

Specification for pedestrian restraint systems in metal

ICS 93.080.30

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/509, Road equipment, to Subcommittee B/509/11, Pedestrian restraint systems, upon which the following bodies were represented:

- Aluminium Federation
- Association of County Councils
- British Railways Board
- British Steel Industry
- County Surveyors' Society
- Department of Transport (Highways Agency)
- Department of Transport (Transport Research Laboratory)
- Fencing Industry Association
- Institution of Civil Engineers
- Institution of Highways and Transportation
- Royal Society for the Prevention of Accidents

This British Standard, having been prepared under the direction of the Building and Civil Engineering Sector Board (B/-), was published under the authority of the Standards Board and comes into effect on 15 November 1995

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Amendments issued since publication

Amd. No.	Date	Comments
15047 Corrigendum No. 1	10 May 2004	Correction to Figure 4a), Figure 4b), Figure 4c) and Figure 5
16540 Corrigendum No. 2	29 September 2006	Correction to Figure 4a) and its title

The following BSI references relate to the work on this British Standard:
Committee reference B/509/11
Draft for comment 93/107158 DC

ISBN 0 580 23787 7

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Foreword

This British Standard has been prepared under the direction of Technical Committee B/509 and supersedes BS 3049:1976 which is withdrawn.

BS 3049:1976 provided a useful guide for the manufacture and installation of metal guard rails for highway situations. The need to provide a new standard has been recognized for some time and in 1992 B/509 made the decision to proceed with a pedestrian restraint systems standard which required the inclusion of pedestrian bridge parapets (not vehicle bridge parapets which are covered by the vehicle restraint systems standards).

Pedestrian restraint systems protect pedestrians when walking near the edge of high retaining walls/bridge parapets and prevent them from walking/running onto a carriageway. The design of the system should have regard to overall safety, be strong enough to withstand envisaged loading, avoid creating a visibility hazard and not become disconnected on impact and cause a major hazard for highway users.

As compared with BS 3049:1976, this British Standard covers the following:

- a) pedestrian parapets;
- b) illustrations of some types of pedestrian restraint systems;
- c) the encouragement of the designers or specifiers to look at the overall issues of both road safety and environment by recognizing the need for particular designs in specific locations e.g. sites where increased visibility through the system is desired or where it may be necessary to extend the existing pedestrian restraint systems in historic locations;
- d) additional loading requirements in recognition of the need to withstand increased crowd loadings in critical situations such as outside sports grounds.

This British Standard deals with pedestrian restraint systems of metal construction. It is hoped to extend the scope to other materials in due course but, pending the publication of such further standards, designers and specifiers wishing to use materials other than metal should ensure that the performance of those materials meets the loading requirements of this standard.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 37 and a back cover.

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Section 1. General

Introduction

Pedestrian restraint systems may take one of the following forms:

- a) *Parapets* are generally installed on bridges, retaining walls or other structures where vehicular traffic is excluded but where pedestrians, equestrians or cyclists may be carried (see Figure 1).
- b) *Guard rails* are installed to control pedestrians, cyclists and equestrians such as on footways, bridleways, footpaths, cycleways, but are not used on structures (see Figure 2 and Figure 3).

The main objectives of pedestrian restraint systems are:

- 1) to sustain the specified design loadings;
- 2) to protect and provide guidance for pedestrians and other non-vehicular highway users taking full account of the needs of the disabled;
- 3) where they are placed adjacent to a carriageway, elements should not become easily detached on impact.

The type, design and layout of a pedestrian restraint system should take account of the needs, safety and visibility of all highway users and maintenance personnel.

NOTE Any system should meet the requirements of the safety audits imposed by the relevant authorities including highway, road and rail.

1.1 Scope

1.1.1 This British Standard specifies requirements for the design, materials, workmanship and construction (including storage, transportation and installation) and testing of components for steel and aluminium alloy pedestrian restraint systems.

Other materials such as cast iron, timber, masonry, brickwork or plastics are not at present covered by this standard.

Systems covered by this standard are not designed to protect pedestrians by containing vehicle impact and if this is required reference should be made to BS 6579-1 to BS 6579-8 and BS 6779-1 and BS 6779-2.

1.1.2 Annex A and Annex B provide information on the layout of pedestrian restraint systems and visibility and inter visibility respectively.

NOTE For barriers in and about buildings see BS 6180. For general fencing see BS 1722. For steel, aluminium and concrete vehicle and vehicle/pedestrian parapets see BS 6779-1 and BS 6779-2. For vehicle safety fences and safety barriers see BS 6579-1 to BS 6579-8.

1.2 References

1.2.1 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 35. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

1.2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

1.3 Definitions

For the purposes of this British Standard the following definitions apply.

1.3.1

road restraint system

generic name for road vehicle restraint system and pedestrian restraint system

1.3.2

vehicle restraint system

a system installed on the road to provide a level of containment for an errant vehicle; it may be used to limit damage or injury to road users and others in the vicinity

1.3.3

pedestrian restraint system

a system installed to provide restraint and guidance for pedestrians, cyclists and equestrians

1.3.4

safety barrier

a road vehicle restraint system installed alongside or on the central reserve of a road

1.3.5

vehicle parapet

a road vehicle restraint system installed on the edge of a bridge or on a retaining wall or similar structure which may include additional protection and restraint for pedestrians and other road users

1.3.6

pedestrian parapet

a pedestrian restraint system installed on the edge of a bridge or on a retaining wall or similar structure (see Figure 1)

NOTE It is not suitable for restraining vehicles.

1.3.7

vehicle/pedestrian parapet

vehicle parapet with additional safety provisions for pedestrians and/or other users

1.3.8

pedestrian guard rail

a pedestrian restraint system installed along the edge of a footway intended to restrain pedestrians from stepping onto or crossing a road or other area likely to be hazardous (see Figure 2, Figure 3 and Figure 4)

NOTE It is not suitable for restraining vehicles.

1.3.9

embankment slope

sloping ground which either forms part of the highway or road or immediately adjoins it

NOTE Pedestrian restraint systems may be necessary to protect pedestrians where the gradient is greater than 1 in 4.

1.3.10

pedestrians

persons on foot

1.3.11

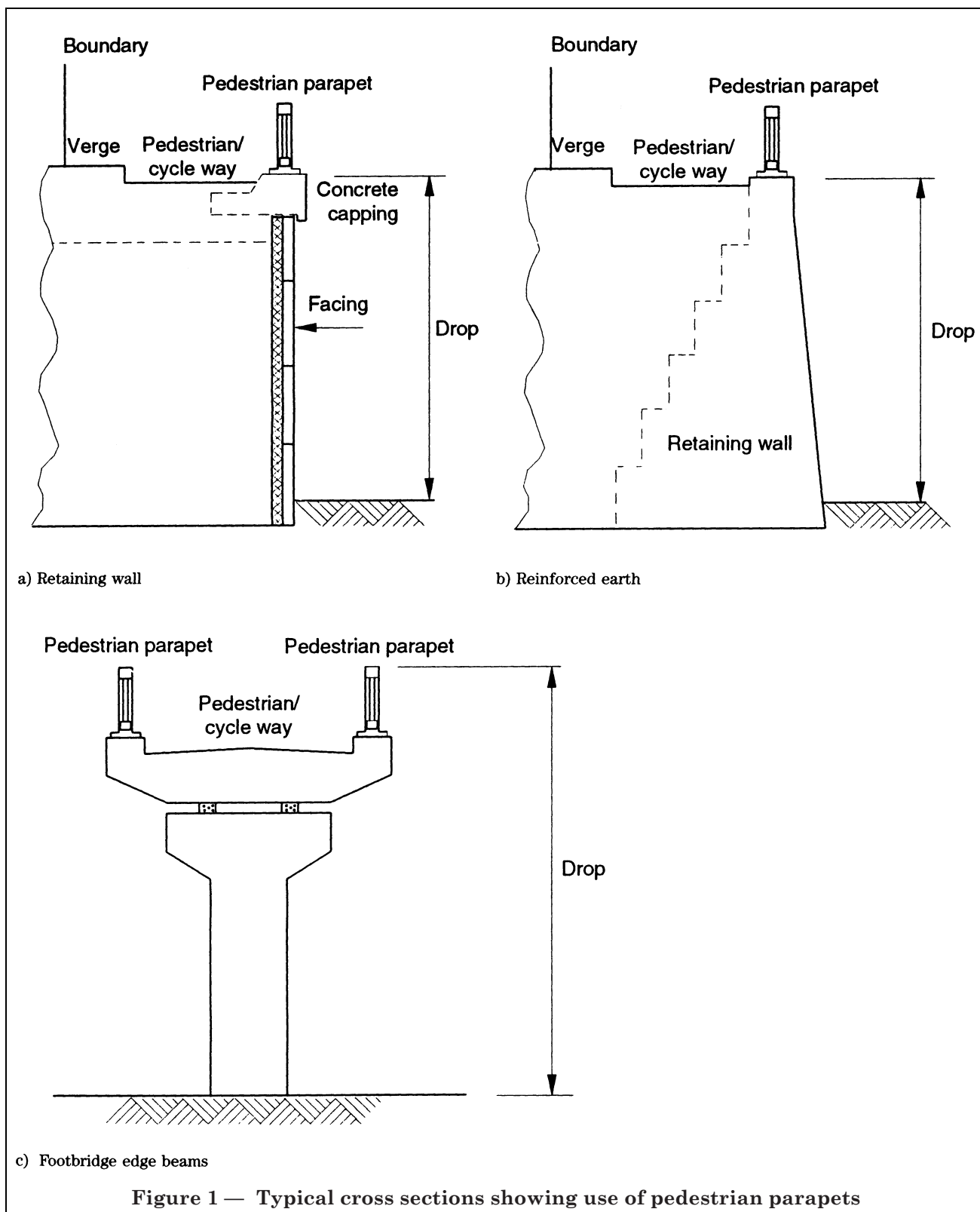
other users

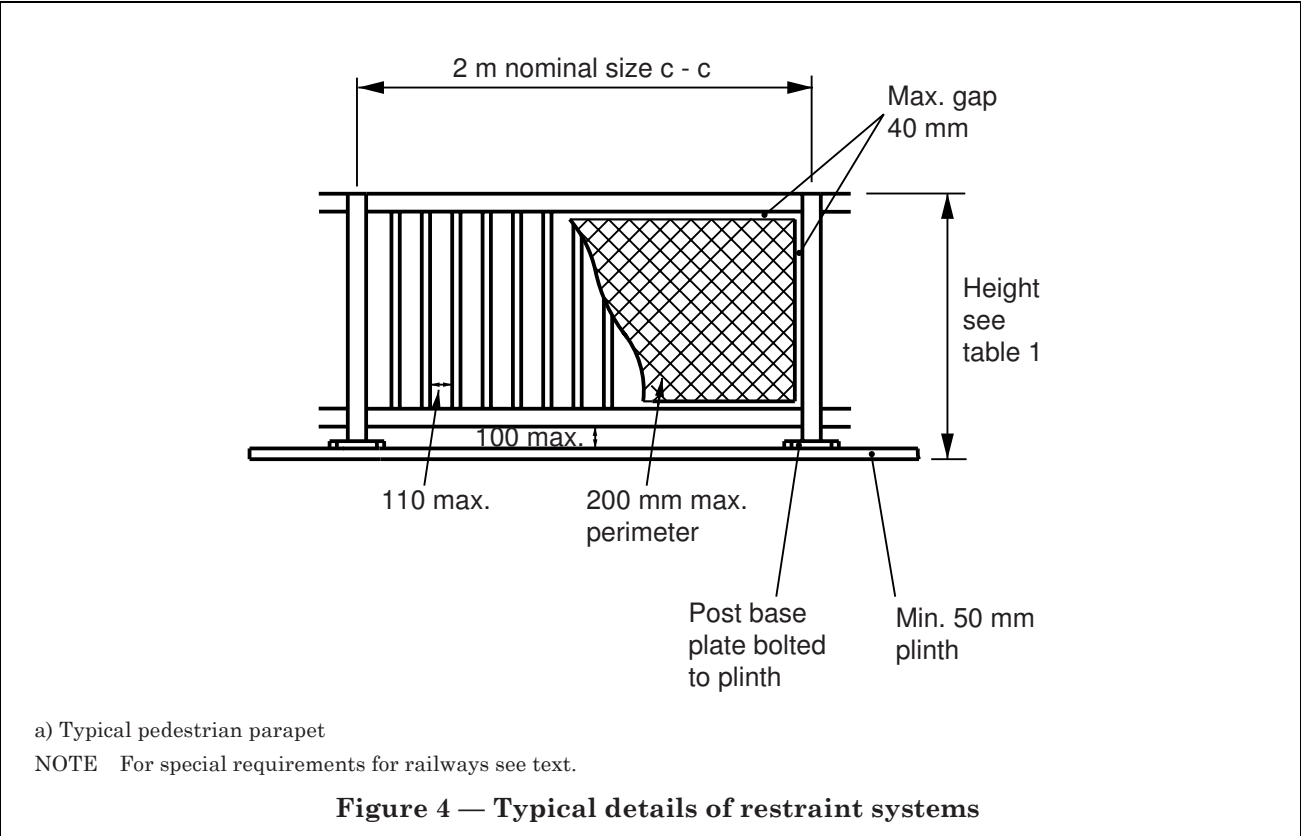
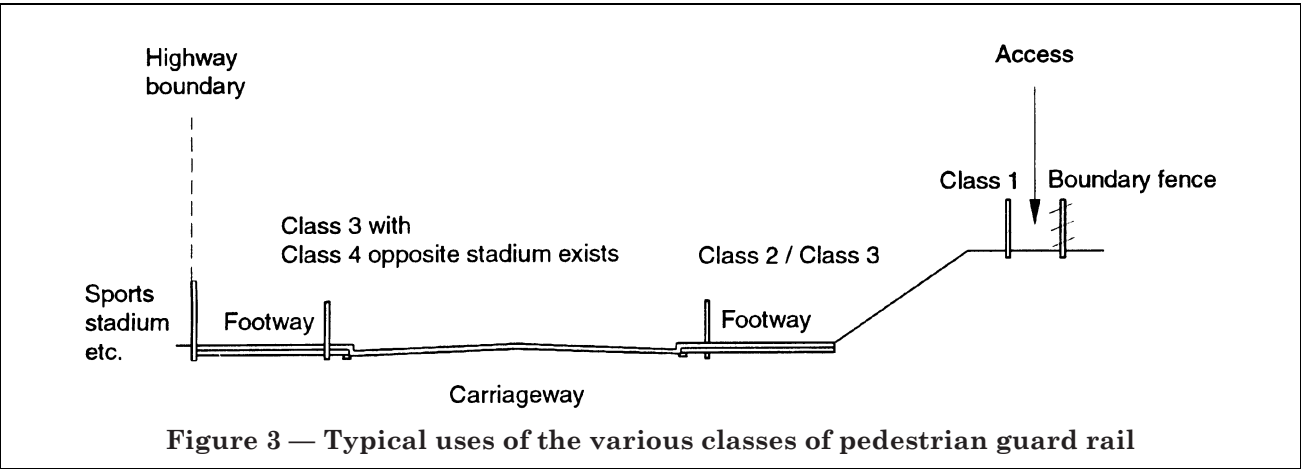
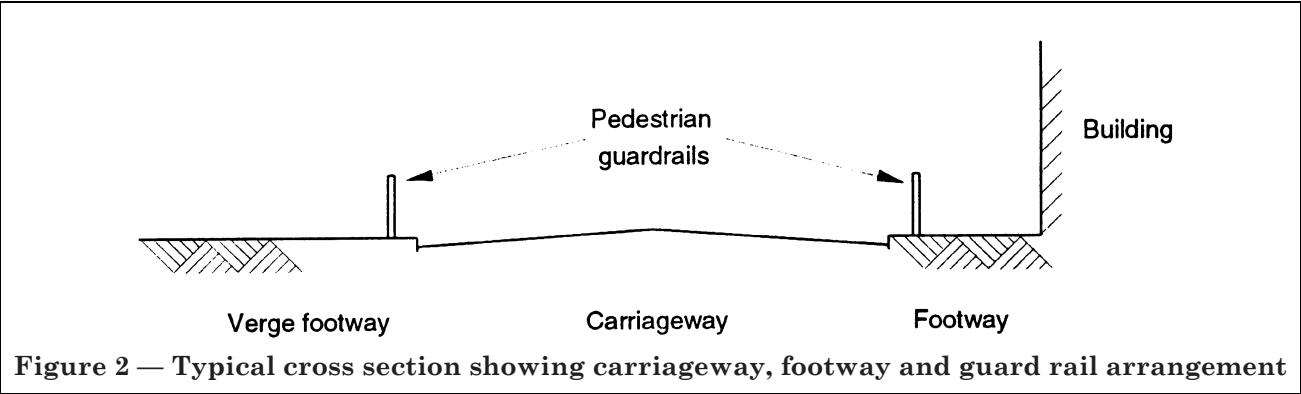
cyclists and equestrians

1.3.12

front face of a pedestrian restraint system

the face nearest to the pedestrian traffic





1.3.13**surface over which the user passes**

the area in front of the face of a pedestrian restraint system, usually paved, immediately adjacent to any plinth or base

1.3.14**datum for height consideration**

the highest level of footway, verge, carriageway or any other part of the highway or road construction within 1.5 m of, and on a line at right angles to, the front face of the pedestrian restraint system but excluding plinths and dwarf walls (see Annex A and Figure 5)

NOTE This will normally be the adjoining paved surface.

1.3.15**ground level**

the final level of the surface above which the system is erected

1.3.16**plinth**

a continuous upstand on the edge of a structure or set into the ground upon which the pedestrian restraint system is mounted

1.3.17**main structure**

any part of a bridge, retaining wall or similar structure upon which a pedestrian parapet is mounted which may include a plinth

1.3.18**attachment system**

the means of attachment of the pedestrian restraint system to the anchorage, usually consisting of holding-down bolts, or posts concreted into holes

NOTE Pedestrian parapets normally have base plates and attachment systems/anchorages. Spigots or cast-in posts are not allowed on structures. Cast-in posts can be used for pedestrian guard rails.

1.3.19**anchorage**

that part contained within the main structure to which the pedestrian restraint system is fixed by means of the attachment system

1.3.20**infill**

material which occupies the spaces between rails and adjacent posts

1.3.21**infill panel**

a panel used to cover the spaces between members. It may provide restraint, or splash protection

1.3.22**vertical infill/bar**

vertical members set at close centres between longitudinal members to provide protection to pedestrians and animals. The vertical members may be fixed or adjustable for gradient

1.3.23**rails**

longitudinal members connecting two or more posts

1.3.24**post**

a structural member mounted in the ground or on the main structure, supporting rails and/or infill.

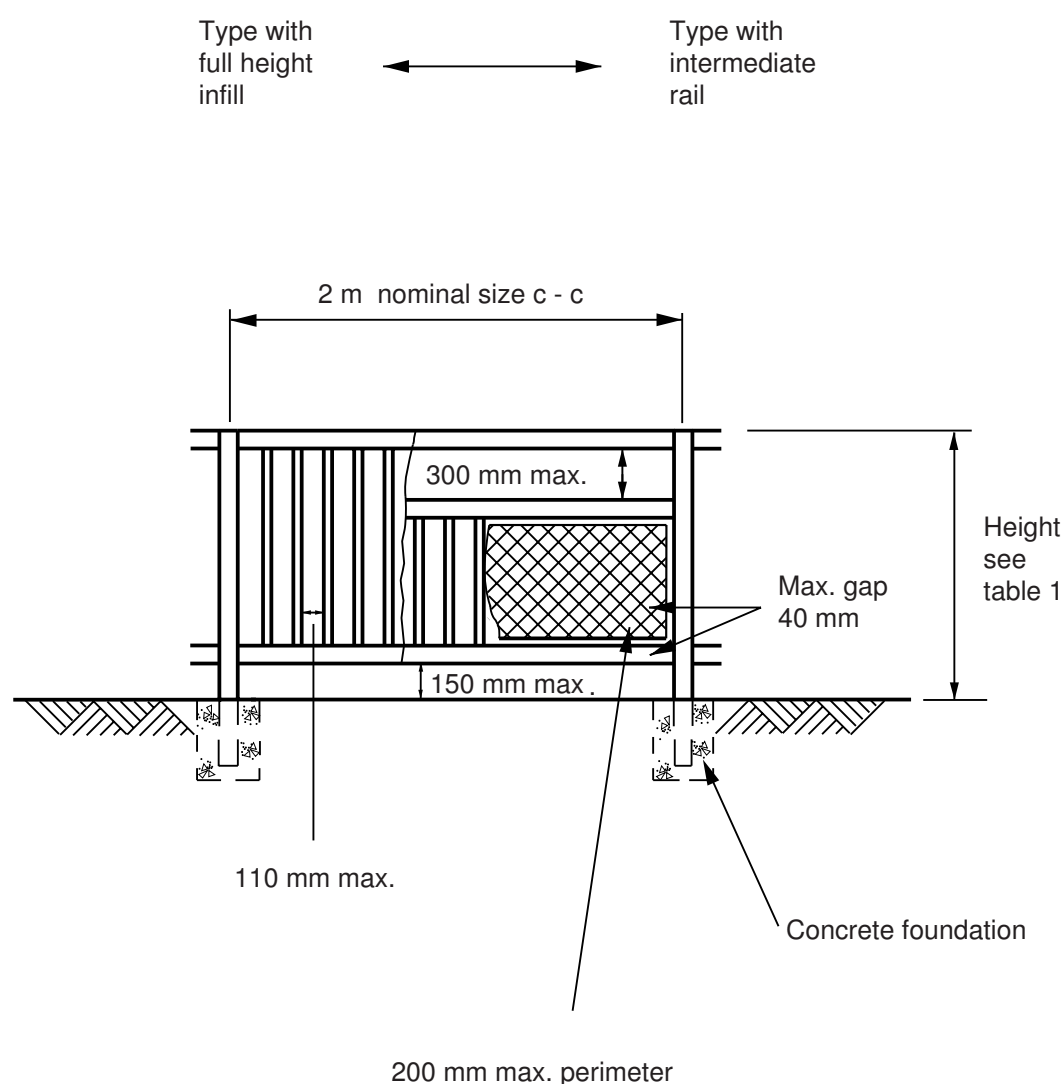
1.3.25**design load** [see Table 2a) and Table 2b)]Design load = nominal load $\times \gamma_{fl}$ **1.3.26****intervisibility**

visibility through a pedestrian restraint system (see Figure 6)

NOTE At points of emergence drivers and pedestrians should be able to see each other from a safe distance and important sight lines between drivers should not be obscured.

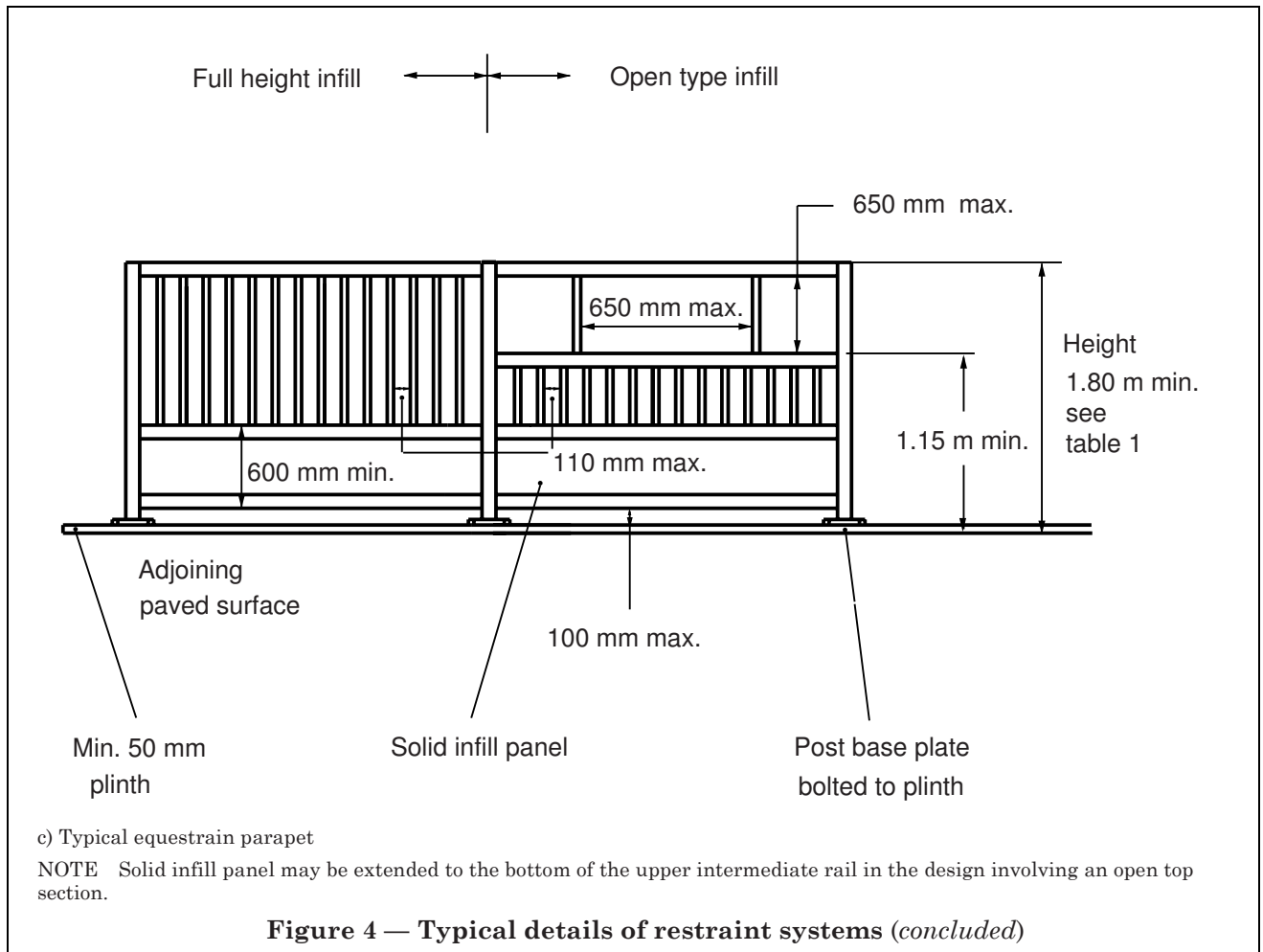
1.3.27**gate**

a movable portion of the pedestrian restraint system provided to give access, e.g. for loading goods



b) Typical pedestrian guard rail

Figure 4 — Typical details of restraint systems (continued)



1.4 Symbols

The following is a list of symbols used in this British Standard to represent variables. Other symbols may be found in the tables and diagrams.

- $\tilde{D}$ Nominal bolt diameters (mm)
- σ_{ub} Minimum ultimate tensile strength of bolt material (N/mm²)
- γ_{fl} Load factor relevant to loading
- σ_y Minimum yield strength of anchorage material (N/mm²)

1.5 Layout consideration

1.5.1 An accurate topographical survey of the proposed site shall be used for the overall design of the system and the following shall be considered (see Figure 6):

- a) the visibility requirements between drivers and other drivers, and between drivers and pedestrians, equestrians and cyclists;
- b) the minimum stopping sight distance;
- c) any special conditions to be met such as loading/unloading requirements;
- d) the location of movement joints in structures.

