Sustrans Design Manual Chapter 5

Traffic free routes: conceptual design (draft)

Route types, alignment and general principles

December 2014

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Contents

This chapter of the Sustrans Design Manual should be read in conjunction with Chapter 1 "Principles and processes for cycle friendly design." That chapter includes key guidance on core design principles, whether to integrate with or segregate from motor traffic, the space required by cyclists and other road users as well as geometrical considerations. Readers are also directed towards the "Handbook for cycle-friendly design" which contains a concise illustrated compendium of the technical guidance contained in the Design Manual. This chapter has initially been issued as a draft and it is intended that it be reviewed during 2015; feedback on the content is invited and should be made by 31 May 2015 to designandconstruction@sustrans.org.uk

1. Key principles

Network planning

- each traffic free route should have a coherent function within the wider network
- urban trip generators should provide direct, coherent links between places, e.g. schools, residential estates, employment areas, transport hubs, healthcare and leisure facilities. Rural routes should connect settlements with public transport points and other rural attractions.
- routes benefit from frequent and convenient access points and should be consistently signed to form a coherent network.

Design

- scheme designers should have a clear design brief from the outset. Routes should be audited as a minimum at detailed design stage, during construction and prior to final completion. Minor amendments and defects rectified before handover to the maintaining authority or organisation
- routes should deliver high standards of coherence, directness, safety, attractiveness and comfort. All new routes should also consider the adaptability of the infrastructure to accommodate large increases in use
- on main urban routes path widths of 3.0m is considered a minimum, on rural routes 2.5m may be sufficient. Designers should factor in potential increases in use, especially if structures are required, and build for future user numbers rather than current levels
- widths should be increased on routes that include schools or major destinations where high numbers can be expected. Locations such as football grounds and concert venues in urban parks are often overlooked
- all traffic free routes within 5km of an urban area should have a sealed surface
- cyclists should have priority at minor road crossings and timings on signalised crossings should be optimised to benefit main cycle and pedestrian movements. This reduces kerbside waiting and improves pedestrian and cyclist safety
- developing the design, including decisions on segregation of users, should include early consultation with relevant interested parties. Groups representing walkers, cyclists, equestrian and disability groups should be consulted before, during and after construction
- designs should consider the space immediately bordering a path. Adjacent fences, hedge lines, boundary walls and building lines all reduce the usable path width and can reduce visibility around bends. Lamp columns, sign posts, benches and litter bins should be set back by at least 500mm from the path edge
- designers should be aware of the ecological constraints and requirements. Sites may be important locally, regionally, nationally and occasionally internationally. Create corridors or retain existing corridors to allow wildlife to move through the landscape
- routes can be built without significant damage to the ecological value of the land. Include cost effective enhancements such as pond scrapes, log piles and areas of bare sub-soils to encourage biodiversity
- ecological issues will vary between routes and even along sections of the same route. Ensure that designers are aware of the ecology by undertaking assessments early in the design process
- level changes are sometimes unavoidable, especially on link routes, but designers should seek to minimise the impact of gradients on all route users
- access controls should generally be limited to bollards. Where control is appropriate these should allow cyclists to pass without dismounting and allow more than one user through at a time
- routes that are interesting and attractive to all users will encourage greater numbers. Ecology and a wide range of biodiversity can be valuable in enhancing a route

2. Introduction

Bridgwater Canal, Sale, Manchester

Afon Valley, Port Talbot, S Wales

Flood bank, River Ouse, Ely, Cambs

Woodland route, Broxbourne, Herts

2.1
Routes free from motorised traffic can be developed in both urban and rural areas, utilising a wide range of linear corridors. Developing routes that provide direct connections between journey attractors, and which maximise connectivity to other parts of the cycle and pedestrian networks, are key to achieving high usage.

2.2
Traffic free routes should deliver high standards of all of the five cyclist requirements: coherence, directness, safety, comfort and attractiveness. Adaptability should also be considered, to ensure that new traffic free routes are capable of accommodating expanding urban areas and increased use.

2.3
The attention to detail in the design process, the quality of materials and construction will have a direct impact upon the levels of use and the future maintenance costs incurred. Investment in cycling infrastructure (design, construction and marketing) represents poor value for money if it does not conveniently serve desire lines, or if design details or deficient maintenance deter usage - even if other elements of the facility are exemplary. Common examples of features which undermine otherwise good routes include restrictive access controls, vegetation growth that encroaches on the path width, or failure of the path surface after winter conditions.

2.4
A route designed to accommodate convenient, unimpeded use by a wide range of users is likely to be more successful than one that focuses purely on cyclists. This may require additional width. This is especially relevant in urban areas, where careful consideration needs to be given to the differing needs of the various user groups.

2.5
Successful traffic free routes require proper consideration of each element during the design and construction process. These are:

2.6
Design

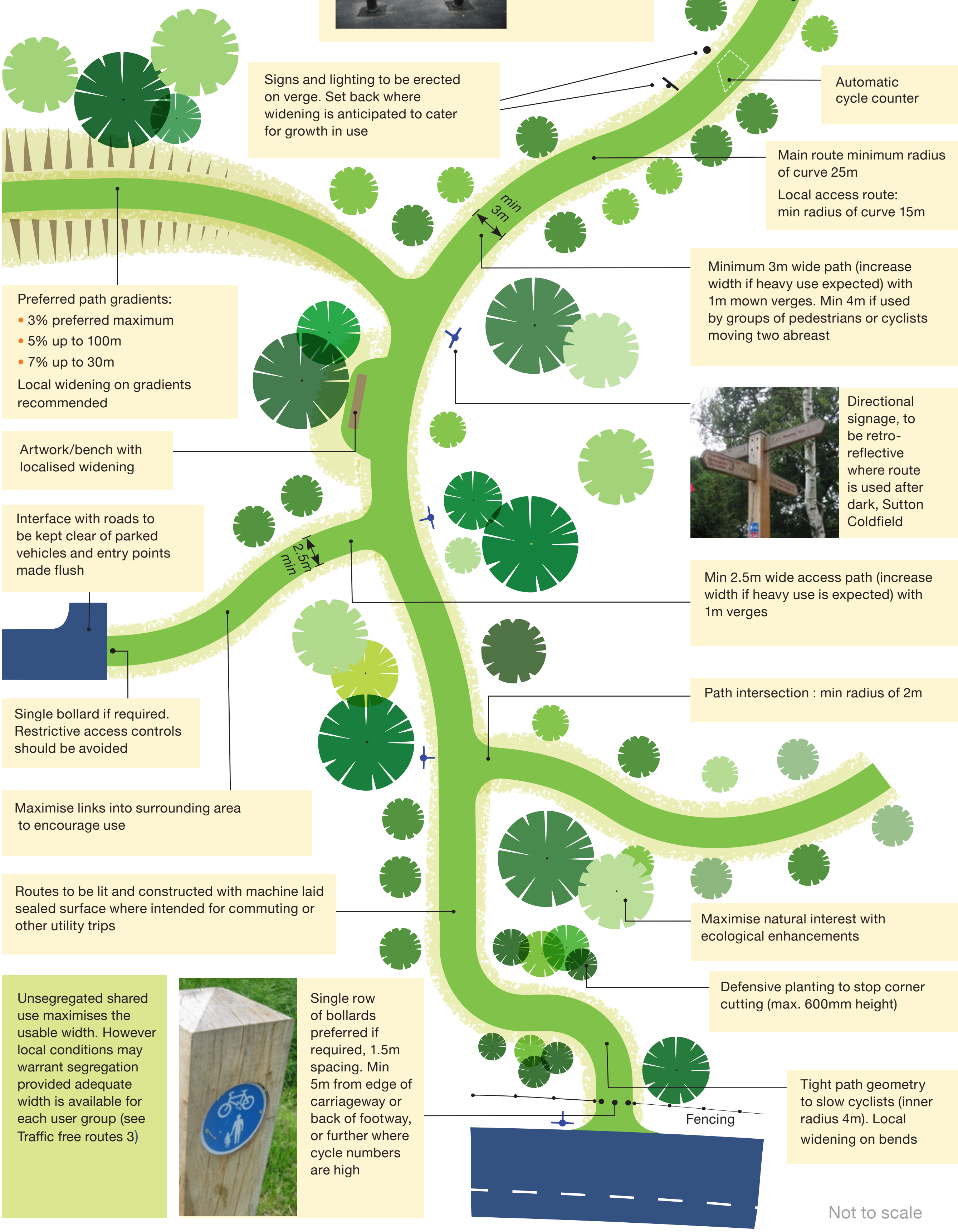
- understanding the role of the route within the wider network
- understanding the types and volumes of target users, including forecast increases
- width
- alignment and access
- gradients
- drainage
- lighting

2.7
Construction

- formation and sub-base
- surfaces
- edges and verges
- drainage
- lighting
- path edges
- access and speed controls

Fig 2.1: **Design of traffic free routes**

Traffic free routes are key features of cycle networks, providing short cuts away from the road. However their design needs to take account of the needs of all users.



Public parks, Watermead, Leicester

Field tracks, Kenilworth, Warwickshire

Multi use, near Ricall, North Yorkshire

Promenades, Hastings sea front

2.8
This chapter summarises key design considerations for developing high quality traffic free walking and cycling routes.

2.9
Chapter 6 describes construction aspects of traffic free routes, and references technical notes that provide additional information on construction.

2.10
Adequate time and money are required to develop high quality routes. No problem is unsolvable, but application of realistic time frames and funding are essential. Experience from developing routes on the National Cycle Network and elsewhere has shown that, when faced with challenges, the easy option does not always provide the best solution.

3. Types and features of traffic free routes

3.1
Traffic free routes come in a wide variety of forms, and a popular route may comprise one or several types that link to create a coherent corridor. The most common types of corridors used as traffic free routes are listed below:

- disused railway alignments
- canal and riverside paths
- river and coastal flood banks
- woodland and forest paths
- farm access roads
- footpaths and bridleways
- seaside promenades
- urban parks
- amenity spaces such as golf courses, racecourses, stately homes
- old road alignments
- other urban corridors (e.g. land adjacent to railways, derelict land)

3.2
Each corridor will present its own, sometimes unique, set of challenges that will need to be overcome. Table 3.1 details the various corridor types, the advantages of each and the types of challenges that may need to be overcome in order to develop a route.

3.3
There will generally be an element of ecological impact, although this will relate to each individual route rather than corridor type.

Table 3.1 **Features of different traffic free routes**

Type of route	Advantages	Key considerations / challenges
Disused railway alignment	• generally level routes • established corridor	• may need new structures • limited access points
Canal / Riverside track	• generally level route • overcome other barriers such as rail or major road networks	• rivers can meander • limited access points • canal infrastructure • width /headroom at bridges
River and coastal flood banks	• generally level	• Environment Agency* consents • not necessarily direct • limited access points
Woodland / forest tracks	• aesthetic • ambiance	• tree roots • leaf fall • lighting / personal security • restricted access / track damage during timber felling
Farm tracks / field tracks	• continuity of route	• farm vehicle movement and ongoing maintenance • directness
Other Public Rights of Way	• established corridor • potential short cuts	• bylaw / legal status • existing route users • established access controls
Seaside promenades	• level, wide, flat areas • heart of urban area	• bylaw / legal status • other route users • windblown sand
Urban Parks	• established destinations • significant green spaces • potential short cuts	• bylaw / legal status • perceived conflict • restricted opening times • specific alignments
Amenity Spaces (racecourse/ golf course etc)	• established destinations • potential short cuts	• third party land owners • restricted 24 hr access
Old road alignments	• sealed surfaces • established corridor	• junction with existing highway • retention on maintenance lists
Other urban corridors	• door to door • good connections	• number / frequency links •ownership

Newton Abbot racecourse

Golf Club access road, Maryport

Re-use of old road, Meadow Lane, Syston

"Living Street", urban concept, Bradford

* *Environment Agency in England and Wales*
SEPA in Scotland
Rivers Agency in Northern Ireland

4. Understanding path users

4.1
Sustrans Design Manual Chapter 1: Principles and Processes for Cycle Friendly Design describes the different types of 'target cyclist' that need to be considered along with geometric design parameters required to provide effective and convenient facilities.

4.2
Particular factors to consider in the design of a traffic free route include:

- **target users -** cycling infrastructure needs to cater for the needs and behaviour of the target cycle users, the dimensions and characteristics of the varied cycles in use and the space ('dynamic envelope') that they require in motion
- **types of cycle** - cycles vary considerably in design. The requirements of tandems, bikes with trailers and children's tag-alongs should routinely be accommodated in designs and the needs of recumbent, hand cranked, mobility aid cycles and adult tricycles should be included in the design process wherever possible. Access controls and substandard widths and radii and are common features that exclude many of these types of cycle
- **physical effort** - cycling requires physical effort to start and accelerate, ride up steep gradients and change direction of travel. Cycle tracks should maximise priority to cycle routes, minimise the need to stop and start, slow down or dismount and should avoid sharp curves and steep gradients
- **dynamic envelope** - a cyclist has a 'dynamic width requirement' (dynamic envelope) when moving which encompasses both the size of the cyclist/cycle, and their lateral deviation. This is illustrated below in the section on path widths. Lateral deviation increases at low speeds, on steep gradients, in wind and rain and on uneven or poorly drained surfaces. Inexperienced cyclists have a greater dynamic envelope
- **design speed** - traffic free routes should generally be designed to provide for the fastest moving group, usually cyclists (see Table 2). Routes need to accommodate cycling design speeds that reflect the mix of user groups. Fast moving cyclists should be encouraged to adapt their riding styles during busy periods, rather than be displaced back onto the road network. Providing good width paths with clear sightlines will enable route users to see each other, and cyclists can adjust speeds accordingly
- **visibility requirements** - routes need to provide adequate forward visibility; sight stopping distance as a minimum (for safety) and, wherever possible sight distance in motion requirements (for user comfort). Routes also need to provide adequate visibility at junctions. Requirements are defined below
- **curve radii** – to enable cyclists to maintain their design speed safely, routes need to provide minimum curve radii as defined below
- **swept paths** - route designers should consider the swept path of cycle users to ensure there is adequate width on curves and at junctions and that any speed reducing measures do not introduce hazards or congestion

Table 4.1 **Design speed on shared use routes**

Shared Users	User governing design speed
Pedestrian / Cycle	Cycle [1]
Pedestrian / Equestrian	Equestrian
Cycle / Equestrian	Cycle [1]
Pedestrian / Cycle / Equestrian	Cycle [1]

Source: TA90/05

[1] *Design speed of 20mph on commuter routes, 12mph on local access routes*

4.3
Where routes are shared with equestrians further considerations include:

- **conflicts/concerns** - there are very few reported conflicts between user groups. Horse riders tend to avoid periods when they know a path will be busy. However, it is important to understand and address concerns raised by wheelchair / mobility scooter users, and parents with young children relating to sharing paths with horses. A "Code of Conduct" or "Friends of" group can be developed to ensure that the various user groups are aware of each others' concerns
- **surfacing** - a sealed surface on all rural routes which have existing or potential horse use is essential to retain the path integrity. The surface should also provide sufficient grip for horses. On unsegregated routes it may be more practical to provide one type of surface for all users rather than delineating a narrow verge for horse use
- **other design details** - rural routes may need to allow for mounting blocks, bridle gates and access controls that accommodate horse movements
- there needs to be clear signing of which routes are intended for use by equestrians. Where bridges do not have 1.8m high parapets, signs should warn horse users and suggest that they dismount (provide mounting blocks) or seek alternative routes

5. Segregation of cyclists and pedestrians

5.1
Definitions:

- **a segregated shared use path** is a facility used by pedestrians and cyclists with some form of infrastructure or delineation in place designed to segregate these two modes
- **an unsegregated shared use path** is a facility used by pedestrians and cyclists without any measure of segregation between modes. It is designed to enable pedestrians and cyclists to make use of the entire available width of the path

5.2
For clarity, 'path' is used in this guidance to refer to traffic free routes used by pedestrians, cyclists and equestrian users, whether segregated or unsegregated, although technically many of these will have the legal status of a cycle track, albeit with a right of way on foot.

5.3
Segregation can take the form of a white line, either painted or in the form of a tactile delineator, or physical separation such as a kerb (standard or tapered), barrier or verge. A white line is poorly observed and so is not recommended.

Tactile physical separation (granite setts), Bristol

Verge separation, Loughborough

Shared use path, Allonby, Cumbria

Shared use path, Westmead, Swindon

Decision on segregated or unsegregated provision

Overview

5.4
Developing the design of a shared use route, including decisions on segregation, should include early consultation with relevant interested parties such as those representing people with disabilities, walkers and cyclists.

5.5
In LTN 1/12, the Department for Transport (DfT) has moved away from a presumption in favour of segregation, stating in para 7.9 that "segregation need no longer be considered the starting point in the design process" and it encourages "designers to think through their decisions rather than start from a default position of implementing any particular feature."

5.6
In Sustrans' experience there are significant advantages with unsegregated paths where the width is shared by all users, particularly on traffic free routes away from the road. Unsegregated routes maximise usable width and minimise maintenance requirements and sign/line clutter. Effective segregation will benefit all users but requires significant additional width to provide the same level of service. Each situation must be considered on a case by case basis, and careful consideration must be given to the factors listed below.

Table 5.1 **Segregated paths**

Advantages	**Disadvantages**
Ability for cyclists to maintain speed	Territorial behaviour and increased conflict when users are in "the wrong space"
Less intimidating for vulnerable pedestrians, particularly visually impaired users	Width of path required to maintain an acceptable facility for all users
Easy for cyclists to avoid pedestrians who may not be walking	Extra land requirements
Reduces perception of user conflict	Costs to construct and maintain a wider path
Move cyclists away from driveways in urban areas	
Easier to accommodate equestrian users	

Table 5.2 **Unsegregated paths**

Advantages	**Disadvantages**
Flexibility during the week when mix of users may vary	High volumes of pedestrians may hinder cyclists
Improved facility for mobility impaired users and larger cycles	High volumes of cyclists may intimidate pedestrians
Less complex to construct and easier to maintain	Public perception where horses are expected to mix freely with young children and mobility impaired users
Reduced street clutter and less signing required	
Encourages greater interaction between user groups and other users	
Easier to accommodate cross movements, bus stops and road junctions	

Level of use and other criteria

5.7
Transport for London (TfL) and DfT recently undertook research to review how shared use paths operated under a variety of conditions.

5.8
Initial findings from the TfL research suggest that the decision on whether to segregate a shared use path should not be based solely on an assessment of user flows, but should also draw on the expertise of the design team, site-specific information, and other relevant guidance. Site-specific factors that may indicate segregation might be appropriate include:

- available land to provide the greater width needed to segregate
- high pedestrian and / or cycle flow
- high proportion of utility cyclists
- locations where significant use by vulnerable pedestrians is expected, especially elderly and/or visually impaired users, such as near residential homes
- low variability of modal split (proportion of cyclists / pedestrians)
- low usage by groups of pedestrians
- high level of non-travelling users (e.g. congregating at an attraction, shoppers)
- low flows across the path / few junctions
- steep gradient
- where the path runs adjacent to driveways with poor visibility segregation can provide a means of moving cyclists away from the driveways

5.9
Cyclists are likely to prefer a high quality segregated route as this will tend to enable higher cycling speeds than unsegregated routes. Any benefit will be negated if segregation results in inadequate width.

5.10
The need for continuity and consistency of provision is also an important consideration in deciding whether to segregate a route.

Type of segregation

5.11
For segregation of user groups to work each group must have sufficient width. Problems arise where paths are too narrow or the choice of segregation is ineffective.

5.12
Segregation should normally be achieved using design features such as contrasting materials, a change in levels or a grass verge. Material choices that give a good tonal contrast will help all users to understand the separation between types of user, and particularly valuable for visually impaired pedestrians. Typically this might involve using asphalt for cyclists and paving slabs or light coloured paviours for pedestrians.

Advisory signing, Worcestershire

Advisory surface signing, Birmingham

5.13
The minimum level of provision for visually impaired pedestrians is the raised white line delineator with the associated tactile paving, taking account of the updated advice on tactile paving included in paras 6.18 and 6.19 of LTN 1/12. Groups representing blind people have major reservations about any design that does not include physical segregation, although some disabled people, particularly wheelchair users and disabled cyclists, may benefit from routes without a raised divider. LTN 1/12 notes that research has shown that white line segregation is ineffective in ensuring a high degree of compliance[1], unless cycle flows are high or there is generous width, and should not be the norm.

[1] *Note that the recent DfT / TfL research has largely considered segregation by white line, as there are very few sites with physical segregation*

5.14
Where physical segregation, such as a kerb, is provided, it is essential that the widths and other design details all contribute to a design where pedestrians are unlikely to use the cycle track.

Management

5.15
Following the introduction of a shared use path it is advisable to monitor its performance. This will enable any concerns to be identified early on and suitable mitigating measures implemented if required.

5.16
On unsegregated paths consideration should be given to the erection of courtesy signs.

6. Geometric design

Key features

6.1
Key features of successful traffic free routes include:

- routes should follow existing desire lines wherever possible
- route capacity is designed for pedestrian and cycle flows under peak demand conditions, including forecast growth
- path widths must allow for the effect of edge constraints such as fences, buildings, walls and kerbs, and it is important to include suitable verges
- routes (particularly utility routes) should respond to local topography to achieve a route that is as direct as possible while avoiding steep gradients where feasible
- designing for cyclists allows engineers greater flexibility than highway designs. Creative alignments and ingenious solutions to common problems can create memorable routes that are popular with the public
- retain features of ecological interest and value alongside the path

Widths

6.2
Adequate widths are essential for high quality infrastructure. This is vital when a new route requires structures as part of the scheme. Guidance on the space required by cyclists and pedestrians is included in Chapter 1.

6.3
Paths should be wide enough to enable cyclists to ride two abreast where possible. On busy urban routes, where gaps in oncoming users are few, widths should be sufficient to enable cyclists to overtake pedestrians and other cyclists while passing oncoming riders.

6.4
Selection of an appropriate width should accommodate forecast and target increases in cyclists and other users, and address planned land-use development which may create large local increases in cycling and walking. Providing a width greater than the minimum will increase the level of service for all users and accommodate future growth in cycling and walking.

6.5
Path width will need to be increased where one or both sides are bordered by kerbs or vertical features (including such features introduced to segregate users) because these reduce the effective path width. Increased width may also be needed where there are steep gradients or reduced forward visibility.

6.6
In rural areas structures should have a minimum usable width between parapets of 3.5m. In urban areas this should be increased to at least 4m.

Widths for unsegregated routes

6.7
Recommended minimum widths for unsegregated shared paths are given in Table 3. These exclude the additional widths required where the path is bounded by vertical features; these additional width allowances are shown in Table 5.

6.8
Traffic free routes through large urban areas need to be wide enough to accommodate high peak cycle flows of commuters and schoolchildren and high pedestrian use as well. Traffic free routes within 5km of a main urban area may also need to carry significant utility trips from outlying villages.

6.9
A minimum width of 3.0m is required on all unsegregated main paths within an urban area or urban fringe. On routes with high flows, or which are likely to become busy for short periods (during school runs and peak hour commutes), providing a path at least 4.0m wide will be more appropriate. On urban links with low usage, 2.5m width may be acceptable.

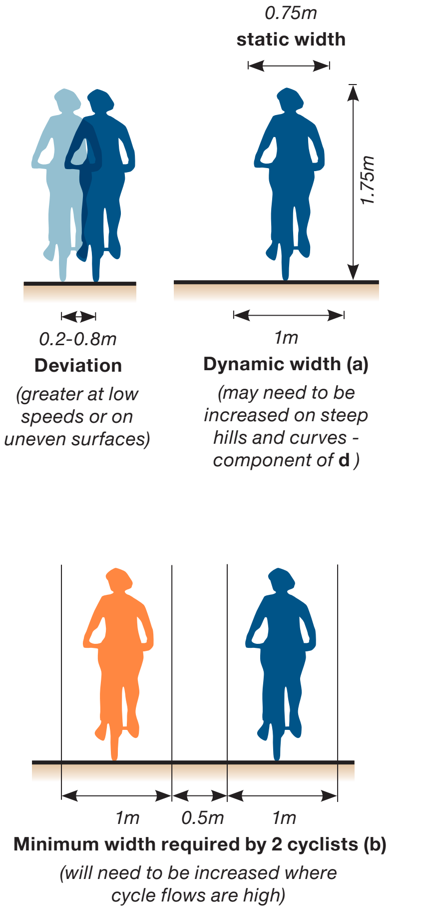


Fig 6.1 **Widths required by cyclists**

6.10
Rural cycle usage may be significant in some places; near stations, schools, rural employers and other popular destinations and in key corridors between villages. Where a route forms an integral part of commuting or utility journeys, an effective width of 2.5m is the recommended minimum width.

6.11
For other rural routes, the acceptable minimum widths can be less than in urban areas, reflecting lower usage levels. For lesser routes and links that are likely to remain lightly trafficked by all groups, and without equestrian use, a path width of 2.0m may be acceptable. In these situations it is essential that overhanging vegetation and minimum verges of 0.5m are maintained.

Table 6.1 **Recommended minimum widths, unsegregated shared use**

Nature of route	Min. effective path width (see Note 1)
Urban traffic free	3.0m on all main cycle routes, secondary cycle routes, major access paths and school links; wider on curves and steep gradients. Where high usage is expected, or significant demand to ride two abreast, a width of 4.0m is preferred and segregation between cyclists and pedestrians considered. 2.5m possible on access routes and links with low use
Urban fringe/ semi rural traffic free	3.0m on all main cycle routes, major access paths and school links 2.5m possible on lesser secondary cycle routes and access links
Rural traffic free	2.5m on all main routes, major access paths and school links 2.0m possible on lesser routes and links

1. *Refer to Table 6.3 for additional width required for various edge constraints*
2. *Minimum acceptable verge width is 0.5m, 1.0m preferred*
3. *Greater width required where route is used by horses*
4. *For widths on segregated routes see Table 6.2*

Widths for segregated routes

6.12
Segregated paths require greater overall width than unsegregated ones. Where segregation is provided, the minimum width to provide for each user group is shown in Table 6.2.

Table 6.2 **Recommended minimum widths where segregation is provided**

	Cyclists	Pedestrians	Total
Preferred minimum	3.5m (1)	3.5m (2)	7.0m
Acceptable minimum	2.5m	2.0m	4.5m
Absolute minimum for short lengths (3)	2.0m	1.5m	3.5m

Notes:

[1] *4.0m preferred on busy routes (greater than 150/hr) ; enables cyclists to pass each other two abreast*

[2] *Width for two pairs of pedestrians to pass each other.*

[3] *Absolute minima are only acceptable for short distances and only on low-use routes and where users can cross to other side of path where necessary.*

[4] *Refer to Table 6.3 for additional width required for various edge constraints*

6.13
Additional width will be needed to accommodate higher flows, and may be needed on bends and step gradients.

6.14
Additional width will also be needed, as set out below, where the path is bounded by vertical features, including kerbs or barriers intended to provide physical segregation.

6.15
On a segregated route, cycle tracks of 2.5m or more in width should normally include a centre line.

Widths of routes shared with equestrians

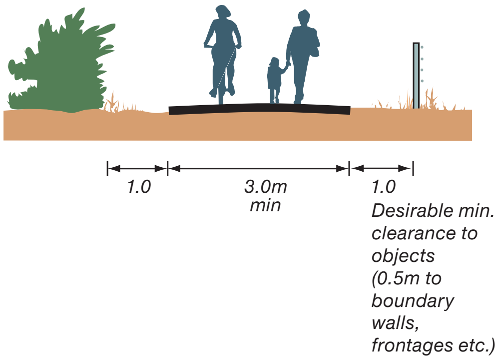
6.16
Detailed advice on routes shared with equestrians is contained in Sustrans Technical Information Note 28: Horses on the National Cycle Network.

- segregation - routes that provide for horse riding can either have clear paths to separate horses from pedestrians and cyclists, or can be unsegregated for all users. Segregated routes should allow a minimum of 2.5m for horses and a width for pedestrian and cycle movements as in Table 6.1
- the British Horse Society recommends a desirable minimum width of 5.0m for new bridleways, and will object to any proposals less than 4.0m. A 5.0m wide bridleway shared by all users will allow for a 3.0m path and 1.0m wide verges on each side

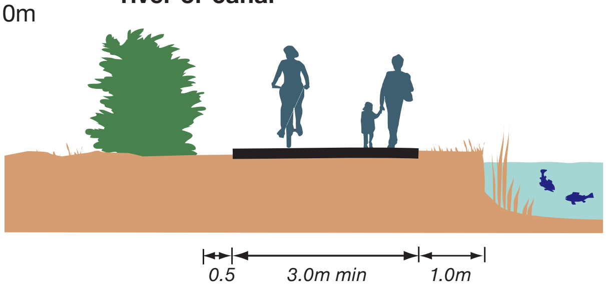
Fig 6.2 **Standard widths for paths and verges**

Most traffic free paths aim for at least 2.0m width in rural areas and 3.0m or more in urban ones, to accommodate the likely usage. The examples here are the ones commonly specified.

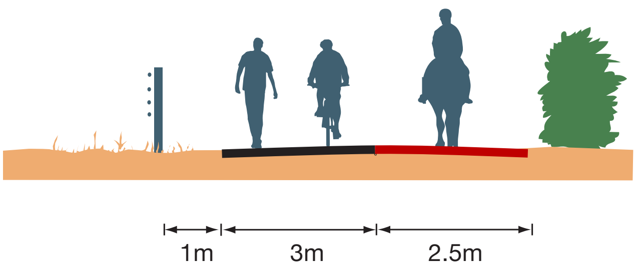
Standard cross-section for a shared use path



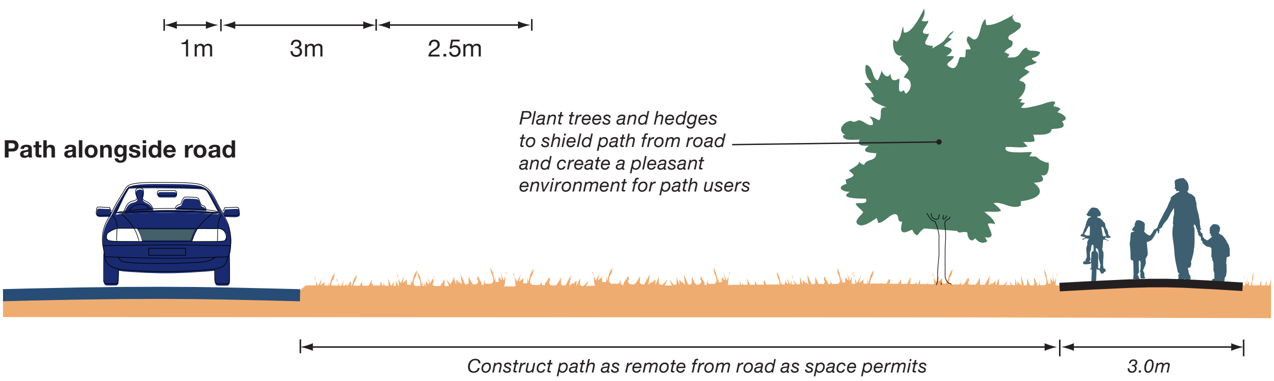
Path alongside river or canal



Shared multi use path



Path alongside road



Edge constraints

6.17
Any traffic free route, when bounded by vertical features should include additional width. This implies a greater sense of space and improves path aesthetics. Extra path width in some circumstances can improve public perception and enhance safety.

6.18
Table 6.3 details the types of edge constraints and the amount by which a path should be widened, in order that an acceptable usable width is maintained. This table relates to features forming a linear barrier above the path level only.

Use of shallow angled battered kerb to increase effective width, London

Table 6.3 **Additional clearances to maintain effective widths for cyclists**

Type of Edge Constraint	Additional width required to maintain effective width
Flush or near flush surface[1]	No additional width needed
Kerb up to 150mm high	Add 200mm
Vertical feature 150-600mm high	Add 250mm
Vertical feature above 600mm high	Add 500mm[2]

Source: LTN 1/12

Notes

[1] including shallow angled battered kerbs

[2] additional width may be needed to provide adequate forward visibility on curves.

6.19
Unprotected path edges alongside open water will also impact upon how the public perceive a route and the amount of space available. Where there are no verges to give a visual barrier then widen the path by at least 0.5m to retain a usable width. The nature of any feature lower than the path itself will determine whether fencing may be necessary, but this should remain visually unobtrusive and act as a subconscious barrier rather than block out views. There should be a presumption against providing fencing, and a risk assessment should be undertaken where fencing may be appropriate. The design of fencing is dealt with in Chapter 6.

6.20
In order to determine the most effective solution, the design should understand and take into consideration the following:

- speed and depth of water
- type of water (stream / river or canal)
- steepness of banks and accessibility to rescue or escape from the water
- height of fall and landing area

6.21
Where there is scope to re-work existing banks they should be re-graded to not steeper than a 1 in 5 gradient. Reed planting and creation of a shallow water edge will also aid anyone unfortunate to fall in. Steep sides are to be avoided wherever possible, and all locations should be within reasonable access of a safety ring.

Northampton –width allows cyclists to ride two abreast with comfort (but not pass oncoming cyclists while two abreast)

Strabane – Lighting columns installed away from path edges to maintain effective width

Bristol – Fencing and signing set back beyond the path edge to maximise effective width

6.22
Banks that cannot be easily re-graded, have hard surface falls, offer little scope for easy escape or have fast or rapid fluctuations in water levels, may need additional edge restraints and greater requirement for fencing. This should be sufficient to prevent mishaps rather than enclose path users to the extent that the view is lost.

Southampton –width enables cyclists to overtake each other and pass oncoming cyclists simultaneously – a requirement on busy commuter routes

Horizontal and vertical alignment

Overview

6.23
The overall configuration of a coherent network, including overall alignments is described in Chapter 2 Network Planning. This section looks in greater detail at the key issues affecting design decisions on horizontal and vertical alignments on a more localised basis. These include visibility, curves and turning radii and gradients.

6.24
Path should be designed to enable:

- cycle speeds up to 20mph on commuter corridors and 12mph on local access routes
- alignment to control cycle speeds on the approaches to junctions or hazards
- minimal effort on gradients
- adequate forward visibility of other path users, hazards, obstructions and junctions
- paths to be suitably drained
- an aesthetically pleasing route that blends into its immediate surroundings
- removal of sudden direction changes or steep crossfalls and reduce risk of skid hazards

6.25
Horizontal alignment can be largely pre-determined where a route follows a narrow linear feature such as a railway corridor (often direct), canal towpath (often direct but constrained) or river flood bank (meandering). Where a path uses a wider corridor, such as a park, there is more scope to vary the alignment, but be aware of local bylaws.

6.26
Vertical alignments should seek to minimise the impact of local topography, but retain a degree of directness for route users. A steeper path, up to 1 in 15, that meanders may be more preferable to a lengthy detour. Always consider able bodied pedestrians in any design, and where appropriate allow for additional flights of steps on a direct line.

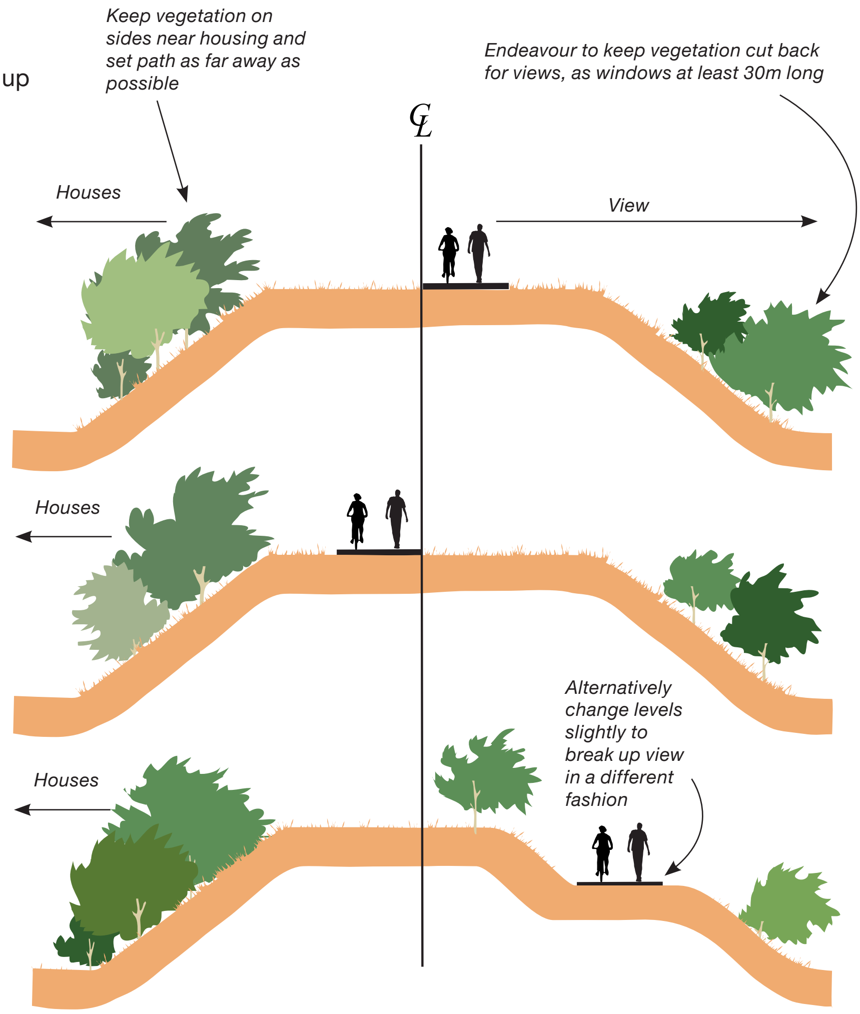
6.27
Traffic free routes may entail transitions from one type of route to another, e.g. railway path to canal towpath. Where this involves significant changes in levels earthworks may be necessary. Structural solutions may be appropriate where there are space constraints, but these may come with other requirements such as planning, and the ability to construct may add further constraints.

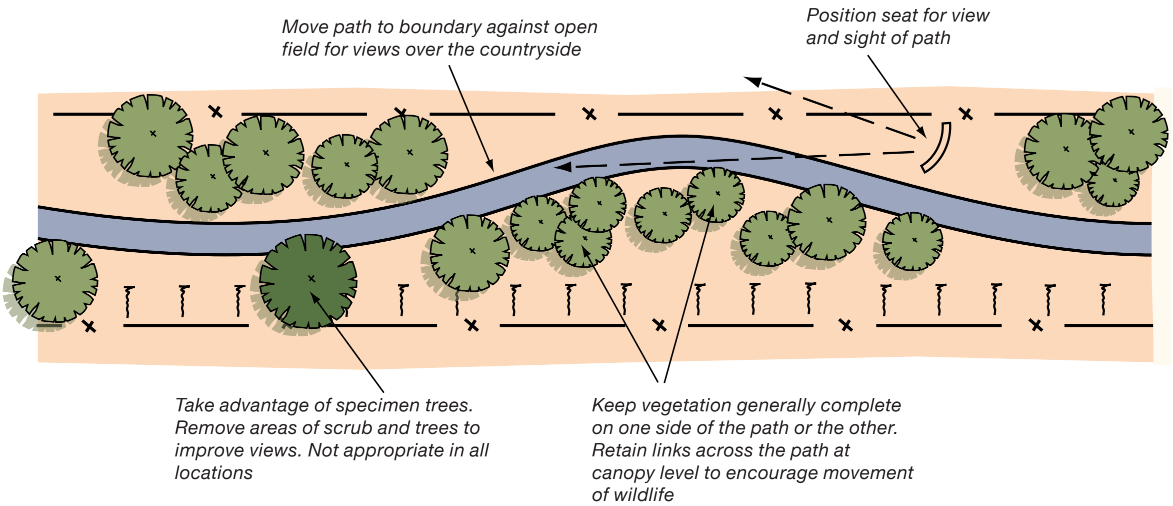
6.28
Very straight paths within wider corridors can become monotonous and designers are encouraged to maximise the aesthetic value of a path. Meandering alignments change users visual perception of a route, but ensuring that the “long view” is retained maximises personal security.

The long view remains despite the subtle meanderings of the path, Paisley

A new path on a straight line can lead to poor aesthetics, Northampton

Figure 6.3 **Plan and sections showing path moving from side to side by its own width** to break up monotonous views





Forward visibility

6.29
The following table shows recommended forward sight distance parameters for design speeds of 12mph and 20mph.

6.30
Stopping sight distance (SSD) should be provided throughout a route to ensure user safety. It comprises the distance travelled by a cyclist in the time taken to react and stop.

6.31
Sight distance in motion (SDM) is the (significantly greater) distance a cyclist needs to see ahead when riding in order to feel safe and comfortable; typically this is the distance covered in 8 to 10 seconds towards a fixed object. Sight distance in motion will increase in situations where there is an unavoidable narrowing of the cycle track, because of the closing speed of oncoming cyclists. Routes should be designed (and maintained) to achieve SDM visibility wherever possible.

6.32
Sight stopping distance values pertain to a level route with a sealed surface, at the speeds shown. SSD will increase significantly at greater speeds and for downhill gradients, poor surface condition, wet or icy conditions, after leaf fall, and for poorly maintained cycles. SSD values on unsealed surfaces should be increased by 50%.

6.33
SSD and SDM should be achieved within an envelope of forward visibility as defined in Figure 6.4. The envelope of forward visibility required by cyclists is measured slightly differently to that for motor vehicles.

Fig 6.4 **Forward visibility envelope**

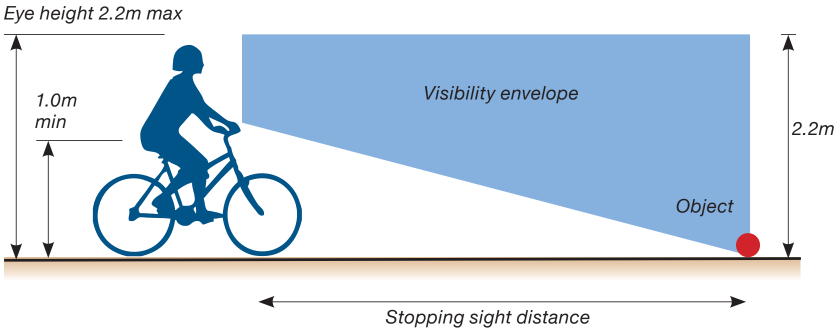


Table 6.4 **Forward visibility requirements on traffic free routes**			
Type of cycle route	**Design Speed**	**Minimum stopping sight distance (SSD)**	**Sight distance in motion (SDM)**
Commuter route	20 mph	25 m	80 m
Local access route	12 mph	15 m	50 m

Visibility at junctions

6.34
Where a cycle track joins a road or another cycle track, adequate visibility must be provided. Normally designs provide the X and Y distances as defined in Figure 6.5.

6.35
Recommended X distances for cyclists are:

- 4.0m preferred; this enables cyclists to make an early decision on whether to stop
- 2.0m recommended minimum
- 1.0m where geometry is tight and cycle approach speeds are low

6.36
If these visibility requirements cannot be achieved a junction or crossing may still be considered on a lightly used cycle route, making use of the full range of markings and signs available to make clear the need for cyclists to slow down and give way.

6.37
Recommended Y distances are also given in Table 6.5.

Table 6.5 **Visibility at junctions**

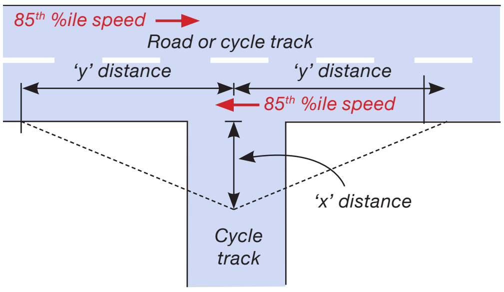
85%ile speed (kph)	20	25	30	40	45	50	60	70	85	100	120
'y' distance (m) on road	14	18	23	33	39	45	59	120	160	215	295

Source: Manual for Streets TD 42/95

6.38
Warning signing for motorists may also be appropriate where visibility is limited

Good visibility at junction of busy paths, Bristol

Fig 6.5 **Visibility at junctions**




Forward visibility and curve radii accommodate commuting design, Cambridge


Geometry to slow cyclists without excessive access control, Bristol


2m radius at intersection, Northampton


45° chamfer at intersection, Royston

Desirable minimum curve radii

6.39

Desirable minimum curve radii on cycle tracks are governed by the design speed of a route and are shown in Table 6.6 for design speeds of 12mph and 20mph. Additional width on bends is desirable to provide clearance for cyclists leaning into the curve.

Table 6.6 **Turning radii**

Type of cycle route	Design Speed	Minimum radius of curve
Commuter route	20 mph	25 m
Local access route	12 mph	15 m

Reduced radii to manage speeds and at junctions

6.40

In some situations, tighter radii are necessary; at junctions or on the approach to an unavoidable hazard. The following minima for the inner radius are recommended in these situations:

- 4.0m on cycle tracks, where speed reduction is needed
- 2.0m at an intersection between two cycle tracks, or between a cycle track and the carriageway. A 45° chamfer at track junctions can be used as an alternative

6.41

Use of a 2.0m radius or a 45° chamfer at track junctions will assist cyclists, pedestrians and users of mobility scooters. It will reduce conflict at cycle track intersections and will help to prevent informal routes developing across the verge to cut the corner.


Radius introduced to slow cyclists at a minor road crossing, Dewsbury

Gradients (longitudinal fall)

6.42
Cyclists' generally try to avoid steep uphill gradients. LTN 2/08 and TA90/05 (DMRB) recommend that designs should aim for the following gradients:

Table 6.7 **Gradients**

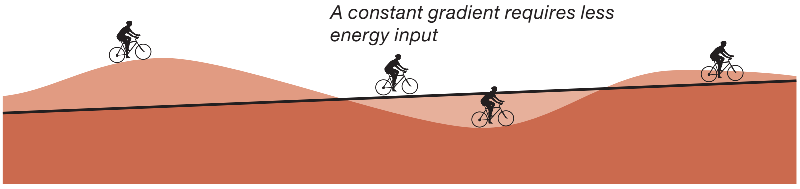
Gradient		Criteria
3%	1 in 33	Preferred maximum
5%	1 in 20	Normal maximum – up to 100m
7%	1 in 14	Limiting gradient – up to 30m, when there is no practical alternative
>7%	Steeper than 1 in 14	For short lengths

Source: LTN 2/08

6.43
New traffic free routes crossing steep slopes may be the only option available. The impact of gradients may be reduced by meandering up a slope.

6.44
Where possible, route designs should aim for constant gradients on an incline because these require less energy input than irregular gradients (Figure 6.6).

Fig 6.6 **Gradients**



Source: LTN 1/12

6.45
Achieving constant and less steep gradients can be achieved in three ways:

- earthworks – cuttings and embankments to 'smooth out' irregular gradients or reduce total level difference
- structures – bridges or tunnels to avoid valley bottoms or hill summits
- adapting the route alignment – creating a zig-zagging route up a slope or diverting to avoid the highest / lowest points of the slope

6.46
Each solution has different merits and challenges in terms of user convenience, aesthetics, land take environmental impact, and cost. Typical issues for each solution are summarised in Table 6.8 overleaf.

Notes

[1] Tunnels generally limited to use of existing tunnels

[2] Paths that weave a sinuous route up a hillside can increase visual interest for users by continually changing the views

[3] Designers need to consider the inconvenience for users travelling downhill with increased distance and cycle speeds. Sharp bends should be avoided. A more direct route up and down a slope may be appropriate for able bodied pedestrians

Table 6.8 **Comparison of design solutions for steep gradients**

Type of Intervention	Advantages	Potential dis-benefits
Earthworks (cuttings & embankments)	• constant gradient achievable • can be cost effective • construction material can be generated on site • can be made aesthetically pleasing • ecological value	• initial visual impact • restricted access from cuttings/embankments to linking routes • works are seasonal/ weather dependent • land take to construct stable embankments • access for heavy construction plant • ecological implications
Structural ramps or bridges or tunnels[1]	• constant gradient achievable • can be a key route feature	• high cost • may be visually unacceptable • initial environmental impact • access for heavy construction plant • existing tunnels / viaducts and bats
Changes in alignment	• potential visual interest [2] • cost effective • easier to deliver	• land ownership implications • may reduce route directness [3] • can negatively affect capacity on sharp bends • land take & visual impact

Bury, Greater Manchester

This new structure costing some £450,000 creates a direct and popular traffic free path without vertical or horizontal deflection

The alternative design option - cut and fill to create earth works ramps at 1 in 20 - would be a major undertaking creating a ramp roughly 270m in length.

The detour and additional effort required for pedestrians and cyclists to climb such ramps would make the cut and fill option unattractive to users.

6.47
Steep gradients increase the speed differential between different cyclists and can have an impact upon the comfort and safety of pedestrian users. The width of cycle tracks (and cycle lanes on steep roads) should be increased where possible to enable cyclists to overtake each other. This will also help to safely accommodate higher vehicle speeds downhill.

6.48
For routes in a cutting or on an embankment, connections to other routes may involve a significant level difference. This can affect personal security as well as user convenience and is common for routes following disused railways. In order to reduce the level difference and gradient and/or length of the links to connecting routes, it may be advantageous to change the level of the main route locally; a gentle gradient can be introduced on the approaches to the link to reduce the height of an embankment or raise the base of a cutting. Because the headroom required by pedestrians and cyclists is considerably less than that provided for trains, it is possible to raise the main path level beneath overbridges.

6.49
It should be emphasised that in hilly areas, many roads and traffic free routes have much steeper gradients and can still make excellent cycle routes. Steep topography does not prevent cities developing significant levels of cycling, as evidenced by Bristol which has nearly 8% of journeys to work by cycle (almost twice the level in 2001) with much higher levels in some hilly parts of the city.

Table 6.9 **Common characteristics and gradient issues for different types of traffic free corridor**

Corridor type	Typical concerns
Old railway alignments	• generally easy or continuous gradients, but frequency of access points may require careful consideration to remain accessible. Consider construction of access points as these may be remote from the area of work
Canal infrastructure	• generally easy or continuous gradients, but frequency of access points may require careful consideration to remain accessible. Consider construction of access points as these may be remote from the area of work
Riverside	• generally flat but some level changes may be necessary to retain close proximity to the river • routes may need to divert away from riverside to generate more direct alignments, cross side channels or pass river frontages
Use of flood banks	• generally flat, but some level issues getting on or off flood banks
Seaside promenades	• flat open spaces. • links to highway network may involve level difference
Former road alignments	• dependent upon local topography • retention of full road corridor will give better width to reduce gradients, especially on bends
Farm access roads	• dependent upon local topography
Other PRoW	• dependent upon local topography. Diversion orders are possible to address difficult situations but require time
Amenity spaces and parks	• gradients vary, depending upon local topography and the type of amenity space used • playing fields will be mostly level, country parks may be more undulating but will offer flexibility with solutions
Woodland and Forest	• winding tracks through trees may present design challenges • achieving 1 in 20 is generally possible with careful design

Penarth, South Wales

A ramp approximately 350m long, constructed as part of a new private housing development, was necessary to overcome a level difference of approximately 26m

Gradients vary between 1 in 20 and 1 in 12 in order to achieve a link between two fixed points.

Gentle horizontal geometry, a minimum path width of 3.0m and regular rest areas combine to create a good connection.

Yeadon, West Yorks

Raising main path levels at road overbridges can help to reduce level difference and the length / gradient of connecting ramps to the wider network.

Existing headroom clearances under railway bridges can be significantly reduced (headroom of 2.4m is acceptable for pedestrians and cyclists).

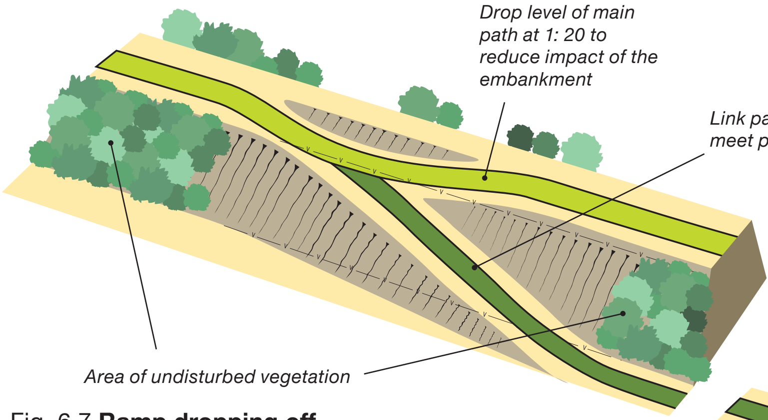


Fig. 6.7 **Ramp dropping off embankment**

Fig 6.8 **Ramp dropping down into cutting**

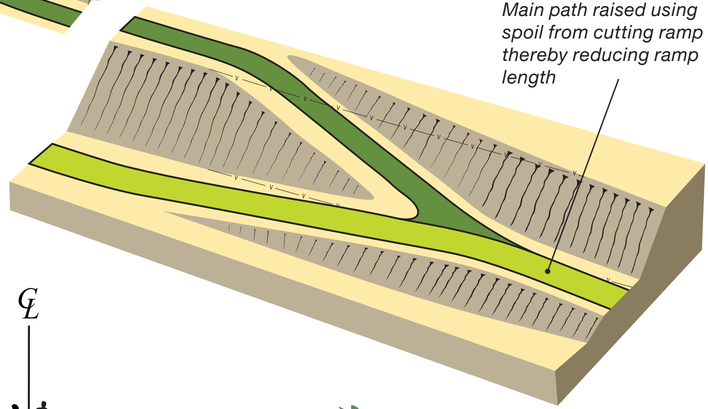
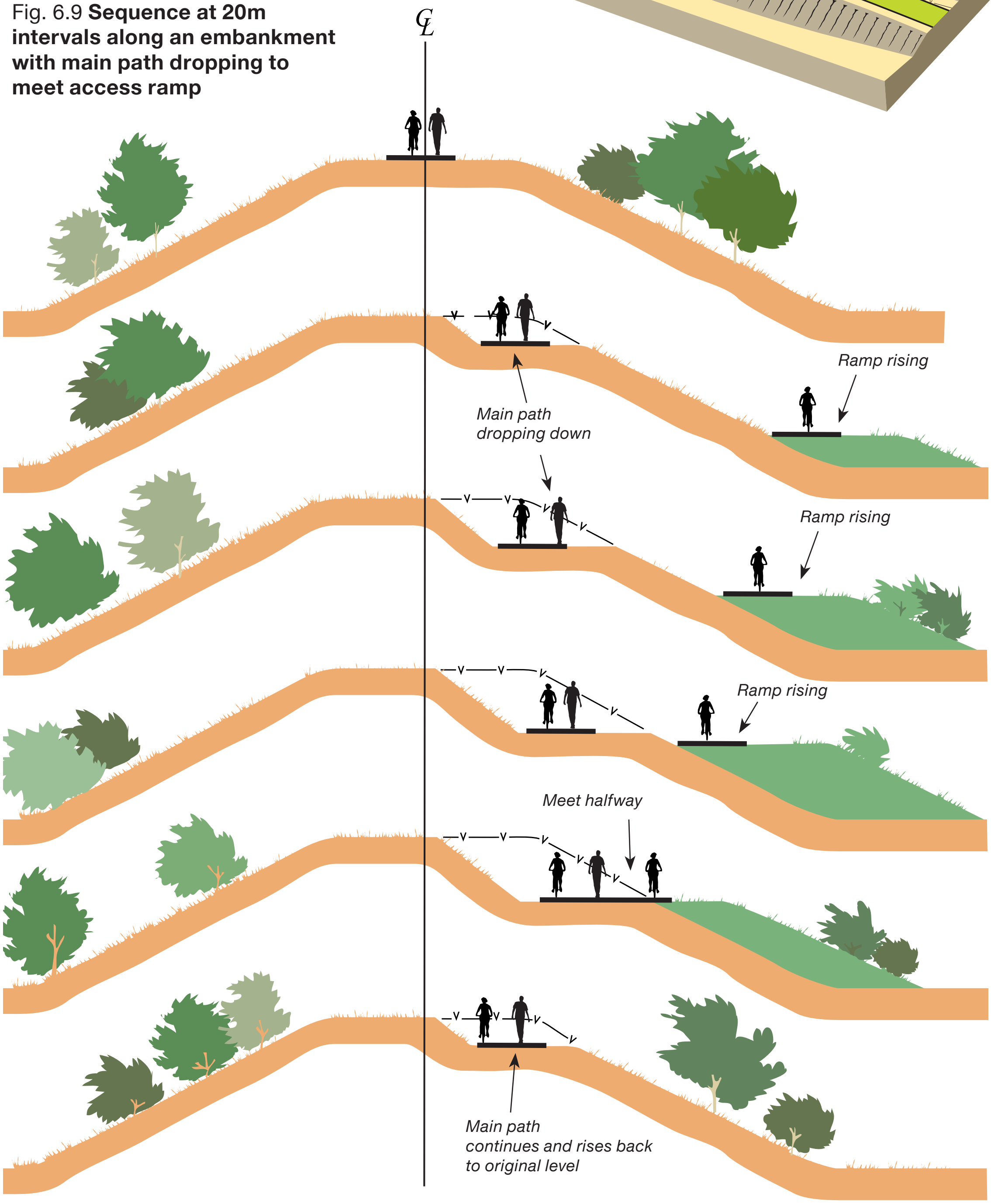


Fig. 6.9 **Sequence at 20m intervals along an embankment with main path dropping to meet access ramp**



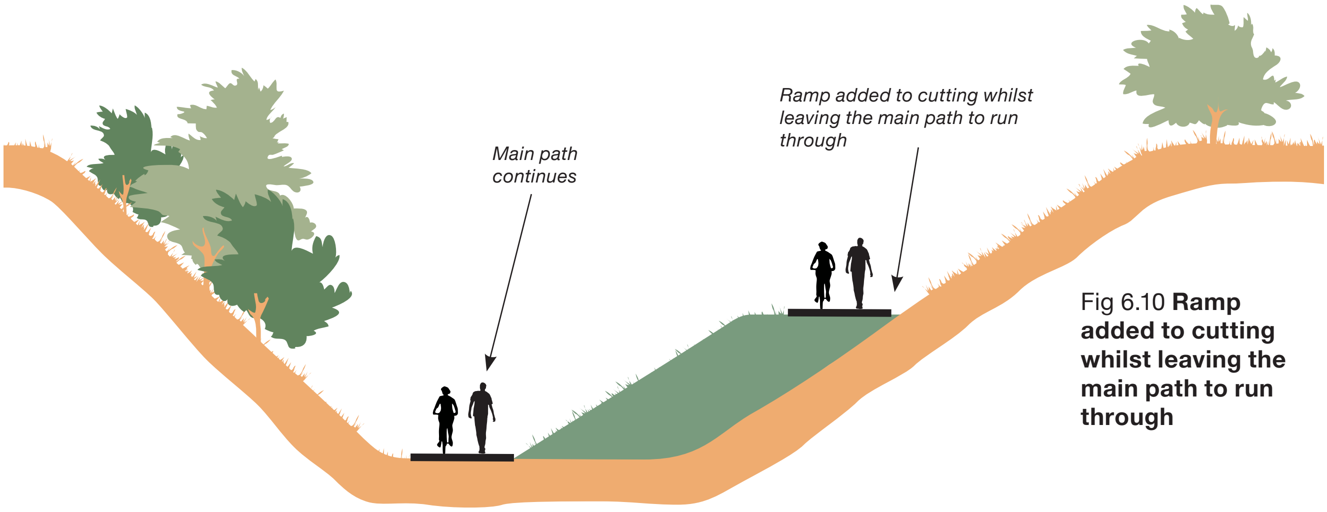


Fig 6.10 **Ramp added to cutting whilst leaving the main path to run through**

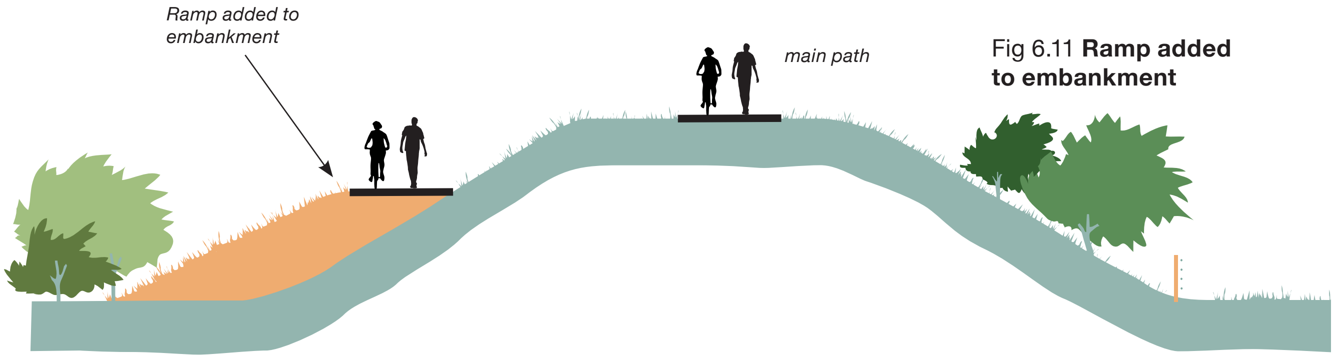


Fig 6.11 **Ramp added to embankment**

View of a railway path cutting in Paisley showing a long, evenly graded and gentle ramp connecting with an access point. Notice how the ramp has been constructed with fill brought in, but still leaving space for the main path to continue on the level. But because the path level itself has not changed, the ramp is very long (as is the one in the other direction, just under the bridge in the distance)

7. Controlling access and speed

Introduction

7.1
Illegal use of traffic free routes and excessive speeds by some cyclists can be problematic to other path users. Managing these issues too often defaults to installing barriers that in turn compromise the access for other legitimate path users. Most impact is felt by mobility impaired users (wheel chair / parents with buggies) and family groups (tag or trailer bikes). Sustrans document "A guide to controlling access on paths" provides detailed information on how to determine the most appropriate access control where these are required, and further design guidance.

7.2
Designers should start with a presumption against the use of any form of access or speed control, with the option of introducing them subsequently if there is a proven need that path management cannot address. The reasons for this include:

- barriers introduce delay, reduce capacity and are inconvenient
- barriers can prevent access by some users who have legitimate rights to use a path. User of mobility scooters and cyclists with tandems and trailers are often particularly inconvenienced
- access controls add another level of cost and maintenance liability to a path
- many access controls are ineffective because fencing along a traffic free corridor is missing, broken or subsequently vandalised
- there are often more effective ways to deter antisocial behaviour and to moderate inconsiderate or unsafe cycling speeds

Access control

Requirements

7.3
Access control measures may be appropriate under the following circumstances:

- where land or boundary constraints prevent minimum stopping sight distances or changes in path geometry to slow cycle speeds from being achieved.
- where cycle speeds on unsegregated paths could be high and potentially a danger to other path users.
- to prevent access by car or van for parking, fly tipping
- to allow farmers to control livestock movements
- where a specific user group is not catered for on a particular section of path, such as weight restrictions for maintenance vehicles, or where bridge parapet heights prevent horses from being ridden but not walked across.

7.4
Where some form of vehicular access control is necessary, a single row of bollards leaving 1.5m gaps and with clear sight lines can be effective in many locations. Double rows of bollards, with a spacing between rows of 1.2 – 1.5m can further reduce cycle speeds and deter motorcycle / car access, while retaining permeability for users. These are preferred to A and K frames in many locations.

7.5
Poor use of barrier control often arises from not understanding the aims of constructing a high quality traffic free route and the impact that they have. Restrictive access controls are often seen as a default solution when:

- there is a demand locally through a perceived problem
- illegal use of motor bikes or trail bikes needs to be prevented
- paths have been damaged through previous misuse
- anti-social behaviour is known to be a significant problem
- there is a need to prevent time trialling by cyclists
- a path intersects with a road
- inadequate sight lines exist either at junctions or on bends

7.6
Access controls however do not effectively address all of these issues. If fencing along a traffic free corridor is broken, non-existent or subsequently vandalised then any barrier control will simply be bypassed. Introducing a barrier to prevent anti-social behaviour may introduce a point around which people may congregate, exacerbating a problem and deterring legitimate path users from gaining access.

7.7
Increasing the legitimate use of the route resulting in improved natural surveillance, combined with targeted enforcement, may prove just as effective. Including new traffic free routes as part of the highway network, rather than as Rights of Way, will allow the police to confiscate and crush any motorcycles illegally used on a path.

Accessibility

7.8
Retaining convenient accessibility for legitimate path users is essential. If controls are required they should be designed using the turning movements of mobility scooters and a range of types of cycle in order to minimise the impact upon users; this may require additional manoeuvring width either side of the access control.

7.9
Any barrier design or bollard layout whilst generally effective in slowing speed, funnel all path users to a point where path width is compromised. This can introduce delays as many designs only permit one path user at a time and become a point of conflict between users.

Positioning

7.10
Locating access and speed control requires careful thought. Measures that reduce capacity or increase complexity around road junctions may quickly become a hazard to path and road users.

7.11
Understanding the dynamics of a path is essential to any effective control needs. A path that may be quiet during the working week may become a key corridor for family groups over a weekend. Any controls need to be set sufficiently back from a road edge to allow family groups with trailer bikes to wait safely. As a minimum this should be 5m with localised path widening in the vicinity of the control.

Visibility

7.12
Barrier control of any sort needs to be visible to all path users. Where paths link back into the public highway any control measures should ideally be visible to drivers but crucially provide sufficient space for groups of path users to wait safely. Any feature is potentially a hazard. They should remain visible during poor light and at night should be capable of reflecting torch or cycle lights.

Costs

7.13
Access controls add another layer of cost to a scheme. Purchase, installation and future maintenance costs need to be included in any budget.

- consideration should be given to using locally sourced items that perhaps reflect an areas industrial history, locally sourced rocks or timber rather than defaulting to an off the shelf solution
- aesthetic barrier designs, perhaps produced by local craftsmen and women, help to soften the impact of a straightforward barrier chicane, but could potentially be more expensive to buy and may have higher maintenance costs because an adopting authority views them as a non-standard item

Vehicular access

7.14
On many traffic free paths it is necessary to allow access for maintenance and other vehicles. These may vary from a small van through to a lighting inspection lorry, and therefore the design of any barrier control or access gates should take this into consideration.

- designs should avoid locking mechanisms where keys could be lost, gates vandalised or require additional maintenance
- where vehicle access is necessary any access barrier should be set back far enough to allow the largest vehicle to sit off the road safely without the barrier being removed/opened
- access for farm vehicles may raise further considerations, as they are often larger and heavier and are likely to need to turn off the traffic free path at some point. This has an impact upon the construction specification as well as access requirements. Although access may be infrequent it may increase during summer months, at a time when path user numbers may also be higher

Speed control

7.15
Excessive speeds by some cyclists using traffic free routes can be problematic to other path users. Education of users may have some effect, but in many instances this will need to be complemented by physical measures. Generally the control of cycling speed is to be avoided, as it reduces the attractiveness of the mode as an alternative to short journeys by car.

7.16
This section summarises typical measures used to control cycling speeds on traffic free routes. In designing these many of the considerations described above for access controls are relevant. Physical barriers and bollards should only be considered as a last resort. Measures to be considered include:

- signing and surface markings
- horizontal alignment with tighter 4.0m radii on bends
- vertical alignment using speed humps
- rumble strips
- artwork and interpretation panels
- engagement with individual path users, user groups, local schools, employers etc
- active promotion of the path and how it should be used

7.15
The design of any measure should ensure that any option for bypassing the barrier or control provides the same level of access and speed reduction as the measure does itself.

7.16
Where speed humps are constructed from bituminous materials the ability of the contractor to construct the hump profile to an acceptable tolerance should be considered. Precast concrete products could be installed as an alternative but there is a cost element to this solution which may preclude its use. Humps should be located away from slopes as this would have a negative effect on uphill cycle movements. It may also impact upon the gradient of the hump and the ability to construct within tolerances.

Types of control

7.17
The advantages and disadvantages of various types of access control, and guidance on siting and cost is provided below.

Table 7.1: **Single row of Bollards**	
Suitable for	Cycle tracks, Footpaths, Bridleways
Approximate costs	£200-£500
Pros	Minimal impact on the legitimate user. Can be used for signing
Cons	Does not prevent access by motorcycles
Restricts	Cars, vans
Impact on legitimate users	Minimal. Consider potential impact where cycle and/or pedestrian flows are high or where restricted sightlines require cyclists to move away from the path edge
Spacing	Allow at least a 1.5m gap between bollards and path edge to permit recumbent cycles, tricycles, trailer bikes. Ideally set bollard at least 5.0m back from the carriageway so users do not have to concentrate on the bollard and highway traffic simultaneously
Height	1000mm will ensure that the bollard is visible A retro-reflective band may be desirable to improve conspicuity

Table 7.2 **Staggered Bollards**	
Suitable for	Cycle tracks, Footpaths
Approximate costs	£500-£1000
Pros	Low impact on most legitimate users. Can be used as speed control for cyclists where needed. Can be used for signing
Cons	Some impacts on legitimate uses and path capacity
Restricts	Cars, vans May deter motorcycle use because require riders to dismount
Impact on legitimate users	Can be inconvenient for users of tandems, trailers, trailer bikes
Spacing	Ensure 1.5m spacing between bollards and at least 1.2m between the rows, to allow a variety of bike styles to negotiate them
Height	1000mm will ensure that bollard is visible A retro-reflective band may be desirable to improve conspicuity

Table 7.3 **Kent Carriage Gap**	
Suitable for	All routes where motor vehicles are prohibited
Approximate costs	£750 - £1500
Pros	Minimal impact on cycles, pedestrians, horses
Cons	Low central bollard may not deter 4x4 vehicles Ineffective against motorcycles
Restricts	Most cars, vans
Impact on legitimate users	Minimal (less than standard bollard) but conspicuity may be an issue
Spacing	For three-post design: gaps of 1.52m between path edge and central bollard (image above) For four-post arrangement (image below), inner posts to be set 0.6m from outer posts, inner gap 1.52m
Height	Low central posts need to be visible - generally 350mm high with retro-reflective band

Hamilton – Gates locked half open act as speed control rather than as access barriers.

Luton to Harpenden – telegraph poles, with added markings for visibility.

Table 7.4 **Chicanes**	
Suitable for	Footpaths and cycle tracks where bollards are not sufficient to deter motorcycle use
Approximate costs	£1000 - £1500
Pros	Restricts illegal use by motorcycles Can be used to moderate cyclist speeds where needed for safety
Cons	Negative impacts on convenience/ capacity for legitimate users Guard railing is commonly used which has poor aesthetics. Many other options are available (see examples below)
Restricts	Cars, vans, motorcycles
Impact on legitimate users	Inconvenient to all cycle users, especially users of tandems, trailers, trailer bikes. Can prevent access by mobility scooters Reduces path capacity by restricting pedestrian and cycle movements to single file
Spacing	Inner gap 1500mm minimum, 2.0m preferred to aid mobility scooters and adapted bikes. Barriers should not overlap
Height	No set height, but need to be visible

Table 7.5 **Stock control and cattle grids**	
Suitable for	Footpaths and cycle tracks through areas with stock. Bridleways where separate gate access is provided Vehicle access where required and suitably designed
Approximate costs	£3000-£4000 for narrow grids for cyclists
Pros	More convenient for cycle users than gates
Cons	Narrower grids reduce path capacity. Narrowing combined with the grid can cause some cycle users to dismount
Restricts	Vehicles, motor cycles
Impact on legitimate users	Minor impact for most legitimate users where cycle flows are low. But, grids less than 2.5m wide reduce flows to a single stream and reduce path capacity Bars can be slippery for cyclists Bar spacing can be a concern for mobility scooters and some users may also have difficulty in using any separate gated facility
Size	Generally 2.6m x 1.5m (1.2m minimum) grid with 100-120mm centre-to-centre spacing between bars Note: requirements to contain sheep and cattle are different

Table 7.6 **Gates**	
Suitable for	Footpaths, cycle tracks and bridleways
Approximate costs	£1000 - £2000
Pros	Can be designed to enable access by any users (including motor vehicles if required)
Cons	Cyclists and horse riders generally need to dismount to open gates. May not restrict motorcycles
Restricts	Cars, vans May restrict motorcycles depending on size and layout.
Impact on legitimate users	Cyclists and horse riders generally need to dismount to open gate
Sizes	Size depends upon need for pedestrian, bridle or full field gate requirements. Generally 1.20m high and with width between 0.95m (pedestrian) 3.5-6.0m (field gates)

Near Wellow, Somerset

Hamilton

Gates can be used to control livestock or to act as a deterrent to motorcycle use. They can be used alongside stock control grids to provide for pedestrians, horses and, if required, other vehicles, while enabling unimpeded access by cycle users via the grid.

The open width of the gate controls the types of users that can use it. An open width of roughly 1.80m will exclude cars.

Gates left "locked open" at 45° can act as speed control for cyclists whilst retaining an element of continuity.

Large field gates can be heavy and harder to open, especially for children and mobility impaired users. A field gate can be split into 2/3 – 1/3 gates to facilitate access by these users, with the larger section locked closed. Opening mechanisms must be robust and easy to use by cyclists and equestrians and users of mobility scooters.

Two- way self-closing gates reduce the risk of a gate accidently being left open, but are not suitable where livestock control is necessary.

Table 7.7 **'A' and 'K' Barriers**	
Suitable for	Footpaths and cycle tracks (but not recommended)
Approximate costs	£250-£1000
Pros	None
Cons	Significant negative impacts on convenience and capacity for all users
Restricts	Vehicles, motor cycles, cycle users, pedestrians
Impact on legitimate users	Significant inconvenience for all legitimate users. Cyclists will need to dismount. Very problematic for tandems, trailers and bikes with high handlebars or childseats. May deter usage
Spacing	Minimum of 800mm between bars enables most handlebars to pass and allows access for mobility scooters
Height	800mm to bottom of narrowing

Aperture narrower than handlebars

Ineffective

Table 7.8 **Summary of access control options**

	Ease of access							**Impact on capacity**	**Speed control function**	**Cost**	**Recomm-ended use**
	Pedestrians	**Cycles**	**Non standard cycles***	**Mobility scooter**	**Horse riders**	**Motor-cycles**	**Cars, vans**				
Single row of bollards								Minimal	Minimal	£200 to £500	Default where access control required Combine with bend in path to reduce speeds
Staggered bollards								Some. May require local widening	Yes	£500 to £1000	Default where single bollard & path geometry are not sufficient to moderate speeds
Kent carriage gap					Access for horse drawn vehicles		Some 4X4 vehicles may be able to access	Minimal	Minimal	£750 to £1500	Bridleways & tracks used by horse-drawn vehicles
Chicane	Difficult with buggy		May prevent access	May prevent access				Significant (single file)	Excessive (may require dismount)	£1000 to £1500	Only where staggered bollards are not effective at managing known motorcycle problem
Stock control grid				May prevent access		Width will enable or restrict access as required	Width will enable or restrict access as required	Dependent on width	Yes	£3000 to 4000	Default option where stock control required
Gate		Requires dismount	Requires dismount	May be difficult to use	Requires dismount	Requires dismount	Width will enable or restrict access as required	Significant	Excessive (may require dismount)	£1000 to £2000	Additional (or alternative) provision to stock control grid for pedestrians / horses / vehicles
'A' or 'K' Barrier		May prevent access with child seat	May prevent access	May be difficult to use	Prevents access	Prevents access	Prevents access	Significant (single file)	Excessive (requires dismount)	£250 to £1000	Not recommended

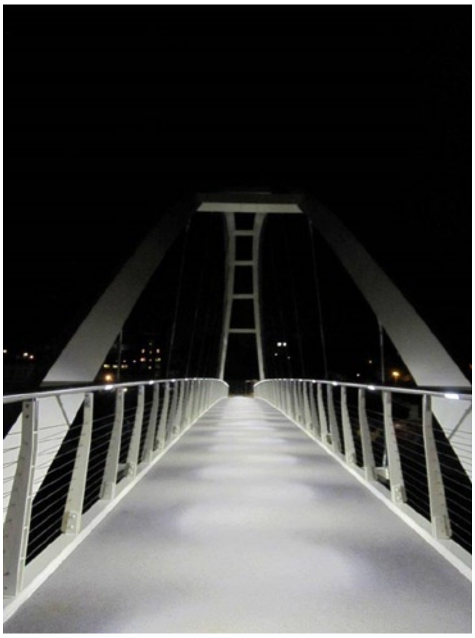
** Tandems, trailers, trailer bikes*

8. Lighting

Factors affecting decision to light a route

8.1

Detailed guidance on lighting traffic free paths is contained in Sustrans Technical Information Note (TIN) 29 “Lighting of Cycle Paths”. The requirement to light paths depends upon a number of considerations. Utility cycle routes should be lit if they are to encourage greater numbers of walking and cycling trips involving commuters. Routes that are used primarily for leisure may not need to be fully lit, but the need for lighting at key junctions and access points should be considered.



Lighting test, Workington

8.2

In Scotland, and some areas of Northern England and Northern Ireland, routes used by school children should be lit as they may be travelling at dusk during winter months. School activities also extend beyond the core school day and this should also be a factor in deciding when and how to light a route.

8.3

Junctions, whether with the road network or where traffic free paths join, are the places where pedestrians and cyclists are exposed to other movements and lighting is essential to reduce impacts. It is also useful to light signs on traffic free paths at key locations as this aids navigation.

8.4

Levels of lighting should be sufficient to discourage anti-social behaviour. High quality, vandal resistant lighting may not come cheaply, but it should not be an area where costs are reduced. Consider the impact of poorer quality solutions and increased maintenance against a higher specification and include it in budget forecasts from the outset.

8.5

Lighting aids personal security and can give greater confidence to users. Women and children are more likely to use a path if it is well lit, and well designed. Not all sections of traffic free route can be lit. In this case the alternative option must be of sufficiently high quality to ensure personal safety, either from motor traffic or from other path users.

Type of lighting

8.6

Excessive lighting can have a negative impact upon wildlife, especially bats, and this should be a major consideration from early design stage. White light (high pressure sodium SON light) will give a better colour dynamic than other solutions, but this again is likely to have a negative impact especially where bats are known to either roost or use corridors. Narrow spectrum light sources may be more suited in some locations. Always engage a supportive ecologist in determining the most appropriate solution. LED lighting combines high efficiency and lower running costs with good colour definition, and may be an acceptable alternative.

Vandal proof lighting units, Dartford

8.7

Lighting could lead to light pollution and impact upon adjacent properties, with overspill into homes and gardens. Consider using lighting bollards rather than columns to create pools of light that spill across a path. The use of hoods and baffles can also reduce light spill onto adjacent vegetation. This may help wildlife, but be wary of creating dark shadows that could encourage anti-social behaviour.

Lighting columns positioned outside path margin to maximise effective width, Ballymoney

Lighting columns positioned outside bridge parapet to maximise effective width, St Neots

8.8
Solar powered studs can be placed along a path to define the edge of the usable space, but do not illuminate the whole path. This may be more appropriate in rural areas, where traditional lighting may be rare or limited to village centres / road junctions. Solar studs should be checked regularly during autumn and winter when they are most likely to benefit users, and any cells not working or faulty should be replaced. Fallen leaves, standing water, unbound surfaces, soil and vegetation creep can have a quick and degrading action on the cells, and maintenance should be included within any costing exercise before specification.

Maintenance

8.9
The ability to maintain traditional lighting columns on traffic free routes may require access by larger maintenance vehicles, and these loadings need to be considered when putting together a construction specification. Vehicles that require a raise and lower platform may also need to use extending footpads which can impact upon the surface.

8.10
Consider using 4-5m high raise and lower lighting columns, which make maintenance of lanterns easier. All lanterns should be inspected regularly during autumn / winter months and any failed lantern replaced as quickly as they would be within the public highway.

8.11
Most local authorities now operate a “CLARENCE”, “STREETCARE” or “RALF” style system which encourages the public to report faulty or non-working lights within the road network. Ensuring that traffic free routes are included within the system, with columns that are numbered and the fault contact number included on a sticker.

8.12
Lighting can be designed to operate on a timed system, or through motion sensors, which will lessen the impact upon bats and other wildlife. Timed systems are more appropriate for urban routes where fewer journeys are made after 10pm.

Siting of lighting

8.13
Lighting columns should be located away from the path edge so that the whole path width can be utilised by pedestrians, cyclists and other user groups. This also allows for further path widening if the number of users increases. This should override any suggestions from utility companies that ducting is susceptible to root damage which can impact upon power supplies and therefore they should install within the path construction.

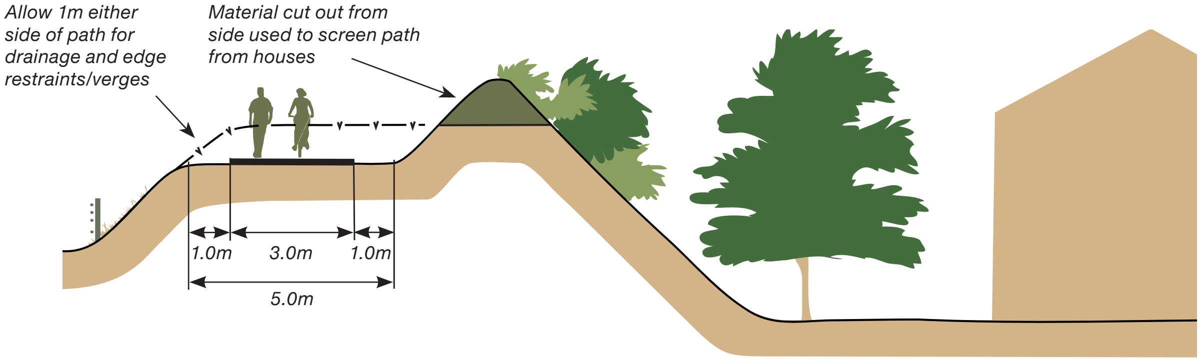
8.14
Lighting on structures should consider the impact of localised additional narrowing of paths that are already constrained by parapets. It is possible to erect lighting columns outside of the main parapets, as in the Willow Bridge, St Neots. These would need to be raise and lower columns for maintenance purposes. Many new structures have successfully included lighting sections within the parapets and handrails.

9. Banks and landscape features

Privacy banks

9.1
Earthworks can be used to create privacy banks shielding adjacent properties from the passing public. There is usually space to do this on disused railways as can be shown in the photo here, taken in inner Bristol.

Fig 9.1 **Reshaping of embankment to create privacy bank**



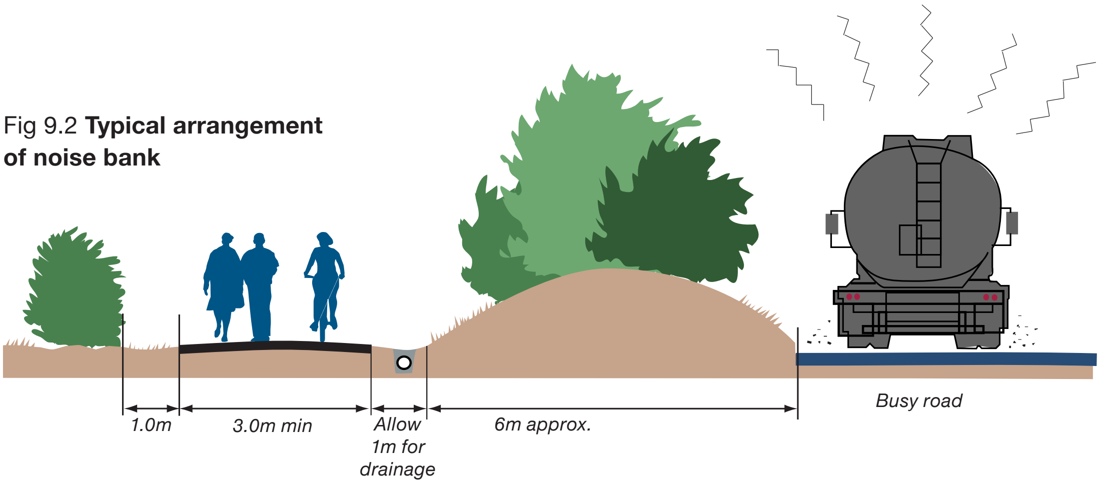
9.2
The Bath and Bristol railway path shown below, runs through the inner suburbs of Bristol down a narrow corridor. Whilst it would not have been possible to construct privacy banks on the top of the existing railway embankment, simply because there was insufficient room, by dropping the path by 1.0m the effect shown here was achieved. Notice also the intention to retain long open views through having grassed banks either side, rather than landscape planting.

Landscape feature, Bristol

Noise banks

9.3
The alignment of a path close to a highway with high volumes of traffic may result in noise levels on the path that can often spoil the experience the path is supposed to create. The use of noise banks shielding the path from excessive noise levels can considerably improve the quality and the overall experience of the path. An additional advantage is that the highway is visually hidden from the view of users of the path.

Fig 9.2 **Typical arrangement of noise bank**



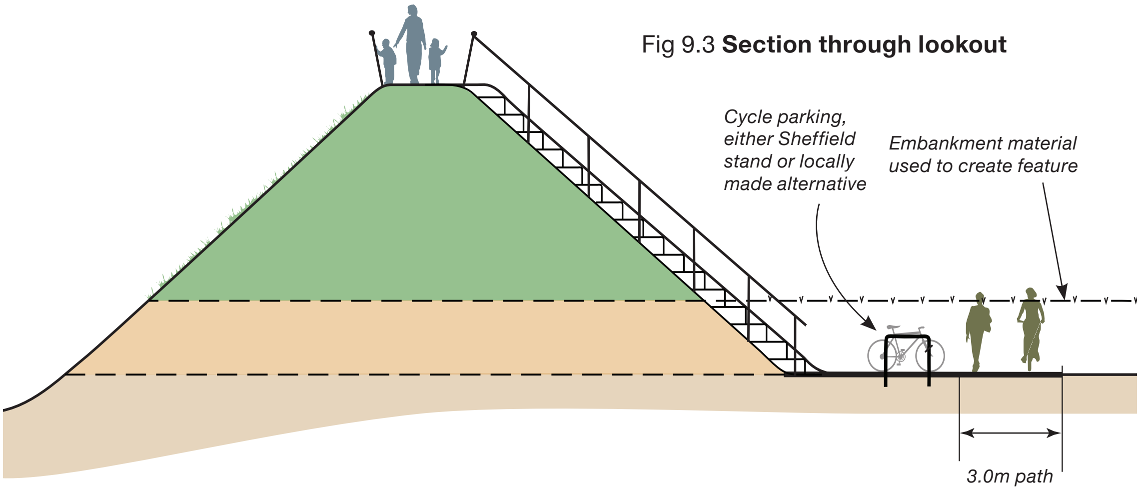
9.4
In areas that are particularly prone to vandalism and other anti-social behaviour it is sometimes thought preferable to maintain a visual relationship between the greenway and the highway to improve "natural surveillance" and thus personal security. In general however, it is to be preferred to establish a separation to reduce noise levels and prevent the unpleasant visual dominance of the highway, relying much more on the popularity of the route to provide casual and informal surveillance.

Viewing mounds and landscape features

9.5

There are many times where opportunities arise to use waste material to create vantage points and to articulate the course of a path. Sometimes these can also be left as the opportunity for some sort of BMX track or fun run beside the more formal Greenway.

Fig 9.3 **Section through lookout**



Mangotsfield, Bristol

10. References

Local Transport Note 2/08, Cycle Infrastructure Design, DfT 2008

Local Transport Note 1/12, Shared Use Routes for Pedestrians and Cyclists, DfT 2012

The Merits of Segregated and Non-Segregated Traffic-Free Paths, Phil Jones Associates, Sustrans 2011

A Guide to Controlling Access on Paths, Sustrans 2012

Sustrans Technical Information Notes;

TIN07: Aggregates for Path Construction, 2011

TIN08: Cycle Path Surface Options, 2012

TIN11: Trees, 2012

TIN28: Horses on the National Cycle Network, 2011

TIN29: Lighting of Cycle Paths, 2012

TIN30: Parapet Heights on Cycle Routes, 2012

Sustrans' Ecology Notes

Ecology Note 01: Hedge Management

Ecology Note 02: Grass Verge Management

Ecology Note 03: Himalayan Balsam

Ecology Note 04: Japanese Knotweed

Ecology Note 05: Ragwort

Ecology Note 06: Ecology in the Planning System