Parapet Heights on Cycle Routes

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Introduction

Where a cycle route runs immediately adjacent to a bridge parapet the usual height of parapet required is 1.4m. Whilst this can generally be accommodated on a new structure, the conversion of a footbridge or a footway on a road bridge to shared use will normally place cyclists next to a parapet designed for pedestrians, at a lower height. If the parapet of an existing structure is to be raised to 1.4m this can involve considerable expense and it is questionable whether this is generally necessary. There is also an absence of empirical evidence to support the 1.4m height.

This note compares the guidance available in the UK and abroad and highlights where these differ from established practice in the UK. It also provides a selection of examples of bridges on cycle routes which have low parapets which have not been raised, and a number where they have been raised to 1.4m.

It recommends a flexible approach to existing bridges, making use of a risk assessment process and taking account of the range of guidance available.

Useful references - UK

This section quotes extracts from the main UK design guidance and standards that relate to the height of a parapet on a cycle route.

TD19/06: Requirement for Road Restraint Systems (for Trunk Roads and Motorways)

- “Height of parapets: The height of vehicle parapets must be measured above the adjoining paved surface and must not be less than the following:

  1400 mm – For cycleways immediately adjacent to the vehicle parapet” (4.23)

BD29/04: Design Criteria for Footbridges (for Trunk Roads and Motorways)

- “On footbridges with cycle facilities the minimum height of a parapet shall be 1.40m. Design criteria and details for this parapet shall be as specified in 7.1 above, but where cyclists are physically segregated from pedestrian facilities the increased parapet height need only be provided on the cycle track side of the bridge” (12.5)

LTN2/08 indicates that raising the parapet height might not always be necessary:

- "Bridges for cyclists should ideally have a parapet height of 1.4 metres (1.8 metres if also providing for equestrian use). On existing structures this cannot always be achieved, but it should not necessarily preclude their use as crossings for cyclists" (10.8.2)

Where equestrian usage is permitted a 1.8m parapet height in generally required unless riders dismount; this can have severe visual impact on a narrow bridge. The normal height for a pedestrian only parapet is 1.15m. On a new bridge over a railway a parapet height of 1.8m is likely to be required and sometimes Network Rail will insist on there being no apertures in the parapet.

Cycling by Design 2010 (Transport Scotland) – those working on Trunk Road projects in Scotland are required to follow the guidance, and it is commended to local authorities and others developing cycling infrastructure in Scotland:

- “Parapets. As illustrated in Figure 7.16, for new bridges carrying cycle routes, bridge parapets should be designed to meet the minimum recommended height of 1.4m. For existing bridges with parapets of height 1.0m or greater above the cycle route, cycle access should still be permitted. The reduced height may be treated as an effective width restriction

of up to 0.50m along the cycle route (refer to Table 6.3). In such circumstances a Departure from Standard can be applied for by the designer if existing informal use demonstrates no particular safety issues. In approving the Departure, the Road Authority may wish to consider the need for mitigation. For example:

- Segregation of pedestrians and cyclists by means of a raised white line, colour contrast or surface texture with pedestrians placed next to the parapet;
- An advisory line keeping cyclists away from the parapet; and
- Monitoring future use for a period of 12 months.

Parapets below 1.0m in height should be raised to a height compatible with the treatments available for mitigating parapet heights between 1.0m and 1.4m. Aesthetics should be a consideration in arriving at the appropriate height and treatment." (P105)

Useful references – other countries

Advice for designers in other countries varies and it is noteworthy that in both Denmark and The Netherlands, which have the highest levels of cycling in Europe but whose people are at least as tall as we are, parapet heights are generally lower.

Collection of Cycle Concepts (Danish Road Directorate, 2000):

http://www.vejdirektoratet.dk/pdf/cykelrapport/063-100Chapter08.pdf

- "Bridges: Especially for pedestrians, cyclists and trucks high guard rails / safety fences are necessary on bridges. Guard rails are recommended to be 1.2m high" (Page 95)

Design manual for bicycle traffic (CROW, The Netherlands, 2007)

- "Cycle bridge: height of bridge handrail >= 1.20m" (V69 page 286)

Guide for the Development of Bicycle Facilities (American Association of State Highway and Transportation Officials, 1999)

- "Railings, fences or barriers on both sides of a path on a structure should be a minimum of 1.1m (42 inches) high" (Page 55)

Planning and Design for Pedestrians and Cyclists (Velo Quebec, 2010)

- "On stand-alone overpasses or along steep slopes, a height of 1.1m is usually adequate to hold back a pedestrian or a cyclist" (Page 56)

We have emailed technical contacts in both countries and they have confirmed that this guidance is still applicable and that it has proven satisfactory.

Design considerations

Where a parapet is on a structure that is part of the Trunk Road network, design standards are set out in the Design Manual for Roads and Bridges (DMRB) which makes it difficult to reduce the 1.4m height specified in TD 19/06, although alternative guidance applies in Scotland.

Bridges which are part of the local highway network need only use DMRB as guidance which means that the local authority is at liberty to decide on the standard to employ, and LTN 2/08 recognises the need for a flexible approach on existing structures.

If the route is demarcated such that cyclists are not adjacent to a parapet, then increasing the height will not normally be necessary.

Deciding on an acceptable parapet height should take account of site specific factors, including:

- the width of the parapet (a wider parapet may mean that less height is needed)
- the possibility of keeping cyclists from riding close to it

Appendix A provides some examples of low parapets on cycle routes in the UK and Appendix B gives examples of schemes where the parapet has been raised.

The use of Cyclists Dismount signs should not feature as an option, since they will be generally ignored and cyclists will remain mounted in any case. If any signing is used it should be to warn cyclists to take care due to the low parapet height.

In coming to a decision on whether to raise the height of a parapet, consideration should include the aesthetics of the design and the strength of the parapet; increasing the height increases the lever arm of the outwards loadings which the parapet is designed to withstand and some may not be strong enough for this, even though they look perfectly OK.

Assessing risk

In 2009 Cycling England made enquiries on the Cycleplanning email group on whether anyone in the industry was aware of any incident where a person cycling across a bridge fell over the parapet because it was below the recommended height. That enquiry elicited no examples of cyclists going over a low parapet. In preparation of this note Sustrans posted a similar question again early in 2012, and again there were no examples either on traffic free routes or on the road.

If the 1.4m height normally used on new bridges is not available, undertaking a simple risk assessment based on what is proposed will enable a balanced decision to be made. It will provide a record to demonstrate that professional judgement has been exercised in coming to the decision and will ensure that the reasons for adopting the solution are recorded for future reference; such an assessment will benefit from the inclusion of user representatives so that their views can be taken into account when reaching a decision. The historic use of the bridge should be considered in making this assessment; if it has been used by cyclists in the past, even unofficially, without incident, then that should help to inform the decision. Appendix C provides guidance on undertaking a risk assessment.

Conclusions

Established guidance in Denmark and The Netherlands is that 1.2m parapets should be provided on cycle routes, and this guidance is still applicable and has proven satisfactory. On the basis of this we are confident that a parapet height of 1.2m is appropriate in most situations.

There are many examples in the UK of footbridges being converted to shared use without any change in the parapet height; the majority of these are likely to have parapets of between 1.1m and 1.15m height. There are also many examples of older structures with parapets lower than 1m, many of these on quiet rural roads with little or no footway. Enquiries to local authority practitioners in 2009

and in 2012 elicited no examples of cyclists falling over low parapets whether on traffic free routes or on the road.

Where a parapet of less than 1.4m is proposed, we recommend using a simple risk assessment process. This should include consideration of the level of historic informal use by cyclists, for how long, and any known history of incidents. It may also be appropriate to monitor future use for a period.

APPENDIX A: Examples of low parapets on cycle routes

St.Asaph Business Park junction on the A55(T) in N Wales, carrying a local cycle route. The principle here being that if cyclists are moved further from the parapet, a lower parapet height may be provided. The parapet height is 1.05m.	
Bothwell Bridge over the A725 dual carriageway north of Hamilton. The parapet height is 1.1m and white lines have been used to pull the cyclists away from the parapet edge and so the safety auditors deemed no parapet works were necessary. The route is an unsegregated shared use section of path on NCN 74.	
Southampton: unsegregated shared use on Northam Bridge, parapet height 1.1m (photo: Southampton City Council)	

Bristol: signed cycle route on bridge over M32. Parapet height 1.1m	
Nantwich: none of the footbridges on the River Weaver in Nantwich were upgraded when the paths were widened to 3m for shared use.	
Milton Keynes: typical overbridge design on shared use Redways. Note that the thickness of the parapet wall provides additional protection that obviates the need for a higher parapet.	

Ealing: 1m high parapet on a canal bridge through open space in Ealing.	
Port Talbot: Connect2 route using old aqueduct with 1.3m high parapets 	
Monsal Trail, height is approx 1m and the bridge passes over highway. The path alignment keeps users away from the parapets and the thickness of the parapet wall provides additional protection	

Bristol: whilst not a bridge, the ‘Chocolate Path’ alongside River Avon has a 970mm parapet height.	

APPENDIX B: Examples of parapets that have been raised

Merthyr: bridge over railway. Additional horizontal rail surmounting the existing parapet supported by extension stubs fitted to existing posts.

Taff Trail over a trunk road near Taffs Well: pedestrian guardrailing installed in front of existing parapet.

Havering: raised pedestrian guard railing - undertaken because the council felt that there was a significant drop from the edge of the path into an adjacent watercourse.

Bedwas: National Cycle Route 4 near Caerphilly	

APPENDIX C: Risk Assessment for Bridge Parapets

Introduction

This appendix provides an example of a risk assessment process that could be applied to situations where consideration is being given to permitting cycling over an existing footbridge or footway on a road bridge. It provides guidance which we hope will be useful to the assessor, but recognise that each situation will need to be considered on a case by case basis. We welcome feedback from those who use it and will update it as necessary.

The risk assessment should be retained in records and reviewed if there are material changes.

Purpose

To assess the risk of a cyclist falling over a parapet, through permitting cyclists to use an existing footbridge or footway on a road bridge where the parapet height is below 1.4m.

Where consideration is being given to permitting cyclists and pedestrians over a bridge that has previously been closed (e.g. on a disused railway) the scope of the assessment will need to be broadened to include the risk to pedestrians, including children. However, it can follow similar principles although a wider range of factors will need to be considered, such as the design of the parapet and the size of any gaps.

The risk assessment should cover normal cycling activity and movement associated with that, including people stopping to look over the parapet where there is a view.

Risk assessment method

Calculation of overall risk combining likelihood and severity.

Risk categories

Likelihood – scoring

The likelihood of a cyclist falling over a parapet is

1 – low – it is unlikely to happen

2 – medium – it could happen

3 – high – it will happen

Likelihood – guidance

The following are suggested examples of situations with low likelihood:

- Where parapet is at least 1.2m in height (based on experience in Denmark and The Netherlands)
- Depth of parapet: deep parapets of height 1m or above, where height of parapet plus depth of parapet is at least 1.5m

- Separation strip: parapets of height 1m or above with a visual separation strip provided to keep cyclists away from the parapet, of up to 0.5m width (depending on parapet height), typically delineated with a white line
- Parapets of height below 1m: physical separation of cyclists from the parapet, of between 0.5m and 1m width (depending on parapet height); examples of delineation include kerb, loose stone surface, bollards, benches
- Segregated shared use path with cyclists located away from the parapet

Where none of these apply, a medium likelihood situation may exist, for example:

- Parapet height of at least 1m but below 1.2m and the path width or level of use is such that the cyclist has to ride close to the parapet
- Parapet height is below 1m but the path width or level of use is such that the cyclist can ride well away from the edge of the structure, or the parapet is very wide.

A high likelihood situation may exist where:

- Parapet height is below 1m and not very wide, and the path width or level of use is such that the cyclist has to ride close to the edge of the structure.

In assessing the likelihood, full consideration should be give to the local circumstances of the site in question, such as:

- History: consideration should be given to the level of historic informal use by cyclists, and for how long, and any known history of incidents
- Level of use / congestion
- Where a cyclist could hit the parapet head on at speed, the likelihood of their falling over the parapet will generally be greater than where any collision is likely to be low speed at a shallow angle
- On a significant gradient, uphill cyclists may wobble and move nearer to the parapet, whilst downhill cyclists may be travelling fast and could impact the parapet at speed
- How robust is the parapet: might it break on impact?
- Lead in railings may be needed on the approaches to a bridge structure, to prevent falls just before or after the bridge. In some instances dense vegetation may provide adequate protection
- High prevailing winds may require a higher parapet or greater mitigation measures than would otherwise be appropriate
- Alternative routes for cyclists: where these would involve mixing with traffic on fast or busy roads, account should be taken of the relative risk of that; where these would involve a substantial detour this should also be considered

The risk assessment will benefit from the inclusion of user representatives with local knowledge of the site.

Severity – scoring and guidance

Falls over parapets: the consequence of a cyclist falling over the top of a parapet:

1 – minor – any injury is unlikely to be more than superficial; e.g. short fall onto hard surface and moderate falls in soft surface

2 – serious – moderate injury (e.g. minor fractures, lacerations) likely; e.g. moderate falls onto hard surface and greater falls onto soft surface

3 – major – severe injury (e.g. major fractures, multiple injuries) or death likely; e.g. high falls

Falls into water will need to take account of the depth of water and its speed of flow.

Calculation of risk

Calculate risk as the product of:

- Likelihood, score 1 to 3
- Severity, score 1 to 3

A risk quantification model can be used to combine the likelihood and severity using the following format:

	Minor (1)	Serious (2)	Major (3)
Low, may happen (1)	1	2	3
Medium, could happen (2)	2	4	**6**
High, will happen (3)	3	**6**	**9**

Risk categories:

Low	Marginal	**Moderate**	**High**

Risk may have a score of 1 to 9, split between the following categories:

- Low: 1 to 2
- Marginal: 3 to 4
- Moderate: 6
- High: 9

Typical actions appropriate for each risk category:

- A low or marginal score will be acceptable and cycling should be permitted
- A moderate score is likely to be acceptable with further mitigation measures, which may include warning signing; the historic informal use of the bridge by cyclists should also be taken into consideration. Before rejecting this option a comparison should be made with risk assessments for the alternative routes available for cyclists and the extra distances involved.
- A high score will be unacceptable and therefore use of the bridge by cyclists will require further, more substantial, mitigation measures

Comments and recommendations

Typically this section of the Risk Assessment will contain:

- Conclusion of Risk Assessment

- Where the risk has been assessed as moderate, summarise the main factors that influenced a decision to permit cycling
- Identification of appropriate mitigation measures and associated responsibilities
- Any proposals to monitor future use for an agreed period, typically 12 months