C.09 Gradients

Key Principle

Designers should aim to achieve a maximum gradient of 3% with the absolute maximum 5% for lengths up to 100m. On the approach to priority junctions this should not exceed 3%. Where steeper slopes are unavoidable the limiting gradient is 7% for lengths up to 30m.

Design Guidance

Cyclists will often go out of their way to avoid climbing a hill. This is particularly true for steep gradients which not only put them at a significant speed disadvantage with motorised traffic but also make them more likely to wobble, making conflict with such traffic more likely. They will also try to avoid losing height once it has been gained.

Cycle route designers should endeavour to follow contours whenever possible and recognise that gradients may make some routes attractive in only one direction. Local consultation may highlight established routes used by cyclists to avoid steep hills.

In hilly areas it is often preferable to site strategic routes along corridors with features such as rivers, railways or canals as they will already be located where the gradient is gentlest. However, at some point in a journey, uphill climbs may be inevitable. The need for cyclists to stop or give way along uphill sections should be kept to a minimum. Pulling away from stationary on an uphill section can be particularly difficult.

Where off-road cycle tracks are provided, the effect of a steep gradient can often be reduced by zig-zagging the track and, if appropriate, segregating it from the pedestrian route. Where this approach is adopted it is essential that the turning points are kept as level as possible using the minimum cross-fall necessary to shed water. It is especially important to avoid adverse camber at these locations.

Gradients in General

Designers should aim to achieve a maximum gradient of 3% with the absolute maximum 5% for lengths up to 100m. On the approach to priority junctions this should not exceed 3%. Where steeper slopes are unavoidable the limiting gradient is 7% for lengths up to 30m. Gradients above this figure are not recommended, especially where cyclists will be sharing space with pedestrians, except for very short lengths. However, the absence of gentle gradients in a hilly area should not be used as a reason for not catering for cyclists. Walking the cycle for some stretches may be preferable to having no convenient route in the first place.

Manual for Streets:

6.3.27 Designers should attempt to keep pedestrian (and cycle) routes as near to level as possible along their length and width, within the constraints of the site. Longitudinal gradients should ideally be no more than 5%, although topography or other circumstances may make this difficult to achieve.

In new-build situations where a balance of excavated and fill material can be achieved, consideration should be given to raising the road (in the case of subways) or lowering (in the case of cycle bridges) to minimise the approach gradients for cyclists.

On gradients exceeding 2% a locally levelled section at least 5m long is desirable in advance of give way or stop lines, or any other location where the cyclist may expect to have to stop. This reduces the effort required to re-start.

Consideration should be given to providing anti-skid surfacing on gradients approaching hazards such as road crossings.

Anti-skid surfacing on approach to road junction, Eastleigh

Picture: Tony Russell

Approach Ramps

Ramps for cyclists are often shared with pedestrians. In these circumstances the needs of wheelchair users and other people whose mobility is impaired should also be accommodated. The preferred gradient for these facilities is 5% with 8% as the absolute maximum. Individual flights should not exceed 10m and resting places should be provided at least 2m long across the full width of the ramp. (See also B10 Wheeling Channels)

Stepped ramps

The introduction of stepped ramps for pedestrians should be avoided because they are not DDA compliant due to the problems they create for wheelchair users and others with mobility impairment.

Gradients

Location	Maximum Gradients *	
General cycle facility:	3%	Unrestricted length
	5%	Up to 100 m
	7%	Up to 30 m
On the immediate approach to priority junctions:	2%	Over a minimum distance of 5m
On the approach ramp to a bridge or subway	3%	8% Desirable Absolute
Wheeling ramps	50%	Absolute

*Note: In some circumstances these gradients may prove difficult to achieve. Where this is the case it may be appropriate to increase them for short distances. Although this is predominantly an ease-of-use issue, a risk assessment (see: A15 Audits and Risk Assessment) may be necessary.

References

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