

Kirklees Council

Highways Guidance Note – Gradients March 2019 (version 2)

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This guidance note

Introduction

- 1 This guidance note summarizes best practice regarding highway gradients.
- 2 This guidance note has been written mainly to help developers, but it will also be used by highways teams within Kirklees Council.

Previous version

- 3 This version replaces the previous version of this guidance note, which is withdrawn.
- 4 Significant changes from the previous version of this guidance note are highlighted with a vertical line to the left of the affected text.

Implementation

- 5 This guidance note applies to all applications for technical review submitted on or after 1 April 2019.

Kirklees Council highway design guide

- 6 Kirklees Council's adopted highway design guide is the former West Yorkshire Metropolitan County Council's *Highway design guide* issued in 1985.
- 7 Where there is a clash, the requirements of this guidance note shall apply instead of those in the West Yorkshire design guide.

Background

Kirklees Council highway design guide

- 8 The West Yorkshire design guide is now over 30 years old and parts of it are out-of-date. In particular, the guidance on gradients has been rendered obsolete by legislative changes and advances in highway engineering and urban design.

Legal requirements

Equality

- 9 Development proposals must comply with the [Equality Act 2010](#). Under this act, it is unlawful to discriminate against anyone on the grounds of disability and 'service providers' – including private

businesses – must make ‘reasonable adjustments’ to remove barriers to disabled people. When applied to new residential or commercial developments this means that roads and paths should be usable by all members of the public, including those with visual, hearing, or mobility impairments or learning disabilities.

10 The Department for Transport publication [Inclusive Mobility](#) gives guidance on how to provide for members of the public with visual, hearing, or mobility impairments or learning disabilities. However, what is deemed ‘reasonable’ will depend upon the circumstances. For example, the topography of a site or any existing development might affect what it would be reasonable to provide.

11 In addition to the above, the [Equality Act](#) requires Kirklees Council to have ‘due regard to the need to advance equality of opportunity’ between people with disabilities and those without when exercising its statutory functions. These functions include the process of adopting roads or paths as publicly maintainable highways.

Safety and health

12 The design of development proposals must comply with health and safety legislation. This includes the [Health and Safety at Work etc Act 1974](#) and the [Construction \(Design and Management\) Regulations 2015](#) (the CDM Regulations).

13 The [Health and Safety at Work Act](#) requires employers – which includes developers – to conduct their business in a way that ensures, ‘so far as is reasonably practicable’, that they do not expose ‘persons not in their employment’ to risks to their health or safety. This means that developers must ensure that their developments do not unreasonably increase the risks to the public, local residents, or people engaged in servicing or maintaining the roads, paths, and drains provided.

14 In addition, the [CDM Regulations](#) impose specific requirements on designers to eliminate, ‘so far as is reasonably practicable’, foreseeable risks to safety or health.

Effects of gradients

Introduction

15 Desirable maximum and minimum gradients are determined by considerations of safety and usability. Excessively steep gradients can present barriers to some users and can also be hazardous. Gradients that are too slack can lead to standing water, which can be inconvenient for non-motorised users and dangerous to all users during cold weather. In addition, the presence of standing water can prevent or deter some people from using a paved surface.

Gradients and equality

16 Excessively steep or slack gradients disproportionately affect disabled and elderly people and those accompanied by children. Discriminating against these groups in this way without a sound reason can be unlawful under the [Equality Act](#).

Gradients and safety

17 Providing slopes that are hazardous because they are either too steep or too slack to drain effectively can contravene safety legislation, particularly the [CDM Regulations](#).

Maximum gradients

General

18 Steep gradients affect highway users in different ways. As they are steepened, they become progressively more dangerous and impassable to an increasing number of users. Accordingly, there is no clear dividing line between gradients that are acceptable and those that are too steep.

Effects of steep gradients – pedestrians

19 Although gradients up to 5% (1 in 20) are generally considered acceptable for pedestrians, including wheelchair users, gradients over 2.5% (1 in 40) might be impassable for some manual wheelchair users. On Gradients of 8% (1 in 12.5) or above, the physical effort of getting up the slope would be too much for many wheelchair users and

there would be a risk of some wheelchairs toppling over. Slopes exceeding 10% (1 in 10) might prove impassable to many non-wheelchair users.

20 Further information on the effects of steep gradients on pedestrians is given in [Inclusive Mobility](#).

Effects of steep gradients – cyclists

21 Increasing uphill gradients lead to increasing difficulties for cyclists. As gradients steepen, more cyclists would have to dismount and push. Accordingly, steep gradients can discourage cycling.

22 At low speeds, cyclists are prone to wobble and deviation from a straight line. The minimum speed required to ride comfortably in a straight line without a conscious effort to maintain balance will vary with individual cyclists. However, as uphill gradients slow cyclists, increases in steepness would produce corresponding increases in the amount cyclists wobble. Where insufficient width is available, this extra wobble will increase the likelihood of conflicts with other traffic. Further information on the effective width required by cyclists is available in the Department for Transport's [Local Transport Note 2/08 – Cycle Infrastructure Design](#) and Sustrans' [Handbook for Cycle-Friendly Design](#).

Effects of steep gradients – motorists

23 Gradients up to 8% (1 in 12.5) do not generally affect the safe use of motor vehicles. Desirable and

absolute gradients of 6% (1 in 16.7) and 8% respectively are often quoted in standards but these are generally based upon economic considerations derived from operating costs on link roads rather than roads within residential or commercial developments.

24 Carriageway gradients of 8% to 10% (1 in 10) can be incorporated successfully into developments but with gradients above 8%, there is an increased chance of vehicles losing traction on icy surfaces.

25 On gradients above 10%, some stationary vehicles can start to slide in icy conditions. For more information on this, see the Chartered Institution of Highways and Transportation publication [Streets and Transport in the Urban Environment](#).

Desirable maximum gradients

26 In view of the above, the desirable maximum gradient on any shared-use road, path, or other paved area that is likely to be walked on is 5% (1 in 20) in any direction. Steeper gradients may be adopted providing that:

- All reasonable steps are taken to minimize discrimination against disabled and elderly people and those accompanied by children.
- The risks to public safety have been adequately assessed and minimized.
- Appropriate mitigation works are provided.

Mitigation of steep gradients

Slopes of between 5% and 8%

27 Consideration shall be given to the provision of off-carriageway facilities for pedestrians, particularly where it would be reasonable to expect a significant proportion of disabled or elderly people.

28 At pedestrian crossing points and vehicle crossings, the level difference between the dropped kerbs and full-height kerbs on the uphill side shall be reduced over two transition kerb lengths.

Slopes of between 8% and 10%

29 Separate off-carriageway facilities for pedestrians shall be provided. As carriageways are designed with vertical curves, the maximum gradients are greater than the averages. However, footways do not need vertical curves. Accordingly, consideration shall be given to providing footways to independent vertical alignments to reduce the maximum gradients required.

30 At pedestrian crossing points and vehicle crossings, the level difference between the dropped kerbs and full-height kerbs on the uphill side shall be reduced over two transition kerb lengths.

31 Consideration shall be given to increasing carriageway widths to accommodate cyclists' increased wobble.

32 The risk of vehicles losing control and the implication for any development in the 'run-off' area at the foot of the slope shall be assessed. Consideration shall be given to not siting sensitive development in the 'run-off' area.

Slopes of 10% or over

33 Separate off-carriageway facilities for pedestrians shall be provided. These shall be to an independent vertical alignment to the adjacent carriageway to reduce the maximum gradient required. Level 'landings' at spacings appropriate to

the gradient and handrails shall be provided for pedestrians. Consideration shall be given to the provision of parallel, alternative routes utilising steps to reduce local gradients.

34 Consideration shall be given to increasing carriageway widths to accommodate cyclists' increased wobble.

35 Paved surfaces sloping at more than 10% in any direction shall not be counted as parking places.

36 The risk of vehicles losing control and the implication for any development in the 'run-off' area at the foot of the slope shall be assessed. Consideration shall be given to not siting sensitive development in the 'run-off' area.

Minimum gradients

All paved areas

37 Minimum gradients are determined by the need to keep paved surfaces drained. To ensure that they are adequately drained, all paved areas shall have a minimum gradient of 2% (1 in 50). This may be in any direction.

Carriageway longfall

38 Where the carriageway crossfall would be at least 2.5% (1 in 40), the longfall may be reduced to 0.5% (1 in 200), but between 0.5% and 0.67% (1 in 150) channel blocks or mastic channels would be required.

Crossfalls

Footpath and cycle path crossfalls

39 On footpaths and cycle paths, crossfall should usually be 2.5% (1 in 40). This provides a good balance between the need to remove surface water and the needs of users. Crossfalls steeper than about 3% (1 in 33.3) can be uncomfortable to walk on and, where the slope runs towards a road, can be dangerous, as wheeled users tend to edge down the crossfall. Accordingly, 3% is the desirable maximum crossfall. However, it will generally be necessary to increase crossfalls at vehicle crossings and similar. In these situations, the crossfall may be increased to an absolute maximum of 5% (1 in 20) providing that the increase is minimized, the risks are adequately assessed, and any necessary mitigation measures are implemented.

40 Where a footway or cycle path runs alongside the edge of the carriageway or is only separated from the carriageway by a grassed verge, the

crossfall on the footway or cycle path and any intervening verge shall be towards the carriageway to ensure that surface water drains on to the carriageway.

41 At vehicle crossings of narrow footways, it might be necessary to reduce the level of the back edges of the vehicle crossing to avoid excessive crossfalls. This might have a knock-on effect on drive and floor levels. Accordingly, if it is not considered at an early stage of design, then redesign might be required.

42 As variations in crossfall, such as at vehicle crossings, can affect the steering of wheelchair users and cause problems for people with walking difficulties, changes in crossfall shall be implemented gradually. However, where the hand of the crossfall changes, the creation of poorly-drained flat areas shall be avoided.

43 In addition, abrupt changes of crossfall at crown lines shall be avoided. Where crown lines are

used, they shall not be diagonal across the general direction of travel.

Crossfalls on hard margins

44 As with footways, the crossfall on hard margins shall usually be 2.5% (1 in 40) towards the carriageway.

Carriageway crossfalls

45 On carriageways, crossfall shall usually be 2.5% (1 in 40). This may be reduced when necessary to apply superelevation providing that appropriate measures are taken to mitigate the effects of the slacker gradient.

46 The difficulties caused to pedestrians by steep gradients are potentially more significant when walking on carriageways. Accordingly, on shared-

use carriageways and at pedestrian crossings and other places where pedestrians would be expected to cross the carriageway, the carriageway crossfall shall not exceed 2.5%. At other locations, the carriageway crossfall shall be no more than 5% (1 in 20).

47 Conflicting crossfalls at crown lines and sudden changes in crossfall can affect the stability of commercial vehicles, even at low speeds. Accordingly, the arithmetic differences in crossfall across crown lines shall not exceed 5% and any changes in crossfall shall be implemented gradually. However, where the hand of the crossfall changes, the creation of poorly-drained flat areas shall be avoided.

48 Further guidance on the effects of changes in crossfalls on commercial vehicle stability is available from Highways England in the [Design Manual for Roads and Bridges](#) document TD 16 – *Geometric Design of Roundabouts*.

Edge of carriageway gradients

Introduction

49 On curves and at locations where the width of the carriageway varies, the gradients along the edges of carriageways will differ across the carriageway and from those along the centreline. This can lead to undesirable effects:

- The edge of carriageway gradients might be dangerous or otherwise unacceptable.

- Differing gradients across the carriageway, particularly where commercial vehicles are turning, can lead to vehicle instability, even at low speeds.

Requirement

50 The edge of carriageway gradients shall be assessed, especially on bends and where the width of the carriageway varies.

Gradients in junctions

Introduction

51 Steep gradients on the minor road approaches to priority junctions can be dangerous. They can hinder drivers' understanding of the road layout and can lead to vehicles approaching too quickly. They can also reduce the intervisibility of vehicles on the major and minor roads.

Requirement

52 For the final 10 m of the approach to a priority junction, the carriageway gradient of the minor road should be no more than 2.5% (1 in 40). This may be increased to an absolute maximum of 4% (1 in 25) providing that the risks associated with this are adequately assessed and any necessary mitigation measures implemented.

Further information, comments, and queries

Kirklees Council highways standards and guidance

Highways guidance notes

- Existing Roads and Paths Affected by New Developments
- Gradients
- Highway Adoption Drawings
- Highway Adoptions and the CDM Regulations
- Highway Adoptions Criteria
- Highways Technical Approval
- Highways, SuDS, and Private Drainage
- Introduction to Highways and Adoptions
- Operation and Maintenance Manuals for Adopted Highways
- Requirements of New and Improved Roads and Paths
- Requirements of Submitted Documents
- Section 38 Agreements for Highway Adoptions
- Soakaways
- Technical Approval of Surface Water Flow Attenuation Tanks and Pipes

Other highways documents

- Kirklees Highways Standard Details

Comments and queries

Kirklees Council welcomes comments and queries about this guidance note

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