



London Cycling Design Standards

Draft for consultation

June 2014

MAYOR OF LONDON



**TRANSPORT
FOR LONDON**
EVERY JOURNEY MATTERS

London Cycling Design Standards

Draft for consultation, June 2014

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1.1 Raising standards

1.1.1

The Mayor has set out his vision for cycling and his aim to make London a ‘cyclised’ city. Building high quality infrastructure to transform the experience of cycling in our city and to get more people cycling is one of several components in making this happen. This means delivering to consistently higher standards across London, learning from the design of successful, well used cycling infrastructure and improving substantially on what has been done before. It means planning for growth in cycling and making better, safer streets for all.



1.1.2

Last published in 2005, the revised London Cycling Design Standards (LCDS) sets out the approach needed in London to deliver this step-change in quality. Now comprehensively updated to reflect established and emerging best practice, it is a document that should inform design options and promote an integrated and ambitious approach to delivering high quality infrastructure for cycling in all parts of London.

1.1.3

LCDS identifies the design outcomes desired to deliver the ambitions of the [The Mayor's Vision for Cycling](#) (2013), reflecting the Mayor's Roads Task Force report, [The Vision and direction for London's streets and roads](#) (2013). This requires that all infrastructure delivered through TfL-funded programmes applies the following:

Guiding principles

These principles help clarify how the Mayor's Vision for Cycling should be delivered.

Levels of service

These are ways of measuring the quality of design outcomes, both in terms of what they offer for cycling and what they contribute to places.

Summary of requirements

As described in more detail below, the requirements for cycling infrastructure proposals delivered through the Mayor's Vision for Cycling, are that they should:

1. demonstrate how the guiding principles have been reflected in design decisions
- 2a. deliver the appropriate strategic level of service as defined by the Roads Task Force street types approach
- 2b. meet the minimum standard expressed in the Cycling Level of Service (CLoS) assessment, and any further programme- or project-specific requirements

Using LCDS

1.1.4

London aspires to be a great cycling city. The application of the guiding principles set out in this document and rigorous attention to achieving higher service levels as a result of new infrastructure are central to this. Street types and the CLoS assessment give the ability to set standards flexibly but consistently. Those planning and delivering cycling infrastructure are encouraged through this guidance to be bolder, to commit to making better, more attractive streets for cycling and walking and to experiment with temporary measures where necessary to prove that change is achievable. The overall aim is to plan and deliver a London-wide network for cycling that meets with aspirations for infrastructure that is safe, comfortable, direct, coherent, attractive and adaptable.

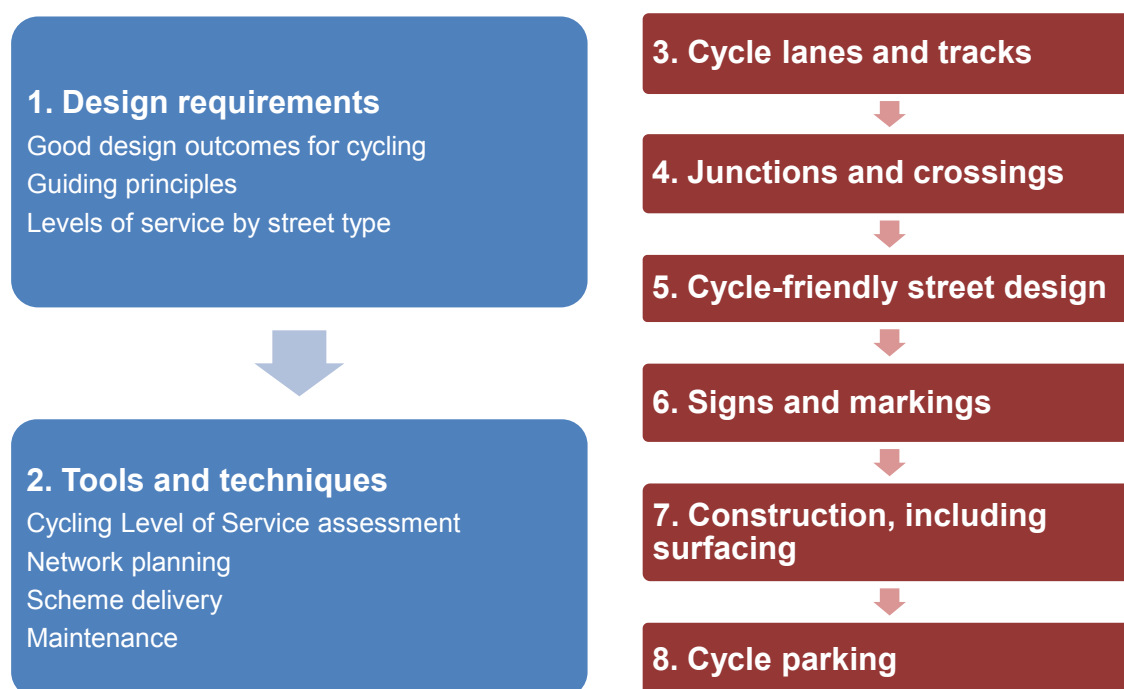
1.1.5

LCDS consists of comprehensive guidance to support meeting those aspirations, and should be read and understood by all those involved in the design of infrastructure for cycling and all those who help shape the street environment. It carries no legal obligation, but gives advice on and options for the design and delivery of infrastructure that will support the planned increase in cycling.

1.1.6

The first two chapters of LCDS cover general design requirements and techniques for planning and delivering high quality infrastructure. The procedures set out here should be applied in a way that is consistent and proportionate with the scale of intervention proposed. The tools and techniques are intended to assist in delivering the desired outcomes efficiently and to a high standard, rather than placing unnecessary burdens on designers. The remaining six chapters of LCDS consist of detailed design guidance to support the requirements and principles set out in chapter 1.

Figure 1.1 Structure of London Cycling Design Standards



Design outcomes

1.1.7

The six core design outcomes, which together describe what good design for cycling should achieve, are: Safety, Directness, Comfort, Coherence, Attractiveness and Adaptability. These are based on international best practice and on an emerging consensus in London about aspects of that practice that we should adopt in the UK. They are important not just for cyclists but for all users of streets, public spaces, parks and riversides, where investment in cycling has the potential to improve the quality of place.

1.1.8

These design outcomes, illustrated in figure 1.2, contribute to broader concepts of placemaking, in particular the principles of good design set out in [National Planning Practice Guidance](#) (2013) and local design guidance such as TfL's [Streetscape Guidance](#) (2009).

Figure 1.2a Good design outcomes 1-3

1. Safety



Good infrastructure should help to make cycling safer and address negative perceptions about safety, particularly when it comes to moving through junctions.

X



Space for cycling is important but a narrow advisory cycle lane next to a narrow general traffic lane and guard-rail at a busy junction is not a safe offer for the majority of cyclists.

2. Directness



Routes must be logical and continuous, without unnecessary obstacles, delays and diversions, and planned holistically as part of a network.

X



This track works well on links but requires cyclists to give way at each side road. Cyclists often choose to stay on carriageway rather than take fragmented routes, with built-in delay.

3. Comfort



Riding surfaces for cycling, and transitions from one area to another, should be fit for purpose, smooth, well constructed and well maintained.

X



Uncomfortable transitions between on- and off-carriageway facilities are best avoided, particularly at locations where conflict with other road users is more likely.

1.1.9

Success will be measured by the quality of design outcomes – how well infrastructure performs in practice and the service level it provides. This is important because growing cycling in London relies on attracting new cyclists as well as providing better infrastructure for those who currently cycle. Improvement therefore needs to be focused on the cycling experience: how safe and comfortable it feels, how direct and attractive a journey is by bicycle, and whether cycle routes are coherent and easy-to-follow.

Figure 1.2b Good design outcomes 4-6

4. Coherence



Infrastructure should be legible, intuitive, consistent and understandable by all users.

5. Attractiveness



Infrastructure should not be ugly or add unnecessarily to street clutter. Well designed cycling infrastructure should enhance the urban realm.

6. Adaptability



Cycling infrastructure should be designed to accommodate an increasing numbers of users over time.

X



Neither cyclists nor pedestrians benefit from unintuitive arrangements that put cyclists in unexpected places away from the carriageway.

X



Sometimes well-intentioned signs and markings for cycling are not only difficult and uncomfortable to use, but are also unattractive additions to the streetscape.

X



Where streets have been engineered primarily for use by motor vehicles, as is often the case with one-way systems and gyratories, it is difficult to make infrastructure for cycling that is legible and adaptable.

1.1.10

The future must not be like the past. Even infrastructure designed with good intentions in mind can fail to provide a good level of service to cyclists, as the examples in figure 1.2 show.

Guiding principles

1.1.11

It will take consistent commitment to the quality and ambition of cycling infrastructure design to realise [The Mayor's Vision for Cycling](#). The 20 guiding principles set out below are fundamental to that approach and working through them can help practitioners to understand what it will take to deliver the design outcomes. They are geared towards learning from what has been done well in the past and tackling the reasons why many previous attempts to deliver good cycling infrastructure have fallen short.

Requirement 1:

Consideration of the guiding principles should shape the design of any infrastructure delivered as part of the Mayor's Vision for Cycling. How they are applied will depend on site-specific conditions and on detailed design, but schemes should demonstrate that these issues have been taken seriously and have informed design decisions.

1. Cycling is now mass transport and must be treated as such

Most current cycle provision is squeezed into spare space or on the margins of roads. It reflects a belief, conscious or otherwise, that hardly anyone cycles, that cycling is unimportant and that bikes must take no meaningful space from more important road users, such as motor vehicles and pedestrians.

This no longer applies, especially in the centre. TfL's April 2013 cycling census found that 24 per cent of all rush-hour traffic in central London is bicycles, and 16 per cent across the entire day, with shares of up to 64 per cent on some main roads. Similar shares apply in inner London.

New cycle facilities must be designed to cope not just with these existing levels of use, but with the future we are planning: of further increases in cycling in zones 1 and 2, and of existing inner-city cycling levels starting to spread to the suburbs.



2. Facilities must be designed for larger numbers of users

In an era of mass cycling, facilities designed for minimal cycling will not work.

Hundreds of cyclists an hour will be using many of the busier main road cycle tracks – sometimes already are. Tracks should ideally be 2 metres wide in each direction (4 metres for bidirectional tracks) to allow room to overtake. If this is not possible, faster cyclists will ignore them. This should be the rule, though there will have to be some exceptions.

People will cycle in growing numbers, whether other road users want them to or not. The only issue is whether we cater for them effectively – reducing the potential for conflict with others - or ineffectively.

3. Bicycles must be treated as vehicles, not as pedestrians

Cyclists and pedestrians should not be forced together where there is space to keep them apart, creating unnecessary conflict which can only increase as the number of cyclists rises.

We have a strong preference against schemes requiring cyclists and pedestrians to share the same highway space, wherever they can be avoided. It will be necessary to use some shared areas in our cycle routes, particularly where the space is wide, but we will prefer to create delineated cycle tracks across it, perhaps with sloping, pedestrian-friendly kerbs or different surfacing.

Cyclists and pedestrians should not share the same space at crossings and junctions. Clearly-delineated separate and/or parallel routes should be provided for cyclists and pedestrians. Typical bad cycle design deals with junctions by making cyclists pretend to be pedestrians, bringing them on to the pavement and having them cross the road, often in several stages, on toucan crossings.



4. Cyclists need space separated from volume motor traffic

There are three ways of achieving this: full kerb segregation, semi-segregation and lower-traffic streets. Full kerb segregation is important and a major part of our plans. Most main roads in London are, however, also bus routes with frequent stops. The cycle lane would have to go between the bus and the pavement. Everybody getting off or on a bus would have to step straight into the lane, which would raise safety concerns both for bus passengers and cyclists. On bus routes where there is room, we will install segregated lanes with ‘floating’ bus stops on ‘islands’ in the carriageway to avoid bus passengers having to step straight off into the cycle lane. Where there is not room, we will use alternative forms of separation.



5. Where full segregation is not possible, semi-segregation may be the answer

Semi-segregation can take a number of forms, described in this document: wider shared bus and bike lanes, better separated from the traffic with means such as traffic wands in the roads, or mandatory cycle lanes, separated with traffic wands. We want to follow the example of US cities in using simpler, more flexible and cheaper forms of separation.

6. Separation can also be achieved by using lower-traffic streets.

Routes should make more use of secondary roads, where they are sufficiently direct, to separate cyclists from volume traffic. A cross-London network of high-quality guided ‘Quietways’ will be created on lower-traffic back streets. Nor is there any rule that Superhighways need be on the busiest main roads; one of the most successful current routes, CS3 in inner east London, is not. We will also mix the two, with stretches on back streets joined to segregated stretches on the main road and across junctions where there is no sufficiently direct side street.

7. Where integration with other road users is necessary, differences of speed, volume and vehicle type should be minimised

In the Dutch principles of sustainable safety, this idea is expressed as the ‘homogeneity’ of mass, speed and direction.

8. Cyclist interventions need not be attempted on every road

We have no intention of preventing cyclists from using any road, save motorways. But some busy, narrow main roads can never be made truly safe for cyclists, and there is little point trying if better alternative roads exist. In locations where a number of roads run parallel, consider designating different roads for different users.



9. Routes must flow

Routes must feel direct and logical. Users should not feel as if they are having to double back on themselves, or go the long way round. Unnecessary small obstacles and diversions should be removed. Chicanes and 'cyclist dismount' signs must be avoided. Currently, many routes appear deliberately designed to break the flow.

10. Routes must be intuitively understandable by all users

Cyclists – and other road users – must be in no doubt where the cycle route runs and where each different kind of user is supposed to be. This is partly about waymarking, which must be frequent, clear and reassuring, guiding users at every decision point and at some points in-between.

It is more, however, about design. Ambiguous or confusing designs, such as shared use footways, schemes where the cycle route disappears, or schemes which funnel cyclists unexpectedly into the path of other traffic, should be avoided.

11. Provision must be consistent and routes must be planned as a network

The worst routes tend to be the result of small, piecemeal interventions made in an unconnected way. Ideally, schemes should be designed on a whole-route basis, integrated with what you want to do for all users on the street. Even without this, strenuous efforts should be made to avoid inconsistent provision, such as a track going from the road to the pavement and then back on to the road, or a track which suddenly vanishes.

Cycle facilities must join together, or join other things together. Routes should be planned holistically as part of a network. Isolated stretches of route are of little value.

12. Routes and schemes must take account of how users actually behave. If they do not, they will be ignored

They should respect people's wishes to take the most direct route. There is little point, for instance, in designing a cycle route through a road junction that requires

cyclists to perform convoluted movements or wait at multiple sets of crossings. If you do, they will simply carry on using the motor traffic route. There is little point in a route which takes cyclists too far out of the way to be useful.

The ‘Cyclists dismount’ sign is the infallible mark of a faulty cycle route. No-one wants to get off and walk. Either the sign will be disobeyed, or the route will simply not be used. If a route cannot be done without these signs, it should not be done at all.



13. Many of the standard tools currently used to manage cyclists’ interactions with others do not work

Chicanes and the like restrict the usefulness and capacity of a route, block the passage of some types of bicycle, especially those used by disabled cyclists, and create unnecessary conflict with other users funnelled into the same small space. We certainly do not say that schemes should not tackle anti-social behaviour by cyclists, which annoys and frightens many people. But they must do so in ways more likely to succeed and to work for all parties.

To slow cyclists down at a pinch-point without compromising capacity or creating conflict at a chicane, we suggest changing the surface to a material such as cobbles or bonded gravel (though such materials should only be installed on short stretches, not long links). Where cyclists need to be slowed right down, ridges can be installed.

14. Changes in road space can influence modal choice

Supply influences demand. Changing road space allocation can impact on modal choice, as is clear from the experience of bus lanes in London. Within the framework provided by the Roads Task Force street types, the network and route planning process should identify where the most benefit is to be gained from reallocating road space. This will help encourage more journeys by bicycle and support planning for growing numbers of bicycle users.

15. Trials can help achieve change

If there is dispute about the impact of a road change, we recommend trialling it with temporary materials. If it works, you can build it more permanently. If it does not, you can easily and quickly remove or change it. However, it is important that the scheme is got right at the beginning, to maximise the chances that it works.

16. Avoid over-complication and the ‘materials trap’

Many UK road and public realm schemes, not just in cycling, waste large sums on over-specified but essentially cosmetic alterations. Cycling interventions need not be heavily engineered and costly. A lot of the best are simple and cheap – such as, for instance, using a small number of bollards to create an entire cycle-only space.

The amount of work on a route should be proportionate to the level of intervention proposed. There is no need to treat a light-touch backstreet route with the same level of design, consultation and intervention as a Superhighway on a busy main road.

17. But do not be afraid of capital infrastructure

Sometimes, investing in more substantial infrastructure is the only way to overcome a major barrier. This can make or break a route, so it is well worth exploring the value that a bridge or a tunnel, for example, might add to a route.



18. All designers of cycle schemes must experience the roads on a bicycle

Ideally, all schemes would be designed by people who cycle regularly. But at a minimum, anyone who designs a scheme must travel through the area on a bicycle to see how it feels. We strongly recommend that designers and engineers also try cycling on some existing facilities, to understand why they do or do not work.

19. As important as building a route itself is maintaining it properly afterwards

Road markings get dug up by utility contractors, ignored in repaints or just worn away; tarmac is allowed to crack and part; tracks and lanes are seldom or never swept, leaving them scattered with debris and broken glass. In winter, cycle lanes are usually the last place on the road or pavement to be cleared of snow and ice, if they are cleared at all.

All lanes must be properly maintained and swept frequently for debris and broken glass. Route proposals must include a maintenance plan.

20. Know when to break these principles

Ideally, routes will be uninterruptedly excellent. In practice, where it is absolutely unavoidable, we will accept a short stretch of less good provision rather than jettison an entire route which is otherwise good. But we expect that this will be rare.

1.2 Levels of service for cycling

1.2.1

The design outcomes articulated in this document do not come in the form of ‘cut-and-paste’ layouts. The focus in delivering the *Mayor’s Vision for Cycling* should be on the quality of the infrastructure delivered. This needs to be informed primarily by the context and by sensitivity to end users’ needs. To address those issues, two measures have been developed, aimed at defining what a good level of service for cyclists means in practice. These aim to define both a strategic and a local level of service.

Responding to context: street types

1.2.2

The first measure arises from the [Roads Task Force](#), which established a framework of nine street types (see figure 1.3) designated according to the relative significance of movement and place within an area. ‘Movement’ is defined in terms of people (and goods), not vehicles, whereas ‘place’ captures activities on the highway and the relationship with frontages adjacent to the street. Urban streets are important both for movement and place related activities so the framework provides a means of associating traditionally competing demands for space. The adoption of street types across neighbouring highway authorities will play an important role in providing a unified view on where best to apply different measures.

Figure 1.3 Cycling infrastructure that may typically feature in each street type



1.2.3

At a strategic level, street types should therefore be used to frame improvements to support cycling and determine the strategic level of service required.

Requirement 2a:

Proposals for interventions to support cycling should refer to the RTF street types. They should demonstrate that the provision made for cycling is appropriate for the street type, referring where necessary to the indicative ranges set out in figure 1.4.

1.2.4

Street types classify the function of a location on the highway. A street's performance can be improved by implementing measures to better meet its functional requirement. For example, the success of a high street may be improved through the implementation of better cycling infrastructure and cycle stands to attract trips. The level of service provided to a user is directly related to the type of activity being promoted as appropriate for that location.

1.2.5

In locations with a higher place function, such as a town square, scheme design might focus on how cycling can help to bring people into a space to dwell. This might be more important for local high streets and squares than for city streets and city places, where levels of pedestrian activity are likely to be high. Where through-movement is dominant, design for cycling should address capacity and safety issues such as cycle priority, avoidance of delay and managing conflict with motorised vehicles.

1.2.6

TfL is developing a process that encourages agreement on street types with all relevant stakeholders. This process will be repeatable, consistent and transparent and involve officers from highway, planning and development authorities. A single view of the network will be approved by appropriate representatives for the highway authority and relevant London Council Committee members. Once approved, street types will be mapped and available for reference via: www.tfl.gov.uk/street-types

Figure 1.4 Indicative range of cycling interventions by RTF street type

↓ Degree of separation (between cyclists and motorised vehicles)	Low place function			Medium place function			High place function		
	Arterial road	Connector	Local street	High road	High street	Town square	City hub	City street	City place
A. Full separation on links (eg cycle track, segregated lane)	●	●		●					
B. Dedicated on-carriageway lanes (eg mandatory or light segregated lanes)		●		●	●		●		
C. Shared on-carriageway lanes (eg advisory lanes, bus/cycle lanes)		●	●	●	●	●	●	●	●
D. Integration with other vehicles			●		●	●	●	●	●

1.2.7

In figure 1.4, types of cycling intervention are categorised according to the ‘degree of separation’ they offer between cyclists and motor vehicles. Greater user separation is needed where the movement function of a street leads to higher motorised traffic speeds and volumes of traffic. Further detail and guidance on degree of separation and different types of appropriate cycling provision are provided in chapter 3.

1.2.8

While it is important to ensure that cycle intervention is appropriate for the street type, shown indicatively in figure 1.4, it is also important to provide continuity for cyclists along a route. A strategic overview of a route is required to ensure cycling provision is seamless across street type boundaries. The management of the interface between different types of provision are important to ensure cyclists retain a minimum level of service across all of the nine street types.



Mandatory cycle lane on a ‘connector’

Cycling Level of Service assessment

1.2.9

The second level of service measure for cycling operates at a more detailed level. A Cycling Level of Service (CLoS) assessment has been developed in order to set a standard for the performance of cycling infrastructure for routes and schemes, and for individual junctions. The assessment is described in full in section 2.1. The purpose of the CLoS assessment is to frame discussion about design options so that schemes are appealing for existing cyclists and can entice new cyclists onto the network. It may be used on any scheme that has an impact on the street environment.

Requirement 2b:

The CLoS assessment describes a level of service that all schemes should meet. This is based on existing policies and good design practice. Falling below the minimum standard on the critical factors triggers the need for reassessment of the scheme.

1.2.10

The assessment also provides an argument for how improvements for cycling could be made in stages, trialling new layouts or different forms of traffic management when it may be difficult to make the case for a permanent change. A closure to motor vehicles, allowing filtered permeability for cyclists, may be a first stage of longer-term area improvements, making streets better, safer places for all. The first stage represents one intermediate level of service, the second a higher level.



Staged improvements for cycling at Palatine Road, Hackney

1.3 Applying LCDS

1.3.1

The test of success will be whether the infrastructure that is delivered is high quality and fit-for-purpose when built. It should achieve the six design outcomes – safe, direct, comfortable, coherent, attractive and adaptable – and be shown to attain the levels of service outlined in the previous section. This high standard will apply to the delivery programmes set in motion by the *Mayor's Vision for Cycling* and described in this section.

Delivering high quality infrastructure

1.3.2

Cycle Superhighways provide radial, direct and safe cycle routes between outer and central London, primarily aimed at commuter cyclists. Since the publication of the Vision, the Superhighways concept has evolved so that routes will include greater separation from motor traffic than was generally provided on the four existing Superhighways (which will also be upgraded). This approach has been implemented on the extension to CS2, and the new, substantially segregated East-West and North-South routes, which will form important axes within the cycling grid for central London.

The primary objectives for Superhighways as part of the cycle network are:

- to improve conditions for existing commuters
- to encourage more people to cycle
- to improve the image and perception of cycling among Londoners, attracting people who want to cycle and promoting good behaviour among all users



Full segregation on CS2 extension



Visualisation of the North-South route

1.3.3

Core principles for physical measures implemented through the Superhighways programme reflect the design outcomes.

- **Safety** – infrastructure should improve safety, and the perception of safety, along the whole route
- **Directness** – Superhighways should follow direct routes into and across central London; they are likely to be on main roads but do not have to be if a sufficiently direct and viable quieter road is available
- **Comfort** – road surface conditions should be improved and obstructions minimised; the level of comfort should be maintained once the route is open and in use
- **Coherence** – Superhighways form an integral part of London's cycle network and will connect seamlessly with Quietways, local cycle routes and the Central London Grid
- **Attractiveness** – the whole route has a clear identity from beginning to end with consistent and easy-to-follow road markings and signage
- **Adaptability** – cycle lanes and tracks should be designed to accommodate expected future increases in cycling volumes; wherever possible, cyclists will be able to pass each other without having to move out into the motorised traffic stream

1.3.4

Quietways will complement Superhighways by providing a network of cycling routes through less heavily trafficked streets in every London borough, joining up with off-carriageway routes where possible. Quietways will be direct, easy to follow and will be delivered end-to-end, not piecemeal. They are not principally aimed at existing fast, confident cyclists. They are aimed at new cyclists who want a safe, unthreatening experience.

1.3.5

Quietways will mostly be radial, from central London to the suburbs, with some orbital routes. They will be continuous, following cyclists desire lines. The vast majority will be on more lightly trafficked back streets, with some on canal towpaths or paths across parks and open spaces. At some points, for the sake of directness, Quietways may need to join main roads, but this should be kept as brief as possible. Where they have to join busier roads, or pass through busy, complicated junctions, segregation should be provided.

1.3.6

Quietways are low-intervention routes, with largely unsegregated cycling provision because they are on quieter streets. The main interventions on the vast majority of the network will be wayfinding, surfacing improvements, removing barriers such as chicanes and improving the flow of the route. There may need to be some removal of parking, but this will be kept to a minimum.

1.3.7

The Greenway and Quietway programmes have been merged. Many Greenways, both existing and those now being delivered, will be used as part of the Quietway network. But not all Quietways will be Greenways – the majority of Quietways will be normal streets, not parks or canal towpaths.

1.3.8

Key principles for Quietways are as follows:

- Routes should be on the quietest available roads consistent with directness.
- Routes should be as straight and direct as possible.
- Routes should try to avoid unnecessary turns.
- At some points, for the sake of directness, Quietways may need to join main roads, but this should be as brief as possible. Where they have to join busier roads, or pass through busy, complicated junctions, segregation must be provided.
- Routes should use the same road in both directions unless it is absolutely unavoidable. One-way streets should be made two-way for cyclists where this is possible.
- Right turns in traffic, which require cyclists to filter into the middle of other vehicles, should be avoided wherever possible. Right turns on quiet roads are acceptable.
- Right turns which require cyclists to filter in busy traffic should always be avoided. If it is unavoidable, a short stretch of segregation or other road rearrangement should be provided.
- Wayfinding will largely be on-carriageway, though signs will be necessary at some junctions.
- Routes need to operate full-time. Where routes are through parks that are closed at night, then an acceptable and sufficiently direct alternative night route, on similarly quiet roads, will need to be well signposted.
- Partners should consider ‘social safety’ as a central and integral part of Quietway design and delivery. Lighting and CCTV should be improved where necessary.

1.3.9

The three outer London Mini-Hollands will see cycling interventions that will transform Enfield, Kingston-upon-Thames and Waltham Forest, and benefit other town centres as areas with exemplar facilities for cyclists. This will result in an uplift in safe cycling associated with excellent cycle facilities and public realm provision. The emphasis is on transformational infrastructure measures, and the programme is specifically targeted at capturing the potential for journeys by bicycle to replace many journeys currently undertaken by private car.

1.3.10

The *Mayor's Vision for Cycling* includes a revised Better Junctions programme. Reflecting the commitment to make London's busiest junctions safer and more attractive for cyclists and other vulnerable road users, this will involve substantial improvements to 33 junctions across London. This includes locations on existing and proposed Cycle Superhighways.

1.3.11

Through the Cycle to School Partnerships initiative, clusters of schools will work with their borough and the local community to identify barriers to cycling to school and solutions for overcoming them. TfL will work with the Cycle to School Partnerships to deliver pilots demonstrating a combination of infrastructural solutions and supporting measures to overcome the barriers and enable safe cycling to school.

1.3.12

Improvements to infrastructure that can help support cycling are also made through the existing TLRN Regional Improvement Programme schemes undertaken by TfL and through Local Implementation Plan (LIP) schemes led by the boroughs and cities.



1.3.13

This document also considers innovations currently being trialled, or planned for trial. These practices are not yet established but have great potential to broaden significantly the options we have for designing high quality infrastructure for cycling in the future. They include:

- Dedicated traffic signal infrastructure for cyclists. Potential applications of low-level signals are described in section 4.3.
- Continuous and intermittent forms of separation of cyclists from motor vehicles on links. Content on kerb segregated and light segregated cycling facilities is provided in chapter 3.
- Different ways of managing kerbside activity, including ‘floating’ parking, loading and bus stops on the offside of cycle lanes/tracks. Sections 3.2, 5.4 and 5.5 cover these areas.
- Ways of helping cyclists turn right from the nearside, without having to turn across lanes of moving motor traffic. Two-stage right turns are described in section 4.3.

Legal and policy context

1.3.14

Current policy on cycling in London is driven by the [The Mayor’s Vision for Cycling](#) (2013) and by the [Mayor’s Transport Strategy](#) (2010). The latter sets a target for the increasing the mode share for cycling to 5 per cent of all journeys by 2026. This will represent a 400 per cent increase since 2001. Figure 1.5 below sets out other important documents that form the policy context for cycling infrastructure, as well as key legal and regulatory considerations.

1.3.15

In August 2013, the Prime Minister announced his ambition to increase cycling in England from 2-3 per cent of trips in England towards the levels achieved in certain other European countries where 10-15 per cent trips are commonly made by bike. To achieve this, he challenged local authorities to raise the bar in designing and delivering cycle-friendly infrastructure to encourage many more people to try cycling. As part of the same announcement, it was indicated that the Department for Transport may endorse the LCDS as best practice guidance for use by highway engineers across England.

1.3.16

The Network Management Duty requires local traffic authorities to manage their networks with a view to securing the expeditious movement of traffic on the authority’s road network and facilitating the expeditious movement of traffic on road networks for which another authority is the traffic authority (so far as may be reasonably practicable having regard to their other obligations, policies and objectives). In this instance, ‘traffic’ is explicitly defined as including pedestrians, cyclists and motorised vehicles.

Figure 1.5 Selected legal and policy context for cycling in London

Most relevant policy context	Key aspects of legal and regulatory context
<p>London-wide</p> <p>Mayor's Vision for Cycling (2013)</p> <p>Roads Task Force report, The Vision and direction for London's streets and roads (2013)</p> <p>The London Plan (2011)</p> <p>Mayor's Transport Strategy (2010)</p> <p>Cycle Safety Action Plan (2014)</p> <p>Cycle Security Plan (2010)</p> <p>Clearing London's Air (2010), the Mayor's strategy for improving air quality</p> <p>Tree and Woodland Framework for London (2005)</p>	<p>TSRGD The Traffic Signs Regulations and General Directions (2002, revised version out for consultation 2014 and due to be adopted in 2015) sets regulatory requirements on signs and road markings.</p> <p>Highways Act (1980) This Act places a statutory obligation on highway authorities to provide for the safe movement of people and goods.</p> <p>Traffic Management Act (2004) This gives additional responsibilities to local traffic authorities to address the shortcomings of the Highways Act and New Roads and Streets Works Act, 1991, particularly in relation to planning and co-ordination of works and in establishing the Network Management Duty.</p> <p>Health and Social Care Act (2012) This shifts more responsibilities onto local authorities and enables more direct links between health outcomes and local policies in areas such as transport.</p> <p>Crime and Disorder Act (2006) Section 17 places a general responsibility on local authorities to design out crime and to take account of community safety plans.</p> <p>Disability Discrimination Act (1995)</p> <p>Equality Act (2010)</p> <p>Construction Design and Management regulations (2007) CDM sets out the need for practitioners to be adequately trained for the work they are doing.</p>
<p>National</p> <p>National Planning Practice Guidance (2013)</p> <p>All Party Parliamentary Cycling Group (APPCG), Get Britain Cycling (2013)</p> <p>Signing The Way (2011)</p> <p>Local Transport Note LTN 2/08: Cycle Infrastructure Design (2008)</p>	

1.3.17

The Disability Discrimination Act 1995 (DDA) and the subsequent Equality Act 2010 require authorities to make reasonable adjustments to overcome physical barriers to access. This should be done by removing or altering barriers, thereby enabling people to avoid them or by providing access by an alternative means. This applies to the street environment and to public transport services.



Cycle stands should not create new hazards for pedestrians: use of on-carriageway space for cycle parking



Seville, Spain: a reminder that wheelchair users are welcome on cycle tracks

Chapter 2

Tools and techniques

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2.1 The Tube Network for the Bike

Overview

2.1.1

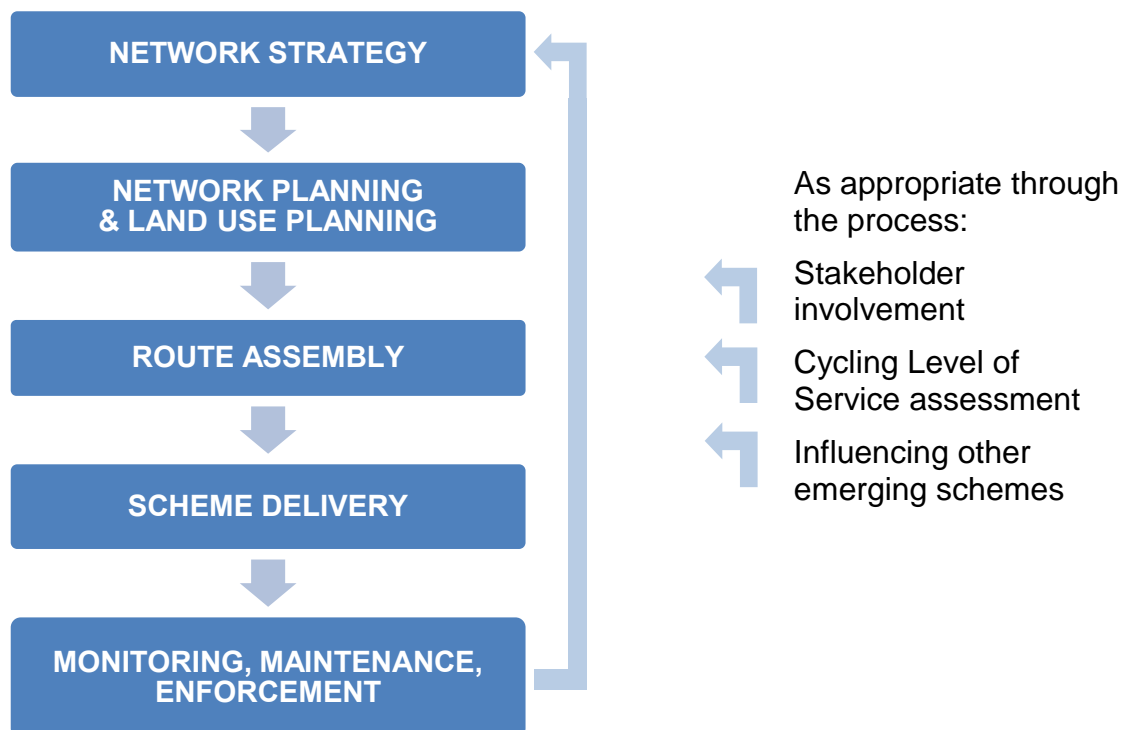
This chapter sets out network planning, route planning and implementation tools and techniques, showing how planning, design and delivery are related. All the tools described here are intended to serve the over-riding objectives of efficiently delivering safer, more comfortable, direct, coherent, attractive and adaptable cycling infrastructure. They should be applied in a proportionate manner.

The level of route delivery planning, design and stakeholder involvement needs to be appropriate for the level of intervention proposed. Where there are limited changes to be made, as is likely for large stretches of Quietway routes, then a minimal approach should be taken and procedural demands should not be allowed to impede delivery.

2.1.2

The relationship between different techniques and procedures is shown in figure 2.1 below.

Figure 2.1 Overview of techniques and procedures for delivery cycle infrastructure



London's cycling network strategy

2.1.3

The network strategy for London is the development of the 'Tube Network for the Bike' approach described in The Mayor's Vision for Cycling. Its application in London is geared to enabling more people to cycle more safely, mindful of the expected growth in numbers of cyclists. Routes and schemes that contribute to the network in outer London are aimed at transforming cycling in areas where numbers of cyclists may be low or stable but where there is great potential for further growth.

2.1.4

The elements that make up the network are:

- **Cycle Superhighways**
New Superhighways
Upgrade of the four existing Superhighways
- **Quietways**
Central London Grid
New Quietways in inner and outer London
- **Mini-Hollands**
Transformation of town centres and associated areas in three boroughs: Enfield, Kingston-upon Thames and Waltham Forest

2.1.5

Different approaches have been planned for areas of different cycling potential. Area-wide infrastructure is appropriate for central London or specific outer London town centres, where there is a high density of potential and existing cycle journeys. Outside these urban centres, the cycling potential is less concentrated, so planned infrastructure such as Superhighway or Quietway routes will be adapted accordingly.

Superhighways

2.1.6

The first four Superhighways brought about an average 77 percent increase in cycling on the routes concerned – 30 per cent of those cycling trips are new or switched from another mode. The contribution of the Cycle Superhighway programme to the overall network has been revised in the light of the aspirations set out in the Mayor's Vision for Cycling. Cycle Superhighways in the new network will include upgraded versions of the existing routes and new routes.

2.1.7

The Cycle Superhighways programme has a large interface with the responsibilities of London boroughs and others. In some cases, the route is on borough-owned roads and there needs to be close working between TfL and the boroughs to obtain approvals and buy-in to any proposals. Even where TfL is the highway authority, boroughs should still be closely involved in the design process as the measures implemented are likely to have an impact beyond the TLRN highway.

Quietways

2.1.8

Assessment criteria for prioritising potential Quietways routes, including those that form part of the Central London Grid, are set out in figure 2.2. Routes should be assessed against these measures as far as possible before final route selection and detailed design.

Figure 2.2 Quietways route prioritisation criteria

Network Prioritisation

- contribution to a network – a geographical spread of routes that capture trip attractors and connect key points across London
- deliverable along the entire length of a route over an agreed period
- awareness of other schemes being delivered in the area that may influence phasing or impact the selected route

Directness and Cohesion

- following cycle desire lines, public transport routes or routes used for short trips by car
- connecting places of interest
- minimising delays and avoiding unnecessary diversions (preferably using the same roads in each direction)
- overcoming specific barriers to cycling, particularly at junctions
- easy to navigate and homogeneous

Attractiveness

- avoiding or treating significant collision hotspots
- secure and offering a feeling of safety
- accessible at all times, or with a suitable 'after-hours' alternative
- having priority at junctions/intersections/crossings (ideally)
- making use of streets with limited traffic access (ideally)

Traffic composition and impact to other users

- minimising use of heavily trafficked roads (<3,000 PCUs per day)
- with limited use by freight vehicles and other HGVs
- having limited points of conflict with oncoming and crossing traffic, parked vehicles and loading bays
- improving pedestrian facilities, if possible, and with the ability to manage movement through areas of heavy pedestrian use

Buildability

- known significant outstanding land ownership, access issues or ecological issues
- with significant sections already to a good standard
- limited requirement for signals work
- practicality and cost effectiveness of any modification to junctions

Political support

- with support in principle for the entire route from the managing authority, senior officer and/or relevant Member
- with agreement on alignments and improvements secured between all boroughs involved

Stakeholder involvement

2.1.9

Stakeholder support and consultation throughout the process is important for schemes to be successful. They can provide valuable information and local knowledge during route planning and scheme development. To be meaningful, it needs to be conducted at times when it can positively influence outcomes without causing delay and done in a proportionate manner. Stakeholder involvement has two distinct functions: incorporating and responding to stakeholder interests, and keeping stakeholders informed of issues that affect their interests.

2.1.10

Stakeholders are likely to include:

- ward councillors and highway authority
- TfL, including modal specific representatives such as buses and taxis and private hire
- local employers and other generators (or potential generators) of significant cyclist movement, such as higher education establishments and hospitals
- cycling organisations
- freight industry representatives
- groups with an interest in pedestrian accessibility
- developers or landowners whose land may be affected or who may be asked to contribute to funding
- residents, local amenity groups, conservation groups and English Heritage.

Cycling Level of Service assessment

2.1.11

A Cycling Level of Service (CLoS) assessment has been developed in order to set a common standard for the performance of cycling infrastructure for routes and schemes, and for individual junctions. The purpose of the CLoS assessment is to frame discussion about design options so that schemes are appealing for existing cyclists and can entice new cyclists onto the network. It may be used on any scheme that has an impact on the street environment.

2.1.12

As it is focused on 'rideability', the experience of cycling and the performance of links and junctions, CLoS does not differentiate between street types. Infrastructure appropriate to the street type is a prior consideration, although acceptable scoring ranges may need adjustment by street type according to how programme-specific requirements are defined.

2.1.13

CLoS builds on the knowledge of existing systems such as the CIHT [Cycle Audit and Cycle Review](#), the London Cycling Campaign's User Quality Audit and ['Love London, Go Dutch' matrix](#) and the Dutch 'Bicycle Balance' system. It does not replace any existing audit system such as the Road Safety Audit, Non Motorised User Audit or Cycle Audit. It is designed to raise issues already covered by regulatory and statutory documents rather than introducing new requirements and can be used in conjunction with toolkits such as PERS and FERS, the pedestrian and freight environment review systems.

2.1.14

Anybody can undertake the CLoS assessment but highway authorities or consultants working within the industry are capable of giving extra quality assurance in using the tool. The assessment is designed to promote discussion, and should be balanced with the judgement of the engineer or planner involved.

2.1.15

The CLoS should fit into several stages of the lifecycle of a scheme:

- at planning stage, it could help to identify issues, frame objectives and quantify benefits arising from potential improvements to inform a business case (by using existing economic evaluation procedures) – this particularly refers to route assessment and route prioritisation
- at design brief stage, it could be used to give a baseline score for the existing conditions
- at a preliminary design stage, several feasibility options could be measured against each other and the differences used to inform discussion with stakeholders
- post-completion, it could help ensure that maintenance of the route remains a priority

2.1.16

CLoS is based on the six design outcomes of safety, directness, coherence, comfort, attractiveness and adaptability. It then breaks down each into specific factors. At the next level of detail are indicators that can be used to measure performance against each factor. For example, the 'safety' element contains three factors: collision risk, feeling of safety and social safety. CLoS focuses on environments that would entice new cyclists to switch journeys from other modes and maintain this modal shift for the long term.

2.1.17

As figure 2.3 shows, each indicator has a set of descriptions and score values – either 0, 1 or 2. The 'basic' level of service, or zero score, may trigger the need for improvement, but this depends on the overall context of the route and of the project. Zero scores should be a prompt for examining whether the factor in question will have a negative impact on the propensity to cycle. Users are encouraged to set expectations that are ambitious while also being achievable.

2.1.18

Certain factors also have 'critical' scores, which describe circumstances that should be a cause for particular concern. Clients and designers must address these as a priority, even if only to 'lift' them to a zero score – a scheme that registers as 'critical' on any one indicator has not met the required standard for programmes and projects funded under the Mayor's Vision for Cycling. To be given greater weighting in the scoring system, it is suggested that the 0, 1 or 2 scores for where critical factors are identified should be multiplied by 3.

2.1.19

At the route planning stage, it is not likely that all factors can be measured, largely because routes are likely to include many types of additional cycling provision. In this case, factors that are of greatest importance and relevance at the network level should be prioritised.

Figure 2.3 Cycling Level of Service assessment matrix (part 1)

Factor	Indicator	Critical	Basic CLoS (score=0)	Good CLoS (score=1, or 3 for critical indicators)	Highest CLoS (score=2, or 6 for critical indicators)	Max score
Safety						
Collision risk	Left/right hook at junctions	Heavy streams of turning traffic cut across main cycling stream	Side road junctions frequent and/or untreated. Conflicting movements at major junctions not separated	Fewer side road junctions. Use of entry treatments. Conflicting movements on cycle routes are separated at major junctions	Side roads closed or footway is continuous. All conflicting streams separated at major junction	6
	Collision alongside or from behind	Nearside lane in pinch point range 3.2 to 3.9m	Cyclists in wide (4m+) nearside traffic lanes or cycle lanes less than 2m wide	Cyclists in cycle lanes at least 2m wide	Cyclists with a high degree of separation from motorised traffic	6
	Kerbside activity or risk of collision with door	Narrow cycle lanes <1.5m alongside parking/loading / no buffer	Frequent kerbside activity on nearside of cyclists / cycle lanes giving effective width of 1.5m	Less frequent kerbside activity on nearside of cyclists / cycle lanes giving effective width of 2m	No kerbside activity / Parking and loading on outside of cycling facility	6
	Other vehicle fails to give way or disobeys signals		Reasonable visibility, route continuity across junctions and priority not necessarily clear	Clear route continuity through junctions, good visibility, priority clear for all users, visual priority for cyclists across side roads	Cycle priority at signalised junctions; visual priority for cyclists across side roads	2
Feeling of safety	Separation from heavy traffic		Cycle lanes 1.5-2m wide / ASLs at junctions	Cycle lanes at least 2m wide / some form of separation	Cyclists physically separated from other traffic at junctions and on links	2
	Speed of traffic (where cyclists are not separated)	85th percentile greater than 30mph	85th percentile greater than 25mph	85th percentile 20-25mph	85th percentile less than 20mph	6
	Volume of traffic (where cyclists are not separated)	>1,000 vehicles / hour at peak	500 -1,000 vehicles / hour at peak < 5 per cent HGV or critical	200 - 500 vehicles / hour at peak, <2 per cent HGV	<200 vehicles / hour at peak	6
	Interaction with HGVs	Frequent, close interaction	Some interaction	Occasional interaction	No interaction	6
Social safety	Risk/fear of crime		Risk is managed: no 'ambush spots', reasonable level of street maintenance	Low risk: area is open, and well designed and maintained	No fear of crime: high quality streetscene and pleasant interaction	2
	Lighting		Some stretches of darkness	Few stretches of darkness	Route lit thoroughly	2
	Isolation		Route generally close to activity, for most of the day	Route close to activity, for all of the day	Route always overlooked	2
	Impact of highway design on behaviour		Seeks to controls behaviour in parts	Controls behaviour throughout	Encourages civilised behaviour: negotiation and forgiveness	2
Directness						
Journey time	Ability to maintain own speed on links		Cyclists travel at speed of slowest vehicle/cycle ahead	Cyclists can usually pass traffic and other cyclists	Cyclists choose their own speed (within reason)	2
	Delay to cyclists at junctions		Journey time slightly longer than motor vehicles	Journey time around the same as motor vehicles	Journey time less than motor vehicles (eg cyclists can bypass signals)	2
Value of time	For cyclists compared to private car use (normal weather conditions)		VOT only slightly greater than private car use value due to some site-specific factors	VOT equivalent to private car use value: similar delay-inducing factors and convenience	VOT less than private car use value due to attractive nature of route	2
Directness	Deviation of route (against straight line)		Deviation factor 35-50 per cent	Deviation factor 20-35 per cent	Deviation factor <20 per cent	2
Coherence						
Connections	Ability to join/leave route safely and easily		Cyclists do not have to dismount to connect to other routes	Cyclists can connect to other routes relatively easily	Cyclists provided with have dedicated connections to other routes	2
	Density of other routes		Network density mesh width >400m	Network density mesh width 250 - 400m	Network density mesh width <250m	2
Way-finding	Signing		Basic road markings provided	Some signs and road markings, making it hard to get lost	Consistent signing of range of routes and destinations at decision points	2

Figure 2.3 Cycling Level of Service assessment matrix (part 2)

Factor	Indicator	Critical	Basic CLoS (score=0)	Good CLoS (score=1, or 3 for critical indicators)	Highest CLoS (score=2, or 6 for critical indicators)	Max score
Comfort						
Surface quality	Defects: non cycle friendly ironworks, raised/ sunken covers/gullies	Major defects	Some localised defects but generally acceptable	Minor defects only	Smooth high grip surface	6
Surface material	Construction: asphalt concrete, HRA or blocks/bricks/sets		Hand laid asphalt; no unstable blocks/sets	Machine laid asphalt concrete or HRA; smooth blocks	Machine laid asphalt concrete; smooth and firm blocks undisturbed by turning vehicles	2
Effective width without conflict	Allocated riding zone range. Lane allocation each direction	<1.5m Superhighway <1.2m elsewhere	1.5-2.0m Superhighway 1.2-1.5m elsewhere (or 3-3.2m shared bus/cycle lane)	2.0-2.5m Superhighway 1.5-2.0m elsewhere (or 4.0m+ bus lane)	>2.5m Superhighway >2m elsewhere	6
Gradient	Uphill gradient over 100m		>5 per cent	3-5 per cent	<3 per cent	2
Deflections	Pinch points caused by horizontal deflections		(Remaining) lane width <3.2m	(Remaining) lane width >4.0m	Traffic is calmed so no need for horizontal deflections	2
Undulations	Vertical deflections		Round top humps	Sinusoidal humps	No vertical deflections	2
Attractiveness						
Impact on walking	Highway layout, function and road markings adjusted to minimise impact on pedestrians		Largely achieves Pedestrian Comfort Level (PCL) B but C in some high activity locations	No impact on pedestrian provision / PCL never lower than B	Pedestrian provision enhanced by cycling provision / PCL A	2
Greening	Green infrastructure or sustainable materials incorporated into design		No greening element	Some greening elements	Full integration of greening elements	2
Air quality	PM10 & NOX values referenced from concentration maps		Medium to High	Low to Medium	Low	2
Noise pollution	Noise level from recommended riding range		>78DB	65-78DB	<65DB	2
Minimise street clutter	Signage and road markings required to support scheme layout		Little signage in excess of regulatory requirements	Moderate amount of signage, particularly around junctions	Minimal signage, eg. for wayfinding purposes only	2
Secure cycle parking	Ease of access to secure cycle parking within businesses and on street		Minimum levels of cycle parking provided (ie to London Plan standards)	Some cycle parking provided above minimum, to meet current demand, and attention to quality and security	Cycle parking is provided to meet future demand and is of good quality, securely located	2
Adaptability						
Public transport integration	Smooth transition between modes or route continuity maintained through interchanges		No additional consideration for cyclists within interchange area	Cycle route continuity maintained through interchange and some cycle parking available	Cycle route continuity maintained and secure cycle parking provided. Transport of cycles available.	2
Flexibility	Facility can be expanded or layouts adopted within area constraints		No adjustments are possible within constraints. Road works may require some closure	Links can be adjusted to meet demand but junctions are constrained by vehicle capacity limitations. Road works will not require closure; cycling will be maintained although route quality may be compromised to some extent	Layout can be adapted freely without constrain to meet demand or collision risk. Adjustments can be made to maintain full route quality when roadworks are present	2
Growth enabled	Route matches predicted usage and has exceedence built into the design		Provision copes with current levels of demand	Provision is matched to predicted demand flows	Provision has spare capacity for large increases in predicted cycle use	2
TOTAL (max 100)						

2.1.20

User satisfaction surveys can be particularly useful for capturing some of the more subjective judgements in the assessment. It is important to make a clear connection between the needs of the local users and the reasons for making certain design decisions. As figure 2.3 shows, subjective safety – therefore the perception of risk – is a key factor in measuring the fitness-for-purpose of a cycling facility, even where the collision history of a location, for example, might indicate that the objectively measured risk is low.

2.1.21

The impact on walking is a critical element in the assessment, even though it may not be directly linked to level of service for cyclists. A Pedestrian Comfort Assessment, as described in TfL's [Pedestrian Comfort Guidance](#), should be used as in the CLoS to provide an objective rating for the balanced profile.

Junction assessment tool

2.1.22

As collisions tend to be clustered around junctions, a supplementary process for assessing junctions has been developed. This may be used to inform a broader assessment of a given location, or in order to inform scoring of the collision risk criteria in the CLoS assessment.

2.1.23

Rather than going through the entire CLoS assessment for each possible movement of a cyclist through a junction, an estimation of potential conflict can be done through briefly assessing each of the potential movements in turn and marking them on a plan of the junction, as shown in figure 2.4. Each movement can be rated 'red', 'amber' or 'green' according to how safely and comfortably it can be made by cyclists:

- where conditions exist that are most likely to give rise to the above collision types, then the movement should be represented on the plan as a red arrow
- where the risk of those collision types has been reduced by design layout or traffic management interventions, then the movement should be coloured amber
- where the potential for collisions has been removed entirely, then the route should be coloured green
- 'green' should be taken to mean suitable for all cyclists; 'red' means suitable only for a minority of cyclists (and, even for them, it may be uncomfortable to make)

2.1.24

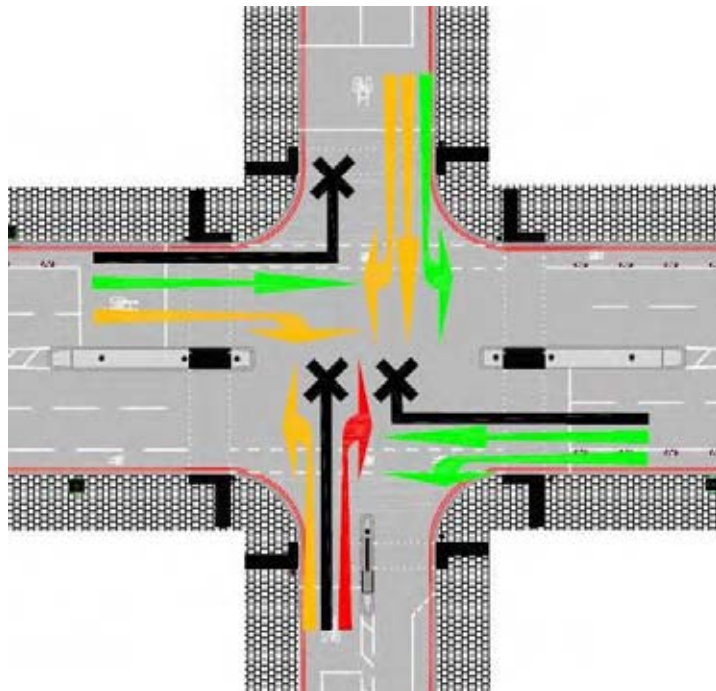
Any banned movements for cyclists should be shown in black with a cross at the end. Movements that can be made but would involve a particularly high level of risk to the cyclist should be noted with a red cross at the end. These are movements that most cycle trainers would advise against making.

Figure 2.4 Example assessment for a generic junction

Ahead movements in two directions are aided by lanes marked through junctions and have been marked as green.

The street at the top is one-way – showing the banned cycling movements highlights a potential need to open it up to contraflow cycling.

The three possible right turns are all relatively difficult to make, being opposed turns, although ASLs help in each case.



In two cases, the pedestrian crossing island on the opposite arm gives some protection for right-turning cyclists from opposing traffic, so these have been scored as amber.

However, the right turn from the arm at the bottom scores a red because it would be hard for a cyclist to find a safe waiting place while ahead and right-turning traffic emerges from the one-way street.

2.1.25

For 'red' movements, one solution might be to enable the movement at a location away from the main point of potential conflict, but there may be many different ways of reconfiguring the junction to provide better and safer provision for cyclists (see chapter 4 for more details on junction design).

2.1.26

To help in comparing options, a score can be given based on each movement: 0 for red, 1 for amber and 2 for green. In this way, a total can be generated for the junction, or even for individual routes through the junction (if it is the case that one route or movement for cyclists is a significantly higher priority than another). The highest possible score for a crossroad junction would be 24 and for a T-junction 12. In order to help assess junction movements, figure 2.5 suggests typical scenarios that might lead to a 'red', 'amber' or 'green' rating.

Figure 2.5 Indicative criteria for scoring junction assessments

Factors needing removal or mitigation	Possible improvements	Further improvements
RED	AMBER	GREEN
<p>Heavy left turn movement with high HGV mix</p> <p>Opposed right turns with general traffic accelerating quickly into opportunistic gaps</p> <p>Left slip lane</p> <p>Guard-railing</p> <p>Large junction radii</p> <p>High speed motor traffic through junction</p> <p>Uphill gradients</p> <p>Wide junction crossings</p> <p>No clear nearside access</p> <p>Multiple lanes</p>	<p>Entry treatment at side road junction</p> <p>Continuation of lane across junction</p> <p>Right-turn protected island</p> <p>Tight corner radii; pinch points removed (avoiding nearside lane of 3.2-3.9m)</p> <p>Bus lane of 3.0-3.2m or of 4.5m or more</p> <p>2m wide central feeder lane</p> <p>ASLs (preferably 5m+ deep)</p> <p>Signal adjustments to cycle movements</p>	<p>Left turn ban for general traffic</p> <p>Opposing right turn banned for general traffic</p> <p>Physically protected turn</p> <p>Left bypass of signals</p> <p>Segregation of cycle movements using dedicated cycle signals</p> <p>Raised tables</p> <p>Area-wide speed limit/reduction</p>

2.1.27

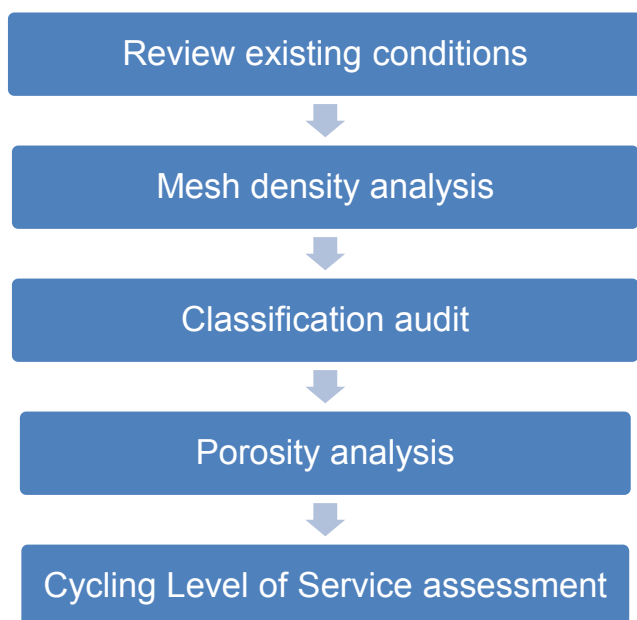
The CLoS assessment also provides an argument for how improvements for cycling could be made in stages. A closure to motor vehicles, allowing filtered permeability for cyclists, may be a first stage of meeting longer-term objectives for area improvements, making streets better, safer places for all. The first stage represent one intermediate level of service, the second a higher level.

2.2 Developing a coherent cycle network

2.2.1

This section covers examples of techniques that can be used to help network planning. Step-by-step it covers the full process for planning a network for cycling, taking into account urban form and land use as well as street types and route characteristics – as summarised in figure 2.6. In reality, some of the network is likely to be in place (but may be in need of upgrading) and some of the analysis may already exist, so these steps are not requirements in route planning and scheme development. They are presented here as helpful techniques that may be applied to support the development of a coherent network and that could be used in communicating what a good network for cycling looks and feels like.

Figure 2.6 Planning a cycle network from the beginning



Review of existing conditions

2.2.2

Figure 2.7 shows a typical London street layout with a railway line, a canal, a park and different road classifications such as connectors, high roads, high streets, city streets, city places and local roads. These are suggested by the road thickness and frontages. Character buildings and major trip generators have also been highlighted. Proposals for cycling should reflect the character of an area and the movement and place functions of its streets. Cycling infrastructure should improve the quality of streets and so coherent network planning needs to be sensitive to its surroundings.

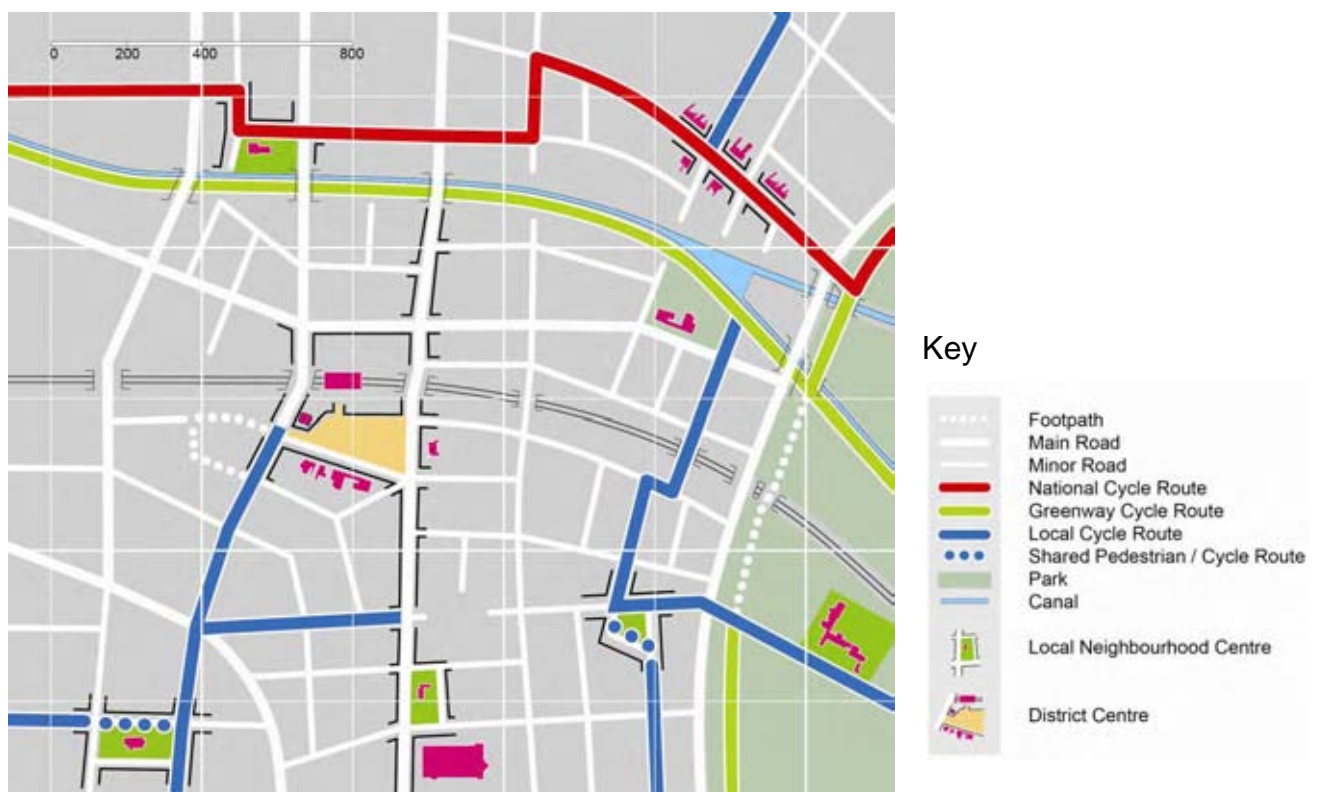
2.2.3

Overlaid on the street plan is a 400m by 400m grid: this is also the standard mesh density sought for cycle networks in central London, as referenced in the CLoS. The coloured lines show the existing cycle networks. In this case, the red route forms part of the national cycle network which spans the UK and, in some cases, joins up with the international EuroVelo network. It should be recognised that this network has a strategic importance and any changes to it could affect many users. The blue routes shown are local routes that may well have been developed as part of the London Cycle Network programme and so may serve a strategic function as part of long-held desire lines for cyclists. Routes of this type can date back many years, may be best considered for future network adoption and often already feature cycle-friendly interventions. The green route shows a route along a canal towpath that may form part of the greenway network. This route may not be suitable for all types of cyclists, particularly commuter cyclists, but could form a part of the area cycle network due to its attractive, traffic-free condition.

2.2.4

In any area the remnants of previously planned strategic cycle networks should be evident and these should be referenced on the base plan so that gaps or other failures can be assessed. It is important to view routes in context and incorporate cycling within the unique layout of the area without compromising strategic network considerations such as coherence and directness. At all stages of this process, it is also important to source up-to-date and accurate information.

Figure 2.7 Existing context showing base network



Method

- briefly assess place characteristics: natural features, key constraints (eg waterways or railways, including bridging points), local centres, land uses, trip generators (see figure 2.17 for a fuller list)
- identify key trip generators, active frontages, character buildings
- classify roads based on RTF street types (or refer to street type maps where this work has already been done)
- overlay existing cycle networks, including strategic and local routes

Analysis

- look for gaps in the existing cycle networks
- look to see if cycling provision is appropriate for the RTF street type
- look for desire lines between trip generators
- identify character areas and heritage areas

Mesh density analysis

2.2.6

In a properly joined-up cycle network, cyclists should not have to travel more than 400m to get to a parallel route of similar quality. As referenced in CLoS, this attribute of a cycle network is known as ‘mesh density’: it describes whether the grid of cycle routes is tighter (with more route choice) or looser (less extensive).

2.2.7

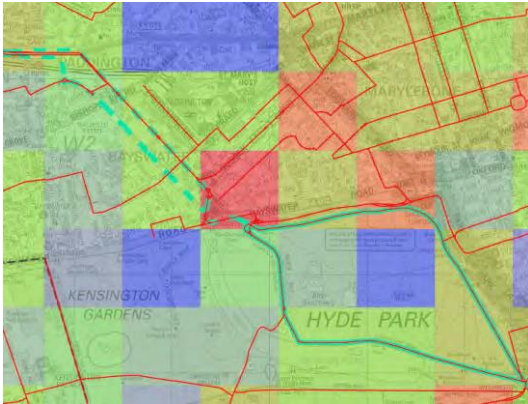
Analysis of mesh density is best undertaken with GIS software and there are two main methods to follow – see figure 2.8. The first involves dividing the area into cells and measuring the length of cycle network in each cell. A 1km by 1km cell should have 4km of cycle network. The second method involves starting with the cycle network and its routes and measuring the size of the areas bounded by the routes. An area of 160,000sqm would be present inside a 400m by 400m mesh and so this can be used as the standard to measure against. Smaller areas should show as hotter on the heat map (reds and oranges) as there is more coverage than required and higher areas should show as cooler (blues) as there is not enough coverage.

2.2.8

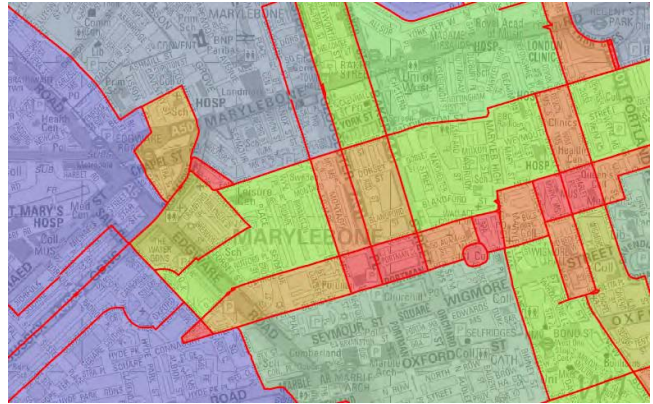
Sections of network that run across major barriers to cycling, such as major untreated junctions and gyratory systems, should not be counted in either method. The data used in the Transport for London Cycle Guides represents the best available picture of cycle routes in London but local authorities may have more up-to-date information about the condition and extent of local networks.

Figure 2.8 Heat map representation of the density

Cell example



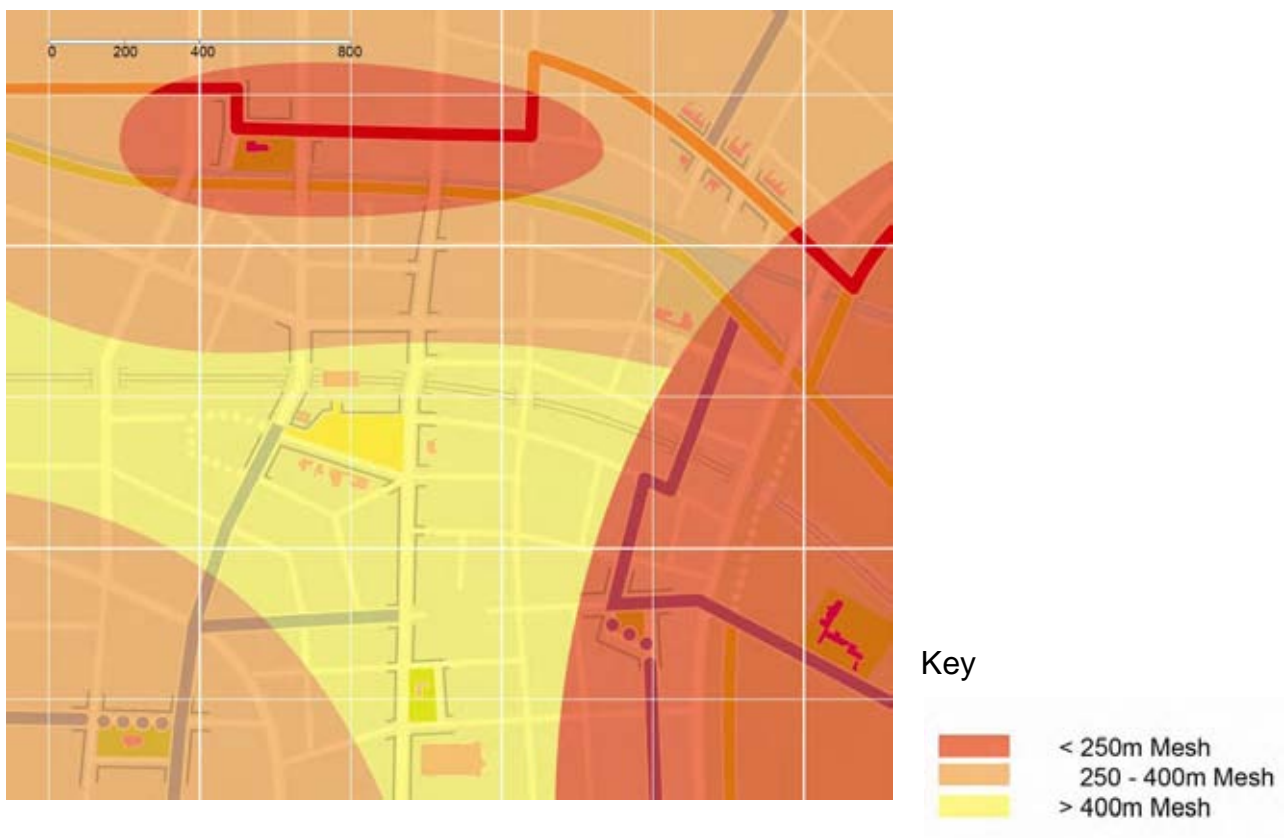
Area bound example



2.2.9

Figure 2.9 shows a heat map representation of the density of routes in the study area. The analysis highlights in yellow the 'cooler' areas, with poorer cycle network coverage. The 'hotter' red areas have a lower mesh density: less distance between parallel routes. This type of analysis can be used to test the impact of planned interventions and can be run after networks have been extended to test even coverage.

Figure 2.9 Mesh density heat map



Method

- assess cycle networks for major barriers
- load cycle network data into
- overlay existing cycle networks, strategically planned and local routes
- highlight bridges, natural features and constraints

Analysis

- look for areas of low network coverage and identify potential route options
- look for areas of high network coverage and identify most strategic alignments

Accessibility classification

2.2.10

Figure 2.10 shows a reclassification of every road in the area based on the level of experience needed to ride it comfortably. Primary roads (coloured red) suggest a high level of confidence, secondary roads (amber) are cyclable in comfort by most cyclists and routes free of motorised traffic (green) are suitable for cyclists of any age and experience. The majority of London's roads are secondary and so are rideable but certain primary roads can be intimidating for new cyclists and so it is important to identify these. Local knowledge and the input of cycle trainers within the authority should help identify the correct classifications. The main determinants are street types, speed and volume of traffic, mix of vehicle types and the extent to which cyclists are required to integrate with general traffic and perform manoeuvres whilst in traffic.

2.2.11

This red, amber and green approach can also be taken to assessing crossings in the area. The difference between primary and secondary crossings of primary roads is particularly important in network terms as cyclists tend to migrate towards the more comfortable crossing conditions. Local cycling stakeholders should be able to provide information about where these pleasant crossings are located if resources are not available to do a full network audit. Ordnance Survey GIS systems also provide this data.

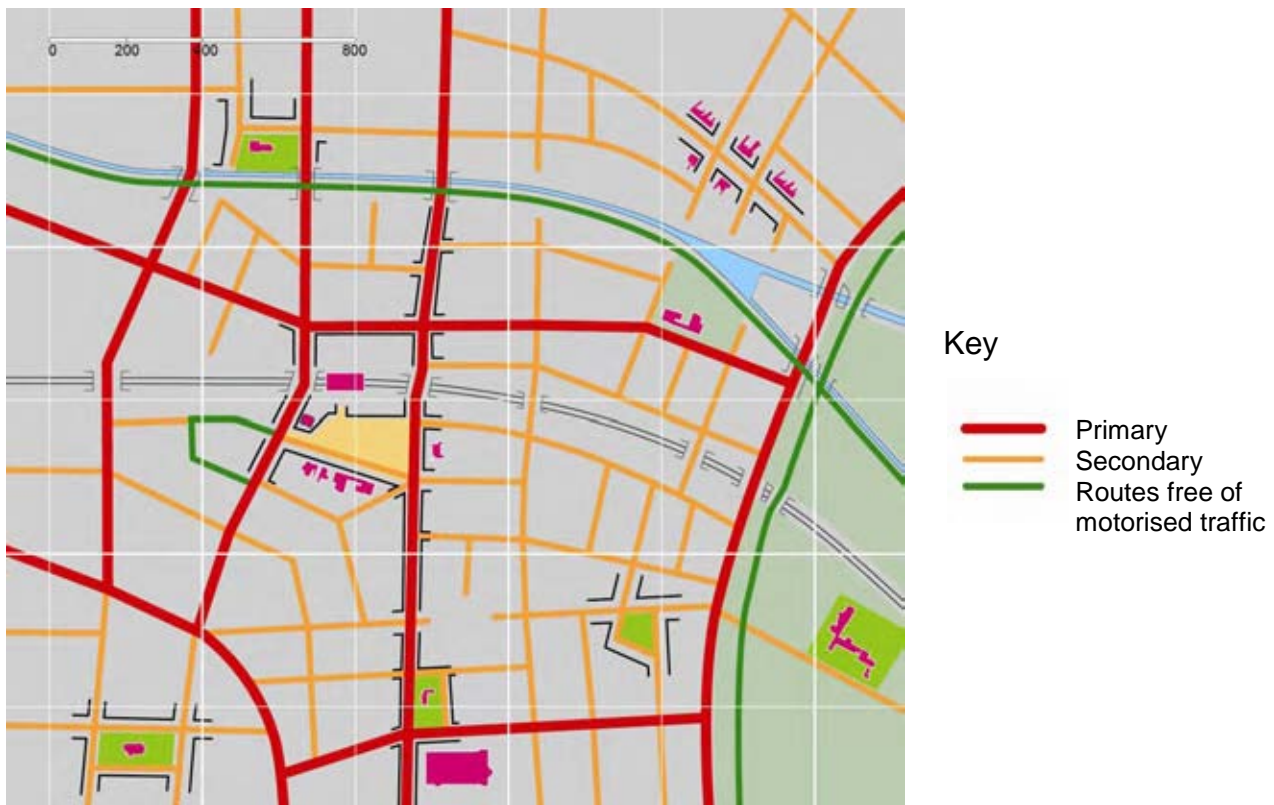
Method

- Assess all links on the network to determine level of experience needed to cycle in comfort
- Highlight comfortable secondary crossings of primary roads

Analysis

- Look for potential new crossing sites, bearing in mind the benefits that can be secured for other users as well as cyclists (ensuring a balanced approach)
- Look for areas dominated by primary roads and consider interventions

Figure 2.10 Accessibility classification of road network



Area porosity analysis

2.2.10

Area porosity is a measure of how many places there are for cyclists to enter, pass through and leave an area comfortably. A location that is 'porous' is a space that cyclists can pass through with ease and comfort – usually a junction. If the porosity of an area is high, then overall it is very permeable for cyclists (but often less so for other vehicles). Figure 2.11 shows areas bound by primary roads. Comfortable (porous) secondary crossings are shown as gateways as these effectively open up areas to less confident cyclists. The provision of a gateway crossing can enable many square kilometres of route options to be opened up and also serve as key navigational points across areas.

2.2.11

Where areas are bound by primary roads and have no gateways, then they are coloured red. Where they have one gateway they are coloured amber and where they have two they are coloured green. Rather than focussing on routes, this method shows the porosity of an area by highlighting different crossing options on different streets. This approach is particularly useful when planning routes to schools as it allows children and their parents to be clear about the standard of roads they will encounter and where key crossings are.

Method

- Create areas bound by primary roads
- Gather information as to where the current comfortable secondary crossings and access points are
- Colour in bounded area based on the number of access points

Analysis

- Look for areas that are effectively cut off as they are bound by busy primary roads
- Assess where the likeliest new crossing can be provided into an area
- Identify where access is needed for maintenance (for vehicles carrying out maintenance works)
- Plan adjustments to networks to incorporate gateways, mindful of the directness design outcome

Figure 2.11 Area porosity analysis showing areas bound by primary roads and number of gateways



Cycling Level of Service audit

2.2.12

Figure 2.12 shows road classification based on the Cycling Level of Service. This takes time to complete in full but gives a comprehensive baseline of the rideability of the streets in an area. Routes that fall below the standards stipulated in the CLoS should be considered for upgrading or, if constraints are too great, then this approach can highlight alternative alignments. The red, amber and green colouring is likely to look similar to the accessibility classification system: this approach, based on the key design outcomes, adds a greater level of sophistication, should it be required. Note that the value ranges may

need to be adjusted according to specific programme requirements. On the example in figure 2.12, the greenway route along the canal is rated as amber in CLoS as there may be concerns about social safety, connections, effective width and lighting.

2.2.13

Potential strategic routes in the chosen area may require substantial investment, which may need detailed justification. It is important that the junction assessment tool is used on all junctions along planned strategic network routes and where cycle routes pass across busier roads. If multiple roads are assessed, then the effect of area traffic management improvements can be measured against the established baseline. This method is the most time-consuming but helps collect vital information to underpin scheme prioritisation and area traffic network strategies.

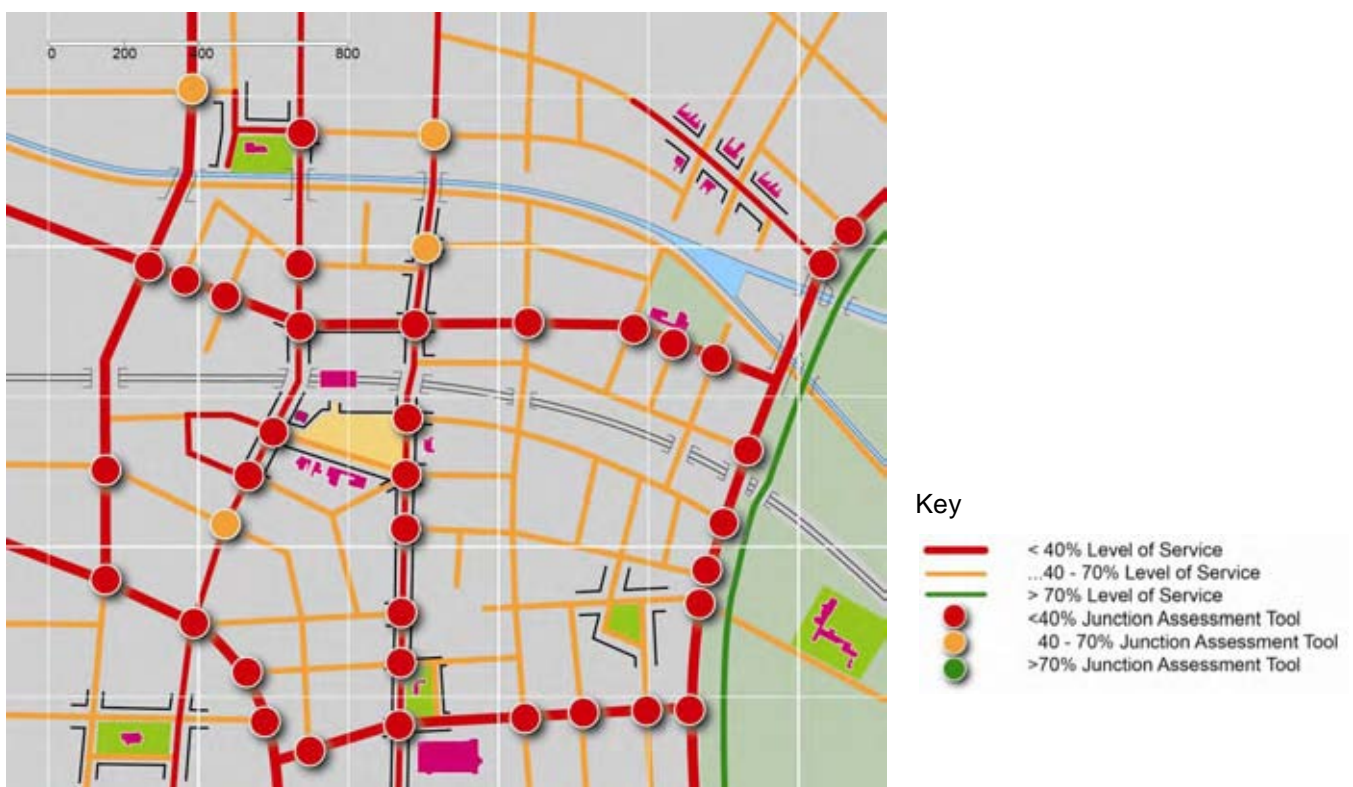
Method

- Use the CLoS and junction assessment tool to assess the area network or focus on particular established or planned strategic routes

Analysis

- Look where best conditions are and assess whether these can be connected to form routes
- Assess potential for upgrading junctions to higher CLoS standards
- Assess the standard of existing networks routes and look for potential improved alignments

Figure 2.12 Cycling Level of Service indicative ratings for network links and key nodes



Example approaches to developing the network

2.2.14

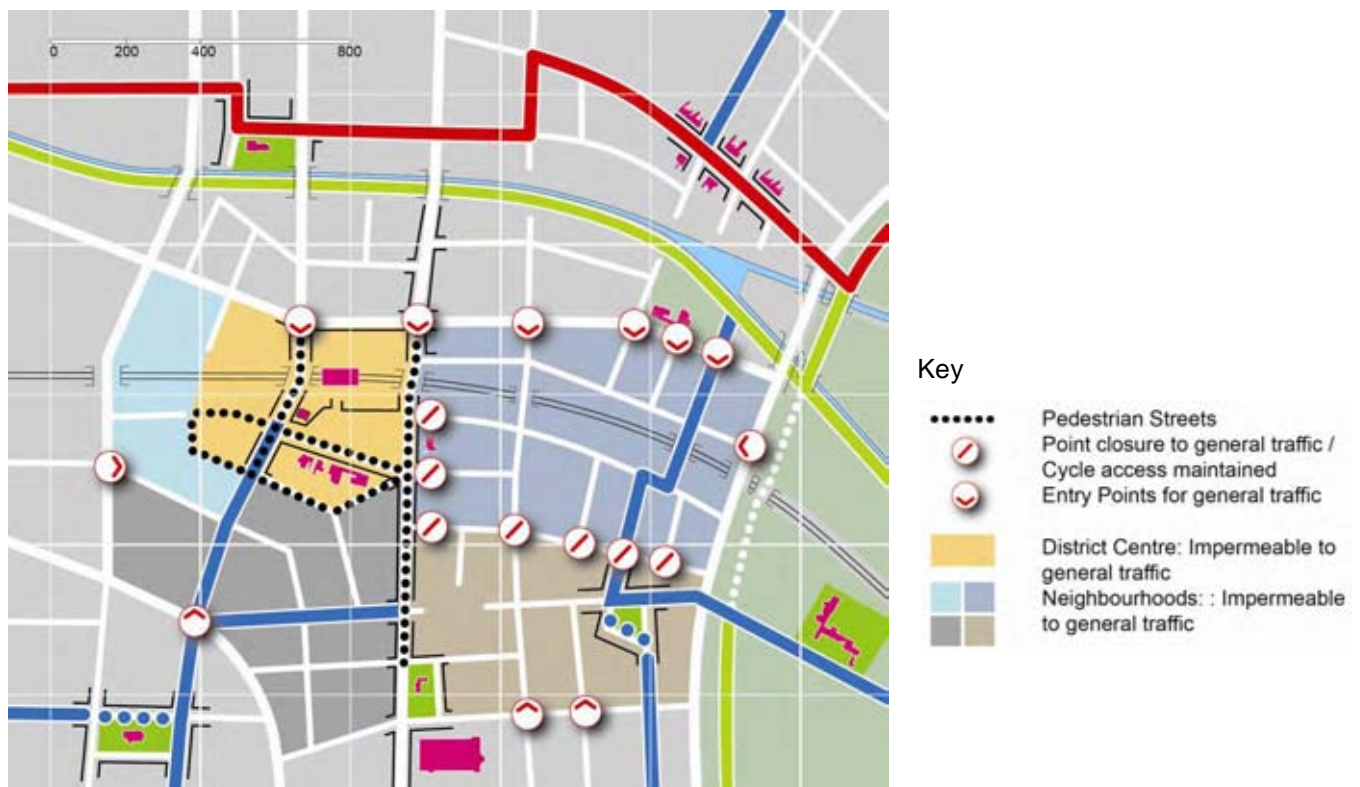
These tools can help identify where interventions would make the whole area accessible to all cyclists. To develop this into a strategy, there are two main options: area-based approaches and route-based approaches. The examples below describe how the application of these strategic approaches may work in practice. In both cases, working through the detail involves engaging with the impact on all modes and considering existing on-street infrastructure and the potential for improving it for a broader range of users.

Area option – filtered permeability

2.2.15

Figure 2.13 shows a potential intervention that takes an area-based approach to improving conditions for cycling by removing through motor traffic in zoned areas around a traffic-free centre. Motorised traffic can enter and leave the zones but cannot pass between them without using the primary routes or alternative roads outside the zones. Cyclists can pass freely through motorised traffic restrictions between zones and so are favoured in terms of journey time and convenience. Residents benefit from removal of through-traffic and their homes can still be served by deliveries and parking. Most motorised vehicle movements will be made by residents themselves. The general level of traffic is reduced to such an extent that the CLoS scores are improved on all roads dramatically without the need for cycle-specific infrastructure. This is a bold approach but delivers a high level of service for cycling in a cost-effective manner.

Figure 2.13 Filtered permeability area treatment example



2.2.16

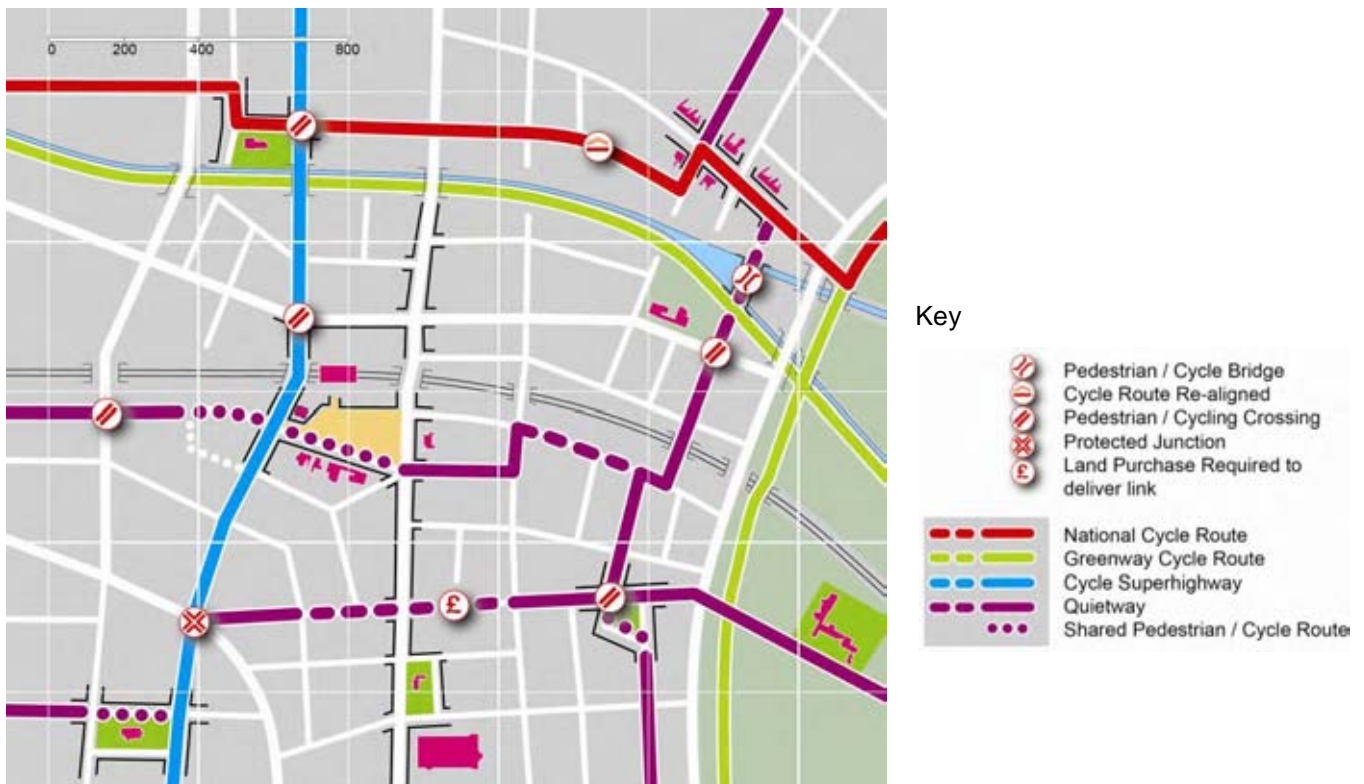
This approach has no obvious cycling facilities to entice new cyclists but is a method employed by many towns and cities with high mode shares for cyclists. The London Borough of Hackney has implemented this approach in certain areas and has the highest modal share for cycling in London. Other cities and towns have used features such as rivers and railway lines to divide areas into zones. If quick and easy access for pedestrians and cyclists are implemented across these barriers then these modes will flourish, while motorised traffic has to take longer, more circuitous routes.

Route option – network delivery

2.2.17

Figure 2.14 shows a route-based approach, where networks have been expanded, connected and revised based on the five-step analysis. In the example, major interventions such as a full junction redesign on a connector road where a Superhighway meets a Quietway have been proposed as well as a new bridge link allowing a Quietway to continue within the stipulated mesh density range. Land purchase has been suggested through some private land acquisition to the south-east of the town centre, enabling two Quietways to connect. New parallel secondary crossings have also been proposed to increase area porosity.

Figure 2.14 Network delivery route treatment example



2.2.18

Some of the interventions are likely to be costly but justification can be made with reference to the five-step process. This presents a logical, best practice assessment of an area's cycling potential and clearly points out network deficiencies and potential improvements.

2.2.19

Cycle networks are often planned at a strategic, city-wide level but this process shows how these can be adjusted locally to reflect the character, constraints and opportunities of the surrounding area. Each local authority should incorporate these approaches into their area planning strategies and this should lead to the mainstream establishment of cycling as a viable mainstream transport option in line with the Mayor's Vision.

Planning cycling into new development

2.2.20

The cycling network strategy should be an important influence on the planning of larger development areas and should be integrated into authority- and area-wide spatial planning frameworks as well being reflected in site-specific proposals. Figure 2.15 summarises how the cycling design outcomes might be addressed in these plans and strategies.

2.2.21

Cycling infrastructure cannot be fitted into the streets of a new development once it has been designed. High quality cycling provision must be designed into all new development from the beginning. This does not mean token cycle parking, token painted separation on footways or token advanced stop lines. It means designing new developments so that the way cyclists move through the development meets the standards set down in this document from the moment the first residents or tenants move in.

2.5.22

TfL's online [Transport Assessment Guidance](#) tool describes the purpose and content of transport assessments as part of the planning application process. This deals with areas such as consideration of pedestrian and cycle linkages, trip generation, modelling and impact. It is important to establish that access for cyclists to and through a development will be provided to a desired quality. This is likely to require the input of cycling officers to the development control process. Through pre-application discussions, the application stage and enforcement, the planning process should ensure that proposals meet policy requirements, that they are fit for purpose for the proposed site and development, and that they are implemented as planned.

2.5.23

The right balance needs to be struck between prescription and flexibility when planning cycling infrastructure. When negotiating Section 106 contributions and Community Infrastructure Levy (CIL) from developments to help fund improvements to cycling in an area, it is better to describe the desired outcomes rather than specifying in the legal agreement exactly what must be built. Where Section 106 requirements and CILs are overly restrictive, they can be difficult to enact, or enacting them may have adverse consequences for cycling.

2.5.24

In an outline planning consent, there should be a commitment to providing dedicated cycling facilities, but some flexibility should remain about the type and exact location of cycling provision. Over-prescription at this stage could undermine attempts to design the most appropriate treatments once detail of street and building design becomes clearer. Setting out the strategy for cycling in an outline application is more important than the detail: ideally this should draw on an existing network strategy (see section 2.1).



Cycling Strategy –
Vauxhall Nine Elms on the South Bank

Figure 2.15 Support for cycling in planning policies, strategies and site-specific proposals

Strategic: planning and policy-making	Area-wide planning	Site specific (planning applications)
Safety Commitments to reducing death and injury on London's streets, and to creating low speed environments.	Analysis of existing conditions for cyclists and pedestrians. Commitment to meeting design standards in improving provision.	Road Safety Audit, Non-Motorised User Audit or Quality Audit as part of Transport Assessment
Directness Policy that prioritises sustainable forms of transport and supports accessible, legible, permeable urban form.	Analysis of the relationship between origins and destinations (schools, local centres, parks, homes, places of work), how cycling links will be provided between them and how all road user needs should be balanced.	Detail on proposed route(s), showing analysis of directness and likely delay for cyclists. Identification of barriers to be overcome by improving cycling provision.

Strategic: planning and policy-making	Area-wide planning	Site specific (planning applications)
Comfort Linking air quality and environmental improvements to shifts from motorised forms of transport.	Requirements on level of service to be provided on identified routes. Evidence of responding to identified future demand for cycling.	Sufficient detail to allow analysis of effective width, gradient, deflections and capacity and surface quality. Should describe impacts on pedestrian comfort (using TfL's Pedestrian Comfort Guidance).
Coherence Commitment to sustainable forms of development and good integration between transport modes.	A hierarchy of streets and routes that clearly shows a joined-up, legible network for cycling.	Details of how proposals contribute to the development of a coherent network in the wider area.
Attractiveness Recognition of the benefits of more people walking and cycling and interventions that promote better places for all. Provision of good quality, well located, secure cycle parking to help support growth in cycling.	Design guidance or code that deals with public realm quality – for example, setting out indicative street types that clearly how show good provision for cyclists will be provided. This should include indicative locations and quantity of cycle parking.	Detailed proposals for materials, cycle parking, other street furniture, signage, landscaping, management arrangements and maintenance costs.
Adaptability Provision for measuring and monitoring strategic outcomes on cycling (eg route use, vehicle volumes and speeds) to help adapt to changing contexts.	Implementation plan that allows (re)assessment of cycling provision during and beyond the various development phases. Consideration of how improvements to cycling and walking are to be funded, for example through CIL or S106.	Proposals that set out how cycling facilities operate with other uses and kerbside activity and how provision can respond to change in demand over time.

2.3 Scheme delivery

2.3.1

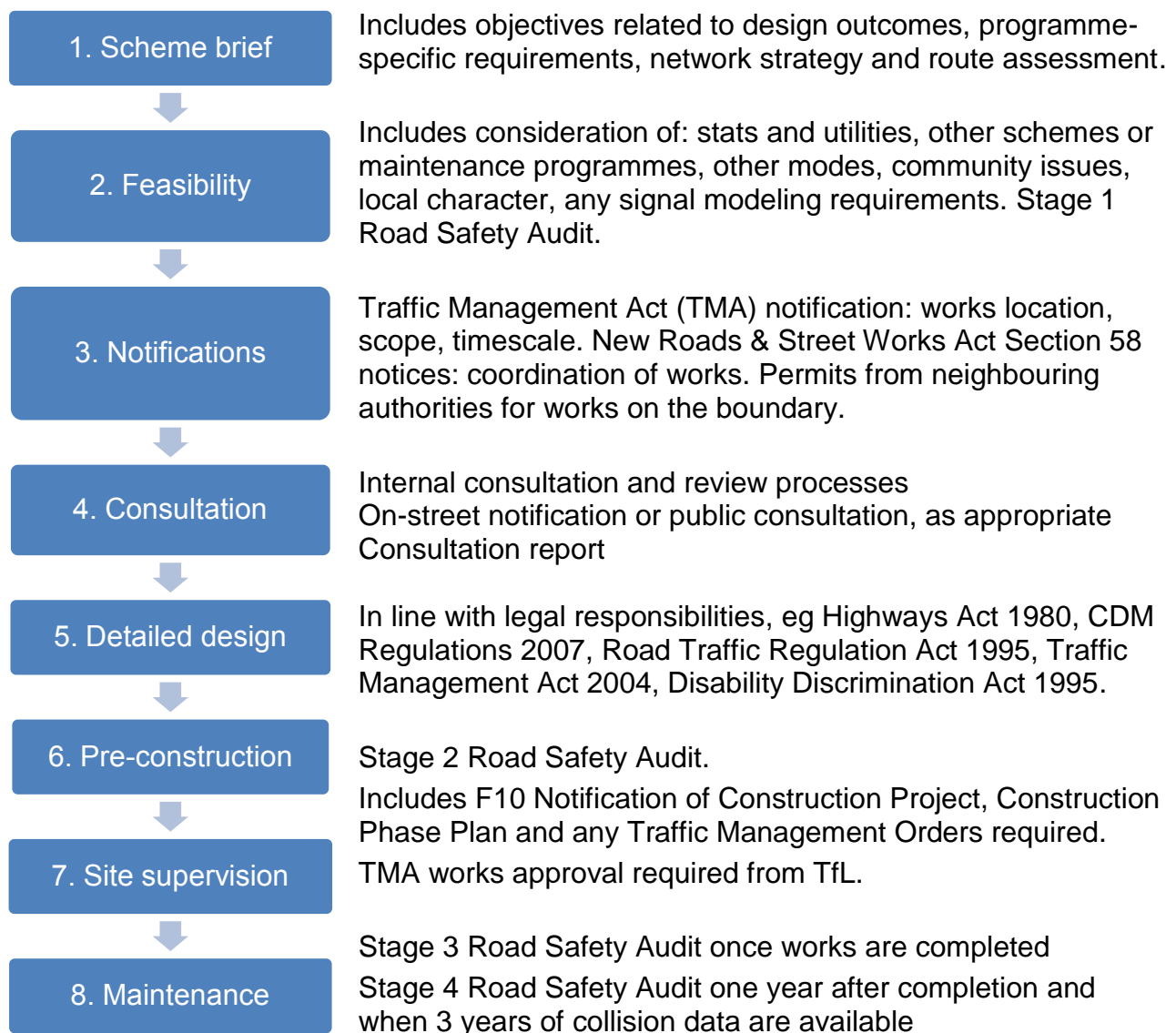
The network planning stage provides a framework for assessing and prioritising routes in more detail. Once a route has been selected, the progress of a scheme involving substantial intervention will normally follow the stages shown in figure 2.16 below.

Scheme stages

2.3.2

The full process set out here should include all necessary consultation, approvals, checks and audits. The six design outcomes – safety, comfort, directness, coherence, attractiveness and adaptability – should be used to frame scheme objectives, together with recognising the intended outcomes for other modes besides cycling.

Figure 2.16 Scheme stages



2.3.2

Figure 2.17 below shows the type of information that could be assessed in order to inform design options in the feasibility stage. An assessment may have already been undertaken during network planning (see section 2.2), but there may be a need to revisit this in more detail once routes have been prioritised. Data collection needs to be done in a proportionate manner, appropriate to the level of intervention proposed.

Figure 2.17 Current route characteristics

Place characteristics	Land uses and mix of activities Trees and other planting Materials Lighting Height, scale and massing of buildings
New developments and other schemes	Changes to physical layout New or removed generators of cycle movement
Major barriers/severance	Waterways, railways and main roads Large, contiguous landholdings
Legal aspects	Traffic Orders Land ownership Conservation areas and Listed buildings Tree Preservation Orders
Pedestrian amenity and activity	Conflicting movements at junctions and crossings Volumes of pedestrians Levels of pedestrian comfort Shared use and shared space Intersection with (off-highway) walking routes, including Strategic Walk Network
Traffic operations	Volume, speed and mix of traffic Capacity of links and junctions Heavy turning movements Main conflicting movements at junctions
Kerbside activity	Loading/unloading provision, including loading bays Parking provision, including parking bays Bus stops and stands Activities of taxis and private hire vehicles Frontage access and islands
Cycle movements and cyclists' needs	Routes, flows and main movements Collision statistics Complaints and comments
Available widths	Highway, carriageway and footway Specific pinch-points and narrowing
24-hour access	Time-limited bus and mandatory cycle lanes Limits on access through parks and green spaces (formal and risk-based)

2.3.3

If signal works are necessary then these should be programmed with TfL during the feasibility stage. If modelling capability is not present in-house then a consultant should be commissioned to run through the Model Auditing Process (MAP) with TfL. MAP is a requirement for schemes that have an impact on the TLRN or Strategic Road Network, and represents good practice for any other scheme. It has been developed to ensure that models submitted to TfL for audit are developed, calibrated and validated to an appropriate standard and is described fully in TfL's [Traffic Modelling Guidelines](#) (2010). Signal design should then be agreed with TfL during the detailed design stage – further information is provided in chapter 4.

2.3.4

Road safety audits (RSAs) are well-established procedures, widely applied to cycling and other traffic schemes. RSAs consider the road safety implications of all measures and their impact on the network under all anticipated operating conditions. The effects on all classes of road user are considered. In the hands of competent practitioners, RSAs improve the design and safety of cycle schemes. TfL has produced guidance on its safety audit procedures in the form of document [SQA-0170, Road Safety Audit, Issue 4](#) (2011).

2.3.5

A balanced approach needs to be taken to RSAs in order to ensure that risk reduction measures and restrictions are proportionate and appropriate for the street environment. It is important that they contribute fully to the six design outcomes for cycling. Note that RSAs are not appropriate tools for determining cycling priorities and requirements that will support growth.

2.3.6

Changes to schemes are recommended as the audit team considers appropriate. On receipt of the safety audit report, the scheme engineer/designer should consider its content and amend the scheme accordingly. If the project sponsor authority does not wish to incorporate some or all recommendations of the safety audit they are required to prepare an 'exception report' stating the reason(s) why they consider the recommended action is not appropriate.

2.3.7

During the pre-construction phase, TMA works approval should be submitted to TfL. Works notification should happen by letter to those affected at least 2 weeks before works begin. Notice required for parking suspensions is 17 days, bus suspensions 3 days and signal switch-offs 3 days. If the works do not proceed then a cancellation notice should be submitted. Works permits should be submitted a minimum of 10 days before works start. Start notice should be submitted by 4.30pm the next working day and stop notice should be submitted by 4.30pm the next working day following the end of the works. The CDM coordinator should approve the construction phase plan before any works progress.

Traffic Regulation Orders for cycling schemes

2.3.8

Proposed changes to regulations stand to give highway authorities greater discretion to take decisions about procedures relevant to cycling infrastructure. This has the potential to streamline processes that have previously added time and complexity to schemes, such as Traffic Regulation Order (TRO) requirements. Importantly, the [Briefing on the Government's ambitions for cycling](#) (2013) commits to removing the requirement for a TRO for creating mandatory and contraflow cycle lanes, and for creating exemption for cyclists from certain prohibitions for other vehicles. This includes simply adding 'except cycles' to an existing 'no entry' restriction.

2.3.9

The [Consultation on the draft Traffic Signs Regulations and General Directions 2015](#) (2014) confirms this intention, which will come into effect in 2015, subject to the results of consultation. Until that time, TROs should still be prepared as set out by the [Road Traffic Regulation Act \(1984\)](#) (RTRA). Should TROs no longer be required, it will still be important for authorities to engage key stakeholders in an appropriate, timely and proportionate way on any proposed changes to highways.

2.3.10

Traffic authorities are empowered under the RTRA to make TROs to regulate and manage the speed, movement and parking and loading of vehicles and to regulate pedestrian movement. The Environment Act 1995 enables Orders to be made in pursuit of national or local air quality management strategies. The use of TROs to exempt cyclists from certain prohibitions is an important tool in delivering coherent cycling infrastructure, particularly as part of a 'filtered permeability' strategy.



Exemptions for cyclists in City of London: Fann Street and Milton Street

2.3.11

The detail of TROs is also relevant to cycling where it places prohibitions on parking and waiting. On-street, these are shown by yellow line markings on the carriageway and the kerb (see section 3.5 for more details). In environmentally sensitive areas, the

intrusiveness of standard yellow line road-markings may be reduced by using narrower lines and a paler shade of yellow.

2.3.12

TROs may be permanent, experimental (up to 18 months) or temporary (in most cases up to 18 months). Temporary traffic orders are normally used for road works or emergencies. Where they are required, specific consideration should be given to maintaining conditions for cycling on cycle routes (see appendix B for further guidance on dealing with cyclists at roadworks). Experimental orders may be useful where monitoring the effect of and public reaction to an exemption, for example, may help make the case for a permanent change.

Procedures for creating cycle tracks and shared use paths

2.3.13

Scheme delivery may also need to build in the process for designating certain infrastructure as being appropriate for cyclists. All on-highway but off-carriageway cycle surfaces (cycle tracks, shared use paths and shared areas) must be formally approved and have effective Notices in place. This will entail approval (by delegated authority) under Section 65(1) of the 1980 Highway Act. For the TLRN this is carried-out by a TfL designated officer. For roads managed by London boroughs, this is normally delegated to a senior officer. As well as major areas of shared use and cycle track, the shared use sections to either side of Toucan crossings will need to have effective Notices.

2.3.14

The TfL Traffic Orders Team hold copies of all Notices for existing TfL/TLRN cycle track, shared use and adjacent/segregated use. These are recorded under HA Section 65(1), not TROs. London boroughs normally have a similar system within their Traffic Order section.

2.3.15

Cycling is not permitted on public footpaths, unless an order has been made under Section 3 of the Cycle Tracks Act (1984) to convert the footpath to a cycle track.



Shared use path away from the highway,
Queen Elizabeth Olympic Park



Footpath part-converted into cycle track,
Hackney

2.4 Maintenance

2.4.1

Effective maintenance for cycle routes needs to be to a higher standard than Highway Act (1980) stipulations suggest. Minor defects can unseat a rider and rough surface quality can increase the effort required to cycle to the extent that it deters cycle use. Cycle route maintenance should therefore be prioritised over roads of equal degradation. Access by maintenance vehicles to all parts of a route needs to be provided for.

2.4.2

Relevant to effective maintenance are ownership issues and the New Roads and Street Works Act, 1991. NRSWA provides a legislative framework for street works activities by all undertakers, with the aim of coordinating them efficiently for the benefit of all road users. In some instances, certain responsibilities under the Highways Act and NRSWA are devolved to contractors.

Figure 2.20 Maintenance issues for cyclists: surface quality



Surface cracking or excessive rutting



Road markings: worn, barely visible, missing (not replaced after repairs), proud (usually resulting from excessive remarking) or low (masked off for repeated surface overlay).



Unsuitable road gullies: dished, with longitudinal waterway gaps or with frame set below adjacent surface.



Missing surface material or failed reinstatement/use of smooth metal plates to 'cover' open trenches



Standing water due to uneven or slack gradients, blocked gullies, rutting of surface or leaking water valves.



Worn/smooth manhole covers

2.4.3

Quietways and Superhighways need to be inspected regularly and resurfaced regularly as budgets permit. Examples of the main types of defects which effect cycle routes are shown in figure 2.20. Occurrences of any of these defects should be rectified in order to maintain the comfort level of service rating.

2.4.4

Surface quality issues

The presence of issues set out in figure 2.20 should be assessed through regular maintenance inspections. Addressing them should be built into the highway authority's operational practices. An appropriate intervention level needs to be set, defining when action needs to be taken, and recommending repair methods as appropriate.

2.4.5

Standing water is a risk as it results in an unnecessarily slippery surface and cyclists swerving to avoid spray from passing vehicles. It needs to be treated as a priority all year round and not just in cold weather. Leaking water valves are the responsibility of the water authority and NRSWA coordinator.

2.4.6

Covers sitting low or loose in frames can, for cyclists, be a source of discomfort or even a safety risk where they need to swerve to avoid the cover. Most inspection covers (other than gullies and other surface water chambers) are the responsibility of service providers: electricity, water, gas, communications etc. These companies may have their own intervention levels but these may not adequately meet the needs of cyclists. Highway authorities may replace covers but may not be able to recover costs. Replacement covers must be 'badged' identifying the owner (as set out by NRASWA, 1991).

2.4.7

Poor maintenance practices can result in the tops of gullies being set unnecessarily low, which is not only a problem for cyclists but also results in vehicle impact loading and early failure. To avoid this issue, contract specifications should address materials and construction details and supervision of work is required.

2.4.8

Refuse and spillages

Some maintenance issues should involve borough street cleansing and refuse collection teams in a programme of inspection and checking, or in the identification of problem areas such as spillages from refuse vehicles. Inspections should focus on typical problem locations, such as the areas around bus stops and petrol stations.



Refuse bags for collection left on edge of cycle lane



Diesel or oil spillage



Litter in cycle track

2.4.9

Vegetation

Vegetation growing over the edges of cycle lanes and tracks can reduce the effective width of a facility, or mean that cyclists avoid it altogether. Certain overhanging trees and hedges that may not affect pedestrians or motor vehicles could be a significant barrier for cyclists. Inspections need to be proactive and enforcement letters to private owners under section 154 of Highways Act 1980 issued before the problem becomes unacceptable. The authority must have in place a procedure for checking out the works in default of a notice and an inspection regime for their own trees. Issues around grass encroaching on cycle tracks should be addressed to the borough street cleansing manager.

2.4.10

Lighting

Inadequate lighting of cycling facilities ideally needs to be addressed through proper design and/or improvement schemes. Frequent inspections can help identify issues, which should be raised with the borough Highway Engineering Manager.

2.4.11

Winter maintenance

Cycle lanes and tracks can become unusable without adequate salting or gritting. However, excessive grit accumulating by the road, in cycling facilities, is also a problem. Issues identified in regular inspections should be raised with the borough Winter Maintenance Manager

2.4.12

Street furniture and signage

Maintenance inspections should highlight where any street furniture close to the kerb represents an obstruction for cyclists. This includes permanent, temporary or fly-posted signs attached to poles and lighting columns. Any missing or damaged signs should also be noted during inspections and reported to the borough Highway Engineering Manager.



Damaged sign
obstructing cycle track



Obstruction by street
furniture



Building materials left
on cycle track



Contractors obstructing
cycle route

2.4.13

Obstructions to cycle infrastructure

Skips, hoardings, scaffold and building materials left on cycle lanes and tracks should be identified in inspections and reported to the borough licensing team for highway works. Effective planning, programming and supervision of works is required to avoid contractors and statutory and private utility companies obstructing cycle infrastructure with compounds, machinery, plant and equipment. Obstructions caused by advertising material or other unofficial street furniture, or by persistent parking, should be dealt with through enforcement and reported to the borough NRSWA team.

Chapter 3

Cycle lanes and tracks

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3.1 Types of cycling facility

3.1.1

This chapter considers specific infrastructure for cyclists on links, including what may be necessary for consistency and coherence across the network. Cycle lanes and tracks are an important part of the overall traffic management toolkit. They can help:

- give safety and comfort benefits based on the degree of separation from motor traffic provided and the quality of the cycling surface
- allocate space to cycling
- confirm a recommended route for cyclists
- raise awareness of cycling as a serious mode of transport and thereby encourage more people to cycle

3.1.2

Quality of provision for cyclists on links is covered by the Cycling Level of Service Assessment, as shown in figure 3.1.

Figure 3.1 Key cycle lane and track considerations in CLoS

Factor	Indicator	Relates in this chapter to
Safety: Collision risk	Kerbside activity or risk of collision with door	Appropriate provision by street type, width of cycle lanes next to parking/loading and floating parking/loading outside cycle tracks.
	Collision alongside or from behind	Nearside lane widths and avoiding widths in the range 3.2 to 3.9m.
Safety: Feeling of safety	Separation from heavy traffic; Speed/volume of traffic; HGV interaction	Appropriate provision by street type and according to traffic conditions and composition
Directness: Journey time	Ability to maintain own speed on links	Type, width and geometry of cycle facility (including ability to overtake)
Comfort: Effective width without conflict	Allocated riding zone range. Lane allocation in each direction	Accommodating different types of cyclist, understanding effective width, setting lane and track widths.
Attractiveness: Impact on walking	Highway layout, function and road markings adjusted to minimise impact on pedestrians	Appropriate provision by street type
Attractiveness: Greening	Green infrastructure or sustainable materials incorporated into design	Appropriate provision by street type, street profiles and function of segregating strips
Adaptability: Flexibility	Facility can be expanded or layouts adopted within area constraints	Considerations of degree of separation and width in order to accommodate growth over time

3.1.3

Cycle infrastructure must be fit-for-purpose for its users – so, lanes and tracks must be safe, direct, comfortable and attractive, and planned and delivered in a way that is coherent and adaptable. At a more detailed level, good design also depends on a proper understanding of cyclists themselves – how much room they need, how they behave and how diverse they are.

Understanding cyclists

3.1.4

Consideration of cyclists must be properly integrated with other aspects of highway design and transport planning. It should never be an add-on, left until the detailed design stage. It is a specialist area of practice and it is easy to get it wrong, even if it is planned in at the right time. It is important that there should be an emphasis on the experience of cycling: what will it feel like to ride on this street? There is no better way to get a feel for this than riding the route and all those involved in design should do this. The CLoS assessment focuses on this ‘rideability’ aspect of infrastructure.

3.1.5

The intention in London is to provide for all types of cyclist. Assumptions may be made about how much space cyclists need, what can be provided to make them feel safer and how they behave under certain circumstances, but it is important to consider those who do not fit the stereotypes.

3.1.6

Cycle infrastructure should be designed in a way that is inclusive both of larger types of bicycle such as the tandem, tricycle (trike), trailer bicycle and cargo bicycle, and various models used by disabled people such as the handbike. Consideration also needs to be given to the possible use of cycle infrastructure by users of wheelchairs and mobility scooters. It is recommended that the concept of ‘the inclusive bicycle’ is embraced – meaning a recognition that, because of the size of many non-standard types of bicycle and the possible limitations of riders, a more forgiving environment is required. There is no need to design a network capable of carrying thousands of inclusive bicycles at once but it is important that infrastructure is tolerant of non-standard users and does not exclude or disadvantage them.

3.1.7

One of the main things that sets cyclists apart from other road users is that they work on human-generated power. This is significant because characteristics of a street that increase the effort required to cycle might deter people from going that way as part of a route, or may put them off cycling at all. Good design for cycling must

therefore be sensitive to physical conditions that matter less for other users, such as surface quality, surface material, ability to maintain constant speed, gradients, deflections and undulations.

3.1.8

Network and route planning and the detailed design of cycling infrastructure should take account of these factors. Routes that are direct and allow cyclists to maintain their speed are the most appealing as they avoid making cyclists stop or deflect unnecessarily. Local environmental conditions, including built form, are also important factors. Trees, for example, can help diffuse the effects of strong winds.

3.1.9

The typical dimensions of a conventional bicycle are 1800mm long and 650mm wide. For a solo adult cyclist, 750mm is the typical static width but extra width is needed for moving cyclists (see 'Design speed and stability' below). A reasonable assumption is that this amounts to a total width of 1000mm (as stated in [LTN 2/08: Cycle Infrastructure Design](#)), although this varies according to speed and type of bicycle. That dimension is often referred to as the 'dynamic envelope' of a cyclist.

3.1.10

People using non-standard types of bicycles should be included through design in all cycle infrastructure. Non-standard bicycles, with indicative dimensions, include:

- Cycles with trailers for children or deliveries (2200-2500mm x 750-850mm)
- Tricycles, including those used by some disabled people (1400-2100mm x 750-850mm)
- Tandems with two or more seats (2100-2500mm x 750mm)
- Recumbent bicycles (1700-2240mm x 750mm)
- Purpose-built cycles for disabled people, such as handbikes (1650-2050mm x 800-860mm)

3.1.11

Key considerations for inclusive design include the following:

- Minimum turning circles for non-standard bicycles are much greater than the dimensions for a standard bicycle shown in LTN2/08 (850mm inner radius, to turn around a fixed object, and 1650mm outer radius, to complete a full turn).
- A tandem needs 2250mm inner radius and 3150mm outer radius.
- Barriers to deter anti-social motorcycling on off-carriageway routes are not encouraged as they can have a major impact on access for wide, non-standard cycles.
- Pedicabs and other similar vehicles can be assumed to use routes designed for motor traffic.
- Lifts to tunnels and bridges, or to allow access to cycle parking areas, should have minimum dimensions of 1.2m by 2.3m, with a door opening of 900mm.

- Vertical deflections such as speed humps should be minimised as cycles with long wheelbases, such as tandems and some recumbent models, are particularly sensitive to the effects of sudden changes in surface level.
- Dropped kerbs should be provided to aid manageable transitions between levels.

Effective width

3.1.12

Effective width refers to the usable width of a cycling facility and depends on how the space is bounded. It is important to make this distinction because the experience of cycling depends more on effective width than actual width. A number of factors reduce effective width, including physical objects, the width of adjacent traffic lane(s), the speed and type of vehicles moving in the adjacent lane, the volume of pedestrians on adjacent footways and the geometry of the cycle lane or track (effective width is reduced on curves and bends).

3.1.13

The minimum clearance between a moving motor vehicle and the outside of the dynamic envelope of a cyclist should ideally be 1.0m where the motor vehicle is travelling at 20mph or less, and 1.4m at 30mph or less. Where traffic is more likely to include buses and other large vehicles, more clearance may be needed, and any measurement should be taken to the furthest side extremity of the vehicle.

3.1.14

When cyclists moving in the same direction and need to overtake each other, or wish to cycle side-by-side, at least 0.5m clearance between dynamic envelopes is required for them to do so comfortably and safely. Based on the dynamic envelope of 1.0m, this would mean that an effective width of 2.5m is required to permit safe overtaking or social cycling. A width of 2m allows these activities with care, preferably at slower speeds. It should be noted that, with a lane or track width of 2.5m, many non-standard cycles cannot overtake or cannot be overtaken without difficulty.



At least 3m width needed for comfortable two-way cycling
Cable Street, Tower Hamlets

3.1.15

When cyclists are moving in opposing directions, there is an added risk of head-on collisions, and at least 1.0m clearance is recommended. This gives rise to a desirable minimum width requirement of 3.0m for two-way tracks. This would allow

overtaking or social cycling only where there is a heavy tidal flow in one direction. Again, this may be inadequate for many non-standard cycles.

3.1.16

Designers should account for 'wobble room' when considering effective width, so that cyclists of all abilities feel they have the space to move comfortably. From a standing start, or at speeds of 3mph or less, an extra 800mm should be allowed for and, at speeds above 7mph, an extra 200mm needs to be added ([LTN2/08](#)). Where cyclists are climbing steep gradients, they will also need additional width to maintain balance.

3.1.17

Continuous or intermittent physical barriers around pedal or handlebar height reduce effective width. Allowance should be made for this when designing kerbs. Objects with a vertical profile need a wider clearance than rounded or sloping objects, so sign posts and lamp columns reduce effective width by 750mm and walls, railings and bridge parapets by 1000mm. Much depends on the characteristics of the object in question and designers need to assess site specific conditions to take an informed view on the width required. These dimensions are minima and should not be regarded as design targets.

3.1.18

Typical ways of achieving more effective widths for cycling include:

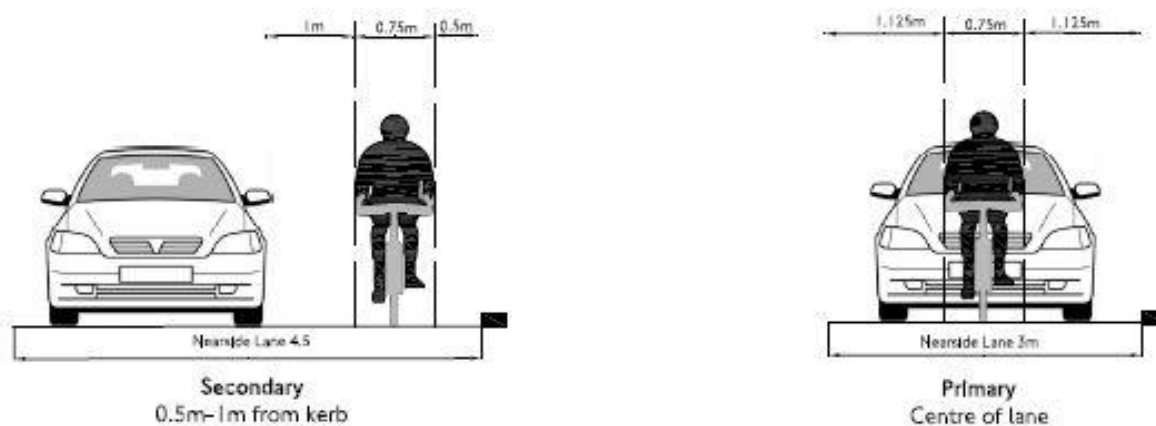
- using low or battered / splayed kerbs rather than kerbs with a vertical or near-vertical profile
- restricting the height of any bounding physical object such as kerb or light segregation – usually this is a balance between making it high enough to deter encroachment by other road users but low enough for it not to be a hazard to cyclists
- wider adjacent general traffic lanes, so that motorised vehicles are less likely to travel close to, or encroach on, a cycle lane
- removal of the centre line on a single carriageway thereby introducing a two-way street with cycle lanes. This encourages motorists to focus on keeping a constant distance from the cycle lane rather than the centre line
- removing or designing out street furniture, including mounting or hanging street lighting, signals and signs from buildings or masts or combining these on fewer poles.

Primary and secondary riding positions

3.1.19

There are two main riding positions that cyclists adopt and are encouraged to adopt by cycle trainers: primary and secondary. The primary position, in the centre of the traffic lane, makes cyclists more visible to other traffic. The secondary position, off-centre and towards the nearside, is used when it is safe and reasonable to allow faster traffic to pass. The recommended secondary position is at least 1m from the kerb or other fixed object on the nearside. Either a dedicated cycle lane on the nearside of the road or a wide nearside lane of at least 4m wide, is required for the secondary position to be appropriate.

Figure 3.2 Primary and secondary riding positions



3.1.20

Designing for the primary position may be appropriate in locations where:

- there are parked vehicles that frequently mean cyclists have to move out into a traffic flow
- there are high left-turning flows from the nearside lane
- there is slow traffic such as in a 20mph speed limit
- cyclists need to change lanes, particularly in slow traffic
- in a nearside turning lane to facilitate cyclists access to the adjacent straight across lane
- the nearside or only lane is less than 3.5m
- approaches to a small or mini-roundabout

3.1.21

Designers need to be aware of these riding positions and design to them, which may enable some good cycling and driving practice to be encouraged and bad practice discouraged. For any cycle lane, it is assumed that cyclists will adopt the secondary position but, in this case, effective width and cycle flows need to be taken into

account, particularly where lanes are advisory or part-time. It is important to consider what position cyclists will need to adopt, particularly as the use of a street environment changes through the day, and to avoid situations where parked cars or other obstructions effectively render cycle lanes useless.

Definitions of cycle infrastructure types

3.1.22

It is important to appreciate the distinction between cycle lanes, tracks and paths. This has implications for signing and, in many cases, enforcement. In this guidance, and in line with the Highways Act (1980), a cycle lane is defined as a part of a carriageway marked with a formal lane marking and allocated for use by cyclists. Mandatory cycle lanes may be reinforced by additional physical protection to deter other vehicles from entering the lane (see section on light segregation below), but they are still lanes.

3.1.23

Formally, a cycle track is a right of way for pedal cycles which can either be part of a public highway adjacent to a carriageway or a separate highway in its own right, with or without a right of way on foot. So, it may be either away from the highway completely, substantially separated from it – by, for example, a verge or planted strip – or simply at a different level from the carriageway. Pedestrians and cyclists may be separated by physical barriers, by level, or by markings only. Section 65(1) of the Highways Act (1980) allows a highway authority to convert a footway into a cycle track by council resolution, and by use of a Section 65 Notice.

3.1.24

Where necessary, to alert different road users to the presence of a cycle track, signing should be to TSRGD diagram 955 with associated diagram 1057 cycle symbol markings. In the interests of more legible, attractive street environments, the preference should be to show that a facility is for cyclists through design and through choice of materials rather than relying on signage.

3.1.25

Kerb-segregated facilities at carriageway level usually alternate between the status of a lane and track, being tracks on links (physically separated and without lane markings) and breaking to become lanes through junctions. For the purposes of classifying cycling facilities in this guidance, it is helpful to regard them functionally as cycle lanes throughout.

3.1.26

Lane markings are not always required to identify space for cycling. Examples include segregated and light segregated types, the status of which as a 'lane' or 'track' is sometimes unclear.



Variation among facilities: a (mandatory) cycle lane and cycle track away from the carriageway



(Left) cycle tracks that break to become lanes across accesses and side roads and (right) space for cycling delineated by objects – technically, neither a lane nor a track

3.1.27

For clarity, the term 'path' is only used in this guidance when referring to shared use paths, covered in section 3.3, and by the Local Transport Note [LTN1/12, Shared use routes for pedestrians and cyclists](#). Nevertheless, there are also complications of definition here. A footpath converted into a shared use path by an order made under section 3 of the Cycle Tracks Act 1984, and the procedures in Cycle Tracks Regulation 1984 (SI 1984/1431), is technically a cycle track with right of way on foot. On conversion, the footpath becomes a highway, maintainable at public expense.

3.1.28

Various categories of Public Rights of Way exist, some of which can be used by cyclists. Public Rights of Way are minor public highways and are described in more detail in the Sustrans [Connect 2 and Greenways Design Guide, chapter 15](#). Cycling

is not permitted on footpaths but is allowed on the other three types of Public Rights of Way:

- bridleways, where cyclists must give way to walkers and horse riders
- restricted byways, which permit horse riders and horse-drawn carriages as well as walkers and pedal cyclists
- byways open to all traffic (BOAT), or simply 'byways', where motor vehicles are also allowed

3.1.29

Permissive rights of way also exist in some areas, where landowners (including organisations such as the Canal and Rivers Trust, the Forestry Commission and the National Trust) have agreed with the local authority for certain categories of access to be permitted, usually for a fixed period. This can include access for pedal cyclists.

Categories of cycling provision

3.1.30

Drawing from these definitions, the different categories of cycling provision used in this guidance are set out in figure 3.3 below. This uses the idea of degrees of separation to demonstrate that there is a range of options, not just a choice of whether or not to segregate cyclists. Using street types, a key distinction is made here between providing for cyclists on-carriageway (separated from motorised vehicles) and off-carriageway (separated from pedestrians). Certain street types, generally those with a lower place function, are likely to require a greater degree of separation from motorised vehicles, so that cycling is provided for off-carriageway. For low movement / high place function street types, more integration of users is likely to be appropriate. These ideas are developed further in figure 3.6.

3.1.31

Each type of lanes and track is dealt with separately in this chapter. Off-carriageway and shared options are covered in chapter 5. The distinctions between all types are summarised in figure 3.3. Note that the 'maximum separation' option would be to separate users at the network level. This means that, in the process of planning cycling routes, an option that offers the best level of service to cyclists may be to dedicate different routes to them across a wider area and avoid streets where provision may be inadequate. Network planning is covered in section 2.1.

Figure 3.3 Degrees of separation

Category		Cycle facility	Street type
Increasing degree of separation ↑	A. Full separation (from motorised vehicles on links)	Cycle track (off-carriageway) Separated path Shared use area with 'suggested route' for cyclists Shared use path Shared use area	Off-carriageway cycling next to: Arterial roads Connectors High roads
		Fully segregated lane/track	
	B. 'Dedicated' cycle lanes	Stepped track Light segregated lane	On-carriageway cycling: Connectors High roads High streets City hubs City streets
	C. 'Shared' lanes	Mandatory cycle lane Shared bus/cycle lane	
	D. Integration of users	Advisory cycle lane Cycle street	On-carriageway cycling: Local streets Town squares City streets City places
		Mixed traffic (optional markings to indicate presence of cyclists) Shared space	

Figure 3.4 Degrees of separation from motorised traffic








A. Full separation (on links)	Fully segregated lane/track Lane segregated by a continuous or near-continuous physical upstand (kerbs and/or segregating islands) along links. 
	Stepped tracks: Vertically separated cycle tracks at an intermediate level between the footway and main carriageway. 
B. 'Dedicated' cycle lanes	Light segregated lane A facility separated and protected by intermittently placed objects. These generally includes formal, mandatory lane markings. 
	Mandatory cycle lane A marked lane for exclusive use of cyclists (with some exceptions) during the advertised hours of operation. It is an offence for other vehicles to enter, unless they are exempted. 
C. 'Shared' lanes	Shared bus lane Cyclists may use the full width of the bus lane during and beyond its hours of operation. Applies to nearside, with-flow bus lanes, and should extend to contraflow and offside types. 
	Advisory cycle lane An area intended for, but not legally restricted to, cyclists' use. Other vehicles are permitted to enter or cross it. 
D. Integration	Cycle street A street where cyclists have assumed priority in a speed restricted area, variously marked with or without formal cycle lanes or indicative areas for cycling. The concept is promoted by DfT in its draft revisions to TSRGD (2014). 

Figure 3.5 Degrees of separation from pedestrians off-carriageway

A. Full separation from motorised vehicles	<p>Cycle track</p> <p>An off-carriageway route dedicated to cyclists, which may or may not be next to a pedestrian-only path. Some physical separation (which can include vertical separation) must be present if cyclist and pedestrian routes are next to one another.</p>	
	<p>Separated path</p> <p>A path where separate areas for cyclists and pedestrians are clearly indicated.</p>	
	<p>Suggested route through shared use area</p> <p>A route for cyclists through an area closed to motor traffic but shared with pedestrians. Subtle changes in surface materials and wayfinding allow some indication to pedestrians of where cyclists are likely to move through. These may be in locations with a high place function, but where it is important to assert clearly the right of cyclists to be there.</p>	
	<p>Shared use path</p> <p>A path either alongside or removed from the carriageway that is shared between cyclists and pedestrians without any form of separation. Examples include canal towpaths, paths through parks and cut-throughs away from the highway.</p>	
	<p>Shared use area: Area shared between cyclists and pedestrians, usually to allow cyclists to make a turn, cross from one side of the street to another, or make a transition between other types of cycling facility.</p>	

Selecting the right provision for cycling

3.1.32

Whether cyclists should mix with general traffic, have their own dedicated space on-carriageway or be taken off carriageway depends primarily on the functional and aesthetic characteristics of streets as places, on the movements of other modes of traffic and on the role of a given street or route within the network. In all cases the chosen facility should be capable of delivering all the good design outcomes:






















- **Safety** – an appropriate degree of separation based largely on the movement function of the street
- **Comfort** – facilities that are fit-for-purpose and appeal to existing and new cyclists
- **Coherence** – consistent, predictable provision, not constantly changing between types
- **Directness** – a choice that promotes direct cycle movement, without unnecessary delay
- **Attractiveness** – facilities that contribute positively to the urban realm and wider neighbourhood
- **Adaptability** – provision for cycling that can be altered to meet changing needs over time

3.1.33

It is recommended that three tests are applied sequentially:

1. What [street type](#) has been agreed for this location?
2. What range of interventions will provide appropriate levels of service for the place (see figure 3.6) in view of the identified street type?
3. What degree of separation from motor traffic is desirable, based on the movement characteristics of the street/route.

Figure 3.6 Recommended on-carriageway cycle facility provision

↓ Degree of separation (between cyclists and motorised vehicles)	Low place function			Medium place function			High place function		
	Arterial road	Connector	Local street	High road	High street	Town square	City hub	City street	City place
A. Full separation on links (eg cycle track, segregated lane)									
B. Dedicated on-carriageway lanes (eg mandatory or light segregated lanes)									
C. Shared on-carriageway lanes (eg advisory lanes, bus/cycle lanes)									
D. Integration with other vehicles									

3.1.34

These tests replace the speed/volume matrix and graph from 2005 edition of LCDS. Motorised traffic speed and volume remain important, but are considered as part of the movement function of a street. In general, recommended options for cycle facility type within a given street type are more flexible where speed and volume can be calmed but decisions about degrees of separation should not be based on traffic characteristics alone (as these are a product of other attributes of a street). Refer to chapter 5 for methods of civilising streets.

3.1.35

Beyond these key considerations of place and movement are various other, more site-specific issues and constraints that are likely to influence choice of type of provision (summarised in figure 3.7).

Figure 3.7 Further considerations for choice of cycling facility

Issues/constraints	Implications
Space available: quantity, shape, how it is bounded	<p>A choice about appropriate cycling facility needs to be informed by the possibilities for changing the physical conditions. Consider the potential for:</p> <ul style="list-style-type: none"> • reconfiguring the space (including opportunities and constraints arising from land ownership or future development) • reallocating space between users (see ‘street profiles’ below) • overcoming specific physical constraints such pinch points within the scope of the project
Streetscape character: built and natural environment	<p>The sensitivity of street environments to physical interventions needs to be taken into account at a more detailed level than street type. Where there are street trees, the default should be to retain them and find a type of cycling provision that allows for this. Where there are particular requirements about materials and use of signs, road markings and colour (for example in conservation areas), more subtle choices may need to be made (cycle lanes and tracks may not be appropriate) and certain more intrusive elements such as large areas of tactile paving will need to be avoided (therefore generally precluding options involving shared use paths).</p>

Issues/constraints	Implications
Cycle and pedestrian flows and desire lines	Existing and future patterns of use by cyclists and pedestrians should be informed by an understanding of where attractors are and by the function of a street within a wider route or network. Certain facilities (segregated tracks, shared space, cycle streets) are unlikely to be appropriate where pedestrian and cycle desire lines cross, and where there are high flows of both, but could work well where those movements are more likely to be in parallel. Adaptability should also be a key consideration: providing for future growth in cycling.
Types of land use and frequency of active frontages	Frequent kerbside activity that needs to be retained in its current location, such as loading bays for certain types of delivery, needs to remain accessible and so requires cycling infrastructure to be designed with some flexibility – i.e. not preventing access to the kerbside. In environments with a mix of uses, where pedestrians and vehicles are coming and going from street entrances often during the day, the possibilities for cycling infrastructure are more limited. Reducing traffic speed and volume is likely to be the most appropriate intervention.
Changes in conditions over time	A choice needs to be made that allows for safe and comfortable cycling at all times of the day and week. Particular care needs to be taken when choosing lanes that operate part-time, such as shared bus lanes, or paths away from the carriageway that may feel unsafe to use after dark.

3.2 Segregated lanes and tracks

3.2.1

Segregated cycle lanes and tracks can provide a high level of service for cyclists on links, offering comfort and subjective safety in particular. Complications arise with the integration of segregated facilities with kerbside activity and at junctions and, for that reason, these types are likely to be most readily applicable to streets with a low place and high movement function, such as arterial roads, connectors and high roads.

3.2.2

Shorter stretches of segregation on these and other street types can help give protection from specific risks, but their use needs to be balanced with the benefits that arise from the coherence and legibility of cycling infrastructure. Bicycles are vehicles and have the same rights to use the highway network as other vehicles (except where specifically prohibited) so any decision to remove them from the carriageway should be based on a clear rationale: there should be identifiable advantage for the cyclist in taking that step.

3.2.3

Where cycle tracks or separated paths are provided away from the highway, personal security issues need to be considered. If the route is intended for use during the hours of darkness, an appropriate level of lighting will be required. In secluded areas, opportunities for increased visibility to and from the cycle facility should be considered.

Fully segregated cycle lanes/tracks



Southwark Bridge



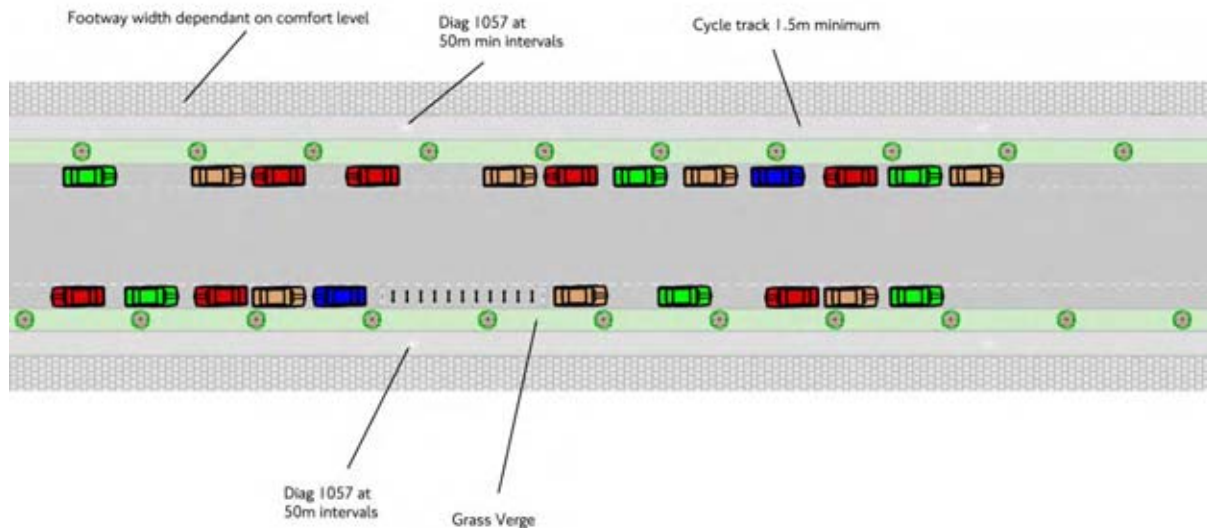
Skinner Street, Islington



Bunhill Row, Islington (contraflow)

3.2.4

Fully segregated lanes and tracks involve the use of features such as kerbs, separating strips, islands, grass verges or lines of planting to create a continuous physical barrier between moving motor vehicles and cyclists on links. The space provides a high degree of separation and, if sufficiently wide, can be designed to provide additional amenity space in the street – for cycle racks and planting, for example.



Indicative layout 3/01: Segregated cycle tracks with verges and parking bays

3.2.5

Fully segregated lanes are one-way, in the same direction as adjacent general traffic lanes, unless signed otherwise. Contraflow cycle lanes may be of the segregated type, particularly if there is fast-moving one-way traffic and/or a high proportion of larger vehicles on the main carriageway. If a facility is created as a cycle track (under Section 65(1) of the Highways Act (1980) or under section 3 of the Cycle Tracks Act 1984 – see section 3.1 above for explanation), then it is two-way unless made one-way by a Traffic Order.

3.2.6

Provided they are well constructed, with a smooth, preferably asphalt riding surface, and are well maintained, fully segregated lanes/tracks can offer a high degree of comfort. They should be provided with regular breaks, both for drainage purposes and to allow cyclists to exit and enter as required. Even with those breaks, however, they tend to reduce effective width and constrain capacity because they do not allow cyclists to move out and overtake unless they are very wide, preferably at least 2.2m one-way or 4.0m two-way. (See section 3.4 on widths, below, for more detail.)



Two-way and contraflow segregated lanes/tracks: Tavistock Street (left) and Bury Place (right)

3.2.7

To maximise the effective width of kerb-separated facilities, the level of the lane/track can be raised above that of the carriageway, reducing the height of the kerb upstand on the cyclists' side to around 50mm. Use of battered or splayed kerbs, sloping on the cyclists' side, can also help reduce loss of effective width and lower the risk of cyclists catching a pedal on a high kerb.



Segregated lanes/tracks with low kerb upstands – in Utrecht (left) and Stockholm (right)



Skinner Street, Islington: battered kerbs and gaps to allow for uncontrolled pedestrian crossing

3.2.8

The strip or island can contribute positively to the quality of the streetscape. It is important to have clarity about the function and future use of such areas, and to ensure they are distinguished visually from the cycle lane or track and from the carriageway. Making use of them for greening and, potentially, sustainable drainage

could have both aesthetic and air quality benefits. If they are intended for pedestrian use, and they resemble the footway, then this needs to be clear from the outset. This may also indicate the need for crossing points on desire lines over the cycling facility. If, on the other hand, they are not intended for pedestrians, they may need to be designed to look deliberately different from the footway.



Segregating strip used for cycle parking, Utrecht



Planted segregating strip, Utrecht



Planted segregating strip in New York



Planted segregating strip in Southwark

3.2.9

The appropriate width for the segregating strip depends on: the relationship between subjective safety of cyclists and speed and volume of adjacent motorised vehicles; space available; integration with pedestrian facilities; signage requirements; and other uses that might be accommodated in the space. There are no absolute requirements, and it is recommended that a risk assessment on a site-by-site basis should inform those decisions related to safety but, indicatively, widths should be:

- 0.5m or above
- 1.0m or above where speed limit is 40mph or above
- 1.8m or above where a pedestrian refuge is needed
- 2.0-3.0m where the strip accommodates parking or loading bays

3.2.10

Where signal poles or bollards are provided on islands and segregating strips, more than 0.3m is needed, in order to accommodate the object itself and provide safe clearance to moving vehicles. Guidance in Design Manual for Roads and Bridge suggests that 450mm clearance is required on the motor traffic side, and this is good

advice for crossings and junctions. However, there is no such requirement on the cyclists' side, and so this clearance could be much lower. In some circumstances, the signal could also be cranked to make the best use of space.

3.2.11

Where it is considered necessary to use a bollard at the start of a segregating island or edge strip, a blank-faced bollard should be used rather than 'keep right' arrow for general traffic otherwise cyclists legally would be required to pass the lane or track on the outside.

3.2.12

Any decision to use kerb segregation should be based on a realistic assessment of future demand for cycling. Given that it generally involves redesign of street drainage and excavation to build the segregation, this type of facility is expensive and difficult to expand to suit future needs.

Stepped cycle tracks



Stepped cycle track in Copenhagen – small, clear level difference between footway and cycleway



Contraflow cycle track at footway level in London – distinction with cycleway is less clear

3.2.13

Stepped cycle tracks are tracks vertically separated from the footway and main carriageway in order to provide protection, safety and comfort. Although they have many similarities to kerb-segregated lanes, stepped tracks may be regarded as a more subtle intervention. The level change between footway and cycleway can help pedestrians and cyclists understand the function of different spaces.

3.2.14

Given that they present less of a barrier to cross-movement by pedestrians or to loading than kerb-segregated lanes/tracks, stepped tracks are likely to be useful where motor traffic conditions dictate that a high degree of separation for cyclists would be desirable but where streets have higher pedestrian flows, more active

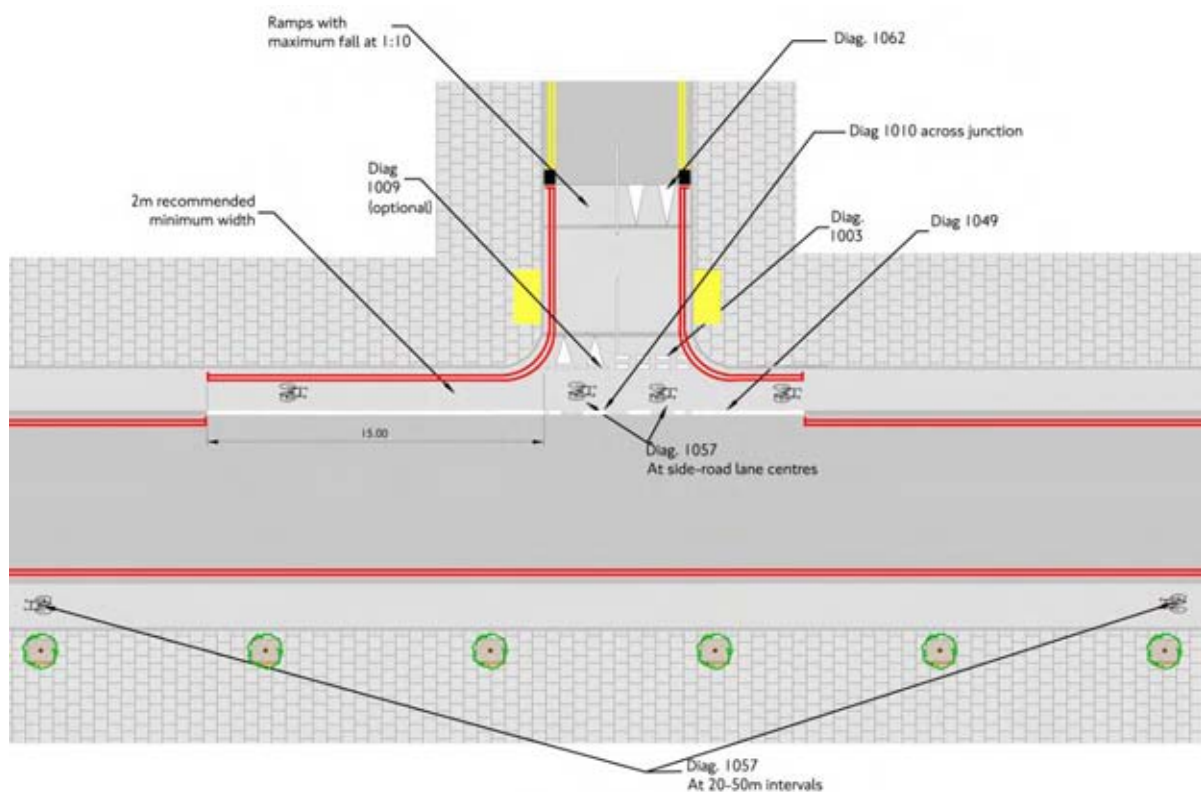
frontages and/or more kerbside activity – for example, the high road street type. They could be applied to Superhighways or, where a shorter stretch of segregation is required on a main road on a longer route, to Quietways.

3.2.15

The model of stepped cycle track described here is the one that has formed the basis for Copenhagen's cycling provision, and has been successfully employed in Brighton and Hove. Although they are very often built up from carriageway space and usually one-way, they are described here as tracks because they are at a different level from the carriageway and are kerb-separated from motorised traffic, so that they are more associated with the footway than the carriageway.

3.2.16

Kerb heights are not fixed but typical provision has level differences of around 50mm between both nearside general traffic lane and the cycle track, and between the cycle track and footway.



Indicative layout 3/02: Stepped tracks at priority junction

3.2.17

Stepped tracks are unlikely to require any lane marking on links. They can be a good solution in sensitive streetscapes where other types of provision may not be acceptable. By using raised entry treatments or even a blended footway/cycle lane

(see section 5.2), they can continue seamlessly across side roads, providing a greater sense of priority for cyclists. However, they need to become on-carriageway lanes through junctions. See section 3.5 on priority of cycling facilities for details.

3.2.18

Stepped tracks can work well when applied consistently and over a long distance, so that they are a recognised part of cycling infrastructure. Isolated stretches of any cycle track tend not to fare so well: cyclists may not choose to use them if they are required to return to carriageway a short way ahead.

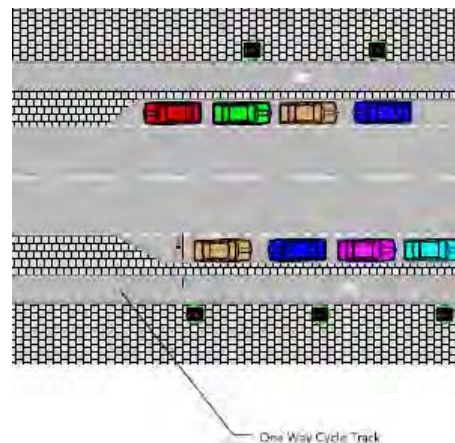
3.2.19

The main drawbacks of stepped cycle tracks are the cost and complexity of construction. Material generally needs to be imported into the carriageway space to install them and gullies will often need relocating. If they are created from footways, excavation is involved, and location of lighting columns can be a problem. Stepped tracks can also require more substantial carriageway reconstruction as the crossfall of the road can be affected.

Segregation using car parking

3.2.20

Continuous separation between cycles and motorised vehicles can be achieved through positioning the cycle lane/track between parking or loading bays and the kerb. When compared to marking lanes on the offside of parking, this method requires little additional space, is unlikely to lead to any overall loss of parking and represent a higher level of service for cyclists in terms of safety and comfort. It could be used for any suitably wide street with parking, but is most appropriate for street types that justify higher levels of separation, such as connectors and high roads.



3.2.21

Facilities such as these should be at least 2m wide wherever possible: wide enough to allow one cyclist to overtake another comfortably, bearing in mind the impact of parked cars on effective width. a 1.5m-wide facility may be appropriate on a Quietway or a route with a moderate cycle flow. If possible, cyclists should run opposite to the direction in which the car doors open, thereby reducing the severity

of any collisions with car doors as they are opened. This is likely to be more difficult to achieve with two-way tracks.



Separation using car parking in Seville (left) and Copenhagen (right)



Separation using car parking in Newham (left) and Amsterdam (right)

3.2.22

Particular consideration needs to be given to the transition in and out of a facility such as this. The visibility of cyclists to other road users on the carriageway may well be greatly reduced as they emerge from behind parked cars.

Two-way cycle tracks

3.2.23

Where cycle tracks are part of the highway – parallel to the carriageway – there is a strong case from a consistency and coherence perspective to make cycle tracks on either side of the street that match the direction of travel of motorised vehicles.

3.2.24

However, two-way tracks on one side have practical advantages for some street types – for example, where there are many more side roads and greater levels of kerbside activity on one side than the other. Where cycle flows are tidal (large flows in one direction during the peak periods), they represent a more flexible use of space than constrained one-way tracks because cyclists can move out into the 'opposing

lane' within the cycle track to overtake. They are likely to require less space than one-way tracks where cycle movements are separated in time and space from those of other vehicles at signal controlled junctions. They can be applicable to street types where a high degree of separation from motorised vehicles is required.



Cycle track by a major arterial road – CS3



Waterfront two-way tracks in Stockholm



Two-way track at Goodman's Yard, City of London



Track at Tavistock Street, Camden, forming a parallel carriageway and simplifying movement through a four-arm junction (but note the need for the left-turn ban).

3.2.25

Use of a centre line on two-way tracks and/or cycle symbols to TSRGD diagram 1057 in the direction of travel can remind users that the track is two-way, and will help distinguish it from an adjacent footway. A half-width (50mm) marking has been authorised by the DfT for Cycle Superhighway use and is recommended for general use, with site specific authorisation. See sections 6.4 and 6.7 for more details.

3.2.26

UK and international practice shows that there are circumstances in which two-way tracks on one side can be a choice that offers a high level of service. This suggests that the model of using segregated two-way tracks on one side of a street ought to be applied very selectively. These conditions include:

- streets with buildings and active uses on only one side (a waterside location, for example)
- streets with few side roads on one side

- streets with a particularly high level of kerbside activity on one side, or where kerbside activity may be reconfigured so as to take place entirely on one side
- one-way systems and gyratories – where motor traffic can only turn one way, there may be advantages in providing for cyclists entirely on the opposite side
- major arterial roads such wide dual carriageways with infrequent crossings, where there may be a case to allow two-way movement for cyclists on both sides of the carriageway

3.2.27

Two-way tracks may also be a good, pragmatic choice away from the highway, or in instances where streets are blocked to motorised vehicles. Effectively, they constitute the carriageway where there are no other vehicles moving through and so it makes sense for them to be two-way.



Track through street closed to motor vehicles, Steatham Street, Camden

3.2.28

The main disadvantages of two-way tracks on one side of the street are:

- they can be an unintuitive arrangement, particularly for pedestrians who do not expect to have to look both ways for cyclists when crossing the first part of the road
- for similar reasons, there is a higher risk of collision with motor vehicles at priority junctions, especially for cyclists travelling the 'wrong' way (generally they can lead to confusion about priorities where tracks cross side roads)
- transitional arrangements with one-way provision at the beginning and end of a two-way track can be difficult to design without using some form of signal control, which may add to delay and journey time for cyclists
- connectivity for cyclists to and from the track is more difficult to manage than for one-way provision – one solution is to design in waiting spaces for cyclists seeking to enter or leave the track.

3.2.29

In each case, an appropriate balance needs to be struck between safety and cycle priority, with additional signage or vehicle slowing measures provided as necessary. On one hand, a cyclist riding in the opposing direction from all other traffic will normally have good intervisibility with the driver of a motorised vehicle about to turn left into a side road. However, a driver about to turn left from a side road into the main dual carriageway will not be expecting a cyclist approaching from the left unless there is clear signing that this may happen.



Two-way facilities can lead to awkward transitions when joining with one-way provision (left)
Consideration needs to be avoiding pinch-points at bends where effective width is squeezed (right)

3.2.30

Since two-way tracks can be unintuitive for pedestrians, there may be advantages in having the track at carriageway level to differentiate it from the footway. This is often the case where tracks are created from the carriageway. However, this can make tracks more visually intrusive in the street environment and it makes them more difficult for pedestrians to cross.

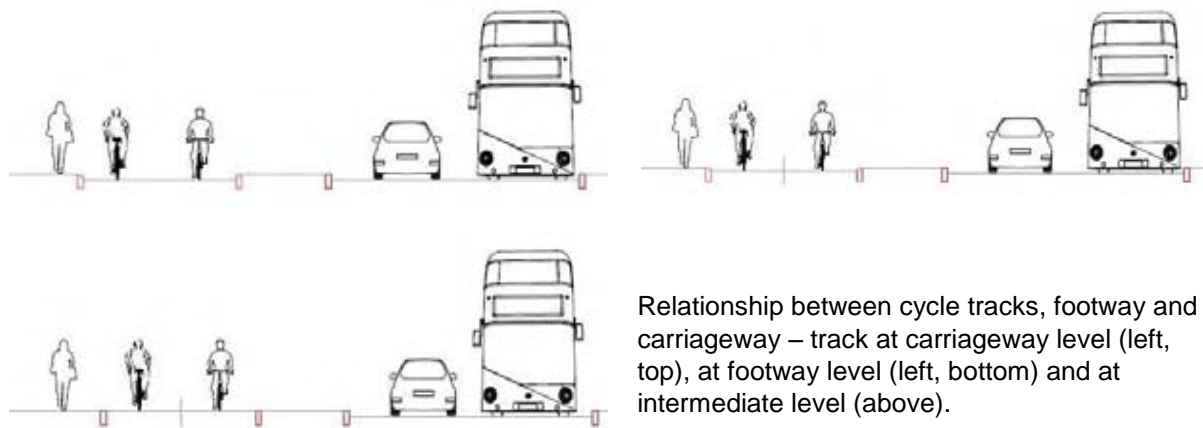


Difficulties in highlighting to all road users that a two-way cycle track is crossing a side road – Tavistock Place, Camden (left) and CS3,Cable Street (right). There is no standardised combination of road marking for this, so efforts are made on a site-by-site basis to demonstrate the intended priority.

3.2.31

Tracks at footway level may integrate better with the street, but they are also likely to invite more pedestrian/cyclist interaction with some users unsure of where they are supposed to be or unaware of the distinction between areas. Two-way tracks at intermediate level (similar to stepped tracks, but with a full-height kerb upstand between track and carriageway) can be a good compromise.

Figure 3.8 Level of cycle track compared to footway and carriageway



3.2.32

International practice also shows occasional use of two-way cycle lanes/tracks in the centre of the carriageway, often using light segregation to separate from adjacent general traffic lanes and heavier forms of segregation at points of potential conflict. Cyclists in both directions have space to overtake yet remain in an expected position in the carriageway, and there is no interaction with kerbside activity to manage so it may be a treatment suitable for bus and cycle priority routes. However, central tracks are likely to need certain vehicle movements to be banned and more complex signalisation than would otherwise be required.



Central two-way cycle track, Cours des 50 Otages, Nantes
(with bus-only lanes on either side)

Geometry of cycle tracks

3.2.33

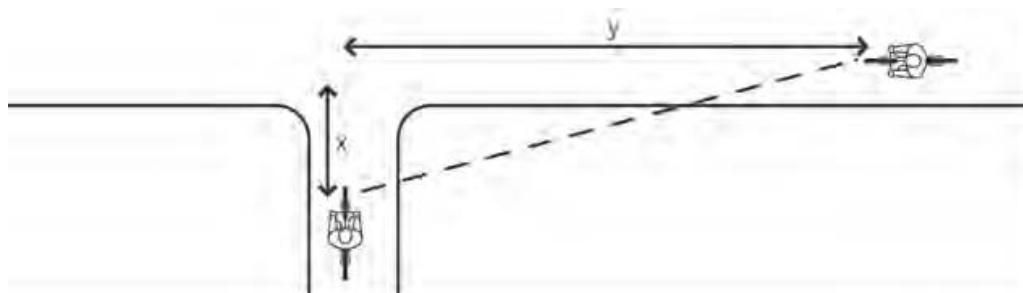
Basic parameters for cycle track or path design are as follows:

- apply a cyclist design speed of at least 15mph on tracks and a maximum of 10mph on shared footways
- avoid instantaneous changes of direction
- use a minimum radius of 14m on links
- use a minimum external radius of 4m at intersections where the cyclist may not need to stop
- consider local widening and super-elevation (banking) on bends, particularly where cycle speeds are likely to be high
- ensure that, where a track or path is two-way, the centre line takes a natural line that cyclists can comfortably follow.

3.2.34

Visibility splays at junctions should generally be provided in accordance with [Manual for Streets](#) are summarised in figure 3.9. The 15mph speed has been included in as an appropriate speed for cycle tracks.

Figure 3.9 Visibility splay and sight lines at junction



Speed	30mph	20mph	15mph
Y	40m	22m	15m

Notes:

1. Motorist's eye level 1.05m minimum
2. Cyclist's eye level age/height dependent but assume 1.00m minimum

3.2.35

The Y-distance (measured along the main route) depends on vehicle (85th percentile) speeds on the road. For urban situations, the [Manual for Streets](#) distances, shown in figure 3.9, should be used rather figures than DMRB. These are based on a Stopping Sight Distance (SSD) for which a formula has been developed.

3.2.36

The normal set-backs for general (motor) traffic on roads are 9m preferred, 4.5m normal minimum, 2.4m minimum, and lesser distances in exceptional circumstances. If sight distances are too long then vehicles may approach junctions at inappropriate speeds as they can effectively see a clear exit. Drivers may not notice the presence of cyclists if they are driving at inappropriate speeds and so care is required when considering sight lines. It is therefore recommended not to exceed the preferred distance in urban environments.

3.2.37

Note that different guidance applies where cyclists are separated from motor traffic – see section 3.5 below, which gives details about set-back of segregation from the mouth of a priority junction.

Transition between cycle lanes and cycle tracks

3.2.38

Occasionally it will be necessary to provide a transition from on-carriageway cycle lanes to off-carriageway cycle tracks and vice versa. This transition should be clear, smooth, safe and comfortable for cyclists. Minimum speed change and vertical and/or horizontal deviation for cyclists should be the objective.

3.2.39

It is particularly important not to have a vertical step change in level along a line running along the general direction of travel. This can happen if cyclists are directed to cross at a shallow angle over a dropped kerb that has not been laid properly. Such situations can de-stabilise cyclists' steering.



Transitions between on- and off-carriageway cycling: Rye Lane, Peckham (left) and Stockholm (right)

3.2.40

Road markings from TSRGD used at transitions may include the diagram 1003 'double-dashed' or diagram 1023 triangular give way markings. These are only appropriate where the cycle track is required to give way to the route it is joining. Preferably a cycle track should make a transition into a lane without having to cede priority.

Cyclist slowing measures

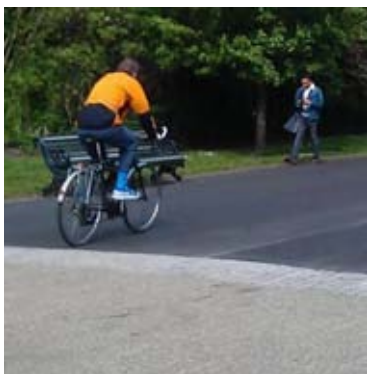
3.2.41

Where, for safety reasons, it is desirable for cyclists to slow down in lanes or tracks, it is better to give the required messages through design such as visual narrowing or changes in surface texture, rather than additional standard signing or physical calming features. Locations where some intervention may be required include:

- Blind bends
- Steep gradients
- Subways and pedestrian/cycle bridges
- Areas of high or specific pedestrian activity including shop entrances
- Approaches to road junctions
- Direct approach to rivers or canals

3.2.42

Over a very short distance, rougher surface texture, with aggregate size of about 20mm can be used for a slowing effect. Rows of granite setts are another option. Care needs to be taken to ensure that the surfaces are safe for cycling, so setts should be reasonably flush and not polished. Rough surfaces should only be used at conflict points as otherwise they can require too much physical effort on the part of cyclists and so reduce the attractiveness of the route.



Use of granite setts to slow cyclists through parks and, right, at a courtesy pedestrian crossing

3.2.43

Where some deflection is desirable, horizontal is preferable to vertical, which can be uncomfortable for both pedestrians and cyclists. Bends and curves, or the breaking-up of straight sections into sweeping curves, can be introduced as horizontal deflections, possibly with the addition of planting or street furniture. Staggered barriers should only be used selectively – in situations where there is a clear safety reason for requiring slowing such as bridges and subway ramps. The speed of cyclists can be tuned by the stagger between barriers with a 2-3m stagger for walking speeds and 5m in a less restrictive situation. Barriers are unlikely to be suitable where there are high levels of cycling.

3.2.44

Vertical methods of slowing cyclists include raised rib markings or road humps or ramps 50-75mm high, preferably with sinusoidal profiles, and with lengths of about 2m.

3.3 Cycle lanes

3.3.1

Provision of cycle lanes helps to:

- facilitate cycling in the carriageway and simplify movements through junctions
- visibly allocate space for cycling and demonstrate investment in cycling as a serious transport mode
- legitimise undertaking slow moving or stationary traffic
- support motor traffic speed reduction by visually narrowing the street

3.3.2

This guidance makes a distinction between dedicated and shared cycle lanes. Dedicated lanes, which include mandatory cycle lanes and light segregated lanes, are kept clear of other vehicles and are available for cycling 24 hours a day. Shared lanes, including bus/cycle lanes and advisory cycle lanes, are more flexible, allowing for general use or occasional entry by other vehicles, and often not operating all of the time.

There can be good, site-specific reasons for using shared lanes, covered in detail below, but in general new cycle lanes should be mandatory lanes, properly enforced and well maintained in order to provide a high level of service for cyclists.

3.3.3

As figure 3.6 shows, dedicated cycle lanes are usually appropriate for street types that have a reasonably high movement function, but where speeds are not excessive, such as high roads, connectors and city hubs.

3.3.4

Shared lanes may be more applicable to locations with lower traffic flows and/or high levels of kerbside activity – appropriate street types include local streets and high streets. They should not generally be used for streets with volumes above 500 motor vehicles per peak hour without a 20mph limit. Bus/cycle lanes can give an acceptable level of service on busier streets such as high roads and city hubs, and may be used on Superhighway routes but are not generally appropriate for Quietways.

Mandatory cycle lanes

3.3.5

Mandatory cycle lanes, with a solid lane marking, are spaces on carriageway dedicated to cyclists within the signed hours of operation (if this is limited). International best practice shows that dedicated, wide, properly enforced on-carriageway lanes such as these are a valuable option for cycling networks.



Mandatory cycle lane – CS8, Millbank



Contraflow mandatory cycle lane – Long Acre

3.3.6

Creating enforceable space for cycling on-carriageway can also be a step towards securing more separated space, particularly if funds and/or political support are not immediately available for more radical change in one phase. There are several examples in New York of this staged approach to delivering cycling infrastructure.



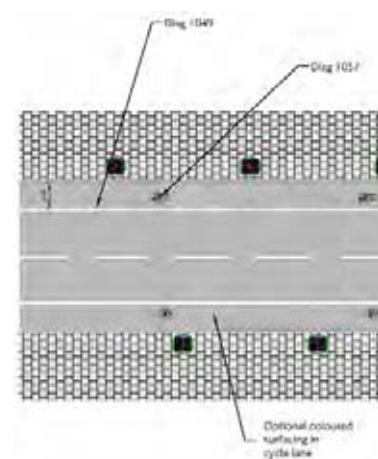
New York: lanes can be a precursor to different forms of separation, such as stepped tracks

3.3.7

Traffic Regulation Orders are currently needed to create mandatory cycle lanes, although it is proposed in the draft revised TSRGD that this requirement will be removed from 2015, making mandatory lanes easier to implement. If the formal TRO process is not undertaken, there should still be consultation with stakeholders. These lanes are thereby enforceable by the police for violation of moving offences and by civil enforcement officers for waiting regulations. It is usually illegal for any motor traffic to enter them, except taxis, which are normally allowed to stop within cycle lanes to drop-off and pick-up passengers.

3.3.8

Mandatory lanes have 150mm-wide TSRGD diagram 1049 lane markings, and the associated 'with-flow cycle lane' sign (diagram 959.1), which can be omitted in 20mph areas. The use of the 'with-flow cycle lane ahead' sign (diagram 958.1) is not necessary. Lanes must start with a diagonal broken line to diagram 1009, with a recommended 1:10 taper, although this is not required at intermediate breaks such as bus stops. It may be appropriate to place these diagonal markings after side-road junctions, where cycle lanes are wider than 1.5m, to ensure that the lanes are clearly visible and enforceable.



3.3.9

Where cycle lanes are at least 2m wide, site-specific or authority-wide authorisation can be sought for 250mm-wide mandatory cycle lane markings in order to reinforce the separation from general traffic lanes. This width of marking does not yet appear in the consultation draft of TSRGD (2015).

3.3.10

Mandatory cycle lanes can be given extra protection to discourage motorised vehicles from entering. One method is light segregation – see below. Another is to create a buffer between the general traffic lane and the cycle lane by using two parallel sets of lane markings, separated by TSRGD diagram 1041.1 'chevron' markings. Intermittent islands can be used to add extra protection and assist pedestrian crossing. In this arrangement, one lane marking should be to diagram 1004 (dashed, advisory) and one to diagram 1049 (solid, mandatory). Whether the solid lane is on the cyclists' or the motorists' side depends on the extent to which either road user might be invited to enter the buffer zone.

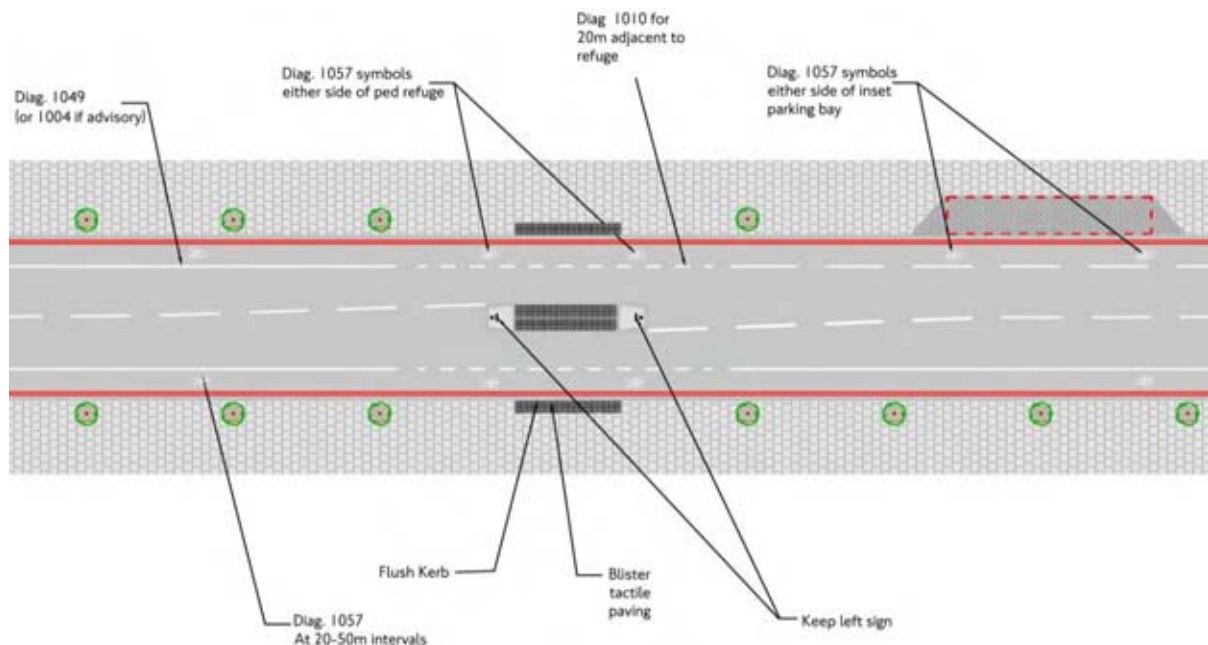


Cycle lane with buffer and intermittent island protection – Baylis Road, Lambeth

3.3.11

Mandatory cycle lanes may be continued through priority and signal-controlled junctions using a dashed diagram 1010 (or 'variant 1010') marking – see section 3.5 for details. As set out in the [Traffic Signs Manual](#) (chapter 5, para 16.5), they can be continuous across certain accesses where a TRO defines the exemption. This is typically done where crossing is unlikely to be frequent, such as access to private

residential properties. For other accesses, such as the entry to petrol stations, it is usually recommended to break mandatory cycle lanes to raise awareness of motorised vehicles entering.



Indicative layout 3/03: Mandatory cycle lanes broken at pedestrian refuge island

3.3.12

On a site-by-site basis, a judgement by the designer is required based on a risk assessment and recognising that breaking a mandatory lane provides a visual message to both cyclists and motorists as to the presence of a hazard. In indicative layout 3/03, the narrowing of the general traffic lane caused by the pedestrian refuge island means there is a case for making the cycle lane advisory at this point to alert all users to the likelihood of other vehicles partly entering the cycle lane. In each case, the benefits of the continuous lane (for example, clear demonstration of priority for cyclists and discouraging encroachment by vehicles in the adjacent traffic lane) need to be weighted up against the disadvantages of allowing more regular crossing by motorised vehicles.



Mandatory lane becomes dashed past side road (lane marked away from kerb and side road)



Dashed markings used to show continuity of lanes through junctions

Light segregation

3.3.13

Light segregation is a term given to the use of physical objects intermittently placed along the inside of a cycle lane marking to give a higher degree of separation and protection to cyclists over motorised traffic. In effect, light segregated lanes are a variant of mandatory cycle lanes. Consideration could be given to their use where a mandatory cycle lane may be appropriate but greater subjective safety for cyclists is desired – for example, on a connector or high road. There is little established practice in on light segregation but current on-street trials around the UK will help in ascertaining the benefits and risks of different products and types.



Light segregation with wands in Minneapolis



Use of concrete 'lacasitas' in Seville

3.3.14

Light segregation has many benefits over full segregation in that it is easier to install, usually costs less, is more adaptable and does not create barriers to pedestrian crossing movements. Generally, it will not require excavation, physical adjustments to the structure of the carriageway or repositioning of drainage or utility covers. It should not constrain cyclists in the same way as full segregation, although this depends on the objects used and how they are spaced. In order to maintain an acceptable level of protection, spaces between objects should be no less than 2.5m and no greater than 10m on links. Tighter spacing can be considered on bends and junction approaches.



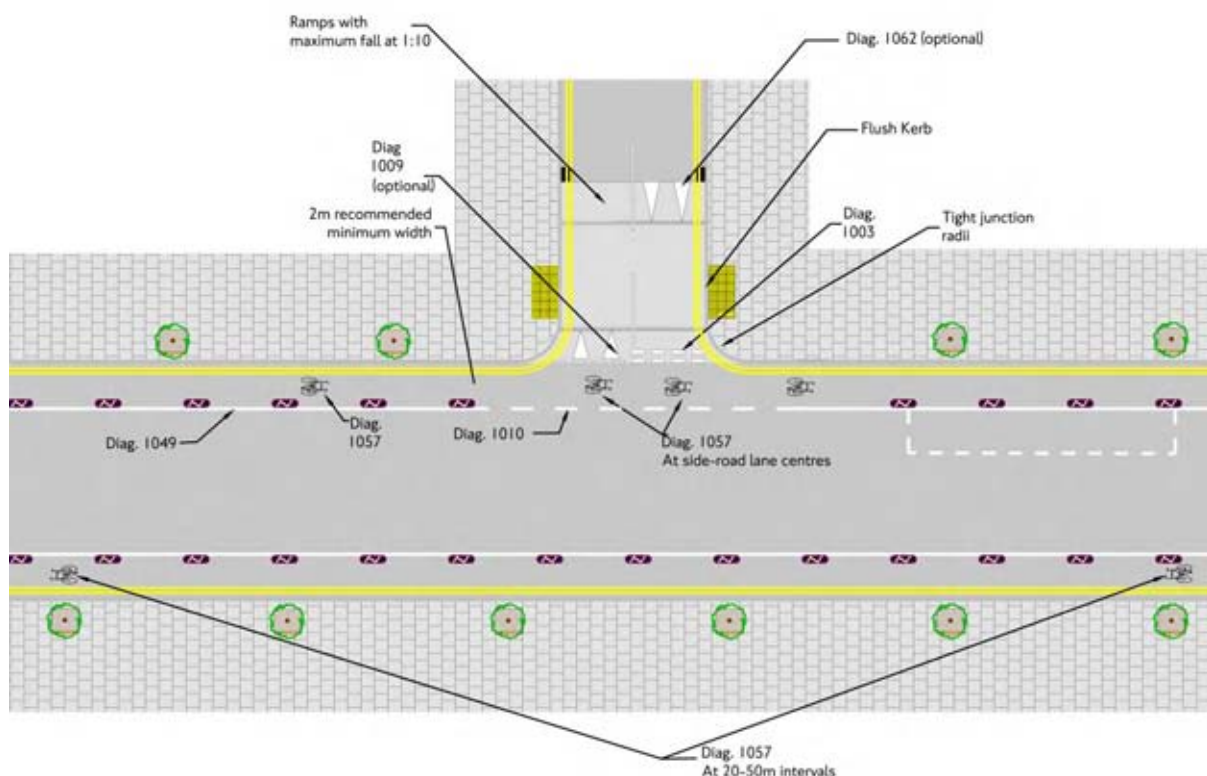
Trialling layouts using light segregation in New York: 'light' reallocation of space can help to make the case for more substantial re-engineering of the carriageway in time

3.3.15

Given the low costs of installing most types of light segregation and the relative with which it can be adjusted or removed, it can be suitable for trialling temporary measures to reallocate carriageway space. Just as mandatory lanes may be a step towards other, more substantial forms of separation, so light segregation could be an interim stage to a more permanent form of segregation.

3.3.16

Light segregation should not be used where general traffic is expected to straddle it. This will diminish the desired effect of providing a clear delineation between general traffic and cyclists. In streets with a 20mph limit, many different objects are used for traffic calming, streetscape improvement and local amenity, so there is more flexibility in the type and purpose of light segregation than on streets with a 30mph or more limit. Any objects used in the carriageway may be struck at higher speed and the potential implications of the destabilising effects of such objects on cycle and motorcycles moving at speed must be taken into account.



Indicative layout 3/04: Mandatory cycle lanes with light segregation at priority junction

3.3.17

Types of light segregation that may be considered include:

- Pre-formed objects made out of rubber, recycled plastic or concrete, including small humped separators variously known as 'armadillos', 'zebras' and 'hedgehogs'. These are placed inside (not on top of) mandatory cycle lane markings, and are easy to install and cheap to replace.
- Knock-down poles or wands, which provide a strong visual indicator of separation of space, and even come with illuminated tops. However, they can look temporary and diminish the attractiveness of a street.
- Planters, narrow versions of which are available and can help to delineate cycle routes. They do present a risk of causing an obstruction at a turning point. Installing them also has maintenance implications.

Whatever object is used for light segregation, it should not resemble an existing road marking or obstruct a road marking in a way that might make it unidentifiable.

3.3.18

Interim results from off-street trials show that, in comparison to lane markings only, users felt safer when light segregation was placed next to the marking. Cyclists stay further from lower objects, such as armadillos and zebras, but are more comfortable riding nearer to moving motor vehicles where they are separated by high objects such as wands. This is an important consideration for the effective width of the cycle lane, and the potential for overtaking within the lane.

3.3.19

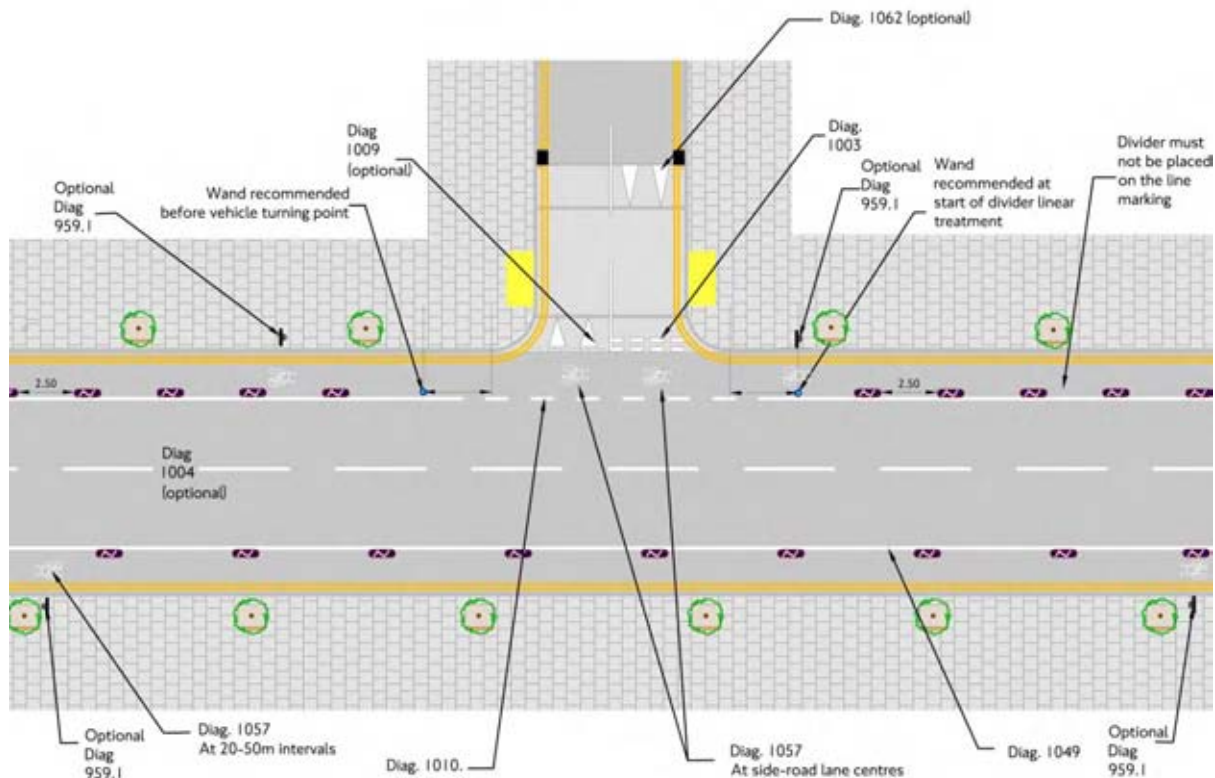
Where lower types of light segregation are used, consideration may be given to providing a more visible object – such as a wand, planter or island – at the beginning of a run. This should keep vehicles out of the cycle lane until the point where they need to turn and send a clearer message that a transition is taking place at that point. For streets with a speed limit of 30mph or more, this treatment is recommended.



Light segregation using planters and 'zebras' – Royal College Street, Camden

3.3.20

Although this has yet to be tested fully, it is reasonable to assume that advice in section 3.5 below on how to begin and end kerb segregation (including how far ahead of a priority junction should it be ended) might also apply to light segregation.



Indicative layout 3/05: Light segregation at priority junction on 30mph street

3.3.21

Access to the kerbside will often need to be maintained to allow for drainage, road sweeping and general maintenance. Where wider lanes are provided, emergency vehicles should also gain kerbside access if required.

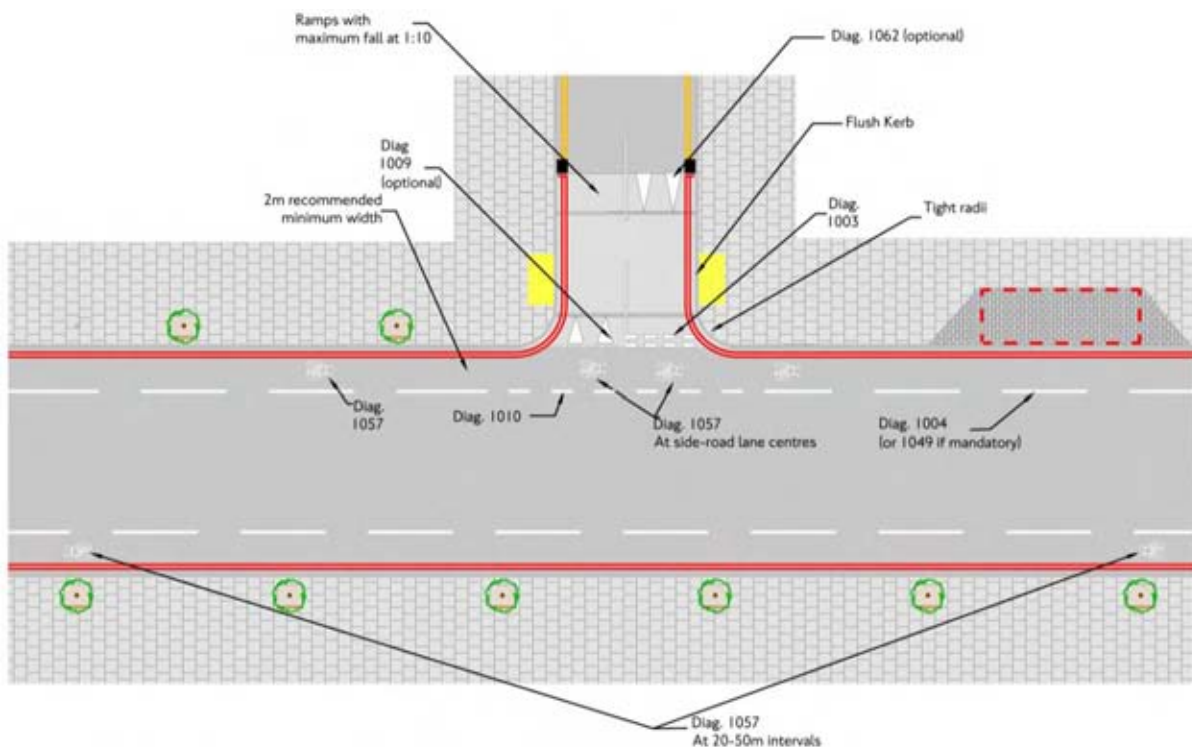
3.3.22

Light segregation can be provided without road markings where there is no ambiguity for road users about the route for cyclists. This can work very well in 20mph areas, since there is less emphasis on communicating important messages to fast moving motorised traffic that have to be processed quickly. However, the areas set aside for cyclists cannot legally be enforced for cyclists' use. Good will between road users is required to ensure they are used as intended. For this reason, parking and loading restrictions are very often important to keep the 'lanes' clear of motorised vehicles.

Advisory cycle lanes

3.3.22

Advisory cycle lanes indicate an area of the carriageway that is intended for the use of cyclists and should indicate a recommended (but never required) line of travel for cyclists. They instruct other vehicles not to enter unless it is safe to do so. They are indicated by broken white line (diagram 1004) and associated sign (diagram 967). To minimise street clutter, the sign should only be used in locations where interpretation of the road markings is not otherwise clear; it is unlikely to be necessary in areas with a 20mph limit.



Indicative layout 3/06: Advisory cycle lanes at priority junction

3.3.23

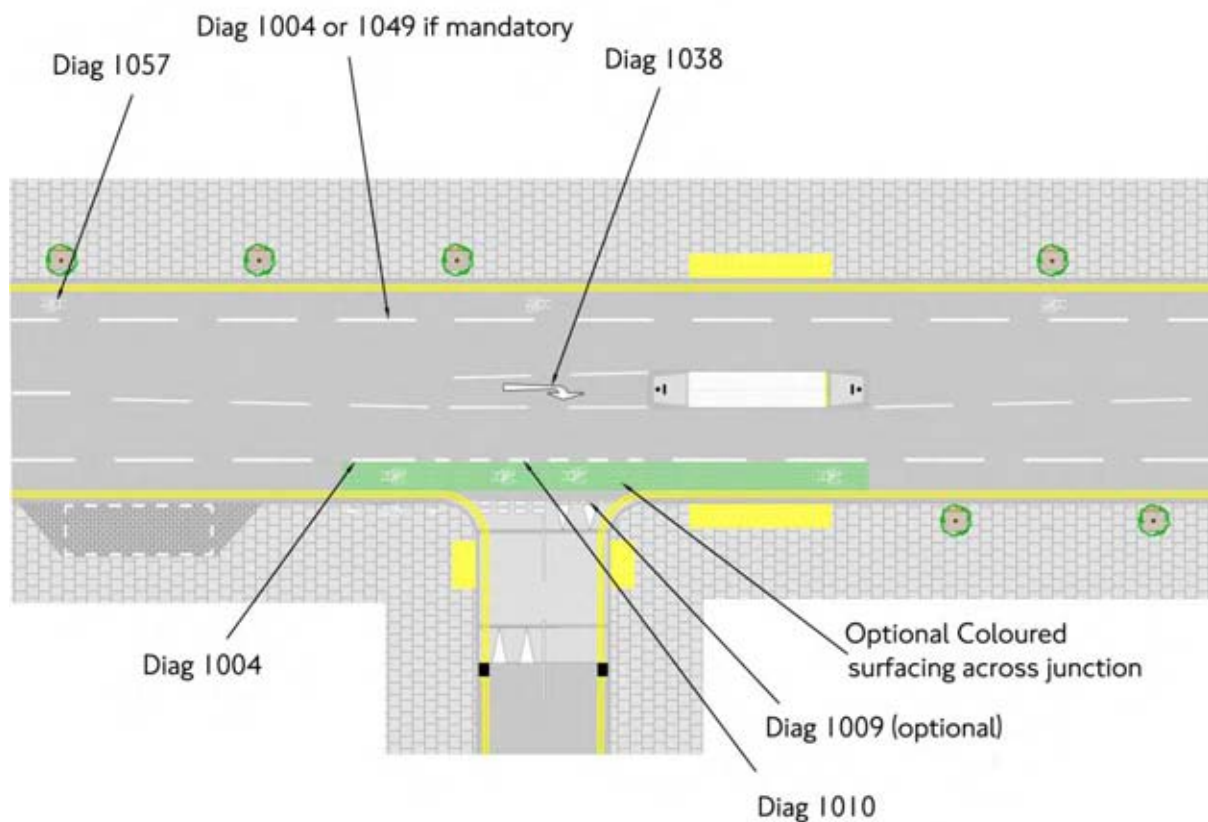
Advisory lanes are a practical option where flexibility is required, often where motor vehicles frequently need to enter or cross the lane in places where there is a high degree of kerbside activity such as high streets or city hubs. Unless that requirement exists, mandatory cycle lanes should be the default provision. Advisory lanes used in this way, on street types with a medium-to-high movement function are unlikely to be suitable for Quietways. However, advisory lanes may be useful on some quieter local streets where some sharing of limited space at low speed may be acceptable and preferably some parking controls are in place or parking provided in marked bays. This treatment could work for Quietways, offering good continuity for a route, provided the level of motor vehicle activity is very low. In these instances, a cycle streets approach may be preferable (see below).



Advisory lanes used for a visible cycling facility where carriageway width is limited



Advisory lanes used where kerbside activity is high; lanes are marked outside parking bays



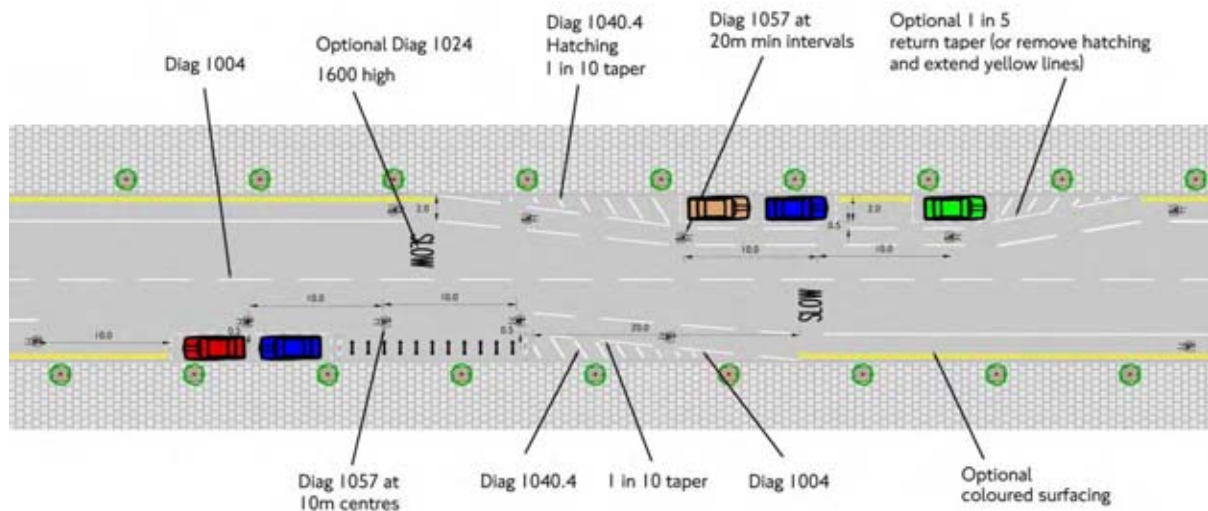
Indicative layout 3/07: Advisory lane markings past splitter island at side road

3.3.24

Advisory cycle lanes can be used next to narrow general traffic lanes where it is inevitable that some encroachment will occur – for example, 2.5 to 3m lanes that some larger vehicles may need to straddle, particularly on bends. As this suggests, there is a significant risk that they may offer a compromised level of service for cyclists, relative to other types of cycle lane.

3.3.25

A major drawback of advisory cycle lanes between junctions is that at times of day when parking and loading are permitted, the lane becomes unusable as cyclists have to pull out round parked vehicles. Time-limited mandatory lanes are often preferable to advisory lanes, for this reason.



Indicative layout 3/08: Advisory cycle lanes and diagram 1057 markings around parking bays

Top shows cycle lane continued past parking; bottom shows continuity through cycle symbols only

3.3.26

To deal with kerbside activity, the preference for a cycle route would be to relocate parking and loading wherever possible, or to 'float' parking and loading on the offside of the cycling facility. The next-best alternative is inset parking and loading bays (see section 5.5). A further option is to mark an advisory cycle lane around the parking, with a buffer zone of at least 0.5m, or use TSRGD diagram 1057 cycle symbols.

3.3.27

Advisory cycle lanes may be continued through priority and signal-controlled junctions using a dashed diagram 1010 (or 'variant 1010') marking – see section 3.5 for details.

Cycle streets

3.3.28

Using advisory cycle lanes and removing the centre line in narrow carriageways on quiet local streets can be a good way of flexibly providing a cycling facility and a high level of service for cyclists. This is a treatment that could be suitable for Quietways.

3.3.29

A cycle street treatment may be appropriate for a street:

- that cyclists already use in large numbers
- where motor traffic volumes and speeds are already very low
- where it is possible to use traffic management across the wider area to bring down speed and volume of motor vehicles, or
- where the street is access-only for motor vehicles.

As a rule of thumb, according to Dutch guidance, cycle streets should have (or have the potential for) flows of at least 1,000 cyclists a day. Cyclists should generally outnumber other vehicles by 2 to 1 during peak hours.

3.3.30

Using UK road markings in this way, together with other features to reduce motor traffic speed and volume (see chapter 5), is a method of approximating the 'cycle streets' approach used in several countries, including the Netherlands and Germany. In a cycle street, motor vehicles have access and there is a conventional footway, but the carriageway is dominated by cyclists in a manner indicated by the design of the street.



Example cycle street types in Utrecht, with standard 'cars are guests' signage

3.3.31

Dutch guidance (CROW, *Design manual for bicycle traffic in The Netherlands*, 2006) shows three types of cycle street, which have in common narrow carriageways, low speeds and low motorised traffic volumes, but which differ in several key characteristics:

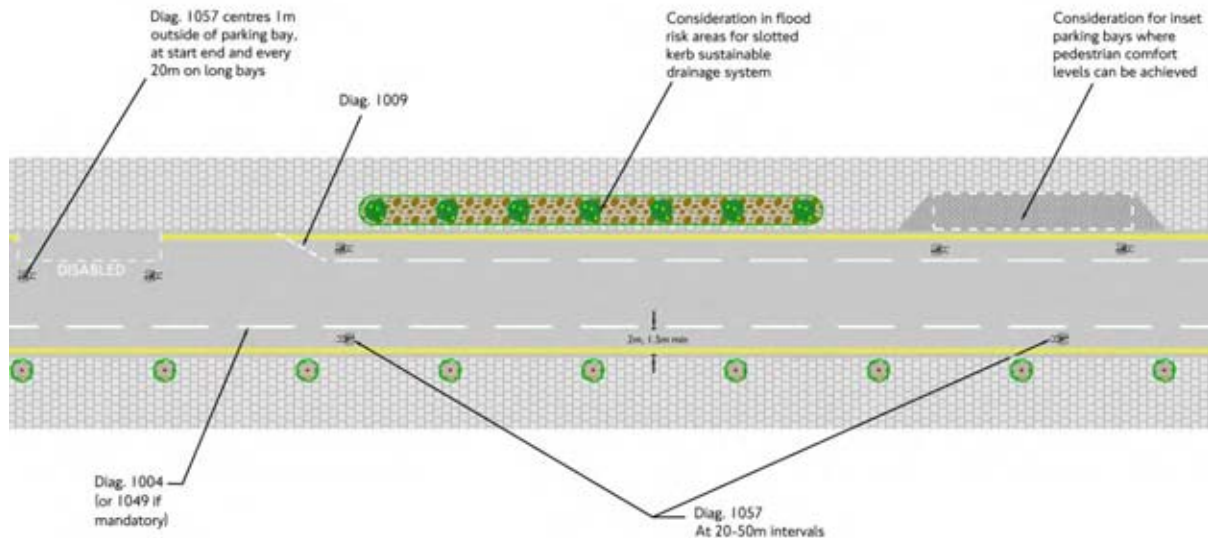
- Cycle street with mixed traffic (above, top left and bottom left). These tend to have few road markings and, throughout the whole carriageway, have the same coloured surfacing as cycle tracks or a distinctive surfacing that marks them out from a conventional carriageway.
- Cycle street with cyclists in the middle (above, top right). Cyclists ride on the central, often coloured lane. Border strips, often in black or grey, allow for cars to move through. The central strip should be no more than 3m wide, with around 0.75m for the border strips.
- Cycle street with cyclists at the side. Cyclists ride on wide advisory cycle lanes (recommended 2m wide) either side of a single, narrow general traffic lane, without centre line (no more than 3.5m on a two-way street). Motorists can only pass a cyclist if there are no oncoming cyclists by straddling into the opposing cycle lane.

3.3.32

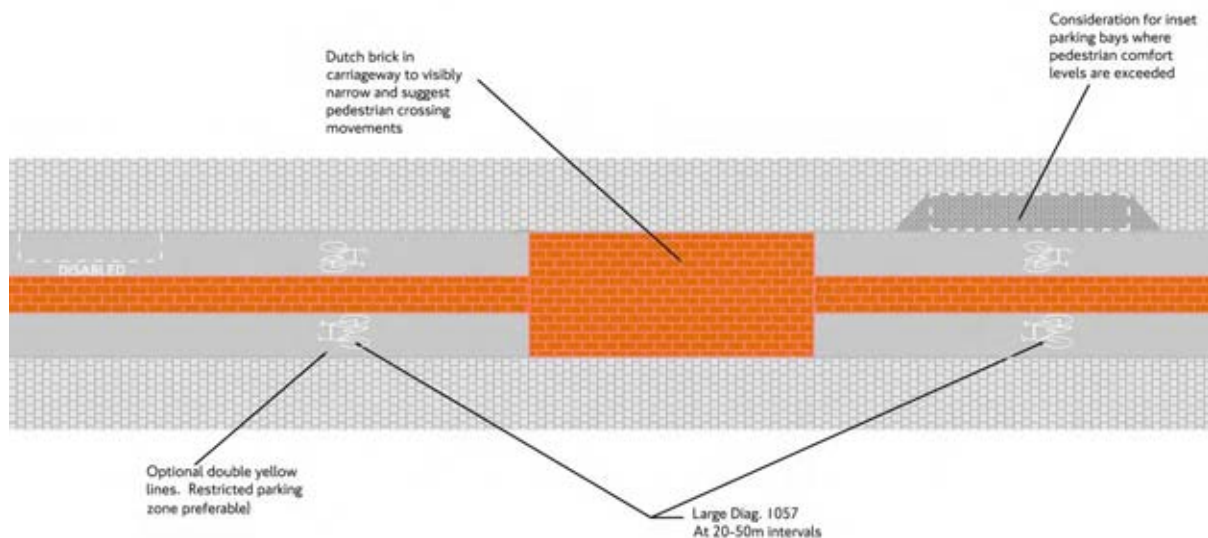
The last of these is likely to be the most achievable in the UK as an extension of existing practice, created by removing the centre line and introducing wide advisory cycle lanes, either side of a narrow general traffic lane. However, the [consultation draft of the revised traffic signs regulations, TSRGD](#) (2014) proposes a formal cycle street designation for the UK in which a speed limit of 15mph would apply and where motorised vehicles would not be permitted to overtake.



Cycle streets in the UK? Benwell Street, Islington (left) and Loughborough Road, Lambeth (right)



Indicative layout 3/09: Street with advisory cycle lanes and centre line removed



Indicative layout 3/10: Cycle street concept

3.3.33

Consideration of cycle streets in 20mph zones may be a practical first step to introducing and refining the concept. In this case, the base plate below the 20mph sign may be adapted to convey a message about the special status of the street, such as a safety campaign logo.

3.3.34

For coherence, cyclists should have priority at any junction with the cycle street itself, and the difference in street environment should be visible and obvious from any side street. Parking and loading should be incorporated in bays rather than freely allowed. Kerbside activity needs to be carefully considered as the design is developed, taking account of use throughout the day.

Shared bus/cycle lanes

3.3.35

Bus lanes provide a high level of continuity and priority – benefits that can easily be transferred to cycling – and they represent an existing means of controlling kerbside activity. Combined bus and cycle lanes are therefore a useful tool in the provision of facilities for cyclists, particularly on street types with a medium to high movement function, such as high roads and connectors.

3.3.36

Designers of bus schemes should consider the needs of cyclists, and include provision for them unless there are exceptional reasons not to do so. Provision for cyclists can add to the justification and business case for the scheme. Bus lanes should be available for cycle use for their full hours of operation (as well as outside those hours). Where there is clear demand for cycling on a bus route, operation hours should be considered for extended times.



With-flow bus lane (left) and contraflow lane with 'bus and cycle' marking (right)

3.3.37

The TSRGD diagram 1057 cycle symbol is not permitted within bus lanes, although can be used as part of a 'Bus and Cycle Lane' marking in contraflow lanes.

3.3.38

To highlight a Superhighway route, the default treatment option in bus lanes is the use of the project symbol as a route continuity indicator within the lane. This has been authorised by DfT for the Cycle Superhighways only, but needs agreement with the relevant highway authority. The only caveat is that it does not interfere with or form any part of the usual bus lane-specific markings.



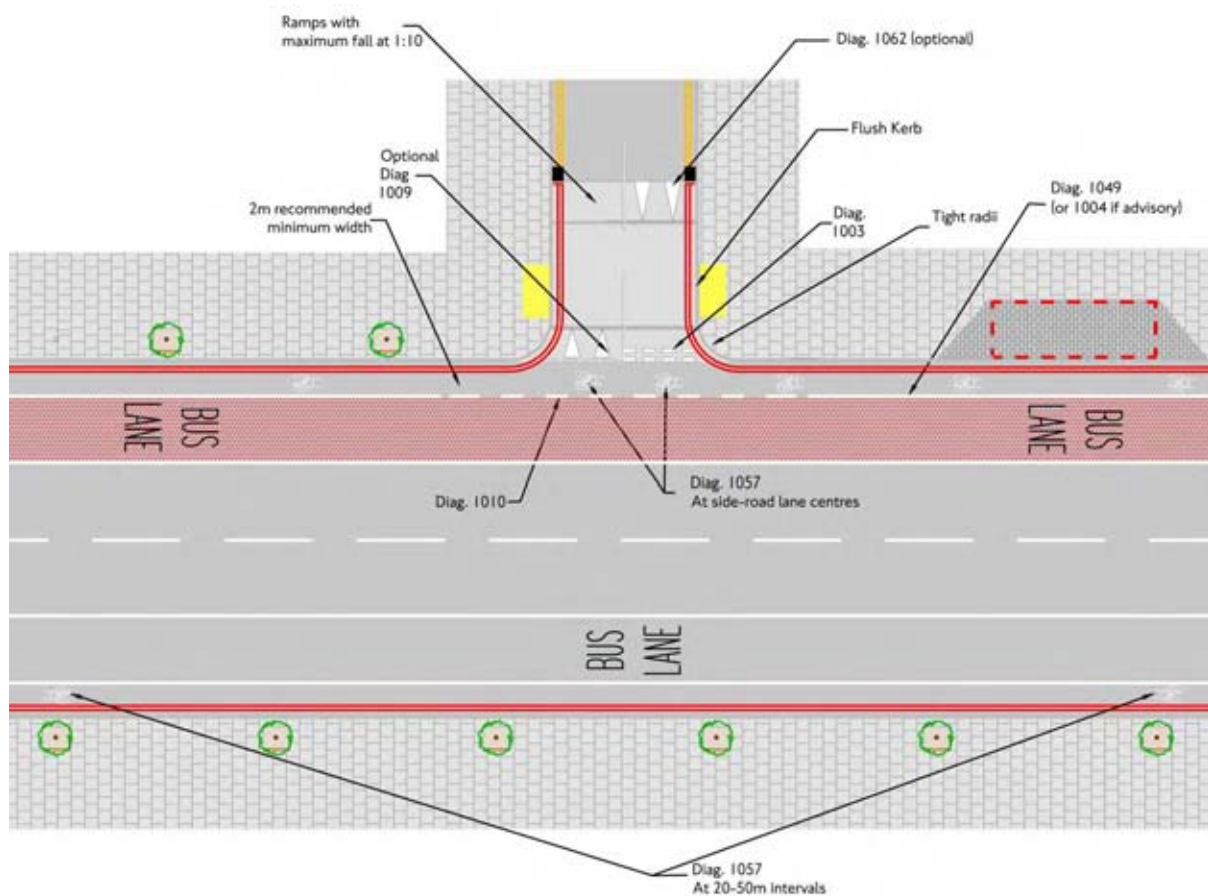
Cycle Superhighway project symbol

3.3.39

Parking and loading is often permitted outside of the operational hours of a bus lane. In such instances, it is preferable if the lane is at least 4.0m wide and if marked bays are provided, to encourage parking closer to the kerb – that way the lane remains usable for cycling. Alternatively, parking and loading could be provided in inset bays, in adjacent side roads or permitted in the bus lane in one direction only during peak times (i.e. the direction opposite the main tidal flow).



Mandatory cycle lane inside bus lane – Blackfriars Bridge (left), Waterloo Bridge (right)



Indicative layout 3/11: Mandatory cycle lane within bus lane

3.3.40

For bus lanes of 4.5m or above, a mandatory cycle lane of at least 1.5m width may be included on the nearside. Since such a lane will be interrupted by bus stops and side roads, there is only likely to be benefit in providing one over a substantial distance or where it would provide a fit-for-purpose cycle facility outside the operational hours. The advantage it will confer, and the level of subjective safety it may offer, will also tend to diminish with higher flows of cyclists.

3.3.41

Bicycles should be allowed in contraflow bus lanes wherever possible, and sufficient room provided to enable cyclists to overtake comfortably at bus stops. Lane widths less than 4.0m should therefore be avoided. When bicycles are not permitted in contraflow bus lanes, the managing highway authority must take on responsibility for the safety and other issues relating to alternative routes that cyclists must use.

3.3.42

Bus gates and other bus priority signals should be carefully designed to ensure that appropriate priority benefits are also given to cyclists. A push-button for cyclists or reliable cycle detection at signals should be provided where a long wait time for cyclists would result if signals were only linked to bus detection. Joint bus and cycle gates can provide bus priority and advanced release for cyclists and so should be considered for these multiple benefits. In some cases, where space allows, a cycle by-pass to bus priority signals may be desirable and, where feasible, this should be provided.

Two-way cycling in one-way streets

3.3.43

Cycle lanes to enable two-way cycling in one-way streets are an established measure, described in [TAL 6/98, Contraflow Cycling](#). Mandatory cycle lanes are the most common way of providing for this where there are moderate and high traffic flows or speeds. They should be at least 1.5m (preferably 2.0m) wide, delineated by the solid line diagram 1049 marking and with diagram 960.1 contraflow cycle lane sign. Particular attention should be given to the design of entry and exit points, side roads, accesses and parking bays to ensure that all road users have adequate warning of priority and each others' movements. Physical separation by traffic islands can be provided as necessary – there is generally a greater need for segregation at the exit point.

3.3.44

The arrangement and placement of cycle symbols, arrows and protection should effectively 'speak for itself' in slow moving environments without the need for additional vertical signage. A flexible, minimal approach to signage should, in particular, be applied to areas with 20mph limits.



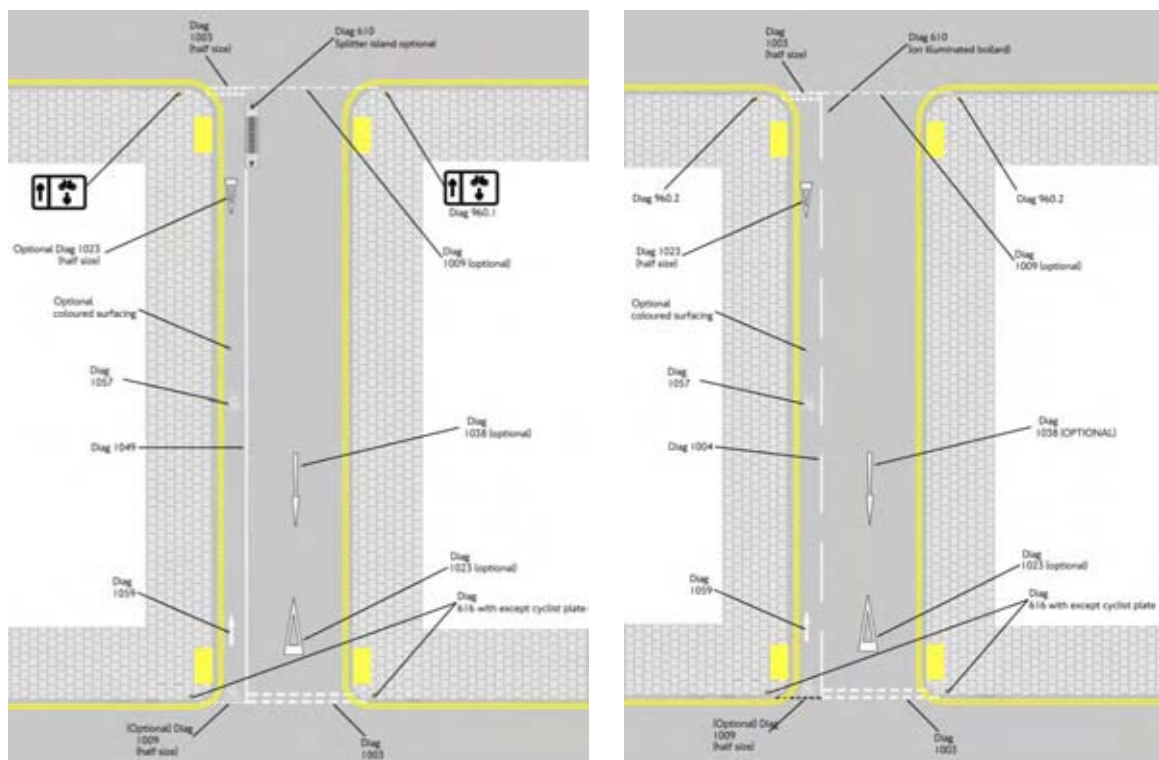
Advisory contraflow cycle lane
– Paul Street, Hackney



Contraflow with island separators, and
showing the diagram 960.1 sign

3.3.44

Where motor traffic speeds and flows are low then an advisory lane marking may be used. The effective carriageway width may be as little as 4m for an advisory lane to work.



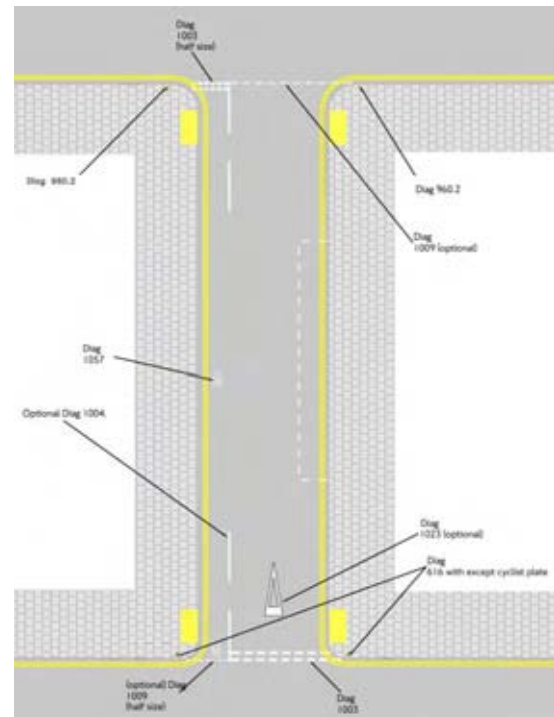
Indicative layout 3/12: a) Mandatory (left) and b) advisory (right) contraflow cycle lanes

3.3.45

A further option for contraflow is to omit lane markings altogether, or provide two TSRGD diagram 1004 advisory lane markings on entrance and exit. This was made possible by amendments to TSRGD in 2011 and the creation of a new sign, diagram 960.2, to signify this arrangement. Diagram 1057 cycle symbols with optional arrows may be used to add clarity to the layout.

3.3.46

The standard signing arrangement at the entrance should be a 'no entry' sign (TSRGD diagram 616) with 'except cyclists' plate underneath. Where additional protection is required due to tracking movements of larger vehicles then a protective island can be introduced with a sign to diagram 955 (route for use by pedal cycles only) on a bollard.



Indicative layout 3/13: Contraflow by exemption only



No motor vehicles, cyclists permitted
– Frazier Street, Lambeth



No entry with 'except cycles' plates, and
raised table entry



Contraflow cycling in City of London using the diagram 960.2 sign: advisory contraflow at Aldermanbury Street (left) and at Noble Street (right) using advisory lane markings only at the junction

3.4 Recommended widths

3.4.1

Advice on widths in the section should not be read as fixed dimensions, but as a guide to help in ensuring that a cycling facility is fit for purpose. Site-specific factors, traffic conditions and anticipated levels of cycling will tend to dictate what is necessary. The 'minimum' width in each case should be seen as the lower limit for a single cyclist to ride in safety and comfort. The 'recommended' width is designed to be more flexible and allow for substantial growth in cycling.

Widths of cycling facilities

3.4.2

Figure 3.10 summarises the minimum and recommended absolute widths, which are described in more detail below. In all cases, consideration should be given to the impact of site-specific conditions on effective width, as described above, and the need to accommodate higher cycle flows over time.

Figure 3.10 Summary of guidance on widths

	Absolute minimum	Preferred minimum
cycle lanes (inc contraflow lanes) **	1.5m	2.0m
lead-in lanes to ASLs (see section 4.3)	1.2m	2.0m
bus/cycle lanes *	4.0m	4.5m
1-way cycle track ** (including segregated lanes)	1.5m (low flow) 2.2m (medium flow) 2.5m+ (high flow)	
2-way cycle track **	2.0m (low flow) 3.0m (medium flow) 4.0m+ (high flow)	
shared use – separated (two-way)	1.5m each for cyclists and pedestrians (low flow) 3.0m each for cyclists and pedestrians (high flow)	
shared use – fully shared (two-way)	2.0m (low flow) 3.0m (medium flow)	

* A 'narrow bus lane' of 3.0m to 3.2m is possible where space does not allow for a lane wider than 4m (except for contraflow and offside bus lanes – see below for more detail). 3.2m to 3.9m should be avoided as it generates situations where unacceptable risks may be taken.

** More width is needed for cycling facilities where separate cycle movements are taking place, particularly at signals. Consideration needs to be given to space for waiting.



Cyclists using the crossing to turn left are directed to wait on the right, allowing others to continue ahead unhindered

Figure 3.11 Flow categories for cyclists

	Peak hour	6am – 8pm	24-hour
Low	<200	<1,000	<1,600
Medium	200-800	1,000-4,000	1,600-5,500
High	800+	4,000+	5,500+

3.4.3

Note that the above minimum dimensions are based on the width of standard bicycles. In order to allow comfortable use by those using trailers and cycles/tricycles used by disabled people, lanes and tracks should normally be 2m wide one-way, but wider where space permits.

3.4.4

On streets that are frequently congested, a narrower lane may be useful to allow cyclists to pass slow or stationary motor vehicles on the approach to junctions. A 1.5m-wide lane may be acceptable in these situations. See 'traffic lane widths' below for more details.

3.4.5

The value given for shared bus lanes allows cyclists space to pass a stopped bus safely and comfortably within the shared lane or for a bus to pass a cyclist with maximum clearance. Widths between 3.2m and 3.9m are generally to be avoided because they create uncertainty about whether enough space is available to overtake but generally do not allow enough space for overtaking. Given that wider bus types are being developed, the preference from a cycling perspective is for shared bus lanes to be 4.5m wide or more wherever possible.

3.4.6

Narrow bus lanes of 3.0-3.2m, where overtaking is clearly not possible, may also be used where bus frequency and cycle flows are both low (up to 20 buses/hour or 100 buses+taxis/hour). Narrow bus lanes should be avoided where there is a significant uphill gradient or where there are high levels of infringement by unauthorised vehicles.

3.4.7

Where bus lanes are on the offside of other lanes or running in contraflow, they ought not to be of the narrow type if cyclists are also permitted to use them – a risk assessment should take place on a site-by-site basis to inform any decision about narrow shared bus lanes of this kind.

3.4.8

Where a bus lane is at least 4.5m wide, it may have a 1.5- to 2m-wide cycle lane marked within it. This could have benefits for cyclists where there are long gaps between bus stops, where a lane becomes a track as a bus stop bypass and/or where the bus lane is time-limited.

3.4.9

For contra-flow bus lanes, widths of 4.5m are desirable where possible but widths down to 3.0m are often adequate, except possibly on longer uphill sections (greater than around 500m).

Traffic lane widths

3.4.10

The introduction of a cycle lane will not necessarily require removal of an existing general traffic lane or result in a negative effect on the overall capacity of a link. In many situations, reducing the width of general traffic lanes can create the space required for a cycle lane, although some caution should be applied where there are high numbers of buses and HGVs. [Manual for Streets 2](#) (2010) states that narrower lanes are easier for pedestrians to cross and can encourage lower traffic speeds without causing a significant loss of traffic capacity. (p53, para 8.6.2)



Traffic lanes narrowed to incorporate nearside feeder to an ASL – Aldersgate Street, City of London

3.4.11

The golden rule is to avoid situations where motorised vehicles and cyclists are expected to move together through a width between 3.2m and 3.9m.

Comfortable overtaking is possible above 3.9m. Below 3.2m it is clear to all parties that overtaking cannot be done safely. Between those widths, however, lies an area of uncertainty where road users might estimate they could overtake each other but where the clearance they would be able to give is inadequate, putting the more vulnerable road user at risk. This includes the typical lane width adopted in much UK practice of 3.65m. Use of this lane width should be avoided.

3.4.12

Where there is no cycle lane, the nearside lane width should therefore either be below 3.2m or at least 3.9m. Where there is a lane, the combined width of the cycle lane and adjacent (nearside) traffic lane should not be between 3.2m and 3.9m.

3.4.13

Where mandatory cycle lanes are provided (and parking is not permitted), the adjacent general traffic lane should be at least 3.0m wide, meaning that the half-road width should be at least 4.5m for a 1.5m cycle lane or 5.0m for a 2.0m cycle lane. The minimum carriageway width that could accommodate mandatory cycle lanes on both sides is therefore 9m, based on a half-road width of 4.5m divided between a 3m general traffic lane and a 1.5m cycle lane.

3.4.14

If the proportion of HGV and public service vehicle traffic is less than 10 per cent then, subject to the carriageway geometry and speed and volume of traffic, motor traffic lane widths may be reduced to between 2.5 and 2.9m, including those adjacent to advisory cycle lanes. Note that deflection due to road geometry needs to be taken into account: a narrow lane may not be appropriate on a bend and may be particularly problematic adjacent to a nearside advisory cycle lane. If the proportion of larger vehicles is above 10 per cent, then general traffic lanes next to advisory cycle lanes should be no less than 3m wide.

3.4.15

Where advisory cycle lanes are used, and the lanes can be over-run by motor vehicles, then an 8m wide carriageway could accommodate 1.5m-wide cycle lanes and 2.5m-wide general traffic lanes on each side. If the centre line of the road is removed, the carriageway could be narrower still: a 7m-wide carriageway could be divided into 1.5m advisory lanes either side of a 4m two-way general traffic lane.

3.4.16

Where parking is permitted, at least another 2.3m needs to be added to the width (and more still for loading bays and disabled parking bays). This comprises at least 1.8m for the bay (less if the bay is half on, half off the carriageway) and a 0.5m gap between the bay and the adjacent cycle lane. A street with bays on one side could therefore be as narrow as 10.3m and still accommodate advisory cycle lanes on both sides and a centre line for general traffic. At 12.6m wide, bays could be provided on both sides. At 9.3m, bays could be provided on one side of a street with advisory cycle lanes either side of a 4m two-way general traffic lane.

3.4.17

Mandatory cycle lanes of 2m or above can be mistaken for a general traffic lane, in which case enforcement becomes an issue. Use of the TSRGD diagram 1057 cycle symbol and/or surface colour can help to clarify where dedicated areas for cycling exist.

3.4.18

Additional protection of cycle lanes from motorised traffic on the rest of the carriageway by physical features has the potential for increasing cyclists' subjective safety and encouraging use. Protection to cycle lanes can be provided by the following methods:

- Hatched road markings outside the cycle lane
- Intermittent traffic islands (which should not reduce the cycle lane width)
- Reflective road-studs (authorised for advisory but not mandatory lanes)



Cycle lane buffered by hatched markings in Beech Street, City of London

3.4.19

Where bus lanes are provided, 3m should be added to the width calculations for a 'narrow' type of bus lane (where overtaking is not possible) and 4.5m for a 'wide' type. Traffic lanes next to narrow bus lanes should ideally not be less than 3m wide.

3.4.20

Note that, in relation to all of the above, lane widths are measured from kerb face to centreline of markings, and vehicle lane widths below 2.5m are seldom acceptable except on roads with very low speeds and flows.

Width considerations for high cycling flows

3.4.21

The above guidance gives some indicative, mostly minimum, figures for cycle lane and track widths, largely based on the dimensions of a single cyclist. On routes where cycle flows could be high, more detailed consideration is needed as the width implemented should ensure the facility does not quickly become congested and lose its appeal for many types of cyclist.

3.4.22

Factors to take into account when considering the appropriate width of a cycle lane or track include:

Physical constraints

This includes the highway width, mature trees, parking and loading facilities and the location of services.

Pedestrian flows and footway widths

Unless the footway is very wide for the pedestrian flows it accommodates, space for cycling should not generally be taken at the expense of pedestrians. Minimum footway widths of 1.8m should be retained, and improved upon where possible.

Predicted cycle flows

(particularly peak flow anticipated and the tidal nature of flows)

Flows of less than 1,000 per day are low; high may be regarded as any flow above 2,000 per day. Some parts of central London already experience the equivalent of 5,000 per day at peak times. Balanced flow assessments should be conducted to identify realistic cycle flows.

Land use and activity levels

The frequency of crossing movements, and the influence that uses on either side of the street may exert on pedestrian movement, may impact on the demand for space and the decision about degree of separation.

Degree of separation

In general, the higher the degree of separation, the greater the width required for the cycling facility (which may reduce the effective width of the facility).

Design speed

Designing bends to accommodate higher bicycle speeds along links is vital and will ensure that all cyclists can travel with an extra level of comfort. Speeds of 18mph (30km/hr) may be regarded as high, and anything below 12mph (20km/hr) low.

User type

The kinematic envelope of a cyclist depends on their speed and the degree to which they 'wobble' when riding (as described in section 3.1), meaning that there is a difference between the width requirements of commuter cyclists and those of more casual cyclists or groups of cyclists. An assessment of potential users may therefore be needed before determining degree (and therefore width) of separation

3.4.23

Other situations not included in the above are key routes such as the Thames bridges where traffic is often congested during peak hours. Here, cycle lanes or tracks should be provided to enable cyclists to overtake on the inside legally, to minimise exposure to vehicle emissions and to maintain momentum on the uphill side of the bridge. Drivers generally respect these lanes, and in these circumstances the provision of a lane can also help to reduce footway cycling.

Street profiles

3.4.24

This section demonstrates how the above guidance on cycle facility types, street types and width can be brought together to derive options for a range of circumstances. The profiles show that, for a given carriageway width, different configurations are possible through adjustment of various parameters:

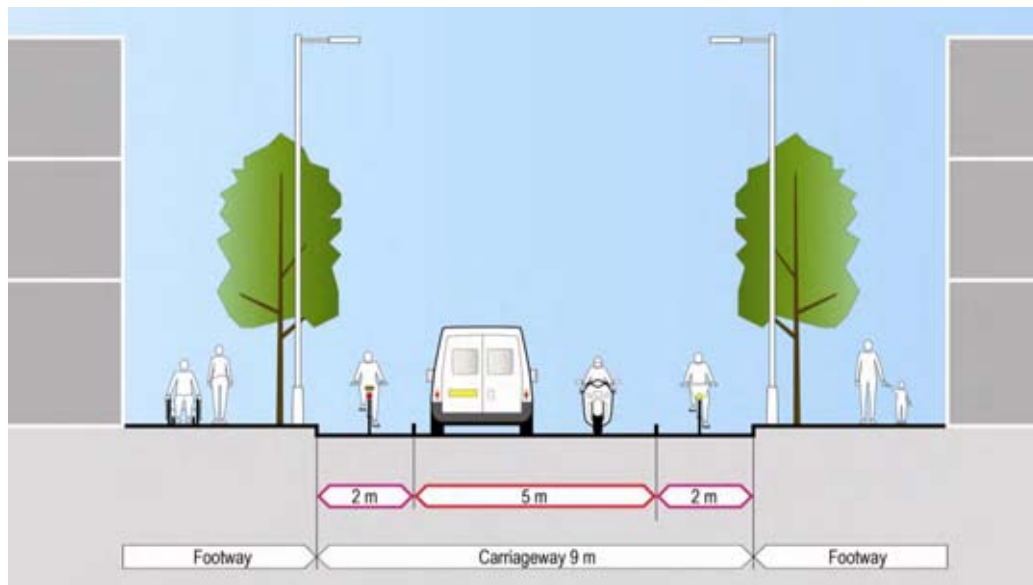
- type of cycling provision (degree of separation from motorised traffic)
- width of cycle lanes/tracks
- one- or two-way working of general traffic in the street
- number and width of general traffic lanes and bus lanes
- parking on one or both sides of the street

3.4.25

9m-wide carriageway

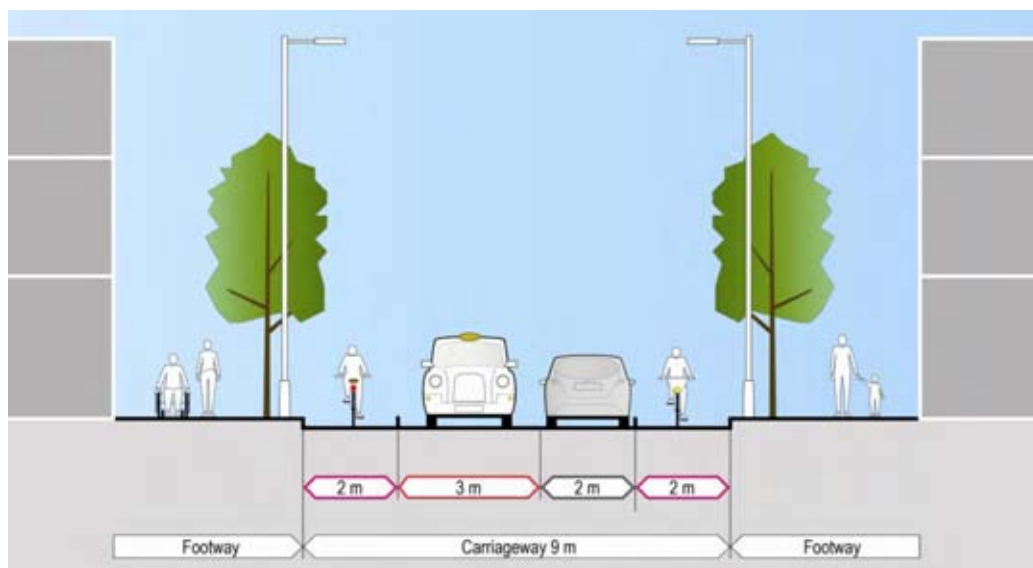
Local street / Connector / City street

Wide, dedicated cycle lanes can be accommodated on both sides. Remaining space for general traffic is 5m, so advisory cycle lanes and/or centre line removal may be advisable to allow passage of all vehicles.



It is difficult to retain parking, unless the street is made one-way to general traffic. If so, the opportunity exists to 'float' the parking on one side and give protection to the cycle lane/track.

In the options in this section, a higher degree of separation could be achieved by adding light segregation to cycle lanes.

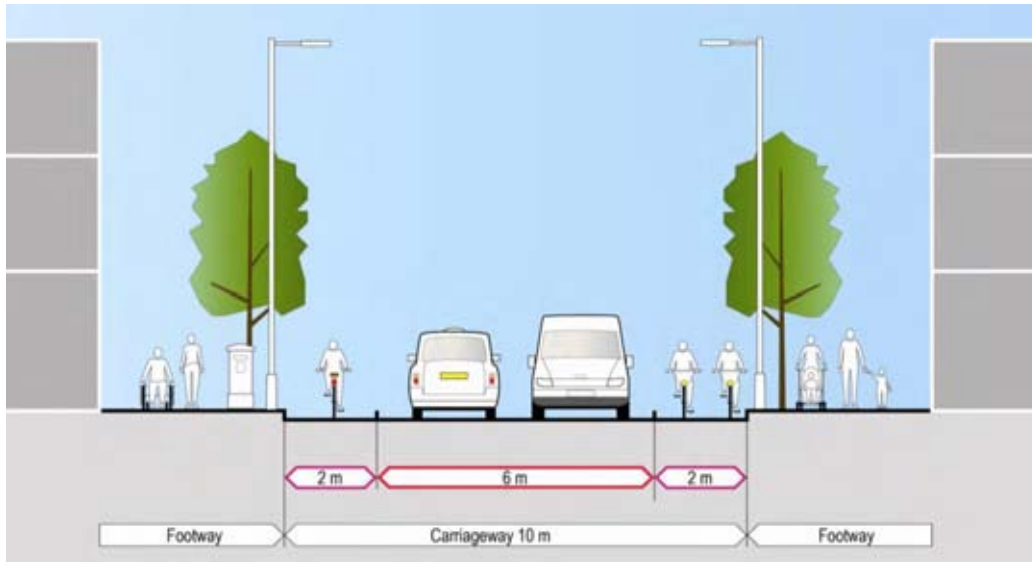


3.4.26

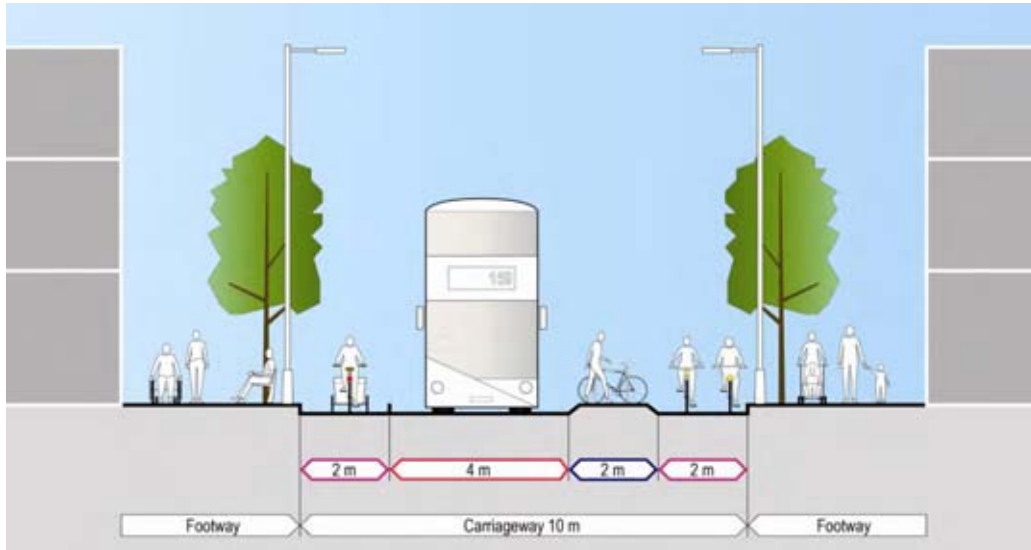
10m-wide carriageway

Connector / High street / City street

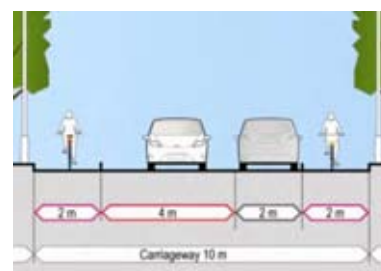
Wide, mandatory cycle lanes can be accommodated without parking and with sufficient space for two-way general traffic in 3m-wide lanes.



Fuller forms of segregation may require one-way working to allow room for a 2m-wide buffer.



The buffer space could also accommodate parking and loading, or be substituted for 'floating' parking.

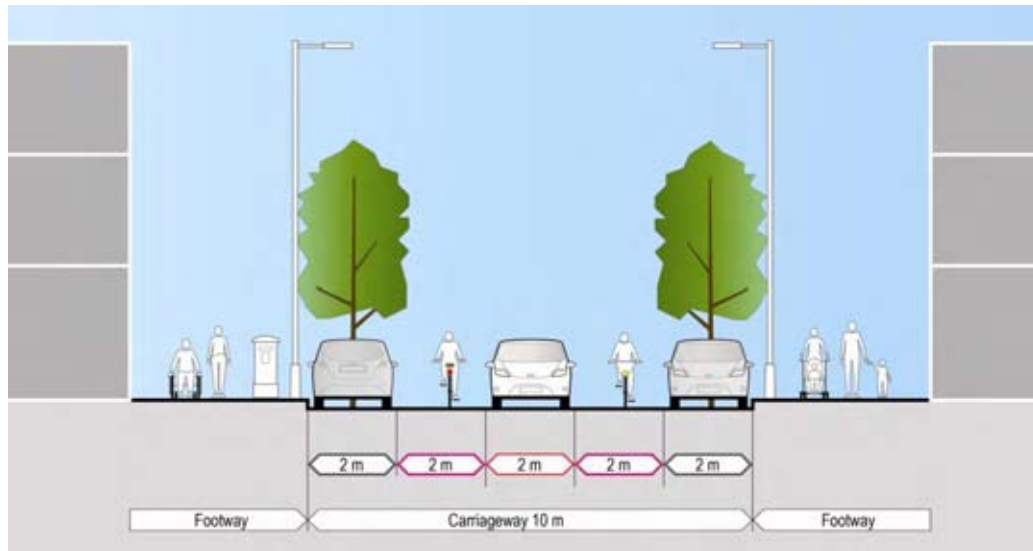


3.4.27

10m-wide carriageway

Local street

An alternative for a local street where parking is needed on both sides could be a 'cycle streets' approach with advisory cycle lanes. This would permit two-way access to all vehicles but at slow speeds, with cyclists having effective priority.

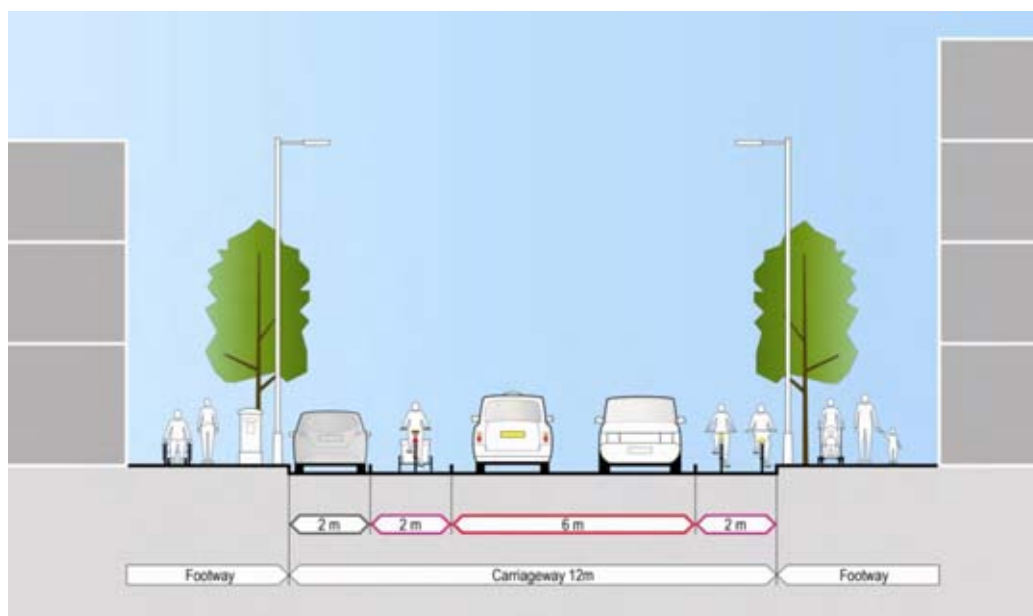


3.4.28

12m-wide carriageway

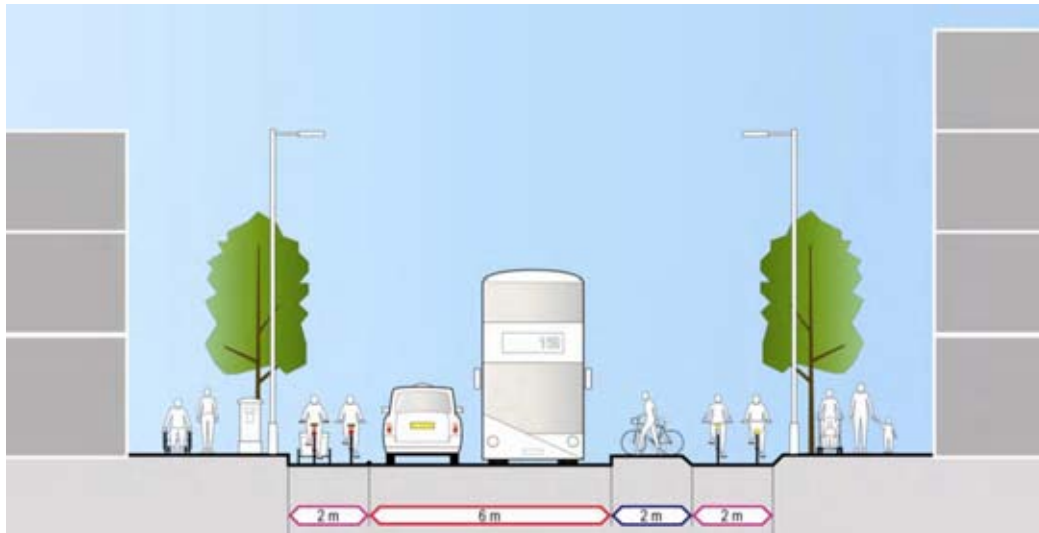
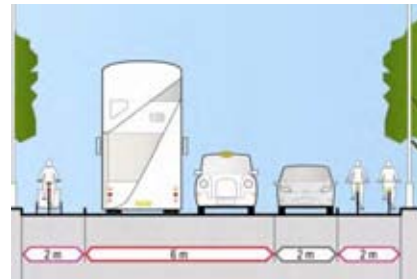
Connector / High street

Wide cycle lanes can be accommodated, together with parking on one side, leaving 6m for two-way general traffic.



The parking could also be 'floated' without losing any space.

For a street with a higher movement function, full segregation could be provided on one side instead of a continuous bay – parking/loading could sit within the segregation.

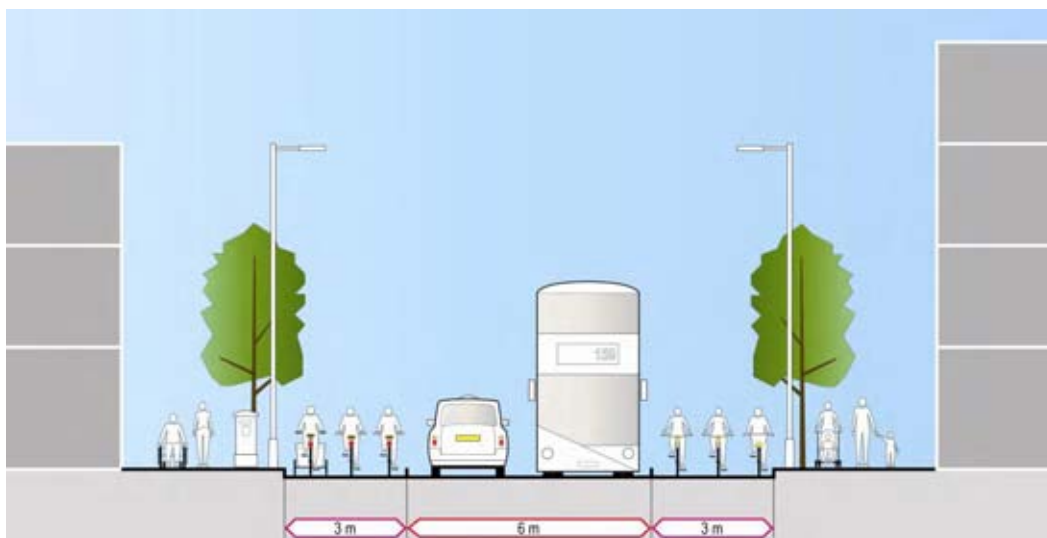


3.4.29

12m-wide carriageway

Connector / High road

Where cycling numbers are very high, parking could be relocated to accommodate cycle lanes as wide as 3m. This still allows two-way working for general traffic. This is only likely to be appropriate where there is very little kerbside activity.

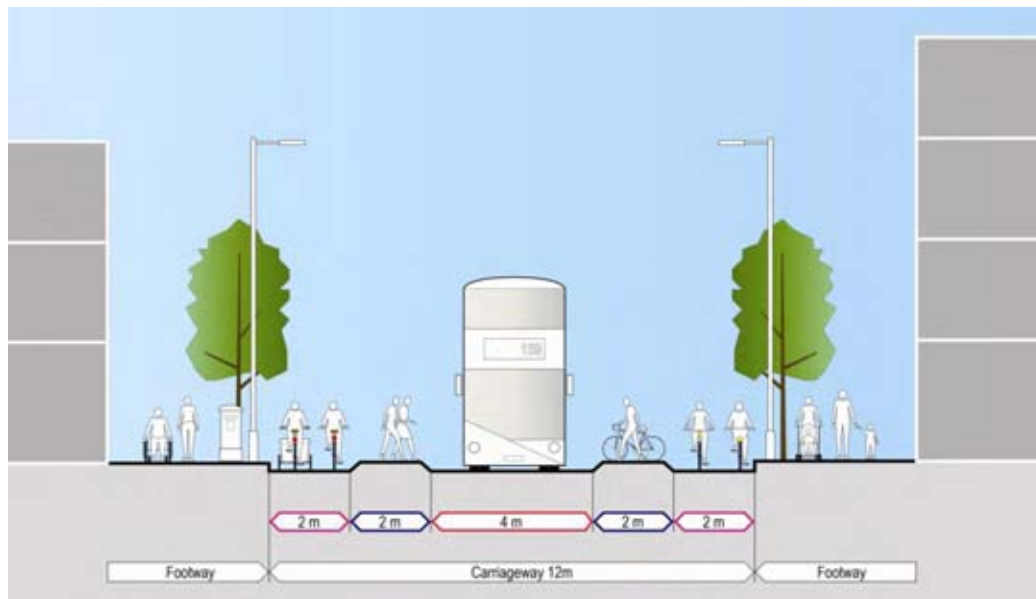


3.4.30

12m-wide carriageway

High road / City hub

A further variant on this approach could be a bus/cycle priority street, where cyclists are segregated either side of a dedicated, one-way bus lane. A similar approach could be applied to a street open to one-way general traffic.

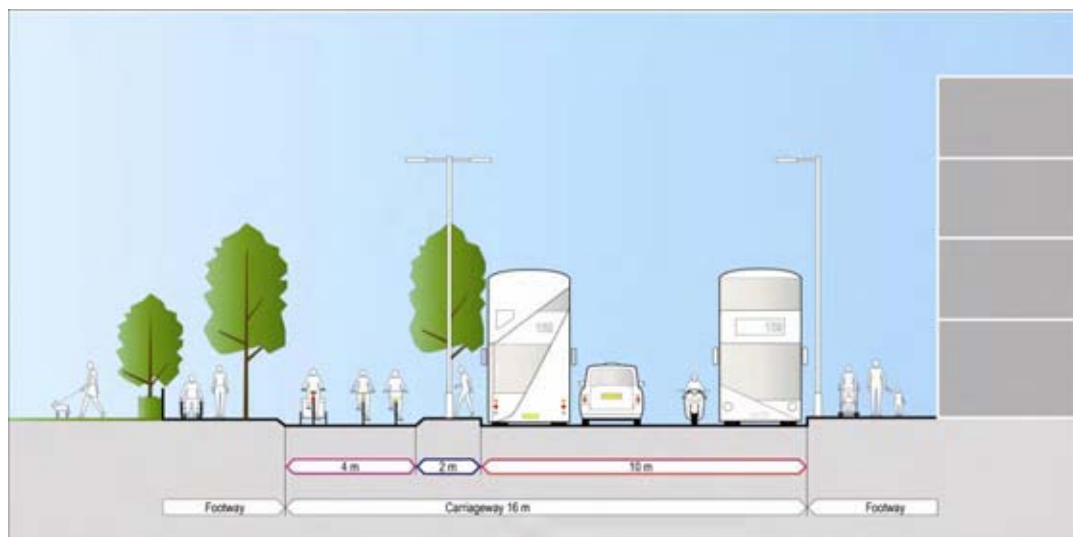


3.4.31

12m+ carriageways

Arterial roads / High roads / City hubs

Wider carriageways offer more possibilities for accommodating cycling on links. Where kerbside activity is concentrated on one side of the road, two-way cycle tracks are an option and could fit within the profile as shown below.



3.5 Priority of cycling facilities

3.5.1

Cycle lanes and tracks should enjoy priority over turning traffic. This is essential not just for directness and continuity, but also safety. A high proportion of collisions involving cyclists arise from motor vehicles turning across cyclists, either through failing to see a cyclist or failing to observe good practice on road user behaviour and priority as set out in the Highway Code (rule 183): 'When turning, give way to any vehicles using a bus lane, cycle lane or tramway from either direction'.

3.5.2

This section covers design that unambiguously gives priority through road markings and design that can help achieve a stronger 'visual' priority. Methods for giving unambiguous priority provided by UK regulations are limited in scope and so 'suggested' priority through design is an important tool.

3.5.3

Some different considerations apply to cycle lanes and tracks respectively. Where cyclists are in lanes, they are generally more visible and are understood by other road users to be on carriageway. Where cyclists are using tracks, separated from the carriageway, there is more ambiguity about their status and they may be more difficult for other road users to see.

3.5.4

The UK lacks a completely supportive legal framework for giving vulnerable road users priority, meaning that physical design and road markings that meet regulations can only achieve so much. Some countries with high levels of urban cycling, such as Denmark and the Netherlands, legally require turning traffic to give way to cyclists and pedestrians on their nearside. People who visit cities such as Copenhagen often report feeling more comfortable and less vulnerable than in London – the experience of motor vehicles giving way to cyclists at junctions is a major part of building that sense of reassurance.

Cycle lanes at priority junctions

3.5.4

Nearside mandatory cycle lanes need to be broken at priority junctions to allow turning movements. For advisory cycle lanes, it is also helpful to highlight visibly the change in the lane's status to prompt a change in behaviour at a location of potential conflict and secure effective priority for cyclists.

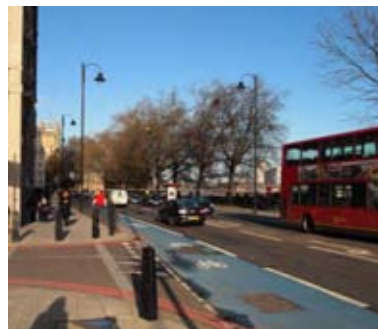
3.5.5

Several different strategies are available to highlight to other road users the ahead movement of cyclists, and the need to give way to ahead movement in the nearside lane (as the Highway Code recommends). These are based on typical road user behaviour: experienced cyclists will tend to move out from the nearside as they approach side roads, both to reduce the potential for being overtaken by a turning vehicle and to enhance their visibility to other road users. Options include:

- widening the lane
- providing a buffer space (of 0.5m) between the the give way (TSRGD diagram 1003) markings at the side road and the cycle lane
- continuing the lane marking across the side road using a short, dashed diagram 1010 marking (these are edge-of-carriageway markings and so do not mean 'give way' but are recognised as lines that should not be crossed without due care – see chapter 6 for further information)
- using surface colour to highlight the potential conflict (which is common practice in Copenhagen)
- using diagram 1057 markings to highlight the cycling facility
- minimising corner radii and providing side road entry treatments to slow turning vehicles (see section 5.2 for more detail on these methods)



Buffer between lane and give way markings, and use of colour



Side road entry treatment and use of colour



Dashed markings and coloured surfacing used for cycle lane

3.5.6

All of the above are visual cues to encourage motorists to slow and/or be more aware of the presence of cyclists before turning. No single measure or combination of measures completely removes the potential conflict but all of them can help improve road user understanding of where cyclists are likely to be. Side road entry treatments and changes to kerblines can have significant benefits for pedestrians – shorter crossings on desire lines, for example – but are more substantial and more expensive interventions that will usually need to be justified as part of a wider traffic management approach rather than a stand-alone measure.

Segregated lanes and stepped tracks at priority junctions

3.5.7

Some different considerations apply when lanes or tracks are physically segregated. In all cases, raising awareness of the presence of cyclists moving past the side road is important.

3.5.8

Segregated and light segregated lanes/tracks must be broken and converted into lanes at priority junctions in order to reintegrate cyclists briefly with general traffic, enhancing their visibility. The distance between the transition point, where the segregation ends, and the mouth of the junction is an important factor in this process of reintegration. Based on interim findings from off-street trials, there are two recommended options:

- 5m or less – where motorised vehicle speeds are low (less than 30mph) and street geometry tight
- 20m or above – in all other cases



Diagrams showing segregation setback distances trialled off-street

3.5.9

The options set out above for treatment of cycle lanes at priority junctions may then be followed. Lanes should be marked as mandatory (with TSRGD diagram 1049 marking) from the point where the segregation ends and then marked across the side road itself with diagram 1010 markings, as described above.

3.5.10

The range of setback distance to be avoided is 5m to 20m as this constrains cyclists but does not have a significant reduction effect on the speed of turning motor vehicles. Greater setback distances may be required where allowance needs to be made for cyclists moving into general traffic lanes to turn right.

3.5.11

This treatment can also be applied to stepped tracks: they can return to carriageway level as lanes through priority junctions. An alternative is to maintain the track at the same level by use of a raised table and apply corner radii that are as tight as possible. The side road should be required to give way to the track at the table, but the provision of markings on the offside of the track should be subject to a site-specific risk assessment. Continuous footway / cycleway treatments could also be applied to reinforce the visual priority in this case (as is observed on major cycle routes in many cities in Sweden and Denmark). See section 5.2 for further details.

Cycle tracks across side roads

3.5.12

Where cycle tracks are more distant from the carriageway – for example, where they are separated by verges or floating parking – then reintegration is, again, a design option. This involves ‘bending in’ the cycle track (diverting it close to the carriageway), returning it to carriageway level some way before the side road and converting it to a lane. This may only be done for one-way tracks, never two-way.

3.5.13

The second option is ‘bending out’, which is the only way of giving unambiguous priority under UK regulations to cyclists as it allows the space for the recommended ‘give way’ markings on either side of the track: both the TSRGD diagram 1003 (double-dash) and diagram 1023 (triangle) markings. With this method, the cycle track continues across the side road on a road hump, raised above carriageway level, but set back of at least 5m from the carriageway. This allows one car to turn into the side road and have enough space to stop to give way to a cyclist on a hump before proceeding. It is an option for one- or two-way tracks.



Bent-out cycle tracks with unambiguous priority over a side road junction at Waterden Road, Hackney. In this instance, the bending is less apparent because the tracks are already set well back from the carriageway.

3.5.14

Cyclists can be given priority over a side road without using a 5m set-back where the side road is one-way leading to the main road (as there is no need to accommodate vehicles turning in). Appropriate set-back, if any, should be determined by visibility considerations for vehicles exiting the side road, bearing in mind the need to give way to the cycle track.

3.5.15

The [Traffic Signs Manual](#) (para 3.25) sets specific requirements for road humps used for bent-out cycle tracks on streets with speed limits of 30mph or less:

- the road hump should be of the flat-topped type and marked with diagram 1062 (the solid triangles showing the sloping part of the hump)
- give way triangle markings (diagram 1023) should be provided on each approach, placed on the carriageway of the road, not on any part of the hump
- longitudinal warning lines to diagram 1004 on each approach (1010 markings could also be used)

However, these conditions are likely to be superseded by the revised TSRGD in 2015 as it is proposed in the consultation draft to remove the requirement for a road hump to allow cycle track priority over a side road.

3.5.16

The above options require deviation of the cycle track – unless the track is already set back 5m from the carriageway on the link – and therefore compromise the directness of the cycle facility. Local conditions, such as low motor traffic flow and speed, low proportion of larger vehicles or high cycle flow, may dictate that a surface treatment, such as a continuous footway and cycle lane/track, is sufficient to give clear visual priority that turning motor vehicles must give way when turning in or out of a side road. A risk assessment should be undertaken on a site-by-site basis.

3.5.17

Where a cycle track is being considered but there are a significant number of side roads, it may be feasible for some of them to be closed or converted to one-way operation by point closure thereby enabling a track to be provided with fewer interruptions.

Cycling facilities across minor accesses

3.5.18

Priority should be given to cyclists at access crossovers, which should be narrowed and raised where feasible. For larger accesses, a give way triangle (TSRGD diagram 1023) may be used to provide further warning to drivers leaving the access that they must give way to cyclists. At wide accesses, such as those at petrol filling stations, alternative measures to slow down vehicles should be considered.

3.5.19

At access crossovers, it is important to retain good visibility of the cyclists for drivers of vehicles intending to turn left across the cycle track. This means keeping the kerbside clear of street furniture and parked vehicles. It is also necessary for drivers leaving the access to have adequate visibility of approaching cyclists.



Track with suggested priority over minor side road entry

Chapter 4

Junctions and crossings

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4.1 Junction design issues

4.1.1

This chapter provides design guidance on the use and adaptation of junctions and crossings to form safer, coherent and comfortable cycling provision, while maintaining optimum accessibility for pedestrians. It is organised according to four categories: crossings, priority junctions (where vehicles on one route have priority over an intersecting route), signal controlled junctions, and roundabouts (including gyratories).

4.1.2

The six design outcomes may be applied as prompts when considering what improvements could be made to enable cyclists to move through junctions or cross other routes more easily:

safety – are there specific issues that need to be resolved, or specific problem locations, based on the collision record of the junction? how can subjective safety for cyclists be enhanced?

directness – are cyclists asked to deviate from their desire lines? could exemptions be made for cyclists from banned movements or even from certain signals?

comfort – can conflicting movements be managed so that all cyclists can feel confident in negotiating the junction? what constraints does capacity impose?

coherence – is the junction legible and intuitive for cyclists – it is clear how a given move should be made and what position should be taken to do it? is junction treatment consistent along a route?

attractiveness – are there opportunities to create usable, attractive public space as part of junction redesign? what is the balance that should be struck between traffic management infrastructure, and the potential for reducing street clutter, and the overall appearance of the area?

adaptability – how might the use of the junction vary through the day, week or year, and over time (might we expect to find a demand for cycling at particular times of day, and growing over time?) is there a role for trialling new layouts?

4.1.3

Quality of provision for cyclists at junctions and crossings is covered by the Cycling Level of Service Assessment, as shown in figure 4.1.

Factor	Indicator	Relates in this chapter to...
Safety: Collision risk Feeling of safety	Left/right hook at junctions Other vehicle fails to give way or disobeys signals Separation from heavy traffic	Junction design: separation of cyclists in space and/or time, use of traffic signals, ASLs.
Directness: Journey time	Delay to cyclists at junction	Balancing separation of cyclists from other vehicles with appropriate priority for cyclists (ensuring that branded cycle routes have reasonable priority). Long delays at signals will deter cycling and reduce compliance.
Directness: Value of time	Value of time	
Coherence: Connections	Ability to join/leave route safely and easily	Use of crossings, appropriate provision at priority junctions and cycle infrastructure at signal-controlled junctions to ensure all desired cycle movements are accommodated.
Attractiveness: Minimise street clutter	Signage and road markings required to support scheme layout	Avoiding over-complication in junction design, so that cycling infrastructure is consistent and intuitive.

Figure 4.2 summarises the content of this chapter by showing potential intervention types for each category of junction for both Superhighways and Quietways. Within each category, more substantial types of intervention are on the left, moving left-to-right through to lighter-touch interventions. This is not to be taken as exclusive of any given approach, but to demonstrate that more decisive changes, likely to have a greater network impact, maybe more appropriate for high capacity Superhighways, while a combination of lighter-touch measures is more likely to be practical for Quietways.

	Crossings	Priority junctions	Signal controlled junctions	Roundabouts
Super-highway	Signal controlled cycle crossing	Convert to signalised junction	Separate signals for cyclists (cycle gate, early start)	Two-way working at gyratory
Quietway	Parallel signal controlled crossings	Changing priorities, banning movements	Managing or removing conflict with left-turners	Convert to cycle-friendly roundabout
	Parallel priority crossings	Introduce crossing	Support for cycle right turn	Remove roundabout
	Shared signal controlled crossing	Lane markings through junction	Bypass to signals	
	Shared priority crossing	Reduce speed on turning (corner radii, tables, entry treatments)	ASLs and feeder lanes	
	Uncontrolled/informal crossing	Introduce refuge islands	Banning movements	
			Convert to priority junction	
			Remove all priority, declutter	

4.1.5

Figure 4.3 below matches junction type with different traffic flow levels, to show indicatively how types may vary with flow. Appropriate design for cycling depends on street type and the site-specific conditions set out in the Cycling Level of Service Assessment.

Figure 4.3 Summary of junction types

Junction Type	Vehicle flows/24 hour		
	main road	side road	cumulative
Priority – without refuge	<5,000	<2,000	5,000
Priority – with central refuge in main road	5,000-10,000	<3,000	10,000
Priority – with controlled cycle crossing	5,000+	1,000+	6,000+
Signal controlled	5,000-20,000	3,000-15,000	30,000
Normal roundabout, with 2-lane entry *	5,000-10,000	3,000-8,000	16,000
Mini- or compact roundabout *	Up to 6,000	1,000-6,000	8,000
Signal controlled roundabout	8,000-15,000	5,000-10,000	20,000

* [DMRB TD16/07](#) defines these roundabout types. See section 4.5 for more details.

4.1.6

Providing for cyclists at junctions is an area where trialling and learning from international practice have had, and will continue to have, a strong influence on design practice. Improvements made by TfL and the London boroughs at junctions and crossings represent an evolving body of practice, and ongoing monitoring and research carried out on such infrastructure schemes will continue to aid understanding of impacts and benefits, and inform future guidance.

4.1.7

From 2012, TfL began working with DfT and other key stakeholders, including borough representatives, on a series of off-street trials at the Transport Research Laboratory test track. Some interim findings from this research have fed into this document but some conclusions may not be available until later in 2014, and so will be incorporated into guidance at a later stage. Wherever possible, innovations in the trial stage have been highlighted in this chapter in anticipation of their eventual full inclusion in LCDS, subject to trial results.

Junction design considerations

4.1.8

It is important for any junction improvement to be based on a comprehensive understanding of the place and movement functions of the location. Sources of information on this include:

- collision history, showing locations, severity of injury and details of the circumstances
- area-wide analysis: relationship between the junction in question and cycling routes, location of public transport stops, information about bus routes, the strategic importance of the streets, kerbside activity, motor traffic speeds
- traffic flow data (including cycling), broken down by time of day and by mode, and traffic modelling
- pedestrian flows, including trip generators and variation by time of day – this should include where crossings currently exist and show pedestrian desire lines

4.1.9

The Junction Assessment Tool, or similar method of analysis, should be applied to any planned intervention, firstly to establish conflicts and cycling movements that are difficult or uncomfortable to make, and then to assess the extent to which a proposal addresses those issues. It is important, however, to keep in mind all desired outcomes: tackling a specific conflict issue could compromise another key outcome, such as directness (avoidance of delay) and may result in poor compliance and more risk taking.

4.1.10

Key conclusions that can be drawn from past research and from analysis of collisions include the following:

‘some of the most significant benefits come from reducing motor vehicle speeds through reducing traffic lane widths, taking out slip lanes and reducing corner radii’ (TRL, [Infrastructure and Cyclist Safety](#) PPR 580, 2011)

‘behavioural factors are prominent, with the two most common contributory factors being “failed to look properly” and “failed to judge other person’s path or speed” – this indicates that infrastructure that influences road user behaviour generally may be more significant than interventions that seek to target specific safety issues’ (TfL, [Pedal cyclist collisions and casualties in Greater London](#), 2011)

Junction geometry and corner radii

4.1.11

Relatively minor adjustments to junction geometry can have a significant effect on the speed of turning vehicles. The advantages to safety that arise from reducing speed need to be balanced against the need to provide adequate visibility and allow larger vehicles to turn.

4.1.12

Small corner radii, often used in conjunction with raised entry treatments or raised tables, can reduce the speed of turning traffic, help simplify tactile paving layouts and reduce crossing distances for pedestrians and cyclists. They are also of benefit to cyclists both on- and off-carriageway because they reduce the zone of risk. Unnecessarily large corner radii can encourage higher speeds by motorists and should be reduced where feasible, particularly at priority junctions and where there is an identified relationship with cyclists or pedestrian casualties.

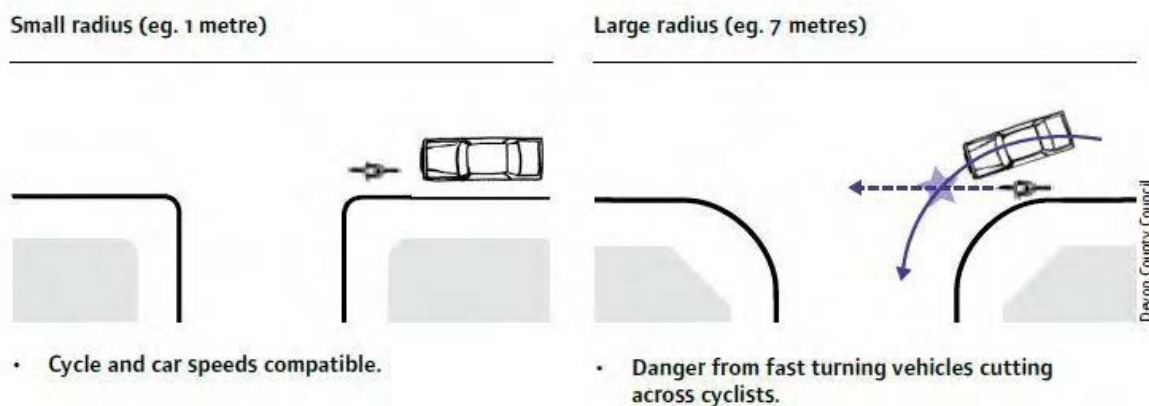


Diagram from [Manual for Streets](#) (6.4.6, p71) showing desirability of smaller corner radii for cyclists

Figure 4.4 Indicative corner radii ranges by street type (movement function)

	arterial road high road city hub/boulevard	connector high street city street	local street town square city place
arterial / high road / city hub/boulevard	6-10m	6-10m	3-6m
connector / high street / city street	6-10m	2-6m	2-3m
local street / town square / city place	3-6m	2-3m	minimal

4.1.13

Many existing streets operate in a satisfactory way with minimal corner radii, even a kerb quadrant only. Designers should start from the assumption that corner radii should be minimised to benefit vulnerable road users, and then test whether this raises any issues. Figure 4.4 shows, indicatively, how corner radii might vary according to the two types of street meeting at a junction, based on the movement function of the street type. For types with a higher place function, the lower end of the range should be used.

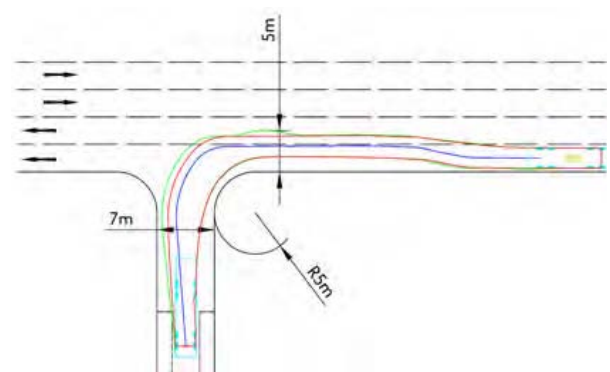
4.1.14

Street types are not the only site-specific factor to take into account when making decisions about corner radii. Other variables that may justify selecting radii towards the lower end of the ranges in figure 4.4 include:

- lower speeds (ideally with a 20mph limit), either on the individual streets or on an area-wide basis
- few large vehicles needing to turn
- wider carriageways and lanes
- more than one lane (turning vehicles may straddle lanes to turn where there is more than one)
- central islands and ASLs
- uphill or level gradients (on the basis that rear-end shunts could be an issue downhill where turning vehicles may decelerate abruptly to turn)

4.1.15

As part of the design process, swept path analysis should be used to track the paths of larger vehicles around corners. ([Manual for Streets](#), 6.3.13) It is usually acceptable for large vehicles to enter the opposing general traffic lane or adjacent with-flow lane in order to turn, provided there are no physical constraints to them doing so. There may need to be some local strengthening of the footway to allow for larger vehicles occasionally overrunning the corner, and it may be necessary to move back a pedestrian crossing, stop line or ASL in order to accommodate turning movements.



Swept path analysis

4.1.16

It is important not to design geometry solely based on infrequent use by large vehicles, such as refuse or removal trucks but, in all instances, the designer needs to take account of the individual site characteristics when choosing the appropriate corner radii. Provided

drivers can make the turn within the overall road space available, it is rarely necessary to design so that they can do so while remaining in a single nearside lane.

4.1.17

In most circumstances, the safety benefits to cyclists of tighter geometry and the slowing of motorised vehicle turning movements outweigh risks to cyclists that exist in relation to larger vehicles moving out to the centre of the carriageway to make a left turn. Turning vehicles should, according to [Highway Code](#) rule 183, give way to a nearside cycle lane, while cyclists should not seek to undertake at priority junctions where any possibility exists that a vehicle may be turning left.

4.1.18

Any change to junction geometry should also take into account the impact on sight-lines, which are needed to ensure adequate visibility at junctions. Conformity with [Manual for Streets](#) guidance is recommended:

- for side roads, the minimum 2.4m 'X' distance should be used – allowing full visibility for the driver of an emerging vehicle without needing to cross the give way markings
- in low flow situations, 2.0m may be acceptable, although it is likely to require some protrusion into the main carriageway.
- for cycle tracks crossing other routes or footpaths, the minimum 'Y' distance should be 20m (based on a cycling speed of 12mph)

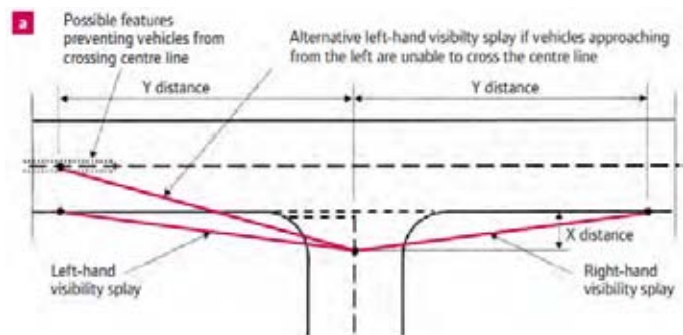


Diagram from Manual for Streets showing x- and y-distances are defined.

4.1.19

Reducing visibility should not compromise cycle safety at priority junctions and a risk assessment should be undertaken to check whether reduced 'Y' distances and tighter geometry generally are acceptable from a cycling perspective. There may, for example, be occasions where horizontal deviations to improve cyclists' sight lines or speed humps should be added on the approach to a crossing, junction or shared-use area.

4.2 Crossings

4.2.1

Crossings are a significant part of the cycling network in London for two quite different reasons:

- Crossings that bicycles can use are important for safely negotiating roads with high motor traffic speeds and volumes, for linking cycle routes and for giving coherence to cycling networks. The type and location of these crossings has a bearing on the directness, coherence, comfort and safety of cycling provision.
- The location, type and operation of pedestrian priority crossings has an impact on the cycling facilities they cross, whether on- or off-carriageway – they give rise to many of the same considerations as dealing with cyclists at junctions.

4.2.2

Crossing types over carriageways may be categorised as follows, with six different types having the potential to be used for cycling infrastructure, as shown in figure 4.5. Type [4] is included in the consultation draft of TSRGD (2015), issued in May 2014, but will not exist in Regulations until TSRGD is adopted in 2015. At a stand-alone location, parallel cycle and pedestrian crossings could be created but this requires introduction of a signal-controlled junction, so it is the same as type [1]. For the purposes of this guidance, shared, ‘toucan’-type crossings are dealt with as a single type – type [3], regardless of whether they are part of a signal-controlled junction.

Figure 4.5 Cycle and pedestrian crossings over general traffic lanes

	Junctions under signal control	Stand-alone locations
Crossings that may be used by cyclists	<p>[1] Parallel pedestrian and cycle crossings</p> <p>[3] Shared pedestrian/cycle crossing</p>	<p>[2] Signal-controlled cycle crossing</p> <p>[3] Signal-controlled shared crossing (toucan, pegasus)</p> <p>[4] Priority parallel pedestrian and cycle crossings</p> <p>[5] Priority shared crossing (zebra)</p> <p>[6] Uncontrolled / informal crossing</p>
No cycling	Pedestrian-only crossing	Signal-controlled pedestrian crossing (pelican, puffin)

4.2.3

The regulatory framework on crossings is described in the [Zebra, Pelican and Puffin Pedestrian Crossings Regulations and General Directions](#) (1997) until this is superseded by the revised TSRGD in 2015. Advice and guidance is provided by DfT in [LTN1/95, Assessment of Pedestrian Crossings](#), [LTN 2/95, Design of Pedestrian Crossings](#), [TAL5/05 Pedestrian facilities at signal-controlled junctions](#) (2005) and [Signing The Way](#) (2011).

4.2.4

Reference should also be made to [Guidance on the use of tactile paving surfaces](#), which describes requirements for accessible crossings. All crossings should be step-free, which can be achieved either through dropped kerbs or by placing crossings on a raised table or entry treatment. There may also be advantages for partially sighted people in using a surface material for the crossing that has a colour contrast with the carriageway. Relevant streetscape and local design guidance should be consulted for advice about materials.



Crossing on a raised table and with contrasting surface treatment, Waterden Road, Hackney



Wide crossing, consisting of two parallel stand-alone, signal-controlled crossings, with contrasting surface treatment, St Paul's Churchyard, City of London

Selecting the crossing type

4.2.5

For a cycle route crossing a road, the most appropriate crossing choice generally depends on the traffic conditions of the road in question – indicative flows by crossing type are shown in figure 4.6. Since signals are expensive to install, operate and maintain and tend to have a negative impact on the street environment, signalisation should be a last resort. For that reason, types [4] to [6] are generally recommended for the lower-intervention Quietways, although new signals may be needed in some locations. Use of zebras and uncontrolled crossings is unlikely to be adequate for high-capacity Superhighways.

4.2.6

At a site-specific level, the appropriate crossing option for a given location also depends on the character of the place in question and considerations of street clutter and accessibility. Where a pedestrian or cycle desire line has been identified, type [6], an

uncontrolled crossing, should be considered first, as the ‘lowest intervention’ form. This is likely to be suitable for locations with relatively low levels of use by those crossing and where traffic speeds and volumes are low enough to allow safe opportunities for crossing.

Figure 4.6 Cycle crossing options

	Type of crossing	Flows (24hr)		
		All vehicles (carriageway)	Bicycles (crossing)	Pedestrians (crossing)
SUPERHIGHWAYS	1. Parallel signal-controlled pedestrian & cycle crossing	> 8,000	Medium-High	Medium-High
	2. Signal-controlled cycle-only crossing	> 8,000	Medium-High	None
	3. Shared pedestrian/cycle crossing (Toucan / Pegasus)	> 8,000	Low-Medium	Low-Medium
	4. Parallel priority pedestrian/cycle priority crossing	3,000-8,000	Medium	Low-Medium
	5. Shared pedestrian/cycle priority crossing (Zebra)	3,000-8,000	Low to Medium	Medium
	6. Uncontrolled (central refuge)	3,000-8,000	Low	Low

Crossings at signal-controlled junctions

4.2.7

Cycle tracks or shared use paths/areas may be joined across one arm of a junction under signal control by using either a shared or separate, parallel pedestrian and crossings or by using type [3], a shared crossing. Parallel crossings, type [1], are a good option where there is high demand by both cyclists and pedestrians, thus reducing potential conflicts between the two modes on the crossing. They may be particularly useful where cyclists are approaching from a different direction from pedestrians. This is often the case when one route is a side street closed to motor traffic. Type [2] is a variant where there is no parallel pedestrian crossing facility. For this type, reliable cycle detection, or a push-button, should be used so that demand can be prioritised and delay minimised. Where the cycle crossing cannot align with the cycle route in a way that allows cyclists to remain on carriageway, a shared use area will be required to allow access to the crossing.



Type [1]: parallel crossings at Westferry and West India Dock Road. Ladder and tramline tactile paving are used for transition from track to shared area.



Type [2]: stand-alone cycle crossing at Goswell Road

4.2.8

Square elephant's footprints markings are recommended for both type [1] and [2] crossings, although pedestrian crossing studs are also sometimes used for this purpose. The consultation draft of TSRGD (2015) proposes a general authorisation for elephants' footprints to mark a parallel cycle route at a crossing under signal control, where previously site-specific authorisation was required. This should add consistency and will bring the UK into line with other parts of Europe on use of a square-format marking for cycle crossings.



Signal-controlled cycle crossings, using elephant's footprint markings through the junction

4.2.9

In some cases, providing cycle gaps through islands may more be appropriate than marking elephant's footprints across the carriageway. It may be necessary to use 'Keep Clear' markings so that queuing traffic on the carriageway does not block the crossing.



Cycle gaps – in the example on the right, the crossing area is created by using 'Keep Clear' markings

Stand-alone signal-controlled crossing

4.2.10

Shared crossings at stand-alone signals are known either as toucan or pegasus crossings, the latter being a special type that also allows horse-riders to cross. As part of signal-controlled junctions, they are generally not known by these names but the design issues are similar. In a toucan crossing, the surface of the crossing and footway areas immediately on either side are shared, although there may be some separation up to that point.



Pegasus crossing

Variants to the standard toucan layout are possible for locations such as side-road junctions that can enable more direct crossings. The DfT provides guidance in [TAL 10/93, Toucan: an unsegregated crossing for pedestrians and cyclists](#) and in [TAL 4/98, Toucan crossing development](#).



Typical toucan crossing arrangements, with shared use and tracks on either side (colour optional)



Toucan crossings are often used to carry off-carriageway tracks through or around junctions

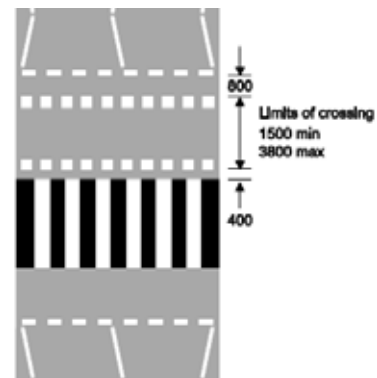


Toucan crossing used to connect streets for cyclists across a main road, Featherstone Street/Leonard Street

Parallel priority crossings

4.2.12

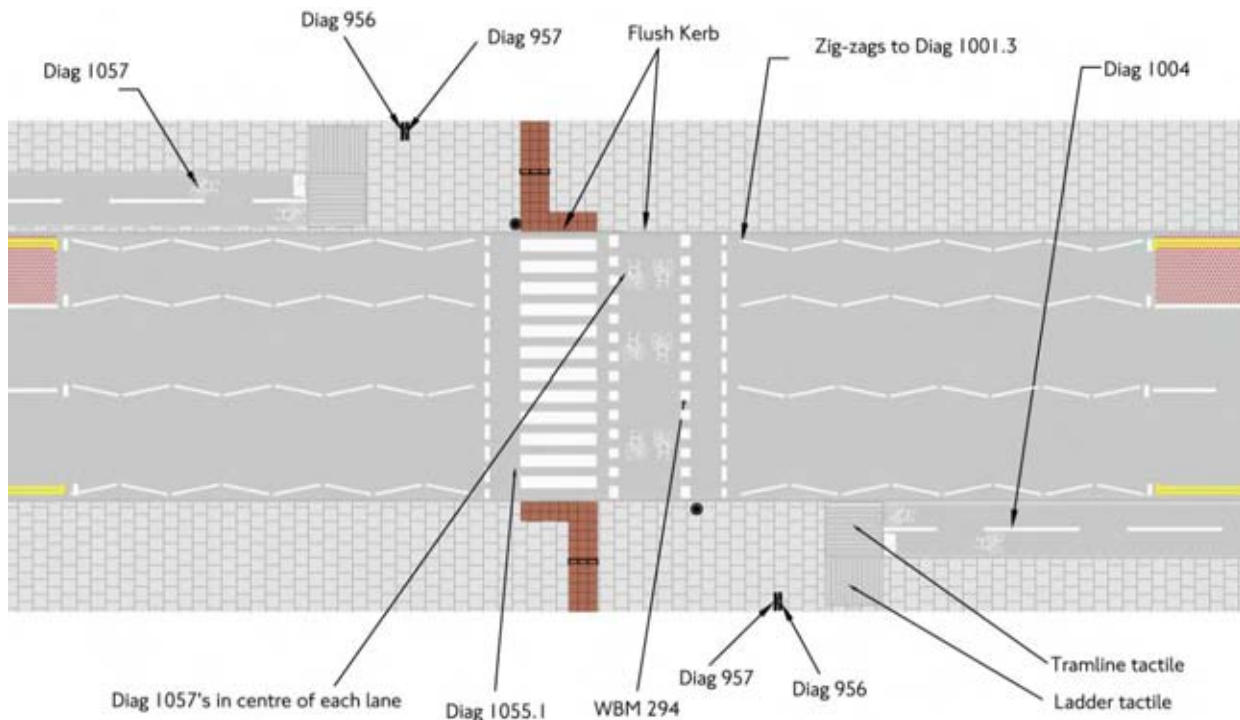
The consultation draft of the revised TSRGD (2015) proposes a new crossing type that would allow for parallel pedestrian and cycle crossings without the need to install signal controls. This priority crossing is similar in appearance to a zebra crossing but with a parallel route for cyclists, marked with elephants' footprints within the controlled area of the crossing. This type will be available to use when the new regulations are adopted in 2015 and will bring the UK more into line with international best practice. Details are yet to be established, including whether two sets of elephants' footprints markings are possible on one crossing and whether diagram 1057 cycle symbols may be used on the crossing area.



Draft revised TSRGD, table 69, item 51



The case for parallel priority crossings. In the UK (left), regulations have not previously allowed for a parallel cycle route at a priority crossing – cyclists are asked to give way twice. A much simpler approach exists in Stockholm, right, where cycle crossings with elephants' footprints are provided within the controlled area of the 'zebra-type' priority crossing.



Indicative layout 4/01: Parallel crossing transfers cycle track to the opposite side of a carriageway

4.2.13

The parallel priority crossing could be used to connect off-carriageway tracks across a main road, to allow crossing from and to streets closed to motorised traffic and to shift two-way cycle tracks from one side of the road to the other.

Priority (zebra) crossing

4.2.14

Wherever possible, separate parallel crossings should be provided for pedestrians and cyclists. However, a low-intervention option may be to use a zebra crossing to take a cycle route over a main road. This option is likely to work best where there are low flows of both pedestrians and cyclists, and could be a pragmatic choice where there are existing shared use footways on either side of the carriageway – for example, in a 'high road' location near a school.



Conventional zebra crossing (left), with buff blister tactiles. Shared area on either side of the zebra (right) to legitimise cycle use of the crossing.

4.2.15

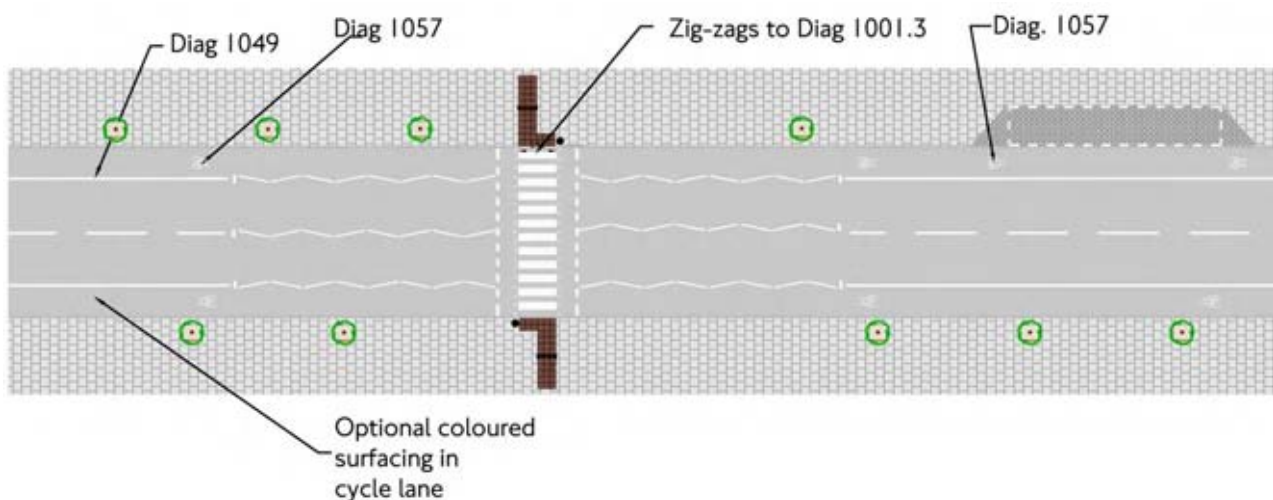
DfT's [Signing The Way](#) (2011) invited highway authorities to permit, at trial locations, cycle use of zebra crossings where they join off-carriageway cycle routes. TfL's position, drawing on conclusions from TRL's [Shared Zebra Crossing Study](#) (2006), is that cyclists can legally ride across zebra crossings in this scenario. A risk assessment of any proposal for cyclists to use zebras is important: although it is not illegal for cyclists to ride over zebra crossings in these instances, they do not formally have the same priority as pedestrians over traffic using the carriageway.

4.2.16

Special design considerations for priority crossings that cyclists may use include: geometry designed to accommodate both pedestrian and cycle flows; design to force cyclists to slow or stop and to give them adequate visibility before crossing; and signing and road marking to make other users aware of the likely presence of cyclists on the crossing.

4.2.17

Where a zebra crossing is marked across a street with a cycle lane, the lane markings may not be continued through the zig-zag markings that show the controlled area of the crossing. However, the consultation draft of TSRGD (2014) allows for the zig-zags to be moved away from the kerbside to align with the cycle lane markings and allow for greater visual continuity of the cycle facility.

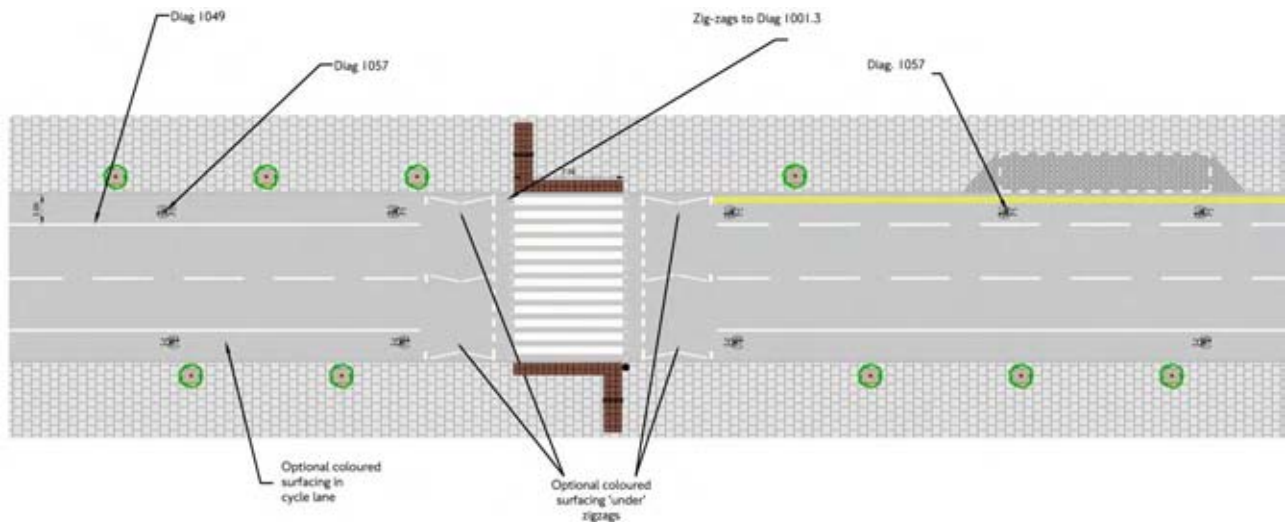


Indicative layout 4/02: Continuity of cycle lane at priority crossing

4.2.18

Note that the number of zig-zag markings may be reduced to from eight to two, depending on site-specific conditions such as visibility and the existence of other parking controls. Where the number of zig-zags is reduced, it may be advisable to widen the crossing, especially where the approach is not straight.

For carriageway widths of 6m or less, the central set of zig-zags may be omitted.



Indicative layout 4/03: Two zig-zag markings at zebra crossing

Uncontrolled crossings

4.2.19

Uncontrolled crossing points for pedestrians and cyclists generally consist of dropped kerbs on either side of the carriageway, with an 800m strip of blister tactile paving across the width of the crossing area, to the dropped kerb. A 2m-deep central island to provide protected waiting space can be beneficial along with road narrowing, provided this does not create pinch points for cyclists using the carriageway. Some speed reduction measures on the carriageway may also be appropriate.



Uncontrolled crossing, Sidmouth Street, Camden



Dropped kerbs for uncontrolled crossing, College Street, City of London

4.2.20

These 'courtesy' crossings do not give priority over vehicles on the carriageway. However, introduction of give-way signs and markings for motorists with a raised table would give formal priority to crossing pedestrians or cyclists without the need for a zebra crossing.

4.2.21

A variant of the uncontrolled crossing is to use materials and streetscape features to 'suggest' that a crossing facility exists, encouraging drivers to slow down through the space and give way as necessary to anyone wanting to cross. These facilities can include informal crossing areas that are striped in the manner of a zebra crossing but do not otherwise meet regulatory requirements (therefore they do not confer any formal priority on the crosser). These kinds of approaches are often used in shared space schemes.

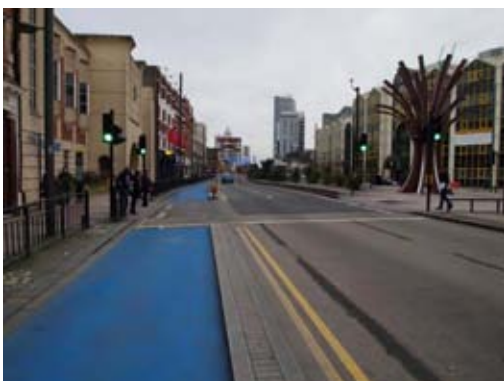


'Suggested' crossing places in high street environments in Bexleyheath (left) and Hornchurch (right), using streetscape features such as raised tables, median strips, planting and a distinctive palette of materials to help break down dominance of the environment by motorised vehicles.

Pedestrian crossing of cycle tracks

4.2.22

For segregated lanes/tracks and light segregated lanes, crossings should ideally extend from footway to footway. In that way, the cycling facility is included within the controlled area of the crossing. This also avoids the need to design a separate way for pedestrians to cross a cycle track.



Signalised and priority (zebra) crossings extending over both carriageway and cycle track

4.2.23

Where there is not a crossing facility that can extend across both carriageway and segregated cycle lane/track, then uncontrolled and suggested crossings are likely to be

the most practical options, given that signalisation or installing a fully compliant zebra crossing would be too heavy handed and expensive for a short crossing only involving cyclists and pedestrians. Many other countries have a small, uncomplicated crossing type that gives crossing pedestrians priority over the cycle track.

4.2.24

In some instances, it may be appropriate to use an uncontrolled crossing to allow pedestrians to cross a cycle track next to the carriageway to an island and then a zebra or pelican crossing over the main part of the carriageway. In this case, the crossings should be staggered so it is clear that the two sections have a different status.



'Mini zebra crossing' over a cycle track, Stockholm



Pedestrian crossing over a cycle track in Seville, with extra warning for cyclists

4.3 Priority junctions

4.3.1

The majority of highway junctions are of the ‘priority’ type – crossroads and T-junctions – where vehicle priority is given to traffic on the major road. The priority is usually indicated by give-way or stop-lines and associated signs, or suggested by pedestrian refuges and traffic islands. In some cases no road markings may be considered to be necessary where vehicle speeds and flows are low.

Figure 4.7 Summary of options for cycle-friendly interventions at priority junctions

SUPERHIGHWAYS	QUIETWAYS	1. Introduce refuge island(s)	Recommended to support cycle and pedestrian crossing, and cycle right turns, but only where avoiding the creation of pinch-points with unacceptable widths.
		2. Reduce speed on turning (entry treatments and raised tables)	Speed reduction generally is beneficial (see chapter 5). On cycle routes, selective use of entry treatments and raised tables can address common risks on turning and suggest visual priority for cyclists and pedestrians. Other changes to geometry that can support speed reduction include: kerb realignment, reduced corner radii, reduced width of junction mouth and footway build-outs. Preventing or restricting parking and loading close to the junction is an important supporting measure in most cases, helping to maintain good visibility.
		3. Road markings through junction	Visual priority can be supported by a combination of: use of TSRGD diagram 1057 cycle symbols, dashed diagram 1010 markings across the mouth of the junction and coloured surfacing. These interventions raise road user awareness of the presence and legitimacy of cycling and specific cycle movements.
		4. Introduce new crossing	Crossings on a main road can help cycle movements in and out of a side road. For streets with a higher movement function, consideration could be given to allowing cycle left and right turns by diverting cyclists onto shared areas of footway and parallel or toucan crossings. See section 4.2.
		5. Change or reverse priority / Ban specific movements	These changes can help address specific conflicts between turning motorised vehicles and cyclists and enhance the directness, safety and comfort of a cycle route. Interventions such as these need to be part of a wider traffic management approach.
		6. Convert to signalised junction	A last resort, justification for which would need to be made on multiple grounds, according to TfL’s Design standards for signal schemes, SQA064 (2014). See section 4.4.

4.3.2

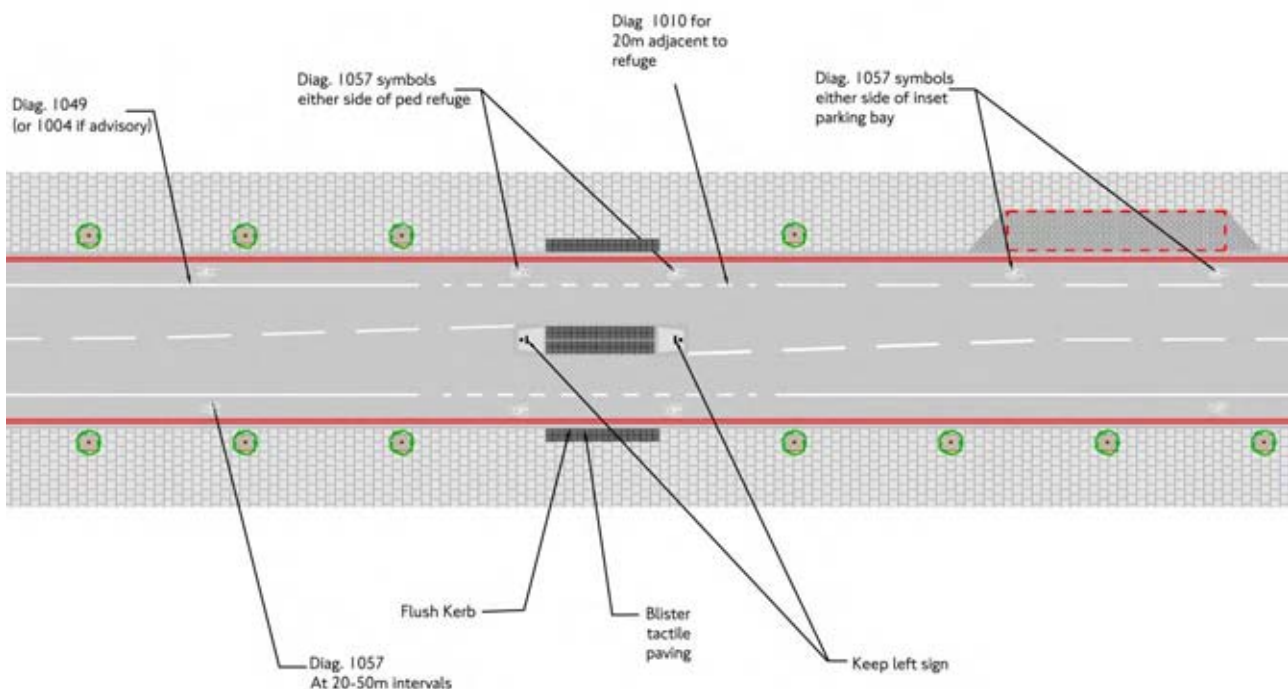
For cyclists, key issues relate to the safety and comfort of moving ahead through a priority junction while motorised traffic seeks to turn in or out, and the safety, comfort and directness of cycle turns into and out of junctions. Priority for ahead cyclists is covered in section 3.5. Any turn for cyclists that involves moving across more than one lane of motorised traffic in one step is likely to be uncomfortable for most users. This section focuses on methods of addressing this issue – its scope is summarised in figure 4.7.

Refuge islands

4.3.3

For cycling infrastructure, two separate issues need to be considered with the use of refuge islands:

- where islands are provided to assist pedestrians crossing the road or for driver guidance, they must avoid creating pinch-points for cyclists; and
- the potential for assisting cyclists by allowing them to make difficult turns under the ‘shadow’ of a protecting island.



Indicative layout 4/04: Cycle lanes at pedestrian refuge island / uncontrolled crossing

4.3.4

Guidance on widths in figure 4.8 should be followed so as to avoid intimidating close passes of cyclists by motorised vehicles at refuge islands. Driver awareness can be increased by continuing a cycle lane through the area (which usually requires conversion from mandatory to advisory in order to allow for some possible encroachment by

motorised vehicles), cycle symbols or coloured surfacing. Cyclists should be able to maintain their speed and consistent line of travel on a direct route, so diverting them off-carriageway around an island should be avoided. ‘Cattle pen’ pedestrian refuges with guard-railing should not be used – refuge treatments should have upstand kerbs to enable safe and direct crossing for pedestrians. In some instances, it may be desirable to replace an informal crossing with a formal pedestrian crossing and achieve consistently wider cycle lanes.

Figure 4.8 One-way lane widths at refuge islands where no cycle track or bypass is provided

85 th percentile traffic speed	Traffic calmed, no buses or HGVs	No calming, no buses, HGVs etc	No calming, with buses, HGVs etc
< 20 mph	<2.5m	<2.5m or 4.0m+	<3.0m or 4.0m+
21 – 30 mph	<3.0m or 4.0m+	4.0m+	4.0m+
> 30 mph	4.0m+	4.0m+	4.5m+

4.3.5

An alternative is to design a bypass to a pinch-point. This should not deviate a cyclist, avoid creating conflict with pedestrians, allow a minimum width of 1.5m between obstructions, be marked with a cycle symbol on the approach and be designed to prevent blocking of the entrance and exit by other vehicles. The last of these may require waiting and loading controls but preferably should be done without relying on enforcement. Any vertical change required for use of the bypass by cyclists should not exceed 1:10.

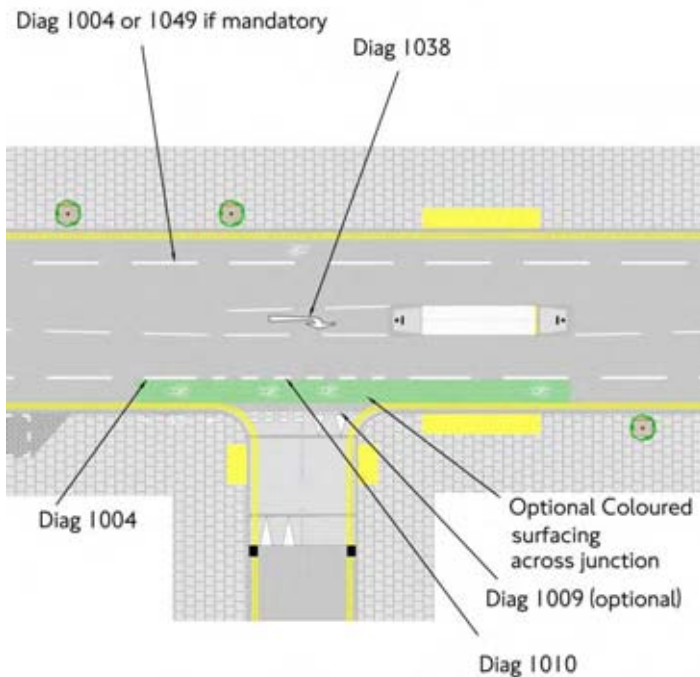


Cycling bypasses used as part of traffic calming measures

4.3.6

Uncontrolled pedestrian crossings with islands can, indirectly, play a useful role in helping cyclists to cross, or get on or off, a main road. They give an effective waiting area, with some protection in the ‘shadow’ of the island, and can therefore help cyclists make difficult

or uncomfortable manoeuvres in more than one step. This can be particularly useful where a (minor) cycle route crosses a busier road. Islands either side of a priority junction can provide a even more protected space to make two-stage cycle movements. This arrangement may require banning of right turns by motorised vehicles.



Pedestrian refuge island assists cycle right turn

Illustrative layout 4/05: Island-protected cycle right-turn into side road

4.3.7

Islands may be useful for protecting cyclists in other circumstances, such as the continuity and safety of contraflow cycling facilities run through a priority junction, or protecting cycle lanes from motor vehicle incursion just before priority junctions.



Island protecting contraflow cyclists at priority junction, Paul Street, Hackney



Hatched area and island protection before side road access, Baylis Road, Lambeth

Entry treatments, raised tables and footway build-outs

4.3.8

Research has shown that side-road entry-treatments have significant safety benefits for cyclists, particularly where provided in conjunction with other street enhancements, such as tree planting. A reduction of around 30 per cent in cycle collisions was found at over 1,000 sites in London. (TfL, [Effect of Side Raised Entry Treatments on Road Safety in London - London Road Safety Unit Research Summary No 9](#), 2007.) Entry treatments to side roads adjacent to a main road are therefore recommended for a cycle route on the main road. However, all vertical forms of traffic calming, even well designed examples, add some discomfort for cyclists riding over them. They may therefore be appropriate on other roads that are traversed by a cycle route or have cycle usage, but a balanced view needs to be taken of the benefits they offer relative to the downsides.



Entry treatment with asphalt table, Gray's Inn Road / Heathcote Street, Camden



Block-paved entry treatment with tight corner radii – Walworth Road, Southwark



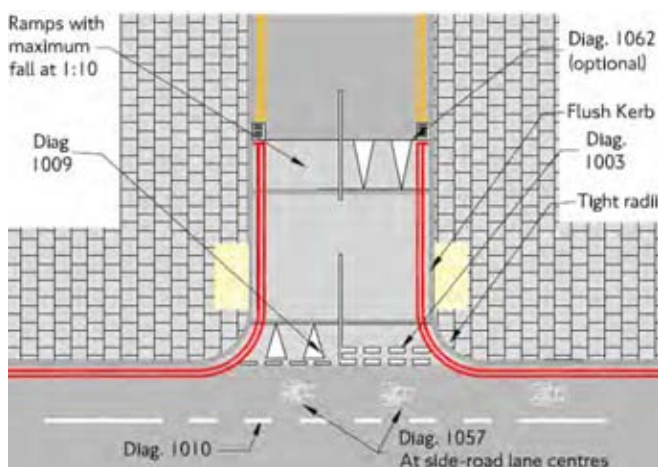
Typical entry treatments in the City of London, with visual contrast with carriageway: at a narrow street with cycle contraflow (Cloak Lane, left) and at a two-way street (Trump Street, right)

4.3.9

To provide the best conditions for cyclists, and to encourage motorists to make careful turning movements into and out of side roads, entry treatments should:

- narrow the side-road carriageway to between 5.0m and 6.5m, depending on the type of traffic using the road (greater widths are likely be required on access routes used by buses, emergency response vehicles, HGVs and refuse collection trucks)
- use a corner radius of kerb-line below 6.0m – see section 4.1 for further guidance

- raise the carriageway by 50-100mm, up to the same level as the adjacent footway
- use materials that have a visual contrast with the carriageway surface to raise awareness (bearing in mind guidance in chapter 7 of this document and in other streetscape and local design guides on appropriate surface materials, particularly from a maintenance perspective)
- use approach sinusoidal ramps, with 1:10 gradient (shallower gradients may be needed on bus and emergency-service routes)
- be constructed using asphalt ramps or other non-skid material
- provide flat pedestrian crossing areas of at least 3m width with blister tactile-paving (off carriage/cycleway) to indicate crossing location
- avoid upstands of more than 6mm where pedestrians cross (as this is likely to interfere with the movement of people in wheelchairs)
- provide cycle stands on footway space created by the entry treatment where demand for them is reasonably anticipated – allowing for considerations of visibility, these and other forms of street furniture can fulfil a similar function to bollards to prevent vehicle over-run of the footway area.



Ramp up to entry treatment, Gresham Street, City of London

Illustrative layout 4/06: Raised entry treatment

4.3.10

Raised tables extend the logic of raised entry treatments across all arms of a junction or crossing area, which can be effective in slowing turning movements but, again, puts in place a vertical shift for cyclists moving through a junction. Where assessment of the junction indicates that there would be a net benefit from a safety and comfort perspective in constructing a raised junction table, these are recommended cycle routes, provided they are constructed in accordance with the above advice. Like entry treatments, junction tables convey to motorists not to expect to have priority over other road users, and to turn with appropriate caution.



Raised table, Mercer Street, Westminster

4.3.11

Entry treatments and raised tables do not require Traffic Orders but are covered by the Highways (Road Humps) Regulations 1999. These state that the highest point on a flat-topped road hump must be within 25 and 100mm of the carriageway surface. In order to construct a raised entry treatment flush with the footway on either side where kerb heights are greater than 100mm, some raising of the carriageway surface in the area leading up to the entry treatment will be necessary to meet the 100mm requirement.

4.3.12

It may be beneficial to continue footway and cycleway treatments across the mouth of the side road to convey further necessary priority for pedestrians and cyclists. Turning vehicles will need to negotiate a change in level, and they must enter and pass through a zone that looks and feels different and where they should clearly cede priority to other users. This is not practised often in the UK but has been applied in key cycling routes in cities such as Copenhagen and Stockholm.



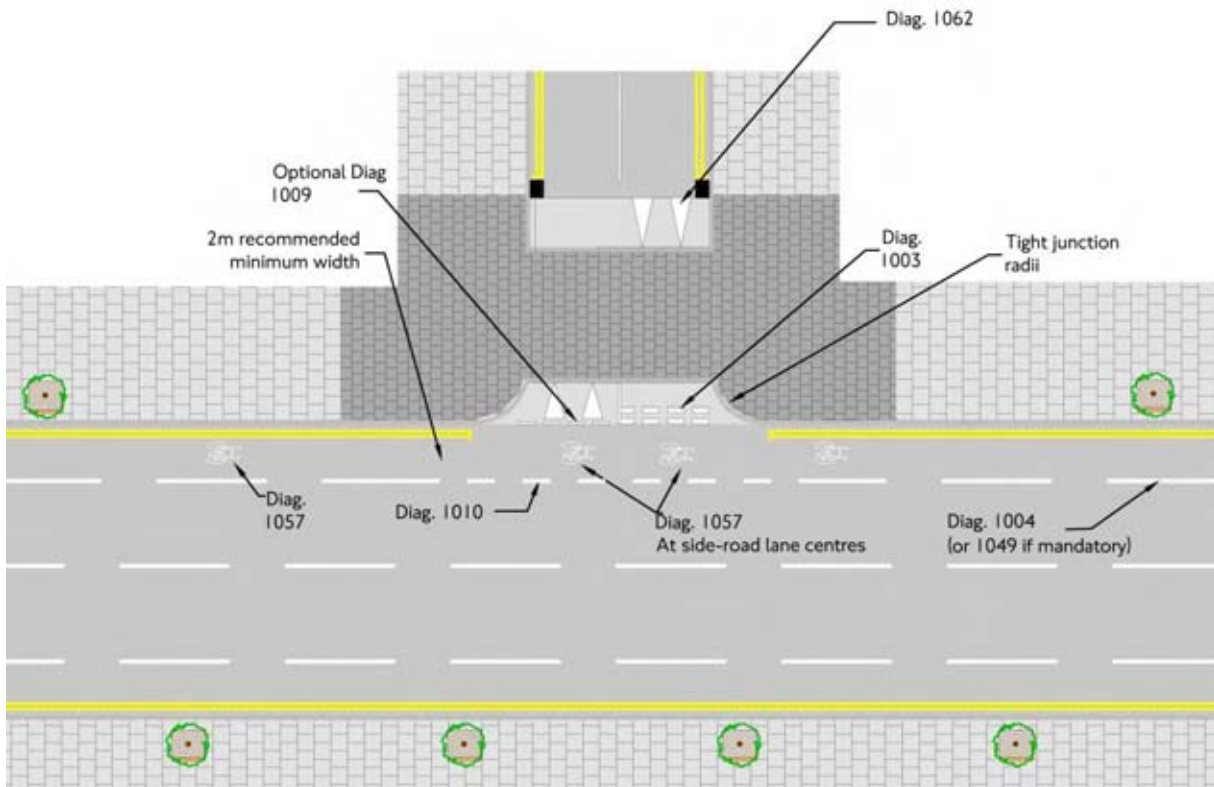
Continuous footway treatments in Stockholm



Continuous footways in Copenhagen – with footway materials continued through (left) and varied (right)

4.3.13

An alternative method employed in Copenhagen is to run a stepped cycle track with a continuous treatment past a side road and continue the footway through but in a different material from the rest of footway. In the UK, a treatment of this kind could be a good method of demonstrating to pedestrians that they have reached a side road, without requiring addition of tactile paving.



Illustrative layout 4/07: Continuous footway treatment



Continuous footways in Lambeth – Coldharbour Lane, Clapham Old Town

4.3.14

Footway build-outs at priority junctions may be used in conjunction with side-road entry treatments to enhance some of the vehicle-slowing aspects of the design and also create either additional footway space or an opportunity for tree planting and greening of the street. Build-outs provide pedestrians with shorter crossing widths and additional visibility when crossing the road at junctions and island sites. However, it is essential from both a road safety and movement perspective that build-outs do not cause pinch-points, forcing cyclists to deviate into the path of vehicles, or restricting cycle flows.

4.3.15

For any proposed build-out, remaining one-way widths should be consistent with the guidance on pinch-points provided in figure 4.7 – namely that, in most instances at least 4.0m one-way width will need to remain after the build-out on most street types, even if there are no large vehicles turning.

For local streets and others in 20mph zones, there can be more flexibility and build-outs can be used that reduce the remaining (two-way) carriageway width to 5.5-6.0m.



Footway build-out incorporating cycle parking

Road markings through junctions

4.3.16

As shown in the illustrative layouts throughout this section, marking cycle lanes through priority junctions in the direction of the cycle route is recommended as a method of increasing subjective safety with regard to the potential of other vehicles turning across cyclists. The lane markings raise the awareness of drivers of the likely presence of cyclists in a nearside lane and help give visual continuity to a cycling facility.



Dashed lane markings continued past side roads with and without entry treatments.

4.3.17

As presented in the consultation draft of TSRGD (2015), the diagram 1010 marking, a shorter dash than the advisory cycle lane marking (1000mm rather than 4000mm), should be used for lanes through junctions in order to give a visual indication to all road users of a change in hazard associated with the junction. Until the revised TSRGD comes into operation, DfT has authorised for TfL the a short-dash 'variant 1010' marking (850mm wide with an 1150mm gap rather than a 1000mm dash and 1000mm gap) for this purpose and could do the same for other highway authorities. See section 6.3 for further details.

4.3.18

DfT's [Signing the Way](#) (2011) cites qualitative research with cyclists to support the desirability of using lane markings through junctions from a cycle safety perspective. (AECOM, [Traffic Signs Policy Review: Research Project into the Awareness of the Meaning of Traffic Signs Project PPRO 04/16/24](#), 2011) The TRL report for DfT [Infrastructure and Cyclist Safety](#) (PPR 580, 2011) is also supportive of cycle lanes continued through junctions.

4.3.19

On streets without cycle lanes, then TSRGD diagram 1057 cycle symbols may be used across junctions and accesses. These are usually positioned at the points where a cyclist should enter and exit from the side road and, in that way, help to guide appropriate cyclist positioning as well as alerting other road users to the presence of cyclists. They remove any need for other warning signs to diagrams 962.1 or 963.1 except for situations where contra-flow cycling is permitted. At side roads with restricted access or less than 5m wide, kerb-to-kerb, one rather than two diagram 1057 markings may be used. On Cycle Superhighways, the CS project symbols (diagram 1057 marking with route number on a coloured patch) may be used to mark continuity of a cycle facility through a priority junction. See section 6.3 for further details on use of road markings for these purposes.

4.3.20

In all instances, analysis of cyclist movements through the junction should be undertaken prior to any decision about placement of lane markings or symbols. Care should be taken not to direct cyclists into taking inappropriate riding positions through the junction. Where there is insufficient space through a junction for a large vehicle to overtake a cyclist, for example, a marked lane should not be provided as cyclists should be discouraged from adopting a secondary riding position.



TSRGD diagram 1057 symbols positioned so as to mark a cycle route through a junction

4.4 Signal-controlled junctions

4.4.1

Various improvements to cycle safety and comfort, and to the directness and coherence of cycle routes may be achieved through remodelling or introducing signal control at junctions, particularly where signal timings can be changed to reallocate time between road users and generate time saving benefits for cyclists. Intervention types covered in this section are summarised in figure 4.9.

Figure 4.9 Summary of options for cycle-friendly interventions at signal-controlled junctions

SUPERHIGHWAYS	QUIETWAYS	1. Separate signals for cyclists	Complete separation at junctions involves signalling cyclists separately to remove all conflicting movements with other users.
		2. Managing or removing conflict with left-turning vehicles	This may be done by separately signalling left-turners (removing the conflict) or seeking to move the point of conflict away from the junction itself (managing the conflict), usually through lane markings.
		3. Support for cycle right turn	As part of a segregated cycling system or a wider strategy on a route or a series of junctions to keep cyclists in a predictable position on the nearside, cyclists could be assisted with right turns by staying on the nearside and making the turn in two stages.
		4. Cycle bypass of signals	In some instances, particularly through signalised T-junctions, cyclists making certain movements may be permitted a bypass of the signal control.
		5. Using ASLs and feeder lanes	ASLs can help cyclists take a safer, more advantageous position at a signal-controlled junction during certain signal phases and so, selectively, can assist cycle movements through a junction.
		6. Banning selected motorised vehicle movements	Generally in conjunction with other measures listed here, certain vehicle movements could be banned to improve cycle safety and directness. This should be done as part of a wider traffic management approach rather than on a case-by-case basis.
		7. Convert to a priority junction	Signal removal can have some beneficial effects where the volume and mix of traffic and nature of conflicting movements does not necessarily justify the existence of a signal-controlled junction. See section 4.3.
		8. Remove all priority and declutter	As part of an integrated, area-wide approach, designers may explore the potential benefits of removing signal control and priority altogether in order to promote more consensual road user behaviour generally. See chapter 3 on cycle-friendly street design.

4.4.2

Introducing new signal control or major re-engineering of existing signal-controlled junctions should be considered primarily as a tool for application to high-capacity Superhighways, on streets with a higher movement function. On Quietways, new or substantially changed traffic signals are less likely to feature, with greater emphasis on simplification of layouts and decluttering. TfL's [Design standards for signal schemes, SQA064](#) (2014) should be consulted for guidance on procedures involving traffic signals.

4.4.3

The primary purpose of traffic control by light signals is to separate conflicting traffic by the division of time, within the available road space, in a safe, efficient and equitable manner. ([Traffic Advisory Leaflet 1/06, General principles of traffic control by light signals, 2006, Part 1](#)) Detection technology is widely used to optimise the operation of traffic signals. This allows for sequence flexibility if no users are detected and for green signal optimisation during busy periods.

4.4.4

Benefits arising from being able to control movements of road users at traffic signals need to be weighed up against the potential disadvantages to cyclists. Minimising delay is a primary objective in achieving a level of service that attracts new cyclists: few advantages are to be gained from signals for cyclists that require them to wait a long time at signals. Delays to cyclists of over 120 seconds due to signals are to be avoided.

4.4.5

Decluttering by minimising use of, or removing, traffic signals is positive for more attractive streets. Although it offers some adaptability through the ability to manage signal timings, junction remodelling with substantial changes to traffic signal infrastructure, may also place limits on the growth of cycling on a given route and necessitate further re-engineering in the near future.

Care should be taken to avoid introducing signal control where it is not justified. This can result in increased journey times for all users and is costly to install and maintain. Over-complicated signal staging and operation can lead to excessive waiting times for cyclists and an increase in non-compliance.

4.4.6

In seeking to improve cycle safety, comfort and directness at junctions, the timing of signals should generally be reviewed and optimised to minimise delay for cyclists, taking account of the needs of all traffic and of pedestrians. When calculating inter-green timings allowance must be made for cycle movements to ensure cyclists can safely clear the junction. This is particularly important where cycle speeds are likely to be lower due to gradients.

Procedures for traffic signals

4.4.7

TfL Traffic Infrastructure, within the Asset Management Directorate, is the Signals Authority for London, responsible for the design, installation, commissioning, maintenance and decommissioning of traffic signals and associated equipment. TfL Network Performance, within the Road Space Management Directorate, is responsible for the management and operation of London's traffic signals and their accompanying systems, technologies and equipment.

4.4.8

The Traffic Management Act 2004 places a Network Management Duty on all local traffic authorities (LTAs) in England. The Duty requires the LTA to 'ensure the expeditious movement of traffic on its own road network, and facilitate the expeditious movement of traffic on the networks of others'. 'Expeditious movement' and 'congestion' are subjective terms. TfL Network Performance therefore uses journey time reliability as a more practical measure to help clarify the legal responsibility. Modelling is the tool used to measure scheme impact on the network and effects on journey time reliability. The way this is applied across London is described in the [Traffic modelling guidelines \(version 3\)](#), issued in September 2010.

4.4.9

For any scheme involving traffic signals, authorities are required to comply with procedures set out in [Design standards for signal schemes, SQA064](#) (2014) and any subsequent document updates.

4.4.10

Criteria in SQA064 are based on the collision rate at the junction, and on flows of traffic, pedestrians and turning traffic. For a new development, modelling evidence is required as a justification for a signal scheme. TfL can work with any client to determine if these criteria are likely to be met.

4.4.11

In practice, initial concept, feasibility and preliminary design is usually carried out by the organisation promoting any scheme involving traffic signals. When requested, TfL provides comments on these preliminary designs for signals and should always be consulted about the method of control to be used.

4.4.12

TfL usually (but not always) carries out the subsequent detailed design work for signals. TfL must also check and approve the completed design before procurement and again after installation, but before commissioning.

4.4.13

The client for the scheme is responsible for obtaining any traffic orders required and for the design and management of civil engineering works, such as ducting, dropped kerbs and tactile paving. This will normally be in advance of any signal works. Scheme installation and maintenance work on site is usually carried out by contractors appointed by competitive tendering or by term contractors.

4.4.14

Where traffic signals are installed on roads for which a London borough is the highway authority, TfL consults with that authority before making major changes to the signal timings and permits reasonable requests for modifications to existing traffic signals and the provision of new signals.

Separate signalling for cyclists

4.4.15

The options covered in this section are generally trial measures that are being developed to enable separation of cyclists' movements through junctions. They all have the potential to become important parts of the toolkit for cycling infrastructure in the UK. Tried-and-tested designs and layouts are likely to emerge in time are yet to be developed but In order to develop agreed, standardised approaches, it would be constructive if any proposals to trial any of these measures were to be discussed with TfL or DfT from an early stage.

4.4.16

Red cycle aspect on standard traffic signal head

A standard traffic signal head can be used to control traffic consisting solely of pedal cycles. This signal includes green and amber cycle logos and a high-level red cycle aspect. Off-street trials commissioned by TfL have confirmed that a red cycle aspect on a standard traffic signal head is equally well understood and complied with by cyclists when compared with a full red aspect.

The consultation draft of TSRGD (2015) proposes a general authorisation for the use of a red cycle aspect on cycle-only traffic signals. Until the new regulations are adopted, the red cycle aspects remains subject to site-specific authorisation.

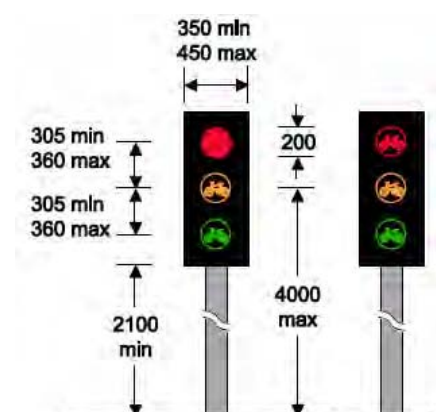


Diagram from TSRGD consultation draft (2015), Table 69, Item 3, showing the option of a red cycle aspect.



Standard signal heads with green cycle aspects



Detail of low-level cycle signal



High-level red cycle aspect (with low-level cycle signal used as repeater) at Bow roundabout

4.4.17

Low-level cycle signals

A further stage of the trials has seen testing of a smaller signal head, mounted at cyclists' eye level on existing signal poles. On-street trials currently see these low-level cycle signals operate as repeaters to the main signals. However, they have the potential to be used in the future to signal separate cycle movements, including in many of the methods set out below. The consultation draft of TSRGD (2015) includes these as alternatives to the above high-level, full-size signal head, specifying a minimum mounting height of 1200mm (to the underside of the signal head).

TfL Traffic Infrastructure is developing further guidance (SQA0651 Design for low-level cycle signals) that will bring together TRL off-street trial research, on-street trial results, information about equipment and generic design considerations.

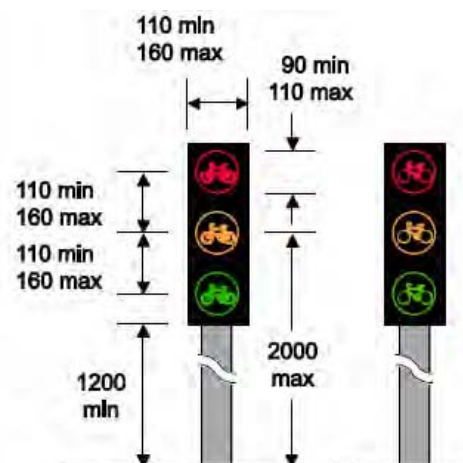


Diagram from TSRGD consultation draft (2015), Table 69, Item 4

4.4.18

Cycle early release

Cycle early release signals allow cyclists to move away ahead of general traffic at a signalised junction. The signal affords them preference in the junction, with timings to be determined by the junction dimensions and the details of signal control for the junction as a whole.

4.4.19

The most likely signal ahead arrangement for this method, as trialled at a site in Cambridge, is a fourth aspect on a standard signal head with a green cycle symbol. However, low-level cycle signals could open up different configurations of infrastructure to manage the early release. The consultation draft of TSRGD (2015) proposes a general authorisation for ‘cycle filter signals’ of this kind.



Cycle early release at Hills Road, Cambridge

4.4.20

‘Hold the left turn’ signal arrangement

TfL is planning to trial an arrangement that involves separately signalling cyclists and left-turning vehicles. This requires some segregation of lanes, a dedicated left-turning lane for general traffic, space for inclusion of islands for signal infrastructure, and provision for right-turning cyclists. It has potential for locations where there is a moderate volume of left-turning traffic and a large cycle flow ahead and/or left. Some separation at the stop line may also be needed of left-turning and ahead cyclists, with potential for left-turners to bypass the signals or run with the left-turning general traffic.



TfL visualisation showing ‘hold the left turn’

4.4.21

Cycle gate

Not to be confused with early start, a ‘cycle gate’ is an alternative method of separating cycle and motorised traffic movements and signals. It could be applied where there is a large number of left-turning motorised vehicle movements, or ‘scissor movement’ conflicts, although it requires a substantial amount of space in terms of road width and depth of reservoir.

4.4.22

The cycle gate relies on there being two sets of signals and two stop lines for cyclists – the first acts as a ‘gate’ to allow cyclists into a ‘cycle reservoir’ ahead of general traffic to await a green light at the second stop line. The reservoir should not be marked in such a way as to make it appear like an ASL – for example, it should not have coloured surfacing or be marked with cycle symbols. Consideration for pedestrian waiting and crossing times also needs to be made, particularly in areas of high pedestrian flow.



Cycle gate at Bow: (left) segregated approach and first cycle stop line, and (right) advanced cycle stop line. Trial low-level cycle signals (used as repeaters) are mounted below the main signal heads.

4.4.23

Layout principles for cycle gate are as follows:

- The cycle lane/track on the approach must be physically segregated, at least 1.5m wide, preferably 2m, to allow for overtaking. It may have coloured surfacing, up to the first cycle stop line.
- The general traffic stop line should be positioned behind the advanced cycle stop line.
- The segregating strip should widen to allow clearance for mounting the traffic signal head. For a signal head mounted in front of a traffic signal pole, the segregating strip should be at least 1.3m.
- The distance from the first cycle stop line to the advanced stop line at the junction (the depth of the reservoir) should be at least 15m. This is to disassociate the two stop lines from each other and reduce the see-through issue between the two sets of traffic signals.

4.4.24

Signal layouts with dedicated cycle phases may also be considered. Typically this is appropriate where one or more arms of the junction allow access for cyclists only, but it may also be applied where cyclists are physically segregated from other traffic.

Managing conflict with left-turning traffic

4.4.25

Drivers turning left across cyclists moving ahead at junctions is one of the most hazardous collision types and a common cause of cyclist death and serious injury. Addressing the potential for this 'left-hook' conflict is essential not just for cycle routes but for design of all highways that cyclists use. At signal-controlled junctions, the above proposed methods of separately signalling cyclists and other traffic are all potential ways of addressing the conflict by seeking to remove it completely. A further technique for doing this is to ban the left turn for general traffic.

4.4.26

It is possible to reduce the risk to cyclists substantially at signal-controlled junctions by managing the conflict rather than by completely removing it. The best method is to calm traffic movement through the junction. In many cases, particularly on local streets, city streets, town square and city places, or in 20mph zones, improvements focused on controlling traffic speeds such as tightening of junction geometry and use of junction tables can allow cyclists and slow-moving motor vehicles to move through junctions comfortably and with reduced risk of conflict. In low-volume and low-speed traffic conditions, ASLs and feeder lanes can be of clear benefit to cyclists, allowing them the advantage of an advanced position at the junction itself.

4.4.27

Other scenarios, particularly those on street types with a higher movement function, will require more substantial intervention. A particular is posed by left-turn general traffic lanes and free-flowing entry and exit slip lanes for left turning vehicles. Reduction in vehicle speeds, particularly on the turning movements, may help, but it is also advisable to seek to reduce the distance where cyclists are vulnerable and move the point of potential conflict away from the junction itself.

4.4.28

The ideal solution is the removal of slip lanes by reconfiguring the junction, which can also release significant space for pedestrian and urban realm enhancements. Where removal of the slip lane is not feasible, measures to reduce vehicle speeds are recommended. If they must remain, the length of slip lanes could be minimised by reducing the taper to 1 in 3 for 30mph roads and 1 in 5 for 40mph roads.

4.4.29

Where it is not practical to reduce the taper adequately, then continuing the ahead cycle lane past the left-turn slip lane will require left-turning vehicles to cross the cycling facility. This can help deter vehicles from changing lanes at lower speeds and generally raise awareness of other road users, particularly if the cycle lane is marked prominently. Guidance set out in the section below on central feeders to ASLs should be followed. However, it is not an ideal solution and it is advisable to apply it only with caution, and where traffic volumes and speeds are not high.

4.4.30

Appropriate measures for managing the conflict at the point of crossover will depend on site-specific conditions such as available width, motor vehicle speeds and flows and mix of vehicles. Interventions that may be considered include ways of encouraging all road users to make an early and clear lane choice, avoiding last-minute manoeuvres. This may involve moving the point of conflict back from the junction. Use of smaller dashed markings (TSRGD diagram 1010), cycle symbols and coloured surfacing can all help to highlight the need for cycle priority at that point of conflict.



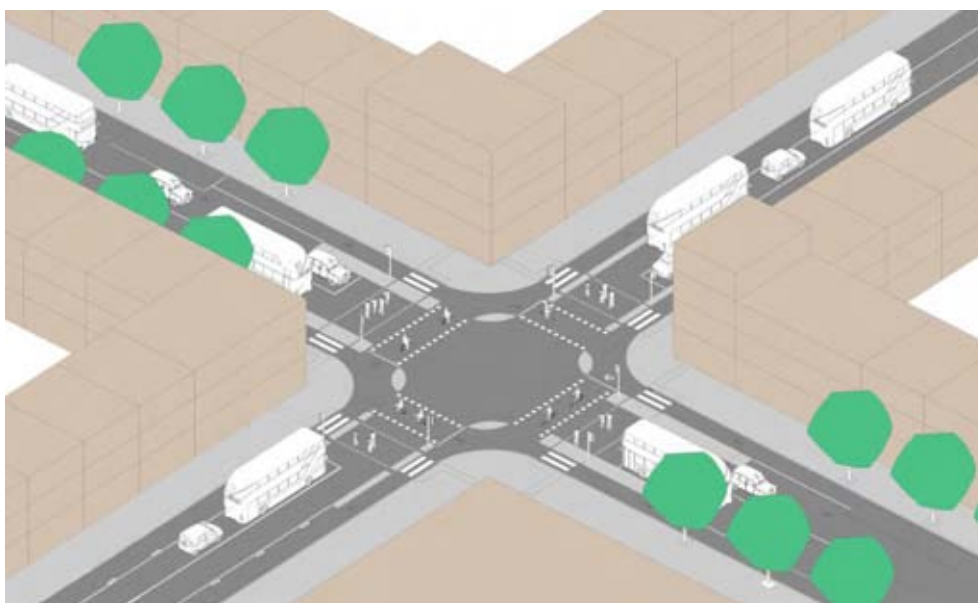
Use of dashed lane markings and surface colour to highlight a cycle lane to motorists seeking to enter a left-turn lane

4.4.31

Where a slip road joins a main road, the cycle lane on the main road should, again, be continued through the conflict area and highlighted for other road users. Diagram 1003 give-way markings should be used on the nearside of the cycle lane, to require vehicles joining the main road to give way to cyclists and other vehicles on that road, while diagram 1010 markings should be used on the outside of the cycle lane, with diagram 1057 cycle symbols at 5m intervals. Coloured surfacing can also help to highlight the conflict area.

4.4.32

Light or island segregation (on the inside of the lane markings on the offside of the cycle lane, or replacing the lane marking) may be considered as a way of focusing the point of crossover, encouraging motorists to keep their distance from the cycle lane and adding to the subjective safety of cyclists.



Concept sketch for a junction redesign involving island protection

4.4.33

Generally, island separation can be used to manage conflicts with left-turning vehicles, and could be applied to bespoke junction redesign in order to give protection to cyclists. Separation of this kind is likely to form the basis for future experimental layouts, in conjunction with innovative use of traffic signals. Any proposal using these methods should be regarded as a trial, and an important contribution to developing local and national standards and best practice for safer junction design.

Support for cyclists making right turns

4.4.34

Many of the above measures are focused on managing conflicts between ahead cyclists and left-turning motor vehicles. However, making right turns on a bicycle can be even more challenging. Crossing multiple lanes of traffic, in the same and the opposing direction, requires assertiveness. It would be of benefit to many cyclists if they could undertake right turns in a different, more comfortable way.

4.4.35

ASLs can help, by allowing a cyclist to position themselves in an appropriate turning position ahead of the traffic, but only if the cyclist arrives during a red phase. Where cycle lanes are segregated, consideration needs to be given to how cyclists can take up an appropriate position to turn right at a junction. Unless another mechanism for turning right is provided at the junction itself, then the segregation will need to end ahead of the ASL to allow cyclists to move into an appropriate position to make the turn.

4.4.36

When faced with a difficult right turn, many cyclists choose to make the turn in two stages on carriageway. This is an informal manoeuvre and not yet specifically encouraged by regulations, signage and lane markings, or the Highway Code. However, current off- and on-street trials in the UK are exploring how it could be used more formally, and supported through regulations.



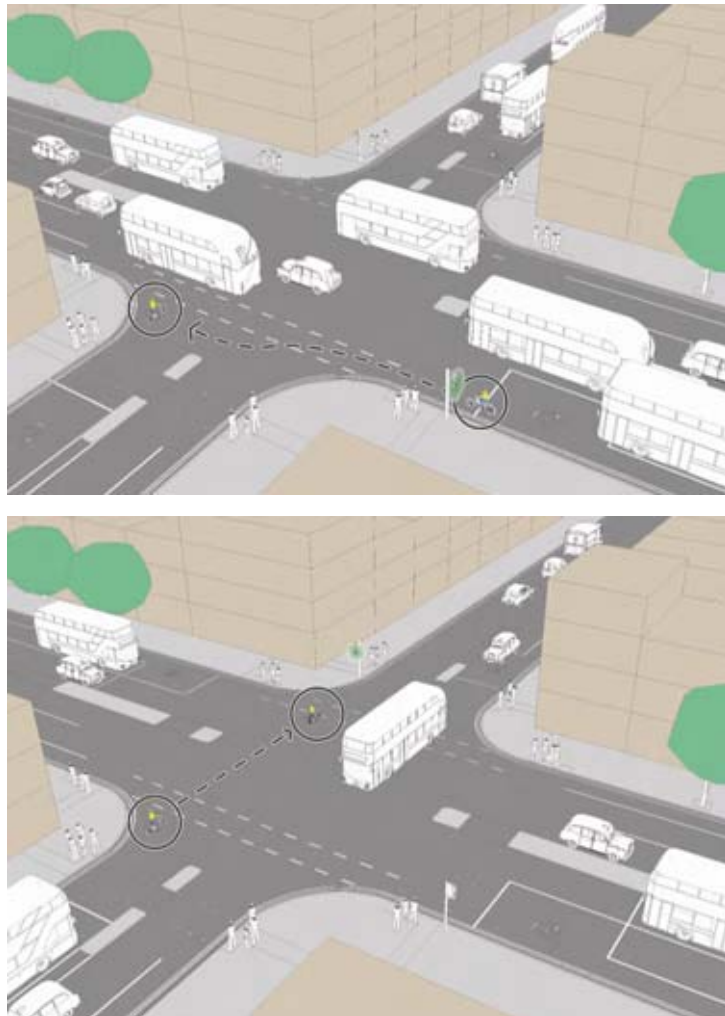
Two-stage left-turn marking at junction in Stockholm (left); and cyclists in different streams in Copenhagen (right) – left turners are heading to the waiting area to the right

4.4.37

In an informal two-stage turn at a crossroads, a cyclist crosses one arm of the junction in an ahead movement, pulls into the left and stops next to the pedestrian crossing studs on the arm adjacent where they started.

They then turn through 90 degrees to face their exit arm and wait for the traffic signals to allow them a second ahead movement. In this way, they can stay on the nearside and avoid having to move across lanes of traffic in order to turn right.

Lanes marked through junctions can assist cyclists making two-stage right turns informally by giving them lines to wait behind in between the two stages of their turn.



Informal two-stage right turn from the right-hand arm to top arm

4.4.38

This manoeuvre has a more formal status in some other countries, being the prescribed way to turn right at larger junctions in Denmark, for example. Road markings and surface colour are often used to mark waiting areas or lines to assist making the second stage of the turn – these are seen as supporting measures. Depending on the context, on junction geometry and on the visibility of signal heads from potential waiting areas, existing UK road markings could be adapted for this purpose. TfL is planning to trial a specific junction design that would enable a ‘formal’ two-stage right-turn.

4.4.39

One other option for turning right in two steps, as illustrated in [LTN2/08](#), page 64, is the G-turn or ‘jug handle’ layout. It may be applied either at a signalised junction – in which case it tends to be designed with dropped kerbs, shared areas and toucan crossings to allow cyclists to make part of their right turn off-carriageway – or to make a right-turn off a main road at a priority junction by moving left into an inset waiting and turning area, or up onto a shared area.

Cycle bypass

4.4.40

In some locations, it may be possible to allow cyclists to bypass signals for general traffic (or to bypass other locations where motor vehicles have to stop). Typically this condition arises at T-junctions where an ahead cycle movement around a red light for general traffic does not give rise to any conflicting movements. Some physical segregation through the junction is advisable in this case. Care must be taken to manage pedestrian/cyclist interaction.



Contraflow cycle lane bypassing traffic signals



Cycle bypass of motor vehicle security checkpoint



Bypass to traffic signals for left-turning cyclists, Hills Road / Cherry Hinton Road, Cambridge



Banning selected vehicle movements

4.4.41

One option for dealing with conflicts that cannot be resolved in other ways is to ban turns for motorised vehicles. This can help in design of signal operation at the junction as well as removing a potential source of conflicting movements. Such a decision, however, should be taken in the light of a wider strategy for the road network around the junction in question. Banning a movement in one place could transfer that movement, and a risk to cyclist safety, to another location. The design should support the ban and be self-enforcing.

Lanes marked through junctions

4.4.42

As set out in section 4.3, marking cycle lanes through junctions in the direction of the cycle route can be beneficial to cyclists from the perspectives of directness, coherence and subjective safety. Depending on the arrangement of lanes and method of signal control, it is recommended that TSRGD diagram 1010 markings (or variant as necessary) should be considered at signal-controlled junctions. Although cyclists are not required to stay within the lane, this method is mostly likely to be of benefit where it is acceptable for cyclists to remain on the nearside for ahead as well as left-turning movements.



Cycle lane marked through signalised junction



Lane markings and surface colour continued through junctions on Cycle Superhighways – short-dashed TSRGD diagram 1010 markings are shown in the image on the right and are recommended for use as lanes through junctions.



Use of coloured surfacing for cycling through junctions in Copenhagen



Coloured surfacing (without lane markings) used through a junction on a Cycle Superhighway

4.4.43

Danish practice includes marking a cycle route through a junction using coloured surfacing but without lane markings. Strips and patches of coloured surfacing through junctions have been employed on Cycle Superhighways in London. (Future use of this technique is subject to completion of a research study and a wayfinding strategy to support infrastructure delivered through the Mayor's Vision for Cycling.)

Advanced Stop Lines

4.4.44

Where provision for cyclists is on-carriageway, signalised junctions should incorporate an advanced stop line (ASL) unless there are over-riding safety or operational reasons not to. ASLs and associated facilities can be used to give cyclists a degree of priority, and help to raise driver awareness of cyclists. Research has shown that ASLs have a zero or very low effect on junction capacity. All ASLs and their access need careful consideration at the design stage, taking into account the junction layout, traffic flows and movements.



Important considerations include ASL capacity...



...and the practicality and comfort of making right-turn manoeuvres using the ASL.

4.4.45

ASLs help cyclists to: position themselves in drivers' line of sight, avoid conflict with left-turning vehicles (when arriving on a red light), wait away from direct exhaust fumes, and enjoy a head start over motorised traffic. General design considerations for ASLs are summarised in figure 4.10.

Figure 4.10 General design considerations for standard ASLs

ASL depth	Recommended minimum 5.0m. The consultation draft of TSRGD (2015) proposes increasing the maximum to 7.5m. Authorisation from DfT may be sought for 5.0- to 7.5m-deep ASLs in the meantime (TfL has authorisation for this for TLRN and Cycle Superhighways). 7.5m ASLs are recommended for higher cycle flows.
Coloured surfacing	While it is recommended that colour is used in locations of potential conflict, there is no legal requirement. Use of colour for the ASL box or lead-in lane depends on the policy of the relevant highway authority.

Set-back from pedestrian crossing	<p>1.7m to 3.0m between advanced stop line and pedestrian crossing studs. 1.7m is recommended for cycle routes as it has been shown: to improve compliance by motorised vehicles (except motorcycles), to lead to cyclists waiting in safer and more visible locations ahead of stationary traffic, to result in better ASL use and operation generally, and to allow for tighter geometry at the junction.</p> <p>Swept path analysis must inform the choice: a greater set-back distance may be required to avoid encroachment from the swept path of large vehicles where there are no splitter islands. Alternatively, a part-width ASL may be appropriate.</p>	
Entry to ASL	<p>Lead-in lane is recommended, although gate entry is also possible.</p> <p>The consultation draft of TSRGD (2015) proposes a change in regulations to permit cyclists to cross the first stop line at any point, meaning that lead-in lanes and gate entries will be optional from 2015.</p> <p>The lead-in lane should be at least 1.5m, although 1.2m is preferable to no lead-in, depending on the likely level of encroachment by motorised vehicles. Lead-in lanes may benefit from colour and TSRGD diagram 1057 cycle symbols to discourage encroachment.</p>	<p>Diagram from TSRGD consultation draft (2015), Table 69, Item 47, showing ASL without lead-in or gate entry.</p>
Lead-in lane type	<p>Can be mandatory or advisory, depending on:</p> <ul style="list-style-type: none"> • adjacent general traffic lane width – if below 3.0m, encroachment by motorised vehicles is likely and lead-in lane needs to be advisory • flows of cyclists, motor vehicles and wider vehicles – higher cycle flows may be used to justify a wide, mandatory cycle lane, while high flows of wider vehicles mean that wider general traffic lanes are likely to be needed • the need for consistency of provision on a given cycle route 	
Lead-in lane length	<p>Ideally as long as the maximum general traffic queue length during peak periods. Some protection (for example light segregation) may be warranted for lead-in lanes.</p>	
Adjacent general traffic lane width	<p>Minimum 2.5m, and no less than 3.0m where buses and HGVs use the lane. For high frequency bus routes, combined width of the lead-in lane and adjacent general traffic lane should be at least 4.5m. Consideration should be given to lane width reallocation to achieve a lead-in lane.</p>	
Longitudinal lines (edges of ASL box)	<p>The solid longitudinal lines that bound the ASL box on either side must be provided, unless that part of the carriageway is delineated by a raised kerb. In practice, this is usually the case for the nearside and relates to the offside where there is an island.</p>	



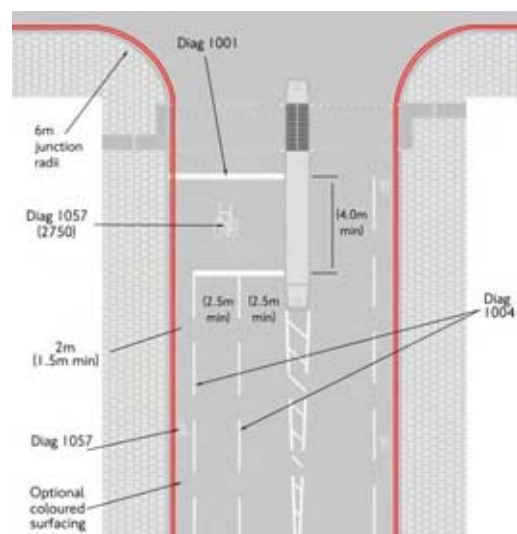
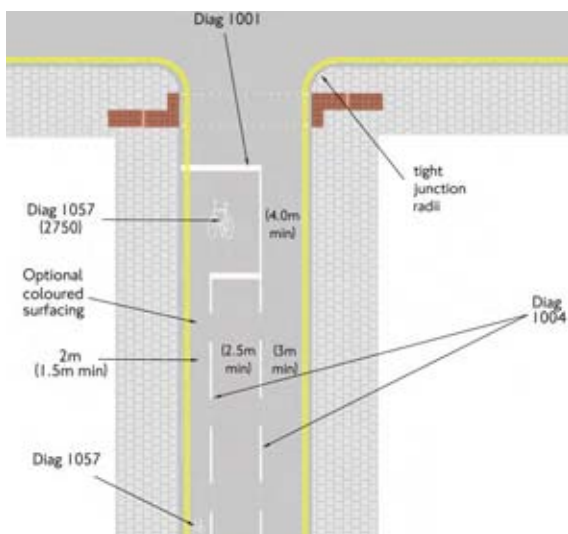
Narrow lead-in lane on street with no centre line, so vehicles tend not to queue over the lead-in lane



ASLs with lead-in lanes are also used in other countries – as in this example from Utrecht

4.4.46

In relation to lane types, a balance needs to be struck between the added protection and subjective safety that a mandatory lane is able to offer over an advisory lane, and the greater flexibility in width that an advisory lane gives because allowance can be made for it to be over-run. For example, a 1.5m mandatory lead-in lane next to a 3.0m traffic lane may, in some circumstances, be preferable to a 2.0m advisory lead-in lane next to a 2.5m general traffic lane, given that the cycle lane in the latter is very likely to be entered by larger vehicles.

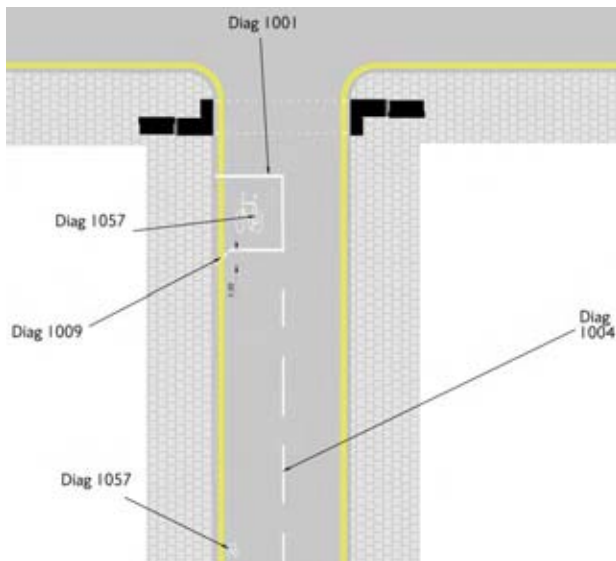


Illustrative layouts 4/08a and 4/08b:
Nearside advisory lead-in lanes to ASL (adjacent to one and two general traffic lanes)

4.4.47

Gate entry

Provision of 1.0m-wide 'gate' entry to an ASL, using the TSRGD diagram 1001.2A road marking, is an option that allows legal entry for cyclists to the reservoir where a lead-in lane cannot reasonably be provided. In all cases, a lead-in lane is preferable; gates represent a lower level of service. Nearside gate entry was permitted in amendments to TSRGD in 2011. Offside gate entry requires site-specific authorisation from DfT.



Gate entry

Illustrative layout 4/09: Gate entry to ASL

4.4.48

Shared nearside lane with gate entry

Where there is left-turning motor traffic and a gate entry instead of a lead-in lane, cyclists should be encouraged to adopt a primary cycling position for the ahead movement. On Cycle Superhighways, one option to help promote this is to use full-width coloured surfacing in the nearside lane, giving an indication to motor vehicle drivers that they are entering a space intended for cycling when they make their left turn.



Shared nearside lane

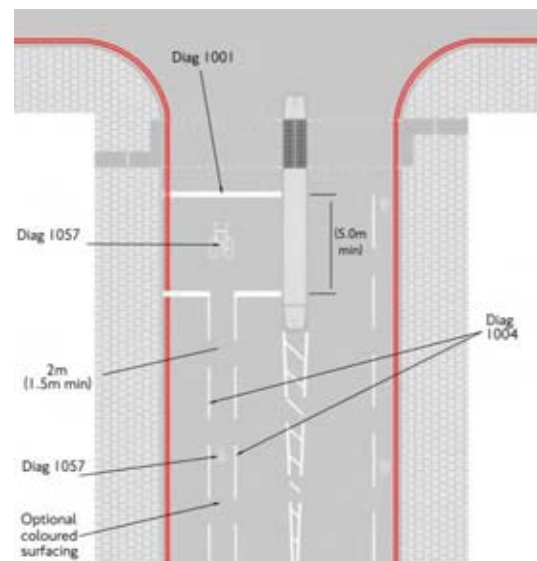
4.4.49

On Cycle Superhighway pilot routes, use of this method showed no negative effect on conflicts and an increase in the separation distance between motor vehicles and cyclists, compared with a non-treated equivalent. This option may be particularly useful where straight ahead movements from the nearside lane are restricted (eg to buses and/or cyclists only) and there are high proportions of left-turning motor vehicles. In this situation, signing to Diagram 877 (see Chapter 6) should be provided to permit specified road users to proceed ahead at the junction.

4.4.50

Central or offside lead-in lane

Another option to reduce the risk from left-turning motor vehicles is a centrally located or offside ASL lead-in lane. Central feed-in lanes should be at least 2.0m in width. Where traffic is expected to be fast-moving, cyclists will need a safe way of reaching the cycle lane in the middle of the road, ideally via continuation of a cycle lane projected from the start of a left turn flare. The lane should not be so long between two general traffic lanes that cyclists are encouraged to join them where other traffic is fast-moving, accelerating and/or weaving. One option may be to use mandatory lane markings for this lead-in lane with a short section of broken lane in advance of the junction, thereby encouraging drivers to cross in a predictable location.



**Illustrative layout 4/10:
Central lead-in lane to ASL**



Central lead-in at signalised junction (left). Long central lead-in to allow for left-turn flare, positioned to facilitate overtaking stopped buses (right).



Offside protection on central lead-in (left). Offside lead-in lane (right)

4.4.51

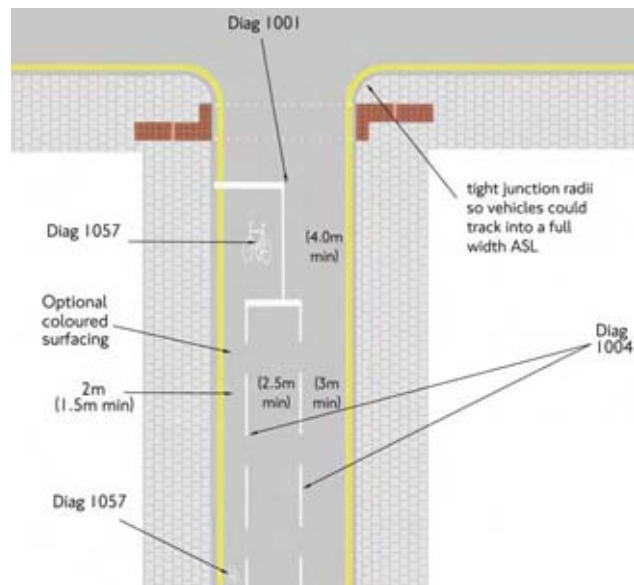
Consideration may also be given to protecting cyclists from other traffic changing lanes, or from the tendency for other traffic not to remain within lane markings around a bend. Small sections of segregating strips (preferably with battered kerb upstands) may, for example, be introduced on the off-side of a cycle lane.

4.4.52

Part-width ASLs

In some situations, part-width ASL reservoirs, not covering the full width of all the approach lanes, may be appropriate. They tend to be better observed by motorists than full-width ASLs. This includes junctions where:

- right turns are not permitted (for cyclists or all vehicles)
- there are multiple right-turning lanes
- tracking of vehicle movements into the arm of the junction shows that they would encroach on the ASL reservoir if it were full-width
- a nearside lane is controlled with a left-turn filter signal



Illustrative layout 4/12: Part-width ASL

4.4.53

General authorisation for part-width ASLs, raised in [Signing The Way](#) (2011), has been proposed in the consultation draft of TSRGD (2015).



Part-width ASL used where right-turning vehicles would over-run a full-width ASL – Ruckholt Road, Waltham Forest



ASL across two lanes only from one-way street (offside lane is a bus lane) – Gower Street, Camden

4.4.54

Split ASLs are possible on a single junction arm where movements are separately signalled and where lanes are physically separated by an island.



Split ASLs with island, Curtain Road, Hackney

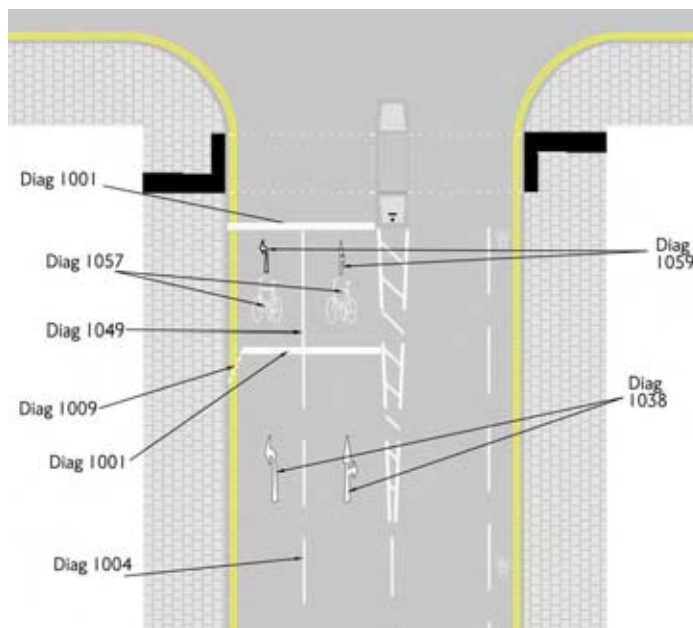


Use of a, irregularly shaped ASL reservoir where an island separates movements

4.4.55

Where there are multiple traffic lanes, there may be a case for marking recommended positioning for different cyclist movements through use of a split ASL with a dividing line and direction arrows for cyclists.

A good example would be where there is a left filter movement for general traffic that precedes the ahead movement, and where it would appropriate to indicate specific suitable places to wait for cyclists undertaking different movements. Site-specific or authority-wide authorisation may be sought for this technique.



Illustrative layout 4/11: Split ASL

4.4.56

The consultation draft of TSRGD (2015) proposes that ASLs will be prescribed for use at stand-alone signalised crossings as well as signalised junctions. Until the regulations come into force, site-specific authorisation will continue to be required for this use.

4.4.57

At junctions with ASLs, **blind-spot safety mirrors** mounted on signal poles can help give motorists a better view of cyclists in a lead-in lane on their nearside and in the ASL box. Blanket authorisation for their use was notified by DfT to local authorities in England in February 2012 and is confirmed in the consultation draft of TSRGD (2015).

4.4.58

However, there is currently little evidence of the safety benefits of blind spot safety mirrors and trials of their effectiveness have been inconclusive. There is, therefore, no general requirement for safety mirrors on every signal-controlled junction with an ASL but they should be considered on a case-by-case basis.



Blind-spot safety mirror showing view of nearside lead-in lane

4.4.59

Any decision to include blind-spot safety mirrors should be taken by the highway authority, as they are regarded as signage rather than traffic signal equipment. However, since they are mounted on signal poles, their installation will need to be considered and assessed by TfL Asset Management Directorate in a similar way to any other signal equipment – see section 2.5 for guidance on these procedures. A risk assessment approach should also be made, with mirrors being most appropriate at junctions with both ahead and left-turn movements and where there are high cycle and HGV flows.

4.4.60

To achieve the optimum position, and reduce the risk of tampering and vandalism, mirrors will usually be mounted on the nearside primary signal pole, between 2.4 and 2.5m clearance above footway level. Ongoing maintenance costs must be considered by the scheme sponsor.

Bus lanes at signal controlled junctions

4.4.60

Some benefits for cyclists can be achieved by continuing bus lanes up to the stop line at a junction. This can only be done where there is no left turn for general traffic (unless the bus lane is separately signalled). This is subject to traffic and safety considerations, including impacts arising from ahead traffic moving left to pass vehicles waiting to turn right within the junction.

4.4.61

There may be situations with a bus lane on the approach where an ASL is not desirable, such as at an intermediate stop line in a multi-junction layout. On the exit from a junction, a bus lane can re-commence immediately by providing diagram 1010 markings rather than a taper to give cyclists more protection and deter 'squeezing' by merging of non-bus lane traffic. ([Traffic Signs Manual](#) figure 17-1 refers).

4.5 Roundabouts and gyratories

4.5.1

Roundabouts and gyratories are rarely comfortable facilities for cyclists to use. It is essential to understand cyclists' desire lines and manoeuvres in order to provide for their safety. At many roundabouts, the geometry creates difficulties for cyclists by not sufficiently reducing motor vehicle speeds. On the other hand, however, the ability to keep moving through the junction with no loss of momentum makes some types of roundabout, when well designed, potentially more appealing to cyclists under some circumstances than signal-controlled junctions.

4.5.2

The ranges of roundabout types, their locations and usage are wide in the UK, and will have varying effects on cycling. The size of a roundabout, and the volumes and speeds of motorised traffic they accommodate, has an impact on the subjective safety of vulnerable road users. Pedestrians also suffer where they are required to undertake circuitous and often hazardous routes to negotiate a large roundabout. Types are defined in [DMRB TD16/07](#) (2007), as follows:

Normal – a roundabout with a kerbed central island at least 4m in diameter, usually with flared entries and exits. Small versions have a single-lane circulatory carriageway. Larger versions can have multiple lanes, or enough width on the circulatory carriageway and on the arms to accommodate two or three vehicles alongside one another.

Compact – a roundabout having a central island, with single-lane entries and exits, and with a circulatory carriageway that does not allow two cars to pass one another.

Mini – a type that has a domed or flush circular solid white road marking of between 1m and 4m in diameter instead of a central island.

Signalised – a roundabout having traffic signals on one or more of the approaches and at the corresponding point on the circulatory carriageway itself. Design guidance for signalised roundabouts is provided in [DMRB TD50/04](#) (2004).

Double – a junction comprising two roundabouts (normal, compact or mini) connected by a short link and designed as a single system rather than two separate roundabouts.

As a rule, **the larger the roundabout, the greater the problems for cyclists**. On cycle routes, large roundabouts should be considered for conversion to a signalised junction or to a more cycle-friendly roundabout type: a compact or a protected roundabout.

4.5.3

Most accidents involving cyclists arise from vehicles entering the roundabout and colliding with cyclists who are on the circulatory carriageway. Interventions that can reduce risks to cyclists include:

- controlling entry, circulatory and exit speeds
- reallocating unused carriageway space, such as reducing approach lanes, ideally to one
- providing an alternative route or by-pass for cyclists that does not result in additional delay
- raising driver awareness of cyclists
- giving cyclists clear, unobstructed passage up to, through, and leaving the roundabout
- managing traffic and conflicting manoeuvres through the use of signals
- reducing motorised traffic volumes
- reducing excessive visibility

Normal and signalised roundabouts

4.5.4

Normal roundabouts with single approach lanes and low flows will normally be satisfactory for cyclists as long as the geometry is 'tight'. Large conventional roundabouts pose greater problems for cyclists.

4.5.5

One intervention that has been shown to have safety benefits is to signalise the roundabout. A study of before and after collision data of 28 roundabouts that had signals installed found a statistically significant decrease in the number of collisions involving cyclists (J. Kennedy and B. Sexton, [Literature review of road safety at traffic signals and signalised crossings](#), TRL, PPR 436, 2009). This report also cites a TfL study from 2003 of ten at-grade and ten grade-separated junctions, finding significant safety benefits for cyclists from signalisation for the at-grade types (F. Martin, An analysis of accidents at roundabouts 'before' and 'after' signal implementation, London Accident Analysis Unit, 2003).

4.5.6

It is likely, however, that the effect of large roundabouts in deterring most cyclists outweighs the benefits that signalisation provides. Where roundabouts are signalised, ASLs can be introduced at signals on the entry lanes and even on the circulatory carriageway. Cycle early start or cycle gates could also be considered.

4.5.7

The greatest degree of separation that could be implemented would be to remove cyclists from the circulatory lane of the roundabout altogether, which may be appropriate if the total junction flows exceed about 25,000 vehicles per day. This could be done by separating cyclists on each entry arm, leading them off-carriageway to cross other arms on parallel pedestrian/cycle or toucan crossings. In this instance, the impact on directness and coherence of cycling facilities and on the potential for pedestrian-cyclist conflict needs to be balanced with the safety benefits of removing cyclists from the carriageway.



Off-carriageway cycling at roundabout in Nantes – motorists give way to crossing cyclists

4.5.8

Other ways to reduce the risks to cyclists include:

- Minimise the number and width of entry and circulatory lanes. More than one entry lane greatly increases the number of potential conflicts involving cyclists at the roundabout. Single lane approach and exit widths of between 4.0m and 5.0m, and single lane circulatory carriageways of between 5.0m and 7.0m are desirable.
- Reduce circulatory speeds by introducing over-run strips around the central island of the roundabout, thereby reducing the width of the circulating carriageway.
- Minimise entry and exit flares (between 20° and 60°). Generally, aim to provide arms that are perpendicular, rather than tangential to the roundabout.
- Provide entry deflection to the left on entering the roundabout.
- Provide islands to segregate cyclists at entry/exit and greater deflection for motorised vehicles.
- Remove unused carriageway space and increase size of deflector islands while ensuring pinch-points for cyclists are not created
- Provide spiral lane markings for general traffic to improve lane discipline.
- Put the whole junction on a speed table, which can help reduce speed on entry and exit, but is unlikely to make a difference to speed on the circulatory carriageway

4.5.9

As described in [DMRB TD50/04](#), signalised roundabouts vary significantly: some or all of the arms may be signalised; the signals may be on the external approaches only, or on both external approaches and on the circulatory carriageway; and the signals may operate full-time or part-time. Taken together with differences in numbers of arms and lanes, there are therefore many permutations governing how they operate. Whether they provide good facilities for cyclists tends to depend on the detail of how potential conflicts have been managed.

Mini-Roundabouts

4.5.10

Mini-roundabouts are not recommended for inclusion on cycle routes. The main problems they raise are failure of vehicles to observe give way due to their geometry and failure to reduce speed through the junction. Where they exist, they should be considered for replacement where they have more than one entry lane and/or where there is an angle approaching 180 degrees between the entry and exit arms (and therefore little horizontal deflection).

4.5.11

Interventions that could improve existing mini-roundabouts for cycling include:

- minimising entry and circulatory widths and speeds
- altering geometry to create greater deflection angles
- making it impossible for vehicles to overtake within the roundabout circulatory area
- reducing single lane carriageway to a maximum width of 5m
- raising the central island to 4m diameter to slow general traffic
- incorporating a speed table to reduce speeds on entry and exit
- incorporating additional deflector islands for motor traffic (and considering omission of 'keep left' bollards from those islands wherever possible, as these can impair the visibility of turning motor vehicles and their indicator lights – such a proposal should be subject to a risk assessment).

Compact and continental roundabouts

4.5.12

These two types of roundabout are described, respectively, in [DMRB TD16/07](#) (2007) and in [TAL 9/97, Cyclists at roundabouts: continental design geometry](#) (1997). They can be useful in addressing cycle and pedestrian safety issues because they reduce motor vehicle speeds significantly and they prevent weaving and overtaking on the circulatory carriageway, making it easier for cyclists to adopt the primary riding position around the roundabout.



Compact roundabout in UK with overrun strip



'Continental' roundabout in Lund, Sweden

4.5.13

As outlined in TAL 9/97, 'continental' roundabouts, which may be suitable for flows of between 5,000 and 20,000 vehicles per day, are likely to have a positive impact on cyclists' safety and comfort because:

- their tighter geometries encourage all vehicles to take the junction more slowly
- they provide only one lane on entry and exit on every arm
- the central island is larger relative to the overall size of the junction when compared to a 'conventional' roundabout, meaning that the entry path curvature of circulating vehicles is increased (they are deviated more and therefore cannot take the roundabout at higher speeds)
- they are recommended for use in lower speed, lower traffic volume contexts.

They are also advantageous for pedestrians because the tighter geometry allows for pedestrian crossings on desire lines much closer to the entry to the roundabout than would be the case for conventional roundabouts.

4.5.14

International best practice shows that roundabouts of this type may also be appropriate in situations where cycle flows are heavy (cyclists comprising a very high proportion of all traffic). This has been seen to be reinforced in some instances by prominent use of the cycle symbol on the circulatory carriageway.



Roundabout in Nantes, France

4.5.15

Compact roundabouts, as described in DMRB, are similar to 'continental' types, having single-lane entries and exits, but are tighter still. They are described as being suitable for roads of 40mph or below, with up to 8,000 vehicles per day. Importantly, the width of the circulatory carriageway is such that motor vehicles cannot overtake each other. Entries and exits should be tight, without flares, and the central island may need an overrun area to account for the movements of larger vehicles. The Irish National Cycle Manual shows a similar model, the 'Shared Roundabout', with cycle symbols on the circulatory carriageway, but suggests that the maximum traffic flow for such a facility ought to be 6,000 vehicles per day. Roundabout types and attributed are summarised in figure 4.10.

Figure 4.10 Comparison of roundabout types

	Roundabout type			
Design feature	Normal	Continental (TAL 9/97)	Compact (TD16/07)	Mini
Approach arms	Ideally perpendicular but can be skewed	Perpendicular	Perpendicular	Preferably perpendicular but can be skewed
Entry width	Add one lane to entries	One lane, usually 4m	One lane, usually 4m	Variable
Entry radius	20m, 6m minimum	Not specified but about 10m	Not specified but about 10m	Not specified
Entry angle	Preferably 20° to 60°	Approx 30° to 45°	Preferably 20° to 60°	Deflection desirable
Entry path curvature	Not to exceed 100m	Not to exceed 100m	Not to exceed 70m	
Exit arms	Easy exits	Tight perpendicular exits	Tight perpendicular exits	Not specified
Exit radius	40m desirable, 20m minimum	Approx 10m	Approx 10m	Not specified/max 5m
Exit width	Add extra lane	Single lane 4-5m	Single lane 4-5m	Not specified
External diameter ICD	28-100m	25-35m	28-36m	Dependent on movements
Island diameter	Min 4m	16-25m	4-18m (including overrun area)	1-4m
Circulatory carriageway	1-1.2 times entry width	Single lane 5-7m	Single lane < 6m	5-7m

Roundabouts with annular cycle lanes

4.5.16

Cycle lanes around the periphery of roundabouts have been used in both the UK and other European countries. They work well where drivers are accustomed to giving way when turning, but are more challenging to design in countries without that cycling culture. They may generate more problems for cyclists unless the lanes are particularly wide and the main problems of vehicle speed and flow are tackled.



Roundabout with annular cycle lane in Utrecht (sharks' teeth markings mean 'give way')

4.5.17

Instructing all vehicles to give way on entry to cyclists in the annular lane in the UK could be achieved through diagram 1003 and diagram 1023 'give way' road markings but this still requires good driver behaviour.

4.5.18

Motorists are not accustomed to giving way on exit to others on circulatory lanes. Use of intermittent segregating islands at key points of conflict can help protect circulating cyclists from collision with motor vehicles seeking to exit.

4.5.19

Increasing the degree of separation of cyclists on roundabouts could be achieved through the use of more infrastructure, effectively creating segregated lanes around the roundabout itself. This leaves the problem of circulating cyclist priority over vehicles entering and exiting from the arms of the roundabout – a similar problem to the generic issue of lane or track priority across side roads (see section 3.5). Marking parallel cycle and pedestrian crossings across each arm in such a way that the cycle crossing aligns with the annular cycle lane is one way of addressing this issue. This will be available when the revised TSRGD comes into operation in 2015 (see section 4.2).

'Dutch style' roundabouts with segregated cycle lanes

4.5.20

Distinct from the UK definition of 'continental' roundabout geometry, this roundabout is a type where cyclists are segregated from other road users with orbital cycle tracks. 'Dutch style' roundabouts of this sort typically have one general traffic lane with parallel cycle and pedestrian crossings on each arm, close to the roundabout itself, to minimise deviation of pedestrians from desire lines. Where these roundabouts are used in urban areas in the Netherlands, motor vehicles entering or exiting the roundabout are required to give way to both pedestrians and cyclists. The geometry is arranged such that motor vehicles leaving the roundabout approach the crossings at close to 90 degrees to maximise inter-visibility.

4.5.21

A 'Dutch style' roundabout is being trialled off-street by TfL, with results available later in 2014. The focus of the trial is on functionality and safety – ensuring that all users understand and use the roundabout in the way that is intended, particularly the various requirements to give way.



Dutch-style roundabout at TRL test track



Roundabout with off-carriageway tracks in Amsterdam

Informal roundabouts

4.5.21

Traffic management or speed reduction features that look like roundabouts but without formal road markings or signage are occasionally used where there is a benefit in encouraging vehicles to act as if there were a roundabout present. These are a flexible alternative to priority junctions and are sometimes used as part of a wider shared space-type approach. There are no set dimensions for such a feature, and they allow for more creative uses of materials and colour.

4.5.22

Where there is little traffic present, vehicles can progress through the 'roundabout' as they would at any priority junction. Where traffic is slightly heavier, vehicles are encouraged by the appearance of the feature to act as if it were a roundabout and give way to the right.

4.5.23

Informal roundabouts can be advantageous to cyclists, allowing them to progress through a junction without having to stop and start, and generally encouraging lower speeds.



Informal roundabouts at Moor Lane, City of London (left) and Bexleyheath town centre (right), both of which have a 'roundabout-like' feature in the carriageway

Gyratories and one-way systems

4.5.24

Gyratories in London vary from area-wide one-way systems to large, 'roundabout-type' junctions. This variation in types means that each needs looking at on its own merits, as part of a wider network management approach. It is essential that an area-wide analysis takes place and that all opportunities for improvements of the local area and for better pedestrian accessibility are taken into account. The Junction Assessment Tool (see chapter 2) can assist in analysing cycle movements through various junctions that may form part of a gyratory.

4.5.25

For cycling, the issues that gyratories and one-way systems present generally include the following:

- motor traffic speed and volume, and close proximity to fast-moving traffic and/or large vehicles
- lack of directness
- lack of legibility
- the need to move across lanes of moving traffic to get into the appropriate road position (the confidence to take the primary road position as necessary)

4.5.26

Gyratory removal and a return to two-way working is an option that can help address the above issues. It is more intuitive, likely to be lower speed, almost always leads to more direct journeys and can enliven and 'humanise' streets that previously were blighted by fast-moving bursts of one-way traffic, helping to foster a more diverse range of active street and land uses. However, gyratory removal should not be an end in itself. The focus of any gyratory redesign should be on enabling more direct journeys with less delay, particularly for pedestrians and cyclists, and on allowing more 'conventional' approaches to be taken to cycling provision and to management of motor traffic speed and volume. This may only entail part-removal or partial remodelling of a gyratory or one-way system.

4.5.27

Other selected interventions can also be made to improve conditions for cyclists. Taking a filtered permeability approach and allowing cyclists to make movements that are banned for other vehicles, together with opening up one-way sections to contraflow cycling, are of obvious benefit for cyclists from a coherence and directness perspective. However, care needs to be taken to avoid putting cyclists into conflict with fast-moving opposing traffic. A higher degree of separation, such as use of full or light segregation, might be appropriate in such cases.

4.5.28

Where one-way systems are likely to remain, and where space is available, an opportunity exists to run cyclists in contraflow around much of the system. This can constitute a high level of service, provided each junction within the system is designed so as to minimise conflicts and delays for cyclists. It can help in avoiding issues related to integration with bus infrastructure.



General traffic lane converted to off-carriageway tracks at Wandsworth Gyratory

Chapter 5

Cycle-friendly street design

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5.1 Better places for everyone

5.1.1

This section is about creating the conditions for better streets – streets for people, not streets dominated by motorised vehicles. It covers aspects of good street design that will benefit pedestrians and cyclists and add economic, social and environmental value to a neighbourhood. Good cycling infrastructure is not only about designating routes and putting in cycle lanes and tracks. Many of the best streets for cycling and walking are those that are calmer, more relaxing places to be.

5.1.2

The sensitivity of many of London's historic street environments needs to be respected in designing facilities for cycling that are appropriate to their context. The quality of the street environment matters as much as its functions, particularly to those on foot and bicycle. Streets play vital roles in community interaction, commerce and social life and it is essential they are dealt with by highway engineers and transport planners as places as well as conduits for movement. As described in chapter 1, street types are a good way of integrating this place-focused approach into planning of changes to highways.

5.1.3

Cycle-friendly street design is covered by the Cycling Level of Service Assessment, as shown in figure 5.1.

Figure 5.1 Key street design considerations in CLoS

Factor	Indicator	Relates in this chapter to...
Safety: Collision risk	Kerbside activity or risk of collision with door	Integration with parking, loading facilities, bus infrastructure and taxis and private hire
Safety: Social safety	Risk/fear of crime Lighting Isolation Impact of highway design on behaviour	The benefits of making better places for everyone by designing more civilised street environments
Comfort: Deflections	Pinch-points caused by horizontal deflections	Filtered permeability for cycling, application and design of physical traffic calming and other speed reduction measures
Comfort: Undulations	Vertical deflections	
Attractiveness: Impact on walking	Highway layout, function and road markings adjusted to minimise impact on pedestrians	Separation from or sharing with pedestrians

Attractiveness: Greening	Green infrastructure or sustainable materials incorporated into design	Area-wide improvements for cycling and methods of civilising street environments
Attractiveness: Minimise street clutter	Signage and road markings required to support scheme layout	Minimising street clutter, particularly in 20mph areas

Good design outcomes for streets

5.1.3

The place characteristics of streets are often seen as the concern of urban designers and landscape architects but they should also be a core priority for transport planners and design engineers.

Safety

Design should promote the safe movement of people and goods, and do so in ways that minimise conflict between road users and contribute to a healthier and more sustainable environment. Local streets should be designed to provide as safe an environment as possible for walking, cycling, play and other recreational activities.

Comfort

Street design should accommodate all users, with particular sensitivity to all mobility and access requirements and with priority for the most energy- and space-efficient modes. Opportunities should be identified and taken to reallocate under-used carriageway space to increase space for pedestrians and/or cyclists.

Coherence

Street design should respond to the context, to the character of the local built environment. Good street environments are legible and can be used intuitively, irrespective of mobility, by use of appropriate materials and avoiding the need for excessive signage.

Directness

Wider route opportunities should be provided for modes that require more effort. This means permeability and flexibility for walking and cycling, minimising journey time for those modes. Priority should first be given to direct pedestrian access to and from destinations, and then to cycle access.

Attractiveness

Many aspects of the wider environment contribute to more attractive streets – trees and other planting, a sense of space and light, good visibility, harmonious use of materials, historic buildings, land uses that support appropriate levels of activity through the day. They are essential to a feeling of enjoyment, security and safety as well as aesthetic integrity, and they make up the sense of place or character that a street is able to offer.

Adaptability

Good street design should deliver value for money, and should take into account life-

cycle costs and benefits. Streets should be able to cope with changing functions or patterns of use without the need for re-engineering. This includes planning for a changing climate. Permeable surfaces, stormwater source controls and maximising tree canopy cover can all contribute to resilience to climate change.



Greening at modal filter – Leytonstone



Greening in De Beauvoir Town, Hackney



Trees provide shade on CS3, Cable Street



Public realm improvements – Canning Town

5.1.4

One way in which adaptability, attractiveness and coherence may be supported is by ensuring that existing materials are retained, restored and reused wherever possible, particularly in heritage settings such as conservation areas, world heritage sites and in the vicinity of listed buildings. This may relate to high quality traditional paving (such as York stone paving) and to granite kerbs, or to street furniture and historic signage.

5.1.5

Streets with a high place function have more active uses, a more diverse range of demands on space and therefore a greater need to have a more flexible, integrated approach between different users. Those with a high movement function are more likely to see separation. The Roads Task Force recommendations also emphasise the multi-faceted roles that streets play in the lives of Londoners:

- as fully accessible public places, a focus for the city's economic, cultural and social activity

- as safe places that can help reduce social isolation by supporting the participation of more vulnerable people in social opportunities
- as a major part of the look, feel and reputation of London
- providing green and open spaces that support biodiversity and resilience to climate change

Interventions to support cycle-friendly streets

5.1.6

This chapter covers street improvements relevant to cycling in London and its scope is summarised in figure 5.2. As covered in chapters 3 and 4, design options for cyclists at links and junctions depend on the character of streets and on traffic conditions – for lower speed, more ‘civilised’ streets, wider design options are available. This chapter also deals with designing for cycling without using cycle lanes, tracks or forms of separation at junctions. Lower-key forms of intervention are appropriate for large stretches of the Quietway network as well as being methods of improving quality of place generally and creating more cycle-friendly streets beyond the network of branded routes.

Figure 5.2 Summary of cycle-friendly street interventions

Intervention	Recommendation	Apply to:
Area-wide improvements	Use of streets with restricted access as part of the cycle network is recommended to avoid less adaptable forms of physical infrastructure on mixed streets. Permeability (through-movement) should be maximised for cycling and walking and managed for motorised traffic as part of an wider approach to managing traffic volumes.	Connectors / High streets / City streets Local streets / Town squares / City places Quietways and Superhighways away from main roads
Civilising streets through speed reduction	Traffic calming offers benefits for vulnerable road users. The preference is for strategies that use visual aspects of street design to influence behaviour and reduce motorised traffic dominance rather than harder physical measures.	
Physical traffic calming	In some streets, physical measures are justified to reduce motorised traffic speeds. These need to be planned and designed in a balanced way to reflect the reduction in comfort for cyclists that they often represent.	Local streets Quietways and Superhighways away from main roads

Decluttering and simpler streets	When well designed, interactions between road users may be improved by removing traffic management infrastructure such as signals, traffic signs and road markings. This encourages road users to negotiate the environment more carefully, with greater awareness of others and at lower speeds.	High streets / City streets / Local streets / Town squares / City places Quietways
Sharing with pedestrians	The preference is for dedicated cycling infrastructure but there will be areas where some sharing is the most pragmatic choice for the place. This needs to be done in a way that minimises potential conflict and is legible and coherent for all users.	City hubs / City streets / City places Quietways and Superhighways, only as a last resort
Integration with bus infrastructure	Since bus routes and bus stops exist on many streets in London, strategies are needed to integrate cycling in ways that support the priority of both modes.	High roads / connectors Superhighways
Integration with kerbside activity	At route planning and detailed design scales, a balanced approach is needed towards parking and loading. In some places, kerbside activity may need reconfiguring. On streets where parking and loading remain in their existing form, specific design strategies for cycling are needed.	All street types Quietways and Superhighways

5.1.7

Design of street environments should take into account other national and local design guidance, including TfL's Streetscape Guidance and borough design guidance at the local level, and [Manual for Streets](#), [Manual for Streets 2](#), the [Design Manual for Roads and Bridges](#) (DMRB) and the [Traffic Signs, Regulations and General Directions](#) (TSRGD) at national level.

5.1.8

Advice set out in Manual for Streets should inform decisions around the options for street interventions set out in figure 5.2. Manual for Streets advocates a more integrated, collaborative process: figure 5.3 sets out key considerations for stages in the street design process.

Figure 5.3 Key considerations in street design process (based on Manual for Streets)

1. Policy review	2. Context appraisal	3. Detailed design issues	4. Implementation and ongoing management
<p>Planning policy and area-based strategy</p> <p>Community priorities</p> <p>Existing or proposed design guidance or codes</p> <p>Identified road safety issues</p> <p>Bicycle, bus, HGV and emergency service vehicle routes</p>	<p>Street network</p> <p>Demand and usage patterns (including trip generators)</p> <p>Accessibility</p> <p>Street character types / form, scale, pattern and character of streets</p> <p>Environmental and public space conditions</p> <p>Land uses and types of user</p> <p>Balance of local versus through traffic</p> <p>Access management (side streets and private accesses)</p>	<p>Target and design speeds</p> <p>Alignments and widths</p> <p>One- / two-way operation</p> <p>Horizontal and vertical geometric elements</p> <p>Public space</p> <p>Materials</p> <p>Gradients and drainage</p> <p>Utilities, lighting and street furniture</p> <p>Trees and other vegetation</p> <p>Stormwater controls</p>	<p>Speed limit</p> <p>Traffic controls</p> <p>Road safety</p> <p>Enforcement</p> <p>Access controls</p> <p>Regulation of parking and loading</p> <p>Maintenance and cleaning</p> <p>Inspection regimes</p> <p>Other short-term operational improvements</p>

5.2 Area-wide improvements for cycling

5.2.1

Design and quality of place influence the ways people choose to travel. Routes that are lightly trafficked or free from use by motorised vehicles are very attractive for cyclists as well as pedestrians. Delivering these conditions depends on taking area-wide approach to traffic management in order to achieve targeted traffic volume reduction on certain routes and streets. As part of this approach, local interventions such as selective street closures can be applied to make streets more permeable (easy to move through) for non-motorised modes but restricted to motorised traffic.

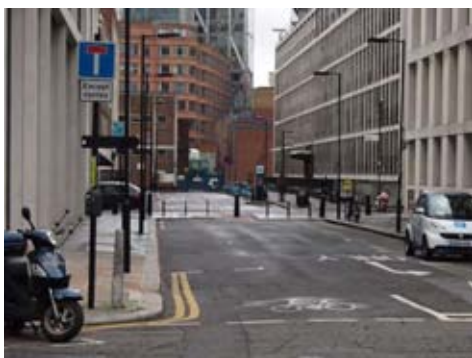
5.2.2

Area-wide traffic management and targeted traffic volume reduction is recommended for Quietways, where routes are likely to pass through areas that could see wider benefits from greater management of through-traffic. These approaches are less relevant for Superhighways although some routes may run away from main roads and through quieter areas.

Targeted traffic volume reduction

5.2.3

Area-wide approaches taken at the planning stage are covered in chapter 2. This section deals with the detailed interventions that contribute to larger scale traffic management. Street types that are more likely to be amenable to targeted traffic volume reduction and cycle permeability measures are those with lower movement functions and higher place functions, such as: local streets, town squares, city places and city streets.



Cyclist exemption from 'no through road'



Contraflow cycling in one-way street

5.2.4

In urban areas where there is a dense grid of streets, adaptations can be made to dedicate or restrict through-routes to selected users. Options for more permeability are

more limited in other urban scenarios – for example, strategic routes with few side streets, areas where major land holdings, rivers and infrastructure such as railway lines cause severance, and one-way traffic systems. The ways in which targeted traffic volume reduction may be used in support of cycling are summarised in figure 5.4.

Figure 5.4 Summary of methods for targeted traffic volume reduction

Point closure to through-traffic	A Traffic Regulation Order (TRO) is required. Point closures are used to close streets to general traffic, usually maintaining motor vehicle access to properties, while keeping them open for cyclists. (See 'Filtered permeability' below)
Making two-way streets one-way to general traffic	A TRO is required. Streets should remain two-way for cycling using contraflow facilities (see section 3.3). A new one-way street may need additional traffic calming measures as one-way traffic speeds can be higher than two-way.
Bans and turning restrictions	A TRO is required. Where selected movements are banned at junctions, cyclists should be exempted. Additional local measures may need to be taken to ensure the cycle movement can be made safely.
Height, width and weight restrictions for HGVs	Subject to considering the need for freight access and deliveries, these can be used to limit the number of HGVs on a given street. They are most likely to be more effective when supported by physical restrictions. Cycle by-passes to width restrictions may be appropriate and these should provide a minimum of 1.5m clear width for cyclists. However, the need for freight access for deliveries should always be considered.
Signing strategies	Signs can be used to direct motorised traffic along suitable roads and away from unsuitable ones such as residential or narrow streets. It is likely to need complementary traffic calming.
Localised traffic calming	See section 5.4.

Filtered permeability for cycling

5.2.5

As set out in chapter 2, an ideal network would be one that maximises permeability for walking and cycling, but exerts tighter controls on through-movement and access for motorised vehicular traffic. When applied to cycling, this approach is often known as 'filtered permeability'. This conventionally involves selective point closures to motor vehicles (or 'modal filters'), contraflow working for one-way streets, and the use of linking off-highway paths and routes through green spaces.



'Modal filters': ways of providing cycle access through places with limited or no motor vehicle access

5.2.6

The minimum clear width (eg kerb-to-kerb or kerb-to-bollard) for cycle access through a point closure should be 1.5m although a greater width is desirable for two-way cycle gaps, particularly where cycle flows are high. Consideration needs to be given to maintaining access for all types of bicycle and tricycle: these types are likely to be excluded by gaps below 1.5m. Where a larger gap is provided, supplementary measures to prevent unauthorised use by motorised vehicles should be considered.

5.2.7

Dropped kerbs are needed to maintain level and comfortable access through a point closure, and are essential for those who need step-free access or for whom pushing a cycle up a kerb is not an option. Access to dropped kerbs should be at least 1.5m wide, and proportionally wider when the approach creates an oblique angle.

5.2.8

Safety and security for pedestrians and cyclists need to be carefully considered where routes are closed to motorised vehicles. Provided they are well-lit with natural surveillance, which relies on levels of use and depends on the wider urban context, they can feel safe and be safe. Underpasses, alleyways and tunnels can also provide a good, safe environment for pedestrians and cyclists when designed with good lighting, clear sightlines, no dead ends and ideally a degree of overlooking, or possibly CCTV.



Cycle access through pedestrian-dominated street

5.3 Civilising streets through speed reduction

5.3.1

Traffic speeds impact directly on the risk of serious collisions and the comfort and attractiveness of cycle routes. Even where cyclists are separated from motorised traffic lanes, reducing motor vehicle speed limits helps to increase the comfort and attractiveness of cycling on an adjacent lane or track, particularly if general traffic is close by.

20mph speed limits

5.3.2

Wherever possible, 20mph should be the maximum speed limit on roads forming part of designated cycling routes off main roads, including local streets, town squares and city places. Locations where 20mph limits may be appropriate should be identified and assessed through the route assessment process (see chapter 2).

5.3.3

Speed limits can be set for individual streets or across zones. Zonal treatments require measures to ensure general compliance, such as signage and, where appropriate, physical traffic calming. However, in its guidance [Circular 01/2013, Setting local speed limits](#) (2013), DfT advises that ‘general compliance needs to be achievable without an excessive reliance on enforcement.’ This is likely to require measures to promote ‘psychological traffic calming’ – see below.



20mph zone in mixed town centre environment



20mph zone signage, Golden Lane, Islington

Homezones and Play Streets

5.3.4

Options for traffic calming on local streets include special designations such as Homezones and Play Streets. While not intended for cycling, these can contribute to speed reduction generally and to a better balance between road users.

5.3.5

Home Zones give added focus to the non-motorised traffic functions of streets by redesign of the street environment, often omitting conventional road markings and using materials that contrast with the wider area to show the street has a different status. A 10mph speed limit normally applies, which means many cyclists may need to moderate their speed. DfT provides guidance on Home Zones via two Traffic Advisory Leaflets: [TAL 10/01 Home Zones: planning and design](#) (2001) and [TAL 08/02 Home Zones: public participation](#) (2002).



Homezones in the UK (left) and Germany (right)

5.3.6

Play Streets are temporary closures to through-motorised traffic for a single or recurring event, allowing people to occupy the carriageway space for activities such as children's play. They do not allow cycling during the closure, but they can change perceptions about the use of the street and, in time, lead to calls for more permanent redesign of the street environment.

5.3.7

Both Play Streets and Home Zones have a recognised regulatory sign – diagram numbers 618 and 881 respectively in [TSRGD](#) (see chapter 6 for more details on signage). This formal status allows other road users to recognise the special nature of the street even, in the case of a Play Street, where there may be no other visual indication for most of the time that it is different from any other residential street. This may give rise to more considerate behaviour towards others, particularly vulnerable road users, and to lower speeds.

Psychological traffic calming

5.3.8

The character of the street has a subtle effect on traffic speeds: the street width, lane widths, the amount of greenery, the sense of enclosure given by the buildings, the levels of activity and the uses that the street supports. If motorists perceive that they have unbridled priority and that the street has been designed primarily for through-traffic, then they will drive accordingly.

5.3.9

A study by TRL, ['Psychological' traffic calming](#) (2005), compared different design techniques for traffic calming, together with more conventional speed reduction methods. Uncertainty was observed to be very effective in reducing speed, particularly 'tree build-outs'. The greatest impacts were achieved using combinations of psychological and physical measures. Geometry is a key factor: when motorists are in more doubt about whether the space exists to make a passing manoeuvre, they are likely to overtake more slowly and more carefully (if at all).

5.3.10

Features that may support this psychological calming effect include:

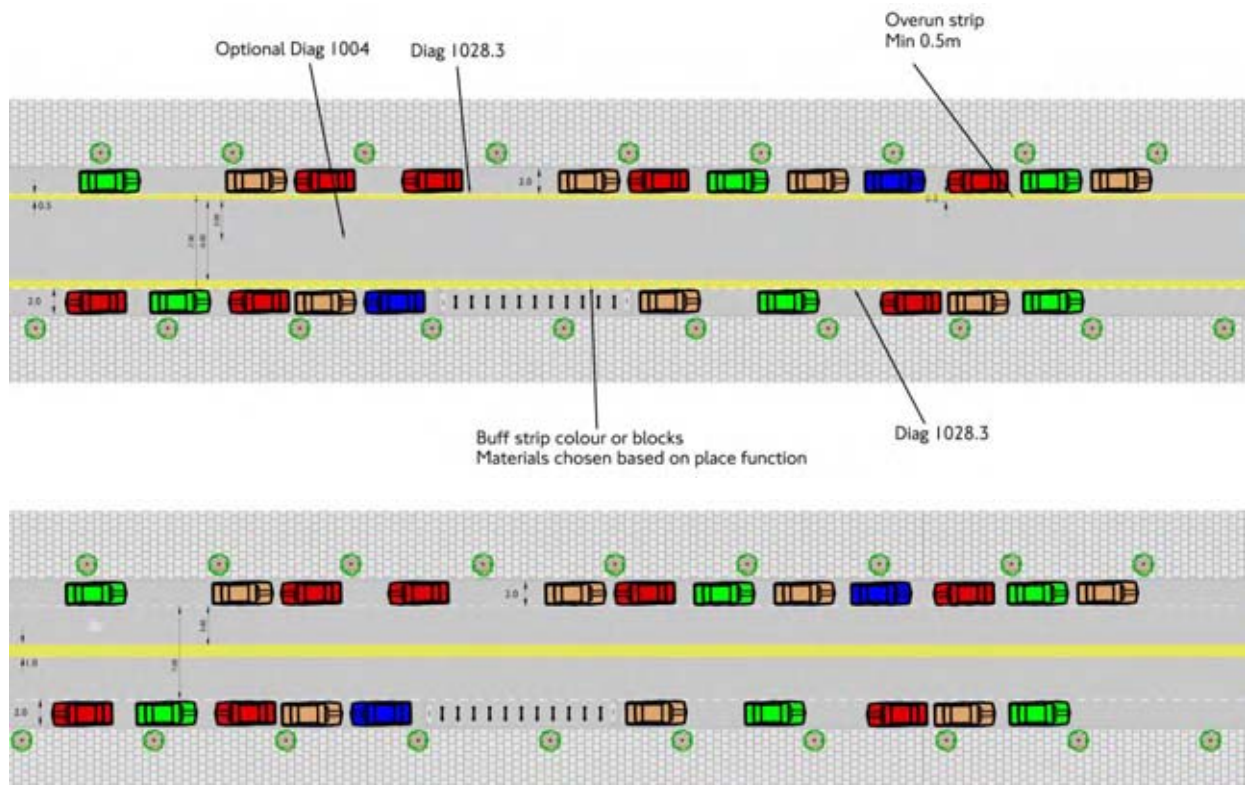
- the appearance of road narrowing and reduction of forward visibility
- removal of road markings that give motorists more security than is appropriate, resulting in excessive speed (typically centre lines on local roads)
- use of different materials, colours, street furniture and planting to make the street environment less 'road-like' – this can include, for example, changes in surface material that give the impression that a raised table exists without the need for construction of a table
- frequent active frontages, with high levels of pedestrian activity
- frequent formal and informal crossing by pedestrians
- use of the carriageway by large numbers of cyclists



Visual narrowing by use of contrasting materials for market stall areas – Whitecross Street



Median strip used for visual narrowing and to enable informal crossing – Hornchurch



Illustrative layouts 5/01a and b: Changes in carriageway materials to support visual narrowing

5.3.11

Centre line removal is a simple and effective way of achieving a traffic calming effect and is recommended for any street with only one general traffic lane in either direction. Motorists often drive to the centre line and, where advisory cycle lanes are marked on narrower streets, are more likely to encroach into the cycle lane than the opposing traffic lane. Removing the centre line encourages them to drive to the advisory cycle lane marking instead, and tends to have a speed reducing effect because motorists are more wary of traffic in the opposing direction.



Many calm, two-way residential streets have no centre lines and little width between parking bays



5.4 Physical traffic calming

5.4.1

Speed reduction through subtle, ‘psychological’ measures are preferred for most circumstances – particularly Quietway routes. However, there may also be a need for physical speed control measures as part of area-wide road safety treatments in order to enforce a speed limit, helping road users to stay comfortably within it.

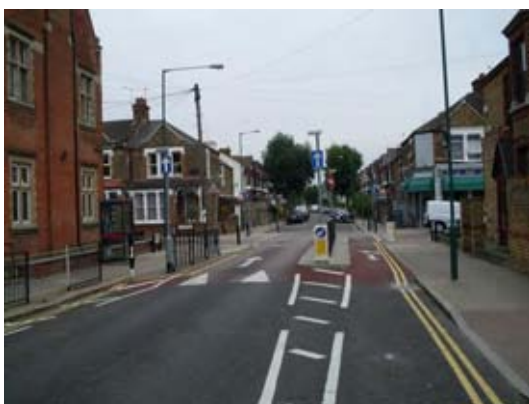
5.4.2

Cyclists are particularly susceptible to being destabilised by abrupt changes in road surface level or being made to deviate sharply from their course. For those reasons, methods of traffic calming designed for motorised vehicles that are a problem for cyclists include: rumble-strips, steep humps with upstands, sharply angled footway build-outs, pinch points and ramps with bumpy or slippery surfacing. These should be avoided on cycle routes, unless the intention is to slow cyclists (see section 3.2, ‘Cyclist slowing measures’).

5.4.3

Physical traffic calming measures include horizontal and vertical forms. Section 4.3 covers some vertical methods, including junction tables and entry treatments, and horizontal methods such as chicanes, footway build-outs and refuge islands. Central hatching, often used to protect traffic islands, should only be used as a speed control measure where absolutely necessary.

Horizontal calming can be effective, and avoids the comfort issues raised by vertical calming. However, it must comply with the guidance set out in figure 4.6 of LCDS, to avoid creating pinch-points for cyclists.



Central hatching used to protect island
– Bathurst Gardens, Brent



Footway build out on street with contraflow
cycling

Ramps and speed humps

5.4.4

Speed humps can be very effective at reducing vehicle speeds but need to be carefully designed so that their presence does not deter cyclists from using the road. Sinusoidal humps and sinusoidal ramps to tables and entry treatments should always be used on cycle routes as they allow cyclists to maintain speed and they generate lower levels of vibration than flat-topped humps. For a level change of 50mm or less, a sinusoidal profile is not required for the ramp.



Sinusoidal-profile humps



Flat-topped hump

5.4.5

Linear ramp gradients should normally be between 1 in 10 and 1 in 20, although the legal maximum is 1 in 6. It is recommended that the new surface of the ramps is continued 500mm beyond the ramp into the existing surface to produce a smoother profile. Steeper gradients and higher tables will provide greater speed reductions, and may be suitable for less trafficked roads, but will be more of an inconvenience to cyclists as well as motorists. Where there are higher flows, then flatter gradients and lower tables, or sinusoidal ramps may be more appropriate. The TfL note [BP2/05, Traffic calming measures for bus routes](#) (2005) provides further advice in this area.

5.4.6

On routes used by buses, only sinusoidal or shallow-ramped flat-topped varieties of hump may be used. Humps may not be acceptable on any route used by emergency service vehicles.

Speed cushions

5.4.7

Speed cushions are often introduced in preference to humps on routes used by buses and emergency vehicles. They need to be carefully positioned to allow the cyclists to continue on a line that is at least 0.5m from parked cars and their door-opening space. The route for cyclists and P2Ws should be clear and direct, avoiding the need for either 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 (greater than the 0.7m specified by road humps guidance). Where frequent parking adjacent to the cushions cannot be avoided, gaps should fit cyclists' normal alignment.



Gaps between speed cushions are in line for cyclists, reinforced by cycle symbol positioning



Gaps force cyclists to deviate from their line and into the door-opening space of parked cars

5.4.8

The safety and comfort of cycle trailers and non-standard cycles (including tricycles and handbikes) must be considered when specifying cushions. Unless a nearside gap of at least 1.5m is provided, then 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.

Materials for vertical traffic calming

5.4.9

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 in 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.

5.4.10

Ramps constructed of granite setts can be effective at slowing motor vehicles because of the rumble effect, although they can be manufactured and laid smooth. The surface must be smooth enough to be comfortable for cyclists, particularly the (edge) section most used by them. However, in higher usage situations granite can polish, becoming slippery and creating stability problems for cyclists and other two wheeled vehicles. Granite setts are also not likely to be a durable choice of material when frequently over-run by larger vehicles.

5.4.11

Sinusoidal ramps can be constructed with asphalt, block paving or imprint pattern. Pre-cast concrete units are available but are of a shorter and steeper profile and so should only be used with caution. Good skid-resistance is important particularly where there are turning movements.



Sinusoidal ramp in block paving

5.5 Decluttering and simpler streets

5.5.1

On most cycle routes, particularly Quietways, it is likely to be beneficial to simplify the street environment. Not only is this consistent with the idea of psychological traffic calming – removing features that give the impression of motor traffic domination – but it also helps in meeting the Mayor's Vision for Cycling requirement of 'better places for everyone' by making streets more attractive, aesthetically pleasing places to be.

Methods of decluttering

5.5.2

Minimising street clutter is one way of simplifying the street environment, and should be applied in line with relevant street design guidance, such as TfL's Streetscape Guidance. It is particularly important for those street types with a high place function, such as city hubs, city streets and city places, where the aesthetic integrity of streets and the need to accommodate multiple functions are a high priority.

5.5.3

Interventions to support decluttering include:

- removing and consolidating existing signage whenever feasible
- using existing poles, posts, columns, walls and railings along the route for signage (the net number of signage posts should be the same or less than previously existed)
- using agreed street furniture options and palette of materials to ensure that all the various elements are in keeping with their surroundings
- keeping the variety of materials to a minimum – employing, for example, changes in colour and surface texture only where it serves both a practical and aesthetic purpose
- co-locating signal heads and lighting on the same column
- ensuring that litter bins, control cabinets, other street furniture and trees are located in the furniture zone adjacent to the carriageway, leaving at least 2m clear width for walking
- removing pedestrian guardrail, unless it is absolutely necessary
- attaching street lighting to buildings
- removing any inconsistent or unnecessary road markings



Minimal use of road markings – Bunhill Row



Decluttered street environment – Liverpool Street

5.5.4

Cycling infrastructure can add extra complications, particularly when it comes to physical separation or additional demands for signage, signals and surface markings. To help minimise infrastructure and signage clutter whenever there is a decision that a higher degree of separation is required:

- Consider lighter and intermittent forms of segregation. These are invariably cheaper and more flexible than continuous forms.
- Ensure the street is as legible as it can be. Ideally, people should be able to tell where motor vehicles, cyclists and pedestrians are supposed to be without the need for conventional signage to explain the environment. This can often be done in subtle ways, through changes of material or embedding signage within surface materials.
- Make the street environment intuitive, avoiding wherever possible scenarios where road users are put into an unfamiliar relationship with one another. Where the context calls for a more 'unintuitive' layout – such as contraflow cycling or cyclists and pedestrians sharing space – signage, markings and tactile paving has to be used to inform road users of how the space operates, and this is likely to undermine efforts to declutter.
- Be consistent with cycling infrastructure. Keep cyclists either in a one-way or two-way system of tracks for as long as possible without unnecessarily switching between the two, unless this serves a deliberate strategy of returning cyclists to the carriageway at junctions and side roads, as is common in Danish practice.
- Use only the amount of regulatory signage that is strictly necessary.

5.5.5

Decluttering is consistent with local and national policy. The Mayor's [Better Streets](#) initiative focuses on practical steps to achieve high quality streets, and advocates a staged approach. The five stages it describes represent increasing levels of intervention, with decluttering and merging functions being at 'easy' end of the scale. Manual for Streets takes the view that designers should use 'the minimum of highway

design features necessary to make the streets work properly’ (para 1.1.6, p13). This is an approach supported by the Department for Transport in [Signing the Way](#), explained further in [TAL 01/13, Reducing Sign Clutter](#) and reinforced in the [consultation draft of the traffic signs regulations, TSRGD](#) (2014).

Removing priorities and sharing space

5.5.6

Stripping back signs, markings and formal traffic management means relying more on good behaviour, negotiation of movements and sharing. This contrasts with approaches that warn, instruct, separate and control different movements and, often, different modes.

5.5.7

Given that it is challenging to integrate new infrastructure and signage with the existing sense of place and local distinctiveness, it is advisable to start with decluttering in mind. In some instances, for example on streets with a mix of uses and functions, such as high streets, city streets and city hubs, design objectives related to changing the balance between users could be better served not only by seeking to minimise clutter but also by removing priority between users and promoting more sharing of space. This is not an approach that is likely appropriate for branded cycle routes, but could form a linking part of the cycle network through a town centre, for example.



Van Gogh Walk, Lambeth



Byng Place, Camden

5.5.8

In shared spaces, all users negotiate their right of way cooperatively rather than relying on traffic controls. The street environment can therefore be used more flexibly throughout the day or for special events, and can support a more diverse range of uses. Ideally, those active land uses can spread into the surrounding street network, fostering a vibrant public realm. Comfortable, attractive environments encourage ‘staying’ activities such as relaxing, shopping, eating, socialising and playing.



Seven Dials, Covent Garden



New Road, Brighton

5.5.9

The principal sources of guidance on shared space in the UK are [Manual for Streets](#) (2007) and DfT's [Local Transport Note 1/11, Shared Space](#) (October 2011). LTN1/11 stresses that bicycles are vehicles and that the emphasis is on pedestrians not having to defer to vehicles. It advises that an indicator of sharing is 'drivers and cyclists giving way to one another'.

5.5.10

Typical features of shared space include:

- removal of traffic management related street furniture, eg. traffic signals and guardrailling
- opportunities for tree planting and/or other soft landscaping
- minimal use of signage
- indications of priority at minor junctions omitted
- low flows of motorised vehicles
- low vehicle speeds (LTN1/11 recommends a design speed of 15mph or less)
- use of courtesy crossings at surface level instead of controlled crossings
- a 'ladder-grid' movement pattern – encouraging pedestrian crossing at certain points, at regular intervals, through subtle variations to the width of the footway or comfort space
- dedicated, carefully designed parking/loading bays
- generous amounts of seating
- well designed lighting
- street trees, street art, cycle parking or other items of street furniture in 'unconventional' positions

5.5.11

More vulnerable road users may feel uncomfortable trusting considerate behaviour by others, particularly those who present a high risk of injury in the event of a collision. People with visual and physical impairments may feel that they have a much reduced

level of subjective safety if they are being asked to share with other road users. How these types of areas are navigated, particularly by blind and partially sighted people, needs to be considered carefully as part of the scheme design.

5.5.12

Application of shared space approaches can be an opportunity to promote greening and use of sustainable drainage. Permeable surfacing should be used wherever possible and care needs to be taken around the impact on street drainage of any level changes or changes to surface materials. More detail on this is provided in the section on shared surfaces, below.

5.5.13

It is important that the transitions to shared space are well designed, so that drivers enter the space at an appropriate speed. Gateway features, raised tables or continuing the footway and cycleway across the entrance to the street are all ways that this might be achieved. Other alternatives include a reduction in road width, visual narrowing, a change in surface material or, simply, signs and markings.

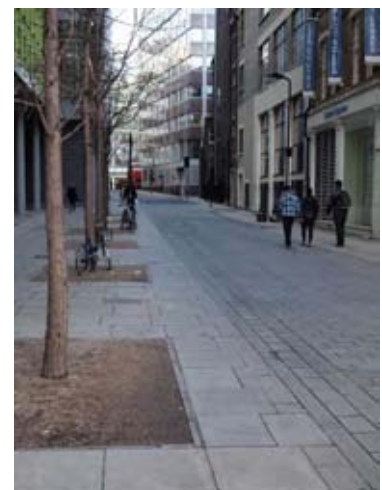
5.5.14

Design of parking and loading in shared space is important, due to the risk that stationary vehicles may obstruct movement, although parking can be used constructively to help frame the pedestrian space and create horizontal deflections that assist in controlling vehicle speeds. There may be a desire to discourage regular vehicle movements, so short-term parking bays should be avoided, as should parking that reduces the width of the pedestrian space.

Level surface treatments

5.5.15

Simplification of the street environment, in support of a better balance between road users and slower speeds, may also be served by the use of level surface treatments, where there is no level difference between footway and carriageway. Level surfaces usually form part of a wider shared space approach, but can be applied as a separate measure, in order to remove a physical and psychological barrier to pedestrian movement and increase drivers' awareness of possible pedestrian movement into the carriageway. They are also often an efficient use of limited carriageway space.



Level surface on a quiet street



Level surface treatment, Coventry



Venn Street, Lambeth

5.3.16

DfT reports in LTN1/11 that level surfaces are appreciated by many people with mobility, hearing and learning impairments. However, others with mobility and visual impairments may be disadvantaged by the removal of the obvious physical edge-of-carriageway delineator that a kerb normally provides. Mitigating measures in such circumstances will need to include an alternative form of delineation so that the edge of the footway or comfort space can be perceived. In some places, corduroy tactile paving is used instead of a kerb (see section 7.3 for further details). Colour and strong tonal contrast are also important, particularly for visually impaired people. Complicated surface patterns can be confusing and disorientating.

5.3.17

One alternative option, to achieve many of the traffic calming and decluttering effects without the stipulation of a strictly level surface, is to include a minimal kerb upstand, usually around 50mm.



Minimal kerb upstands – Church Lane, Leytonstone

5.6 Sharing with pedestrians

5.6.1

This section concerns interactions between cyclists and pedestrians off-carriageway, particularly the question of whether they can or should be separated or whether they are asked to share space.

As this guidance makes clear, bicycles are vehicles and the highest levels of service for cyclists come with dedicated facilities, not areas shared with pedestrians.

5.6.2

International best practice shows that cities with good quality, joined-up cycling networks do not generally rely on footways shared between pedestrians and cyclists in inner urban areas. That is not to say that shared facilities might not have their place in certain circumstances, particularly alongside major arterial roads, but to stress that they are an option offering a level of provision that ought to be explored only when options that provide separated space have been exhausted.

5.6.3

In general, it is not desirable to take space from pedestrians to provide for cycling, nor to create cycling facilities that resemble the footway. However, there may be examples of very wide or little used footways that may be suitable for reallocation or shared use.

Understanding pedestrian needs

5.6.4

Pedestrians' needs are described in Manual for Streets and Manual for Streets 2. The key factors that affect pedestrian safety, comfort and behaviour are speed and volume of other traffic. Various Local Transport Notes have been published by DfT that touch on these issues, particularly [LTN 1/12 Shared use routes for pedestrians and cyclists](#). Other key references are the TRL report, [Cycling in Motor Vehicle Restricted Areas](#) (TRL582, 2003) and Phil Jones Associates for Sustrans, [The merits of segregated and non-segregated traffic-free paths: a literature-based review](#), 2011.)

5.6.5

TfL's [Pedestrian Comfort Guidance for London](#) (2010) is a comprehensive tool to assess the level of service of footways for pedestrians, based on pedestrian volumes: it should be consulted in the planning stage of schemes.

5.6.6

Any change to the street environment, including those intended to make streets safer and more attractive for cyclists, must take into account the accessibility needs of all kinds of users. It is a legal requirement for local authorities to consider the impact of changes to the built environment on different people. Key sources on this area include Manual for Streets and [DfT, Inclusive mobility – a guide to best practice on access to pedestrian and transport infrastructure \(2002\)](#).

5.6.7

Four separate types of disability need to be taken into account in every instance:

Mobility impairment

This describes the use of some form of aid for moving, including wheelchairs, walking frames and sticks

Visual impairment

This includes blind and partially sighted people, some of whom also use some form of mobility aid. Visually impaired people tend to use the building line and kerbs as their main form of navigation

Hearing impairment

This group of people, which includes around 10 per cent who are profoundly deaf, can have difficulties with balance and so gradients and surface treatments are of particular significance to them

Cognitive impairment

This refers to people with learning difficulties, which includes age-related impairment. Some may experience difficulties knowing where they are. Legibility is therefore an important component of street design for this group

5.6.8

Inclusive design does not stop at dealing with the accessibility needs of people with these kinds of impairments. Consideration also needs to be given to other typical users of street environments who may be adversely affected by such things as physical segregation for cyclists. This includes families with small children, people using push-chairs and buggies and even people with bulky luggage, which is an important factor at public transport interchanges.

Good design outcomes for pedestrian/cycle interaction

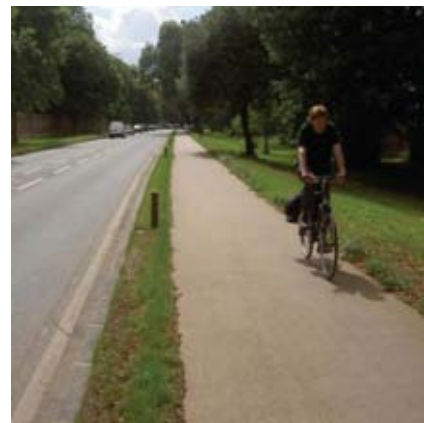
5.6.9

In designing cycling infrastructure, the default should be to separate pedestrians and cyclists, providing fit-for-purpose, safe and comfortable infrastructure for both. Shared provision may be appropriate in some circumstances, but only after other options have been properly explored.

5.6.10

Safety and comfort

Street types and local traffic conditions may justify a decision to accommodate cyclists on or next to the footway rather than on the carriageway – for example on an arterial road or high road. Pedestrians should always have priority on shared paths and cyclists should be encouraged to exercise care and courtesy. Pedestrian-dominated areas should look different from the carriageway or dedicated cycle infrastructure, to encourage cyclists to behave in a way that minimises conflict.



Shared use path – Hampton Court Road

5.6.11

Directness: the role of shared paths in cycling and walking networks

Where shared use paths are the only practicable option due to land or funding constraints, it is usually better to have them to support pedestrian and cycle movement rather than provide no facility at all and for them to be designed to be fit-for-purpose for both users. Failure to complete a key connection will devalue the remainder of the link and the cycling and walking networks as a whole.



Shared use path in Regent's Park

5.6.12

Coherence (legibility and consistency)

The design of any infrastructure shared between pedestrians and cyclists should be legible to all users as a priority. Two of the best ways to deliver this are: to avoid confusing users by switching cycling facilities back and forth from carriageway to shared use areas, and to minimise use of tactile paving and signage. If large amounts of tactile paving appear to be warranted, then it is likely that the design is not sufficiently coherent or legible.

5.6.13

Attractiveness

Better conditions for cycling can help to civilise the interaction between cyclists and pedestrians, removing points of obvious conflict, promoting courteous behaviour on both sides and alleviating the stressful on-carriageway conditions that lead to some cyclists acting too assertively when they make sudden shifts into shared areas.

5.6.14

Adaptability: planning for how a space may be used in future

It is essential to base any proposal for changing the physical environment and/or shifting the balance between users on a comprehensive understanding of how people currently use the space. This needs attitudinal surveys and views from residents, retailers, town centre managers, community safety officers, local access groups and mobility officers as well as data related to flows of different users.

Degrees of separation

5.6.15

As figure 5.6 shows, various degrees of separation between cyclists and pedestrians are possible. While separating pedestrians and cyclists is desirable in most cases, this is not an order of preference. Circumstances often dictate that more sharing is a better option than partial forms of separation, particularly where flows are low, for example on arterial roads and high roads. Note that design guidance on complete separation is covered in section 3.3 on cycle tracks and paths.






5.6.16

Pedestrian flows, cyclist flows and speeds, and the desire lines of different users are important considerations. Indicative flow ranges for cyclists and pedestrians are provided in figure 5.5 below.

Figure 5.5 Flow categories for shared routes

Level of flow	Pedestrians per hour	Cyclists per hour
Very low	0 - 120	0 - 10
Low	120-200	10 - 50
Medium	200 – 450	50 - 150
High	450 – 900	150 - 450
Very high	900 +	450 +

Figure 5.6 Degrees of separation between cyclists and pedestrians

↑ More formal separation	<p>1. Complete separation of users</p> <p>There are formal, clearly separated tracks for cyclists, using contrasting materials (generally asphalt-surfaced) and/or vertical separation. Pedestrian movement over the tracks is managed by formal crossings. It is always clear who has priority where.</p>	
	<p>2. Partial separation of users</p> <p>Physical and visual separation is less obvious and tends not to last for long stretches. It is clear who should be where for the most part but there may be places where sharing is necessary. LTN1/12 refers to this type of provision as 'segregated shared use'.</p>	
	<p>3. Shared use with suggested routes for cyclists</p> <p>Pedestrians have priority but a cycle route through a space is 'suggested' through material choice and signs and/or markings. In this way, the right of cyclists to use the space is asserted.</p>	
↓ More sharing	<p>4. Fully shared use paths and areas</p> <p>Pedestrians have priority. Cyclists are allowed to ride, but there is no indication which part of the space they are likely to use. Signs are sometimes used to remind cyclists to ride considerately. Shared use may be found on the highway or on links such as railway paths, riversides, towpaths and routes through parks.</p>	
	<p>5. Shared space</p> <p>No one user has priority. Users negotiate their way through the space cooperatively.</p>	

5.6.17

In most instances where cyclists are permitted to ride through pedestrian priority areas, much relies on courteous behaviour: cyclists should ride more slowly than they would in instances where they have priority. Signage telling cyclists that pedestrians have priority can be helpful, and can bring about more considerate behaviour, but the preference should be that the environment gives the right cues about behaviour without the need to impose codes of conduct through additional signage.

5.6.18

Steps should be taken to establish comfortable cycling speeds in shared environments that is lower than cycling speeds on-carriageway or on off-carriageway tracks. Taking steps to communicate to pedestrians the legitimate right of cyclists to be in a given space, and to indicate exactly where those cyclists are more likely to be, can help reduce the potential for conflict.



Pedestrian priority signage (away from the highway)

Partial separation of users

5.6.19

Partial separation usually takes the form of a line separating an area of footway or public space between cyclists and pedestrians. A low, raised separator to diagram 1049.1 of TSRGD may be used, between 12mm and 20mm in height, often away from the highway, through parks for example. Next to the carriageway, where it will usually have been created by dividing the footway, partial separation is generally only possible on links, reverting to fully shared areas at crossings and junctions.

5.6.20

Space will tend to dictate whether separating users is feasible. For low flows of both pedestrians and cyclists (see figure 5.5 for definitions), at least 3m width should be available, which allows for 1.5m for each user. For high flows, 3m is desirable – so, for high flows of both users, 6m would be required. If sufficient width is not available, shared use may be a better option.



(Left) Raised delineator and tramline paving indicate the beginning of a cycle track on a partially separated footway. The symbol in the foreground shows a shared area. (Right) Corduroy paving is used to bound a shared area at a crossing, with footway for pedestrians only beyond this.



Separated pedestrian/cycle path in London Fields



High flows of both users in Hyde Park, and a good case for separation on wide paths

5.6.21

Flows change throughout the day and week, and peaks may not necessarily coincide with peak flows on the road network. The proximity of schools, residential accommodation for older people, hospitals, health centres and facilities for disabled people, for example, can have a significant influence on pedestrian and cycle flows.



Separation on an off-highway route with few pedestrians. The high wall reduces effective width, and the cyclist is cycling on the 'wrong' side.



There is insufficient width to allocate sides of this cut-through to different users, so shared use makes more sense

5.6.22

The next question is whether separation is justified. Even if the width is available, there may be other reasons why shared use might be a better choice. Research shows that there is little difference in terms of reported pedestrian/cycle conflict between separated and fully shared paths. Separation is only positive for all users if it actually works: it would be unwise to assume that all users will notice and comply with more subtle forms of separation. Non-compliance is quite common, and where and when it occurs, it may lead to increased potential for user conflicts.

- more pedestrians walk on the cycle side when cycle flows are lower
- compliance with separation by both users is better during peak commuting times
- at other times, when cycle flows are lower and when there is a higher proportion of larger pedestrian groups using the route, compliance with separation will be lower
- conflict may arise from cyclists seeking to overtake on the pedestrian side when pedestrians are walking in the cycling side
- cyclists ride marginally faster when separated

Some of the pros and cons of shared and separated routes are set out in figure 5.7.



Little distinction between walking and cycling provision – same level, same surface treatment



Strong visual contrast between adjacent spaces for cycling and walking (Utrecht).

5.6.23

Appearance is also important. Regardless of how it is designated and signed, infrastructure that looks like the footway will tend to be used by pedestrians. The clearest and best understood convention is that paving slabs constitute the footway and an asphalt surface shows space for cycling. Where that distinction is blurred, then more confusion is likely. A variety of contrasting surface treatments may be possible: consistency should be sought within the framework provided by documents such as

TfL's Streetscape Guidance and design guides produced by individual boroughs. Design approaches that can help reduce confusion include:

- use of a separating strip, often a grass verge or other planted strip
- difference of level between cycleway and footway
- use of contrasting materials
- maintaining the separation for as long as possible

Figure 5.7 Comparison of fully shared and separated types of shared use

	Fully shared	Separated (or partially separated)
Public satisfaction and perceptions	<p>User consultation and public engagement should emphasise the opportunities as well as site-specific challenges</p> <p>Giving information about detailed path designs can help build consensus</p> <p>User satisfaction tends to decrease with user age</p>	<p>User consultation and public engagement should emphasise the opportunities as well as site-specific challenges</p> <p>Public perceptions may favour separated shared use</p>
Activity and behaviour	<p>More considerate behaviour among all users, especially with code of conduct and coherent design</p> <p>Lower cycling speeds at all times</p> <p>More interactions between users</p> <p>Could be less potential for actual conflict and severe collisions</p>	<p>Pedestrians may walk in cycle track, especially during periods of low cycle activity</p> <p>Cyclists tend to comply with separation unless pedestrians are in cycle track</p> <p>Non-compliance with separation can increase potential for severe collisions</p> <p>May be preferred where cyclist flows are heavier</p>
Priority, Codes of Conduct and Signing	<p>Clear, coherent and consistent code of conduct may encourage considerate use, but would need conveying to other user groups</p> <p>Supports more effective management of network</p>	<p>May require greater number of signs in order to give information along route</p> <p>May be less suitable if frequently intersected by formal and informal cross-routes, where priority may not be consistent with path design</p>

Physical design	Efficient use of width Could enable more sympathetic design and sense of place	May require more width for a given level of activity to support adequate levels of separation at peak periods May require more significant levels of infrastructure
Maintenance	Maintenance regime taking into account seasonal planting growth and surface degradation May require more maintenance if surface is unbound	May require stricter and more costly maintenance regime to support suitable separation Impact of seasonal planting growth and surface degradation can adversely affect compliance with separation
Cost	Potentially lower implementation and management costs	Potentially more costly to implement and manage

Shared use paths

5.6.24

As a general rule, shared use paths are rarely capable of offering a high level of service for cycling and should be confined to locations where cycle and pedestrian flows are low, where space dictates that no better alternative is available or where, as the above section shows, partial separation might give rise to other potential drawbacks, such as confusion about who belongs where, lack of consistency or the use of large amounts of signage and tactile paving.

5.6.25

The main application of shared use paths is on off-carriageway routes such as Greenways. Sustrans' [Connect 2 Greenways Guide](#) (2009) provides comprehensive guidance on this kind of facility. Shared use paths alongside the carriageway can also serve as useful parts of the cycling network, particularly where on-carriageway traffic conditions preclude good quality, safe provision, as on arterial roads.

5.6.26

Where there are few pedestrians, shared use paths can be attractive for people of all abilities and are an important way of providing access to facilities for use by people living locally. In some circumstances, shared use paths may be the only viable option for completing the network, in which case, the value that they represent in making traffic-free connections for pedestrians and cyclists usually outweighs any disadvantages arising from perceptions of conflict.



Shared use on a canal towpath



Shared use 'greenway' in Stockholm

5.6.27

Consideration of the needs and potential vulnerability of all users of any shared use path is vital for informing the planning and design process, so that the facility is safe and comfortable for all. This may include mobility and sensory impaired users, equestrians, joggers, anglers, maintenance officers (who may also require vehicular access) and cyclists.

5.6.28

Where investment in cycling improvements results in provision of any new shared use path, it can be an opportunity to improve pedestrian facilities through better surface quality and better lighting. The needs of wheelchair users could, for example, be better accommodated by upgrading an existing footway to be suitable, either in part or as a whole, for use by cyclists.

Shared use areas and suggested routes

5.6.29

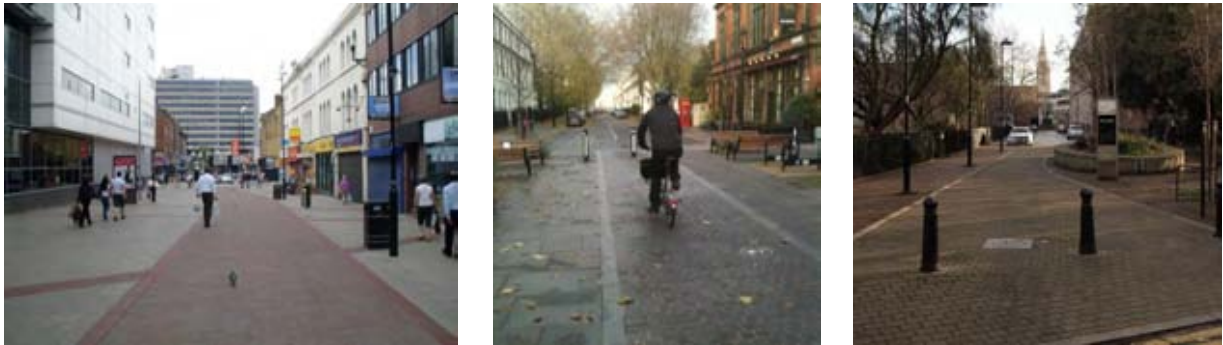
In streets such as city streets, city places and town squares, shared use facilities may also consist of limited, shared areas of public space, where cyclists are catered for in areas otherwise dedicated to pedestrians. These can provide important links between areas dedicated to cycling but need careful design in order to avoid compromising the safety and comfort of both users.

5.6.30

Typical downsides to this kind of provision include breaking route continuity for cyclists and having to shift confusingly between areas where different priorities apply. Pedestrian comfort is also compromised. Shared use areas are therefore at the low end of the level of service for cyclists. Alternatives may include:

- exploring all ways to accommodate cyclists on-carriageway
- redesigning an area more comprehensively using shared space principles

- creating a dedicated cycle track, with some form of physical segregation or change in level to separate cyclists from pedestrians
- using subtle variations in materials to suggest a dedicated cycle route (without formally creating a cycle track) through what is technically a shared use area



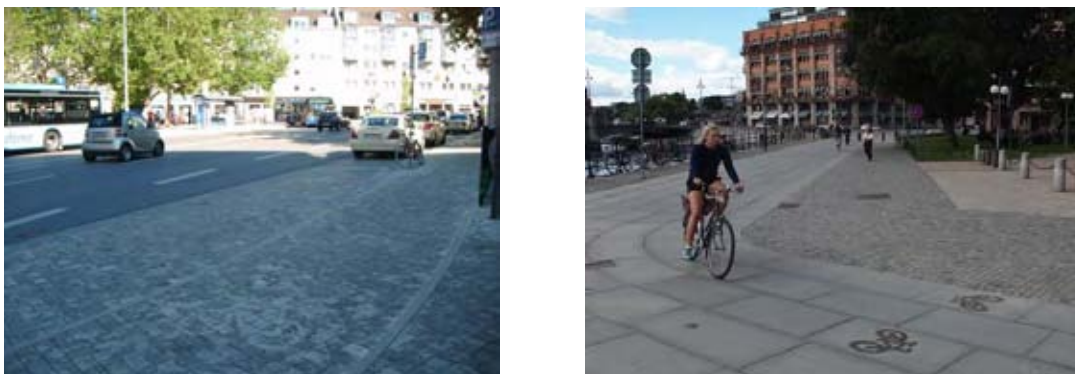
Suggested routes through pedestrian areas: Sutton town centre, Trinity Street, Southwark; Spa Fields, Islington.

5.6.31

The last of the above options could be applied either to the case of allowing cycling through ‘pedestrianised’ areas or for shared-use treatments at junctions and crossings. International best practice shows that this kind of approach is often used to soften the impact of cycling routes through sensitive areas, either by application of bespoke studs or cycle symbols, or through variations in surface materials that suggest this is a space that does not have the same characteristics as the rest of the footway.

5.6.32

Illuminated studs are also used in some places. These have the advantage that they can be controlled so as to be illuminated at times when more cyclists may be using the facility. Flexible application of lighting and other markings that help to manage conflict in shared use areas during certain parts of the day or week could be a good way of addressing many of the concerns that arise from all sides about these type of cycling facilities.



Subtle indications that cycling is permitted in a shared area: Munich (left), Stockholm (right)

5.6.33

Where it is appropriate to slow cyclists – if, for example, space is limited and cyclists and pedestrians may be moving in close proximity – surface materials could be used that have a deliberate slowing effect, such as block paving.

5.6.34

Note that pedestrians continue to have priority in such areas and courteous behaviour from cyclists is essential if they are to work well, without conflict. Care should therefore be taken to avoid indicating that cyclists have any priority over pedestrians. Subtly demarcated routes through shared use areas should stop short of the carriageway at crossings, so as to encourage cyclists to give way to ‘normal’ pedestrian movement to continue along the footway.

5.6.35

This should not mean using give way markings. In general, any ‘road-type’ markings on the footway should be avoided. No matter what the formal meaning of such markings may be, they tend to give the impression that the rules of the carriageway apply on the footway. Where necessary, signage may be used sparingly to clarify pedestrian priority.

5.7 Integration with bus infrastructure

5.7.1

The needs of buses and bicycles often coincide and there may well be a desire to encourage and prioritise both on the same street, particularly for street types that are commonly used for bus routes, such as connectors, high streets and high roads. Combining provision allows for interventions that benefit two priority road users, offering directness and coherence to cycling infrastructure, mainly for Superhighways. Sharing with buses is not likely to be a treatment appropriate for Quietways, although advice in this section on bus stops is relevant to situations where cycling is provided for off-carriageway. Guidance on shared bus/cycle lanes may be found in 3.3.

5.7.2

Appropriate provision depends on: carriageway width, number of traffic lanes, cycle route type, bus frequency and infrastructure, and other permitted vehicle types. In suggested order of preference for cyclists, the following possibilities exist for integrating buses and cyclists effectively:

- segregated cycle lane/track and dedicated bus lane
- segregated cycle lane/track and general traffic lane (no bus lane)
- nearside cycle lane within wide shared bus/cycle lane
- cycle lane and general traffic lane (no bus lane)
- wide shared bus/cycle lane
- narrow shared bus/cycle lane



Designing for cyclists at bus stops

5.7.3

Liaison with TfL is required when developing changes to bus infrastructure. [Accessible Bus Stop Design Guidance](#) (2014) assists highway authorities in the development of practical and affordable measures to improve accessibility at bus stops. It provides designers with a wide range of issues that need to be considered when reviewing individual bus stops and their immediate surroundings.

5.7.4

Options to provide for cyclists at bus stops are largely dependent on the nature of the general provision for cycling on the corridor, which in turn is influenced by the bus infrastructure and operation. Factors to be taken into account include:

- cycle flows, and flow variation during the day and week
- general motorised traffic volumes
- volume and frequency of buses stopping (including the frequency with which more than one bus is likely to use the stop at any one time)
- the number of bus passengers using the stop at different times
- the pedestrian routes to and from the bus stop
- access for wheelchair users

5.7.5

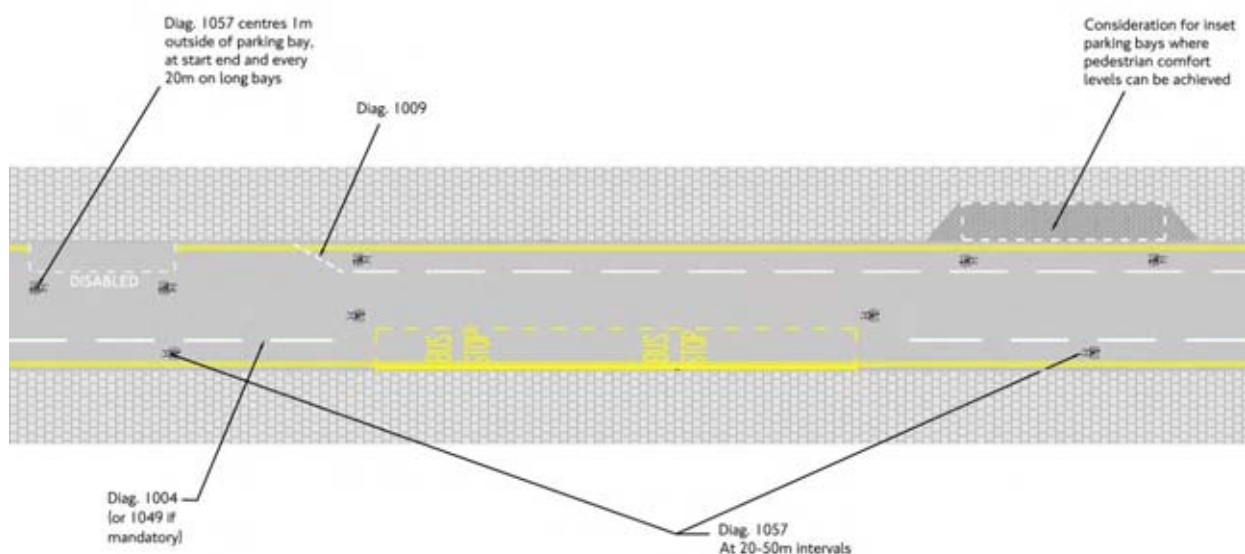
In most cases where cyclists are being provided for on-carriageway, they should be kept on carriageway through the bus stop area, to maintain the consistency and predictability of cycling infrastructure. The main objective should be to minimise risks when the bus stop is occupied, while maintaining a reasonable continuity of route. The continuity of a cycle route can be maintained by marking TSRGD diagram 1057 cycle symbols around the bus stop cage. This raises the awareness of other road users to the possibility of cyclists moving out to overtake a stationary bus at the stop.



Space for cyclist to pass bus at bus stop



Cycle lane continued around bus stop cage



Illustrative layout 5/03: Advisory cycle lanes at bus stop

5.7.6

In terms of provision, a suggested order of preference by degree of cyclist comfort and 'protection' is:

1. bus stop within a 'wide', 4.5m+ bus lane
2. bus stop within a 'wide', 4m bus lane – widen bus lane if feasible, and provide appropriate symbols on carriageway at bus stop
3. bus stop within a wide nearside general traffic lane (4m or greater) – provide appropriate symbols on carriageway at bus stop
4. bus stop within narrow (c.3m) bus lane or narrow nearside lane – undertake a risk assessment for cyclists based on factors such as geometry, peak period bus usage, traffic flows, gradient (this can provide a high, medium or low risk for cycling and will give an indication of the amount of effort and cost that is appropriate at the location – see below for options)
5. where the bus stop is within a 3.2-3.9m wide bus lane, widen the bus lane to 4m or greater and provide appropriate symbols on the carriageway at the bus stop
6. if widening is not viable for a 3.2-3.9m lane, consider reducing the bus lane width and treating as category 4 above

5.7.7

For stops within a narrow (c.3m) bus lane or narrow nearside lane, options to improve comfort and minimise risk to cyclists include:

- adjust the lane width markings so that the stops fits into categories 1-3 (bus lane or nearside lane is 4m or wider)
- widen carriageway to enable a partially inset bus stop so that cyclists can comfortably pass a stationary bus within the bus lane or nearside lane (with appropriate on-carriageway symbol)
- adjust lane width markings for a wider bus lane / nearside lane, providing sufficient width to enable a cycle lane or coloured surfacing around the bus stop – this could be aligned to suit kerbside parking / loading
- shorten the bus stop in length if it is longer than standard, subject to an assessment of the bus stop usage (only likely to be an option if there has been a reduction in the number of buses serving the stop)
- relocate the stop – adjust the position so that it becomes a category 1-3 stop or relocate into nearby side road if viable
- remove the stop altogether – either it is not justified or it can be consolidated with another nearby stop

The last two options are only likely to be viable in exceptional situations. Scheme designers or promoters should liaise with TfL Bus Network Development and Infrastructure at the earliest stage if this is being considered as an option. An evaluation of bus passenger disbenefits will need to be provided in any such circumstance.



Bus stop bypass at Stratford High Street, showing pedestrian crossing over cycle track in detail

5.7.8

Drawing on successful examples of similar infrastructure in other cities in Europe, the concept of the bus stop bypass is being developed in the UK as a trial measure. In a bus stop bypass, a cycle track passes through the bus stop area behind the shelter, thereby creating an island for passengers boarding and alighting the bus. Layouts of this solution are currently being assessed and optimised through off- and on-street trials, with a particular focus on the interaction between cyclists and bus passengers.

5.7.9

The size of the island should be adequate for the number and frequency of bus services and for current and predicted future pedestrian flows – island capacity is being tested in off-street trials and further guidance will be provided on this when available. The priority is to ensure good visibility between cyclists and pedestrians, and between cyclists and other vehicles when cyclists make a transition from carriageway to cycle tracks. This is largely dependent on careful siting of the bus stop shelter and by avoiding obstructive advertising/information panels.

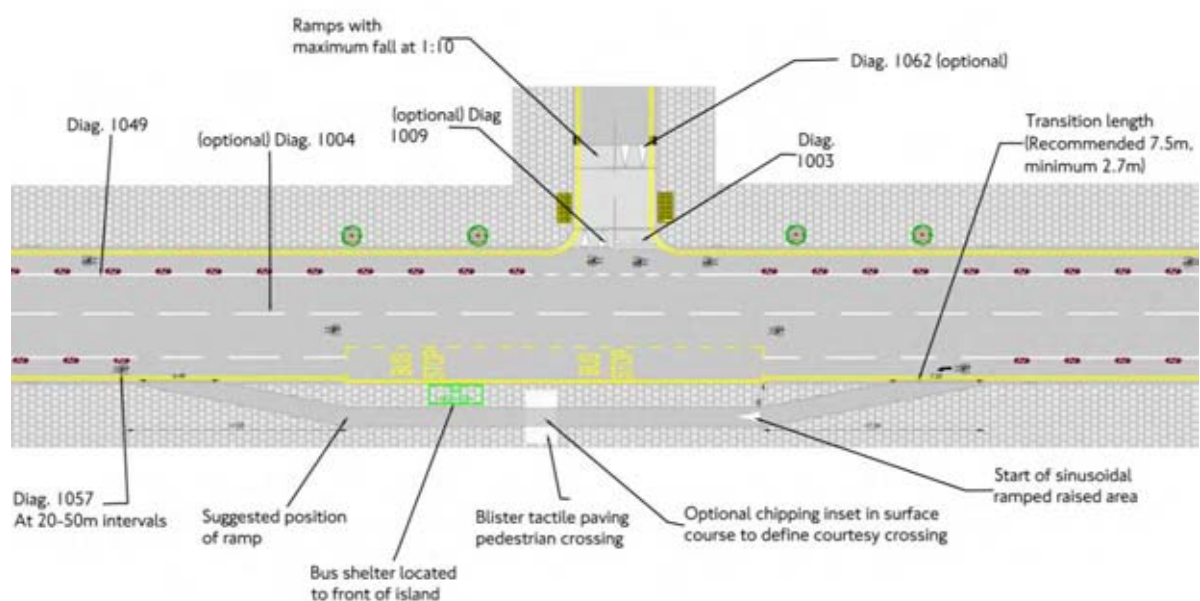
5.7.10

All pedestrians should be confident that they can cross the cycle track safely. The basic layout trialled off- and on-street includes one central, uncontrolled crossing point. In some instances, two crossing-points may be warranted to serve pedestrian desire lines, although it is likely that pedestrians will choose the shortest path available

regardless of whether or not a designated crossing point is available. Whether the crossing needs to have pedestrian priority indicated (ie. give way markings on the cycle track) in some instances is another variable subject to further trialling.



Examples of bus stop bypasses – clockwise from top left: Stockholm, Seville, Brighton & Hove, Copenhagen



Illustrative layout 5/04: Bus stop bypass where cycling provision is on-carriageway

5.7.11

To help visually impaired users to distinguish between the footway, the track and the bus waiting area, it is likely to be helpful to use visually contrasting surface materials and a minimum kerb height for the cycle track of 25mm high. However, kerbs with a vertical profile can represent a trip hazard for pedestrians or could unseat cyclists if struck, and they reduce the effective width of the cycling facility. Battered or splayed kerbs could help to mitigate this problem.

5.8 Integration with kerbside activity

5.8.1

Interactions of cycling infrastructure with kerbside activity need to be designed and managed in such a way as to minimise risks to cyclists while maintaining all necessary access. This includes design for loading and unloading activity to take place as efficiently as possible, which is important for street types such as high streets, town squares, city streets and city hubs which have a diverse mix of land uses, intensive use of kerbside space and the need for flexibility during the day and week.

Design that successfully integrates cycling, parking and loading needs an appropriate balance between physical measures and the management of kerbside activity. Enforcement of measures put in place to deal with competing demands is essential.

5.8.2

Kerbside activity also includes the activities of taxis and private hire vehicles, bus and coach stops and the provision of appropriate facilities for blue badge holders. Detailed analysis of existing and likely future needs for all these types of kerbside activity, and the extent to which they are tied to a fixed location or can be accommodated more flexibly, should be undertaken during the route assessment and prioritisation stage (see section 2.3), involving dialogue with those affected.

5.8.3

Considerations for parking and loading are, broadly, as follows:

Creation of dedicated, enforceable kerbside space for loading or parking requires a Traffic Regulation Order.

In many areas, loading and parking take place on the carriageway, as indicated by appropriate road markings and signage showing timings and restrictions.

Single and double yellow lines (or red lines for TLRN) indicate waiting restrictions, including parking. Waiting is not permitted at any time on a double yellow line. Single yellow lines indicate a waiting restriction, operated according to timings given on adjacent signs.



Signs showing time-limited loading

Loading restrictions are indicated by yellow or red 'blips' marked on the kerb next to a double line. A double-blip marking means no loading at any time. A single blip indicates a time-limited loading restriction, which is explained by accompanying signage. Typically this restricts loading to short 20- or 40-minute periods.

Dispensations may be granted by the highway authority for specific vehicles or for deliveries for certain premises to take place in spite of advertised restrictions. The dispensation is usually displayed in the vehicle's window or incorporated into the local enforcement regime. These are exceptional and design should limit the need for them.

5.8.4

As a basic principle, taking space from the footway is sometimes justifiable for loading, as part of a flexible approach to using space on a busy street, but should generally be avoided for parking. At least 2m width must remain clear for pedestrian movement, depending on existing levels of comfort for pedestrians (DfT, [Inclusive Mobility Guidelines](#), 2002) while 2.5m is recommended in front of shops (TfL, [Streetscape Guidance](#), 2009).

Techniques for integrating cycling with parking and loading

5.8.5

Figure 5.8 summarises types of intervention that could be applied to rethinking parking and loading on a cycle route. In terms of cycle safety and comfort, floating parking and loading is the option that is likely to provide the highest level of service, followed by inset bays. Area-wide approaches can be more appropriate in many instances, particularly when it comes to creation of Quietways. They can be a good way of simplifying the street environment, enhancing its overall attractiveness. It is important to understand the detail of local parking, loading and access requirements and to ensure that the free and safe movement of all users, including cyclists, pedestrians and powered two-wheelers, is maintained. In general, the default should be to seek to retain any existing dedicated loading bays.

Figure 5.8 Summary of interventions for parking and loading on cycle routes

Separating cycling from kerbside activity at network level	Where integrating uses cannot be resolved on a given street, it may be possible to rationalise parking and loading across an area to focus it on particular streets, leaving others free of most kerbside activity. This is likely require rethinking cycle route options at the route assessment stage.
Mechanisms for area-wide management of parking and loading	<p>Urban clearways In these zones, there is no stopping on the carriageway for parking or loading – they can be time-limited, with hours of operation provided on signs.</p> <p>Controlled parking zones (CPZs) prohibit waiting throughout a defined area. Signs at entry-points to the CPZ show times of operation and can include ‘no loading’. Other variants include: resident permit holders only, meter payment or pay-and-display only, voucher parking or waiting restrictions for goods vehicles.</p> <p>Restricted parking zones (see below) avoid the need for painted lines at the kerbside by allowing parking and loading subject to restrictions shown by signs.</p>

Relocation of parking and loading locally	For cycle routes, it can be beneficial to move parking and loading away from main routes and onto side streets. Certain types of loading activity are more amenable to being moved than others, while the extent to which parking can be relocated depends on consultation with businesses and residents whose needs are served by that parking. (See 'Management of on-carriageway loading' below)
Floating parking and loading	Where segregated or light segregated cycle lanes/tracks are used, parking and loading could be included in bays 'floated' away from the cycle track (potentially inset into segregating islands). Where cyclists are accommodated between the footway and parking/loading facilities, allowance needs to be made for the 'dooring zone' and the kerb height and profiles, all of which of which may reduce the effective width for cycling. (See section 3.2, 'Segregation using car parking')
On-carriageway loading/parking bays	Kerbside activity may be rationalised by creating dedicated bays rather than allowing parking and loading generally on a street. This allows kerbside activity to be focused at particular locations and for cycling infrastructure to be designed around it. Bays may be defined by built-outs, planting or other streetscape features. (See 'Loading and parking bays' below) This may also require re-marking of cycle facilities around existing parking/loading areas, changes to the timing of restrictions or minor reallocation of carriageway space. (See 'Integration with lanes and tracks' below).
Inset loading/parking bays	Although likely to require a more extensive redesign of the highway, this is a good option for cycling, and can be one that invites a more flexible use of space, with inset bays effectively forming part of the footway when not in use. However, they may not be suitable for all types of delivery. (See 'Loading and parking bays' below)

5.8.6

Restricted parking zones, which require a TRO, can be applied where a restriction is uniform and where exceptions can be captured easily in signage. They avoid the need for yellow or red line markings or kerb markings, and so they can contribute positively to more attractive, less cluttered streets. The balance to be struck is whether this justifies the extra signage that needs to be put up at each entrance to the zone. Many types of restriction are possible but the recommended way of using restricted parking zones in support of cycle infrastructure is to permit parking and/or loading in designated bays only.



Management of on-carriageway loading

5.8.7

Any decision about changing loading arrangements should go through a robust process to allow for different stakeholders to have an input, and for considerations such as the availability and suitability of alternative facilities to be taken into account. This is described fully in TfL's [Kerbside Loading Guidance](#) (2009), which describes a hierarchy of considerations for making changes to loading. The [Freight Environment Review System](#) is a useful tool for scoping levels of risk associated with freight activity.

5.8.8

Existing loading practices should be assessed to see where scope for change exists, including where deliveries cannot be catered for within present facilities. Options for rethinking loading include:

- A Delivery Point Assessment, which may be undertaken to encourage operators to make best use of the available facilities.
- Delivery and Servicing Plans can be implemented, in order to coordinate and manage deliveries and make better use of limited delivery space. These plans are owned and managed by the premises where the deliveries are being made.
- Loading restrictions and timings may be reconsidered and revised as necessary, recognising that land use and delivery activity change over time. The need for change might be informed by looking at the time and location of freight-related penalty charge notices, indicating where there is an existing mis-match between loading provision and demand.
- Deliveries to multiple premises could be consolidated in one location.
- Better enforcement of existing arrangements can be sought.
- Facilities shared with other street users, such as taxis and coaches, could be a more efficient use of space.
- To avoid peak demand and more congested periods, deliveries could be 'retimed' to out-of-hours slots. Social impacts need to be considered with this option, which are often already accounted for through noise abatement notices or planning conditions (see DfT/Freight Transport Association, [Delivering the Goods: a toolkit for improving night-time deliveries](#)). Note that the London Lorry Control Scheme limits noise pollution in residential areas at night by restricting the movement of HGVs overnight and at weekends. The scheme is enforced by London Councils and applies to vehicles weighing more than 18 tonnes.

5.8.9

The size and location of loading facilities needs to be taken into account in considering these options. Loading activities can cause congestion by blocking the flow of traffic, including cyclists. The time, frequency and volume of the activities taking place, and

the physical location where loading is permitted, all have an impact. Consideration needs to be given to access to loading facilities and the potential for reversing vehicles to impede the flow of traffic and increase the risk of conflict.

5.8.10

The potential for moving, consolidating or redesigning loading bays depends on the goods being transported. For example:

- Cash-in-transit requires vehicles to stop as close as possible to the delivery point and for the driver to have a clear line of sight to the delivery point, for reasons of safety and security. Where fit-for-purpose facilities are not provided, drivers are likely to choose to stop in any location that they deem to be safest, regardless of any dedicated loading provision that exists in the area.
- Deliveries made by the brewery trade require that vehicles may stop at 90 degrees to and a minimal distance from the cellar door, so as to avoid moving heavy barrels over a long distance. Where vehicles are side-opening, as is the case with drays used by the brewery trade, the adjacent kerbside also needs to be free of any street furniture that would obstruct the path of the delivery.
- Manoeuvring heavy items can damage the surface of the carriageway or cycle track, thereby increasing the maintenance requirement.
- Goods in roll-cages will require dropped kerbs to allow access over kerb-segregated or stepped tracks.

5.8.11

Loading can only be expected to take place on a side road where there are no width, height or weight restrictions that would prevent it and where any resulting reversing movements can be managed in such a way as not to constitute a hazard to other road users. At side roads, large vehicles will also need an adequate turning radius to manoeuvre without over-running the footway. This requirement needs to be balanced with safety and the advantages to pedestrian and cycle movement and quality of public realm that arise from tightening corner radii. Where occasional incursion of large vehicles into other vehicle lanes for the purposes of turning can be accommodated without undue risk to the safety of other road users, this is preferable to increasing the corner radii at the side road.

5.8.12

The use of bollards is not recommended and should be avoided where bays are shared use or where they obstruct loading to /unloading from side-opening vehicles. In exceptional circumstances where bollards are used they must not become obstacles for pedestrians: consideration needs to be given to people with visual impairments. Where used, bollards should be aligned with existing street furniture to provide a pedestrian 'channel'.

5.8.13

Segregated cycle lanes/tracks will generally preclude all loading activity, unless it takes place in marked bays on the offside of the cycle tracks and involves goods that can be delivered across the tracks. Much depends on the type and width of cycling facility and on the goods being delivered. Where there are wide, stepped tracks, for example, off-peak loading of lighter items could take place half on the cycle track – this is observed in many leading cycling cities.



Loading across stepped tracks with low step up from the carriageway – Utrecht (left), Copenhagen (right)

Loading and parking bays

5.8.14

Dedicated parking and loading bays can be useful for managing and localising kerbside activity. They may be marked on-carriageway, fully inset into a footway, verge or segregating island, or half-in / half-out. The choice depends to a large extent on available carriageway width and the likely impact on the general traffic flow.

5.8.15

Parking bays for cars, taxis and motorcycles are a minimum of 1.8m wide. Loading bays require a minimum of 2.4m, while the minimum dimensions of a bay for blue badge holders is 6.6m by 2.7m.

5.8.16

The location and size of bays also varies for certain goods and certain vehicles. Vehicles with a rear tail-lift will require more clear space at the rear than curtain-sided vehicles, but the latter may require more footway space to the side. Further information on space requirements is provided in TfL's [Kerbside Loading Guidance](#) (2009).

5.8.17

On-carriageway bays are indicated by a broken line around the boundary of the bay and marked on the carriageway side, for example with 'LOADING ONLY'. White lines indicate that loading can take place for an unlimited length of time during the designated hours, while red or yellow lines indicate a restriction on the duration of loading. Variations include bays that allow for mixed uses at different times of day, such as taxis, police and ambulances, as well as waiting and loading. In these cases, broken yellow lines are used, and restrictions must be explained by signage.

5.8.18

Fully inset bays have the advantage of keeping the carriageway clear and can help in accommodating multiple uses on the same street, particularly within the high street, city street and city hub typologies. They can generally be operated with fewer restrictions than bays marked in the carriageway and, when not in use, they can act as part of the footway, depending on levels and surface treatment. Control over the hours of operation can allow for a single bay to be used for loading for part of the day and short-term parking at other times. It needs to be made clear in the parking enforcement plan that it is acceptable for vehicles to stop with a wheel on the footway, as this behaviour otherwise can result in a penalty charge notice.



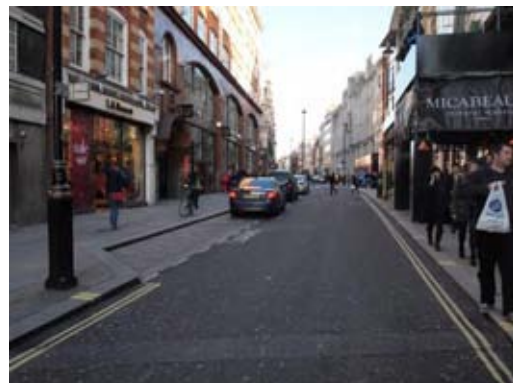
Inset bay, Wallis Road, Hackney



Loading bay inside advisory cycle lane



Inset loading facilities to support an office building – Milton Street, City of London



Fully inset loading bays to support retail premises – Long Acre, Covent Garden

5.8.19

Inset bays may be at carriageway or footway level. Where fully inset and at footway level, they should be within the street furniture zone and accessed over a kerb upstand of at least 25mm. A minimum nearside lane width of 3.0 metres is required alongside any inset bay to maintain safe traffic flow.

5.8.20

Where footway width does not allow fully inset bays, half-on, half-off facilities can be a good compromise. In these bays, vehicles are allowed to stop with their nearside wheels on the raised footway. They should not be used where they narrow the remaining width of the nearside lane to between 3.2 and 3.9 metres.



Inset parking bays. Left to right: Montague Street bay; Monmouth Street bay; Russell Square footway-level bay.

Integration with cycle lanes and tracks

5.8.21

To maintain the safety, comfort, coherence and directness of cycling infrastructure, loading and parking should, wherever possible, not be permitted in cycle lanes and shared bus/cycle lanes during their hours of operation. Advisory cycle lanes that are regularly blocked by vehicles are a poor quality facility and very often worse than no dedicated cycling facilities at all. Mandatory cycle lanes where parking and loading restrictions are not enforced are equally unacceptable.

5.8.22

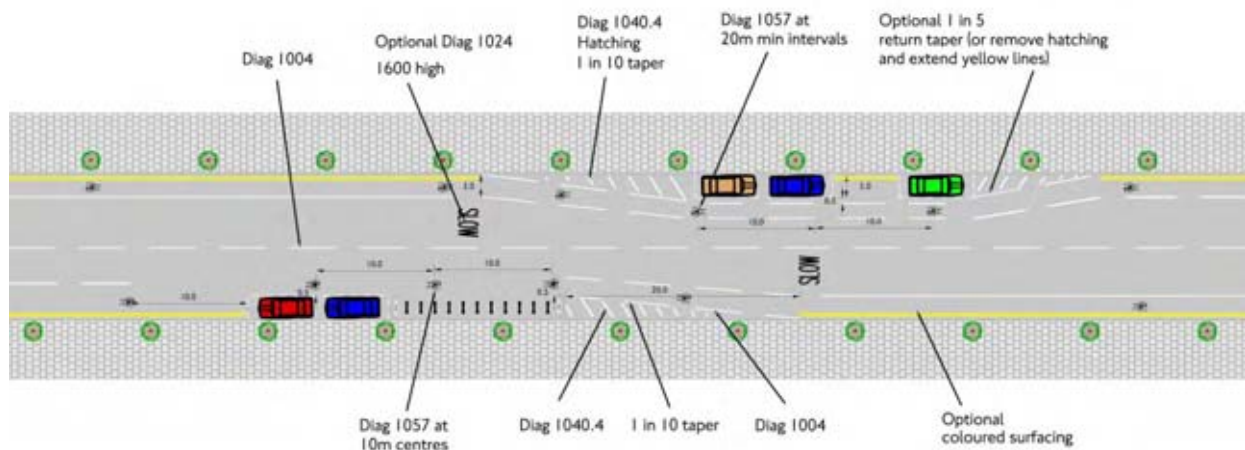
Operating hours need to be determined with reference to anticipated demand and to the conditions that cyclists may experience outside of the times of operation. 24-hour mandatory lanes are preferred, although there may be substantial benefit in simply adjusting hours of operation. Cycling peaks have been observed to begin earlier and end later than peaks for other modes of transport: indicatively, 6am to 10am and 4pm to 8pm. Lane operation until 8pm, either through extending the hours of bus lanes and/or extending parking restrictions for a further hour, could therefore constitute a much more effective facility for both cyclists and buses during the evening peak.

5.8.23

Traffic lane widths are important when it comes to cycling provision outside parking or loading bays, particularly where those lanes are narrow and larger vehicles are likely to encroach on (advisory) cycle lanes. Where cyclists are required to move out and around an obstruction such as a parked car or a delivery vehicle, the principal considerations should be that they have time and space to make that adjustment, and that they are not put into conflict with other moving vehicles in doing so.

5.8.24

Where there are no marked cycle lanes, bays should be designed and located so that at least 3.9 metres width is still available, allowing moving vehicles to overtake cyclists moving past a bay at a safe distance. Traffic speed calming measures may be appropriate in such circumstances. If this width is not available, then traffic lanes should not be in the range 3.2 to 3.9m. Where there are narrow (less than 3.2m-wide) lanes, use of TSRGD diagram 1057 cycle symbols, centrally placed on the carriageway ahead of a bay, can help in encouraging cyclists to move out from the kerb well before the bay itself and take the primary position, and in raising the awareness among motorists of cyclists needing to move out from the kerbside.



Indicative layout 5/05: Options for marking cycle lanes around on-carriageway parking bays

5.8.25

Cycle lanes marked on the outside of on-carriageway or half-inset loading or parking bays will usually need to be advisory so that they can be crossed, and at least 1.5m wide. A buffer zone of 0.5-1.0m should be provided to protect cyclists from the risk of 'dooring'. This arrangement should not be used if it narrows the usable carriageway in such a way as to mean that motorists frequently encroach on the advisory cycle lane: diagram 1057 cycle symbols should be used around the bay instead.

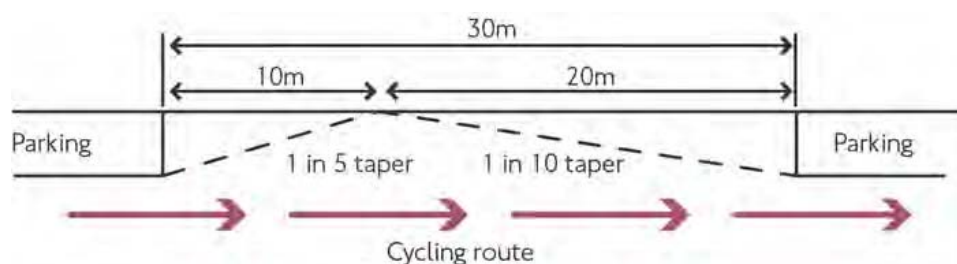
5.8.26

In design of cycling facilities adjacent to parking and loading, consideration should be given to the blind spot areas immediately in front of and to the side of larger vehicles. Drivers rely on indirect vision aids (ie. mirrors) but some older vehicles are exempt from the requirement for class IV and V mirrors, which improve vision at the front and nearside of the vehicle. Note that the Safer Lorry Scheme is aimed at addressing this issue.

5.8.27

Where there are short gaps between parking or loading bays, including at junctions, then a cycle lane should maintain its position in the road rather than zig-zag back to the kerb-line. Cycle lanes should only return to the kerbside when the gap between bays is 30m or more. This is based on an assumption of 1:5 exit tapers and 1:10 entry tapers, although as this will depend on cyclists' individual speeds, gradients and other conditions that may need to be assessed on a site-by-site basis. (See figure 5.9.)

Figure 5.9 Cyclists keep a constant line past short breaks between parking/loading areas



Integration with taxis and private hire vehicles

5.8.28

Taxis and private hire vehicles (PHVs) play a key role in London's transport system and so it is important to consider their needs early in any proposed redesign of street space. TfL is responsible for the licensing of taxi (black cab) and private hire services in London. Private hire includes minicabs but also covers a wide range of other services such as limousines, chauffeur services, tour guide vehicles and some school run and community transport services.

5.8.29

As users of many of the same streets as cyclists and even of the same space on individual streets, particularly where shared bus lanes are concerned, taxis and PHVs should be considered in any scheme to improve cycling. It should be noted that taxis can be hailed on street or at designated taxi ranks, while PHVs have to be booked with a TfL-licensed operator.

5.8.30

Relevant representatives need be consulted with and engaged at an early stage in the design process in order to understand the ways that taxi and PHV services currently operate in different locations. TfL can assist with this process and ensure that the most appropriate representatives are involved. When design options for cycle infrastructure are being considered, it is essential to understand if the area has a high number of taxis or PHVs stopping to pick up and drop off passengers, and to check when during the day this activity takes place.

5.8.31

Taxis and PHVs play an important role in providing a door-to-door service for disabled passengers. Allowing step-free, level access between the kerb and taxi/PHV, with all obstacles removed where possible, is one of the key factors to consider, as is the potential use of wheelchair ramps across cycle facilities. Gaps in physical segregation, use of light segregation or frequent raised pedestrian crossings of the cycle facility can help alleviate some of these concerns.

5.8.32

Where physically segregated cycle facilities are introduced, it is recommended that monitoring of taxi and PHV activity takes place, to check on potential conflict issues. It may be worth considering the need for a dedicated drop-off bay at a suitable, nearby location. These tend to be used only at stations but could potentially be suitable in other locations.

5.8.33

Where there are dedicated taxi ranks, many of the same considerations covered in the section on parking and loading also apply. Taxi ranks provide space for taxis to stop and wait to be hired, which helps to reduce vehicle emissions by reducing the need for taxis to be continuously driving around. Any proposals to build dedicated cycling infrastructure near a taxi rank should be discussed with TfL at the earliest possible stage so as full consideration can be given to how these facilities can be integrated, whether changes can be made to the taxi rank, if multi-use or shared facilities are an option and if alternative locations could be possible.



Advisory cycle lane marked around a taxi rank

5.8.34

The most significant interactions with cyclists take place as a result of taxis' use of bus lanes and by their dropping off and picking up activities at the kerbside. Taxis cannot use mandatory cycle lanes as running lanes but they can stop to drop-off and pick-up passengers in them, unless the kerbside markings prevent them from stopping. Taxis are generally only excluded from bus lanes when there will be an operational impact on buses but are permitted to travel in the vast majority of bus lanes in London.

5.8.35

PHVs are not permitted to travel in bus lanes when the lane is in operation, but they can enter most bus lanes to pick-up and drop-off passengers. Consideration therefore needs to be given as to how frequently this may be happening in locations where a bus lane provides part of a cycle route. This may be an issue where there are particular uses nearby – for example late-night taxi and PHV activity to serve pubs, bars and clubs.

5.8.36

Potential PHV activity also needs to be taken into account in the vicinity of PHV operating centres, which are often on high roads, high streets, town squares/streets, or in or near city hubs, streets, bus and underground stations and other places. This can mean that there are high volumes of passengers entering and leaving the centres and many PHVs turning in or pulling out near or in front of the centre.

Chapter 6

Signs and markings

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6.1 Sign requirements

6.1.1

This section gives an overview of requirements on signage and marking to support cycling, both for dedicated cycling infrastructure and for cyclists' general use of the highway. It includes some specific information on additional requirements for signage for the established Cycle Superhighways.

New signage and wayfinding for the Quietways is currently in development and a full strategy will be added to this guidance when available.

6.1.2

Signage requirements for cycle routes is covered by the Cycling Level of Service Assessment, as shown in figure 6.1.

Figure 6.1 Key signage considerations in CLoS

Factor	Indicator	Relates in this chapter to
Coherence: Connections	Ability to join/leave route safely and easily	Fit-for-purpose direction signing
Coherence: Wayfinding	Signing	Wayfinding strategy
Attractiveness: Minimise street clutter	Signage and road markings required to support scheme layout	Minimising the need for signage

6.1.3

Road signs and markings (both regarded as 'signs' in this guidance) have three main functions:

- Regulatory – traffic management signing that is enforceable
- Warning and informatory – traffic management signing that warn of hazards and guide vehicle positioning
- Wayfinding – location and direction signing

The same sign may combine more than one function and some signs for cyclists fall into this category. It is important to understand these multiple roles, particularly where one is regulatory and requires enforcement.

6.1.4

Regulatory signs are important for the role they play in enforcing the provision of safer, more comfortable cycling infrastructure. Signs and markings for warning, information and route guidance should be applied sparingly in order not to add unnecessarily to street clutter. It is almost always better to convey this information through informal cues in the environment rather than through formal signs, for example cycling facilities that look like cycling facilities, rather than shared infrastructure with pedestrians.

Regulatory requirements

6.1.5

Regulatory signs must conform to the [Traffic Sign Regulations and General Directions](#) (2002), referred to throughout this document as TSRGD. When on the public highway, signs and road markings used for warning, information or wayfinding should also conform to TSRGD, although there are some exceptions.

TSRGD revision, 2014-15

The Department for Transport (DfT) is undertaking a full revision of TSRGD and published its [Consultation on the draft Traffic Signs Regulations and General Directions 2015](#) in May 2014. The proposed changes this brings about are referred to throughout LCDS, but this will not be applicable until the consultation has completed and it is finalised in mid-2015.

6.1.6

TSRGD revision follows a national traffic signs' policy review and the publication of the policy paper, [Signing The Way](#) (2011). Key themes from this review, intended to set a direction that TSRGD will follow, include:

- providing greater discretion for local authorities to design and deliver traffic signs that meet local needs
- greater emphasis on the role and responsibility of traffic engineers and sign designers
- reduction in the need for central approval of non-standard signing
- improved signs and signals that will promote cycling and walking
- reducing the environmental impact of signs
- welcoming innovation and trialling



The 2011 TSRGD amendments made it possible to add an 'Except cycles' plate to a 'no entry' sign to permit contraflow cycling.



Flexibility in sign use: small version of the 'shared-use path' sign as part of context-sensitive design

6.1.7

On the highway, local authorities may use any of these prescribed signs or markings from TSRGD, provided they meet the conditions for application. Any variation from those conditions, or any sign or marking not included in TSRGD will require further authorisation from DfT. This usually takes the form of a site-specific authorisation, but DfT may also authorise the limited use of a sign or marking by a single authority on any of its highways. This can be particularly useful for the purposes of conducting on-street trials of non-prescribed signs. Requests for sign authorisation should be directed to:

DfT Signing Section
Head of Traffic Signs Policy Branch
Zone 3/21, Great Minster House
76 Marsham Street
London SW1P 4DR

Email: traffic.signs@dft.gsi.gov.uk / Tel: 0300 330 3000

6.1.8

DfT occasionally issues formal amendments to TSRGD. There have been several such examples that have been beneficial for cycling in recent years, including some changes in October 2011 that gave local authorities more flexibility to allow contraflow cycling in one-way streets, and to permit use of blind-spot safety mirrors at signalised junctions in February 2012. These amendments are summarised in [Traffic Advisory Leaflet 1/12](#). The up-to-date list of authorisations may be found here: <http://www.legislation.gov.uk/ukxi/2011/3041/introduction/made>

6.1.9

The 'Schedule of signs' (section 6.5) summarises most of the signs used for cycling infrastructure in the UK, over and above those that form part of the general traffic signing regime. This references the current TSRGD diagram numbers, although these may be subject to change in the revised TSRGD. Supplementary advice on the correct application of signs and road markings can be found in the [Traffic Signs Manual](#) (HMSO/Stationery Office).

Signs requiring enforcement

6.1.10

Traffic Regulation Orders (TROs) made by the traffic authority require regulatory signs and markings to give them effect, so that they can be enforced. These orders are particularly relevant to on-carriageway restrictions, common examples of which are bus lanes, one-way working, no entry, waiting and loading restrictions, width and weight restrictions, speed restrictions and banned turns. TROs are not normally needed for off-carriageway cycling unless those facilities operate one-way.

6.1.11

As is set out in section 2.3, the requirement for a TRO for certain cycle-friendly measures is set to be removed under proposals in the consultation draft of TSRGD (2015). This includes cyclist exemption to general traffic restrictions, which is important for maximising the permeability of cycle routes. It is usually applied through the diagram 954.4 'except cycles' plate, which can be used on the following signs.



6.1.12

Similar provision can be made in many cases at traffic signals, but different diagram numbers apply and a process applies – see section 4.4 for procedures for schemes involving traffic signals.



Cycle exemptions to general traffic restrictions

6.1.13

Under TSRGD, site-specific approval may be sought for variants of diagram 877 that allow for 'Except buses and cycles' or 'Except cycles' to be added to lanes dedicated to left-turning general traffic but also used by buses and bicycles. This and similar signs should only be used where road markings do not provide sufficient clarity.

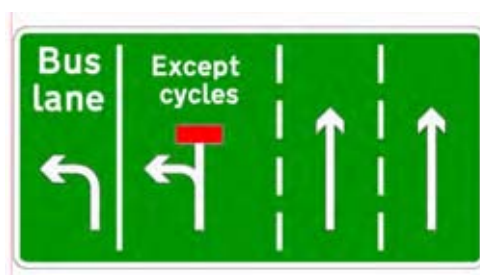


Diagram 877 variant

6.1.14

Other markings such as yellow 'box junction' markings to diagram 1043 and 1044 can be provided at junctions where cyclists' movements would otherwise be obstructed. This can be particularly useful at a cycle-only crossing of another road where queuing traffic is common. There are strict requirements as to the shape and extent of these junctions, as set out in TSRGD and the Traffic Signs Manual.

Warning signs

6.1.15

Sign 963.1, warning pedestrians of a cycle track, may occasionally be necessary, but a carefully positioned diagram 1057 cycle symbol may be a suitable alternative. On cycle tracks a diagram 955 sign (Route for Pedal Cycles only) can serve a dual purpose by removing the need for a 963.1 sign.



diagram 963.1



diagram 955



diagram 950

6.1.16

Where there is a high risk of conflict between cyclists and motor vehicles and where the conflict cannot be eliminated by design, diagram 950 signs can be used to raise motorists' awareness of the likely presence of cyclists ahead. To maximise the impact of this sign it should not be used frequently.

6.1.17

Where it is necessary to warn cyclists of a hazard such as a low bridge or other obstruction giving a vertical clearance of less than 2.3m, then a warning of the specific hazard, eg 'Cyclists beware – low headroom', should be used together with a height warning sign stating the actual headroom available. Non-standard signs will require authorisation from DfT.

Signs for pedestrian zones

6.1.18

Town centre pedestrian priority zones are usually created under Section 249 of the Town and Country Planning Act and should be marked with an appropriate combination of signs to diagram numbers 618.2, 618.3, 619, 620 or 620.1 to show what restrictions are in place and when they apply. Diagram 619, 'no motor vehicles', means that cycling is permitted, while diagram 617, 'no vehicles', means that it is not.

This can lead to some ambiguity about the status of cycling. Cycle symbol paving slabs and other inset symbols have been used in some areas to clarify that cycling is permitted, although these do not have any legal status and TSRGD indicates that vertical signing is required.

The consultation draft of TSRGD (2015) proposes that pedestrian zones can be referred to as 'Pedestrian and Cycle Zones' to help clarify the status of cycling.



Diagram 618.2, 'Entry to pedestrian zone restricted', with diagram 620.1, 'Exemption for loading/ unloading'. Cycling would not be permitted here. Diagram 619, 'No motor vehicles' can be substituted for diagram 617 'No vehicles'.



Proposed new signage for Pedestrian and Cycle Zone in TSRGD (2015)



Diagram 620 plate can be used instead of diagram 620.1.



Non-prescribed uses of the cycle symbol, to show that cycling is permitted



6.1.19

For all cycle routes serving town centres and other pedestrian priority areas, a management and enforcement plan is desirable. This should detail proposals for reducing the obstruction and risk to cyclists and pedestrians from unlawful and inconsiderate driving/riding and car parking.

Signs to minimise or avoid

6.1.20

There are a number of signs that were featured in TSRGD 2002 for use in conjunction with cycle facilities, but are confusing, unnecessary, or in some way compromise wider objectives of promoting safety, comfort, coherence and directness in cycling. This category includes:

- 958.1 (sign) Advanced warning sign for with-flow cycle lane ahead
- 962.1 (sign) Cycle lane on road at junction ahead
- 965 (sign) End of lane, route or track
- 966 (sign) Cyclists dismount
- 1058 (marking) END

A cycling route should never disappear abruptly

‘End’ signing and ‘Cyclists Dismount’ signs are unacceptable because they show that consideration for cyclists has simply ended. Where an off-carriageway track ends, signed provision must continue on the carriageway – therefore the diagram 966 sign ‘Cyclists Rejoin Carriageway’ should be used instead of ‘Cyclists Dismount’, as set out in the 2011 amendments to TSRGD.

6.2 Sign design

6.2.1

Designers should, wherever appropriate, help guide cycle positioning and direction by using surface markings. Posts are very often unsightly and obstructive and should be kept to a minimum, unless used as a short-term measure to support legibility on a new route.

Where it is essential to use signs on streets, then lighting columns, existing sign-posts, walls, railings and bollards should be considered as a sign fixing point in the first instance – subject to a wind loading assessment as appropriate.

6.2.2





On all cycle routes inappropriately placed cycling signage and signage in a poor state of repair or inadequately illuminated should be rectified, removed or replaced.

Minimising sign clutter

6.2.3

Signs should not create more visual impact than is necessary to convey the right information to those who need to see it. The signs in figure 6.2 below, usually seen as 300mm-diameter signs, can be used at smaller sizes (down to 150mm on unlit bollards for diagram 956 and 957), which may be particularly useful for environmentally sensitive areas as well a general contribution to decluttering. When used as intermediate signs, they may be fixed to bollards where practicable, rather than posts.

Figure 6.2 Signs that may be used at a smaller size

TSRGD diagram no. and name	
	[951] 'Riding of pedal cycles prohibited'
	[955] 'Route for use by pedal cycles only'
	[956] 'Route for use by pedal cycles and pedestrians only' (i.e. shared use)
	[957] 'Route comprising two ways... for use by pedal cycles only and by pedestrians only' (i.e. a separated path)

6.2.4

For other signs the smallest practicable plate size should be considered, taking into account the prescribed options in TSRGD. See ‘Schedule of signs’ (section 6.5) for further details.

6.2.5

To minimise plate sizes on direction signs for cyclists, 25mm x-height text (the smallest permitted size, in mm) should normally be used. In TSRGD, x-heights of between 30mm and 60mm are allowable (usually 30, 35, 37.5 or 50mm). An x-height of 25mm has been authorised for use on Cycle Superhighways, appears in Signing The Way and is included in the consultation draft of TSRGD (2015). It is seldom necessary to use the larger size texts, except where the viewing distance is large (in excess of 30m).

6.2.6

The Traffic Advisory Leaflet [TAL 1/13, Reducing sign clutter](#) gives guidance on reducing the environmental impact of signs. [TfL Streetscape Guidance](#) (2009) gives further recommendation on methods of avoiding clutter, based on ‘Better Streets’ principles. See figure 6.3 for a summary of options for minimising clutter.

The consultation draft of TSRGD (2015) proposes that the change to regulatory requirements will explicitly support the aims set out in TAL1/13, Reducing sign clutter. While TSRGD will continue to prescribe signs, decisions on how to use them to sign restrictions and manage traffic and on where and how to place signs are for local authorities to take.

Figure 6.3 Summary of methods for minimising signage clutter

Option	Notes and justification
Combine existing signs and incorporate cycle signs into general direction signage.	See TSRGD (2002) diagrams 2005.1, 2105.1 and 2106.1 for guidance on combined signs.
For branded routes, consolidate existing signage wherever possible and use existing poles and columns along the route.	Show existing and proposed posts and signs on scheme drawings to allow for review and rationalisation as necessary.
Omit vertical signage in favour of road markings, which avoids the need for sign posts and can be more convenient for cyclists and pedestrians, given their field of view.	This should be a site-specific consideration, bearing in mind visibility in the dark, maintenance, the impact of more surface markings on all two-wheelers and the possibility of markings being covered or obscured by other vehicles.

Use restricted parking zones and 'permit holders only past this point' area-wide parking controls (avoiding the need for road markings to indicate waiting restrictions and parking bays).	Local authorities in England may remove yellow lines from pedestrian zones where appropriate repeater signs are placed, according to the 2011 amendments to TSRGD.
Consider omitting yellow or red 'no waiting' lines and kerb 'no loading' marks where mandatory cycle lanes are provided.	These are not legally required, but are often provide to facilitate enforcement of stationary vehicle and parking and loading offences.
For 20mph and 30mph roads, reduce the width of red or yellow line markings to 50mm (for higher speeds retain 100mm markings).	This is recommended by TfL for TLRN in Streetscape Guidance (2009, page 7.13). It helps to minimise visual clutter and incursion of markings into nearside cycling space. Authorities should determine their own approach, bearing in mind the need for consistency.
For streets with a carriageway width of less than 5.0m, omit one regulatory sign (two are normally provided at the street entrance).	TSRGD allows for this – e.g. one diagram 616 'no entry' sign. Note that, for all signs other than speed limit signs, the centre of the single sign should be within 2.0m of the edge of the carriageway.
In conjunction with signal heads, use small diameter restrictive signs (eg 'no left/right turn').	These are permitted by TSRGD only where all of the movements on that aspect are controlled.
For off-highway routes, use smaller sign sizes, as they only need to be visible to cyclists and pedestrians. Also consider reducing frequency of repeater signs.	The 2011 TSRGD amendments specify a minimum of one repeater sign, in place of the earlier need to provide them at 'regular intervals', thus giving designers the flexibility to place only those signs they deem necessary.

6.2.7

Legibility, attractiveness and visibility in the dark and when wet and in snow, all need to be taken into account when designing signs and road markings. It is difficult for a sign to compensate for poor lighting or for a road layout that is not easily legible. The design of the street, and detailing such as borders, paving or surface colour, can also used to assist to cyclists and others, to complement and reinforce signage and, in some cases (but not where the signs have a regulatory function), to supersede the need for signs and markings.

Sign installation and mounting

6.2.8

Signs should ideally be mounted at the eye level of the intended user. However, where their placement might be a hazard for other users – typically when they are on the footway – minimum clearance will be needed. The possibility of parked or moving vehicles or pedestrians obscuring the sign may also have a bearing on the chosen mounting height.

In general, any sign likely to be a hazard to pedestrians should be mounted at a minimum height of 2.1m to the underside. A minimum of 2.3m is required where cyclists can cycle beneath them. For wall or bollard mounting, heights of between 0.5m and 1.5m are preferred.

6.2.9

Signs may be mounted at lower heights where they do not represent a hazard to pedestrians, cyclists and motor vehicles, such as on grass verges and in parks. Note that, away from the footway, the normal mounting height, measured to the lower edge of a sign, its backing board or any supplementary plate, is between 900mm and 1500mm above carriageway level. (Traffic Signs Manual, chapter 3, para 1.21)

6.2.10

For signs and posts, guidance on recommended dimensions for lateral clearance is as follows:

- signs should be sited no more than 1.0m away from the relevant surface, to avoid confusion
- where moving motorised vehicles are passing to the side, posts and signs should normally have a minimum of 450mm lateral clearance (or more if the crossfall of the carriageway is greater than 2.5 per cent) – this is in order to prevent damage by vehicles having a lateral overhang, bearing in mind their likely swept paths
- less than 450mm clearance is needed on any side where cyclists are the only vehicles passing (it is recommended that the appropriate clearance be determined by a risk assessment on a site-by-site basis)
- posts and signs should not encroach into travel envelope of cyclists

6.2.11

Signs that indicate the existence of off-carriageway cycling facilities should be sited no more than 10m from the start and end of the facility. Ideal spacing for intermediate signs can vary between 20m and 200m, depending on the level of footway activity (the need to warn pedestrians about the presence of cyclists) and the frequency of interruptions such as side roads and bus stops.

Fixing and illumination

6.2.12

Where there is a risk that signs could be rotated (e.g. by wind or vandalism), anti-rotational fixings should be used, particularly on finger-post type direction signs. These are clamp-type fittings sometimes with set-screws, rather than banding. Dealing with rotation of finger post signs should be a key part of maintenance regimes.

6.2.13

The consultation draft of TSRGD (2015) proposes that illumination requirements for certain categories of signs will be removed – in other words left for local authorities to determine on a site-by-site basis. This includes lighting requirements for regulatory cycle signs and warning signs. Illumination requirements remain only for safety critical signs, such as give way, no entry, banned manoeuvres and vehicle size restrictions.

6.2.14

Since illumination requirements will only be changed once TSRGD (2015) comes into force, requirements of Schedule 17 of TSRGD 2002 are summarised in section 6.5 below.

6.2.15

In most instances, if street lighting is adequate, signs for off-carriageway facilities do not require illumination. For example, there is seldom any need to illuminate terminal signs to diagram 955, 956 and 957. One exception may be diagram 955 signs indicating cycle gaps on-carriageway, which are likely to continue to need illuminating. In all instances the site characteristics need to be considered to identify where illumination is appropriate.

6.2.16

Cycle-specific signs should have reflective, anti-graffiti coating. Single- or double-faced signs can be used, as appropriate to the location.

6.3 Surface Markings

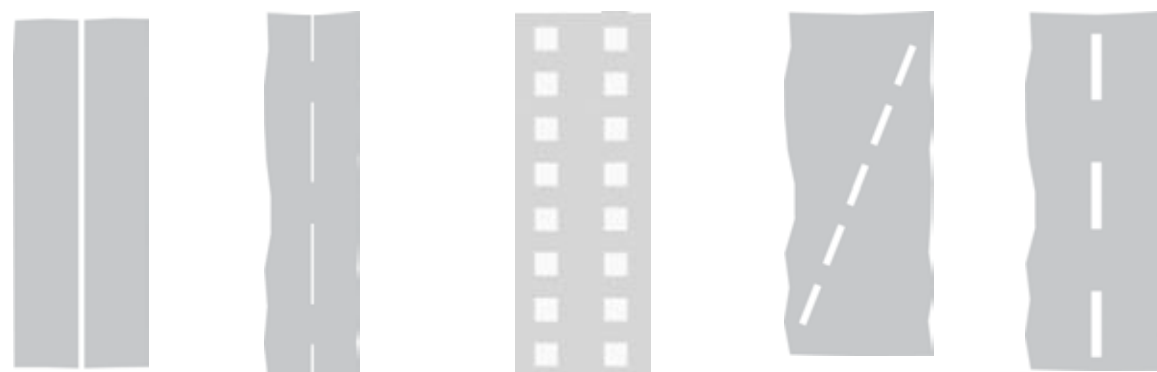
6.3.1

Surface markings are generally the best way to communicate traffic management and directional information to cyclists, and should be used wherever practicable and legal. All markings are classified as traffic signs and are covered by TSRGD. The markings set out below should all be provided in retroreflective material.

6.3.2

It is essential to check the condition of surface markings on a regular basis, particularly in areas also used by motor vehicles, and to take swift remedial action when needed. This checking should form part of regular maintenance regimes – see section 7.2 for more details.

Lane markings



[1049] Mandatory cycle lane marking also division of a route between pedal cycles and for pedestrians	[1004] Advisory cycle lane marking (when used in conjunction with diagram 967)	[WBM 294] ‘Elephants footprints’ to define cycle routes across a carriageway	[1009] Entry taper to cycle lane recommended 1:10 taper where cycle lane begins	[1010] Lane through junction or edge of carriageway marking in TSRGD
150mm wide or 250mm where lanes are 2m+ wide	100 or 150mm wide 4000mm dash 2000mm gap	square, with gap equal to length of one side, anywhere in range 250-400mm (as proposed in TSRGD 2015)	150mm wide 600mm dash 300mm gap	150mm wide 1000mm long 1000mm gap (or 850 long, 1150 gap variant)

6.3.3

The entry taper, diagram 1009, is more important for mandatory cycle lanes. An angle of 30 or even 45 degrees may be adequate for advisory cycle lanes because it is not so essential to deflect vehicles in advance of it. (Traffic Signs Manual, chapter 5, para 16.10) The taper is not necessary where a cycle lane ends before and recommences after either a junction, bus stop cage or crossing zig-zag marking.

6.3.4

A longer dashed advisory cycle lane marking exists (diagram 1004.1, 6000mm dashes with 3000mm gap) but its use is not recommended because it is for roads of 40mph or more, where an advisory cycle lane is unlikely to be appropriate.

6.3.5

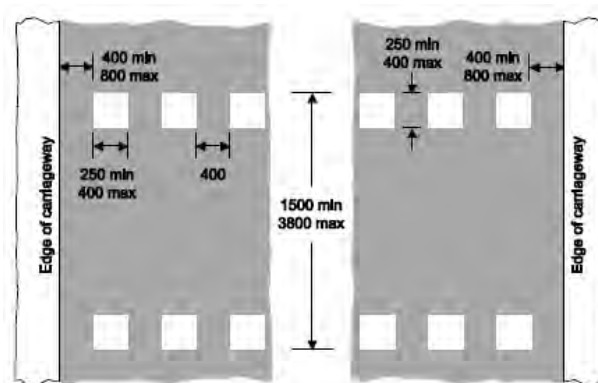
TfL has authorisation to use the 250mm-wide diagram 1049 marking on its network and on Cycle Superhighways but authority-wide or site-specific authorisation need to be sought for its use elsewhere. Wider cycle lane markings are proposed for general authorisation in the consultation draft of TSRGD (2015) but the 250mm-wide mandatory cycle lane marking does not yet appear in the schedules.

6.3.6

The use of 1010 markings for the continuation of cycle lanes across junctions is, however, proposed in the consultation draft of TSRGD (2015). Until the regulations come into effect, DfT has authorised TfL to use a 'variant 1010' marking, with 850mm dashes and 1150mm gaps, on its network. Other authorities may seek similar authorisation.

6.3.7

'Elephants' footprint' markings can be used to delineate a cycleway when it crosses a carriageway where the route may not otherwise be clear to cyclists, generally under the protection of traffic signals. The consultation draft of TSRGD extends a general authorisation to this use of elephants' footprints and allows for flexibility in the size of the square markings between 250 and 400mm (where previously 400x400 was the convention).



'A route for vehicular traffic consisting solely of pedal cyclists', in draft TSRGD (2015), table 69, item 55

6.3.8

These markings may be used to delineate a cycle crossing parallel to a signal-controlled pedestrian crossing (providing a separated alternative to the toucan crossing). The consultation draft of TSRGD also proposes that they may be used for a new type of parallel priority crossing (see section 4.5).



WBM294 Elephants' footprints markings at Royal College Street / Crowndale Road junction, Camden



Elephants' footprints markings and surface colour used to highlight conflict point as cycle route crosses the carriageway (Copenhagen)

6.3.9

International practice shows extensive use of square markings similar to elephants' footprint markings to show continuity of cycle routes crossing the carriageway, marking them a widely recognised aspect of cycling infrastructure, particularly in Europe. They are used not only at signal-controlled junctions and crossings but also to help give priority at side roads and roundabouts.

Give way markings

6.3.11

Single-dash give way markings are proposed in the consultation draft TSRGD (2015) for zebra and parallel pedestrian/cycle crossings (see section 4.5). Give way markings should not be used at linear transitions between cycle tracks and cycle lanes.



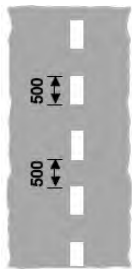
[1003]
Give way double-dashes

300mm dashes
1500mm gaps
300mm gap



[1023]
Give way triangle

3750x1250 full-size but 1875x625 recommended for cycle use



Give way single-dashes

200mm wide
500mm dashes
500mm gaps

6.3.12

‘Keep Clear’ (diagram 1026), hatching and chevron road markings may also be useful for warn drivers to give priority to cyclists crossing or moving in the same direction. They remind drivers to give cyclists a wide berth. ‘Keep Clear’, often employed for safeguarding access for emergency vehicles, can also be used to ensure that cycle gaps are unobstructed by parked vehicles.



Chevron markings used in conjunction with islands



Keep clear markings allow space for cyclists to cross





6.3.13

In countries such as the Netherlands and Denmark, a further ‘give way’ option is to use small, ‘sharks’ teeth’ triangular give way markings. These are often used in conjunction with elephants’ footprints but confer formal priority on the cyclist in a way that elephants’ footprints alone do not.

Additional markings for cycle tracks and paths

6.3.14

For two-way cycle tracks, centre line markings should consist of 50mm-wide diagram 1008 markings generally, with two sets of the longer diagram 1004 markings used where the track adjoins an intersection or shared use area (where more conflicting movements are likely). Where centre lines are omitted – for example, where flows are expected to be tidal and designers wish to suggest there is more flexibility in use of width – an alternative may be the use of pairs of diagram 1057 cycle symbols in opposing directions.

			
[1008] Centre-line marking for two-way cycle tracks (A carriageway centre line marking)	[1004] Centre-line marking for use at intersections (Same as advisory cycle lane marking)	[1049.1] Raised marking to divide a route between pedal cycles and pedestrians	[1009] Edge of carriageway on cycle track (Same marking as entry taper to cycle lane)
50mm wide when used as centre line 2000mm dash 4000mm gap	50mm wide when used as centre line 4000mm dash 2000mm gap	150mm wide, with 50mm top face 12-20mm high May need 20mm gaps at 3m intervals for drainage	100mm wide 300mm dashes 150mm gaps

Cycle symbols

6.3.15

Diagram 1057 cycle symbol markings are used, orientated in the direction of travel for cyclists, in three distinct and well recognised ways:

- for wayfinding: indicating a route, particularly at a decision point
- suggesting a recommended path for cyclists across a junction
- alerting motorists to expect the presence of cyclists

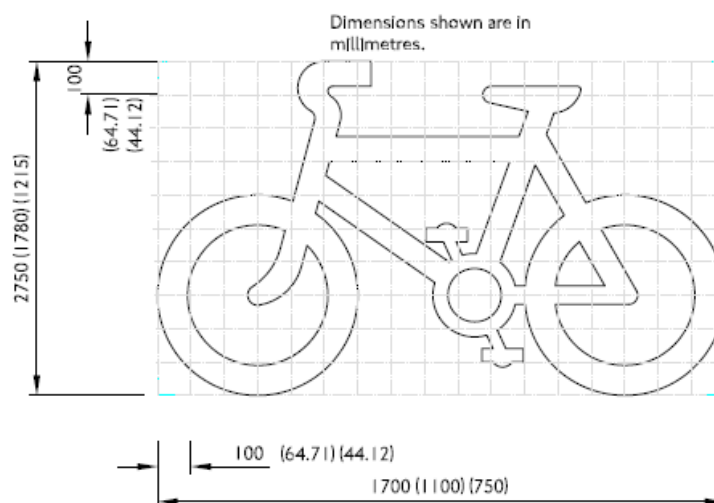
Diagram 1059 markings should be used in conjunction with the 1057 marking or a bespoke number patch for a branded route (see section 6.4). They should not be used in conventional, with-flow cycle lanes.



[1057] Cycle symbol marking	[1059] Route direction arrows
750x1215, 1100x1780 or 1700x2750mm Select according to width available: normally small for cycle tracks, medium for cycle lanes and large for ASL boxes.	1000 or 2000mm Select size according to space available

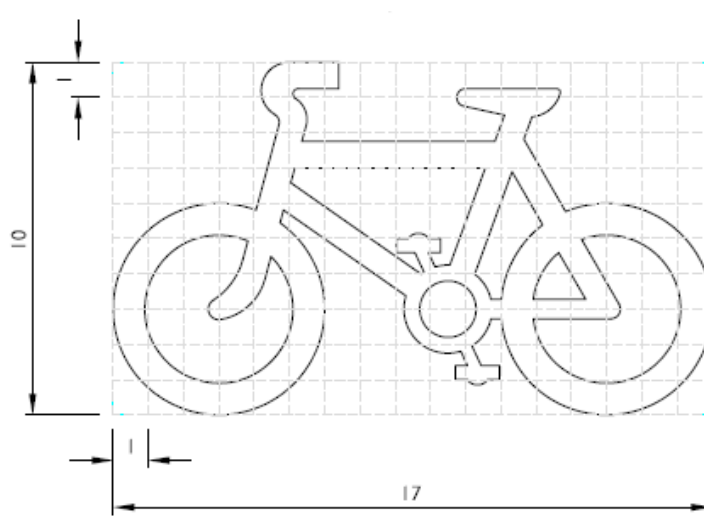
6.3.16

Detailed design and dimensions of the cycle symbol when used as a road marking (right, above) and on a sign (below). On the sign, dimensions are given in grid divisions, which normally correspond to $\frac{1}{4}$ of the x-height used on the sign.



6.3.16

The diagram 967 sign should only be used with the diagram 1057 road marking where there is an additional need to alert other road users to the presence of a cycle route. This is consistent with advice in [Traffic Advisory Leaflet 1/13, Reducing Sign Clutter](#), on interpreting TSRGD (2002) guidance flexibly.



6.3.17

Cycle symbols marked at the entry to and exit from side roads joining a cycle route are an effective way of warning motorists and pedestrians of the presence of cyclists. They remove any need for warning signs to diagrams 962.1 or 963.1 except for situations where contra-flow cycling is permitted. At side roads with restricted access or less than 5m wide, kerb-to-kerb, one rather than two diagram 1057 markings may be used.



6.3.18

Symbols should never be placed so as to encourage a riding position closer than 0.5m away from a kerb, side road or obstruction. Where conditions are appropriate for primary position riding symbols should be placed in the centre of running lanes.

6.3.19

It is good practice to provide cycle symbols to diagram 1057 on cycle lanes and cycle tracks at the start of each lane or track, and immediately after each decision point thereafter (including just after a side road has joined the route). On long sections of route, optional repeater symbols may be provided, to give a maximum interval between symbols of 200m. Where practical, cycle symbols should be placed close to street lights, to maximise visibility after dark. Further uses of cycle symbols for route continuity are summarised in figure 6.4.



Diagram 1057 symbols showing continuation of cycle route and recommended road position

Figure 6.4 Examples of use of diagram 1057 markings for route continuity

Location	Spacing/layout
Cycle route on quiet roads (no lanes)	50-200m
Main road route (no lanes)	10-30m
Cycle lanes on-carriageway (normal)	20-50m
Cycle lanes (high stress)	10-20m
Cycle feeder lane to ASL	10-20m
Off-carriageway cycle track (surfaced)	50-200m

6.3.20

It is important to use the cycle symbol in ways that reinforce its multiple functions. Care should be taken when using them for route continuity, so that they are not placed in a manner that puts cyclists in a vulnerable position, particularly past parking and loading bays. If cyclists are accustomed to following them as a suggested route then they will expect this to be the case whenever they see the symbols.

6.3.21

Cycle symbols may also be used as a substitute for lane markings through junctions (see section 4.3). This may be most appropriate where a route is signified by diagram 1057 symbols only before and after the junction, as it provides continuity.



Well-placed cycle symbols through a junction to show a recommended route for ahead cyclists (left).
Poorly placed cycle symbol on a bend (right).

Surface colour

6.3.22

Colouring surfacing is optional for cycle lanes and tracks. The colour has no legal meaning and is used for wayfinding/branding purposes or for specific safety reasons, or both. If it is provided, the designer should be clear about the purpose for its use and consistent in its application for any given area, route or street.

6.3.23

There may also be benefits in using coloured surfacing to raise awareness at the following locations:

- across the mouth of side road junctions / past priority junctions (see section 4.2)
- alongside on-street car parking
- feeder lanes and reservoirs used in conjunction with advanced stop lines (see section 4.3)
- through signal-controlled junctions (see section 4.3)
- through zig-zag markings at crossings (see section 4.5)
- at the entry to and exit from roundabouts
- where there is 'crossover' between cycle lanes and on/off slip lanes (see section 4.3)

6.3.24

Any decision about use of colour in these circumstances needs to be balanced with use of other signs and markings and any location-specific requirements, and needs to be in line with an overall strategy about the meaning of coloured surfacing. Diagram 1057 cycle symbols can perform a similar function in many of the locations cited above.

6.4 Direction signing

6.4.1

To help cyclists find their way, clear direction signing and wayfinding principles should be developed and applied consistently, within the framework of a London-wide strategy for cycle wayfinding. That strategy is still in development, with customer research ongoing. The first part of this section therefore sets out some interim principles emerging from the research, pending the finalisation of a complete strategy to support delivery of the Vision for Cycling.

6.4.2

It is important to note that direction signing has several purposes; it is not only to help cyclists find their way and assess the physical and mental effort needed to complete their journey. It also highlights the presence of cyclists for other road users, asserting their right to travel along a particular street or path.



Cycle Superhighways patch, showing the cycle symbol and route number on a blue background

Wayfinding signage

6.4.3

TfL has commissioned customer testing of proposals for a new wayfinding system for cycling in London: a Tube Network for the Bike. This involves exploring both the network and route naming strategy and the detail of the design and application of signs and road markings. It focuses on Quietways, and the objective of gaining the confidence of people who may currently be deterred from cycling. The intention is that it should lead to the development of a coherent signage and wayfinding strategy for all cycle infrastructure in London.

6.4.4

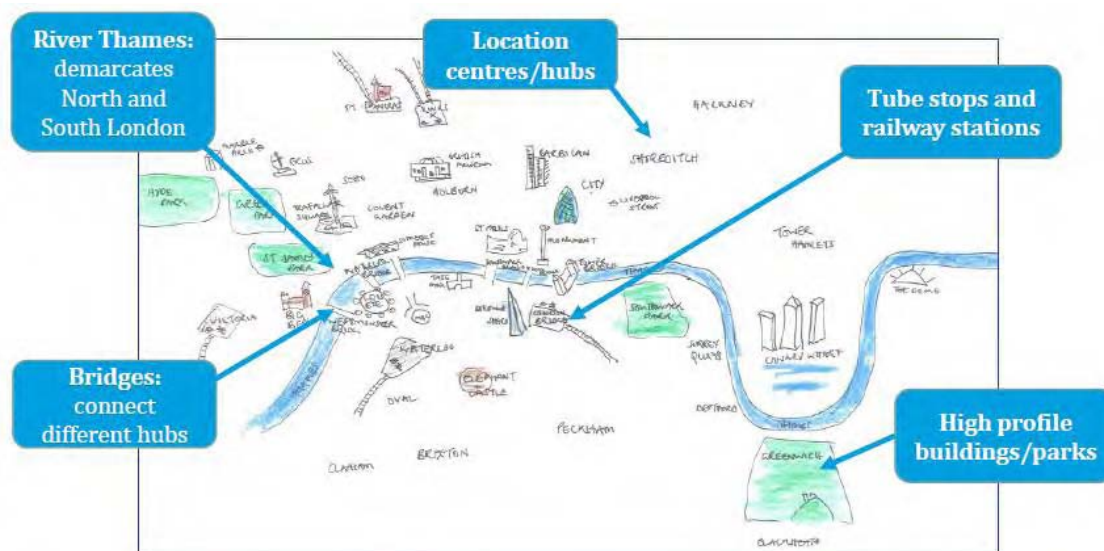
Feedback has been received from qualitative focus groups and some on-street testing of sign concepts. Further phases of research include a quantitative online survey. It was clear from the focus groups that, for a wayfinding system to be effective, it needs to build from people's intuitive wayfinding thought-processes.

6.4.5

Other key recommendations emerging from this research are that wayfinding for Quietways should:

- build on and reference the current mental map of London
- create routes by linking together landmarks from our mental maps

- help people find ‘safe and efficient’ routes
- include a range of tools, not just on-street signage
- adopt distinctive branding
- include signage that is easy for cyclists to read at a glance
- both indicate (give directional information) and reassure
- include an ‘iconic’ cycle map



Mental maps, built around memorable places, help to make the city legible for people

6.4.6

When asked about signs and road markings, some clear patterns emerged in the focus groups. Cyclists said they mainly use pole-mounted signage for information on direction, and found it most useful ahead of major decision-points (at the junction, they have many more demands on their attention). In contrast, on-carriageway signage, in the form of road markings, has a different function, being primarily understood as reassurance and ideally placed after major decision-points.



Quietways logo, for use on signage

6.4.7

Drawing on those findings, TfL is working with DfT to develop and refine signage that meets these aspirations and emerging regulatory requirements. A new type of sign for branded routes such as Quietways has been allowed for in the consultation draft of TSRGD (2015). In London, this will include the Quietways logo to meet the desire for distinctive, recognisable route branding.

6.4.8

It is also clear from the research conducted to date that cyclists use a variety of wayfinding tools to navigate, combining pre-journey planning with support from information provided on-route. Given the growing sophistication of mapping tools accessible through smartphone technology, pre-journey planning and personalised on-route wayfinding are likely to become ever more important over time.

Signing strategies

6.4.9

A direction signing strategy should be prepared for each whole Superhighway or Quietway route, to ensure that signing is coherent, consistent and easy-to-follow. This should take account of and maintain appropriate continuity with existing signing of cycle routes along and crossing the route. Although signing for off-highway sections do not, strictly, need to conform to TSRGD requirements, it is recommended that they are consistent with on-highway signs for the route wherever possible.

6.4.10

The strategy needs to recognise existing cycling provision and networks and links in the vicinity. It is an opportunity to identify and where appropriate and feasible enable cycle movements that are currently banned, such as contraflow provision or exceptions to banned turns. It should include a schematic diagram of the route with adjoining routes and destinations for agreement among stakeholders to ensure a joined-up approach to planned signage and infrastructure changes on the network.

6.4.11

Preparation of the signing strategy should ideally be part of the route planning and scheme design process. A base plan should be prepared, taking account of:

- crossing- points with other routes or other unbranded cyclist desire lines, identified from route rides and using TfL Cycle Guide maps
- potential strategic and local destinations
- existing cycle and vehicle signing – signs recorded photographically
- locations for proposed direction signing – preferably existing posts or lamp columns

A draft schematic ('spider') diagram should then be prepared, showing the route considered and the destinations proposed. The aim is to facilitate the safe and convenient movement of cyclists onto, along and off a given route

Types of direction signs

6.4.12

The ways in which route information may be communicated via the various basic types of direction sign are set out below. The sign concept for Quietways will be developed to include these different types.

Flag-type or finger post signs

[TSRGD diagram 2602.1, 2601.1]

These signs should be placed at the junction or decision-point itself and point in the appropriate direction using a chevron-type arrow.



TSRGD diagram 2601.1 (above), 2602.1 (left)

Route confirmatory signs and repeaters

[diagram 2602.2, 2602.3]

Repeater signs may be needed on long sections of cycle routes between nodes to confirm to users that they have not left the route inadvertently, and to keep drivers conscious of the use of the route by cyclists. These should be provided a least every half mile, as well as after each decision point (normally the far side of every junction). Route numbers can also be used as confirmatory signs, preferably on existing posts or lamp columns.



Advance direction signs [diagram 2601.1]

For more complex scenarios, usually prior to junctions on main roads, advance signs may be used in order to give warning of the junction and to enable initial manoeuvring to take place. These may be appropriate in advance of a right-turn or where there is a downhill gradient.

The main sub-types are:

Stack signs, where different junction destinations are listed above each other in tabular form.

Map-type signs, which include a pictorial representation of the junction. Alternatively, a map type sign to TSRGD diagram 2601.2 can show a precise route through a junction, distinguishing between on- and off-carriageway provision, and showing priorities and crossings.



Stack sign



Map-type sign



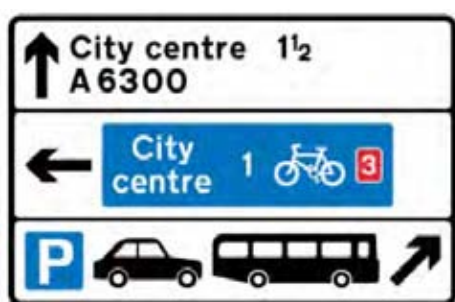
TSRGD diagram 2601.2

6.4.13

Direction signs should only be used where they meet a purpose not already served by road markings, existing road signage or other types of cycle signage. For example, the cycle route sign to diagram 967 may serve as a confirmatory sign.

6.4.14

Branded route information, such as the Quietway logo, can be incorporated into the sign types above. TSRGD provides for the addition of a coloured panel with route number on the blue-background signs. Route symbols may also be included, with DfT authorisation, as is the case with Cycle Superhighway signage. This uses the route name, number and branding on a rubine red-coloured panel on the blue cycle signage.



TSRGD diagram 2106.1



Route branding patch on a finger-post sign

6.4.15

Signing information for cyclists may also be added to other direction signs by using the method shown in diagram 2106.1 in TSRGD: cycle route information on a blue background as part of a 'conventional' direction sign for all road users.

Sign design principles

6.4.16

Detailed sign design requires specialist traffic engineer input, reference to the Traffic Signs Manual and TSRGD and use of appropriate computer software. Overall, the size of signs should be kept as small as possible while clearly conveying the necessary information.

6.4.17

Closest destinations should be listed at the top of the sign, with more distant and strategic destinations below. Where distances are provided, they should be in imperial measurements: the smallest fraction of a mile allowed is 1/4 mile, and yards must be to the nearest 50.

6.4.18

For Superhighways and Quietways, time to destination in minutes should be used, followed by 'mins'. Signing to other destinations, off the branded routes, should use distance and be on a separate diagram, though may be on the same backing plate. Journey times should be rounded up to the nearest five minutes, except where a journey is expected to last less than 15 minutes. Minutes ending in 1, 2, 6 and 7 are rounded down to the nearest five minutes and minutes ending 3, 4, 8 and 9 rounded up. Journeys under 15 minutes should be rounded to the nearest minute if there is benefit to users. Timings should be calculated using an average cycling speed of 16kph (as used in the TfL Journey Planner) and confirmed by riding the route at different times and conditions so that a realistic and accurate average time is provided.

6.4.19

'Via' and other wording can be introduced on signs to clarify a route, eg via park, common, towpath, bridle-way, subway, bridge, shopping centre etc. The size of this lettering should be 80 per cent of the normal size, ie 25 x-height where 30 is the normal size.

6.4.20

Dimensions and other details for branded signs for Cycle Superhighways approved by DfT in 2010, are:

- flag-type route destination signs – sign face 845mm wide and 255mm high, including a 'header patch' ('Cycle Superhighways', the symbol and the route name) on rubine red, and destinations and timings in white on blue background.
- route confirmatory signs – sign face 720x255mm, containing the same information as the flag-type sign, but without indicating a direction.

- stack-type signs – sign face 645x425mm, showing destinations and timings in multiple directions, together with a route name (on rubine red patch) but without using the full header patch
- repeater signs – sign face 165mm wide and 230mm high, including the route name and Superhighways symbol only, on rubine red patches.

In all cases, x-height is 25mm.

Destinations for signing

6.4.21

Signs may be required to:

- mark a route, and provide route confirmation
- direct cyclists to join the route at intermediate places
- direct cyclists to destinations at intermediate places along the route, or at the end

6.4.22

Guidance on destinations for signing for programmes delivered as part of the Mayor's Vision for Cycling is in preparation as part of the wayfinding strategy.

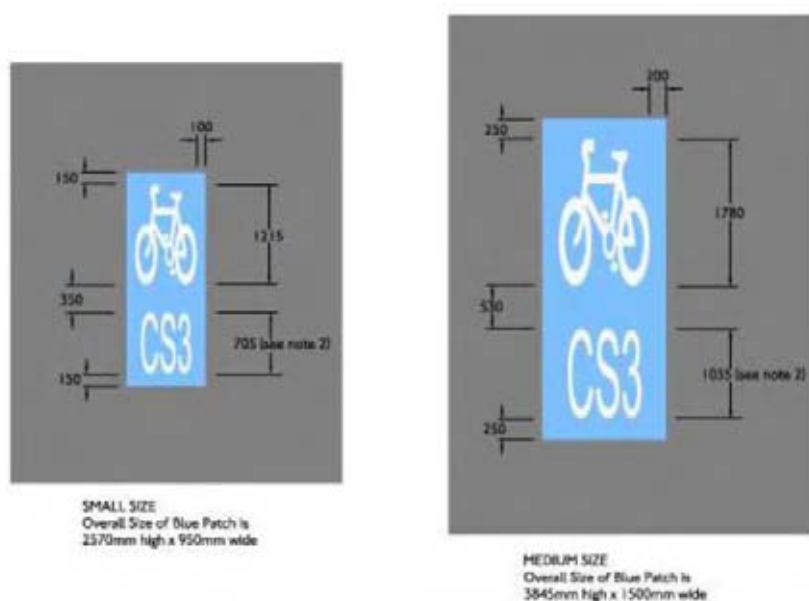
Branded road markings on Superhighways

6.4.23

For Cycle Superhighways, the diagram 1057 cycle symbol road marking should appear as part of the 'Cycle Superhighway project symbol'. This consists of diagram 1057 centred above the route number, based on TSRGD diagram 1058. Two sizes are available:

- small (1215mm high cycle symbol, 350mm gap, 705mm high text) – usually in cycle lanes and tracks and within cycling facilities (which may have blue surfacing) up to 2.5m wide
- medium (1780mm high cycle symbol, 530mm gap, 1035mm high text) – the default size for stand-alone Superhighways markings, and usually within cycling facilities (which may have blue surfacing) greater than 2.5m wide

A blue background may be applied underneath a CS project symbol. The size of the patch should be 2570x950mm for the small version and 3845x1500mm for the medium.



6.4.24

Within cycle lanes, narrow bus lanes (up to 3.1m) and blue surfacing, CS project symbols should be positioned centrally between any parking-related markings (red or yellow lines) and the relevant lane marking or coloured surfacing. Alignment across junctions should be based on projected parking markings (the outside of any parking bay up to and after the junction) and cycle lane markings / surfacing so that a smooth, continuous alignment for cyclists is maintained.

6.4.25

For stand-alone markings and wide bus lanes (4m or greater), the centre of the CS project symbol is to be positioned one third of a lane's width from the left side of the lane. It is important that markings are not positioned such that a general traffic lane could be interpreted to be a cycle lane when it is not.

6.4.26

Before and after bus stop/stand cages and parking or loading bays, CS project symbols cannot be placed within the cage or bay and so should usually be positioned one third of a lane's width inside the right side of the lane. A bespoke layout may be necessary where bus stands are located in very wide nearside lanes.



6.4.27

CS project symbols should be positioned with visual continuity in mind so that there are not unexpected lateral steps between consecutive markings. Between junctions, they should be positioned as follows:

on-carriageway (no cycle or bus lane)	40-60m spacing
within cycle lanes	90-110m spacing
within bus lanes	40-60m spacing
within cycle tracks	100-200m spacing

6.4.28

At non-inset bus stop/stand, cages and non-inset parking or loading bays, CS project symbols should be placed alongside the outside of the cage/bay immediately before the start and immediately after the end of it, with a maximum interval between the centres of symbols of between 20m and 40m. This also applies to multi-lane roads with bus lanes less than 3.9m where CS project symbols should be provided in the second lane. Where gaps between cages/bays are 30m or less, the CS project symbols should be continued across the gap at the same offset from the edge of the carriageway or the projected kerb line.

6.4.29




CS project symbols in opposing directions on cycle tracks or single-carriageway roads should usually be no closer than 10m between the edges of the opposing symbol borders. Exceptions are permitted where additional CS symbols are provided to identify decision points.


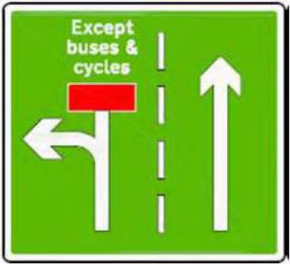



6.4.30


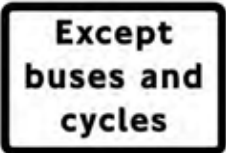


CS project symbols should be provided on cycle lanes, coloured surfacing and cycle tracks at the start of each section and immediately after (within 10m or as soon as possible beyond that, subject to avoidance of other road markings) each decision point, including side road junctions. The exception to this is when markings across side road junctions indicate a change of direction. In this case, the route number patch may be used instead of the CS project symbol.




6.5 Schedule of signs


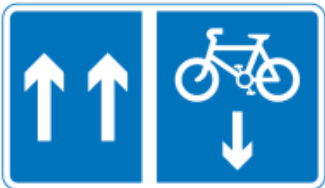


This table is for general reference only and contains requirements current in TSRGD (2002) rather than changes proposed in the consultation draft of TSRGD (2015), which are described in sections 6.1-6.4 above. Please refer to TSRGD and the Traffic Signs Manual for further details of sign application.




	<p>[612] No right turn for vehicular traffic</p> <p>Normally 600mm diameter</p> <p>To be illuminated</p> <p>Can be used with [954.3] ‘except buses and cycles’ or [954.4] ‘except cycles’ plates (or with equivalent signs in a signal head at 270mm diameter).</p>
	<p>[616] No entry for vehicular traffic</p> <p>Can be used with [954.4] ‘except cycles’ exemption plate</p> <p>Normally 600 or 750mm diameter</p> <p>To be illuminated</p> <p>300mm variant (non-illuminated) can show no-entry for cycles at one-way off-carriageway cycle tracks, but this requires site-specific authorisation.</p> <p>Authorisation of use of [954.4] ‘except cyclists’ plate was made through the Traffic Signs (Amendment) (No.2) Regulations and General Directions 2011 (SI 2011 No. 3041), and included in Signing The Way (2011)</p> <p>Use of [616] with [954.3] ‘except buses and cycles’ plate is anticipated in the revised TSRGD but in the meantime requires DfT authorisation.</p>
	<p>[617] All vehicles are prohibited except non-mechanically propelled vehicles being pushed by pedestrians</p> <p>Normal size 600mm</p> <p>To be illuminated</p> <p>Not be used on cycle routes as it would exclude cycles.</p> <p>[618] Play Street exemption plate prohibits all vehicles from the street during the period indicated, except for access.</p>



	<p>[619] No motor vehicles (i.e. cycles permitted)</p> <p>Normal size 600mm (also 450, 750, 900 and 1200mm)</p> <p>To be illuminated</p> <p>Can have exemption plates [620] 'Except for access' and [620.1] 'Except for loading by goods vehicles' attached.</p> <p>For other permitted variants see TSRGD Direction 21 (1). A [967] cycle route sign can be used with this sign to emphasise cycle only access.</p>
	<p>[877 - variation] Appropriate traffic lanes for different movements at a junction ahead</p> <p>(Extension of permitted variants to include 'Except cycles' or 'Except buses and cycles')</p> <p>Normal size 900mm height (also 1200, 1500 and 1800mm)</p> <p>To be illuminated</p> <p>Approved for TLRN and Cycle Superhighways only. All other uses subject to site-specific authorisation.</p>
	<p>[881] Start of Homezone / [882] End of designated Homezone</p> <p>Normal size 540mm width (also 675mm)</p> <p>To be illuminated</p> <p>The plate on [881] contains the name of the Homezone. This may occupy two lines.</p>
	<p>[950] Cycle route ahead</p> <p>Can be used with [950.1] exemption plate stating 'Cycles crossing', 'Cycle event', 'Child cycle tests' or 'Child cycle training'</p> <p>Normal size 600mm (also 750, 900, 1200 and 1500mm)</p> <p>Direct illumination not normally required unless the sign is on a principal or trunk road (See Schedule 17 of TSRGD) in which case the sign should be illuminated if placed within 50m of a system of street lighting.</p> <p>[572] 'Distance ahead to hazard' plate or [573] 'Distance and direction to hazard' may be used with this sign.</p>
	<p>[951] Riding of pedal cycles prohibited</p> <p>Normal size 270, 300mm (450 and 600mm not recommended)</p> <p>Means of illumination: retroreflecting material</p> <p>Indicates the effect of a statutory prohibition and is placed at the beginning of the restriction. Could be supplemented with a 'No cycling' plate for which DfT authorisation is required.</p>

	<p>[953] Route for use by buses and pedal cycles only</p> <p>Normal size 600mm (also 450, 750 and 900mm)</p> <p>Means of illumination: this sign shall have direct illumination if placed within 50m of a lamp forming part of a system of street lighting.</p> <p>Indicates the effect of a statutory prohibition and is placed at the beginning of the restriction. Can be used in conjunction with [953.2] 'Only' to reinforce the meaning.</p>
 	<p>[954.3] Except buses and cycles (954.6 where used within traffic signals)</p> <p>[954.4] Except cycles</p> <p>An x-height approximately one tenth of the main sign height is normally appropriate from the prescribed options: 37.5, 50, 62.5, 75 and 100mm 37.5 is recommended for 'Except cycles'</p> <p>Means of illumination must be the same as the sign which it is placed in combination with, unless the illumination for the sign adequately illuminates the plate. Where either plate is used in association with traffic light signals it must be internally/externally illuminated.</p> <p>The plates indicate the effect of a statutory prohibition. They may be used in combination with [606] or [609], 'vehicular traffic must proceed in the direction indicated by the arrow'. And they may be used with [612] or [613], 'no right/left turn for vehicular traffic' but when such a turn is into a contra-flow bus lane or bus/cycle only street, protected by a [616] 'no entry' sign, an alternative is to use [953] 'route for use by buses and pedal cycles only' or [960] 'contra-flow bus and cycle lane' to overcome restrictions on plates with 'No entry' signs.</p> <p>However, [954] 'except cycles' may be used with [616] 'no entry' and [816] 'no through road for vehicular traffic'.</p>
	<p>[955] Route for use by pedal cycle only</p> <p>Sizes: 150mm (recommended for bollards), 270mm (recommended for illuminated bollards), 300mm (recommended for sign posts), 450mm (recommended for illuminated use), and 600mm (not normally necessary)</p> <p>Normally class 1 reflective material is sufficient unless the specific location warrants direct illumination</p> <p>On-carriageway, this sign indicates a Traffic Order defining a route where only cyclists are permitted. Off-carriageway, it indicates the effect of a statutory prohibition (erected by a Council Resolution under the Highways Act) and is placed at the beginning of the defined section. The 2011 TSRGD amendments changed the minimum requirement for repeater signs to one.</p>

	<p>[956] Route for use by pedal cycles and pedestrians only (i.e. shared use)</p> <p>[957] Route comprising two ways, separated by the marking shown in diagram 1049 or 1049.1 or by physical means, for use by pedal cycles only and by pedestrians only (separated path)</p> <p>Normal size 300mm on posts. 100 and 150 may be used on bollards and 270mm on illuminated bollards. 450mm may be appropriate for a terminal sign that is otherwise difficult to see, eg. against a cluttered background. 600mm is rarely warranted.</p> <p>Normally class 1 reflective material is sufficient unless the specific location warrants direct illumination. See section 7.4.</p> <p>These signs indicate the effect of a statutory order (a Council Resolution, not a Traffic Order) and are placed at the beginning of the defined section and along a route. The 2011 TSRGD amendments changed the minimum requirement for repeater signs to one. For [957] symbols may be reversed in a mirror image to represent the arrangement on the ground.</p>
	<p>[958] With-flow bus lane ahead that bicycles, powered two-wheelers and taxis may also use</p> <p>Two sizes 800x825mm recommended (also 960x990mm)</p> <p>Means of illumination is optional – internal/external lighting or retroreflecting material.</p> <p>This sign indicates the effect of a statutory order. The word 'taxi' may be omitted and 'local' may be included on the bus if appropriate (as shown below on [959]). Permitted vehicles and times of operations may be varied as necessary.</p> <p>Use of [958.1], 'With-flow cycle lane ahead' is not recommended, although there may be a case for it in situations where general traffic is moving at 30mph or more and/or where the number of general traffic lanes has been reduced to fit in a cycle lane.</p>
	<p>[959] With-flow bus lane that pedal cycles may also use</p> <p>Two sizes 450x825mm recommended (and 540x990mm but not normally recommended unless speed limit is 40mph or greater)</p> <p>Class 1 reflective material is normally appropriate.</p> <p>This sign indicates the effect of a statutory prohibition and is placed at intervals along the route. The word 'taxi' in white letters may be added alongside the cycle symbol, and 'local' may be added to the bus symbol. A powered two-wheeler may be included, as shown in [958] above.</p>

	<p>[959.1] With-flow cycle lane</p> <p>Two sizes 375x825mm recommended (and 450x990mm)</p> <p>Class 1 reflective material is normally appropriate</p> <p>This sign is for mandatory lanes and is placed at intervals along the route. Reverse may be used for offside lanes but requires site specific authorisation</p>
	<p>[960.1] Contra-flow (mandatory) cycle lane</p> <p>Two sizes 475x825mm (recommended) and 570x990mm.</p> <p>Class 1 reflective material is normally appropriate</p> <p>This plate indicates the effect of a statutory prohibition, and is placed at intervals along the route. The number of arrows showing vehicle lanes may be varied depending on number of lanes, normally one.</p>
	<p>[960.2] One-way traffic with contraflow pedal cycles</p> <p>Two sizes 475x650mm (recommended) and 570x780mm.</p> <p>Class 1 reflective material is normally appropriate</p> <p>Should be used with an advisory contraflow cycle lane, or no lane marking.</p> <p>This sign was authorised by the Traffic Signs (Amendment) (No.2) Regulations and General Directions 2011 (SI 2011 No. 3041), having been included in Signing The Way (2011)</p>
	<p>[961] Times of operation of a bus or cycle lane</p> <p>Two sizes prescribed, 825 and 990mm</p> <p>'x-heights' 50 and 60mm to match the size of sign used.</p> <p>Method of illumination for this plate must be the same as the sign which it is placed in combination with, unless the illumination for the sign adequately illuminates the plate.</p> <p>This sign is for mandatory lanes and is placed at intervals along the lane, in combination with [958], [958.1] or [959]. Time of day and day of the week may be varied.</p>

	<p>[962.1] Cycle lane on the road at junction ahead or cycle track crossing the road</p> <p>50mm 'x-height' recommended</p> <p>Class 1 reflective material is normally appropriate</p> <p>Unlikely to be necessary and should only be used where specific problems are encountered. [1057] cycle symbols positioned on the cycle lane on main roads are preferred as a method of warning emerging drivers of the likely presence of cyclists.</p> <p>Lane may be varied to track, and the cycle symbol and arrow may be reversed for a contra-flow. If a sign is needed, and there are lanes in both directions, the arrow should be omitted and 'lane' varied to 'lanes'. Reference to the times of operation of the lane may be added if appropriate.</p>
	<p>[963.1] Cycle lane with traffic proceeding from right (sign for pedestrians)</p> <p>Two sizes 40mm 'x-height' recommended (and 50mm)</p> <p>Class 1 reflective material is recommended</p> <p>This sign should not be routinely used. It is sometimes helpful to warn pedestrians when cyclists travel from an unexpected direction e.g. on a two-way cycle track. It will often be sufficient to place the cycle marking to diagram 1057 in the lane or track at the point where pedestrians cross.</p> <p>'RIGHT' may be varied to 'LEFT' or 'BOTH WAYS', symbols may be reversed, and 'LANE' may be varied to 'TRACK'.</p>
	<p>[966] Cyclists Rejoin Carriageway</p> <p>Two sizes 40mm 'x-height' recommended if used (and 50mm)</p> <p>Retroreflecting material is recommended</p> <p>Sign has no statutory meaning. It replaced 'Cyclists Dismount' as the recommended wording on this sign through the 2011 amendments to TSRGD.</p>

	<p>[967] Route recommended for pedal cycles</p> <p>Two sizes 300x440mm recommended (and 375x550mm)</p> <p>Retroreflecting material is recommended</p> <p>The sign is for advisory cycle lanes and cycle routes on carriageways.</p> <p>959.1 should be used in conjunction with mandatory lanes.</p>
	<p>[968/968.1] Cycle parking</p> <p>170x170mm + 250x170mm recommended (250x250mm + 420x250mm not recommended)</p> <p>Retroreflective material is recommended but not a requirement of TSRGD</p> <p>This sign is usually unnecessary. It may be used in conjunction with signing denoting a combined cycle/ motorcycle parking facility</p>

Chapter 7

Construction, including surfacing

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7.1 Introduction and general issues

7.1.1

Close attention must be paid to construction standards and details to ensure that routes are: safe and comfortable for cyclists, attractive, legally acceptable, easy to maintain and durable.

7.1.2

Quality of construction for cycle infrastructure is covered by the Cycling Level of Service assessment, as shown in figure 7.1.

Figure 7.1 Key construction considerations in CLoS

Factor	Indicator	Relates in this chapter to...
Directness: Directness	Deviation of route	Major infrastructure such as bridges and tunnels to make direct connections.
Comfort: Surface quality	Defects: non cycle friendly ironworks, raised/sunken covers and gullies	Surfacing material options, drainage design and road marking materials.
Coherence: Wayfinding	Construction: asphalt concrete, HRA or blocks/bricks/setts	
Attractiveness: Greening	Green infrastructure or sustainable materials incorporated into design	Use of permeable surfaces as appropriate.

7.1.3

Streetscape issues need to be considered in all aspects of design. Cycle schemes should seek to reinforce the distinctive character of places and neighbourhoods and wherever practical improve environmental quality by lessening the predominance of motor traffic and traffic related street furniture. Street designers are directed to chapter 5 of this document and to the TfL [Streetscape Guidance](#) (2009) as well as other national and individual borough's streetscape guidance documents and streetscape-related supplementary planning documents.

7.1.4

The sections below set out general advice to inform design development. In all cases, the highway authority and its standard details for carriageway and footway construction should be consulted. This is particularly important wherever the authority is expected to adopt the facility: non-compliance with the relevant standards could lead to rejection.

7.1.5

Similarly, the highway authority's lighting unit will need to be consulted on all lighting proposals. An appropriate level of lighting is important for all cycle routes. This may entail upgrading existing lighting or the provision of new lighting in open spaces, particularly where there are concerns for personal security. For aesthetic and conservation reasons, lighting may not be acceptable through parks and other green corridor areas. If adequate lighting is not feasible on routes away from the highway then alternative night-time routes should be provided.

7.1.6

In some areas lighting units may be targeted and damaged by vandals, so this will need to be taken into account in the provision. It is now possible to obtain solar powered equipment for some installations, although this is only likely to be suitable for low-power uses.

Basic construction requirements

7.1.7

Practicalities such as cost, consideration of future maintenance and availability of materials have a significant bearing on decisions about construction of paths, tracks and cycle lanes. However, it is essential to remember that, from the perspective of the user, the riding quality and reliability of the surface are the most important construction considerations (see section 7.2 below).

7.1.8

A standard carriageway construction is appropriate for all cycling infrastructure on carriageway. Some modifications to the surface may be required to incorporate cycle lanes, advanced stop lines, or traffic speed control measures (traffic calming). Dimensional tolerances should follow normal highway standards, and when a new cycle route is installed a check should be carried out to confirm that this is the case.

7.1.9

Off-carriageway, cycle tracks and shared paths will generally have a similar construction to footways or footpaths. Factors to consider include occasional use by motor vehicles (eg. maintenance) and ground conditions.



Typical off-carriageway facility

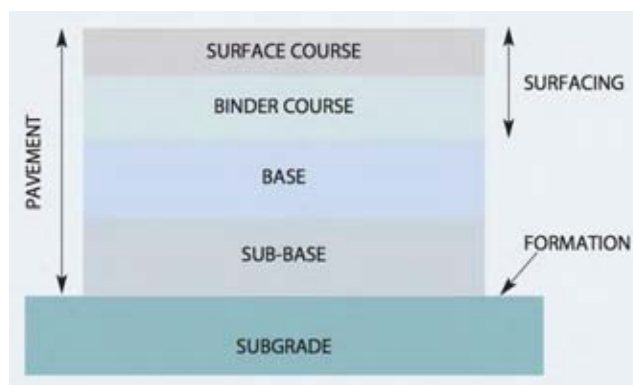


Diagram from Mineral Products Association, [Asphalt applications: construction and surfacing of footways and cycleways using asphalt](#) (2009)

7.1.10

For all types of construction, the surface is built up in a number of layers – typically surface course, binder course, base and sub-base. The binder, base and sub-base should be chosen and applied in accordance with the local authority's highway design standards, and in a manner appropriate to the context. When considering what depth of construction to adopt, it should be borne in mind that one of the most common reasons why some cyclists use the main carriageway in preference to a cycle track alongside the road is that the riding quality of the main road carriageway is better. The riding quality of any cycle track should be at least as good as that of the adjacent road. Further detail is provided in the guidance referred to above.

7.1.11

The depth of each layer will depend on the materials and local ground conditions – indicatively for a cycle track, a surface course may be around 25mm, the binder and base course may be another 50mm and the sub-base 125-225mm.

7.1.12

In all cases, consideration should also be given to:

- the impact of construction and the choice of materials on drainage
- responsible sourcing and re-use of construction products (bearing in mind that certain types and colours of aggregate, for example, may not be local and will need to be transported over a long distance)
- local character, and selection of materials appropriate to the context, which may be covered in local design or streetscape guidance

The porosity of surface, binder and base materials should be a consideration for any integrated approach to sustainable drainage.

7.1.13

For cycle tracks and shared footways, adequate edge restraint should normally be provided in the form of edging to restrict the deformation and erosion of the facility. Standard 50mm wide, 150mm deep concrete edging is normally suitable, which can be laid flush to allow water run-off, or raised as a low (50mm) kerb if adjacent to a pedestrian way if required. Alternatively kerbs (125x150mm) either bull-nose, battered or half-battered can be used. Kerb-faces of 50-100mm should be used, 50mm being preferable for cyclists.

7.1.14

Kerb re-alignment will be needed in many instances. Any new carriageway construction should be to normal highway standards unless there is kerb segregation of the cycle lane. Carriageway construction depth depends on ground conditions and expected loadings – indicatively, this may be around 600mm. This can entail the relaying and/or protection of utilities plant (electricity, gas, water, foul and surface water drainage, telephone, cable TV, tram cables etc.)

7.1.15

Maintenance of the riding surface after construction is essential to ensure the facility delivers a high level of service. This includes proper reinstatement following works by statutory undertakers. Close attention to drainage is necessary so that ponding is avoided as this provides a poor level of service and can result in cyclists moving into positions where conflict with other traffic is more likely to occur.



Problems caused by ponding

Drainage

7.1.16

Gully location and levels are critical for cyclists to ensure good route drainage. This is particularly important where segregation for cycling has been introduced. Acceptable gully characteristics are as follows:

- no gaps between the frame and cover wider than 15 mm
- transverse bars or 'portcullis' type bars on the cover

- recessed gully frames raised to be flush (tolerance +/- 5mm) with the surface
- suitable for their location to take public highway loadings
- open in a manner suitable to be cleansed by a normal gully cleansing or jetting machine under the relevant highway authority contract

7.1.17

Dished and other gratings unsuitable for cycling across should be replaced. Side-entry gullies or perforated kerb type gullies (such as Beany Blocks) may be suitable in some circumstances, particularly where there is restricted width and where cyclists will be close to the kerb. Drainage on cycle lanes and tracks may need additional gullies as well as appropriate falls to facilitate run-off. A minimum grating size of 300 x 300mm is recommended, as the smaller size gully gratings that are sometimes used in off-carriageway situations tend to get blocked.



Perforated kerb gullies, as used in a cycle track



Grates should be perpendicular to direction of travel

7.1.18

In any location where there is a possibility that cycle wheels will cross gullies, the grate slots should be at right angles to the direction of travel. Alternatively, non-slot 'pedestrian style' gratings should be provided.

7.1.19

Falls of at least 1:40 cross-fall and 1:200 longitudinally are preferred. With non-machine laid surfaces steeper longitudinal falls will be required. Falls on roads (including 'summit and valleying') have often been reduced or removed during re-surfacing, and so may need to be corrected. Any areas of ponding on a cycle route that will have an adverse effect on cyclists should be addressed, including where splashing from a carriageway onto an adjacent cycleway occurs.

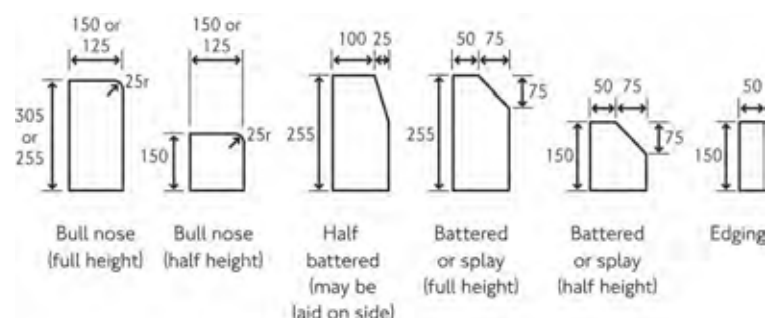
Construction of kerbs and segregating islands

7.1.20

Low kerbs (50-100mm high face) may be appropriate between cycling and pedestrian surfaces. These can allow better use of restricted space by maximising effective width – allowing cyclists to travel closer to them without risk of catching pedals on the kerb. Bullnose, battered (45° faces) or half-battered kerbs can be used to help increase effective width in this way. Red-brick and block-battered units are also available. Kerbs, blocks and edging will normally be laid on a 150mm deep bed and haunchings in lean concrete – refer to local authority's standard details for construction.

7.1.21

Where they are necessary, dropped kerbs should be specified as flush, within a tolerance of $\pm 6\text{mm}$ of the adjacent surfaces, to provide a comfortable surface for cyclists. Where appropriate, minor upstands can be beneficial as a speed control measure for cyclists. Particular care is needed with channel levels to ensure that ponding does not occur at crossing points.



Typical kerb profiles



Battered kerbs as used in London, left and the Netherlands, right

7.1.22

The edges of cycle tracks and segregated lanes need to be detailed so as to provide clear but safe delineation between carriageways and footways. Depending on width and on context (particularly in conservation areas), suitable materials for the edge strip or segregating island may include: paving slabs, block paving, granite setts, or coloured surfacing.

7.1.23

A strip or island installed to create segregated cycling facilities may also incorporate parking bays, lighting columns and other street furniture. Features such as low walls and planting may be appropriate to either protect the cycling area or improve the ambience. Guard railing and crash-barriers can create dangerous squeeze points, particularly where heavy goods vehicles turn, so they should be used only with caution, and with consideration for impact on cycling provision on-carriageway.

7.1.24

The segregating strip should be visually differentiated from the cycle lane or track by using a contrasting material. Paved strips with granite kerbs may be appropriate in more central urban settings but grass verges may also be suitable. They are relatively easy to maintain and provide suitable space in which to take avoiding action in case of an emergency. Any planting should be designed with consideration of safe and effective operation of the cycling facility. Plant height and growth, for example, should not affect forward visibility, and thorny bushes should be avoided adjacent to the edge of the cycling facility.

7.2 Surfacing

7.2.1

Good surface riding quality is essential for cyclist safety and comfort. This is the case whether cycling is on- or off-carriageway. Cyclists need a smooth riding surface, which should not be undulating and should have skid resistance appropriate to the location.

- The surface should be laid on adequate, well compacted base materials so that subsequent settlement does not occur.
- Sudden changes of level or ‘steps’ should be avoided, and inspection covers and transitions between on and off-carriageway should be flush.
- Potholes, rutting and other surface defects should be rectified.
- Patching or re-surfacing, and deeper trench reinstatements should be carried out as necessary.
- Where anti-skid surfacing is used, it should continue over ironwork particularly where cyclists are likely to be changing direction.

Bituminous surfaces should be well laid, usually by machine, with a finish to highway standards and including vertical tolerances no less stringent than applicable to carriageways.

Surfacing material options

7.2.2

This section sets out the most common materials that are used to create a good quality surface for cycling, whether on carriageway, on a dedicated track or on a shared use path – see figure 7.2 below.

Figure 7.2 Surface construction options

Surfacing material	
Asphalt surfacing: asphalt concrete, hot-rolled asphalt, or thin surface course system	Generally recommended for cycling – see section below.
Concrete	Historically used on estate roads, good for cycling if the joints and slabs are in good condition, but surface markings are not clearly visible.
Brick or block paving	Acceptable for cycling on, but skid resistance can be low on some brick paving types. Can be beneficial where high cycling speeds are not appropriate.

Natural stone blocks	May be suitable if bedded on mortar/concrete and surface is not uneven or smooth, and has good skid resistance.
Granite setts	Too rough for some bikes, but if laid flush can be acceptable in limited areas. Can polish with use and be slippery when wet.
Surface-applied treatments	
Self-binding surfaces, e.g. limestone fines to dust, Coxwell gravel (which has a reddish colour) and hoggin (a well-graded mixture of sand, gravel and clay)	Often used for rural paths, but poor skid resistance and not very durable. Requires a 100mm aggregate base. It remains loose-ish and dusty and is suitable only for lightly trafficked, environmentally sensitive areas or anywhere where a bound surface would not be acceptable.
High-friction surfacing (anti-skid), cold applied	Normally acceptable for cycling but laying methods resulting in ridges should be avoided (ie. lay in longitudinal rips rather than transversely)
Coloured veneer coat	Specialist coloured surfaces in blue, green, red etc. laid on to wearing courses, normally anti-skid
Resin-bonded or tar spray and chip dressing	Often used to change the colour or grip of an existing asphalt surface. Has the appearance of loose gravel but the aggregate held firmly in place. It only works on surfaces that are already well constructed and in good condition. Loose aggregate must be swept from the path before use.
Surface dressing – resin-bound pea shingle (6-8mm stone)	A cheap maintenance layer, suitable for rural/park situations, lower skid resistance, traditionally used on country roads.
Surface dressing – granite stone	A cheap maintenance layer, acceptable for cycling if the stone size is not too large (10-14mm).
Slurry sealing	A cheap maintenance layer, suitable for temporary cycling use only

7.2.3

Types to be avoided for general cycling use include:

- paving slabs/flags – lower wet skid resistance and risks of trips and rocking
- cobbles (pebbles in concrete). – uncomfortable surface with poor skid resistance

- ungraded aggregate such as shingle, ballast or scalping – poorly graded materials will be too rough and bike wheels will sink in.



Pea shingle paths in Kingston: Skerne Walk (left) and Thames Path (right)

7.2.4

Self-binding surfaces and surface dressings can be used in some circumstances, generally away from the highway, but sealed surfaces (using bitumen or other polymer-bound materials) should normally be chosen for cycling infrastructure. Sealed surfaces tend to be more expensive to construct but last longer, so the level of service is significantly better and whole-life costs are usually much lower. See Sustrans, [Cycle path surface options, technical information note no.8](#) (2012).

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7.2.5

For routes across parks or commons, bitumen or polymer-bound materials are preferred, such as pea shingle surface dressing, to ensure that a smooth and durable surface is provided. In these conditions it may be appropriate to omit formal concrete or timber edging and allow the edge to gradually deteriorate and become overgrown by grass. This will result in a loss of edge width of up to 300mm. Alternatively, treated timber edge restraints may help maintain the durability of the path and sub-base but still be sympathetic to the environment.

7.2.6

Unbound surfacing such as gravel or hoggin is only recommended for lower usage recreational routes, due to problems with deterioration of the surface caused by weather and use by traffic. These surfaces will also result in more road grime on cycles. Routes likely to be used by commuters and utility cyclists should always be hard surfaced.

Asphalt surfacing

7.2.7

The typical choice for the carriageway, and for many footways, is an asphalt surface. Asphalt used for roads and paths contain bitumens and aggregates which give a durable, joint-free surface that is relatively straightforward to construct and maintain. Different products are available, each with their own properties. The main variables are the aggregate size, aggregate content, binder content and binder grade, which have an effect on stiffness, resistance to cracking and other physical properties of the asphalt. The smoothness of the riding surface tends to be dictated by the texture depth of the asphalt – the higher the texture depth, the rougher the surface and vice-versa.

7.2.8

Asphalt surface treatments for carriageways, cycle tracks and footways generally come in one of three forms:

Asphalt concrete (also known as bitmac or dense bitumen macadam)

A close-graded, 6mm asphalt concrete is typically used on footways and cycle tracks as it gives a consistent and smooth surface finish. Designers should also consider porous asphalt concretes where sustainable urban drainage is of benefit to the area.

HRA, hot-rolled asphalt, (with or without pre-coated chippings)

This was the UK surface material of choice before the 2000s. Its use has been in decline especially in urban areas due to the positive textured nature of this material, which means it generates more noise than some other treatments. For HRA with pre-coated chippings, hard-stone (often granite) chippings are rolled into the asphalt surface course while it is still hot. They add texture to the surface and therefore increase its skid-resistance properties. The chippings are pre-coated with a binder, which can contain coloured pigment if necessary. They must be hard-wearing but with a high polished stone value (PSV), so that they are durable and do not polish over time. A typical choice for carriageway surfaces would be HRA 35/14 but other carriageway and footway grades exist.

TSCS, a thin surface coarse system

This is often applied to carriageway rather than footway surfaces. It typically uses a 10mm or 14mm aggregate. The advantage of using TSCS is that these materials come in a variety of texture depths and also colours. The use of clear bitumens and coloured aggregates allows these materials to be used as decorative asphalts. Use of such decorative asphalts is not recommended in areas of load unless assurances are sought from material suppliers. Note that proprietary types of TSCS have replaced generic stone mastic asphalt (SMA).

7.2.9

The use of all these materials is described in the European Standard Specification EN13108 and thicknesses should be specified using the British Standard [BS594987](#):

[2010, Asphalts for roads and other paved areas – specification for transport, laying compaction and type testing protocols](#), in conjunction with the local highway authority's design and construction standards. Full guidance on using the British Standards is provided in PD 6691 Guidance on the use of BS EN 13108 Bituminous Mixtures - material specifications (BSI, 2010).

7.2.10

In selecting a suitable type of asphalt for a given location, consideration should be given to the wider approach to sustainable drainage – specifically the extent to which the surface material may contribute to run-off into gullies and drains, or may be capable of holding water in situ during a rainfall event and allowing it to permeate slowly into the ground or on highway drainage systems. Open-graded asphalt concrete (where finer particles are eliminated from the aggregate mix) is more porous, and may therefore be more suitable as part of a SUDS-led approach, but its ability to hold water reduces after application because of accumulation of dust and other particles. It can be cleaned using a high-pressure washing, but it is difficult to reinstate its original appearance. Any porous surface material can be laid on a porous base or installed as part of the highway drainage.

Coloured surfacing

7.2.11

In most situations black bituminous surfacing in conjunction with cycle symbols and appropriate lane markings is satisfactory. This should be the norm except in locations of potential conflict where colour may be considered, such as ASL boxes and feeder lanes (see sections 4.3 and 6.4). For some shared use facilities a different surface treatment may also be beneficial in distinguishing these areas from dedicated cycle facilities though this is usually best achieved by using different materials.

7.2.12

The colour of asphalt surfaces depends largely on the colour of the aggregate used. This can be emphasised by using a clear binder – often a synthetic or vegetable-based binder. Coloured pigment can also be added but the colour of the aggregate endures much longer than any added colour, which tends to fade over time as the bitumen is worn from the riding surface. Coloured aggregate may cost up to twice as much as the standard shades of black/grey.

7.2.13

In conservation or other sensitive areas, natural stone-coloured chippings on HRA or natural stone-coloured asphalt concrete can be used. These colours can have longer life and better colour retention than other colours, but are often less visible.

7.2.14

In London it is generally agreed that where colour is used for marking cycling facilities, it should be Deep Chrome Green (No 267 BS381C: 1988) or blue on Cycle Superhighways (RAL5075).

Comparison of surface materials

7.2.15

Among the most important considerations in choosing an appropriate surface material are cost (and variation by colour), durability and skid resistance. Polished stone value (PSV) gives a measure of skid resistance. A PSV of 55 is normally acceptable for road skid resistance. Figure 7.3 below shows, indicatively, a comparison of different surface materials and treatments according to these criteria. Only materials costs are included here. Laying costs can vary considerably depending on the area (m²) and the required traffic management arrangements – difficult and restricted access, in particular, are likely to increase costs. The cost per square metre will also be higher for smaller areas. In each case, more accurate figures should be obtained from suppliers.

Figure 7.3 Surface treatments and indicative costs

Surface Material	Life (years)	Skid resistance (PSV)	Indicative cost per square metre (£)		
			Normal	Red	Blue/Green
6mm asphalt concrete	20	60+	8	12	25
Coloured TSCS, 30-50mm thick	20	55+	-	25+	25+
Block paving	20	55	20-30	20-30	-
Brick paving	20	-	-	20-40	-
Concrete paving flags	10	-	20-30	-	-
Tactile paving	10	-	30-40	-	-
York stone flags	20	-	160	-	-
Granite paving flags	20	-	100	-	-
Thermoplastic High-Friction Surfacing	4-6	70+	13	16	16
Resin High-Friction Surfacing	8-10	70+	15	18	18
Cycle Track Veneer (thermoplastic slurry)	5	55+	8	8	8

Surface Material	Life (years)	Skid resistance (PSV)	Indicative cost per square metre (£)		
			Normal	Red	Blue/Green
Cycle Lane Veneer (polymer binder)	10	55+	10	12	12
Slurry Seal (poor colour and life)	5	55			
Surface Dressing – Granite Stone (bituminous binder)	20	60+			
Surface Dressing – Granite Stone (clear binder colour enhance)	20	60+			
Surface Dressing – Pea Shingle Stone	20	50			

Road marking materials

7.2.16

A consistent standard of road markings is required, as described in TSRGD and the Traffic Signs Manual, chapter 5. For cycle symbols to diagram 1057, pre-formed markings are preferred.

7.2.17

Re-surfacing works can be an opportunity to review and address various aspects of construction quality (falls to prevent or address ponding, gully positions, grating types, chamber covers) and provision for cyclists (lane widths, pinch-points, corner radii, road markings).

7.2.18

Depending on the policy of individual highways authorities, resurfacing may be an opportunity to re-mark red and yellow lines in the minimum width, as recommended in the Traffic Signs Manual, chapter 5. This needs to take into account enforcement requirements, maintenance and the need for consistency between boroughs and across London. Narrower line markings reduce visual intrusion, save on materials, can help to visually accentuate the width of cycle lanes or coloured surfacing, and can reduce the risk of two-wheelers skidding on road markings in the wet.

7.2.19

The possible application of raised rib markings to cycle lane markings is a measure currently under trial. The idea would be to give an audible and vibratory warning to motor vehicles that they have encroached into a cycling facility. TSRGD (Schedule 6, Diagrams 1012.2 and 1012.3) describes two types of ribbed marking, used for the edge of carriageways, one with a maximum 11mm upstand, used for motorways, and the other with an 8mm upstand. TSRGD does not recommend applying either to a cycle lane marking: approval would need to be sought from DfT for any proposal to do so.

7.2.20

Road studs, or cat's eyes, are an authorised marking, primarily a means of illuminating other road markings. These must comply with the requirements of TSRGD (Direction 57 / 58) and may only be used in conjunction with those markings stipulated in direction 31(5). This does not currently include diagram 1049 mandatory cycle lane marking. Any proposal to use them on cycle lane markings would need to be raised with DfT and trialled.

7.3 Footways and tactile paving

7.3.1

The needs of pedestrians must be considered in the design of cycle facilities, in particular the needs of mobility and visually impaired people and people with learning difficulties. The layout of pedestrian facilities should be as simple and logical as possible and be consistent along a route.

7.3.2

Advice on tactile paving – provision of surface textures to assist blind and partially sighted pedestrians – can be found in DfT's [Guidance on the use of Tactile Paving Surfaces](#) (2007). The following documents also provide useful guidance on general issues and those specifically related to integration with cycling facilities.

CABE, [Sight Line](#) (2010)

RNIB, [Building Sight](#) (1995)

Joint Committee on Mobility of Blind and Partially Sighted People (JCMBPS), [Adjacent Facilities for Pedestrians and Cyclists](#) (2004)

DfT, [TAL 4/90 Tactile markings for segregated shared use by cyclists and pedestrians](#) (1990)

7.3.3

Types of tactile paving likely to be used in the construction of cycle facilities and covered in this section include:

- 'corduroy' paving to warn pedestrians of hazards, such as shared surfaces
- longitudinal ribbed 'tramline' paving to show cycle only surfaces adjacent to paths
- transverse ribbed 'ladder' paving to show pedestrian only areas
- 12-20mm high raised tactile marking (diagram 1049.1) to delineate cycling from walking surfaces
- blister paving adjacent to areas where pedestrians cross at controlled and uncontrolled crossings

Principles for application of tactile paving

7.3.4

It should be noted that there is variation in practice between highway authorities, so specific authority practice agreements will need to be taken into account. However, in principle, consideration for users should be paramount and this means that guidance should not be applied in an overly rigid manner.

Design should be as supportive as it can be for all users, while avoiding over-complication, illegibility or confusion. National guidance on tactile paving needs to be interpreted in an intelligent and balanced way, informed by a good understanding of the purpose of all the elements in any context and of the messages that need to be conveyed to different users.

7.3.5

Signage and tactile paving can never redeem poor design. In all cases, consideration needs to be given to the message they communicate to the intended user. In urban areas where junctions are numerous and movements are complex, it is important to understand what the main pedestrian and cyclist desire lines are and to use tactile paving to clearly alert mobility and visually impaired people to the greater risk.

7.3.6

Tactile paving should be provided so that all users can detect it and therefore needs to be no deeper than the length of the longest likely stride. Research undertaken in 2010 by University College London concluded that ‘the blister profile is readily detectable when it is 800mm wide’, leading TfL to make a recommendation (in [Streetscape Guidance design best practice note D4](#), 2012) that the minimum width for longitudinal blister tactile paving on TLRN should be reduced from the 1200mm recommended in national guidance to 800mm.

7.3.7

On the basis that the same principle applies to other types of tactile paving, it is reasonable to assume where tactile paving is intended to be understood only by pedestrians, the minimum depth should be 800mm, ie. two rows of 400x400mm flags.

7.3.8

Seeking to rationalise the amount of tactile paving used in a scheme makes sense from the perspective of legibility and comfort. Moving across certain types of tactile paving can be uncomfortable for both pedestrians and cyclists and therefore they should, ideally, be used sparingly.

Corduroy tactile paving

7.3.9

According to [Guidance on the use of Tactile Paving Surfaces](#), ‘The purpose of the corduroy surface is to warn visually impaired people of the presence of specific hazards: steps, level crossings or the approach to on-street light rapid transit (LRT) platforms. It is also used where a footway joins a shared route. It conveys the message “hazard, proceed with caution”.’

7.3.10

This national guidance should be consulted for details of how and where corduroy tactile paving should be used. In most instances where cycling and pedestrian facilities at footway level are separated, ladder and tramline tactile should be used to show a transition between separated facilities and a shared use area. Corduroy tactile is only likely to be necessary where another footpath (pedestrian use only) joins a shared area.



7.3.11

Corduroy tactile paving material has ribs that are rounded at the top and spaced closer together (50mm apart) than ladder and tramline tactile paving. It should be accompanied by a shared use sign to diagram 956. Buff, grey or charcoal colour tactile paving is available to match the footway. The depth of 1200mm recommended in Guidance on the use of Tactile Paving Surfaces may be reduced to 800mm in most instances for reasons described above.

7.3.12

Corduroy tactile paving material has also developed a 'variant' use (ie one not described in DfT guidance) as substituting for a kerb edge in schemes where a level surface treatment has been applied. This is in order help blind and partially sighted pedestrians find the edge and is intended particularly to assist cane users. Whether this treatment is appropriate will depend on the overall design for a street. It should not be applied without broader consideration of the needs of all users as part of a scheme and without assurances from user groups that it will convey the intended message.



Corduroy paving used instead of a kerb edge at Bexleyheath

Tactiles for shared use: ladder and tramline

7.3.13

[Guidance on the use of Tactile Paving Surfaces](#) and Traffic Advisory Leaflet [TAL 4/90](#) recommend that corduroy and ladder-and-tramline tactile paving should be applied to shared use areas to allow people, particularly visually impaired users, to detect a transition between a shared area and separate spaces for pedestrian and cycle movement. On the cycling side, the 'tramline' tactile is aligned with the direction of movement. On the pedestrian side, it is laid transversely in a 'ladder pattern' – that is

across the direction of movement. Raised profiled delineator markings (TSRGD diagram 1049.1) are used to divide the surface.

7.3.14

Ladder and tramline tactile paving material ribs are wider and flat across the top, and they are spaced further apart (70mm) than on corduroy type tactile paving. The profiled slabs are available in the normal modular paving size of 400 x 400mm in various colours. These include light or dark grey, buff, or green, so that a consistent colour background can be achieved and also to allow painted markings such as give way or cycle logos to be more visible.

7.3.15

It is possible to use tramline tactile paving on its own at the start of a cycle track and accompanied by cycle track sign TSRGD diagram 955, or at the start of a segregated path with sign diagram 957. However, it is preferable that other visual cues should be used to identify a facility as a track or path for cyclists before resorting to tactile paving.

7.3.16

A proportionate approach needs to be taken to applying these tactiles, bearing in mind the message that needs to be conveyed. For example, where ladder-and-tramline tactile paving indicates a transition from separated to shared provision, then the key recipients of the message are cyclists. Entering a shared area means, for them, that they are more likely to encounter pedestrians and that there is a much greater obligation to act with courtesy and give way to pedestrians, modifying their speed as necessary.

7.3.17

For pedestrians, understanding the message about the shared area, or knowing that they have passed from a dedicated pedestrian space into a shared area, is less crucial because a change in behaviour is not necessarily required from them. It is important, however, that they understand when they are stepping into an area for cycling, so this should be distinguished from the footway using a raised delineator strip and tramline tactile paving.

7.3.18

Certain other difficulties arise in instances where guidance suggests that tactile paving is required in order to sign a transition from separated to shared space.

- It is more or less impossible to account for every direction or angle of possible pedestrian movement – this makes it difficult to provide tactile paving that is fit-for-purpose.

- Cyclists can slip on tramline tactile paving, particularly in wet or freezing conditions – their wheels can become deflected by the longitudinal grooves.
- It is recommended that all other alternatives should be explored before relying on tactile paving to distinguish between different areas. Preferably, this should include clear physical and/or visual distinction between an area for cycling and a shared area.

7.3.19

Rather than the depth of 2400mm stipulated in [Guidance on the use of Tactile Paving Surfaces](#), it is recommended that 1200mm should be the minimum depth for ladder and tramline tactiles at the beginning of and end of a separated facility and that 800mm should be required at more minor, repeated transitions along the way. In some cases the 'ladder' paving on the pedestrian side could be omitted to avoid confusion, where there are extensive areas of different tactile paving types.



Where appropriate, 2400mm depth of ladder and tramline may be reduced to 1200mm.

7.3.20

Where guidance indicates that both blister and ribbed tactiles are required, the ribbed paving will normally need to be set back from the kerb-line by 2-3m to avoid confusing blind people when they have crossed a carriageway. This will allow them to reach the comparative safety of a (shared) footway before having to determine on which side of the shared surface to proceed.

7.3.21

Where a cycling scheme appears to require a large amount of corduroy and ladder-and-tramline, this usually indicates that the design solution is not fit-for-purpose and it should prompt a re-design.

If cyclists cannot be accommodated in safety and comfort on the carriageway, or vertically separated from pedestrians off-carriageway, then fully shared use may very often preferable to short, 'stop-start' sections of separated use at footway level.

Blister tactile paving

7.3.22

Blister tactile paving is for use on the footway at carriageway controlled crossings, such as zebra crossings or toucan crossings, and at uncontrolled crossings. This could include the crossing of a cycle track by a footpath/way. As set out in para 7.3.6 above, the minimum depth for blister tactile paving should be 800mm. 800mm wide ‘tails’ are also required, running between the blister paving at the crossing-point and the back of the footway or building line. Appropriate tail lengths should ideally be derived from understanding pedestrian movement at each crossing – ensuring that the tail is perpendicular to the predominant pedestrian flow.

7.3.23

Local streetscape guidance will dictate site-specific requirements but, for the most part, buff or contrasting grey coloured blister tactile paving is used at uncontrolled crossings on the footway adjacent to vehicle ways, including cycle tracks. Both red and buff tactile paving should be of a contrasting colour to the surrounding paving. The use of light or dark grey blister paving may give the appropriate contrast in conservation areas. Visibility can also be achieved with a contrasting band of brick or blockwork.



Red and grey blister tactile paving used at crossings

Pedestrian guardrailing

7.3.24

[The Mayor's Manifesto](#) (2012) said: 'The capital has too many guardrails, restricting the movement of pedestrians and also presenting a hazard for cyclists.' TfL has produced [Guidance on the Assessment of Pedestrian Guardrail](#) (2012), based on the experience of analysing and removing pedestrian guardrail at around 150 junctions and 200 staggered crossings in central London.

7.3.25

The assessment procedure should include a road safety audit, starting from the assumption that all the guardrailing is to be removed. Guardrails can be especially hazardous for cyclists as they block a potential escape route in the event of collision.

7.4 Maintenance and asset management

7.4.1

The maintenance of cycle routes and cycle facilities is essential if they are to encourage cycle use. Most of the conditions covered in this section have a greater negative impact on cyclists as compared to motorists, and frequently result in severe hazards for cyclists. Cycle route infrastructure design should include access for the use of maintenance vehicles where appropriate, particularly where the route is off-carriageway.

Sweeping

7.4.2

Appropriate frequencies for sweeping are important and these may only become apparent after a route has opened. Broken glass or other debris often blown across by motor traffic is the most frequent problem. This can cause danger to cyclists trying to avoid it, or inconvenience to detour via an alternative route, or to mend a puncture.

7.4.3

Debris can be a particular problem when cycle lanes are introduced so that debris ceases to be deflected by the normal flow of vehicles. Any changes to the cleansing contractor's schedule will need to be notified and agreed, and should be recorded in case cleansing problems arise.

Landscape growth

7.4.4

Cycle tracks, adjacent paths and shared paths frequently suffer from problems from the growth of adjacent planting. This can seriously reduce the available width of a path, and reduce sight lines to create blind spots, sometimes giving rise to social safety issues. Cyclists can find it harder than pedestrians to avoid branches due to their speed, and their height off the ground, especially when on a bicycle.



Consider proximity of trees and bushes when planning and maintaining signs

7.4.5

Trimmed-back thorn bushes need to be thoroughly removed after cutting to ensure that punctures do not result. Preferably separate cycle tracks from thorn bushes.

7.4.6

In summer, many cyclists, especially children, will be wearing shorts. Stinging nettles and brambles can grow quickly so frequent maintenance is required.

Surface defects

7.4.7

Uneven surfaces can affect the balance and stability of bikes, or generate swerving manoeuvres, and can cause the rider discomfort. Potholes, bumps, ridges, and sunken gully and inspection cover gratings are frequent problems that should be addressed. Steps in excess of 10mm or deformation in excess of 10mm over a 1m straight edge length should be rectified.

7.4.8

Ironwork such as manhole covers should be checked during routine inspections so that skid resistance is compatible with that of the surrounding road surface, particularly where surface coatings have been applied.

7.4.9

Blocked drainage gullies or inadequate drainage are frequent problems on cycle routes, and should be identified and rectified during normal maintenance routines. Any additional drainage will need to be included within the drainage maintenance schedule in conjunction with other asset management.

Maintenance of signs and markings

7.4.10

Clear signs and markings are important both for safety reasons and the legibility and coherence of routes. Signs can be rotated, removed unofficially, not replaced after collision damage, and can be made illegible with graffiti. Problems such as these can give the impression of a route with problems of social safety as well as indicating lack of importance given to cycling by the managing authority.

- Anti-rotational brackets should be fitted to appropriate signs, particularly ‘finger’ direction signposts – see section 6.3.
- Surface markings are likely to become worn, and may be removed by trench digging or by resurfacing. These defects should be rectified as soon as they become illegible.

7.4.11

Where significant lengths of re-surfacing requires the removal of existing red or yellow line markings, highways authorities should consider providing replacement lines at the minimum permitted width. In addition to reducing visual intrusion and saving on

materials, this can help to visually accentuate the width of cycle lanes or coloured surfacing and reduce the risk of cyclists skidding on road markings in the wet. The [Traffic Signs Manual, chapter 5](#) allows for this. 50mm line width is technically acceptable for design speeds of up to 30mph, and 100mm above this. Design teams should take account both of enforcement requirements and reasonable consistency of appearance.

Maintenance regimes

7.4.12

Cyclists' needs should be taken into account in risk registers and maintenance regimes. On carriageway, defects in certain locations may not cause problems for motor vehicles, but could cause significant risks for cyclists. Off carriageway, there is often a poor understanding of cyclists' needs on cycle tracks and shared use footways.

7.4.13

The quality, comfort and popularity of designated cycle routes depend on the surface continuing to be of consistently high quality. A regime is required to ensure that defects are picked up and acted on as soon as possible. Visual inspection by bicycle and on foot are the simplest ways to do this but cycle or motor vehicle mounted equipment can be a useful additional tool in measuring surface quality on a regular basis.

7.4.14

TfL has developed the following simply hierarchy based on cycle flows and the relative importance of designated routes:

Prestige

Policy priority route, with very high flows (>2500 cyclists/day) and/or part of the Cycle Superhighway network.

Primary

High flows (1000 to 2500 cyclists/day) and/or sites that are part of designated cycling routes.

Secondary

Medium / low flows (\leq 1000 cyclists/day) and/or local access and links, as shown on the TfL cycle guide maps.

Cyclists excluded

Any section of Highway at which cyclists are legally excluded.

7.5 Structures

7.5.1

Making difficult connections can often only be done by taking cycling facilities over or under other features such as highways, railways and waterways. Because these require cyclists to deal with gradients, and because they are likely to be costly, a strong case will need to be made for their construction: comparison with other reasonable options and a strong benefit-to-cost ratio, for example. However, bridges and subways can play an important role in cycling networks, and they can offer a high degree of safety and directness.

7.5.2

Advice on structures in this section is generally to be found in the Design Manual for Roads and Bridges (DMRB). Individual sections are referenced in the text below.

Bridges and ramps



White House Lane bridge, Hackney – before and after. Conversion to a fit-for-purpose cycling link.

7.5.3

New bridges should allow for comfortable and direct cycle and pedestrian movement and, wherever practicable, some separation should be provided. Consideration should be given to the probable growth in both cyclist and pedestrian numbers from making a new link. New pedestrian/cycle bridges in urban areas should be built with at least 4m clear width.

7.5.4

Bridges for cyclists' use should be designed so as not to require cyclists to dismount and use steps. Access ramps are the best ways of meeting cyclists' needs. Ramps should preferably avoid 90- or 180-degree turns, and have a gradient shallow enough to allow most cyclists to continue to ride up the slope. This should be no greater than 1:20, although as steep as 1:12 may be acceptable in some circumstances.



Bridges with separate pedestrian and cycling facilities in Stockholm (left) and Minneapolis (right)



Ravensbury Park shared use bridge, Merton



Access ramp, Richmond

7.5.5

Where steps are unavoidable at bridges and subways, or as a short term low cost measure pending replacement, concrete or steel-section wheeling ramps should be installed. They should be at least 100mm and 50mm deep and can be on one or both sides, at least 0.2m away from the wall and/or banister. Retrofitting wheeling ramps should be considered whenever bridges, railway stations and underpasses are refurbished. Care needs to be taken to avoid compromising the accessibility needs of pedestrians, particularly young children, the elderly and mobility impaired users, through installing such a ramp. Where this is an issue, a ramp on one side only may be the best solution.



Wheeling ramps

7.5.6

The minimum vertical headroom provided for cyclists should be 2.3m (as opposed to 2.1m for pedestrians) to allow for cyclists' higher position when riding. This will also apply to all signs that may obstruct cyclists.

7.5.7

On footbridges intended for shared pedestrian and cycle use the minimum parapet height stipulated by [DMRB, section BD 29/04](#) is 1.4m. Where pedestrian and cycle use is separated, this requirement only applies to the cycle side. On other structures and situations it is recommended that a risk assessment be carried out to inform design options. The Sustrans guide, [Parapet heights on cycle routes: Technical information note no. 30](#) (2012), includes guidance on undertaking such a risk assessment.



High bridge parapets

Tunnels and subways

7.5.8

A dedicated cycle tunnel or subway, or one shared with pedestrians, may be a viable option as part of an urban cycling network. It can help:

- avoid circuituous, possibly motor traffic-dominated routes
- give protection from weather and, provided it is not used by other vehicles, a good riding surface
- offer consistent provision where the tracks join off-carriageway facilities on either side

7.5.9

A well designed tunnel or subway could become an attractive, distinctive and memorable part of any cycling route. However, this will require good lighting, high standards of maintenance and comfortable ways of getting on and off the facility (ie. ramps), so construction and maintenance costs are likely to be high.

7.5.10

[DMRB section BD 78/99](#) sets out tunnel design requirements for vehicular traffic, much of which also applies to tunnels for cycle and/or pedestrian use only. The DMRB definition of a road tunnel is 'a subsurface highway structure enclosed for a length of 150m, or more'. Most of the basic design and management requirements set out in DMRB are assumed to apply to tunnels largely dedicated to cycling.

7.5.11

Headroom through subways should be a minimum of 2.4m ([DMRB, section TD 36/93](#)). If this cannot be achieved because of structural constraints, then the reduced headroom should be highlighted using an explanatory sign with the text 'Cyclists beware – low headroom', and stating the actual height available.

7.5.12

Sustrans' [Technical Information Note No.29, Lighting of cycle paths](#) (2012) provides further information on design considerations for tunnels, underpasses, subways and bridges.

Chapter 8

Cycle parking

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8.1 Why cycle parking is important

8.1.1

Provision of cycle parking and its security are essential for supporting the development of cycling as a practical transport choice. A lack of appropriate cycle parking facilities is often cited as a barrier to cycling and bicycle ownership.

The number and the quality of cycle parking spaces available must not only keep pace with the growing use of bicycles in London, but also needs to allow for the substantial future growth set out in the Mayor's Vision for Cycling.

8.1.2

Opportunities to provide more and better cycle parking should not have to come exclusively through programmes and projects aimed at promoting cycling. Various streetscape and highway improvements offer the possibility of raising the quality of cycle parking provision in the public realm.

8.1.3

Cycle parking also needs to be a key consideration for any new development that people are expected to travel to and from – just as journeys on foot, by public transport and by private car are planned for. Through the planning process, high quality cycle parking should be regarded as an integral part of a scheme, an essential part of the attraction of a development – never just an add-on to meet minimum policy requirements.

8.1.4

This chapter focuses primarily on the quality of cycle parking and the process for planning and implementing it. Key principles underpinning this guidance are that cycle parking should be:

Fit-for-purpose – meeting identified current and future demand, with an appropriate balance of short-stay and longer-stay provision.

Well-located – convenient, accessible and as close as possible to the destination.

Secure, visible and well-overlooked – stands that allow for secure locking in places that are well lit and with high levels of natural surveillance.



Cycle parking in Covent Garden

Policy context

8.1.5

Local authorities and developers are expected to make appropriate provision for cycle parking to support ambitious targets for cycling in the [Mayor's Transport Strategy](#) (2010). In order to fulfil that role effectively, the quality of cycle parking will be as important as the quantity. A number of key issues around the quality of cycle parking were raised in the London Assembly report, [Stand and Deliver: Cycle Parking in London](#) (2009).

8.1.6

TfL's [Cycle Security Plan](#) (2010) aims to tackle the issue of cycle theft by improving the cycle parking environment. This includes actions to increase the number of fit-for-purpose cycle parking spaces and to provide advice on locating cycle parking. It also advocates more detailed design guidance on secure cycle parking.



8.1.7

'We will deliver 80,000 additional cycle parking spaces in residential locations, stations, workplaces and other trip destinations by 2016. We will put them where people most need them, above all in central London.' [The Mayor's Vision for Cycling](#), 2013, p24.

The Vision promises more cycle parking at central London termini and suburban stations, enabling better integration between transport modes and embedding types of travel behaviour that support trip chaining. The Vision also introduces the idea of cycle hubs and superhubs, which will provide extensive and secure parking and are located where cycle routes intersect. Hubs should incorporate cycle hire and other associated facilities such as cycle repair.

8.1.8

The [London Plan](#) requires better cycle parking through planning. In the [Further Alterations to the London Plan](#) (2014) new cycle parking standards are proposed for new or re-development in London by use class, including specific requirements for both long and short-stay parking. While these standards establish minima for cycle parking provision, clients, designers and planners should seek to identify and meet identified future demand, which will invariably lead to a higher level of provision than the minimum standards.

8.1.9

Long-stay cycle parking serving particular buildings or sites is primarily for residents or staff, and should be provided in secure, covered facilities with controlled, step-free access. Short-stay parking may be for visitors, customers or other short-stay needs and should be highly visible, accessible, convenient and as close to the main site or building entrance as possible. The guidance in this document should be used to inform the location, type and design of the parking agreed and delivered.

8.1.10

Assessment of cycle parking provision should take into account current demand and predicted trends for cycling across London. This should be allied with advice in this document on achieving the best quality of provision, in terms of location, design and type. This is important in order to:

- ensure that adequate facilities are available for those who already cycle
- reduce cycle theft through appropriate facilities to lock and store bikes
- encourage more people to choose cycling as a mode of transport
- reduce obstruction and other nuisance caused by ad-hoc ‘fly parking’
- relocate any under-used cycle parking
- help more children to cycle

8.1.11

In summary, the planning process should be used to help deliver better cycle parking for London through:

- applying London Plan and Local Plan policies and standards on cycle parking to new development
- ensuring that development and transport plans include proposals for addressing existing gaps in provision
- using planning obligations and conditions to help deliver additional high quality cycle parking facilities to meet those identified gaps

8.2 Procedures

8.2.1

Providing the right cycle parking for a place requires an understanding of the dynamics of current and likely future cycle use in an area, and ideally should be planned in an integrated way with cycle routes. Qualitative criteria are just as important as the quantity of cycle parking provided. The section below on design principles for cycle parking sets out key requirements.

Assessing demand for cycle parking

8.2.2

Cycle parking should be provided where there is evidence of demand and/or the potential to attract use. Consideration should be given to the probable need for cycle parking to serve a demand that is currently suppressed. For any strategy that aims to increase cycling substantially in an area, increase in demand for cycle parking over and above that suggested by analysis of trip generators should be planned for.

The right amount of cycle parking for a site or area would be at a level that:

- meets existing baseline demand
- meets the potential demand generated by the existing and proposed land uses in the area
- ensures there is allowance for spare capacity (ideally, at least 20 per cent)

8.2.3

All destinations should be served by cycle parking that can accommodate employees, customers, residents and visitors. Key destinations include:

- residential areas
- shopping centres and high streets
- workplaces
- services, e.g. hospitals, health centres, council buildings
- education establishments including schools, colleges and universities.
- community facilities and services e.g. libraries
- entertainment and leisure venues
- public transport interchanges and National Rail, Docklands Light Railway and London Underground and Overground stations

8.2.4

Methods of assessing potential demand include:

- surveys of existing patterns of cycle parking, taking into account formal and informal parking areas, existing cycle stands in public and private areas, and 'fly parking' to street furniture and guard railing
- undertaking surveys at different times of the day, week and year – cycle parking demand in winter tends to be approximately 60-80 per cent of the demand in summer, while identifying variations by time of day and day of week can reveal peaks and give indications of trip purpose
- making a broader assessment of where trip generators are, and where and when people are likely to – or could – travel there by bicycle. This includes identifying where and when new developments are proposed locally.
- trialling temporary stands



Cycle parking serving destinations



Gauge demand for cycle parking

8.2.5

Provision of new or increased cycle parking should also be informed by consultation with cyclists, pedestrians, retailers and local residents, many of whom will be able to give a more rounded view about variation of cycle parking demand through the day, week and year. This should be proportionate to the level of investment and the likely impact on other users.

8.2.6

If the target London-wide mode share of around 5 per cent by 2026 is to be achieved, certain more accessible locations will need to deliver mode shares substantially higher than this. As TfL's cycle census of April 2013 showed, many locations see a cycling mode share above 20 per cent during peak hours. ([TfL, *Central London Cycle Census: technical note*, October 2013](#)). Levels of cycling in central and many parts of inner London are likely to continue to see higher-than-average increases, with investment in better routes through the *Mayor's Vision for Cycling* programme. Those significant changes need taking into account when estimates of future mode share are made.

8.2.7

For new development, applicants should consult the latest version of the London Plan to verify minimum requirements, and should check with the local planning authority, which may have its own minimum standards in its Local Plan. Developers and planners should seek greater provision than the minimum wherever possible, particularly in locations where trips by bicycle could grow substantially. The quantity and quality of cycle parking is likely to become an ever more important factor in attracting potential buyers, occupiers and customers.

8.2.8

The feasibility of providing cycle parking in a given location needs to be considered alongside assessing demand. Footway space and underground utilities or structures will determine whether locations are suitable. Clarity about these constraints is important before consulting on any options for new cycle parking.

8.2.9

A Traffic Regulation Order (TRO) is necessary for on-carriageway cycle parking, but not for off-carriageway (ie. on the footway), although this may be an effective form of consultation in some sensitive areas. Obtaining a TRO involves several stages:

- consultation on initial layout / design: obtaining the view of local councillors, emergency services and other relevant institutions
- advertisement of the TRO, via public notices, for at least 21 days
- making the TRO
- implementing the TRO

8.2.10

Alternatively, a temporary TRO may be secured more quickly for a temporary use of part of the carriageway for cycle parking, for up to 18 months.

Fit-for-purpose cycle parking

8.2.11

In planning cycle parking, it is important to ensure that provision is appropriate for the purpose of the trip and the length of stay. Peaks and the spread of demand across the day need to be considered.

8.2.12

In workplaces, the demand for spaces will be at similar times during the working day. Spaces may be assumed to be used frequently with a low turnover in the number of people using a space in one day. In these instances the cycle parking will not

necessarily need to be as visible as parking in a shopping area would need to be, though a higher level of 'access only' security will be required.

8.2.13

In contrast, a Sheffield stand located in a busy shopping area is likely to offer a convenient facility, suitable for short stays, and should be located in a highly visible area with good natural surveillance. This parking is also likely to have a higher daily turnover of use.



Bespoke cycle stands, Windrush Square, Brixton



Cycle stands for DLR stations

8.2.14

A fit-for-purpose stand is also one that is appropriate for its context, and alternative types may be needed for sensitive areas. By using bespoke types, cycle parking can also serve a place-making function as part of an integrated approach to public realm improvement.

Well located cycle parking

8.2.15

Proximity to a destination influences a cyclist's choice of where to park, so cycle parking should be convenient and well located. As a general rule, cycle parking should be provided:

- as close as possible to the final destination
- within 15m for short-stay parking serving a single destination
- within 25m for short-stay parking serving multiple sites
- within 50m for longer-stay parking
- in convenient locations for entrances to and exits from the destination
- where there is easy access – eg. through use of dropped kerbs, cycle routes and crossings

8.2.16

Where cycle parking is inside a building, it should be located so as to avoid the need to negotiate obstacles such as stairs, tight corners, multiple doors and narrow doorways. Lifts should be provided to any basement cycle parking and accessing the parking area should involve passing through no more than two sets of doors.

8.2.17

The strategy for signage and wayfinding in an area should ensure cycle parking is easy to find, and also help cyclists continue their journey from the parking area. [TSRGD](#) contains a standard sign, diagram 968, for this purpose. Wherever it is necessary, any such sign should be mounted so as to avoid creating additional sign clutter in the public realm.



Secure, well overlooked cycle parking

8.2.18

Wherever it is located, cycle parking must be secure, visible and well overlooked. Users need to feel both that their bicycle will be safe where it is parked, and that they will be safe accessing and using the parking. Cycle parking should be:

- sited in locations that are clearly visible and well overlooked with high levels of natural surveillance, and CCTV where necessary
- designed with consideration of sight lines into and out of the cycle storage area – this is particularly important when cycle cages, compounds or secure stores are provided
- adequately lit and overlooked, particularly at night time or where the parking is indoors/under cover

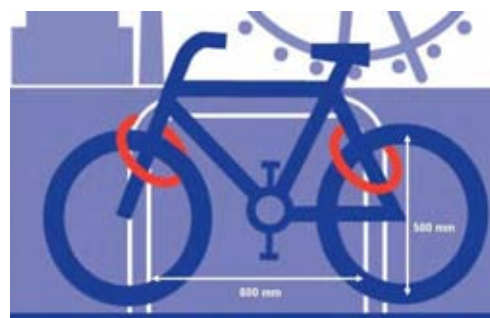
8.2.19

A wide range of cycle parking products is available, but the cycle parking design chosen, and the location of the cycle parking should as far as possible:

- allow the frame and both wheels of the bicycle to be secured
- provide support for any type of bicycle without damaging it
- ensure that, whether in use or not, the stand is not causing an obstruction or danger to pedestrian movements, or causing the user to be in danger or a danger to vehicles on the carriageway

8.2.20

In order to allow for securing the bicycle by the frame and both wheels, locking points should be approximately 600mm apart and 500mm above ground. The stand shape should provide locking within 100mm of these points to facilitate the use of two 'D' locks, i.e. range of 400-800mm in width and 400-600mm above ground. It should be noted that stands thicker than 75mm will stop the use of a 'D' lock.



Recommended double locking practice

8.2.21

Damaged or vandalised bicycles left in public often signal the insecurity of cycle parking and, in some areas, cycle parking facilities are unlawfully occupied by motorcycles and scooters, sending a similar negative message.

8.3 Types of cycle parking

8.3.1

The three design principles for cycle parking – fit-for-purpose, well located and secure – should apply to the choice of cycle stand. Response to context should be addressed through conforming to relevant street design guidance.

8.3.2

Space available is always likely to be a constraint, although the choice of cycle parking type should not be dictated by space alone. Indicatively, types such as the Sheffield stand offer around one space per 1.4 sq m (if implemented according to the guidance in section 8.4 below), meaning that 1,000 spaces requires 1,400 sq m. High density facilities, such as the two-tier stand, offer around one space per 0.7 sq m, or 1,000 spaces in 700 sq m.

Tubular stands



Sheffield stand, with visibility bands and tapping rail



M-profile stand



Alternative type of tubular stand

8.3.3

Sheffield stands are the most common type of tubular stand. They offer a simple, robust and cost effective cycle parking solution: two bikes can be parked on one stand and a range of locking positions are possible.

8.3.4

It is recommended that the finish of stands on the highway should be either stainless steel or galvanised with a black nylon coating that is hard-wearing and does not scratch the bicycle's paintwork. Stands located off-highway in compounds may be plain galvanised steel.

8.3.5

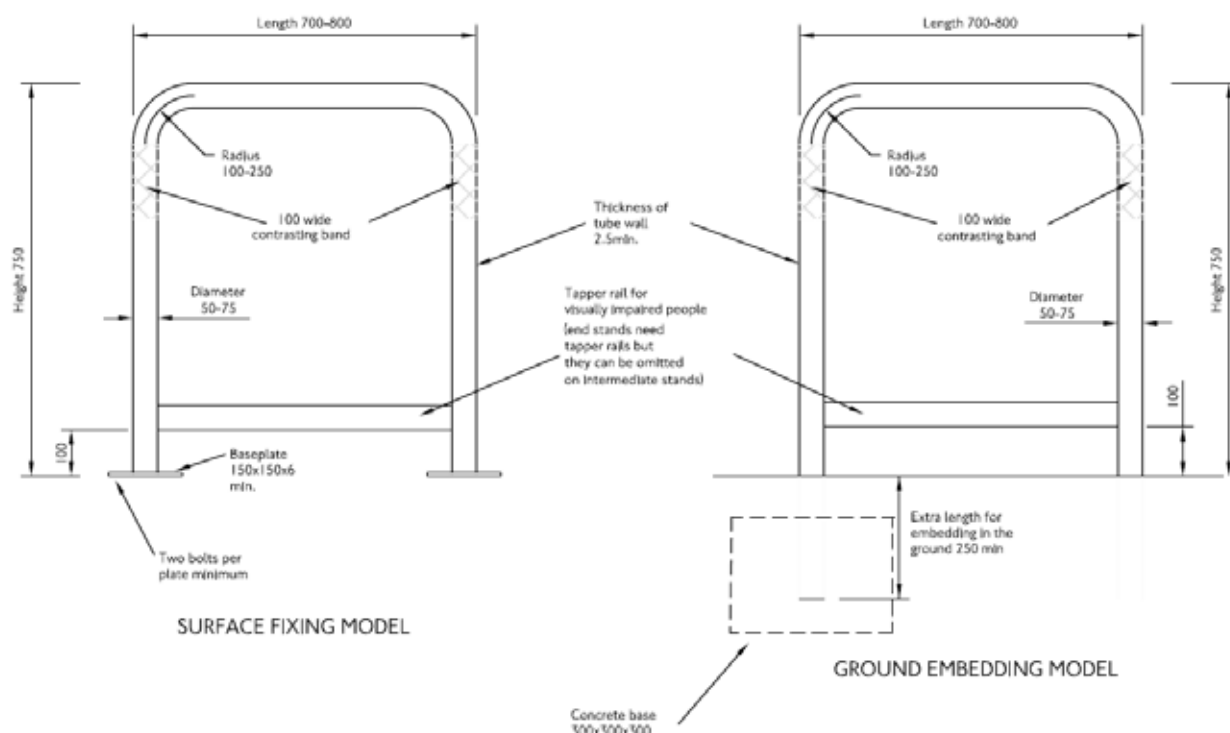
Visibility bands must be used on Sheffield stands to assist partially sighted street users to identify areas of cycle parking, and should be identifiable by using agreed contrasting colours. For example, a black visibility band should be used on a stand with a stainless steel finish. A tapping rail is usually required on cycle stands, or on the end unit when stands are grouped together, so that an empty stand can be identified by a pedestrian using a white cane.

8.3.6

An alternative to the Sheffield stand is the M-profile stand, which has been designed specifically to facilitate double locking.

8.3.7

Other tubular cycle parking designs are available on the market, and may be suitable in many locations. While it is important to take a flexible approach to the design of cycle parking stands, they should always fulfil the main function of allowing for two-point frame and wheel locking.





8.3.8

Two tier cycle racks are an innovative solution tackling the issues of space constraints and high demand for cycle parking. The racking system stores bicycles above each other, increasing the capacity of cycle parking sites. Racking systems are best provided in locations where instructions for use can be given to ensure that cyclists use the facilities safely.



Two-tiered, high capacity cycle parking at Liverpool Street station (left) and Euston station (right)

8.3.9

A minimum aisle width of 2500mm beyond the lowered frame is required to allow bicycles to be turned and loaded. An overall aisle width of 3500mm should be provided in areas of two-way movements and racks on either side of aisles, though this may limit the density advantages of two tier stands. The minimum height requirement is 2600mm.

8.3.10

Careful consideration should be given to:

- the location of stands, minimising conflict with pedestrians using the surrounding area
- the level of natural surveillance surrounding the stands to ensure users feel confident to lock their bicycles using the stand
- the design of the chosen stand, to ensure bicycles can be locked by securing at least one wheel and the frame – it is possible to specify two-tier racks with an additional security bar, to enable both wheels and the frame to be secured

Cycle lockers

8.3.11

Cycle lockers can offer secure and dry parking, and other storage facilities for longer stays. However they require more management than other cycle parking solutions.



8.3.12

Consideration should be given to:

- the design of the locker, particularly any moving parts, which are particularly vulnerable to vandalism or leverage by thieves
- the space available and cycle parking demand – some cycle lockers have a large footprint
- whether the locker is suitable for all sizes of bicycle (a typical adult bicycle is approximately 1800mm long and 1200mm tall)
- the level of supervision of locker sites, ensuring they do not suffer from vandalism or misuse
- the location of lockers within a site, to ensure the facility is convenient and accessible

- the operation and management system of lockers when installed and sustainability of any system in the future, allowing access to anyone who wants to use it
- a management system, which may be provided by the supplier or planned separately
- liability for securing contents, which may need to be clearer than with open parking
- the ability to open and search lockers for security reasons

Secure shelters and compounds

8.3.13

Secure shelters, compounds and cages can be used in to provide additional security for longer stays. This can include public transport interchange points, workplaces or high density residential developments. Access can be enabled by a key or swipe card operated by a registered user. Some products, like the 'bike hangar' or Fietshangar are designed for use in the street environment, making more efficient use of space previously dedicated to car parking. They are particularly useful in areas of terraced housing where space for bicycle storage is often in short supply.

8.3.14

For any secure shelter or compound, careful consideration should be given to:

- administration of the access system and responsibility for keys/access cards, including a deposit system for cards and whether a charge is levied
- who is given access to the facility, to ensure spaces are available to registered users
- type of cycle parking racks, allowing bicycles to be secured within the compound
- personal security of those accessing the compound, including lighting, CCTV, visibility in the compound



Fietshangars in car parking spaces on residential streets in Lambeth (left) and Hackney (right)

Parking for larger bicycles

8.3.15

Tricycles, recumbent bicycles, cargo bicycles and disability bicycles have other specific cycle parking requirements. They are self-supporting when stationary, but still require a stand to which they can be locked. Sheffield stands allow for all known cycles to be secured, so these types of bicycles can be best accommodated by the use of end stands at a group of cycle stands.



Space at the end of a run of stands in Copenhagen

8.3.16

Larger lockers, bike hangars and secure cages may all be suitable for secure storage of larger types of bicycle but care needs to be taken to include sufficient space beyond the last stand, and to ensure that entrances are wide enough for all models of bicycle.

8.3.17

Where there may be a particular demand for parking of non-standard bicycles, appropriate signage could be provided for 'trailer/tricycle/disability cycles parking only' at the end of bays. A kerb-free access from such spaces to the carriageway will be required, so a suitably positioned section of dropped kerb may need to be provided.

8.4 Cycle parking in the public realm

8.4.1

A good location for on street cycle parking is essential so that facilities will be well used and integrated with other street functions as appropriate.

Parking should be located in close proximity to user destinations and accessible to local services. Ideally, cycle parking should be no more than 15m from the destination, and provided in clusters of stands.

8.4.2

In public areas, careful consideration should be given to the layout and positioning of cycle stands, which should not:

- obstruct pedestrian desire lines and movement
- obstruct access and deliveries to shops and other premises
- prevent car doors from opening
- obstruct access to street utilities
- obstruct the view of drivers at junctions or near pedestrian crossings
- obstruct access or egress onto buses (where cycle stands are proposed in the vicinity of bus stops, consideration should be given to the amount of buses expected to use the stop)

Standard practice in layout of stands

8.4.3

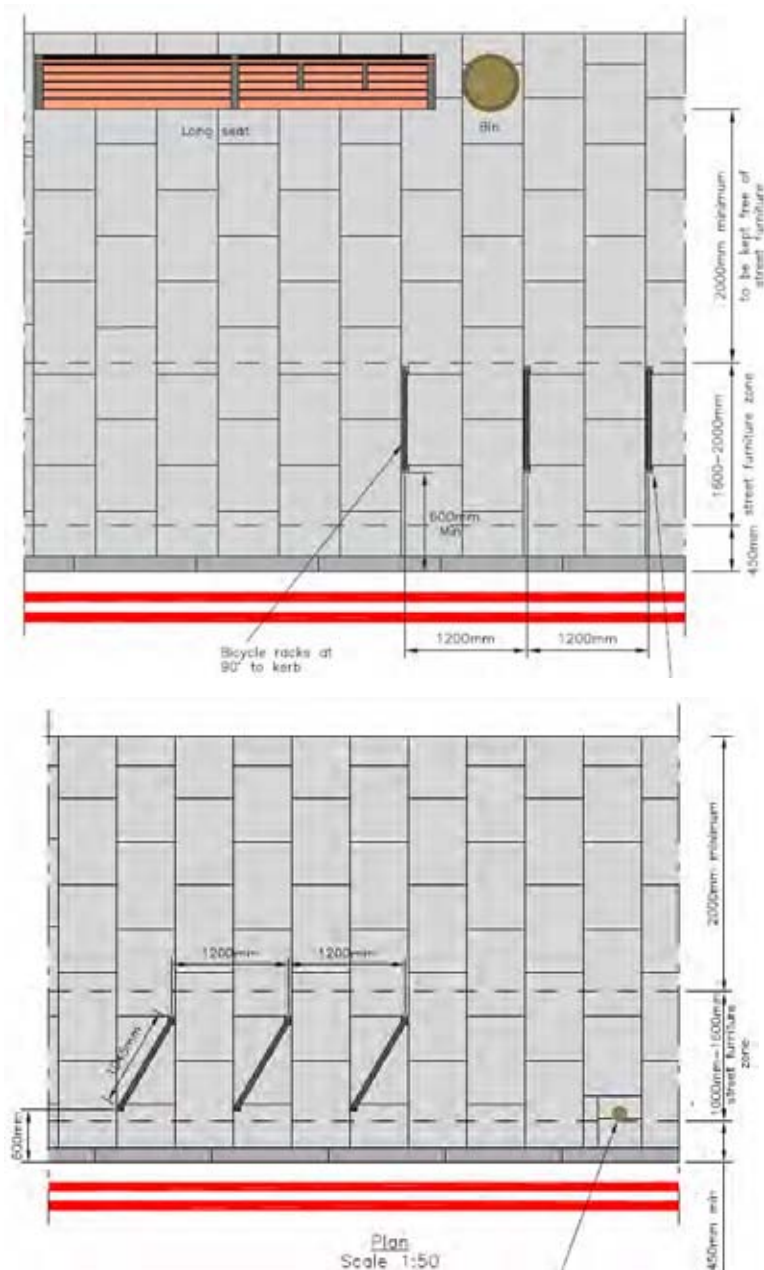
On-street cycle parking should be highly visible, well-lit and clear of pedestrian and vehicle sight lines. Recommended practice for design of layouts is provided by TfL's [Streetscape Guidance](#) (2009), chapter 8 'Technical guidance: street furniture', and this must be followed on TLRN. Separate guidance on cycle parking may be provided by individual boroughs and will apply to borough roads. TfL's recommendations are as follows:

- Sheffield-type cycle stands on the footway should be placed 600mm from and parallel to the kerb, not at the back of the footway.
- where footways have sufficient width, cycle stands should be set at either 45 or 90 degrees to the kerb – in this arrangement they occupy a smaller area of footway for a greater number of stands
- when cycle stands are grouped together, a minimum spacing of 1000mm should be provided between stands to allow access – 1200mm is preferred

- the visual impact of cycle stands can be reduced if they are placed between other items of street furniture, especially tree planting within an organised street furniture zone
- the guidance also advises that de-mountable stands might be considered to aid maintenance at locations where cycles and stands are subject to vandalism

8.4.4

While the advice on layout given in TfL and borough represents is good practice, innovative approaches to overcoming space constraints are often required and should be considered on a case-by-case basis.



Parallel and echelon cycling parking stand layouts

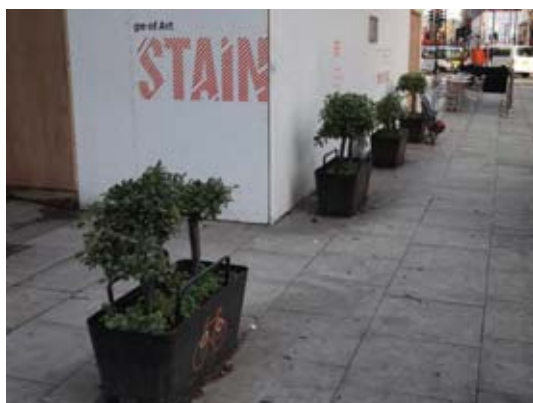
Integration with streetscape design

8.4.5

Cycle parking should be considered as an integral part of streetscape design. Where an area has particular characteristics that are reinforced by street furniture, cycle parking should complement the approach adopted.

8.4.6

Cycle parking located poorly on narrow sections of footway not only creates hazards for pedestrians but also contributes to the cluttering of the street. In situations where footway space is limited, under-used areas of carriageway on the edges of squares as well as the conversion of car parking spaces may offer better opportunities for cycle parking.



Informal, moveable cycle parking can add to the qualities of an area, provide facilities while works are taking place and serve local businesses



On-street cycle parking in Hackney and Kensington & Chelsea

8.4.7

Informal tactile paving or the use of contrasting surfaces could be used to define areas of cycle parking and assist people, particularly visually impaired pedestrians, navigate away from potential conflicts. For example, a row of granite setts are

sometimes used around cycle parking stands grouped together on the footway.



Kensington High Street – stands on central median



Granite setts provide contrasting surface treatment for cycle parking areas

8.4.8

Stands in the middle of the carriageway on median strips or adjoining traffic light and pedestrian crossing facilities can work well as part of an overall streetscape design. Care should be taken when proposing this kind of solution. While centrally located stands have advantages in being able to serve destinations on both sides of a street, if traffic conditions make it difficult to cross or to leave or re-enter the carriageway from the cycle parking area, or the distance to destinations is too great, then they may not be well used and 'fly parking' will continue to take place.

8.5 Cycle parking to support different uses

8.5.1

Consideration needs to be given to the appropriate balance between long- and short-stay cycle parking. Long-stay is for residents, employees and others who may be leaving their bicycle over a night or more, and normally has limited, controlled access. Short-stay is for visitors, customers and other, more flexible uses, and tends to be in the public realm with open access.

8.5.2

Long-stay cycle parking is best located in a building, for example in a basement parking area. Where this is not possible, bespoke shelters and lockers are an option, but consideration needs to be given to planning requirements.

8.5.3

Where cycle parking is located in a building, access needs to be considered carefully, including for those using non-standard bicycles and tricycles. Parking areas accessible only by stairs are not acceptable. Typically, lifts need to be provided for basement cycle parking areas. They should have minimum dimensions of 1.2m width, 2.3m length and a door opening of 900mm in order to accommodate all types of cycle.

Public transport interchanges

8.5.4

The type and location of cycle parking at stations varies greatly across London. Space constraints at stations in central London are often addressed through use of freely available, high capacity stands, while outer London stations more often feature stands in covered, secure locations. Cycle hire also plays an increasingly important role in facilitating choice in access to and onward journeys from a transport interchange.

8.5.5

There is increasing evidence of the link between cycling and rail use, and increasing demand for cycle parking at stations in London. Generous cycle parking provision at stations, including secure, longer-stay parking, is essential to allow stations to act as hubs for interchange and to cope with the projected increase in numbers of cyclists resulting from investment in cycling infrastructure.



Covered cycle parking at Shoreditch High Street station (left) and Finsbury Park station (right)

8.5.6

At larger stations, the projected demand for cycle parking is likely to be so high that it will be difficult to accommodate stands in the public realm or in existing buildings. In many cities in continental Europe, good quality cycle parking has been provided in bespoke new buildings, or in underground facilities.



Entrance to underground cycle parking at s'Hertogenbosch station, Netherlands



Cycle parking at Malmo station, Sweden



Cycle parking at Houten station, Netherlands



Bus stop cycle parking, Nantes, France

8.5.7

A study of existing cycle parking at London railway stations by Mott MacDonald on behalf of TfL (Cycle Parking Standards at Rail Stations Report, 2010) found that demand either exceeded supply or cycle parking was close to capacity at central London termini, zone 1 and strategic interchanges. With the increase in cycling since this report was produced, pressures will have grown further.

8.5.8

Commercial relationships between train operating companies and third parties may complicate the installation of cycle parking facilities at some stations. In these instances local authorities should work in partnership with train operating companies to make the case for cycle parking. They should demonstrate what the future is likely to hold in terms of an increasing mode share for cycling and rising demand for cycle parking, which will in turn have a role to play in supporting the various transport-related and commercial activities of the interchange.

8.5.9

The right balance needs to be struck between serving the demand for cycle hire, short-term / freely available cycle parking and secure, long-stay facilities. Where secure facilities are provided, consideration needs to be given to how access will be operated and whether there will be a charge or deposit requirement. The parking stands within a secure facility need to be capable of allowing the frame and at least one wheel to be secured. Parking stands outside of secure areas need to allow for the frame and both wheels to be secured.

8.5.10

Basic principles for all types of cycle parking at stations and public transport interchanges are as follows:

- located within footprint of the station, with convenient access to all entrances and exits
- well managed and maintained
- overlooked, with high levels of natural surveillance and CCTV coverage
- not obstructing pedestrians
- clearly signed, and shown on station maps
- meeting security standards for National Rail (eg Transec compliant)
- included in travel information provided to passengers

8.5.11

Levels of staffing at railway stations vary across London. Open access Sheffield stands can be provided at staffed stations but more security is needed at unstaffed stations. Where it is not possible to accommodate demand by using lockers or a secure compound, measures such as CCTV might be employed to prevent vandalism occurring and to ensure users feel confident to use the facilities provided.

Cycle parking hubs

8.5.12

A cycle parking hub provides not only stands but also a range of other, related facilities. It should be able to offer both a high quantity and quality of cycle parking to meet existing and future demand and to promote modal integration, helping to open up possibilities for people with long commutes who may wish to cycle for part of their journey.



Bicycle repair and CCTV as part of station parking facility in s'Hertogenbosch, Netherlands

8.5.13

At a successful hub, a cluster of related businesses and facilities should be feasible: this could play an important role in making cycling even more attractive.

8.5.14

In addition to the issues for cycle parking at public transport interchanges listed above, further considerations for a cycle parking hub include:

- monitoring the level of demand for paid cycle parking as well as open access facilities
- appropriate tariff for the parking, to ensure the facility can attract users
- type of cycle parking used within the hub, to ensure it is securable and easy to use
- staffing levels required to maintain a security and good quality service
- design and location that will allow access at all the hours required by users
- collaboration with bicycle retailers and other partners to provide additional services – this could include bicycle sales, bicycle repair and information on cycling in the area

Housing

8.5.15

New residential developments should take every opportunity to overcome barriers to cycling for their prospective residents and for visitors. Good quality cycle parking is a selling-point. As a bare minimum, London Plan requirements must be met – preferably a level of cycle parking should be provided that meets projected future demand, plus 20 per cent. Planning obligations should be used not only to require enough cycle parking, but also to ensure that it is of high quality: well located, secure, visible, well overlooked and fit for purpose. Developers have much to gain from making cycling an integral part of their transport strategy should be encouraged to approach the issue positively.

8.5.16

Additional guidance on providing cycle storage in new residential development is given in the [London Housing Supplementary Planning Guidance](#), adopted in November 2012. This states that:

‘Individual or communal cycle storage outside the home should be secure, sheltered and adequately lit, with convenient access to the street. Where cycle storage is provided within the home, it should be in addition to the minimum GIA [gross internal floor area] and minimum storage and circulation space requirements. Cycle storage identified in habitable rooms or on balconies will not be considered acceptable.’

8.5.17

Residents' parking in new developments should be designed to be:

- secure, with access for residents only, and with stands/racks allowing both the frame and at least one wheel to be secured
- well located: close to the entrance of the property and avoiding obstacles such as stairs, multiple doors, narrow doorways and tight corners
- covered
- managed, in order for access to be administered and to provide ongoing maintenance

Where cycle parking is provided within buildings, guidance in section 8.2 above should be followed. This includes providing level access, avoiding multiple and narrow doorways.

8.5.18

Options for long-stay, secure facilities for residents may include cycle compounds, shared garages or other indoor facilities and cycle lockers. Requirements for visitors' parking are different, but it also needs to be convenient and secure. Visitor cycle

parking is usually provided in the public realm, and must be convenient and visible, overlooked and close to the building entrance. It must be sufficient to meet visitor demand and stands/racks must allow for the frame and both wheels to be secured. Sheffield stands are usually fit for purpose for this use.

8.5.19

Retrofitting cycle parking into existing housing areas is more challenging than negotiating cycle parking in new developments. A lack of cycle parking in residential areas was identified by the London Assembly in its report [Stand and deliver: cycle parking in London](#) (2009) as a significant factor discouraging people from taking up cycling as a mode of transport.

8.5.20

Constraints on space and the security often lead to cycle parking being neglected. Residents have to resort to 'fly parking' bicycles or storing them within their homes, which can create security and safety hazards such as blocking sharing hallways and staircases.

8.5.21

Much depends on housing type and tenure. Space for cycle parking for privately owned housing usually needs to be found by individual owners within their properties, although possibilities exist for groups of neighbours or formal residents' groups to negotiate collective solutions. Careful management of access to facilities such as these is needed, as well as a means for all those involved to contribute financially, as required.

8.5.22

The use of bike hangars on-street is a good example of how this can work in practice, and local authorities should endeavour to give support and advice to ideas such as these whenever possible, include help with TRO procedures as necessary.

8.5.23

One issue may be determining which households should be prioritised for access to secure bicycle storage, and it may take local authority leadership to determine this even if residents intend to manage the facility themselves. Criteria could include whether residents could use private outdoor or indoor space, whether they would have to negotiate stairs, how frequently they cycle and the number of cyclists in the household.

8.5.24

Housing estates may offer more opportunities for developing good quality, secure and well-used communal cycle parking. Under-used internal spaces, such as garages, bin stores and pram sheds, can make good cycle parking facilities with relatively simple adjustments. In other instances, lockers and cages may be more suitable. In these instances, cyclists typically prefer using facilities that provide access to a small number of users.



Cycle lockers in Hackney



Cycle parking at Old Gascoyne Estate, Hackney

8.5.25

When promoting the retrofitting of cycle parking into estates, local authorities should also engage with other key stakeholders who may provide support or need 'convincing'. This includes:

- registered social landlords / housing associations
- health and well-being boards, who may support cycle parking as a contribution to improving public health
- police, who have a duty to provide crime prevention advice to residents and boroughs
- local neighbourhood teams, responsible for management of streets, who role is also likely to include maintaining cycle parking facilities on estates
- residents' associations, who may be able to apply for funding and gain local support for new facilities
- local cycling organisations

8.5.26

TfL is preparing Residential Cycle Parking Guidance, which focuses on retrofitting cycle parking in areas of existing housing.

Shops and places of work

8.5.27

Businesses operating from central London offices often struggle to provide enough secure cycle parking for staff and visitors. If more people are encouraged to cycle through investment provided by the *Mayor's Vision for Cycling* programme, then this will place further pressure on employers to find ways of meeting demand. Commuters often need to use on-street facilities that were designed for short-stay parking. Not only is this less secure than formal workplace cycle parking, but it removes capacity for short-term parking to support other uses in the area.

8.5.28

Similar issues apply to retailers. Staff should be offered good quality, long-stay cycle parking without having to use short-stay parking on-street.

8.5.29

According to TfL's [Travel in London survey 3](#) (2010), which included survey information from new users of Barclays Cycle Superhighways 3 and 7, a significant number of people who began cycling to work on the Superhighways cited improved cycle parking facilities at work as a contributory factor – 18 per cent for users of CS3.

8.5.30

Cycle parking at workplaces is often an outcome of development control obligations or Workplace Travel Plans that help promote sustainable transport for staff. Investment in workplace cycle parking helps promote a mode of transport that has health and productivity benefits as well as reducing the strain on the local transport infrastructure. TfL's [Workplace Cycle Parking Guide](#) (2006) provides more information on initiatives such as these.

8.5.31

In order for secure cycle parking facilities to be well used, employers will need to engage with employees to identify the level of demand for cycle parking as well as employee's needs and expectations.

8.5.32

Consideration should be given to storage within buildings, cycle compounds, storage in areas with controlled access and cycle lockers, in order to help serve the need for long-term cycle parking from staff. There may be opportunities within many buildings to convert part of under-used areas, such as basements and car parks, into cycle parking.

As is the case with new residential developments, these parking areas need to be fully accessible.

8.5.33

Well designed cycling parking for staff should be:

- secure, with access for staff only
- designed to allow the frame and at least one wheel to be secured
- covered
- accessed conveniently from outside and inside
- introduced with complementary facilities: showers, changing rooms, storage (lockers) and equipment for basic maintenance, such as pumps

8.5.34

Visitors also need to be catered for. Either their cycle parking needs could be accommodated within the staff cycle parking area, or they may need separate provision outside of the building. This must be convenient, close to the entrance, visible, overlooked and with frames that allow the frame and both wheels to be secured. Information about cycle parking facilities, as well as cycle routes to the building, should be included in correspondence with visitors.

8.5.35

Cycle parking serving individual shops or retail parks needs to be accessible, conveniently located for building entrances and well-overlooked and secure during all opening times. Particular attention needs to be paid to accommodating larger models, such as cargo bicycles, and to how cyclists access parking areas safely, particularly where they must do so through a car park.



Cycle parking serving a restaurant and studio spaces in Hackney Wick



Moveable cycle parking stand outside a shop in Copenhagen

8.5.36

In many cities with high levels of cycling, retailers often provide their own temporary cycle parking for customers during opening hours, moving the stands back inside overnight. This is based on understanding that convenient cycle parking is vital for their businesses.

Cycle parking at schools

8.5.37

Good quality cycle parking facilities at schools plays an important role in influencing the travel choices of young people. The right provision will depend on the age group of the children, and the range in sizes of bikes to be parked, as well as the cycle parking needs of staff.

8.5.38

Good quality cycle parking at schools should be:

- located within footprint of the facility
- easily accessible – clustered close to entrances/exits
- visible, open and overlooked – to serve staff, students and visitors
- covered

8.5.39

It is important that cycle parking is not located in areas where conflict is likely with motor vehicle access to and from car parks. Similarly, it should not be located near drop-off points.

8.5.40

Schools are generally fenced and gated, are open only during certain hours, are staffed and are on private land. It may therefore be that existing security in the school grounds is adequate and that a secured compound is not required. It may be advisable, however, to operate a system where staff lock and unlock facilities at the beginning and end of the school day so as to protect any bicycles left overnight.

Large, multi-access sites

8.5.41

Large multi access sites such as hospitals, universities and colleges tend to have large numbers of people both working and visiting the sites. Cycle parking provision at such land uses are likely to cater for both long stay demand for staff and or students, but also for short to medium stays, given that they have a high daily turnover of students, staff and visitors.

8.5.42

Such sites often have a number of entrances and exits. Cycle parking therefore needs to be carefully planned in clusters, convenient for users, and located near to the entrances and exits that have higher levels of natural surveillance and footfall.

8.5.43

At sites where access may be permitted for 24 hours or beyond the normal working day, particular consideration is required of lighting and levels of surveillance after dark, and how safe the user feels accessing the parking.

Appendix

Cyclists at roadworks

This appendix provides guidance for those planning, designing and operating temporary traffic management associated with construction activities on the highway to ensure that the convenience and safety of cyclists is fully considered alongside the needs of all other road users, as well as those undertaking the works.

It is important for temporary traffic management designers to examine and assess each and every site individually and not just apply standard layouts. Each option should be carefully considered and risk assessed to ensure that the most appropriate option is taken forward.

It is essential that temporary works are observed, maintained and monitored, with any risks and issues continuously addressed.

The guidance was developed jointly by a group of contributing organisations: AECOM, Amey, EnterpriseMouchel, Ringway Jacobs and Transport for London. It was written primarily for works undertaken on the Transport for London Road Network but it can also be applied to similar urban roads.

Background

Documents such as chapter 8 of the [Traffic Signs Manual](#) and [Safety at Street Works & Road Works, a Code of Practice](#) (the 'Red Book', 2013) refer to the need to consider cyclists when designing temporary traffic management. This appendix provides further detail on those considerations and takes forward ideas outlined in the Traffic Advisory Leaflet [TAL 15/99 Cyclists at Roadworks](#) (1999).

The Mayor's Vision sets out a pro-active approach to improving provision for cyclists through temporary layouts, stating that: 'We will monitor roadworks and building schemes to avoid unnecessary disruption to cycle routes. Following the standard set by Crossrail works at Farringdon, we will try to ensure that even when a road is closed to motor traffic, passage is still provided for bikes.'

Traffic lane widths in the range of 3.2 to 3.9m where there is no dedicated cycle lane. These provide pinch points and a level of uncertainty about whether safe overtaking is possible between cyclists and drivers. (Note that [TAL15/99](#) suggests that lane widths of 3.25m and above are adequate for cars to overtake cyclists, but goes on to demonstrate that around 4m is needed for larger vehicles to overtake safely.)

Issues for consideration

There are a number of potential hazards or impacts that must be considered when designing 'cycle friendly' temporary traffic management. These include:

- pinch points that 'squeeze' cyclists
- removal or obstruction of existing cycle lanes or tracks
- unacceptably long diversion routes
- inappropriate use of temporary 'cyclists dismount' signs: where a clear route has been maintained, cyclists should still be able to use the carriageway
- poor temporary road surfaces, including raised ironworks
- raised cable protectors, hoses or road plates
- road closures (without cyclist exemption)
- one-way working (without cyclist exemption)
- cyclists entering the work site
- measures to avoid conflicts between cyclists and other vulnerable road users

Consideration of these issues should be made from the outset of every project, whether it is a major scheme or minor maintenance.

The issues that should be considered when developing the detailed temporary management proposals are as follows.

Temporary speed limits

Where road widths are limited but sufficient volumes of cycle traffic exists, consideration should be given to lowering the speed limit or a temporary maximum speed recommendation to encourage motorised vehicles to either safely overtake or follow cyclists. This will require a Traffic Order.

A temporary speed limit may also be required or desirable for other reasons such as to reduce risk to site operatives. Changes to speed limits could be either mandatory or advisory, depending on the duration of the works.



Temporary speed limit sign

Lane widths

Temporary lane widths through road works should be designed for cyclists comfort as well as safety. The key initial considerations are whether cyclists are predominantly on or off the carriageway and, if on carriageway, what the volume, speed and composition of motor traffic is. Transitions to and from areas with traffic management layouts are also important and consideration needs to be given to ways of preventing cyclists being 'squeezed' by manoeuvring vehicles at the lead-in taper.

Where cyclists are on-carriageway and the speed limit is 30mph or 20mph, it is usually desirable to keep them on carriageway through the roadworks. In this case, a wide lane (minimum width of 4m) enables drivers of all motor vehicles to overtake cyclists with an acceptable clearance.

If a 4m lane width cannot be achieved then, according to advice given in [TAL 15/99 Cyclists at Roadworks](#) (1999), a 'narrow' lane width of up to 3.25m to 3.50m will enable car drivers to overtake comfortably and will generally deter drivers of larger vehicles from trying to pass at all. If even 3.25m cannot be provided, then a 'narrow' lane width of up to 3.25m and a speed limit of 20mph should be considered with signs stating 'narrow lane(s): do not overtake cyclists'.

Lane widths between 3.50m and 4m should normally be avoided as drivers of large vehicles may attempt to overtake cyclists without adequate clearance.

On higher speed roads (40mph), there will often be off-carriageway provision for cyclists which they should be encouraged to use through signing, though cyclists will usually also be permitted to use the carriageway. In these cases, a minimum lane width of 4.25m should be used through the roadworks to enable comfortable overtaking of cyclists. Where this cannot be achieved, a speed limit of 30mph should be considered in conjunction with a 3.25m to 3.50m or 4m lane width, or a 20mph speed limit and 'narrow' lane as described above. Consideration should be given to the need for extra width at bends and turns in traffic management layouts.

On roads with speed limits of 50mph or more, scheme specific measures appropriate to the existing provision and use by cyclists should be provided.

On prestige cycle routes, including Cycle Superhighways, or routes with high peak time cycle flows (> 10 per cent of vehicles), consideration should be given to arranging the works layout such that temporary cycle lanes can be provided. Where it is not feasible to maintain two-way traffic and where there are significant cycle flows, consideration should be given to providing a cycle contra-flow facility. This will be particularly beneficial where a diversionary route would satisfy one or more of these conditions:

- be in place for a long period
- involve significantly greater effort owing to distance and gradients
- put cyclists at greater risk due to the road layout and traffic conditions

Contraflow cycle facilities should be a minimum of 1.2m wide (recommended 1.5m) and may require some physical segregation from opposing traffic, based on site-specific risk assessment.

It should be noted the minimum lane width recommended in the DfT code of practice, [Safety at Street Works and Road Works](#) (2013), to enable the passage of buses and HGVs is 3m.

Summary of recommended lane widths at roadworks

<3.25m	Consider 20mph speed limit and 'Narrow lane: do not overtake cyclists' sign
3.25 to 3.5m	Too narrow for drivers of large vehicles to overtake but cars can pass cyclists
3.5 to 4.0m	To be avoided
4.0m+	Wide enough for all vehicles to overtake on lower speed roads (20mph)
4.25m+	Wide enough for all vehicles to overtake on higher speed roads

Note that these are different from the recommended widths in LCDS section 4.4, because they take into account effective width for cyclists in scenarios where there is a physical barrier on both sides of the lane.

Traffic signal timings

Temporary traffic signals should give cyclists sufficient opportunity to pass safely through road works (appropriate intergreen times should be used, see also 'Lengths of road works' below), particularly where oncoming motor vehicles cannot pass without conflict. When specifying the most appropriate arrangements, consideration should be given to clearance times for cyclists, particularly on steep hills.

Length of road works

Cyclists are generally more at risk through road works, so limiting the length of the site should be considered. For example, if a scheme is to be constructed over 100m and a cycle facility or wide traffic lanes (4m+) cannot be provided, then it should, where possible, be completed in shorter sections to reduce the exposure of cyclists travelling through pinch points. If the length of the work site cannot be adapted, and there is significant cycle demand, then an alternative off road cycling facility or other measures such as a general traffic diversion should be considered.

Maintaining access

Wherever possible, access should be maintained for cyclists in both directions throughout the period of road works, avoiding more hazardous diversions. Cyclists are unlikely to accept lengthy detours or long delays. In such conditions some cyclists will be tempted to ride contra-flow or use footways. This can be avoided by, for instance, providing a temporary segregated cycle lane, shared path or route away from the carriageway. This kind of provision will be most desirable on dual carriageways.

Temporary route signing

Temporary routes and other facilities for the exclusive use of cyclists (and pedestrians) should be clearly signed well in advance of the road works. The examples shown below are sign face template examples. Other temporary signs such as 'Cyclists use ramp onto footway' may also be useful.

It should be noted that signs marked ** below do not have specific Department for Transport approval. However Regulation 53.(1).(e).(i) of TSRGD (2002) states 'in this regulation 'temporary sign' means a sign placed on or near a road for the purpose of conveying to traffic warnings about, or information on how to avoid, any temporary hazards caused by works being executed on or near a road'. It is for highway authorities to define what constitutes a specific 'hazard' in any given location, but there is a strong case for regarding narrow lanes as such a hazard for cyclists.



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Note that narrow lanes may not be the only reason why there may be a design to instruct drivers not to overtake cyclists. Greater risk at bends and corners may also justify a 'do not overtake' sign.

Road surface

It should be borne in mind that cyclists are particularly vulnerable to uneven, slippery or excessively rough surfaces. Therefore, consideration should be given to phasing of works to avoid temporary surfaces or raised ironwork.

If cyclists are to be signed via a diversion route, then the surfacing on this alternative alignment should be checked and corrected if necessary before the diversion is introduced. Where raised iron work is unavoidable, in addition to warning signs, consideration should be given to marking it in a contrasting colour to improve visibility, in addition to warning signs.

Barriers

It has been identified that cyclists will often pass through a line of cones and enter the works safety zone, and even the works area on occasion. This could be minimised by the use of a solid barrier and closely spaced cones in the taper and the first metre, then normal cone spacing along the remaining length, whilst also providing barriers alongside the linear safety zone. This would provide a clearer obstruction to cyclists, to discourage encroachment into the working and safety zones.

Road Safety Audit

A Road Safety Audit may be required for temporary traffic management schemes. TfL policy is that such schemes will not generally require auditing unless they remain in operation for a period of six months or more. Consideration should be given to auditing temporary traffic management schemes that are to remain in operation for a period of less than six months if a significant impact on the highway network is anticipated.

Temporary traffic management layouts

Some schematic drawings adopting the general principles detailed in section 3 have been developed in order to assist with the design of temporary traffic management to cater for cyclists more adequately.

In developing the most appropriate solution, reference should also be made to the 'Cyclists and temporary traffic management design checklist' below.

The overall risk to cyclists should be considered on a case-by-case basis, taking into account, firstly, the number of cyclists and the effect that the proposed works and resultant temporary traffic management will have on their journey. The assessment should include an estimation of the relative cycle and non-cycle flows. If a significant number of cyclists will be affected by road works, then they should be provided for specifically in the design of temporary traffic management. If an existing facility exists, every effort should be made to maintain it.

There are a number of actual and hypothetical scenarios in the ‘worked examples’ section below, providing further commentary and drawings relating to measures for cyclists at road works.

‘Cyclists dismount’ signs

Simply placing a ‘cyclists dismount’ sign at each of the works is not acceptable and is only to be used where there is no vehicular access of any kind through the works. It should be noted that in cases such as option 2 below, the presence of a shared/segregated footway avoids the need for ‘cyclists dismount’ signs. The use of this sign has not been covered in this guidance because there is invariably a more suitable solution.

Cyclists and temporary traffic management design checklist

Project name:			
Location:			
Road number:		TLRN / SRN / borough?	
AADT (two-way):			
Peak hour cycle flow (two-way):			
Per cent of commercial vehicles			

Existing cycle facilities		Proposed temporary cycle facilities	
Direction 1:		Direction 1:	
Direction 2:		Direction 2:	
Junction 1:		Junction 1:	
Junction 2:		Junction 2:	
Existing speed limit (mph):		Proposed speed limit (mph):	
Existing no. of lanes:		Proposed no. of lanes:	
Existing nearside lane width (m) if no cycle lane:		Proposed nearside lane width (m) if no cycle lane:	

	Y, N or n/a
Existing cycle facilities maintained? If not, see below.	
Lane widths appropriate for cyclists?	
Alternative off-carriageway cycle facility necessary?	
Temporary off carriageway cycle facility signed and TTRO?	
Intergreen timings at temporary signals suitable for cyclists?	

Intergreen timings suitable for cyclists on steep gradients?	
Temporary signal cables in existing ducts or use wireless	
portable traffic signals?	
Temporary ASL provided if temp signals layout over 30 days?	
Barriers / closely spaced cones to deter cycle encroachment?	
Cycle 'escape areas' provided, where continuous barriers?	
Length and number of pinch points minimised?	
All access maintained for cyclists?	
Off line cycle diversion required?	
Cycle safety, and surface checked on diversion?	
Cyclists at Road Works – Guidance Document 15	
Cyclists dismount signs provided? Only if all alternatives have been rejected?	
Cycling prohibited signs provided, if no suitable alternative?	
If narrow lanes, 'do not overtake cyclists' signs specified?	
Offside merge provided on two lane carriageways?	
Bus stops suspended in works area?	
Is a Road Safety Audit required as per TfL SQA0170?	

Traffic management option 1 – Temporary cycle lane on carriageway

If an existing cycle facility exists either on a wide single lane carriageway or on a dual carriageway, the priority should be to maintain the facility 'on-line' using temporary signs, cones / barriers and road markings as required. The costs and disruption associated with the application (and subsequent removal) of new line markings should be balanced against a temporary facility provided by a line of cones. As such, line marking a temporary cycle facility is unlikely to be practical for layouts in place for less than 30 days. (See Traffic Management Layouts A, B and C)

Traffic management option 2 – Temporary shared path on footway

Should it not be practicable to maintain an 'on-carriageway' facility and where an adjacent footway of at least 3m is available, consideration could be given to temporarily diverting the cyclists on to the footway. There may be some locations where a slightly narrower footway could be considered (2m absolute minimum) if there is no street furniture obstructing the footway and the timing of the works is such that pedestrian and cycle flows are low. The most convenient diversion requiring the least movement away from the cyclists' desire line should be used.

Should the footway be wide enough and have no trips or hazards a temporary dedicated cycle track could be considered, though shared use would be simpler and easier to implement, depending on the site specific details, the pedestrian and cycle flows and whether it is 1 or 2-way. Dropped kerbs for access to and egress from the footway will be necessary or a secure temporary ramp could be provided.

The need for a buffer/safety zone for cyclists on the footway from any adjacent traffic should also be considered for safety reasons. The use of this option will require a Temporary Traffic Management Order or Notice of the temporary cycle facility, appropriate signing and involve consultation / advertising periods (of up to 6 weeks). (See Traffic Management Layout D)

Traffic management option 3 – Temporary speed limit on carriageway

A temporary reduced speed limit is an option if a high volume of cycle traffic exists and if it is desirable to keep cyclists on the carriageway. A lower speed limit allows cyclists to be followed or overtaken by cars at reduced clearances, useful in situations where lane widths are limited. The temporary speed limit could be either advisory or mandatory.

Where works are due to be completed within 60 days it is suggested that an advisory lower speed limit is signed (see sign face template examples above). Where works are due to last longer than 60 days, a mandatory lower speed limit should be considered.

Where narrow lanes are provided, such that it is not wide enough for motor vehicles to safely overtake cyclists, an advisory speed limit of 20mph should be considered through the road works. (See Traffic Management Layouts E and F)

Traffic management option 4 – Reduced available lane widths

Where no on-line or reasonable off-line facility can be provided, reducing the available lane widths to discourage overtaking movements should be considered. (See Traffic Management layouts G and H) This would also have an effect of reducing vehicle speeds. Practically, a restriction of this nature would not be enforceable but can be signed using a temporary sign warning of the hazard caused by works being carried out on or near the road.

Recent observations of a temporary one way traffic management layout suggest that the reduction of a lane to 3.0m will strongly deter large vehicles from attempting to overtake cyclists. Alternatively consider making the works and working area narrower to enable provision of a cycle lane within the remaining carriageway width.

Traffic Management Layout 5 – Motorist diversion

Practitioners should be aware that cyclists should not be unreasonably disadvantaged compared to motor traffic and may not use a long or poor quality diversion. A risk assessment should be undertaken to establish whether motorised traffic should be diverted whilst allowing cycle traffic to continue adjacent to the works area. (See Traffic Management layout I)

Depending on the length of the closure you may need to consider a no through road option for service vehicles with a gateway / point closure beyond which only cycles may pass in accordance with 'no entry except cycles' signage (authorised by DfT in November 2011). Note the use of 'road ahead closed except cycles' signage is currently being discussed with DfT in terms of authorisation.

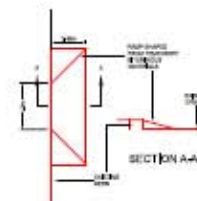
Traffic management option 6 – Off-line cyclist diversion

Should it not be practicable to maintain acceptable provision for cycling through the road works, the most convenient off-line diversion should be sought. This option could be appropriate where a full road closure is intended and a shorter/alternative diversion for cyclists than for motorists is possible (see Worked Example 2).

This option may also be useful where the road works are closing an off carriageway cycle facility and it is not appropriate to simply direct cyclists adjacent to the works via the carriageway.

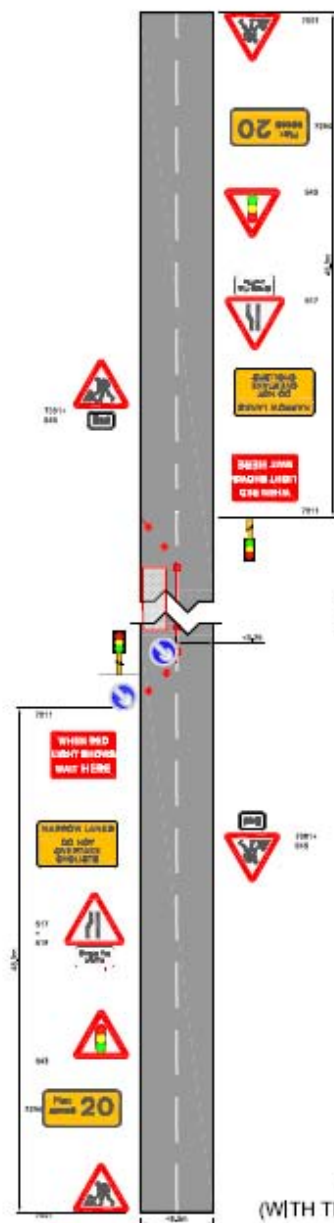
Where a diversion is proposed, provision and maintenance of appropriate signing is vital (see example signs above). Assessment should be undertaken of the diversion route to ensure that it is suitable for cyclists, including: surface condition, suspension of prohibitions, right turn movements designed out / or cyclists routed via signals so right turn movements can take place under signal control. (See Traffic Management Layout J)

When designing the cycle diversion care should be taken to avoid the potential issue of motorists following the cycle diversion signs. This can sometimes be the case with black on yellow signage, therefore the need to make the cycle route as clear as possible to both general traffic and cyclists is paramount. This could be achieved by using versions of the signs with special symbols ie. black on yellow with text such as 'Cyclists follow [diamond symbol]' or similar.

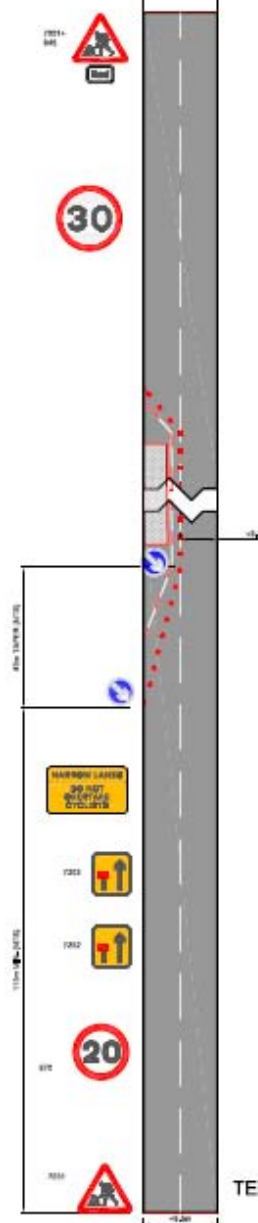


TM LAYOUT D
TEMPORARY SHARED USE FOOTWAY,
DUAL C/WAY

[illegible]



TM LAYOUT E
TEMPORARY ADVISORY SPEED LIMIT
(WITH TEMPORARY TRAFFIC SIGNALS), SINGLE C/WAY



TM LAYOUT F
TEMPORARY MANDATORY SPEED LIMIT
DUAL C/WAY

REV	REV DATE	REASON FOR CHANGE	DESIGN	DATE	APPROVED
1					
TRANSPORT FOR LONDON					
CYCLISTS AT ROADWORKS GUIDANCE					
TRAFFIC MANAGEMENT OPTION 3 TEMPORARY SPEED LIMIT					
ISSUED FOR REVIEW					
DATE	SCALE	DO NOT SCALE			
Drawing Number: 801448B/CARG/OPT3					
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