

2.4 Application of panels in flooring

2.4.1 Selection of panels for flooring

The selection of wood-based panels for flooring depends on a number of factors of which the most important are:

- the type of floor
- the load that the floor has to carry
- the ambient moisture conditions.

2.4.1.1 Type of floor

It is convenient to recognise the following different types of floor:

- Suspended floors in which the floor decking is attached to a series of joists.
- Floating floors in which the floor decking rests either on insulation above a structural sub-floor, or on a series of battens which has insulation between them. Note that in both situations the panel is load-bearing as, in event of failure, the underlying insulation is unlikely to be able to sustain the imposed loads.
- Raised access floors in which the floor segments are supported on short pillars to permit access to cables below the floor.
- Industrial platform floors which embrace both mezzanine and raised storage floors.

The selection of wood-based panels for the different floor types is set out in *Table 2.1* and *Table 2.2*.

2.4.1.2 Loading

The second criterion is the load that the floor has to carry. Load classes for use with limit state design to *Eurocode 5*, are given in *Eurocode 1*.

In *Eurocode 1* (Actions on structures) there are four basic 'categories of use' of which there are also sub categories for most uses. Each European Member State will have its own National Annex detailing the imposed loads for each category of use, the UK is no exception. The categories of use are as follows:

- Category A – Domestic, this includes houses, bedrooms and wards in hospitals and rooms in hotels
- Category B – Offices
- Category C – Public areas where people might congregate, this category is split into five sub categories. Some examples might be cafes, restaurants in schools, churches, theatres or cinemas, museums, gyms, stages, football terraces, railway platforms
- Category D – Shopping areas, which is split into two sub categories for retail shops and department stores
- Category E – Industrial storage.

When designing a floor using permissible stress design in accordance with *BS 5268*, the code of practice for dead and imposed loads is *BS 6399*. *BS 6399* has very similar categories of use as *Eurocode 1* with the addition of

categories F and G, which are for car parking, driveways, paths with vehicle access and garages.

The selection of wood-based panels for floors subjected to domestic and non-domestic loading is given in *Table 2.1* and *Table 2.2* respectively. It should be appreciated that the designer can design the floor to carry any specified load. More information on loadings for floors is provided in *Eurocode 1* and *BS 6399*.

2.4.1.3 Moisture conditions

Moisture conditions is the third main criterion as they will have markedly different effects on the performance of wood-based panels; these are quantified in terms of Service Classes as described in *Section 2.3*. The selection of panels for floors subjected to the different Service Classes is set out in *Table 2.1* and *Table 2.2*.

Additional considerations might include thermal, acoustic performance and the likelihood of wetting during construction.

2.4.1.4 Thermal performance

In order to meet the requirements of the Approved Documents L1A, L1B, L2A, L2B³⁵, the corresponding Scottish Technical Handbook Part 6.2,³⁶ Building Regulations Technical Booklet F1 and F2³⁷ in Northern Ireland, and Part L in the Republic of Ireland³⁸, the thickness and thermal conductivity of the panel in combination with the other components of the floor system will need to be considered as a whole during the design phase. This might in some cases increase the dead load, which may require the size or grade of the supporting joists to be increased.

2.4.1.5 Acoustic performance

In order to achieve the requirements of Building Regulations in the UK and Ireland, the thickness of the panel used in the floor system will have to be considered alongside all the other components and design of the floor system. This might in some cases increase the dead load which may require the size or grade of the supporting joists to be increased.

2.4.1.6 Wetting during construction

The time a wood-based panel floor is left exposed to the weather could have an impact on the performance of the board in service if it were to get wet for prolonged periods of time. This issue has been recognised and there are now proprietary products available with protective surfaces, some as a 'peel clean' type coating and joint protection that will protect the floor from weather and/or dirt caused by trades and traffic during the construction phase. This may be a consideration where the floor is built at an early phase of the construction or where it is unlikely that the building will be water tight quickly.

2.4.2 The design of timber floor decking

The various factors to be incorporated in design are set out in *Section 2.2*.

Table 2.1: Panel grades* for domestic floors and the location of design and testing information

Selection	DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
Suspended floors		1 2	636-1 636-2	P4 P5	OSB/2 OSB/3	MDF.LA -	MBH.LA 1 -	CBPB CBPB
Design by deemed to satisfy	✓	For the panel products listed in BS 8103-3, tables are present permitting the use of certain thicknesses for different maximum spans						
or	✓	Test using BS EN 1195 (see manufacturer's test data). Check BS EN 12871 National Foreword for recommendations for designing with wood-based panels in the UK. Design using BS EN 1995-1-1 (Eurocode 5) and any national provisions (in the UK this is PD 6693-1 Recommendations for the design of timber structures to Eurocode 5: Design of timber structures. General. Common rules and rules for buildings)						
Design by performance testing	or	Test using BS EN 1195 (see manufacturer's test data). Satisfy the requirements in BS 5268-2. Design using BS 5268-2						
or	✓	Using limit state design in BS EN 1995-1-1 (Eurocode 5) and any national provisions (PD 6693-1 Recommendations for the design of timber structures to Eurocode 5: Design of timber structures. General. Common rules and rules for buildings). Characteristic values for all panels except solid wood panels and CBPB are given in BS EN 12369 Parts 1 and 2; alternatively, characteristic values for all load-bearing panels can be derived using BS EN 789 and BS EN 1058 and may be obtained from the manufacturers. Time modification factors for design for all panels except CBPB are included in BS EN 1995-1-1 (Eurocode 5), or an estimate of them can be derived using BS EN 1156						
Design by calculation	or	Using permissible stress design in BS 5268-2. Stress and moduli are derived from the characteristic values in BS EN 12369 Parts 1 and 2 except solid wood panels and CBPB: grade stresses and moduli for certain specific types of plywoods are also included in BS 5268-2. Alternatively, characteristic values for all load-bearing panels can be derived using BS EN 789 and BS EN 1058 and may be obtained from the manufacturers. Time modification factors for design are included in BS 5268-2 for all panels except CBPB						
Guidance on application	✓	Guidance on the use of load-bearing panels in suspended floors is given in DD CEN/TS 12872						

Selection	DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
Floating floors		1 2	636-1 636-2	P4 P5	OSB/2 OSB/4	MDF.LA -	MBH.LA 1 -	CBPB CBPB
Design by performance testing	✓	Test using CEN/TS 13810-2 (see manufacturer's test data). Satisfy the requirements in BS EN 13810-1 (Note that the panels used as a floating floor should be of a load-bearing grade, as in the event of failure the underlying insulation is unlikely to be able to sustain the imposed loads)						
Guidance on application	✓	Guidance on the installation of floating floors is given in the WPIF Industry Standard 3/2018 for particleboard and OSB; this is reproduced in PanelGuide Annex 3						

Selection	DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
Fabricated underlays (surface on which to lay floor covering), see Section 2.4.5.3		1 2	636-3 conforming to BS 8203 Annex A 636-3 conforming to BS 8203 Annex A				HB.H HB.H	
Guidance on application	✓	Fabricated underlays: plywood minimum thickness should be 5.5mm nominal and hardboard 4.8mm nominal where fully supported. The panels must be fixed to prevent lifting at the joints; consideration should be given to the provision of expansion joints (BS 8203).						

* The table provides the minimum grade of panel that satisfies the particular set of requirements: panels of higher quality may be substituted, and their selection may result in a reduction in required thickness. Although all the panels meeting the grade specifications will satisfy a particular set of requirements, the level of performance of different brands of these panels may vary considerably; some may even be endowed with high levels of properties not directly covered by the table.

The 'deemed to satisfy' approach to the design of non-domestic floors is no longer valid. For domestic floors BS 8103-3 gives tables where various grades and thicknesses of panels can be used at different maximum spans.

In the absence of 'deemed to satisfy' information, recourse must be made to designing either by prototype

testing, or by calculation as detailed in Section 2.2.1.4 and set out in Table 2.1 and Table 2.2.

The typical panel size for flooring is 2400mm × 600mm, with other sizes available to order. The usual panel width of 600mm makes handling in internal spaces easier and a length of 2400mm suits nominal framing centres of 600mm or 400mm.

Table 2.2: Panel grades* for non-domestic floors and the location of design and testing information

Selection	NON-DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
	Suspended floors	1 2	636-1 636-2	P6 (P4) P7 (P5)	OSB/4 (3) OSB/4 (3)	- -	MBH.LA 1 -	- -
Design by deemed to satisfy	x	There are no deemed to satisfy routes for non-domestic flooring						
or	✓	Test using BS EN 1195 (see manufacturer's test data). Check BS EN 12871 National Foreword for recommendations for designing with wood-based panels in the UK. Design using BS EN 1995-1-1 (Eurocode 5) and any national provisions (in the UK this is PD 6693-1)						
Design by performance testing	or	Test using BS EN 1195 (see manufacturer's test data). Satisfy the requirements in BS 5268-2. Design using BS 5268-2						
or	✓	Using limit state design in BS EN 1995-1-1 (Eurocode 5) and any national provisions (PD 6693-1). Characteristic values for all panels except solid wood panels and CBPB are given in BS EN 12369 Parts 1 and 2; alternatively, characteristic values for all load-bearing panels can be derived using BS EN 789 and BS EN 1058 and may be obtained from the manufacturers. Time modification factors for design for all panels except CBPB are included in BS EN 1995-1-1 (Eurocode 5), or an estimate of them can be derived using BS EN 1156						
Design by calculation	or	Using permissible stress design in BS 5268-2. Stress and moduli are derived from the characteristic values in BS EN 12369 Parts 1 and 2 except solid wood panels and CBPB: grade stresses and moduli for certain specified plywoods are also included in BS 5268-2. Alternatively, characteristic values for all load-bearing panels can be derived using BS EN 789 and BS EN 1058 and may be obtained from the manufacturers. Time modification factors for design are included in BS 5268-2 for all panels except CBPB						
Guidance on application	✓	Guidance on the use of load-bearing panels in suspended floors is given in DD CEN/TS 12872						
Guidance on application	Industrial platform floors	Specific information on mezzanine and raised storage floors is available in BRE Digest 437						

Selection	NON-DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
	Floating floors	1 2	636-1 636-2	P6 P7	OSB/4 OSB/4	- -	MBH.LA 2 MBH.HLS2	CBPB CBPB
Design by performance testing	✓	Test using CEN/TS 13810-2 (see manufacturer's test data). Satisfy the requirements in BS EN 13810-1 (Note that the panels used as a floating floor should be of a load-bearing grade, as in the event of failure the underlying insulation is unlikely to be able to sustain the imposed loads)						
Guidance on application	✓	Guidance on the installation of floating floors is given in the WPIF Industry Standard 3/2018 for particleboard and OSB; this is reproduced in PanelGuide <i>Annex 3</i>						

Selection	NON-DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
	Raised access floors	Provided the performance requirements set out in BS EN 12825 are met, any panel product may be used						

Selection	NON-DOMESTIC FLOORS	SERVICE CLASS	PLYWOOD BS EN 636	PARTICLEBOARD BS EN 312	OSB BS EN 300	MDF BS EN 622-5	FIBREBOARD BS EN 622-3,4	CBPB BS EN 634
	Fabricated underlays (surface on which to lay floor coverings), see Section 2.4.5.3	1 2	636-3 conforming to BS 8203 Annex A 636-3 conforming to BS 8203 Annex A			- -	HB.H HB.H	
Guidance on application	✓	Fabricated underlays: plywood minimum thickness should be 5.5mm nominal and hardboard 4.8mm nominal where fully supported. The panels must be fixed to prevent lifting at the joints; consideration should be given to the provision of expansion joints (BS 8203).						

* The table provides the minimum grade of panel that satisfies the particular set of requirements: panels of higher quality may be substituted, and their selection may result in a reduction in required thickness. Although all the panels meeting the grade specifications will satisfy a particular set of requirements, the level of performance of different brands of these panels may vary considerably; some may even be endowed with high levels of properties not directly covered by the table.

Panels may be plain (square) edged, or profiled. Plain edged panels need gaps to be provided between panels (see Section 2.4.3.6), and support to be provided by joists or noggings at all edges (see Section 2.4.3.6). Profiled edges are usually matching tongue and groove and

remove the need to provide support at all edges. For flooring purposes it is recommended that tongued and grooved (T&G) panels with glued joints are used to provide a smooth and stable substrate.

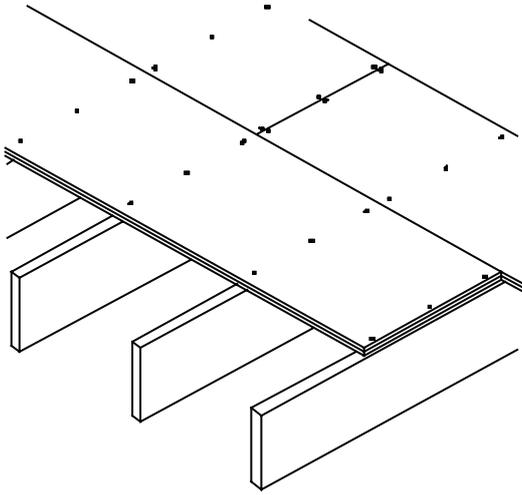


Figure 2.2: Tongued and grooved edge structural decking should be laid across the joists with short edges supported on joists

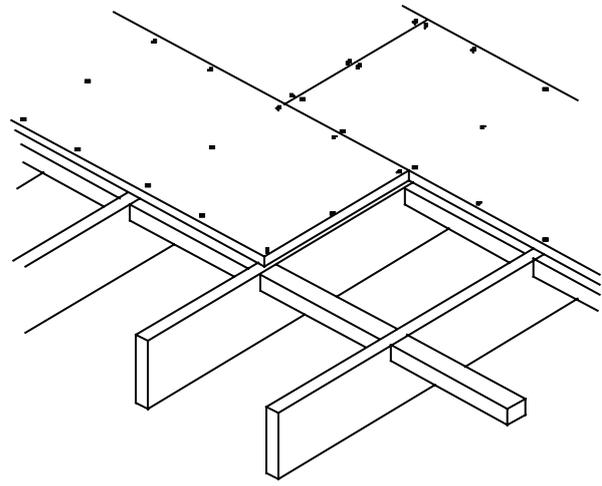


Figure 2.3: Square edge structural decking laid across the joists and supported by noggings

2.4.3 Sitework: floor decking on joists

2.4.3.1 Conditioning

It is important that panels are installed at a moisture content close to that which they will achieve in service. Advice on the conditioning of panels is to be found in *PanelGuide Section 4.2.4*.

2.4.3.2 Preparation of structure

The void beneath a joisted ground floor must be adequately ventilated to comply with the Building Regulations as well as with the requirements of NHBC where required.

Supporting joists, noggings and edge support should be laid to line and level.

Check the moisture content of joists as floor panels should not be laid on joists which have a moisture content above 20% as moisture can migrate into the panels and will cause localised swelling.

Access traps or ducting should be pre-planned and the necessary noggings and edge supports provided at all edges.

Joists and noggings should provide a minimum bearing for panel edges of 18mm (see *Figure 2.4*).

All noggings should be made with timber of 38mm × 38mm (unless otherwise specified by joist manufacturer) and securely fixed to the joists.

2.4.3.3 Laying all types of panel products

T&G and square edge boards should be laid across the joists with both short edges supported on a joist, or other edge support (see *Figure 2.2*). Square edged boards should be continuously supported along all edges so that the short edges are supported on the joists and the long edges by noggings (see *Figure 2.3*). Readers should note that additional materials (not shown in the figure) may be required to meet other requirements such as acoustics, thermal, reaction to fire or resistance to fire.

For all boards, maximum strength and stiffness will be obtained if each panel is continuous over at least two spans between joists.

At floor perimeter, where the floor deck is laid after the wall is in place (ie, not cassette floors), panels should be fixed and supported on noggings between the joists (T&G and square edge panels). However, at the perimeter of a floor, between the first joist and the wall (joist parallel to wall), a 25mm-75mm gap may be allowed to aid floor installation and for services to be installed. The floor decking at the perimeter, in this case, may therefore be laid to overhang the joist up to a maximum of 75mm.

Panels of both edge types should be laid to break joint, ie with staggered short edge joints to avoid lining them up. Ideally, the stagger should be at the mid-point of the adjacent panel for maximum stiffness.

To reduce the risk of creaking in use and enable the joint to have maximum strength, all joints in T&G panelled floors should be glued with at least a durability class D3 adhesive (classified to *BS EN 204 Classification of thermo-plastic wood adhesives for non-structural applications*³⁹). Glue should be applied liberally to both the tongue and the groove to ensure the entire joint is bonded.

It is further recommended that particleboard and OSB are also glued to supporting timber joists with a durability class D4 (classified to EN 204) adhesive or a proprietary product suitable for that application.

However, where manufacturers supply both panels and adhesive as systems (for example, weather-proof systems), the manufacturer's own adhesives, tapes and fixing instructions should be used.

Where the short edge of a board finishes mid span (ie between joists), while this is not ideal it is possible to use a so-called 'H' noggings to support the short edge of the panel on the horizontal part of the 'H'.

Table 2.3: Spacings of fixings for floor decking

Panel type	Maximum spacings (mm)		
	Perimeter framing	Intermediate framing	Min edge distance (mm)
Particleboard	150–300	300	8
Cement-bonded particleboard	see note	see note	see note
OSB	150–300	300	8
Plywood	150–300	300	8

Note: For cement-bonded particleboard recommended nail spacings and edge distances vary with thickness and from manufacturer to manufacturer – examples of nail spacing range from 200 to 400mm on perimeter framing and from 300 to 610mm on intermediate framing; nail edge distance varies from 15mm for panels less than 12mm and 20mm for thicker panels up to 25mm irrespective of thickness. Panels may need to be pre-drilled or fixed with self-drilling screws to avoid splitting. For fixing cement-bonded particleboard it is therefore essential to obtain and follow the manufacturer’s recommendations.

2.4.3.4 Expansion gaps

A gap should be provided around the perimeter of a floor, to upstands or abutting construction, to allow for possible expansion of the decking. This should be a minimum of 10mm at each stage or 2mm per metre run of panel. The gap should be left open and covered by a skirting panel, or filled with a compressible strip such as cork or other suitable material. Larger floors may also require intermediate expansion gaps of a minimum of 20mm at 10-metre intervals.

Where a floor is laid before the wall (often as a pre-fabricated cassette floor), it is possible to omit a perimeter expansion gap and lay the boards to the ends of the joists to fix the wall directly over. This is common practice in ‘low’ load situations, where ‘high’ loads are present, for example point loads; the compressive strength should be checked and where required an alternative design detail or product should be employed at the end of the joists where a wall is bearing directly on the panel (see *Figure 2.4*).

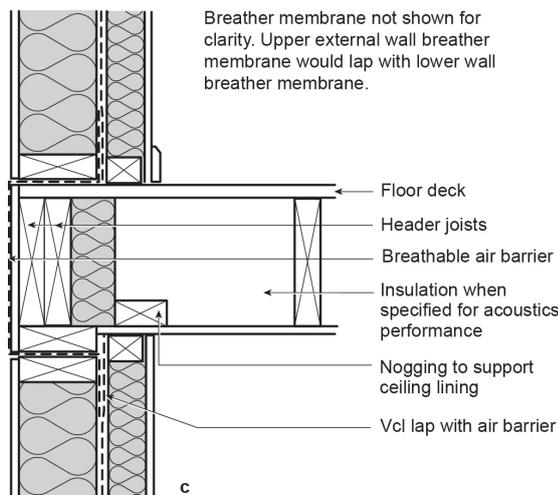


Figure 2.4: Floor/external wall junction showing panel extending beyond room perimeter under the wall

A 3mm gap should also be left between each square-edged panel.

Note: For T&G panels or panels that, by design, are tightly butted, special attention must be given to fixing down to avoid buckling.

2.4.3.6 Fixing

Panels should be fixed using corrosion resistant nails or screws. Corrosion resistant materials include galvanised or sheradised steel, austenitic stainless steel, phosphor bronze and silicon bronze.

Screws and flat headed improved nails (such as annular grooved or ringshank) have superior holding power and should be used in preference to plain shank nails.

Screws should be conventional countersunk woodscrews or, where fixing to steel structural frames, self-drilling self-tapping screws.

When fixing to timber, the minimum fixing length should be 50mm or 2.5 times the panel thickness, whichever is

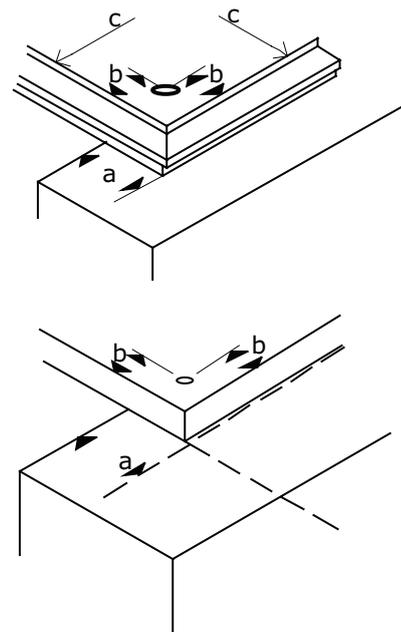


Figure 2.5: A minimum edge nailing distance of 8mm should be maintained and a minimum bearing of 18mm provided to each panel in both T&G panels (top) and square-edged panels (bottom)

greater. The minimum fixing diameter should be 0.16 times the panel thickness.

When fixing into steel, the length of the screw should be sufficient for the threaded shank of the screw to fully penetrate the full thickness of the steel.

The frequency and pattern of nailing to joists and noggings should be as set out in *Table 2.3* unless structural calculations require otherwise. To avoid tear out at panel edges, fixings should not be inserted closer to the edges than the minimum distances given, and as shown in *Figure 2.5*.

All nail heads should be punched home by 2–3mm. Screws should be countersunk.

Where manufacturer's instructions are supplied with the panels their recommendations should be followed. This might include so-called 'glue only' floor system that use a proprietary adhesive to fix the panels to the joists, as well as a reduced amount of mechanical fixing (nails/screws); each manufacturer's fixing requirements may be different with some requiring more or less mechanical fixings than others, in this case no fewer fixings should be used than the instructions require.

After fixing, panel surfaces should be protected with building paper/polythene, or a proprietary panel product may be used (for example, 'peel clean') to prevent damage and the treading in of grit and debris during building works. Heavily trafficked areas should be protected with a temporary panel covering.

2.4.4 Sitework: floating floor decking

Guidance on the installation of floating floors is given in the WPIF Industry Standard No.3/2018 for particleboard and OSB which is reproduced as *Annex 3* of PanelGuide.

2.4.5 Finishing

2.4.5.1 General

Particleboard floors provide a smooth flat surface which is suitable for many types of floor covering, provided that the fixing, edge support and gluing recommendations are followed. Unsanded OSB panels have a surface texture which shows the shape of the wood strands – panels produced for use as flooring usually have a smooth sanded surface.

2.4.5.2 Carpet and sheet floorings

Where carpet is laid over particleboard and held in place using pre-nailed carpet gripper, adequate edge distance must be left for the gripper nails to avoid splitting the panels.

Sheet flooring can be loose laid or bonded directly to most panel surfaces (see *Section 2.4.5.5*).

Thin sheet flooring or thin carpet may allow the panel joints beneath to show through, particularly after trafficking, and may require the use of a fabricated underlay to remove this effect (see *Section 2.4.5.3*).

2.4.5.3 Fabricated underlay

2.4.5.3.1 Materials

The following types of panel product are suitable as a fabricated underlay in dry conditions:

- Plywood conforming to *BS EN 636 Plywood. Specifications*⁴⁰
- Hardboard conforming to *BS EN 622-2 Fibreboards. Specifications. Requirements for dry process boards (MDF)*⁴².

Clean plywood or hardboard without any surface sealants, residues or coatings applied are best suited as a fabricated underlay. Fabricated underlay specifications (plywood and hardboard) can be found in BS 8203, which also includes a detailed plywood specification in its Annex A.

2.4.5.3.2 Fabricated underlay application

The purpose of a fabricated underlay is to smooth out any irregularities of a sub-floor before laying a floor covering that may telegraph these imperfections through to the floor surface (for example fully bonded thin vinyl on a particleboard sub-floor may telegraph the joint lines).

It is recommended that the fabricated underlay should ideally have a minimum nominal thickness of 4.8mm for hardboard and 5.5mm for plywood; depending on the level of rigidity required, the underlay may be specified to be slightly thicker and panels as large as possible should be used to minimise the number of joints. It is assumed that underlays will be used on top of an existing structural deck such as particleboard, OSB or floorboards, rather than forming the top layer of a floating floor where thicker panels are usually employed. It is also worth noting that if the underlay becomes too thick it is difficult to cut on site.

All wood-based panel sheets used as fabricated underlays should be loosely stacked in the room where they are to be laid to condition or acclimatise as close to the in-use conditions as possible before laying. Hardboard (unless sold as pre-conditioned) should be pre-conditioned by sponging with water on the mesh side with approximately 1 litre per each full panel (1200mm × 2400mm). The panels should then be stacked for at least 24 and preferably 48 hours before fixing. Following fixing, hardboards should be left to fully dry before fixing the floor covering.

Where possible, hollows in the sub-floor should be brought level by sanding, planing or patch-filling with a suitable proprietary flexible cementitious smoothing underlayment. The fabricated underlay panels should be laid across the line of the panels in the sub-floor.

In order to obtain the best results the fabricated underlay should be laid so that there are no gaps between the joints of the panels, nor any step between each panel. A gap should be provided around the perimeter of a floor to upstands or abutting construction and at door thresholds to allow for possible expansion of the fabricated underlay. This should be a minimum of 10mm at each stage or 2mm per metre run of panel. The gap should be left open and covered by a skirting panel, or filled with a compressible strip such as cork. Joint lines should be staggered and joints in the panel and the timber base should not coincide.

Underlays should be fixed using ringshank nails, screws or screw nails which should be finished flush with the surface. The length of the fixings should be at least 2.5 times the thickness of the fabricated underlay panel but no longer than would allow the fixing to protrude below the sub-floor. Each panel should be fixed at not more than 100mm intervals around the edges of the panel and at 150mm intervals in rows every 400mm across the length of the panel, with the fixing line at a minimum edge distance of 10mm. Fixing of each panel should start at the centre of one edge of the panel and continue across the panel to the other three edges.

2.4.5.4 Tiles

The application of rigid ceramic tiles to wood-based panels requires great care in specification and site practice to avoid cracking at joints or through tiles. Further information is provided in PanelGuide *Section 4.7.5*.

2.4.5.5 Adhesives

Most common floor laying adhesives are suitable for use with wood-based panels; however, water-based adhesives should not be used unless they have a very low water content or the panel surface is sealed with a suitable sealer. This will prevent excessive amounts of water (which may not be able to evaporate through the floor covering being absorbed by the panel) causing swelling and/or distortion if present in sufficient quantities.

An issue with adhesion to panel products that have had their 'peel clean' surfaces removed is possible, it is recommended in these cases to use a fabricated underlay.

2.4.5.6 Sealers and surface finishes

Panels are available pre-finished with a surface seal. Panels may also be site finished with surface coatings to give temporary protection or to give a fully treated decorative finish.

Cement-bonded particleboard surfaces must be primed with an anti-alkali primer before decorating or applying coverings, unless alkali resisting products are being used.

Most types of internal and external paints and stains may be used, in accordance with manufacturers' instructions. Water-based paints may be used on wood chipboard and

OSB but may cause unacceptable raising of 'grain' and increase the risk of movement and/or distortion.

2.4.5.7 The use of wood-based panels in under-floor heating applications

2.4.5.7.1 Applications

Wood-based panels are commonly used as the structural floor layer, as a non-structural overlay to under-floor heating systems or in a grooved form as the carrier for under-floor heating pipes.

In their raw form, wood-based panels are rarely used as the finished walking surface, although they are often machined and coated to manufacture decorative flooring products. But when they are covered with thin flexible coverings, such as carpets, they are required to withstand imposed floor loads and to cope with changes in moisture content (see *Moisture content effects* below).

2.4.5.7.2 Grooved panel systems

Wood-based panels used as a structural deck, spanning across joists or battens and carrying imposed floor loads must comply with the relevant clauses of *BS EN 13986*. Where they may be subject to imposed concentrated loads or soft body impacts, they must be tested in accordance with *BS EN 12871* and the performance declared.

Where wood-based panels are grooved and used as a carrier for water pipes, their ability to resist imposed concentrated and soft body impact load is likely to be significantly reduced. They must therefore be tested in accordance with *BS EN 12871* at what is determined as the weakest point on the floor system and assessed against the relevant imposed loads from *Eurocode 1*. For domestic floor loads it is likely that a grooved panel made from a conventional thickness will need an additional structural layer, either under or over the grooved layer, to provide additional support to achieve the imposed design load.

2.4.5.7.3 Moisture content effects

Like all wood products, wood-based panels will be subject to changes in dimensions and moisture content depending upon the environmental conditions to which they are exposed (see PanelGuide *Section 4.2.4*). Where panels are used in conjunction with an under-floor heating system, the final moisture content is likely to be lower than that achieved with other heating systems. It is therefore critically important to consider moisture content related movement issues. In particular:

- Panels must be kept dry prior to installation and not exposed to direct wetting or prolonged periods of high humidity.
- Panels should be assessed for their moisture content and if necessary conditioned prior to installation in a climate as close as possible to the final heated environment.
- Consideration should be given to the likely effects of any shrinkage and expansion that may result from the

use of the underfloor heating system. The moisture content in the wood-based panel may fall to less than 5% when the heating is on and relative humidity is low, but could rise to 9–10% or more when it is switched off in summer and there is greater atmospheric humidity.

Due to this dimensional change, some manufacturers will advise against under-floor heating with their products. In terms of wood-based panels it is therefore advisable to specify flooring of low movement to give more stability to dimensional change.

2.4.6 References

- 1 UK Building Regulations Approved Document L – Conservation of fuel and power, available at www.planningportal.gov.uk
- 2 Scottish Technical Handbook, Part 6.2, available at www.scotland.gov.uk
- 3 NI Building Regulations Technical Booklet F1 and F2, available at www.dfpni.gov.uk/building-regulations
- 4 Republic of Ireland Building Standards Technical Guidance Document Part L – Conservation of Fuel and Energy, available at www.environ.ie/en/TGD/
- 5 BS EN 204. Classification of thermoplastic wood adhesives for non-structural applications, BSI
- 6 BS EN 636. Plywood. Specifications, BSI
- 7 BS EN 622-5. Fibreboards. Specifications. Requirements for dry process boards (MDF), BS12.4 Application of panels in flooring

PanelGuide Version 4.1
ISBN 978-1-909594-21-0

Published in 2014 by the Wood Panel Industries Federation, TRADA Technology Ltd, and the National Panel Products Division (a division of the Timber Trades Federation).

Revised with amendments to Section 2 and Annex 3, 2018

Previous editions are listed in Annex 4 of the PanelGuide

This is a technical book for professionals in the built environment sector. While every effort is made to ensure the accuracy of the advice given, the project partners cannot accept liability for loss or damage however caused arising from the use of the information supplied

All rights reserved. PanelGuide may be downloaded and printed for single use only. You must request the permission of the copyright owners if you wish to extract content from the PanelGuide or use it for any other purpose

© Wood Panel Industries Federation, Warringtonfire Testing and Certification Ltd and the National Panel Products Division (a division of the Timber Trades Federation)

Unless otherwise stated in the caption, all photographs and illustrations included in the Panel Guide are © Wood Panel Industries Federation, Warringtonfire Testing and Certification Ltd and the National Panel Products Division

Revisions to PanelGuide Version 4 contributed by Ian Rochester (WPIF), Vic Kearley (BM TRADA) and Nick Boulton (TTF)

Produced by the publishing team at BM TRADA, the official publisher for the Timber Research and Development Association

Contact details for the PanelGuide project partners are:



Wood Panel Industries Federation
Autumn Business Park
Dysart Road
Grantham
Lincs
NG31 7EU
Tel: 01476 512 381
Email: enquiries@wpif.org.uk
Website: www.wpif.org.uk

Timber Research and Development
Association
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe
Bucks
HP14 4ND
Tel: 01494 569 603
Email: information@trada.co.uk
Website: www.trada.co.uk

National Panel Products Division
Timber Trades Federation
The Building Centre
26 Store Street
London
WC1E 7BT
Tel: 020 3205 0067
Email: tff@tff.co.uk
Website: www.tff.co.uk



Produced by BM TRADA,
the official publisher for TRADA

Email: publications@bmtrada.com
Website: www.bmtrada.com