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BS 1722-12:2006

Incorporating
Corrigendum No. 1

BRITISH STANDARD

Fences –

Part 12: Specification for steel palisade fences

ICS 91.090

Confirmed
December 2011

BSI
British Standards

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ISBN 978 0 580 59290 4

The following BSI references relate to the work on this standard:
Committee reference B/201
Draft for comment 06/30139513 DC

Publication history

First published June 1979
Second edition July 1990
Third edition April 1999
Fourth (present) edition November 2006

Amendments issued since publication

Amd. no.	Date	Text affected
Corrigendum No. 1	31 October 2007	Correction of values in Tables 1 and 6

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Summary of pages

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Foreword

Publishing information

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

Supersession

This part of BS 1722-12 supersedes BS 1722-12:1999, which is withdrawn.

Relationship with other publications

BS 1722 is published in the following parts:

- *Part 1: Specification for chain link fences;*
- *Part 2: Specifications 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 surrounds;*[1)]
- *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 systems.*[2)]

Information about this document

It should be noted that no attempt has been made to standardize fences or gates of a purely decorative nature, or those to suit special requirements; or to specify requirements for "patent" proprietary fencing systems. However, such fences or gates should be designed in accordance with the relevant clauses of this part of BS 1722.

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

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This standard establishes minimum requirements for materials and workmanship of the more common types of fence in order to ensure satisfactory service for the purchaser, and to assist manufacturers and erecting contractors by eliminating unnecessary minor variations in the demands of purchasers. It specifies requirements for the components that make up a fence and the way in which the fence should be constructed, including requirements for sizes of components, together with the permissible tolerances on size.

NOTE It should normally be acceptable to use larger size components, except if this could adversely affect the fitting of components or if replacement parts are required to match with those already present.

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

This standard includes requirements for protective treatments but does not include requirements on maintenance. Premature failure of the fence can be avoided by taking care not to damage protective treatments during installation.

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

It is generally assumed in this standard that the fence is erected on horizontal ground. Where erected on a gradient special measures are required.

One of the major changes in this revision of BS 1722-12 is the removal of the 2.4 m high fence from the list of security (SP) palisade fences.

Other changes include the following:

1) More emphasis is placed on the requirements of pales and fixing devices to meet performance standards.
2) The use of rivets is no longer specified, but the standard includes the use of cold swaged pin and flanged collar fastenings.
3) The use of zinc coatings for nuts, bolts, etc. is permitted, but extra treatments might be required where long term use is envisaged.
4) Recommendations for additional security measures are made.
5) Requirements for gates and gate posts have been revised.
6) A requirement for a statement of conformity has been included.

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The general purpose (GP) palisade fence is intended for use in those situations where it is deemed necessary to deter the casual intruder or trespasser from gaining access to areas within the fence where property or goods that are vulnerable to vandalism or interference are located. It is not considered that this fence in itself would prevent unauthorized access. Where dangerous situations could exist for the intruder, a fence of minimum height of 2.4 m should be used.

On those occasions where greater protection from trespass and vandalism is required, the SP fence should be used. Where an improved resistance to vandalism is required for a GP fence, fixings specified for SP fences can be used. However, it should be appreciated that it is not possible to erect a fence that cannot be negotiated by a determined intruder given adequate time, freedom from observation and suitable climbing aids or tools for forcing an entry.

A number of different profiles have been developed for corrugated pales for use in palisade fencing but it would be impracticable to attempt to describe all such profiles in this standard. Such an approach would also present a risk of stifling further development. To avoid this, requirements are now included to ensure an adequate profile by specifying minimum performance requirements for a pale in terms of bending (flexural) strengths and post to rail fixing assembly. Verification is by means of the test procedures described in Annexes A, B and C. These requirements have been based on the results of an extensive series of tests carried out on a range of different profiles.

In developing the design and installation of palisade fences the supplier and installer should exercise care to avoid providing projections or footholds on the face of the fence and gates that could aid climbing. Junctions of the palisade with existing buildings or other types of fencing should also receive special attention to ensure that corners, angle returns in the palisade, rain water pipes, lighting standards, signboards, etc., do not negate the security being provided by the palisade. Each type of fence has been subdivided according to its height and duty. Height is considered to be the height of the top of the pale above the general ground level as measured at the posts.

It should be noted that throughout this part of BS 1722, the fence post spacings are given in terms of centre distances. All references to rails mean horizontal rails and all references to pales mean vertical pales.

This part of BS 1722 specifies requirements for fence materials and their combination and installation. Because a fence is made up of a number of separate components of which the particular features vary, e.g. galvanized, primed or painted pales, a number of combinations are available to the user. Annex D provides details of the fence requirements and installation site that should be agreed between the fence supplier and purchaser at the time of ordering a fence. However, as conditions vary from site to site, Annex D should not be assumed to be exhaustive.

Use of this document

It has been assumed in the drafting of this part of BS 1722 that the execution of its provisions 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.

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At the time of publication of this British Standard, the registration cards are validated by the Joint Fencing Industry 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.

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1 Scope

This part of BS 1722 specifies requirements for steel palisade fences and gates for general purposes ("GP" fences) in corrugated and angle pales for heights up to 2.4 m, and for security purposes ("SP" fences) in corrugated pales for heights of 3.0 m and 3.6 m, all with posts at 2.75 m centres. This standard also covers fences between 2.4 m and 3.0 m in height with components constructed to the SP specification.

NOTE 1 Where greater resistance against penetration is required, for fences below 2.4 m in height, the SP components should be specified by the purchaser.

NOTE 2 Requirements in this standard for the minimum sizes of fence components are based on a design wind loading, q, at right angles to the plane of the fence of 900 N/m^2 employing a shape factor of 1.9 on the net area presented to the wind.

NOTE 3 In situations of extreme exposure or abnormal loading, it is necessary to carry out a special appraisal and for the design criteria to be specified.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the publication (including any amendments) applies.

BS 4-1, *Structural steel sections – Part 1: Specification for hot-rolled sections*

BS 907, *Specification for dial gauges for linear measurement*

BS 3693, *Recommendations for design of scales and indexes on analogue indicating instruments*

BS 4320, *Specification for metal washers for general engineering purposes – Metric series*

BS 4484-1, *Specification for measuring instruments for constructional works – Part 1: Metric graduation and figuring of instruments for linear measurement*

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

BS 7371-3, *Coatings on metal fasteners – Part 3: Specification for electroplated zinc and cadmium coatings*

BS 7371-6, *Coatings on metal fasteners – Part 6: Specification for hot dipped galvanized coatings*

BS 7371-8, *Coatings on metal fasteners – Part 8: Specification for sherardized coatings*

BS 7805-1, *Swaged collar grooved rivets – Part 1: Specification for sizes up to and including 10 mm diameter*

BS 8500-1:2002, *Concrete – Complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance for the specifier*

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BS 8500-2:2002, *Concrete – Complementary British Standard to BS EN 206-1 – Part 2: Specification for constituent materials and concrete*

BS EN 287-1, *Qualification test of welders – Fusion welding – Part 1: Steels*

BS EN 1011-1, *Welding – Recommendations for welding of metallic materials – Part 1: General guidance for arc welding*

BS EN 1011-2, *Welding – Recommendations for welding of metallic materials – Part 2: Arc welding of ferritic steels*

BS EN 10025-2, *Hot rolled products of non-alloy structural steels – Part 2: Technical delivery conditions for flat products*

BS EN 10051, *Specification for continually hot-rolled uncoated plate, sheet and strip of non-alloy and alloy steels – Tolerances on dimensions and shape*

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

BS EN 10058, *Hot rolled flat steel bars for general purposes – Dimensions and tolerances on shape and dimensions*

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

BS EN 10210-2, *Hot finished structural hollow sections of non-alloy and fine grain structural steels – Part 2: Technical delivery requirements*

BS EN 10219-1, *Cold formed welded structural sections of non-alloy and fine grain steels – Part 1: Technical delivery requirements*

BS EN 10219-2, *Cold formed welded structural sections of non-alloy and fine grain steels – Part 2: Tolerances, dimensions and sectional properties*

BS EN 10240, *Internal and/or external protective coatings for steel tubes – Specification for hot dip galvanized coatings applied in automatic plants*

BS EN 10263-1, *Steel rod, bars and wire for cold heading and cold extrusion – Part 1: General technical delivery conditions*

BS EN 10263-2, *Steel rod, bars and wire for cold heading and cold extrusion – Part 2: Technical delivery conditions for steels not intended for heat treatment after cold working*

BS EN 10263-3, *Steel rod, bars and wire for cold heading and cold extrusion – Part 3: Technical delivery conditions for case hardening steels*

BS EN 10263-4, *Steel rod, bars and wire for cold heading and cold extrusion – Part 4: Technical delivery conditions for steels for quenching and tempering*

BS EN 10296-1, *Welded circular steel tubes for mechanical and general engineering purposes – Technical delivery conditions – Part 1: Non-alloy and alloy steel tubes*

BS EN 12620, *Aggregates for concrete*

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BS EN ISO 376, *Metallic materials – Calibration of force-proving instruments used for the verification of uniaxial testing machines*

BS EN ISO 1461:1999, *Hot dip galvanized coatings on fabricated iron and steel articles – Specification and test methods*

BS EN ISO 7500-1, *Metallic materials – Verification of static uniaxial testing machines – Part 1: Tension/compression testing machines – Verification and calibration of the force-measuring system*

3 Dimensions and general characteristics

3.1 Dimensions and tolerances

The minimum dimensions for components shall be as given in Table 1, Table 2, Table 3, Table 4 and Table 5.

Steel components shall conform to their specified sizes within the normal allowance on cross sections as specified in the applicable material standard.

3.2 Characteristics of pales

3.2.1 General

Pales shall be hot or cold formed. General purpose (GP) fences (see Table 1 and Table 6) shall be either corrugated or angle section; security (SP) fences (see Table 2 and Table 6) shall be corrugated with fastener head protection.

3.2.2 Performance

When tested in accordance with Annex A, pales shall conform to the relevant load/deflection as follows:

a) For SP fencing, the maximum deflection at the middle of the span under a test load of 3.5 kN shall not exceed 10 mm.

b) For GP fencing, the maximum deflection at the middle of the span under a test load of 2.5 kN shall not exceed 8 mm.

Pales shall also withstand the relevant loading for the pale to fence rail assembly in **5.2**.

The pale thickness shall conform to the requirements of **3.2.2**. Pale nominal thickness shall be exclusive of finish and shall conform to the rolling tolerances in BS EN 10051.

NOTE Pale strength is dependant on the profile section and the fabrication methods used. Typical pale thicknesses are given in Table 6.

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3.2.3 Spacing and face to view

The maximum spacing of pales centre to centre shall be:

a) for corrugated pales: 155 mm;

b) for angle pales: 135 mm.

The minimum face to view (width) shall be:

a) for corrugated pales for SP fences: 70 mm;

b) for corrugated pales for GP fences: 65 mm;

c) for angle pales: 56 mm.

3.3 Statement of conformity

The pale manufacturer shall provide a statement of conformity (see **9.1**) to confirm that the pales conform to the specified requirements.

4 Materials

4.1 Steel

The steel grade(s) employed shall be specified on the basis of the mechanical properties, formability and weldability required.

NOTE 1 The steel grade should be specified by the customer (the purchaser, fence designer, supplier, component manufacturer, fabricator or erector), as applicable, see Annex D.

Appropriate mild steel grades shall be selected from Table 7.

As a general guideline, steel grades to be considered shall have a minimum yield strength in excess of 235 N/mm^2, unless the design permits lower strength materials to be employed.

NOTE 2 Materials can be hot or cold formed.

Where components are to be hot dipped galvanized, the purchaser shall confirm with the supplier that the steel composition is suitable.

NOTE 3 A non-exhaustive range of recommended material grades is given in Table 7.

4.2 Bolts, nuts and washers

Bolts shall be strength grade 4 for GP fences and strength grade 8.8 for SP fences. Panel fixing bolts shall be cup square headed. Bolts for pales shall have special formed heads to suit pale profiles and shall be tamper resistant, i.e. not easily removed using simple tools.

Nuts shall be strength grade 4 for grade 4.6 fasteners, and grade 8 for grade 8.8 fasteners.

Washers, if specified, shall conform to BS 4320.

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The corrosion protection to be applied to the bolts, nuts and washers shall be at the discretion of the fence supplier and selected from the following options:

a) galvanizing in accordance with BS EN ISO 1461 or BS 7371-6;

b) sherardizing in accordance with BS 7371-8;

c) zinc electroplating in accordance with BS 7371-3;

d) other suitable proprietary treatments.

NOTE For additional protection other treatments such as galvanizing to BS EN ISO 1461 or BS EN 10240 can be specified.

4.3 Cold swaged pin and collar fixings

Cold swaged collar grooved or grooved fasteners shall conform to BS 7805-1, and shall be formed from carbon boron steel conforming to BS EN 10263-1, BS EN 10263-2, BS EN 10263-3 and BS EN 10263-4, or equivalent, having a minimum tensile strength of 850 N/mm^2. They shall have a suitably formed head and shall be provided with a ductile flanged collar.

The tensile strength of cold swaged pin and collar fixings shall be determined in accordance with Annex B.

The corrosion protection to be applied to the cold swaged pin and collar fixings shall be at the discretion of the fence supplier and selected from the following options:

a) galvanizing in accordance with BS EN ISO 1461 or BS 7371-6;

b) sherardizing in accordance with BS 7371-8;

c) zinc electroplating in accordance with BS 7371-3;

d) other suitable proprietary treatments.

5 Construction

5.1 Pales

Pales shall be secured to the rails at every intersection by one of the following methods:

a) welding;

b) bolting;

c) riveting.

Welding shall comprise 3 mm fillet welds of minimum length 30 mm on each side of the pale.

All welding operations shall be carried out in accordance with BS EN 1011-1 and BS EN 1011-2, by suitable personnel qualified in accordance with BS EN 287-1.

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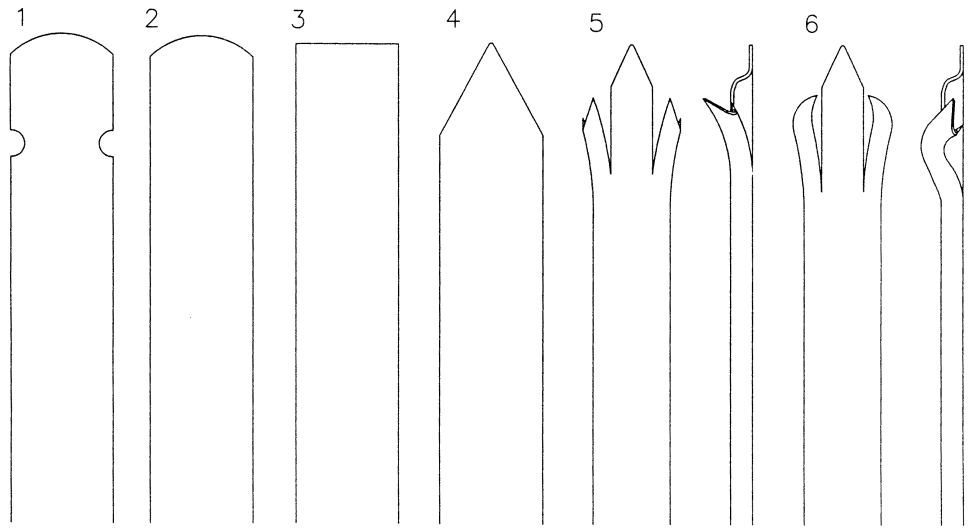
Pales that are not welded shall be secured with fixings of minimum diameter 8 mm. The heads of all fastenings shall have the minimum possible projection beyond the face of the pale to minimize tampering and footholds. For SP pales, the pale to rail fixing design shall allow for the protection of the fastener head from attack. The tolerance on the length of the pale shall be ±5 mm.

NOTE 1 Special fabrication procedures for pales might be required for fences to be erected on a gradient.

*NOTE 2 The shape of the tops of the pales should be specified. The shape of the tops of the pales should be selected from the basic shapes illustrated in Figure 1 and Figure 2 or from the manufacturer's literature. Pointed head pales are not recommended for use on fences less than 2.1 m high adjacent to public thoroughfares. For SP fences only shapes 4 and 6 (see Figure 1) should be specified unless some form of topping is also specified (see **6.4**).*

NOTE 3 Figure 2 illustrates angle pale top shapes.

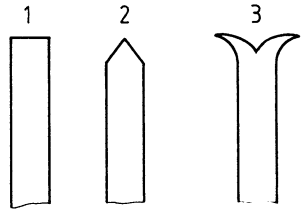
Figure 1 **Corrugated pale top shapes**



Key

1 Round and notched
2 Round only
3 Plain
4 Single pointed
5 Triple pointed and splayed
6 Triple pointed, splayed and returned

Figure 2 **Angle pale top shapes**



Key

1 Plain
2 Single pointed
3 Double pointed and splayed

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5.2 Pale to rail fixing

All samples tested for the pale to rail fixing assembly shall withstand the following loadings when tested in accordance with Annex C:

a) for GP fences: 10 kN;

b) for SP fences: 18 kN.

5.3 Posts

Posts shall be provided at 2.75 m centres.

NOTE 1 Recommended minimum dimensions for posts are given in Table 1 and Table 2.

NOTE 2 Alternative section sizes to those shown can be used in appropriate cases, if agreed between purchaser and supplier.

When a fence is fabricated with pointed top pales, posts shall also be pointed. Where posts are required at different centres, the centres shall be specified and all components shall be purpose designed.

Posts shall be embedded in concrete foundations to the minimum depths given in Table 1 and Table 2. Where removable lengths of palisade fence are required, the construction details or design criteria for the removable posts and their foundations shall be specified.

5.4 Stays

NOTE The fences specified by this British Standard are designed to be used without stays.

If stays are necessary to withstand abnormal loading or site conditions, the design criteria or constructional details of the stays shall be specified.

5.5 Rails

Fences shall have two horizontal rails.

NOTE 1 Recommended minimum dimensions for posts are given in Table 1 and Table 2.

NOTE 2 Alternative section sizes to those shown can be used in appropriate cases, if agreed between purchaser and supplier.

5.5.1 The oversail from the centre of the upper rail fixing to the top of the pales and the oversail from the centre of the lower rail fixing to the bottom of the pales shall be as given in Table 1 and Table 2.

5.6 Post to rail connections

Rails shall be secured to posts with connector plates or fish plates bolted to the vertical leg of the rail. For SP fences, a fish plate or a connector plate shall be fitted to the web of the post. The diameter of the bolts shall be as given in Table 1 and Table 2. Provision shall be made for thermal expansion by providing slotted holes at the rail to plate connection. Plates shall be a minimum of 6 mm thick, and of sufficient section to give a minimum distance of 9 mm to the edge of the hole.

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Connector plates or fish plates shall be connected to the post by one of the following methods:

a) bolting;

b) welding;

c) slotting.

Slotting of the post shall not reduce its resistance to bending by more than 10%.

5.7 Intermediate supports

Intermediate supports, as specified in Table 1 and Table 2, shall be provided to the lower structural rail. Each support shall be either a 40 mm × 40 mm × 5 mm angle or a 30 mm × 10 mm flat, fixed to the rail by an 8 mm diameter bolt or rivet.

5.8 Protective treatment

After fabrication of gates and fencing components, including the punching or drilling of any holes and all welding, the fencing and gates shall normally be hot dip galvanized in accordance with BS EN ISO 1461 or BS EN 10240, unless otherwise specified by the purchaser.

5.9 Renovation and repair of hot dipped galvanized coatings

The fence shall be inspected after erection and any damaged areas found in the hot dipped galvanized coating shall be repaired in accordance with one of the procedures given in BS EN ISO 1461:1999, **6.3**.

*NOTE The procedures given in BS EN ISO 1461:1999, **6.3** include thermal spraying with zinc or use of a suitable zinc rich paint.*

The zinc content of such paint shall be in accordance with BS 4652 (i.e. at least 80% in the dry film).

The coating thickness in the repaired area shall exceed that of the local galvanized coating layer.[3)]

6 Additional security

6.1 General

Additional security measures shall be taken, in accordance with **6.2**, **6.3** or **6.4** as appropriate, for all SP fences.

NOTE These measures are optional for GP fences.

[3)] Suitable proprietary coating repair products are given by the Galvanizers' Association (www.hdg.org.uk). This information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of these products.

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6.2 Burrowing

If burrowing is possible, one of the following measures shall be specified:

a) A concrete sill shall be provided in accordance with **8.1.3**;

b) Pales shall be extended by 150 mm and embedded in the concrete sill as in a);

c) Pales shall be extended by 350 mm and buried in the ground.

6.3 Pale removal

To increase resistance to pale removal, and if the pales are not buried or set in concrete in accordance with **6.2**, an additional rail shall be attached to the lower part of each pale. This additional rail shall be fixed to the pales 100 mm from the bottom of the pale.

6.4 Topping

If required, further security against climbing shall be provided by fixing a spiked topping, barbed wire entanglement or barbed tape concertina to the pales. Such toppings shall be fitted as close to the top of the pales as possible or, in the case of barbed coils, the wire shall sit within the oversail.

NOTE The use of such toppings on SP fences is highly recommended. However, the use of barbed tape concertina is not recommended for fences below 3 m in height as the bottom of the coil should not be less than 2.5 m above ground level.

7 Construction of gates

7.1 General

Gates shall be of comparable quality, and provide a comparable degree of security, to the adjacent fencing. The overall height of the gates when fixed shall not be less than the adjacent fencing height. The top and bottom rails of the gate shall be at the same level as the fence rails.

The distance from the bottom edge of the gate pales to the surface of the road shall not exceed 70 mm when the gate is in the closed position.

The spacing of pales on the gates shall not be greater than that used on the fencing. The clear distance between any vertical framing of the gates and adjacent posts or pales shall not be greater than the clear distance between pales on the adjacent fencing.

All gate frames shall be fabricated from rectangular hollow sections and joints shall be continuously welded.

NOTE 1 The recommended minimum section sizes for gate frames are given in Table 3.

The large dimension of the rectangular hollow section shall be at right angles to the face of the gate.

NOTE 2 Alternative section sizes to those shown can be used in appropriate cases, if agreed between purchaser and supplier.

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To provide rigidity and to limit deflection and sag in service, all pales shall either be fully welded with 3 mm fillet welds at their contact points with the frame so that they form an integral part of the structure of the gate or, if not welded, vertical members or muntins shall be fully welded and located behind the pales at intervals not greater than 2.0 m and not more than 1.0 m from the hinge end of the frame.

Where pales are not welded they shall be attached by the same method as fence pales, to a 40 mm × 6 mm flat (set 40 mm to view) stitch welded to the gate frame by 50 mm alternating welds at pale centres on both sides.

There shall be no footholds between the top and bottom horizontal rails of the gate. Cross-bracing shall not be used.

When cup and socket bottom hinges are used for gates 2.4 m high or higher and over 3.5 m wide (see Table 3), a 6 mm thick triangular gusset shall be welded between the hanging stile and the bottom rail in order to strengthen the bottom overhang of the stile which carries the hinge. The vertical height of the gusset shall be equal to the oversail and the horizontal dimension shall be 0.6 of the vertical height.

Gates 3 m high or higher and over 3.5 m wide (see Table 3) shall be fitted with heel and cup bottom hinges and shall have a 200 mm × 200 mm × 6 mm thick triangular gusset plate continuously welded between the hanging stile and the top horizontal rail.

All welding operations shall be carried out in accordance with BS EN 1011-1 and BS EN 1011-2, by suitable personnel, qualified according to BS EN 287-1.

7.2 Hinges

Hinges and posts shall be designed to take the full load of the gate plus an allowance for superimposed vertical loads equal to 100 kg applied at the nose of the gate without deflection in any position detrimental to its operation.

Hinges shall be designed so that it is impossible to remove the gates by lifting at the hinges when they are in the shut and locked position. The hinges shall be provided with a simple and easily applied system of adjustment for the correction of sag, settlement or misalignment during installation and service.

The bottom hinge shall be attached to the gate frame and the gate post. The dimensions of the hinge components shall be as specified in Tables 7 and 8.

7.3 Drop bolts and slam plates

Minimum drop bolt and slam plate dimensions shall be as specified in Table 7 and Table 8. Mild steel (low carbon steel) drop bolts shall be fitted to all gate frames (and therefore to each leaf of a double gate) so that they cannot be removed. Corresponding sleeves to receive the bolts shall be set securely in the ground and concreted in to enable the gate to be secured in both the closed and opened position. The last closing leaf of double gates shall incorporate a stop that prevents one drop bolt being lifted when the gates are closed. Double gates shall be provided with slam plates top and bottom on the first closing leaf.

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7.4 Locking devices

Locking devices shall be of the sizes specified in Table 7 and Table 8. Double gates shall be fitted with a sliding horizontal locking bar, secured to a locking plate welded to the gate frame at approximately mid-height (but not exceeding 1.5 m) to ensure that the locking bar passes through both of the meeting stiles so that the two gate leaves are firmly held in the shut position. For single gates, the locking bar shall shoot into a socket on the gate post. Locking bar guides welded to the stile shall be an integral part of the stile.

Locking bars shall be holed to receive a padlock or the locking plate shall be prepared for alternative locking devices if these are specified.

Locking devices on SP gates shall not form a foothold or climbing aid on the face of the gate.

NOTE Other locking systems can be specified by the purchaser to suit specific requirements.

7.5 Gate posts

Gate posts shall be of the minimum dimensions given in Table 4 and Table 5.

NOTE 1 In calculating the dimensions, it has been assumed that the major axis of the post is perpendicular to the line of the fence.

NOTE 2 Alternative section sizes can be used in appropriate cases, if agreed between purchaser and supplier.

8 Installation

8.1 Foundations and sills

8.1.1 General

Foundations for SP fences shall be designed to take account of conditions of service if these give rise to loads in excess of the defined wind loads.

Posts for all steel palisade fences shall normally be set in concrete.

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.

8.1.2 Holes for fence post foundations

Unless specifically designed foundations are specified, the dimensions in plan of the holes excavated to receive the posts shall be as given in Table 10. The hole shall be formed, with vertical sides, to a depth below ground level equal to one third of the height of the fence above ground level.

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8.1.3 Concrete sills

Where a concrete sill is specified it shall be formed of *in situ* concrete and shall be continuous between posts under the line of the pales. The sill shall be not less than 125 mm wide × 150 mm deep and cast with the top at or within 50 mm of ground level so that the distance between the underside of the pales and the top of the sill does not exceed 50 mm. If shuttering of the side or weathering of the top of the sill is required, this shall be specified.

8.1.4 Concrete for post foundations and sills

Concrete for post foundations and sills shall be at least one part cement to ten 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.

8.2 Line

The fence shall follow lines specified by the purchaser. The bottom of the pales shall be not more than 50 mm above mean ground level or concrete sill level.

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

NOTE Unless otherwise agreed between the purchaser and supplier (see Annex D) the installation of the fence does not include work required to cut or fill the ground to vary levels nor does it cover special work to secure culverts, ditches, etc.

8.3 Posts

Posts shall be fixed in a concrete base to the appropriate depth. They shall be vertical. The hole for the posts shall be filled to ground level, top of ground beam or road level with concrete which shall be rammed as the filling proceeds and the top of the concrete weathered.

8.4 Intermediate supports

Intermediate supports shall be embedded in concrete to a depth of 100 mm. The concrete shall be either a concrete sill as specified in **8.1** or a concrete base 150 mm × 150 mm × 150 mm deep with the top at ground level.

8.5 Fastenings

On completion fastenings shall be secure and tamper resistant, i.e. not easily removed using simple tools.

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8.6 Installation of palisade fences

To reduce the final amount of deflection in the fence rails, during the installation of palisade fences the bottom horizontal rail shall be supported so that, after propping, tightening of the bolts, aligning and plumbing to the fence and before placing concrete to posts surround, there is a slight upward camber. The temporary props to the bottom rail shall be removed only after the concrete has set.

9 Statement of conformity

9.1 Fence manufacturer

On delivery, the manufacturer/supplier of the fence shall provide the installer with a certificate, conforming to **9.3**, 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 **9.3**.*

9.2 Fence installer

On completion, the fence installer shall provide the end user with a certificate, conforming to **9.3**, 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 **9.3**.*

9.3 Certificate

In addition to the requirements of **9.1** and **9.2**, 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.

9.4 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.

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Table 1 **Basic dimensions for GP fences with posts at 2.75 m centres**

BS type reference	Fence height above ground [A]	Basic dimensions										
		Posts			Rails (horizontal)		Pales					
							Angle (minimum face to view = 56 mm)			Corrugated (minimum face to view = 65 mm)		
		Rolled steel joist		Embedded length [B]	Rolled steel angle	Connector bolt diameter	Rolled steel angle	Oversail		Nominal thickness	Oversail	
								Top	Bottom [E]		Top	Bottom [E]
	mm	mm	kg/m	mm	mm	mm	mm	mm	mm		mm	mm
GP 15	1.50	102 × 44	7.5	525	40 × 40 × 6 [C]	10	40 × 40 × 5	225	150		225	150
GP 18	1.80	102 × 44	7.5	525	40 × 40 × 6 [C]	10	40 × 40 × 5	225	150	See **3.2.3** and Table 6	225	150
GP 21	2.10	102 × 44	7.5	625	45 × 45 × 6 [D]	10	40 × 40 × 5	275	200		275	200
GP 24 [F]	2.40	102 × 44	7.5	725	45 × 45 × 6 [D]	12	40 × 40 × 5	300	210		300	210

[A] For other heights of fence, unless stated, the specification for the nearest fence height given in the table should be used.

[B] The embedded length shall be derived from the formula: embedded length $= \frac{\text{fence height}}{3} - 75$ (all dimensions in mm, min. 525).

[C] One intermediate support shall be provided (see **5.7**).

[D] Two intermediate supports shall be provided (see **5.7**).

[E] Maximum ground clearance 50 mm.

[F] If fences are required above this height, use fixings as specified for SP fences.

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Table 2 **Basic dimensions for SP fences with posts at 2.75 m centres**

BS type reference	Fence height above ground [A]	Basic dimensions							
		Posts			Rails (horizontal)		Corrugated pales (minimum face to view = 70 mm)		
		Universal beam		Embedded length [B]	Rolled steel angle [C]	Connector bold diameter	Nominal thickness	Oversail	
								Top	Bottom [D]
	m	mm	kg/m	mm	mm	mm		mm	mm
SP 30	3.00	127 × 76	13.0	925	50 × 50 × 6	12	See **3.2.3** and Table 6	475	380
SP 36	3.60	127 × 76	13.0	1 125	75 × 50 × 6[E]	12		650	550

[A] For other heights of fence, unless stated, the specification for the nearest fence height given in the table shall be used.

[B] The embedded length shall be derived from the formula: embedded length $= \frac{\text{fence height}}{3} - 75$ (all dimensions in millimetres).

[C] If pales are not embedded two intermediate supports shall be provided (see **5.7**).

[D] Maximum ground clearance 50 mm.

[E] 75 mm leg horizontal.

Table 3 **Frame sizes for individual gate leaf widths (pairs or singles)**

Fence height	Frame sizes for individual gate leaf widths							
	⩽1.5 m	**>1.5 m ⩽1.75 m**	**>1.75 m ⩽2.5 m**	**>2.5 m ⩽3.5 m**	**>3.5 m ⩽3.75 m**	**>3.75 m ⩽4.75 m**	**>4.75 m ⩽5.5 m**	**>5.5 m ⩽6.5 m**
m	m	m	m	m	m	m	m	m
1.5	60 × 40 × 3	60 × 40 × 4	80 × 40 × 4	90 × 50 × 3.5	90 × 50 × 3.5	90 × 50 × 3.5	90 × 50 × 3.5	100 × 60 × 5
1.8	60 × 40 × 3	60 × 40 × 4	80 × 40 × 4	90 × 50 × 3.5	90 × 50 × 3.5	90 × 50 × 3.5	90 × 50 × 3.5	100 × 60 × 5
2.1	60 × 40 × 3	60 × 40 × 4	80 × 40 × 4	90 × 50 × 3.5	90 × 50 × 3.5	90 × 50 × 3.5	100 × 60 × 5	100 × 60 × 5
2.4	60 × 40 × 3	60 × 40 × 4	80 × 40 × 4	90 × 50 × 3.5	90 × 50 × 3.5	100 × 60 × 5	100 × 60 × 5	100 × 60 × 5
3 [A]	90 × 50 × 3	90 × 50 × 3.5	100 × 60 × 5	100 × 60 × 5.0	100 × 60 × 5	100 × 60 × 5	120 × 60 × 5	120 × 60 × 6
3.6 [A]	90 × 50 × 3	90 × 50 × 3.5	100 × 60 × 5	100 × 60 × 5.0	100 × 60 × 5	100 × 60 × 5	120 × 60 × 5	120 × 60 × 6

NOTE 1 Where the clear opening of a gateway is critical this should be specified.

NOTE 2 The dimensions of the hollow sections specified are minimum dimensions.

[A] See Clause **7** for construction details.

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Table 4 **Size of steel posts (RSJ, UB or UC) for individual gate leaf widths (pairs or singles)**

Fence height	**Embedded length**	**Size of steel posts for individual gate leaf widths**							
	(see **8.3**)	**⩽1.5 m**	**>1.5 m ⩽1.75 m**	**>1.75 m ⩽2.5 m**	**>2.5 m ⩽3.5 m**	**>3.5 m ⩽3.75 m**	**>3.75 m ⩽4.75 m**	**>4.75 m ⩽ 5.5 m**	**>5.5 m ⩽6.5 m**
m	mm	mm	mm	mm	mm	mm	mm	mm	mm
1.5	525	178 × 102 × 19	178 × 102 × 19	152 × 152 × 37	152 × 152 × 37	203 × 203 × 60	203 × 203 × 60	203 × 203 × 60	203 × 203 × 86
1.8	525	178 × 102 × 19	178 × 102 × 19	152 × 152 × 37	152 × 152 × 37	203 × 203 × 60	203 × 203 × 60	203 × 203 × 60	203 × 203 × 86
2.1	625	178 × 102 × 19	178 × 102 × 19	152 × 152 × 37	203 × 203 × 60	203 × 203 × 60	203 × 203 × 86	203 × 203 × 86	254 × 254 × 107
2.4	725	178 × 102 × 19	152 × 152 × 37	152 × 152 × 37	203 × 203 × 60	203 × 203 × 60	203 × 203 × 86	254 × 254 × 89	254 × 254 × 107
3	925	152 × 152 × 37	152 × 152 × 37	203 × 203 × 60	203 × 203 × 60	203 × 203 × 86	254 × 254 × 89	254 × 254 × 89	305 × 305 × 97
3.6	1 125	152 × 152 × 37	152 × 152 × 37	203 × 203 × 60	203 × 203 × 60	203 × 203 × 86	254 × 254 × 89	254 × 254 × 89	305 × 305 × 97

NOTE *The dimensions of the sections specified are minimum dimensions.*

Table 5 **Recommended steel posts sizes (RHS) for individual gate leaf widths (pairs or singles)**

Fence height	**Embedded length**	**Size of steel posts for individual gate leaf widths**							
	(see **8.3**)	**⩽1.5 m**	**>1.5 m ⩽1.75 m**	**>1.75 m ⩽2.5 m**	**>2.5 m ⩽3.5 m**	**>3.5 m ⩽3.75 m**	**>3.75 m ⩽4.75 m**	**>4.75 m ⩽ 5.5 m**	**>5.5 m ⩽6.5 m**
m	mm	mm	mm	mm	mm	mm	mm	mm	mm
1.5	525	80 × 80 × 5	100 × 100 × 5	100 × 100 × 6	120 × 120 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 6
1.8	525	80 × 80 × 5	100 × 100 × 5	100 × 100 × 6	120 × 120 × 6	150 × 150 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 6
2.1	625	80 × 80 × 5	100 × 100 × 6	120 × 120 × 6	120 × 120 × 6	150 × 150 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 8
2.4	725	80 × 80 × 5	100 × 100 × 6	120 × 120 × 6	120 × 120 × 6	150 × 150 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 8
3	925	100 × 100 × 5	100 × 100 × 6	120 × 120 × 6	150 × 150 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 6	250 × 250 × 8
3.6	1 125	100 × 100 × 5	100 × 100 × 6	120 × 120 × 6	150 × 150 × 6	200 × 200 × 6	200 × 200 × 6	200 × 200 × 6	250 × 250 × 8

NOTE *The dimensions of the steel sections specified are minimum dimensions.*

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Table 6 **Typical profile and nominal thickness of pales which have been found satisfactory**

Typical profile	**General purpose**	**Security**
	mm	mm
Angle	5	Not applicable
Corrugated "W"	2.5	3.0
Corrugated "D"	3.0	3.9

Table 7 **Recommended steel grades**

Material	**Dimensional standard**	**Material standard**	**Material grade** [A)]
Rolled steel angle	BS EN 10056-1	BS EN 10025-2	S235JR
Flat bar	BS EN 10058		
Pales	BS 1722-12	BS EN 10025-2	S235JR
Circular, square or rectangular hollow sections	BS EN 10210-2 BS EN 10219-2	BS EN 10210-1 BS EN 10219-1	S235JRH S235JRH
Circular tubes	BS EN 10296-1	BS EN 10296-1	E 235
I/H sections –rolled steel joists, universal beams and universal columns.	BS 4-1	BS EN 10025-2	S235JR
Plate for baseplates, caps, connectors, fishplates, etc.	–	BS EN 10025-2	S235JR

[A)] Where applicable, the use of higher strength or more enhanced grades than those shown is permissible, provided that they meet the necessary requirements for formability, weldability or galvanizing.

Table 8 **Minimum requirements for fittings for gates (see Table 9 and Figure 3)**

Height of fence	**Fitting schedule category**			
	For single gate	**For pair of gates**		
m	**1.5 m wide or less**	**3.5 m wide or less**	**Over 3.5 m up to 5.0 m wide**	**Over 5.0 m up to 7.0 m wide**
2.4	A	B	B	C
3.0	B	B	D[A)]	D [A)]
3.6	B	B	D[A)]	D [A)]

[A)] Schedule D gates shall be fitted with heel and cup bottom hinges.

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Table 9 **Minimum dimensions for gate fittings**

Description	**Dimensions**			
	Schedule A	**Schedule B**	**Schedule C**	**Schedule D** [A]
	mm	mm	mm	mm
Hinge pins diameter	20	20	30	–
Pivot bolt diameter	20	20	30	30
Gate eye bolt:				
Eye thickness	20	20	30	30
Bolt diameter	20	20	30	30
Lugs:				
Single	20	20	30	–
Double	15	20	20	20
Backing plate thickness	10	12	12	12
Bolt diameter for connecting backing plate to gate frame or posts	2 × 16	2 × 20	2 × 20	2 × 20
Heel pin diameter	–	–	30	40
Heel cup block	–	–	75 × 75 on plan × 50 deep	75 × 75 on plan × 50 deep
Locking bar	50 × 10	50 × 10	75 × 10	75 × 10
Drop bolt diameter	20	22	22	22
Slam plate	6	8	8	8

[A] Schedule D gates shall be fitted with heel and cup bottom hinges.

Table 10 **Holes for fence post foundations**

Fence height above ground level	**Minimum plan dimensions**	
	Square hole	**Round hole**
m	mm	mm
Less than 2.4	350 × 350	450 diameter
2.4	350 × 350	450 diameter
3.0	450 × 450	600 diameter
3.6	450 × 450	600 diameter

NOTE These foundation sizes are based on the assumption of normal ground conditions and wind loading. In abnormal conditions, conditions of extreme exposure or severe conditions of service special measures might be required.

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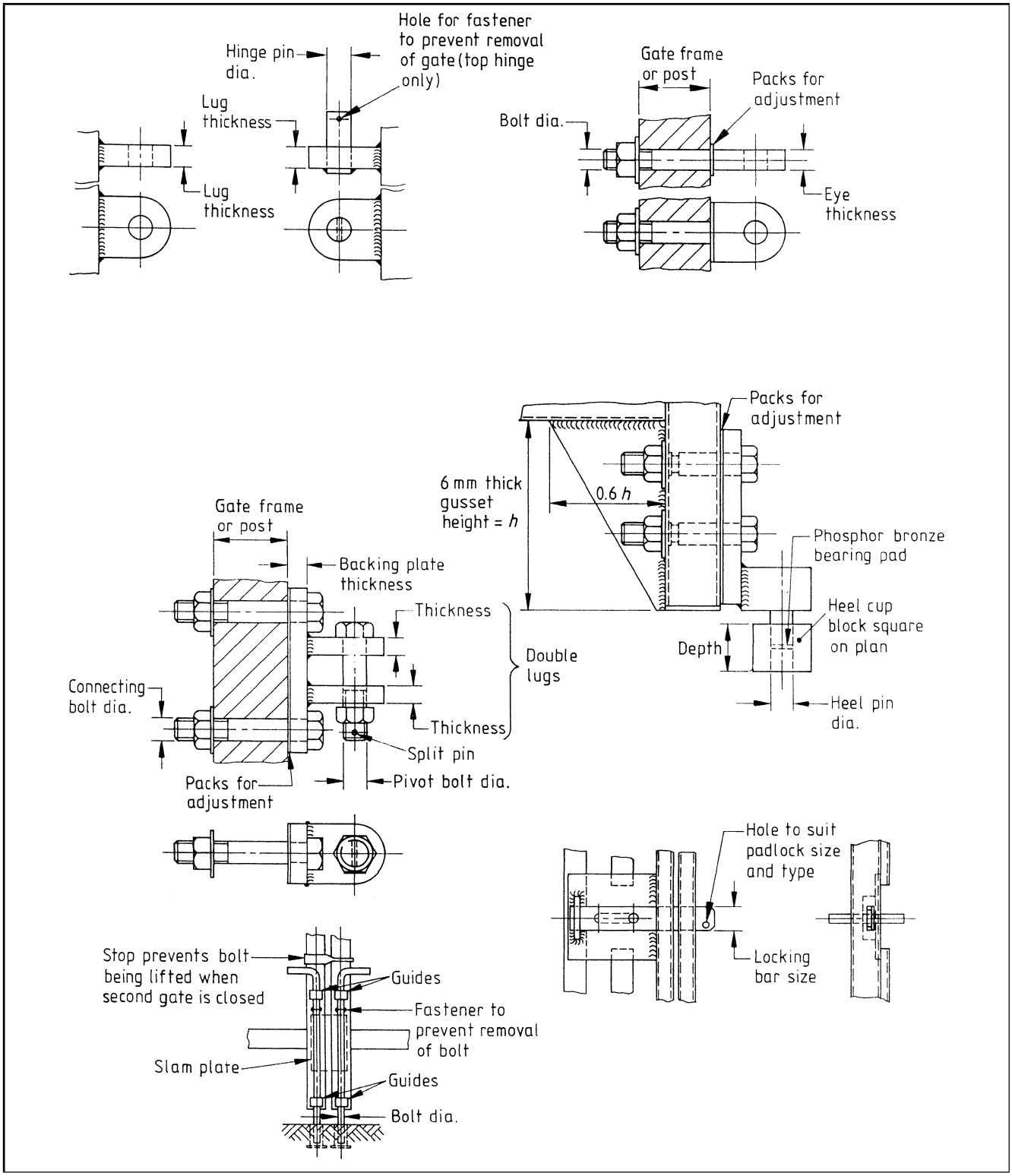
Figure 3 **Examples of gate components**



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Annex A (normative) Method for the determination of characteristic flexural strength of pales

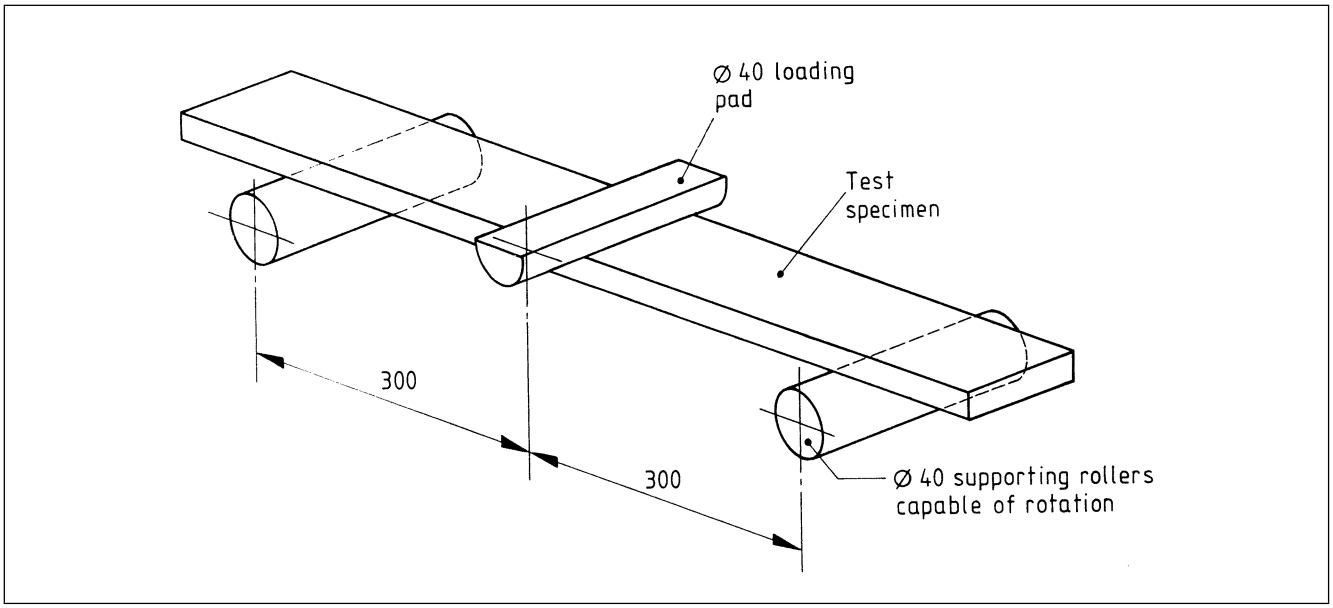
A.1 Apparatus

A.1.1 General

The test shall be carried out using any reliable machine of sufficient capacity and capable of applying the load continuously and vertically.

The device for applying the load shall consist of two radiused supports and a load-applying roller or radiused pad (see Figure A.1).

Figure A.1 **Arrangement of loading test specimen**



All rollers, radiused loading pads or blocks shall be manufactured from steel and shall have a circular cross-section with a diameter of 40 mm ± 2 mm; they shall be at least 10 mm longer than the width of the test specimen.

The distance between the outer supports (i.e. the span), shall be equal to 600 mm. The load shall be applied at the centre of the span as shown in Figure A.1. All rollers shall be adjusted in their correct position with all distances having an accuracy of ±1.0 mm.

A.1.2 Load control

The machine shall be capable of applying the load uniformly without shock using manual or automatic control.

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A.1.3 Load scale indicators or digital displays

A.1.3.1 The machine shall be provided with either:

a) easily read dials or scales which conform to BS 3693; or

b) electrical load indicators, which shall include a visual display.

If electrical load indicators are supplemented by recording devices, e.g. punched tape or printout recorders, these shall conform to the calibration requirements of BS EN ISO 376.

A.1.3.2 The machine shall conform to grade 2.0 of BS EN ISO 7500-1:1999. The machine scale range shall be chosen so that the specimens can be tested in the part of the range which is certified accurate to ±2% of the indicated load.

A.1.3.3 The grading of the machine in accordance with BS EN ISO 7500-1 shall not be affected by variations in mains supply voltage or frequency of ±10% from the normal value to the machine.

NOTE Where electrical or other interference exists, this can affect the accuracy of load indication, and special provisions to overcome this interference may be necessary.

A.1.4 Load verification

The machine dials, scales or displays shall be verified in accordance with BS EN ISO 7500-1.

A.1.5 *2 m metric metal tape measure*, conforming to BS 4484-1.

A.1.6 *0 mm to 25 mm dial test indicator*, conforming to BS 907.

A.2 Test specimens

A.2.1 Dimensions

Test specimens supplied by the mill or pale producer before any other form of processing, machining or surface treatment shall consist of pale cut to 1 000 mm ± 20 mm in length.

A.2.2 Sample size

Six test specimens shall be tested.

A.3 Test procedure

A.3.1 Wipe clean the bearing surfaces of the supporting and loading members and wipe any loose surface deposits off the specimen. Place the specimen in the machine, correctly centred and with the longitudinal axis of the specimen at right angles to the supporting and loading rollers. Do not use any packing between the specimen and the rollers. Apply the test load when all loading and support members are in even contact with the specimen. Discard without testing any specimen which, due to twist, has a clearance of more than 1.0 mm from any contact position under zero load.

Establish a datum for deflection.

Apply the test load steadily and without shock over a period of not less than 30 s. When equilibrium has been achieved measure and record the deflection at the centre of the span.

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A.3.2 Using a new test specimen each time, carry out the test three times with the face of the pale uppermost and three times with the back of the pale uppermost.

A.4 Test report

A.4.1 General

The report shall affirm that the tests were carried out in accordance with Annex A of this standard and shall include the information in **A.4.2** and **A.4.3**. The report shall also state whether or not certificates of sampling and specimen preparation are available. If available a copy of each certificate shall be provided.

A.4.2 Information to be provided to the test laboratory

The following information shall be provided to the test laboratory for inclusion in the report:

a) the date, time and place of sampling and the sample identity number;

b) the name of the supplier.

A.4.3 Information to be provided by the test laboratory

The following information on each specimen shall be provided by the test laboratory for inclusion in the test report:

a) identification (including pale profile);

b) condition when received;

c) date of receipt;

d) measured length, thickness, width and depth;

e) any surface preparation;

f) deflection at the specified loading;

g) date of test;

h) other remarks, as necessary.

Annex B (normative) Method of determination of tensile strength of cold swaged pin and collar fixings

B.1 General

This annex describes a procedure for testing assembled fixings against pull-out and push-out loads.

This test is intended for design verification to be used:

a) during product development;

b) when there is a change in the design, cross-section or material specification;

c) whenever a definitive means of checking compliance is required.

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B.2 Apparatus

B.2.1 *Test plates of hardened steel*, as shown in Figure B.1 and Figure B.2, of a thickness suitable for the fastener to be tested.

B.2.2 *Hydraulic ram*, or other means of applying a force to the test plates and to test the plunger.

B.2.3 *Proving ring*, or other means of determining the force, applied to an accuracy of 0.5 kN.

Figure B.1 **Push-out test arrangement**

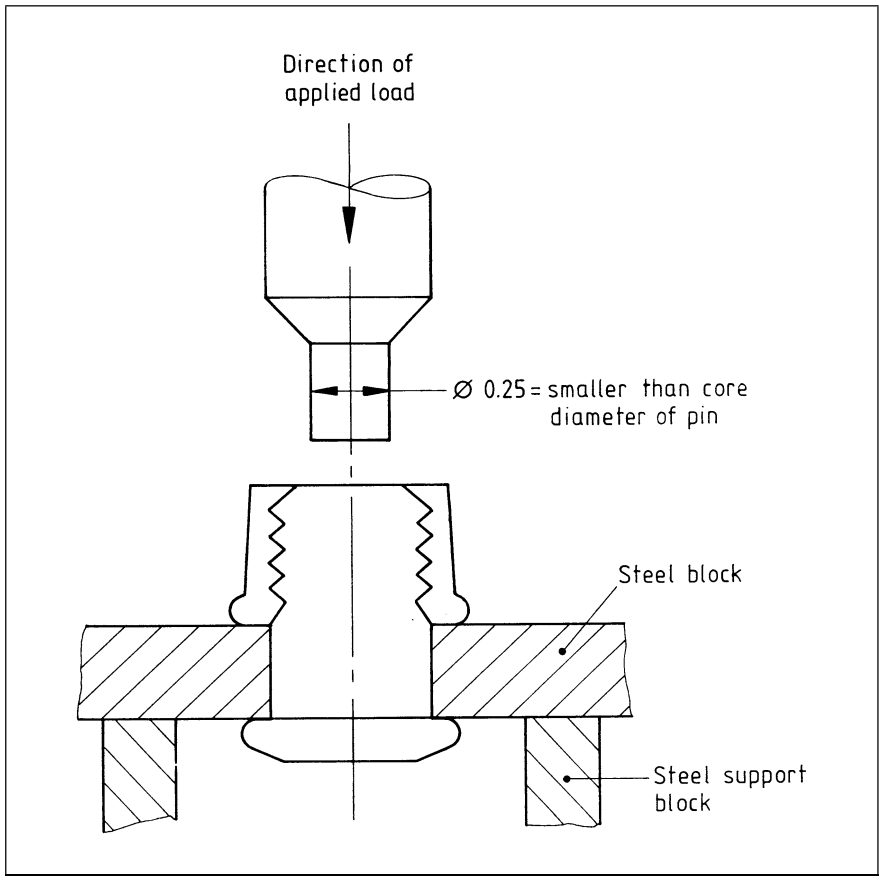

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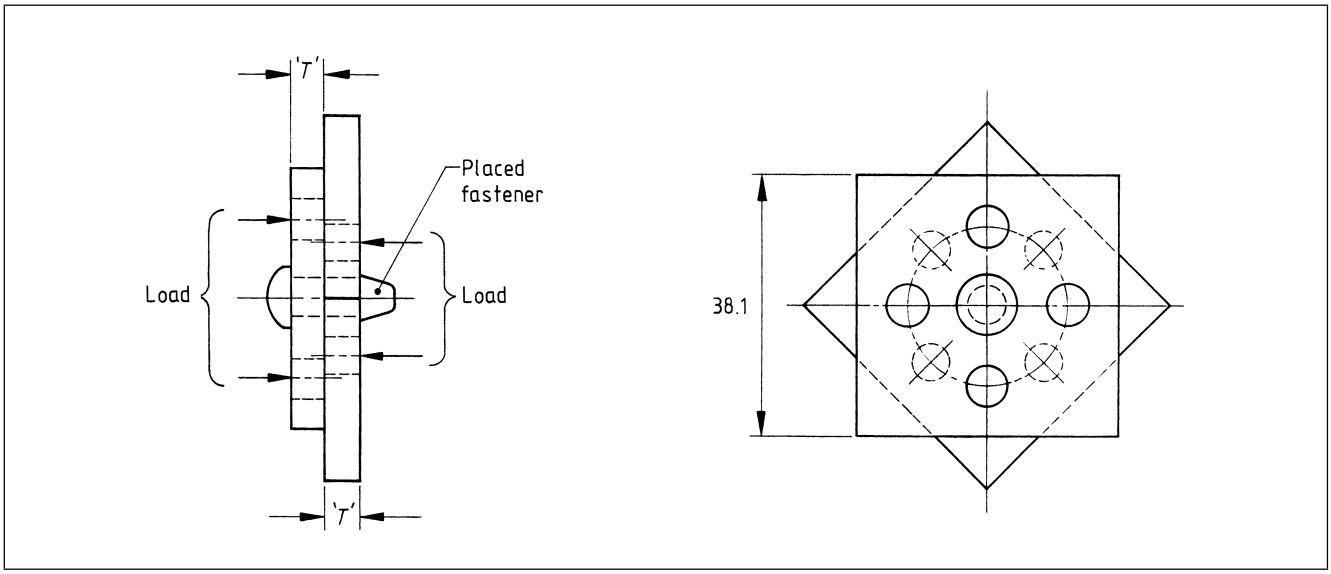
Figure B.2 **Pull-out test arrangement**



B.3 Specimen

The specimen for the pull-out test shall consist of two test plates fastened together by the fixing under test, in accordance with the manufacturer's instructions. The specimens for the push-out test shall consist of the test fixing fastened to a steel block, in accordance with the manufacturer's instructions. The hole diameter in the test pieces shall be 8.2 mm ± 0.05 mm for a nominal 8 mm fastener.

The thickness, *T*, shall be half the grip length of the fastener to be tested.

B.4 Sample size

A minimum of four fixings shall be tested.

B.5 Procedure for pull-out test

Fasten together two test plates of a total thickness equal to the maximum grip for the fastener, in accordance with the manufacturer's instructions. Apply an increasing load to the plates in line with the axis of the fastener until the fastener fractures.

Repeat with plates equal to the minimum grip for the fastener.

B.6 Procedure for push-out test

Fix the fastener to a steel plate equal in thickness to the maximum grip for the fastener, in accordance with the manufacturer's instructions. Apply an increasing load to the fastener via the plunger in line with the axis of the fastener until the fastener is pushed out.

Repeat the test with a steel plate equal in thickness to the minimum grip for the fastener.

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B.7 Report

Record the four maximum loads which the fastener was able to resist and identify them with each of the tests.

Report the tension test of the fastener which is the lowest of the four loads.

Annex C (normative) Method of determination of the strength of the pale to fence rail fastening assembly

C.1 General

This annex describes the procedure for testing the assembled strength of the pale to rail fastening system. The test is intended for design verification when selecting components during:

a) product development;

b) whenever there is a change in design, product or material specification;

c) to check compliance.

C.2 Apparatus

The test shall be carried out using any reliable machine of sufficient capacity and capable of applying the load continuously and vertically, without shock, and at a strain rate not greater than 25 mm per minute.

The device for applying the load shall consist of two radiused supports and a heavy steel bridging piece with 50 mm square loading pads (see Figure C.1).

The span between supporting rollers shall be 150 mm and the centres of the loading pads shall be 130 mm.

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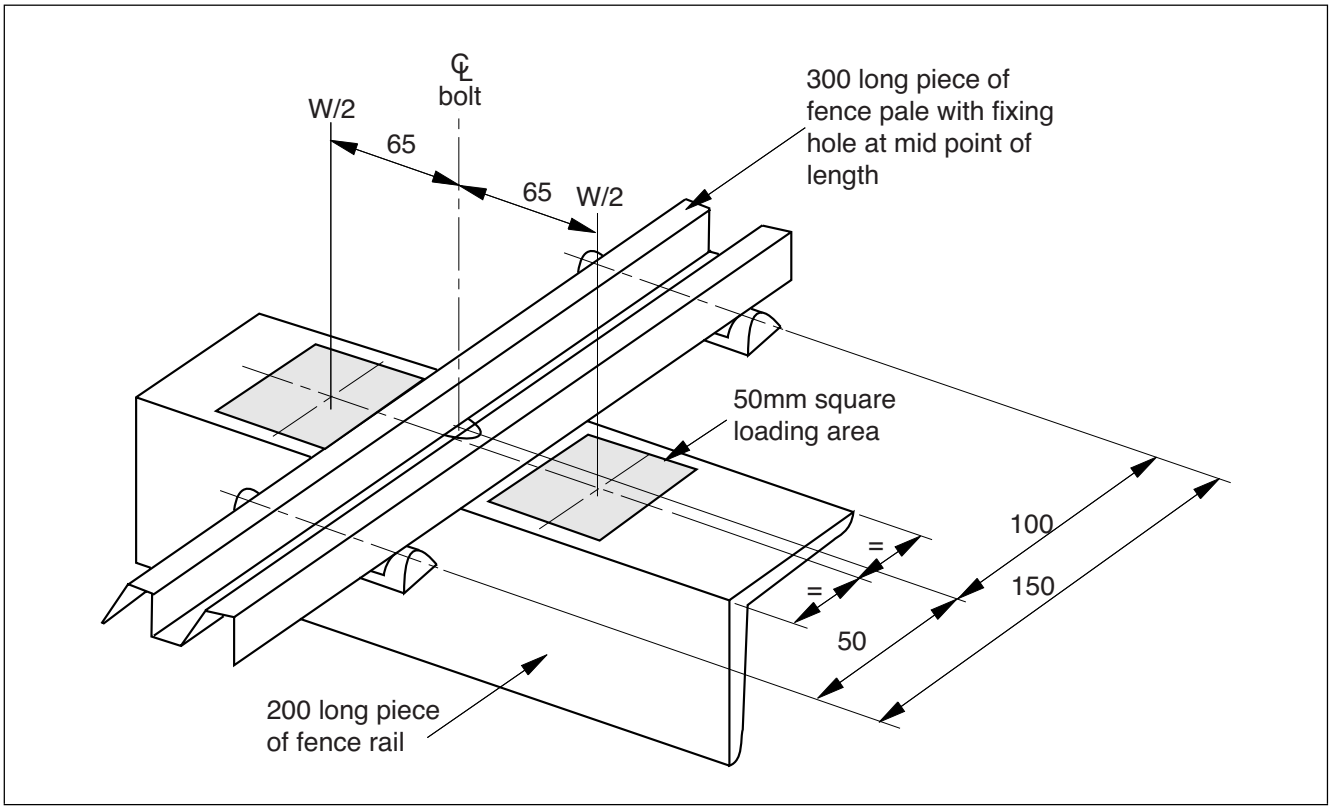
Figure C.1 **Pale fixing test arrangement**



C.3 Test specimens

C.3.1 Sample size

Three test assemblies shall be tested.

C.3.2 Source

The test specimens shall be made from material and components of identical type and quality as those intended for use in the finished fencing system. The components and the machining of holes, etc., shall be the same as that intended to be used in the finished fence system.

The pale and rail material shall be self-coloured black steel. Fasteners shall be in the condition as normally supplied by the fastener manufacturer.

The test assembly shall be set up in exactly the same manner and configuration as that proposed for the installed fencing system.

C.4 Test procedure

Wipe clean the bearing surfaces of the loading machine and the sample.

Install a stop on the machine so that all sample pieces can be placed on exactly the same position with respect to the centre of the loading ram.

Place the specimen in the machine so that it is in contact with the stop and place the loading bridge across the pale so that the loading pads are central about the pale centre line. Ensure that the bridging piece does not touch the sides or top of the pale profile or the pale bolting system.

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Ensure that the sample piece is assembled square and that it is sitting on the support rollers at right angles to the loading bridge.

Discard any sample that, due to twist or distortion, has a gap of more than 1 mm from any support or loading pad whilst under zero load.

Apply the test load steadily and without shock over a period of not less than 30 s.

Continue loading whilst the sample distorts and deflects until such time as it is apparent that the sample will not accept further load, and remains intact.

Do not continue loading until destruction because this can obscure the mode of failure and make it difficult to determine which component precipitated failure.

Using a new sample each time carry out the test three times.

C.5 Test report

C.5.1 Contents

The test report shall affirm that the tests were carried out in accordance with Annex C of this standard and shall contain the information detailed in **C.5.2** and **C.5.3**.

C.5.2 Information to be provided to the test laboratory

The following information shall be provided to the test laboratory for inclusion in the report:

a) date, time and place of sample manufacture and sample identity number;

b) names of those to be present during testing (if any);

c) name of supplier of sample and fixing bolts and nuts.

C.5.3 Information to be provided by the test laboratory

The following information on each specimen shall be provided by the test laboratory for inclusion in the test report:

a) identification of the sample, pale type and fastener;

b) the condition when received;

c) the date of receipt;

d) the name of the test operator and those present during the test;

e) the date of the test;

f) the maximum load recorded on the sample;

g) any erratic behaviour by the sample during testing and application of the load;

h) identification and description of which component suffered the maximum distortion or deflection and, from observation, probably contributed most to the failure;

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i) description of the condition of the pale, angle rail and bolt assembly after the test has been completed and the sample has been removed from the machine and has been examined in detail;

j) any other remarks or observations (e.g. photographs), that would assist in determining how the effectiveness of the fastening assembly could be improved.

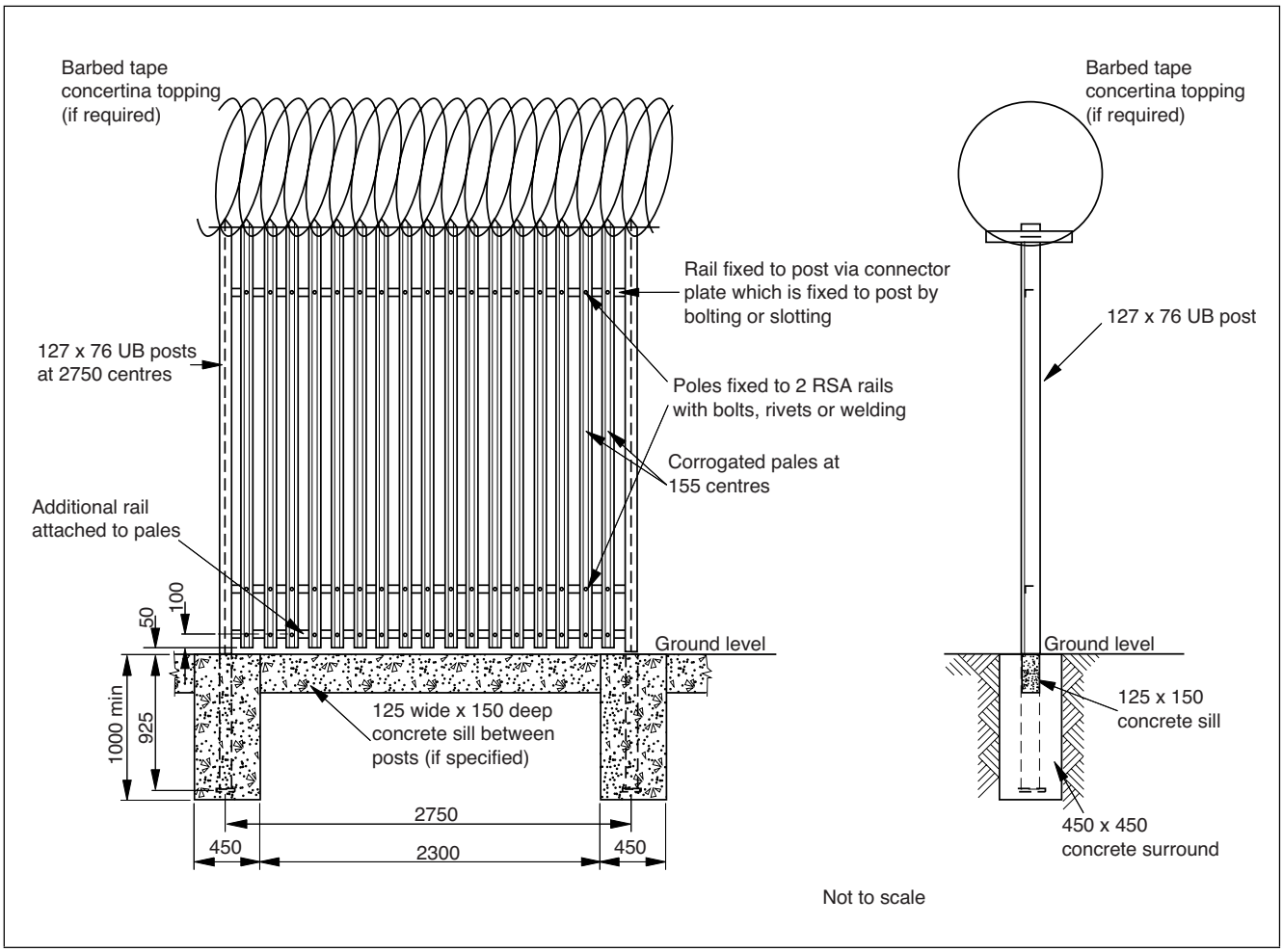
Annex D (informative) Specifying a steel palisade fence

D.1 General

When preparing a specification for a fence it is important that precise details of the requirements of the fence and the installation site are provided. This annex lists those items that should be specified at the time of ordering the fence. As conditions vary from site to site, this annex should not be assumed to be exhaustive.

A typical arrangement for an SP fence is shown in Figure D.1.

Figure D.1 **Typical arrangement for an SP fence**



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D.2 Site conditions

The following items should at least be agreed between the supplier and purchaser at the time of enquiry and/or order:

a) the line and length of fence (see Foreword and Clause **6**);

b) the height and type of fence, i.e. GP or SP (see Table 1 and Table 2);

c) site preparation (see Clause **6**):

   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 for the lengths of posts and stays in this standard and foundation sizes are for "normal" ground conditions. This standard does not cover conditions of particularly firm or soft ground, where other lengths or foundation sizes might be required. Unless otherwise agreed between the purchaser and supplier, the installation of the fence does not include the work required to cut or fill the ground to vary the levels.

e) any special measures required due to site gradients;

f) the number and position of any gates (see Clause **7**).

D.3 Construction of fence

The following items should at least be agreed between the supplier and purchaser at the time of enquiry and/or order:

a) pales:

   1) whether GP or SP;

   2) the type of pale (for which a statement of conformity should be provided);

   3) the shape of tops of pales (see **5.1**);

   4) the method of fixing pales (see **5.1**).

b) posts:

   1) the type of section (see Table 1 and Table 2);

   2) the particular requirements for spacing posts (see **5.3**);

   3) the design and foundation requirements for removable posts (see **5.3**).

   *NOTE 1 Subclause **5.3** specifies 2.75 m centres for posts. If shorter bays are required they should be specified.*

c) the type of protective treatment (see **5.8**).

   NOTE 2 The same treatment will be applied to all components unless otherwise specified.

d) gates (see also **D.2**):
   1) if any clear openings are required (see note to Table 3);
   2) the type of post (see Table 4 and Table 5);
   3) locking devices (see **7.4**);
   4) road profile (see **7.1**).

e) additional security:
   1) burrowing (see **6.2**);
   2) pale removal (see **6.3**);
   3) topping (see **6.4**).

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