

## Key points

- For softwood timber fencing to provide a satisfactory service life of 15 to 30 years it must be treated with a wood preservative.
- Not all preservation treatments are equally effective – certified pressure treatment by the manufacturer is far superior to a dip or brush treatment which will only provide short term protection.
- Evidence of proper treatment can be provided by a treatment certificate from the manufacturer – if there is no certification the fencing is probably not properly treated.
- Timber fencing rails are classified as being in 'Use Class 3' which relates to the level of risk for above ground timbers from fungal decay or insect attack.
- Timber fence posts are classified as being in 'Use Class 4' which relates to a higher level of risk for timbers in ground contact from fungal decay and insect attack.
- Fencing timbers should be machined to shape prior to treatment. Where subsequent cutting, notching or boring is required the cut surfaces should be re-treated with a brush applied wood preservative.
- Where a 30 year service life is required for fencing timbers (roadside and horse farm fencing) a more intensive treatment schedule is required to achieve the needed higher loading of wood preservative. This level of loading is referred to as the 'retention' of wood preservative in the timber.
- In some cases -mechanical incising- producing a pattern of cuts in the surface of the timber is required to allow the correct level of loading and retention of preservative to achieve the desired service life.

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## Irish standards on timber fencing – general information

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### Introduction

This information sheet provides information on timber fencing for roadside use, farm fencing and horse stud farm fencing. It is mainly aimed at specifiers, fencing manufacturers, fencing contractors and distributors. The information provided is based on the content of the three current Irish product standards on fencing and includes requirements for timber species, grading, moisture content, tolerances and dimensions, preservation treatment, marking, packaging and installation.

The section on preservation treatment is a general summary of the information on timber preservation contained in the Irish fencing standards and in the British and European standards on wood preservation. BS 8417: 'Preservation of wood – Code of practice' is particularly useful as it links together the information in the British and European series of standards on timber preservation.

As there is no harmonised European standard on timber fencing, requirements for CE marking and Declaration of Performance (DoP) do not apply. Metal fixings such as nails, staples and wire are however covered by European standards and therefore CE marking and DoP requirements can apply to these components. The current Irish standards on timber fencing are as follows:

### Roadside fencing

- I.S.435-1: Roadside fencing – Timber post and rail – Requirements for timber;
- I.S.435-2: Roadside fencing – Timber post and rail – Erection of fencing by excavation of posts;
- I.S.435-3: Roadside fencing – Timber post and rail – Erection of fencing by driving of posts.

### Farm fencing

- I.S.436: Farm Fencing - Timber post and wire.

### Horse and stud farm fencing

- I.S.437: Horse and stud farm fencing - Timber post and rail.

The Irish standards and therefore this information sheet are based on the assumption that timber used for fencing will be preservative treated to provide a minimum service life as listed in Table 1:

**Table 1: Minimum desired service life of treated timber fencing.**

Type of fencing	Service life in years
Roadside fencing – timber post and rail	30
Farm fencing – post and wire	15
Horse and stud farm fencing – timber post and rail	30

## Fencing Terminology

- **Bale:** Quantity of timber pieces bound together for purposes of preservation treatment and transport.
- **Charge:** Quantity of timber undergoing a preservation treatment cycle identified by a unique charge number.
- **Critical value:** A reference value for the wood preservative relating to its effectiveness against a range of biological hazards at a defined level of loading. This value is available from the preservative manufacturer for each preservative product.
- **Durability:** The natural durability of the timber for resistance to fungal decay as defined in five Durability classes: DC1 to DC5. DC 1 being very durable and DC 5 being non-durable.
- **Penetration class:** The effective depth of penetration of the preservative into the wood as defined in six penetration classes NP1 to NP6.
- **Posts:** Timber members fixed in ground contact and supporting the horizontal rails, steel wire or steel mesh.
- **Rails:** Horizontal timber members running between the posts and fixed to the sides of the posts.
- **Retaining boards:** Large section boards running between the posts and fixed near the lower ends of the posts.
- **Retention:** The amount of wood preservative that remains in the timber after treatment and normally expressed as overall charge retention in kg/m<sup>3</sup>.
- **Strainer posts:** Large end posts or posts provided with angled timber struts fixed in ground contact to resist loads from tensioning wire or from animals.
- **Top boards:** Large section boards oriented on the flat running horizontally between the posts.
- **Treatability:** Four classes define the levels of permeability of different timbers to preservative treatment. Class 1 being most permeable and class four being least permeable.

## Roadside Fencing – Timber Post and Rail (I.S. 435)

The principal use of roadside fencing is alongside the national road and motorway network as a barrier to road access by animals. In conjunction with the local authorities the national roads network is the responsibility of Transport Infrastructure Ireland (TII), previously the National Roads Authority (NRA). The requirement for roadside fencing is compliance with the TII specification and with Irish Standard I.S. 435. This standard requires a minimum desired service life of 30 years for roadside fencing.

**Note:** Transport Infrastructure Ireland (TII) requires that fencing rails be omitted from fencing alongside national roads where the fencing is within 8-10 m of the edge of the road. In these zones the timber rails are replaced by wire mesh fixed between the fence posts and a flexible plastic rail fitted along the top of the wire mesh.

**Table 2: Timber species commonly used for roadside fencing.**

Common name	Scientific name
Douglas fir	<i>Pseudotsuga menziesii</i>
Larch	<i>Larix species</i>
Pine	<i>Pinus species</i>
Sitka spruce	<i>Picea sitchensis</i>
Norway spruce	<i>Picea abies</i>
Oak	<i>Quercus species</i>

### Visual grading rules for roadside timber fencing

The visual grading rules for roadside fencing given in I.S. 435-1 are summarised in Table 3 below.

**Table 3: Visual grading rules for roadside timber fencing.**

Defect	Permitted limit
Knots	Not greater than 1/2 cross section
Slope of grain (cross grain)	Not more than 1 in 6
Wane (missing edge)	Up to 1/3 on face or edge for full length Up to 1/2 over any 300 mm length
End splits (fissures)	Not more than 150 mm in length
Fissures / splits on face or edge	Not more than 1/2 thickness in depth
Bow (lengthwise distortion along face)	Max 25mm over 3 m
Spring (lengthwise distortion along edge)	Max 15mm over 3 m
Cup (concave curvature across width of board face)	Max 1/25 of board width
Twist (spiral distortion along length)	Max 20mm over 3 m
Sapstain (fungal discoloration e.g. bluestain)	Permitted without limit
Decay (fungal disintegration of the wood)	Not permitted
Insect damage (insect holes)	No active insect attack allowed

**Note:** Timber pieces shall meet the requirements in Table 3 when assessed in accordance with the methods described in I.S.127 and I.S. EN 14081-1.

## Moisture content

The moisture content of the timber shall be measured by a calibrated moisture meter in accordance with I.S. EN 13183-2. To confirm the accuracy of meter readings, oven-drying methods shall also be used in accordance with I.S. EN 13183-1.

**Note:** The moisture content of the timber shall not exceed 30% immediately prior to treatment.

## Timber Dimensions and Maximum Permitted Tolerances

The permissible tolerances for dimensions for timber components of roadside fencing given in I.S. 435-1 are shown in Table 4 for a reference moisture content of 30%. Changes in moisture content can affect dimensions. Normally the thickness and width of a piece of timber will increase by up to 0.25% for every 1% increase in moisture content above 20%, up to fibre saturation point (circa 30%) and decrease by up to 0.25% for every 1% of moisture content decrease below 30%. Dimensional changes due to changes in moisture content are additional to the tolerances allowed in manufactured sizes given in Table 4.

**Table 4: Maximum permitted tolerances and dimensions for roadside fencing.**

Dimension	Posts	Rails
Width	150 +/- 3 mm	100 +/- 3 mm
Thickness	75 +/- 3 mm	44 +/- 3 mm
Length	2100-3000 +/- 3 mm	4200 +/- 3 mm

## Geometry of posts and rails

**Posts:** The standard specifies that tops of all posts shall be cut at an angle (weathered) unless otherwise specified. The base profile shall be square for erection by excavation and four-way-pointed for erection by driving. All machining shall be done prior to treatment.

**Rails:** Rail ends shall be cut square.

## Marking of roadside fencing bales

The standard states that each bale shall be labelled to enable traceability and shall include at least the following information:

- Manufacturer's company name and address;
- Name of the preservative used;
- The penetration class (depth of treatment into timber);
- Retention value of the treatment (amount of preservation chemical retained in the analytical zone of the timber measured in kilograms per cubic metre (kg/m<sup>3</sup>);
- Treatment charge number (as per treatment charge sheet);
- Bale number;
- Number of pieces in the bale;
- Dimensions of timber;
- Date of labelling;
- Standard reference: I.S. 435-1.

## Packaging, transport and on-site storage of roadside fencing

The standard states that packaging and transport shall be in accordance with manufacturer's written instructions.

Treated timber shall be protected during transport and storage to prevent deterioration.

## Farm Fencing – Timber Post and Wire (I.S. 436)

Farm fencing is intended to protect newly established forest against stock trespass and to provide safe enclosures for cattle, sheep, deer and goats. The Department of Agriculture, Food and the Marine (DAFM) operate a grant aid scheme. Compliance with the DAFM grant aid specification and with I.S. 436 are required to avail of grant aid. Timber fencing must be certified as complying with I.S. 436. Certification forms for grant applications are available from DAFM.

**Note:** Farm fencing has a desired service life of at least 15 years.

**Table 5: Timber species commonly used for farm fencing.**

Common name	Scientific name
Douglas fir	<i>Pseudotsuga menziesii</i>
Larch	<i>Larix spp</i>
Lodgepole pine	<i>Pinus contorta</i>
Scots pine	<i>Pinus sylvestris</i>
Sitka spruce	<i>Picea sitchensis</i>
Norway spruce	<i>Picea abies</i>

**Note:** Other species should not be used unless suitability for use has been established by an appropriate expert body.

## Visual grading rules for farm fencing timber

Rules are summarised in Table 6: Note that they are slightly different to those for roadside fencing.

**Table 6: Visual grading rules for timber farm fencing timber.**

Defect	Permitted limit
Knots	Not greater than ½ cross section
Slope of grain (cross grain)	Not more than 1 in 6
Wane	Up to 1/3 on face or edge over full length
Sapstain (fungal discoloration)	Permitted without limit
Fungal decay (fungal disintegration)	Not permitted
Insect damage (insect holes)	No active attack allowed
Surface condition	Surface shall be free from dirt and bark

**Note:** Limits for knots, slope of grain and wane relate to rectangular sections only

## Maximum permitted tolerances and dimensions for farm fencing posts

**Table 7: Peeled rough posts – round – tolerances and dimensions.**

Length +/- 30 mm	Tolerances and diameter (+ only / negative tolerance not allowed)							
	50 mm	75 mm	100 mm	125 mm	150 mm	175 mm	200 mm	225 mm
1200 – 3000 mm	+ 25mm				+ 50 mm			

**Note:** 1800 x 200 mm and 225 mm posts are not commonly used

**Table 8: Peeled rough posts – half round – tolerances and dimensions.**

Length +/- 30 mm	Tolerances and diameter (+ only / negative tolerance not allowed)		
	100 mm	125 mm	150 mm
1200 – 1800 mm	+ 25 mm		

**Table 9: Machined posts – round (pencil type) – tolerances and dimensions.**

Length +/- 30 mm	Tolerances and diameter (+/-)									
	50 mm	65 mm	75 mm	85 mm	100 mm	125 mm	150 mm	175 mm	200 mm	225 mm
1200 - 3600 mm	+/- 3 mm									

**Table 10: Machined posts – half round – (pencil type) – tolerances and dimensions.**

Length +/- 30 mm	Tolerances and diameter (+/-)		
	100 mm	125 mm	150 mm
1370 – 3600 mm	+/- 3 mm		

**Table 11: Rectangular sawn posts – tolerances and dimensions.**

Length +/- 30 mm	Tolerances and dimensions (+/- 3 mm)
1200 – 3600 mm	75x75 mm - 200x200 mm

**Table 12: Rectangular sawn rails – tolerances and dimensions.**

Length +/- 3 mm	Tolerances and dimensions (+/- 3 mm)
3000 – 4800 mm	22x75 mm – 48x150 mm
5400 mm	38x175 mm – 48x175 mm

## Geometry of farm fencing posts

Where installation of posts is by driving, the ends shall be pointed. Where installation is by excavation the ends shall be flat.

## Ancillaries

Metal fixings shall not be attached to treated timber until 14 days after treatment or until the moisture content has reduced to below 20%

## Nails

Nails shall be galvanised steel with round heads to I.S. EN 10230-1. Galvanising shall comply with I.S. EN 1461 except that the coat weight shall be a minimum of 300 g/m<sup>2</sup>.

## Staples

Staples shall be to I.S.105-1. Galvanising shall comply with I.S. EN 10244-2 Class A.

## Wire

Wire in general shall be galvanised steel to I.S. EN 10223. Galvanising shall comply with I.S. EN 10244-2 coating class A.

## Marking of farm fencing timber posts

Bale marking: The following is the minimum information necessary for traceability:

- Manufacturers name and address;
- Manufacturers certification number;
- Certification body;
- Bale number;
- Number of pieces in bale;
- Dimensions of timber pieces;
- Date of treatment;
- Standard reference I.S. 436.

## Packaging, transport and on-site storage of farm fencing

Packaging and transport shall be in accordance with manufacturer's written instructions.

Treated timber shall be protected during transport and storage to prevent deterioration.

## Certification forms for grant aid

Fencing post certificate forms are obtainable from DAFM; section A of the certificate is completed by the post manufacturer and section B completed by the supplier. The end user then completes the final certificate and submits it with the grant aid application.

## Desired service life

The desired service life for treated farm fencing posts is 15 years. This requires that any treatment process achieves the correct level of penetration into the timber and that the correct retention level of treatment is achieved in the timber.

**Note:** All the species listed in Tables 1 and 4 require preservative treatment to provide the required service life.

## Horse And Stud Farm Fencing – timber post and rail (I.S. 437)

Horse and stud farm fencing is intended to provide a safe and protected enclosure for horses. The standard provides detailed requirements for boundary fencing, paddock fencing, lunging and turnout areas.

Creosote is frequently the treatment of choice as horses are not attracted to it. Timber that has been treated using a salt based treatment can be damaged by horses.

Note: Horse and stud farm fencing has a desired service life of at least 30 years.

## Permitted timber species for horse and stud farm fencing

These are the same as in Table 2 (Roadside fencing) *except that Norway or Sitka spruce are not permitted.*

## Visual grading rules for horse and stud farm fencing timber

These are the same as in Table 3 (Roadside fencing) except that limits for wane are stricter:

Wane limit: Up to  $\frac{1}{4}$  of face or edge over full length and up to  $\frac{1}{2}$  in any 300 mm length.

## Moisture content requirements

The moisture content of timber posts, rails, retaining boards and top boards cannot exceed 30% immediately prior to treatment. Moisture content measurement is the same as roadside and farm fencing.

## Tolerances and dimensions

The dimensions and tolerances for horse and stud farm fencing relate to timber at a moisture content of 30%. The additional allowances for dimensional changes due to moisture content changes are as before.

**Table 13: Sawn posts – tolerances and dimensions.**

Length (min)	Width +/- 3 mm	Thickness +/- 3 mm
1800 – 2700 mm	125 – 150 mm	75 mm

**Table 14: Sawn rails- tolerances and dimensions.**

Length +/- 3 mm	Width +/- 3 mm	Thickness +/- 3 mm
4200 – 4800 mm	100 mm	100 mm

**Table 15: Retaining boards – tolerances and dimensions.**

Length +/- 3 mm	Width min size	Thickness min size
4200 – 4800 mm	175 mm	44 mm

**Table 16: Top board – tolerances and dimensions.**

Length +/- 3 mm	Width +/- 3 mm	Thickness min size
5400 mm	175 mm	44 mm

**Table 17: Machined posts – round (pencil type) – tolerances and dimensions.**

Length min size	Diameter +/- 3 mm
1800 – 2700 mm	100 – 200 mm

**Table 18: Peeled rough posts – round – tolerances and dimensions.**

Length min size	Diameter (negative tolerances not allowed)	
1800 – 3000 mm	100 – 125 mm (+ 25 mm)	150 – 225 mm (+ 25 mm)

## Geometry of posts, rails, retaining boards and top boards

Top of posts to be flat and base of posts must be four-way pointed. Ends of rails, retaining boards and top boards are to be cut square.

## Marking requirements

- Manufacturers details.
- Bale number.
- No of pieces.
- Dimensions of pieces.
- Date of treatment.
- Verification of final inspection.
- Irish Standard number.

## Packaging, transport and on-site storage

To be in accordance with manufacturer's instructions.

## Preservative Treatment

This section provides general guidance on timber preservation relating to both roadside, farm and stud farm fencing. The information is based on the content of the Irish fencing standards, EN 599-1, EN 13991 and BS 8417.

The need for preservative treatment is related to the natural durability of the timber and the service environment to which it is exposed. The service environment is usually referred to as Use Class as defined in EN 335-1: 'Durability of wood and wood based products – use classes'.

### Use Class

Use Classes range from 1 to 5; UC1 has a low level of degradation risk while UC5 has a very high degradation risk. The Use Classes for fencing from EN 335-1 are shown in Table 19.

**Table 19: Use class for fencing timbers.**

Component	Use Class
Fencing posts, retaining boards and restraining posts	4
Fencing rails, top boards	3

### Natural durability of timber

The natural durability of timber varies between different species. EN350: 'Durability of wood and wood based products – Natural durability of solid wood' describes methods of classifying natural durability and provides a list of timbers and their natural durability classes.

The natural durability of the timber as defined by EN 350 relates *only to the heartwood* of the timber. Where sapwood is present treatment is essential regardless of the natural durability of the heartwood, as the sapwood of all timber is non-durable. It can be difficult to differentiate between the sapwood and heartwood of some species and most fencing timbers will contain some sapwood.

**Note:** Technical information and additional factors affecting durability of the timber and treatment specifications are dealt with in other WTI information sheets on timber durability and treatment.

### Permeability of timbers to treatment

Timbers of different species have different levels of permeability to treatment and some species such as Sitka spruce are more resistant to treatment and this must be considered in the selection of the treatment processes.

Treatability or permeability to treatment is based on the sapwood and has 4 classifications:

1. Easily treated;
2. Moderately easy to treat;
3. Difficult to treat;
4. Extremely difficult to treat.

The permeability of some of the commonly used timber species used in Ireland is given in Table 20 below.

**Table 20: Permeability of timber species to treatment.**

Timber species Common name	Permeability to treatment (Class)	
	Heartwood	Sapwood
Douglas fir	4	2-3
Larch	4	2
Pine	3-4	1
Oak	4	1
Sitka spruce	3	2-3
Norway spruce	3-4	3

**Note:** BS 8417 divides timber permeability into two classifications; permeable wood (where the sapwood has a permeability class of 1) and resistant wood (where the sapwood has a permeability class greater than 1).

### Moisture Content at time of treatment

The moisture content of the fencing timber shall not exceed 30% prior to treatment with wood preservatives. The normal method of measurement is by calibrated electrical moisture meter or by the oven dry method in accordance with I.S. EN 13183 (parts 1 and 2). The moisture content value of 30% represents a typical 'fibre saturation point' for most timbers used in fencing; this means that most of the remaining moisture is inside the cell walls of the timber leaving an open space inside the cells free from liquid sap and therefore at an optimal condition to receive wood preservative treatment. Drying of the timbers after the treatment process reduces the moisture content of the cell walls and results in progressive shrinkage and dimensional change in the size (mostly cross sectional) of the timber.

**Note:** Grant aid for horse fencing only applies to creosote treated timber

### Recommended levels of preservative treatment

BS 8417 "Preservation of Wood – Code of Practice" and the UK Wood Preservation Association (WPA) provide information on recommended penetration depths for the wood preservatives and the retention levels which relate to the amount of preservative which remains in the timber following the treatment process. The preservative manufacturer's recommendations should always be followed when using their products. Where longer service lives are required higher loadings of preservative are used.

## Penetration of preservatives

Classification of penetration levels given in I.S. EN 351-1 are given in Table 21:

**Table 21: Penetration classes for determination of retention in accordance with I.S. EN 351-1.**

Penetration class	Depth requirement
NP1	None
NP2	Minimum 3 mm lateral into sapwood
NP3	Minimum 6 mm lateral into sapwood
NP4	Minimum 25 mm into sapwood
NP5	Full sapwood
NP6	Full sapwood and minimum 6 mm into exposed heartwood

**Note:** For penetration depths of NP3 or greater mechanical incising of the wood may be required

## Preservative treatment recommendations for fencing timbers for a service life of 15 years

The recommended levels of penetration and retention of preservatives for fencing rails for use class 3 are given in Table 22 for a service life of 15 years.

**Table 22: Preservative penetration and retention levels for fencing rails for a service life of 15 years.**

Preservative	Permeability class of timber	Penetration requirement	Retention requirement (kg/m <sup>3</sup> )
Creosote	1	NP5	90
Creosote	2,3,4	NP3	100
Copper organic based preservatives	1	NP5	CV1 (see note 1)
	2,3,4	NP2	CV1 (see note 1)

The recommended levels of penetration and retention of preservatives for fencing posts for use class 4 are given in Table 23 for a service life of 15 years.

**Table 23: Preservative penetration and retention levels for fencing posts for a service life of 15 years.**

Preservative	Permeability class of timber	Penetration requirement	Retention requirement (kg/m <sup>3</sup> )
Creosote	1	NP5	110 (see note 2)
Creosote	2,3,4	NP3	120 (see note 2)
Copper organic based preservatives	1	NP5	CV1 (see note 1)
	2,3,4	NP3	CV1 (see note 1)

## Preservative treatment recommendations for fencing timbers for a service life of 30 years

The recommended levels of penetration and retention of preservatives for fencing rails for use class 3 are given in Table 24 for a service life of 30 years.

**Table 24: Preservative penetration and retention levels for fencing rails for a service life of 30 years.**

Preservative	Permeability class of timber	Penetration requirement	Retention requirement (kg/m <sup>3</sup> )
Creosote	1	NP5	100
Creosote	2,3,4	12mm	110
Copper organic based preservatives	1	NP5	CV1.25 (see note 1)
	2,3,4	NP3	CV1.25 (see note 1)

The recommended levels of penetration and retention of preservatives for fencing posts for use class 4 for a service life of 30 years are given in Table 25.

**Table 25: Preservative penetration and retention levels for fencing posts for a service life of 30 years.**

Preservative	Permeability class of timber	Penetration requirement	Retention requirement (kg/m <sup>3</sup> )
Creosote	1	NP5	110
Creosote	2,3,4	12mm	115
Copper organic based preservatives	1	NP6	CV1.5 (see note 1)
	2,3,4	12mm sapwood and 6mm heartwood	CV1.5 (see note 1)

**Note 1:** Information on CV values is available from the preservative manufacturers for each of their products.

**Note 2:** Retention is expressed as overall charge retention. These values take account of industrial experience in Ireland.

## Quality Control

EN 351-1 describes two methods of factory production control: direct and indirect testing. Direct testing involves the testing of samples taken from a batch of treated timber for penetration of treatment and retention levels. Indirect testing involves monitoring and recording the volumes of timber and chemical treatment fluid used in the treatment process for each batch of timber. This information should be recorded on a charge sheet for each batch of treated timber.

For preservation treatment to conform to these requirements, direct testing by the measurements of penetration and retention shall be carried out in accordance with I.S. EN 351-1: Durability of wood and wood based products – Preservative treated solid wood – Part 1: Classification of preservative

penetration and retention. Treatment providers should comply with their preservative suppliers treatment schedules and annual maintenance and service requirements in order to maintain compliance with the Irish Standards on timber fencing and with the EU standards on wood preservation.

Purchasers of timber fencing should request a treatment certificate from the supplier as evidence that the fencing supplied is in compliance with the relevant Irish Standard and has been treated to the levels specified for the expected use class and service life.

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