

BRITISH STANDARD

Fences –

Part 5: Specification for close-boarded fences and wooden palisade fences

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Publishing and copyright information

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Summary of pages

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Foreword

Publishing information

This part of BS 1722 was published by BSI and came into effect on 30 November 2006. It was prepared by Technical Committee B/201, *Fences and gates*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 1722 supersedes BS 1722-5:1999, which is withdrawn.

Relationship with other publications

BS 1722 is published in parts as follows:

- *Part 1: Specification for chain link fences;*
- *Part 2: Specification for strained wire and wire mesh netting fences;*
- *Part 4: Specification for cleft chestnut pale fences;*
- *Part 5: Specification for close-boarded 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 horizontals;*
- *Part 10: Specification for anti-intruder fences in chain link and welded mesh;*
- *Part 11: Specification for prefabricated wood panel fences;*
- *Part 12: Specification for steel palisade fences;*
- *Part 13: Chain link fences for tennis court surrounds¹⁾;*
- *Part 14: Specification for open mesh steel panel fences;*
- *Part 16: Specification for organic powder coatings to be used as a plastics finish to components and mesh;*
- *Part 17: Specification for electric security fences – Design, installation and maintenance;*
- *Part 18: Specification for steel mesh site perimeter temporary fencing systems²⁾.*

Information about this document

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags **[C1]** **[C1]**.

It should be noted that no attempt has been made to standardize fences or gates which are of a purely decorative nature, or those suited to special requirements; nor to specify requirements for “patent” proprietary fencing systems. However, the structure of such fences or gates is to be in accordance with the applicable clauses of this part of BS 1722.

¹⁾ Obsolescent.

²⁾ Part 18 is in development and will be published as a Draft for Development (DD).

This standard aims to establish minimum requirements for materials and workmanship for close-boarded fences and wooden palisade fences in order to ensure satisfactory service for the purchaser and to assist manufacturers and installing contractors by eliminating unnecessary minor variations in the demands of purchasers. It specifies requirements for the components that make up a fence and for the way in which the fence needs to be constructed.

Choosing a suitable fence is affected by factors such as intended purpose, the 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 installing the fence of the basic characteristics required.

Premature failure can be avoided by taking care not to damage protective treatments during installation.

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

It is generally assumed in this standard that the fence is installed on horizontal ground. Where the fence is installed on a gradient, special measures may be required.

Use of this document

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 hold a current FISS/CSCS registration card skilled level (blue card) or equivalent and all other operatives should hold the basic fence operative card (green card) or equivalent.

At the time of publication of this British Standard the registration cards are validated by the Joint Fencing Industry Skills Scheme (FISS) and Construction Scheme Skills Certification Scheme (CSCS). FISS/CSCS maintains a national register of fence installers and operatives. There might be other schemes available.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Requirements in this standard are drafted in accordance with *The BSI guide to standardization – Section 2: Rules for the structure, drafting and presentation of British Standards*, subclause **11.3.1**, which states, “Requirements should be expressed using wording such as: ‘When tested as described in Annex A, the product shall ...’”. This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

Contractual and legal considerations

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

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 1722 specifies requirements for close-boarded and wooden palisade fences. It includes requirements for the installation of the fencing at the specified location.

This standard specifies requirements for protective treatments. However, maintenance, which is an important aspect of extending the service life of the fence, is outside the scope of this standard.

This standard includes 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 if this could adversely affect the fitting of components or if replacement parts are required to match with those already present.

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 957-2, *Specification for feeler gauges – Part 2: Metric units*

BS 1202-1, *Specification for nails – Part 1: Steel nails*

BS 3892 (all parts), *Pulverized fuel-ash*

BS 4027, *Specification for sulfate resisting Portland cement*

BS 4102, *Specification for steel wire and wire products for fences*

BS 4449, *Steel for the reinforcement of concrete – Weldable reinforcing steel – Bar, coil and decoiled product – Specification*

BS 4482, *Steel wire for the reinforcement of concrete products – Specification*

BS 4483, *Steel fabric for the reinforcement of concrete – Specification*

BS 4652, *Specification for zinc-rich priming paint (organic media)*

BS 4978, *Specification for visual strength grading of softwood*

BS 8417:2003, *Preservation of timber – Recommendations*

BS 8500 (all parts), *Concrete – Complementary British Standard to BS EN 206-1*

BS EN 197-4, *Cement – Part 4: Composition, specifications and conformity criteria for low early strength blastfurnace cements*

BS EN 206-1, *Concrete – Part 1: Specification, performance, production and conformity*

BS EN 212, *Wood preservatives – General guidance on sampling and preparation for analysis of wood preservatives and treated timber*

BS EN 335-2, *Durability of wood and wood-based products – Definition of use classes – Part 2: Application to solid wood*

BS EN 350-2, *Durability of wood and wood-based products – Natural durability of solid wood – Part 2: Guide to the natural durability and treatability of selected wood species of importance in Europe*

BS EN 844-9, *Round and sawn timber – Terminology – Part 9: Terms relating to features of sawn timber*

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

BS EN 10244-2, *Steel wire and wire products – Non-ferrous metallic coatings on steel wire – Part 2: Zinc or zinc alloy coatings*

BS EN 12620, *Aggregates for concrete*

BS EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods*

3 Terms and definitions

For the purposes of this part of BS 1722, the terms and definitions given in BS EN 844-9 and the following apply.

3.1 structural components

posts and main rails

3.2 non-structural components

gravel boards, feather-edged boards, palisades, capping, counter rails, stumps and cleats

4 Designation, dimensions and general characteristics

4.1 The dimensions and general characteristics of close-boarded fences, and their corresponding designation, shall be as given in Table 1.

4.2 The dimensions and general characteristics of wooden palisade fences, and their corresponding designation, shall be as given in Table 2.

NOTE The general arrangement of a close-boarded fence is shown in Figure 1, and of a wooded palisade fence in Figure 2.

Table 1 Designation, dimensions and general characteristics of close-boarded fences

Fence type designation										Concrete posts ^{A)}				Timber posts				
Fences with oak					Fences with softwood ^{C1)}					No. of main rails	Typical applications	Height of fence ^{C1)} m ^{C1)}	Recessed		Morticed		Length m	Section mm
With concrete posts		With oak posts ^{B)}		With concrete posts		With softwood posts ^{B)}		Length m	Section mm				Length m	Section mm				
Recessed ^{C)}	Morticed ^{B)}	Recessed ^{C)}	Morticed ^{B)}	Recessed ^{C)}	Morticed ^{B)}	Recessed ^{C)}	Morticed ^{B)}											
PCR 105	PCM 105	PW 105	BCR 105	BCM 105	BW 105	1.05	Housing, parks (inner fences)	2	1.6	All 140 × 115	1.75	All 140 × 115	1.65	100 × 100				
PCR 120	PCM 120	PW 120	BCR 120	BCM 120	BW 120	1.20	General purposes	2	1.75	at base, tapering to 100 × 115	1.90	100 × 125	1.80	100 × 125				
PCR 150	PCM 150	PW 150	BCR 150	BCM 150	BW 150	1.50	General purposes	3	2.20	100 × 115	2.35	100 × 125	2.10	100 × 125				
PCR 165	PCM 165	PW 165	BCR 165	BCM 165	BW 165	1.65	Housing	3	2.35		2.50	100 × 125	2.40	100 × 125				
PCR 180A	PCM 180A	PW 180A	BCR 180A	BCM 180A	BW 180A	1.80	Housing	3	2.50		2.65	100 × 125	2.70	100 × 125				
PCR 180B ^{D)}	PCM 180B ^{D), E)}	PW 180B ^{D), E), F)}	BCR 180B ^{D), E)}	BCM 180B ^{D), E)}	BW 180B ^{D), E), F)}	1.80	Parks, railways, commercial and public buildings	3	2.50		2.65	100 × 150	2.70 ^{G)}	100 × 150				

NOTE All lengths are for normal ground conditions.

A) See Figure 3, Figure 4 and Figure 7 for further details.

B) Morticed posts may be used with or without gravel boards.

C) Recessed posts are used without cappings or gravel boards.

D) Separate extension arms and barbed wire may be attached.

E) A capping shall be provided.

F) A single line of barbed wire may be directly attached to extended timber posts. (See 9.3.7.1.)

G) If a single line of barbed wire is specified for direct attachment to the post (see 9.3.7.1), the post length shall be at least 2.70 m.

Table 2 Designation, dimensions and general characteristics of wooden palisade fences

Fence type designation		Height of fence m	Typical applications	No. of main rails	Concrete posts ^{A)}		Timber posts	
With concrete posts	With timber posts				Length m	Section mm	Length m	Section mm
WPC 105	WPW 105	1.05	Housing, parks, inner fences	2	1.60	All 140 × 115 at base, tapering to 100 × 115	1.65	100 × 100
WPC 120	WPW 120	1.20	General purposes	2	1.75		1.80	100 × 125
WPC 150	WPW 150	1.50	General purposes	3	2.20		2.10	100 × 125
WPC 165	WPW 165	1.65	Housing	3	2.35		2.40	100 × 125
WPC 180A	WPW 180A	1.80	Housing	3	2.50		2.70	100 × 125
WPC 180B ^{B)}	WPW 180B ^{B), C)}	1.80	Parks, railways, commercial and public buildings	3	2.50		2.70 ^{D)}	100 × 125

NOTE All lengths are for normal ground conditions.

A) See Figure 4 and Figure 7 for further details.

B) Separate extension arms and barbed wire may be attached.

C) A single line of barbed wire may be directly attached to extended timber posts (see 9.3.7.1.)

D) If a single line of barbed wire is specified for direct attachment to the post (see 9.3.7.1), the post length shall be at least 2.70 m.

Figure 1 General arrangement of a close-boarded fence

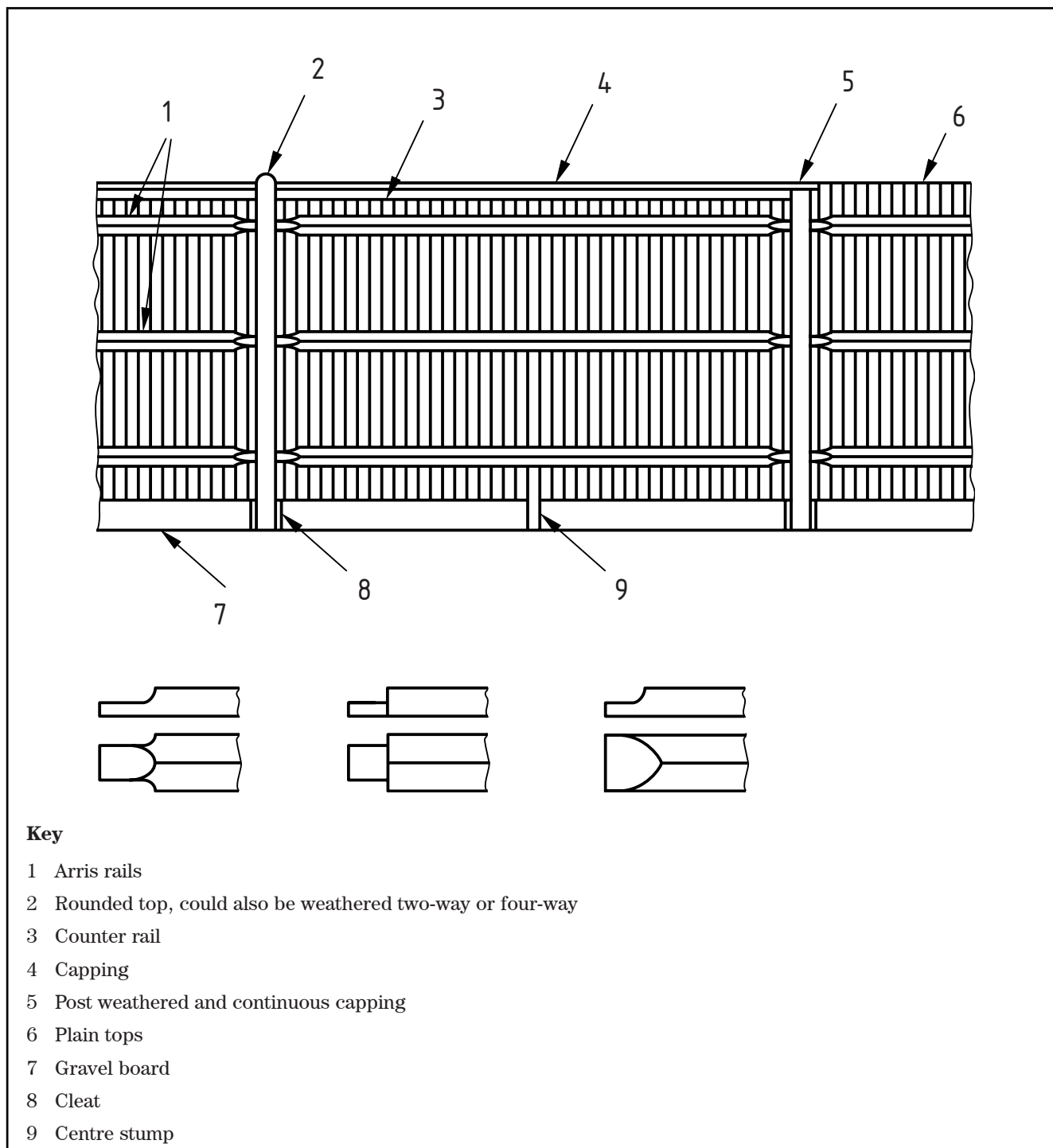
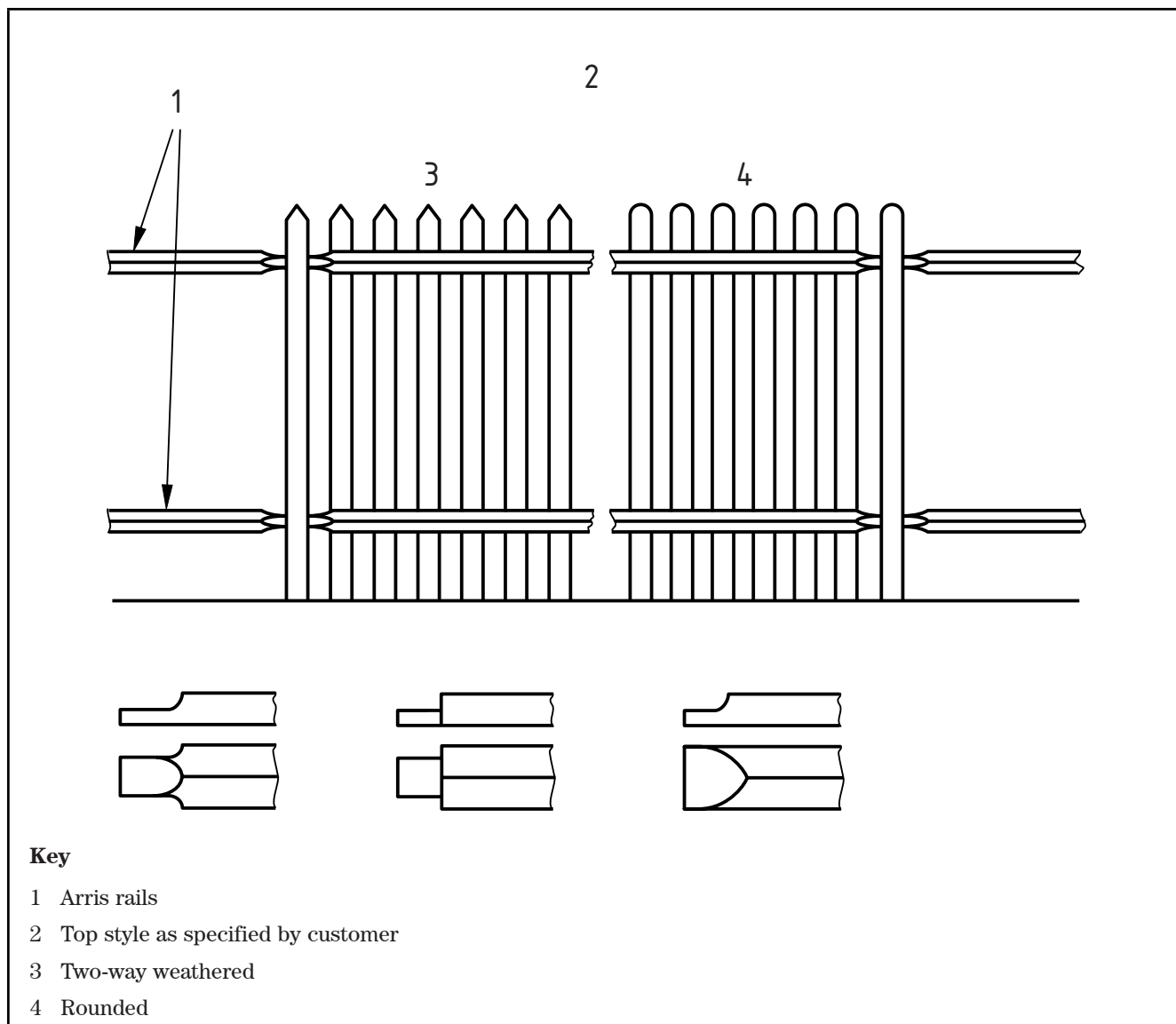


Figure 2 General arrangement of a wooden palisade fence



5 Wire

5.1 General

All wire shall conform to BS 4102.

5.2 Tying wire

Tying wire shall be of zinc-coated low-carbon steel (mild steel) and shall have a nominal wire diameter of 2 mm.

5.3 Barbed wire

Barbed wire shall conform to BS EN 10223-1.

6 Concrete components

6.1 General

Concrete posts shall be of steel-reinforced concrete conforming to BS EN 12839 and Annex A.

6.2 Tolerances on size

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

- a) a demoulding draw allowance of up to 4 mm on each of two opposing sides;
- b) length of posts: $\pm 1\%$;
- c) cross-section: ± 3 mm;
- d) base dimensions of intermediate posts, if a mould base with dimensions conforming to Tables 1 and 2 is used for shorter posts, using a stopping-off plate located not more than 300 mm from the base of the mould;

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

6.3 General construction

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 overspill.

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

6.3.1 Posts

The dimensions of morticed concrete posts shall be at least those shown in Figure 3 and the dimensions of recessed concrete posts shall be at least those shown in Figure 4 to conform to the specified wind class (see BS EN 12839:2001, **4.3.3**).

The heads of morticed posts shall be either weathered or half-rounded in order to prevent the lodgement of water.

Mortices for counter rails shall be 50 mm \times 32 mm.

Mortices for arris rails shall be 65 mm \times 25 mm.

The heads of recessed posts shall be back-weathered.

Recesses shall be at least 5 mm deep and be twice holed for 8mm diameter bolts (see Figure 4).

Posts for use with barbed wire extension arms shall be twice holed for 8 mm diameter bolts for attachment of the arms.

6.3.2 Gravel boards

Concrete gravel boards shall have a cross-section of 150 mm \times 50 mm. They shall be provided with a slot at each end and a hole at the centre for one 8 mm diameter bolt. They shall be reinforced to give strength on handling.

Figure 3 Dimensions of morticed concrete posts

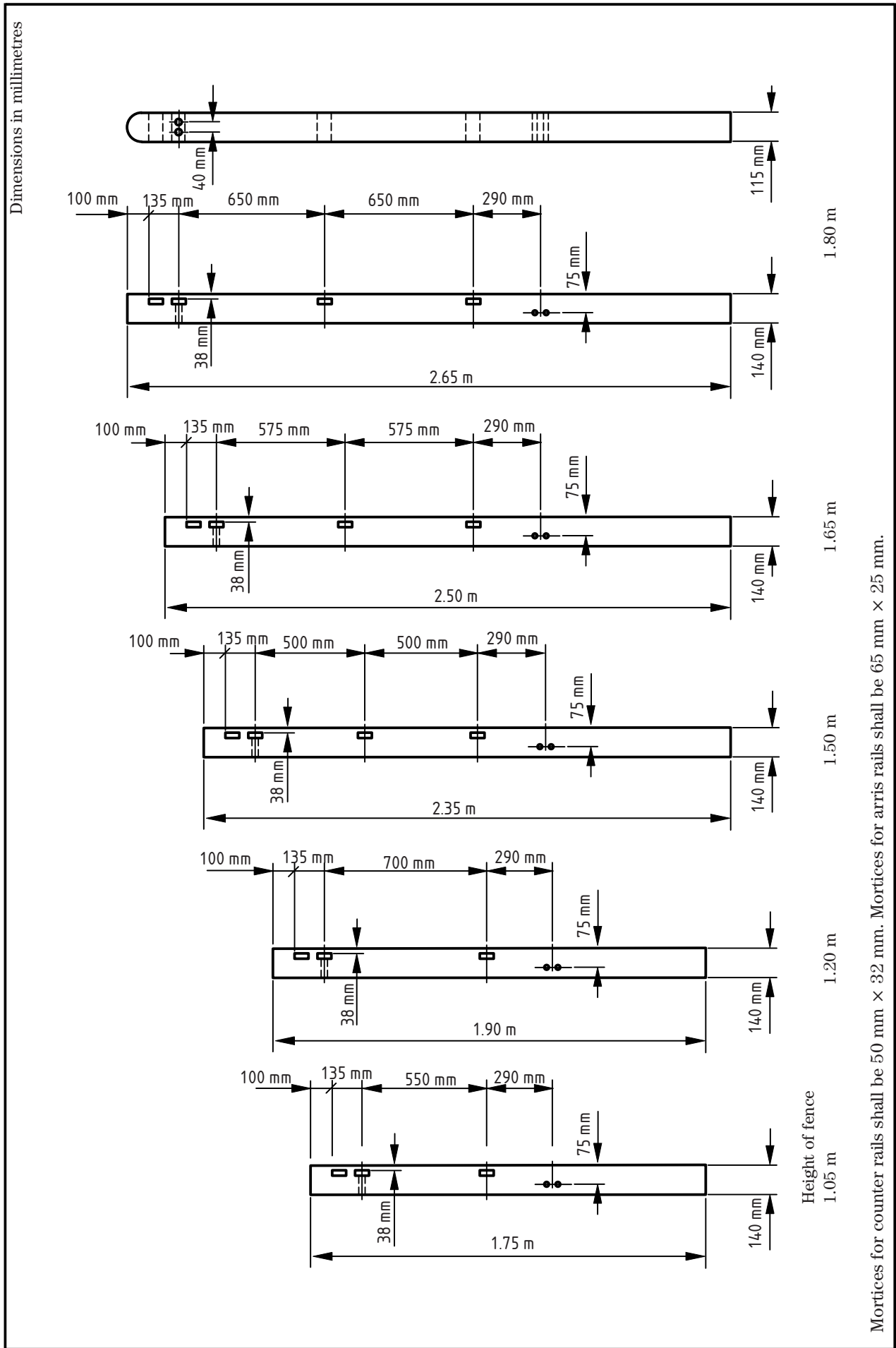


Figure 4 Dimensions of recessed concrete posts

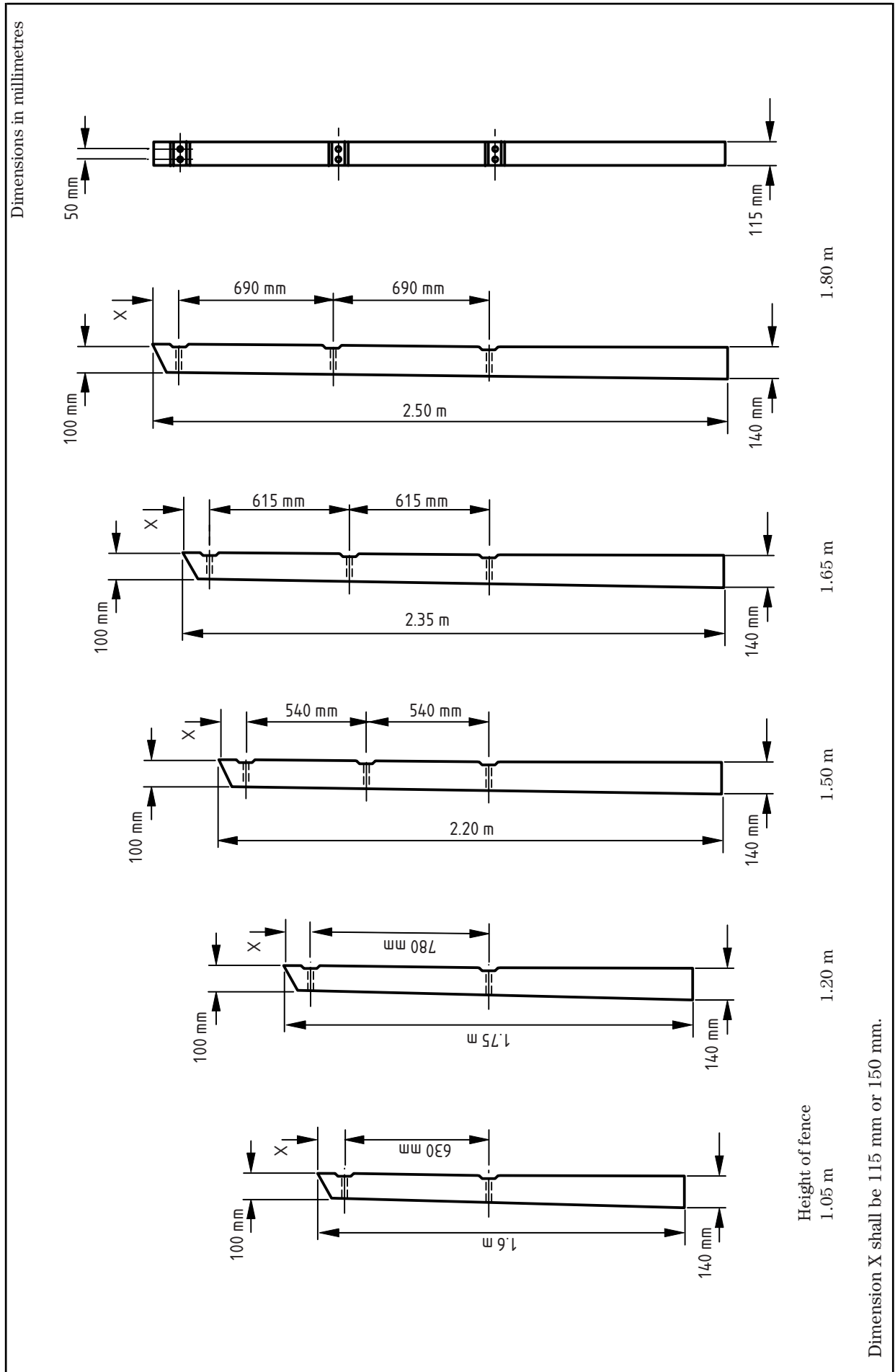
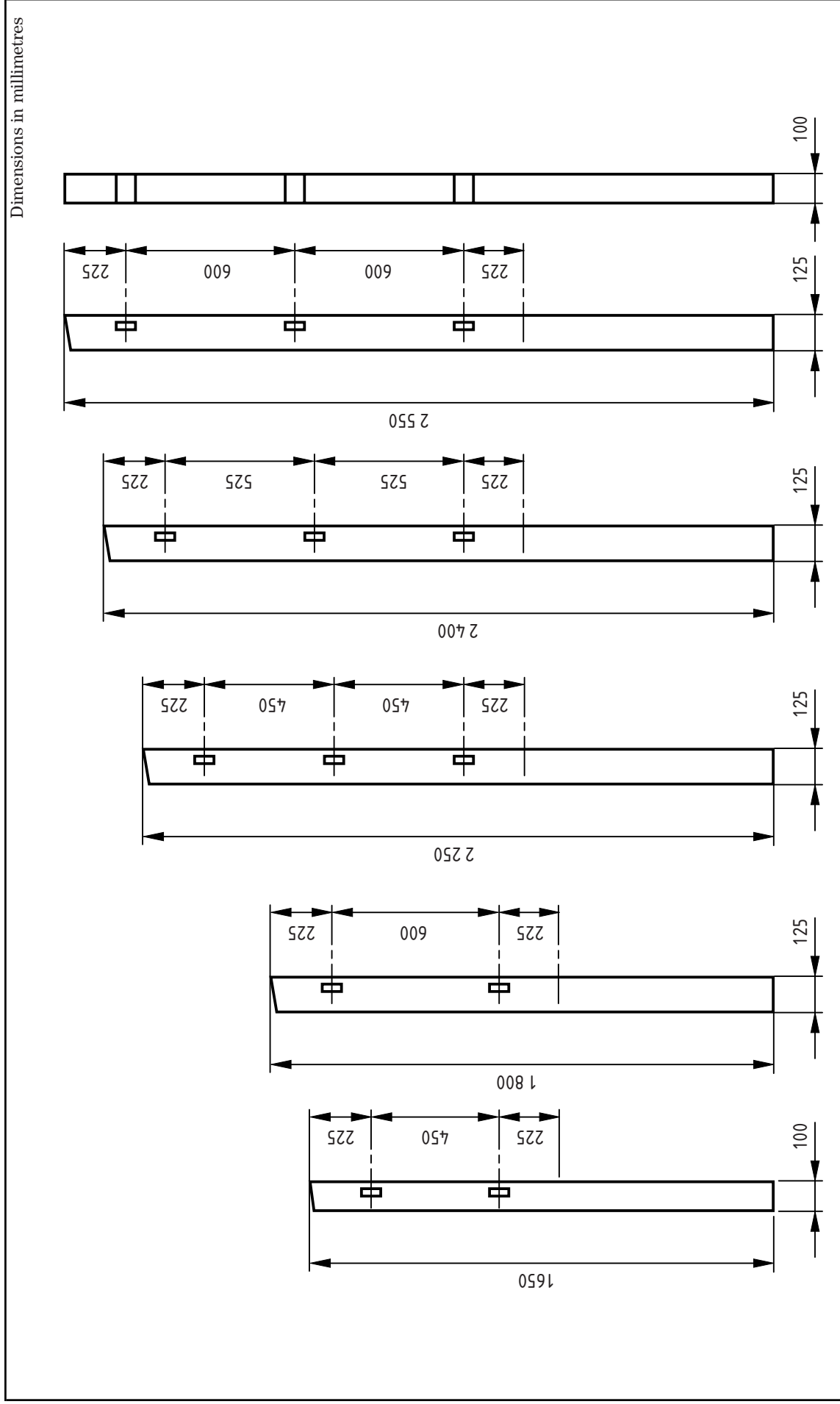


Figure 5 Dimensions for morticed timber posts



a) Dimensions of morticed wooden posts without counter rail and capping

NOTE Can be one-way weathered, half-way weathered, round top.

Figure 5 Dimensions for morticed timber posts (continued)

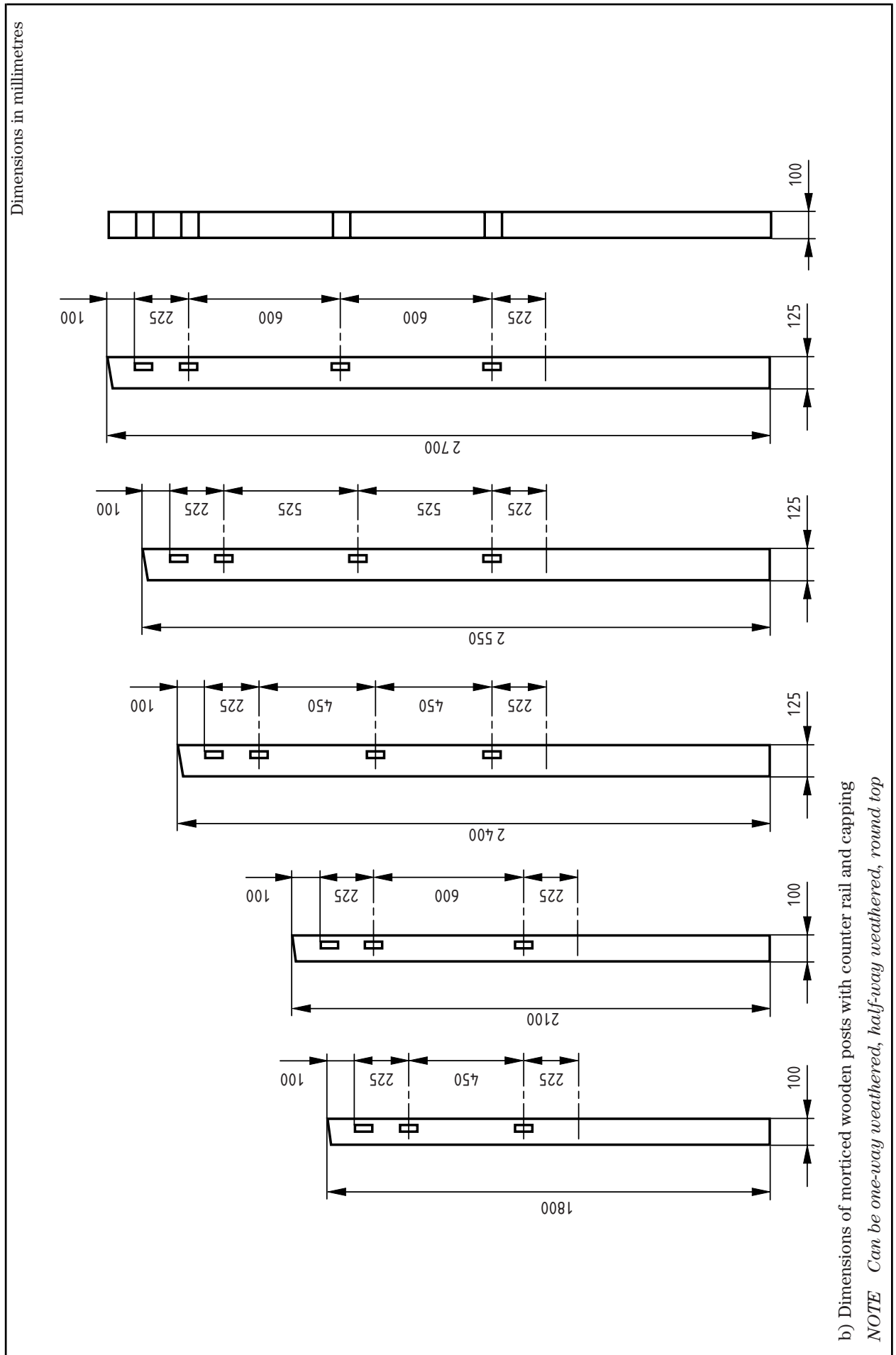


Figure 6 Dimensions for recessed timber posts

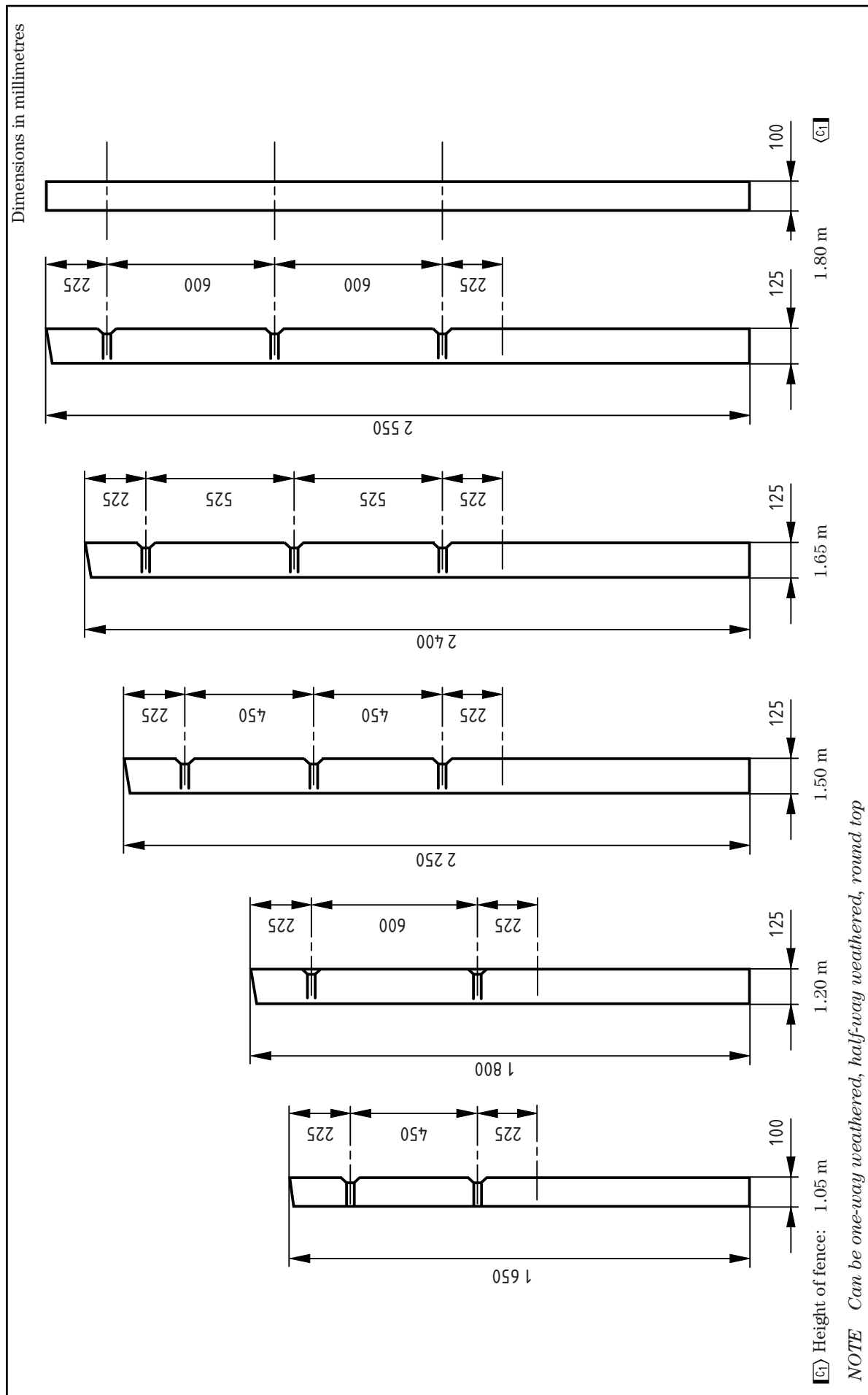
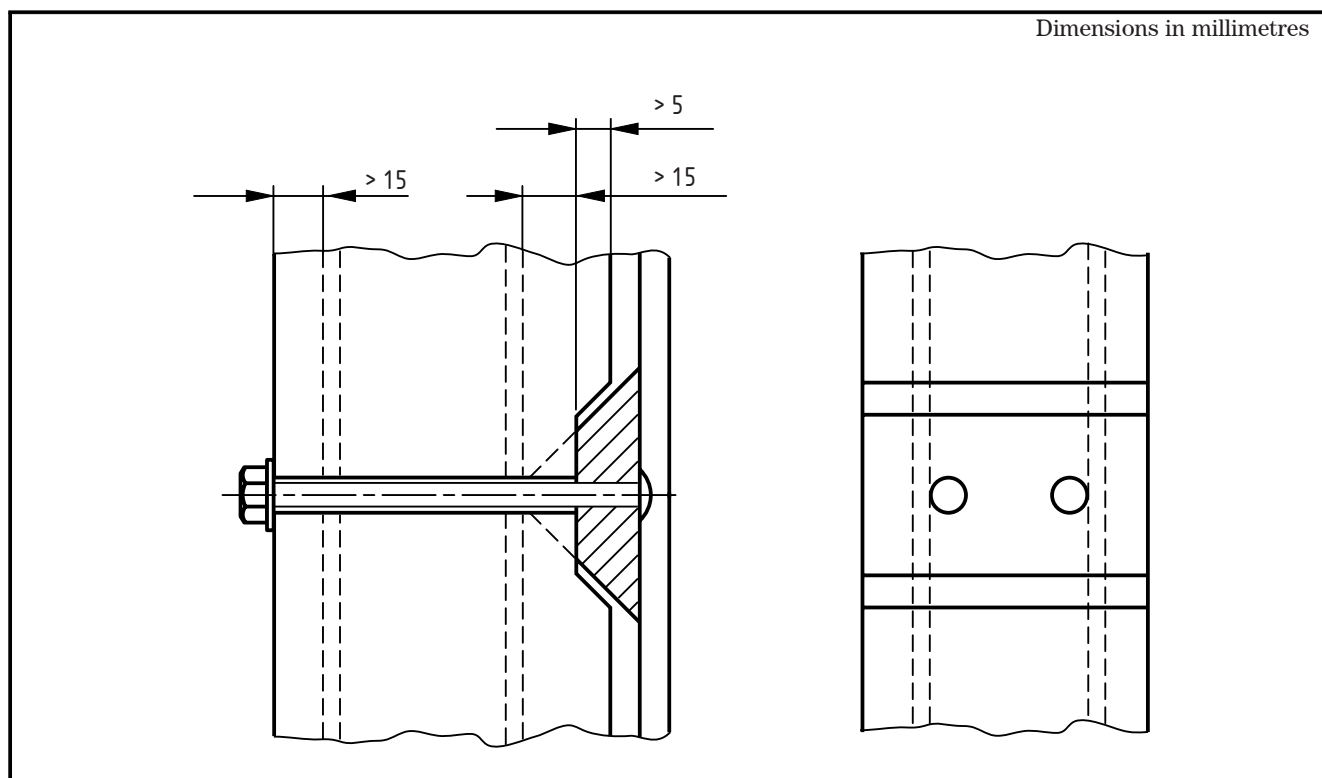


Figure 7 Details of housings for arris rails in recessed concrete posts



7 Timber components

7.1 Material

Timber components shall be of sawn timber conforming to Annex B. All timber components of oak pale fencing shall be of oak.

NOTE Annex C gives a suggested method of sampling for fence timber.

7.2 Tolerances on size

7.2.1 The following tolerances apply to the specified dimensions of timber components:

- a) length of posts: $^{+50}_{-0}$ mm
- b) length of rails: $^{+2}_{-0}$ mm
- c) length of pales and feather-edged boards: $^{+3}_{-0}$ mm
- d) thickness of feather edges boards: ± 2 mm
- e) other dimensions:
 - 1) specified dimensions < 75 mm: ± 3 mm
 - 2) specified dimensions > 75 mm: ± 6 mm

7.2.2 A maximum sawing deviation is permitted on 10% of pieces only within a batch, or on 10% of a sample (see Annex C).

7.2.3 The sizes specified in this standard relate to timber with moisture content of 28%.

NOTE Moisture content is determined in accordance with Annex D.

When timber has a lower moisture content than 28%, an additional allowance (reduction) on size of 1% for every 5% of moisture content below 28% is permitted.

In vertical feather-edged boards and palisades there shall be no dead knots greater than 15 mm.

7.3 Posts

The dimensions of timber fence posts shall be as given in Table 1 and Table 2. Fence posts shall have the same cross-section throughout their length and shall be cut square across at their base. The tops of the posts shall be weathered or rounded as shown in Figure 1 and Figure 2 to prevent the lodgement of water.

Timber posts shall have 65 mm × 25 mm mortices. The front edges of the mortices shall be 25 mm from the face of the posts, or 38 mm when triangular-section palisades are used. The mortices shall be positioned so that the centre of the bottom rail, when fixed, is approximately 225 mm from the bottom of the boards, the centre of the top rail is approximately 235 mm from the top of the boards, the middle rail, if any, is central between the top and bottom rails, and the top of the counter rail, if any, is in line with the top of the boards.

Posts for use with barbed wire extension arms shall be holed twice for 8 mm diameter bolts for the attachment of the arms. The tops of the posts for use with a single line of barbed wire shall be extended for direct attachment of wire as specified in **9.3.7.1**.

Mortices for counter rails shall be 50 mm × 32 mm.

Mortices for arris rails shall be 65 mm × 25 mm.

7.4 Main rails

7.4.1 Arris rails

Timber triangular arris rails for fence types designated with a suffix letter "B" in Table 1 and Table 2, shall be cut from timber 87 mm × 87 mm in section. Timber triangular arris rails for all other fence types shall be cut from timber 75 mm × 75 mm in section.

7.4.2 Rectangular rails

Timber rectangular rails for fence types designated with a suffix letter "B" in Table 1 and Table 2, shall be 100 mm × 47 mm in section. Timber rectangular rails for all other fence types shall be 75 mm × 38 mm in section.

7.4.3 Fixing

When morticed posts are used, the ends of the rails shall be shaped to fit into the mortices to a depth of half the width of the post, so that the face of the rails, when fixed, is in line with the front edges of mortices (see Figure 1 and Figure 2).

When recessed posts are used, the ends of the rails shall be shaped to fit the housings in the posts. The ends of the rails shall be 25 mm thick for a length of approximately 65 mm so that, when fixed, they project in front of the face of the post. Each end of the rails shall be bored for one 8 mm bolt approximately 25 mm from the end.

7.5 Capping and counter rails

Capping, if specified, shall be 65 mm × 38 mm in cross-section. It shall be continuous between posts, and shall be twice weathered on one wide face.

Counter rails shall be 65 mm × 25 mm in cross-section for use with timber posts, or 50 mm × 32 mm for use with concrete posts.

7.6 Feather-edged board filling

Feather-edged boards shall be cut two ex 100 mm × 22 mm, tapered from 13 mm to 6 mm.

7.7 Palisades

Palisades for fences less than 1.5 m high shall be of rectangular cross-section 75 mm × 22 mm. For fences having a height of 1.5 m or greater, palisades shall be of rectangular cross-section 75 mm × 22 mm, or of triangular cross-section such that two palisades are cut from timber of 50 mm × 50 mm cross-section.

If palisades are supplied ready-cut, the tops of rectangular palisades shall be pointed or cut square, and the tops of triangular palisades shall be weathered.

7.8 Gravel boards

The dimensions of timber gravel boards shall be either 150 mm × 22 mm or 150 mm × 32 mm in cross-section.

7.9 Centre stumps

The dimensions of centre stumps shall be 600 mm × 50 mm × 50 mm.

7.10 Cleats

The dimensions of timber cleats shall be 150 mm × 65 mm × 38 mm.

8 Fittings

8.1 Fixing and straining devices

8.1.1 Eye bolt strainers

Eye bolt strainers shall consist of bolts of 250 mm overall length and not less than 9.50 mm diameter, with an 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 EN ISO 1461.

8.1.2 Staples

The size of staples for fixing barbed wire to timber posts shall be 40 mm × 4 mm. They shall be of round or sectional wire with a zinc coating conforming to BS EN 10244-2.

8.1.3 Bolts, nuts, washers and nails

Nails shall be round plain-head nails conforming to BS 1202-1. Bolts, nuts and washers shall be hot dip galvanized in accordance with BS EN ISO 1461.

8.1.4 Coach screws

Coach screws for use with extension arms shall be of 8 mm nominal diameter and 65 mm long. They shall be hot dip galvanized in accordance with BS EN ISO 1461.

8.1.5 Cleats

Angle cleats shall consist of low-carbon steel (mild steel) angle, 45 mm × 45 mm × 4 mm in section. They shall be holed for two 8 mm bolts for attachment to posts, and one 8 mm bolt for attachment of gravel boards.

Two-pin cleats shall consist of mild steel flat 150 mm × 50 mm × 6 mm in section complete with two 10 mm locating pins.

Cleats shall be hot dip galvanized in accordance with BS EN ISO 1461.

8.2 Extension arms for attachment of barbed wire

8.2.1 General

Extension arms for barbed wire shall be either straight or bent at an angle of 40° to 45° from the vertical. They shall be holed or slotted to allow the attachment of at least three lines of barbed wire. These holes or slots shall be positioned such that the distance between lines of barbed wire is not greater than 150 mm, and the height of the lowest line of barbed wire is not more than 150 mm above the top of the feather-edged board filling or, if fitted, the capping. Extension arms and their fixings shall be hot dip galvanized in accordance with BS EN ISO 1461.

8.2.2 Extension arms for use with straining fittings

Extension arms for use with straining fitting shall consist of low-carbon steel (mild steel) angle 50 mm × 50 mm × 6 mm in section. They shall be holed to allow the attachment of eye bolt strainers and twice holed to allow attachment to a post.

8.2.3 Intermediate extension arms

Intermediate extension arms shall consist of low-carbon steel (mild steel) flat, 30 mm × 6 mm in section, and shall be twice holed to allow attachment to a post.

8.3 Concrete surrounding bases of posts and struts

Concrete for surrounding the bases of posts and struts shall be at least one part cement to 10 parts 20 mm all in ballast to BS EN 12620 mixed with the minimum requisite quantity of clean water, or grade C8/10 or ST2 concrete to BS 8500-1:2002 and BS 8500-2:2002. The concrete shall be placed in position before commencement of the initial set.

9 Installation

9.1 Line and level

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

The presence of any electricity, gas, water or other underground services shall be established prior to commencement of excavation, drilling or erection in the working area.

NOTE Unless specified (see Annex E), the installation of the fence does not include cutting or filling of the ground to vary the levels.

9.2 Posts

For palisade fences and for close-boarded fences where a gravel board is included, posts shall be provided at intervals of not more than 3 m, measured centre-to-centre of the posts. For close-boarded fences that do not have a gravel board, the maximum distance shall be 2.4 m between post centres.

Posts shall normally be set vertically in the ground to a depth of 0.6 m for fences less than 1.5 m high, and to a depth of 0.75 m for other fence heights. Holes for posts set in concrete shall be not less than 0.3 m × 0.3 m in plan, or, if round, as produced by an auger, not less than 0.3 m in diameter. The holes for posts set only in rammed backfill shall be as small as is practicable to allow for refilling with backfill and ramming. All holes shall have vertical sides.

NOTE 1 It is realized that the ground at the top of a hole is damaged during digging. This is acceptable provided that the damage is limited to the top of the hole and does not extend downward such that the hole itself is tapered out towards the top.

Concrete surrounding the base of concrete posts shall fill at least half the depth of the hole. The remainder of the hole shall be filled with backfill.

NOTE 2 The concrete should be placed after insertion of the post and should be well rammed as the filling proceeds. The backfill should be well rammed before the commencement of the initial set of the concrete.

If timber posts are used, they shall either be set in concrete as for concrete posts, or set directly in the ground and surrounded by rammed backfill.

NOTE 3 The backfill should be well rammed as filling proceeds.

9.3 Infill

9.3.1 Rails

Where recessed concrete posts are used, main rails shall be fixed to the posts by means of one 8 mm diameter bolt at each end.

Where morticed posts are used, the main rails and, where a capping is to be provided, the counter rail shall be fitted into the mortices (see Figure 1 and Figure 2).

Where timber posts are used, the top arris or rectangular rail shall be pinned at each end with a single 12 mm diameter wooden peg.

9.3.2 Gravel boards

Concrete gravel boards shall be attached to concrete posts with angle cleats or two-pin cleats. Angle cleats shall be twice bolted to the posts or two-pin cleats shall be located by fitting the pins into the same bolt holes in the posts and the gravel board shall be once bolted to each cleat and once to the centre/gravel stump, using 8 mm diameter bolts.

Timber gravel boards shall be attached to posts with timber cleats. The timber cleats shall be twice bolted to concrete posts using 8 mm bolts, or twice nailed to timber posts using 65 mm × 3 mm nails. The timber gravel board shall be twice nailed to each cleat and twice nailed to the centre stump, using 65 mm × 3 mm nails.

9.3.3 Centre stumps

Centre stumps shall be fitted under the bottom rail at the centre of each bay, and nailed to the rail with one 65 mm × 3 mm nail. The lower end shall be set in the ground.

The stumps shall be cut at the top to fit the bottom rail.

Where a gravel board is specified, it shall be accompanied by a stump.

NOTE If a gravel board is not fitted, the use of a stump is at the discretion of the customer.

9.3.4 Feather-edged boards

No fewer than 12 feather-edged boards shall be provided per metre. They shall be lapped by approximately 18 mm. They shall rest on top of the gravel board, if any, and be nailed to each main rail with 50 mm × 2.65 mm nails. They shall be nailed to the counter rail, if any, with 40 mm × 2.65 mm nails if the counter rail is of 65 mm × 25 mm section, or with 50 mm × 2.65 mm nails if the counter rail is of 50 mm × 32 mm section. Each nail shall pierce only one feather-edged board.

The tops of the feather-edged boards shall be aligned. Where gravel boards are not fitted, there shall be a clearance between the bottom of the feather-edged boards and the general ground level.

9.3.5 Palisades

The space between adjacent rectangular palisades shall be 75 mm. Rectangular palisades shall be nailed to each rail with 50 mm × 2.65 mm nails, using two nails for each rail.

The space between adjacent triangular palisades shall be 50 mm. Triangular palisades shall be nailed to each rail with 65 mm × 3.35 mm nails, using two nails for each rail.

The tops of palisades shall be aligned. There shall be a minimal clearance between the bottom of the palisades and the general ground level.

NOTE In areas where vandalism is a threat, consideration should be given to fixing palisades with annular ring shanked and larger headed nails.

9.3.6 Capping

Capping, if provided, shall be nailed to the counter rail at each end and along the capping at intervals not greater than 450 mm centres, using 45 mm × 2 mm nails.

9.3.7 Barbed wire

9.3.7.1 Single lines of barbed wire

Where a single line of barbed wire is specified for direct attachment to extended timber posts for fence types designated PW 180B and BW 180B (see Table 1), it shall be stapled to the side of the post nearest to the protected site, at a point not more than 150 mm above the top of the capping.

9.3.7.2 Extension arms

Separately provided extension arms shall be attached to concrete posts with two 8 mm diameter bolts. They shall be attached to timber posts with either two 8 mm diameter bolts, or with two coach screws conforming to 8.1.4.

NOTE Cranked extensions for barbed wire should normally be directed inwards towards the protected site.

9.3.7.3 Attachment of barbed wire

Each line of barbed wire shall be strained on the extension arms on each post by means of eye-bolt strainers at ends, corners and changes of direction, and at intervals not exceeding 150 m along straight lengths of barbed wire. Each line of wire shall be secured to the extension arm on every intermediate post by means of a tying wire passed through a hole in the extension arm or by locating the strained wire within slots in the extension arm.

9.4 Renovation of damaged areas of a hot dip galvanized coating

Small areas of a hot dip galvanized coating damaged by welding, cutting or by excessively rough treatment during transit and installation shall be renovated either by the use of low-melting-point zinc alloy repair or powders made specifically for this purpose, or by the use of at least two coats of zinc-rich paint conforming to BS 4652).

Sufficient material shall be applied to provide a zinc coating at least equal in thickness to the original layer.

NOTE The maximum area for which such repairs are acceptable depends on the article and the application, but a maximum area of 40 mm² is suggested as a guide.

10 Statement of conformity

10.1 Fence manufacturer

On delivery, the manufacturer/supplier of the fence shall provide the installer with a certificate, conforming to **10.3**, confirming that the fence and/or gates are manufactured in accordance with the client's instructions.

NOTE This certificate can be in the form of an invoice provided this conforms to **10.3**.

10.2 Fence installer

On completion, the fence installer shall provide the end user with a certificate, conforming to **10.3**, confirming that the installation, and materials used, are in accordance with the client's instructions.

NOTE This certificate can be in the form of an invoice provided this conforms to **10.3**.

10.3 Certificate

In addition to the requirements of **10.1** and **10.2**, the certificate shall also include the following information:

- a) the supplier's name and address;
- b) the contract or order number;
- c) the date of delivery or installation, as appropriate;
- d) the purchaser's name and address.

10.4 Statement

The manufacturer and/or installer shall make a statement to the effect that it is their policy to conform to a previously client agreed and documented specification and to offer goods and/or services accordingly.

NOTE This could be done by inclusion in trade advertising and “terms of trading” statements supplied with quotations.

Annex A (normative) **Concrete components**

A.1 Materials

A.1.1 Cement

Cement for concrete shall be:

- a) Portland cement (ordinary or rapid hardening) conforming to BS EN 197-1;
- b) Portland-blastfurnace cement conforming to BS EN 197-4; or
- c) sulfate-resisting Portland cement conforming to BS 4027.

A.1.2 Aggregate

Aggregate shall conform to BS EN 12620.

Aggregate shall not exceed 10 mm nominal size.

A.1.3 Admixtures

Admixtures for concrete shall conform as follows:

- a) pigments: BS EN 12878;
- b) pulverized-fuel ash: BS 3892;
- c) concrete admixtures: BS EN 480 or BS EN 934 and shall be used in accordance with BS EN 12839.

A.1.4 Chloride content

For chloride content BS EN 206-1:2001, **5.2.7** applies.

Calcium chloride and chloride based admixtures shall not be added to concrete containing steel reinforcement.

A.1.5 Reinforcement

Reinforcement for concrete shall conform to BS 4449, BS 4482 or BS 4483.

A.2 Moulds

Moulds shall remain rigid during placing and compaction of the concrete and shall prevent loss of water, grout or mortar. Moulds shall produce finished components accurately within the specified limits.

Timber moulds shall be of closely jointed planed timber.

A.3 Manufacture

A.3.1 Mixing

The concrete shall be mixed in a mechanical mixer until uniform in colour and consistency.

A.3.2 Placing and compaction

The concrete shall be placed as soon as practicable after mixing, and shall be thoroughly compacted by vibration, tamping or other method so that on demoulding the surface is free from honeycombing and other large blemishes (see A.4).

NOTE Blemishes do not include small surface voids caused by entrapped air or water.

A.3.3 Location of reinforcement

Reinforcement shall be prefabricated and located during the placing and compacting of the concrete so that the cover of concrete measured from the main external faces and from the top of a post or strut is at least 15 mm, or 10 mm if the section is 100 mm × 100 mm or less.

The length of the assembled reinforcement shall be at least equal to the minimum length of the component, minus up to 100 mm to allow for the minimum cover and up to 75 mm to allow for cutting, prefabrication and location.

Reinforcement shall extend beyond the centre line of the uppermost line wire hole or beyond the top edge of the uppermost rail fixing point, as appropriate.

NOTE If the ends of the components are splayed, each bar can be of equal length.

A.3.4 Protection from freezing

Materials that have been exposed to below freezing point shall not be used unless completely thawed.

Components shall not be moulded if the mould is below freezing point. The temperature of fresh concrete shall be not less than 5 °C at the time of placing.

A.3.5 Maturing

Components shall not be used unless:

- a) the concrete has a strength of 45 N/mm², as tested in accordance with A.5; or
- b) they have been allowed to mature under suitable conditions for at least 28 days at normal ambient temperatures.

A.4 Surface characteristics

A.4.1 Surface finish as cast

The surface finish shall be assessed against the reference photographs in BS EN 12839:2001, Annex B. Furthermore, the total area of blowholes shall not exceed 3% of the concrete surface and no blowhole shall exceed 150 mm².

NOTE It is acknowledged that semi-dry cast posts may have a more visually open surface texture than shown in these photographs.

A.4.2 Surface finish as treated

The requirements of BS EN 12839:2001, 5.3.2 shall apply.

A.5 Tests

To demonstrate compliance, testing shall comprise of initial type testing and factory production control in accordance with BS EN 12839:2001, Clause 6.

A.6 Product information

The manufacturer shall give the following information on at least one product by unit of packaging, delivery notes, certificate or any documentation supplied with components in accordance with BS EN 12839:2001, **ZA.3**.

- a) Name (or identifying mark) and address of the manufacturer.
- b) Last 2 digits of the year in which the marking was affixed.
- c) BS 1722 and BS EN 12839: Elements for Fences.
- d) Loadbearing capacity, expressed in newtons according to the result of initial type testing, rounded down to the nearest ten.

Annex B (normative) Timber components

B.1 General

Timber shall be of a species suitable for use in fencing. Timber fencing components shall be suitably designed 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 **B.3**).

NOTE This annex is concerned with ensuring the durability of timber components. In some cases economic or aesthetic constraints will influence the choice of species.

Timber shall be of the appropriate durability recommended in BS EN 335-2, BS EN 350-2 and BS 8417:2003, Table 2.

B.2 Quality of sawn timber

B.2.1 Limiting characteristics

When measured in accordance with **B.2.2**, 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 conform to Table B.1.

NOTE 1 The method of sampling should be agreed between the supplier and the specifier. A suggested sampling procedure is given in Annex C.

NOTE 2 Defects caused by changing climatic conditions should 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.

B.2.2 Methods of measurement

B.2.2.1 Knots in structural components

NOTE 1 See Figure B.1 a) and Figure B.1 b).

Knots or groups of knots in the same cross-section shall be limited by their knot area ratio (KAR), which shall be taken as the ratio of the sum of the projected cross-sectional areas of the knots to the cross-sectional area of the piece. Knots shall be considered as part of the same cross-section if any parts of the knots, or the grain disturbances for which they are responsible, overlap along the length of the piece. Knots or knot holes of diameters equal to or less than 5 mm are ignored. No distinction shall be made between knot holes, dead knots or intergrown knots.

NOTE 2 B.2.3 describes a method for measuring KAR, for use in verifying the grading of a piece of timber, for instance in the case of a dispute.

NOTE 3 An intergrown knot is a knot having fibres intergrown with those of the surrounding wood to the extent of approximately 75% or more of the cross-sectional perimeter.

B.2.2.2 Knots in non-structural components

NOTE 1 See Figure B.1c).

Only knots emerging on the face of non-structural components are considered. Take the size of the individual knots and knot clusters as being the minimum dimension (k) that can be enclosed by a pair of parallel lines. Measure the dimension k on each face; the greatest value of k shall not exceed $0.5w$, where w is the width of the face. Dead knots are acceptable if their diameter is less than 25 mm.

NOTE 2 A dead knot is a knot whose fibres are intergrown with those of the surrounding wood to an extent of less than 25% of the cross-sectional area.

B.2.2.3 Wane

NOTE See Figure B.2.

Place a straightedge against a face or edge of the piece and measure the wane.

B.2.2.4 Slope of grain

Measure the slope of grain either:

- a) by taking a line parallel to the surface fissures; or
- b) by using 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 B.3, in which AB is a line indicating grain direction, AC is a line drawn parallel to the edge of the member, and 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 the length of BC.

B.2.2.5 Checks

NOTE See Figure B.4a.

Measure the maximum depth to which a 0.2 mm feeler gauge conforming to BS 957-2 can be inserted without using excessive force.

B.2.2.6 End shakes

NOTE See Figure B.4b.

Measure the maximum distance from the split end of the piece to a point at which a 0.2 mm feeler gauge conforming to BS 957-2 can be inserted to a depth of half the piece without using excessive force.

B.2.2.7 Straightness

Measure bow, spring, twist and cup as shown in Figure B.5, taking the actual length or width (as relevant) of the piece as the reference.

B.2.3 Method for determining the KAR for structural components**B.2.3.1 General**

If it is necessary to verify the visual assessment of the KAR of a structural component, for instance in the case of a dispute, the method described in **B.2.3.2** shall be used.

B.2.3.2 Procedure

B.2.3.2.1 Select a section in the piece that intersects the knot or group of knots.

B.2.3.2.2 In calculating the knot area ratio of the whole piece, consider all the knots and knot holes with diameters greater than 5 mm which are intersected by the chosen section.

B.2.3.2.3 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.

B.2.3.2.4 Measure the total area of knots as described in either 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 outside the cross-section, examine the nearest end of the piece and assume that all annual rings are concentric with the pith.

- a) If the pith is within the cross-section (see Figure B.1), 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 those lines which corresponds to knots for the whole cross-section.
- b) 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, to determine the knot area ratio (see **B.2.2.1**).

B.3 Preservative treatment

Timber shall be preserved in accordance with the recommendations for fencing timber given in BS 8417.

Under normal conditions the life expectancy of the panel shall be 15 years, subject to the maintenance recommended by the manufacturer where prescribed; if a longer service life is required 30 years shall be specified. Where preservation is required to achieve this service life, Tables 4, 5, 6 and 9 of BS 8417:2003 shall apply.

NOTE Certain species of timber do not require treatment, depending upon the intended use and provided that there is not excessive sapwood. Durability classes for common species are given in BS EN 350-2 and guidance on which of these can be used without preservation is given in BS 8417. Whenever an amount of sapwood is present, the loss of which would render the fence component unfit for its intended use, the timber should be treated with preservative.

B.4 Regulations regarding wood preservatives

Users are reminded of two regulations regarding the wood preservatives chromated copper arsenate (CCA) and creosote.

NOTE 1 Marketing and use of chromated copper arsenate (CCA): The Environmental Protection (Controls on Dangerous Substances) Regulations 2003, SI 2003/3274 [1] and The Marketing and Use of Dangerous Substances (No. 4) Regulations (Northern Ireland) 2003, SR 2003/548 [2] restrict the marketing and use of chromated copper arsenate (CCA) treated timber. Examples of uses for which treated timber is not permitted include residential or domestic structures (whatever the purpose) and in any application where there is a risk of repeated skin contact. Guidance on the restrictions is available from the Wood Protection Association [3].

NOTE 2 Marketing and use of creosote: The Creosote (Prohibition on Use and Marketing) (No. 2) Regulations 2003 [4] restrict the marketing and use of creosote treated timber. Examples of uses for which treated timber is not permitted include uses in parks, gardens or outdoor leisure facilities where there is a risk of frequent skin contact. Guidance on the restrictions is available from the Wood Protection Association [5].

Table B.1 Characteristics and defects of sawn softwoods and hardwoods

Characteristics	Structural components		Non-structural components
	Posts	Rails	
Knots	Total KAR (see B.2.2.1) not greater than $\frac{1}{2}$ ^{A)}		Size of knot shall not exceed half width of face
Wane	Not more than 15 mm on any corner. At least two adjacent corners shall be free of wane	Not more than 10 mm on any corner. At least two adjacent corners shall be free of wane	
Slope of grain	Not more than 1 in 6 to the longitudinal axis of the piece		
Rate of growth	Unlimited		
Checks ^{B)}	The depth of each check shall not exceed one half of the thickness of the piece		
End shakes ^{B)}	Not longer than 150 mm		
Resin pockets	Unlimited	Not longer than the width of the piece	
Bark pockets	Unlimited	Not longer than the width of the piece and not wider than 5 mm	
Rot	Not permitted		
Active insect attack	Not permitted		
Lyctus damage	Not permitted		
Pin holes	Not more than 20 in any 0.3 m length	Not more than 10 in any 0.6 m length	
Blackheart	Unlimited ^{C)}		
Blue stain	Unlimited ^{C)}		
Straightness ^{B)}	Bow	Not more than 10 mm per 1 m length	
	Spring	Not more than 10 mm per 1 m length	
	Twist	Not more than 2 mm per 25 mm width	
	Cup	Not more than 1 mm per 25 mm width	
Boxed heart	Unlimited		

^{A)} Within a parcel, no fewer than 90% of the pieces shall have a KAR of $\frac{1}{2}$ or less. A KAR not exceeding $\frac{3}{5}$ is permitted in up to 10% of the pieces in the parcel.

^{B)} Defects affected by changing climatic conditions (see Note 2 to **B.2.1**).

^{C)} Not considered a defect.

Figure B.2 Measurement of wane

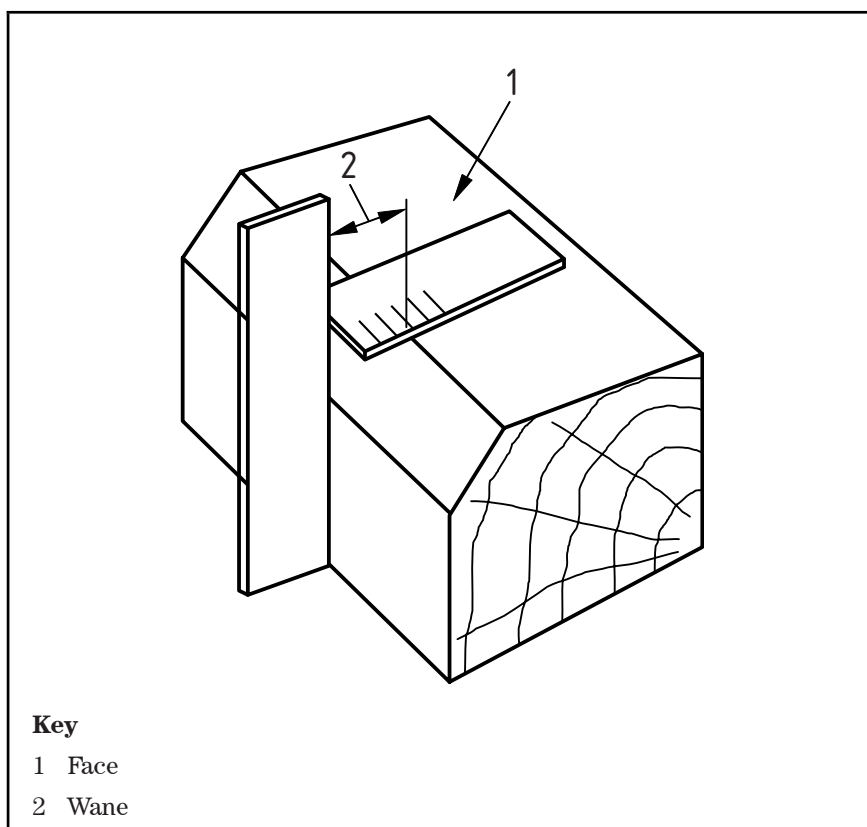


Figure B.3 Measurement of slope of grain

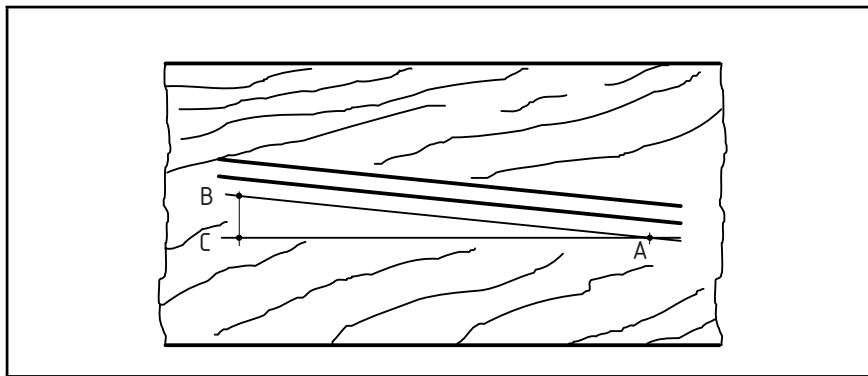


Figure B.4 Measurement of checks and end shakes

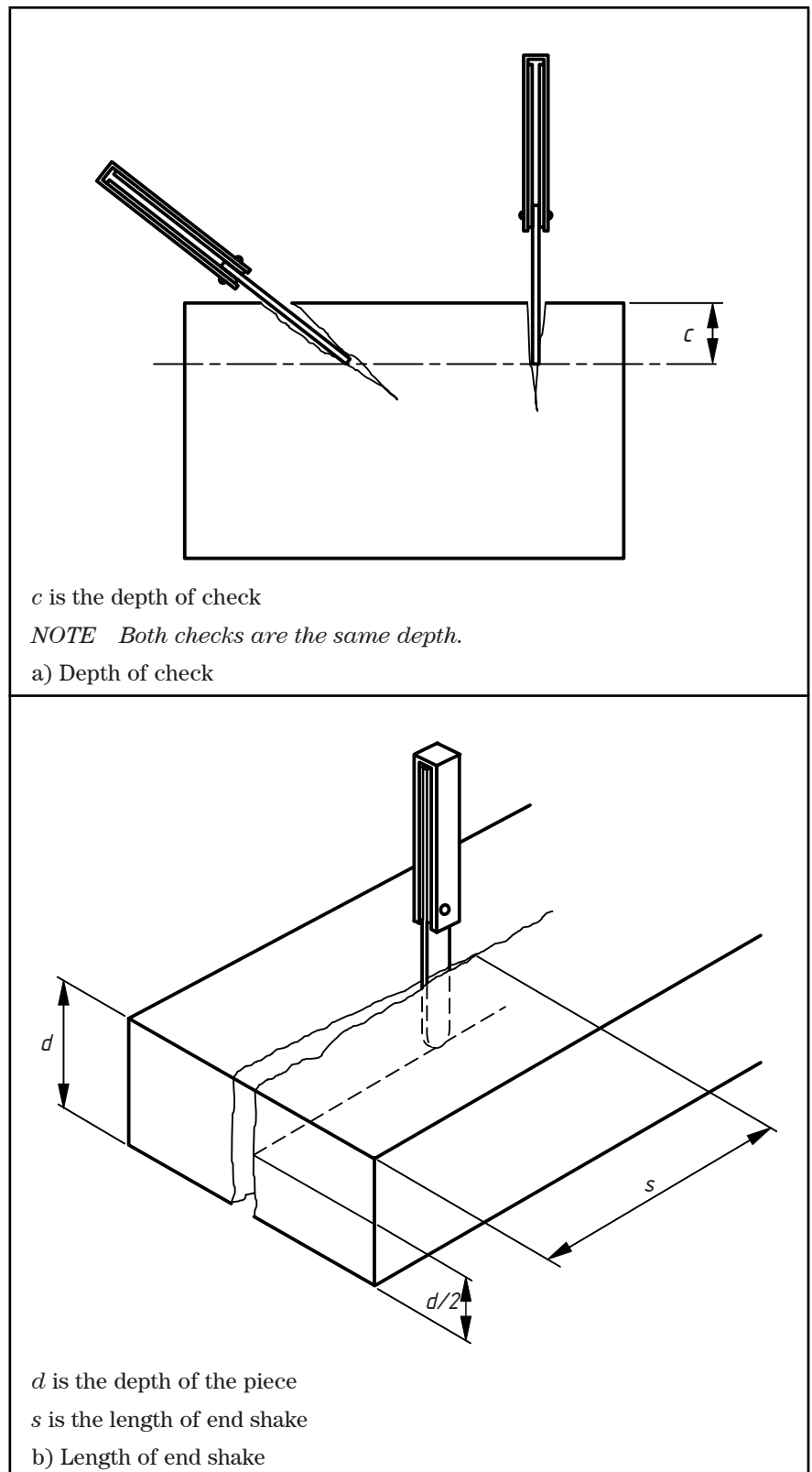
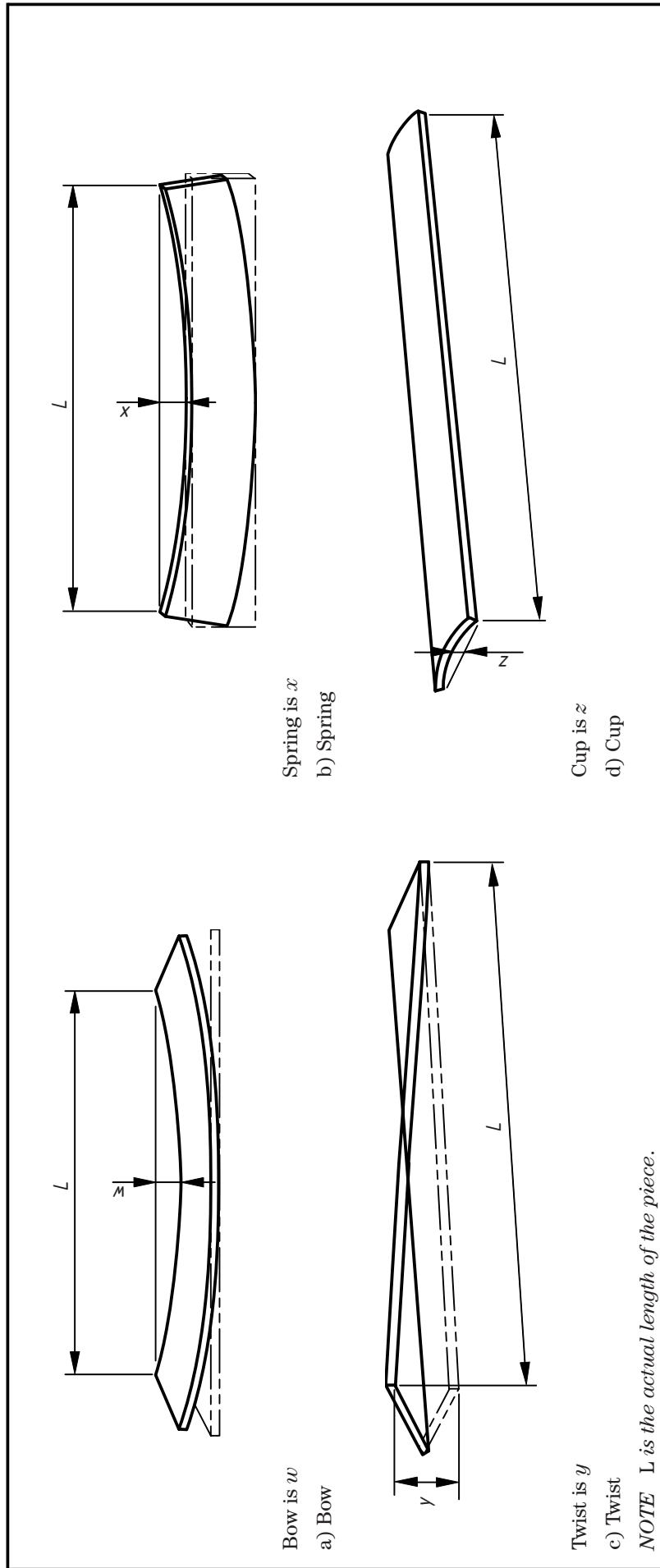


Figure B.5 Measurement of straightness



Annex C (informative) Suggested sampling method for use when measuring the limiting characteristics of timber

C.1 Purpose

This sampling plan is for use in determining initially if a parcel of timber pieces conforms to Table C.1. It does not preclude the subsequent rejection of individual pieces for non-conformity with Table C.1, except for defects due to changing climatic conditions (see Table C.1).

C.2 Procedure

Sample in accordance with Table C.1. 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 a defective piece).

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

Table C.1 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 fewer than 91 pieces, 100% inspection is recommended.

Annex D (informative) Determination of moisture content

Moisture content should not exceed 28% when measured with a calibrated moisture meter of the electrical resistance type, fitted with insulated probes that can be hammered into wood to the depth specified in Table D.1.

When determining the suitability of a charge of timber for preservation, moisture readings should be made on no fewer than $\sqrt{(n/2)}$ separate components, where n is the total number of components in the charge. The components to be measured should be taken from random positions in the charge. The number of heartwood and sapwood faces sampled should reflect the relative proportions of these types of wood in the charge as a whole.

If preferred, the oven-dry method of determining moisture content as described in BS EN 212 may be used in place of a moisture meter.

To achieve the recommended moisture content of 28% (m/m) timber can be either air dried or kiln dried. For either process it is essential that fencing timber is debarked and stacked so that air can circulate freely. In winter little natural drying is likely, therefore kiln drying may be the only effective solution.

Table D.1 **Determination of moisture content of timber to be treated for use in fencing**

Type of timber	Length of electrodes within the timber	Maximum indicated moisture content in an sample %
a) All sapwood	25 mm, or sapwood thickness if less	
b) Heartwood of wood species other than those listed in c):		28
posts	25 mm	
other components	12 mm	
c) Heartwood of sweet chestnut, dahoma, danta, guarea, kapur, kempas, oak	5 mm	

Annex E (informative) **Specifying a close-boarded or palisade fence**

E.1 **General**

This standard specifies requirements for materials and how they are combined and installed to provide a serviceable fence. Because a fence is made up of a number of separate components whose particular features may vary, a number of combinations are available to the user. When preparing a specification for a fence, it is therefore important to give precise details, including details of the installation site. This appendix lists those items which typically need to be specified. However, as conditions vary from site to site, this list should not be assumed to be exhaustive.

E.2 **Site conditions**

The following items typically need to be specified:

- a) line and length of fence;
- b) profile of fence, and any ground clearance (see **9.1**);
- c) site preparation (see **9.1**):
 - 1) site clearance;
 - 2) cutting or filling of ground level;
- d) any specific requirements for non-standard post lengths due to ground conditions (see Foreword).

NOTE The requirements given in this standard for the length of posts relate to "normal" ground conditions. This standard does not cover situations where the ground is particularly soft or firm, when it may be necessary to modify the specified lengths or foundation sizes. The method used to set timber posts in the ground is also determined by the local ground conditions.

E.3 Close-boarded fence

The following items typically need to be specified:

- a) fence type designation (see Table 1);
- b) additional security: barbed wire (see footnotes to Table 1):
 - 1) separate extension arms and barbed wire:
 - i) form of extension arm (see **8.2.1**), i.e. vertical or cranked, and its orientation relative to the protected site (see **9.3.7.2**);
 - ii) number of lines of barbed wire (see **8.2.1**);
 - iii) particular requirements for attachment of barbed wire to extension arms (see **9.3.7.3**);
 - 2) single line of barbed wire directly attached to extended timber posts (see **9.3.7.1**);
- c) gravel boards (see footnotes to Table 1):
 - 1) concrete;
 - 2) timber: specify section (see **7.8**);
- d) capping and counter rails (see footnotes to Table 1);
- e) posts:
 - 1) method of setting timber posts in the ground (see **9.2**);
 - 2) any special requirements for the spacing of posts;

NOTE The maximum spacing for posts is specified in 9.2. If shorter bays are required, they need to be specified by the purchaser.
 - 3) concrete posts:
 - i) wind class of concrete posts;
 - ii) standard of surface finish, assessed against the reference photographs in Annex B of BS EN 12839:2001;
 - iii) if it is desired that sharp edges are removed from all long arrises of concrete posts, this should be agreed as an additional requirement of the specification (see **6.3**);
 - 4) main rails (see **7.4**):
 - i) arris;
 - ii) rectangular.

E.4 Wooden palisade fence

The following items typically need to be specified:

- a) fence type designation (see Table 2);
- b) type of infill:
 - 1) section of palisade (see 7.7);
 - 2) shape of top of palisades (see 7.7);
- c) additional security: barbed wire (see footnotes to Table 2):
 - 1) separate extension arms and barbed wire:
 - i) form of extension arm (see 8.2.1), i.e. vertical or cranked, and its orientation relative to the protected site (see 9.3.7.2);
 - ii) number of lines of barbed wire (see 8.2.1);
 - iii) particular requirements for attachment of barbed wire to extension arms (see 9.3.7.3);
 - 2) single line of barbed wire directly attached to extended timber posts (see 9.3.7.1);
- d) posts:
 - 1) method of setting timber posts in the ground (see 9.2);
 - 2) any special requirements for spacing of posts;

NOTE The maximum spacing for posts is specified in 9.2. If shorter bays are required, they need to be specified by the purchaser.
 - 3) concrete posts:
 - i) standard of surface finish, assessed against the reference photographs in BS EN 12839:2001, Annex B;
 - ii) If it is desired that sharp edges are removed from all long arrises of concrete posts, this should be agreed as an additional requirement of the specification (see 6.3);
- e) rails (see 7.4):
 - 1) arris;
 - 2) rectangular.

Bibliography

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For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 13556, *Round and sawn timber – Nomenclature of timbers used in Europe*

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- [1] GREAT BRITAIN. Statutory Instrument 2003 No. 3274: The Environmental Protection (Controls on Dangerous Substances) Regulations 2003. London: The Stationery Office.
- [2] GREAT BRITAIN. Statutory Rules 2003 No. 548: The Marketing and Use of Dangerous Substances (No. 4) Regulations (Northern Ireland) 2003. London: The Stationery Office.
- [3] Wood Protection Association. *Use of CCA wood preservatives and CCA-treated timber*³⁾.
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³⁾ Wood Protection Association, WPA, 1 Gleneagles House, Vernongate, Derby, UK, DE1 1UP; www.wood-protection.org

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