Lancashire - the cyclists' county

A code for planning, designing and maintaining roads and tracks for cyclists

Lancashire County Council

Environment Directorate

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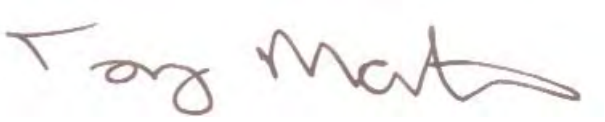
Foreword

I am delighted to see the publication of "Lancashire - The Cyclists' County: A code for planning, designing and maintaining roads and tracks for cyclists". Cycling has an important role in the county's transport system. I want Lancashire to be the best place in the country in which to cycle.

Cycling has a key part to play in combating congestion, improving accessibility and reducing pollution in Lancashire. It can help improve people's quality of life and help enable development on a more human scale. Cycling also has important health benefits. In rural areas cycle tourism can help support local businesses.

To achieve our target, cycle use in Lancashire is given a high priority in the planning of our transport systems and in new developments. New developments should have easy cycle access and be laid out to favour cyclists. Road design should seek to help the flow of cyclists. Public Transport Interchanges should have good cycle access and cycle parking. Cycle paths need to be designed and built to a high standard. Innovation is also important. The new guidelines will show designers and planners how to achieve these aims.



County Councillor Tony Martin

Cabinet Member for Sustainable Development

Copies of these guidelines may be obtained from:

Cycling Officer (Tel: 01772 534609)
Environment Directorate
Lancashire County Council
PO Box 9
Guild House
Cross Street
Preston
PR1 8RD

cycling@env.lancscc.gov.uk

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Principal author: John Parkin, The University of Bolton, MVA

Other authors: Michael Kitching, MVA
Andy Skinner, MVA

Graphic Design: Sarah White, MVA

Cover Photograph courtesy Jon White

Steering Group:

Alasdair Simpson,	Lancashire CC
Robin Field,	CTC, LCAG
Roland Graham,	Cycling Projects
Matthew Hargreaves,	Hyndburn BC
Roy Potter,	LCAG, CTC
Pat Douglass,	Wyre BC/Sustrans
Dick Follows,	Dynamo

We also acknowledge the help of Alex Sully of the English Regions Cycling Development Team and Tony Russell of the CTC.

Whilst strongly backing the guidelines overall, Lancashire Cycling Action Group does not endorse the recommendations in every detail.

Lancashire County Council accepts no responsibility for the use of the guidelines by other highway authorities.

Preamble

This code for planning, designing and maintaining road and tracks for cycle traffic is to be used in the disciplines of:

- town and land-use planning;
- transport planning;
- development and tourism promotion;
- development control;
- traffic engineering;
- highway design; and
- highway maintenance.

The code specifies the policies for the creation of cycle friendly infrastructure at the planning, feasibility, new build and maintenance works stages in the County of Lancashire. They provide for cyclists, tricyclists, tandemists, cyclists with trailers and other vehicles propelled by muscle power. Disabled users of wheelchairs and self propelled 2, 3, or 4 wheeled vehicles are also provided for.

If there are problems with complying with these guidelines, then advice should be sought from Lancashire County Council's cycling development team.

THESE GUIDELINES APPLY TO ALL ROADS (EXCEPT MOTORWAYS) AND CYCLE TRACKS IN THE COUNTY BOTH ON HIGHWAY AND OTHERWISE.

THE GUIDANCE OFFERED SHOULD BE FOLLOWED BY ALL AGENCIES, INTERNAL AND EXTERNAL TO LANCASHIRE COUNTY COUNCIL, RESPONSIBLE FOR TRANSPORT IN THE COUNTY.

Amendment Record Sheet

Amendment Record Sheet

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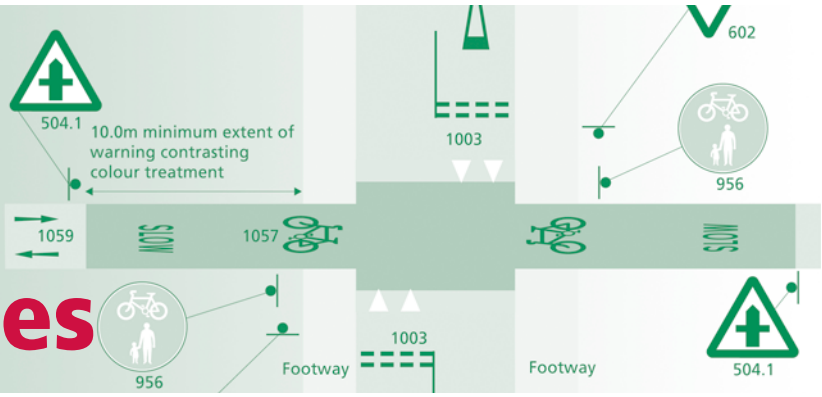

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Glossary

The words **"legal"**, **"engineering"** and **"planning"** after the terms indicate the context of the meaning described.

Adjacent use (Planning): cycle facilities that are adjacent to a pedestrian route but segregated from it.

Bridleway (legal): means a right of way on foot, to ride or lead a horse and to drive animals. There is also a right to ride a pedal cycle but right of way must be given to other users.

Byway open to all traffic (BOAT) (legal): route that carries footpath, bridleway and vehicular rights, usually unsurfaced.

Carriageway (engineering): that part of a highway used by vehicles (that is pedal cycles and other wheeled traffic).

Cycle (legal): means a bicycle, a tricycle, or a cycle having four or more wheels, not being in any case a motor vehicle (S192 of Road Traffic Act 1988). An electrically assisted pedal cycle is not treated as a motor vehicle (S189(1) Road Traffic Act 1988).

Cycle lane: Advisory Cycle Lane (engineering): cycle lane indicated by broken white line that allows motor vehicles to cross if necessary and park if not so restricted.

Cycle lane: Mandatory Cycle Lane (engineering): cycle lane on a carriageway indicated by a solid white line and motor vehicles may not cross into the cycle lane.

Cycle path (planning): imprecise term for way with no legal status, commonly used to indicate a route that is created by licence or permissive access agreement.

Cycle track (legal): right of way constituting or comprised in a highway, being a way over which the public have right of way on pedal cycles with or without a right of way on foot. May physically comprise all of a footway (un-segregated), or be one part of a footway (segregated), or not be part of a footway at all. Note that pedestrians may still have right of way even across cycle tracks that are segregated.

Footpath (legal): means a highway over which the public have a right of way on foot only, not being a footway. Use of a bicycle is a trespass against the landowner. Usually unsurfaced.

Footway (legal): means a way comprised in a highway which also comprises a carriageway, being a way over which the public have right of way on foot only. It is a traffic offence to cycle on a footway.

Highway (legal): a way over which the public has the right to pass and repass, may be any way, court, alley, footpath, bridleway.

Off-carriageway (engineering): used to describe a specific cycle facility not on the wheeled traffic carriageway of a highway.

On-carriageway (engineering): used to describe a specific cycle facility on the wheeled traffic carriageway of a highway.

Pavement (engineering): the engineering material used to form the structure and surface of footways, cycle tracks and highways etc. (Note: despite common usage, "pavement" in these guidelines does not refer to a footway).

Permissive routes (legal): routes that may be used by permission of the landowner. These may, for example, be routes through a park where the relevant local authority committee has permitted pedal cycle use.

Restricted byways (legal): all Roads Used as Public Paths (RUPPs) are re-designated as restricted byways under the Countryside and

Rights of Way Act 2000 and will have rights of way on foot, pedal cycle and for horse riders and horse drawn carriage vehicles.

Shared use facility (planning): cycle facilities that are not segregated but comprise surfaces "shared" by pedestrians and cyclists but not motor vehicles.

Traffic free route (Planning): a loose term used to describe routes that are not in a carriageway. They may include routes in forests, parks, along towpaths and old railway lines and may be permissive routes or BOATs, bridleways, restricted byways or cycle tracks.

Section 1: Philosophy

1.1 General Principles

1.1.1 The bicycle and the rider

1. The bicycle is a **vehicle** and it is driven and powered by the cyclist.
2. The cyclist needs to develop sufficient skill to handle the vehicle and to operate it on the road network.
3. The cyclist is subject on the highway to usual legal and highway code regulations and advice.
4. There is no equivalent regulation and advice for cycling off-highway. Consequently good design and construction specifications are needed for off-highway routes to assist in overcoming this lack of advice.

1.1.2 The purpose of guidelines

1. The guidelines provide a readily usable reference guide for professionals and others involved in highway engineering generally, and cycle traffic infrastructure engineering and planning in particular. They are to be used in Vulnerable Road User Audits.
2. They should be used to adapt existing and develop new infrastructure to an appropriate standard where required for cycle traffic.
3. Their use should assist in increasing the competitive advantage of cycling by minimising journey times and by creating more comfortable conditions.
4. Overall they should assist in increasing the proportion of the population feeling readily able to make a positive choice to use the bicycle.
5. The guidelines also help to ensure maintenance is undertaken appropriately and is considered during design.

1.1.3 Attitudes to cycling

1. A detailed questionnaire of 650 people and a small number of questions in a nationally representative sample of 3000 (TRL Report 481) demonstrated that the greatest increase in cycling could be achieved by promoting its convenience and the fact that cycling can provide fast door to door journey times.

Table 1.1.1 Types of UK cyclist

Regard of Cycling	Percentage of Population
Committed cyclists	7%
Regular cyclists	8%
Occasional cyclists	15%
Do not think of it	18%
Unconvinced / no-need or other regard	52%
Total	**100%**

Source: TRL Report 481

1.1.4 Speeds and competency

1. Cyclists' speed on the flat can vary from walking pace to around 20 mph. Many cyclists travel at between 20 mph and 30 mph on steep or long downhill sections.

Some cyclists will wish to travel as fast as possible with as few stops as possible. Others may wish to progress at a slow pace. Design needs to accommodate this range in speed.

2. Just as general highway design guidance assumes a level of competence for highway users, design guidance specifically for cycling assumes a level of competence also. This applies equally to child and adult cyclists.

1.1.5 Types of provision

1. Different sections of the cycling community have different views about provision of cycle friendly infrastructure. Some suggest comprehensive routes off the highway, others suggest the optimum network is available on-carriageway.
2. These design guidelines seek to provide advice on how to minimise time and effort in cycling for any given journey.
3. The type of provision needs to be appropriate for the route and be comfortable for cyclists (See Tables 2.2.1, 4.2.3 & 4.2.4).
4. If routes are on the carriagway, traffic can influence the level of comfort a cyclist feels. The environment can be noisy and air quality poor and traffic moving at different relative speeds to the cyclist can engender fear.
5. Safety still needs to be considered on traffic free routes and traffic free does not mean accident free. While the surroundings may be more pleasant, great effort needs to be placed on appropriate designs to minimise cycle-cycle and cycle-pedestrian conflicts.
6. Crossings of highways, particularly if not controlled, can pose difficulties also.

1.1.6 Criteria

Many practitioners follow the established requirement first defined in the Dutch cycle design manual (CROW, 1993):

Coherence: links all departure and destination points of cyclists.

Directness: as direct a route as possible.

Attractiveness: designed and fitted into the surroundings.

Safety: improves safety for cyclists, including personal safety.

Comfort: quick and comfortable flow for bicycle traffic.

These criteria are further expanded below as a series of actions to maximise and minimise:

Maximise:

- advantage to cycle traffic;
- the speed range over which it is comfortable to cycle;
- accessibility for cycle traffic using the network; and
- integration with public transport.

Minimise:

- journey times;
- the number of stops required;
- the number of cycle give ways required;
- the gradient required to ascend and descend; and
- obstacles and barriers along a route.

1.1.7 Factors to consider

1. In line with Cycle Friendly Infrastructure (IHT, 1996) the following solutions, or combinations of them, should be considered:
   - traffic reduction (volume reduction);
   - speed reduction;
   - junction treatment and traffic management to help cycle traffic;
   - allocation of the carriageway width;
   - provision of cycle lanes; and
   - provision of cycle tracks.
2. It is difficult to achieve overall traffic reduction in an area, but it is possible by

reducing traffic on one road to improve conditions for cyclists on that road. Low speeds and traffic calming are generally acceptable to the public on minor roads, but speed limits lower than 30mph on main roads are not. Measures that prioritise cyclists that result in delays to motorists are not likely to be popular with the public.

3. Speed reduction techniques include speed limits, cameras, vehicle activated "SLOW DOWN" signs and traffic calming.

4. Measures to prioritise cycle traffic at junctions include advanced stop lines or cycle stages in the signal cycle.

5. Space can be allocated to cycle traffic using measures such as cycle lanes. Cycle tracks remote from the carriageway can be well used if they provide a short-cut.

6. Lancashire County Council's road user hierarchy can be given real meaning through appropriate use of these guidelines. The hierarchy is:

   - pedestrians, including people with reduced mobility;
   - emergency service vehicles;
   - cyclists;
   - public transport, including community transport and taxis;
   - delivery vehicles; and
   - private motor vehicles.

7. An objective of these guidelines is to promote the appropriate allocation of road space and priority and reduction of motor vehicle speeds to favour cycle traffic, in line with Lancashire County Council's functional road hierarchy strategy.

8. Other relevant design guidance is Cycling by Design (Scottish Executive, 1999a) and National Cycle Network Guidelines and Practical Details (Sustrans, 1997).

1.1.8 Applicability

1. It may be necessary to make changes to policy documents and practices to reflect these guidelines. The guidelines apply to all roads, cycle tracks, bridleways and footpaths for which Lancashire County Council is the highway authority, including those maintained by Districts on behalf of Lancashire County Council. They should be used for any scheme to which Lancashire County Council is contributing cost and it is recommended that they are used on other roads, cycle tracks and paths in the county.

2. Innovative measures that are not included in these guidelines would also be considered if they have been successfully used elsewhere.

3. Statutory undertakers need to comply with these guidelines in the work that they undertake in the highway.

4. Developers and their agents will need to refer to these guidelines.

5. These guidelines will assist in the completion of Vulnerable Road User Audits.

6. Where it is difficult to meet the recommendations of these guidelines, designers should carefully balance different users needs giving priority to the needs of those at the top of the hierarchy. Designers may need to consider whether a sub-standard measure is better than no measure at all, but should recognise that sub-standard measures can cause more problems than they solve. In such instances it is recommended that designers consult the county's cycling team.

Section 2: Design Principles

2.1 Design Speeds

2.1.1 Design speeds and geometry

1. Design Manual for Roads and Bridges TA90/05 (DfT, 2005) provides some information for the design of cycle path links constructed in connection with trunk road schemes. Where motor vehicles are not present, for example, off-carriageway provision, the adoption of design speeds appropriate to cycle traffic will assist in specifying appropriate geometry.

2. Choice of design speed will depend on assumed principal types of user. Cycle tracks and other traffic free routes used for commuting and other utility riding shall normally be to a design speed of 30 kph. Reductions to "one-step below" design speed of 20 kph are acceptable, but should be avoided at certain locations, for example radii tighter than 39 metres should be avoided at the bottom of gentle gradients. The 40 kph design speed is provided for information but may be of relevance when considering downhill sections. For leisure routes it may be quite acceptable to adopt a 20kph design speed.

Table 2.1.1 Geometric design parameters

Design Speed kph	40	30	20
Design Speed mph	25	19	12
Stopping Sight Distance (m)	64	40	22
(DMRB preferred minimum		30)	
Horizontal radius (m)	70	39	17
(DMRB preferred minimum		25)	
Vertical curve crest K value	9.1	8.2	3.4
(DMRB minimum crest K value		5.0)	
(DMRB minimum sag K value		1.6)	
Full overtaking sight distance (m)	217	156	94

Notes

1) Assumes co-efficient of friction of 0.18 and angle of lean of cyclist limit to 10°. Superelevation will not significantly affect these radii and hence camber for drainage should determine the crossfall.

2) Where a cyclist is expected to slow down (e.g. on theapproach to a subway), the design speed may be reduced to 10Kph over short distances with the use of SLOW markings. At 10Kph Stopping Sight Distance is 10 metres and the minimum radius 4 metres.

3. Stopping sight distance is based on comfortable deceleration at 0.15g. The visibility envelope should encompass everything from cyclists eye height (95% of which are less than 1.81 metres) to the road surface.

4. Horizontal radii are based on similar formulations as for motor vehicles. Junction radii are given elsewhere.

5. The vertical curve crest K value multiplied by the difference in gradient gives the length of a vertical curve and is based on the stopping sight distance criterion.

6. Full overtaking sight distance is based on usual accepted highway principles. Note that at lower speed cycle traffic readily interacts, it is only at higher speed that the issue becomes relevant.

7. Note that it is not possible to impose speed limits other than 20mph, 30mph and above on UK highways. It should be noted that on cycle tracks, cycle traffic may readily cycle at speeds greater than 20 mph.

8. Consideration should be given to using slow markings and warning signs as appropriate on cycle tracks.

2.1.2 Gradient

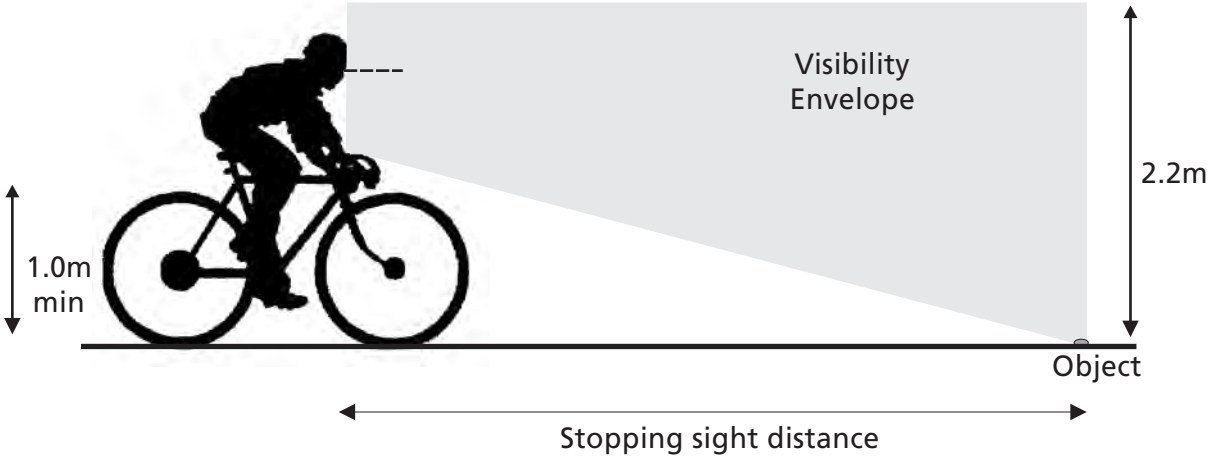
1. A gradient of 3% is comfortable and hence should be regarded as a desirable maximum. (Note that a power output of 75 watts and a minimum speed of 5mph would imply a gradient of 2.4%). Up to 6% a gradient remains possible for most people over short distances of 100 metres or so. Gradients of more than 6% should be avoided where possible, for planned cycle routes but, for short essential links, modern gearing (and recently power-assisted cycles) enable much steeper slopes to be tackled without much difficulty.

2. At constant power output a gradient of 5% may reduce a cyclists' speed to roughly one third of the speed on the level. Some cyclists may maintain a constant power output, others may respond to hills by increasing their effort to maintain a constant speed. The majority are likely to increase power output and reduce speed to climb a hill. Increased effort is likely to reduce perceptions of comfort.

3. At the base and top of gradients exceeding 2% a level plateau at least 5 metres long is desirable in advance of give way and stop lines.

4. A longer slacker gradient detour to an ascent will always consume more energy and will always take longer for a given power output (as there are greater distances over which the air resistance and rolling resistance have to be overcome).

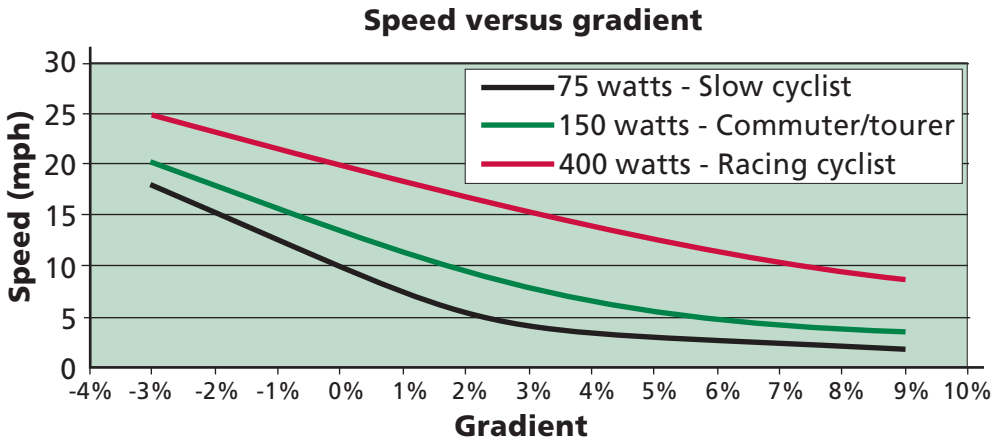
Figure 2.1.1 Cyclists' eye height



Notes

1) Cyclists should be able to see an object at minimum stopping distance from an eye height of 1 metre to 2.2 metres. The object height should be taken from ground level (e.g. a pothole) to 2.2 metres high.

Figure 2.1.2 Speed versus gradient



Nevertheless, such an arrangement may be more desirable for some cyclists who prefer a lower power output.

5. A slacker gradient can be less intimidating and require less bodily stressful effort on the part of the cyclist. (Note that slow leg motion is an inefficient way to produce power, so steep gradients feel much harder work).

6. It is useful to realise that:

   - steeper gradients are better at the bottom of a rise, slackening off near the top; and
   - plateaux at the bottom of a hill on a descent are appropriate before junctions, bends etc.

7. Uphill and downhill gradients have important consequences for the design and use of road space. Uphill cyclists cannot maintain traffic speed, cannot look back easily and are more unstable. In particular they must not be expected to tackle pinch points or other difficult manoeuvres (See Table 4.1.1). Downhill it will be easier to mix with general traffic but the consequences of a collision are greater. Cycle lanes, if provided, should have extra width with no abrupt manoeuvres or pinch points.

8. On down hill gradients cyclists stopping sight distance increases. Obstacles and sharp bends should be avoided at the bottom of long/steep gradients.

9. Wind has a severe effect on speed. Consideration should be given on coastal routes and other exposed routes to the prevailing direction of the wind and bunds, walls, fences and landscaping that could mitigate its effects. Effects may be particularly pronounced at discrete locations such as promontories and crests or bends on hills or minor roads leading into large junctions.

2.1.3 Headroom

1. For obstacles longer than 23 metres, a minimum headroom of 2.7 metres should be provided. For shorter obstructions such as signs, this may be reduced to 2.4 metres. Where 2.4 metres headroom can not be provided cyclists should be advised to dismount.

2. For ridden horses desirable headroom is 3.4 metres and absolute minimum headroom is 2.8 metres. Where horse riders have to dismount signs and mounting blocks should be provided.

2.2 Network Engineering

2.2.1 Principles

1. Provision for cycle traffic is more than the construction of specific measures. The needs of cycle traffic should be catered for in the design of all traffic management and highway improvement schemes. Cycle Review procedures and, specifically for proposed schemes, Vulnerable Road User Audits will assist in this process.
2. Most cycling in urban areas is on the carriageway and will remain so. However, traffic management schemes designed to control motor traffic often produce inferior routes for cycle traffic.
3. In many circumstances significant reductions in journey times can be achieved for cycle traffic by short sections of route that make essential connections that are inappropriate or impossible for motor traffic.
4. Sometimes this may mean crossing or running onto a footway converted to cycle track for a short section. Great care must be taken not to inconvenience pedestrians or slow cycle traffic to an unreasonable extent.
5. Development control should ensure that roads in new developments are designed to take into account the needs of cyclists and that internal layouts (e.g. to supermarket car parks) allow for safe and convenient progression of cycle traffic from the entrances to the allocated cycle parking facility (see section 7).

2.2.2 Route types

1. Cycle route density is created principally by the existing highway network. It is helpful to have a high density of routes for cycle traffic.
2. Depending on context, it may be useful to consider the cycle network as comprising three types of route:
   - **Main-Road Routes** which may include all distributor roads;
   - **Minor-Road Routes** to provide additional permeability and a more pleasant environment; and
   - **Off-road Routes** for recreational use and essential connections.
3. There may be widely varying priorities for the implementation of routes. Priorities may depend on wider social policies, but it is important to provide for a high proportion of complete journeys to be made by bicycle in the short term. It is also important to have a long-term plan, so that sections of routes that can be fortuitously and economically implemented with other developments are incorporated in them.
4. The features of the **Main-Road Routes** would be direct alignments principally on-carriageway with limited time delays at congestion spots. Proposals for improvement on the Main-Road Routes should address delay issues and promote enhanced priority. Many of the Main-Road Routes may also have priority measures for buses. Other facilities, specifically for cycle traffic, may include cycle lanes to access advanced stop lines.
5. Measures on **Minor-Road Routes** would be most likely to consist of traffic calmed roads, other lower speed connections and 20 mph zones. Good crossings of major roads are very important in establishing these routes. They must be comprehensive and could extend over long distances. Direction signing to ensure route visibility will be essential.
6. Routes should extend to ultimate destinations where parking facilities are provided. At building entrances, for example, these should not normally be further than 20 metres from the main entrance (see section 7).
7. Main-Road Routes may be cycling "Proactive", "Friendly" or "Neutral" in the terms of IHT (1998) cycle audit and cycle review. Signed cycle routes will always be "Proactive".

Table 2.2.1 Types of provision

	Applicability	Advantages	Disadvantages	Comment	See also
On-carriageway (with or without cycle lanes)	• most urban situations; • rural lanes /minor roads; • the basic cycle network.	• visibility to drivers; • flexible, comprehensive network; • direct, smooth, level, convenient.	• traffic speed and volume; • squeezing at pinch points; • poor driving; • engineering not accounting for cycle traffic; • difficult junctions; • confidence needed; • congestion and delay at junctions.	• overlooked in too many cycling strategies.	Table 4.1.1 Figure 4.1.3 Table 4.2.3
Adjacent to carriageway	• essential connections / bypasses to solve particular problems; • long stretches beside major roads; • where speed / volume / space requirements make within carriageway provision unattractive.	• motor traffic free (except crossing roads and junctions); • can create direct short cuts; • greater feelings of safety?	• conflict with pedestrians / horse riders / disabled; • conflict with passengers waiting at bus stops; • poor visibility to drivers; • giving way and danger at junctions and crossings; • poor surfaces and gradients; • less sweeping, or clearance of snow and leaves usually undertaken; • false sense of security; • poor designs often evident; • encourages footway cycling.	• poor facilities abound; • not an easy option to get right.	Table 4.2.4 Figure 4.1.6 Figure 5.2.1
Away from carriageway	• short links to complete a route; • leisure routes; • routes through parks, green spaces, canals and old railways.	• traffic free; • sometimes direct; • few if any traffic hold ups.	• maintenance (clearing leaves, snow); • poor surfaces; • need for or lack of lighting; • possible conflict with pedestrians, children, dogs and horse riders; • can be indirect; • personal security perceptions; • vandalism if use is low; • gradients often poor /undulating; • ownership and legal situation complex; • connection with surrounding road network can be poor.	• should be to complement the road network and not instead of the road network; • character must be appropriate to intended use.	Table 4.2.4 Figure 4.1.6 Figure 5.2.1 Figure 5.2.3

2.2.3 Essential connections in a network

1. Essential connections need to avoid being "stopped-up" in traffic management and highway schemes. They can also be created where they do not presently exist. Examples of avoiding loss of connections include:
   - exemptions for banned turns;
   - exemptions to one-way streets, i.e. contra-flow cycle lanes;
   - cycle use of bus lanes;
   - progression through culs-de-sac to adjoining streets;
   - use of vehicle restricted areas;
   - toucan crossings across major roads; and
   - essential links preserved through development sites.
2. Examples of creating essential connections include:
   - well defined cycle tracks across pre-existing pedestrianised areas;
   - timed access to cycle traffic in pedestrianised areas. Access would usually be co-temporal with any loading and unloading activity, otherwise before 10 am and after 4 pm to allow for the commuter peak;
   - adapting existing subways;
   - routes across parkland;
   - using what are otherwise footbridges over obstacles such as rivers or railways;
   - constructing bridges over rivers and railways etc.;
   - using ginnels and passageways (recognising any personal security implications); and
   - preservation and enhancement of permeability through development sites.
3. All of the above require **local knowledge**, **imagination** and some **determination** to see through any legal processes required.
4. Direction signing of cycle routes, particularly where there are convenient essential connections that may easily be missed, is an essential feature of provision.

Table 2.2.2 Issues to consider between on-carriageway and off-carriageway provision

Factor	Cycle traffic on-carriageway ⟷	Cycle traffic off carriageway
Motor Traffic volume	lower ⟷	higher
Traffic speed	lower ⟷	higher
Cyclist type	experienced ⟷	less experienced
Carriagway width	wider ⟷	narrower
Number of junctions and accesses	higher ⟷	lower
Pedestrian flow	higher ⟷	lower
On street parking	lesser ⟷	greater
% HGV	lower ⟷	higher

Notes

1) See also Section 4, particularly figures 4.1.6 and 4.1.7.

2.2.4 Road Hierarchy

1. Cycle provision can also be related to the road hierarchy.

Table 2.2.3 Cycle Provision and Road Hierarchy

Footways divergent from carriagway	Cycling not allowed.	In new developments consider whether they should be cycle tracks rather than from footways.
Cycle tracks divergent from carriageways	Shared with pedestrians.	
Pedestrian Streets	Priority to pedestrians.	Consider allow cycling in pedestrian streets, especially if alternative routes for cyclists are poor and have a poor safety record for cyclists.
Cycle Streets	Through streets for cyclists, but restricted access for motor vehicles.	In a town centre could be the next stage up from pedestrian streets.
Bridleways	Cyclists allowed, but should give way to pedestrians and horse riders.	Where bridleway is promoted both as a horse, cycling and pedestrian route, consider a sealed surface for pedestrians with a stone surface for horses.
Quiet Roads	Minor roads with low vehicle flows and low speeds promoted as walking, cycle and horse riding routes.	
Shared Access Routes Home Zones	Living space. Streets where children can play (including on bikes) in safety.	May not be appropriate to direct through cycle routes through them.
20mph Zones, Traffic calmed streets	Generally attractive to cycle on carriageway.	Tight profiles will generally be acceptable.
Access Roads	Generally attractive to cycle on carriageway.	Tight profiles will generally be acceptable.
Local Distributors (eg Main Housing Estate Roads)	Depending on traffic flows may not be attractive to cycle on a standard width carriageway.	Consider "spacious profile" with Cycle Lanes or off carriageway cycle track depending on traffic flows and speeds.
District Distributor Roads (Broad roads in urban areas)	Will not normally be attractive to cycle on standard width carriageway due to traffic volumes.	"Spacious profile" with cycle lanes or off carriageway cycle track.
Primary Distributors (A Roads)	Will not normally be attractive to cycle on standard width carriageway due to traffic volumes and speeds.	1. Speeds 30/40mph - consider spacious profile with cycle lanes or off carriageway cycle track. 2. Speeds greater than 40mph. Off carriageway cycle track.
Roads of Regional Significance (eg single carriageway trunk roads)	1. Will not normally be attractive to cycle on standard width carriageway due to traffic volumes and speeds.	1. Generally off carriageway cycle track. 2. Cyclists have a legal right to cycle on all A roads including high speed trunk roads therefore need to consider how to provide for them. 3. Some routes of regional significance will also be important urban routes, therefore it is important that cyclists are provided for on them.
Grade separated A Roads	1. Traffic merging and leaving road at slip roads will make it unsafe for cyclists to use the road.	1. Provide a parallel cycle route. 2. Consider slipway crossovers for cyclists. 3. Roundabout associated with grade separated junctions will often cause cyclists safety problems. Consider alternative routes or signalisation.
Motorways	1. Cyclists not allowed.	1. Roundabout associated with motorway junctions will often cause cyclists safety problems. Consider alternative routes or signalisation of roundabouts.

2.3 Safety Facts

2.3.1 Accidents in Lancashire

1. The chart below shows the number of accidents to cyclists plotted against the contributory factors quoted as causing the accident. Of those that are of known cause, or are attributable in some way, the majority (54%) are attributable to motor vehicles (Factors 1-11). When child (under 16 years) cyclist accidents are removed this jumps to 72% attributable to motor vehicles.

2. Causes of child cyclist accidents are predominantly cycling onto or off the carriageway, and emerging from a minor road into the path of a vehicle. There is no substitute for training children to regard highways as places where rules and discipline are required and such training may positively influence a reduction in the numbers of this type of accident.

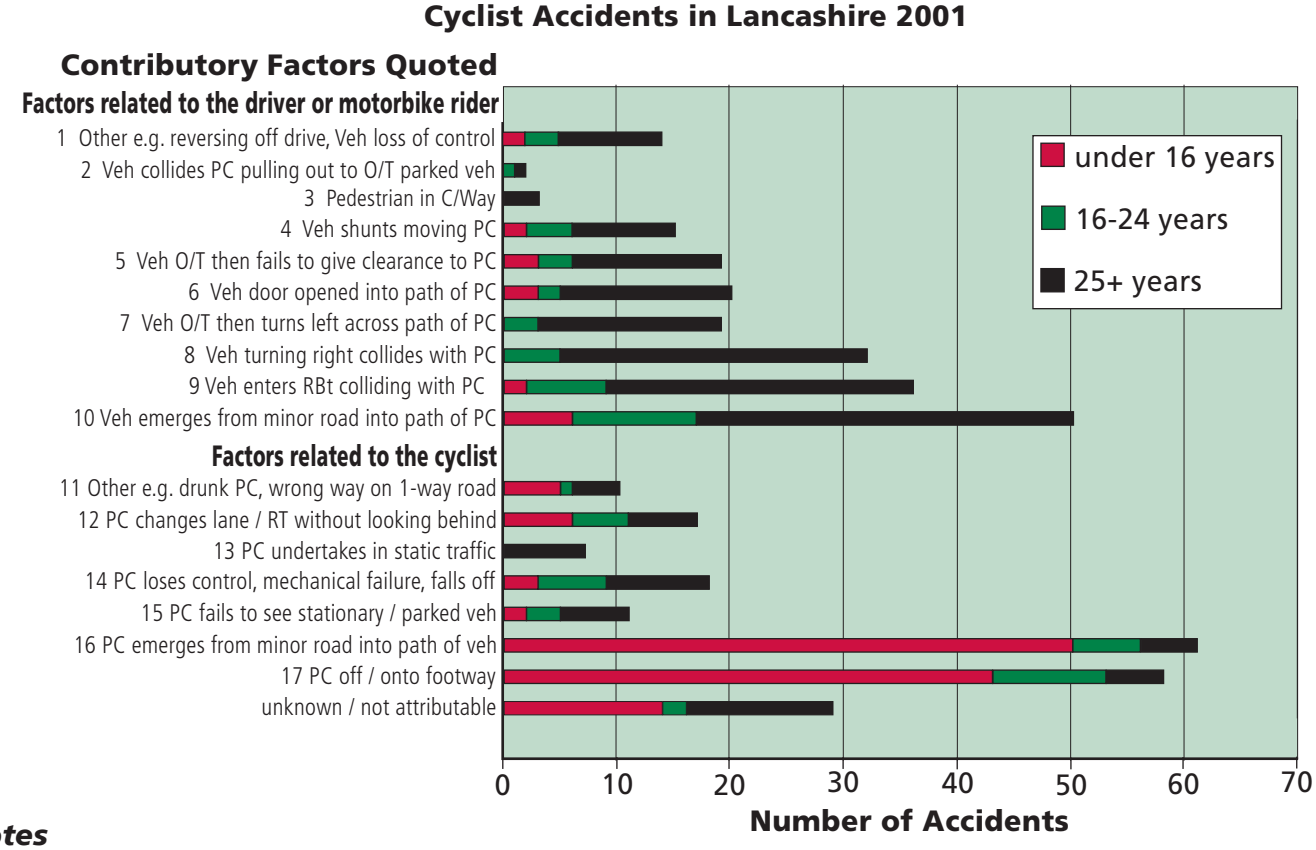
3. So far as adult accidents are concerned the majority (67%) of those accidents attributable to vehicles (factor numbers 8 to 11) occur at junctions. There are few accidents associated with moving traffic along a highway (factor numbers 5, 6 and 14, 14% in both "caused by cyclist" and "caused by vehicle" categories).

2.3.2 Caution and conclusion

1. It should be noted that casualty accidents are under-reported to the police (DfT, 2000b). Of those that are reported, about a fifth do not appear in statistical returns. There is a tendency to underestimate casualty severity and, finally, reporting rates for vulnerable road user groups are lower than the average.

2. An absence of cycle traffic on the highway may be an indication of the level of perceived risk. As a result cyclists may chose not to use that road.

Figure 2.3.1 Cyclist injury accidents in Lancashire 2001



Notes

1) From STATS 19 accident data.

3. The corollary to the above is that measures must not be introduced which could falsely create the impression of greater safety where no such greater safety exists. This may encourage use, but in dangerous situations.

4. Indeed evidence from Europe (Ekman, 1996) suggests that when the level of cycle traffic exceeds a certain threshold, drivers are more likely to expect to see cyclists resulting in a reduction in cycle accidents. 20mph and home zones in areas where young children are likely to be playing on cycles will also help to reduce accidents.

5. Analysis of the contributory factors involved in accidents to cyclists in Lancashire leads to the conclusion that training of child cyclists and attention to design at junctions would lead to the greatest reduction in casualties. Simply cycling along the carriageway should not pose significant risk provided conditions are reasonable, although of course it may be less than pleasant.

6. Appropriate speed reduction, particularly in residential areas may also assist in reducing the child cyclist accident rate.

7. Where the driver is at fault in junction accidents it is often the failure of drivers to see cycle traffic that is the cause. Factors relating to this are:

   - speed of vehicle through junction; for example at roundabouts with little entry deflection or junctions with relaxed radii;
   - entry angles that drivers look through to see traffic over their shoulder;
   - visibility available too far back from the junction;
   - difficulty drivers have in moving away from the junction; and
   - poor visibility at the junction.

8. Drivers are also likely to misjudge the speed of cycle traffic going downhill through a junction.

9. It should be noted that common perceptions of the risk of cycling are not born out by the safety facts presented above.

10. The accident record should not be the only criterion for introducing changes to the road environment (See Section 1.1.6).

2.4 Legal Guidelines

2.4.1 Countryside Act 1968

S30 provides a right to ride a bicycle, not being a motor vehicle, on a bridleway but the cyclist shall make way to pedestrians and persons on horseback.

2.4.2 Highways Act 1980 definitions

General Provisions

Provides power to local highway authorities and to the Secretary of State as a highway authority. These cover provision of new highways, powers of maintenance and protection of public rights on highways etc.

Cycle tracks

S24(2) enables a highway authority to provide a cycle track as highway.

S65(1) empowers a highway authority to construct a cycle track as part of a highway maintainable at public expense which includes a made-up carriageway and to provide street lighting on the cycle track.

S65(2) empowers a highway authority to alter or remove a cycle tack provided under S65(1).

S66(4) empowers a highway authority to remove a footway.

S329(1) defines a cycle track as a way comprised in or constituting a highway with a right of way for pedal cycles with, or without, a right of way of foot.

Footways

S66 places a duty on a highway authority to provide a footway when necessary or desirable for the safety or accommodation of pedestrians.

S75 allows an authority to vary the relative widths of a carriageway and of any footway.

Guard rails etc.

S66(2) provides for the undertaking of specified works on a highway maintainable at public expense which consists of or comprises a carriageway, for the purpose of safeguarding persons using the footway.

S66(3) provides for the undertaking of specified works, on a footpath, for the purpose of safeguarding persons using the footpath.

Subways and footbridges

S69(1) provides for the construction of subways for the use of pedestrians to cross a highway including a carriageway. Any subway can be altered, removed or temporarily closed.

S70(1) gives power to construct, maintain and light pedestrian bridges across highways. Any footbridge can be altered, removed or temporarily removed. This provision applies where part of the bridge falls outside the limits of the highway. Land acquisition powers are also available.

Road humps

S90A-F contain powers for constructing road humps, either as specially authorised by the Secretary of State for Transport, or in accordance with the current Highways (Road Humps) Regulations. For further guidance see Traffic Advisory Leaflet 7/96 Highways (Road Humps) Regulations 1996.

Traffic Calming

The Traffic Calming Act 1992 amended the Highways Act 1980 by the addition of S90G-I that provide for the construction of the main traffic calming features other than road humps. They must either conform with the current highways (Traffic Calming) regulations or be specially authorised by the Secretary of State for Transport. Features currently enabled by the regulations are build-outs, chicanes, gateways, islands, over-run areas, pinch points and rumble devices. For further information see Traffic Advisory Leaflet 7/93.

Lighting

S97 empowers a local highway authority to provide lighting on any highway for which it is the highway authority.

Land acquisition

Part XII contains powers for the acquisition, vesting and transfer of land required for highway purposes.

Stopping-up

S116 provides magistrates' courts with a power to authorise the stopping up or diversion of a highway.

2.4.3 Wildlife and Countryside Act 1981

S53 requires surveying authorities to keep a definitive map and statement of rights of way under review.

2.4.4 Cycle Track Act 1984

Mopeds

S1 removes the right of mopeds to use existing or future cycle tracks.

Motor Vehicles

S2 made it an offence, with specified defences, to drive or park a motor vehicle (including moped) other than a bicycle on a cycle track. Legal advice may need to be sought as pre-existing rights of access for motor vehicles may create conflict. S2 is superseded by S21 of the Road Traffic Act 1988.

Conversion of footpaths into cycle tracks

S3 provides a procedure under which all or part of a footpath can be converted to a cycle track under an order made by the highway authority and confirmed by them if unopposed. If the order is opposed, confirmation by the Secretary of State contingent on a public inquiry or written representations is required.

Barriers etc.

S4(1) empowers authorities to provide and maintain barriers on a cycle track.

S4(2) empowers authorities, where a cycle track is adjacent to a footpath or footway, to provide and maintain such works as they consider necessary to separate, in the interests of safety, cycle track users from those using the footpath or footway.

S4(3) empowers authorities to alter or remove any works provided under subsection (1) or (2).

2.4.5 Road Traffic Regulation Act 1984

General provisions

Covers traffic regulation orders, parking place orders (including the provision of stands and racks for bicycles) compulsory purchase powers and traffic signs.

S122 imposes a duty upon local authorities to secure the expeditious, convenient and safe movement of vehicular and other traffic, and the provision of suitable and adequate parking facilities on and off the highway.

Traffic Regulation Orders

S1 allows traffic authorities to make traffic regulation orders which include prohibiting any class or classes of traffic from streets, or parts of streets, either generally or at specific times.

S9 allows local authorities to make experimental traffic regulation orders. Such experimental orders are limited to a maximum period of 18 months.

Parking places

Part IV of the Act enables local authorities to provide off-street parking places for vehicles, and, by order, to authorise use of any part of a road as a parking place. These powers are extended under S63 of the Act to enable local authorities to provide, in roads or elsewhere, stands and racks for bicycles. A schedule needs to be maintained of cycle racks in the highway.

Traffic signs

S64 and S65 contain general provisions regarding traffic signs, including traffic signals and tactile markings. Traffic signs must comply with the current Traffic Signs Regulations and General Directions, or be specially authorised on behalf of the Secretary of State for Transport.

Bollards and other obstructions

S92 gives authorities powers to erect bollards and other obstructions, to give effect to a traffic regulation order made under either S1 or S9.

2.4.6 Town and Country Planning Act 1990

General provisions

Provides powers for local planning authorities, a duty to prepare structure and local plans and powers to grant planning permissions.

Development

S55 excludes the following as development: where a Highway Authority carries out works for maintenance or improvement within the boundaries of the highway, unless, where they are not exclusively for maintenance, this includes any works which may have significant adverse effects on the environment.

Stopping-up

S247 gives the Secretary of State powers to stop-up highways for the purposes of development.

Extinguishment of vehicular rights

S249 covers orders to extinguish vehicular rights (with or without exceptions to classes of vehicles), made by the Secretary of State.

2.4.7 Environmental Protection Act 1990

While not a Highway Authority function, S89 requires local authorities and local highway authorities to keep the highway clear of litter and clean. For further information see the Secretary of State's code of practice at www.defra.gov.uk/environment/localenv/litter/code/index.htm.

2.4.8 Countryside and Rights of Way Act 2000

S47(2) "road used as a public path" shall be treated instead as a "restricted by-way".

S48(4) a restricted by-way has rights of way on foot, horseback or leading a horse and vehicles other than mechanically propelled vehicles under the Road Traffic Act 1988.

S50 Private vehicle rights in addition to public rights of way may obtain on restricted by-ways.

2.4.9 Transport Act 2000

S268 allows a local traffic authority to designate a road as a quiet lane or a home zone. This may be done by use orders and speed orders but these powers have not yet been introduced.

S268(3) A use order is an order permitting the use of a road for purposes other than passage.

S268(5) A speed order is an order authorising the local traffic authority by whom it is made to take measures with a view to reducing the speed of motor vehicles or cycles (or both) on a road to below that specified in the order.

2.5 Cycling Benefits

2.5.1 Benefits

1. Promotion of cycling can create switches in mode choice away from private motor vehicle. Such mode share changes would result in **time savings** accruing to general motor traffic and to individuals who may find their individual journeys quicker and/or less costly by bicycle. Cycling can help reduce congestion and the need to invest in more expensive transport modes.
2. A further benefit of cycling is linked with increased general **health and fitness** which has personal benefits as well as economic benefits for the nation in terms of health service costs.
3. Employers will benefit from a workforce that is healthier and stress free and there is some, but growing evidence of less absenteeism amongst cyclists. Cycle parking takes up less land space allowing land to be used for other purposes.
4. There are environmental benefits in terms of **reduced pollution, noise and severance** as a result of fewer motor vehicles.
5. The bicycle is more affordable than the car and hence there are **social equity** benefits to the promotion of cycle traffic. Cycling allows people without cars to reach destinations that they might otherwise be unable to reach.
6. Particularly in more rural areas, routes may stimulate activity not present beforehand. Such activity may broadly come under the umbrella of **tourism** and could be significant. Surveys show that cyclists spend more than motorists in local shops, pubs and small businesses. There is also evidence that, as well as supporting existing business, new businesses are created.

2.5.2 Costs

1. There can be significant costs of provision for cycle traffic, particularly for routes away from the carriageway where large structures and earthworks may be being re-used, for example on old railway alignments.
2. Consideration needs to be given in the early stages of any design scheme to significant engineering costs that may emerge.
3. Similarly, provision of new schemes can create a requirement for changed maintenance regimes. These may have cost implications and again should be considered by the designer in consultation with the relevant maintaining agency. This may be a highways department, or, for example, a parks department.
4. Compared to other transport schemes, cycle schemes are relatively low cost.

Section 3: Creating Pleasant Road Conditions

3.1 Principles

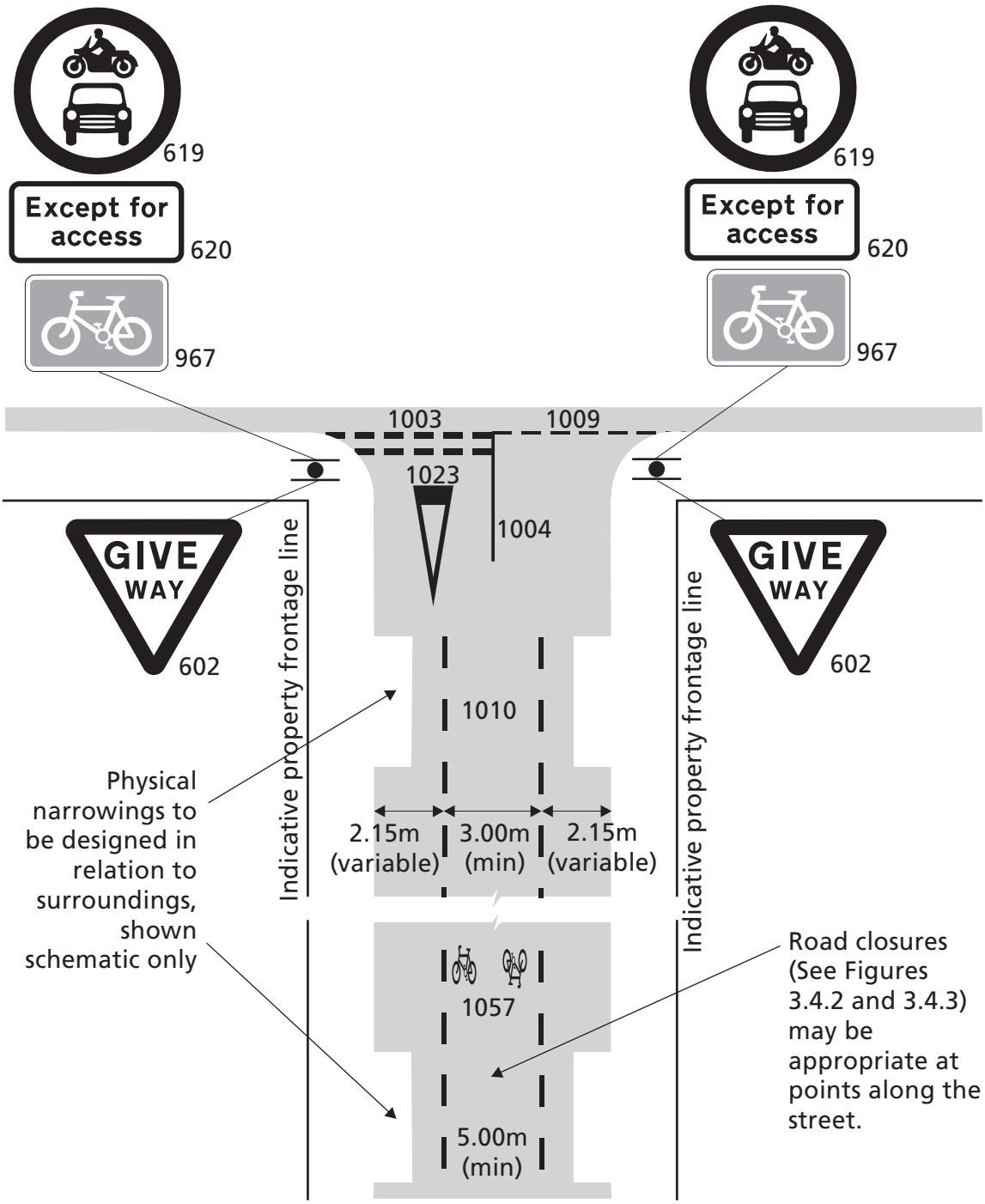
3.1.1 Coverage

1. This section deals with a wide range of issues to make routes more direct and pleasant for cycle traffic. The intention is to create greater permeability and advantage for the cyclist.
2. Traffic management methods suggested include:
   - **Restricted Access streets**: streets for through cycle traffic but restrict motor traffic to access only;
   - **Exemption from one-way streets**: streets that are one way for general traffic but allow two-way bicycle traffic;
   - **Network permeability for cycle traffic**: street patterns that have dead ends for general traffic but not for cyclists; and
   - **Networks in non-motorised areas**: Permission to ride in pedestrian areas.
3. Other schemes that may broadly be considered as traffic management, for example use of bus lanes on cycle routes, or specific facilities at traffic signal junctions, are dealt with in other sections.
4. Measures presented in this section should be pursued in their own right to promote cycling, and may also be promoted as part of general traffic management schemes in an area.
5. Measures in this section may form essential connections as described previously, and should have appropriate direction signing.
6. Networks created by the above methods should create comprehensive networks and not dead ends or a need to dismount.

3.1.2 Reduction and restraint

1. Traffic reduction and restraint will assist in making conditions more pleasant for cyclists.
   - **Traffic restraint**, managing the demand for journeys by motor vehicles to within the notional capacity of the existing road network;
   - **Traffic management**, managing traffic onto the most appropriate routes requires strategic thinking. All traffic management decisions affect cycle traffic and should be taken with a view to increasing the geographical permeability and other advantages for cyclists.
2. Traffic restraint measures include:
   - creation of Home Zones or 20mph Zones that limit the attraction of a street for motor traffic, but maintain permeability for cyclists;
   - use of traffic regulation orders to limit accessibility to streets by certain types of motor vehicle;
   - restriction on parking, both on and off-street; and
   - introduction of traffic calming measures.
3. Traffic Management measures include:
   - control of volumes of traffic for example on parallel routes, to encourage cycling on one of the routes;
   - control of movements through bans and closures that favour cycle traffic over motor traffic; and
   - control of speed through signing or automatic enforcement (e.g. cameras).

Figure 3.1.1 Restricted access street



Notes

1) *Width dimensions shown for 7.3m carriageway.*
2) *For carriageways less than 6.00m, consideration should be given to parking on one side only.*
3) *The 3.00m carriageway width is for 2-way cycle traffic.*
4) *Kerb alterations should be in sympathy with design of surroundings.*
5) *Kerb and white line changes should accommodate drainage and highway sweeping requirements.*

3.2 Restricted Access Street

3.2.1 Restricted Access street

1. A restricted access street will usually be a residential street but the measure may be used in town centres perhaps in conjunction with other traffic management measures. In town centres, they represent the next step down from pedestrian streets. Dean Gate by York Minster could be described as a restricted access street with through cycle traffic only, and there are roads in the centre of Amsterdam that are cycle only streets. Cycle streets are also common in Germany.
2. Opportunities for motor traffic passing places should be provided if the restricted access street is long.
3. A traffic regulation order is needed to limit motor vehicle traffic to "access only".
4. Compliance with the order may be an issue and, depending on volumes, rising bollards or other physical control measures may be appropriate.
5. Clear cycle traffic direction signing should be employed to alert cycle traffic to the restricted access street.
6. Space created by build outs should be carefully designed to blend aesthetically with the surroundings.
7. Consideration should be given to the long term maintenance of any landscape features introduced, particularly if their initial costs are being met from a one-off capital allocation.

Table 3.2.1 Potential action to create restricted access street

Visual narrowing by, for example, creating a carriageway with edge of carriageway markings 3.00 metres apart
Physical narrowing, such as use of appropriate kerb build outs and planters or other landscape features
Restricting Access, such as motor traffic being allowed for access only
Point closure of the road to motor traffic (see Figures 3.4.2 and 3.4.3)

3.3 One-way Streets

3.3.1 Principles

1. One-way streets for motor traffic should, under normal circumstances, always be available for cycle traffic to travel along in both directions, that is a contra-flow should be established.
2. Prevention of two-way cycle traffic on one-way streets will inevitably lead to greater times and distances than would otherwise be the case for some cycle journeys. This will reduce the competitive advantage to cycle traffic and force cyclists to use generally busier roads which may be less pleasant to cycle on.
3. Exemptions for cycle traffic should always be considered when one-way streets for general traffic management are promoted.
4. One-way streets in town centres are often wide (more than one lane), long and encourage higher speeds than average urban central areas. These situations can be difficult for pedestrians and cyclists, and the generation of high speeds through use of one-way streets should be avoided.
5. Direction signs are likely to be principally directed at motor traffic routes. Changes to route signing may be necessary to show the different shorter cycle route created by contra-flow cycle lanes along one-way streets.
6. There is evidence that engineers undertaking safety audits are concerned about contra-flow cycle lanes. Safety audits should include consideration of risks to cyclists if they have to use alternative routes in the absence of contra-flow facilities.
7. For further general advice on contra-flow cycle facilities see TAL 6/98.

3.3.2 Contra-flow cycling

1. Cyclists feel safe in contra-flow situations. They are looking into the direction of oncoming traffic but otherwise have a traffic free route. The risk is largely at side roads on contra-flow routes.
2. To avoid diminishing the well recognised effect of “No Entry” signs, exemptions are discouraged but may be used if space is limited and the link an essential connection. An island, providing a separate channel for cycle traffic is a better option.
3. Cycle traffic will make movements different to motor traffic at the junctions at either end of a contra-flow cycle lane, and consideration needs to be given to ensuring safety and convenience. An example of how to treat a signalised junction is given at Figure 6.4.3.
4. Signs along the route need to be placed beyond junctions where motor traffic may enter the one-way street and be repeated as often as deemed necessary to reinforce the presence of the lane.
5. The cycle symbol (dia. 1057) in the carriageway should be used similarly.
6. If a contra-flow lane is provided it should normally be 2.0 metres wide if traffic volumes and speeds are high. Wider lanes may need to be provided depending on the speed, volume, composition and visibility of oncoming traffic and volume of cycle traffic. Narrower cycle lanes may be acceptable to complete an essential connection provided traffic speeds are low.
7. Contra-flow lanes need to be wider at bends where otherwise encroachment by on-coming motor traffic might occur (See Figure 4.2.4 note 6).
8. Additional islands may be added along the length of the one-way street to clearly denote the cycle lane (See Figure 4.2.4 note 3).

3.3.3 False one-way streets

1. "False" one-way streets may be created where two-way movement is still allowed along the street apart from over a short section at the end of the street where it joins with, for example, a main road.
2. A "false" one-way street is useful where access, perhaps via other connecting roads along the street, is deemed necessary and where there is such demand that both sides of the road are needed for parking.
3. As an alternative to "false" one-way streets, it may be appropriate to consider placing advisory cycle lanes behind parking bays (See also Figures 3.8.3 and 4.2.4).
4. The "No Entry" to a "false" one-way street will be supported by a traffic regulation order creating a one-way street over a short length, usually the length of the kerb line build-out.
5. "False" one-way streets have numerous advantages:
   - very flexible and overcome other access problems sometimes created by one-way streets;
   - less signing required;
   - the traffic regulation order is often easier to make; and
   - There is less objection from frontagers.

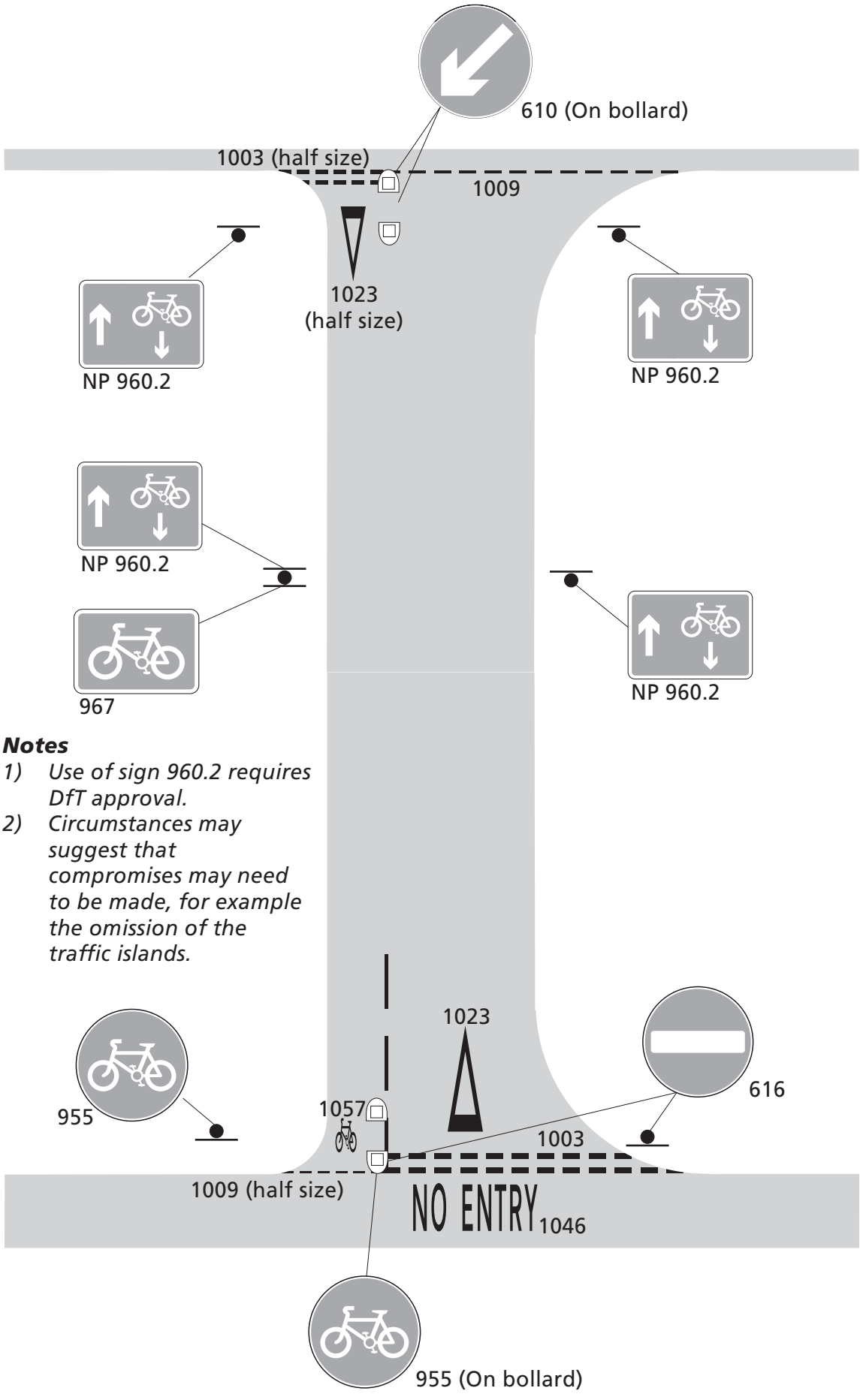
3.3.4 Legal issues

1. Contra-flow conditions may be established by:
   - a cycle traffic only lane in the opposite direction to a one way-general traffic lane; or
   - leaving a two-lane highway open to all traffic, but restricting turns at the entrance to the road.
2. Both of these scenarios are possible to create by regulation order.

Table 3.3.1 Types of contra-flow provision

Type of contra-flow provision	Conditions for use
No cycle lane	• as for false one-way street.
False one-way street	• there is a lot of kerbside parking; • 85%ile speed less that 25mph and flows less than 1,000 vehicles per day; • street part of 20mph zone or subject to use order or speed order under Transport Act 2000.
Advisory cycle lane	• 85%ile speed is less than 25 mph or vehicle flows less than 1,000 vehicles per day; • encroachment for manoeuvring or overtaking is anticipated; • occasional loading/unloading is required; • it is not possible to restrict waiting at all times of the day.
Mandatory cycle lane	• waiting and loading can be prohibited; • no encroachment by opposing direction vehicles is anticipated.

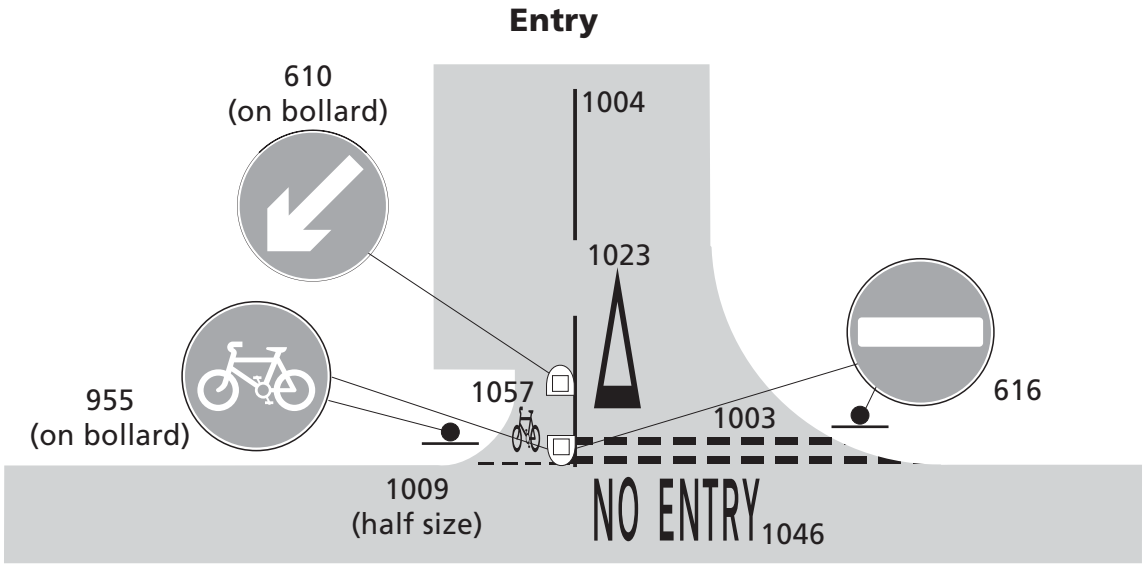
Figure 3.3.1 Contra-flow with no cycle lane



Notes

1) *Use of sign 960.2 requires DfT approval.*
2) *Circumstances may suggest that compromises may need to be made, for example the omission of the traffic islands.*

Figure 3.3.2 False one-way street

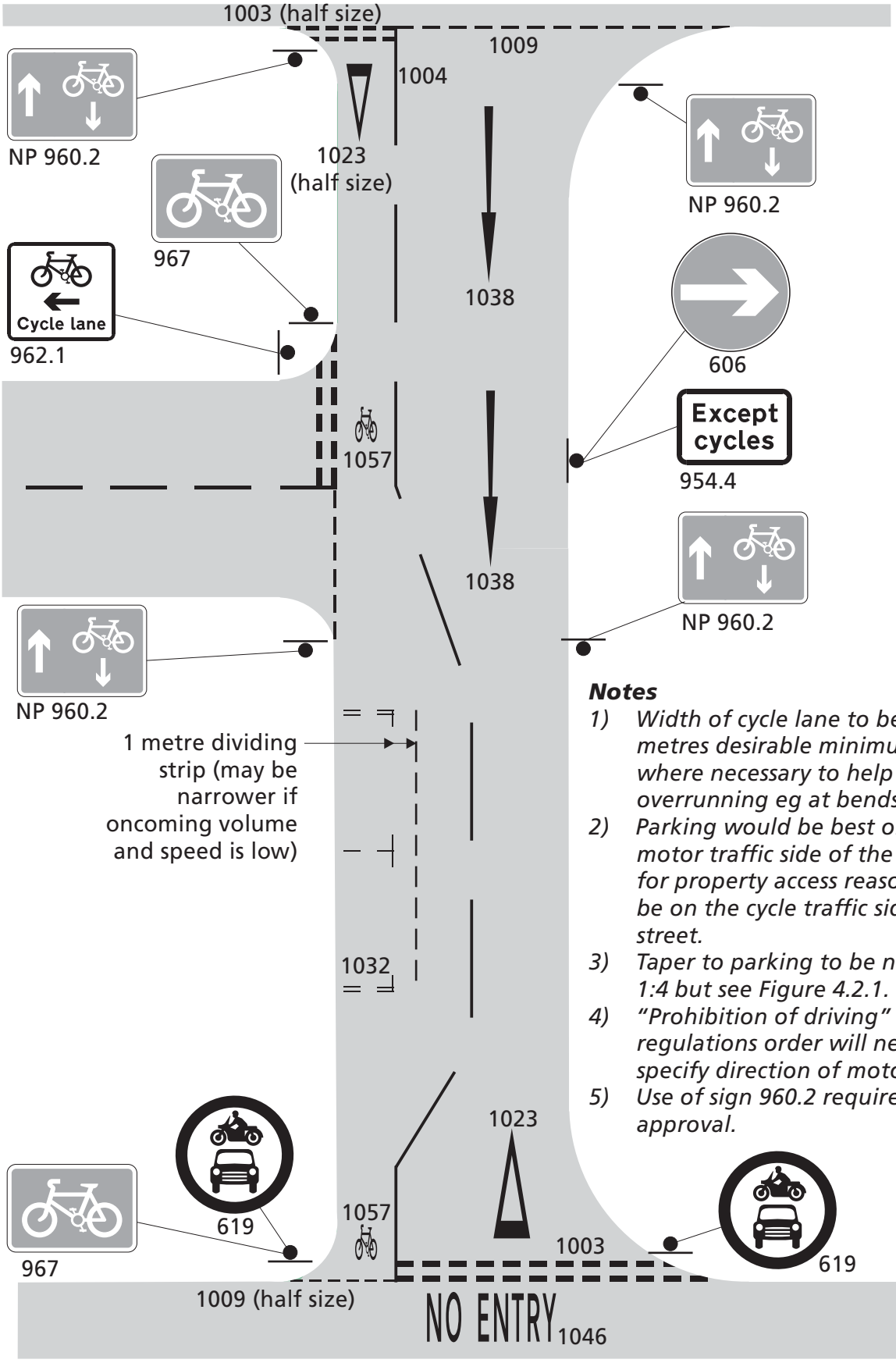


Notes

1) Kerb and white line changes should accommodate drainage and highway sweeping requirements.

Plate 3.3.1 Example of false one-way street

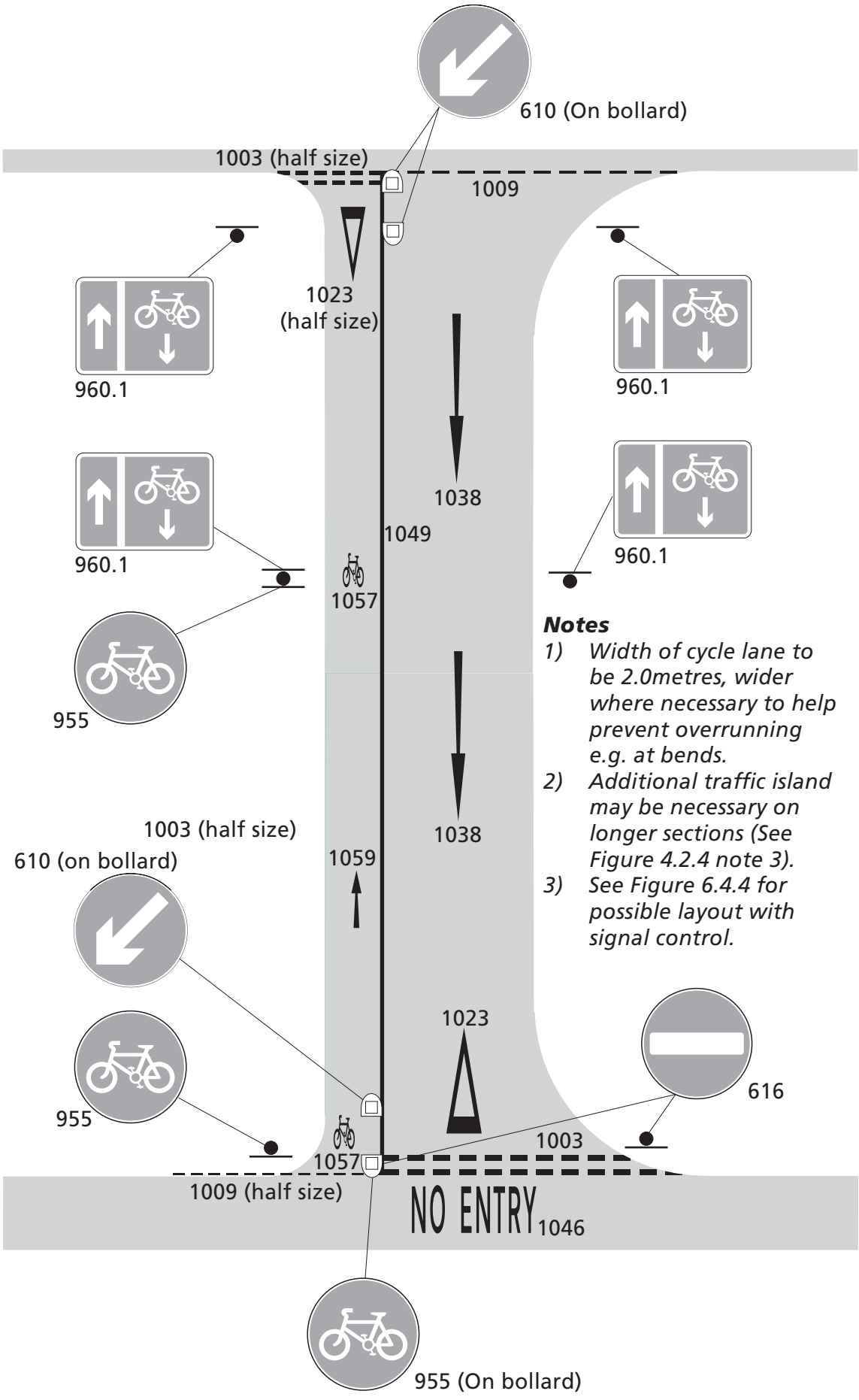
Figure 3.3.3 Advisory contra-flow cycle lane



Notes

1) *Width of cycle lane to be 2.0 metres desirable minimum, wider where necessary to help prevent overrunning eg at bends.*
2) *Parking would be best on the motor traffic side of the street but for property access reasons might be on the cycle traffic side of the street.*
3) *Taper to parking to be no less than 1:4 but see Figure 4.2.1.*
4) *"Prohibition of driving" regulations order will need to specify direction of motor traffic.*
5) *Use of sign 960.2 requires DfT approval.*

Figure 3.3.4 Mandatory contra-flow cycle lane



Notes

1) *Width of cycle lane to be 2.0metres, wider where necessary to help prevent overrunning e.g. at bends.*
2) *Additional traffic island may be necessary on longer sections (See Figure 4.2.4 note 3).*
3) *See Figure 6.4.4 for possible layout with signal control.*

3.4 Network Permeability

3.4.1 Network permeability

1. In town and other district centres, where careful management of road space is required to balance the activity requirements of different road users, it is always necessary to consider network permeability for cycle traffic.
2. This is equally true in areas where traffic management is introduced to limit use of residential roads by longer distance motor traffic.
3. In both of these cases any proposals for curtailment of the highway network using either culs-de-sac or road closures should always take account of the needs of cycle traffic.
4. Street closures for motor traffic management should be kept open for cycle traffic wherever possible to maintain essential connections.
5. The creation of short sections of cycle track should be considered where two existing roads, that were never joined, could readily be joined to create greater permeability and essential connections in the network.

Figure 3.4.1 Essential connection across closed road

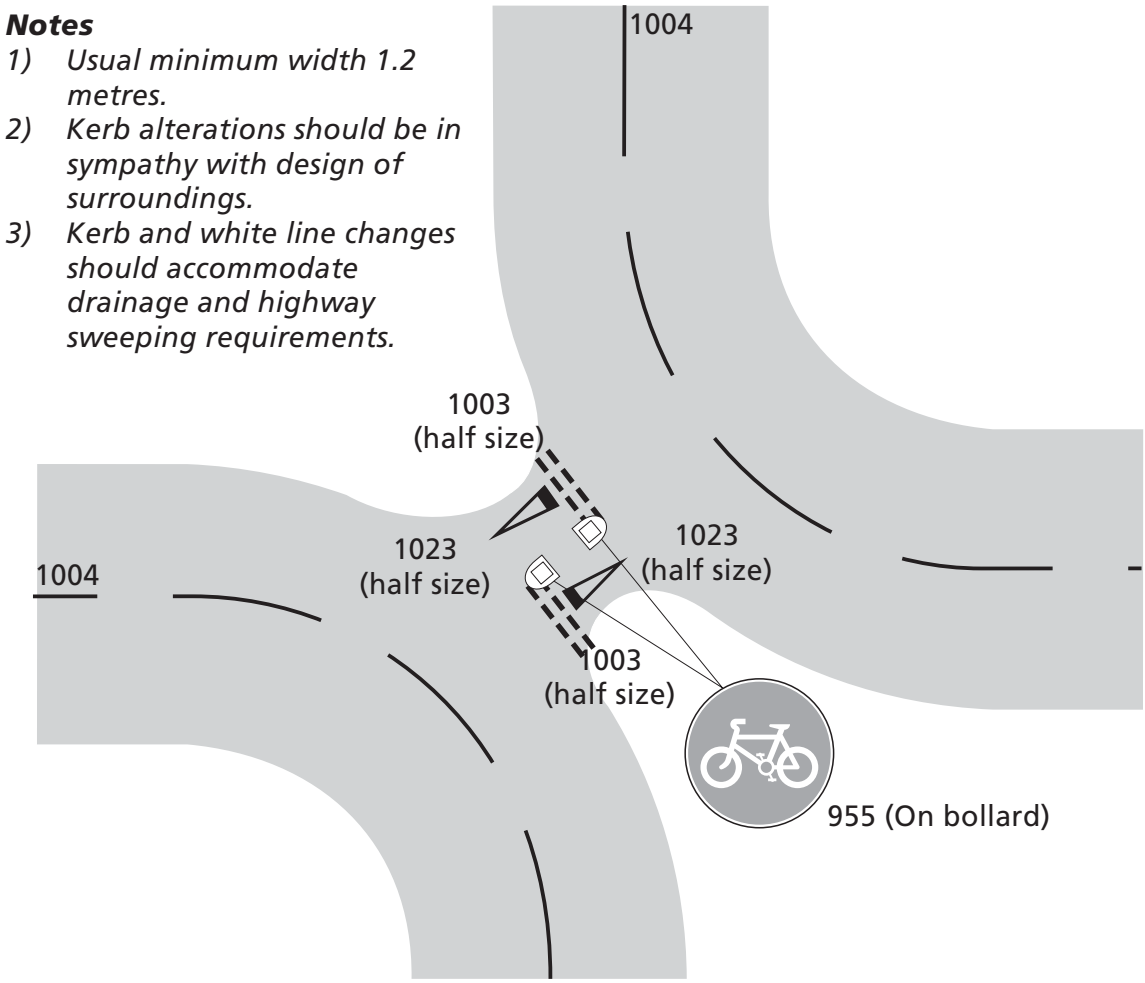


Figure 3.4.2 Road closure with side cycle access

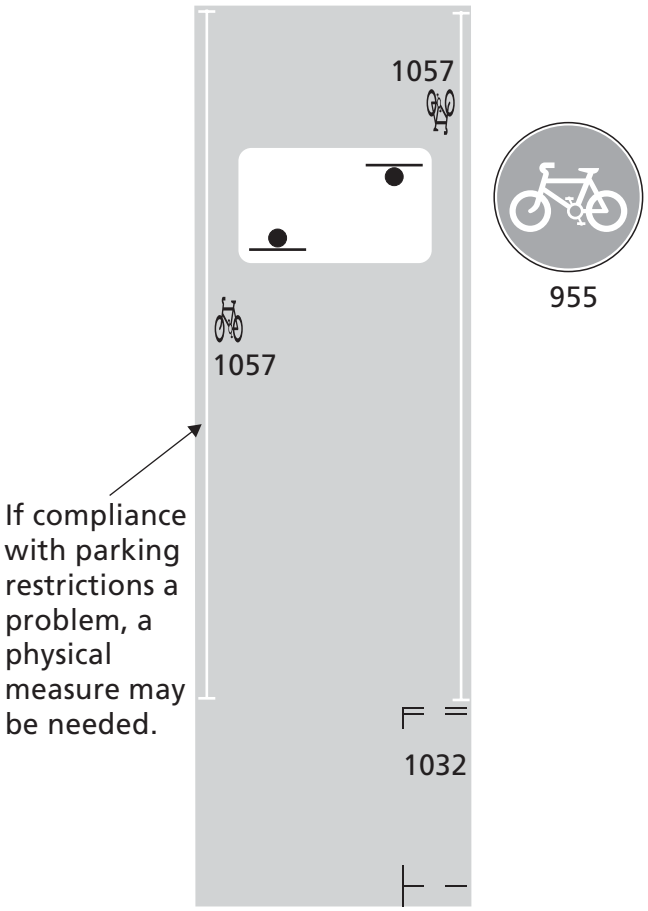
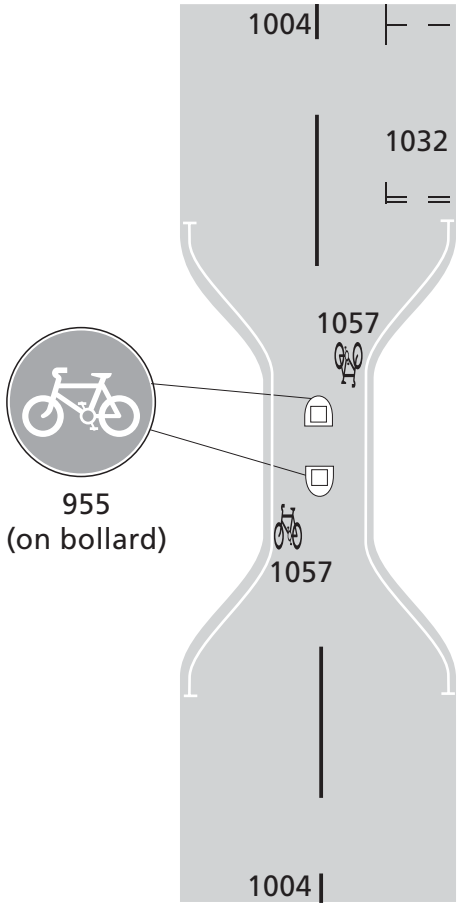


Figure 3.4.3 Road closure with central cycle access



Notes

1) Usual minimum width per direction is 1.2 metres, wider for higher cycle speeds. Width never more than 1.5 metres to prevent motor vehicle abuse.
2) Waiting and loading restrictions may need to be applied to prevent blockage by parked vehicles.
3) Turning facilities may need to be provided for motor traffic.
4) Designated parking spaces may usefully be identified.
5) Kerb alterations should be in sympathy with design of surroundings.
6) Footway sweepers need to visit regularly.
7) Kerb and white line changes should accommodate drainage and highway sweeping requirements.

3.5 Networks in Non-motorised Areas

3.5.1 Principles

1. A study by the Transport Research Laboratory (TRL Report PR15) suggests there is little reason to justify excluding cycle traffic from pedestrianised areas, and that cycling could be more widely permitted in these areas without detriment to pedestrians. Town centre traffic management schemes often force cycle traffic onto unsuitable inner relief roads.
2. Pedestrian areas can reduce dramatically the permeability for cycle traffic and may force cyclists to use longer, busier and less pleasant routes. It is often the case that pedestrian areas in central locations are adjacent to public transport interchanges. Such lack of permeability reduces dramatically the accessibility of public transport interchanges by cycle traffic.
3. Some parts of a pedestrianised area may very distinctly be appropriate only for pedestrians use. In all cases, however, serious consideration should be given to ways of allowing access by cyclists to what would otherwise be pedestrian only areas. These include:
    - unlimited access to the full pedestrianised area;
    - timed access to the full pedestrianised area;
    - access along the same routes as other permitted vehicles such as PSVs and delivery HGVs;
    - access along defined channelled/coloured routes; and
    - combinations of the above (e.g timed access along channelled routes).
4. If HGVs or buses are allowed into pedestrianised areas (e.g. for delivery at certain times of the day) then cycle traffic should be allowed at least at these same times and possibly for longer periods.
5. It is especially the case that if alternatives to routes through the pedestrian area are inadequate, time consuming or otherwise inappropriate, then routes within a pedestrianised area must be available at certain times of the day.

3.5.2 Legal issues

1. The following may be appropriate legal procedures depending on the outcome required:
    - Orders to extinguish vehicle rights (with exemptions for cycle traffic) under S249 of the Town and Country Planning Act 1990;
    - Traffic Regulation Orders under S1 or S9 of the Road Traffic Regulations Act 1984 to prohibit, restrict or regulate classes of vehicular traffic.
2. The Department for Transport advises use of Traffic Regulation Orders even with use of an order under S249 of the Town and Country Planning Act 1990, in order to provide criminal sanction against offences.
3. Pedestrianised areas, particularly as part of a development, may be created by land assembly from private land holders. It may be necessary to create a highway as part of the development process to allow for cycle access to or across such a pedestrianised area. This would normally be constructed through the development process and then adopted under S38 of the Highways Act 1980.

3.5.3 Signing and design

1. Routes across pedestrian areas need to be provided with adequate direction signing. For timed access this may involve variable message signs with prohibitions and exemptions shown as appropriate at different times of the day.
2. Channelling should guide cyclists away from shop entrances and areas of intense

pedestrian activity using street furniture or changes in surface texture which fits with the overall architectural design of the area. For example where there are cobbles and blocks laid, cyclists would naturally follow the blocks. Such routes may be legally designated or not.

3. The choice of whether to provide segregated routes will depend on many factors, e.g. footfall, size of area, "peakness" of flows etc. and is a subject not easy to provide tight guidance on.

4. Quality provision should be provided for the "transport" elements of a scheme, just as much as for other parts of the public realm.

5. Concerns may persist in respect of feelings of intimidation on the part of pedestrians. Ways of overcoming this may include:

   - advisory "cycle at walking pace" or "cyclists please give way to pedestrians" signs (Bristol);
   - use of urban rangers, town centre ambassadors or other similar town centre uniformed presence to help control anti-social behaviour generally, which may include inappropriate cycling (Cambridge).

Table 3.5.1 Do's and don'ts in non-motorised areas

DO	DON'T
• consider allowing for cycle traffic across central pedestrianised areas; • back up planning legislation orders with traffic regulation orders; • provide adequate signing; • guide cycle traffic away from shop entrances and areas of intense pedestrian activity • provide contrasting surfacing to hint at cycle routes; • provide access to final destination for cycle traffic.	• ignore cycle traffic desire lines in central areas; • force cycle traffic around long detours.

3.6 Calming Principles

3.6.1 Principles

1. Traffic calming can make conditions pleasant for cycle traffic but individual discrete traffic calming features can cause problems if not well designed. Some traffic calming features can take road space from cycle traffic.
2. Traffic calming may be useful for the following reasons:
   - to reduce accidents;
   - reduce traffic volumes;
   - make the general environment more pleasant; and
   - to reduce speeds.
3. None of the above should be seen as intrinsically making the situation necessarily better for cycle traffic, although reductions in speed and volume may assist.
4. Of overarching importance is the adaptation of behaviour of traffic to the environment through which it passes.

3.6.2 Speed, pleasantness and conflict

1. Speeds in urban areas are usually limited to 30 mph. Often 85%ile speeds on radial routes into urban areas may be in the range 30-35 mph.
2. Some roads in urban areas, such as dual-carriageway ring roads, may have 40 mph speed limits. Here the 85%ile speeds could again be greater than the speed limit.
3. In rural areas on de-restricted single carriageway roads vehicles will not be restricted to lower limits.
4. Differential speeds between cycle traffic and motor traffic, coupled with proximity, are most closely related to conflict measured amongst cyclists (TRL Report 490). Higher motor-traffic speeds are less pleasant for cyclists than lower speeds.

3.6.3 The surrounding environment and speed

1. The surrounding environment influences how fast traffic travels. For example a driver is more likely to travel quickly on a wide boulevard than on a narrow village street.
2. The most successful traffic calming schemes are those which combine environmental measures with physical ones.
3. Traffic calming should seek to change the perception of drivers about the area in which they are travelling, encouraging low speeds and considerate driving. Some drivers see traffic calming schemes as obstacle courses, and attempt to speed up between features.
4. Traffic calming schemes that relate to their surroundings are more likely to be accepted by drivers and not seen as a source of hazard or delay. Traffic calming features should be designed to coincide with natural changes in the surrounding landscape and townscape.

3.6.4 Summary of measures

1. Features that can cause difficulty for cycle traffic include:
   - carriageway narrowings;
   - horizontal shifts in carriageway;
   - priority narrowings;
   - refuges;
   - vertical deflections.
2. The problems caused are either because of the creation of conflict points (See Figure 4.1.5) or discomfort from going over a vertical feature.
3. Appropriate traffic calming features include:
   - **humps**: gaps to the side or sinusoidal ramps;
   - **speed cushions**: gaps to the side;
   - **rumble strips**: gaps to the side;
   - **over-run areas** for motor vehicles to keep tight geometry;

- **bypasses** to avoid conflict points at refuges and narrowings.

4. Traffic calming features intrinsically friendly to cycle traffic include:
   - speed cameras and vehicle actuated signs;
   - general environmental changes (see Section 3.6.3);
   - appropriate parking layouts; and
   - cycle lanes.

3.6.5 Problems with features

1. There are many measures presently popular for addressing certain traffic issues that have detrimental side effects so far as the promotion of cycling is concerned.
2. The effect on cyclists of a tight or critical cross-section (See Figure 4.1.5) is that they are intimidated or exposed to greater danger than would be the case with a spacious cross-section (See Figure 4.1.5).
3. The issues of conflict points created by features in the carriageway is further dealt with in Section 4, particularly Figures 4.1.4 and 4.1.5.
4. Build-outs of any sort deflect cycle traffic into the path of motor vehicle traffic.
5. They can be created for all sorts of other good reasons but their severe detrimental effect on cycle traffic should be realised.

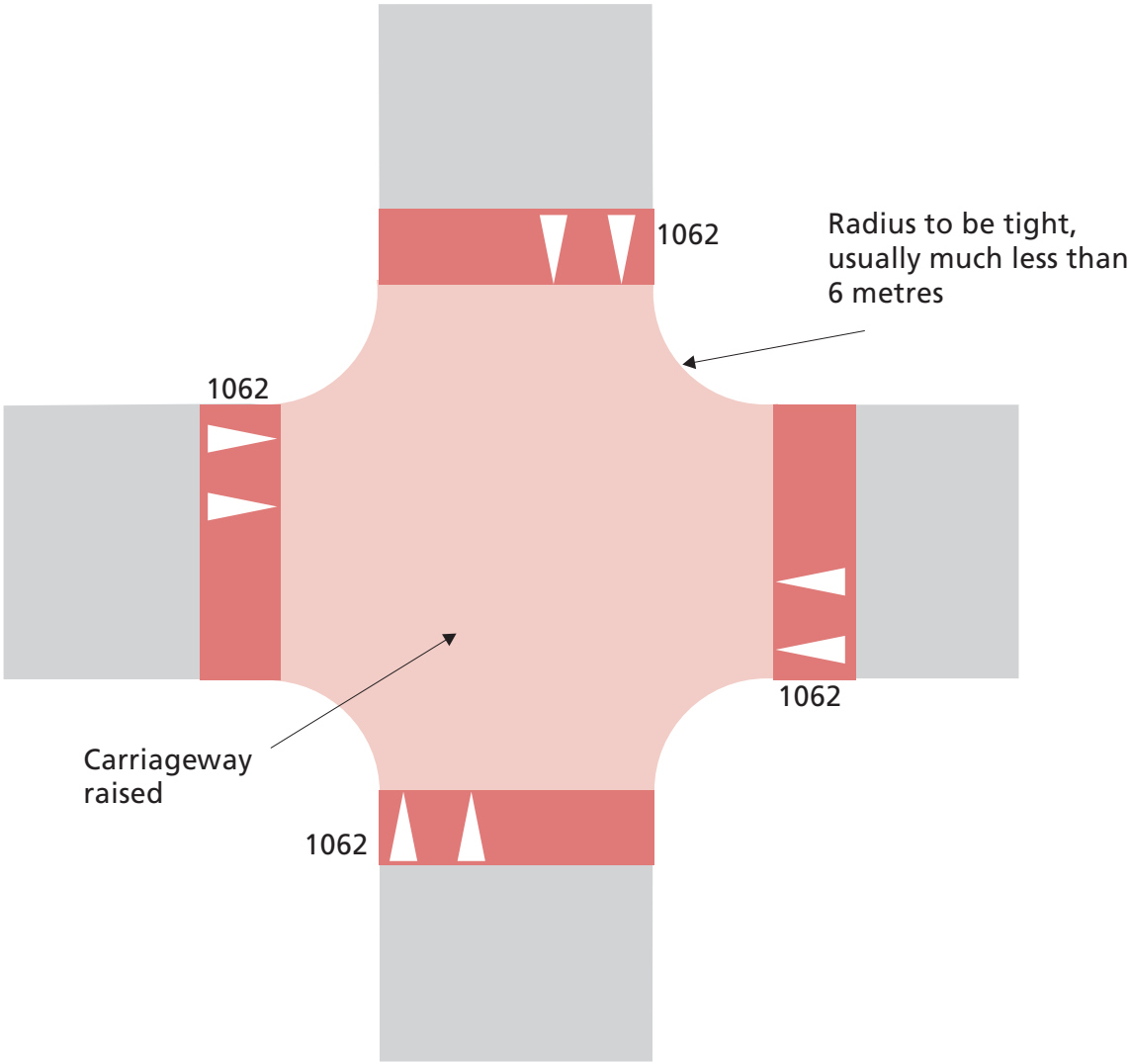
Table 3.6.1 Problem traffic calming measures

Measure	Desired effect	Detrimental effect on cycle traffic
Traffic islands/ refuges	• prevent overtaking; • control speeds; • pedestrian crossing points; • create gateways; • separation of lanes of traffic.	• tend to push motor traffic in to line of travel of cycle traffic; • causes localised narrowing of the carriageway to a tight or critical cross-section (See Figures 3.8.8 and 4.1.5).
Ghost islands	• to facilitate right turn without causing delay or conflict with following traffic.	• tend to push motor traffic into line of travel of cycle traffic; • causes localised narrowing of the carriageway to a tight or critical cross-section (See Figure 4.1.4).
Kerb build-outs (chicanes, throttles, gateway treatment, crossings, bus boarders)	• to protect designated parking bays; • to attempt to slow traffic; • to create shorter distances for pedestrians to cross and improve visibility for pedestrians.	• tend to push cycle traffic into line of travel of motor traffic; • causes localised narrowing of the pedestrian carriageway to a tight or critical cross-section (See Figure 4.1.5).
Central hatching	• to separate opposing direction traffic streams; • to reduce lane widths to control speed; • to control sight lines around bends; • to improve conspicuity of layout; • discourage overtaking.	• longer sections of route that are of a tight or critical profile; • on bends tends to push motor traffic into line of travel of cycle traffic; • to improve conspicuity of road layout.
Additional narrow lanes	• additional capacity; • slower speeds.	• creation of tight cross-sections (See Figure 4.1.4) encouraging motor traffic to squeeze past cycle traffic.

***Notes**: 1) See also Figures 4.1.4 and 4.1.5.*

3.7 Junction Measures

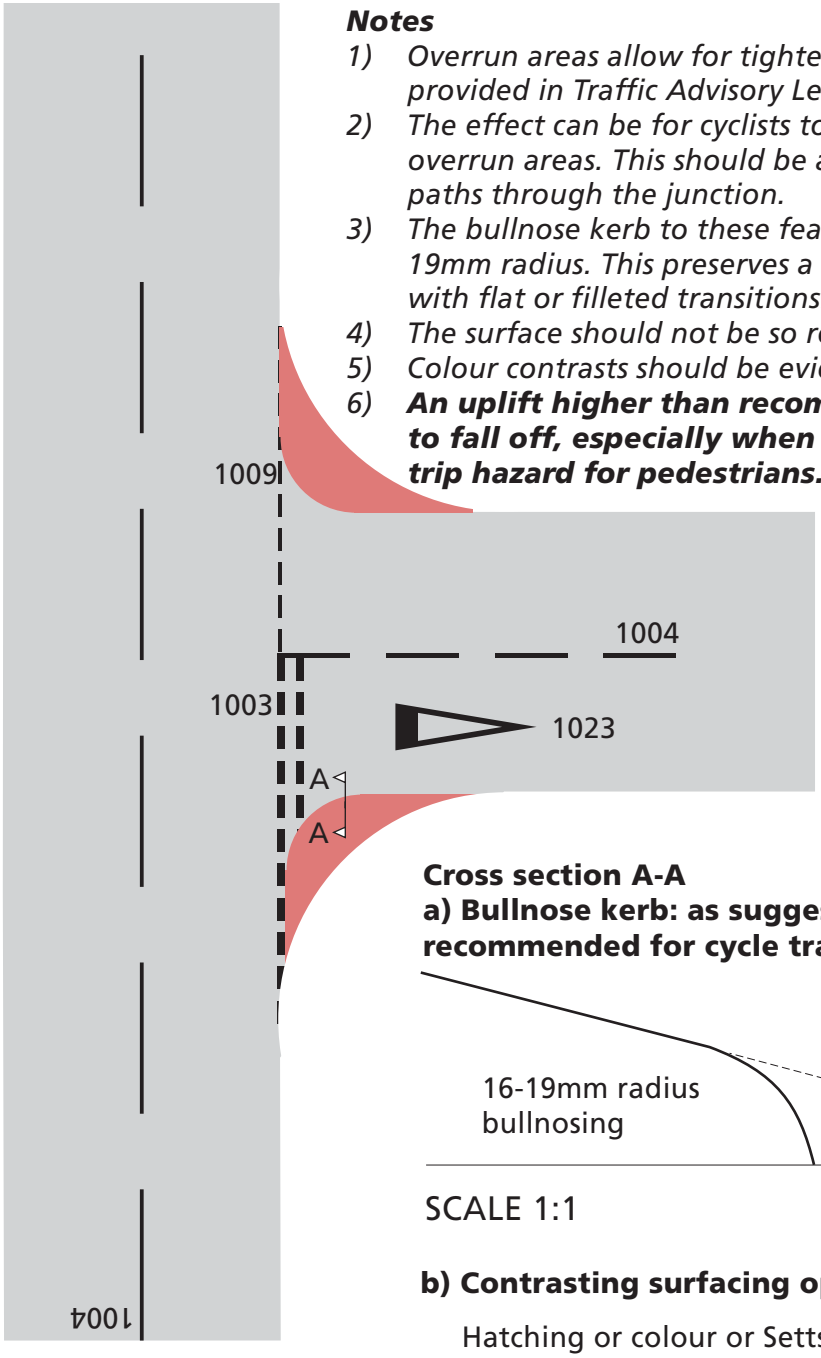
Figure 3.7.1 Junction treatments (Raised Table)



Notes

1) Benefit for cycle traffic is lower speed of motor traffic.
2) Alterations should be in sympathy with design of surroundings.
3) Gullies may need to be added, relocated or raised.
4) Kerbs laid across the road as a construction former should be avoided.
5) Constrained but adequate sight lines will constrain speed.
6) The principle of the sinusoidal profile is the tapered ends. Contractors may develop their own techniques to create the shape while not compromising the principle. Alternatively a slope of 1:15 (1:10 max) may be provided (see Figure 3.8.4 for details).

Figure 3.7.2 Over-run areas

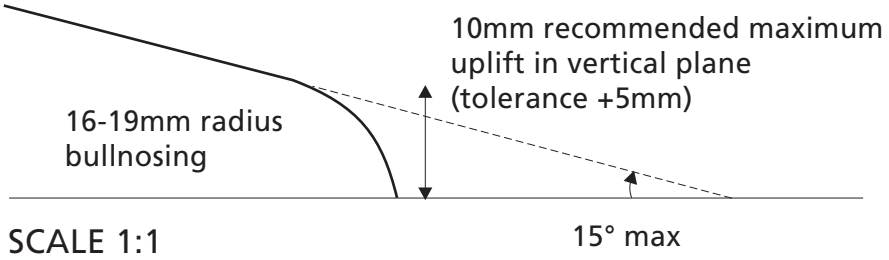


Notes

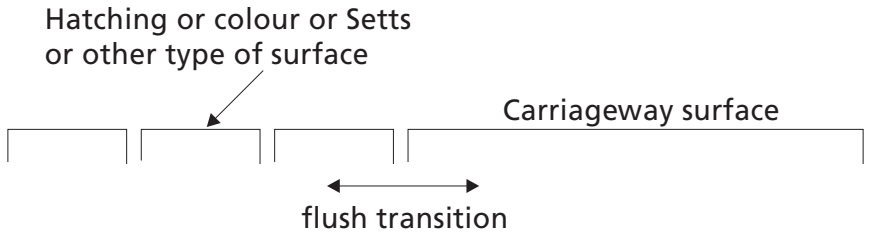
1) *Overrun areas allow for tighter junction radii. More details are provided in Traffic Advisory Leaflet 12/93.*
2) *The effect can be for cyclists to be forced obliquely onto the overrun areas. This should be avoided by consideration of cyclist paths through the junction.*
3) *The bullnose kerb to these features should not be greater than 16-19mm radius. This preserves a clear boundary for cyclists by contrast with flat or filleted transitions.*
4) *The surface should not be so rough as to be dangerous.*
5) *Colour contrasts should be evident under street lighting.*
6) ***An uplift higher than recommended is likely to cause cyclists to fall off, especially when crossed at an angle, and may be a trip hazard for pedestrians.***

Cross section A-A

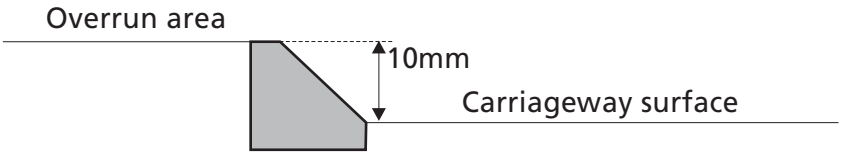
a) Bullnose kerb: as suggested by TAL 12/93 but not recommended for cycle traffic



b) Contrasting surfacing option

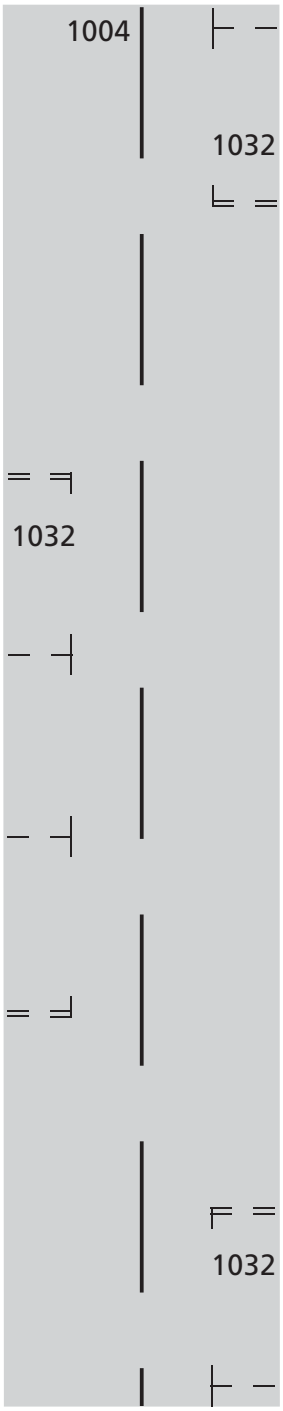


c) 45° kerbstones



3.8 Link Measures

Figure 3.8.1 Parking & limited waiting bays



Notes

1) *Where parking places are marked out on one side of a road, it may be better to leave the centre line at the centre of the road, as cyclists will cycle in the middle of the remaining lane width. Drivers are more likely to cross over to the other side of the road when overtaking cycle traffic. This is preferable to motor traffic attempting to squeeze past cycle traffic in tight cross-section lanes (See Figure 4.1.4 and Figure 4.1.5). As cyclists may be riding further out into the carriageway this may also reduce the chance of them being hit by somebody opening a car door.*
2) *Build outs can help pedestrians cross a road and improve visibility from a side road. However they force cyclists out into the path of traffic creating conflict points (See Figure 4.1.5). They should therefore be used with care and discretion.*
3) *Where there is space, consideration should be given to a hatching strip between the parking bay and running/cycle lane. This will reduce the chance of a cyclist being hit by a car door being opened. This is especially important where there is a high turn round of parked vehicles, for example on a shopping street.*

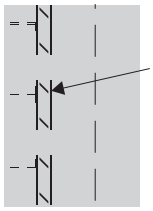
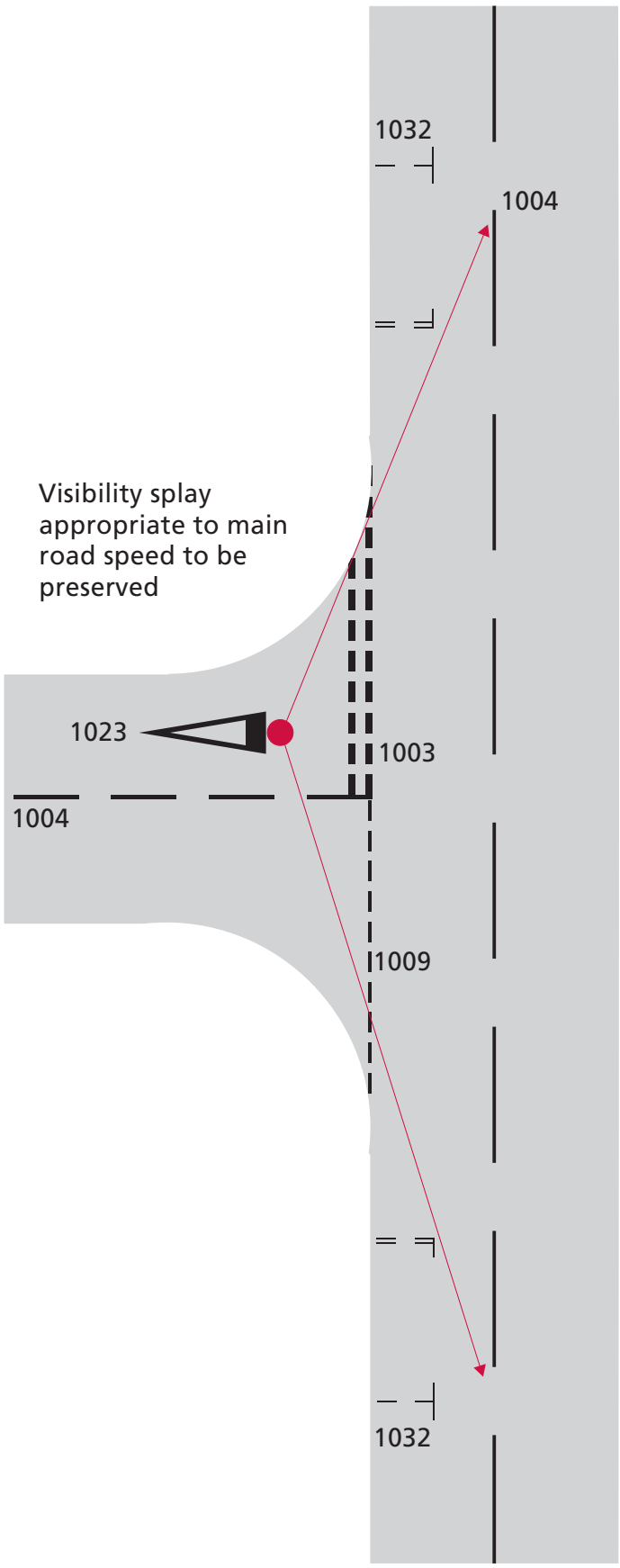


Plate 3.8.1 Parking or limited waiting provision

Figure 3.8.2 Parking near junctions



Notes

1) *Give-way lines on side roads with parking either side on the main road should not normally be brought into the main carriageway as cyclists may be cycling through the parking bays if they are unocupied.*
2) *Give way markings may be brought into the main carriageway, if build outs are used (if main carriageway is sufficiently wide).*
3) *Parking usually set back from the junction to create appropriate sight lines.*

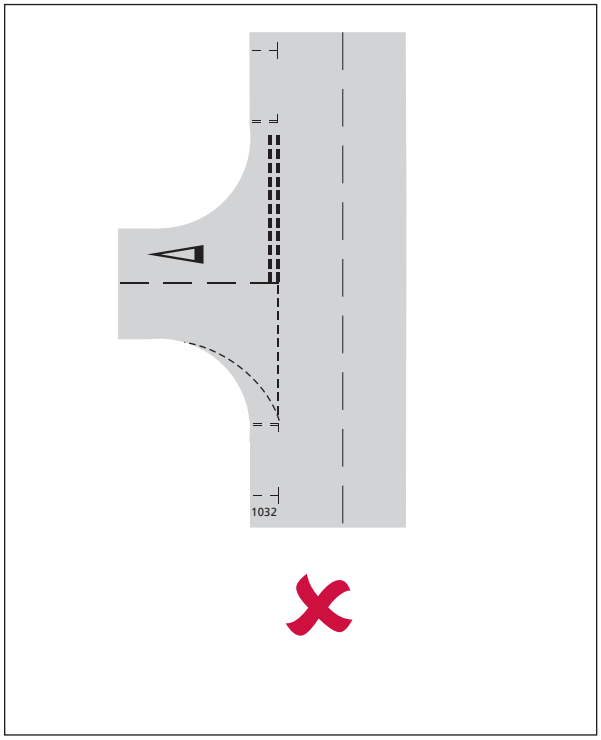
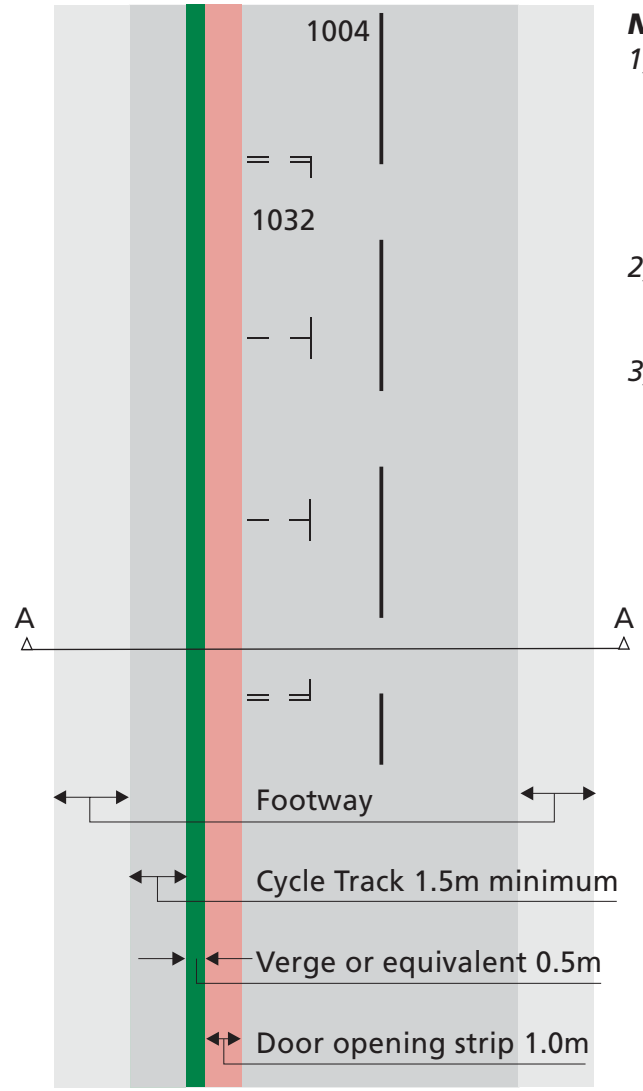
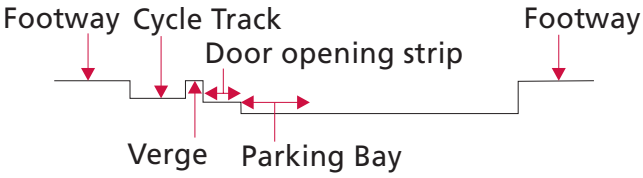


Figure 3.8.3 Cycle track behind parking bays





Cross section A-A

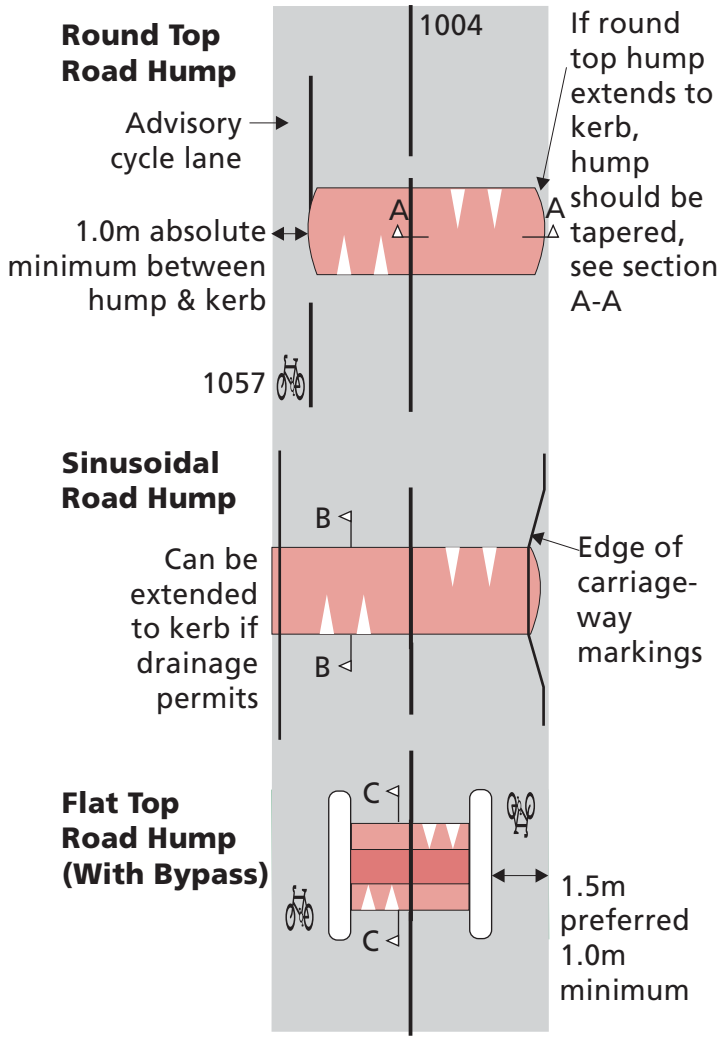
Notes

1) Can be provided where there is advantage to cyclists (i.e. too many slow moving/maneuvering vehicles on the carriageway or where cyclists may more readily be able to access frontages.

2) For a cycle lane in front of a parking bay see Figures 3.3.3 and 3.8.1 note 3.

3) Door opening strip to be above carriageway level to limit parking on the door opening strip.

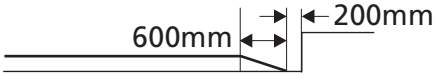
Figure 3.8.4 Road hump options



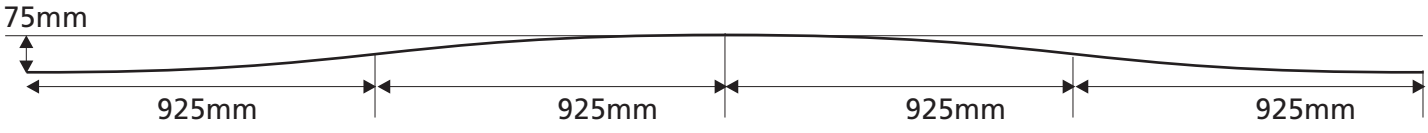
Notes

1) *The cycle lane width of 1.0m for road hump with by-pass should occur only over a short distance. No gullies should be located in or near the bypass.*
2) *Humps with bypasses may be more appropriate on busy roads as on quieter roads cycle traffic is more likely to have the full lane width available to overcome the hump.*
3) *Where there are parked cars, a gap is not likely to be of much assistance to cycle traffic.*
4) *A full width hump may be more expensive to construct because of drainage costs.*
5) *The principle of the sinusoidal profile is the tapered ends (in cross section). Contractors may develop their own techniques to create the approximate shape while not compromising the principle. The profile must be gentle as illustrated.*
6) *Maximum slope to a flat-topped hump to be 1:15 (Lancashire standard) with smoothed transitions from the ramp to the horizontal surfaces.*
7) *Humps should accommodate drainage and highway sweeping requirements.*
8) *Consider the needs of wheelchair users who are often forced to use the main carriageway. They find poor vertical features even more uncomfortable than cyclists do and prefer tables to humps.*
9) *See also Figure 9.3.1 on remedial measures for vertical features.*
10) *More details are provided in Traffic Advisory Leaflet 7/96.*

Transverse section A-A
Round top hump extending to kerb (Scale 1:100)



Cross section B-B
Sinusoidal road hump with tapered edges



Cross section C-C
Flat topped hump

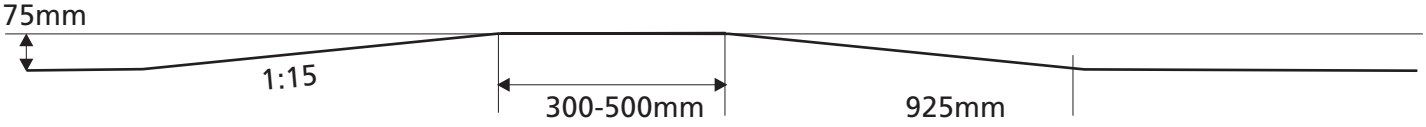
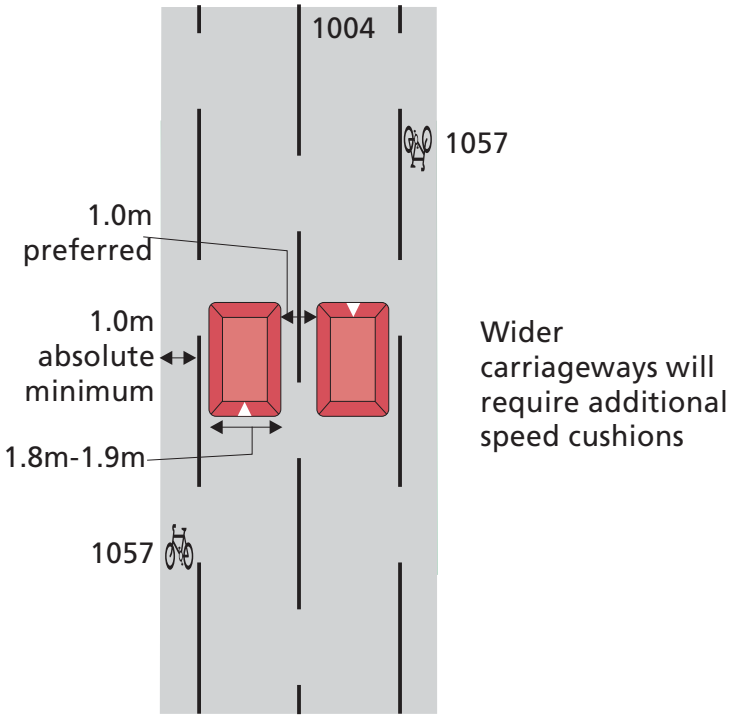


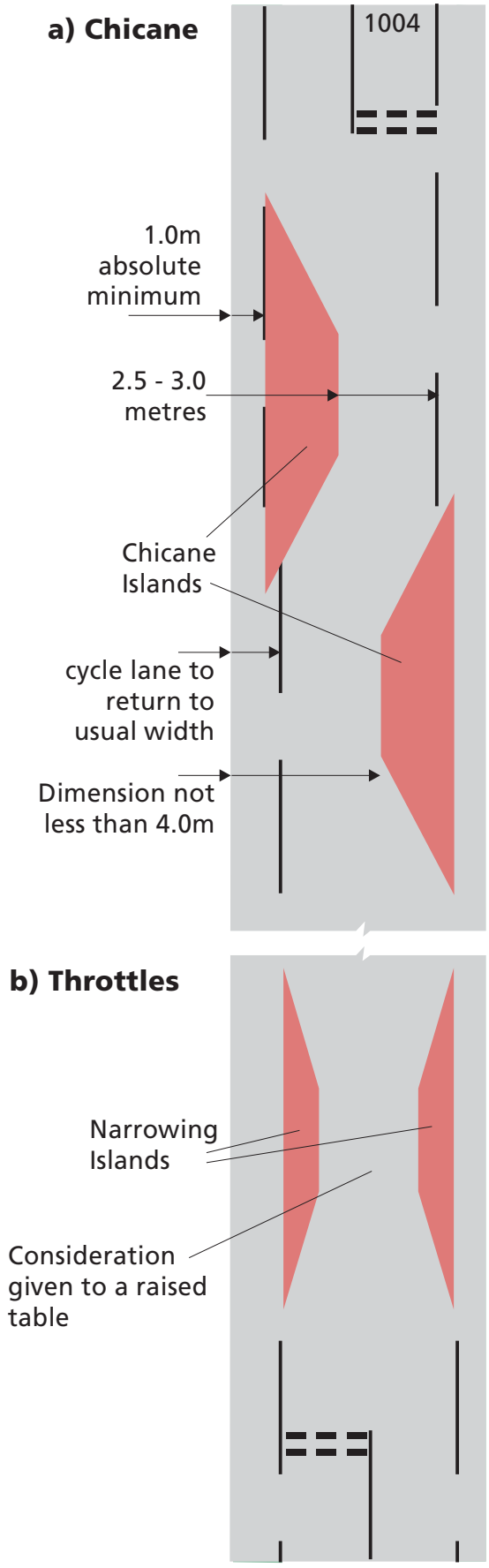
Figure 3.8.5 Speed cushions



Notes

1) *Cushions have advantages on bus routes.*
2) *Road narrowings to bring the width to one appropriate for humps may be considered.*
3) *Cushions should not be laid so as to create a need for cyclists to deviate off-course to negotiate them.*
4) *No gullies should be located adjacent to or near the speed cushions.*
5) *More details are provided in Traffic Advisory Leaflet 7/96.*

Figure 3.8.6 Enforced priority at road narrowings

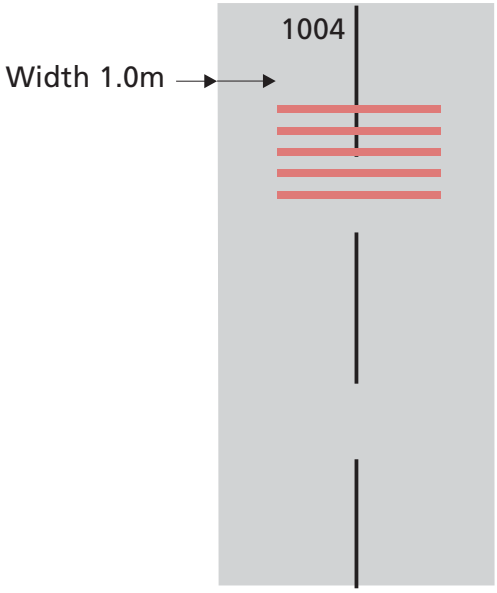


Notes

1) *If they are used, the principle is that bicycles should be exempt.*
2) *Cycle bypasses to be not less than 1.0 metre, preferably 1.5 metres. No gullies should be located in or near the bypasses.*
3) *Kerb alterations, so far as feasible should be in sympathy with design of surroundings.*
4) *Kerb and white line changes should accommodate drainage and highway sweeping requirements.*
5) *Consideration should be given to raising the cycle lane to footway level at islands. Grade changes should be over lengths not less than 5m with careful smoothing at each end. Option should not be used where high cyclist speeds are anticipated.*
6) *Enforced priority road narrowings without cycle bypasses are not recommended.*
7) *Parking restrictions should be considered on approaches to enforced priority narrowings.*
8) *Tapers to islands to be no less than 1:3. Hatching to be avoided as debris will collect and become a maintenance problem.*
9) *Careful design can help integrate them into their natural environment.*

Plate 3.8.2 Example of cycle bypass

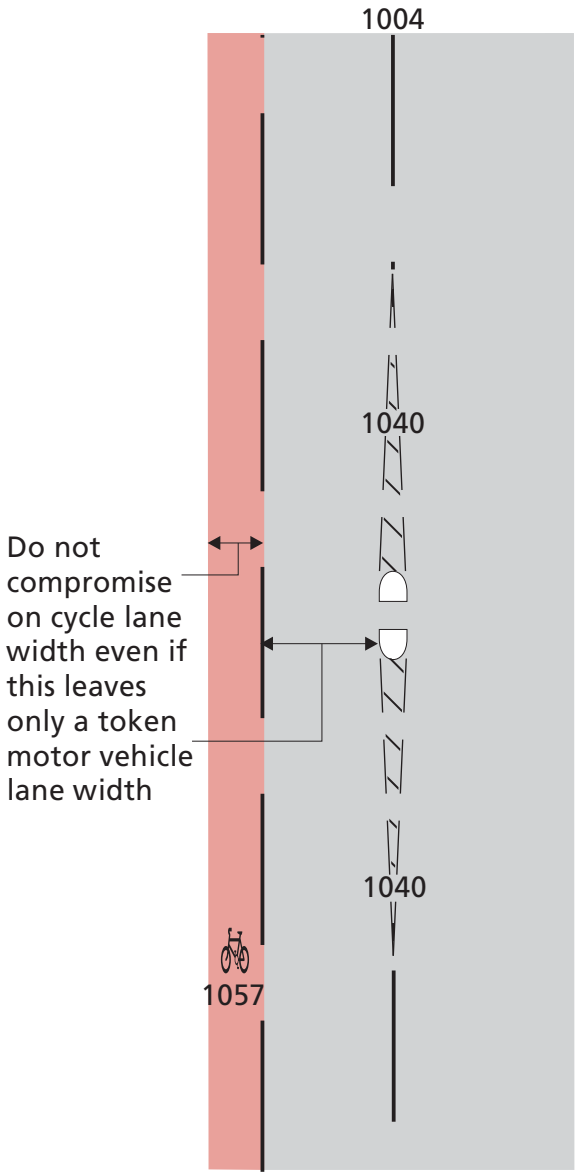
Figure 3.8.7 Rumble devices



Notes

1) For more details on rumble strips see Traffic Advisory Leaflet 11/93.

Figure 3.8.8 Traffic islands/refuges



Notes

1) *Motor vehicles turn into the path of cyclists at refuges and sometimes race them for the gap. They may overtake too closely and this intimidates.*
2) *Only normally use refuges if there is a **demonstrable demand** for pedestrians and where the following minimum width criteria are met:*
   40mph: 5.0m
   30mph: 4.5m
3) *A 3.0m gap is acceptable at low speed such as at the exit from a mini-roundabout or slow entry to a side road.*
4) *These minima must be strictly adhered to on gradients, uphill or downhill, or if there are significant numbers of wider vehicles.*
5) *Consider using a zebra or puffin to cater for pedestrian demand.*
6) *An over wide advisory cycle lane through an existing narrow gap will help deter traffic from dangerous overtaking by leaving only a token residual motor traffic lane. It is important that the vehicle lane width left does not encourage drivers to overtake cyclists. To achieve this, the cycle lane may need to be wider than the minimum 1.5 metres and the vehicle lane less than a car width.*
7) *Narrow cycle lanes should **never** be used past a refuge, as they encourage drivers to drive dangerously near to cyclists in the gap.*
8) *Space taken from the footway to widen the carriageway should be considered (see table 4.2.2).*
9) *A cycle symbol should be placed in advance of the refuge.*
10) *As shown it may be worth while using colour for the cycle lane at pinch-points.*
11) *See also Table 4.1.1.*

Plate 3.8.3 Narrowings that cause danger

Section 4: Routes Within the Highway

4.1 Widths

4.1.1 Width issues for cycle traffic

1. Busy roads can be unpleasant to cycle on where there is inadequate width for a vehicle to pass a cyclist without having to cross the centre line of the road. This can result in a driver giving a cyclist too little room when overtaking. It can be intimidating for a cyclist to have a vehicle waiting close behind him or her for an opportunity to overtake. Having to wait behind a cyclist until it is safe to overtake can cause delay and frustration for a motorist.

2. If cycle flows are to increase it is important that, as far as possible, adequate space for cycle traffic is provided on main roads. Dutch design advice (Crow, 1993) gives useful guidance on the space requirements of a cyclist.

4.1.2 Lane cross sections

1. These design guidelines adopt as a basis for discussion the concepts of "spacious", "critical" and "tight" lane cross-sections, taken from the Dutch Design Manual (Crow, 1993).

2. An adequate lane cross-section is required to allow for overtaking space of a bicycle past a motor vehicle and also of a motor vehicle past a bicycle.

3. A **"spacious"** cross-section is the ideal. It provides sufficient space, for motor vehicles to overtake bicycles safely without crossing into the adjacent lane. See Figure 4.1.2

4. A **"critical"** cross-section cross-section occurs where the majority of motor vehicles may be encouraged to overtake a bicycle within the lane, but with inadequate clearances. Wider vehicles however will need to move over the centre line of the road.

5. A **"tight"** cross-section is too narrow for a motor vehicle to overtake a bicycle within the lane. Motor vehicles following cycle traffic within a tight cross-section, or suddenly braking to do so, can be very intimidating. Cycle traffic can operate comfortably in a tight cross-section only if the speeds and volumes are low and overtaking by using the outside or oncoming lane is easy. The creation of a tight cross-section, for example by footway widening, may be considered in urban central locations, but can be intimidating for cyclists being followed by motor vehicles.

6. Figure 4.1.3 indicates dimensions of vehicles and gaps between vehicles for speeds of 30 mph. Narrower roads or narrowings in the road below these dimensions can cause problems for cycle traffic.

7. The dimensions in Figure 4.1.3 represent a spacious cross-section. A 7.3 metre wide carriageway does not adequately provide for high cycle traffic flows. To provide for high flows a 1.5 metre wide cycle lane may be considered or an off-carriageway cycle track.

8. If cycle lanes are too narrow they may increase the hazard from motor vehicles. Drivers may think that they are able to drive "right up to" the cycle lane line, leaving less room than is required for the cycle traffic.

Figure 4.1.1 Cyclist's kinematic envelope

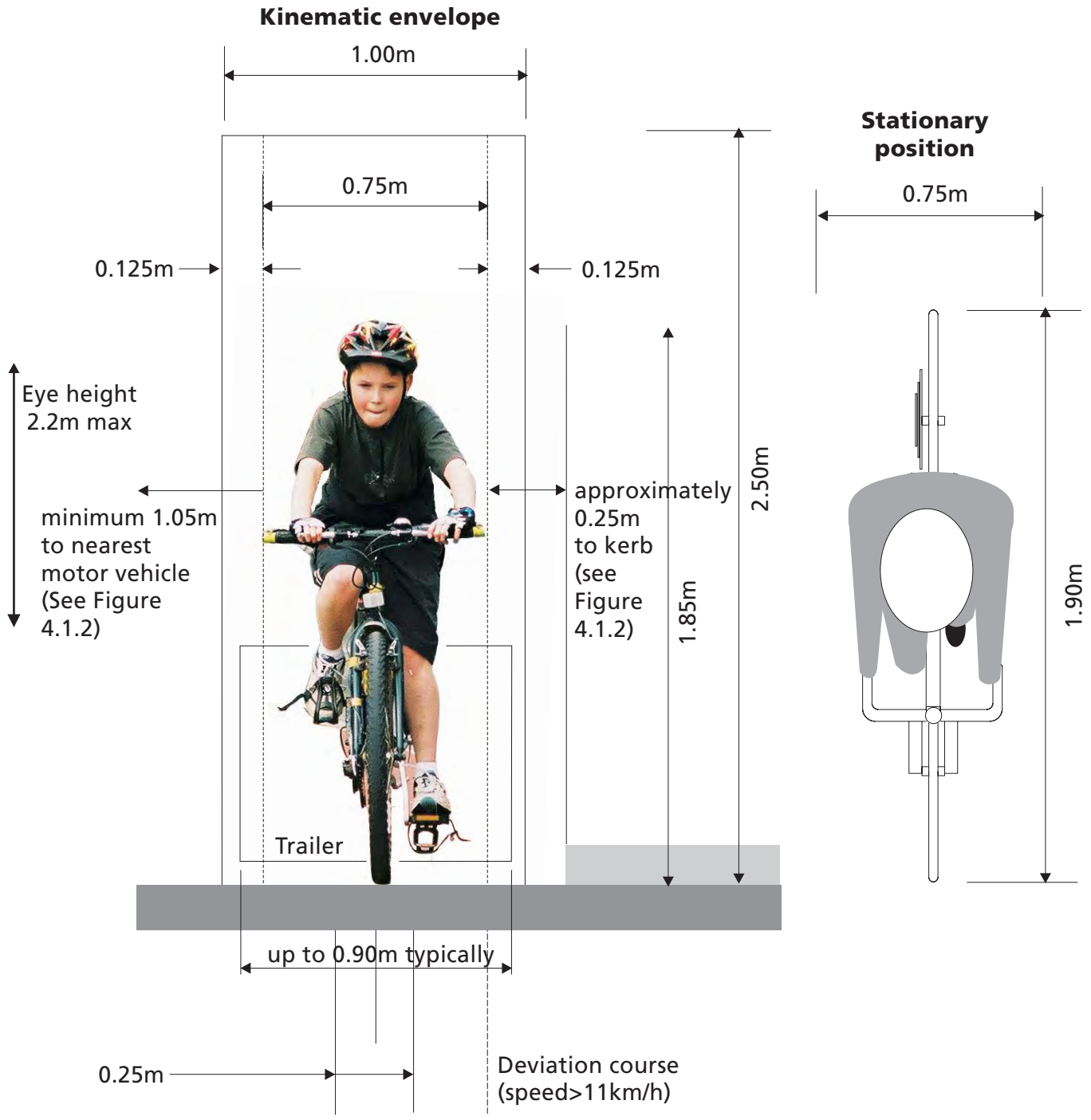
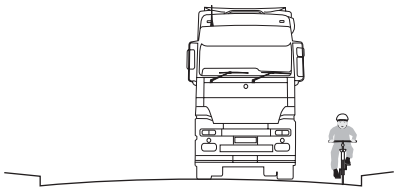


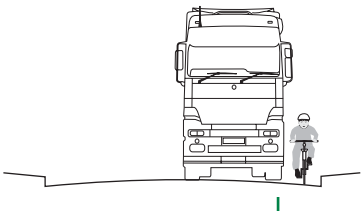
Figure 4.1.2 Cross-section descriptions

Spacious cross-section



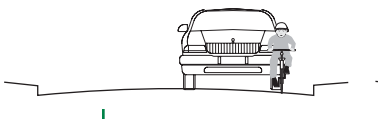
- At 30 mph cars and cyclists can pass each other comfortably with 4.26m lane width.
- At 30 mph with significant numbers of HGVs/PSVs overtaking can take place comfortably with 5.05 m width.
- Wider than 4.20m, motorists may form two lanes in congested conditions.

Critical cross-section



- TO BE AVOIDED.
- Standard UK DMRB Vol 6 Sec1 Part 1 TD9/93 lane widths of 3.65m mean that a heavy goods vehicle or Public Service Vehicle with cycle overtaking manoeuvre would encroach the oncoming lane.

Tight cross-section



- On roads with narrow lanes motor vehicles will follow cyclists until an appropriate gap in oncoming or outside lane traffic.
- For use only where speeds are 20 mph or less and where traffic volumes are low so that a motorist only needs to follow a cyclist for a short distance before overtaking.

Table 4.1.1 Cross-section comments and mitigation

	Spacious	Critical	Tight
Definition	Sufficient room to safely overtake cycle traffic	Dangerous close overtaking	No room within the lane for overtaking of cycle traffic
Dimensions	At 30 mph: 4.20m (cars only) or 5.05m (HGVs) At 20mph: 3.75m (cars only) or 4.60m (HGVs)	3.10 to 3.75 metres	3.10 metres or less (cars) or 3.60 metres or less (with HGV traffic)
Comment	• acceptable at most speeds but more space or separation needed as speed increases.	• not advised as it encourages dangerous overtaking; • more acceptable if it is easy to overtake (e.g. little oncoming traffic, no central island).	• only normally acceptable for short distances; • speeds lower than 20mph; • good visibility; • more acceptable if next to lanes that allow easy overtaking (e.g. no barrier, little traffic).
Mitigation		• reduce speeds; • an advisory cycle lane or cycle logos within the main carriageway may help to boost cyclists' confidence and keep traffic to the right.	• reduce speeds; • wide advisory cycle lane to alert drivers to cycle traffic presence and lack of overtaking space.
Application	Main roads, distributor roads with cycle lanes	Not recommended without off-carriageway cycle path	Residential roads

Notes

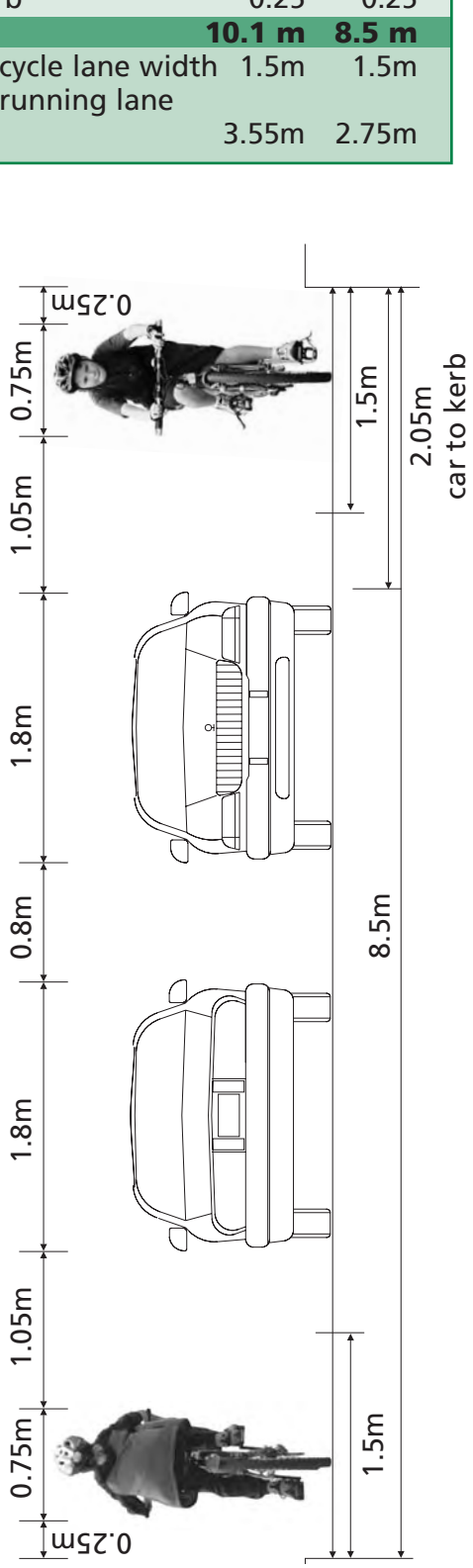
1) *Table 4.1.1 is relevant to:*
   - *Cycle lane widths (Table 4.2.2).*
   - *Refuges (Figure 3.8.8).*
   - *Kerb build-outs and footway widening (Figure 4.1.5).*
   - *Adding traffic lanes, hatching and ghost islands (Figures 4.1.6 and 6.2.6).*
   - *Dual carriageways (Figure 4.1.4).*
   - *Hills and gradients (Section 2.1.2).*

Figure 4.1.3 Required lane widths at 30mph

2-lane road	With HGVs	Car only
Gap to kerb	0.25	0.25
Cycle	0.75	0.75
Cycle/motor vehicle gap	1.05	1.05
Motor vehicle	2.60	1.80
M. vehicle/m. vehicle gap	0.80	0.80
Motor vehicle	2.60	1.80
Cycle/motor vehicle gap	1.05	1.05
Cycle	0.75	0.75
Gap to kerb	0.25	0.25
	10.1 m	**8.5 m**
Minimum cycle lane width	1.5m	1.5m
Minimum running lane width	3.55m	2.75m

Notes

1) At lower speeds less width is required and at higher speeds more width is required.



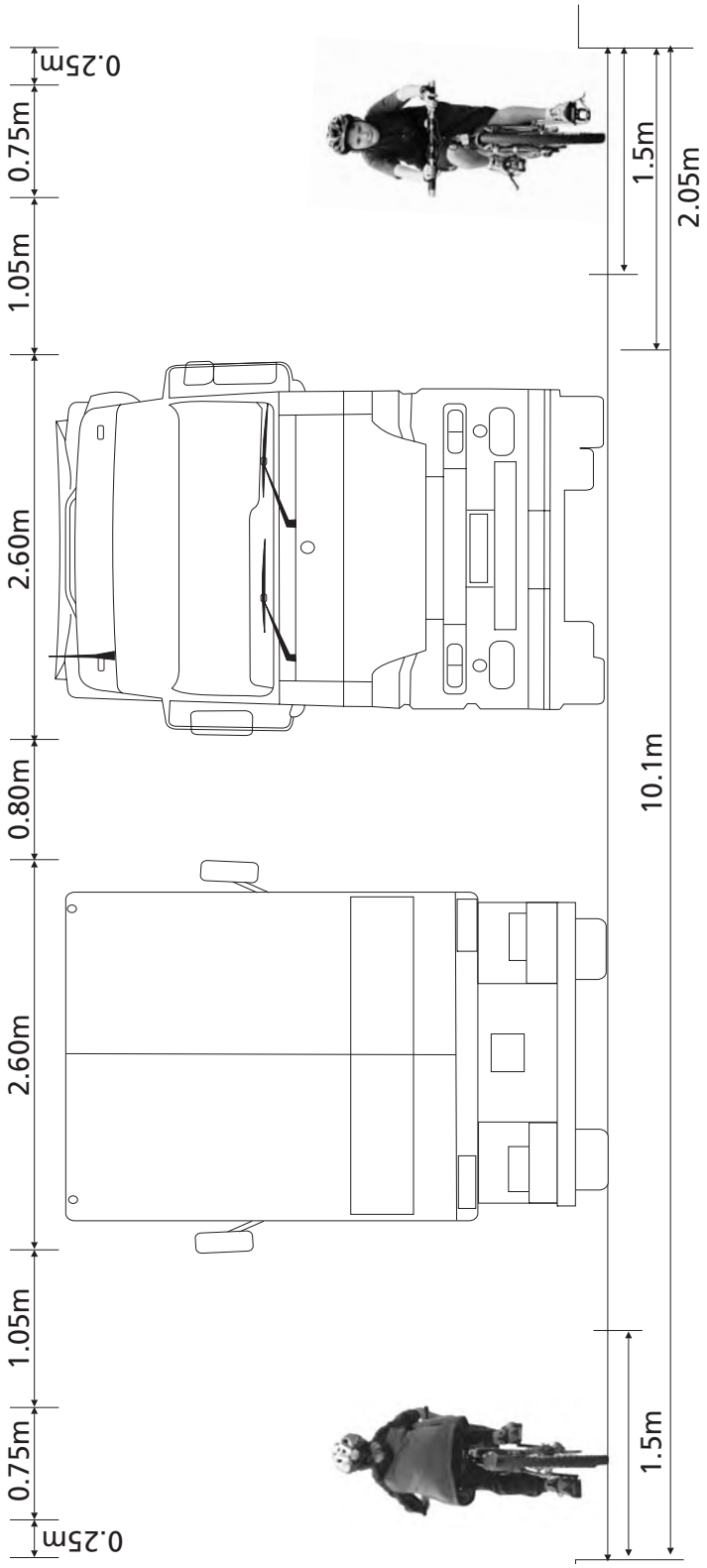
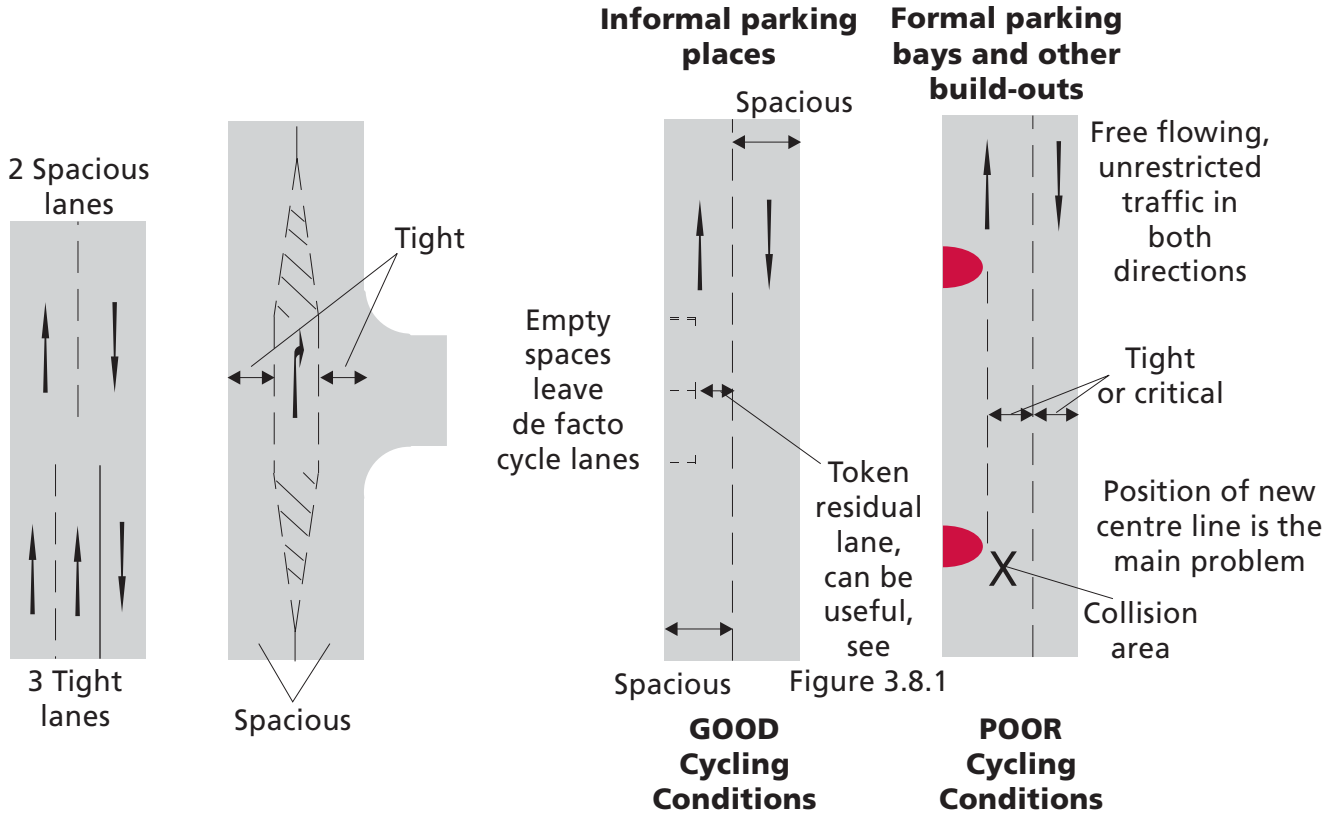
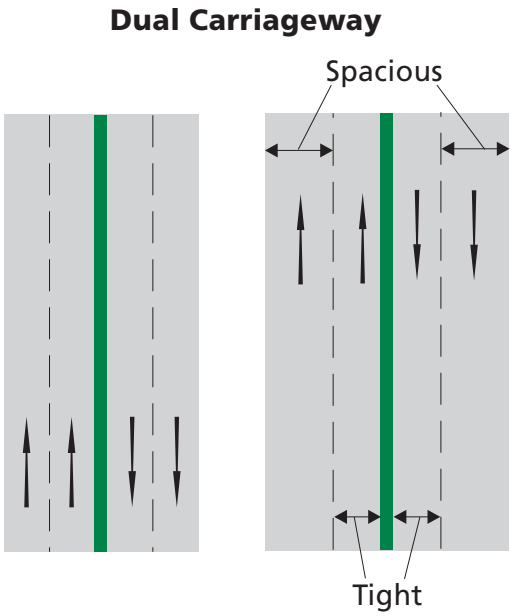


Figure 4.1.4 Cross-section examples

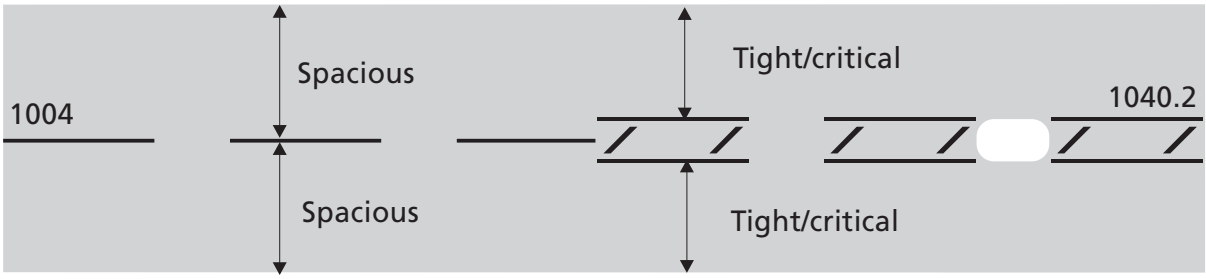


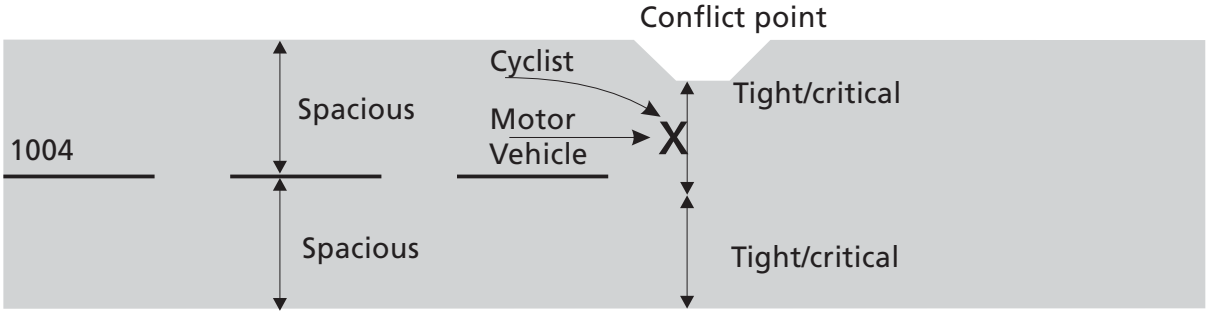


Notes

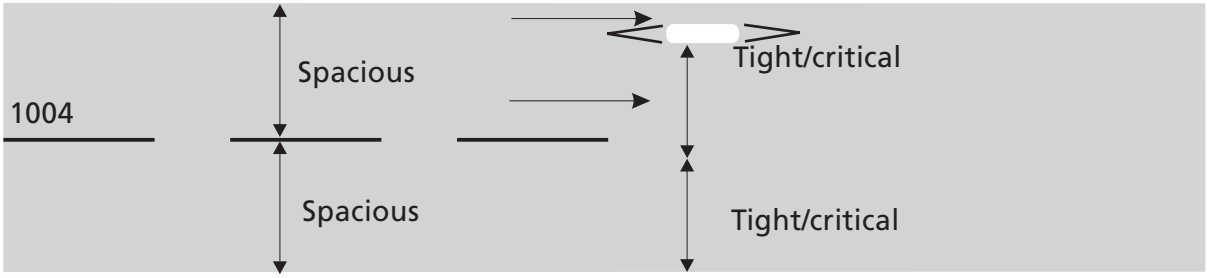
1) *See Figure 3.8.1 for further detail on parking and limited waiting bays.*
2) *See also Table 4.1.1.*
3) *On a dual carriageway with 30mph speed and low HGV flows, the nearside could for example be 4.2 metres and the offside lane 3.1 metres.*
4) *Alternatively on a dual carriageway with low flows, the number of running lanes could be reduced to one lane with a cycle lane. This will also help reduce speeds.*

Figure 4.1.5 Features that create tight or critical cross-sections





Possible remedy; a cycle bypass:



Notes

1) *If it creates a tight or critical profile, central hatching should only be used where traffic flows are light.*
2) *The remedy of a bypass may or may not be feasible, depending on the purpose of the build-out.*
3) *Sweeping the carriageway adjacent to the build-out will be a problem.*
4) *Using the footway is a possible solution but only if tapers both vertically and horizontally are acceptable, see Figures 4.2.1 and 4.2.2.*
5) *It is always better to avoid a pinch point.*
6) *See also Table 4.1.1.*

4.1.3 Design for existing roads

1. The Design flow chart in Figure 4.1.6 assists designers in deciding on whether and what sort of on-road provision may be made for cycle traffic.
2. It may be used in reviewing existing facilities or where improvements are sought in a route for cyclists.
3. Figure 4.1.7 shows lines of equal cycle level of service deduced from work by Landis et. al. (1997). For example, on a road carrying 4,000 vehicles per day a similar level of service for cycle traffic is obtained with a width of 4.0m at 30mph or 4.5m at 40mph or 6,000 vehicles per day with a width of 4.5m ans a speed of 30mph. Designers may use the chart as a guide for the design of traffic management schemes and new roads.

4.1.4 Design for new roads

1. Estates roads will usually have low volumes of traffic and road widths to suit.
2. Distributor roads and other new main roads should normally be designed with a spacious profile to accomodate cycle lanes or off-carriageway cycle paths. The choice of facilities is discussed in the next section.

Figure 4.1.6 Design flow chart

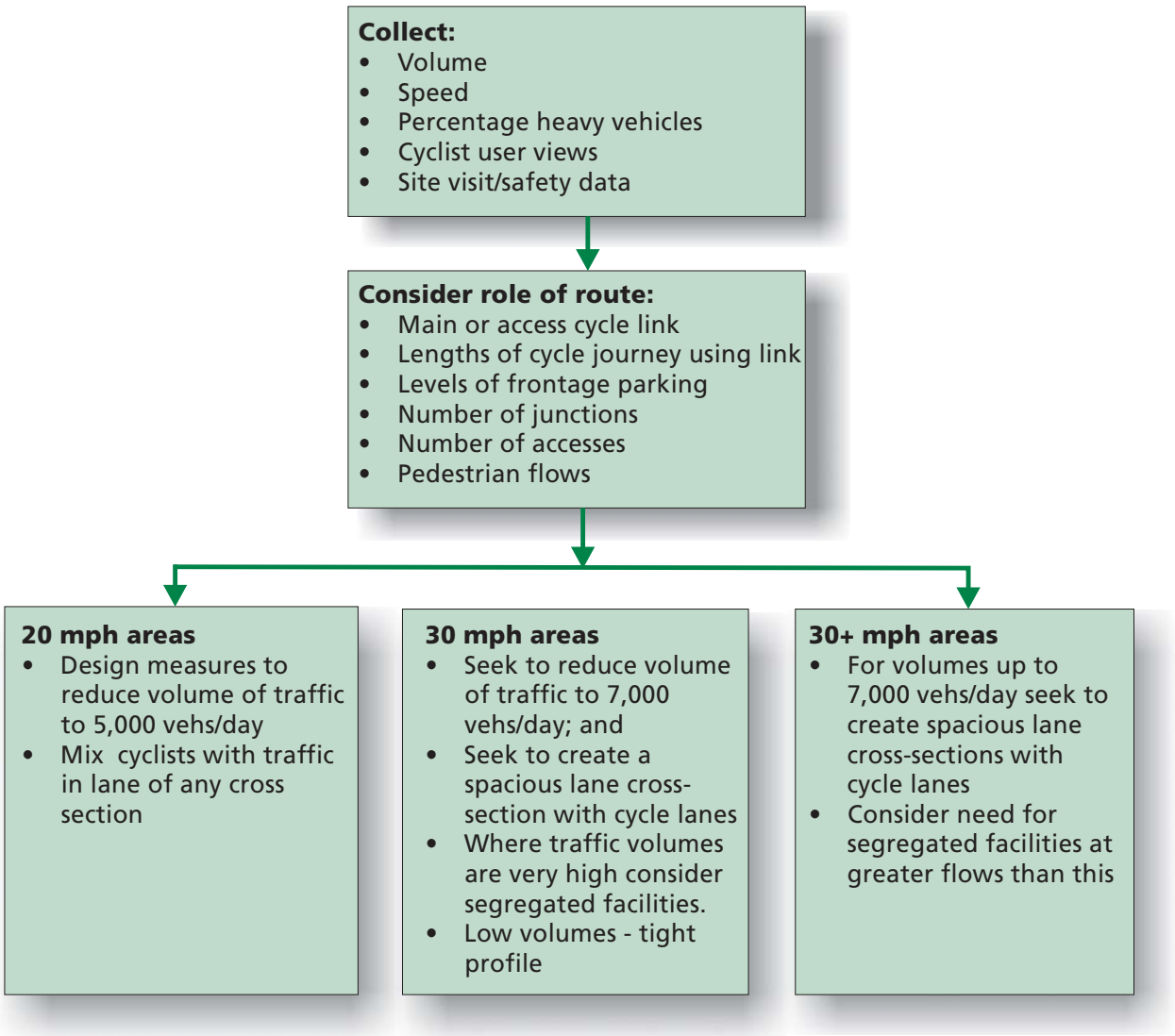
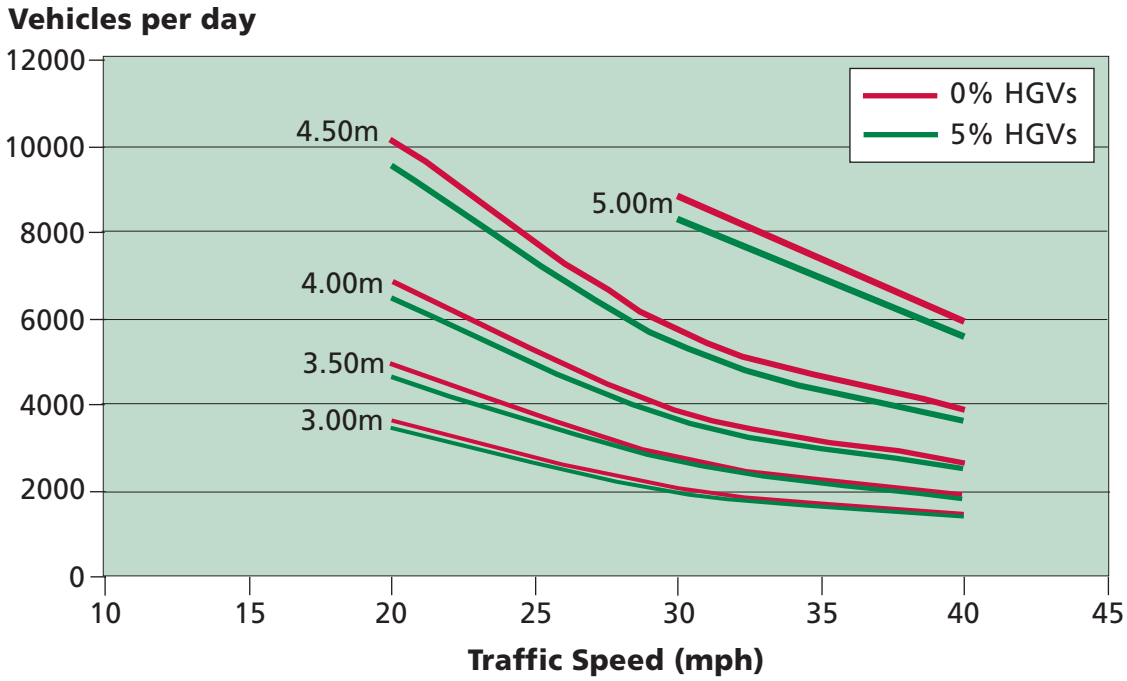


Figure 4.1.7 Lines of equal cycling level of service



4.2 Choice of facilities

4.2.1 On carriageway and cycle lanes

1. There are three ways of providing space for cycle traffic:
   - a lane shared with motor traffic;
   - a Mandatory Cycle Lane; and
   - an Advisory Cycle Lane with or without parking restrictions.

   Cycle lanes of the correct width ensure drivers give cyclists adequate width when overtaking them.

2. Mandatory cycle lanes (Figure 4.2.4) are segregated with a solid white line (Dia. 1049) and it is a traffic offence for motor vehicles to move in them (see also para 4.4.2).

3. Advisory lanes are marked with a dashed white line (Dia. 1004) and motor vehicles are allowed to move in them if they are clear of cycle traffic. This makes it easier to provide full width cycle lanes where space is limited.

4. The cycle lane should be used to direct a cyclist to the most appropriate part of the road. Often, they have not been used in this way. Poorly designed lanes will increase danger for cycle traffic as they will not be able properly to stay within them, against the expectation of motor vehicle drivers.

5. Cycle lanes may create the impression of a facility which is in some way safer for cycle traffic. This may not be the case and is certainly not the case if cycle lanes are too narrow for the conditions.

6. The absence of a cycle lane is nearly always preferable to a cycle lane that is too narrow i.e. below 1.5-2.0m (see Table 4.2.2). This is principally because motorists tend to drive right up to the line, which may be too close to cycle traffic. They also direct cyclists too close to the kerb, often a hazardous and uncomfortable place.

7. An exception to this may be approaching a junction to allow for a cyclist to bypass queueing traffic. A narrow cycle lane is not recommended where, during the green aspect of the signals, speeds are higher than about 20 mph.

8. Cycle lanes should not be absent where they are most needed, for example to assist in protecting space or directing traffic flow through a junction or at narrowings. Consideration should be given to joining up cycle lanes past constrictions into continuous lanes.

9. Cycle lanes between two lanes of running traffic should never normally be less than 2 metres wide.

10. Coloured surfacing is not usually required for cycle lanes. It may be considered at certain points where there is a greater risk of collision problems to assist in enhancing the visual presence of the cycle lane. These should be used sparingly.

Table 4.2.1 Cycle lane advantages and disadvantages

Cycle Lane Advantages	Cycle Lane Disadvantages
• Can usefully direct cyclists to be in the most appropriate positions on the road; • Can separate motor vehicles from cycles; • Provide a legal means for cyclists to "undertake" other traffic in a queue; • Highlight the potential presence of cyclists; • May encourage more cycling; • Provide a degree of route continuity.	• Can direct cyclists inappropriately; • Motor vehicles may drive "up to the line" and, where the lane width is inadequate, provide less space for cycle traffic than required; • difficult to overtake within the cycle lane.

11. An engineering review on the surface of the carriageway by riding on a cycle should be undertaken before the introduction of

a cycle lane. Rough and uneven surfaces should be re-surfaced and ironworks re-laid if necessary.

12. Table 4.2.2 shows minimum cycle lane widths. Where cycle lanes may provide an advantage for cycle traffic at widths less than these, then consultation with cycling groups should take place first before they are implemented.

13. Where speeds are greater than 40mph, consideration should be given to increasing the width of the cycle lane. There is a possibility that traffic may use a cycle lane of 2 metres or more as a running lane. A hatching strip between the cycle lane and running lane is another option. Where speeds are higher than 40mph, consideration could also be given to reducing the speed limit if only 1.5metre wide cycle lane can be installed.

Table 4.2.2 Cycle lane widths

Design Speed	Gradient	Minimum Cycle Lane Width
Over 30 mph	flat	2.0 metres
30 mph	flat	1.5 metres (see notes 2 & 3)
30 mph	greater than ± 3.0%	2.0 metres

Notes

1) Cycle lane widths less than these recommended may create significant hazard for cycle traffic.

2) These widths assume appropriate lane widths for other traffic lanes, see figure 4.1.3. Narrow motor traffic lanes will result in motor vehicles driving up to the cycle lane dividing line. In these situations wider cycle lane widths (up to 2 metres) and even narrower motor traffic lane widths should be considered to ensure the preservation of the kinematic envelope for cycle traffic.

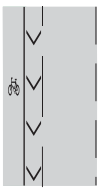
14. Additional treatments may include (See Figure 4.2.4):

- separation from car parking by a 1.0 metre (0.5 metre minimum) hatched strip;
- greater separation from other motor traffic by a hatched strip;
- addition of an occasional separating island.

15. Abrupt changes in lane direction should be avoided. This is necessary for both motor traffic and for cycle traffic. The table indicates the maximum taper inclinations for traffic at different speeds. Note that the design must consider both cycle traffic and motor traffic separately and guard against too great an inclination for both types of traffic where they are in separate streams.

16. Tapers to create the start of a cycle lane (and also a bus lane) may be at not greater than 1:10. It is the speed and direction of motor traffic that should be the main determinant of the position and taper of the cycle lane, not so much the cyclists' speed or the shape and position of the kerb.

3) Where the carriageway is very wide, a half-metre hatching strip between the cycle lane and vehicle lane will give cyclists greater protection and help reduce vehicle speeds.



4) See also Table 4.1.1.

5) DMRB TA 90/05 recommends a desirable width of cycle lanes on trunk roads as 2 metres and a minimum width of 1.5metres.

6) Yellow lines can help deter parking in cycle lanes.

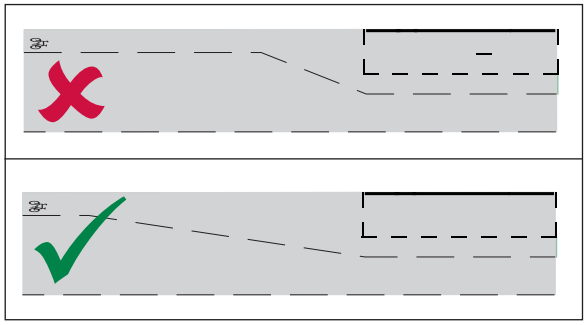
Table 4.2.3 Advantages and disadvantages of different types of on-carriageway provision

Type of lane	Advantages	Disadvantages
No cycle lane	• better downhill; • better where cycle traffic should not feel constrained to move along a certain path, e.g. at junctions.	• may not provide adequate manoeuvring space without a lane.
Mandatory lanes	• exclusive space for cycle traffic.	• often difficult to provide sufficient width; • inflexible; • inapplicable at junctions.
Advisory lanes	• flexible, as encroachment by motor vehicles allowed; • can be used even where road cross-section is narrow; • may be used past hazards (e.g. central refuges or left hand bends) if the width is 1.5 metres or greater.	• parking can mean the lane is useless; • if parking restrictions imposed, raised rib of yellow painted line can be problematic, especially in narrow cycle lanes (i.e. less than 1.5m).

Notes

1) Where space is limited it is better to provide an uphill cycle lane and no downhill cycle lane.

Figure 4.2.1 Tapers



Speed	Change in direction taper
96kph / 60mph	1:50
50kph / 30mph	1:20
40 kph / 25 mph	1:9
30 kph / 19 mph	1:7
20 kph / 12 mph	1:4

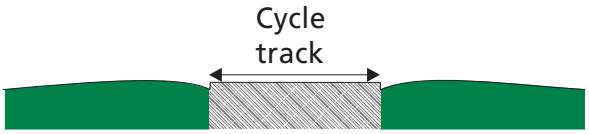
Notes

1) Note that a cyclist may easily cycle at 20 mph, particularly downhill, and so sharp changes in direction at this speed are not possible.

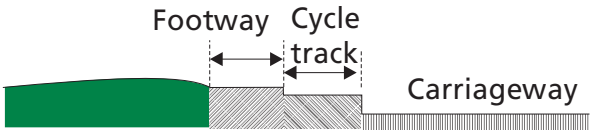
4.2.2 Cycle tracks

1. Cycle tracks may be categorised as follows (See also Figure 4.2.2):
   - A - remote from the highway;
   - B - cycle-only track kerb separated from the remaining carriageway and from the footway;
   - C - cycle-only track separated from the remaining carriageway by a dividing strip, often kerbed;
   - D - Adjacent use footway and cycle track;
   - E - Shared use footway and cycle track.
2. All cycle tracks should be smooth, level and direct and at least as good in quality as adjacent or nearby carriageways.
3. Tracks REMOTE FROM THE HIGHWAY (Type A) are dealt with in Section 5.
4. CYCLE-ONLY TRACKS - KERB SEPARATED FROM THE REMAINING CARRIAGEWAY (Type B) provide an additional degree of separation from motor traffic and may be appropriate where motor vehicle speeds and volumes are high or where cycle volumes are high or could be high based on provision of this type. Great attention to detail is needed with kerbed routes, particularly at junctions, passing places and where there are many pedestrians crossing randomly. Adequate width to allow safe overtaking by other cyclists is also essential.
5. CYCLE-ONLY TRACKS SEPARATED BY A DIVIDING STRIP (Type C), particularly if kerbed, will create significant maintenance problems.
6. CYCLE TRACKS SAME LEVEL AS FOOTWAY Conversion of parts of the footway to cycle use should be avoided unless widths allow and there is an advantage to cycle traffic (Types D and E).
7. **Cycle tracks should normally be on both sides of the carriageway**. This will help ensure that the cycle traffic has better access to premises and side roads. It will encourage them to use the track on the left hand side of the road, which may reduce the chance of an accident involving a driver failing to see a cyclist from the right at a junction. In unlit areas cyclists lights heading towards oncoming vehicles on a two cycle track can cause confusion.
8. A gap of 0.5 - 1 metre is desirable at the side of a cycle track to allow for hedge growth, or to locate signs or lamp columns.
9. Where there are hazards adjacent to the side of a cycle track such as a ditch or embankment slope greater than 1 in 3, consideration should be given to measures to protect cyclists such as fencing or shrubs. The risks are greater on bends and at night.
10. On high speed roads consideration should be given to physical separation between the carriageway and cycle track. If a hardstrip is provided this can be counted as part of the separation. The desirable minimum separation is 1.5 metres on roads with a speed limit of more than 40mph.

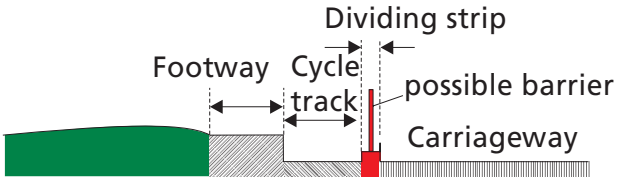
Figure 4.2.2 Types of off-carriageway provision



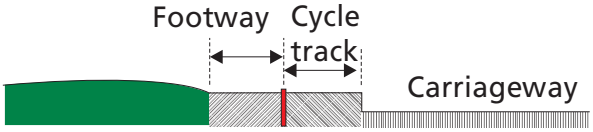
A - remote from carriageway



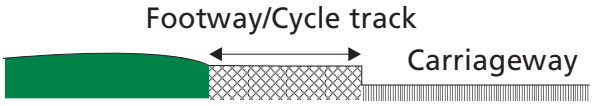
B - cycle-only track kerb separated from footway and carriageway



C - cycle-only track kerb separated from footway and divided from carriageway



D - Adjacent-use footway and cycle track (see also Figure 5.2.1)



E - shared-use footway and cycle track

Notes

1) Widths are indicative only, see Figure 4.2.3.

4.2.3 Joining and leaving the carriageway

1. The accident data (Section 2.3) has shown that joining and leaving the carriageway is potentially hazardous.
2. Significant care needs to be taken in placing locations where cycle tracks enter and leave the carriageway. For example this should not be where traffic is accelerating or turning.
3. Good locations are at junctions where motor traffic already anticipates conflicting movements.
4. Principles for linking tracks and carriageway.
   - all tracks and off-road facilities need safe, practical and convenient links to other tracks and to the carriageway network;
   - motor traffic (rightly) does not expect cycle traffic to be moving on and off the carriageway at other than places that have clear visual clues that cycle traffic may be joining or leaving;
   - parallel merges for cycle traffic onto the carriageway should be provided as opposed to give ways; and
   - cycle traffic must not be expected to join or leave the carriageway at pinch points.

Table 4.2.4 Advantages and disadvantages of different types of off-carriageway provision

Letter Type Designation	Advantages	Disadvantages	Typical use	Two or one way
A Remote from highway	May provide useful alternative direct routes Absence of unpleasantness due to motor traffic	May be night time security issues	Any level of, use if provides essential connections	Usually two-way, directions to be reinforced by arrows on the surface
B Cycle-only track kerb separated from footway and carriageway	Design speed same as highway Cycle Track level may rejoin carriageway level at junctions No obstructions (unlike cycling on footway) Only ever in same direction as traffic creates no conflict problems Better for the visually or mobility impaired Reduced unpleasantness due to motor traffic	Construction and drainage costs potentially high Trip hazard for pedestrians Increased land take In busy areas pedestrians may walk on cycle track anyway Increased construction cost Higher maintenance cost	High cycle flows	One-way only, with the direction of flow same as adjacent traffic One-way reinforced by Dia 652 and arrows on surface if necessary
C Cycle-only track kerb separated from footway and divided from carriageway	Design speed same as highway No obstructions (unlike cycling on footway) Safety strip between track and carriageway If wide enough, a place for signs etc. Reduced unpleasantness due to motor traffic	Construction and drainage costs potentially high Significant drainage and sweeping problems Difficult to enforce one-way movement of cycle traffic Trip hazard for pedestrians Not suitable in streets where pedestrians cross at any point rather than specific crossings Higher verge cutting costs Greater land take	High cycle flows	Better to be one-way as above
D Adjacent-use footway and cycle track	Less land take Pedestrians and cyclists can cross white line to pass Cheaper to maintain Reduced unpleasantness due to motor traffic	Low speeds required for cyclists Conflict with pedestrians If provided as two-way then there are MAJOR conflict problems. At junctions cyclist will be forced to act as though they are pedestrians. Usual footway obstructions (signing, etc.) cause problems. Difficult to enforce preferred one-way movement of cycle traffic On two-way tracks drivers do not expect on-coming cycle traffic on left	Very low cycle flows	Better to be one-way, could be two-way over short sections to provide essential connections
E Shared-use footway and cycle track	Reduced unpleasantness due to motor traffic	All as above Even more conflict with pedestrians Almost impossible to enforce one-way movement of cycle traffic	Very low flows	Better to be one-way

Notes

1) Off-carriageway provision should normally be placed on both sides of the carriagway.

4.2.4 Factors to consider when converting an exising footway to a cycle track

1. It is important that schemes that involve the conversion of existing footways to cycle tracks do not result in disbenefits for pedestrians, especially people with disabilities or visual impairment. National advice is available from the Department for Transport on this.

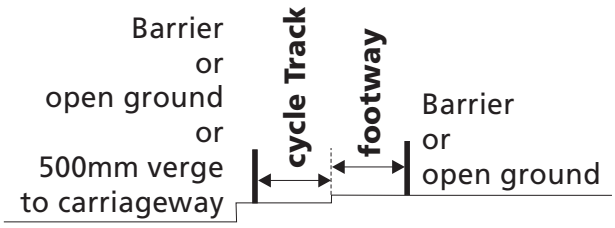
Table 4.2.5 Factors to consider when converting an existing footway to a cycle track.

1. Whether good cycling conditions can be provided on the carriageway, either by reducing traffic volumes or speeds or by allocating road space to cyclists.
2. Effect on pedestrians, including blind and disabled people.
3. Benefits for cyclists. Cyclists are not likely to use a shared path if it has frequent give ways.
4. Type of cyclists likely to use facility e.g. school children.
5. Gradients. On steep hill consideration should be given to widening the path or increasing the separation between cyclists and pedestrians.
6. Existing and potential use by cyclists and pedestrians.
7. Accident statistics.
8. Effect on frontage e.g. closeness to windows.
9. Number of roads and private accesses crossed. A higher number of roads and private accesses crossed increase the chance of an accident happening.
10. Conflict with pedestrians going to shops
11. Physical constraints of site.

2. Disabled and visually impaired groups should be consulted about any proposals to convert a footway to a cycle track.
3. It should not be automatically assumed that cyclists can be better served off-carriageway if an on-carriageway solution is not feasible. It is necessary to demonstrate that an adjacent or shared use path will be attractive to new cyclists, those already using the carriageway, whilst addressing the needs of new cyclists.
4. Any proposal to convert a footway to a cycle track should:
   - Be safe for all users, including those with disabilities and visual impairments;
   - Be easily accessible from side roads, private accesses and the carriageway, and avoid frequent give ways;
   - Be at least as convenient as the on road equivalent;
   - Be well designed, attractive, comfortable to use and have a good riding surface.
5. To convert a footway to a cycle track, the footway must be removed under section 66(4) of Highways Act and a cycle track constructed under Section 65(1) of the act. (See section 4.4.1).

Figure 4.2.3 Widths of off-carriageway provision

a)



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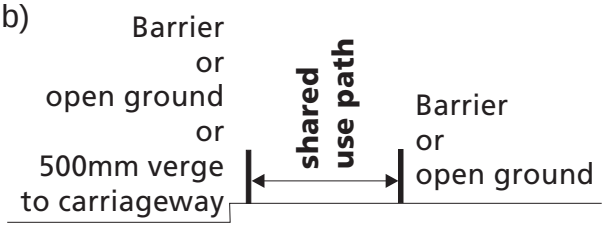


Adjacent to	One-way cycle track to allow ocassional passing	One-way cycle track (1)	Two-way cycle track (2)	Cycle track Separated from footway by(3)	footway
Open ground	2500 mm	1500 mm	3000 mm	50 mm kerb	2000 mm
Walls / bushes etc.	2500 mm	1750 mm	3250 mm	50 mm kerb	2000 mm
500 mm verge to carriageway	2500 mm	1500 mm	3000 mm	50 mm kerb	2000 mm
Open ground	2000 mm	1500 mm	3000 mm 1500mm min	White line / colour contrast	2000 mm 1500 mm min
Walls bushes etc.	2250 mm	1750 mm	3250 mm	White line / colour contrast	2000 mm
-	-	-	3000 mm shared use path		

Notes *(all dimensions in millimetres)*

1) *Where there are cycle tracks on both sides of the road arrows may be needed to indicate to cyclists the direction in which they are expected to use the cycle track.*

2) *Kerb separation from footway necessary when track remains part of carriageway. Kerb separation may be used on shared use footways when volumes of pedestrians or cyclists is high. Fencing either between the cycle track and the carriageway or the cycle track and the footway may be used where there is good reason to enhance segregation.*

3) *Where verge causes maintenance problems the additional width may be provided in blacktop with lining to indicate the cycle track. Bollards may be placed intermittently along the verge to prevent abuse of the cycletrack by motor vehicle (e.g. for parking).*

4) *Unsegregated options may be considered where either pedestrian or cycle traffic is low, in this case widths as for the cycle track may be appropriate.*

5) *Where the cycle side of a path segregated by a white line is less than 2 metres wide, cyclists will have to cross it to pass another cyclist. This is generally only acceptable where flows of pedestrians and cyclists are low, or there are width constraints.*

6) *Available widths and anticipated cycle and pedestrian volumes may suggest that narrower widths could be acceptable.*

7) *Where, because of physical constraints, a full width can not be constructed, consideration could be given to a narrower path with passing places. The passing places should be at least every 50 metres and in sight of one another.*

8) *Where a two way cycle track is provided on one side of the road, it is recommended that a high degree of separation be provided between the cycle track and carriageway, to avoid cyclists' lights confusing oncoming vehicles.*

9) *In some cases provision for horses will be needed alongside a carriageway as well as cyclists. Horses do not have a legal right to use cycle tracks. However Section 71 of the Highways Act 1980 places a duty on highway authorities to provide an adequate verge for ridden horses where this is necessary or desirable. In such cases the verge should not be obstructed by signs.*

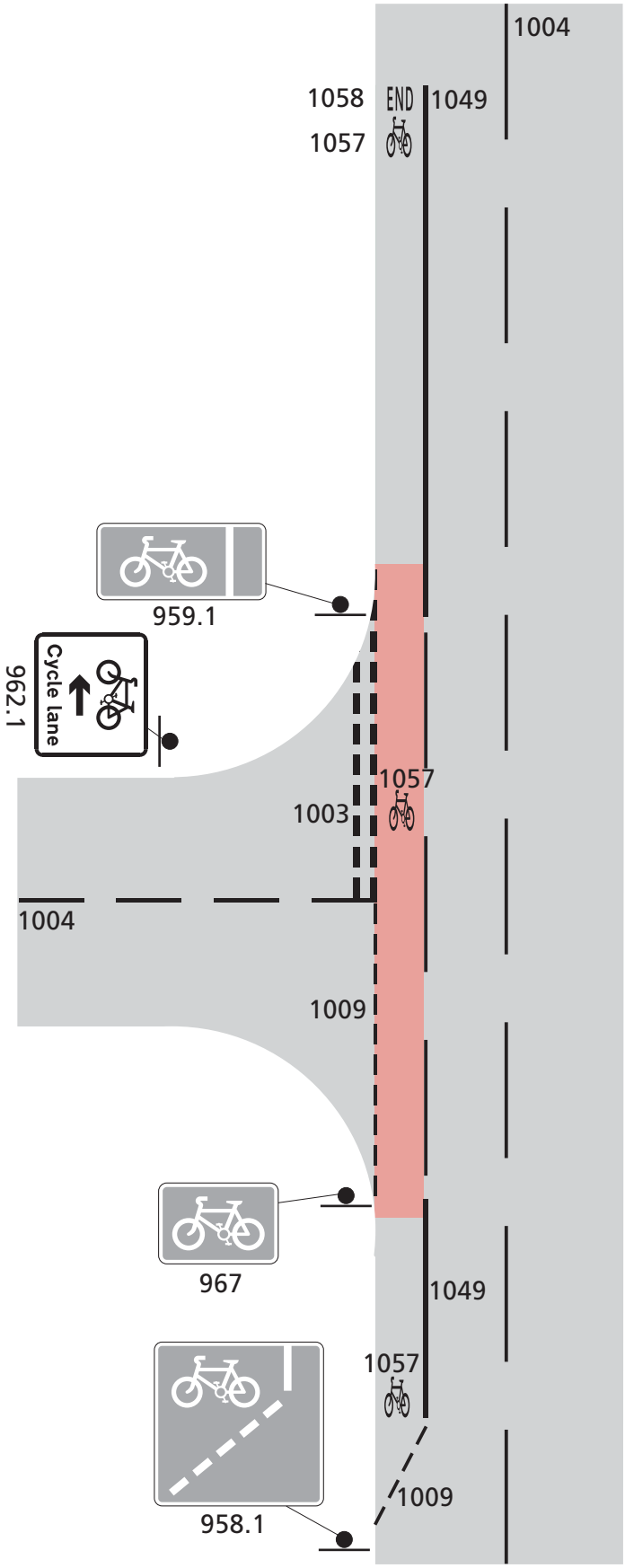
10) *Guard rails should only be used to separate cycle and pedestrian paths for a short distance as there is a risk that cyclists' handlebars and pedals will collide with them.*

11) *Unsegregated shared use paths have operated satisfactorily down to 2 metres wide. However the preferred minimum width is 3 metres.*

12) *Where the combined flow of cyclists and pedestrians is more than 200 in a peak flow, for example outside a school, consideration should be given to segregation or to widening the path.*

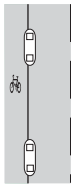
13) *See also Figure 5.2.1.*

Figure 4.2.4 Cycle lane layouts

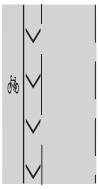


Notes

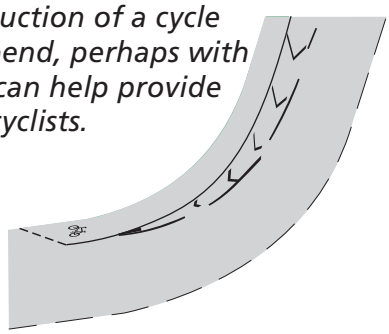
1) *Advisory cycle lane marked across junction even if mandatory elsewhere. In some circumstances consider coloured strip without lane marking to prevent impression that cycle lane is give way line.*
2) *Coloured surfacing used in cycle lane only where additional conspicuity would help prevent inappropriate vehicle encroachment.*
3) *Traffic islands may help reinforce separation of cycle lane from motor vehicle lane.*



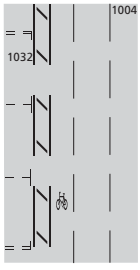
4) *On very steep descents, or where cycle speeds are high, cycle lanes may need to be wider than the standard. (See Table 4.2.2).*
5) *Hatching may be beneficial where a cycle lane is narrower than recommended or where motor vehicle speeds are high.*



6) *The introduction of a cycle lane at a bend, perhaps with hatching, can help provide space for cyclists.*

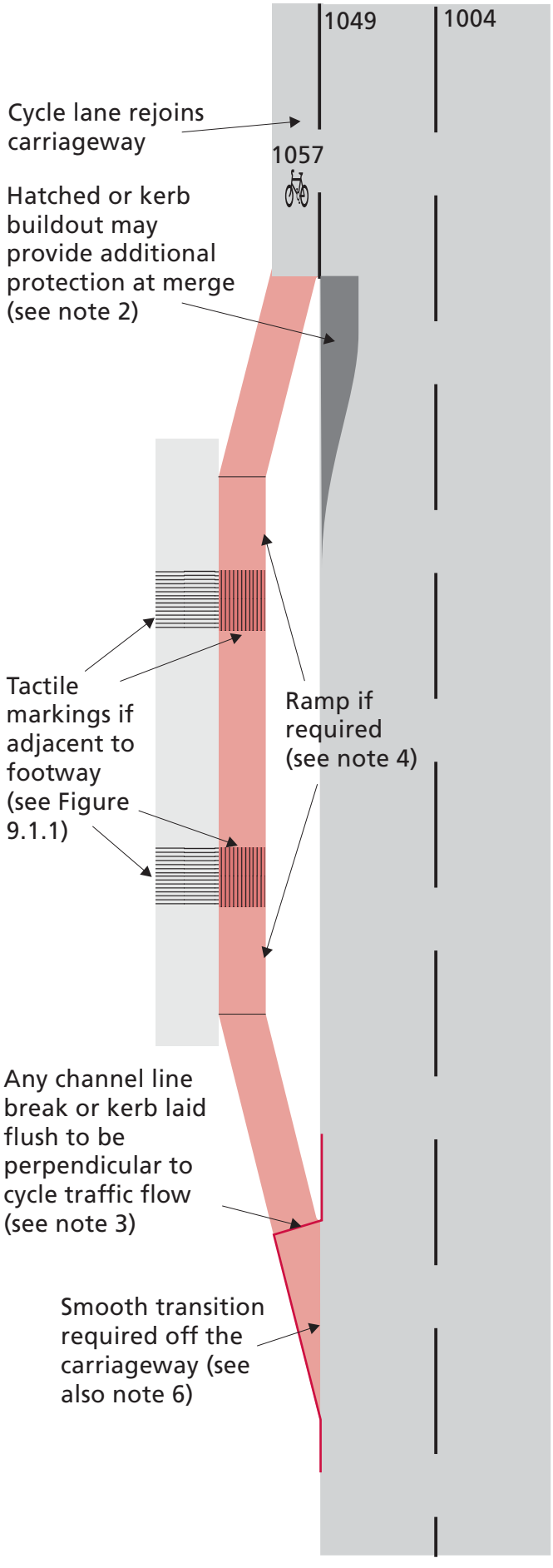


7) *A hatching strip between parked vehicles and cycle lane may be beneficial (advisory lanes only) especially on shopping streets, where the turnover of parked cars is likely to be high. This will reduce the chance of a cyclist being injured by somebody opening a car door.*



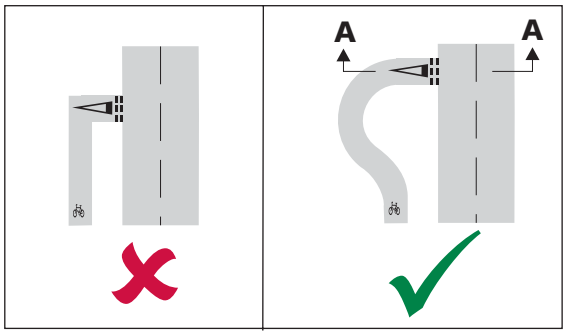
8) *Gullies with gratings parallel to kerb should be replaced when introducing cycle lanes.*

Figure 4.2.5 Principles of cycletrack/carriageway merge/diverge



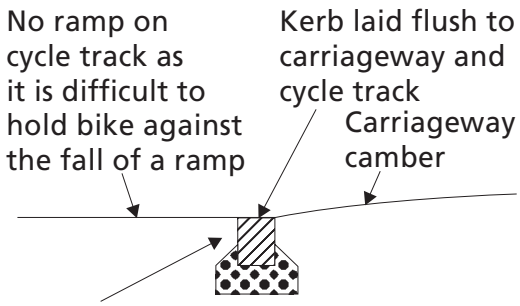
Notes

1) *Merges and diverges to and from carriageway should be at a 1:4 taper or slacker. (but see Figure 4.2.1).*
2) *The carriageway may need to be narrowed prior to the merge.*
3) *Any changes in level to cycle track not to occur where horizontal changes in direction of the cycle track occur.*
4) *Vertical changes to be avoided and limited to a maximum gradient relative to the general profile of 1:40.*
5) *Gradient changes to be smoothed.*
6) *A diverge mirroring the merge (as shown) is a further alternative.*
7) *A kerb upstand of 10mm is required where pedestrians and cyclists cross the kerbline, otherwise they should be flush.*



- impossible angles.
- radius of 4m OK
- only acceptable where majority of cycle traffic is crossing, not merging.

Section A to A



Longditudinal fall needs to be sufficient to avoid ponding.

4.3 Cycle Traffic and Buses

4.3.1 Bus lanes

1. Cyclists should be allowed to use all bus lanes. Where existing bus lanes do not allow such use then traffic regulation orders should be remade to allow such use.
2. The following summarises bus lane widths in relation to the cross-sections defined in Table 4.1.1.
   - **Tight**: 3.6 metres width and less: a bus would have to move out of the lane to overtake a cyclist;
   - **Critical**: 3.6 metres to 4.4 metres: can create the impression that there enough room to pass when there is not in reality;
   - **Spacious**: 4.4-5.2 metres wide at 30 mph, greater widths required at higher bus speeds.
3. Without too many buses or too great a speed, bus lanes can be the best cycle lanes available. Advantages of bus lanes include:
   - improvement in safety;
   - improvement in convenience;
   - maintenance of permeability in areas closed to motor traffic; and
   - distances cycle traffic from motor traffic.
4. Bus lanes may operate on a timed basis and such timing should have regard to the needs of cycle traffic.
5. There are some problems with bus lanes as identified below:
   - buses may tend to travel faster than they otherwise would as they are freed from congestion;
   - bus lanes may create narrower lanes for traffic in the opposite direction, hence creating critical, or even tight cross-sections where they did not exist previously.
6. In places, taxis have been allowed in bus lanes. Taxis can cause cyclists problems in narrower bus lanes and if high cycle volumes are expected, then in line with the hierarchy of users, consideration should be given to the effect of taxis on cycle traffic.

4.3.2 Bus stops and cycle tracks

1. Consideration needs to be given to the layout of an off-carriageway cycle track in the vicinity of a bus stop.
   - there may be conflict with passengers waiting for a bus or getting on and off it;
   - cycle traffic may be impeded;
   - cyclists might collide with a bus shelter in the dark.
2. Possible solutions are:
   - A wider verge by bus stop, so bus passengers have a landing point before crossing the cycle track;
   - running the cycle track at the back of the footway rather than on the carriageway side;
   - bending the cycle track away from the carriageway at the bus stop;
   - reflective strips on the bus stop.
3. In some cases, conflict with passengers waiting at bus stops may be a reason for preferring on carriageway provision to an off carriagway cycle track.
4. Bus boarders can cause problems for cyclists deflecting them onto the path of traffic.

4.4 Planning and Legal Issues

4.4.1 Advice on converting footways

1. A proposal to convert a footway or part of a footway to a cycle track requires that:
   - the footway be "removed" under the powers in section 66(4) of the Highways Act 1980; and
   - the cycle track be "constructed" under section 65(1) of the Highways Act 1980.
2. The process need not involve construction work but there needs to be clear evidence that the highway authority has exercised its powers. This can be provided by a resolution of the cabinet member.
3. The order needs to be specific about which part of the footway will become cycle track. Rights of way on foot are not affected by such orders, unless the order specifically excludes pedestrians. Consultation (i.e. notices on the footway) is advisable though not statutorily necessary.
4. By virtue of Section 21 of the Road Traffic Act 1988 it is an offence to use a motor vehicle on a cycle track, and the making of Traffic Regulation Order is no longer required to control such use on a cycle track.
5. A shared facility should be clearly signed. Usually orders are cast such that pedestrians can walk on the footway and the cycle track, but cyclists must not stray onto the part designated for pedestrians.
6. Crossings of a footway, for example from a carriageway to a route away from the carriageway (e.g. a permissive route through a park or cycle track leading away from the carriageway) usually do not need conversion orders and in this sense are similar to a driveway or other access crossing of a footway. Short sections of cycle track along a footway leading to such off-carriageway routes may however need conversion to a cycle track.
7. The engineering layout and design of the pavement will need to be considered carefully for any footway to cycle track conversion. (See Sections 4 and 9).

4.4.2 Advice on cycle lanes

1. Mandatory cycle lanes are given effect by the use of a Traffic Regulation Order. It is common practice to reinforce a mandatory cycle lane with "no parking at any time" and "no loading at any time" traffic regulation orders where parking may otherwise take place.
2. It should be noted, that the crossing of the white line is a moving traffic offence, only enforceable by the police. Parking behind a solid white line with no traffic regulation order preventing parking leaves traffic wardens and decriminalised parking authorities with no powers to enforce.
3. It is worth noting that decriminalised parking authorities and traffic wardens can enforce parking restrictions on cycle tracks, whether created under S65 of the Highways Act 1980 or under a Cycle Track Act 1984 Order.
4. Solid white lines should be carried across private accesses, but only broken white lines should extend across junctions.
5. Advisory cycle lanes are sometimes promoted and these do not need Traffic Regulation Orders. This may be expedient, but as motor vehicles may freely enter the lane, then abuse through parking is more readily observed. Advisory lanes are needed where vehicles have to encroach onto the cycle lane to pass along the road.

4.4.3 Advice on highway extinguishment

1. Restrictions on the use of highways by vehicles is usually dealt with under traffic regulation orders.

2. As part of general land use or specifically in connection with development, a local planning authority can extinguish rights to use a highway by vehicles. Types of vehicle may be specifically described in the order and therefore allow for continued use of pedal cycles.

3. This power has been exercised in relation, for example, to pedestrianisation schemes.

4. Traffic regulation orders would also normally be made so that prosecution could be carried out against offenders. This may be unnecessary if the design of the scheme is self-enforcing, for example through physical measures.