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Transport Infrastructure Ireland

TII Publications

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Rural Cycleway Design (Offline & Greenway)

DN-GEO-03047
February 2025

DN Design

Standards

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TII Publications

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Contents

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

Date: February 2025

Amendment Details:

This document supersedes DN-GEO-03047 published in August 2022 with the following changes:

a) This document has been revised to include advice and requirements regarding the technical acceptance and design of structures for use on rural offline cycleways, including national and regional greenways. These amendments have been included in a new Chapter 8: Structures.

b) The content of Chapters 8-10 of the previous revision of this document have been moved to Chapters 9-11 to accommodate the inclusion of the new chapter as follows:

- Chapter 9: Rural Cycleway Monitoring & Evaluation *(formerly Chapter 8)*
- Chapter 10: Maintenance and Management *(formerly Chapter 9)*
- Chapter 11: References *(formerly Chapter 10)*

c) Various updates and minor amendments.

Contents Table

1. Introduction

1.1 Application

This Design Standard provides advice and requirements regarding the planning, design, and development of rural offline cycleways – including national and regional greenway infrastructure – which are funded through Transport Infrastructure Ireland (TII) and/or when TII is the Approving Authority, unless otherwise instructed by TII.

1.2 General

The *TII Project Management Guidelines* (PE-PMG-02041) and associated *Project Manager's Manual for Greenway Projects* (PE-PMG-02047) provide a framework for a phased approach to the management of the development and delivery of national and regional greenway projects from initiation through to delivery.

Rural offline cycleways and national and regional greenways necessarily integrate and interface with urban and rural transport infrastructure. Consequently, this Standard requires interfacing and shall be read and applied in conjunction with complementary design documents including, but not limited to, the *Cycle Design Manual*; the *Design Manual for Urban Roads and Streets*; Department of Transport Guidelines; and TII Publications (Standards and Technical).

The Designer shall take account of design integration and interface requirements associated with the complementary design documents outlined above and within **Figure 1.1**.

Standards & Guidelines – Interfacing Requirements	
• Design Manual for Urban Roads and Streets • Cycle Design Manual • Traffic Signs Manual • Strategy for the Future Development of National and Regional Greenways • Greenway and Cycle Routes Ancillary Infrastructure Guidelines • Code of Best Practice for National and Regional Greenways. • TII Publications (Standards and Technical) • PE-PMG-02047 – Project Manager's Manual for Greenway Projects.	• Active Travel Infrastructure adjacent to national roads shall be design in accordance with TII Publications, including; • DN-GEO-03030 – Design Phase Procedures for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes • DN-GEO-03031 – Rural Road Link Design • DN-GEO-03036 – Cross Sections and Headroom • DN-GEO-03060 – Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)

Figure 1.1 National Standards & Guidelines – Interfacing Requirements

The development of rural offline cycleways, including national and regional greenways, shall be plan and planning led, and the Designer needs to consider the level and extent of interventions to be provided for their particular location and context (e.g. demography, receiving environment, etc.).

Rural offline cycleways, including national and regional greenways, contribute and are central elements to the sustainability, safety, and efficiency of Ireland's national transport infrastructure.

Necessarily, their effective planning and design, including integration with existing transportation modes and the built environment, will be key to successful project development, delivery, and operation.

Rural offline cycleways, including national and regional greenways, can interact with areas of differing characteristics and contexts such as riversides, coastal, uplands, historical, and town and village transition zones and centres. This necessarily requires consideration to be afforded to determining design solutions appropriate to the environment.

1.3 Scope

This Standard applies to the development and delivery of new or improved rural offline cycleways, including national and regional greenways, which are funded through Transport Infrastructure Ireland (TII) and/or when TII is the Approving Authority, unless otherwise instructed by TII.

Where rural offline cycleways, including national and regional greenways, interface with the national, regional, and local road networks the requirements of complementary Standards including those outlined herein and presented in **Figure 1.1** shall be taken into consideration and apply.

In relation to provision of cycle and pedestrian infrastructure adjacent to national road infrastructure:

- Where the posted speed limit exceeds 60km/hr, the requirements of TII Publications (Standards and Technical) – including *DN-GEO-03031 – Rural Road Link Design*, *DN-GEO-03036 – Cross Sections and Headroom*, and *DN-GEO-03060 – Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions)* – shall apply.
- Where the posted speed limit is 60 km/h or less, the requirements of *DN-GEO-03084 - The Treatment of Transition Zones to Towns and Villages on National Roads* – including the application of the *Design Manual for Urban Roads and Streets* and *the Cycle Design Manual* – apply, taking cognisance of the requirements of TII Publications with respect to national road works.

1.4 Definitions

For definitions of general road elements referred to in this Standard, such as central reserve, grassed verge, hard shoulder, hard strip, etc., refer to *DN-GEO-03036 - Cross-sections and Headroom* and *DN-GEO-03031 - Road Link Design*. Particular definitions that apply to this Standard are as follows:

a) **Active Travel:** Walking, wheeling, and cycling for all users for all trip purposes where walking, wheeling, and cycling mean:[1]

   i) **Walking and Wheeling**: Engaging in the typical act of walking plus jogging, using mobility aids (i.e., manual and electric wheelchairs as well as motorised mobility scooters), and using non-motorised scooters; and

   ii) **Cycling**: Cycling using any type of cycle, such as bicycles, electric cycles, adapted cycles, and cargo cycles. Cycles should, except for specific situations, be treated as 'vehicles', not as 'pedestrians'.

[1] Walking and wheeling are of equal importance to cycling as they are much more commonly utilised modes; they form part of all trips, even those where the primary mode is the private vehicle or public transport.

b) **People Walking, Wheeling, and Cycling:** Pedestrians and cyclists, and other users (e.g., people with luggage, with children and pushchairs, with disabilities).

c) **Active Travel Infrastructure:** All types of pedestrian and cycle facilities for people walking, wheeling, and cycling.

d) **Ancillary Infrastructure:** Constructed features that provide added value to the cycle route and enhance the user's experience.

e) **Offline Facility:** Element of active travel network or rural offline cycleway catering for people walking, wheeling, and cycling that is not part of the road cross section (notwithstanding, potential sole designation as cycleway).

f) **Online Facility:** Element of active travel network or rural offline cycleway catering for people walking, wheeling, and cycling that is part of the road cross section. Online active travel facilities may be provided as on-road pavement or off-road pavement facilities:

   i) **Off-road Facility**: Facility that is physically segregated from the road pavement by, for example, a verge.

   ii) **On-road Facility**: Facility that forms part of the road pavement without physical separation or demarcation from the road / vehicular carriageway.

g) **Pedestrian Facilities:** All types of measures which improve conditions for people walking and wheeling, and include:

   i) **Footpath**: A path, separated from the road / vehicular carriageway by a kerb, for use by pedestrians which does not form part of the road pavement.

   ii) **Footway:** A path for use by pedestrians, separated from the road / vehicular carriageway by a verge, which does not form part of the road pavement.

   iii) **Bridleway:** A road (surfaced or unsurfaced) for use on foot or horseback.

h) **Cycle Facilities:** All types of facilities which improve conditions for people cycling.

   i) **Cycleway**: An offline public road reserved for the exclusive use of people cycling or people walking, wheeling, and cycling (see also definitions of 'Greenway' and 'Shared Use Active Travel Facility'). All mechanically propelled vehicles, other than mechanically propelled wheelchairs and electric bikes, are prohibited from entering except for the purpose of maintenance and access.

   ii) **Greenway:** A cycleway, or other, that caters for people walking, wheeling and cycling in a mainly recreational environment.

   iii) **Cycle Track:** A part of the road cross section, separated from the road / vehicular carriageway by a verge, which is reserved for the use of cycles and from which all mechanically propelled vehicles, other than mechanically propelled wheelchairs and electric bikes, are prohibited from entering except for the purpose of maintenance and access. A cycle track can be adjacent to a footway (see also definition of 'Shared Use Active Travel).

   iv) **Shared Use Active Travel Facility:** A cycleway, cycle track, or other that is provided for people walking, wheeling, and cycling.

   v) **Cycle Lane**: Part of the road pavement reserved for use by cycles. The cycle lane forms part of the road pavement, and it is thus located within the contiguous road surface. It is not a cycleway nor cycle track and therefore, generally not for the exclusive use of cycles.

vi) **Cycle Network:** A defined collection of routes which connect key origins and destinations in a specified area for cyclists.

i) **Designer:** The entity responsible for undertaking and/or ensuring that the project is capable of being constructed to be safe, can be maintained safely and complies with all relevant safety and health legislation.

j) **Express Road:** An Express Road is a legal category of road designed for motor traffic, which is accessible primarily from interchanges or controlled junctions and which:

i) Prohibits stopping and parking on the road pavement; and

ii) Does not cross at grade with any railway or tramway track.

k) **Code of Best Practice for National and Regional Greenways (Code of Practice) DoT, 2021:** The Code provides information on planning, designing, and constructing of Greenways. It includes an overview of the public consultation processes, constraints study, route selection and statutory processes. It also includes information on the use of State-owned lands and the acquisition of private lands for developing Greenways.

l) **'Five S' Criteria: Strategy for the Future Development of National and Regional Greenways** The Five S criteria are outlined in the Government's Strategy for the Future Development of National and Regional Greenways. They are "Scenic, Sustainable, Substantially Segregated and Shared use, offer lots to See and do and Strategic". Designers shall take cognisance of these criteria whilst undertaking project appraisal in line with TII Publications (Standards and Technical). However, these are not headline project appraisal criteria.

m) **Maintaining Organisation:** The organisation which will be responsible for the maintenance of the road or other after construction.

n) **Road Authority:** The authority responsible for the road construction or improvement scheme. For roads, the Road Authority is the Maintaining Organisation. Refer to GE-GEN-01005 which outlines who the Road Authority is for various projects.

o) **Rural Area**: an area outside of a built-up area which is generally controlled by speed limits greater than 60 km/h.

p) **Rural National Road:** A road, generally, outside of built-up areas with a speed limit of greater than 60km/h, including:

i) Single Carriageway roads.

ii) All-purpose Dual Carriageway roads; or

iii) Motorways.

q) **Transition Zone:** Generally, element of road within a 50 to 60 km/h posted speed limit zone passing through areas of low density residential and commercial development and/or industrial areas.

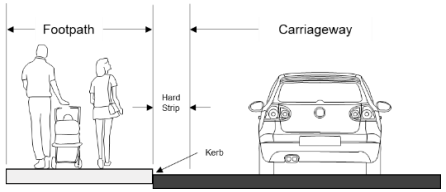
r) **Urban Roads and Streets**: Streets and roads with a speed limit of 60 km/h or less (DMURS, 2019).

s) **Green Blue Infrastructure**: high quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings. (European Union (2013): Building a Green Infrastructure for Europe - http://ec.europa.eu/environment/nature/ecosystems/docs/green_infrastructure_broc.pdf.

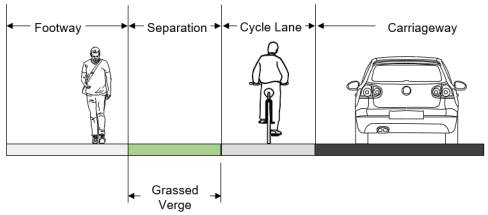
t) **Structures:** Constructed features along rural cycleways – including greenways – such as bridges, boardwalks, retaining walls, tunnels, culverts and subways that form part of the cycleway.

Table 1.1 Facility Cross Sections

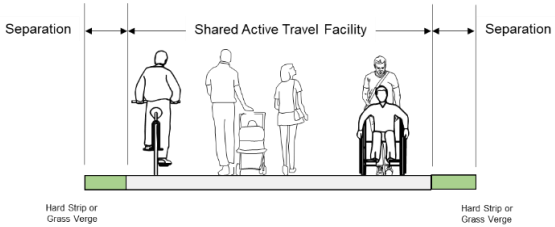
Footpath
A path, separated from the road / vehicular carriageway by a kerb, for use by pedestrians which does not form part of the road pavement.



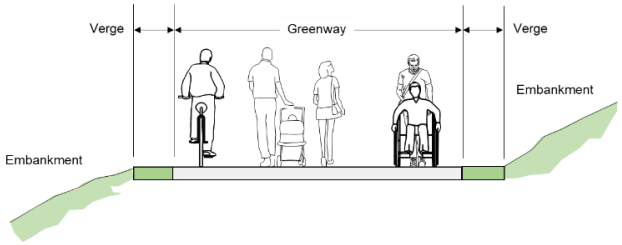
Footway
A path for use by pedestrians, separated from the road / vehicular carriageway by a verge, which does not form part of the road pavement.



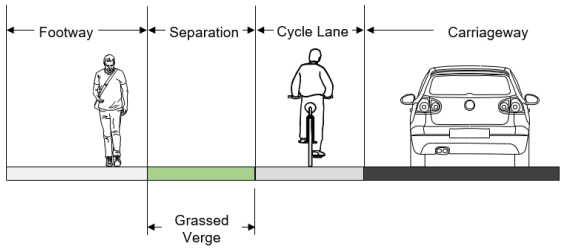
Shared Active Travel Facility
A cycleway, cycle track, or other that is provided for people walking, wheeling, and cycling.



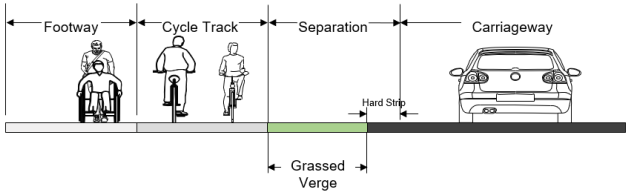
Greenway
A cycleway, or other, that caters for people walking, wheeling and cycling in a mainly recreational environment.



Cycle Lane
Part of the road pavement reserved for use by cycles. It is not a cycleway nor cycle track and therefore, generally not for the exclusive use of cycles (TII departure required).



Cycle Track
A part of the road cross section, separated from the road / vehicular carriageway by a verge, which is reserved for the use of cycles and from which all mechanically propelled vehicles, other than mechanically propelled wheelchairs and electric bikes, are prohibited from entering except for the purpose of maintenance and access.



1.5 Departures from Standard

The requirements contained in this document represent the various criteria and levels of provision whose incorporation in the design would achieve a desirable level of performance in terms of safety, operability, economic impact, environmental integration, and sustainability return. Design parameters in excess of the requirements presented in this Standard may, as appropriate, be considered by the Designer particularly where - by doing so - the project's development is enhanced serving to meet the requirements of cyclists, walkers, and other users.

With due care and regard, designs can be developed which meet the requirements outlined within this Standard. However, at some locations, it may not be possible to provide minimum design parameters owing to site constraints, economic constraints, or environmental constraints. In such cases, sufficient advantages might justify either a Relaxation within the Standards or, in more constrained locations, a Departure from the Standards. 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.

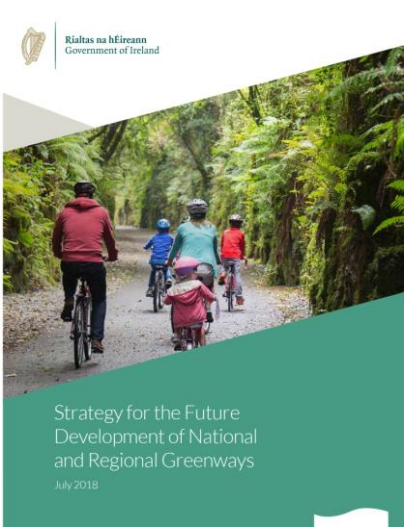
See GE-GEN-01005 - Departures from Standards for information, guidance, and requirements on Relaxations and Departures.

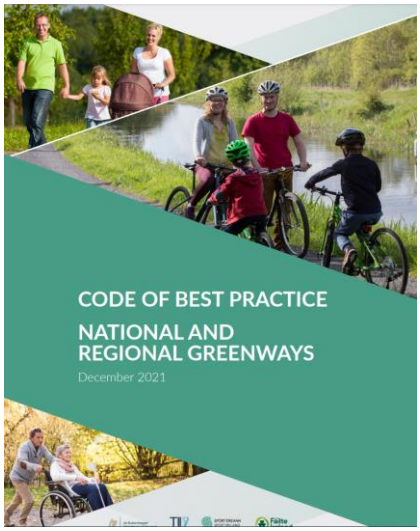
For National and Regional Greenway projects, any proposals to depart from the requirements of this document should be raised formally with the relevant TII Senior Engineering Inspector.

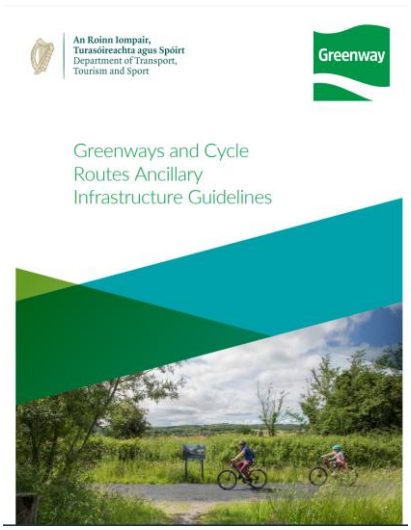
1.6 Note

Please note that all drawings and images in this Standard are diagrammatic only. For example, no reliance should be placed upon them for road marking layouts for which reference should be made to the Traffic Signs Manual.

2. Planning for Rural Cycleways (Offline & Greenway)







2.1 Scope and Objectives

Appropriate planning and design considerations need to be embedded in all stages of a rural offline cycleway project development from inception through to construction and operation. This is necessary to create environments where walking, wheeling, and cycling are feasible and attractive options facilitating a shift in the Irish population's mindset towards more sustainable transport modes. Moreover, appropriate planning and design considerations enable rural offline cycleways, including national and regional greenway infrastructure, to act as economic drivers in local areas – including enhancing tourism potential and the efficient movement of people and goods.

Guidance around the setting of detailed project objectives is contained within TII's Project Appraisal Guidelines suite of documents.

2.2 National Transport Policy

The Department of Transport's *National Investment Framework for Transport in Ireland* provides the strategic framework for future investment decision making in land transport by communicating modal hierarchies and intervention hierarchies (maintain, optimise, improve, new).

The Department of Transport's *National Sustainable Mobility Policy* sets out a strategic framework to 2030 for active travel (walking and cycling) and public transport journeys to help Ireland meet its climate obligations by centring upon safe, sustainable, green, and integrated mobility. The various climate action plans also detail ambitious decisive actions to reduce greenhouse gas emissions and to create a greener economy.

Ireland's transport policy is centred around the efficient movement of people and goods and ensuring increased accessibility for all users of the transport network. A strong transport system enhances competitiveness, sustains economic progress, promotes balanced regional development, and contributes to social cohesion. This transport system should be inclusive of people walking, wheeling, and cycling and should place such users at the top of the hierarchy of road users as outlined within the aforementioned Irish Department of Transport publications.

The *'avoid-shift-improve'* approach will be central to transport and mobility infrastructure planning. A key element of this approach is an objective to shift carbon-intensive journeys to zero carbon modes such as walking, wheeling, and cycling.

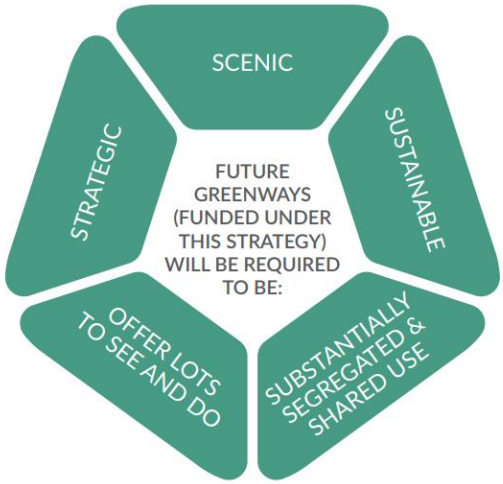
Necessarily, to encourage more sustainable travel patterns and safer road networks, the Designer must place people walking, wheeling, and cycling at the apex of consideration as part of transport and mobility infrastructure planning.

2.3 Strategy for the Future Development of National and Regional Greenways

The Department of Transport published the *Strategy for the Future Development of National and Regional Greenways* in 2018. The objective of this strategy is to assist in the strategic development of nationally and regionally significant greenways in appropriate locations constructed to an appropriate Standard to deliver a quality experience for all greenways users.

The delivery of 'a quality experience' of an appropriate Standard should not be confused with the delivery of 'a Standardised experience'. National and regional greenways should ultimately reflect the diversity of landscapes and places in which each project is uniquely set.

National and regional greenways funded under this strategy are required to be Scenic, Sustainable, Substantially Segregated and Shared Use, Strategic, and offer lots to See and do ('Five S' criteria).



Strategy for the Future Development of National and Regional Greenways, 2018.

2.4 Code of Best Practice – National and Regional Greenways

The Department of Transport, in combination with Transport Infrastructure Ireland (TII) and partner and stakeholder organisations, published the *Code of Best Practice – National and Regional Greenways* in 2021. This code applies to the delivery of national and regional greenways. The code acknowledges the important role of farmers / landowners in the development process and outlines the procedures to ensure that they are treated fairly and equitably.

The code provides information on the planning, designing, and constructing of national and regional greenways. It includes an overview of the public consultation processes, constraints study, route selection and statutory processes. It also includes information on - and an objective to maximise - the use of State-owned lands and information on the acquisition of private lands for developing national and regional greenways.

2.5 Project Appraisal

Transport Infrastructure Ireland's Project Appraisal Guidelines (PAG) incorporate the requirements of project appraisal which are set out in the Public Spending Code and transport sectoral specific guidelines.

Rural offline cycleways, including national and regional greenways, shall undergo project appraisal in line with TII PAG *Unit 13.0 - Appraisal of Active Modes* and the broader suite of TII Project Appraisal Guidelines including, but not limited to, *PAG Unit 4.0 – Consideration of Alternatives and Options*.

2.6 Public Transport Integration

Providing coherent and connected cycle infrastructure and interventions to service public transport plays a vital role in the attractiveness of both modes. Connectivity to public transport and associated ancillary infrastructure such as safe and secure cycle parking is important, as it may serve to encourage and enable people to travel further distances to get to where they need to go without depending on private cars.

The integration of rural cycleways, including national and regional greenway infrastructure, to cater for linkages to and from public transport should be considered during their development, including integration with the National Transport Authority's (NTA) bus and rail transport plans.

2.7 Park and Cycle

High density cycle parking may be appropriate at trailheads which connect with public transport interchanges or at particular locations along a route.

Existing parking at major trailheads may be examined for suitability in terms of capacity and infrastructure – such as pavement, lighting, etc. The option to use existing car parking for cycleway parking such as existing parking in Park and Ride sites, edge of town employment areas, and tourist attraction parking may be considered.

2.8 Villages, Town, and Cities Integration

Many trip attractors and generators are located in urban centres (i.e. villages, towns, and cities) with many journeys to/from/within these areas. The provision of connectivity from such centres to rural offline cycleways, including national and regional greenway infrastructure, to cater for journeys in, to, and from villages, towns, and cities for multivarious purposes via connecting and integrating with urban transport plans (NTA, local authority) should be considered during the development of the project. In particular, such opportunity should be considered during the preparation of relevant land use and transport plans for these settlements and within the context of statutory development plans for the areas concerned.

2.9 Everyday Journeys

Rural cycle infrastructure, including National and Regional Greenways, can aid in servicing everyday journeys to and from trip attractors / generators including, but not limited to:

- Places of work and education;
- Health facilities;
- Shopping centres and streets;

- Religious buildings;
- Sport venues;
- Archaeological, landscape, and Heritage sites;
- Theatres and cinemas;
- Cafes, restaurants, and pubs;
- Public areas/parks;
- Residential areas.

2.10 Rural Cycleway (Offline & Greenway) Development Principles

In order to develop design Standards for rural offline cycling facilities promoting design which can accommodate all users as an amenity for physical activity and daily activities and contribute to health and wellbeing, there are a number of core and commonly recognised design principles that need to be implemented. The principles include: Coherence, Convenience, Directness, Safety, Comfort, Attractiveness and Access. Necessarily, each rural offline cycleway design should be site-specific, and features should reflect local uses, needs, and culture.

Coherence: Cycling infrastructure should form a coherent network which links origins and destinations in a logical way for all people who use them. Networks should be continuous and easy to navigate. 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. 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. Surface defects should not be allowed to develop to the extent that they become a hazard, and vegetation should be regularly maintained 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 cycles 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 cycle at the appropriate speed. Additionally, ancillary infrastructure such as the provision of rest areas enhances comfort and usability for less abled walkers and riders.

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 cycles, including those with panniers and trailers as well as trikes and recumbents. They should be designed so that anybody who may want to cycle on the network can do so safely and comfortably taking cognisance of the context and location. The cycle route may be provided into and through areas normally inaccessible to motor vehicles, such as parks and other motorised vehicle restricted areas, if possible.

3. Nature and Form of Rural Cycleways (Offline & Greenway)

Waterford Greenway

3.1 General

The development of rural offline cycleways, including national and regional greenway infrastructure, may comprise a mixture of new infrastructure - greenfield or brownfield; existing infrastructure – requiring upgrading or enhancement; and existing local or undesignated road infrastructure (requiring departure approval) which may require measures to make the route more suitable for inexperienced cyclists. Consequently, rural offline cycleways may be made up of any, or all, of the following:

a) Cycleways, as outlined herein;

b) Utilisation of existing infrastructure [2]:

   i) Existing cycle facilities;

   ii) Existing road – including unclassified roads - infrastructure (which may require measures to make the route more suitable for inexperienced cyclists);

   iii) Service roads, maintenance tracks, etc;

   iv) Disused railway infrastructure.

As highlighted, rural offline cycleways and national and regional greenways necessarily integrate and interface with urban and rural transport infrastructure. Consequently, the Designer shall take cognisance and due care in designing the integration of rural cycleway to urban cycle and active travel networks and the urban environment generally.

Moreover, when determining appropriate facilities, it is necessary to provide continuity with respect to level of provision. That is, for example, an offline shared facility cannot terminate via abrupt transition to a footway or to an existing road. Regard shall be had to providing coherence and connectivity for cycleway users at interaction points.

[2] Where existing infrastructure is part of a National Road Corridor, such infrastructure shall be designed in accordance with the TII geometry suite of publications as outlined within Section 1 herein.

3.2 Utilising Existing Infrastructure

A range of existing infrastructure – be it abandoned, disused, redundant, or serving alternate functions at present – may be suitable for use as a rural offline cycleway subject to evaluation, enhancement, and engagement with landowners and stakeholders. Additionally, as required, it is necessary to consider legislative and heritage requirements (e.g. protected structure status, seeking Ministerial consents under National Monuments Act, etc). Such infrastructure includes, but is not limited to:

a) Abandoned, disused, or redundant railway lines.

b) Canal towpaths.

c) River navigation schemes.

d) Forest roads.

e) Flood relief schemes and embankments; and

f) Rail, river, road, gas, and electrical maintenance paths.

g) Historic structures, archaeological, and other heritage sites.

3.2.1 Abandoned, Disused, or Redundant Railway Lines

Before any potential consideration of retrofitting or redesign of an abandoned, disused, or redundant 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 or redundant lines, the ownership of the full extent of the lands required should be clearly established, as parties other than Iarnród Éireann and Bord na Móna may have established rights.

3.2.2 Canal Towpaths

The provision of cycleways along canal towpaths under the control of Waterways Ireland requires the approval of Waterways Ireland. It is essential that before a canal towpath be considered for use as a cycleway that consultation is undertaken with Waterways Ireland and their consent received. Conditions of use and available space along the canal system varies. Consequently, via consultation with Waterways Ireland it is necessary to establish any restrictions and conditions they may have to consider during project development. Considerations associated with the canal system include, access control measures, available width through deep cuttings, the provision of edge protection, the suitability of existing embankments to accommodate cycleways, and ongoing maintenance and operation requirements (cycleway).

3.2.3 River Navigation Schemes

The provision of cycleways along river navigation schemes may present for consideration. In such instances, the Designer shall engage with the appropriate local authority to obtain permission and establish any restrictions and conditions they may have to consider during project development. Consideration shall also be given to the necessary set back required from the riverbank to protect and maintain the riparian strip.

Whilst limited to the urban environment, Designers may have regard and reference to Inland Fisheries Ireland's guidance *Planning for Watercourses in the Urban Environment*. It must be reiterated that suitably qualified environmental experts shall be engaged when undertaking Design adjacent watercourses.

Additionally, Designers shall refer to the requirements and guidelines available within TII's environmental and construction guidelines, including *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*[3].

3.2.4 Forest Roads, Bord Na Móna Infrastructure

The provision of cycleways through forestry in the ownership of Coillte or via railway corridors in the ownership of Bord Na Móna will require their permission and integration with their strategies with respect to the future management and development of cycleways or greenways within their lands.

Lands currently made available as pedestrian trails through forested areas may not be suitable 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 which are funded through Transport Infrastructure Ireland (TII) and/or when TII is the Approving Authority, unless otherwise instructed by TII, are to be designed in accordance with this Standard.

3.2.5 Flood Relief Schemes / Maintenance Paths (Utility / Infrastructure Operator)

The provision of cycleways as part of, or complementary to, flood relief schemes or along maintenance paths will require coordination, agreement, and development consent in partnership with the requisite authority – be it a local authority, a state agency such as the Office of Public Works, or a utility organisation. The Designer shall engage with the appropriate authority to obtain permission and establish any restrictions and conditions they may have to consider during project development.

3.2.6 Historic Structures, Archaeological and other Heritage Sites.

There may be opportunities during the design of a rural offline cycleway, including national and regional greenways, to utilise historic structures (e.g. bridges, viaducts and indeed archaeological and heritage sites). In such instances the Designer shall engage with the requisite authorities as early as possible in the process. For sites in state care the National Monuments Service and the Office of Public Works shall be contacted. For sites listed on the Record of Monuments and Places and the Sites and Monuments Record, the National Monuments Service shall be contacted. For bridges and other infrastructure included on the Record of Protected Structures, the local authority shall be engaged. Such sites and places may also provide interesting waypoints or indeed destinations. Designers shall refer also to the requirements for structures contained within Chapter 8 of this document.

3.3 Rural Cycleways Adjacent to National Road Infrastructure

Rural cycleways, including national and regional greenway infrastructure, may interact with national road infrastructure in both rural areas (outside of a built-up area which is generally controlled by speed limits greater than 60km/h) and transition zones (generally element of national road within a 50 to 60km/h posted speed limit zone).

The permissible forms of cycle provisions are outlined in **Table 3.1** below.

[3] Available at https://www.tii.ie/technical-services/environment/.

Table 3.1 Minimum Provision for New Active Travel Infrastructure on Rural National Roads

Speed Limit (kph)	Motor Traffic Flow (AADT--Average Annual Daily Traffic)	Active travel infrastructure on rural national roads
60 and over	All flows	Cycleway, greenway, shared use active travel facility, cycle track, Footway (refer Section 1 for definitions).
50 - 60 (transition zone areas)	All flows	Above plus requirements of DN-GEO-03084 – The Treatment of Transition Zones to Towns and Villages on National Roads.

*In interpreting **Table 3.1**, the following shall also be noted.*

Notes:

1. *Motorway or Express Road offline facilities shall be located outside lands adjoining the Motorway or Express Road in order to prevent direct access to the Motorway or Express Road as required under the Roads Act, 1993.*
2. *Where adjacent facilities are not provided, provision may be remote from the road on a suitable new route in accordance with the requirement of TII DN-GEO-03036, within the maintenance strip or verge of the road, or using a suitable existing alternative route (the latter requires a departure from TII Standards).*
3. *The utilisation of cycle lanes is limited to where they already exist, new cycle lane provision requires TII departure approval.*
4. *Appropriate horizontal separation from the edge of the running lane of National Roads in a rural context is required per **Table 3.2** below.*

Table 3.2 Minimum Horizontal Separation (Rural National Road Infrastructure)

Speed Limit (kph)	Desirable Minimum Horizontal Separation - Rural (m)
50	0.5
60	1.0
80	2.0 (including any hard strip) 1.5 (excluding any hard shoulder)
100	2.5 (including any hard strip) 2.0 (excluding any hard shoulder)

Notes:

1. *Utilisation of horizontal separation distances below the desirable minimum values are a departure from Standard.*
2. *Horizontal separation may be planted to mitigate against noise, pollution and visual impact taking cognisance of the All-Ireland Pollinator Plan and maintenance considerations.*
3. *Horizontal separation may include screening fencing subject to geometric considerations (stopping sight distance), safety barrier considerations (passive safety), and environmental or other considerations.*

3.4 Existing Local and Unclassified Road Infrastructure

In rural locations it may be necessary to use existing local or undesignated road infrastructure as part of the rural offline cycleway, including national and regional greenways. This may present in two principal guises; firstly, utilisation as part of the mainline cycleway (including national and regional greenway) corridor and secondly, utilisation to provide connectivity from the mainline cycleway corridor to the surrounding environs (e.g. link routes).

Where the use of existing local or undesignated road infrastructure, including unclassified roads, forms part of the mainline cycleway corridor, **Departure approval is required from TII** (where vehicular traffic will mix with cyclists and pedestrians). As part of the required Departure application, the Designer shall outline and demonstrate the measures which are to be implemented to make the intervention suitable for inexperienced cyclists.

The Designer, when evaluating as to whether existing local or undesignated road infrastructure will form part of the overall project, shall take due care in evaluating and identifying appropriate measures. In relation to corridors, measures may include but are not limited to the following:

- Introducing / utilising special speed limits;
- Speed control and management, via enforcement and design interventions (intuitive layouts) and self-enforcing environment for drivers, where the priority of walkers and cyclists is readily apparent;
- Utilising appropriate regulatory and advisory traffic signage to communicate road functionality. For example:
  - The rural speed limit sign (RUS041A)
  - Shared space signage
  - Regulatory signage to support special speed limits
- Filtered permeability, such as local access restrictions and diversionary routes
- Provision of refuge areas, to enhance safety of interactions between users. For example, widening to enable agricultural traffic to pass safely (i.e. passing bays)
- Reallocation of road space, such as road narrowing and changed priorities (e.g. shuttling movements)
- Designation or re-designation of existing infrastructure as cycleway
- Apt supporting interventions and infrastructure, such as lighting
- Regard and reference shall be had to the Traffic Management Guidelines (https://assets.gov.ie/30277/e3faaeaef9f74832947150bd6de1fae2.pdf)

4. Design Considerations

This chapter outlines the design criteria to be used when designing new or improved rural offline cycleways, including national and regional greenway infrastructure.

Rural offline cycleways, including national and regional greenway infrastructure, do not exist in isolation and indeed many are – or will be - located in areas of high landscape value and sensitivity, culturally historic areas, etc. Design of rural offline cycleways should necessarily take account of local context, which will present opportunities for enhancing design, operation, and ultimately user experience.

4.1 Segregation of Walking & Wheeling from Cycling

Shared use infrastructure will be provided as the default when rural offline cycleway need is identified - in particular where the volumes of pedestrians will be low (less than 100 people per hour per metre width of unsegregated shared facility) and/or where spatial constraints constrain provision.

It is necessary to consider segregating pedestrian and cyclists (typically in the urban environment) where flow volumes warrant same (greater than 100 pedestrians per hour per metre width of unsegregated shared facility). Refer to **Table 4.1** below which indicates the type of arrangement that may be suitable on the basis of density of pedestrian activity.

The density of pedestrians (users/hr/m) metric is based on the CROW Design Manual for Bicycle Traffic. It is a publication on bicycle transportation planning and engineering from the Netherlands. It is considered as best practices for cycleway design worldwide.

Table 4.1 Pedestrian flow density

Density of Pedestrians (users/hr/m) *	Recommended Arrangement
< 100	Shared use is usually appropriate (cycles give way)
101 – 199	Segregation may be considered
> 200	Segregation should be considered

*Based on CROW, Design Manual for Bicycle Traffic, 2016.

Where separation of pedestrian and cyclist flows is deemed necessary and appropriate, a minimum level of separation should be provided through one of the following means:

- A level difference of at least 60 mm (cycleway raised)
- A raised, bevelled kerb (cycleway raised) or
- A grassed verge of minimum width 500mm (incorporating landscaping treatment as necessary).

Interaction of pedestrian and cyclist flows should be considered on links and at crossings. Where a route for pedestrians must cross a route for cycles, this crossing should be examined carefully to ensure that interfacing is safe for all users. Relating to the latter, it is necessary to reference and afford regard to the requirements of the Cycle Design Manual.

4.2 Safety and Quality Audits

Delivery of projects that are suitable and safe is critical and it is important that safety audits and quality audits are undertaken to demonstrate that appropriate consideration has been given to all the relevant aspects of the design.

4.2.1 Safety Audit

Safety audits of rural offline cycleways, including national and regional greenways, shall be undertaken in accordance with the requirements and scheduling of GE-STY-01024 – Road Safety Audit where the rural offline cycleway interacts with the road network.

4.2.2 Quality Audit

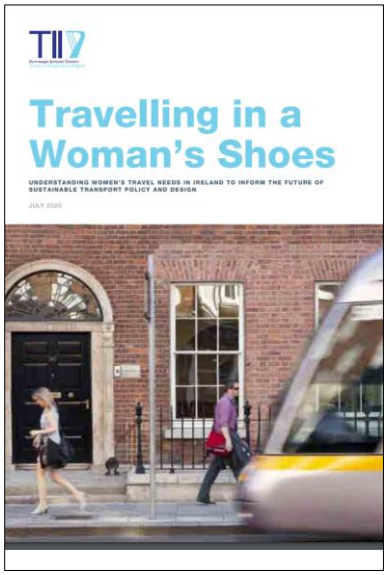
Quality audits should be undertaken to demonstrate that appropriate considerations have been given to all the relevant aspects of rural cycleway design from a user perspective.

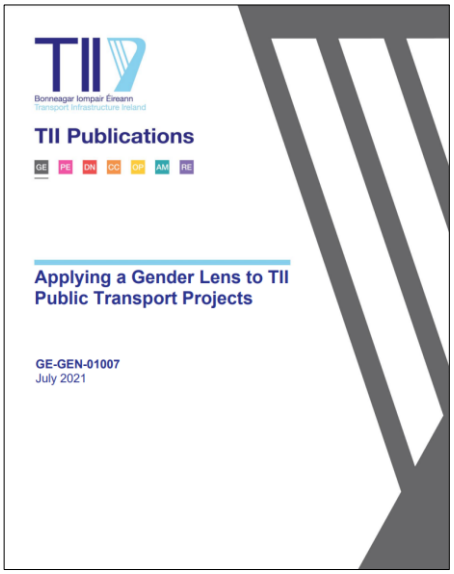
Depending on the nature of the project, focus areas for the quality audit of rural offline cycleways shall include:

- Non-motorised user considerations
- Walkability considerations
- Accessibility considerations
- Cycleway considerations – e.g. visual quality, functionality, materials, etc
- Design review

In relation to rural offline cycleways, including national and regional greenways, quality audits shall be undertaken at the Stage 1, Stage 2, and Stage 3 road safety audit points. A quality audit report shall be prepared at these intervals summarising the issues raised. Items should be presented as a series of recommendations and considerations. Refer to **Appendix A** for quality audit requirements.

4.3 Inclusive Design / Safety and Security





Safety and the perception of safety are shaped by the design (hard and soft design measures) of transport infrastructure and public space, cultural context, socioeconomic factors, security, confidence in reporting, available emergency response mechanisms, and the 'last mile' journey home.

Lighting and high visibility at crossings, terminations, and transition zones indirectly improves safety and the perception of safety. Judicious use of wayfinding and directional signage also serve to improve safety on cycleways. The perceived safety of users, however, extends beyond design and operation measures such as the inclusion of the foregoing or CCTV or other in an area, it is cumulatively about how a space feels to users in the context of design, sense of place, community, and passive surveillance. These, allied with design - although not an exhaustive list - are important to delivering inclusive design.

Consideration is required during the development of rural cycleways to maximise safety and the perception of safety. In this regard, reference and regard may be had to the following TII documentation when developing rural offline cycleways, including national and regional greenways. These are *TII's Travelling in a Woman's Shoes* publication and *TII Publication GE-GEN-01007 Applying a Gender Lens to TII Public Transport Projects*. The latter contains design guidance that supports the implementation of a design that accommodates the needs of people with respect to enhancing personal security, better understanding of their travel needs (particularly, those who are responsible for care giving duties), and the inclusion of public life into the design.

4.4 Rural Cycleway (Offline & Greenway) Layout Design Requirements

As noted, this Standard shall be read and applied in conjunction with complementary design documents – both external and internal to TII Publications (Standards and Technical).

In relation to TII Publications (Standards and Technical), the Designer shall take account of integration and interface requirements associated with, including but not limited to, the documents outlined within **Figure 4.1**. Necessarily, these Standards and guidelines shall be read and applied in conjunction with this Standard (DN-GEO-03047) and the outline list of Standards and guidelines outlined within **Figure 1.1** (for further guidelines, including environmental guidelines, refer to https://www.tiipublications.ie/ and https://www.tii.ie/technical-services/environment/).

Standards & Guidelines – TII Publications

- Active Travel infrastructure adjacent to national roads shall be designed in accordance with TII Publications including:
  - DN-GEO-03030 - Design Phase Procedure for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes.
  - DN-GEO-03031 - Rural Road Link Design.
  - DN-GEO-03036 - Cross Sections and Headroom.
- DN-GEO-03044 - The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts.
- DN-GEO-03060 - Geometric Design of Junctions (priority junctions, direct accesses, roundabouts, grade separated and compact grade separated junctions).
- DN-GEO-03084 - The Treatment of Transition Zones to Towns and Villages on National Roads.
- PE-PMG-02047 - Project Manager's Manual for Greenway Projects
- DN-STR-03005 - Design Criteria for Footbridges.
- DN-REQ-03034 - The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges.
- DN-GEO-03040 - Subways for Pedestrians and Pedal Cyclists Layout and Dimensions
- PE-PDV-02046 - Area Based Transport Assessment (ABTA) Guidance Notes
- PE-ENV-01101 - Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects - Overarching Technical Document.
- DN-LHT-03038 - Design of Road Lighting for National Roads.

Figure 4.1 TII Publications (Standards & Guidelines)

4.5 Rural Cycleway (Offline & Greenway) Design Criteria

This section provides design criteria for rural offline cycleways, including national and regional greenway infrastructure. **Table 4.2** tabulates key requirements with this expanded upon in the following subsections.

Table 4.2 Rural Cycleway (Offline and Greenway) Design Requirements

Design Heading	Parameter	Requirement	Standard / Section Reference
Design Speed	Approach to junction/obstacle	10km/h	**DN-GEO-03031**
	All cycleway facilities	30km/h	
	Long downward slope (steeper than 5% and longer than 150 m)	50km/h (adequate DSD and SSD required)	

Design Heading	Parameter	Requirement	Standard / Section Reference
Dynamic Sight Distance (DSD)	10km/h	15m	**Refer to Table 4.3 of this document**
	30km/h	65m	
	50km/h	110m	
Stopping Sight Distance (SSD)	10km/h	15m	**Refer to Table 4.4 of this document**
	30km/h	35m	
	50km/h	60m	
Horizontal Alignment	10km/h	4m	**DN-GEO-03031** **Refer to Table 4.5 of this document**
	30km/h	25m	
	50km/h (on downward slopes steeper than 5% and longer than 150m)	94m	
Vertical Alignment	Desirable Minimum	0.5%	**Refer to Table 4.6 of this document**
	Desirable Maximum	3%	
	One Step Below Desirable Maximum	5% (max 150m long)	
Surface Crossfall / Camber	Maximum Rate of Change	1%	**DN-GEO-03031**
	Minimum crossfall	1%	
	Maximum crossfall	3%	
	One Step Below Desirable Maximum (confined to short sections of the cycle route and should be preferably less than 100 metres in length)	5%	

Design Heading	Parameter	Requirement	Standard / Section Reference
Cross Section (information pertaining to cross section amends road type cross sections, including those outlined within **Table 3.1**)	Cycleway / cycle track / cycle lane (minimum)	2.0m – 5.0m	**DN-GEO-03036** **Refer to Table 4.8 of this document**
	Subways and under/over bridges	Varies	**DN-GEO-03040** **Refer to Table 4.9 of this document and Section 4.5.5**
	'Separation' distances (online facility)	Varies	**Refer to Table 3.2 of this document**
	Lateral clearances (fixed objects)	1.0m	**Refer to Table 4.7 of this document and Section 4.5.5**
Clearance and Headroom.	Subways	2.3m – 2.7m Greater required depending on access requirements.	**DN-GEO-03040** **DN-STR-03005** **Refer to Table 4.10 of this document**
Overtaking	**Refer to Dynamic Sight Distance.**		
Junction Visibility	'X' – Distance Desirable Min.	4.0m	**DN-GEO-03031** **DN-GEO-03060** **Refer to Table 4.12 of this document**
	X' – Distance One Step Below Desirable Min.	2.0m	
	'Y' – Distance.	Varies	**DN-GEO-03031** **DN-GEO-03060** **Refer to Table 4.13 of this document** **Refer to Table 4.14 of this document**
Overbridge / Underbridge Requirements	**Refer Section 4.5.5, Section 4.5.6, and Section 5.5.3.**		

Design Heading	Parameter	Requirement	Standard / Section Reference
Cycleway terminals	**Refer to Section 4.5.8 Rural Cycleway Terminals**		
Cycleway transitions	**Refer to Section 4.5.9 Rural Cycleway Transitions**		

4.5.1 Design Speed

Design speed requirements are provided below:

a) It is recommended that all cycleway facilities have a design speed of 30 km/h.

b) On approach to junctions and obstacles, a reduced design speed of 10 km/h is acceptable over short distances (SSD in advance + obstacle distance + SSD afterwards, in cases other than junctions).

c) On long downward slope sections (steeper than 5% and longer than 150 m), a design speed of 50 km/h should be implemented (adequate DSD and SSD are required).

4.5.2 Visibility Parameters

4.5.2.1 Dynamic Sight Distance (DSD)

Desirable minimum values for Dynamic Sight Distance are shown in **Table 4.3** below. 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 below are those covered by the cyclist in approximately eight seconds when travelling at the speeds shown.

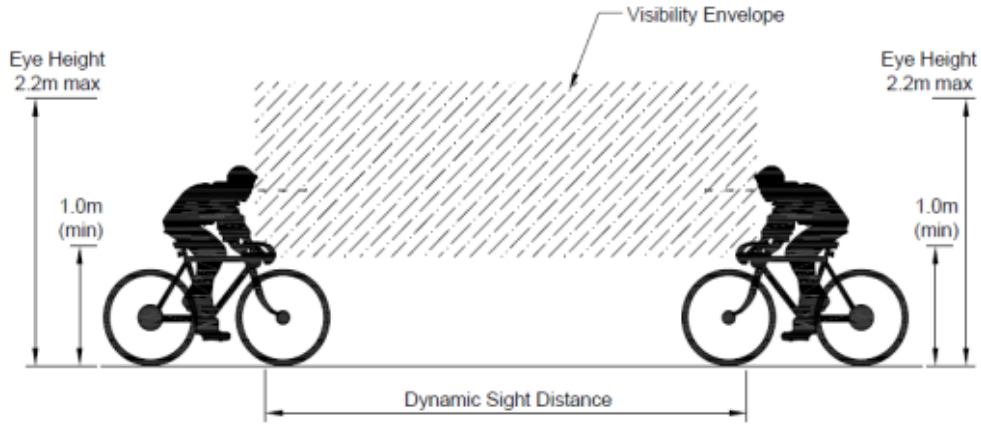


Figure 4.2 Dynamic Sight Distance Envelope

Table 4.3 Dynamic Sight Distance

DSD	10 km/h	30 km/h	50 km/h
	15 m	65 m	110 m

4.5.2.2 Stopping Sight Distance (SSD)

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 unbound surface tracks.*** SSD shall be achieved in line with **Table 4.4**. 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 paving.

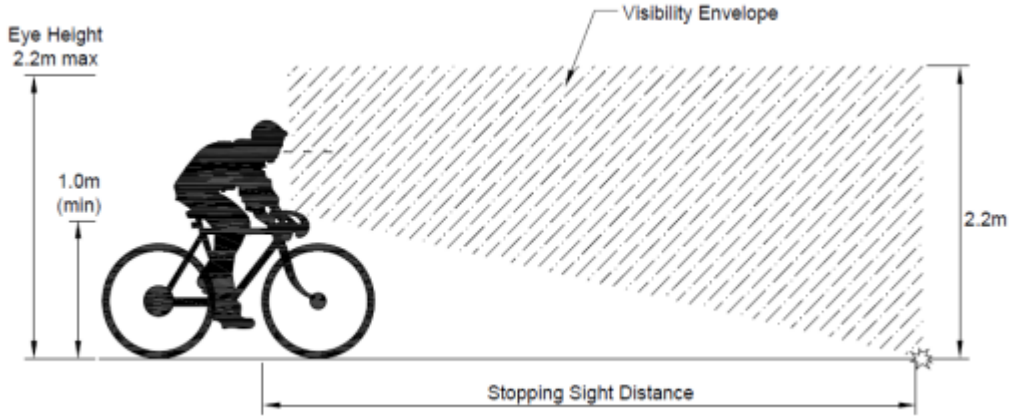


Figure 4.3 Stopping Sight Distance Envelope

Desirable minimum values for Stopping Sight Distance are shown in **Table 4.4** below.

Table 4.4 Stopping Sight Distance

SSD	10 km/h	30 km/h	50 km/h
	15 m	35 m	60 m

4.5.3 Geometric Alignment

4.5.3.1 Horizontal Alignment

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.

The desirable minimum horizontal radii for cycle facilities are outlined in **Table 4.5** below.

Table 4.5 Desirable Minimum Horizontal Radii for Cycle Facilities

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

4.5.3.2 Vertical Alignment

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.

Vertical alignment requirements for cycle facilities are summarised in **Table 4.6** below. The vertical profile allied with the horizontal alignment dictates the forward visibility.

Table 4.6 Vertical Alignment Requirements

Requirement	Gradients
Desirable Minimum	0.5%
Desirable Maximum	3%
One Step Below Desirable Maximum	5% (max 150m long)

The provision of gradients of 5% should be confined to short sections of the cycle route and should be less than 150 metres in length. Where long sections of steep gradients cannot be avoided due to existing topography, then mitigation measures shall be considered, e.g. resting places, increased widths to mitigate conflicts, etc.

Regard and reference should be had to the Irish Wheelchair Association's access guidelines for Trails, Greenways, and Public Parks when developing the project's vertical alignment.

For effective drainage, a resultant gradient (combined effect of longitudinal and transverse gradients) below 0.5% shall be avoided. For further information, refer to DN-GEO-03031.

4.5.4 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% confined to short sections of the cycle route and should be preferably less than 100 meters in length. The maximum rate of change is 1.0%.

The crossfall of cycle facilities should be directed towards the inside of a bend to prevent negative crossfall and its impact on cycle 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, in rural areas. 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.

4.5.5 Cross Section – Width Requirements including Lateral Clearance Considerations

Generally, cycleways will provide for pedestrians as well as cyclists as noted, unless a separate pedestrian footway, or segregation 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.

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 their 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 10 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.

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 lateral clearance / buffer between the object and the cycleway to avoid limiting the effective capacity of the cycleway. **Table 4.7** provides the minimum separation distance required where vertical objects are located adjacent to cycleways.

Table 4.7 Mandatory Minimum Lateral Clearance

Type of Edge Constraint	Desirable Min (m)
Vertical features (wall, fencing, etc.)	1.0

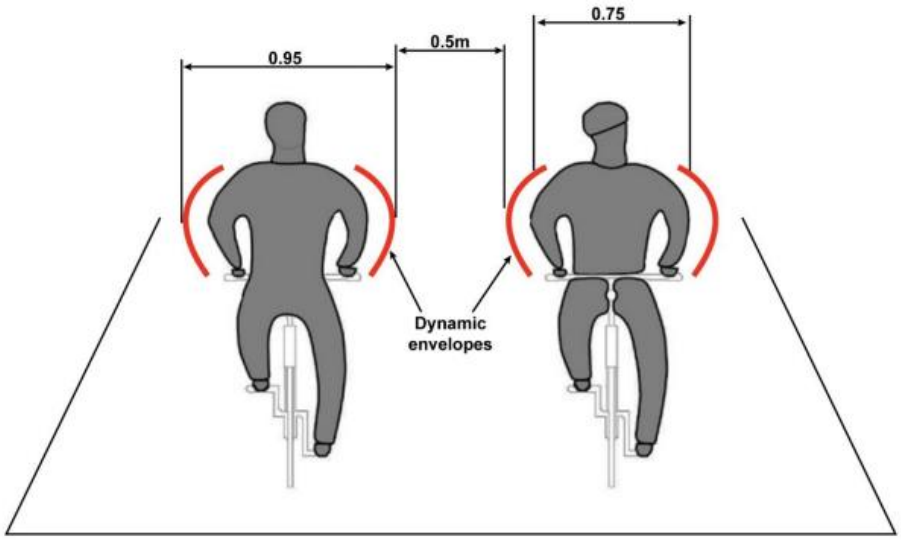


Figure 4.4 Width Requirements of Passing Cyclists

It is unusual for the dynamic envelope of any cycle to be any greater than 1.4m, and consequently, any one-way cycle lane or track should be at least 1.5m wide, or it will risk excluding some types of user. Additional width shall be provided if the expected flow of pedestrians and cyclists is high. Low volume facilities are those considered to attract less than 300 users an hour and high-volume facilities are those expected to attract greater than 300 users an hour.

Table 4.8 Mandatory Minimum Widths for Cycle Facilities

Cycleway Types	Volume	Minimum Width (m)
One Way Cycleway	Low Volume	2.0
	High Volume	3.0
Two Way Cycleway	Low Volume	3.0
	High Volume	4.0
	Low Volume	3.0

Cycleway Types	Volume	Minimum Width (m)
Shared Use Cycleway	High Volume	5.0

For minimum dimensions at underbridges and subways the Designer will refer to **Table 4.9.** Regard shall also be had to DN-GEO-03040.

Note:

1. *When determining minimum facility widths, the Designer shall take cognisance of operation and maintenance considerations including access and emergency service access.*
   *That is, facility width in excess of those outlined within **Table 4.8** may be required where the facility must provide access for emergency service providers, operation and maintenance equipment, local or farming access, continuity of level of provision, or other. The Designer shall prepare an emergency access plan for the facility to ensure that emergency service access is available to all areas of the cycleway.*

Table 4.9 Minimum Width Dimensions for subways and overbridges

Type of Subway / overbridge	Width (m)
All	• Width of structure to enable continuity of level of service (same width as cycleway mainline, widened as necessary owing to edge constraints). • Width of structure to take cognisance of sightline, and lighting requirements. • Width of cycleway to take cognisance of emergency access and maintenance requirements. • Attractiveness / context of proposed underpass / subway.

4.5.6 Clearance and Headroom

It is important that clear headroom is available throughout the rural offline cycleway. Headroom restrictions may result in cyclists banging their heads, thereby, 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.

A desirable minimum clearance / headroom shall be provided for cycleway facilities at structures. Refer to **Table 4.10** below**.** Further guidance is available within DN-STR-03005.

Note: When determining minimum facility clearances, the Designer shall take cognisance of operation and maintenance considerations including access and emergency service access (which are to be agreed with the appropriate representatives of the emergency services). That is, facility clearance in excess of those outlined within **Table 4.10** may be required where the facility must provide access for emergency service providers, operation and maintenance equipment, local or farming access, or other. The Designer shall prepare an emergency access plan for the facility to ensure that emergency service access is available to all areas of the cycleway.

Table 4.10 Minimum Height Dimensions for subways

Type of Subway	Length of Subway (m)	Minimum Headroom inside enclosure (m)
All	Site and context dependent	2.7 *

***** *Height dependent upon emergency access and maintenance requirements and site context – lighting, approach gradients, designing for cyclist attractiveness, etc.*

4.5.7 Junction Visibility

On a cycleway on the approach to a road, the desirable minimum setback shall be provided as shown in **Table 4.12** below extracted from DN-GEO-03060.

The appropriate visibility envelope 'Y' distance, depends on the design speed / posted speed of the road which the cycle facility is intersecting with as shown in **Table 4.13** below and DN-GEO-03060.

Downward deviations from the desirable minimum 'X' and 'Y' distances are departures from Standard.

Table 4.12 Values used as set-back distance (X) from edge of carriageway

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

The 'X'-distance shall be measured back along the centre line of the cycle facility from the edge of the road.

Table 4.13 'Y' Visibility distances from the minor road

Design Speed / posted speed of major road (kph)	'Y' Distance (m)
42	50
50	70
60	90
70	120
85	160
100	215

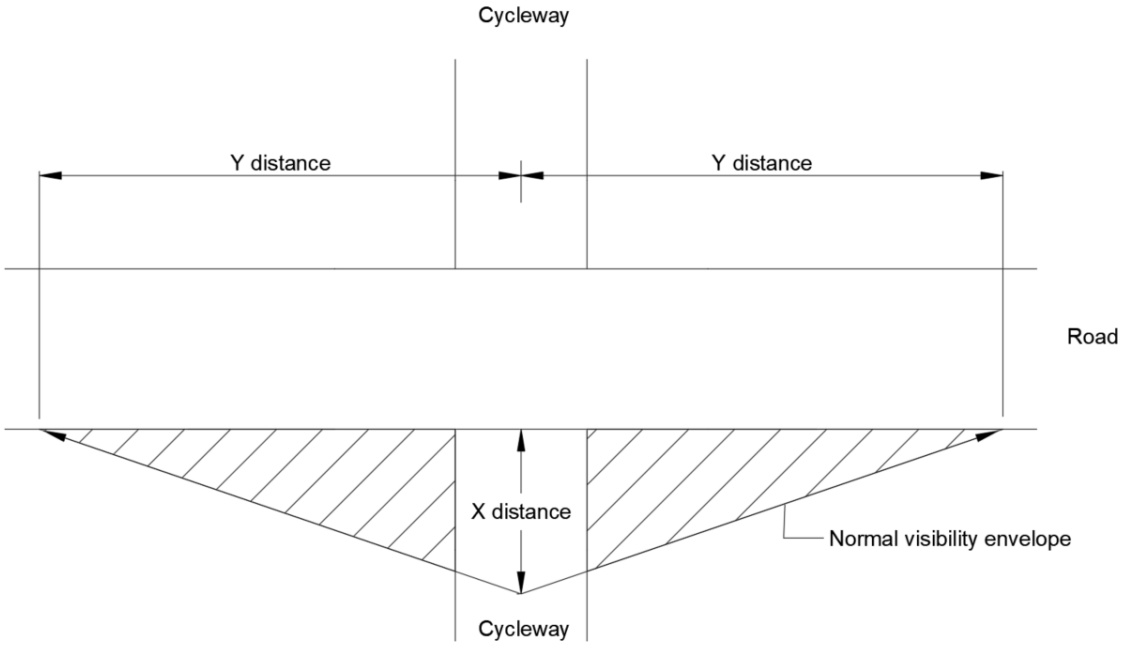


Figure 4.5 Visibility splays for junctions with roads and crossings of roads

4.5.7.2 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 will be the stopping sight distance (SSD) as shown in **Table 4.14** below.

Table 4.14 Cycleway Stopping Sight Distance

Design Speed (kph)	50 kph	30 kph	10 kph
Minimum Stopping Sight Distance (m)	60	35	15

4.5.8 Rural Cycleway Terminals

The termination of cycleways, including national and regional greenway infrastructure, requires careful consideration. Cycleways shall not be terminated abruptly or simply by abutting existing road infrastructure. Care and consideration are to be afforded to providing safe, coherent, and connected cycle infrastructure networks. At rural cycleway (including greenway) terminals it shall be necessary to:

- Provide safe and effective connectivity to the existing infrastructure, including where possible and appropriate other transport modes.
- Clearly identify that the rural cycleway (including greenway) is terminating and that users are joining existing infrastructure and can do so in a safe manner.
- At rural cycleway terminals, provide an area of minimum 25m^2 to enable users to dismount and as appropriate reorient and plan onward journeys. This requirement also applies to terminals which serve as trailheads.

- At rural cycleway terminals, where the rural offline cycleway (including greenway) terminates at existing road infrastructure, it is necessary for the rural offline cycleway to meet the existing road infrastructure at 90 degrees, whilst taking account of the foregoing.

4.5.9 Cycleway Transitions

As noted, rural offline cycleways including greenways may comprise a mixture of offline, online (separated from vehicular), and shared space interventions / existing Local and unclassified road infrastructure. Moreover, rural cycleways and national and regional greenways necessarily integrate and interface with urban transport infrastructure.

Owing to the range of potential scenarios it is not possible to exhaustively outline criteria for each potential interaction. However, the following principles shall apply:

- Transitions shall provide safe and effective connectivity.
- Transitions shall provide continuity with respect to level of provision. For example, an offline shared facility cannot abruptly terminate via transition to a footway. Regard shall be had to providing coherence and connectivity for cycleway users at interaction points.
- Networks should be continuous and easy to navigate. Routes should be continuous from an origin to a destination, easy to navigate and of a consistent quality. Cycle signage should be clear and logical at the approaches to and exits from junctions, transitions, etc.
- The requirements of national Standards and guidelines shall be considered, including but not limited to the Cycle Design Manual and the Design Manual for Urban Roads and Streets.
- In relation to national road transition areas, the requirements of DN-GEO-03084 – The Treatment of Transition Zones to Towns and Villages on National Roads shall be considered.
- Where rural cycleways integrate with TII Urban Renewal and Local Improvement Schemes, the requirements of DN-GEO-03030 – Design Phase Procedure for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes shall be considered.

4.6 Access Control

Where access control points are necessary, for example for safety reasons – such as controlling uncontrolled interface with vehicular traffic at local road crossings, they must be provided in a manner which ensures universal access (including for people with disabilities) and the free flow of cycling. When an access control point does not meet these requirements, it is not compliant and constitutes a departure from this Standard.

Further guidance is available within National (Infrastructure) Guidelines and Standards Group Circular 4 of 2022 titled *Access Control of Active Travel Facilities*.

Figure 4.6, Figure 4.7, and **Figure 4.8** outline permissible layouts for access control. **Figure 4.9** and **Figure 4.10** provides an outline arrangement for a farm / crossing.

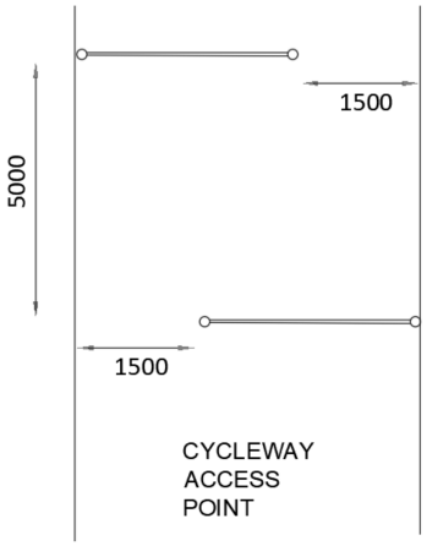


Figure 4.6 Staggered Approach Barrier

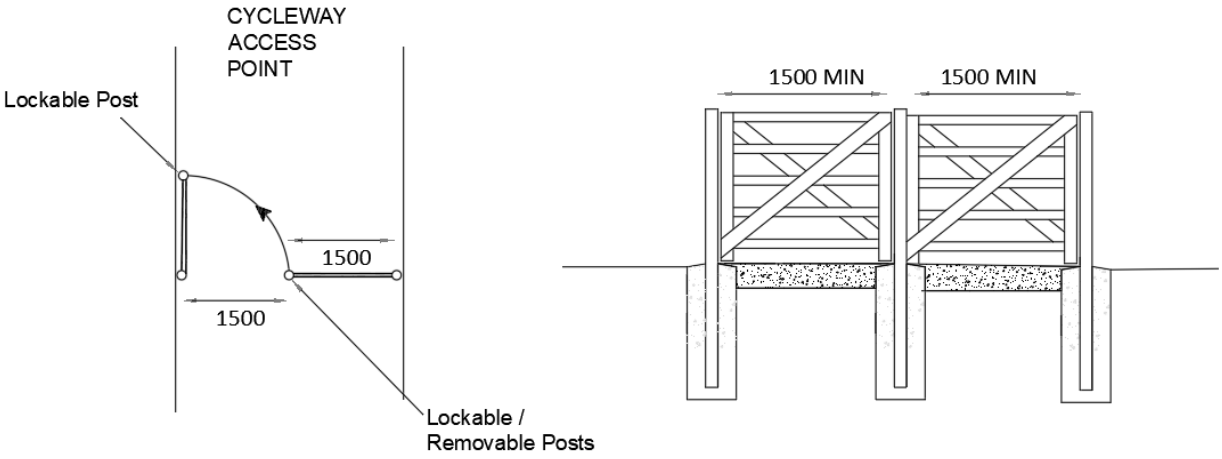


Figure 4.7 Access Gate

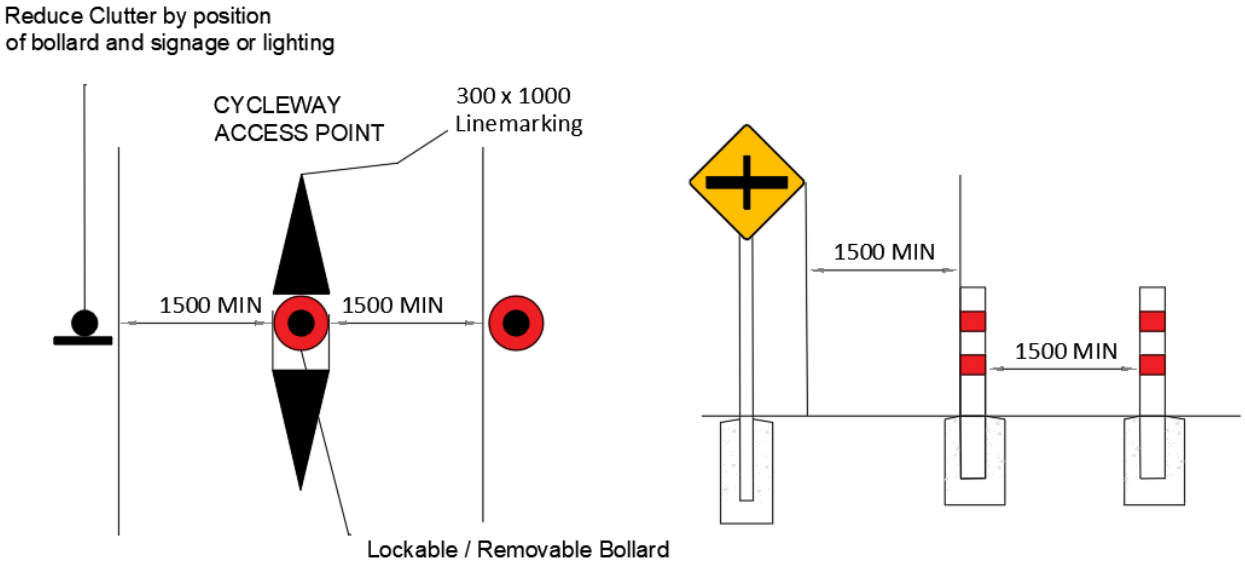


Figure 4.8 Access Bollards

When bollards are being installed, the following shall be considered:

- White road markings are to be provided in conjunction with bollards so as to highlight the bollard to travelling users during poor weather conditions. These markings shall be 1000mm in height x 300mm wide.
- To reduce clutter of signage and furniture, consideration shall be afforded to coinciding the position of bollards and street signage or lighting.
- Where the width of a facility is greater than 3m, the positioning of bollards shall be such that clear access points of 1.5m are maintained.
- Visual contrast between any bollard and the corridor surfacing or landscape is required. This shall include the provision of appropriate reflective surfacing on the bollard.
- Bollards shall be minimum 1000mm in height from the finished corridor surfacing.
- The provision of demountable bollards shall be considered where maintenance access is required, or as otherwise identified as necessary.

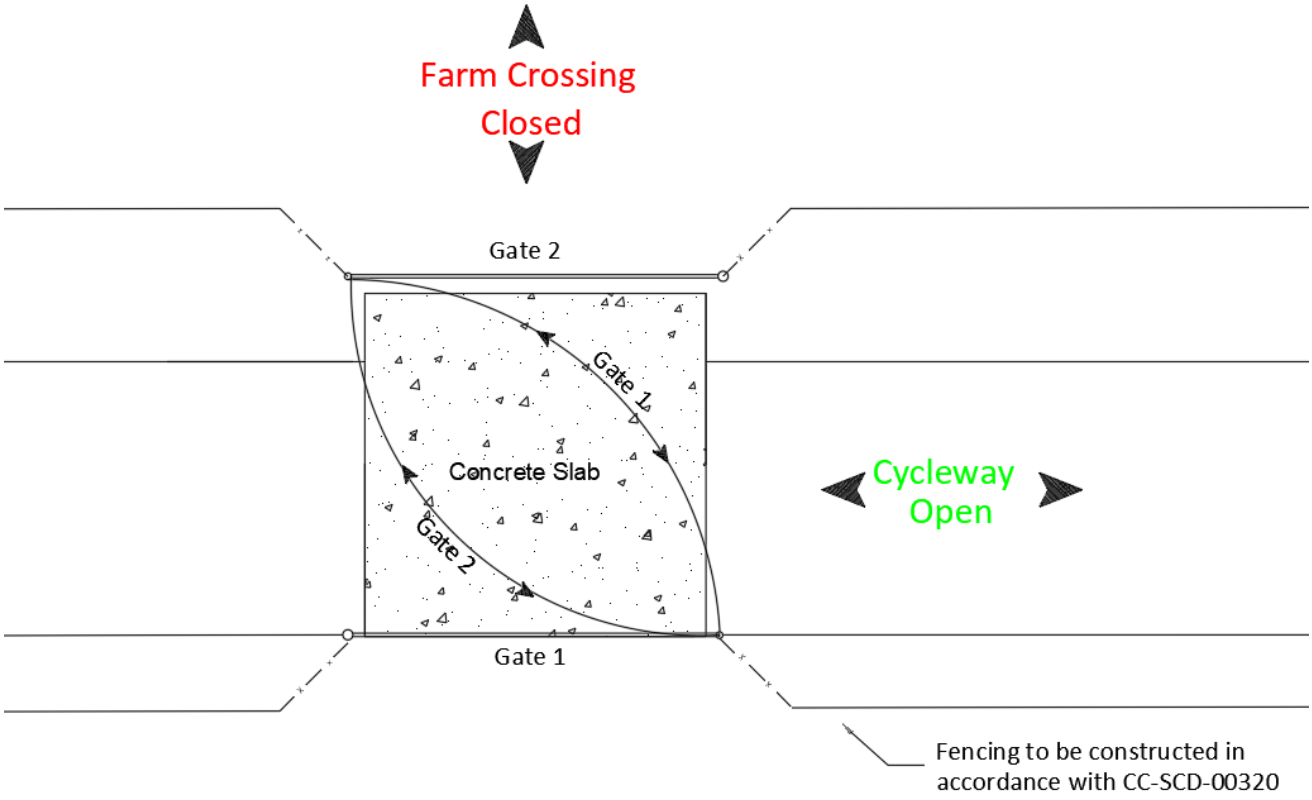


Figure 4.9 Farm Crossing Gate Detail (Open for Greenway Users)

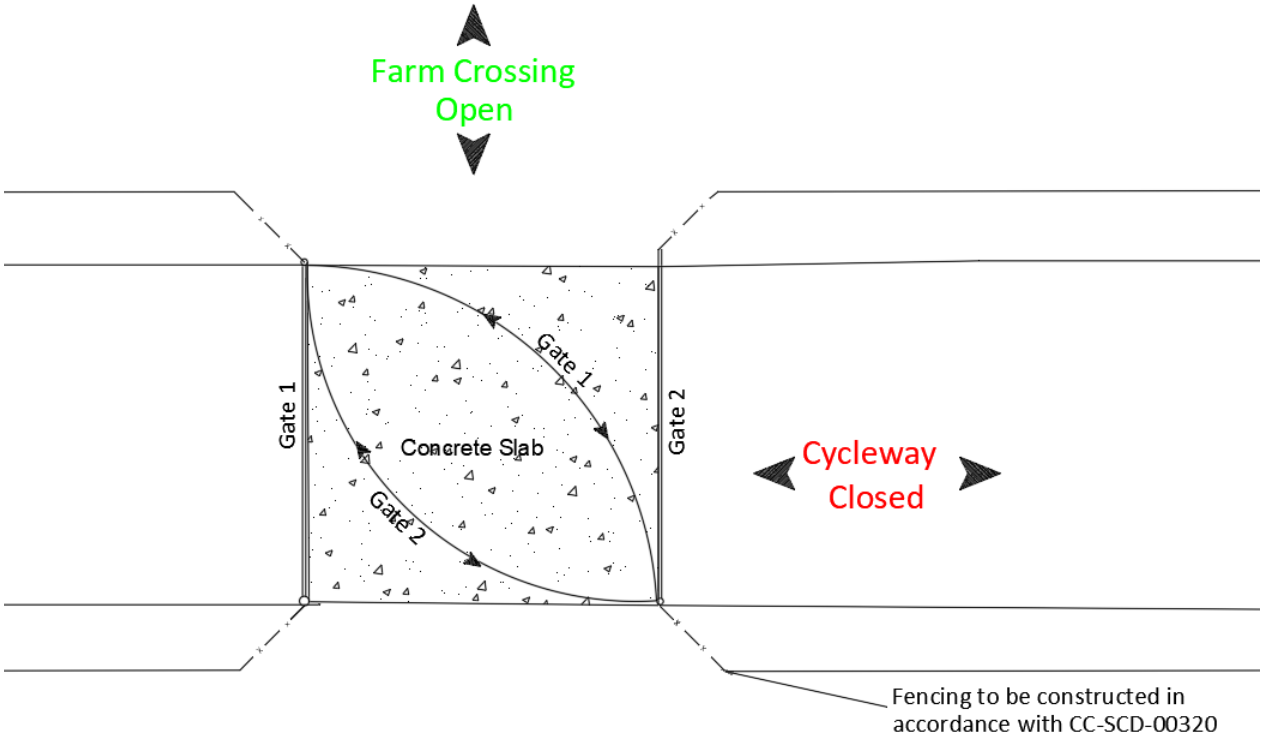


Figure 4.10 Farm Crossing Gate Detail (Closed for Greenway Users)

The layouts presented in **Figure 4.9** and **Figure 4.10** may be adopted where landowners require access across the cycleway. There are two gates provided where a farmer can open the two gates through 90 degrees in opposition direction to close off the cycleway and provide a passage across the cycleway, as illustrated. Visual contrast between any gate and the corridor surfacing or landscape is required. This shall include the provision of appropriate reflective surfacing / boarding on the gate and a water connection for maintenance where appropriate and feasible.

In relation to this layout, it must be noted that this layout is most appropriate in instances where farmers need to cross the cycleway occasionally. They may not be suitable in areas where there are intense farming operations such as dairy farms which could involve the farmer having to cross the greenway a number of times daily which would result in the crossing points being heavily soiled by the farm animals. In this situation alternative interventions such as accommodation over/under passes shall be considered.

4.7 Over the Edge Drainage

Over-the-edge drainage is the preferred arrangement for a rural offline cycleway, where possible. 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. Cycleway drainage shall be in accordance with Edge of Pavement Design (DN-DNG-03062) where applicable.

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.

Design considerations shall be made at constrained locations such as transitions, junctions, and at structures, where over-the-edge drainage may be unsuitable. Surface drainage shall intercept runoff that may accumulate at these constrained locations. A longitudinal grated or slotted linear drainage channel may be provided. Traditional gully grating should not be used. Cycle friendly drainage gullies as detailed in CC-SCD-05144 Cycle Friendly Gully Details shall be provided as an alternative.

Further guidance on drainage infrastructure design for linear infrastructure is available within TII Publications. This includes guidance on vegetated systems, sustainable drainage systems, attenuation and pollution control, and catchment analysis.

4.8 Signage and Road Markings

Appropriate signage and road markings are an integral and important part of any cycleway serving to enhance coherence, safety, and attractiveness. Appropriate signage gives clarity to the user as to where the cycleway starts/ends and provides warnings to potential risks that may be present. Beyond communicating operating requirements to users, the role of signage is important in the success of a route and is primarily to bring users to and along the route and inform them about the route.

Consequently, signage and road markings can be viewed from two guises. The first relates to its regulatory function and the second relates to its branding / wayfinding / communication purpose.

4.8.1 Regulatory Signage and Line Marking

All signs related to cycle routes that are erected on public roads must adhere to statutory requirements as outlined in the Traffic Signs Manual.

Statutory signs are located primarily on public roads and the use of these signs is regulated under Irish law. They include signs providing directions to a greenway or cycle route, on-road cycle route directional signs and various information and warning signs for motorists and cyclists. Where a greenway or other traffic free cycle route crosses a public road the Standards regarding the signs to be used and their positioning are outlined in **Figure 5.1**.

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 as shown in **Figure 4.11**, 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.

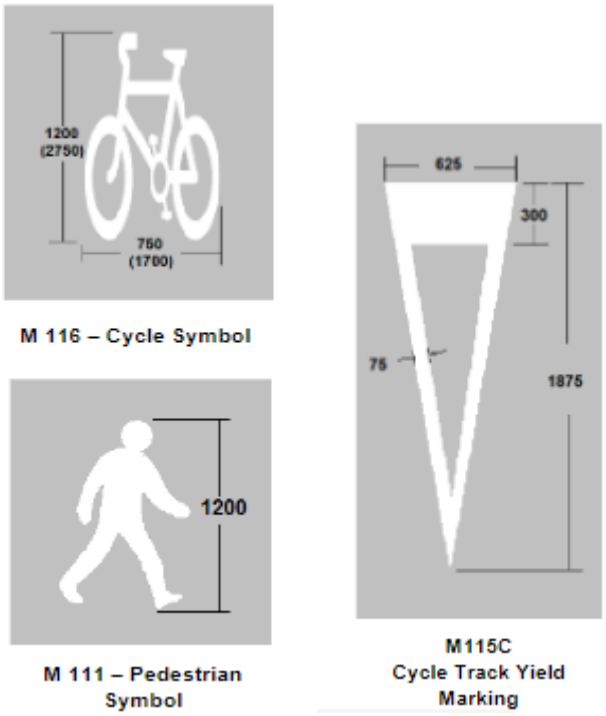


Figure 4.11 Examples of TSM Cycleway marking

The following shall also be noted:

- Segregation between pedestrians and cyclists, where determined as necessary, via road markings only is a departure from Standard.
- Where special speed limits are proposed as part of project development, requisite approvals will be necessary in advance of their communication via statutory signage.
- Appropriate distance markers and location markers shall be provided on rural offline cycleways, including national and regional greenways at a spacing of 500m. The function of these markers is to aid the infrastructure user to identify their location for emergency purposes.

The traffic signs manual includes details of a Standard location marker, however, signage placed on the cycleway mainline shall be scaled to an appropriate size taking cognisance of design speed and stopping sight distance of the cycleway and any project aesthetic schema. Further guidance and considerations are outlined within DN-GEO-03046 – The Location and Layout of Lay-bys and Location Markers.

- Signage limited to the cycleway mainline shall be scaled to an appropriate size taking cognisance of design speed and stopping sight distance of the cycleway.
- Bespoke or branded signage (including location markers, information boards, place locaters, Irish language signage, etc.) may be utilised on the cycleway mainline. Such signage shall be developed by the Designer and approved by the Sponsoring Agency subject to alignment with the *Greenway Design and Brand Guidelines* and any project aesthetic schema.
- The Designer shall prepare a Traffic Signs and Road Markings plan and associated drawings for approval by the Sponsoring Agency.

4.8.2 Cyclist Dismount Signage

The utilisation of cyclist dismount signage, as per Figure 4.12, is a departure from Standard. Where the provision of dismount signage is necessary owing to site constraints or unmitigable hazards, their incorporation within a route corridor shall be clearly communicated to users at rural offline cycleway access points to enable users to plan their journey.

W 145:
Cyclists Dismount

Figure 4.12 Examples of TSM Cyclist Dismount

4.8.3 Branding / Wayfinding / Communication Signage and Line Marking

Branding guidelines for greenways in Ireland is provided in the *Greenway Design and Brand Guidelines*. The use of this branding on a route must be approved by Transport Infrastructure Ireland. Approved greenways must use the branding guidelines.

Where Fáilte Ireland are engaged as a project partner or stakeholder, the Designer shall engage therewith whilst determining Branding / Wayfinding / Communication requirements. Similarly, engagement with the appropriate Sponsoring Agency personnel in this area shall be required (e.g. heritage locations, sites of interest, attractions, county networks, etc.). More broadly, route planning and wayfinding requirements for the project shall integrate with adjacent cycleways and infrastructure – such as route referencing and identification points.

Where a cycle route does not meet the criteria for a greenway the greenway branding does not apply. Branding for such cycle routes can be determined by the route developer.

Where forming part of a EuroVelo route the EuroVelo branding must also be incorporated into the signage.

Details on this are provided in the document Si*gning of EuroVelo Cycle Routes* and the Traffic Signs Manual provides details on how the logo may be incorporated into on-road cycle route directional signs.

When rural offline cycleways, including national and regional greenways, form part of the National Cycle Network, signage and wayfinding appropriate to the National Cycle Network shall be provided.

4.9 Lighting

Generally, cycleways will not be illuminated. However, lighting should be considered at road / cycleway crossings, close to and in built-up areas, and enclosed areas (e.g. tunnels). Furthermore, the requirement for lighting may be identified in areas outside built up areas and the aforementioned contexts - such as transition zones or to illuminate busy segments.

The design and implementation of lighting should be carried out in accordance with I.S. EN 13201-2:2015 Road Lighting, PLG 23 Lighting for Cycling Infrastructure, BS 5489-1:2003 Code of practice for design of road lighting, and DN-LHT-03038 – Design of Road Lighting for National Roads.

Lighting design shall avoid creating an obstruction for cyclists or pedestrians, requiring careful consideration when positioning lighting infrastructure at the edge of the rural cycleway. A minimum lateral clearance of 1m between the lighting infrastructure and cycleway pavement edge shall be provided.

Design considerations such as locating lighting infrastructure adjacent to large trees that may diminish the light should also be taken into account.

Lighting design shall be undertaken early in project development taking cognisance of environmental constraints and requirements.

4.10 Electrical and Information and Communication Technology

4.10.1 Electrical Connections and Ducting

The Designer shall identify and agree any necessary electrical connections required for the safe and effective operation of the rural offline cycleway, including national and regional greenways. This includes, but is not limited to, connections for lighting, cycle and pedestrian counters, CCTV systems, and weather stations. During the development of rural offline cycleways, the Designer shall identify necessary ducting to accommodate the distribution of electrical networks.

4.10.2 Information and Communication Technology and Ducting

The Designer shall identify and agree any necessary Information and Communication Technologies required for the safe and effective operation of the rural offline cycleway, including national and regional greenway. This includes, but is not limited to, the provision of emergency telephones, the provision of weather stations, connectivity for cycle and pedestrian counters, and connectivity for CCTV systems.

During the development of rural offline cycleways, the Designer shall identify necessary ducting to accommodate the distribution of information and communication technology.

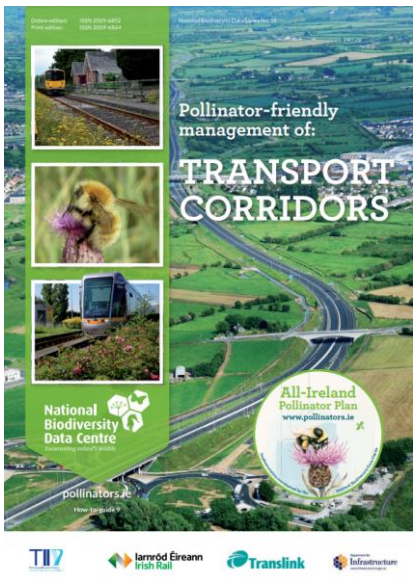
4.11 Environmental Considerations, Landscaping, & Environmental Integration

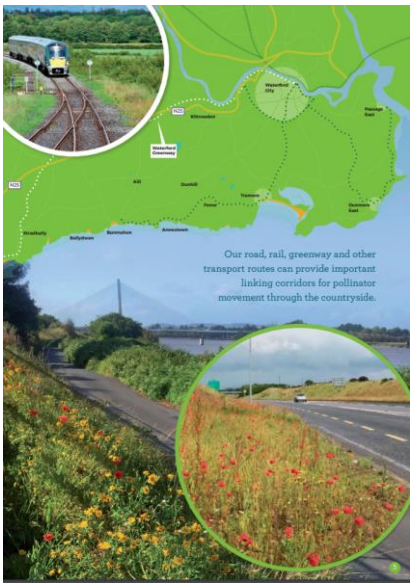


The preferred option for a rural cycleway, including national and regional greenways, will be determined following comprehensive option selection and evaluation taking account of environmental, engineering, and economic factors, amongst others.

As noted, rural offline cycleways - including national and regional greenways, shall undergo project appraisal in line with TII PAG *Unit 13.0 - Appraisal of Active Modes* and the broader suite of TII Project Appraisal Guidelines including, but not limited to, *PAG Unit 4.0 – Consideration of Alternatives and Options* and *PAG Unit 7.0 – Multi Criteria Analysis.* Appropriate consideration of environmental impacts and their elimination and mitigation is paramount to safeguard the receiving environment and ecosystems.

Consequently, rural cycleway development shall advance in compliance with statutory and supranational planning and development requirements including environmental assessments.





Importantly, rural offline cycleways shall be developed from the start with environmental considerations in mind. Effort shall be expended to develop the cycleway harmoniously with the environment. This should include adopting nature-based design approaches – which the International Union for Conservation of Nature define as actions to protect, sustainably manage, and restore natural or modified ecosystems. Particular care shall be taken when projects interface with water bodies so as to protect riparian and coastal environments. Efforts should extend to sensitively and beneficially integrating rural cycleways into the environmental context and landscape. In this regard, reference may be had to the All-Ireland Pollinator Plan and related guidance relating to pollinator friendly management of transport corridors. Regard shall be had to the EU Biodiversity Strategy 2030 and Ireland's National Biodiversity Action Plan when developing projects.

Additionally, regard and reference shall be had to PE-ENV-01101 - Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects - Overarching Technical Document.

The development of rural offline cycleways shall include the preparation of a Construction Environmental Operating Plan. This will consider measures required to construct the project (including construction compounds, drainage measures required during construction, e.g. silt control, dust or noise control, etc) and outline design and mitigation measures identified during project development.

A range of environmental integration policy documents, planning guidelines, and construction guidelines are available for download from the Environment section of TII's website[4]. This information shall be considered during the development of rural cycleways.

Rural offline cycleways, including national and regional greenways, are subject to the *Code of Practice for Archaeology* agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland. Should routes be designed in proximity to historic buildings or archaeological sites and monuments, then these will need to be addressed in the development approval process (whether 'Part 8', 'Section 177AE' or Environmental Impact Assessment), and care will be required to ensure that all necessary notifications are made to both the planning authority and the Department of Housing, Local Government and Heritage.

Should the rural offline cycleway be in proximity to a national monument, then Ministerial Consents (Section 14) will be required, while Section 12 notifications will be required is in proximity to any sites published on the RMP/SMR.

OPW guidance *The Planning System and Flood Risk Management - Guidelines for Planning Authorities* identifies different locations of potential flooding and different classes of infrastructure for which different flood risk criteria might apply. With respect to National and Regional Greenways, the class that will apply is: *Less Vulnerable Development which includes Local Transport Infrastructure*.[5]

[4] Available at: https://www.tii.ie/technical-services/environment/.
[5] Certain sections of National and Regional Greenways carrying high numbers of functional journeys may need to be considered as Highly Vulnerable Development on a case by case basis.

5. Road / Cycleway Junctions & Crossings

5.1 General

The interaction between rural offline 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. 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 Traffic Signs Manual.

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

The surface of the cycle facility shall have a colour contrast (red) treatment on the 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 may be considered to regulate the speed of cyclists on approach to intersections with the public road.

5.2 Junction Stopping Sight Distances

As noted, downward deviations from the required stopping sight distances (based on design speed of cycleway and design speed / posted speed of the public road approaching the cycleway) are departures from Standard. That is, desirable minimum stopping sight distances for the cycleway and the public road shall be maintained on the immediate approach to road / cycleway junctions and crossings.

5.3 Junction Visibility

Refer to **Section 4.5.7** above.

5.4 Cycleway Visibility

Refer to **Section 4.5.7** above.

5.5 Road / Cycleway Junction and Crossing Types

Rural offline cycleways, including national and regional greenways, which are to be designed in accordance with this design Standard shall accommodate all users as an amenity for physical activity and daily activities and contribute to health and wellbeing in accordance with the *Strategy for the Future Development of National and Regional Greenways*.

Necessarily, the design of national and regional greenways shall seek to minimise direct user conflicts between cycleway users and high volume and high-speed vehicular trafficked roads. This is of particular consideration at interface points such as road / cycleway junctions and road / cycleway crossings.

Consequently, where a rural offline cycleway, including a national and regional greenway, interfaces with a vehicular trafficked road the arrangements outlined within **Table 5.1** are permissible.

Table 5.1 Possible Interventions for Road / Cycleway Junctions and Crossings

Rural Conditions – outside urban areas (outside 60km/hr zone).					
Intervention	**Motorway (100km/hr, 120km/hr)**	**National Primary (100km/hr)**	**National Secondary (80km/hr - 100km/hr)**	**Regional Road, Local Primary Road (80km/hr)**	**Local Secondary, Local Tertiary (30km/hr [6] – 80km/hr)**
Grade Separation	✓	✓	✓	✓	✓
At Grade (vehicular priority)	X	X	X	✓ (Subject to the implementation of measures to make the junction / crossing suitable for inexperienced cyclists).	✓ (Subject to the implementation of measures to make the junction / crossing suitable for inexperienced cyclists).
At Grade (cycle priority)	X	X	X	X	✓ (Subject to the implementation of measures – such as speed reductions - to make the junction / crossing suitable for inexperienced cyclists).

Notes:

1. *Where it is not possible to implement the arrangements outlined within **Table 5.1** owing to site constraints or other, a departure from Standard will be required which shall detail the proposed design and any associated operating measures.*
2. *Measures which may serve to make a junction / crossing more suitable for an inexperienced cyclist include, but are not limited to, the items outlined at **Section 3.4** herein. The Designer shall take cognisance and due care in designing junction / crossing layouts.*
3. *Risks associated with road / cycleway and junction crossings are to be mitigated as much as possible. Given the higher risk for collisions involving cyclists at junctions, particular attention should be paid to measures to reduce this risk.*

5.5.1 Local & Regional Road Carriageway Crossings

Rural offline cycleway crossings shall cross local and regional roads perpendicularly / at right angles.

This serves to maximise the cycleway user's visibility of road traffic. Such crossings shall be developed with the required regulatory signage and road markings.

[6] Subject to implementation of special speed limit.

Rural offline cycleway crossings shall include appropriate dwell areas on the approach to crossings with local and regional roads. Such dwell areas shall be minimum 25m^2 and have maximum vertical alignments as required under this Standard at Section 4.

Figure 5.1 outlines the required design details where a cycleway crosses a local or regional road.

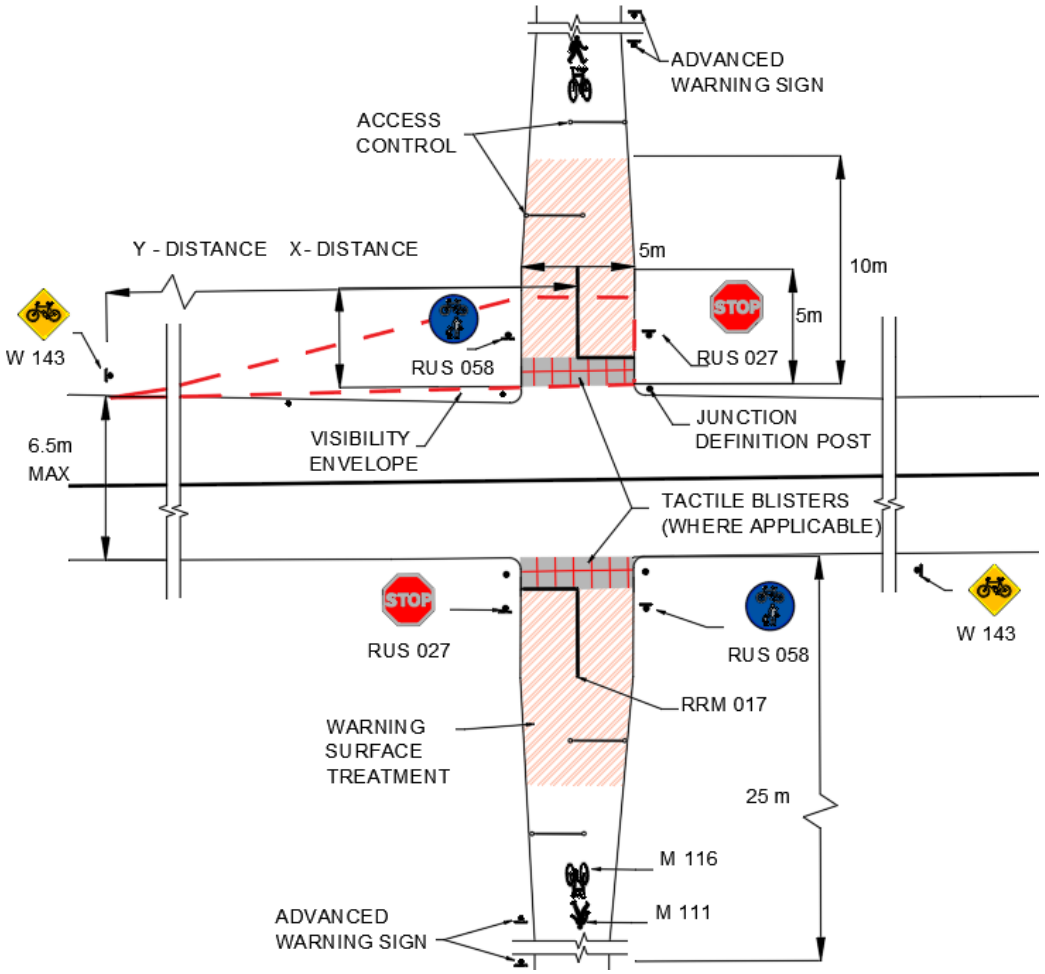


Figure 5.1 Road Crossing Detail

Notes:

1. *Traffic Signs and Linemarkings shall be provided in accordance with TSM. Combination of signs and line markings may vary depending on layout of cycleway crossing.*
2. *The provision for access control measures is dependent on geometric alignment and existing constraints. Access Control measures to be placed from 5 to 10 meters from edge of pavement. Bollards may be used as a deterrent for motorised users from accessing the cycleway when provision for access control is not required for cycleway traffic calming. Bollards are to be placed in the proximity of the stop line when used as a deterrent measure.*

5.5.2 Jug Handle Crossing

As noted, rural offline cycleway crossings shall cross local and regional roads perpendicularly / at right angles. This serves to maximise the cycleway user's visibility of road traffic. Such crossings shall be developed with the required regulatory signage and road markings.

Where a cycle track (cycle route travelling adjacent to a vehicular road) is terminating, is continuing on the other side of the road, or such similar situations; it is necessary to provide a 'jug handle' crossing. Similarly, a 'jug handle' crossing shall be provided where a rural offline cycleway is approaching a road on skew. The key objective of the 'jug handle' junction is to ensure that cyclists approach the road perpendicularly to maximise the cycleway user's visibility of road traffic.

Figure 5.2 outlines a typical 'jug handle' junction arrangement.

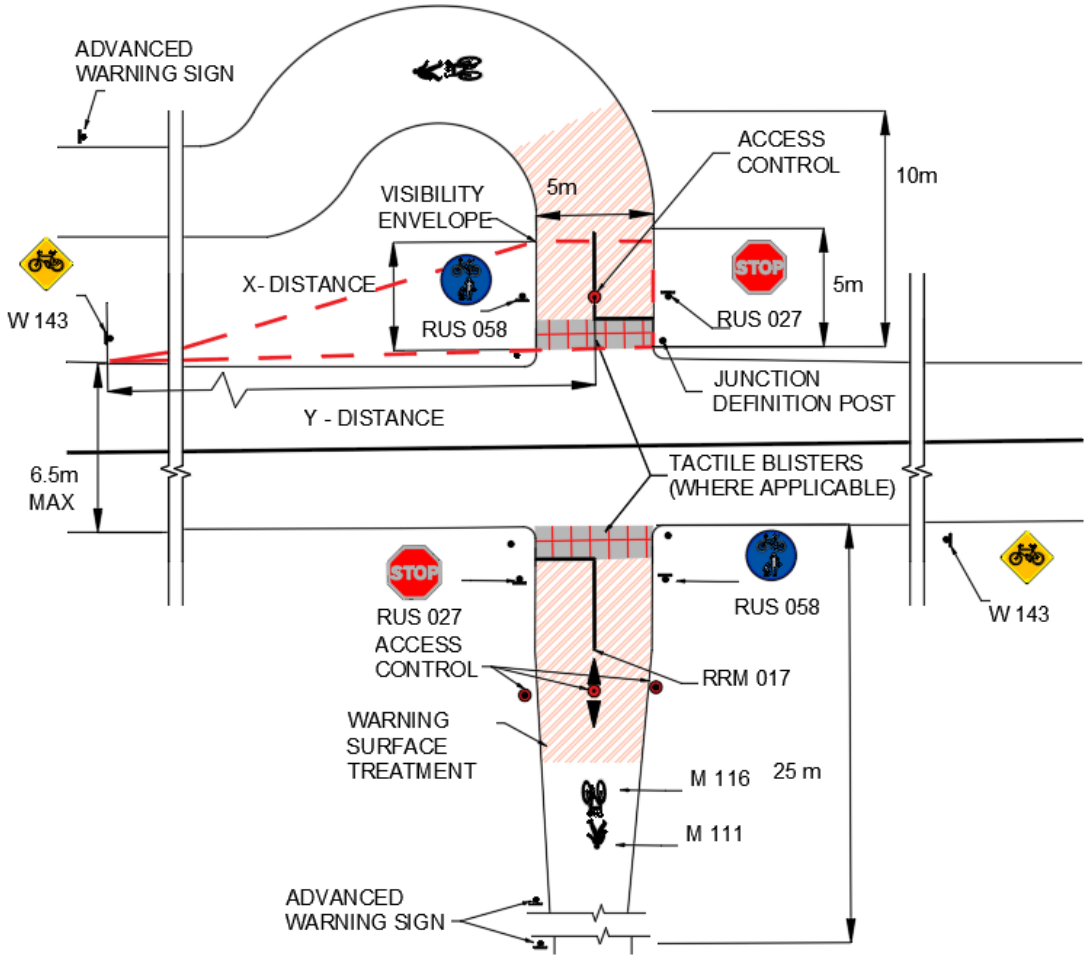


Figure 5.2 Road Crossing Detail

Notes:

1. *Traffic Signs and Linemarkings shall be provided in accordance with TSM. Combination of signs and linemarkings may vary depending on layout of cycleway crossing.*
2. *The provision for access control measures is dependent on geometric alignment and existing constraints. Access Control measures to be placed from 5 to 10 meters from edge of pavement. Bollards may be used as a deterrent for motorised users from accessing the cycleway when provision for access control is not required for cycleway traffic calming. Bollards are to be placed in the proximity of the stop line when used as a deterrent measure.*

5.5.3 Grade Separated Crossings

The design of any grade separated cycle facility should be in accordance with *DN-STR-03005 - Design Criteria for Footbridges*, *DN-GEO-03040 - Subways for Pedestrians and Pedal Cyclists*, and the requirements of this design Standard. Grade separated crossings shall be designed taking cognisance of the development principles outlined at **Section 2.10 –** in particular accounting for its attractiveness and safety for cyclists.

5.5.4 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 (including avoiding undulating vertical profile).

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 4.4**).

6. Greenways Ancillary Infrastructure

6.1 General

Requirements within this section apply to the development of national and regional greenway infrastructure. These requirements may be used, or applied, to the development of other rural cycle infrastructure subject to agreement with the requisite Sponsoring Agency and ultimate maintaining organisation.

The Department of Transport published the *Greenways and Cycle Routes Ancillary Infrastructure Guidelines*. These guidelines highlight and recognise that route infrastructure is more than the linear path itself. These guidelines highlight that a greenway or cycle route is brought to life by the addition of 'ancillary infrastructure'. The *Greenways and Cycle Routes Ancillary Infrastructure Guidelines* outline information on the installation and creation of ancillary infrastructure intended to bring a route to life and make its utilisation an attractive and enjoyable experience.

Within this section and this design Standard, minimum ancillary infrastructure provision requirements are outlined. Regard and reference shall be had to the *Greenways and Cycle Routes Ancillary Infrastructure Guidelines* for further context and illustration.

6.2 Ancillary Infrastructure Provision

Rural offline cycleways, in particular national and regional greenways will be of a scale and quality as outlined within the *Strategy for the Future Development of National and Regional Greenways* (minimum 20km, ideally 40km+). Necessarily, at this scale and such distances the requirement for appropriate ancillary infrastructure presents so as to ensure that the route is attractive and enjoyable for users.

Herein, distance is utilised as a proxy to identify level of provision or levels of ancillary infrastructure. However, given that route requirements will vary depending on context (for example, predominantly rural versus connecting rural communities, villages, and towns, environmental and heritage issues); it is necessary to examine the project scenario and identify apt and appropriate ancillary infrastructure interventions and provisions (for example, not all routes will be 40km+ long, some routes will interface with existing infrastructure, some routes will be well served by urban population centres, it will be possible to overlap provision where intervals coexist, etc.). Consequently:

- Level of provision within **Table 6.1** outlines minimum requirements. Greater provision will be warranted in many situations. For example, where two settlements connected by a cycleway are within 15km of each other, Level 1 provision may be warranted at each location. Further, Level 1 provision may be warranted at each trailhead to the cycleway. Moreover, some sections of cycleway will include vantage points or attractions at close intervals or steeper inclines, warranting provision of Level 4 infrastructure at closer spacing.
- The broader network requires consideration. It is inappropriate to omit ancillary infrastructure in anticipation or reliance on such infrastructure on adjacent cycleways. The need for ancillary infrastructure requires consideration on a project-by-project basis taking cognisance of adjacent infrastructure.

Furthermore, and following from the ethos presented within the *Greenways and Cycle Routes Ancillary Infrastructure Guidelines*, where possible the opportunity to take advantage of existing facilities (sanitary, bike repair services, etc.) at population settlements shall be seized.

Additionally, the provision of ancillary infrastructure, and resultant operation and maintenance obligations, shall be carefully considered by the Sponsoring Agency in consultation – and in agreement – with the ultimate maintaining organisation – to ensure whole of life management and liabilities are considered and agreed.

Table 6.1 below presents minimum ancillary infrastructure provision requirements. Provision of greater levels of ancillary infrastructure shall be determined on a project basis.

Table 6.1 Minimum requirements for 'ancillary infrastructure'

Element	Minimum frequency / provision			
	Level 1 (Minimum provision at max. 40km spacing)	**Level 2 (Minimum provision at max. 15km spacing)**	**Level 3 (Minimum provision at max. 5km spacing)**	**Level 4 (Minimum provision at max. 2km spacing)**
Seating	Seating for 8 people.	Seating for 6 people.	Seating for 4 people.	Seating for 2 people (with back and armrest).
Waste collection (subject to agreement with maintaining organisation)	Waste bins (General mixed waste, dry recyclable waste, organic/food waste) with a maintenance plan in place.	Waste bins (General mixed waste, dry recyclable waste, organic/food waste) with a maintenance plan in place.	Leave no Trace signage.	Leave no Trace signage.
Cycle parking	Bicycle parking for 20 bicycles in the vicinity of the seating/picnic tables. 4 parking places for accessible cycles.	Bicycle parking for 14 bicycles in the vicinity of the seating/picnic tables. 2 parking places for accessible cycles.	Bicycle parking for 8 bicycles in the vicinity of the seating/picnic tables. 1 parking place for an accessible cycle.	Bicycle parking for 2 bicycles in the vicinity of the seating.
Picnic table (suitable for all users, regard shall be had toward CARA guidelines).	3 picnic tables each seating 4 people.	2 picnic tables each seating 4 people.	1 picnic table seating 4 people	-
Information tables and mapping	Map of the cycle network. Locations of services and tourist attractions. Information on flora and fauna.	Map of the cycle network. Locations of services and tourist attractions. Information on flora and fauna. Leave No Trace guidelines.	Information to be provided on the immediate surroundings of the context or area on as-needed basis (e.g. a landmark).	-

Element	Minimum frequency / provision			
	Level 1 (Minimum provision at max. 40km spacing)	**Level 2 (Minimum provision at max. 15km spacing)**	**Level 3 (Minimum provision at max. 5km spacing)**	**Level 4 (Minimum provision at max. 2km spacing)**
	Information on Built Heritage – architectural and archaeological. Leave No Trace guidelines. Telephone numbers for emergency services.	Telephone numbers for emergency services.		
E-bike charging (subject to agreement with maintaining organisation)	Charging point with parking and locking possibility for 2 electric bicycles.	Charging point with parking and locking possibility for 1 electric bicycle.	-	-
Shelter	Shelter covering 1 picnic table and 2 benches. Shelter from wind.	Shelter covering 1 picnic table and 2 benches. Shelter from wind.	-	-
Water points	Drinking water source outside, accessible 24/7.	Drinking water source outside, accessible 24/7.	-	-
Additional lighting	In the vicinity of: picnic tables and shelter; toilets; and bicycle repair station.	In the vicinity of: picnic tables, and shelter, and toilets.	-	-
Toilets (subject to agreement with maintaining organisation)	2 toilets (including one accessible dry toilet, baby changing facilities).	1 accessible dry toilet.	-	-
Bicycle repair	Air pump. Bicycle mount. Set of tools for basic repairs: Allen keys, fork wrench set, screwdrivers, spoke spanner, chain tool.	Air pump.	-	-

Element	Minimum frequency / provision			
	Level 1 (Minimum provision at max. 40km spacing)	**Level 2 (Minimum provision at max. 15km spacing)**	**Level 3 (Minimum provision at max. 5km spacing)**	**Level 4 (Minimum provision at max. 2km spacing)**
Car parking	At urban locations existing parking provision shall accommodate users unless demonstrated otherwise. Exact quantum of vehicle parking to be determined on the basis of anticipated level of use. Where new level 1 provision is determined or identified, a minimum of 10 vehicle spaces are required, including; 1 space for accessible parking (or greater as determined), and 1 additional accessible parking spot for every 20 additional spaces (or greater as determined).	Directional signage to/from existing parking locations within 500m (including P+R locations for weekend use as appropriate).	-	-
Restaurant / cafe / kiosk / supermarket	Directional signage to the services to/from the Greenway, as appropriate.	Directional signage to the services to/from the Greenway, as appropriate.	-	-
Accommodation	Directional signage to the services to/from the Greenway, as appropriate.	-	-	-
Connection to public transport	Directional signage to the services to/from the Greenway, as appropriate.	Directional signage to the services to/from the Greenway, as appropriate.	-	-

7. Pavement and Foundation Construction Details

7.1 General

A major function of a cycleway is the provision of a pavement structure which will provide good ride comfort and a safe cycleway surface for users throughout the life of the cycleway. A cycleway with a high-quality pavement will provide a safe, attractive, and comfortable environment for potential users. 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.

The provision of this functionality is achieved through the application of a pavement design process for cycleways. This section will detail the pavement design process to be carried out by the Designer in developing a cycleway pavement structure.

The cycleway pavement design process will follow the following steps:

a) Definition of the Design Scenario;

b) Pavement Type and Material Selection;

c) Pavement Structural Design.

Each of the steps in the pavement design process are detailed below.

7.2 Design Scenario

The significant design scenario aspects considered within cycleway pavement design are listed below. Each aspect needs to be considered and quantified in order to characterise the conditions within which the pavement structure will exist and provide adequate levels of service to the cycleway user.

- Subgrade conditions;
- Traffic loading;
- Environmental conditions.

7.2.1 Subgrade Conditions

The subgrade is the structure on which a cycleway pavement is required to be constructed. The subgrade can comprise of imported material such as fill or existing materials prepared to achieve cycleway alignment requirements.

For the cycleway pavement design process, a minimum subgrade condition is required to be achieved to ensure adequate pavement structure performance for the life of the cycleway.

The minimum subgrade condition requirement is defined as a design California Bearing Ratio (CBR) of 2.5%. The determination of the design CBR for a particular subgrade material and as measured in-situ is detailed in Pavement and Foundation Design (DN-PAV-03021).

Where subgrade design CBRs determined are less than 2.5%, subgrade treatment through cement stabilisation, geotextiles, or material replacement will be required. A capping layer may also be required where subgrade conditions are insufficient to carry construction traffic.

7.2.2 Traffic Loading

The estimated traffic loading to the pavement structure needs to be assessed within the pavement design process. Vehicles with a gross vehicle mass greater than or equal to 3.5 tonnes are considered to structurally degrade a pavement structure under repeated load repetitions. Vehicles with a gross mass less than this are not considered to structurally deteriorate a pavement structure and environmental impacts on pavement long term performance take precedence.

For the purposes of the pavement design process detailed here two levels of traffic loading are considered, namely:

- Cycles/pedestrian only;
- Lightly trafficked with less than 0.2 million Standard axles (msa) over the pavement design life.

Where future traffic loads in excess of 0.2 msa is expected a full pavement design according to DN-PAV-03021 should be considered.

7.2.3 Environmental Conditions

Environmental conditions have a significant impact on the long-term performance of a pavement structure. For lightly trafficked pavement structures, environmental conditions are often the predominant factor in deteriorating a pavement structure's condition over time. Moisture, temperature, and ultra-violet radiation exposure all affect the rate of deterioration of pavement materials over time.

Based on pavement design research conducted in Ireland it has been determined that environmental conditions do not vary sufficiently across the country to substantiate the inclusion of an environmental condition related design parameter.

7.3 Pavement Type and Material Selection

7.3.1 Pavement Type

A pavement structure type is defined based on the pavement material type specified for use within the pavement structural layers. The pavement types considered for cycleway pavements are summarised below:

- Type A - Bituminous material base/binder and surface course;
- Type B - Unbound granular base with surface dressing;
- Type C - Unbound granular base, un-sealed (**use requires TII Departure Approval**).

The selection of the most suitable pavement type is at the discretion of the Designer based on the particular requirements and conditions at the location of the cycleway. Guidance in terms of the most suitable pavement type selection is provided in Table 7.1 below. Notwithstanding, when determining the most appropriate pavement type provision regard shall be had to the receiving environment and context (e.g. using local materials and colours, environmental sensitivities – hydromorphological considerations, etc.).

Table 7.1 Guidance on Pavement Type Selection

Type	Ride Quality	Skid Resistance	Maintenance Need	Construction Cost
A	Good	Good	Good	Poor
B	Fair	Good	Fair	Fair
C	Poor	Poor	Poor	Good

Additional guidance on the selection of an appropriate pavement type for a specific design scenario is provided below:

i. Type A - Bituminous material base and surface course: Use where high traffic volumes are expected and significant cumulative riding quality impact on user experience is expected.

ii. Type B - Unbound granular base with bituminous material surface course: Use where lower traffic volumes are expected and the cumulative impact of reduced levels of ride quality on the users are reduced. This pavement type also provides an opportunity to reduce construction costs.

iii. Type C - Unbound granular base, un-sealed: Where there is a specific need to align with a rural aesthetic – including colours, environmental sensitivities, and traffic volumes are such that the increased maintenance need and reduced levels of ride quality do not have a significant cumulative impact on users. The use of Type C pavement requires TII Departure Approval.

7.3.2 Pavement Materials

A number of pavement material types are available for consideration and inclusion within a cycleway pavement structure. These material types, relevant National Standards Authority of Ireland (NSAI) and TII Specification for Road Works publications and mixtures allowed for use within cycleway pavement structures are tabulated below.

Table 7.2 Cycleway Pavement Materials and Mixtures

Material Type	TII SPW Publication	Mixtures
Bituminous Materials	NSAI SR 28:2018 Recommendation for the use and implementation of the I.S. EN 13108 series bituminous mixtures – material specifications End use: Cycleways	AC 6 close surf 70/100 SMA 10 surf 70/100 AC 20 dense bin 70/100
	CC-SPW-00900 Specification for Road Works Series 900 - Road Pavements - Bituminous Materials	Recipe Surface Dressing – 6/10 & 2/6 mm double
Unbound Granular	CC-SPW-00800 Specification for Road Works Series 800 - Road Pavements - Unbound and Cement Bound Mixtures	UGM A UGM B
Earthworks	CC-SPW-00600 Earthworks	Capping 6F1 Capping 6F2

Material Type	TII SPW Publication	Mixtures
Gravel Surface Course	CC-SPW-00800 Specification for Road Works Series 800 - Road Pavements - Unbound and Cement Bound Mixtures	Well graded gravel with a maximum aggregate size of 6mm

The above specification documents detail the constituent, mixture, and constructed layer requirements for each pavement material type. Significant opportunity exists within the above material types and mixtures for the incorporation of reclaimed aggregates within the pavement structure to be constructed.

Pavement materials, and related structures, other than those listed in **Table 7.2** may be specified by a designer with TII approval through the TII departure application process.

Additional cycleway specific considerations related to pavement construction, Standard details and routine maintenance are provided in **Appendices C** and **D** respectively.

7.4 Pavement Structural Design Catalogue

Figure 7.1 below details the required pavement materials and layer thicknesses for each pavement type (Section 7.3.1) and traffic loading scenario (Section 7.2.2).

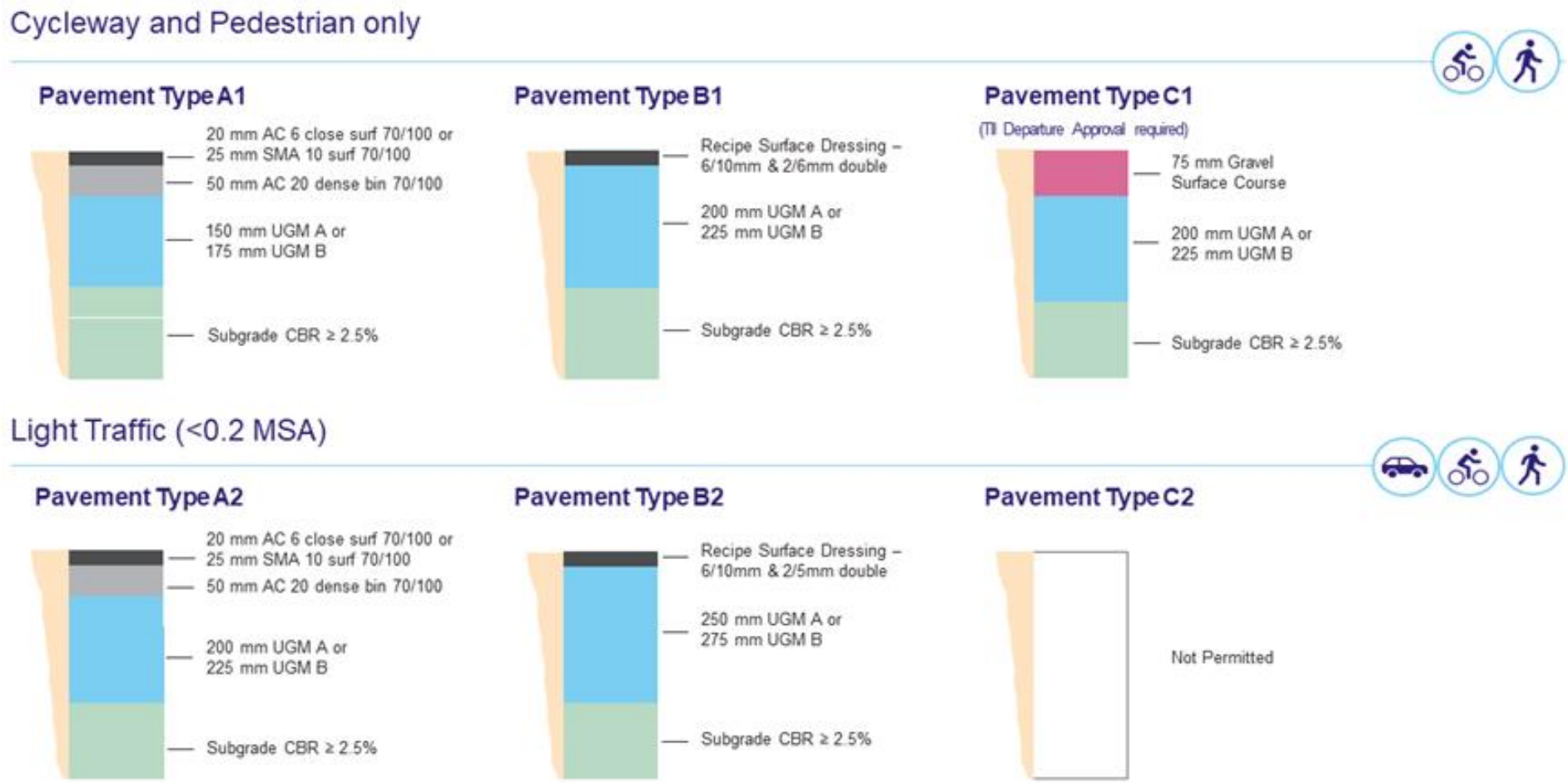


Figure 7.1 Cycleway Pavement Design Catalogue

8. Structures

8.1 General

Structures on rural offline cycleways, including national and regional greenways, may be new build structures or existing structures that are being repurposed for use on these routes.

The design, construction, assessment and modification of these structures shall ensure the safety of the users, with consideration given to the maintenance needed to ensure the safety throughout the life of the structure.

The content of this chapter applies to all structures on rural offline cycleways, including national and regional greenways, including bridges, boardwalks, tunnels/underpasses, retaining structures and structures that meet the criteria outlined in Section 1.2 of *DN-STR-03001 – Technical Acceptance of Road Structures on Motorways and Other National Roads*.

In the context of this chapter, the term “existing structures” is referring to structures that were constructed prior to the consideration of the route as a rural offline cycleway, including regional and national greenways, and that are intended to be repurposed for use on these routes or to be brought back into service after a period of disuse for this purpose. These may include structures such as disused railway bridges, tunnels, underpasses or retaining walls.

8.2 Technical Acceptance

For structures that interface with national roads, Technical Acceptance shall be carried out in accordance with the requirements of *DN-STR-03001 – Technical Acceptance of Road Structures on Motorways and other National Roads*. In this case, contact must be made with the TII Structures Section in the early phases of the project.

Technical Acceptance of new build and existing repurposed structures that are intended for use on rural offline cycleways, including greenways, and which do not interface with national roads should be carried out in accordance with an appropriate and robust Technical Acceptance procedure. Integral to the Technical Acceptance procedure is the:

- Technical Acceptance Report (TAR) which records the agreed basis and criteria for the detailed design or assessment of a structure; and
- certification by the Design/Assessor/Checker confirming that the design, assessment, specification or construction works complies with the TAR.

It is the responsibility of the relevant Local Authority, as Sponsoring Agency, to administer the Technical Acceptance procedure, including the initiation, implementation and quality management of the procedure. The Local Authority is the organisation responsible for accepting the TAR and relevant certificates. The requirements in this Standard should be addressed in the Technical Acceptance procedure.

Existing structures that are intended to be repurposed for use on rural offline cycleways, including national and regional greenways, may vary in age and be in varying states of disrepair. The Technical Acceptance process for such structures must reflect the inherent risks and challenges of bringing them back into use and/or repurposing them for use on a cycleway, while ensuring the safety and comfort of users.

The assessment, design and cost estimation of rehabilitation and retrofitting works for an existing structure may present complexities due to the structure’s age, form or condition.

Consideration of these complexities shall be taken into account when determining the qualification and experience requirements of the engineer performing the design, assessment and cost estimation, and specialist expertise shall be sought where necessary.

Prior to the inclusion of any existing structures within the Technical Acceptance procedure, an initial Feasibility Evaluation of these structures should be carried out. The purpose of this evaluation is to show that these structures are suitable for their intended use and are appropriate for inclusion along the proposed route, with or without repairs and/or modification.

In order to mitigate the risk of issues in the later design stages, a Preliminary Structural Assessment should be performed – including an inspection for assessment in accordance with Chapter 2 of *AM-STR-06026 – The Assessment of Road Bridges and Structures* – before the inclusion of an existing structure in the Preliminary Design Report at the applicable stage of the Technical Acceptance procedure.

This assessment shall show that the structure in question is safe for use and functional for the intended use, or that it may feasibly be made safe and functional through reasonable repairs and modifications at a reasonable cost.

Subsequently, a Detailed Structural Assessment of existing structures to be repurposed should be carried out prior to the submittal of a Technical Acceptance Report within the adopted Technical Acceptance procedure. This assessment shall show that the structure is safe for the intended use with the inclusion of the effects of any modifications or repairs. The detailed design of all modifications will require an assessment to determine their impact on the original structure.

Further details of the requirements of a Feasibility Evaluation, Preliminary Structural Assessment and Detailed Structural Assessment may be found in Section 8.7.1.

8.3 Structural Form & Materials

The structural form and material type has a major impact on the appearance and maintenance demands of the structure. Rural offline cycleways and greenways shall be developed in harmony with the surrounding environment, and care shall be taken to ensure that structures used on these routes are integrated with the existing environmental context and landscape.

The selection of the structural form and material shall give due consideration to the following aspects:

- Visual appearance & harmony with the local environment;
- Structural performance (strength, stiffness);
- Construction methodology & detailing;
- Design service life;
- Maintenance demands;
- Sustainability.

Materials to be used in new build structures should conform with the requirements of relevant National Standards Authority of Ireland (NSAI) and TII Specifications for Works publications. In the event that the Designer proposes to use non standard materials (for sustainability or circular economy reasons), prior engagement shall take place with the TII Structures Section through the TII Senior Engineering Inspector.

Existing structures that are to be repurposed for use on a rural offline cycleway, including greenways, may be constructed from materials that are not commonly used in modern construction, e.g. masonry arch structures or wrought iron structures.

The assessment and modification of these structures may require specialist knowledge of the materials used. Consideration shall also be given to the conservation requirements for these structures, where re-use of the original materials may be necessary, see Section 8.7.4.

8.4 Sustainability

The design and assessment / repurposing of structures requires the necessary consideration of sustainability aspects.

A sustainable structure may comprise of the following non-exhaustive list of considerations:

- minimal use of materials (i.e. efficient construction);
- material with the lowest possible environmental impact (low LCA score);
- detailing, design and material ensuring an optimal lifespan;
- low maintenance requirements;
- suitable for the intended use;
- suitable for the expected service life;
- reusable materials;
- innovation in design and material choices;
- easy removal after end of use.

As part of the design process, the aspects identified above should be considered and evaluated to ensure that the design choices achieve the sustainability objectives of the project.

8.5 Geometry

8.5.1 Cross Section at Structures

The minimum widths for pathways and cycleways on structures shall comply with the requirements given in Table 4.8

Where a structure has segregation between the footway and cycleway, this form of segregation shall be consistent over the full length of the structure.

In the design of structures adjacent to enclosing vertical features such as walls, a minimum lateral clearance of 1.0 m for cycleways from these restraint systems applies as described in Section 4.5.5.

For bridges, boardwalks, ramps and other structures with parapet systems, the design of these structures shall account for a minimum lateral clearance of 0.5m from the parapets.

Consideration shall also be given to anticipated future growth in traffic volume over the structure, as future widening may not be feasible.

Examples of typical cross sections at structures on rural offline cycleways, including greenways, are shown in the figures below. All dimensions shown are in millimetres.

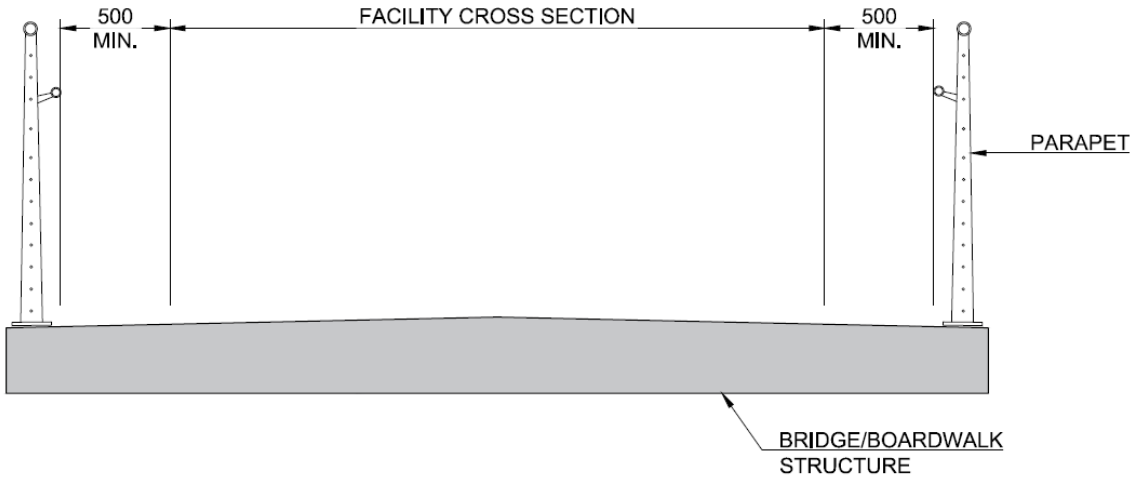


Figure 8.1 Typical Cross Section at Bridge Structure

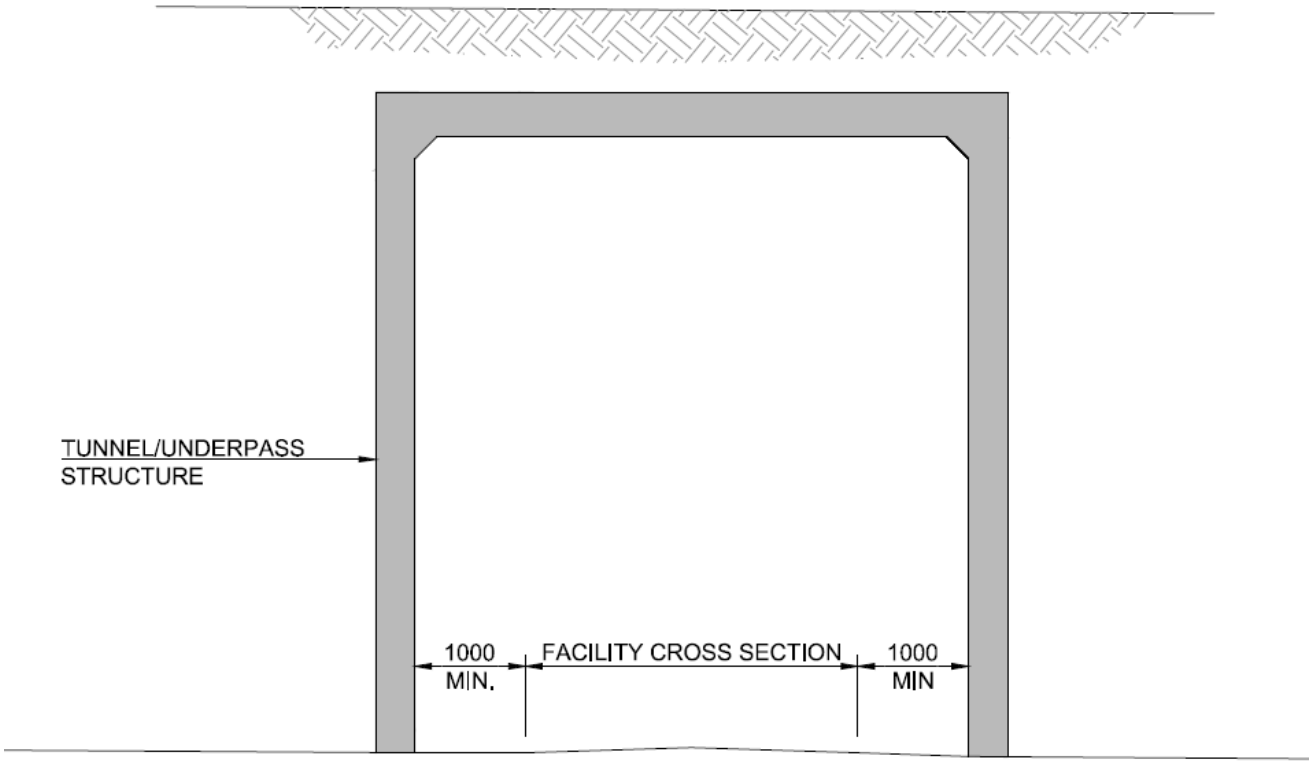


Figure 8.2 Typical Cross Section at Tunnel/Underpass Structure

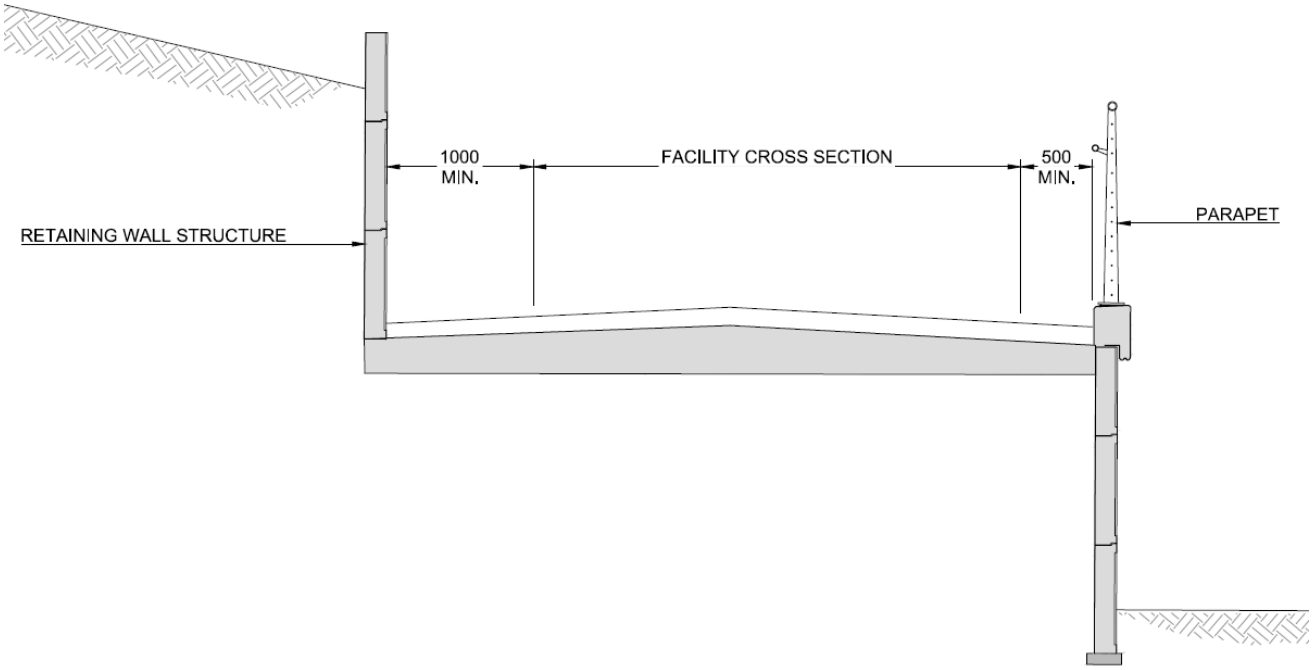


Figure 8.3 Typical Cross Section at Retaining Wall Structure

8.5.2 Clearance and Headroom at Structures

For subways, tunnels, underpasses and for clearance to users on overbridges, refer to Table 4.10.

For structures over watercourses, the clearance requirements are to be agreed with Waterways Ireland, OPW and relevant stakeholders.

For structures over national roads, the minimum headroom clearance below the structure shall be in accordance with the requirements of *DN-GEO-03036 – Cross Sections and Headroom*.

8.6 Design Requirements

The following design requirements are applicable for all structures for use on rural offline cycleways – including national and regional greenways. Existing structures to be repurposed for use on rural offline cycleways, including greenways, are subject to the additional requirements contained in Section 8.7. The structural design shall be undertaken in accordance with the Eurocodes and the Irish National Annexes. Reference shall be made to TII Standards and Published Documents for aspects not covered by and/or outside the scope of Eurocodes, as given in *DN-STR-03020 – The Structural Design of Road Structures* and *DN-STR-03005 – Design Criteria for Footbridges*.

8.6.1 Design Service Life

The design service life of new build structures shall be aligned with the requirements of *DN-STR-03020 – The Structural Design of Road Structures* .

NOTE: In most cases, this will result in a design life of 120 years.

8.6.2 Categories and Reliability Classes

The structure category and reliability class, and associated supervision and inspection levels, of new build structures shall be aligned with the requirements of *DN-STR-03020 – The Structural Design of Road Structures* and *DN-STR-03001 – Technical Acceptance of Road Structures on Motorways and Other National Roads*.

NOTE: In most cases, structures are likely to be Category 1 or 2, with a Consequence Class 2 (CC2).

8.6.3 Execution Standards including Execution Classes

The execution Standards, including execution classes, shall be aligned with the requirements of *DN-STR-03020 – The Structural Design of Road Structures*.

NOTE: This implements the TII Specification for Works, including the relevant EN execution Standards. In most cases, this will result in execution class 3 (EXC3) for concrete, steel composite and steel structures.

8.6.4 Loading

The structural loading to be considered shall be in accordance with the Eurocode Standards and the Irish National Annexes.

NOTE: Depending on the choice of materials, consideration may need to be given to fire loading.

Unless agreed otherwise by the relevant parties and stakeholders, where no permanent barrier is present to prevent access of service vehicles over a structure, the service vehicle defined in Figure 5.2 of IS EN 1991-2 should be considered in a transient design situation.

NOTE: Inclusion of service vehicle loading may have a significant impact on the structural design, therefore careful consideration should be given to the repair and maintenance requirements at the structure and at points along the rural offline cycleway or greenway that will require use of the structure for maintenance access.

NOTE: When considering service vehicles or emergency vehicles in the design of structures intended for cyclist and/or pedestrian traffic, reasonable consideration should be given to the type of vehicle and the expected frequency of passage. It must be noted that the design loads for a service vehicle may be less onerous than for a specific emergency vehicle or vice versa, so appropriate loading should be considered.

Accidental loading on the structure shall be considered and applied where relevant – for example, a bridge structure that passes over a non-national road may be subject to collision loading, or structures over a river may be subject to debris loading.

Where a service vehicle different from Figure 5.2 of IS EN 1991-2 has been considered in the transient design situation and where access to the structure for other vehicles is feasible, the service vehicle defined in Figure 5.2 of IS EN 1992-1 shall be considered in the accidental design situation.

Where there are no permanent physical barriers in place to prevent a vehicle traversing a structure, signage shall be posted at the structure to show the service vehicle loading considered in the design.

8.6.5 Vibrations

The design of structures on rural offline cycleways, including national and regional greenways, shall account for the effects of dynamic loading and user comfort criteria due to resonant frequencies of the structure in accordance with the requirements of the Eurocodes and Irish National Annexes.

8.6.6 Parapets and Restraint Systems

Parapets and restraint systems shall be designed in accordance with the requirements of *DN-REQ-03034 – The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges*.

NOTE: Typically this results in the use of a pedestrian parapet on bridge structures in accordance with PD CEN/TR 16949:2016 and with a minimum height as per table 8.2 / 10.1 of that Standard.

NOTE: For retaining walls, or similar structures, the type of protective measure to be used will need to be determined for each specific location depending on the ease of pedestrian/cyclist access to the hazard in question. It could be a pedestrian guardrail, a pedestrian parapet or an appropriate type of boundary fencing. The choice of protective measure shall be supported by a site-specific risk assessment in accordance with the requirements of DN-REQ-03034 – The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges.

8.6.7 Surfacing

Where structures may be traversed by cyclists and/or pedestrians, the surfacing applied to the traversed areas of the structure shall be appropriate for the user. The chosen surfacing system shall be non-slip and skid resistant, with a minimum slip resistance equivalent to a mean corrected pendulum test value of 45 units using a standard skid resistance pendulum test in accordance with IS EN 13036-4.

Drainage systems and joints shall be designed such that holes or gaps in traversed areas of the structure do not exceed 12mm, accounting for movements due to temperature, to avoid trip hazards for the user. Any cover plates or similar applied over gaps and joints shall be set flush with the top of the surfacing to prevent tripping and the upper surface shall be profiled to reduce the likelihood of slippage.

Traversed areas of the structure must also be waterproofed or otherwise protected against deterioration due to surface contaminants.

8.6.8 Drainage

Appropriate drainage systems shall be put in place to allow for the drainage of water from the surface of structures and to avoid water build up behind retaining walls, within inspection galleys, bearing shelves and elsewhere.

Drainage systems shall be designed with consideration of future access and maintenance requirements.

8.6.9 Lighting

The provision of lighting systems at structures on rural offline cycleways and greenways may not always be required, see section 4.9 for general lighting requirements, however structures shall be illuminated in areas where public lighting is provided. The decision to provide lighting at structures shall consider the safety of the user, as well as the power supply and maintenance requirements.

The Designer shall consider the required ducting, supply, fittings and fixtures associated with the lighting system. All fittings and fixings shall be robust and tamper-proof.

Lighting systems shall not impede on the minimum width and headroom clearance requirements for the structure.

8.6.10 Access

Rural offline cycleways, including national and regional greenways, can be located in areas that may have limited accessibility via local roads. Access requirements to the site for construction, inspection, maintenance and repair shall be considered in the design of structures.

Where access to a site is significantly restricted, limitations for future maintenance and repair shall be considered in the design through the use of more durable components or systems. For example, opting for bearings or expansion joints with a higher design service life or specifying more durable paint, surfacing or waterproofing systems.

The design of structures on rural cycleways and greenways shall account for access requirements within and around the structure, where required, for inspection and maintenance activities. This may include:

- Access for inspection and replacement of replaceable components;
- Access for repainting of metal structures or metal components;
- Design of access galleries within the structure, where appropriate.

8.7 Additional Design Requirements for Existing Structures

8.7.1 Structural Assessment

Structural assessments should be undertaken for all existing structures that are intended to be repurposed for use on a rural cycleway or greenway. The purpose of structural assessments is to verify that the existing structure is safe for public use and is functional for its intended purpose and for the intended service life.

Structural assessments shall be carried out in accordance with the requirements of the TII Structures Assessment Standards (AM-STR series documents).

The level of assessment required may vary between structures due to the structure type, age, loading history and levels of risk. Any structures found to be sub-standard relative to the Stage 1 requirements of the TII Structures Assessment Standards shall pass a Stage 2 or 3 Assessment, or must be adequately repaired and/or strengthened prior to use.

In some cases, additional testing may be required to inform the structural assessment. This may include material testing or non-destructive testing methods.

Existing structures should undergo a Feasibility Evaluation, a Preliminary Structural Assessment and a Detailed Structural Assessment as part of the Technical Acceptance procedure. These are detailed in the following sections.

NOTE: There may be inherent risks associated with the repurposing of existing in-service structures or bringing previously abandoned structures back into use. The assessment of these structures can be complex and time consuming due to potential difficulties obtaining as-built information of the structure, as well as information of construction methodology and maintenance and repair activities that have occurred during the lifetime of the structure. Some of these structures may contain hidden defects that are difficult to diagnose, for example the effects of scour or substructure and foundation defects. It must also be considered that these structures may have more onerous future maintenance and inspection demands than an equivalent new build structure. Equally, there may be cost and sustainability benefits and opportunities for enhanced user experiences in repurposing existing structures or bringing them back into service. All relevant constraints, risks and opportunities will be considered by the Designer in the development of the project.

8.7.1.1 Feasibility Evaluation

An initial Feasibility Evaluation of any existing structures intended for use on a rural offline cycleway, including greenways, should be carried out as part of the Technical Acceptance procedure.

The purpose of this evaluation is to determine the feasibility and cost for inclusion of this existing structure on the planned route, including an evaluation to determine whether the structure is appropriate for the intended purpose. This evaluation shall also consider the feasibility of potential repairs or modifications needed to make the structure safe for use and suitable, as well as future maintenance requirements.

8.7.1.2 Preliminary Structural Assessment

A Preliminary Structural Assessment should be carried out for all existing structures to be repurposed for use on rural offline cycleways, including national and regional greenways. Details of this assessment should be included in the Preliminary Design Report.

A Preliminary Structural Assessment must be made based on available information of the existing structure, which may include as-built and/or construction records, maintenance information and inspection data. The assessment shall consider the expected function of the structure and shall account for any expected modifications and repairs that will be implemented prior to the structure opening. An associated preliminary cost estimate to bring the structure back into service must also be developed, based on inspection data of sufficient level of detail to ensure a robust cost estimate at this stage of the process.

An Inspection for Assessment of the structure must take place prior to the completion of the Preliminary Structural Assessment such that information such as geometry and materials of the structure may be confirmed. This inspection and any associated surveys and investigations must provide sufficient detail of the structure to allow for robust cost estimates.

8.7.1.3 Detailed Structural Assessment

A Detailed Structural Assessment should be carried out for all existing repurposed structures intended for use on rural offline cycleways, including national and regional greenways. Details of this assessment should be included in the Technical Acceptance Report.

A Detailed Structural Assessment shall be made based on available information of the existing structure, and shall include details of modifications and repairs developed during the detailed design stage of the project. A detailed cost estimate shall also be developed.

An Inspection for Assessment of the structure shall take place prior to the completion of the Detailed Structural Assessment such that information such as geometry and materials of the structure may be confirmed. Where relevant, material testing of the structure may be required to confirm this information. If sufficient information was gathered in the inspection for the Preliminary Structural Assessment, an additional inspection may not be required at this stage.

8.7.1.4 Inspection for Assessment

As mentioned in Section 8.7.1.2 and 8.7.1.3, an Inspection for Assessment shall be carried out prior to the Preliminary Structural Assessment to verify the form of construction, dimensions, and nature and condition of the structure. In some cases, this inspection may require additional surveys and investigations, which could include diver scour surveys and rope access surveys, to ensure that a comprehensive understanding of the structural condition is obtained.

If further verifications are required, an additional Inspection for Assessment shall take place prior to the Detailed Structural Assessment.

All Inspections for Assessment shall be carried out in accordance with the requirements of Section 2 of *AM-STR-06026 – The Assessment of Road Bridges and Structures.*

8.7.2 Structural Safety and Remaining Service Life

For existing structures on rural offline cycleways including greenways, the structure shall be appropriately assessed to demonstrate the structural safety of the structure and the remaining service life.

NOTE: The desirable minimum remaining working life should not be less than 30 years.

In the event that a structure has previously been abandoned, is in disrepair, or is being repurposed for use as a rural cycleway or greenway structure, relevant repairs, strengthening and retrofitting of the structure shall be carried out to ensure safety of the structure and the safety of the structure in use (for users and maintainers).

The design service life for any non-replaceable repair or retrofitting components shall not be less than the remaining service life of the structure.

8.7.3 Geometry

8.7.3.1 Minimum Bridge Width

When renovating or repurposing existing structures for use rural offline cycleways, including greenways, it may not be possible to achieve the minimum design widths as outlined in Section 8.5.

This may not necessarily preclude the use of the structure, particularly where any risks to users can be mitigated or where there are no feasible alternative design solutions.

8.7.3.2 Parapets and Restraint Systems

In cases where it is not feasible to achieve the minimum recommended parapet requirements as outlined in 8.6.6 for existing structures due to technical, environmental, or conservation reasons, relaxations of the requirements may be used.

In these cases, all non-compliant elements shall be subject to a Designer's Risk Assessment in accordance with the requirements of the Health, Safety and Welfare at Work (Construction) Regulations 2013.

Where the outcome of the Designer's Risk Assessment results in hazards for the user, mitigation measures shall be put in place. These may include:

- Locating the path or cycleway away from the parapets or directing users away from the parapets (delineating strips, tonal contrast of surface, advisory line to keep cycle users away and direct pedestrians to parapet side)
- Re-profiling the bridge deck to increase the parapet heights

8.7.4 Aesthetics and Conservation

In some cases, existing structures intended for use as part of a rural offline cycleway, including greenways, may have historical significance. These may include Protected Structures, National Monuments, or structures that are considered to have historic or conservation merit by the relevant Local Authority. The recommissioning of these structures must involve engagement with relevant stakeholders as outlined in Section 3.2.6, and care should be taken to conserve the historical integrity of these structures in accordance with the requirements of *AM-STR-06051 – The Conservation of Road Structures*.

Modifications may be required when repurposing an existing structure for use on a cycleway or greenway. These modifications may be structural or non-structural in nature. Where practicable, modifications shall not detract from the original aesthetics of the structure and similar materials must be used. Further guidance on modification methods for existing structures may be found in *AM-STR-06026 – The Assessment of Road Bridges and Structures*.

8.8 Construction Considerations

Rural offline cycleways, including greenways, are often located in rural environments, where sites may be exposed and be less accessible for large construction equipment or heavy goods vehicles transporting materials or components to or from the site. Consideration of access routes, environmental conditions and material availability should be taken when planning construction activities.

Where practicable, the prefabrication of structural components may be preferable if access to the site is limited. The design of these components should account for any accessibility or spatial constraints at the site or when transporting to the site.

When repurposing existing structures, it should be considered that specialist expertise may be required during construction. This could include:

- Repointing of masonry;
- Refurbishment of wrought iron and rivets;
- Divers for scour inspection;
- Roped access surveys;
- Paint removal and repainting of metal components (including hanging scaffolding and encapsulation);
- Removal, rehabilitation and reinstatement of existing materials or components (e.g. corroded metal elements);

Care should be taken to ensure that specialists with the appropriate experience are employed to ensure high standards of execution.

8.9 Inspection & Maintenance

See Section 10 for general maintenance requirements for rural offline cycleways, including national and regional greenways.

The inspection and maintenance of structures on rural cycleways and greenways are important considerations to ensure the ongoing safety of its users and the durability of the structure so that it may meet its expected design service life. The following provides some good practice advice to structures asset owners on the processes around the inspection and maintenance of structures.

The inspection and maintenance of structures on rural offline cycleways, including national and regional greenways, should be managed through an appropriate asset management system. This system should allow the asset owner or manager to record and compare past inspection data and all maintenance activities. Inspection data should include:

- Photographs of the structure that illustrate the current condition – especially in locations of damage or deterioration;
- A condition rating for the structure and individual components of the structure e.g. expansion joints, bearings, parapets etc.;
- Descriptions of any damage or deterioration noted during inspections;
- Details of past repair and maintenance activities and required future repairs;

- Any other relevant information that will inform future inspectors of the structural condition and will allow for the planning of maintenance interventions, including a chronology or history of the structure where relevant (e.g. current and historical function, history of disuse etc.).

The maintenance requirements for all structures on rural offline cycleways, including national and regional greenways, should be recorded in an Operations & Maintenance manual. This may include structure-specific maintenance requirements.

8.9.1 Inspection

The objective of inspections of structures is to ensure the safety of the user, to determine the impact of the environment and traffic on the structure, and to identify necessary maintenance interventions.

All data obtained during inspections should be recorded and stored in an asset management system so that it is easily accessible ahead of future inspections or maintenance interventions, and so that data may be easily compared between inspections.

All inspections of structures should be undertaken by an engineer with qualifications and experience that are appropriate for the form and complexity of the structure. Inspectors are required to have met the minimum educational and experience requirements stipulated in The Department of Transport Bridge Asset Management System Guidelines or similar requirements as determined by the relevant Local Authority as Sponsoring Agency.

NOTE: For existing structures to be repurposed for use on a rural offline cycleway, specialist expertise may be required for the inspection of more complex aspects of the structure, such as wrought iron structures, riveted connections and masonry structures.

In the case that the structure interfaces with a national road, inspections shall be undertaken in accordance with the requirements of *AM-STR-06055 – EIRSPAN Bridge Management System Routine Maintenance Manual* and *AM-STR-06054 – EIRSPAN Bridge Management System Principal Inspection Manual*.

8.9.1.1 Maintenance Inspection

Maintenance Inspections should comprise of a visual inspection of the structure which should be undertaken from ground level. In the case of bridges, the visual inspection should also be taken from below the bridge and at deck level.

The procedure followed in Maintenance Inspection and Routine Maintenance of structures on rural offline cycleways, including national and regional greenways, should include the rating of the observed condition of elements of the structure and the environment, including parapets, access & egress, vegetation, external walls, abutments and piers, and the deck and arch – where applicable. An example of an appropriate procedure is described in The Department of Transport Bridge Asset Management System Guidelines. Inspection and maintenance data should be stored in an appropriate asset management system to be determined by the relevant Local Authority.

Maintenance Inspections of structures on rural cycleways and greenways should take place on an annual basis, with additional Maintenance Inspections taking place after a significant event such as flooding. In the event that serious damage or deterioration of the structure is observed, a more detailed Engineering Inspection per 8.9.1.2 should take place such that the extent and consequences of the damage may be determined and the relevant bridge managers shall be notified.

8.9.1.2 Engineering Inspection

Engineering Inspections are systematic visual checks of all accessible parts of the structure. The purpose of an engineering inspection is to evaluate structural safety and need for repairs, monitor changes in the structural condition, and monitor the performance of routine maintenance.

The procedure followed in the Engineering Inspection of structures on rural offline cycleways, including national and regional greenways, should include a detailed condition rating of structural or non-structural components to determine an overall structure condition rating. This must include a description of defects and proposed remedial actions, where applicable. An example of an appropriate procedure is described in The Department of Transport Bridge Asset Management System Guidelines. Inspection and maintenance data should be stored in an appropriate asset management system to be determined by the Local Authority.

The initial Engineering Inspection of a new build structure should take place within 6 months of opening and should take place prior to opening for existing structures. Subsequent Engineering Inspections of structures on rural cycleways and greenways should take place at intervals of one to six years. The length of this interval is dependent on the structural condition and expected rate of future deterioration.

8.9.2 Maintenance

The objective of routine maintenance of structures is to carry out cleaning and maintenance activities to prevent or delay the deterioration of the structure. Routine maintenance interventions may be identified visually during inspections and may include the following:

- Cleaning of expansion joints, gullies and manholes and similar openings on the bridge surface;
- Removal of vegetation that is impeding on the structure or obstructing it from view such that it may not be adequately inspected;
- Repair of damaged barriers, parapets, surfacing, joints etc. in order to eliminate safety hazards;
- Sweeping and cleaning of the traversable area of the bridge deck. In the case of surfaces such as timber that may become slippery, any surface mould or mildew should be completely removed;
- Re-painting of steel structures or components such as barriers, parapets, and handrails.

When planning maintenance and repair interventions on structures on rural offline cycleways – including greenways, it is essential to consider the accessibility of the structure and the equipment and machinery required. No maintenance or service vehicles may load a structure unless consideration of a similar vehicle was taken during the structural design and/or assessment. In the case of major interventions requiring heavy machinery, consideration should be taken of the recommendations in Section 8.8 of this document.

9. Rural Cycleway Monitoring & Evaluation

9.1 General

The type of monitoring and evaluation undertaken for a rural offline cycleway project should be dependent upon the specific project needs, objectives, and targeted outcomes. At the beginning of each project, a project-specific Monitoring and Evaluation Plan shall be developed to identify the necessary data collection and interrogation requirements needed to advance the development of the design from project initiation to construction, as well as the physical infrastructure needed to fulfil these requirements (e.g. counters, power supplies, transmission infrastructure). The development of the Monitoring and Evaluation Plan shall take cognisance of the data required to meet these obligations, as well as the requirements set out in TII's Project Appraisal Guidelines, in particular *TII PAG Unit 13.0 – Appraisal of Active Modes.*

9.1.1 The Need for Monitoring & Evaluation

Understanding how rural cycleway and active travel interventions function will allow the Sponsoring Agency and maintaining organisation to better manage and improve these facilities. The data collected can be used to:

- Assess the demand for active travel and where to prioritise investments
- Aid in the planning and construction of present and future interventions
- Review the performance of experimental interventions
- Make the case for new proposals
- Demonstrate and quantify the economic benefits of the interventions
- Communicate the long-term community gains

9.1.2 Limitations and Considerations Associated with Monitoring & Evaluation

When planning a new cycle route or improvements to an existing network, the Designer may look for data from other existing routes and networks of a similar nature (proximity, geography, population, etc.) to aid in the forecasting of the future usage after completion and to help make the case for the intervention. However, this information should not be solely relied upon when planning future interventions, as the progress towards meaningful and aspirational modal shift may be incremental and it can often be difficult to account for any induced demand that are yet to be realised without the buildout of the full infrastructure or network. Therefore, Sponsoring Agencies and Designers should be reminded that the design for sustainable outcomes and growth should be plan-led and policy-driven, and not purely based on survey-derived assumptions.

9.1.3 Objectives and Key Performance Indicators

The form and extent of the Monitoring and Evaluation Plan will be dependent on the type and scale of the intervention. To ensure that it meets the intended project outcomes and objectives, the Designer should develop the Monitoring and Evaluation Plan in close consultation with the Sponsoring Agency and:

- Set S.M.A.R.T.[7] outcome targets (e.g. x% increase in active travel mode share at local trip attractors, y% annual improvement in user satisfaction, z% of utility trips along an active travel route)

[7] S.M.A.R.T = Specific, Measurable, Achievable, Relevant and Time-bound

- Identify appropriate Key Performance Indicators (KPIs) for the evaluation – the selection of the KPIs should be informed by the information outlined in Section 9.2, the TII Project Appraisal Guidelines, the Public Spending Code, as well as the Common Appraisal Framework for Transport Projects and Programme
- Establish a baseline for future benchmarking through the collection of existing, pre-intervention data
- Measure and evaluate changes to the indicators on an annual or regular basis to capture any incremental changes that may occur over time

9.2 Data Requirements

Two main types of data are commonly used in the monitoring and evaluation of active travel projects – Quantitative and Qualitative data.

Quantitative data includes information that can be collected either manually or through some form of automatic detection technology. Examples of quantitative data include the number of users passing a certain point, user speed, direction and mode of travel.

Qualitative data deals with user characteristics that are not normally collected through detection technologies and require some form of engagement with the user. This includes information such as user demographic and socio-economic profiles, trip purpose and frequency, as well as user experience and perception of the facilities.

The selection of the appropriate datasets to be used for monitoring and evaluation should be done in close coordination and collaboration with TII, the Sponsoring Agency and any other relevant agencies and stakeholders that may have a need for the data.

Table 9.1 provides a summary of some of the potential datasets to be used in the monitoring and evaluation of rural offline cycleway projects.

Table 9.1 Potential Datasets for Monitoring and Evaluation

Type	Dataset	Reason for Collection	Collection Methods
Quantitative	Volumes of people walking, wheeling and cycling	Understand, quantify and compare the usage of cycling facilities. Analyse the usage trends over different time periods (e.g. time of day, day of week, season, year over year). Assess and evaluate the impact of an improvement/ intervention.	Manual counting, automatic counters, video recording, crowd sourced datasets.
	Cycle parking provisions and utilisation rates	Identify popular destinations (trip end data points) and prioritise locations for additional amenities.	Manual counting, video recording, usage data from cycle parking providers/operators.
Qualitative	User profile	Understand the different types of users and their trip purpose.	On-site observations, surveys, demographics data from crowd sourced datasets (if available).
	User perceptions	Identify locations and areas for future improvements.	Surveys

Type	Dataset	Reason for Collection	Collection Methods
	User expenditure	Understand and quantify the economic impact of cycling facilities.	Surveys, transaction datasets.

The choice of datasets should take cognisance of the specific project needs, objectives and targeted outcomes, as well as the resources available.

9.3 Data Collection Methods

Before deciding on a data collection method, the Designer shall first review the list of existing national and local datasets to identify if any may be used for the project (e.g. Census of Anonymised Records (POWSCAR)). The method of data collection should be selected based on the remaining data requirements outlined in the project Monitoring and Evaluation Plan. **Table 9.2** provides a list of some common data collection methods.

Table 9.2 Common Data Collection Methods for Monitoring and Evaluation

Type	Method	Advantage	Disadvantage
Quantitative	Automatic counts	Ability to collect continuous data over a long period of time.	Require routine maintenance and validation to ensure data quality. Depending on the technology make and model, automatic counters can often require a higher start-up cost and more supporting infrastructure (See **Section 9.3.1**).
	Post processed video recordings	Ability to store and review footage at a later date. Ability to collect certain user attributes (e.g. cycle type, helmet usage).	Risk of vandalism in low traffic areas. Data privacy concerns and requirements (e.g. GDPR, Data Protection Impact Assessments).
	Manual counts	Ease of deployment and lower start-up cost. Less supporting infrastructure required. Ability to collect certain user attributes (e.g. high-level demographics data, cycle type, helmet usage).	Higher operating cost associated with manual collection. Difficult to sustain for a long period of time and could be prone to human errors.
	Crowd sourced data using computer or smartphone applications	Possibility to obtain large datasets.	Inherent bias in data, as not all users may have access to the necessary technologies. Data privacy concerns and requirements (e.g. GDPR, Data Protection Impact Assessments)
Qualitative	Intercept surveys	Ability to collect user attributes.	Risk of inconsistency between interviewers.

Type	Method	Advantage	Disadvantage
		Questions are tailored to the needs and objectives of the project.	Significant operating cost associated with on-site data collection. Potentially challenging to collect a representative sample size.*
	Travel surveys	Ability to collect user attributes. Questions are tailored to the needs and objectives of the project. Surveys can be distributed either in person or online.	Depending on the survey uptake, it can be potentially challenging to collect a representative sample size.*
	Interviews/ focus groups	Questions are tailored to the needs and objectives of the project. Opportunity for more detailed information/ more in-depth conversations.	Potentially challenging to collect a representative sample size.*
	Central Statistics Office (CSO) data	Expansive dataset, including information on socio-demographic indicators.	Questions may not be tailored to the needs of the project.

**The appropriate sample size shall be identified in accordance with the project context, needs, and objectives.*

In addition to the methods listed above, there are also a number of emerging data sources, such as bike-share location data, that might be considered on a case-by-case basis for project monitoring and evaluation by the Designer.

9.3.1 Quantitative Data Collection

Data collection for quantitative data may be either automated or manual in nature, as seen in **Table 9.2**. The method, location, and number of data collection points required for the project shall be determined by the Designer in consultation with TII. Depending on the needs of the project, automatic counters can be used on either a temporary or permanent basis.

To help improve the quality of the quantitative data collected, a range of external factors, such as the usage profile of the infrastructure (e.g. tourist vs commuter), seasonal variations in usage, and any adjacent parallel roadway corridors for potential co-location of the counters, should be considered ahead of time. The following sections provide a summary of a few key factors for consideration when locating automatic data counters.

Urban vs. Rural Environment

In the context of active travel, urban environments are characterised by a shorter distance in between intersections and access points, a higher overall user demand (as well as a higher proportion of bicycle trips for commuting purposes), better cellular network coverage, more infrastructure connection points and an easier access for equipment maintenance. As such, automatic counter placements are recommended to be more frequent in urban settings to provide better resolution for the data collected.

On the other hand, rural environments are characterised by a longer distance in between intersections and access points, a lower overall user demand, lower coverage by cellular networks, fewer infrastructure connection points and generally less accessible for equipment maintenance.

As such, automatic counters are often deployed more sparsely in these areas and manual data collection is often necessary to compliment overall data collection.

Temporary vs. Permanent Deployment

Temporary data collection can often be used to evaluate the impact of an intervention or to compare the impact of a specific event, such as a short-term detour due to road construction. Compared to permanent data collection methods, temporary collection is more flexible in nature, requires less supporting infrastructure and is often cheaper and easier to deploy. As such, it is often used for pilot projects or low-demand corridors, where the cost of an automatic counter might not be fully justified, and at sensitive locations not yet suited for a permanent solution (e.g. on-going roadwork that might require the relocation of a permanent counter). In some scenarios, an enhanced temporary collection program could be set up to collect data at regular intervals to provide a discrete data set for longitudinal monitoring.

Compared to temporary data collection, permanent data collection offers the advantage of continuous long-term data that can be analysed for changes over a number of different timeframes. However, due to the maintenance and supporting infrastructure required for an automatic counter, the cost for a permanent solution is often higher. Thus, permanent data collection is often reserved for deployment at strategic locations.

Data Verification and Validation

Another common use case of temporary manual data collection is for the verification and validation of automatic counters. Routine verification gives Designers and Sponsoring Agencies an opportunity to identify any potential issues in data quality ahead of time, improve analysis reliability and can sometimes help prevent costly equipment upgrades down the road.

To ensure the quality and accuracy of the automatic counters installed, manual counts and/or survey data are recommended to be used to independently validate the data taken from automatic counters on an on-going basis. Video camera footage and online travel surveys may also be used for this purpose and to adjust the raw visitor counts.

In these cases, the secondary data source (e.g. manual counts, survey data, video camera footage) should take place at a location close to the automatic counter to ensure the representativeness of the data. Furthermore, the verification and validation of automated counter data shall be subject to TII's approval and certification processes.

Infrastructure

In general, the following supporting infrastructure should be considered during the technology and site selection phase for automatic counters:

- **Power supply** – depending on the technology and the model selected, the counter could be powered using either one or a combination of the following methods:
  - Built-in batteries – for this method of power supply, regular monitoring and upkeep of the battery shall be put in place to maintain the health of the system. For some technologies with a low power draw, the battery life can last up to 10 years.
  - Power from grid – for this method of power supply, it is necessary to review the location of installation ahead of time to confirm that a connection to the existing power grid is possible.
  - Solar panels – for this method of power supply, it is necessary to review the historical weather data at the location of installation to confirm its viability. Solar panels and associated supporting structures will also need to be installed.

- **Telecommunications/ transmission** – for automatic transmission, the counter can be either:
  - Hardwired to an existing ethernet/fibre optic network or a nearby traffic cabinet; or
  - Connected wirelessly to an existing Wi-Fi or cellular network.

However, it is worth noting that both of these options can be hard to come by in rural areas. In those cases, manual retrieval of the data might be required for data processing.

- **Mounting structure and equipment housing** – depending on the technology and the model selected, additional mounting structures and equipment housing might be required to protect and support the counter.
- **Parking and hard standing area** – for ease of maintenance, a maintenance parking and hardstanding area made up of materials such as compacted stone or geogrid is recommended near the counter.

Figure 9.1 Example of the supporting infrastructure for an automatic counter

9.3.2 Qualitative Data Collection

A sample qualitative survey is included within **Appendix B**. As noted, the Designer shall tailor the data collection and evaluation requirements based on the project context, needs, objectives and limitations. The points hereunder outline some of the considerations associated with field surveys. However, the Designer should note that other forms of qualitative data collection, such as online travel surveys, should also be considered and utilised as appropriate.

Location

If applicable, the location of the on-site survey should coincide with the location of the automatic counters or manual counts to help with the integration between quantitative and qualitative data sources.

Frequency

In terms of frequency, qualitative data collection programs are recommended to be conducted, at a minimum, every three to five years to understand any potential change in the use and perception of the infrastructure.

Where possible, yearly collection is also encouraged to provide more granularity in the data. Such surveys are not limited to on-site or on-infrastructure surveys and may include formats such as focus group surveys, community surveys, school surveys, enterprise surveys, etc.

Duration

For on-site surveys, the duration of data collection should be determined on a case-by-case basis based on the specific needs and objectives of the project. In general, the more detailed the results required, the longer the survey duration.

Survey time should be divided to cover both the high and quieter seasons, based on data collected from the automatic counters and local knowledge. The minimum amount of survey days shall be determined taking cognisance of the need to gather weekday, evening, and weekend periods. Moreover, the number of survey days required shall take into account the volume of users on the route and the time period required to gather sufficient data.

Unless a site has been observed to have a significant winter ridership, the surveys should only take place over the spring, summer, and autumn seasons. UK (Department for Transport) experience highlights spring to be the best season for surveys administration.

In terms of the time of day, the survey duration should cover the period of time with the highest user traffic. A common time period for intercept surveys and counts is from 7:00 am to 22:00 pm but the exact time should be determined on a case-by-case basis using data from any nearby counters or on-site observations.

On all occasions, the time and duration of the survey, such as the day of the week, weekend, on or off any holidays, during or outside of school-terms and working hours, should all be taken into account when designing and analysing the survey responses. For a more representative result, the experience from UK recommends that the surveys be carried out during school terms.

Format

In terms of format and cost, a self-administered, on-site format is often the most cost-effective and has a very high response rate (in contrast to online surveys), especially for cycling tourists.

Sample Size

The sample size for the survey responses should be large enough to avoid any potential disclosure of private personal information and ideally be in the range of 100+ responses. To help ensure an equitable reach of infrastructure users, the sample size should also take into account the demographics profile of the respondents, such as their gender and age, and aim to achieve a representative distribution that is similar to the general population (ideally minimum 1000 responses). Otherwise, survey analysis may not be fully representative of the opinions of the general public.

9.3.3 Rural Data Collection Considerations

If selected, automatic counters installed on rural cycleways should be capable of collecting both pedestrian and cyclist flows on a continuous basis. As seen at the beginning of **Section 9.3**, a broad range of technologies are available for automatic data collection, such as a combination of inductive loops and passive infrared sensors, to capture both modes in the rural context. **Figure 9.2** shows some of the data fields that can potentially be collected using an automatic counting unit using such a configuration.

Mode Type			User Age	Traffic Count		
Pedestrian	Cyclist*	Car	Age	Count	Speed	Direction
✓	✓			✓	✓	✓

* Other active modes of travel, such as e-scooters or wheelchairs, may also be detected depending on the material of the mobility device, its speed of travel, and the level of sophistication of the data processing algorithm.

Figure 9.2 Data Fields – Quantitative Data Collection (Automatic Methods)

Depending on the needs of the project, qualitative data collection may be undertaken to augment and expand the range of information collected. **Figure 9.3** shows the fields of information that can potentially be collected using a combination of automatic counting units and qualitative surveys.

Mode Type			User Age	Traffic Count		
Pedestrian	Cyclist	Car	Age	Count	Speed	Direction
✓	✓		✓	✓	✓	✓

Figure 9.3 Data Fields – Quantitative and Qualitative Data Collection (Automatic + Surveys)

Data collected using automated technologies shall be stored in a format that is compatible with existing TII data platforms and readable using existing TII systems. Similarly, any manual or temporary counts shall be formatted in such a manner so it can be readily uploaded to existing TII systems. The Designer shall consult with TII to identify the necessary data format and specifications, as well as any data cleaning and quality assurance requirements prior to undertaking any data collection efforts.

9.4 Data Analysis and Output

Once collected, the data shall be analysed in accordance with the requirements outlined in the Monitoring and Evaluation Plan and the output from the analysis shall be expressed in a clear and structured manner to enable its use and dissemination. The content and format of the output should be established at the outset of the project as a part of the development of the Monitoring and Evaluation Plan, but flexibility should be allowed for further improvements of the data presentation and/or analysis. Pre- and post-intervention comparisons should be carried out to quantify and assess the impact of the intervention.

Depending on the needs and objectives of the project, the outputs of the analysis may include, but are not limited to the following:

- Total walking, wheeling, and cycling movements (volume) and percent change
- Walking, wheeling, and cycling movements (volume) and percent change across different user groups
- Perceptions of the cycleway – overall, infrastructure and amenities, sense of safety, convenience, etc.
- Economic, environmental and community benefits (e.g. increased spending in town centres, reduced cost of congestion, reduced cost to healthcare, increase in social cohesion and community pride)

10. Maintenance and Management

10.1 General

When designing new or improved rural offline cycleways it is necessary to take account of requirements pertaining to their maintenance. This chapter provides guidance on items to be considered in relation to their maintenance and management.

Of greatest significance during project development is identifying long term maintenance and management considerations, including the requisite maintaining organisation. Maintenance and management arrangements and requirements shall be agreed with the maintaining organisation.

10.2 Designing with Maintenance in Mind

Maintenance should be considered as part of the route development process long before construction starts. It is essential that the Designer consider maintenance and management requirements in the project's development.

The requirement for maintenance access, including associated equipment, shall be considered during the project's development. This is required so as to ensure adequate clear space and headroom for maintenance vehicles, or an alternative access route, is available.

10.3 Maintenance Responsibilities

Ascertaining maintenance responsibilities of rural offline cycle infrastructure, including national and regional greenway infrastructure, requires careful consideration. Ascertaining, and allocation of responsibilities will require concerted communication and engagement between the Sponsoring Agency and landowners and corporate bodies, as necessary.

10.4 General Maintenance Tasks

The maintaining organisation will be required to maintain their cycleways and establish inspection regimes. Some of the considerations that affect walking, wheeling, and cycling network safety and serviceability include:

- Surface defects;
- Drainage and utility cover maintenance;
- Guardrail, fencing, and restraint systems;
- Traffic systems and pedestrian and cycle crossings;
- Lighting;
- Verge, trees, and hedges;
- Structures maintenance and inspection;
- Surfacing inspection and enhancement, including path edge deterioration and colour deterioration;
- Signing and road markings inspection, including wear and tear and clear visibility ;
- Vandalism or damage to signs, walls, fences, gates, ancillary infrastructure, and cycle parking;

- Grassland mowing;
- Cleanliness and weed growth.

10.5 Winter Maintenance

Walking, wheeling, and cycling routes are core tenets of a strong transport system and consequently should form part of regular and ongoing winter maintenance programmes. It is essential that the Designer consider winter maintenance and management requirements pertaining to the proposed rural offline cycleway during the project's development. Regard and reference may be had to Winter Service Manual – AM-PAV-06051.

It should be noted that the use of de-icing salts for winter maintenance is generally not appropriate for metal bridges or decking, such as steel, aluminium or wrought iron. Alternative means of maintenance shall be implemented in cases where de-icing salts are not appropriate.

11. References

11.1 TII Publication (Standards) References

AM-PAV-06051 - Winter Service Manual

AM-STR-06026 – The Assessment of Road Bridges and Structures

AM-STR-06051 – The Conservation of Road Structures

AM-STR-06054 – EIRSPAN Bridge Management System Principal Inspection Manual

AM-STR-06055 – EIRSPAN Bridge Management System Routine Maintenance Manual

CC-SCD-05144 - Cycle Friendly Gully Details

CC-SPW-00600 - Earthworks

CC-SPW-00800 - Specification for Road Works Series 800 - Road Pavements - Unbound and Cement Bound Mixtures

CC-SPW-00900 - Specification for Road Works Series 900 - Road Pavements - Bituminous Materials

DN-DNG-03062 - Edge of Pavement Design

DN-GEO-03030 - Design Phase Procedure for Road Safety Improvement Schemes, Urban Renewal Schemes and Local Improvement Schemes

DN-GEO-03031 - Road Link Design

DN-GEO-03036 - Cross Sections and Headroom

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

DN-GEO-03044 – The Geometric Layout of Signal-Controlled Junctions and Signalised Roundabouts

DN-GEO-03046 - The Location and Layout of Laybys and Location Markers

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

DN-GEO-03084 - The Treatment of Transition Zones to Towns and Villages on National Roads

DN-LHT-03038 – Design of Road Lighting for National Roads

DN-PAV-03021 - Pavement and Foundation Design

DN-PAV-03074 – Design of Bituminous Mixtures, Surface Treatments, and Miscellaneous Products and Processes

DN-REQ-03034 – The Design of Road Restraint Systems (Vehicle and Pedestrian) for Roads and Bridges

DN-STR-03001 – Technical Acceptance of Road Structures on Motorways and Other National Roads

DN-STR-03005 - Design Criteria for Footbridges

DN-STR-03020 – The Structural Design of Road Structures

GE-ENV-01103 - A Guide to Landscape Treatments for National Road Schemes in Ireland

GE-GEN-01005 - Departures to Standards and Specification

GE-GEN-01007 - Applying a Gender Lens to TII Public Transport Projects

GE-STY-01024 - Road Safety Audit

PE-ENV-01101 - Landscape Character Assessment (LCA) and Landscape and Visual Impact Assessment (LVIA) of Specified Infrastructure Projects - Overarching Technical Document

PE-PAG-02013 - Project Appraisal Guidelines for National Roads Unit 4.0 - Consideration of Alternatives and Options

PE-PAG-02031 - Project Appraisal Guidelines for National Roads Unit 7.0 - Multi Criteria Analysis

PE-PAG-02036 - Project Appraisal Guidelines for National Roads Unit 13.0 - Appraisal of Active Modes

PE-PDV-02046 - Area Based Transport Assessment (ABTA) Guidance Notes

PE-PMG-02041 - TII Project Management Guidelines

PE-PMG-02042 - Project Manager's Manual for Major National Road Projects

PE-PMG-02047 - Project Manager's Manual for Greenway Projects

11.2 Other Relevant Publications

Design Manual for Urban Roads and Streets (Department of Transport Tourism and Sport and Department of Environment, Community and Local Government, Dublin 2019)

Cycle Design Manual (National Transport Authority)

Traffic Signs Manual (Department of Transport Tourism and Sport, Dublin 2021)

Strategy for the Future Development of National and Regional Greenways (Government of Ireland, 2018)

Greenways and Cycle Routes Ancillary Infrastructure Guidelines (Department of Transport, 2022)

Code of Best Practice – National and Regional Greenways (TII, 2021)

Climate Action Plan 2021 (Government of Ireland, 2022)

National Investment Framework for Transport in Ireland 2021 (Department of Transport, 2021)

TII's Travelling in a Woman's Shoes (TII, 2020)

Code of Practice for Archaeology as agreed between the Minister for Arts, Heritage, Regional, Rural and Gaeltacht Affairs and Transport Infrastructure Ireland (TII, 2017)

Traffic Management Guidelines (Department of Transport, 2022)

PLG 23 Lighting for Cycling Infrastructure (ILP, 2020)

I.S. EN 13201-2:2015 Road Lighting

I.S. EN 13036-4:2011 Road and airfield surface characteristics. Test methods - Method for measurement of slip/skid resistance of a surface: The pendulum test

BS 5489-1:2003 Code of practice for design of road lighting

Ireland's National Biodiversity Action Plan (NPWS, 2017)

EU Biodiversity Strategy 2030 (European Commission, 2020)

National Sustainable Mobility Policy (Government of Ireland, 2022)

Access Control of Active Travel Facilities, Standards Group Circular 4 of 2022

Greenway Design and Brand Guidelines (Department of Tourism, 2018)

NSAI SR 28:2018 Recommendation for the use and implementation of the I.S. EN 13108 series bituminous mixtures – material specifications

Guidance Planning for Watercourses in the Urban Environment (Inland Fisheries Ireland)

Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes (TII)

Roads Act, 1993 (as amended)

Signing of EuroVelo Cycle Routes (EuroVelo, 2016)

Department of Transport Circular RW 10/2021: Structures Technical Acceptance Procedures for Regional and Local Roads

Bridge Asset Management System for Regional and Local Roads (Department of Transport, 2019)

11.3 Other Reference Documents

Design Manual for Bicycle Traffic (CROW, Netherlands, 2016)

Census of Anonymised Records (POWSCAR)

Appendix A:

Safety and Quality Audits

A1 Safety Audit

Safety audits of rural offline cycleways, including national and regional greenways, shall be undertaken in accordance with the requirements and scheduling of GE-STY-01024 – Road Safety Audit where the proposed infrastructure interacts with the road network.

A2 Quality Audit

Quality audits of rural offline cycleways, including national and regional greenways, should be undertaken to demonstrate that appropriate considerations have been given to all the relevant aspects of rural cycleway design from a user perspective.

The key benefits of a rural cycleway quality audit are as follows;

- A transparent process that demonstrates that the needs of pedestrians and cyclists and the design objectives are being considered.
- Enables the projects objectives to be delivered by putting in place a review procedure.
- Contributes to cost efficiency in design and implementation.
- Encourages engagement with stakeholders.

A quality audit report shall be prepared at the required intervals below summarising the issues raised. Items should be presented as a series of recommendations and considerations.

A3 Safety and Quality Audit Stages

Quality audits are required for all works carried out on rural offline cycleways which involve new infrastructure or reconfiguration of existing infrastructure, and which are not purely maintenance works. Audits and subsequent actions are to be completed at specific stages in the preparation of the project. These stages are:

- Stage F: Route selection stage; Road safety audit only.
- Stage 1: Completion of preliminary design; Road safety and quality audit.
- Stage 2: Completion of detailed design; Road safety and quality audit.
- Stage 3: Completion of construction; Road safety and quality audit.
- Stage 4: Early operation. Road safety audit only.

At the early stages of project development (Stage 1, and Stage 2) undertaking quality audits will be inherently interlinked with design development and ensuring appropriate design consideration.

It is imperative that design takes cognisance of ‘on the ground’ conditions and as such it is necessary that the Designer ground truth and cycle any potential routes (potential junction locations, connections to existing infrastructure, urban environment, etc.) so as to develop cohesive, safe, comfortable, and attractive cycle infrastructure.

A4 Audit Teams

Road Safety Auditors shall meet the requirements of TII GE-STY-01025 – Road Safety Audit – Audit Team Qualifications.

Quality auditors shall be appointed or identified by the Sponsoring Agency. Quality auditors may be members of the Designer organisation or independently appointed agencies such as Sports Ireland.

A5 Quality Audit Considerations and Sample Questions

Guidance and information on the completion of quality audits can be found in the Design Manual for Urban Roads and Streets (DMURS) Advice Note 4[8].

Depending on the nature of the project, focus areas for the quality audit of rural offline cycleways shall include:

- Non-motorised user considerations.
- Walkability considerations.
- Accessibility considerations.
- Cycleway considerations – e.g. visual quality, functionality, materials, etc.
- Design review.

The core tenet in relation to examining these considerations and identifying issues is that the perspectives of a range of users is required when developing infrastructure.

The below questions shall apply when undertaking quality audits for rural offline cycleways, including national and regional greenways. Please note this list is non-exhaustive, further questions shall be formulated and tailored to specific project and contextual requirements. Moreover, it shall be noted that adherence to the requirements of *DN-GEO-03047* (this Standard) will serve to respond and negate the presentation of commonly identified issues such as those relating to surfacing, access control, and traffic signs and road markings implementation.

Moreover, design criteria shall be in accordance with the requirements of this Standard, TII Publications more generally, the Cycle Design Manual, and the Design Manual for Urban Roads and Streets - with deviations therefrom requiring departure approval.

As noted, a quality audit report shall be prepared at the required intervals outlined summarising the issues raised. Items should be presented as a series of recommendations and considerations.

A5.1 Cycleways Sample Questions

1. Are cycleway facilities appropriate to the operating environment, taking cognisance of intended users (for example, consistent level of provision across entire route – connected, safe, coherent, accessible)?
2. Does the cycleway terminate at an appropriate location and in an appropriate manner?
3. Are the cycleway design, layout, and operating conditions clear to users so as to mitigate unintended conflicts and maximise the safety of intended users?
4. Does the cycleway include segregation, between pedestrians and cyclists, at requisite locations / operating conditions?
5. Are suitable waiting / dwell areas provided at junctions / crossings / trail heads?

[8] Design Manual for Urban Roads and Streets, Advice Note 4 – Quality Audits, Available at < https://www.dmurs.ie/_files/ugd/f378bf_18a49f74995940cfa97f2dc95226b7a8.pdf>

6. Is the cycleway surfacing appropriate for the location context / operating conditions?
7. Is the cycleway edging clear and unambiguous to users (for example, defined edging)?
8. Is the cycleway clear of landscape obstructions (trees, high bushes, and shrubbery) that impact visibility?
9. Are all drainage features, including surface water gullies, of cycle friendly design?
10. Is suitable wayfinding signage (including wayfinding boards, communication of route limitations – such as dismount signage – to potential users, etc) and regulatory signage provided for pedestrians and cyclists and, as appropriate, where the cycleway interacts with public road infrastructure? Is this signage clear and unambiguous?
11. Are the wayfinding signs of a suitable size and colour combination and uncluttered?
12. Are there suitable ancillary infrastructure; including seating, bike parking, water points; provided?
13. Is seating provided at inclines or slopes as rest points for mobility impaired users?
14. Is access control appropriate and proportionate?
15. Is the overall route implementation consistent in terms of layout, legibility, interpretability, level of infrastructure provision (including width, junction layouts, regulatory signage layouts, road marking layouts, ancillary infrastructure, and so on)?

A5.2 Walking Sample Questions

16. Does the cycleway adequately cater for the safe passage of existing pedestrian users after completion of the project by reinstating existing facilities or providing alternative new facilities?
17. Is cycleway of adequate width to cater for the expected pedestrian numbers?
18. Is the cycleway direct to points of interest without unnecessary diversions, loops etc?
19. Are any areas of shared use suitably signed by way of change in environment from segregated routes to shared facilities (surface colour, texture, signage, furniture etc.)?

A5.3 Accessibility Sample Questions

20. Is the cycleway clear of obstructions that would impede wheelchair users or be a trip hazard to sight impaired users?
21. Are all surface water gullies / slot drains outside of the desire line or less than 13mm wide and set at right angles to the line of traffic?
22. Are all paving materials suitable for the passage of sight impaired and arthritic and wheelchair users?
23. Is the cycleway clear of obstacles mounted more than 300mm above ground and protruding into the cycleway by more than 100mm?
24. Are flat areas provided at regular intervals on inclines or slopes as rest point for mobility assisted (wheelchair, frames, stick) users?

25. Is the cycleway clear of abrupt changes in level?
26. Is the cycleway clear of physical obstructions, such as trees, water features, roots, signage that approaches onto the cycleway route?
27. Is suitable tactile surfacing provided at all pedestrian crossing locations?
28. Are kerbs lowered to form a dished kerb approach gradient no greater than 1:12 and an upstand above road level no greater than 6mm?
29. Is the cycleway crossing free of road gullies, gratings or channels that may cause wheelchair or stick users' problems?
30. Is visibility to approaching road traffic achieved from all crossing locations and clear of temporary obstructions such as parked vehicles?
31. Is there a clear wheelchair turning circle of 1.8m at the junction of the crossing?
32. Are disabled user parking spaces provided at the trailhead or park and cycle facilities?
33. Are disabled parking spaces provided with a clearly marked TSM 104m symbol on the carpark surface to show parking assigned to disabled or mobility impaired drivers or passenger?
34. Is there a flush kerb to allow wheelchair access to the adjacent footpath at the trailhead or park and cycle facilities?
35. Are the signs mounted at a suitable height so they can be read but not cause a head clearance issue?
36. Are the signs positions so they do not cause a hazard?

Appendix B:

Qualitative Data Collection – Sample Data Fields

Qualitative Data Collection – Sample Data Fields (intercept survey – sample)

Qualitative data collections are often undertaken to help agencies better understand the different types of users and their trip purpose. The format and scope of the qualitative surveys should be formulated by the Designer based on the specific project needs, objectives and targeted outcomes. As such, the information presented herein is for sample purposes only and further modification may be required.

i. Survey Design

- The survey shall be designed to consist mainly of multiple-choice answers to allow for efficient completion and analysis of the survey.
- Questions with regard to the respondents' perceptions of the infrastructure shall be designed as open-ended questions to allow for a more impartial response.
- A number of other questions may include the option for open text or 'other (please specify)' options, where relevant, to capture the maximum level of detail.
- The survey should incorporate a range of questions in relation to the user, their trip purpose and daily spend while using the infrastructure to help assess the relevant economic indicators.
- The surveys should be repeated at regular intervals to help capture any changes in usage patterns and/or user perceptions over time.

ii. Fieldwork

- Comparing to digital surveys distributed online, the on-site intercept format has been found to produce a representative dataset.
- The number of locations shall be scoped by the Designer while taking into account of the targeted objectives. As highlighted within DN-GEO-03047, there are significant benefits in terms of data validation and integration to be garnered from undertaking surveys adjacent to the quantitative data collection locations.
- To ensure good data capture and anonymisation of responses, a sufficiently large sample size shall be targeted.
- Fieldwork shall be spread over a number of days and time periods to capture the broadest range of insights possible (e.g. school periods, commuting periods, recreation periods, tourism periods).

iii. Data Fields (Questionnaire Formulation)

Different types of qualitative data are available for collection depending on the needs, objectives, and scale of the project. In order to facilitate a Standardised approach, the qualitative data collection program should aim to collect the following information at a minimum:

- **Housekeeping/Background –** this information allows the data to be catalogued for future analyses and integrated with quantitative data collected over a similar time or at similar locations.
- Location.
- Date and time.

- Weather condition (this information can often be obtained afterwards from a nearby weather station).
- **Demographics and Socio-economic profile –** this information can help agencies better understand the demographics and socio-economic reach of the infrastructure, inform the direction of any marketing or engagement strategies and ensure an equitable access to these amenities (See Section 9.3.2 for information on sample size).
- Age group.
- Gender.
- Cultural and ethnic background.
- **User Type** – this information can help agencies better understand the current use of the infrastructure.
- Mode of travel at the time of survey – pedestrian, cyclist, etc.
- Usual mode of travel – walking, biking, transit, driving, etc.
- Experience level for cyclists – experienced, new, etc.
- Bike ownership for cyclists – own, borrowed, rented, etc.
- **Trip Characteristics** – this information can help agencies better understand the current use and reach of the infrastructure.
- Trip purpose – exercise, tourism, commuting, etc.
- Frequency of visit.
- Group size and type, family, etc.
- Origin and Destination.
- One-way vs two-way trip.
- Returning mode of travel for one-way trips.
- **User Experience –** this information can help agencies better understand the user's motivation for visiting and identify areas of potential improvements for future investments. Open ended questions in this field can be valuable in capturing the respondent's perceptions of the cycleway in greater detail, providing valuable opportunities in further enhancing the cycleway based on the constructive feedback/ criticisms received.
- Reason for choosing this section of the cycleway / how heard about cycleway.
- Favourite cycleway destination.
- Perception of the cycleway:
- Overall.
- Safety.
- Communication – Website, brochure, map, wayfinding signage, etc.
- Connivence – parking, café, washrooms, rental services, cleanliness, etc.
- Additional feedback (in an open format).

In addition to the fields above, Sponsoring Agencies might also want to collect the following information as needed to capture the relevant economic indicators:

- **Tourist Profile –** this information can help better quantify the economic impact of a cycleway and is essential in calculating the Return on Investment (RoI) for any cycleway project.
- Home country/ county.
- Tour type – self-guided, group tour, etc.
- Accommodation type and location, and reasons for choice.
- Duration of stay.
- Intention of visiting areas along the cycleway or staying at one location as a base.
- Total spend by category – accommodation, food and drink, transport, sightseeing, gifts, etc.

In summary, careful considerations and good planning should be made at the onset of any data collection program to help improve the quality and suitability of the data collected. Considerations such as the local context and survey objectives should be clearly articulated in the Monitoring and Evaluation Plan to ensure its overall success.

iv. Summary and Analysis

As highlighted in the body of the document, a successful monitoring and evaluation program is highly dependent on the careful planning and execution of the data collection and analysis. Particular care and consideration should be utilised when summarising qualitative survey responses to elicit universal insights into overall cycleway attributes and characteristics. For example, maintaining organisations often seek to understand the number of unique visitors/peak visitor numbers for their operations using a combination of permanent or temporary counters and qualitative survey results. Such exercises may require the engagement of appropriate experts such as statisticians and/or economists.

Appendix C:

Pavement Construction Considerations

Pavement Construction Considerations

The majority of the requirements and guidance with respect to pavement material production and layer construction is provided in the relevant TII Publication Specification for Road Works document as listed in Section 7.3.1. Additional, cycleway specific considerations are provided in this Appendix.

To ensure a smooth riding quality it is recommended that subbase, base, binder and surface courses be paver laid where possible for UGM, HBM and bituminous materials. Where narrow paving runs are required, pavers with paving widths as narrow as 800mm are available. Narrow track compaction equipment is also available. The use of hand work should be limited to localised restricted areas. **Figure C.1** depicts a typical narrow width bituminous material paver.

Figure C.1 Narrow width bituminous material paver

Cycleway pavement foundations specified in this document are sensitive to heavy weight construction machinery. This reduction in foundation capacity, in comparison to road pavements, is required due to economic and material optimisation considerations.

It is therefore required that suitable lightweight equipment be used to avoid deformation of the pavement and foundation during cycleway construction. Such equipment is readily available and should be specified in the Construction Contract.

Some examples of typical lightweight equipment are shown in **Figure C.2** and **Figure C.3**.

Figure C.2 Lightweight roller compactor equipment for cycleway construction

Figure C.3 Lightweight backacter for cycleway construction

C1 Geotextile Reinforced Unbound Granular Layer

The use of geotextile reinforced unbound granular layers can assist with crossing very soft ground.

An example of a typical solution is shown in **Figure C.4** where a geotextile (geogrid and geofabric) reinforced unbound granular layer construction is used to cross poor ground conditions.

Where a geotextile is considered for use within a cycleway pavement structure its use and design should be developed with the specific geotextile producer.

Additionally, its use should be limited to sections of cycleway which will not be expected to accommodate vehicular traffic. Notwithstanding, its specification and provision should be able to accommodate maintenance and emergency vehicle use.

Figure C.4 Geotextile reinforced unbound granular layer construction

C2 Use of in-situ Vegetation

Where suitable, the existing topsoil layer may be retained to take advantage of the natural load-spreading capacity of in-situ vegetation and root layer.

The overall settlement of the cycleway under its own self-weight will be negligible to the final vertical alignment of the route and therefore it would be acceptable to retain the original ground undisturbed in the construction.

C3 Surface Dressing Design

Where a surface dressing is selected as the pavement surfacing a surface dressing design is required. Once the surface dressing aggregate characteristics and substrate penetration rates are known at construction stage, a surface dressing design can be carried out. Due to low traffic volumes travelling the cycleway and assisting with chip embedment, consideration of increased binder application rates within the surface dressing design and additional pneumatic tyred roller passes are required. The surface dressing design procedure is detailed in DN-PAV-03074.

Appendix D:

Cycleway Pavement Routine Maintenance

Cycleway Pavement Routine Maintenance

Both routine and periodic maintenance activities are important considerations in the management of the cycleway pavement asset and ensuring the long-term durability and achievement of the expected life of the asset.

D1 Routine Maintenance

Routine maintenance activities relate to small, short-term interventions which promote the long-term durability of pavement assets. Routine maintenance intervention are identified visually by maintenance teams that regularly inspect the condition of the pavement asset. Routine maintenance activities include the following:

i. Crack sealing - This involves the filling of cracks in bituminous material pavement surfacing with hot or cold poured bituminous crack sealant. This intervention will promote the waterproofing of the pavement structure and reduce moisture ingress to the pavement structure facilitating accelerated pavement deterioration.

ii. Localised patching/pothole repairs - Where bituminous material surface and pavement failures occur in localised areas, the defect should be repaired to ensure cycleway user ride quality and safety. Proper repair methodologies should be applied to ensure repair durability e.g. shaped failure excavations, tack coat application and bituminous mixture compaction.

iii. Vegetation control - the removal of weeds and vegetation growing within or adjacent to the cycle way are required to ensure a safe riding surfacing for users. Vegetation present along a cycleway will negatively impact pavement surfacing skid resistance and the drainage flow of water.

iv. Spot re-gravelling - Unsealed roads will require localised re-gravelling to retain adequate levels of user ride quality. Localised gravel erosion occurs over time due to traffic and water run-off.

v. Blading - Where significant gravel erosion and surface irregularities have occurred across the full width of a cycleway blading of the gravel surface course may be required. Due to the low traffic levels expected on cycleways, blading is not expected to be required at high frequencies. Where unsealed cycleway drainage is poor, excess gravel erosion and pavement unevenness may require frequent blading and possible extensive re-gravelling.

Requirements with respect to the winter maintenance of cycleways can be found in TII Publication AM-PAV-06051 Winter Service Manual.

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