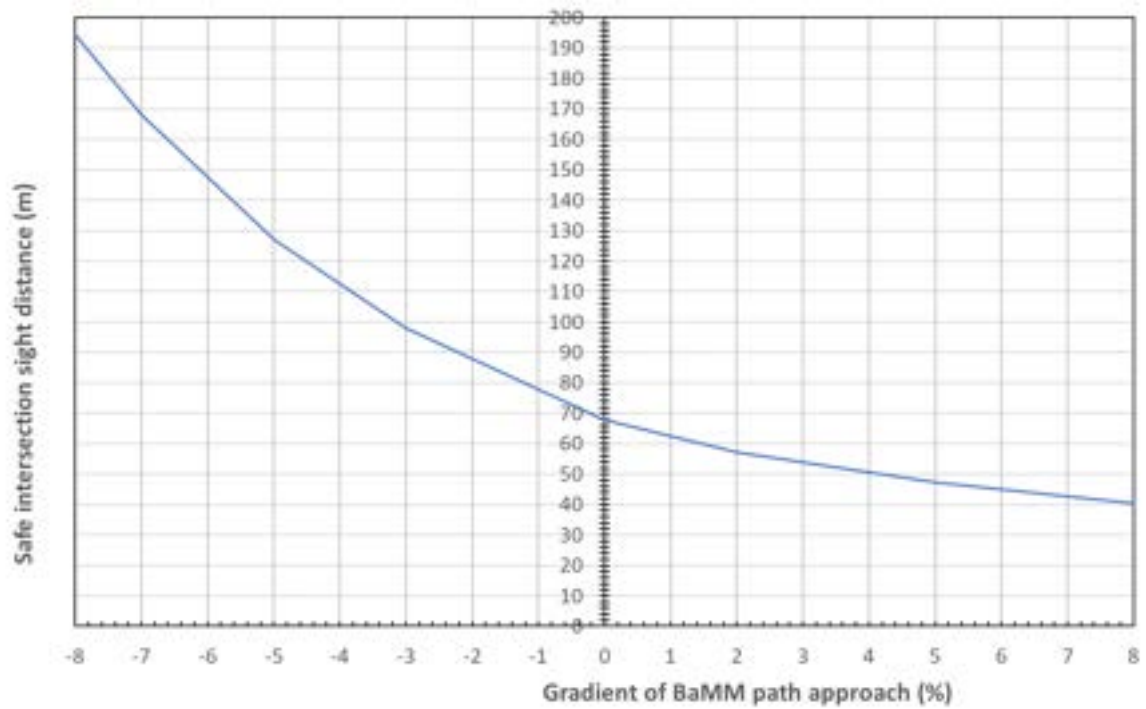


Figure 18-6: Safe intersection sight distance (SISD) for BaMM priority crossings – values

MIDBLOCK DESIGN FUNDAMENTALS

Midblock facilities provide for biking and micro-mobility travel between intersections. Part 9 - Selecting facility types provides an indication of which midblock facility type(s) may be appropriate based on motor vehicle speeds and volumes. The choice ultimately depends on how well a facility achieves the [fundamentals of providing for biking and micro-mobility](#) within the site-specific context, including integration with [intersection](#) provision.

The following midblock facility types may be appropriate for AAA users:

- Separated cycleways
- Quiet streets (mixed traffic)
- Shared paths
- Pedestrian priority areas
- Cycle lanes
- Buffered cycle lanes
- Off-road paths for biking and micro-mobility

The following aspects must also be assessed in conjunction with the type of midblock facility:

- Driveways
- Horizontal and vertical alignment

PART 19 - SEPARATED CYCLEWAYS

19.1 Description and application

Separated cycleways are facilities exclusively for biking and micro-mobility, without pedestrians. They involve some form of physical separation from motor traffic. The separation may involve horizontal and / or vertical components. Separated cycleways may cater for BaMM users travelling in the direction of adjacent traffic and / or BaMM users travelling in the contra-flow direction.



Figure 19-1: 2-way separated cycleway, Ferry Road, Christchurch

For a route to be suitable for AAA, separated cycleways are to be used if any of these criteria apply:

Table 19-1: Separated cycleway criteria (if ANY apply, a separated cycleway is required for AAA)

Vehicle flow (whole roadway)	See Figure 9-1: Indicative facilities for AAA biking and micro-mobility for all combinations, full separation is required when: > 4,000 vehicles per day > 400 vehicles per hour
Motor vehicle speed	See Figure 9-1: Indicative facilities for AAA biking and micro-mobility for all combinations, required: 85 th percentile speed > 60 km/h
Heavy vehicles	Frequent / rapid public transport network > 4% heavy vehicles (if vehicle volumes are > 1,000 vehicles per day)

19.2 Considerations and options

19.2.1 Directional nature (one-way vs two-way)

Separated cycleways are normally one-way but in some cases may be two-way. One-way separated cycleways usually provide for cycling in the same direction of travel as the adjacent traffic lane; in some locations, however, they may cater for contra-flow cycling. The [CROW Design Manual for Bicycle Traffic](#) cautions that two-way separated cycleways and contra-flow one-way separated cycleways have more risk at driveways and side roads, as drivers may not expect or notice BaMM users travelling the “wrong way” (i.e. in the contra-flow direction). Facilities with contraflow cycling in the downhill direction (with gradients of 3% or steeper) should not be used crossing driveways, as the increased speed increases the risk. The

[separated cycleway options tool \(SCOT\)](#) and its [explanatory note](#) can assist with the decision whether to consider contraflow facilities along a given route.⁵



Figure 19-2: Contra-flow cycleway crossing side street, Federal Street, Auckland

At priority-controlled intersections two-way cycleways should always have an [offset side road crossing](#).

19.2.2 Cycleway level

A cycleway may be located:

⁵ Noting that, as of 2023, SCOT does not take gradients into consideration.

Table 19-2: Cycleway level options

Cycleway level	Opportunities	Constraints
Roadway level	Often the simplest retrofit to existing carriageways Drivers exiting driveway cross a kerb cutdown prior to crossing cycleway = speed-calming effect (note drivers turning into driveways are slowed by geometry of turn)	Can increase hazards for pedestrians crossing between parked cars and footpath – need to carefully design gaps in separators at parking, and make it clear where they have to step up / down for a separator
Footpath level	Easiest transition for pedestrians crossing the cycleway (e.g. to / from parked cars)	Could result in pedestrians and / or BaMM users in each other's facilities, which can improve passing opportunities and access to destinations, but can also increase hazards / discomfort for certain pedestrians May result in cycleway being closer to the property boundary, therefore more constraints on visibility at driveways No speed-calming effect of kerb cutdown for drivers exiting driveway prior to crossing cycleway
"Stepped" between roadway and footpath levels	Reduces likelihood of cyclists straying onto footpath = improves quality for pedestrians Some speed-calming effect for drivers exiting driveways	Need to ensure vertical difference between footpath and cycleway is clear, especially to vision-impaired pedestrians

19.3 Road cross-section elements with separated cycleways

The road design for a separated cycleway includes the following elements:

- Footpath (see HCC [District Plan](#) for minimum widths, and the PNG [footpath width](#) section)
- Separation between footpath and cycleway
- Separated cycleway; either:
- One-way
- With flow

- Contraflow
- Two-way
- Separation between cycleway and parking or general traffic lane
- Parking (if provided)
- General traffic lane



Figure 19-3: Separated one-way cycleway



Figure 19-4: Separated two-way cycleway

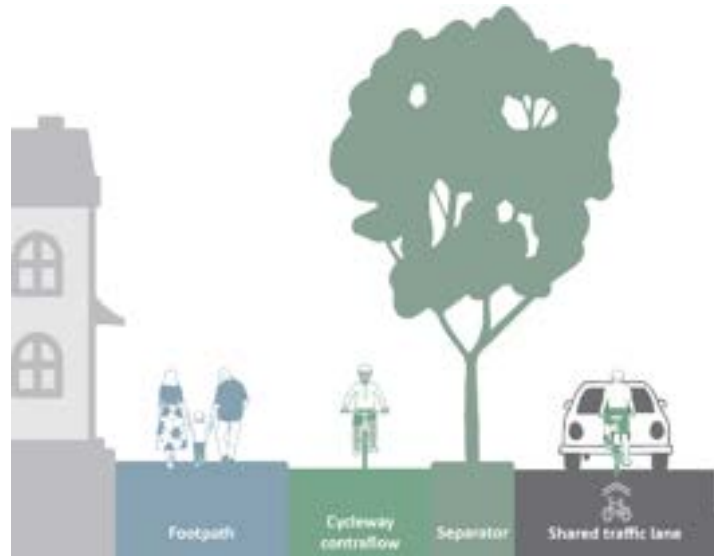


Figure 19-5: Separated contra-flow cycleway

The following subsections outline the important aspects of the various elements of a separated cycleway, except for widths which are detailed in Separated cycleway element widths.

19.3.1 Separation between footpath and cycleway

A separated cycleway must be separated from footpaths by a feature that is detectable by people with visual impairments. This may include kerbs, dish channels, textured paving, or berms.

19.3.2 Separated cycleway

See Separated cycleway widths for the widths of cycleway components.

See Cycleway level for the different options of cycleway height relative to the footpath and carriageway.

19.3.3 Separation between cycleway and parking or general traffic lane

Where a separated cycleway is provided at roadway level, the separator should:

- Meet the width requirements in Separated cycleway element widths
- Include continuous or closely spaced separator elements at least 100 mm high

Where parking is provided, the separator layout should conform to the layout below (note the required setbacks to driveways for separators are detailed in Part 27 - Driveways).

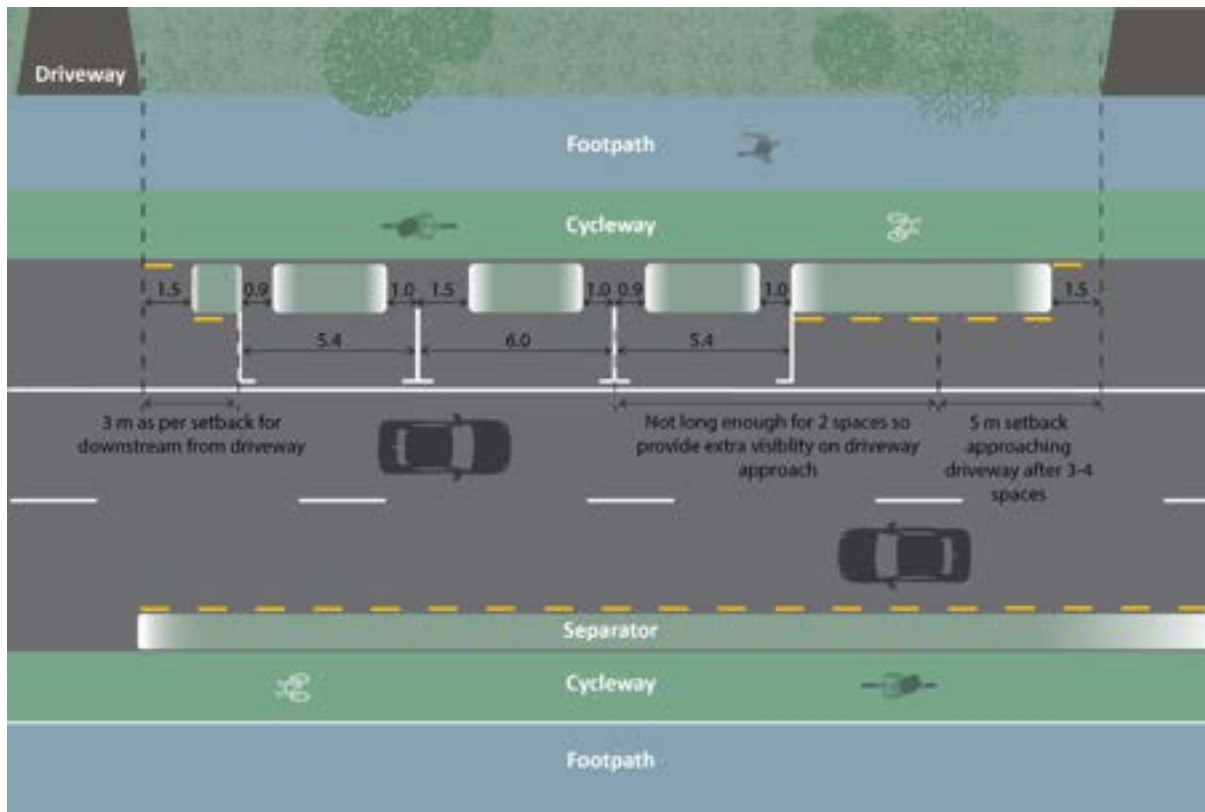


Figure 19-6: Separator gaps adjacent to on-street parallel parking

19.3.4 Parking (if provided)

See Width of parking adjacent to separated cycleway.

Note also the section on [driveways](#) includes implications on parking provision adjacent to separated cycleways.

19.4 Separated cycleway element widths

19.4.1 Separated cycleway widths

Width requirements for separated cycleways consist of:

$$W_{\text{cycleway}} = W_{\text{base}} + Cl_{\text{side 1}} + Cl_{\text{side 2}} + Wd_{\text{uphill}} + Wd_{\text{curve}} + Wd_{\text{speed}}$$

Where W = width, Cl = clearance, Wd = widening

Table 19-3: Cycleway base width (W_{base})

Cycleway direction	Projected peak user volume (BaMM users / hour)	Base cycleway width (m)		
		Acceptable	Tolerable min	Absolute min
One-way	< 150	2.1	1.8	1.6
	150-500	2.4	2.1	1.8
	> 500	3.0	2.6	2.4
Two-way	< 150	3.0	2.5	2.3
	150-500	3.5	3.0	2.5
	> 500	4.0	3.5	3.0

Objects at or close to the edge of a that are higher than pedal height (about 50 mm) will result in a “shy space” – i.e. a zone where cyclists are not willing to ride. This shy space / clearance (Table 19-4) should be added to the base path width, or, preferably, discrete hazards should be placed adjacent to the path and offset by the shy space width.

Table 19-4: Additional clearance for objects that create shy space (apply for BOTH sides – Cl_{side1} , Cl_{side2})

Object / edge constraint	Side clearance (m)
Kerb / separator with bevelled edge (1V:1H or flatter), ≤ 600 mm high	0
Kerb / separator without bevelled edge, ≤ 600 mm high	0.25
Kerb / separator / vertical feature > 600 mm high	0.5
Drop or slope > 0.5 m and steeper than 1V:10H	1.0

Where a facility involves uphill cycling, an additional width should be applied to the base facility width, as per Table 19-5. This is to account for the natural tendency of cyclists to wobble and weave as they travel at slower speeds.

Table 19-5: Cycleway widening for uphill gradients (Wd_{uphill})

Uphill gradient (%)	Additional width (m)
2	0.0
3	0.2
4	0.4
≥5	0.5

The requirements in Table 19-6 only apply if the facility width is less than the acceptable base width as per Table 19-3.

Table 19-6: Additional width requirements (m) for horizontal curves with tight radius and base width less than acceptable (Wd_{curve})

		Path radius, measured to centre of path (m)			
		5	10	12	> 12
Cycleway direction	One-way	0.5	0.3	0.2	0
	Two-way	1.0	0.6	0.3	0

The requirements in Table 19-7 only apply if the facility width is less than the acceptable base width as per Table 19-3.

Table 19-7: Additional width requirements (m) for horizontal curves with high design speeds and base width is less than acceptable (Wd_{speed})

		Design speed (km/h)		
		≥40	35	< 35
Cycleway direction	One-way	0.5	0.3	0
	Two-way	1.0	0.6	0

Notes on separated cycleway widths:

Wherever a base width below the acceptable base width is used (but satisfying the tolerable minimum or absolute minimum), or the additional width requirements are not satisfied, designers should document their justifications.

An isolated section (where the absolute minimum width can be applied):

- Should be no longer than 100 m.
- Could involve a series of discrete constraints, e.g. power poles that pose intermittent restrictions.
- Should not be created as a result of a newly installed / retrofitted asset (e.g. a bridge).

Any utilities, such as manholes and cabinets, must be located clear of paths with sufficient space for vehicles to park nearby and for access and working space at the chamber or cabinet so that routine maintenance does not create additional path shy space.

Other considerations for additional width include:

- Where there is expected to be high proportion of child riders is expected.
- There are frequent points of access along the cycleway.
- Stacking capacity to accommodate waiting BaMM users, sufficient time for long queues to travel through the intersection, and sufficient opportunity for faster riders to pass slower ones while travelling through the intersection or on the departure.

Where cycleway widths are greater than 2.0 m, some motorists may park or drive in them (either deliberately or inadvertently). Where there is an ongoing problem, consider the use of:

- Coloured surfacing and cycle logos on the cycleway.
- ‘No-stopping’ lines along the kerb side.
- A narrowing at the entrance of the section.
- Central bollards or posts should only be used as a last resort (Waka Kotahi NZ Transport Agency's policy on [Access control devices on paths](#)).

The base widths presented in Table 19-3 are greater than for cycle lanes, as the latter involves the opportunity for one cyclist to cross into the general traffic lane to pass another cyclist, which is not generally possible for separated cycleways.

19.4.2 Width of separation between cycleway and parking or general traffic lane

Table 19-8 gives the width of the separation between the cycleway and the adjacent parking (if provided) or general traffic lane (where there is no on-street parking).

Table 19-8: Cycleway separation widths (regardless of cycleway level)

Location	Cycleway next to parking			Cycleway next to general traffic lane		
	Desired min		Absolute min	Desired min		Absolute min
Applications	Wheelchair access Street trees Waste bins*	Loading zone	Door zone (passenger side) Requires spaces for larger waste bins* in setback or parking lane	Street trees	Waste bins*	Waste bins* on footpath or berm; trucks must straddle cycleway
Width	1.5	1.2	0.8	1.5	1.0	0.3

* refer to section on [waste collection trucks](#).

19.4.3 Width of parking adjacent to separated cycleway

Table 19-9 gives the widths required for parking spaces depending on the characteristics of the adjacent traffic. In some cases, a buffer between the parking spaces (marked with “hockey sticks”) and the traffic lane is also required.

Table 19-9: Parking and parking buffer widths between separated cycleway and general traffic lane

AADT	Speed environment	Frequent bus route+ or heavy vehicle route*?	Minimum parking buffer (m)	Parking width (m)	
				Preferred	Minimum
> 10,000 vpd	> 50 km/h	Yes	0.3	2.1	1.9
		No	0.3		
	≤ 50 km/h	Yes	0.3		
		No	0.2		
5,000-10,000 vpd	> 50 km/h	Yes	0.2		
		No	0.2		
	≤ 50 km/h	Yes	0.2		
		No	0		
<5,000 vpd	> 50 km/h	Yes	0.2		
		No	0		
	≤ 50 km/h	Yes	0		
		No	0		

+ A frequent bus route operates 4 or more buses per hour (across different services) in the peak period.

* A heavy vehicle route is a “strategic heavy vehicle route” or a “designated heavy vehicle route” as per the [District Plan](#).

Note that the parking widths above assume vehicles can park close to the separator kerb face. Generally, the stormwater channel will be to the left of the cycleway. If there is a channel on the parking side of the separator, additional width should be considered.

PART 20 - QUIET STREETS (MIXED TRAFFIC)

20.1 Description and application

Quiet streets (also known as ‘neighbourhood greenways’, ‘slow streets’ or ‘bicycle boulevards’) are streets with low volumes of motor traffic travelling at low speeds; this creates a pleasant environment for biking and micro-mobility, without requiring specific facilities.



Figure 20-1: Quiet Street – Malcolm Street, Hamilton

To suit the AAA target audience, quiet streets are appropriate when all the following criteria apply:

20-1: Quiet street criteria (ALL must apply for a quiet street to suit AAA)

Traffic lanes	≤ 2 (peak or permanent lanes, including both directions of travel).
Vehicle flow (whole roadway)	≤ 2,000 vehicles per day ≤ 200 vehicles per peak hour
Motor vehicle speed	85 th percentile speed ≤ 30 km/h
Heavy vehicles	≤ 80 heavy vehicles per day

Considerations and options commonly incorporate low speed limits and, more importantly, physical measures to ensure low speed environments. Physical measures may be used to

restrict the movements available to motorists travelling in and out of a neighbourhood greenway, thus controlling vehicle volumes, whilst still allowing permeability for cycling.

20.2 Considerations and options

20.2.1 Tools to achieve suitable vehicle volumes and speeds

Auckland Transport's [Local Path Design Guide](#) presents a number of tools that can be used to reduce motor vehicle speeds and volumes to appropriate levels for quiet streets.

20.2.2 Legibility (signage and markings)

Way-finding signage and markings are important to show people riding bikes or micro-mobility devices, as well as people in cars, that BaMM users share the roadway. [Sharrows](#) ('share arrows') are a particularly useful tool for increasing driver awareness of people on bikes.

20.2.3 Shared zones

Shared zones are a special case of mixed traffic where there are no footpaths, kerbs or formal segregation, and pedestrians share the roadway with cyclists, micro-mobility riders and motorists. This results in an intentional level of ambiguity so that drivers proceed with caution and at slow speeds.

Shared zones must be designated through a traffic bylaw. The [Land transport \(Road User\) Rule 2004](#) includes a definition of shared zones and clauses that require drivers to give way to pedestrians and pedestrians to not unduly impede the passage of vehicles.

The CNG provides further guidance on [shared zones](#).

20.3 Road cross-section elements with quiet streets

The road design for a quiet street includes the following elements:

- Footpath (see HCC [District Plan](#) for minimum widths, and the PNG [footpath width](#) section)
- Quiet street element widths
- Parking (if provided) - should be parallel to the kerb and does not need to be specifically marked
- Mixed traffic lanes

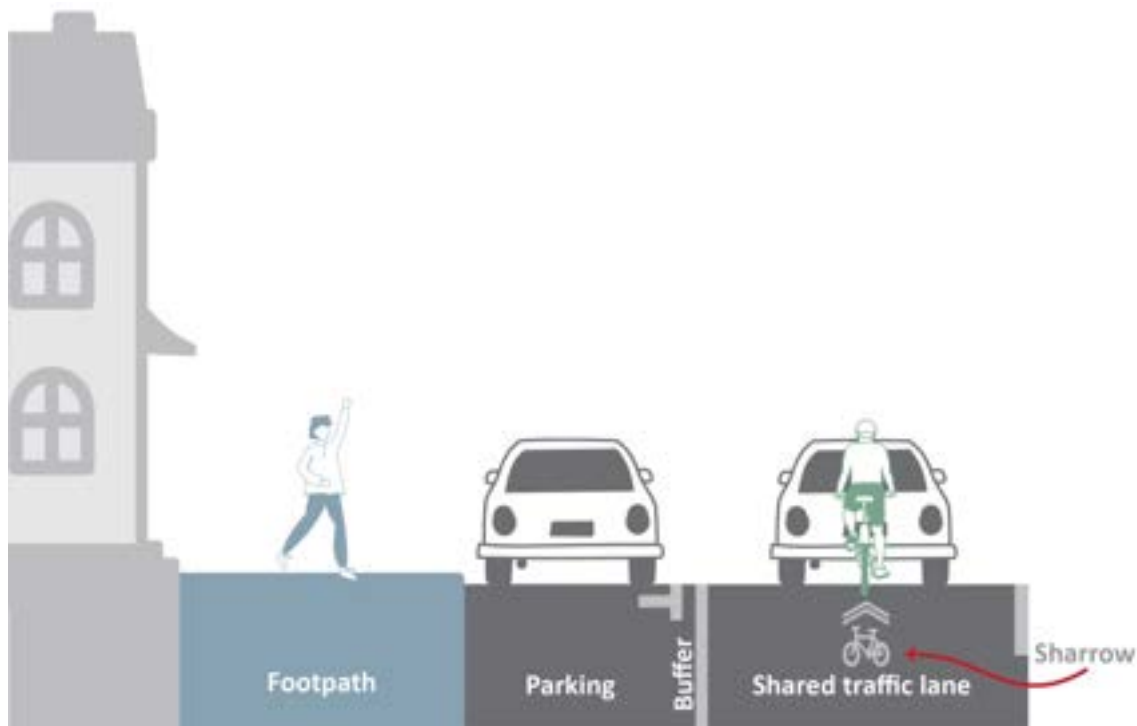


Figure 20-2: Quiet street

20.4 Quiet street element widths

20.4.1 Parking (if provided)

The width available for parking should be 1.9–2.1 m.

20.4.2 Mixed traffic lanes

Lane widths for quiet streets depend on whether there is kerbside parking provided and whether buses use the street:

Table 20-2: Quiet street lane widths

Adjacent parking?	Bus route?	Wide lane (side-by-side use) width (m)		Narrow lane (single file) width (m)
		Desirable min	Acceptable range	Acceptable range
Yes	Yes	4.5	4.3–4.5	3.2
	No	4.5	4.3–4.5	2.5–3.0
No	Yes	4.2	4.2–4.5	3.2
	No	4.2	4.0–4.5	2.5–3.0

Quiet streets can be wide enough to accommodate cyclists and motor vehicles travelling side-by-side or narrow enough so that it is clear that single-file use is required. In-between widths should be avoided, because motorists may mistakenly think they can pass a BaMM user when there is not enough space to do so safely.

PART 21 - SHARED PATHS

21.1 Description and application

Shared paths are for pedestrians, cyclists, and users of micro-mobility; all these users must be considered as part of the AAA target audience when planning and designing shared paths.



Figure 21-1: Shared path, Hagley Park, Christchurch

Planning and designing shared paths for the AAA target audience while aligning with the design principles of “directness” and “comfort” (as shown in Table 11-1) is challenging, and alignment is often difficult to achieve. In general, in urban areas, shared paths should be considered a last resort for catering to an AAA audience.

Shared paths are generally only considered an appropriate facility if walking and cycling volumes are low, and where there are few driveways or side roads (e.g. through a park, along a rail corridor or waterway etc, or in rural areas) or, where no other facility type is feasible.

21.2 Considerations and options

21.2.1 Form of provision

In Hamilton, it is preferred that shared paths have no formal separation of travel directions or user groups. Behavioural messages (e.g. ‘warn when approaching’) marked on the ground can help encourage good path etiquette.

21.2.2 Accommodating contraflow biking and micro-mobility

Shared paths normally accommodate travel in both directions. The inclusion of cyclists and micro-mobility users travelling in the contra-flow direction relative to the adjacent road increases risk at [driveways](#) and side roads (see Part 31 - Priority-controlled intersections) as drivers may not expect or notice BaMM riders travelling the “wrong way”. Shared paths with

contraflow cycling in the downhill direction should not be used crossing driveways, as the increased speed increases the risk. The [separated cycleway options tool \(SCOT\)](#) and its [explanatory note](#) can assist with the decision whether to consider facilities with contraflow cycling along a given route (noting that, as of 2024, SCOT does not take gradient into consideration).

21.3 Cross-section elements

The road design for a shared path includes the following elements:

- Separation between path and property boundary
- Shared path
- Separation between shared path and parking or general traffic lane
- Parking (if provided)
- General traffic lane

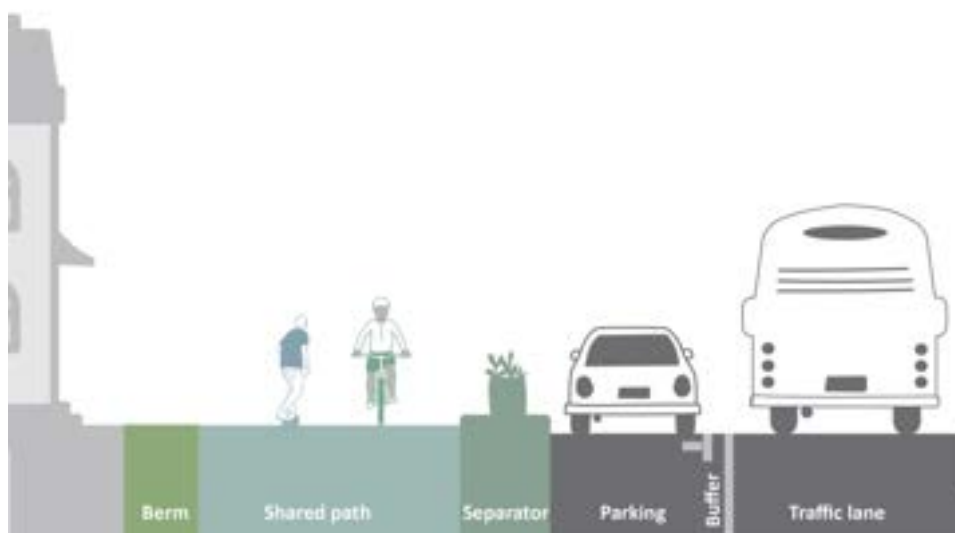


Figure 21-2: Shared path

21.3.1 Separation between path and property boundary

Drivers exiting a driveway must have sufficient [visibility](#) that they can see and give way to approaching shared path users. The [visibility](#) splay depends on based on gradient, which affects cycling speed, and also the offset between the path and property boundary. Fences and landscaping must be below driver eye height within the [visibility](#) splay.

21.3.2 Shared path

In addition to the [visibility](#) splay requirements, shared paths must continue through driveways with no change in gradient or surface quality.

A shared paths should NOT be considered as a treatment option for the AAA target audience under any of the following circumstances:

- Where there is a high density of driveways (more than 3 driveways per 100 m).
- Where gradients exceed 3%.
- Where space is not available to accommodate a buffer between the path and both property boundaries and the kerb.
- Where the volume of people walking and / or biking or using micro-mobility devices exceed the combinations given in Shared path width.
- Where people walking or riding are likely to move in ways increasing the likelihood of conflict (e.g. near shop entrances).
- Where smooth and flat surfacing is not possible due to crossfall requirements, driveways, or other obstacles.

In the above cases, it is strongly recommended to provide separate walking and BaMM facilities, or change the road environment to enable other facility types (e.g. mixed traffic conditions appropriate for BaMM inclusion).

In other situations, the design standards for shared paths will be challenging to meet and maintain in the medium / long term. In these cases, shared paths should only be considered when all other options are considered inappropriate or infeasible. These situations include:

- Where section is part of a “cross-city connections” route (see Part 8 - Identifying route options) – facility should be designed with higher volumes in mind
- Where existing fences do not meet the [visibility](#) splay requirements in section 27.2.
- Where facility runs along a frontage that has no commercial / retail activity currently, but where retail / commercial uses are a permitted activity under the District Plan

21.3.3 Separation between shared path and parking or general traffic lane

A shared path will generally be at footpath level. There must be a horizontal buffer, plus physical separation (an island or kerb) between the shared path and adjacent provision (parking or general traffic lane) to offer comfort / protection from car doors or moving traffic. The separation should have the following characteristics:

- Profile: vertical edge on the traffic lane side (bevelled on the shared path side if not at footpath level).
- Height: 100 mm above the traffic lane
- Width: see Width between shared path and parking or general traffic lane

21.3.4 Parking (if provided)

Note also the implications of [driveways](#) on parking provision adjacent to shared paths.

21.4 Shared path element widths

21.4.1 Separation between path and property boundary

The section on [visibility](#) at driveways details the required visibility splay, which is a function of the offset between the path and the property boundary.

21.4.2 Shared path width

Width requirements for shared paths consist of:

$$W_{path} = W_{base} + Cl_{side\ 1} + Cl_{side\ 2} + Wd_{uphill} + Wd_{curve} + Wd_{speed}$$

Where W = width, Cl = clearance, Wd = widening

The base width of a shared path depends on the combination of pedestrians and BaMM riders expected to use it in the peak period. Figure 21-3 shows that shared paths should be at least 3.0 m wide, or 4.0 m wide as user volumes increase.

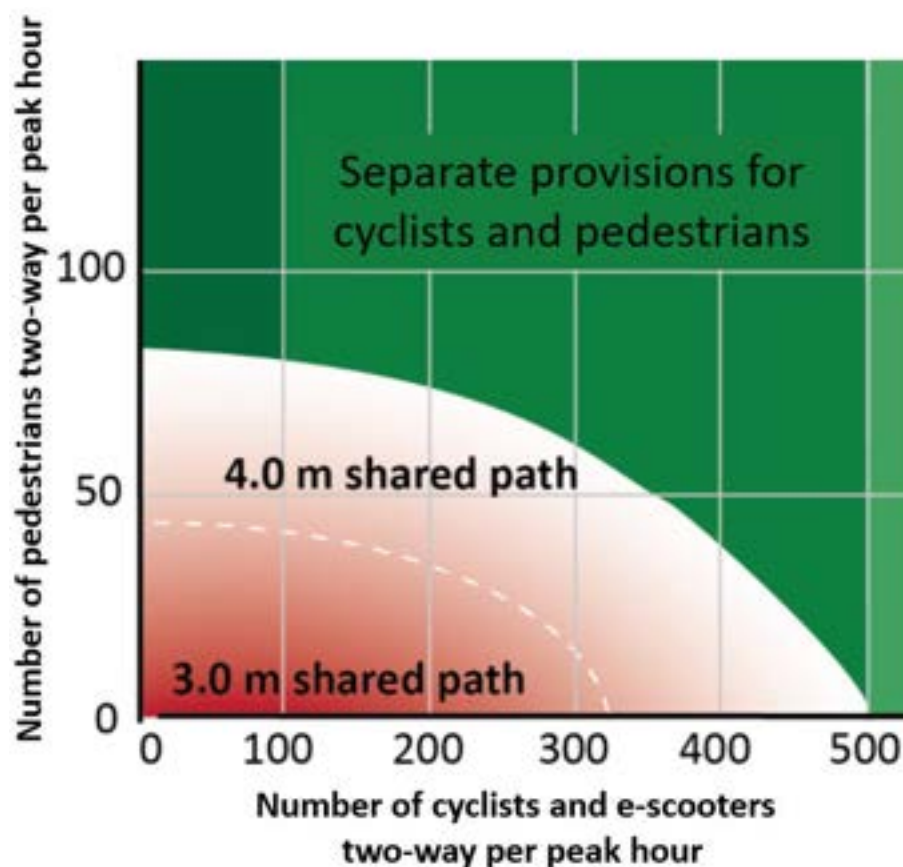


Figure 21-3: Shared path base widths vs separate provisions for BaMM riders and pedestrians (W_{base})

Objects at or close to the edge of a path that are higher than pedal height (about 50 mm) will result in a “shy space” – i.e. a zone where cyclists are not willing to ride. This shy space / clearance (Table 21-1) should be added to the base path width, or, preferably, discrete hazards should be placed adjacent to the path and offset by the shy space width.

Table 21-1: Additional clearance for objects that create shy space (apply for BOTH sides – Cl_{side1} , Cl_{side2})

Object / edge constraint	Side clearance (m)
Kerb / separator with bevelled edge (1V:1H or flatter), ≤ 600 mm high	0
Kerb / separator without bevelled edge, ≤ 600 mm high	0.25
Kerb / separator / vertical feature > 600 mm high	0.5
Drop or slope > 0.5 m and steeper than 1V:10H	1.0

Where a facility involves uphill cycling, an additional width should be applied to the base facility width, as per Table 21-2. This is to account for the natural tendency of cyclists to wobble and weave as they travel at slower speeds.

Table 21-2: Shared path widening for uphill gradients (Wd_{uphill})

Uphill gradient (%)	Additional width (m)
2	0.0
3	0.2
4	0.4
≥5	0.5

The requirements in Table 21-3 only apply if the facility width is less than the base width as per Figure 21-3.

Table 21-3: Additional width (m) requirements for horizontal curves with tight radius and base width less than acceptable

		Path radius, measured to centre of path (m)			
		5	10	12	> 12
Cycleway direction	One-way	0.5	0.3	0.2	0
	Two-way	1.0	0.6	0.3	0

The requirements in Table 21-5 only apply if the facility width is less than the base width as per Figure 21-3.

Table 21-4: Additional width (m) requirements for horizontal curves with high design speeds and base width is less than acceptable

		Design speed (km/h)		
		≥40	35	< 35
Cycleway direction	One-way	0.5	0.3	0
	Two-way	1.0	0.6	0

21.4.3 Width between shared path and parking or general traffic lane

Table 21-5 gives the width required between the edge of a shared path and the adjacent parking or traffic lane.

Table 21-5: Width between shared path and adjacent parking or traffic lane

Location	Shared path next to parking		Shared path next to general traffic lane		
	Desired min	Absolute min	Desired min		Absolute min
Applications	Wheelchair access	Door zone (passenger side)	Street trees	Waste bins	Waste bins encroach on shared path
	Street trees	Requires spaces for larger waste bins in setback or parking lane			
	Waste bins				
Width	1.5	0.8	1.5	1.0	0.3

It is not acceptable for waste collection trucks to drive along shared paths, or to reach across shared paths to collect bins on the other side. More detail on how waste bins can be accommodated is given in the section on waste collection.

21.4.4 Parking (if provided)

Table 21-6 gives the widths required for parking spaces adjacent to a shared path depending on the characteristics of the adjacent traffic. In some cases, a buffer between the parking spaces (marked with “hockey sticks”) and the traffic lane is also required.

Table 21-6: Parking and parking buffer widths between shared path and general traffic lane

AADT	Speed environment	Frequent bus route+ or heavy vehicle route*?	Minimum parking buffer (m)	Parking width (m)	
				Preferred	Minimum
> 10,000 vpd	> 50 km/h	Yes	0.3	2.1	1.9
		No	0.3		
	≤ 50 km/h	Yes	0.3		
		No	0.2		
5,000-10,000 vpd	> 50 km/h	Yes	0.2		
		No	0.2		
	≤ 50 km/h	Yes	0.2		
		No	0		
<5,000 vpd	> 50 km/h	Yes	0.2		
		No	0		
	≤ 50 km/h	Yes	0		
		No	0		

+ A frequent bus route operates 4 or more buses per hour in the peak period.

* A heavy vehicle route is a “strategic heavy vehicle route” or a “designated heavy vehicle route” as per the [District Plan](#).

Note that the parking widths above assume vehicles can park close to the separator kerb face. Generally, a shared path will be at footpath level and the stormwater channel will be on the parking / traffic side of the shared path; if this channel prevents vehicles from parking close to the kerb (e.g. a dish channel) additional width should be added to the parking space.

PART 22 - PEDESTRIAN PRIORITY AREAS

22.1 Description and application

In pedestrian priority areas, pedestrians, cyclists and micro-mobility riders share the same area, without any motor vehicles. This makes the situation similar to a shared path, but rather than there being one linear facility, people may travel in multiple different directions. Examples include town squares and plazas that are free of motor vehicles.

As for [shared zones](#), pedestrian priority areas have no footpaths or kerbs, and only limited line-marking and signage. The needs and comfort levels of pedestrians are paramount; people cycling or using micro-mobility devices are expected to act like guests, traveling in a way that is consistent with a walking pace. Using different surface materials (e.g. patterned paving stones) can be a good way of communicating to people on bikes and wheeled devices that this is not a normal road or path.



Figure 22-1: Garden Place pedestrian mall, Hamilton

PART 23 - CYCLE LANES

23.1 Description and application

Cycle lanes are painted on the carriageway, with painted cycle symbols that designate them to be used by cycles. Micro-mobility devices are not currently permitted to use on-road painted cycle lanes – see 23.2.1 Provision for micro-mobility users.

Drivers of motor vehicles may cross or drive a short distance along a cycle lane in certain circumstances, such as to access parking, intersections, or driveways. Cycle lanes are almost always for one-way cycle travel only, but may be provided for cycling in the opposite direction to the adjacent traffic lane (“contra-flow”).

Cycle lanes are generally not an AAA treatment, but may be acceptable at modest traffic speeds and volumes, as per Figure 9-1: Indicative facilities for AAA biking and micro-mobility. If the cycling audience is limited to “enthused and confident” (i.e. not encompassing **all** ages and abilities), the [Cycling Network Guidance section on cycle lanes](#) can be applied, as it

includes design requirements for traffic speed and volume combinations outside of the AAA envelope.

Symbols, coloured surfacing and line markings are important for marking cycle lanes; these are detailed in the Signs and markings section – in particular, note the green dashed line to the right of the cycle lane line.

23.2 Considerations and options

23.2.1 Provision for micro-mobility users

Micro-mobility devices are not currently permitted to use on-road painted cycle lanes (although the [Accessible Streets Package](#) aims to address this).

If a cycle lane is the most appropriate facility type for cycling, it should also be considered whether the footpath provision is suitable for micro-mobility users. This should include analysis of the expected number and ability of micro-mobility users compared with the number of vulnerable pedestrians, as well as the footpath width and quality. For example, where there are people with mobility or sensory impairments (e.g. near a retirement home) it would not be appropriate to expect them to share a standard footpath with a large number of young scooter users (e.g. near a primary school) or a large number of electric scooter users (e.g. near the CBD). But nor would it be appropriate to expect young scooter users to ride in the general traffic lane. In this case, it should be considered whether a wider shared path or a separated cycleway would be more appropriate.

23.2.2 Contra-flow cycle lanes

There may be situations where a contra-flow cycle lane could be used to provide for cycling on a route, for example on one-way streets where a bylaw allows this.

Site-specific factors to consider for contra-flow cycling include:

- Traffic volumes and speeds – caution should be given to applying contra-flow cycle lanes near the upper limits for cycle lanes shown in Figure 9-1: Indicative facilities for AAA biking and micro-mobility, especially in considering the other factors listed here.
- Available width
- Type and location of parking – in particular, be cautious of high-turnover parking and reverse-out angle parking.
- Driveways and side roads – see the [CNG interim guidance note on separated cycleways at side roads and driveways](#), especially concerning contra-flow cycling.
- Treatments at the start and end of the facility – are all required movements supported and clear to users?
- Gradients – contraflow cycling should not be provided on steep downhill sections.



Figure 23-1: Contraflow cycle lane, Hurstmere Road, Auckland (photo: Reset)

23.2.3 Buffers

A painted buffer may be added either side of a cycle lane to provide horizontal separation between the general traffic lane and / or parking – creating a [buffered cycle lane](#).

23.3 Road cross-section elements

The road design for a cycle lane includes the following elements:

- Footpath (see HCC [District Plan](#) for minimum widths, and the PNG [footpath width](#) section)
- Parking (if provided)
- Cycle lane
- General traffic lane



Figure 23-2: Kerbside cycle lane



Figure 23-3: Cycle lane next to parking

23.3.1 Parking (if provided)

Angle parking next to a cycle lane is not acceptable for AAA provision. If angle parking is to be used (for a non-AAA audience), the CNG should be consulted, including for the additional clear space required between the parking and the cycle lane.

23.3.2 Cycle lane

See Cycle lane widths.

23.4 Cycle lane widths

Cycle lane widths differ depending on whether the cycle lane is located next to the kerb, next to parallel parking, or between two traffic lanes (e.g. approaching an intersection):

Table 23-1: AAA cycle lane width requirements

Cycle lane location	Desirable width (m)	Minimum width (m)
Kerbside	1.8-2.0	1.6
Next to parking	1.9-2.2	1.8

In addition to the table above, the following notes apply for kerbside cycle lanes:

- 1 A cycle lane wider than **2.5 m** is NOT recommended, as it can be mistaken for a traffic lane.
- 2 If cycle traffic flows exceed 150 in the peak hour, then the upper limit of the desirable width should be used, to accommodate overtaking manoeuvres.
- 3 When 2.0 m or more of the cross section is available for the cycle lane, then a buffer can be applied between the general traffic lane and the cycle lane – see [buffered cycle lanes](#).
- 4 The cycle lane width should also be considered in the context of the width of the adjacent traffic lane and combined widths of less than 4.6 m avoided.
- 5 For cycle lanes adjacent to parking, the cycle symbol and green background road surface should be placed in the two-thirds of the cycle lane furthest from the parked cars (see Cycle symbol positioning). This will encourage cyclists to avoid the hazard posed by car doors being opened.

PART 24 - BUFFERED CYCLE LANES

24.1 Description and application

Buffered cycle lanes comprise a conventional on-road [cycle lane](#) with a marked buffer between the cycle lane and the general traffic. This makes people on bikes feel safer by having something between them and the moving traffic, plus reduces the likelihood that someone on a bike who is hit by an opening door of a parked car will be thrown into the path of moving traffic.

If, after adding a buffer between the cycle lane and the general traffic lane, more space is available, the width of the cycle lane should be increased. This helps increase the gap between parked cars and the cycle lane markings which guide cyclists where to position themselves in the cycle lane (see Cycle symbol positioning). Note this extra width is not marked as a buffer, because drivers tend to park over such a buffer.

Figure 9-1: Indicative facilities for AAA biking and micro-mobility shows that buffered cycle lanes can be appropriate for AAA at higher traffic speeds and volumes than regular cycle lanes.

Symbols, coloured surfacing and line markings are important for marking buffered cycle lanes; these are detailed in the Signs and markings section – in particular, note the green dashed line to the right of the cycle lane line.



Figure 24-1: Buffered cycle lane, King Street, Hamilton

24.2 Road cross-section elements

The road design for a buffered cycle lane includes the same elements as for a standard [cycle lane](#), plus a painted buffer between the cycle lane and the general traffic lane.

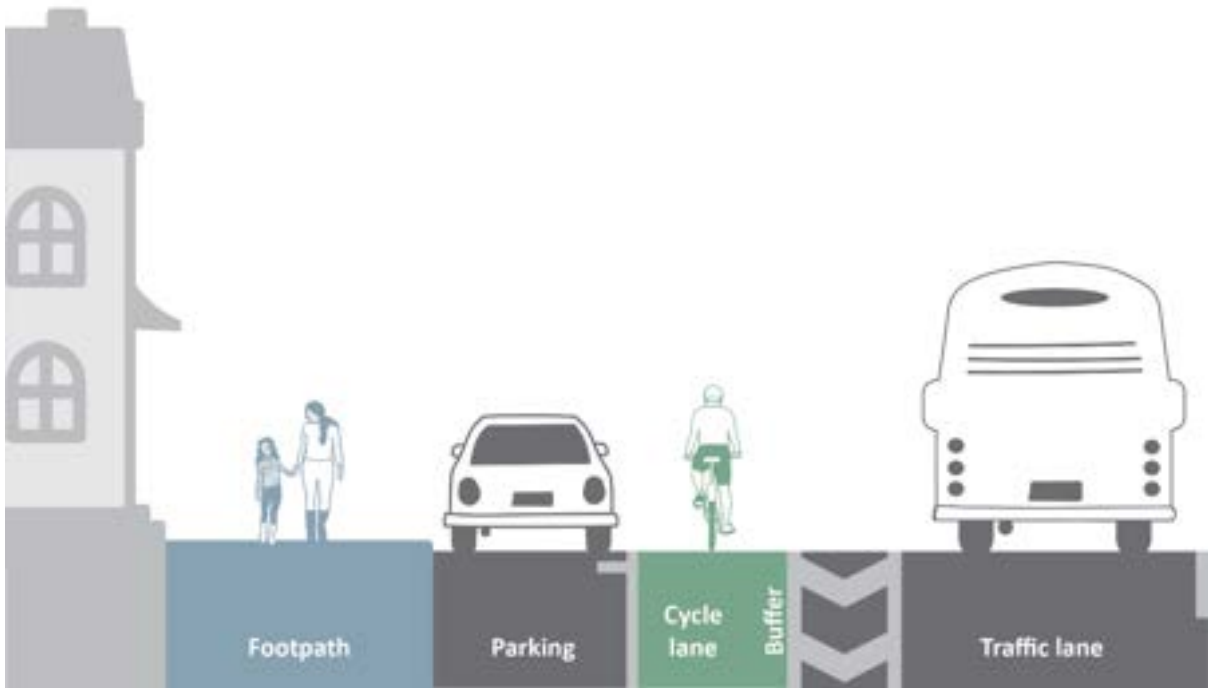


Figure 24-2: Buffered cycle lane next to parking

24.3 Width of buffer between cycle lane and traffic lane

The buffer between the cycle lane and the traffic lane should be:

Table 24-1: cycle lane buffer to general traffic lane width

	Desired width (m)	Absolute min (m)
Buffer between cycle lane and general traffic lane	1.0	0.3

PART 25 - BUS-CYCLE LANES

25.1 Description and application

A bus lane is reserved for buses, cycles, mopeds, and motorcycles, unless some of these latter vehicle classes are excluded by markings and/or signs. Micro-Mobility devices are not currently permitted to use bus lanes, and, unlike cycle lanes, the [Accessible Streets Package](#) did not include any proposal to modify this.

While bus lanes will seldom appeal to all people of [All Ages and Abilities](#), all bus lanes that are installed should be designed with biking and micro-mobility users in mind, unless there are other provisions for these users. If bus lanes are being designed, the HCC Public Transport Guide should be consulted.



Figure 25-1: Bus-cycle lane, Lincoln Rd, Christchurch

PART 26 - OFF-ROAD PATHS FOR BIKING AND MICRO-MOBILITY

26.1 Description and application

Paths for biking and micro-mobility that are away from the road network, include;

- Paths parallel to a motorway or major expressway
- Paths along a railway corridor
- Paths along an esplanade reserve
- Paths through a public open space
- Paths linking between roads that provide network permeability advantages to biking and micro-mobility.

Off-road paths are expected to be sealed (unsealed alternatives would be known as “trails”).



Figure 26-1: off-road path for biking and micro-mobility

The widths for off-road paths should be as per:

- Widths of two-way [separated cycleways](#) – if pedestrians are provided for separately; or
- Widths of [shared paths](#) – if pedestrians are included.

All biking and micro-mobility facilities must be adequately lit at nighttime. All lighting must be designed according to the Waikato [Regional Infrastructure Technical Specifications](#) (RITS).

PART 27 - DRIVEWAYS

27.1 Driveway form

[RITS D3.3.1](#) gives two driveway configurations. Where the BaMM facility is at footpath level, it is preferable that a driveway ramp be provided between the facility and the kerb; where this is not possible, the kerb ramp should be restricted to only a portion of the footpath / shared path / cycleway, thus leaving a portion of it as a continuous, level path for pedestrians and / or BaMM riders.

27.2 Visibility

Drivers exiting a driveway must have sufficient visibility that they can see and give way to approaching users, in particular those on shared paths, footpaths, or cycleways at footpath level who will be closer to the property boundary than on-road users and not experience the same traffic calming effects from the driveway kerb ramp.

Fences and landscaping must be below driver eye height within the visibility splay.

Figure 27-1 shows the visibility design diagram. The same visibility splay also applies for vehicles *reversing* out of the driveway instead.

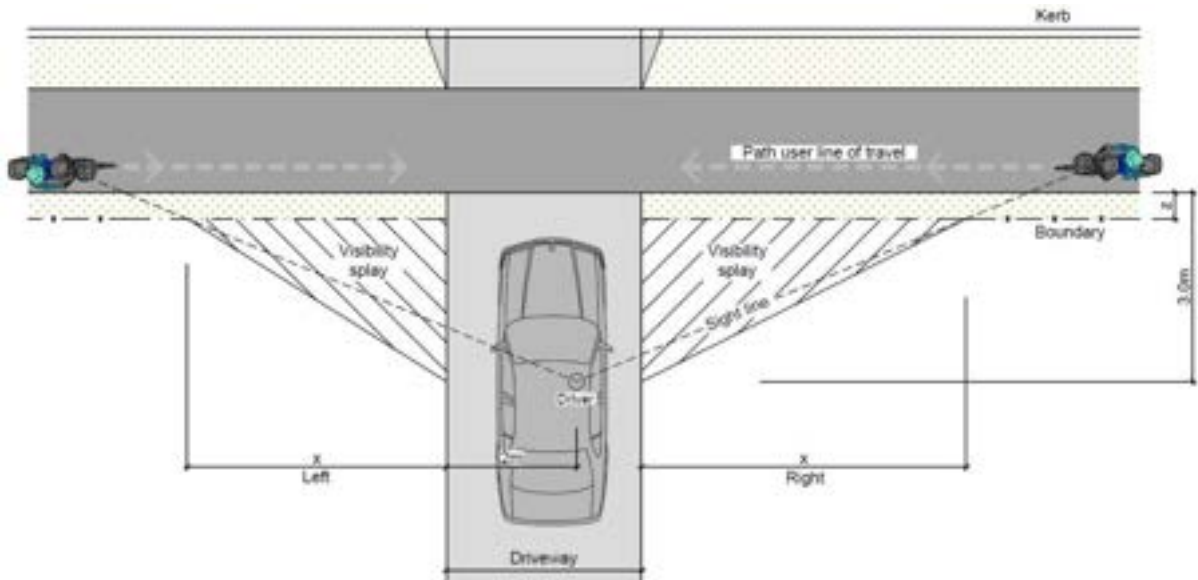


Figure 27-1: Visibility splay requirements for driveways at BaMM facilities

For a path on level ground, the visibility splay must enable 13.9 m of sight distance so that the full width of the path can be seen. As the offset of the property boundary to the path (*z*) increases, the splay length (*x*) decreases, as shown in Table 27-1:

Table 27-1: Required visibility splay, *x* for level ground

Boundary offset to through path, <i>z</i> (m)	Visibility splay, <i>x</i> (m)
0.0	16.7
0.5	13.9
1.0	11.1
1.5	8.3
2.0	5.6
2.5	2.8
≥3.0	0.0

Calculations of *x* and *y* assuming other values of *z* and *v* can be determined through the following formulae:

$$x = \frac{v}{1.8} * \left(1 - \frac{z}{3}\right)$$

$$y = 3 - z$$

Where:

x = width (m) of the visibility splay on private property

y = depth (m) of the visibility splay on private property

v = design speed (m/s) of path users, which depends on gradient – see [design speed](#)

z = offset (m) of BaMM facility to boundary

Table 27-1 shows that a shared path offset (z) of 3.0 m or more from a property boundary (e.g. a wide berm) will not require a visibility splay on private property at all – this holds true regardless of gradients.

27.3 Cycleway separator setback at driveways

For a separated cycleway, at each driveway a length of the separator must be traversable to enable property access and reduce damage to the separator.

Where on-street parking is provided adjacent to a cycleway at residential driveways, a traversable section of separator shall be provided; this shall extend 2 m either side of the driveway at the property boundary, as per Figure 27-2.

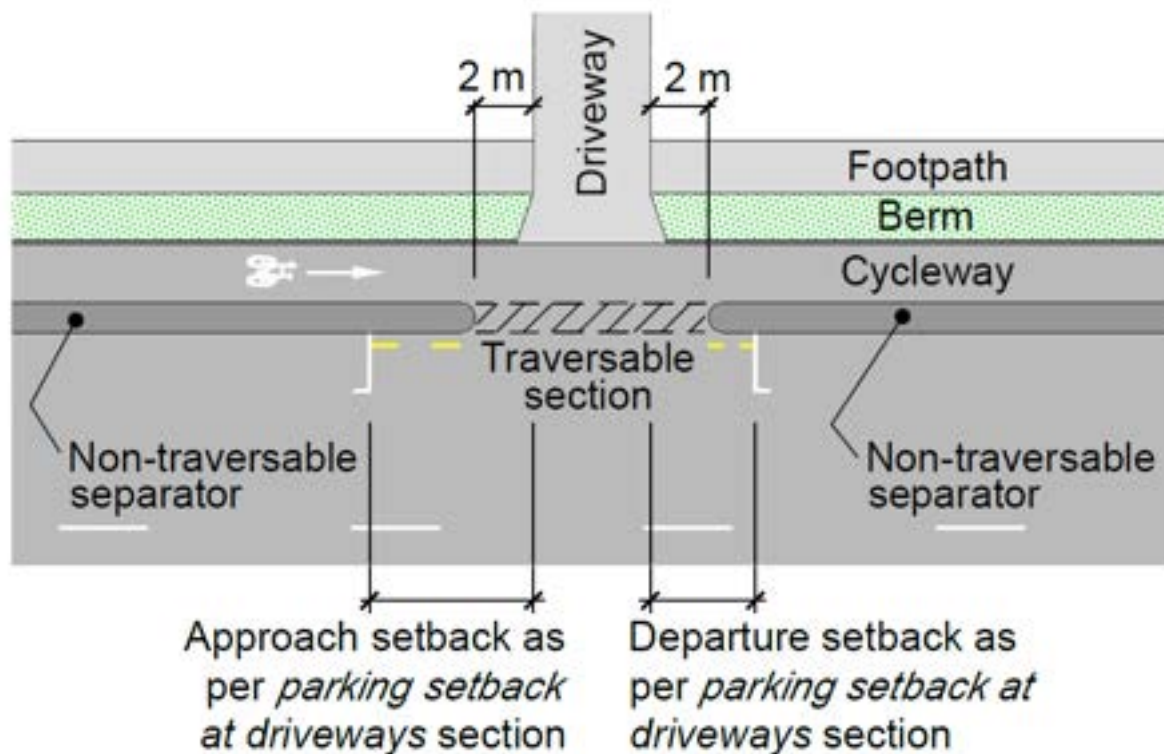


Figure 27-2: Separator setback at residential driveway on one-way cycleway with adjacent parking

Where there is no on-street parking adjacent to a cycleway and vehicles need to complete left turns without crossing the centreline, the length of traversable separator for residential driveways should extend 2.0 m from the edge of the driveway at the property boundary on the approach side and 3.0 m on the departure side, as per Figure 27-3.

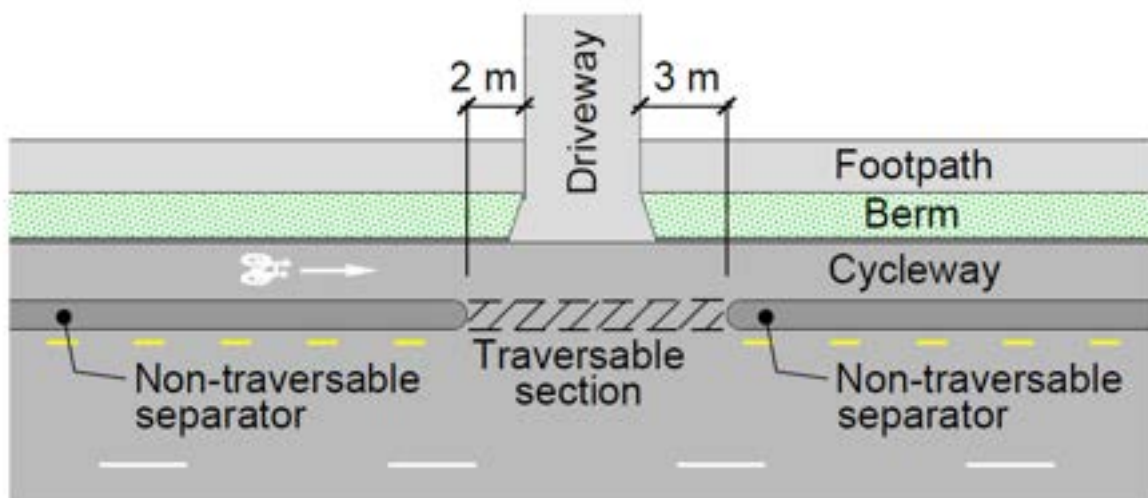


Figure 27-3: Separator setback at residential driveway on one-way cycleway with no adjacent parking

Site-specific tracking is required for commercial properties where larger vehicles are expected.

27.4 Parking setback at driveways

Parking setbacks are necessary adjacent to a separated cycleway to provide intervisibility between cycleway users and drivers turning across the cycleway, and between drivers entering the roadway and drivers on the roadway.

The setback requirements depend on whether the facility involves contra-flow BaMM travel, the parking occupancy on the approach to the driveway, the inherent risk level of a driveway, based on the number of vehicle movements, the familiarity of drivers turning there, and whether there is sufficient [visibility](#). Driveway risk categories are described in Table 27-2.

Table 27-2: Driveway risk categories

Category	Description
Low risk	Residential driveway with up to 50 vehicle movements per day. Sufficient visibility .
Medium risk	Up to 100 vehicle movements per day / minimal heavy vehicle traffic / some unfamiliar users. Sufficient visibility
High risk	More than 100 vehicle movements per day and / or heavy vehicle use. OR: sites with insufficient visibility that otherwise satisfy the criteria for low or medium risk.
Very high risk	Traffic volumes / characteristics consistent with side road intersections. OR: insufficient visibility with otherwise high-risk characteristics.

The following setbacks in Table 27-3 are based on the parking provision on the approach to the driveway and the driveway risk category:

Table 27-3: Approach parking setbacks based on parking provision and driveway risk category

Number of effective parking spaces on approach to driveway*	Driveway risk category			
	Low	Medium	High	Very high
1-2	3 m	6 m	9 m	30 m
3-4	5 m	10 m	15 m	30 m
> 4	8 m	16 m	24 m	30 m

* Beyond the numbers stated, there must be a gap of at least 5 m to any previous vehicles parked upstream, with it not being possible to park there because of the presence of a driveway or a kerb extension.

For a one-way cycleway in the with-flow direction, the parking setback on the departure side should be a minimum of 3 m. For a contra-flow or two-way cycleway, the approach setbacks in Table 27-3 apply to both sides of the driveway. Figure 27-4 illustrates the various parameters discussed above.

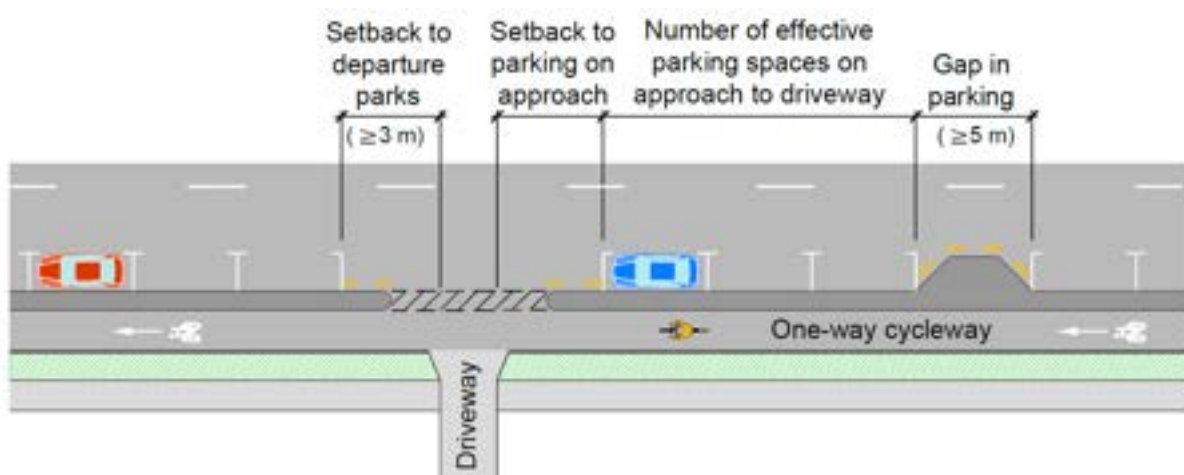


Figure 27-4: Setbacks for parking at driveways along separated cycleways

In many cases, the clear space provided by the setbacks could be intermittently used for waste bins on waste collection days (markings can be provided to denote these spaces if required), or for low level landscaping to enhance the street amenity and the attractiveness of the cycleway.

27.5 Driveway treatments

The [Design guidance note on High-Use Driveway Treatment for Cycle Paths and Shared Paths \(NZTA, 2019\)](#) details the possible driveway treatment elements; the following table outlines the level of treatment required by driveway characteristics.

Table 27-4: Driveway treatment criteria

Treatment	Criteria
Level 1: Markings optional (also option to use painted symbols without green box)	Satisfies ALL the following criteria: - One-way BaMM travel in same direction as adjacent traffic ONLY. - Residential properties only - Up to 50 vehicle movements per day. - Sufficient visibility.
Level 2: Painted symbols with green box	For sites with one-way BaMM travel in the same direction as adjacent traffic – satisfies ALL the following: - Up to 100 vehicle movements per day / minimal heavy vehicle traffic / some unfamiliar users. - Sufficient visibility. OR, site with contra-flow / 2-way BaMM travel but satisfies the other criteria for Level 1
Level 3: Full treatment (markings, signage, speed hump)	- More than 100 vehicle movements per day and / or significant heavy vehicle use. - Sufficient visibility. OR, site with insufficient visibility but satisfies the other criteria for Level 1 or Level 2 OR, site with includes contra-flow / 2-way BaMM travel but satisfies the other criteria for Level 2
Level 4: Specific design	Traffic volumes / characteristics consistent with side road intersections.

PART 28 - HORIZONTAL AND VERTICAL ALIGNMENT

28.1 Horizontal alignment (curves)

The required radius of a horizontal curve (measured to the path centreline) depends on the design speed for cyclists / micro-mobility users – note that travel speed will be influenced by gradient (see [Design speed](#)). For design speeds 30 km/h or greater, superelevation may be incorporated to reduce the required radius at higher speeds.

Table 28-1: Horizontal curve radius based on speed and superelevation, for sealed paths⁶

Design speed (km/h)	Superelevation (%)					
	0	2%	3%	4%	5%	6%
Stopping	2					
10	4					
15	7					
20	10					
25	17					
30	25	24	23	22	22	21
40	51	47	46	44	43	41
50	92	84	81	78	75	72

Designers should avoid horizontal curves that result in a severe change in design speed. It may be necessary to include an intermediate curve to transition the design speed in less-severe increments.

The CNG is due (expected mid-late 2024) to issue a technical note on chicanes for paths – this will provide further guidance on speed management for paths including cyclists and micro-mobility users, e.g. on the approaches to intersections and crossings.

28.2 Vertical alignment (gradient)

Ideally, the maximum gradient for a biking and micro-mobility facility should be 3%; however, this will often be constrained by topography. For facilities within the road reserve, it may be unavoidable to include steeper gradients. However, facilities with gradients steeper than those listed below are not suitable for All Ages and Abilities.

Table 28-2: Gradients for paths and landings

Use	Maximum gradient	Maximum section length
Biking and micro-mobility only	3% (1:33)	No limit
	5% (1:20)	240 m
	8.33% (1:12)	90 m
Shared paths / pedestrian only paths	3% (1:33)	No limit
	5% (1:20)	120 m (between landings)

The vertical alignment will influence the design speed for cycling and this should be reflected in the facility widths prescribed in the [midblock design fundamentals](#) section, as well as the [horizontal alignment at curves](#).

Sag and crest curves can cause destabilising effects for cyclists and micro-mobility users. Sag and crest curves should meet the following requirements:

⁶ Based on Austroads Guide to Road Design series, using linear trendline to determine friction factors at slower speeds, and adding a further constant at slower speeds in-line with Auckland Transport specifications.

Table 28-3: Sag / crest curve lengths for design speed bands

Design speed	Sag / crest curve length
Design speed <20 km/h	Minimum 10 m
Design speed >20m/h, change in grade <5%	Minimum 15 m
Otherwise	Specific design

Designers should avoid locating sharp curves, narrow cycleway sections, bollards and barriers, or crossings near the bottom of a steep downhill grade. If this is not possible then consider the use of:

- An intermediate curve to transition the design speed in less-severe increments
- Additional facility width
- Improved sight distance clearances
- A clear “escape route” path or protective features (e.g. soft vegetation)
- Additional warning signs or markings

Cycleways on steep ($\geq 4\%$) gradients should also be designed with some crossfall and drainage measures to prevent rainfall running down the pathway, potentially creating a slippery surface.

INTERSECTION AND CROSSING DESIGN FUNDAMENTALS

This section covers the different treatment types for intersections and crossings, as well as transition points between midblock and intersection or different facility types. Recall that there is often an iterative process between choosing intersection treatments and midblock facilities.

PART 29 - SAFE SYSTEM CROSSING ELEMENTS

The fundamental elements for BaMM routes crossing roads are:

Table 29-1: Safe system crossing elements and sources

Element	Specifications / guidance source
Kerb crossings (/ ramps / cut-downs)	RITS D3.3.1 RITS D3.3.2 – pedestrian / cycle cutdown See also PNG: kerb ramp design*
Kerb extensions	PNG: kerb extensions*
Median refuges	RITS D3.6.4*
Raised safety platforms	RITS D3.10 See also Effectiveness and Implementation of Raised Safety Platforms (Austroads, 2020)
Tactile indicators	RITS D3.6.3 See also: Road and Traffic Standard 14 (RTS 14) and PNG Tactile Indicator Installation Note .

*Note reference document is for pedestrian facilities; where biking and micro-mobility is included, widths should be at least equal to minimum [shared path widths](#) for projected user volumes.

PART 30 - MIDBLOCK CROSSINGS

There are four types of midblock crossings for biking and micro-mobility facilities:

- Uncontrolled crossings
- Dual priority crossings
- Signalised crossings
- Grade-separated crossings

30.1 Uncontrolled crossings

30.1.1 Requirements

This crossing form is suitable for All Ages and Abilities only if all of the following criteria are met:

- Road road has one lane on each approach
- Traffic volume is
- $\leq 7,500$ vpd (both directions combined), or
- $\leq 7,500$ vpd in each direction *and* a median refuge is provided
- 85th percentile traffic speed is ≤ 50 km/h

The crossing distance should be minimised. This can be achieved using kerb buildouts and / or median refuge islands. The crossing must provide adequate [crossing sight distance](#) for cyclists and micro-mobility users waiting to cross.

Because BaMM riders may be required to wait in median refuges at uncontrolled crossings, refuge islands should be 3 m wide to cater for larger cycles.

Raised safety platforms (see Safe system crossing elements) while often associated with crossings where motor traffic gives way to cycleway users and / or pedestrians, can also be used at crossing points where motor traffic has precedence to achieve safe system speeds and make it easier for crossing users to judge gaps in traffic.

30.2 Dual priority crossings

This crossing form is suitable for All Ages and Abilities only if all of the following criteria are met:

- 85th percental traffic speed is ≤ 30 km/h
- Crossing distance is ≤ 10 m
- Maximum of one lane of traffic in each direction

A dual priority crossing consists of a zebra crossing for pedestrians, plus a parallel green strip for cyclists (and, by association, micro-mobility users). Motor vehicles are controlled by give way signs, with supplementary “to cyclists and pedestrians” plates. While dual crossings are not legally required to be on raised safety platforms it is usually required in order to achieve 85th percentile traffic speeds ≤ 30 km/h.

The crossing must provide adequate [approach sight distance and safe intersection sight distance](#) for drivers required to give way to cyclists.

The [TCD Manual part 4](#) criteria for when to use give way versus stop control apply to dual priority crossings.



Figure 30-1: Dual crossing on raised safety platform at roundabout, Queens Ave / Killarney Rd, Hamilton

The design elements for dual crossings are presented in Figure 30-1:

Table 30-1: Dual crossing design elements

Dual crossing component	Requirements	Options / considerations
Zebra crossing markings	As per the TCD Manual: Pedestrian crossings (zebra) and the Pedestrian Network Guidance ≥ 2.0 m wide	
Cycle crossing markings	Apple green colouring ≥ 2.5 m wide for 2-way cycling ≥ 1.5 m wide for 1-way cycling	
Crossing distance		Shorter crossing distances reduce exposure for users, and so the crossing distance should be minimised where possible, although cross section widths should be sufficient for road and cycleway users travelling along the road corridor.
Traffic control devices	As per the TCD Manual Part 4 section 8.	Advance warning diamond marking – see TCD Manual: Pedestrian crossings (zebra)
Motor vehicle speed control	85 th percentile operating speed is less than or equal to 30 km/h	Ideally located on a raised safety platform or having speed humps on the approaches even if not required
Cycle & micro-mobility device speed control		If BaMM users can approach the crossing at high speeds, drivers are more likely to fail to give way. The crossing should achieve the specified Sight distance requirements, and it may be necessary to reduce cycle speeds to achieve these. If so, horizontal deflection (see horizontal alignment) should be used to achieve suitable speeds.

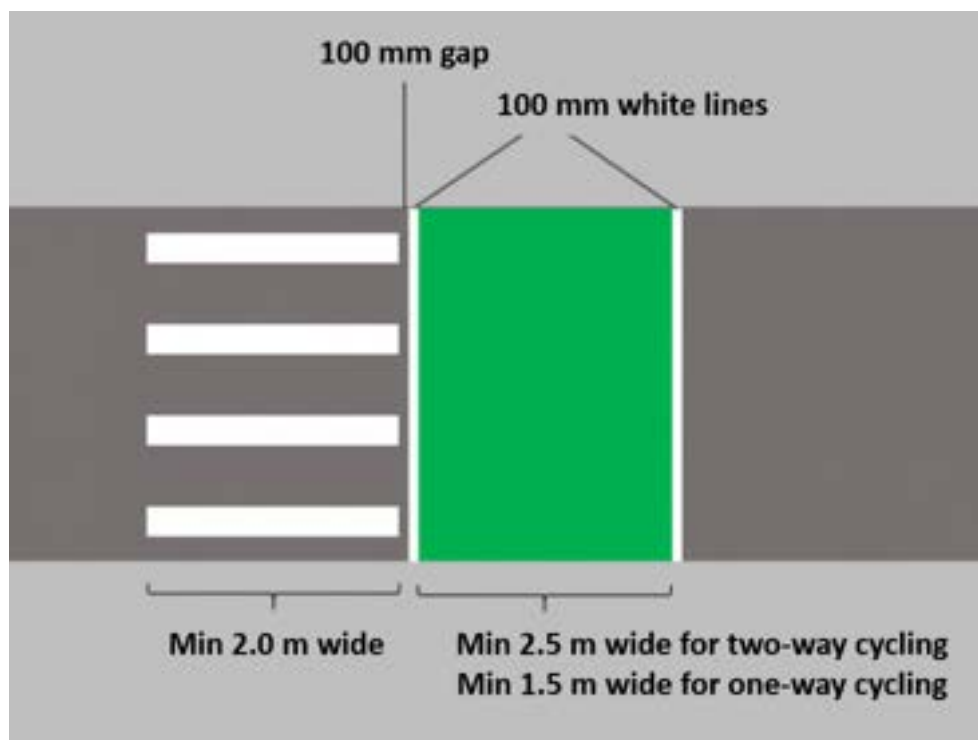


Figure 30-2: Markings on dual crossing for cyclists and pedestrians (adapted from Auckland Transport)

30.3 Signalised crossings

This crossing form is suitable for All Ages and Abilities only if all of the following criteria are met:

- 85th percental traffic speed is:
- ≤ 30 km/h; or
- ≤ 60 km/h and road has one lane on each approach

A signalised crossing provides priority for cyclists and micro-mobility users using traffic signals in a mid-block location. Periods of time are allocated to pedestrians and riders crossing the road and vehicles travelling along the road. The phasing plan may prioritise pedestrians and riders depending on the type of crossing and its location in the network.

The design elements for a signalised midblock crossing are:

Table 30-2: Signalised crossing design elements

Dual crossing component	Requirements	Options / considerations
Integration with pedestrians	See Table 30-3	
Crossing distance		Minimise with the use of kerb build-outs.
Traffic signal hardware	Comply with the TCD Rule, the National P43 Specification for Traffic Signals , and the HCC P43 Specification – Regional Special Conditions regarding signal hardware, placement and operation.	
Crossing detection	Push buttons for BaMM users and pedestrians at the waiting area.	- Advanced cycle detection to call phase ahead of cyclist / micro-mobility user arriving. - Presence detection on the road to determine whether people are still crossing, and extend or terminate the crossing phase if necessary or possible.
Phasing		In general, midblock crossings should operate independently of any co-ordinated traffic control system. However, a signalised crossing can be co-ordinated with other signals if vehicle operating speeds are more than 70 km/h, or if the crossing is located very close to an adjacent signalised intersection that is part of the co-ordinated system.
Motor vehicle speed control		While signalised crossings provide temporal separation from motor vehicles, people can still make mistakes or poor choices. Therefore, signalised crossings should ideally be placed on raised safety platforms in locations where motor vehicle speeds are above 30 km/h.

Wherever there is a signalised BaMM crossing, there will need to be some form of provision for pedestrians. In most cases, providing a single crossing with segregated spaces for pedestrians and cyclists is preferred, as this helps users queue efficiently and enables the use of different detection methods and phasing operation for the two user groups. Users of micro-mobility devices will choose where they feel best-placed. The main options are described in Table 30-3:

Table 30-3: Methods of providing crossings for cyclists and pedestrians

Provision	Description	Applications
Pedestrian and cyclist segregated crossing (default)	A single crossing with separate delineated spaces for cyclists and pedestrians.	Sites with reasonable user volumes and enough space to accommodate queuing users as well as those approaching their designated waiting areas.
Pedestrian and cyclist shared crossing	A single crossing shared by pedestrians and cyclists.	Constrained sites – narrow waiting areas. Low volumes of cyclists and pedestrians. Short crossing distance. Or, conversely: sites with complex layouts where it would be difficult for certain users to reach a designated waiting area without pushing through other queuing users but it would be more possible for users to sort themselves out while crossing.
Crossings for cyclists and pedestrian completely separate	Two crossing facilities that are physically separate, possibly with some distance between their respective waiting areas and different trajectories. The pedestrian crossing may involve a staggered layout and staged phasing, whereas the cycle crossing may be direct. At an intersection, they may operate in different phases.	Cycleway trajectory separate from footpath. Wide roads (cyclists can cross more quickly, pedestrians may do so in two stages). Locations with high cyclist volumes but few pedestrians.

30.4 Grade-separated crossings

Grade-separated crossings provide BaMM users and pedestrians spatial separation from motor vehicles. Grade separation is generally implemented at busy intersections or across major roads. These crossings generally take the form of an overpass (bridge) or underpass (tunnel). It is important to follow the general guidance for [horizontal and vertical alignment](#), plus the widths and clearances required for the specific facility type.

For routes with higher pedestrian and BaMM volumes (or expected volumes), the preference is to maintain segregation between users. It is important that additional width is adjusted for features such as vertical features, curves, gradients etc. Designers should refer to recommended widths for the facility type ([shared path](#) or [separated cycleway](#)).

The CNG provides further design guidance on [grade separated crossings](#).

PART 31 - PRIORITY-CONTROLLED INTERSECTIONS

In Hamilton City, the most common form of intersection control is priority-control; this means cyclists and micro-mobility users are likely to encounter multiple of these intersections on their journey, so it is paramount that they are appropriately designed. Any intersection on a route with designated biking and micro-mobility provisions should have some form of control (i.e. either priority control, signalisation, or roundabout). Existing uncontrolled intersections (sometimes used for low volume roads, especially T intersection) should be upgraded to have at least some form of priority-control.

At priority-controlled intersections, there are four options to provide for cycling:

- [No dedicated intersection treatment for BaMM users](#)
- [Adjacent cycle crossing](#)
- [Offset side road crossing](#)
- [Main road crossing point](#)

[Modal filtering treatments](#) may be used to support these options.

Practitioners should ensure that the facility proposed is suitable for All Ages and Abilities, and for all BaMM movements, using the requirements described in the following sections. In some situations, it may be appropriate to provide a combination of facility types at a single intersection, depending on the characteristics of the intersecting roads, and the midblock provisions.

31.1 No dedicated intersection treatment for BaMM users

31.1.1 Requirements

This intersection form is suitable for All Ages and Abilities only if all of the following criteria are met:

- Side road is appropriate for mixed traffic (see Figure 9-1: Indicative facilities for AAA biking and micro-mobility)
- Side road has one lane on each approach (with no additional right turn lanes or right turn bays)
- Main road has one lane on each approach, excluding right turn lanes or right turn bays.
- Main road is appropriate for mixed traffic, cycle lanes, or buffered cycle lanes (see Figure 9-1: Indicative facilities for AAA biking and micro-mobility)

31.1.2 Features

Cycle lanes or buffered cycle lanes should have some form of marking past the side street, in accordance with Part 4 of the TCD Manual, plus some green surfacing and green continuity lines as per Figure 31-1.

If the main road has a buffered cycle lane, then both edges of the buffer should be marked as continuity lines.

Kerb radii and road widths at the intersection should be minimised to reduce vehicle speeds as well as reduce the effective crossing distance for cyclists and micro-mobility users.

Where BaMM users ride in mixed traffic, [sharrows](#) may be marked on the approach and departure.

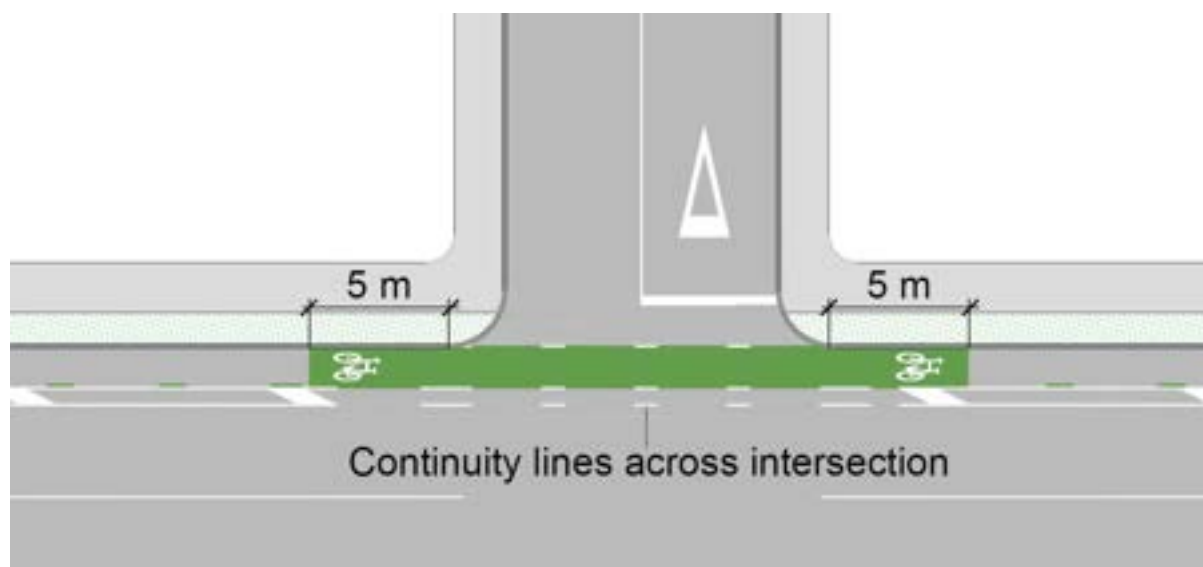


Figure 31-1: buffered cycle lane treatment across intersection

31.2 Adjacent side road crossing

31.2.1 Requirements

This intersection form is suitable for All Ages and Abilities only if all of the following criteria are met:

- Side road is appropriate for mixed traffic (see Figure 9-1: Indicative facilities for AAA biking and micro-mobility)
- Side road has no more than one general traffic lane on each approach (with no additional right turn lanes or right turn bays)
- Main road has one lane on each approach, plus the option of an additional right turn lane or right turn bay.
- Operating speed on main road is less than or equal to 50 km/h

- The BaMM facility on the main road is a cycle lane, buffered cycle lane, or uni-directional separated cycleway. Or, a midblock facility that transitions to one of these facilities approaching the intersection.

31.2.2 Features

The BaMM facility is directly adjacent to the general traffic lane (with possibly a narrow cycleway separator on the approach and departure).

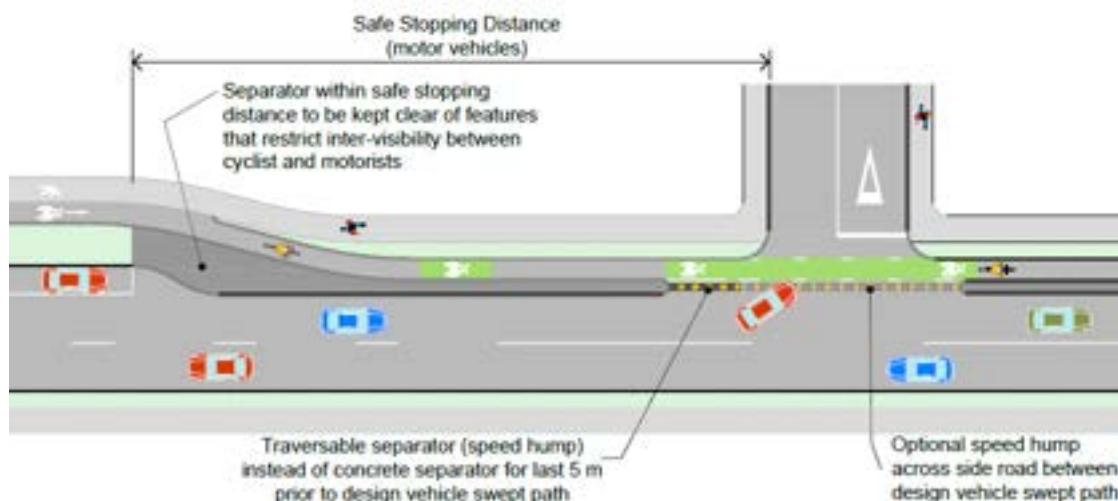


Figure 31-2: Adjacent side road crossing

The required stopping sight distance must be provided for the main road motor vehicle. Sight distance between the traffic lane and cycleway must not be obstructed by any road furniture or parked vehicles. The required sight distance can be calculated according to the equation in Appendix A.1, using the 85th percentile motor vehicle speed and appropriate coefficients of friction and driver reaction times as per Austroads.

To reduce the required parking setback, approach speeds of vehicles turning left from the main road can be managed, for example by:

- Placing speed humps across the side road as a continuation of the cycleway separator.
- Narrowing the side road and reducing the radius of the left turn in.
- Speed reduction treatments on the main road approaching the side road, e.g. a raised safety platform.
- On the main road, midblock facilities should transition to a separated cycleway at roadway level prior to the intersection, and the separator width should be less than or equal to 1.0 m so that the cycleway is directly adjacent to the general traffic lane. The appropriate [horizontal alignment](#) should be used for the transition.

The cycle / micro-mobility trajectory should be marked across the intersection in accordance with Part 4 of the TCD Manual. However, the separator should be discontinued to allow

vehicle tracking into the side road and marked as a buffered cycle lane where no separator is provided (see Figure 31-2 and its notes).

Kerb radii and road widths at the intersection should be minimised to reduce vehicle speeds as well as reduce the effective crossing distance for cyclists.

Where cyclists ride in mixed traffic, [sharrows](#) may be marked on the approach and departure.

It may be appropriate for cyclists on the side road to use the intersection in the same way as motor traffic does, unless main road volumes make it necessary or desirable to provide a [main road crossing](#) facility.

31.3 Offset side road crossing

31.3.1 Requirements

This intersection form is suitable for All Ages and Abilities only if all of the following criteria are met:

- Side road has no more than one general traffic lane in each direction
- Operating speed on main road is less than or equal to 60 km/h
- The BaMM facility on the main road is a shared path, or separated cycleway. Or, a midblock facility that transitions to one of these facilities approaching the intersection.

31.3.2 Features

The BaMM crossing is offset from the main road, making it similar to a midblock crossing.



Figure 31-3: Offset side road crossing

On the main road, midblock facilities should transition to a separated cycleway or shared path prior to the intersection; this facility then has a side road crossing point that is offset from the main road.

Kerb radii and road widths at the intersection should be minimised to reduce vehicle speeds as well as reduce the effective crossing distance for BaMM riders.

Where cyclists ride in mixed traffic, [sharrows](#) may be marked on the approach and departure.

The crossing of the side road may be:

- A [dual priority crossing](#) (preferred)
- A [signalised crossing](#)
- An [uncontrolled crossing](#)

A 7.5 m offset from the traffic lane of the main road to the crossing point is desirable (e.g. Figure 31-3). While a 6 m offset is typically acceptable, designers should consider the site-specific context, including turning volumes and traffic composition.

Pedestrian desire lines and volumes should also be considered. Where the footpath or shared path is close to the main road and it is likely that pedestrians will choose to cross directly

rather than follow the path alignment to the offset crossing, it may be preferable to apply the minimum 6 m offset.

- Distances greater than 7.5 m should be avoided unless there are frequent long vehicles, as the larger offset can encourage a second driver to attempt to wait between the main road and the crossing. An offset greater than 7.5 m can also reduce the directness and coherence of the BaMM facility, and may lead to riders choosing to cross the road closer to their desire line or to remain on the roadway where the safety risk may be higher.

BaMM users on the side road use the intersection in the same way as motor traffic does. However, in some cases, it may be desirable to provide a [main road crossing point](#) with off-road approaches / waiting areas

31.4 Main road crossing point

BaMM riders on side roads with mixed traffic provision may use priority-controlled intersections in the same way as motor traffic does.

However, it is necessary to provide an off-road crossing approach for riders to cross the main road if any of the following situations apply:

- The side road is inappropriate for mixed traffic (see Figure 9-1: Indicative facilities for AAA biking and micro-mobility)
- General traffic faces turning restrictions, but it is desirable to permit the movement for cyclists and micro-mobility users
- The main road has more than one lane in each direction (excluding right turn lanes)
- The operating speed on the main road is greater than 50 km/h.

Where a main road crossing is provided, a shared path or separated cycleway should be provided for BaMM riders to access between the crossing and the side road. The main road crossing should adhere to the guidance in the [midblock crossings](#) section]

31.5 Modal filtering treatments

Modal filtering can be implemented to support any of the turning treatments described above and may be used to achieve the criteria for a facility to be suitable for All Ages and Abilities.

PART 32 - SIGNALISED INTERSECTIONS

Intersections may be signalised to address a road safety, efficiency or operational issue, or to improve crossing opportunities for pedestrians and BaMM riders. Signalised intersections are generally installed at intersections of major roads and usually involve several approach lanes on each leg, to provide storage space for waiting vehicles and enable different movements to be operated independently. Signalised intersections are generally the most complicated components of a biking and micro-mobility route. They involve the highest volumes of motor traffic and many potential conflicts between users travelling in different directions.

There are five main signalised intersection treatment options that may be appropriate for AAA users; these are outlined in the following subsections in terms of layout, phasing, signal hardware provision, safety and efficiency, and application. However, the complexity and individuality of signalised intersections makes it impossible to include all details and considerations in this document. Designers must consider which treatment is most appropriate for their site-specific context, with the aim of minimising the potential for conflict between BaMM users and motor vehicles.

32.1 Fully protected phasing

32.1.1 Overview

At signalised intersections, the traffic signal phasing can be designed so no conflicting movements are operated at the same time as cyclists. This is called ‘full protection’ and requires the use of specific traffic signals for cyclists, so that the general traffic and cycle movements can be distinguished and controlled independently. Protected phasing is theoretically the safest option because cyclists and motorists move through the intersection at different times. However, this reduces the intersection efficiency and increases delays, which can result in some road users adopting non-compliant and unsafe behaviours.



Figure 32-1: Separated cycleway (north-south corridor) with fully protected phasing, Christchurch⁷

Fully protected phasing is a potential intersection treatment for cycle lanes, separated cycleways (one-way or two-way) or shared paths. However, at lower volumes of conflicting vehicles (lower than 150 vehicles per hour), the phasing arrangement should be carefully considered to ensure cyclists and / or left turning drivers are not held at a red light for an unnecessary length of time with no conflicting traffic, and other possibilities should be considered.

32.1.2 Layout

- Physically separated cycleways on approaches
- Separation continues to the cycleway limit line.
- Cycleway has an advanced stop line compared to the adjacent general traffic lanes.
- Ideally have separate lanes for left turning and through vehicles, or at least shared lanes wide enough to accommodate two streams of traffic (for when left turners have a red arrow when the cycleway operates).
- No specific provision for cyclists travelling through the intersection.
- Hook turn boxes or “jug handles” for right-turning cyclists (see Figure 32-2 and Figure 32-3)
- Phasing and signal provision

⁷ Note that narrow cycleway separators are used, and these are replaced with painted buffer markings on the departure sides, due to motor vehicle tracking constraints.

- Operate non-conflicting movements with the cycleway movements.
- Conflicting turning movements held back while cyclists have a green signal.
- Ideally, coordinate cyclist green waves along a corridor
- Where there is a kerbside cycleway with left turning motorists from the same approach, TCD Rule 6.4(2A) currently makes it impossible to use cycle signals plus a red left turn arrow and still enable cyclists to turn left at any point in the cycle. Under the current rules, the “correct” signal provision would be to not use green cycle signals and instead cyclists will be governed by the general traffic signals. It is hoped that this will be addressed early-2024. A more-detailed explanation of these legal considerations is provided in the Tristram / Ward investigation report (ViaStrada, 2023).



Figure 32-2: Hook turn box at signalised intersection, Christchurch



Figure 32-3: Jug handle at signalised crossing, Auckland

32.1.3 Safety & efficiency

Table 32-1: Safety and efficiency summary for fully protected phasing

Consideration	Advantages	Disadvantages
Safety	- No conflicting vehicle movements operated with cycleway movements. - Good perception of safety for cyclists.	- Factors such as decrease in cyclist LOS and poor cyclist green time compared to that of parallel traffic are likely to result in non-compliant behaviour, therefore safety risks. - Frustrated through drivers may overtake left turners.
Efficiency		- Increases total intersection time, therefore increases delay to all users. - Minimal green time to cyclists, therefore reduced LOS. - Left turners at red arrows will hold back through traffic in narrow shared lanes.

32.2 Filter left turns with cycle head starts

32.2.1 Overview

When cyclists can travel straight ahead through the intersection and turning motorists are allowed to wait for a gap in the cyclists and turn across the cyclist trajectory, this is called “filter turning”. Whilst filter turning does not involve full protection for cyclists, it makes a higher proportion of the total intersection time available to cyclists and left turning traffic. Hence, while [fully protected phasing](#) may seem initially to be the safest option, in some cases it may be more appropriate to consider filter turning.

There are currently ambiguities regarding the definition of “roadway” in the Land Transport: Road User Rule. The [Accessible Streets Package](#) proposed to address this by changing to the Land Transport Rule to “give cycles, transport devices [a new category covering both powered and unpowered micro-mobility devices] and buses priority over traffic turning when they’re travelling through an intersection in a separated lane”. Unless this proposal is adopted it is advisable to discontinue the physical separation prior to the limit line if filter turning across a cycle movement coming from a cycleway is to be allowed.

The use of filter turning requires techniques to reduce the likelihood and consequences of conflicts. This generally involves layouts that slow motorists and emphasise the give way requirements.

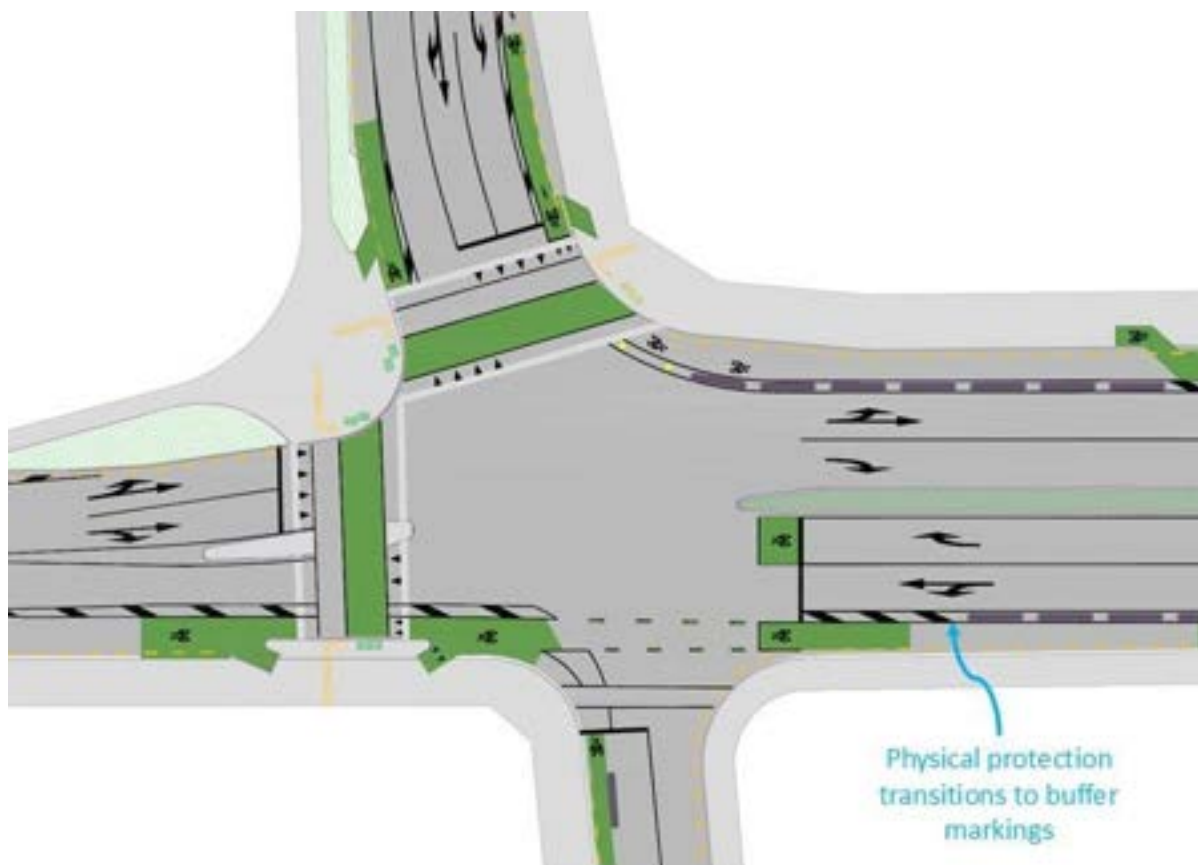


Figure 32-4: Separated cycleway with left filter turning allowed, Hamilton

Filter turning is a potential intersection treatment for cycle lanes or one-way separated cycleways.

Figure 32-5 summarises the layouts where filter turning is possible. The maximum recommended volume for these turning movements is 150 vehicles per hour.

32.2.2 Layout

- Physically separated cycleways
- Last 5 m before the limit line replaced with traversable separators (to address current issue with the definition of “roadway” – won’t be necessary if the relevant proposal in the [Accessible Streets Package](#) is adopted).
- Generally built at road level.
- Generally at the kerbside.
- Cycleway has an advanced stop line compared to the adjacent general traffic lanes.
- Ideally have separate lanes for left turning and through vehicles, or at least shared lines wide enough to accommodate two streams of traffic (for when left turners have a red arrow when the cycleway operates).

- No specific provision for cyclists travelling through the intersection (it may be possible / desirable to mark continuity lines)
- Hook turn boxes for right-turning cyclists.

Filtering can be applied for a left turning vehicle movement, or a right turning vehicle movement coming from the same direction as the cycleway where there is no opposing motorised traffic (e.g. a right turn from a one-way street across a separated cycleway on the right-hand side of the road). Both cases require that there is only one lane provided for the turning movement. These scenarios are summarised in Figure 32-5.

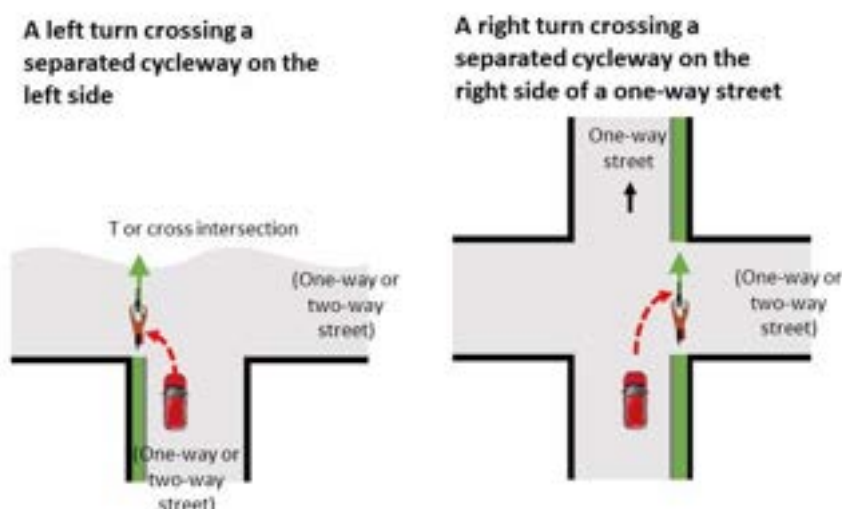


Figure 32-5: Summary of possible filter turning applications

Filtered right turns across cyclists coming from the opposite direction may be assessed on a site-by-site basis; the HCC Network Operations Team has developed a methodology for this which will be included in the next update of RITS.

Filtered turning across two-way separated cycleways is not advised, due to the risk of drivers not expecting to encounter cyclists travelling in the contra-flow direction.

32.2.3 Phasing and signal provision

The Tristram / Ward investigation report (ViaStrada, 2023) outlines options for signal provision and sequence under the legislative framework as of October 2023 (i.e. without the [Accessible Streets Package](#)); the current version of the Traffic Control Devices Rule should be consulted before designing cycle signals.

The following principles should be applied:

- Right turn movements operated in different phases to cycleway movements.
- Initial period of full protection, i.e. green cycle signal with red left turn arrow (parallel through traffic can also have a green signal, but cyclists should be banned from making a direct right turn and required to make a two-stage “hook” turn to turn right).

- Transition period where cyclists are given some indication that their situation is changing.
- Left turn filtering through cycle movement allowed – give way rules apply, i.e. left turners give way to cyclists travelling straight through

Ideally, a flashing yellow arrow would be applied to the filtering left turners, to remind them to watch for and give way to cyclists (see [Gregory & Wilke, 2018](#)). However, this device is not currently included in the NZ Traffic Control Devices Rule and would require a trial.

32.2.4 Safety & efficiency

Table 32-2: Safety and efficiency summary for filter left turns

Consideration	Advantages	Disadvantages
Safety	• Better cyclist compliance due to improved cyclist LOS	• Potential for conflict between left turners and cyclists • Flashing yellow arrow not available to increase awareness of left turning motorists. • Only feasible for up to 150 left turning vehicles per hour⁸ • Not appropriate for two-way cycleways.
Efficiency	• Maximum green time for cyclists • Reduced delay to left turners	• Left turners at red arrows will hold back through traffic in narrow shared lanes. • If there are high volumes of cyclists and left turners, there could be some delay to through traffic in the shared lane.

32.3 Separated cycle intersection

32.3.1 Overview

“Separated cycle intersection” is a term for a package of signal phasing and layout features that seeks to minimise delay to all users whilst also minimising potential for conflict. This treatment can also be known as a ‘Dutch intersection’, given its use in the Netherlands. In the USA, it is commonly referred to as a “protected intersection”.

Separated cycle intersections may be an appropriate intersection treatment for separated cycleways, especially where two such facilities intersect. They are not recommended for [cycle lanes](#), due to the difficulties of channelling cyclists into the separated cycle intersection facilities.

⁸ This is the upper limit stated in several international guides and appears to be taken from the Dutch [CROW Manual](#), which does not specify whether this is based on empirical research. We recommend that if used, this should be subject to conflict studies to determine whether it is a sensible upper limit for New Zealand conditions.

32.3.2 Layout & phasing

The main elements to separated cycle intersection design are:

1. Corner refuge island – to channel motor vehicles around the corner, so drivers are near-perpendicular to cyclists where the movements cross, and create the physical space for some of the other elements.
2. Advanced limit line for cyclists – to provide a physical head start and increased visibility, plus enable cyclists to undertake a “free left turn” i.e. turn left regardless of the traffic signals.
3. Setback cycle and pedestrian crossing – i.e. crossing is set back from the intersection due to the corner refuge island, to separate decision points for motorists. To further increase safety and visibility, the crossings could be put on a raised platform.
4. Cycle-friendly signal phasing – to minimise cyclist waiting time. Current legislation does not allow left or right turning vehicles to make filter turns across the cycle crossing. Therefore, signal phasing must not allow filter turning and a dedicated turn lane should be provided.
5. Pedestrian crossing of separated cycleway – making it clear where and/or when cyclists must give way to pedestrians where the two paths cross approaching the waiting areas (e.g. a zebra crossing).
6. Separate cycle signals and detection at each cycle crossing.

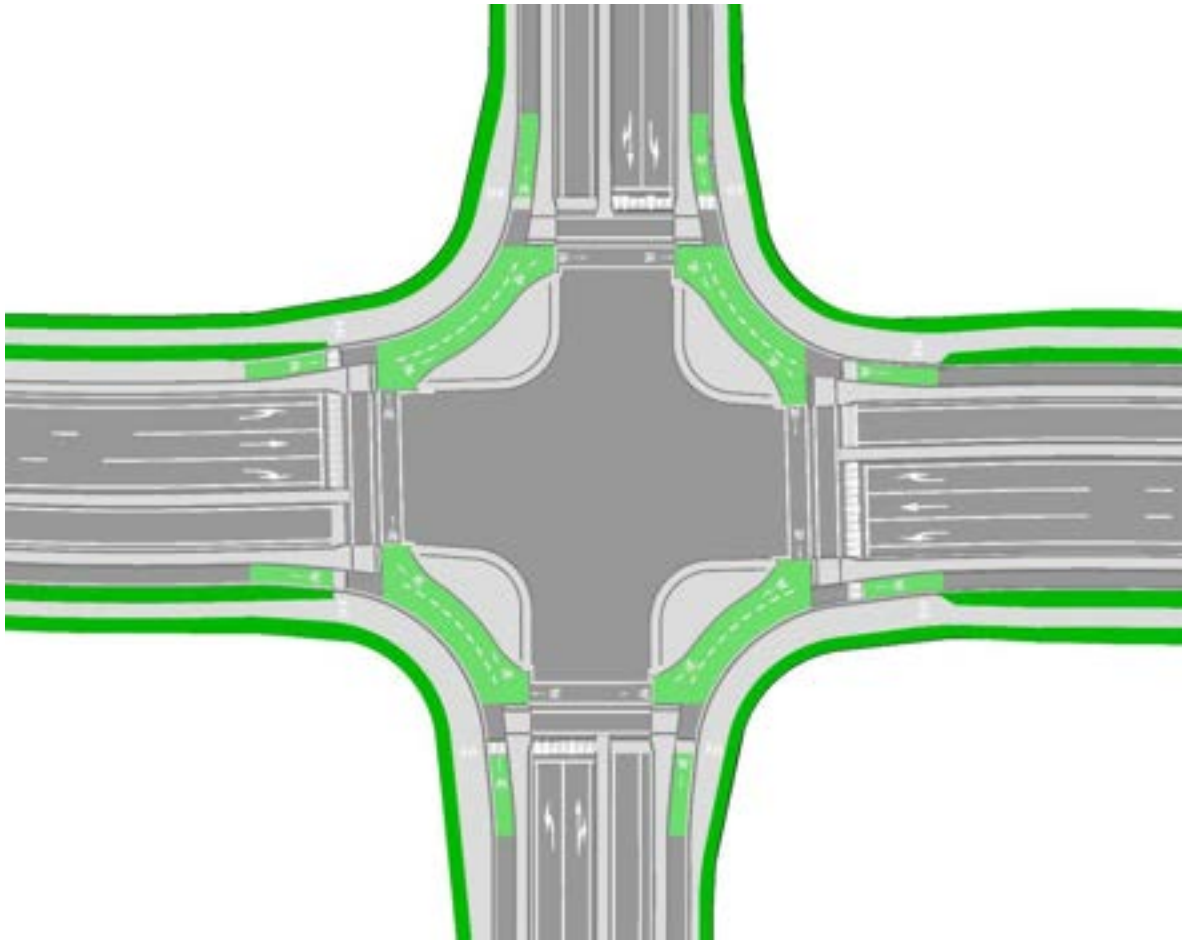


Figure 32-6: Separated cycle intersection with protected phasing and exclusive left turn lanes – designed for greenfield site

The MassDOT (Massachusetts Department of Transportation) [Separated Bike Lane Planning and Design Guide](#) is a comprehensive source for designing protected intersections.

32.3.3 Safety & efficiency

Table 32-3: Safety and efficiency summary for separated cycle intersection with full protection and exclusive left turn lane

Consideration	Advantages	Disadvantages
Safety	- Physical head start and reduced crossing distance for cyclists. - Increased intervisibility between motorists and cyclists - Geometry reduces motor vehicle speeds approaching conflict points	- Potential for reduced cyclist and left turner compliance due to lower green time - Cyclist storage space can be compromised - Increased potential for cyclist vs. pedestrian conflicts
Efficiency	- Reduced cycle crossing distance - Left turners shouldn't hold up through traffic (if storage sufficient)	- Lower proportion of green time for cyclists and left turners compared to filter turning options - Potential for left turn queue to spill into through lane - Requires a large footprint to accommodate dedicated left turn lane

32.4 CYCLOPS

32.4.1 Overview

The CYCLOPS (CYCLE Optimised Protected Signals) intersection design from the UK looks similar in layout to a separated cycle intersection, but with the pedestrian crosswalks closest to the centre of the intersection and pedestrian crossing refuges incorporated in the corner islands. However, the biggest difference is in the operation – whereas a separated cycle intersection involves some concurrent operation of cyclists and general traffic, the CYCLOPS does not operate cyclists and general traffic concurrently, rather it operates an exclusive cycle phase for all approaches. This makes a CYCLOPS more similar to a Barnes Dance operation for pedestrians, where cyclists must follow the circulating path and cannot cross through the centre of the intersection.

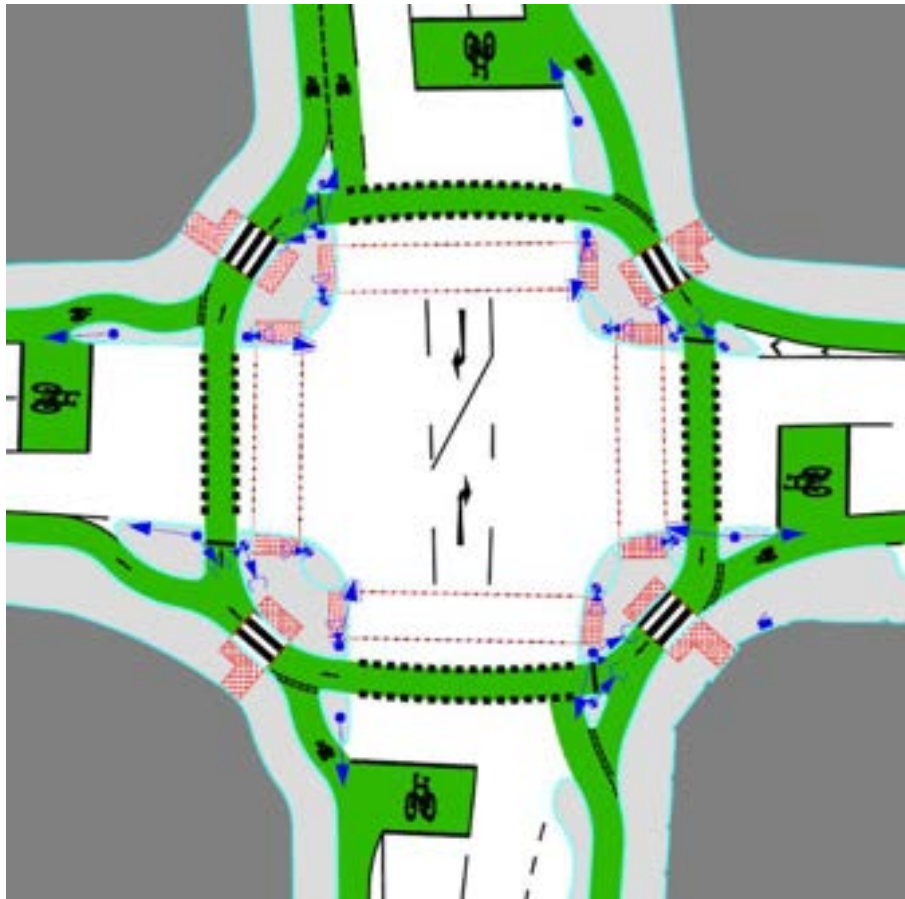


Figure 32-7: UK CYCLOPS layout (source: Butler et al, 2019)

CYCLOPS intersections are suitable for midblock approaches with cycle lanes, and one-way or two-way separated cycleways. They are not recommended for shared paths, because pedestrians and cyclists are provided for differently within the intersection.

32.4.2 Layout

A CYCLOPS layout includes the following elements:

- Physically separated cycleways on approaches
- Circulatory path around outer extent of intersection
- Cycle limit lines at side road crossing
- Pedestrian crossings closest to the centre of the intersection, within corner refuge islands
- Pedestrian crossing of cycleway for pedestrians transitioning to / from pedestrian corner islands

A substantial amount of space is necessary to achieve the elements of a CYCLOPS intersection – probably at least the same as a separated cycle intersection, but with larger corner splays

to accommodate a footpath on the outside of the cycleway plus a pedestrian waiting area on the inside of the cycleway.

32.4.3 Phasing and signal provision

- Cycle movements held back while general traffic operates.
- Exclusive phase for cyclists and pedestrians Should be long enough to allow pedestrians to make a diagonal crossing and to allow cyclists to clear two consecutive crossings (to enable right turns)

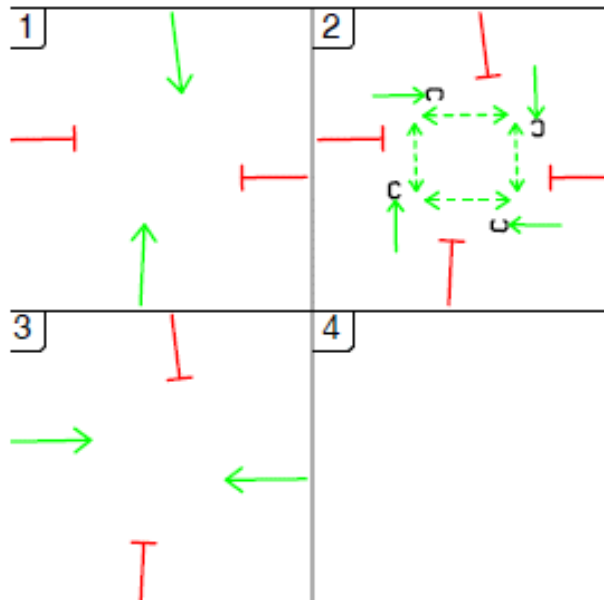


Figure 32-8: CYCLOPS phasing (source: Butler et al, 2019)

32.4.4 Safety & efficiency

Table 32-4: Safety and efficiency summary for CYCLOPS intersection

Consideration	Advantages	Disadvantages
Safety	- No conflicting vehicle movements operated with cycle movements. - Good perception of safety for cyclists - Potential for conflict between cyclists and pedestrians significantly reduced (compared to cycle Barnes Dance) and clearly defined.	- Factors such as decrease in cyclist LOS and poor cyclist green time compared to that of parallel traffic are likely to result in non-compliant behaviour, therefore safety risks. - Cyclists wanting to turn right might be tempted to ride contra-flow for more direct access
Efficiency	- Cyclists have the option of joining the general traffic lanes. - Could be an efficient way to operate an intersection if cycling volumes are high.	- Cannot run cycle movements in conjunction with general traffic in other phases. - Likely to result in less green time for cyclists travelling straight ahead, compared to parallel through traffic. - Cyclists making a right turn may have to do so in 2-stages (depending on their speed and the length of the phase) - Adding a cycle / pedestrian phase increases delay to all intersection users.

32.5 Slip lane crossing

32.5.1 Overview

If an intersection involves a left turn slip lane (or a slip lane is to be introduced) the conflict between left turning vehicles and cyclists travelling straight ahead could be addressed by:

- A conflict zone across the vehicle entry to the slip lane (not suitable for AAA) with a shorter gap for turning traffic to slow vehicle turning speeds; or
- A crossing point further down the slip lane, followed by a signalised crossing at the main intersection, free of conflict from left turners. Figure 32-9 gives an example of a dual pedestrian-cycle crossing across a slip lane.

The form of control of a slip lane crossing may either:

Table 32-5: Slip lane crossing provision for AAA

Form of control on slip lane crossing	Limitations
Dual priority crossing for cyclists and pedestrians ("dual crossing")	- Requires sign-off from NZTA for speed limits greater than 50 km/h - Not appropriate for more than one lane of slip lane traffic
Signal-controlled crossing for cyclists and pedestrians	Additional delay for crossing users and motorists compared with dual priority crossing, due to intergreen phase requirements

Slip lane crossings without any form of control (i.e. where pedestrians and cyclists are expected to find a gap in motor traffic) are not likely to be suitable for AAA, but could be considered if traffic speeds and volumes are in the mixed traffic realm in Figure 9-1: Indicative facilities for AAA biking and micro-mobility.



Figure 32-9: Dual crossing across slip lane

Slip lane crossings are more suited to separated cycleways than cycle lanes which may result in some riders choosing to continue straight across the slip lane entrance.

Slip lane crossings are likely to be appropriate for higher turning vehicle volumes, provided sufficient left turn lane capacity is provided.

32.5.2 Layout

The following considerations apply to the design of the various components of a slip lane crossing:

Table 32-6: Slip lane crossing component considerations

Slip lane crossing component		Considerations
Intersection footprint		A slip lane requires more space than a standard intersection layout where the left turn is signal-controlled, due to the angle of the slip lane. Adding a suitable approach path for cyclists to a slip lane crossing will require even more space.
Cycleway approach to crossing		Should be offset from the slip lane, so that BaMM users will have turned towards the crossing before arriving there. The offset should not be too great, otherwise BaMM users may prefer to take the more direct on-road trajectory rather than following the intended provision.
Vehicle approach to crossing		The slip lane should be designed to slow vehicle speeds approaching the crossing. The volumes of left turners and likely delay they will experience should be considered, to ensure the left turn queue doesn't affect the safe operation of adjacent through traffic.
Slip lane crossing	Priority	A non-signalised slip lane crossing should be a dual crossing for cyclists and pedestrians, designed so that BaMM users and pedestrians have priority over vehicle slip lane traffic. The unsignalised crossings section of the CNG includes design considerations for dual crossings – including that they should have zebra markings plus green for the cyclist area, and be on a raised safety platform. These should only be used for single-lane slip lanes.
	Signalised	A signalised slip lane crossing should have a similar layout to a midblock signalised crossing for pedestrians and cyclists, ideally involving a raised platform (although this may not be appropriate in higher-speed areas). This could involve slip lanes with multiple lanes.
Distinction between slip lane crossing and main intersection crossing		It is critical that users can tell it the slip lane crossing and the main intersection crossing are two separate crossings, that may have different forms of control or phasing etc. Users must understand that, after completing the first crossing (which might be the slip lane crossing but, for a 2-way cycleway, could be the main intersection crossing) they may have to wait in the slip lane island before completing the second crossing stage. To achieve this distinction, the slip lane island design must include at least one of the following characteristics: • Change in direction between the two crossings (most likely due to slip lane geometry) • Offset / stagger between the two crossing stages • Long distance between the two crossings It is preferable that the cyclist trajectory within the slip lane involves a tight enough curve that reduces cyclists' speed. For signalised crossings (slip lane and / or main intersection) approaching users must be able to see the necessary signal hardware, which can require careful placement within a the constraints of a slip lane island. There should also be no "look-through" issues, i.e. where approaching cyclists see the signals for other movements instead of their own.
Slip lane island		Must have enough capacity to accommodate the number of cyclists and pedestrians expected to be waiting there between crossing stages



Figure 32-10: Dual pedestrian / cycle priority slip lane crossing, St Lukes Road, Auckland

32.5.3 Phasing and signal provision

In most cases, a slip lane crossing will not be signalised and will instead be a priority crossing for pedestrians, cyclists and micro-mobility users.

In some cases, especially if the slip lane consists of more than one traffic lane or has a speed limit greater than 50 km/h, a signalised crossing for cyclists and pedestrians could be accommodated across the slip lane.

After BaMM users cross the slip lane, they should have a signalised crossing to indicate when they can cross the rest of the intersection.

32.5.4 Safety & efficiency

Table 32-7: Safety and efficiency summary for slip lane crossings

Consideration	Advantages	Disadvantages
Safety	- Shifts conflict point to location with fewer cognitive demands on cyclists and drivers and slower speeds (compared to full intersection). - Good level of perceived safety. - Makes it easier to locate hook turn boxes within intersection.	If route to cross slip lane deviates too much from through route, BaMM users may choose to ride in general traffic lane, and thus risk conflict with left turners at slip lane entry.
Efficiency	- Pedestrian / cycle priority crossing – best LOS for crossing users. - Avoids having to hold back through traffic from a shared lane whilst still protecting cycle movement. - Improves overall intersection efficiency.	Signalised slip lane – trade-off between cyclist LOS and driver LOS, may be governed by phasing of intersection and surrounding network.

PART 33 - ROUNDABOUTS

At roundabouts, there are three options to provide for cycling and micro-mobility:

- Cyclists and micro-mobility riders mixed with traffic;
- Cyclists and micro-mobility riders use circulating path with at-grade crossings; or
- Cyclists and micro-mobility riders use circulating paths with grade separated crossings.

For roundabouts designed with a circulating path, it is preferred to have BaMM riders separated from pedestrians and consideration should be given to providing one or two-way cycle paths. Two-way cycleways can reduce the number of crossing points, therefore reducing potential conflicts. Shared paths should only be considered where there is limited space, low pedestrian and BaMM volumes (including predicted volumes), or there are high numbers of micro-mobility users (e.g. outside of primary schools).

Practitioners should ensure that the facility proposed is suitable for All Ages and Abilities using the requirements described in the following sections. In some situations, it may be appropriate to provide options for cyclists and micro-mobility riders to either mix with traffic or use a circulating path at a single intersection. Practitioners must ensure the operating speeds of the roundabout are suitable for the type of AAA provision – see Achieving operating speeds.

33.1 Cyclists mix with general traffic

33.1.1 Requirements

This intersection form is suitable for All Ages and Abilities only if the following criteria are met:

- Operating speed on all legs and the circulating roadway is < 30 km/h
- All approach legs, departures legs, and the circulating roadway have a single lane in each direction.
- All legs have a maximum traffic volume of 2,000 vehicles per day.

33.1.2 Features



Figure 33-1: Cyclists entering mixed traffic from a [cycle lane](#) approaching a roundabout

If provided in the midblock, cycle lanes or separated cycleways should end 30 m prior to the limit line approaching a mixed traffic roundabout as per Figure 33-1. They may begin immediately on the departure. Cycle lanes must not be marked in the circulating roadway of a roundabout.

[Sharrows](#) may be marked on the approach and departure.

33.2 Cyclists use circulating path with at-grade crossings

33.2.1 Requirements

This intersection form is suitable for All Ages and Abilities only if the following criteria are met:

- At grade-crossings allow cyclists to make any movement at the intersection
- All crossings cross a maximum of one lane of traffic in each direction, or are subject to signal control
- Vehicle operating speeds at the crossing points are < 30 km/h.

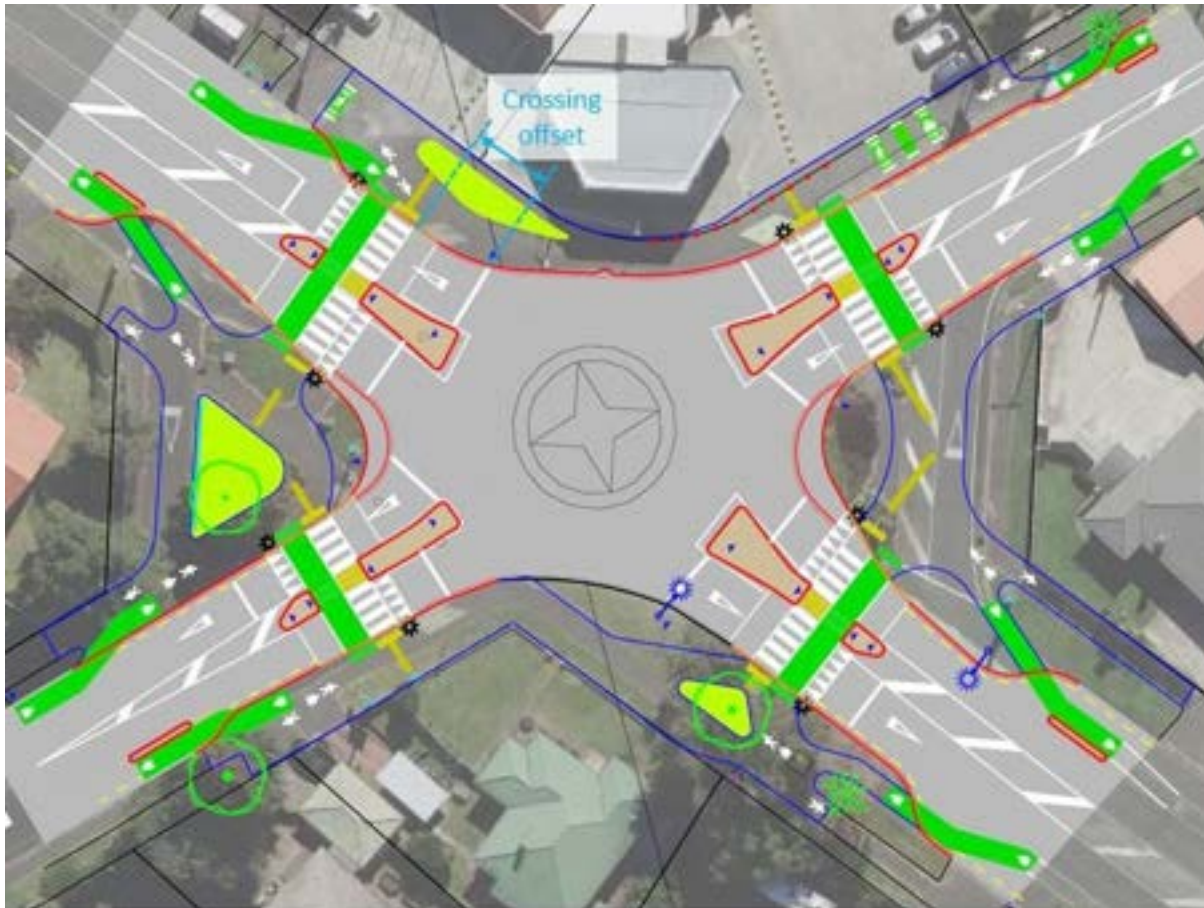


Figure 33-2: Cycle lanes transition to circulating shared path at Grey / Naylor roundabout, Hamilton

33.2.2 Features

Circulating path

The circulating path may be a [shared path](#) or a [separated cycleway](#), and should meet the requirements of the chosen facility types. For a separated cycleway, particular attention is required at intersections with the footpath.

Transition from midblock facility

Cyclists should be able to easily transition between the circulating path and the midblock facilities. The transition should meet the requirements in the [transition points](#) section.

Crossing control

The crossing may be:

- A [signalised crossing](#). Note that the area controlled must be at least 30 m from the limit line of the roundabout (as per the specifications for signalised pedestrian crossings for pedestrian facilities at roundabouts in the [TCD Manual Part 4](#), which apply to cyclist crossings also).
- A [dual priority crossing](#).

- An [uncontrolled crossing](#)

For dual priority crossings or uncontrolled crossings, offsetting the crossing point from the limit line can improve safety by:

- Allowing drivers on the approach leg to wait at the limit line without blocking the crossing point;
- Allowing drivers on the departure leg to wait at the crossing without blocking the circulating roadway; and
- Reducing the risk that a driver is so focused on vehicles approaching from the right, that they fail to give way to someone crossing from their left.

However, this offset can reduce the directness and coherence of the cycling facility and may lead to cyclists choosing to cross the road closer to their desire line, or to remain on the roadway where the safety risk may be higher.

As for an [offset side road crossing](#), a 7.5 m offset from the circulating roadway to the crossing point is typically desirable, but designers should consider the site-specific context.

33.3 Cyclists use circulating paths with grade separated crossings

Where the conditions for cyclists to mix with traffic or use a circulating path with at-grade crossing cannot be met, cyclists should be separated from motor traffic entirely.

[Grade-separated crossings](#) should be provided to allow cyclists to make any movement at the intersection.

33.3.1 Features

Circulating path

The circulating path may be a [shared path](#) or a [separated cycleway](#), and should meet the requirements of the chosen facility types.

Transition from midblock facility

Cyclists should be able to easily transition between the circulating path and the midblock facilities. The transition should meet the requirements in the [transition points](#) section.

Crossing design

See [grade-separated crossings](#).

33.4 Achieving operating speeds

Many existing roundabouts will not currently achieve the operating speeds required for use by All Ages and Abilities. To manage operating speeds, roundabouts may be modified by:

- Limiting approach visibility

- Increasing horizontal deflection and reducing lane widths, for example compact roundabouts and small roundabouts, as per the [CNG section on cycle-friendly roundabouts](#).
- Increasing vertical deflection, by installing raised safety platforms on approach: refer to VicRoads guidance

PART 34 - CYCLEWAY-CYCLEWAY AND CYCLEWAY-FOOTPATH INTERSECTIONS

Where there is an intersection between facilities solely for biking and micro-mobility and pedestrians (i.e. cycleways, shared paths or footpaths):

- the [sight distance requirements](#) apply
- additional space may be required for negotiation and manoeuvring
- the layout should communicate whether any users / travel directions have priority and which (if any) are required to give way.

PART 35 - RAILWAY CROSSINGS / INTERSECTIONS

Railway crossings and corridors are under the jurisdiction of KiwiRail. The [Design Guidance for Pedestrian & Cycle Rail Crossings \(KiwiRail, 2017\)](#) details the design considerations and standard designs for level crossings located on footpaths, shared paths or cycle paths. The [Applications for New Rail Crossings – Guidance for Applicants \(KiwiRail, 2021\)](#) outlines the process for applying to establish a new rail crossing.

PART 36 - TRANSITION POINTS

Where a cycle facility transitions from one facility type to another, or to a different level with respect to the roadway, it is important to consider the following features:

36.1 Transition alignment

The transition between facility types must meet the [horizontal and vertical alignment](#) requirements.

36.1.1 Transition between levels

The following figures show the two methods of transitioning between footpath and roadway level or transitioning the kerb alignment either side of a cycleway.

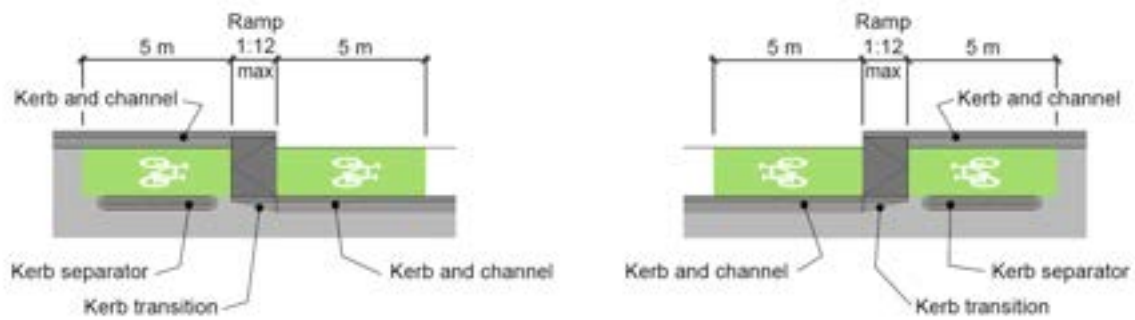


Figure 36-1: Ramps at cycleway changes in level

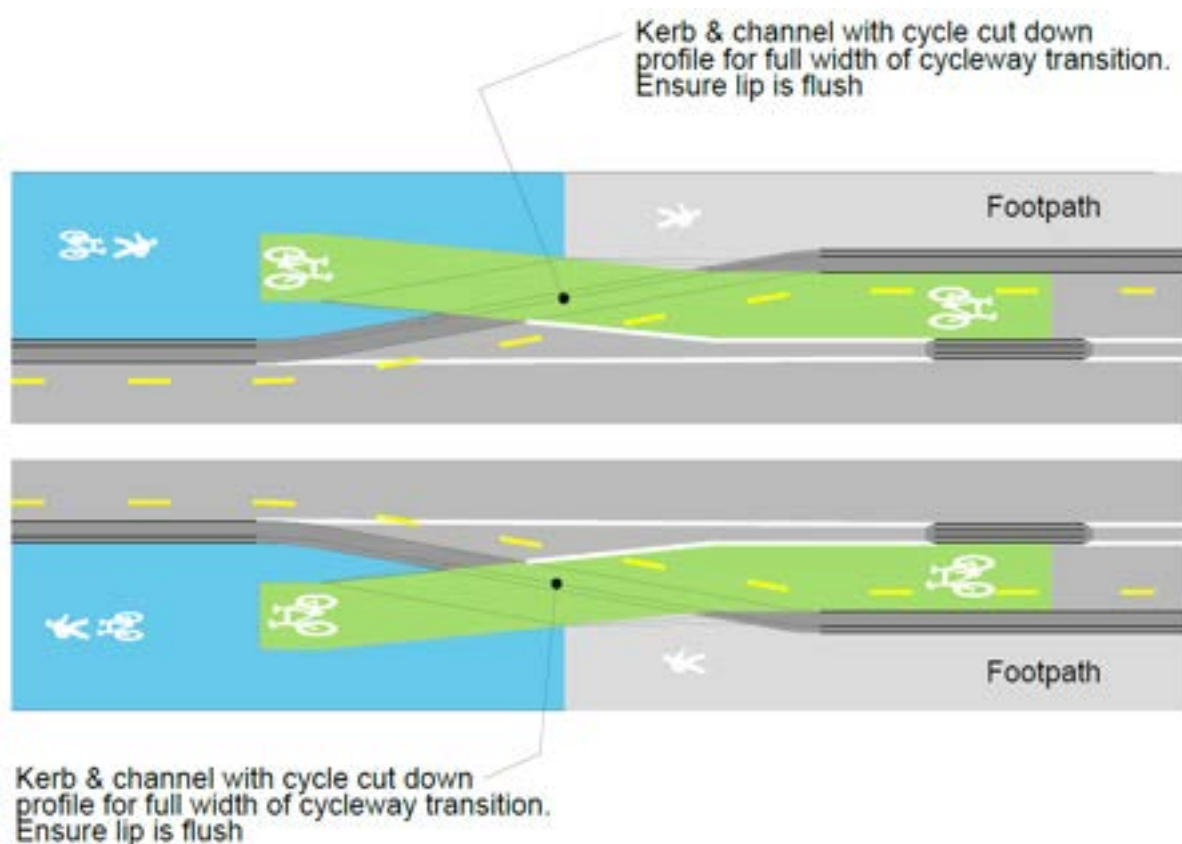


Figure 36-2: Cycle cutdown in continuous kerb and channel at cycleway change in level

36.1.2 Horizontal transition alignment

Where cycling infrastructure causes motor traffic to change alignment, for example a transition from mixed traffic to separated cycleway as illustrated in the figures below, the design should consider:

- the [horizontal and vertical alignment](#) requirements
- if the general traffic lane reduces in width or deviates in alignment: the required diverge taper length (L_d) to achieve the lateral shift for motor vehicles as per [TCD Manual Part 5](#)

- if there is no change to the general traffic lane width or alignment: necessary separator gap to accommodate the tracking envelope of a turning cyclist
- clear markings – lane lines, coloured surfacing at the start of the cycle facility etc
- vertical elements prior to and at the start of the cycleway separator

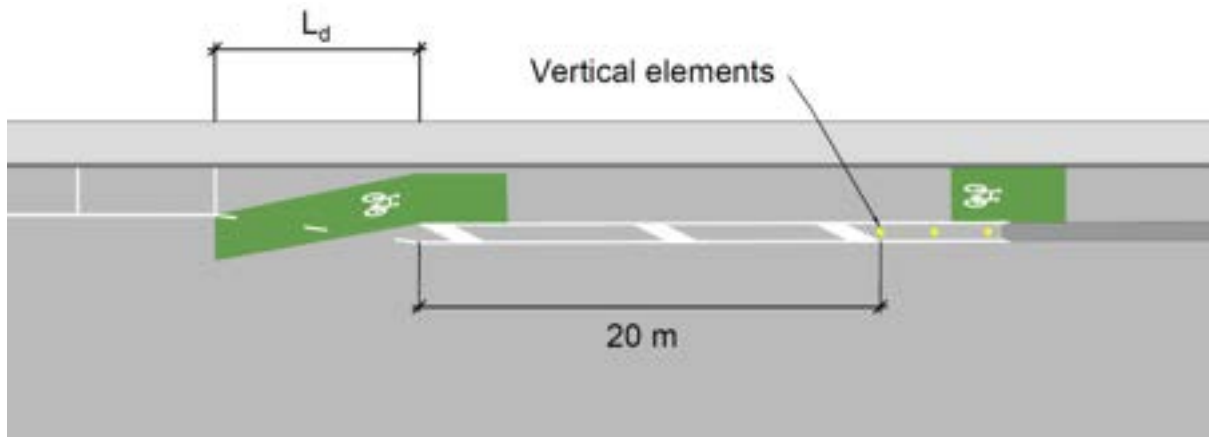


Figure 36-3: Horizontal transition alignment option 1 – vehicle deviation, cycleway remains on-road

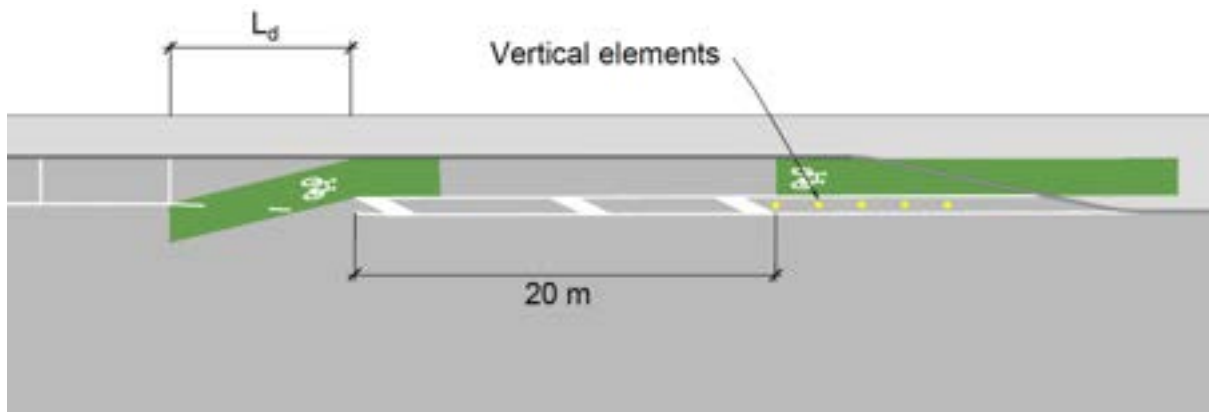


Figure 36-4: Horizontal transition alignment option 2 – vehicle deviation and transition to off-road

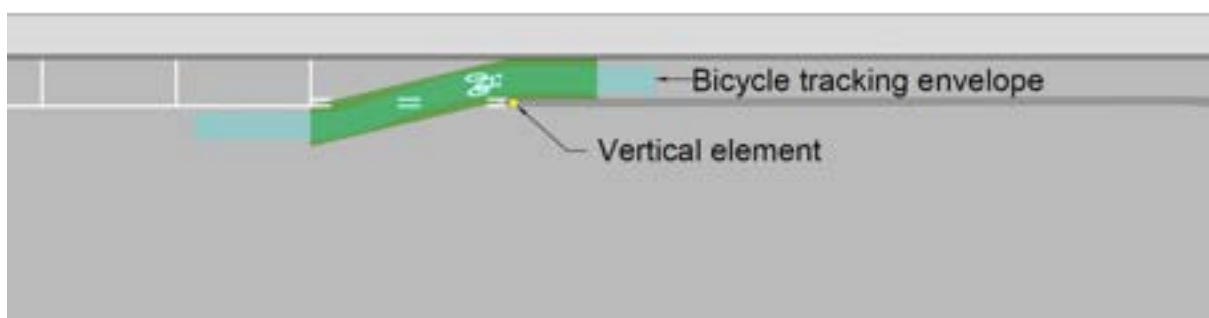


Figure 36-5: Horizontal transition alignment option 3 – narrow cycleway, transition governed by cycle tracking

36.2 Delineation

The design must make it clear what the form(s) of cycle provision is / are, and where the biking and micro-mobility route is heading. This could include use of painted markings, way-

finding signage, and physical elements (e.g. cycleway separators that channel the cycleway in a different direction).

36.3 Interaction with motor vehicles

If a cycleway, shared path, or cycle lane transitions to mixed traffic, for example on the approach to a [mixed traffic roundabout](#), the change must be clear to motorists as well as BaMM users. Sharrows are the best tool to achieve this, and should:

- be placed centrally in the traffic lane
- have a green box background
- have at least three occurrences
- have a gap of 6 – 7 m between each.

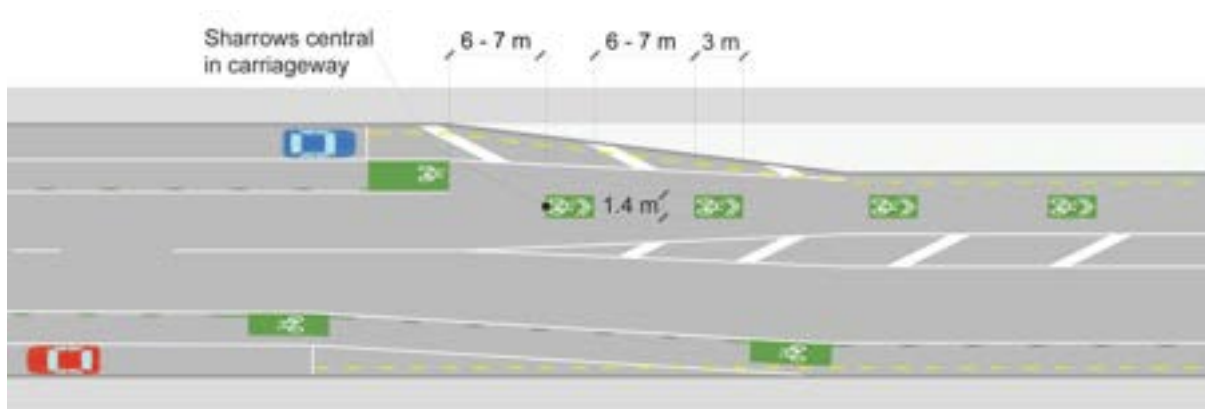


Figure 36-6: Sharrows at transition to mixed traffic

36.4 Visibility

Where a change to mixed traffic is involved, there must be sufficient intervisibility between cyclists and motorists approaching the merge. This may require restriction of parked cars or street furniture etc that could hinder visibility.

FURTHER DESIGN REQUIREMENTS

This section covers the finer nuances of design required to ensure the midblock facilities and intersection provisions are suitable for AAA users and integrate with provisions for other transport users.

PART 37 - CYCLE FACILITIES AT BUS STOPS

37.1 Separated cycleways at bus stops

Where separated cycleways coincide with a bus route, the “[Bus stops with separated cycleways](#)” section of the NZTA Public Transport Design Guide should be followed, in particular the “[Design options for island bus stops](#)” and “[Key components of island bus stop design](#)” sub-sections.

A “full-width island bus stop” is strongly preferred, and use of a “nominal width island” bus stop will require a departure from standards process.

Due to the width requirements of the bus stop, bus island, cycleway, and footpath, it may be preferable or necessary to make the bus stop in-lane. NZTA’s [In-lane bus stop calculator tool](#) should be applied to determine the appropriateness of this, and design should be as per the “[in-lane bus stops \(with bus boarders\)](#)” section of the Public Transport Design Guide. In addition to the PTDG designs, the gap between the edge of the bus stop cage and the lane line should be at least 1.5 m wide if there is likely to be cyclists choosing to ride on the roadway, and should never be more than 2.0 m wide.

37.2 Quiet streets or cycle streets at bus stops

Bus stops along a quiet street or cycle street can be either to the side of the traffic lane or in-lane. NZTA’s [In-lane bus stop calculator tool](#) should be applied to determine which is most appropriate.

Design of an in-lane stop should be as per the “[in-lane bus stops \(with bus boarders\)](#)” section of the Public Transport Design Guide, with one addition:

Where the PTDG specifies 1.5 m minimum between the edge of the bus stop cage and the lane line, a maximum of 2.0 m should also be applied; this range allows on-road cyclists to pass a stopped bus, without the gap being wide enough for motorists to think they can “squeeze” past.

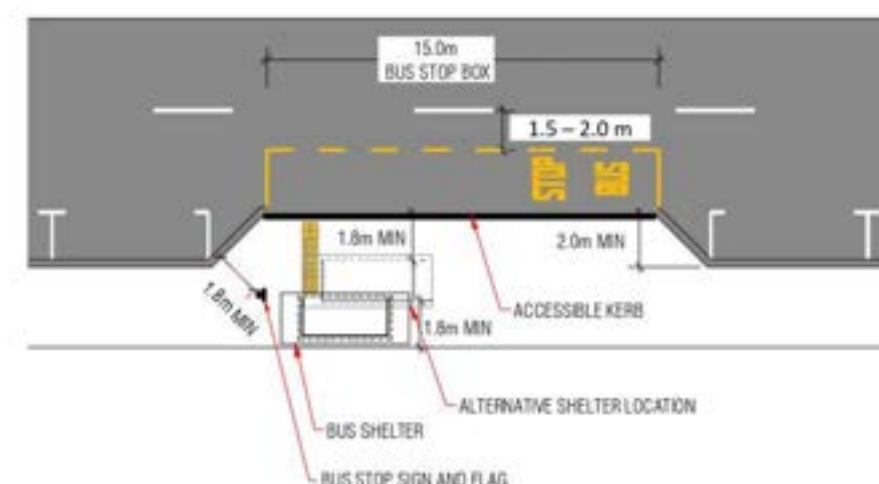


Figure 37-1: Bus boarder on mixed traffic street (modified from Public Transport Design Guide)

Where the bus stop is clear of the general traffic lane, additional sharrows on the approach to and departure from the bus stop should be applied, to ensure bus drivers as well as general motorists are conscious of the possibility of cyclists being present.

37.3 Shared paths at bus stops

Where shared paths coincide with a bus route, the “[Bus stops with shared paths](#)” section of the NZTA Public Transport Design Guide should be followed.

A “shared path with bus boarder” is strongly preferred, and use of a “shared path with shared zone” design will require a departure from standards process.

Due to the width requirements of the bus stop, bus island, and shared path, it may be preferable or necessary to make the bus stop in-lane. NZTA’s [In-lane bus stop calculator tool](#) should be applied to determine the appropriateness of this, and design should be as per the “[in-lane bus stops \(with bus boarders\)](#)” section of the Public Transport Design Guide. In addition to the PTDG designs, the gap between the edge of the bus stop cage and the lane line should be at least 1.5 m wide if there is likely to be cyclists choosing to ride on the roadway, and should never be more than 2.0 m wide.

37.4 Cycle lanes at bus stops

Where a cycle lane coincides with a bus stop, the bus must drive across the cycle lane area to pick up or drop off passengers. In these situations, a cycle lane can be located:

Table 37-1: Options for cycle lane relative to bus stop Cycle lane location relative to bus stop	Requirements to suit AAA
Kerbside (i.e. cycle lane terminates where the bus stop starts, and commences again beyond the bus stop)  <i>Figure 37-2: bus stop coincides with cycle lane</i>	Up to 3 buses per hour. Buses only stop briefly (i.e. excluding stops where large groups of passengers board or alight; note also the Road User Rule precludes this layout at bus timing points). Not appropriate for downhill slopes greater than 2% (bus drivers likely to not see cyclists, or misjudge their speed) Only applicable where road space prohibits preferred option.
Between the bus stop and live traffic lane  <i>Figure 37-3: Bus stop crosses cycle lane</i>	Up to 2 buses per hour. Not appropriate for downhill slopes greater than 2% (bus drivers likely to not see cyclists, or misjudge their speed). Not appropriate in locations with heavy congestion where general traffic may often be travelling slower than cyclists. Only applicable where road space prohibits preferred option.
As a bypass behind an 'island' bus stop – becomes a short section of separated cycleway. Could be in conjunction with an in-lane bus stop.  <i>Figure 37-4: Cycle lane transitions to separated cycleway behind bus island at in-lane bus stop</i>	Most appropriate for AAA. See Separated cycleways at bus stops

In any of the three cases, the cycle lane should be made prominent through use of line markings, cycle symbols and colouring. Apple Green coloured boxes should be applied in the

locations where a bus would need to cross the cycle lane to highlight conflict points. A length of at least 10 m of green paint on the approach is recommended as it accounts for the wheel tracks of the bus and to maintain visibility of the cycle lane given potential wear from bus swept paths. Green paint markings may need to be longer for the egress conflict area.

PART 38 - OTHER KERBSIDE ACTIVITIES

Parking, loading, waste collection, street furniture and planting are kerbside activities / functions that will usually interact with cycle facilities within the road corridor. Another kerbside activity is [bus stops](#), which is covered in its own section.

38.1 Parking

The integration of on-street parking is discussed for each of the various [midblock facility types](#). The aims are to separate cyclists from the door zone and, for cycle lanes and mixed traffic, minimise risk where vehicles moving to or from parking spaces cross cyclists' trajectories.

38.2 Loading

Where a dedicated loading zone is located adjacent to a separated cycleway, shared path, or cycle lane, additional coloured surfacing and symbols can be applied in the cycle facility, to make it clear that cyclists [and pedestrians] have priority over any activity associated with the loading zone.

There should be a buffer at least 1.2 m wide between the cycle facility and where the loading vehicle parks, to allow for transferral of goods between the vehicle and a hand trailer / sack barrow etc. In the case of a separated cycleway, this can be accommodated within the cycleway separator.

Easy passage for loading at a separated cycleway should be provided, either by:

- Raising the cycleway to footpath level;
- Having a gap in the cycleway separator, and a kerb ramp on the opposite side; or
- Using 1:3 bevels on the cycleway separator kerbs, with a kerb ramp on the opposite side.

Where 500 or more cycle movements per day are expected, and a high level of loading activity is expected, it may be necessary to restrict the loading zone to outside of peak hours, to ensure priority for cyclists and avoid crashes.

38.3 Waste collection

38.3.1 Provision for waste bins

It is imperative to consider where residents will place their bins on waste collection days, and how waste collection trucks will access these bins, including where the trucks will drive and where their arms will reach.

Table 38-1: Provision for waste bin placement and collection along biking and micro-mobility facilities

	Waste bin placement relative to cyclists	Applications	Details
Preferred	Cyclists > waste bins > general traffic lane	Separated cycleways: bins on separator, in build-outs created for bins, in parking setbacks at driveways (see 27.4), or in other designated bin spaces on the roadway.  Shared paths: bins in buffer between path and traffic lane, in build-outs created for bins, in parking setbacks at driveways, or in other designated bin spaces on the roadway.  Buffered cycle lanes, no kerbside parking: bins in designated spaces in buffer 	Ensure separator devices / buffers are wide enough for them (or include insets to house them). See the details on separator and buffer widths for waste bins at separated cycleways or shared paths. Ensure vertical elements (e.g. bollards) have wide enough spacings to fit a bin between them. Use pavement markings to indicate where bins should go. Where parking is provided but setback spaces are insufficient for the number of bins, consider adding frequent buildouts, or time-restrictions that prohibit parking when waste collection trucks operate. For buffered cycleways, if bins are to be provided it would be preferable to also include intermittent physical separators within the painted buffer, with bins placed in the gaps. Inform residents about the intended protocol.

Acceptable	Waste bins > cyclists > general traffic lane	Separated cycleways with limited separator widths and no opportunity to put bins. 	Would require the waste truck arm to cross the cycle facility, and therefore require the waste truck to drive along the cycle facility. See criteria below for Waste collection trucks straddling separated cycleways. Incompatible with on-street parking. Inform residents about the intended protocol.
		Buffered cycle lanes next to kerbside parking. 	
		Cycle lanes 	

Absolute minimum	Waste bins on footpath > cyclists > general traffic lane	Any facility type where there is no space to provide bins closer to the road 	Would require the waste truck arm to cross the cycle facility, and therefore require the waste truck to drive along the cycle facility. See criteria for Waste collection trucks straddling separated cycleways. Will severely limit the function of the footpath, especially for a narrow footpath and if bin etiquette is poor. Inform residents about the intended protocol.
Unacceptable	Waste bins on shared path		Too risky as bins will reduce the shared path effective width, especially if etiquette is poor. Absolute-minimum alternative is to reportion a strip of the shared path as a buffer, with a surface that is rideable but distinctly different to that of the main path.

38.3.2 Waste collection trucks straddling separated cycleways

It is NOT acceptable for waste collection trucks to straddle a separated cycleway where any of the following apply:

- The cycleway is 2-way or contraflow;
- There will be large groups of bins (e.g. outside a multi-unit housing development).

If waste collection trucks are to straddle the cycleway separator, there can be no vertical elements (signs, trees etc) on the separator.

38.4 Street furniture

Street furniture includes things like benches, café seating, waste bins, and cycle parking stands. It is often located on the footpath but should be considered as a separate zone to the pedestrian through route. Street furniture zone can be used to separate a cycleway from the footpath. The PNG provides further guidance on [street furniture](#).

38.5 Planting / vegetation

Street planting is critical to achieving a successful, healthy street. Planting can be used to separate a cycleway from the roadway or footpath, or may be alongside a path separated from the road corridor. The cross-section elements for [separated cycleways](#) and [shared paths](#)

include options for street trees, smaller planting areas could also be incorporated into narrower separators. Further detail relating to street planting is in [Regional Infrastructure Technical Specifications \(RITS\)](#).

Vegetation / planting adjacent to a cycle facility must be offset so that, when it grows, it will not create an additional clearance requirement (as per the width requirements in the various facility types in the [midblock design fundamentals](#) section).

Designers should be mindful when evaluating the [sight distance requirements](#), that high planting can restrict sightlines at intersections and around bends.

Maintenance programmes must allow for regular trimming of vegetation adjacent so that it does not encroach further than intended.

PART 39 - ADDITIONAL DESIGN DETAILS

39.1 Key surface elements

39.1.1 Surface

The provision of good riding surfaces is critical for safe and comfortable cycling. Cycle lanes and paths must have permanent, all-weather surfaces, with a smooth transition between adjacent surfaces where people on bikes may need to move sideways off the facility.

Asphalt surfacing is the approved surface for cycleways and off-road paths. It provides a smooth ride with lower friction drag, but good slip resistance.

Grade 6 chip seal, or a cape seal slurry is acceptable on cycleways or cycle paths. Where chip seal of grade 5 or lower is used on a street that is to become a quiet street or cycle street, the whole road surface should be upgraded to asphalt.

Concrete may be used on shared paths, cycleways and cycle paths. The design needs to ensure the concrete finish is sufficiently different in colour from any footpath, and have a smooth, skid resistant surface with 90-degree edge saw cut joints.

Timber surfaces for cycle paths should be avoided. They can be dangerously slippery when wet and make corners particularly difficult for people on bikes and runners.

Skid resistant surface coatings can be applied to various substrates to make them suitable for bicycle use, but a departure from standard is required to approve the chosen coating.

39.1.2 Utility covers

It is preferable that utility covers are not located within cycle facilities. When this is unavoidable, they should not be located where they risk destabilising people on bikes, especially in wet weather, e.g. on curves or braking points.

Covers that are located within a cycle facility should have a surface finish with high slip resistance. For metal covers, an applied surface coating is preferred. This is subject to agreement by the utility operators, who own the covers. Covers should be 0-5 mm above the surrounding surface to avoid trapping surface water.

39.1.3 Approved colours

The colour of cycleway is important for several reasons:

- To provide a clear contrast with pedestrian areas
- To differentiate it from a general traffic lane
- To contribute positively to the public realm
- To provide a consistent experience for people on bikes

Currently there is limited availability of coloured asphalt in the NZ market and use of standard black asphalt is supported while products are tested and approved.

If a light-coloured surface is used, white paint markings (e.g. for user symbols, line markings and messaging) will not contrast sufficiently, in which case it may be necessary to apply a background colour underneath the marking or, for non-regulatory markings, change the marking colour.

39.2 Drainage

Stormwater design must be in accordance with [RITS](#). In addition:

39.2.1 Catchpits and grates

Catchpits and grates within cycleways or cycle paths must be flush with the facility surface and of cycle-friendly design, i.e. standard grate with slots oriented perpendicular to the line of travel (as per RITS drawing D4.8) or an alternative slot configuration that minimises the risk of a bike wheel getting caught in the grate.

39.2.2 Drainage gaps in separators

Where water drains across a separator, drainage gaps (typically 500 mm) will be required in the separator at regular intervals.

39.3 Signs and markings

39.3.1 Overview

Some signs and markings are traffic control devices (TCDs) and subject to the specifications in the [Traffic Control Device Rule](#). Others, e.g. coloured surfacing, are used to enhance TCDs and others can help guide users in their behaviour and route choice.

To designate the use of a facility, markings are usually adequate. Signs are usually only required where it is physically possible for a driver to enter a cycle path or shared path. The NZTA best practice guidance note on [signs and markings to designate paths for pedestrians and cyclists](#) includes further guidance.

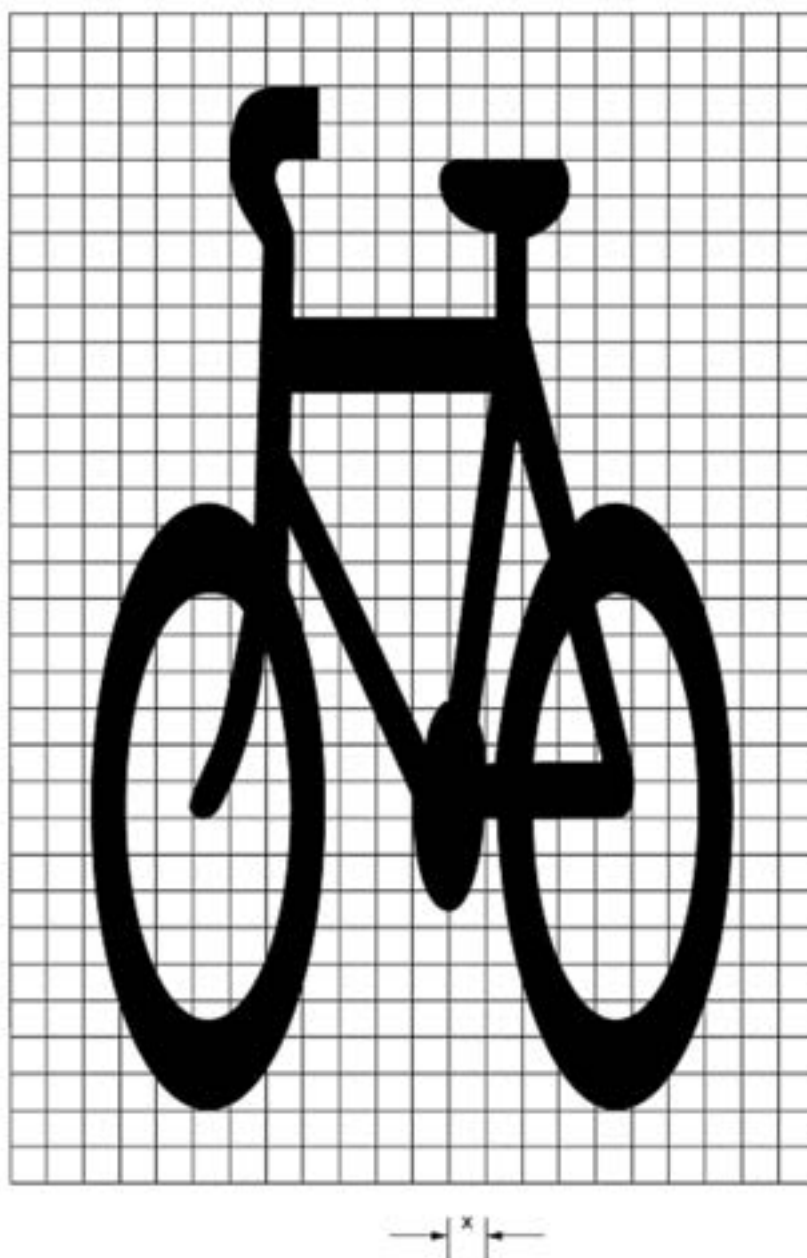
39.3.2 Cycle symbols

Cycle symbol templates

Cycle symbols should be marked in accordance with the table below.

Table 39-1: Cycle symbol applications and specifications

	Cycle lane	Separated cycleway	Shared cycle and pedestrian pathways
Image and scale	Standard (Figure 39-1) X = 60 mm	Standard (Figure 39-1) X = 40 mm	Alternative (round-wheel cycle symbol) (Figure 39-2) X = 20 mm
Cycle symbol width x height (mm)	1080 x 1680	720 x 1120	360 x 198

*Figure 39-1: Standard cycle symbol template (source: TCD Rule M2-3)*

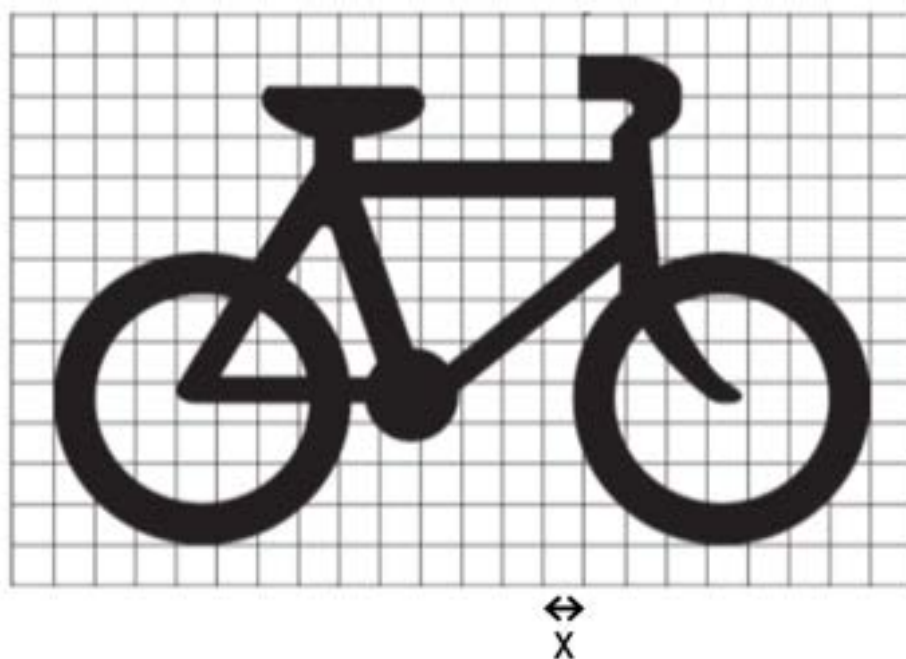


Figure 39-2: Alternative cycle symbol template – for shared paths (source: TCD Rule M2-3E)

Cycle symbol positioning

For cycle lanes (including buffered cycle lanes) adjacent to parking, the cycle symbol and green background road surface should be placed in the two-thirds of the cycle lane furthest from the parked cars (see Figure 39-3). This will encourage cyclists to avoid the hazard posed by car doors being opened.

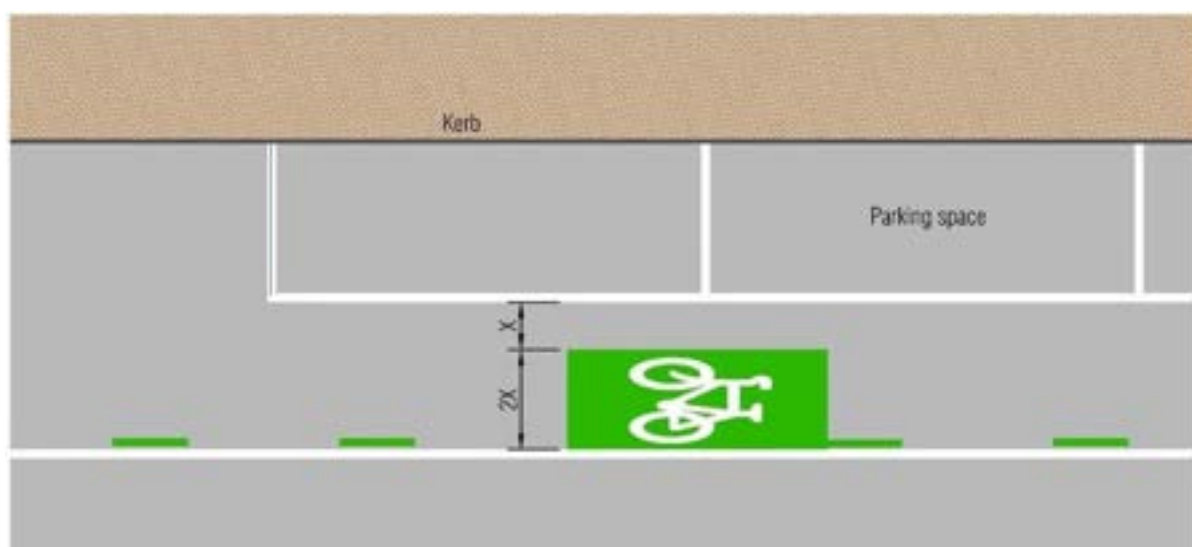


Figure 39-3: Cycle symbol placement in cycle lane next to parking (adapted from TCD manual)

39.3.3 Sharrows

Sharrows should be marked in accordance with the figure below.

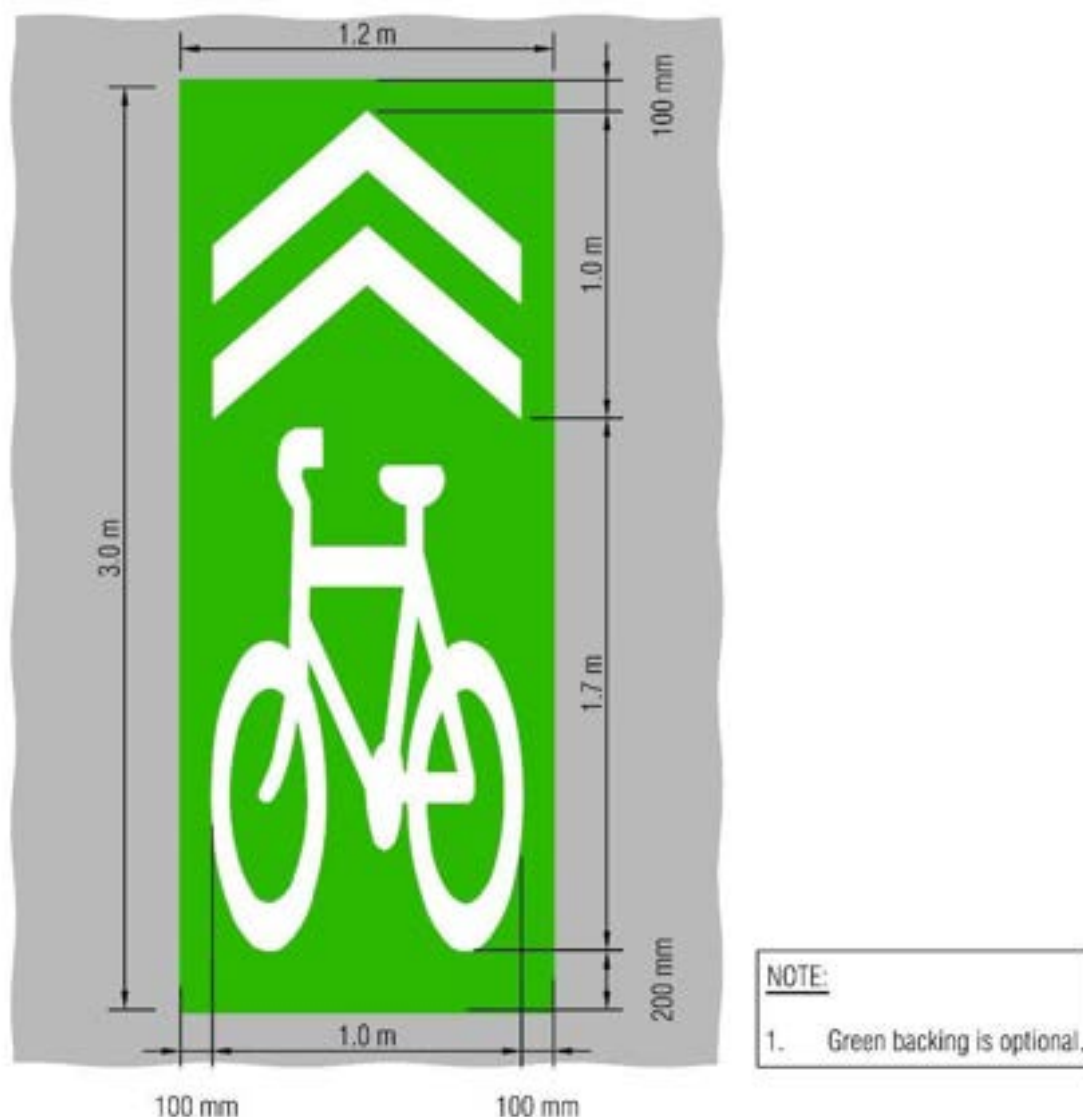


Figure 39-4: Sharrow template (source: TCD Rule M2-3B)

The [Sharrows Best Practice Guidance Note](#) outlines how sharrows should be applied.

39.3.4 Pedestrian symbol

A pedestrian symbol (M2-4 from the TCD Rule) plus a [cycle symbol](#) is used to designate a shared path.

39.3.5 Arrows and line markings

Other markings that may be required for cycle facilities include:

Table 39-2: line and arrow markings for cycle facilities

Marking	Specifications	Applications
Directional arrows	In accordance with the proportions in the TCD Rule for general traffic (M7-1) but scaled to suit cycle facility (30% is usually a suitable scale).	Separating two-way facilities by travel direction. Designating contra-flow facilities. Designating cycling direction at intersections where different cycling movements from the same approach are operated individually.
Cycle lane edge lines (left side of the cycle lane)	As per TCD Manual part 5 > cycling facilities > general .	Left side of cycle lanes. Left side of a separated cycleway if there is an uncyclable space e.g. dish channel.
Cycle lane / cycleway lines (right side of the cycle lane)	As per TCD Manual part 5 > cycling facilities > general .	Right side of cycle lanes. Traffic lane side of a separated cycleway.
Cycle lane / buffered cycle lane line enhancement	In addition to the standard lane line (above) a 100 mm green dashed line should be marked on the inside of the lane line (offset 0 – 100 mm) as per Figure 39-5.	Right side of all marked on-road cycle facilities that do not have physical separation from motor traffic – i.e. cycle lanes and buffered cycle lanes.
No-stopping lines	As per TCD Manual Part 13 Section 6.2.	For consistency, all kerbside cycle lanes in Hamilton must have no-stopping lines. It may also be appropriate to mark no-stopping lines to the right of separated cycleways.
Cycleway centre lines	Reflectorised white broken (1 m stripe, 2 m gap) or continuous line, 100 mm wide.	Separating two-way facilities by travel direction. Around bends where extra reminders to keep left are necessary.

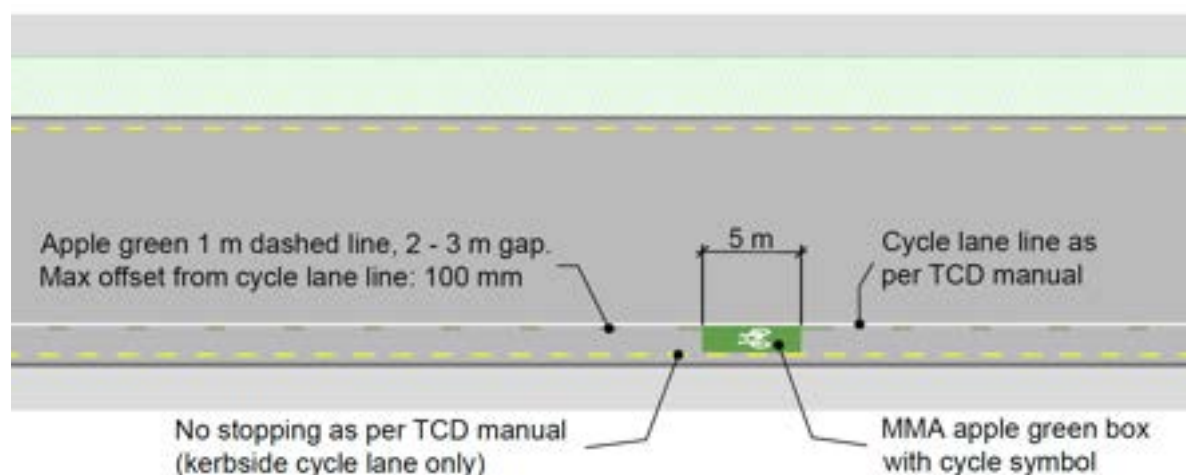


Figure 39-5: Cycle lane markings

39.3.6 Behavioural markings

Behavioural markings are most commonly used on shared paths to positively influence users' conduct. Messages can include give space, keep left, no passing, slow, keep dogs close, and move to side when stopped; these are detailed in NZTA's [path behaviour markings guidance note](#).

39.3.7 Coloured surfacing

The green surfacing used in cycle lanes in Hamilton is A/NZS 2633 G26 "Apple green". This is used in locations to:

- indicate that the facility is provided for cyclists and micro-mobility users, and that motor vehicles either shouldn't be there (e.g. cyclist waiting facilities at signalised intersections) or, if motorists need to cross the cycle facility (e.g. at driveways or side streets) they must check for and give way to cyclists.
- emphasise route continuity for cyclists and micro-mobility users, e.g. make it clear which direction they're heading towards when crossing an intersection or where the route transitions to a different location / facility type.
- enhance a painted marking e.g. a [cycle symbol](#) (use a 5.0 m long box) or a [sharrow](#) (a 3.0 m long box as per Figure 39-4).

Red surfacing should be applied at [bus stop](#) bypasses, in accordance with NZTA's [Public Transport Design Guidance](#).

Further guidance on coloured surfacing is given in NZTA's [coloured surfacing principles best practice guidance note](#).

39.3.8 Traffic control device signs

The use of pole-mounted signage should be minimised and optional signs should not be used unless there is good cause to do so. It is critical, however, that appropriate markings are applied and the facility design and surrounding environment communicates the intended facility designation.

Signs should be in accordance with the TCD Manual, particularly [TCD manual part 5 > cycling facilities > general > cycle signs](#).

39.3.9 Wayfinding

Having route and destination ('wayfinding') signage is important in promoting facilities and making them user-friendly. Comprehensive directional signs assist people on bikes and micro-mobility devices to easily navigate to their trip destinations, builds user confidence in the system, increases personal safety, and improves information and access to community facilities.

Hamilton City Council's wayfinding guidance is due to be published. In the mean time, the [NZTA cycle wayfinding design guidance note](#) details how to develop wayfinding for cycle networks.

39.4 Lighting

The [Regional Infrastructure Technical Specifications](#) (RITS) contains standard specifications for lighting hardware. For now, Hamilton uses the [Auckland Transport Street Lighting Design Code](#) for street lighting design.

The section on [lighting](#) from NZTA's cycling network guidance provides additional guidance on lighting biking and micro-mobility facilities.

39.5 Access control devices (bollards, barriers etc)

Access control devices such as bollards, staggered barriers and gates should only be used where unauthorised vehicles must be physically excluded and no other method of control is practicable. They must allow for the convenient passage of all [AAA users](#) including mobility scooters, motorised wheelchairs, large baby buggies and the [design cycle](#). Access control devices should not be used as a tool to slow down AAA users; where necessary, speed management should be achieved through [driveway treatments](#).

The NZTA Guidance Note on [Access Control Devices on Paths](#) should be used to design the location of access control devices and the markings that delineate them.

39.6 Maintenance considerations

Designers must consider:

- Catchpit cleaner access / parking where catchpits are located within a separated cycleway
- Access for gardening services to maintain planting on or behind a cycleway separator
- Health and safety of maintenance operators if required to move between their vehicle and the maintenance site
- How BaMM facility design might impact the operational costs of temporary traffic management

PART 40 - BAMB PARKING AND END-OF-TRIP FACILITIES

As Hamilton expands its biking and micro-mobility network, more people are choosing these modes for transport. Private and commercial design and development must reflect the changing transport patterns and demand for cycle parking that results from this investment.

Adequate parking for bikes and micro-mobility devices should be available at all destinations. Designers should consider providing additional end-of-trip facilities at major destinations such as:

- Schools
- Sports facilities

- Playgrounds
- Shopping centres
- Public Transport stations

Further guidance on planning, designing and maintaining bike parking, scooter parking and other end-of-trip facilities is found in [Cycle parking planning and design guide version 3 \(NZTA, 2022\)](#) and [Bicycle Parking Facilities: Guidelines for Design and Installation \(Austroads 2016\)](#).

The key dimensions for cycle parking envelopes are shown in Figure 40-1.



Figure 40-1: typical cycle parking envelope, cargo bike parking envelope, and dimensions for stands.

Key features of a bike parking layout include:

- 0.2 m spacing between parking **envelopes** for parallel stands
- 1.5 m minimum **aisle width** between envelopes for manoeuvring cycles to/from parking
- 0.4 m desirable clearance between parking envelope and walls or other vertical features.

Furthermore:

- Wherever bike parking is provided, at least one space should be able to accommodate the cargo bike parking envelope
- Hanging racks or vertical stands requiring lifting of the bicycle shall not exceed 50% of spaces.

[Cycle parking planning and design guide version 3 \(NZTA, 2022\)](#) gives an example bike parking layout that includes a range of stand types, orientations and locations with respect to parking, footpaths, street furniture and buildings etc.

PART 41 - INTEGRATION WITH PUBLIC TRANSPORT

Biking and micro-mobility can be used in conjunction with public transport trips. Designers should consult the [Auckland Transport Public Transport interchange guidance](#) and the Hamilton Public Transport Design Guidance (release pending).

GLOSSARY

PART 42 - TERMS AND PHRASES

Term	Definition
Accessible Streets Package	A proposed regulatory package that would make changes to the Land Transport Rule to update how vehicles (particularly cycles and micro-mobility devices) are categories and improve the safety of all road users. Issued for consultation in 2020, as a Road to Zero action, the Accessible Streets Package has not yet been approved, and efforts do so appear to have stalled. The consultation document, Accessible Streets – Overview to the Rules, explains the various proposals included in the package.
Adjacent side road crossing	Where a cycleway on a main road crosses a side road directly adjacent to the general traffic lane.
All Ages and Abilities (AAA)	A biking and micro-mobility target audience encompassing people with a wide range of cognitive and physical abilities who should reasonably be able to ride a bike or use a micro-mobility device if suitable provision is made. The types of AAA users, and the devices they use are covered in the section 6.1 All Ages and Abilities (AAA).
Bike (bicycle)	Technically a bicycle is a cycle with two wheels, but the term ‘bike’ is commonly used to refer to any cycle , regardless of its number of wheels. See Cycle .
Buffered cycle lane	A cycle lane that has a painted horizontal buffer separating it from adjacent on-street parking and / or traffic lane. See Part 24 - Buffered cycle lanes.
Bus lane	A special vehicle lane reserved for the use of buses, cycles, mopeds, and motorcycles (but not micro-mobility devices). If a bus lane is specified as ‘bus only’ it may not be used by other modes. Road controlling authorities may also choose to specify the inclusion of additional user classes, e.g. taxis. See Part 25 - Bus-cycle lanes.
Cargo bike	A cycle that is specifically designed to carry larger and heavier loads than a regular bicycle, generally with an in-built container. Sometimes these may involve electric motors (see e-bikes) or more than two wheels.
Carriageway	Typically understood as the road surface between kerbs, but has no legal definition. Commonly used interchangeably with “ roadway ” but could also include any separated cycleways built at roadway level.
Contra-flow cycling	Cycling is provided in the direction opposite to that of the adjacent general traffic. Opposite of with-flow cycling . Note that two-way cycleways involve contra-flow cycling, as do one-way contra-flow facilities.
Cross-section	The configuration across the road reserve, i.e. the layout and dimensions of elements such as lanes, paths, buffers, separators, parking spaces etc.
Cycle	A vehicle with two or more wheels and pedals, including pedal cycles (propelled solely by the muscular effort of the rider) and power-assisted pedal cycles (‘e-bikes’, includes a motor with no more than 300 watts total auxiliary power). This includes bicycles, tricycles and cargo bikes. Commonly referred to as a ‘bike’.
Cycle facility	Infrastructure specifically provides for cycling, such as separated cycleways , cycle lanes , shared paths , provisions with grade separation , and end of trip facilities .

	Micro-mobility devices are currently excluded from cycle lanes , but can use the other cycle facilities.
Cycle lane	A special vehicle lane marked on a road with a cycle symbol, which can only be used for cycling. Note that infrastructure commonly referred to as 'cycle lanes' that are not on the roadway are mostly shared paths and separated cycleways . See Part 23 - Cycle lanes.
Cycle provision	The provision of satisfactory conditions for the intended cycling target audience, whether or not there are specific cycle facilities . This may include quiet streets . Micro-mobility users are often assumed to be included in this provision (although they are not legally permitted to use cycle lanes).
Cycleway	A broad category which may be used to refer to all facilities provided for cycling. However, it is best to use more specific terminology, e.g. to distinguish separated cycleways from other cycling facilities such as cycle lanes .
Cycling network guidance [CNG]	An online framework developed by the NZ Transport Agency which compiles guidance relating to all stages of planning and design for cycling for use by transport practitioners.
Cyclist	A person who rides a cycle. While strictly an accurate description of anyone cycling, it can have negative connotations, and many people who ride do not identify themselves as 'cyclists'. Therefore, careful use is needed in public documents.
Desire line	A person's ideal trajectory between the origin and destination for a potential cycle trip , or part of a trip.
E-bike	Electric bicycle. A cycle to which is attached one or more auxiliary electric propulsion motors that have a combined maximum power output not exceeding 300W. Officially known as a "power-assisted" cycle.
End-of-trip facility	Provisions such as bike racks, gear lockers, showers, and changing rooms that are used by biking and micro-mobility users at the end of their travel, improving the comfort and convenience of these trips. See Part 40 - BaMM parking and end-of-trip facilities.
E-scooter	An electric scooter, a common type of micro-mobility device. Often available to be hired by members of the public and used for short trips, generally as a replacement for walking, biking or public transport.
Filter turn	Turning traffic gives way to traffic travelling straight ahead but can turn when there is a gap in the stream of traffic travelling straight ahead. This relies on users giving way and therefore has some potential for conflict but improves intersection efficiency which can result in overall safety gains. This can be an option at signalised intersections as an alternative to full protection . See section 32.2 Filter left turns with cycle head starts.
Full protection	A movement at a signalised intersection operates without any conflicting movements in the same phase. This is contrary to filter turning . See section 32.1 Fully protected phasing.
General traffic lane	A traffic lane available to all vehicular traffic, i.e. including both motor vehicles and cycles, without any special restrictions or provisions.
Grade separation	A facility that separates people walking, riding bikes or using micro-mobility devices from motor traffic on a vertical level. For example, a bridge or underpass across a roadway or railway line. This contrasts with an at-grade intersection or level crossing.

Hook turn	A right turn a cyclist makes at traffic signals, where they keep left while proceeding most of the way through the intersection then wait at the far-left side for the lights to turn green, then cross at the same time as the side road traffic. Sometimes a marked facility is provided to assist this.
Level of service (LOS)	A measure of how well conditions provide for transport users, based mainly on interruptions to free traffic flow. Quality of Service (QoS) may be a more suitable measure when considering biking and micro-mobility users.
Main road	The road at an intersection on which traffic has precedence over side road traffic. (Elsewhere can also be referred to as “major road”, although this is less accurate as it could refer to the road’s position in the road hierarchy, rather than at the specific intersection).
Micro-mobility	Personal travel devices that can carry one or two riders. They generally travel at low speeds (<45 km/h) and are either human-powered or run on low-power batteries (<2 kW). Examples include scooters, skateboards, self-balancing uni-wheels, mobility scooters. This category includes, but is not limited to, devices currently categorised as ‘wheeled recreational devices’ .
Midblock	The portion of road between intersections.
Mixed traffic	The combination of cyclists and micro-mobility users with motor vehicles, generally in a general traffic lane on the roadway .
Offset side road crossing	Where a cycleway on a main road crosses a side road set back (at least 6 m) from the adjacent general traffic lane. See section 31.3 Offset side road crossing.
One Network Framework (ONF)	The One Network Framework is our national classification system. It will be used to determine the function of our roads and streets, and inform decision making. The new One Network Framework acknowledges the transport network has a ‘Place’ function. This means roads and streets are destinations for people, as well as transport corridors. The new framework also introduces classifications for different modes of transport, recognising that our roads and streets have different functions for different modes.
Pedestrian	A pedestrian is defined in the Land Transport (Road User) Rule 2004 as ‘a person on foot on a road; and includes a person in or on a contrivance equipped with wheels or revolving runners that is not a vehicle’. This can include a person walking or running, a person pushing a pram, a person in a wheelchair and a number of other users. Users of micro-mobility devices such as skateboards, skates and scooters are not pedestrians as defined by law but are generally permitted on the pedestrian network.
Quality of Service (QoS)	An alternative to Level of Service (LoS) that gauges how well conditions provide for transport users in terms of factors such as perceived safety, comfort, and directness of route, as well as delay.
Quick-build	Cycle facilities that have intended lifetimes ranging from 1 month to 15 years and require minimal road reconstruction (such as drainage) to implement.
Quiet street	Mixed traffic streets with low volumes of motor traffic travelling at low speeds where no specific cycle facility is required. This will generally imply the use of lower speed limits, supported by physical measures to ensure low traffic speeds and volumes, as well as guiding drivers and people on bikes to share the same road space. May also be known as ‘neighbourhood greenways’, ‘slow streets’ and ‘bicycle boulevards’.

	See Part 20 - Quiet streets (mixed traffic).
Road reserve	The area legally designated for transport, between adjacent property boundaries, thus including not only the roadway , but also separated cycleways , footpaths, berms and possibly shared paths situated adjacent to the roadway .
Roadway	The portion of the road reserve used or reasonably usable for the time being for vehicular traffic in general (definition from the Land Transport (Road User) Rule 2004). Within an urban area, this is generally the sealed area between kerbs that can be driven on. See also carriageway .
Separated cycleway	A facility exclusively for cyclists and micro-mobility users, which excludes pedestrians and involves some form of physical separation from motor traffic and is generally situated on or adjacent to the roadway, usually within the road reserve. The separation used may involve horizontal and/or vertical components. See Part 19 - Separated cycleways.
Separator	Also known as 'cycleway separator' – a physical device used to delineate a separated cycleway and prevent /discourage motorists from entering it.
Shared path	A path provided for use by both cyclists and pedestrians, with motor vehicles being legally excluded. See Part 21 - Shared paths.
Shared zone	A mixed traffic environment where the road corridor is not separated into specific lanes, rather the space is shared by pedestrians, drivers, and people on bikes. The concept relies on a particular urban design approach as well as lower speed limits.
Sharrow	A traffic control device marking in the form of a cycle symbol with two chevrons above it, used to indicate a shared traffic lane environment for both cyclists and motorists. A sharrow is different to a standard cycle symbol as the former is applied in a general (i.e. mixed) traffic lane, whereas the latter denotes a special vehicle lane for cyclists.
Side road	The road at an intersection on which traffic is required to give way to main road traffic. Elsewhere may also be referred to as "minor road".
Stepped cycleway	A type of separated cycleway located part-way between the footpath and roadway levels. Elsewhere known as a 'Copenhagen' cycleway, due to its popularity in Denmark.
Target audience	The subset of people for which a particular BaMM facility, route or network is intended. There are different ways of defining these groups, including with respect to risk tolerance, willingness to cycle or cycling skill level. For this Code of Practice, the target audience is " All Ages and Abilities " (AAA)".
Traffic calming	A combination of measures (mostly changes to the road environment) aimed at altering driver behaviour (such as by reducing speed or discouraging 'rat-running') and improving conditions for pedestrians, cyclists and residents.
Trail	A typically unsealed, off-road path; usually shared by cyclists and pedestrians.
Transit lane	A lane that can only be used by public passenger vehicles, motor cycles, cycles and motor vehicles carrying a specified minimum number of passengers.
Trip	A transport journey that starts at an origin and ends at a destination and can have a variety of purposes generally aimed at either utility or recreation.
Turning circle	The radius of the area covered by a vehicle when making a turn.
Waste bin	Bins or crates for food scraps, recycling and rubbish collected from the kerbside on a weekly rotation by waste collection trucks.

	See section 38.3 Waste collection.
Wheeled recreational device	A vehicle that is a wheeled conveyance (other than a cycle that has a wheel diameter exceeding 355 mm) and that is propelled by human power or gravity; and includes a conveyance to which are attached one or more auxiliary propulsion motors that have a combined maximum power output not exceeding 300 W.
With-flow cycling	Cycling is provided in the same direction as the adjacent general traffic. Opposite of contra-flow cycling

PART 43 - ABBREVIATIONS AND ACRONYMS

BaMM: Biking and Micro-Mobility

CAS: Crash Analysis System.

CNG: Cycling Network Guidance.

HCC: Hamilton City Council

LOS: level of service (see [glossary](#)).

LTP: long-term plan (formerly known as LTCCP – long-term council community plan).

MoT: Ministry of Transport.

NZTA: New Zealand Transport Agency Waka Kotahi

ONF: One Network Framework

PNG: Pedestrian Network Guidance

PTDG: Public Transport Design Guidance

QOS: quality of service (see glossary)

RCA: road controlling authority.

TCD: traffic control device.

APPENDIX A - DESIGN CONTROL FORMULAE

A.1 Stopping sight distance (SSD) and forward sight distance (FSD)

The main calculation to achieve safe visibility is stopping sight distance – the distance travelled while the user perceives the hazard and then applies their brakes to come to a stop before colliding with the hazard. Stopping sight distance is calculated by:

$$S = \frac{V^2}{254 \times \left(f + \frac{G}{100}\right)} + \frac{R_T \times V}{3.6}$$

Where:

S = stopping sight distance (m)

V = design speed (km/h) – for cyclists, use the worst case from the speed envelope (see [design speed](#))

f = coefficient of friction – typically 0.16 for a bicycle in wet conditions

G = percent gradient of path (positive for uphill, negative for downhill)

R_T = reaction time (s) – typically 2.5 s for cyclists

If the user only has to slow down to negotiate a hazard, the following chart can be used to determine the forward sight distance required to identify the hazard and adjust their speed to the required hazard negotiation speed. This is based on the [design speed for a given gradient](#). Note that using the hazard negotiation speed = 0 km/h gives the stopping sight distance.

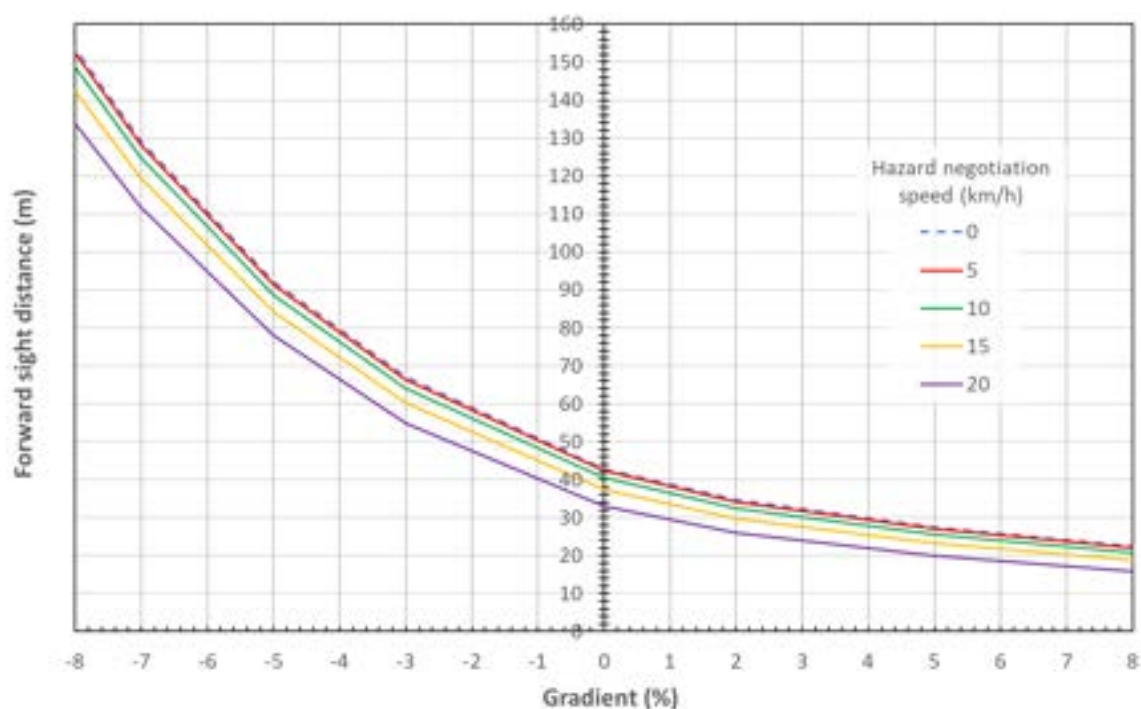


Figure 0-1: Forward sight distance required to slow or stop for a hazard

A.1 Crossing sight distance

The following equations can be used to calculate the crossing sight distance required for a cyclist starting from stationary.

$$\begin{aligned} \text{For } D_x \leq \frac{V_{c15}^2}{2a_c} - L_b: \quad CSD &= \sqrt{\frac{2(D_x + L_b)}{a_c}} \times \frac{V_{mv85}}{3.6} \\ \text{For } D_x > \frac{V_{c15}^2}{2a_c} - L_b: \quad CSD &= \left(\frac{V_{c15}}{2a_c} + \frac{D_x + L_b}{V_{c15}} \right) \times \frac{V_{mv85}}{3.6} \end{aligned}$$

Where:

D_x = crossing distance, measured from kerb to kerb, or kerb to a central refuge island if provided.

V_{c15} = 15th percentile speed of cyclists for given gradient – see [design speed](#)

a_c = acceleration of cyclist (use 0.5 m/s² for up to 3% uphill gradient and 0.4 m/s² for greater than 3% gradient)

L_b = design length of bike (see [cyclist dimensions](#))

CSD = crossing sight distance required for a cyclist

V_{mv85} = 85th percentile speed of motor vehicles

FURTHER INFORMATION

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