

ANNEX 2G

PARTICLEBOARD (FLAXBOARD)



Description

Flaxboard like particleboard is an engineered sheet 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 EN 309 and contains at least 70% flax and which can also contain other raw materials such as particles of wood.

The flaxboard industry in Europe dates from the late nineteen fifties 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 board in various lengths, and enable it to be cut into many possible sizes without wastage. Flaxboard can now show excellent surface properties and offers numerous benefits. It is a lightweight board and has natural characteristics which aid fire resistance.

Although flaxboard is similar in some ways to particleboard, it has different properties and applications and should not be used as a chipboard substitute.

Flaxboard is a non-structural product.

Composition

Flax shives from the stalk of the flax plant comprise the bulk of flaxboard and are prepared in a mechanical chipper and can also contain 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) 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 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. 6-8% formaldehyde based resin or 2-3% PMDI, 5-7% water, 2-3 % Nitrated Ammonium and 1-2% 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, but for identification purposes the whole panel, or individual layers of the panel, may be dyed according to industry practices (eg green for panels with enhanced moisture resistance). The presence of a coloured surface does not in itself infer that these enhanced properties are present and reference should always be made to panel markings or manufacturer's literature to confirm such enhanced performance.

Density, mass and sheet size

Panel density (and thus board mass) varies depending upon the thickness and end-use. Typical densities are 350 - 600kg/m³. Thus, for example, a 2440 x 1220 x 19mm panel will weigh approximately 26 kg.

Panel sizes (length x width) commonly available are 1830mm x 1200mm, 2440mm x 1220mm, 2750mm x 1220mm, 3050mm x 1220mm, 3660mm x 1220mm, 6200mm x 1280mm, 6250mm x 2620mm in thicknesses from 12mm up to 60mm. Several manufacturers specialise in "door-sizes" to avoid wasteful cutting, e.g. 1850mm x 1220mm, 1895mm x 600mm, 1895mm x 840mm.

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

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 board for use in dry conditions (for filling purposes and veneering) to non-

load bearing board for use in humid conditions. The higher grades also find use for interior fitment (including furniture and worktops).

Flaxboard can also find uses for doors, partitioning walls and packaging (protection sheets), table tennis tables, and warehouse shelves.

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 the European standard EN 15197 (Flaxboards – Specifications). As explained in Section 2 of PanelGuide, flaxboard that is used in construction must comply (by law) with the CPD and the 6 essential requirements, the easiest way to achieve this is compliance with the Harmonised Standard for wood-based panels (EN 13986); this standard calls up 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 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. Boards of this type are only suitable for use in biological hazard class 1 of EN 335-3. Humid conditions are defined in terms of service class 2 of 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.

A type FB4 board is equivalent in terms of technical class to P3 chipboard

Guidance on the selection of the different grades of flaxboard is given in tabular format in sections 2.3 to 2.14 of PanelGuide.

Physical properties

a) 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 particleboard by the amount set out in the table below:-

Dimensional change for a 1% change in panel moisture content (based on un official data)

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

As a general guide, particleboards can be expected to attain the following moisture content under the following specified conditions.

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 sheets in the room where they will be used prior to fixing them. The time required for the boards to achieve equilibrium moisture content will vary depending upon the temperature and relative humidity in the building. The likely equilibrium moisture content of particleboards in various conditions are as follows:

In a building with continuous central heating:	7-9%
In a building with intermittent central heating:	9-12%
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 EN 15197) will not break down in the presence of moisture. Physical wetting of all grades of flaxboard should be avoided.

b) 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 Wood Protection Association manual 'Industrial Wood Preservation – specification and practice Commodity Specification C11. This guidance helps make 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.

c) Water vapour 'permeability'

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

d) Thermal conductivity

There is no official data for the thermal conductivity for flaxboard. Flaxboard can be considered to be relatively good for thermal conductivity because of its relatively low density. However, it is not sold based on any particular suitability in this respect; rather the end users have to satisfy themselves as to the suitability for any application.

e) Reaction to Fire

Under the new Euroclass system for characterising the reaction to fire performance of materials, an untreated particleboard may be assumed to achieve the following:

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)}	EN 15197	Without an air gap behind the wood-based panel	600	9	D-s2,d0	-
Flaxboard ^{(3) (5)}	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)}	EN 15197	With a closed air gap behind the wood-based panel	600	15	D-s2,d0	-
Flaxboard ^{(4) (5)}	EN 15197	With an open air gap behind the wood-based panel	600	18	D-s2,d0	-
<p>⁽¹⁾ Mounted without an air gap directly against class A1 or A2-s1, d0 products with minimum density 10kg/m³ or at least class D-s2, d2 products with minimum density 400 kg/m³.</p> <p>⁽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.</p> <p>⁽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/m³.</p> <p>⁽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/m³.</p> <p>⁽⁵⁾ Veneered phenol- and melamine-faced panels are included for class excl. floorings.</p> <p>⁽⁶⁾ A vapour barrier with a thickness up to 0,4mm and a mass up to 200 g/m² can be mounted in between the wood-based panel and a substrate if there are no air gaps in between.</p> <p>⁽⁷⁾ Class as provided for in Table 1 of the Annex to Decision 2000/147/EC.</p> <p>⁽⁸⁾ Class as provided for in Table 2 of the Annex to Decision 2000/147/EC.</p>						
<p>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.</p>						

If the manufactured product does not satisfy any of these minimum requirements then it must be tested and classified according to EN 13501-1.

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

Storage and handling

Careful storage and handling is important to maintain panels in their correct condition for use; thus, flaxboard must be protected from rain and accidental soaking. 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 Section 4 of PanelGuide.

Working with flaxboard

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

a) 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 board edge should be avoided.

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 particleboard is included in Section 4.4 of PanelGuide.

b) Adhesive-bonded joints

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

- The joint parts should be 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.
- The width of grooves machined in particleboard should be limited to about one-third of the thickness of the board. 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.
- A tongue and groove joint is very efficient, provided the fit of the joints is not too tight to cause a split along the edge.
- When attaching lippings, the tongue should be machined on the solid wood piece.

c) Finishing

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

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

Health and safety

a) Dust

Flaxboard will generate dust when it is machined and, 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 other 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 5mg/m³ 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 (for example, Type FFP2 to EN 149) should be worn. If possible, work in a well-ventilated place.

Further information on dust is given in Section 6.3 of PanelGuide.

b) Formaldehyde

Free formaldehyde in the workplace atmosphere has an 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 (determined in accordance with EN 120, EN 717-1 and EN 717-2)are specified in Harmonised Standard (EN 13986) at a moisture content of 6.5%:

- Class E1 \leq 8mg/100g dry board
- Class E2 > 8 to \leq 30mg/100g dry board

Manufacturers of flaxboard offer standard grades of flaxboard with Class E1 and Class E2 formaldehyde content. Further information on formaldehyde is given in Section 6.4 of PanelGuide.

c) Hazards and control

In sheet or processed form, flaxboard is non-classifiable under the COSHH regulations. However, as with particleboard, 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.

The table below gives the most common hazards and identifies control methods to minimise the risk of harm actually occurring.

Common hazards and methods of control

Activity	Hazard	Control
Manual handling (in full sheet form)	Large sheet sizes present a risk of strain or crush injuries if not handled correctly.	Store carefully in uniform stacks on a flat level base. Use mechanical handling equipment. Adopt correct manual handling procedures.
Carpentry work Activities likely to produce high dust levels include: <ul style="list-style-type: none"> • Sanding by machine and hand • Sawing, routing and turning • Hand assembling machined or sanded components. 	Wood dust in general (including dust from flaxboard) may cause dermatitis and allergic respiratory effects. Wood dust is flammable.	Off site: preparation under exhaust ventilated plant. On site: enclosure and exhaust ventilation. Dust extraction on portable tools. Good ventilation. Respiratory protection equipment. <i>Note:</i> Any health hazards arising from the use of particleboard at work can and should be controlled by compliance with the requirements of the Control of Substances Hazardous to Health (COSHH) Regulations 2002.