Chapter 7
Construction including surfacing

Contents

7.1 General issues including streetscape

7.1.1
This chapter deals with the construction of any cycle route or cycle facility, and associated matters.

7.1.2
It is essential that close attention be paid to construction standards and details to ensure that routes are fast, safe and comfortable for cyclists, as well as being legal, aesthetically acceptable, easy to maintain and durable.

7.1.3
As set out in section 1.1 of this document, streetscape issues need to be considered in all aspects of design. Designers are directed to the TfL Streetscape Guidance (2005) as well as other national and individual borough's streetscape documents.

Cycle schemes should seek to reinforce the distinctive character of places and neighbourhoods and wherever practical improve environmental quality by lessening the predominance of motor traffic and traffic related street furniture

7.1.4
The riding quality of the surface is very important to the cyclist. Cyclists need a smooth riding surface, preferably with good skid resistance. The surface should not contain undulations. There should not be sudden changes of level or 'steps' e.g. at badly laid dropped kerbs or inspection covers.

7.1.5
A wide range of surfacing materials and techniques is available. A smooth transition between different surfaces is part of the requirement to provide a continuous smooth running surface. It is also important that the surface is laid on adequate base materials, which will vary depending on location, usage and ground conditions.

7.1.6
Maintenance of the riding surface after construction is also of great importance to the cyclist, including proper reinstatement following works by statutory undertakers.

7.1.7
Other issues covered later in this chapter include crossings, drainage, lighting, headroom, asset management issues and an indication of typical costs.

7.2 On-carriageway routes

7.2.1
A standard carriageway construction is appropriate for cyclists. Modifications to the surface may be required to incorporate cycle lanes, advanced stop lines, or traffic speed control measures (traffic calming). Dimensional tolerances should follow normal highway standards, and when a new cycle route is installed a check should be carried out to confirm that this is the case.

7.2.2
Kerb re-alignment will be needed in many instances. Any new carriageway construction should be to normal highway standards unless there is kerb segregation of the cycle lane. Carriageway construction depth is normally at least 450mm. This can entail the relaying and/or protection of utilities plant (electricity, gas, water, foul and surface water drainage, telephone, cable TV, tram cables etc.)

7.2.3
High friction (anti-skid) surfacing and traffic signals works are dealt with in sections 7.4 and 7.10 respectively.

7.3 Off-carriageway routes

7.3.1
Cycle tracks, adjacent paths and shared paths will have a similar construction to footways or footpaths. Variations to consider include the use by motor vehicles (maintenance, authorised, or otherwise), and ground conditions. The main options for construction are shown in figure 7.1 below.

7.3.2
When considering what depth of construction to adopt, it should be borne in mind that one of the most common reasons why some cyclists use the main carriageway in preference to a cycle track alongside the road is that the riding quality of the main road carriageway is better. The riding quality of the cycle track should be at least as good as that of the adjacent road.

Figure 7.1
Cycle track construction options

Surfacing	Base course	Base - see note 1
20mm thick bitmac, 6mm stone	50mm thick bitmac, 20mm stone	150mm Type 1 OR 175mm Type 2
20mm SMA	50mm thick bitmac, 20mm stone	150mm Type 1 OR 175mm Type 2
30-40mm HRA with chippings (coloured if required)	50mm thick bitmac, 20mm stone	150mm Type 1 OR 175mm Type 2
Pea-shingle surface dressing	Pea-shingle surface dressing with double rate tack-coat	250mm Type 1 OR 275mm Type 2
75mm thick Coxwell Gravel	–	200mm thick Type 1 base (may also be Coxwell gravel)
20mm thick limestone dust-to-fines	–	250mm crushed limestone, Type 1

Notes:
1. If maintenance vehicles for sweeping, lighting or drainage will require access, then the base will need to be increased by at least 100mm depending on the formation material.
2. SMA – stone mastic asphalt, a recent carriageway surfacing
3. HRA – hot rolled asphalt, a traditional carriageway surfacing
4. bitmac - bituminous macadam, a typical footway surfacing

The riding quality of the cycle track should be at least as good as that of the adjacent road

7.3.3

Adequate edge restraint should normally be provided in the form of edging to restrict the deformation and erosion of the track. Standard 50x150mm concrete edging is normally suitable, which can be laid flush to allow water run-off, or raised as a low (50mm) kerb if adjacent to a pedestrian way if required. Alternatively kerbs (125x150mm) either bull-nose, battered or half-battered can be used. Kerb-faces of 50-100mm should be used, 50mm being preferable for cyclists, but 100mm may be more appropriate to deter over-running and to facilitate drainage falls. See also section 7.6 for further kerb information.

Pea-shingle surface dressing on Type 1 granular material base on Thames Cycle Route in Kingston

7.3.4

For routes across parks or commons, bitumen or polymer bound materials are preferred, such as pea shingle surface dressing to ensure that a smooth and durable surface is provided. In these conditions it may be appropriate to omit formal concrete or timber edging and allow the edge to gradually deteriorate and become overgrown by grass. This will result in a loss of edge width of up to 300mm.

Treatment that respects the quality of the Richmond park environment

7.3.5

Unbound surfacing such as gravel (hoggin) is only recommended for lower usage recreational routes, due to problems with deterioration of the surface caused by weather and use by traffic. These surfaces will also result in more road grime on cycles. Routes likely to be used by commuters and utility cyclists should always be hard surfaced.

7.4 Surfacing

Bituminous surfaces should be laid to normal highway tolerances

7.4.1

Surfacing, whether on the carriageway or on a dedicated off-carriageway cycle facility, should be to a good standard so as not to slow cyclists or make their ride unsafe or uncomfortable. This means that bituminous surfaces should be well laid, normally by machine, with a finish to highway standards and including vertical tolerances no less stringent than applicable to highways. Potholes, rutting and other surface defects should be rectified. Patching or re-surfacing, and deeper trench reinstatements are to be carried out as necessary.

7.4.2

A range of surfacing materials can be used as shown in figure 7.2. These will often depend on the individual location. Streetscape issues are particularly important in conservation and other sensitive areas. Due consideration should be given to the streetscape implications of surfacing materials in all areas.

7.4.3

Where anti-skid surfacing is used, it should continue over ironwork particularly where cyclists are likely to be changing direction.

Figure 7.2
Surfacing material options

Surfacing material	Comments
Stone mastic asphalt (SMA)	Normal main road surface (generally superseding hot rolled asphalt (HRA)), good for cycling
Hot rolled asphalt (HRA)	Normal main road surface, good for cycling
Bituminous macadam (bitmac)	Normal minor road and footway surface material, good for cycling. Some grades can be obtained coloured.
Fine cold asphalt	Footway surfacing material, smooth and good for cycling on but tends to be bumpy as hand laid
Concrete	Historically used on estate roads, good for cycling if the joints and slabs are in good condition, but surface markings are not clearly visible
High friction surfacing (Anti-skid)	Normally good for cycling but laying methods resulting in ridges should be avoided
Coloured Veneer Coat	Specialist coloured surfaces in green, red etc. laid on to wearing courses, normally anti-skid
Surface dressing – Granite Stone	A cheap maintenance layer, good for cycling if the stone size is not too large (10-14mm)
Surface Dressing – Pea-Shingle (6-8mm stone)	A cheap maintenance layer, good for rural/park situations, lower skid resistance, was used on country roads
Slurry Sealing	A cheap maintenance layer, suitable for temporary cycling use only
Brick or Block Paving	Acceptable for cycling on, skid resistance can be low on some brick paving
Paving slabs/flags 600x900	Not suitable as a general cycling surface because of lower wet skid resistance and risks of trips and rocking
Modular Paving 400x400	As for paving slabs although less tendency for rocking and trip hazard. Note use for tactile paving slabs.
Natural Stone blocks	May be suitable if bedded on mortar/concrete and surface is not uneven or smooth, and has good skid resistance
Granite Setts	Too rough for some bikes, but if laid flush can be acceptable in limited areas. Can polish with use and be slippery when wet.
Cobbles (Pebbles in concrete)	Appropriate as deterrent paving for pedestrians. Not acceptable for cycling, as uneven surface with poor skid resistance.
Graded Aggregate e.g. Limestone fines to dust and Coxwell gravel	Often used for rural paths, but poor skid resistance and not very durable
Ungraded Aggregate i.e. Shingle, Ballast, Scalpings	Not suitable. Bike wheels will sink in. Poorly graded materials such as ballast or scalpings will also be rough and not be acceptable for surfacing.

Smooth riding surfaces are required, with no step changes in level or undulations

Appropriate surface materials should be used

7.4.4

A variety of types of coloured surfacing are available, which have a range of skid resistance, surface texture, durability and colour-fastness. They can be naturally coloured aggregate materials, coloured bituminous macadam, or veneer coats laid on top of hot rolled asphalt (HRA), stone mastic asphalt (SMA) or other bituminous wearing courses.

7.4.5

Cost implications need to be considered, with rates ranging from about £5/m² for slurry seals to over £20/m² for some high friction surfaces. Green colours tend to be more expensive and less colour-fast, but product quality is improving in this respect. Figure 7.3 shows some of the coloured surfacing that is available together with approximate cost estimates per square metre laid and the polished stone value (PSV). Laying costs can vary considerably depending on the area (m²) and the traffic management arrangements that are required.

Figure 7.3 Surface treatments and costs

Surfacing Material	Life (years)	Skid resistance PSV	Cost per square metre (£) (2005)		
			Normal	Red	Green
Bituminous Macadam 6mm aggregate, 20mm thick	20	60	3-4	10	20
Bus Lane Surface Dressing – red stone and polymer or epoxy binder	10	60	-	15	-
Anti-Skid (epoxy resin binder)	10	70+	12	13-15	13-15
Cycle Track Veneer (thermoplastic slurry)	5	65	8	8	8
Cycle Lane Veneer (polymer binder)	10	65	10	12	12
Surface Dressing – Granite Stone (bituminous binder)	20	60+	4-5	5	5
Surface Dressing – Granite Stone (clear binder colour enhance)	20	60	-	8	8
Surface Dressing – Pea Shingle Stone	20	50	4-5	-	-
Slurry Seal (poor colour and life)	5	55	2	4	4
Coloured stone mastic asphalt (SMA) 30mm thick	20	60	-	20-25	20-£5
Block paving	20	55	20-30	20-30	-
Brick paving	20	-	-	20-40	-
Concrete Paving flags	10	-	15-30	-	-
Tactile paving	10	-	30-40	-	-
York stone flags	20	-	100-130	-	-

Notes:

1. Traffic management costs not included – these can double costs
2. Small areas will normally cost far more, maybe double or more
3. Difficult and restricted access such as along towpaths may increase costs
4. Surfacing dressings will have bituminous binders unless otherwise stated.
5. PSV is a measure of the Polished Stone Value. A PSV of 55 is a normal acceptable road skid resistance.

Coloured surfacing

7.4.6
In most situations black bituminous surfacing in conjunction with cycle logos and appropriate lane markings is satisfactory. This should be the norm except in locations of potential conflict, where colour is recommended.

7.4.7
Locations where coloured surfacing should be used are:

- Advanced stop line reservoirs and their feeder lanes
- Across the mouth of junctions
- Through some complex junctions
- On cycle lanes alongside on-street car parking
- Any other areas of potential conflict

7.4.8
In London it is generally agreed that where colour is used for marking cycling facilities, it should be Deep Chrome Green (No 267 BS381C: 1988).

Deep chrome green should be used to highlight cyclists' routes in appropriate locations

7.4.9
As well as the normal veneer coat, coloured chippings on HRA or coloured bitmac with natural stone colours can be used. These natural colours have longer life and better colour retention, but are often less visible, and are therefore more suitable for conservation or other sensitive areas.

7.4.10
In less formal rural situations pea shingle surface dressing on a bituminous or granular base can be used, which should provide a smooth and durable surface.

Shared use facilities

7.4.11
For shared-use facilities a different surface is beneficial to distinguish these areas from dedicated cycle facilities. Paving slabs or flags should not normally be used for the cycle surfaces, only for pedestrian-only surfaces. This is because their lower texture depth results in lower wet skid-resistance, and is also to help discourage footway cycling.

Road markings

7.4.12
A consistent standard of road markings is required. For cycle symbols to Diagram 1057 the finish should be at least as good as that obtainable by using pre-formed markings.

7.5 Drainage

Gullies

7.5.1
Gully location and levels are particularly critical for cyclists to ensure good drainage. Any recessed gully frames should be raised to be flush (tolerance +/-5mm) with the surface. Dished and other gratings unsuitable for cycling across should be replaced. Side-entry gullies or perforated kerb type gullies (e.g. Beany Blocks) may be suitable in some circumstances, particularly where there is restricted width and where cyclists will be close to the kerb. However, these non-standard gullies are not recommended as standard practice.

7.5.2
In any location where there is a possibility that cycle wheels will cross gullies, the grate slots should be at right angles to the direction of travel. Alternatively, non-slot 'pedestrian style' gratings should be provided.

7.5.3
Drainage on cycle lanes and tracks may need additional gullies as well as appropriate falls to facilitate run-off. A minimum grating size of 300 x 300mm is recommended, as the smaller size gully gratings that are sometimes used in off-carriageway situations tend to get blocked.

Gully gratings must be flush with adjacent surfaces

Correctly laid gully provides a level riding surface

Falls and ponding

7.5.4
Falls of at least 1:40 cross-fall and 1:200 longitudinally are preferred. With non-machine laid surfaces steeper longitudinal falls will be required. Falls on roads (including 'summit and valleying') have often been reduced or removed during re-surfacing, and so may need to be corrected.

7.5.5
Any areas of ponding on a cycle route that will have an adverse effect on cyclists should be addressed, including where splashing from a carriageway onto an adjacent cycleway occurs.

Pedestrian style grating is preferable to slot grating where cycle and pushchair routes intersect

7.6 Kerbs, dropped kerbs and edge details

7.6.1
Where they are necessary, dropped kerbs must be flush, that is within a tolerance of +/-6mm of the adjacent surfaces, to provide a comfortable surface for cyclists.

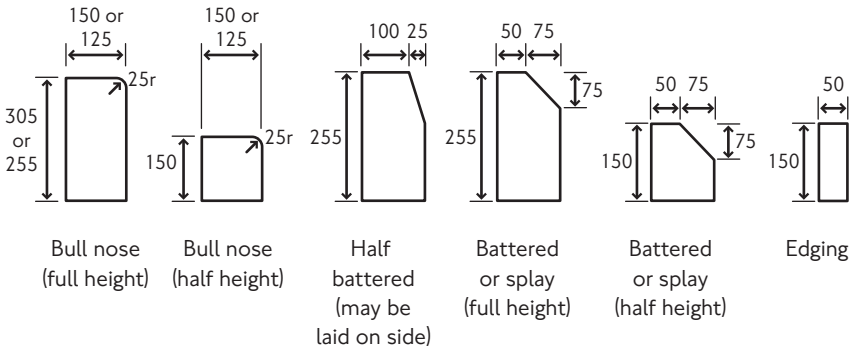
7.6.2
Particular care is needed with channel levels to ensure that puddling does not occur at crossing points.

Dropped kerbs must be flush with adjacent surfaces

7.6.3

Low kerbs (50-100mm high face) may be appropriate between cycling and pedestrian surfaces. These can allow better use of restricted space by allowing cyclists to travel closer to them as the pedals can overlap the kerb. Kerbs (125x150mm) either bullnose, battered (45° faces) or half-battered can be used. Red brick and block battered units are also available. Kerbs, blocks and edging will normally be laid on a 150mm deep bed and haunchings in lean concrete.

Figure 7.4
Typical kerb profile types



7.6.4

The edges of cycle tracks, adjacent paths and shared paths need to provide clear but safe delineation between carriageways and footways. Marginal strips with a minimum width of 0.5m should be provided adjacent to carriageways. Paving slabs, block paving, granite setts, or coloured surfacing may be appropriate for this purpose. Where speed limits are 40mph or over a strip of at least 1m should be provided, in which case a grass verge may be more appropriate.

Clear delineation between cycle track and pedestrian space using brick battered kerbs

7.6.5

The marginal strip may also incorporate lighting columns and other street furniture, and the width may need to be increased accordingly. Features such as low walls and planting may be appropriate to either protect the cycling area or improve the ambience. Guard railing and crash-barriers can provide dangerous squeeze points, particularly where heavy goods vehicles turn, so they need to be carefully considered and possibly removed or resited.

7.7 Tactile paving

7.7.1

Tactile paving refers to a range of surface textures to assist blind and partially sighted pedestrians. Tactile paving should be used in accordance with DfT "Guidance on the use of Tactile Paving Surfaces", originally published by DETR. See also typical detail drawings in Appendix C for more cycle-specific situations and the inclusion of signing.

Tactile paving to be provided in accordance with "Guidance on the use of Tactile Paving Surfaces" and typical detail drawings in Appendix C

7.7.2
Several types of tactile paving are likely to be used in the construction of cycle facilities in addition to the raised tactile delineators. These are:

- Red blister paving adjacent to areas where pedestrians cross at controlled crossings (signal controlled phases and at zebras)
- buff or contrasting grey coloured blister paving for areas adjacent to where pedestrians wish to cross 'uncontrolled' vehicle ways (these can include cycle tracks)
- longitudinal ribbed 'tramline' paving to show cycle only surfaces adjacent to paths
- transverse ribbed 'ladder' paving to show pedestrian only areas
- 'corduroy' paving to warn pedestrians of hazards, such as shared surfaces
- tactile marking (Diagram 1049.1) to delineate cycling from walking surfaces and used in conjunction with ladder and tramline paving

7.7.3
The needs of pedestrians must be considered in the design of cycle facilities, in particular the needs of those who are blind or partially sighted or those who have mobility impairment or other handicap. The layout of pedestrian facilities should be as simple and logical as possible and be consistent along a route.

7.7.4
Documents that give specific guidance in these areas are

- 'Guidance on the use of Tactile Paving Surfaces' (DETR)
- 'Building Sight' (RNIB)
- 'Shared Facilities for Pedestrians and Cyclists' (JCMBPS)
- TAL 4/90 Tactile Markings for Segregated Shared Use by Cyclists and Pedestrians

7.7.5
In urban areas where junctions are numerous and movements are complex, it is important to understand what the main pedestrian and cyclist desire lines are and to use tactile paving to clearly alert disabled pedestrians to the greater risk.

7.7.6
Large areas of tactile paving can be confusing to both blind and sighted people and this should be considered carefully in the design of installations. Where this is of concern, it is suggested that the depths of longitudinal blister paving be reduced to 1200mm. In some situations even 800mm may be acceptable. 800mm wide 'tails' are the normal depth on blister paving.

7.7.7
In some cases the omission of the ribbed tactile paving on the pedestrian side may be desirable to avoid confusion, where there are extensive areas of different tactile pavings. Both blister and ribbed tactile paving may be required at the same site. Here ribbed tactile paving will normally need to be set back from the kerb-line by 2-3m to avoid confusion by blind people when they have crossed a carriageway. This will allow them to reach the comparative safety of a (shared) footway before having to determine on which side of the shared surface to proceed. Drawings in Appendix C show suggested layouts for combined tactile paving and road/surface markings.

Red coloured blister tactile paving

7.7.8
Red coloured blister tactile paving is for use on the footway at controlled crossings of the carriageway. A controlled crossing is defined where the pedestrian has some form of control over the crossing movement, thus including zebra crossings, toucan crossings and other signal crossings where there is a pedestrian aspect shown by an illuminated green man. This could include the signalling of a cycle track crossed by a footpath/way.

Buff or contrasting grey coloured blister tactile paving

7.7.9
Buff or contrasting grey coloured blister tactile paving is for use at uncontrolled crossings on the footway adjacent to vehicle ways including cycle tracks. Sources of guidance for use are largely as for red blister tactile paving. Both red and buff coloured tactile paving should be of a contrasting colour to the surrounding paving. The use of light or dark grey blister paving may give the appropriate contrast in conservation areas. Visibility can also be achieved with a contrasting band of brick or blockwork.

7.7.10
It is necessary to provide the blister paving in a variety of locations to warn pedestrians. These include dropped kerbs on shared surfaces and where cycle tracks cross pedestrian routes. Examples of details of these are shown on various drawings in Appendix C.

Ribbed tramline and ladder tactile paving for segregated cycle tracks

7.7.11
Ribbed patterned tactile paving is for use on both the cycle and pedestrian sides of segregated surfaces. It is laid longitudinally in 'tramline' pattern on the cycle track, i.e. is aligned with the direction of movement. Care should be taken to try to ensure that cyclists' wheels follow the grooves, and so do not become deflected by them. This may mean setting back the tactile by 2-3m from a junction or corner. On the pedestrian side, it is laid transversely in

'ladder pattern' – that is across the direction of movement. Its use is dealt with by Traffic Advisory Leaflet TAL 4/90 and the 'Guidance on the use of Tactile Paving Surfaces' (DETR).

7.7.12
The profiled slabs are available in the normal modular paving size of 400 x 400mm in various colours. These include light or dark grey, buff, or green, so that a consistent colour background can be achieved and also to allow painted markings such as give way or cycle logos to be more visible.

Corduroy Tactile Paving

7.7.13
Corduroy has finer pattern than ribbed paving and is for use where pedestrians need to be warned, normally where a footway joins a shared path.

7.7.14
A set of drawings is included in Appendix C showing how, in tight situations, tactile paving may be incorporated with the appropriate road/surface markings and signs. These drawings are based on similar layouts given in 'Guidance on the use of Tactile Paving Surfaces'.

7.8 Lighting

7.8.1
An appropriate level of lighting is required. This may entail upgrading existing lighting or the provision of new lighting in open spaces, particularly where there are concerns for personal security.

7.8.2
For aesthetic and conservation reasons, lighting may not be acceptable through parks and other green corridor areas. If adequate lighting is not feasible on routes away from the highway then alternative night-time routes should be provided.

7.8.3
In some areas lighting units may be targeted and damaged by vandals, so this will need to taken into account in the provision. It is now possible to obtain solar powered equipment for some installations, although this is only likely be suitable for low-power uses. The highway authorities lighting unit will need to be consulted for all lighting changes.

7.9 Headroom and parapets

7.9.1
Parapets and safety railings that protect cyclists from a drop are required to be 1.4m high for safety reasons. For pedestrians only, a 1.1m parapet is acceptable. The protection will only need to be provided at locations where there is real danger to the users. These do not include alongside all rivers or embankments.

Safety parapets on bridges to protect cyclists must be 1.4m high

Bridge and other safety parapets must be 1.4m high for cyclists

7.9.2
As set out in section 1.6, the minimum vertical headroom provided for cyclists should be 2.3m (as opposed to 2.1m for pedestrians) to allow for cyclists' higher position when riding. This will apply to any signs that may obstruct cyclists.

Headroom to signs must be 2.3m for cyclists

7.9.3
Headroom through subways should be 2.4m, given the more confined ambience. If not even a reduced headroom of 2.3m can be achieved because of existing structural constraints, then an explanatory sign 'Cyclists beware – low headroom' plus the actual measurement available should be used, not a 'Cyclists dismount' sign.

Headroom to subways must be 2.4m for cyclists

7.10 Traffic signal controlled junctions and crossings

7.10.1
Traffic signals that benefit cyclists can be used at a variety of junction and crossing types. They may be cycle-only crossings or schemes with cycling benefits, such as advanced stop lines. Design of the preliminary signal layouts will be the responsibility of the traffic or highway authority.

7.10.2
The Signals Section of TfL (formerly Traffic Technology Services (TTS)) will include the signals scheme in their works programme via the borough or Area Team's signals contact. They will then complete the design of the signal layouts, signal equipment, including its ordering and installation. A period of 6-12 months is normally required for the signals programme, depending on the type and complexity of the work.

7.10.3
Toucan crossings have standard off-the-shelf controllers, but other more complicated junctions will need bespoke systems. Most signals now use infra-red detectors for vehicles as opposed to loops. TfL Signals Section carry out their own safety audits on the design of all signals schemes. For more information on TfL Signals procedures see Chapter 2 and Appendix B.

7.10.4
Construction of the civil engineering works will be by the highway authority's contractor. This will include hole digging, ducting and draw-pits, cable pulling, pole erection, road markings, dropped kerbs, paving (including tactile paving), and anti-skid surfacing. TfL Signals Section will not commission or switch on

signals until all carriageway works are complete, including markings and anti-skid surfacing.

7.11 Maintenance and asset management

7.11.1
The maintenance of cycle routes is essential if they are to encourage cycle use.

7.11.2
Areas that need to be considered are:

- Sweeping
- Landscape growth
- Surface defects (including gully and manhole levels, surface texture and skid resistance)
- Signs and markings (removed, turned, defaced)
- Drainage (blocked, inadequate, missing)
- Winter maintenance

7.11.3
Most of these conditions can have a greater negative impact on cyclists as compared to motorists, and frequently result in severe hazards for cyclists. Cycle route infrastructure design should include for the access and use of maintenance vehicles where appropriate.

Each section of LCN+ route should have a defined route-specific maintenance and inspection regime

Sweeping

7.11.4
Appropriate intervals for sweeping are important and these may only become apparent after a route has opened. Broken glass or other debris often blown across by motor traffic is the most frequent problem. This can cause danger to cyclists trying to avoid it, or inconvenience to detour via an alternative route, or to mend a puncture.

7.11.5
Debris can be a particular problem when cycle lanes are introduced so that debris ceases to be deflected by the normal flow of vehicles. Any changes to the cleansing contractor's schedule will need to be notified and agreed, and should be recorded in case cleansing problems arise.

A landscape maintenance regime could have prevented these signs being obscured

Landscape growth

7.11.6
Cycle tracks, adjacent paths and shared paths frequently suffer from problems of the growth of adjacent planting. This can seriously reduce the available

width of a path, and reduce sight lines to create blind spots, sometimes giving rise to personal security issues. Trimmed-back thorn bushes need to be properly removed after cutting to ensure that punctures do not result. Preferably separate cycle tracks from thorn bushes.

7.11.7
Particularly in summer, some cyclists will be wearing shorts. Stinging nettles and brambles can grow quickly in summer months and can present problems on narrow paths with inadequate landscape maintenance.

Surface defects

7.11.8
Uneven surfaces can affect the balance and stability of bikes, or generate swerving manoeuvres. They can also cause the rider discomfort. Potholes, bumps, ridges, and sunken gully and inspection cover gratings are frequent problems that should be addressed. Steps in excess of 10mm or deformation in excess of 10mm over a 1m straight edge length should be rectified. The national highways maintenance standards would normally apply.

7.11.9
Ironwork such as manhole covers should be checked during routine inspections to make sure that their skid resistance is compatible with that of the surrounding road surface, particularly where surface coatings have been applied.

Signs and markings

7.11.10
Clear signs and markings are important both for safety reasons and to retain the ability to follow a route, particularly if the route is complex. Signs can be rotated, removed unofficially, not replaced after collision damage, and can be made illegible with graffiti. If graffiti is not quickly removed, other graffiti is more likely to follow, and can give the impression of a route where there may be a problem of personal security.

7.11.11
Anti-rotational brackets should be fitted to appropriate signs – see section 6.3.

7.11.12
Surface markings are likely to become worn, and may be removed by trench digging or by resurfacing. These defects should be rectified. Otherwise, it may not be possible to follow the route.

Drainage

7.11.13
Blocked drainage gullies or inadequate drainage are frequent problems on cycle routes, and should be identified and rectified during normal maintenance routines. Any additional drainage will need to be included within the drainage maintenance schedule in conjunction with other asset management. See Section 7.5 on drainage provision.

7.12 Road works

7.12.1
The carrying out of road works needs to be assessed for any adverse effects on cyclists.

7.12.2
Frequent problems will be:

- Poor road surfaces
- Creation of pinch points
- Unacceptably long diversion routes
- Temporary 'Cyclists Dismount' signs
- Raised cable protectors for temporary signals

7.12.3
Solutions may include:

- exemption to road closures for cyclists
- temporary shared paths
- temporary direction and other signing for cyclists
- special warning signs to raise motorists' awareness of cyclists
- good temporary surfacing or staged final surfacing
- temporary wide near-side lane (or cycle lane)
- separately coned cycle lane
- rebated temporary cables

Temporary 20mph limits through roadworks will assist cyclists and can be enforced by camera

7.12.4
Unplanned emergency road works arising from statutory undertakers' works can result in damage to the cyclist's riding surface. As soon as such works arise, a works and reinstatement inspection routine should be put in place.

7.13 Typical construction costs

7.13.1
Construction costs will vary considerably for cycle routes, depending on the type of route and the specific facilities incorporated. An average cost of £100,000 per kilometre can be used but this will vary from about £10,000 for a signed quiet route to over £200,000 for a cycle track, and over £1M per kilometre when there are frequent and complex junctions.

7.13.2
Figure 7.5 showing approximate construction costs has been prepared to assist with cost estimates, including the comparison of alternative options. Highway Authorities will normally have term contractors each with their own schedules of rates. Costs of traffic management, statutory undertakers works, contingencies and supervision will also need to be included, as these can more than double the costs shown in difficult locations.

7.13.3

Additional cost may also occur because of the poor standard of the existing and adjacent streets. Top-up funding from maintenance and other budgets should be sought in such cases.

Figure 7.5
Typical Construction Costs

Category	Item	Unit	Cost (£) (2005)
Construction	Gravel or limestone path (250mm thick, no excavation)	m²	10-15
	Track construction (250mm thick, type1 plus bitmac base no excavation or surfacing)	m²	20-35
	Extra for excavation and disposal	m²	10-20
	Extra for surfacing (see figure 7.3)	m²	4-30
	Extra for edging	m	10
	Extra for concrete kerbing	m	20-30
	Extra for granite kerbing	m	80-100
Drainage	Road gulley including pot	No.	500-800
	Gulley connection	m	100-200
Lighting	Relocate lighting column (incl. connections)	No.	700-1000
	New lighting column (incl. connections)	No.	700-1000
	Illuminated bollard (incl. connections)	No.	300-500
Marking	White line	m	2
	Raised white line [1049.1]	m	10
	Cycle logo [1057]	No.	15-30
Parking	Sheffield stand	No.	150-300
	Cycle locker including base	No.	1000
Signals	Conversion of Pelican to Toucan	No.	15-20,000
	Toucan on single carriageway	No.	25-50,000
	Toucan on dual carriageway	No.	50-100,000
Signs	Small Signs (up to 0.5 m²)	No.	75
	Medium sign (0.5-1 m²)	No.	100
	Extra for sign post	No.	100
	Extra for illumination on lighting column	No.	250
	Extra for illumination on new post	No.	400-500
	Bollard - cast iron or stainless steel	No	200-300

Notes:
1. These costs do not include traffic management
2. Costs can vary considerably

7.13.4

For different types of cycle facility a global cost estimate may be useful. The following figure 7.6 shows overall cost estimates for various types of facility.

Type of facility	Cost range (£000s/Km) (2005)
Gyratory type junctions	500+
Cycle track with major junctions	300-800
Cycle track with simple junctions	100-300
Segregated path with major junctions	250-400
Segregated path with minor junctions	100-200
Shared path many junctions	70-130
Shared path (conversion), few junctions	30-60
Kerb segregated lane, many junctions	300-800
Kerb segregated lane, few junctions	100-300
Cycle lane with ASLs many junctions	40-80
Cycle lane with few junctions	20-40
Cycle lanes on bus lane route	20-40
Home zones / cycle streets	300-800
Traffic calmed/ managed area	100-300
Quiet routes town centres	40-80
Quiet routes suburban	10-20

Figure 7.6
Global costs of various types of cycle facility

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