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BSI Standards Publication

External timber cladding

Part 1: Method of specifying

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Contents

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Foreword

Publishing information

This part of BS 8605 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 December 2014. It was prepared by Panel B/543/-/2, *External timber cladding*, under the authority of Technical Committee B/543, *Round and sawn timber*. A list of organizations represented on this committee can be obtained on request to its secretary.

Relationship with other publications

BS 8605 is published in two parts:

- Part 1: *Method of specifying*; and
- Part 2: *Code of practice for design and installation*.

Some types of external timber cladding are covered by harmonized European Standards BS EN 14915 or BS EN 13986. This British Standard offers suppliers and designers additional information relevant to the UK's climate and construction practices.

Use of this document

It has been assumed in the preparation of this part of BS 8605 that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

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Introduction

External timber cladding assemblies can comprise several types of timber or wood-based components and can be used in a variety of ways. This complexity can cause difficulties when specifying because:

- suppliers need to know what performance characteristics are important and which of these should be declared in product documentation;
- designers need to know what performance characteristics need to be taken into account and which should form part of a cladding specification.

Several factors need to be considered when determining which performance characteristics should be specified. These vary depending upon the type of timber cladding: boards, for example, involve different considerations from shingles. There is, however, no single source of information that suppliers and designers can use when preparing product documentation or specifications.

- External timber cladding made of boards or wood-based panels is within the scope of harmonized standards BS EN 14915 and BS EN 13986, respectively. This means that where a characteristic is covered by one of these standards, manufacturers need to document their products in accordance with that standard. Some provisions only apply in specific circumstances. There is no harmonized standard for shingles and shakes.
- Neither harmonized standard covers all of the performance requirements that apply to external timber cladding. Some additional requirements are given in product standards BS EN 14519, BS EN 14951 and BS EN 15146, although not all criteria are covered.

Accordingly, this standard complements the harmonized standards and product standards for external timber cladding by:

- listing the main performance requirements that might be applicable to external timber cladding in the UK;
- specifying requirements for areas that are outside the scope of harmonized standards; and
- giving guidance on requirements that are covered by BS EN 14915 or BS EN 13986.

As a method of specifying, this part of BS 8605 gives verifiable performance characteristics, which can be controlled by product manufacturers and distributors. Issues, such as cavity ventilation, that become applicable during design and installation are addressed in BS 8605-2.

1 Scope

This part of BS 8605 describes methods of specifying the characteristics of external timber cladding products from which selection has to be made and for which values might have to be agreed between the purchaser and manufacturer.

This part of BS 8605 complements harmonized standards BS EN 14915 and BS EN 13986. It lists all performance requirements that might apply to external timber cladding in the UK and provides a method of specifying those requirements that are outside the scope of those standards, but which are relevant to the UK's climate and construction practices.

This part of BS 8605 specifies characteristics of components at the time they are transferred to the purchaser. It is intended for use by specifiers of external timber cladding components.

NOTE 1 Suppliers can refer to this British Standard for guidance when manufacturing external timber cladding components and preparing technical documentation.

This part of BS 8605 applies to external timber cladding designed to function as a rainscreen. The types of external timber cladding components covered by this standard are boards, shingles and shakes, and wood-based panels. Requirements are listed separately for each of these product types.

NOTE 2 BS 8605-2 gives guidance for designers of external timber cladding assemblies and installers of such products on site. It also gives guidance on the selection of other components in the external timber cladding assembly. These include, for example, cavity barriers, breather membranes, fasteners and flashings.

This part of BS 8605 does not apply to components to be used as non-rainsceen cladding, roofing, solar shading, pressure equalized cladding, double skin facades, curtain walling or any kind of wall covering intended solely for interior use. Nor does it apply to cladding made of composite materials such as fibre cement board or wood-plastic composites.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

BS 8605-2, *External timber cladding – Part 2: Code of practice for design and installation* [1)]

BS EN 301, *Adhesives, phenolic and aminoplastic, for load-bearing timber structures – Classification and performance requirements*

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*

BS 476 (all parts), *Fire tests on building materials and structures*

BS EN 635-2, *Plywood – Classification by surface appearance – Part 2: Hardwood*

BS EN 635-3, *Plywood – Classification by surface appearance – Part 3: Softwood*

BS EN 927-1, *Paints and varnishes – Coating materials and coating systems for exterior wood – Part 1: Classification and selection*

BS EN 927-2, *Paints and varnishes – Coating materials and coating systems for exterior wood – Part 2: Performance specification*

BS EN 1310, *Round and sawn timber – Method of measurement of features*

BS EN 13183-1, *Moisture content of a piece of sawn timber – Part 1: Determination by oven dry method*

BS EN 13183-2, *Moisture content of a piece of sawn timber – Part 2: Estimation by electrical resistance method*

BS EN 13183-3, *Moisture content of a piece of sawn timber – Part 3: Estimation by capacitance method*

BS EN 13307-1, *Timber blanks and semi-finished profiles for non-structural uses – Part 1: Requirements*

1) In preparation.

BS EN 13501-1:2007+A1:2009, *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*

BS EN 13556, *Round and sawn timber – Nomenclature of timbers used in Europe*

BS EN 13647, *Wood flooring and wood panelling and cladding – Determination of geometrical characteristics*

BS EN 13986:2004, *Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking*

BS EN 14519, *Solid softwood panelling and cladding – Softwood machined profiles with tongue and groove*

BS EN 14915, *Solid wood panelling and cladding – Characteristics, evaluation of conformity and marking*

BS EN 14951, *Solid hardwood panelling and cladding – Machined profiles elements*

BS EN 15146, *Solid softwood panelling and cladding – Machined profiles without tongue and groove*

BS EN ISO 2808, *Paints and varnishes – Determination of film thickness*

ISO 13061-2, *Physical and mechanical properties of wood – Test methods for small clear specimen – Part 2: Determination of density for physical and mechanical tests*

PAS 2021, *Exercising due diligence in establishing the legal origin of timber and timber products – Guide to Regulation (EU) No 995/2010*

Other publications

[N1] WOOD PROTECTION ASSOCIATION. *WPA manual: Industrial wood preservation, specification and practice, 2nd edition.* Castleford: WPA, 2012.

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1 air barrier
layer of the construction that provides the primary resistance to the passage of air through the wall

[SOURCE: BS 8298-1:2010, **3.1**]

NOTE 1 The air barrier is part of the backing wall and is normally located near the inner face of the building envelope. In new buildings, it is typically a dedicated air-impervious layer (e.g. a vapour control layer). In existing buildings, it is generally a non-dedicated layer comprising the air-impervious components that are already fitted around the inner face of the building envelope.

NOTE 2 The permeability of the air barrier can affect wind suction on the cladding. See BS 8605-2 for guidance.

3.2 arris
line of intersection of two faces or a face and an edge

[SOURCE: BS 844-3:1995 **3.19**]

NOTE 1 The term applies to internal and external corners of components.

NOTE 2 Sharp arrises can reduce the service life of coating systems.

3.3 biodeterioration
spoilage of appearance and/or loss of strength properties caused by biological agents

[SOURCE: BS EN 1001-2:2005, **1.5**]

3.4 bow
lengthwise curvature of a piece of sawn timber normal to the face

[SOURCE: ISO 24294:2013, **5.34.1**]

3.5 breather layer
layer of a construction that is designed to resist the passage of liquid water from one part of a construction to another, whilst permitting the passage of water vapour in either direction

[SOURCE: BS 8298-1:2010, **3.8**]

*NOTE 1 The breather layer does not function as the air barrier (see **3.1**).*

NOTE 2 The breather layer comprises a breather membrane or other product having similar performance.

3.6 cavity
air layer within a building envelope located between the external cladding and inner components such as the breather layer

NOTE Cavities can be unventilated, slightly ventilated or ventilated as defined in BS EN ISO 6946. Not all cavity types are suitable for use with external timber cladding. See BS 8605-2 for further information.

3.7 cavity barrier
construction provided to close a concealed space against penetration of smoke or flame, or provided to restrict the movement of smoke or flame within such a space

[SOURCE: BS 8298-1:2010, **3.11**]

3.8 cladding
external covering to a structure

[SOURCE: BS 8298-1:2010, **3.12**]

3.9 cleft timber
timber brought to approximately the required cross-section by cleaving along the grain

3.10 closed jointed
external timber cladding that, after installation, has overlapping or force fitted joints between each component

3.11 coating system
combination of coating materials, which are to be applied or have been applied to the face of a joinery part

[SOURCE: BS EN 14220:2006, **3.7**]

3.12 concealed face
face of a joinery part which, after installation of the joinery is completed, is permanently concealed by other parts of the joinery product, or by other parts or other elements, including materials such as veneer, plastic or metal

[SOURCE: BS EN 14220:2006, **3.2**]

NOTE Application of a surface coating does not constitute concealment.

3.13 counter batten
vertical support batten fixed to the building's structure and carrying a horizontal support batten

3.14 cup
curvature of a piece of sawn timber across the width of the face

[SOURCE: ISO 24294:2013, **5.34.3**]

3.15 equilibrium moisture content
moisture content at which wood neither gains nor loses moisture to the surrounding air

[SOURCE: BS EN 1995-1-1:2004+A1:2008, **1.5.2.2**]

NOTE The equilibrium moisture content is on based upon temperature and relative humidity. It is used to characterize the moisture content that timber attains in stable atmospheric conditions (e.g. inside buildings). It has limited relevance in conditions where timber is exposed to frequent or sustained rainfall.

3.16 external timber cladding
timber or wood-based materials used as cladding

NOTE External timber cladding is used in many parts of the world and several methods have been developed in response to different climates. The most important difference is whether the cladding is mounted directly on a building's structure or is separated from it by a cavity to form a rainscreen.

3.17 external timber cladding assembly
all components that go to make up external timber cladding, its support assembly and associated items

NOTE The assembly could include, for example, cladding, support battens, breather membrane, fasteners, cavity barriers, flashings and vermin mesh.

3.18 extractives
compounds present in timber which are extraneous to its structure and can be extracted using water or organic solvents

NOTE Extractives include compounds that are essential to the tree's metabolic activities and others that help prevent attack by wood destroying organisms. The latter types of compound are mainly found in heartwood.

3.19 fibre saturation point (FSP)
state of a piece of timber when the cell walls are saturated with moisture but no moisture exists in the cell cavities

[SOURCE: BS EN 1001-2:2005, **1.15**]

NOTE In most temperate timber species the FSP occurs at a moisture content of approximately 27% to 32%; tropical timbers tend to have a FSP between 19% and 26%.

3.20 fungal decay
biodeterioration caused by fungi

[SOURCE: BS EN 844-12:2001, **12.45**]

3.21 grade
established classification of timber and wood-based panels according to quality or performance

[SOURCE: BS 6100-8:2007, **08 17012**]

3.22 green timber
timber that has not been dried to or below the fibre saturation point

[SOURCE: BS EN 1001-2:2005, **1.18**]

3.23 hardwood
wood of trees of the botanical group dicotyledons

[SOURCE: BS EN 1001-2:2005, **1.20**]

NOTE The term "hardwood" is historical and does not imply that timber from these species is necessarily harder than from a softwood species, nor should it be assumed that all hardwood species have a high natural durability.

3.24 heartwood
inner zone of wood that, in the growing tree, has ceased to contain living cells or to conduct sap

[SOURCE: BS EN 350-1:1994, **3.3**]

3.25 insect attack
biodeterioration caused by insects

[SOURCE: BS EN 844-12:2001, **12.46**]

3.26 knot
portion of a branch embedded in wood

[SOURCE: BS EN 844-8:1997, **8.1**]

3.27 longitudinal shrinkage
shrinkage of timber in a direction parallel to the fibres

[SOURCE: BS EN 844-12:2001, **12.15**]

3.28 modified wood
wood or wood-based product whose properties have been altered by a wood modification process

NOTE For the purposes of this British Standard, modified wood comprises wood that has been modified across the entire cross section of the component. Components that have been subject to "envelope treatments" or have untreated zones (e.g. heartwood) are not within the scope of this standard.

3.29 moisture content
mass of moisture in wood expressed as a percentage of its oven-dry mass

[SOURCE: BS EN 1001-2:2005, **1.27**]

3.30 movement
dimensional changes that take place when timber, which has been dried to a moisture content below the FSP, is subjected to changes in atmospheric conditions

NOTE Movement tends to be linear with moisture within a moisture content range of 5% to 20%.

3.31 movement class
classification of timber species according to their movement values

NOTE Movement classes give an approximate ranking of the dimensional stability of timber species but cannot be used to accurately predict the range of dimensional change in external timber cladding. This is because, firstly, the moisture content of timber cladding is often above 20% and, secondly, knots and other features of timber can have a greater influence on distortion than the movement class.

3.32 movement gap
gap provided between adjacent cladding components to accommodate the anticipated movement

3.33 natural durability
inherent resistance of wood to attack by wood-destroying organisms

[SOURCE: BS EN 1001-2:2005, **3.1**]

NOTE Only heartwood may be classified as durability class 1 to class 4.

3.34 open jointed
external timber cladding that, after installation, has clear longitudinal gaps between each component

3.35 preservative treatment
treatment with wood preservative to improve the resistance of wood to biodeterioration

[SOURCE: BS EN 1001-2:2005, **4.66**]

3.36 pressure equalization
method of sealing and compartmenting the wall that enables the rapid minimization of differential air pressure between cold facade cavities or glazing rebates and the external air

[SOURCE: BS EN 13119:2007, **2.19**]

NOTE Pressure equalization (also known as pressure difference moderation) is mainly associated with non-porous cladding materials such as a sheet metal. This is because moisture penetrates porous cladding materials, such as brick or timber, even if full pressure equalization is achieved. In the case of external timber cladding this moisture has to be removed by drainage and vertical through-ventilation of the cavity. Pressure difference moderation is ineffective in these circumstances.

3.37 purchaser
owner of the building works

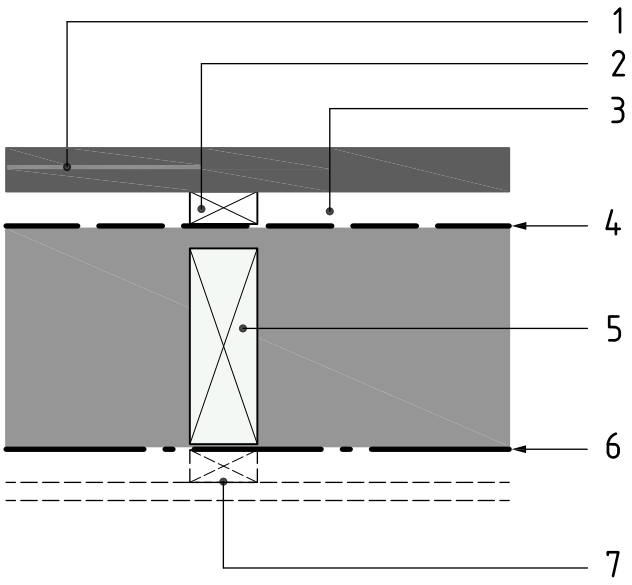
NOTE The purchaser could be represented by a consultant (e.g. architect) or agent.

3.38 rainscreen
external cladding assembly comprising a layered construction where the cladding is separated from the wall structure by a drained and ventilated cavity

NOTE 1 See Figure 1 for an example of a typical build-up of a timber-clad rainscreen wall.

NOTE 2 In temperate oceanic climates, such as the UK, a cavity is generally used between the cladding and structure of occupied buildings to prevent wind-driven rain penetrating the building envelope. The cladding acts to screen out most rain, but it is accepted that some moisture might enter the cavity, from where it is channelled back to the building's exterior through drainage and ventilation. The degree of ventilation required varies according to the materials used. Timber needs more ventilation than cladding made of inorganic materials. Accordingly, the construction detailing and terminology used with timber rainscreens differ from those formed from other materials. Timber rainscreen cladding can be closed jointed or open jointed. External timber cladding on framed buildings that are not insulated (e.g. barns, steeples, workshops) is able to dry to the interior of the building and so might not need a ventilated cavity. Occupied buildings are often constructed in this way in relatively warm or dry climates. BS 8605-2 gives guidance on cavity drainage and ventilation.

Figure 1 **Typical build-up of a timber-clad rainscreen wall (plan section)**



Key

1 External timber cladding (open or closed jointed)
2 Drained and ventilated cavity
3 Support batten fixed to the wall structure
4 Breather layer
5 Wall structure
6 Air barrier
7 Room lining such as plaster board (with optional services void)

NOTE 1 In this example:

- *The cladding consists of horizontal boards. Other types of timber cladding (e.g. vertical boards) are acceptable although they might require a layer of horizontal support battens.*
- *The wall structure is a timber frame consisting of vertical studs braced with a sheathing board immediately behind the breather layer. Other types of timber frame (e.g. reverse wall, structural insulated panels) are acceptable as are wall structures of metal frame, masonry etc.*
- *The breather layer is a breather membrane. Other types of breather layer such as moisture resistant wood fibre board are acceptable.*
- *For clarity, the fasteners are not shown.*

*NOTE 2 The breather layer forms a drainage plane at the rear face of the cavity. All components outside of the breather layer are assumed to be in the wet zone (see **3.58**).*

NOTE 3 The cavity can be part filled with insulation providing that drainage and ventilation routes are maintained.

3.39 reaction to fire
response of a product in contributing by its own decomposition to a fire to which it is exposed, under specified conditions

[SOURCE: BS EN 13501-1:2007+A1:2009, **3.1.15**]

3.40 sapwood
outer zone of wood that, in the growing tree, contains living cells and conducts sap

[SOURCE: BS EN 1001-2:2005, **1.37**]

NOTE Sapwood is frequently paler than heartwood although it is not always clearly differentiated.

3.41 shake
relatively small cladding component made of cleft timber and laid in overlapping layers similar to tiles

3.42 shingle
relatively small cladding component made of sawn timber and laid in overlapping layers similar to tiles

3.43 shrinkage
initial decrease in dimension of a piece of timber as it first dries below FSP

NOTE 1 Longitudinal shrinkage is minimal and so usually ignored. Shrinkage is not directly related to movement.

NOTE 2 Shrinkage values are useful in estimating the approximate dimensional allowances necessary when green timber is used as cladding. An additional allowance might be needed to take account of losses due to distortion.

3.44 softwood
wood, whether soft or not, of trees of the order Gymnospermae

[SOURCE: BS EN 1001-2:2005, **1.38**]

NOTE 1 Most commercial timbers of this group belong to the botanical class Coniferae (conifers).

NOTE 2 The term "softwood" is historical and does not imply that timber from these species is necessarily softer than from a hardwood species, nor should it be assumed that all softwood species have a low natural durability.

3.45 spring
lengthwise curvature of a piece of sawn timber normal to the edge

[SOURCE: ISO 24294:2013, **5.34.2**]

3.46 supplier
manufacturer or distributor

3.47 support batten
timber component, of a section, grade and durability suitable for supporting external timber cladding

NOTE The term includes battens (which are used horizontally or diagonally) and counter battens (which are only used vertically).

3.48 surface finish
timber surface that has been shaped to final size, profile and texture

NOTE Shaping is usually by a mechanical process such as sawing, planing or brushing, although cleft timber is also used.

3.49 treatability
the ease with which a wood can be penetrated by a liquid (for example, a wood preservative)

[SOURCE: BS EN 350-2:1994, **3.4**]

3.50 twist
lengthwise spiral distortion of a piece of sawn timber

[SOURCE: ISO 24294:2013, **5.34.4**]

3.51 use class
moisture exposure situation of the wood element in use

NOTE 1 Guidance on use classes can be found in BS EN 335.

NOTE 2 The use class system classifies the risk of biodeteriation of timber in different moisture exposure situations. It does not relate to the effect of moisture upon timber's strength, deformation or corrosion risk. These issues are addressed through the service class system given in BS EN 1995-1-1. See BS 8605-2 for guidance.

NOTE 3 In older standards, the term "hazard class" was used instead of "use class".

3.52 use class 3
situations in which the wood or wood-based product is above ground and exposed to the weather (particularly rain)

NOTE 1 In use class 3, the moisture content of timber is frequently at or above 20%.

NOTE 2 Calculations (e.g. of movement) based upon equilibrium moisture content are of limited relevance in use class 3 due to the frequent presence of a film of water on the timber surface.

3.53 vapour control layer
layer comprising a material or coating with greater resistance to vapour transmission than the other layers of the wall and designed to control vapour movement through the wall

[SOURCE: BS EN 13119:2007, **2.34**]

3.54 visible face
face of a joinery part which, after installation of the joinery is completed, is not permanently concealed or semi-concealed

[SOURCE: BS EN 942:2007, **3.4**]

NOTE Application of a coating system does not constitute concealment.

3.55 wall
part of a building envelope where the mean slope is no more than 15° from the vertical

NOTE The wall can slope inwards or outwards.

3.56 wane
original rounded surface of a log, with or without bark, on any face or edge of sawn timber

[SOURCE: BS EN 844-3:1995, **3.6**]

3.57 warp
distortion of a piece of timber in the process of conversion, and/or drying and/or storage

[SOURCE: BS EN 1001-2:2005, **1.52**]

3.58 wet zone
part of the rainscreen system that can be assumed to be exposed to rainfall, either directly or as a result of water flowing through joints and gaps in the system

[SOURCE: BS 8298-1:2010, **3.37.1**]

NOTE 1 It is usually possible to identify one layer of the construction as being the watertight layer. All parts of the construction outside this layer can be assumed to be in the wet zone.

NOTE 2 In the case of external timber cladding in the UK, the watertight layer is generally the breather layer.

NOTE 3 In the case of porous cladding materials such as timber, moisture can flow into the cavity through the material itself even if all joints and gaps are closed. This is not a problem providing that the cladding assembly is resistant to moisture effects (e.g. biodeterioration) and is detailed for drainage and ventilation.

3.59 wood-based panel
solid wood panel, laminated veneer lumber (LVL), plywood, oriented strand board (OSB), resin-bonded particleboard, cement-bonded particleboard or fibreboard

[SOURCE: BS EN 13986:2004, **3.1**]

3.60 wood density
mass of a unit volume of wood at a specified moisture content

3.61 wood destroying organisms
organisms (typically basidiomycete fungi, beetles and termites) which colonize wood and affect its structural integrity by using its components as food or shelter

3.62 wood disfiguring fungi
fungi causing blue stain or mould in service

NOTE Wood disfiguring fungi are mainly of practical concern in relation to aesthetic appearance. In the case of external timber cladding, the organisms can colonize uncoated timber where they are an important factor in weathering. They can also colonize some types of coating system.

3.63 wood modification
action of a chemical, physical or other process upon the material, in order to achieve a desired property enhancement during the service life of the material

NOTE 1 If the modification is intended for, or confers, improved resistance to biological attack, then the mode of action should, as far as can be determined, be non-biocidal.

NOTE 2 The most common processes are chemical modification and thermal modification.

3.64 wood preservative
active ingredient(s) or preparations containing active ingredient(s), in the form in which they are placed on the market, which are on the basis of the properties of their active ingredient(s), intended either to prevent wood-destroying or wood disfiguring organisms (fungi, insects and marine borers) from attacking wood and wood-based products, or to combat an attack by those organisms

[SOURCE: BS EN 1001-2:2005, **1.56**]

4 General

The specifier shall ensure that all relevant requirements for the characteristics of external timber cladding components are included in the specification given to the supplier. Table 1 lists the characteristics that shall be specified for each type of product, as well as optional characteristics that might be required in some circumstances.

When preparing a specification, designers shall select the appropriate characteristics from Table 1. Test methods are given for each characteristic and shall be specified as appropriate.

NOTE 1 See BS EN 14915 and BS EN 13986 for requirements for CE marking. Annex A provides further information.

NOTE 2 A few criteria, such as weathering, are not included in Table 1 because they are unverifiable. Others are omitted because they are included as sub-categories within a listed characteristic. Requirements for preservative treatment, for example, are given within the clause for durability against biological attack.

Table 1 **Performance requirements for external timber cladding and support battens**

Characteristic	Boards	Shingles and shakes	Wood-based panels	Clause
Moisture content	M	O	O	**5**
Durability against biological attack	M	M	M	**6**
Species	M	M	O	**7**
Grade	M	M	O	**8**
Geometrical characteristics	M	M	M	**9**
Warp	M	O	O	**10**
Resistance to fixing	M	O	M	**11**
Dimensional stability	M	–	–	**12**
Reaction to fire	M	O	O	**13**
Resistance to deformation	O	–	O	**14**
Bonding quality	O	–	M	**15**
Coating system	O	–	O	**16**
Wood density	O	–	–	**17**
Hygrothermal performance	O	–	O	**18**
Release of dangerous substances	O	–	O	**19**
Moisture resistance	–	–	M	**20**
Airborne sound insulation	–	–	O	**21**

KEY M *Mandatory* O *Optional*

5 Moisture content

*COMMENTARY ON Clause **5***

The mean moisture content in the heartwood of all unmodified solid timber within an external cladding assembly in the UK is approximately 16% during dry weather, although during rain storms it can range up to a maximum near the FSP for the timber species concerned. The minimum moisture content of unmodified timber is around 10% irrespective of the species. The moisture content in external cladding components made of modified wood or wood-based panels depends upon the material. Modified woods, for example, can have a moisture content of between 3% and 25% when used as external cladding. Support battens are in the wet zone of the building envelope and so have a similar moisture content to the cladding. In this clause, moisture content values are expressed in accordance with BS EN 14298, wherever applicable. BS 8605-2 gives further guidance on moisture content.

5.1 General

Moisture content shall be agreed between the purchaser and supplier.

5.2 Moisture content of boards

One of the following moisture content requirements shall be specified, depending upon the nature of the timber.

a) When measured in accordance with **5.5**, the moisture content of boards (excluding those that are made of modified wood or are impregnated with preservatives or flame retardants) shall be (16 ±4)% unless otherwise agreed between the purchaser and supplier.

NOTE 1 This value is in accordance with BS EN 942.

NOTE 2 Green or part air dried timber can also be used as external cladding providing special provisions are made to accommodate its characteristics. See BS 8605-2 for guidance.

b) When measured in accordance with **5.5**, the moisture content of boards made of modified wood shall be (5 ±3)%.

c) Preservative treated boards shall be held until in a drip free condition.

NOTE 3 To prevent loss of treatment product to the environment, preservative treated wood should be held by the supplier until the wood surfaces are free of drips. For further information, see WPA manual: Industrial wood preservation, specification and practice *[N1].*

NOTE 4 It is not practical to specify a more precise moisture content for preservative treated timber. Although the surface of preservative treated timber might be relatively dry, its core moisture content should be assumed to be at least 22%.

NOTE 5 The flame retardant manufacturer might be able to advise on the moisture content of timber that has been treated with their product.

5.3 Moisture content of shingles and shakes

Preservative treated shingles and shakes shall be held until in a drip free condition.

*NOTE 1 See **5.2**, Notes 3 and 4.*

*NOTE 2 Some types of shingles and shakes might be supplied without preservative treatment (see **6.1.2**). Such products should be assumed to be green.*

5.4 Moisture content of wood-based panels

When measured in accordance with **5.5**, the moisture content of wood-based panels shall be specified as (5 ±3)% unless otherwise agreed between the purchaser and supplier.

5.5 Moisture content measurement

The moisture content of solid timber (excluding modified wood and wood treated with a preservative or flame retardant) shall be measured with an electronic moisture meter in accordance with BS EN 13183-2 or BS EN 13183-3.

NOTE Electronic moisture content readings can be affected by some types of wood modification, wood preservative, flame retardant and glue.

In cases of dispute, the moisture content of timber shall be measured gravimetrically in accordance with BS EN 13183-1.

The moisture content of modified wood, timber containing preservatives or flame retardants, and wood-based panels shall be measured gravimetrically in accordance with BS EN 13183-1.

In the event of a dispute, moisture content sampling of timber components (excluding modified wood, wood-based panels and timber containing preservatives or flame retardants) shall conform to Annex B.

6 Durability against biological attack

*COMMENTARY ON Clause **6***

All of the external timber cladding assembly is classified as use class 3 in accordance with BS EN 335:2013. This means that timber is exposed to frequent wetting but is out of ground contact. The biodeteriorating organisms in use class 3 in the UK are fungi and insects; wood disfiguring fungi also occur.

The external timber cladding assembly should have sufficient natural or conferred durability for use class 3. This can be achieved by either:

- *selection of heartwood of appropriate natural durability (see **6.1**);*
- *by using modified wood of appropriate durability (see **6.2**); or*
- *appropriate preservative treatment (see **6.3**).*

The level of natural or conferred durability should be appropriate for the desired service life. The risk and consequences of failure and ease of maintenance and replacement should be taken into account.

This clause only addresses natural durability and conferred durability. The other factors are addressed in BS 8605-2. Wood disfigurement is also addressed in BS 8605-2.

6.1 Natural durability

*COMMENTARY ON **6.1***

BS EN 350-2 gives natural durability classifications for most of the timber species that are available in Europe. It gives five classes of natural durability against fungi, ranging from 1 (very durable) to 5 (not durable). Sapwood of all species is assigned to durability class 5 and so the higher classes only apply to heartwood. The natural durability of some species varies in which case the timber should be assigned to the lowest durability class within its range. If a timber is not listed in BS EN 350-2, it should be tested in accordance with BS EN 350-1. For ease of reference, Annex C gives natural durability classes for most timber species currently used as external cladding in the UK in accordance with BS EN 350-2. Durability against insect attack involves a different classification but in external cladding timber in the UK this is less important than durability against fungal decay.

6.1.1 Natural durability of boards

*COMMENTARY ON **6.1.1***

Boards come within the scope of BS EN 14915, which states that the natural durability of a timber species should be as given in BS EN 350-2 or be tested in accordance with BS EN 350-1.

The specifier shall specify the natural durability of boards in accordance with BS EN 14915.

NOTE BS EN 14915 does not give guidance on how to select a performance level for the natural durability of external cladding boards. In the absence of such guidance, specifiers should refer to Annex D.

6.1.2 Natural durability of shingles and shakes

*COMMENTARY ON **6.1.2***

Shingles and shakes are usually made of imported western red cedar. Other timbers such as eastern white cedar, European oak, sweet chestnut, larch or home-grown western red cedar are also used. The majority of shingles and shakes are sold as roof cladding. Experience has shown that most timber species ought to be preservative treated for use as a roof covering in the UK. The exceptions are European oak and sweet chestnut, which might give adequate performance on a roof without preservative treatment. The natural durability requirements for shingles and shakes used as wall cladding (see Annex D) are not as demanding as that for roofs.

The specifier shall specify the natural durability class of shingles and shakes according to the degree of wetting and service conditions of the timber component in use; guidance on selecting an appropriate performance level is given in Annex D.

If a timber species is listed in Annex C, the natural durability of its heartwood is to be as given there; otherwise it shall be tested in accordance with BS EN 350-1.

If sapwood is present beyond the limits specified in Annex E, the timber shall be designated as durability class 5.

Where the natural durability of a timber species varies, the timber shall be assigned to the lowest durability class within its range.

The specifier shall state that the timber species used in a finished external cladding product shall remain the same or shall not change to an extent which would change the natural durability class. An alternative timber species shall only be substituted with the agreement of the purchaser.

Where the natural durability of a shingle or shake does not conform to this subclause, it shall be preservative treated in accordance with **6.3.2**.

6.1.3 Natural durability of wood-based panels

*COMMENTARY ON **6.1.3***

Wood-based panels come within the scope of BS EN 13986, which states that natural durability should be appropriate to the use class as given in BS EN 335.

Plywood should conform to DD CEN/TS 1099. DD CEN/TS 1099 states that the natural durability of plywood should be selected according to the use class of its end use situation and taking into account any risk from the perceived hazards that are likely to occur. Preservative treatment should be used where natural durability is judged to be insufficient for the use class. No comparable standard is available at the time of publication for the other wood-based panels that are used as external cladding, although some of the guidance in DD CEN/TS 1099 might be applicable.

The specifier shall specify the natural durability of wood-based panels in accordance with BS EN 13986.

6.2 Wood modification

*COMMENTARY ON **6.2***

Some modified woods can be used in external timber cladding as boards or as a constituent of wood-based panels. Modified woods are not used as shingles or shakes. Wood modification is a rapidly changing field that is not yet fully standardized. The Wood Protection Association gives guidance on the modified wood products for use in the UK in their Modified wood specification manual *[1], although it should be borne in mind that recently introduced modified woods might not be included. In terms of resistance to wood destroying organisms, modified woods can usually be specified as if they are timber species of equivalent natural durability. Their suitability for use class 3 conditions can be expressed in terms of desired service life categories taken from BS 8417. These categories are outlined in Annex D.*

6.2.1 Wood modification for boards

Modified wood for use as external cladding boards shall be specified to achieve a desired service life of either 30 years or 60 years in use class 3 conditions.

NOTE Annex D gives guidance on selecting an appropriate level of resistance to biological attack.

6.2.2 Wood modification for wood-based panels

*COMMENTARY ON **6.2.2***

Wood-based panels come within the scope of BS EN 13986, which states that natural durability should be appropriate to the use class as given in BS EN 335.

The specifier shall specify the wood modification for wood-based panels in accordance with BS EN 13986.

6.3 Preservative treatment

6.3.1 Preservative treatment of boards

*COMMENTARY ON **6.3.1***

Boards are within the scope of BS EN 14915, which states that preservative treatment should be in accordance with BS EN 599-2, specifically:

- *use class in accordance with BS EN 335 (external timber cladding is in use class 3);*
- *wood preservative performance in accordance with BS EN 599-2 for use class 3;*
- *penetration class in accordance with BS EN 351-1;*
- *mean retention of preservative in the analytical zone in accordance with BS EN 351-1.*

Preservative retention should be equal to or better than the requirement for the use class; all cutting and machining of the timber component should be completed before preservative treatment; and in case of wane, the bark should be removed before treatment. Any unavoidable post-treatment cross-cutting, notching or boring should be re-treated with an appropriate end grain preservative. Any rip sawn boards should be returned to the treatment plant.

BS EN 599-2 does not give guidance on how to select a performance level for preservative treated timber cladding boards. Selection of performance levels is addressed in BS 8417, which gives recommendations for preservative treatment processes that conform to BS EN 599-2. WPA manual: Industrial wood preservation, specification and practice *[N1] gives guidance on preservative treatment of timber in accordance with BS 8417. In this manual, external timber cladding is covered by WPA commodity specification code C6.*

The specifier shall specify that, where boards are to be preservative treated, it shall be performed in accordance with BS EN 14915.

6.3.2 Preservative treatment of shingles and shakes

The specifier shall specify that, where shingles and shakes are to be preservative treated, the process shall be performed in accordance with commodity specification code C6 in *WPA manual: Industrial wood preservation, specification and practice* [N1].

6.3.3 Preservative treatment of wood-based panels

The specifier shall specify that, where wood-based panels are to be preservative treated, the process shall be performed in accordance with BS EN 13986.

NOTE DD CEN/TS 1099 gives current preservative treatment guidance for plywood.

7 Species

*COMMENTARY ON Clause **7***

Although timber for external timber cladding can be selected on the basis of performance requirements alone, it is more common to specify the species required. This is a convenient and reliable way of ensuring that a particular combination of performance characteristics is provided. The relevant timber characteristics of most species are given in Annex C.

The commercial names of timber species (e.g. redwood) are ambiguous as they can refer to several species or to different species depending upon the location or usage. A timber species should, therefore, be identified using either its two part botanical name (e.g. Pinus sylvestris*) or the four letter code given in BS EN 13556 (e.g. PNSY). Commercial names (e.g. Scots pine) can also be used but are not, by themselves, sufficient for product specification. Annex C gives the commercial name, botanical species and four letter code for timbers frequently used as external cladding in the UK. Some species have different characteristics depending upon their provenance (e.g. old growth forest or plantation); this is addressed in Annex C.*

*Modified woods are not included in Annex C because they are proprietary products. These products are specified by their proprietary trade names and not the timber species they are made from (see **6.2**).*

Individuals and organizations that trade in timber and wood-based products within the EU have an obligation to ensure that the products they sell are harvested in accordance with the applicable legislation in the country of harvest. Attention is drawn to the relevant EU regulations [2] [3]. Sustainable timber sourcing might also be required, particularly for contracts involving public procurement. Guidance on these issues is available from several sources, including PAS 2021, the CPET website [2] *and TRADA Technology's* Construction briefing on EU timber regulations *[4]. Some timber species, particularly in the tropics, are threatened due to over-exploitation. The* Convention on International Trade in Endangered Species (CITES) [3] *lists species in which trading is prohibited. Even where trading in a species is permitted, it might be still be at risk.* The IUCN Red List of Threatened Species [4] *gives the environmental status of most timbers.*

7.1 Species for boards, shingles and shakes

The species of timber used shall be specified with regard to the appearance expected, the suitability for the intended purpose, the general characteristics of the species itself and sustainability (see Annex C and Annex D for guidance).

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[2] See <http://www.cpet.org.uk> [last viewed 5 December 2014].
[3] See <http://www.cites.org> [last viewed 5 December 2014].
[4] See <http://www.iucnredlist.org> [last viewed 5 December 2014].

Species shall be specified in accordance with BS EN 13556 or using their botanical names.

Modified woods shall be specified using their proprietary trade names.

7.2 Species for wood-based panels

Species for wood-based panels shall be specified in accordance with BS EN 13986.

Wood-based panels made of modified woods shall be specified using their proprietary trade names.

8 Grade

8.1 General

The specifier shall specify that timber intended for use as part of an external timber cladding assembly shall be graded in accordance with the quality requirements in **8.2**, **8.3** or **8.4**, as applicable.

Features of solid timber specified shall be measured in accordance with BS EN 1310.

8.2 Grades for boards

Unless otherwise agreed between the purchaser and the supplier, the grading of boards specified shall conform to the requirements in Annex E or shall be carried out using reference samples.

NOTE 1 Reference samples provide a practical and readily understood quality standard for the timber supplier, purchaser and installer. They are particularly useful where a timber supplier or contractor is unfamiliar with grading timber for external cladding applications. Where reference samples are used, they should show the lower limit of the quality to be provided and be of sufficient size and number to clearly demonstrate what is needed.

NOTE 2 The grades in BS EN 14519, BS EN 14951 or BS EN 15146 can be used as an alternative to those in this subclause, although they might not be suitable for all circumstances.

Suppliers may remove unacceptable timber before it is dried and grading shall be undertaken after boards have been dried in accordance with **5.1**.

Where cladding boards are to be finished with a coating system, grading shall be done before the coating is applied.

NOTE 3 Timber that is to be factory pre-coated might require a more restrictive grading criteria than if uncoated timber is to be used. Suppliers who offer factory pre-coated cladding boards should check with the manufacturer of the coating system to ensure that the grading criteria are appropriate.

Glued joints (i.e. laminated or finger jointed) shall conform to **13.1**.

In the event of dispute, the quality of a lot or batch shall be assessed in accordance with Annex B.

8.3 Grades for shingles and shakes

Unless otherwise agreed between the purchaser and the supplier, the shingles and shakes specified shall be graded in accordance with the criteria issued in their country of origin or by using reference samples.

NOTE 1 The grading of shingles and shakes can vary according to the wood species. It is, therefore, not possible to issue common grades for all species.

*NOTE 2 Shingles and shakes of western red cedar (*Thuja plicata*) and eastern white cedar (*Thuja occidentalis*) should be graded in accordance with criteria issued by the Canadian Standards Association [5] [6]. Other species might have grades issued by their manufacturer.*

*NOTE 3 See **8.2** for a note on reference samples.*

8.4 Grades for wood-based panels

Plywood specified to be used as external cladding shall conform to the grades in BS EN 635-2 or BS EN 635-3, as applicable.

NOTE No equivalent grades are published for other wood-based panels used as cladding. The panel manufacturers might be able to advise.

9 Geometrical characteristics

*COMMENTARY ON Clause **9***

*Suppliers can offer any timber cladding profile that meet the applicable criteria in **9.1** to **9.4**. Solid timber used as external cladding can have a range of surface finishes, for example:*

- *an off-saw finish has saw marks, roughness and other signs of saw processing;*
- *a semi-profiled finish is planned, brushed or otherwise shaped so that most, but not all, roughness is removed;*
- *a profiled finish means that surfaces are machined to remove roughness and regularize the section;*
- *a cleft finish has irregular grain, roughness and other signs of being shaped by cleaving (mainly associated with shakes).*

9.1 General

Timber components for use as external cladding shall be specified to be cleanly and accurately shaped to the final size and to have a surface finish suitable for the type of component and the coating system, if any, to be used.

Manufacturing tolerances shall be specified in accordance with **9.2**, **9.3** or **9.4**, as appropriate.

*NOTE Requirements for coating systems are given in Clause **16**.*

9.2 Geometrical characteristics of boards

All forms of external timber cladding boards shall be specified, provided that:

a) their spans are <600 mm;

NOTE 1 Where longer spans are unavoidable (e.g. with some types of diagonal cladding), the board thicknesses should be increased in accordance with BS EN 8605-2.

b) their thickness, after making allowance for shrinkage, is >9 mm;

NOTE 2 Attention is drawn to the Building Regulations [7] [8] [9] [10].

c) board profiles are compatible with the dimensional stability of the timber species, its specified moisture content and the selected grade;

NOTE 3 Table F.1 gives guidance on assessing compatibility.

d) exposed top surfaces of horizontal cladding are angled, with a slope of not less than one in eight (7°), to shed water away from the cavity behind the cladding;

NOTE 4 A slope of 15° to 30° gives optimum performance.

e) where a board profile is included in Annex F, its dimensions and permitted deviations are as specified therein;

NOTE 5 Other profiles might also be suitable providing that they address the criteria in this subclause.

f) unless otherwise agreed between the purchaser and the supplier, arrises on profiles to be given a surface coating (in the factory or on site) shall conform to **16.1**; and

g) dimensions shall be given at the applicable moisture content in **5.1**.

Unless otherwise agreed between the purchaser and the supplier:

1) boards that have been dried to the moisture content in accordance with **5.1** shall be specified to have the applicable cross-sectional tolerances in Table 2;

2) boards that are supplied green shall be specified to be supplied to a tolerance of +4 mm/-1 mm;

3) tolerances shall be measured in accordance with BS EN 13647.

Table 2 **Cross-sectional tolerances for boards**

Type of surface finish	Cross-sectional tolerance (mm)
Off-saw	+2
	–1
Semi-profiled	+1
	–0.5
Profiled	+0.5
	–0

NOTE The off-saw and profiled criteria are based on BS EN 13307-1.

The specifier shall ensure that the tolerances in Table 2 are applied at a moisture content of 12%. For tolerances at other moisture contents, Equation 1 shall be used to correct the tolerance to a 12% value:

$$\Delta = 3d\left(\frac{12-w}{1000}\right) \quad (1)$$

where:

Δ is the calculated tolerance;

d is the face dimension (mm) at moisture content w; and

w is the moisture content.

Specified lengths of boards shall not have any negative tolerance.

In the event of dispute, tolerances shall be assessed in accordance with Annex B.

9.3 Geometrical characteristics of shingles and shakes

*COMMENTARY ON **9.3***

Shingles and shakes have a range of geometrical characteristics. In general:

- *Shingles have a smooth face and are often radially cut from the timber block to ensure that the edge grain is continuous along the shingle. They can also be tangentially cut, although performance might be impaired. Shingles can be machine retrimmed; this is also known as rebutted and rejointed.*
- *Shakes have at least one rough surface. A type known as handsplit and resawn is produced by hydraulically splitting the timber block and then sawing the section from corner to corner to produce a split face and sawn back. Other types include taper split, straight split and tapersawn. Taper split and straight split are produced by hand using a steel froe and mallet. Tapersawn are produced by sawing both faces of the shake to give an appearance similar to a shingle.*

Shingles and shakes generally taper in thickness. The top (concealed) end is usually thinner than the bottom (exposed) end. The bottom end is normally squared off, although diagonal or curved ends are available.

All forms of shingles and shakes shall be allowed within the specification, provided that:

a) their appearance and geometrical characteristics are suitable for their intended use; and

b) their thickness, after making allowance for shrinkage, is >9 mm.

NOTE 1 Attention is drawn to the Building Regulations [7] [8] [9] [10].

Dimensions shall be given at the applicable moisture content conforming to **5.2**.

The methods of measurement of geometrical characteristics shall be specified in accordance with BS EN 1310.

NOTE 2 National trade associations might specify geometrical characteristics for their shingles and shakes.

Unless otherwise agreed between the purchaser and the supplier, the surface finish of shingles and shakes shall be carried out to a specification issued by their manufacturer.

*NOTE 3 Shingles and shakes are made to a range of surface finishes. Where no suitable specification is available, the finish can be agreed by means of reference samples (see **8.2**, Note 1).*

Dimensional tolerances shall be as agreed between the supplier and purchaser.

Tolerances shall be measured in accordance with BS EN 13647.

9.4 Geometrical characteristics for wood-based panels

The specifier shall specify the width, height and thickness of wood-based panels. The thickness of wood-based panels shall be specified to be at least 9 mm.

NOTE Attention is drawn to the Building Regulations [7] [8] [9] [10].

10 Warp

10.1 Warp in boards

Unless otherwise agreed between the purchaser and the supplier, warp in cladding boards shall be no greater than that specified in Table 3.

Where twist appears to be combined with bow or spring the permissible values shall be halved.

Any defect of flatness shall be compatible with the relevant tolerances in Table 2.

Warp shall be measured in accordance with BS EN 1310.

In the event of dispute, warp shall be assessed in accordance with Annex B.

Table 3 **Maximum permitted warp in cladding boards**

Type of warp	Type of finish	
	Off-saw	Semi-profiled or profiled
Cupping (C)	C = b/100 or 1 mm, whichever is the greater	C = b/100 or 0.2 mm, whichever is the greater
Bow (F)	$F = (L/1\,000)^2$ or 2 mm, whichever is the greater	$F = (L/1\,000)^2/2$ or 1 mm, whichever is the greater
Spring (V)	V = (L/1 000) x b/50 or 2 mm, whichever is the greater	V = (L/1 000) x b/100 or 1 mm, whichever is the greater

NOTE 1 The information in this table is based on BS EN 13307-1.

NOTE 2 b = width of the piece, L = length of a piece.

10.2 Warp in shingles and shakes

Unless otherwise agreed between the purchaser and the supplier, warp in shingles and shakes shall be specified to be within the dimensions and permitted deviations specified by their manufacturer.

*NOTE National trade associations can issue warp specifications for their shingles and shakes. Where no suitable specification exists, warp can be agreed by means of reference samples (see **8.2**, Note 1).*

Where required, warp shall be measured in accordance with BS EN 1310.

10.3 Warp in wood-based panels

Limits for warp in wood-based panels shall be agreed between the supplier and the purchaser.

11 Resistance to fixing

*COMMENTARY ON Clause **11***

Resistance to fixing of solid wood is dependent on species, density, component thickness and other factors. In the case of external cladding, the most important considerations are usually:

- *some timber species are prone to splitting (see Annex C for guidance);*
- *the risk of splitting increases if the board thickness is less than seven times the fastener diameter;*
- *timber with a density of over 600 kg/m³ (at 20% moisture content) might need to be pre-drilled. Use of self-tapping screws might constitute pre-drilling (see BS 8605-2 for guidance).*

Resistance to fixing of modified woods and wood-based panels depends upon the material. Manufacturers might be able to give guidance.

11.1 Resistance to fixing of boards

*COMMENTARY ON **11.1***

*Boards come within the scope of BS EN 14915, which specifies that a declaration of resistance to fixing should be given. See Commentary on Clause **11** for guidance.*

11.2 Resistance to fixing of shingles and shakes

Where a timber species is relatively dense or is known to be prone to splitting, resistance to fixing shall be documented by the supplier.

*NOTE See Commentary on Clause **11** for guidance.*

11.3 Resistance to fixing of wood-based panels

The fixing characteristics of wood-based panels shall be documented by the supplier.

12 Dimensional stability

*COMMENTARY ON Clause **12***

Moisture-related dimensional change is quantified differently for size reduction as green timber initially dries and for on-going changes due to moisture fluctuations in service (i.e. after the timber has been dried to its target moisture content). On-going dimensional changes after the timber is dried are known as "movement". The term "shrinkage" commonly refers to size reduction as the timber is initially dried from green. Initial shrinkage is always greater than subsequent movement. Wood is anisotropic with regard to moisture-related dimensional change. Change in dimension, for the same change in moisture content, is different in the various directions of tree growth. The change is least in the longitudinal direction (i.e. along the grain), much greater in the radial direction (i.e. from the pith to bark) and greatest in a direction tangential to the growth rings. Movement is usually quoted as the sum of radial and tangential movements. The dimensional stability of shingles and shakes is not generally assessed. Dimensional change in timber due to temperature fluctuation is minimal and usually ignored.

12.1 Dimensional stability of boards

12.1.1 General

The dimensional stability of timber used as external timber cladding boards shall be specified to conform to **12.1.2**. If the timber is to be used green, then it shall also conform to **12.1.3**.

12.1.2 Movement

The specifier shall require that a movement class shall be given for all timber supplied as external cladding boards.

Unless otherwise agreed between the purchaser and the supplier, the movement class of external cladding timber shall be medium or small (see Annex C, Table C.2).

NOTE 1 A tighter specification might be required where wide boards or complex board profiles are used. Annex F gives guidance on the compatibility of particular movement classes and board profiles.

NOTE 2 Movement classes for common external cladding timbers are given in Annex C, Table C.4.

12.1.3 Shrinkage

A shrinkage value shall be given for all green timber supplied for use as external cladding.

*NOTE Shrinkage does not need to be quantified where the timber has been dried to a moisture content of (16 ±4)% in accordance with **5.1.***

Where required, shrinkage shall be quoted as a tangential value for the species (see Annex C, Table C.5 for guidance).

12.2 Dimensional stability of wood-based panels

Where necessary, the specifier shall specify that the dimensional stability of wood-based panels shall be in accordance with BS EN 13986:2004, **5.5**.

NOTE The dimensional stability of wood-based panels is not generally assessed.

13 Reaction to fire

*COMMENTARY ON Clause **13***

In the UK, reaction to fire on wall surfaces can be classified in accordance with either the BS 476 series or BS EN 13501-1. However, because external timber cladding boards and wood-based panels come within the scope of BS EN 14915 or BS EN 13986, respectively, only the classification in BS EN 13501-1 can be used for those applications. Classification in accordance with the BS 476 series is acceptable for wall cladding of shingles and shakes. See Annex H for an indicative transposition between these two classification systems.

A Euroclass D or B classification for external timber cladding can only be achieved if the product assembly is either tested to BS EN 13823 or conforms to the requirements for Classification Without Further Testing (CWFT) given in BS EN 14915 or BS EN 13986, as applicable. Most external timber cladding assemblies in the UK do not meet CWFT criteria, nor do cladding assemblies involving low density timbers such as western red cedar. In cases where a cladding assembly involving boards or wood-based panels does not conform to CWFT criteria it should be classified as Euroclass F (i.e. untested) or the product assembly should be tested to BS EN 13823. A Euroclass F classification is acceptable for external timber cladding in many circumstances. Attention is drawn to the Building Regulations [7] [8] [9] [10].

13.1 Reaction to fire classification of boards

The specifier shall specify that reaction to fire of boards shall be classified in accordance with BS EN 14915.

13.2 Reaction to fire classification of shingles and shakes

Where a reaction to fire classification is required for shingles and shakes, the cladding assembly shall be classified in accordance with either BS EN 13501-1 or the BS 476 series.

NOTE This might require the cladding assembly to be tested in accordance with BS EN 13823 or the BS 476 series.

13.3 Reaction to fire classification of wood-based panels

The specifier shall specify that reaction to fire of wood-based panels shall be classified in accordance with BS EN 13986.

14 Resistance to deformation

*COMMENTARY ON Clause **14***

Resistance to deformation can be relevant to external cladding made of wood-based panels. The relevant performance characteristics are bending strength and bending stiffness (modulus of elasticity). Resistance to deformation is not an issue that needs to be taken into account for boards, providing that they conform to the other requirements in this standard and have a span of no more than 600 mm between supports. Board assemblies involving spans in excess of 600 mm should conform to this British Standard and be designed in accordance with BS 8605-2. Resistance to deformation is not relevant to shingles and shakes.

Wood-based panels come within the scope of BS EN 13986. Bending stiffness should be specified in accordance with that standard, which states that bending stiffness should be determined to the requirements of either BS EN 310 or BS EN 789, as applicable. See BS 8605-2 for guidance on deformation of support battens.

15 Bonding quality

*COMMENTARY ON Clause **15***

Where external timber cladding components are manufactured by gluing, the adhesives used need to be water resistant. This criterion applies to boards and wood-based panels. There are no bonding requirements for shingles and shakes as these types of component are not glued.

15.1 Bonding quality for boards

The specifier shall specify that adhesives used to bond boards shall conform to the requirements for a type 1 adhesive given in BS EN 301.

NOTE 1 Cladding boards are either uncoated or, where they are coated, the long-term protection afforded by the coating cannot be guaranteed. A fully water resistant adhesive is, therefore, required.

NOTE 2 In BS EN 301, type 1 adhesives include aminoplastic resin, phenolic resin and polycondensation adhesive.

The specifier shall specify that individual parts of jointed members shall be of similar wood structure in respect to width and slope of the growth rings. There shall be no gap between the finger and root of a cut, nor cracks radiating from the fingers or roots of a cut. Glue lines shall be uninterrupted. The distance between two adjacent finger joints shall be greater than 150 mm.

NOTE 3 The specifier should request that factory production control is carried out in accordance with BS EN 13307-2.

In case of dispute, laminated and finger jointed blanks shall be tested in accordance with BS EN 13307-1.

15.2 Bonding quality for wood-based panels

The specifier shall specify that bonding quality for wood-based panels shall be determined in accordance with BS EN 13986.

NOTE Wood-based panels come within the scope of BS EN 13986, which states that bonding quality should be determined in accordance with BS EN 314-1, as applicable.

16 Coating systems

*COMMENTARY ON Clause **16***

External timber cladding on walls can be either uncoated or have a coating system. Uncoated timber can minimize the need for maintenance, providing that suitable timber is used and the purchaser is prepared for a variable surface appearance as the timber weathers (see BS 8605-2). Where a coating system is to be applied, factory pre-coating is recommended as it gives a better performance than coating on-site. This clause only specifies factory pre-coating of external timber cladding. Recommendations for coating on-site are given in BS 8605-2. Shingles and shakes are not generally given a surface coating.

16.1 Coating systems for boards

Where external timber cladding is to be factory pre-coated, the following shall be specified:

a) coatings shall be formulated for external use in accordance with BS EN 927-1;

b) the coating system performance shall meet the requirements of BS EN 927-2 as a minimum;

c) the moisture content of the timber shall, as applicable, conform to either (16 ±4)% or (5 ±3)% as specified in **5.1**;

NOTE 1 Manufacturers of coating systems typically recommend that the moisture content of timber should be no more than 16% when the coating is applied. Higher moisture contents lead to longer drying times and can reduce the performance of coatings. It is impractical to dry external timber cladding to a guaranteed moisture content at or below 16% and so the coatings manufacturer should be consulted for advice regarding extended drying times. See BS EN 14298 for the type of statistical quality control required to offer a guaranteed maximum moisture content.

NOTE 2 Green timber is unsuitable as a substrate for coating systems.

d) timber cladding components shall be supplied with a complete coating system applied to all surfaces including the endgrain and those to be concealed by the installation process;

NOTE 3 The dry film thickness of the coating system on concealed areas of the cladding can be less than the thickness on weather-exposed faces.

e) arrises shall be rounded off;

NOTE 4 A radius of 3 mm is recommended. If the radius is less than 3 mm, the service life of the coating and timber substrate might be reduced. There might be circumstances (e.g. historic buildings) where a radius of 3 mm is unacceptable; in which case a smaller radius may be applied with the agreement of the coating system manufacturer. Rounded arrises are not suitable for all profiles (see Annex F).

f) coatings shall be applied in accordance with the coating system manufacturer's recommendations;

g) coating systems shall be selected for non-stable end use conditions in accordance with BS EN 927-1;

h) coating thickness shall be measured in accordance with BS EN ISO 2808; and

i) in cases where external timber cladding needs to be preservative treated in accordance with **6.3** or achieve a specific reaction to fire classification in accordance with Clause **13**, manufacturers shall ensure that the coating is compatible with that treatment.

NOTE 5 The pre-treatment manufacturer should be consulted for guidance.

16.2 Coating systems for wood-based panels

NOTE 1 Wood-based panels surfaced with an impermeable layer such as a resin or a plastic film are outside the scope of this standard.

Where wood-based panels are to be factory pre-coated for use as external cladding, the following shall be specified:

a) coatings shall be formulated for external use in accordance with BS EN 927-1;

b) the coating system performance shall conform to BS EN 927-2 as a minimum;

c) the moisture content of the panel shall conform to **5.4**;

d) wood-based panels shall be supplied with a complete coating system applied to all surfaces including the endgrain and those to be concealed by the installation process;

NOTE 2 The dry film thickness of the coating system on concealed areas of the cladding can be less than the thickness on weather-exposed faces.

e) coating systems shall be applied in accordance with the coating system manufacturer's recommendations;

f) coating systems shall be selected for stable end use conditions in accordance with BS EN 927-1; and

g) coating thickness shall be measured in accordance with BS EN ISO 2808.

17 Wood density

Annex C gives mean densities of the timber species commonly used as external cladding; where a species is not listed in Annex C, its density shall, where required, be determined in accordance with ISO 13061-2.

NOTE Where the density of timber for support battens is required, this should be determined in accordance with BS EN 384. This is because design of support battens in accordance with BS 8605-2 might involve structural calculation, in which case a characteristic density value is necessary.

18 Hygrothermal performance

Where the thermal conductivity or water vapour permeability of external cladding needs to be specified, it shall be determined in accordance with BS EN 14915 or BS EN 13986.

NOTE The hygrothermal performance of external timber cladding assemblies is not relevant where the cavity ventilation is such that the cavity can be deemed equivalent to the outside air. See BS 8605-2 for guidance.

19 Release of dangerous substances

Where the release of dangerous substances needs to be specified, it shall be determined in accordance with BS EN 14915 or BS EN 13986.

NOTE Solid wood as such, without chemical treatment, adhesives or coating system, has no pentachlorophenol release.

20 Moisture resistance

The moisture resistance of wood-based panels shall be determined in accordance with BS EN 13986; this criterion does not apply to other types of external timber cladding component.

21 Airborne sound insulation

The airborne sound insulation of wood-based panels shall, where required, be determined in accordance with BS EN 13986.

NOTE Airborne sound insulation is not generally a relevant criterion for external cladding in the UK. Attention is drawn to the Building Regulations [7] [8] [9] [10].

Annex A (informative)

CE marking of external timber cladding

Boards and wood-based panels come within the scope of harmonized standards BS EN 14915 or BS EN 13986, respectively. Where a characteristic is covered by one of these standards, the standards require that manufacturers should CE mark their products. The affected characteristic criteria are listed in Table A.1. Some provisions are optional or only apply in specific circumstances. There are no harmonized standards for shingles and shakes and so there are no requirements for these products to be CE marked.

The specifier may also list other characteristics; the applicable clauses are given in Table 1.

Table A.1 **Characteristics to be declared by a supplier as part of CE marking**

No	Requirement for CE marking	Status		Clause
		Boards	Wood-based panels	
1	Reaction to fire	M	M	**13**
2	Pentachlorophenol content	M	O	**19**
3	Other dangerous substances	M	–	**19**
4	Water vapour permeability	M	O	**18**
5	Thermal conductivity	M	O	**18**
6	Resistance to fixing	M	–	**11**
7	Resistance to biological attack	M	M	**6**
8	Bending stiffness	–	M	**14**
9	Bonding quality	–	M	**13**
10	Moisture resistance	–	M	**20**
11	Release of formaldehyde	–	M	**19**
12	Airborne sound insulation	–	O	**21**

NOTE M *Mandatory* O *Optional*

Annex B (normative)

Sampling of boards

All boards shall be inspected before installation or within seven days after delivery, whichever is earlier.

In the event of a dispute with regard to the moisture content, geometrical dimensions or grade, sampling shall be carried out in accordance with the following instructions, unless otherwise agreed by the parties.

The consignment shall be divided into batches. Each batch shall contain the same species, grade, range of moisture content, profile, thickness, width and length.

The sample shall be picked randomly from the batch.

The sample size and maximum number of nonconforming pieces shall be in accordance with Table B.1.

If moisture content is being sampled, pieces from the outer layers (top, bottom, sides) shall not be included.

NOTE See DD CEN/TS 12169 for detailed guidance on random sampling and other issues related to statistical quality control of sawn timber.

Table B.1 **Sample size and maximum number of non-conforming pieces**

Batch size (number of boards)	**Sample size** (number of boards)	**Maximum number of non-conforming pieces**
1 to 19	All boards	No more than 5% of those sampled
20 to 100	20% of the batch	No more than 5% of those sampled
101 to 150	20	5
151 to 280	32	7
281 to 500	50	10
501 to 1 200	80	14
1 201 or more	125	21

NOTE Recommendations for batch sizes of 100 or more are taken from acceptable quality level 10 in DD CEN/TS 12169:2008, Table 2. The acceptable quality level (AQL) defines the maximum percentage of non-conforming pieces of sawn timber that can be considered satisfactory as a process average.

Annex C (informative) Characteristics of timber species

C.1 General

Table C.1 and Table C.2 give the key characteristics of most timbers currently used as external timber cladding in the UK. Table C.1 lists the data for softwoods and Table C.2 lists the data for hardwoods.

Species are listed alphabetically according to their common trade names, and not in order of importance.

NOTE 1 A few species that are currently used as external cladding have been omitted from Table C.1 and Table C.2 because insufficient data are available or their characteristics are unsuitable.

*NOTE 2 Shrinkage is not included in Table C.1 and Table C.2 in order to avoid confusion with movement. Instead, shrinkage classes for UK grown timbers are given in **C.10**.*

*NOTE 3 Modified woods (see **7.2**) are proprietary products and so are not included in this annex.*

Subclauses **C.2** to **C.10** describe each characteristic. The data are from BS EN 350-2 wherever applicable. Additional data are from BRE handbooks [11] [12] and *Physical and related properties of 145 timbers* [13]. The abbreviation n/a indicates that no data are available.

Colour is not given. This is because all uncoated timbers eventually weather to grey when exposed out of doors, although the effect is highly variable.

C.2 Species

Species are listed using their common trade name, botanical name and code as given in BS EN 13556.

Botanical names conform to BS EN 13556 (with the exception that the abbreviated name of the person who identified the species is omitted).

a) When a common name describes between one and three species, the botanical name is given in italics and the genus is abbreviated if more than one species is described.

b) When a common name describes four or more species, the entry comprises the genus (in italics) and the abbreviation spp.

The four letter species codes conform to BS EN 13556.

1) When a common name describes between one and three species, the first two letters in the code generally refer to the genus, whilst the second two letters refer to the species.

2) When a common name describes two or more species, the first two letters generally give the genus and the second two letters use species designation XX, although there are exceptions as described in the standard.

NOTE BS EN 13556 does not give species codes for all of the species in Table C.1 and Table C.2.

C.3 Origin and availability

The main regions of origin are given using the following abbreviations: EU for Europe, AF for Africa, AM(N) for North America, AM(S) for South America, AM(C) for Central America, AS (Asia) and AP for Australasia and the Pacific.

The commercial availability of each species is given using the following abbreviations: 1 for readily available, 2 for available through specialist suppliers and 3 for rarely available.

NOTE The characteristics of plantation grown timber can differ from old-growth forest material. Where this is the case with timber grown in the UK, this is noted.

Table C.1 **Relevant characteristics of selected softwood species**

Common name(s)	Botanical name(s) Plus four letter code from BS EN 13556	Origin and availability	Mean density (kg/m³)	Natural durability class (fungi)	Movement class	Treatability class (sapwood)	Fibre saturation point (%)	Remarks
Douglas fir also known as British Columbian pine, Columbian pine, Oregon pine	*Pseudotsuga menziesii* **PSMN**	AM(N)* 1	510–550	3	Small	Resistant	28	Corrosive Prone to split when nailing UK grown timber may be available
		UK grown 2	475–520	4				
Eastern white cedar also known as white cedar	*Thuja occidentalis* **THOC**	AM(N) 3	330	2	n/a	n/a	n/a	Only available in small dimensions Corrosive
European larch	*Larix decidua* **LADC**	EU 2	470–650	3–4	Small	Resistant	n/a	Prone to split when nailing UK grown timber might be available
Hybrid larch also known as Dunkeld larch	*Larix x eurolepis* **LAER**	EU 2	n/a	3–4	n/a	n/a	n/a	Prone to split when nailing UK grown timber might be available
Japanese larch	*Larix kaempferi* **LAKM**	AS 2	520	3–4	Small	Resistant	n/a	Prone to split when nailing UK grown timber might be available
Lodgepole pine	*Pinus contorta* **PNCN**	AM(N) 1	430–470	3–4	Small	Permeable	n/a	UK grown timber might be available
		UK grown 3						
Maritime pine	*Pinus pinaster* **PNPN**	EU 3	530–550	3–4	Small	Permeable	n/a	–
Norway spruce	*Picea abies* **PCAB**	EU 1	440–470	4	Medium	Resistant	27	UK grown timber might be available

Table C.1 **Relevant characteristics of selected softwood species**

Common name(s)	Botanical name(s) Plus four letter code from BS EN 13556	Origin and availability	Mean density (kg/m^3)	Natural durability class (fungi)	Movement class	Treatability class (sapwood)	Fibre saturation point (%)	Remarks
Radiata pine	*Pinus radiata* **PNRD**	AM(N)* 2	420–500	4–5	Medium	Permeable	n/a	–
Scots pine Imported timber is termed European redwood	*Pinus sylvestris* **PNSY**	EU 1	500–540	3-4	Medium	Permeable	30	UK grown timber might be available
Siberian larch	*Larix sibirica, L. gmelinii* **LAGM**	AS 1	570–650	3	Small or medium	n/a	28	Prone to split when nailing
Sitka spruce	*Picea sitchensis* **PCST**	AM(N) 1	400–450	4–5	Small or medium	Resistant	29	UK grown timber might be available
Southern pine also known as southern yellow pine, shortleaf pine, slash pine and longleaf pine	Pinus spp., including: *P. palustris, P. elliottii, P. eshinata, P. taeda* **PNEL, PNEC**	AM(N) 2	400–500	4	Medium	Permeable	n/a	–
Western red cedar also known as giant arbour vitae, red cedar	*Thuja plicata* **THPL**	AM(N)* 1/2	330–390	2	Small	Resistant	23	Corrosive Fine dust can be an irritant when machining or sanding UK grown timber might be available
		UK grown 2	–	3				
Yellow cedar also known as Alaskan yellow cedar, western cypress	*Chamaecyparis nootkatensis* **CHNT**	AM(N) 3	430–530	4	Small	Permeable	n/a	–

Table C.2 **Relevant characteristics of selected hardwood species**

Common name(s)	Botanical name(s) Plus four letter code from BS EN 13556	Origin and availability	Mean density (kg/m³)	Natural durability class (fungi)	Movement class	Treatability class (sapwood)	Fibre saturation point (%)	Remarks
African padauk also known as barwood, camwood	*Pterocarpus soyauxii* *P. osun* **PTXX**	AF 3	720–820	1	Small	n/d	n/a	–
Afzelia also known as welw chamfuta, massacossa, aligna, doussie, mbembaoka or mkota	*Afzelia* spp., including: *A. Africana,* *A. bipindensis,* *A. pachyloba* **AFXX**	AF 3	700–830	1	Small	Resistant	22	Prone to leaching of extractives
Andira also known as acapurana, angelin or maguilla	*Andira* spp., principally *A. parviflora* **AAXX**	AM(C) AM(S) 2	790	1	Small	n/a	n/a	–
Angelim also known as angelim amarello, angelum pedra, sapupira	*Hymenolobium* spp. **HMXX**	AN(S) 2	700–990	1	Medium (v)	n/a	n/a	Occasional hard gum deposits
Balau also known as selangan batu, yellow balau or red balau	*Shorea* spp., including: *S. laevis* **SHBL** *S. junsteri* **SHRB**	AS 1	700–1 160	2	Medium	Resistant	22	–
Cumaru also known as almendrillo, kumaru, sarrapia or tonka	*Dipteryx* spp., principally *D. odorata* **DXOD**	AM(S) AM(C) 1	1060	1	Small	n/a	n/a	–

Table C.2 **Relevant characteristics of selected hardwood species**

Common name(s)	Botanical name(s) Plus four letter code from BS EN 13556	Origin and availability	Mean density (kg/m³)	Natural durability class (fungi)	Movement class	Treatability class (sapwood)	Fibre saturation point (%)	Remarks
Garapa also known as ferro, grapia or pau mulato	*Apuleia leiocarpa*	AM(S) 2	800–960	2–3	Medium	n/a	n/a	High silica content
Iroko also known as bang, kambala, moreira, mvule, odum, tule or intule	*Chlorophora excelsa, C. regia* **MIXX**	AF 1	650	2	Small	n/a	21	Formally named *Milicia excelsa*, and *M. regia*
Itauba also known as louro itauba	*Mezilaurus* spp., principally *M. itauba* **MZXX**	AM(S) 2	830	1	Small	n/a	n/a	–
Jarrah	*Eucalyptus marginata* **EUMR**	AP 3	660–990	1	Medium	n/a	n/a	Corrosive
Jatoba also known as courbaril, jatai, farinheira, jatai amarelo, jatai vermelho, or locust	*Hymenaea courbaril* **HYCB**	AM(S) AM(C) 3	900	3	Medium	n/a	n/a	–
Louro also known as louro inamui or silverballi	*Nectandra* spp., *Ocotea* spp.	AM(S) 3	530	3	Medium	n/a	n/a	–
Massaranduba also known as balata, bolletrie, macarandupa or nispero	*Manilkara* spp., principally *M. bidentata* **MNXX**	AM(S) AM(C) 1	1 030	1–2	Medium	n/a	n/a	–

Table C.2 **Relevant characteristics of selected hardwood species**

Common name(s)	Botanical name(s) Plus four letter code from BS EN 13556	Origin and availability	Mean density (kg/m³)	Natural durability class (fungi)	Movement class	Treatability class (sapwood)	Fibre saturation point (%)	Remarks
Meranti - dark red also known as dark red seraya, oba suluk or red lauan	*Shorea* spp., particularly *S curtisii* *S. pauciflora* **SHDR**	AS 1	600–730	2–4	Small	Resistant	28	See Notes 1 and 2
Oak – American white also known as chestnut oak, prinus, overcup oak or swamp chestnut oak	*Quercus* spp., including Q. alba and other species **QCXA**	AM(N) 1	670–770	2–3	Medium	Resistant	n/a	Corrosive Prone to leaching of extractives Usually supplied at a moisture content of 8%
Oak – European also named after country of origin, e.g. English oak	*Quercus petraea* *Q. robur* **QCXE**	EU 1	670–760	2	Medium	Resistant	30	Corrosive Prone to leaching of extractives UK grown timber might be available
Opepe	*Nauclea diderrichii* **NADD**	AF 1	740–780	1	Small	n/a	n/a	–
Purpleheart	*Peltogyne* spp. comprising: *P. venosa var densiflora, P. confortiflora, P. lecointei* **PGXX**	AM(S) AM(C) 3	830–880	3	Small to medium	n/d	n/a	–
Red grandis also known as flooded gum or rose gum	*Eucalyptus grandis*	AM(S) 3	480–720	3	Medium	Resistant	n/a	Corrosive A wide variation in colour

Table C.2 **Relevant characteristics of selected hardwood species**

Common name(s)	Botanical name(s) Plus four letter code from BS EN 13556	Origin and availability	Mean density (kg/m³)	Natural durability class (fungi)	Movement class	Treatability class (sapwood)	Fibre saturation point (%)	Remarks
Red louro also known as determa, gamela, louro vermelho or wana	*Ocotea rubra* **OCRB**	AM(S) 2	600–650	2	Small to medium	Resistant	26	–
Robinia also known as black locust, false acacia	*Robinia pseudoacacia* **ROPS**	EU 2	720–800	1–2	n/a	n/d	n/a	–
Sucupira	*Diplotropis* spp., principally: *D. martiusii, D. purpurea, Bowdichia* spp., principally *B. nitida* **BOXX**	AM(S) 3	790–940	1–2	Small	n/a	n/a	Species from other genera are sold as sucupira – their characteristics may vary
Sweet chestnut	*Castanea sativa* **CTST**	EU 2	540–650	2	Small	Resistant	30	Corrosive Prone to leaching of extractives UK grown timber might be available
Tatajuba	*Barassa guianensis, B. guianensis* **BGGN**	AM(S) 2	790	2	Medium	n/a	n/a	–
Teak also known as kyun, sagwan, teka or teku	*Tectona grandis* **TEGR**	AS 3	650–750	1	Small	Resistant	22	Plantation grown timber has a durability class of 1–3 Dust might be an irritant

Table C.2 **Relevant characteristics of selected hardwood species**

Common name(s)	**Botanical name(s)** Plus four letter code from BS EN 13556	**Origin and availability**	**Mean density** (kg/m^3)	**Natural durability class** (fungi)	**Movement class**	**Treatability class** (sapwood)	**Fibre saturation point** (%)	**Remarks**

NOTE 1 To maximize the probability of obtaining dark red meranti of class 3 natural durability, select wood of a density of at least 670 kg/m^3 (measured at a moisture content between 12% (m/m) and 17% (m/m).

NOTE 2 "Meranti" from Malaysia (Shorea, Parashorea and Pentacme species; also known as seraya and lauan from other origins) refers not to a specific wood species, but to a mixed commercial group of east-Asian hardwoods. The individual species within each group can have different durability and treatability properties and it is, therefore, difficult to assign a single rating to such mixed species consignments.

C.4 Wood density

Wood density varies with the amount of water it contains. It is, therefore, important that the moisture content at which density is measured is stated. In Table C.1 and Table C.2, wood density is given as a mean density range at a moisture content of 12%. The range refers to commonly encountered values and not to the total variation.

NOTE 1 In some cases the mean density range is not available in which case a single mean value is given.

NOTE 2 Wood density at any other moisture content up to the FSP can be estimated by adding 0.5% of the given weight for each 1% moisture content above 12%. In cases where the FSP is not available, refer to the guidance notes in ***C.8.***

C.5 Natural durability

The BS EN 350 series gives several classification schemes for natural durability. These indicate the relative performance of each wood species with respect to its resistance to degradation by fungi, insects or marine borers. Table C.3 gives the five natural durability classes against fungi and is based upon BS EN 350-2.

Table C.3 **Natural durability classes against fungi**

Durability class	Description
1	very durable
2	durable
3	moderately durable
4	slightly durable
5	not durable

C.6 Movement class

Table C.4 gives the movement classification for timber. These classes are based upon research by BRE (see *The movement of timbers, technical note 33* [14]). Shrinkage values for UK timbers are given in **C.10**.

Table C.4 **Movement classes of timber**

Movement class	Sum of radial and tangential movements as relative humidity changes from 60% to 90% at 20 °C	Across the grain dimensional change within a moisture content range of 5% to 20%
Small	<3%	1% for every 5% change in moisture content
Medium	3% to 4.5%	1% for every 4% change in moisture content
Large	>4.5%	1% for every 3% change in moisture content

NOTE There is no movement above the FSP.

C.7 Treatability

BS EN 350-2 gives four classes to indicate the treatability of sapwood and heartwood of a range of wood species. However, in accordance with BS 8417, Table C.1 and Table C.2 only use two classes: permeable (treatability class 1 in BS EN 350-1) and resistant (treatability classes 2, 3 and 4 in BS EN 350-2). Both classes are based on the treatability of the sapwood.

NOTE Treatability is important when timber is to be impregnated with, for example, a wood preservative or flame retardant.

C.8 Fibre saturation point

For the purposes of this standard, the fibre saturation point (FSP) can be used to give an indication of the upper moisture content zone that might be attained in heartwood during sustained wetting by rainwater. The upper moisture content in sapwood can be higher than the FSP.

NOTE 1 The upper moisture content is important when the maximum self-weight of cladding needs to be calculated.

Where no FSP is given for a timber species, the following guidance applies:

- most tropical species of durability class 1 have a FSP of 19% to 23%;
- most tropical species of durability class 2 have a FSP of 24% to 26%;
- most tropical species of durability class 3 have a FSP of 27% to 32%;
- most temperate species have a FSP of 27% to 32%, irrespective of their durability class.

NOTE 2 These data are from TNO Building and Construction Research in the Netherlands (see Physical and related properties of 145 timbers: information for practice *[13]). The maximum moisture content of modified woods can be around 25% when used as external cladding.*

C.9 Remarks

Where a species is particularly known for another characteristic, this is noted even though that characteristic might be unverifiable.

NOTE 1 Corrosion of metals by wood is an example of an unverifiable characteristic. There is no standard test for corrosion of metals by wood. Moreover, pH levels in timber vary in response to several factors.

NOTE 2 BS 8605-2 gives guidance on design and installation to address unverifiable characteristics.

C.10 Shrinkage

Table C.5 gives tangential shrinkage values for the main UK grown timbers used as external cladding. These data are from BRE handbooks [11] [12].

*NOTE External timber cladding can dry down to a moisture content of 10% (see Clause **5**). Distortion is affected by the grade of timber that is used.*

Table C.5 **Shrinkage values for UK timbers**

Species	**Tangential shrinkage** (% of green dimension when the moisture content dries from FSP to 12%)
Douglas fir	4
European larch	4.5
European oak	7.5
Hybrid larch	n/a
Japanese larch	n/a
Norway spruce	4
Scots pine	4.5
Sitka spruce	5
Sweet chestnut	5.5
Western red cedar	2.5

Annex D (informative)

Timber durability selection

BS EN 460 and BS 8417 give general guidance on the suitability of timber of a particular natural durability class for application in a specific use class. However:

- although BS EN 460 contains useful guidance, it only gives generic Europe-wide information;
- BS 8417 gives general guidance on the suitability of timber for application in a specific use class and desired service life category, but the prediction of service life is not precise and desired service lives are indicative rather than a guarantee of performance, and are based on an assumption of good design and maintenance.

Table D.1 summarizes the guidance in BS EN 460 and BS 8417 as it applies to external timber cladding in the UK. When selecting timber for a particular end use, designers should select the natural durability class that can give the performance they require (see **6.1**) that can give the performance they require, taking account of the cost of failure and ease of maintenance. Where natural durability is not suitable, resistance to wood destroying organisms can be increased using preservative treatment (see **6.3**).

Table D.1 **Selection of a level of natural or conferred durability**

Natural durability class (fungi)	**Suitability of each natural durability class for external cladding in the UK**	**Desired service life (years) in different moisture situations**	
		Occasionally wet	**Frequently wet**
1	Suitable without preservative treatment	>60	60
2		60	30
3	Often considered suitable without preservative treatment but for certain end uses (e.g. tall buildings) preservative treatment is recommended	30	15
4	Unsuitable unless preservative treated	15	<15
5		<15	<15

NOTE 1 The natural durability of some species varies, in which case the timber should be assigned to the lowest durability class within its range.

*NOTE 2 Some modified woods may be specified as if they are timber species of equivalent durability (see **6.2**).*

*NOTE 3 The distinction between occasionally wet and frequently wet is not clear cut. In general, large eaves can help minimize wetting, particularly on low-rise buildings. Some types of surface coating (see Clause **16**) also help minimize wetting providing that they are correctly applied and regularly maintained. By contrast, external timber cladding on walls of taller buildings or those sites exposed to wind-driven rain or high relative humidity can experience frequent wetting. Wetting is most pronounced on uncoated timber but even coated timber can experience high moisture contents (see Clause **5**) if wetting is sustained or where there are water traps or other defects. These effects are not fully understood (see Davies, et al. [16]).*

Annex E (normative)

Timber grading for boards

*COMMENTARY ON Annex **E***

In the UK, external cladding timber has for many years been graded in accordance with the criteria in BS 1186-3. These grades are popular and workable but are not fully consistent with those given in BS EN 942, to which this British Standard conforms. Accordingly, this annex uses the four grades in BS EN 942 that are closest to those in BS 1186-3. BS EN 14519 and BS EN 14951 also give grades for external cladding. These can be used as an alternative to the grades given in this annex, taking into account that these are European grades and might not be suitable for all timber species or for particular purposes such as where green timber or virtually knot free timber is required.

The following shall be specified for external timber cladding boards; they shall conform to either:

- the grades in Table E.1; or
- the grades in BS EN 14519, BS EN 14951 and BS EN 15146, as applicable.

In all cases:

a) natural variation within a timber species shall be accepted as a common feature of wood and shall not be considered for grading;

b) different criteria shall apply to the weather exposed face and concealed face of the board;

c) in cases where boards are sawn through-and-through, the surface of the board nearest the pith shall, wherever possible, be designated as the weather exposed face;

NOTE Board orientation is discussed further in Annex F.

d) sapwood shall either be excluded from the weather exposed face or be made resistant to wood destroying organisms as specified in **6.3**;

e) sapwood on the concealed surface shall be permitted providing that the use of the board is not impaired and the maximum extent of sapwood does not exceed 5 mm in depth and 500 mm in continuous length;

f) loose or unsound knots shall not be present except on concealed faces;

g) limit on size of arris knots shall be expressed as a percentage of the overall width or thickness of the finished piece on which the knot or knot cluster occurs and a maximum knot size;

h) no individual knot or knot cluster shall exceed the size limit shown in Table E1;

i) these size limits shall apply even if a piece of timber is laminated or edge jointed;

j) when a knot or knot cluster lies within the end 70 mm of a piece and is to be trimmed off before the piece is fixed in the final work, the knot or knot cluster and the length of timber that is to be trimmed off shall be disregarded in the calculation of average centres;

k) machining requirements shall conform to Table 2 and apply to all grades and all species;

l) when measured to BS EN 1310, distortion shall be in accordance with BS EN 13307-1;

m) on visible faces, knots or knot clusters larger than 10 mm shall be distributed at centres no closer than 150 mm on average, measured over the length of the piece;

n) for all classes, when considering distribution, knots of 10 mm or less shall be disregarded;

o) knots shall be measured to BS EN 1310; and

p) measuring board dimensions shall be in accordance with BS EN 13647.

Table E.1 **Limits of timber features on visible face**

	Features	Class			
		J5	**J20**	**J30**	**J50**
1	Spiral grain	Not permitted	≤10 mm/m	≤10 mm/m	≤20 mm/m
2	Slope of grain	≤20 mm/m	≤50 mm/m	≤50 mm/m	No limit
3	Knots [A)]				
	Maximum% of face	20	30	30	50
	Maximum diameter	5 mm	20 mm	30 mm	50 mm
4	Resin pockets and bark pockets [B)]	≤3 mm by 30 mm per 2 m length	≤3 mm by 75 mm per 2 m length	≤3 mm width No length limit	≤3 mm width No length limit
5	Fissures, shakes				
	Maximum width	Not permitted	0.5 mm	1.5 mm	1.5 mm
	Maximum length		100 mm	200 mm	300 mm
	Maximum aggregate length [C)]		10%	25%	50%
6	Exposed pith	Not permitted	Not permitted	Permitted	Permitted
7	Discoloured sapwood	Not permitted	Not permitted	Permitted	Permitted
8	Ambrosia beetle damage	Not permitted	Permitted	Permitted	Permitted
9	Sapwood	Not permitted unless preservative treated			

[A)] The limit on knot size is expressed as a percentage of the overall width or thickness of the piece on which the knot or knot cluster occurs subject to a maximum knot size expressed in mm.

[B)] If more than one per metre, total length shall not exceed the length given for class.

[C)] Calculated as a percentage of the length of each face.

Annex F (informative)

Geometrical characteristics of boards

Board profiles for use as external timber cladding should be designed so that their geometrical characteristics are compatible with the grade of timber and in proportion to its movement class, moisture content, width and thickness. Different profiles might be necessary depending upon whether the boards are to be used coated or uncoated. Table F.1 gives guidance on these issues.

There are six main types of board profile used as external cladding (see Figure F.2 to Figure F.7). Geometrical characteristics of external cladding boards should be designed to criteria for the applicable profile in Figure F.2 to Figure F.7 and Table F.2 to Table F.7. If a board profile is not included in Figure F.2 to Figure F.7 it should be designed to the criteria in Table F.1 as far as is possible.

Nails and screws should be positioned so that their distance from the edge of the board conforms to the applicable edge distances in BS EN 1995-1-1. This criterion might affect the geometrical characteristics of some board profiles. See BS 8605-2 for guidance.

Table F.1 **Compatibility of board profiles with timber characteristics and other criteria**

Criteria	Classes	Compatibility
Grade (to Annex E)	J5 and J20	No restrictions
	J30	Unsuitable for complex profiles and board widths >150 mm
	J50	Unsuitable for complex profiles, coated timber and board widths >150 mm or <75 mm
Movement class (to **12.1.2**)	Small	No restrictions
	Medium	Unsuitable for complex profiles or boards over 150 mm wide
Moisture content (to **5.1**)	(16 ±4)%	Suitable for any profile [C]
	Green	Only suitable for simple overlapping or open jointed profiles [D]
Board width (mm) [A]	151 to 200	Only suitable for small movement class timber in grades J5 and J20
	75 to 150	No restrictions, this is the recommended width range
	25 to 74	Only suitable if the high costs are acceptable
Board thickness (mm) [B]	>25	Mainly used with labyrinth joints (profile F5)
	20 to 25	Unsuitable for labyrinth joints, otherwise no restrictions
	16 to 19	Unsuitable for all complex profiles
Arrises	Sharp	Unsuitable for boards to be factory precoated
	Rounded off	Unsuitable for profile F5

[A] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.

[B] Parts of some profiles can be less than 16 mm; however, no part should be less than 9 mm thick. Attention is drawn to the Building Regulations [7] [8] [9] [10]. The 9 mm minimum thickness is applicable in the absence of a surface coating or before a surface coating is applied. This criterion does not apply to tongues and grooves.

[C] If modified wood is used, the moisture content should be (8 ±2)% (see **5.1**).

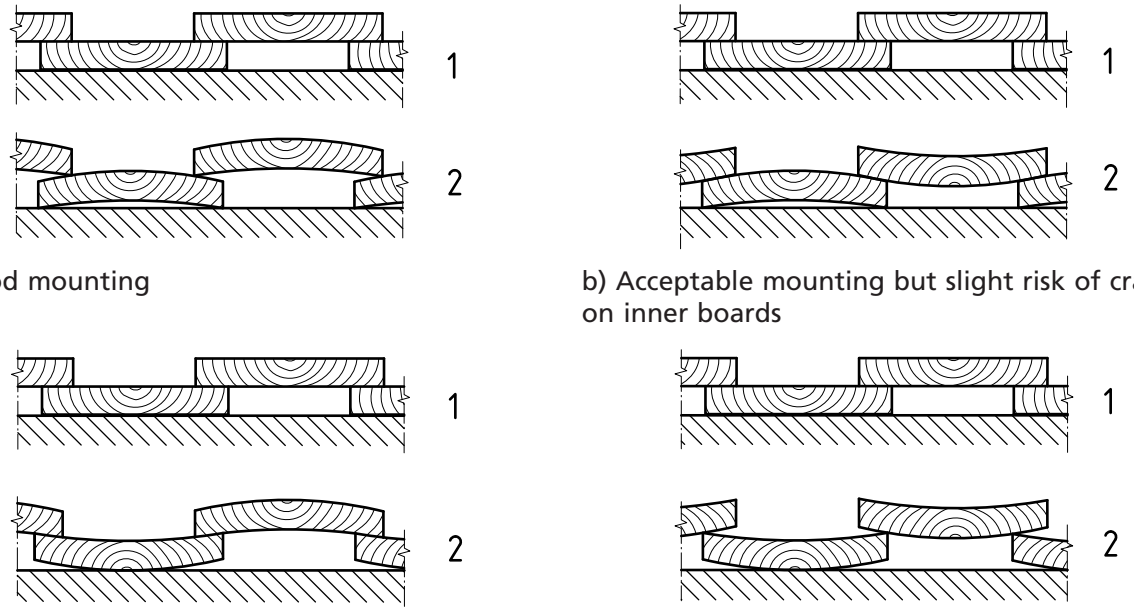
[D] If green timber is used, ensure that total shrinkage (see Table C.6) is allowed for when the board section is designed. See BS 8605-2 for guidance.

In cases where timber is sawn through-and-through, the boards should be mounted on the wall so that their orientation is in accordance with Figure F.1a) wherever possible.

NOTE 1 The orientations in Figure F.1b) and Figure F.1c) can be used if board defects make the mounting in Figure F.1a) impractical. The mounting in Figure F.1d) should be avoided in all circumstances.

NOTE 2 These recommendations apply to all of the board profiles in this annex and not just to the rectangular profiles in Figure F.3.

Figure F.1 **Recommended mounting for timber cladding boards sawn through-and-through**



a) Good mounting

b) Acceptable mounting but slight risk of cracks on inner boards

c) Poor mounting – risk of cracks on inner boards

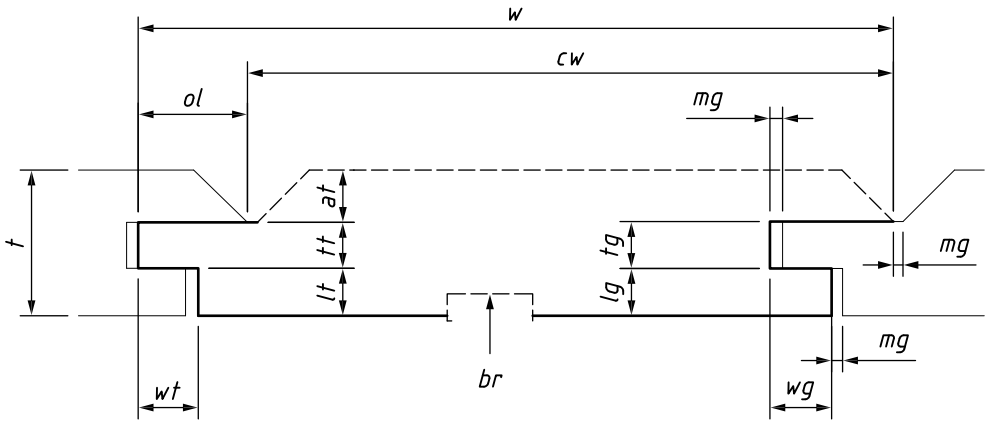
d) Very poor mounting

Key

1 Green timber

2 Dry timber

Figure F.2 **Generic profile for tongue and groove boards**



Key

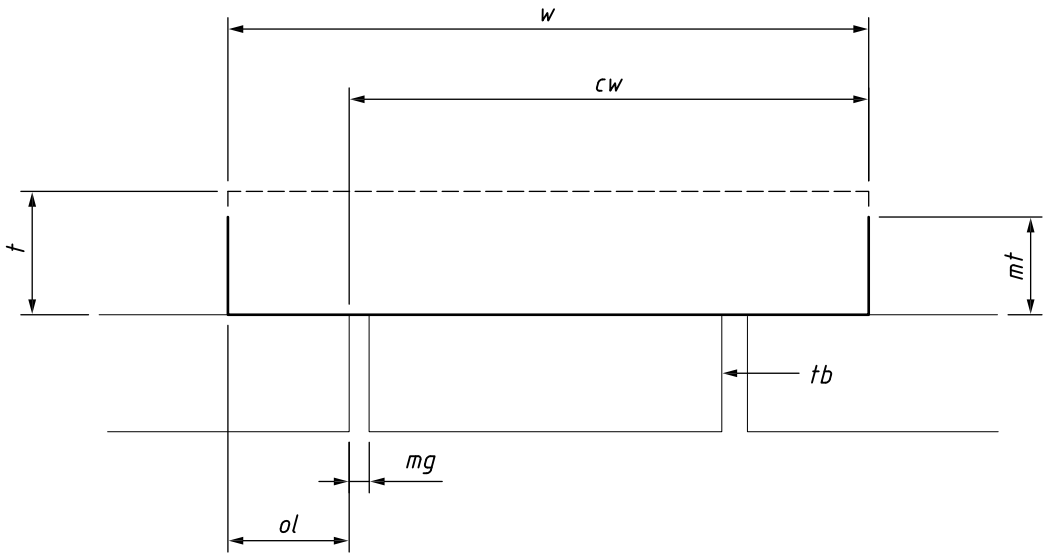
———	Required profile	*at*	Thickness above tongue
– – –	Unrestricted profile	*tt*	Thickness of tongue
———	Adjacent board	*lt*	Thickness of lip under tongue
w	Width	*wt*	Width of tongue
t	Thickness	*wg*	Width of groove
cw	Covering width	*ol*	Width of overlap
mg	Movement gap	*br*	Back rebate (optional)

Table F.2 **Generic characteristics and dimensions for tongue and groove boards**

Criteria	Permissible characteristic or dimension
Joint type	Closed
Board orientation	Horizontal, diagonal or vertical
Moisture content (to **5.1**)	(16 ±4)%
Grade (to Annex E)	J5 or J20
Movement class (to **12.1.2**)	Small or medium
Suitability for coatings	Can be used coated or uncoated [A)]
Arrises	Rounded off if a factory precoating is to be applied [B)]
Shrinkage (to **12.1.3**)	n/a
Growth ring orientation	If the log has been converted into boards by sawing it through-and-through, board orientation should be in accordance with Figure F.1
Board width (*w*)	4 to 6 times the board thickness (*t*) [C) D)]
Thickness (*t*)	$t = \geq 20$ mm
Movement gap (*mg*)	See Table F.8
Thickness above groove (*at*)	≥35% of total thickness (*t*)
Width of tongue (*wt*)	See Table F.9
Tongue thickness (*tt*)	See Table F.10
Thickness below groove (*lg*)	≥25% of thickness (*t*)
Width of groove (*wg*)	$wg = wt$ [E)]
Width of overlap (*ol*)	$ol \geq wt + mg$ [F)]
Covering width	$cw = w - ol$

[A)] If the boards are to be coated, factory precoating in accordance with **16.1** is recommended.
[B)] A 3 mm radius is recommended. Rounded arrises are also recommended for boards to be coated on site.
[C)] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.
[D)] Maximum width 125 mm unless very small movement timber is used, in which case the maximum is 175 mm.
[E)] Width of groove (*wg*) should be 1 mm wider if a factory precoating is to be applied.
[F)] The overlap (*ol*) can be lengthened to conceal a fastener head on the adjacent board. The distance from fastener shank to board edge (excluding the tongue) should be in accordance with the minimum edge distances in BS EN 1995-1-1.

Figure F.3 **Generic profile for rectangular boards**



Key

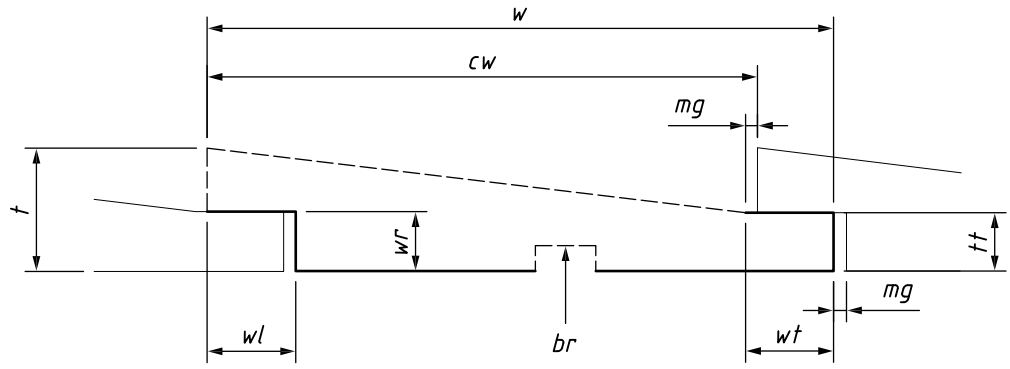
———	Required profile	*cw*	Covering width
– – –	Unrestricted profile	*mg*	Movement gap
———	Adjacent board or timber block (*tb*)	*ol*	Overlap
w	Width	*tb*	Timber block (optional)
t	Thickness	*mt*	Minimum thickness

Table F.3 **Generic characteristics and dimensions for rectangular boards**

Criteria	Permissible characteristic or dimension
Joint type	Closed
Orientation	Vertical
Moisture content (see **5.1**)	(16 ±4)% or green
Grade (see Annex E)	J5, J20, J30 or J50
Movement class (see **12.1.2**)	Small or medium
Suitability for coatings	Can be used coated or uncoated [A)]
Arrises	Rounded off if a factory precoating is to be applied [B)]
Shrinkage (see **12.1.3**)	To be allowed for if green timber is used
Growth ring orientation	If the log has been converted into boards by sawing it through-and-through, board orientation should be in accordance with Figure F.1
Board width (*w*)	4 to 6 times the board thickness (*t*)[C) D)]
Total thickness (*t*)	Normally 16 mm to 25 mm although thicker boards are acceptable
Minimum thickness (*mt*)	16 mm
Movement gap (*mg*) [E)]	See Table F.8
Overlap (*ol*)	≥20 mm
Covering width (*cw*)	$cw = w - ol$

[A)] If the boards are to be coated, factory precoating in accordance with **16.1** is recommended.
[B)] A 3 mm radius is recommended. Rounded arrises are also recommended for boards coated on site.
[C)] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.
[D)] Outer and inner boards can be different sections in which case coverage width (cw) might need to be determined separately for both the front and rear boards.
[E)] The front or rear boards might be close together or a timber block (tb) might be positioned between the rear boards at the base of a cavity as part of the vermin protection. Movement to be allowed for in all cases.

Figure F.4 **Generic profile for shiplap boards**



Key

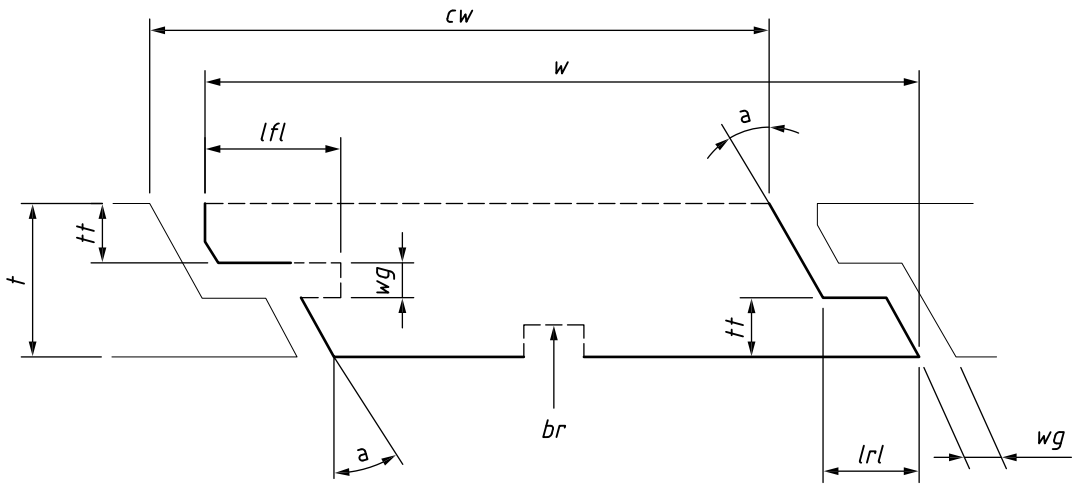
———	Required profile	*mg*	Movement gap
– – –	Unrestricted profile	*tt*	Thickness of tongue
———	Adjacent board	*tg*	Thickness of groove
w	Width	*wl*	Width of lip
t	Thickness	*wr*	Width of rebate
cw	Covering width	*br*	Back rebate (optional)
wt	Width of tongue		

Table F.4 **Generic characteristics and dimensions for rebated boards**

Criteria	Permissible characteristic or dimension
Joint type	Closed
Orientation	Horizontal or vertical
Moisture content (see **5.1**)	(16 ±4)%
Grade (see Annex E)	J5, J20, J30
Movement class (see **12.12**)	Small or medium
Suitability for coatings	Can be used coated or uncoated [A)]
Arrises	Rounded off if a factory precoating is to be applied[B)]
Shrinkage (see **12.1.3**)	n/a
Growth ring orientation	If the log has been converted into boards by sawing it through-and-through, board orientation should be in accordance with Figure F.1
Board width	4 to 6 times the board thickness (*t*) [C)]
Board thickness (*t*)	≥18 mm
Movement gap (*mg*)	See Table F.8
Width of rebate (*wr*)	≥9 mm
Tongue thickness (*tt*)	$tt = wr$
Width of lip (*wl*)	$wl \geq mg$ x 5 (minimum 15 mm)
Width of tongue (*wt*)	$wt = wl$
Covering width	$cw = w - wt$

[A)] If the boards are to be coated, factory precoating in accordance with **16.1** is recommended.
[B)] A 3 mm radius is recommended for boards to be factory precoated. Rounded arrises are also recommended for boards to be coated on site.
[C)] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.

Figure F.5 **Generic profile for labyrinth jointed boards**



Key

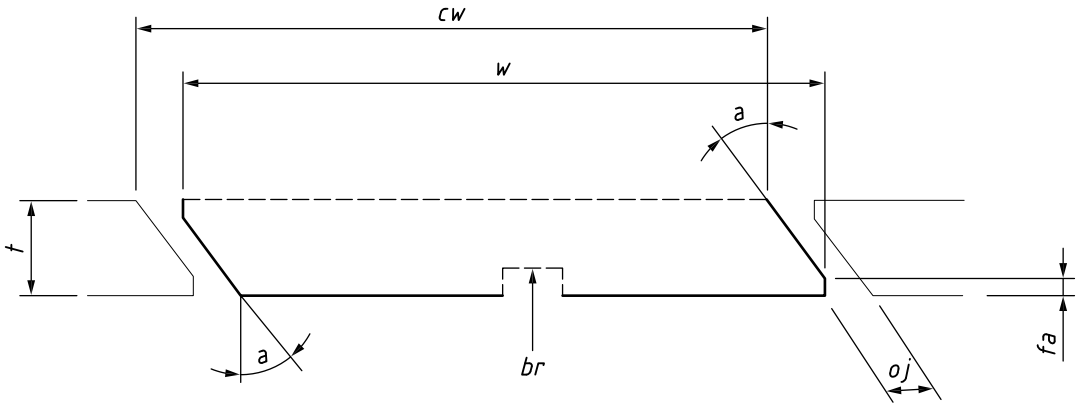
———	Required profile	*tt*	Thickness of tongue
– – –	Unrestricted profile	*wg*	width of gap or groove
———	Adjacent board	*lt*	Lip under tongue
w	Width	*lg*	Lip under groove
t	Thickness	*tt*	Thickness of tongue
cw	Covering width	*a*	Angle of slope
mg	Movement gap	*br*	Back rebate (optional)
lfl	Length of front lip	*lrl*	Length of rear lip

Table F.5 **Generic characteristics and dimensions for labyrinth jointed boards**

Criteria	Permissible characteristic or dimension
Joint type	Open
Orientation	Horizontal
Moisture content (see **5.1**)	(16 ±4)%
Grade (see Annex E)	J5, J20
Movement class (see **12.1.2**)	Small
Suitability for coatings	Only to be used uncoated [A]
Arrises	n/a
Shrinkage (see **12.1.3**)	n/a
Growth ring orientation	If the log has been converted into boards by sawing it through-and-through, board orientation should be in accordance with Figure F.1
Board width (*w*)	4 to 6 times the board thickness (*t*) [B]
Total thickness (*t*)	≥26 mm
Width of open joint (*oj*)	≥6 mm
Angle of slopping edges (*a*)	30°
Length of front tongue (*lft*)	$lt \geq wg + 10$ mm
Length of rear tongue (*lrt*)	$lr \geq wg \times 2$
Thickness of tongue (*tt*)	≥10 mm
Approximate covering width	$cw = w - (lrg + wg)$ [C]

[A] The rounded arrises associated with surface coatings tend to reduce the weather tightness of labyrinth joints and so coatings should be avoided.
[B] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.
[C] An accurate covering width calculation requires trigonometry.

Figure F.6 **Generic profile for parallelogram boards**



Key

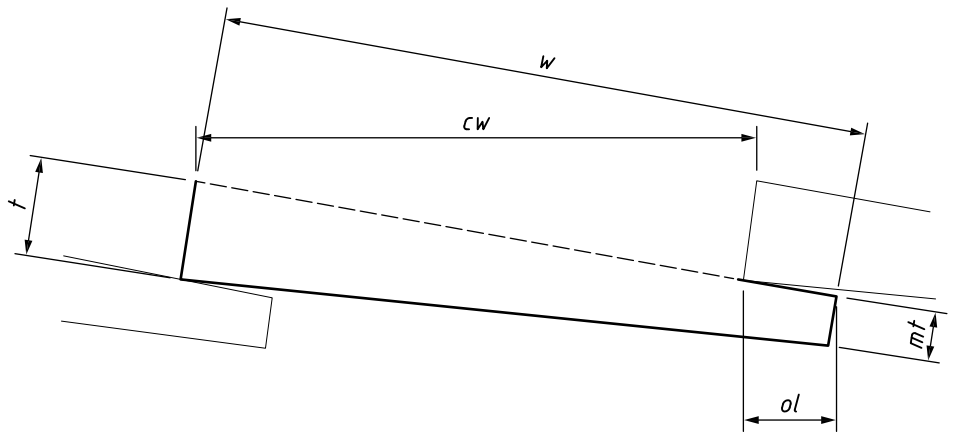
———	Required profile	*a*	Angle of slope
– – –	Unrestricted profile	*oj*	Width of open joint
———	Adjacent board	*fa*	Flattened arris
w	Width	*br*	Back rebate (optional)
t	Thickness	*cw*	Covering width

Table F.6 **Generic characteristics and dimensions for parallelogram boards**

Criteria	Permissible characteristic or dimension
Joint type	Open
Orientation	Horizontal
Moisture content (see **5.1**)	(16 ±4)% or green
Grade (see Annex E)	J5, J20, J30 or J50
Movement class (see **12.1.2**)	Small or medium
Suitability for coatings	Can be used coated or uncoated [A)]
Arrises	Rounded off if a factory precoating is to be applied [B)]
Shrinkage (see **12.1.3**)	To be allowed for if green timber is used
Growth ring orientation	If the log has been converted into boards by sawing it through-and-through, board orientation should be in accordance with Figure F.1
Board width (*w*)	Normally 4 to 6 times the board thickness (*t*)[C) D)]
Total thickness (*t*)	Normally 16 mm to 25 mm but can be up to 50 mm [C)]
Width of open joint (*oj*)	8 mm to 15 mm
Angle of slopping edges (*a*)	30°
Width of flattened arris (*fa*)	2 mm to 3 mm
Approximate covering width [E)]	$cw = w - oj$

[A)] If the boards are to be coated, factory precoating in accordance with **16.1** is recommended.
[B)] A 3 mm radius is recommended for boards to be factory precoated. Rounded arrises are also recommended for boards to be coated on site.
[C)] Width thickness ratio can be up to 1:1 providing the thickness (*t*) is no more than 50 mm
[D)] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.
[E)] An accurate covering width calculation requires trigonometry.

Figure F.7 **Generic profile for feather edge boards**



Key

———	Required profile	*t*	Thickness
– – –	Unrestricted profile	*cw*	Covering width
———	Adjacent board	*mt*	Minimum thickness
w	Width	*ol*	Overlap

Table F.7 **Generic characteristics and dimensions for feather edge boards**

Criteria	Permissible characteristic or dimension
Joint type	Closed
Orientation	Horizontal
Moisture content (see **5.1**)	(16 ±4)% or green
Grade (see Annex E)	J5, J20, J30 or J50
Movement class (see **12.1.2**)	Small or medium
Suitability for coatings	Can be used coated or uncoated [A)]
Arrises	Rounded off if a factory precoating is to be applied[A) B)]
Shrinkage (see **12.1.3**)	To be allowed for if green timber is used
Growth ring orientation	If the log has been converted into boards by sawing it through-and-through, board orientation should be in accordance with Figure F.1
Board width (*w*)	4 to 6 times the board thickness (*t*)[C)]
Total thickness (*t*)	Normally 16 mm to 25 mm
Minimum thickness (*mt*)	9 mm
Overlap (*ol*)	At least 20 mm
Width of flattened arris (*fa*)	2 mm to 3 mm
Approximate covering width [D)]	$cw = w - o$

NOTE This profile is vulnerable to splitting at the fastener and so particular care is needed during installation. See BS 8605-2 for guidance.

[A)] If the boards are to be coated, factory precoating in accordance with **16.1** is recommended.
[B)] A 3 mm radius is recommended for boards to be factory precoated. Rounded arrises are also recommended for boards to be coated on site.
[C)] A width thickness ratio of between 4:1 and 6:1 is recommended. A ratio of greater than 6:1 can be used with very small movement class timbers graded to class J5. A ratio of less than 4:1 can also be used providing the increased material and installation costs (relative to wider boards) are acceptable.
[D)] An accurate covering width calculation requires trigonometry.

Table F.8 **Minimum movement gap**

Movement class of timber	Board width mm						
	50	**75**	**100**	**125**	**150**	**175**	**200**
Small	2	2	2	2	3	3	4
Medium	2	2	3	4	4	–	–

NOTE 1 The minimum movement gap has been set at 2 mm to allow for construction tolerances.

NOTE 2 Interpolation is possible.

Table F.9 **Minimum tongue width for tongue and groove profiles**

Movement class of timber	Board width mm						
	50	**75**	**100**	**125**	**150**	**175**	**200**
Small	8	8	8	10	12	14	16
Medium	8	9	12	15	18	–	–

NOTE 1 The minimum tongue width has been set at 8 mm to ensure weather tightness.

NOTE 2 Interpolation is possible.

Table F.10 **Minimum tongue thickness for tongue and groove profiles**

Movement class of timber (see **C.6**)	**Board width** mm						
	50	**75**	**100**	**125**	**150**	**175**	**200**
Small	5	5	5	5	6	7	8
Medium	5	5	6	7.5	9	–	–

NOTE 1 The minimum tongue thickness has been set at 5 mm to ensure robustness during handling.

NOTE 2 Interpolation is possible.

Annex G (informative)

Reaction to fire

Reaction to fire classifications apply to a complete assembly and not to the components in isolation. This means that components might achieve a different classification depending upon how they are assembled and tested. Producers should ensure that the reaction to fire classification being claimed is applicable to the cladding assembly in question.

NOTE Different reaction to fire classification systems apply to external cladding on walls and roofs.

In BS EN 13501-1, untested external timber cladding assemblies on walls are classified as Euroclass F; this class is suitable for many external cladding applications. Where a higher classification is required, external timber cladding assemblies can (depending upon timber density and other factors) achieve test classifications of up to Euroclass D without flame retardant treatment and Euroclass B with a flame retardant (not all timbers are suitable for treatment). Flame retardant manufacturers can advise on suitable timbers and supply test data. The Wood Protection Association's *Flame retardant specification manual: Industrial flame retardant treatment of solid timber and panel* products [17] also gives guidance. Although BS EN 14915 allows some timber cladding assemblies on walls to be classified without further testing (CWFT) to Euroclass D, some CWFT criteria might be inapplicable to timber rainscreen cladding as currently designed in the UK.

Flame retardants used for external cladding are exposed to leaching by rainwater. Resistance to leaching is classified in PD CEN/TS 15912. The most moisture resistant classification is DRF class EXT, although the service life of flame retardants classified as such might depend upon a suitable coating system being applied and regularly maintained. Flame retardant treated timber cladding to be used in an uncoated condition should achieve class DRF class EXT without a coating system. Flame retardants might be incompatible with some wood modification processes, preservative treatments or surface coatings. Flame retardant manufacturers can advise on compatibility. Timber cannot be made non-combustible (Euroclass A1 or A2) under any circumstances.

In the UK, reaction to fire classifications to the BS 476 series might be given instead of those in the BS EN 13501 series. Table G.1 gives an indicative transposition between the systems.

Table G.1 **Indicative transposition between European and UK reaction to fire classes**

Type of timber cladding	**Classifications for cladding on walls**	
	BS 476 series	**BS EN 13501-1**
Not applicable to timber	Non combustible	Euroclass A1 or A2
Timber cladding tested after flame retardant treatment	Class O	Euroclass B
	Class 1, 2 or 3	Euroclass C
Timber cladding tested without flame retardant treatment	Class 4 or 5	Euroclass D or E
Untested timber cladding	Unclassified	Euroclass F

NOTE 1 Class O does not exist as a category in the BS 467 series. It is, however, sometimes used to describe a particular combination of test results obtained using these standards. Attention is drawn to the Building Regulations [7] [8] [9] [10].

NOTE 2 This table is only for information as the transposition between these classifications is not exact.

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BS 1186-3, *Timber for and workmanship in joinery – Part 3: Specification for wood trim and its fixing*

BS 6100-8:2007, *Building and civil engineering – Vocabulary – Part 8: Work with timber and wood-based panels*

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BS 8417, *Preservation of wood – Code of practice*

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