

# Fences —

## Part 10: Specification for anti-intruder fences in chain link and welded mesh

ICS 91.090

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# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/201, Fences, to Subcommittee B/201/3, Fences — Wire, upon which the following bodies were represented:

- Association of Security Consultants
- British Precast Concrete Federation Ltd.
- County Surveyors' Society
- Fencing Contractors Association
- Forestry Commission
- National Council of Building Materials Producers
- National Fencing Training Authority
- Security Facilities Executive
- Society of Chain Link Fencing Manufacturers
- UK Steel Association
- United Kingdom Forest Products Association

This British Standard, having been prepared under the direction of the Sector Committee for Building and Civil Engineering, was published under the authority of the Standards Committee and comes into effect on 15 May 1999

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First published October 1963  
Second edition February 1972  
Third edition July 1990  
Fourth edition May 1999

The following BSI references relate to the work on this standard:  
Committee reference B/201/3  
Draft for comment 97/105975 DC

ISBN 0 580 28267 8

## Amendments issued since publication

| Amd. No. | Date | Text affected |
|----------|------|---------------|
|          |      |               |
|          |      |               |
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## Foreword

This British Standard has been prepared by Technical Subcommittee B/201. It supersedes BS 1722-10:1990, which is withdrawn.

BS 1722 is published in the following parts:

- *Part 1: Specification for chain link fences;*
- *Part 2: Specification for rectangular wire mesh and hexagonal wire netting fences<sup>1)</sup>;*
- *Part 3: Specification for strained wire fences;*
- *Part 4: Specification for cleft chestnut pale fences;*
- *Part 5: Specification for close boarded fences and wooden palisade fences;*
- *Part 7: Specification for wooden post and rail fences;*
- *Part 8: Specification for mild steel (low carbon steel) continuous bar fences and hurdles;*
- *Part 9: Specification for mild steel (low carbon steel) fences with round or square verticals and flat posts and horizontals;*
- *Part 10: Specification for anti-intruder fences in chain link and welded mesh;*
- *Part 11: Specification for woven wood and lap boarded panel fences;*
- *Part 12: Specification for steel palisade fences;*
- *Part 13: Specification for chain link fences for tennis court surrounds;*
- *Part 14: Specification for open mesh steel panel fences;*
- *Part 16: Specification for organic powder coatings for use as a plastics finish to components and mesh.*

The various parts specify requirements for the types of fence that are considered suitable for standardization. No attempt has been made to standardize fences or gates of a purely decorative nature, or to suit special requirements; nor to specify requirements for “patent” proprietary fencing systems. It is recommended, however, that such fences or gates should be designed in accordance with the relevant clauses of this part of BS 1722.

This standard aims to establish minimum requirements for material and workmanship of the more common types of fence in order to ensure satisfactory service for the purchaser, and to assist manufacturers and erecting contractors by eliminating unnecessary minor variations in the demands of purchasers. It specifies requirements for the components that make up a fence and the way in which the fence should be constructed.

This standard includes requirements for sizes of components, together with the permissible tolerances on size. These are minimum requirements and it should normally be acceptable to use larger sizes, except if this could otherwise adversely affect the fitting of components or if replacement parts are required to match with those already present.

Choosing a fence is affected by factors such as intended purpose, desired service life, aesthetic considerations and availability of components. The specifier can match a suitable choice of fence to its intended purpose by reference to Tables 1 and 2 and also inform those erecting the fence of the basic characteristics required.

This standard includes requirements for protective treatments. However, maintenance requirements for the fence after installation are outside the scope of this standard. Premature failure of the fence can be avoided by taking care not to damage protective treatments during installation.

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<sup>1)</sup> In course of revision.

This standard specifies the requirements for anti-intruder wire mesh fences. It may be used as a specification for work to be carried out by a specialist fencing contractor or, if such a contractor is not available, by local labour under strict supervision, with component parts supplied by firms approved by the purchaser. It specifies concrete and steel posts and struts, steel gates and gate posts and zinc coated and plastics coated zinc coated mesh infill.

The specification given in this standard is suitable for use in industrial estates, airfields, oil and gas installation etc. where an enhanced level of security over fences conforming to BS 1722-1 is required. Other types of enhanced security fences are specified in BS 1722-12 [security palisade (SP) fences] and in the relevant clauses of BS 1722-14.

It should be appreciated that it is not possible to install a fence that cannot be negotiated by a determined intruder given adequate time, freedom from observation and suitable climbing aids or tools for forcing an entry. It can also be accepted that an intruder will not wish to advertise his presence to a patrolling guard and that he will, therefore, endeavour to negotiate a fence without leaving obvious traces. In order to make the task of the intruder more difficult, and at the same time to assist patrols, this part of BS 1722 incorporates a number of features derived from experience of intruders' techniques. Attention is, therefore, drawn to the following requirements:

- a) the nominal length of the side of the mesh is limited so as to make footholds difficult;
- b) the bottom of the wire mesh fencing is buried or fastened to the ground to prevent burrowing;
- c) the top edge and, if exposed, the bottom edge of the wire mesh fencing is barbed;
- d) the top lines of barbed wire are fitted with droppers so that they cannot be bunched together;
- e) the bolts are burred over to guard against dismantling;
- f) the angle at any change of direction in the fence is (where possible) not less than 130° to avoid providing facilities for climbing;
- g) the gates are designed to eliminate as far as possible any increased facilities for unauthorized entry.

This revision of BS 1722-10 provides a more detailed specification for gates and locking devices. Further changes in this revision include clarification of the specification for posts and the use of heavier gate posts to act as fence strainers. The thickness of stirrup wire has been lowered to facilitate fixing of the mesh. Cube tests of concrete strength are now required and the frequency of testing is specified to ensure that regular quality checks are made.

It should be noted that throughout this part of BS 1722 fence post spacings are given in terms of centre-to-centre distances.

Ground conditions may indicate that a variation in the length of a post or strut, or the depth to which it should be set, is desirable. The post and strut setting depths specified in this standard are intended for use in normal ground conditions but if special conditions exist that warrant a change in the specification, e.g. the ground is softer or firmer than usual, such a change should be agreed with the specifier. This also applies to other similar changes.

This part of this standard specifies requirements for fence materials and their combination and installation. Because a fence is made up of a number of separate components of which the particular features vary, e.g. zinc coated or plastics coated wire, a number of combinations are available to the user. Annex C provides details of the fence requirements and installation site that should be agreed between the fence supplier and purchaser at the time of ordering a fence. However, as conditions vary from site to site, annex C should not be assumed to be exhaustive.

It has been assumed in the drafting of this part of BS 1722 that the execution of its provision is entrusted to appropriately qualified and experienced people. Before installation commences, the lead installer should either:

- a) have achieved the appropriate National Vocational Qualification (NVQ) or Scottish Vocational Qualification (SVQ) in fence installation (Level 2) relevant to this part of BS 1722; or
- b) be currently registered for the appropriate NVQ or SVQ in fence installation (Level 2) relevant to this part of BS 1722 provided such registration has not been in place for a period greater than 5 years from the date of registration without successful assessment having taken place.

Annexes A and B are normative. Annex C is informative.

A British Standard does not purport to include all necessary provisions of a contract. Users of British Standards are responsible for their 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 20, an inside back cover and a back cover.

## 1 Scope

This part of BS 1722 specifies requirements for anti-intruder chain link or welded mesh fences and gates of at least 2.4 m in height for situations that require a higher level of protection than that offered by fences conforming to BS 1722-1. It also includes requirements for the installation of the fencing at the specified location.

Provision is made for either single or double extension arms.

## 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

- BS 4-1, *Structural steel sections — Part 1: Specification for hot-rolled sections*.
- BS 12, *Specification for Portland cement*.
- BS 146, *Specification for Portland blastfurnace cement*.
- BS 443, *Specification for testing zinc coatings on steel wire and for quality requirements*.
- BS 882, *Specification for aggregates from natural sources for concrete*.
- BS 729, *Specification for hot dip galvanized coatings on iron and steel articles*.
- BS 1014, *Specification for pigments for Portland cement and Portland cement products*.
- BS 1210, *Specification for wood screws*.
- BS 1449-2:1983, *Steel plate, sheet and strip — Part 2: Specification for stainless and heat-resisting steel plate, sheet and strip*.
- BS 1881-116, *Testing concrete — Part 116: Method for determination of compressive strength of concrete cubes*.
- BS 3892 (all parts), *Pulverized fuel ash*.
- BS 4027, *Specification for sulfate-resisting Portland cement*.
- BS 4102, *Specification for steel wire for general fencing purposes*.
- BS 4190, *Specification for ISO metric black hexagon bolts, screws and nuts*.
- BS 4320, *Specification for metal washers for general engineering purposes — Metric series*.
- BS 4449, *Specification for carbon steel bars for the reinforcement of concrete*.
- BS 4482, *Specification for cold reduced steel wire for the reinforcement of concrete*.
- BS 4483, *Specification for steel fabric for the reinforcement of concrete*.
- BS 4652, *Specification for zinc-rich priming paint (organic media)*.

BS 5075 (all parts), *Concrete admixtures*.

BS 5135, *Specification for arc welding of carbon and carbon manganese steels*.

BS 5328-1:1997, *Concrete — Part 1: Guide to specifying concrete*.

BS 6323-2, *Specification for seamless and welded steel tubes for automobile, mechanical and general engineering purposes — Part 2: Specific requirements for hot finished welded steel tubes*.

BS 7359, *Nomenclature of commercial timbers including sources of supply*.

BS EN 10024, *Hot rolled taper flange I sections — Tolerances on shape and dimensions*.

BS EN 10025:1993, *Hot rolled products of non-alloy structural steels — Technical delivery conditions*.

BS EN 10056-1, *Specification for structural steel equal and unequal angles — Part 1: Dimensions*.

BS EN 10210-1, *Hot finished structural hollow sections of non-alloy and fine grain structural steels — Part 1: Technical delivery conditions*.

BS EN 10210-2, *Hot finished structural hollow sections of non-alloy and fine grain structural steels — Part 2: Tolerances, dimensions and sectional properties*.

BS EN 10223-1, *Steel wire and wire products for fences — Part 1: Zinc and zinc alloy coated steel barbed wire*.

BS EN 10223-4, *Steel wire and wire products for fences — Part 4: Steel wire welded mesh fencing*.

BS EN 10223-6:1998, *Steel wire and wire products for fences — Part 6: Steel wire chain link fencing*.

## 3 Wire for chain link fences

### 3.1 General

All wire shall conform to the relevant parts of BS EN 10223 or BS 4102. Mild steel wire diameters shall be in accordance with Table 1.

### 3.2 Chain link mesh

Chain link mesh shall be of zinc or class A zinc alloy coated wire conforming to BS EN 10223-6:1998, 5.2d), or organic coated wire conforming to BS EN 10223-6:1998, 5.2a). The size of mesh shall be 40 mm or 50 mm as defined in BS EN 10223-6. The width of the mesh shall be 2.4 m, if it is not to be buried, or 2.7 m if it is to be buried. The top edge and, if exposed, the bottom edge shall be barbed. Chain link mesh shall be joined by interweaving a spiral and restoring the knuckle or barb.

### 3.3 Line wire

Mild steel line wire shall conform to BS 4102 with a diameter conforming to Table 1.

### 3.4 Stirrup wire

Stirrup wire, used for securing line wires to intermediate posts, shall be of mild steel conforming to BS 4102 with a diameter conforming to Table 1.

### 3.5 Tying wire

Tying wire, used for securing mesh to line wires, shall be of mild steel conforming to BS 4102 with a diameter conforming to Table 1.

### 3.6 Barbed wire

Barbed wire shall conform to BS EN 10223-1.

## 4 Concrete components for chain link fences

### 4.1 General

Concrete posts and struts shall be of steel reinforced concrete conforming to annex A.

NOTE See clause 5 for steel posts and struts.

### 4.2 Tolerances on size

Concrete components shall conform to their specified size within the following tolerances:

- a) a demoulding draw allowance of up to 4 mm on each of two opposing sides;
- b) additional deviations on size of:
  - 1) length of posts:  $\pm 1\%$ ;
  - 2) cross-section:  $\pm 3$  mm.

NOTE The cross-section is measured about the centre lines.

### 4.3 Posts

The long arrises formed in the base of the mould shall either be rounded or all their sharp edges shall be removed. The arrises formed at the top of the mould shall be free from overfill. The heads of posts shall be either weathered or half rounded in order to prevent lodgement of water.

Posts shall be holed to allow the fixing of line wires, etc. as specified in 4.4. The hole for the top line wire shall be approximately 75 mm below the top of the post (excluding any extension for barbed wire). Holes for bolts shall allow the bolt to be freely inserted. Holes for wire shall allow a nominal 6 mm diameter bolt to be freely inserted. All holes shall be free from obstructions and accurately positioned.

Posts for use with barbed wire shall have integral extensions (see 4.5) or be holed for the attachment of extension arms (see also 6.11).

### 4.4 Intermediate posts

The cross-section of intermediate posts shall be 125 mm  $\times$  100 mm. The 100 mm dimensions shall be constant and parallel to the fence line.

The vertical portion of intermediate posts shall be holed for the attachment of line wires but shall not be tapered. The heads of intermediate posts with an integral cranked extension arm shall be tapered to 85 mm  $\times$  100 mm at the top, and shall be holed for the attachment of barbed wire.

The length of intermediate posts shall be 3.15 m measured from the top line wire position to the base of the post. The top line wire position shall be 75 mm below the tops of posts without an integral extension, bringing the overall length of the post to 3.22 m. Where separate extension arms are to be fitted, intermediate posts shall be holed for the attachment of the arms [see Figures C.1a) and C.1b)].

### 4.5 Straining posts

The cross-section of straining posts shall be 150 mm  $\times$  150 mm. The 150 mm dimensions parallel to the fence line shall be constant.

The vertical portion of straining posts shall be holed for the attachment of straining fittings for line wires but shall not be tapered. The heads of straining posts with an integral cranked extension arm shall be tapered to 85 mm  $\times$  150 mm at the top and shall be holed for the attachment of straining fittings for barbed wires.

The length of straining posts shall be 3.15 m measured from the top line wire position to the base of the post. The top line wire position shall be 75 mm below the top of posts without an integral extension, bringing the overall length of the post to 3.22 mm. Where separate extension arms are to be fitted, straining posts shall be holed for the attachment of the arms.

Straining posts shall provide a firm bearing for the struts, which shall meet the straining posts at a point within the top one-third of the length of the vertical portion of the straining post which is above the ground [see Figures C.1a) and C.1b)].

### 4.6 Gate posts

Gate posts for gates up to 1.2 m wide leaf shall conform to 4.5. Gate posts shall, in addition, be holed for the attachment of gate and fence fittings and be weathered to discourage scaling. Integral extension arms on gate posts shall be vertical.

NOTE Gates with leaves over 1.2 m in width should have steel gate posts (see 5.5).

### 4.7 Struts

The cross-section of struts shall be 100 mm  $\times$  100 mm. Struts shall not be tapered. The length of struts shall be not less than 3.25 m.

### 4.8 Reinforcement

Posts and struts shall be reinforced with four steel bars. Reinforcements for gate posts and straining posts shall be 10 mm diameter. Reinforcement for intermediate posts and struts shall be 8 mm diameter.

NOTE If steel having a characteristic strength greater than 250 N/mm<sup>2</sup> is used for reinforcement, the cross-section of the bars may be proportionately reduced (see annex A).

Table 1 — Diameters of wires in chain link fencing

| Type of mesh protection    | Mesh wire |                           |                              |                   | Line wire                 |                              |                   | Stirrup wire              |                              |                   | Tying wire                |                              |                   |
|----------------------------|-----------|---------------------------|------------------------------|-------------------|---------------------------|------------------------------|-------------------|---------------------------|------------------------------|-------------------|---------------------------|------------------------------|-------------------|
|                            | Mesh size | Zinc coated wire diameter | Plastics coated wire grade A |                   | Zinc coated wire diameter | Plastics coated wire grade A |                   | Zinc coated wire diameter | Plastics coated wire grade A |                   | Zinc coated wire diameter | Plastics coated wire grade A |                   |
|                            |           |                           | Core wire diameter           | External diameter |                           | Core wire diameter           | External diameter |                           | Core wire diameter           | External diameter |                           | Core wire diameter           | External diameter |
|                            | mm        | mm                        | mm                           | mm                | mm                        | mm                           | mm                | mm                        | mm                           | mm                | mm                        | mm                           | mm                |
| Zinc coated chain link     | 40        | 3.55                      | —                            | —                 | 4.00                      | —                            | —                 | 2.5                       | —                            | —                 | 1.60                      | —                            | —                 |
| Zinc coated chain link     | 50        | 3.55                      | —                            | —                 | 4.00                      | —                            | —                 | 2.5                       | —                            | —                 | 1.60                      | —                            | —                 |
| Zinc coated chain link     | 50        | 5.00                      | —                            | —                 | 5.00                      | —                            | —                 | 2.5                       | —                            | —                 | 1.60                      | —                            | —                 |
| Plastics coated chain link | 50        | —                         | 3.55                         | 4.75              | —                         | 3.55                         | 4.75              | —                         | 2.5                          | 3.55              | —                         | 1.40                         | 2.00              |
| Plastics coated chain link | 50        | —                         | 4.75                         | 6.40              | —                         | 4.75                         | 6.40              | —                         | 2.5                          | 3.55              | —                         | 1.40                         | 2.00              |

NOTE The wire diameters specified are taken from BS EN 10223-6:1998, Table 1.