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Transport Infrastructure Ireland

TII Publications

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Rural Cycleway Design (Offline)

DN-GEO-03047

April 2017

Withdrawn

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TII Publication Title	<i>Rural Cycleway Design (Offline)</i>
TII Publication Number	<i>DN-GEO-03047</i>

Activity	<i>Design (DN)</i>	Document Set	<i>Standards</i>
Stream	<i>Geometry (GEO)</i>	Publication Date	<i>April 2017</i>
Document Number	<i>03047</i>	Historical Reference	NRA TD 300

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TII Publications



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**Updates to TII Publications resulting in changes to
Rural Cycleway Design (Offline) DN-GEO-03047**

Date: April 2017

Amendment Details:

This document supersedes DN-GEO-03047 published in April 2014 (including Amendment No. 1, dated December 2014) with the following changes:

- a) This document has been revised to present details for Cycleways and Greenways only.
- b) Cross section details for cycle facilities incorporated into the road cross section i.e. excluding cycleways and greenways have been incorporated into DN-GEO-03036 Cross Sections and Headroom.
- c) The geometric design parameters for cycle facilities incorporated into the road cross section have been incorporated into DN-GEO-03031 Rural Road Link Design.
- d) The design requirements for cyclists at rural road junctions where cycle facilities are incorporated into the road cross section have been included in DN-GEO-03060 Geometric Design of Junctions (Priority Junctions, Roundabouts, Grade Separated and Compact Grade Separated Junctions).
- e) This document has been renamed from Rural Cycle Scheme Design to Rural Cycleway Design (Offline).

Date: October 2019

Amendment Details:

Minor Update – Section 7.2 updated to refer to DN-GEO-03060.

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1. Introduction

1.1 Scope

The purpose of this Design Standard is to outline the design standards and factors that need to be considered by Design Organisations when providing cycleways.

1.2 Definitions

For definitions of general road elements referred to in this Standard, such as central reserve, grassed verge, hard shoulder, hard strip, etc., see DN-GEO-03036 Cross-sections and Headroom and DN-GEO-03031 Road Link Design.

For this Design Standard specific terms have been defined as follows:

- a) **All-purpose road:** - A road for the use of all classes of traffic (e.g. not a motorway).
- b) National, Regional, Local & Public Roads:
 - i. A **National Road** is a public road or a proposed public road which is classified or is intended to be classified as a national road under Section 10 of the Road Act (1993).
 - ii. A **Regional Road** is a public road or a proposed public road which is classified or is intended to be classified as a regional road under Section 10 of the Road Act (1993).
 - iii. A **Local Road** is a public road or a proposed public road other than a national road or a regional road.
 - iv. A **Public Road** is a road over which a public right of way exists (or will exist in the case of a proposed public road) and the responsibility for the maintenance of which lies with the Road Authority.
- c) **Rural Cycle Scheme Design:** is the design associated with the construction of cycle facilities in a rural area.
- d) **Cycle Facilities:** refers to all types of measures which improve conditions for cyclists and include:
 - i. **Cycleways:** a public road or proposed public road reserved for the exclusive use of cyclists or cyclists and pedestrians.
 - ii. **Cycle Track:** Part of a road, including part of a footway or part of a roadway, which is reserved for the use of pedal cycles and from which all mechanically propelled vehicles, other than mechanically propelled wheelchairs, are prohibited from entering except for the purpose of access.
 - iii. **Cycle Lane:** part of the carriageway of a road reserved primarily for use by cyclists. The cycle lane forms part of the road and it is located within the contiguous road surface. A cycle lane can also be referred to as an on-road cycle track.
 - iv. **Shared Use Cycle and Pedestrian Facilities:** An off road cycle track or cycleway that is provided for both cycle and pedestrian use.

- v. **Shared roads with Motor Vehicles:** A road under low speed/low traffic flow conditions that is provided for both cycle and pedestrian use.
 - vi. **Greenway:** a cycleway that caters for pedestrian and cyclists in a recreational environment
 - vii. **Cycle Network:** is a defined collection of routes which connect key origins and destinations in a specified area for cyclists.
- e) **Rural Road:** A road outside of a built-up area such as a city, town or village including:
- i. Single Carriageway roads;
 - ii. All-purpose Dual Carriageway roads; or
 - iii. Motorways.
- f) **Urban Road:** A road within a built-up area such as a city, town or village.
- g) **Urban Street:** A road within a built-up area such as a city, town or village where the primary purpose of the road is to provide direct access to premises.
- h) **Urban Relief Road:** An urban road where the primary purpose of the road is to facilitate the movement of traffic and avoid congestion or other obstacles to movement.
- i) **Urban Motorway:** An urban motorway is a motorway constructed in a built-up area such as a city, town or village.
- j) **Rural Area:** an area outside of a built-up area which is generally controlled by speed limits greater than 60 km/h.
- k) **Carriageway Separation Distance:** is the distance between the road carriageway edge and the edge of the cycle track.
- l) **Design Organisation:** The organisation responsible for undertaking and/or certifying the design.
- m) **Road Authority:** The authority responsible for the road construction or improvement scheme.

1.3 Relaxations and Departures from Standard

The standards contained in this document represent the various criteria and maximum/minimum levels of provision whose incorporation in the design would achieve a minimum desirable level of performance in average conditions in terms of safety, operation, economic environmental impact and sustainability. Design parameters in excess of the parameters presented in this standard should be considered by the designer to ensure the resulting scheme best meets the requirements of cyclists and other road users.

In most cases, with care, designs can be achieved which do not utilise the lowest levels of design parameters given. However, at some locations, it may not be possible to justify even the lowest levels of design parameters in economic or environmental terms, due to high costs, low demand projection, and/or environmental damage, etc. In such cases, sufficient advantages might justify either a Relaxation within the standards or, in more constrained locations, a Departure from the standards. The various parameters quoted in this Standard are not, therefore to be regarded as sacrosanct in all circumstances. Relaxations and Departures should be assessed in terms of their effects on the economic worth of the scheme, the environment, and the safety of the user. See DN-GEO-03031 Road Link Design for further information on Relaxations and Departures.

The scope for Relaxations has been set so as to allow designers to consider parameter values that would generally be approved if they were put to Transport Infrastructure Ireland (TII) as Departure proposals. The designer is required to consider carefully the benefits and any potential disadvantages of Relaxations. Relaxations are considered to conform to standards.

Three levels of standard values have typically been defined in this Standard. This allows for a flexible approach to be applied to a range of situations, where the strict application of the highest standards could lead to disproportionately high construction costs or severe environmental impacts upon people, properties or landscapes. The three levels are as follows:

- a) Desirable Minimum standard, which will produce a high standard of safety.
- b) One Step Below Desirable Minimum standard, where the level of service may remain generally satisfactory and the facility may not become unsafe where these values are reduced. The application of this level of standard should be considered carefully and where difficult circumstances can be shown to justify using One Step Below Desirable Minimum standard. Design elements incorporating One Step Below Desirable Minimum standards shall be considered Relaxations.
- c) Two Steps Below Desirable Minimum standard, where the level of service may be further reduced yet remain satisfactory and safe. Typically, this level of standard should be applied sparingly, over short sections and where difficult circumstances can be shown to justify using Two Steps Below Desirable Minimum standard. Design elements incorporating Two Steps Below Desirable Minimum standards shall also be considered Relaxations.

The Design Organisation shall record the fact that a Relaxation has been used in the design and the corresponding reasons for its use. The Design Organisation shall report all Relaxations incorporated into the design as part of the project report at the end of each project management phase.

Design elements below Two Steps Below the Desirable Minimum standards shall only be considered under an Approved Departure from TII as per the requirements of GE-GEN-01005 Departures to Standards and Specification.

1.4 Disclaimer

Please note that all drawings in this standard are diagrammatic only. No reliance should be placed upon them for road marking layouts for which reference should be made to the Traffic Signs Manual.

2. Rural Cycleways

2.1 National Cycle Network Policy

The National Cycle Policy Framework 2009-2020 (NCPF) identified the requirement to develop and implement the National Cycle Network to promote cycling as a transport mode, leisure activity and tourist activity in Ireland.

Transport Infrastructure Ireland published the National Cycle Network Scoping Study in August 2010, which identified a core network of corridors between the larger towns and cities, and through the regions of greatest interest for tourist and recreational cycling.

This Design Standard will assist in the delivery of the National Cycle Network and will ensure a consistent approach is applied to the design of cycle schemes in rural areas.

2.2 Design Principles

In order to develop appropriate design standards for rural cycling facilities, there are a number of core design principles that need to be implemented. The principles include Coherence, Convenience, Directness, Safety, Comfort, Attractiveness and Access.

Coherence: Cycling infrastructure should form a coherent network which links origins and destinations. Coherence is about giving people the opportunity to access places by bicycle and to integrate cycling with other modes of travel. Routes should be continuous from an origin to a destination, easy to navigate and of a consistent Quality of Service. Cycle signage should be clear and logical at the approaches to and exits from junctions.

Convenience: A cycle network should serve main destinations, and new cycle facilities should offer an advantage in terms of safety and attractiveness compared with the existing provision. Routes and key destinations should be properly signed, and place names should be clearly visible. Routes should be unimpeded by street furniture, and other obstructions which can be hazardous to users. Designers should consider the future ease of maintenance, including access to motorised vehicles for sweeping, trimming grassed verges and surface / lighting repairs along off-road facilities.

Directness: Rural routes need to take into consideration the distance an average cyclist can travel in a day and the linking of intermediate destinations and attractions will be an important consideration with respect to the route design. It should be recognised that directness has both geographical and time elements. The presence of complicated junctions and crossings as well as physical detours will affect use.

Safety: Cycle facilities need to be safe for all users including pedestrians and cyclists. With very popular facilities the potential for conflict between pedestrians and cyclists should be minimised through the introduction of segregation between these users. Surface defects should not be allowed to develop to the extent that they become a hazard, and vegetation should be regularly cut back to preserve available width and sight lines. Crossings are generally the most dangerous parts of the cycling journey and the needs of all road users should be considered where cycle facilities cross roads and entrances.

Comfort: Generally cyclists prefer sheltered, smooth, uninterrupted, well-maintained surfaces with gentle gradients. Cycle facilities should meet surface width, quality and gradient standards and be convenient, avoiding complex manoeuvres. Dropped kerbs are particularly beneficial to users of wheelchairs, pushchairs and bicycles at interface points. Cyclists who are familiar with particular crossings will also appreciate good sightlines on approach, this allows them to gauge their environment and minimise any loss of momentum.

Attractiveness: Cycle facilities should be designed in harmony with their environment such that the whole experience makes cycling an attractive option. A route should complement and where possible, enhance the area through which it passes. The cycle route should pass through interesting places and their design should be sensitive to environmental issues including lighting, personal security, aesthetics, environmental quality and noise. Cycle facilities should be well maintained and free from litter and broken glass. The ability for people to socialise by walking or cycling two abreast, or to stop and rest or look at a view, makes for a more pleasant experience.

Access: Cycling routes should link trip origins and key destinations along convenient and comfortable routes. Cycling routes should be accessible to all types of bicycles, including bikes with panniers and trailers as well as trikes and recumbents. The cycle route should be provided into and through areas normally inaccessible to motor vehicles, such as parks and other motorised vehicle restricted areas, if possible.

Withdrawn

3. Development of Rural Cycleways

3.1 General

The development of rural cycleways will comprise a mixture of new and retrofitted infrastructure which may on different routes be made up of any or all of the following:

- a) Greenways
- b) Existing Cycle Facilities
- c) Existing Footways/ Footpaths
- d) Cycleways
- e) Low Speed Environments

3.2 Reuse of existing disused infrastructure

A range of existing & disused infrastructure has the potential to be suitable for reuse as a cycleway facility, such as;

- a) Disused Railway Lines
- b) Canal Towpaths & River Banks
- c) Forest Trails

3.2.1 Disused Railway Lines

Before any potential consideration of retrofitting or redesign of a disused or abandoned railway, it is essential that approval from the relevant authorities is acquired. In the case of disused railway lines, Iarnród Éireann should be consulted and their permission sought. Even though such lines are not currently in use, there may be a desire in the future to re-commission them for reasons of tourism, commuting and / or logistical transport. In respect of abandoned lines the ownership of the full extent of the lands required should be clearly established, as parties other than Iarnród Éireann may have gained rights.

3.2.2 Canal Towpaths & River Banks

The provision of cycleways along canal towpaths or river banks under the control of Waterways Ireland requires the approval of Waterways Ireland. It is essential that before a canal towpath be considered to be incorporated as part of the National Cycle Network consultation is undertaken with Waterways Ireland and their permission sought. As conditions, use and available space along the canal system varies consultation with Waterways Ireland is essential to establish any restrictions and conditions they may have to be incorporated with the cycleways along specific sections of towpath. The key issues associated with the canal system include, access control measures, available width through deep cuttings, the provision of edge protection and the suitability of existing embankments to accommodate cycleways.

3.2.3 Forest Trails

The provision of cycleways through forestry in the ownership of Coillte will require their permission and integration with their strategies with respect to the future management and development of cycleways or greenways within its lands. Lands currently made available as pedestrian paths through forested areas may not be suitable for cycle paths due to the rutted nature of the ground caused by tree roots and also due to overhanging branches that may provide a danger to cyclists. All cycleways within forested lands are to be designed in accordance with this standard.

4. Rural Cycle Scheme Layout

4.1 Cross-section

Generally, cycleways will also provide for pedestrians as well as cyclists, unless a separate pedestrian footway, or separation of a shared path is provided. When determining the cross-section widths, consideration needs to be given to the likely level of pedestrian and cyclist usage, the anticipated speed of the cyclist given the vertical profile, and the space that each user will occupy when using the cycleway.

Experience has shown that pedestrian and cycle flows can be catered for safely (even if it is with reduced comfort and convenience) on shared facilities of restricted width. However, a reduced width facility may inhibit the speed of cyclists and result in some faster cyclists choosing to remain within the road carriageway rather than using the dedicated facility.

The space needed for a cyclist to feel safe and comfortable depends on:

- a) the space needed for a cyclist to maintain balance in motion, particularly at low speeds
- b) sufficient clearance when passing fixed objects
- c) the distance from, and speed of other traffic

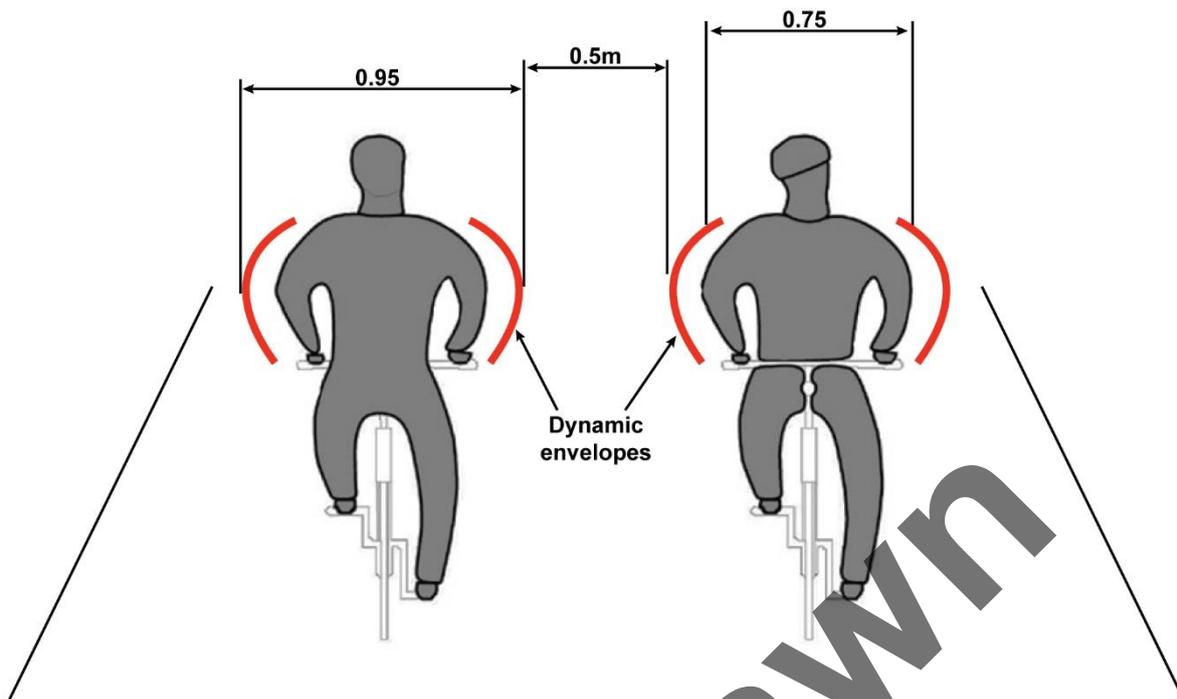
Sufficient width is required for a cyclist to maintain his/her balance. The average width of a cyclist and bike is 0.75 m but cyclists wobble as they apply power through the pedals particularly when starting, going up inclines and when accelerating/decelerating. This width is called the cyclist's dynamic envelope.

At normal cycling speeds and in normal conditions this wobble movement is about 0.2 m. For most cyclists a speed of 11 km/h is required to ride comfortably in a straight line without a conscious effort to maintain balance. However, the wobble movement can increase considerably when considering inexperience, age, slow speeds, climbing and pulling away from stationary positions where the figure can increase to 0.8 m.

Other considerations in determining cycle width are:

- a) Cycling in a rural environment is a social activity and therefore sufficient width is required to allow cyclists to pair up or travel in groups
- b) Not all cyclists travel at the same speed therefore room to overtake needs to be provided
- c) When families travel together sufficient width for an adult to cycle parallel with young children for safety and reassurance reasons
- d) The volume of cyclists
- e) Cyclists with trailers/panniers
- f) Trikes and recumbents
- g) Whether the cross-section is shared with other users (pedestrians)
- h) Distance cyclists stay out from obstacles such as kerbstones, lamp posts, bollards, trees and walls

Figure 4.1 Width Requirements of Passing Cyclists



The recommended cross sectional widths (Table 4.1) are presented under three levels of standard values.

The first column is the desirable minimum which describes the minimum widths which should be implemented to provide a reasonable quality of service and that would satisfy all of the core design principles. These widths provide enough space for cyclists to maintain balance and control of the bicycle at typical speeds. As they are desirable minimums they should not be regarded as the recommended width but as the minimum allowable. It is imperative that the designer considers the location, function and probable use of the cycleway and provide as much width as is sustainable. It is recognised that these desirable minimums may not be attained for a variety of reasons and Table 4.1 allows for both One Step Below Minimum and Two Steps Below Minimum.

The second column presents the One Step Below Minimum widths that should be applied to the design of cycleways. These values will satisfy the core design principles but will provide a minimum acceptable quality of service. There will be situations whereby the cycleway will travel along canal towpaths, disused railway tracks, forest trails etc. In these situations the desirable width may not be achievable due to a number of factors such as land constraints, historical sites infringing on the proposed facility and other obstacles that could be encountered.

The final column presents the Two Step Below Minimum widths. These values cover those situations where the desirable minimum width cannot physically be provided and should only be considered over short lengths, whereby the sight line is greater than the length of the reduced width. These values will require departures from the standard to be incorporated into the design.

Table 4.1 Required Cross Sectional Widths

		Desirable Min (m)	One Step Below Desirable Min (m)	Two Steps Below Desirable Min (m)
Cycleways	Low Volume	3.0	2.0	1.75
	High Volume	5.0	3.0	2.5

As part of the design process it is important to define whether the cycleway will attract low or high volumes of pedestrian/cyclist traffic to give the designer the choice to make an informed decision on cross section dimensions and whether or not segregation of cyclists and pedestrians is necessary. Low volume facilities are those considered to attract less than 1500 users a day and high volume facilities are those expected to attract greater than 1500 users a day.

On shared facilities that cater for high pedestrian and cycle flows the segregation of the pedestrian and cycleway is preferred.

4.2 Grassed Verge Width

If vertical objects such as a wall, a fence or a safety barrier are located immediately adjacent to a cycleway the effective width of the cycleway will be reduced. It is therefore necessary to provide a buffer between the object and the cycleway to avoid limiting the effective capacity of the cycleway. Table 4.2 provides the additional widths required where vertical objects are located adjacent to cycleways.

Table 4.2 Lateral Clearances for Cycleways

Type of Edge Constraint	Desirable Min (m)	One Step Below Desirable Min (m)	Two Steps Below Desirable Min (m)
Vertical features (wall, fencing, etc.)	1.00	0.50	0.25

4.3 Safety Barriers

The provision of safety barriers shall be made in accordance with DN-REQ-03034 Safety Barriers.

Any safety barrier required shall be positioned between the obstacle and the cycleway. The minimum distance between the cycleway and the safety barrier shall be equal to the working width of the safety barrier and comply with the edge constraint distances shown in Table 4.2. In addition, any exposed safety barrier posts facing the cycleway require protection to prevent injury to any passing cyclists.

4.4 Headroom

It is important that clear headroom is available throughout the cycleways. Headroom restrictions may result in cyclists banging their heads, therefore impacting on the safety and comfort along the cycleway. The designer needs to take into account headroom issues associated with gateway entrances, sign heights, overhanging trees, lighting and car/van/truck restriction devices and underpasses. The desirable minimum headroom along cycleways is 2.7 metres, however over short distances a reduced head height of 2.4 metres is acceptable. Where minimum headroom is unavailable (e.g. exiting bridges/ tunnels) cyclists should be advised to dismount.

The designer should refer to DN-GEO-03040 Subways for Pedestrians and Pedal Cyclists Layout and Dimensions with respect to headroom requirements along cycleways

5. Sight Distance

5.1 General

It is recommended that all cycleways have a design speed of 30 km/h. However, on approach to obstacles a reduced design speed of 10 km/h is acceptable (over short distances). It is important to note that for cycleways located on long downward slope sections (steeper than 5% and longer than 150 m), a design speed of 50 km/h should be implemented.

Table 5.1 Design Cycle Speed

Assumed Cycle Design Speed (km/h)	Characteristic
10	Obstacle
30	Standard
50	Down-hill

The distance at which a cyclist has visibility of potential hazards is an important design parameter. The greater the visibility a cyclist has, the greater their comfort and safety on the cycleway. Table 5.2 gives visibility parameters of Dynamic Sight Distance (DSD) and Stopping Sight Distance (SSD) for cycleways.

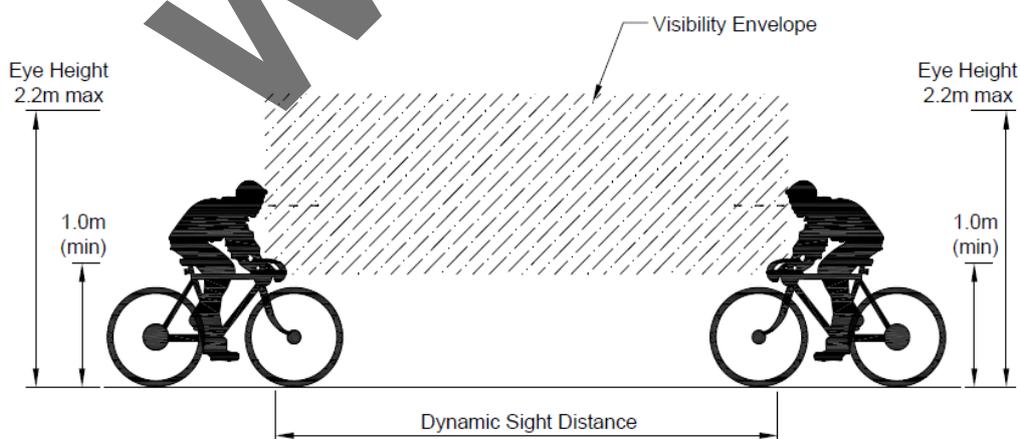
Table 5.2 Dynamic Sight Distances & Stopping Distances

Design Speed (km/h)	50 km/h	30 km/h	10 km/h
Minimum Dynamic Sight Distance (m)	110	65	15
Minimum Stopping Sight Distance (m)	60	35	15

5.2 Dynamic Sight Distance (DSD)

DSD is the advance distance a cyclist requires to see ahead, to make the task of riding feel safe and comfortable and to pass slower cyclists and pedestrians safely. The distances specified in Table 5.2 are the distances covered by the cyclist travelling at 30 km/h in approximately eight seconds.

Figure 5.1 Dynamic Sight Distance Envelope



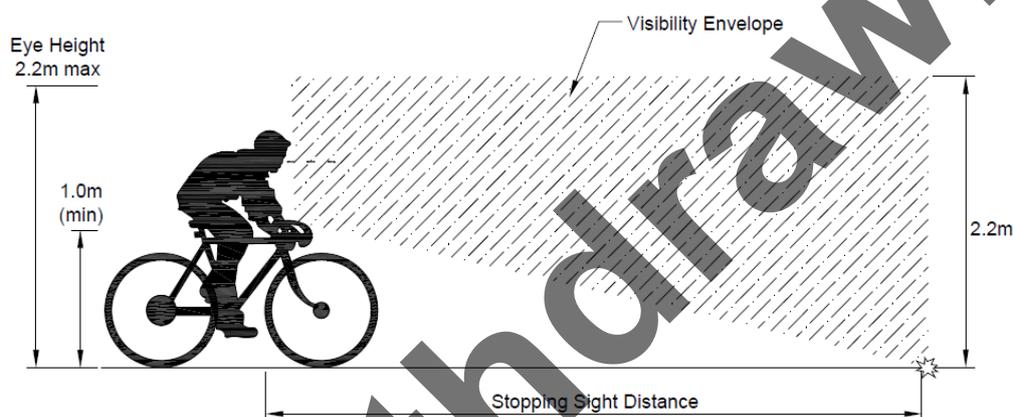
5.3 Stopping Sight Distance

SSD is the distance required to perceive, react and stop safely in adverse conditions (i.e. the distance covered in the perception/ reaction time (two seconds) plus the actual braking distance (deceleration rate of 0.15g)). Minimum SSDs should be increased by 50% on loose surface tracks. Designers should ensure that an object at the minimum SSD is visible from a range of cyclist eye heights. SSD should be measured from a point 0.6m inside the edge of the cycle facility.

Designers should ensure that an object at the minimum SSD is visible from the following range of eye heights, 1.0m to 2.2m. The object height should be taken as a range from ground level to 2.2 m, as cyclists need to be able to observe deformations, holes and objects which could interfere with safe progress.

Street furniture, trees and shrubs should be located outside of the envelope of the SSD where practical. In particular trees can obscure pedestrians from approaching cyclists. Isolated objects with widths of less than 300 mm are unlikely to have a significant effect on visibility and may be ignored if removal is not practicable.

Figure 5.2 Stopping Sight Distance Envelope



6. Geometric Alignment

6.1 Horizontal Alignment for Cycle Facilities

In order for a cyclist to achieve a safe and comfortable level of cycling sufficient horizontal radii are required. Horizontal radii below the values recommended may create difficulties for cyclists to keep their balance or lose momentum having to apply their brakes on approach to the bend. The provision of tight horizontal radii can compromise safety and the attractiveness of the cycleway.

On approach to obstacles and/or major junctions the introduction of tight horizontal alignments can be used as a speed inhibitor. The introduction of tight horizontal alignments needs to be accompanied by appropriate warning signage.

Table 6.1 presents the recommended horizontal radii that shall apply for the different design speeds.

Table 6.1 Recommended Horizontal Radii (m) for different Design Speeds

Design Speed (km/h)	Minimum Horizontal Radius (m)
10 km/h	4
30 km/h	25
50 km/h	94

6.2 Surface Crossfall

Cycleway surfaces need to be adequately drained to avoid the difficulties that standing water and ice can create for cyclists. A cycleway should be constructed with a crossfall generally between 1.0% and 3.0%, with a maximum of 5.0% permitted over short sections.

Superelevation is not required as part of the design of cycleways. Where possible the crossfall of cycleways should be directed towards the inside of a bend to prevent negative crossfall and its impact on cyclist safety.

Surface water runoff from cycleways is preferably collected from over-the-edge drainage ditches or by direct runoff into combined surface water and ground water filter drains. In some limited areas runoff may be collected by a kerb and gully system, but this should be avoided if possible as it is not really suitable in a rural area. Standing water is to be avoided as it will form a hazard that will contribute to pushing cyclists out of position and into oncoming cyclists whilst attempting to avoid the hazard.

6.3 Gradient

The overall gradient along a cycle route is an important design consideration. Comfort and attractiveness of a cycleway will be greatly increased if the route follows a shallow gradient.

The gradient of a cycle facility impacts on two issues; the physical limitations of a cyclist to climb steep inclines and maintain speed, and their ability to stop when descending steep inclines. Steep gradients are not welcomed by cyclists and have the potential to put off users. Steep inclines generate high downhill speeds increasing the potential to conflict with other users who may be struggling to climb the steep gradient in the opposite direction.

Table 6.2 presents the maximum vertical gradients permissible on a cycleway.

Table 6.2 Vertical Gradient Requirements

	Gradients
Desirable Maximum	3%
One Step Below Desirable Maximum	5%
Two Steps Below Desirable Maximum	10%

The provision of gradients greater than 5% should be confined to short sections of the cycle route and should be preferably less than 100 metres in length.

Withdrawn

7. Crossings

7.1 General

The interactions between cycleways and the public road is an important component of the overall design of such facilities. Drivers need to understand where to expect interactions with cyclists on the public road and cyclists need to understand the control measures in place when interacting with the public road.

Layouts that place a cyclist outside the driver's normal field of view are not recommended as they can lead to hazardous situations and layouts which are simple to understand for both cyclists and motorists are preferred.

Crossing facilities should include clear rules and signage with respect to which user has priority and due to the high speed nature of the rural environment cyclists will generally be required to give way to motor vehicles at conflict points.

Approaches to crossings should be at right angles to the carriageway to ensure adequate visibility for cyclists. Where cycleways merge with a cycle track which leads to a crossing point, a 'jug handle' junction layout as described in this document should be used to place cyclists at right angles to the traffic flow. Adequate advance warning signage is to be provided in line with the TSM.

At crossings it is important that there is adequate visibility between cyclists and drivers, and between cyclists and pedestrians.

It is recommended that the surface of the cycle facility has a colour contrast treatment on approach to crossings as a warning to cyclists of upcoming conflicts with vehicular traffic. In addition, the introduction of a chicane or an approach stagger should be considered to regulate the speed of cyclists on approach to intersections with the public road.

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7.2 Road Carriageway Visibility

The following table and diagram sets out the required set back (X- Distance) value that should be provided for on the cycleway on approach to a road. The appropriate Visibility Envelope (Y- Distance) is as set out in DN-GEO-03060 and depends on the design speed of the road which the cycle facility is intersecting with.

Figure 7.1 Visibility splays for junctions with roads and crossings of roads

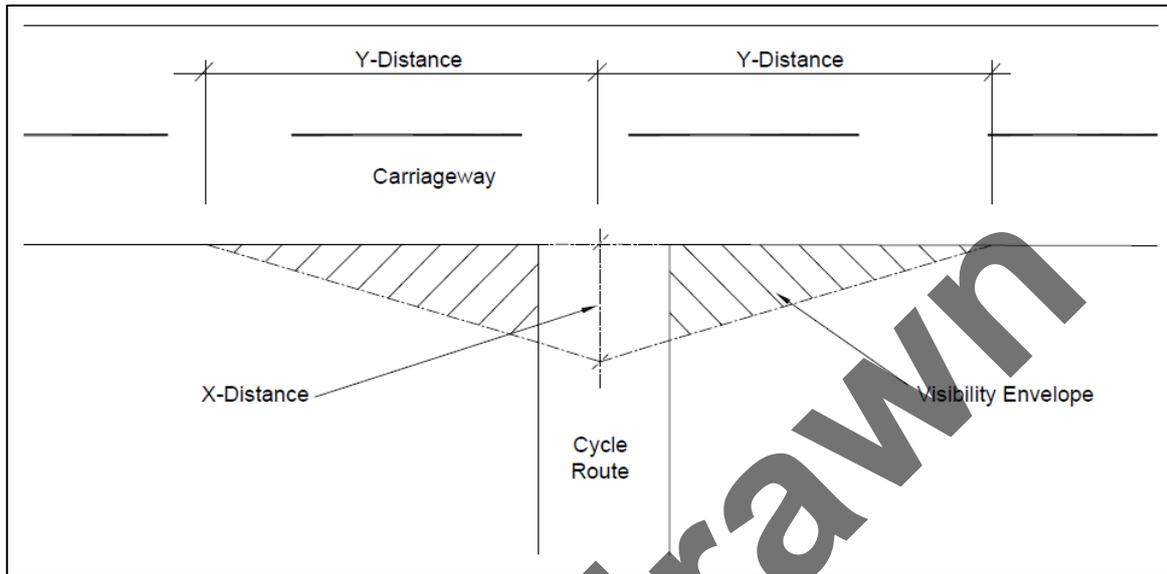


Table 7.1 Values used as set back distances (X) from edge of carriageway

X – distance (m)	Description of Use
4.0	Cycle route approach to a road – Desirable Minimum
2.0	Cycle route approach to a road – Absolute Minimum

7.3 Cycleway Visibility

Where a cycleway intersects with another cycleway, the required visibility splay is dependent on the design speed of the cycle facility and the 'Y' distance that is presented under Table 5.2 for Stopping Sight Distances.

7.4 Crossings

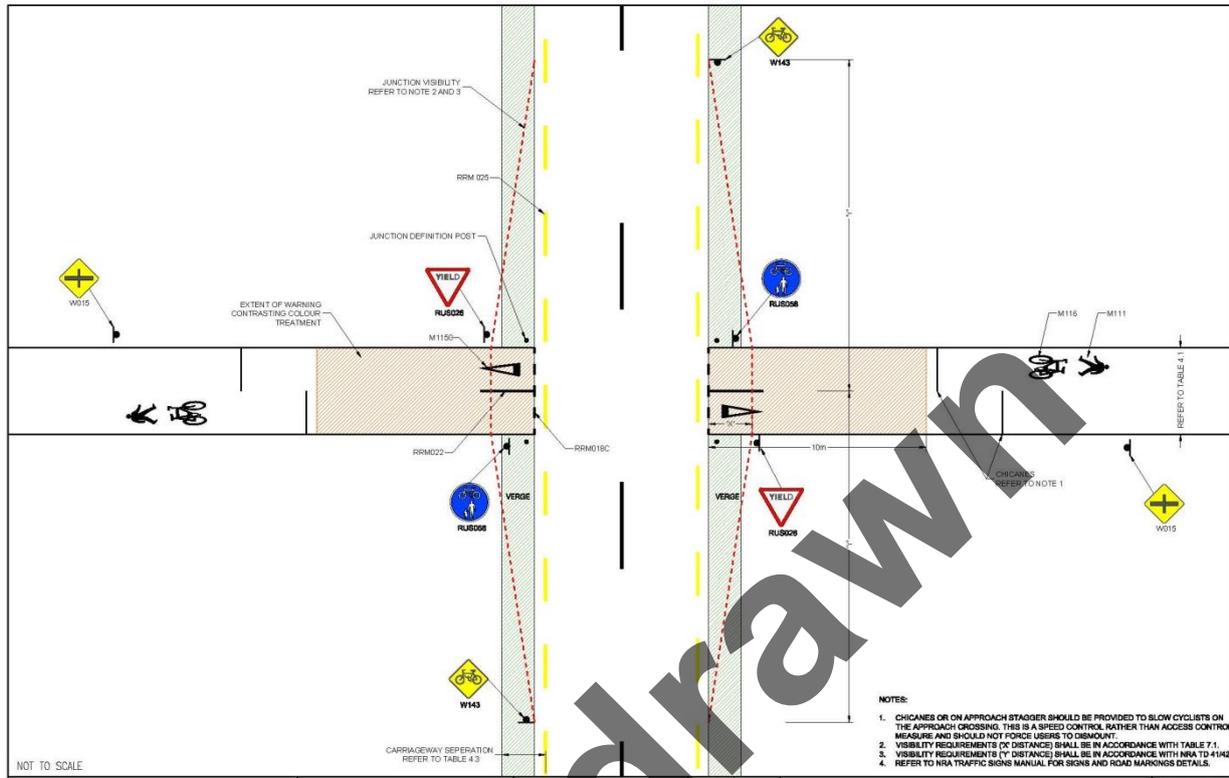
7.4.1 General

The type of crossing required where a cycleway crosses a trafficked road will depend primarily on the AADT of the road which needs to be crossed. On a road carrying less than 12,000 AADT a give-way crossing is acceptable while on roads with greater than 12,000 AADT the provision of a grade separated crossing should be considered, taking into account the projected number of users, the available land and the availability of suitable gaps in traffic to cross the road. The design of any grade separated cycle facility should be in accordance with DN-STR-03005 - Design Criteria for Footbridges and DN-GEO-03040 - Subways for Pedestrians and Pedal Cyclists.

7.4.2 Single Carriageway Crossings

Figure 7.2 demonstrates the required design details where a cycleway crosses a rural road.

Figure 7.2 Road Crossing Detail

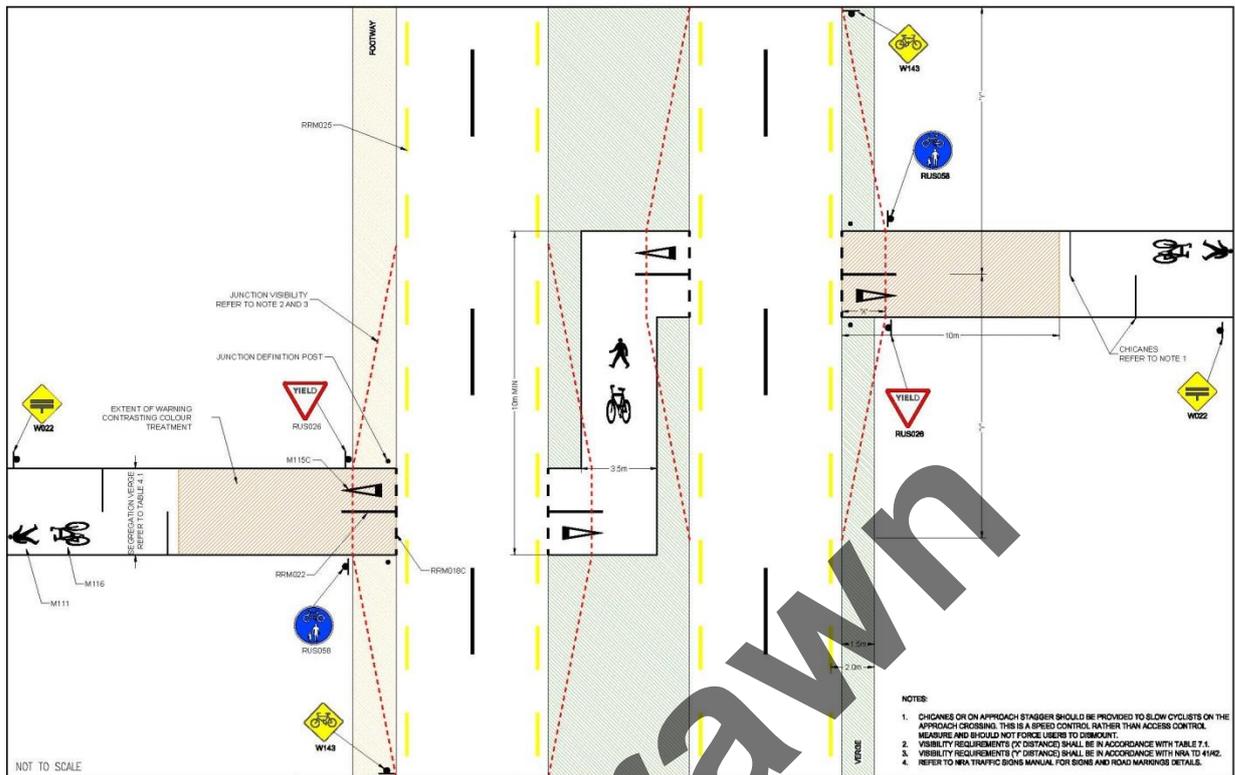


7.4.3 Dual Carriageway Crossing

Where a crossing traverses a dual carriageway with traffic flows carrying less than 12,000 AADT, a central island of ≥ 3.50 metres should be provided within the central median and the crossing should be staggered right to left to ensure crossing pedestrians and cyclists are protected by the safety barriers. The staggered distance between crossings should be a minimum of 10 metres.

Figure 7.3 demonstrates the required design details where a cycleway crosses a rural dual carriageway.

Figure 7.3 Dual Carriageway Road Crossing

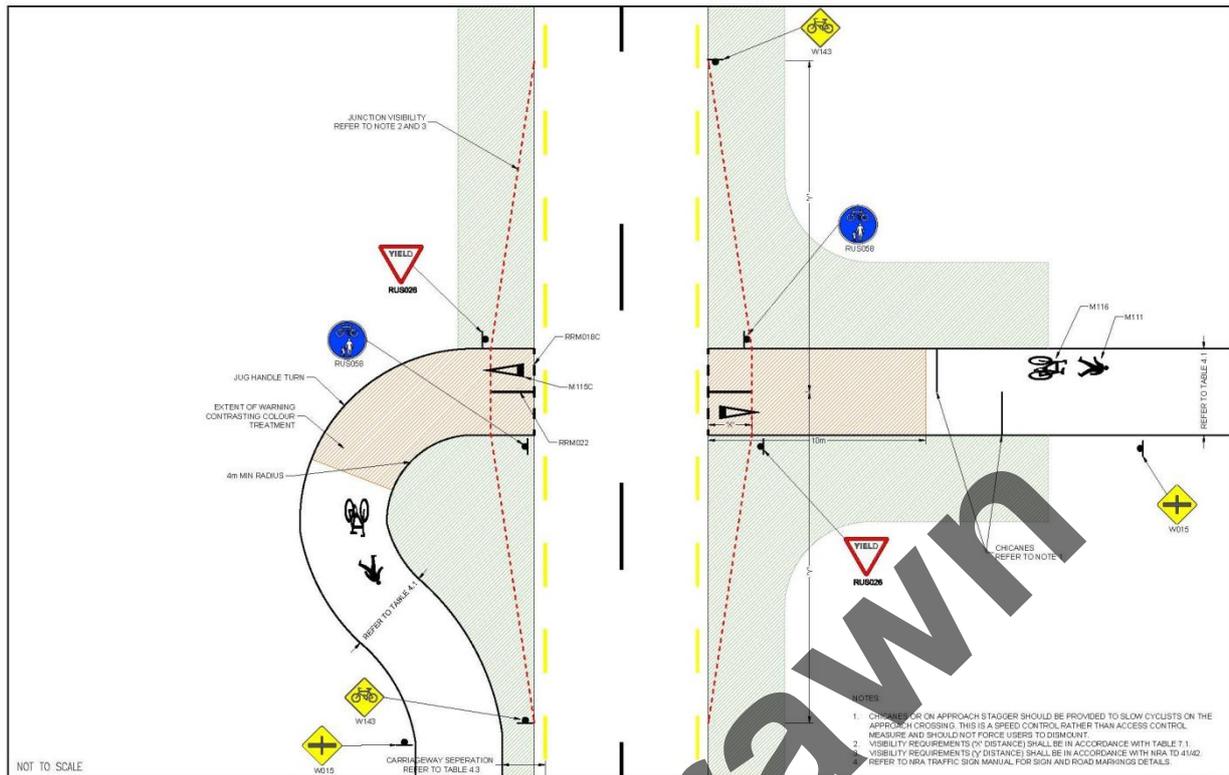


7.4.4 Jug Handle Crossing

Where cyclists travelling on a cycleway wish to turn and join another cycleway or cycle track on the other side of a road, it may be appropriate to provide a jug handle crossing. A jug handle crossing may be included in places where the cycleway cannot continue on that side of the carriageway or where a cycleway needs to terminate. A key objective of the jug handle design is to ensure cyclists approach the road at right angles to maximise visibility.

Figure 7.4 demonstrates the required design details where a cycleway crosses a rural road to connect with another cycleway or cycle track on the opposite side of the road.

Figure 7.4 Jug Handle Crossing



7.4.5 Direct Accesses

A cycleway may need to cross direct accesses such as farm and house entrances. As a general objective the priority at these crossings should lie with the cyclists and it is preferable that the alignment of the cycleway is retained past the entrance.

Visibility requirements for motorised vehicles at direct entrances shall be in accordance with DN-GEO-03060. The 'x' distance shall be measured from the nearside edge of the carriageway without the need to accommodate the cycleway.

Additionally, at direct accesses, the access will require a visibility splay setback of 2.0 m ('x' distance) from the cycleway with a stopping sight distance based on the design speed of the cycleway (Table 5.1).

7.5 Access Control

It is preferable that access control measures are kept to minimum as this will enhance the comfort and attractiveness of the cycleway, however, it is recognised that there will be circumstances where access control measures will be required, in order to prevent open access to the cycleway for motorised vehicles, farm animals, etc.

The key objective of any access control requirement is to ensure that cyclists do not have to dismount to negotiate the access control, and it would be preferable to keep gates to a minimum. If gates need to be introduced, the self-closing type would be preferable, as this type of facility is less likely to result in cyclists having to dismount.

The design of access control gates or barriers must take into account the variety of cyclists who are likely to use the facility to include bicycles with panniers and trailers and trikes/ recumbents. Figure 7.5 and Figure 7.6 demonstrates the design requirements associated with the provision of approach barriers/ gates for both cycleways.

Figure 7.5 Staggered Approach Barrier

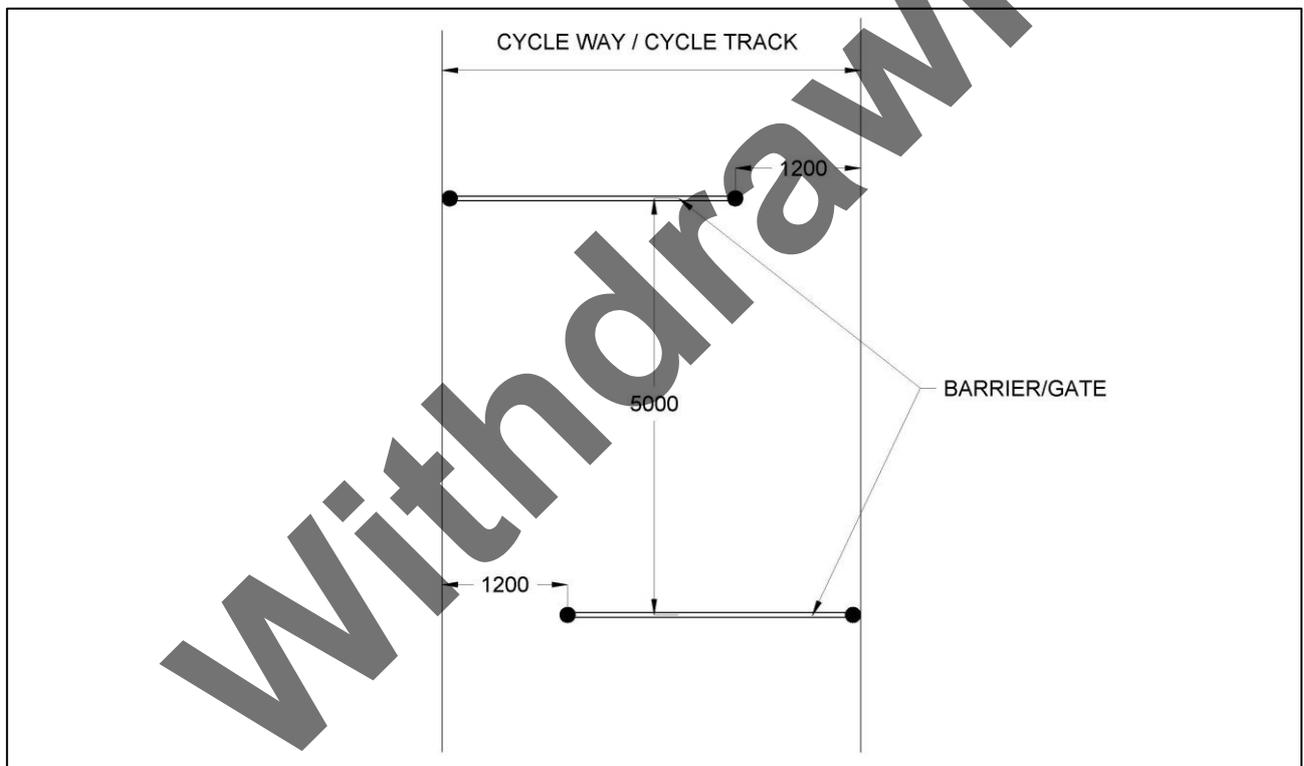
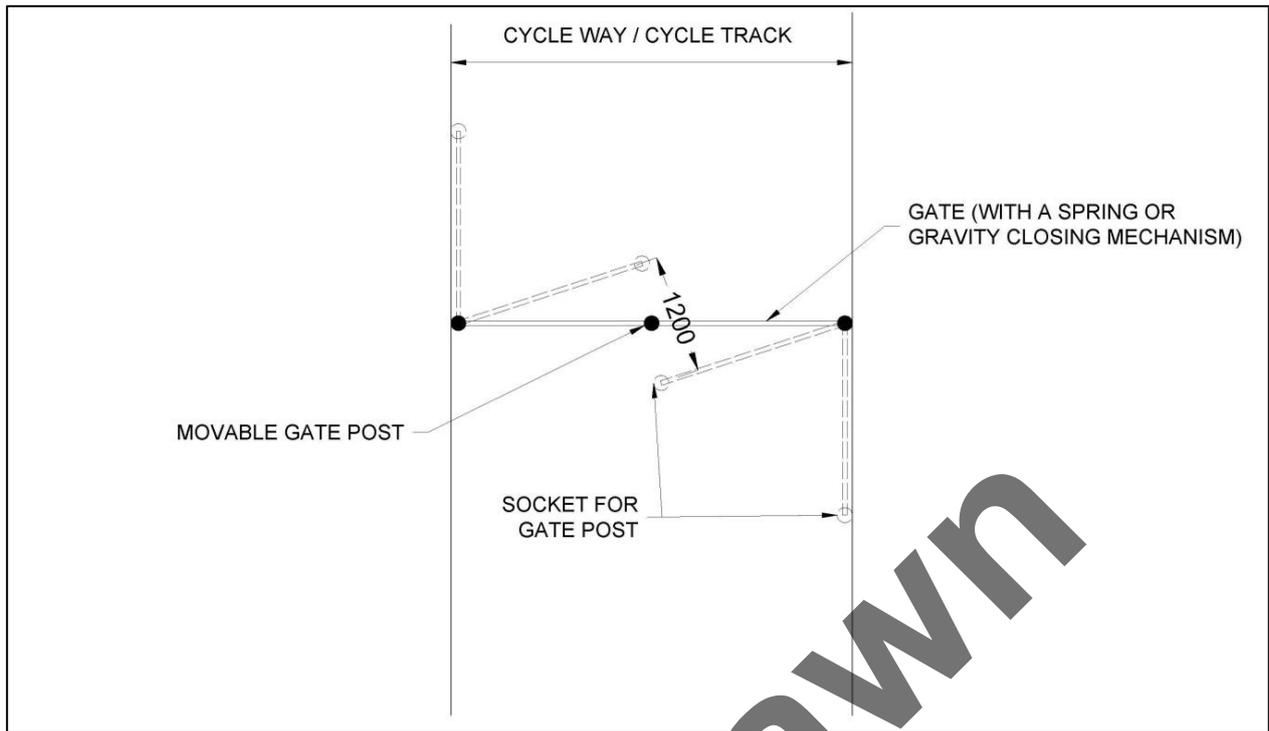


Figure 7.6 Cycle Gate



8. Construction Details

8.1 General

The type and quality of the cycleway track surface and its construction detailing will affect the attractiveness of the facility. Cycleways do not experience the same degree of wear compared to road pavement for motor vehicles and a much lighter construction is acceptable.

The material specifications and construction techniques are to be consistent with the requirements of the relevant design standards, specifications and standard construction details of TII Publications (Standards).

8.2 Pavement

A key objective for any cycleway is a smooth even surface. A smooth riding surface improves the enjoyment of the facility and prevents cyclists having to avoid potential hazards along the road surface. Cyclists can ride at speeds up to 50 km/h on downhill sections, and a rough surface or pothole can cause a cyclist to fall, leave the cycleway and crash or come into conflict with other users of the facility.

A cycleway with a good quality pavement will provide a safe, attractive and comfortable environment for potential users. In addition, early investment in paving will cut down on expensive future maintenance and repairs, cutting down on lifecycle costs and limiting times at which the cycleway will be out of service because of maintenance.

The pavement design should also consider the need of other potential users including cleaning equipment, maintenance vehicles and or local traffic access. Machine laid closed pavement construction (i.e. asphalt) is the preferred surface treatment for cycleways.

Bicycles are more sensitive to ride quality than motor vehicles and it is desirable to provide a finished surface quality for a cycleway that meets the minimum requirements of the specification for road pavements CC-SPW-00700.

The design of cycleways should include foundations and geotextiles underneath the paving to avoid the risk of subsidence and/or edge damage. Foundations will need to be wider than the paving in order to eliminate the risk of edge damage. The cycleway pavement foundations should be designed to the road design standards in TII Publications (Standards). Where necessary, due to soft ground conditions, capping should be placed in accordance with CC-SPW-00600 - Specification for Road Works Series 600 - Earthworks.

Asphalt surfacing is the most popular among cyclists because of its evenness and high skid resistance. It is recommended that an aggregate grading of 0/6 to 0/11 is provided. It is recommended that a closed surface pavement construction should be made up of the following:

- a) 20 mm thin surface course macadam
- b) 40 mm to 55 mm base course
- c) 150 Clause 804 sub base (machine laid to achieve correct ride quality)
- d) Geotextile layer (where necessary)
- e) Capping (where necessary)

Like asphalt paving, cement concrete offers a closed surface with a high level of evenness and is an acceptable surface for a cycleway. However, shrinkage joints, thermal joints and construction joints need to be installed correctly to achieve a high level of comfort for cyclists. The preferred surface finish is fine brooming, which will provide a high level of skid resistance. Concrete will offer excellent drainage and it is a material that possesses high durability. The occurrence of potholes and rutting will be minimal.

Although a closed pavement construction is preferred by cyclists in terms of comfort and safety, there are occasions where a surface is required to give a sense of the environment. In rural cycleway and greenway situations, where the cycleways attractiveness is just as important as comfort, dust path construction or other loose material construction maybe the preferred option in order to blend with the environment and to avoid unnecessary impacts in forests, along protected heritage trails, tow paths and along river banks. The application of loose surfaces can enhance the cycleways' appeal to its users due to its more natural aesthetics.

As an alternative to unbound surfaces in environmentally sensitive locations the provision of surface dressed base course is an acceptable alternative.

8.3 Over-the-Edge Drainage

Over-the-edge drainage is the preferred arrangement for a rural road with a cycleway adjoining. Where over-the-edge drainage is used it is important to ensure that the surface water runoff flows off the cycleway towards the drainage ditch and does not pond. Suitable crossfall of between 1% and 3% should be provided on the cycleway pavement.

The verge either side of the cycleway must be constructed with a crossfall of no more than 10% so as not to destabilise an errant cyclist. No minimum crossfall is specified for the grassed verge as water infiltration is desirable to limit and attenuate the overall runoff to the receiving watercourse.

The outside pavement edge detail of both the carriageway and cycleway should be higher than the proposed ground level by the depth of the pavement wearing course to stop back flow of the surface water runoff from a flat grassed verge.

8.4 Signage and Road Markings

Proper signage and lining is an integral and important part of any cycleway and furthermore provides a good level of coherence, safety and attractiveness. Good signage gives clarity to the user as to where the cycleway starts/ends and provides warnings to potential risks that may be present. Signs and lines used on the public road network shall comply with the Traffic Signs Manual 2010.

At the start and end of a cycleway and where the cycleway connects with a public road, Sign RUS 009 should be erected for facilities solely used by cyclists and Sign RUS 058 for facilities shared between pedestrians and cyclists.

Cycleways which form part of the National Cycle Network should include the relevant signage requirements as identified in the Traffic Signs Manual.

The cycleway should include clear directional signage along the route to ensure cyclists along the route understand that they are proceeding in the correct direction. The erection of directional signage is particularly important where the cycleway interacts with the public road or where the cycleway temporarily follows the public road.

Road markings should be kept to a minimum along the cycleway. The provision of cycle symbols (M116) and pedestrian symbols (M111) need only be applied when the cycleway intersects with the public road, or other public rights of way.

Delineation between pedestrians and cyclists is not recommended on low volume shared facilities, however the segregation of pedestrians and cyclists is recommended on high volume shared facilities. It is possible to segregate pedestrians and cyclists using road markings however the provision of a vertical (i.e. kerb) or a horizontal (i.e. grassed verge) separation along with contrasting surfacing is the preferred method of segregation.

8.5 Lighting

Generally, cycleways will not be illuminated. Lighting should only be considered at crossings and close to and in built-up areas. The design and implementation of lighting should be carried out in accordance with BS EN 13201-ss 2:2003, Table 3.

Withdrawn

9. References

9.1 TII Publication (Standards) References

DN-GEO-03031 – Road Link Design

DN-GEO-03051 – Provisions for Cyclists and Pedestrians on Type 2 and Type 3 Single Carriageway National Roads in Rural Areas

DN-DNG-03022 – Drainage Systems for National Roads

DN-STR-03005 - Design Criteria for Footbridges

DN-GEO-03040 - Subways for Pedestrians and Pedal Cyclists. Layout and Dimensions

DN-REQ-03034 – Safety Barriers

DN-GEO-03036 – Cross Sections and Headroom

DN-GEO-03060 – Geometric Design of Junctions (Priority Junctions, Roundabouts, Grade Separated and Compact Grade Separated Junctions)

9.2 Other TII Publications

National Cycle Manual (National Transport Authority, 2011)

Traffic Signs Manual (Department of Transport Tourism and Sport, Dublin 2010)

Design Manual for Urban Roads and Streets (Department of Transport Tourism and Sport and Department of Environment, Community and Local Government, Dublin 2013)

9.3 Other documents

National Cycle Policy Framework 2009 – 2020 (Department of Transport)

Cycle by Design 2010 (Transport Scotland, 2011)

Design Manual for Bicycle Traffic (CROW, Netherlands, 2006)

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