
**VOLUME 2 HIGHWAY STRUCTURES:
DESIGN
(SUBSTRUCTURES)
MATERIAL**

SECTION 2 SPECIAL STRUCTURES

PART 8

BD 29/17

DESIGN CRITERIA FOR FOOTBRIDGES

SUMMARY

This Standard specifies design criteria for footbridges for use by pedestrians, cyclists and equestrians.

INSTRUCTIONS FOR USE

1. Remove existing Contents pages for Volume 2.
2. Insert new Contents pages for Volume 2 dated May 2017.
3. Remove BD 29/04 from Volume 2, Section 2, Part 8 and archive as necessary
4. Insert BD 29/17 in Volume 2, Section 2, Part 8.
5. Please archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from The Stationery Office Ltd.



HIGHWAYS ENGLAND

BD 29/17
Volume 2, Section 2
Part 8



TRANSPORT SCOTLAND



Llywodraeth Cymru
Welsh Government

LLYWODRAETH CYMRU
WELSH GOVERNMENT



DEPARTMENT FOR INFRASTRUCTURE
NORTHERN IRELAND

Design Criteria for Footbridges

Summary: This Standard specifies design criteria for footbridges for use by pedestrians, cyclists and equestrians.

REGISTRATION OF AMENDMENTS

Amend No	Page No	Signature & Date of incorporation of amendments	Amend No	Page No	Signature & Date of incorporation of amendments

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1. INTRODUCTION

General

- 1.1 This Standard deals mainly with geometric and user requirements. Other design aspects such as strength and properties of materials are covered by other documents within the DMRB Series.
- 1.2 This Standard supersedes standard BD 29/04. It is to be used where appropriate in conjunction with the relevant Parts of the Eurocodes as implemented by the Overseeing Organisation except where otherwise specified by this Standard.
- 1.3 The major changes to this document are as follows:
- Removal and replacement of references to BS 5400 with references to the Eurocodes.
 - Removal and replacement of references to other withdrawn, obsolete or superseded standards with references to other current documents.
 - Minimum widths referred to in Chapter 12 have been updated in line with current guidance.

Implementation

- 1.4 This Standard must be used forthwith on all projects for the design, construction, assessment, operation and maintenance of motorway and all-purpose trunk roads (and all roads in Northern Ireland) except where procurement of works has reached a stage at which, in the opinion of the Overseeing Organisation, its use would result in significant additional expense or delay progress (in which case the decision must be recorded in accordance with the procedure required by the Overseeing Organisation)

Definitions

- 1.5 For the definition of the general highway terms used in this Standard such as “highway types” (trunk road, motorway etc) and “components of the highways” (carriageway, verge etc) refer to BS 6100; Subsection 2.4.1.
- 1.6 Particular terms used in this standard are defined as follows:

Desire Line	Line likely to be taken by pedestrians, cyclists or equestrians finding the shortest route between two points.
Goal orientated users	Users making a journey to reach a specific destination.
Recreational users	Users making a journey for leisure purposes.
Bridleway	Public right of way open to pedestrians, equestrians and cyclists.
Cyclist	A pedal cyclist.
Footway	A footway forms part of the road reserved for pedestrians.
Cycle Lane/Cycleway	A marked part of the footway or footbridge for use by cyclists.

Scope

- 1.7 This Standard specifies non-structural criteria for the design of footbridges for use by pedestrians, cyclists and equestrians, in urban and rural areas, which may be constructed of steel, aluminium alloy, reinforced or prestressed concrete, timber or other agreed materials.
- 1.8 Designers should be aware of the requirement to consider the needs of all users. The selection of specific design features that would exclude some users must be fully justified. (For example use of stairs instead of ramps will prevent use by wheel chair users)
- 1.9 Guidelines for the selection of other suitable forms of pedestrian crossings are outside the scope of this Standard. However, TA 91 (DMRB 5.2.4) "Provision for Non-Motorised Users" (Ref. 4) contains advice on the selection of appropriate NMU crossings.

2. GENERAL PRINCIPLES

General

- 2.1 This section describes the principles to be followed when designing footbridges. The underlying principle is that the designer is given the maximum flexibility to develop footbridge designs that will meet the stated objectives of the Overseeing Organisation.
- 2.2 The designer should balance the full range of considerations such as modes of users, safety, aesthetics, environmental impact, cost, robustness, sustainability, buildability, operation and maintenance. Where there are options for alignment, layout and structural form, the selection process should include due consideration of these factors and any other relevant design constraint. The designer shall produce assessments covering equality impact, environmental impact and Health & Safety as part of their design.
- 2.3 Footbridges can be more prone to various forms of damage, misuse and vandalism by users than road bridges and this shall be taken into account in the design and agreed with the Overseeing Organisation. See in particular paragraphs 2.4 and 8.1 below. Where there is a history of vandalism and/or graffiti, the designer shall ensure that the design reduces or mitigates the opportunity and likely impact of vandalism and graffiti on the structure and the visual aspect of the footbridge.

It is important to recognise that engineering solutions to address non-engineering issues should not be routinely incorporated within a footbridge design, and should only be considered where there is an identified risk/history of incidents. Where there is a significant history of localised incidents (i.e. vandalism, suicide, anti-social behaviour, etc.) then a feasibility study should be undertaken, fully considering the risks and a range of mitigating actions. Designers should consider what reasonable measures could be implemented to address issues and agree these with the Overseeing Organisation. These could include local community and organisational initiatives, publicity campaigns, signage, improved surveillance, and specialist direct telephone lines. Engineering measures may also be considered, but only if other solutions are not feasible. Where appropriate consultation with relevant bodies such as the local police, neighbourhood watch, community groups, local health boards, Samaritans etc. may be considered.

Vandalism may be reduced on some existing footbridges by simple measures like clearing vegetation and providing more visibility. Providing higher or different types of parapets to prevent objects being dropped onto the carriageway, may also reduce visibility and increase the risk of unsighted antisocial behaviour. Similarly providing enclosures to deter or prevent stone throwing or suicide attempts may just displace the incidents to another location, whilst imposing additional risks and ongoing maintenance liabilities at the footbridge site. Significant engineering solutions are unlikely to be covered by current standards, and will require fully justified and agreed departures.

Structural forms and materials vulnerable to damage by vandalism or fire, or by defacement by graffiti that would be difficult to remove, might be inappropriate in particular locations.

- 2.4 The designer shall ensure that where they have specified the use of materials or components which have a high value, either as a component or scrap, then measures shall be taken to minimise potential unauthorised removal. Consideration may be given to tamper resistant fixings or to specific design features. However due attention must be given to the requirements for inspection and maintenance. Where specific measures require special tools, techniques or procedures then the designer shall ensure that full consideration is given to ensuring measures are effective throughout the required design life. These must be set out within the maintenance manual.

Provision of Footbridges

- 2.5 The principal purpose of footbridges is to facilitate and encourage walking and cycling whilst ensuring safety for all road users. The design of crossing provided shall therefore be such as to encourage people to use it, addressing the needs of all likely users, taking account of likely pedestrian flows and movements, and to encourage people to regard walking or cycling as an acceptable mode of transport.
- 2.6 The design shall address the needs of all users, including access for wheel chairs and mobility scooters, and people with prams and buggies
- 2.7 It is important to determine the user groups of the bridge and their main purpose before deciding on its location. For goal-orientated use, location on the desire line is usually the highest priority. For recreational use, where possible, the new crossing should be located to add value to the recreational route, e.g. by reducing exposure to traffic, introducing new views or creating a new circular route.

3. LAYOUT

Location

3.1 Where a footbridge crosses a dual carriageway carrying traffic with permitted speeds in excess of 30 mph, both carriageways should be crossed with a single span to avoid the need for a support in the central reserve.

Where it is proposed to use intermediate piers then this shall be justified and agreed with the Overseeing Organisation at 'Options Phase' and that appropriate levels of protection are specified as part of the design.

3.2 Where a separate footbridge is installed alongside a road bridge it should be detailed such as to deter attempts by persons to cross between. This may be effected by making the gap between the structures at least 2m wherever possible. Where this cannot be provided, adequate alternative safety precautions shall be taken to minimise the risk of persons falling through the gap.

3.3 Where a separate footbridge is located close to a highway bridge such that an errant vehicle could impact the footbridge, the design of the footbridge shall include protection.

3.4 The position of a footbridge should be chosen to maximise the use of the topography so as to avoid or minimise the need for stairs and ramps. See Figure 1.

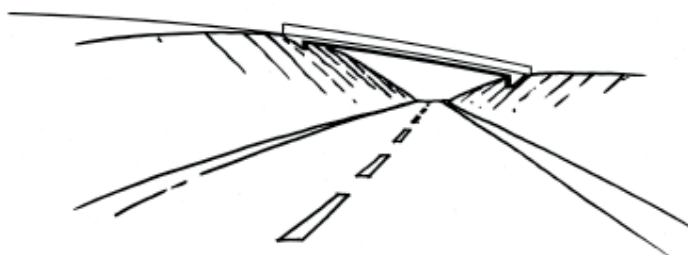
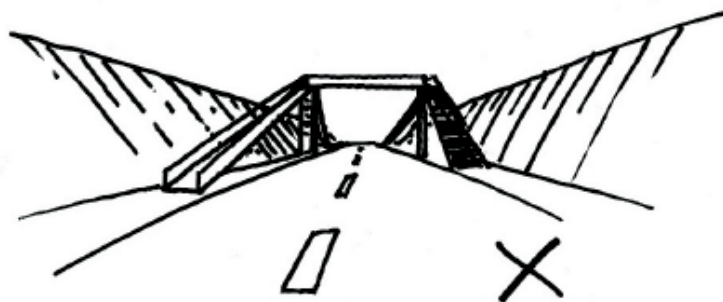


Figure 1 (ref para. 3.4)

3.5 Where a paved approach to the ramp or stairs of a footbridge is located immediately adjacent to the carriageway, it should, as far as practicable, taking account of risks to all users, be sited in such a way that pedestrians walking towards the bridge face oncoming traffic.

3.6 When a road, other than a motorway, is in cutting or has other ground modelling which provide side slopes on one or both sides, these should be used as far as is practicable to provide access to the footbridge by incorporating ramps in the side slopes. See Figure 2.



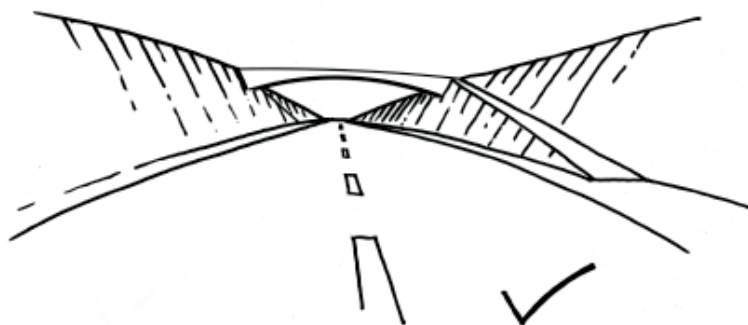


Figure 2 (ref para.3.6)

- 3.7 When the footbridge is in a cutting, particularly when visible on the skyline, the cutting slope should if possible extend at least up to deck level, using a false cutting if necessary. In such situations, where the footpath is within the cutting, the steps and ramps should be built into the face of the cutting. Alternatively, where the footpath is outside the cutting at original natural ground level, the access to the deck should be linked gradually into the footpath.

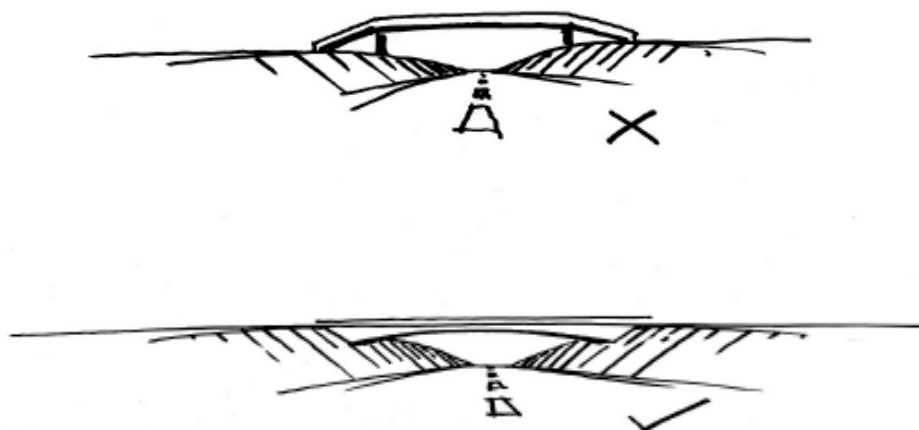


Figure 3 (ref para. 3.7)

- 3.8 Where a footbridge is installed to provide a crossing point for an existing rural footpath, bridleway or byway, any diversion of that route should commence as far from the carriageway or crossing point as is practicable to minimise the total route length and maintain the desire line to the footbridge. This will make the path more pleasant for users, provide better accessibility and help exploit the topography. However, rural footpaths frequently follow field boundaries and historic rights of way and care should be taken to avoid diversions that cut directly across fields. Further guidance on the diversion of existing Rights of Way can be found in Section 3 of TA 91(DMRB 5.2.4) “Provision for Non-Motorised Users” (Ref. 2).
- 3.9 To encourage use, rural footpaths, bridleways and byways shall not be diverted to run beside unscreened, busy roads.

Access

- 3.10 Access to the deck of a footbridge shall be provided by both ramps and stairs, unless ramps alone would provide the most direct route to the deck, in which case the stairs may be omitted. Access by stairs alone should only be considered in exceptional circumstances in consultation and the agreement of the Overseeing Organisation and local access and disability groups. Access shall be as short and direct as practicable and follow the desire line of the main pedestrian flow wherever possible, avoiding long detours and unnecessary climbing.
- 3.11 Ramp geometry should be as simple as is practical, ideally following directly the desire line. The design shall accommodate the needs of all users. The choice of gradients, landings (rest areas) and the radii of turns and manoeuvring space shall include the needs of equestrians, cyclists and mobility-impaired users.
- 3.12 Footbridge access stairs and ramps can have an adverse visual impact that should be minimised. Opportunities to build access into contours of the landscape should be taken.
- 3.13 The design shall encourage users to cross at a footbridge, rather than crossing at grade. This may be achieved by such provisions as suitable guardrails, fencing or appropriate planting which prevent them from crossing the carriageway at road level.
- 3.14 The design shall stop motor vehicles being driven onto the footbridge. This may be achieved by restricting access through the use of spaced bollards or a system of staggered horizontal rails. The method of restriction adopted shall be appropriate to its environmental setting and shall allow the passage of all non-motorised users of the footbridge. Restrictions shall be adequately marked in contrasting colour to assist visually impaired persons. Further information can be obtained from Inclusive Mobility (Ref. 8), and the Sustrans information sheet Access Controls (Ref. 6).
- 3.15 The design of the footbridge and surrounding environment shall minimise the visual and environmental impact of the bridge and access ramp/stairs. This may be achieved by using existing hedgerows or treelines. Where there are no trees in the area of the footbridge, landscaping with trees should be considered, especially in flat country. See Figure 4. Any proposed planting should be discussed if necessary with a landscape architect and should take into account the effect on any future maintenance liabilities for the structure. Planting schemes should be designed to avoid creating an enclosed area which might cause anxiety or a risk to users' personal security, or which may eventually cause trip or slip hazards to users such as those from root and branch growth or leaf-fall.



Figure 4 (ref para. 3.16)

- 3.16 The design shall ensure that it is not possible for rubbish and detritus to accumulate in inaccessible or confined spaces.

- 3.17 There should be no concealed areas or recesses on the bridge that may cause bridge users to become concerned about their personal security while crossing.

Appearance

- 3.18 The appearance of a footbridge shall be appropriate for its site. It should be aesthetically pleasing, both from the viewpoint of the user travelling across it and the driver travelling below, it shall enhance the environment around it and encourage people to use the bridge.
- 3.19 The appearance of footbridges shall follow the advice given in the HA publication “The Appearance of Bridges and Other Highway Structures” (Ref. 7) particularly chapter 12, and the more general advice in BA 41 (DMRB 1.3.11) “The Design and Appearance of Bridges”.
- 3.20 The design of footbridges which will have a significant visual impact on their local environment, or which are situated in areas requiring special consideration such as Conservation Areas, Areas of Outstanding Natural Beauty, Heritage sites etc, may require additional consultation with the Design Council CABE. (The relevant bodies for Scotland and Wales are the Royal Fine Arts Commission for Scotland and the Design Commission for Wales. In Northern Ireland please consult the Overseeing Organisation.) The need for consultation with these bodies shall be discussed at an early stage with the Overseeing Organisation.
- 3.21 Visual clarity of the structure and all of its elements is essential. To this end the mounting of signs or signal equipment on the bridge structure or in its immediate environment, which create an impression of clutter, should be avoided. Where the provision of gantry signs in close proximity to a footbridge is unavoidable their interaction should be taken into account from the earliest stages of design. Because the plane of the sign is fixed relative to the road alignment, the line of the footbridge should follow this to avoid awkward clashes in angle.

4. BRIDGE SUPPORTS

- 4.1 Footbridge supports and foundations shall be designed in accordance with the relevant Parts of the Eurocodes as implemented by Departmental Standards.
- 4.2 Where footbridge sub-structures are sited on Railway or Waterway property, the appropriate Authority's requirements shall be satisfied.
- 4.3 For new bridges over existing roads, the foundation design shall take into account the effects during construction. This should include, but not be limited to, the safety of the travelling public, the safety of the workforce, any disruption to traffic and future inspection & maintenance requirements.

5. DESIGN STANDARDS

General

- 5.1 Steel, concrete, timber and aluminium footbridges shall be designed in accordance with the relevant Parts of the Eurocodes as implemented by Departmental Standards. Proposals to use other construction materials shall be agreed with the Overseeing Organisation.

Vibration and Dynamic Response

- 5.2 Due consideration shall be given by the Designer to the susceptibility of any footbridge to vibrations induced by pedestrians and by other bridge users. Particularly the possibility that vandals may deliberately attempt to excite the structure into motion or that the passage of large numbers of people may unintentionally do so. All footbridges shall satisfy the vibration serviceability requirements set out in BS EN 1991-2 its National Annex, and PD 6688-2, as implemented by Departmental Standards. Designers should be aware that footbridges having modes of oscillation with frequencies less than 5Hz involving vertical motions of the deck, and/or less than 1.5Hz involving horizontal motions of the deck, are particularly susceptible to unacceptably large oscillations caused by the passage of large groups of people who may unconsciously or deliberately synchronise their walking patterns. Such oscillations can present a hazard to pedestrians on the structure and can risk damaging the structure itself. The possibility of the synchronisation of a large number of people to vertical motions shall be investigated and analysed. For any footbridge having modal frequencies below these limits the Designer should identify, in consultation with the Overseeing Organisation, any need for dynamic testing to verify that the footbridge is suitable for service, and the provisions needed for the future installation if required of vibration reduction devices such as dampers, if needed. Criteria for accepting or rejecting a design on the basis of its expected dynamics shall be agreed with the Overseeing Organisation.

Minimum Thickness of Metal Sections

- 5.3 The minimum thickness of metal structural elements shall be as follows:

Steel plates and sections other than hollow sections	6mm
Steel hollow sections effectively sealed by welding	5mm
Aluminium alloy plates and sections	4mm

6. DIMENSIONAL STANDARDS

Clearances

- 6.1 The vertical clearances to the carriageway shall be in accordance with Departmental Standard TD 27 (DMRB 6.1.2). The vertical and horizontal clearances to railways, canals and watercourses shall be agreed with the Appropriate Authority.
- 6.2 The horizontal clearance from the edge of the carriageway to the bridge supports shall be a minimum of 4.5m. Designs should consider the possibility that the hard shoulder may be used as a running lane in the future. The Overseeing Organisation should be consulted to agree if specific allowance should be made for this.

Width

- 6.3 The minimum clear width of the bridge footway, ramps and stairs, which shall be not less than 2m, shall be derived on the following basis to meet the peak pedestrian flows:
- a) On the level or up to 1 in 20 gradient: 300mm of width per 20 persons per minute.
 - b) On steps or ramps steeper than 1 in 20 gradient: 300mm of width per 14 persons per minute.
 - c) For shared use with cyclists and equestrians the requirements contained in Section 12 shall also be complied with.

Gradients on Bridge Structure

- 6.4 Where the bridge structure incorporates an inclined deck, the slope requirements regarding plain ramps shall apply. Where the deck exceeds 150m in length, landings shall be incorporated into the design. Where a deck is steeper than 1 in 20 the requirements regarding landings may be waived across the deck in agreement with the Overseeing Organisation, having given due regard to the likely mobility levels of the bridge users in consultation with the local access and disability groups.
- 6.5 Gradients on the deck shall be no steeper than those adopted for the access ramps. However, where the deck form incorporates a varying slope (e.g. suspension, trafficked arch, stressed ribbon etc.), this requirement may be relaxed over localised lengths of the deck by agreement with the Overseeing Organisation.

Ramps

Plain Ramps

- 6.6 Ramps for pedestrians, cyclists and equestrians shall not be steeper than 1 in 20. Where compliance with this would create difficulties in keeping the access on the desired line, avoiding long diversions, minimising environmental impact, or making best use of available space, a relaxation in ramp steepness may be considered to 1 in 15. In cases of extreme difficulty the gradient may be increase up to 1 in 12. However, no ramp shall be steeper than 1 in 12. Where a ramp steeper than 1 in 20 is adopted then the reason for accepting this must be clearly documented and recorded, together with evidence of acceptance by the Overseeing Organisation.

- 6.7 Where the ramp is steeper than 1 in 20, for safety reasons there should be a significant change either of direction (30 deg or more) or in horizontal alignment (e.g. offset by at least one ramp width), at least at every 3.5m rise of the ramp at an intermediate landing.
- 6.8 For ramps of gradient steeper than 1 in 20, successive sloping ramps in one line may be used in agreement with the Overseeing Organisation where either no other arrangement of ramps is possible on the site or where it provides more encouragement to pedestrians to use the footbridge by shortening the walking distance
- 6.9 The footway, cycleway or equestrian approaches to the footbridge or ramps shall not, for the purpose of design to this Standard, be regarded as part of the footbridge structure.

Spiral and Curved Ramps

- 6.10 The effective gradient for spiral and curved ramps shall comply with the requirements for plain ramps. The effective gradient and governing dimensions shall be measured 900mm from the edge of the walkway surface on the inside of the curve. The minimum inside radius of walkway surfaces for curved and spiral ramps shall be 5.5m.

Landings

- 6.11 For straight or spiral ramps of gradient 1 in 20, landings shall be provided at equal intervals of maximum rise 2.5m. For gradients flatter than 1 in 20, intermediate landings are not required.
- 6.12 For straight ramps of gradient steeper than 1 in 20, horizontal landings shall be provided at intervals producing a rise of no more than 650mm between landings.
- 6.13 The length of a landing shall not be less than 2m measured for straight ramps on the centreline of the ramp or for spiral ramps circumferentially at 900mm from the walkway edge on the inside of the curve.

Stairs

- 6.14 Access stairs to footbridges shall comply with the dimensional and safety requirements of BS 5395 for 'public' stairs, except as amended below (see also Figure 6):
- (a) The number of risers in a single flight shall not be more than 13.
 - (b) A maximum of three successive flights may be used in line, provided any adjacent flights provide a change in direction of at least 30 degrees.
 - (c) The risers and treads of each step in a flight of stairs shall be uniform.
 - (d) Risers shall not be variable in height over their width.
 - (e) The riser shall be not more than 150mm
 - (f) The tread width shall be not less than 300mm and not greater than 350mm.
 - (g) Landing lengths shall be not less than 2m measured along the centre line of the stairs, or not less than the width of the stairs, whichever is the greater.

Further guidance can be obtained from Inclusive Mobility (Ref. 8).

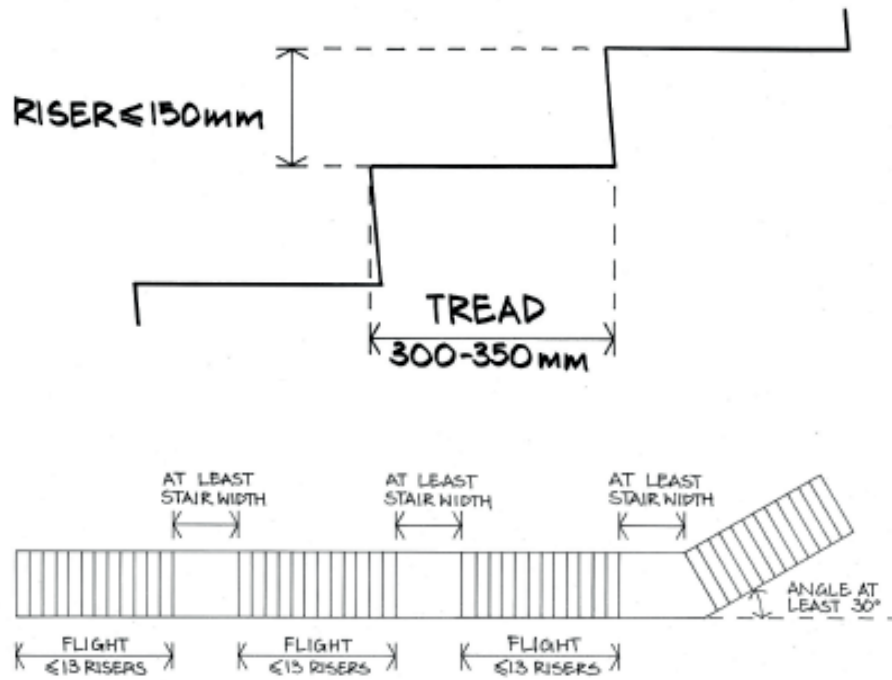


Figure 6 (ref para. 6.14)

- 6.15 Completely open risers shall not be used. Stairs may however have perforated risers, in which case the openings shall meet the following requirements:
- (a) The principal dimensions of the perforation shall not exceed 50mm.
 - (b) The ratio of the open area to the total area of the riser shall be not greater than 0.4.
- 6.16 Consideration should be given by the Designer to the provision of solid infill panels to parapets and step risers to protect the privacy of users and screening to protect the privacy of neighbouring dwellings.

7. PARAPETS

- 7.1 All bridge spans, ramps and stairs shall be provided with parapets. Parapets shall conform to the current requirements of the Overseeing Organisation given in TD 19 (DMRB 2.2.8) or, when implemented, by EN1317 Part 6, and the following:
- (a) No upstand is required under the parapet on stairs.
 - (b) Where the parapet is provided with a bottom rail, the clearance from the rail to the nose of the stairs shall be not less than 50mm and not greater than 100mm.
 - (c) The height of the parapet shall be measured vertically above the line joining the noses of the stairs.
 - (d) For plain or spiral ramps the height of the upstand shall be not less than 25mm and not more than 50mm.
 - (e) If glass is used it shall be laminated. A risk assessment shall be undertaken during the selection of the glazing system. It shall be demonstrated that the panels, if damaged in service, would retain sufficient post fracture strength to remain in place within its fixings on the structure. Shards created during the shattering of the outer plies shall be large enough to be retained by the laminating materials.
- 7.2 In areas of high prevailing winds or where a footbridge is designed for pedestrian use only, and the headroom under the bridge is greater than 10m, the height of the parapet may be increased to 1.30m with the agreement of the Overseeing Organisation. Alternatively, an enclosed form of superstructure should be considered – see Section 8.
- 7.3 Where structural members of a footbridge serve as a parapet, the height of the parapet, the infilling of open areas, the upstand at the edge of the walkway surface and the climbability of any part shall be in accordance with requirements of 7.1. The climbability aspect requires particular attention where diagonal members at intermediate heights are employed.

Handrails

- 7.4 Handrails shall be provided on both sides of stairs, ramps and to decks with a gradient steeper than 1 in 20. Handrails shall be designed in accordance with BS 8300. Additional central handrails shall be provided where the width of the stairs or ramps exceeds 3m. Handrails may either be fixed to the parapet or be self-standing. The height of the handrail shall be not less than 900mm or more than 1000mm, measured vertically above the line joining the noses of the stairs or above the line of the ramps as appropriate.
- 7.5 Handrails of circular section should have a diameter of 40 – 50mm and if within an enclosure should have a clearance from any part of the frame of 50 – 60mm. Those of non-circular section should be 50mm wide by 38mm deep with rounded edges.
- 7.6 Handrails should be of a contrasting colour to the parapet to which it is attached, to aid those with visual impairment. Further guidance on provision of handrailings can be found in Inclusive Mobility (Ref. 8).
- 7.7 The handrail and its fixings shall be designed to resist a uniformly distributed load of 700 N/m applied separately in the horizontal and vertical directions in such a way that the system is designed for the most severe effects. This loading is not additional to the loading for parapets.

8. ENCLOSED FOOTBRIDGES AND CLEARANCE GAUGE

- 8.1 The design shall ensure that the risk of objects being dropped or thrown from the footbridge, and the risk of persons jumping onto the carriageway from the bridge is minimised. To mitigate these risks, the design may include full or partial enclosure of the crossing and its ramps or stairs, where these are over the highway. The need for such provision shall be agreed with the Overseeing Organisation. The design of an enclosure shall be such that unauthorised access to the sides or the roof is prevented.
- 8.2 Consideration should be given by the Designer to enclosing footbridges when they are on sites exposed to very adverse weather, e.g. high winds, or where they are of such a height above the road that pedestrians may feel insecure. The need for such provision shall be agreed with the Overseeing Organisation.
- 8.3 Where bridge enclosures are proposed, aerodynamic effects shall be investigated and analysed. Wind tunnel testing may be required and guidance is given in BD 49 (DMRB 1.3.3). Requirements shall be agreed with the Overseeing Organisation.
- 8.4 Cladding and infill panels shall be suitable for their use and location, with a durability appropriate for the lifespan of the footbridge. Panels (perforated or otherwise) may be of any suitable material, but solid panels which are above the handrail should be transparent, except where the footway is combined pedestrian/equestrian, when the parapet shall be opaque. Where transparent panels are used, the design shall facilitate the cleaning of both sides of the panel in a safe manner. Depending on the particular site problems, high parapets with an inward canted top or full enclosure may be required. Flush glazing outside the face of the structure is an acceptable form for enclosure walls and arched mesh roofs are an acceptable form for preventing roof access. The design shall prevent access at the end of main spans where the bridge is over a cutting. Enclosures shall comply with the parapet requirements of 7.1.
- 8.5 The minimum headroom inside the enclosure shall be as follows:
- | | |
|--|------|
| Pedestrian only | 2.3m |
| Pedestrian and Cyclist | 2.4m |
| Equestrian (dismounting provisions in accordance with 12.14) | 2.7m |
| Equestrian (mounted) | 3.7m |
- 8.6 A vertical clearance envelope shall be maintained at all locations on decks, stairs and ramps whether open or enclosed appropriate to the respective user groups. No part of any structural items such as cable stays, enclosure frames, or any signing or other attachments, shall intrude into the envelope. The clearance envelope shall be formed by a vertical line flush with the innermost surface of each parapet, fence or handrail, and a horizontal line complying with the height requirements given in 8.5. Where shared facilities exist, the height requirement shall be the greatest height of the respective users.

9. DRAINAGE

- 9.1 Provision shall be made for the drainage of water from the footbridge and its roof in the case of enclosed footbridges. All walkway surfaces, steps, ramps and roof shall have adequate falls and suitable detailing to allow water to run off.
- 9.2 With the exception of stair treads and perforated decks, water should not be allowed to discharge or spill from the structure on to the carriageway or footpaths or to stain exposed surfaces, but shall be carried away either to a drainage system or to a soakaway.
- 9.3 Positive drainage of bearing shelves shall be provided beneath all deck movement joints.

10. WALKWAY SURFACES

- 10.1 The fitness for purpose of the combined substrate/surfacing system for the respective user type shall be agreed with the Overseeing Organisation as an Aspect Not Covered by Standards.

This should address such requirements as corrosion resistance, resistance to slip, environmental deterioration, durability, and additionally for equestrian use, noise attenuation. Account shall be taken of the design details of each structure to ensure effective drainage, adequate adhesion with all parts of the structure (including painted elements, ducts, etc.)

- 10.2 On the traversed areas of decks, stairs and ramps, the upper substrate surfaces shall be waterproofed or otherwise protected against deterioration from surface contaminants, and the surfacing shall be fit for purpose with respect to the user type.
- 10.3 The minimum slip resistance of traversed areas shall be equivalent to a mean corrected Pendulum Test Value of 45 units using a standard skid resistance pendulum test (BS EN 13036-4) for the life of the walkway surfacing.
- 10.4 The upper face of cover plates to expansion joints at deck level shall be provided with a suitable slip resistant coating.
- 10.5 The Designer, or for existing structures the Maintaining Agent, shall ensure that the Maintenance Manual for the structure states the installation date and minimum expected life from the surfacing or surfacing/waterproofing system.
- 10.6 Exposed gaps in walkway surfaces shall not be in excess of 12mm in width. Cover plates to gaps and joints shall be set flush with the top of the surfacing to prevent tripping, and the upper surfaces shall be suitably profiled or treated to reduce the likelihood of slippage.

11. LIGHTING

- 11.1 Footbridges shall be illuminated if they are located in areas where public lighting is provided and any lighting shall conform with the requirements of BS 5489: Part 1. Design of road lighting, fixings and connections shall be robust and tamper proof.
- 11.2 Illumination on footbridges shall be bright and consistent, ensuring that all walkway surfaces, stairs and handrails are visible. Footbridges shall be illuminated by means of existing road or footway lighting augmented, if necessary, by additional ground level mounted lighting columns and lanterns. Where this is not possible, for instance in the case of a covered walkway, the footbridge shall be illuminated by parapet lighting fittings or lighting columns mounted on the bridge structure, using fixings incorporated in the bridge design. All components of lighting systems, their fittings and connections shall be robust and tamper proof. Parapet members shall not be used as cable ducts.

12. REQUIREMENTS FOR COMBINED USE BY PEDESTRIANS AND CYCLISTS OR EQUESTRIANS

- 12.1 For guidance on the layout and surfacing of Non-Motorised User (NMU) provision to the footbridge approaches beyond the ramp and stair ends, see TA 91(DMRB 5.2.4) “Provision for Non-Motorised Users” (Ref. 4). For requirements and advice regarding designing for cycle traffic see IAN 195. For additional information on tactile surfacing for combined use situations see “Guidance on the use of tactile paving surfaces” (Ref. 12).

Footbridge Designed for Combined Use by Pedestrians and Cyclists

- 12.2 Shared facilities may be segregated or unsegregated. The form of segregation on the structure as determined locally shall match the segregation on the approaches. Differing surface textures on segregated footways to aid visually impaired users may be continued across the structure, subject to the requirements of Section 10.
- 12.3 Where the bridge is part of a pedestrian and cycle route, specific provision shall be made in accordance with the guidance on shared use by cyclists and pedestrians contained in Local Transport Note 1/12 (Ref. 10) or any current update of that document. In Scotland, reference shall be made to ‘Cycling by Design’ (Ref. 5).
- 12.4 The minimum widths for a footpath (or footway) and a cycle track on a bridge and ramps shall be:

	Pedestrian Path	Cycle Path	Total Width
When segregated by kerb not less than 50mm high	2.0m	2.7m	4.7m
When segregated by railings not less than 900mm high	2.0m	3.0m	5.0m
When segregated by a white line, colour contrast or surface texture	1.5m	2.5m	4.0m
Unsegregated	–	–	3.5m

- 12.5 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.
- 12.6 Where there is an opportunity for cyclists or other users to build up excessive speed which may be considered a risk to other users the design shall include such features to manage or reduce this build-up of speed. This should be done in such a way that the passage of prams and wheelchairs or mobility and visually impaired users would not be hindered, and should be located on level landings especially where ramp slopes are steeper than 1 in 20. Barriers should encourage cyclists to slow down but should not force them to dismount. Similarly chicanes should take account of different vehicle types which may use that bridge, for example tandems, cyclists with trailers, etc.

Unless there is an immediate justification for using barriers or chicanes they should be omitted, but the geometry of the bridge approach must be such that installation at a later date is possible.

Footbridge Designed for Combined Use by Pedestrians and Equestrians

- 12.7 Where a bridge is designated for equestrian use, it shall be designed in accordance with the relevant Parts of the Eurocodes as implemented by Departmental Standards and 7.1 above. All bridges catering for equestrians shall be designed for combined pedestrian/equestrian use.
- 12.8 The minimum width of a footbridge for combined pedestrian/equestrian use shall be 3.5m.
- 12.9 Where the minimum headroom of the bridge is not designed for mounted use in accordance with 8.5, mounting/dismounting blocks shall be provided on the approaches to the bridge to enable horses to be led across. Suitable signs shall be erected to indicate that equestrians should dismount.

Mounting/dismounting blocks may also be provided where the crossing is not part of a designated bridleway.

The location of mounting/dismounting blocks shall be placed in such a position that the passage of users, including prams and wheelchairs or mobility and visually impaired users would not be hindered. These are for the convenience of the horse rider only, these shall not reduce the clear width required for combined pedestrian/equestrian use.

- 12.10 In pursuance of 12.7 above, the use of solid infill panels higher than the minimum requirement defined in the documents referred to in 7.1 above may be used in order to reduce the risk of horses being startled by traffic on the carriageway below. Due account shall be taken of the effects of this on aesthetics and potential loss of utility to other users.
- 12.11 Wherever possible the bridge should be aligned such that all NMUs can see the entire length of the structure from the approaches and suitably sized equestrian waiting areas should be provided off the structure to allow users the option to cross when the deck is clear.
- 12.12 The design of the footbridge shall include suitable signs to be erected on the approaches to the footbridge to warn other users of the presence of horses, requesting cyclists to take particular care or give way to equestrians.
- 12.13 On designated bridleways where the deck is constructed of steel or timber or any other material where the sound made while crossing the bridge could alarm the horses, then the design should incorporate suitable noise attenuation measures, for example special surfacing. On other routes, with the agreement of the Overseeing Organisation, suitable warning notices shall be erected.

13. NORMATIVE REFERENCES

1. British Standards: BSI

BS 6100: Subsection 2.4.1. Glossary of Building and Civil Engineering Terms, Highway Engineering

BS 5395: Part 1: Code of Practice for the Design of Stairs

BS 8300: Design of buildings and their Approaches to meet the needs of disabled people – Code of Practice

BS 5489: Part 1: Lighting of roads and public amenity areas

BS EN 13036-4. Method for measurement of slip/skid resistance of a surface: The pendulum test

BS EN 1991-2: Traffic loads on bridges

PD 6688-2: Background to the National Annex to BS EN 1991-2. Traffic loads on bridges
2. Design Manual for Roads and Bridges (DMRB): TSO

BD 49 Design Rules for Aerodynamic Effects on Bridges (DMRB 1.3.3)

BA 41 The Design and Appearance of Bridges (DMRB 1.3.11)

TD 19 Requirement for Road Restraint Systems (DMRB 2.2.8)

TD 27 Cross Sections and Headroom (DMRB 6.1.2)

TA 91 Provision for Non-Motorised Users (DMRB 5.2.4)

IAN 195 Cycle Traffic and the Strategic Road Network.
3. Manual of Contract Documents for Highways Works (MCHW): TSO Specification of Highways Works. (MCHW)
5. Cycling by Design – June 2011, Transport Scotland
6. A Guide to Controlling Access on Paths, Sustrans 2012
7. The Appearance of Bridges and Other Highway Structures, Highways Agency, 1996
8. Inclusive Mobility, Department for Transport, London, 2005
9. National Suicide Prevention Strategy, Department of Health, London 2015
10. Local Transport Note 1/12 – Shared Use Routes for Pedestrians and Cyclists – September 2012, TSO
12. Guidance on the Use of Tactile Paving Surfaces. Department for Transport (1998)

14. INFORMATIVE REFERENCES

Highways Report HR6 – Equestrian Use of Trunk Road Structures, Transport Research Laboratory, 2002

15. APPROVAL

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ANNEX A SPECIAL REQUIREMENTS FOR OVERSEEING ORGANISATIONS

Motorways and Trunk Roads in Wales

A.1 After clause 8.1 insert the following:

In Wales when the risk assessment has identified a particular risk associated with unauthorised access then designers shall consider what reasonable measures could be taken to restrict access to the means of suicide. Subject to the agreement of the Technical Approval Authority, consultation may be required with the Local Health Board and health stakeholders to identify reasonable provision for the footbridge. Account should be taken of the current Suicide and Self Harm Prevention Strategy for Wales.

Motorways and Trunk Roads in Scotland

A.2 After clause 8.1 insert the following:

In Scotland, during the project development and design a risk assessment shall be undertaken by the designers. This assessment shall include the likelihood of self-harming by jumping from the footbridge. If a particular risk is identified then the designers shall, subject to agreement with the Technical Approval Authority, develop reasonable provision for the footbridge. Consultation may be required with the Local Health Board and health stakeholders to identify reasonable and appropriate mitigation measures that may be adopted. Account is to be taken of the National Strategy and Action Plan to Prevent Suicide in Scotland.