

Highway maintenance

THIS BRIEFING COVERS

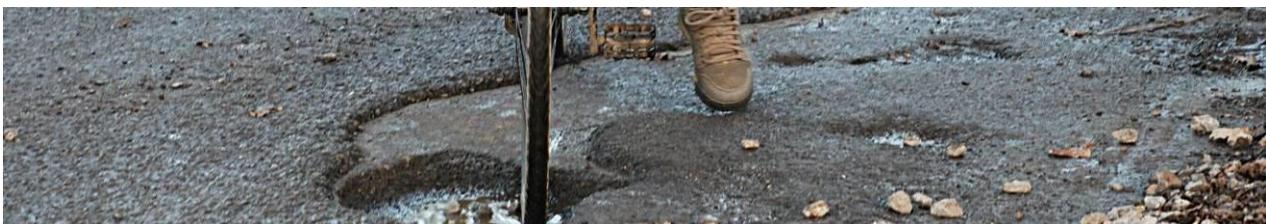
The impact of road defects on road safety, funding and costs; duties, standards and liability; compensation claims; how defects form; maintenance procedure and practice; types of defects that affect cyclists in particular; improving cycling conditions in planned road maintenance programmes.

HEADLINE MESSAGES

- For their comfort and safety, cyclists need highway authorities to maintain smooth and defect-free roads.
- Potholes, ruts, loose gravel, ice or diesel/oil spills not only make cycling uncomfortable, but can cause serious, sometimes fatal injuries.
- Any road maintenance procedure is a cost-effective opportunity to make other changes to improve conditions for cycling at the same time (e.g. through road layout or marking).

KEY FACTS

- Between 2007 and 2016 (GB), a 'poor or defective road surface' was recorded by police at the scene as a 'contributory factor' (CF) in incidents in which 22 cyclists died and 368 were seriously injured.
- In 2017 (GB), in incidents for which the police recorded a CF, the percentage attributed to a 'poor or defective road surface' was almost four times higher for cycles than it was for each type of motor vehicle (except for motorcycles).
- Around 12% of the legal claims handled by Cycling UK's Incident Line on behalf of our members is due to poor maintenance.
- Between 2013 and 2017, the average pay-out for a successful maintenance-related injury claim from 163 highway authorities in Britain was 13 times higher for cyclists (£11,007.12) than for motorists (£867.88)
- In England, Wales and London (2017/18), over half of all local authority roads were reported to be in good structural condition (i.e. with 15 years or more life left in them). One in five, however, was reported to be in poor condition (i.e. with less than five years left).
- Over a four-year period 2011/12 to 2014/15, 63% of roads maintained by Scottish Councils were in an acceptable condition, but that there was a wide variation among them (44% - 77%). In 2018, Audit Scotland reported "no significant change" in road condition.
- The maintenance backlog in England, Wales and London will take c14 years to clear.
- In England, the proportion of local highway maintenance budgets allocated to minor roads – where most cycling takes place – dropped from 65% in 2008/9 to just 51% in 2016/17.
- For 2017/18, authorities in England & Wales (including London) reported a total shortfall of £555.7 million in their annual carriageway maintenance budget, an average of £3.3 million each.



Cycling UK VIEW

- All road users suffer from poorly maintained roads, but cyclists are disproportionately affected.
- Local authorities need sufficient funding so that they can maintain roads well.
- The business case for highway maintenance investment should reflect the environmental and health benefits of reduced fuel consumption, and the deterrent effect of poor surfaces on cycling and walking (due to the greater risks and effort involved), as well as the reduced costs of highway repairs, delays, and damages to both people and vehicles.
- National guidance, and the policies and standards adopted by individual highway authorities for inspecting and prioritising repairs should take account of cyclists' comfort and safety. These should then be used to assess whether highways authorities are liable when cyclists suffer injury or other damages due to highway defects.
- For cyclists, the location and shape of a surface defect, not just the depth, are important. All guidance should therefore emphasise that special consideration must be given to defects that:
 - Are at or near junctions;
 - Are on downhill sections of roads;
 - Present a sharp upstand on the far side of the defect;
 - Run along rather than across the path that cyclists will be taking, i.e. those which are more likely to trap a cyclist's wheel.
- Local authorities should devote more of their resources to road surface renewal or resurfacing programmes, rather than short-term, emergency patching.
- Minor roads and off-road cycle facilities, where most cycling occurs, should be given greater priority in highway maintenance policies and procedures (including winter maintenance), while the whole-life upkeep of off-road cycle routes should be planned and costed-in from the outset.
- Highway authorities should be encouraged to use bicycles with sensors to monitor road and cycle track surface quality, and to use specialised narrower vehicles to keep cycle tracks free of debris and vegetation, or from snow and ice.
- Safe and convenient cycle access should be retained at the site of road/streetworks, wherever possible.
- Utility companies must ensure that reinstatements are safe, and remain safe, for cycling; and that cycle signing, coloured surfacing and other features are retained or enhanced. Where utility companies perform to a poor standard, local authorities must oblige them to reinstate to a proper condition.
- Authorities should respond quickly to any reports made by cyclists alerting them to road defects. Online reporting tools (e.g. Cycling UK's Fill that Hole) are an effective channel for this.
- The providers of defect management systems for highway authorities should integrate their products with Fill that Hole and similar public defect-reporting websites, to facilitate two-way communication between site-users and highway authorities.
- When resurfacing, local authorities should take the opportunity to 'cycle proof' the road, i.e. systematically consider improving cycling conditions as part of the project. This approach requires coordination between maintenance planning, highways engineers and those promoting sustainable travel. It also helps maximise the synergies between cycling and maintenance budgets and enhances their value.



BACKGROUND INFORMATION

1. Road defects – the problems: road safety, funding and costs

Cycling UK view:

- All road users suffer from poorly maintained roads, but cyclists are disproportionately affected.
- Local authorities need sufficient funding so that they can maintain roads well.
- The business case for highway maintenance investment should reflect the environmental and health benefits of reduced fuel consumption, and the deterrent effect of poor surfaces on cycling and walking (due to the greater risks and effort involved), as well as the reduced costs of highway repairs, delays, and damages to both people and vehicles.

a. Road safety

Poorly maintained roads not only make cycling uncomfortable and arduous¹, but can cause injury, both from vibration and crashes. In fact, cyclists have died as a result of surface defects.

Road defects, of course, have an impact on all road users: the RAC's 2018 report on motoring found drivers' top concern was the condition of the roads, rather than congestion or the costs of travel.² It also found that 83% of drivers supported earmarking a proportion of motoring taxes for local road maintenance.

Cyclists, however, are disproportionately disadvantaged because they are not protected in the same way as the occupants of motor vehicles. The fact that motor vehicles (especially lorries) cause most wear and tear to the road surface, whereas the damage done by cycles is negligible, makes this situation even more inequitable.

- Between 2007 and 2016 (GB), a 'poor or defective road surface' was recorded by police at the scene as a 'contributory factor' (CF) in incidents in which 22 cyclists died and 368 were seriously injured.³
- In 2017 (GB), in incidents for which the police recorded a CF, the percentage attributed to a 'poor or defective road surface' was almost four times higher for cycles than it was for other types of motor vehicle (except for motorcycles). (For motorcyclists, this figure was four and a half times higher).⁴
- About 12% of the legal claims handled by Cycling UK's Incident Line on behalf of Cycling UK members are due to poor maintenance.
- A survey by NHS Bristol found that around 26% of all non-collision incidents involving cyclists were ice-related, and largely occurred on commuting journeys.⁵

b. Condition of local roads

More minor roads, maintained chiefly by local councils, attract the most cycle traffic (see section 3d). Unfortunately, they are also the most likely to have deteriorated in recent years and be in need of maintenance:

- The local authorities in England (including London) & Wales who responded to the Asphalt Industry Alliance's 2018 *Annual Local Authority Road Maintenance Survey (ALARM)*, reported that over half of their roads were in good structural condition (i.e. with 15+ years' life left). They also said, however, that one in five were in poor condition (i.e. with fewer than five years left in them). The backlog will take around 14 years to clear (up from 12 years in 2016/17).⁶
- Government statistics for England suggest that conditions on 'A', 'B' and 'C' roads have improved somewhat in recent years: the percentage of 'A' roads for which maintenance should be considered fell from 5% to 3% since 2012/13, with 'B' and 'C' roads seeing an equivalent fall from 10% to 6% since 2011/12. Unclassified roads, however, have not seen this improvement: 17% of them should be considered for maintenance, up from 15% in 2009/10.⁷

- In 2016, Audit Scotland said that, over a four-year period 2011/12 to 2014/15, 63% of roads maintained by Scottish Councils were in an acceptable condition, but that there was a wide variation among them (44% - 77%).⁸ In 2018, they reported “no significant change” in road condition.⁹

c. Funding and costs

Structural road maintenance is largely funded by central governments and, in the capital, by Transport for London. In England, the funding is now allocated according to need, but there are other streams available (e.g. the Pothole Action Fund). According to the *ALARM* survey:¹⁰

- In the 2017/18 financial year, the overall average budget for highway maintenance per authority – which includes work on bridges, street lighting and cyclical processes like sweeping etc. – stood at: £26.2m in England (excluding London); £9.2m in London, and £8.1m in Wales. In England (exc. London) and Wales, well over half went on carriageway maintenance, but in London it was just under half.
- The average cost to fill one pothole *reactively* is £74 in England (exc. London), £89 in London and £60 in Wales. *Planned* maintenance per pothole costs less than this in England (exc. London) and London at £49 and £56 respectively; and about the same in Wales (£61).

Local authorities, however, are struggling to resource their maintenance duties, and most central funding is being allocated to national rather than local roads:

- According to the *ALARM* survey, authorities in England (including London) and Wales reported a total shortfall of £555.7m in their annual carriageway maintenance budget or, on average, £3.3m each.
- In 2016/17, £4.5 billion was spent on the maintenance of roads in England. Of this, £900 million was spent on roads managed by Highways England’s motorways and A roads, and £3.6 billion on local authority managed roads. This means that a fifth of the funding was invested in only 2.4% of the network, i.e. the 4,400 miles of roads managed by Highways England.¹¹
- The proportion of total road maintenance spending on minor roads (i.e. ‘B’, ‘C’ and unclassified roads) has fallen markedly, from 60% in 2009/10 (£2.51bn) to just 51% in 2016/7 (£1.87bn).¹²
- The Local Government Association (LGA) says that the Government plans to spend £1.1 million per mile to maintain its strategic road network between 2015 and 2020, but is giving councils (England) just £21,000 per mile for the local roads they maintain over the same period.¹³
- According to Audit Scotland, while 13 authorities increased their maintenance spending between 2011/12 and 2014/15, overall council expenditure went down from £302m to £259m. Overall, councils spent £33 million (13%) less on planned and routine maintenance in 2014/15 than the Society of Chief Officers of Transportation Scotland (SCOTS) considers necessary to maintain the current condition of local roads.¹⁴

Yet evidence suggests that cuts to road maintenance budgets are more detrimental to local roads than to trunk roads:

- A Transport Scotland review of the economic value of road maintenance found not only that a £1 cut would have an average economic cost of £1.50 in general, but also that this disbenefit was significantly higher for local roads (£1.67) than for trunk roads (£1.12).¹⁵



d. Compensation claim costs

Poor road conditions also generate road user compensation claims for personal injury or vehicular damage – an added expense:

- Freedom of Information requests from Cycling UK found that, from 2013 to 2017, 163 councils (GB):¹⁶
 - spent at least £45.6m between them on compensation claims relating to potholes (settlements + legal costs);
 - accepted the claims of 687 cyclists and 31,976 drivers;
 - paid out on average £867.88 per successful claim to motorists;
 - paid out on average £11,007.12 per successful claim to cyclists – or 13 times as much as for motorists (this is doubtless because cyclists' claims are much more likely to involve serious injury, whereas motorists' claims are more typically for property damage only).
 - altogether, spent £10,310,312.28 on legal costs;
 - spent on average £279,909.96 each on pothole claims.

Clearly, local authorities need more funding to keep their roads in a fit state of repair and, because of the shortfall, are paying out £millions in compensation.

Use our interactive map to see how much your council is spending on pothole compensations claims
www.cyclinguk.org/article/how-much-are-potholes-costing-your-council

e. Wider case for highway investment

The economic case for investment in road maintenance is not simply to reduce damages and delays.

For instance, there is an extensive literature on how poor maintenance increases other vehicle operating costs, e.g. by increasing fuel consumption, due to the reduced level of contact between the tyre and the road.^{17 18}

The effort involved in cycling is also significantly affected by poor surfaces, both by reducing contact between the tyre and the road and because of the effect of the vibrations on cyclists' comfort.¹⁹

Poor surfaces thus deter cycle use not only by increasing the risks involved but also the sheer physical effort. Good surfaces are therefore important not only for reducing the risks involved in cycling and walking, but also for encouraging more people to cycle, particularly for slightly longer journeys where they might otherwise opt for the car.



2. Duties, standards and liability

Cycling UK view:

- National guidance, policies and standards adopted by individual highway authorities for inspecting and prioritising repairs should take account of cyclists' comfort and safety. These should then be used to assess whether highway authorities are liable when cyclists suffer injury or other damages due to highway defects.

Strategic roads (i.e. most motorways and trunk roads) are maintained by the relevant national authority (e.g. Highways England, Transport Scotland and the Welsh Government; N.B. in Northern Ireland, the Department for Infrastructure is the sole roads authority for both national and local roads). Most other roads, which carry most cycle traffic (see section 3d), are the responsibility of local highways authorities.

a. Duties

• Local authorities

Local authorities have several statutory duties and powers relating to the maintenance (interpreted as 'repairing') the public highway, principally under the:

- *Highways Act 1980* (s41(1)) (HA1980), England and Wales;
- *Roads (Scotland) Act 1984* (ss 1&2); and
- *Roads (Northern Ireland) Order 1993*, Article 8.

The 'highway' includes footways and cycleways.

The *Active Travel (Wales) Act 2013* states: "The Welsh Ministers and each local authority must, in the exercise of their functions under Parts 3, 4, 5, 9 and 12 of the *Highways Act 1980* (creation, maintenance and improvement of highways, interference with highways and acquisition etc. of land), in so far as it is practicable to do so, take reasonable steps to enhance the provision made for walkers and cyclists." ²⁰

Snow and ice: Section 41 of HA1980 (as modified by section 111 of the *Railways and Transport Safety Act 2003*), imposed a duty on highway authorities to "ensure, so as is reasonably practicable, that safe passage along a highway is not endangered by snow and ice".

Section 34 of the *Roads Scotland Act* says: "A roads authority shall take such steps as they consider reasonable to prevent snow and ice endangering the safe passage of pedestrians and vehicles over public roads."

The duty under Section 41 HA1980 does not extend to gravel or oil on the surface of the road, a common source of danger to cyclists. However, this does not remove the possibility of a highway authority being found negligent if it fails to remove gravel, oil or other debris which subsequently results in injury/damage to a road user.²¹

See how snow and ice is cleared from cycle lanes in Copenhagen:
www.copenhagenize.com/2010/12/ultimate-bike-lane-snow-clearance.html



- **Utility companies**

The *New Road and Street Works Act 1991* (UK-wide) applies to the conduct of gas, water, electricity and telecommunications companies who have a statutory right dig up the highway if they need to – i.e. Section 81 (England and Wales), for instance, requires such ‘statutory undertakers’ to satisfy the highway authority that their apparatus doesn’t cause danger to road users. The highway authority can also order the utility company to make good any defects associated with their operations.

For more on streetworks, see: www.gov.uk/government/publications/street-works-faq

b. Guidance and standards

Local highway authorities must refer to the national code of practice, *Well-managed Highway Infrastructure* which, although not statutory, is backed by central and local government in all the nations of the UK.²²

The Code’s last revision in 2016 strengthened the focus on ‘asset management’ and made a shift to a ‘risk-based’ approach, leaving local authorities to develop their own levels of service to reflect local needs, priorities and affordability. Most authorities were (or are) working towards compliance²³, and publish their own guidelines on their websites.

The emphasis on ‘asset management’ suggests that highway maintenance professionals support the need to shift from reactive maintenance to more planned maintenance. Cycling UK wholeheartedly welcomes this (see section 3b).

Conversely, the ‘risk-based’ approach is more double-edged. Instead of recommending standards (that potholes, for example, should be classed as needing urgent repair if they are more than 40mm deep – see 3a), the Code gives councils the freedom to make their own decisions on criteria for repair, inspection frequency, vegetation clearance and winter maintenance regimes etc. They are thus being asked to minimise the risks of harm (including disruption as well as injuries), rather than simply to comply with standards.

Cycling UK understands the rationale for this approach but fears that, in response to mounting budgetary pressures, councils may be taking the opportunity to revise their standards downwards.

As far as cycling is concerned, the Code includes advice on maintaining/managing cycle routes specifically, and on the need to keep them in mind more generally (see next page for relevant extracts).



Extracts from Well-managed Highway Infrastructure: A Code of Practice (UK Roads Liaison Group):

- Authorities should consider the needs of all road users, particularly vulnerable users, in planning and managing the network. [...] When schemes are planned and programmed there may be an opportunity to incorporate added value to the safety, priority, integrity or quality of footways and crossing facilities (particularly for vulnerable users), cycle routes and crossing facilities [etc].”
- Network hierarchy should take into account the desirability of continuity and of a consistent approach for walking and cycling.
- ... traffic composition might indicate unusually high proportions of particular users, for example motorcyclists or cyclists for whom surface condition is of particular importance.
- Where the level of use on particular cycle routes is significant and relevant to maintenance need, for example on commuter cycle routes, authorities may choose to establish categories based on use to ensure carriageways, footways and cycle routes are kept free of ice or snow at all times, even on the treated parts of the network.
- Securing continuous improvement in the safety and serviceability of cycle routes, in particular network integrity, will be a necessary component for encouraging cycling as an alternative to the car. It will be important for maintenance strategy positively to address this.
- Network integrity is a particularly important consideration where cycle routes are segregated for part of their length, but intermittently rejoin the carriageway. In these circumstances a reasonably consistent level of maintenance should be provided, and attention paid to carriageway edge condition in the un-segregated sections.
- It would seem logical for cycle routes to be inspected by cycle, although inspection of parts of some shared routes may be possible by walking or by vehicle as appropriate.
- Where footways or cycle routes remote from carriageways form part of an integrated route or network intended to encourage walking and cycle use, or are promoted by the authority, consideration should be given to adopting a consistent safety inspection frequency for the route or network as a whole.
- The [safety inspection] regime should be developed based on a risk assessment and provide a practical and reasonable approach to the risks and potential consequences identified. It should take account of potential risks to all users, and in particular those most vulnerable.
- Feedback from members of the public is an increasing source of data on the condition of all aspects of the highway network, with the use of smartphones and other personal mobile technology providing details such as the location, time and imagery. If this source of data is to be used to complement dedicated inspection and survey techniques outlined above, then a policy should be approved and made public, with processes and systems [to make sure...] suitable communication is provided to contributors to both acknowledge receipt of any submitted information, and also feedback on how it has been used (for example, any resulting maintenance activity).
- Issues for consideration in developing [a winter service] policy should include [...] treatment of facilities for walking and cycling; [...] extent of priority for vulnerable users.
- It is also important to consider equipment requirements for dealing with footways and cycle routes. Specialist equipment, such as footway ploughs and footway salt spreaders, may be necessary for this purpose.

Cycling UK was nevertheless dismayed that the new Code failed to mention the site-specific type of defects that put cyclists most at risk (see 3a below), despite a request to do so from the DfT's Cycle Proofing Working Group (see 4a). This means that, inevitably, all too many councils will not give cyclists' comfort and safety proper consideration.

In 2017, an inquest into the death of an 83-year-old cyclist who hit a pothole in March 2016, led a coroner to conclude that recent changes to Bury Metropolitan Borough Council's highway management procedure would "... increase the risk of future deaths, in particular to cyclists." The case raised questions about how councils choose to interpret the guidance given in *Well-maintained Highways*: (UK Roads Liaison Group) (see P7 above).

c. Compensation claims and Section 58

An authority that fails to discharge its duty puts itself at risk of compensation claims from road users who suffer damage or personal injury as a result a road, footway or cycleway surface defect. Such cases, however, are often disputed by a council's legal advisers, and liability may be difficult to substantiate. Moreover, the law provides authorities with a 'statutory defence' against claims if they can prove that they operate a reasonable and adequate system for highway repair and maintenance.

For England and Wales, this defence is set out in Section 58 of the *Highways Act 1980* (England and Wales), which states: "*it is a defence ... to prove that the authority had taken such care as in all the circumstances was reasonably required to secure that the part of the highway to which the action relates was not dangerous for traffic.*"

This, and following clauses, explains that, to mount such a defence, the authority must maintain those roads according to a hierarchy and which types of traffic are likely to use them. They must also carry out inspections to detect errors when they occur, and, if the road condition is below standard, repair it, or erect notices alerting users to the problem.

Section 1 of the *Roads (Scotland) Act 1984* and the *Roads (Northern Ireland) Order 1993*, Article 8 make similar provisions.

Yet there is no definition of 'reasonable', often making it too hard for injured parties to establish whether the council has failed in its duty, and too easy for councils to defend themselves successfully.

Cycling UK therefore believes that *Well-Managed Highway Infrastructure* should include, or be supplemented by, recommended good practice standards for inspections, intervention levels (i.e. how urgently a defect needs to be repaired), vegetation clearance and winter maintenance procedures for different types of road. These should take account of the safety of cyclists and other vulnerable road users (see section 3a). They would provide a 'benchmark' of good practice – and thus as a default basis for settling liability claims – while leaving local authorities latitude to adopt reasoned departures from this guidance, in accordance with local circumstances and priorities.

Forcing a highway authority to repair a road (UK)

1: Raise your concerns directly with local authority

2: If no action results, resort to legal action under Section 56 of the *Highways Act 1980*. This involves obtaining an order from the Magistrates' Court, which should force them to fix the defect(s).



How road defects form:

Road surfaces tend to deteriorate gradually as a result of natural weathering and ageing. Asphalt, the most common material used to bind aggregate into a road surface, normally lasts for only 15-20 years before it becomes oxidized by sunlight and heat. This makes it increasingly brittle and susceptible to cracking, while the constant passage of vehicles exacerbates the damage.

Cracks allow water to infiltrate the surface and, as they expand and let in more water during repeated freezes and thaws, bigger holes form. Motor vehicle tyres widen and deepen the defects and can push loose foundation material out of them.

Preventative action:

- **Inspect surfaces regularly** - a good programme of inspection, backed by reporting tools for the public (e.g. Cycling UK's fillthathole.org.uk) can help councils identify their priorities for repair.
- **Keep roads well-drained** - ditches, culverts and drains need to be cleared regularly and roads engineered so that they don't collect standing water.
- **Ensure surfaces are watertight** - if done properly, surface dressing (a thin layer of asphalt and chippings) can help make the surface watertight, but care is needed to avoid leaving loose chippings and other hazards behind (see section 3b).
- **Minimise utility works and check quality of repair** - opening the road surface for streetworks (i.e. work carried out by utility companies) weakens the structure and contractors may not reinstate the carriageway properly afterwards.
- **Cut back overhanging vegetation regularly** - overhanging vegetation (mainly trees) can prevent or reduce the amount of direct sunlight falling on the road surface and drip rain water onto it. This means that the carriageway underneath takes longer to dry out and more susceptible to water penetration and the freeze-thaw effect.
- **Regularly resurface** - all roads eventually fail. There comes a point when it is more cost-effective to resurface a road completely, than to keep patching it (see section 3b).
- **Reduce traffic** - as large vehicles cause most damage, restricting their access to certain roads can help prolong the life-span of the surface.

Which vehicles do the damage?

Road damage caused by vehicles passing over the surface is roughly proportional to the weight over the axle to the power of four.

(see: <http://www.standardsforhighways.co.uk/ha/standards/dmr/vol7/section2/hd2406.pdf>).

Thus, a car with 500kg weight over each axle does over 15,000 times the damage of a 90kg rider + bike, while a lorry axle with the maximum 10.5 tonnes does almost 200,000 the damage of a car, and almost 2.5 billion times the damage of a person on a bike.

Lorries, therefore, are responsible for by far and away the greatest proportion of damage to the road network, despite making up just 5% of road traffic.

3. Cycling and road maintenance procedure & practice

Cycling UK view:

- For cyclists, the location and shape of a defect, not just the depth, are important. All guidance should therefore emphasise that special consideration must be given to the type of defect listed below (3a).
- Local authorities should devote more of their resources to road surface renewal or resurfacing programmes, rather than short-term, emergency patching.
- Minor roads and off-road cycle facilities, where most cycling occurs, should be given greater priority in highway maintenance policies and procedures (including winter maintenance), while the whole-life upkeep of off-road cycle routes should be planned and costed-in from the outset.
- Highway authorities should be encouraged to use bicycles with sensors to monitor road and cycle track surface quality, and to use specialised narrower vehicles to keep cycle tracks free of debris and vegetation, or from snow and ice.
- Safe and convenient cycle access should be retained at road/streetworks, wherever possible.
- Utility companies must ensure that reinstatements are safe, and remain safe, for cycling; and that cycle signing, coloured surfacing and other features are retained or enhanced. Where utility companies perform to a poor standard, local authorities must oblige them to reinstate to a proper condition.
- Authorities should respond quickly to any reports made by cyclists alerting them to road defects. Online tools (e.g. Cycling UK's Fill that Hole) are an effective channel for this.
- The providers of defect management systems for highway authorities should integrate their products with Fill that Hole and similar public defect-reporting websites, to facilitate two-way communication between site-users and highway authorities.

a. Types of road defects that affect cyclists in particular

The criteria that local authorities use when identifying which surface defects to prioritise for repair usually specify a certain depth, typically 40mm (according to the annual ALARM survey, around 65% of responding authorities defined a pothole thus in 2018 – a similar proportion to earlier years).²⁴

The depth of a defect, however, is by no means the only factor that needs to be taken into account when considering the comfort and safety of cyclists. In fact, its shape and/or location may be the main problem, regardless of how deep it is.

These are type of defects that cause particular problems for cyclists, and should be given special consideration in national and local maintenance standards, and all relevant policies and regimes:

- Defects located towards the side of the road, where most people ride – i.e. the 2 metres nearest to the kerb or any regular car parking space – defects here can force cyclists to swerve out into the carriageway.
- Defects at or near junctions, where cyclists are likely to be looking at other traffic rather than the road surface. Their balance may also be affected when cornering.
- Defects on downhill sections of roads where cyclists will probably be travelling faster, making it more likely for a defect to cause serious injury or damage.
- Defects which present a sharp upstand on the far side, i.e. where a bike wheel will hit a steep or sharp-edged 'wall' as it tries to leave the depression.
- Defects which run along rather than across the path that cyclists will be taking, i.e. those which are more likely to trap a cyclist's wheel, like a tramline. Slotted drainage covers that are aligned in such a way that they could do this too should also be avoided.

Potentially, any deviation in a road surface can present a hazard and, even if a cyclist is aware of a pothole coming up, passing motor traffic can force them to alter their chosen path and ride over or into it. Worse, in the dark and/or if filled with rainwater, defects are especially hard to see and avoid in time.

In the Netherlands and other countries, instrumented bicycles are used for assessing the smoothness and comfort of cycling conditions, (i.e. with sensors which can detect unevenness). We urge their adoption in the UK.²⁵

There are, of course, other surface hazards, such as oil spills, ice, snow, gravel patches, broken glass, sunken drain covers and slippery ironwork or road markings etc. Authorities need to tackle these too, e.g. through robust winter maintenance and sweeping procedures, and regular inspections.

- The problems caused by vegetation, hedge trimmings etc. are covered in our briefing at: www.cyclinguk.org/campaigning/views-and-briefings/vegetation-and-hedge-trimmings

b. Reactive maintenance, surface dressing or full-depth resurfacing?

Surface defects are often patched up reactively on a short-term, individual basis, and millions are fixed each year:

- At least 1,534,175 potholes were filled altogether in England, Wales and London in 2017/18 at a cost of £94.9m.²⁶

However, many of these defects result from an underlying structural problem, or because the road has been allowed to reach the end of its usable life. This situation may well lead to mounting costs for more and more emergency repairs and compensation claims.

A better option is either to seal the surface before the road reaches the end of its lifespan, or to reconstruct it completely to its full depth. This will prevent potholes from forming so frequently, and ample evidence suggests that this is better value for money.²⁷

• The problems of surface dressing

Surface dressing is commonly used on minor roads as a cheap alternative to full resurfacing. It is designed to seal the surface and prevent moisture penetration. If well-laid in good conditions and on smooth roads, this treatment can preserve a deteriorating surface for longer, extending the road's life and preventing potholes.

However, where resources and conditions permit, resurfacing will give a far better, long-lasting surface, and one that will not cause the following problems for cyclists:

- If applied poorly to an already deformed or damaged surface, surface dressing merely blankets it. The surface remains bumpy and difficult to negotiate on a cycle.
- The standard approach is to make at least two sweeps afterwards, but this may not be done or still leave loose chippings behind all over the road for some time. These are very hazardous to cyclists because they can cause a rider to skid.
- Poor workmanship or bad weather can lead to premature failure, especially if the dressing has been laid under trees where conditions are cooler and damper. Irregular adhesion creates an extremely rough surface and undermines the treatment's purpose.



c. Costs of different treatments

Method	Cost (m ²)	Long -evity	Benefits	Drawbacks
Surface dressing: asphalt layer with chipped stone rolled in. Loose stones swept up twice.	£8.50	7 years	Seals surface to prevent water ingress; restores skid resistance; very cheap; quick to lay.	Very poor riding surface, especially when first laid; fails to deal with surface irregularities; short term gravel deposits on the road; fails if laid in or just before poor weather; very unpopular with cyclists.
Micro-surfacing: thin layer of asphalt mixed with small aggregate	£12.50	7 years	Fixes slight surface irregularities; restores skid resistance; cheap.	May miss larger defects; similar problems with surface lifting or failing if laid poorly or in bad conditions.
Resurfacing: damaged sections of the road planed out and relaid with fresh material	£14-£36	8-20 years	Fully repaired surface makes excellent riding surface, and fully impermeable to water ingress.	Expensive; some disruption.
Full reconstruction: removal of base course and rebuild, to prevent recurrent failure due to underlying weakness	£82	18 years	As with resurfacing.	Very expensive; considerable disruption.

The costs above are based on Buckinghamshire County Council's estimates.²⁸

d. Greater priority for minor roads and off-road cycle routes

Minor roads carry only about 36% of car mileage, compared to over 83% of cycle mileage, but major roads are usually deemed more important in maintenance terms because they carry most motor traffic overall (over 65%).²⁹

In contrast, in the Netherlands and Denmark where cycle use is high, cycle paths and roads used for cycling enjoy more attention than the road network. Cycling UK believes that this should become the practice in the UK. These routes need to be inspected and swept regularly and subject to effective winter maintenance.



Budgeting for whole-life maintenance: When planning an off-road cycling facility, authorities need to ensure that it budgets for ongoing maintenance. Routes that fall into disrepair, remain unswept or are encroached by vegetation that is rarely, if ever, cut back, will naturally fail to attract users and result in yet further neglect. A range of equipment is available for carrying out cycle path maintenance (e.g. small, narrow sweepers), and it is important to invest in it from the start.

Lighting, markings and signage: Inspection regimes should include checks on lighting and all signage relevant to cyclists. Ill-lit cycle paths may be hazardous and make users feel personally insecure, putting them off using routes in the dark, while worn markings or damaged signage might make it difficult to identify a cycle facility.

e. Utility companies and streetworks

As mentioned above (section 2a), utility companies have the statutory right to dig up the road surface. Their operations often take place at the side of the road and involve trenches, drainage gullies and ironwork. As this is the part of the carriageway where most cycling occurs, it is particularly important that the companies reinstate the road properly. Local authorities, who have control over the work of utilities, need to insist that this is done and force action if it is not.

f. Cycle access during road/streetworks

Safe and convenient cycle access should be retained at road/streetworks wherever possible. This means that:

- Cyclists should not be unnecessarily diverted, especially not onto busier or narrower carriageways.
- Cyclists should not be endangered by grit, debris, temporary metal plates or any slip hazard. The area round construction sites needs to be kept clean.
- Temporary, one-way shuttle-working traffic lights to control narrowed sections of road should give cyclists enough time to pass through safely before traffic starts coming towards them.
- Reducing speed limits and/or providing warning signs advising drivers not to overtake cyclists are preferable to 'Cyclists dismount' signs (unless the entire carriageway is closed to all traffic and cyclists have to be diverted onto the footway).
- Two-way cycling should be arranged wherever possible even when one-way diversions are in place for motor traffic.

Code of practice: The DfT publishes a code of practice for anyone responsible for street and road works on all highways and roads (except motorways and dual carriageways with a speed limit of 50 mph or more). This has a section on catering for cyclists, advising practitioners that they "*must ensure suitable provisions are made for the safety of cyclists passing or crossing the works.*" It stresses the need for particular care where cycle lanes or cycle tracks are affected; to "*consider whether access on the carriageway can be preserved for cyclists, even if it needs to be closed to motor vehicles*"; prevent unsafe conditions for cyclists during shuttle working with traffic control; and to bear in mind that cyclists need more time than motorists to clear a section controlled by portable traffic signals.³⁰

g. Reporting systems

Cycling UK's Fill That Hole site, set up in 2007, allows any road user to report road defects online. This automatically relays the information to the relevant highways authority so that they can fix the problem. The tool is popular with cyclists and the response rate from authorities is high. Most local authorities offer their own online reporting facilities too.

Fill That Hole and systems like it are a valuable complement to routine inspections because they help alert the authority to a problem that they may not otherwise find out about until the next inspection, which might be months away. To optimise their benefits (and the statistics collected from them),

though, they need to develop a better way of facilitating communication between contributors and councils (i.e. to acknowledge receipt of a report, or to feedback on whether the defect has been repaired). This is something that Well-Managed Highway Infrastructure advises. We know from Fill That Hole, for example, that authorities and individuals by no means always log the fact that a pothole has been filled.

We therefore urge the makers of these systems to work with Cycling UK and the providers of similar sites (notably My Society, the creators of the Fix My Street website) to ensure these they facilitate good two-way communication between authorities and members of the public.

- In 2017, 10,538 reports of road defects were filed on Cycling UK's Fill that Hole site.
www.fillthathole.org.uk

4. Improving cycling conditions in planned road maintenance programmes

Cycling UK view:

- When resurfacing, local authorities should take the opportunity to 'cycle proof' the road, i.e. systematically consider improving cycling conditions as part of the project. This approach requires coordination between maintenance planning, highways engineers and those promoting sustainable travel. It also helps maximise the synergies between cycling and maintenance budgets and enhances their value.

Most roads are many decades old and were designed according to guidance since superseded. *Manual for Streets 1* and *2* (2007 and 2010 respectively) offer an updated design approach, much of it incorporating better provision for cycling and, in doing so, aiming to encourage more people to cycle.³¹ Excellent modern guidance is also available in the revised *London Cycling Design Standards* (LCDS) and the design guidance issued in conjunction with the *Active Travel (Wales) Act*.³²

Planned maintenance programmes for an established road, street or junction are cost-effective opportunities to implement these new approaches and layouts. As such, all maintenance procedures and their results need to be 'cycle-proofed'.

- New York City is introducing simple, high-quality 'light-segregated' tracks with planters and 'traffic wands', as it carries out planned maintenance.
- Plymouth City Council (UK) is 'cycle-proofing' its planned maintenance programmes.

a. 'Cycle proofing'

Cycle proofing is defined as: "... a process which over time ensures that the built environment generally, and roads specifically, are seen to be safe, convenient and pleasant for cycle use by people of all ages and abilities."

Cycle proofing is a concept that has received prime-ministerial backing and a working group has been set up by the Department for Transport to take it forward. In its terms of reference, one of the Group's tasks is "advising on the maintenance of roads to improve conditions for cycling."

For more on cycle proofing and the working group, see:

www.gov.uk/government/groups/cycle-proofing-working-group



b. Cycle proofing and road resurfacing

It is important not to deal with maintaining roads in isolation from other processes, especially managing the traffic that uses them and looking at the role of the street as a place, not simply as a route for through-traffic – or ‘placemaking’.

Road surfaces have a 10-20-year lifespan, and local authorities typically schedule streets for total reconstruction and renewal several years in advance. This gives them an ideal opportunity to plan improvements for cycling well ahead, and coordinate their cycling and planned road maintenance programmes to maximise the synergies between budgets. The best way of facilitating this is through partnership working between highways engineers, sustainable travel officers and other stakeholders.

When planning resurfacing, therefore, Cycling UK recommends that local authorities ask themselves:

Question	Measures/changes to consider alongside resurfacing
Do all relevant parties, including stakeholders with interests in cycling (and in walking), know which roads are scheduled for resurfacing, and when?	Make sure utility firms, transport strategy, planning development and those tasked with implementing transport improvements are involved at the outset. Road user groups should also be notified.
Are there opportunities for developer funding?	Seek developer contributions towards highway improvements, e.g. better cycle provision, design features or cycle-friendly traffic calming to reduce the dominance and speed of motor traffic. NB: Avoid resurfacing near new or planned development sites – construction traffic can create additional road damage.
Is the design of the road/street appropriate for the speed limit or desired speed?	Consider measures to lower speeds where necessary, and to stop drivers breaking the speed limit. <i>Manual for Streets*</i> offers guidance on how to make 20 mph self-enforcing.
Is the kerb alignment suitable for the type of traffic the road is intended to carry/encourage?	Think about: widening the footway; installing raised footway or shared footway crossovers at side road junctions; providing semi or fully segregated cycleways; and tightening corner radii. See <i>Manual for Streets*</i> .
Are road markings correct or necessary?	Remove centrelines – this can slow down drivers, bringing other road safety benefits ³³ ; include decent width cycle lanes (2.0m preferred, 1.5m minimum), or other suitable markings; and add coloured surfacing.
Can the resurfacing allow for flexibility in future use?	Introduce new approaches to make the road layout more flexible, e.g. lightly-segregated cycle infrastructure, demarcated by planters, ‘traffic wands’ (i.e. plastic bollards), or semi-permanent kerbing. If necessary, this can be easily removed or laid out differently later to accommodate changes in use.

FURTHER READING:

- Cycling UK Campaigns Briefings on:
 - *Cycle-friendly design and planning: Overview*
www.cyclinguk.org/campaigning/views-and-briefings/cycle-friendly-design-and-planning-overview
 - *Vegetation and hedge trimmings*
www.cyclinguk.org/campaigning/views-and-briefings/vegetation-and-hedge-trimmings
- UK Roads Board. *Well-managed Highway Infrastructure: a code of practice*. October 2016.
<http://www.ukroadsliaisongroup.org/en/codes/index.cfm>
Non-statutory code of practice for highway maintenance management providing local authorities with guidance on highways management.
- *Roads: maintenance, repairs and street works* (Parliamentary briefing SN00739). 2014.
Describes the framework in which local authorities and the highways agencies in England and Wales maintain and repair the road network. It also sets out the powers of utility companies and others to undertake streetworks and the powers available to highway authorities to manage and mitigate those works. <http://researchbriefings.parliament.uk/ResearchBriefing/Summary/SN00739>
- *Maintenance and management of routes designed for cyclists* (Sustrans Design Manual Chapter 15). Nov 2014.
www.sustrans.org.uk/sites/default/files/images/files/Route-Design-Resources/Maintenance-31-10-14.pdf
- *Cycling by Design*, chapter 10 (Transport Scotland). 2010
www.transportscotland.gov.uk/system/files/uploaded_content/documents/tsc_basic_pages/Environment/Cycling_by_Design_2010_Rev_1_June_2011.pdf
- *London Cycling Design Standards*, chapter 7 (Transport for London). 2014.
<https://tfl.gov.uk/corporate/publications-and-reports/streets-toolkit>
- *Design Guidance: Active Travel (Wales) Act 2013*, section 10. (Welsh Government). 2014.
<http://gov.wales/docs/det/publications/141209-active-travel-design-guidance-en.pdf>
- Asphalt Industry Alliance annual ALARM survey.
<http://www.asphaltuk.org/alarm-survey-page/>
- *Safety and Road and Street Works: A Code of Practice*. (DfT). Oct 2013.
www.gov.uk/government/uploads/system/uploads/attachment_data/file/321056/safety-at-streetworks.pdf
- *Manual for Streets 1* (DfT/DCLG / Thomas Telford Publishing). 2007.
Guidance on enhancing the design of residential streets, with advice on how this can help “create better places – places with local distinctiveness and identity.”
www.gov.uk/government/uploads/system/uploads/attachment_data/file/341513/pdfmanforstreets.pdf
- *Manual for Streets 2*. (CIHT). 2010.
Companion guide to *Manual for streets 1*, extending its practices beyond residential streets to encompass both urban and rural situations. It is intended to assist those in the planning, construction and improvement of our streets to deliver more contextually sensitive designs.
<https://www.gov.uk/government/publications/manual-for-streets-2>

FOOTNOTES AND REFERENCES:

¹ Taylor, Mark (et al). *Cyclist exposure to hand-arm vibration and pavement surface improvement in the City of Edinburgh*. Scottish Transport Applications Research (STAR 2017). www.starconference.org.uk/star/2017/Taylor.pdf.

² RAC. *Report on Motoring 2018*. www.rac.co.uk/report-on-motoring

³ Answer to a parliamentary question. 15 March 2018. <https://www.theyworkforyou.com/wrans/?id=2018-02-22.129317.h>

⁴ DfT. *Reported Road Casualties Great Britain 2017*. September 2018. Table RAS 50005.
www.gov.uk/government/collections/road-accidents-and-safety-statistics

- ⁵ Benington R. *An introduction to non-collision cycling incidents*. NHS Bristol. Oct. 2012. (No longer online).
- ⁶ Asphalt Industry Alliance. *ALARM: Annual Local Authority Maintenance Survey*. March 2018. <http://www.asphaltuk.org/alarm-survey-page/>
- ⁷ DfT. *Road Conditions in England 2017*. Jan 2018. Tables RDC 0121 & 0131. www.gov.uk/government/collections/road-network-size-and-condition
- ⁸ Audit Scotland. *Maintaining Scotland's Roads: A follow-up report*. August 2016. <http://www.audit-scotland.gov.uk/report/maintaining-scotlands-roads-a-follow-up-report-0>
- ⁹ Audit Scotland. *Maintaining Scotland's Roads. A follow-up report: impact report*. June 2018. www.audit-scotland.gov.uk/uploads/docs/report/2018/ir_180626_maintaining_roads.pdf
- ¹⁰ Asphalt Industry Alliance. *ALARM: Annual Local Authority Maintenance Survey*. March 2018.
- ¹¹ DfT. *Road Conditions in England 2017*. January 2018. www.gov.uk/government/uploads/system/uploads/attachment_data/file/674577/road-conditions-in-england-2017.pdf. Also, pteg (Passenger Transport Executive Group) identified a growing gap in maintenance spend between national and local roads: although 98% of the road network is managed by local highways authorities and carries two thirds of all motorised traffic, the 2% of the road network managed by Highways England received 2.7 times as much maintenance spend per km as local authority-managed 'A' roads and motorways; and 15.9 times as much as local authority unclassified roads. *A Bumpy Ride*. Sept 2015. www.urbantransportgroup.org/resources/types/reports/bumpy-ride-local-highways-maintenance
- ¹² DfT. *Road Conditions in England 2017*. Jan 2018. Table RDC 0310 www.gov.uk/government/collections/road-network-size-and-condition
- ¹³ LGA. *Government's national roads receiving 52 times more funding than councils' local roads*. Press release 25 Jan 2018. www.localgov.co.uk/Councils-hit-out-over-disparity-in-road-funding/44608
- ¹⁴ Audit Scotland. *Maintaining Scotland's Roads: A follow-up report*. August 2016. (Link above).
- ¹⁵ TRL/Transport Scotland. *Making the case for road maintenance spend in a competitive environment*. 3013 www.trl.co.uk
- ¹⁶ These figures come from Freedom of Information requests made to all UK highways authorities by Cycling UK in February 2018 (not all replied). See: *156 local authorities spend total of £43.3 million on pothole claims*. Press release 25 March 2018. www.cyclinguk.org/press-release/156-local-authorities-spend-total-ps433-million-pothole-claims (the figures quoted in this briefing are updates made in April 2018).
- ¹⁷ Holzel, C. (et al). *Cycling comfort on different road surfaces*. 2012. <https://www.sciencedirect.com/science/article/pii/S1877705812016955>
- ¹⁸ Robbins, M (et al). *Literature review: The effect of pavement roughness on vehicle operating costs*. NCAT. May 2015. <http://www.eng.auburn.edu/research/centers/ncat/files/technical-reports/rep15-02.pdf>
- ¹⁹ Taylor, Mark (et al). *Cyclist exposure to hand-arm vibration and pavement surface improvement in the City of Edinburgh*. Scottish Transport Applications Research (STAR 2017). (Link above).
- ²⁰ www.legislation.gov.uk/anaw/2013/7/pdfs/anaw_20130007_en.pdf
- ²¹ Grierson I and Huxford R, *Highway Risk and Liability Claims*. UK Roads Board/ICE. 2009.
- ²² UK Roads Board. *Well-managed Highway Infrastructure: a code of practice*. October 2016. In theory, its guidance took effect in October 2018. <http://www.ukroadsliaisongroup.org/en/codes/index.cfm>
- ²³ Asphalt Industry Alliance. *ALARM: Annual Local Authority Maintenance Survey*. March 2018. (P10). (Link above)
- ²⁴ Asphalt Industry Alliance. *ALARM: Annual Local Authority Maintenance Survey*. March 2018. (P12). (Link above).
- ²⁵ Bil, Michal (et al). *How comfortable are your cycling tracks? A new method for objective bicycle vibration measurement*. 2015. www.researchgate.net/publication/276939322_How_comfortable_are_your_cycling_tracks_A_new_method_for_objective_bicycle_vibration_measurement.
- ²⁶ Asphalt Industry Alliance. *ALARM: Annual Local Authority Maintenance Survey*. March 2018. (P13). (Link above).
- ²⁷ DfT/Highways Agency. *Maintaining strategic infrastructure: roads*. June 2014. www.nao.org.uk/wp-content/uploads/2015/06/Maintaining-Strategic-Infrastructure-Roads.pdf.
- ²⁸ www.buckscc.gov.uk/services/transport-and-roads/road-maintenance-and-repairs/road-treatment-programme/choosing-the-right-road-surface/
- ²⁹ DfT. *Road Traffic Estimates in Great Britain 2017*. July 2018. Tables TRA 0204 & 0402. www.gov.uk/government/collections/road-traffic-statistics
- ³⁰ DfT. *Safety and Road and Street Works: A Code of Practice*. Oct 2013. www.gov.uk/government/uploads/system/uploads/attachment_data/file/321056/safety-at-streetworks.pdf
- ³¹ DfT/DCLG. *Manual for Streets 1*. Thomas Telford Publishing. 2007. www.gov.uk/government/uploads/system/uploads/attachment_data/file/341513/pdfmanforstreets.pdf ; CIHT. *Manual for Streets 2*. 2010. www.gov.uk/government/publications/manual-for-streets-2
- ³² TfL. *London Cycling Design Standards*. 2014. <https://tfl.gov.uk/corporate/publications-and-reports/cycling> ; Welsh Government. *Design Guidance: Active Travel (Wales) Act 2013*. 2014. <http://gov.wales/docs/det/publications/141209-active-travel-design-guidance-en.pdf>
- ³³ TfL. 2013. *Centreline removal trial*. <http://www.tfl.gov.uk/cdn/static/cms/documents/centre-line-removal-trial.pdf>