

Code of practice for flooring of timber, timber products and wood based panel products —

(Formerly CP 201)

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- Chipboard Promotion Association Ltd.
- Contract Flooring Association
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- Department of the Environment (Property Services Agency)
- Fibre Building Board Organization (Fidor)
- Greater London Council
- Incorporated Association of Architects and Surveyors
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Foreword

This British Standard code of practice has been prepared under the direction of the Timber Standards Committee. It is a revision of CP 201-1:1967 (Imperial) and CP 201-2:1972 (Metric) which it supersedes and which are both withdrawn.

The information and recommendations given in CP 201 have been rationalized where necessary and the opportunity has been taken to add recommendations relating to flooring made from wood based panel products.

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

General recommendations applicable to all types of wood flooring are contained within sections 1 and 7 but recommendations specific to individual types of floor are given in sections 2 to 6 inclusive. Because some recommendations are applicable to more than one individual type of floor this layout 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.

Appendix A describes test methods for use in conjunction with the recommendations given in 6.4.6.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 50, an inside back cover and a back cover.

This standard has been updated (see copyright data) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

0 Introduction

0.1 This code does not specifically deal with the selection and means of fixing impermeable coverings to wood floors. However there are certain precautions that should be observed when such coverings are subsequently to be applied. These precautions are described in **6.8** (also see **6.4.6**).

0.2 Floors of wood based panel products are normally expected subsequently to be covered by carpets, linoleum and the like. Certain measures are therefore recommended to ensure that the floor is suitable for such covering and these measures are described in **28.6**. Although most floors of wood based panel products may be covered, the text includes information on their resistance to wear in the uncovered condition in order to be consistent with other materials.

0.3 The words “timber” and “wood” in this code cover softwoods, hardwoods, plywood, hardboard, blockboard and chipboard as may be appropriate in the context.

0.4 Sections 2 to 6 should always be read in conjunction with sections 1 and 7.

1 Scope

This code of practice gives recommendations for laying the following types of flooring of wood and wood products:

- a) board and strip;
- b) block;
- c) mosaic;
- d) overlay and parquet;
- e) wood based panel products.

The code does not deal with the protection afforded to a floor by floor coverings or surface finishes.

This code does not deal with floors for temporary structures or floors intended for limited use.

Different considerations may apply to these floors.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this code the definitions given in BS 6100-4 apply together with the following.

2.1

base

element that supports the flooring

2.2

screed

layer of material of substantial thickness laid in-situ to provide a suitable surface upon which the flooring may be applied without requiring further adjustments of level to bring the surface of the flooring to the designated level

2.3

underlay

sheet material laid over a structural floor to accommodate irregularities or unevenness of its surface in order to provide a smooth surface for the final flooring

2.4

vapour check

material or part of a construction element that offers a high resistance to the passage of water vapour

2.5

damp proof membrane

continuous layer of impervious material

2.6

face

better or preferred surface of a plywood panel

2.7

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

2.8

fixed floor

method of construction where the flooring is fixed directly to the base [See Figure 1 and Figure 3(a).]

2.9

floating floor

upper part of a floor laid upon a base, sometimes with resilient material between, without being positively fixed (See Figure 2.)

2.10

suspended floor

floor that spans between (local) supports

2.11

wood board flooring

lengths of hardwood or softwood sections spanning between bearers with the width of board being greater than 100 mm

2.12**wood strip flooring**

length of hardwood or softwood sections spanning between bearers, with the width of strip being 100 mm or less

2.13**block flooring**

softwood or hardwood blocks with a system of interlocking

2.14**end grain block flooring**

flooring of softwood or hardwood blocks with the wearing surface at right angles to the grain

NOTE Normally the blocks are 75 mm deep.

2.15**mosaic flooring**

panels comprising squares assembled from softwood or hardwood fingers held together by a removable surface membrane or fixed flexible backing

2.16**overlay**

pre-finished panels or interlocking wood strips of proprietary manufacture for direct application to a fully supporting base

2.17**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

2.18**panel flooring**

plywood, blockboard, flooring type chipboard and hardboard panels having square, rebated or, tongued and grooved edges

2.19**flooring thickness**

finished thickness of the flooring prior to installation

3 Materials**3.1 Nomenclature of timbers**

The names used for the timbers referred to in this code are in accordance with the nomenclature given in BS 881, BS 589.

3.2 Classification of timber

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

3.3 Basic recommendations

3.3.1 Freedom from defects. All wood flooring should be free from:

- a) rot;
- b) active insect attack;
- c) such defects as will detract from the suitability of the flooring, e.g. splits, shakes and loose knots. However, for softwoods within the scope of BS 1297 some minor defects are permissible.

In hardwood, firm knots and pinholes normally are unacceptable.

NOTE 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 particular cases it may be desirable further to limit the size and number of firm knots in the exposed face of softwood flooring. In other cases it may be reasonable to allow a relaxation in the normal requirement for hardwood floors. These cases fall outside the recommendations of this code and, if changes are required, they should be the subject of separate agreement between the purchaser and the supplier. If pinholes are so permitted then they should be filled with a suitable filler. Pinhole borers (ambrosia beetles) cannot live in wood after it has been cut and dried.

3.3.2 Colour variations. Natural colour variations in both softwood and hardwood are to be expected.

NOTE 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.

3.3.3 Softwood and hardwood. Tongued and grooved softwood flooring should comply with BS 1297. Sizes of hardwood flooring should comply with BS 5450.

3.3.4 Blocks. Softwood and hardwood blocks should be between 200 mm and 500 mm long with a face width not greater than 90 mm and thickness not less than 20 mm with at least 9 mm of clear wearing thickness above the interlocking system.

3.3.5 Mosaic fingers. Mosaic fingers should be 100 mm to 165 mm long with a thickness of 6 mm to 10 mm and width 20 mm to 25 mm. The layout of the individual fingers within a panel should be such as to maintain a regular pattern over the whole of the floor.

3.3.6 Parquet strips. Parquet strips should be not less than 6 mm thick.

3.3.7 Fibre building board. Fibre building board should comply with the requirements of Parts of BS 1142 as follows:

- a) hardboard with Part 2;
- b) bitumen impregnated insulating board with Part 3;
- c) insulating board with Part 3.

3.3.8 Wood chipboard. Wood chipboard should comply with the requirements of BS 5669 and be of type II or type II/III.

3.3.9 Blockboard. Blockboard should comply with the requirements of BS 3444 with bond type MR as a minimum.

3.3.10 Plywood. Plywood should comply with the requirements of BS 6566 with bond type MR as a minimum.

3.3.11 Adhesives. Adhesives should meet the recommendations given in Table 12.

3.3.12 Nails. Except where masonry nails are recommended, nails and pins should comply with the requirements of BS 1202-1 and should be selected, as appropriate to the use (see 6.7.2 and Table 12), 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;
- 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 it is essential that the manufacturer’s recommendations regarding usage are strictly adhered to.

3.3.13 Screws. Screws should comply with the requirements of BS 1210 and should be not less than size no. 8.

4 Performance factors

4.1 General

The suitability of wood for flooring use depends on resistance to wear, resistance to dimensional change (movement), appearance and other factors. Quarter-sawn material, which is very expensive and not readily available, usually gives better wear 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 Wetting and humidity

Where the range of atmospheric humidity is likely to be wide or where seasonal moisture changes are likely to be large, e.g. in a heated floor, it is advisable to keep the width of the floor boards as narrow as practicable. If the floor is to be subject to frequent wetting, species having good durability and low movement should be chosen and should either be given oleoresinous treatment or be sealed. Seals should be one or two parts polyurethane.

Seals provide excellent wearing properties but may produce “fissure cracking” in newly installed floors. One part mixes, because they are ready to use, have advantages on a building site. The manufacturer’s recommendations should be followed when using all these materials. For further details on floor surface treatment reference should be made to CP 209-1.

4.3 Impact resistance

End grain wood blocks (see 2.13) 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. 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

It is emphasized that none of the normal finishes for floors can “up-grade” 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. Careful and regular maintenance will, however, retard the rate of surface wear of a timber, the degree of retardation depending on the surface conditions and the type of finish used. In this respect epoxy finishes are the most hard wearing.

4.5 Sound insulation

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. However the use of panel flooring, e.g. wood chipboard, as compared to using narrow floor boards will further help to improve sound insulation. This is because of the reduction in the number of joints involved. A heavy or dense panel product will provide better sound insulation than a light one.

4.6 Slipperiness

In the natural state, most species of wood commonly used for flooring are not slippery and will not become so in adverse conditions if they are finished with a treatment which is in accordance with the recommendations of CP 209-1. Where a non-slip surface is very important, e.g. stages and gymnasia, tempered hardboard, fixed screen side up, provides a hardwearing non-slip surface. Some plywoods are manufactured with a non-slip surface.

4.7 Thermal insulation

The thermal resistivity of wood varies with the species, but is of the order of $7 \text{ m}^2 \text{ K/W}$. As a result, wood materially reduces heat transfer through the whole floor construction, and thus wood flooring should not be specified over an underfloor heating installation without 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 so that this can be taken into account in the heating calculations. The low thermal capacity of wood provides a surface which is readily warmed and upon which moisture vapour is unlikely to condense. Figure 3 shows typical ground floor constructions having improved thermal insulation.

4.8 Fire resistance

Wood is a combustible material and, in the densities normally used for flooring, 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 476-5. However, for all floors above the lowest floor, it is the fire resistance of the complete floor construction that is of primary importance in fire, and the ignitability and surface spread of flame characteristics of timber flooring itself are not normally significant.

The thickness and design of the flooring may affect significantly the overall fire performance of the floor construction and should always be taken into account when assessing the fire resistance of a floor.

4.9 Colour sensitivity

It should be borne in mind that some timbers are sensitive to light which will affect the colour of the wood.

5 Selection

5.1 General

Careful consideration should be given to the selection of the form of the flooring, whether board, strip, mosaic or panel products, and the performance factors (see clause 4) applicable to the intended use should be considered.

5.2 Selection of timber species

5.2.1 Suitability for use. The hardwoods and softwoods suitable for various applications are given in Table 1 to Table 11 and are derived from the appendix to F.P.R.L. Bulletin 40¹⁾. They 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 species of timber does not imply that it is necessarily unsuitable for flooring. At the same time the inclusion of a timber in the list does not imply that it is always readily available on the market.

Those timbers 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 should be appreciated, however, that the various timbers indicated as suitable for any particular service conditions may not all be equally suitable in every respect.

The timbers 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"²⁾ where additional timbers are listed.

5.2.2 Movement classification. In Table 1 to Table 11, the movement data are taken from BRE Technical Note No. 38³⁾. "Movement of timbers". Technical Note No. 38 lists timber species according to their movement in response to changes in atmospheric conditions. Classification 1 signifies small movement and classification 3 signifies large movement. Where no movement classification is given it means that no information is available.

5.2.3 Densities. Densities are the appropriate average densities in kg/m^3 at 12 % moisture content. For more precise averages or ranges refer to "The handbook of hardwoods"⁴⁾ and "The handbook of softwoods"⁵⁾.

¹⁾ "Timbers for flooring" Forest Products Research Laboratory Bulletin No. 40 by F H Armstrong HMSO 1957.

²⁾ Timber selection by properties, the species for the job, Part 1. Windows, doors, cladding and flooring, by C Webster, HMSO 1978.

³⁾ Technical Note No. 38 "The movement of timbers" (revised) — BRE Princes Risborough Laboratory. BRE Publications Sales Department 1982.

⁴⁾ "The handbook of hardwoods" (revised by R.M. Farmer) — BRE Princes Risborough Laboratory. BRE Publications Sales Department 1972.

⁵⁾ "The handbook of softwoods" (metric edition) (revised) — BRE Princes Risborough Laboratory. BRE Publications Sales Department 1981.

Table 1 — Timbers suitable for floors for heavy pedestrian traffic

Movement classification	Timber	Density
1	African padauk (<i>Pterocarpus soyauxii</i>)	770
1	Banga wanga (<i>Amblygonocarpus obtusangulus</i>)	995
	Bubinga (<i>Guibourtia demeusei</i>)	800
	Burma padauk (<i>Pterocarpus macrocarpus</i>)	835
2	Danta (<i>Nesogordonia papaverifera</i>)	755
3	East African olive (<i>Olea hochstetteri</i>)	880
3	European beech (<i>Fagus sylvatica</i>)	705
2	European oak (<i>Quercus robur</i> and <i>Q. petraea</i>)	705
	Haldu/kwao (<i>Adina cordifolia</i>)	675
2	Hornbeam (<i>Carpinus betulus</i>)	735
	Japanese maple (<i>Acer spp.</i>)	705
1	Loliondo (<i>Olea welwitschii</i>)	800
	Makarati (<i>Burkea africana</i>)	975
2	Malaysian keruing (<i>Dipterocarpus spp.</i>)	785
1	Missanda (<i>Erythrophleum guineense</i> and <i>E. ivorensis</i>)	895
3	Mora (<i>Mora excelsa</i>)	1 025
2	Muhimbi (<i>Cynometra alexandri</i>)	865
1	Muhuhu (<i>Brachylaena hutchinsii</i>)	960
1	Panga panga (<i>Millettia stuhlmanii</i>)	800
2	Pillarwood (<i>Cassipourea elliottii</i>)	755
1	Purpleheart (<i>Peltogyne spp.</i>)	865
2	Pyinkado (<i>Xylia dolabriformis</i>)	930
	Rhodesian copalwood (<i>Guibourtia coleosperma</i>)	800
1	“Rhodesian teak” (<i>Baikiaea plurijuga</i>)	915
2	Rock maple (<i>Acer saccharum</i>)	735
	Spotted gum (<i>Eucalyptus maculata</i>)	960

NOTE Heavy pedestrian traffic is assumed to be intensities of 2 000 persons per day and upwards, usually concentrated in definite traffic lanes, as experienced in public institutions, barracks, industrial canteens, corridors in large schools, colleges, etc.

Table 2 — Timbers suitable for floors for normal pedestrian traffic

Species listed in Table 1 plus:		
Movement classification	Timber	Density
2	African celtis (<i>Celtis spp.</i>)	785
1	Afrormosia (<i>Pericopsis elata</i>)	735
1	Afzelia (<i>Afzelia spp.</i>)	815
	American pitch pine (<i>Pinus palustris</i> and <i>P.elliottii</i>) mainly quarter-swan	655
3	Apitong (<i>Dipterocarpus spp.</i>)	690
1	Ayan (<i>Distemonanthus benthamianus</i>)	675
1	Dark red meranti/dark red seraya (<i>Shorea spp.</i>)	690
2	Grevillea (<i>African silky-oak</i>) (<i>Grevillea robusta</i>)	560
1	Guarea (<i>Guarea spp.</i>)	610
3	Gurjun (<i>Dipterocarpus spp.</i>)	705/735
1	Iroko (<i>Chlorophora excelsa</i>)	655
2	Jarrah (<i>Eucalyptus marginata</i>)	865
3	Karri (<i>Eucalyptus diversicolor</i>)	915
	Kempas (<i>Koompassia malaccensis</i>)	865
2	Keruing (<i>Dipterocarpus spp.</i>)	800
1	Makore (<i>Mimusops heckelii</i>)	610
2	Malayan kapur/North Borneo kapur (<i>Dryobalanops spp.</i>)	770/705
1	Mengkulang (<i>Heritiera spp.</i>)	705
1	Merbau (<i>Intsia bijuga</i>)	770
2	Mersawa/krabak (<i>Anisoptera spp.</i>)	625
1	Muninga (<i>Pterocarpus angolensis</i>)	655
3	Musine (<i>Croton megalocarpus</i>)	705
2	Okwen (<i>Brachystegia nigerica</i>)	675
2	Opepe (<i>Sarcocephalus diderrichii</i>)	755
3	Ramin (<i>Gonystylus spp.</i>)	655
2	Sapele/utile (<i>Entandrophragma spp.</i>)	640
1	Selangan batu (<i>Hopea spp.</i> and <i>Shorea spp.</i>)	865/945
1	Swamp sepetir (<i>Pseudosindora palustris</i>)	655
	“Tasmanian myrtle” (<i>Nothofagus cunninghamii</i>)	675
1	Teak (<i>Tectona grandis</i>)	690
3	Yang (<i>Dipterocarpus spp.</i>)	705
3	Yellow birch (<i>Betula alleghaniensis</i>)	690

NOTE Normal pedestrian traffic is assumed to be intensities less than 2 000 persons per day, as experienced in large village halls and in large assembly halls, in school and college classrooms; and in hospitals, hotels, canteens, offices, shops, etc.

NOTE In addition, all those species listed in Table 3 may be used for normal pedestrian traffic as defined in Table 2, but before specifying these species in circumstances where the traffic intensity is expected to approach the maximum permitted in Table 2, careful consideration should be given to the factors involved.

Table 3 — Timbers suitable for floors for light pedestrian traffic

Species listed in Table 1 and Table 2 with:		
Movement classification	Timber	Density
1	Abura (<i>Mitragyna ciliata</i>)	545
1	Afara (<i>Terminalia superba</i>)	495
1	African mahogany (<i>Khaya spp.</i>)	495
1	“African walnut” (<i>Lovoa klaineana</i>)	545
1	Agba (<i>Gossweilerodendron balsamiferum</i>)	545
2	Dahoma (<i>Piptadenia africana</i>)	690
1	“Douglas fir” (<i>Pseudotsuga taxifolia</i>)	495
1	East African camphorwood (<i>Ocotea usambarensis</i>)	595
2	European birch (<i>Betula spp.</i>)	675
1	Gedu nohor (<i>Entandrophragma spp.</i>)	545
1	Idigbo (<i>Terminalia ivorensis</i>)	545
1	Light red meranti/light red seraya (<i>Shorea spp.</i>)	530
	Manio (<i>Podocarpus spp.</i>)	515
	Matai (<i>Podocarpus spicatus</i>)	610
2	Niangon (<i>Tarrietia utilis</i>)	625
2	“Parana pine” (<i>Araucaria angustifolia</i>)	530
	Podo (<i>Podocarpus spp.</i>)	515
2	Redwood/Scots pine (<i>Pinus sylvestris</i>)	480
	Saligna gum (<i>Eucalyptus saligna</i>)	755
2	“Tasmanian oak” (<i>Eucalyptus spp.</i>)	675
1	Western hemlock (<i>Tsuga heterophylla</i>)	480
1	White seraya (<i>Parshorea plicata</i>)	530
1	Whitewood (<i>Picea abies</i>)	465
1	Yellow meranti/yellow seraya (<i>Shorea spp.</i>)	640
NOTE Light pedestrian traffic is assumed to be intensities less than 500 persons per day as experienced in domestic situations, small classrooms, small offices, small village halls and small assembly rooms.		

Table 4 — Timbers suitable for decorative floors

Movement classification	Timber	Density
1	“African walnut” (<i>Lovoa klaineana</i>) mainly quarter-sawn	545
1	African padauk (<i>Pterocarpus soyauxii</i>)	770
1	Afrormosia (<i>Pericopsis elata</i>)	735
	Andaman padauk (<i>Pterocarpus dalbergioides</i>)	785
	Burma padauk (<i>Pterocarpus macrocarpus</i>)	835
3	East African olive (<i>Olea hochstetteri</i>)	880
2	European oak (<i>Quercus robur</i> and <i>Q. petraea</i>) selected, quarter-sawn material	705
1	Gedu nohor (<i>Entandrophragma angolense</i>) selected, quarter-sawn material	545
2	Grevillea African silky-oak (<i>Grevillea robusta</i>)	560
2	Muhimbi (<i>Cynometra alexandri</i>)	865
1	Muhuhu (<i>Brachylaena hutchinsii</i>)	960
1	Muninga (<i>Pterocarpus angolensis</i>)	655
1	Panga panga (<i>Millettia stuhlmannii</i>)	800
1	Purpleheart (<i>Peltogyne</i> spp.)	865
2	Pyinkado (<i>Xylia dolabriformis</i>)	930
2	Redwood/Scots pine (<i>Pinus sylvestris</i>)	480
	Rhodesian copalwood (<i>Guibourtia coleosperma</i>)	
1	“Rhodesian teak” (<i>Baikiaea plurijuga</i>)	915
2	Sapele (<i>Entandrophragma cylindricum</i>) selected, quarter-sawn material	640
1	Whitewood (<i>Picea abies</i>)	465
	Yew (<i>Taxus baccata</i>)	610
NOTE A decorative floor is a floor selected for its appearance, bearing in mind that the species should be chosen according to duty requirements.		

Table 5 — Timbers suitable for heavy duty industrial floors

Movement classification	Timber	Density
1	Banga wanga (<i>Amblygonocarpus obtusangulus</i>)	995
	Billian (<i>Eusideroxylon zwageri</i>)	1 025
	Brush box (<i>Trstania conferta</i>)	930
	Bubinga (<i>Guibourtia spp.</i>)	865
3	East African olive (<i>Olea hochstetteri</i>)	880
2	Greenheart (<i>Ocotea rodiaei</i>)	1 040
2	Muhimbi (<i>Cynometra alexandri</i>)	865
1	Muhuhu (<i>Brachylaena hutchinsii</i>)	960
	Nkunya (<i>Manilkara cunifolia</i>)	1 040
1	Okan (<i>Cylicodiscus gabunensis</i>)	1 040
2	Pillarwood (<i>Cassipourea elliottii</i>)	755
2	Pyinkado (<i>Xylia dolabriformis</i>)	930
1	“Rhodesian teak” (<i>Baikiaea plurijuga</i>)	915
2	Rock maple (<i>Acer saccharum</i>)	735
1	Wallaba (<i>Eperua falcata</i>)	835

NOTE Heavy duty industrial floors are assumed to withstand exceptionally severe traffic including trucking and other impact loads as in factories, mills, sorting sheds, workshops, warehouses, etc.

Table 6 — Timbers suitable for light duty industrial floors

Hardwoods listed in Table 5 plus:		
Movement classification	Timber	Density
2	Danta (<i>Nesogordonia papaverifera</i>)	735
3	European beech (<i>Fagus sylvatica</i>)	705
	Haldu kwao (<i>Adina cordifolia</i>)	675
1	Loliondo (<i>Olea welwitschii</i>)	800
1	Missanda (<i>Erythrophleum guineense</i> and <i>E. ivorensis</i>)	895
3	Mora (<i>Mora excelsa</i>)	995
	Rapanea (<i>Rapanea spp.</i>)	880
1	Swamp sepetir (<i>Pseudosindora palustris</i>)	720
2	Tallowwood (<i>Eucalyptus microcorys</i>)	1 010
	“Tasmanian myrtle” (<i>Nothofagus cunninghamii</i>)	675
3	Yellow birch (<i>Betula alleghaniensis</i>)	690

NOTE Light duty industrial floors are assumed to withstand traffic such as would be found in clothing and food processing and other industrial establishments with trucking of a light nature.

Table 7 — Timbers suitable for floors with high resistance to chemicals and acids

Movement classification	Timber	Density
1	Afrormosia (<i>Pericopsis elata</i>)	735
1	Afzelia (<i>Afzelia spp.</i>)	815
	Burma padauk (<i>Pterocarpus macrocarpus</i>)	835
1	East African camphorwood (<i>Ocotea usambarensis</i>)	595
2	European oak (<i>Quercus robur</i> and <i>Q. petraea</i>)	705
3	Gurjun (<i>Dipterocarpus spp.</i>)	735
1	Iroko (<i>Chlorophora excelsa</i>)	655
2	Jarrah (<i>Eucalyptus marginata</i>)	865
3	Karri (<i>Eucalyptus diversicolor</i>)	915
	Kempas (<i>Koompassia malaccensis</i>)	865
2	Keruing (<i>Dipterocarpus spp.</i>)	800
2	Malayan kapur (<i>Dryobalanops spp.</i>)	770
3	Mora (<i>Mora excelsa</i>)	995
2	Opepe (<i>Sarcocephalus diderrichii</i>)	755
1	Purpleheart (<i>Peltogyne spp.</i>)	865
2	Pyinkado (<i>Xylia dolabriformis</i>)	930
2	Redwood/Scots pine (<i>Pinus sylvestris</i>)	480
1	“Rhodesian teak” (<i>Baikiaea plurijuga</i>)	915
	Spotted gum (<i>Eucalyptus maculata</i>)	960
2	Tallowwood (<i>Eucalyptus microcorys</i>)	1 010
1	Whitewood (<i>Picea abies</i>)	465
NOTE Floors with high resistance to chemicals and acids are assumed to have an inherent resistance (i.e. with no surface treatment), e.g. floors in science laboratories.		

Table 8 — Timbers suitable for floors with small movement

8(a) Where industrial processes are carried out involving wide variations in temperature and humidity:		
Movement classification	Timber	Density
1	Banga wanga (<i>Amblygonocarpus obtusangulus</i>)	495
1	Loliondo (<i>Olea welwitschii</i>)	800
1	Missanda (<i>Erythrophleum guineense</i> and <i>E. ivorensis</i>)	895
1	Muhuhu (<i>Brachylaena hutchinsii</i>)	960
1	Panga panga (<i>Millettia stuhlmannii</i>)	800
1	“Rhodesian teak” (<i>Baikiaea plurijuga</i>)	915
8(b) For residential and other buildings with underfloor heating:		
Hardwoods listed under 8(a) plus:		
1	Abura (<i>Mitragyna ciliata</i>)	545
1	African mahogany (<i>Khaya</i> spp.)	495
1	Afrormosia (<i>Pericopsis elata</i>)	735
1	Afzelia (<i>Afzelia</i> spp.)	815
1	Agba (<i>Gossweilerodendron balsamiferum</i>)	495
1	Ayan (<i>Distemonanthus benthamianus</i>)	675
1	East African camphorwood (<i>Ocotea usambarensis</i>)	595
1	Gedu nohor (<i>Entandrophragma angolense</i>)	545
1	Guarea (<i>Guarea</i> spp.)	610
1	Iroko (<i>Chlorophora excelsa</i>)	655
1	Makoré (<i>Mimusops heckelii</i>)	610
1	Muninga (<i>Pterocarpus angolensis</i>)	655
2	Opepe (<i>Sarcocephalus diderrichii</i>)	755
1	Teak (<i>Tectona grandis</i>)	690

Table 9 — Timbers suitable for gymnasium floors

Movement classification	Timber	Density
1	Ayan (<i>Distemonanthus benthamianus</i>)	675
2	Danta (<i>Nesogordonia papaverifera</i>)	735
1	“Douglas fir” (<i>Pseudotsuga taxifolia</i>) quarter-sawn only	495
3	East African olive (<i>Olea hochstetteri</i>)	880
3	European beech (<i>Fagus sylvatica</i>) quarter-sawn only	705
1	Guarea (<i>Guarea spp.</i>)	610
3/2	Gurjun/keruing (<i>Dipterocarpus spp.</i>)	735/800
	Haldu/kwao (<i>Adina cordifolia</i>)	675
3	Japanese beech (<i>Fagus spp.</i>) quarter-sawn only	610
	Japanese maple (<i>Acer spp.</i>)	705
1	Loliondo (<i>Olea welwitschii</i>)	800
1	Muninga (<i>Pterocarpus angolensis</i>)	655
2	Pillarwood (<i>Cassipourea elliottii</i>)	755
2	Rock maple (<i>Acer saccharum</i>)	735
2	“Tasmanian oak” (<i>Eucalyptus spp.</i>)	675
1	Western hemlock (<i>Tsuga heterophylla</i>) quarter-sawn only	480
1	White seraya (<i>Parashorea plicata</i>)	530
3	Yellow birch (<i>Betula alleghaniensis</i>)	690

Table 10 — Timbers suitable for ballroom floors

Movement classification	Timber	Density
2	Danta (<i>Nesogordonia papaverifera</i>)	735
3	East African olive (<i>Olea hochstetteri</i>)	880
2	European oak (<i>Quercus robur</i> and <i>Q. petraea</i>)	705
	Haldu/kwao (<i>Adin cordifolia</i>)	675
1	Guarea (<i>Guarea spp.</i>)	610
	Japanese maple (<i>Acer spp.</i>)	705
1	Loliondo (<i>Olea welwitschii</i>)	800
2	Muhimbi (<i>Cynometra alexandrii</i>)	865
2	Pillarwood (<i>Casipourea elliottii</i>)	770
1	“Rhodesian teak” (<i>Baikiaea plurijuga</i>)	915
2	Rock maple (<i>Acer saccharum</i>)	735
2/1	Sapele/gedu nohor (<i>Entandrophragma spp.</i>)	640/545
3	Yellow birch (<i>Betula alleghaniensis</i>)	690