WPA
Wood Protection Association






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Specification and Practice

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About the Wood Protection Association (WPA)

The WPA is a not for profit technical and advisory organisation interested in the development and promotion of wood protection technology to support the use of wood as a cost effective, sustainable and low environmental impact construction material.

The WPA acts as a technical advisor to British and European Standards setters on wood preservation, modified wood and the fire protection of wood. On the Regulations governing wood protection, the WPA enjoys lead body status with agencies like the Health & Safety Executive, Environment Agency, Scottish Environmental Protection Agency, the Department for Environment, Food & Rural Affairs and the Highways Agency.

The roots of the WPA go back to the 1930's with the formation of the British Wood Preserving Association which became the British Wood Preserving & Damp-proofing Association in 1989 and subsequently the WPA in 2006.

As designers look increasingly to wood as a low carbon construction material the WPA is committed to providing guidance on the best ways to ensure wood is fit for the purpose intended.

Wood Protection Association

Clicking on highlighted text will take you to the appropriate place in the document or to a linked web site page if it begins with the prefix www.

ARCHITECTS HELPLINE
If you need help with a wood preservation specification then e-mail the WPA info@wood-protection.org

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How to use this manual

This manual provides detailed guidance on industrial wood preservation for specifiers, timber treaters and those involved in using treated wood.

Underlined links in this manual are designed to speed navigation and simplify access to the key information relevant to their particular interests.

Specifiers

The manual provides a user-friendly system of specifications on the type and level of treatment most appropriate for the desired life of timber commodities in UK service conditions. The WPA Commodity ('C code') Specification system covers many of the common uses for timber species whose natural durability is insufficient to deliver an adequate service life. Model specifications are presented that provide a simple and reliable way of specifying treatment without the need for detailed knowledge of the underlying principles.

Full details are also available to enable specifiers who prefer to either include a detailed specification or simply wish to be assured that the model specifications are sufficient to cover all aspects of wood choice, preparation for treatment, treatment itself and post-treatment handling.

The manual also provides guidance on the allocation of timber components to Use Classes and Service Factors applying to end-use situations which also help to guide the decision on whether treatment is required or not.

Information is also provided on quality assurance procedures that underpin confidence in the performance of treated material.

Treatment plant managers and operators

The manual includes detailed information on preparing timber for treatment and the treatment to be achieved to conform to specifications received. While in many cases preservative suppliers will assist treatment companies with guidance on processes to achieve combinations of penetration and retention of preservative products, plant operators can also use the tables and techniques described to assess the conformity of their procedures with the requirements of preservative treatment specifications. Sections are also included on handling and storing treated timber, quality assurance and analytical procedures.

Users of treated timber

The manual provides information on characteristics of treated timber and guidance on the use, safety and disposal of treated timber. The relevant sections should be consulted by users to ensure that the full benefits of additional durability conferred by treatment can be obtained while conforming to safety, health and environmental protection rules.

Treated wood in action

Highways fencing
National Highways Sector Scheme for pre-treated fencing (Sector Scheme 4) requires that motorways and trunk road fencing is treated to a 30 year service life specification.
BSEN335:1 Use Class 4 (for posts),
Use Class 3.2 (for rails).
Treatment in accordance with BS 8417.
Desired service life: 30 years.

Photo courtesy: Calders & Grandidge

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Quick click to Commodity Specifications

Introduction

The WPA Commodity ('C') Specifications provide a simple route to accurate specification based on the latest British Standard BS 8417:2011. Treatment is tailored to the risk faced by timber in five Use Classes: 1: Interior dry; 2: Interior – risk of wetting; 3: Exposed to weather, above ground; 4: In ground or water contact; 5: In sea water. The Commodity Specifications allocate timber commodities to appropriate Use Classes and identify suitable preservative treatments.

Simple specifications based on the Commodity Specifications mean that no further detail is needed to ensure that a specification is comprehensive and calls up all the relevant detail on suitable timber species, preservatives and quality assurance.

Example model specifications are given on page 18.

The Commodity Specifications

Preservative treatment of:

C1 Timber to be used in cooling towers

C2 Timber for use permanently or intermittently in contact with sea or fresh water

C3 Fencing timber

C4 Agricultural and horticultural timbers

C5 Non load-bearing external softwood joinery and external fittings (excluding cladding not in ground contact

C6 External timber cladding

C7 Timber for use in buildings in termite infested areas

C8 Constructional timbers (excluding walls of timber framed houses)

C9 Timber framed housing

C10 Hardwood external joinery

C11 Wood-based board and engineered wood products

C12 Decking timber

For Model Specification clauses go to page 18

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1. Objectives and Practice of Industrial Wood Preservation

The fundamental objective of the pre-treatment of wood with preservatives is to ensure that, even when the wood is inherently vulnerable to biological deterioration, it remains sound throughout the design life of the structure of which it forms a part. Achieving this objective enables designers and specifiers to make maximum use of wood - the most environmentally acceptable construction material available. It is important to understand, however, that preservation is not a substitute for good design and appropriate maintenance programmes over the life of a structure, rather it is one component of a holistic approach to design, construction and maintenance.

It is also an objective of pre-treatment to achieve the desired improvement in wood durability with the minimum of environmental impact. It is a major advantage of pre-treatment (which may often be precautionary in nature) that it is carried out in controlled impregnation or application equipment which:

a) *gives minimum potential for exposure of either workers or the environment, to wood preservative chemicals, and*

b) *can impart greater durability than is possible with uncontrolled superficial processes, such as brushing and spraying.*

2. Wood preservatives

2.1 Regulation of preservatives

The sale and use of wood preservatives are governed in the UK by the Control of Pesticides Regulations 1986 (as amended). Approval under the regulations must be obtained before a wood preservative can be placed on the market and approval is given under one or more use categories – Amateur (DIY); Professional (typically used in remedial treatment); and Industrial (typically used in industrial wood preservation plants). It is the latter that are the subject of the specifications in this manual.

Under new regulations (The Biocidal Products Regulations 2001 and The Biocidal Products Regulations (Northern Ireland) 2001 as amended) made to comply with the Biocidal Products Directive, the UK approval system will be phased out beginning in 2009 in favour of a pan-European system. A consequence of the application of these regulations is that approval for the supply and use of CCA preservatives in the European Union was withdrawn from 1 September 2006 though second hand CCA-treated timber may still be sold and used in accordance with the REACH Regulations and guidance on this is available from the WPA.

The use of creosote and timber treated with it are further restricted under the REACH Regulation and these restrictions are highlighted in the relevant sections of this manual. It should be noted, however, that the main provisions of REACH do not apply to creosote or any other preservative active ingredients as such substances are already controlled under other legislation. In this case REACH is a convenient locus for restrictions on specific substances that had been included in previous directives now repealed.

Although these approval schemes incorporate a requirement to demonstrate efficacy, it is at a basic level and approval under the regulations cannot be taken as an indication that performance of treated wood will meet any particular standard. Preservatives listed in this manual and included in its specifications, however, comply with British or European Standard specifications as well as being approved under the regulations.

While certain characteristics of individual products may lead a purchaser or specifier to prefer one preservative over another, all preservatives must be considered safe for both people and the environment when used in accordance with conditions of approval and other regulations which apply to their use.

Treated wood in action

Roofing timbers
BSEN335:1 Use Class: 1 (dry) or
Use Class 2 (where there is a risk of wetting or condensation)
WPA commodity code specification: C8

Photo courtesy: Lonza Wood Protection

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2.2 Types of wood preservatives

A European performance standard for wood preservatives, EN 599, was published in 1996 and as a British Standard in 1997 (BS EN 599-1:1997 Durability of wood and wood-based products. Performance of preservatives as determined by biological tests. Specification according to Use Class). This standard defines the biological tests and the results needed to show preservative effectiveness. Effectiveness is expressed as the Critical Value – the amount of preservative required to protect wood in biological tests carried out in accordance with BS EN 599: Part 1 for any given Use Class. The retention of preservative required in practice for Use Class and service life combinations may be either the Critical Value (CV) or a higher figure calculated by applying a factor to the CV. Where a factor is applied it is shown in Table 10.

The EN 599 system allows suppliers to place products on the European market based on their own claims of performance. Prior to the appearance of BS EN 599 it had been UK practice to publish British Standard product specifications for preservative types. The only current example referenced in this edition of the WPA manual is BS EN 13991 Derivatives from coal pyrolysis. Coal tar based oils. Creosotes. Specifications and test methods.

Where a British Standard was not published but a preservative type was being used, for example in the case of boron compounds, the WPA published a specification (updated in this manual). For any particular preservative type, a supplier may either declare compliance with BS EN 599 or declare compliance with one of the published product specifications.

A description of each wood preservative type follows. Tables 1 to 5 of this manual contain the Wood Protection Association list of those wood preservatives which can be used to comply with the specifications given in this manual.

Copper-organic

Generally suitable for Use Classes 1- 4. Applied by high-pressure processes.

Suitable for situations where timber is exposed to a high risk of biological attack, e.g. fencing, path edge boards, timber embedded in masonry. Treated timber has no smell and does not discolour or taint adjacent materials. These preservatives are cost effective for the degree of protection afforded. Treatment imparts a greenish colour to the timber making it easy to identify. A dye can be added to impart a brown colour. Treatment will cause timber to swell, raise the grain and may cause some distortion.

For inclusion in Table 1, these products shall have been tested in accordance with BS EN 599-1.

Water-based organic

Suitable for Use Class 3 (uncoated and coated), ideally for external landscape and cladding timbers. Can also be used in use classes 1 and 2. Applied by high-pressure processes.

Treatments are clear and do not colour the timber. A colorant can be added. Treatment will cause timber to swell, raise the grain and may cause some distortion.

For inclusion in Table 2, these products shall have been tested in accordance with BS EN 599-1.

Microemulsions (water-based)

Generally restricted to Use Classes 1, 2 and 3 (coated). Ideally suited for internal construction timbers. Applied by low-pressure (double vacuum) processes.

Although water based, the treatment has little effect on dimensions of timber but may raise the grain. Can be used on joinery items where surface appearance is not of prime importance.

Note: Where suitability of a microemulsion preservative is claimed for use class 3 uncoated, a high-pressure process will normally be used in which case treatment will cause the timber to swell, will raise the grain and may cause some distortion.

Treated wood in action

Deck boards
BSEN335:1 use class: 3 (external out of ground contact applications)
WPA commodity code specification: C12

Photo courtesy: John Brash & Co

For inclusion in Table 3, these products shall have been tested in accordance with BS EN 599-1.

Organic solvent

These are also commonly known as light organic solvent based products (LOSP).

Generally restricted to Use Classes 1, 2 and 3 (coated). Applied by low-pressure processes.

Their main advantage is they do not change the dimensions of timber or raise its grain; they do not change the colour of the timber (unless tinted for the purposes of identification), making them particularly suitable for joinery components.

For inclusion in Table 4 these products shall have been tested in accordance with BS EN 599-1.

Boron compounds

Generally restricted to Use Classes 1, 2 and 3 (coated). Applied by high-pressure processes to seasoned timber or by diffusion processes to timber before seasoning.

For inclusion in Table 5, these products shall comply with the requirements of Appendix 1 of this Manual. Specification is in accordance with the requirements of Table 11. The penetration and retention requirements are based on experience in the UK.

Such treatments do not change the colour of the timber. Treatment may raise the grain and, if applied using vacuum-high pressure process, cause the timber to swell and cause some distortion.

Creosote

For inclusion in Table 6 on page 11, creosote products shall comply with the requirements of BS EN 13991.

Creosote is suitable for timbers to be used externally, above and below ground and in water contact (Use Classes 3 (uncoated), 4 and 5). Applied by high-pressure processes.

Treatment with creosote reduces moisture movement in timber but can be difficult to paint over. It can stain absorbent materials with which it comes into contact.

Creosote has a strong smell and can taint foodstuffs. It can affect plants within the first few months of application. Freshly treated timber is more flammable during the first few months.

Regulation (EC) No 1907/2006 of The European Parliament and of the Council restricts the marketing and use of creosote and creosote treated timber. Before specifying creosote treatment consult the regulations and the Wood Protection Association Guidance Note available on www.wood-protection.org for details of where creosoted timber may be used.

Note that these regulations do not apply to creosote treated timber already in place in any end use situation.

Treated wood in action

External timber cladding
BSEN335:1 Use class: 3.2 (natural/un-coated)
WPA commodity code specification: C6

Photo courtesy: Edward Cullinan Architectss

2.3 Preservatives supplied by Wood Protection Association members

These named wood preservatives can be used to comply with the specifications given in this manual.

Table 1 Copper-organic preservatives (tested in accordance with BSEN599-1)

SUPPLIER	PRODUCT NAME	USE CLASSES 1	2	3c1	3uc1	4	5	ADDITIONAL INFORMATION[1]	HSE NUMBER
Lonza Wood Protection Wheldon Road Castleford West Yorkshire WF10 2JT Tel: 01977 714000 Email : timberprotectionadvice.ukca@lonza.com Website: www.archtp.com	**Tanalith E 3462**	✓	✓	✓	✓	✓	✗	P N T H 3F 4F	8891
	Tanalith E 3492	✓	✓	✓	✓	✓	✗	P N T H 3F 4F	6269
	Tanalith E 3494	✓	✓	✓	✓	✓	✗	P N T H 3F 4F	6434
Dr Wolman UK Office BASF PLC-Wolman Division P O Box 4, Earl Road Cheadle, Cheadle Hulme Cheshire SK8 6QG Tel: 0161 488 5329 Fax: 0161 488 5220 Email: Irene.jones@basf.com Website: www.wolman.de/en	**WOLMANIT CX-10**	✓	✓	✓	✓	✓	✗	P N T H 3F 4F	7943
	WOLMANIT CX-8	✓	✓	✓	✓	✓	✗	P N T H 3F 4F	7944
	WOLMANIT CX-8 WB	✓	✓	✓	✓	✓	✗	P N T H 3F 4F	8911
Osmose Fieldhouse Lane Marlow Bucks SL7 1LS Tel: 01628 486644 Fax: 01628 476757 Email: info@osmose.co.uk Website: www.protimsolignum.com	**Celcure AC 500**	✓	✓	✓	✓	✓	✗	P N 4F	7404
Viance Ltd Moorfield Road Widnes Cheshire WA8 3AA United Kingdom Tel: 0151 495 2222 Fax: 0151 424 8532 Email: SalesEU@viance.net Web: www.treatedwood.com	**Permawood ACQ 1900**	✓	✓	✓	✓	✓	✗	P N T 3F 4F	6487
	Permawood ACQ 2100	✓	✓	✓	✓	✓	✗	P N T 3F 4F	6490

Notes to Table 1

1. F*or descriptions of* Additional Information Codes *see notes on page 11.*

Table 2 Water-based organic preservatives (tested in accordance with BSEN599-1)

SUPPLIER	PRODUCT NAME	USE CLASSES 1	2	3c1	3uc1	4	5	ADDITIONAL INFORMATION[1]	HSE NUMBER
Lonza Wood Protection Wheldon Road Castleford West Yorkshire WF10 2JT Tel: 01977 714000 Email : timberprotectionadvice.ukca@lonza.com Website: www.archtp.com	**Tanalith M 6305**	✓	✓	✓	✓	✗	✗	P N T 3F	9063

Table 3 Microemulsion preservatives (tested in accordance with EN599-1)

SUPPLIER	PRODUCT NAME	USE CLASSES 1	2	3c1	3uc1	4	5	ADDITIONAL INFORMATION[1]	HSE NUMBER
Lonza Wood Protection Wheldon Road Castleford West Yorkshire WF10 2JT Tel: 01977 714000 Email : timberprotectionadvice.ukca@lonza.com Website: www.archtp.com	**Vacsol Aqua 6108**	✓	✓	✓	✗	✗	✗	P N T H	6083/6994(RTU)
	Vacsol Aqua 6111	✓	✓	✓	✗	✗	✗	P N H	7484
	Vacsol Aqua 6112	✓	✓	✓	✗	✗	✗	P N H	8179/8180(RTU)
	Vacsol Aqua 6151	✓	✓	✓	✗	✗	✗	P N H	7358
	Vacsol Aqualine 6152	✓	✓	✓	✗	✗	✗	P N H	9089
Dr Wolman UK Office BASF PLC-Wolman Division P O Box 4, Earl Road Cheadle, Cheadle Hulme Cheshire SK8 6QG Tel: 0161 488 5329 Fax: 0161 488 5220 Email: Irene.jones@basf.com Website: www.wolman.de/en	**Wolsit KD20**	✓	✓	✓	✓	✗	✗	S P N T H 3F	6307
	Wolsit KD20C	✓	✓	✓	✓	✗	✗	S P N T H 3F	6966
Osmose Fieldhouse Lane Marlow Bucks SL7 1LS Tel: 01628 486644 Fax: 01628 476757 Email: info@osmose.co.uk Website: www.protimsolignum.com	**Protim E406**	✓	✓	✓	✗	✗	✗	P N	8367
	Protim E415	✓	✓	✓	✗	✗	✗	P N	5908
	Protim E418	✓	✓	✓	✗	✗	✗	P 3F	8280
	Protim B610	✓	✓	✓	✗	✗	✗	P	6366

Notes to Table 2 and 3

1. F*or descriptions of* Additional Information Codes *see notes on page 11.*

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Table 4 Organic solvent preservatives (tested in accordance with EN599-1)

SUPPLIER	PRODUCT NAME	USE CLASSES 1	2	3c1	3uc1	4	5	ADDITIONAL INFORMATION[1]	HSE NUMBER
Lonza Wood Protection Wheldon Road Castleford West Yorkshire WF10 2JT Tel: 01977 714000 Email : timberprotectionadvice.ukca@lonza.com Website: www.archtp.com	**Vacsol Azure 2627**	✓	✓	✓	✗	✗	✗	P N T H	5558
	Vacsol Azure 2723	✓	✓	✓	✗	✗	✗	P N T H	8140
Osmose Fieldhouse Lane Marlow Bucks SL7 1LS Tel: 01628 486644 Fax: 01628 476757 Email: info@osmose.co.uk Website: www.protimsolignum.com	**Protim 418**	✓	✓	✓	✗	✗	✗	P N2 H 3F	6466

Table 5 Water soluble boron preservatives (Complying with Appendix 1)

SUPPLIER	PRODUCT NAME	USE CLASSES 1	2	3c1	3uc1	4	5	ADDITIONAL INFORMATION[1]	HSE NUMBER
Rio Tinto Plc Rio Tinto Minerals 8051 E Maplewood Ave Greenwood Village, CO 80111 USA Tel: +1 303 713-5228 Email: mark.manning@riotinto.com Web: www.borax.com/wood	**Tim-bor**	✓	✓	✓	✗	✗	✗	S P N T H G D 3F	6270
Dr Wolman UK Office BASF PLC-Wolman Division P O Box 4, Earl Road Cheadle, Cheadle Hulme Cheshire SK8 6QG Tel: 0161 488 5329 Fax: 0161 488 5220 Email: Irene.jones@basf.com Website: www.wolman.de/en	**Diffusit S**	✓	✓	✓	✗	✗	✗	S P N T H G D 3F	5992

Notes to Table 4 and 5

1. F*or descriptions of* Additional Information Codes *see notes on page 11.*

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Table 6 Creosote preservatives (Complying with BS EN 13991)

SUPPLIER	PRODUCT NAME	USE CLASSES 1	2	3c1	3uc1	4	5	ADDITIONAL INFORMATION	HSE NUMBER
Koppers Netherlands PO Box 9 1420 AA Uithoorn The Netherlands Tel: +31 0297 545533 Email: info@cindu.nl Website: www.cindu.nl	**Cindu Creosote**	✓	✓	✗	✓	✓	✓		6001
Koppers UK Ltd Port Clarence Works, Huntsmans Drive, Port Clarence, Middlesbrough. TS2 1SD Tel: 01642 544023 Fax: 01642 546241 Email: CurrieGD@koppers.eu Website: www.koppers.com/htm/PandS_CMaC_Dist.html	**Koppers UK Creosote**	✓	✓	✗	✓	✓	✓		5882

Additional Information Codes

Most preservatives formulated for industrial pre-treatment of timber are designed to be used in processes (called penetrating processes in EN 599) which have features designed to overcome the natural resistance of wood to penetration by preservatives. In some cases, however, preservatives are suitable only for application by superficial processes or by both penetrating and superficial application. The following codes identify which processes are suitable for each product.

S = suitable for superficial application processes e.g. spraying, brushing

P = suitable for penetrating processes e.g. double vacuum, vacuum/pressure

All preservatives suitable for UC 2, 3, 4 and 5 are effective against wood-rotting fungi. Effectiveness against wood-boring beetles and/or termites and/or bluestain fungi is shown by the following codes:

N =effective against wood-boring beetles

T = effective against termites

B = protects against disfiguring bluestain fungi in service

Not all preservatives are suitable for protection of external hardwood joinery. Those which have been shown to be effective have the following Additional Information code :

H = suitable for the treatment of hardwood joinery

Boron based preservatives can be used for the treatment of green, unseasoned timbers or dry timbers. Suitability is shown by the following codes:

G = Suitable for the treatment of green, unseasoned timbers

D = Suitable for the treatment of dry timbers

Most of the test methods in EN 599-1 are laboratory tests. However two methods are available to assess performance in close to in-service conditions. Those preservatives which have been so tested have the following codes:

3F = protective efficacy for external joinery tested in a simulated in-service exposure test

4F = protective efficacy for wood in ground contact tested in a field trial of at least 5 years duration

Notes to tables 1 to 6:

1. 3c = wood in use class 3 protected from the weather in service typically by a coating
   3uc = wood in use class 3 not protected from the weather in service.
2. Effectiveness of Protim 418 against wood-boring beetles is based upon compliance with BS5707. The manufacturer warrants that treatment in accordance with Table 11 confers protection against wood-boring beetles (and in Use Classes 2 and 3 (coated), decay fungi)

3. Preservative treatment

3.1 The need for treatment

To determine whether a wooden component needs preservative treatment, three main considerations must be taken into account; the biological hazard, the risk and consequence of failure, and the inherent natural durability of timber.

3.1.1 Use Classes

The different service situations in which wood can be used have been categorised into a series of Use Classes. Five such classes, which describe the different service situations on the basis of the biological hazard likely at the in-service moisture conditions which may prevail, are defined in BS EN 335-1.

The allocation of a component to a particular Use Class assumes good design and maintenance of the construction. It should be recognised that if conditions arise during the service life of the component which result in unexpected wetting of the timber, for example as a result of design faults, condensation, failure of other materials, poor workmanship or lack of maintenance, the Use Class assigned to the component can change and therefore the recommendations for preservation can change.

Table 7 summarises the Use Class system. Examples of typical service situations are given.

Column 5 of Table 7 allocates a representative range of components to the Use Class which they usually occupy in the UK. If a component being considered is not listed, the specifier should either allocate it to the appropriate Use Class based on the examples given, or contact the Wood Protection Association for advice: info@wood-protection.org or via the website enquiry service at www.wood-protection.org

Treated wood in action

External timber joinery
BSEN335:1 use class: 3.2 (uncoated)
WPA commodity code specification: C5

Photo courtesy: Wood Window Alliance

Table 7. Use Class and typical service situations

USE CLASS	SERVICE SITUATION	PRINCIPAL BIOLOGICAL AGENCY	TYPICAL SERVICE SITUATION	EXAMPLES
1[1]	Above ground, covered. Permanently dry	Insects	Internal, with no risk of wetting.	All timbers in normal pitched roofs except tiling battens and valley gutter members. Floor boards, architraves, internal joinery, skirtings. All timbers in upper floors not built into solid external walls[1].
2	Above ground, covered (i.e. by a roof or other building component). Occasional risk of wetting	Fungi / Insects	Internal, with risk of wetting.	Tiling battens, frame timbers in timber frame houses [2], timber in pitched roofs with high condensation risk, timbers in flat roofs, ground floor joists [2], sole plates (above dpc), timber joists in upper floors built into external walls [2].
3	Coated Above ground, protected, e.g. by a coating. Exposed to frequent wetting. If wood becomes wet, drying out may be delayed by a coating.	Fungi[4]	External, above damp proof course (dpc) coated[3].	External joinery including roof soffits and fascias, bargeboards, etc., cladding, valley gutter timbers [2], external structural load bearing timbers
	Uncoated Above ground, not protected. Exposed to frequent wetting.	Fungi[4]	External, above damp proof course (dpc) uncoated [3]	Fence rails, gates, fence boards, agricultural timbers not in soil / manure contact and garden decking timbers that are not in contact with the ground.
4[5]	In contact with ground or fresh water. Permanently exposed to wetting.	Fungi[4]	Timbers in permanent contact with the ground or below dpc. Timbers in permanent contact with fresh water. Cooling tower packing. Timbers exposed to the particularly hazardous environment of cooling towers.	Fence posts, gravel boards, agricultural timbers in soil / manure, Earth-retaining walls, poles, sleepers[6], playground equipment, motorway & highway fencing and garden decking timbers that are in contact with the ground. Lock gates and revetments. Cooling tower packing (fresh water).
5	Permanently exposed to wetting by salt water.	Marine borers, Fungi	All components in permanent contact with sea water.	Marine piling, piers and jetties, dock gates, sea defences, ships hulls, and cooling tower packing (sea water).

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Notes to Table 7

1. UK Building Regulations require preservative treatment of softwood roof timbers in the Hylotrupes area. UK government climate change criteria indicate an increased risk of insect attack in use class 1 in all parts of the UK.
2. These timbers are assigned to a "higher" Use Class than suggested by their location in the structure, owing to the potential consequences of failure based on experience within the UK.
3. Some preservatives are only recommended for use in Use Class 3 when protected by a coating, guidance is provided at appropriate points in this manual. If in doubt consult the preservative manufacturer.
4. BS EN 335-2 includes insects as a risk factor in Use Classes 3 and 4 but this is not, under present conditions, recognised as a significant risk for timbers in these situations in the UK.
5: BS EN 335-2 has two sub-classes in Use Class 4 but the difference in biological hazard is not recognised as sufficiently different for timbers in these situations in the UK and recommended preservative treatments in BS 8417 and this manual are based on a single Use Class for timber in ground or water contact.
6. Sleepers laid on well-drained ballast maintained in service are considered to be Use Class 3 but durability appropriate to Use Class 4 is indicated to meet service life requirements and the safety-critical use. Sleepers in direct ground contact are Use Class 4.

3.1.2 Risk and consequence of failure

Although different components may fall into the same Use Class as given in Table 7, the risk of failure or consequence of failure may be quite different. However, these considerations may be very important when deciding whether a component should be treated.

Table 8 contains four service factors that have been used in this manual to describe variations in risk and consequence of failure.

Table 8. Service factors

SERVICE FACTOR CODE	DESCRIPTION OF RISK AND CONSEQUENCES OF FAILURE	NEED FOR PRESERVATION[1]
A	Negligible risk of failure	Unnecessary
B	Where risk of failure is low and preservation can be regarded as an insurance against cost of repairs, and/or where replacement of timber or remedial action is not difficult or expensive.	Optional
C	Where risk of failure is high and/or where replacement of timber or remedial action is difficult and expensive.	Desirable
D	Where risk of failure is very high and/or where failure of timber components would result in serious danger to structure or persons	Essential

Notes to Table 8

1. An alternative to preservation is the selection of timber of suitable natural durability

3.1.3 Natural durability of timber.

The natural durability of heartwood varies among different timber species. For some end uses, the natural durability of the heartwood of a particular timber species may provide sufficient durability to be used without further preservation. BS EN 350-2 defines the durability class of commonly available timber species and BS EN 460 gives guidance as to whether natural durability alone is appropriate for the specified Use Class.

Where naturally durable components are to be used, their natural durability should not be less than that given in Table 9. The natural durability ratings in table 9 are relevant to durability to decay fungi. Where natural durability against insect and marine borer attack is required, a suitable wood species should be chosen in accordance with BS EN 350-2, using the additional classifications for durability against these organisms.

The durability of sapwood is minimal whatever the species. Where sapwood is present, the loss of which would render the component unfit for its intended use, preservative treatment should be applied whatever the associated natural durability of the heartwood. Softwoods contain a high percentage of sapwood, which may be difficult to distinguish

Treated wood in action

Marine applications
Piling, sea defence, pier and quay timbers in direct salt water contact.
BSEN335:1 Use class:5
WPA commodity code specification: C2

Photo courtesy: Lonza Wood Protection

© Wood Protection Association

from the heartwood and it is usually impractical and uneconomical to forbid its inclusion. The practical result is that softwoods for general purposes must be regarded as non-durable when considering the need for preservative treatment if conditions favour fungal attack.

Timbers of high natural durability frequently derive from sources prone to be environmentally vulnerable or fragile. The full implications of specifying particular species of timber should be considered when choosing between the use of naturally durable timber and a less durable timber with preservative treatment.

Table 9 - Natural durability recommendations for timber components

COMPONENT	USE CLASS	DURABILITY CLASS OF WOOD WHOSE HEARTWOOD CAN BE USED WITHOUT TREATMENT[1]		
		DESIRED SERVICE LIFE (Years)		
		15	30	60
Internal joinery [1A]	1	5	5	5
Roof timbers dry[1A]	1	5	5	5
Roof timbers dry (Hylotrupes area)	1	3[2]	3[2]	3[2]
Roof timbers (risk of wetting)	2	4	3	2
External walls/ground floor joists	2	4	3	2
Sole plates above damp-proof course (DPC)	2	3	2	2
External joinery (non load bearing)	3	4	3	2
Fence rails, deck boards and joists, cladding and battens for cladding	3	3	2	1
Fence and deck posts, earth retaining walls, raised beds and bridge timbers	4	2[3]	1	1[4]
Poles	4	2[3]	1	1[4]
Sleepers	4[7]	2[3]	1	1[4]
Timber in fresh water	4	2	1	1
Timber in salt water	5	1[5]	No recommendation[6]	No recommendation[6]
Cooling tower packing (fresh water)	4	2	1	No recommendation
Cooling tower packing (salt water)	5	1	No recommendation	No recommendation

Notes to Table 9

1 Natural durability categories for timbers listed in BS EN 350-2 (numbers = Fungal decay rating, letters = additional rating (named organisims)).

1A UK government climate change criteria are expected to indicate an increased risk of insect attack in use class 1 in all parts of the UK.

2 Any hardwood can be used. Recommendations based on evidence that the house longhorn beetle (Hylotrupes bajulus L) can attack the heartwood of some softwoods of lower natural durability.

3 Some timbers of natural durability class 3 can achieve 15 years' service.

4 Selected timbers of natural durability class 1 can be expected to achieve 60 years' service life.

5 Species of hardwoods, the heartwood of which is preferred for use untreated in sea water: afrormosia, andaman padauk, basralocus, ekki, greenheart, iroko, jarrah, kapur, okan, opepe.

6 In general, species of natural durability class 1 cannot be relied upon to give more than 15 years' service. However, certain species can give longer service, particularly if adequately sized cross-sections are used.

7 Sleepers laid on well-drained ballast maintained in service are considered to be Use Class 3 but durability appropriate to Use Class 4 is indicated to meet service life requirements and the safety-critical use. Sleepers in direct ground contact are Use Class 4.

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3.2 Specifying treatment

3.2.1 UK regulations, harmonised standards and warranty schemes

Historically the decision whether or not to specify preservative treatment of particular wood or wood-based components was largely a matter for the individual specifier unless a structure came under statutory or voluntary 'regulation'. Examples of the latter are:

a) *Building Regulations which lay down statutory treatment requirements for a limited range of timber roof components in the small area around north west Surrey subject to a high risk of infestation by Hylotrupes bajulus (house longhorn beetle) (see Approved Document A - Structure)*

b) *Insurance backed warranty schemes for new homes such as those operated by NHBC and Zurich where considerations of building durability and performance are laid down in specification manuals for both insurance purposes and owner confidence*

c) *Grant schemes where the granting of some types of financial support to farmers has been conditional on a certain minimum life expectancy being designed into agricultural buildings.*

However, the introduction of the Construction Products Directive 89/106/EEC (CPD) and its progressive implementation under for example Building Regulations 2000 (England and Wales) and The Building (Scotland) Regulations 2004 create a different framework of standards and regulations. The six "Essential Requirements" of the CPD include a requirement that building products covered in the scope of the CPD exhibit adequate "Mechanical Stability and Strength" throughout their design-life. Harmonised European Product Standards exist for certain wood and wood-based products and these may include durability and preservation requirements. Where such standards exist they must be adhered to for products governed by the CPD.

Thus, there is a clear legal onus on the designer of any structure encompassed by the CPD to take such measures as are necessary to ensure the materials specified are of sufficient strength and durability to fulfil these requirements, It is from this that the need to apply appropriate preservative material to wood arises. Thus, whilst the designer / specifier continues to have considerable freedom in the choice and use of preservatives, his duty to safeguard the mechanical stability and strength of the structure is now more explicit than formerly.

3.2.2 Basis of specifications

BS EN 351-1 Durability of wood and wood-based products sets out a framework for specifying preservative treatment based on a combination of penetration and retention of preservative. This is known as a results specification. Quality assurance involves demonstrating by analysis that the required combination of penetration and retention has been achieved in each batch. If this had to be carried out on each batch the cost would normally be considered to be prohibitive (though not invariably, for example in the case of small batches of high value and performance-critical commodities such as poles). This is avoided in most cases by taking advantage of the allowance in the standard for the treatment of batches of similar size, species and end-use to be evaluated to show that the application of a preservative by a particular process can be safely relied upon to achieve the desired result. This so-called 'safe relationship' should be reconfirmed from time to time.

BS EN 351 makes provision for two forms of factory production control known as direct and indirect testing. Direct testing is the measurement of penetration and retention in samples taken from a batch of treated wood. Indirect testing involves first demonstrating a consistent relationship, known as a safe relationship, between the penetration and retention requirements and more easily measurable features of the treatment process. This is explained in more detail in the Factory Production Control and labelling section

British Standard 8417 Preservation of timber – Recommendations provides guidance on appropriate combinations of penetration and retention for most industrial wood preservatives in use in the UK. These recommendations are subject to review and revision from time to time and this manual may include improvements that may be adopted by BSI in subsequent revision(s) of BS 8417.

Treated wood in action

Domestic fencing
BSEN335:1 Use class: 4 (for posts), 3.2 (for rails)
WPA commodity code specification: C3

Photo courtesy: Lonza Wood Protection

WPA Benchmark Treated Wood Quality Scheme

Benchmark is a quality assurance scheme operated by the WPA that provides third party verification of the safe established relationship for the treatment of a specific commodity to ensure it is compliant with BS8417 and fit for purpose.

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3.2.3 Desired Service Life

The level of preservative treatment recommended depends not only on the risk of attack but also on the expected life of the timber component in service. In Tables 11, and 12 preservative recommendations are given where appropriate for desired service lives of 15, 30 and 60 years. Where a treatment is not recommended for a particular end use/service life combination, it is because a generic recommendation is not currently possible. Similar desired service lives using naturally durable timbers are in Table 8.

It is essential to realize that the prediction of service life is not precise; these desired service lives are not guarantees of performance but indications of the expectation against which the recommendations for timber treatment are drawn up, assuming good design and normal conditions of use. As they relate solely to the resistance of the timber to biodeterioration, it is essential to bear in mind that other factors, such as mechanical damage or failure of other elements of the construction, could limit the life of the complete commodity. The service lives in Tables 10, 11 and 12 have in some cases not been established by direct service evidence and therefore could be subject to revision as more experience is gained.

3.2.4 Results-based specification

Tables 10 to 12 allocate component groups to Use Classes and specify penetration and retention values for treatment of permeable and resistant species with the preservatives listed in Tables 1 to 5 for 15, 30 or 60 year service lives. Compliance is achieved by meeting these penetration and retention requirements to an acceptable quality level which involves a combination of process control parameters specific to each timber treatment installation with confirmatory chemical analysis on a mutually agreed basis. See section 4.5 for further details on Factory Production Control.

When specifying treatment using results-based specification, the following information should be given:

Component type *(plus Use Class if required)*
Species or timber type *(permeable or resistant)*[1] if required
Desired service life *(15, 30 or 60 years where available - see tables 11 to 16)*
Preservative type *(if a specific type is required)*[2]

Notes

1 It should be noted that the treatability of timber varies between species. If a specific wood species is to be specified, care should be taken to ensure that a species is chosen appropriate to the treatment requirements.

2. It should be noted that not all preservatives are appropriate for all Use Classes

Example model specification phrases for Results-based Specifications

"Fencing timber† [*add timber species or type if desired*] (*Use Class* [*insert Use Class(es)*]) treated with a [*add preservative type if desired**] preservative in accordance with the current WPA Manual for which a desired service life of 15 [*or alternative from Tables 11 to 16*] years is required"

"Structural timber† [*add timber species or type if desired*] (Use Class [*insert Use Class(es)*]) treated with a [*add preservative type if desired**] preservative in accordance with the current WPA Manual for which a desired service life of 60 [*or alternative from Tables 11 to 16*] years is required"

If specifying particular preservative types or timber species, it is important to note that not all preservatives are appropriate for all Use Classes and that some timber species are not sufficiently permeable to achieve the penetration levels required, at least without additional preparation such as mechanical incising.

Treated wood in action

Constructional timbers
Roof timbers and battens, floor beams and joists internal and external wall studding (excluding walls for timber frame structural timbers)
BSEN335:1 Use class: 1(dry interiors) or use class 2 (where there is a risk of wetting or condensation)
WPA commodity code specification: C8

Photo courtesy: Osmose

* *A specifier may decide to leave the choice of preservative to the treater or choose one himself. If the latter, a generic preservative type may be chosen e.g. copper-organic, boron, organic solvent or microemulsion.*

† *As much detail as possible of the end use should be given; for example "Structural timber (sole plates)"*

3.2.5 Commodity Specifications

The specification of preservative treatment using the penetration and retention (results) system can be difficult without detailed knowledge of the suitability of wood species and preservative types for timber to be used in a particular Use Class together with other details of treatment. Recognising this, the Wood Protection Association has for many years published its 'C' (Commodity) Specifications that provide a simple route to accurate specification.

For each Commodity Specification the manual indicates wood species that can be treated, suitable types of treatment and the typical service life. It is essential to realize that the prediction of service life is not precise; these desired service lives are not guarantees of performance but indications of the expectation against which the recommendations for timber treatment are drawn up, assuming good design and normal conditions of use. As they relate solely to the resistance of the timber to biodeterioration, it is essential to bear in mind that other factors, such as mechanical damage or failure of other elements of the construction, could limit the life of the complete commodity.

On receipt of a specification calling up a WPA Commodity Specification and depending on the degree of selection exercised by the specifier beyond the basics (see model specifications below) for example timber type or species and preservative type, the treater identifies the appropriate combination of species, preservative (following the preservative supplier's guidance on suitability for the relevant end use) and its penetration and retention and carries out the treatment following guidance provided by the preservative supplier or based on his own experience and analysis.

Preservative treatment of:

C1	**Timber to be used in cooling towers.**
C2	**Timber for use permanently or intermittently in contact with sea or fresh water.**
C3	**Fencing timber**
C4	**Agricultural and horticultural timbers.**
C5	**Non load-bearing external softwood joinery and external fittings (excluding cladding) not in ground contact.**
C6	**External timber cladding.**
C7	**Timber for use in buildings in termite infested areas.**
C8	**Constructional timbers (excluding walls of timber framed houses).**
C9	**Timber framed housing.**
C10	**Hardwood external joinery.**
C11	**Wood-based board and engineered wood products**
C12	**Decking timber**

Treated wood in action

Timber Frame
Load bearing timber for external wall frames and sole plates above dpc level.
BSEN335:1 Use class 2
WPA commodity code specification: C9

Photo courtesy: Lonza Wood Protection

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When specifying treatment using a WPA commodity specification, the following information should be given:

Component type *(plus Use Class if required)*
The commodity specification number *(C number)*

The following additional information may also be given:

Species or timber type *(permeable or resistant)* if a specific timber species or type is required
Desired service life *(15, 30 or 60 years where available – see tables 11 to 16)* where this differs to the "default" service life given in the commodity specification
Preservative type *(if a specific type is required)*

Example model specification phrases for Commodity Specifications.

"Fencing timber† [*add timber species or type if desired*] (*Use Class* [*insert Use Class(es)*]) treated in accordance with WPA specification C3 [*add preservative type if desired**] [*add service life if different from default*]"

"Facias/soffits† [*add timber species or type if desired*] (*Use Class* [*insert Use Class(es)*]) treated in accordance with WPA specification C5 [*add preservative type if desired**] [*add service life if different from default*]"

"Structural timber† [*add timber species or type if desired*] (Use Class [*insert Use Class(es)*]) treated in accordance with WPA specification C8 [*add preservative type if desired**] [*add service life if different from default*]"

* *A specifier may decide to leave the choice of preservative (from those ticked) to the treater or choose one himself. If the latter, a generic preservative type may be chosen e.g. copper-organic, boron, organic solvent or microemulsion.*

† *As much detail as possible of the end use should be given; for example "Structural timber (sole plates)"*

If specifying particular preservative types or timber species, it is important to note that not all preservatives are appropriate for all Use Classes and that some timber species are not sufficiently permeable to achieve the penetration levels required, at least without additional preparation such as mechanical incising.

Commodity Specification C1

C1 Preservative treatment of timber to be used in cooling towers

Preservative treatment of timber to be used in cooling towers

Scope

This specification gives recommendations for the species and preservative treatment for timber to be used in water cooling towers. It applies to all cooling tower timbers, including splash bars, eliminator louvres, air-sealing walls, doors and door frames, and structural timbers.

For cooling tower timbers, strict limitations are imposed on the timber species, the preservatives and the method of application.

Hazards

Due to the severity of the hazard in cooling towers the risk of attack by fungi, particularly soft rot fungi, is high especially in the relatively small cross-section of packing timbers. Failure of untreated timber in this environment can occur within a few years. To achieve a longer service life it is essential that cooling tower packing timbers are treated in accordance with this specification.

Timber Species

Only permeable softwoods are recommended for this end use. European redwood has proved satisfactory in practice.

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Timber Condition and cutting after treatment

Timber for treatment should be in a suitable condition as recommended in Section 4.1 of this manual. In addition, the quality of the timber as regards knots, grain and other defects should comply with the requirements of BS 4485: Part 4. Timber should be bundled in such a manner as to permit ease in handling and to allow access of the solution to the flat surfaces of the timber.

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C1 contains information on the selection of a preservative suitable for use to achieve a C1 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 11, 15 and 16. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Table C1 Selection of preservative type suitable for C1 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
					COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Cooling tower timbers - fresh water	14	4	15	D	✓[4]	✗	✗	✗	✓
Cooling tower timbers - salt water[4]	15	4[5]	15	D	✓[4]	✗	✗	✗	✓

Notes to Table C1

1. The code numbers allocated to component groups also appear in the first column of Tables 10 and 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which is generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Although thought to be suitable, treatment recommendations for these types of preservative are not given in Table 10 - recommendations regarding the use of these preservatives in this end use will need to be sought from preservative suppliers.
5. Although timber is exposed to salt water, the exposure hazard is considered to be UC4, not UC5.

Commodity Specification C2

Preservative treatment of timber for use permanently or intermittently in contact with sea or fresh water

C2 Preservative treatment of timber for use permanently or intermittently in contact with sea or fresh water

Scope

This specification gives recommendations for the species, preservative treatment and other requirements for solid timber, generally in large dimensions, intended for use in locations in which it is to be permanently or intermittently immersed in sea water or fresh water in and around the British Isles. It does not cover the treatment of timber in cooling towers - see Commodity Specification C1.

The choice of ship hull or superstructure timbers will be influenced by the working properties of individual species. For these items if treated with a suitable water based preservative, post-treatment drying is essential before use in order to minimise movement after construction.

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Examples of items covered by this part are:

- **Marine piling**
- **Structural timbers in piers, jetties, quays, etc.**
- **Lock and dock gates and sluices**
- **Revetments on inland waterways**
- **Timber used in sea defence works**
- **Wooden foundations for piers and bridges**
- **Ship hull and superstructure timbers**

Hazards

Timber for the fabrication of structures in fresh water (Use Class 4) and sea water (Use Class 5) can be subjected to severe and rapid attack by wood rotting fungi. In sea water, particularly warmer waters, there is the additional hazard of attack by marine boring organisms such as Limnoria spp and Teredo spp. To enhance service life in this environment it is essential to use either a timber species of adequate natural durability (BS EN 350: Part 2) or timbers which have been properly treated with an appropriate preservative.

Timber Species

Table C2-1 indicates the suitability of timbers for use permanently or intermittently in contact with sea or fresh water.

Table C2-1 Suitability of timber for use in water

SPECIES WITH HEARTWOOD SUITABLE FOR USE UNTREATED IN SEA WATER	SPECIES WITH HEARTWOOD SUITABLE FOR USE UNTREATED IN FRESH WATER	SPECIES SUITABLE, IF TREATED, FOR USE IN SEA AND FRESH WATER
Afrormosia, African padauk, Andaman padauk, Basralocus[1], Belian[1], Ekki[1], Greenheart[1], Iroko, Jarrah, Kapur, Muninga, Okan[1], Opepe[1], Pyinkado[1], Red Iouro[1], Teak.	All timber rated as very durable in BS EN 350-2	All species in which the required combination of penetration and retention can be achieved.

Notes to Table C2

1. Species generally believed to be the best for marine work.

Timber Condition and cutting after treatment

The timber before treatment should be in a suitable condition as recommended in Section 4.1.

The timbers listed in column one of Table C2-1, in addition to having a high natural resistance to wood-rotting fungi, also possess sufficient resistance to attack by marine borers to give a good performance in sea water in temperate countries. However, these timbers are not always readily obtainable. It is important to remember that it is only the heartwood of these timbers which is resistant to marine borers; the sapwood is usually very susceptible to attack and should be removed. Particular care should be taken with greenheart and some other timbers because the sapwood can easily be mistaken for heartwood.

In order to obtain the high and consistent standard of preservative treatment necessary for timber used in sea water, consideration should be given to using the timber in the round. The band of sapwood on the outside of round timber is normally much more permeable than the heartwood and can be penetrated completely with a high loading of preservative. This can provide a much higher degree of protection than that to be expected from the limited preservative penetration often obtained in the heartwood of timber classed as 'resistant' or 'extremely resistant' to impregnation (See BS EN 350: Part 2).

Certain species which are difficult to impregnate with preservative (including exposed heartwood) require incising before treatment to the pattern laid down in BS 144: 1997 (Annex 1).

Treated wood in action

Freshwater applications
Lock gates, sluices, revetments, piling and pier timbers in direct freshwater contact.
BSEN335:1 Use class:4
WPA commodity code specification: C2

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C 2-2 contains information on the selection of a preservative suitable for use to achieve a C2 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10 and 12. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Additional precautions

Where treated timber is to be placed in a small volume of water (such as a garden pond) containing fish or other aquatic animals it is advisable to seek the advice of the preservative manufacturer before use.

Table C2-2 Selection of preservative type suitable for C2 specification

COMPONENT GROUP DESCRIPTION, EXAMPLES AND NUMBER[1]		USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
					COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
All timbers in fresh water *Freshwater lock gates and sluices* *Revetments on inland waterways*	12	4	15	D	✓	✗	✗	✗	✓
All timbers in salt water *Marine piling.* *Sea defence timbers.* *Seawater piers, jetties and quays.*	13	5	15	D	✓[4]	✗	✗	✗	✓

Notes to Table C2-2

1. The code numbers allocated to component groups also appear in the first column of Tables 10 and 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which is generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Check Table 1 for copper-organic preservative(s) available for this end use. At the date of publication of this edition of this manual no copper organic preservatives are listed for Use Class 5. Check with manufacturers for the latest position.

Commodity Specification C3

C3 Preservative treatment of fencing timber

Preservative treatment of fencing timber

Scope

This specification gives recommendations for the preservative treatment of fencing timbers prior to use in or out of ground contact.

This specification covers timber in types of fencing with a life expectancy of 15 years or more in normal use. It does not describe the design or construction of wood fencing and attention is drawn to BS 1722 which covers these aspects for different types of fences using wood components. Longer service lives (e.g. 30 years) may be specified where these are required.

Examples of items covered by this part are:

- **Fencing, gate posts and struts**
- **Gravel boards**
- **Rails**
- **Gates**
- **Boarding and slats**
- **Droppers**
- **Post caps**
- **Dowels**

Hazards

The timbers most liable to decay are those which remain wet longest - normally those in contact with the soil (Use Class 4).

Timbers subject to intermittent wetting (Use Class 3) are at lower risk but may also decay.

Insects are not important as a cause of damage to external timbers in the UK until they have already been significantly weakened by fungal decay.

Timber Species

For posts and other components in ground contact the heartwood of timber species rated grade 2 in BS EN 350-2 may be used untreated for a service life of 15 years, while those rated as grade 1 may be used untreated for a service life of 30 or more years. For components not in ground contact, species rated grade 3 should provide a 15-year service life while grade 2 and grade 1 are required for 30 and 60 years respectively. Where sapwood is present, or a less durable timber is used, treatment is required.

Timber Condition and cutting after treatment

The timber before treatment should be in a suitable condition, as recommended in Section 4.1.

Natural drying

To encourage natural drying, it is essential that fencing timber is debarked and stacked so that air can circulate freely. In this condition it is likely to reach a moisture content low enough for preservative treatment within about three summer months in the United Kingdom. In the winter, little natural drying is likely, and kilning may be required.

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Posts should be erected with an uncut/non-machined end in the ground. Do not cut or drill posts at or near ground level after treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C3 contains information on the selection of a preservative suitable for use to achieve a C3 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10-12. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

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Table C3 Selection of preservative type suitable for C3

COMPONENT GROUP DESCRIPTION, EXAMPLES AND NUMBER[1]		USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
					COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Fence rails (coated) *Fence components out of ground contact: fence rails, post caps, gates*	7[4]	3c	15	D	✓	✓	✓	✓	✗
Fence rails (uncoated) *Fence components out of ground contact: fence rails, post caps, gates*	8	3uc	15	D	✓	✓	✗[5]	✗	✓
Fence posts *Fence components in ground contact: fence posts, gravel boards*	9	4	15	D	✓	✗	✗	✗	✓

Notes to Table C3

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
5. Products listed in Table 3 which have been tested in accordance with BS EN599 and for which an approved retention for Use Class 3uc is declared may be used in accordance with Table 10.

Commodity Specification C4

C4 Preservative treatment of agricultural, horticultural and landscaping timbers

Preservative treatment of agricultural, horticultural and landscaping timbers

Scope

This specification gives recommendations for the preservative treatment of timber intended for use in buildings for the housing of livestock, the growing of vegetables, fruit and flowers and the storage of equipment and produce. It also covers landscaping timbers such as raised beds and soil-retaining walls. It does not cover fencing - see Commodity Specification C3.

Examples of items covered by this part are:

- **Agricultural:** timber components in buildings and equipment for housing livestock or the storage of farm products and machinery.
- **Horticultural:** timber components in buildings and equipment for the growing, storage and processing of produce.
- **Landscaping:** timber components used for earth-retaining walls, raised beds and walkways.

Hazards

The timbers most liable to decay are those which remain wet for long periods. They include timber in contact with the ground, soil or manure (Use Class 4) and timber in buildings with a high condensation risk, such as certain animal houses, glass houses and buildings used for drying and storing crops.

Timbers which are subject to intermittent wetting (Use Class 3), although at lower risk, may also decay.

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Insects are not important as a cause of damage to external timbers until they have already been significantly weakened by fungal decay, but the sapwood of internal timbers in farm buildings may be attacked.

This specification does not cover countries outside the UK, where termites can cause extensive damage to wood and this must be taken into account when farm or horticultural buildings are to be exported. Commodity Specification C7 covers buildings in termite infested areas.

Timber species

For components in ground, soil or manure contact the heartwood of timber species rated grade 2 in BS EN 350-2 may be used untreated for a service life of 15 years, while those rated as grade 1 may be used untreated for a service life of 30 or more years. For components not in ground contact, species rated grade 3 should provide a 15-year service life while grade 2 and grade 1 are required for 30 and 60 years respectively. Where sapwood is present, or a less durable timber is used, treatment is required.

Timber condition and cutting after treatment

Timber for treatment should be in a suitable condition, as recommended in Section 4.1.

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment. Timbers to be placed in the ground should be erected with an uncut/non-machined end in the ground. Do not cut or drill posts at or near ground level after treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C4 contains information on the selection of a preservative suitable for use to achieve a C4 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10-12. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Additional precautions

Seed boxes, internal timbers in greenhouses and any other timbers which will come into contact with plants or produce should not be treated with a preservative containing creosote. With any organic solvent type preservative, the solvent should be allowed to evaporate before the wood is put into service. For other preservatives consult the manufacturer for advice.

Treated wood in action

Deck and boardwalk support
BSEN335:1 Use class: 4 (for posts), 3.2 (for for beams and joists out of direct ground contact)

Photo courtesy: Deckbuilders

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Table C4 Selection of preservative type suitable for C4 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Timbers subject to intermittent wetting (coated) [4]	7	Cladding	3c	15	D	✓	✓	✓	✓	✗
Timbers subject to intermittent wetting (uncoated)	8	Cladding	3uc	15	D	✓	✓	✗[5]	✗	✓
Battens to which cladding is fixed	8	Battens for cladding	3uc	15	D	✓	✓	✗[5]	✗	✓
Timbers in contact with the ground, soil or manure; also those likely to get wet and remain wet	9	Timbers below DPC, animal pens (soil/ manure contact), wood in glass houses, raised beds, walkways.	4	15	D	✓	✗	✗	✗	✓
	9	Soil-retaining walls	4	30	D	✓	✗	✗	✗	✓

Notes to Table C4

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber may not be suitable for use with some C4 components due to odour and surface deposits. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
5. Products listed in Table 3 which have been tested in accordance with BS EN599 and for which an approved retention for Use Class 3uc is declared may be used in accordance with Table 10.

Commodity Specification C5

C5 Preservative treatment of non load-bearing external softwood joinery and external fittings (excluding cladding) not in ground contact

Preservative treatment of non load-bearing external softwood joinery and external fittings (excluding cladding) not in ground contact

Scope

This specification covers the requirements for preservative treatment of softwood timber for use in external joinery in buildings, e.g. window frames, casements and sashes, surrounds for non wooden windows, doors, door frames and porches, and external fittings, e.g. soffits, facias and barge boards. It does not cover cladding (see Commodity Specification C6) or plywood (see Commodity Specification C11).

Hazards

Timbers of low natural durability used in these situations (Use Class 3) are liable to decay, mainly due to attack by wet rot.

Attack by wood boring beetles is very rare on painted joinery but may occasionally occur on some fittings.

Timber species

The heartwood of those softwoods rated grade 3 in BS EN 350-2 may be used untreated for a service life of 30 years, while those rated as grade 2 may be used untreated for a service life of 60 years. Where sapwood is present, or a less durable timber is used, treatment is required.

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Timber condition and cutting after treatment

Timber for treatment should be in a suitable condition as recommended in Section 4.1.

The quality of joinery timber should be in accordance with BS EN 942

Care should be taken to exclude timber infected with incipient decay, particularly in the case of western hemlock (Tsuga heterophylla), since preservative treatment of seasoned timber does not afford protection against deep seated, tree borne infection.

Good preservation of these commodities requires maximum end grain penetration. This is usually greatest when timbers are treated before assembly although other considerations such as any need to machine after assembly may make it preferable to treat assembled units.

The practice of removal of horns when fitting windows on site is not recommended, since such removal reduces the effectiveness of the preservative treatment. Where horn removal or a small amount of cutting after treatment cannot be avoided, the procedures in Section 5.3 must be followed.

Appropriate preservatives

Table C5 contains information on the selection of a preservative suitable for use to achieve a C5 specification. However, some preservatives types may be more appropriate than others for certain joinery components (see section 4.3). The treater will find details of the appropriate retention and penetration requirements in Tables 10 - 12. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Treated wood in action

External timber sofitts, fascias and bargeboards
BSEN335:1 use class: 3.1 (coated), 3.2 (uncoated)
WPA commodity code specification: C5

Photo courtesy: BSW

Table C5 Selection of preservative type suitable for C5 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Timbers subject to intermittent wetting (coated) [4]	7	Cladding	3c	15	D	✓	✓	✓	✓	✗
Timbers subject to intermittent wetting (uncoated)	8	Cladding	3uc	15	D	✓	✓	✗[5]	✗	✓
Battens to which cladding is fixed	8	Battens for cladding	3uc	15	D	✓	✓	✗[5]	✗	✓
Timbers in contact with the ground, soil or manure; also those likely to get wet and remain wet	9	Timbers below DPC, animal pens (soil/ manure contact), wood in glass houses, raised beds, walkways.	4	15	D	✓	✗	✗	✗	✓
	9	Soil-retaining walls	4	30	D	✓	✗	✗	✗	✓

Notes to Table C5

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which is generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Deep impregnation of sapwood with copper-organic preservatives may lead to distortion and grain raising in machined wood components so care is necessary if this product type is chosen for treatment of joinery.
4. Creosote-treated timber may not be suitable for C5 components due to odour and surface deposits; it is unsuitable for uses where a coating is to be applied. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
5. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
6. External cladding is excluded (See Commodity Specification C6 for external cladding)
7. Products listed in Table 3 which have been tested in accordance with BS EN599 and for which an approved retention for Use Class 3uc is declared may be used in accordance with Table 10 to achieve a 15 year service life.

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Commodity Specification C6

Preservative treatment of external timber cladding

Scope

This specification covers the requirements for preservative treatment of timber for use as external cladding, including battens for cladding, to buildings. It does not cover plywood cladding (see Commodity Specification C11).

Hazards

Timbers of low natural durability used in this situation (Use Class 3) are liable to decay, mainly due to attack by wet rot. Wood boring beetles do not present a significant hazard, except in the case of elm.

Timber Species

The heartwood of timber species rated in BS EN 350-2 as grade 2 and grade 1 are required for 30 and 60 years service life respectively. Where sapwood is present, or a less durable timber is used, treatment is required.

Timber condition and cutting after treatment

Timber for treatment should be in a suitable condition, as recommended in Section 4.1.

The moisture content should be below 22% if treatment is to be with an organic solvent based preservative, microemulsion or creosote and below 28% if treatment is to be with a copper-organic

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C6 contains information on the selection of a preservative suitable for use to achieve a C6 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10 - 12. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Table C6 Selection of preservative type suitable for C6 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
External softwood cladding (coated)[4]	7	Cladding on buildings	3c	30	D	✓	✓	✓	✓	✗
External softwood cladding (uncoated)	8	Cladding on buildings	3uc	30	D	✓	✓	✗[5]	✗	✓
Softwood battens	8	Battens to which cladding is fixed	3uc	30	D	✓	✓	✗[5]	✗	✓

Notes to Table C6

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which is generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber may not be suitable for some C6 components due to odour and surface deposits; it is unsuitable for uses where a coating is to be applied. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
5. Products listed in Table 3 which have been tested in accordance with BS EN599 and for which an approved retention for Use Class 3uc is declared may be used in accordance with Table 10 to achieve a 15 year service life.

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Commodity Specification C7

Preservative treatment for timber for use in buildings in termite infested areas

Scope

This specification covers the requirements for preservative treatment of timber for use in buildings destined for use in countries where termites are the major timber pest. Where termites occur, timber buildings should not be in direct contact with the ground and the preservative specifications recommended in this code are designed for out of ground contact situations. However Copper-organic and CCA preservatives are suitable for ground contact situations.

Hazards

Termites

Where termites occur they constitute a major hazard to timber. The sapwood of all timbers is susceptible to attack, and the heartwood of most commonly used species is also vulnerable. In general terms termites are to be found in all land areas between latitudes 40°N and 40°S. There are two basic types that attack timber: dry wood termites and subterranean termites.

Dry wood termites need no contact with the ground, and where they occur most timbers are prone to attack, including furniture, wooden cabinets etc. They are only found in certain areas near the sea, i.e. islands and coastal regions.

Subterranean termites are ground dwelling and are much more widespread. They enter buildings from nests in the ground by constructing covered runways. They can penetrate concrete slabs and traverse brick or metal foundations until timber is reached.

Other Wood Boring Insects

Other insect pests occur in termite regions. Effective treatments that control termites have historically been found to also prevent attack by these other wood boring insects. Specific assurances should be sought from the preservative manufacturer where protection from attack by other wood boring insects is desired.

Fungal Decay

When wood becomes wet and remains wet it is liable to decay. Wet conditions, suitable for fungal decay may occur due to the local climate, condensation or to local habits, e.g. in certain regions it is common practice to wash down the interior of homes frequently with water. For these situations, dual purpose (insecticidal and fungicidal) preservatives should be used.

Timber Species

European redwood, European whitewood, western hemlock, Douglas fir and other softwoods all require preservative treatment. In addition, many hardwoods commonly used in construction are susceptible. Similarly board materials, such as plywood, fibre building board and particle board require protection from termite attack and when they are used as internal linings in areas where frequent washing down with water occurs, they must be water-resistant. Adhesives for all components should be moisture resistant or better, and plywood that is either WBP (BS 1204 – now withdrawn) or BS EN 636 Exterior (BS EN 314 Part 2 bonding class 3) should now be specified. Humid grade (bonding class 2) might be acceptable but the board manufacturer or supplier should be asked to confirm that humid grade board is suitable. See C11 for more detail.

A number of timber species contain heartwood that is resistant to termite attack and these can be selected for use without preservative treatment, provided that all sapwood is removed. These are rated in BS EN 350-2 as 'durable' against termites.

Some of the more common species with termite-resistant heartwood are afzelia, iroko, opepe and teak. However, for most purposes it is more economic to use a less durable timber properly treated with a suitable wood preservative.

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Timber condition and cutting after treatment

Timber for treatment should be in a suitable condition, as recommended in Section 4.1. The moisture content of the timber should be suitable for the region where it will be used. This will normally be 15% or less. It is advisable to dry the timber to the end-use moisture content before treatment.

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C7 contains information on the selection of a preservative suitable for use to achieve a C7 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10 - 12. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Additional precautions

It may be necessary to treat the soil beneath buildings with insecticide prior to erection, thus forming a barrier through which it is difficult for termites to penetrate. Local regulations should be adhered to.

It is essential that preservatives used for the treatment of C7 timbers contain an insecticide that has been shown to be effective against termites. Choose a preservative listed in Tables 1 to 7 with the additional claim of "Effective against termites" (Code T).

Table C7 Selection of preservative type suitable for C7 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Internal, above ground timber components (dry)[4]	2	Floor boards, skirting boards, internal joinery, roof timbers in constant dry conditions.	1	30	B to D	✓	✓	✓	✓	✗
Internal, above ground timber components (risk of wetting)[4]	4	Timbers listed above where short term , intermittent wetting occurs	2	30	B to D	✓	✓	✓	✓	✗
External, above ground timber components (coated) [5]	7	Window frames, external cladding	3c	30	C to D	✓	✓	✓	✓	✗
External, above ground timber components (uncoated)	8	Window frames, external cladding	3uc	30	C to D	✓	✓	✗[6]	✗	✓

Notes to Table C7

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which is generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber is not suitable for use with most C7 components due to odour and surface deposits; it is unsuitable for uses where a coating is to be applied. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. In certain termite regions it is common practice to wash down the interior of homes frequently with water. For this reason components that in the UK would be considered to be in Use Class 1 or 2 situations might be subjected to conditions associated with higher hazard classes. The allocation of components to Use Class in termite regions must take into account such local practices.
5. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
6. Products listed in Table 3 which have been tested in accordance with BS EN599 and for which an approved retention for Use Class 3uc is declared may be used in accordance with Table 10 to achieve a 15 year service life.

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Commodity Specification C8

Preservative treatments for constructional timbers (excluding walls of timber frame houses)

Scope

This specification covers the requirements for preservative treatment of constructional timbers in buildings in the United Kingdom.

Examples of items covered are:

- **Roof timbers** rafters, purlins, joists, tiling battens, wall plates
- **External walls** framing, studding, soleplates (above dpc)
- **Floors** ground floor joists, fillets in concrete

Where the UK Building Regulations require timbers to be protected against house longhorn beetle (Hylotrupes bajulus) the appropriate treatments given in Table C8 should be given to all softwoods.

Hazards

Structural timber in buildings is not directly exposed to the weather, but it can become wet in service through such things as the breakdown of the weather-proof shell of the building, or condensation. Although design precautions are intended to prevent trouble from decay, experience has shown that there are some situations where it is wiser not to rely solely on design to keep the timber dry, but to employ preservative treatment on timber of low durability (see Table 6, note 2).

Timber containing sapwood is at risk from attack by wood boring insects, as is timber where there is no clear distinction between heartwood and sapwood.

Timber Species

All timbers with sapwood present should be preservative treated when they are to be used in the situations in Table C8. The heartwood of certain species may be used without treatment in certain situations (Guidance on durability class and service life is given in Table 8.).

Timber condition and cutting after treatment

Timber should, as far as possible, be fully shaped before treatment and should be in a suitable condition to receive treatment, as recommended in Section 4.1.

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed

Appropriate preservatives

Table C8 contains information on the selection of a preservative suitable for use to achieve a C8 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10 and 11. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species

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Table C8 Selection of preservative type suitable for C8 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Roof timbers (dry)	4[4]	Pitched roofs: rafters, purlins, joists, wall plates	1[4]	60	B	✓	✓	✓	✓	✗
Roof timbers (dry) in areas with house longhorn beetle	4[4]		1[4]	60	D	✓	✓	✓	✓	✗
Roof timbers (risk of wetting)	4	Flat roofs joists, sarking, tiling battens, valley boards, timbers exposed to risk of condensation	2	60	C	✓	✓	✓	✓	✗
Roof timbers (risk of wetting) in areas with house longhorn beetle	4		2	60	C	✓	✓	✓	✓	✗
External walls/ ground floors	5	Timber frames, ground floor joists, I-beam studwork	2	60	C	✓	✓	✓	✓	✗
Sole plates above dpc	6	Soleplates or bottom member of frame, when acting as a soleplate above dpc	2	60	D	✓	✓	✗	✓	✗
Fillets in concrete	8	Timber fillets in concrete (above dpm)	2[5]	60	C	✓	✓	✗	✗	✗

Notes to Table C8

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber is not normally considered suitable for C8 components due to odour and surface deposits. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. If the decision is to specify treatment, treat as UC2. See Table 6 note 2.
5. Once wet, fillets in concrete can take longer to dry than other UC2 components, and so be subject to greater risk of decay. Consequently although strictly speaking these components are UC2, the WPA recommend they be treated as UC 3uc fence rails (see Table C3 or Table 10)

Commodity Specification C9

C9 Preservative treatments for timber frame housing

Preservative treatments for timber frame housing

Scope

This specification is ancillary to Commodity Specification C8 and covers recommendations for the preservative treatment of the constructional frame of external walls in timber frame housing. It does not cover sheathing materials.

Timber in service

Structural timber in buildings is not directly exposed to the weather, but it can become wet in service through such things as the breakdown of the weather-proof shell of the building, or condensation. (Use Class 2)

With houses of timber frame construction, where a high proportion of the timber is load bearing and inaccessible after construction, the consequences of decay and insect attack are of economic and structural importance.

Although design precautions are intended to prevent trouble from decay, there are some situations where it is wiser not to rely solely on design to keep the timber dry, but to employ preservative treatment.

Irrespective of accidental wetting, timber containing sapwood can be at risk from attack by wood boring insects, as also is timber where there is no clear distinction between heartwood and sapwood.

Timber species

All timbers with sapwood present should be preservative treated when they are to be used in the situations in Table C9. The heartwood of certain species may be used without treatment in certain situations (Guidance on durability class and service life is given in Table 8.).

Timber condition and cutting after treatment

Commercially, European redwood, European whitewood, hem/fir and spruce/pine/fir (SPF) are the timbers most commonly used for the frames of houses. It is recognised that mixed parcels of timbers cannot be separated into individual species prior to preservative treatment. In order to ensure adequate preservative treatment of all timbers, the treatment undertaken should be appropriate for the most difficult to treat timbers in a mixture. If use of the recommended treatments leads to excessive solvent retention in more permeable species extended drying times should be allowed.

Timber should, as far as possible, be fully shaped before treatment and should be in a suitable condition to receive treatment, as recommended in Section 4.1

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C9 contains information on the selection of a preservative suitable for use to achieve a C9 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10 and 11. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Table C9 Selection of preservative type suitable for C9 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
External walls	5	Timber frames that form a separate inner leaf or where there is a space behind the exterior finish	2	60	B	✓	✓	✓	✓	✗
External walls	-	Timber frames where exterior finishes are fixed directly to the sheathing or studs with no air space.	2	60	C	No recommendations are made for this type of construction now not considered to be good practice. Consult preservative manufacturers if treatment guidance is needed				
Sole plates above dpc	6	Soleplates or bottom member of frame, when acting as a soleplate above dpc	2	60	C	✓	✓	✓	✓	✗

Notes to Table C9

1. The code numbers allocated to component groups also appear in the first column of Tables 10 and 11 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber is not suitable for C9 components due to odour and surface deposits. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org

Commodity Specification C10

Preservative treatment of hardwood external joinery

Scope

This specification describes the requirements for the pretreatment of hardwood external joinery where it is necessary to improve the durability of the timber used.

Hazards

The sapwood of all hardwood species has a low resistance to fungal decay in Use Class 3. In addition, the sapwood of many hardwoods is liable to attack by the Powder Post Beetle (Lyctus spp), particularly during the first few years of service. It is therefore necessary to treat timber containing sapwood or to remove the sapwood before utilisation.

In some commercial grades exclusion of the sapwood may be undesirable, whilst with some species there is no clear distinction between heartwood and sapwood and its exclusion is therefore impracticable. In these instances the timber should be treated.

Some hardwoods have the general attributes of good joinery timber but even their heartwood lacks sufficient natural resistance to decay to enable them to be used for external work. Proper preservative treatment provides a means of extending the use of these timbers to external joinery.

Timber Species

Where the heartwood of timbers rated as moderately durable, see Table C10-1, or better is used in external joinery, preservative treatment is unnecessary when sapwood is absent.

Table C10-1 Hardwoods commonly used for external joinery classified according to durability of heartwood

LESS THAN MODERATELY DURABLE (treatment required)	MODERATELY DURABLE OR BETTER (treatment required only if sapwood is present)	
Dark red meranti (Red lauan)	Afrormosia	Makore
Red meranti (White lauan)	Agba [1,2]	Oak - American white
Seraya	Afzelia	Oak - European
Note: The above include a number of different timber species, some of which are less than moderately durable.	Guarea	Opepe
	Idigbo [1]	Sapele
	Keruing [2]	Teak
	Brazilian mahogany	Utile
	American mahogany	African walnut

For timbers other than those listed above, reference should be made to BS EN 350-2

Notes to Table C10-1

1. The sapwood of these timbers is not easily distinguishable from the heartwood.
2. Subject to resin bleed which may be exacerbated by preservative treatment.

Timber condition and cutting after treatment

Timber should, as far as possible, be fully shaped before treatment and should be in suitable condition to receive treatment, as recommended in Section 4.1. The moisture content should be below 22%. Other aspects of the quality of the timber should be in accordance with BS EN 942 .

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment.

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Where other cutting cannot be avoided, the procedures in 5.3 must be followed.

Appropriate preservatives

Table C10-2 contains information on the selection of a preservative suitable for use to achieve a C10 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10 and 11. The preservative manufacturer will give guidance as to how these can be achieved for a given product and timber species.

Table C10-2 Selection of preservative type suitable for C10-2 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Hardwood external joinery (coated)[4]	7	Hardwood window frames, casements, sashes doors and door frames	3c	30	C	✓	✓	✓	✓	✗
Hardwood external joinery (uncoated)	8	Hardwood window frames, casements, sashes doors and door frames	3uc	30	C	✓	✓	✗[5]	✗	✗

Notes to Table C10-2

1. The code numbers allocated to component groups also appear in the first column of Tables 10 and 11 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which is generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber is not normally considered suitable for C10 components due to odour and surface deposits; it is unsuitable for uses where a coating is to be applied. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
5. Products listed in Table 3 which have been tested in accordance with BS EN599 and for which an approved retention for Use Class 3uc is declared may be used in accordance with Table 10 to achieve a 15 year service life.

Commodity Specification C11

C11 Preservative treatment of wood-based board and engineered wood products

Preservative treatment of wood-based board and engineered wood products

Scope

This commodity specification applies to the preservation of panel and engineered wood products, examples of which are:

- **Particle board e.g. wood chipboard and flaxboard**
- **Oriented strand board (OSB)**
- **Cement bonded particle board**
- **Wet process fibreboard e.g. softboard, medium board, hardboard**
- **Dry process fibreboard e.g. medium density fibreboard (MDF)**
- **Plywood.**
- **Laminated veneer lumber (LVL)**
- **Parallel strand lumber (PSL)**
- **Oriented strand lumber**

Further information on wood-based panels is obtainable from the Wood Panel Industry Federation PanelGuide.

This commodity specification also applies to other products such as I-beams which include either a mixture of different wood-based composite products, or a mixture of wood based composite products and solid wood.

This commodity specification does not apply to glue laminated components - in which the constituent pieces are rectangular in section, and in excess of 5 mm thick. For the purposes of specifying preservation, glue laminated structures should be treated as solid timber.

This commodity specification provides information on appropriate preservative treatment to apply to wood composite products. However many of these products are affected by water and so are unsuitable for use in situations where they will become wet or even damp, and may also be unsuitable for preservation by certain preservative types. Therefore, before preservation is considered, it is essential to verify that the wood composite product in question will give satisfactory physical and mechanical performance in the intended end use. The use of, for example, a Use Class 3 preservative will not render a wood composite product suitable only for use in dry interior conditions (Use Class 1) suitable for use in anything other than an Use Class 1 situation.

Advice should also be sought regarding the suitability of a wood composite product for preservative treatment. The declared characteristics of the untreated composite product (BS EN 13986) may be affected by the treatment. Specific advice on plywood suitability is given below.

Hazards

The heartwood of certain timber species may display considerable natural resistance to degradation by insects and fungi (natural durability) while the sapwood of all timbers is susceptible to biological deterioration. Because of the mixture of timber species which may occur in wood-based composite materials, and the mixture of heartwood and sapwood of which composite materials are composed, no wood based composite material can be regarded as naturally durable in the conventionally understood meaning of this term. However cement bonded particle board is resistant to biological deterioration. Additionally, wood-based composite products made from particles or strands which are less that 2 mm thick are generally regarded as resistant to infestation by wood boring beetles by virtue of insect larvae being reluctant to penetrate glue lines. Products with veneers thicker than 2 mm will not intrinsically be resistant to wood-boring beetles. Where termites occur, all wood based composite materials are susceptible to attack by these insects.

Preservatives

The preservatives listed in this manual as being suitable for solid wood can be regarded as also being adequate for the treatment of wood-based composite materials in corresponding Use Classes - providing their use would not have deleterious effects on the properties of the composite material. The specifier should verify with the treater that both preservative and application methods are suitable for the composite product to be treated.

A fungus which has frequently been found to be responsible for decay of board materials but which is not commonly encountered in solid wood, is Pleurotus sp. There is no standard European test procedure for assessing the activity of preservatives against Pleurotus in board materials, although BS1982: Part 1 describes a test for this purpose, and an experimental European standard (DD ENV 12038) is also relevant. Specifiers may wish to seek information from preservative suppliers to determine whether they have established the efficacy of particular preservatives products against Pleurotus sp.

Penetrations and Retentions

For products composed of a mixture of wood-based composite products or a mixture of wood based composite products and solid wood, the penetration and loading requirements given for each component of the product concerned apply.

Table C11 contains information on the selection of a suitable preservative. The treater will find details of the appropriate retention requirements in Tables 11 to 16. The preservative manufacturer will give guidance as to how these can be achieved for a given preservative and wood-based product. The Penetration Classes (see 4.2.1) listed in Tables 11 to 16 are not always appropriate for the treatment of boards and engineered wood products. Table

Treated wood in action

Wood based board
Roof and wall sheathing
BSEN335:1 Use class:2
WPA commodity code specification: C11

Photo courtesy: Norboard

C11 gives appropriate Penetration Classes where a preservative is suitable for use.

A manufacturer wishing to incorporate preservative during the manufacturing process should ensure that, as a minimum, the penetrations and retentions specified in Table C11 are achieved.

While it is important to ensure that adequate penetrations and loadings are achieved, it is equally important to avoid over-treatment, which can lead both to product integrity problems and to compatibility problems.

Application Methods

Preservation of wood-based composite products is usually accomplished by application of preservative after manufacture of the composite product has been completed.

The penetrations and retentions of preservatives required for compliance with Commodity Specification C11 may be achieved either by incorporation of preservative during the manufacturing process, or by application of preservative to finished composites.

Different wood-based composite materials respond differently to treatment. Because of the high surface area / volume ratio and the relative thinness of many boards compared with solid timber, uptakes are often high and special handling and drying procedures may be required. For this reason, processors are advised to contact their preservative suppliers for advice on treatment methods. This is especially important when treating to Penetration Classes NP2 and greater, because achieving these can potentially have an adverse effect on the structure of the material being treated.

Points to be considered in selecting a preservative and application method include:

Because of the potential for swelling, over-treatment with water based products can give rise to problems. For their normal uses, softboard, MDF (internal grades) and particle board are particularly susceptible to adverse effects caused by water.

PSL and OSB, if bonded with suitable adhesives, are less susceptible to water-induced degradation and are unlikely to be seriously affected by treatment for use in UC 1, UC 2 or UC 3 situations.

Suitably bonded plywood and LVL are not particularly susceptible to degradation by water and can be treated to give full impregnation of preservatives without significant structural effects.

Plywood bonding

Under the old system one looked for WBP grade (weather- and boil-proof). Now, plywood grades are based on BS EN 636 (Dry, Humid, Exterior classifications) which are themselves based on bonding classes 1, 2 and 3 from BS EN 314 Part 2. Plywood that is either WBP or BS EN 636 Exterior (BS EN 314 Part 2 bonding class 3) should now be specified. Humid grade (bonding class 2) might be acceptable (almost certainly so for double vacuum processing (microemulsion treatment)) but the board manufacturer or supplier should be asked to confirm that Humid grade board can be put through a vacuum/high pressure treatment process if that is required.

Care must be taken to ensure that the resin system used to bind the product is not solubilised in the preservative carrier solvent. Products designed for service in UC 2 – 4 situations have to use moisture resistant resins. These include melamine urea formaldehyde (MUF) phenol formaldehyde (PF) and polymeric diphenylmethane diisocyanate (pMDI) .

Characteristics of treated materials

In addition to the information in section 5 particular consideration needs to be given to the effect of preservative treatment on the strength of treated composites. Because different materials respond differently to different treatments advice should be sought from the manufacturer of the preservative, and /or composite material under consideration.

Treated wood in action

Engineered wood
Internal glulam beams, I-joists etc
BSEN335:1 Use class: 2
WPA commodity code specification: C11

Photo courtesy: Metsä

© Wood Protection Association

A second issue requiring particular specific consideration relates to compatibility of preservatives with other building materials. Treated composite materials, particularly treated wood based panels, may be used in close association with membranes made from Polyvinylchloride (PVC), Ethylene Propylene Diene Monomer (EPDM), synthetic rubber, and polyolefins. With such membranes it is particularly important that treated wood based composite products are permitted adequately to re-dry before membranes are applied to them. Entrapped moisture can give rise to a range of problems - mostly relating to dimensional change whilst entrapped organic solvent can cause membranes to deteriorate, or change their properties significantly.

Retreatment of cut ends

Most of the treatments specified in this commodity specification are envelope treatments in which each component is surrounded by a continuous barrier of preservative which protects untreated material underneath. It follows that it is critically important that the envelope remains intact if the value of the preservative treatment is to be maintained. It is obviously therefore best practice to treat wood based composite products in their final dimensions. Reworking, when unavoidable, should be limited to cross cutting, and any surfaces exposed by cross cutting must be retreated by two liberal brush coats - or equivalent - of a suitable preservative.

Table C11 Preservative type and Penetration Class suitable for the treatment of wood-based board and engineered wood products

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) AND APPROPRIATE PENETRATION CLASS (✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Roof timbers (dry)	4[4]	Pitched roof components	1[5]	60	B	NP1 [5]	NP1 [5]	NP1 [5]	NP1 [5]	✗
Roof timbers (dry) in areas with house longhorn beetle	4[4]		1[5]	60	D	NP1 [5]	NP1 [5]	NP1 [5]	NP1 [5]	✗
Roof timbers (risk of wetting)	4	Flat roofs components, timbers exposed to risk of condensation	2	60	C	NP2 [6]	NP2 [6]	NP2 [6]	NP2 [6]	✗
Roof timbers (risk of wetting) in areas with house longhorn beetle	4		2	60	D	NP2 [6]	NP2 [6]	NP2 [4]	NP2[6]	✗
External walls (inner leaf)	5	Timber frames that form a separate inner leaf or where there is a space behind the exterior finish	2	60	C/D	NP2	NP2	NP2	NP2	✗
External walls (outer leaf)	-	Timber frames where exterior finishes are fixed directly to the sheathing or with no air space.	2	60	D	No recommendations are made for this type of construction now not considered to be good practice. Consult preservative manufacturers if treatment guidance is needed.				
External cladding and fittings (coated)[7]	7	External cladding soffits, facias and barge boards	3c	30	C	NP2	NP2	NP2	NP2	NP2
External cladding and fittings (uncoated)	8	External cladding soffits, facias and barge boards	3uc	30	C	NP2	NP2	✗	✗	NP2
Ground contact components[8]	9	In contact with ground, soil, manure.	4	15	C/D	✗	✗	✗	✗	✗

Notes to Table C11

1. The code numbers allocated to component groups also appear in the first column of Tables 10 to 12 which contain the appropriate treatment requirements for each component group. See 4.3. (Penetration requirements are given in the table above).
2. Unless otherwise specified the treater shall use the desired service life listed in this table which generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance). Desired service lives apply only to biological durability and not to physical/mechanical durability (see C11 Scope).
3. Creosote-treated timber may not be not suitable for use with some C10 commodities due to odour and surface deposits. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Treat as UC2. See Table 1 note 2.
5. NP2 is necessary when protection against termites is required.
6. P1 may be accepted by agreement between vendor and purchaser.
7. Treatment specifications for these uses require that the exposed surfaces of the woodwork to be painted or given some other protective finish which will be maintained in service.
8. Recommendations for preservation to UC4 specifications are only valid for veneer composites (e.g. plywood and LVL). No recommendations for treatment are given for other composites because at the time of writing, no non-veneer composites are known which are suitable for use in UC4.

Commodity Specification C12

Preservative treatment of timber for decks and associated structures

Scope

This specification gives recommendations for the preservative pre-treatment of timber components used for decks and associated structures in or out of ground contact.

This specification covers timber for use in construction of decks with a life expectancy of 15 years or more in normal use. It does not describe the design or construction of decks and for these aspects, the Wood Protection Association recommends the various technical publications available from the Timber Decking Association www.tda.org.uk.

Examples of items covered by this specification are:

- **Deck support framework including posts and other components in ground contact**
- **Deck boards out of contact with the ground**
- **Parapets/safety rails and other on-deck features.**

Risk of decay and insect attack

BS EN 335-1 defines the biological hazards (fungal decay and insect attack) faced by timber during its service life. These are referred to as "Use Classes" (previously "Hazard Classes"). Components for deck construction mainly fall into Use Class 3 or Use Class 4.

The timbers at greatest risk of decay are those which remain wet longest - normally those in direct contact with the soil or freshwater (Class 4).

Timbers subject to intermittent wetting (Use Class 3) are at lower risk but still require protection from decay.

Insects are not at present important as a cause of damage to external timbers in the UK but consideration should be given to protecting timbers whose desired service life is 30 years or longer against an increased risk of insect attack as a potential consequence of warmer climatic conditions in the UK.

Timber Species

For posts and other components in ground contact the heartwood of timber species rated grade 2 in BS EN 350-2 may be used untreated for a service life of 15 years, while those rated as grade 1 may be used untreated for a service life of 30 or more years. For components not in ground contact, species rated grade 3 should provide a 15-year service life while grade 2 and grade 1 are required for 30 and 60 years respectively. Where sapwood is present, or a less durable timber is used, treatment is required in accordance with Table C12.

Treated wood in action

Planter boxes
BSEN335:1 Use Class 4
WPA Commodity Code Specification: C4

C12 Preservative treatment of timber for decks and associated structures

© Wood Protection Association

Timber Condition and cutting after treatment

The timber before treatment should be in a suitable condition, as recommended in Section 4.1 of this manual. Machined components are usually kiln-dried but care should be taken to ensure all timber for treatment is at a suitable moisture content.

Cutting after treatment

All cutting, drilling, profiling and shaping of the timber should be carried out, as far as possible, before treatment. Where unavoidable, surfaces exposed by minor wood working procedures during installation (cross cutting, boring, notching) shall be given two liberal brush coats of a preservative compatible with the preservative used in the original treatment process. Rip sawing, regularising or planning should not be undertaken unless the component is to be retreated according to the appropriate Use Class.

Posts may be embedded in the ground or surface mounted using specialist metal brackets. Where cross cutting cannot be avoided posts should be erected with an uncut/ non-machined end in/facing the ground. Do not cut or drill posts at ground level after treatment.

Appropriate preservatives

Table C12 contains information on the selection of a preservative suitable for use to achieve a C12 specification. The treater will find details of the appropriate retention and penetration requirements in Tables 10-12 of this manual. The preservative manufacturer will give guidance to the treater as to how these can be achieved for a given product and timber species.

Treated wood in action

Boardwalk
BSEN335:1 use class:3.2 for above ground components and use class 4 for all components in direct ground or freshwater contact.
WPA commodity code specification: C12

Photo courtesy: BSW

Table C12 Preservative type suitable for C12 specification

COMPONENT GROUP DESCRIPTION AND NUMBER[1]		EXAMPLES	USE CLASS	DESIRED SERVICE LIFE[2] (years)	SERVICE FACTOR	SUITABILITY OF PRESERVATIVE TYPES (SEE 2.2) (✓ = SUITABLE; ✗ = NOT SUITABLE)				
						COPPER-ORGANIC	WATER-BASED ORGANIC	ORGANIC SOLVENT OR MICRO-EMULSION	BORON	CREOSOTE[3]
Decking	8	Deck panels, deck boards, security rails and other on-deck features	3uc	15	C/D	✓	✓	✗	✗	✗
Decking support framework including posts and other components in and out of ground contact[4]	9	Posts, beams, joists, elevated deck support components	4	15	D	✓	✗	✗	✗	✓

Notes to Table C12

1. The code numbers allocated to component groups also appear in the first column of Tables 10 and 12 which contain the appropriate treatment requirements for each component group. See 4.3.
2. Unless otherwise specified the treater shall use the desired service life listed in this table which generally considered to be appropriate for the end use. In exceptional circumstances, a different service life may be specified from the standard choice of 15, 30 and 60 years (see Tables 10-12 and consult preservative manufacturers for detailed guidance).
3. Creosote-treated timber should not be used for any deck components where skin contact is likely. Regulation (EC) No 1907/2006 of The European Parliament and of the Council imposes restrictions on where creosote-treated timber can be used. Guidance on the restrictions is available at www.wood-protection.org
4. Decking support structures may include components used both in and out of ground contact. To impart a high degree of confidence in structural performance the WPA recommends treating all decking support structures to Use Class 4 standard.

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4. Treating timber

The importance of ensuring that timber treatment procedures do not compromise the health and safety of humans and the environment cannot be over-emphasised. Treatment plants should be operated in accordance with the Wood Protection Association Timber treatment installations - Code of Practice for Safe Design and Operation.

4.1 Condition of wood for treatment

For optimum protection, wood should be in an appropriate condition to receive treatment, as follows:

4.1.1 Surface Characteristics

The surface of the wood shall be free from anything that interferes with preservative penetration e.g. mud, dirt, dust and bark, decorative coatings, paint, stain, polish and any other surface finishes.

4.1.2 Freedom from decay and insect attack

The wood shall be free from all signs of attack by wood destroying fungi and insects. Wood showing signs of attack by mould, sapstain (bluestain) fungi or pinhole borers may be acceptable subject to agreement between the timber supplier and the customer.

4.1.3 Moisture content

The moisture content of the wood shall be appropriate for the preservative, treatment method and end use. For all methods of treatment except boron by diffusion, the moisture content must be below the fibre saturation point (circa 30%). Care should be taken that timber is presented for treatment at a moisture content which is at or below the likely in-service moisture content. See Section 4.6.1 for further details of drying treated timber.

For diffusion treatments with boron the wood shall be in its green, freshly felled and milled state. The average moisture content of the sawn wood shall not be less than 50% when determined in accordance with the methods given in Section 7.2. Timber which has been seasoned and subsequently re-wetted may not be treated by this method.

4.1.4 Temperature

Timber shall not be treated if it is frozen.

4.1.5 Glued timber and board materials

Although most cured adhesives are not affected by preservative treatment, there are some exceptions to this (notably PVA is not suitable where timber is subsequently to be treated with water-containing preservative). For wood-based boards for which a glue bond is an integral feature, bond performance is critical and guidance is provided in Commodity Specification 11.

4.1.6 Metal fittings and fixings

It is important the metal fixings should not be attached to wood prior to treatment with copper based preservatives.

4.1.7 Mixed species

As far as is practicable, wood for which different treatment schedules are appropriate (for example due to species or end-use) should not be treated in the same charge, unless the most intense schedule required can be applied without detriment to those timbers only requiring lesser schedules.

4.1.8 Stacking for treatment

The wood should be stacked to ensure that preservative solution shall have access to all faces of the timber and to facilitate natural drainage. Bindings should be sufficiently loose to permit this.

4.2 The treatment process

Tables 10 to 12 allocate specific component groups to Use Classes and recommend appropriate penetration and retention values for permeable and resistant species for 15, 30 and 60 year service lives.

Treated wood in action

External cladding - coated
BSEN335:1 Use class: 3.1
WPA commodity code specification: C6

Photo courtesy: Lonza Wood Protection

© Wood Protection Association

A penetrating process, one which includes features or procedures intended to overcome the natural resistance of wood to penetration by a wood preservative in its ready for use form, will be required where any Penetration Class other than P1 is specified. The application process is not defined, but process parameters will need to be selected in order to achieve the required penetration and retention requirements.

The treatment cycles and concentration of preservative used for treatment may vary depending upon the timber species being treated, the desired service life and the Use Class. Generally speaking, there is an increased biological risk of timber deterioration the higher the Use Class nmber, and increasing service life. In such cases, more severe treatment cycles which result in increased penetration are frequently necessary to meet these more demanding requirements, often in conjunction with higher preservative loading.

4.2.1 Penetration

Penetration is defined as a Penetration Class taken from BS EN 351-1 (Table 9A gives details). The analytical zone given in Table 9A is that part of the treated wood which is analysed for assessing the retention requirement.

Table 9A: Penetration requirements and analytical zone of each Penetration Class

PENETRATION CLASS	PENETRATION REQUIREMENTS[1]	ANALYTICAL ZONE
NP1	None	3 mm from lateral faces
NP2[2]	Minimum 3 mm lateral	3 mm lateral into sapwood
NP3[2]	Minimum 6 mm lateral into sapwood	6 mm lateral into sapwood
NP4[3]	Minimum 25 mm	25 mm lateral into sapwood
NP5	Full sapwood	Full sapwood
NP6	Full sapwood and minimum 6 mm into exposed heartwood	Full sapwood and minimum 6 mm into exposed heartwood

Notes to Table 9A

1. If it is not possible to distinguish between heartwood and sapwood, the whole sample should be regarded as sapwood.
2. Penetration requirements NP2 and NP3 may be supplemented by a requirement for longitudinal penetration, denoted by the suffix 'L'. Longitudinal penetration shall be ten times the required lateral penetration, unless otherwise stated by the specifier.
3. NP4 only applies to round wood of resistant timber

4.2.2 Permeability and Treatability

Treatment requirements in this manual may vary depending on whether the chosen timber species is classified as permeable or resistant.

BS EN 350-2 defines four treatability classes for wood species depending on the ease with which their timber can be impregnated with preservative. For the purposes of BS EN 351-1, BS 8417 and this manual, this system is simplified into two groups of species:

Permeable species: *Those wood species having timber comprising of sapwood or both sapwood and heartwood of treatability class 1 as defined in EN 350-2.*

Resistant species: *All wood species having timber not defined as permeable.*

4.3 Using results specifications with preservatives listed in 2.3

A specification for timber treatment needs to describe the component to be treated and the desired service life of that component. This information, along with the treatability of the wood species to be treated (see section 4.2.2) will enable the treater to select an appropriate preservative (assuming a particular

preservative has not already been specified) from tables 10-12 and establish the required retention and penetration to achieve that specification. The required retention is the amount of preservative to be found in the analytical zone as defined by the Penetration Class (see Table 9A).

Treated wood in action

External timber joinery
BSEN335:1 Use class:3.1 (coated)
WPA commodity code specification: C5

Photo courtesy: Wood Window Alliance

© Wood Protection Association

Where a Commodity Specification (C 1 to 12) has been used, the tables in section 3.2.4 enable the treater to apply tables 11-16 by using component group numbering that links components described in the Commodity Specifications with those in Tables 10 to 12.

Note that in some cases the Commodity Specifications describe specialised end uses that are treated in the same way as the standard range of components listed in Tables 10 to 12; for example animal pens from C 4 are treated in the same way as fence posts in Tables 10 to 12.

4.3.1 Products for which the manufacturer declares compliance with BS EN 599

Products listed in Tables 1, 2 and 3 which have been tested in accordance with BS EN 599-1 should be applied to give the penetration and retention combinations recommended by their supplier. Table 10 provides recommendations for penetration and retention combinations.

The recommended retentions in Table 10 are expressed in terms of '**R**'. '**R**' represents a figure declared by the preservative manufacturer for a given Use Class. **R** is always qualified by a suffix to indicate the Use Class it is intended for (e.g. **R**2).

R should not be less than the Critical Value (CV) derived from the results of the minimum efficacy tests required in BS EN 599-1 for the given use class and the claims made for the preservative. However, preservative manufacturers are required to ensure that the recommended retention takes into account factors which have an effect on the lifetime of preservative treated wood but that are not taken into account in the laboratory tests used in the derivation of the CV in BS EN 599-1. Unlike comparatively short term laboratory procedures, field trials take into account depletion and biodegradation mechanisms and allow for losses in the level of protection over a prolonged period of service life. For preservatives designed for use in use classes 1 and 2 laboratory tests provide an adequate basis for the assignment of **R**. For use class 3 field trials may provide additional information and confidence in service life when deriving **R**3. For use class 4 data from field tests must be considered in the determination of **R**4.

R may be declared at a retention that is higher than the CV.

R may vary for a given end use depending on the organisms against which the preservative is to provide protection (e.g. if protection against blue stain, wood boring insects etc is required), and whether the preservative is to be applied to softwood or hardwood.

Multiplication factors are applied to **R** for use classes 3 and 4 to indicate that higher retentions of preservative should be used where longer service lives are required. Multiplication factors in Table 4 are the default factors that apply to all preservatives unless long term information from field tests or from practical experience can provide a sound and acceptable basis for using multiplication factors for a wood preservative different from those in Table 4.

For treatments in use class 5, **R** is based on laboratory and field tests.

Some component / service life combinations in table 10 do not have allocated retention and penetration requirements. This occurs where performance over extended service lives or the use of treated timber in particularly severe conditions cannot easily be predicted using standard test methods. For these uses and service lives the preservative manufacturer should be consulted.

4.3.2 Preservatives complying with product specifications

Products listed in Table 5 meeting the requirements of BS EN 13991 (creosote) should be applied in accordance with Table 12. These penetration and retention requirements are based on experience of use in the UK.

Products listed in Table 4 meeting the requirements of Appendix 1 should be specified and used in accordance with Table 11.

Treated wood in action

Cooling towers
Where fresh or saltwater is cooled by running over timber packing
BSEN335:1 Use class: 4
WPA commodity code specification: C1

Table 10 Treatment recommendations for preservatives tested in accordance with BS EN 599-1 and listed in 2.3

COMPONENT (group number and description)		USE CLASS	SERVICE FACTOR	DESIRED SERVICE LIFE (YEARS)											
				15				30				60			
				PRESERVATIVE RECOMMENDATIONS				PRESERVATIVE RECOMMENDATIONS				PRESERVATIVE RECOMMENDATIONS			
				PERMEABLE WOOD		RESISTANT WOOD		PERMEABLE WOOD		RESISTANT WOOD		PERMEABLE WOOD		RESISTANT WOOD	
				PENETRATION[1] /RETENTION[2]		PENETRATION[1] /RETENTION[2]		PENETRATION[1] /RETENTION[2]		PENETRATION[1] /RETENTION[2]		PENETRATION[1] /RETENTION[2]		PENETRATION[1] /RETENTION[2]	
1	Internal joinery	1	A	No treatment required[3]				No treatment required[3]				No treatment required[3]			
2	Roof timber dry	1	B	NP1	R1×1	NP1	R1×1	NP1	R1×1	NP1	R1×1	NP1	R1×1	NP1	R1×1
3	Roof timbers dry (Hylotrupes area)[13]	1	D	NP1	R1×1	NP1	R1×1	NP1	R1×1	NP1	R1×1	NP1	R1×1	NP1	R1×1
4	Roof timbers (risk of wetting) (if in the Hylotrupes area see note 13; Service Factor becomes 'D')	2	C	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1
5	External walls/ground floor joists	2	C/D	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1	NP1[4]	R2×1
6	Sole plates (above DPC)	2[5]	D	NP2	R3[5]×1	NP2	R3[5]×1	NP2	R3[5]×1	NP2	R3[5]×1	NP2	R3[5]×1	NP2	R3[5]×1
7	Fence rails (coated), external joinery (non load-bearing, coated) and cladding (coated)[6]	3c	C/D	NP2	R3c×1	NP2	R3c×1	NP2	R3c×1.25	NP2	R3c×1.25	NP3	R3c×1.5	NP3[8]	R3×1.5
8	Fence rails, deck boards and joists, external joinery (non load-bearing, uncoated), cladding (uncoated) and battens for cladding	3uc	C/D	NP5	R3×1	NP2	R3×1	NP5	R3×1.25	NP3[8]	R3×1.25	*Note 7*			
9	Fence and deck posts, soil-retaining walls, raised beds, bridge timbers (above water)[12]	4	C/D	NP5	R4×1	NP3[8]	R4×1	NP5	R4×1.5	12mm[8,10]	R4×1.5	*Note 7*			
10	Poles	4	D	NP5	R4×1	NP4[8]	R4×1	NP5	R4×1.5	NP5[8]	R4×1.5	*Note 7*			
11	Sleepers	4[11]	D	NP5	R4×1	NP5[8]	R4×1	NP6	R4×1.5	NP6[8]	R4×1.5	*Note 7*			
12	Timber in fresh water	4	D	NP6	R4×1	NP6[8]	R4×1	NP6	R4×1.5	NP6[8]	R4×1.5	*Note 7*			
13	Timber in salt water	5	D	NP6	R5×1	NP6[8]	R5×1	*Note 7*				*Note 7*			
14	Cooling tower timbers (fresh water)	4	D	*Note 7*				*Note 7*				*Note 7*			
15	Cooling tower timbers (salt water)	4[9]	D	*Note 7*				*Note 7*				*Note 7*			

Notes to Table 10

1. Penetration Classes are summarised in Table 9A.
2. Retention expressed as a multiple of the 'R'. Except for unfixed water-soluble preservatives, retention values refer only to the analytical zone. For unfixed water-soluble preservatives, retention should be calculated on the basis of the whole cross section and should be R×2 to allow for possible losses prior to installation.
3. UK government climate change criteria are expected to indicate an increased risk of insect attack in use class 1 in all parts of the UK. Consequently a specifier may consider a Use Class 1 or Use Class 2 treatment is required.
4. Recommended treatment only by a penetrating treatment process.
5. Soleplates are at greater risk of wetting so the decay hazard is higher than for other components in use class 2. For this end use the preservative retention should be derived from R3.
6. These recommendations assume that the exposed surfaces of the woodwork will be painted or given some other protective finish which will be maintained in service.
7. Generic treatment recommendations are not given for these component and service life combinations. See Section 4.3.1 for further explanation. Where such combinations are desired, consult preservative suppliers for recommendations. NP6 Penetration Class will normally be required.
8. Achievement of NP3 and deeper penetration in resistant woods is often very difficult. Processes to aid penetration such as incising may be required.
9. Although timber is exposed to salt water, the exposure hazard is considered to be UC4, not UC5.
10. No appropriate NP class exists for this specification. In this case the penetration requirement and analytical zone are both 12 mm lateral into the sapwood.
11. Sleepers laid on well-drained ballast maintained in service are considered to be Use Class 3 but durability appropriate to Use Class 4 is indicated to meet service life requirements and the safety-critical use. Sleepers in direct ground contact are Use Class 4.
12. Bridge timbers above water are use class 3 but UC4 treatment is recommended.
13. If roof timbers are to be used in the Hylotrupes area then a preservative suitable for use class 1 (dry roofs) or use class 2 (roofs with risk of wetting in service) which has the additional performance code 'N' (effective against wood-boring beetles) must be selected from the preservatives listed in section 2.3

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Table 11 Treatment recommendations for aqueous solutions of boron compounds (Appendix1) listed in 2.3.

COMPONENT (group number and description)		USE CLASS	SERVICE FACTOR	DESIRED SERVICE LIFE (YEARS)											
				15				30				60			
				PRESERVATIVE RECOMMENDATIONS				PRESERVATIVE RECOMMENDATIONS				PRESERVATIVE RECOMMENDATIONS			
				PERMEABLE WOOD		RESISTANT WOOD		PERMEABLE WOOD		RESISTANT WOOD		PERMEABLE WOOD		RESISTANT WOOD	
				PENETRATION[1] /RETENTION[2] kg/m³		PENETRATION[1] /RETENTION[2] kg/m³		PENETRATION[1] /RETENTION[2] kg/m³		PENETRATION[1] /RETENTION[2] kg/m³		PENETRATION[1] /RETENTION[2] kg/m³		PENETRATION[1] /RETENTION[2] kg/m³	
1	Internal joinery	1	A	No treatment required[3]				No treatment required[3]				No treatment required[3]			
2	Roof timber dry	1	B	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0
3	Roof timbers dry (Hylotrupes area)	1	D	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0
4	Roof timbers (risk of wetting) (Also in Hylotrupes area)	2	C	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0
5	External walls/ground floor joists	2	C/D	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0
6	Sole plates (above DPC)	2	D	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0	NP2L[4]	2.0
7	Fence rails (coated) external joinery (non load-bearing, coated) and cladding (coated)	3c	C	NP2L[4, 5]	2.0	NP2L[4, 5]	2.0	NP2L[4, 5]	2.0	NP2L[4,5]	2.0	*Note 6*			
8	Fence rails, deck boards and joists, external joinery (non load-bearing, uncoated) and cladding (uncoated)	3uc	C/D	*Not recommended*											
9	Fence and deck posts, soil-retaining walls, raised beds, bridge timbers	4	C/D												
10	Poles	4	D												
11	Sleepers	4	D												
12	Timber in fresh water	4	D												
13	Timber in salt water	5	D												
14	Cooling tower timbers (fresh water)	4	D												
15	Cooling tower timbers (salt water)	4	D												

Notes to Table 11

1. Penetration Classes are summarised in Table 9A. The penetrations recommended in this table do not allow for machining after treatment.
2. These values are 'boric acid equivalent' (BAE). The values are intended to give a minimum assay of 0.4% m/m BAE. The analytical zone is the full cross section of the piece(s) being analysed.
3. UK government climate change criteria are expected to indicate an increased risk of insect attack in use class 1 in all parts of the UK. Consequently a specifier may consider a Use Class 1 or Use Class 2 treatment is required.
4. Axial penetration requirement is 10 mm (this is different from that indicated in BS EN 351 (30 mm minimum) but reflects a technical re-appraisal of the requirement for the UK)
5. These recommendations assume that the exposed surfaces of the woodwork will be painted or given some other protective finish which will be maintained in service.
6. Standard treatment recommendations are not available for these component and service life combinations. Where such combinations are desired, consult preservative suppliers for recommendations.

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Table 12 Treatment recommendations for creosote[1] conforming to BS EN 13991 and listed in 2.3

COMPONENT (group number and description)		USE CLASS	SERVICE FACTOR	DESIRED SERVICE LIFE (YEARS)											
				15				30				60			
				PRESERVATIVE RECOMMENDATIONS				PRESERVATIVE RECOMMENDATIONS				PRESERVATIVE RECOMMENDATIONS			
				PERMEABLE WOOD		RESISTANT WOOD		PERMEABLE WOOD		RESISTANT WOOD		PERMEABLE WOOD		RESISTANT WOOD	
				PENETRATION[2]	/RETENTION[3] kg/m³	PENETRATION[2]	/RETENTION[3] kg/m³	PENETRATION[2]	/RETENTION[3] kg/m³	PENETRATION[2]	/RETENTION[3] kg/m³	PENETRATION[2]	/RETENTION[3] kg/m³	PENETRATION[2]	/RETENTION[3] kg/m³
1-6	All Internal components			Creosote treatment not permitted in the European Union [1]											
7	Fence rails (coated) external joinery (non load-bearing, coated) and cladding (coated)	3c	C	Creosote treatment not recommended where coatings are to be applied											
8	Fence rails, deck boards and joists, external joinery (non load-bearing, uncoated) and cladding (uncoated)	3uc	C/D	12mm[8]	145	NP3[4]	160	NP5	160	12mm[8]	180	NP5	180	NP5 4	180
9	Fence[5] and deck posts – round	4	C/D	NP4	160	NP3[4]	185	NP5	185	NP4[4]	195	NP5	195	NP5[4]	210
9	Fence[5] and deck posts – sawn, earth-retaining walls, raised beds	4	C/D	NP5	180	NP3[4]	195	NP5	185	12mm[8]	195	NP5	210	NP6[4]	210
10	Poles	4	D	NP4	160	NP4[4]	160	NP5	185	NP5[4]	185	NP5	195	NP5[4]	195
11	Sleepers	4[9]	D	NP5	180	NP5[4]	180	NP5	185	NP5[4]	185	NP5	210	NP5[4]	210
12	Timber in fresh water	4	D	NP5	195	NP5[4]	195	NP5	210	NP5[4]	210	NP5	240	NP5[4]	250
13	Timber in salt water	5	D	NP5	240	NP5[4]	240	NP5	290	NP5[4]	290	*Note 6*			
14	Cooling tower timbers (fresh water)	4	D	NP5	240	NP5[4]	240	NP5	290	NP5[4]	290	*Note 6*			
15	Cooling tower timbers (salt water)	4[7]	D	NP5	290	NP5[4]	290	*Note 6*							

Notes to Table 12

1. Use of creosote-treated timber is restricted in the UK under Regulation (EC) No 1907/2006 of The European Parliament and of the Council - Guidance on the restrictions is available at www.wood-protection.org
2. Penetration Classes are summarized in Table 9A
3. These values take account of industrial experience in the UK. Retention values refer only to the analytical zone.
4. Achievement of NP3 and deeper penetration in resistant woods is often very difficult. Processes to aid penetration such as incising may be required.
5. BS 8417 introduced in 2003 a uniform range of service lives for treatment specifications – 15, 30 and 60 years. However, in the pre-existing standard BS 5589 service lives of 20 and 40 years were indicated. For specifications for fencing components linked to 20 and 40 years, the 15 and 30 year life penetration and retention recommendations respectively in this table are considered to be appropriate.
6. Standard treatment recommendations are not available for these component and service life combinations. Where such combinations are desired, consult preservative suppliers for recommendations
7. Although timber is exposed to salt water, the exposure hazard is considered to be UC4, not UC5.
8. No appropriate NP class exists for this specification. In this case the penetration requirement and analytical zone are both 12 mm lateral into the sapwood.
9. Sleepers laid on well-drained ballast maintained in service are considered to be Use Class 3 but durability appropriate to Use Class 4 is indicated to meet service life requirements and the safety-critical use. Sleepers in direct ground contact are Use Class 4.

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4.5 Factory production control and labelling

By reference to the appropriate Tables 10 - 12 a treater can determine the penetration and loading required to satisfy a given specification. It is the responsibility of the treater to ensure that those treatment criteria are fulfilled. Compliance is achieved by meeting these penetration and retention requirements to an acceptable quality level which involves a combination of process control parameters specific to each timber treatment installation with confirmatory chemical analysis on a mutually agreed basis.

Attestation of Conformity is the phrase used in European Standards to describe procedures for declaring that a material conforms to a relevant specification. There are different levels of Attestation of Conformity ranging from a suppliers declaration to a full third-party assessment and validation. It is anticipated that different levels of attestation will be required for different building components but at the time of the publication of this manual these have not been finalised for treated timber by the European Commission.

Where a treater operates a quality management system which complies with BS EN ISO 9001 Quality Management Systems and a treater can demonstrate that his process reliably achieves the requirements of the specification, analysis of each batch of timber is not necessary. Once a pattern of consistent specification compliance has been established, (a safe relationship) chemical analysis to demonstrate continuing compliance should be undertaken at 6 monthly intervals.

Where a treater does not operate such a Quality Management System specifiers may require analysis of each batch treated.

Unless otherwise required by the customer or specifier a batch should be considered to comply with specification if the requirements of BS EN 351 part 2 are met as follows:

1) *the loading found by analysis in a composite sample comprising portions of the full depth of the analytical zone of the square root of half the total number of pieces from a charge, equals or exceeds the minimum loading required by the specification.*

   If as a result of experience the coefficient of variation (Standard deviation divided by the Mean) is less than 5% a composite sample of 10 pieces can be taken.

2) *Where penetration classes NP 2 to NP6 are included in the treatment requirements, there is no evidence of penetration at the limit of the penetration zone in 10% or less of the samples (25% or less for sawn resistant timber). Where Penetration Class NP1 is included in the treatment requirements assessment of penetration is not required.*

When determining whether the penetration requirements appearing in Tables 10 - 12 have been met, some evidence of penetration at the limit of the penetration zone must be found. Unless acceptable quality levels (AQL) have been agreed between the supplier and customer, those levels given in BS EN 351-1 will apply, and the number of samples selected will be governed by BS EN 351-2. Sampling units shall be selected from a charge immediately after appropriate post-treatment conditioning. As several sampling procedures are destructive, arrangements should be made to include additional material in a batch to be included for sampling purposes.

4.6 Post-treatment handling

4.6.1 Drying treated wood

a) Water based Preservatives

High pressure impregnation with water-containing preservatives increases the moisture content of wood. After treatment this needs to be reduced to a level suitable for the end use of the wood.

Drying may be accelerated by open stickering with through ventilation, by an increase in temperature, or by use of other means such as kiln drying.

Low pressure impregnation with water-containing preservatives will raise moisture levels only in a superficial outer zone and this is normally fully reversible by air drying within a short time.

WPA Benchmark Treated Wood Quality Scheme

Benchmark is a quality assurance scheme operated by the WPA that provides third party verification of the safe established relationship for the treatment of a specific commodity to ensure it is compliant with BS8417 and fit for purpose.

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b) Organic Solvent Based Preservatives

The moisture content is not increased with treatments using organic solvent preservatives. The solvents evaporate quite quickly providing there is adequate ventilation and good airflow. Most timbers can be used within 2 to 7 days of treatment depending on the uptake of preservative and the prevailing conditions.

Occasionally a pack of treated wood will contain some pieces which have pockets of abnormally permeable sapwood. Although undetectable before treatment, after treatment these can be seen as dark-coloured streaks. Such pieces, when identified, should be removed from the pack for prolonged drying before gluing, painting or installation.

c) Creosote

Creosote is used undiluted and as such has no carrier solvent to evaporate and so does not 'dry' in the conventional sense. Users should be aware, therefore, that because it continues to contain liquid preservative for many years it is in the nature of creosoted wood that creosote may re-migrate to the surface, especially when the wood is exposed to sunlight.

4.6.2 Machining

Machining after treatment is not recommended. See 5.3.

4.6.3 Storage of treated timber

All treated timber should be stored at the treatment site in accordance with the requirements of the Wood Protection Association Timber treatment installations - Code of Practice for Safe Design and Operation. It is good practice to protect from the weather all treated timbers destined for use in Use Classes 1 and 2 , also 3 when treated with a preservative that is used with a coating in that Use Class.

5. Using treated timber

5.1 Compatibility with other materials

5.1.1 Adhesives

In consultation with the adhesive manufacturer, select an adhesive appropriate to the in-service exposure condition and appropriate for load bearing or non-load bearing requirements.

Although much treated wood can be bonded perfectly satisfactorily, there are potential incompatibility problems and care is required.

Wood treated with creosote cannot normally be satisfactorily bonded using adhesives.

Wood treated by high pressure with water based preservatives can normally be bonded satisfactorily provided the timber is first re-dried, (i) to a moisture content suitable for the glue being used (usually less than 22%) and (ii) to the in-service moisture content of the timber.

Wood treated with organic solvent preservatives can normally be bonded satisfactorily provided adequate solvent evaporation has occurred. Adhesives differ widely in their tolerance to residual solvent and thus the advice of the specific adhesive supplier should be sought. Compatibility problems may also arise where water based adhesives are used on timber treated with water-repellent grades of preservative, but here again compatibilities differ widely and the advice of the preservative manufacturer and adhesive manufacturer should be sought.

Wood treated with microemulsion preservatives may not bond satisfactorily and the advice of the preservative manufacturer and adhesive manufacturer should be sought.

Although most cured adhesives are not affected by preservative treatment, there are some exceptions to this (notably PVA is often not suitable where timber is subsequently to be treated with water-containing preservative). Additionally, certain timber composites do not retain their integrity during treatment.

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5.1.2 Putties, mastics, sealants, floor coverings

Provided that waterborne preservative treated wood is dried to a moisture content below 22% there should be no difficulties with the application of glazing putties, mastics, sealants or floor coverings.

Organic solvent based preservative treated wood is also compatible provided adequate solvent has evaporated.

5.1.3 Surface finishes

Wood which has been treated with a waterborne preservative, or with an organic solvent based preservative formulated for use under a surface coating, can be painted, stained, varnished or lacquered satisfactorily. It is important however that adequate provision has been made to ensure that the treated wood is in the correct condition for coating. In principle wood should be dry and solvent free. This can vary for the different preservative types and the manufacturer's advice should be sought and followed.

5.1.4 Metal fasteners and fittings

To prevent premature corrosion and failure of metal fixings and fastenings it is important to follow the recommendations of the manufacturer of the metal products for specific advice regarding suitability, desired service life expectations and particular exposure conditions.

Preservative treated timber has a long life expectancy and it is appropriate to use metal fixings and fastenings that will have a comparable length of life.

It is important that the specifier is aware that there are many thicknesses of galvanised coating available and the thicker the galvanised coating the longer the expected service life. The level of galvanising should be commensurate with the end use.

Electroplated metals only provide a thin coating and are unsuitable for exterior applications.

It is important not to apply any metal fixings until the wood has been dried to less than 22%.

It is important that with water-based preservatives metal fixings should not be attached to wood prior to treatment.

If wood treated with a copper containing preservative is to be used with aluminium sheeting an impermeable barrier such as bituminous paper must be included between the materials to prevent direct contact.

Refer to BS 5534:2003 Code of Practice for slating and tiling.

Eurocode 5 (BS EN 1995-1-1) gives minimum specifications for material protection against corrosion for fasteners and fixings used in internal building, low hazard situations (Use Classes 1 and 2) where the moisture content of the treated timber will not exceed 20% throughout its service life.

5.2 Flammability of treated timber

Wood treated with waterborne preservatives show the same flammability as untreated wood unless specific flame retardant properties are claimed.

Once solvent has evaporated, the flammability of wood treated with organic solvent preservatives is no greater than the untreated wood.

The burning characteristics of wood treated with creosote is different from that of untreated wood.

5.3 Cutting after treatment

It is best practice to treat wood in its final dimensions. The exception to this is diffusion treatment with borates (or other application methods achieving comparable penetration) where timber less than 75 mm can be reworked after treatment. For all other treatments, reworking should be limited to cross cutting, boring, drilling or notching and exposed surfaces should be given two liberal brush coats of a suitable preservative as recommended by the manufacturer of the industrial wood preservative.

For treated timber to be used in Use Class 4, always put an uncut end in the ground.

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5.4 Strength of treated timber

For timber treated with preservatives listed in Tables 1 to 5 it may be assumed that any loss of strength or stiffness due to the preservative treatment will be small and may be disregarded. See Specification C11 for information on strength of wood-based board materials. Contact the preservative supplier for specific advice.

6. Safety, health, and the environment

6.1 Wood preservatives

Treatment of wood with preservatives contributes positively to the environment by prolonging the useful life of wood in construction, reducing the requirement to fell timber and reducing the energy inputs into a construction during its desired service life. However, wood preservatives can adversely affect human health and the environment if misused.

The Control of Pesticides Regulations 1986 (as amended) govern the UK's system of approval for the advertising, storage, sale, supply and use of wood preservatives. The Health and Safety Executive (HSE) administers the approval scheme for wood preservatives.

Under new regulations (The Biocidal Products Regulations 2001 and the Biocidal Products Regulations (Northern Ireland) 2001 as amended) made to comply with the Biocidal Products Directive, the UK approval system mentioned in the first paragraph of this section will be phased out in favour of a pan-European system.

The statutory instructions and precautions resulting from such approval are given on the product label and on product safety data sheets for wood preservatives. This information, as well as any specific instructions from the manufacturer, should be followed.

6.2 Treatment plant and treatment processes

Detailed guidance on these aspects may be found in the Wood Protection Association Timber treatment installations - Code of Practice for Safe Design and Operation.

6.3 Treated wood

6.3.1 General

When handling treated wood, protective gloves, footwear and an impervious apron should be worn if the wood is still wet to the touch. Except where treatment has involved creosote, once treated wood has dried, no special precautions are required in the case of occasional handling of treated wood, other than washing hands afterwards. However, in the case of persistent or repeated handling of such wood, it is advisable to use appropriate protection, such as gloves and overalls. Wood treated with creosote does not dry out in the same way and continued precautions may be necessary if the surface is oily.

6.3.2 Machining and sanding treated wood

Machining of treated wood is not recommended (see 4.2). If it is necessary to machine or sand treated wood, an efficient dust extraction system should be used. Attention is drawn to the hazard potential of hardwood and softwood dust, whether treated or untreated (see The Control of Substances Hazardous to Health Regulations (Amendment) Regulations 2004 available at http://www.opsi.gov.uk/si/si2004/uksi_20043386_en.pdf).

6.3.3 Foodstuffs

Care must be exercised in the use of wood preservative treatments to be used in proximity to foodstuffs for human and animal consumption, so as to avoid contamination and tainting. Any conditions laid down in HSE product approvals in this respect must be observed.

6.4 Waste and its disposal

It is recommended that wherever possible, steps are taken to avoid or minimise the production of waste.

6.4.1 Preservative and used containers

Waste wood preservative product and used containers must be disposed of safely in accordance with any conditions laid down in the HSE Approval and by reference to the Product Safety Data Sheet and in accordance with regulations.

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6.4.2 Waste treated timber

Wherever possible redundant treated timber should be reused. Appropriate disposal strategies may be to landfill or incinerate. Enquiries should be made to the local waste management authority or the preservative supplier. Treated wood waste must not be supplied for use as animal bedding or litter; or be used in barbeques or domestic fires.

6.4.3 Disposal options for treated timber

The Wood Protection Association has published Dealing with Treated Wood Related Waste Streams - Guidance Note on the Legislation and Options. This should be consulted for guidance on options for disposal of waste. Copies are available from the WPA.

7. Supporting information

7.1 Evaluation and test procedures

7.1.1 Method for sampling preservatives.

a) Number of items in consignment:

The least number of drums to be sampled out of any given consignment of preservative material, irrespective of whether it is composed of a solid or a liquid, shall be the nearest whole number to the square root of half the total number of drums in the consignment. The drums to be sampled shall be taken at random.

b) Sampling of solid preservatives:

A standard 'thief' of internal diameter 32 mm and probe length 900 mm is a suitable sampling device for the purpose of sampling the quality of the preservative in a drum.

Take three 'thief' samples by the triangulation method from each drum selected for testing. Transfer the contents of the 'thief' to an airtight 2.25 kg sample container. Bulk the extracted samples and mix well. Transfer the entire sample to a clean dry surface and heap into a cone. Turn over to form a new cone until the operation has been carried out three times. Form each conical heap by depositing material on the apex of the cone so that the portions which slide down the side are distributed as evenly as possible, and so that the centre of the cone is not displaced. Some of the larger aggregates of the mixture may roll and scatter round the base, and these should be pushed back to the edge of the heap or broken and distributed evenly over the heap.

Flatten the third cone from the mixed content of the container by repeated vertical insertions of the edge of a board, commencing about the centre and working radially round the cone, lifting the board clear of the material after each insertion. Carry out this operation so that the flattened heap is of uniform thickness and diameter, and the centre coincides with the centre of the original one.

Quarter the heap along two diameters which intersect at right angles, using a suitable divider. Shovel one pair of opposite quarters into a heap and reject the remainder. Mix and cone three times as described above, flatten the cone and quarter along two diameters. Repeat these operations until about 200 g gross sample remains. Take the utmost care to reduce the moisture picked up during the sampling and mixing and reducing processes. If necessary, grind the whole of the gross sample to pass a No. 8 mesh BS test sieve (see BS 410: 'Test sieves') and well mix the ground sample. Immediately enclose the test sample in an airtight container until ready for analysis.

c) Sampling of preservatives in paste form :

A sampling can of about 500 ml capacity is required. It should be fitted with a long, stiff handle so that it can be made to submerge in the material to be sampled. It should also carry a removable lid to which a second stiff handle is attached, so that after the can is immersed in the paste, the lid can be removed, allowing the container to fill. A stout steel stirring rod, suitable for stirring the contents of a drum, is also required.

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Thorough mixing of the preservative in each drum is necessary before the samples are taken. Any settled material should be displaced from the base of the drums using the stirring rod. The drum closures should then be re-attached and the drums shaken and rolled to make the contents completely homogeneous. Mechanical agitation should be used if available. The drums should then be re-opened and examined for uniformity by probing with the steel rod. Alternate stirring, shaking and rolling should be continued until the contents appear to be completely homogeneous.

Three samples are then taken from each drum with the sampling can, one from just below the surface of preservative, a second at a position about half-way between the surface and the base of the drum and thirdly from near the base. The three samples from each drum should be poured into a clean glass or plastic container and mixed together for analysis.

d) Sampling of concentrated preservatives or preservatives supplied as ready to use :

A convenient sampling device consists of a heavy glass tube of 13 mm internal diameter, cut to a length suitable for extracting the treatment solution to a depth of about 600 mm. The actual length of the tube will vary according to the treatment solution container. The bottom end of the tube should be softened in a flame and the glass allowed to collapse until the opening is reduced to 6 mm diameter.

Insert the glass tube vertically into the well mixed solution to be tested, and allow the liquid to reach its natural height in the glass tube. Place the thumb on the end of the tube to prevent movement of the liquid from the tube while the tube is being lifted from the vessel. Lift the tube from the vessel or drum and insert the end into the test bottle. Allow the liquid to drain into the bottle by removing the thumb. Bulk the liquid samples from the various drums or containers, mix and reduce to a suitable volume for analytical purposes. Seal the final container to await analysis.

e) Sampling ready for use preservative in a plant or storage tank :

Ensure a representative sample is taken. Fluid samples should be taken from either the treatment vessel or storage tanks; they must not be taken from drip areas or bunds. Before taking a sample the bulk should be agitated by vigorous stirring or recirculation using pumps

7.1.2 Method of sampling treated timber.

Reference should be made to BS EN 351-2

7.2 Determination of moisture content

7.2.1 Oven dry method

a) Apparatus:

A ventilated oven which can be thermostatically controlled at 103° ± 2°C.

b) Sample selection:

The sample to be cut should be a full cross-section taken not less than 230 mm from one end and 13 - 19 mm thick.

If it is not possible to cut the timber, borings totalling not less than 8 g may be taken not less than 230 mm from one end. The bore should be taken from the sapwood face to the centre of the section using a test borer consisting of a hollow auger and extractor. If the samples cannot be weighed immediately after extraction they should be individually sealed in a weighed airtight container.

c) Procedure :

The samples should be weighed as soon as possible after extraction or cutting and placed in an oven which has been adjusted to a temperature of 103° ± 2°C. The samples should be removed periodically, allowed to cool in a desiccator and then reweighed. The samples should be dried to a constant weight, such that the loss of weight for a drying interval of six hours does not exceed 0.1%.

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d) Calculation :

The moisture content of the sample, as a percentage of the dry weight, is calculated using the following equation:

$$\text{Moisture content (\%)} = \frac{m1 - m2 \times 100}{2 \qquad m}$$

where: m1 is the mass of the sample, in grams, when wet
m2 is the mass of the sample, in grams, after drying to a constant mass.

7.2.2 Moisture meter method

a) Apparatus :

An electrical resistance type moisture meter provided with insulated electrodes and calibrated for the species of wood to be measured. It should be capable of taking an individual measurement with an error of not greater than 2% for moisture contents of between 7% and 28% (m/m). It should be noted that such moisture meters are less accurate outside this range. Additionally, where treated timber is concerned the preservative can influence the accuracy of such meters and the advice of the preservative manufacturer should be sought.

b) Sample selection :

The timbers to be measured should be selected from random positions in the treatment charge. The number of heartwood and sapwood faces should be in the same ratio as the proportions of these types of wood in the charge as a whole.

If the number of components in the charge is n, moisture meter readings should be taken on no fewer than the square root of half n. The moisture content should be measured on each face not less than 230 mm from either end at a point midway across the width.

c) Procedure :

The electrodes should be driven into the wood to half its depth, or to a depth appropriate to the type of wood specified below. The line between the tips of the electrodes should be in direction of, or perpendicular to, the grain according to the instructions for the type of meter used.

TYPES OF TIMBER	ELECTRODE DEPTH
i) Sapwood of all species.	25 mm or sapwood thickness if less than 25 mm.
ii) Heartwood of sweet chestnut, dahoma, danta, ekki, cuarea, iroko, kapur, kempas, makore, mansonia, oak, akan, opepe, utile.	5 mm
iii)Heartwood of species other than those listed in ii)	
Posts	25 mm
Other components	12 mm

7.3 Analysis of biocides used in wood preservatives

Where British Standard methods are available, these should be used. Reference should be made to the British Standards Institution for information on available appropriate analytical methods.

Where no British Standards method exists, the supplier of the biocide should be approached for advice.

The following British Standard documents give guidance on the analysis of wood preservatives and preservative treated timber.

BS EN 212:2003

Wood preservatives – General guidance on sampling and preparation for analysis of wood preservatives and treated timber

BS EN 351-2:1996
Durability of wood and wood-based products – Preservative-treated solid wood. Guidance on sampling for the analysis of preservative-treated wood

BS EN 1014-1:1995
Wood preservatives – Creosote and creosoted timber – Methods of sampling and analysis – Part 1. Procedure for sampling creosote

BS EN 1014-2:1996
Wood preservatives – Creosote and creosoted timber – Methods of sampling and analysis – Part 2. Procedure for obtaining a sample of creosote from creosoted timber for subsequent analysis

BS EN 1014-3:1998
Wood preservatives – Creosote and creosoted timber – Methods of sampling and analysis – Part 3. Determination of the benzo(a)pyrene content of creosote

BS EN 1014-4:1996
Wood preservatives – Creosote and creosoted timber – Methods of sampling and analysis – Part 4. Determination of the water-extractable phenols content of creosote

BS EN 12490: 1999
Durability of wood and wood-based products - Preservative-treated solid wood - Determination of the penetration and retention of creosote in treated wood

PD CEN/TR 14823: 2003
Durability of wood and wood-based products. Quantitative determination of pentachlorophenol in wood – Gas chromatographic method

BS 5666-2:1980
Methods of analysis of wood preservatives and treated timber. Qualitative analysis

BS 5666-3:1991
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of preservatives and treated timber containing copper/chromium/arsenic formulations

BS 5666-4:1979
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of preservatives and treated timber containing copper naphthenate

BS 5666-5:1986
Methods of analysis of wood preservatives and treated timber. Determination of zinc naphthenate in preservative solutions and treated timber

BS 5666-6:1983
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of preservative solutions and treated timber containing pentachlorophenol, pentachlorophenyl laurate, γ- hexachlorocyclohexane and dieldrin

BS 5666-7:1991
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of preservatives containing bis(tri-n-butyltin)oxide : determination of total tin

DD 257-1:2003
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of wood preservative solutions and treated timber containing boron compounds. Determination of total boron

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DD 257-2:2003
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of wood preservative solutions and treated timber containing n-butyltin compounds. Determination of tributyltin, dibutyltin and monobutyltin

DD 257-3:2003
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of permethrin in solutions of wood preservatives in organic solvents

DD 257-4:2003
Methods of analysis of wood preservatives and treated timber. Quantitative analysis of cypermethrin in solutions of wood preservatives in organic solvents

DD 257-5:2003
Methods of analysis of wood preservatives and treated timber. Determination of carboxylic acid type in zinc and copper carboxylate preservative so lutions by gas chromatography

7.4 Standards

The principal British and European Standards concerning wood treatments are:

BS 144
Specification for coal tar creosote for wood preservation
Note this standard is expected to be withdrawn as it conflicts with BS EN 13991 but it contains certain information (e.g. incising patterns) not available elsewhere so is referenced solely for that purpose.

BS EN 314-2
Plywood. Bonding quality. Requirements

BS EN 335-1
Durability of wood and wood-based products – Definition of Use Classes - Part 1: General
Comment: Divides the many situations in which wood may be used into 5 Use Classes.

BS EN 335-2
Durability of wood and wood-based products – Definition of Use Classes - Part 2: Application to solid wood.

BS EN 335-3
Durability of wood and wood-based products - Definition of hazard classes of biological attack - Part 3: Application to wood-based panels.
Comment: when this standard is revised it will refer to 'Use Classes' to align with the revision of BS EN 335 Parts 1 and 2.

BS EN 350-1
Durability of wood and wood-based products - Natural durability of solid wood - Part 1: Guide to the principles of testing and classification of the natural durability of wood.
Comment: Gives information about the "natural durability", i.e. about the inherent resistance or susceptibility of named wood to named agents of biological deterioration.

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

BS EN 351-1
Durability of wood and wood-based products - Preservative-treated solid wood - Part 1: Classification of preservative penetration and retention.
Comment: Provides a "vocabulary" for specifiers to use when specifying penetration and level of chemical protection.

BS EN 351-2
Durability of wood and wood-based products - Preservative-treated solid wood - Part 2: Guidance on sampling for the analysis of preservative-treated wood.

BS EN 460
Durability of wood and wood-based products - Natural durability of solid wood : Guide to the durability requirements for wood to be used in hazard classes.
Comment: Gives guidance on the degree of durability required for satisfactory performance in each of the 5 hazard classes When this standard is revised it will refer to 'Use Classes' to align with the revision of BS EN 335.

BS EN 599-1
Durability of wood and wood-based products - Performance of preventive wood preservatives as determined by biological tests - Part 1: Specification according to hazard class.
Comment: Defines the formal efficacy assessment procedures by which preservative performance can be evaluated. When this standard is revised it will refer to 'Use Classes' to align with the revision of BS EN 335)

BS EN 636
Plywood. Specifications

BS EN 599-2
Durability of wood and wood-based products - Performance of preventive wood preservatives as determined by biological tests - Part 2: Classification and labelling.

BS EN 942
Timber in joinery. General classification of timber quality.

BS 1282
Wood preservatives - Guide on choice, use and application

BS 1722
Fences - 15 parts.

BS 1982-1
Fungal resistance of panel products made of or containing materials of organic origin. Method for determination of resistance to wood-rotting Basidiomycetes

BS 4072
Copper / chromium / arsenic compositions for wood preservation .

BS 4261
Wood preservation - Vocabulary

BS 5268 : Part 5
Structural use of timber : Code of practice for the preservative treatment of structural timber.
Comment: Provides guidance on the preservation of structural timber for use in buildings in the UK. This standard has been declared for obsolescence, which means it is still valid but will not updated.

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BS 5589

Code of practice for Preservation of timber.

Comment: Provides guidance on the preservation of wood to be used, mainly in the UK. Note BS 5589 has been declared for obsolescence, which means it is still valid but will not updated.

BS 5707

Specification for preparations of wood preservatives in organic solvents.

BS 8417

Preservation of timber – Recommendations

Comment: Provides information for the specifier concerning the treatment of timber for use in the UK, drawing upon appropriate portions of the relevant BS EN documents.

BS EN 13991

Derivatives from coal pyrolysis. Coal tar based oils. Creosotes. Specifications and test methods

BS EN 13986

Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking.

DD ENV 1099

Plywood – Biological durability – Guidance for the assessment of plywood for use in different hazard classes – UK National Annex on treatment.

Comment: When this standard is revised it will refer to 'Use Classes' to align with the revision of BS EN 335).

DD ENV 12038

Durability of wood-based products – wood based panels – Method of test for determining the resistance against wood-destroying Basidiomycetes.

Readers of this manual are advised to check that they refer to the current version of a standard, including any amendments. The status of British Standards can be checked online at http://www.bsigroup.com from where copies of standards can also be ordered.

7.5 Other sources of information

WPIF PanelGuide: The Wood Panel Industry Federation, 28 Market Place, Grantham, Lincolnshire NG31 6LR www.wpif.org.uk/panelguide.asp

Appendix 1

Water soluble boron compounds

The following water soluble boron compounds are suitable for use:

Disodium octaborate tetrahydrate ($Na_2B_8O_{13}.4H_2O$)

Boric acid (H_3BO_3)

Disodium tetraborate (($Na_2B_4O_7$)

Disodium octaborate tetrahydrate

a) Prior to dissolution in water the preservative shall be a white powder or granules free from visible impurities and readily soluble in water.

b) Disodium octaborate tetrahydrate shall have a sodium oxide (Na_2O) content within the range 13.7 - 15.7% m/m and a boric oxide (B_2O_3) content within the range 66.1 - 68.1% m/m.

c) The disodium octaborate tetrahydrate shall contain not more than 0.1% m/m of insoluble matter.

d) The preservative solution shall be made up by dissolving the appropriate amount of preservative in water.

e) Since sapstain may develop on the surface of the timber during diffusion treatment, preventative measures are desirable. For this purpose, the solution may contain an adjunct of a suitable biocide.

f) The pH of the solution shall be not lower than 6.0 nor higher than 8.5

Boric Acid

a) Prior to dissolution in water the preservative shall be a white powder or granules free from visible impurities and readily soluble in water.

b) Boric acid shall have a boric oxide (B_2O_3) content within the range 55.0 – 57.0% m/m.

c) The boric acid shall contain not more than 0.1% m/m of insoluble matter.

d) The preservative solution shall be made up by dissolving the appropriate amount of preservative in water.

e) Since sapstain may develop on the surface of the timber during diffusion treatment, preventative measures are desirable. For this purpose, the solution may contain an adjunct of a suitable biocide.

For boric acid the pH of the solution shall not be lower than 3.5 nor higher than 6.1.

Disodium tetraborate

a) Prior to dissolution in water the preservative shall be supplied as a white powder or granules free from visible impurities and readily soluble in water.

b) Disodium tetraborate shall have a sodium oxide (Na_2O) content within the range 29.8 – 31.8 % m/m and a boric oxide (B_2O_3) content within the range 68.2 – 70.2 % m/m.

c) Disodium tetraborate shall contain not more than 0.1% m/m of insoluble matter.

d) The preservative solution shall be made up by dissolving the appropriate amount of preservative in water.

e) Since sapstain may develop on the surface of the timber during diffusion treatment, preventative measures are desirable. For this purpose, the solution may contain an adjunct of a suitable biocide.

f) For disodium tetraborate the pH of the solution shall be not lower than 9.0 or higher than 9.5

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