

# Timber fencing

Timber has proved to be a particularly suitable material for a wide range of domestic and commercial fencing applications throughout the UK. Easily worked and readily available in a variety of types, shapes and sizes, it can last longer and perform better than many alternative materials – either in its natural form or with wood preservative treatment.

Fences are available in many forms and serve many purposes; examples include boundaries, containment of livestock, windbreaks and noise barriers. Fencing is a major use of British grown timber, with a strong market for small round wood thinning (from plantations).

This Wood Information Sheet (WIS) discusses some of the more important factors to consider when constructing new or replacing existing fencing. It is primarily concerned with the compliance of timber fences with the relevant parts of *BS 1722 – Fences* [1].

It includes TRADA's advice on applications, design considerations, specification, durability and preservation, erection and workmanship, inspection and maintenance. It provides an overview of the subject, with signposts to more detailed sources listed at the end.

BM TRADA recommends *Eurocode 5 Common rules and rules for building* [2] for structural design of timber. However, this WIS includes a summary of variations when using *BS 5268-2 Structural use of timber. Code of practice for permissible stress design, materials and workmanship* [3], which the BSI has withdrawn.

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Figure 1: Closeboard fence

## Key points

- Fencing accounts for a significant amount of the UK's timber consumption, including home grown species.
- Timber's versatility, strength, durability and sustainability contribute to its suitability as a fencing material.
- A fence incorporating timber may need to comply with the relevant part(s) of *BS 1722 – Fences*, which sets out provisions designed to provide specifiers with basic minimum requirements.
- *BS 1722* gives some generous allowances for the limiting characteristics of timber, which are often technically compliant with the standard.
- The service life of most fences is governed by the resistance to decay of those wooden components that are in ground contact.
- Desired service life can be achieved by design, preservative treatments and finishes.
- To ensure the longevity and structural integrity of a fencing system, it should be installed by suitably qualified professionals and be inspected and maintained regularly.

## Introduction

Fencing accounts for a significant proportion of the UK's annual softwood consumption – approximately 17% in 2012, with over 1.3 million m<sup>3</sup> of material used [4].

British softwoods are frequently specified, mainly lower strength species such as pine and spruce. Often these are faster grown than imported species from northern Europe. Hardwood species are also used – namely oak and sweet chestnut.

## Types of timber fencing

Timber fencing is diverse in its use and style, and performance requirements can vary considerably. Examples include:

- Domestic – garden fencing, boundary fencing
- Boundary and perimeter – barriers against intruders, railway fencing, protecting hazardous areas (such as electricity pylons, power plants), agricultural fencing
- Noise – motorway/road fencing, railway fencing
- Health and safety – hill top/cliff edge fencing, playground fencing.



Figure 2: Hilltop safety fencing

## Timber characteristics

Timber is a natural product that does not benefit from exact dimensional or compositional consistency. It expands and contracts due to changing climactic conditions and is prone to splits (shakes), cracks (checks), knots, twisting, bowing, bending etc. When machine sawn, it can also exhibit saw marks, rough edges (with some splintering) and minor dimensional discrepancies.

However, timber has several general characteristics that contribute to its suitability as a material for fencing (*Table 1*):

**Table 1:** Characteristics of timber contributing to its suitability for fencing applications

<b>Versatility</b>	It is an easily workable material, available in a range of sizes and lengths, readily formed into a range of product shapes and sizes.
<b>Strength</b>	Appropriate species selection, with additional protection where necessary, can withstand structural damage caused by, for example, animals or wind load.
<b>Sustainability</b>	A renewable material, timber is available in a wide variety of sustainably sourced certified species.
<b>Durability</b>	Together with the appropriate timber species selection, and relevant preservative treatment for the use and desired service life, timber can out-last and out-perform many other alternatives.

## Specifying a fence

There are several considerations worth taking when constructing a new or replacing an existing fence, including resistance to the elements, desired service life and ease of maintenance.

In particular, specification may require a fence incorporating timber to comply with the relevant part(s) of *BS 1722 – Fences* [5]. Road noise barriers are subject to even more stringent requirements laid down by the Department of Transport [6].

## Domestic fencing

Most fencing supplied for the domestic and DIY markets is not sold as compliant with BS 1722. However, fencing suppliers should provide clear statements about the qualities and expected performance of materials used.

## Design considerations

### Types of fencing

Take into account the use of the fence along with the desired appearance to determine what type of fencing to choose. Types of timber fencing include:

- Post and rail fences
- Palisade, picket and pale fences
- Close boarded fences
- Panel fences
- Lattice and trellis
- Acoustic fences.

## Examples

### Post and rail

This option is available in several different styles and is commonly used for perimeter or boundary fencing around agricultural areas, or to contain livestock (Figure 3). There are also thousands of miles of post and rail fencing either side of motorways and major roads in rural areas.



Figure 3: Post and rail fence

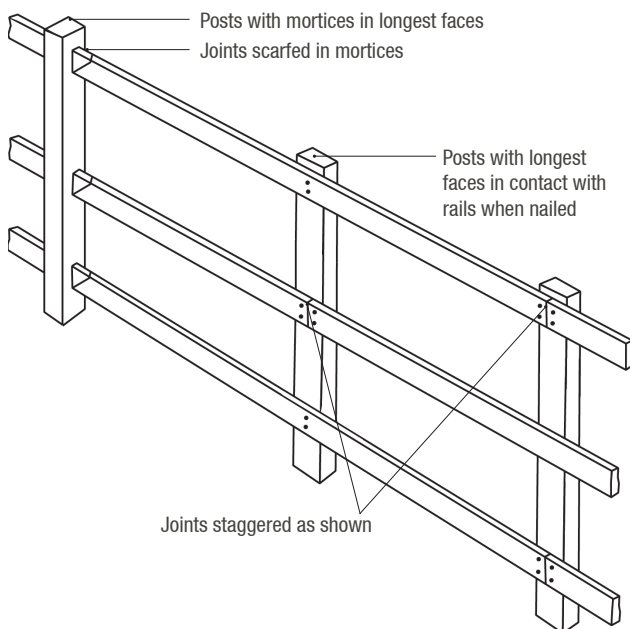


Figure 4: Specification for a post and rail fence

### Palisade, picket and pale

Palisade (or picket) fencing is popular for domestic settings, for example as a decorative, lower level garden border. It is also widely used for sectioning and as perimeter fencing, offering limited security where privacy is not paramount, for example in public access areas (Figure 5). Another example of use is for bin store surrounds, either with small gaps or with an opposing hit and miss pattern, where air can circulate without the fence being see-through. See Figure 9 for an illustration of the construction principles, which are similar to those for close board fencing.



Figure 5: Palisade perimeter fencing

Cleft chestnut pale is a traditional style with rustic appeal, mainly used for boundaries, constructed as rough-cut stakes attached to rows of wire (Figure 6). Often used as a temporary fence on building sites or areas of construction or conservation work, this is a sustainable and economical option where demarcation or protection is required, in situations where metal would look unsightly and security is not a concern.



Figure 6: Cleft chestnut pale fence

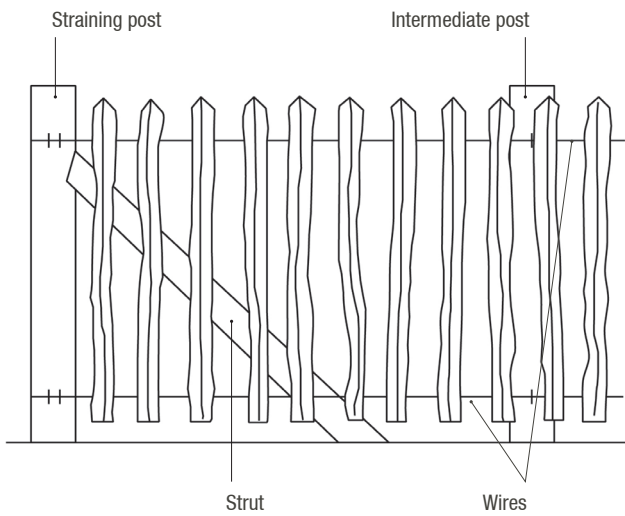


Figure 7: Specification for cleft chestnut pale fence

### Closeboard

Based on the same construction principles as palisade fencing, closeboard fencing provides privacy in a domestic context and can be an effective noise barrier. It is widely used as a domestic garden fence, notably on new-build housing estates (Figure 8). It is sometimes called “feather edge” fencing due to the tapered cross-section of the overlapping boards.



Figure 8: Closeboard fencing in a residential setting

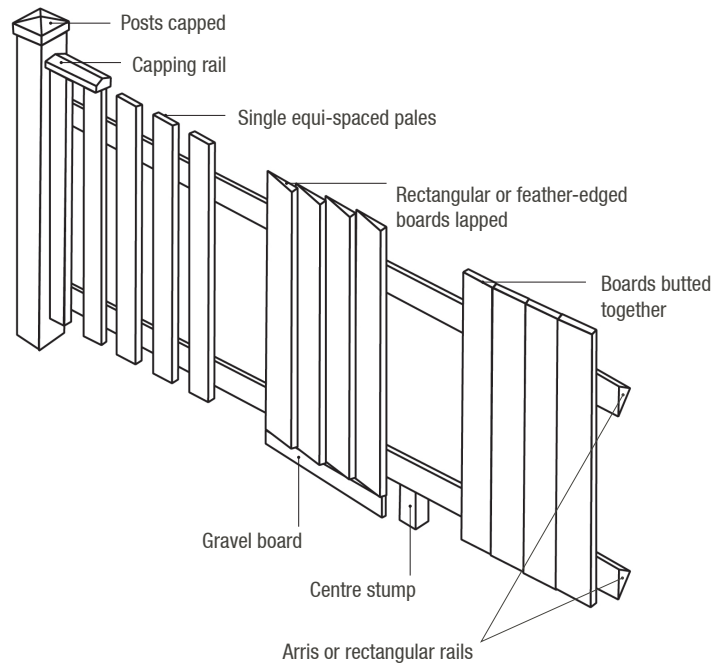


Figure 9: Arrangement of palisade and closeboard fences

### Panel fences

For an enclosed system, such as a noise barrier to reduce the amount of noise emitted from a certain area, a panel system is a suitable option. Also referred to as timber panel, larch-lap/waney-edge panels or close board systems, this type of fencing offers privacy and so is popular in residential settings (Figure 10).



Figure 10: Waney-edge panel fence in a residential setting

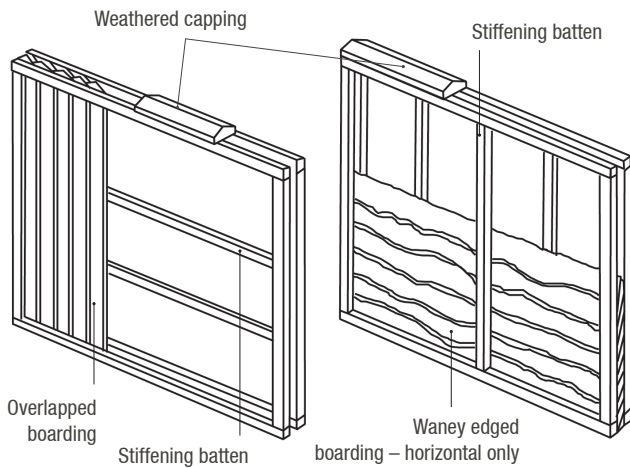
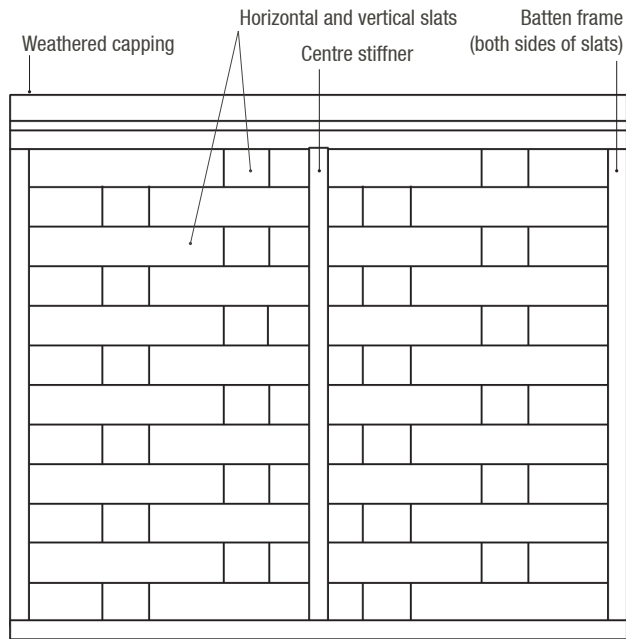


Figure 11: Specifications for panel fences

**Diagonal lattice and trellis**

These are predominantly used as boundary or perimeter fences for residential properties (Figure 12). Trellis sections can also be used to add height to panel fences and for trailing plants.



Figure 12: Diagonal lattice as a garden boundary

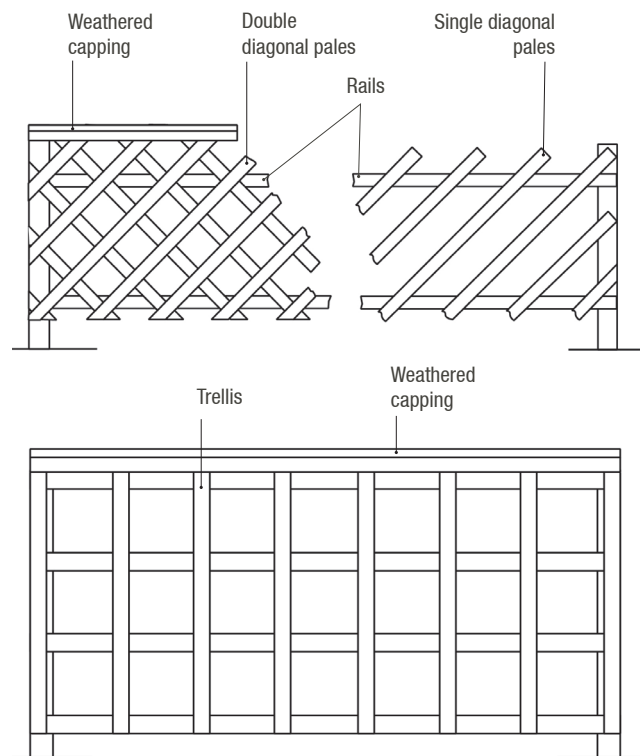


Figure 13: Specification for lattice and trellis

**Noise/acoustic barriers**

The use of noise barriers is increasing for motorways and trunk roads where traffic noise is troublesome, for example to local residents (Figure 14). These barriers can be constructed wholly from timber or incorporate timber panels. They are typically up to 3m high and must be suitably designed and specified for appropriate structural function and decay resistance. Motorway fencing of this type is can be sometimes subject to high wind loads due to their exposed location. Reference should be made to the specific details given in the Department of Transport 'Specification for highway works' [7].



Figure 14: Roadside noise barrier fencing  
Photo: AlphaFence

## Size

To determine other aspects of the fence design, it is important to know the overall height, length and spacings of the fence, so that the supplier can provide the correct individual components of the structure. Guidance to the dimensions of certain components can be found in BS 1722.

## Strength

### Wind loading

The fence will be subjected to various loads during service. Wind loads will have the most detrimental effect on the fence structure and it is recommended that this is accounted for at design stage to reduce the risk of failure.

For commercial use it is advisable for a structural engineer to assess the structure and the possible loads that it may experience. Strength graded timber may be specified for some of the components. A specification for the different strength classes of timber is available in *BS 4978:2007+A1:2011 Visual strength grading of softwood. Specification* [8] and *BS 5756:2007+A1:2011 Visual strength grading of hardwood. Specification* [9].

### Structural strength

BS 1722 refers to four distinct timber quality selection methods depending on the type of fence:

- Strength graded – to rules referred to originally in *BS 5268 Part 2* [10] (as replaced by *BS EN 1995-1-1:2004+A1:2008*, or *Eurocode 5: Design of Timber Structures* [11]). Normally, this will only apply to structures like noise barriers for designed structural elements such as posts and rails.
- Structural selection – used for the major structural elements of fences, such as posts and rails. BS 1722 uses the 'knot area ratio' method of knot assessment originally developed for stress graded timber, simplified for use in fencing.
- Non-structural selection – used for infill boarding and small square posts. Timber selected for this use will be judged on its broad faces only, where knots are limited to one half of the face width.
- Timber used in the round or cleft – the principle of selection for these relies on the natural strength of timber in the round. For timber which is to be cleft, significant weaknesses caused by knots naturally rejects unsuitable material.

Apart from knots, other limiting characteristics given in BS 1722 include wane, slope of grain, checks, and splits, resin and bark pockets, pin worm and distortion. Defects such as rot, active insect attack and Lyctus damage are specifically excluded. BS 1722

gives some generous allowances for features and they are often technically compliant with the standard. It is important however that specifiers and timber suppliers refer to the correct part of the standard that details the requirements for timber in each fence type.

## Appearance

Where a certain colour, style or character is required, thought should be given to the appearance of the timber. This will have some impact on the timber species that is selected.

- The natural colour of timber varies between different species and its appearance will change over time due to the effects of weathering, even if a preservative treatment is used.
- With a wide range of stains and other finishes available on the market, it is possible to give the timber a variety of colours and a consistent appearance.
- The character of the wood will vary between different batches and different species. This will come down to availability and, as with the 'style' of the fence, personal preference.

## Specification

The key to achieving a fence with appropriate stability, life and aesthetics relies predominantly on the design, initial specification and construction.

BS 1722 sets out provisions designed to provide specifiers with basic minimum requirements in terms of species, timber quality, dimension, preservation and quality of construction for a fence to perform adequately over its expected service life.

## Species

Specification will depend on the overall design of the fence and the desired performance.

Softwoods need to be treated with a suitable preservative treatment before use. Hardwoods would not be treated and are used for posts and also for sweet chestnut palings. *Table 2* gives examples of British grown timber species used for fencing.

For further guidance on the timber species that are suitable for constructing fencing, refer to BS 1722-7 and to *WIS 2/3-10 Timbers – their properties and uses* [12].

Modified wood products are also available, see *WIS 2/3-63 Modified wood products* [13] for further information.

**Table 2:** Examples of British grown timber species used for fencing

Species	Fencing applications (with or without ground contact)	Preservative treatment required
<b>Softwoods</b>		
Pine	Yes	Sapwood easy to treat
Spruce	Yes	Difficult to treat – often incised
<b>Hardwoods</b>		
Oak	Yes	Untreated
Sweet chestnut	Yes	Untreated

### Durability and preservation

Guidance on the natural durability of timber is given in *BS EN 350-1:1994 Durability of wood and wood-based products. Natural durability of solid wood. Guide to the principles of testing and classification of natural durability of wood* [14] and *BS EN 350-2:1994 Durability of wood and wood-based products. Natural durability of solid wood. Guide to natural durability and treatability of selected wood species of importance in Europe* [15]. There are also several design and finish options, including preservative treatments, that will increase the natural durability of timber in external situations.

### Risk of decay

The service life of most fences is governed by the resistance to decay of those wooden components that are in ground contact e.g posts, gravel boards etc. Many of the timber species used do not have sufficient natural resistance to last more than five years in ground contact.

Where timbers are classified as being sufficiently durable for use without preservative treatment, this applies only to the heartwood of those species. Where the sapwood content exceeds one third of the cross section, treatment will be required for compliance. Desired service life can be achieved by design, preservative treatments and finishes.

### Detailing and design

Careful design can considerably extend the durability of fencing components – for example, designing to allow for water to drain will reduce the water collection around joints. To protect the exposed end-grain of fence posts from wetting, the tops of the posts should be capped or sloped to shed rainwater (Figure 15).



**Figure 15:** Top of post sloped to shed water

The service life of fence panels can be extended by supporting them off the ground using pre-treated or concrete gravel boards (Figure 16), which can be more easily replaced than the entire fence panel.

*WIS 4-28: Durability by design* [16] describes principles of protective detailing, and design against weathering and wetting.



**Figure 16:** Gravel board

### Preservative treatments

It is usual to apply preservative treatment to fence components, especially those in contact with the ground. A service life of 15 to 30 years may be achieved with correct timber specification, appropriate preservative treatment and rigorous execution of the treatment process under industrial conditions. For required performance levels, ensure that moisture content levels are less than 30%, and that all cutting and machining has been carried out before preservation treatment.

*BS 8417:2011 Preservation of wood. Code of practice* [17] provides recommended levels for wood preservative penetration and retention requirements, taking into account the use class, the likelihood and consequence of failure, the desired service life (15 to 30 years) and the treatability of the wood being used. The

recommendations are based on use class and typical service situations given in BS EN 335-1. Note that many sawmills still do not provide timber treated to BS 8417 (or BS 1722). Table 3 summarises the appropriate use classes for fencing service situations.

**Table 3:** Use classes for typical fencing service conditions

Use class	Typical service situations
UC4	In ground contact – the minimum specification for posts and gravel boards etc
UC3	Minimum specification for components not in direct contact with the ground

A list of the types of wood preservatives available and their advantages and disadvantages for use in different end use situations, along with the approved preservative types, products, suppliers and other information is given in the *The Manual: Industrial Wood Preservation*, published by The Wood Protection Association (WPA) [18].

For guidance on the preservation of timber, refer to BS 8417:2011 *Preservation of wood* [19] and BS EN 15228:2009 *Structural timber. Structural timber preservative treated against biological attack* [20].

### Finishes

All timber exposed to the weather, including that treated with preservative and not protected by some form of finish, will ‘weather’ to a greyish colour and develop surface splits and checks. While this may be acceptable in many situations, it may be desirable to protect the timber from this effect. More information can be found in WIS 2/3-60: *Specifying timber exposed to weathering* [21] and WPA’s *Wood Selection Guide* [22].

### Exterior wood stains

These are available in a range of colours to enhance or alter the natural colour of the timber. These types of coatings are the most likely to achieve a satisfactory finish. Figure 17 shows an example. They can be used advantageously on sawn timber, where the increased uptake of stain compared with that on planed surfaces greatly extends the maintenance interval.

### Protective finishes

These provide an envelope around the surface of a timber member and, providing the application is consistent, can help to prevent the ingress of water. However, this is not to say that finishes will prevent the deterioration and decay of timber, but they can significantly reduce the water ingress and keep the timber below the moisture content decay threshold (of approximately

20%). Note also that the application of stains, especially dark stains, will increase the absorption of heat and may lead to splits and cracks in the wood due to greater expansion and contraction.

Further information on finishes can be found in WIS 2/3-1 *Finishes for external timber* [23].



**Figure 17:** Stained closeboard fence

## Erection and workmanship

To ensure the longevity and structural integrity of a fencing system, it should be installed by suitably qualified professionals. BS 1722 offers some guidance with regard to qualifications, and recognised fencing industry associations (such as the European Fencing Industry Association (EFIA) or Fencing Contractors Association (FCA)) have membership entry criteria covering quality, safety and professionalism.

### The top line

Ground conditions will often be uneven. The top line of the fence can be strictly straight and level, resulting in gaps beneath that compromise security. Otherwise it can follow the undulation of the ground, resulting in an “up and down” effect. Panel fences will need to accommodate undulating ground by “stepping”.

### Posts

Fence posts should have suitably sized foundations for the ground conditions (soft and/or wet ground will need larger foundations than hard ground). Posts should be set inline and plumb.

For normal ground conditions posts should be set in the ground to depths of between 0.6 and 0.75m, depending upon their height. Tall acoustic fences may require very deep foundations. Posts can be back filled, driven into the ground, fitted into metal post-spikes or into brackets bolted to concrete footings. Posts should always be concreted into the ground unless they are going across concrete, in which case they should be bolted down with a steel shoe.



## Fixings

Fixings should be protected from corrosion and the use of hot dipped galvanised fixings to *BS EN ISO 1461:2009 Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test method* [24] is recommended. Non ferrous fixings should be used for timbers known to increase corrosion rate, such as oak and Western red cedar.

## Inspection and maintenance

Routine inspections and regular maintenance are essential, to ensure the fence remains in good condition, safe and fit for purpose.

Finishes and preservatives may, over time, fail due to factors that inevitably occur when a natural material is used in an outdoor environment. Weathering and movement of the timber will cause stresses in the coating. Due to swelling and shrinkage, checks and fissures may appear in the timber making it more susceptible to water ingress, and therefore increasing the risk of localised decay. Maintaining the protective finish by regular re-application of a stain or paint will help keep the fence structurally sound (free from decay) for an extended period of time.

## Acknowledgments

BM TRADA acknowledges the assistance of the European Fencing Industry Association for their peer review of a draft of this Wood Information Sheet.

## References

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Part 5:2006 Fences. Specification for close-boarded fences and wooden palisade fences, BSI  
Part 7:2006 Fences. Specification for wooden post and rail fences, BSI  
Part 11:2006 Fences. Specification for prefabricated wood panel fences, BSI
2. BS EN 1995-1-1:2004+A1:2008 Eurocode 5. Design of timber structures. General. Common rules and rules for buildings, BSI
3. BS 5268-2:2002+A1:2007 Structural use of timber. Code of practice for permissible stress design, materials and workmanship, BSI [WITHDRAWN]
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22. Guidance Note WPA/GN 10/12 Wood Selection Guide, WPA, 2012
23. WIS 2/3-1: Finishes for external timber, TRADA Technology, 2012
24. BS EN ISO 1461:2009 Hot dip galvanized coatings on fabricated iron and steel articles. Specifications and test methods, BSI

## Further reading

Choose and use – Timber for garden projects, TRADA Technology, 2012  
WIS 1-31: Timber for landscape architecture, TRADA Technology, 2012  
WIS 4-14: Moisture in timber, TRADA Technology, 2011  
European Fencing Industry Association [www.efia.co.uk](http://www.efia.co.uk)  
Fencing Contractors Association [www.fencingcontractors.org](http://www.fencingcontractors.org)

### About TRADA

The Timber Research and Development Association (TRADA) is an internationally recognised centre of excellence on the specification and use of timber and wood products.

TRADA is a company limited by guarantee and not-for-profit membership-based organisation. TRADA's origins go back over 75 years and its name is synonymous with independence and authority. Its position in the industry is unique with a diverse membership encompassing companies and individuals from around the world and across the entire wood supply chain, from producers, merchants and manufacturers, to architects, engineers and end users.

### Our aim

To provide members with the highest quality information on timber and wood products to enable them to maximise the benefits that timber can provide.

### What we do

We seek to achieve this aim through active and on-going programmes of information and research. Information is provided through our website, an extensive collection of printed materials and our training courses.

Research is largely driven by the desire to update and improve our information so that it continues to meet our members' needs in the future.

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