About Sustrans

Sustrans makes smarter travel choices possible, desirable and inevitable. We're a leading UK charity enabling people to travel by foot, bike or public transport for more of the journeys we make every day. We work with families, communities, policy-makers and partner organisations so that people are able to choose healthier, cleaner and cheaper journeys, with better places and spaces to move through and live in.

It's time we all began making smarter travel choices. Make your move and support Sustrans today.

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This first chapter of the Sustrans Design Manual provides key background on core design principles that underlie the guidance in subsequent chapters. As well as specific cycling schemes, these principles apply to the cycle proofing of wider highway and traffic management schemes as well as maintenance; highway maintenance schemes can offer an important opportunity to implement key improvements for cyclists at minimal additional cost.

This chapter is part of a suite of technical design guidance on active travel being developed by Sustrans. This library of guidance will be largely web based and will be regularly updated with new examples including the latest innovative and experimental schemes.

Readers of the Sustrans Design Manual are also directed towards the “Handbook for cycle-friendly design” which contains a concise illustrated compendium of the technical guidance contained in the Design Manual. This chapter has initially been issued as a draft and it is intended that it be reviewed during 2015; feedback on the content is invited and should be made to designandconstruction@sustrans.org.uk

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1. **Top 10 tips for user-focused design for cycling**

1. **Cyclists are important:** designs should send the message that cyclists are at least as important users of the highway network as motor traffic, with cyclists being given an advantage in terms of directness and priority where possible;

2. **User experience:** cycle the route yourself, at various times of the day / week, and make sure you consult with potential cycle users and existing users throughout the design process;

3. **Target user:** design should be attractive and comfortable for the less confident cyclist – a sensible 12 year old or novice adult who is trained to National Standards / Bikeability Level 2 – but should aim to provide for the more confident cyclist as well. Where more confident cyclists choose not to use any facilities provided their needs should also be addressed with separate provision where appropriate; they should not be compromised by the design;

4. **Design in line with cycle training:** on-highway design should reinforce how people are taught to cycle in National Standards / Bikeability Level 2, in particular primary and secondary road positioning;

5. **Cycles are vehicles:** take account of their space requirements, manoeuvrability and speed in all infrastructure, not just specific cycle facilities;

6. **Cycles are muscle powered:** aim to minimise energy loss through stopping, hills and sharp corners; cyclists should never be required to dismount on cycle routes;

7. **Make space for cyclists:** where segregation of traffic is appropriate this should be achieved through reallocation of road space – taking space from the footway should be the last resort;

8. **Tame traffic:** the speed and volume of motor traffic, the proportion of large vehicles, and opportunities to reduce these, will influence the type of provision appropriate and whether specific cycle facilities may be necessary;

9. **Continuity and quality of standards:** consistent high quality provision (including signage) along a route and at both ends of the trip is essential, with route design following the 5 Core Principles of Coherence, Directness, Safety, Comfort and Attractiveness. Difficult engineering solutions should be addressed early on to avoid gaps being left. The design should aim to minimise maintenance requirements and costs, and take account of who is responsible for that. Ensure the design of the route enables it to be used effectively in the dark and in poor weather;

10. **Behaviour of other users:** take account of the real world behaviour of all users – including how pedestrians and drivers may interact with cyclists and vice versa.
2. Design principles

Overview

2.1 In order to achieve the behavioural change required to increase levels of cycling, and to engage those who are currently deterred from cycling, a physical environment that encourages the greatest number of people to cycle must be created and properly maintained. To achieve this, a network of high quality cycle routes suitable for the less confident cyclist should be integral to that environment. This is particularly important in urban areas where the majority of short trips occur and where the greatest modal shift can be delivered.

2.2 The network must also provide a high level of service for confident and experienced cyclists; a user group into which increasing numbers of cyclists will graduate. This group tends to place particular importance on directness, journey time reduction and can be catered for on roads with higher volumes of mixed traffic, but they will also benefit from facilities that provide convenience and increase safety for cyclists in these environments.

2.3 The network should connect all significant trip generators and attractors - schools and colleges, retail areas, primary healthcare and hospitals, businesses, public transport interchanges, leisure and visitor attractions and public open space – with residential areas.

2.4 The network may be organised around a hierarchy of route categories that distinguishes main through routes from more local access routes. Network Planning is dealt with in Chapter 2 of the Design Manual.

2.5 Local circumstance, the category of route and the expected user type will inform the type of intervention proposed. The main options to consider are:

- measures to make mixing with traffic more attractive through reducing traffic volumes and speeds, allocating adequate lane widths and managing conflicting turning movements;
- cycle routes separated from traffic - as defined by cycle lanes and tracks on the highway and traffic free routes away from the highway.

2.6 Design guidance in The Netherlands and Denmark, reflected in much of the UK guidance, identifies a number of underlying principles for the design of cycle routes:

- core principles for high quality design
- degree of segregation from motor traffic relates to speed and volume or motor traffic

2.7 Guidance for provision for walkers is covered by the CIHT’s Guidelines for Providing for Journeys on Foot, whilst the standard reference for those designing for mobility impaired, visually impaired and wheelchair users is DfT’s Inclusive Mobility.
Core principles for high quality design

2.8 Extensive networks of high quality routes that enable people to cycle safely and conveniently should reflect the five core design principles of:

- coherence
- directness
- safety
- comfort
- attractiveness

2.9 These appear in various forms in the most widely used UK local authority design guidance documents and in the most highly regarded guidance from other countries. Encouraging less confident / returning / new cyclists will usually need a significantly higher level of provision to cater for their safety (real and perceived) and comfort, than existing, confident cyclists.

2.10 Where substantial increases in cycling are expected, consideration should also be given to the adaptability of infrastructure to accommodate large increases in use.

Table 2.1 The core design principles

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Description</th>
<th>Typical measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coherence</td>
<td>Link all potential origins and destinations</td>
<td>Continuity of suitable provision along the route</td>
</tr>
<tr>
<td></td>
<td>Be continuous and recognisable</td>
<td>Routes through areas inaccessible to motor traffic</td>
</tr>
<tr>
<td></td>
<td>Offer consistent standard of protection throughout</td>
<td>Routes must be recognisable – ideally which the user can follow intuitively, without dependence on frequent signing</td>
</tr>
<tr>
<td></td>
<td>Be properly signed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Include well located cycle parking</td>
<td></td>
</tr>
<tr>
<td>Directness</td>
<td>Be based on desire lines</td>
<td>Cyclists being able to maintain an appropriate speed</td>
</tr>
<tr>
<td></td>
<td>Result in minimal detours or delays</td>
<td>Minimised delays at junctions and crossings</td>
</tr>
<tr>
<td></td>
<td>Provide a positive advantage, in terms of directness and priority,</td>
<td>Route not perceived as a detour (this may include a trade-off between distance and gradients)</td>
</tr>
<tr>
<td></td>
<td>over motor traffic</td>
<td>Infrastructure to cross physical barriers, e.g. bridges, major changes to junction layouts</td>
</tr>
<tr>
<td>Safety</td>
<td>Be safe and be perceived as safe</td>
<td>Reduced traffic speed and volume</td>
</tr>
<tr>
<td></td>
<td>Provide personal security</td>
<td>Reallocation of road space as the norm</td>
</tr>
<tr>
<td></td>
<td>Limit conflict between cyclists and pedestrians and other vehicles</td>
<td>Safe provision at crossings and junctions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adequate widths, forward visibility and turning radii on traffic free routes</td>
</tr>
<tr>
<td>Comfort</td>
<td>Be smooth, non-slip, well maintained, drained and free of debris</td>
<td>Provide lighting where used for utility trips</td>
</tr>
<tr>
<td></td>
<td>Have sufficient width for the level of use</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Have easy gradients</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Be designed to avoid complicated manoeuvres</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Enable cyclists to maintain momentum</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Minimise impacts of noise, spray and headlight dazzle from other traffic</td>
<td></td>
</tr>
<tr>
<td>Attractiveness</td>
<td>Be attractive and be interesting</td>
<td>Dropped kerbs are flush</td>
</tr>
<tr>
<td></td>
<td>Integrate with and complement their surroundings</td>
<td>Minimise requirement to give way at junctions</td>
</tr>
<tr>
<td></td>
<td>Contribute to good urban design</td>
<td>Adequate turning radii</td>
</tr>
<tr>
<td></td>
<td>Enhance personal security</td>
<td>Lighting on routes used for commuting &amp; utility trips</td>
</tr>
<tr>
<td></td>
<td>Be well maintained</td>
<td>Attention to detail</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>A pleasant environment for cyclists exposed to their surroundings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green space / trees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In front of buildings rather than to the rear</td>
</tr>
</tbody>
</table>
Target users

2.11 Cyclists can be categorised into a range of different groupings that relate to the person, the design of bike or the type of journey they are making, with varying characteristics and needs, for example:

- sports (16-25+mph)
- experienced commuter (13-17mph)
- general utility (10-13mph)
- children (5-13mph)
- leisure
- users of specialist equipment (child trailers, tandems, adult tricycles, disabled adapted cycles, recumbents, load carrying bikes)

2.12 If cycle routes are to attract those who currently cycle rarely or not at all, the design should be attractive and comfortable for the less confident cycle user - a sensible 12 year old or novice adult who is trained to National Standards / Bikeability Level 2. Whilst this should be seen as the key target user, a high quality route will also provide for the more confident cyclist as well. Where the more confident cyclists choose not to use facilities provided their needs should also be addressed with separate provision where appropriate; they should not be compromised by the design.

2.13 In addition, it is essential that infrastructure design reinforces how people are taught to cycle, in particular primary and secondary road positioning.

2.14 Different types of cyclist tend to place different priorities on each of the five core principles, because of their different levels of familiarity and skill in riding in traffic and because of their different speeds (and the consequent speed differential with motorised traffic).

2.15 Experienced cyclists who can maintain higher speeds are better able to merge with moving traffic and place particular importance on directness, minimising detours and delays.

2.16 Less experienced cycle users and those cycling with children or heavy luggage (or in poor weather) will tend to value more segregation and facilities to assist them to make right turns, and may tolerate slightly less direct routes to achieve this.

2.17 Leisure cyclists will tend to place higher value on the attractiveness of a route.
Integration and segregation of motor traffic

2.18 A decision on whether specific cycle provision is appropriate on a link should consider a range of requirements, constraints and problems when selecting options. These will include:

- movement functions (including the type(s) of cycle users and the current and forecast volumes of cyclists)
- place functions
- visual character
- physical dimensions of the highway
- interface with the provision at junctions and adjoining sections of route
- wider cycling objectives (e.g. cycle network considerations, potential for growth)

2.19 This section considers how the appropriate cycle facility (shared carriageway, cycle lane, physical segregation) on cycle routes along the highway corridor might be chosen. As traffic free routes away from the carriageway generally offer important additional links on the cycle network away from the road network, the decision to provide these is based on wider network considerations, discussed later in this chapter.

2.20 Tools for assessing the appropriate design solution under different traffic volume and speed combinations are in widespread use in design guidance, both in the UK and abroad. Figure 2.1 illustrates how traffic volume and speed may influence the decision on the need to segregate cyclists from other traffic, and demonstrates how restraint of traffic speeds and volumes is central to creating satisfactory conditions to encourage new and novice cyclists to use the carriageway. The threshold values are intended to reflect the needs of the key target user, described above.
2.21 There are two main ways of using this graph:

- determine what level of provisions may be appropriate for a given highway environment
- select the type of provision you would like to have and then determine how much the speed and volume of traffic would need to be reduced to enable this.

2.22 In deciding the appropriate form of provision consideration must be given to the following:

- traffic speeds
- traffic volumes
- volume of HGVs
- primary cyclist desire lines and cyclist turning movements
- width available
- conflicting uses, such as loading and parking
- arrangements at road junctions – the frequency of minor arm junctions, intervisibility with conflicting traffic, potential to include cycle priority;
- interface with cycle provision on adjoining links (to avoid crossing and re-crossing the road, for example)
- gradients
- volume of cycle use, including future increase
- adaptability of the design to accommodate future growth in cycling

2.23 For routes along the highway corridor, full consideration should be given to options for provision for cyclists on the carriageway – traffic speed / volume reduction, junction treatment and reallocation of carriageway space – before considering converting the footway to shared use or diverting cyclists along a different route.

2.24 In practice, a cycle route will often be a combination of different types of provision: shared roads, cycle lanes, cycle tracks alongside the carriageway and traffic-free routes away from the road. Safe and convenient transitions between these different forms of provision is critical.

2.25 Physical segregation can take a number of forms:

- separation by time – using traffic signals to separate cycle movements from other traffic streams
- intermittent physical separation from vehicles (e.g. use of refuges, planters, bollards, other intermittent delineators)
- continuous physical separation that can be crossed by the cyclists (e.g. low kerb)
- continuous physical separation that can only be crossed at designated locations (e.g. full height kerb, verge)
Reallocation of roadspace

2.26 A fundamental aspect of the provision of cycling facilities is the reallocation of carriageway space from motor vehicles to cycling. This can be seen in the majority of figures within this document. The provision of cycle tracks in urban areas at the expense of the footway is not encouraged (it tends to be unpopular both with pedestrians and cyclists), particularly where there are high pedestrian flows, although there are some limited situations where this may be necessary.

2.27 Reallocation of road space makes an important statement about the relative priority of different transport users as it not only promotes a higher level of service for cycling but can also act as a restraint on motor traffic which is an important aspect of transport and planning policy. Typically this will involve one or more of the following:

- filtered permeability
- removal of a traffic lane
- conversion of traffic lanes to bus lanes or introduction of weight limits
- reduced width of traffic lanes
- removal of centre line
- reduction in traffic speeds
- removal of car parking
- shared space

2.28 As traffic is discouraged from town / city centres this frees up space to improve the environment for cyclists and pedestrians, through the provision of dedicated space or the conversion of carriageways into shared space.

2.29 The following drawings illustrate a number of options where traffic lanes have been removed or narrowed to accommodate provision for cyclists.
Fig 2.2 Reallocation of roadspace

Narrowing of traffic lanes

Single carriageway

Remove centre line to reduce speeds

Cambridge

Advanced stop lines with feeder lanes

Removal of traffic lane to provide cycle track

Dual carriageway

Segregated two way cycle track

Bristol

Camden

Hull
3. Design parameters

Overview

3.1 Designing for cycling must recognise that cyclists have different needs and behaviour from motor traffic or pedestrians. In particular, highway designers need to understand that:

- cycles are vehicles with their particular space requirements, range of speed and manoeuvrability,
- cycles are muscle powered and so users want to minimise energy loss through stopping, hills and sharp corners,
- cycles are strongly affected by surface condition, crossfall and positioning and orientation of gullies and access covers.

3.2 The design of any infrastructure must reflect the geometric and space requirements of cycles and the needs of cycle users. For on-carriageway routes, this will influence traffic lane width, protection for right turns and the design of features such as cycle lanes, cycle gaps, and the interface with cycle tracks. For routes away from the carriageway additional considerations include path radii, path width, visibility, gradient and surface condition. This chapter considers:

- space required by moving cyclists
- dimensions of users
- design speed
- curves and turning radii
- sight distance
- visibility at junctions
- gradients

Space required by moving cyclists

3.3 The space required by cyclists in motion needs to take account of:

- the ‘dynamic width’ of the cyclist
- the clearance when passing fixed objects
- the distance from other traffic, both cyclists and passing motor traffic

Dynamic width

3.4 The static width of a cyclist is around 0.75m. However, cyclists in motion deviate from a straight line, especially at low speeds, and this is recognised by the use of the term ‘dynamic width’ (Fig 3.1). The dynamic width will vary with speeds:

- above around 7mph the amount of deviation is around 0.2m
- at 3mph deviation is typically 0.8m
- for design purposes the dynamic width of a cyclist is taken as 1m, but this may need to be increased on steep hills and on curves.

Fig 3.1 Width required by a cyclist

Fig 3.2 Width required by 2 cyclists (greater width where flows are high)
Clearance when passing fixed objects

3.5
The cycle and cyclist are wider at handlebar level than at the ground, and the effective width available for cyclists is reduced when they pass a fixed object and sufficient clearance or additional width may need to be provided. Figure 3.3 and Table 1 show the additional width required for various types of edge constraint.

<table>
<thead>
<tr>
<th>Type of edge constraint</th>
<th>Additional width required (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flush or near-flush surface (including shallow angled battered kerbs - see photo)</td>
<td>Nil</td>
</tr>
<tr>
<td>Kerb up to 150 mm high</td>
<td>Add 200</td>
</tr>
<tr>
<td>Vertical feature from 150 to 600 mm high</td>
<td>Add 250</td>
</tr>
<tr>
<td>Vertical feature above 600 mm high</td>
<td>Add 500</td>
</tr>
</tbody>
</table>

**Table 3.2 Overtaking by motor vehicles**

<table>
<thead>
<tr>
<th>Minimum passing distance from cyclist’s dynamic envelope</th>
<th>20mph</th>
<th>30mph</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 m</td>
<td>1.5 m</td>
</tr>
</tbody>
</table>

**Table 3.3 Calculation of minimum width required:**

minimum width = a + b + c + d

<table>
<thead>
<tr>
<th>Description</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>a: dynamic width</td>
<td>a</td>
</tr>
<tr>
<td>b: minimum passing distance</td>
<td>b</td>
</tr>
<tr>
<td>from other users (Table 3.2)</td>
<td></td>
</tr>
<tr>
<td>c: clearance for edge constraints (Table 3.1)</td>
<td>c</td>
</tr>
<tr>
<td>d: additional width for high cycle/pedestrian volumes, steep gradients, curves</td>
<td>d</td>
</tr>
</tbody>
</table>

**Table 3.4 Total width required for overtaking**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Width required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car passing at 20 mph</td>
<td>4.3m</td>
</tr>
<tr>
<td>Car passing at 30 mph</td>
<td>4.8m</td>
</tr>
<tr>
<td>Bus/HGV passing at 20 mph</td>
<td>5.1m</td>
</tr>
<tr>
<td>Bus/HGV passing at 30 mph</td>
<td>5.6m</td>
</tr>
</tbody>
</table>
Dimensions of users

3.9
A typical bicycle is approximately 1800mm long and 700mm wide (Table 3.6), but there is a great variety of types in use, for example:

- a bicycle towing a trailer cycle is typically 2750mm long
- a tricycle courier or rickshaw may be 1200mm wide

3.10
Typical minimum widths required by pedestrians and wheelchair users are given below in Figure 3.5. Pedestrians and wheelchair users will benefit from additional width where pedestrian flows are high and/or where the path is bounded by vertical features.

Design speed

3.11
Key design parameters for cycle tracks will normally reflect the expected design speed of the route. A design speed of 12mph is appropriate for a local access route, or for a main route where there is likely to be significant interaction with pedestrians. For other commuter routes, designers should aim to provide a higher design speed of 20mph.

Curves and turning radii

3.12
Desirable minimum curve radii on cycle tracks are governed by the design speed of a route and are shown in Table 3.5 for design speeds of 12mph and 20mph. Additional width on bends is desirable to provide clearances for cyclists leaning into the curve.

<table>
<thead>
<tr>
<th>Table 3.5 Link design parameters - traffic free</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of cycle route</td>
</tr>
<tr>
<td>--------------------</td>
</tr>
<tr>
<td>Commuter route</td>
</tr>
<tr>
<td>Local access route</td>
</tr>
</tbody>
</table>

1. Add 50% for unsealed surfaces
2. Sight distance in motion is the distance a cyclist needs to see ahead when riding in order to feel safe and comfortable

3.13
In some situations, tighter radii are necessary; at junctions or on the approach to an unavoidable hazard. The following minima for the inner radius are recommended in these situations:

- 4m on cycle tracks, where speed reduction is needed
- 2m at an intersection between two cycle tracks, or between a cycle track and the carriageway.
3.14
The absolute minimum turning circle of a bicycle depends on the ability of the rider to balance at low speeds and will be influenced by the design of the cycle. Table 3.6 provides some examples, but these should be treated as limiting dimensions only and not as acceptable design dimensions.

### Table 3.6 Cycle parking and manoeuvring at low speeds: minimum dimensions

<table>
<thead>
<tr>
<th></th>
<th>Overall width (mm)</th>
<th>Overall length (mm)</th>
<th>Minimum turning circle (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Outer radius (a)</td>
</tr>
<tr>
<td>Conventional bicycle</td>
<td>700</td>
<td>1800</td>
<td>1650</td>
</tr>
<tr>
<td>Tandem</td>
<td>700</td>
<td>2400</td>
<td>3150</td>
</tr>
<tr>
<td>Bicycle and trailer</td>
<td>800</td>
<td>2700</td>
<td>2650</td>
</tr>
<tr>
<td>Cargo trike</td>
<td>1200</td>
<td>2600</td>
<td>2300</td>
</tr>
</tbody>
</table>

Note: a wide range of adapted bikes are used for disability cycling: their design requirements will generally fall within the ranges in this table.

### Sight distance

3.15
Table 3.5 shows recommended sight distance parameters for design speeds of 12mph and 20mph. As well as stopping sight distance, figures are included for ‘sight distance in motion’, which is the distance a cyclist needs to see ahead when riding in order to feel safe and comfortable; typically this is the distance covered in 8 to 10 seconds. Sight distance in motion will increase in situations where there is an unavoidable narrowing of the cycle track, because of the closing speed of oncoming cyclists.

3.16
The envelope of forward visibility required by cyclists is given in Fig 3.7. This is measured slightly differently to that for motor vehicles.
Visibility at junctions

3.17
Where a cycle track joins a road or another cycle track adequate visibility must be provided. Normally this takes account of the X and Y distances as defined in Figure 3.8.

3.18
Recommended X distances for cyclists are:
• 4m preferred; this enables cyclists to make an early decision on whether to stop
• 2m recommended minimum
• 1m where geometry is tight and cycle approach speeds low

3.19
If these visibility requirements cannot be achieved, a junction or crossing may still be considered on a lightly used cycle route, making use of the full range of markings and signs available to make clear the need for cyclists to slow down and give way.

Recommended Y distances are given in Table 3.7:

Table 3.7 Visibility at Junctions

<table>
<thead>
<tr>
<th>85%ile speed (kph)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>60</th>
<th>70</th>
<th>85</th>
<th>100</th>
<th>120</th>
</tr>
</thead>
<tbody>
<tr>
<td>’y’ distance (m) on road</td>
<td>14</td>
<td>18</td>
<td>23</td>
<td>33</td>
<td>39</td>
<td>45</td>
<td>59</td>
<td>120</td>
<td>160</td>
<td>215</td>
<td>295</td>
</tr>
</tbody>
</table>

Source: Manual for Streets TD 42/95

Gradients

3.20
Cyclists often choose their route to avoid climbing a steep hill, and new routes up steep gradients should aim to provide acceptable gradients by extending the length of ramp. Generally the gradients in Table 3.8 should be aimed for.

3.21
However, in hilly areas, many roads have much steeper gradients and can make excellent cycle routes.

3.22
Steep gradients tend to increase the speed differential between cyclists and motor vehicles travelling uphill and can make merging manoeuvres with traffic more difficult for cyclists. Designers should assess the need for facilities to assist cyclists make right turns in such situations.

3.23
Steep gradients also increase the speed differential between different cyclists. The width of cycle tracks and cycle lanes on steep gradients should be increased where possible to allow for greater wobble and to enable cyclists to overtake each other.

Table 3.8 Gradients

<table>
<thead>
<tr>
<th>Grad</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3%</td>
<td>Preferred maximum</td>
</tr>
<tr>
<td>5%</td>
<td>Normal maximum – up to 100m</td>
</tr>
<tr>
<td>7%</td>
<td>Limiting gradient – up to 30m</td>
</tr>
<tr>
<td>&gt;7%</td>
<td>For short lengths</td>
</tr>
</tbody>
</table>

Source: LTN 2/08
4. Key Processes

4.1
This section focuses on three key processes which should underlie the development and delivery of a walking or cycling scheme: placemaking, audits, assessments and ecology. A number of other key processes are covered in separate chapters of the Design Manual, including consultation, planning, legal & land and monitoring & evaluation. A separate chapter on placemaking is also included, as opportunities to consider this are often overlooked.

Placemaking

4.2
Provision for cyclists and pedestrians can help create high quality public spaces, and public realm enhancements should in turn deliver improvements for cyclists and pedestrians. National guidance, such as Manual for Streets 1 and 2, calls for a better balance between ‘movement’ and ‘place’ in streets and public spaces. When designing a cycle route, either on-street or traffic free, there is a wider impact on the quality of ‘place’. What makes a good place and how designers can positively contribute to achieving it are outlined below and are described in more detail in Chapter 3.

4.3
The factors which contribute to a successful place are wide-ranging. They include its physical character - scale and massing of buildings, levels of spatial enclosure, legibility of layout, aesthetic qualities, the intricacies and historical references which all combine to define the experience of both being in a place and travelling through it.

4.4
Placemaking is also about functionality and meeting people’s needs – land uses, building design and the public realm should facilitate different modes of travel, provide access for all and create the conditions for social interaction and the development of strong communities. Whilst the physical fabric of a place provides the canvas for public life, it is people and their use of a space which animate it. Good places are the ones which provide a setting for human activity.

4.5
The making of a good place is achieved at different scales. At a strategic scale, towns and cities need to be joined-up and connected so that people can access local services and employment opportunities. New developments need to integrate and connect with existing communities and not become inward looking and closed. Opportunities for strategic corridors of open space should be exploited to provide attractive walking and cycling routes, as well as to provide amenity space and wildlife corridors.

4.6
At the streetscape level, the public realm should be designed to bridge the barriers presented by heavily segregated roads and large volumes of traffic and encourage the sharing of space between motorised and non-motorised transportation. The conditions needed to deliver a cycle and pedestrian-friendly environment – reduced traffic volumes and speeds and connectivity and freedom of movement for cyclists and pedestrians – are the same measures that contribute to creating civilised and socially vibrant places. The presence of cyclists travelling through an area together with provision of seating, cycle parking and good lighting
can practically facilitate human activity and social interaction and make a place feel safer by creating more vibrancy and ‘eyes on the street’. Guidance on specific design measures that can be used to integrate cycle networks with successful placemaking is described in Chapter 3 of the Design Manual.

**Integrating cycling with public realm improvements, London**

### Audits and assessments

4.7

There are a number of different types of audit and assessment processes which can be undertaken when designing and implementing infrastructure schemes. Manual for Streets outlines a Quality Audit process to bring these together, developed further in TAL 5/11, which may include all or some of the following:

- Road Safety Audit, including a risk assessment
- Cycle Audit
- Visual Quality Audit
- Access Audit
- Walking Audit
- Non-Motorised User Audit (pdf)
- Placecheck Audit

### Cycling Level of Service assessment tool

4.8

The recent draft revision of the London Cycling Design Standards (LCDS) introduced a new Cycling Level of Service assessment tool with an associated junction assessment tool. These are intended to set a common standard for the performance of cycling infrastructure for both links and junctions, and can be applied at various stages of the development and implementation of a scheme. A full description is included in the consultation draft of the revised LCDS.
Road Safety Audits

4.9
Where a Road Safety Audit (RSA) identifies that normally recognised design standards cannot be met, all options to mitigate for the issues raised should be explored. The actual level of risk posed by issues highlighted should also be considered and a risk assessment of these may be useful in considering an appropriate proportionate response. It is important to remember that designs do not ‘pass’ or ‘fail’ a RSA. It may be appropriate to accept an identified risk where mitigation of that risk undermines the objectives of the scheme, particularly where the risk is small.

4.10
Sustrans has produced a Technical Information Note 23 that outlines the Road Safety Audit process and how it has been applied, recent changes that reflect new guidance, issues on risk and liability when addressing cycling and walking.

Equality Impact Assessments

4.11
An Equality Impact Assessment (EqIA) is a tool to establish the level of any impact of current legislation, and to identify possible measures to mitigate for these. Initial screening will generally be undertaken by the local authority’s access officer; they will then decide whether to proceed to a full EqIA.

Ecology

4.12
When creating new cycle routes designers are required to take wildlife legislation and nature conservation policies into consideration. It is inevitable that route creation will involve some vegetation clearance, and may impact on protected species or other sensitive receptors. A well designed route will cause minimal disturbance to wildlife, preserve features of particular value and, wherever possible, introduce features that enhance the nature interest of the route. This of course will also make the route more attractive and interesting.
4.13 Sustrans has produced a **Technical Information Note on ecology in the planning process**. This summarises what information is needed by the planning process and timing restrictions for surveys. With ecology it is important for designers to assess proposed routes well in advance in order to programme the surveys (which can be time consuming or have restricted survey periods) and to design the route around features of interest.

4.14 Ecology should also be taken into consideration in the long term maintenance of the route. Vegetation management and structural repairs will be necessary to keep the paths clear and in good condition but maintenance schedules must also take statutory conservation designations, protected species and invasive weeds into account. A management regime that seeks to maintain and enhance biodiversity will also make the route more varied and interesting, contribute to nature conservation goals and create a more valued route.

5. **References**

Guidelines for Providing for Journeys on Foot, IHT 2000

Inclusive Mobility, DfT 2005

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

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

Quality Audits, Traffic Advisory Leaflet 5/11, DfT 2011

Manual for Streets, DfT 2007

Manual for Streets 2, CIHT 2010


Ecology Technical Information Notes, Sustrans

Road Safety Audits, Technical Information Note 23, Sustrans 2011