SEStran
South East of Scotland Transport Partnership

Cycling Infrastructure:

Design Guidance and Best Practice

Clackmannanshire Council · Edinburgh The City of Edinburgh Council · East Lothian Council · Falkirk Council · Fife Council · Midlothian · Scottish Borders Council · West Lothian Council

SEStran Cycling Infrastructure: Design Guidance and Best Practice

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This document should be used as guidance only. It only relates to specific cycle facilities and is not intended to be comprehensive. In particular, design teams should consider sightlines and other road user or location specific issues, as well as the application of general signs and traffic markings.

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1. INTRODUCTION

1.1 WHY CYCLING

Cycling is the often the fastest and along with walking the healthiest and most environmentally sustainable form of transport. Cycling is frequently the fastest door-to-door mode for urban journeys of up to 3 miles; modal shift to cycling away from less sustainable forms of transport can help reduce greenhouse gas emissions and other pollutants and can help individuals meet the recommended 30 minutes of daily physical activity, thereby contributing to healthier, more active lifestyles and combating obesity.

The South East Scotland Transport Partnership's (SEStran) position on cycling infrastructure was laid out in the Regional Transport Strategy:

> *"The improvement of cycling facilities will assist present day cyclists, and encourage more people to consider cycling as a potential mode of transport, since exposure to traffic is a significant deterrent for some. The promotion of cycling can bring major health and environmental benefits."*

Cycling contributes to several of SEStran's key objectives, especially:

- To improve access to employment;
- To contribute to the achievement of the UK's national targets and obligations on greenhouse gas emissions;
- To promote more sustainable travel, and;
- To increase transport choices, reducing dependency on the private car.

One of SEStran's key targets is to increase the proportion of all trips by walking and cycling in the SEStran area by 5% over 15 years, with a 1.5% increase after 5 years. This target is in addition to the target that progress should be made at the SEStran level towards the Scottish Government's national traffic reduction target of a return to 2001 traffic levels by 2021.

The aim of this document is to contribute to the achievement of these objectives and targets by:

- Providing cycle infrastructure design guidance to assist Local Authorities, developers and other stakeholders that are involved in providing new infrastructure, either specifically for cycling or for all modes of transport, and:
- Provide examples of best practice from the UK and Europe.

1.2 SESTRAN'S REGIONAL TRANSPORT STRATEGY

SEStran's Regional Transport Strategy (RTS) provides a blueprint for transport development in South East Scotland, which will form the core of our work for the next 15 years. The RTS identifies several policies which should have a major influence on provision of cycling facilities on development planning, accessibility, prioritisation of investment and integration with other projects:

- **Policy 20** - SEStran will use its influence to support development plan strategies by seeking to ensure that major trip generating sites – including housing – are located in areas that are capable of being well served by walking, cycling and public transport, or will be made so by transport investment delivered in phase with the development.
- **Policy 23** - Schemes that improve the accessibility by public transport, walking and cycling of key development areas will be afforded higher priority for implementation.

- **Policy 24** - The RTS will prioritise interventions that promote the use of more sustainable modes of transport, in particular non-motorised modes.
- **Policy 40** - All projects and interventions will be subject of a Quality Audit to ensure they maximise opportunities to meet all RTS objectives and policies. In particular schemes designed to encourage public transport use and / or reduce congestion should be audited to ensure they maximise their potential to also encourage walking and cycling. The Quality Audit will ensure that the needs of all groups are given due consideration in the assessment and design of RTS measures.

The RTS also contains several Region Wide Initiatives intended to guide investment in cycling facilities over the next 15 years:

- **Urban cycle networks**- paralleling major strategic flows across the region (High priority). The aim is to gradually retrofit safe and direct cycle routes into the existing urban fabric, as well as ensuring that new development caters for cyclists
- **Rural cycle networks**, including delivery of Round the Forth route (Medium priority). National Cycle Network route development should also lead to increased cycling levels as well as encouraging tourism.
- **Cycling infrastructure best practice** (Medium priority). This document is a key step to delivering this initiative to ensure new and existing infrastructure helps rather than hinders cycling.
- **Links to stations and cycle parking** (Medium priority). The aim is to ensure there is safe and high quality cycle access to, and cycle parking at, stations, major bus stops and interchanges across the region, starting with the most heavily used stops and stations. Minimum standards are being suggested in this document.

A fundamental goal of all these region-wide initiatives is to develop facilities which enable cycling to integrate with other transport modes.

2. SESTRAN PRINCIPLES

2.1 Principles of Providing Cycling Infrastructure

There are two fundamental issues in providing cycle infrastructure: the role of the planning system and whether to integrate or separate cyclists from other traffic.

- It is common to look to the Netherlands for the best examples of best practice in provision for cyclists. The main threat to bicycle use in the Netherlands is cited as urban sprawl: people living within three kilometres of a centre or sub-centre tend to make more frequent short journeys, more suited to cycling, than people living further away. Cycling levels depend on the distance people live from places of employment, leisure facilities and other goods and services. Successful design for cycling therefore depends heavily on the planning system in the first instance.
- As the bicycle is legally defined as a vehicle the cyclist has the same right to use the public road system as any other user. All new road infrastructure should take account of the needs of cyclists unless cycling is specifically prohibited. Similarly all traffic management schemes on existing roads should cater for cyclists, wherever possible giving them visible priority.

  Many people are nervous about taking up or returning to cycling due to factors such as the speed of traffic and the limited width of the carriageway. In those circumstances it is essential to provide alternative routes, either on alternative roads or off-road.

  In order to increase the number of cyclists and reassure, those who may be nervous about mixing with traffic, it is therefore essential to provide off-road facilities as well, especially where the demand or potential demand is known to exist, such as through residential areas, linking to town or major retail centres, etc.

  Current guidance (DfT Circular 106) encourages 20 mph limits in situations where there is a particular risk to vulnerable road users. Where 20mph zones are in place it may be preferable for cyclists to share the carriageway with other road users rather than provide off-road routes, other than to provide short cuts or other connections.

2.2 Basic Design Principles

Throughout this guidance, safety and the growth of cycling are the twin priorities. In order to keep people cycling and attract more cyclists, the infrastructure for cycling needs to address the following factors:

- **Coherence:** Cycling infrastructure should form a coherent route which links origins and destinations. Routes should be continuous and be of a consistent standard.
- **Directness:** Routes should be as direct as possible and be based on known or modelled desire lines. Detours and delays will deter use.
- **Attractiveness:** The perception of a route is important, especially if it is to attract new users. The total experience of the cyclist on the journey should be taken into account e.g. the environmental quality of the route combined with appropriate engineering detail. A route should complement and, where possible, enhance the area through which it passes: sensitive issues include lighting, personal safety, aesthetics and noise.
- **Safety:** Design should minimise actual and perceived risk for cyclists/road users. It is important to avoid ambiguity in design.

- **Comfort:** Cyclists prefer smooth, well-maintained surfaces, regular sweeping and gentle gradients. Routes should be convenient to use and avoid complicated manoeuvres.

It may be appropriate to put cyclists into four general categories, to help identify how cycling infrastructure can best serve different users:

A. **Leisure cyclists**, including families;
B. **Risk averse and child utility cyclists**, often inexperienced and often worried by traffic;
C. **Utility cyclists**, generally experienced cyclists somewhat tolerant of traffic, including commuters, and;
D. **Sports cyclists**, usually very experienced cyclists.

These cyclist categories are looked at in more detail in Appendix 1 of this guidance.

There are a number of issues to consider when looking at the development of new cycle facilities including:

- Identify the level and nature of the demand;
- Where possible make use of infrastructure that already exists;
- The contribution that off road paths can make to the core path network;
- Try and ensure simplicity of design to facilitate use;
- Minimise clutter in signage to avoid confusion and maximise impact;
- Consider local knowledge to ensure the most appropriate route is identified;
- Ensure facilities are obvious to potential users;
- Reduce barriers as much as possible;
- Try and give advantage to cyclists over other road users;
- Keep in mind impact on other road users;
- Ensure any new measures are realistically enforceable;
- Consider cost of maintenance at outset;
- Conduct a baseline study so as to measure future change;
- Promote the new facility to maximise use, and;
- Monitor the impact of new facilities.

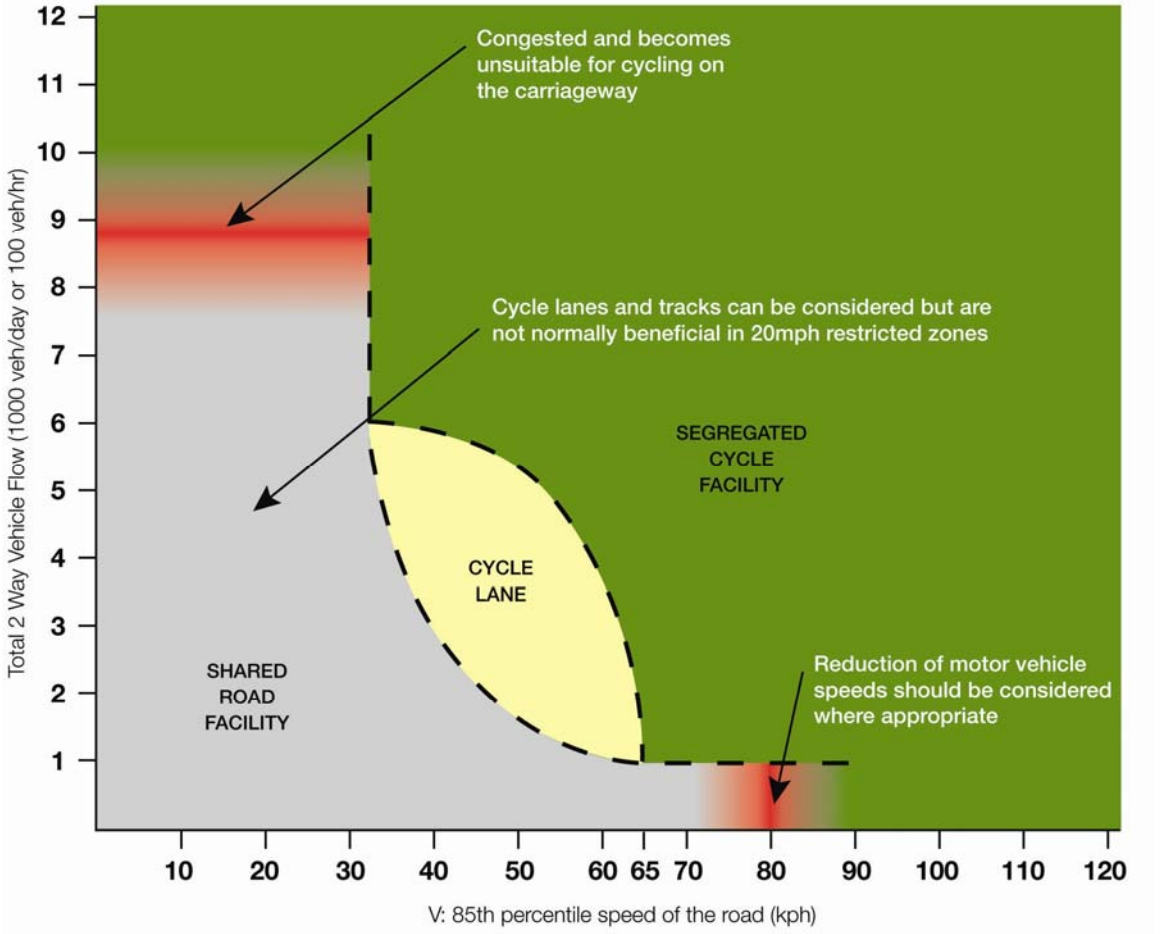
2.3 Integration or Segregation

At lower vehicle speeds and in the absence of high levels of congestion, use of the carriageway by cyclists is generally adequate. At higher vehicle speeds and/or greater levels of congestion, it may be necessary to segregate cyclists from other road users, especially where high levels of cycle demand, both actual and latent exist, and/or where significant numbers of vulnerable or inexperienced cyclists exist:

- In general cyclists can share the carriageway with other road users when there are relatively low volumes of traffic. It may be appropriate to segregate cyclists from other road users with use of cycle lanes when traffic speed and/or volume and/or cycle demand is high.
- If the carriageway is unsuitable to accommodate on-road cycling an off-road cycle path should be pursued.
- Where possible, off-road cycle paths should use existing paths where they are of a sufficient width to allow shared use by pedestrians and cyclists.
- If none of the above are possible, then off-road cycle tracks should be pursued.

Diagram 2.3 provides a visual summary of these principles (This diagram uses 85th percentile speeds; the DfT Circular 1/206 recommends using mean speeds be used for setting local speed limits).

Diagram 2.3 Link Specification Criteria[1]



Points to note:

- *In some areas there may be considerable recreational cycling at weekends, but little or no flow on weekdays. In these areas average daily measurements should be calculated on the basis of flows taken over not fewer than 4 July/August weekends, to provide the average maximum recreational flow.*
- *At an HGV content greater than 15% of the total flow a segregated cycle facility is recommended due to the potential increase in danger to the cyclist.*
- *On an urban road with frequent side road junctions, such as every 200m, an off carriageway segregated facility (especially a converted footway) loses most of its advantages. The benefit of a traffic-free cycle track is counteracted by cyclists having to be alert at each junction. In such circumstances an on-road cycle lane, properly protected by waiting and loading restrictions, may be more beneficial.*

3 DESIGN PROCESS

Scottish Transport Appraisal Guidance (STAG)[2] principles should be followed for all projects: Setting Objectives, Option Development, Appraisal, Participation and Consultation, Monitoring and Evaluation. In developing cycling facilities, the design process steps can be summarised as:

1. Assessment
2. Mapping
3. Consider Issues
4. Feasibility
5. Consultation
6. Modelling
7. Design
8. Construction
9. Promotion
10. Monitoring and Maintenance

3.1 Assessment

When considering specific projects, the evaluation of the current situation should normally include:

- Which points need to be linked, strategically?
- Demand volume – both existing and potential demand
- Demand type – recreational and/or commuter cycling
- Current traffic volume and speed: segregation or integration?
- Shared use with pedestrian traffic
- What already exists
- Who can benefit
- Opportunities and Constraints

A number of methods, including modelling, survey, use of census data and counting, can be employed to help assessment. It may also be worthwhile having an experienced cyclist, such as a Local Authority Cycling Officer, cycle the proposed route and provide a detailed survey of the route 'from the saddle'. This assessment should record some or all of the following:

- A general description of the route: what areas does it link and where go?
- Existing conditions along the route: for example does it primarily run through a mixed residential area?
- Any barriers or constraints: are there currently any physical barriers of constraints along the route that would limit use?
- Adjacent carriageway conditions: what is the typical width and the speed and volume of traffic along the route?
- Current usage: are parts of the route off-road pedestrian routes, carriageway or residential streets, etc?
- Potential usage: is the route likely to cater for commuting cyclists, recreational cyclists, etc?
- Safety record: how safe is the proposed route and what is the level of reported accidents?

3.2 Mapping

Mapping is an important part of the development process and can help identify barriers and opportunities along a proposed route. This process should include:

- Tracing the potential route, considering existing infrastructure along the route and the overall objectives of the scheme;
- Identifying where use can be made of existing off-road infrastructure, including disused railway lines, footpaths, greenways, that could be used;
- Identify potential for modification of existing on-road infrastructure, including modifications to accommodate cyclists such as traffic calming and dedicated cycle infrastructure;
- Pay particular attention to junctions, identifying types, reviewing their layout and how well they accommodate cyclists;
- Use GIS or accessibility planning software like Accession to map postcodes where potential cyclists live and distances to the nearest cycleway, identifying where links into the existing network, or new sections of network may be best used;
- Note key origins and destinations in relation to the route including residential areas, supermarkets, scenic, historic and entertainment locations of interest, etc; Weigh up the directness of route against safety, and;
- Identify an approximate cost, both in terms of initial construction and ongoing maintenance.

3.3 Issues

It is important to identify key issues that may affect development of the route, including:

- Land ownership
- Landscape, including issues such as gradient and drainage, etc;
- Predisposing factors such as the risk of vandalism, safety and security, fly tipping illegal parking, etc;
- Local Development Plan, e.g. to show areas zoned for housing, plus other planning documents.

3.4 Feasibility

Drawing on the previous work, consider the practicality, financial feasibility and justification for the project. For example: How do estimated levels of use for the new route compare with its estimated cost?

When looking at the financial feasibility it is also important to consider the potential cost savings of the project such as the reduced cost to environment arising from higher proportions of people cycling, the reduced cost of health care arising from more people engaging in healthy and active travel or reduced economic costs of congestion.

Sustrans have produced an Economic Appraisal of local walking and cycling routes which will be of use in this regard.

3.5 Consultation

Consultation is an essential part of the development process and should be carried out at an early stage, in line with STAG principles. Potential consultees include:

- Local residents, either directly or through community councils, residents associations, the local access forum and the community planning process, etc;
- Local cycling groups;

- National cycling and sustainable transport organisations such as Sustrans, Cycling Scotland and the Cycle Touring Club;
- Local employers and employer organisations;
- Local and national disability advisory groups, and;
- Where traffic management implications exist, the police.

Consultation can assist the development process by providing the opportunity to take advantage of local or specialised knowledge that can help improve and enhance a scheme.

3.6 Modelling

For larger schemes, it may be necessary to model, either through traffic modelling software or manually, the route and its traffic flow to create a simulation, providing an opportunity to identify potential unintended consequences for other road users.

3.7 Design

When designing the infrastructure for a new route it is important to consider all the issues outlined above and keep in mind requirements dictated by the geography of the land and the requirements of different users, including:

- Basic Design Principles (see Section 2 above);
- Ensure potential hazards are identified and dealt with;
- Simplicity, continuity and lowest gradient;
- The requirements of users with disabilities;
- Criteria determining the width of a cycle lane or cycle track;
- Visibility issues particularly at junctions;
- The potential for conflict with pedestrian traffic;
- Junctions – priority junctions, signal controlled junctions, roundabouts, priority crossings, signal controlled crossings, etc;
- Traffic calming and traffic reduction measures, and;
- Rest areas

It may be necessary to audit the proposed design to ensure it meets the needs of cyclists both in terms of accessibility and safety (see Section 10).

3.8 Construction

Following construction it may be necessary to assess the construction to ensure the new facilities meet the required standards and are ready for use by cyclists.

3.9 Promotion

Promotion of facilities is essential to ensure potential users are aware of their existence. The level and duration of promotion will depend on the scale and purpose of the development. It could, for example, take the form of the one-off promotion of a new cycle lane or the regular promotion of town centre cycle parking and it can use a variety of mediums such as maps, signage, leaflets, an official opening, a webpage and advertising at common destinations, etc. See Section 9 for more details.

3.10 Assessment and Maintenance

Where appropriate, a final audit paper can be used to survey satisfaction and level of use. Monitoring of the use and quality of the infrastructure and a maintenance program should be in place. See Section 9 for more details.

A detailed guide to the design process is available in Local Transport Note 2/04 - Adjacent and Shared Use Facilities for Pedestrians and Cyclists.[3]

4. ON ROAD PROVISION FOR CYCLISTS

On-road facilities for cyclists can be introduced both to encourage more cycle use and for reasons of safety. In locations where there are high levels of cycle use, more innovative measures could be considered, with higher levels of road space reallocation similar to that seen in some European towns and cities.

The impact of on-road cycle measures on other modes of traffic needs to be assessed to ensure modifications for safer cycling do not have unintended negative consequences for pedestrians or other road users. Cycle infrastructure can have benefits for pedestrians and other road users, cycle lanes can improve the pedestrian environment by keeping other road users further from the pedestrian footway and they may also improve visibility and contribute to a safer environment for all road users.

4.1 Traffic Management

Traffic calming measures can potentially be more cost effective in increasing the safety of all road users, including cyclists, than investing in new dedicated cycling infrastructure to make a road more cycle-friendly, whether due to traffic speed or traffic volume. It is important to ensure traffic calming measures are designed to be cycle-friendly, as some measures can be problematic for cyclists.

Cycle facilities can potentially be used to support traffic calming measures. A cycle lane, for example, can be used to slow traffic by reducing the width of the carriageway. It is, however, essential to keep a balance; cycle solutions should not excessively disadvantage other road users.

4.1.1 Vehicle Speed Reduction

Where speed reduction is required, a number of methods can be used, including:

- Speed limit reduction;
- Safety cameras;
- Horizontal deflection, and;
- Road humps and cushions.

Speed-control measures should not:

- Direct vehicles or pedestrians into the path of cyclists or vice versa;
- Make cyclists deviate sharply from their course;
- Otherwise de-stabilise cyclists (e.g. abrupt changes in level);
- Force cyclists to stop or significantly lose momentum;
- Increase cyclists' anxiety or perception of danger, or;
- Create pinch points for cyclists.

4.1.2 Designing for cyclists

Bicycles are vehicles and design for cyclists needs to account for turning radii, sight distance and similar factors to ensure that cycle infrastructure is navigable by cyclists. Cyclist's speeds vary dramatically depending on gradient and ability. Some indications are given in the table below.

Cycle Track Design Criteria

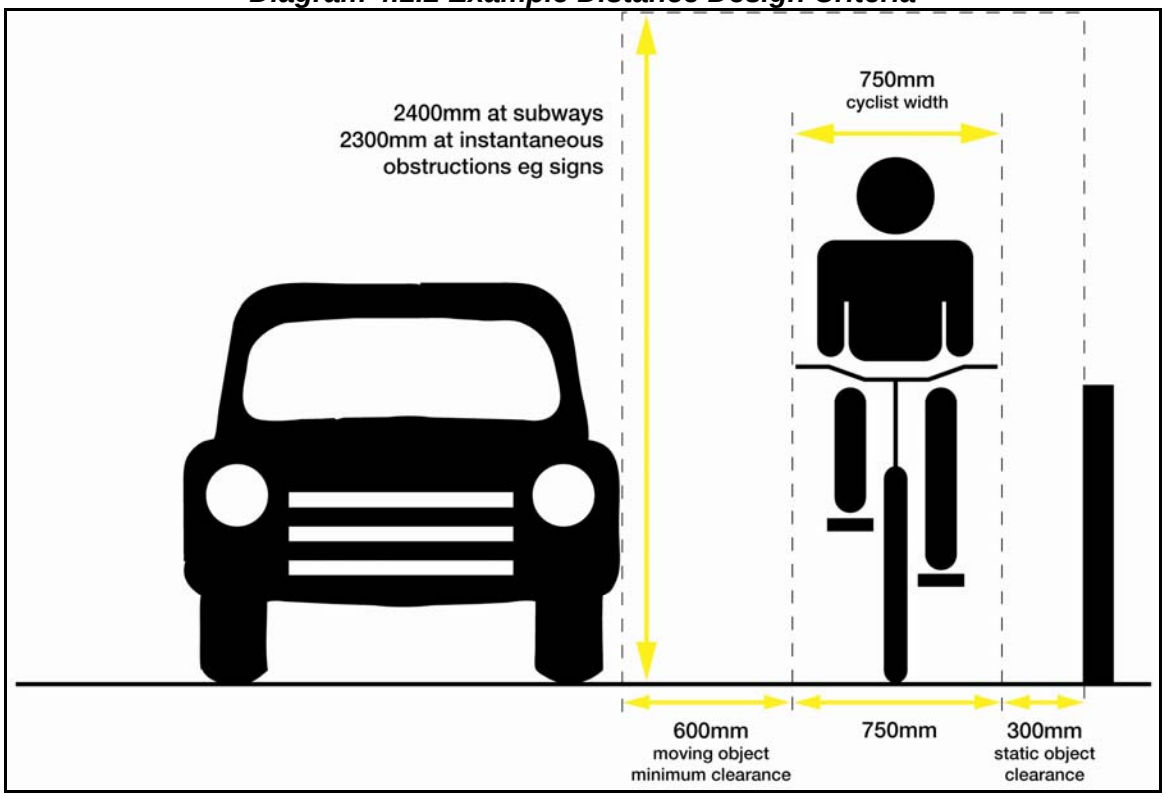
	Gradient		
	<2%	2 - 5%	5%>
Design Speed	20kph	25kph	30kph
Desirable minimum radius[a]	15m[b]	20m[b]	25m[b]
Stopping sight distance	20m	30m	40m
'y' distance for visible splays[c]	25m	30m	35m

Notes:
a Cycleway centre line radius
b Consult Cycle Team if lower radii are proposed
c 'y' distance as per Design Manual for Roads and Bridges where 'x' distance is 2.4m.

Vertical curves should be provided at all changes in gradient.
The curvature should be large enough to provide for comfort.

These speeds and desirable minimum radii should be considered when designing an off-road cycle path, taking account of surfacing, approach visibility distance at crossings, etc. Diagram 4.1.2 below provides an example of the distance design criteria.

Diagram 4.1.2 Example Distance Design Criteria



Cyclists should be encouraged to travel as speeds no greater than 12/13mph on routes shared with pedestrians such as in town centres and shared pedestrian/cycle paths. It may be necessary in some circumstances to look at physical measures to manage cyclist speeds or increase the separation.

When the shared path or street is busy:

- Where there are between 100 to 200 pedestrians/cyclists per hour cyclists should be encouraged to travel at speeds of 10mph or less (e.g. a fairly busy traffic restricted street, such as High Street, Edinburgh).
- Where there are over 200 pedestrians/cyclists per hour consideration should be given to segregating cyclists from pedestrians by providing separate cycle lanes (e.g. the central main pedestrian street of a town).

4.1.3 Traffic Reduction

Traffic reduction schemes, such as re-routing traffic, temporary, seasonal and permanent road closures, banned turns and changed priorities at junctions can benefit cyclists and consideration should be given to how such changes might affect cyclists.

4.1.4 Vehicle restricted areas

Allowing cycling through vehicle restricted areas should be the rule rather than the exception. Any bollards or other physical measures to restrict access should leave a gap of 1.2m to 1.5m to permit cycle access.

Where conflict between cyclists and pedestrians is possible warning signage may be advantageous, see Diagram 4.1.4/1 below.

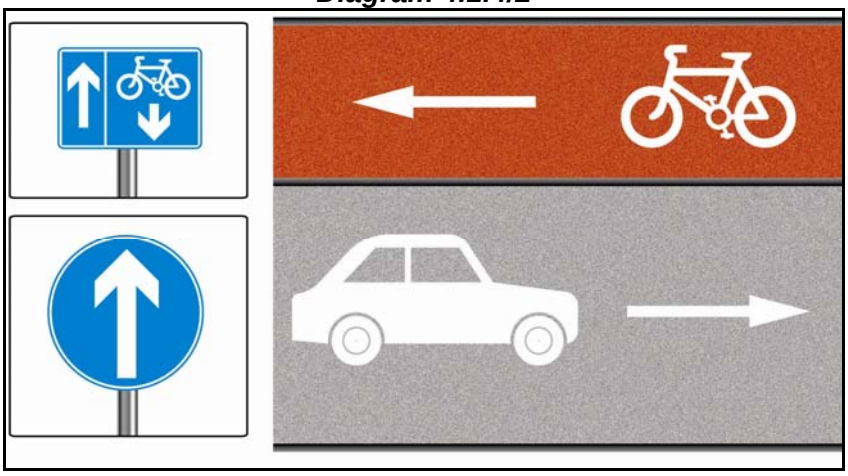
Diagram 4.1.4/1

Banned turns should not apply to cyclists unless deemed unsafe. Signage at the junction should make this clear, see Picture 4.1.4/1 below.

Picture 4.1.4/1

One way streets should be considered for use by cyclists where a contra- flow lane can usually be added, see Diagram 4.1.4/2 and Picture 4.1.4/2 below.

Diagram 4.1.4/2



Picture 4.1.4/2

An alternative, where it is not possible to install a one-way street and contra-flow lane, may be to maintain a 2-way road, but to restrict entry at one end with 'No entry except cyclists' signage.

Home zone streets should be areas where cyclists of any age and level can progress without the threat of being hit by a motorised vehicle. Signage or, preferably, the design of the carriageway, should ensure vehicles, and cyclists, keep a low speed and are aware the street is a home zone and that there may be children playing, elderly people crossing, etc. Diagram 4.1.4/3 below identifies home zone street signage while Picture 4.1.4/3 shows a street where speeds would need to be kept low.

Diagram 4.1.4/3

Picture 4.1.4/3

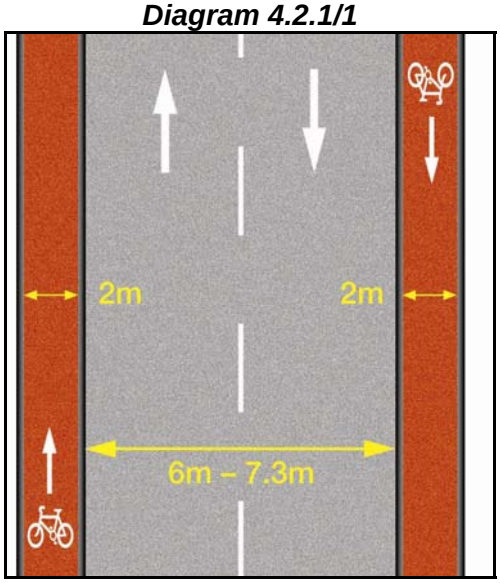
4.2 Infrastructure Modification

4.2.1 Carriageway width

Depending on the layout of the carriageway and different obstacles present, a cycle lane can be on each side of the carriageway or, in certain instances both lanes on the same side.

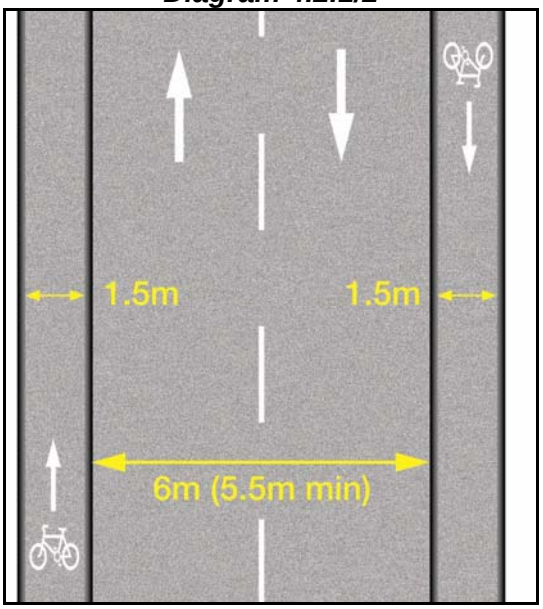
The preferable width of a cycle lane is 2m. The minimum width is usually 1.5m except possibly in exceptional cases and/or for very short distances. However, wider lanes above 2m allow cyclists to ride side-by-side which can be important for leisure cycling or introducing new cyclists to the road.

Diagram 4.2.1/1



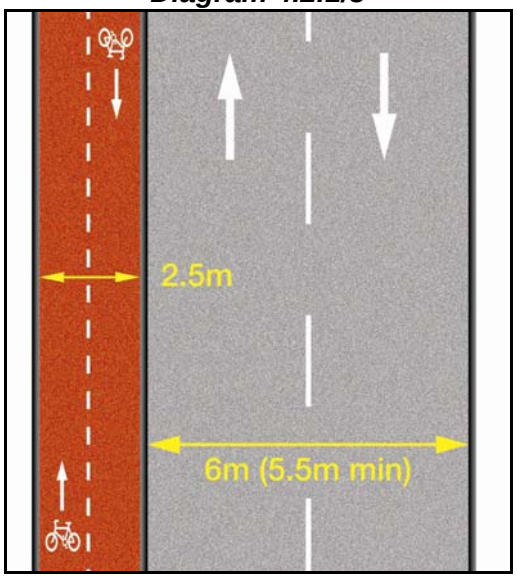
Lanes of 1.5m to 2.0m are adequate when cyclist speeds can be maintained. If the cyclist speed is likely to fall under 5kmph (3mph) regularly, then a wider lane is recommended.

Diagram 4.2.1/2



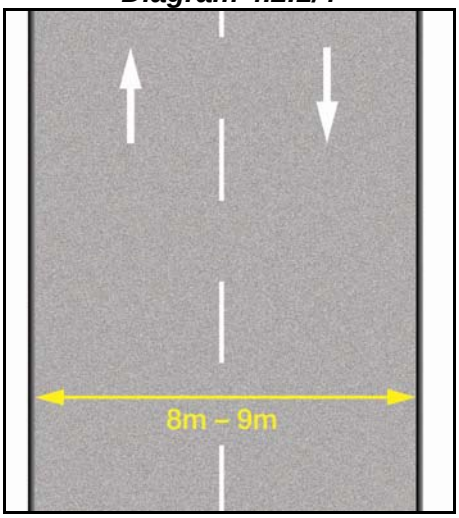
When both cycle lanes are on the same side, the overall lane width should be a minimum of 2.5m and the lane adjacent to the road should be the contra-flow lane. A physical separation between the cycle and the traffic lanes, such as a small intermittent kerb/ridge/or slabs is essential and particular care is needed with the design.

Diagram 4.2.1/3



A wider nearside lane of 4 to 4.5m allows vehicles to overtake cyclists easily and without pushing them against the kerb. A width of 4.25m would be ideal, whilst anything wider than 4.5m can encourage use as two lanes by other road users.

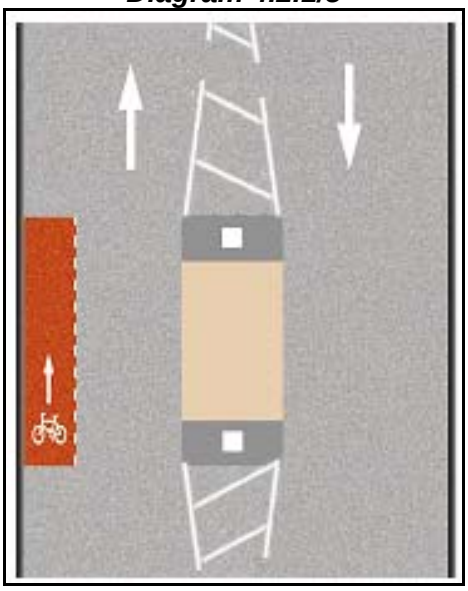
Diagram 4.2.1/4



If there is a central island to aid pedestrians crossing the carriageway a short segment of advisory lane should be added at the level of the island to ensure drivers do not encroach on the cyclist's path, see Picture 4.2.1/1 and Diagram 4.2.1/5 below.

Picture 4.2.1/1

Diagram 4.2.1/5

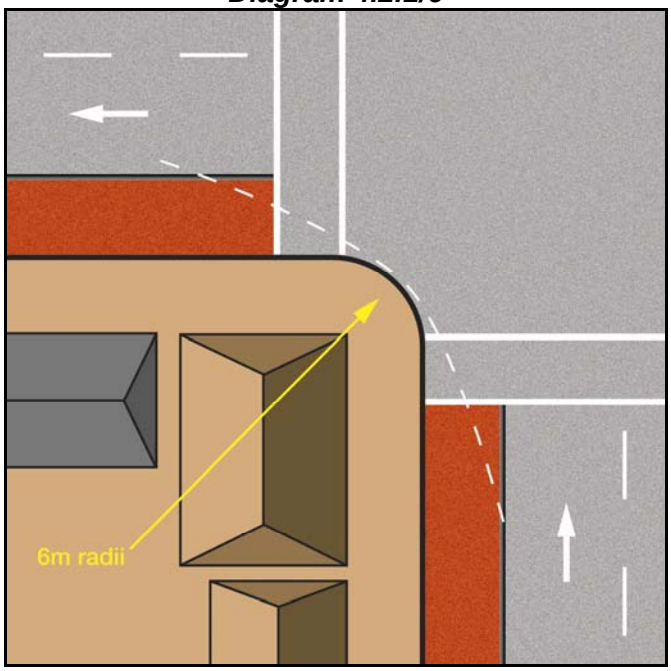


Central pedestrian islands can be a difficult feature for cyclists to navigate as traffic attempting to overtake can potentially squeeze cyclists against the kerb due to the narrowed width of the carriageway. Alternatives to central islands include other pedestrian crossings such as pelican crossings, zebra crossings, raised tables, etc.

Where central islands are unavoidable, it may be possible to install segregated cycle lanes bypassing the section of the carriageway narrowed by the pedestrian island. Where this is not possible the cycle lane should be clearly coloured with a minimum width of 1.5m, even if this results in larger vehicles encroach into the cycle lane, as the cycle lane clearly identifies the width required by cyclists to navigate that section of the carriageway.

The desirable minimum radius of curvature for the path followed by cyclists using the road should be 6m. Where cyclists need to turn sharply (e.g. when leaving the carriageway at a cycle gap) this may be reduced to an absolute minimum of 4m. See Diagram 4.2.1/6

Diagram 4.2.1/6



There may be circumstances where it is not possible to design and install cycle infrastructure on the carriageway to meet recommended specifications. This may be due to existing circumstances such as the limited width of the carriageway or due to the limited resources available to engineer a solution.

When dealing with sub-optimal conditions it may be necessary to install cycle infrastructure that does not meet the recommended standard. The aim of this guidance is not to encourage substandard cycle facilities but on balance it may, at times, be better to install cycle infrastructure that does not meet the recommended standard and which does not risk the safety of cyclists and other road users, than to install no cycle facilities at all. The table below identifies the desirable and absolute minimum distances and should be used as a guide when dealing with sub-optimal conditions.

Cycle Lanes and On-Street Parking Dimensions

PARKING		Minimum road widths required for cycle lanes. Widths required*								
		DIRECTION 1				DIRECTION 2				
		Parking	Door opening strip	Cycle lane	General lane	General lane	Cycle lane	Door opening strip	Parking	**Total width required**
None	Absolute min			1.25m	2.75m	2.75m	1.25m			**8.0m**
	Desirable min			1.5m	3.0m	3.0m	1.5m			**9.0m**
One side	Absolute min**	1.8m	0.5m	1.25m	2.75m	2.75m	1.25m			**10.3m**
	Desirable min	1.8m	0.7m	1.5m	3.0m	3.0m	1.5m			**11.5m**
Both sides	Absolute min**	1.8m	0.5m	1.25m	2.75m	2.75m	1.25m	0.5m	1.8m	**12.6m**
	Desirable min	1.8m	0.7m	1.5m	3.0m	3.0m	1.5m	0.7m	1.8m	**14.0m**

Notes : * If greater widths are available, wider cycle lanes of 1.75m are desirable. Narrower cycle and vehicle lanes may be acceptable on approaches to signalled junctions.

4.2.2 Signal controlled junction

Advanced stop lines should be provided at all signal controlled junctions in urban areas. The depth of the reservoir should be designed to take account of all the manoeuvres cyclists need to make when entering and leaving the advance stop line, as well as the numbers of cyclists.

Picture 4.2.2/1

At a double lane stop, the reservoir should be long enough for a cyclist to pass behind a bicycle with trailer, when wanting to move from the cycle lane to the most inner line. Generally, the depth should be between 4.5m and 5m. Where the road is a single lane, it can be reduced to 3.5m. See Diagrams 4.2.2/1 and 4.2.2/2 below for details.

Diagram 4.2.2/1

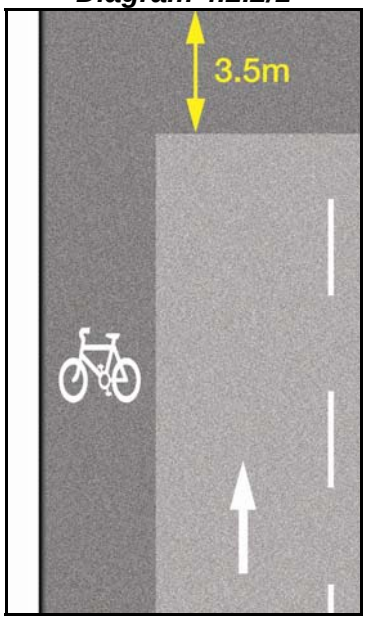
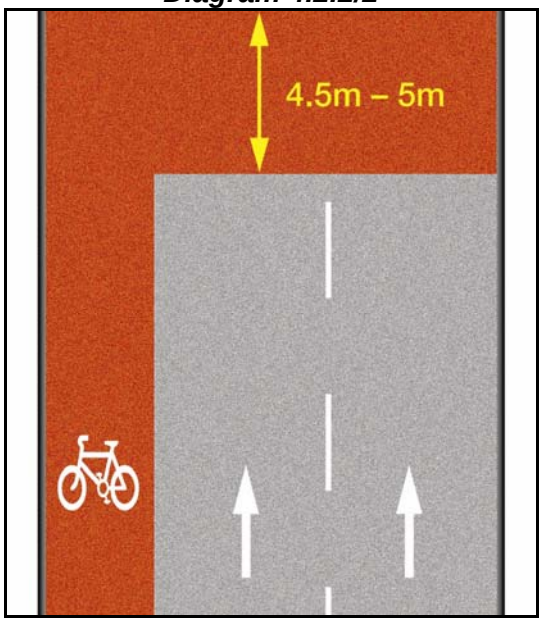


Diagram 4.2.2/2



An advanced signal controlled departure for cyclists can also be considered as an addition or an alternative to the advance stop line, see Diagram 4.2.2/3 below for details.

Diagram 4.2.2/3

Advanced signal controlled departure can be used to provide timing to allow cyclists a few seconds start where appropriate, such as in areas with high volumes of traffic and high volumes of cyclists and/or at wide junctions. Advanced signal controlled departure is used fairly extensively in some continental European cities.

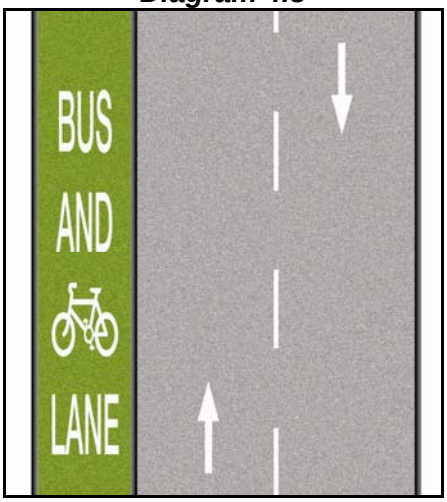
4.3 Bus lane/stop

All bus lanes should be open to cyclists by default, unless there are clear safety reasons to exclude cyclists. New bus stops should be audited to ensure that they do not compromise cyclists' needs or safety. In rural areas where the distance to the nearest bus stop is likely to be greater, provision of cycle parking should be considered to increase integration between the modes.

To accommodate cyclists on a bus lane and allow room for buses to overtake cyclists, the desirable width for the bus lane is 4.6m and the minimum desirable width is 4.25m. 3.0m is the absolute minimum width and should only be used for short distances and where installation of a

wider lane is not possible. Diagram 4.1.6 below illustrates a bus lane clearly marked for use by cyclists.

Diagram 4.3



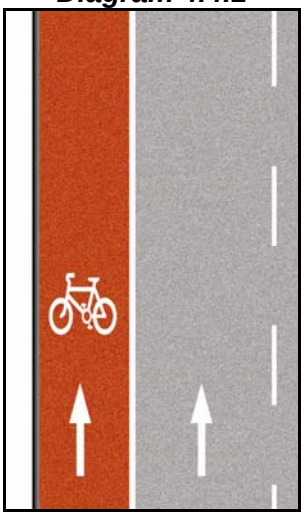
4.4 Mandatory and Advisory Cycle lanes

4.4.1 Mandatory Lanes

A mandatory lane is bounded by a solid white line, and motor vehicles are prohibited from entering the lane. However, cyclists can freely enter and leave the lane and its use is not compulsory. See Picture 4.4.1 and Diagram 4.4.1 below.

Picture 4.4.1

Diagram 4.4.1



Mandatory lanes should be considered whenever possible and where demand is high and/or where parked vehicles are likely to block an advisory lane. A Traffic Regulation Order will be required to prohibit the use of the lane by motor vehicles (except for emergency or statutory purposes) and prohibit waiting, but may permit loading and unloading outside the working day.

If there are premises adjacent to the cycle lane which are accessible only from that lane, the Order, by prohibiting waiting and loading during the working day, may prevent access for more than 8 hours in 24 and may require the consent of Scottish Ministers.

As an alternative, cycle lanes can operate for limited time periods only, e.g. peak periods, if this eases access or parking problems. The mandatory cycle lane signs would then need to be placed in conjunction with the appropriate time plate and approval sought from Scottish Ministers.

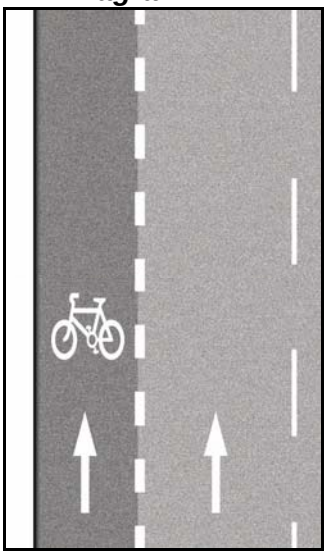
4.4.2 Advisory lane

When mandatory lanes are not appropriate, such as where there are regular feeding roads/street on the left with other road users frequently crossing the cycle lane to either enter or leave the road, where the width of the carriageway would result in a mandatory cycle lane being of substandard width, or where the cycle lane is located between on-street parking and the carriageway, an advisory lane can be used.

An advisory lane is bounded by a dotted white line, and motor vehicles are advised not to drive or park in it, but it is not an offence to do so (though if there are yellow lines bordering the edge of the carriageway the usual rules apply). It is advisable to use yellow lines to keep the cycle lane clear of parked cars during peak periods. See Picture 4.4.2 and Diagram 4.4.2 below.

Picture 4.4.2

Diagram 4.4.2



4.5 Car Parking and Loading and Unloading along carriageway

As far as possible parking on a cycle lane should be prevented, especially during peak commuting times. Pictures 4.5/1 and 4.5/2, below, demonstrate examples of good practice.

4.5/1 shows segregation of cyclists from other road users, but may be less useful on roads with high volumes of commuter cycling where speed is a more important factor. 4.5/2 shows a layout particularly appropriate where on-street parking is provided or loading/unloading is regularly required. In both cases a gap of 50cm should be allowed between the parking and cycle lanes, to reduce the risk of conflict between cyclists and those entering and exiting vehicles.

Picture 4.5/1

Picture 4.5/2

4.6 Drainage

Ironwork should not be located within the bounds of a cycle lane. Where this is not feasible ironwork should be reset so that it is flush with the carriageway surface. Any gratings should be re-oriented so that they run at right angles to the direction of cycle flow to reduce the risk of both of damage to bicycle wheels and of serious accidents. Damaged ironwork should be replaced as soon as possible as it can pose a significant hazard to cyclists.

4.7 Roundabouts

Most traditional UK roundabout designs represent a particular hazard for cyclists. The City of Edinburgh is progressively converting roundabouts to signal controlled junctions partly for reasons of cyclist safety, but also to improve bus priority and provision for pedestrians. This approach, where resources allow, can play a significant role in increasing levels of cycling and improving safety.

Where roundabouts are introduced the intention must be to maximise safety for all road users, particularly the most vulnerable, such as pedestrians and cyclists, rather than to maximise capacity. The main roundabout design options are discussed below.

4.7.1 Mini Roundabouts

When a roundabout is small enough that there is only one traffic lane at each entry and exit, and where these entries/exits are at right angles to the roundabout, without significant deflections, it does not require any special design for cyclists who can follow the normal traffic flow.

Mini roundabouts appear to be a satisfactory junction type in terms of cycle safety.[4] Safety for cyclists and other road users is maximised by designs which minimise entry, circulating and exit speeds. A raised central island which encourages low vehicle speeds and prevents motor vehicles from overtaking cyclists through the mini roundabout may also be beneficial.

Picture 4.7.1

4.7.2 Conventional Roundabouts

Conventional roundabouts, those with a solid island, 2 or more approach and/or circulating lanes, are poor for cycle and pedestrian safety and their introduction should be avoided, particularly in the built-up areas. Low speed conventional roundabouts, those with single lane entries and a single circulating carriageway, are designed to minimise entry, circulating and exit speeds and appear to perform satisfactorily in safety terms but are still frequently perceived as dangerous by cyclists.

4.7.3 Large Roundabouts

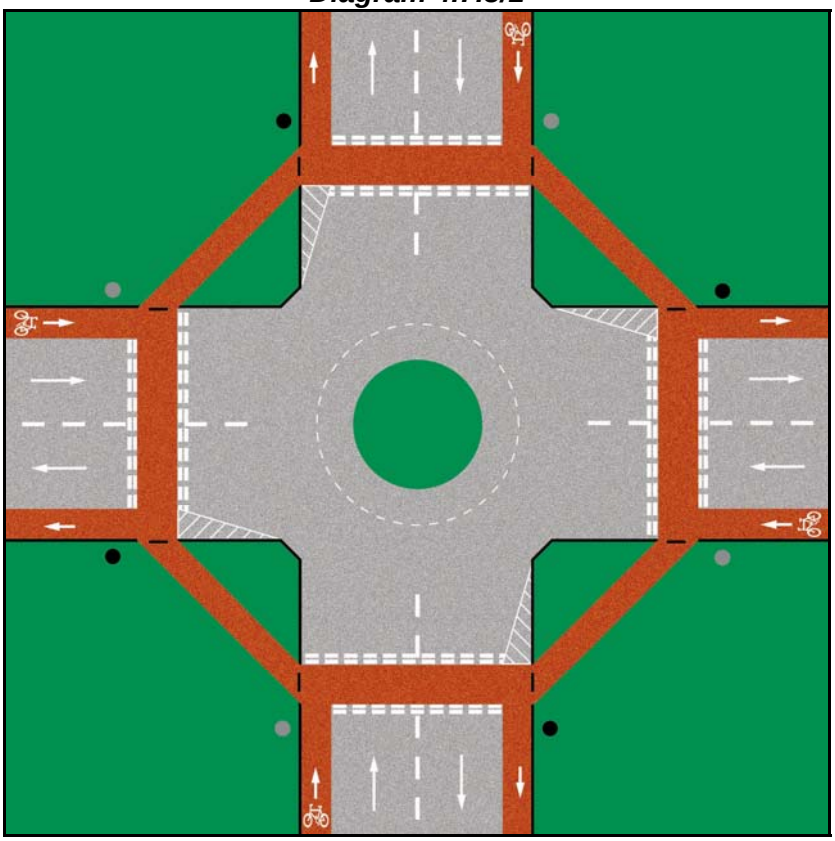
When the roundabout is bigger and has a raised physical centre, with an entry flow greater than 1000 vehicles per hour, a cycle lane should be considered. In a larger roundabout with four entries or more, if the entry flow is lower than 1500 vehicles per hour, a design such as the roundabout with 3 entries would be considered a minimum standard. If the entry flow is greater than 1500 vehicles per hour there are particular safety issues for cyclists. Pedestrians and cyclists can be provided with underpasses, as in Picture 4.7.3/1 and 4.7.3/2 or, if possible convert existing pedestrian underpasses to cater for pedestrians and cyclists, or provide other means of navigating the roundabout safely. While these measures may be necessary in certain circumstances they do remove cyclists from their desire line and should be avoided whenever possible.

Picture 4.7.3/1

Picture 4.7.3/2

Crossing each entry lane individually avoids the safety concerns that can be a factor with some underpasses but still removes cyclists from their desire lines – although generally to a lesser extent. Diagram 4.7.3/1 below shows a roundabout with signalised Toucan crossings to allow cyclists to avoid travelling around the roundabout and complete their journey.

Diagram 4.7.3/1



Where entry exit roads are dual carriageway, a Toucan or other signal controlled crossing may be necessary. The signal request button for cyclists or pedestrians would normally be at the black dots (heading in a clockwise direction). When feasible, siting the 'green man request' button at the grey dot would reduce waiting time at the lights for cyclists. Kerb build outs at the triangular hashed areas would help reduce the danger to crossing pedestrians and cyclists.

Diagram 4.7.3/2 below provides an example of a Dutch sign used to warn other road users of a cycle crossing on the roundabout exit road. (Special permission would be required to use such a sign in the UK).

Diagram 4.7.3/2

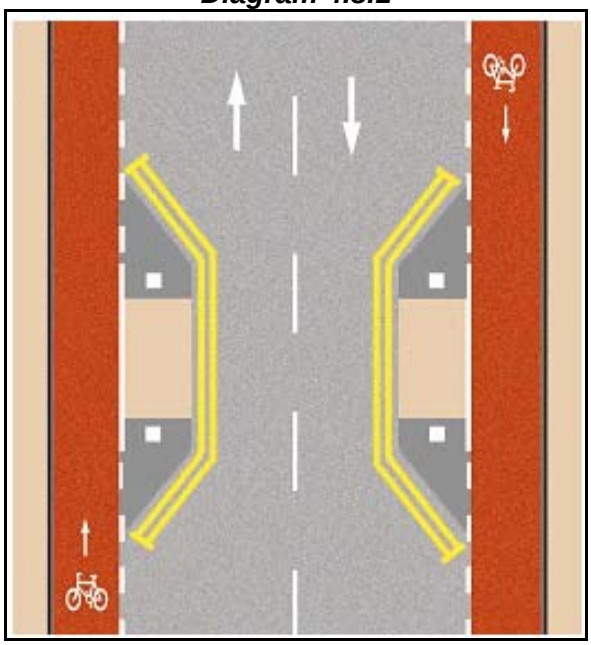
4.8 Traffic Calming

4.8.1 Carriageway Narrowing

Picture 4.8.1

Narrowing of the carriageway can be extremely hazardous to cyclists using the road with vehicles likely to squeeze them against the kerb. Picture 4.8.1 shows a solution in Edinburgh on the left hand side of the road while Diagram 4.8.1 demonstrates another potential option.

Diagram 4.8.1



Chicanes are often used to narrow the carriageway in order to slow traffic. Chicanes often require road users to negotiate an obstacle and therefore encourage them to slow down. Single lane chicanes can require road users travelling in one direction to give way to opposing traffic. Two-way chicanes can narrow the carriageway with wider pedestrian footways but separate lanes with road markings or a central island.

Central hatching, areas of white diagonal stripes or chevrons painted on the road, are used to separate traffic lanes or to protect traffic turning right. Central hatching is often placed down the centre of the road to create the narrower traffic lanes and keep opposing vehicle flows away from each other.

Chicanes and central hatching and can potentially pose a hazard for cyclists as it may encourage other road users to overtake too close to cyclists due to the narrower carriageway. The needs of cyclists should be taken into consideration when looking at carriageway narrowing measures.

Where the carriageway is narrowed cycle bypasses should be provided:

- Allowing a minimum width between obstructions of 1.5m
- Marked with cycle symbol and, if appropriate, coloured surfacing
- Designed to prevent vehicles from blocking the entrance and exit preferably without the need for enforcement.
- Including waiting and loading controls, if necessary, to protect the entrance and exit to the bypass
- If a bypass takes the cyclist off the carriageway the angle of deflection and vertical ramps for the cyclist should be kept to a minimum (not more abrupt than 1:10)

4.8.2 Vertical Measures

Vertical deflections can be very effective at reducing vehicle speeds. However, unless carefully designed they can pose hazards for cyclists. Excessive vertical deflections can cause cyclists to slow down and lose momentum. Some pre-formed cushions or humps have a vertical up-stand on their leading edge and these should be avoided as they can pose a hazard for cyclists and can potentially damage bicycle wheels. Care is required to avoid introducing measures that can potentially reduce a cyclist's ability to safely use hand signals. Only cushions and shallow-ramped flat-topped humps may be acceptable on routes used by buses. Emergency service vehicles will have to be accommodated on their main routes, where vertical measures may not be acceptable.

Where road humps are proposed at or near junctions their sloping faces should, where possible, be set back to enable cyclists to complete their turning manoeuvre before having to negotiate the road hump. Where feasible, up-stands should be avoided.

4.8.3 Sinusoidal profile humps

Where road humps are to be traversed by cyclists, sinusoidal profile humps should be used. Sinusoidal humps are normally constructed in bituminous material. Pre-cast concrete units are available but are of a shorter and steeper profile and so should only be used with caution.

4.8.4 Flat-topped humps and Junction tables

These can be constructed in a variety of sizes, ramp gradients and materials. The height is normally no greater than 100mm but heights of 75mm or 50mm have been successfully used,

particularly at raised crossings. They are also particularly useful as junction tables and entry treatments.

Linear ramp gradients should normally be 1:10 to 1:20, although the legal maximum is 1:6. Steeper gradients and higher tables will provide greater speed reductions but will be more of an inconvenience to cyclists. Where there are higher flows with buses and Heavy Goods Vehicles (HGVs) then flatter gradients and lower tables may be more appropriate.

A variety of materials can be used for ramps and tables. For low flow locations bituminous materials are inexpensive and quick to construct. In other locations block-paving tables will give a clearer pedestrian route. If block paving is used on ramps steeper than 1:20 then potentially hazardous deformation is likely to occur. Contrasting colour or texture will make the feature more visible and have a greater slowing effect.

Ramps constructed of granite setts can be effective at slowing motor vehicles because of the rumble effect. The surface should be smooth enough to be comfortable for cyclists, particularly along the most used side. The new surface of the ramps can be continued 500mm beyond the ramp into the existing surface to produce a smoother profile.

4.8.5 Speed Cushions

Speed cushions are often used on routes used by buses and emergency vehicles. Where used they need to be carefully positioned to take into account parked cars and door-opening space. The route for cyclists should be clear and direct, avoiding the need to deviate from a direct line, thus causing conflict. This may require parking controls for a short distance either side of the cushion. The nearside gap should normally be clear of gulleys and 1.2 to 1.5m wide. It is also important to avoid locating cushions adjacent to gully drainage covers if the nearside gap is narrow as these can potentially damage bicycle wheels.

The safety and comfort of cycle trailers and bicycles designed specifically for disabled users (including tricycles) must be considered when specifying cushions. However, if the only practical way of providing speed cushions at a particular location is with a nearside gap of less than 1.2 to 1.5m, the inconvenience to users of cycle trailers and tricycles needs to be weighed against the discomfort that might otherwise arise for other disabled persons such as ambulance passengers, or disabled users of two-wheeled cycles. If the decision is taken to provide a narrower nearside gap, the width of the cushion needs to be sufficient to allow users of cycle trailers and tricycles to ride over the top of the cushion.

5. SURFACES

5.1 On-Road

Surfaces should be chosen with due regard to whole-life costs and to ensure an even profile and a smooth running surface.

Widespread visible cycle facilities such as cycle lanes may also have a promotional effect in encouraging cycling and clearly marked cycle lanes may also help minimise intrusion by other road users. However, colouring may be inappropriate in some historic or environmentally sensitive areas. The ability/resources to maintain the coloured surface also must be taken into account. The type of additional surfacing, if any, should be chosen with full regard to:

- Existing standards – ensuring consistency with existing colours schemes such as red and green. Blue is also used in some continental European cities;
- The location of the scheme – avoiding unsympathetic or visually intrusive schemes, although bright colours tend to tone down rapidly once the lane is in use;
- The visual effect – ensuring compatibility with existing road markings and the best us of markings to emphasise the existence of a cycle lane;
- The environmental impact - choice of colour and surfacing should be made with regard to wider environmental considerations;
- The requirements of users – for example: disabled users, recreational cyclists and commuter cyclists, and;
- Maintenance requirements, including ability to maintain colour.

Particular consideration should be given to surfacing where there is a greater need to highlight the existence of a cycle lane to other road users such as where:

- Cycle lanes across the mouths of junctions;
- Cycle lanes run adjacent to street car-parking;
- Cycle lanes run between traffic lanes;
- Cycle lanes run through narrowed carriageway;
- Cycle lanes run through junctions;
- Where a cycle lane or facility is not adjacent to a left-hand kerb, and;
- Where motor traffic and/or pedestrians frequently move in and out of the cycle facility.

There are two basic methods of achieving a coloured carriageway surface:

- The use of coloured aggregates, fillers and binders in part of the wearing course mix, and;
- Surface application of a coloured material.

The final decision as to which type of coloured surfacing material should be used will be dependent on its location within the carriageway, the design standards specified for the carriageway and the cost. The most common materials used are:

- Thermoplastic paint;
- Resin based materials with coloured chips;
- Coloured macadam, and
- Slurry seal.

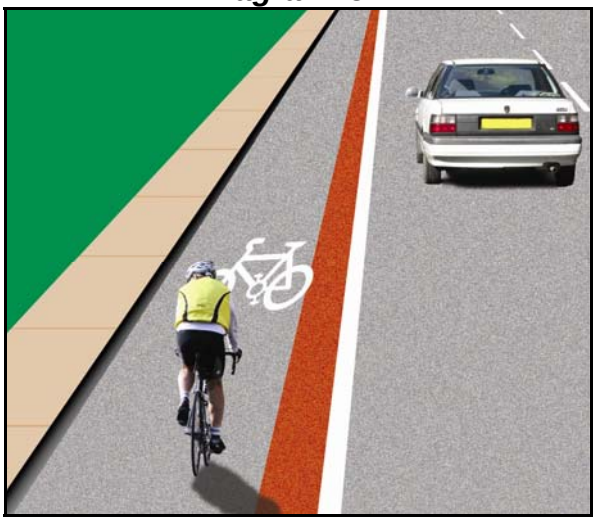
In selecting the most appropriate material for a particular location the following should be assessed:

- Skid resistance;
- Adhesion to existing surface;
- Colour retention;
- Durability requirements;
- Ride quality, and
- Cost of installation and maintenance
- Level of wear expected

In order to reduce the cost of surfacing and maintenance for colouring a full cycle lane, a strip can be applied to mark a cycle lane on the side adjacent to the road used by motor vehicles- see Picture 5.1 and Diagram 5.1 below.

Picture 5.1

Diagram 5.1



5.2 Off-Road

Smooth, firm and non-slip surfaces are the easiest for all users to navigate. Tarmac or concrete are the usual path surfaces in parks and recreation areas but will detract from the appearance and feel of less intensively managed areas, especially for other users such as pedestrians and horse riders. Various loose surfacing such as hoggin, crushed stone, planings or scalpings (recovered road surfacing) can be used, firmly compacted with a powered roller or vibrating plate. The material should be gently cambered for drainage. If the cycle path is in a wooded area a tree root resistant surface can be considered.

The treatment of the path edges is important. Where the site is suitable and the maintenance funds available, mown grass is the best option. This itself produces a reasonably hard-wearing surface which can be used as an overspill. It also keeps sight lines open. For maintenance reasons shrub, hedge and tree planting should preferably be kept well back from the path, leaving an edge of at least 2m. The need for adequate drainage should be considered during the design of all cycle tracks, to prevent flooding or erosion due to inclement weather.

6. OFF-ROAD PROVISION FOR CYCLISTS

6.1 Connections, Links and Networks

The measures available to create off-road cycle links can range from a gap left for cyclists in a road closure to the construction of a new bridge or the provision of a rural off-road network, well away from any towns. Off-carriageway links need to be designed, built and maintained so that they are safe, convenient, clearly signposted, direct and relevant to cyclists' needs. They should be incorporated in an area's core path network.

6.2 Crossings and junctions

When designing a crossing/junction, simplicity of design for cyclists and drivers is particularly important for safety. Junctions are high risk areas for collisions, especially in heavily trafficked urban areas.

6.2.1 Road Crossings – Minor Roads

These are a potentially hazardous point of interaction between cycles and vehicles. Maintaining the continuity of cycle tracks is important if they are to provide an attractive alternative to being on road. Consideration could be given to the use of cycle priority crossings and/or raised-table crossings where they cross minor roads, particularly where daily traffic flows are below 2000 vehicles per day.

Picture 6.2.1

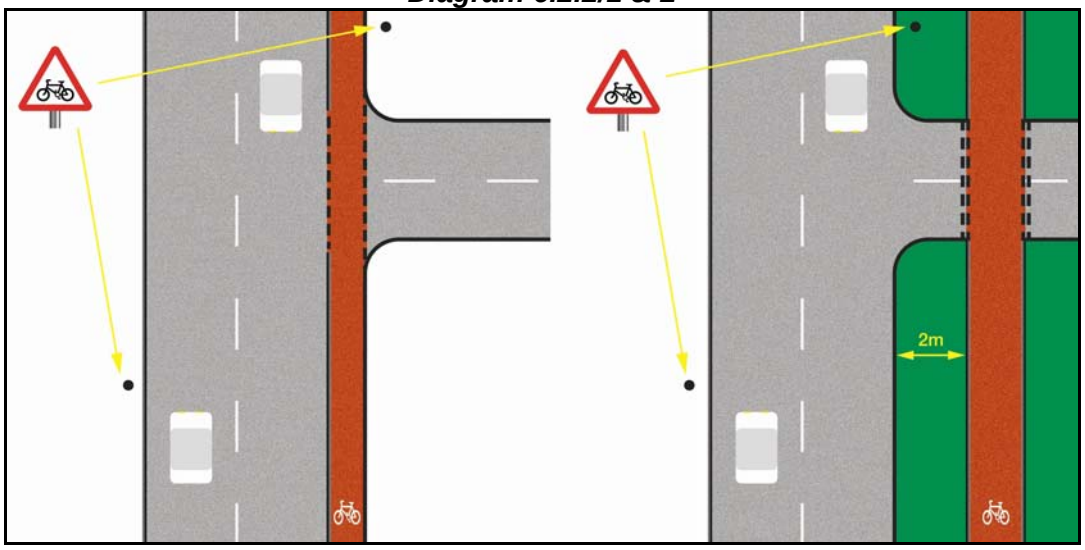
European experience suggests that where the cycle track is used solely by cyclists travelling in the same direction as vehicles on the adjacent traffic lane, returning cyclists to the carriageway before and after side road junctions can also be an effective solution. See picture 6.2.1 above.

6.2.2 Intersection with Minor Roads

When a vehicle is leaving the main road to go onto an adjacent road where it will need to cross an on-road cycle lane it requires to give way to cyclists before turning. Signage could be added as

indicated in Diagram 6.2.2/1 below to reinforce this message. Cycle lanes should be designed to offer maximum visibility to traffic turning on to or off the main road.

Diagram 6.2.2/1 & 2



These junctions may pose particular risks where the vehicle cross an off-road cycle lane and the recommended distance between the edge of the kerb on the road side and the cycle lane is 5m although where this is not possible the minimum recommended distance is 2m to reduce the risk of the stopped car disrupting the traffic on the main road. Diagram 6.2.2/2 above illustrates the minimum 2m distance as well as the signage and road markings that can be used.

A raised-table crossing should also be considered for each crossing where this would enhance the safety of crossing and consideration should be taken of the alignment and level of the cycle lane relative to the road.

Picture 6.2.2

6.2.3 Road Crossings – Main Roads

Cycle tracks could be provided with priority crossings across roads where average speeds are less than 30 mph, where total traffic flows do not exceed 4,000 vehicles per day and where the crossing is sited on a flat-topped road hump.

At present cyclists may not lawfully cycle across zebra crossings within the UK. For signal crossings, a lane for the cyclist adjacent to the pedestrian crossing can be provided. The width of the cyclist lane should ideally be 3-3.5m to allow cyclists going in opposite directions to cross simultaneously, see Picture 6.2.3/1.

Picture 6.2.3/1

An alternative to this approach is to provide a toucan crossing to allow both pedestrian and mounted cyclist signalised crossing. Toucan crossings are typically 4 m wide, rather than the 2.8m width of a pelican crossing. A "green bicycle" is usually displayed next to the "green man" when cyclists and pedestrians are permitted to cross. Toucan crossings also typically differ from pelican crossings by displaying a steady amber instead of the flashing amber seen on pelican crossings. See picture 6.2.3/2 and 6.2.3/3 below for details.

Picture 6.2.3/2

Picture 6.2.3/3

6.2.4 Rail Crossings

For rail and tram crossings, appropriate signage should be used to indicate the crossing, Picture 6.2.4 below provides an example of signage used by some countries in continental Europe. (Special permission would be required to use such a sign in the UK). Underpasses or ramped bridges may be suitable alternatives to some crossings. Whenever possible, crossings should be as close to 90 degrees as possible, to minimise the risk of bicycle wheels becoming trapped.

Picture 6.2.4

6.2.5 New bridge/Subway

It may sometimes be necessary, due to geographical and/or traffic conditions, to engineer a solution having cyclists cross over or under a carriageway or railway line. Depending on the circumstances, a bridge can often be less expensive infrastructure to invest in than a subway. However, if the budget is available and if safety concerns can be addressed, a subway can often be more comfortable for cyclists to use. Subways are highly recommended in rural/forested areas, since they can also be used by local wildlife.

When designing a bridge or a subway, the following factors should be taken into account:

- Ensure a good drainage system is in place by slightly inclining the surface of bridge to facilitate run off, or providing gullies in a subway, etc;
- Minimise susceptibility to vandalism by ensuring, where possible that the bridge or subway is visible to passing traffic, local residential areas, etc to ensure passive surveillance;
- Ensure, where appropriate, that the bridge or subway is well lit, and;
- Maintaining a clear visibility along the bridge or subway to allow users to navigate the route and each other safely.

Headroom in new subways should be a minimum of 2.4m to facilitate use by cyclists. Existing subways with lower headroom have been successfully converted for use by cyclists but should always be risk assessed to ensure they are fit for use and should have warning signs added where appropriate. Signs should be mounted at least 2.3m above the surface of a cycle track.

The choice of bridge or subway will be strongly influenced by topography. An at-grade crossing will often be the prefered option. Issues such as length and gradient of ramp should be considered along with appropriate widths for shared use and parapet hights, etc.

6.3 Visibility

It is important to ensure that, where a cycle track crosses the carriageway, both cyclists and other road users are accorded the maximum possible visibility. Assuming an average speed of 12 mph for a cyclist approaching a crossing from a cycle path, visibility from at least 20m is required. Re-enforcing awareness of a crossing both to cyclists and other road users with signage may sometimes be necessary.

6.4 Footways and Cycle Paths

6.4.1 Conversion of Footpaths

Where it is desirable for cyclists to share existing pedestrian footways/footpaths, their right to share must be established by changing the legal status of the footway/footpath to a cycle track. Any such proposal to convert a footway or footpath to shared use should be taken forward through full and detailed consultation procedures with key stakeholders, including access officers, involved at all stages of the scheme's development.

The following factors should help determine whether or not separation of pedestrians and cyclists is desirable

- Bicycle and pedestrian volumes: If the volumes of both categories are high (combined flows in excess of 200 per hour), relative to the width of the shared path, pedestrians and cyclists are likely to impede each other when mixed;
- The function of the area for cyclists: On a well-used long-distance cycle route, and on main commuter routes, cyclists are likely to be travelling faster than on local routes, and thus potentially engender more serious pedestrian/cycle conflict. Local cyclists normally do not travel regularly in excess of 12-13mph (20kmph);
- The function of the area to pedestrians: In general on a street with trip attractors such as shops on both sides, pedestrians have more need for freedom of movement in lateral directions than on a general walking route, therefore the potential for conflict will be greater, and;
- Level of Congestion: Depending on the level of congestion, cyclist and pedestrian routes can be segregated or unsegregated. However if the path is wide enough (a minimum of 5m- 2m for the footpath and 3m for the 2 way cycle path), segregation will help reduce potential conflict.

6.4.2 Unsegregated Facilities

When using unsegregated facilities both cyclists and pedestrians should be very aware of each other to reduce potential conflict. Signage, as identified in Diagram 6.4.2 and Picture 6.4.2 below, at entrances to the path can help reinforce awareness while reminders should appear, especially at

every junction/feeding path or approximately every kilometre where the path continues without interruption. Reminders can also be added to the path surface.

Picture 6.4.2

Diagram 6.4.2

The recommended unsegregated cycle track widths are identified in the table below:

Recommended Unsegregated Cycle Track Widths

Standard	Width (m)	Comments
Recommended Min.	3.0	For Long Distance Routes and Commuter/Local Access Routes where space allows (2-way facility if necessary)
Absolute Min.	2.0	Satisfactory for combined flows of up to 200 per hour when the recommended minimum is not achievable.
Limiting	1.5	May be used where there are grass verges- minimum width 0.5m- adjacent to the unsegregated area (or 0.75m for areas adjacent to boundary walls, frontages etc.), or where no other option exists and then only over short distances.

6.4.3 Segregated Facilities

Segregated paths are an ideal solution when feasible. It implies two distinct parallel routes, usually consisting of:

- A cycle track, where cyclists are legally permitted to ride but which usually has a continuing right of way on foot to allow pedestrians to cross, and
- An adjacent footpath, where only pedestrians have the right of way and on which it is illegal for cyclists to ride.

Segregation can also sometimes be achieved by having an adjacent footpath at a slightly elevated level to the cycle track.

A raised white line should be enough to separate the two sides, see Picture 6.4.3/1 and Diagram 6.4.3/1 below. If the surface does not allow a white line, a contrast in surface texture can mark the segregation. Where such a solution is adopted it may be more effective to use two contrasting all-weather surfaces as where a tarmac for cyclists and a compacted earth path for pedestrians is used, pedestrians will often prefer to use the tarmac section, particularly in inclement weather or when using pushchairs etc.

Picture 6.4.3/1

Diagram 6.4.3/1

Surface reminders or signs should be at the beginning and approximately every 50m on pedestrian streets and every 100m for other paths. Surface reminders should be used to minimise requirements for additional signposts, especially in rural areas, see Picture 6.4.3/2 below.

A colour contrast can be considered for pedestrian streets. The cycle lane should be as central as possible to reduce conflict with pedestrians entering and exiting buildings. Picture 6.4.3/3 shows poor design with two posts which may impede cyclists.

Picture 6.4.3/2

Picture 6.4.3/3

6.4.4 Footway Crossings and Tactile Paving

Where a cycle path crosses a footway the visibility of the crossing should be approximately 20m for the cyclists. Cyclists should be warned of the crossing by a sign approximately 20m prior to the crossing and the pedestrian 10m prior to the crossing. Surface markings should be used to remind cyclists that they are required to give way to the pedestrians and they can also be used to identify where traffic may cross the cycle path to gain access such as at the entrance to driveways. See Picture 6.4.4/1 for details.

Picture 6.4.4/1

Where cycle tracks cross footways to reach the carriageway, blind and partially sighted pedestrians should be warned by means of corduroy paving. See Picture 6.4.4/2 below. Ladder tactile paving should not be placed in the path of a turning cyclist and the length of ladder paving should be kept to a minimum (800mm) wherever possible. This is less applicable in rural areas.

Picture 6.4.4/2

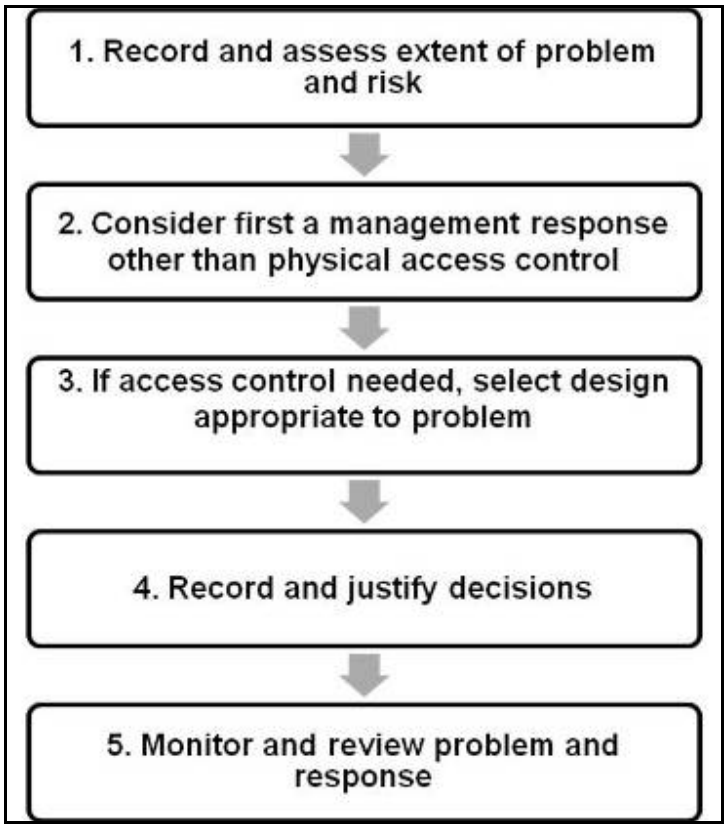
6.5 Gradients and Curves

To be able to cycle comfortably, horizontal radii are required which may be negotiated without loss of speed. In the vicinity of junctions, smaller radii may be used as cycle speeds reduce. An absolute minimum radius of 4m is recommended. If lower radii are used a cyclist's speed is liable to fall below 7-8mph (12kph) making it difficult for some cyclists to maintain balance. Maximum gradients will depend on needs of disabled users.

6.6 Cycle Route Barriers

There should be a presumption against the use of any access barriers on a cycle track/shared-use path, except where there is a proven need, because of the difficulties they can cause all users. It may, however, be necessary to implement such measures where they are required to prevent motorcycles from being used on some off-road paths, posing a danger to pedestrians and cyclists

and damaging the pathway. Any device designed to restrict motorcycle access may also deter or limit access by legitimate users. The following process may be of use:



Further guidance on restricting motorcycle access is available in British Waterways: Motorcycles on Towpaths: Guidance on managing the problem & improving access for all.[6]

Where cycle tracks emerge onto the carriageway, suitable arrangements should be put in place to prevent parked vehicles obstructing access and to ensure adequate visibility such as 'Keep Clear' road markings, double yellow lines etc.

At blind corners, obstacles to reduce speed could be considered to reduce the risk of collision; an alternative option, only at very low speeds, may be to consider installing a mirror providing a view of oncoming pedestrians.

Where a path is too narrow to allow segregation, but there is a high volume of traffic, physical measures to slow cyclists, particularly at danger points, may be required. Measures such as low humps or chicane-barriers used in this way should be designed to be highly visible in poor lighting conditions, particularly on unlit paths, to reduce the risk of an accident.

6.7 Lighting

Off-road routes which cyclists are encouraged to use after dark should be lit to help ensure the safety of all users. Even lit facilities are less likely to be used if remote from passive surveillance and a lit on-road alternative should be identified. The provision of floodlighting where cycle routes cross roads should be considered.

On long distance cycling routes, where tracks travel through relatively sparsely populated areas, it may be inappropriate for paths to be lit and cyclists are less likely to use these kinds of tracks at night.

Lighting needs to be easy to replace, vandal proof (particularly in subways) and spacing, intensity, and colour of light required will be different depending on the location. Solar powered lights offer an alternative where power sources are not easily available and provide an opportunity to reduce costs and carbon dioxide emissions.

Lighting columns should be located such that they do not restrict the width of the cycle track available and where possible should be set back in the verges, etc.

6.8 Rest Areas and Scenery Point Layout

If feasible, shelter should be available at points where cyclists may have to wait before continuing their onward journey, such as connections with bus, rail and ferry services. Shelters may also be considered in areas where cyclists are likely to wait for each other such as at the junctions between major cycle routes. The shelter should be big enough to shelter at least one person and their bike and could be supplemented with cycle parking facilities such as Sheffield Stands. They should be orientated in such a way that passers-by can see inside and those inside can see outside especially when waiting for bus, rail and ferry services.

Rest areas equipped with benches and rubbish bins are often very popular on long distance cycle tracks, possibly every 3 miles depending on local circumstances. If recycling facilities such as bottle banks are provided, they should be positioned at a distance of at least 5m from the cycle path in order to reduce the risk of punctures from broken glass.

6.9 Requirements for People with Disabilities

To ensure a cycle path is also suitable for people with disabilities, including wheel chair users, a number of issues such as gradient, provision ramps and the width of the path are particularly important.

Tracks should preferably have a maximum gradient of 3% or maximum 5% for lengths up to 100m. On the approach to priority junctions this should not exceed 3%. Where steeper slopes are unavoidable a maximum gradient of 7% for lengths up to 30m is preferable.

Ramps should be provided as an alternative to steps, wherever feasible. Both ramps and steps may need handrails. Ramps and steps should be a minimum of 1.2m wide and 1.7m wide for busy areas. Handrails are needed on steps, or ramps of 1:16 or steeper and more than 3m long. Wheelchair users would use a rail 750-800mm high. A bottom rail no more than 100mm above the ground can be a useful edging for wheelchair users and tapping rail for the visually impaired.

Safety handrails on bridges or above drops should be 1m high to cater for wheelchair users or as high as 1.4m for particularly hazardous situations. A middle rail at 800mm, suitable for grip support, and bottom rail at no more than 100mm above ground should also be fitted.

On long ramps a rest platform should be considered at a maximum of 10m or after each 800mm of vertical rise. The length of rest platforms should not be greater than 1.8m. A level distance of 1.8m continuing in the direction of the ramp should be allowed at the top and bottom to give room for turning.

Slightly roughened surfaces such as brushed concrete give a better grip.

A path width of 1.2m is a minimum for wheelchair use, with 1.7m allowing two wheelchairs to pass, or walkers to comfortably pass a wheelchair user. Some elderly walkers, the visually impaired or disabled walkers need the support of an able person beside them, and like to feel they are not holding up other walkers behind them. Where possible a 2m width path is even better.

6.10 Wheeling Channels

Stairs can pose a significant barrier for cyclists and can block access for some mobility-impaired users, so ramps may be a preferable option wherever practical. However, where stairs are unavoidable, wheeling channels should be provided. See picture 6.10 below for details:

Picture 6.10

Stepped footbridges encountered along cycle routes should also be fitted with suitable wheeling ramps.

7. CYCLE PARKING

The inclusion of cycle parking stands should be considered in all traffic management and maintenance schemes with several guiding principles:

- Located in a safe and convenient location;
- Easy to use;
- Secure as possible;
- Adequately lit;
- Well signed, and;
- Where possible sheltered from the elements.

7.1 Legal Requirements

Part IV of the Road Traffic Regulation Act 1984[7] enables the provision of off-street parking for vehicles and authorises the use of any part of a road as a parking place. These powers are extended by Section 63 of the Act to enable the provision, in roads and elsewhere, of stands and racks for cycles. This section also applies to roads which have been pedestrianised by an Order under Section 203 of the Town and Country Planning (Scotland) Act 1997.[8]

Where there are existing waiting and loading restrictions in force, cycles, like other vehicles, may not be parked on the carriageway or the footway of a road. However, on-street cycle parking could be accommodated either through an exemption to the existing waiting and loading Orders or by additional Orders designating part of the road for cycle parking only.

7.2 Parking Requirements

A cycle parking facility should provide a frame allowing both wheels and the frame of a bicycle to be securely locked to the fixture. Cycle stands which only grip a bicycle by a wheel, including concrete slots, offer very limited security, can result in damage to wheel rims and should be discouraged.

When designing parking facilities the space required for a parked bicycle should be 1,800mm in length by 600mm in width.

Cycle parking serving a specific public destination (such as a supermarket) should be located as close as possible to the entrance, to maximise convenience and security. For short-term parking in particular, very convenient location is more important than shelter, if both cannot be achieved. Cycle parking serving a more general shopping/utility area should be installed in small numbers at frequent locations throughout the area, rather than at large parking areas.

In general, cycle parking locations should be overlooked by the occupiers of the buildings they serve or be in clear view of passing pedestrians. Stands placed in dark recesses or at the rear of car parks will not be attractive to cyclists in terms of their convenience and security and are therefore much less likely to be used.

Cycle stands should be placed carefully in relation to their surroundings. The appearance of cycle stands may be enhanced by incorporating them into wider environmental improvement schemes, while still providing the required level of security. Care should be taken to ensure that any stand provided does not obstruct pedestrians or incorporate dangerous projections.

7.3 Parking Standards

Short to medium term cycle parking facilities, typically used for periods of up to 12hours, are generally used at:

- Public Transport Interchanges such as: railway stations, tube stations, tram stops, park and ride sites, guided bus stops and bus and coach stops;
- Public Buildings such as: Local Authority offices , hospitals, health centres, public libraries, etc;
- public, private and voluntary organisation workplaces;
- Education Facilities such as: primary, secondary and further and higher education facilities;
- High streets and outside shopping centres, and;
- Parks and other leisure facilities.

Sheffield Stands provide good support to the cycle and allows the cyclist to secure both the frame and wheels without risk of damage. Stands should be 750mm high and a minimum of 700mm long. A desirable minimum distance of 1,000mm should be provided between stands to accommodate two cycles per stand. Stand ends should either be embedded in concrete, bolted to the ground or welded to parallel bars at ground level to form a 'toast rack' system. Adequate space should be provided at either end of the stand to enable cycles to be easily removed.

Diagram 7.3/1

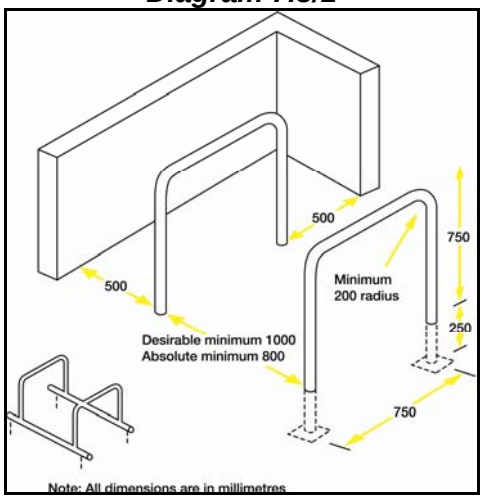
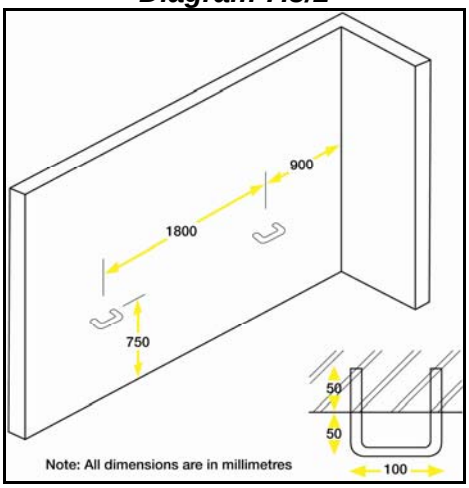


Diagram 7.3/2



Wall loops (or locking rings) are simple, relatively inexpensive and may be more appropriate than Sheffield stands in areas where pavement widths are restricted. They may also be less environmentally intrusive than Sheffield stands in certain circumstances.

Loops should be 750mm from the ground, project no more than 50mm from the wall, and be a minimum of 1,800mm apart. The disadvantage with wall loops is that an excessively long chain is required to secure both the cycle wheels and the frame. Therefore, in the majority of circumstances wall loops are likely to only offer a limited level of security.

Medium to long term cycle parking facilities are generally required at:

- Major transport Interchanges such as railway stations, coach stations, park and ride facilities, airports and ferry ports;
- Student halls of residence;
- Private residences;
- Hotels and hostels, and;

- Camping and holiday sites.

In addition to the requirements for short to medium stay parking, designs for medium to long term cycle parking facilities should aim to provide:

- Higher level of security such as: individual secure cycle lockers;
- Weather protection to minimise damage to bicycles from the elements, and;
- Secure storage areas clothing and cycle safety equipment.

Cycle lockers, cycle stores, such as cycle cages or compounds, or supervised areas within car parks are likely to be more appropriate than unsupervised Sheffield stands as they provide increased security and storage facilities. In some circumstances it may be appropriate to locate Sheffield Stands near to luggage lockers at railway stations and bus stations, etc.

7.4 Cycle Parking

The time when cycle parking is likely to be most fully utilised will vary from day to day, from location to location and from season to season. In order to estimate the number of cycle parking spaces required, the following rough formula may be of assistance:

(Number of cycles present at the optimum time of day) X (110% to 120%)

If the available cycle parking is going to cater for an increase in cycling, it is better to multiply by 120%, but if there is a restriction of space, it is then better to only add 10%.

*11am is typically the time when cycle parking is likely to be most fully utilised in a train station, but between 8.30 and 9am is typically the time when cycle parking is likely to be most fully utilised at a work place, depending on shift patterns and the type of work carried out. Typically, there will be higher demand for cycle parking in the summer months than in winter as many cyclists tend to cycle seasonally to avoid cycling in inclement weather.

Picture 7.4 illustrates extremely successful cycle parking arrangements.

Picture 7.4

8. MAINTENANCE

Cycling facilities not only require good design but also effective management and maintenance. Poor surfaces, overhanging vegetation, ponding, worn markings, broken glass, poor lighting etc, all affect cyclists more quickly and more seriously than motorists and are a continuous source of complaint. It is therefore essential that cycle tracks, both on and off road, are inspected and maintained on a similar basis to the rest of the road network.

All new cycling infrastructure should be delivered in a manner that will minimise whole-life costs, including ongoing revenue maintenance costs.

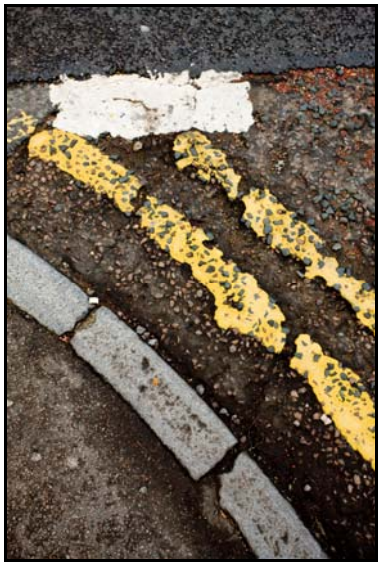
To maintain on-road conditions for cyclists, attention should be focused on the condition of the strip of carriageway within 1.5-2m of the kerb. Off-road, both construction and landscaping should aim to minimise maintenance costs. Off-road paths may be particularly susceptible to fly-tipping and can be rendered impassable to cyclists by broken glass.

The relevant authority should put in place a monitoring and maintenance procedure for each segment of the cycle network and specific infrastructure such as shared pedestrian and cyclist foot bridges, subways and rest areas, etc should be checked regularly. Consideration should be given to utilising the assistance of volunteers such as Sustrans Rangers, who are aware of the maintenance standards, and are able to report problems as they arise. It should be as straightforward as possible for members of the public to report maintenance issues and they should be dealt with as quickly as possible.

After any prolonged period of inclement weather such as heavy rain, strong wind and snow etc, extra maintenance may be required.

Picture 8.1 illustrates poor maintenance of a cycle lane near the kerb which would have a negative impact on cycling.

Picture 8.1



9 SIGNAGE AND PROMOTION

9.1 Signage

The most important function of signposting is to help cyclists unfamiliar with the local area to find their destination. Signage provides visual continuity and helps cyclists understand the geography of a local cycling network, especially on routes with frequent changes of direction. Signage also plays an important role in identifying and advertising the existence and availability of cycle facilities.

The experience of the Netherlands suggests that dedicated signage for cyclists is important because:

- General signage does not always indicate the most appropriate route for cyclists;
- Signage primarily intended for motorists is usually positioned to offer maximum visibility for motorists rather than cyclists, and;
- Cyclists have different signage needs because they travel more slowly and over shorter distances than other vehicle traffic.[9]

Planning Signage for Cyclists

Step	Description
1. Identify important departure and destination locations	Identify locations for inclusion in signposting system including recreational areas, tourist attractions, urban areas, transport interchanges, cycle parking and other destinations likely to attract cyclists.
2. Signage at decision points	Signage must be placed at decision points to enable cyclists to follow their chosen route. Once a destination has been identified, it must be repeated on subsequent signage so the cyclist can reach the destination.
3. Opt for the most direct route	If different routes are possible from the departure point, signage should always identify the most direct route, except where a less direct route offers a safer route to the destination and is not substantially longer.
4. In larger urban areas indicate the town centre	All signage should indicate approximate distances to the destinations identified. Where signage directs cyclists to urban areas signage should identify the town or city centre.
5. Number routes	In urban areas and where there are a greater number of route options, route numbering may make it easier for cyclists to follow a route. Where route numbering is used it should be included on signage and it may be appropriate to include 'reminder signs' along each route.
6. Provide maps	Road signage for motorists on the edge of built-up areas often includes maps to assist motorists in navigating to their destination. It may be appropriate on some cycle routes, such as when they enter an urban area, to provide cyclists with a map identifying the route and key destinations and salient landmarks. Where map information is provided cyclists should be provided with sufficient space to safely dismount in order to consult the map.
7. Provide signage at street corners and intersections	Although the provision of street names do not form part of dedicated signage for cyclists it is important that streets along which cycle routes run include clearly legible street signs to aid cyclists in navigating to their destination.

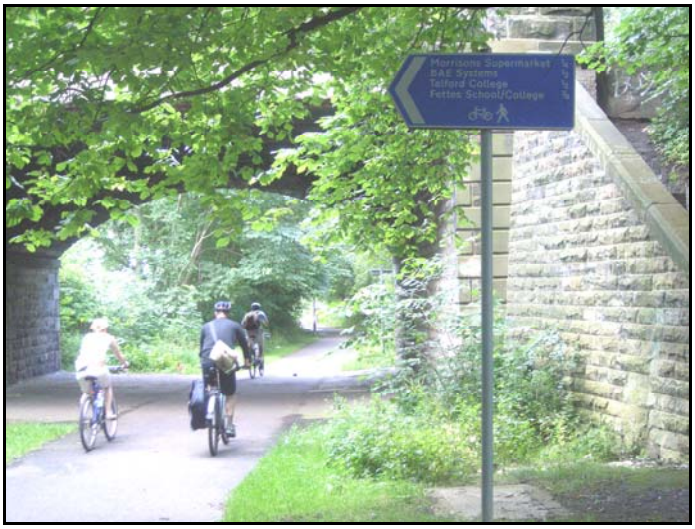
Picture 9.1/1 below shows an example of cycling signage used in Germany on the Velo-Vision D-Route Network made up of 12 national routes with a total length of approximately 11,700km with

standardised signposting and influenced by cycle routes networks in Switzerland or the Netherlands.

Picture 9.1/1

The Velo-Vision D-Route Network signage includes key destinations such as tourist attractions, town centres and transport interchanges and also includes approximate distances and route numbers.

Picture 9.1/2



Picture 9.1/2 above shows signage in Edinburgh on a shared pedestrian and cyclist route identifying the approximate distances to a variety of key destinations for shopping, work and education. This sort of information may be particularly important for commuter cyclists.

Picture 9.1/3

Picture 9.1/3 above identifies signage in Edinburgh on a shared pedestrian and cyclist route identifying approximate distances to key urban areas including the city centre and the route number for Sustrans Route 1. Signage identifying villages, towns or suburbs within a city may be particularly important on longer distance routes between settlements.

Signage on long distance routes should indicate mileage approximately every ½ mile and/or at each intersection. For shorter routes such as those within a town or city, with a greater number of route options and more frequent junctions there may be a greater requirement for more regular signage and distance may be less important .

Where possible, existing lampposts, signage posts, fences etc. should be used to mount cycle related signage rather than erecting new posts to minimise clutter. Posts and sign faces should not reduce the effective width of a cycle track by being placed in the path of pedestrians or cyclists. Where possible, sign posts and lamp columns should be set back 500mm beyond the edge of a cycle track. Where walls or fences prevent this they should be placed tight up against them to avoid potential accidents.

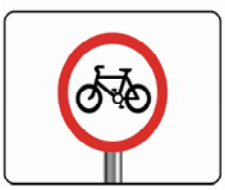
Where vandalism is a problem signs should be mounted high enough to discourage graffiti and square posts used to prevent rotation. Sign x-heights should depend upon the positioning and likely speed of approaching cyclists.

Below are examples of cycle related signage:

Cycle route for use by cyclists only

Contra-flow cycle lane on the road (usually on one-way roads)

Cycle route ahead



No cycling

Cycle lane on the road ahead

Cycle lane on the road for use by cyclist in the same direction as the other traffic

Advisory route for cyclists to use
(usually on road with no provisions for cyclists)

Picture 9.1/4 below shows a 'Cyclists dismount' sign. Cyclists dismount signs and 'End of route' signs should be avoided except where there are overwhelming safety reasons. Having cyclists dismount along parts of a cycle route can disrupt the continuity of a cycle route and make the route unpopular with cyclists.

Picture 9.1/4

9.2 Promotion

Visible cycle facilities have an important role in increasing the general awareness of cycling as a mode of transport and can help encourage cycling. However, good quality infrastructure alone will not necessarily increase levels of cycling and the introduction of new cycle friendly infrastructure should always be accompanied by measures to actively market cycling as a safe, healthy and convenient mode of transport.

Cycling should also be promoted as part of any new development to encourage those accessing a site to cycle and to highlight new cycle friendly infrastructure installed as part of a new development, especially where this has been installed as part of the Development Control process.

Cycling can be promoted using a variety of messages and in a variety of ways, and promotion can target a specific group or be intended for everyone. Promotion can be used to encourage cycling:

- Along a particular route – promoting a new high quality recreational cycle route;
- To a particular location – such as encouraging cycling to a school or a community centre with good cycling facilities;
- For a particular group – such as encouraging the employees of a particular company cycling to cycle work;

- For a particular reason – including to achieve goals such as improving personal health, reducing environmental impact and saving money or practical reason such as avoiding traffic congestion to and from work or do a shop at a local supermarket;
- For a particular group for a particular reason – for example promoting cycling to young people as a way of improving personal mobility;
- By providing information on a particular aspect of cycling – for example, cycle maintenance, cycle safety and cycling at night, and;
- To the public generally – by highlighting some or all of the options already mentioned to the general public, although less targeted promotion is likely to have less impact.

Methods of communicating cycling include:

- Promotional material, including:
  - Printed material such as leaflets, brochures, booklets and posters, etc. can be used to promote specific cycle routes cycling or providing information on a specific aspect of cycling such as bicycle maintenance or cycling safety, and;
  - Cycle Maps detailing a particular cycle route or the cycle network in a particular area and featuring information such as the location of cycle parking, 20mph areas, transport interchanges, key destinations, etc.

- Communications such as:
  - Articles in local newspapers and magazines, staff newsletters, work intranet sites, etc. providing advice and information on cycling.

- Events, including:
  - National annual events such as Bike to Work Week, Bike to School Week and In Town without my Car Day, comprising activities such as: such as cycle repair workshops, cycle film festivals, organised rides, etc;
  - Local events to promote cycling such as the launch event to promote a new cycle route or new cycling facilities, and;
  - Work place events such as free ‘Bike breakfasts’.

- Services and incentives intended to facilitate cycling such as:
  - Bike to Work schemes offering tax and national insurance savings on bicycle purchase, and;
  - Training and education such as bike buddy schemes bicycle user groups (BUGs), cycle training, cycle safety checks and guided ride programmes.

- Travel plans promoting sustainable transport, including cycling, such as:
  - Site specific travel plans – a travel plan for an office or school
  - Residential travel plans – a travel plan for a residential area
  - Personalised journey plans – a plan identifying how to travel between two points using sustainable transport

10. AUDITING AND MONITORING

The Institution of Highways and Transportation Cycle Review Guidelines identify two types of cycle audits – audits and reviews – that can be used to help identify measures to improve a particular scheme, a route or part of a network for cycling.[10] Both cycle audits and cycle reviews can be used to assess infrastructure based on the 5 key principles identified in section 2.2 of this report, specifically:

- Coherence
- Directness
- Attractiveness
- Safety
- Comfort

Auditing and monitoring plays a key role in the development control process. As part of the development control process, planning authorities and developers should take the opportunity to ensure that cycle friendly infrastructure, including secure cycle parking and direct routes for cyclists and pedestrians both within the development and linking the development to the local cycle network, are installed as part of a new development, for example:

- Creating access to and from existing cycle ways
- Allowing secondary access for cyclists and pedestrians into developments
- Creating links between minor roads or cycle ways through new developments
- Improving the quality of cycle routes.

10.1 Cycle Audits

Cycle audits are used to examine new schemes for cycle-friendliness. A Cycle audit is systematic process, applied to planned changes to the transport network, designed to ensure that opportunities to encourage cycling are considered comprehensively and cycling conditions are not inadvertently made worse.

Ideally, every new scheme, including maintenance, should be audited for cycle friendliness. Cycle audits should always be carried out as part of the development control process to ensure new developments include high quality provision for cyclists. The resources put into an audit or review should reflect the importance of the scheme audited. For example, there may be little benefit in spending a great deal of time auditing a remote rural road with steep gradients. New schemes may be prioritised into the following categories:

- Cycle Pro-active Route - includes strategic or local cycle networks; and roads that are, or could be, popular with cyclists;
- Cycle Friendly Route - routes where there is a general desire to encourage cycling, and;
- Cycle Neutral Route - all other routes where cycling is permitted.

A cycle audit can be carried out at four stages in any scheme:

- Preparation of a Design Brief - usually prepared by the client for the designer.
- Preliminary Design - when scheme options are considered.
- Detailed Design - prior to inclusion in the contract documents.
- Substantial Completion - once the works are complete, just before the scheme is opened to traffic.

It may be necessary to tailor the audit, depending on the type, size and complexity of the scheme to be audited.

10.2 Cycle Reviews

Cycle reviews are systematic processes applied to existing transport infrastructure and designed to identify both positive and negative attributes for cycling and to assess ways in which those networks can be improved in order to encourage cycling. Cycle review is a tool that can be used to help draw up Local Cycling Strategies and to integrate cycling interests into transport plans. Cycle reviews can play an important role in the development control process as they can be used to provide an indicator as to where any improvements funded through planning gain can best be sited to ensure maximum improvement to the cycling network.

When prioritising the parts of the network for review it is important to consider:

- Relevant policies or development pressures
- Existing and potential levels of cycling
- Accident records
- The importance of a route to cyclists
- The resources available

Cycle reviews can be conducted with varying levels of detail depending on the nature of the route or network being reviewed. A cycling review can be conducted in three general stages:

- Review of Conditions - an assessment of the infrastructure type and the nature and volume of traffic using it;
- Level of Service Assessment - an appraisal of the cycle friendliness of the route, and;
- Assessment of Measures - suggested methods of improving the route for cyclists.

10.3 Monitoring

Monitoring cycling is important because it can identify current demand for cycling, it can record the uptake of new cycling facilities and assist in the identification of key problems or constraints on the network.

There is often a lack of available information about cycling levels. Monitoring cycling levels effectively is an exercise that can often require significant resources. Cycle flows tend to be comparatively small and subject to wide variation depending to weather conditions and season. This tends to mean that a significant amount of data must be collected before a statistically reliable conclusion may be drawn about changes in cycle traffic on a given route.

The Monitoring the National Cycling Strategy in Scotland report provides an example: To detect a 20% change in cycle traffic on even a heavily used route with 250+ cycles per day would require at least seven count days per year. By comparison, a route less utilised by cycle traffic would require 30 count days per year. In effect, the less important the route, the greater the resources required to detect changes in the level of traffic.[11]

There are number of potential methods for monitoring cycling, including:

- Manual Classified Counts – MCCs consists of staff manually counting cyclists at certain locations and at certain times of the day. MCCs are very labour-intensive, require careful planning and their results be devalued by unseasonal weather.

- Automatic cycle counters – ACCs offer a solution to labour-intensive MCCs, significantly reducing the staff resources required to accurately monitor cycling levels. ACCs can however be expensive to install and maintain, can sometimes fail to detect cyclists close together or riding on the pavement and may occasionally be subject to vandalism.
- Cycle parking counts – Counting parked bicycles at key locations such as transport interchanges and at major local employers is a simple monitoring method to record cycling levels. However, cycle parking counts do not provide good information on the use of particular routes by cyclists and abandoned or unused bicycles can potentially reduce the accuracy of counts.
- Travel diaries – Surveys based on travel diaries distributed to a representative sample of the local population can be used to produce a reasonably accurate measure of cycling by the local population, although low response rates can sometimes be an issue and travel diaries only account for local cyclists.
- Cyclist questionnaires – surveys of cyclists on local routes can provide useful information about who cycles, why they cycle, what problems they encounter and what improvements they would like to see.
- Enquiries and complaints – monitoring enquiries and complaints from cyclists is an important way to gauge, satisfaction levels and key issues for cyclists. It is also important to record responsiveness to enquiries and complaints to ensure issues are adequately addressed.
- Development control – planning authorities should ensure that measures to encourage cycling required as part of the development control process, such cycle friendly infrastructure and/or the marketing and promotion of cycling are installed and undertaken when required. It is important that evidence of new infrastructure and marketing and promotion is sought and if necessary those responsible for the new development are reminded of their requirements as part of the planning process.

Appendix 1

Cycle User Group Categories

	User Group	Priority of design principles *	Route types where likely to be most applicable
A	**Leisure cyclists including families**	**1** Coherence – continuity is paramount **2** Safety – Like coherence, this is critical **3** Attractiveness – significantly more important than directness though steep hills are an issue **4** Comfort is important but a traffic-free route with a less smooth surface would be better than a busy route with a good surface. **5** Directness is less important for leisure cyclists though see attractiveness	Long distance routes. Rural routes. Routes accessing the countryside from urban area
B	**Risk-averse and child utility cyclists**	**1** As for leisure cyclists safety and coherence are the first priorities. 'Social safety' for example routes supervised by being overlooked, is important. **2** Comfort and directness are secondary priorities, directness is more important than for leisure cyclists **3** Attractiveness is desirable but less important than the other factors	Routes to schools, shopping areas, hospitals Commuter routes on main roads <u>especially outwith urban areas</u>
C	**Risk tolerant/experienced 'utility' cyclists including many commuters**	**1** Directness. This is paramount, as indirect routes will not be used. Gradients are a factor. **2** Comfort. Speeds are likely to be higher for this group than for either of categories 'A' or 'C'. **3** Safety is important but slow 'safe' facilities (eg using indirectly routed minor roads) will tend to be ignored in favour of faster routes. **4** Coherence is important but degree of exposure to traffic can be greater than for users A or C. **5** Attractiveness is desirable but less important for this group	Main commuter routes and/or routes used by higher education students <u>especially within urban areas</u>
D	**Sports and cyclists**	Comfort and Directness are considered likely to be the main priorities for this group.	The main issue in designing for this group is in ensuring that cycle facilities have good geometric design, and are well maintained

Acknowledgements

All diagrams based on images by Clotilde Chéreau except: Diagram 2.3, 7.3/1 and 7.3/2 reproduction based on diagrams in Cycling by Design.

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SEStran
First Floor
Hopetoun Gate
8b McDonald Road
Edinburgh
EH7 4LZ
Tel: 0131 524 5150
www.sestran.gov.uk

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