
British Standard

Safety fences and barriers for highways

Part 4. Specification for components for tensioned rectangular
hollow section beam (200 mm X 100 mm) safety fence

Barrières et glissières de sécurité sur autoroutes

Partie 4. Eléments de barrières de sécurité en profilés rectangulaires creux tendus (200 mm X 100 mm) —
Spécifications

Sicherheitszäune und Leitplanken an Autobahnen

Teil 4. Elemente (vorgespannt) von Sicherheitszäunen aus 200 mm X 100 mm Hohlprofilen

Foreword

This Part of BS 6579 has been prepared under the direction of the Road Engineering Standards Policy Committee. The other Parts of BS 6579 either published or in preparation are:

- Part 1 Specification for components for tensioned corrugated beam fence on 'Z' posts
- Part 2* Specification for tensioned corrugated beam fencing on offset brackets
- Part 3 Specification for components for tensioned rectangular hollow section beam (100 mm × 100 mm) safety fence
- Part 5 Specification for open box beam safety fence (single height)
- Part 6 Specification for components for open box beam safety fence (double height)
- Part 7 Specification for untensioned corrugated beam safety fences
- Part 8 Specification for concrete safety barriers

Appendix A and appendix B of this Part of BS 6579 provide additional information helpful to the users of the components.

Fences detailed in Parts 1 to 7 have been developed already and approved for use on roads in the United Kingdom.

The designs are based on the results of static and dynamic tests carried out in the past on components and complete systems under the direction of the Transport and Road Research Laboratory (TRRL).

The safety barrier detailed in Part 8 is for use only on certain roads at the date of publication of this Part of BS 6579.

If further types are developed, BS 6579 will be revised and increased in scope to cover additions and variations.

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

* Work on this Part of BS 6579 is in abeyance.



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Specification

0 Introduction

0.1 The objective of providing safety fences or barriers adjacent to a highway is to reduce the consequences of vehicles leaving the carriageway and entering areas where it would be unsafe for them to travel.

Safety fences are intended to absorb some of the energy of impact and to redirect the errant vehicle so that it follows, within a narrow angle, the line of the fence in the direction of the traffic and does not overturn.

Safety barriers are intended to provide containment without significant deflection or deformation under impact, and to redirect errant vehicles along the line of the barrier in the direction of traffic.

0.2 The safety fences and barriers for ground mounting which are the subject of BS 6579 are for use in conjunction with parapets on bridges, which are the subject of BS 6779. Although definitions in both standards have been chosen so as to align as closely as possible, there are some cases where a definition is applicable only to a particular Part of BS 6579 and does not apply generally.

0.3 No direct guidance is given in BS 6579 on the situations where safety fences and barriers should be erected or on the choice of the types described in the various Parts, but information pertaining to general characteristics of different types of safety fences is given in appendix A.

0.4 There are various situations and various methods by which transition between a safety fence or safety barrier and a vehicle containment parapet can be assured without impairing the overall protection afforded to the users of the highway.

Appendix B gives recommendations for connections between this type of safety fence and existing designs of metal parapets.

0.5 It is important to recognize that the performance of a safety fence can be affected by factors that are not covered by the specifications for the components. These factors include the choice of intermediate posts to suit the ground conditions and the erection and maintenance of the fence. Tensioned fences are not complete until all tensioning procedures have been satisfactorily completed.

0.6 Figure 1 illustrates the general arrangement of a tensioned rectangular hollow section beam (200 mm x 100 mm) safety fence for which the components specified in this Part of BS 6579 are intended. It is essential that the end posts and all angled beam posts are set in concrete as illustrated in figure 1. Intermediate posts, as illustrated in figure 1 and detailed in figure 3 are either driven securely into the ground, or set in concrete in the ground or mounted on bridge decks using 'bridge deck posts'. Where a tensioned rectangular hollow section beam fence is not continued over a bridge, the full height anchorages shown in figure 5 should be used. These should be set in concrete and located adjacent to the approach and departure ends of the bridge deck. Figure 6 shows typical details for the installation at a bridge pier or similar structure.

0.7 Enquiries concerning the availability of detailed drawings providing information on manufacture and installation should be made to the Department of Transport*.

0.8 Where a tensioned rectangular hollow section beam safety fence is used on a curve the limiting radius of the installation should be as given in appendix C.

0.9 The approach to the safety fence should be set back away from the traffic and flared. The flare length should be at least ten times the set back.

0.10 In appendix D the number of components is given for 1 km of safety fence.

0.11 In appendix E important recommendations are given on the transport, handling and storage of components prior to assembly on site and appendix F lists information that should be provided when making an enquiry or order.

0.12 In appendix G information is given on the action to be taken after raising of the running surface in order to maintain the height of the safety fence.

1 Scope

This Part of BS 6579 specifies requirements for the components to be used in the construction of tensioned rectangular hollow section (200 mm x 100 mm), type TRHS 2 safety fence supported on 'Z' posts.

Requirements are made in respect of materials, dimensions, protective finishes and identification.

Erection and tensioning of the assembled fence is outside the scope of this Part of BS 6579 (see 0.3).

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 6579 the following definitions apply.

2.1 vehicle restraint system. Installation to provide a level of containment for errant vehicles to limit damage or injury to users of the highway.

2.2 vehicle safety fence. Vehicle restraint system that is continuously in contact with its supporting foundations throughout its length.

2.3 vehicle safety fence. Vehicle restraint system in the form of horizontal members mounted on posts.

2.4 single sided safety fence. A safety fence having the traffic face of its beams in front of, or in line with, the face of the supporting posts, with traffic approaching on one side only.

2.5 double sided safety fence. A safety fence having the traffic face of its beams in front of, or in line with, the traffic faces of the supporting posts, with the traffic approaching on both sides.

* Department of TRansport, BE Division, St Christopher House, Southwark Street, London SE1 0TE.

2.6 traffic face. The face of a safety fence or barrier that is nearer the vehicular traffic flow.

2.7 impacting vehicle. A vehicle striking a safety fence or barrier whether or not it is redirected.

2.8 terminal. That end-section of the length of a safety fence within which the beam rises from or is brought down to an anchorage.

2.9 flaring (of the ends). The setting back of ground anchorages behind the line of a safety fence.

NOTE. Flaring is intended to reduce the risk of errant vehicles hitting or mounting the anchorages and to reduce the risk of a vehicle passing behind the safety fence.

2.10 full height anchorage. A cross-braced frame extending to the full height of a safety fence.

NOTE. For use in locations where ground anchorages are not suitable.

2.11 initial installation length. The length of safety fence, obtained by setting out the position of each intermediate post from the centre of the angled beam post (the datum) when bolt clearances have been taken up but before beam to post connections are tightened.

2.12 adjuster assembly. A device for tensioning safety fences and adjusting the verticality of end posts.

3 Requirements for components

3.1 Beams

Beams shall be fabricated from 200 mm × 100 mm × 5 mm hot rolled rectangular hollow sections in accordance with the dimensional requirements of BS 4848 : Part 2 and figure 2 of this Part of BS 6579 and with physical properties in accordance with BS 4360 grade 43C.

3.2 Posts and anchorages

3.2.1 Posts and anchorages shall be made from steel in accordance with BS 4360 and to the following grades:

- (a) rectangular hollow sections: grade 43C;
- (b) angle and channel sections: grade 43A;
- (c) plates: grade 43A.

3.2.2 Posts and anchorages shall be dimensionally in accordance with figures 3 and 5 of this standard and the following:

- (a) rectangular hollow sections: BS 4848 : Part 2;
- (b) angle sections: BS 4848 : Part 4;
- (c) channel sections: BS 4 : Part 1.

3.3 Adjuster turn-buckles and nuts

Adjuster turn-buckles and nuts shall be manufactured in steel in accordance with BS 970 : Part 1 grade 080M40 and shall be dimensionally in accordance with figure 4 of this standard.

3.4 Connections

3.4.1 Connector plates. Connector plates shall be made from steel in accordance with BS 4360 grade 43A and shall be dimensionally in accordance with figure 2 of this standard.

3.4.2 Connectors. Connectors shall be made from hot rolled rectangular section dimensionally in accordance with BS 4848 : Part 2 and figure 4 of this standard and with physical properties in accordance with BS 4360 grade 43C.

3.4.3 Fasteners. Bolts, screws, nuts and washers shall be manufactured in steel and selected from the following as appropriate.

(a) Bolts and screws shall be ISO metric black hexagon type, complying with grade 4.6 of BS 4190 unless specified otherwise in appendix D table 2.

(b) Nuts shall be ISO metric black hexagon nuts complying with grade 4 of BS 4190 unless specified otherwise in appendix D, table 2.

(c) Washers shall be black complying with BS 4320 form A, as in appendix D, table 2, or BS 1449 : Part 2, grade 304S15 for stainless steel washers.

(d) Stainless steel bolts and nuts shall be in accordance with grade A.4-80 of BS 6105.

NOTE. The above items, except those manufactured from stainless steel, should be spun galvanized before use (see clause 5).

3.5 Transition pieces

Beam transition pieces shall be manufactured from hot rolled rectangular hollow section steel dimensionally in accordance with BS 4848 : Part 2 and figure 2 of this standard and with physical properties in accordance with BS 4360 grade 43C and grade 50C.

3.6 Reinforcing rings and tie bars

Reinforcement for use in concrete foundations shall be made from 10 mm diameter steel rod in accordance with BS 4449 grade 250.

4 Tolerances

4.1 Tolerances on dimensions of components shall be in accordance with the appropriate dimensional specification, detailed drawings and relevant figure of this Part of BS 6579.

4.2 Deviation from the specified dimensions for materials and fabricated components shall be measured before galvanizing.

5 Protective finish

5.1 All steel components excluding stainless steel items, reinforcing rings and reinforcing bars shall be hot dipped galvanized, in accordance with BS 729, after fabrication.

5.2 Fasteners shall be spun galvanized.

NOTE 1. Where the purchaser wishes the components to be further protected by a paint system such requirements should be specified at the time of the enquiry and/or order. In this respect attention is drawn to BS 5493.

NOTE 2. At connections to parapets, additional protection may be required. See appendix B at **B.5.2** and **B.5.3**.

6 Marking

All beams, posts and anchorages shall be clearly and permanently marked with the following:

- (a) the number of this British Standard, i.e. BS 6579*;
- (b) manufacturer's identification mark;
- (c) digits indicating the month and year of manufacture (e.g. 10/89 indicates manufacture during October 1989).

Appendices

Appendix A. Vehicle safety fences and barriers for highways: type characteristics

Information on type characteristics is given in table 1. Illustrations of fence and barrier types are given in figure 14.

* Marking BS 6579 on or in relation to a product represents a manufacturers' declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the appropriate Part of BS 6579. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Table 1. Type characteristics

Type	Ref.	Material	Types of support or mounting	Post spacing	Beam position mounting height	Single/double sided	Tension/untensioned T/UT	Design deflection	Design vehicle mass	Vehicle speed	Design angle of departure (max.)	Comments
Corrugated beam	TCB1	Steel	Z section steel post	3.2	mm	Single	T	mm	t	km/h	degrees	May reduce dazzle when mounted in central reserve
Corrugated beam	TCB2	Steel	Z section steel post	1.6	Side 610	Single	T	800	1.5	113 (70 mile/h)	10	
Corrugated beam	TCB3	Steel	Steel or timber post with offset	3.2	Side (inclined at 15°) 535	Double	T	800	1.5	113 (70 mile/h)	10	
Corrugated beam	TCB4	Steel	Single Z section steel post	3.2	Side	Double	T	800	1.5	113 (70 mile/h)	10	
Corrugated beam	UCB	Steel	Steel or timber posts with offsets	3.2 (max.)	Side 525	Single or double	UT		1.5	80 (50 mile/h)	10	
Rectangular hollow section 100 mm X 100 mm	TRHS1	Steel	Single Z section steel post	3.2	Top 610	Both	T	1000	1.5	113 (70 mile/h)	10	Reduces extent of snow/sand drift. On dual carriageways central reserve has to be hardened
Rectangular hollow section 200 mm X 100 mm	TRHS2	Steel	Single Z section steel post	3.2	Top or side 610	Both Single	T T	600 600	1.5	113 (70 mile/h)	8	
Open box beam	OB1	Steel	Z section steel post	2.4	Side 610	Single	UT	600	1.5	113 (70 mile/h)	<10	This type of safety fence will also satisfy the condition of a 1.5 t vehicle impacting at 20° and travelling at 113 km/h (70 mile/h)
Open box beam	OB2	Steel	Z section steel post	2.4	Side 610	Double	UT	400	1.5	113 (70 mile/h)	<10	
Open box beam (double height)	OB3	Steel	Z section steel post	2.4	Side 610 and 1020	Single	UT	1000	5	80 (50 mile/h)	15	
Concrete barrier	CSB	Concrete	Profiled barrier on continuous foundation	—	816 to top of concrete	Double	—	Zero	1.5	80 (50 mile/h)	8	May reduce dazzle when mounted in central reserve

NOTE 1. Mounting heights quoted are to the centre of the beam above the adjacent carriageway level. If the horizontal distance from the beam traffic face to the carriageway exceeds 4500 mm the height dimension of the beam centreline will relate to the surface immediately below.

NOTE 2. Design angle of approach is 20° in each case.

NOTE 3. Beams TRHS2 and OB1 may be mounted on steel brackets fixed to structures.

NOTE 4. Generally, double sided beams for dual carriageways on similar levels require only a single line of posts.

Appendix B. Transition between safety fences and bridge parapets

B.1 General

B.1.1 This appendix deals with the methods of connecting rectangular hollow section beam (200 mm × 100 mm) safety fences to bridge parapets in accordance with BS 6779.

B.1.2 It should be noted that the means for connecting safety fences to bridge parapets referred to in **B.1.1** varies according to whether the bridge parapets are fabricated in steel or aluminium.

B.1.3 Where direct connection to a bridge parapet is not sufficient to take the full tension of 330 kN, a full height anchorage shall be provided adjacent to the parapet. For various methods of connecting the safety fence to a parapet, see figures 7 to 11.

B.2 Transition to rectangular hollow section beam (100 mm X 100 mm) safety fence

B.2.1 A specially fabricated transition piece may be incorporated along the length of the safety fence installation in order to provide a transition from a rectangular hollow section beam (200 mm × 100 mm) safety fence (see figure 2) to a rectangular hollow section beam (100 mm × 100 mm) safety fence (see BS 6579 : Part 3).

B.2.2 A minimum length of 14.4 m of rectangular hollow section beam (200 mm × 100 mm) safety fence should be used between the transition piece referred to in **B.2.1** and the bridge parapet.

B.3 Expansion joints

Where a tensioned rectangular hollow section beam (200 mm × 100 mm) safety fence extends across an expansion joint, continuity should be provided by a full height anchorage either side and as close as possible to the expansion joint. See figure 5.

B.4 Connection to steel parapets

Tensioned rectangular hollow section beam (200 mm × 100 mm) safety fence should be connected to steel parapets by a connection piece as shown in figure 7.

B.5 Connection to aluminium parapets

B.5.1 Tensioned rectangular hollow section beam (200 mm × 100 mm) safety fence should preferably be connected to aluminium bridge parapets by a connection plate and full height anchorage installed adjacent to the bridge parapet to take the full tension force of 330 kN. See figures 8 and 9.

B.5.2 Alternatively, connection to an aluminium bridge parapet may be made by a connecting plate as shown in figures 10 and 11.

B.5.3 In making all connections between steel and aluminium components stainless steel bolts should be used (see 3.4.3(c) and (d)) and suitably insulating material applied to the interfaces.

Appendix C. Limiting radius of installation on a curve

This Part of BS 6579 does not cover the use of 200 mm × 100 mm rectangular hollow section beam safety fence for radii less than 120 m.

Appendix D. Schedule of components for 1 km of fence

For the convenience of users of this Part of BS 6579 the schedule given in table 2 gives the number of components required for an uninterrupted length of approximately 1 km (0.621 miles).

Table 2. Components for 1 km of fence		
Item No. correlates with TRRL DRG series 1040-48/-	Number required	Description of item
G01.001	2	Post, intermediate
G01.002	312	Post, driven (verge)
G01.003	312	Post, driven (central reserve)
G01.004		Profile of post
G01.005	1256	Nut (M24)
G01.006	2	Anchorage beam
G01.007	202	Beam
G01.008	2	End post
G01.009	314	Strap (verge)
G01.010	314	Strap (central reserve)
G01.011	426	Connector plate
G01.013	2	Reinforcing rod
G01.015	8	Reinforcing hook
G01.016	A/R	Anchor bolt M20
G01.017	628	Strap bolt (M10 x 130 length)
G01.018	1704	Connector screw (M20 x 40 length)
G01.019	4	Anchorage stud
G01.020	4	Nut (M24)
G01.022	A/R	Long post, driven (verge)
G01.023	A/R	Long post, driven (central reserve)
G01.024	628	Screw M10 x 25 length hex. steel BS 4190 grade 4.6
G01.025	2512	Black washer M10 (form E) BS 4320
G01.026	1704	Black washer M20 (form E) BS 4320
G01.027	8	Black washer M24 (form E) BS 4320