

Highway parapets for bridges and other structures —

Part 2: Specification for vehicle containment parapets of concrete construction

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Road Engineering Standards Policy Committee (RDB/-) to Technical Committee RDB/18, upon which the following bodies were represented:

- Aluminium Federation
- Association of Consulting Engineers
- British Cement Association
- British Railways Board
- British Steel Industry
- Convention of Scottish Local Authorities
- County Surveyors' Society
- Department of Transport
- Fencing Industry Association
- Institution of British Engineers
- Institution of Civil Engineers
- Institution of Highways and Transportation
- Royal Automobile Club
- Royal Society for the Prevention of Accidents

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Department of Transport (Transport and Road Research Laboratory)

This British Standard, having been prepared under the direction of the Road Engineering Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 28 February 1991

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The following BSI references relate to the work on this standard:
Committee reference RDB/18
Draft for comment 89/15659 DC

ISBN 0 580 19025 0

Amendments issued since publication

Amd. No.	Date	Comments
7057	April 1992	Indicated by a sideline in the margin

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Foreword

This Part of BS 6779 is one of a series prepared under the direction of the Road Engineering Standards Policy Committee. The other Part already published in the series is:

— *Part 1: Specification for vehicle containment parapets of metal construction.* |

The other Part so far planned in the series is:

— *Part 3: Specification for vehicle containment parapets of combined metal and concrete construction.* |

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

0 Introduction

0.1 This Part of BS 6779 specifies requirements for the design and construction of concrete parapets, intended to provide specific levels of vehicle containment on highways. These parapets are installed on bridges, retaining walls or other structures.

Parapets of metal or of combined concrete and metal are not covered in this Part of BS 6779.

0.2 The specification requirements are based upon the results of tests on panels of 2.1 m and 3.0 m lengths and it is considered reasonable to extrapolate to include panel lengths from 1.5 m to 3.5 m. Designers wishing to use panel lengths outside these limits will have to form their own judgement as to making further extrapolation in the light of the individual circumstances.

0.3 The design of free standing panels and of panels having adequate shear transfer arrangements are covered.

0.4 Containment levels are related to defined vehicle impacts and normal and high levels of containment are specified. A low level of containment, used in Part 1 of this series for the design of metal parapets in certain circumstances, is not considered appropriate to concrete construction. Appendix A to Part 1 of this series outlines the derivation of design forces in relation to containment levels. The normal level of containment specified in BS 6779 is considered to offer a reasonable level of protection under all but the most exceptional cases.

0.5 The main objectives of the forms of parapet defined in this Part of BS 6779 are:

- a) to provide specified levels of containment to limit penetration by errant vehicles;
- b) to protect highway users and others in the vicinity by redirecting errant vehicles with minimum deceleration forces on to a path as close as possible to the line of the parapet and to reduce the risk to the vehicle of overtopping the parapet and of overturning.

0.6 It is possible in the case of concrete parapets to give theoretical design criteria to produce satisfactory designs. This is because the dynamic response of such rigid structures is relatively predictable. In consequence full scale acceptance testing, as required for metal parapets in Part 1 of BS 6779; is not necessary.

1 Scope

This Part of BS 6779 specifies requirements for the design and construction of in situ and precast concrete parapets which are designed to provide specified levels of containment for vehicles on highways. The requirements for minimum panel length and for the prevention of composite action with the main structure limit the direct application in the case of bridge decks to those of 7.5 m and greater span. As they are of solid construction they also provide effective pedestrian protection without modification. Parapets are to be prevented from acting compositely with the main structure by dividing them into panels. Parapets designed to act compositely as part of the main structure are outside the scope of this Part of BS 6779 as are prestressed concrete parapets, parapets of metal construction and parapets of combined concrete and metal design.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 6779 the following definitions apply.

2.1 vehicle restraint system

an installation to provide a level of containment for errant vehicles to limit damage or injury to users of the highway

2.2 highway parapet

a barrier at the edge of a bridge, or on top of a retaining wall or similar structure, associated with a highway

2.3 safety fence

an installation, provided for the protection of users of the highway, consisting of horizontal beams mounted on posts

2.4 safety barrier

an installation, provided for the protection of users of the highway, that is continuously in contact with its supporting foundation

2.5 transition system

an arrangement for connecting dissimilar and/or different capacity protective systems

2.6 front face of a parapet

the face nearest to the traffic

2.7**outer face of a parapet**

the opposite face to the front face

2.8**main structure**

any part of the bridge, retaining wall or similar structure upon which the parapet is mounted

2.9**adjoining paved surface**

the paved area on the traffic side of a parapet, immediately adjacent to the base of a parapet

2.10**datum for height considerations**

the highest level of footway, verge, carriageway or any other part of the road construction within 1.5 m of, and on a line at right angles to, the front face

NOTE This will normally be the adjoining paved surface.

2.11**anchorage**

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

NOTE For example, a cast-in anchorage cradle in a reinforced concrete deck beam.

2.12**attachment system**

the system of attachment of the parapet to the anchorage, usually consisting of holding-down bolts

2.13**top of front face of a parapet**

notional or actual point at a transverse section where the horizontal projection through the highest point intercepts the plane of the front face

2.14**shear transfer**

an arrangement for transferring horizontal shear between adjacent panels across the vertical joint

2.15**vehicle parapet**

highway parapet that acts as a vehicle restraint system

2.16**vehicle pedestrian parapet**

vehicle parapet with safety provisions for pedestrians and animals

3 Symbols

The following is a list of the symbols used in this Part of BS 6779 to represent variables. Other symbols used for designation purposes are listed in Table 1.

D	Nominal bolt diameter (mm)
f_k	Characteristic (or nominal) strength of the material
H	Vertical distance from top of parapet to the horizontal section where shear force is considered (m)
L	Length of parapet panel (m)
Q^*	Design load (kN)
Q_k	Nominal load (kN)
R^*	Design resistance
S^*	Design load effect
γ_{fL}	Partial load factor
γ_{f3}	Partial factor for load effect
γ_m	Partial factor on material strength
σ_{vb}	Minimum ultimate tensile strength of bolt material (N/mm ²)
σ_{ya}	Minimum yield strength of anchorage material (N/mm ²)

Table 1 — Designation of vehicle parapets

Item	Designation	Clause ref.
a)	Levels of containment N = Normal level of containment H = High level of containment	5 5.1 5.2
b)	Height above datum 1.00 = 1 m height 1.25 = 1.25 m height 1.50 = 1.50 m height etc.	8
c)	Type Without shear transfer I = In situ concrete P = Precast concrete With shear transfer i = In situ concrete p = Precast concrete	11.3.9

NOTE Examples of designation:
N/1.00/I indicates an in situ concrete parapet of 1 m height, of normal level of containment, with no shear transfer arrangement.
H/1.50/p indicates a precast concrete parapet of 1.50 m height, of high level of containment, with shear transfer arrangement.