

BS 8201:2011



BSI Standards Publication

# Code of practice for installation of flooring of wood and wood-based panels

**bsi.**

...making excellence a habit.  
**AVA** Documents™  
Document Sharing Hub

**Publishing and copyright information**

The BSI copyright notice displayed in this document indicates when the document was last issued.

© BSI 2011

ISBN 978 0 580 69012 9

ICS 91.060.30

The following BSI references relate to the work on this standard:

Committee reference B/543

Draft for comment 11/30209204 DC

**Publication history**

First published February 1987

Second (present) edition, October 2011

**Amendments issued since publication**

| Date | Text affected |
|------|---------------|
|------|---------------|

---

# Contents

Foreword *iii*

## Section 1: General 1

Introduction 1

- 1 Scope 1
- 2 Normative references 1
- 3 Terms and definitions 3
- 4 Performance factors 8
- 5 Care on site 11
- 6 Exchange of information 12
- 7 Time schedule 13

## Section 2: Materials 14

- 8 Selection of flooring type 14
- 9 Selection of wood species 14
- 10 Selection of panel products 15
- 11 Basic recommendations 16

## Section 3: Design and installation 19

- 12 Design and installation considerations 19

## Section 4: Board and strip 33

- 13 General considerations 33
- 14 Work off site 33
- 15 Work on site 33
- 16 Inspection 38

## Section 5: Blocks 40

- 17 Subfloor construction 40
- 18 Work off site 40
- 19 Work on site 40
- 20 Inspection 41

## Section 6: Mosaic 42

- 21 Subfloor construction 42
- 22 Work off site 42
- 23 Work on site 42
- 24 Inspection 43

## Section 7: Overlay and parquet 44

- 25 Construction 44
- 26 Work off site 44
- 27 Work on site 44
- 28 Inspection 46

## Section 8: Flooring of wood-based panel products 47

- 29 General considerations 47
- 30 Care and conditioning of panel products 47
- 31 Work on site 48
- 32 Inspection 54

## Section 9: Upkeep and maintenance 55

- 33 General 55
- 34 Routine maintenance 55
- 35 Maintenance of moisture content after installation 55

## Annexes

Annex A (normative) Hygrometer test for dampness of concrete, cementitious and anhydrite bases 57

Annex B (informative) Guidance on selection of wood species 59

Annex C (normative) Examples of the size of expansion gaps at perimeters of floors 70

## Bibliography 71

**List of figures**

Figure 1 – Typical forms of fixed floor construction for use with timber or wood-based panel flooring 6

Figure 2 – Typical forms of floating floor construction to provide impact and airborne sound resistance (e.g. between flats) 7

Figure 3 – Typical forms of ground floor construction for use with wood-based panel products 8

Figure 4 – Typical range of designs for wood block flooring 31

Figure A.1 – Apparatus for hygrometer test 58

**List of tables**

Table 1 – Summary of recommendations for laying and fixing plywood panels 52

Table 2 – Summary of recommendations for laying and fixing particleboard and OSB panels 53

Table B.1 – Timbers suitable for floors for heavy pedestrian traffic 61

Table B.2 – Timbers suitable for floors for normal pedestrian traffic 62

Table B.3 – Timbers suitable for floors for light pedestrian traffic 63

Table B.4 – Timbers suitable for decorative floors 64

Table B.5 – Timbers suitable for heavy duty industrial floors 65

Table B.6 – Timbers suitable for light duty industrial floors 65

Table B.7 – Timbers suitable for floors with high resistance to chemicals and acids 66

Table B.8 – Timbers suitable for floors with small movement 67

Table B.9 – Timbers suitable for gymnasium floors 68

Table B.10 – Timbers suitable for ballroom floors 69

Table B.11 – Timbers suitable for skating rink floors 69

Table C.1 – Typical examples of size of expansion gaps at perimeters of floors 70

**Summary of pages**

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 72, an inside back cover and a back cover.

## Foreword

### Publishing information

This British Standard is published by BSI and came into effect on 30 October 2011. It was prepared by Technical Committee B/543, *Round and sawn timber*. A list of organizations represented on this committee can be obtained on request to its secretary.

### Supersession

This British Standard supersedes BS 8201:1987, which is withdrawn.

### Information about this document

This British Standard includes recommendations relating to the work involved in laying flooring and illustrates some typical constructions on which it may be laid.

This is a full revision of the standard, and introduces the following principal changes:

- information and recommendations have been rationalized in consideration of current best practice;
- new materials and product availability;
- materials are included in a new Section 2; and
- details provided are now in relation only to wood and wood-based panels installed as, or as a component part of, finished wood flooring

General recommendations applicable to all types of wood flooring are contained within Section 1, Section 2, Section 3 and Section 9, with recommendations specific to individual types of flooring given in Sections 4 to 8. Because some recommendations are applicable to more than one individual type of floor, this involves some repetition. It was considered that a limited degree of repetition to ensure reasonable completeness of each section would be preferable to excessive cross-referencing.

Annex A describes the test method for use in conjunction with the recommendations given in 12.4.6.

Increasingly, in addition to material selection based on performance capabilities, suitability and appearance, consideration is being given to the specification of wood and wood products with regard to legality and sustainability of source.

Whilst this aspect of material specification is not within the remit of British Standards (this might be set to change with the desire of the European Commission to see environmental criteria included in EN product standards) the committee believe it to be of sufficient importance that reference to provisions being made in the UK to address this issue is included in the new Annex B.

### Use of this document

As a code of practice, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this British Standard is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this British Standard 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 in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is “should”.

*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.**

# Section 1: General

## Introduction

This British Standard gives recommendations and guidance on the material, environment and installation variables that in combination have a fundamental effect on the achievement of satisfactory performance and serviceability of finished wood flooring.

The content of the document has been modified to reflect more appropriately wood and wood-based panels installed as finished flooring and, of necessity, as underlayment for finished wood flooring but not for subsequent installation of carpet or resilient flooring.

The installation and use of wood-based panels as primarily a load-bearing surface has been cross referenced to BS 8103-3.

The words "timber" and "wood" in this British Standard cover softwoods, hardwoods and wood-based panels, as appropriate in the context.

## 1 Scope

This British Standard gives recommendations for laying the following types of flooring:

- a) board;
- b) pre-assembled board;
- c) strip;
- d) mosaic;
- e) overlay;
- f) parquet;
- g) block;
- h) end grain flooring;
- i) multi-layer; and
- j) wood-based panels.

This British Standard does not cover the protection afforded to a floor by floor coverings or surface finishes.

This British Standard does not cover floors for temporary structures or floors intended for limited use. Different considerations might apply to these floors.

*NOTE For laminate flooring, see BS 8425.*

Bamboo flooring is also not covered by this British Standard.

The hygrometer test for dampness of concrete bases is given in Annex A. Guidance on the selection of wood species is given in Annex B.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. 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 1187, *Specification for wood blocks for floors*
- BS 1202-1, *Specification for nails – Part 1: Steel nails*
- BS 1210, *Specification for wood screws*
- BS 1297, *Specification for tongued and grooved softwood flooring*
- BS 4050-2, *Specification for mosaic parquet panels – Part 2: Classification and quality requirements*
- BS 6100-8, *Building and civil engineering – Vocabulary – Part 8: Work with timber and wood-based panels*
- BS 8103-3, *Structural design of low-rise buildings – Part 3: Code of practice for timber floors and roofs for housing*
- BS 8204-1 *Screeds, bases and in situ floorings – Part 1: Concrete bases and cementitious levelling screeds to receive floorings – Code of practice*
- BS 8204-4:2004 *Screeds, bases and in situ floorings – Part 4: Cementitious terrazo wearing surfaces – Code of practice*
- BS 8417:2011, *Preservation of timber*
- BS EN 204, *Classification of thermoplastic wood adhesives for non-structural applications*
- BS EN 300:2006, *Oriented strand boards (OSB) – Definitions, classification and specifications*
- BS EN 301, *Adhesives, phenolic and aminoplastic, for loading bearing timber structures – Classification and performance requirements*
- BS EN 312:2003, *Particleboards – Specifications*
- BS EN 636:2003, *Plywood – Specifications*
- BS EN 1313-2, *Round and sawn timber – Permitted deviations and preferred sizes – Part 2: Hardwood sawn timber*
- BS EN 1991-1-1, *Eurocode 1 – Actions on structures. Part 1-1: General actions – Densities, self-weight, imposed loads for buildings*
- NA to BS EN 1991-1-1, *UK National Annex to Eurocode 1 – Actions on structures. General actions – Part 1-1: Densities, self-weight, imposed loads for buildings*
- BS EN 1995-1-1, *Eurocode 5 – Design of timber structures – Part 1-1: General – Common rules and rules for buildings*
- BS EN 13226, *Wood flooring – Solid parquet elements with grooves and/or tongues*
- BS EN 13228, *Wood flooring – Solid wood overlay flooring elements including blocks with an interlocking system*
- BS EN 13629, *Wood flooring – Solid pre-assembled hardwood board*
- BS EN 13986, *Wood-based panels for use in construction – Characteristics, evaluation of conformity and marking*
- BS EN 14342:2005, *Wood flooring – Characteristics, evaluation of conformity and marking*
- BS EN 14904, *Surfaces for sports areas – Indoor surfaces for multi-sports use – Specification*
- DD CEN/TS 15676, *Wood flooring – Slip resistance – Pendulum test*

### Other publications

[N1] Property Care Association. *Remedial Timber Treatment Code of Practice*. Huntingdon: PCA, 2008.

## 3 Terms and definitions

For the purposes of this British Standard, the terms and definitions given in BS 6100-8 and the following apply.

- 3.1 base/subfloor**  
element that supports the flooring
- 3.2 battens**  
solid wood or laminated wood to enable timber flooring to be mechanically fixed and raised off a solid subfloor or base  
*NOTE Battens are usually floating. They may be used with cradles or other levelling systems.*
- 3.3 block flooring**  
softwood or hardwood blocks either square edged or with a system of interlocking into each other
- 3.4 concrete subfloor**  
mass concrete base (floor slab) onto which wood flooring, or a finishing screed prior to installation of wood flooring, is to be applied
- 3.5 damp-proof membrane**  
continuous layer of impervious material installed under a concrete slab between the slab and the ground
- 3.6 end grain block flooring**  
flooring of softwood or hardwood blocks with the wearing surface at right angles to the grain
- 3.7 end matched**  
joint at the end of the strip or board, square-ended and tightly abutted, usually interlocking in the form of a tongued and grooved joint  
*NOTE This term does not in any way refer to the colour or grain pattern of the timber.*
- 3.8 face**  
better or preferred surface of the element
- 3.9 fixed floor**  
method of construction where the flooring is fixed directly to the base  
*NOTE E.g. fixed to joists or glued down to the base. [See Figure 1 and Figure 3a).]*
- 3.10 floating floor**  
method of construction where the flooring is fixed to a floating batten or laid upon a base, with a resilient underlay between, without being positively fixed to the base  
*NOTE See Figure 2.*
- 3.11 flooring**  
upper layer of a floor providing a finished surface; including wood board and strip, block, mosaic, overlay and parquet, and wood-based panel products

- 3.12 flooring thickness**  
finished thickness of the flooring prior to installation
- 3.13 laminate flooring**  
plastic laminate bonded to a wood-based material
- 3.14 mosaic flooring**  
panels comprising squares assembled from softwood or hardwood fingers held together by a removable surface membrane or fixed flexible backing
- 3.15 multi-layer flooring (engineered hardwood flooring)**  
interlocking laminated elements consisting of a top layer of solid wood, greater than 2.5 mm in thickness and additional lower layer or layers of wood or wood-based materials bonded together
- 3.16 overlay**  
panels or interlocking wood strips or boards for direct application to a fully supporting base
- 3.17 panel flooring**  
plywood, blockboard, flooring type particleboard, OSB and hardboard panels having square, rebated or tongued and grooved edges
- 3.18 parquet**  
hardwood strip or strip of proprietary manufacture, in long or short lengths according to pattern requirement, for direct application to a fully supporting base
- NOTE Although not a true term for wooden flooring, this is also a modern generic term for decorative types of hardwood flooring.*
- 3.19 pre-assembled board**  
solid or multi-layered timber product of proprietary manufacture available in a multitude of widths, thicknesses and lengths and finishes
- NOTE Pre-assembled board is made by factory joining smaller pieces together and supplied in long lengths. Boards are normally tongued and grooved/interlocking and end matched.*
- 3.20 prefinished**  
method of supplying hardwood flooring, where it has a uniform moisture content and a protective and decorative finish applied during manufacture
- 3.21 screed**  
layer of material of substantial thickness laid in-situ to provide a suitable flat surface upon which the flooring can be applied without requiring further adjustments of level to bring the surface of the flooring to the designated level
- 3.22 service class**  
class defined by the moisture levels of products used in dry (service class 1), humid (service class 2) or exterior (service class 3) conditions
- NOTE See BS EN 1995-1-1 for further details on service classes.*
- 3.23 solid**  
product that is manufactured or joined together from one piece throughout its entire thickness
- 3.24 surface damp-proof membrane**  
material applied to the surface of the subfloor to inhibit the passage of water vapour

*NOTE The membrane is designed to inhibit water vapour of above 75% relative humidity (RH) to the manufacturer's maximum level.*

- 3.25 suspended floor**  
floor that spans between (local) supports
- 3.26 underlay**  
product or component, usually in the form of a thin sheet, installed beneath flooring
- 3.27 underlayment**  
smoothing compound/levelling compound or wood-based panel, applied in-situ to a sound base, screed or substrate to provide a suitable finish to receive adhesive, the underlay or floor covering
- 3.28 unfinished**  
method of supplying hardwood flooring, where it will need to be sanded and sealed on site after fitting and might need to be acclimatized to ensure the moisture content is uniform
- 3.29 vapour check membrane**  
a membrane laid over the base, subfloor or screed to prevent low levels of residual moisture affecting the timber flooring  
*NOTE A low level is considered to be below 75% RH.*
- 3.30 veneered**  
laminated elements with a thin decorative top layer of solid wood less than 2.5 mm thick
- 3.31 wood board flooring**  
solid timber of random length, and varying width exceeding 100 mm installed in parallel rows or multi-layered timber product of proprietary manufacture available in a multitude of widths, thickness and finishes  
*NOTE Boards are normally tongued, grooved and end matched.*
- 3.32 wood strip flooring**  
solid timber of random length and varying width not exceeding 100 mm to be installed in parallel rows  
*NOTE The strips are normally tongued, grooved and end matched.*

Figure 1 Typical forms of fixed floor construction for use with timber or wood-based panel flooring

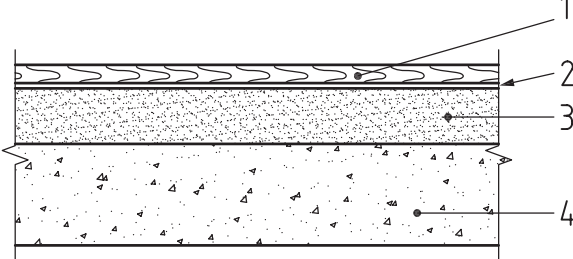
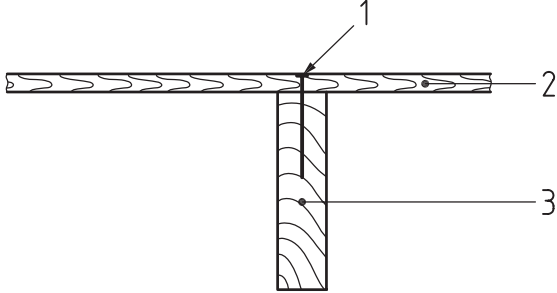
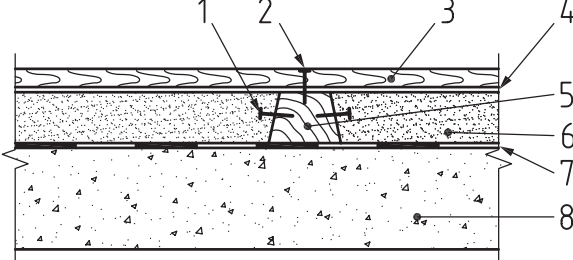
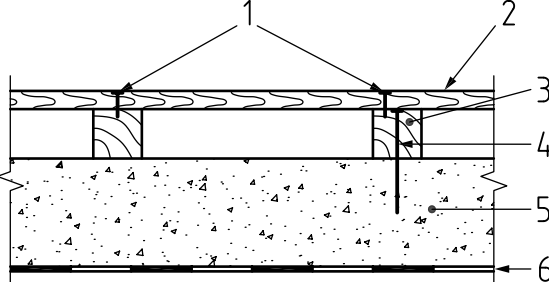
|                                                                                                                                                                                       |                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>a) Floor glued down to a subfloor of screed or wood</p>                                          | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Flooring</li> <li>2 Adhesive</li> <li>3 Screed</li> <li>4 Concrete base</li> </ul>                                                                                                                        |
|  <p>b) Suspended timber floor</p>                                                                    | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Fixing nail or screw</li> <li>2 Flooring</li> <li>3 Joist</li> </ul>                                                                                                                                      |
|  <p>c) Batten held in position by in-filling and located over sandwich damp-proofing</p>            | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Clout nails</li> <li>2 Fixing nail or screw</li> <li>3 Flooring</li> <li>4 Vapour check</li> <li>5 Batten</li> <li>6 Insulating screed</li> <li>7 Damp-proof membrane</li> <li>8 Concrete base</li> </ul> |
|  <p>d) Batten held in position by plug and screw fixing and located over surface damp-proofing</p> | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Fixing nails or screws</li> <li>2 Flooring</li> <li>3 Batten</li> <li>4 Plug and screw fix</li> <li>5 Concrete base</li> <li>6 Damp-proof membrane</li> </ul>                                             |

Figure 2 Typical forms of floating floor construction to provide impact and airborne sound resistance (e.g. between flats)

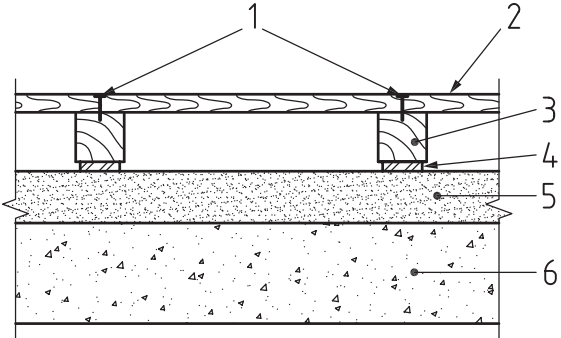
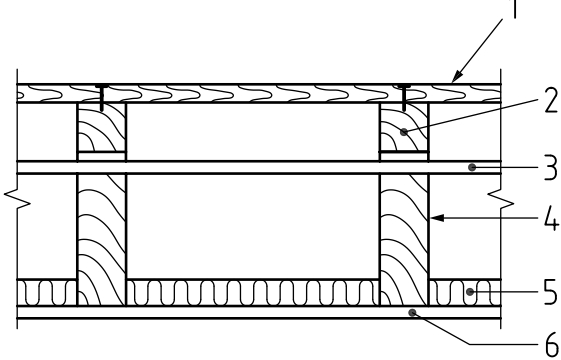
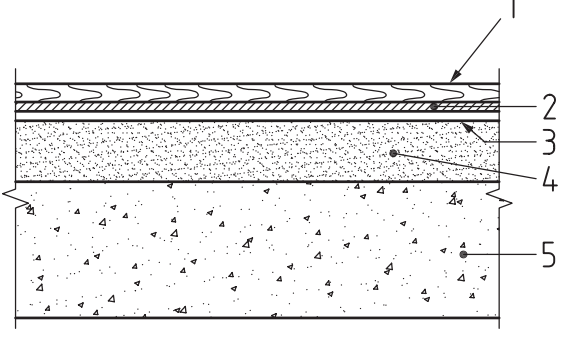
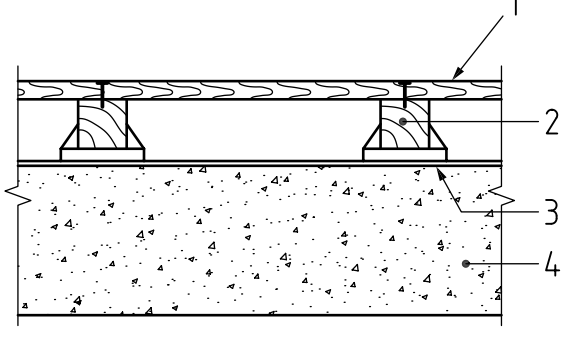
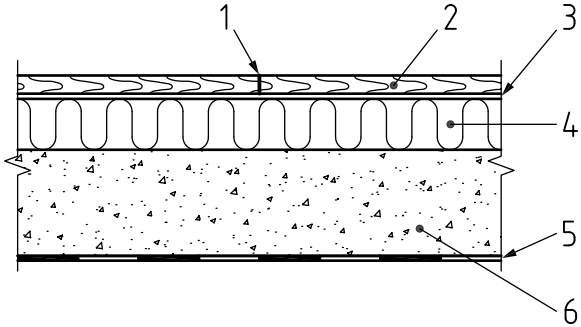
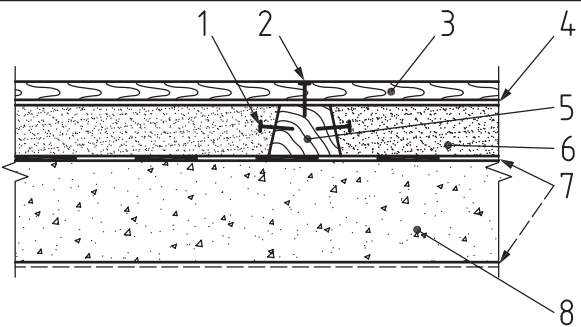
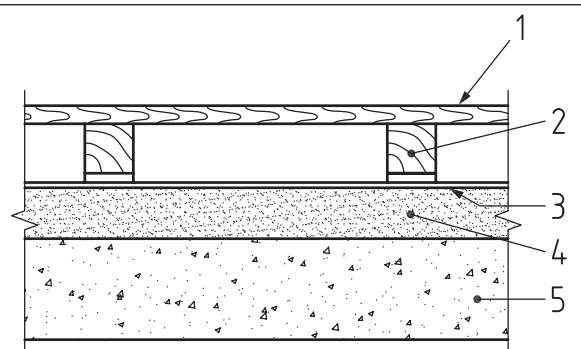
|                                                                                                                                                   |                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>a) Flooring fixed to battens on resilient pads or strips</p> | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Nail or screw fixing (should not project through batten)</li> <li>2 Flooring</li> <li>3 Batten</li> <li>4 Resilient pad or strip</li> <li>5 Screed</li> <li>6 Concrete base</li> </ul> |
|  <p>b) Flooring fixed to battens on subfloor over joists</p>    | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Flooring</li> <li>2 Batten</li> <li>3 Subflooring</li> <li>4 Joist</li> <li>5 Insulation</li> <li>6 Ceiling</li> </ul>                                                                 |
|  <p>c) Flooring loose-laid on concrete base</p>                | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Flooring</li> <li>2 Underlay</li> <li>3 Vapour check</li> <li>4 Screed</li> <li>5 Concrete base</li> </ul>                                                                             |
|  <p>d) Flooring fixed to battens in cradle support</p>         | <p><b>Key</b></p> <ul style="list-style-type: none"> <li>1 Flooring</li> <li>2 Cradle and batten</li> <li>3 Vapour check</li> <li>4 Concrete base</li> </ul>                                                                                      |

Figure 3 Typical forms of ground floor construction for use with wood-based panel products

|                                                                                                                                                               |                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>a) Panel flooring carried on continuous layer of insulating material</p> | <p><b>Key</b></p> <ul style="list-style-type: none"><li>1 Glued tongued and grooved joint</li><li>2 Flooring</li><li>3 Vapour check</li><li>4 Thermal insulation layer</li><li>5 Damp-proof membrane</li><li>6 Concrete base</li></ul>                                               |
|  <p>b) Panel flooring fixed to battens on concrete</p>                       | <p><b>Key</b></p> <ul style="list-style-type: none"><li>1 Clout nails</li><li>2 Fixing nail or screw</li><li>3 Flooring</li><li>4 Vapour check</li><li>5 Batten</li><li>6 Insulating screed</li><li>7 Damp-proof membrane (or below concrete base)</li><li>8 Concrete base</li></ul> |
|  <p>c) Panel flooring fixed to floating battens</p>                        | <p><b>Key</b></p> <ul style="list-style-type: none"><li>1 Flooring</li><li>2 Foam backed batten</li><li>3 Vapour check</li><li>4 Screed</li><li>5 Concrete base</li></ul>                                                                                                            |

4 Performance factors

4.1 General

Wood flooring should conform to BS EN 14342; wood-based panels should conform to BS EN 13986.

*NOTE The suitability of wood for flooring use depends on resistance to wear, resistance to dimensional change (movement), appearance and other factors.*

*Quarter-sawn material usually gives better stability than plain sawn stock. Plywood has some advantages in economy of material and in fixing but, due to comparative thinness of face veneers, has less tolerance to wear than solid boarding.*

## 4.2 Temperature and moisture

Where the range of atmospheric humidity is likely to be wide or where seasonal moisture changes are likely to be large, e.g. with underfloor heating, the width of the floorboards should be as narrow as practicable.

*NOTE 1 With underfloor heating the appearance of gaps is less noticeable if the widths of the flooring elements are kept as narrow as practicable.*

If a wood floor is desired in a situation where it might be subject to frequent wetting, species with good natural resistance to liquid and low movement should be chosen. Additional coats of protection should be applied in these cases. The manufacturer's recommendations should be followed when using all these materials.

*NOTE 2 Timber flooring is affected by exposure to dampness and wetting and is therefore designed for dry areas or for areas subject to minimal liquid exposure. Where the floor is to be subject to pooling water that is not cleaned up in a timely manner, the use of a wood floor is not advisable.*

*NOTE 3 Seals provide excellent wearing properties but might produce "fissure cracking" or "rafting" in newly installed floors which have contracted. For further details on floor surface treatment, see TRADA's guides to seals [1, 2, 3].*

## 4.3 Impact resistance

End grain wood blocks (see 3.5) should be used in industrial premises where the use of wood is required for its sound reducing qualities and for its ability to absorb impact from heavy objects, e.g. castings, without damage to the object and without unacceptable damage to the floor.

*NOTE These blocks are usually impregnated to improve durability and to reduce movement problems.*

End grain wood blocks are normally supplied as proprietary items and the manufacturer's recommendations for installation should be followed.

## 4.4 Resistance to abrasion

Resistance to abrasion is an inherent variable characteristic of wood species, with a higher resistance to abrasion generally commensurate with a higher density. Resistance to abrasion of a floor finish is dependent on the nature of the coating materials. Choice of either wood species or floor finish should be based on the anticipated wear to which the floor is to be subjected. For unfinished or waxed wood Tables B.1 to B.11 provide useful guidance. For proprietary coatings, seek manufacturer's guidance.

*NOTE It is emphasized that none of the normal finishes for floors can "upgrade" the classification in the tables of a species by improving its natural ability to resist abrasive action. This resistance is mainly governed by the particular nature of its anatomical structure. In general, the influence of a floor finish is superficial and not effective in depth.*

## 4.5 Acoustic and impact sound insulation

The sound attenuation properties of a floor are dependent on the entire floor construction; when the finished floor forms an integral part of the acoustic system for sound attenuation between dwellings, installers should work precisely to the flooring designer's details ensuring that mechanical fixings do not breach any separation layer.

*NOTE Acoustic and impact sound insulation is as much a matter of construction as of materials. Figure 2 gives typical examples of floating floor construction intended for this purpose. Attention is drawn to the Building Regulations [4, 5, 6]. It is advisable to consult Robust Details ([www.robustdetails.com](http://www.robustdetails.com)) for advice on acoustic and impact sound insulation.*

## 4.6 Slipperiness

Where a slip resistance is specified, testing should be in accordance with DD CEN/TS 15676. Sports floors should conform to BS EN 14904.

*NOTE 1 An increase in slipperiness is almost certainly linked to surface contamination owing to improper or insufficient maintenance. Generally, finishes on wood or wood-based panel floors have a low potential for slip in dry conditions. However, if they are allowed to get wet, for example with spillages, the potential for slip increases.'*

Specialist slip resistant site applied coatings should be applied if the spillages cannot be managed.

*NOTE 2 In dry conditions, most wood-based flooring falls within the Low Potential for Slip category when tested in accordance with BS 7976-2, and remains so if it is finished and maintained in accordance with the manufacturer's recommendations.*

## 4.7 Thermal insulation

*NOTE 1 The thermal resistance of wood varies with the species but is in the order of 0.13 m<sup>2</sup> K/W. In recent years, underfloor heating has been used more commonly with wooden flooring.*

Wood materially reduces heat transfer through the whole floor construction, and thus wood flooring should only be considered over an underfloor heating installation with full prior consultation with the heating engineer and the floor supplier. The heating engineer should be informed of the thickness of the wood flooring to be used along with the thermal conductivity and thermal resistance so that this can be taken into account in the heating calculations.

*NOTE 2 The low thermal capacity of wood provides a surface which is readily warmed and upon which moisture vapour is unlikely to condense.*

*NOTE 3 See 12.6 for further information on underfloor heating. Figure 3 shows typical ground floor constructions having improved thermal insulation.*

## 4.8 Fire performance

### COMMENTARY ON 4.8

For all floors above the lowest floor, it is the fire resistance of the complete floor construction that is of primary importance in a fire, and the reaction to fire (ignitability and surface spread of flame) characteristics of wood flooring itself are not normally significant for the purpose of evacuating a building.

### 4.8.1 Fire resistance

The fire resistance of a floor is dependent upon the entire floor construction and should be determined taking into account only those elements considered as permanent unless there is specific advice to the contrary.

*NOTE For a wood floor this would include the permanent structural floor deck but not the decorative finished floor which could be removed or replaced at any time.*

### 4.8.2 Reaction to fire

#### COMMENTARY ON 4.8.2

Wood is a combustible material and, in the densities normally used for flooring (greater than 400 kg/m<sup>3</sup>), has surfaces of class 3 flame spread as determined by the tests described in BS 476-7. Wood flooring is classified as "P" by the ignitability test described in BS 476-12.

Reaction to fire should be assessed using either the European standard based system or the British Standard system. When using the British Standard system, flame retardance and smoke production of wood-based flooring should be assessed in accordance with BS EN 13501.

*NOTE 1 There are seven fire classes for both floor surfaces and other building surfaces: A1, A2, B, C, D, E and F. Most wood floors are in categories C or D and therefore have an average fire safety rating. In addition to the origin and spread of fire, information is also required for the classification of smoke production. There are three smoke classification groups: S1: Minimal smoke production; S2: Average smoke production; and S3: Large smoke production. Most wood floors belong in category S1.*

When using the European standard based system, wood-based flooring should be assessed in accordance with BS EN 13051-1.

*NOTE 2 A typical classification for wood and wood-based panels used in flooring would be  $D_{fl-s1}$  with specific installation requirements (e.g. without an air gap) or  $E_{fl}$  for any end use condition. See BS EN 14342.*

#### 4.9 Formaldehyde release

Where formaldehyde-containing materials, particularly aminoplastic resins or coatings, have been added to the wood or wood-based panel flooring as part of the production process, the product should be tested for the release of formaldehyde and classified into one of two classes, E1 or E2, in accordance with BS EN 14342:2005+A1 (for solid wood flooring) or BS EN 13986 (for wood-based panels). All timber flooring products should conform to BS EN 14342 or BS EN 13986, which set out the level of formaldehyde permitted in timber products.

#### 4.10 Colour sensitivity

Wood is sensitive to light; it affects the colour of the wood over a period of time, varying from species to species and this should be considered at the design stage.

### 5 Care on site

On site, all materials intended for flooring should be stacked carefully to retain flatness. They should be stored in a weathertight and dry environment with conditions that maintain the moisture content at the level recommended for laying (see 12.5.3) and as close as possible to the conditions of the finished building.

Unless there is a particular need to acclimatize the flooring, delivery should be programmed to ensure the shortest possible storage period. The moisture content of timber and wood products should be checked immediately upon receipt on site or, if well protected by moisture resistant wrapping, when unwrapped. Packages should not be undone until fixing is to take place.

Before flooring is laid, all other building operations should, as far as possible, have been completed. All wet trades should be completed and fully dry. However, the fixing of skirtings, architraves and other similar finishings should be deferred until after the floor has been installed.

The laid flooring should be kept clean and free from cement, plaster droppings and other debris likely to cause damage. As the flooring is laid, it should be protected progressively with suitable material. If plant such as trestles, ladders or steps has to be used, parts resting on the flooring should be provided with protective padding. No plant should be slid over the finished flooring.

A suitable permanent division strip, allowing for the movement of the timber flooring, should be inserted at any change in the flooring to protect the exposed edge.

*NOTE This might also be appropriate at doors/openings between separate rooms, refer to manufacturer's advice.*

Where flooring has to be sanded and sealed on site, for example in accordance with the recommendations of 15.6, such sanded finish should encompass all of the upper surface. Sanding papers of appropriate grits should be used in sequence to achieve an all-over smooth surface free from score marks.

*NOTE Squash courts are finished with a 60 grit paper and unless specified otherwise are left unsealed.*

Wood shavings and other debris should be prevented from accumulating under a floor as this can lead to a fire hazard or to infestation by vermin.

## 6 Exchange of information

In order for the wood flooring to be correctly installed under appropriate conditions, all parties should have a clear understanding of the requirements of the project [see list a) to ii)], and of the implications for all concerned. To ensure that this is achieved, there should be wide consultation between all parties involved in the project, including sub-contractors and materials suppliers. This consultation should start early in the design stage but is necessary throughout the contract, especially if requirements or the time scale change and as new-contract work is initiated.

The information to be exchanged should include whichever of the following are applicable:

- a) location, access, unloading and storage facilities;
- b) construction of base;
- c) type, thickness, species, grade and use of flooring;
- d) method of heating the building;
- e) type and location of damp-proofing;
- f) type, thickness and finish of screed;
- g) level of finished floor;
- h) preservative treatment;
- i) work consequent upon services passing through the flooring;
- j) type of underlay;
- k) method of fixing;
- l) treatment of skirtings and abutments;
- m) provision for expansion and position and treatment of expansion gaps;
- n) treatment of junctions with adjacent flooring;
- o) any dressing or polishing required;
- p) method of and responsibility for protection of the completed work;
- q) lighting and power supply;
- r) any special site or contract conditions applicable;
- s) time schedule for progress of the work and its relationship to the work of other trades, particularly wet trades;
- t) type of use;
- u) type and density of foot and/or wheeled traffic;
- v) loadings;
- w) specific requirements;

- x) acoustic requirements;
- y) whether upper floor, ground floor or below ground level;
- z) whether ground-supported or suspended construction;
- aa) particulars of any under floor heating installation or security installation;
- bb) curing and drying times of screeds and bases likely to be required before the installation of floor coverings;
- cc) screed or base with finished floor level, permissible departure from datum and class of surface regularity required;
- dd) in refurbishment work, the type and condition of existing base or floor finish and any type of treatment required;
- ee) type of damp-proof membrane and position within the floor construction, in particular, the need for specialist surface applied membranes where likely drying times for the base exceed time available in the programme;
- ff) choice of substrate, underlayment, adhesives, intermediate products and floor coverings;
- gg) requirements for direction of material and the position and type of expansion joint profiles;
- hh) size, position and design of barrier matting; and
- ii) advice on regular routine maintenance requirements (see Section 9).

Where a Building Owner's Manual is required, all the necessary information should be provided for inclusion, e.g. species of timber, where used and maintenance procedures.

## 7 Time schedule

The time schedule should include dates for the following:

- a) delivery of materials;
- b) start and completion of the various sections of the flooring.

When a time schedule is prepared, arrangements should be made, amongst other things, for:

- 1) all services to be installed and tested before the flooring is laid (see 12.6.5);
- 2) any concrete and screed in the base or any adjacent bases and any wet plaster to have time to dry before the flooring is laid (see 12.4.6).

## Section 2: Materials

*NOTE The names used for the wood species referred to in this British Standard are in accordance with the nomenclature given in BS EN 13556.*

*The classification of softwoods and hardwoods is botanical. Softwoods, belonging to the order Coniferae (conifers), include European redwood, European whitewood, Douglas fir, hemlock and yew. Hardwoods, belonging to the order Dicotyledoneae (broad leaf trees), include, for example, oak, beech, teak, maple and balsa.*

### 8 Selection of flooring type

Careful consideration should be given to the selection of the form of the flooring, whether board, strip, blocks, mosaic or panel products, taking into account all the performance factors (see Clause 4) applicable to the intended use, wood species capabilities, characteristics and availability.

### 9 Selection of wood species

The suitability of hardwoods and softwoods for various flooring applications should be based on the known performance of the wood species. The listings for different flooring end use applications given in Table B.1 to Table B.11 should be used as an initial reference (this information was derived from the annex to Forest Products Research Laboratory Bulletin 40 [7]) together with all pertinent performance factors given in Clause 4.

#### COMMENTARY ON Clause 9

*The suitability of wood species listed in Table B.1 to Table B.11 is based on comprehensive research, together with a long history of satisfactory use over many years, providing a valuable information resource when determining which wood species are most appropriate for particular flooring applications. The lists have been included, in their entirety, from the previous edition of this British Standard.*

*The listed species are recommended as having performance suited to use as flooring, mainly in wood strip, board or wood block form but not as end grain blocks. The list is not exhaustive and the omission of any particular wood species does not imply that it is necessarily unsuitable for flooring. At the same time the inclusion of a wood species in the list does not imply that it is always readily available on the market.*

*Those species mentioned as especially suited to particular conditions of service can be used under other conditions when they possess the necessary properties. Some species have been included therefore in more than one group. It ought to be appreciated, however, that the various species indicated as suitable for any particular service conditions might not all be equally suitable in every respect.*

*The species listed are a selection only. Property requirements for each category of use are given in "Timber selection by properties, the species for the job, Part 1: Windows, doors, cladding and flooring" [8] where additional timbers are listed.*

*For further information on the selection of wood species, see Annex B.*

## 10 Selection of panel products

*NOTE For guidance on the selection of timber species, see Annex B.*

### 10.1 General

#### COMMENTARY ON 10.1

*Solid timber has been extensively used and tested and can be expected to last the life of the building. However, it is not possible to be as definite about the wear of panel products. The recommendations given in this subclause apply to an exposed wearing surface and not to the basic flooring structure, and it is assumed that the wearing surface will have applied to it (and suitably maintained) a surface finish comparable to that which would be given to a hardwood or softwood floor in the same performance classification.*

Where floors have a structural function, the thicknesses, related spans and fixings of wood-based panels should conform to BS 8103-3 or be in accordance with the manufacturer's recommendations.

Wood-based panels are generally available in sizes based on a 300 mm modular dimension, with the customary sizes being:

- a) square edged: 2 400 mm × 1 200 mm;
- b) tongued and grooved: 2 400 mm × 600 mm.

The availability of smaller panels should be established before being specified.

Wood-based panels intended for use as finished flooring should not be exposed to the weather before or during construction. The floor should only be laid once the building is weather proof and all wet trades completed.

### 10.2 Plywood and blockboard

*NOTE Plywood and blockboard are considered suitable only for 'light' and 'normal' pedestrian traffic.*

Where the face veneer is to become the wearing surface, the wood should be of a suitable species (see Annex B for guidance) and of sufficient thickness to accommodate the anticipated wear. Panels sanded on at least one surface should be used to reduce variety of thicknesses between panels.

For face veneers that have a coating applied, consideration should be given to the density of the species used (e.g. a high density gives better wear characteristics than a plywood with lower densities).

Blockboard should not be used without continuous support (see 29.3); in consequence, the panel thickness of blockboard is determined by the service conditions applicable to the situation where the blockboard is used.

Plywoods and blockboards should conform to BS EN 636 and be of a suitable grade for their end use. BS EN 636:2003, Clause 6, should only be used in situations where there is no possibility of high humidity. BS EN 636:2003, Clause 7, and BS EN 636:2003, Clause 8, should be used where high humidity is likely, such as in bathrooms, washrooms, lavatories, ground floors or kitchens.

### 10.3 Particleboard

#### COMMENTARY ON 10.3

*Particleboard is usually suitable for light and normal pedestrian traffic in domestic situations.*

Type P4 or P6 particleboard conforming to BS EN 312:2003 should only be used where the possibility of high humidity does not need to be allowed for (e.g. upper floor bedrooms).

Type P5 and P7 particleboard conforming to BS EN 312:2003 should be used in those situations where the particleboard is likely to be exposed to high humidity (e.g. in bathrooms, washrooms, lavatories, ground floors or kitchens).

Wood-based panels intended for use as decorative flooring should not be exposed to the weather before or during construction. The floor should only be laid once the building is weather proof and all wet trades completed.

*NOTE Types P4 and P6 are intended only for use in non-humid environments. The National House-Building Council ([www.nhbc.co.uk](http://www.nhbc.co.uk)) standards do not recommend type P4 or P6 for use in domestic floors.*

## 10.4 Oriented strand board (OSB)

### COMMENTARY ON 10.4

*OSB is usually suitable for light and normal pedestrian traffic in domestic situations.*

An OSB with a sanded finish should be used.

OSB/2 conforming to BS EN 300:2006 should only be used where the possibility of high humidity does not need to be allowed for (e.g. upper floor bedrooms).

OSB/3 conforming to BS EN 300:2006 should be used in situations where the particleboard is likely to be exposed to high humidity (e.g. in bathrooms, washrooms, lavatories, ground floors or kitchens).

*NOTE 1 The National House-Building Council ([www.nhbc.co.uk](http://www.nhbc.co.uk)) standards do not recommend type OSB/2 for use in domestic floors.*

*NOTE 2 Where there might be subsequent installation of a glued surface covering it should be confirmed that adhesives used are compatible with both the base and the floor covering.*

## 10.5 Hardboard

*NOTE Standard hardboard type HB as specified in BS EN 622-2:2004 is suitable for use as a surface subjected to light pedestrian traffic.*

*Tempered hardboard type HB.E as specified in BS EN 622-2:2004 has a surface suitable for light and normal pedestrian traffic. It provides a slip resistant surface when installed screen-side up.*

The overall thickness of hardboard should be related to the intended use as follows:

- a) for normal use: 3.2 mm;
- b) for floors with open joints (e.g. some square edge boarding): 4.8 mm or 6.4 mm.

# 11 Basic recommendations

## 11.1 Freedom from defects

All wood flooring should be free from:

- a) rot;
- b) active insect attack; and
- c) defects that would detract from the suitability of the flooring, e.g. unstable splits, shakes and loose knots.

*NOTE 1 For softwoods within the scope of BS 1297, some minor defects are permissible.*

*NOTE 2 The maximum dimensions of sound and tight knots, and limits on other defects in tongued and grooved or strip flooring of softwood are specified in BS 1297. In certain cases, it might be desirable further to limit the size and number of firm knots in the exposed face of softwood flooring. In other cases, it might be reasonable to allow a relaxation in the normal requirement for hardwood floors. These cases fall outside the scope of this British Standard and, if changes are required, they ought to be the subject of separate agreement between the purchaser and the supplier. If pinholes are so permitted, they ought to be filled with a suitable filler. Pinhole borers (ambrosia beetles) cannot live in wood after it has been cut and dried.*

*NOTE 3 Many producers of solid wood flooring now offer proprietary named products (e.g. "rustic") which use growth characteristics for different appearance grades. Such products reflect the producer's own quality requirements with regard to grading, appearance, performance and strength.*

## 11.2 Colour variations

Natural colour variations in both softwood and hardwood should be expected but if for a particular contract more uniform colour is required, this should be arranged by prior agreement between the purchaser and the supplier. In such cases, the level of acceptance should be clearly specified preferably after discussion between the parties on the cost and other implications.

## 11.3 Softwood and hardwood

Tongued and grooved softwood flooring should conform to BS 1297. Sizes of hardwood flooring should conform to BS EN 1313-2.

## 11.4 Blocks

Blocks should generally conform to BS 1187, although some manufacturers produce blocks of overall dimensions outside BS 1187 limits.

## 11.5 Mosaic fingers

Mosaic fingers should be in accordance with BS EN 13488. The layout of the individual fingers within a panel should be such as to maintain a regular pattern over the whole of the floor.

## 11.6 Parquet strips

Parquet strips should be not less than 6 mm thick.

## 11.7 Adhesives

Adhesives should be of an appropriate type and should be applied in accordance with the manufacturer's instructions.

## 11.8 Nails

Except where masonry nails are recommended, nails and pins should conform to BS 1202-1 and should be selected, as appropriate to the use (see **12.7.2**), from the following list:

- a) round plain head nails ("normal" nails);
- b) round lost head nails;
- c) oval lost head nails;
- d) oval brad head nails;
- e) annular-ringed shank flat head nails ("improved" nails);
- f) clout nails; and

g) panel pins.

In addition, the use of lost head screw shank nails or machine nailing using a portable nailing machine is permissible; in both cases, the manufacturer's recommendations regarding usage should be followed.

### **11.9 Woodscrews**

Woodscrews should conform to BS 1210 and should be not less than size no. 8.