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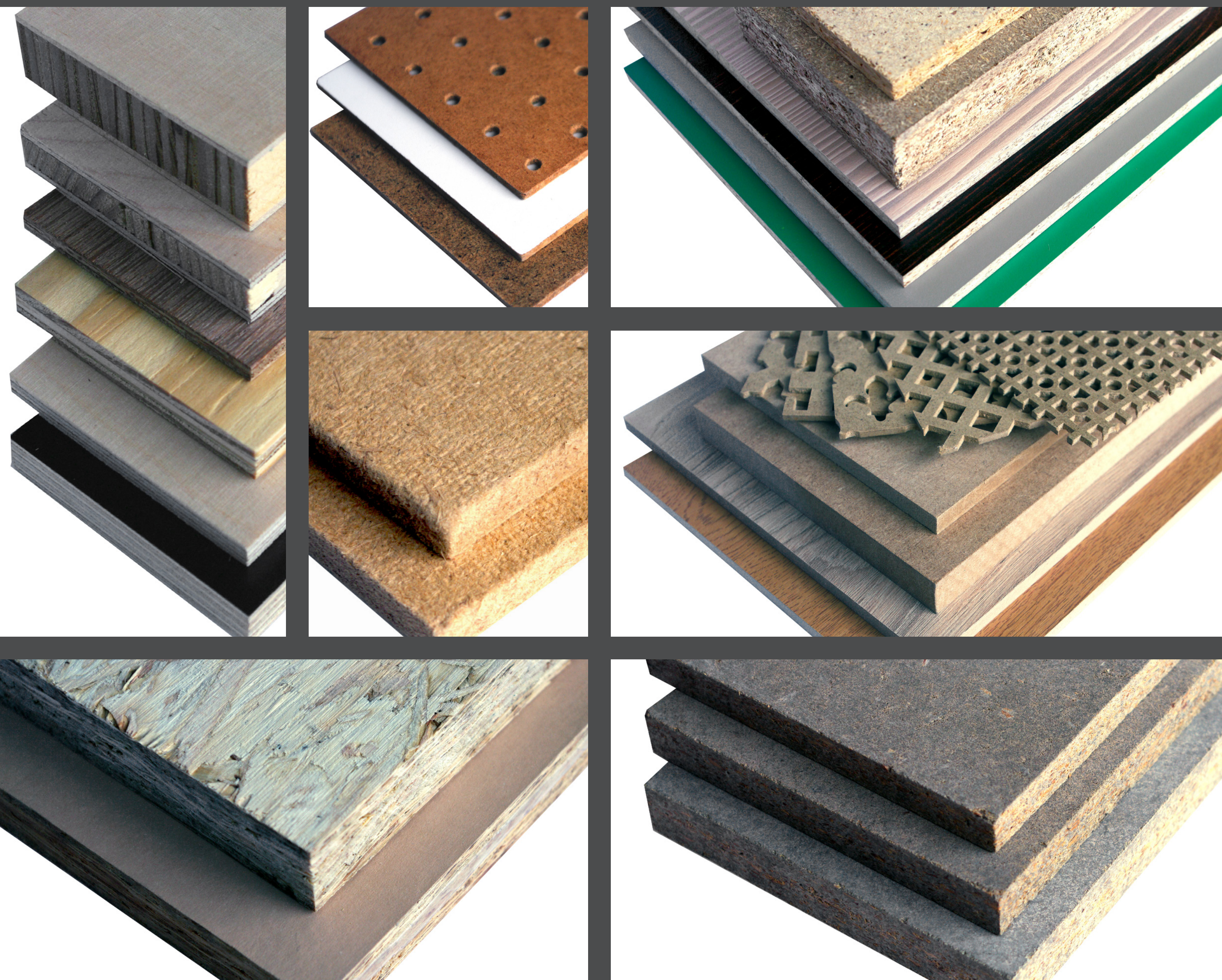
Panel Guide

Version 4



Annex 2G: Particleboard – flaxboard

Description

Flaxboard, like particleboard, is an engineered panel material in which shives from the stalk of the flax plant are bonded together with a synthetic resin adhesive. Flax shives are in fact a by-product of the linen industry.

Flaxboard is defined as a particleboard in *BS EN 309* and is specified in *BS EN 15197 Wood-based panels. Flaxboards. Specifications*[1] as containing at least 70% flax and can also contain other raw materials such as particles of wood.

The flaxboard industry in Europe dates from the late 1950s and until recently, flaxboard was only available in standard panel sizes because it was produced by daylight presses. Now the technology has developed to produce a continuous panel in various lengths, which enables it to be cut into many possible sizes without wastage. Flaxboard can show excellent surface properties and offers numerous benefits. It is a lightweight panel and has natural characteristics which aid fire resistance. Although flaxboard is similar in some ways to particleboard, it has different properties and applications and so users should check technical performance data against the intended end-use application. The specification for flaxboard is given in *BS EN 15197* as non-load-bearing which in terms of the Construction Products Regulation (CPR) would define the product as non-structural.

Figure A2.10: Flaxboard

Composition

Flax shives from the stalk of the flax plant comprise the bulk of flaxboard and are prepared in a mechanical chipper. The product may also contain a small percentage of other raw materials such as particles of wood (wood, flakes, chips, shavings, saw dust and similar materials). These chips are compressed and are generally bound together with synthetic resin systems such as urea-formaldehyde (UF) or melamine-urea-formaldehyde (MUF), though phenol-formaldehyde (PF) and polymeric methylene di-isocyanate (PMDI) are used by some manufacturers.

The binding system employed depends on the end use intended and the grade of the product. The most common resin employed is urea-formaldehyde, but this is only suitable for use in dry conditions: the other three resin systems, mentioned above, confer a measure of moisture resistance to the composite.

Some manufacturers of flaxboard produce a three-layer type, obtained through the separate gluing of the coarse and fine fractions of flax shives.

Typical constituents of a flaxboard are of the order (by mass) of:

- at least 70% flax shives and which can also contain other raw materials such as particles of wood (wood flakes, chips, shavings, saw dust and similar materials), with the addition of a polymeric adhesive
- 6% to 8% formaldehyde based resin or 2% to 3% PMDI
- 5% to 7% water
- 2% to 3% nitrated ammonium
- 1% to 2% paraffin wax solids.

Appearance

Flaxboard can have smooth, sanded surfaces similar in appearance to particleboard if required. In order to achieve this smooth surface, the panel density is increased at the faces by the use of small particles of wood with a larger percentage of resin binder compared to the core of the panel. If flaxboard is to be covered, for instance for use as door cores, it does not necessarily need a smooth finish. Generally, flaxboard has a pale straw colour.

Density, mass and panel size

Panel density (and therefore panel mass) varies depending upon the thickness and end use. Typical densities are 350 kg/m^3 to 600 kg/m^3. For example, a 2440mm × 1220mm × 19mm panel will weigh approximately 26kg.

Panel sizes (length × width) commonly available are:

- 1830mm × 1200mm
- 2440mm × 1220mm
- 2750mm × 1220mm
- 3050mm × 1220mm
- 3660mm × 1220mm
- 6200mm × 1280mm
- 6250mm × 2620mm

in thicknesses from 12mm up to 60mm. Several manufacturers specialise in 'door-sizes' to avoid wasteful cutting: 1850mm × 1220mm, 1895mm × 600m, 1895mm × 840mm.

Other sizes are available or can be produced to order. Panels are produced with either square or post form edges.

Table A2.36: Dimensional change for a 1% change in panel moisture content (based on unofficial data)

Type of panel	Grade	Dimensional change at 1% change in panel moisture content		
		Length %	Width %	Thickness %
Flaxboard to BS EN 15197	FB1, FB2 and FB3	0,05	0,05	0,7
	FB4	0,03	0,04	0,5

Applications

The special properties of flaxboard have several advantages in a wide range of non-load-bearing applications. Its lightweight properties and natural characteristics, which aid fire resistance, make it a natural choice for fire resistant door cores and partitions. Different grades of the product are available for different environmental conditions, ranging from general purpose panels for use in dry conditions (for filling purposes and veneering) to non-load-bearing panels for use in humid conditions. The higher grades also find use for interior fitment (including furniture and worktops). Flaxboard can also find uses for acoustic doors and partitioning, packaging in the form of protection panels and profiled pack bearers, table tennis tables, warehouse shelves and worktops.

Specification

Flaxboard manufactured in Europe and used for general purposes, non load-bearing applications and interior fitments in dry conditions, and flaxboards for non load-bearing applications for use in humid conditions may now be specified in accordance with *BS EN 15197*. As explained in PanelGuide *Section 2*, flaxboard that is used in construction must comply (by law) with the Construction Products Regulation (CPR) by compliance with the harmonised European standard for wood-based panels (*BS EN 13986*); this standard calls up *BS EN 15197* which contains the requirements for the following four grades (technical classes):

- FB1: general purpose flaxboard for use in dry conditions (usually for filling purposes)
- FB2: non-load-bearing flaxboard for use in dry conditions (usually for further processing, such as veneering)
- FB3: flaxboard for interior fitment (including furniture) for use in dry conditions
- FB4: non-load-bearing flaxboard for use in humid conditions.

Dry conditions are defined in terms of Service Class 1 of *BS EN 1995-1-1 (Eurocode 5)* which is characterised by the moisture content in the material corresponding to a temperature of 20°C and a relative humidity of the surrounding air only exceeding 65% for a few weeks per year. Panels of this type are only suitable for use in Use Class 1 of *BS EN 335*. Humid conditions are defined in terms of Service Class 2 of *BS EN 1995-1-1 (Eurocode 5)*, which is characterised by a moisture content in the material corresponding to a temperature of 20°C and relative humidity of the surrounding air only exceeding 85% for a few weeks per year.

Guidance on the selection of the different grades of flaxboard is given in tabular format in PanelGuide *Sections 2.4 to 2.14*.

Physical properties

Climate

Like wood-based panel products, flaxboard is hygroscopic and its dimensions change in response to a change in humidity. A 1% change in moisture content increases or decreases the length, width and thickness of the different grades of flaxboard by the amount set out in *Table A2.36*.

As a general guide, flaxboard can be expected to attain the following moisture content under the conditions specified in *Table A2.37*.

Table A2.37: Flaxboard expected moisture content

Relative humidity at 20°C	Approximate equilibrium moisture content
30%	7%
65%	11%
85%	15%

Flaxboard, therefore, should be conditioned to bring it into equilibrium with its environment before it is fixed. This is usually achieved by loose stacking the panels in the room where they will be used prior to fixing them. The time required for the panels to achieve equilibrium moisture content will vary depending upon the temperature and relative humidity in the building (*Table A2.38*).

Table A2.38: Likely equilibrium moisture content of flaxboards in various conditions

In a building with continuous central heating	7% to 9%
In a building with intermittent central heating	9% to 12%
In an unheated building	up to 15%

When components are factory produced for installation on site, it is essential that the site conditions are suitable to receive the components, with wet trades completed and the building dried out.

Panels with enhanced moisture resistance are not waterproof; the term 'moisture resistant' applies to the adhesive binder which (within limits defined by *BS EN 15197*) will not break down in the presence of moisture. Physical wetting of all grades of flaxboard should be avoided.

Biological attack

Flaxboard will not normally be attacked by wood-boring insects common in temperate climates, but is susceptible to fungal attack under prolonged wet conditions.

General guidance on the use of preservative treatments for panel products can be found from the WPA Manual *Industrial wood preservation specification and practice. Commodity Specification C11*. This guidance assists with making the right choice of preservatives for the end use and the panel product to be treated, as not all panel products need to be treated for particular end uses or are indeed suitable for some treatments. It also stresses that the preservative and/or the panel manufacturer should be consulted before any treatment is carried out as treatment may alter the physical and/or visual properties of the panel product.

Water vapour 'permeability'

There is no data currently available on the vapour resistance of flaxboard.

Thermal conductivity

In generic terms, flaxboard can be considered to be a poor thermal conductor because of its relatively low density. Individual manufacturers are obliged to provide performance data in this area where claims are made under the Construction Product Regulations (CPR).

Reaction to fire

Under the Euroclass system for characterising the reaction to fire performance of materials, as taken from *European Commission Decision 2007/348/EC* untreated flaxboard may be assumed to achieve the performance shown in *Table A2.39*.

If the manufactured product does not satisfy any of these minimum requirements and a reaction to fire claim is to be made in a DoP for CE marking purposes, then it must be tested and classified according to *BS EN 13501-1*. However if no claim is made in the DoP for CE marking purposes it is still possible to use the British standard system to make a separate claim.

Further information on the reaction to fire testing in both the BS and EN systems is provided in PanelGuide *Section 2.2.3*.

Storage and handling

Careful storage and handling is important to maintain panels in their correct condition for use; therefore flaxboard must be protected from rain and accidental wetting. During transport, it is particularly important to keep edges well covered. Panels should be stored flat in an enclosed, dry building. When handling panels, the edges and corners should be protected against damage.

Detailed guidance on the storage and handling of wood-based panel materials is given in *DD CEN/TS 12872* and PanelGuide *Section 4*.

Working with flaxboard

Flaxboard can be cut by a hand saw or power saw and machined (routed, spindled, planed and bored) with normal woodworking machinery. Tungsten carbide cutting edges are recommended for use with power tools.

Mechanical joints and fixings

Wherever possible, fittings that depend upon face fixing should be selected; fittings that depend upon the expansion of a component inserted into the panel edge should be avoided.

Table A2.39: Reaction to fire classification without further testing of untreated flaxboard

Product	EN Product standard	End use condition(6)	Minimum density (kg/m^3)	Minimum thickness (mm)	Class (7) (excluding floorings)	Class (8) (floorings)
Flaxboard (1),(2),(5)	BS EN 15197	Without an air gap behind the wood-based panel	600	9	D-s2,d0	-
Flaxboard(3),(5)	BS EN 15197	With a closed or an open air gap not more than 22mm behind the wood-based panel	600	9	D-s2,d2	-
Flaxboard(4),(5)	BS EN 15197	With a closed air gap behind the wood-based panel	600	15	D-s2,d0	-
Flaxboard(4),(5)	BS EN 15197	With an open air gap behind the wood-based panel	600	18	D-s2,d0	-

(1) Mounted without an air gap directly against class A1 or A2-s1, d0 products with minimum density 10 kg/m^3 or at least class D-s2, d2 products with minimum density 400 kg/m^3
(2) A substrate of cellulose insulation material of at least class E may be included if mounted directly against the wood-based panel, but not for floorings
(3) Mounted with an air gap behind. The reverse face of the cavity shall be at least class A2-s1, d0 products with minimum density 10 kg/m^3
(4) Mounted with an air gap behind. The reverse face of the cavity shall be at least class D-s2, d2 products with minimum density 400 kg/m^3
(5) Veneered phenol- and melamine-faced panels are included for class excl. floorings
(6) A vapour barrier with a thickness up to 0,4mm and a mass up to 200 g/m^2 can be mounted in between the wood-based panel and a substrate if there are no air gaps in between
(7) Class as provided for in Table 1 of the Annex to Decision 2000/147/EC
(8) Class as provided for in Table 2 of the Annex to Decision 2000/147/EC
NOTE: The classes given in this table are for unjointed panels, T&G jointed panels installed according *to DD CEN/TS 12872* and fully supported joints installed according to *DD CEN/TS 12872*

Conventional woodworking fixings and techniques can be applied to flaxboard which provides good holding power for screw fixings into the panel faces; generally, edge fixing is not recommended. Parallel core screws should be used because they have greater holding power than conventional wood screws. A high ratio of overall diameter to core diameter is desirable.

Pilot holes for all screw fixings are required. Typically, the holes should be 85% to 90% of the screw core diameter. Fixings into the panel face should not be within 8mm of edges and 25mm of the corners.

Nails and staples can be used for lightly loaded fixings or to hold glued joints while the adhesive sets.

Further information on working with flaxboard is included in PanelGuide *Section 4.4*.

Adhesive-bonded joints

A wide variety of jointing methods can be used, provided the following simple guidelines are observed:

- Ensure the joint parts are accurately machined.
- Use sharp cutters to avoid tearing or burnishing the surfaces to be bonded.
- Use a high solids content adhesive with low flowing properties such as polyvinyl acetate or urea-formaldehyde.
- Locate mating pieces accurately and hold them under pressure while the adhesive sets.
- Ensure the width of grooves machined in flaxboard is limited to about one-third of the thickness of the panel. The depth of groove is typically about one-half of the panel thickness.
- Allow adhesive-bonded joints to condition for several days before sanding and finishing; this avoids the appearance of sunken joints and is essential with high-gloss finishes.
- For an efficient tongued and grooved joint, ensure the fit of the joints is not too tight as this can cause a split along the edge.
- When attaching lipping, ensure the tongue is machined on the solid wood piece.

Finishing

The faces of flaxboard are usually pre-sanded during manufacture to provide a smooth surface suitable for direct application of most veneers and plastic foils.

Additional information on finishing is provided in PanelGuide *Section 4.7*.

Health and safety

Dust

Flaxboard will generate dust when it is machined which, like wood dust, is a potentially hazardous substance and must be controlled. There is no evidence that exposure produces health effects that are different in nature to those associated with exposure to similar levels of dust from conventional wood sources.

Dust from cutting operations can be controlled adequately by complying with the Control of Substances Hazardous to Health (COSHH) Regulations 2002. Under these Regulations flaxboard dust has a Workplace Exposure Limit (WEL) of 5 mg/m^2 expressed as an 8-hour time-weighted average. Exposure must be reduced as far as possible below this limit, usually with properly designed and maintained dust extraction equipment fitted to woodworking machines.

Extraction equipment is often not practicable or even available when using portable or hand-held tools, so a suitable dust mask should be worn. If possible, work in a well-ventilated place.

Further information on dust and dust masks is given in PanelGuide *Section 6*.

Formaldehyde

Free formaldehyde in the workplace atmosphere has a WEL of 2 parts per million (ppm). However, studies indicate that anyone machining flaxboard in mechanically ventilated situations is exposed to levels of free formaldehyde significantly below this.

Two classes of 'in service' formaldehyde potential are specified in *BS EN 13986*, Class E1 and Class E2, E2 being the higher of the two. The test methods available for determining the formaldehyde potential are *BS EN 717-1*, *BS EN 120* and for coated flaxboard, *BS EN 717-2*.

European manufacturers of flaxboard offer standard grades of flaxboard with Class E1. Further information on formaldehyde is given in PanelGuide *Section 6.4*.

Hazards and control

In panel or processed form, flaxboard is non-classifiable under the COSHH Regulations. However, there may be handling hazards.

COSHH Regulation 6 requires an assessment to be made (and normally recorded) of health risks associated with wood dust or formaldehyde, together with any action needed to prevent or control those hazards.

Table A2.40 presents the most common hazards and identifies control methods to minimise the risk of harm actually occurring, more detailed information is given in PanelGuide *Section 6.3* and by the Health and Safety Executive.

Reference

1 BS EN 15197. Wood-based panels. Flaxboards. Specifications, BSI

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