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Fences –

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

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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This part of BS 1722 supersedes BS 1722-10:1999, which is withdrawn.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 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 to suit special requirements; nor to specify requirements for “patent” proprietary fencing systems. It is recommended, however, that such fences or gates should be designed in accordance with the relevant clauses of this part of BS 1722.

¹⁾ Obsolete.

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

This standard aims to establish minimum requirements for material and workmanship of the more common types of fence in order to ensure satisfactory service for the purchaser, and to assist manufacturers and installing 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.

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 Table 1 and Table 2 and also inform those installing the fence of the basic characteristics required.

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

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

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

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

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

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

Provision is made for either single or double extension arms.

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

This standard includes requirements for protective treatments. However, maintenance requirements for the fence after installation are outside the scope of this standard.

It specifies concrete or steel posts and struts, steel gates and gate posts and zinc coated or plastic coated zinc coated wire or mesh infill.

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

2 Normative references

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

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

BS 1722-16, *Fences – Part 16: Specification for organic powder coatings to be used as a plastics finish to components and mesh*

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

BS 4027, *Specification for sulfate-resisting Portland cement*

BS 4102, *Specification for steel wire for general fencing purposes*

BS 4190, *ISO metric black hexagon bolts, screws and nuts – Specification*

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

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 8500 (all parts), *Concrete – Complementary British Standard to BS EN 206-1*
- BS EN 197-1, *Cement – Part 1: Composition, specifications and conformity criteria for common cements*
- BS EN 197-4, *Cement – Part 4: Composition, specifications and conformity criteria for low early strength blastfurnace cements*
- BS EN 206-1:2000, *Concrete – Part 1: Specification, performance, production and conformity*
- BS EN 287-1, *Qualification test of welders – Fusion welding – Steels*
- BS EN 480 (all parts), *Admixtures for concrete, mortar and grout – Test methods*
- BS EN 934 (all parts), *Admixtures for concrete, mortar and grout*
- 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 10088-1:2005, *Stainless steels – Part 1: List of stainless steels*
- BS EN 10088-3, *Stainless steels – Part 3: Technical delivery conditions for semi-finished products, bars, rods, wire, sections and bright products of corrosion resisting steels for general purposes*
- BS EN 10223-1, *Steel wire and wire products for fences – Part 1: Zinc and zinc alloy coated steel barbed wire*
- BS EN 10223-4, *Steel wire and wire products for fences – Part 4: Steel wire welded mesh fencing*
- BS EN 10223-6:1998, *Steel wire and wire products for fences – Part 6: Steel wire chain link fencing*
- BS EN 10240, *Internal and/or external protective coatings for steel tubes. Specification for hot dip galvanized coatings applied in automatic plant*
- 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 12839:2001, *Precast concrete products – Elements for fences*
- BS EN 12878, *Pigments for the colouring of building materials based on cement and/or lime – Specifications and methods of test*
- BS EN ISO 1461, *Hot dip galvanized coatings on fabricated iron and steel articles – Specifications and test methods*
- BS EN ISO 2063, *Thermal spraying – Metallic and other inorganic coatings – Zinc, aluminium and their alloys*
- BS EN ISO 12944 (all parts), *Paints and varnishes – Corrosion protection of steel structures by protective paint systems*

3 Wire for chain link fences

3.1 General

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

3.2 Chain link mesh

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

Chain link mesh shall be joined by interweaving a spiral and restoring the knuckle or barb.

3.3 Line wire

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

3.4 Stirrup wire

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

3.5 Tying wire

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

3.6 Barbed wire

Barbed wire shall conform to BS EN 10223-1.

4 Concrete components for chain link fences

4.1 General

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

NOTE See Clause 5 for steel posts and struts.

Table 1 Diameters of wires in chain link

Dimensions in millimetres

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

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

4.2 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.

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

4.3 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 overfill. The heads of posts shall be either weathered or half rounded in order to prevent lodgement of water.

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

Posts for use with barbed wire shall have integral extensions (see 4.4 and 4.5) or be holed for the attachment of extension arms (see also 6.11).

4.4 Intermediate posts

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

The vertical portion of intermediate posts shall be holed for the attachment of line wires but shall not be tapered.

The heads of intermediate posts with an integral cranked extension arm shall be tapered to 85 mm \times 100 mm at the top and shall be holed for the attachment of barbed wire.

The top line wire position shall be 75 mm below the tops of posts without an integral extension, bringing the overall length of the post to 3.22 m.

Where separate extension arms are to be fitted, intermediate posts shall be holed for the attachment of the arms [see Figure C.1a) and Figure C.1b) for typical layout of fence types].

4.5 Straining posts

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

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

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

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

4.6 Gate posts

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

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

4.7 Struts

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

5 Steel posts for chain link fences

NOTE See Clause 6 for steel fittings.

5.1 Materials and protective treatments

Steel grades for posts, struts, baseplates and caps, and details of corrosion protective treatments that can be applied to these materials, shall be as given in Annex B.

5.2 Tolerances on size

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

- a) an allowance on length of ± 10 mm;
- b) an allowance on cross-section as specified in the appropriate material standard (see Table B.1).

5.3 General constructional

Steel components shall be free from sharp edges and burrs. The tops of all hollow steel posts shall be capped or sealed.

Posts shall be holed, or otherwise fabricated, for the attachment or threading of line wires, etc. All holes shall be free from obstructions and shall be accurately positioned.

5.4 Fence posts and struts

The recommended dimensions for steel intermediate posts, strainer posts and struts, produced from rolled steel angle, round tube and rectangular or round hollow sections, are set out in Table 2.

NOTE 1 The use of thicker walls than those shown in the table for both posts and struts is permissible if agreed between purchaser and supplier.

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

Straining posts and struts of rolled steel angle shall either have spragged ends or be fitted with base plates. Straining posts or struts of other sections shall either have dowels fitted through the base or be fitted with base plates (see 5.6). Straining posts and struts shall be holed to allow the two to be bolted together with bolts of minimum diameter 8 mm, at a point within the top one-third of the length of the straining post (excluding the length of any extension for barbed wire) measured above the ground level. In addition, straining posts shall be holed to allow the attachment of straining fittings.

Intermediate posts of rolled steel angle for use with anti-intruder fences shall either have spragged ends or be fitted with base plates [see C.2d)]. Intermediate posts shall be holed to allow the attachment or threading of line wires. When steel posts are holed for threading line wires, the holes shall be as close as possible to the face of the posts.

Posts shall have integral extensions having the same cross-section as the post or be provided with means for the attachment of extension arms (see also 6.11).

NOTE 3 Separate extension arms may be either bolted or welded on.

5.5 Gate posts

Dimensions for gate posts, which may act as gate/end posts or be freestanding, produced from rolled steel joists, universal columns, round tubes and rectangular or round hollow sections, shall be as given in Table 3.

NOTE 1 The use of thicker walls than those shown in the table is permissible if agreed between purchaser and supplier.

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

5.6 Base plates and dowels

Base plates shall have a minimum specified thickness of 3 mm and shall be bolted or continuously welded to posts. Welded base plates shall be welded in two places for a length not less than 50% of the sum of the external faces of the post or struts. Base plates for steel straining posts and struts shall project at least 50 mm all round the post. Base plates for steel intermediate posts (if specified) shall project at least 40 mm from at least one face of a post. Base plates for steel gate posts shall be as for straining posts, and shall be positioned so that they do not interfere with any adjacent straining posts.

Dowels shall be of steel at least 10 mm in diameter.

Dowels shall be driven through the post within 250 mm of the base of the post and shall project at least 50 mm either side of the post.

Table 2 Recommended dimensions for steel posts and struts

Type of post	Intermediate posts				Straining posts				Struts ^{A)}	
	Vertical length ^{B)} m	Section		Vertical length ^{B)} m	Section		Length ^{B)} m	Section		
		Normal mesh ^{C)} mm	Heavy duty mesh ^{D)} mm		Normal mesh ^{C)} mm	Heavy duty mesh ^{D)} mm		Normal mesh ^{C)} mm	Heavy duty mesh ^{D)} mm	
Rolled steel angle	3.2	50 × 50 × 6	60 × 60 × 6	3.2	60 × 60 × 8	75 × 75 × 8	3.2	45 × 45 × 5	50 × 50 × 6	
Rectangular hollow section ^{E)}	3.2	50 × 50 × 3	50 × 50 × 4	3.2	60 × 60 × 3	60 × 60 × 4	3.2	50 × 50 × 3	50 × 50 × 4	
Circular ^{B)} hollow section ^{E)}	3.2	48.3 × 3.2	60.3 × 4	3.2	60.3 × 4	76.1 × 4	3.2	48.3 × 3.2	48.3 × 3.2	

NOTE The designations in BS EN 10296-1, BS EN 10210-2, and BS EN 10056-1 may be used for ordering.

^{A)} All struts shall have a horizontal tie bar not less than 600 mm long, securely fixed to strut and straining post with bolts not less than 8 mm nominal diameter. The tie bar should be the same section as the strut. The ends of hollow sections are to be capped or sealed.

^{B)} Excluding extension arm.

^{C)} Normal mesh for wire diameters of 3.55 mm zinc coated and 3.55 mm/4.75 mm plastic coated.

^{D)} Heavy duty mesh for wire diameters of 5.0 mm zinc coated and 4.70 mm/6.4 mm plastic coated.

^{E)} The ends of tubes and hollow sections are to be capped or sealed.

Table 3 Recommended dimensions for steel gate posts

Width of gate opening	Rolled steel joist (RSJ) or universal column			Rectangular hollow section ^{A)}			Tube or circular hollow section ^{A)}		
	Size mm	Mass per unit length kg/mm	Size mm	Mass per unit length kg/mm	Size mm	Mass per unit length kg/mm	Size mm	Mass per unit length kg/mm	
≤ 1.2	102 × 102	23.0	80 × 80 × 4	9.22	114.3 × 3.5	9.56			
2	127 × 114	26.9	100 × 100 × 4	11.7	139.7 × 3.5	11.8			
3 (see Note)	152 × 127	37.3	150 × 150 × 4	22.3	168.3 × 5	20.1			
5 (see Note)	203 × 203	71.0	180 × 180 × 4	32.1	219.1 × 6	27.8			

NOTE These gate posts may serve as wire fence straining posts without an additional strut.

^{A)} The ends of hollow section posts are to be capped or sealed.

6 Fittings for chain link fences

6.1 Fixing and straining devices

Fixing and straining devices shall be zinc coated in accordance with BS EN 10244-2.

6.2 Eye bolt strainers and cleats

Eye bolt strainers shall consist of 250 mm long bolts of at least 9.50 mm diameter, with an eye at one end.

Eye bolt strainers shall be threaded and fitted with nuts and washers. Eye bolt strainers for use with high tensile line wire shall have welded eyes. Eye bolts for intermediate straining posts shall be fitted with ring nuts (loop adaptors).

Each eye bolt shall have a uniformly sized cleat of mild steel angle, not less than 50 mm × 50 mm × 6 mm.

Eye bolt strainers and cleats shall be galvanized in accordance with BS EN 10244-2.

6.3 Winding brackets

Winding brackets for posts shall be of mild steel, flat and at least 25 mm × 3 mm and shall be fitted with a winding bolt of 12 mm minimum diameter and with a friction type, ferrule or ratchet winder. Each such winding bracket shall have one M8 bolt. Winding brackets shall be galvanized in accordance with BS EN 10244-2.

6.4 Stretcher bars

Stretcher bars shall be of mild steel, flat, and 25 mm × 5 mm for mesh with a 50 mm side, or 20 mm × 5 mm for mesh with a side less than 50 mm. Stretcher bars shall be holed for attaching to cleats or to straining fittings by 8 mm bolts. Stretcher bars shall be hot dip galvanized in accordance with BS EN 10244-2, unless they are used in conjunction with plastic coated infill or steel posts when they shall have the same additional protective treatments as the plastic coated posts.

6.5 Staples

Hair pin staples for fixing barbed wire to extension arms or droppers shall be of round wire 3 mm in diameter or sectional wire with the same cross-sectional area, with a zinc coating conforming to BS EN 10244-2. Their length shall allow at least 30 mm of each leg to be bent at right angles.

6.6 Zinc coated hair pin staples

Staples for fastening down the bottom of galvanized wire mesh fencing shall be of 3.55 mm wire conforming to BS EN 10223-6. The ends of zinc coated hair pin staples shall be bent outwards to secure anchorage.

6.7 Plastic coated hair pin staples

Staples for fastening down the bottom of plastic coated chain link fencing shall have a core diameter of 3.55 mm and an outside diameter of 4.75 mm and shall conform to grade A of BS EN 10223-6:1998. The ends of plastic coated hair pin staples shall be bent outwards to secure anchorage.

6.8 Long droppers for barbed wire

Long droppers shall be of mild steel not less than 25 mm × 5 mm thick, holed for the attachment of the top three rows of barbed wire. Long droppers shall be not less than 0.45 m long.

Long droppers shall be hot dip galvanized in accordance with BS EN 10244-2.

6.9 Short droppers for barbed wire

Short droppers shall be of mild steel not less than 25 mm × 5 mm thick, holed for the attachment of the bottom row of barbed wire and the top line wire. Short droppers shall be of a length to extend 25 mm beyond the line wire and at least 25 mm beyond the barbed wire.

Short droppers shall be hot dip galvanized in accordance with BS EN 10244-2.

6.10 Bolts, nuts and washers

Bolts and nuts shall conform to BS 4190 and shall be strength grade 4.6. Washers shall conform to BS 4320. Bolts, nuts and washers shall be galvanized in accordance with BS EN 10244-2.

6.11 Extension arms (for attachment of barbed wire)

NOTE This clause applies to both integral and separately provided extension arms, unless otherwise indicated.

6.11.1 General

Extension arms for barbed wire shall be either straight or bent at an angle of 40° to 45° from the vertical. Extension arms for use on gates and gate posts opening 180° shall be straight. Extension arms shall be holed for the attachment of three lines of barbed wire. These holes shall be positioned not more than 75 mm from the end of the extension arm so that the distance between lines of barbed wire is not greater than 200 mm, and the distance of the lowest line of barbed wire is not more than 150 mm from the top of the mesh, measured vertically, and not more than 200 mm measured at an angle to the vertical. Separate extension arms and their fixing bolts shall be galvanized in accordance with BS EN 10244-2.

When separate extension arms are used in conjunction with plastic coated steel posts the arms shall have the same additional protective treatment as the plastic coated steel posts.

6.11.2 Extension arms for straining posts and gate posts

Extension arms for straining posts and gate posts shall be holed for the attachment of eye bolt strainers or winding brackets. Separate extension arms shall have two holes for attachment to posts with 8 mm bolts. Separate extension arms for concrete posts shall be of mild steel angle, 50 mm × 50 mm × 6 mm. Extension arms for steel posts shall be of the same section as the post, either integral or welded, or separate for bolting to the top of the post.

6.11.3 Extension arms for intermediate posts

Extension arms for intermediate concrete or steel posts shall be holed for the attachment of two 8 mm bolts and to take hair pin staples or stirrup clips for fixing three lines of barbed wire.

7 Concrete surrounding bases of posts and struts for chain link fences

Concrete for bedding 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.

8 Installation of chain link fences**8.1 Line and level**

The top of the fence shall follow approximately the level of the ground along the line 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 C) the installation of the fence does not include cutting or filling the ground to vary levels or special work to secure culverts, ditches, etc.

To reduce the opportunities for climbing, where possible the line of fence shall be set out so that changes of direction are formed as obtuse angles, no angle being less than 130°.

Any opening below or through the fence shall be protected in accordance with the purchaser's requirements specified at the time of ordering.

8.2 Posts and struts**8.2.1 General**

Holes for posts and struts shall have vertical sides.

NOTE 1 The side of a strut hole adjacent to the post may be sloped.

NOTE 2 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.

Holes for posts and struts shall, after installation, be filled to at least two thirds with concrete, which shall be well rammed as the filling proceeds (see also 8.2.5). The remainder of the hole shall be filled with backfill, which shall be well rammed before initial setting of the concrete.

Where mesh is being buried the depth of concrete shall be 450 mm minimum.

8.2.2 Straining posts

Straining posts shall be placed at all ends and corners of fences, at changes in direction or acute variations in level, and at least every 69 m in straight lengths of fence. Straining posts for fences following a curve shall be agreed between the supplier and the purchaser.

Straining posts shall be set in the ground to a depth of 0.75 m. Holes for straining posts shall be not less than 0.45 m × 0.45 m or, if round, at least 0.45 m in diameter.

8.2.3 Struts

Struts shall be fitted to all straining posts and gate posts acting as straining posts in the direction of the line of fencing. Concrete struts and posts shall be securely located together. Steel struts and posts shall be bolted together with 8 mm bolts.

The bottom end of all struts shall be at least 0.45 m below ground level, measured to the centre of the strut or base plate. The holes for struts shall be at least 0.30 m wide × 0.45 m long.

8.2.4 Intermediate posts

Intermediate posts shall be set at least every 3.0 m, measured centre-to-centre.

Intermediate posts shall be set into the ground to a depth of 0.75 m.

Square holes for intermediate posts shall be a minimum of 300 mm square in plan. Round holes shall be 300 mm in diameter.

8.2.5 Gate posts

A hanging and a shutting post shall be provided for single gates. Two hanging posts of the same cross-section shall be provided for double gates.

Gate posts shall be set in the ground to a depth of at least 750 mm. Holes for gate posts shall be at least 0.45 m × 0.45 m in plan.

After installation of the gate posts the hole shall be filled completely with concrete, which shall be well rammed as the filling proceeds. Concrete around steel posts shall be filled to approximately 50 mm above ground level and finished with a weathered top to prevent water accumulation.

When wire mesh fencing is attached directly to a concrete gate post, or a steel gate post for a gate width smaller than 4.0 m, the gate post shall be supported by a strut as specified in 8.2.3.

8.3 Infill

8.3.1 Line wires

8.3.1.1 General

Chain link fences shall have a minimum of five rows of line wires. The top row of wires shall be double and secured not more than 50 mm below the top of the chain link mesh, excluding the barb. The bottom row of wire shall be close to the ground. All other line wires shall be evenly spaced.

NOTE To strengthen the fence the number of rows of line wires may be increased to seven, making a total of eight line wires.

Line wires joined at mid-span shall be joined so that normal tension can be applied to the wire.

8.3.1.2 Straining posts

Each row of line wire shall be strained between each pair of straining posts by winding brackets, or eye bolt strainers passing through a hole in the straining post and secured with a nut and washer. Eye bolt strainers fixed to intermediate straining posts shall, in addition, be fitted with ring nuts (loop adaptors) after the wire is tensioned.

8.3.1.3 Intermediate posts

Each row of line wire shall be secured to intermediate concrete posts by a wire stirrup passing through a hole in the post secured to the line wire by three complete turns on each side of the post.

Each row of line wire shall be secured to intermediate steel posts (either CHS or RHS) by:

- a) the method specified for concrete intermediate posts; or
- b) passing through a hole in the post.

Each row of line wire shall be secured to intermediate rolled steel angle posts by passing through a hole in the post.

8.3.2 Chain link mesh

Before attaching the mesh to the fence the fifth line wire (see **8.3.1.1**) shall be threaded through the top of the mesh. The line wire and mesh shall be stranded between each pair of straining posts and secured to the straining posts. Chain link mesh shall be secured at each straining post by means of a stretcher bar secured to cleats or to the straining posts by M8 bolts. The stretcher bars shall be attached to concrete posts by cleats. The mesh shall be attached to the line wires by wire ties, spaced approximately 210 mm apart on the top and bottom line wire and 450 mm apart on the intermediate line wires.

Chain link mesh shall be joined by interweaving a spiral and restoring the knuckle or barb.

The bottom of the fencing shall be treated in one of the following ways, as agreed between the supplier and purchaser.

- a) The bottom 300 mm of the fencing shall be buried vertically and the ground surface reinstated.
- b) 4 mm hair pin staples shall be threaded over the bottom row of mesh and line wire at 500 mm centres and grouted into rock or other hard formation to a depth of 150 mm.
- c) A continuous concrete sill 300 mm wide × 300 mm deep in the ground shall be cast the full length between posts with the top approximately 25 mm below the bottom of the chain link mesh. The concrete shall be as specified in Clause 7. 4 mm hair pin staples shall be threaded over the bottom row of mesh and line wire at 500 mm centres and set in the sill to a depth of 150 mm.

NOTE In corrosive ground it is recommended that plastic coated wire should be specified for buried chain link. It is considered that burying the mesh offers the best resistance against gaining entry at ground level.

8.4 Cranked tops and extension arms

8.4.1 General

Cranked tops or single extension arms shall point in the direction specified by the purchaser at the time of ordering (see Annex C).

Extension arms shall be supplied for concrete posts which do not have cranked tops cast on. Double extension arms, if specified, shall consist of two single arms in “V” configuration fixed on opposite sides of each post. Where barbed wire is specified inside and outside a fence having concrete posts with cranked tops, single extension arms shall be used pointing in the opposite direction to the cast cranked tops.

8.4.2 Fixing barbed wire to cranked tops or extension arms

Three lines of barbed wire shall be provided. The wires shall be attached by eye bolts or winders to the cranked tops of the straining posts, or to the extension arms, and shall be properly strained. On concrete intermediate posts the wires shall be secured to cranked tops with stirrup wires and to other sections with stirrups or hair pin staples.

8.4.3 Droppers

One long dropper (see 6.8) shall be fitted to barbed wire at the centre of each bay. Two short droppers (see 6.9) shall be fitted at equal distances between posts. Droppers shall be attached to the barbed wire and/or line wire with hair pin staples (see 6.5) or tying wire (see 3.5) so that the barbed wires cannot be bunched together or moved away from the fence top.

8.5 Bolts

All bolts to fencing shall be burred over.

9 Materials for welded mesh fences

9.1 Wire

9.1.1 General

As a minimum all wire shall be zinc coated and conform to BS EN 10223-4.

9.1.2 Welded mesh

Welded mesh shall be manufactured from 3 mm diameter zinc coated wire and, if specified, plastic coated. The size of the mesh shall be 50 mm × 50 mm or 75 mm vertical × 25 mm horizontal. The width of the welded mesh shall be 2.4 m, if it is not buried, or 2.7 m if it is buried. The top edge and, if exposed, the bottom edge shall be barbed or a strand of barbed wire shall be fixed to the edge.

If plastic coated mesh is used in two separate widths each width shall be overlapped horizontally by a minimum of two complete meshes. The width of 2.4 m for 75 mm × 25 mm mesh shall be made up of 1 500 mm and 1 050 mm widths and for 50 mm × 50 mm mesh of 1 500 mm and 1 000 mm widths. The width of 2.7 m for 75 mm × 25 mm mesh shall be made up of 1 800 mm and 1 050 mm widths, and for 50 mm × 50 mm mesh of 1 800 mm and 1 000 mm widths.

NOTE If plastic coated mesh is specified, it should be noted that it is currently not possible to obtain full height plastic coated mesh from UK manufacturers.

9.1.3 Line wire

Line wire shall conform to BS EN 10223-6 or BS 4102 with a nominal diameter of 3.00 mm.

9.1.4 Stirrup wire

Stirrup wire, for securing line wires to intermediate posts, shall conform to BS 4102 with a nominal diameter of 2.50 mm.

9.1.5 Tying wire

Tying wire, for securing mesh to line wires, shall conform to BS 4102 and be of mild steel with a nominal diameter of 1.6 mm.

9.1.6 Barbed wire

Barbed wire shall conform to BS EN 10223-6.

9.2 Concrete components

Concrete components shall be as specified in Clause 4.

9.3 Steel components

Steel components shall be as specified in Clause 5 and Tables 2 and 3.

9.4 Fittings

9.4.1 General

Fittings shall be as specified in **6.1** to **6.3**, **6.5**, **6.6** and **6.8**. to **6.10**.

9.4.2 Stretcher bars (clamping bars)

Two stretcher bars shall be used for welded mesh fences. Stretcher bars shall be of low carbon steel, flat, and 25 mm × 5 mm. Stretcher bars shall be holed for attaching to cleats or straining fittings by 8 mm bolts. They shall also be holed mid-way between the line wire positions for bolting together with M8 bolts. Stretcher bars shall be zinc coated in accordance with BS EN 10244-2 unless they are used in conjunction with plastic coated infill or steel posts when they shall have the same additional protective treatments as the plastic coated posts.

9.4.3 Stainless steel clips

Stainless steel clips shall conform to one of the following steel grades from BS EN 10088-1:2005.

- a) Steel number: 1.4301 (steel name: X5CrNi18-10).
- b) Steel number: 1.4401 (steel name: X5CrNiMo17-12-2).
- c) Steel number: 1.4113 (steel name: X6CrMo17-1).

The steel shall be 0.8 mm thick and 17 mm wide to form a closed nominal internal diameter of 9 mm and shall conform to BS EN 10088-3.

9.4.4 Extension arms (for attachment of barbed wire)

Extension arms shall conform to **6.11**.

9.5 Concrete surrounding bases of posts and struts

Concrete for surrounding the bases of posts and struts shall conform to Clause **7**.

10 Installation of welded mesh fences

10.1 General

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.

10.2 Line and level

The top of the fence shall follow approximately the level of the ground. On sloping or undulating ground the upright wires shall be fixed out of vertical. At changes of slope the mesh shall be cut vertical and secured to a straining post with stretcher bars.

NOTE Unless specified (see Annex C), the installation of the fence does not include cutting or filling the ground to vary levels or special work to secure culverts, ditches, etc.

The line of the fence shall be as specified in **8.1**.

10.3 Posts and struts

10.3.1 General

Holes for posts and struts shall conform to **8.2.1**.

10.3.2 Straining posts

Straining posts shall conform to **8.2.2**.

10.3.3 Struts

Struts shall conform to **8.2.3**.

10.3.4 Intermediate posts

Intermediate posts shall conform to **8.2.4**.

10.3.5 Gate posts

Gate posts shall conform to **8.2.5**.

10.4 Infill

10.4.1 Line wires

10.4.1.1 General

Welded mesh fences shall have four line wires evenly spaced.

The bottom wire shall be close to the ground and the top wire shall be not more than 50 mm below the top horizontal of the mesh for 50 mm × 50 mm mesh and not more than 75 mm below the top horizontal of the mesh for 75 mm × 25 mm mesh.

NOTE To strengthen the fence the number of line wires may be increased to seven.

Line wires joined at mid-span shall be joined so that normal tension can be applied to the wire.

10.4.1.2 Straining posts

Each row of line wire shall be strained in accordance with **8.3.1.2**.

10.4.1.3 Intermediate posts

Each line wire shall be attached in accordance with **8.3.1.3**.

10.4.2 Welded wire mesh

The mesh shall be strained, with vertical wires on the outside, between each pair of straining posts and secured by means of two stretcher bars clamping the mesh between them. The stretcher bars shall be secured to cleats or steel straining posts by M8 bolts, and shall be further bolted together between the line wires with M8 bolts. Each clamp bolt shall pass through a complete mesh. The fence shall be attached to the line wires by wire ties, or clips conforming to **9.4.3**, spaced approximately 150 mm apart on the top and bottom line wires and 450 mm apart on the intermediate wires.

Welded mesh shall be joined by overlapping the mesh by at least two complete meshes for the 50 mm × 50 mm mesh and at least four complete meshes for the 75 mm × 25 mm mesh. Welded mesh shall be secured by means of mechanically applied clips, conforming to **9.4.3**, at 150 mm centres to the vertical edge wires and pairs of clips at 300 mm centres to the horizontal wires (see note to **C.1**).

The treatment of the bottom of the fencing shall be in accordance with **8.4.2a)**, b) or c).

NOTE In corrosive ground it is recommended that plastic coated wire should be specified for buried welded mesh.

Where plastic coated welded mesh is used in two widths, the horizontal joint shall be secured by means of mechanically applied clips conforming to **9.4.3** at 250 mm centres to the horizontal wires at both edges of the joint. The joint shall be made so that the overlap does not provide any assistance for climbing, with the wider mesh at the lower level.

10.5 Cranked tops and extension arms

10.5.1 General

The arrangement of cranked tops and extension arms shall conform to **8.4.1**.

10.5.2 Fixing barbed wire to cranked tops or extension arms

The fixing of barbed wire to cranked tops or extension arms shall conform to **8.4.2**.

10.5.3 Droppers

Droppers shall conform to **8.4.3**.

10.6 Bolts

All bolts to fencing shall be burred over.

11 Construction of gates

11.1 General

Steel gates shall be constructed to match the height of the fence and shall be produced from steel tube or hollow sections in accordance with Annex B. Dimensions for steel gate frames and braces fabricated from tubes or hollow sections shall be as given in **11.2**.

NOTE 1 The use of thicker walls than those shown in the table is permissible if agreed between purchaser and supplier.

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

11.2 Dimensions

Single gates shall be used to fill openings up to 2 m in width. Double leaves, of equal width, shall be used to fill openings up to 10 m in width. The tops of the gates and barbed wire shall be approximately level with the tops of the wire mesh fencing and the barbed wire in the fence. The bottom of the gates shall have a ground clearance of no more than 80 mm. When closed the space between meeting stiles shall be no more than 25 mm.

For gates up to 2 m in width, 48.3 mm × 3 mm round tube or hollow section or 40 mm × 40 mm × 4 mm rectangular hollow section shall be used for the outside frame and 42.4 mm × 3 mm round tube or hollow section or 40 mm × 40 mm × 3 mm rectangular hollow section shall be used for the braces.

For gates over 2 m in width, 60.3 mm × 3.2 mm round tube or hollow section or 50.0 mm × 50.0 mm × 4 mm rectangular hollow section shall be used for the outside frame and 48.3 mm × 3 mm round tube or hollow section or 50.0 mm × 50.0 mm × 3.0 mm rectangular hollow section shall be used for the braces.

Pedestrian gates shall also match the height of the fence.

11.3 Construction

Gate frames shall be of welded construction. 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. Frames shall be square with all the corners mitred or saddled. Bent tubes or radiused corners shall not be used. Vertical braces shall be fixed at no more than 1.2 m centres. Gates shall have one central horizontal brace on the inside.

NOTE Consideration should be given to providing barbed tops to gate frames to deny handholds.

After fabrication, the gate shall be hot dipped galvanized in accordance with BS EN ISO 1461 for corrosion protection.

11.4 Infilling

The infilling of the gate (see note to C.1) shall consist of chain link of equivalent strength to the fence or 4 mm galvanized mild steel wire mesh conforming to 3.2 welded at all intersections, with the wires running horizontally and vertically.

To fix the infilling to the frame and vertical braces, 5 mm flats shall be stitch welded to the frame and vertical braces, up to 25 mm from each junction.

The infilling shall be clamped to the flats over their full length with 25 mm × 5 mm clamp bars bolted at no more than 0.30 m centres with 25 mm × 8 mm hot dip galvanized bolts and nuts. The distance from the end of the clamp bar to the nearest bolt shall not exceed 100 mm.

11.5 Extension arms and barbed wire

Hanging and shutting stiles shall be extended vertically upwards 0.5 m to carry three lines of barbed wire. Each vertical brace shall have a 0.5 m vertical extension arm above the frame, welded and saddled over it, and drilled to take and include fasteners for securing the barbed wire. The barbed wire shall conform to BS 4102, and shall be tensioned by winding brackets and secured to lugs at the stiles.

11.6 Hinges

Hinges and pins shall be of steel. The bottom hinge shall be of either the heel and socket or plate and pin type.

For heel and socket hinges for gate leaves up to 2 m wide, the heel plate shall be at least 12 mm thick and the pin at least 20 mm in diameter. For gate leaves over 2 m wide, the heel plate shall be at least 25 mm thick and the pin at least 25 mm in diameter. For heel and socket type bottom hinges, a block and band top hinge may be used, but the band shall be at least 50 mm × 6 mm.

Plate and pin hinges for gate leaves up to 2 m wide shall be of plate at least 12 mm thick with a 20 mm diameter pin. For wider gates, hinges shall be of 25 mm thick plate with 25 mm diameter pins.

Female halves of hinges shall be welded to the gate frame.

Hinge plates for steel gate posts shall be welded to the gate posts or holed to take two 12 mm bolts.

Hinge plates for concrete gate posts shall be holed to take a single 16 mm bolt. The top hinge pin shall be inverted or the hinge designed to prevent removal of the gate in the closed position.

NOTE To facilitate gate adjustment suitable fixings should be incorporated in the manufacture.

11.7 Drop bolts and slam plates

Mild steel drop bolts of 20 mm diameter shall be fitted to all gate frames and to each leaf of double leaf gate frames. These shall be provided with ground sockets which shall be set securely in the ground.

Ground sockets shall be of the “easy clean” type.

The last closing leaf of a pair of gates shall incorporate a stop, which prevents one drop bolt being lifted when the gates are closed. Double gates shall have a slam plate at least 12 mm thick.

11.8 Locking devices

Each gate shall be fitted with a locking bar at least 40 mm × 10 mm flat, secured in a frame of 40 mm × 10 mm flat, welded to the gate frame at the junction of the horizontal brace on the shutting stile. The gap between the locking bar and the frame shall not exceed 50 mm.

Locking bars for single gates shall shoot into a socket on the gate post. Locking bars for pairs of gates shall shoot into a staple at least 25 mm × 5 mm and shall protrude by a minimum of 100 mm.

The locking area shall be secured with mesh or plate so that hand or footholds are not formed.

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

NOTE A mortice deadbolt, housed in a lock case, with the bolt shooting into a corresponding slot in the locking bar, may be used. This area should be plated over to deny foot or handholds.

12 Installation of gates

12.1 General

Gates shall be hung in accordance with 11.2, unless otherwise specified.

12.2 Gate posts

Gate posts shall be fixed in accordance with 8.2.5.

12.3 Gates and fittings

Gates and fittings shall be fixed in accordance with 11.5 to 11.8.

12.4 Sills for gates

When gates are not installed over hard, properly constructed and surfaced roadways, a concrete sill shall be formed as specified by the purchaser to suit the proposed usage.

13 Statement of conformity

13.1 Fence manufacturer

On delivery, the manufacturer/supplier of the fence shall provide the installer with a certificate, conforming to 13.3, 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 13.3.

13.2 Fence installer

On completion, the fence installer shall provide the end user with a certificate, conforming to 13.3, 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 13.3.

13.3 Certificate

In addition to the requirements of **13.1** and **13.2**, 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.

13.4 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-blast furnace cement conforming to BS EN 197-4; or
- c) sulfate-resisting Portland cement conforming to BS 4027.

A.1.2 Aggregate

Aggregate for concrete 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 used in accordance with BS EN 12839.

A.1.4 Chloride content

For chloride content BS EN 206-1:2000, **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 size limits.

Timber moulds shall be of closely jointed planed timber.

A.3 Manufacture**A.3.1 Mixing**

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

A.3.2 Placing and compacting

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 or 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 placing and compacting of the concrete so that the cover of concrete measured from 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 in a post, as appropriate.

NOTE If the ends of 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**.

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

Annex B (normative) Steel components

B.1 Materials

Steel posts, struts, gate frames³⁾ and braces²⁾ shall be produced from the following:

- rolled steel angle (RSA⁴⁾ or angle re-rolled from railway lines;^{3), 5)}
- rectangular or square hollow sections (RHS);
- circular hollow section (CHS) or round tubes;
- I/H sections⁶⁾ (rolled steel joists (RSJ) and universal columns).

B.2 Material grades

NOTE 1 The steel grade(s) employed should be specified by the customer (the purchaser, fence designer, supplier, component manufacturer, fabricator or installer, as applicable), on the basis of the mechanical properties, formability and weldability required.

Appropriate mild steel grades shall be selected from National or International Standards or suitable equivalent proprietary materials may be used.

Steel grades to be considered shall have a minimum yield strength in excess of 175 N/mm², unless the design permits lower strength materials to be employed.

NOTE 2 Tubes and hollow sections may 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 B.1.

³⁾ Gate frames and braces shall only be produced from tubes or hollow sections.

⁴⁾ Fence posts and struts only.

⁵⁾ Re-rolled angles are normally produced from steel sections.

⁶⁾ Gate posts only.

Table B.1 Recommended steel grades

Material	Dimensional standard	Material standard	Material grade ^{A)}
Rolled steel angle	BS EN 10056-1	BS EN 10025-2	S185/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 10255 BS EN 10296-1 DIN 1615	BS EN 10255 BS EN 10296-1 DIN 1615	S195T E155 ^{B)} /E190/E195 ST 33
I/H sections – rolled steel joists, universal beams and universal columns	BS 4-1	BS EN 10025-2	S185/S235JR
Plate for baseplates, caps, etc.	—	BS EN 10025-2	S185/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.

B) Where the design permits.

B.3 Protective treatment

Steel components and fabrications shall be suitably protected against corrosion by one or more of the following treatments.

- Hot dip galvanizing in accordance with BS EN ISO 1461 or BS EN 10240.
- Thermal spray coating of zinc or aluminium in accordance with BS EN ISO 2063.
- Organic powder coating in accordance with BS 1722-16.
- Painting in accordance with BS EN ISO 12944 (parts 1 to 8), as applicable, to meet durability requirement H.

All loose scale, oil and dirt shall be removed from all surfaces before treatment. Closed hollow sections to be hot dipped galvanized shall be provided with the necessary drain holes.

NOTE Guidance on the appropriate protective coatings to use in specific environments and recommended coating thicknesses can be found in BS EN ISO 14713.

Annex C (informative) Specifying a wire mesh fence

C.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, including natural or industrial climatic conditions, anticipated life and likely vandalism. This annex lists those items that should be specified at the time of ordering the fence.

However, as conditions vary from site to site, this annex should not be assumed to be exhaustive.

NOTE Examples of typical fences and posts are given in Figure C.1. Examples of posts are given in Figure C.2 and examples of other features are given in Figures C.3 to C.5.

C.2 Site conditions

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

- a) the line and length of the fence (see **8.2** and **10.2**);
- b) the profile of the fence and any special requirements for sills (see **8.2** and **10.2**);
- c) site preparation:
 - 1) site clearance (**8.2**);
 - 2) cutting or filling of ground level, to avoid projection of the sill etc. (see **8.2.1**);
 - 3) provision of trench or shuttering for sills (see **8.4.2** and **10.4.2**);
- d) any specific requirements for non-standard post lengths due to ground conditions (see Foreword);

NOTE The requirements for lengths of posts and struts 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 may be required. Where special circumstances exist, the required modifications should be agreed between the purchaser and the supplier, e.g. the need for base plates on intermediate posts in soft ground.

- e) number and position of any gates and type of infill (see **4.2**).

C.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) the type of infill:
 - 1) zinc coated chain link (see Table 1);
 - 2) plastic coated chain link, grade A (see Table 1);
 - 3) welded mesh;
 - 4) mesh size (see Table 1);
 - 5) mesh wire diameter (chain link) (see Table 1);
 - 6) how mesh is secured at ground line [see **8.4.2a**), b) or c)];
 - 7) sill (see **8.4.2** and **10.4.2**);
 - 8) form of extension arm (see **6.11** and **8.4.1**):
 - i) vertical⁷⁾;
 - ii) cranked, which direction³⁾;
 - iii) integral;
 - iv) separately provided;
 - v) orientation relative to protected site;
 - vi) double cranked tops;
 - vii) barbed wire (see **9.1.6**);

⁷⁾ Any extension arms on gates and gate posts and straining posts adjacent to gate posts should be vertical.

- b) barbed wire:
- 1) mild steel;
 - 2) high tensile;
- c) line wire (see **3.1.3**):
- 1) mild steel;
 - 2) high tensile steel;
 - 3) method of attachment to infill and posts;
 - 4) number of rows of line wires if more than four;
- d) the type of posts and struts:
- 1) concrete, including:
 - i) standard of surface finish, assessed against the reference photographs 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 **4.3**);
 - 2) steel (see Clause **5**), including:
 - i) the type of section (see **5.4**);
 - ii) the type of protective treatment (see **B.2**);
 - iii) the type of cap or seal;
 - 3) any specific requirements for spacing of posts;

NOTE 1 As 8.2.2 does not provide for straining posts on a curved fence, this should be specified.

NOTE 2 Subclause 8.2.4 provides for spacing of intermediate posts at maximum centres of 3 m. If shorter bays are required this should be specified.
- e) fittings including particular requirements for protective treatments of stretcher bars or steel extension arms (see **5.4**);
- f) gates (see Clause **11**):
- 1) the width of opening (measured as width clear for passage), for:
 - i) single leaf gates (see **11.2**);
 - ii) double leaf gates, for all gates over 2 m wide (see **11.2**);
 - 2) the type of hinge (see **11.6**):
 - i) top, either:
 - plate and pin; or
 - block and band;
 - ii) bottom, either:
 - heel and socket; or
 - plate and pin;
 - 3) sill requirement (see **12.2**);
 - 4) locking arrangements.

NOTE 3 It is recommended that the number of gates on any site should be kept to the minimum with the proviso that the provision of a pedestrian gate adjacent to vehicular entry gates is desirable. It may be easier to secure a pedestrian gate (see 11.8) rather than the larger vehicular gates which should be secured and operable from the inside only.

NOTE 4 Vehicular entry gates and gate posts can be vulnerable to damage from vehicles. It may be advantageous to allow generosity in specifying gate openings suitable for the maximum vehicle size likely. If the nature of the site or its operation makes the damage to gates likely then the last intermediate post before the gate post may become a straining post. This will allow the last bay of mesh etc. to be strained to the gate post.

Figure C.1 Typical fences conforming to BS 1722-10

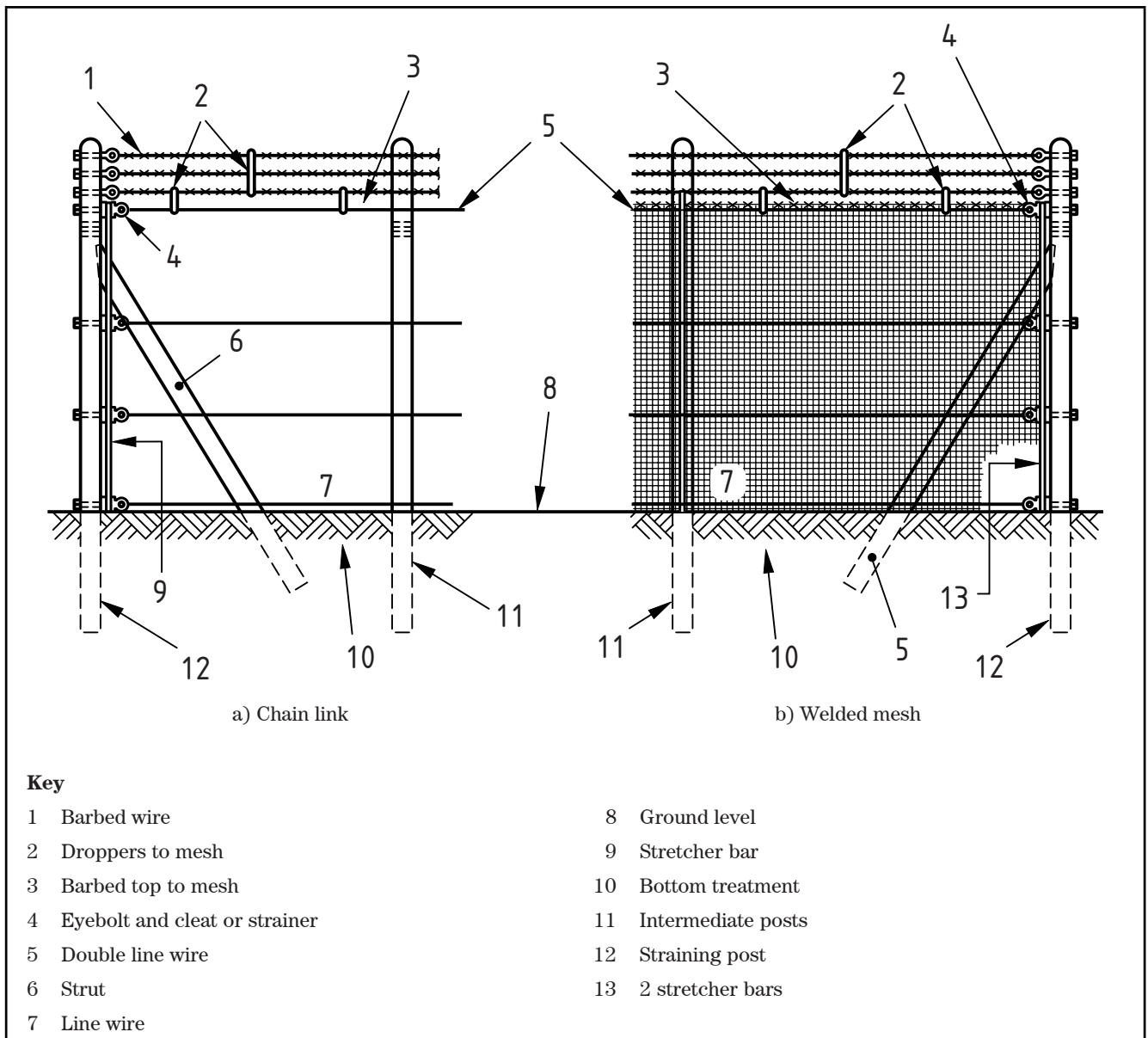


Figure C.2 Intermediate post options

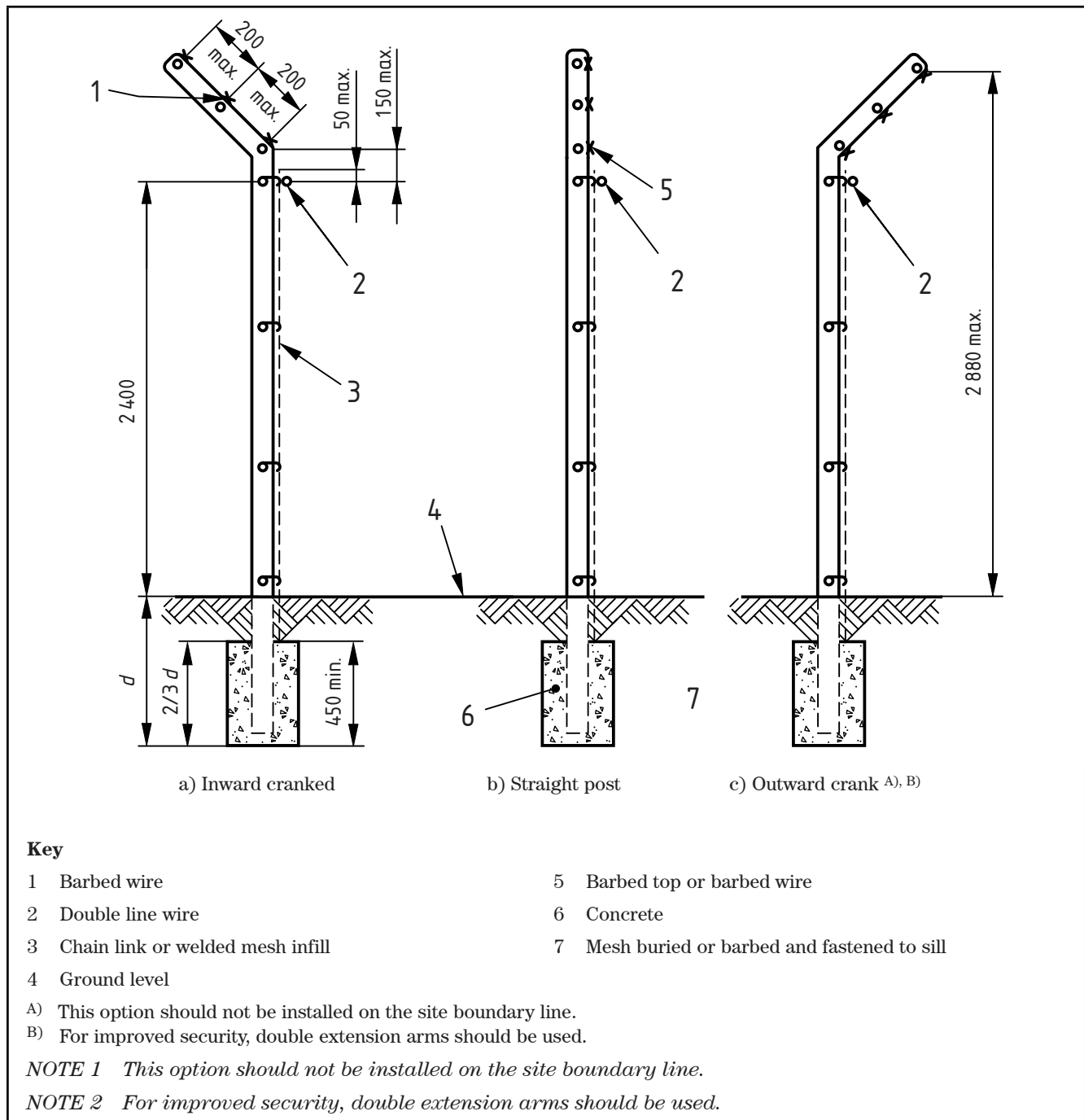


Figure C.3 Joining welded mesh between posts

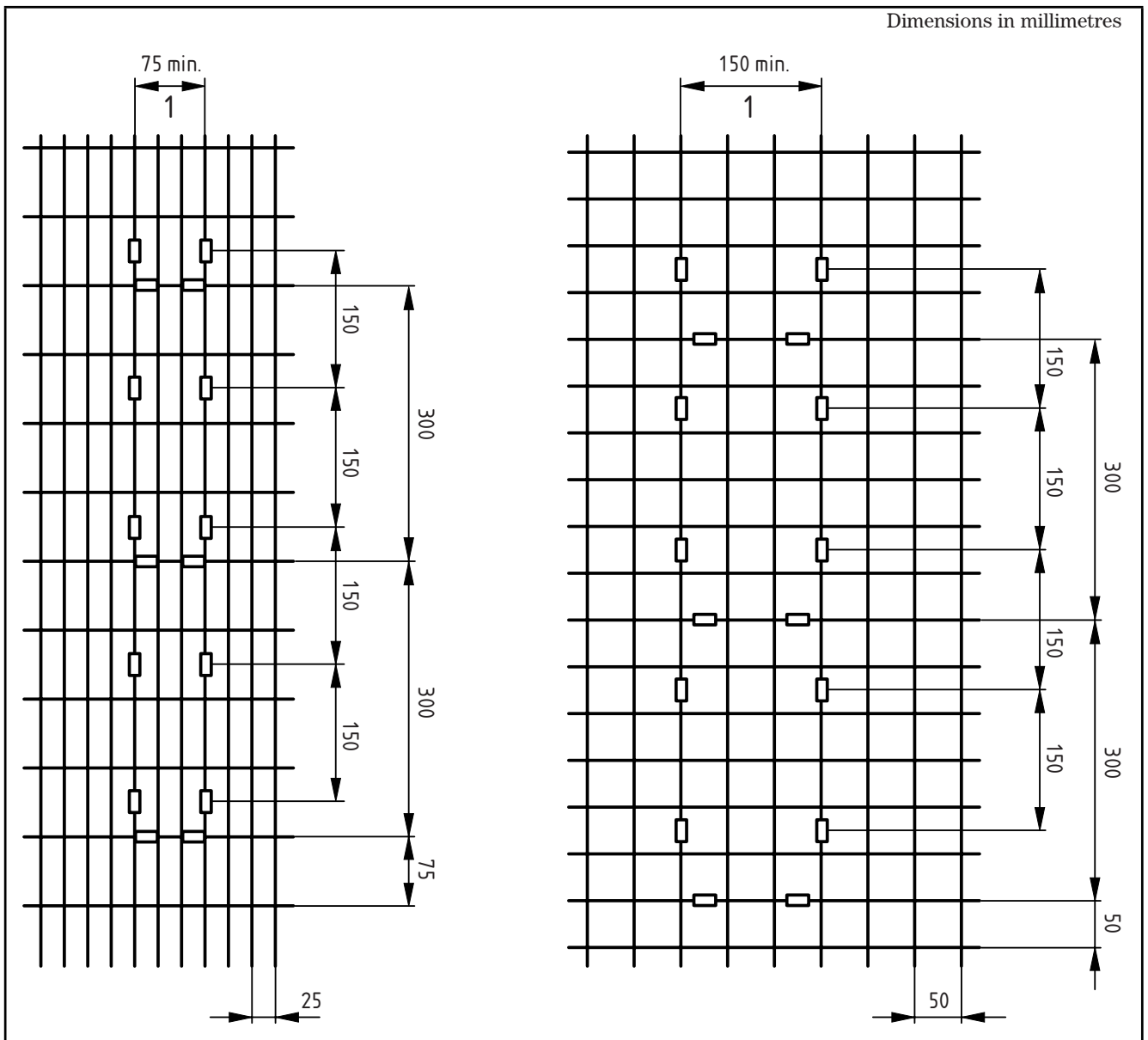


Figure C.4 Typical double gate detail (internal elevation)

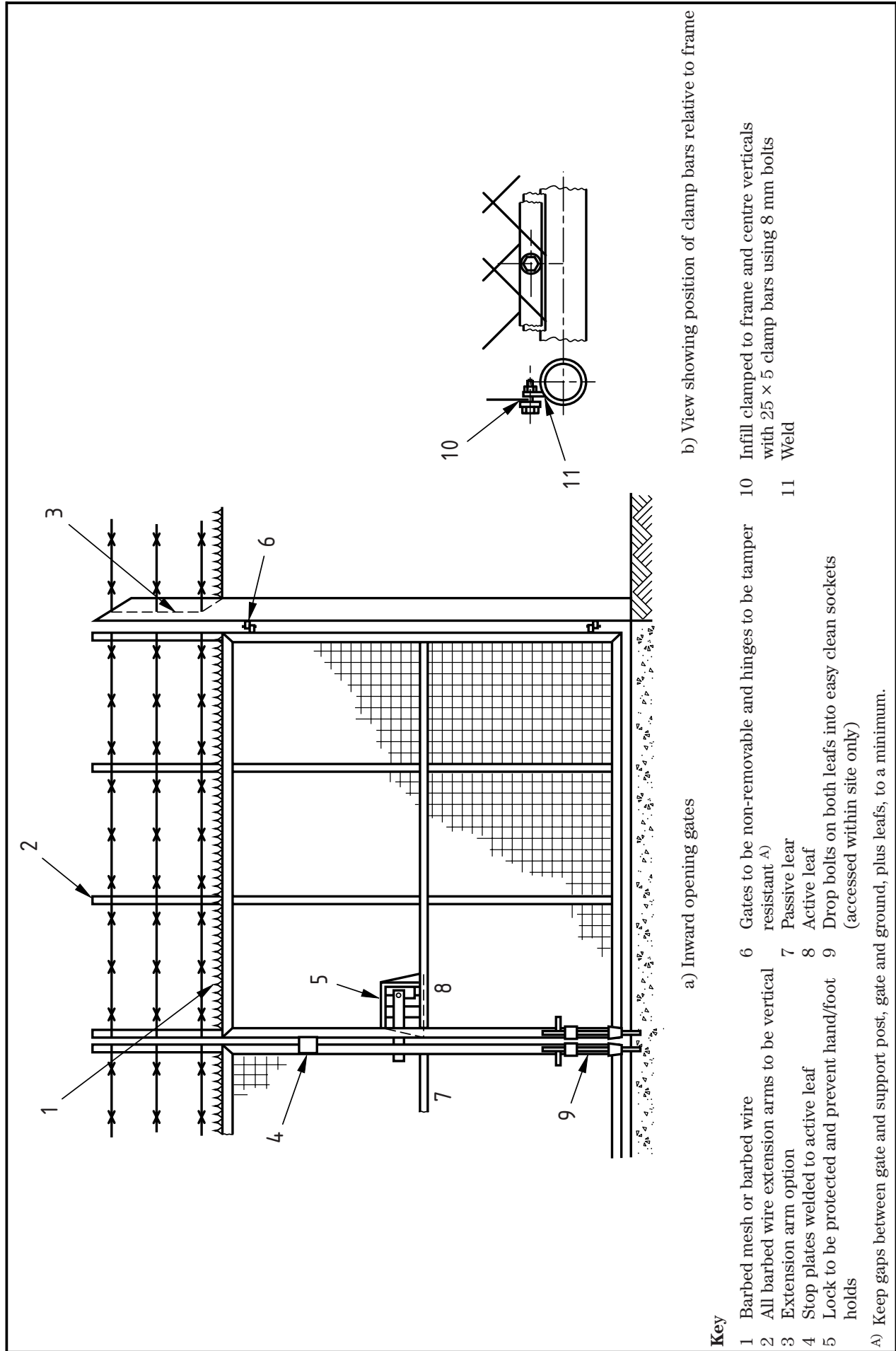
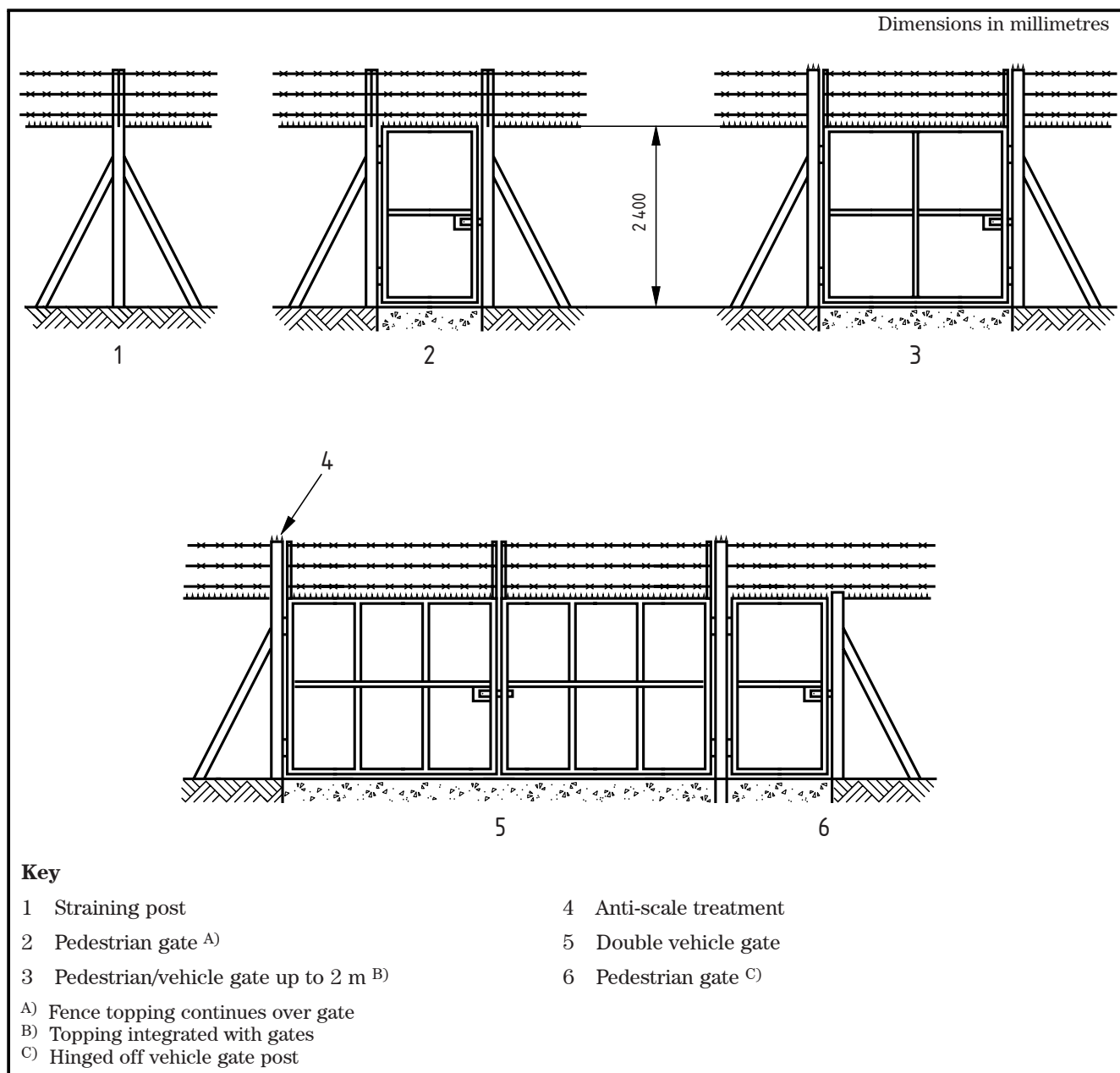


Figure C.5 Typical gate arrangement with straining posts



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