

Fences —

Part 3: Specification for strained wire fences

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Road Engineering Standards Committee (RDB/-) to Technical Committee RDB/34 upon which the following bodies were represented:

British Independent Steel Producers' Association
 British Precast Concrete Federation Ltd.
 British Steel Industry (Wire Section)
 British Timber Merchants' Association
 British Wire Netting Association
 British Wood Preserving Association
 Cement and Concrete Association
 Concrete Society
 Country Landowners' Association
 Department of Agriculture and Fisheries for Scotland
 Department of the Environment (Building Research Establishment, Princes Risborough Laboratory)
 Department of the Environment (Property Services Agency)
 Department of Transport (Highways)
 Fencing Contractors' Association
 Forestry Commission
 Home Timber Merchants' Association of Scotland
 Institute of Clerks of Works of Great Britain Inc.
 Institute of Leisure and Amenity Management
 Institution of Civil Engineers
 Landscape Institute
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 National Farmers' Union
 Royal Institution of Chartered Surveyors
 Society of Chain Link Fencing Manufacturers
 Society of Chestnut Fencing Manufacturers
 Timber Growers United Kingdom
 Timber Research and Development Association
 Timber Trade Federation
 Wire Products Association

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

Consumer Standards Advisory Committee of BSI
 County Surveyor's Society
 Fencing Industry Association

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Foreword

This British Standard has been prepared under the direction of the Road Engineering Standards Committee. It is a revision of BS 1722-3:1973, which is withdrawn.

BS 1722 is published in separate Parts as follows:

- *Part 1: Specification for chain link fences;*
- *Part 2: Specification for rectangular wire mesh and hexagonal wire netting;*
- *Part 3: Specification for strained wire fences;*
- *Part 4: Specification for cleft chestnut pale fences;*
- *Part 5: Specification for close-boarded fences;*
- *Part 6: Specification for wooden palisade fences;*
- *Part 7: Specification for wooden post and rail fences;*
- *Part 8: Specification for mild steel (low carbon steel) continuous bar fences;*
- *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 wire mesh fencing for tennis court surrounds.*

The various Parts specify requirements for the types of fence that are considered suitable for standardization. It should be noted that no attempt has been made to standardize fences of a purely decorative nature, or to suit special requirements, or to specify requirements for “patent” proprietary fencing systems. It is recommended that the structure of such fences should comply with those parts of this Part of BS 1722 that are applicable.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

The purpose of this standard is to establish minimum requirements for materials and workmanship for 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 needs to be constructed. Throughout this standard there are requirements for sizes of components, together with the permissible tolerances on size. These are minimum requirements and it will normally be acceptable to use larger sizes, except where it would otherwise adversely affect the fit of components or where replacement parts need to match up with those already present.

The choice of a fence is affected by factors such as the intended purpose of the fence, the desired service life, aesthetic considerations and the availability of components. The specifier of the fence will know its intended purpose and by reference to Table 1 a suitable choice can be made. This then gives those erecting the fence the basic characteristics that need to be provided. This standard includes requirements for protective treatments. However, an important aspect of providing an extended service life is the maintenance of the fence after its erection; this is outside the scope of this standard. Premature failure can be avoided by taking care not to damage protective treatments during installation.

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

This revision has retained the method of allocating a reference code to each type of fence indicating its height, the number of line wires and whether they are used in conjunction with droppers, and the material used for the posts. These type references are given in full in Table 1. The first letter indicates that it is either a general pattern or a dropper pattern strained wire fence, the second the type of post that is used. The numbers give an indication of the height of the fence, e.g. DC 90 indicates a 0.90 m high fence with concrete posts and droppers. For the sake of uniformity the quoted heights are those to the top wire and exclude any variation in ground clearance at the base. The third letter, where present, indicates the number of line wires.

Designations of bolt sizes are in accordance with BS 4190.

The proof test of concrete strength has been deleted as experience had shown that there were technical problems associated with the application and interpretation of the test. Cube tests of concrete strength are now required and the frequency of testing is specified to ensure that regular quality checks are made.

Since the publication of the previous edition of this standard BS 5589 has been published, and the timber appendix in this standard has been revised to include the recommendations of BS 5589. Quality requirements have been added for round, quartered and cleft timber posts.

In appendix C details have been included of methods for measuring defects in timber, and in particular the measurement of knots. In the case of the structural members of a fence, including posts, struts and rails, the principle of knot area ratio (K.A.R.) has been introduced as a means of determining, by visual assessment of the proportion of the cross section occupied by knots, the maximum permissible knots for fencing grade timber. Although the application of the method of knot measurement is new, in so far as timber fencing components are concerned, it has been applied to the grading of structural timber for more than a decade. K.A.R. is a firmly established and widely accepted method of knot assessment which in itself is a critical part of all timber grading. The adoption of K.A.R. as part of grading timber for fencing is a logical move in unifying timber grading rules where the question of strength is involved.

To assist those specifying and/or providing a fence, appendix E provides guidance on the more important details, which often take the form of selected options, that need to be specified at the time of ordering a fence. Appendix D contains a suggested sampling procedure. These are new features of the standard.

A British Standard does not purport to include all the 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 24, 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

1.1 Scope

This Part of BS 1722 specifies requirements for strained wire fences of the general pattern and of the dropper pattern, where droppers are used to maintain the spacing of the wires.

This standard specifies lengths of posts and struts, and foundation details for use in normal ground and does not cover the situations where special conditions exist, e.g. ground that is softer or firmer than usual, which warrant a change in normal lengths (see foreword).

This standard is divided into sections that specify separate requirements for the material components for fences (see sections 2 and 4) and the erection of the fences (see sections 3 and 5).

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

1.2 Definitions

For the purposes of this Part of BS 1722, the timber definitions given in BS 6100-4.1 apply.

NOTE For convenience, the relevant definitions have been repeated in C.2.

1.3 Dimensions and general characteristics

The dimensions of strained wire fences shall be as given in Table 1.

NOTE Figure 1 illustrates the general characteristics of the two patterns of strained wire fencing. It is not intended to illustrate any particular requirements of this Part of the standard but provides guidance as to the general layout of a typical fence, and on the terminology associated with this form of fencing.

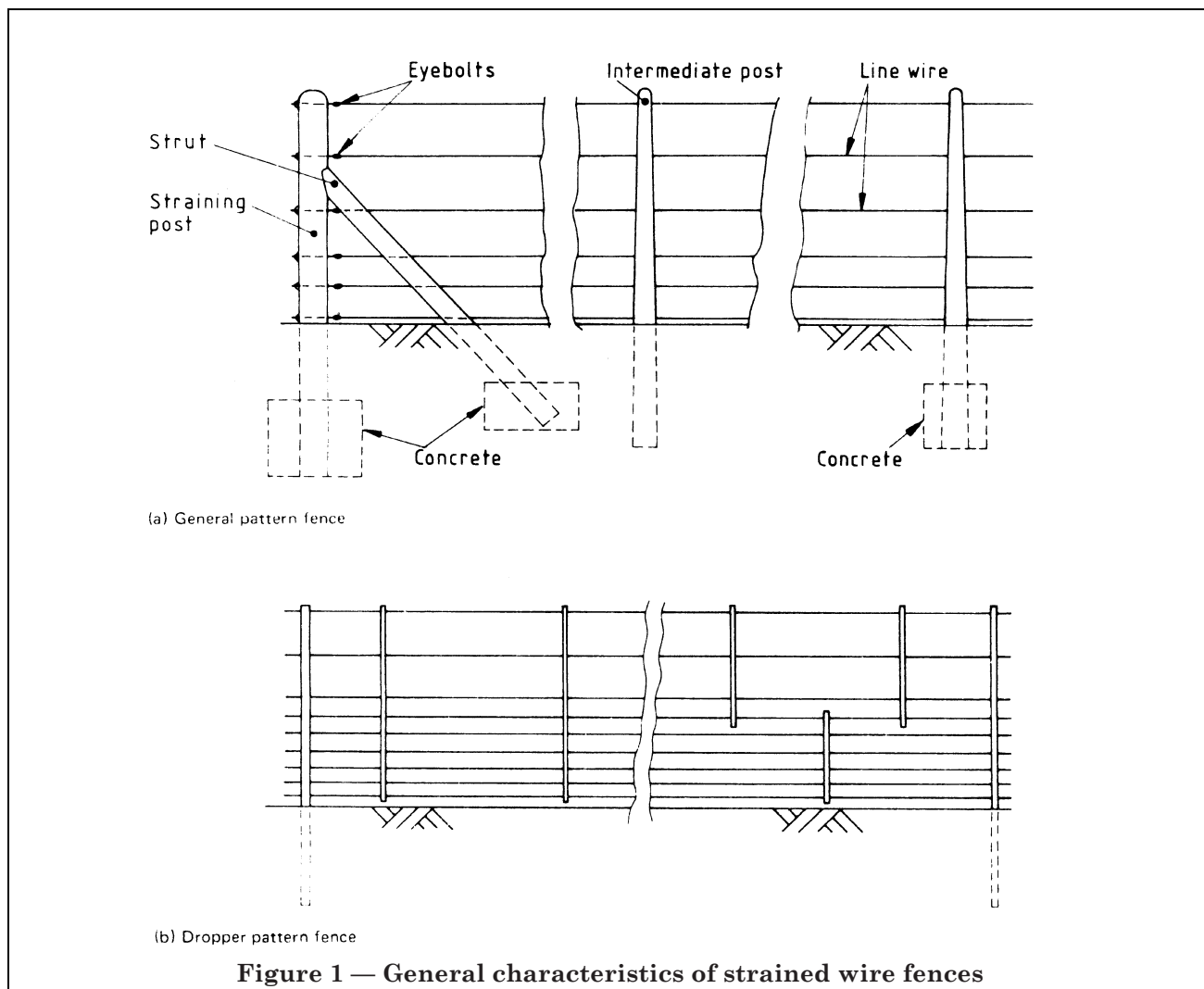


Table 1 — General characteristics of strained wire fences

Fence types						Height of top wire	Number of horizontal wires	Applicability ^a	Spacings between horizontal wires, from the top wires ^b
With concrete post		With steel posts		With wooden posts					
General pattern	Dropper pattern	General pattern	Dropper pattern	General pattern	Dropper pattern				
SC 90	DC 90	SS 90	DS 90	SW 90	DW 90	m	3	Housing	mm 330, 330
SC 105A	DC 105A	SS 105A	DS 105A	SW 105A	DW 105A	1.05	5	General purposes	250, 250, 230, 150
SC 105B	SS 105B	SS 105B	DS 105B	SW 105B	DW 105B	1.05	6		250, 250, 230, 150, 100
SC 120	DC 120	SS 120	DS 120	SW 120	DW 120	1.20	6		250, 250, 230, 150, 150
SC 135A	DC 135A	SS 135A	DS 135A	SW 135A	DW 135A	1.35	7	Special purposes	250, 250, 230, 150, 150, 150
SC 135B	DC 135B	SS 135B	DS 135B	SW 135B	DW 135B	1.35	8		250, 250, 230, 150, 150, 150, 100
SC 135C	DC 135C	SS 135 C	DS 135C	SW 135C	DW 135C	1.35	9		250, 225, 225, 150, 125, 125, 100, 75
—	DC 180	—	DC 180	—	DW 180	1.80	11		225, 225, 200, 175, 175, 175, 150, 150, 125, 100
—	DC 210	—	DC 210	—	DW 210	2.10	16		250, 225, 225, 175, 125, 100, 100, 100, 100, 100 100, 100, 100, 100, 100

NOTE To prevent damage to the fence by animals, additional lines of barbed wire may be attached to the face of the posts in a suitable position.

^a The applicability of fences is dependent on many factors which cannot be standardized, and the selection of fence type should be made for particular circumstances.

^b Top wire secured 75 mm below the top of concrete or wood posts, or 25 mm below the top of steel posts.

Section 2. Materials for general pattern fences

2.1 General

The sizes specified in 2.2 to 2.7 are minimum requirements and it shall therefore be permissible to use larger sizes, except where this would adversely affect the fit of the components or where replacement parts need to match those already present.

2.2 Wire

2.2.1 Line wire

Line wire shall comply with BS 4102 and shall be one of the following:

- a) zinc coated low carbon steel (mild steel) with a nominal wire diameter of 4.0 mm, 4.5 mm or 5.0 mm; or
- b) zinc coated high tensile wire with a nominal wire diameter of 3.15 mm; or
- c) plastics coated high tensile wire having a tensile strength of 1 050 N/mm² with a zinc coated core of 3.15 mm nominal core diameter and a 4.0 mm overall diameter.

2.2.2 Stirrup wire

Stirrup wire shall comply with BS 4102 and shall be of zinc coated low carbon steel (mild steel) or grade A plastics coated low carbon steel (mild steel) and shall have a nominal wire core diameter of 2.5 mm.

2.2.3 Barbed wire

Barbed wire shall comply with BS 4102 and shall be zinc coated and shall be made from either low carbon steel (mild steel) wire or high tensile steel wire.

2.3 Concrete components

2.3.1 General

2.3.1.1 Material. Concrete posts and struts shall be of steel reinforced concrete complying with appendix A.

2.3.1.2 Tolerances on size. The following permissible deviations shall apply to the specified size of concrete components when determining the actual sizes.

- a) A de-moulding draw allowance of up to 4 mm on each of two opposing sides.
- b) An allowance on the base dimensions of intermediate posts resulting from the use of a mould having the base dimensions given in Table 2 that has been shortened by means of a stopping-off plate located not more than 300 mm from the base of the mould.

c) Additional deviations on size of:

- 1) length: $\begin{matrix} +50 \\ -25 \end{matrix}$ mm;
- 2) cross section: $\begin{matrix} +6 \\ -4 \end{matrix}$ mm.

NOTE The cross section is measured about the centre lines.

2.3.1.3 General constructional details. The long arrises formed in the mould shall either be rounded or have all sharp edges removed. The heads of posts shall be weathered so as to prevent lodgement of water.

Holes for bolts shall allow the bolt to be freely inserted. Holes for wire shall allow an M6 bolt to be freely inserted. All holes shall be free from obstruction and accurately positioned.

2.3.2 Posts and struts

The dimensions of concrete fence posts and struts shall be as given in Table 2. Posts shall be reinforced with four steel reinforcing bars of the size given in Table 2, except that if steel having a characteristic strength greater than 250 N/mm² is used, it shall be permissible for the cross section of the reinforcing bars to be proportionately reduced.

Straining posts and struts shall not be tapered. Straining posts shall be provided with a firm bearing for struts at a point within the top third of the length of the straining post, measured above the ground level. Straining posts shall be holed for the attachment of straining fittings. When line wires are to be passed through them, struts shall be provided with either holes or slots.

Intermediate posts shall be tapered to 75 mm × 75 mm at the top and shall be holed to allow the attachment of line wires.

NOTE The positions of line wires are given in Table 1.

2.4 Steel components

NOTE See 2.6 for steel fittings.

2.4.1 General

2.4.1.1 Materials and protective treatment. Steel posts and struts shall comply with appendix B.

2.4.1.2 Tolerances on size. The following permissible deviations shall apply to the specified sizes of steel components when determining the actual sizes:

- a) length: $\begin{matrix} +50 \\ -25 \end{matrix}$ mm;
- b) cross section: as specified in the appropriate material standards given in B.1.

2.4.1.3 General constructional details. Steel components shall be free from sharp edges and burrs. The tops of all hollow steel posts shall be capped.

Posts shall be holed for the attachment of line wires, etc. as specified in 2.4.2. The hole for the top horizontal wire shall be appropriately 25 mm below the top of the post. All holes shall be free from obstructions and shall be accurately positioned.

2.4.2 Posts and struts

2.4.2.1 Fence posts and struts. The dimensions of steel posts and struts of rolled steel angle, circular hollow section or rectangular hollow section shall be as given in Table 3.

Straining posts and struts shall either be fitted with baseplates or have spragged or dowelled ends (see 2.4.2.2). Straining posts and struts shall be holed to allow the two to be bolted together with bolts with a minimum diameter of 8 mm at a point within the top third of the length of the straining post, measured above the ground level. In addition, straining posts shall be holed to allow the attachment of straining fittings.

Table 2 — Concrete fence posts and struts

Fence height type	Intermediate posts			Straining posts			Struts ^a		
	Length	Base dimensions	Reinforcement diameter	Length	Section	Reinforcement diameter (all lengths)	Length (approx.)	Section	Reinforcement diameter (all lengths)
m	m	mm × mm	mm	m	mm × mm	mm	m	mm × mm	mm
0.90	1.57	100 × 100	6	1.57	100 × 100 or 125 × 125 ^b	6 or 8 ^b	1.50	75 × 75 or 100 × 75 ^b	6
1.05	1.72	125 × 125		1.87	125 × 125	8	1.83	100 × 75	
1.20	1.87			2.02			1.98		
1.35 A and B	2.02			2.17			2.13		
1.35 C	2.17			2.32	150 × 150	10	2.13	100 × 100	8
1.80	2.62	2.77		200 × 200	12	2.73			
2.10	2.92	3.07				3.03			

^a These lengths are suitable for struts fixed at an angle of 45° on level ground. If site conditions make the use of struts of these lengths unsuitable, the length may need to be specified (see 1.1).

^b The larger section is for use with high tensile or spring steel line wires.

Table 3 — Steel fence posts and struts

Fence height	Intermediate posts				Straining posts				Struts ^a			
	Length	Section			Length ^b	Section			Length ^b approx.	Section		
		Rolled steel angle	Circular hollow section	Rectangular hollow section		Rolled steel angle	Circular hollow section	Rectangular hollow section		Rolled steel angle	Circular hollow section	Rectangular hollow section
m	m	mm × mm × mm	mm × mm	mm × mm × mm	m	mm × mm × mm	mm × mm	mm × mm × mm	m	mm × mm × mm	mm × mm	mm × mm × mm
0.90	1.52	40 × 40 × 5	33.7 × 2.6	20 × 25 × 2.5	1.52	50 × 50 × 5	48.3 × 3.2	50 × 50 × 4	1.52	40 × 40 × 5	26.9 × 3.2	25 × 25 × 2.5
1.05	1.67	45 × 45 × 5	42.4 × 2.6	40 × 40 × 3	1.82	60 × 60 × 8	76.1 × 3.2	60 × 60 × 4	1.67	45 × 45 × 5	42.4 × 3.2	40 × 40 × 3
1.20	1.82				1.97				1.82			
1.35	1.97				2.27				1.97			
1.8	2.57	50 × 50 × 6	48.3 × 3.2	50 × 50 × 3	2.72	80 × 80 × 10	114.3 × 3.6	100 × 50 × 4	2.72 ^c	50 × 50 × 6	60.3 × 3.2	50 × 50 × 4
2.1	2.87				3.02				3.02 ^c			

^a These lengths are suitable for struts fixed at an angle of 45° on level ground. If site conditions make the use of struts of these lengths unsuitable, the length may need to be specified (see 1.1).

^b Straining posts and struts not set in concrete shall be increased in length by 300 mm and posts shall be set 300 mm deeper in the ground.

^c Doubled struts shall be used with the dropper pattern fences.

Intermediate posts shall:

- a) be fitted with baseplates; or
- b) have spragged ends; or
- c) have dowelled ends; or
- d) be pointed for driving into the ground.

Intermediate posts shall be holed to allow the attachment of line wires.

NOTE The positions of line wires are given in Table 1.

2.4.2.2 Baseplates and dowels. Steel baseplates shall be fabricated from rolled steel plate complying with grade 43C of BS 4360 and shall have a minimum thickness of 3 mm. They shall be either bolted or welded to their associated posts. If welded on, the baseplates shall be welded in two places and for a length of not less than 50 % of the sum of the external faces of the posts or struts. Baseplates for steel straining posts and struts shall project not less than 50 mm from all external faces of a post.

Baseplates for steel intermediate posts shall project not less than 40 mm from at least one external face of a post.

Dowels shall be of steel and shall be at least 10 mm in diameter. They shall be driven through the post within 250 mm of the base of the post and shall project not less than 25 mm from either side of the post.

2.5 Timber components

2.5.1 General

2.5.1.1 Material. Timber posts and struts shall be of square sawn, round or cleft timber complying with appendix C.

NOTE Appendix D gives a suggested method of sampling for fence timber, for use when specified.

2.5.1.2 Tolerances on size. The following permissible deviations shall apply to the specified sizes of timber components when determining the actual size.

- a) The sizes specified in this standard relate to timber with a moisture content of 28 % determined in accordance with BS 5589. When timber has a lower moisture content than this an additional allowance (reduction) on size of 1 % for every 5 % of moisture content below 28 % shall be permitted.
- b) Additional deviations on size of:
 - 1) length of posts: ± 50 mm;
 - 2) other dimensions:
 - i) sawn timber:
 - specified size, under 75 mm: ± 3 mm
 - specified size, 75 mm and over: ± 6 mm;
 - ii) round or cleft timber: sizes are minimum sizes.

2.5.2 Posts and struts

The dimensions of timber fence posts and struts shall be as given in Table 4 and Table 5. Sawn fence posts and struts shall have the same cross section throughout. Round and cleft fence posts and struts shall be sufficiently straight to provide at least one straight face to which wires can be fixed.

Straining posts and struts shall be cut square across at their base. Straining posts shall be notched to receive struts at a point within the top third of the length of the straining post measured above the ground level.

Intermediate posts shall be either cut square across or pointed for driving.

2.6 Fittings

2.6.1 Eye bolt strainers

Eye bolt strainers shall consist of bolts of 250 mm overall length and not less than 9.50 mm diameter with a welded eye at one end. They shall be threaded and fitted with nuts and washers. Two-way eye bolt strainers shall be fitted with ring nuts.

Eye bolt strainers shall be hot dip galvanized in accordance with BS 729.

2.6.2 Winding brackets

Winding brackets intended for attachment to a post shall be manufactured from mild steel flat not less than 25 mm \times 3 mm and shall be fitted with a winding bolt of 12 mm minimum diameter with a friction type ferrule or ratchet winder.

Each winding bracket shall have one fixing bolt, provided with two nuts and one washer, which can be either;

- a) an eye bolt of 9.5 mm minimum diameter with a welded eye; or
- b) a bolt of 10 mm diameter, with a ring nut when for use at intermediate straining posts; or
- c) a tubular bolt threaded at both ends.

Wire winding fittings for use in-line with line wires or barbed wire shall be manufactured from mild steel flat not less than 45 mm \times 2 mm and shall be fitted with a winding bolt of 12 mm diameter and with a friction type ferrule or ratchet winder. One end of the winding bracket shall be provided with a hole for the attachment of a line of wire.

Winding brackets, fixing bolts and nuts shall be hot dip galvanized in accordance with BS 729.

Staples

Hair-pin staples shall be of not less than 3 mm diameter round wire or sectional wire with the same cross-sectional area and shall have a zinc coating complying with BS 443.

Staples for timber posts shall be 40 mm × 4 mm of round or sectional wire with the same cross-sectional area and shall have a zinc coating complying with BS 443.

2.6.3 Preformed fence connectors¹⁾

Preformed fence connectors shall consist of not less than three wires of 2 mm minimum diameter formed into a helix approximately 380 mm long and with a central core into which the line wire is fitted. The connector shall have a zinc coating complying with BS 443 and shall be provided with a slip resistant finish.

NOTE It is essential that connectors are designed to match the diameter and type of line wire used. One connector is adequate for terminating a line wire at a straining post, two connectors are required to join two line wires in a continuous run.

2.6.4 Bolts, nuts, washers and nails

Bolts and nuts shall comply with BS 4190 and shall be strength grade 4.6. Nails shall be round plain head nails complying with BS 1202-1. Washers shall comply with BS 4320. Bolts, nuts, washers and nails shall be hot dip galvanized in accordance with BS 729.

2.7 Concrete surrounding bases of posts and struts

Concrete for surrounding the bases of posts and struts shall be not leaner by mass than one part of cement to ten parts of graded aggregate of 40 mm nominal maximum size mixed with the minimum requisite quantity of clean water. The concrete shall be placed in position before the commencement of the initial set.

Table 4 — Sawn timber fence posts and struts

Fence height	Intermediate posts		Straining posts		Struts ^a	
	Length	Section	Length ^b	Section	Length ^b	Section
m	m	mm × mm	m	mm × mm	m	mm × mm
0.90	1.57	75 × 75	1.57 or 1.72 ^c	100 × 100 or 125 × 125 ^d	1.57	75 × 75
1.05	1.72		1.87		1.87	
1.20	1.87	100 × 100	2.02	125 × 125	2.02	100 × 100 or 100 × 50 (twin)
1.35 A and B	2.02		2.17		2.17	
1.35 C	2.02		2.32	2.17		
1.80	2.62		2.75	2.75		
2.10	2.92		3.00	150 × 150	3.00	

^a These lengths are suitable for struts fixed at an angle of 45° on level ground. If site conditions make the use of struts of these lengths unsuitable, the length may need to be specified (see 1.1).

^b When not set in concrete the lengths of straining posts and struts shall be increased by 300 mm and posts set 300 mm deeper in the ground.

^c The longer length is for use with high tensile line wire.

^d The larger section is for use with high tensile line wire.

¹⁾ Used to join or terminate line wires.

Table 5 — Round timber fence posts and struts

Fence height	Intermediate posts		Straining posts		Struts ^a	
	Length	Top diameter (min.)	Length ^b	Top diameter (min.)	Length ^b (approx.)	Top diameter (min.) ^c
m	m	mm	m	mm	m	mm
0.90	1.57	65	1.57 or 1.72 ^d	100 or 125 ^e	1.57	65
1.05	1.72		1.87		1.87	
1.20	1.87	80	2.02	125	2.02	80
1.35 A and B	2.02		2.17		2.17	
1.35 C	2.02		2.32		2.17	
1.80	2.62		2.75	150	2.75	100
2.10	2.92		3.00		3.00	

^a These lengths are suitable for struts fixed at an angle of 45° on level ground. If site conditions make the use of struts of these lengths unsuitable, the lengths may need to be specified (see 1.1).

^b When not set in concrete the lengths of straining posts and struts shall be increased by 300 mm and posts set 300 mm deeper in the ground.

^c Dimensions are under bark measurements. If cleft or quartered timber is used, this is the diameter of a circle that fits inside all parts of the perimeter of the top of the post or strut.

^d The longer length is for use with high tensile line wire.

^e The larger section is for use with high tensile line wires.

Section 3. Erection of general pattern fences

3.1 Level

The top of the fence shall follow approximately the level of the ground along the line of the fence.

NOTE Unless specified (see appendix E), the erection of the fence will not include cutting or filling of the ground to vary the levels.

3.2 Posts and struts

3.2.1 General

Holes for posts and struts shall have vertical sides except that it shall be permissible for the side of a strut hole adjacent to the post to be sloped.

NOTE It is realized that the ground at the top of a hole is damaged during digging and this is acceptable provided it is limited to the top of the hole and does not extend down such that the hole itself is tapered out towards the top.

Holes for fence posts and struts to be set in rammed backfill only shall be as small as is practical to allow for backfilling and ramming.

When erecting any concrete posts, or steel posts with spragged or dowelled ends, after insertion of the post the hole shall be filled for not less than half its depth with concrete which shall be well rammed as the filling proceeds. The remainder of the hole shall be filled with backfill which shall be well rammed before the commencement of the initial set of the concrete.

If timber posts with square cut ends or steel posts fitted with baseplates are used, they shall be set either in concrete, as specified for concrete posts, or directly in the ground and surrounded by rammed backfill. The backfill shall be well rammed as the filling proceeds.

Timber or steel posts with pointed ends shall be driven into the ground.

3.2.2 Straining posts

Straining posts shall be provided at all ends and corners, at changes in direction or acute variations in level and at intervals not exceeding 150 m for mild steel line wire or 300 m for high tensile line wire in straight lengths of fence.

Straining posts set in concrete shall be set in the ground to a depth of 0.6 m for fences 0.9 m high, 0.75 m for fences over 0.9 m²⁾ but less than 1.8 m high, and 0.9 m for fences 1.8 m high and over. Straining posts not set in concrete shall be set an additional 300 mm deeper in the ground. The holes for straining posts set in concrete shall be not less than 0.45 m × 0.45 m in plan or, if round, as may be produced by an auger, not less than 0.3 m in diameter.

3.2.3 Struts

Struts shall be fitted to all straining posts in the direction of each line of fencing. Concrete struts and posts shall be securely located together. Steel struts and posts shall be bolted together with M8 bolts. Timber struts shall be securely nailed into the notch in the straining posts with two 125 mm × 5 mm nails.

The bottom end of all struts shall be not less than 0.45 m below ground level measured to the centre of the strut or baseplate. The holes for struts set in concrete shall be not less than 0.30 m wide × 0.45 m long in plan.

3.2.4 Intermediate posts

Intermediate posts shall be provided at intervals, measured centre-to-centre of posts, not exceeding 3.5 m.

Intermediate posts shall be set or driven into the ground to a depth of 0.6 m for fences less than 1.8 m high and 0.75 m for fences 1.8 m high and over.

Square holes for intermediate posts to be set in concrete shall allow a minimum thickness of 75 mm of concrete on each side of the post. Round holes shall have a minimum diameter of 0.3 m.

3.3 Infill

3.3.1 Line wire

3.3.1.1 General. The number of line wires shall be as given in Table 1. The top wire shall be secured approximately 75 mm below the top of concrete and timber posts, and 25 mm below the top of steel posts. The spacing of the line wires shall be as given in Table 1. If a line wire is joined at mid-span, the means of joining shall enable the line wire to be strained to the tension normally applied to a line wire in one length.

3.3.1.2 Attachment to straining posts. Each line wire shall be strained tightly and secured to each straining post as follows:

For round timber posts, one of the following means shall be used.

Winding brackets attached to the post with fixing bolts.

Eyebolt strainers passed through a hole in the post and secured with a nut and washer. Eyebolt strainers fixed to intermediate straining posts shall, in addition, be fitted with ring nuts; in this case the wire attached to the eye of the eyebolt strainer shall be tensioned before the ring nut is fixed.

²⁾ For fences designated 135C straining posts set in concrete are set in the ground 0.9 m.

Each line shall be strained tightly around each straining post using a suitable straining tool³⁾. Once strained, the free end of the line wire shall be secured to the main length by means of a preformed fence connector and shall be maintained at the required height with a staple driven into the post to a running fit.

- d) For all other posts, the method specified in either 1) or 2) of a) shall be used.

3.3.1.3 Attachment to intermediate posts. With the exception of high tensile line wires, for which wire stirrups are not permitted, each line wire shall be secured to each intermediate post by the following means.

- a) For concrete posts, one of the following:
- 1) a wire stirrup passed through a hole in the post and secured to the line wire by three complete turns on each side of the post; or
 - 2) a hair-pin staple passed through a hole in the post and the ends twice bent over or, if high tensile wire staples are used, once bent over; or
 - 3) the line wire passed through a hole in the posts.
- b) For steel posts, one of the following:
- 1) a wire stirrup fixed as for concrete posts; or
 - 2) a hair-pin staple fixed as for concrete posts; or
 - 3) the line wire passed through a hole in the posts.

- c) For timber posts, either:
- 1) the line wire passed through a hole in the post; or
 - 2) a single staple driven to a running fit.

NOTE Care should be taken to avoid damaging the wire or its coating by driving the staple too far home.

3.3.2 Barbed wire

If barbed wire is specified (see note to Table 1), it shall be attached to the straining posts and intermediate posts by the means specified for line wires (see 3.3.1).

NOTE 1 It is not possible to pass barbed wire through holes in posts.

NOTE 2 When tensioning high tensile barbed wire, care should be taken to avoid any untwisting of the wire as a result of over-straining.

3.4 Renovation of damaged areas of hot dip galvanized coating

Small areas of hot dip galvanized coating damaged by welding, cutting or by excessively rough treatment during transit and erection shall be renovated either by the use of low melting point zinc alloy repair rods or powders made specifically for this purpose, or by the use of at least two coats of good quality zinc-rich paint (see BS 4652). Sufficient material shall be applied to provide a zinc coating at least equal in thickness to the original layer.

NOTE The maximum size of the areas for which such repairs are acceptable will depend, to some extent, on the article and the application but for general guidance an area of 40 mm² is suggested as being suitable.

³⁾ Careful consideration should be given to the choice of straining tool for use, in order to minimize damage to the coated wire.

Section 4. Materials for dropper pattern fences

4.1 General

The sizes specified in 4.2 to 4.7 are minimum requirements and it shall therefore be permissible to use larger sizes, except where this would adversely affect the fit of the components or where replacement parts need to match those already present.

4.2 Wire

4.2.1 Line wire

Line wire shall comply with BS 4102 and shall be one of the following:

- a) high tensile wire with a nominal wire diameter of 3.15 mm and a zinc coating complying with BS 443; or
- b) spring steel wire complying with type NS 2 of BS 5216 with a minimum nominal wire diameter of 2.65 mm and a zinc coating complying with BS 443; or
- c) plastics coated high tensile wire having a tensile strength of 1 050 N/mm² with a zinc coated core of 3.15 mm nominal core diameter and 4.00 mm overall diameter.

4.2.2 Stirrup wire

Stirrup wire shall comply with 2.2.2.

4.2.3 Barbed wire

Barbed wire shall comply with 2.2.3.

4.3 Concrete components

Concrete components shall comply with 2.3.

4.4 Steel components

Steel components shall comply with 2.4.

4.5 Timber components

Timber components shall comply with 2.5.

4.6 Fittings

4.6.1 Eyebolt strainers

Eyebolt strainers shall comply with 2.6.1.

4.6.2 Winding brackets

Winding brackets shall be manufactured from either low carbon steel (mild steel) flat not less than 50 mm × 3 mm or cast iron of similar strength, and shall be fitted with a steel or malleable cast iron drum or spindle with a minimum diameter of 25 mm, and with a ratchet winder.

Each winding bracket shall have one fixing bolt provided with two nuts and one washer which can be either:

- a) an eye bolt of 9.5 mm minimum diameter with a welded eye; or
- b) a bolt of 10 mm diameter, with a ring nut when for use on intermediate straining posts; or
- c) a tubular bolt threaded at both ends.

Winding brackets, fixing bolts and nuts shall be hot dip galvanized in accordance with BS 729.

4.6.3 Staples

Hair-pin staples shall be of not less than 3 mm diameter round wire or sectional wire with the same cross-sectional area and shall have a zinc coating complying with BS 443.

Staples shall have a zinc coating complying with BS 443 and shall be 40 mm × 4 mm for fixing line wires to timber posts, and 25 mm × 2.65 mm for fixing line wires to timber droppers.

4.6.4 Preformed fence connectors

Preformed fence connectors shall comply with 2.6.3.

4.6.5 Bolts, nuts, washers and nails

Bolts, nuts, washers and nails shall comply with 2.6.4.

4.6.6 Droppers

Droppers shall be at least 65 mm longer than the distance between the top and bottom wires covered by them and shall be made of one of the following:

- a) cleft chestnut pales complying with BS 1722-4;
- b) timber battens not less than 50 mm × 25 mm and complying with appendix C; or
- c) steel of section not less than 0.0066 kg/m or steel wire, all hot dip galvanized in accordance with BS 729 or having a zinc coating complying with BS 443, as appropriate.

NOTE Droppers may be full length droppers or sectional droppers (see 5.3).

Droppers shall be securely fixed to all the line wires covered by them and of sufficient strength to maintain the spacing of the line wires and spread the load between them in use.

4.7 Concrete surrounding bases of posts and struts

Concrete for surrounding the bases of posts and struts shall comply with 2.7.

Section 5. Erection of dropper pattern fences

5.1 Level

The level shall comply with 3.1.

5.2 Posts and struts

5.2.1 Straining posts

Straining posts shall comply with 3.2.1 and 3.2.2, except that in straight lengths of fence the interval between straining posts shall not exceed 300 m and the concrete shall be the full depth of the hole to within 75 mm of ground level.

5.2.2 Struts

Struts shall comply with 3.2.1 and 3.2.3.

5.2.3 Intermediate posts

Intermediate posts shall comply with 3.2.1 and 3.2.4, except that the interval between intermediate posts shall not exceed 12 m.

5.3 Infill

5.3.1 Line wire: general

The infill shall comply with 3.3.1.1 and 5.3.2 to 5.3.4.

NOTE Experience has shown that it is useful to specify the distance between intermediate posts and the number of droppers in each bay.

5.3.2 Attachment of line wires to straining posts

With the exception that, on round wood posts, preformed fence connectors shall be used with spring steel line wire, each line wire shall be strained to comply with 5.3.5 and secured to straining posts in accordance with 3.3.1.2.

5.3.3 Attachment of line wires to intermediate posts

With the exception that wire stirrups shall not be used, each line wire shall be secured to each intermediate post in accordance with 3.3.1.3.

NOTE Wire stirrups are not permitted as it is important that the line wires are a running fit.

5.3.4 Droppers

Droppers shall be used to maintain the spacing of line wires between posts and shall be attached after all wires have been strained and secured in position. The interval between a dropper and a post or between adjacent droppers, shall not exceed the following:

- a) full length droppers⁴⁾: 2 m;
- b) sectional droppers⁵⁾:
 - 1) bottom wires: 2 m;
 - 2) top wires: 2.5 mm.

Where sectional droppers are used, the ends of all droppers on adjacent levels of wire shall be fixed to at least one wire common to both levels.

5.3.5 Line wire tension

When measured within 14 days of erection the settled tension in a line wire between straining posts 100 m apart shall be at least 1 600 N. A suitable method of approximately measuring tension is described in appendix F.

⁴⁾ A single dropper covering all the wires.

⁵⁾ Two or more droppers covering separate horizontal levels of wire.

Appendix A Concrete components

A.1 Materials

A.1.1 Cement

The cement shall be Portland cement (ordinary or rapid hardening) complying with BS 12, Portland-blastfurnace cement complying with BS 146, or sulphate-resisting Portland cement complying with BS 4027.

A.1.2 Aggregate

The aggregate shall comply with BS 882. The aggregate shall not exceed 10 mm nominal maximum size.

A.1.3 Admixtures

Admixtures shall comply with the following.

- a) Pigments: BS 1014.
- b) Concrete admixtures: BS 5075.
- c) Pulverized-fuel ash: BS 3892.
- d) Other admixtures: used in accordance with the manufacturer's instructions.

When admixtures are used they shall be such as to have no harmful effect on the reinforcement and the setting, hardening and durability of the concrete.

A.1.4 Reinforcement

The reinforcement shall comply with the requirements for size and tensile strength of BS 4449, BS 4461, BS 4482 or BS 4483.

A.2 Moulds

Moulds shall be so constructed that they remain rigid during the placing and compaction of the concrete and prevent the loss of water, grout or mortar. They shall be such that the finished components are accurate within the specified limits. Timber moulds shall be of closely jointed wrought timber.

A.3 Manufacture

A.3.1 Concrete strength

The strength of the concrete mix in use at the manufacturer's works shall be demonstrated by regular testing to be not less than the following when tested in accordance with A.5.1:

- a) 17 N/mm² when tested after 7 days; or
- b) 25 N/mm² when tested after 28 days.

The cement content shall be not less than 350 kg per cubic metre of concrete.

NOTE The above strengths may be expected from a mix composed of one part by mass of cement and not more than five parts by mass of graded aggregate. It is desirable that the water/cement ratio should not exceed 0.55 by mass.

A.3.2 Mixing

The concrete shall be mixed in a mechanical mixer until there is a uniform distribution of the materials and the mass is uniform in colour and consistency.

A.3.3 Placing and compacting

The concrete shall be used as soon as possible after being mixed, and shall be thoroughly compacted by vibration, tamping or other effective methods such that the surface achieved on demoulding is free from honey-combing or other large blemishes.

NOTE Small surface voids caused by entrapped air or water are permissible.

A.3.4 Location of reinforcement

The reinforcement shall be prefabricated and located during the placing and compacting of the concrete in such a manner that the actual cover of concrete measured from main external faces and from the top of a post or strut is not less than 15 mm. The length of the assembled reinforcement shall be not less than the minimum length of the component, less an allowance not exceeding 100 mm to allow for the minimum cover and an allowance not exceeding 75 mm in total for cutting, prefabrication and location.

The reinforcement shall extend beyond the centre line of the uppermost line wire hole or beyond the top edge of the uppermost rail fixing point in a post, as appropriate.

NOTE Where the ends of components are splayed, each bar may be of equal length.

A.3.5 Protection from freezing

No material that has been exposed to a temperature below freezing point shall be used until it has been completely thawed, nor shall components be moulded when the temperature of the moulds is below freezing point. The components shall not be subjected to the effects of frost until one of the following conditions has been met:

- a) the concrete has attained a strength of 5 N/mm² as indicated by testing in accordance with A.5.2; or
- b) the components have been stored in such a way that they are not subjected to freezing for at least 48 h after casting.

A.3.6 Maturing

No components shall be supplied until one of the following conditions has been met:

- a) the concrete has attained a strength of 25 N/mm² as indicated by testing in accordance with A.5.2; or
- b) the components have been allowed to mature under suitable conditions for not less than 28 days at normal temperatures.

A.4 Finish

The finish shall be that obtained by thoroughly compacting the concrete in the moulds (see **A.3.3**).

NOTE Some manufacturing methods may produce a slightly textured finish or the imprint of the slight grain of planed timber and its joints.

A.5 Tests

A.5.1 Cube tests for concrete proportioning

Cubes shall be made and tested in accordance with BS 1881-116. The frequency of testing shall be not less than weekly. Each test result shall be not less than the strength specified in **A.3.1**. The record of results shall be available for inspection. Where the concrete mix is not in regular use, at least three satisfactory test results shall be required to establish compliance.

A.5.2 Cubes tests for concrete strength development

Cubes shall be made and tested in accordance with BS 1881-116, except that they shall be stored under similar conditions to products after casting. The frequency of testing shall be not less than weekly. Each test result shall be not less than the strength specified in **A.3.5** or the mean of three consecutive results shall be not less than the strength specified in **A.3.6**, as applicable. The record of results shall be available for inspection. Where the concrete mix is not in regular use, at least three satisfactory test results shall be required to establish compliance.

A.5.3 Examination of location of reinforcement

If the purchaser wishes to verify the location of reinforcement he shall select at random one product from the batch at the manufacturer's works, subject to a maximum of one in every 100 components, which shall be tested to ascertain if the location of the reinforcement complies with **A.3.4**. If the reinforcement is found to be incorrectly located it shall be permissible for a second product to be selected from the same batch, and if this also fails, the batch shall be deemed not to comply with this standard.

NOTE If additional tests on hardened concrete are required, reference may be made to BS 1881 or BS 4408.

Appendix B Steel components

B.1 Materials

Steel posts and struts shall be constructed from material complying with the following standards:

- a) rolled steel angle (RSA)⁶⁾: BS 4848-4 and BS 4360 (grade 40C) or angle re-rolled from railway lines⁷⁾;
- b) rectangular hollow sections (RHS): BS 4848-2 and BS 4360 (grade 43C);
- c) circular hollow section (CHS): BS 4848-2 and BS 4360 (grade 43C);
- d) rolled steel joists (RSJ)⁸⁾: BS 4-1 and BS 4360 (grade 40C);
- e) universal column⁸⁾: BS 4-1 and BS 4360 (grade 40C).

B.2 Protective treatment

Steel components shall be protected against corrosion using one or more of the following treatments:

- a) one works coat of steel priming paint complying with either BS 3698 or BS 5193;
- b) a metal coating complying with BS 2569-1;
- c) hot dip galvanizing complying with BS 729.

All rust, loose scale, oil and dirt shall be removed from all surfaces before treatment. Damaged areas of hot dip-galvanized coating shall be renovated after erection as specified in **3.4**.

NOTE The protective treatment specified in a) is not intended to serve as a finishing coat. Finishing coats are best applied immediately after erection. Reference should be made to BS 5493.

Appendix C Timber components

C.1 General

The quality of fencing timber and the preservative treatment shall be as specified in **C.3** and **C.4**.

NOTE 1 Provided a timber fencing component is suitably designed, for instance to avoid the collection of water at joints, and suitably protected against premature failure due to natural decay, by the use of suitable preservative treatment (see **C.4**), there is a large choice of species of timber available for use in fencing. This appendix is largely concerned with ensuring the durability of timber components, but in some cases there will be additional constraints on the choice of species, such as economic or aesthetic factors. The specifier needs to make known any additional limits on the type of timber to be used.

⁶⁾ Fence posts and struts only.

⁷⁾ Re-rolled angles will normally be produced from steel sections formerly complying with BS 9:1935 "Bull head railway lines" (now withdrawn).

⁸⁾ Gate posts only.

The timber shall be selected from the following:

- a) oak (European and English) (see BS 881, 589), sweet chestnut or both;
- b) other homegrown hardwoods (specified as mixed hardwoods);
- c) imported hardwoods;
- d) softwoods;
- e) a mixture of hardwoods and softwoods.

NOTE 2 Although e) is technically acceptable it may present difficulties to suppliers. Differences of shrinkage may be apparent if different species of wood are used together.

C.2 Definitions

In this appendix the definitions given in BS 6100-4.1 apply; these include the following.

C.2.1

knot

portion of a branch embedded in the wood

C.2.2

dead knot

knot having fibres intergrown with those of the surrounding wood to the extent of approximately 25 % or less of the cross-sectional perimeter

C.2.3

intergrown knot (live knot non-preferred)

knot having fibres intergrown with those of the surrounding wood to the extent of approximately 75 % or more of the cross-sectional perimeter

NOTE A knot formed from the base of a live actively growing branch is normally completely intergrown.

C.2.4

live knot

see intergrown knot

C.2.5

knot cluster

group of knots around which the fibres are deflected

C.2.6

knot hole

Hole caused by the removal of a knot

C.2.7

check

separation of fibres along the grain forming a crack or fissure that does not extend through timber or veneer from one surface to the other

C.2.8

end check

check at the end of a log or piece

C.2.9

split

separation of fibres along the grain forming a crack or fissure that extends through timber or veneer from one surface to the other

C.2.10

end split

split at the end of a log or piece

C.3 Timber quality

C.3.1 *Limiting characteristics*

When measured in accordance with C.3.2 either at any time within 14 days of delivery to the preservation treatment works or at any time within 14 days of delivery to the site, the timber shall comply with Table 6.

NOTE Compliance of the timber with Table 6 should be determined by a mutually agreed procedure. A suggested sampling procedure is given in appendix D.

Defects affected by changing climatic conditions shall not be considered a valid reason for subsequent rejection after the initial inspection within 14 days of delivery either to the preservation treatment works or to the site.

C.3.2 *Methods of measurement*

C.3.2.1 Knots (see Figure 2). Knots or groups of knots in the same cross section shall be limited by their knot area ratio (K.A.R.) which shall be taken as the ratio of the sum of their projected cross-sectional areas to the cross-sectional area of the piece. Knots shall be considered as part of the same cross section if any part of the knot, or the grain disturbances for which they are responsible, overlap along the length of the piece. Knots or knot holes of diameter equal to or less than 5 mm shall be ignored. No distinction shall be made between knot holes, dead knots or intergrown knots (formerly known as live knots).

NOTE C.3.3 describes a method for determining K.A.R. for use in verifying the grading of a piece of timber, for instance in the case of a dispute.

C.3.2.2 Wane (see Figure 3). Place a straightedge against a face or edge of the piece and measure the wane.

C.3.2.3 Slope of grain. Measure the slope of grain either:

- a) by taking a line parallel to the surface fissures; or
- b) by the use of a grain detector as described in BS 4978.

The slope of grain shall be determined over a distance sufficiently great to determine the general slope, disregarding local deviations. Measure the inclination of grain as shown in Figure 4 in which AB is a line indicating grain direction, AC is a line drawn parallel to the edge of the member, BC is of length one unit (any convenient unit may be used) and is at right angles to AC. Express the slope of grain as 1 in x where x is the length of AC measured in terms of BC.

C.3.2.4 Checks. [see Figure 5 a)]. Measure the maximum depth to which a 0.2 mm feeler gauge complying with BS 957-2 can be inserted without using excessive force.

C.3.2.5 End splits [see Figure 5 b)]. Measure the maximum distance from the split end of the piece to a point at which a 0.2 mm feeler gauge complying with BS 957-2 can be inserted to a depth of half the piece without using excessive force.

C.3.2.6 Bow, spring, twist and cup. Measure bow, spring, twist and cup as shown in Figure 6, taking the actual length or width (as relevant) of the piece as the reference.

C.3.3 Method for determining the knot area ratio (K.A.R.)

C.3.3.1 General. C.3.3 describes a method for assessing the K.A.R. of a cross section by plotting a projection of the knots as a drawing. It is supplementary to visual grading and will usually only be applied when verification of the grading of a piece is required, for instance in the case of a dispute.

C.3.3.2 Procedure. Select a section in the piece that intersects a knot or group of knots.

Consider all knots and knot holes with diameters greater than 5 mm intersected by the chosen section in calculating the knot area ratio of the whole piece.

Make full scale drawings of the chosen section.

Mark points on the appropriate side of the rectangle representing any knot on that surface. The points marked shall represent the widest projection of the knot on that face or edge.

Calculate the knot area ratio as described in a) or b) according to whether or not the pith occurs within the cross section. For the purpose of estimating the position of the pith, within or without the cross section, examine the nearest end of the piece and assume that all annual rings are concentric with the pith.

If the pith is within the cross section (see Figure 2), join the points representing the limits of the knots on the drawing by straight lines to a point representing the estimated position of the pith. Measure the area within these lines which corresponds to knots for the whole cross section.

c) Where the pith is outside the cross section, mark its estimated position at an appropriate position on the drawing. Join up the points on the perimeter of the drawing in a manner appropriate to the assumption that each knot is approximately a cone with its apex at the pith. Measure the area thus enclosed, corresponding to the estimated position of the knots, for the whole cross section.

In both cases a) and b) express the total area of knots within the cross-sectional area of the piece as a proportion of the cross-sectional area of the piece for the purpose of determining the knot area ratio.

C.4 Preservative treatment

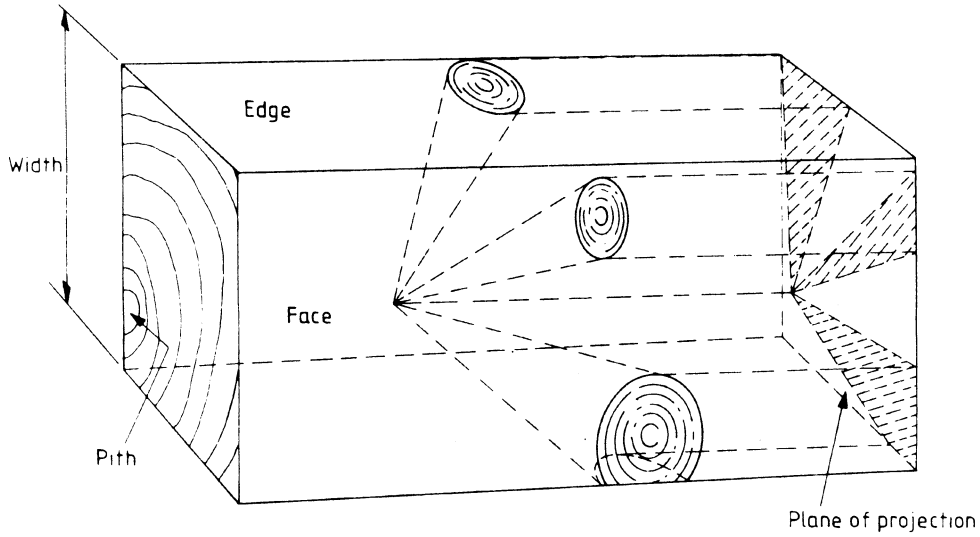
Timber shall be preserved in accordance with the recommendations for fencing timber in BS 5589.

NOTE 1 BS 5589 Includes recommendations for preservative treatment for two categories of service life, these being category A (40 years) and category B (20 years). In most cases category B will provide sufficient protection, but if a longer service life is required category A should be specified.

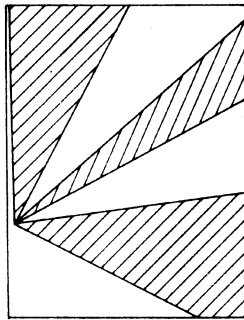
NOTE 2 Certain species of timber do not require treatment, depending upon the intended use and provided there is not excessive sapwood, i.e. in excess of one-third of the cross-sectional area of the piece, and details of these are given in BS 5589.

Table 6 — Characteristics and defects of softwoods and hardwoods

Characteristics	Posts and struts		
	Sawn	Round or cleft	
All knots	Total K.A.R. not greater than $\frac{1}{2}$ ^a	Not applicable	
Wane	Not more than 15 mm on any one corner. At least two adjacent corners shall be free of wane	Not applicable	
Slope of grain	Not exceeding 1 in 6 to the longitudinal axis of the piece	Not applicable	
Rate of growth	Unlimited		
Checks ^b	The depth of each check shall not exceed one-half of the thickness of the piece		
End splits ^b	Not longer than 150 mm		
Resin pockets	Unlimited		
Bark pockets	Unlimited		
Brittle heart	Not permitted		
Rot	Not permitted		
Active insect attack	Not permitted		
Lyctus damage	Not permitted		
Pinholes	Not more than 20 in any 0.3 m length	Not applicable	
Black heart	Unlimited ^c		
Stain	Unlimited ^c		
Straightness ^b	Bow	Not more than 25 mm within the length of the piece	A straight line from the centre of the butt to the centre of the top shall pass within the circumference of the piece for the full length. Any bow shall be in not more than one plane and one direction.
	Spring	Not more than 25 mm within the length of the piece	
	Twist	Not more than 20 mm within the length of the piece	
	Cup	Not more than one twenty-fifth of the width of the piece	
Boxed heart	Unlimited		
^a Within a parcel not less than 90 % of the number of pieces shall have a K.A.R. of $\frac{1}{2}$ or less. A K.A.R. not exceeding $\frac{3}{5}$ shall be permitted in up to 10 % of the number of pieces in the parcel. ^b Defects affected by changing climatic conditions (see C.3.1). ^c Not considered a defect.			

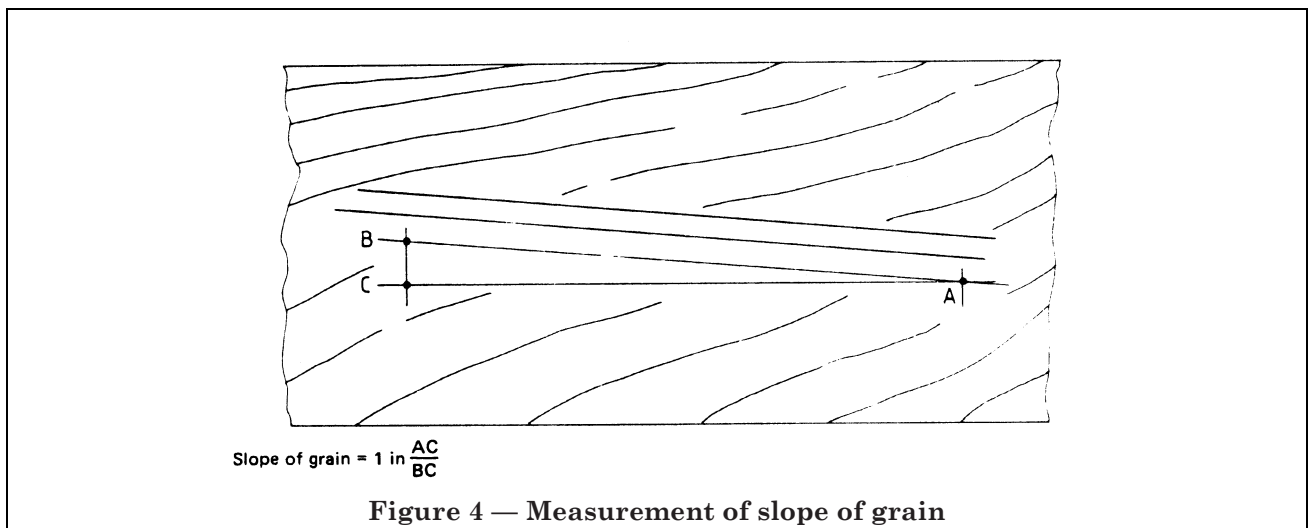
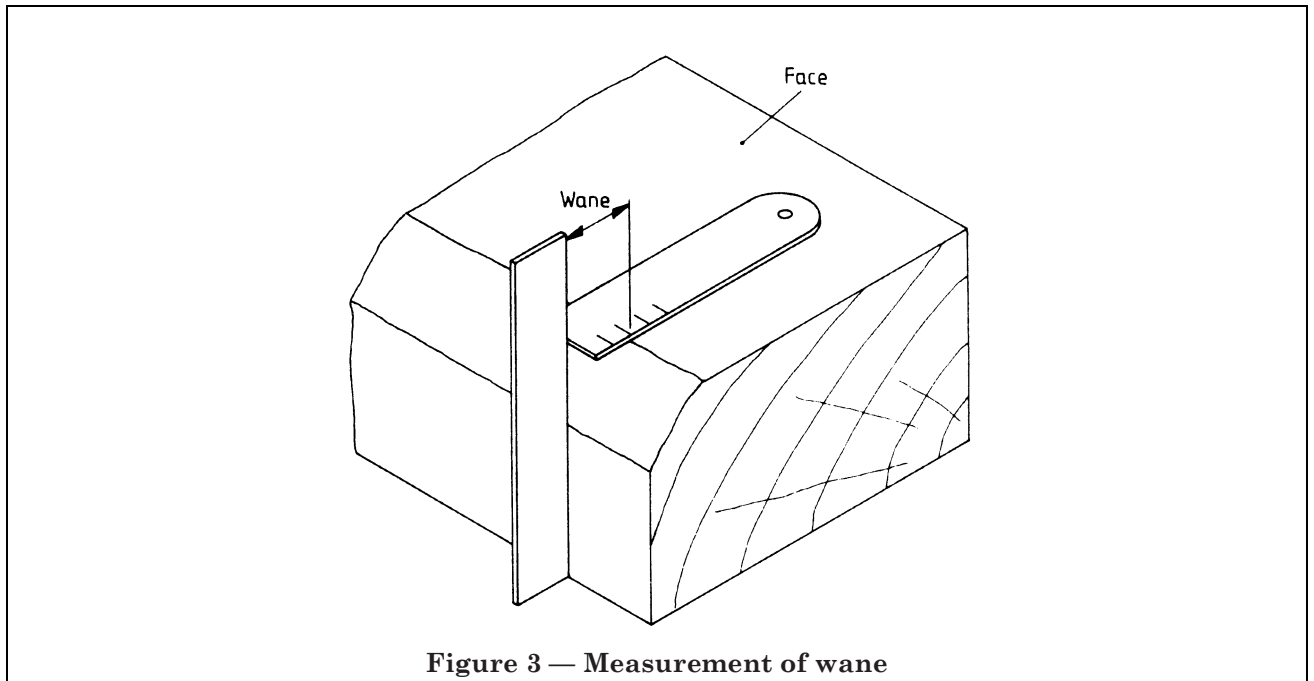


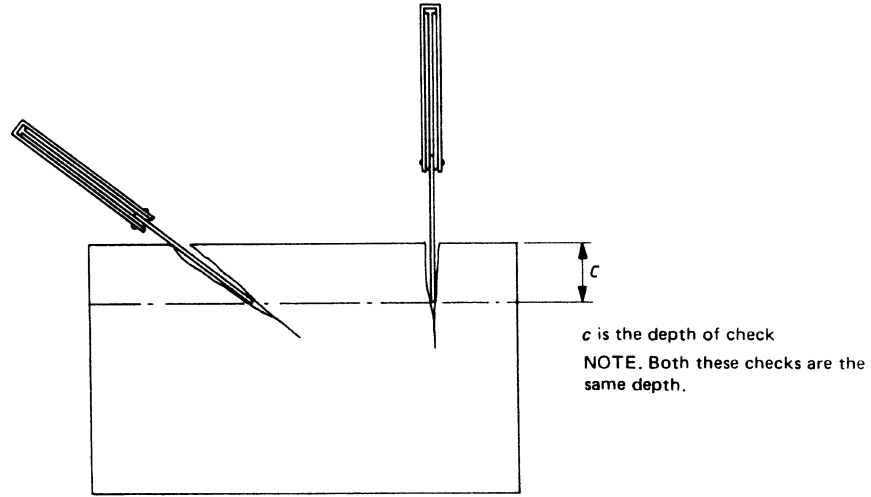
(a) Axonometric view showing in three dimensions a group of knots in a piece and their projection on a cross-sectional plane



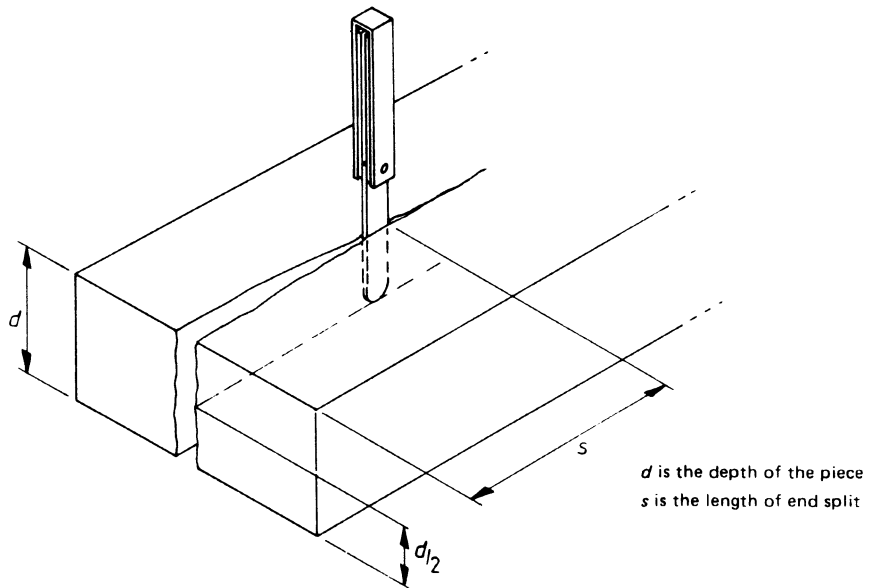
(b) Front view of projection plane, showing projection of knots (hatched)

Figure 2 — Knot projection



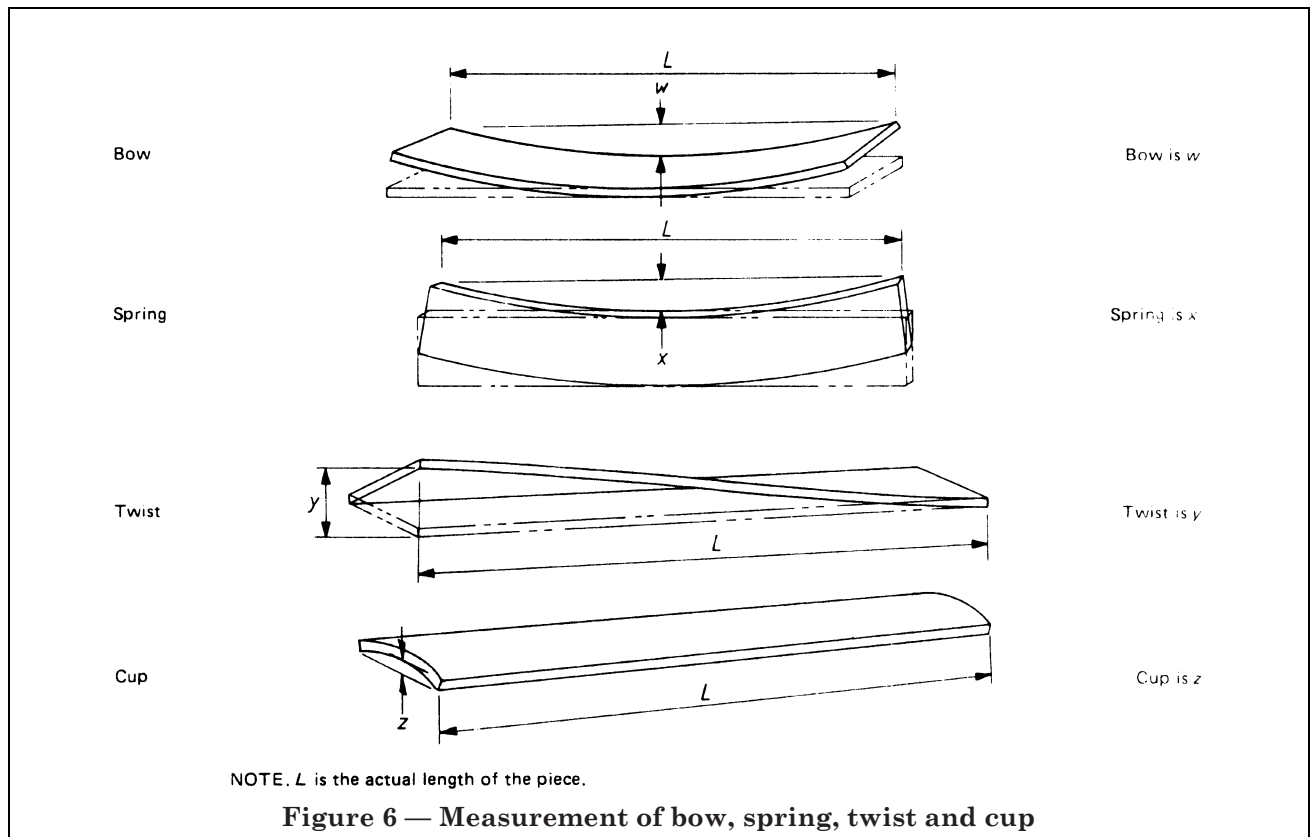


(a) Depth of check



(b) Length of end split

Figure 5 — Measurement of checks and end splits



Appendix D Suggested sampling method for limiting characteristics of timber

D.1 Purpose

The purpose of the sampling plan is to determine initially if the parcel complies with the requirements of Table 2. It does not preclude the subsequent rejection of individual pieces for non-compliance with Table 2, except for defects due to changing climatic conditions (see Table 2).

D.2 Procedure

Sample in accordance with Table 3.

Take the pieces comprising the sample at random. Inspect by defective pieces, not by defects (i.e. a piece containing one or more defects is to be counted as one defective piece).

Reject a parcel if the number of defective pieces is equal to, or exceeds, the rejection number.

Table 7 — Single sampling plan

Number of pieces in parcel ^a	Number of pieces in sample	Rejection number
91 to 150	20	4
151 to 280	32	6
281 to 500	50	8
501 to 1 200	80	11
1 201 to 3 200	125	15
3 201 to 10 000	200	22

^a For parcels comprising 90 pieces or less, 100 % inspection is recommended.

Appendix E Specifying a strained wire fence

E.1 General

This standard specifies requirements for materials and how they are combined and erected to provide a serviceable fence. Because a fence is made up of a number of separate components whose particular features may vary, e.g. plain wire or high tensile wire, there will be a number of permissible combinations available to the user. When preparing a specification for a fence it is therefore important to give precise details of the requirements of the fence and of the erection site. This appendix lists those items that typically need to be specified. However, as conditions will vary from site to site it should not be assumed to be exhaustive in its listings.

E.2 Site conditions

The following items will typically need to be specified.

- a) Line and length of fence (see 3.1).
- b) Profile of fence and ground clearance (see 3.1).
- c) Site preparation (see 3.1):
 - 1) site clearance;
 - 2) cutting or filling of ground level [see b)].
- d) Any specific requirements for non-standard post lengths due to ground conditions (see the foreword).

NOTE The requirements for the lengths of posts and struts specified in this standard (see Table 2, Table 3, Table 4 and Table 5) and foundation sizes have been related to "normal" ground conditions. This standard does not cover situations where the ground is particularly firm or soft when it may be necessary to modify the specified lengths or foundation sizes. The base details of steel and timber posts and the method used to set them in the ground are also determined by the local ground conditions.

- e) Number, position and specification of any gates.

E.3 Construction of fence

The following items will typically need to be specified.

- a) Fence type reference (related to proposed use of fence) (see Table 1).
- b) Type of infill, including special features and additional lines of barbed wire (see 3.3.2).

- c) Type of line wire (see 2.2.1/4.2.1):
 - 1) low carbon steel (mild steel) (general pattern fences only);
 - 2) high tensile steel;
 - 3) spring steel;
 - 4) plastics coated high tensile steel;
 - 5) plastics coated spring steel (dropper pattern only).
- d) Type of barbed wire (see 2.2.3):
 - 1) low carbon steel (mild steel);
 - 2) high tensile steel.
- e) Posts and struts:
 - 1) material of posts and struts (see Table 1):
 - i) concrete;
 - ii) steel;
 - iii) timber;
 - 2) steel:
 - i) type of section (see Table 3);
 - ii) type of protective treatment (see B.2);
 - 3) timber:
 - i) any limits on species to use (see 2.5 and appendix C);
 - ii) hardwood;
 - iii) softwood;
 - iv) round, cleft or sawn;
 - v) preservative treatment: category A or B? (see C.4);
 - vi) sampling: is sampling in accordance with appendix D required? (see C.3.1);
 - 4) length⁹⁾;
 - 5) base details of steel or timber posts⁹⁾, including, i.e. concrete or rammed earth (see 3.2.1);
 - 6) any specific requirements for spacing of posts.

NOTE The maximum centres for posts are specified in 3.2 and 5.3. If shorter bays are required they need to be specified. The distance between intermediate posts in dropper pattern fences should be specified.

f) Fittings:

particular requirements for attachment of line wires or barbed wire (see 2.6 and 3.3.1).

g) Droppers (see 4.6.6):

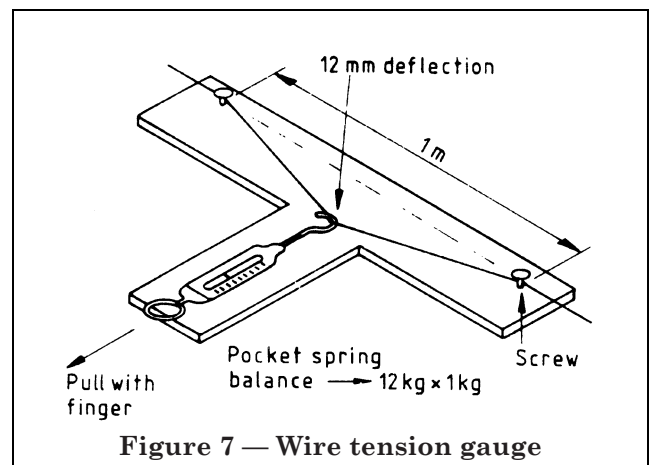
- 1) type of dropper;
- 2) number of droppers to be used in each bay between posts (see 5.3.4).

⁹⁾ Lengths and base details will be affected by ground conditions [see E.2 d)].

Appendix F Approximate method for measuring line wire tension

Using the apparatus shown in Figure 7, position and hold the apparatus such that the general direction of the line wire is not changed. Deflect the wire 12 mm by pulling on the spring balance.

Obtain the tension, in newtons, on the wire by multiplying the spring balance reading by 200.



Publications referred to

- BS 4, *Structural steel sections.*
- BS 4-1, *Specification for hot rolled sections.*
- BS 12, *Specification for ordinary and rapid-hardening Portland cement.*
- BS 146, *Portland-blastfurnace cement.*
- BS 146-2, *Metric units.*
- BS 443, *Specification for testing zinc coatings on steel wire and for quality requirements.*
- BS 729, *Hot dip galvanized coatings on iron and steel articles.*
- BS 881, *589 Nomenclature of commercial timbers, including sources of supply.*
- BS 882, *Specification for aggregate from natural sources for concrete.*
- BS 957, *Feeler gauges.*
- BS 957-2, *Metric units.*
- BS 1014, *Pigments for Portland cement and Portland cement products.*
- BS 1202, *Nails.*
- BS 1202-1, *Steel nails.*
- BS 1722, *Fences.*
- BS 1722-4, *Specification for cleft chestnut pale fence.*
- BS 1881, *Methods of testing concrete.*
- BS 1881-116, *Method for determination of compressive strength of concrete cubes.*
- BS 2569, *Sprayed metal coatings.*
- BS 2569-1, *Protection of iron and steel by aluminium and zinc against atmospheric corrosion.*
- BS 3698, *Calcium plumbate priming paints.*
- BS 3892, *Pulverized-fuel ash.*
- BS 3892-1, *Specification for pulverized-fuel ash for use as a cementitious component in structural concrete.*
- BS 3892-2, *Specification for pulverized-fuel ash for use in grouts and for miscellaneous uses in concrete.*
- BS 4027, *Specification for sulphate-resisting Portland cement.*
- BS 4102, *Steel wire for fences.*
- BS 4190, *ISO metric black hexagon bolts, screws and nuts.*
- BS 4232, *Surface finish of blast-cleaned steel for painting.*
- BS 4320, *Metal washers for general engineering purposes.*
- BS 4360, *Specification for weldable structural steels.*
- BS 4408, *Recommendations for non-destructive methods of test for concrete.*
- BS 4449, *Specification for hot rolled steel bars for the reinforcement of concrete.*
- BS 4461, *Specification for cold worked steel bars for the reinforcement of concrete.*
- BS 4482, *Hard drawn mild steel wire for the reinforcement of concrete.*
- BS 4483, *Steel fabric for the reinforcement of concrete.*
- BS 4652, *Metallic zinc-rich priming paint (organic media).*
- BS 4848, *Hot-rolled structural steel sections.*
- BS 4848-2, *Hollow sections.*
- BS 4848-4, *Equal and unequal angles.*
- BS 4978, *Timber grades for structural use.*
- BS 5075, *Concrete admixtures.*
- BS 5075-1, *Specification for accelerating admixtures, retarding admixtures and water-reducing admixtures.*
- BS 5075-2, *Specification for air-entraining admixtures.*
- BS 5075-3, *Specification for superplasticizing admixtures.*
- BS 5135, *Specification for the process of arc welding of carbon and carbon manganese steels.*

BS 5193, *Zinc phosphate pigment for paints.*

BS 5216, *Patented cold drawn carbon steel wire for mechanical springs.*

BS 5493, *Code of practice for protective coating of iron and steel structures against corrosion.*

BS 5589, *Code of practice for preservation of timber.*

BS 6100, *Glossary of building and civil engineering terms.*

BS 6100-4.1, *Characteristics and properties of timber and wood based panel products.*

CP 3012, *Cleaning and preparation of metal surfaces.*

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