3. Cycle-friendly streets and spaces

This chapter is about good design for cycling in the context of creating better streets and about balancing user needs. It covers aspects of street design that will help to add economic, social and environmental value to a neighbourhood.

The advice here forms part of a wider suite of advice issued by TfL on street design that includes:

- Streetscape Guidance
- London Pedestrian Design Guidance
- Accessible Bus Stop Design Guidance
- Kerbside Loading Guidance
- Station Public Realm Urban Design Guidance

Version control

Version 1 (Dec 2014) – Published

Version 2 (Sept 2016) – Minor amendments following publication of TSRGD (2016)

3. Cycle-friendly streets and spaces

3.1 Better places for everyone

3.1.1 Better streets

The Roads Task Force recommendations 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

> Many of the best streets for cycling and walking are those that are calmer, more relaxing places to be. Healthy streets are those where people from all walks of life are able to choose to walk or cycle.

Cycle-friendly street design is covered by the Cycling Level of Service Assessment, as shown in figure 3.1.

Figure 3.1 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, bus infrastructure, 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
Directness Journey time	Value of time for cyclists compared to private car use Deviation of route on link	Offering shorter routes for cycle journeys than for cars encourages modal shift and helps to rebalance priority between users
Comfort Deflections	Pinch-points caused by horizontal deflections	Filtered permeability for cycling, application and design of physical traffic calming and other speed reduction measures
Attractiveness Impact on walking	Highway layout, function and road markings adjusted to minimise impact on pedestrians	Understanding pedestrian needs
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

3.1.2 Healthy streets

Many of the factors that make for a high level of service for cyclists are the same as the components of healthy streets set out in the health action plan, Improving the health of Londoners (2014). This includes being able to enjoy clean air and an environment that feels safe, relaxed, easy to move through and not too noisy.

The 'whole streets' approach described in the action plan serves as a framework for balancing user needs and creating inclusive environments that can be accessed and enjoyed by all.

> "Everybody needs to be active every day. If the mix of people walking in the street does not include certain groups such as children, older people or those with disabilities then the street environment is excluding some people from staying active."

'Whole streets' approach – as set out in Improving the health of Londoners

3.1.3 Good design outcomes for streets

The sensitivity of many of London's historic street and off-road environments needs to be respected in designing facilities for cycling that are appropriate to their heritage and context. The quality of the street environment matters as much as its functions, particularly to those on foot and cycle. Streets and public spaces play vital roles in community interaction, commerce and social life and it is essential they are dealt with by highway engineers, transport planners and urban designers as places as well as conduits for movement. Figure 3.2 shows how the six good design outcomes for cycling relate to the place characteristics of streets.

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 signs. Even where this is not possible, materials should be chosen that respect the environment and complement the history of the place.

Figure 3.2 Good design outcomes for streets

Safety	Design should promote the safe movement of people and goods, minimise conflict between road users and contribute to a healthier and more sustainable environment. Local streets should provide a safe environment for walking, cycling, socialising and play.
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	Good street environments are legible and can be used intuitively by everyone. Street design should respond to the context, to the character of the local built environment, through use of appropriate materials and avoiding the need for excessive signing.
Directness	Permeability, flexibility and reduced journey times should be achieved for walking and cycling, as modes that require more effort. Priority should first be given to direct pedestrian access to and from destinations, and then to cycle access.
Attractiveness	Aspects of the wider environment should be cultivated that contribute to a feeling of enjoyment, safety, security and aesthetic integrity. This may include trees and other planting, a sense of space and light, good visibility, harmonious use of materials, historic buildings, and land uses that support appropriate levels of activity through the day.
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 conditions without needing to be re-engineered. This may require permeable surfaces, stormwater source controls and more tree canopy cover, to build resilience to climate change.

Trees, local buildings and a motor vehicle restricted route contribute to sense of place

Opportunities taken to add planting and visual interest in a street closed to motor vehicles

Trees and seating provided as part of rebalancing priorities and calming a junction

Planting introduced in a hard public space, and in order to help delineate a cycle track

3.1.4 Street design guidance

Design of street environments should take into account other relevant design guidance, including TfL's Streetscape Guidance and borough design guidance at the local level, and Manual for Streets, Manual for Streets 2 and the Traffic Signs, Regulations and General Directions (TSRGD) at national level.

This guidance advocates the more integrated, collaborative process to street design set out in Manual for Streets.

Figure 3.3. 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
• Planning policy and area-based strategy • Community priorities • Existing or proposed design guidance or codes • Identified road safety issues • Cycle, bus, HGV and emergency service vehicle routes	• Street network • Demand and usage patterns (including trip generators) • Accessibility • Street character types/form, scale, pattern and character of streets • Environmental and public space conditions • Land uses and types of user • Balance of local versus through traffic • Access management (side streets and private accesses)	• Target and design speeds • Alignments and widths • One- / two-way operation • Horizontal and vertical geometric elements • Public space • Materials • Gradients and drainage • Utilities, lighting and street furniture • Trees and other vegetation • Stormwater controls	• Speed limit • Traffic controls • Road safety • Enforcement • Access controls • Regulation of parking and loading • Maintenance and cleaning • Inspection regimes • Other short-term operational improvements

3.2 User needs

3.2.1 Overview

This section sets out design parameters to consider for all infrastructure that cyclists will use, not just cycle-specific infrastructure.

In order to inform a balanced approach to street design, this section also gives an overview of user needs from the perspective of pedestrians, bus operation, loading, parking and taxi and private hire operation.

Taking account of user needs must be an inclusive process. Planners should actively seek views not only from typical existing users but also from under-represented groups, including people with protected characteristics under the Equality Act (2010).

3.2.2 Understanding cyclists

Consideration of cyclists is a specialist area of practice and 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 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.

> The intention in London is to provide for all types of cyclist. It is important to consider those who do not fit the stereotypes.

Inclusive cycling

Cycle infrastructure should be designed in a way that is inclusive both of larger types of cycle and various models used by disabled people. It is recommended that the concept of 'the inclusive cycle' is embraced – meaning a recognition that, because of the size of many non-standard types of cycle and the possible limitations of riders, a more forgiving environment is required. This reflects the position adopted in the Accessible London: achieving an inclusive environment SPG (2014).

> "Boroughs and developers should seek to encourage inclusive cycling thorough considering the spatial requirements of inclusive cycles and tricycles with the design of cycle routes."

There is no need to design a network capable of carrying thousands of inclusive cycles at once but it is important that infrastructure is tolerant of non-standard users and does not exclude or disadvantage them.

People in wheelchairs, powered wheelchairs and mobility scooters, which are all classed as invalid carriages, have no specific right to use a cycle track. However they commit no offence in doing so (unless a local by-law creates one) and they should not be excluded.

The effort required to cycle

One of the main things that sets cycles apart from motorised vehicles is that they work on human-generated power, and they are highly efficient in sustaining the momentum generated. 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.

A network with routes that are direct and allow cyclists to maintain their speed helps to 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.

For some cyclists, the experience of cycling does not stop at the street. Where disabled people rely on their cycle as a mobility aid, their cycle journey is a door-to-door one and so the accessibility of transitions between different parts of the public realm and between public and private spaces is particularly significant.

3.2.3 Cycle design parameters

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.

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 cycle. That dimension is often referred to as the 'dynamic envelope' of a cyclist.

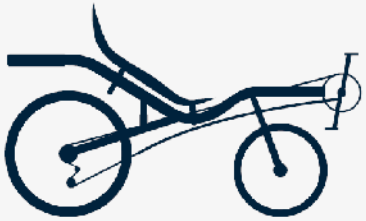
LTN 2/08 states that the turning radius around a fixed object for a standard bicycle is 850mm while a circle of 1650mm radius is required to complete a 180-degree turn. For an inclusive approach, most riders of 'standard' cycles are likely to need more space to turn than this suggests.

Cargo cycle in Amsterdam

Figure 3.4 Indicative dimensions of typical 'non-standard' cycles

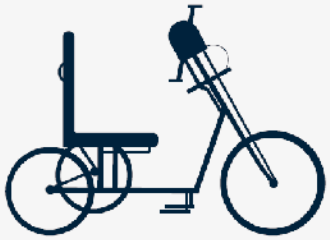
Cycle with trailers for children or deliveries
L 2200-2500mm / W <850mm

Cargo cycle / box bike
L 2000-2300mm / W <870mm



Recumbent cycle
L 1700-2240mm / W <750mm

Tandems, including steer-from-rear tandem
L 2100-2500mm / W <750mm



Hand cycle
L 1650-2050mm / W <860mm

Tricycle, including wheelchair-friendly model
L 1400-2100mm / W <850mm

Side-by-side tandem
L 1800-1950mm / W <1070mm

Non-standard cycles

An inclusive approach to cycle infrastructure means designing for all types of cycle, including freight cycles and those used by people with mobility impairments. Given the variety in lengths and widths, and the different manoeuvring abilities of these various types, there are currently no established standards for meeting all needs. This guidance refers throughout to considerations of non-standard and larger models of cycle, and makes recommendations for how infrastructure might cater for all. However, this is an area that requires more research and testing and so the dimensions and advice provided here should be regarded as provisional.

Key assumptions that should be made in inclusive design for cycling are as follows:

Cargo cycles in Copenhagen

- A width of at least 1.5 metres is needed for any cycle gap or access control point. See section 4.5.15 for guidance on how to incorporate this access while controlling access for users such as powered two-wheelers
- Minimum turning circles need, at the very least, to follow LTN 2/08 guidance – this states that the longest model, a tandem, needs 2250mm around a fixed point and 3150mm for a full turn. Given the likely future use of cycle infrastructure by an even greater range of cycles than is presented in figure 3.4, it is recommended that design allows for these parameters to be significantly exceeded in practice
- Lifts should have minimum dimensions of 1.2 metres by 2.3 metres, with a door opening of 900mm. This is important for access to locations such as cycle parking areas, subways, bridges and station platforms (see chapter 8 for more guidance on inclusive cycle parking)
- 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
- Any upstand of greater than 10mm should be avoided as it can destabilise many types of cycle, particularly when approached from an angle; dropped kerbs should be specified as flush within a tolerance of 6mm
- Pedicabs and other similar vehicles should be assumed to use routes designed for motor traffic

3.2.4 Effective width

Effective width refers to the usable width of a cycling facility and depends on how the space is bounded. The experience of cycling depends more on effective width than actual width. A number of factors can reduce this, 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 or shared footways/footpaths and the geometry of the cycle lane or track (effective width being reduced on curves and bends). Figure 3.5 summarises the key parameters.

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

Figure 3.5 Cyclists' effective width: key considerations

Dynamic envelope of a standard cyclist, taking into account 'wobble room' when moving (Note more width should be added for an uphill gradient in order for cyclists to maintain balance)	1.0m
Indicative maximum dynamic envelope of the widest cycle types, assuming less 'wobble room' for types with three or more wheels	1.3m
Recommended minimum clearance between the furthest extremity of a moving motor vehicle and the outside of the dynamic envelope of a cyclist at 20mph or less *	1.0m
Recommended minimum safe clearance at 30mph *	1.5m
Recommended clearance between dynamic envelopes of cyclists moving in the same direction**	0.5m

*Greater clearances are recommended for larger vehicles

**Greater clearance should be considered for cyclists moving in opposing directions, particularly at higher speeds

Widths from figure 3.5 have informed the recommendations provided throughout this guidance. For example, it is clear from the above that a 2.5-metre wide two-way track allows for cyclists to pass at the recommended 0.5-metre clearance but that, for wider types of cycle, this becomes an uncomfortably close pass.
See sections 4.4.1 and 4.5.7 for more details.

Continuous or intermittent physical barriers around pedal or handlebar height reduce effective width. Allowance should be made for this when designing kerbs. In most cases, 500mm clearance from the kerb is recommended. However, lower kerb upstands, down to a minimum of 50mm, or angled kerbs can mean that it is acceptable to ride closer to the kerb without the risk of catching pedals on the upstand.

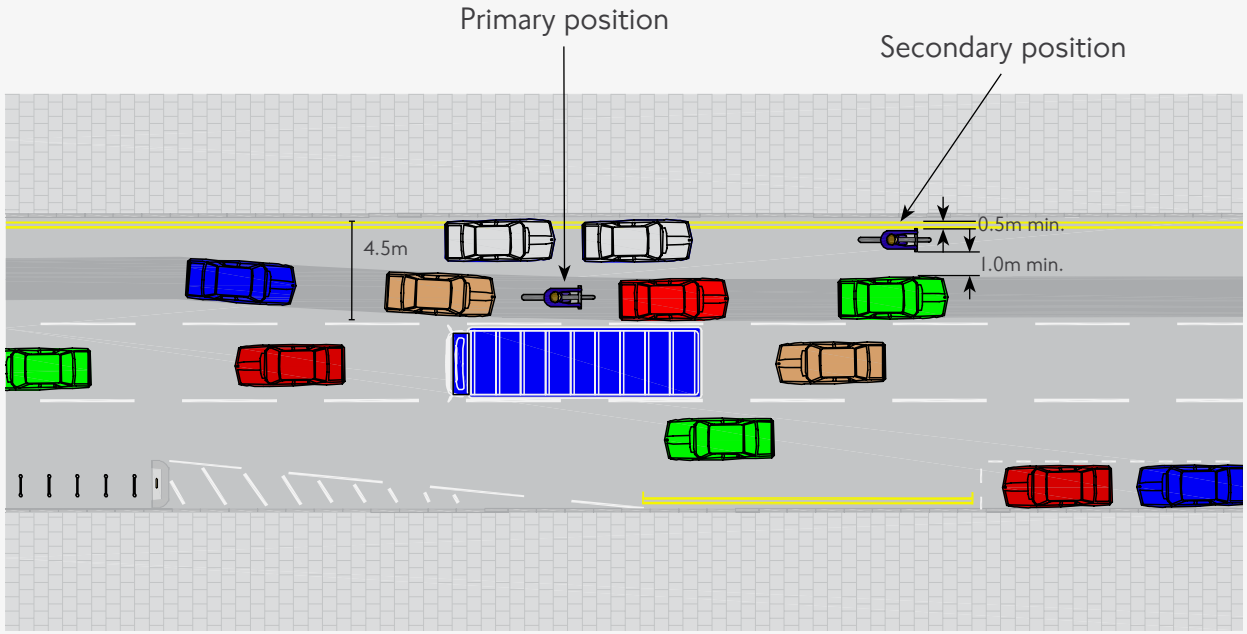
Objects with a vertical profile need a wider clearance than rounded or sloping objects – recommended clearances are given in LTN2/08. This states that intermittent objects like sign posts and lamp columns should have 750mm clearance to the cyclist's wheel (meaning, for standard bicycles, that effective width is reduced by 250mm) while continuous features like walls, railings and hoardings need 1 metre clearance to the wheel (so effective width is reduced by 500mm for a standard bicycle). 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.

3.2.5 Primary and secondary riding positions

Effective width and clearance to fixed and moving objects gives rise to consideration of recommended riding position for cyclists – that is to say, the safest position in the road for a cyclist to adopt in any given scenario. Cyclists may safely ride on the nearside of other vehicles if there is sufficient width to be overtaken with adequate clearance – this is known as the secondary riding position. However, if that clearance is not available, the safest course of action for the cyclist will be to ride in such a way that they are as visible as possible and cannot be overtaken – this is the primary riding position.

The primary and secondary riding positions are taken by cyclists relative not just to the available width but also to the presence of other vehicles. Even in a wide lane, the primary position may be the safest position to take if there are parked cars ahead that squeeze the space available so as to make the secondary position uncomfortable and, potentially, unsafe. This is demonstrated in indicative layout 3/01.

Allowing for the effective widths and clearances set out above, the secondary riding position can therefore usually be adopted where:



Indicative layout 3/01: Primary and secondary riding positions

- The nearside traffic lane has a constant minimum width of 4.5 metres or more, or
- A cycle lane of at least 1.5 metres width is provided on the nearside of a general traffic lane of 3.0 metres or more

In other circumstances, it should be assumed that cyclists will, at least some of the time, need to adopt the primary position relative to other vehicles.

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. 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.

3.2.6 Understanding pedestrian needs

Pedestrians' needs are described in Manual for Streets and Manual for Streets 2 and in TfL's London Pedestrian Design Guidance. 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 issues of cycle/pedestrian interaction, particularly LTN 1/12 Shared use routes for pedestrians and cyclists.

Other key references are the TRL report, Cycling in Motor Vehicle Restricted Areas (TRL583, 2003) and Phil Jones Associates for Sustrans, The merits of segregated and non-segregated traffic-free paths: a literature-based review, 2011.

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 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, Accessible London: achieving an inclusive environment SPG (2014) and DfT, Inclusive mobility – a guide to best practice on access to pedestrian and transport infrastructure (2002).

Key design requirements

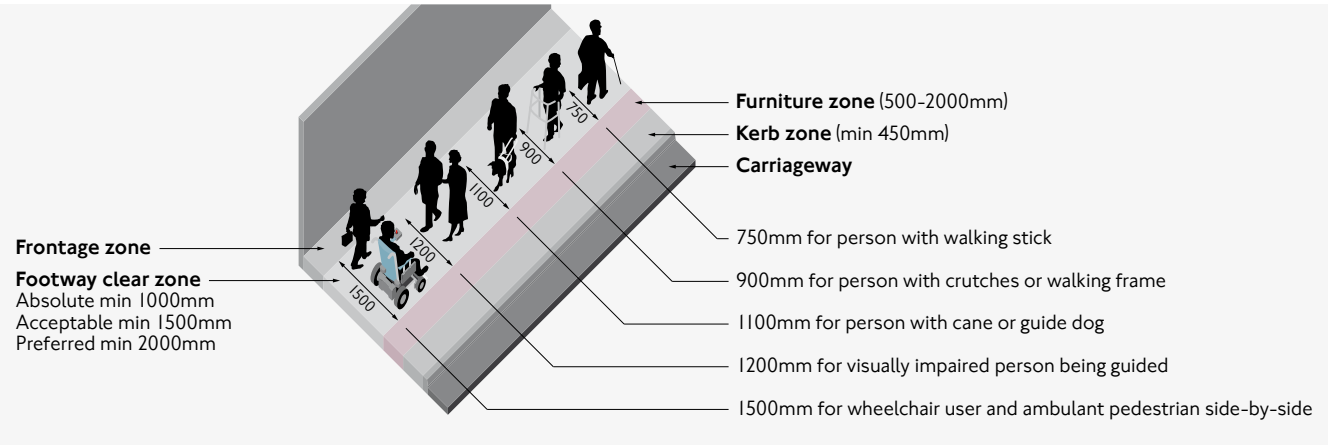
Such things as poorly maintained surfaces, narrow footways, street clutter, abrupt changes in level, gradients and environments that are difficult to navigate are likely to have an adverse impact on many kinds of people. They may be deterred from returning to a place that they cannot use with comfort and confidence. This may relate not only to a person using a mobility aid, or a blind or partially sighted pedestrian, but also to anyone with a hearing impairment, which very often leads to difficulties balancing, and to anyone with learning difficulties or an age-related impairment.

As a key issue for street design, figure 3.6 shows recommended clear widths for comfortable use of the footway. It is recommended that at least 2 metres' clear footway width should be provided or retained wherever possible.

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 and be used as a framework for seeking to improve pedestrian comfort in any intervention for cycling.

Inclusive design does not stop at people with protected characteristics under the Equality Act (2010). It should also include consideration of 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.

Figure 3.6 Footway width requirements (adapted from DfT, Inclusive mobility)



3.2.7 Integration with bus and coach infrastructure

Guidance on integration of bus infrastructure with street environments is provided in TfL's Streetscape Guidance. Accessible Bus Stop Design Guidance further 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. Note that liaison with TfL is required when developing any changes to bus infrastructure.

In many cases there may be a desire to prioritise both buses and cycling on the same street, particularly for street types that are commonly used for bus routes, such as connectors, high streets and high roads. This may be done by separating users, providing shared bus/cycle lanes or by calming street environments where there are no dedicated bus or cycle lanes.

Cycling in bus lanes

Sharing with buses can generally deliver a basic cycling level of service, but it is unlikely to be comfortable and attractive for all types of cyclist. Unless separation for cyclists can be provided on a given link, network and route planning will therefore need to ensure that there are good alternatives to streets and traffic lanes shared with buses.

Interaction with buses can be well designed and offer a basic level of service for many cyclists, but it is unlikely to be attractive and comfortable for all.

Appropriate provision for buses and cyclists 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

See chapter 4 for further details on design of bus lane and bus stop infrastructure in conjunction with cycle tracks and cycle lanes.

Bus stops

Integration of bus stops with cycle infrastructure is an important issue for level of service for cyclists, bus passengers and other pedestrians. Consideration must also be given to the specific needs of coaches in dedicated coach bays. Coaches tend to be longer than buses, and the space for boarding and alighting needs to be designed so as to accommodate movement of all passengers from a given vehicle at one time.

3.2.8 Integration with loading and parking

Interactions of cycling infrastructure with kerbside activity need to be designed and managed in such a way as to minimise risks and stress to cyclists while maintaining all necessary access. This includes design for loading and unloading activity to take place as efficiently as possible. This is important for street types such as high streets, town squares, city streets and city hubs that 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.

It is important to make the distinction between short-stay and longer-stay kerbside activity. The former includes loading/unloading, passenger drop-off and short-stay coach parking, is location-specific and generally needs to be retained. The latter largely comprises other parking, which may, dependent on context, be more flexible and amenable to relocation or removal. The parking needs of blue badge holders are a further consideration and provision needs to be retained or improved upon wherever possible – dedicated bays are recommended.

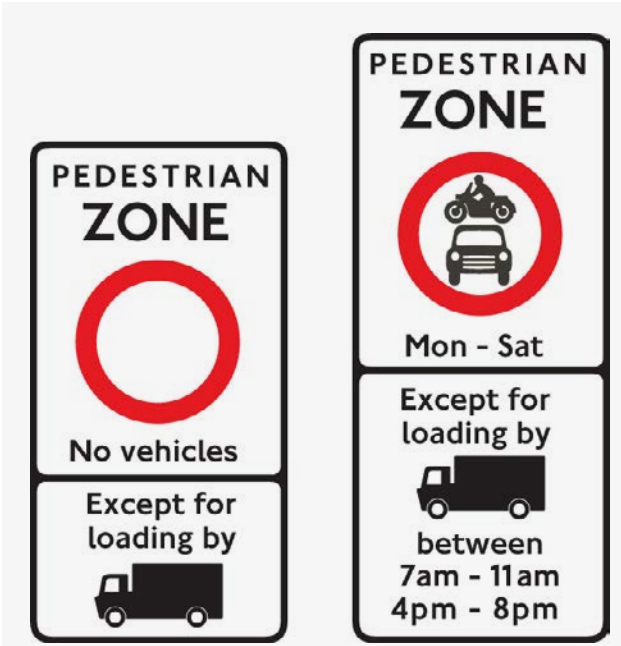
Procedures

During the route assessment and prioritisation stage, 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 should be undertaken (see section 2.3). This should include early dialogue with those affected.

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.

Design considerations

- Creation of dedicated, enforceable kerbside space for loading or parking requires a Traffic Order
- In many areas, loading and parking take place on the carriageway, as indicated by appropriate road markings and signing showing timings and restrictions
- Loading restrictions are indicated by yellow '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 signing (typically this restricts loading to short 20- or 40-minute periods)



Signs showing time-limited loading

- 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; loading is permitted unless blips or other signed restrictions are present
- 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)

Figure 3.7 summarises types of intervention that could be applied to rethinking parking and loading on a cycle route. Area-wide approaches can be appropriate in many instances, particularly when it comes to creation of Quietways and other local access routes. They can be a good way of simplifying the street environment, enhancing its overall attractiveness and ensuring that access for cyclists, pedestrians and, where appropriate, powered two-wheelers is maintained.

Restricted parking zones

Restricted parking zones require a Traffic Order in the same way as other restrictions. They can be applied where a restriction is uniform and where exceptions can be captured easily in signing. 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 signing that needs to be put up at each entrance to the zone. Many types of restriction are possible: permitting parking and/or loading in designated bays only is likely to be the most useful in support of cycling.

Figure 3.7 Summary of interventions for parking and loading on cycle routes

Separating cycling from kerbside activity at network level	Where integration of 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 to require rethinking cycle route options at the route assessment stage.
Mechanisms for area-wide management of parking and loading	In **Urban clearways** there is no stopping on the carriageway for parking or loading (including for cyclists). They can be time-limited, with hours of operation provided on signs. **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'. **Restricted parking zones** avoid the need for painted lines at the kerbside by allowing parking and loading subject to restrictions shown by signs.
Relocation of parking and loading locally	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.
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. 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 4.2.6)
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.
Inset loading/parking bays	Although likely to require a more extensive redesign of the highway, this is a good option for cycling, provided that on-carriageway cycling facilities are appropriately marked so as to deter riding in the dooring zone. It can invite a more flexible use of space, with inset bays effectively forming part of the footway when not in use, depending on the materials used. However, they may not be suitable for all types of delivery.

3.2.9 Changing loading practices

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 mismatch between loading provision and demand
- Deliveries to multiple premises could be consolidated in one location
- 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, some deliveries could be 're-timed' 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.

However, there are many opportunities at locations that are not restricted. For example, avoiding school start and end times can have significant benefits for safety and for efficient movement. Information and guidance on options for re-timing is provided in the Re-timing Deliveries Consortium's Getting the timing right (2014) and the Freight Transport Association (FTA) and DfT Quiet Deliveries guidance (2014). 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.

The size and location of loading facilities needs to be taken into account when considering these options, as do the time, frequency and volume of the activities taking place, 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.

Special considerations

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-separated or stepped tracks.

Relocating loading facilities

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 (other than in exceptional cases). 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.

3.2.10 Integration with taxis and private hire vehicles

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.

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.

Inclusive design considerations

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 a key factor 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.

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.

Taxi ranks

Dedicated 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 full consideration can be given as 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.

Taxis' use of bus and cycle lanes

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.

Advisory cycle lane marked around a taxi rank – lane would benefit from being wider or having a buffer to the marked rank

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.

Potential PHV activity also needs to be taken into account in the vicinity of PHV operating centres. This can mean that there are high volumes of passengers entering and leaving the centres and many PHVs turning in or pulling out nearby.

3.3 Civilised streets

3.3.1 Traffic calming

Large parts of the cycle network, including the Quietways, are likely to consist of traffic-calmed neighbourhoods and streets rather than cycle-specific infrastructure. The remainder of this chapter therefore covers creating civilised, cycle-friendly streets through area-wide improvements and through traffic calming. This is an important part of an integrated approach to delivering better places and 'healthy streets' for everyone.

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.

Civilising streets through design is recommended over insertion of physical traffic calming measures, although the latter may be required for effective speed control in streets with a higher movement function.

A study by TRL, 'Psychological' traffic calming (2005), compared different design techniques for traffic calming with more conventional speed reduction methods. Uncertainty was observed to be very effective in reducing speed. 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).

Measures that have a function, and contribute to a space that looks and feels like a lower-speed environment, tend to be more successful than 'bolt-on' physical measures and signing.

Features that may support this psychological calming effect include:

- The appearance of road narrowing and reduction of forward visibility
- Removal of road markings, such as centre lines, which give motorists more security than is appropriate, resulting in excessive speed
- Use of different materials, colours, street furniture and planting to make the street environment less 'road-like'
- 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

3.3.2 Area strategies

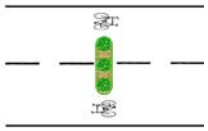
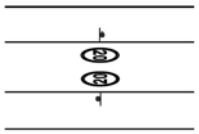
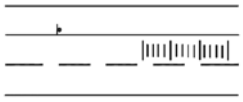
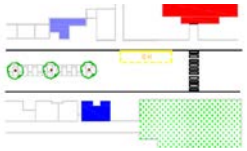
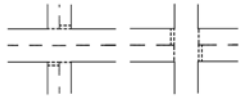
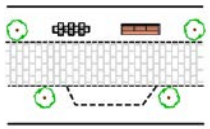
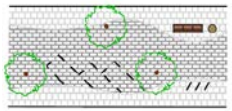
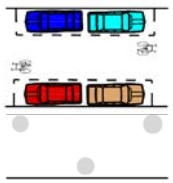
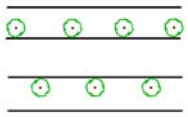
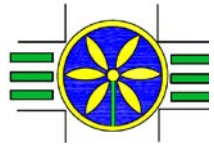
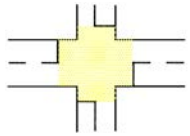
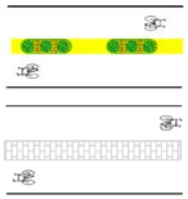
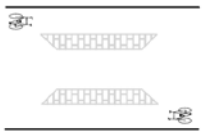
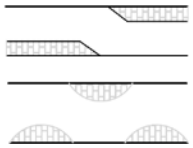
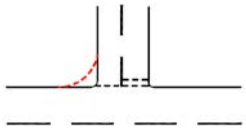
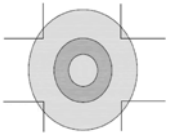
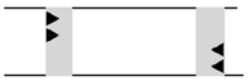
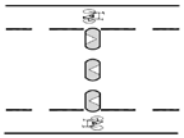
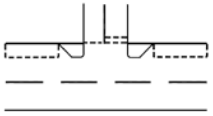
Figures 3.8 and 3.9 set out the recommended options for creating more civilised, cycle-friendly streets. The first covers strategies, the second the types of design intervention that can bring about traffic calming, both on links and at junctions.

Filtered permeability at Goldsmith's Row, Hackney

Figure 3.8 Strategies for civilised streets and neighbourhoods

Intervention	Recommendation
Filtered permeability	Use of streets with restricted access as part of the cycle network is recommended. Permeability (through-movement) and directness should be maximised for cycling and walking and managed for motorised traffic as part of a wider approach to reducing traffic volumes.
Civilising streets through traffic calming	Traffic calming, allied to limiting speed and introducing 20mph limits, 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.
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.
Changing the balance of uses and activities	A greater diversity of uses in the street environment can have a civilising and calming effect, either through designating a street as having a special status, such as a Home Zone or cycle street, or through more incremental change. Design strategies can be developed that embrace kerbside activity in an integrated way, as well as more active, people-focused uses such as play, walking and cycling.

Figure 3.9 Traffic calming techniques

Area-wide traffic management – on links					– at junctions	
Filtered permeability 	Speed limits 	Speed cameras 	Emphasise place over movement 		Change in priority 	Signalise 
Calming through street design – on links					**– at junctions**	
Formal / informal crossings 	Streetcape enhancements 	Rebalance priorities 	Objects, eg parking 	Street trees/ planting 	Street art 	Change in materials/colour 
Centre line removal 	Apparent lane narrowing 	Median strip 	Modal filter with cycle bypass 	Lane deflecton / chicane 	Tighten geometry 	Implied roundabout 
Physical traffic calming – on links					**– at junctions**	
Sinusoidal speed humps 	Raised table (sinusoidal profile) 	Cushions (cycle-friendly gaps) 	Footway build-outs 		Entry treatment 	Raised table (sinusoidal) 

3.3.3 Speed limits

An 85th percentile maximum speed of 20mph should be aimed for on roads forming part of designated cycling routes, including local streets, town squares and city places, and on many other high streets and city streets. Locations where 20mph limits would help achieve this should be identified and assessed through area-based analysis or through the review of existing conditions for cycling recommended in section 2.3.2. The limit should be enforceable so that it functions as intended.

Speed limits can be set for individual streets or across zones. Zonal treatments require measures to ensure compliance. These can comprise any of the measures set out in TSRGD (2016) schedule 10, part 4, or in the area-wide authorisation issued by DfT to English local authorities in October 2011, which relaxed the signing requirements for 20mph zones. These changes are summarised in DfT's Area-wide authorisations and special directions guidance note (2012) and included in TSRGD (2016).

Enforcement

In its guidance Circular 01/2013, Setting local speed limits (2013), which sets out a wide range of scenarios where 20mph limits may be appropriate, DfT advises that 'general compliance needs to be achievable without an excessive reliance on enforcement.' This is likely to require measures to promote psychological and, where necessary, physical traffic calming. As with all speed limits, if the design of the street environment seems inconsistent with the advertised limit, compliance is not likely to be high.

Metropolitan Police Service traffic management officers should be consulted on 20mph proposals, and will seek assurance that they are compliant with Circular 01/2013. Traffic calming will need to be applied where 85th percentile speeds are above 24mph in free-flowing conditions. Enforcement supports design measures and signing, and should not be relied upon as a preventative measure on its own.

Enforcement can also be supported by use of speed cameras. Average speed cameras are being introduced on the TLRN as a trial measure. These can help improve speed compliance over longer stretches of road, rather than bringing about location-specific speed reduction.

20mph zone in mixed town centre environment

20mph zone signing, Golden Lane, Islington

3.3.4 Traffic volume reduction

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 approaches to traffic management in order to achieve targeted traffic volume reduction on certain streets.

Street types that are more likely to be amenable to targeted traffic volume reduction and cycle permeability measures include not just those with lower movement functions and higher place functions, but also types where an appropriate balance can be most challenging to achieve, such as high streets, high roads and city boulevards.

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 3.9.

Point closure, allowing cycle access

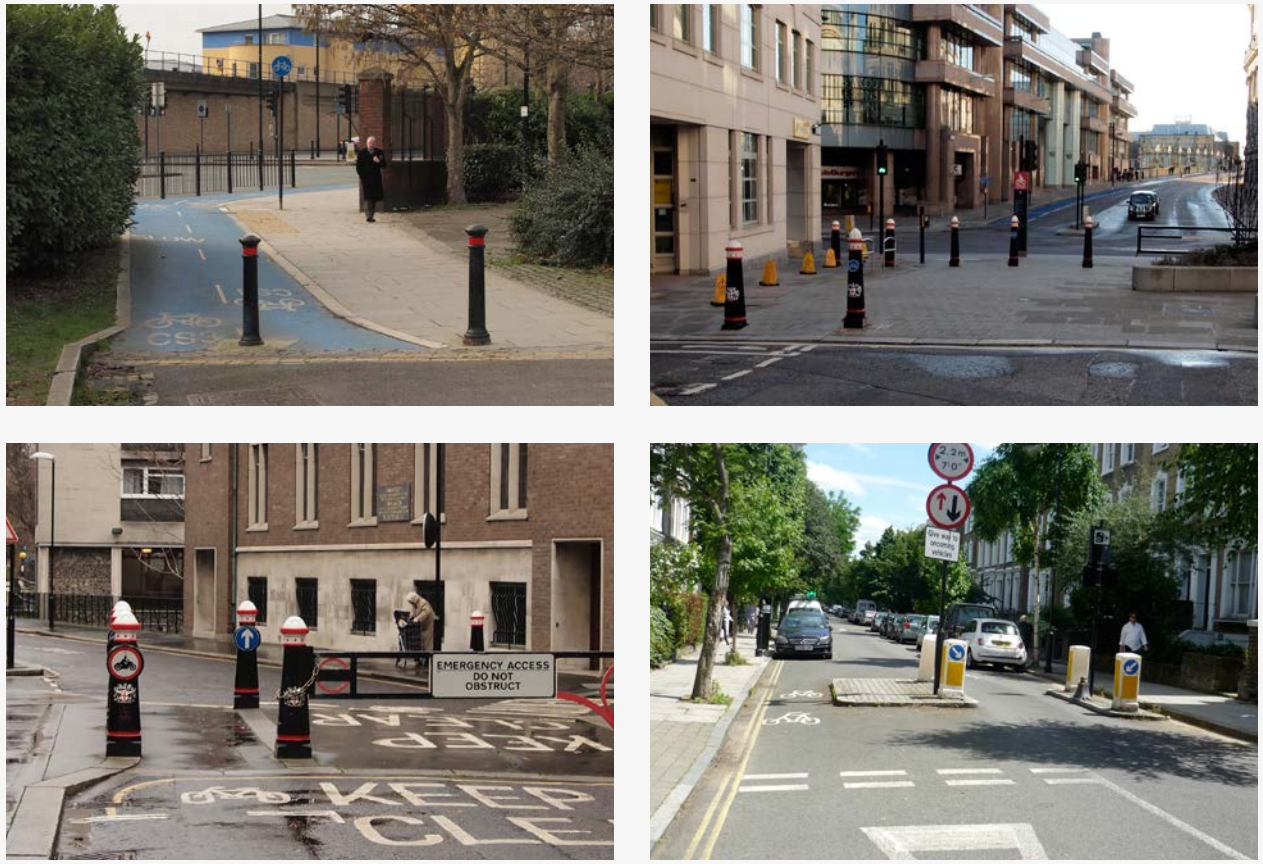
Ban on two-way movement: cyclists excepted

Figure 3.10 Summary of methods for targeted traffic volume reduction

Point closure to through-traffic	Point closures are used to close streets to general traffic, usually maintaining motorised vehicle access to properties, while keeping them open for cyclists. A Traffic Order is required.
Bans and turning restrictions	Where selected vehicle movements are banned, cyclists should be exempted, unless this would be unsafe. Additional local measures may need to be taken to ensure the cycle movement can be made safely. A Traffic Order is required.
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 1.5 metres clear width for cyclists. However, the need for freight access for deliveries must 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 figure 3.9.

3.3.5 Filtered permeability

As set out in section 2.3.7, 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

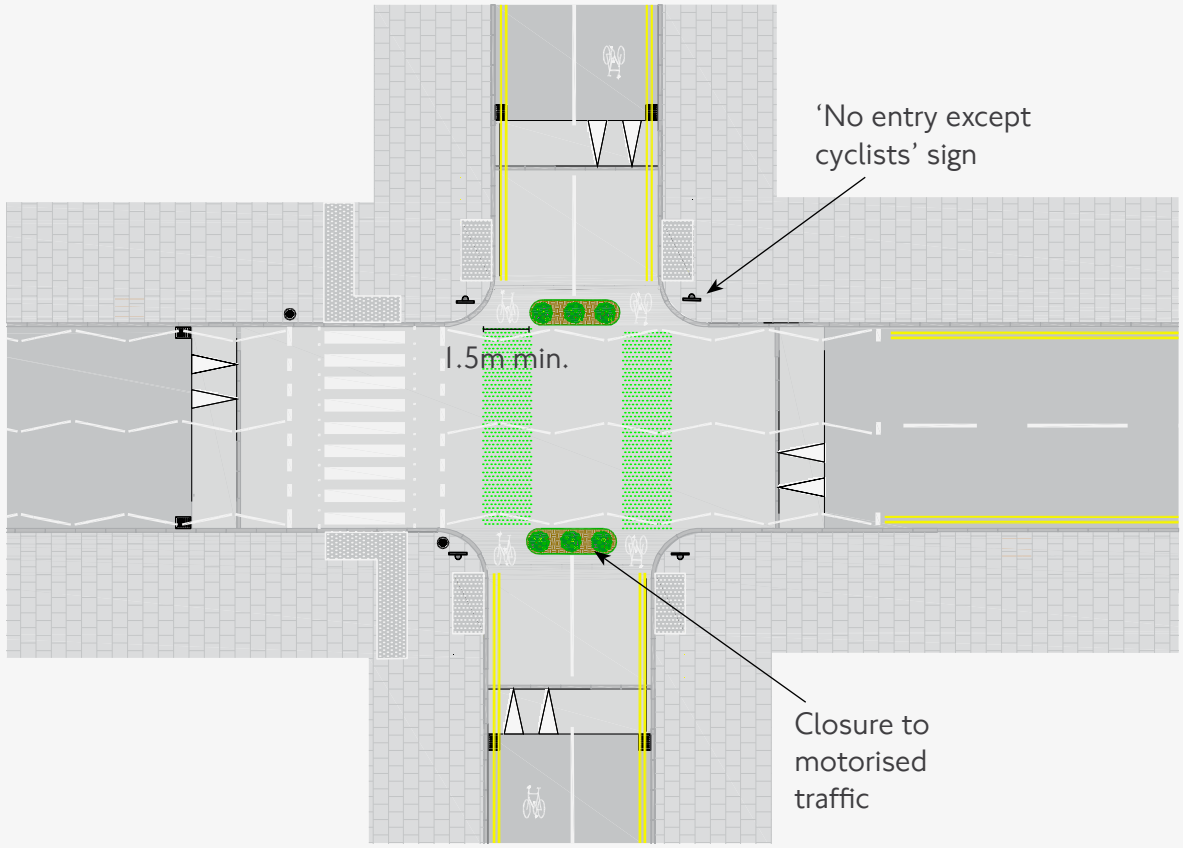
Access controls

The minimum clear width (eg kerb-to-kerb or kerb-to-bollard) for cycle access through a point closure should be 1.5 metres to allow for access by all types of cycle. A greater width is desirable for two-way cycle gaps, particularly where cycle flows are high – bollards, spaced by 1.5 metres, are usually provided to restrict access to cycles.

Where emergency vehicles need access, a folding bollard is recommended. Where a larger gap is provided, supplementary measures to prevent unauthorised use by motorised vehicles, particularly powered two-wheelers, should be considered. See 'Access controls' in section 4.5 for further details.

Modal filter with greening and folding bollards, Leytonstone

Access controls should be positioned so as to minimise deviation for cyclists and avoid putting them into vulnerable positions relative to parked cars. Allowance should be made for the larger turning radii of many non-standard cycles when considering cycle movements through gaps and past other obstructions (see section 3.2.3).



Indicative layout 3/02: Point closures allowing cycle access only

Inclusive access

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 1.5 metres wide, and wider when the approach creates an oblique angle. Dropped kerbs should be specified with zero upstand within 6mm tolerance; any upstand of more than 10mm could destabilise the rider when approached at an angle.

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

Closure with cycle access in Lambeth: public realm improvements add to a feeling of safety and security

3.4 Calming through street design

3.4.1 Character and context

The character of the street has a measurable 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. Minimising speed differentials between motorised vehicles and vulnerable users, including cyclists, has significant safety benefits.

The 'whole street' approach advocated in Improving the health of Londoners (2014) should be referred to in considerations of street design. This emphasises the roles of streets as places to dwell and relax, and places where there are things to see and do.

3.4.2 Street use and activity

Where a street features more active uses, this can have a calming effect on traffic in the carriageway, breaking down perceptions of the space as dominated by the highway. This is related to land use – the opening hours and activities of shops and other businesses have an impact on the way the street environment is used. But it is also about encouraging people to stay in a space as well as move through it. This could be achieved in a variety of ways, including provision of places to sit, planting to offer shade and shelter or even special treatments, such as public art, water features and space for temporary stalls.

Active frontages in Hackney

Special surface treatment in Copenhagen

3.4.3 Home Zones, Play Streets and Quiet Lanes

While not intended for cycling, these special designations can contribute to speed reduction generally and to a better balance between road users. They are generally provided within 20mph zones.

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 signing). 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.

Home Zones must be designated as such under section 268 of the Transport Act (2000), and require the regulatory signing to diagram numbers 881 and 882 of TSRGD. Play Streets must be indicated by a sign to diagram 618, backed up by a Traffic Order. Consideration could also be given to creation of informal 'Home Zone' environments by using the TSRGD diagram 886 'share space' sign instead.

Home Zones

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. This can include painted and patterned surfaces, often as a result of a community-led design process. DfT provides guidance on Home Zones via: TAL 10/01 Home Zones: planning and design (2001), TAL 08/02 Home Zones: public participation (2002) and Home Zones: Challenging the Future of our Streets (2005). See also the Institute of Highway Engineers' Home Zone Design Guidelines (2002).

Play Streets

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. They can also be used as a way of trialling modal filtering. Consideration should be given to any necessary cycle diversion around the Play Street.

Quiet Lanes

In less urban parts of outer London and routes running within green spaces, consideration may also be given to using a 'Quiet Lanes' designation and associated signing. Quiet Lanes are minor rural roads designated by highway authorities as needing special attention to the needs of walkers, cyclists, horse riders and other vulnerable road users. Motorists are permitted, but should be encouraged to slow down and act with appropriate courtesy. A speed limit may be applied separately, but does not form part of the designation. For further information, see Campaign for the Protection of Rural England's Guide to Quiet Lanes (2003).

Home Zones in the UK (top) and Germany (bottom)

Sign to TSRGD diagram 881

Sign to diagram 884

Sign to diagram 886

Sign plate to diagram 618 and surface marking to diagram 1046.1

3.4.4 Narrowing and forward visibility

Manual for Streets explains the relationship between visibility, carriageway width and vehicle speeds, demonstrating that limiting forward visibility and reducing carriageway widths have a speed reducing effect. Reducing carriageway widths can also allow for greater footway space to be provided, which helps to promote active uses, or for planting and use of sustainable urban drainage systems, which are a positive contribution to healthy streets.

The advantages of speed reduction through narrowing need to be balanced against increasing the risk to cyclists riding with general traffic. Avoiding pinch-points and lane widths in the range 3.2 to 4.0 metres is essential – see section 4.4 for details.

Narrowing through use of kerbed median strip, Hornchurch. Raised tables act as informal flush crossings.

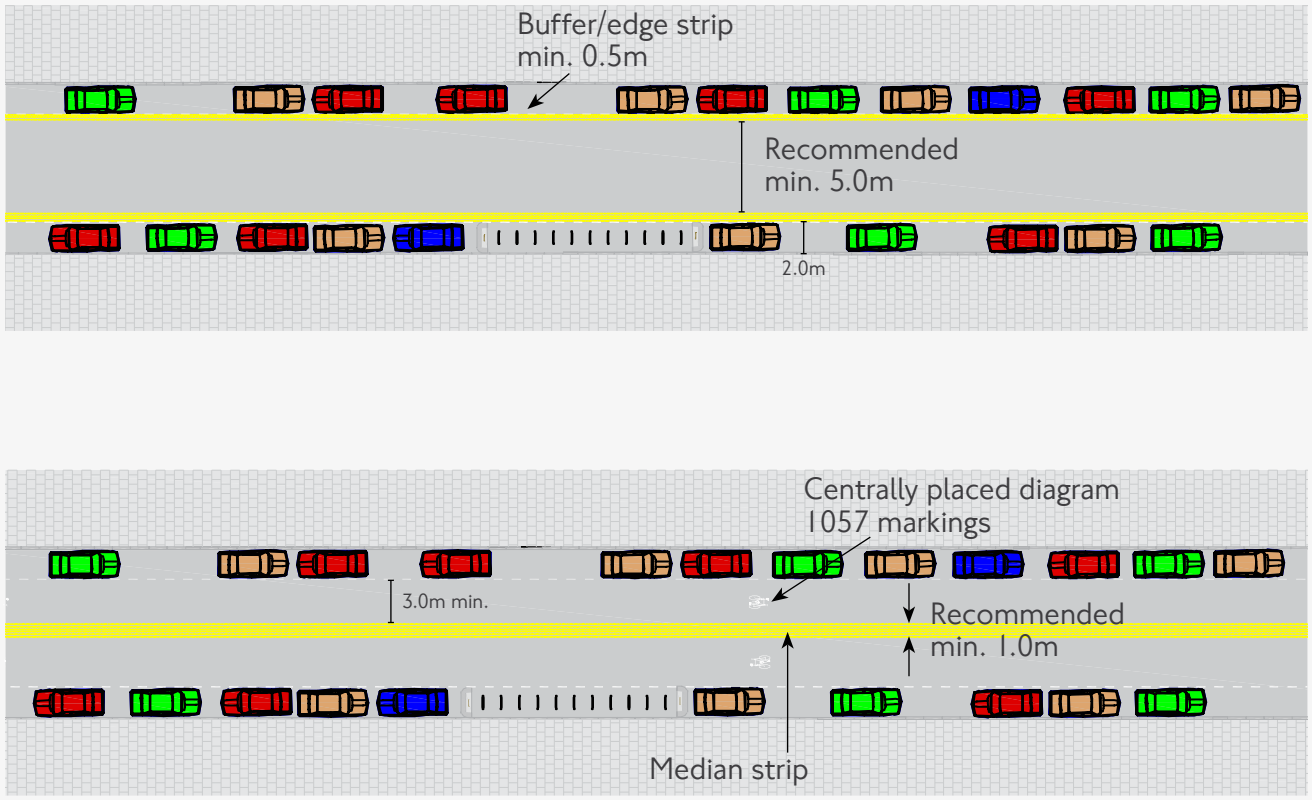
Flush median strip, Bexleyheath

Visual narrowing of the carriageway at Whitecross Street, Islington. Stalls are set out on the paved area when the market is on.

Median and edge strips

Narrowing may be visual instead of physical, using different surface materials to suggest a narrow carriageway where the usable space is actually wider. This can be a good solution where temporary uses need to be accommodated and can be applied to median strips, provided those medians can be over-run by cyclists. Use of a strip with a domed or flush profile can help achieve this, rather than the conventional median strip with kerbed upstand. A flush median strip can be a good solution to facilitate overtaking of buses in stops or to maintain emergency vehicle access.

Research described in the TRL report 'Psychological' traffic calming (2005) found that use of edge markings, such as hatching, to narrow the carriageway width had a speed reducing effect on motorists. That effect was greater, however, if the markings were substituted for surfaces that appeared unsuitable for driving on. It should be noted that central hatching does not appear to have an equivalent speed reducing effect, according to the DfT's Traffic Advisory Leaflet 01/00, Traffic calming in villages on major roads (2000).



Indicative layout 3/03: Visual narrowing using a) edge strips and b) median strip

3.4.5 Parking and loading bays

If designed with marked-out bays and build-outs to create a consistent line in the carriageway, parking and loading facilities can be used as a technique for narrowing. Moving the bays out to create protected space for cycling between bays and footway can be a good way of providing a high level of service for cycling – see section 4.2 for more details. Alternating bays of echelon parking can also be used to create horizontal deflection, and therefore slowing, in the street environment.

Loading bays are indicated by a broken white line and optional 'LOADING ONLY' legend. Time limits and hours of operation are shown on associated upright signs. On a red route, the bays will be shown by broken red lines. 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.

The choice of parking or loading facility depends on available carriageway width and the likely impact on the general traffic flow, as well as on the functional requirements of loading and parking and on cycling level of service. It is recommended that parking bays for cars, taxis and motorcycles should be a minimum of 2.0 metres wide and loading bays 2.4 metres.

Minimum dimensions will no longer be prescribed by TSGRD when it is published in 2015. However, the minimum requirement of 6.6 by 2.7 metres for a bay for blue badge holders will remain. Refer to advice in section 4.2.6 on cycle lanes and buffer strips past parking bays.

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).

Trial measures on Gotgaten, Stockholm: car and cycle parking moved out into the carriageway to create more protected space for cycling. The existing, stepped cycle track has been used for temporary seating

Maintaining good pedestrian provision

Taking space from the footway may be justifiable in exceptional circumstances for loading, as part of a flexible approach to using space on a busy street, but should generally be avoided for parking. At least 2 metres' width should remain clear for pedestrian movement, depending on existing levels of comfort for pedestrians (DfT, Inclusive Mobility, 2002). No space should be taken from the footway if it cannot achieve at least Pedestrian Comfort Level 'C'. For TLRN, 2.5 metres of footway is recommended in front of shops (TfL, Streetscape Guidance). Consult borough design guidance for further requirements on footway widths and loading facilities.

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. However, where they are at the same level as the footway, the potential impact on vulnerable pedestrians must be considered through consultation with access groups early in the process. Defining and enforcing bays and associated parking contraventions can be challenging. Borough guidance on inset bays should be consulted in every case.

Inset bay, Wallis Road, Hackney

Inset loading facilities to support an office building – Moor Lane, City of London

Loading bay inside advisory cycle lane

Fully inset loading bays to support retail premises – Long Acre, Covent Garden

Where bays are 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 metres is required alongside any inset bay to maintain safe traffic flow. Consideration also needs to be given to drainage implications of inset bays, which ideally need to have a cross-fall towards the carriageway and the recommended upstand at the interface so that run-off from the carriageway will not flow into the bay. Refer to advice in section 4.3.10 on cycle lanes and buffer strips past parking bays.

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, particularly visually impaired people. Where used, bollards should be aligned with existing street furniture to provide a pedestrian 'channel'.

Half-on, half-off bays

Where footway width does not allow fully inset bays, half-on, half-off facilities can be a good compromise to protect accessibility and provide adequately wide footways. In these bays, vehicles are allowed to stop with their nearside wheels on the raised footway. As London is subject to an area-wide footway parking ban, note that a Traffic Order and associated signing is needed to permit vehicles to park on the footway.

Cycle lanes need to be marked around half-on, half-off bays, with a buffer zone, in the manner described in section 4.3.10. Where there are no cycle lanes, the remaining width of the nearside general traffic lane must be no less than 4.5 metres to allow cyclists to stay clear of the door zone. On a bus route, this treatment is not recommended, unless a nearside lane of 5.5 metres can be provided.

Inset parking bays

3.4.6 Decluttering

Removing features that give the impression of motorised traffic domination, such as signs, road markings and certain kinds of street furniture, can contribute to psychological calming, to accessible pedestrian environments and to making streets more attractive, aesthetically pleasing places to be.

Minimising street clutter should be applied in line with relevant street design guidance, such as TfL's Streetscape Guidance or borough design 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.

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 steps it describes represent increasing levels of intervention, with decluttering and merging functions being at the '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 revised traffic signs regulations, TSRGD (2016).

Minimal use of road markings – Bunhill Row

Decluttered street environment – Liverpool Street

Decluttering techniques

Interventions to support decluttering include:

- Removing and consolidating existing signing whenever feasible
- Using existing poles, posts, columns, walls and railings along the route for signing, with permission from the owner where required (the net number of sign 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, where feasible
- Ensuring that litter bins, control cabinets, other street furniture and trees are located in the furniture zone adjacent to the carriageway, leaving at least 2 metres' clear width for walking
- Removing pedestrian guardrail, unless it is absolutely necessary
- Attaching street lighting to buildings, with the permission of the owner
- Removing any inconsistent or unnecessary road markings

Retaining essential street furniture

Careful consideration needs to be given to the role played by street furniture in contributing to a street's sense of place. As the 'whole streets' approach emphasises, it is important that people should feel relaxed, that they have places to stop and that they should enjoy shade and shelter in the street environment.

Provision of adequate, good quality and well located seating is therefore an important contribution to street activity and to accessible environments, and removing it in the name of decluttering should generally be resisted.

Similarly, while cycle parking stands need to be considered in any audit of street furniture, the provision of cycle parking in the area needs to be looked at holistically. Where it is poorly located, good quality parking should be re-provided (see chapter 8 for guidance).

Minimising cycle infrastructure clutter

Cycle infrastructure in the street environment can lead to additional demands for signing, signals and surface markings. To help minimise clutter whenever there is a decision that a higher degree of separation for cyclists is required:

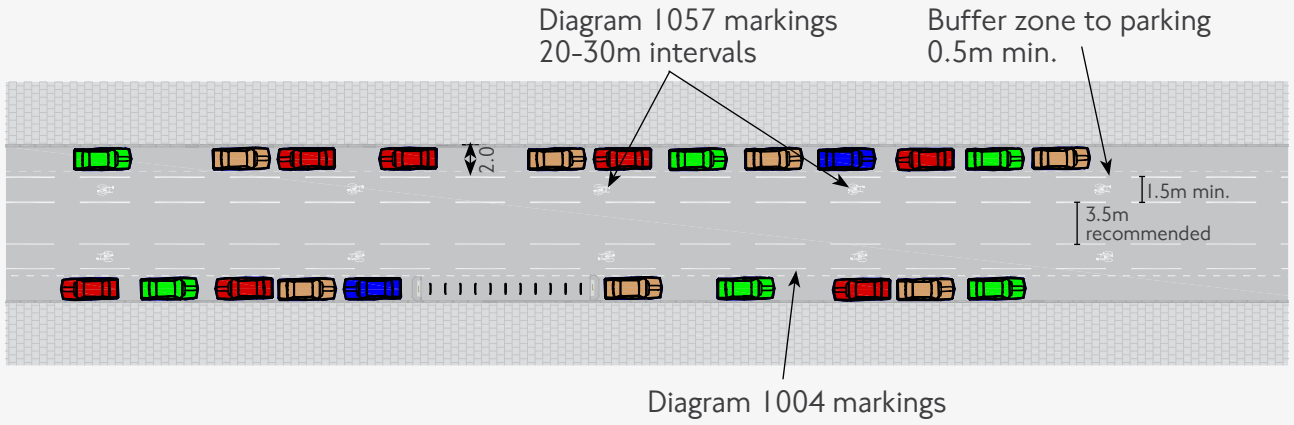
- Ensure the street is as legible as it can be, and that people are able to tell where motor vehicles, cyclists and pedestrians are supposed to be without the need for conventional signing to explain the environment: this can often be done in subtle ways, through changes of material or embedding signing 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 – signing, 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: on links, keep cyclists either in a one-way or two-way system of tracks for as long as possible without unnecessarily switching between the two
- Use only the amount of regulatory signing that is strictly necessary

3.4.7 Centre line removal

Centre line removal is a simple and effective way of achieving a traffic calming effect and is recommended for consideration 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.

Trials conducted by TfL show a statistically significant speed reduction effect from this intervention at all three study sites, as documented in the report Centre line removal trial (2014).
As this report explains, some roads may not be suitable for centre line removal, and markings need to remain where they convey a warning about a particular hazard, such as the presence of an island.

Many calm, two-way residential streets have no centre lines and little width between parking bays



Indicative layout 3/04: Centre line removal to support visual narrowing

3.4.8 Rebalancing priorities

Many streets and public spaces have the potential for a more diverse mix of active uses, but suffer from domination by motorised traffic. Rebalancing priorities so that people can use the space more flexibly can have positive effects for pedestrians and cyclists, if it results in a calmer, low-speed environment and encourages more considerate behaviour. This generally involves removing signals, signs and markings and allowing for more interaction between users.

More negotiation of movement, sharing and courtesy between users is a feature of shared space approaches. Described more fully in Manual for Streets (2007) and DfT's Local Transport Note 1/11, Shared Space (October 2011), these could complement efforts to remove formal traffic controls through decluttering and other forms of psychological traffic calming.

Accessible design considerations

While removal of priorities and calmer traffic conditions can make the street environment more attractive and accessible for many pedestrians – making it easier for them to cross informally, for example – the street environment needs to remain fully accessible for all. How a place can be navigated in safety and comfort by visually impaired people needs to be considered carefully as part of the scheme design. The recommended ways of dealing with this are to:

- Retain footways and kerb upstands of 50mm or more, or

Seven Dials, Covent Garden

- Design in other kinds of 'comfort space' predominantly for pedestrian use that would not be used by vehicles moving through the street

In order to ensure that a scheme properly addresses accessibility and highway authorities' obligations under the Equality Act (2010), it is recommended that the early stages of a project should involve those users who may have concerns about the changes to the environment, and that an Equality Impact Assessment be undertaken. It is important that the legibility of the street environment is such that it can be used in confidence by older and disabled people, including (but not limited to), people with cognitive impairments, neuro-diverse conditions or learning difficulties. The document Accessible London: achieving an inclusive environment SPG (2014) provides further advice on planning and designing for all users.

Bonnington Square, Lambeth

Leonard Circus, Hackney – removal of priorities

New Road, Brighton

Comfort space

Comfort space may be delineated by physical objects such as street furniture, planting or bollards, or may simply be space that vehicles do not need to track into.

Strong tonal contrast in surface treatments can support delineation of the comfort space. However, care should be taken to avoid complicated patterns that can confuse and disorientate users.

In streets with greater use by vehicles, including cycles, delineation is likely to be needed throughout, in order to deter encroachment onto pedestrian space, although it should not be a continuous barrier. It should link users to safe crossing points. The main objective is to allow blind or partially sighted people to follow a familiar path through the street in comfort, using the building line on one side and the various forms of delineation on the other as navigating features.

Sharing space

Preconditions for more sharing of space are low or access-only flows of motorised vehicles and low speeds. LTN 1/11 recommends a design speed of 15mph or less and advises that 'shared space should present a series of features and events to drivers that require them to increase their awareness and make conscious decisions on how they should negotiate each feature.' With that in mind, techniques to consider include:

- Removal of traffic management related street furniture, eg traffic signals and guardrailing
- Opportunities for tree planting and/or other soft landscaping
- Minimal use of signing
- Indications of priority at minor junctions omitted
- 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

Application of shared space approaches can be an opportunity to promote greening and use of sustainable drainage. Consideration should be given to use of permeable surfacing and care needs to be taken around the impact on street drainage of any level changes or changes to surface materials.

It is important that the transitions to shared space are well designed, so that drivers and cyclists 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 signing.

Greening the street, Van Gogh Walk, Lambeth

Design of parking and loading in shared space is important, due to the risk that stationary vehicles may obstruct vehicular and pedestrian 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.

3.4.9 Surface treatments

Changes in surface material and level surface treatments, where there is no level difference between footway and carriageway can support rebalancing of priorities and shared space approaches. 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 lack of a kerb edge and so a form of delineation should be provided. This could take the form of comfort space or, as recommended in LTN1/11, corduroy tactile paving.

Level surface treatment, Coventry

Some of the calming and aesthetic effects of level surfaces can be achieved by using a low kerb upstand. It is important this should be a minimum of 50mm in order to be detectable by anyone using a long white cane or guide dog.

Changes in surface material are often used to suggest an environment where priorities are different – less dominated by motorised traffic.

Level surface on a quiet street

Venn Street, Lambeth

This can usefully be applied to crossing locations, where the contrast in surface material might serve the dual purpose of highlighting the crossing as well as suggesting to vehicles that they should slow, even when they are allowed to move through the crossing area. In this way, a 'suggestion' of a raised table may be provided without any vertical deflection.

Minimal kerb upstands – Byng Place, Camden and Church Lane, Leytonstone

Imprint surfacing used for calming effect at pedestrian crossing at Kingsland High Street

3.5 Physical traffic calming

3.5.1 General principles

Speed reduction through 'psychological' measures are preferred for most circumstances. 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.

Cyclists are susceptible to being destabilised by abrupt changes in road surface level or being made to deviate sharply from their course. This is particularly uncomfortable or painful for disabled cyclists. For those reasons, methods of traffic calming that are a problem for cyclists should be avoided. This includes:

- Vertical deflections such as rumble-strips or steep humps that destabilise cyclists or force them to lose momentum
- Sharply-angled footway build-outs that require cyclists to deviate abruptly from a direct path
- Destabilising ramp surfacing material, eg bumpy or slippery surface
- Central islands where pinch-points are created (see section 5.2.8 for more information on the use of islands as refuges for pedestrian crossings)

Note that central hatching, which is often necessary to protect traffic islands, should not otherwise be used as a speed control measure, as it typically leads motorists to drive closer to kerbside cycle lanes.

> Speed control measures should not: direct vehicles or pedestrians into the path of cyclists or vice-versa, make cyclists deviate sharply from their course, destabilise cyclists, force cyclists to stop or significantly lose momentum, or increase cyclists' anxiety or discomfort.

The preferred forms of physical traffic calming in support of cycle infrastructure are:

- Use of raised entry treatments and raised tables to slow turning movements
- Forms of narrowing set out in the section above (including the use of parking)
- Selected types of horizontal calming, such as build-outs and traffic islands – but these should be used with caution because of their localised effects on width and, therefore, passing distances

Vertical traffic calming should only be used where other forms of calming are not deemed adequate to bring down speeds. Raised entry treatments, raised tables and road humps must always have a sinusoidal or shallow profile.

Legal requirements relating to vertical traffic calming features are set out in the Highways (Road Humps) Regulations 1999. Advice on their use is given in DfT's Local Transport Note 1/07: Traffic Calming.

3.5.2 Raised entry treatments and raised tables

Research has shown that raised entry treatments have significant safety benefits for cyclists, particularly where provided in conjunction with other street enhancements. A reduction of around 30 per cent in cycle collisions was found at over 1,000 sites in London. (TRL report PPR092: Effect of Side Raised Entry Treatments on Road Safety in London, 2007).

Raised 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. Where a cycle route crosses a main road that is also well used by cyclists, a balanced view needs to be taken of the benefits they offer to cyclists moving in one direction relative to the downsides for those moving in the other.

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)

Raised entry treatments

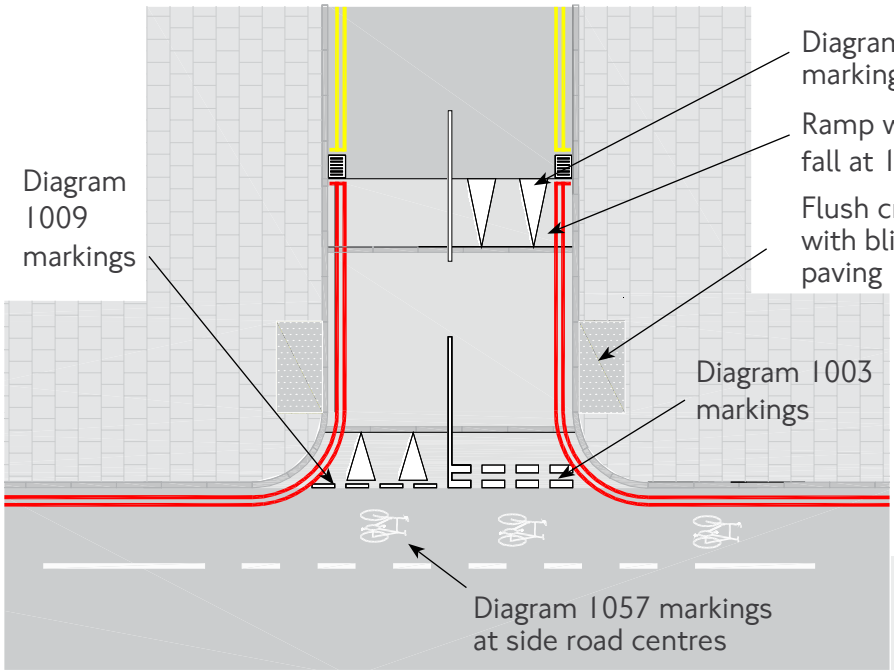
To provide the highest levels of service for cyclists, and to encourage motorists to make careful turning movements into and out of side roads, raised entry treatments may:

- Narrow the side-road carriageway to between 5.0 metres and 6.5 metres
- Use a corner radius of kerb-line below 3.0 metres – see section 5.1.4 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 or shallow 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 3 metres width with blister tactile-paving 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)

- Consider providing cycle stands on footway space created by the entry treatment where demand for them is reasonably anticipated, allowing for considerations of visibility: these can help deter vehicles from over-running the footway area

Shallow ramp up to entry treatment, Gresham Street, City of London

Raised table, Mercer Street, Westminster



Indicative layout 3/05: Raised entry treatment

Raised tables

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, provided they are constructed in accordance with the above advice. Like raised entry treatments, junction tables convey to motorists not to expect to have priority over other road users, and to turn with appropriate caution.

Heights

Raised entry treatments and raised tables do not require Traffic Orders but as a form of road hump they are covered by the Highways (Road Humps) Regulations 1999. The maximum permitted height of a road hump is 100mm from the carriageway surface, but DfT advice in Local Transport Note 1/07: Traffic Calming recommends a maximum of 75mm as this gives similar speed reducing benefits while reducing discomfort for vehicle occupants. In order to construct a raised entry treatment flush with the footway, some raising of the carriageway surface in the area leading up to the entry treatment may be necessary.

3.5.3 Continuous footways and cycleways

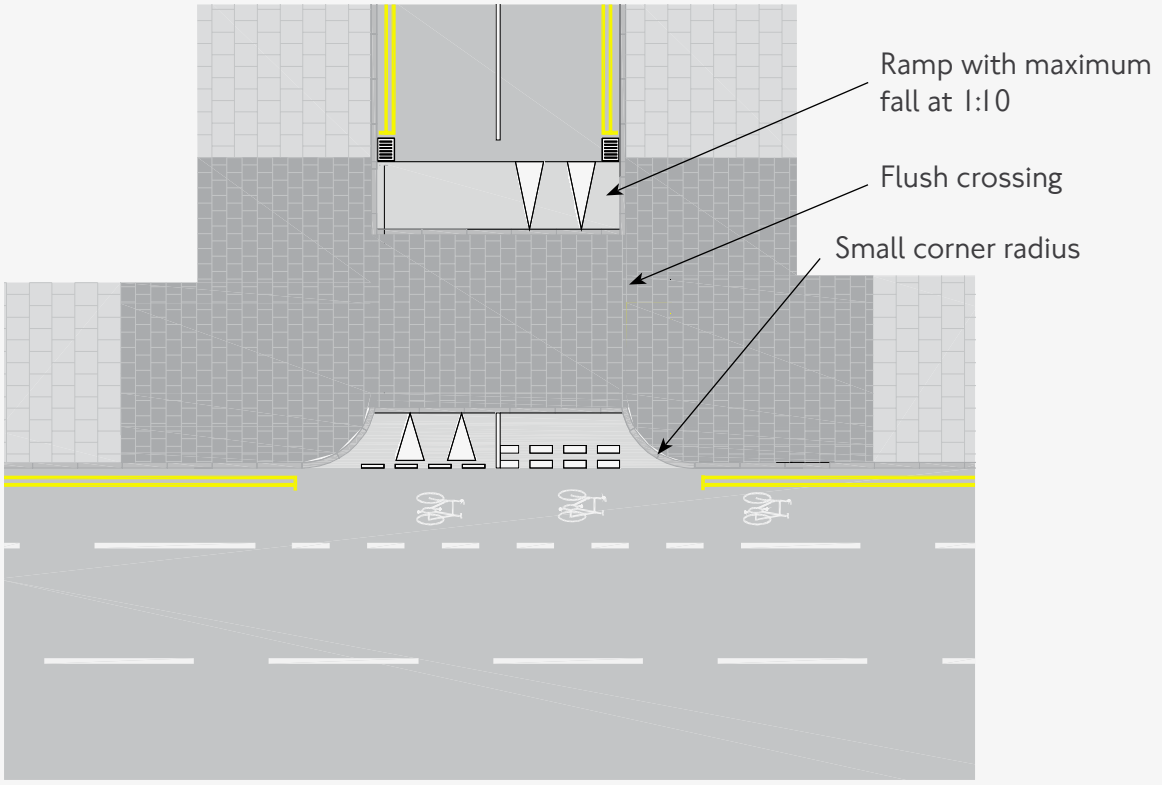
Consideration may be given to continuing footway and cycleway treatments across the mouth of the side road to convey further necessary priority for pedestrians and cyclists. Turning vehicles will need to negotiate a change in level, and they must enter and pass through a zone that looks and feels different and where there is a strong indication they should cede priority to other users. This is not practised often in the UK but has been applied in cities such as Copenhagen and Stockholm. A short dropped kerb section is sometimes provided to enable more comfortable access for cyclists and others.

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 the footway.

Continuous footway treatments in Stockholm. Note the dropped kerb to allow level access by cycle

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

Both of these methods should currently be regarded as experimental in the UK. Further development of the concept is needed, in consultation with access groups, to determine acceptable approaches, given concerns over the lack of delineation between the footway and the area accessible to vehicles that runs over the entry treatment. Any proposal should be subject to an Equality Impact Assessment.



Indicative layout 3/06: Continuous footway treatment

Continuous footway treatments in Lambeth

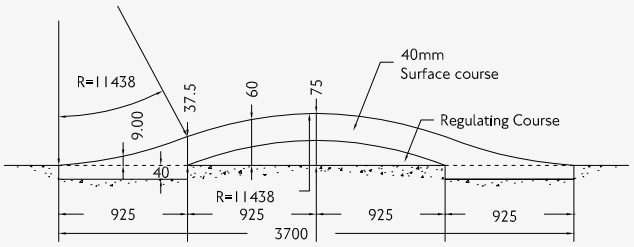
Continuous footway treatment in Hackney

3.5.4 Road humps

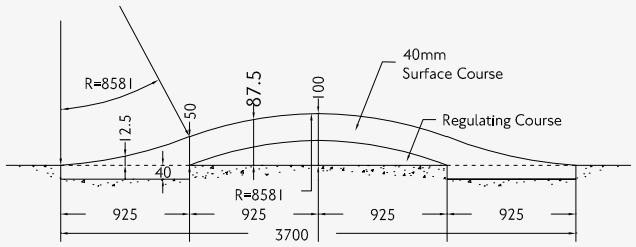
Road humps can be very effective at reducing vehicle speeds but need to be carefully designed so that their presence does not deter cyclists from using the road. Sinusoidal humps allow cyclists to maintain speed and they generate lower levels of vibration than flat-topped humps. Mixed or rough profile on humps must be avoided, as they slow cyclists more than other vehicles. For a shallow humps with level change of 50mm or less, a sinusoidal profile is not required.

Where used, humps should always be cycle-friendly – meaning a shallow or sinusoidal profile.

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.



A. 75mm High hump



B. 100mm High hump

Sinusoidal hump profile

Ramp gradients

Linear ramp gradients should normally be between 1 in 10 and 1 in 20. It is recommended that the new surface of the hump is continued 500mm beyond the ramp into the existing carriageway surface to produce a smoother profile. Steeper gradients 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 humps may be more appropriate. The TfL note BP2/05, Traffic calming measures for bus routes (2005) provides further advice in this area.

Type of flat-topped hump to be avoided

3.5.5 Speed cushions

Speed cushions are not recommended for cycle use, if avoidable, but are often introduced in preference to humps on routes used by buses and emergency vehicles. They rarely have a significant speed-reducing effect on certain wider-based vehicles and on powered two wheelers. Where they are used, they need to be carefully positioned to allow the cyclists to continue on a line that is at least 0.5 metres from parked cars and their door-opening space, and the gap between cushions should be clear of gulleys and 1.5 metres wide.

Parking controls are likely to be beneficial, but where frequent parking adjacent to the cushions cannot be avoided, gaps should fit cyclists' normal alignment. The route for cyclists and powered two-wheelers should be clear and direct, avoiding the need for either to deviate from a direct line.

Careful consideration should be given in placement of cushions to the likely path taken by motorised vehicles: avoid situations where three cushions are aligned so as to induce motorists to straddle the central cushion into the path of an oncoming cyclist. Similarly, the relative positions of speed cushions and traffic islands can, if poorly designed, create uncomfortable close passes between motorists and cyclists by forcing cyclists to the kerbside when they would better served taking a primary riding position.

The safety and comfort of cycle trailers and non-standard cycles (including tricycles and handcycles) must be considered when specifying cushions. Unless a nearside gap of at least 1.5 metres 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 and the ramp profile on the cushion needs to meet the same standards as for speed humps.

Gaps between speed cushions are in line for cyclists, reinforced by cycle symbol positioning. However they are not the recommended width apart and would be uncomfortable for users of many types of non-standard cycle

Gaps force cyclists to deviate from their line and into the door-opening space of parked cars

3.5.6 Materials for vertical traffic calming

Bituminous materials are inexpensive, quick to construct and recommended for humps and ramps. In other locations, block-paving tables may give a clearer pedestrian route but need to be well constructed to avoid potentially hazardous deformation when over-run by larger vehicles. Contrasting colour or texture will make the feature more visible and have a greater slowing effect. Good skid-resistance is important particularly where there are turning movements.

Humps and ramps constructed of granite setts are difficult to provide in a way that is durable and cycle-friendly and are therefore not generally recommended. They 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.

3.5.7 Footway build-outs

Footway build-outs at priority junctions may be used in conjunction with raised 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 (see section 5.2.8 for further discussion of use of refuge islands). 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.

For any proposed build-out, remaining one-way widths should be consistent with the guidance on pinch-points provided in section 5.2.8.
For local streets and others in 20mph zones, build-outs can be used that reduce the remaining (two-way) carriageway width to 5.5-6.0 metres.

Footway build-out with contraflow cycle provision

Footway build-out incorporating cycle parking

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