Barriers and fences on cycling routes

Design Guidance Note

Waka Kotahi NZ Transport Agency

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WAKA KOTAHI NZ TRANSPORT AGENCY

New Zealand Government

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More information

Waka Kotahi NZ Transport Agency
May 2024

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This document is available on Waka Kotahi NZ Transport Agency's website at www.nzta.govt.nz

Feedback

This is draft guidance, and we welcome your feedback at cycledesign@nzta.govt.nz

Barriers and fences

This Note provides guidance for barriers (to prevent falls) and fences on cycle facilities including on bridges and other structures.

Barriers and fences are necessary safety features of many cycle routes and may provide an opportunity for cultural and artistic expression.

However, they can act as a hazard in their own right or impact negatively on landscape values, so should only be used when necessary, such as on bridges and structures with a fall of greater than one metre.

Barriers and fences must be sufficiently high to minimise the probability of a person falling over them and may need to be constructed to prevent a person falling through or climbing over them. They should be free of elements that would snag people cycling and other wheeled users, including people using wheelchairs, mobility scooters and scooters. They should provide for people of all ages, sizes and abilities.

Urban design is a key aspect of barrier and fence design. Refer to Waka Kotahi Urban Design Guidelines or seek advice from an urban design specialist.

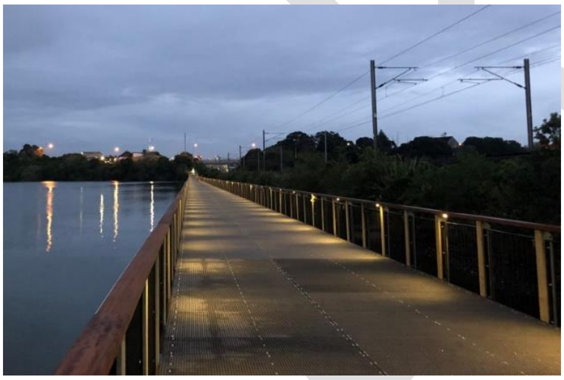
Barriers on bridges and structures

Guidance for pedestrian and cyclist barriers on structures is provided in the Waka Kotahi NZ Transport Agency Bridge Manual Appendix B. The Bridge Manual sets out the following requirements for the height of barriers on structures for people cycling:

- Where the risk of angled collision resulting in a cyclist vaulting over the barrier is considered low, the minimum height to the top edge of the top rail for a cyclist barrier shall be 1200mm.
- Where the risk of angled collision or launch is high, the minimum height for a cyclist barrier shall be 1400mm. This would typically be at tight bends or junctions (Radius less than 25 metres) or where cyclists travel at high velocities (greater than 40 km/h).

Angled collision is considered to be an approach angle greater than 25°.

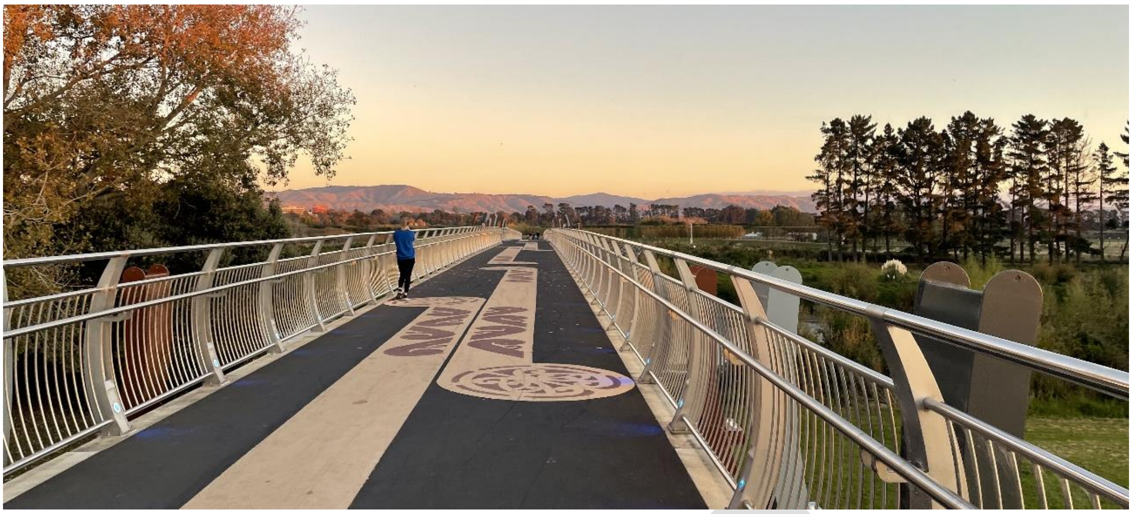
Where people could fall 1 metre or more from structures, the New Zealand Building Code *Clause F4 – Safety from Falling* requires a barrier to be provided.



1200mm fence where risk of angled collision is low. Orakei Basin Boardwalk, Auckland

1400mm fence on a steep downhill gradient with curves. Wainuiomata Hill Shared Path (photo: James Wratt)

Where a structure is at a significant height, and the fall appears frightening, it may be preferable to have higher barriers to increase perceived safety for people walking and cycling, though the actual risk of a cyclist vaulting is no higher.



A taller fence may improve perceived safety for people cycling and walking. Manawatū River bridge, He Ara Kotahi (photo: James Wratt)

Some cycle routes utilise heritage bridges where meeting the minimum height requirement may have heritage implications. Where appropriate, a departure from the minimum height requirement may be considered by Waka Kotahi.

Some cycle routes utilise waterfront areas, where a barrier may be considered undesirable from an aesthetic point of view. In these situations, mitigation measures include a low wall/barrier to prevent prams and wheelchairs from rolling of the edge of the path, clear delineation of the edge of the path, ample path width to allow users to stay well clear of the edge, and supporting treatments such as lighting and street furniture.

The following section also applies to barriers on structures.

Fencing and edging treatments for paths

Comprehensive and detailed guidance on fencing and barrier treatments for cycle facilities has been produced by the Queensland Government Department of Transport and Main Roads in its fencing and edging treatment guideline.

Barriers and fences are used after preventative measures such as eliminating, relocating, or reducing risks from hazards have been considered. Fences close to the path edge can also be hazardous to people cycling. Fencing treatments must pose less risk than the hazard being treated.

The Queensland guidance describes ten separation and fencing treatments for cycle facilities:

Non-fencing treatments:

- Delineation
- Rideable clear zones
- Planting and landscaping
- Inclined edge treatments and edge treatments

Fencing treatments:

- Low walls
- Partial barrier fence
- Full barrier fence
- Full barrier fence with anti-throw screen

Fencing treatments associated with vehicle barriers:

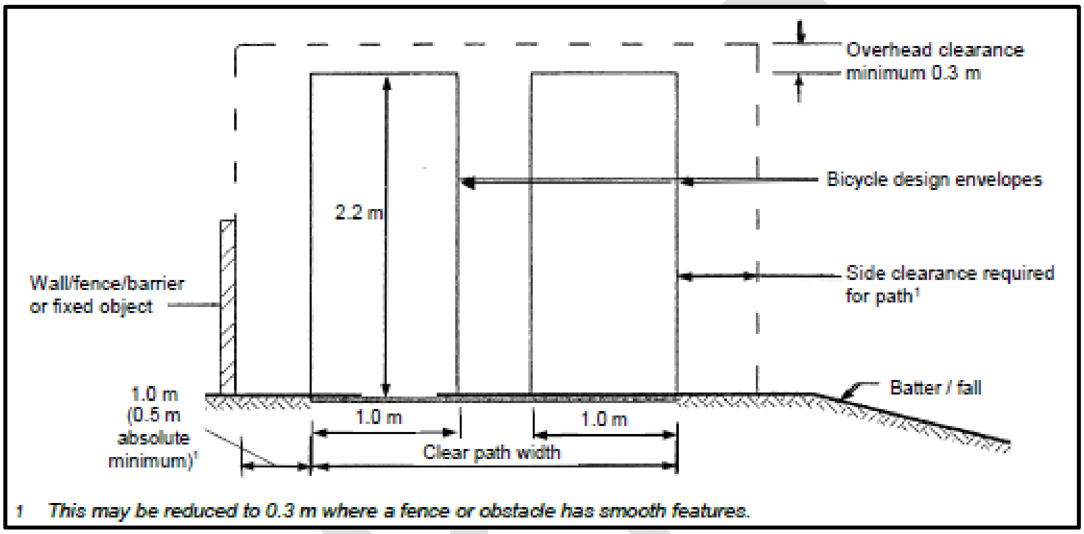
- Road safety barriers: smooth profile continuous
- Road safety barriers: steel beam guardrail

Austroads Guide to Road Design Part 6A: Paths for Walking and Cycling, section 5.5.3 provides guidance on selection of full or partial barrier fences in relation to the severity of the hazard being protected and the closeness of the fence to the path.

Some specific design considerations are discussed in the following subsections:

Path effective width

Where practical, provide a traversable shy space between the edge of the path and any fencing treatment. The preferred separation of any obstacle is 1 metre. Fences that are at least 1 metre from the path, pose a negligible snag risk. If a fence is installed within 0.5 metres of the path, it reduces the effective width of the path and can increase the risk of collisions between users. In constrained situations, a continuous smooth design, free of snag risk removes the need for protection rails, providing more effective width.



Clearances between cyclist envelope and potential path hazards (Austroads Guide to Road Design Part 6A). Note clear path width is equivalent to effective width.

Snag Risk

Vertical elements including posts, handrail supports, joins, apertures larger than 25 mm and high kerbs can catch wheels, pedals, handlebars and body parts. Where barriers cannot be set back from the path, designers should eliminate or mitigate these snag risks.

Welded mesh can be used to prevent wheels from being trapped or catching in vertical elements. In order to prevent handlebars from being snagged, and aperture size of 25 mm or less is necessary. An alternative to mesh is perforated panel.

Where the snag risk cannot be eliminated, deflection rails, hand rails, and kerbs can provide protection, against snagging elements. However, it is difficult for rails to be effective for all user types and sizes. These elements can also reduce the path effective width.

Deflection rails are designed to deflect the arms of adult riders of standard bicycles so that handlebars (typically 0.8 m to 1.0 m from surface level) do not get caught in the vertical components or holes in the fence. Deflection rails provide for adult riders if mounted 1.2 metres above path level, but this is above shoulder height for younger children, hand-cycle and wheelchair users, etc. Supports connecting below deflection rails can snag shoulders and handlebars. Where the deflection rail is positioned out from fence, supports should be horizontal rather than protruding below the rail. In most circumstances the deflection rail can also serve as the top rail of the barrier.

Both a hand rail and deflection rail prevent handlebars from snagging the vertical barrier elements. He Ara Kotahi, Manawatu River bridge (photo: James Wratt)

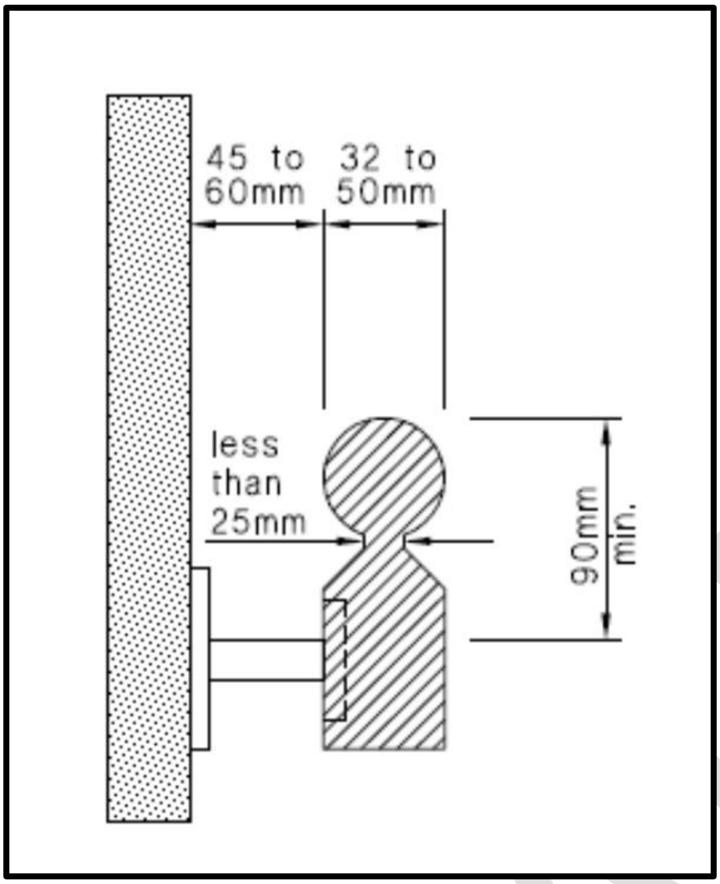
Perforated panels prevent handlebars and bicycle wheels from being trapped or catching in the fence. Whairepo Lagoon Bridge, Wellington Waterfront (photo: James Wratt)

Snag risk is especially high at the start of a fence or railing. To avoid this, fences and railings should be flared out so the start/end well clear of the line of travel of path users.

Railing flared out to mitigate snag risk, Christchurch Northern Motorway shared path (photo: James Wratt)

Handrails.

Handrails are required by the Building Code, as shown in the Acceptable Solution D1, on access routes to buildings that have a gradient steeper than 5%. They are also beneficial when functioning as second deflection rails protecting against snag risks for shorter riders, wheelchair users, etc. NZS 4121 and Acceptable Solution DS1 specify a height of top of rail 900mm to 1000mm above path level, though NZS 4121 permits a height as low as 840mm above ramps. Handrails are required to have a grasping profile free of obstructions which prevents horizontal mounts like those for deflection rails, so typical designs have supports that protrude below the rails. These are a snag risk for some users. A snag free solution is included in the Acceptable Solution DS1 Figure 26(b) reproduced below.



Acceptable profile for a snag-free handrail from the NZ Building Code (Acceptable Solution DS1)

Edge treatments

Shared paths with a significant edge drop should have an edge treatment (e.g. kerb upstand) at least 75mm high to keep wheel chairs on the ramp or path.

If an edge treatment is provided with a fence or barrier, they should align vertically.

Where an edge treatment is provided without a fence or barrier, note that 75mm is the kerb height recommended, as any higher and there is an increased risk of pedal strike.

Edge treatment provided on a bridge with a barrier. Haywards pedestrian bridge (photo: James Wratt)

Edge treatment provided on a boardwalk with no fence or barrier. Pauahatanui Estuary boardwalk (photo: James Wratt)

Fences on constrained sections of path

Outward leaning fences can improve visibility around corners, and increase useable width of path, reducing the risk of collision between path users. The useable width of the path is increased as cyclists can track closer to the edge of the path without snagging their handlebars.

Inward leaning fence restricts visibility around corner and reduces useable width. Leinster Ave Footbridge, Kapiti (photo: James Wratt)

Outward leaning fence on a narrow bridge increases useable width for cyclists. Wairau River Bridge, Marlborough (photo: Peter Kortegast).